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Annual Progress Report Fishery Management Plans 1993

Alosid

Blue Crab

Oyster

Bluefish

Weakfish/Spotted Seatrout

Summer Flounder

Atlantic Croaker/ Spot

American Eel

Chesapeake Bay Program

Printed on Recycled Paper

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Fishery Management Plans
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Summer Flounder
Atlantic Croaker/Spot
American Eel

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INTRODUCTION

The management process for fisheries resources began with the signing of the 1987 Chesapeake Bay Agreement. To date, 11 fishery management plans (FMPs) have been developed encompassing 16 species. An annual review of each adopted FMP began in 1990 to provide a format for incorporating new information on the status of the resource, evaluate progress toward achieving objectives, and update management strategies. This report reviews the progress of management plans during 1993 and includes the following species: American shad, hickory shad, blueback herring, alewife herring, blue crab, oyster, bluefish, weakfish, spotted seatrout, summer flounder, spot, croaker and American eel. The 1993 Striped Bass Annual Progress Report is under separate cover in order to include the entire commercial fishing season. The FMPs for black and red drum were adopted in September 1993 and will not be reviewed until next year. After the narrative for each FMP, a table provides a synopsis of the actions, dates, and relative comments regarding the action's implementation. Although habitat issues are defined in each FMP, they will not be reviewed separately unless there are unique topics for individual species. A habitat overview for FMPs is presented at the end of the report. For previous updates, refer to the 1990, 1991 and 1992 Annual Progress Reports. For details on background information, problem areas, and management strategies, refer to the appropriate management plan. This report begins with a synopsis of two important efforts that will directly affect management plans, the results of the Fishery Management Plan Re-assessment Task Force Committee and the Atlantic Coastal Fisheries Cooperative Management Act.

Fishery Management Plan Reassessment Task Force

During 1993, an independent Task Force Committee was appointed by the Chesapeake Bay Program's Living Resources Subcommittee (LRSC) to review and assess the implementation and effectiveness of 7 FMPs. The FMPs that were evaluated were: Alosids (shad and herring), Striped Bass, Weakfish/Spotted Seatrout, Bluefish, Blue Crab, Summer Flounder, and Atlantic Croaker/Spot. These 7 FMPs contained 170 recommended actions. According to the findings of the Task Force, the jurisdictions have completed or are implementing 160 or 94% of the planned actions. Implementation of the management actions has been delayed beyond the implementation date for 20 planned actions with 13 of the delays contained in the Blue Crab FMP. Failure to implement an action or a delay can be attributed to one or more of the following: lack of funding or personnel to implement; lack of public and/or administrative support for implementation; unrealistic implementation date or schedule; and/or a revision of the action plan. Overall, the Task Force concluded that fishery management in the Chesapeake Bay has been effective in:

1) focusing attention on the fishery problems in the Bay;
2) producing regional agreement on the need for interjurisdictional cooperation and action to restore and conserve the fisheries in the Bay;
3) identifying data gaps and information needs;
4) initiating and focusing research efforts;
5) creating support for regulations and achieving resource conservation; and,
6) reducing wastage in the recreational and commercial fisheries.

In order to improve the effectiveness of the fishery management process, the Task Force made the following recommendations:

1) develop a process to review each FMP at three to four year intervals to delete implemented actions and upgrade the plan;
2) convert plans from problem solving to problem preventing documents by developing "triggers" to guide management and regulatory decisions;
3) attain interjurisdictional cooperation in data gathering and uniformity in setting regulatory controls such as size and creel limits;
4) involve user groups to a greater extent in formulating FMPs and fisheries management strategies;
5) delegate authority to the Principal Staff Committee (PSC) to approve changes in existing FMPs as identified by the FMP Workgroup to expedite the FMP process;
6) consider multispecies or fisheries specific management plans;
7) improve the habitat aspects related to fisheries;
8) address two potential problem areas proactively, a) data collection, storage, interpretation and management associated with FMPs and b) management of recovered fisheries will require a supportive constituency and probably additional resources (Fisheries Management Plan Reassessment Task Force Report, J. Gilford, July 1993).

As a result of the Reassessment Task Force, the FMP workgroup developed a process for revising the existing FMPs. For changes that are not extensive, an amendment procedure will be followed. This will entail developing a description of the proposed changes and sending it through the FMP Workgroup for endorsement. The amendment will be published for public comment and reviewed by the Living Resources Subcommittee (LRSC) and the Implementation Committee (IC) for their comment and approval. The Executive Council (EC) has given the PSC authority to approve minor changes or FMP amendments. The FMP Workgroup felt that a major revision of each plan would be necessary to address the Task Force recommendations. A revision schedule was developed (Table 1) for each FMP. Since the schedule extends over a five year period, important minor changes can be addressed through the amendment procedure. Updates on current stock status, commercial and

Table 1. Schedule for reviewing fishery management plans.

SPECIES	COMPLETION DATE	REVIEW DATE
Shad/Herring	1989	June 1995
Blue Crab	1989	Revision in progress, completion date-Feb. 1995
Oysters	1989	Revision in progress, completion date-Oct. 1994
Striped Bass	1989	August 1995
Weakfish/Seatrout	1990	March 1996
Bluefish	1990	June 1995
Croaker/Spot	1991	1996
American Eel	1991	1996
Summer Flounder	1991	March 1996
Black/Red Drum	1993	1997
Catfish	1995	2000
Mackerel	1994	1998
Black Sea Bass	1995	2000
Tautog	1995	2000
Horseshoe Crabs	1994	1999

recreational fisheries statistics, and regulations will be accomplished through the annual progress report. During the revision process, the management strategies, actions and implementation dates will be examined. Actions that have been fully implemented will be deleted from the management section but included in the background section. On-going strategies will be updated within the management section. New strategies will be developed as necessary. The Task Force recommendations will be addressed as thoroughly as possible and included in the revision. The revised FMP will go through the standard adoption procedure which includes an open public comment period, review and endorsement by the LRSC, the IC, the PSC, and the EC.

Atlantic Coastal Fisheries Cooperative Management Act

During 1993, Congress passed the Atlantic Coastal Fisheries Cooperative Management Act. The purpose of the Act is "to support and encourage the development, implementation, and enforcement of effective interstate conservation and management of Atlantic coastal fishery resources." The bill directs the Atlantic States Marine Fisheries Commission (ASMFC) to adopt FMPs for coastal fisheries and establishes an obligation for the states to implement the coastal plan recommendations. The ASMFC is required by the bill to review state implementation and report to the Secretary of Commerce. If a state is not in compliance with ASMFC recommendations, the Secretary may impose a moratorium on all fishing for that particular species until the state complies. Violation of the moratorium would be a federal offense and result in criminal and civil penalties and forfeitures. Financial assistance has been granted to ASMFC and the states to implement the bill. Authorized appropriations are $3 million for FY 1994; $5 million for FY 1995; and $7 million for FY 1996. The bill also repeals the sunset provision on the moratorium authority of the Atlantic Striped Bass Conservation Act and extends and increases the authorization levels for interstate marine fisheries commissions under the Interjurisdictional Fisheries Act of 1988. The specifics of how this bill affects the Chesapeake Bay FMPs will be defined with time. Most likely, the Bay states will need to make some changes in order to be in compliance.

CHESAPEAKE BAY ALOSID MANAGEMENT PLAN

The 1989 Alosid FMP, which addressed four different species: American shad (Alosa sapidissima), hickory shad (A. mediocris), blueback herring (A. aestivalis), and alewife herring (A. pseudoharengus), was written prior to the 1993 agreement to restore migratory fish to the Susquehanna River in Pennsylvania. The restoration goals of 2.0 million American shad and 15.0 million river herring were developed by the Susquehanna River Anadromous Fish Restoration Committee (SRAFRC) whose fishery agency representation includes the United States Fish and Wildlife Service (USF&W), Pennsylvania Fish and Boat Commission (PFBC), National Marine Fisheries Service (NMFS), Maryland Department of Natural Resources (MDNE) and New York Department of Environmental Conservation (NYDEC). This agreement will need to be considered when the Alosid FMP is reviewed in 1995. A moratorium on the harvest of shad from the Maryland portion of the Chesapeake Bay has been in effect since 1980. The moratorium was implemented in response to historic low levels of harvest and the tenuous status of the stock. Virginia will implement a moratorium on harvesting shad from the Bay in 1994. In Pennsylvania, no harvest of alosids is permitted within the Susquehanna River basin.

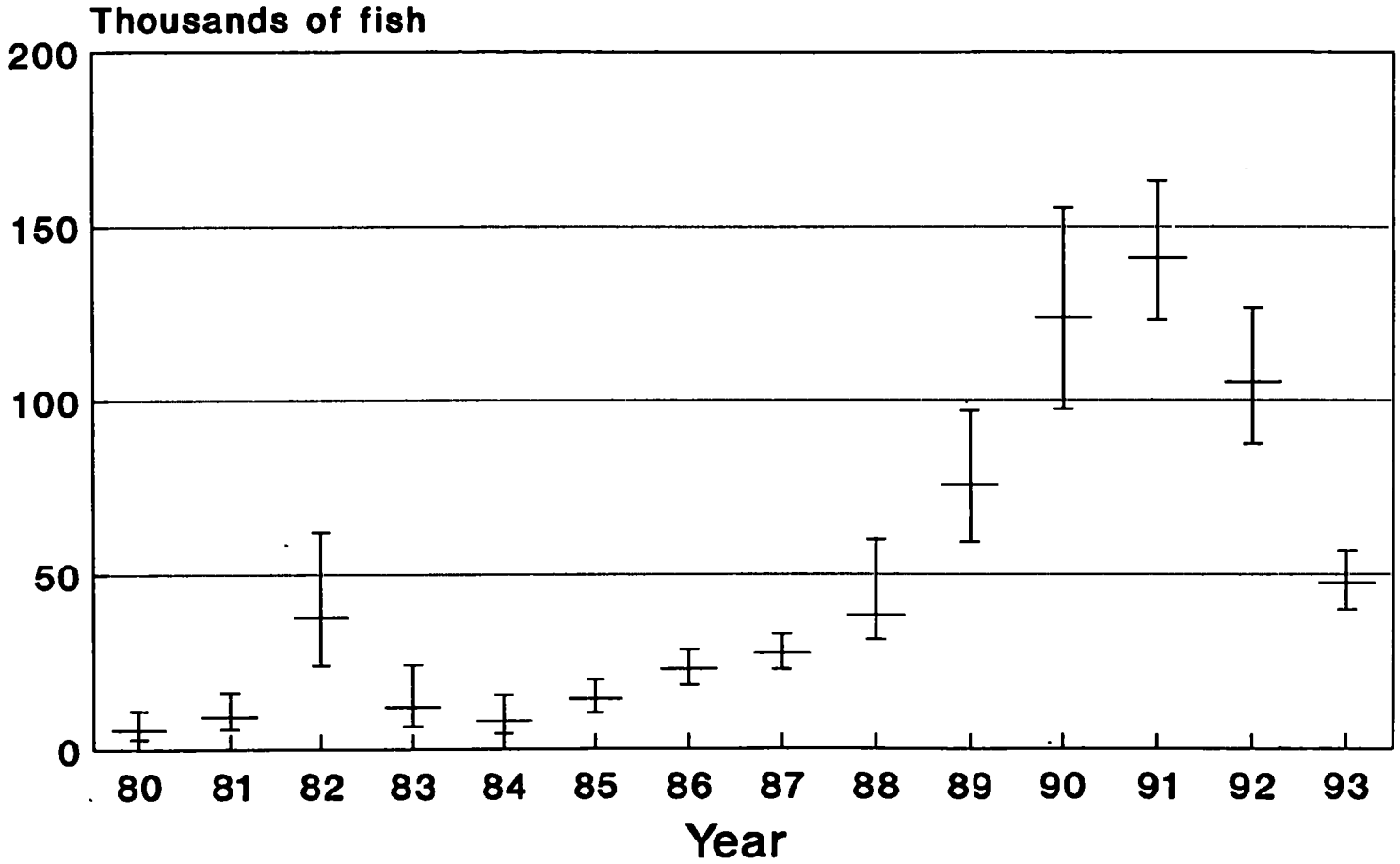
Declining Abundance

American Shad

The 1993 population estimate of American shad in the upper Chesapeake Bay was 47,563 with 95% confidence intervals between 39,745 and 56,904. This value represents a 55% decrease from the 1992 estimate of 105,255 (Figure 1). Possible reasons for the decline in adult abundance include poor reproduction and/or larval survival 3-5 years earlier, continued exploitation by intercept fisheries, and record flood conditions over the entire Susquehanna River basin which may have adversely affected the 1993 spring spawning migration (Markham et al. 1993). A total of 13,546 American shad were caught by the fish lifts at Conowingo Dam and 11,170 shad were transported and released above the dam. Most shad were stocked at Middletown and Columbia, Pennsylvania. There was a declining trend in the abundance of American shad along the entire Atlantic coast. In New England (Maine through Connecticut), the 1993 Merrimack River run was 75% lower than the 1992 run and the Connecticut River run declined from a projected return of 1.7 million adults to 700,000 adults. The Hudson River shad run has declined over the last three consecutive years. The coastwide decline in American shad abundance has prompted the ASMFC to convene a Species Board for alosids to review the problem.

Since Maryland's stocks remain at low levels, the moratorium on harvesting shad from the Bay will continue during 1994. The trigger for considering an open fishery in the upper Bay is an increase in the annual population estimate for three consecutive

Figure 1. American shad population estimates for the upper Bay



Bars indicate 95% confidence ranges

years with at least 500,000 fish (50% of the historical population) during one of those three years. With the adoption of specific restoration goals in the Susquehanna River basin, the trigger will need to be reconsidered during the Alosid FMP review in 1995. Additional fishery targets for shad are being developed through the Fisheries Goal-Setting Task Force, a special subcommittee of the Chesapeake Bay Program.

Preliminary American shad commercial landings in Virginia were 555,791 pounds during 1993 (Figure 2). The harvest represented a slight increase from 478,000 pounds in 1992. Of the total 1993 Virginia commercial catch, 65,637 pounds were harvested from the Bay and tributaries during a 30 day season (March 15-April 15). A total moratorium on Virginia's American shad fisheries within the Chesapeake Bay and its tributaries will be effective January 1, 1994. The ocean fishery continues with a 3,000-yard gill net restriction and no season.

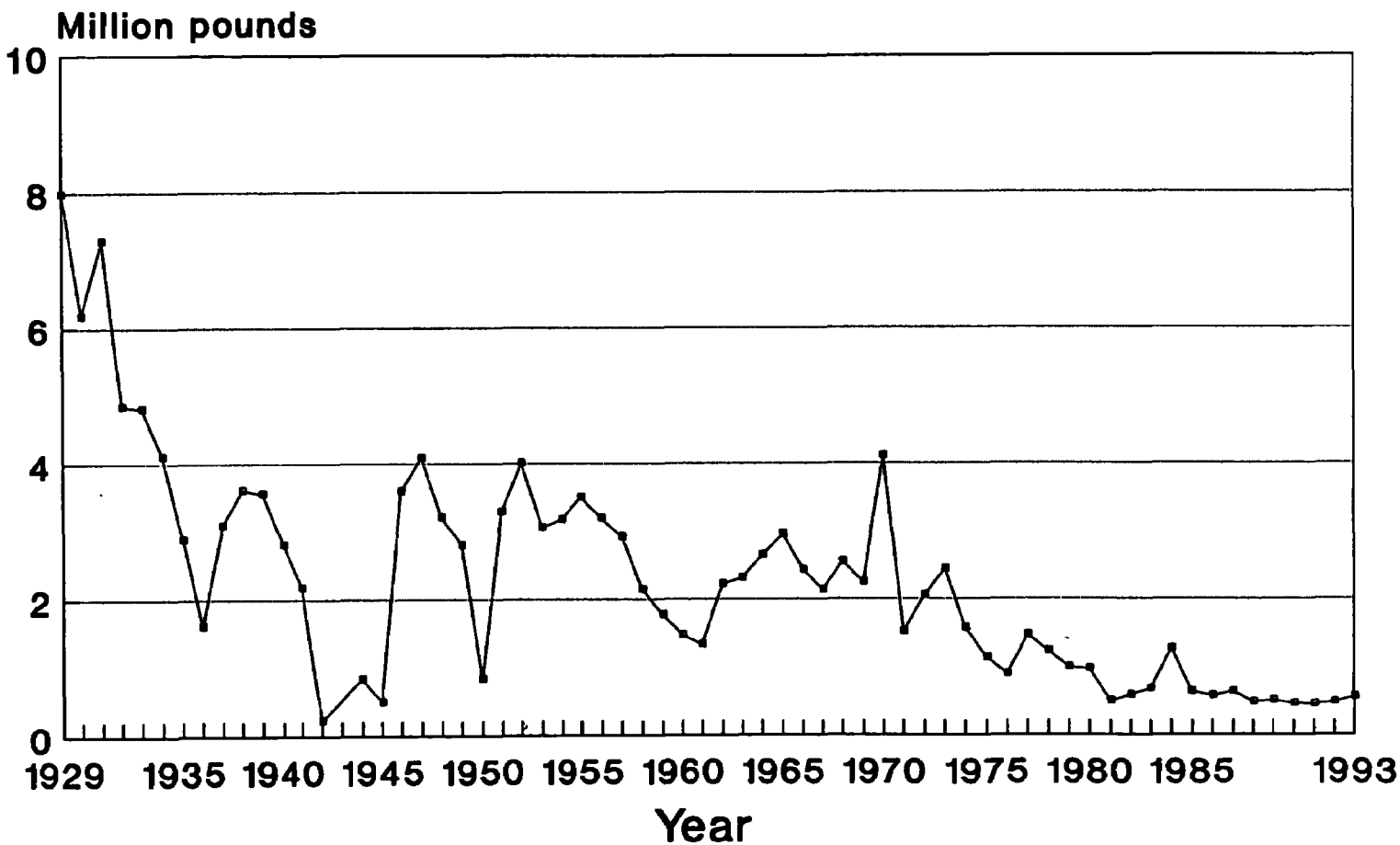
Alewife and Blueback Herring

Alewife and blueback herring are collectively known as river herring. They formerly supported important commercial and recreational fisheries throughout their range. River herring landings declined dramatically during the 1960's and have remained low. Historically, Maryland and Virginia were the major harvesters of river herring in the mid-Atlantic area. Preliminary data indicate that 154,900 pounds of river herring were caught by Maryland watermen during 1993. This is a slight decrease in harvest compared to the last three years (Figure 3a). However, examining trends in commercial landings is very limited without data on the amount of effort. River herring monitoring at the Conowingo Dam continued with 8,600 blueback herring and 572 alewive herring captured. Adult river herring were monitored on the Nanticoke River during 1993. Results indicate that catch-per-unit-of-effort (CPUE) for alewife decreased but without any linear trend between 1989 and 1993. Blueback herring CPUE showed a marginal decrease over time (Markham et al. 1993). In Virginia, preliminary landings indicate 360,000 pounds of river herring were harvested during 1993. This was a substantial decrease from 1.1 million pounds in 1992 (Figure 3b). It should be noted that river herring are an important forage species for large predators such as striped bass which have increased in abundance. River herring have not been managed on a system by system as recommended in the 1989 Alosid FMP and no controls on river herring harvest have been implemented.

