



# **2011 Fishery Management Plan Report to the Legislative Committees**



**Prepared by**

**Maryland Department of Natural Resources  
Fisheries Service  
Fishery Management Plans Program**

**September 2012**



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## **2011 Fishery Management Plan (FMP) Updates (September 2012)**

This document addresses the requirement to regularly report on the status of each managed stock in the Chesapeake Bay and Coastal Bays of Maryland as required under Natural Resources Article Section 4-215. The report consists of a species introduction and implementation table for each FMP. The introduction page contains information on the FMP background, stock status, management measures, the fisheries and issues/concerns. The implementation table is a synopsis of all the management strategies and actions found in the FMP, implementation dates, and current status of the management action. The boldface type highlights the most recent comments.

### **Background**

Under the 1987 Chesapeake Bay Agreement and the 1992 Amendments, the Bay jurisdictions developed a series of FMPs for commercial, recreational, and selected ecologically valuable species. The Chesapeake Bay FMPs provide a framework for the Bay jurisdictions to generate compatible, coordinated management measures to conserve and utilize a fishery resource. As ecosystem-based management plans begin to be developed, the FMP framework will become even more important for delineating a baywide approach. Since a large fraction of the managed fish species in the Chesapeake Bay spends a portion of their life history outside the Bay boundaries, fishery management measures must be coordinated on a regional and coastal basis. For coastal migratory species, the federal Mid-Atlantic Fishery Management Council (MAFMC) develops management measures for species mainly found in the Exclusive Economic Zone (EEZ or 3-200 miles offshore). For species utilizing the inshore area (0-3 miles offshore), the Atlantic States Marine Fisheries Commission (ASMFC) defines compliance requirements. The ASMFC requires the states to prepare annual compliance reports for the following species: American eel, Atlantic croaker, Atlantic

menhaden, Atlantic striped bass, Atlantic sturgeon, black sea bass, bluefish, horseshoe crabs, mackerel, shad and herring, scup, spot, summer flounder, and weakfish. Beginning in 2013, a compliance report will also be required for spotted seatrout. Additional information on stock status and fishery management measures for these migratory fish species can be found at [www.asmfmc.org](http://www.asmfmc.org) and [www.mafmc.org](http://www.mafmc.org). Coastal fishery requirements are mandated along the Atlantic coast. The Chesapeake Bay FMPs outline how Bay jurisdictions will implement coastal compliance requirements and identify any additional issues specific to the Bay region. The Maryland Coastal Bays FMPs outline how species are managed in the Coastal Bays. Maryland's Coastal Bays FMPs are part of a larger plan, the Comprehensive Coastal Management Plan (CCMP). The CCMP will be undergoing an extensive review with new recommendations expected by December 2012.

In addition to the Chesapeake Bay Program process, Natural Resource Article §4-215 (b)(1-24), Annotated Code of Maryland states that the Department of Natural Resources shall prepare fishery management plans for a list of species. Once a plan has been developed and signed off, it is incorporated by reference into COMAR. A 2010 legislative bill gave the Department authority to create fishery management plans without the need to annually amend §4-215 to add new species to the list of managed species. The bill requires the Department to address overfishing when data shows that it is an issue. The Department also consults with the Tidal and Sport Fisheries Advisory Committees for their input when developing management strategies and actions.

### **Introduction**

Fifteen (15) Chesapeake Bay Fishery Management Plans (FMPs) encompassing 21 species and over 260 commitments have been adopted by the Chesapeake Bay Program's Executive Council. In addition, Maryland has developed 4 state-specific FMPs: Yellow

Perch, Coastal Bays Blue Crab, Coastal Bays Shellfish, Brook Trout; and a technical report for catfish. During 2011, a draft FMP for black bass was completed. The draft will undergo a series of reviews by the DNR fisheries advisory groups and stakeholders. The development of a draft Chesapeake Bay Shellfish FMP is scheduled for the end of 2012.

Fishery management plans are updated on a regular basis and periodically reviewed to evaluate progress towards meeting goals and objectives. An FMP update consists of Fisheries Service (FS) staff compiling the most recent information on the status of management strategies and actions for each FMP species. An FMP review consists of a more intensive evaluation of a species FMP goal, objectives, management strategies and actions, the current stock status, and any outstanding species issues. The review is conducted by the species-specific biologists and FMP staff. In order to maintain effective management strategies that reflect the changing needs of fishery resources, the review team: 1) examines the monitoring data for status and trends of the species being reviewed; 2) updates the recreational and commercial fishery statistics; 3) implements coastal recommendations (ASMFC and/or MAFMC); 4) integrates habitat and trophic considerations; 5) tracks the progress/implementation of management actions; 6) addresses any new issues; and , 7) makes recommendations for adaptive management, i.e., whether to continue with the current management framework, amend the plan or revise the plan. The plan review team's recommendations are reviewed by the Sport Fish Advisory Committee and the Tidal Fish Advisory Committee for additional input. If an amendment or revision is recommended by the review team, the process for developing FMPs begins.

### **Fish Habitat and Land Conservation**

Maryland Fisheries Service (FS) has identified land development as one of the major threats to fish habitat. However, fisheries managers have no authority to regulate land use. To address this challenge, FS

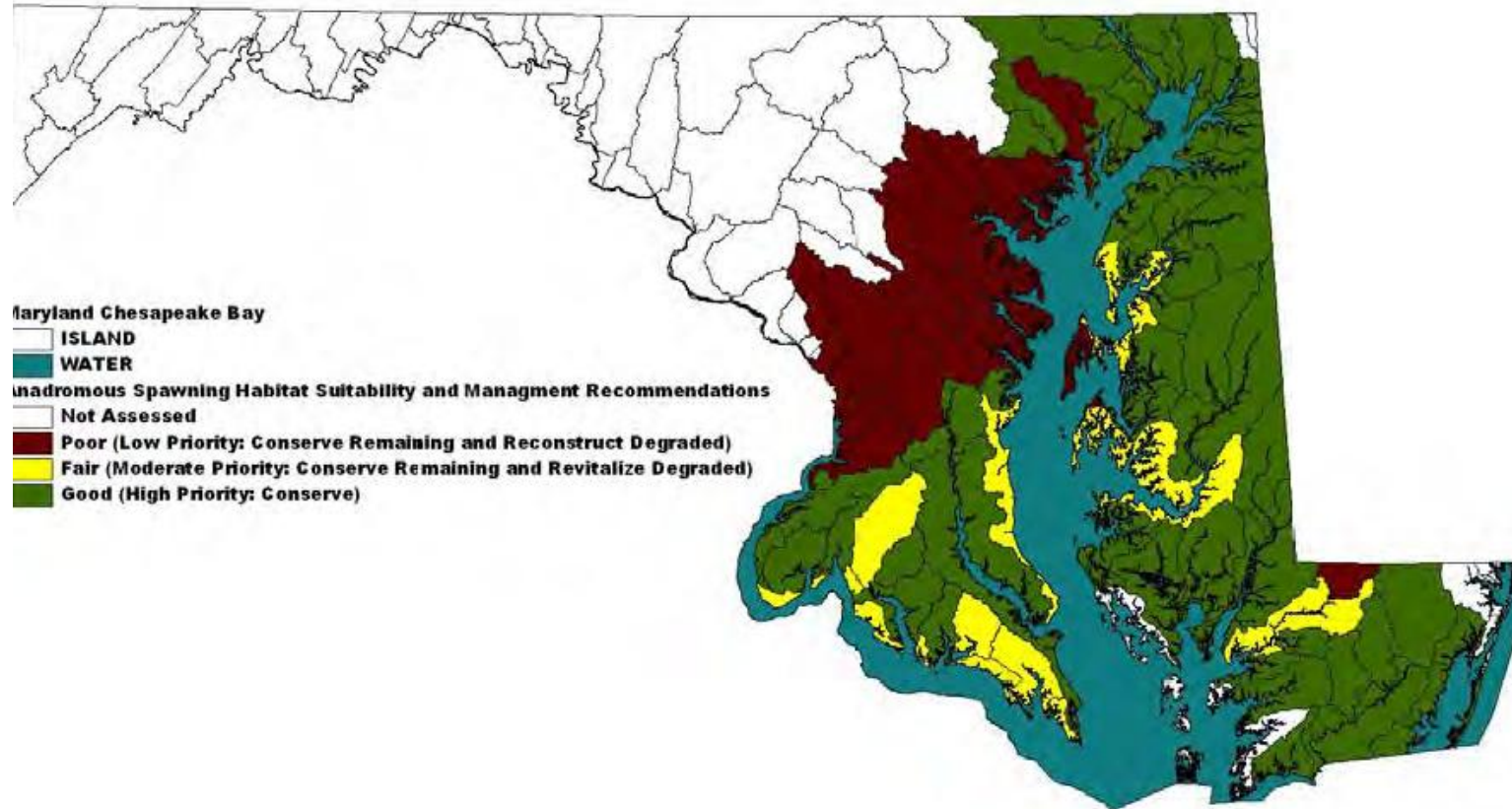
is developing strategies to work with constituents to communicate fisheries' concerns. The message is "land conservation = fish conservation." Studies have been conducted to assess the impacts of impervious surface on fish and fish habitat. A DNR study on the Choptank River (1980-1990) examined the survival rate of striped bass larvae and agricultural best management practices (BMPs). Larval survival increased with the increased adoption of BMPs especially those that conserved soil, reduced run-off and reduced the use of pesticides and fertilizers. Two agricultural methods were notable, conservation tillage and cover crops.

Another DNR Fisheries study examined how the amount of impervious surface (due to the amount of development) affects water quality and then impacts fish spawning. The DNR Fish Habitat Team examined the number of herring eggs or larvae present in a stream. They found that the number of herring decreases with increasing development. As rural watersheds (impervious surface less than 10%) transitioned to suburban watersheds (greater than 10% impervious surface), the number of streams with eggs or larvae decreased. A study on larval yellow perch feeding success also found negative effects due to increasing impervious surface in a watershed. For more details about these studies go to [http://www.dnr.maryland.gov/fisheries/fhep/pdf/CBC\\_Land\\_Con\\_servation\\_Fish\\_Conservation\\_Fact\\_Sheet.pdf](http://www.dnr.maryland.gov/fisheries/fhep/pdf/CBC_Land_Con_servation_Fish_Conservation_Fact_Sheet.pdf)

These studies illustrate how important land use decisions are to fish management. Land use policies and conservation strategies need to be better aligned with fishery management strategies. As a conservative recommendation, impervious surface should be kept below 8% to minimize the effects on the aquatic habitat and fish. As impervious surface increases above 10%, fishery resources are less able to cope with the stress of poor quality habitat.

The Fisheries Habitat and Ecosystem Program within MDNR's Fisheries Service, has developed a map to help guide conservation and land management. First, they identified high quality anadromous

fish habitat. Then they added stressors that limit fish distribution and production, specifically the effects of impervious surface. The areas were ranked into three categories (good, fair, and poor) based on the potential to support anadromous fish spawning under the existing levels of development.



For more detailed information on the Habitat and Ecosystem Program go to <http://www.dnr.maryland.gov/fisheries/fhep/index.asp?p=pub>

## **Marine Recreational Information Program (MRIP)**

Recreational fishery statistics are an important part of any stock assessment. Scientists need to know how many fish are taken, how much effort was used to catch the fish, and where the fish were caught. The National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) is responsible for collecting statistics on marine recreational fishing and calculating harvest estimates. Most stakeholders are familiar with the NMFS recreational fishing statistics program known as the Marine Recreational Fisheries Statistics Survey or MRFSS. The MRFSS program began in 1981 and has calculated recreational harvest since then. The recreational fishery estimates have been used in conjunction with commercial fishery statistics to develop fishery management policies and actions.

Beginning in 2008, NMFS began a new process to improve the estimation of recreational harvest. The program is being implemented in three concurrent phases: evaluation of current methods; identification and testing of new methods; and implementation of improved methodologies (MRIP 2011). During 2010-2011, MRIP accomplished the following: utilized the National Saltwater Angler Registry; tested alternative effort survey approaches; created a new catch estimation methodology; improved the collection of catch data; and improved data timeliness. Improvements to the methodology include better angler dockside surveys, improved statistical precision, and more frequent reporting. As a result, new estimates for recreational catch by species have been calculated. The new MRIP estimates replace the previous MRFSS recreational estimates. The new recreational catch estimates improve the accuracy of the estimates by removing statistical bias. Since historic estimates are particularly important data for stock

assessments, the recreational catch estimates were recalculated back to 2004. Prior to 2004, the dockside survey design was different and not compatible with the new methodology. During 2012, MRIP is expected to develop a revised method to recalculate catch estimates going back in time as far as possible.

The recalculation of recreational harvest estimates has resulted in species-specific changes. Some new catch estimates go up, some go down and some stay about the same. There is no overall trend in catch estimates from the previous MRFSS estimates. On a coastwide basis, approximately 20% of the species harvest estimates differed by more than or less than 15% of the previous estimates. Species harvest estimates that were considerably different from past estimates include mid-Atlantic scup and species from other areas (Maine- Atlantic cod and haddock; Gulf of Mexico – mutton snapper and black grouper; South Atlantic – black and red grouper; and Atlantic yellowfin tuna).

The new MRIP recreational harvest estimates will not directly change any of the species' stock status. However, as species stock assessments come up for new assessments, the MRIP estimates will be used along with all other pertinent data, to determine the stock status and provide data for management strategies. Management actions may need to be amended or revised based on the new assessments.

Improvements to recreational harvest estimates will continue under MRIP. During 2012, MRIP is expected to evaluate a number of pilot projects including: an electronic logbook reporting system for charter boats; enhanced angler dockside survey; and additional ways to report estimates on a more timely basis. For more detailed information on MRIP go to <http://www.countryfish.noaa.gov/index.html>



## 2011 Maryland FMP Report (June 2012)

### Section 1. American Eel (*Anguilla rostrata*)

The life history strategy of the American eel is unique. Eels spawn in the Sargasso Sea and their larvae (called leptocephalii) are carried by currents along the entire Atlantic coast from South America to Greenland. The larvae change into glass eels, then elvers, and migrate into estuaries, rivers and streams. They continue to grow into larger yellow eels and remain in freshwater habitats as long as 14 years. They finally begin their maturation process as silver eels when they migrate back to the Sargasso Sea to spawn and begin their life cycle again. As a result of this unique life history, American eels comprise one panmictic population, i.e., they are a single-breeding population with random mating. They occur in the broadest array of habitats, more than any other fish species. Their range of habitats includes open ocean, estuaries, large coastal tributaries, rivers, small freshwater streams, lakes and ponds. Although the population is panmictic, there are distinct habitat-related differences in size and sex ratio. Given their range of habitats and their complex life history, assessing the current status of the stock is difficult.

A Chesapeake Bay American Eel Fishery Management Plan (CBFMP) was adopted in 1991. The goal of the CBFMP is to manage the American eel population in the Chesapeake Bay and its tributaries so that harvest does not exceed the natural capacity of the population to maintain its size from year to year. The CBFMP was reviewed in 2011 and the plan review team concluded that the 1991 management framework is still appropriate for managing the population in Chesapeake Bay. However, the results of the 2011 coastal stock assessment may lead to new management measures in the coming year or two.

The ASMFC adopted a coastal FMP for American Eel in 1999 with addenda I (2006) and II (2008). The purpose of the coastal FMP is to reverse any local or regional declines in abundance and institute consistent fishery-independent and dependent monitoring programs along the coast. Fishery-independent monitoring guidelines require all states to implement a young-of-the-year (YOY) monitoring project (2001-present). Minimum monitoring criteria include one sampling site monitored four times a week for a six-week period. Standardized YOY surveys have been completed in Maryland since 2000. Each jurisdiction is required to complete an ASMFC annual compliance report

#### Stock Status

The American eel stock along the Atlantic coast was assessed in 2010/2011 and peer-reviewed in March 2012. The results of the assessment suggest that there is decreasing recruitment in the population and that there are localized declines in abundance<sup>1</sup>. The Panel review concluded that the American eel population is depleted in U.S. waters and at historically low levels. The reasons for the current status are due to a combination of historic overfishing and habitat loss. Habitat has been lost due to blockages (dams) on rivers and streams and mortality from passing through hydroelectric turbines. In addition, the stock may also have experienced

impacts from parasites and disease, and unexplained mortality at sea. Unfavorable wind-driven currents may also affect recruitment into estuaries making climate change effects a concern. The ASMFC Stock Assessment Subcommittee (SASC) conducted a depletion-based stock reduction analysis (DB-SRA). The results suggest overfishing has been occurring since the 1980s. Although the American eel stock is depleted, the overfishing and overfished status in relation to the biomass and fishing mortality reference points cannot be stated with confidence<sup>1</sup>. The coastal states will continue monitoring and collecting data in order to develop biological reference points in the future.

An age- and sex-structured assessment model for American eels in the Potomac River was completed<sup>2</sup>. Model results indicate that between 1980 and 2008 estimated recruitment, biomass and abundance decreased. Exploitation during this same time period exceeded  $F_{50\%}$ . Declines in recruitment have been reported from other places along the Atlantic coast.

Since habitat loss due to stream/river blockages has contributed to reductions in American eel. The Maryland Fish Passage Program has added eels to its list of targeted species. Blockage removal projects consider whether or not eels would benefit from implementing a proposed project.

#### Current Management Measures/The Fishery

In 2010, total reported commercial eel landings for Maryland was 404,981 pounds (Figure 1). This was the highest annual total since 1983 when a commercial license was first required to harvest eels. Landings have exceeded the time series mean of 253,993 pounds for eight consecutive years. Landings from the Chesapeake Bay typically account for about 60% of the coastwide harvest of eels.

In 2010, catch-per unit-effort (CPUE) from eel pots in state tidal waters was 0.71 pounds per pot, the lowest CPUE recorded over the last five years. However, the 2010 CPUE was approximately 40% higher than the cumulative CPUE of 0.51 pounds per pot since 1990. Eels are also harvested for crab bait. Licensed commercial crabbers in Maryland harvested 106,220 pounds of American eel for use as trotline bait in 2010. This was an increase of more than 500% from the 17-year time series average of 18,125. In 2010, changes were made to the commercial crab reporting forms. The increase in the amount of American eels harvested as bait is being further investigated to determine if the change in the commercial crab forms contributed to the significant increase in eel landings for use as trotline bait. It is not suspected that a significant change in bait use occurred in 2010 to explain this increase.

Currently, there is a minimum size limit of 6" in Maryland, Virginia, and on the Potomac River to protect elvers (eels less than 6"). There is a minimum mesh size of ½ x ½" for eel pots and smaller mesh sizes are required to have escape panels. There are no harvest limits. Current monitoring projects include a young-of-the-year abundance survey conducted in the Coastal Bays, fishery dependent sampling from



the pot fishery, a fishery independent pot survey in the Sassafras River, and a silver eel survey in a first order stream to the Corsica River.

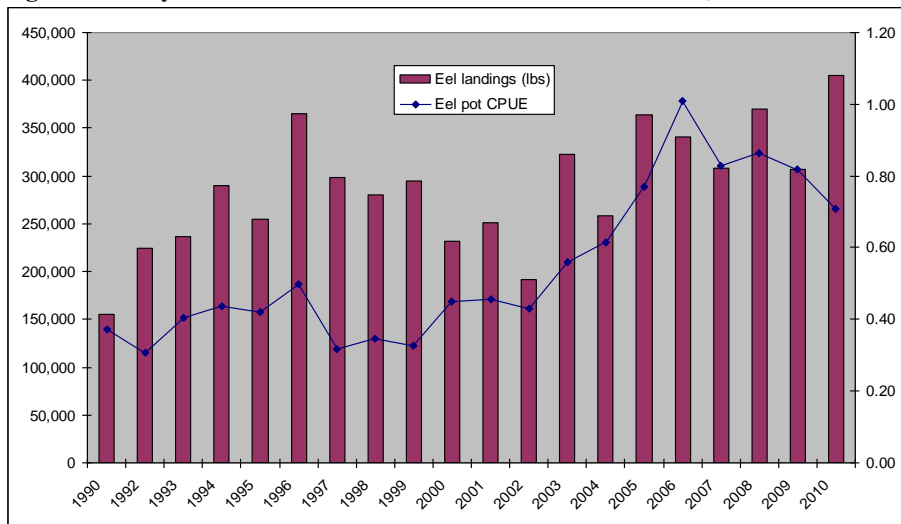
### Issues/Concerns

The U.S. Fish and Wildlife Service is reconsidering listing American eel as an endangered species. They received a petition in 2010 to list American eel under the Endangered Species Act from the Council for Endangered Species Reliability. A similar petition was received in 2004 and after a 3-year process concluded that the stock did not warrant listing as an endangered species. However, the latest petition presents substantial scientific and commercial information that indicates a listing for eels may be warranted.

