

Chesapeake Executive Council

Chesapeake Bay
Striped Bass Management Plan

Chesapeake
Bay
Program

Agreement Commitment Report

December 1989

Chesapeake Bay Striped Bass Management Plan

**An Agreement Commitment Report from
the Chesapeake Executive Council**

**Annapolis, Maryland
December, 1989**

ADOPTION STATEMENT

We, the undersigned, adopt the **Chesapeake Bay Striped Bass Management Plan**, in partial fulfillment of Living Resources Commitment Number 4 of the 1987 Chesapeake Bay Agreement:

"...by July 1989 to develop, adopt, and begin to implement a Bay-wide management plan for oysters, blue crabs and American shad. Plans for other major commercially, recreationally and ecologically valuable species should be initiated by 1990."

Striped bass, or rockfish, was given priority as one of these valuable species in the Schedule for Developing Bay-wide Resource Management Strategies, and 1990 was set for completion of the plan.

We agree to accept the plan as a guide to enhancing and perpetuating the striped bass stock in the Chesapeake Bay and its tributaries, and throughout its Atlantic coast range, for optimum long-term 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 address protection of the adult spawning stock and other life stages; regulatory and enforcement issues; stock assessment and research needs; and water quality criteria necessary for healthy striped bass populations.

We recognize the need to commit long-term, stable financial support and human resources to the task of enhancing and perpetuating the striped bass stock. In addition, we direct the Living Resources Subcommittee to review and update the plan periodically and to prepare an annual report addressing the progress made in achieving the plan's management recommendations.

Date

Dec. 19, 1989

For the Commonwealth of Virginia

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For the State of Maryland

William Donald Schafer

For the Commonwealth of Pennsylvania

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For the United States Of America

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James E. McCallan

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 striped bass FMP was scheduled for 1990.

The date for the striped bass FMP was moved ahead to December 1989, in order to have a framework in place for a reopening of the Bay fishery in 1990. The fishery can be reopened due to improvement in Chesapeake Bay striped bass reproduction, as measured by the Maryland young-of-year index. The three-year average index from 1987 through 1989 is above the long-term average of 8.0. This meets the criterion of the Atlantic States Marine Fisheries Commission for allowing a conservative fishery designed to protect the reproductive potential of the species. Recovery of the stock is also indicated by a large increase in the number of mature females on Chesapeake Bay spawning grounds.

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. Development of a fishery management plan is a dynamic, ongoing process.

The development process starts with initial input by the Fishery Management Workgroup, is followed by public and scientific review of the management proposals, and then is endorsed by the appropriate Chesapeake Bay Program committees. After an FMP is

adopted by the Chesapeake Bay Program's Executive Committee, an implementation plan is formulated to provide additional detail on actions that participating jurisdictions will take and the mechanisms for taking these actions. In some cases, regulatory and legislative action will have to be initiated, while in others, additional funding and staffing may be required. 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 of the Chesapeake Bay Striped Bass Management Plan

The goal of the Chesapeake Bay Striped Bass Management Plan is to enhance and perpetuate the striped bass stock in the Chesapeake Bay and its tributaries, and throughout its Atlantic coast range, to generate optimum long-term ecological, social and economic benefits.

In order to meet this goal, a number of objectives must be met. The primary objective, from which all others stem, is to abide by Atlantic States Marine Fisheries Commission guidelines and requirements. Other objectives are included in the discussions of problems and management strategies that follow.

Problem Areas and Management Strategies

Problem 1: Overharvesting, Reduced Spawning Stock and Poor Recruitment. Striped bass is a popular game and food fish, making it a highly sought after species. Heavy fishing pressure drastically reduced both commercial and recreational catches of striped bass during the 1970s and early 1980s, eliminating many of the large spawning fish while lowering the yield per fish. A reduced spawning stock contributes to poor reproduction. A succession of poor-to-average year classes since 1974 has contributed to low adult striped bass abundance and a lack of diversity in sizes and ages in the spawning population.

Strategy 1: Fishing mortality will be controlled to restore and maintain striped bass stocks at levels appropriate for protecting the reproductive potential of the species while allowing some harvesting. Fishing rates accepted by the Atlantic States Marine Fisheries Commission fall into two categories: $F=0.25$ (equivalent to about 18% of legal sized fish being harvested) during a conservative transition fishery; and $F=0.5$ (equivalent to about 32% of legal sized fish being harvested) during a recovered fishery. A transition fishery is allowed when the Maryland juvenile index reaches a three-year average of 8.0 and there are indications of recovering spawning populations, while a recovered fishery must wait until the spawning stock is composed of an adequate proportion of mature females (the exact proportion must

still be defined by the Atlantic States Marine Fisheries Commission). In addition, minimum size limits will be set that allow sufficient numbers of females to reach spawning size and that increase the optimum yield per fish.

Problem 2: Regulatory and Enforcement Issues. The strong interest in fishing for striped bass makes timely promulgation of regulations, especially in-season adjustments, essential for adequately protecting the resource. The ability to monitor stocks, harvests, and sales of striped bass in a timely manner is a critical component of this effort. Conflicts among sport, charter, and commercial interests must be addressed. Inconsistency among the Chesapeake Bay jurisdictions in regulating and enforcing the fishery must be avoided. An effective and efficient enforcement strategy for the fishery is also needed.

Strategy 2: In order to allocate and control the harvest at safe levels, harvest regulations will be developed. These will include gear restrictions, fishing seasons, creel limits, and other measures. A monitoring program will be established for the recreational, charter and commercial fisheries to provide accurate and timely data. Monitoring techniques will include surveys of recreational fishermen, boat and port sampling of fish, and reporting requirements for commercial fishermen, charter boat operators, and buyers. The individual jurisdictions will comply with ASMFC criteria for the striped bass fishery, and will promulgate compatible fishing regulations in doing so. Enforcement will be given high priority.

Problem 3: Stock Assessment and Research Needs. Restrictions on striped bass fishing in the Chesapeake Bay since 1985 have allowed several aspects of the species' life history to be identified. These include migration rates, maturity schedules and mortality rates. Additional information is needed to identify, protect and enhance the Chesapeake striped bass population.

Strategy 3: The Chesapeake Bay Stock Assessment Committee's (CBSAC) Stock Assessment Plan and the Atlantic States Marine Fisheries Commission's (ASMFC) Striped Bass Plan identify numerous areas for additional study. Stock identification studies should be expanded to provide information on stock mixing and the contribution of hybrids and hatchery-produced fish to the wild population. A review of various fishing and by-catch mortality rates is needed to help develop more precise fishing controls. Studies on reproduction, larval growth, and recruitment in relation to environmental variables are needed to provide a better understanding of the factors affecting the strength of striped bass year classes.

Problem 4: Declining Water Quality. Good water quality in spawning areas is critical for the survival of striped bass eggs and larvae, however the specific roles many water quality parameters play are not well known. Traces of heavy metals and organic compounds have been found in striped bass spawning areas, and dissolved aluminum and pH interactions are known to affect early life stages of the fish. Low dissolved oxygen in the Chesapeake Bay during the summer may limit some striped bass habitat. High levels of contaminants in tissues of adult striped bass (as in the Hudson River stock) may pose health risks for consumers.

Strategy 4: Spawning and nursery areas with good water quality are critical for striped bass survival. Although causes of poor reproduction may differ among years and spawning areas, several water quality parameters are known to reduce survival of young. Studies will continue to examine the effects of environmental parameters on striped bass stocks. Chesapeake Bay jurisdictions will take measures to meet habitat requirements for striped bass and to reduce the input of nutrients, toxic materials, and conventional pollutants entering the Bay watershed, as adopted under other 1987 Chesapeake Bay Agreement reports.

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:

- o oysters, blue crabs and American shad by July 1989;
- o striped bass, bluefish, weakfish and spotted seatrout by 1990;
- o croaker, spot, summer flounder and American eel by 1991; and
- o red and black drum by 1992

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. 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.

WHAT IS A FISHERY MANAGEMENT PLAN?

A Chesapeake Bay fishery management plan is a framework under which the Bay jurisdictions are committed to implementing compatible management measures according to a specified timetable. Developing a plan is a dynamic 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. In the next step, the chosen management strategies are put into action. A plan requires an adaptive management scheme which responds to the most current status of the fishery; therefore, as a fourth step, it is important to regularly review and update management strategies.

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 for each management plan summarizes:

- FMP status and management unit;
- fishery parameters;
- biological profile;
- habitat issues;
- historical fishery trends;
- economic perspective;
- current resource status;

- o status of traditional management approaches; and
- o data and information 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 each of the species.