Hickory Shad

The status of hickory shad in the Bay and along the Atlantic coast is unclear. The species historically occurred in significant abundance from Virginia to Florida. Management actions and strategies did not change for hickory shad in the Bay and tributaries during 1993. Maryland continued its moratorium on the

Figure 2. Virginia commercial landings for American shad (bay & ocean)



•1993 preliminary data

Figure 3a. River herring commercial landings from Maryland, 1975-1993

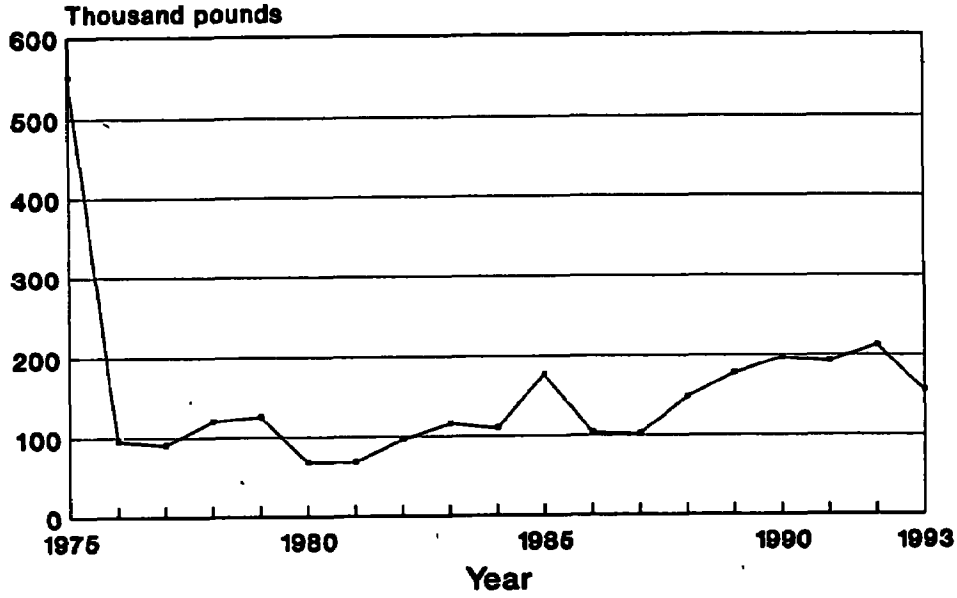
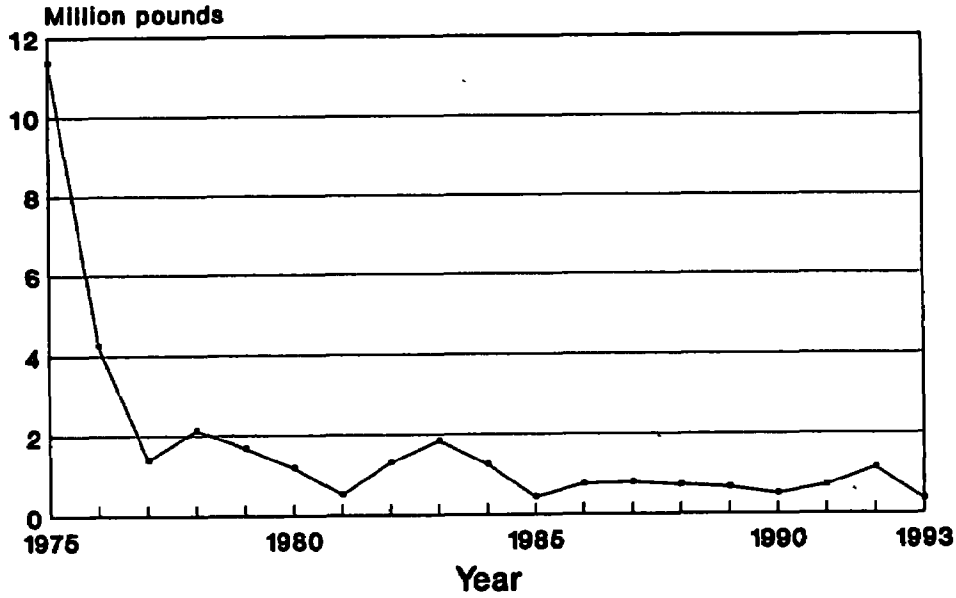


Figure 3b. River herring commercial landings from Virginia, 1975-1993



• Note the difference in scale, MD & VA

harvest of hickory shad. The Potomac River Fisheries Commission (PRFC) continued their 2 fish/person/day creel limit on hickory shad. The District of Columbia continued its moratorium on the harvest of both American and hickory shad. No hickory shad were caught from the Conowingo fish lift (upper bay) during 1993. Hickory shad adults have been caught during the adult American shad survey in the upper Bay but in very low numbers. A small but record number (16) of juveniles were caught during the 1993 Maryland estuarine juvenile finfish survey. Hickory shad juveniles have not been collected by the juvenile finfish survey since 1971. Reported hickory shad commercial catch from Virginia was 1,264 pounds during 1993. Only North Carolina is actively conducting research on hickory shad and many aspects of its life history, migration patterns and fisheries remain unknown.

Susquehanna River Restoration

In June 1993, an agreement was signed by the governors of Pennsylvania and Maryland, as well as utilities, fisheries agencies and fishery interests to provide fish passage at Holtwood and Safe Harbor Dams by 1997 and York Haven Dam by the year 2000. This action will provide American shad access to nearly 500 miles of major river habitat in Pennsylvania. The restoration goals stated in the agreement are for 2.0 million American shad and 15.0 million river herring. Striped bass and American eel are expected to use the Susquehanna River when it is accessible by fish passage facilities. The restoration effort is being managed by SRAFRC. Operation and management of upstream and downstream passage facilities at each dam is directed by the individual utility owners and a Technical Advisory Committee (TAC) composed of fisheries agency staff from the USF&W, PFC, and MDNR.

Since 1976, over 102 million larval shad have been stocked at locations above the dams on the Susquehanna River and below Conowing Dam. Hatchery fish were marked with various tetracycline tag combinations which appear on their otoliths (ear bones). During 1993, otoliths were examined from 124 adult American shad taken by the Conowingo fish lifts. The results indicate that 17% were of wild origin. The Van Dyke hatchery (Juniata River, Pennsylvania) component of the returning adult American shad population has ranged from 67% to 83% since 1989. Otoliths from shad caught by pound nets in the upper Bay indicated 52% were of wild origin and 48% were from hatcheries. A total of 11,171 American shad and 1,333 river herring were transported upstream of dams on the Susquehanna River in 1993. The restoration efforts on the Susquehanna River represent a commitment by state and federal fishery resource agencies and private utility companies to return shad and other migratory fishes to historic spawning and nursery areas above the dams. For a complete report on the operation of the Conowingo Dam fish passage facilities, American shad egg collection program, hatchery operations and stocking, juvenile shad outmigration, and

turbine studies, refer to the 1993 Annual Report of the Susquehanna River Anadromous Fish Restoration Committee.

Potential For Overfishing

The jurisdictions have continued to participate in the on-going Atlantic States Marine Fisheries Commission (ASMFC) alosid management program. An interstate FMP for shad and herring was adopted by ASMFC in 1985 and a supplement assessing progress was developed in 1988. Although some progress has been made to implement the ASMFC plan, alosid stocks continue to remain at low abundance when compared to stock levels between 1950 and 1970. Stock assessment from twelve rivers along the Atlantic coast indicate that the maximum sustainable yield (MSY) ranges between 12,000 to 2.5 million pounds (ASMFC 1993). Current catch levels are below MSY values and will be reevaluated by the ASMFC Species Board during 1994.

Directed ocean fisheries for American shad during 1993 occurred in New Jersey, Maryland, Virginia and North Carolina. Maryland ocean catches peaked at 487,812 pounds in 1989 but have decreased since then. During 1992 and 1993, Maryland implemented a coastal shad season from February 4th through April 30th. In 1993, Maryland harvested 77,885 pounds and Virginia harvested 490,150 pounds of American shad from the ocean (Figure 4). Virginia's coastal shad fishery accounts for over 90% of its total shad catch. A Virginia coastal season was in effect during 1992 but not in 1993. A new mandatory reporting system was implemented in Virginia 1993.

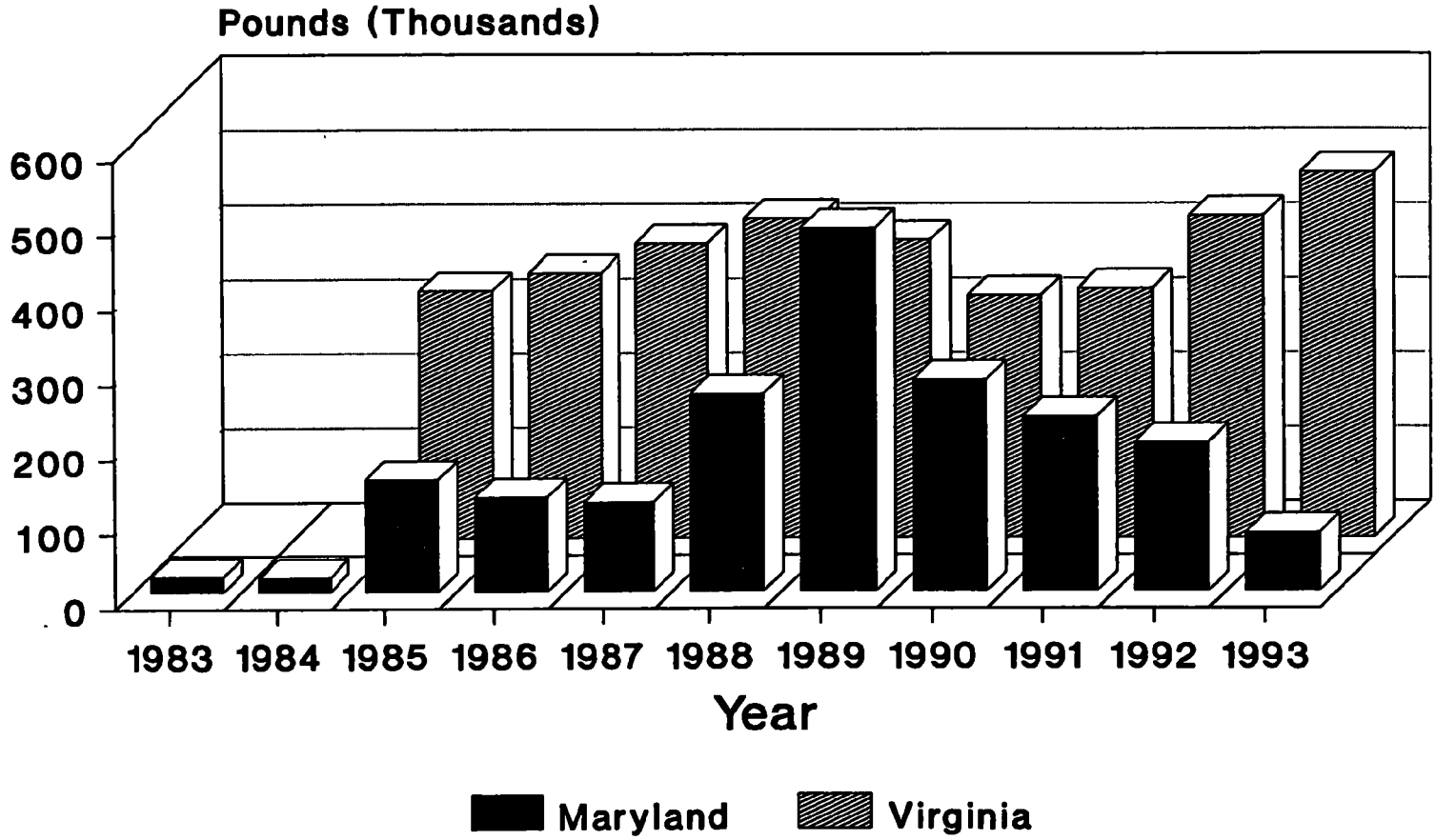
American shad and river herring tagging studies have indicated that the Bay of Fundy in Canadian waters is an important summer area. The ASMFC is monitoring the status of Bay of Fundy tidal power development which could impact all east coast shad, alewife, and blueback herring stocks. Coastal shad tagging projects were not conducted in Maryland or Virginia during 1993.

Monitoring river herring bycatch in the foreign and domestic mackerel fisheries continued during 1993. Since 1983, the river herring bycatch has averaged 0.22% of the total mackerel catch and does not appear to adversely impact the mid-Atlantic stocks.

Research and Monitoring

A cooperative effort between the Maryland Department of Natural Resources (MDNR) and the University of Maryland (UM) was undertaken to develop a comprehensive stock assessment program for important commercial and recreational fisheries in Maryland. One task of this project was to review MDNR fishery-dependent and fishery-independent projects to evaluate if the data being collected met the needs of a comprehensive stock assessment program. The evaluation involved a review of the following MDNR

Figure 4. American shad landings from the Atlantic Ocean & seaside bays



field projects: the American shad juvenile survey; the river herring juvenile survey; the characterization of adult river herrings in the Nanticoke River; and the characterization of adult American shad stocks in the upper Chesapeake Bay and Nanticoke River. The results of the project evaluation by Rugolo et al. (1993) and the 1993 project results (Markham et al. 1993) are as follows:

1) In 12 years of sampling (haul seine and otter trawl), the American shad juvenile survey caught 75 juvenile shad. Catch-per-unit-of-effort (CPUE) ranged from 0 to 0.6. Estimates of adult shad were not reflected in increased spawning success as measured by the juvenile survey and for this reason the project was terminated in 1991.

2) The river herring juvenile survey samples the relative abundance and distribution of juvenile anadromous alosids (including shad) using a mid-water trawl. The overall abundance of alewife and blueback herring has varied significantly from year to year and from region to region. Catch data indicate that alosids were absent from the Gunpowder and Patapsco Rivers and at low levels in the Bush River. Nonsignificant differences between years and locations may indicate stable levels of recruitment or be the result of small sample sizes. During 1993, juvenile Alosa abundance was monitored in the Patuxent, Chester, Choptank, and Nanticoke rivers. From 1985 through 1993, the weighted geometric mean for alewife herring in all river systems combined showed a significant increasing trend in abundance. Blueback herring showed no significant trend over the same time period. Abundance levels for both species have remained similar in all areas over time. No juvenile American shad or hickory shad were collected during 1993 from the four river systems. A total of 31 juvenile American shad were collected from the upper Bay by electrofishing. This high number could indicate that natural reproduction and survival has improved this year even though adult abundance decreased. The overall weighted geometric mean index was 0.32. Alosa sp. were also sampled by the Maryland Estuarine Juvenile Finfish survey from the head of the Bay, the Choptank, Nanticoke and Potomac river systems. The relative abundance of blueback herring was very good (73.5 fish/seine haul) and comparable to abundance levels in the 1970's. Mean catches for alewife herring have generally been low but the 1993 catch was better than 1992. American shad have been collected by the seine survey but in extremely low numbers. The 1993 index was 0.2 fish/seine haul which was an increase from 1992.

3) Characterization of adult river herring from the Nanticoke River is important since this river accounts for 30% to 50% of the total Maryland commercial river herring catch and is a key spawning area. The 1993 evaluation concluded that the study is achieving its objectives. For river-specific management to be implemented, additional sampling areas would be necessary. Additional sampling areas would also be needed to evaluate the status of herring stocks

in the Bay. The Nanticoke survey has provided estimates of adult mortality. Average annual mortality estimates for alewife herring were 73% and 62% for males and females, respectively, between 1989 and 1993. Average annual mortality estimates for blueback herring were 52% and 47% for males and females, respectively, between 1989 and 1993.

4) The project to characterize adult American shad stocks in the upper Bay and Nanticoke River is also achieving its objectives. The upper Bay population estimate provides a basis for assessing stock status and will provide a framework for managing a fishery once it is reopened. Recommendations to improve the project include a consideration of river flow characteristics before making inter-annual comparisons of the population estimates and separate comparisons by gear type when examining stock composition. In Maryland, the 1993 adult population estimate for American shad decreased by 55% from the previous year. There has been a downward trend in the population estimate for the last two years after reaching a high of 148,000 fish in 1991. The 1988 shad year-class (age 5) was the most abundant year-class sampled in the upper Bay during 1993. Total mortality estimates during 1993 for upper Bay adult shad were 92% for males and 73% for females. The average annual mortality between 1985 and 1993 was 86% for males and 72% for females. Total mortality estimates for the Nanticoke River during 1993 were 51% for males and 60% for females. The average annual mortality between 1988 and 1993 was 55% for males and 61% for females. A decrease in mean length at age was noted for females. Repeat spawning was the highest recorded in recent years at 20%, males and females combined.

The 1992 shad juvenile indices on the Mattaponi and Pamunkey Rivers were the lowest since 1979. Surveys on the James and Rappahannock Rivers also showed very low juvenile indices during 1992. The Alosa juvenile study was not funded in 1993 but an abbreviated study limited the assessment to the Mattaponi and Pamunkey Rivers. During 1993, the Mattaponi River shad index was 30.3, the highest index value observed since the annual survey began in 1979 and almost double the long-term index of 16.1. The Pamunkey River index remained considerably below the long-term mean of 5.7.

During 1993, 1,552 American shad were sampled by the VMRC Fish Stock Assessment Program. The mean total length of the 1993 collection was 508mm (20 inches). A complete summary of the harvest and biological data collected is in progress. The VMRC stock assessment program also collected 557 American shad from ocean and river gill net fisheries for use in a genetic identification study being conducted by Virginia Commonwealth University.

Besides otolith examination of adult shad taken by the Conowingo fish lifts, juvenile otoliths were also examined during 1993. Out of a total of 603 juveniles, 69% were wild. In comparison

to previous years, 40% (1992) and 21% (1991) of the juvenile shad otoliths were wild. In 1993, all 67 juvenile shad taken by MDNR electrofishing efforts and seine surveys below Conowingo Dam were wild (SRAFRC, December 1993 Technical Meeting).

Approximately 500,000 American shad larvae were stocked by the Virginia Department of Game and Inland Fisheries in the James River during 1993. The restocking effort was part of the fish passage plan to restore populations of anadromous fish to historical spawning areas. The James River, the largest Bay tributary In Virginia, once supported a large spring migration of anadromous fish. The first effort to trap and transport river herring in Virginia was accomplished. A total of 680 adult blueback herring were collected and transported to the Appomattox River. Fish passages at the dams in Richmond have been completed. When construction is completed at Boshers Dam (spring 1995), 140 miles of the James River will be open to spawning fish.

The ASMFC American Shad Stock Assessment Committee is working on updating the 1988 stock assessment of 17 shad stocks from Rhode Island to Florida and examining the impact of ocean commercial fisheries. The results of these studies should be available in 1994. There is concern about the magnitude of the ocean harvest especially with the continued decline in shad stocks. New England and mid-Atlantic states continue to actively participate in alosid restoration efforts through fish passage construction and stocking programs (ASMFC 1993).

Habitat Loss and Degradation

Since the signing of the 1987 Chesapeake Bay Agreement to remove stream blockages for migratory finfish species, a total of 53 fish passage projects have been initiated through 1993. An additional 42 fish passage projects are planned in the next five years and another 24 projects after ten years. During 1993, 20 fish passages were completed in Maryland and have opened 114 miles of stream/river habitat (1993 Chesapeake Bay Program Annual Progress Report). The fish passage program includes the design and construction of new fishways, the trap/transport and reintroduction of shad and river herring, biomonitoring of fishways to evaluate passage success, and assessment of spawning/recruitment in stocked streams. A total of 2,302 blueback herring were transported from the Conowingo Fish Lift and stocked at four sites in the Patapsco River. This was a decrease in the number of adult fish transported by MDNR in 1992 and is a direct result of heavy rainfall and high flows in the Susquehanna River. The fish lift operations were delayed approximately 4 weeks because of the high flows and affected the number of herring available for transport.

Four fish ladders were monitored during 1993. Big Elk Creek in the upper Bay had large numbers of herring using the fish ladder during late May. The Tuckahoe fish ladder provided passage of

blueback herring and several other species in April. Monitoring on the Tuckahoe indicated a need for the development of a fish ladder operation schedule for installing and removing the entrance and exit stoplogs and the dam splashboards. Monitoring began at the Bloede Dam fish ladder on the Patapsco River as soon as the ladder was completed. Trash accumulation was a problem at this site. Although a small number (294) of blueback herring were stocked downstream of the ladder, there was no evidence the ladder provided passage for anadromous fish species. Anecdotal information suggests that some carp and gizzard shad were present in the fish ladder when it was drained. The Daniels Dam fish ladder on the Patapsco was also completed in the spring and monitored. A single blueback herring was collected which documents the use of this ladder. Continued restoration and monitoring of alewife and blueback herring in the Patapsco have been proposed for 1994. For more details on the fish passage program, refer to the document, "Removing Impediments to Migratory Fishes in the Chesapeake Bay Watershed."

The most important abiotic factors which affect spawning success are river flow rates and water temperature. In years with "normal" river flows during the shad spawning period, year-class strength exhibits a good correlation with parental stock size. Years with high flow rates and low water temperature during critical developmental periods result in reduced survival (Crecco et al. 1983). Water quality standards for dissolved oxygen and minimum flows in the Susquehanna River below Conowingo Dam were implemented between 1989 and 1991. Other factors which affect year-class strength include interspecific competition for food, food availability, predator abundance, and availability of shelter.

The effects of acidic conditions on early life history stages of blueback and alewife herring in three Maryland coastal plain streams from the Potomac, South and Nanticoke river systems were investigated. Episodic acidification events are stressful to alewife and blueback herring and are inhibiting recovery of these stocks (Hall, Jr. et al. 1993). It is important to document river systems where acidic conditions are a problem and may hinder stocking efforts.

Conclusion

The major concern for alosid stocks is the unexplained coastwide decline in abundance. Although stocks are being monitored and historic spawning habitat has been opened through fish passage programs, abundance remains at low levels. The following areas should be emphasized during 1994:

1) Participate in reevaluating the goals and objectives of the coastal alosid FMP and stock assessment.

2) Continue to collect basic biological information on stock status, i.e., age structure, length frequency, mortality estimates, juvenile and adult abundance of alosids in the Chesapeake Bay.

3) Consider implementing stronger harvest controls on the coastal harvest.

4) Continue opening spawning habitat through the Fish Passage Program.

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CHESAPEAKE BAY ALOSID IMPLEMENTATION SCHEDULE

Problem Area	Action	Date	Comments
1. Declining alosid abundance	1.1.1 Continue shad moratorium in MD's portion of the Chesapeake Bay.	Continue	The 1993 population estimate for adult American shad in the upper Bay was 47,563 fish. This is a decrease from the 1992 estimate of 105,255 fish. This is the 2nd year of decreasing abundance.
		1993	A Bay moratorium in VA will be implemented in January 1994.
		Continue	DCFM implemented a moratorium on shad harvest during 1992.
		Continue	PRFC will continue their 2 fish/person/day creel limit.
	1.1.2 VA will follow ASMFC recommendation to limit exploitation rate on shad and herring to 25%.	1993	VA had a shad season from Mar 15-Apr 15 within the Bay & tributaries during 1993.
	1.2 Control river herring catch, including: by system, regulate areas slated for restoration, gear and/or seasonal restrictions.	1990	No restrictions have been implemented for river herring in VA or MD.
	1.3 Hickory shad fishery will follow the same management actions as in shad fishery (see Action 1.1.1).	Continue	MD will continue moratorium on hickory shad. PRFC will continue restrictions on hickory shad. DC implemented a moratorium on hickory shad during 1992.
	1.4 Protection will be given to alosids in the Susquehanna as restoration efforts continue.	Continue	Agreement on the construction of 3 passage facilities upstream of Conowingo was reached in Nov. 1992. Two dams should be opened by 1997 & the third dam by the year 2000.
2. Overfishing	2.1 Jurisdictions will participate in the ongoing ASMFC alosid management program, with the goal of providing adequate protection to the component of the coastal stock which returns to the Chesapeake Bay to spawn.	Continue	MD & VA have continued to participate in the coastal deliberations for shad and herring.

