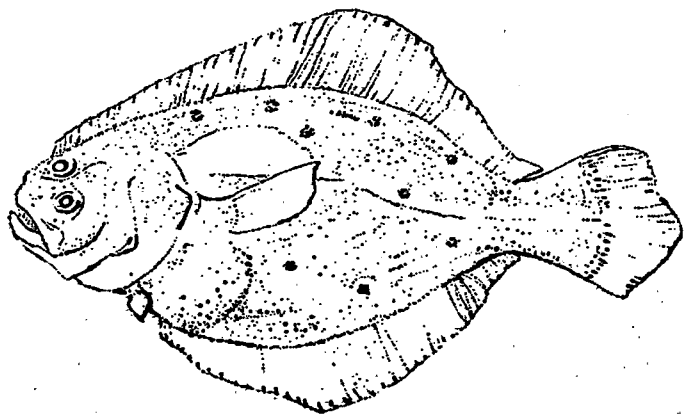
EPA-903-R-92-006

Chesapeake Bay Summer Flounder Fishery Management Plan



Agreement Commitment Report 1991

Chesapeake Bay Program

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Chesapeake Bay Summer Flounder Fishery Management Plan

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Agreement Commitment Report 1991

Produced under contract to the U.S. Environmental Protection Agency
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ADOPTION STATEMENT

We, the undersigned, adopt the Chesapeake Bay Summer Flounder Fishery Management Plan in partial fulfillment of Living Resources Commitment Number 4 of the 1987 Chesapeake Bay Agreement:

> *". . . by July to develop, adopt, and begin to implement a Bay-wide management plan of oysters, blue crabs, and American Shad. Plans for the other major commercially, recreationally and ecologically valuable species should be initiated by 1990."*

The Summer Flounder was designated a valuable species in the Schedule for Developing Baywide Resource Management Strategies. In 1991, the Summer Flounder plan was completed.

We agree to accept the plan as a guide to managing the Summer Flounder stock in the Chesapeake Bay and its tributaries for optimum ecological, social and economic benefits. We further agree to work together to implement, by the dates set forth in the plan, management actions recommended to monitor the status of the stocks, obtain catch and effort information from the bait fishery, address research and monitoring needs, and develop the habitat and water quality criteria necessary for healthy Summer Flounder populations.

We recognize the need to commit long-term, stable, financial support and human resources to the task of managing the Summer Flounder stock. In addition, we direct the Living Resources Subcommittee to periodically review and update the plan and report on progress made in achieving the plan's management recommendations.

Date December 18, 1992

For the Commonwealth of Virginia _____

For the State of Maryland _____

For the Commonwealth of Pennsylvania _____

For the United States of America _____

For the District of Columbia _____

For the Chesapeake Bay Commission _____

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EXECUTIVE SUMMARY

Introduction

One of the strategies for implementing the Living Resources Commitments of the 1987 Chesapeake Bay Agreement is to develop and adopt a series of baywide fishery management plans (FMPs) for commercially, recreationally, and selected ecologically valuable species. The FMPs are to be implemented by the Commonwealth of Pennsylvania, Commonwealth of Virginia, District of Columbia, Potomac River Fisheries Commission, and State of Maryland as appropriate. Under a timetable adopted for completing management plans for several important species, the summer flounder FMP was scheduled for completion in December 1991.

A comprehensive approach to managing Chesapeake Bay fisheries is needed because biological, physical, economic, and social aspects of the fisheries are shared among the Bay's jurisdictions. The Chesapeake Bay Program's Living Resources Subcommittee formed a Fisheries Management Workgroup to address the commitment in the Bay Agreement for comprehensive, bay-wide fishery management plans. The workgroup is composed of members from government agencies, the academic community, the fishing industry, and public interest groups representing Pennsylvania, Maryland, Virginia, the District of Columbia, and the federal government.

Development of Fishery Management Plans

An FMP prepared under the 1987 Chesapeake Bay Agreement serves as a framework for conserving and wisely using a fishery resource of the Bay. Each management plan contains a summary of the fishery under consideration, a discussion of problems and issues that have arisen, and recommended management actions. An implementation plan is included at the end of the FMP to provide additional details on the actions that participating jurisdictions will take and the mechanisms for taking these actions.

Development of a fishery management plan is a dynamic, ongoing process. The process starts with initial input by the Fishery Management Workgroup, is followed by public and scientific review of the management proposals, and then by endorsement by the appropriate Chesapeake Bay Program committees. A management plan is adopted when it is signed by the Chesapeake Bay Program's Executive Committee. In some cases, regulatory and legislative action will have to be initiated, while in others, additional funding and staffing may be required to fully implement a management action. A periodic review of each FMP will be conducted under the auspices of the Bay Program's Living Resources Subcommittee, to incorporate new information and to update management strategies as needed.

Goal Statement

The goal of the Chesapeake Bay Summer Flounder Management Plan is to enhance and perpetuate summer flounder stocks in the Chesapeake Bay and its tributaries, and throughout their Atlantic coast range, so as to generate optimum long-term ecological, social and economic benefits from their commercial and recreational harvest and utilization over time.

In order to meet this goal, a number of objectives must be met. They include following the guidelines established by the Atlantic States Marine Fisheries Commission (ASMFC) and the Mid-Atlantic Fishery Management Council (MAFMC) for coastwide management of the summer flounder fishery, providing for fair allocation of the resource, promoting efficient harvesting practices, promoting biological and economic research and pursuing standards of environmental quality and habitat protection. These objectives are incorporated into the problems and management strategies discussed below.

Problem Areas and Management Strategies

Problem 1: Overfishing. The summer flounder is an important fishery resource along the Atlantic coast, particularly between New York and North Carolina. Total coastwide landings by weight have shown a decreasing trend since 1980. Recent stock assessments indicate that summer flounder stocks along the entire Atlantic coast are experiencing growth and recruitment overfishing. The 1990 NEFC stock assessment workshop (11th SAW) describes the summer flounder population as being overexploited and seriously depleted; of the twelve species or groups of species examined by the workshop, no other species was found to be as depleted as summer flounder. Estimated fishing mortality (F) was computed as greater than 1.4 and as high as 2.1. Thus, current fishing mortality is at least six times the MAFMC target level of 0.23. At this rate of fishing mortality, only 20 % of all summer flounder alive now will be alive one year later. The spawning stock of summer flounder is severely depleted. Flounder are being caught at such a small size that each female flounder is contributing only 2-3 % of the eggs which she is capable of producing. The Mid-Atlantic summer flounder stock also shows compression of age structure as measured by scientific research surveys, historical length-frequency analyses of commercial catch data and age composition data from the 1976-1990 NEFC surveys. Summer flounder between the ages of five and eight were regularly captured in NEFC surveys from 1976-1981; by 1990, the oldest fish observed were three years of age. Compression of age structure is considered a primary indicator of overexploitation in a stock.

Strategy 1: Bay jurisdictions will evaluate a number of alternatives to control directed fishing mortality and improve protection of summer flounder beyond age I. Management options include higher minimum size limits, trawling bans, mesh size restrictions and hook-and-line creel limits. Management agencies

will continue to participate in deliberations to protect small flounder in other coastal states and in the Exclusive Economic Zone.

Problem 2 - Stock Assessment and Research Needs: Currently, fisheries managers lack some of the biological and fisheries data necessary for effective management of the flounder resource.

Strategy 2 - Stock Assessment and Research Needs: Atlantic coast databases are limited concerning harvest, fishing effort and biological characteristics of the harvest and fishery independent measures of summer flounder stocks. Specific research to address these deficiencies will be identified.

Problem 3 - Habitat Issues: Estuarine areas are utilized by summer flounder stocks for nursery and feeding grounds. Increasing urbanization and industrial development of the Atlantic coastal plain has resulted in a decrease in the environmental quality of many estuarine communities. Estuarine habitat loss and degradation in Chesapeake Bay may contribute to declines in summer flounder stocks.

Strategy 3 - Habitat Issues: The jurisdictions will continue their efforts to improve water quality and define habitat requirements for the living resources in the Chesapeake Bay.

INTRODUCTION

MANAGEMENT PLAN BACKGROUND

As part of the 1987 Chesapeake Bay Agreement's commitment to protect and manage the natural resources of the Chesapeake Bay, the Bay jurisdictions are developing a series of fishery management plans covering commercially, recreationally, and selected ecologically valuable species. Under the agreement's Schedule for Developing Baywide Resource Management Strategies, a list of the priority species was formulated, with a timetable for completing fishery management plans as follows:

- oysters, blue crabs and American shad by July 1989;
- striped bass, bluefish, weakfish and spotted seatrout by 1990;
- croaker, spot, summer flounder and American eel by 1991;
- red and black drum by 1992; and
- Spanish mackerel, king mackerel, tautog, black sea bass and freshwater catfish by 1993

A comprehensive and coordinated approach by the various local, state and federal groups in the Chesapeake Bay watershed is central to successful fishery management. Bay fisheries are traditionally managed separately by Pennsylvania, Maryland, Virginia, the District of Columbia, and the Potomac River Fisheries Commission (PRFC). There is also a federal Mid-Atlantic Fishery Management Council, which has management jurisdiction for offshore fisheries (3-200 miles), and a coast-wide organization, the Atlantic States Marine Fisheries Commission (ASMFC), which coordinates the management of migratory species in state waters (internal waters to 3 miles offshore) from Maine to Florida. The state/federal Chesapeake Bay Stock Assessment Committee (CBSAC) is responsible for developing a Baywide Stock Assessment Plan, which includes collection and analysis of fisheries information, but does not include the development of fishery management plans.

Consequently, a Fisheries Management Workgroup, under the auspices of the Chesapeake Bay Program's Living Resources Subcommittee, was formed to address the commitment in the Bay Agreement for Baywide fishery management plans. The Fisheries Management Workgroup is responsible for developing fishery management plans with a broad-based view. The workgroup's members represent fishery management agencies from Maryland, Pennsylvania, Virginia, the District of Columbia, and the federal government; the Potomac River Fisheries Commission; the Bay area academic community; the fishing industry; conservation groups; and interested citizens. Establishing Chesapeake Bay FMP's, in addition to coastal FMP's, creates a format to specifically address problems that are unique to the Chesapeake Bay. They

also serve as the basis for implementing regulations in the Bay jurisdictions.

WHAT IS A FISHERY MANAGEMENT PLAN?

A Chesapeake Bay fishery management plan provides a framework for the Bay jurisdictions to undertake compatible, coordinated management measures to conserve and utilize a fishery resource. A management plan includes pertinent background information, lists management actions that need to be taken, the jurisdictions responsible for implementation, and an implementation timetable.

A fishery management plan is not an endpoint in the management of a fishery; rather, it is part of a dynamic, ongoing process consisting of several steps. The first step consists of analyzing the complex biological, economic and social aspects of a particular finfish or shellfish fishery. The second step includes defining a fishery's problems, identifying potential solutions, and choosing appropriate management strategies. Next, the chosen management strategies are put into action or implemented. Finally, a plan must be regularly reviewed and updated in order to respond to the most current information on the fishery; this requires that a management plan be adaptive and flexible.

GOALS AND OBJECTIVES FOR FISHERY MANAGEMENT PLANS

The goal of fisheries management is to protect the reproductive capability of the resource while providing for its optimal use by man. Fisheries management must include biological, economic and sociological considerations in order to be effective. Three simply stated objectives to protect the reproductive capabilities of the resource while allowing its optimal use include:

- quantify biologically appropriate levels of harvest;
- monitor current and future resource status to ensure harvest levels are conserving the species while maintaining an economically viable fishery; and
- adjust resource status if necessary, through management efforts.

MANAGEMENT PLAN FORMAT

The background section of this management plan summarizes:

- natural history and biological profile of summer flounder;
- FMP status and management unit;

- fishery parameters;
- habitat issues;
- historical fishery trends;
- economic perspective;
- current resource status;
- current laws and regulations in the Chesapeake Bay; and
- data and analytical needs.