A significant glass eel fishery exists due to high market demand from Japan. Currently the price of a pound of glass eels is around \$2000. Although it is illegal to harvest glass eels from the Chesapeake Bay, the high market price makes them very attractive to poachers. Since glass eels migrate into inland waters in large, concentrated quantities, they are especially vulnerable to illegal harvest. Along the coast, only Maine and South Carolina maintain a legal glass eel fishery.

American eel provide a significant ecosystem service as a primary host for freshwater mussel larvae. Mussels provide important ecological services as water filters in freshwater. Providing fish passage so American eels have the opportunity to move into freshwater habitat will facilitate the rebuilding of freshwater mussel populations.

**Figure 1. Maryland commercial eel harvest and annual CPUE, 1990-2010**



(From Whiteford 2011)

### Research Needs

The ASFMC Stock Assessment identified the following research needs for American eel: improve the accuracy of commercial catch and effort data; estimate catch and effort for personal-use and the bait fisheries; estimate non-directed fishery losses; improve estimates of recreational catch and effort; improve understanding of the distribution of eels along the coast; improve understanding of coastwide recruitment trends; improve understanding of spawning and maturation; improve upstream and downstream passage for all life history stages; and, improve understanding of habitat needs and availability<sup>1</sup>.

<sup>1</sup> ASFMC American Eel Stock Assessment Peer Review, *Terms of Reference & Advisory Report of the American Eel Stock Assessment Peer Review*, Stock Assessment Report No. 12-01 of the Atlantic States Marine Fisheries Commission, March 2012

<sup>2</sup> Fenske, KH., Wilber, MJ., Secor, DH & Fabrizio, MC. 2011. Can. J. of Fish. & Aqua. Sci., published on the web, 10, 1139/p2011-038

| <b>1991 Chesapeake Bay American Eel Management Plan Implementation Table</b> (updated 06/12)  |   |                              |  |
|---|---|------------------------------|--|
| <b>Problem Area</b>   | <b>Action</b>   | <b>Date</b>                  | <b>Comments</b>  |
| 1. Stock Status<br>Strategy 1.1 The jurisdictions will adopt a conservative management approach until stock assessment analyses have been completed for American eels in the Bay. | 1.1 Maryland and PRFC will adopt a 6" minimum size limit. Virginia will continue a prohibition of taking elvers and adjust definition to correspond to a 6" minimum size limit  | 1992<br>1993<br>Continue     | A coastal stock assessment was conducted in 2005/2006 but failed some of the terms of reference. <b>A new coastal stock assessment was completed in 2011 and peer-reviewed in 2012. The stock assessment concluded that eels are depleted along the coast. MD data from fishery independent pot survey (1999-present) indicate a positive trend and stable abundance in MD portion of CB.</b> All eels available for harvest are pre-spawn fish. The 6" minimum size prevents the development of an elver fishery. The recreational limit in MD is 25 eels/day. Recreational limit in VA and by PRFC is 50 eels/day. ASMFC has recommended a 50 eel limit. |
|   | 1.2 MD will implement a ½ by ½" mesh size for eel pots. Eel pots in MD with undersize mesh require a 16 in <sup>2</sup> escape panel of ½ x ½" mesh. VA & PRFC will continue to enforce their ½ x ½" mesh. VA will continue to enforce ½ by 1" escape panels in ½ x ½ mesh pots | 1993<br>Continue             | MD, VA and PRFC currently enforce the ½ x ½" minimum mesh size for eel pots. In MD, pots with mesh size <1/2" require escape panels. <b>Commercial landings from the Chesapeake Bay during 2010 were 533,690. This includes 79,896 from VA plus eels harvested from the Potomac (PRFC). NMFS includes all of PRFC's eel harvest in Maryland's statistics</b>   |
|   | 1.3 Upon restoration of eels to the Susquehanna River basin PRFC will adopt regulations to prevent over fishing of small eels.  | On-going                     | Fish passage goals have been adopted for the Bay and Tributaries. Eels were added to the 2010 SRAFRC plan with specific actions for eel passage on the Susquehanna River.  |
| 2. Bait Fishery<br>Strategy 2.1 Catch and effort statistics for the American eel crab bait fishery will be obtained.  | 2.1 MD will require the reporting of eels used for crab bait on crab reporting forms  | 1993<br><br>2007<br>Continue | Information gathered from the Crab Reporting Forms indicated that previous bait estimates were probably too high. Commercial harvest data is continually being improved. Beginning in 2007, ASMFC required all coastal states/jurisdictions to collect both catch and effort information from their eel fisheries. MD commercial crabbers are required to report their harvest and effort of eels used for crab bait on the crab reporting forms. <b>These forms changed in 2010 and may have resulted in an increase in reporting. Currently, commercial crabbers can use up to 50 eel pots with no catch limit.</b>                                      |
| 3. Research Needs<br>Strategy 3.1 The   | 3.1 Continue to collect catch & effort data from live eel fishery and begin monitoring crab bait fishery  | Continue                     | Basic stock assessment and biological monitoring is needed. MD conducts an annual population   |

|  |  |  |  |
|--|--|--|--|
| <p>jurisdictions will increase their understanding of the American eel resource in the Chesapeake Bay. Important research topics include but are not limited to the following: fishery independent estimates of abundance; mortality rates; the effects of fishing exploitation on growth; the factors that influence recruitment in the Bay; and how economic aspects affect the eel fishery.</p>   | <p>3.2 Encourage research to collect basic biological and socioeconomic information</p>  | <p>Continue<br/>2000<br/>2001<br/>2004<br/>2006<br/>Continue</p> | <p>study which was started in 1997 to present. ASMFC adopted Addendum I to the Coastal Eel FMP (Feb. 2006).in order to improve data collection and subsequent stock assessments.</p> <p>Since an ASMFC coastal eel FMP was adopted in 2000, states are required to conduct an annual young of year survey (started in 2001). USFWS determined there was no need to list eels as endangered or threatened (2004) <b>but are now reconsidering a petition to list eels as endangered. The review is currently in progress.</b> Continued emphasis on collecting stock assessment data especially commercial catch and effort data. In 2006, MD initiated an annual fishery independent eel pot survey and silver eel survey. MDNR also samples for disease prevalence (since 2006). Between 30 and 60% of the eels sampled showed evidence of parasites in their swim bladders.</p>  |
| <p>4. Habitat and Water Quality Issues<br/>Strategy 4.1 The jurisdictions will continue to promote the commitments of the 1987 Chesapeake Bay Agreement. The achievement of the Bay commitments will lead to improved water quality and enhanced biological production. In addition, the jurisdictions have committed to providing upstream passage for migratory fishes.<br/><b>(A new Bay agreement was adopted in 2000 and the President's Executive Order in 2009)</b></p> | <p>4.1 Continue to provide stream passage</p> <p>4.2 Continue to set specific objectives for water quality goals and habitat requirements.</p> | <p>2000<br/>2005<br/>2009<br/>On-going</p> <p>Continue</p>       | <p>A new CBP fish passage goal to open additional 1,000 miles of tributary by 2014 was adopted in 2005. The 2009 Executive Order modified the goal to include 100 projects and 1,000 stream miles by 2025. ASMFC approved Addendum II to the Coastal FMP (2008) which places increased emphasis on improving upstream and downstream eel passage. <b>USFWS is conducting a study to determine the timing &amp; cues for out-migrating eels in the Shenandoah River. Results of the study will assist hydroelectric companies to manage power generation to minimize impacts on out-migrating silver eels. A total of 150 silver eels will be radio-tagged over the next 2 years to track their movements.</b></p> <p>The Chesapeake Bay Program has continued to emphasize water quality and habitat commitments. Additional actions were added the C2K including stream health guidelines which should improve eel habitat. Eels are widely distributed in many aquatic habitats and are impacted by low DO, contaminants and water removal projects. The new fish passage goal is part of the CBP's Action Plan.</p> |

ASMFC= Atlantic States Marine Fisheries Commission

C2K= Chesapeake 2000 agreement

FMP= Fishery Management Plan

CBP = Chesapeake Bay Program

DO = Dissolved oxygen

PRFC= Potomac River Fisheries Commission

## 2011 Maryland FMP Report (July 2012)

### Section 2. American shad (*Alosa sapidissima*) and hickory shad (*Alosa mediocris*)

#### Chesapeake Bay FMP

The American shad population in the upper Chesapeake Bay remained at low abundance. In contrast, the Potomac River's 2011 American shad abundance index exceeded the ASMFC restoration target of 31.1 lbs/pound net-day (E. Cosby, Potomac River Fisheries Commission, pers. comm.). Baywide abundance remains low despite a moratorium since the 1980s and increased access to spawning habitat. Bycatch mortality from Atlantic coast trawl fisheries may contribute to limited restoration success. In contrast, the abundance of wild hickory shad continues to increase in systems that are stocked. Hickory shad restoration in the Patuxent River appears successful and stocking has been discontinued.

The Atlantic States Marine Fisheries Commission (ASMFC) adopted the Interstate Fishery Management Plan for Shad and River Herring in 1985. In 1989, Chesapeake Bay States implemented the Chesapeake Bay Alosid Management Plan (CBFMP) to coordinate shad and river herring management. The CBFMP identified declining abundance, over-fishing, insufficient research and monitoring, and habitat loss as problems. The CBFMP set guidelines to continue the American shad moratorium, remove stream blockages and reopen historic habitat, and continue stocking hatchery-raised fish. The CBFMP Amendment #1 (1998) continued the shad moratorium, initiated review of criteria to reopen a shad fishery, and initiated development of measurable restoration targets.

ASMFC implemented Amendment I to the Interstate Fishery Management Plan for Shad & River Herring in 2000. The amendment mandated a 40% reduction in the American shad ocean intercept fishery by 2003 and closure by 2005. In-river commercial fisheries were also limited. ASMFC Addendum I (2002) clarified hatchery-rearing requirements. Amendment 2 was developed to address coastwide declines in alewife and blueback herring stocks (2009). Amendment 3 (2010) established an instantaneous total mortality (fishing and natural) benchmark of  $Z_{30}$ , made the juvenile recruitment failure definition more conservative, mandated states to monitor American shad bycatch and discards, and required states with commercial and/or recreational (excluding catch and release) fisheries to have an approved sustainability plan. In early 2011, a Plan Review Team (PRT) reviewed the CBFMP, including Amendment #1, to determine if the strategies and actions provided an appropriate management framework to address management changes implemented by ASMFC. The PRT recommended development of a second amendment to the CBFMP due to substantial changes in American shad and river herring stock status.

In 2006, the National Oceanic and Atmospheric Administration (NOAA) Chesapeake Bay Fisheries Ecosystem Advisory Panel adopted a Fisheries Ecosystem Plan for Chesapeake Bay. In 2009, Maryland Sea Grant facilitated the development

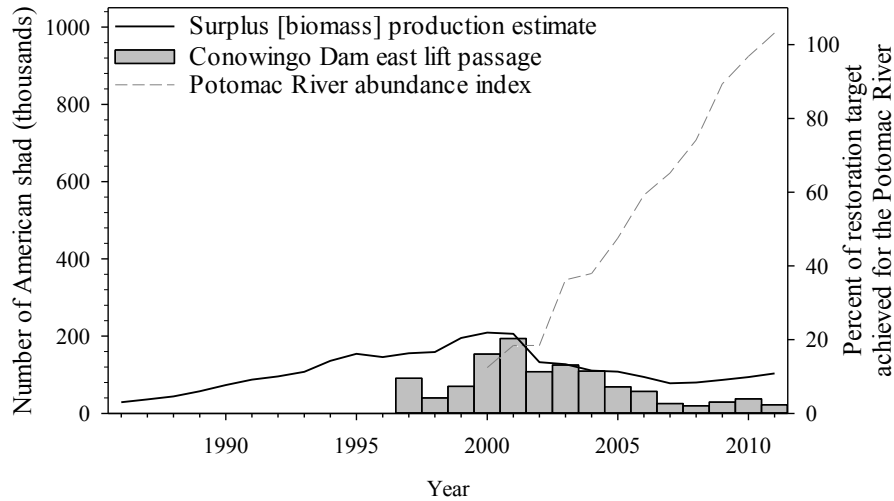
of Ecosystem-based Fisheries Management for Chesapeake Bay Alosine Background and Issue Briefs (American shad, hickory shad, alewife herring, and blueback herring) in cooperation with state, federal, and academic representatives. The issues section examined four stressor categories: habitat (migratory barriers, flow and water quality, land-use ecology, and physical alteration), food web (forage, competition, predation, freshwater ecology, and vectors of biological material), stock dynamics (stock assessment history, anthropogenic mortality, life history, connectivity, and stock structure), and socioeconomic (cultural, economic, and environmental considerations, restoration, and management guidelines). This information will be used to develop Amendment #2 to the CBFMP once a timeline is adopted. For more information on the EBFM process, go to <http://www.mdsg.umd.edu/programs/policy/ebfm>.

#### Stock Status

American shad stocks began to decline in the 1960s and reached all time lows in the 1970s. American shad fisheries were closed in 1980. Based on shad passage counts at Conowingo Dam (Figure 1)<sup>1</sup> and Maryland Department of Natural Resources tagging data (Figure 2)<sup>2</sup>, American shad abundance increased from 1998 to 2001, decreased after 2001, and has remained at low levels since 2007 (Figure 1). The 2011 American shad population estimate for the Susquehanna River below Conowingo Dam was 104 thousand fish (Figure 1). In contrast, American shad abundance in the Potomac River has steadily increased since 2000 to early 1950s levels (Figure 1). The 2011 catch per unit effort (CPUE) of spawning adults exceeded the ASMFC restoration target or was 103% of the restoration goal (E. Cosby, Potomac River Fisheries Commission, pers. comm.).

Wild (non-hatchery) spawning American shad abundance varies among river systems. Approximately 62% of American shad in the Conowingo Dam tailrace were of wild stock.<sup>2</sup> Twenty-eight percent of males and 25% of females were repeat spawners (spawned in previous years).<sup>2</sup> In the Nanticoke River, 84% of American shad were wild, and 13% of males and 29% of females were repeat spawners.<sup>2</sup> Eight percent of male and 44% of female shad in the Potomac River were repeat spawners.<sup>2</sup>

For hickory shad, age structure has remained consistent. Proportions of wild and repeat spawning adults have been increasing. Sixty-nine percent of hickory shad in Deer Creek were repeat spawners in 2011<sup>2</sup>. Data from the Maryland Department of Natural Resources (MD DNR) are insufficient to estimate hickory shad adult and juvenile abundance. NOAA's marine recreational fisheries statistics survey stopped collection of American and hickory shad data in 2009 due to inadequate samples.



### Current Management Measures

Chesapeake Bay American shad harvest has been prohibited in Maryland since 1980, Potomac River Fisheries Commission since 1982, and Virginia since 1994. Maryland allows commercial fishermen a two fish per day bycatch of dead American shad for personal use. No sale of bycatch is allowed. Virginia maintains an American shad bycatch permit and limited bycatch allowance of 10 fish per vessel from permitted areas so long as a greater number of spot, croaker, bluefish, catfish, striped bass or white perch are landed. Pennsylvania and New York have also prohibited harvest of American shad in the Susquehanna River basin. Maryland enacted a hickory shad moratorium in 1981. Maryland closed its ocean intercept fishery in 2005.

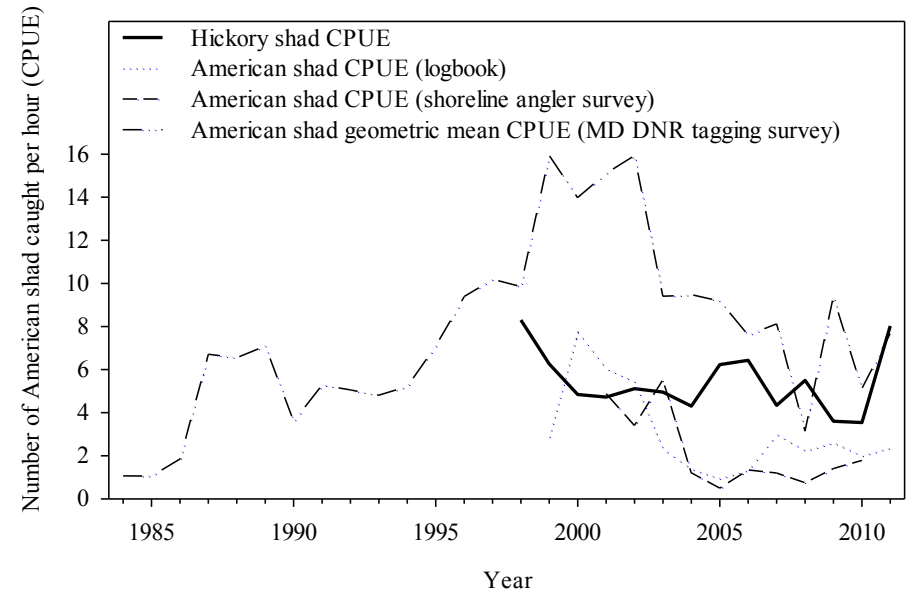
The Mid-Atlantic Fishery Management Council submitted river herring and shad monitoring and bycatch reduction recommendations to the National Marine Fisheries Service in June 2012. The recommendations increase monitoring requirements and reduce bycatch for these species caught by trawlers fishing for mackerel and squid in federal waters. Bycatch reduction would include a river herring and shad catch cap with implementation through Amendment 14 in 2014. Monitoring requirements will improve vessel and dealer reporting and add more onboard observers. The fishery will need to fund a portion of the increased cost.

### The Fisheries

Recreational catch and release fisheries for American and hickory shad occur in the tailrace below Conowingo Dam. Popular hickory shad fisheries can also be found in Deer Creek and Octoraro Creek. MD DNR initiated a voluntary angler logbook program for both American and hickory shad in 1998 (Figure 2).<sup>2</sup> The MD DNR also conducts an annual creel survey of shoreline anglers at the Conowingo Dam tailrace.

Hickory shad catch rates have remained relatively constant over time. Results from the American shad logbook and angler surveys have provided similar results and have mirrored the MD DNR tagging survey catch per hour trend (Figure 2).

Figure 2. Average catch per hour (CPUE) for the MD DNR tagging study and the recreational logbook and angler surveys for hickory shad (Deer Creek) and American



### Issues/Concerns

The accuracy of using scales to age American shad and assess repeat spawning remains uncertain. Comparison of scale ages for known age fish revealed a notable amount of bias and error. Otolith sampling is not a feasible option considering the depressed stock status. Standardization of scale ageing methods is necessary.

American shad abundance in Maryland increased from 1998 to 2001, decreased after 2001, and increased some in 2009 and 2010. The effect of multiple mortality sources such as bycatch, discard, dam turbines, pollution, and predation on abundance trends is unknown. Additional data are required to estimate total mortality and develop appropriate biological target and threshold benchmarks.

River and stream blockages, such as dams, prevent shad from reaching suitable spawning habitat and may negatively affect abundance. Fish passage structures have varying success, but the cause of poor efficiency is rarely studied. Of particular concern is the lack of knowledge about shad response to the Conowingo Dam East Fish Lift's design and operation. Exelon Generation Company, LLC, Conowingo Dam operator, initiated several studies as part of the Federal Energy Regulatory

Commission relicensing process. Studies include radio telemetry, fish passage effectiveness, East Fish Lift attraction flows, passage impediments below the dam, and plant operation impact on fish reproduction. An Environmental Impact Statement is scheduled for completion in 2013.

## **References**

<sup>1</sup> Pennsylvania Fish and Boat Commission. 2011. Susquehanna River American shad. from [http://www.fish.state.pa.us/shad\\_susq.htm](http://www.fish.state.pa.us/shad_susq.htm)

<sup>2</sup> Maryland Department of Natural Resources. 2011. Chesapeake Bay Finfish / Habitat Investigations. US FWS Federal Aid Project F-61-R-7 2010 – 2011. Annapolis, Maryland.

## **Alewife herring (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*)**

### **Chesapeake Bay FMP**

River herring populations are currently depleted and declining.<sup>1</sup> Commercial landings have been at all time lows from 2006 to 2011. Due to the decline and persistent low levels of river herring, Maryland did not develop an ASMFC river sustainability plan to keep the herring fisheries open. On December 26, 2011 Maryland closed its commercial and recreational fisheries after 35 years at historic low levels.