ALOSID CONT'D.

Problem Area	Action	Date	Comments
2. Overfishing (cont'd)	2.2 A) Implement a coastal shad tagging program to determine which stocks are being exploited in the intercept fishery.	1991-1992	Results from 1991 & 1992 study indicate that the coastal fishery is mixed & highly variable from year to year. Additional genetic work will be continued.
	B) Control the coastal intercept fishery through a combination of gear restrictions, seasonal and areal closures, and harvest limits.	1992 Continue	Coastal shad seasons were started in 1992 by both MD & VA. MD continued a coastal season during '93 (Feb-Apr). VA did not have a coastal season during 1993.
	C) Continue to monitor and document its territorial seas intercept fishery for American shad.	1993	MD coastal landings during 1993 were 77,885 lbs. VA coastal landings during 1993 were 490,150 lbs. VA continued its genetic analysis of the shad stocks taken in the intercept fishery.
	2.3.1 Virginia will control river herring harvest during spawning migrations through gear restrictions & spawning area closures.	1992 Continue	VA has restricted use of commercial fishing gear in the spawning areas in the Chickahominy River below Walker's Dam.
	2.3.2 MD & VA will monitor river herring bycatch through the MAFMC and support the following recommendations: a) Foreign fishery will stay 20 miles offshore; b) Maximum bycatch of 1% for river herring in foreign & domestic mackerel fisheries with a cap on total allowable bycatch; c) Intercept fisheries will be discouraged.	In effect	River herring bycatch is being monitored under the MAFMC Squid, Mackerel, and Butterfish FMP. River herring stocks have been relatively stable since 1968.

ALOSID CONT'D.

Problem Area	Action	Date	Comments
3. Stock Assessment	3.1 Continue to collect alosid data:		
	a) Collect alosid juvenile data;	Continue	On-going VIMS, MDNR & DCFM alosid juvenile survey.
	b) MD will continue project in upper Bay & Nanticoke to estimate adult shad;	Continue	
	c) VA will improve assessment of shad stocks in territorial waters & improve catch & effort data through mandatory reporting;	Continue	Mandatory reporting has been implemented in VA.
	d) Continue VMRC stock assessment;	Continue	
	e) VA will initiate ocean intercept tagging program;	1991-1992	Tagging project was a joint MD & VA endeavor. Results indicate coastal catch is mixed & highly variable.
	f) MD will examine exploitation rates of herring in selected tributaries & improve landings data;	Continue	Mortality rates have been calculated for the Nanticoke R.
	g) VA will implement a surveys of alosid spawning grounds & associated biological data;		
	h) A joint effort will be made to investigate shad in the Potomac.	1991	DCFM has been sampling the upper Potomac.
4. Habitat Loss and Degradation	4.1 Implement the Chesapeake Bay Fish Passage Plan:		To date, 53.6 miles of historic spawning habitat have been opened.
	A) - I) Implement various fish passage projects.	Variable	Refer to Fish Passage Plan for details.
	J) Coordinate resources for restocking efforts.	Continue	The source for river herring restocking efforts are from the Conowingo fish lift. 2,300 herring stocked in the Patapsco R.
	K) Establish measures to protect reintroduced fish stocks.	1990	Regulations to protect reintroduced herring have not been implemented in MD.
	L) Monitor impact of fish passage projects.	Continue	Monitoring efforts need to be improved.

ALOSID CONT'D.

Problem Area	Action	Date	Comments
4. Habitat Loss and Degradation (cont'd)	4.2.1 MD & PA will continue to work within SRAFRC's ongoing programs to ensure downstream passage for juveniles and adults.	Continue	
	4.2.2 A) Promote use of Susquehanna brood stock for PA restocking.	Continue	
	B) VA will expand funding for Pamunkey/ Mattaponi shad hatcheries.	1993	Continue hatchery funding. VDGIF initiated a shad stocking program on the upper James River.
	4.3 A)- E) Technical issues regarding water quality at Conowingo Dam.	Continue	Standards have been implemented since 1989.
	4.4 Establish new water classification system based on living resources, habitat, & water quality.		
	4.5 Promote Bay Agreement water quality commitments.	Variable	The Bay Program added a tributary initiative which will set nutrient reduction goals for major tributaries.

LEGEND:
ASMFC = Atlantic States Marine Fisheries Commission
DCFM = District of Columbia, Fisheries Management
MAFMC = Mid-Atlantic Fisheries Management Council
MDNR = Maryland Department of Natural Resources
PRFC = Potomac River Fisheries Commission
SRAFRC = Susquehanna River Anadromous Fish Restoration Commission
VDGIF = Virginia Department of Game and Inland Fisheries
VIMS = Virginia Institute of Marine Science
VMRC = Virginia Marine Fisheries Commission

CHESAPEAKE BAY BLUE CRAB MANAGEMENT PLAN

Reports of increased effort and lower commercial landings of the Chesapeake Bay blue crab (Callinectes sapidus) during 1992 provided the impetus to develop additional management measures for containing crab harvest, a primary goal of the 1989 Blue Crab FMP. A special blue crab committee convened in late 1992 to advise Maryland's Department of Natural Resources (MDNR) on blue crab fishery management. The Maryland Blue Crab Advisory Board (MBCAB), similar to Virginia's Blue Crab Advisory Committee formed in 1987, was comprised of watermen, packers, retailers, recreational crabbers, legislators, scientists, environmental organizations and technical advisors.

Both Maryland and Virginia took steps to implement the 1989 Blue Crab FMP and contain commercial and noncommercial catch and effort. The 1993 session of the Virginia General Assembly restructured the commercial crab gear license fees, established new commercial licenses for crab shedders and peeler potters, and authorized the Commission to establish recreational gear licenses. During 1993, the Virginia Marine Resources Commission (VMRC) adopted regulations that included: establishing recreational licenses for crab pots, crab traps and crab trotlines, with gear restrictions and mandatory report; requiring one cull ring (2-5/16" diameter) in hard crab pots to allow small crabs to escape; reducing the daily catch limit in the crab dredge fishery; and establishing limited entry in the crab dredge fishery. The Potomac River Fisheries Commission (PRFC) established a regulation requiring the use of crab pot cull rings of 2-5/16" diameter, compatible with Virginia's regulations.

In June 1993, Maryland's Governor introduced the Maryland Crab Action Plan (MCAP). Regulations proposed in the MCAP would place limits on gear for both commercial and sport crabbers and reduce catch limits for sport crabbers. Also proposed were time limits for commercial and sport crabbers and increased spacing between certain gear types to control effort and reduce conflict between user groups. The MCAP proposed mandatory installation of cull rings in commercial-style crab pots and an air space in riparian pots for air-breathing animals. The legislative portion of the MCAP included a proposal to restructure the licensing system. The proposed license amendment would eliminate the noncommercial crabbing license, institute a recreational crabbing license, limit the number of commercial licenses that may be issued, and require a license for shedding soft-shell crabs.

The regulatory package of the MCAP was first introduced at public hearings in October, 1993. Significant public comment modified the original regulation package to recognize crew members as licensees under the captain's license and allow for a maximum of 900 crab pots per boat. Also, the requirement for an air space in

riparian pots was postponed. The regulations as modified will be reintroduced in January 1994.

Fishing Effort and Catch

The number of commercial licenses in Maryland has remained stable over recent years. In 1993, 4,978 commercial crab licenses were issued in Maryland in addition to 1,540 Tidal Fish Licenses which permit commercial harvest of crabs, shellfish and finfish. The greatest number of commercial licenses are issued in the category of Junior and Senior Commercial Crabber which is intended for State residents under 14 years and over 64 years. Their reported commercial catch is insignificant when compared to other commercial license categories. There were 5,024 noncommercial licenses issued in Maryland in 1993.

There is evidence in Maryland that effort has increased in the crab pot fishery and catch per pot fished has declined. Despite a decline in the Maryland blue crab harvest in 1992 to 20.9 million pounds, the 1993 landings of 57.6 million pounds exceeded the 10 year average (45 million pounds) (Figure 5). In Virginia, the 1992 harvest of 23.3 million pounds was also low. Preliminary Virginia commercial hard crab landings for 1993 are 50.6 million pounds, nearly double the 1992 landings and more than the 10 year average (40.5 million pounds) (Figure 6). Virginia implemented mandatory reporting for all commercial harvesters in 1993 and the increase in landings may be, in part, an artifact of the new reporting system. Anecdotal observations in Virginia indicate 1993 was not an exceptional year for the fishery, and may even be on scale with 1992 landings. Virginia's new reporting system should provide improved statistics on catch and effort in following years.

Harvest declines of the magnitude experienced in 1992 made it difficult to establish a catch limit for the 1993 season. It is probable that the 1992 landings reflected a one year reduction in abundance resulting from a weak year class of crabs in the fishery. An annual quota, a monthly quota system or catch limits will not have any effect on maintaining catch or effort above a certain level until annual abundance can be predicted with confidence and more is known about stock-recruitment and harvest-stock relationships. A Fisheries Target Setting Task Force will be developing specific targets for guiding the management of blue crabs in the next few years.

Recreational fishing effort remains poorly documented. Estimates of recreational catch in Maryland range from a high of 41 million pounds in 1983 to 11 million pounds in 1990. Currently, the Maryland sport crab fishery is comprised of unlicensed recreational crabbers and licensed noncommercial crabbers. Noncommercial harvest in Maryland for 1993 was 6.2 million pounds. Maryland has not surveyed recreational crabbers since 1990 and no current estimates of recreational catch or effort are available. Virginia issued 361

Figure 5. Maryland commercial blue crab landings and value

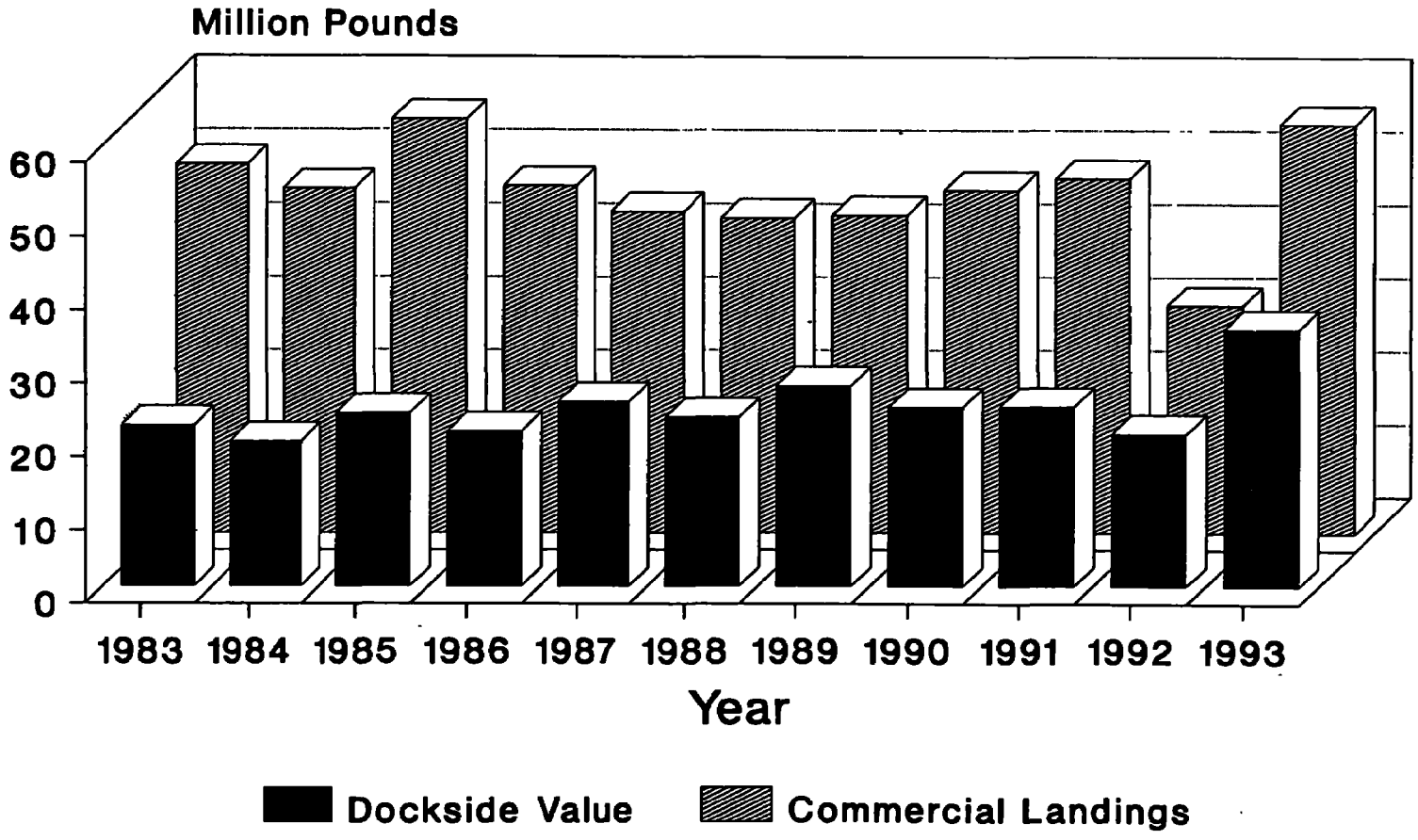
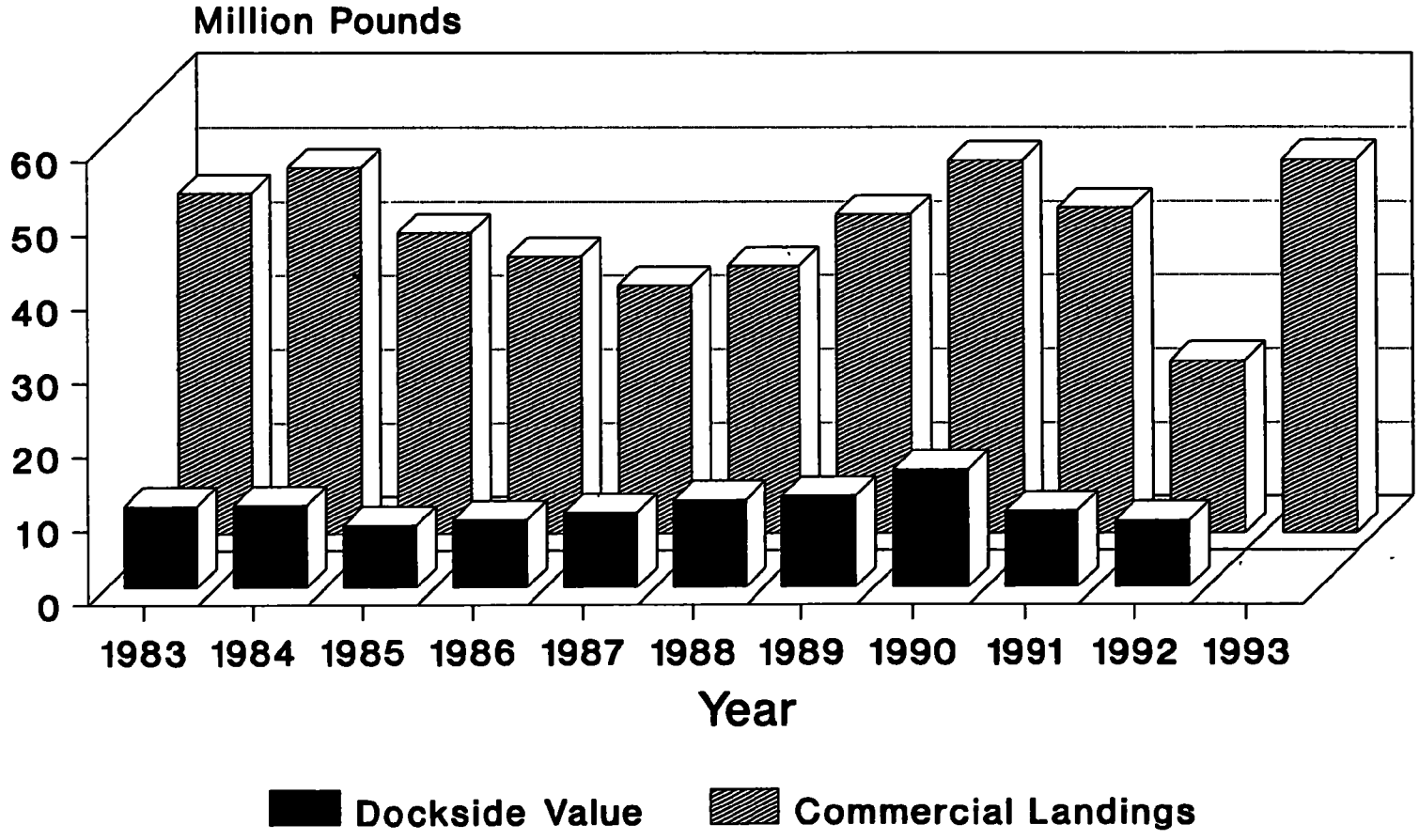


Figure 6. Virginia commercial blue crab landings and value



*1993 preliminary data, dockside value not available
Hard crab landings only

recreational crabbing licenses in 1993. Catch reports are still being processed to determine harvest by licensed recreational crabbers in Virginia.

Wasteful Harvesting Practices

Cull rings in crab pots were made mandatory in Virginia to conserve small crabs and are proposed in Maryland. Research conducted by several States, including Virginia, has proven that cull rings significantly reduce the capture and mortality of small crabs. Biodegradable escape panels for crab pots were investigated in Maryland as a means to reduce crab mortality in abandoned pots. Jute appears to be the best material for a biodegradable panel with a decomposition rate of approximately 55 days. The economics of installing the panel and sustained proper use continues to be investigated.

The MCAP and the 1994 regulatory package include measures to address the recreational use of crab pots. Currently, recreational crab pots are limited to private piers and structures, and these unattended pots trap and kill air-breathing species. Recreational crab pots will be limited to two pots per property and air spaces and escape mechanisms will continue to be investigated.

In response to high peeler mortality estimates during a 1990 MDNR survey of 86 crab shedding operations, a soft-shell crab shedding operator's license will be introduced to the Maryland legislature in 1994. The purpose of the license is to identify crab shedding operators, provide them with technical information on reducing shedding mortality, and develop better techniques for managing the soft crab fishery. Virginia established crab shedding licenses in 1993 for commercial as well as recreational shedders.

Stock Assessment

The method for obtaining commercial crab data in Maryland will change in 1994 from a survey that estimates harvest to a direct reporting system similar to Virginia's new reporting system. In place of establishing a separate recreational crabbing license in Maryland, the proposed 1994 legislation would require recreational crabbers to obtain a sportfishing license. The sportfishing license requirement will not be effective for collecting crab catch and effort data unless license holders are surveyed annually. With the elimination of the noncommercial license, the noncommercial catch estimates will be unavailable. Virginia established a recreational license in 1993 and requires reporting by licensed recreational crabbers. Catch data for unlicensed recreational crabbers who can use dip net, handline or two crab pots for personal use, is not currently monitored in Virginia.

The winter population of blue crabs in the Chesapeake Bay during 1993 was estimated at 653.3 million crabs (winter dredge survey) of which 366.7 million were 50 mm (2 inches) or greater. While these estimates are thought to be conservative when compared to total baywide landings, they are the only estimates currently available. Little is known about the growth of crabs in the wild, and it is uncertain if crabs less than 50 mm enter the fishery the following summer. Assuming that they do not enter the fishery, the exploitation rate of crabs 50 mm and greater in 1992 was 50%. This figure does not include the harvest of soft and peeler crabs or recreational harvest which would increase the exploitation rate.

Baywide summer trawl surveys and winter dredge surveys continue to provide fishery independent population data. Maryland DNR summer trawl data indicate that blue crab abundance was relatively high in 1977, low from 1978-1980, and relatively high through 1986. Since then (1987-1993), considerable fluctuation has been observed. The Virginia Institute of Marine Science, William and Mary (VIMS/W&M) trawl data from 1972-1988 indicate major interannual fluctuations in blue crab abundance, often asynchronous with abundance patterns of crabs in Maryland. Historically, population abundance has remained high or low for two or more years before significant fluctuation in abundance is observed. This has not been the case in recent years. Winter dredge data from Maryland and Virginia indicate fluctuations between single years with high population estimates in 1991 and 1993 and a very low estimate in 1992.

The Chesapeake Bay winter dredge survey from mid-December 1992 through March 1993 sampled both shallow and deep regions of the Bay. A total of 1,897 crabs were caught (n=1386) with 57% sampled from Maryland waters and 43% from Virginia. Catch statistics from the Virginia commercial dredge fishery show a significant decline in winter harvests from 1956 to 1992 and this decline is also reflected in the fishery independent trawl survey conducted in the James, York, and Rappahanock Rivers. The trawl survey indicates a decline in adult female abundance over the same time period. The dredge and trawl data sets correlate well when compared together. Similar declines have been observed in the softshell industry which is dependent on spring "peeler runs" when females are approaching their final molt preceding maturity. The dredge and peeler fisheries, dependent on female abundance in the winter and spring, are preceded by the summer hard crab fishery which has had relatively stable landings. There is evidence in Maryland and the Potomac River that the stability in hard crab landings is due, in part, to a greater amount of effort initiated by commercial crabbers, and this increased effort is accompanied by a concurrent decrease in return per unit of effort. Catch and effort data is unavailable for Virginia.