The background information is derived primarily from the document entitled, Chesapeake Bay Fisheries: Status, Trends, Priorities and Data Needs and is supplemented with additional data. Inclusion of this section as part of the management plan provides historical background and basic biological information for the species.

The management section of the plan, which follows the background, defines:

- the goal and objectives for the species;
- problem areas for the species;
- management strategies to address each problem area; and
- action items with a schedule for implementation.

THE CHESAPEAKE BAY PROGRAM'S FISHERY MANAGEMENT PLANNING PROCESS

The planning process starts with initial input by the Fisheries Management Workgroup and development of a draft plan. This is followed by a review of the management proposals by Bay program committees, other scientists and resource managers, and the public. After a revised draft management plan is prepared, it must be endorsed by the Chesapeake Bay Program's Living Resources Subcommittee and Implementation and Principal Staff committees. The plan is then sent to the Executive Committee for adoption.

Upon adoption by the Executive Committee, the appropriate management agencies implement the plan. In 1990, the Maryland legislature approved § 4-215 of the Natural Resources Article giving the Maryland Department of Natural Resources authority to regulate a fishery once an FMP has been adopted by regulation. In Virginia, FMP recommendations are pursued either by legislative changes or through a public regulatory process conducted by the Commission. A periodic review of each FMP is conducted by the Fisheries Management Workgroup to incorporate new information and to update management strategies as needed.

SECTION 1. BACKGROUND

Life History - Summer Flounder

The summer flounder, or fluke, Paralichthys dentatus (Linnaeus), is a member of the lefteye flounder family, Bothidae. As such, it is recognizable from the winter flounder, which has its eyes on the right side of its body and is also found in Chesapeake Bay waters and the yellowtail flounder, occasionally caught in Maryland and Virginia offshore fisheries. Other members of the various flatfish families found in the Chesapeake Bay are generally too small to be of interest to commercial or recreational fishermen or to present an identification problem, with the rare exception of the Atlantic Halibut.

All flatfishes are bottom dwelling predators, relying on their flattened shape and ability to change coloration and pattern on the upper (eyed) side of their bodies to lie in ambush for prey. Flounder are efficient predators with quick movements and sharp teeth allowing them to capture the small fishes, squid, seaworms, shrimp and other crustaceans which comprise the bulk of their diet (Lux et. al., 1966).

The geographic range of summer flounder includes estuarine and coastal waters from Nova Scotia to Florida (Liem and Scott, 1966). They are found in waters with salinities from 0 to 37 ppt. and temperatures from 49 to 88°F (6.6 to 31.2 ^{o}C) , inhabiting depths of 13 to 118 feet (4 to 36 m) in summer and 118 to 600 feet (36 to 183 m) in winter (Bigelow and Schroeder, 1953). Occurrence in Chesapeake Bay waters is largely restricted to waters south of Annapolis (U.S.F.W.S., 1978), but they can occasionally be found in the upper Bay. The center of abundance for this species lies within the Mid-Atlantic Bight, with numbers diminishing north of Cape Cod, Massachusetts and south of Cape Fear, North Carolina (Grosslein and Azarovitz, 1982). Within Chesapeake Bay, summer flounder range from marine waters of the Territorial Sea to inland estuarine waters of the Eastern Shore Seaside, Chesapeake Bay and its tributaries.

Summer flounder generally inhabit coastal and estuarine waters during warmer months and migrate to offshore waters (100 to 600 feet) during fall and winter (Bigelow and Schroeder, 1953). Offshore migration is presumably cued by decreasing water temperatures and declining fall photoperiods (MAFMC, 1987). Typically, adult summer flounder are scarce or absent in inland waters during winter months. Winter NEFC bottom trawl surveys in Northeast US continental shelf waters generally did not find adult summer flounder at depths less than 230 feet (70 m); prerecruits (fish less than or equal to 12 inches) were usually found in less than 130 feet (40 m) and never greater than 200 feet (60 m) in depth. A mild winter can delay or alter offshore movements resulting in some adult fish overwintering in the Chesapeake Bay mouth and Territorial Sea.

Spawning occurs in the fall and winter during offshore migrations and at the wintering grounds. Migratory patterns vary with latitude; northern populations move offshore and spawn earlier, southern populations spawn closer inshore and later (Smith, 1973). Off the coast of New Jersey and Delaware, spawning occurs mostly at depths of 66 to 157 feet (20-48 m) and 14 to 38 miles (22-61 km) offshore; 40 miles (65 km) offshore of Maryland and 6 to 12 miles (9-19 km) off North Carolina.

Winter spawning migrations from Chesapeake Bay waters begin in October. Fish move south along the beach (nearshore area) from October to December, gradually moving to an area approximately 20 miles east of Oregon Inlet in January-March. Samples taken during a November 1988 cruise north of Currituck Beach, North Carolina and approximately 1 1/2 miles offshore, found some partially spent females (Musick, 1989). This is evidence that some spawning is occurring during the early portion (October-December) of the migration in close proximity to the beach. North of Chesapeake Bay, the spawning season lasts from September to December and south of Chesapeake Bay, from November to February. Peak spawning activity off the Virginia Capes occurs between October and November. Larvae and post-larvae drift and migrate inshore, aided by prevailing water currents, entering coastal and estuarine nursery areas between October and May (Williams and Deubler, 1968). Movements of larval, transforming and possibly juvenile flounder into estuaries occur over an extended time period (Able et al., 1990).

Upon reaching the estuaries, larval flounder undergo a metamorphosis to the post-larval stage which resembles the adult fish. Larval flounder more closely resemble the larvae of other fishes than adult flounder, with body symmetry and eyes on both sides of their head. During metamorphosis, the eyes of the larval flounder gradually migrate to the left side of the head and the body takes on a flattened appearence, as in the adult fish (Lux et. al., 1966). Once metamorphosis is complete the post-larval flounder assumes the bottom dwelling lifestyle characteristic of the adult fish (Smith, 1973).

The primary Atlantic Coast nursery grounds are Chesapeake Bay, coastal Virginia and Maryland bays, and North Carolina sounds (Poole, 1966). Some juveniles in the Chesapeake Bay region migrate to offshore waters at the end of their first year, while others remain in inshore nursery areas. Thus, fish of all ages are vulnerable to exploitation by both the recreational and commercial, inshore and offshore fisheries (Henderson, 1979).

Juvenile summer flounder abundance above Cape Hatteras is greatest in the Chesapeake Bight area. Northeast summer flounder stocks obtain some recruitment from the Delaware Bay, in addition to the nursery grounds mentioned above. Recruitment success above Delaware Bay is poor, primarily due to winter kills. However, juveniles are found in estuarine waters from Massachusetts to North Carolina during spring, summer and fall. In southern waters, these young fish will overwinter in bays and sounds. In

northern waters, juveniles may move offshore with adults, however, juvenile fish will overwinter inshore. Bottom trawl surveys conducted by the Applied Marine Research Laboratory (AMRL) of Old Dominion University in the lower Chesapeake Bay, Elizabeth and James Rivers, found young of the year summer flounder in the Bay throughout the winter.

Analysis of summer flounder population structure from the Middle and South Atlantic Bights resulted in the identification of two summer flounder stocks (Smith, 1973; Gillikin et. al, 1981; Desfosse et. al., 1990). Linear discriminant analysis of morphometric and meristic data demonstrated a significant difference in samples north and south of Cape Hatteras (Wilk et. al., 1980). Middle Atlantic Bight samples were statistically similar as were South Atlantic Bight samples, with population intermixing most prevalent off North Carolina.

The ASMFC and MAFMC have used a unit stock in preparing their management plans, based upon the best available scientific data at the time of writing those plans. This plan will also use a unit stock assumption for consistency with these plans.

FMP Status and Management Unit

The Atlantic States Marine Fisheries Commission (ASMFC) plan was adopted in 1982 and the Mid-Atlantic Fishery Management Council (MAFMC) FMP was completed in October 1987 and approved by the National Marine Fisheries Service in September 1988. The Virginia Summer Flounder Management Plan was completed and signed into law in 1989. An ammendment (#1) to the MAFMC plan was completed in September 1990, but was partially disapproved by the Secretary of Commerce. A second ammendment is due for consideration in 1991. The Chesapeake Bay FMP, consistent with the ASMFC, MAFMC and Virginia plans, will be completed by December 1991.

The management unit is summer flounder (Paralichthys dentatus) in U.S. waters from Maine to North Carolina.

Fishery Parameters

Status of exploitation:	Overexploited and seriously depleted.
Long-term potential catch:	There is no generally accepted estimate of MSY, despite improved commercial and recreational data.
Importance of recreational fishery:	Very significant.
Importance of commercial fishery:	Very significant, especially in the

Exclusive Economic Zone (which extends from 3-200 miles offshore and is under the jurisdiction of the Mid-Atlantic Council). Summer flounder have traditionally ranked first in finfish value for species landed in Virginia.

Fishing mortality rates: Annual rates for the Atlantic Coast population 70% both sexes combined (M = 0.20) during the late-1980s (F= 1.0 or higher). More recent estimates of F = 1.4 during 1982-1988 and F = 2.1, 1985-1989 (11th SAW). Overfishing is defined by MAFMC as F> 0.23. Total mortality in Virginia for 1987-1989 is estimated at 78 %.

Biological Profile

Natural mortality rate: Approximately 18% a year (M= 0.2).

Fecundity: 463,000 - 4,188,000 eggs/fish at sizes of 14" to 27" (356-686mm) TL.

Age/Size at maturity: The length at which 50 percent of the fish are mature is estimated at 11.0" (280mm) for males and 13.0" (330mm) for females.

Longevity: 20 years.

Spawning and Larval Development

Spawning season: There is a seasonal progression in spawning from north to south. Spawning north of Chesapeake Bay peaks in October, and spawning south of Chesapeake Bay peaks in November.

Spawning area: Cape Cod, Massachusetts to Cape Lookout, North Carolina.

Location: Spawning occurs at depths of 65-160 feet as adults migrate towards, or are on, the continental shelf. In the Mid-Atlantic Bight, eggs occur in greatest concentrations in an area about 30-35 miles off the coast. Eggs are most abundant in surface waters. Larvae and post-larvae drift and/or migrate inshore, entering coastal nursery areas from October through May.

Salinity:	Optimal spawning salinity is 32 to 35 ppt; most larvae occur at salinities greater than 8 ppt.
Temperature:	Adults inhabit water ranging from 49-88°F (6.6-31.2°C), optimal spawning temperature is 53 to 66° F (12-19° C).

Young-of-Year

Location:	Juveniles move into brackish or estuarine waters shortly after metamorphosis is complete. At sizes of about 6" TL, they begin to move back to marine water.
Salinity:	0 to 37 ppt. Growth rate of post-larvae is positively correlated with increasing salinity.
Temperature:	36 to 88° F (2-31°C).

Subadults and Adults

Location:	Shallow coastal and estuarine waters during the warmer months of the year; offshore in 120-600 feet of water during fall and winter. After age three, summer flounder occur almost exclusively in coastal waters.
Salinity:	0 to 37 ppt.
Temperature:	43 to 88° F (6-31°C).

Habitat Issues

Coastal and estuarine areas are extremely important as feeding and nursery areas for summer flounder. Consequently, habitat modifications such as those resulting from dredging, filling, coastal construction, energy development, sewage effluent and ocean dumping pose potentially serious, but as yet unquantified, threats to the summer flounder resource.

About 75% of the U.S. population lives within 50 miles of the coasts. Since U.S. population growth is expected to continue well into the next century, the rate of degradation in Atlantic estuarine and coastal habitat will accelerate in the future, if current land and water use practices are not modified.

The coincidental timing of the offshore fall/winter flounder

migration, and attendant trawl fishery, and the seasonal departure of sea turtles from temperate latitudes has recently created concern over the effects of flounder trawling off the southern Virginia and North Carolina coast. One species of sea turtle, the Kemp's ridley, is considered endangered, and is therefore subject to inclusion for protection under the Endangered Species Act. The NMFS Biological opinion on the Summer Flounder Management Plan determined that "the continued unrestricted operation of this fishery jeopardizes the continued existence of the Kemp's ridley population."