ASMFC adopted the Interstate Fishery Management Plan for Shad and River Herring in 1985. In 1989, Chesapeake Bay States implemented the Chesapeake Bay Alosid Management Plan (CBFMP) to coordinate shad and river herring management. The CBFMP identified declining abundance, over-fishing, insufficient research and monitoring, and habitat loss as problems. The CBFMP set guidelines to reduce river herring fishing mortality and remove impediments to historic habitat. Amendment #1 (1998) to the CBFMP did not address any issues related to river herring.

In early 2011 a Plan Review Team (PRT) assessed the adequacy of the CBFMP, including Amendment #1 to the recent management changes by ASMFC. The PRT recommended development of a second CBFMP amendment due to continued declines of the river herring stock and the substantial management actions specified in Amendment 2 to the ASMFC FMP. ASMFC enacted Amendment 2 to their FMP to address coastwide declines in alewife and blueback herring stocks (2009). Amendment 2 requires states to have an ASMFC Board approved river herring sustainability plan by 2012 or to close their river herring fisheries. Maryland closed its river herring fisheries. A sustainability plan requires states to develop a river herring juvenile index to monitor spawning adults, collect commercial and recreational fisheries statistics, and collect bycatch data. River herring stocking programs are encouraged. As required by ASMFC, Maryland submits an annual compliance report.

In 2006, the National Oceanic and Atmospheric Administration (NOAA) Chesapeake Bay Fisheries Ecosystem Advisory Panel adopted a Fisheries Ecosystem Plan for Chesapeake Bay. In 2009, Maryland Sea Grant facilitated the development of an Ecosystem-based Fisheries Management for Chesapeake Bay Alosine Background and Issue Briefs (American shad, hickory shad, alewife herring, and blueback herring) in cooperation with state, federal, and academic representatives. The issues section examines four stressor categories: habitat (migratory barriers, flow and water quality, land-use ecology, and physical alteration), food web (forage, competition, predation, freshwater ecology, and vectors of biological material), stock dynamics (stock assessment history, anthropogenic mortality, life history, connectivity, and stock structure), and socioeconomic (cultural, economic, and environmental considerations, restoration, and management guidelines). This

information will be used to development the CBFMP Amendment #2 once a timeline is adopted. For more information on the EBFM process, go to <http://www.mdsg.umd.edu/programs/policy/ebfm>.

### **Stock Status**

The ASMFC's 2012 river herring stock assessment determined that alewife and blueback herring abundance is depleted.<sup>2</sup> Furthermore, the report authors noted that mean age and maximum length have declined. Commercial landings cycled from high to low approximately every 20 years between 1929 and 1969 (Figure 1). However, a trend of decreased landings was evident. Maryland DNR has monitored alewife and blueback herring from the Nanticoke River and other portions of Chesapeake Bay since 1980. River herring landings have failed to rebound since 1976. Catch per unit effort (CPUE) and mean length of blueback herring have decreased significantly since 1989. Alewife herring CPUE and mean length have not changed since 1989. Total mortality (Z) in 2011 was 0.73 for alewife herring and 1.01 for blueback herring. These values are between the  $Z_{20\% SPR}$  and  $Z_{collapse}$  benchmarks. Adult river herring stocks in Maryland are projected to remain at low abundance levels for the near future.

Juvenile alewife and blueback herring abundance has also been monitored in the Nanticoke River and baywide since 1980. Juvenile abundance indices (JAI) have varied among years without trend.<sup>3</sup> Initial analyses indicate that a river herring JAI is a predictor of future year class strength (L. Barker, Maryland Department of Natural Resources, pers. comm.).

Beginning in 2009 alewife and blueback herring recreational data are no longer available from the Marine Recreational Fisheries Statistics Survey (MRFSS) due to inadequate sampling. The recreational river herring fishery in Maryland has been considered minimal, but limited data is available. The next ASMFC river herring trend analysis is scheduled for 2017 and the next benchmark assessment is scheduled for 2022.

### **Current Management Measures**

Maryland, Virginia, and the Potomac River Fisheries Commission instituted a recreational and commercial river herring moratorium as of January 1, 2012. All river herring and river herring products imported into either state must include a bill of landing or commercial invoice from a state with an approved river herring fishery.

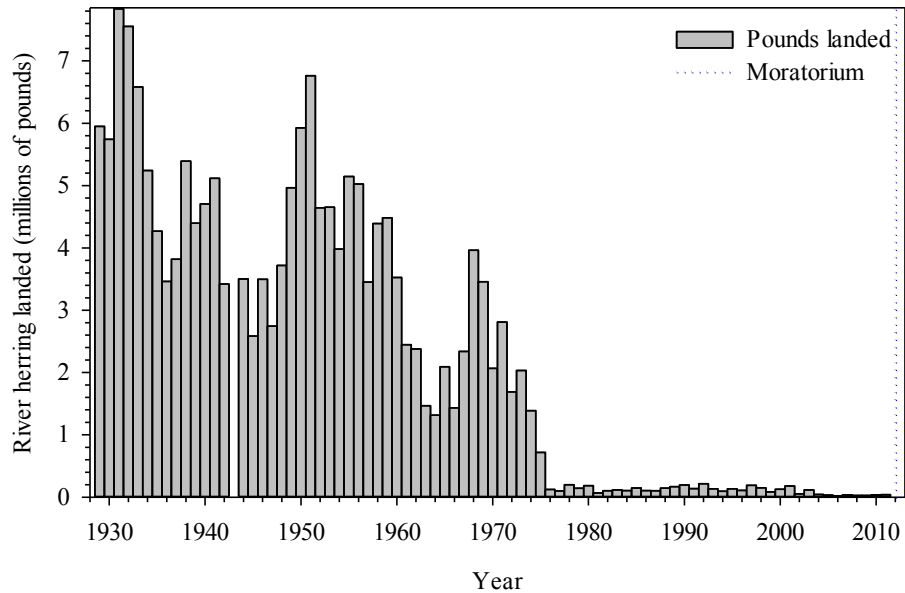
The Mid-Atlantic Fishery Management Council (MAFMC) submitted river herring and shad monitoring and bycatch reduction recommendations to the National Marine Fisheries Service in June 2012. The recommendations would increase monitoring requirements and reduce bycatch for these species caught by trawlers fishing for mackerel and squid in federal waters. Bycatch reduction would include a river herring and shad catch cap with implementation through Amendment 14 in 2014.



Monitoring requirements will improve vessel and dealer reporting and add more onboard observers. The fishery will need to fund a portion of the increased cost.

## The Fisheries

Commercial river herring landings have been in decline since the mid-1900s, but the landings declined precipitously after 1968 (Figure 1). River herring harvest has not improved since 1976. All commercial and recreational river herring fisheries in Maryland have been closed.



## Issues/Concerns

Misidentification of river herring species is relatively common. Alewife and blueback are easily confused and they have also been confused with young hickory shad and American shad. The magnitude of identification errors within the offshore trawl fisheries is unknown.

River herring mortality sources include harvest, bycatch, discard, dam turbines, pollution, and predation. Ocean trawl bycatch is of particular concern. The MAFMC recommended an increase in the number of bycatch observers on offshore vessels. It would increase the amount of data available to develop management benchmarks. Additional data collection will likely be needed to comply with future ASMFC management requirements.

Adult access to suitable spawning habitat has been historically impeded by blockages such as dams. Blockage removal (preferred), fishway, and bypass channel efficiency data is insufficient to determine restoration effectiveness. Two large dams on the Patapsco River have been removed (Union and Simkins) and two dams still remain on the mainstem river. Pre-removal data collection, engineering design, and permitting are underway for Bloede Dam. Funding sources for the possible removal of Daniels Dam are being identified.

A river herring fishery independent survey is currently being developed by MD DNR in the upper Chesapeake Bay to fulfill the survey requirements of Amendment 2 to ASMFC's FMP.

## References

- <sup>1</sup> Atlantic States Marine Fisheries Commission. 2012. River Herring Stock Assessment Overview (May 2012). Atlantic States Marine Fisheries Commission. Arlington, Virginia.
- <sup>2</sup> Atlantic States Marine Fisheries Commission. 2012. River herring benchmark stock assessment volume I. Atlantic States Marine Fisheries Commission. Arlington, Virginia.
- <sup>3</sup> Maryland Department of Natural Resources. 2011. Chesapeake Bay Finfish / Habitat Investigations. US FWS Federal Aid Project F-61-R-7 2010 – 2011. Annapolis, Maryland.
- <sup>4</sup> Durell, E.Q., and Weedon, C. 2010. Striped Bass Seine Survey Juvenile Index Web Page. <http://www.dnr.state.md.us/fisheries/juvindex/index.html>. Maryland Department of Natural Resources, Fisheries Service.

1998 Amendment 1 to the 1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

| Strategy   | Action  | Date  | Comments   |
|--|---|---|--|
| <p>1.1 The Bay jurisdictions will reevaluate the criteria for reopening a fishery in the Chesapeake Bay during the Alosid FMP revision process. Until new criteria are determined, the moratorium will remain in place for American and hickory shad in the Chesapeake Bay.</p>  | <p>1.1 The Bay jurisdictions will continue the moratorium on American shad in Chesapeake Bay.</p>           | <p>1989<br/>On-going</p> <p>2009</p> <p>2009 - 2011</p> <p>On-going</p> | <p>The Bay jurisdiction will reevaluate the criteria for reopening a fishery in Chesapeake Bay during the Alosine FMP revision process. Coastal fishery is scheduled for closure December 2004. Until new criteria are determined, the moratorium will remain in place for American and hickory shad in Chesapeake Bay.</p> <p>Development of a Chesapeake Bay EBFMP coordinated by MD Sea Grant began in 2009 and will continue through 2011.</p> <p>Chesapeake Bay jurisdictions continue to follow ASMFC requirements.<br/><a href="http://www.asmfc.org/shadriverherring.htm">http://www.asmfc.org/shadriverherring.htm</a></p>  |
| <p>1.2 A special target-setting task force was charged to “establish measurable restoration targets” for American shad in the Bay. Eight spawning/nursery areas that historically supported substantial recreational and commercial fisheries were used to develop tributary-specific, quantitative recovery targets. The task force recommended that the stock recovery targets proposed for American shad be incorporated into the Alosid management plan.</p> | <p>1.2 The bay jurisdictions will incorporate the shad restoration targets into the revised Alosine FMP</p> | <p>1999</p> <p>2007</p> <p>On-going</p> <p>2010</p> <p>2011</p>         | <p>River specific targets were proposed in 1997, but need to be reevaluated.</p> <p>STAC conducted a workshop on alosine targets during 2001. Recommendations from the workshop will be considered. A target-setting white paper is under development.</p> <p>The CBP shad abundance index was expanded from the Susquehanna River to include the James, York, and Potomac Rivers. The index is based on fish passage on the Susquehanna and James Rivers, commercial bycatch on the Potomac River, and gill net on the York River. For more information:<br/><a href="http://www.chesapeakebay.net/issues/issue/shad">http://www.chesapeakebay.net/issues/issue/shad</a></p> <p>No relationship exists between adult and juvenile shad abundance limiting the usefulness of a JAI. Any relationship that may exist is masked by at-sea mortality.</p> <p><b>The CBP Fisheries GIT recommended that the shad abundance indicator be reevaluated. An ad hoc workgroup has been put together to complete the evaluation and recommend a new shad indicator by the end of 2012/beginning of 2013.</b></p> |

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

| Strategy   | Action   | Date   | Comments   |
|--|--|--|--|
| <p>1.1.1 Removing the moratorium on Maryland American shad will not occur until the stocks of American shad in the upper Bay are fully recovered. Reestablishing a fishery will occur when annual population estimates in the upper Bay increase for three consecutive years and stock size reaches at least 50% of historical levels (approximately 500,000 fish) during one of those three years. Regulations will be established to ensure that initial annual exploitation in the upper Bay does not exceed 10% when the fishery is opened. Stock levels will be determined from an annual stock estimation study and exploitation rates will be established based on recreational and commercial surveys.</p> | <p>1.1.1 American shad abundance in the upper Bay has improved but has not sufficiently recovered to warrant an open fishery. American shad abundance is also low in other Maryland river systems. Maryland will continue the moratorium on American shad in the Chesapeake Bay.</p>                                   | <p>Continue</p> <p>1982</p> <p>1992</p>                                | <p>Shad stocks in the upper Bay initially increased after the moratorium in 1980. American shad spawning adult population size is annually estimated for the Conowingo Dam tailrace but the Upper Bay shad estimates are no longer possible with the loss of a commercial pound net in the Susquehanna Flats. Criteria for reopening the fishery needs to be reevaluated.</p> <p>PRFC has a moratorium on directed shad harvest since 1982.</p> <p>DCFM implemented a moratorium on shad during 1992.</p> <p>Limited hickory and American shad bycatch harvest is allowed from the Potomac River pound net and gill net fisheries.</p> |
| <p>1.1.2 Virginia will follow ASMFC recommendations for a 25% exploitation rate for alosids [<i>sic</i>].</p>  | <p>1.1.2 Virginia will utilize the Virginia Marine Resources Commission's Stock Assessment Program and the fishery surveys of the Virginia Institute of Marine Science to assess current Alosid [<i>sic</i>] exploitation is above the 25% rate, Virginia will take the appropriate steps to limit fishing effort.</p> | <p>1994</p> <p>2005 – 2012</p> <p>Continue</p> <p>2010</p> <p>2012</p> | <p>VA implemented a moratorium on the harvest of American shad and hickory shad from the Bay in 1994.</p> <p>No harvest restrictions on river herring.</p> <p>ASMFC allows a limited American shad commercial bycatch harvest in the James, York, and Rappahannock rivers for the anchored and staked gill net fisheries. VA has an allowable catch for Native American tribe(s).</p> <p>PRFC adopted a moratorium on directed harvest of river herring.</p> <p><b>VA instituted a river herring moratorium January 1, 2012.</b></p>   |
| <p>1.2 Maryland will recommend management of river herring on a system by system basis. Criterion for closing a system to river herring harvest will be based on juvenile indices from 1985 through 1989 and commercial harvests over the last 10 years.</p>   | <p>1.2 River herring harvest will be controlled. Types of management actions which will be considered in the regulation of river herring are as follows:<br/><u>Harvest</u> – Quotas would be a reasonable regulation if the size of the spawning stock in a given year was</p>  | <p>1990 - 2011</p>   | <p>No restrictions were implemented for river herring from 1990-2011.</p> <p>Commercial harvest has been declining due to low market demands and questionable stock status.</p>  |

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

| Strategy   | Action  | Date   | Comments   |
|--|---|--|--|
| Maryland, Pennsylvania and Virginia will recommend that harvest from all systems slated for restoration be regulated or closed. Technical criterion will be submitted to ASMFC for reevaluation of the 0% exploitation rate for river herring in Maryland. In addition, Maryland will control the harvest of river herring by one or a combination of the following harvest limits; harvest season; areal closures; or gear restrictions. Virginia will use similar measures to control harvests of river herring, American shad and hickory shad. | <p>predictable</p> <p><u>Seasons</u> – Setting a season during a segment of the “average” spawning period to regulate exploitation</p> <p><u>Areal closures</u> – Restrict exploitation in those areas where the potential for harvest is greatest such as restricted portions of migratory routes or at migration barriers</p> <p><u>Gear restrictions</u> – Restrict large-volume harvesting by pound nets and/or haul seines</p> | 2012   | <b>Commercial and recreational river herring fisheries in MD and VA do not have an ASMFC approved sustainable fishery plan. These fisheries were closed as of January 1, 2012. All river herring and river herring products imported into MD and VA need to include a bill of lading or commercial invoice.</b>  |
| 1.3 Maryland will continue the moratorium on the fishery for hickory shad and consider opening a recreational fishery when the American shad stocks have recovered.  | 1.3 Management actions and strategies for American shad and hickory shad will not be separated due to the paucity of information available for hickory shad and by nature their similar life history.   | On-going<br><br>2011,<br>Continue                        | MD (1981) and DC (1992) and PRFC (1995) will continue moratorium on hickory shad.<br>- Recent monitoring results suggest hickory shad are rebuilding in the Bay.<br><br>Larval and juvenile hickory shad have been stocked in the Patapsco, Patuxent, Choptank, and Nanticoke rivers. <b>Only the Choptank River was stocked in 2011.</b>  |
| 1.4 Pennsylvania will continue to prohibit the harvest of American shad in the Susquehanna River and its tributaries, and American and hickory shad in the Conowingo Reservoir while restoration efforts are in progress.  | 1.4 As restoration of alosids [ <i>sic</i> ] progresses over dams in the Susquehanna River, additional regulations in Pennsylvania will be promulgated to protect these species until a degree of restoration is achieved   | On-going<br><br>Continue<br><br>2009                     | PA prohibits the harvest of shad in the Susquehanna River watershed.<br><br>The recreational catch and release fishery below Conowingo Dam will continue.<br><br>No Alosa recreational data are available after 2008 because of inadequate sampling.   |
| 2.1 Maryland, Pennsylvania and Virginia will continue to participate in the ongoing ASMFC-coordinated coastal fishery stock identification and ocean landing studies of alosids [ <i>sic</i> ].  | 2.1 Maryland, Pennsylvania and Virginia will participate in the ongoing ASMFC alosid [ <i>sic</i> ] management program, both in Board and Scientific and Statistical Committee activities, with the goal of providing adequate protection to the component of the coastal stock which returns to the Chesapeake Bay to spawn.   | On-going<br><br>1997<br><br>1999<br><br>2010<br><br>2010 | MD, VA, and PRFC participate in the ASMFC shad management board and technical committee.<br><br>ASMFC conducted a stock assessment in 1997.<br><br>In 1999, Amendment 1 to the ASMFC coastal shad plan adopted a strategy to keep fishing mortality below $F_{30}$ .<br><br>ASMFC Amendment 3 changed the American shad mortality threshold to $Z_{30}$ (total mortality).<br><br>American shad and river herring mortality rates have been increasing. Alosa bycatch in Atlantic ocean fisheries are contributors, but data is limited. |

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

| Strategy  | Action  | Date                                 | Comments   |
|---|---|--------------------------------------|--|
|   |   |                                      | <p><b>The ASMFC Management Board will approve the most recent river herring stock assessment in May of 2012.</b></p> <p><b>MAFMC will recommend expanded at-sea observers for squid and mackerel trawl fisheries which also includes alosine bycatch in 2012.</b></p>  |
| <p>2.2 Virginia will follow ASMFC recommendations to reduce shad harvest to a 25% exploitation rate.</p>                                | <p>2.2 A) Implement a coastal shad tagging program to determine which stocks are being exploited in the intercept fishery</p>   | <p>1991-1992</p>                     | <p>Results from the tagging study indicated that the coastal fishery is mixed and highly variable from year to year.</p>   |
|   | <p>2.2 B) Control the coastal intercept fishery through a combination of gear restrictions, seasonal and area closures, and harvest limits</p>  | <p>1993</p> <p>2005<br/>On-going</p> | <p>ASMFC Amendment #1 required a closure of the coastal intercept fishery by December 2004.</p> <p>Moratorium on the harvest of shad from coastal waters as of January 1, 2005.</p>  |
|   | <p>2.2 C) Continue to monitor and document its territorial sea intercept fishery for American shad</p>  | <p>1993</p> <p>2004<br/>On-going</p> | <p>VA is required to monitor coastal commercial harvest.</p>   |
| <p>2.3.1 Virginia will follow ASMFC recommendations to reduce river herring harvest to a 25% exploitation rate.</p>                     | <p>2.3.1 Virginia will control river herring harvest during spawning migrations through gear restrictions and spawning area closures.</p>   | <p>1992</p> <p>On-going</p>          | <p>The harvest of river herring has declined for a number of reasons including a loss of spawning habitat due to dams, commercial fishing and by-catch from the mackerel and squid ocean fisheries.</p> <p><b>This action has been superseded by the 2012 closure of herring fisheries by VA &amp; MD.</b></p>   |
| <p>2.3.2 Maryland and Virginia will ensure that river herring by-catch in the foreign and domestic mackerel fisheries is minimized.</p> | <p>2.3.2 Maryland and Virginia will monitor river herring by-catch through the mid-Atlantic Fishery Management Council and support the following recommendations:<br/>a) The foreign fishery will stay 20 miles offshore.</p> | <p>In effect</p> <p>On-going</p>     | <p>River herring bycatch is being monitored under the MAFMC Squid, Mackerel and Butterfish FMP.</p> <p><b>MAFMC will recommend expanded at-sea observers for squid and mackerel trawl fisheries in 2012.</b></p>   |
|   | <p>2.3.2 b) Maximum by-catch of 1% for river herring in the foreign and domestic mackerel fisheries with a cap on total allowable by-catch.</p>   | <p>In effect</p> <p>On-going</p>     | <p>River herring bycatch is being monitored under the MAFMC Squid, Mackerel and Butterfish FMP.</p>  |
|   | <p>2.3.2 c) Intercept fisheries will be discouraged.</p>  | <p><b>2011</b></p>                   | <p><b>The Mid-Atlantic Fishery Management Council (MAFMC) will submit river herring and shad monitoring and bycatch reduction recommendations to the National Marine Fisheries Service in June 2012. The recommendations will increase monitoring requirements and reduce bycatch for these species caught by trawlers fishing for mackerel and squid in federal waters. Bycatch reduction</b></p> |