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

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

Once the plan has been adopted by the Bay Program's Executive Committee, appropriate administrative, regulatory and legislative action will be initiated. A periodic review of the management plan will be required to continually update management strategies and actions. The Living Resources Subcommittee will be responsible for this review.

Section 1. Striped Bass Background

Striped bass (Morone saxatilis), or rockfish, occur along the east coast of North America from the St. Lawrence River, Canada to the St. Johns River, Florida. The coastal migratory pattern of anadromous stocks of striped bass is northward along the coast in the spring and southward in the fall. Striped bass from southern North Carolina to northern Florida do not undertake coastal migrations. Likewise, striped bass from the Canadian provinces of Nova Scotia and New Brunswick are relatively isolated and probably do not move great distances after spawning. The east coast migratory population is composed of three major stocks - Hudson, Chesapeake and Roanoke. Historically, the majority of striped bass caught in northern waters were of Chesapeake Bay origin, with a lesser contribution of Hudson and Roanoke River fish. An understanding of the contribution of each stock to the coastal fisheries is an important issue for management.

The striped bass stock within the Chesapeake Bay is composed of pre-migratory fish, primarily age V and younger, and coastal migratory striped bass from 2 to more than 20 years in age. In late winter and spring, mature resident and migratory striped bass move into tidal freshwater to spawn. Shortly after spawning, migratory fish return to the coast. Most spend the summer and early fall months in middle New England near-shore waters. During late fall and early winter, coastal striped bass migrate south to winter off the North Carolina/Virginia Capes.

Chesapeake female striped bass may spawn as early as age IV, but a year class may not reach complete sexual maturity until age VIII or older. Most male striped bass reach sexual maturity at age II or III. Spawning is triggered by an increase in water temperature and generally occurs in April, May and early June in the Chesapeake Bay. Eggs and newly hatched larvae require sufficient turbulence to remain suspended in the water column; otherwise, they will settle to the bottom and be smothered. The migratory behavior of juvenile striped bass varies with location. Generally, juveniles move downstream to areas of higher salinity. There is evidence that some striped bass younger than 2 years old migrate along the Atlantic Coast, however, significant migration does not occur until age III. Most young striped bass remain within the river system in which they were spawned.

FMP status and management unit

Detailed analyses of habitat, biology, economics, population parameters, and management options are available in the Atlantic State Marine Fisheries Commission (ASMFC) Striped Bass Management Plan (ASMFC 1987). The ASMFC consists of forty-five members, three from each of the fifteen member states. In addition, more than 125 fishery biologists and managers provide technical information and

policy guidance for interjurisdictional fishery problems. The goal of the ASMFC is to achieve cooperative interjurisdictional management of migratory fisheries in state waters of the Atlantic coast. In October 1984, the U.S. Congress gave the ASMFC regulatory authority "...to evaluate the state's compliance and enforcement of its Striped Bass Management Plan and all amendments thereto related to fishing." The Revised Interstate Striped Bass Management Plan (ASMFC 1989), which was adopted by the ASMFC at its October 1989 meeting, provides the most recent framework for state management of the striped bass fishery. The interstate plan includes requirements for a young-of-year index trigger, adult stock triggers, and harvest regulations, as well as recommendations for stocking, habitat and water quality requirements, and research.

The management unit is the Chesapeake Bay stock of striped bass (Morone saxatilis) throughout its range on the Atlantic coast.

Fishery Parameters

Status of exploitation:	Moratorium on the harvest of striped bass in Maryland since January 1, 1985; in the Potomac River since May 31, 1989; and in Virginia since June 1, 1989.
Long term potential catch:	Unknown.
Importance of recreational fishery:	Significant in the District of Columbia, Maryland, Potomac River and Virginia.
Importance of commercial fishery:	Significant in Maryland, Virginia and the Potomac River.
Fishing mortality rates:	Potomac River, 1974-77 annual rates males -- 70% (F=1.2), females -- 42-58% (F=0.55-0.87); Chesapeake Bay, 1982-85 annual rates -- males 63% (F=1.00), females -- 58% (F=0.87).

Biological Profile

<u>Natural mortality rate:</u>	15% - 20% (M=0.17-0.23) annually.
<u>Fecundity:</u>	200,000 - 8,000,000 eggs/female, based on length and weight.
<u>Longevity:</u>	In excess of 30 years.

Spawning and larval development

Spawning season: April - June.

Spawning area: Northern Chesapeake Bay and all major tributaries.

Location: Generally within the first 25 miles downriver of the tidal/freshwater interface.

Salinity: 0.0 - 3.0 ppt.

Temperature: Peak spawning activity - 60-70° F.

Dissolved oxygen: At least 5.0 ppm.

pH: Optimum 7.5 - 8.5.

Flow: Optimum 0.3 - 2.0 ft/sec.

Young-of-Year

Location: Fresh, tidal and estuarine waters at depths of 10 feet or less.

Salinity: 0 - 20 ppt.

Dissolved oxygen: At least 5.0 ppm.

pH: Optimum 7 - 9.

Subadults and Adults

Location: Estuarine and ocean waters.

Salinity: 0 - 35 ppt.

Dissolved oxygen: At least 5.0 ppm.

Habitat Issues

Estuaries are critically important to the life cycle of striped bass. These areas are utilized as spawning grounds and as nursery areas. Any major alteration of these habitats could disrupt the life cycle of striped bass. Emergency Striped Bass Study research projects have shown that some combinations of contaminants found in Chesapeake Bay affect survival of striped bass early life stages. In some years, poorly buffered Eastern Shore spawning

rivers had pH depressions which, in combination with high levels of dissolved aluminum, cadmium and copper, produced excessive larval mortality. These conditions have been documented in the Choptank and Nanticoke Rivers. Inorganic contaminants have been identified as a potential problem in the Potomac River.

Although deep water hypoxia in Chesapeake Bay resulting from nutrient enrichment is definitely a problem for some Chesapeake Bay species, its effect on striped bass is not known. It has been hypothesized that the striped bass population that inhabits Chesapeake Bay in the summer can be limited and stressed by hypoxic conditions.

Presently, adequate water quality conditions exist for coastal striped bass except in the New York Bight area and some smaller rivers on the New England coast. These areas have had periodic dissolved oxygen depressions and may contain elevated levels of organic pollutants. Hudson River stocks of striped bass are carrying heavy tissue burdens of PCBs, and although they are a health risk for human consumption, there is no evidence that this contaminant poses a threat to successful fish reproduction.

The Fisheries

Commercial landings in the Maryland portion of the Bay generally increased from the early 1930s to reach historically high levels during the period 1961 through 1974, then declined dramatically, thereafter (Figure 1a, b, & c). Similarly, commercial landings in Virginia were at or near historically high levels in the 1960s and early 1970s. As was the case in Maryland, Virginia harvests declined rapidly after 1974.

Principal gears used in the Chesapeake Bay commercial striped bass fishery included pound nets, haul seines, and drift, anchor and stake gill nets. Gill nets have been the predominant gear type in the Maryland striped bass fishery (Figure 2a), accounting for 30% (1946) to 97.5% (1981) of the total catch. Haul seines were an important gear for capturing striped bass between 1946 and 1957, averaging 26% of the total catch, before dropping to between 1% and 3% of the catch in the 1970s (Figure 2b). Pound nets followed a similar pattern of usage, averaging about 28% of the total catch between 1944 and 1953, then fluctuating between 1% and 15% of the total catch (Figure 2c). Commercial landings by gear type for the Virginia fishery are available from 1960 to the present. During the 1960s, the total catch was almost equally divided among haul seines, pound nets, and gill nets (Figure 3a, b, & c). Striped bass caught by haul seine began to decline in the 1970s, and by 1980 haul seines captured an insignificant amount of the total commercial catch. Gill nets increased in importance to become the dominant gear type. Pound nets continued to account for approximately 25% of the total catch.