Discussions were held with the governing agencies and the state of North Carolina to determine how to best comply with measures designed to reduce mortality on sea turtle populations in the flounder trawl fishery. It was determined that increased turtle mortality in recent years was largely attributable to higher sea surface temperatures off the Virginia/North Carolina coast. In order to reduce turtle mortality and better monitor the effects of the fishery, it was decided to implement a program employing observers, limited tow times and turtle excluder devices (TEDS) in the Virginia/North Carolina flounder trawl fishery from January 24 to March 5, 1992.

The Fisheries

Total Atlantic coast landings of summer flounder for 1990 were 11.5 million pounds. This figure represents a 46% decline from 1989 landings, a 60% decline from the 1980-1989 ten year average and a 73% decline from the 1979 peak landings of 42.9 million pounds.

Summer flounder landed in Maryland and Virginia are harvested primarily in offshore coastal waters by otter trawls (Figures 1 & 2). For example, during the period 1980-1989 about 81% of the Virginia commercial catch and 80% of the Maryland commercial harvest were taken in the Exclusive Economic Zone (EEZ). In 1990, over 90% of Virginia's flounder landings came from the offshore fishery (Figure 2), despite the closure of Virginia's Territorial Sea to trawling in 1989.

Maryland commercial flounder harvest for the Chesapeake Bay and ocean fisheries combined generally increased from the 1930s through 1958 (Figure 3), declined through the early 1970s, and then increased to an all time high of 1.7 million pounds in 1979. During the 1980s, the Maryland commercial harvest has declined from 1.3 (1980) to 0.18 million pounds (1989) (Figures 3 & 5), with an associated decline in the value of fish landed from 600,000 to 275,000 dollars (Figure 6). Preliminary 1990 landings were 83,000 pounds.

The commercial harvest in Virginia has historically been an order of magnitude higher than the Maryland catch (Figure 5). The Virginia harvest gradually increased from about 300,000 pounds a year in the 1930s to about 2 million pounds a year in the early

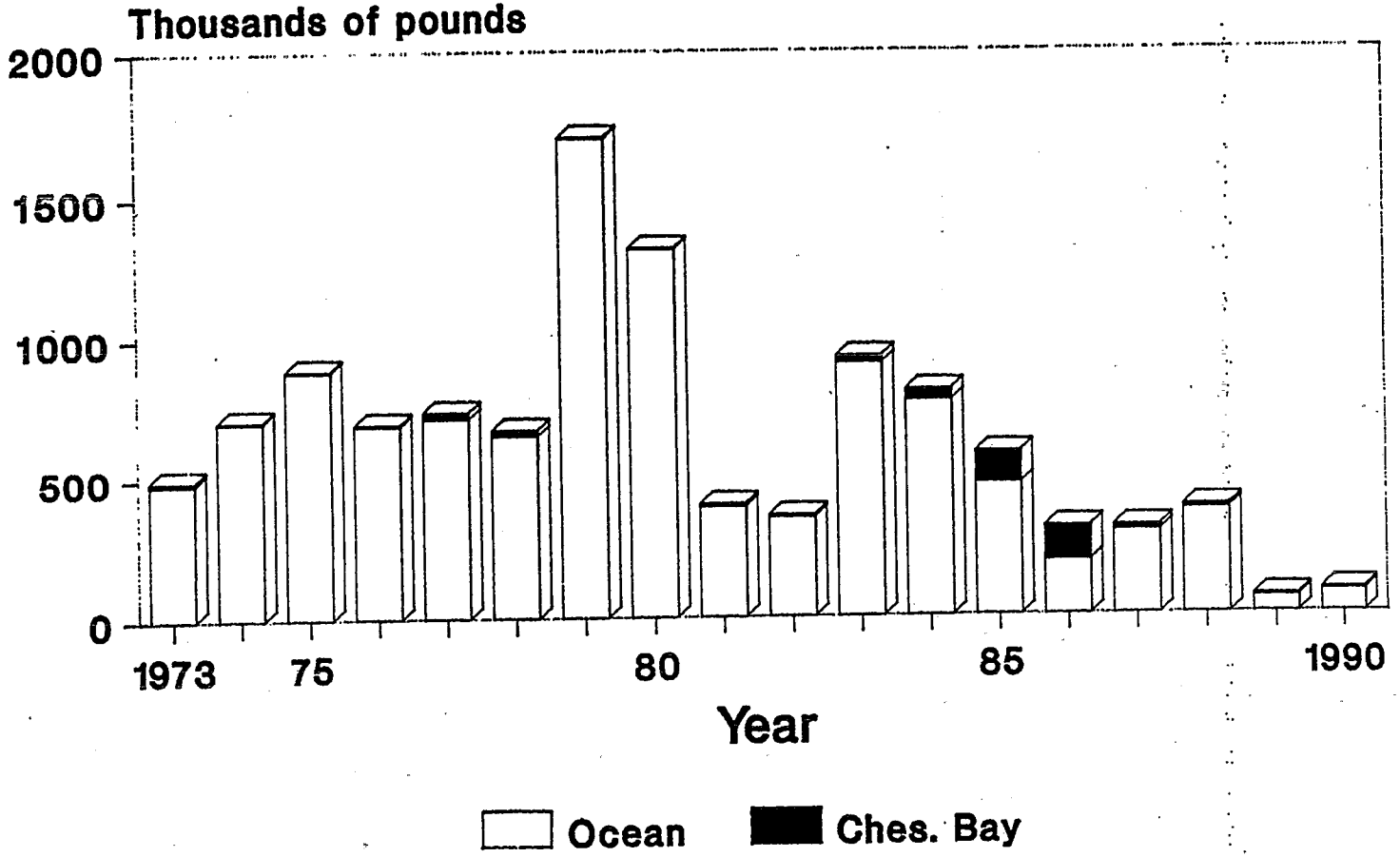
1970s (Figure 4). Landings then increased dramatically through 1979, when an all time high of 10 million pounds was recorded. Virginia harvests in the 1980s have ranged from 3.6 million pounds (1981 and 1989) to 9.6 million pounds (1984)(Figure 4), with dockside value ranging between 2 and 8 million dollars (Figure 7). In 1989, Virginia prohibited all trawling in its territorial waters as a specific effort to protect summer flounder (VMRC, 1989b). Preliminary figures for 1990 indicate a harvest of approximately 2.1 million pounds.

Separation of Virginia's summer flounder landings into ocean and bay categories gives a clearer indication of trends in the fishery (Figures 8 & 9). The ocean fishery is comprised almost entirely of trawl landings. Increasing capital investment, with resultant increases in efficiency, in this segment of the fishery since the early 1970's (Ross et al., 1990) allowed increased catch rates initially and then helped slow the decline in flounder landings (Figure 8). Attempts to maintain high landings in this fishery have resulted in long term (VMRC, 1990; Ross et al., 1990) and short term (Pearson, 1932; Ross et al., 1990) decreases in the average size of fish caught and lower catch per unit effort (Ross et al., 1990; 1991).

In contrast, the Chesapeake Bay fishery has remained relatively unchanged in regards to gear type and efficiency during the same time period, with the exception of a ban on trawling in state waters enacted in July, 1989. Landings from this segment of the fishery have declined from 450 thousand pounds annually in the 1970's to 61 thousand pounds in 1990 (Figure 9). The majority of this decline in landings occurred prior to the moratorium on trawling in state waters.

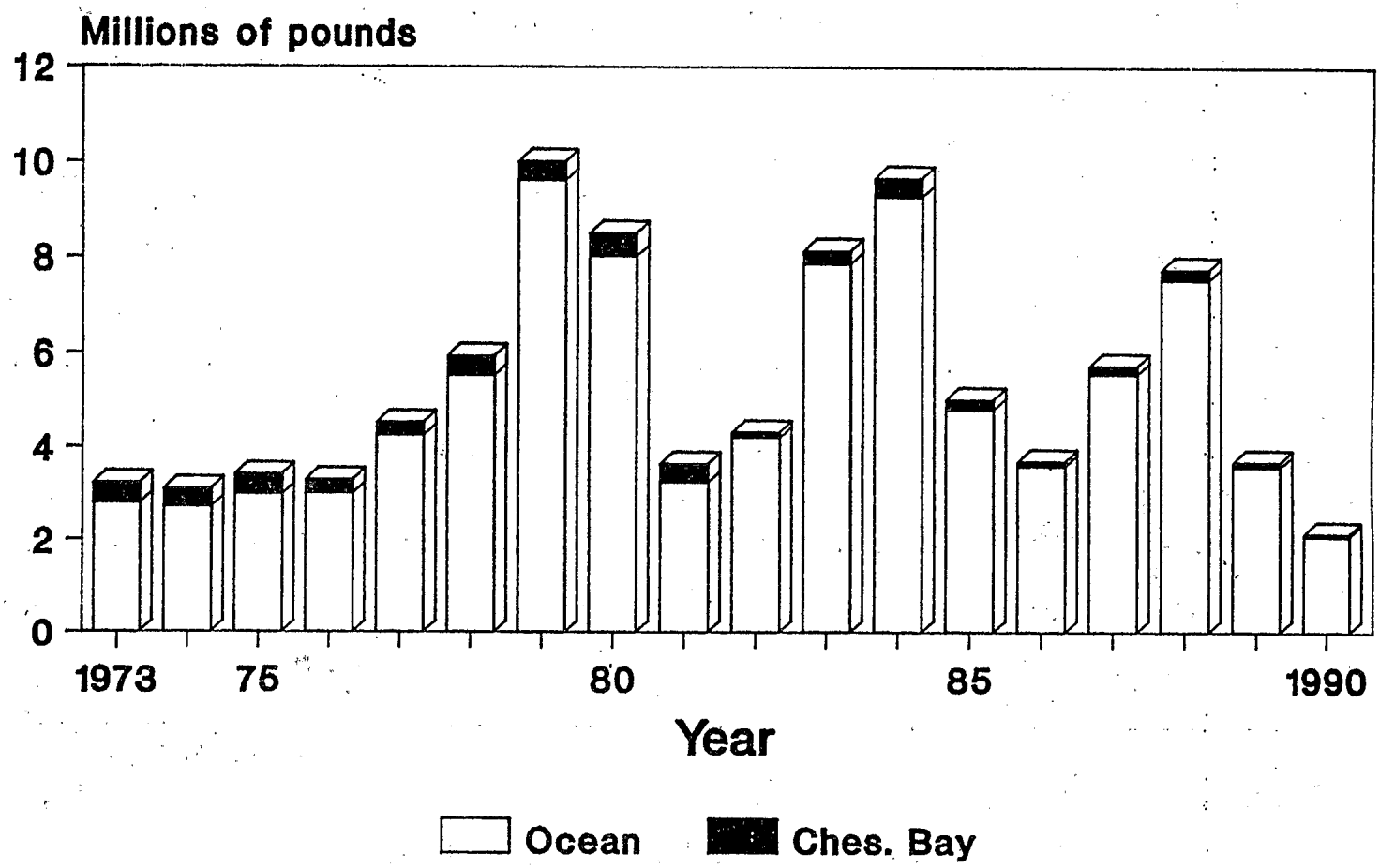
Recreational summer flounder landings on the Atlantic Coast ranged from 5.0 (1989) to 54.5 (1983) million pounds a year in the 1980s. Exclusive Economic Zone (EEZ) catches accounted for 3% to 20% of the total recreational harvest. In 1987 and 1988, summer flounder were the most sought after species from the Mid-Atlantic region and that region accounted for about 80% of the Atlantic Coast recreational summer flounder catch (USDC, MRFSS 1979-1989). The annual catch of summer flounder from the Mid-Atlantic region was about 18 million fish between 1979 and 1984; from 1985-1989 the average catch dropped to 10 million fish and the catch for 1989 was 1.5 million fish (Figure 10). The average annual recreational harvests in Maryland and Virginia were 0.6 and 4.9 million pounds, respectively, between 1979 and 1985. In 1989, the recreational harvests dropped to 0.47 and 0.61 million pounds, respectively (Ron Essig, NMFS, pers. comm.).