Regulatory and Conflict Issues

The concept of the blue crab as a resource equally accessible to all is difficult to practice. Division between commercial and recreational crabbers is quite apparent. Recreational crabbers believe that commercial crabbers are not asked to bear a proportionate share of the regulatory burden. Commercial crabbers, on the other hand, believe that since they are dependent upon the resource for a living, they are entitled to a larger portion. Several of the proposed regulations and the licensing legislation in Maryland are in response to conflicts between recreational and commercial crabbers. An increase in the required distance between trotlines is a result of complaints from both commercial and recreational crabbers experiencing gear conflicts. Another example is the proposal to eliminate the "noncommercial crabbing" license. The noncommercial catch limit is believed to be more than one could use for personal consumption and should be included in the commercial license structure. Staggered start and end times for crabbing proposed in Maryland are also an attempt to reduce conflict between commercial and recreational crabbers.

Habitat Degradation

Recent studies by the Smithsonian Environmental Institute emphasize the importance of tributary habitat to the survival of the blue crab. Shallow, vegetated areas provide shelter for young and shedding crabs and are probably important wintering areas. The 1992 amendments to the Chesapeake Bay Agreement place greater emphasis on the tributaries. This expanded emphasis, the Tributary Initiatives, will focus on improving water quality and habitat in the shallow areas in the Bay.

Conclusion

Both states have continued efforts to reduce fishing effort on the blue crab resource. Areas to be pursued during the 1994 management year include:

1) A reevaluation of the blue crab management recommendations and a revision of the 1989 Blue Crab Fishery Management Plan.

2) Continue monitoring the status of the blue crab fishery and determine the need and means of controlling effort.

3) Continue collecting and analyzing data from summer and winter surveys and implement management measures suggested by the data.

4) Continue improving the catch and effort data base for both the commercial and recreational fisheries.

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Problem Area	Action	Date	Comments
1. Fishing Effort is Increasing	1.1.1 MD and VA will contain the commercial harvest at present levels; assess and introduce potential regulatory measures.	1993	A MD crab advisory committee was formed and made recommendations. A legislative and regulatory package was proposed which included commercial gear and time limits and limited entry to the commercial fishery. VA reduced the commercial dredge daily catch limit and limited entry into the dredge fishery.
	1.1.2 MD will continue delayed entry and VA will develop a delayed entry program.	Continue 1993	VA began a delayed entry program effective Jan., 1993. Maryland will consider limited entry.
	1.2 MD and VA will determine Baywide regulations concerning harvest of peeler, soft, hard and female crabs and size limits on all crabs based on yield and recruit data.	1991	MD and VA continue to collect and assess data; discuss size limits, gear and time restrictions and licenses.
	1.3.1 A clear distinction between commercial, noncommercial and recreational crabbers will be defined by reducing the bushel limit for the noncommercial crabbing license in MD.	1991	The MD Crab Action Plan proposed reduced gear and harvest limits for noncommercial crabbers and will be considered by the 1994 legislature.
2. Wasteful Harvesting Practices	2.1 A. MD will promote the release of buckram crabs. B. VA will consider design limitations on crab dredges and establish management or sanctuary areas.	1990 Continue	A. The FMP RAT Force determined implementation of this action was minimal. B. Changes in dredge designs were evaluated and no recommendations were made. No new sanctuary areas were established.
	2.2 MD and VA will promote the use of cull rings and continue to evaluate the effectiveness of cull rings from crab pot studies.	1993	VA passed regulation for mandatory cull rings in crab pots. Rings may be obstructed by permission of the Commission. MD proposed regulation for mandatory cull rings.

Problem Area	Action	Date	Comments
	2.3 A. MD will prohibit the harvest of sponge crabs. B. VA will monitor the harvest of female crabs in the dredge fishery. C. MD and VA will investigate the extent of mortality on mature female crabs used in for eel bait. D. PRFC will continue to prohibit possession of egg-bearing females.	A) 1989 B) 1993 C) Cancelled D) Continue	A. MD adopted prohibition on harvest of sponge crabs in 1989. B. VA continued winter dredge surveys, CPUE data collection and mandatory reporting will be utilized to monitor commercial harvest. C. This action has not been implemented. D. PRFC has implemented this action and has continued prohibition on sponge crab harvest.
	2.4 A. VA will continue prohibition of abandoned crab pots. B. MD will evaluate the need for regulation of abandoned pots. C. MD will asses biodegradable panels in crab pots. D. MD and VA will improve enforcement. E. PRFC will consider regs for abandoned pots.	A) 1993 B) No change C) Continue D) No change E) No change	A. VA code has been changed. B. No new regulations have been proposed. C. Materials for degradable escape panels continue to be investigated.
	2.5 Promote reduction of peeler mortality in shedding operations. Necessary regulatory changes will be implemented.	1993	VA implemented a crab shedding license. MD has proposed a crab shedding license which will be considered in 1994.
3. Stock Assessment Deficiencies	3.1 A. Continue trawl survey. B. Continue dredge survey. C. MD will implement a modified reporting system. D. VA will implement mandatory reporting. E. VA and MD will make reporting systems as compatible as possible.	Continue	A-B. Trawl and dredge surveys were continued. C. Commercial crab mandatory reporting requirement will be implemented in 1994. D. Mandatory reporting was in effect for 1993. E. When MD implements mandatory reporting, the two systems should be more compatible.

Problem Area	Action	Date	Comments
	3.2 A. Utilize information from federal survey. B. MD will continue recreational survey and VA will study survey methods and implement a survey. C. Implement effort control measures for recreational crabbers.	Variable	A. Implementation by MD was minimal and was lacking in VA. B. Implementation by MD has not been on a regular basis. VA established a recreational crabbing license and mandatory reporting by license holders. C. VA established gear and catch limits for licensed crabbers, and gear limits for unlicensed crabbers. MD is considering regulations that limit gear, harvest and time for recreational and noncommercial crabbers.
	3.3 MD and VA support cooperative research to address and define the stock/recruitment relationship, mortality and environmental effects on crab population.	Continue	Fishery independent surveys were continued. VA analyzed historical fishery independent data and compared to commercial landings and continues to investigate stock/recruitment relationships and environmental factors. Baywide data was analyzed for fishing mortality rates and absolute abundance estimates.
	3.4 MD will conduct studies on use of eels as bait for trotlines.	1994	MD will add questions on eels to the crab reporting survey forms beginning in 1994.
4. Regulatory Conflicts	4.1 MD will decrease the number of crab pot floats and increase the number of float-free areas.	Completed in 1990.	Resources to mark float free areas is a limiting factor.
	4.2 Determine need for coordinated soft and peeler size limits.	1991	No consensus to date.
	4.3 MD will consider crab pots for commercial use only.	1993	Landowners are still permitted to use crab pots from private piers; reduced gear limits by landowners are being considered.
	4.4 A. MD maintains a point assignment system. B. VA will consider a point assignment system. C. Make enforcement consistent among jurisdictions.	Continue	B. VA has strengthened laws against repeat offenders.

Problem Area	Action	Date	Comments
	5.1 A. Achieve a 40% reduction of nutrients to the Bay. B. Develop and adopt a basinwide plan for toxic materials. C. Develop and adopt basinwide plan for point and nonpoint source pollution.	Continue	A. Continued. Tributary strategies are being developed by each jurisdiction. B-C. Toxics strategies are being developed.
	5.2 MD and VA will establish crab sanctuaries where harvest may be controlled and environmental modifications restricted.	1991	VA has established no new sanctuaries and MD has not considered establishment of a sanctuary.
	5.3 Support SAV and wetland research and management, development of habitat requirements document.	Continue	SAV replenishment strategies being developed; habitat requirements document revised in 1991.

LEGEND: FMP RAT Force = Fishery Management Plan Reassessment Task Force
CPUE = Catch per unit effort
PRFC = Potomac River Fisheries Commission
SAV = Submerged aquatic vegetation

Chesapeake Bay Oyster Management Plan

The oyster (Crassostrea virginica) resource in the Chesapeake Bay has been significantly impacted by the oyster parasites MSX and Dermo, habitat losses, water quality, and harvesting. In 1989, an FMP was completed for oysters and included strategies to address the problems of harvest decline, recruitment, disease mortality, leased ground production, habitat issues, shellfish sanitation, market production and the repletion program. As the ecological value of the oyster resource became more important and disease became more limiting, an improved management framework was needed. The 1989 Oyster FMP was scheduled for a complete revision during 1992. The Chesapeake Bay Program's Scientific and Technical Advisory Committee (STAC) initially played a dominant role in coordinating efforts to draft an oyster restoration action agenda. After several workshops, eight problem areas were defined to maintain the oyster fishery and restore the oyster reef community. These problem areas were: restoration of habitat; recognition of ecological function; control of fishing mortality; improvement of the repletion program; management around disease; support of research; promotion of aquaculture and the establishment of oyster sanctuaries. The revision process has been more complex and time-consuming then originally planned and the completion date has been postponed until October 1994. Since a revision is in progress only a brief summary of the status of the oyster resource will be presented in this report.

During 1993, the state of Maryland convened an Oyster Roundtable to reach a consensus about a comprehensive plan to bring oyster stocks back to economically and ecologically healthy levels. The objectives defined by the Roundtable were:

1) maximize and enhance the ecological benefits of oysters;
2) maximize and enhance the economic benefits derived from harvesting in the public and private oyster fisheries; and
3) maximize the ability of government to respond effectively to the magnitude of the problem.

One of the major innovations resulting from the Roundtable was defining oyster recovery areas (ORA's). Restoration areas will be established in the Chester, Choptank, Magothy, Nanticoke, Patuxent, and Severn Rivers. These areas will be targeted for restoring oyster populations and then scientifically monitored to see how well new techniques are working. A non-profit corporation will be formed by aquaculturists, environmentalists and watermen to play a major role in developing and applying innovative oyster restoration techniques. Maryland DNR will also establish a pilot permitting program for oyster aquaculture demonstration projects. Specific actions recommended by the Roundtable will serve as one of the source documents for revising the 1989 Oyster FMP. In Virginia, the "Blue Ribbon" Committee has developed the Holton Plan which recommends specific actions for the oyster resource in Virginia.

The Holton Plan will also be used as a source document in revising the 1989 Oyster FMP.

Currently, oyster harvest from the Bay is at an all time low. Preliminary 1993-1994 commercial oyster landings from Maryland are 75,600 bushels, 30,000 bushels from Virginia, and 223 bushels from the Potomac River. During the 1992/1993 season, 125,000 bushels were harvested from Maryland, 64,500 bushels from Virginia, and 105,000 bushels from the Potomac River. This is the seventh consecutive year of harvests below 500,000 bushels (Figures 7 & 8).

The Virginia Marine Resources Commission (VMRC) biologists recommended a moratorium on the harvest of oysters from public grounds during 1993. After much deliberation and public hearings, the VMRC decided to shorten the oyster season and set a 6,000 bushel limit from October 15th through December 31st, restrict the length of tongs to 18 feet, and prohibit harvest after 12 noon. The VMRC's actions did not affect the harvest of oysters from private grounds. The restrictions were similar to those approved by the Potomac River Fisheries Commission (PRFC) in response to high oyster mortalities. Mortalities as high as 90% were reported in parts of the Potomac River due to a high freshwater influx from spring rainfall and snowmelt. For 1993/1994, Maryland delayed opening the oyster season until October 15th and prohibited the harvest of oysters on Saturdays.

Oyster surveys in Maryland indicate that Dermo continued to intensify, especially in low salinity areas and that it has expanded to every productive oyster bar in the Maryland portion of the Bay. During the summer of 1993, MSX underwent remission throughout the upper Bay. Its distribution and intensity closely resembled data collected in 1990. The 1993 oyster spat set was 16.2 spat per bushel which ranks in the lower one-fourth of the distribution of annual spat fall records. Maryland's oyster growing areas that are sustaining the present harvest did not receive a significant spat set in 1992 or 1993 (Krantz 1994, in prep.).

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Figure 7. Maryland commercial oyster landings by season

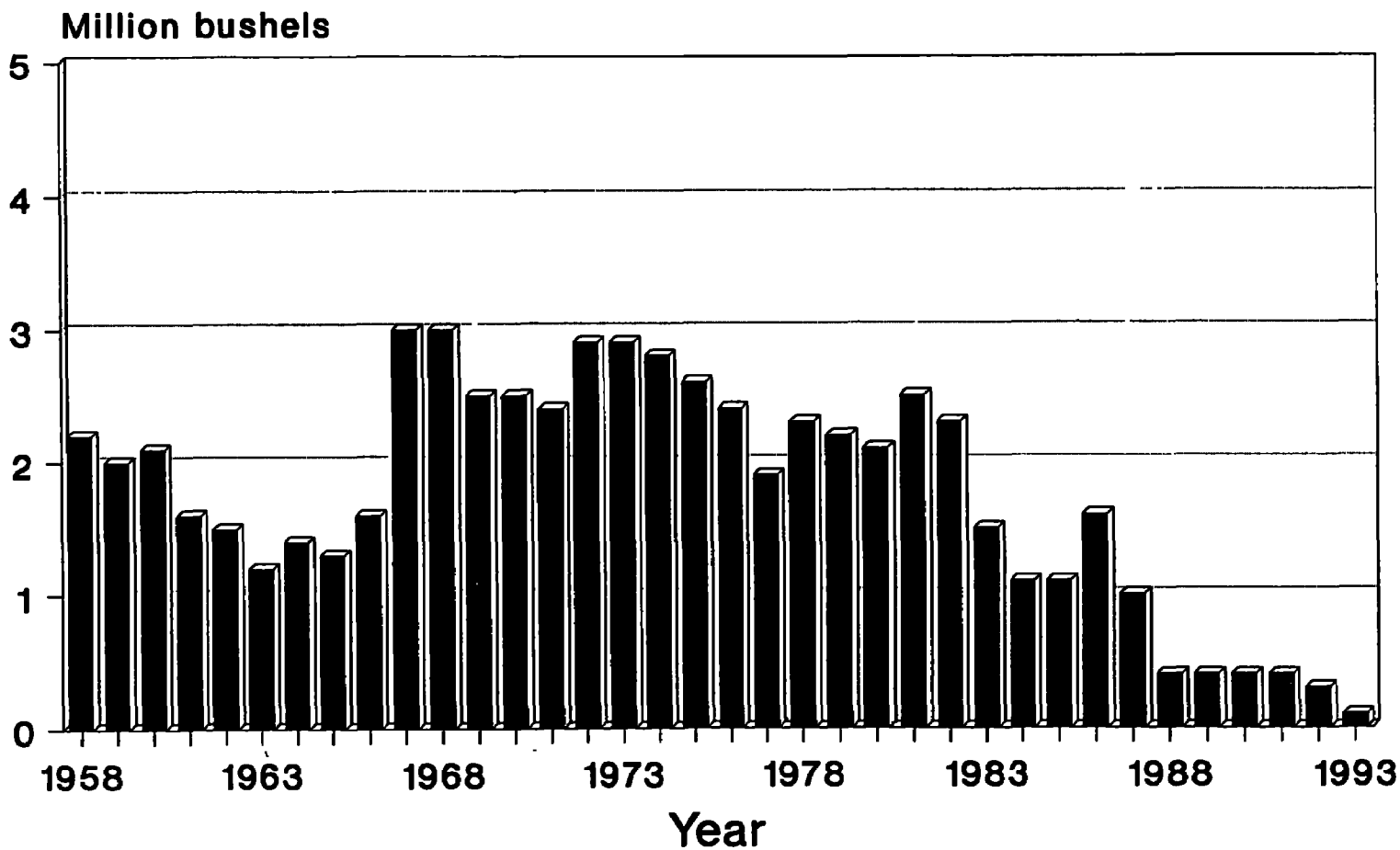
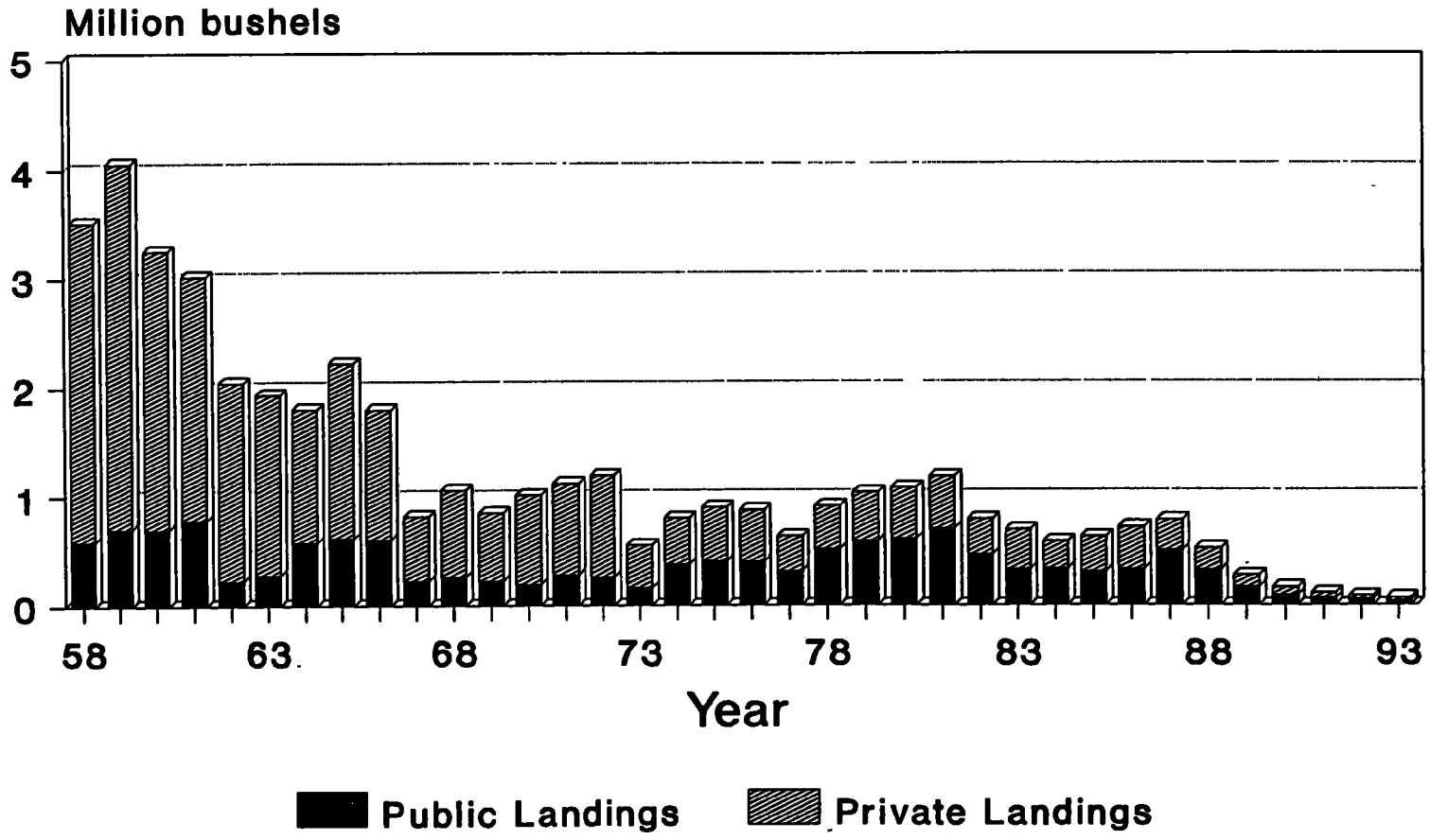


Figure 8. Virginia oyster ground production by season



Bluefish Fishery Management Plan

Stock Status and Increased Fishing Pressure

Total bluefish (Pomatomus saltatrix) landings from the Atlantic coast were 48.0 million pounds during 1992. Since 1988, total landings have been substantially below the 14 year average (1979-1992) of 112.0 million pounds. Total commercial harvest from the Atlantic coast during 1992 was 10.7 million pounds. Commercial harvest from the Chesapeake region during 1992 was 214,500 pounds from Maryland and 579,100 pounds from Virginia. Preliminary commercial harvests during 1993 are 94,050 pounds from Maryland and 629,900 pounds from Virginia (Figure 9 a & b).

Recreational bluefish landings from the Atlantic coast were 37.2 million pounds during 1992. The 1992 value was the lowest since the Marine Recreational Fisheries Statistics Survey (MRFSS) began in 1979. Recreational landings have been decreasing since 1986 when 130.9 million pounds were landed. Both the 1992 commercial and recreational catch were below the 14 year average of 13.9 and 98.2 million pounds, respectively. The estimated recreational catch from Maryland during 1992 was 621,229 fish. Preliminary 1993 estimated bluefish catch is 193,190 fish (MRFSS data). Currently, there is a 10 fish creel limit in the Chesapeake Bay. Maryland and PRFC will continue their 8" minimum size limit. The Bluefish Review and Monitoring Committee did not recommend any changes for the recreational fishery during 1994. Catch and effort estimates from the Marine Recreational Fisheries Statistics Survey (MRFSS) will be recalculated for data collected in 1979 through 1986 to make them more directly compatible with the estimates from 1987 to 1993. It is expected that the recalculations will lower recreational bluefish catch estimates during the earlier years by 10 to 15% (ASMFC 1993).