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

| Strategy   | Action  | Date   | Comments   |
|--|---|--|--|
|  |   |  | <b>would include a river herring and shad catch cap to be implemented through MAFMC Amendment 14 in 2014.</b>  |
| 3.1 The jurisdictions will collect specific data on alosined species to improve stock assessment databases.                        | 3.1 A) Maryland will continue the alosid [ <i>sic</i> ] juvenile survey and develop an index of stock abundance. Virginia will continue to collect shad and herring juvenile abundance data with the objective of developing a baywide index of abundance for these species. (Currently being implemented) The juvenile index will be used in conjunction with adult stock estimates to trigger regulatory changes and harvest rates. | Continue<br>2009   | VIMS, MD DNR and DCFM have alosine juvenile surveys and calculate indices for each species.<br>- The last several years indicate an increase in juvenile alosines.   |
|  |   | Continue<br><br>2011   | ASMFC Amendment 2 requires river herring JAI surveys. VA & MD continue to provide data to coastal stock assessment<br><br><b>MD is developing alewife and blueback herring JAIs.</b>   |
|  |   | pending  | <b>MD will implement a river herring bycatch monitoring program by 2016.</b>   |
|  |   |  |  |
|  | 3.1 B) Maryland will continue research projects for American shad in the upper Bay and Nanticoke River which provide annual estimates of adult shad. (Currently being implemented)  | Continue<br>Discontinued<br><br>2009<br>Continue<br><br>2011<br><br>2011/2012  | Adult shad project on the Nanticoke River was ended due to a lack of tag returns.<br><br>ASMFC Amendment 2 requires adult river herring spawning/population assessment. The Nanticoke River commercial survey is the current data source for the river herring spawning population assessment. <b>The Nanticoke River commercial survey will continue during the moratorium.</b><br><br><b>A fishery independent survey is being designed to monitor river herring in the upper Chesapeake Bay region.</b> |
|  | 3.1 C) Virginia will improve assessment of current fishing rates on shad stocks in territorial waters and seek to improve catch and effort data through mandatory reporting. (1990)   | 1995<br>Continue   | Commercial landing data has been improved on a coastwide basis with the establishment of ACCSP. Shad are still caught as bycatch (limited).  |
|  | 3.1 D) The VMRC Stock Assessment Program will provide additional fishery dependent data collection for Virginia's shad fisheries (on-going)   | On-going   | Required by the ASMFC.   |
| 3.1 E) Virginia will initiate an ocean intercept tagging program to determine stock composition in the coastal shad fishery (1990) | 1991-1992   | Tagging work completed in 1992.<br>- Results indicated coastal catch is mixed and highly variable.<br>- Other tagging work has been discussed. |  |
| 3.1 F) Maryland will examine the exploitation rates of alewife and blueback herring in selected                                    | 1990<br>On-going  | Mortality rates are calculated for river herring in the Nanticoke River.   |  |

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

| Strategy   | Action  | Date   | Comments  |
|--|---|--|---|
| <p>4.1 The Chesapeake Bay Program’s Fish Passage Workgroup has analyzed the problem of impediments to Alosid [<i>sic</i>] migration and presented its recommendations for acceptance in December 1988. Maryland will develop a multi-faceted program based on the program’s recommendations to restore spawning habitat to</p> | <p>tributaries of the Chesapeake Bay and improve the accuracy and utility of herring landings. (1990)</p>   |  | <p>Exploitation rates for river herring have not been a priority in the past.</p>   |
|  | <p>3.1 G) Virginia will cooperate with research institutes to implement a survey of selected shad and herring spawning grounds, compiling information on basic spawning stock characteristics including relative adult abundance, juvenile abundance, size, age and sex ratios. (Currently being implemented)</p> | <p>1990 Completed</p> <p>2004</p> <p>2009</p> <p>2009 on-going</p> | <p>A map of historic shad and herring spawning areas has been completed.</p> <p>Tributary-specific targets were considered. The FMPC and ad hoc Fish Passage workgroups met to discuss how to address the development of targets. No targets were adopted.</p> <p>A „white paper“ to address the C2K was completed in 2004.</p> <p>CBSAC sponsored a workshop to evaluate different methodologies and recommended a multi-metric approach.</p> <p>ASMFC Amendment 2 requires adult river herring spawning/population assessment.</p>  |
|  | <p>3.1 H) American shad abundance will be investigated in the Potomac River, a system of historic importance, through a joint effort by Maryland, Virginia, and District of Columbia. (1991)</p>  | <p>1991 Continue</p> <p>2011</p> <p>2011</p>                       | <p>DCFM has been sampling the upper Potomac for shad and river herring since 1991.</p> <p>The juvenile survey on the Potomac indicates shad are increasing in abundance especially since 2000. Juvenile shad indices have ranged from 1.05 (2010) to 13/3 (2004).The 2011 JAI was 1.99 (GM)</p> <p>The abundance of juvenile Alosa spp is highly variable and involves density dependent processes that regulate year class strength.</p> <p><b>The PRFC American shad pound net survey indicates that CPUE in the Potomac River is 103% of the ASMFC restoration target.</b></p> |
|  | <p>4.1 The District of Columbia, Maryland, Pennsylvania and Virginia will implement the plan adopted by the Fish Passage Workgroup to remove barriers. Projects include:</p> <p>A) Permanent fish passage facilities are being designed and will be constructed at Conowingo</p>                                  | <p>Variable</p> <p>Completed</p> <p>2011</p>                       | <p>Actions 4.1A - 4.1C, 4.1E, and 4.1G - 4.1I have been completed. Actions 4.1D, 4.1F, and 4.1J – 4.1L are underway.</p> <p>Conowingo Dam East Fish Lift is operational.</p> <p>The last significant blockage in MD for spawning</p>  |



1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

| Strategy  | Action   | Date                       | Comments  |
|---|--|----------------------------|---|
| migratory fishes by removing blockages. Virginia, through its Anadromous Fish Restoration Committee, will develop a comprehensive inventory of dams and other impediments restricting the migration of the shad and river herring to their historical spawning grounds and establish fish passage facilities. The Pennsylvania Fish Commission (PFC) will continue to refine its inventory of low head dams through SRAFRC and continue to promote fish passage at structures on the Susquehanna River tributaries having the potential for Alosid [ <i>sic</i> ] spawning and nursery habitat. Maryland, Virginia, District of Columbia, U.S. Fish and Wildlife Service and Corps of Engineers will continue its work for fish passage at Little Falls and Rock Creek. | Dam at a cost of \$12.5 million. (1989)  |                            | American shad passage is the Conowingo Dam.<br><br>Many blockages to river herring spawning habitat remain.   |
|   | 4.1 B) Design planning and implementation of fishways at Holtwood, Safe Harbor and York Haven dams on the Susquehanna River. (In progress)   | 1986 Completed<br><br>2010 | Fishways have been constructed. Fishway improvements and redesign are implemented to boost fish passage efficiency.<br><br>Holtwood Dam is being renovated to improve upstream passage of Alosa.  |
|   | 4.1 C) A comprehensive inventory of dams and other impediments restricting the migration of shad and river herring to their historical spawning grounds has been completed. (1989) | 1990<br><br>2011/2012      | Action completed.<br><br><b>The Nature Conservancy in conjunction with NOAA, USFWS, MDNR, PA BGC and VGIF is completing a GIS based Chesapeake Fish Passage Prioritization tool that prioritizes dams based on ecologically relevant metrics. The development of the GIS tool is scheduled for completion by Dec. 2012.</b>   |
|   | 4.1 D) Removal of stream blockages, re-stocking efforts, and construction of fish ladders at sites of barriers on priority streams and rivers will begin. (1990)                   | Continue<br><br>2009       | 1,838 miles of Chesapeake Bay stream habitat was reopened in PA, VA, and MD for anadromous fish from 1988 through 2005.<br><br>The revised fish passage goal is now 2,807 miles of steam opened by 2025.<br><br>Between 1986 and 2003, more than 340 million American shad fry and fingerlings were cultured and released in Susquehanna, James, Pamunky, Mattaponi, Rappahannock, Potomac & Choptank rivers. |

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

| Strategy | Action   | Date   | Comments   |
|----------|--|--|--|
|          |  | <p>2010<br/>Continue</p> <p>2010<br/>Continue</p> <p><b>2011/2012</b></p> <p><b>2012</b></p> | <p>Stocking began on the Rappahannock River in 2003.</p> <p>Hickory shad abundance has increased in the Patuxent River and stocking will be discontinued in 2011. Stocking will only continue in the Choptank River as of 2011.</p> <p>MD is only stocking American shad in the Choptank River as of 2011. Patuxent River and Marshyhope Creek are no longer being stocked due to a loss of wild spawning adults.</p> <p><b>Hatchery upgrades are being made to accommodate river herring culture.</b></p> <p><b>Experimental stocking of American shad, hickory shad, and river herring in the Patapsco River will be started in spring 2012 and will be in full operation beginning in 2013.</b></p> |
|          | 4.1 E) A demonstration fish ladder project has been developed with the Chesapeake Bay Foundation and the town of Elkton as an example with public access. (1989)   | Completed  | <p>Elkton dam fishway was built in 1993. Since then, thousands of herring and resident fish have used the fishway to access 12 miles of upstream habitat for spawning, forage, and cover. Fish Passage staff have documented over 7,000 alewife and blueback herring using the fishway (1999). The number of herring using the fishway has significantly decreased since 2005. This is the same time frame for the coast wide decline of both shad and herring.</p> <p>The stream area around the ladder was dredged in 2005 to increase its effectiveness. Periodic dredging will be needed to keep the ladder operating effectively.</p>   |
|          | 4.1 F) A program to reduce turbine mortalities by implementing guidance and avoidance techniques, i.e., use of fish attraction or avoidance devices to guide shad away from turbines to “sluice gate”.(1991) | 2009-2013  | Under consideration during the FERC relicensing for Conowingo and Holtwood dams.   |
|          | 4.1 G) Fish passage facilities on the James and Rappahannock Rivers will be established. (Currently being implemented )  | 1999<br>Completed  | Vertical slot fishway completed at Boshers Dam on the James River, the last in the fall zone of Richmond. This reopened 137 miles of the   |

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

| Strategy | Action  | Date  | Comments   |
|----------|---|---|--|
|          |   | 2005 Completed  | mainstem James and over 150 miles of major tributaries.<br><br>Embrey Dam was removed from the Rappahannock River reopening 106 miles of the Rappahannock and Rapidan rivers.  |
|          | 4.1 H) The recently constructed passage facility on the Chickahominy River at Walker's Dam will be evaluated for its effectiveness. (1990)  | 1989 Completed  | A double Denil fishway on Walkers Dam was rebuilt in 1989 by the City of Newport News to allow passage of migratory fish. Alosa, blueback herring, alewife and American shad have been documented using the fishway.   |
|          | 4.1 I) Fish passage facilities at Little Falls Dam on the Potomac River will restore about 10 miles of spawning habitat and at Rock Creek park will open an additional 5 miles of spawning habitat.   | 2002 Completed  | A hydraulic model study of Little Falls Dam fish passage was completed.  |
|          | 4.1 In addition to the strategies detailed in the Fish Passage Plan, several aspects must be coordinated with the Fishery Management Plan:<br><br>J) Sources of adult fish used for restocking areas will be coordinated with other states and agencies. (1990) | Continue<br><br>Continue                                      | Standardized hatchery-rearing methods in practice.<br><br>All American shad broodstock used by MD, VA, PA, and USFWS are from the Potomac River.   |
|          | 4.1 K) The reintroduction of alosid [ <i>sic</i> ] stocks will require specific regulatory measures to protect the newly-introduced fish until populations have been established.   | Continue<br><br><br><br>2011                                  | Moratorium in place for American and hickory shad.<br><br>Regulations to protect reintroduced herring have not been implemented.<br><br><b>River herring moratorium went into effect on Jan 1, 2012.</b>   |
|          | 4.1 L) Monitoring is essential in gauging the impact of fish passage projects on restoration efforts.   | 1999 Continue<br><br>Continue<br><br>Continue<br><br>Continue | ASMFC Amendment 2 encourages assessment of fishway passage efficiency/inefficiency for river herring.<br><br>Boshers Dam vertical slot fishway is monitored for passage each spring. American shad plus 23 other species are known to use the passage.<br><br>Fishways are monitored on a limited basis as new ladders are constructed.<br><br>A new 10 year fish passage goal will require all new fish passage projects be monitored to ensure |

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

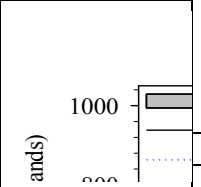
| Strategy  | Action   | Date                                 | Comments  |
|---|--|--------------------------------------|---|
|   |  |                                      | they are passing fish. Fishway efficiency has been difficult to measure.  |
| <p>4.2 Restoration of shad and river herring to suitable unoccupied habitats will be accomplished by introducing hatchery-raised juveniles or transplanting gravid adults. Present policy fully supports the transplantation of adult shad using fish passage facilities at Conowingo Dam under the assumption of reasonable outmigration. However, if outmigration is not obtained, then the effects of transporting adults from the population below the dam needs to be reevaluated.</p> | <p>4.2.1) Maryland and Pennsylvania will continue to work within SRAFRFC's ongoing programs as described in the annual workplan to evaluate methods for ensuring successful downstream passage for juveniles and adults. This will include spill, diversion devices, and bypass systems.</p> | <p>Continue<br/>2002</p> <p>2010</p> | <p>SRAFRFC adopted a new Alosine Management and Restoration Plan for the Susquehanna River Basin in 2002.</p> <p>A revised SRAFRFC Management and Restoration Plan was completed.</p>   |
|   | <p>4.2.2 A) Maryland, Pennsylvania, and Virginia working within SRAFRFC, will promote using Susquehanna River brood stock for hatchery production.</p>   | <p>Continue</p> <p>2002</p>          | <p>PA broodstock are being collected from the Susquehanna River.</p> <p>MD, VA, PA, and USFWS use American shad brood stock collected from the Potomac River. MD discontinued using Susquehanna River brood stock in 2002. USFWS recently discontinued their use. Susquehanna River American shad spawned at MD hatcheries have had poor fertilization rates. The cause has not been determined. Normandeau Associates, Inc. spawns Susquehanna River American shad for stocking in PA.</p> |
|   | <p>4.2.2 B) Virginia will expand funding to the recently constructed Pamunky/Mattaponi Indian Reservation shad hatcheries.</p>   | <p>1993</p>                          | <p>CBP provided limited funds for hatchery work</p>   |
| <p>4.3.1 Technical issues concerning water quality standards for dissolved oxygen and minimum flows in the Susquehanna River below Conowingo Dam have been negotiated.</p>  | <p>4.3.1 The following technical issues have been accepted.</p> <p>A) Adoption of Maryland water quality standard for dissolved oxygen of 5.0 mg/liter in the Susquehanna River below Conowingo Dam (1989)</p>   | <p>Continue</p>                      | <p>Standards were implemented in 1989 and have been monitored ever since. New water quality criteria for living resources have been adopted. During the present (2009) FERC relicensing of Conowingo Dam on the Susquehanna River, Maryland is insisting on establishing sampling protocols for water quality.</p>  |
|   | <p>B) Installation of turbine venting systems and intake air injection capabilities (1991)</p>   | <p>1988 – 1991</p>                   | <p>All 7 Francis turbines now have turbine venting systems and partial intake air injection system.</p>   |
|   | <p>C) Operation of turbines as necessary to meet the D.O. standard (1989)</p>  | <p>Continue</p>                      | <p>Power generation is adjusted as needed.</p>  |
|   | <p>D) Monitored spills as necessary (1989)</p>   | <p>Continue</p>                      | <p>Water releases are closely monitored.</p>  |
|   | <p>E) A schedule of minimum and continuous flows (1989)</p>  | <p>Continue</p>                      | <p>The dam and reservoir are managed to meet required water flows.</p>  |
| <p>4.4 Maryland DNR has proposed new criteria for use in the revised water use classification and water</p>   | <p>4.4 Establish new categories in the water classification system to guide resource management</p>  | <p>2007</p>                          | <p>Maps delineating particular habitats of concern have been utilized for developing water quality</p>  |

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

| Strategy   | Action  | Date   | Comments  |
|--|---|--|---|
| <p>quality standards system setting standards for temperature, dissolved oxygen, pH, amount of suspended solids and a number of “priority pollutants” in anadromous fish spawning areas.</p>   | <p>based on the physical habitat and water quality characteristics. The revised system would define anadromous fish spawning areas as either Class II waters (fresh, nontidal warm water streams, creeks and rivers) or Class III waters (tidal estuarine waters and Chesapeake Bay).</p>   | <p><b>2011</b></p>   | <p>standards.<br/><b>Revised habitat prioritization maps have been completed by CBP.</b></p>  |
| <p>4.5 The District of Columbia, Maryland, Pennsylvania and Virginia will cooperatively evaluate the available scientific data on the effects of impaired water quality on alosids [<i>sic</i>] as a means of developing more effective water quality criteria for spawning and hatching areas and take action now to reduce pollution from several sources.</p> | <p>4.5) The first three action items are commitments under the 1987 Chesapeake Bay Agreement. Maryland DNR, PFC, DC and VMRC will not carry out the specific commitments, but are involved in setting the objectives of the programs to fulfill the commitments and reviewing the results of the action programs. The achievement of these commitments will lead to improved water quality and enhanced biological production.</p> <p>A) Develop and adopt a basinwide plan that will achieve a 40% reduction of nutrients entering the Chesapeake Bay by the year 2000.</p> <ol style="list-style-type: none"> <li>1) Construct public and private sewage facilities.</li> <li>2) Reduce the discharge of untreated or inadequately treated sewage.</li> <li>3) Establish and enforce nutrient and conventional pollutant limitations in regulated discharges.</li> <li>4) Reduce levels of nutrients and other conventional pollutants in runoff from agricultural and forested lands.</li> <li>5) Reduce levels of nutrients and other conventional pollutants in urban runoff.</li> </ol> | <p>On-going<br/>Variable</p> <p>May 2009</p> <p>2010</p> <p>2010</p> | <p>Chesapeake Bay Program develops, revises, and monitors goals and strategies for air pollution. For more information:<br/> <a href="http://www.chesapeakebay.net/issues/issue/nutrients">http://www.chesapeakebay.net/issues/issue/nutrients</a><br/> <a href="http://www.chesapeakebay.net/issues/issue/wastewater">http://www.chesapeakebay.net/issues/issue/wastewater</a><br/> <a href="http://www.chesapeakebay.net/issues/issue/sediment">http://www.chesapeakebay.net/issues/issue/sediment</a><br/> <a href="http://www.chesapeakebay.net/issues/issue/stormwater_runoff">http://www.chesapeakebay.net/issues/issue/stormwater_runoff</a><br/> <a href="http://www.chesapeakebay.net/issues/issue/development">http://www.chesapeakebay.net/issues/issue/development</a></p> <p>New commitments were established in the new Chesapeake 2000 Agreement. Of particular importance to Alosines will be the assessment of priority migratory species populations and the development of tributary-specific target.</p> <p>STAC sponsored a workshop during 2001 to address targeting efforts. A document to address the targets is under development.</p> <p>An executive order by President Barack Obama required federal agencies to increase cooperation and leadership, coordinate with state and local government, and enforcement of the clean water act by EPA.</p> <p>EPA is mandating restoration criteria and actions for Chesapeake Bay States.<br/>                     - EPA has developed a Chesapeake Bay watershed TMDL.<br/>                     - States must have plans approved by EPA or face possible fines or other sanctions.</p> |
|  | <p>4.5 B) Develop and adopt a basinwide plan for the</p>  | <p>On-going</p>  | <p>Chesapeake Bay Program develops, revises, and</p>  |