Figure 1. Maryland commercial flounder landings by area



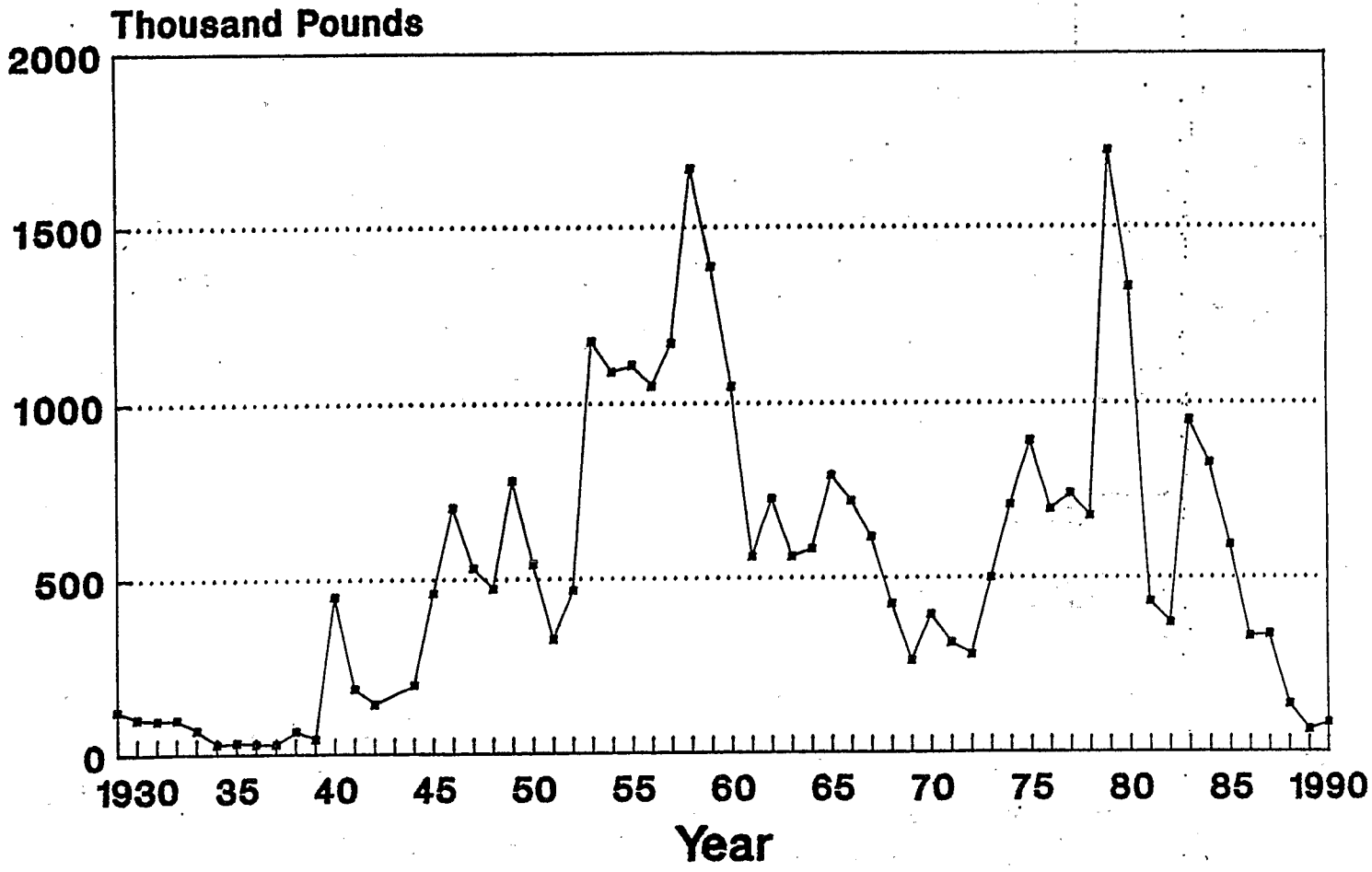
Md has partial jurisdiction over Ocean

Figure 2. Virginia commercial flounder landings by area



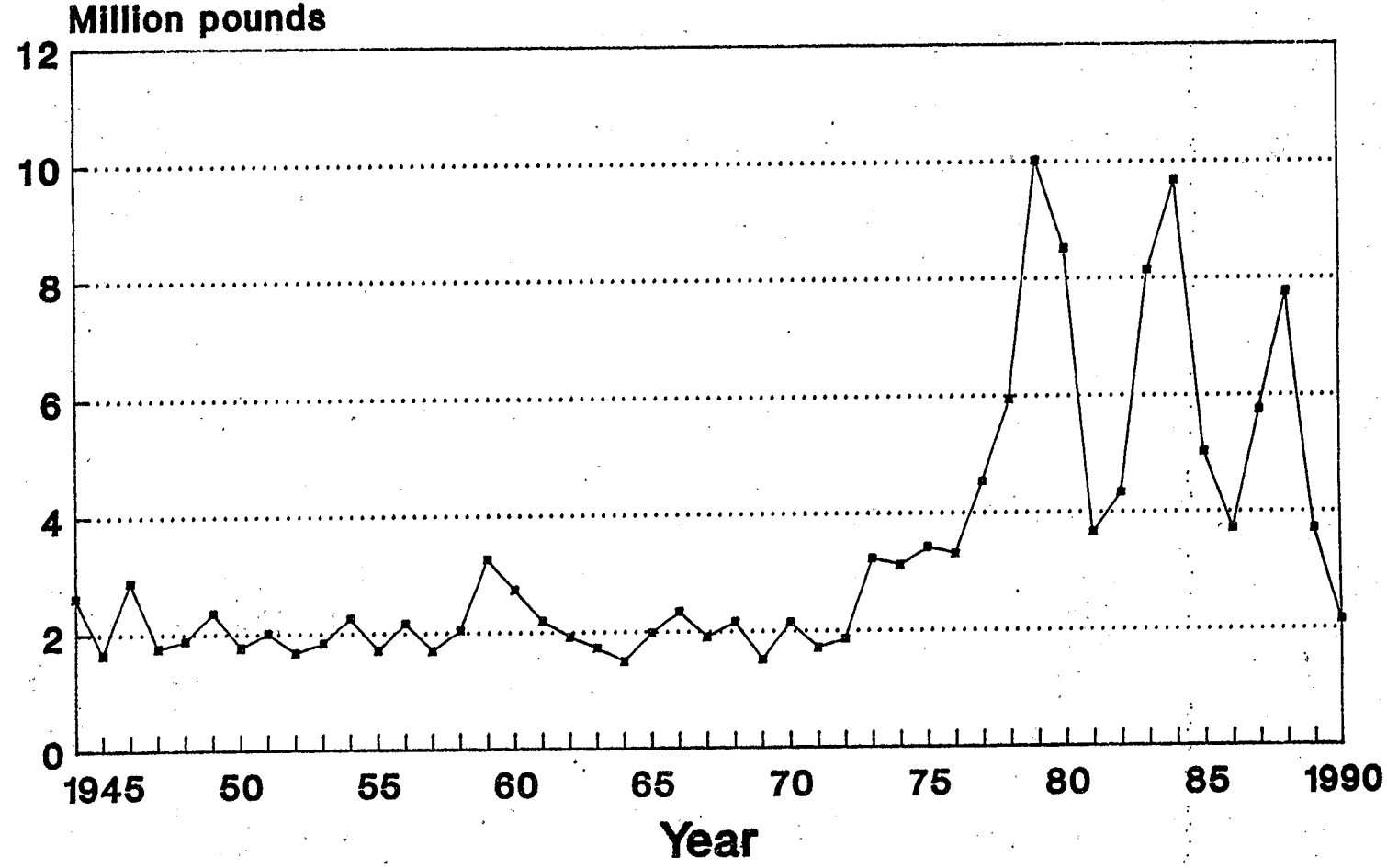
Va has no jurisdiction over Ocean catch

Figure 3. Maryland Commercial Landings for Summer Flounder



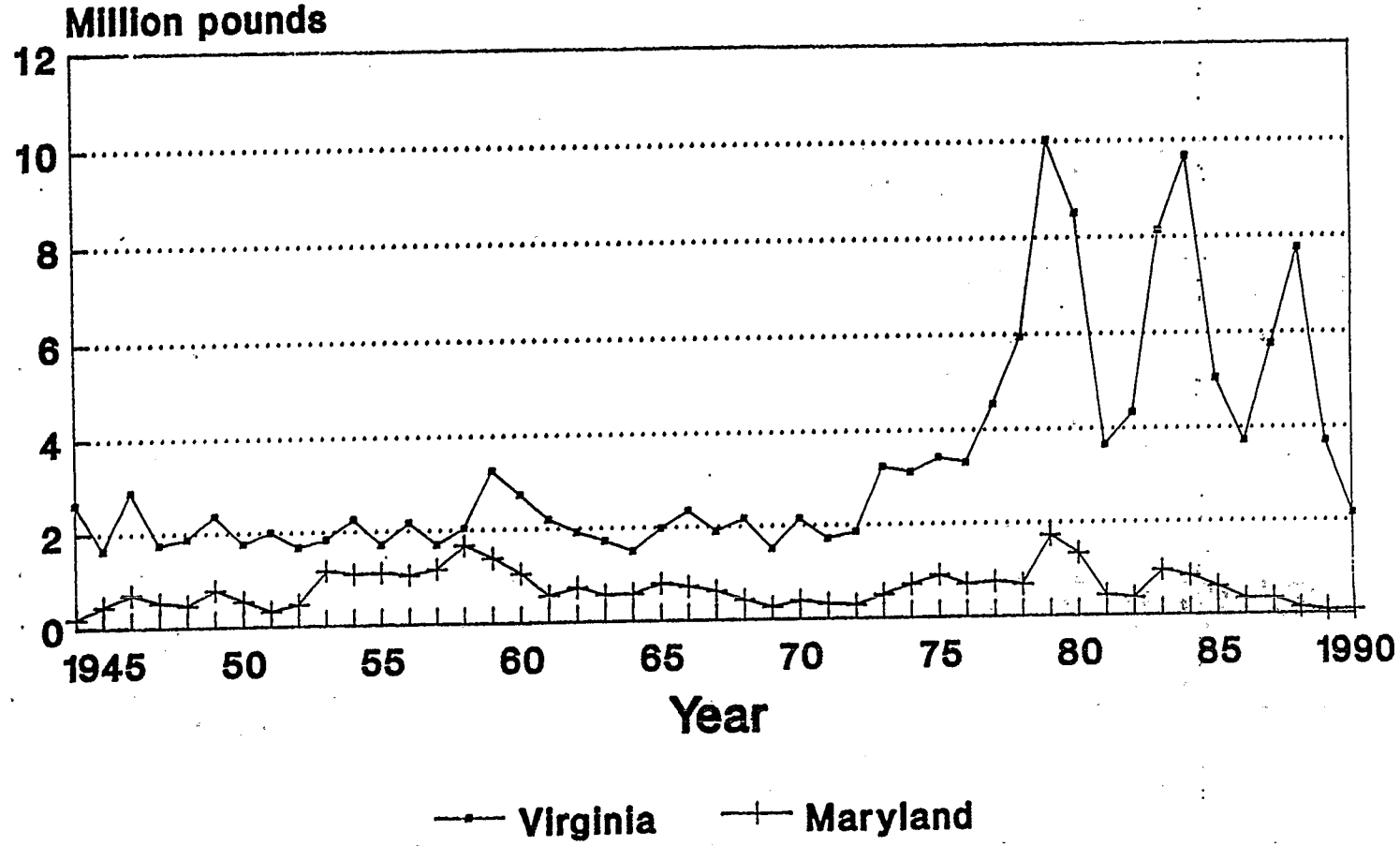
Includes all flounder landed in Maryland