A coastal fishery management plan for bluefish was developed by the Mid-Atlantic Fishery Management Council (MAFMC), adopted by the Atlantic States Marine Fisheries Commission (ASMFC) members in October, 1989 and approved by the Secretary of Commerce in March, 1990. Included in the plan was a trigger for implementing a commercial quota when bluefish harvest criteria were exceeded, a commercial permit requirement, and a recreational creel limit. A Chesapeake Bay Bluefish Management Plan was completed in December 1990 which followed the guidelines established in the coastal plan.

During 1993, the Bluefish FMP Review and Monitoring Committee recommended that the MAFMC and ASMFC implement a commercial quota system for bluefish in 1994. Their recommendation to implement a quota was based on the evaluation of two indices or triggers that were defined in the 1989 Coastal FMP. The first index was a three-year moving average of both commercial landings and total bluefish catch used to derive a time-series projection of the commercial share for 1994. If the projected share was 20% or above, then

Figure 9a. Commercial bluefish landings from Maryland

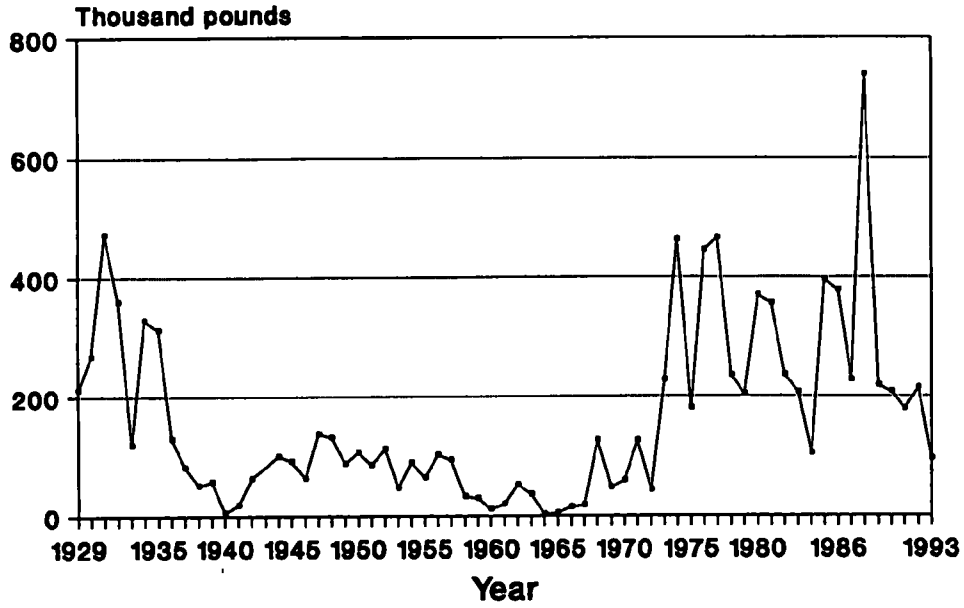
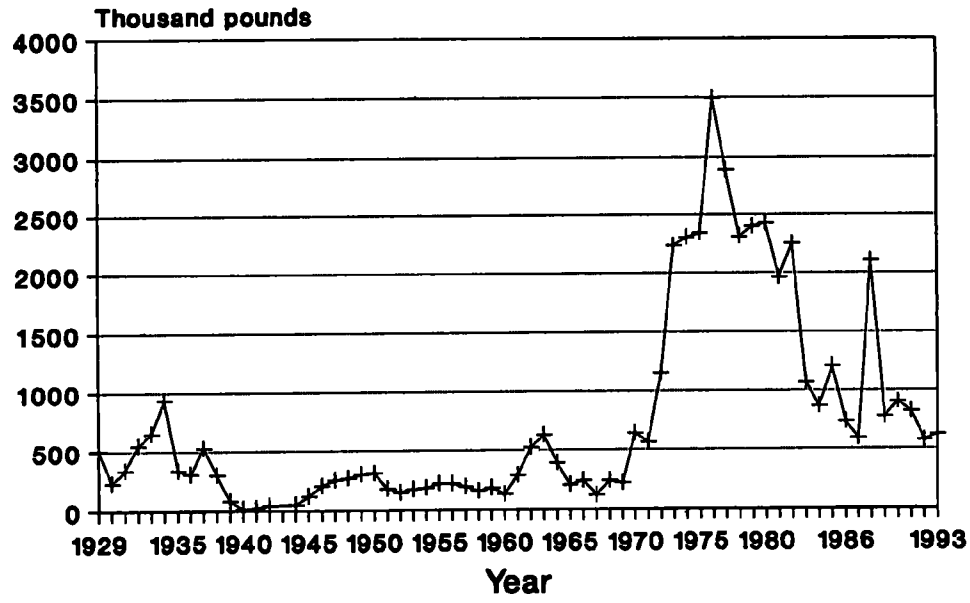


Figure 9b. Commercial bluefish landings from Virginia



*1993 preliminary data

commercial controls would be implemented. Using 1979-1992 data, the projected 1994 commercial catch would be 21.2%. The second index was based on the percentage of commercial landings in the total bluefish catch calculated for each year and compared to the commercial share for the previous year. If the change in the commercial percentage was equal to or exceeded 50%, then policy makers would use the criteria of the second index to determine if commercial controls would be implemented. The change in commercial share from 1991 to 1992 decreased by 0.6%. The Committee recommended the implementation of commercial controls based on the first index. A quota was calculated using a regression equation to predict the 1994 commercial share and is 11.4 million pounds. The allocation of the quota among states was based on the 10 year average of commercial landings by state (1978-1987). Maryland's allocation is 2.8% of the total or 323,300 pounds. Virginia's allocation is 10.7% or 1.2 million pounds. Individual states will be responsible for monitoring their harvest and closing the fishery when their quota is reached.

Bluefish recreational landings, catch-per-unit-of-effort (CPUE), and relative spawning stock biomass (SSB) have decreased over the last five years. Estimates of SSB from the coast suggest a decline from approximately 300 million pounds in 1982 to below 81 million pounds in 1989. It is unclear whether the decrease in bluefish stock abundance is due to natural events or increased exploitation (ASMFC 1993). During 1993, the Bluefish Stock Assessment Subcommittee re-estimated the biological reference points for the Atlantic coast bluefish stock to include data on estimated young-of-year losses from recreational fishing, shrimp bycatch and scrap fishing. Previously, F_{msy} was calculated at 0.35. Using the additional data, the new F_{msy}=0.25. Fishing mortality (F) ranged between 0.23 and 0.42 from 1982 to 1985. Since then, F has been higher than 0.25 and may be responsible for the decline in landings and SSB. The level of F will be re-evaluated at the 1994 Stock Assessment Workshop.

Wasteful Harvest Practices

In 1991, a 10 fish creel limit was implemented for the recreational fishery as a method to reduce waste within the fishery. Eleven states have implemented the possession limit or an equivalent measure. Connecticut, North Carolina, New Jersey and Pennsylvania are not in compliance with the recommendation. Some jurisdictions have also implemented a minimum size limit (Delaware, Maryland, and PRFC).

The reduction of small bluefish as bycatch from the commercial fishery has been indirectly accomplished by the adoption of increased minimum mesh sizes for gill nets (3") and otter trawls (3") in Maryland. Virginia has a 2 7/8" minimum mesh size for gill nets and a ban on trawling in state waters. There have been no new

efforts to educate the general public about the need to reduce waste in the recreational fishery. Hook and release is still being promoted.

Research and Monitoring

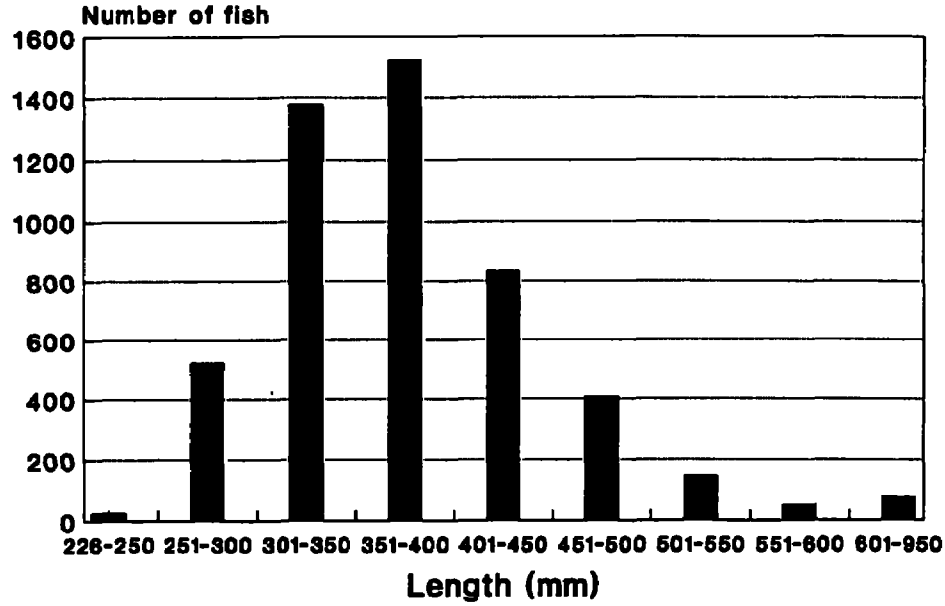
Ichthyoplankton surveys along the Atlantic coast indicate that there are three separate spawning concentrations of bluefish: a spring-spawned group from the South Atlantic Bight (SAB); a summer-spawned group from the Middle Atlantic Bight (MAB); and a fall-spawned group from the SAB. It appears that the spring-spawned group contributes the most to the Atlantic coast bluefish population. Fish from the spring-spawned group recruit to estuaries as far north as Maine and to southern estuaries. Estuaries of the MAB which includes the Chesapeake Bay region, are important nursery grounds for bluefish (McBride et al. 1993).

The National Marine Fisheries Service (NMFS) autumn trawl survey, conducted from Cape Cod to Cape Hatteras, provides the best available measure of bluefish year class success along the Atlantic coast. Indices of juvenile abundance suggest that a moderately strong year class recruited to the stock in 1989 and significantly contributed to the fishery in 1990 and 1991 (NOAA Tech. Memo. 1993). Bluefish were sampled by month for length and sex through the VMRC stock assessment program. The fish ranged between 226mm (8.9 inches) and 950mm (37.4 inches) in length (Figure 10a & b). Based on size data, most bluefish available in the Bay were age 1 and 2 (300 to 400mm).

Maryland implemented a mandatory reporting system for charter boats in 1991. The logbooks provide information on the number of trips, and number and weight of fish caught and released, on a monthly basis for part of the recreational fishery in Maryland. During 1993, 156,137 pounds (59,299 fish) of bluefish were reported by charter boat fishermen. This was approximately half the number of bluefish caught during 1992 (304,271 lbs.) and 1991 (333,823 lbs.). Catch-per-unit-of-effort (CPUE) was calculated using the number of bluefish caught divided by the number of charter boat trips. The CPUE decreased from 8.1 during 1992 to 3.6 during 1993. Although abundance was lower in 1993, average weight remained similar compared to previous years. Average weight of bluefish caught by charter boat fishermen between April and November was 2.9 pounds (1991), 2.3 pounds (1992) and 2.6 pounds (1993). Bluefish were also sampled from the commercial fishery through a multi-species study implemented in Maryland during 1993. A small sample size and only one year of data make any observations tentative, at best. However, as the study continues, it should provide valuable, basic biological data on bluefish in the Bay.

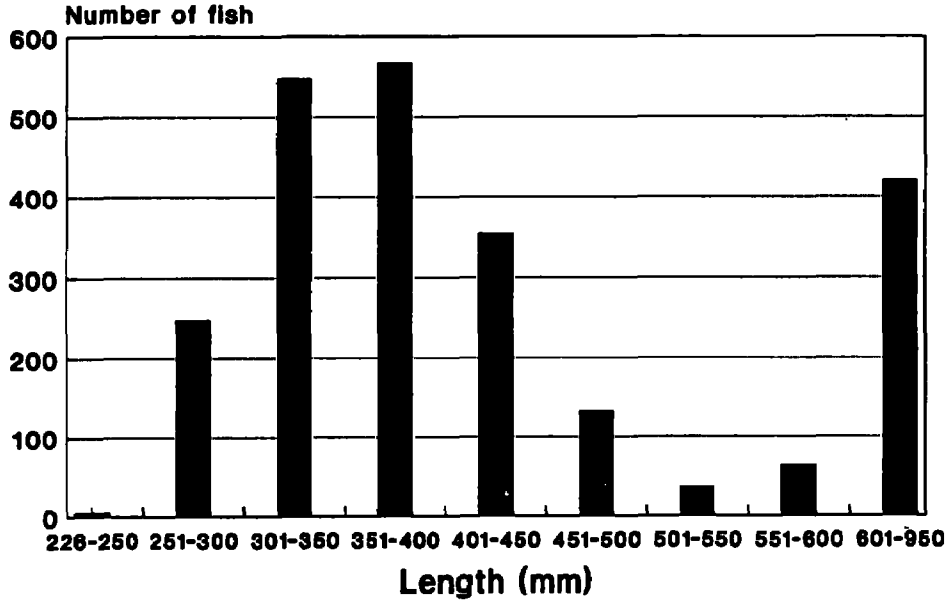
The Marine Fisheries Project has been surveying Maryland's coastal bay areas for juvenile and adult marine and estuarine species since 1972. During 1992, a small number (n=18) of juvenile

Figure 10a. Bluefish length frequency distribution, VA. Stock Assessment, 1992



n=4966

Figure 10b. Bluefish length frequency distribution, VA. Stock Assessment, 1993



n=2341

bluefish were caught by haul seine. The number of bluefish in the coastal bay area has declined since 1982 and current numbers indicate a continuing low trend (Casey et al. 1993).

Conclusion

Projected coastwide commercial landings triggered the implementation of a commercial quota for bluefish in 1994. There has been a steady decline in bluefish recreational landings, CPUE, and SSB over the last 5 years. Although the trend in F varied between 1982 and 1985, it increased between 1986 and 1988 to levels beyond the current F_{msy} and $F_{collapse}$ of 0.25 and 0.55, respectively. The current level of fishing mortality (F) is uncertain based on the assumptions and model used in the analysis. The uncertainty should be resolved in the upcoming Stock Assessment Workshop when the status of the bluefish stock is reviewed. The following areas should be emphasized during 1994 for the bluefish resource:

1) Implement and monitor the 1994 commercial quota,

2) Continue to collect biological data and stock assessment information on bluefish within the Bay.

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1993 ANNUAL PROGRESS REPORT
CHESAPEAKE BAY BLUEFISH IMPLEMENTATION PLAN

Problem Area	Action	Date	Comments
1. Stock Status & Increased Fishing Pressure	1.1.1 Continue to participate in scientific & technical meetings for managing bluefish along the coast & in estuarine waters.	Continue	
	1.1.2.1 Will adhere to state allocations established by the MAFMC/ ASMFC if commercial harvests levels meet criteria in the coastal plan.	Continue	Preliminary commercial landings during 1993 are 65,100 lbs (MD) and 629,900 lbs. (VA). Coastal FMP review committee has recommended a commercial quota for bluefish in 1994.
	1.1.2.2 Will continue present licensing requirements for harvest and sale; VA will establish a 10 fish creel limit for its commercial hook & line fishery & pursue a license for that fishery.	1991 Continue	VA implemented a 10 fish creel limit for all bluefish harvested by hook and line. A recreational fishing license for VA Bay and commercial H&L for VA tidal waters was in effect during 1993.
	1.1.2.3 MD will establish a 10 fish/ person/day recreational creel limit. VA & PRFC instituted 10 fish creel in summer 1990. Creel limits and minimum legal sizes may be modified as appropriate.	1991 Continue	A 10 fish/person/day creel limit was implemented by the Bay jurisdictions during 1991. MD and PRFC will continue their 8" minimum size limit for bluefish.
2. Wasteful Harvest Practice	2.1.1 A 10 fish creel limit will minimize wastage.	1991 Continue	Chesapeake Bay jurisdictions have implemented a 10 fish creel limit.
	2.1.2 Educate the general public about the need to reduce waste in the bluefish fishery.	1991 Continue	Jurisdictions are promoting hook & release via brochures and press releases. Awareness by the general public has increased & more are practicing conservation.
	2.1.3.Assess factors causing waste in the commercial fishery and identify potential solutions.	1991 Continue	VA and MD sample pound net catches. Data on length frequency & sex ratios will be available. VA is promoting plastic escape panels in pound nets.

BLUEFISH (CONT'D)

Problem Area	Action	Date	Comments
3. Research Needs	3.1.1 Improve the catch and effort data collected from the bluefish commercial fishery in the Bay.	Continue	VA began mandatory reporting in January, 1993.
	3.1.2 Assess methods for improving recreational & charter catch/effort data needed to evaluate biological and economic impacts.	Continue	Jurisdictions continue to support the MRFSS for bluefish and other species. MD requires daily/weekly log books for charterboat fishery. VA initiated a charter boat task force in 1993 to study the issue of logbooks.
	3.1.3 Encourage research to collect data on blue fish.	1991 Continue	MD pound net survey will provide size and age information on bluefish.
4. Habitat Issues	4.1. Continue to set goals for water quality and habitat, review programs established under the 1987 Bay Agreement.	Continue	In addition to the Bay Program, a tributary initiative will set nutrient reduction goals for major tributaries.

LEGEND:
ASMFC = Atlantic States Marine Fisheries Commission
MAFMC = Mid-Atlantic Fisheries Management Council
MRFSS = Marine Recreational Fisheries Statistics Survey
PRFC = Potomac River Fisheries Commission

Weakfish and Spotted Seatrout Management Plan

Overfishing and Stock Status

Weakfish

An ASMFC management plan for weakfish (Cynoscion regalis) was developed in 1985. Following a dramatic decline in commercial and recreational weakfish landings along the Atlantic coast, Amendment #1 was developed and adopted in 1991. This amendment recognized the overfished status of the weakfish stock and proposed a phased reduction in exploitation of 15% during 1992, reaching a 50% reduction by 1995. To meet the reduction in exploitation, increasing minimum size limits (10" in 1992, 11" in 1993 and 12" in 1994) were required. Also recommended was a 50% bycatch reduction in the southern shrimp fishery by January, 1994 and the implementation of a commercial mesh size that would allow 75% of undersized weakfish to escape. To date, the implementation of Amendment #1 by the coastal states has been inadequate to effect the recovery of the weakfish stock. State implementation was reviewed by the ASMFC weakfish management board for the states of New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina. Only Delaware and New Jersey were judged to have met the recommended reduction in fishing mortality during 1992. These two states account for approximately 14% of the coastal fishery while Virginia and North Carolina account for approximately 80% of the fishery. A 25% reduction in exploitation was the target during 1993. Procedures for instituting annual state weakfish implementation plans, evaluating state plans and determining state compliance were developed by ASMFC and documented as Supplement to the Weakfish FMP-Amendment #1, Addendum 1-Procedures. Under revised guidelines developed by the Weakfish Technical Committee, no state was judged in compliance during 1993.

The ASMFC Weakfish Management Board is considering more extensive restrictions for reducing weakfish exploitation. A complete moratorium or quota based system may be required. A current assessment of stock status should be completed by the first quarter of 1994. In the interim, states are encouraged to fully comply with the recommendations of Amendment #1 during 1994. The ASMFC recommended that the MAFMC implement complementary management measures for weakfish in the Exclusive Economic Zone (EEZ, 3-200 miles offshore). After consideration, the MAFMC deferred action back to the states. The MAFMC is less flexible in enacting complementary regulations when there are multiple size limits in state waters. The MAFMC recommended new language for a management measure concerning state possession and landing regulations which: a) prohibits the landing or possession of fish smaller than that state's minimum size limit, and b) requires a vessel with a 100 pounds or more of weakfish to use a gear type that allows a 75% escapement rate equivalent or greater than the recommended ASMFC minimum size limit of 12".

Maryland implemented a 12" minimum size limit for weakfish in September, 1993. Additional regulations included a 10 fish creel limit for the recreational fishery, a 3" minimum mesh size for trawls and gill nets, and a closed coastal commercial season from July 1st through September 30th. The PRFC continued their 13" minimum size limit for both the recreational and commercial fisheries and 10 fish creel limit (implemented in 1992). Virginia continued their 12" minimum size limit and 15 fish creel limit for the recreational fishery; a 12" minimum size limit for gill nets; and a 10" minimum size limit for pound nets and haul seines with a 10% tolerance (implemented in 1993). The ASMFC weakfish evaluation team concluded that Maryland would have achieved a 12% reduction in exploitation for the recreational fishery if management measures had been implemented earlier in the Year. The PRFC achieved an 18% reduction in exploitation for the recreational fishery and Virginia achieved a 10% recreational reduction during 1993.

The 1993 weakfish stock assessment indicated an average annual exploitation rate of 62% and a F=1.2 between 1990 and 1992 (Crecco 1993). In order to achieve the maximum spawning potential (MSP) of 20% of an unfished spawning stock at F_{20}=0.22, the annual exploitation rate must be lowered to 17%. The weakfish stock showed a drop in MSP from 7-12% to 2-5%. Effort has remained high and F has risen from 0.9 to 1.1 or 1.2 in the last three years (ASMFC 1993). The most recent calculation of F, which also has the most associated uncertainty, shows a slight reduction. Because the stock has been under heavy exploitation, the age structure of the population has been truncated. Although stock biomass has decreased, recruitment has been good. Restrictive regulations could rapidly rebuild the stock given the early maturation and fast growth of weakfish. Continued reductions in spawning stock biomass could lead to recruitment failure (Gibson 1993).