Figure 1a. Striped Bass Commercial Landings from the Chesapeake Bay

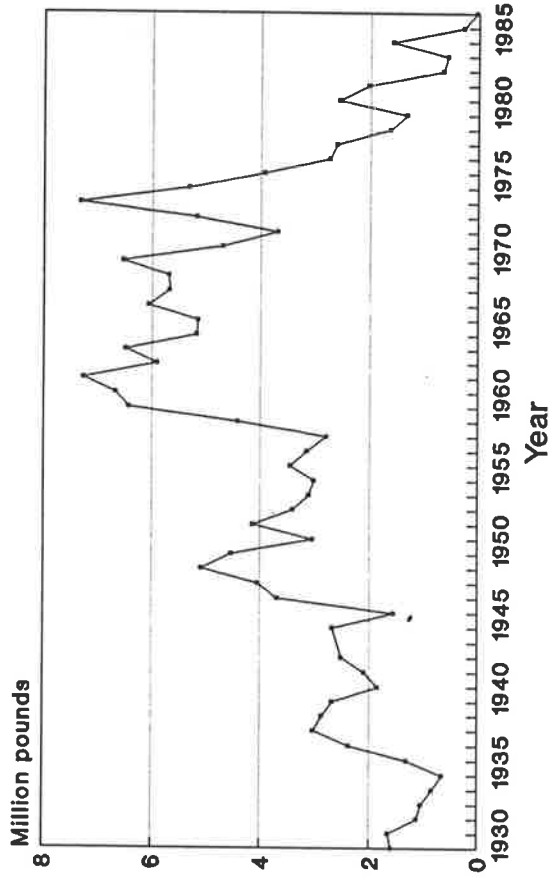


Figure 1b. Striped Bass Commercial Landings from Maryland

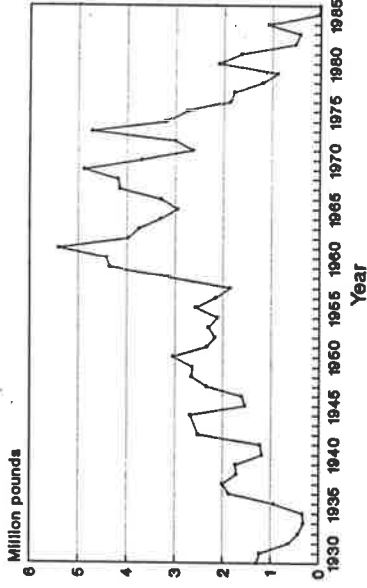


Figure 1c. Striped Bass Commercial Landings from Virginia

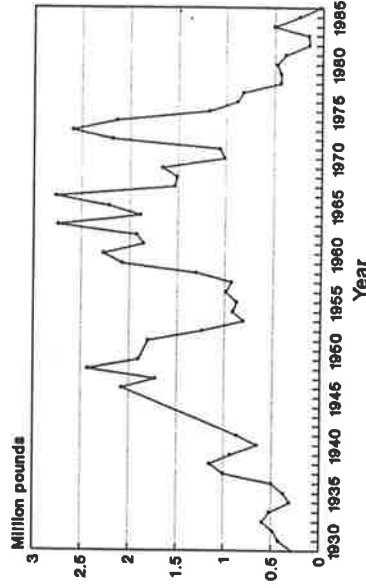


Figure 2a. Maryland Striped Bass Landings by Gill Net

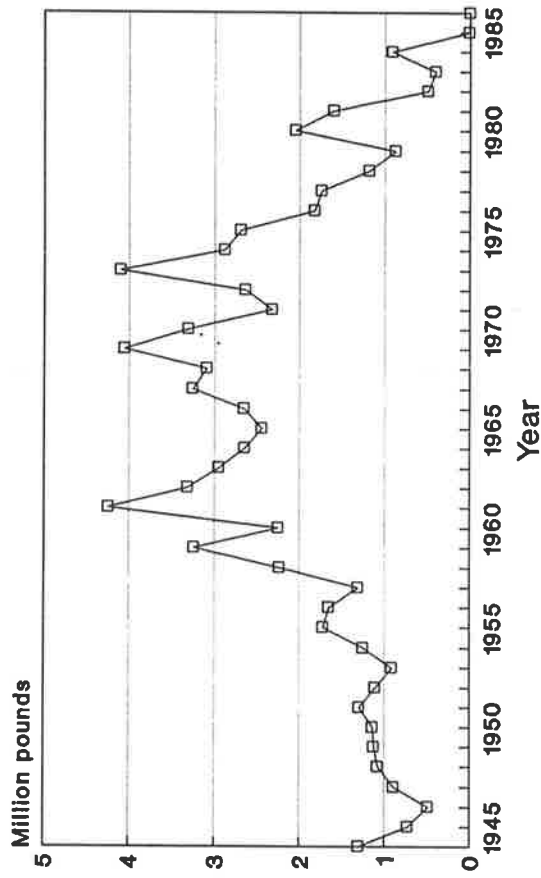


Figure 2b. Maryland Striped Bass Landings by Pound Net

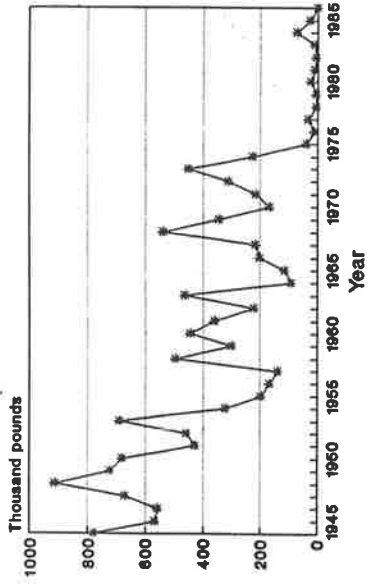


Figure 2c. Maryland Striped Bass Landings by Haul Seine

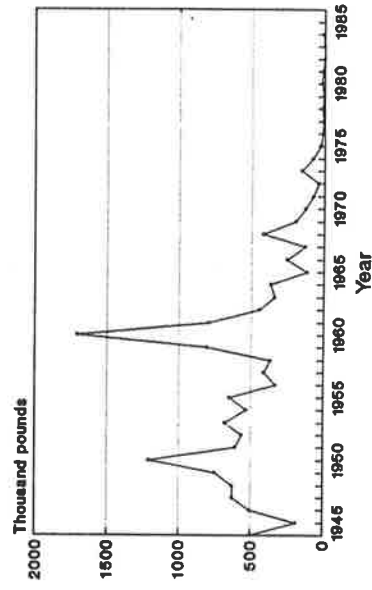


Figure 3a. Virginia Striped Bass Landings by Gill Net

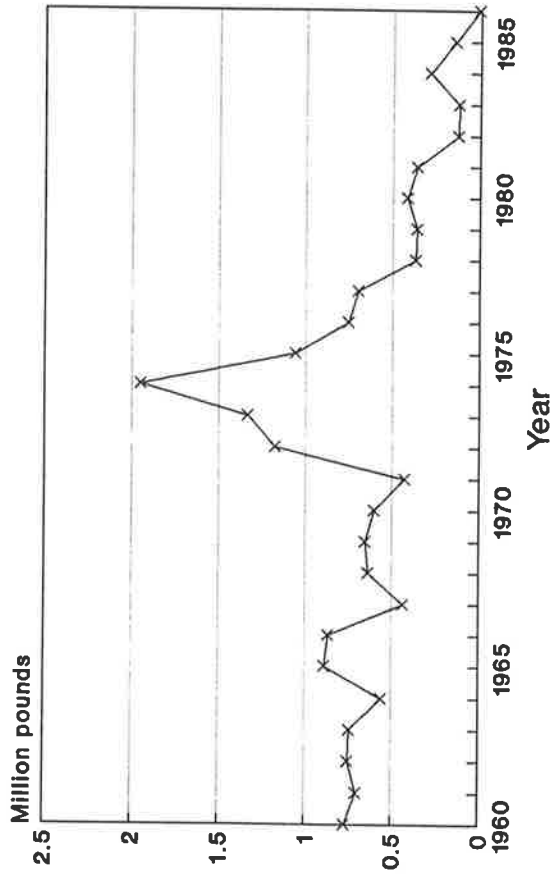


Figure 3b. Virginia Striped Bass Landings by Pound Net

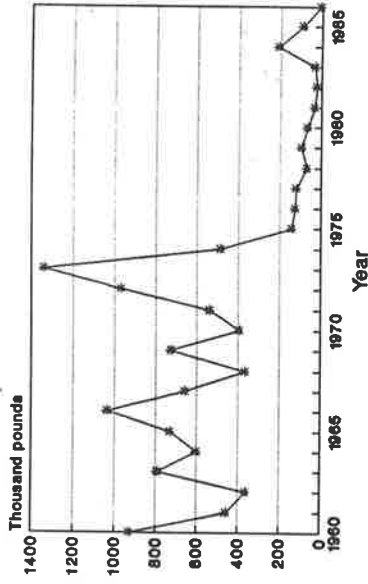
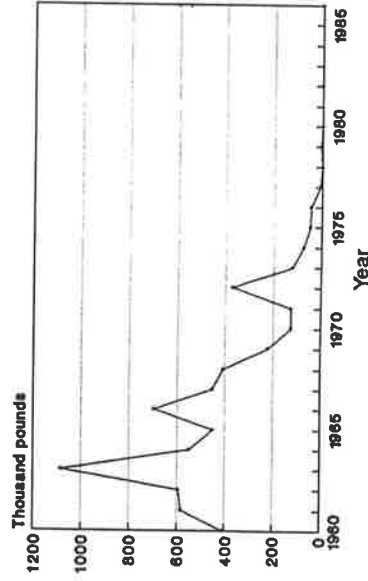


Figure 3c. Virginia Striped Bass Landings by Haul Seine



Historically, the harvest of striped bass from the Chesapeake Bay was regulated through gear restrictions (gill net mesh size), minimum size limits, and areal/seasonal closures. These regulations did not effectively protect the striped bass stocks as an alarming long term decline in abundance began in the mid-1970s. Commercial harvest of striped bass from the Atlantic Coast also began to decline. In an attempt to conserve the striped bass resource along the coast, the Atlantic States Marine Fisheries Commission (ASMFC) adopted an Interstate Fishery Management Plan in 1981 which called for minimum size and creel limits along the Atlantic Coast. However, landings and recruitment continued to decline.