Figure 4. Virginia Commercial Landings of Summer Flounder



Includes all flounder landed in Virginia

Figure 5. Summer Flounder Landings Maryland and Virginia- commercial



Includes Bay and Ocean landings

Figure 6. Maryland Summer Flounder Dockside Value

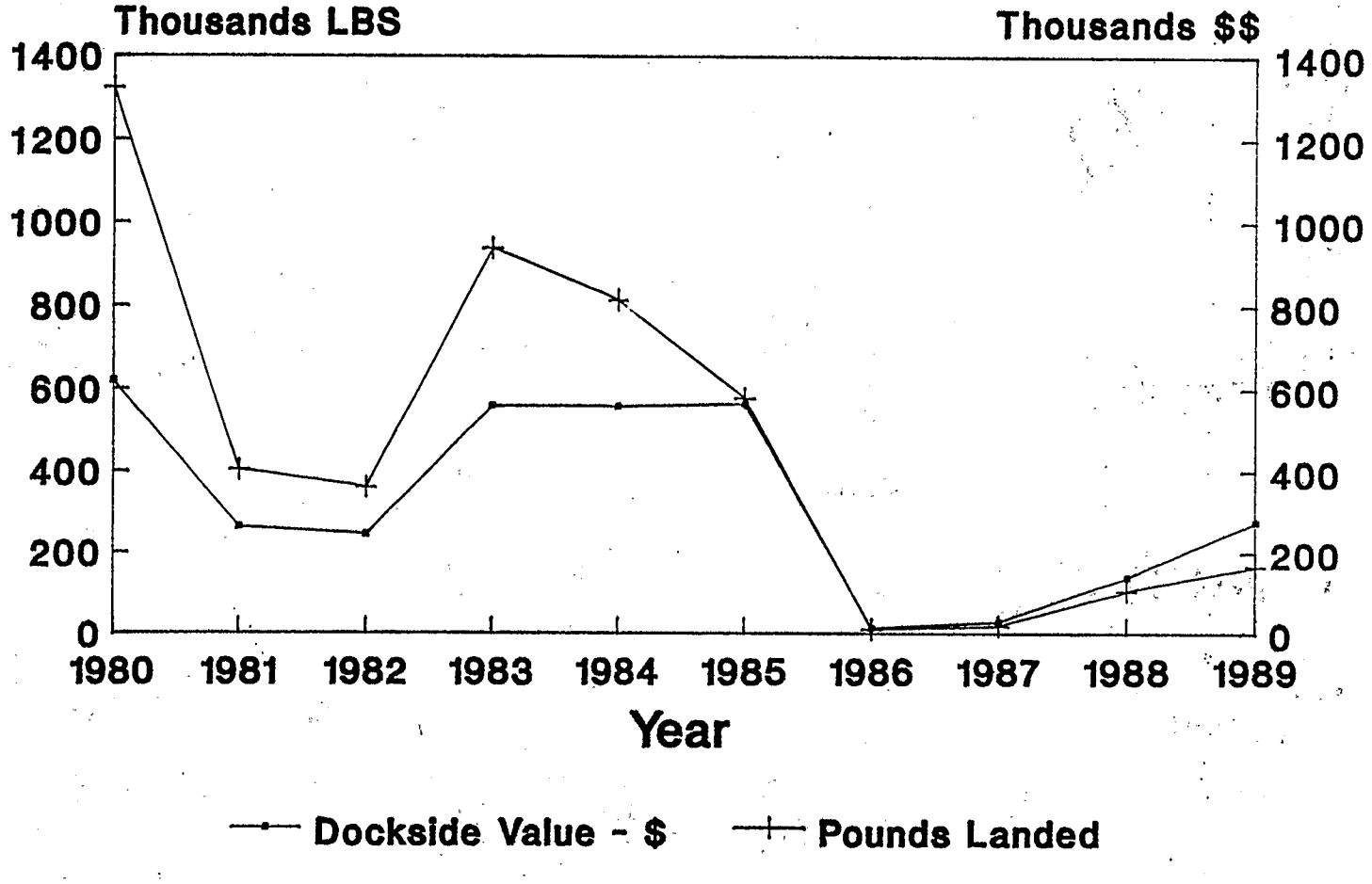
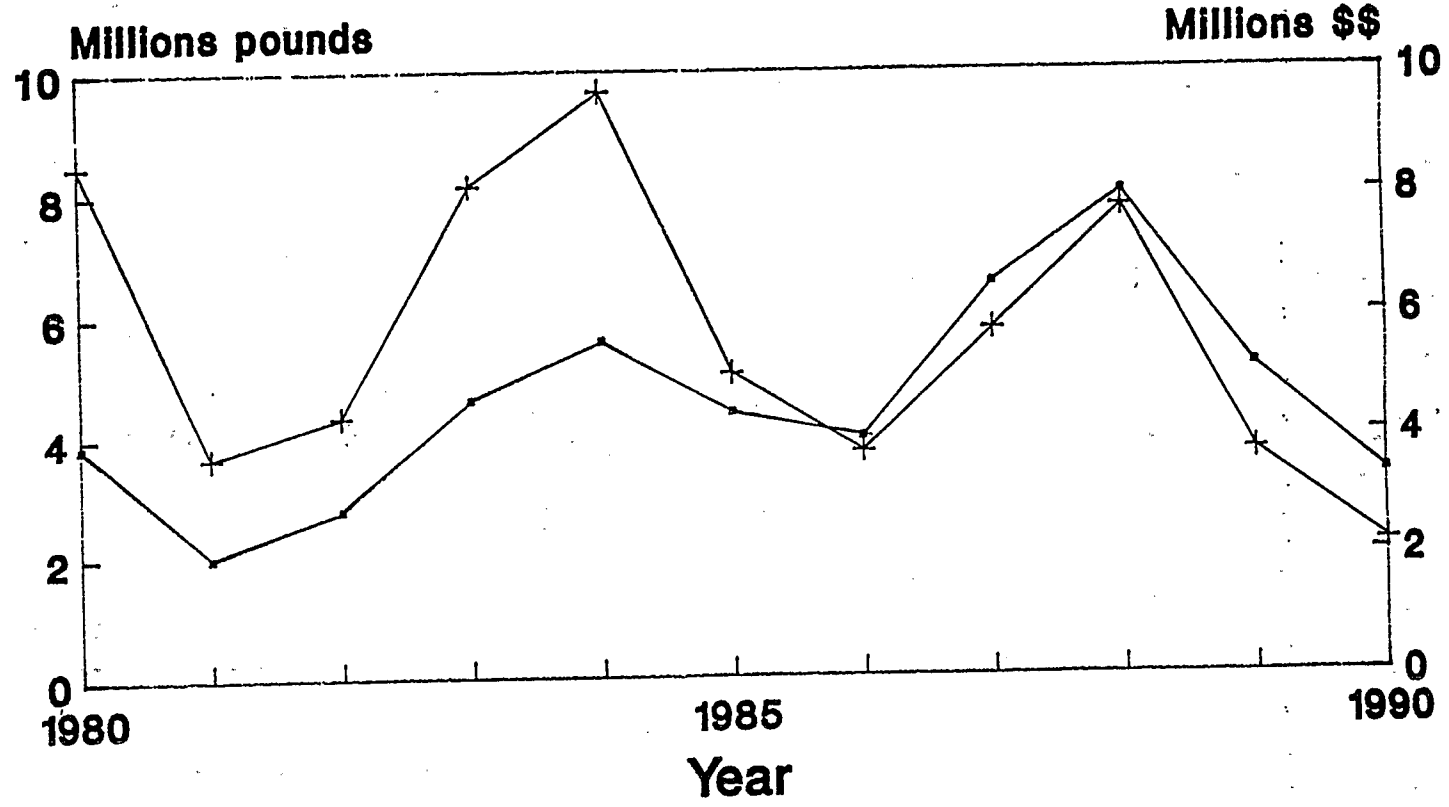
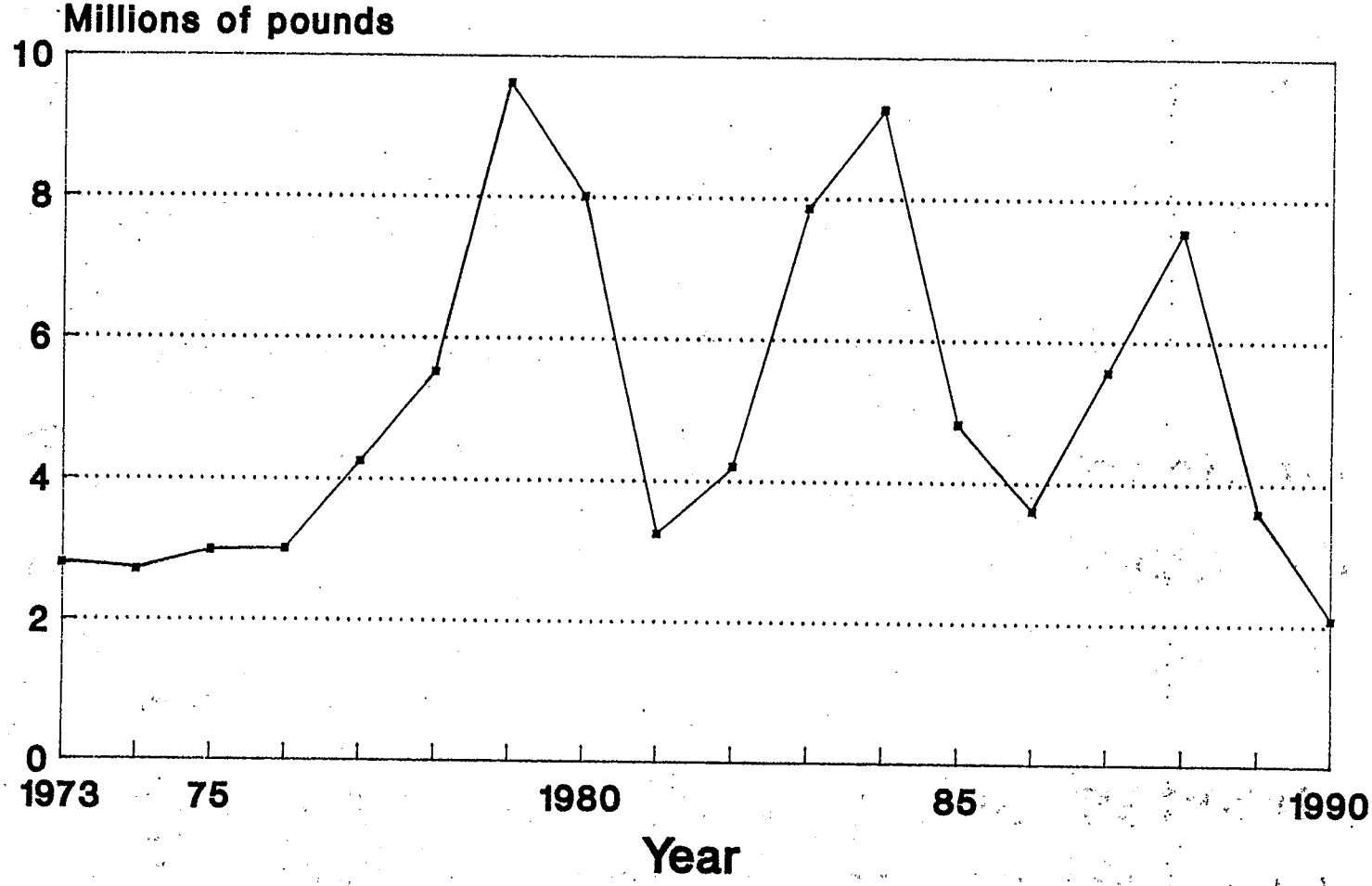