Coastwide commercial landings of weakfish during 1992 were 7.4 million pounds. This was a decrease from the 1991 catch of 8.8 million pounds. Commercial landings during 1992 were 385,000 pounds and 549,900 pounds from Maryland and Virginia, respectively. During 1993 commercial weakfish landings from the Chesapeake Bay region increased. Preliminary landings indicate that 135,600 pounds were harvested from Maryland and 1.1 million pounds were harvested from Virginia (Figures 11 a & b). Part of Virginia's apparent increase may be the result of implementing a mandatory reporting system beginning in January 1993. Recreational weakfish landings have been estimated by the Marine Recreational Fisheries Statistics Survey (MRFSS) since 1979. The estimated number of weakfish caught by marine recreational anglers during 1992 from the Atlantic coast was 1.4 million fish (1.8 million pounds). This was a decrease from the 1991 estimate of 2.0 million fish (2.4 million pounds). Preliminary recreational weakfish harvest from Maryland during 1992 is estimated at 314,244 fish and for 1993 at 203,870 fish.

Figure 11a. Maryland commercial landings for weakfish, 1950-1993

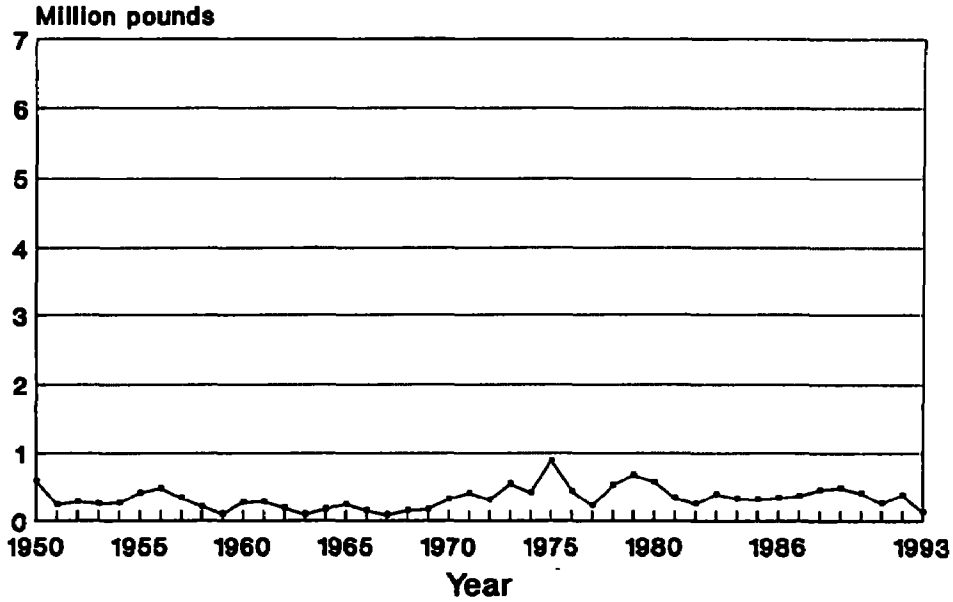
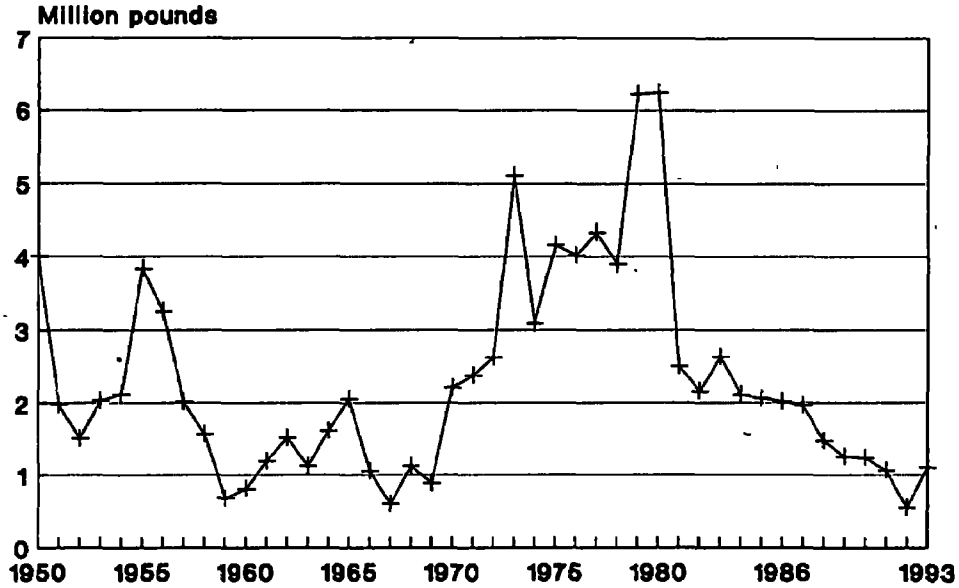


Figure 11b. Virginia commercial landings for weakfish, 1950-1993



*1993 preliminary data

Spotted Seatrout

A stock assessment workshop on spotted seatrout (Cynoscion nebulosus) was conducted during 1993. Results from the workshop will be available in 1994. Spotted seatrout are harvested by both recreational and commercial fishermen and are most frequently caught in the South Atlantic region (North Carolina to east coast of Florida). The recreational fishery has generally been more important than the commercial fishery. Estimated recreational catch (MRFSS data) from Maryland and Virginia combined, was 207,000 fish in 1991. In 1992, recreational anglers caught an estimated 6,032 fish from Maryland. Data from Maryland's charterboat logbooks indicate 4,609 fish (5,067 pounds) were harvested during 1993. Maryland has not reported any commercial catch of spotted seatrout for several years. Commercial landings from Virginia were 10,400 pounds during 1992. Preliminary 1993 landings are 36,450 pounds.

Currently, the Bay jurisdictions have the following regulations in place for spotted seatrout: Maryland- 12" minimum size limit and a 10 fish creel limit; PRFC- 13" minimum size limit and 10 fish creel limit; and Virginia- 14" minimum size limit, 10 fish creel limit, and a 5% tolerance of fish less than 14" for pound nets and haul seines.

Bycatch

The bycatch mortality of weakfish in non-directed fisheries, especially in the southern Atlantic shrimp trawl fishery, is a problem. The average (1985-1988) annual number of age 0 weakfish killed by the South Atlantic trawl fishery is about 18.9 million or approximately 2.7 million pounds (ASMFC 1993). It has been estimated that large gains in yield per recruit and spawning potential can be realized if age 0 and 1 weakfish (10" or less) are protected by requiring bycatch reduction devices (BRDs) in the South Atlantic shrimp fishery (MAFMC 1993). The Bay jurisdictions support the ASMFC recommendation that bycatch of weakfish be reduced by 50% by January, 1994. The bycatch of weakfish in Chesapeake Bay non-directed fisheries is being monitored through the Maryland multi-species pound net sampling program started in 1993. Approximately 77% of the weakfish sampled (n=432) were smaller than 12". Maryland culling practices allow the return of undersized fish with a minimum of bycatch mortality. Weakfish were also sample from the ocean trawl fishery. The length frequency data indicate that over 90% were larger than 12". Oceanside data suggests that the discard mortality of small weakfish is minimal.

Stock Assessment and Research Needs

Weakfish

Maryland charter boat logbooks indicate that 83,180 pounds of weakfish (62,780 fish) were caught during 1993 by charter boat

anglers. Average weight decreased slightly from 1.6 pounds (1992) to 1.3 pounds (1993). The catch-per-unit-effort (CPUE) was 3.8 during 1993. Bycatch of small weakfish was monitored in the commercial fishery by sampling pound nets in the Bay and sampling the catch from the ocean trawl fishery.

Young-of-year and yearling weakfish were collected by trawl from Maryland's coastal bay areas during 1992. The 1993 coastal bay juvenile weakfish index of 2.1 did not indicate strong recruitment (Uphoff, in prep.). Offshore sampling of weakfish indicated that age 3 and 4 fish were harvested by the commercial gill net fishery off Ocean City, Maryland (Casey et al. 1993). Studies on weakfish bycatch, mesh size, and catch and release mortality are recommended by the ASMFC Technical Committee.

Spotted Seatrout

No directed research on spotted seatrout has occurred in Maryland or Virginia but some southern states are collecting data. A life history study is in progress and other studies include: age-growth analysis; food habits; maturity and reproductive habits; mortality estimates; and migration (ASMFC 1993a). Coastal states have begun to collect catch and effort data on spotted seatrout. South Carolina has begun work on developing a pre-recruit index of abundance. Data from specific geographical areas may not be transferable to other areas since it appears that the coast has several different stocks.

Recreational-Commercial Conflicts

Recreational anglers, recreational boaters and commercial harvesters all compete for the same resource. There have been conflicts among the user groups on a variety of topics including fishing gears and fishing locations. The Bay jurisdictions have established advisory boards which include representatives from the user groups, to address fishing conflicts. To date, these advisory boards provide an adequate forum to address recreational and commercial conflicts.

Conclusion

The weakfish resource continues to be overfished. The Bay jurisdictions did not completely implement the ASMFC recommendations to reduce exploitation on weakfish by 25% during 1993. The results of the ASMFC weakfish/spotted seatrout stock assessments will be available in 1994 and should provide better estimates of fishing mortality and spawning stock biomass. The adoption of the Atlantic Coastal Fisheries Cooperative Management Act should provide the "backbone" to implement coordinated coastwide management. The following areas should be emphasized during 1994 for the weakfish and spotted seatrout resources:

1) Fully implement the ASMFC recommendations to reduce exploitation on the weakfish resource, and

2) Continue to monitor recreational and commercial harvest of both species from the Bay.

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1993 ANNUAL PROGRESS REPORT
CHESAPEAKE BAY WEAKFISH/SPOTTED SEATROUT IMPLEMENTATION SCHEDULE

Problem Area	Action	Date	Comments
1. Overfishing	1.1.1 MD, VA & PRFC will continue stock assessment work & analyses of catch/ effort data described in Action 2.1 to improve management measures for controlling overharvest.	Continue	No state was judged in compliance with ASMFC recommendations for reducing exploitation during 1993.
	1.1.2. a) MD & PRFC will propose an increase in the minimum size limit for weakfish from 10" to 12"; b) VA will continue to enforce its minimum size limit of 9" for weakfish; c) Bay jurisdictions will pursue discussions on a consistent baywide minimum size for weakfish.	1992 1993	VA implemented a 12" min. size limit for H&L & gill net; a 10" min. was adopted for haul seine & pound net with a 10% tolerance by wt. PRFC implemented a 13" min. size for weakfish during 1992. MD implemented a 12" size limit in Sept. 1993.
	1.1.3 MD, PRFC & VA will continue to enforce their 12" minimum size limit for spotted seatrout.	Continue	In 1992, PRFC implemented a 13" min. size limit. VA implemented a 14" min. size with a 5% tolerance for haul seine & pound net. MD implemented a 12" min. size in Sept. 1993.
	1.1.4 MD will continue its Delay of Application program for commercial fishing licenses to control fishing effort. VA will continue to pursue a limited & delayed entry program.	Continue	In MD, charter boat captain licenses are now under the Delay of Application procedure. VA implemented a delayed entry program in 1993 & VMRC was given authority to implement limited entry. MD has proposed a limited entry law for 1994.
	1.1.5 MD, PRFC & VA will evaluate recreational & commercial creel limits for weakfish & spotted seatrout H&L fisheries, & implement them as needed.	1992 1993	VA implemented a 15 fish creel for weakfish & a 10 fish creel for spotted seatrout during '92. PRFC implemented a 10 fish creel for both species. MD had no creel limits until Sept. 1993 when a 10 fish/person/day limit was implemented for both species.

WEAKFISH/SPOTTED SEATROUT CONT'D.

Problem Area	Action	Date	Comments
	1.2. a) MD will collect information from pound net, ocean gill net & ocean trawl fisheries to develop management strategies for reducing the non-directed bycatch of small weakfish & other species; b) VA will continue to monitor the species compostion & biological characteristics of bait harvested in its pound net fishery. Will take action as needed to reduce the incidental bycatch of small weakfish; c) MD, PRFC & VA will work through MAFMC/ASMFC to encourage protection of immature weakfish caught in NC fisheries.	1991 Continue 1992 Continue	a) MD has a new multi-species monitoring program which will provide data on the extent of incidental bycatch of small weakfish. b) VA began a study on the use of escape panels in pound nets for reducing the bycatch of juvenile finfish. The study continued in cooperation with NC during 1993. The jurisdictions have worked through ASMFC & MAFMC to promote the use of FEDs & TEDs. Use of these devices have been successful at eliminating some of the bycatch of small fish including weakfish & spotted seatrout.
2. Stock Assessment & Research Needs	2.1 a) Continue to support stock identification research. Coordinated studies on the relative contribution of various estuaries to the coastal weakfish stock will be initiated. b) Continue VMRC's stock assessment to collect biological data from commercial catch. A weakfish population study including mortality estimates & yield models is proposed; c) Continue to collect landings data, sample pound nets, pursue limited & delayed entry, & require mandatory reporting; supplement MRFSS & charterboat logbooks. d) Continue baywide trawl survey.	Continue	b) VA stock assessment program provided the ASMFC with length data from the mid-Atlantic region which was used in a coastwide assessment of weakfish. c) VA implemented mandatory reporting & delayed entry in 1993. MD continued charterboat logs which has provided data on the number & lbs of fish caught by charterboat fishermen. d) MD's summer trawl survey has provided some data on juvenile weakfish. VIMS trawl survey provides indices of juvenile abundance for weakfish & other species.

WEAKFISH/SPOTTED SEATROUT CONT'D.

Problem Area	Action	Date	Comments
3. Habitat Loss and Degradation	3.1 1-7) Continue to set specific objectives for water quality goals & review management programs.	Continue	The Bay Program added a tributary initiative which set nutrient reduction goals for major tributaries.
4.Recreational & Commercial Conflicts	4.1 Continue to address fishing conflicts & issues with existing advisory groups.	Continue	Interjurisdictional conflicts have arisen because of the different size and creel limits.
	4.2. a) VMRC adopted a uniform marking system & a minimum mesh size of 2 7/8" for gill nets in tidal waters. b) MD adopted a marking system based on VA's scheme for drift gill nets in the striped bass fishery.	Continue	VA also restricts gill net by area & season. MD implemented a 3" min. mesh size for gill nets and trawls in Sept. 1993.

LEGEND:
ASMFC = Atlantic States Marine Fisheries Commission
FEDs = Finfish exclusion devices
MAFMC = Mid-Atlantic Fisheries Management Council
MRFSS = Marine Recreational Fisheries Statistics Survey
PRFC = Potomac River Fisheries Commission
TEDs = Trawl efficiency devices or turtle exclusion devices
VIMS = Virginia Institute of Marine Science
VMRC = Virginia Marine Resources Commission

Summer Flounder Fishery Management Plan

Overfishing and Stock Status

The Atlantic coast summer flounder (Paralichthys dentatus) stock continues to be overfished. Based on the most current stock assessment, summer flounder stock biomass is still low but has increased since 1989. Fishing mortality (F) rates were approximately 1.1 in 1992, a decrease from a high of 1.8 in 1988-1989. An F=1.1 equated to an exploitation rate of 62% during 1992. Fishing mortality rates have varied between 0.7 and 1.8 over the last 10 years and relate to annual exploitation rates between 46% and 78%. With the implementation of a summer flounder quota, no increase in the discard of summer flounder and no recruitment failure, F during 1993 is expected to decrease to 0.5, an exploitation rate of 36%. Overfishing was defined by MAFMC/ASMFC as fishing in excess of the F_{max} level or F=0.23. The F_{max} level equates to a spawning stock biomass (SSB) per recruit level of 20%. Past fishing mortality rates equate to a spawning stock biomass per recruit level of about 2 to 3%. With the 1993 quota, SSB is predicted to increase. The age composition of the stock continues to be compressed. The NMFS spring survey indices indicate that stock abundance is being sustained by age 2 fish and younger. Approximately 11% of the spawning biomass is composed of ages 3 and older. At F_{max}, about 77% of the SSB would be expected to be fish age 3 and older with average recruitment (16th SAW). The stock is still at risk because older, more fecund adults are being removed too rapidly from the population. Overall recruitment from along the coast was poor in 1988 and 1989. Recruitment levels in 1990 and 1991 were around the recent average but still below the long-term average. Young-of-year summer flounder sampled from Virginia rivers and Bay were about average in 1990 and 1991 but decreased in 1992 and 1993.

An ASMFC coastal summer flounder plan was developed in 1982 and a MAFMC plan was prepared in 1988. Since then 5 amendments have been added to the plans. Amendment #1 (Sept. 1990) provided a definition of overfishing; Amendment #2 (Aug. 1992) provided a strategy for reducing fishing mortality and a sea turtle conservation requirement; Amendment #3 (Jul. 1993) revised the exempted fishery description and increased possession limits for those not participating in the exempted mesh program; Amendment #4 (Aug. 1993) revised the state specific shares of the coastwide quota; and Amendment #5 (Aug. 1993) allowed the transfer or combination of summer flounder quotas between two or more states. Amendment #6 has been proposed and if implemented would allow the following: larger mesh size nets on board if properly stowed; changes in the time requirements on regulations for the recreational fishery so it is more responsive to the previous year's events; a prohibition on twisted mesh; authorization for an experimental fishery under certain conditions; definition of a fish box, consistent with the

Northeast Multispecies FMP; and authorization for the reporting of fish size frequencies rather than weights from the party and charter boat fishery. The overfished status of the summer flounder stock was acknowledged in the Chesapeake Bay Summer Flounder FMP (1991). Following ASMFC and MAFMC recommendations, various strategies to reduce fishing exploitation were implemented.

A commercial quota of 12.35 million pounds and a recreational harvest limit of 4.36 million fish (8.38 million pounds) were implemented in all states (Maine to North Carolina) beginning on January 1, 1993. Maryland had a 251,829 pound quota and Virginia had a 2.63 million pound quota. The total commercial harvest of summer flounder from the Atlantic coast during 1993 was 12.46 million pounds. Harvest from state waters was not included in the quota except for Massachusetts. Maryland harvested 254,081 pounds or 100.9% of its quota and closed the coastal commercial summer flounder fishery on October 12, 1993. Virginia's total allowable quota was 2.88 million pounds after a transfer of quota from North Carolina. Virginia harvested 2.9 million pounds or 100.7% of its quota. Preliminary recreational data for 1993, indicate 4.69 million fish (6.2 million pounds) were landed. Maryland recreational anglers landed an estimated 659,00 pounds (unpublished MRFSS data). Complete recreational data will not be available until 1994. In addition to the quota, a minimum mesh size of 5.5" was required for the directed trawl fishery and a 13" minimum size limit for the commercial fishery. The recreational fishery required a 14" minimum size limit, a 6 fish per person per day creel limit and a season from May 15 to September 30. During 1993, Maryland's recreational fishery had a 14" minimum size limit, a 10 fish creel limit, a Bay season from June 1 to October 31 and an ocean season from May 15 to September 30. Virginia's recreational fishery had a 14" minimum size limit, a 10 fish creel and no season. The PRFC had a 14" minimum size limit for both the recreational and commercial fishery, a 10 fish creel limit and a recreational season from May 15 to September 30.

The summer flounder coastal plan recommends a coastwide commercial quota and recreational harvest limit each year. A quota of 26.7 million pounds has been proposed for 1994 with 16.0 million pounds allocated to the commercial fishery and 10.6 million pounds (7.6 million fish) allocated to the recreational fishery. The 1994 proposed quota represents a 30% increase from 1993. Recreational and commercial allocations are based on historic records, with 60% for the commercial fishery and 40% for the recreational fishery. Maryland's allocation for the commercial fishery is 326,389 pounds and Virginia's allocation is 3.41 million pounds. Recommendations for the summer flounder recreational fishery will be developed once the 1993 recreational data is completely analyzed. If the coastwide harvest limit was not exceeded during 1993, the creel limit would be increased and/or the season extended. Several states were not in compliance with MAFMC recommendations for a creel limit and/or

season during 1993. They include North Carolina, Virginia, Maryland and Connecticut which have historically accounted for approximately 35% of the recreational landings (MAFMC 1993).

The catch of undersized flounder has been a problem for the summer flounder commercial fishery. The implementation of a 5.5" diamond or 6" square minimum mesh size for the directed summer flounder fishery in Maryland and Virginia's ban on trawling should effectively allow smaller summer flounder to escape capture in state waters. Bycatch of small summer flounder in non-directed fisheries such as pound nets has not been well documented. Both Maryland and Virginia collected information on the catch of summer flounder. Data from the 1993 Maryland multi-species pound net sampling program in the Bay indicate that approximately 20% of the catch (n=218) was under 330mm (13"). The amount of summer flounder caught in Virginia's pound net bait fishery is not monitored separately from the overall commercial catch. The VMRC stock assessment data indicate that 11.6% of summer flounder sampled (n=3024) from the commercial fishery in state waters (all gear types) were less than 330mm (13"). Pound nets, which landed the majority of summer flounder caught in state waters, had 10.8% of the sample catch (n=2647) measuring less than 13".

Stock Assessment and Research Needs

The status of the summer flounder stock was assessed during the 16th Northeast Regional Stock Assessment Workshop (16th SAW). The results were based on an analytical assessment (Virtual Population Analysis or VPA) of the total commercial and recreational catch by age. Data on recruitment and stock abundance are provided by year-round trawl surveys from along the coast. Young-of-the-year (YOY) surveys are conducted by Massachusetts, Delaware, Maryland, Virginia and North Carolina. The Virginia Institute of Marine Science (VIMS) trawl survey has been recognized as a good predictor of year-class strength, consistent with past VPA estimates. The VIMS indices for 1992 and 1993 were considered spawning failures with estimated numbers of YOY comparable to the lowest years during the mid-to-late 1980;s. Coastwide, the 1988 year class was the weakest recorded and estimated at only 17 million fish. Coastwide recruitment since 1988 has improved with an estimated 33 million fish in 1989, 37 million fish in 1990, and 42 million fish in 1992 (16th SAW).