To counteract the decline, Amendment 3 to the ASMFC plan established larger size limits in 1985, to protect the 1982 and all subsequent year classes until 95% of the females had spawned at least once. The amendment also provided the criterion for relaxing management measures when a 3-year running average of 8.0 for the Maryland juvenile striped bass index was reached. The Maryland index was incorporated into the amendment because it is a reliable indicator of reproductive success and because the Chesapeake Bay stock of striped bass traditionally accounted for 60% to 90% of the total coastal landings. To accelerate the restoration of Chesapeake Bay striped bass stocks, Maryland imposed a moratorium on the harvest, sale and possession of striped bass within state boundaries. All states along the Atlantic Coast complied with Amendment 3 with various restrictions on their fisheries. Virginia and the Potomac River Fisheries Commission enacted moratoriums in 1989.

Historically, striped bass were a valuable commercial and popular recreational finfish in the Chesapeake Bay. In Virginia, striped bass traditionally commanded one of the highest prices per pound of any finfish and, as a result, it was a target species of many commercial fishermen. In both Maryland and Virginia, recreational anglers considered striped bass the top game fish in Chesapeake Bay. At least one user group fished for striped bass each month of the year. Recreational and charter boat fishing began in May and, in some areas of the Bay, fishing continued into December. Commercial fishing occurred during every month, with most of the annual harvest landed from November through May.

Estimates of the striped bass recreational catch in Maryland range from two times the commercial catch in 1962, an estimated 9.3 million pounds, to seventy percent of the commercial catch in 1979, an estimated 657,000 pounds. Only recently has data been collected to specifically assess Maryland's recreational harvests. In 1979 and 1980, the annual recreational striped bass catch in Maryland was approximately 508,000 and 441,000 pounds, respectively. Total Maryland sportfishing effort for all finfish species during 1979 and 1980 was in the range of 2.6 to 2.7 million fishing trips each year. Virginia's recreational fishery for striped bass has not been determined. Both the saltwater sportfishing surveys in Virginia

and the 1980 National Marine Fisheries Service survey data are unable to provide accurate estimates of recreational catch. It has been assumed that sportfishermen in Virginia are comparable to sportfishermen on the Atlantic coast and probably take at least equal the amount as the commercial fishery.

Economic Perspective

The following economic perspective on the striped bass fishery in the Chesapeake Bay was taken from a study conducted by Norton, Smith and Strand (1983). This economic analysis was based on the fishing industry that existed along the Atlantic Coast during 1979 and 1980.

Gill netting was the major commercial gear type reported in Maryland, accounting for 97% of the total 1980 commercial striped bass landings. About one-fourth of the 1,555 registered gill netters were part-time fishermen. The average annual expenditures attributable to striped bass, by both part-time and full-time fishermen using gill nets in Maryland during 1980 were \$5,516 and \$22,717, respectively. Income contributions from striped bass fishing appear to vary geographically with the middle and upper Bay harvesters relying more heavily on striped bass and finfish than on shellfish.

During 1980, 82% of Virginia's striped bass landings were caught by gill nets with harvest concentrated in the area between the Potomac and Rappahannock rivers. An estimated 761 full-time gill netters and an additional 2,000-3,000 part-time fishermen participated in the striped bass fishery in Virginia. However, full-time netters do not rely solely on the unpredictable availability of striped bass. Average annual expenditures attributable to striped bass by Virginia fishermen during 1980 were \$2,415. Net economic benefits are the value of consumption in excess of the cost of production. Estimated net value of the striped bass fishery from the Chesapeake Bay region in 1980 was \$1,747,000 for the commercial fishery and \$3,487,000 for the recreational fishery.

An analysis of the economic impact and value of the recreational striped bass fishery in the Chesapeake Bay was based on estimates of total effort (trips), catch rate and total catch, mean and total expenditures, and the average striped bass fishing trip. Compared to other states along the Atlantic Coast, the Chesapeake Bay region received the most benefits from a striped bass fishery by generating the largest recreational values. Maryland's benefits were significantly greater than Virginia's. The total net economic benefit from both the recreational and commercial striped bass fisheries during 1980 was estimated at \$5,234,000 for the Chesapeake Bay region.

In addition to the net benefits from the Chesapeake Bay region, the striped bass fisheries produced important income and employment in the coastal areas. For the ten coastal states from Maine to North Carolina, a total net economic value of \$12 million was generated in 1980. Approximately 75% of the total was associated with the recreational fishery and 25% with the commercial fishery.

Resource Status

The Maryland striped bass moratorium began on January 1, 1985 and was followed four years later by the closure of the Potomac River fishery on May 31, 1989 and the Virginia fishery on June 1, 1989. Strict management measures along the Atlantic coast, including the Chesapeake Bay moratorium, were scheduled to remain in effect until Maryland's spawning stock recovered to the point of successfully reproducing. Reproductive success was measured by the juvenile index of abundance reaching a 3-year running average of 8.0. Maryland's juvenile index was used as the criterion for relaxing fishing restrictions because it is a reliable indicator of annual reproductive success and subsequent adult abundance in the Bay and Atlantic coast. To establish reliability, statistically significant relationships must be demonstrated between the index value from year to year, and either the relative magnitude of harvest from that year class or the relative magnitude of abundance as measured by fishery-independent sampling programs.

Modest improvement in the juvenile index occurred the first three years after the Maryland moratorium was imposed (2.9, 4.1 and 4.8 respectively, in 1985, 1986 and 1987). In 1988, the index declined slightly (2.7), but by 1989 the juvenile index was 25.2, the highest index recorded since 1970 (Table 1). Spawning success, as measured by the juvenile index, indicates that the Chesapeake Bay striped bass stock is recovering from a prolonged period of low abundance. Surveys also indicate a significant increase in the number of female striped bass on Chesapeake Bay spawning grounds.

The Virginia Institute of Marine Science (VIMS) conducted a juvenile striped bass seining survey from 1967 through 1973 and from 1980 to the present. A recent trend of steadily increasing values in the juvenile index have been observed, and the 1987 index was the highest ever recorded in Virginia. Based on the results of these surveys, it appears that striped bass juvenile production in the lower Chesapeake Bay nursery areas is at historic levels.

The Maryland moratorium on striped bass fishing and minimum sizes observed by other states allowed many aspects of striped bass life history to be examined. Migration rates, maturity schedules, and mortality rates have been refined, allowing a more precise assessment of the Bay stocks. Striped bass spawning stock surveys carried out from 1982-1989 on the spawning reaches of the

Table 1. Maryland striped bass juvenile (age 0) index, 1954 - 1989.