Figure 7. Virginia Summer Flounder Dockside Value



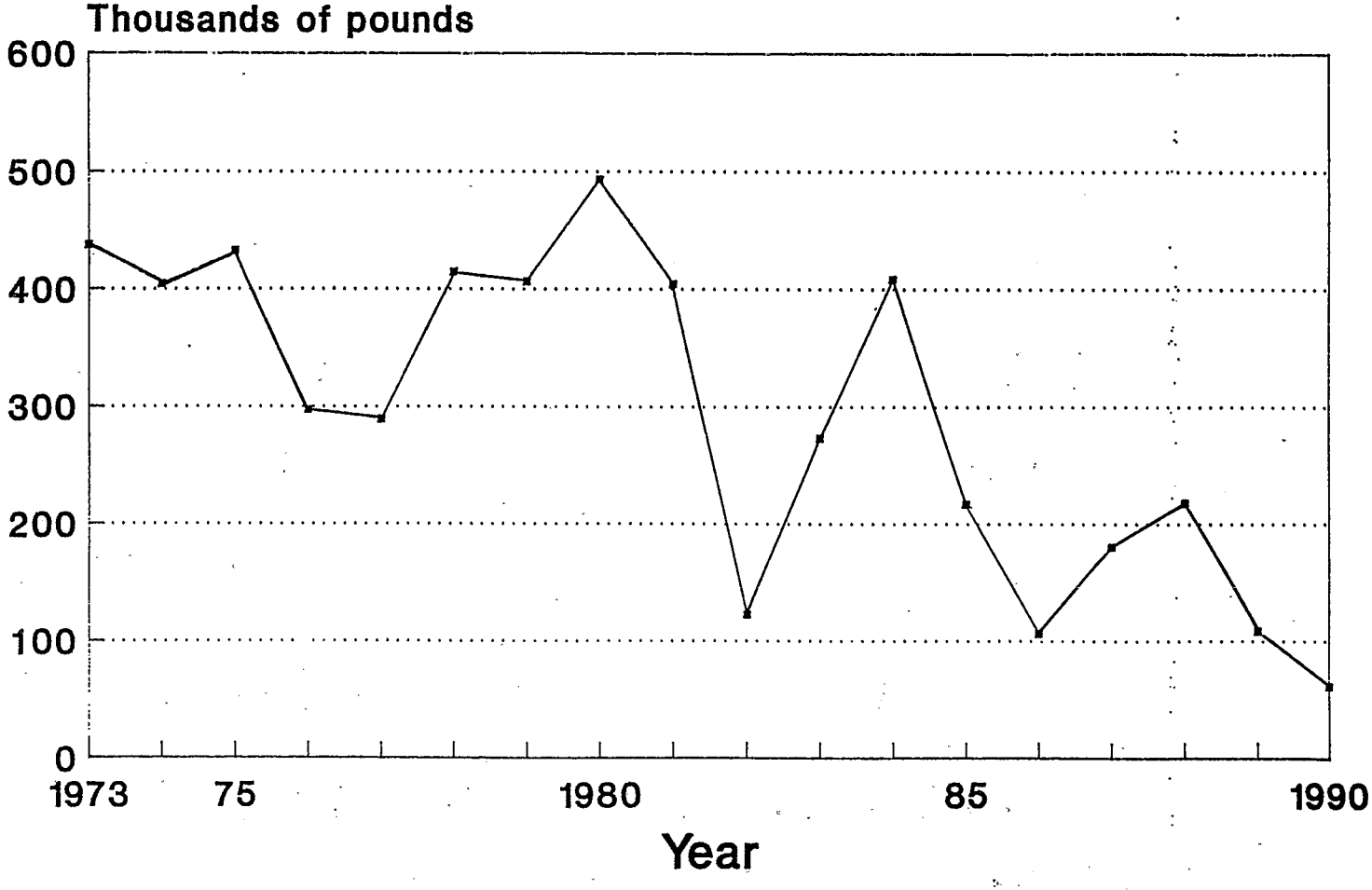
Includes Bay and Ocean landings

Figure 8. Ocean Commercial Flounder Landings - Virginia



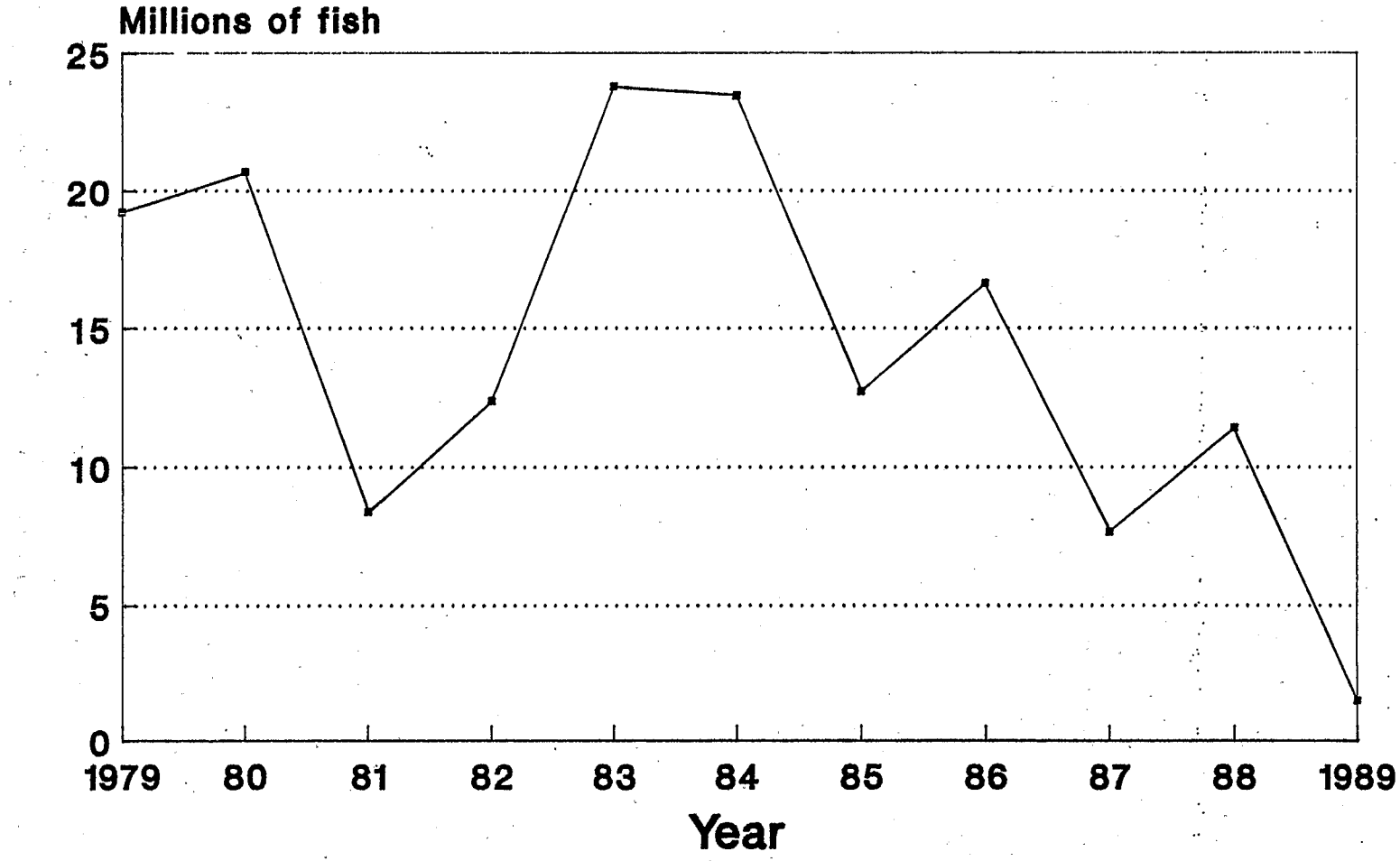
VMRC data

Figure 9. Chesapeake Bay Commercial Flounder Landings - Virginia section



July 1989 - Trawling banned inshore

Figure 10. Recreational Flounder Catch Mid-Atlantic Region



MRFSS data (A + B1 catch)

Economic Perspective

Summer flounder has traditionally commanded the highest price per pound and generated the greatest dollar value of all finfish species taken in Virginia. Prices are similarly high in Maryland, but the much smaller volume of landings is reflected in flounder only being valued in the top ten species. The value of commercial flounder landings surpassed the million dollar mark for Virginia waters in 1976 and has ranged between two and four million dollars annually during the 1980s (Figure 5). During the same time period, the value of Virginia's flounder landings fell to half its 1980 value despite doubling in price. Summer flounder brought $ 0.78 per pound in 1980 and $ 1.54 per pound during 1990 in the Virginia market. In 1990, Virginia's flounder landings were valued at $ 3.3 million. The dockside value of Maryland's summer flounder landings has not exceeded $ 600,000 in the past ten years. Although total value fell to a record low in 1986, price per pound has continued to increase. Maryland's summer flounder landings were valued at $ 277 thousand and $ 1.66 per pound in 1989 (Figure 4) and $ 137,000 in 1990.

The dollar value of the recreational summer flounder catch probably far exceeds even the considerable value of the commercial catch. Throughout most of the 1980s, the recreational catch was 40% of the total flounder landings along the Atlantic coast (MAFMC, 1990). As recently as 1988, summer flounder were ranked as the most desirable species to catch by the MRFSS survey (USDC, 1991), despite rapidly declining populations. By 1989, the summer flounder population along the Mid-Atlantic section of the east coast had fallen so low that the recreational catch of flounder had declined to 13% of the total (MAFMC, 1991) and the species was not ranked in the top three as a target species (USDC, 1991).

Resource Status

Current estimates of the instantaneous fishing mortality rate (F) are approximately six times the estimate of F_{max} which would produce the maximum yield per recruit for both sexes combined. All indices of abundance, both commercial and recreational, plummeted in 1989 relative to the rest of the 1980s. Based on the disparity in the reported values of F and F_{max} and the recent indices of abundance, it is unlikely that the Atlantic coast summer flounder population will remain healthy in the future unless current levels of fishing mortality are reduced substantially. Maintaining current F levels will continue to depress the stock and average yield of the fishery (NOAA\NMFS, 1990).

Compression of age structure in the Mid-Atlantic summer flounder population is apparent from various independently determined sources, including scientific research surveys (Desfosse et al., 1990), the Mid-Atlantic Fishery Management

Council (1987), the eleventh New England Fisheries Council (NEFC) stock assessment workshop (NOAA/NMFS, 1990) and historical length-frequency analyses of commercial catch data (Pearson, 1932; Eldridge, 1962; Ross et. al., 1990).

NEFC surveys conducted from 1976-1981 captured fish from five to eight years of age (24 to over 30 inches); in 1990, the oldest fish observed were three years old (about 19 inches). A monthly trawl survey by the Delaware Division of Fish and Wildlife found that during the 1960's the majority of flounder measured over 15.75 inches (40 cm.; about 2 years old); in the 1980's, most fish were under 15.75 inches (40 cm.) and by 1990 almost all fish were one year old (11.6 inches). Compression of age structure is considered a primary indicator of overexploitation in a fishery.

Commercial landings of summer flounder along the Atlantic coast have dropped to their lowest level in 15 years, while the estimated recreational catch is lowest of the entire time series (MAFMC, 1990).

The spawning stock biomass of the Atlantic coast flounder population is currently about 2-3% of the unfished level. This reduced spawning stock has led to concern over the possibility of recruitment failure. In 1988, nearly every state conducting a survey of young of the year flounder experienced poor recruitment (MAFMC, 1990). The 1990 stock assessment workshop summer flounder working group (11th SAW, WG # 21, 1990b) developed a consensus that recruitment between 1987 and 1990 was generally poorer than from 1980-1986.

The only available predictor of summer flounder recruitment which has shown agreement with population analysis estimates is the VIMS young of the year (YOY) trawl survey (MAFMC, 1990). The VIMS YOY index also shows decreased flounder recruitment in the late 1980s relative to the early 1980s. However, the 1990 index and preliminary estimates of 1991 recruitment indicate the presence of more young flounder than any year since 1986 (MAFMC, 1990; Bonzek, VIMS, 1991, pers. comm.). Surveys conducted in 1991 off Chincoteague, Virginia by the Marine Science Consortium found over 90 % of the flounder caught to be less than or equal to 13 inches (331mm<) in length (Sloan, 1991, pers. comm.). Since a one year old summer flounder averages 11.6 inches in length and flounder from the 1990 year-class would have averaged one and a half years old when these surveys were conducted, most of these fish were likely from the 1990 and 1991 year-classes.