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012)

| Strategy | Action   | Date     | Comments  |
|----------|--|----------|---|
|          | reduction and control of toxic materials entering the Chesapeake Bay system from point and nonpoint sources and from bottom sediments.<br>1) Reduce discharge of metals and organic compounds from sewage treatment plants receiving industrial wastewater.<br>2) Reduce the discharge of metals and organic compounds from industrial sources.<br>3) Reduce levels of metals and organic compounds in urban and agriculture runoff.<br>4) Reduce chlorine discharges to critical finfish areas.   |          | monitors goals and strategies for air pollution. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/chemical_contaminants">http://www.chesapeakebay.net/issues/issue/chemical_contaminants</a>   |
|          | 4.5 C) Develop and adopt a basinwide plan for the management of conventional pollutants entering the Chesapeake Bay from point and nonpoint sources.<br>1) Manage sewage sludge, dredge spoil and hazardous wastes.<br>2) Improve dissolved oxygen concentrations in the Chesapeake Bay through the reduction of nutrients from both point and nonpoint sources.<br>3) Continue study of the impacts of acidic conditions on water quality.<br>4) Manage groundwater to protect the water quality of the Chesapeake Bay.<br>5) Continue research to refine strategies to reduce point and nonpoint sources of nutrient, toxic and conventional pollutants in the Chesapeake Bay.   | 2011     | <p><b>Some Alosa spawning reaches appear to be sand and gravel deficient and may impair egg survival. MD DNR and USACE are studying sand and gravel transport at the Simkins Dam removal site (Patapsco River) as well as possible negative effects of accumulated sand and gravel behind blockages.</b></p> <p>MD DNR Fisheries Service is researching spawning and hatching success with associated habitat and watershed conditions.</p> |
|          | 4.5 D) Develop and adopt a plan for continued research and monitoring of the impacts and causes of acidic atmosphere deposition into the Chesapeake Bay. This plan is complimented by Maryland's research and monitoring program on the sources, effects, and control of acid deposition as defined by Natural Resources Article Title 3, Subtitle 3A, (Acid Deposition: Sections 3-3A-01 through 3-3A-04).<br>1) Determine the relative contributions to acidic deposition from various sources of acid deposition precursor emissions and identify any regional variability.<br>2) Assess the consequences of the environmental impacts of acid deposition on water quality.<br>3) Identify and evaluate the effectiveness and | On-going | Chesapeake Bay Program develops, revises, and monitors goals and strategies for air pollution. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/air_pollution">http://www.chesapeakebay.net/issues/issue/air_pollution</a>   |



| 1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 7/2012) |   |      |          |
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| Strategy   | Action  | Date | Comments |
|  | economic costs of technologies and non-control mitigative techniques that are feasible to control acid deposition into the Bay. |      |          |

**Acronyms:**

- ACCSP – Atlantic Coastal Cooperative Statistics Program
- ASMFC – Atlantic States Marine Fisheries Commission
- C2K – Chesapeake 2000 Agreement
- CBP - Chesapeake Bay Program
- CBSAC – Chesapeake Bay Stock Assessment Committee
- DCFM – District of Columbia Fisheries Management
- EBFMP – Ecosystem Based Fisheries Management
- FERC – Federal Energy Regulatory Commission
- FMP - Fishery Management Plan
- FMPC – Fisheries Management Planning and Coordination
- GIS – Geographic Information System
- GM – Geometric Mean
- JAI – Juvenile Abundance Index
- MAFMC – Mid-Atlantic Fisheries Management Council
- MD DNR – Maryland Department of Natural Resources
- PRFC – Potomac River Fisheries Commission
- SRAFRC – Susquehanna River Anadromous Fish Restoration Committee
- STAC - Chesapeake Bay Program, Scientific and Technical Advisory Committee
- USACE – United States Army Corps of Engineers
- VIMS – Virginia Institute of Marine Science
- VMRC – Virginia Marine Resource Commission



## 2011 Maryland FMP Report (July 2012)

### Section 3. Atlantic croaker (*Micropogonias undulatus*) and Spot (*Leiostomus xanthurus*)

#### Chesapeake Bay FMP

Atlantic croaker and spot are among the most reliable catches for anglers fishing near the bottom within the mid to lower portions of the Chesapeake Bay. The use of circle hooks to reduce recreational discard mortality is encouraged. The Chesapeake Bay Atlantic Croaker and Spot Fishery Management Plan (FMP) was adopted in 1991. The FMP goal is to: "Protect the Atlantic croaker and spot resource in the Chesapeake Bay, its tributaries, and coastal waters, while providing the greatest long term ecological, economic, and social benefits from their usage over time." To accomplish this goal, management strategies were developed to prohibit the harvest of small fish, mostly under age 1, and to recommend monitoring and research programs for stock assessments and habitat needs.

The Atlantic States Marine Fisheries Commission (ASMFC) adopted coastal FMPs for each species in 1987. The main purpose of the plans was to decrease the number of small fish caught as bycatch in the coastal shrimp trawl fishery. Bycatch reduction devices were required and have successfully reduced the number of small fish caught in the trawl fishery. There are currently no interstate requirements for Atlantic croaker.

**Atlantic croaker** - Biological reference points (BRPs) for croaker were established for the mid-Atlantic region in 2005. The BRPs were revised in 2011 (Addendum 1) following the 2010 ASMFC stock assessment and now apply to the entire Atlantic coastal stock<sup>1</sup>. The BRPs define overfishing and set targets for spawning stock biomass and fishing mortality. The BRPs are ratio-based. If  $F/F_{MSY} > 1$ , overfishing is occurring. If  $SSB / (0.70 * SSB_{MSY}) < 1$ , the coastal stock is overfished. The 2011 ASMFC Atlantic Stock Assessment Technical Committee evaluated the stock assessment triggers in 2011 and found no evidence to activate the triggers<sup>1</sup>. The ASMFC Atlantic croaker plan review team accepted the 2010 review of the FMP in August, 2011<sup>2</sup>.

Maryland is required to complete an annual Atlantic croaker compliance report for ASMFC. This report describes the fishery, management program for Atlantic croaker, including fishery dependent and independent monitoring, regulations, commercial harvest reports and recreational catch estimates<sup>3</sup>. Juvenile indices (seine and trawl) have been calculated for every year since 1959.

**Atlantic croaker Stock Status** – According to the 2010 benchmark assessment<sup>4</sup>, overfishing is not occurring but the overfished status could not be determined due to data limitations. Atlantic croaker is considered a single stock along the entire Atlantic Coast. Monitoring data from Maryland's portion of the Chesapeake Bay

indicate a broad and stable size and age structure. The strong 2008 year-class fully recruited into the fishery in 2011<sup>4</sup>.

#### The Fisheries

Figure 1. Maryland commercial landings of Atlantic croaker, 1929-2011, with mean line (2011 landings preliminary; NMFS and Maryland DNR<sup>3</sup>).

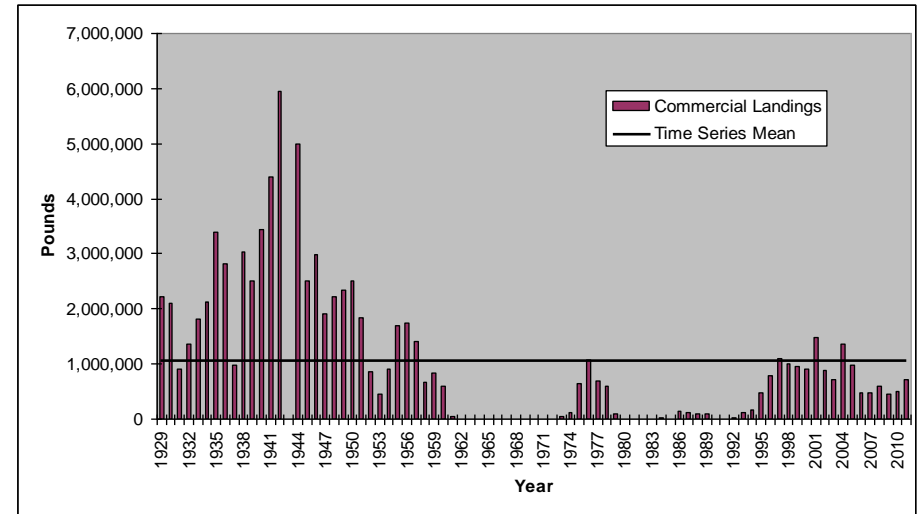


Figure 2. Maryland recreational harvest and release estimates for Atlantic croaker, 1981-2011<sup>8</sup>. (Marine Recreational Information Program, MRIP data)

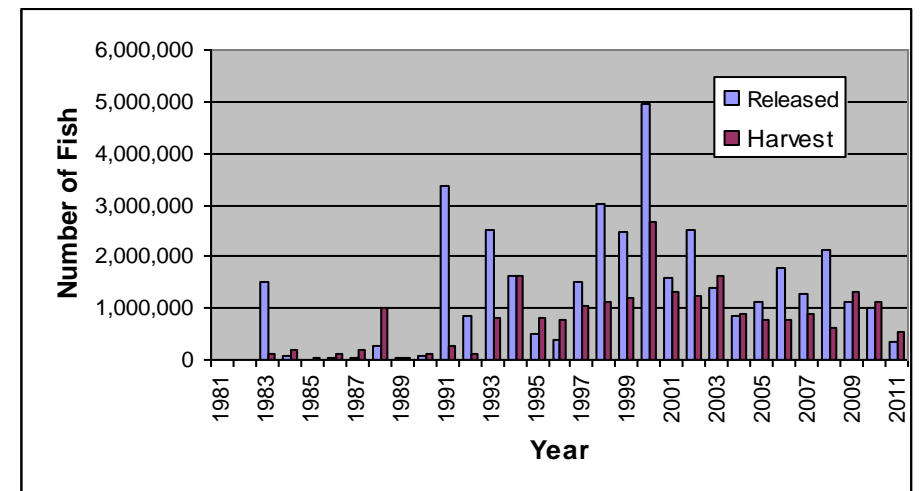


Figure 3. Virginia commercial landings of Atlantic croaker, 1950-2010<sup>7</sup>

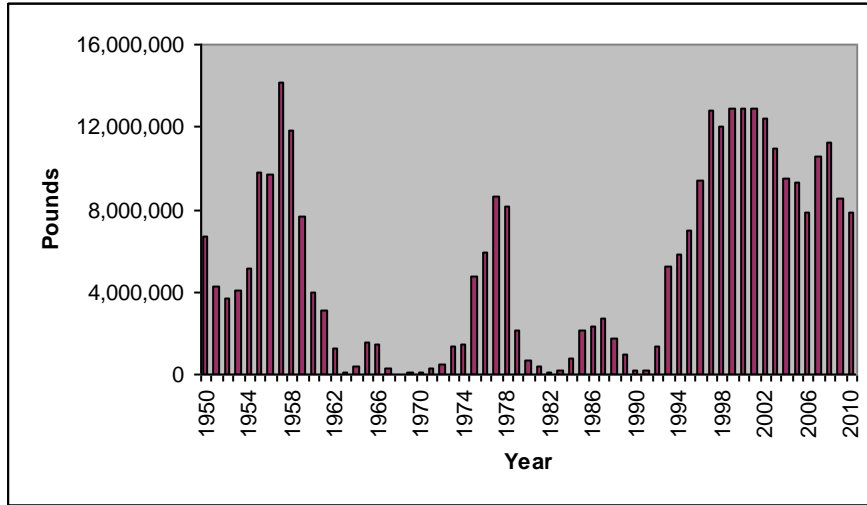
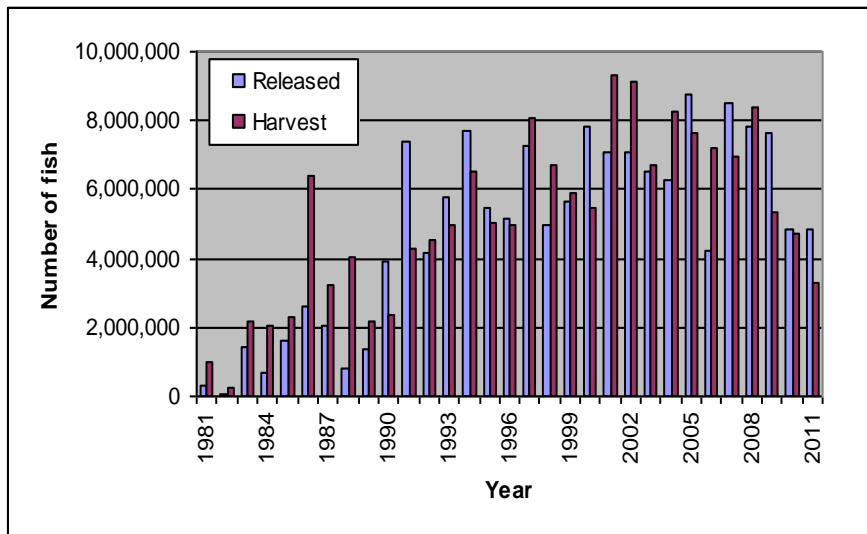


Figure 4. Virginia recreational Atlantic croaker harvest and release estimates, 1981-2011<sup>8</sup>



**Spot** - Maryland is a member of the ASMFC Spot Plan Review Team (PRT) and has prepared a status report to the PRT<sup>5</sup>. The ASMFC South Atlantic State-Federal Fisheries Management Board approved the omnibus amendment for Spanish mackerel, spot and spotted seatrout<sup>6</sup>. A management trigger for spot is included in the recently approved omnibus amendment and will help the ASMFC Management Board monitor the status of the stock until a full coastwide stock assessment can be completed.

**Spot Stock Status**— Overfishing and overfished status remain unknown. Catch per unit effort (CPUE) data have been used to evaluate the status of spot. CPUE values are highly variable and differ by gear type. There is some concern that there is a declining trend. Four juvenile indices (JI) are calculated in an evaluation of the status of spot in Maryland. For the Chesapeake Bay, a JI is calculated for spot from the MD DNR Blue Crab Trawl Survey (BCS) and another from the Striped Bass Juvenile Seine Survey (JSS). In addition to the Chesapeake Bay JIs, two coastal bay JIs are derived from trawl and seine data. These indices are highly variable. Chesapeake Bay juvenile indices indicated a very strong 2010 year class but all four 2011 JIs were very low. The spot index derived from the JSS JI was the lowest since 1967.

Figure 5. Maryland and Virginia commercial landings of spot, 1981-2010<sup>7</sup>.

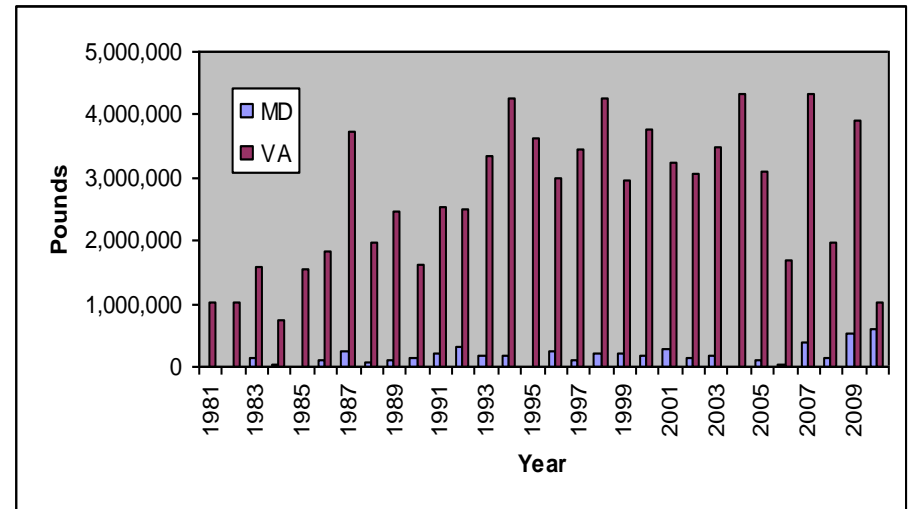
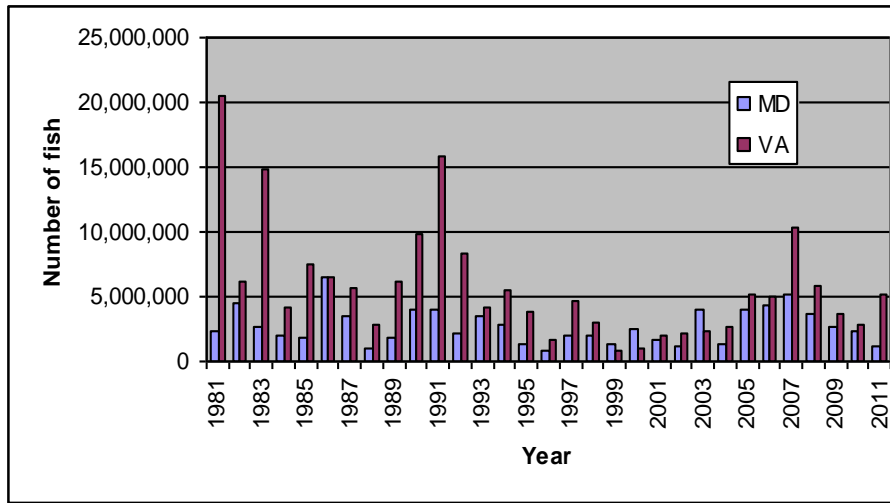


Figure 6. Maryland recreational spot harvest estimates, 1981-2011<sup>8</sup>



### Management Measures

There are currently no management measures required by ASMFC to restrict the commercial or recreational fisheries for either croaker or spot. The recently approved omnibus amendment requires no additional management criteria<sup>6</sup>. The omnibus amendment does not implement biological reference points to define if overfishing is occurring or if the stocks are being fished at target levels<sup>6</sup>. The coastal states are required to compile commercial and recreational harvest statistics and monitoring data. Maryland has a recreational minimum size limit of 9 inches for croaker and a creel limit of 25 fish per person per day. There is a commercial season from March through December and a 9 inch minimum size limit. There are no harvest restrictions for spot. Annual spot compliance reports are due November 1 to ASMFC starting in, 2012<sup>6</sup>.

### Issues/Concerns

Continued monitoring of the commercial and recreational harvest of both croaker and spot is important in order to obtain data for conducting stock assessments and evaluating the status of the stock. Both species are caught indirectly and together during other fishing activities and bycatch mortality is a continued concern. Small spot, for example, could account for as much as 80% of the shrimp trawl catch by weight and 60% by number, depending on area<sup>9</sup>. States are encouraged to use BRDs to reduce bycatch.

A winter kill estimated at two million juvenile spot occurred in late December 2010 and was associated with a sudden cold snap. The consequences of this winter kill are unknown.

Spot and croaker are important prey items for predators such as spotted seatrout, red drum, striped bass, marine mammals and many bird species. Their importance as prey and their dependence on coastal estuaries for juvenile habitat make them a consideration in ecosystem management. With increasing temperatures due to climate change, croaker are predicted to expand their distribution northward.

Atlantic croaker survival to adulthood may benefit from increased temperatures due to climate change. A coupled climate change-population model has forecast both increased northern distribution and a 60-100% increase in average spawning biomass at current levels of fishing<sup>10</sup>.

### References:

- <sup>1</sup> Annual Review of Assessment Triggers, 2011. Atlantic States Marine Fisheries Commission Atlantic Croaker Technical Committee.
- <sup>2</sup> 2011 Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for Atlantic Croaker (*Micropogonias undulatus*) 2010 Fishing Year. Accepted August 2011.
- <sup>3</sup> Rickabaugh, H., Jr. 2012. Maryland Atlantic Croaker (*Micropogonias undulatus*) Compliance Report to the Atlantic States Marine Fisheries Commission – 2011. Maryland Department of Natural Resources Fisheries Service June 2012.
- <sup>4</sup> ASMFC. 2010. Atlantic Croaker 2010 Benchmark Stock Assessment. Washington DC.
- <sup>5</sup> Rickabaugh, H. and K. Capossela. 2011. Evaluation of the Status of Spot in Maryland – 2010. Maryland DNR Fisheries Service doc. 6-23-2011.
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- <sup>8</sup> Personal communication from the National Marine Fisheries Service, Recreational Fisheries Statistics Division June 14, 2012.
- <sup>9</sup> Peuser, R (editor). 1996. Estimates of finfish bycatch in the south Atlantic shrimp fishery. Final Report of the SEAMAP-South Atlantic Committee: Shrimp Bycatch Work Group. Washington DC: Atlantic States Marine Fisheries Commission.
- <sup>10</sup> Hare, J.A., M.A. Alexander, M.J. Fogarty, E.H. Williams, and J.D. Scott. 2010. Forecasting the dynamics of a coastal fishery species using a coupled climate-population model. Ecol. Appl. 20(2):452-464.