	Head of Bay	Potomac River	Choptank River	Nanticoke River	Overall Average
1954	0.9	5.2	1.2	25.1	5.2
1955	4.4	5.7	12.5	5.9	5.5
1956	33.9	6.2	9.8	8.2	15.2
1957	5.4	2.5	2.1	1.3	2.9
1958	28.2	8.4	19.5	22.5	19.3
1959	1.9	1.6	0.1	1.8	1.4
1960	9.3	4.3	9.0	4.7	7.1
1961	22.1	25.8	6.0	1.5	17.0
1962	11.4	19.7	6.1	6.6	12.2
1963	6.1	1.1	5.4	4.1	4.0
1964	31.0	29.1	10.6	13.3	23.5
1965	2.2	3.4	9.5	21.6	7.4
1966	32.3	10.5	13.6	3.3	16.7
1967	17.4	1.9	5.3	4.1	7.8
1968	13.1	0.7	6.3	9.0	7.2
1969	26.6	0.2	4.8	6.2	10.5
1970	33.1	20.1	57.2	17.1	30.4
1971	23.7	8.5	6.3	2.0	11.8
1972	12.1	1.9	11.0	25.0	11.0
1973	24.7	2.1	1.0	1.1	8.9
1974	19.9	1.5	15.3	3.9	10.1
1975	7.6	7.8	4.7	5.2	6.7
1976	9.8	3.2	2.4	1.7	4.9
1977	12.1	1.9	1.2	1.0	4.8
1978	12.5	7.9	6.0	4.8	8.5
1979	8.3	2.2	2.8	0.9	4.0
1980	2.3	2.2	1.0	1.8	2.0
1981	0.3	1.4	1.3	2.4	1.2
1982	5.5	10.0	13.0	6.2	8.4
1983	1.2	2.0	0.9	1.0	1.4
1984	6.1	4.7	2.8	1.5	4.2
1985	0.3	5.6	3.7	2.1	2.9
1986	1.6	9.9	0.5	2.2	4.1
1987	0.3	6.4	12.1	2.5	4.8
1988	7.3	0.4	0.7	0.4	2.7
1989	19.4	2.2	97.8	2.9	25.2
Average (1954-89)	12.6	6.3	10.1	6.3	8.9

Choptank River, Upper Bay, Chesapeake and Delaware Canal, and Potomac River suggest that the recent recovery of the female spawning stock is the dominant contributor to the large 1989 year class. Poor reproduction in Maryland since the mid-1970's, combined with apparently high levels of fishing mortality, had resulted in a spawning stock with relatively low numbers of females in most age classes. The lack of females in the spawning population was so severe from 1982 through 1986 that the oldest year classes in the population (the 1969-1971 age classes) were contributing a significant portion of the eggs produced on the spawning grounds. Because of the significant increase in the contribution of the 1982 year class and younger females to the total number of eggs produced in 1989, this is no longer the case.

Since the Maryland juvenile index for 1987 through 1989 is greater than 8.0, the ASMFC will allow a conservative, transitional fishery along the Atlantic coast in 1990. The ASMFC must approve a coastal jurisdiction's striped bass management plan before the jurisdiction can initiate its transitional fishery. ASMFC criteria are designed to build and maintain the coastal striped bass stock.

Status of Traditional Fishery Management Approaches

Catch-Effort (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): Historical commercial fisheries data is of low quality. The catch data is imprecise and there is no species specific effort data. Maryland's fishery independent survey data (1982-1989) and historical Potomac River spawning stock assessment data (1976-1987) provide estimates of age and sex specific catch-per-unit-of-effort (CPUE).

Estimates of mortality based on abundance (Instantaneous mortality is defined as the rate at which fish are removed from a population by death (Z). It can be represented mathematically by the natural logarithm of a ratio of the number of fish alive at the end of a unit of time, to the number alive at the beginning of the unit of time. It can also be expressed as a percentage of the population): Potomac 1974-1977: males age 4-7, 70% (Z=1.2); females age 4-7, 58% (Z=0.87); females age 4-14, 43% (Z=0.57); females age 7-14, 41% (Z=0.54); MDNR survey 1982-1985: males ages 3-9, 62% (Z=0.99); females ages 4-9, 58% (Z=0.87).

Yield-per-Recruit (Describes the yield, by weight, per individual fish. Yield-per-recruit changes with age of the fish. Yield models are calculated from a fixed number of fish as a function of fishing mortality and age at first capture): Yield-per-recruit is maximized by delaying fishing in Chesapeake Bay and on the Atlantic Coast until striped bass reach 33-37 inches total length. However, because of the migratory behavior of the Chesapeake stock, Maryland has essentially no striped bass 33 inches and larger except during the spawning season. First approximations indicate that at $F =$

about 0.5 (32% of legal sized fish being harvested), yield-per-recruit in Maryland is maximized at 16-18 inches total length.

Stock-Recruitment (The relationship between the number of adults and the number of surviving progeny or recruits they produce): Analysis in progress and will be incorporated into the management plan when it is available.

Maximum Sustainable Yield (There are many definitions in quantitative terms, but it is usually considered the greatest catch that can be taken for a long period of time without any danger to the fish population): Analysis has not been carried out and there are no plans to do so since the concept is considered of limited value for practical management purposes.

Virtual Population Analysis (Defined as the minimum estimate of catchable fish present in one year, i.e. the total of the minimum number of fish in each year class. A yearly age census of the catch and the allocation of the catch among year classes must be carried out.): Has not been carried out because of a lack of historical information on age specific estimates of catch.

Data and Analytical Needs:

1. Continued surveys on age and sex specific estimates of the relative abundance of premigratory and spawning stocks in Chesapeake Bay.
2. Annual age specific estimates of Chesapeake Bay and coastal fishing mortality rates, including mortality by catch and release of undersize fish.
3. Precise estimates of the commercial, recreational and charter boat harvest, by sex and age class, when the fishery re-opens in the Chesapeake Bay.
4. Refined estimates of sex and age specific rates of migration of immature females and young males from the Bay.
5. Data which can be used to further refine estimates of the Chesapeake Bay female striped bass maturity schedule.
6. Analysis of data on the stock-recruitment relationship.
7. Improved information on the composition (system of origin, hatchery produced vs. natural) of the coastal stock.
8. Additional research on striped bass reproduction and early life history stages.
9. Determination of contaminants which affect reproductive success and the extent to which they do so.

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Section 2. Striped Bass Management

The source documents for this plan (Setzler et al. 1980; Atlantic States Marine Fisheries Commission 1987 and 1989; Maryland Department of Natural Resources Annual Status Reports 1985, 1986, 1987; Emergency Striped Bass Study Group Reports 1981, 1982, 1983, 1984, 1985, 1986 and 1987) contain current knowledge and the status of striped bass stocks in the Chesapeake Bay and coastal waters.

Although striped bass reproduction in the Chesapeake Bay has met the ASMFC criterion of a 3-year-running average of 8.0 and will result in relaxed management measures along the coast, the population must continue to be protected. A highly conservative reopening of the fishery (transition fishery) in the Chesapeake Bay will be implemented to allow time to assess the impact of regulated fishing on the striped bass population and to guard against overfishing. Thereafter, management actions in the Bay jurisdictions will be adjusted as needed to reflect the status of the resource, the success of the actions themselves, and ASMFC coastal guidelines.

The Maryland Department of Natural Resources (MDNR), Fishery Division is the responsible fishery management agency in Maryland. The department is advised on fisheries policy by several commissions and committees. In 1987, Governor Schaefer appointed a Striped Bass White Paper Committee (SBWPC) to develop a framework for striped bass management in Maryland. The committee has representatives from MDNR, including enforcement and fisheries personnel, the University of Maryland, conservation organizations, commercial, recreational, and charter boat fisheries, processors and the State General Assembly. The white paper committee recommendations are incorporated in this plan.

Fishery activity on the tidewater portion of the Potomac River is managed by the Potomac River Fisheries Commission (PRFC), a six member body empowered under the Maryland-Virginia Potomac River Compact of 1958. The commission meets quarterly to establish and maintain a program of conservation and improvement of the seafood resources, and to regulate and license fisheries in the Potomac River. The commission was responsible for developing actions in this plan that were within its purview. A Rockfish Study Group was established in 1989 to evaluate alternatives for managing the striped bass fishery in the Potomac River, and will make its recommendations to the commission. The study group is composed of representatives from management agencies and Potomac River fishing interests in both Virginia and Maryland.

The Virginia Marine Resources Commission (VMRC), Fisheries Management Division is responsible for fisheries management in the Commonwealth of Virginia. The commission developed actions to address problems identified in this plan for the Virginia portion

of the Chesapeake Bay. The Finfish Subcommittee of the Virginia Fisheries Advisory Committee is evaluating management options for the striped bass fishery and is providing VMRC with its recommendations. Subcommittee members represent Virginia fishermen and processors.

The District of Columbia Department of Consumer and Regulatory Affairs, Fisheries Management Section (DCFM), was responsible for developing actions for the District of Columbia management of striped bass. There is no commercial striped bass fishery in the District's portion of the Potomac River.