Laws and Regulations

Limited entry: Maryland's Delay of Application Process, which went into effect September 1, 1988, requires previously unlicensed applicants to wait two years after registering with MDNR before a license to

	harvest finfish with commercial fishing gears will be issued. Limited or delayed entry are not in effect in Virginia or Potomac River.
Minimum size limit:	13" total length for Maryland, Virginia and Potomac River.
Creel limit:	Not in effect for Maryland or Potomac River; 10 fish in Virginia.
Harvest quotas:	Not in effect for Maryland, Virginia or Potomac River.
By-catch restrictions:	Maryland - 5% sublegal (by number) may be retained by licensed commercial fishermen. Potomac River- 5% sublegal (by number) may be retained. Virginia - 2 fish or 10%, whichever is greater, under 13 inches.
Season:	No closed season for Maryland, Virginia or Potomac River.
Gear - Area restrictions:	Maryland - Purse seines, otter trawls, beam trawls, troll nets, drag nets, trammel nets, monofilament gill nets and gigs are prohibited (otter and beam trawls are legal on the Atlantic Coast at distances of one mile or more offshore). Minimum stretch mesh size restrictions: pound net, 1.5"; fyke and hoop net, 1.5"; haul seine, 2.5". Potomac River - Purse seines, otter trawls, beam trawls, troll nets, drag nets, trammel nets, drift gill nets and gigs are prohibited. Minimum stretch mesh size restrictions: pound net, 1.5"; fyke and hoop net, 1.5"; haul seine, 2.5"; gill net, 5" minimum and 7" maximum. Virginia - Trawling prohibited. It is illegal to alter flounder so that total length cannot be determined. It is unlawful to set, place or fish a fixed fishing device of any type within three hundred yards in either direction from the Chesapeake Bay

Bridge Tunnel. From April 1 through May 31 the spawning areas of the James, Pamunkey, Mattaponi, and Rappahannock Rivers are closed to stake and anchor gill nets. Minimum stretch mesh size restrictions: pound net, 2"; haul seine, 3" (nets over two hundred yards long). In addition, no haul seine can be longer than one thousand yards in length or deeper than forty meshes; and the cod or bunt end of a trawl net shall have a minimum of fifty meshes deep. Any gill net, whether floating or submerged, that is not assigned a fixed location shall be set in a straight line, have no greater depth than 330" and shall be fished no closer than 200 feet to any other such gill net. Also, Sections 28.1-52 and 28.1-53 of the Code of Virginia outline placement, total length and distance requirements for fishing structures.

Status of Traditional Fishery Management Approaches

The following definitions have been adapted from the documents, "Status of the Fishery Resources Off the Northeastern United States" for 1989 and 1990 (NOAA Technical Memoranda NMFS-F/NEC-72 and 81), "Amendment 2 to the Fishery Management Plan for the Summer Flounder Fishery" (MAFMC, 1991) and "The Atlantic Coast Red Drum Fishery Management Plan" (SAFMC, 1990). For a more through review of fisheries terminology, refer to these documents under the "definitions" section.

Catch-Effort or CPUE: Defined as the number or weight of fish caught during a specific unit of fishing time and considered a basic measure of abundance or stock density.

Estimates of mortality: A mortality rate is the rate at which fish die from natural causes or fishing. Mortality rates can be expressed in terms of instantaneous or annual mortality. Instantaneous rates are used extensively in fisheries management for ease of comparing the relative importance of different sources of mortality. Annual mortality rates can be easily converted to percentages, while instantaneous rates cannot. The instantaneous total mortality rate (Z) is the natural logarithm of the ratio of the number of fish alive at the end of a period of time to the number of fish alive at the beginning of the same period of time. Fishing mortality is usually expressed in terms of an instantaneous rate (F), as is natural mortality (M). For example, an instantaneous total mortality rate (Z) of 1.5 equals an annual mortality rate of 0.78 or 78 % annual total mortality. Instantaneous mortality rates are additive, but annual rates are

not.

Yield-per-recruit (YPR): The theoretical yield that would be obtained from a group of fish of one year-class if harvested according to a certain exploitation rate over the lifespan of the fish.

Spawning Stock Biomass (SSB) and Spawning Stock Biomass per Recruit (SSBR): SSB is the weight of all adult females in the population, calculated as the remaining number of individual females in each year-class times the percent that are mature times their average weight. SSBR is the total contribution of a cohort (year-class) to the SSB over its lifetime, determined by summing its contribution at each age.

Maximum Sustainable Yield (MSY): The largest average catch or yield that can be continuously taken from a stock under existing environmental conditions, while maintaining stock size.

Virtual Population Analysis (VPA): an analysis of the catches from a given year-class over its life in the fishery.

FBAR: represents an average value of fishing mortality for fish of a given age. For example, the eleventh SAW measured fishing mortality for age 0 flounder between 1982 and 1988, derived a mean fishing mortality rate (FBAR) and applied this value to the age 0 flounder born in 1989 to determine how many age 1 flounder would be left in 1990.

Catch-Effort or CPUE:	Historical commercial fisheries statistics exist; however, they are unreliable compared to data collected since 1982. Catch per unit effort (CPUE) exhibited a 75% decrease during the two year stock assessment survey conducted in Virginia waters by VIMS 1987-1989.
Estimates of mortality:	Estimates of fishing mortality rates based on the eleventh SAW were greater than F = 1.4, 1982-1988 and F = 2.1 from 1985-1989. Natural mortality (M) is estimated at 0.2, giving a total mortality estimate of Z = 1.6 or higher. Total mortality in Virginia waters between 1987 and 1989 was 78 %, with a Z value of 1.5.
Yield-per-Recruit:	At the current F of 2.1, yield-per-recruit (YPR) for the Mid-Atlantic stock is about 0.75 pounds and 12.7 inches. At the target F of 0.23, YPR would be maximized at a harvest size of 15 inches (1.3 lbs) for both

	sexes combined. Flounder are fully recruited to the existing East coast fishery at age 2.
Stock-Recruitment:	No derived relationship.
MSY:	A preliminary estimate of the maximum sustainable yield for the Atlantic Coast population is about 44 million pounds. This estimate has not been used to make management decisions because the general belief is that summer flounder abundance was very low during the period of analyses (1967 - 1974). Also, good effort data is lacking in recreational surveys conducted prior to 1979.
VPA Analysis:	The first accepted VPA was produced at the 11th SAW workshop (1990). FBAR values for 1982-1989 show fishing mortalities of F> 1.0 for all fully recruited (age 2 or older) year classes measured.
SSB/SSBR:	Current spawning stock is estimated at about 2-3% of the unfished level. SSB should be at least 20% to allow the stock to sustain itself, based on SSB analyses conducted on other species.

Data and Information Needs

1. Annual estimates of catch and effort in the commercial and recreational fisheries.

2. Annual estimates of the age, length and sex composition of the commercial and recreational catch.

3. Information on discard levels in the commercial and recreational fisheries.

4. Evaluation of the impact of different minimum legal size limits and/or mesh regulations on the recreational and commercial fisheries in the Chesapeake Bay.

5. Studies to investigate the principal environmental factors affecting year class strength.

6. Stock identification work to establish whether more than one summer flounder stock contributes to the Mid-Atlantic population and if so, the relative contribution of each stock.

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Section 2. Summer Flounder Management

The source documents for this plan, the Atlantic States Marine Fisheries Commission FMP (1982), the Mid-Atlantic Fisheries Management Council FMP (1987), and the Virginia Summer Flounder FMP (1989) contain current knowledge and discuss management priorities for summer flounder stocks. Information from these documents has been supplemented and updated with recent work published by the Virginia Institute of Marine Science (1990), NOAA/NMFS (1990) and MAFMC (1990). Problems and management strategies have been defined and grouped into specific categories and serve as the basis for identifying the goals and objectives of the plan. The management strategies and actions will be implemented by the jurisdictions to protect and enhance the stocks of summer flounder utilizing the Chesapeake Bay. Existing regulations regarding the harvest of this species will continue to be enforced except where otherwise indicated by the plan.

A. GOAL AND OBJECTIVES

The goal of this plan is to:

Enhance and perpetuate summer flounder stocks in the Chesapeake Bay and its tributaries, and throughout their Atlantic coast range, so as to generate optimum long-term ecological, social and economic benefits from their commercial and recreational harvest and utilization over time.

In order to meet this goal, the following objectives must be met:

1) Follow guidelines established by the Atlantic States Marine Fisheries Commission and the Mid-Atlantic Fishery Management Council for coastwide management of summer flounder stocks and make Bay regulatory actions compatible where possible.

2) Promote protection of the resource by maintaining a clear distinction between conservation goals and allocation issues.

3) Maintain summer flounder spawning stocks at a size which minimizes the possibility of recruitment failure and determine the effects of environmental factors on year-class strength.

4) Promote the cooperative interstate collection of economic, social and biological data required to effectively monitor and assess management efforts relative to the overall goal.

5) Improve collection of catch and standardized effort statistics in the summer flounder fisheries.

6) Promote fair allocation of allowable harvest among various components of the fishery.

7) Continue to provide guidance for the development of water quality goals and habitat protection necessary to protect the summer flounder population within the Bay and state coastal waters.

B. PROBLEM AREAS AND MANAGEMENT STRATEGIES

Problem 1: Overfishing. The summer flounder is an important fishery resource along the Atlantic coast, particularly between New York and North Carolina. Total coastwide landings by weight have shown a decreasing trend since 1980. Recent stock assessments indicate that summer flounder stocks along the entire Atlantic coast are experiencing growth and recruitment overfishing. The 1990 NEFC stock assessment workshop (11th SAW) described the summer flounder population as being overexploited and seriously depleted; of the twelve species or groups of species examined by the workshop, no other species was found to be as depleted as summer flounder. Estimated fishing mortality (F) was computed as greater than 1.4 and as high as 2.1. Thus, current fishing mortality is at least six times the MAFMC target level of 0.23. At this rate of fishing mortality, only 20 % of all summer flounder alive now will be alive one year later. The spawning stock of summer flounder is severely depleted. Flounder are being caught at such a small size that each female flounder is contributing only 2-3 % of the eggs which she is capable of producing. The Mid-Atlantic summer flounder stock also shows compression of age structure as measured by scientific research surveys, historical length-frequency analyses of commercial catch data and age composition data from the 1976-1990 NEFC surveys.

Summer flounder between the ages of five and eight were regularly captured in NEFC surveys from 1976-1981; by 1990, the oldest fish observed were three years of age. Compression of age structure is considered a primary indicator of overexploitation in a stock.

Strategy 1: Bay jurisdictions will evaluate a number of alternatives to control directed fishing mortality and improve protection of summer flounder beyond age I. Management options include higher minimum size limits, trawling bans, mesh size restrictions and hook-and-line creel limits. Management agencies will continue to participate in deliberations to protect small flounder in other coastal states and in the Exclusive Economic Zone (EEZ).

PROBLEM 1.1
All estimates of stock abundance have continued to show a declining trend in recent years, despite the institution of a ban on trawling in Virginia's Territorial Sea and the imposition of a 13" minimum size limit in all Bay jurisdictions.

STRATEGY 1.1
Maryland, Virginia and the PRFC will propose changes in minimum size regulations, creel limits and seasons in the recreational fishery to conform to guidelines set by MAFMC. Maryland and Virginia will comply with commercial quotas, mesh sizes or other commercial restrictions enacted by MAFMC. These recommendations are intended to provide greater spawning stock biomass from each flounder year-class and provide a greater yield-per-recruit.

ACTION 1.1a: Maryland, the PRFC and Virginia will propose an increase in their minimum size limit for recreationally caught flounder from 13 inches to 14 inches.

IMPLEMENTATION 1.1a
1) 1992

ACTION 1.1b:
Maryland, Virginia and the PRFC will propose creel limits and seasonal restrictions in compliance with MAFMC recommendations. A six fish creel limit will be proposed as one measure to meet these recommendations. A recreational fishing season extending from May 15 - Sept. 30 may also be required to reduce fishing mortality. Virginia will continue to enforce its ten fish per day limit until such time as MAFMC recommendations can be implemented.