**1991 Chesapeake Bay Program Atlantic Croaker and Spot Fishery Management Plan Implementation** (updated 06/12)

| Problem Area  | Action   | Date  | Comments  |
|---|--|---|---|
| <p><b>Stock Status</b><br/>Annual abundance of Atlantic croaker and spot is highly variable from year-to-year. Little information is available on the causes of stock fluctuations.</p> | <p>Action 1.1<br/>CBP jurisdictions will continue to participate in scientific and technical meetings for managing Atlantic croaker and spot along the Atlantic coast and in estuarine waters.</p> | <p>2005<br/><br/>2009<br/><br/><br/><br/><br/><br/><br/><br/><br/><br/>Continue</p> | <p>CBP jurisdictions will continue to monitor Atlantic croaker and spot stocks and cooperate with the ASMFC to manage stocks through inter-jurisdictional management measures. BRPs were adopted for the coastal croaker stock in 2005 <b>and updated in 2010</b>. Current estimates of F and SSB indicate that the croaker stock is healthy and overfishing is not occurring (ASMFC 2010). The status of the coastal spot stock is undeterminable. No stock assessment has been completed and available data indicate contradictory trends. The ASMFC Spot PRT has been monitoring stock status through reports to the South Atlantic Management Board, including development of management triggers. <b>Data from the MD Chesapeake Bay Seine Survey is one of five state and regional indices considered for triggering management The omnibus amendment’s adaptive management section allows states to implement management changes more quickly. Spot compliance reports are now due to ASMFC annually starting in 2012.</b></p> |
|   | <p>Action 1.2.1<br/>A) MD and the PRFC have a minimum size limit for Atlantic croaker.<br/>B) VA does not have a minimum size limit for Atlantic croaker.</p>                                      | <p>Continue<br/><br/>1993</p>   | <p>CBP jurisdictions will promote the increase in yield per recruit for the Atlantic Croaker and spot fisheries. MD has a 9” minimum size limit for the recreational and commercial fisheries. MD &amp; PRFC also have a 25 fish/person/day creel limit. MD has an open commercial season from March thru December. VA does not have any restrictions.</p>  |
|   | <p>Action 1.2.2<br/>CBP jurisdictions will evaluate the need to implement a minimum size limit for spot.</p>   | <p>1992<br/>2009</p>  | <p>No recommendations have been made. There is some concern over declining juvenile abundance. Georgia is the only coastal state with a size limit (8”). The ASMFC <b>omnibus amendment, approved in 2011, requires no additional management criteria but recommends implementation of conservation measures when triggered.</b></p>  |

| <b>1991 Chesapeake Bay Program Atlantic Croaker and Spot Fishery Management Plan Implementation</b> (updated 06/12)  |  |  |  |
|--|--|--|--|
| <b>Problem Area</b>  | <b>Action</b>  | <b>Date</b>  | <b>Comments</b>  |
| <b>Harvest of Small Croaker and Spot</b><br>Incidental bycatch and discard mortality of small croaker and spot in non-directed fisheries is substantial and has the potential to significantly impact croaker and spot stocks. | Action 2.1<br>A) Through the ASMFC, the jurisdictions will promote the development and use of trawl efficiency devices (TEDs) in the southern shrimp fishery and promote the use bycatch reduction devices (BRDs) in the finfish trawl fishery.<br>B) Virginia will continue its prohibition on trawling in state waters. Virginia will maintain its 2 <sup>7</sup> / <sub>8</sub> inch minimum mesh size for gill nets<br>C) Maryland will continue its 4-6 inch gill net restriction during June 15 through September 30 and implement a 3 inch minimum mesh size along the coast.<br>D) PRFC will continue its prohibition on gill net fishing in the summer. | Continue<br><br>Continue<br><br>1992<br><br>Continue | Commercial trawling is prohibited within the Chesapeake Bay in both MD and VA. The 2004 Croaker Stock Assessment indicated that the coastal states have been successful at reducing mortality on age 1 fish. The commercial & recreational catch-at-age data showed an increasing age distribution with a few croaker at age 12. The stock assessment analyses indicated that the shrimp bycatch estimates are important to consider in the calculations but there needs a more comprehensive evaluation. <b>ASMFC encourages states to use bycatch reduction devices (BRDs). MD currently allows attended gill nets with a stretched mesh size of 3 1/8 to 3 1/2 inches from January 1 through March 15 and 2 1/2 to 3 1/2 inches between March 16 and December 31 in the Chesapeake Bay and tributaries, with location restrictions during striped bass spawning seasons. The minimum stretched gill net mesh size in MD waters is 2 1/2 inches.</b> |
|  | Action 2.1.2<br>CBP jurisdictions will investigate the magnitude of the bycatch problem and consider implementing bycatch restrictions for the non-directed fisheries in the Bay   | 1992<br><br>On-going                                 |  |
| <b>Research and Monitoring Needs</b><br>There is a lack of stock assessment data for both Atlantic croaker and spot stocks in the Chesapeake Bay.  | Action 3.1<br>VMRC stock assessment program will continue to analyze size and sex data from Atlantic croaker and spot collected from the VA commercial fishery.  | Continue   | The amount of data available for croaker changed and provided the basis for the 2003/2004 coastal stock assessment. The 2010 ASMFC coastal stock assessment update (benchmark) concluded that the coastal Atlantic croaker population is a single stock. Addendum 1 to the ASMFC FMP changed the management unit to a single stock and modified the BRPs. Stock assessment data for Atlantic croaker and spot is collected from the MD Juvenile Striped Bass Survey, and VIMS Juvenile Abundance Surveys (formerly known as the VIMS Trawl Survey and the VIMS Juvenile Seine Survey), NEAMAP and ChesMMAP.  |

| <b>1991 Chesapeake Bay Program Atlantic Croaker and Spot Fishery Management Plan Implementation</b> (updated 06/12)   |  |   |   |
|---|--|---|---|
| <b>Problem Area</b>   | <b>Action</b>  | <b>Date</b>                                 | <b>Comments</b>   |
|   | <p>Action 3.2</p> <p>A) MD and PRFC will encourage research to collect data on croaker and spot biology, especially estimates of population abundance, recruitment, and reproductive biology.</p> <p>B) VA will continue to fund its stock assessment research conducted by the conducted by VIMS and ODU, specifically designed to provide the estimates of population abundance, recruitment, and reproductive biology.</p>  | <p>Continue</p> <p>Continue</p>             | <p>An Atlantic Croaker Ageing Workshop was held in October 2008 and resulted in a standardized ageing procedure. High priority research &amp; monitoring recommendations include: determining migratory patterns; collecting life history information; evaluating bycatch and discard practices; and examining reproductive strategies. Spot up to age 3 are regularly represented in the commercial fishery. <b>Commercial catch-at-age data has contracted the last several years. Length-at-age and Weight-at-age have decreased for ages 1-3.</b> Spot age 4 to 6 years are not seen every year and when present, only account for a small percentage of harvest. <b>Recommendations for spot in the 2011 omnibus amendment include: monitoring data and gear studies on discards from the shrimp fisheries, recreational and commercial fisheries; expanding sampling; assessing BRDs; continuing development of fishery-dependent and fishery-independent size and sex specific relative abundance estimates; evaluating juvenile indices to predict year class strength; improving catch and effort statistics; and developing stock assessment analyses such as a yield-per-recruit analysis and determining the onshore vs offshore components of the fishery.</b></p> |
| <p><b>Habitat and Water Quality Issues</b></p> <p>Habitat alteration and water quality impact the distribution of finfish species in the Chesapeake Bay</p> | <p>Action 4.1</p> <p>CBP jurisdictions will continue to set specific objectives for water quality goals and review management programs established under the 1987 Chesapeake Bay Agreement. The Agreement and documents developed pursuant to the Agreement call for:</p> <p>A) Developing habitat requirements and water quality goals for various finfish species.</p> <p>B) Developing and adopting basinwide nutrient reduction strategies.</p> <p>C) Developing and Adopting basinwide plans for the reduction and control of toxic substances.</p> <p>D) Developing and adopting basinwide management measures for conventional pollutants entering the Bay from point source and non-point sources.</p> <p>E) Quantifying the impacts and identifying the sources of atmospheric inputs on the Bay system.</p> <p>F) Developing management strategies to protect and restore wetlands and submerged aquatic vegetation (SAV).</p> <p>G) Managing population growth to minimize adverse impacts to the Bay environment</p> | <p>Continue</p> <p>2000</p> <p>on-going</p> | <p>Water quality and living resource commitments were updated and renewed in the Chesapeake Bay 2000 Agreement. These activities include the discharge of toxic pollutants or excessive nutrients into the Chesapeake Bay and its tributaries, interruption or changes in water discharge patterns, deposition of solid waste, sewage sludge or industrial waste into the Bay (which may lead to anoxic conditions), rapid coastal development, unregulated agricultural practices, net coastal wetland loss or the dredging of contaminated sub-aqueous soils. Based on the most recent available data, scientists project that 58% of the pollution reduction efforts needed to achieve the Bay restoration goals have been implemented since 1985. Excess nitrogen, phosphorus and sediment are the major pollutants. The greatest challenge to achieving restoration is population growth and development which destroys forests, wetlands and other natural areas. Habitat and water quality objectives and actions were delineated in the President's Executive Order and provide more current strategies for managing resources in the Chesapeake Bay. <b>Estuaries are designated as Habitat Areas of Particular Concern (HAPC) for spot.</b></p>                       |

**Acronyms:**

ASMFC = Atlantic States Marine Fisheries Commission;

BRPs = Biological Reference Points

CHESFIMS = Chesapeake Bay Fishery Independent Multispecies Fisheries Survey

ChesMMAP = Chesapeake Bay Multispecies Monitoring and Assessment Program;

CBP = Chesapeake Bay Program

FMP = Fishery Management Plan;

ODU = Old Dominion University;

PRFC = Potomac River Fisheries Commission

PRT = Plan Review Team

VIMS = Virginia Institute of Marine Science



## 2011 Maryland FMP Report (July 2012)

### Section 4. Atlantic Menhaden (*Brevoortia tyrannus*)

New biological reference points were adopted for the coastal Atlantic menhaden stock in 2011. Currently, the stock is not overfished but overfishing is occurring. The stock has experienced overfishing in 32 of the last 54 years (Figure 1). The Atlantic States Marine Fisheries Commission (ASMFC) is currently developing actions to address the overfishing status.

A coastal Atlantic menhaden fishery management plan (FMP) was developed by the Atlantic States Marine Fisheries Commission (ASMFC) in 1981. Subsequently, the plan was revised in 1992 and the stock is currently managed under Amendment I (2001) and several addendums (2004, 2005, 2006, 2009). Since the 2009 coastal stock assessment was updated and revised in 2010, new biological reference points were developed and adopted in ASMFC Addendum V (2011). The goal of Addendum V is to increase abundance, to increase spawning stock biomass, and to increase menhaden availability as forage. The new threshold and target equate to a maximum spawning potential (MSP) of 15% and 30%, respectively. The Board has initiated the development of Amendment 2 to establish management measures to implement the new fishing mortality reference points. A series of options to reduce harvest will be identified in the draft amendment scheduled for completion by the end of 2012 (implementation in 2013).

The first step in the development of Amendment 2 has been completed. A Public Information Document (PID) was compiled which contained preliminary discussions on biological, environmental, social, and economic information, fishery issues, and potential management options for action. A Draft PID was presented to the Board at the Commission's Winter Meeting in February 2012. The PID provided an opportunity for public input on changes observed in the fisheries; actions that should or should not be taken in terms of management, regulation, enforcement, and research. The PID's primary focus was to initiate discussion on the timing and implementation of achieving the new fishing mortality threshold ( $F = 1.32$ ) and target ( $F = 0.62$ ) reference points adopted through Addendum V. The PID also solicited public input on a more timely and comprehensive catch reporting system, and scoped the potential options to be used in managing the Atlantic menhaden commercial bait and reduction fisheries as well as the recreational fishery. The public comment on the PID closed in April. For additional information on the current status of Amendment 2, go to the ASMFC website <http://www.asmfc.org/>

In addition to developing a new amendment, ASMFC has placed a high priority on developing ecosystem-based reference points to address the forage needs of predator species. However, this is expected to take several years to develop. Menhaden are important prey for striped bass, weakfish and bluefish.

There is no Chesapeake Bay fishery management plan (FMP) for Atlantic menhaden. Menhaden was one of the species slated for the development of an ecosystem-based fishery management plan (EBFMP). Maryland Sea Grant facilitated the EBFM process and developed biological briefs on key ecosystem topics for menhaden in Chesapeake Bay. More information on the EBFM process and the completed menhaden briefs can be found at the following website address:

<http://www.mdsg.umd.edu/programs/policy/ebfm>.

#### Stock Status

Biological reference points (BRPs) were established in ASMFC Amendment 1 and updated in 2004. A benchmark assessment was conducted during 2009, peer reviewed, and released in 2010. The assessment included two new components: a factor for aging error and natural mortality rates that varied with age and time of year. The assessment was updated with data from 2009 through 2011. The results indicate that fishing mortality rates have been above the new BRPs. Although there is considerable uncertainty associated with the calculated rates, it was concluded that overfishing is occurring but the stock is not overfished.

Other indicators of stock status especially recruitment indices (Figure 2) supported the need for new BRPs. In Maryland, juvenile menhaden are sampled annually through the Juvenile Finfish Seine Survey. The index of juvenile menhaden has been low since 1992. The new BRPs are expected to protect the spawning stock and to take into account the needs of top predators. The development of new management actions and reduced harvest should contribute to improved recruitment.

#### Management Measures

There were no changes in monitoring programs or regulations for menhaden in Maryland during 2011. Purse seining, the predominant gear type for harvesting menhaden, is not allowed in the Maryland portion of the Chesapeake Bay. However, menhaden are harvested from pound nets for the bait fishery. Virginia allows purse seining in the lower bay. Omega Protein has a menhaden reduction plant in Reedville, Virginia, which is the only active menhaden reduction factory on the Atlantic coast. ASMFC Addendum II (2006) established a harvest cap (109,020 metric tons) for the reduction fishery in Chesapeake Bay. If harvest is less than the cap, there is the flexibility to capture additional fish the following year but not over 122,740 metric tons. The cap was originally in place until 2010 but was extended to 2013. With the development of new BRPs, harvest will need to be reduced and the cap on Virginia's harvest will be evaluated.

#### The Fishery

Maryland commercial fishermen harvested 6.76 million pounds of menhaden in 2011 (Figure 3). Virginia commercial fishermen harvested 433.24 million pounds in 2010 (Figure 4). The total harvest for Virginia includes Chesapeake Bay and Atlantic coast landings. Reported Virginia landings from the Chesapeake Bay for 2010 was 187.39 million pounds or 85,000 metric tons, which was below the 2010 harvest cap of

122,740 metric tons. The harvest cap for 2011 was set at the maximum level allowed. Although there is a cap on the purse seine harvest from the Chesapeake Bay, the cap has not been reached since it was implemented in 2006.

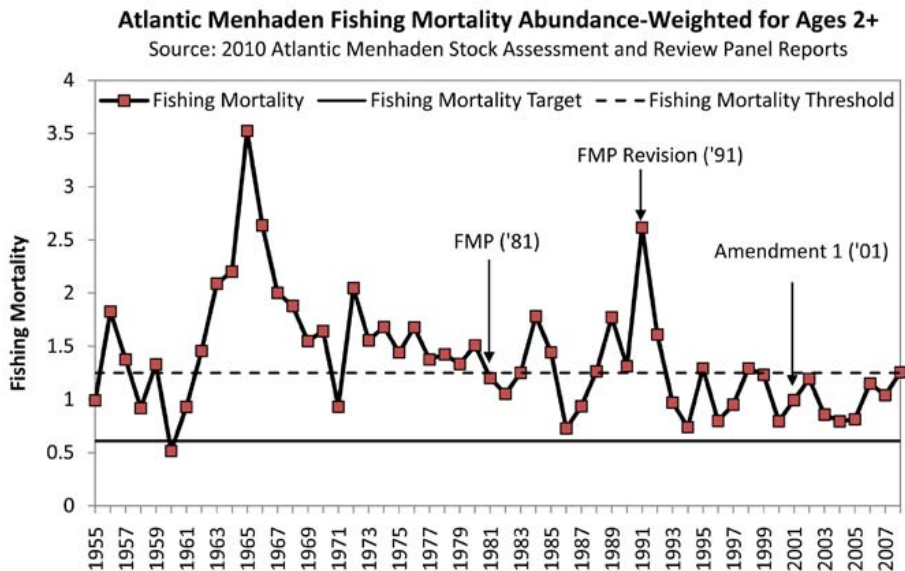
Biological monitoring from the Maryland pound net (bait) fishery indicated that the majority of harvested menhaden were age 1 and age 2 fish (69%). Only about 2% of the fish were age 5 and older.

**Issues/Concerns**

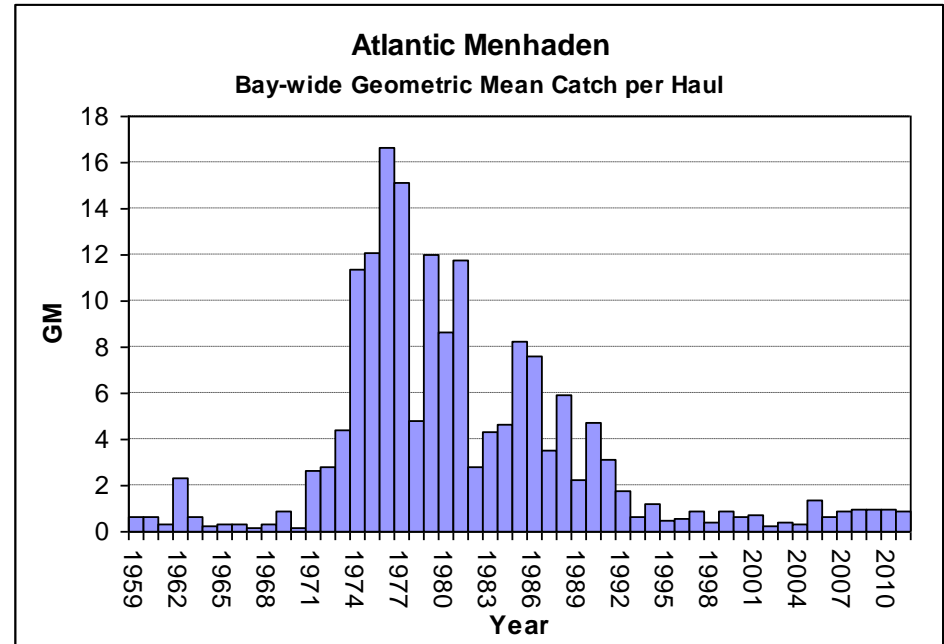
Menhaden have a unique role in the Chesapeake Bay ecosystem as both a primary filter-feeder and an important forage species for top predators (striped bass, bluefish, osprey, etc). The development of ecosystem-based biological reference points would be useful for managing the stock. Menhaden support a major commercial fishery and are the Bay’s largest fishery by weight. Consequently, they also are an economically important species.

Two ways to improve the menhaden stock assessments (and recommended by ASMFC) are the development of a coastwide fishery-independent survey to assess adult abundance at age and better estimates of natural mortality by age class.