Administrative authority to open and close areas to fishing, adjust the length of the season, determine fishing quotas, set size limits, regulate permissible gear types, require record keeping, and monitor the results of these actions is necessary to react to changing conditions. The strategies in this plan reflect a broad approach that gives the affected jurisdictions flexibility in meeting their specific management needs, while striving toward compatibility and consistency. The management plan for striped bass will be adaptive and continuously responsive to new information about the current status of the resource.

A. GOAL AND OBJECTIVES

The goal of this plan is to:

Enhance and perpetuate the striped bass stock in the Chesapeake Bay and its tributaries, and throughout its Atlantic coast range, so as to generate optimum long-term ecological, social and economic benefits.

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

- 1) Follow guidelines established by the Atlantic States Marine Fisheries Commission (ASMFC) for coastwide management of striped bass 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) Restore and maintain an adequate spawning stock with a balanced age composition to minimize the possibility of recruitment failure.
- 4) Promote fair allocation of allowable harvest among various components of the fishery.
- 5) Establish programs to closely monitor the harvest and sale of striped bass.

- 6) Promulgate an effective enforcement strategy during an open fishery.
- 7) Promote research to improve our understanding of striped bass biology and population dynamics, and the socioeconomics of the fishery.
- 8) Adopt standards of environmental quality necessary for the maximum natural production of striped bass and for the utilization of allowable harvest.

B. PROBLEM AREAS AND MANAGEMENT STRATEGIES

Problem 1 - Overharvesting, Reduced Spawning Stock and Poor Recruitment: Historically, the striped bass population in Chesapeake Bay has experienced heavy fishing pressure. From 1973 to 1983, striped bass commercial landings in the Chesapeake Bay decreased from over 7,000,000 pounds to less than 600,000 pounds. Recreational harvests also decreased but catch records are not adequate to quantify their contribution to the population decline. An analysis of the average size of striped bass in the Maryland commercial harvest indicated a downward trend in size over time. Harvest of fish at small sizes reduced the number of females reaching spawning age. New information indicates that a year class of female striped bass is not expected to reach 100% maturity until age VIII or older in the Chesapeake Bay.

There has been a succession of poor-to-average year classes since 1974, resulting in lowered adult striped bass abundance and a lack of diversity in sizes and ages in the spawning population. Reduced spawning stock has contributed to poor reproduction.

Strategy 1 - Overharvesting, Reduced Spawning Stock and Poor Recruitment: Controlling fishing mortality will be the primary method of maintaining adequate striped bass stocks. Optimum yield per fish will be more closely approached by establishing minimum sizes greater than historic limits. Long term fishery maintenance must be based on a management objective commensurate with reproductive success. The number of eggs per striped bass is directly related to fish size and age. Females will be protected so that more can reach their spawning potential. As reproductive potential is protected and spawning stock increases, more young striped bass should enter the fishery.

Two types of fisheries have been defined by the ASMFC: (1) A conservative transitional fishery, which would go into effect after the Maryland striped bass juvenile index has reached a 3-year-average of 8.0; and (2) A more robust recovered fishery, to be considered when a certain percentage of the female spawning stock is composed of striped bass females equal to or greater than age VIII. The percentage will be determined by the ASMFC.

Mathematical models were utilized to determine acceptable fishing rates (F) and were the basis for arriving at a transition fishing rate of 0.25 and a long-term fishing rate of 0.5. These rates have been accepted by ASMFC as appropriate levels of fishing harvest while protecting the reproductive potential of the resource.

PROBLEM 1.1

Overfishing has led to depressed striped bass populations.

STRATEGY 1.1

Fishing mortality will be controlled by several means to protect striped bass stocks. Harvest restrictions will be set to provide a fishing mortality rate of 0.25 (equivalent to about 18% of the legal sized fish being harvested) during a transition fishery and a rate of 0.5 (equivalent to about 32% of the legal sized fish being harvested) during a recovered fishery, in accordance with ASMFC guidelines (these percentages may change slightly as additional calculations are made by the ASMFC). Adult stock levels, stock composition, and the Maryland striped bass young-of-the-year index (or other juvenile indices as approved by ASMFC) will be used in determining needed restrictions.

ACTION 1.1.1

The District of Columbia, Maryland, Virginia and the Potomac River Fisheries Commission will utilize a combination of harvest restrictions to meet target fishing mortality rates. Controls may include seasonal quotas, daily bag limits, minimum size limits, seasons, time restrictions, gear restrictions, license requirements, and other actions. Maryland's annual quota will be presented as total sport and commercial landings.

IMPLEMENTATION 1.1.1

1990 for a transition fishery.

ACTION 1.1.2

Maryland, the Potomac River Fisheries Commission and Virginia will cap commercial harvest during the transitional fishery with a quota not to exceed 20% of the average annual commercial harvest as reported for the period 1972-1979. No commercial fishing is permitted in the District of Columbia.

IMPLEMENTATION 1.1.2

1990; to be evaluated annually thereafter with a goal of setting the harvest two years in advance.

PROBLEM 1.2

Excessive fishing mortality on immature fish has led to an inadequate spawning stock, thereby hampering reproductive success.

STRATEGY 1.2

Size limits and fishing mortality rates will be set to allow sufficient recruitment to the spawning stock.

ACTION 1.2.1

The District of Columbia, Maryland, Virginia and the Potomac River Fisheries Commission will establish a minimum size limit of 18 inches total length in the Chesapeake Bay and tributaries during the transition fishery. Maryland may establish a larger minimum legal size during a May trophy fishery beginning in 1991.

IMPLEMENTATION 1.2.1

1990 for the transitional fishery; to be reevaluated for a recovered fishery.

ACTION 1.2.2

Maryland, Virginia and the Potomac River Fisheries Commission will prohibit the keeping and sale of sublegal (fish smaller than the minimum size) striped bass by-catch.

IMPLEMENTATION 1.2.2

1990

ACTION 1.2.3

As a conservation measure, the District of Columbia, Maryland, Virginia and the Potomac River Fisheries Commission will establish a consistent maximum legal size for striped bass in the Chesapeake Bay and its tributaries.

IMPLEMENTATION 1.2.3

1990

PROBLEM 1.3

Excessive fishing mortality on Chesapeake Bay spawning stocks reduced both the number of viable spawners and the diversity in age and size of spawners, resulting in decreased reproductive potential.

STRATEGY 1.3

Fishing mortality rates will be set to ensure a viable female spawning stock of age VIII and older females, and stocks will continue to be enhanced with hatchery production.

ACTION 1.3.1

During a transition fishery, mortality will be controlled to protect age VIII or older females until they comprise at least a certain percentage (as determined by the ASMFC) of the female spawning population.

IMPLEMENTATION 1.3.1

1990

ACTION 1.3.2

A fishery on a recovered stock will be controlled so that females age VIII or older continue to comprise at least a certain percentage (as determined by the ASMFC) of the female spawning stock.

IMPLEMENTATION 1.3.2

Open, depending on when a recovered fishery is reached.

ACTION 1.3.3

Maryland and Virginia will continue hatchery production to enhance striped bass spawning stocks in areas that are still depleted. The District of Columbia will work with the Maryland and Virginia hatchery programs to enhance striped bass spawning stocks.

IMPLEMENTATION 1.3.3

In progress. Restocking programs will target areas with inadequate striped bass spawning populations.

ACTION 1.3.4

Hybrid striped bass stocking and the introduction of non-native stocks will be restricted in the Chesapeake Bay and its tributaries in accordance with ASMFC guidelines. The Maryland Department of Natural Resources, the Pennsylvania Fish Commission and the U.S. Fish & Wildlife Service will discuss stocking issues regarding the Susquehanna River.

IMPLEMENTATION 1.3.4

1990

Problem 2 - Regulatory and Enforcement Issues: Striped bass is a highly desirable market item and recreational trophy which provides a strong incentive to fish at high levels. A limited fishery requires promulgation of timely annual regulations to balance and limit the pressures of both commercial and recreational fishing on the stock. In-season adjustments to the fishery may also be needed. The ability to monitor stocks and measure the results of regulations is of great importance. Allocation of harvest between sport and commercial interests is a highly debated issue that must be resolved. In addition, Chesapeake Bay jurisdictions have different fisheries for striped bass, which has led to a set of different and often inconsistent regulatory measures. An enforcement strategy is needed to provide the most effective and efficient protection for the striped bass resource.

Strategy 2 - Regulatory and Enforcement Issues: In order to control fishing effort and fishing mortality rates, harvest and sale regulations will be developed and implemented. Guidelines will be set for monitoring the resource and harvest restrictions. The individual jurisdictions will comply with ASMFC goals and criteria for the striped bass fishery and, where possible, have compatible fishing regulations. Areas of harvest pressure and times when harvesting pressure will be the heaviest will be defined in order to facilitate adequate enforcement.