IMPLEMENTATION 1.1b
1) 1992

ACTION 1.1c:
Commercial size limits will remain at 13" for Virginia and Maryland in conformance with MAFMC recommendations. The PRFC will propose a 14" minimum commercial size limit for its commercial flounder fisheries to provide parity with the recreational fishery. A 5.5 inch diamond or 6 inch square minimum cod end mesh size will be implemented in all directed flounder trawl fisheries.

IMPLEMENTATION 1.1c
1) 1992

ACTION 1.1d:
Commercial fisheries will be subject to quotas set by MAFMC and administered by the states. All flounder landed by a vessel registered in a state will be counted towards that state's quota, without regard to the actual fishing location. Commercial fisheries in each state will be closed when that state's quota is reached. The PRFC will propose a moratorium on its commercial flounder fisheries from January through June, inclusive, to complement the seasonal closure proposed for the recreational fishery, in addition to conforming with MAFMC quota closures.

IMPLEMENTATION 1.1d
1) 1992

PROBLEM 1.2
The continuing catch of undersize flounder by trawl fisheries, along with a total harvest far in excess of sustainable levels, consitutes a principal reason for the precipitous decline in summer flounder stocks. Culling of undersize fish from the catch is not a viable alternative in this fishery, as mortality of the culled catch is so high.

STRATEGY 1.2
Management agencies will continue to promote the implementation of minimum mesh size in the directed flounder trawl fisheries sufficient to allow escapement of immature female flounder. Management agencies will urge the Mid-Atlantic Fisheries Management Council to enact a mesh size compatible with these goals in the directed flounder trawl fisheries to complement the mesh size requirements enacted through the Baywide Plan.

ACTION 1.2a
Virginia and Maryland will implement a 5.5 inch diamond or 6 inch square minimum cod end mesh size in all directed flounder trawl fisheries to allow escapement of immature female flounder.

Virginia and the PRFC will continue their bans on trawling in state waters.

IMPLEMENTATION 1.2a
1) 1992

ACTION 1.2b
Virginia and Maryland will work with the Mid-Atlantic Fisheries Management Council to adopt a 5.5 inch diamond or 6 inch square minimum cod end mesh size for the EEZ flounder trawl fishery consistent with the objectives of the Baywide Plan and MAFMC's recommendations for conservation of the resource.

IMPLEMENTATION 1.2b
1) Continue

PROBLEM 1.3
The incidental bycatch of small summer flounder in non-directed fisheries impacts recruitment to the flounder spawning stock. Nondirected fisheries include the Chesapeake Bay's pound net fishery, Maryland's coastal trawl fisheries and North Carolina's trawl, flynet, pound net, long haul seine and beach seine fisheries for finfish and shrimp.

STRATEGY 1.3
Virginia, Maryland and the Potomac River Fisheries Commission will investigate the incidental bycatch of small flounder in non-directed fisheries and participate in coastal deliberations to protect small flounder in other coastal states.

ACTION 1.3a
Maryland will collect information from its pound net and ocean trawl fisheries to develop management strategies for reducing the non-directed bycatch of small flounder and other species. Options for consideration include minimum mesh sizes, season and area restrictions, culling practices, escape panels and fishing efficiency devices.

IMPLEMENTATION 1.3a
1) 1992; Continue

ACTION 1.3b
Virginia will continue to monitor the species composition and biological characteristics of bait harvested in its pound net fishery. The VMRC will take action, as needed, to reduce the incidental bycatch of small flounder in the bait fishery.

IMPLEMENTATION 1.3b

1) Continue

ACTION 1.3c
Maryland, the PRFC and Virginia will work through the Mid-Atlantic Fisheries Management Council and the Atlantic States Marine Fisheries Commission to encourage protection of immature flounder.

IMPLEMENTATION 1.3c
1) Continue

Problem 2 - Stock Assessment and Research Needs: Currently, fisheries managers lack some of the biological and fisheries data necessary for effective management of the flounder resource.

Strategy 2 - Stock Assessment and Research Needs: Atlantic coast databases are limited concerning harvest, fishing effort and biological characteristics of the harvest and fishery independent measures of summer flounder stocks. Specific research to address these deficiencies will be identified.

PROBLEM 2.1
Atlantic coast summer flounder stock structures and the extent of stock mixing are poorly understood. Stock identification research will be continued and the summer flounder population will be treated as a unit stock for management purposes in the interim.

STRATEGY 2.1
Maryland, Virginia and the Potomac River Fisheries Commission will continue to support stock identification research to determine the extent of stock mixing in the Chesapeake Bay flounder population.

ACTION 2.1
The jurisdictions will continue to support stock identification research, particularly stock composition tagging studies being conducted at Virginia's Institute of Marine Science (VIMS) and the University of Maryland. Coordinated studies on the relative contribution of various estuaries, including the Chesapeake Bay, to the coastal flounder stock will be initiated.

IMPLEMENTATION 2.1
1) Continue

PROBLEM 2.2
Data for summer flounder size and age composition, maturity schedules, growth rates, mortality rates and estimates of abundance are inconsistent.

STRATEGY 2.2
Virginia will continue to support stock assessment work

conducted by the VMRC and index of abundance research performed by Virginia Institute of Marine Science (VIMS).

ACTION 2.2
VMRC's Stock Assessment Program will continue to collect biological data (age, size, sex) from commercial catches of summer flounder. VIMS will continue to monitor abundance of juvenile flounder through its young-of-the-year and juvenile flounder survey trawl survey indices.

IMPLEMENTATION 2.2
1) Continue

PROBLEM 2.3
Catch and effort statistics for summer flounder recreational fisheries need to be improved for fisheries stock assessment.

STRATEGY 2.3
Maryland, Virginia and the Potomac River Fisheries Commission will continue to support inter-jurisdictional efforts to maintain a comprehensive data base on coastwide level.

ACTION 2.3
Maryland, Virginia and the PRFC will continue to collect fisheries landings data on summer flounder as part of ongoing commercial fisheries statistics programs. Virginia will continue to pursue adoption and implementation of a limited and/or delayed entry program and a mandatory reporting system for commercial licensees. Maryland and Virginia will continue to supplement the Marine Recreational Fisheries Statistics Survey to obtain more detailed catch statistics at the state level. Through FISHMAP, Maryland will begin a pound net sampling project to collect information on summer flounder and other species.

IMPLEMENTATION 2.3
1) Continue

PROBLEM 2.4
Information relating to the stock-recruitment relationship for summer flounder is lacking.

STRATEGY 2.4
Maryland and Virginia will continue their joint and individual efforts in providing the information needed to determine the relationship between abundances of adult and juvenile flounder.

ACTION 2.4
Maryland and Virginia will continue the Baywide trawl survey of estuarine finfish species and crabs to measure size, age, sex, distribution, abundance and CPUE. Maryland will continue seaside juvenile summer flounder studies utilizing bottom trawls, beach seines and their cooperative sampling of trawl fisheries.

IMPLEMENTATION 2.4
1) Continue

Problem 3 - Habitat Issues: Estuarine areas are utilized by summer flounder stocks for nursery and feeding grounds. Increasing urbanization and industrial development of the Atlantic coastal plain has resulted in a decrease in the environmental quality of many estuarine communities. Estuarine habitat loss and degradation in Chesapeake Bay may contribute to declines in summer flounder stocks.

Strategy 3 - Habitat Issues: The jurisdictions will continue their efforts to improve water quality and define habitat requirements for the living resources in the Chesapeake Bay.

PROBLEM 3.1
Water quality impacts the distribution and abundance of finfish species in the Chesapeake Bay.

STRATEGY 3.1
The District of Columbia, Environmental Protection Agency, Maryland, Pennsylvania, the Potomac River Fisheries Commission, and Virginia will continue to promote the commitments of the 1987 Chesapeake Bay Agreement. The achievement of the Bay commitments will lead to improved water quality and enhanced biological production.

ACTION 3.1
The District of Columbia, Environmental Protection Agency, Maryland, Pennsylvania, the Potomac River Fisheries Commission, and Virginia will continue to set specific objectives for water quality goals and review management programs established under the 1987 Chesapeake Bay Agreement. The Agreement and documents developed pursuant to the Agreement call for:

1) Developing habitat requirements and water quality goals for various finfish species.
2) Developing and adopting basinwide nutrient reduction strategies.
3) Developing and adopting basinwide plans for the reduction and control of toxic substances.
4) Developing and adopting basinwide management measures for conventional pollutants entering

the Bay from point and nonpoint sources.

5) Quantifying the impacts and identifying the sources of atmospheric inputs on the Bay system.
6) Developing management strategies to protect and restore wetlands and submerged aquatic vegetation.
7) Managing population growth to minimize adverse impacts to the Bay environment.

IMPLEMENTATION 3.1
Continuing.

CHESAPEAKE BAY SUMMER FLOUNDER MANAGEMENT PLAN IMPLEMENTATION

PROBLEM AREA	ACTION	DATE	RESPONSIBLE AGENCY & METHOD	ADD. STAFF OR $$	COMMENTS/NOTES
1. Overfishing	1.1a VA, MD and the PRFC will propose an increase in their recreational minimum size limit for summer flounder from 13 inches to 14 inches.	1991; Continue	VMRC - R MDNR - A PRFC - A		
	1.1b MD, VA and the PRFC will propose creel limits and seasonal restrictions in compliance with MAFMC recommendations.	1991; Continue	MDNR - R VMRC - R PRFC - R		
	1.1c Commercial size limits will remain at 13 inches for VA and MD; PRFC will propose a 14 inch size limit. Commercial flounder trawl fisheries will be subject to a 5.5" diamond or 6" square minimum mesh size.	1991; Continue	VMRC - A,R MDNR - A		
	1.1d Commercial fisheries will be subject to a quota system administered by MAFMC. Each state's fishery will close when its quota is met.	1991; Continue	MDNR - A,R VMRC - A,R,L PRFC - A,R		
	1.2a VA, MD and the PRFC will implement a 5.5" diamond or 6" square minimum mesh size in all directed flounder trawl fisheries to allow the escapement of immature flounder.	1991; Continue	MDNR - A,R VMRC - A,R,L PRFC - A,R		
	1.2b VA and MD will promote, through MAFMC, implementation of a 5.5" diamond or 6" square minimum mesh size in all EEZ directed flounder trawl fisheries.	1991; Continue	MDNR - A,R VMRC - A		
	1.3a MD will collect information from its pound net and ocean trawl fisheries to develop strategies for reducing bycatch of undersized flounder and other species.	1991; Continue	MDNR - A		
	1.3b Va will monitor the species composition and biological characteristics of its pound net fishery and take steps to reduce bycatch as needed.	1991; Continue	VMRC - A,R,L		

	1.3c MD, VA and the PRFC will work with tha MAFMC and ASMFC to encourage protection of immature flounder.	1991; Continue	VMRC - A MDNR - A PRFC - A		
2. Stock Assessment and Research Needs	2.1 Conduct stock identification work	Continue	VMRC - A MDNR - A		
	2.2 Continue collection of data from commercial catches	Continue	VMRC - A MDNR - A PRFC - A		
	2.3 Continue on-going commercial fisheries statistics programs; VA will persue its mandatory reporting system; VA and MD will continue to supplement the Marine Recreational Statistics Program	Variable by item	VMRC - A MDNR - A PRFC - A		
	2.4 Continue the Baywide Trawl Survey to measure size, age, sex, distribution, abundance and CPUE	Continue	VMRC - A MDNR - A		
3. Habitat Issues	3.1 Promote the objectives of the Chesapeake Bay Agreement to improve water quality	Variable	VMRC - A MDNR - A DCFM - A PFC - A		

Legend:
VMRC = Virginia Marine Resources Commission
MDNR = Maryland Department of Natural Resources
PRFC = Potomoc River Fisheries Commission
DCFM = District of Colombia, Fisheries Management
FMAC = Fisheries Management Advisory Committee
TFAC = Tidal Fisheries Advisory Committee
PFC = Pennsylvania Fish Commission
SFAC = Sports Fisheries Advisory Commission

A = Administrative action
R = Regulation
L = Legislation