Summer flounder were collected by trawl and seine from the Maryland coastal bay area by the Marine Fisheries Project during 1992. A total of 657 flounder were caught and 74% were YOY. Coastal bay data indicate an increasing population until 1986, followed by a decline. Summer flounder numbers were slightly higher than in 1988 but the increase is not enough to indicate a recovery (Casey et al. 1993). The summer flounder juvenile index (flounder less than 8") from the coastal bays during 1993 was 1.3.

Data from Maryland charter boat logbooks indicate that 21,088 pounds (12,121 fish) of summer flounder were caught during 1993. This was a 64% decrease from the reported 1992 charter boat harvest (57,852 pounds) and probably related to the creel limit implemented in 1993. Although a 14" minimum size limit was also implemented in 1993, the average reported weight was similar between years at 1.7 pounds per fish.

Conclusion

The summer flounder stock is overexploited and the stock is at a low biomass level. The MAFMC/ASMFC coastal summer flounder set a target fishing mortality rate of F=0.53 for 1993-1995. The implementation of a 1993 summer flounder quota along the Atlantic coast reduced fishing mortality on the stock and appears to have met the target fishing rate. If there have been no changes in the pattern of discarding and recruitment levels remain within recent ranges, summer flounder stock biomass is expected to increase during 1994. The fishery continues to be dependent on recruitment because the age structure of the stock is truncated. A 1994 quota has been recommended. The following areas should be emphasized during 1994:

1) Monitor the 1994 commercial summer flounder quota;

2) Implement the MAFMC/ASMFC recommendations for the summer flounder recreational fishery to achieve the necessary reduction in fishing mortality;

3) Continue research and monitoring efforts to characterize the age structure of the Chesapeake Bay and coastal populations;

4) Continue the VIMS and Maryland trawl surveys to monitor recruitment of YOY summer flounder in the Chesapeake region; and,

5) Continue to participate in ASMFC/MAFMC monitoring and technical committee meetings to present data on the Chesapeake region fisheries.

References

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Mid-Atlantic Fishery Management Council (MAFMC). 1993. Memo on Summer Founder Quota for 1994, August 1993. Summer flounder Plan Monitoring Committee. MAFMC. Dover, Delaware.

Report of the 16th Northeast Regional Stock Assessment Workshop (16th SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessment (NEFSC Ref. Doc. 93-18). 1993. Terceiro, M. (ed).

1993 ANNUAL PROGRESS REPORT
CHESAPEAKE BAY SUMMER FLOUNDER IMPLEMENTATION SCHEDULE

Problem Area	Action	Date	Comments
1. Overfishing	1.1a. MD, VA & PRFC will propose an increase in their minimum size limit for recreationally caught flounder from 13" to 14".	1992 1993	PRFC implemented a 14" min. size limit for the '92 & '93 seasons. MD & VA adopted regulations increasing recreational size limit to 14", with Mar. 1, 1993 and Jan. 1, 1993 effective dates for MD and VA, respectively.
	1.1b. MD, VA & PRFC will propose creel limits & seasonal restrictions in compliance with MAFMC recommendations.	1993	MAFMC recommends a 6 fish creel & a recreational season from May 15-Sep 30. PRFC implemented a 10 fish creel & a season (May 15- Sep 30). MD implemented a 10 fish creel a Bay season, Jun 1-Oct 31 & ocean season, May 15-Sep-30. VA had a 10 fish creel with no season.
	1.1c. Commercial size limits will remain in effect for VA & MD; PRFC will propose a 14" size limit. A 5.5" or 6" min. mesh size will be implemented in all directed flounder trawl fisheries.	1993	PRFC 14" size limit for commercial fishery went into effect for the '92 fishing season. VA has a ban on trawling within state waters. MD implemented regulations for a 5.5" or 6" min. mesh size for flounder trawl fisheries (effective Mar. 1, 1993).
	1.1d. Commercial fisheries will be subject to a quota administered by MAFMC. Each state's fishery will close when its quota is met.	1993	The 1993 commercial quota was 251,829 lbs for MD & 2.6 million lbs for VA. Each state allocated the annual quota by quarter & area. VA kept a 10% tolerance by wt less than 13" for pound nets. VA eliminated the recreational tolerance of 2 fish less than 14".
	1.2a. VA & MD will implement a 5.5" diamond or 6" square mesh in all directed trawl fisheries to allow escapement of immature flounder.	1993	MD drafted regulations for a 5.5" diamind or 6" square min. mesh size for flounder trawl fisheries, effective date Mar 1, 1993. VA has a ban on trawling within state waters.
	1.2b. VA & MD will promote implementation of 5.5" diamond or 6" square mesh in all EEZ directed flounder trawl fisheries.	Continue	5.5" diamond or 6" square minimum mesh size for trawls went into effect November 30, 1992 in the EEZ. NC began a seasonal requirement for 5.5" diamond & 6" square mesh in directed flounder fisheries during 1990.

SUMMER FLOUNDER CONT'D.

Problem Area	Action	Date	Comments
1. Overfishing (cont'd)	1.3a. MD will collect information from its pound net & ocean trawl fisheries to develop strategies for reducing by-catch of undersized flounder & other species.	1993	MD implemented a pound net sampling program in the Bay.
	1.3b. VA will monitor species composition & biological characteristics of its pound net fishery & take steps to reduce bycatch as needed.	Continue	Escape panels for reducing bycatch of juvenile finfish were tested in 1992. Testing continued during 1993.
	1.3c. MD, VA & PRFC will work with the MAFMC & ASMFC to encourage protection of immature flounder.	Continue	
2. Stock Assessment and Research Needs	2.1 Conduct stock identification work.	Continue	
	2.2 Continue collection of data from commercial catches.		VMRC has continued stock assessment work including summer flounder. MD sampled pound nets and offshore trawl catches.
	2.3 Continue on-going commercial fisheries statistics programs; VA will pursue its mandatory reporting system; VA & MD will continue to supplement the MRFSS.	Variable	Mandatory reporting was implemented in VA beginning Jan. 1993.
	2.4 Continue the baywide trawl survey to measure size, age, sex, distribution, abundance, and CPUE.	Continue	MD drafted a multi-species sampling program which examined size, age & sex of selected species from commercial gear types & a limited creel census. VIMS continued baywide trawl survey & juvenile flounder index to predict future population size.

SUMMER FLOUNDER CONT'D.

Problem Area	Action	Date	Comments
3. Habitat Issues	3.1 Promote the objectives of the Chesapeake Bay Agreement to improve water quality.	Continue	The Bay Program added a tributary initiative which set nutrient reduction goals for major tributaries.

LEGEND:
ASMFC = Atlantic States Marine Fisheries Commission
CPUE = Catch per unit of effort
EEZ = Exclusive economic zone (3-200 miles offshore)
MAFMC = Mid-Atlantic Fishery Management Council
MRFSS = Marine Recreational Fisheries Statistics Survey
PRFC = Potomac River Fisheries Commission
VIMS = Virginia Institute of Marine Science
VMRC = Virginia Marine Resources Commission

Atlantic Croaker and Spot Management Plan

Stock Status

Atlantic Croaker

Croaker are a major component of the fishery independent trawl and seine surveys along the Atlantic coast. Adult abundance and juvenile recruitment are highly variable from year to year and dependent on natural environmental conditions. Data from the Southeast Area Monitoring and Assessment Program's (SEAMAP) spring inshore trawl survey indicate the mean abundance of croaker (70mm-280mm) has increased from 1990 to 1992. Juvenile indices have been low in Maryland, Virginia and North Carolina (ASMFC 1993). A total mortality rate of 55-60% has been calculated for the Chesapeake Bay region.

Atlantic croaker commercial landings have decreased from 10.1 million pounds in 1987 to 4.1 million pounds in 1992. The Bay jurisdictions have continued to monitor the harvest of croaker. During 1992, Maryland harvested 17,000 pounds and Virginia harvested 1.3 million pounds. Commercial harvest of croaker from Maryland during 1993 was 92,900 pounds. Preliminary commercial harvest from Virginia for 1993 is 4.8 million pounds (Figure 12 a & b).

Croaker is also an important recreational species in the Chesapeake region. According to the data collected by the MRFSS, Maryland had the second highest croaker recreational catch from 1990 to 1992. Average weight of croaker caught by recreational anglers during 1992 was 0.3 kg (0.6 pounds) (Uphoff and Piavis 1993). The MRFSS data also indicates that most of the croaker that were caught were also discarded. Data from Maryland charter boat logbooks indicate that 115,618 pounds (127,265 fish) of croaker were caught at an average weight of 0.9 pounds. The availability of croaker in the Bay appears to have increased in the last three years. Average weight for the last two years has been similar.

Spot

Spot are frequently caught in large proportions in fishery independent trawl and seine surveys along the Atlantic coast. Like croaker, spot adult abundance and juvenile recruitment are variable from year to year and dependent on environmental factors. The abundance of juvenile spot caught in Maryland and Virginia surveys has fluctuated with no apparent long-term trend.

Spot commercial landings from along the Atlantic coast were 7.0 million pounds in 1987. Since then, commercial landings have fluctuated between 5.3 million pounds and 5.9 million pounds. Commercial landings were 5.8 million pounds in 1992. Over the same period, Maryland commercial landings ranged between 58,000 pounds

Figure 12a. Commercial landings for Atlantic croaker from Maryland

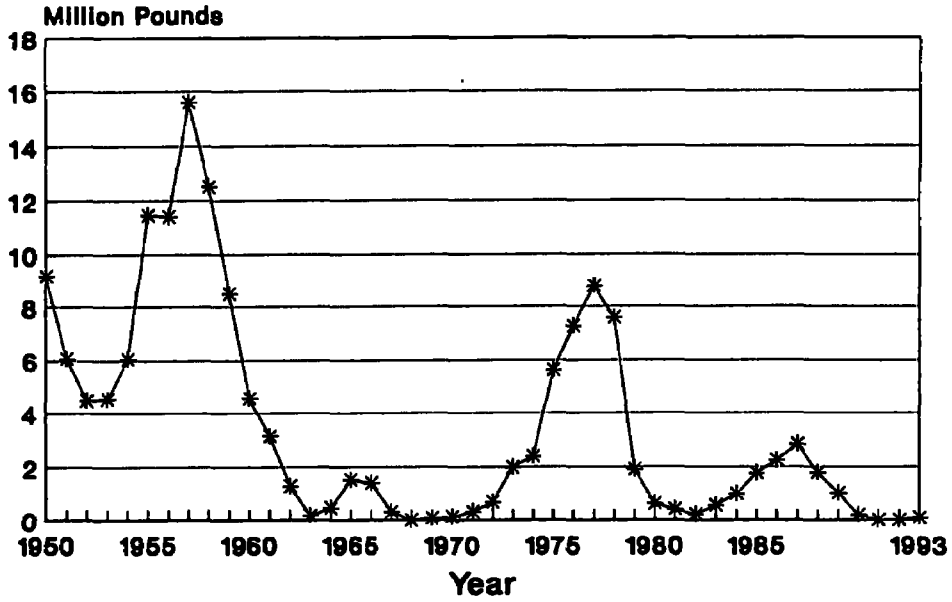
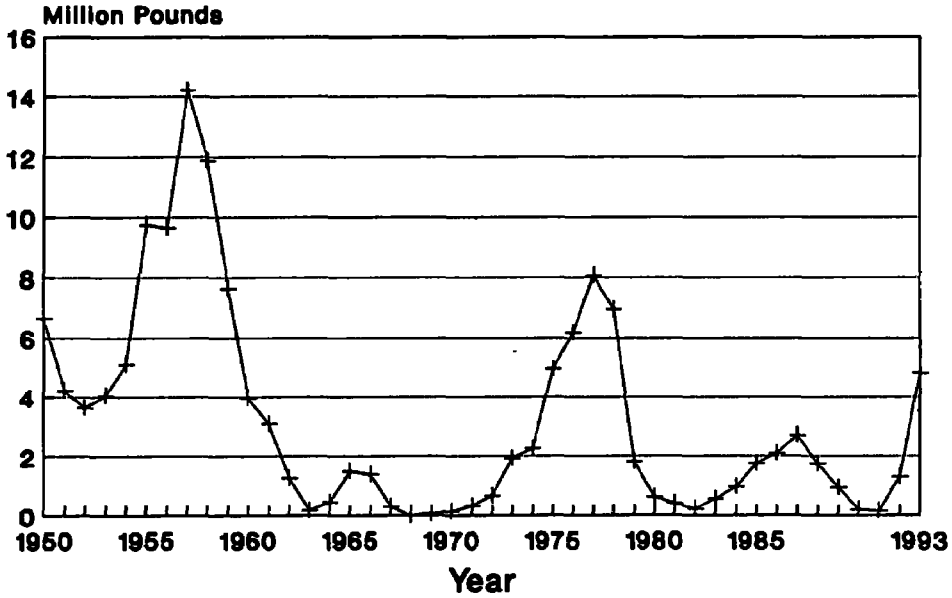


Figure 12b. Commercial landings for Atlantic croaker from Virginia



*1993 Preliminary landings

and 253,000 pounds. Virginia commercial landings ranged between 1.7 million pounds and 3.7 million pounds. Spot commercial landings from Maryland during 1993 were 146,000 pounds. Preliminary 1993 commercial harvest from Virginia is 3.2 million pounds (Figure 13 a & b). During 1992, 54% of Chesapeake Bay commercial spot landings were caught by hook and line (probably the sale of headboat catch) and 34% were caught in pound net (Uphoff and Piavis 1993). Estimated recreational catch of spot from Maryland during 1992 was 2.7 million fish (MRFSS data). Since spot are frequently caught and usually not targeted, recreational reporting is probably not as accurate as for other species.

The Bay jurisdictions continued to participate in interjurisdictional scientific and technical meetings. An Atlantic croaker and spot workshop was held during 1993 to review the ASMFC plans for each species and to assess the status of the stock and fishery. Several recommendations for spot and croaker were developed during the workshop. They are as follows:

1) ASMFC management recommendations in the 1987 Spot and Croaker FMPs are still relevant and should be implemented by coastal states;
2) Bycatch and fishing mortality of fish less than age 1 should be monitored;
3) The harvest of less than age 1 fish should be minimized through minimum size limits, minimum mesh size and/or other gear restrictions;
4) The effects of bycatch reduction devices (BRDs) should be evaluated;
5) Research on bycatch reduction devices (BRDs) should be a funding priority;
6) Size and sex specific relative abundance estimates should be developed;
7) Juvenile indices should be developed to clarify stock status;
8) Standardized ageing methodology should be developed for both species; and,
9) A yield per recruit analysis should be completed.

Harvest of Small Spot and Croaker

The bycatch of small spot and croaker continues to be a concern for the stocks. Spot is a major component of the bycatch in seine, fish trawl, and pound net fisheries. They also comprise a large portion of the bycatch in the southern shrimp trawl fishery. There are no minimum size limits or creel limits on spot along the Atlantic coast. Bycatch reduction devices (BRDs) are currently required in the inshore shrimp trawl fishery in several states and should benefit the spot and croaker stocks.

Figure 13a. Commercial landings for spot from Maryland

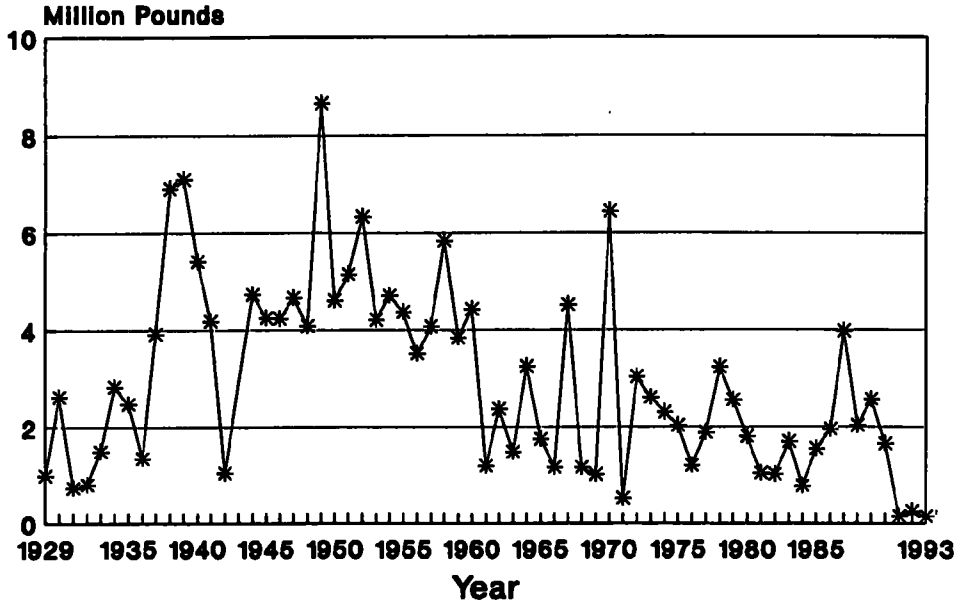
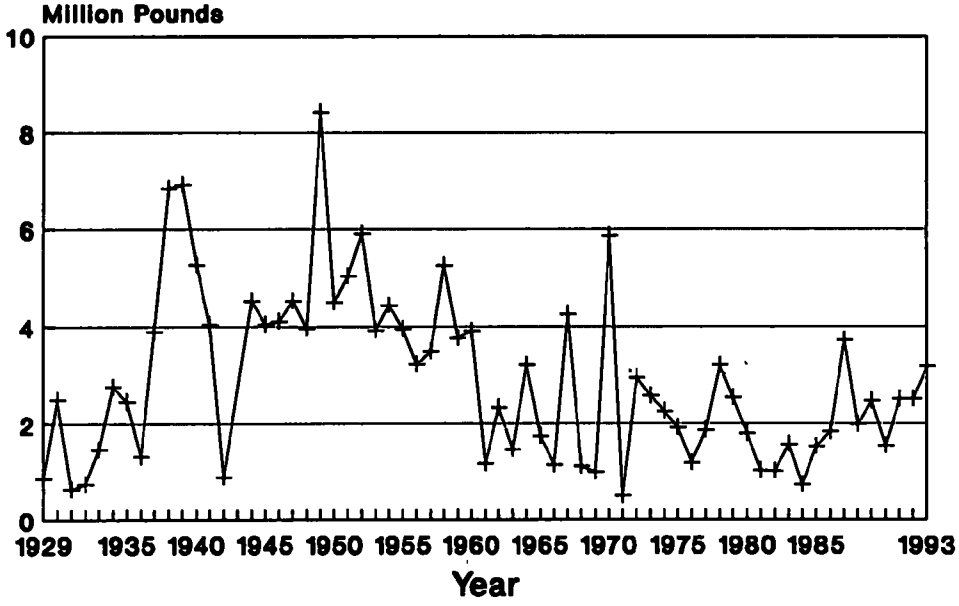


Figure 13b. Commercial landings for spot from Virginia



*1993 Preliminary landings

Research and Monitoring Needs

Stock identification studies or estimates of adult abundance have not been conducted for croaker or spot. Recreational and commercial fisheries statistics are being collected but effort data is not available. Juvenile surveys provide some data on recruitment but are highly variable from year to year. The Virginia Institute of Marine Science (VIMS) has conducted studies on temperature tolerance and developed a juvenile croaker recruitment model based on the effect of winter water temperature and offshore wind velocities. Staff from VMRC and North Carolina are evaluating the use of culling panels in pound nets for the release of small spot and croaker. During 1993, Maryland DNR conducted a hook and line mortality study on croaker and a study to determine a size-related maturity schedule for croaker.

Conclusion

Abundance of adult spot and croaker and juvenile recruitment are highly variable from year to year. The resources do not appear in need of any additional management measures at this time but analysis of data from the 1993 spot/croaker workshop may revise management recommendations in the ASMFC plan. Bycatch of small spot and croaker are being addressed by the implementation of BRDs. The following areas should be emphasized during 1994:

1) Continue to monitor the commercial and recreational harvest of spot and croaker from the Chesapeake Bay;

2) Work through ASMFC to promote the development and use of bycatch reduction devices in the trawl fisheries; and,

3) Promote the harvest of spot and croaker that are age 1 and older.

1993 ANNUAL PROGRESS REPORT
CHESAPEAKE BAY ATLANTIC CROAKER AND SPOT IMPLEMENTATION SCHEDULE

Problem Area	Action	Date	Comments
1. Stock Status	1.1. MD, VA & PRFC will continue to participate in scientific and technical meetings for management of the fishery along the Atlantic coast and in estuarine waters.	Continue	Bay jurisdictions continued to monitor Bay stocks. A workshop on spot & croaker was held in October 1993.
	1.2.1a Md & PRFC will continue 10' minimum size for croaker.	Continue	The recreational size limit for croaker was changed to 9" with a creel limit of 25 fish/day in MD. The 10" size limit stayed in effect for the commercial fishery.
	1.2.1b VA will implement a minimum size limit for croaker if suggested by length-frequency analyses currently being conducted by VIMS & ODU.	1993 Delayed	Data analysis should be completed by January 1994.
	1.2.2. Jurisdictions will evaluate the need for implementing a minimum size limit for spot.	1992 Continue	No minimum size is recommended at this time.
2. Harvest of Small Spot and Croaker	2.1.1 a) Jurisdictions will promote the development and use of trawl efficiency devices in the southern shrimp fishery and promote the use of bycatch reduction devices in the fin fish trawl fishery.	Continue	The jurisdictions have worked through ASMFC/MAFMC to promote the use of TEDs & BRDs. Use of these devices has been successful in eliminating some bycatch of small fish including croaker and spot.
	b) VA will continue its prohibition on trawling in State waters and will maintain its 2 7/8" minimum mesh for gill nets.	Continue	
	c) MD will continue its 4-6" gill net restriction during June 15 through September 30 and implement a 3" minimum	1992 Continue	MD prohibits summer gill net use and anchor and stake gill net use at anytime in the Bay.