PROBLEM 2.1

Traditionally, there have been three harvesting components in the striped bass fishery - commercial, recreational, and the charter boat industry, which contains both commercial and recreational elements. Allocation conflicts exist between these groups.

STRATEGY 2.1

The striped bass harvest will be equitably allocated among user groups on a yearly basis.

ACTION 2.1.1

The Maryland quota will be allocated as follows - 42.5% commercial; 42.5% recreational; 15% charter. Virginia and the Potomac River Fisheries Commission will use various restrictions in fishing seasons and bag limits to equitably allocate and restrict harvest among the commercial, recreational and charter boat fisheries.

IMPLEMENTATION 2.1.1

1990; to be reevaluated after 1990 season.

ACTION 2.1.2

Maryland will terminate the fishing season for each of its three component fisheries when their individual quota is reached, regardless of time during the season. Virginia will terminate its commercial fishing component when its harvest quota is reached, regardless of time during the season. The Potomac River Fisheries Commission will terminate its fishing seasons when the allowable harvest under the ASMFC's Striped Bass Plan is reached, regardless of the time during that season.

IMPLEMENTATION 2.1.2

1990

PROBLEM 2.2

Gill netting is the primary method for commercially harvesting rockfish. Unrestricted use of gillnets could result in high fishing mortality. There would also be a high by-catch mortality of sublegal striped bass from the use of gill nets with small mesh sizes. Similar problems exist for other commercial fishing gear. In concert with gear restrictions to limit fishing effort and mortality, certain measures are needed to facilitate enforcement.

STRATEGY 2.2

Maryland, Potomac River Fisheries Commission and Virginia will establish commercial gear restrictions to limit fishing effort and sublegal by-catch, and to facilitate enforcement.

ACTION 2.2.1

Maryland, the Potomac River Fisheries Commission and Virginia will establish a minimum gill net mesh size designed to reduce sublegal by-catch mortality to negligible levels.

IMPLEMENTATION 2.2.1
1990

ACTION 2.2.2

Maryland and Virginia will require that gill nets be marked, tended, and recovered (except for Virginia's stake nets) daily. The Potomac River Fisheries Commission will continue a fixed location for each gill net licensed in the Potomac.

IMPLEMENTATION 2.2.2
1990

ACTION 2.2.3

Maryland and Virginia will establish a maximum length of gill net allowed on board a vessel and in the water based on the number of expected gill netters, the total gill net quota and the projected season. The Potomac River Fisheries Commission will establish a maximum number of gill net licenses for the Potomac River and maintain a maximum length per license during the transitional fishery. When the recovered fishery begins, maximum yardage will be reevaluated.

IMPLEMENTATION 2.2.3
1990

ACTION 2.2.4

Maryland and Virginia will establish annual quotas for their commercial fisheries.

IMPLEMENTATION 2.2.3
1990

PROBLEM 2.3

Unrestricted selling and purchasing of striped bass can lead to commercial transactions that bypass monitoring efforts and reduce the effectiveness of harvest quotas.

STRATEGY 2.3

Selling and buying procedures and timely reporting requirements will be established to monitor and regulate harvest.

ACTION 2.3.1

- A) Maryland will establish check-in stations for the commercial sale of striped bass.
- B) Virginia dealers and commercial watermen that harvest striped bass will be required to have a special permit to sell striped bass.
- C) The sale of striped bass caught by recreational or charter boat fishermen will be prohibited.

IMPLEMENTATION 2.3.1

1990

ACTION 2.3.2

Maryland and Virginia will establish a weekly reporting system for licensed commercial fishermen, and a daily reporting system for buyers during the commercial season. Maryland and Virginia will provide the Potomac River Fisheries Commission with information obtained through their mandatory buyer reporting provisions. The Potomac River Fisheries Commission will reduce the time period required for the finfish reporting system from monthly to weekly.

IMPLEMENTATION 2.3.2

1990

PROBLEM 2.4

For striped bass fishing, harvest limits, seasons, time periods, and areas have varied among the harvesting components of the fishery (commercial, charter boat, and recreational), as well as with the particular type of gear used and the location in the bay. A combination of inconsistent regulations and a lack of regulation has contributed to problems of overfishing and enforcement.

STRATEGY 2.4.1

Fishing seasons will be established for the recreational, charter boat and commercial fisheries. The length of the season may be adjusted as needed, including when quotas are reached (see Action 2.1.2), by opening and closing areas to fishing, or with other actions as appropriate. Seasons will be consistent among jurisdictions to the extent possible.

ACTION 2.4.1

- A) The District of Columbia will establish a recreational fishing season within the period June through December.

B) Maryland will establish fishing seasons within the following periods:

- o The commercial gill net season will be within the period November through March 15.
- o The commercial pound net/haul seine/fyke net/hook and line seasons will be within the period June through November.
- o The recreational and charter boat seasons will be within the period June through November.
- o There may be a May trophy fishery for recreational and charter boat fishing, effective May 1991, limited to a single trophy fish per boat per day.

C) Virginia will establish fishing seasons within the following periods:

- o The commercial netting season will be within the period September through February.
- o The recreational and charter boat seasons will be within the period June through December.

D) The Potomac River Fisheries Commission will establish fishing seasons within the following periods:

- o The commercial gill net season will be within the period November through March.
- o The commercial pound net/haul seine/hook and line seasons will be within the period June through December.
- o The recreational and charter season will be within the period June through December.

E) Maryland, the Potomac River Fisheries Commission and Virginia will annually review the need for a Bay spawning season fishery in relationship to the issue of parity with the coastal states.

IMPLEMENTATION 2.4.1
1990

STRATEGY 2.4.2

Establish time periods when fishing is allowed to aid law enforcement and monitoring.

ACTION 2.4.2

Maryland will prohibit commercial fishing on weekends and at night during the transitional fishery.

IMPLEMENTATION 2.4.2

1990

STRATEGY 2.4.3

Maryland, the Potomac River Fisheries Commission and Virginia will maintain appropriate striped bass fishing areas.

ACTION 2.4.3

Maryland will continue to restrict fishing for striped bass in spawning areas and rivers, and spawning reaches as defined in COMAR 08.02.05.02. Virginia will continue to restrict fishing within the spawning reaches defined in VMRC Regulation 450-01-0034. The Potomac River Fisheries Commission will continue its prohibition on gill netting or striped bass fishing during April and May throughout the entire Potomac River during the transitional fishery.

IMPLEMENTATION 2.4.3

In effect.

STRATEGY 2.4.4

The District of Columbia, Maryland, the Potomac River Fisheries Commission and Virginia will establish recreational and charter boat creel limits consistent with ASMFC guidelines and dependent on length of season.

ACTION 2.4.4.1

The District of Columbia, Maryland, the Potomac River Fisheries Commission and Virginia will establish creel limits for the recreational and charter boat fisheries of up to five (5) fish per person per day within the established season.

IMPLEMENTATION 2.4.4.1

1990

ACTION 2.4.4.2

Maryland may allow one trophy fish per boat during a May trophy season.

IMPLEMENTATION 2.4.4.2

Open

PROBLEM 2.5

Inadequate or untimely information on fishing effort and catch can result in quota overharvest.

STRATEGY 2.5

Maryland, Virginia and the Potomac River Fisheries Commission will establish monitoring programs to provide timely knowledge of harvest and effort data.

ACTION 2.5.1

Maryland, the Potomac River Fisheries Commission and Virginia will monitor harvest for the striped bass fishery by one or a combination of the following:

- o Utilize daily trip tickets for commercial and charter fishermen.
- o Conduct port sampling of commercial vessels.
- o Conduct onboard sampling of commercial catches.
- o Utilize check-in station sampling to characterize exploited stocks.
- o Require dealer logs
- o Maintain Natural Resource Police activity reports.
- o Utilize aerial overflights to estimate recreational effort.
- o Conduct port and onboard sampling of recreational vessels.
- o Conduct telephone surveys to estimate recreational participation.
- o Utilize mail surveys to estimate recreational catch and effort.
- o Utilize an enhanced National Marine Fisheries Service survey and/or Chesapeake Bay Stock Assessment Committee recreational monitoring data.

IMPLEMENTATION 2.5.1

1990

ACTION 2.5.2

The District of Columbia will conduct an angler survey to determine striped bass fishing effort and harvest.