**Figure 1.**

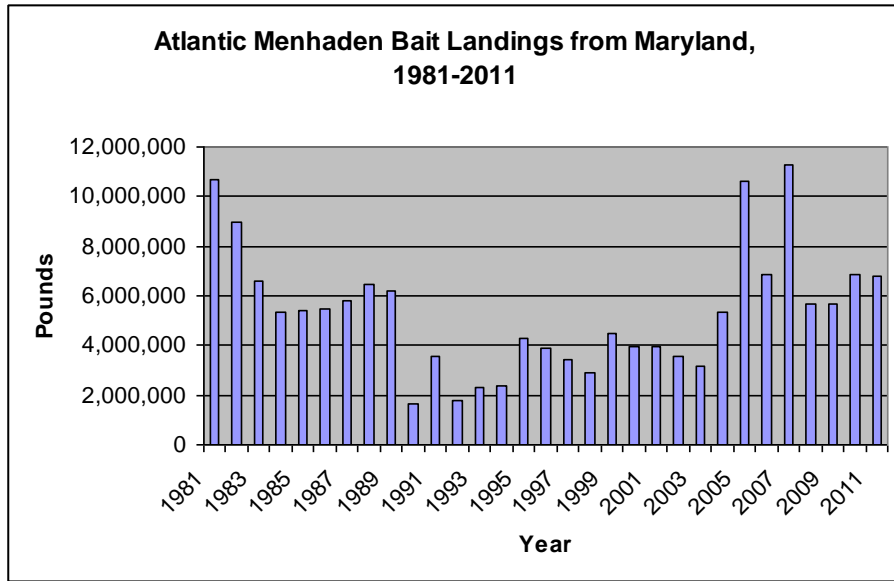


**Figure 2.** Geometric mean catch per haul of menhaden juveniles in the Maryland portion of the Chesapeake Bay, 1959-2011



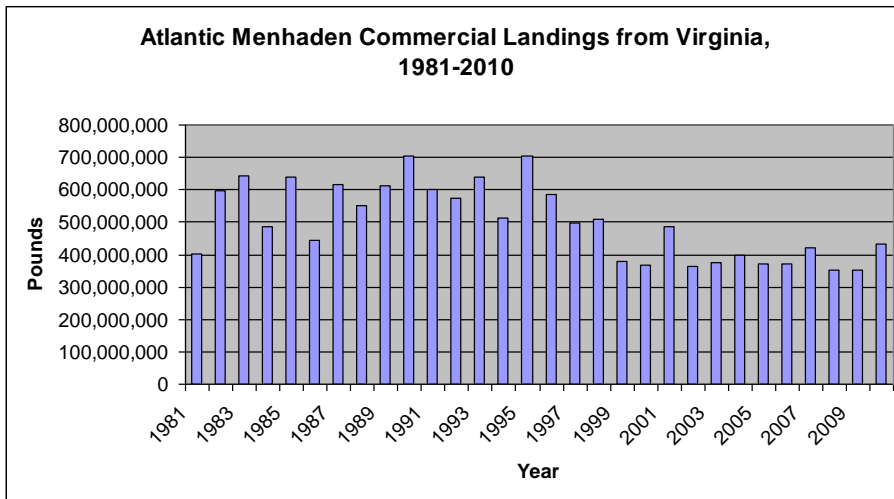
(from Durell et al. 2011)

Figure 3.



(MDNR data)

Figure 4.



(NMFS data)

## 2011 Maryland FMP Report (July 2012) Section 5. Black Drum (*Pogonias cromis*)

### Chesapeake Bay FMP

The management status of black drum was unchanged in 2011. Maryland's Fisheries Service conducted a review of the 1993 Chesapeake Bay Fishery Management Plan (CBFMP) for Black Drum in 2010 and determined that the plan was still an appropriate framework for managing the black drum stock. The CBFMP is currently the only regional FMP for black drum on the Atlantic Coast. Delaware and New Jersey have discussed the development of a joint DE-NJ black drum FMP as well as an increase in the minimum size limit to 32". There is concern that the fisheries along the coast target juvenile black drum and that the coastal fisheries have expanded. ASMFC has produced a public information document (PID) to assess the feasibility of developing a stock assessment and coastwide FMP<sup>1</sup>. Public comment will be accepted through July 25, 2012. The PID identifies three reasons for developing an FMP: 1) to provide consistent coastwide management of a migratory population; 2) to provide a framework to implement management measures for black drum, should it be necessary to conserve the stock; and, 3) to confront issues that may face the fishery now or in the future. The 2012 ASMFC Action Plan includes tasks to "continue to support monitoring and other data collection to improve information available for assessments of spot, kingfish and black drum" and to add members as needed to represent black drum fishery interests to the South Atlantic Species Advisory Panel.

### Stock Status

There is no formal stock assessment of black drum from the Chesapeake Bay or the Atlantic Coast and the stock status is unknown. Tagging data suggest there is one Atlantic coastal stock. Maryland has some data from 1999 but very little since that time. Virginia indicated that black drum did not appear to be overharvested (2005), but they cautioned that "many unknowns surround the stock and its harvest". Some biological information is available from Gulf of Mexico black drum but evidence suggests that this is a separate stock.

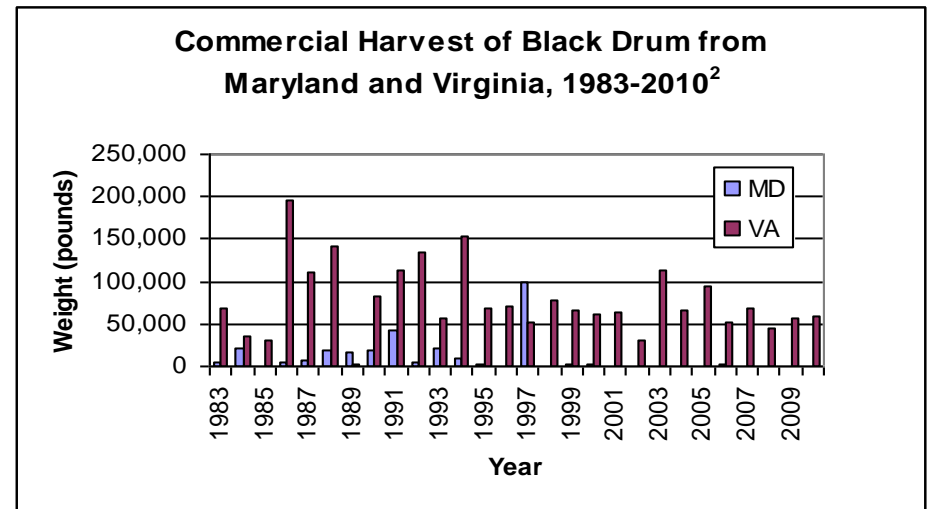
### Current Management Measures

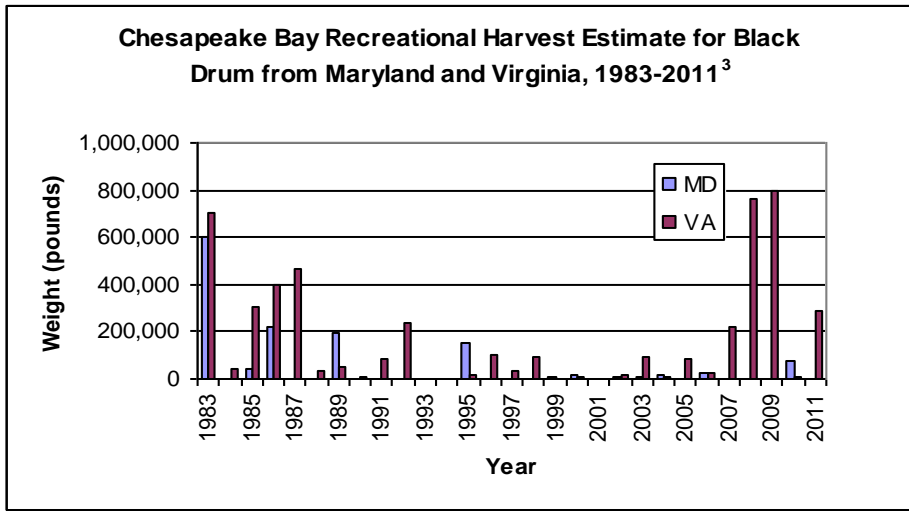
Maryland closed its Chesapeake Bay commercial black drum fishery in 1999, but retains a limited coastal fishery with a 1500 pound annual cap. Virginia manages its commercial fishery through limited entry and a quota. Size limits and catch reporting are also required. Virginia established a management zone in the southeast portion of the Chesapeake Bay for black drum, further restricting some commercial gear. Both states limit recreational harvest to one fish over 16".

### Issues/Concerns

Age-growth studies by ODU showed an average age of 34 years and a maximum age of 64 years. Long-lived species make stock assessments difficult to conduct. Lacking a formal stock assessment, management of the species by Chesapeake Bay states and the PRFC is precautionary. There are occasional requests from the Maryland commercial fishery to consider re-opening the commercial harvest of black drum in Chesapeake Bay. In addition, the 16" minimum size limit does not protect immature black drum.

### The Fisheries





References

<sup>1</sup> Public Information Document for an Interstate Fishery Management Plan for Black Drum. ASMFC. February 2012. 22p.

<sup>2</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 2, 2012. <http://www.st.nmfs.noaa.gov/st1/commercial/>.

<sup>3</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 2, 2012. <http://www.st.nmfs.noaa.gov/st1/recreational/index.html>.

**1993 Chesapeake Bay Program Black Drum Implementation** (updated 05/12)

| <b>Problem Area</b>  | <b>Action</b>   | <b>Date</b>                | <b>Comments</b>   |
|----------------------|---|----------------------------|---|
| 1. Status of Stock   | 1. Virginia (VA) will continue tagging black drum to determine coastal movements of the Chesapeake Bay Stock, fund research to determine age, fecundity, and spawning periodicity, and sample the commercial and recreational catch to determine length, weight, and sex. Maryland (MD) will continue to support the Old Dominion University (ODU) drum tagging study | Continue<br>Completed      | VA's tagging program is opportunistic and the ODU tagging study is complete. ODU has an ongoing otolith aging study for black drum. Forty-eight black drum were collected in 2007 with an average age of 33.8 years and ranging from 0 to 64 years. MD conducted an adult tagging program from commercial pound nets in 1998 and 1999. There have been a few tag returns each year since the program ended.<br><b>ASMFC conducted a data workshop to discuss the availability and state of black drum data and concluded there was sufficient data to develop an ASMFC FMP.</b> |
| 2. Fishing Mortality | 2a VA will limit entry into the commercial black drum fishery & continue to require commercial black drum fisherman & buyer to obtain a permit and report weekly. VA will continue a 16-inch minimum size limit, 120,000 pound commercial quota, a 1 fish/person/day recreational creel limit, and continue monitoring commercial and recreational landings.          | 1992;<br>1994;<br>Continue | Fully implemented<br>VA will emphasize the need for timely reporting.   |
|                      | 2b MD will adopt a 16 inch minimum size limit and a 1 fish/person/day recreational creel limit  | 1994<br>Continue           | MD REG: COMAR 08.02.05.15 The minimum size limit (16") with a creel limit of 1 fish/person/day and a maximum of 6 fish/boat.  |
|                      | 2c Potomac River Fisheries Commission (PFRC) will consider similar size and bag limits once VA and MD regulations are established   | 1994<br>Continue           | PFRC adopted a 16-inch minimum size limit and 1 fish/person/day creel limit for recreational and commercial fisheries   |
|                      | 2d MD and PFRC will assess the need for commercial black drum harvest restrictions as data becomes available  | 1994<br>Continue           | MD- Beginning in 1999, the commercial catch of black drum from the coastal bays and tributaries, and the Chesapeake Bay and its tidal tributaries is prohibited except for scientific investigation. Total allowable landings from the Atlantic Ocean is 1500 pounds.   |
| 3. Gear Conflicts    | 3. VA has established a Special Black Drum Management Zone, for "high use" areas such as the Cabbage Patch and Latimer Shoals. During May 1 through June 7, no gill net or trot line may be in established zone from 7:00 AM to 8:30 PM.  | 1992;<br>Continue          | Established to address commercial and recreational area and time conflicts  |

**1993 Chesapeake Bay Program Black Drum Implementation** (updated 05/12)

| <b>Problem Area</b> | <b>Action</b>   | <b>Date</b> | <b>Comments</b>   |
|---------------------|---|-------------|---|
| 4. Habitat Issues   | 4.1-7 Bay jurisdictions will continue to set water quality goals and review management programs under the 1987 Chesapeake Bay Agreement | Continue    | The Chesapeake 2000 Agreement renewed the commitment to improve water quality and habitat for living resources. The 2009 President's Executive Order provided additional water quality and habitat goals for living resources. Juveniles utilize shallow water. MD records juvenile black drum collected in seine and trawl surveys of the Coastal Bays. Black drum feed on crabs, oysters, mussels and clams within the Bay. |

## 2011 Maryland FMP Report (July 2012)

### Section 6. Black Sea Bass (*Centropristis striata*)

#### Chesapeake Bay FMP

Recent tagging studies indicate that black sea bass movements are regional rather than coast wide. The tagging data will be considered when considering management objectives. Beginning in 2011, states are allowed to adjust regulations to better meet their fisheries needs. This is important for Maryland since black sea bass support vital recreational and commercial coastal fisheries. The majority of black sea bass are caught in federal waters (>3 nautical miles offshore) where natural hard bottom and cold water corals can be found. The coastwide stock was declared rebuilt in 2010. However, data suggest that a regional management program may be more appropriate for black sea bass.

The Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan (CB FMP) was adopted in 1996. At that time, the black sea bass stock was overfished. The CB FMP was developed to reduce fishing mortality particularly on juvenile black sea bass. The Chesapeake Bay is a nursery area for juvenile black sea bass which utilize reef structures and submerged aquatic vegetation (SAV). Protecting these two habitats is part of the Chesapeake Bay Program's habitat goals.

Black sea bass are managed under a joint ASMFC and MAFMC multispecies FMP that was approved in 1996. Black sea bass are one component of a multispecies FMP that also includes summer flounder and scup. Black sea bass from Cape Hatteras, NC to the US-Canadian border are managed as one stock. The joint FMP implemented permit requirements for charter boats, commercial fishermen, and seafood dealers. Degradable materials were specified and required on all traps and pots to prevent "ghost fishing" by lost gear. Criteria to designate special management zones around artificial reefs were given. A progressive implementation schedule was instituted to increase minimum length, reduce landings, modify gear as specified, and introduce a commercial quota system. Several addenda and one amendment have been developed to make a series of modifications to the overfishing mortality threshold and target exploitation rate. Addendum XXI enacted state-by-state management for 2011. Draft Addendum XXII would extend this provision through 2012. Since 1996, black sea bass fishing mortality (F) has been reduced and the spawning stock biomass has increased. Maryland is required to complete an annual compliance report for ASMFC.

#### Stock Status

The ASMFC's Technical Committee for black sea bass concluded that the stock was rebuilt in 2010. This determination was made based on revised biological reference points (BRP). The new fishing mortality (F) reference point is  $F_{40\%} = 0.42$  and the spawning stock biomass (SSB) reference point is  $SSB_{40\%} = 27.6$  million pounds. A

spawning stock biomass threshold was established to determine if black sea bass are overfished. The  $SSB_{\text{threshold}}$  is  $\frac{1}{2}SSB_{40\%}$  or 13.8 million pounds. Currently  $F = 0.26$  and  $SSB = 28.6$  million pounds. Black sea bass are not overfished since SSB is well above  $SSB_{\text{threshold}}$ , and overfishing is not occurring since the fishing mortality rate is below  $F_{40}$ . An updated draft stock assessment is due in 2012.

Black sea bass are protogynous hermaphrodites. They begin life as a female but between ages 2 to 5 they change sex becoming male. A new stock assessment methodology was used in 2009 because of black sea bass' unusual life cycle. Protogynous species increase the amount of uncertainty associated with stock assessments. Reference points and stock status should be viewed with caution<sup>1</sup>.

Trawl and beach seine surveys are used to monitor black sea bass juvenile abundance. Data from these and other similar surveys indicate that juvenile abundance can be a predictor of adult abundance. In Maryland, the geometric mean catch per unit effort (CPUE) for juveniles has varied annually since the surveys began in 1989. No juvenile CPUE trend is evident for either the trawl or beach seine surveys.

#### Current Management Measures

The coastwide recreational sector is allocated 51% of the total allowable catch and the commercial fishery is allocated the remaining 49%. Maryland receives 11% of the coastwide quota. Within a given fishing season, excess quota in one state can be transferred to another state that has exceeded its quota. Black sea bass harvested by recreational anglers, coastwide, exceeded the quota by 935 to 924 thousand pounds in both 2009 and 2010, respectively. Coupled with uncertain harvest accuracy, the 2012 coastwide quota has been reduced by approximately 30%. The ASMFC Management Board approved state-by-state [catch] shares and regulation. Maryland's harvest, combined with Delaware's and Virginia's, is less than three percent of the coastwide harvest. Recreational harvest in Maryland has varied little since 2006 (Figure 1). Maryland DNR will maintain 2010 regulations since harvest reduction measures are not necessary for 2012.

Recreational anglers are limited by a 12½" minimum size and 25 fish per person per day. The recreational fishing season is from May 22 to December 31. An October 12 to 31 season closure was implemented in 2010 and will continue through 2012.

The Maryland commercial black sea bass fishery has limited entry. A finite number of permits exist, which requires an individual to arrange for a permit transfer prior to entering the fishery. Individual fishing quotas are assigned to each black sea bass permit card. Beginning in 2011, allocation of Maryland's annual black sea bass quota is based on the permit's proportion of the prior year's total harvest in Maryland. A vessel is not allowed to land black sea bass in excess of a permit's allotted quota. Quota is allocated among four commercial sectors: 87% pots, 11%

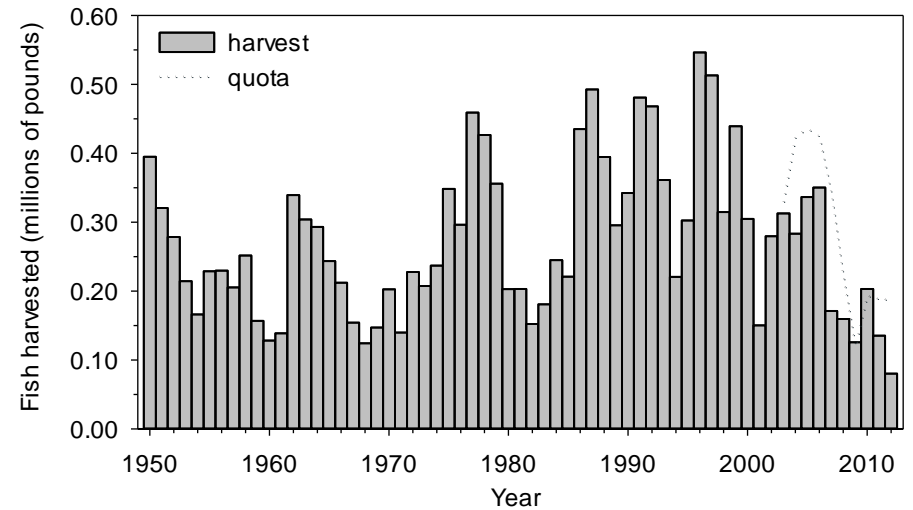
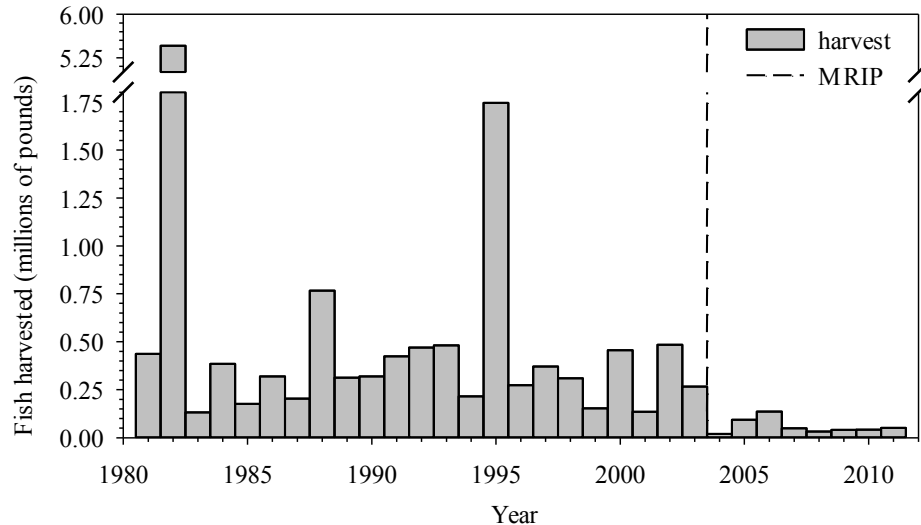


trawl, 1% hook and line, and 1% for all other fishing gear. Persons without a commercial black sea bass permit card are limited to landing 50 lbs per day. The commercial fishery has an 11" minimum size limit.

### The Fisheries

ASMFC does not allocate recreational quota to the states. Instead, a coastwide total allowable landings (TAL) quota is assigned. The 2011 recreational TAL was 1.78 million pounds and the TAL for 2012 is 1.32 million pounds. Maryland's recreational anglers harvested 17.9 thousand pounds in 2011 (Figure 2). ASMFC set the 2011 coastwide commercial quota at 1.78 million pounds and at 1.32 million pounds for 2012. Maryland's commercial harvest quota for 2011 was 188 thousand pounds and 167 thousand pounds were harvested (Figure 2). The 2012 commercial quota was decreased by 500 pounds.