ALANTIC CROAKER AND SPOT (cont'd)

Problem Area	Action	Date	Comments
2. Harvest (Cont'd)	2.1.1 d) PRFC will continue prohibition on gill net fishing during the summer.	Continue	
	2.1.2 Jurisdictions will investigate the magnitude of bycatch problem & consider implementing bycatch restrictions for the non-directed fisheries in the Bay.	1992 Continue	VA conducted a study on escape panels for reducing the bycatch of juvenile finfish in pound nets. The study continued in 1993. MD began a multi-species sampling program which collected data on spot & croaker during 1993.
3. Research & Monitoring Needs	3.1 VMRC stock assessment program will continue to analyze size and sex data from Atlantic croaker and spot collected from VA commercial fisheries.	Continue	VA will continue to provide stock assessment data on spot and croaker.
	3.2 a) MD & PRFC will encourage research to collect data on croaker & spot biology, i.e. estimates of abundance, recruitment, & reproductive biology.	Continue	
	3.2 b) VA will continue to fund VIMS & ODU stock assessment research, specifically designed to provide estimates of population abundance, recruitment, & reproduction.	Continue	VA will continue to fund stock assessment research.
4. Habitat & Water Quality	4.1 A-G) Continue to set water quality goals & review management programs under the 1987 Bay Agreement.	Continue	The Bay Program added a tributary initiative which set nutrient reduction goals for major tributaries.

LEGEND:
ASMFC = Atlantic States Marine Fisheries Commission
BRDs = Bycatch Reduction Devices
FEDs = Finfish Efficiency Devices
MAFMC = Mid-Atlantic Fisheries Management Council
ODU = Old Dominion University
PRFC = Potomac River Fisheries Commission
VIMS = Virginia Institute of Marine Science
VMRC = Virginia Marine Resources Commission

AMERICAN EEL FISHERY MANAGEMENT PLAN

Stock Status

The status of the American eel (Anguilla rostrata) stock in the Chesapeake Bay remains incomplete. Information from commercial watermen suggests that eels are less abundant and smaller than in the past. Watermen have also suggested that the demand for eel as trotline bait has diminished because bull lips and chicken necks are cheaper.

Commercial landings have fluctuated over the years (Figure 14 a & b) and include only eels caught for the live-eel market. Preliminary 1993 commercial landings are 221,900 pounds from Maryland and 390,180 pounds from Virginia. The value of the live-eel catch has averaged $1.74 per pound in Maryland over the last several years. Preliminary 1993 data from Maryland indicates the dockside value of eels has dropped to $1.04 per pound. In Maryland, the total eel harvest is unknown because a substantial number of eels are taken for bait by commercial crabbers but are not reported as part of the commercial harvest. Beginning in 1993, specific questions relating to the commercial crabber's "eel-for-personal use" catch were added to the commercial crab catch report forms.

Current biological data to characterize the Chesapeake stock remains unavailable. The American eel does not enter the Bay until they are in the elver stage. Elvers usually appear in the Bay area during April and can be harvested quite easily with dip nets at the base of impoundments. In other states, elvers are used in the live-eel industry for aquaculture and exportation to foreign markets. Considering the potential to harvest large quantities of elvers (size range from 1.8"-5") which could result in a significant effect on the local eel fishery, the American Eel FMP recommended a 6 inch minimum size limit. Virginia already prohibits the taking of elvers but needs to adjust its definition to correspond to 6 inches. The Potomac River Fisheries Commission adopted a 6 inch minimum size limit in January 1992. Maryland has proposed a 6 inch minimum size limit but will not be in effect until 1994. The jurisdictions agree that until information*p1656Xvailable on optimizing yield per recruit, the 6 inch minimum size will prevent the development of an elver fishery. Although not intended as an eel management measure, the use of eel as bait for hook and line (except as specifically allowed during striped bass season) is prohibited in Maryland as of 1992. Striped bass often swallow the bait and hook which makes the safe release of under sized fish, or fish out of season, unsuccessful. On the other hand, the demand for eel during the short intense striped bass season usually far exceeds supply and drives prices up.

A baywide minimum mesh size of 1/2 by 1/2" for eel pots was also recommended by the eel FMP. The minimum mesh size restriction for eel pots has been in effect in Virginia since 1990 and on the

Figure 14a. Reported commercial landings of American Eel from Maryland

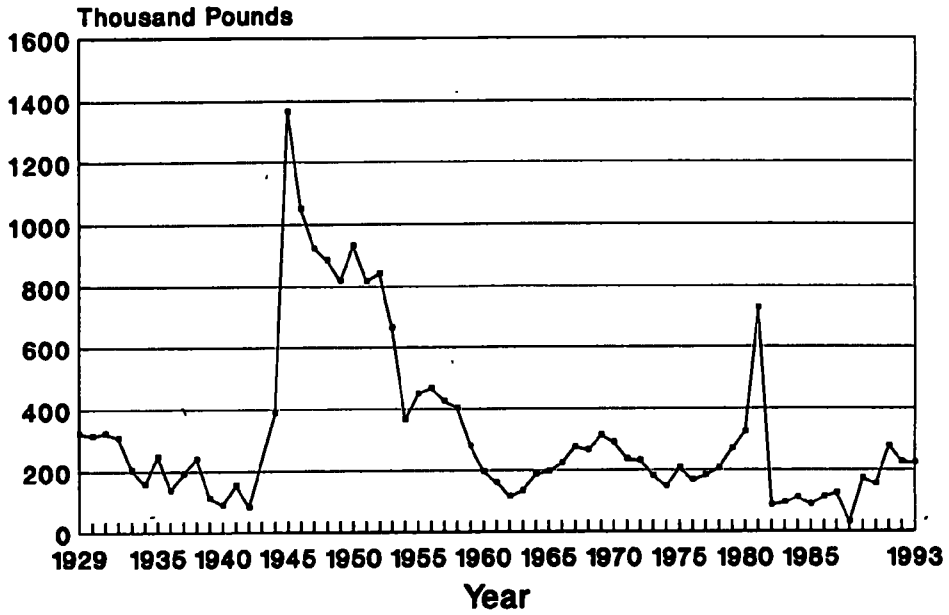
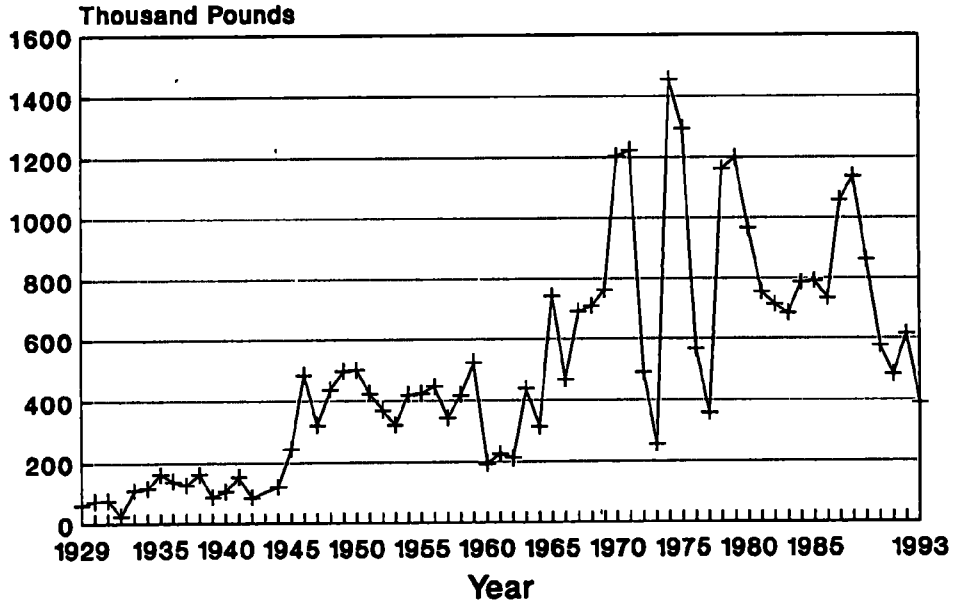


Figure 14b. Reported commercial landings of American Eel from Virginia



*1993 preliminary data

Potomac since 1983. In addition, Virginia also requires escape panels for eel pots. The minimum mesh regulation was imposed as a means to conserve the Chesapeake Bay eel stock, reduce the possibility of growth overfishing, and prevent the wastage of small eels. Maryland has proposed the 1/2 by 1/2" minimum mesh size for eel pots but it will not go into effect until 1994.

Historically, American eels populated the Susquehanna River Basin from the mouth of the river to its headwaters. Construction of four hydropower dams on the lower river in the 1900s blocked thousands of miles of eel habitat. Fish passage began operation at Conowingo Dam in 1991. In June 1993, an agreement was signed by the governors of Pennsylvania and Maryland, as well as utilities, fisheries agencies and fishery interests to provide fish passage at Holtwood and Safe Harbor Dams by 1997 and York Haven Dam by the year 2000. This action will provide American eels access to nearly 500 miles of major river habitat in Pennsylvania and many tributaries. Fish passage initiatives on the Pennsylvania tributaries to the lower Susquehanna River will provide eels access to many miles of high quality habitat. As eels are restored to the Susquehanna River Basin, PFBC will adopt regulations to prevent the overharvest of small eels.

Bait Fishery

In the Chesapeake Bay region, there are two distinct industries for eels. There is the crab bait market which uses eels that are 0.5 - 1.0" in diameter and 10 - 14" long for trotlines, and the live-eel market which prefers eels at least 13" long and are exported alive to Japan and Europe. There may be an interest in farming eels, but little information is available for Maryland eel aquaculture.

Eels are used for bait in the commercial crab trotline fishery in Maryland but much of this eel harvest goes unreported. A commercial crabber is allowed to catch eels for personal use but is not required to report their bait eel catch. The unreported harvest has been estimated between 700,000 and 1.7 million pounds per year based on estimated eel usage in the late 1970s. There has been a reported reduction in the use of eels as crab trotline bait in Maryland. Catch and effort statistics from the bait fishery is important in monitoring the harvest of eels from the Bay. Maryland considered adding the harvest of bait eels on their mandatory finfish reporting forms during 1992, but decided to target crab trotliners instead of finfish license holders to obtain bait eel information. The Maryland commercial crab catch reporting form was modified to obtain information on the number of eels being used for trotline bait beginning with the 1993 season. Preliminary results will be available in 1994.

Research Needs

Basic stock assessment data and information for American eel in the Chesapeake Bay remains inadequate. Size and age composition, maturity, growth rates, mortality rates, and estimates of abundance are not available. There is a limited amount of fishery dependent and fishery independent data. Catch information from the crab trotliners in Maryland should improve estimates of the bait eel harvest. Besides the lack of basic biological and fisheries data, socioeconomic information is not available. Although the Eel FMP encourages research to collect information on eels from the Chesapeake Bay, no studies were begun during 1993.

Habitat and Water Quality Issues

The Habitat Workgroup of the Chesapeake Bay Program Living Resources Subcommittee has requested the development of a Habitat Restoration Plan for Fisheries Management document which would expound on habitat management issues for all managed species. Future management plans will cover more habitat issues and contain specific recommendations for habitat protection mandates.

Fish passage efforts continue to improve eel habitat. Migrating eels are hindered by dams and other stream blockages. Restoring self-sustaining populations of American eels to their historic ranges is an integral part of the Fish Passage Plan. As more passages are opened to migrating fish, stock assessment strategies for newly introduced eel stocks should be developed by Maryland and Pennsylvania.

Conclusions

The status of American eels in the Chesapeake Bay is unclear and stock assessment data is unavailable. Management recommendations are conservative and directed at reducing the possibility of growth overfishing and preventing the wastage of small eels. Changes in the crab catch reporting form should improve the estimates of bait eel harvest. Areas of prime importance during 1994 are:

1) Implement a minimum size limit and minimum mesh size in the Maryland portion of the Bay;

2) Evaluate the commercial crab bait eel catch in Maryland from the additional questions placed on the Crab Reporting form.

3) Promote basic research.

1993 ANNUAL PROGRESS REPORT
CHESAPEAKE BAY AMERICAN EEL IMPLEMENTATION SCHEDULE

Problem Area	Action	Date	Comments
1. Stock Status	1.1 MD & PRFC will adopt a 6" minimum size limit. VA will continue a prohibition on taking elvers & adjust definition to correspond to a 6" minimum size limit.	1992 1993	Until information is available on optimizing yield per recruit, the 6" minimum size will prevent the development of an elver fishery. MD proposed a regulation for a 6" minimum size during 1993. DCFM will implement a 6" size limit by 1996.
	1.2 MD will implement a 1/2" by 1/2" mesh size for eel pots. VA & PRFC will continue to enforce their 1/2" X 1/2" mesh. VA will continue to enforce 1/2" by 1" escape panels in 1/2" by 1/2" mesh pots.	1993	There will be reluctance in accepting a minimum mesh size by the bait eel harvesters. A 1/2 x 1/2" min. mesh was proposed in MD during 1993. DCFM will implement a 1/2 x 1/2" minimum mesh size for eel pots by 1996.
	1.3 Upon restoration of eels to the Susquehanna River basin PFC will adopt regulations to prevent overfishing of small eels.		Providing fish passage will make American eel habitat more accessible & benefit the Bay population.
2. Bait Fishery	2.1 MD will require the reporting of eels used for crab bait on crab reporting forms.	1993	Additional questions on the crab reporting forms were added and should provide some information on the crab bait harvest.
3. Research Needs	3.1 Continue to collect catch & effort data from live eel fishery & begin monitoring crab bait fishery.	Continue	Development of a monitoring approach for the bait eel fishery has begun. Basic stock assessment & biological monitoring is needed.
	3.2 Encourage research to collect basic biological and socioeconomic information.	1992 Continue	Requires coordination with other agencies and universities.

AMERICAN EEL CONT'D

Problem Area	Action	Date	Comments
4. Habitat and Water Quality Issues	4.1 Continue to provide stream passage.	Continue	Requires coordination with other agencies.
	4.2 Continue to set specific objectives for water quality goals and habitat requirements.	Continue	In addition to the 1987 Chesapeake Bay Agreement, a Bay tributary initiative set nutrient reduction goals for major tributaries.

LEGEND:
DCFM = District of Columbia, Fisheries Management
PFC = Pennsylvania Fish Commission
PRFC = Potomac River Fisheries Commission

Chesapeake Bay Program
Habitat and Water Quality

In 1987, Virginia, Maryland, Pennsylvania, the District of Columbia, the Chesapeake Bay Commission and the U.S. Environmental Protection Agency formally agreed to reduce and control point and nonpoint sources of pollution to improve water quality in the Bay. During 1991, the strategies to achieve the goals of the Agreement were reevaluated. Based upon the 1991 nutrient reduction reevaluation, the following conclusions were made:
1) Significant improvements in water quality and living resources habitat conditions have occurred in the mainstem of the Chesapeake Bay;
2) There is a need to expand program efforts to include the tributaries since most of the spawning grounds and essential habitat are in the tributaries;
3) In order to meet the 40% nutrient reduction goal, intensified efforts to control nonpoint sources of pollution from agriculture and developed areas will be necessary;
4) There is a demonstrable link between water quality conditions and the survival and health of submerged aquatic vegetation (SAV);
5) Implementation of the Clean Air Act Amendments will provide additional opportunities to achieve nitrogen reductions;
6) Achieving a 40% nutrient reduction goal challenges the limits of current point and nonpoint source control technologies.

In order to further efforts in restoring and protecting the ecological integrity, productivity and beneficial uses of the Chesapeake Bay system and further the commitments made in the 1987 Chesapeake Bay Agreement, the 1992 Amendments were developed and signed by the Executive Council. The jurisdictions and agencies will continue the commitment to achieve an overall 40% reduction of nitrogen and phosphorus entering the mainstem Chesapeake Bay by the year 2000 and maintain this level of reduction thereafter. The jurisdictions recognize the importance of the tributaries in restoration efforts. The 1992 Amendments call for the following:
1) Amend the water quality goal of the 1987 Chesapeake Bay Agreement to reflect the importance of tributaries in restoring the Bay;
2) Develop and implement tributary-specific strategies to reduce nutrients, achieve water quality requirements for living resources, incorporate public participation and involvement, and advance both cost-effectiveness and equity;
3) Use the distribution of SAVs in the Bay and its tidal tributaries as an initial measure of progress in the restoration of living resources and water quality;
4) Incorporate into the Nutrient Reduction Strategies an air deposition component which builds upon the 1990 Amendments to the federal Clean Air Act and explores additional implementation opportunities to further reduce airborne sources of nitrogen entering the Chesapeake Bay and its tributaries;

5) Continue to explore cost-effective and improved technologies to attain further nutrient reductions;
6) Explore cooperative working relationships with the other three basin states, New York, West Virginia, and Delaware, in the development of tributary-specific strategies for nutrient reduction.

Two specific goals have been set by the Bay Council to help restore the Chesapeake Bay habitat. To date, 2,526 river blockages that prevent migratory fish from reaching upstream spawning areas have been surveyed. Removal of blockages has reopened 149 miles thus far. Because there are so many blockages, the Fish Passage Plan has adopted the following goals to reopen waterways to migratory fish species: a 5-year goal to open 582 miles of potential spawning habitat and a 10-year goal to open 1,356 miles. The Bay Council has also set specific goals for the restoration of submerged aquatic vegetation (SAV). An interim goal of 114,000 acres which at current recovery rates would be achieved by 2005. The abundance of SAVs is closely associated with water quality and also provides shelter and nursery areas for many species of fish and wildlife.

New action was taken towards meeting the 40% reduction in nutrients which amounts to the removal of 74 million pounds of nitrogen and 8.4 million pounds of phosphorus. The tributary-specific strategies were defined and implementation reports completed. The tributary plans recognize that each river is different in its geography, hydrography, and ecology and will require flexibility in meeting the 40% nutrient reduction goal. As a result, Maryland has divided its Bay watershed into 10 tributary basins. A long-term monitoring and computer modeling effort is underway in the lower Bay. The lower tributaries in Virginia have little impact on nutrient loading because of their proximity to the mouth of the Bay and require a different approach to reduce nutrient levels and improve habitat. Since agriculture is a major source of nutrient run-off to the Bay, the U.S. Department of Agriculture (USDA) has been asked to play a larger role in developing an integrated plan. The Agricultural Nonpoint Source Initiative will develop guidelines for the use of fertilizers, pesticides, and other chemicals in order to minimize their use while maximizing farm production. The Council has issued a directive for the development of a new basinwide toxics reduction strategy to address three "hot spots" of toxics problems, the Baltimore Harbor, the Anacostia River, and the Elizabeth River.

In addition to the Chesapeake Bay's water quality and habitat programs, the Ecosystem Processes Modeling (EPM) program (funded by the Chesapeake Bay Program Living Resources Subcommittee) is currently developing a set of models for integrating water quality, benthos, plankton, fish, and species-specific SAV processes within littoral habitats of the Chesapeake Bay. The EPM program will ultimately provide an integrated ecological tool for resource

managers which can guide decisions and priorities on living resources. Understanding how living resources influence environmental conditions and how the environment influences living resources is the major goal of the program. The EPMs should provide the capability to predict potential fish production from nutrient loading and to simulate management scenarios. The fish models could be used to predict the potential production of striped bass, bluefish, weakfish, bay anchovy, menhaden, spot, and white perch. (Bartleson et al. 1994).

Habitat Overview for Fishery Management Plans

Restoring and improving habitat and water quality for living resources have been priorities of the Chesapeake Bay Program. Actions towards fish passage, wetlands, monitoring, toxics, exotic species, submerged aquatic vegetation (SAV), nutrient reduction, and atmospheric deposition are being implemented. The water quality and habitat requirements of many important finfish and shellfish species have been investigated and reported in the document entitled: Habitat Requirements for Chesapeake Bay Living Resources (Funderburk et al. 1991). The habitat sections within each management plan have typically been generic in scope and similar from plan to plan. Both the Fisheries Management Plan Reassessment Task Force and the Chesapeake Bay Foundation have recommended strengthening the FMP habitat actions and utilizing them for managing habitat. There are some inherent problems in moving from water quality and habitat improvements to enhanced fish production. The effects of habitat alteration and water quality on fish populations are generally indirect, gradual and unquantifiable (Burns 1991). Fish habitat consists of a wide range of physical, chemical and biological factors. Modifications of fish habitat can vary along a geographic range and/or across a temporal spectrum, presenting a very complex situation. Fish can also respond to their environment by changes in their behavior, growth, reproduction, and physiology. The FMP workgroup will begin a comprehensive review of habitat issues and how they relate to fish production. The ultimate goal of this project will be to develop habitat sections in the FMPs that can be utilized as a vehicle for encouraging and justifying resource conservation by those agencies with regulatory authority over modifications to terrestrial and aquatic ecosystems (Carter, in prep).

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