IMPLEMENTATION 2.5.2

1990

PROBLEM 2.6

Chesapeake Bay fishery agencies must be able to adequately address ASMFC requirements and have appropriate authority to manage the fishery in a timely manner. Inconsistent enforcement policies could lead to interjurisdictional management problems; enforcement capabilities must be adequate to deter striped bass fishery violations.

STRATEGY 2.6.1

The District of Columbia, Maryland and Virginia will establish regulatory procedures that allow for: 1) recognition of and incorporation of ASMFC requirements into state management, and 2) a periodic cycle of public review of management options. The Potomac River Fisheries Commission will promulgate regulations necessary to comply with the ASMFC and Chesapeake Bay Striped Bass Management Plans.

ACTION 2.6.1

Maryland will propose legislation to authorize timely management actions and will develop guidelines for regulations. Virginia will promulgate regulations for timely management and seek legislation to correct any deficiencies if noted.

IMPLEMENTATION 2.6.1

1990

STRATEGY 2.6.2

An assessment of enforcement practices and capabilities will be conducted.

ACTION 2.6.2

The District of Columbia, Maryland, the Potomac River Fisheries Commission and Virginia will adopt consistent enforcement policies for the striped bass fishery throughout the Chesapeake Bay. Strategies to address enforcement needs will be developed.

IMPLEMENTATION 2.6.2
1990

Problem 3 - Stock Assessment and Research Needs: Maryland's moratorium on striped bass fishing in its portion of the Chesapeake Bay has allowed several aspects of the species' life history to be quantified. Migration rates, maturity schedules and mortality rates are important pieces of information which have been recently revised and allow a more accurate assessment of Chesapeake Bay stocks. Additional information is needed to protect and enhance Chesapeake populations.

Strategy 3- Stock Assessment and Research Needs: The Chesapeake Bay Stock Assessment Committee (CBSAC) will continue to improve the coordination of stock assessment pursuant to the Chesapeake Bay Stock Assessment Plan. Stock identification studies should be expanded, especially for the Chesapeake & Delaware Canal and along the coast, to provide information on stock mixing. The contribution of hybrids and hatchery produced fish to the wild population needs to be determined. A review of hooking mortality and other by-catch mortality rates would allow greater precision in establishing fishing mortality controls. Studies on larval survival and growth in relation to environmental variables would provide a better understanding of the factors affecting year class strength.

PROBLEM 3.1

Information on the health of Chesapeake Bay stocks of striped bass must be kept up-to-date; accurate identification of Bay and coastal stocks is critically needed.

STRATEGY 3.1

The jurisdictions will continue to obtain stock information on striped bass in the Chesapeake Bay.

ACTION 3.1

The District of Columbia will continue monitoring aspects of striped bass population dynamics. Maryland will continue surveys of the spawning and premigratory striped bass stock in the Chesapeake Bay. Virginia will initiate surveys of its spawning stock of striped bass. Collection of tissue and scale samples to augment tagging information and stock identification will be considered.

IMPLEMENTATION 3.1

DC - On-going; MD - On-going; VA - 1990.

PROBLEM 3.2

Additional information is needed on fishing and natural mortality of striped bass, reproduction and early survival, and environmental factors affecting adult striped bass.

STRATEGY 3.2

Efforts will be made to improve our understanding of factors that affect reproduction and recruitment to the fishery.

ACTION 3.2

The District of Columbia, Maryland and Virginia, in cooperation with federal agencies, will review and update existing data, and initiate new studies, that target: striped bass reproduction and early life history, especially in relation to environmental parameters; natural mortality; and catch-release mortality induced by various fishing methods.

IMPLEMENTATION 3.2

Variable, depending on project.

Problem 4 - Declining Water Quality: Surveys of striped bass spawning areas have shown traces of heavy metals in amounts high enough to cause concern. The degree to which these substances affect egg and larval development and survival is not well defined. Dissolved aluminum and pH interactions are also known to affect early life stages. Good water quality in spawning areas is critical for the survival of striped bass eggs and larvae, however the relative roles of water quality factors and number of adult spawners in determining levels of juvenile production need to be defined. High levels of contaminants in tissues of some coastal adult striped bass (i.e. Hudson River stocks) pose health risks for consumers. Low dissolved oxygen in the Chesapeake Bay during the summer may limit some striped bass habitat.

Strategy 4 - Declining Water Quality: Adequate spawning and nursery areas with good water quality are critical for striped bass survival. Although causes for the decline in reproduction may differ between years and between spawning areas, several water quality aspects are identified as reducing survival of young. State and Federal studies will continue to examine the effects of environmental contaminants on striped bass stocks.

PROBLEM 4.1

As a result of their migratory nature, striped bass utilize a variety of habitats. Each life stage, i.e., egg/larvae,

juvenile, non-migratory sub-adult and adult, and migratory sub-adult and adult, has specific habitat requirements. These specific water quality and habitat parameters have not been well defined. Non-point sources of pollution continue to be a problem for all living resources in the Chesapeake Bay.

STRATEGY 4.1

Identify those water quality factors, both natural and man-induced, which affect striped bass reproduction and survival, and focus on the control of those factors.

ACTION 4.1

The first four action items are commitments under the 1987 Chesapeake Bay Agreement. The DCFM, MDNR, PRFC and VMRC are not the agencies responsible for carrying out the actual commitments, but are involved in setting objectives of the programs to fulfill the commitments. The achievement of these commitments will lead to improved water quality and enhanced biological production that can only benefit striped bass populations. The DCFM, MDNR, PRFC and VMRC fully support these commitments.

1 - The first commitment adopted under the 1987 Chesapeake Bay Agreement was a report titled, "Habitat Requirements for Chesapeake Bay Living Resources". This document listed the habitat requirements for selected target species including striped bass. The report is being revised and updated by a workgroup of the Living Resources Subcommittee. When complete in May, 1990, the habitat requirements contained in the report will be used to aid managers in improving water quality:

- a) Assist in the revision of water quality standards and criteria as needed,
- b) Develop a Habitat Requirements Use Report which will detail resource needs by river segment,
- c) Assist in the 1991 Nutrient Re-evaluation by providing living resource habitat requirement for use in the 3-D Model (The model will compare existing water quality with the habitat requirements and project whether the requirements would be met under various nutrient removal scenarios), and
- d) Assist in the implementation of the nutrient, toxics and conventional pollutant control strategies by identifying critical habitat needs.

2 - Development and adoption of a basinwide plan that will achieve a reduction of nutrients entering the Chesapeake Bay:

- a) Construct public and private sewage facilities.
- b) Reduce the discharge of untreated or inadequately treated sewage.
- c) Establish and enforce nutrient and conventional pollutant limitations in regulated discharges.
- d) Reduce levels of nutrients and other conventional pollutants in runoff from agricultural and forested lands.
- e) Reduce levels of nutrients and other conventional pollutants in urban runoff.

3 - Development and adoption of a basinwide plan for the reduction and control of toxic materials entering the Chesapeake Bay system from point and nonpoint sources and from bottom sediments:

- a) Reduce discharge of metals and organic compounds from sewage treatment plants receiving industrial wastewater.
- b) Reduce the discharge of metals and organic compounds from industrial sources.
- c) Reduce levels of metals and organic compounds in urban and agriculture runoff.
- d) Reduce chlorine discharges to critical finfish areas.

4 - Development and adoption of a basinwide plan for the management of conventional pollutants entering the Chesapeake Bay from point and nonpoint sources:

- a) Manage sewage sludge, dredge spoil and hazardous wastes.
- b) Improve dissolved oxygen concentrations in the Chesapeake Bay through the reduction of nutrients from both point and nonpoint sources.
- c) Continue study of the impacts of acidic conditions on water quality.
- d) Manage groundwater to protect the water quality of the Chesapeake Bay.
- e) Continue research to refine strategies to reduce point and nonpoint sources of nutrient, toxic and conventional pollutants in the Chesapeake Bay.

5 - The development and adoption of a plan for continued research and monitoring of the impacts and causes of acidic atmospheric deposition into the Chesapeake Bay and its tributaries. This plan is complemented by Maryland's research and monitoring program on the sources, effects, and control of acid deposition as defined by Natural Resources Article Title 3, Subtitle 3A, (Acid Deposition: Sections 3-3A-01 through 3-3A-04):

a) Determine the relative contributions to acid deposition from various sources of acid deposition precursor emissions and identify any regional variability.

b) Assess the consequences of the environmental impacts of acid deposition on water quality.

c) Identify and evaluate the effectiveness and economic costs of technologies and mitigative techniques that are feasible to control acid deposition into the Chesapeake Bay.

IMPLEMENTATION 4.1

Variable, depending on project.