Recreational catch estimates have been revised as a part of the Marine Recreational Information Program (MRIP). Catch estimates have been recalculated for 2004-2011 to provide more accurate estimates and replace those previously made by the Marine Recreational Fisheries Statistics Survey (MRFSS) (For more details go to the FMP Introduction).



### ncerns

Results indicate that black sea bass migration is limited to regional scales. A meso-scale model is being used to account for the regional variability. Addenda I and II have been developed to facilitate regional management including interstate quota transfer.

Additional regulatory text is needed to clarify the declaration period, ownership of a permitted vessel, the limit of 2 quotas fished from the same vessel, coverage of public notice issuance, allowance of 100% transfer of an individual's quota with a cap on an individual's quota acquisition, and add consistency with other regulations. A Maryland black sea bass regulatory package (2011) was submitted (submission to AELR 4/13) to address these issues.

### References

1. GR. 2009. Black sea bass 2009 stock assessment update. US Dept of Commerce, Northeast Fish Sci Cent Ref Doc. 09-16; 30 p.

2. Communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 2, 2012:

<http://www.st.nmfs.noaa.gov/st1/recreational/index.html>.

<sup>3</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 2, 2012: <http://www.st.nmfs.noaa.gov/st1/commercial/>.

<sup>4</sup> Personal communication from the NOAA Fisheries Service, Northeast Regional Office, Fisheries Statistics Office. May 2, 2012: [http://www.nero.noaa.gov/ro/fso/reports/reports\\_frame.htm](http://www.nero.noaa.gov/ro/fso/reports/reports_frame.htm).

**1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 6/2012)**

| Strategy   | Action  | Date  | Comments   |
|--|---|---|--|
| 1.1) Reduce fishing mortality, increase YPR and provide more escape opportunities for small BSB to the spawning stock. A maximum spawning potential level of 22-30% should be achieved.    | 1.1a) The Bay jurisdictions will implement a 9" minimum size limit for commercial and recreational BSB fisheries in year 1 (1996) and year 2 (1997) of the plan. Beginning in year 3 (1998), the minimum size will be determined by MAFMC on an annual basis. Regulations will be written so that they are applicable to all fish landed in a state, whether caught in state or federal waters. | 1996<br>1997<br>Continuing<br><br>2003<br><br>2004<br><br>2009<br><br><b>On-going</b> | BSB have exceeded the survey index since 2003 and are not considered overexploited. The minimum size limit for the commercial fishery is 11 inches and for the recreational fishery is 11.5 inches with a 25 fish/day /person creel limit.<br><br>In MD, individual commercial BSB quota and limit are identified on a BSB permit card. Non permitted individuals are limited to landing ≤50 lbs. MD & VA have an 11" minimum size limit for the commercial fishery.<br><br>MD recreational minimum BSB size limit increased to 12.5" with a creel limit of 25/person/day<br><br>VA recreational minimum BSB size limit increased to 12.5" with a creel limit of 25/person/day.<br><br><b>No changes in minimum size or creel limit.</b> |
|  | 1.1b) Based on the MAFMC Monitoring Committee's evaluation of the success of the FMP relative to the overfishing reduction goal, additional restrictions such as seasonal closures, creel limits, quotas, and limited entry, may be established.  | Continuing<br>2000<br>2002<br><br>2003<br><br>2010<br><br>2011                        | Amendment 13 of the MAFMC and ASMFC's Summer Flounder, Scup and BSB FMP changed the management of the commercial fishery from coastal quarterly quotas to state by state allocations. MD and VA will receive 11% and 20% respectively of the commercial TAL in 2005.<br><br>MD is allotted 11% of coastwide landings and VA is allotted 20%. The BSB fishery is open year round in MD & VA until quota is met.<br><br>MD & VA implemented recreational closures from January 1 to May 21 and October 12 to October 31.<br><br><b>A new stock assessment update began in summer 2011 and should be completed in 2012.</b>   |
| 1.2) Management agencies will require the use of escape panels, trawl efficiency devices, selective mesh sizes, culling devices and/or other methods to promote gear efficiency and reduce | 1.2a) VA, MD, and PRFC will investigate the potential for innovative devices designed to reduce the bycatch of juvenile finfish in non-selective fisheries. Continued testing of these bycatch reduction devices will be encouraged.  | Continue  | PRFC has tested plastic escape panels for pound nets.  |

**1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 6/2012)**

| Strategy | Action   | Date   | Comments  |
|----------|--|--|---|
| bycatch. | 1.2b) VA and MD will work with MAFMC/ASMFC to develop and require the use of more efficient gear consistent with policies designed to reduce bycatch and/or discards.  | Continuing                                     | No specific gear alterations have been recommended.   |
|          | 1.2c) VA and MD will implement a mesh size of 4.0 inch diamond mesh for trawl vessels harvesting more than 100 pounds of BSB per trip. Changes in minimum mesh size will be implemented based on MAFMC/ASMFC recommendations. VA will continue its ban on trawling in state waters. PRFC will continue its ban on Potomac River. | 1996<br><br>1980<br>1981<br>1992<br>2004       | Mesh size requirements for the commercial fishery are appropriate for the minimum size requirements.<br><br>MD COMAR 08.02.05.21: Minimum mesh: larger nets are required to possess a minimum of 75 meshes of 4 ½” diamond mesh in the codend or the entire net must have a minimum mesh size of 4 ½” throughout; smaller nets must have 4.5” mesh or larger throughout. Maximum roller rig trawl roller diameter ≤ 18”   |
|          | 1.2 d) VA and MD will require escape vents in BSB pots, based on the recommendations of MAFMC/ASMFC. The minimum size requirements will be considered after the MAFMC completes its study on escape vents.   | Continuing<br><br>1996<br><br>1996<br><br>1996 | Chesapeake Bay Program (CBP) jurisdictions are in compliance with vent requirements in pots and traps.<br><br>MD COMAR: Unobstructed escape vent in holding chamber of at least 2 ½” diameter, if circular, or 2 ½” stretched mesh size if square.<br><br>4VAC20-950-40: Two escape vents of 2 ½” circular dimension, 2” square dimension, or 1 3/8” by 5 3/4” rectangular dimension.<br><br>MD & VA require hinges or fasteners on one side panel or door made of the following materials: a) Untreated hemp, jute, or cotton string of 3/16” or less diameter; b) Magnesium alloy, timed float releases (pop-up devices), or similar magnesium alloy fasteners; or c) ungalvanized or uncoated iron wire of 0.094” or less in diameter. |
|          | 1.2e) The jurisdictions will define a BSB pot for enforcement requirements as recommended by the MAFMC.  | 2002<br><br>2008                               | Has not been implemented because CBP jurisdictional commercial fishermen use lobster pots and fish traps to catch both lobster and black sea bass.<br><br>MD COMAR 08.02.05.02: (9) "Fish pot" means a single, finfish entrapment net device, without associated wings or leads, consisting of: (a) An enclosure of various shapes covered with wire, fabric, or nylon mesh webbing of not less than 1 ½” stretched mesh size; (b) One or more conical entrance funnels; (c) One or more unobstructed escape vents, in the holding chamber, of at least 2 ½” in diameter, if circular, or 2 ½” stretched mesh size if square.   |

**1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 6/2012)**

| Strategy   | Action  | Date   | Comments   |
|--|---|--|--|
|  |   |  | VA does not have a fish pot definition.  |
|  | 1.2f) VA and MD will require that BSB pots and traps have biodegradable hinges and fasteners on one panel or door.  | 1996<br>Completed 2002                                   | MD & VA require hinges or fasteners on one side panel or door made of the following materials: a) Untreated hemp, jute, or cotton string of 3/16" or less diameter; b) Magnesium alloy, timed float releases (pop-up devices), or similar magnesium alloy fasteners; or c) ungalvanized or uncoated iron wire of 0.094" or less in diameter. Pots and traps having wooden slats will remove one set of parlor slats so it is 1 1/8" apart.   |
| 2.1) VA and MD will work with the Institute of Marine Science, Old Dominion, and University of Maryland to promote research concerning the effects of sex-reversal. The stock assessment departments of VMRC, MDNR, and PRFC will continue to collect information on size composition in commercial catches as part of a coastwide effort to monitor the effects of minimum sizes on BSB stocks. | 2.1a) Research on effects of hermaphroditism on yield, spawning stock and other parameters will be encouraged. VMRC's stock assessment department, in cooperation with VIMS, will attempt to determine the appropriate size at which sex reversal takes place for BSB in this region.<br><br>2.1b) VA will continue its annual VIMS Trawl Survey, of estuarine finfish species and crabs found in VA Bay waters, to measure size, age, sex, distribution, abundance, and catch-per-unit-effort (CPUE).  | Continuing<br><br>2009<br><br>1997<br>2002<br>Continuing | Although the stock has been rebuilt, management measures have been kept conservative because of unknown population dynamics due to hermaphroditism.<br><br>A new stock assessment methodology was used to address the increased uncertainty because black sea bass are protogynous.<br><br>BSB were sporadically caught during the 2002-2006 trawl surveys. The majority of BSB abundance and biomass exist in Virginia waters of the Chesapeake Bay. Typically, BSB are first observed during the summer and peak during the fall portions of the survey. BSB may be observed during spring trawls. BSB caught range from ~70 mm to 270 mm total length. In 2002 to 2003 80%-90% were age 1 ranging from ages 0 to 2 From 2002 to 2006 >75% were female, except in 2004 (57%), and 50% maturity was at 228 mm. 17%-20% caught from May-September were male. |
| 2.2) The jurisdictions will promote research to define movements and mortality of BSB between state and federal waters.  | 2.2a) VMRC's Stock Assessment Program will continue to collect biological data (age, size, sex) from commercial catches of BSB.<br><br>2.2b) Research on migration of BSB between inshore and offshore areas will be encouraged. Tagging experiments to provide data on BSB migration may be funded from sales of VA saltwater fishing licenses.<br><br>2.2c) PRFC will collect information on BSB harvested and discarded in the Potomac River pound net fishery as part of a two year pound net study funded by the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA). | Continuing<br><br>Continuing<br><br>Continuing           | Biological data is used for the coastal stock assessment.<br><br>In VA, black sea bass is 1 of 10 species currently being tagged in the Virginia Volunteer Angler Gamefish Tagging Program.<br><br>PRFC continues to collect BSB harvest data.   |

**1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 6/2012)**

| Strategy   | Action  | Date   | Comments   |
|--|---|--|--|
| 2.3) MD, VA and PRFC will continue to support interjurisdictional efforts to maintain a comprehensive database on a baywide scale.   | 2.3a) The jurisdictions will collect information on commercial landings.  | 2008<br><br>2010                                       | MD does not have a fishery-dependent monitoring program. Data is occasionally collected from the recreational for-hire fishery. Northeast Data Poor Stocks Working Group determined that BSB are undergoing overfishing, but the stock is not overfished.<br><br>ASMFC Technical Committee declared stock rebuilt. Revised BRPs are $F_{40\%} = 0.42$ and $SSB_{40\%} = 27.6$ million pounds. Overfished threshold is $SSB_{\text{threshold}} = 13.8$ million pounds ( $1/2 SSB_{40\%}$ ). In 2010 $F = 0.26$ and $SSB = 28.6$ million pounds. Well within BRPs.   |
|  | 2.3b) VA will continue to supplement MRFSS data with more detailed catch statistics at the state level.   | 1996-1997  | <b>MRFSS data has been improved through the MRIP.</b>  |
|  | 2.3c) MD will require mandatory reporting for all black sea bass landed in Maryland, wherever harvested.  | Continuing   | Data is included in the commercial fishery statistics.   |
| 3.1a) Restoration of aquatic reefs would lead to increased habitat for black sea bass. Jurisdictions will continue to expand and improve their current oyster restoration programs with periodic program evaluations to ensure maximum success. Specific attention should be focused on aquatic reefs in the salinity range of the black sea bass. | 3.1aA) MD and VA will continue implementation of the 1994 Oyster FMP which combines the recommendations of both the VA Holton Plan and the MD Roundtable Action Plan. | Continued<br><br>2008                                  | CBP jurisdictions developed a 2004 Oyster Management Plan (2005) which combines the FMP and habitat objectives. It includes reef development using reclaimed and fresh oyster shell, oyster repletion and oyster sanctuary and harvest reserve areas. Maryland is currently managing oyster restoration under the Maryland 10-point Action Plan.<br><br><i>Crassostrea virginica</i> (native oyster) and not <i>Crassostrea ariakensis</i> (Asian oyster) will be used for reef development following the Environmental Impact Statement for Oyster Restoration in Chesapeake Bay Including the Use of a Native and/or Nonnative Oyster. |
|  | 3.1aB) MD and VA will continue the implementation of the Aquatic Reef Habitat Plan.   | Continued 2007<br><br>Continue<br><br>2010<br>On-going | Artificial Reef Committee, Maryland Artificial Reef Initiative, and Maryland's Artificial Reef Management Plan were developed and several reefs have been created in Bay and the Atlantic Ocean.<br><br>Reefs are qualitatively monitored with underwater video.<br><br>ARC and MARI have begun support for shallow water (<20 ft.) reef projects. <b>For a complete list of reef sites go to <a href="http://www.dnr.state.md.us/fisheries/reefs/">http://www.dnr.state.md.us/fisheries/reefs/</a></b>  |
|  | 3.1bA) Jurisdictions will continue to maintain, expand, and improve their artificial reef programs.   | Continuing   | In VA, artificial reefs are being funded through Recreational Advisory Board. All artificial reefs created by funds from recreational license revenues adhere to the gear type prohibition.  |

**1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 6/2012)**

| Strategy  | Action   | Date               | Comments   |
|---|--|--------------------|--|
| population.   |  | 1996-2006          | MD terminated its program in 1996. Artificial reef development was administered in the Chesapeake Bay by MD Environmental Service and in the Atlantic Ocean by the Ocean City Reef Foundation (OCRF).  |
|   |  | 2007               | MD Artificial Reef Committee and the MD Artificial Reef Initiative (MARI) were established to develop reefs in cooperation with OCRF. Both MARI and OCRF accept private donations while MD contributes funds when available for reef development projects.   |
|   |  | 2008               | 44 NY subway cars were deployed off Ocean City.  |
|   |  | Continue           | USN Destroyer <i>Radford</i> is being prepared for reefing. Ship continues to be tested for contaminants. Additional funding is required. Permits are pending. OCRC continues to deploy small steel hulled vessels and concrete material for reef development.   |
|   |  | <b>2011</b>        | <b>USN Destroyer <i>Radford</i> was reefed on August 10, 2011. The vessel has since broken into 3 pieces but remains upright.</b>  |
|   | 3.1bB) VA recently prohibited use of all gear except recreational rod and reel, hand-line, spear, or gig on four artificial reefs in state waters.   | Continuing<br>1998 | MD and VA both adopted legislation that prohibits hydraulic clamming (and crab dredging in VA) in or near SAV beds.  |
| 3.2) Jurisdictions will continue efforts to “achieve a net gain in submerged aquatic vegetation distribution, abundance, and species diversity in the Chesapeake Bay and its tributaries over current populations | 3.2a) Protect existing SAV beds from further losses due to degradation of water quality, physical damage to plants, or disruption to the local sedimentary environment as recommended by Chesapeake Bay SAV Policy Implementation Plan. <ul style="list-style-type: none"> <li>• Protect SAV and potential SAV habitat from physical disruption. Implement a tiered approach to SAV protection, giving highest priority to protecting Tier I and II areas but also protecting Tier III areas from physical disruption.</li> <li>• Avoid dredging, filling or construction activities that create turbidity sufficient to impact nearby SAV beds during the SAV growing season.</li> <li>• Establish an appropriate undisturbed buffer around SAV beds to minimize the direct and indirect impacts on SAV from activities that significantly increase turbidity.</li> <li>• Preserve natural shorelines. Stabilize shorelines,</li> </ul> | Continue           | MD implemented a living shorelines program in 1970 to encourage vegetative shoreline stabilization.<br><br>Regulations are in place to prohibit dredging through SAV beds. Tiered designation and prioritization of SAV beds has not been implemented.<br><br>Avoidance of dredging, filling and construction impacts to SAV is strictly enforced by MDE and USACE with input from DNR, USFWS, and NMFS.<br><br>MD has not established undisturbed buffers. VA has established buffer criteria.<br><br>2003<br><br>The revised SAV goal adopted by Chesapeake Bay Program is restoration of 185,000 acres of SAV by 2010 and planting 1,000 acres of SAV by 2008. Only 15% of restoration target was met by 2008. There’s been very little long-term survival from SAV |

1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 6/2012)

| Strategy   | Action  | Date   | Comments  |
|--|---|--|---|
|  | <p>when needed, with marsh plantings as a first alternative. Use structures that cause the smallest increase in local wave energy where planting vegetation is not feasible.</p> <ul style="list-style-type: none"><li>Educate the public about the potential negative effects of recreational and commercial boating on SAV and how to avoid or reduce them.</li></ul>     | <p><b>2011</b></p><br><p>2008</p>  | <p>plantings. <b>STAC reviewed the SAV restoration projects during 2011 and concluded that the projects were operationally successful but functionally unsuccessful. They are currently reviewing next steps.</b></p> <p>MD legislated that shoreline stabilization projects must use living shoreline techniques unless demonstrated to be infeasible.</p>   |
|  | 3.2b) Set and achieve regional water and habitat quality objectives that will result in restoration of SAV through natural revegetation as recommended by the Chesapeake Bay SAV Policy Implementation Plan.  | Continuing   | Water quality criteria have been adopted<br><a href="http://www.chesapeakebay.net/restoringwaterquality.aspx?menuitem=14728">http://www.chesapeakebay.net/restoringwaterquality.aspx?menuitem=14728</a> .   |
|  | 3.2c) Set regional SAV restoration goals in terms of acreage, abundance, and species diversity considering historical distribution records and estimates of potential habitat as recommended by the Chesapeake Bay SAV Policy Implementation Plan.  | Continue<br>2003<br><b>On-going</b>  | A bay wide SAV restoration goal was set. The new SAV goal is 185,000 acres restored by 2010 and 1,000 acres planted by 2008. In 2008, there were approximately 76,900 acres of bay grasses, about 42% of the goal. In 2009, there were 85,899 acres of bay grasses throughout the Bay, which was 46% of the goal. The 2010 acreage was 79,675 (43% goal). <b>The 2011 acreage was 63,074.</b>   |
| 3.3) Establish a goal of no net loss of wetlands and a long term goal of a net resource gain for tidal and nontidal wetlands as recommended in the Chesapeake Bay Wetlands Policy. | 3.3) Jurisdictions should strive towards achieving the following, especially in the salinity range of BSB. <ul style="list-style-type: none"><li>Define the resource through inventory and mapping activities.</li><li>Protect existing wetlands.</li><li>Rehabilitation, restoring and creating wetlands.</li><li>Improving education.</li><li>Further research.</li></ul> | Continuing<br><br>2006<br>Continuing<br><br>2006<br>Continue<br><br>2009<br>Continue<br><br>2011 | <p>Programs have been expanded to the tributaries.</p> <p>GIS mapping activities are underway to target protection and restoration efforts habitat resources, but habitats are not targeted for a single, specific species' benefit. MD is developing a Blue Infrastructure that includes mapping of BSB habitats such as structural habitat and SAV.</p> <p>MD is developing a Blue Infrastructure that includes mapping structural habitat and SAV.</p> <p>Wetland mosquito ditches from the 1930s-1940s are being plugged to reduce tidal flow and restore wetland hydrology and function.</p> <p><b>Between 2010 and 2011, 3,775 acres of wetlands were established or re-established and 107,239 acres were enhanced or rehabilitated.</b></p> |
| 3.4) Jurisdictions will continue efforts to improve baywide water quality through the efforts of programs established under the 1987 Chesapeake                                    | 3.4a) Based on the 1992 baywide nutrient reduction plan reevaluation, the jurisdictions will: <ul style="list-style-type: none"><li>Expand program efforts to include tributaries.</li><li>Intensify efforts to control nonpoint sources of</li></ul>   | Continue   | Maps that indicate regions of concerns for living resources have been developed.<br><br>See Chesapeake Bay Program website for updates on nutrient  |



**1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 6/2012)**

| Strategy   | Action   | Date       | Comments   |
|--|--|------------|--|
| Bay Agreement. In addition, the jurisdictions will implement new strategies, based on recent program reevaluations, to strengthen deficient areas. | pollution from agriculture and developed area. <ul style="list-style-type: none"> <li>• Improve on current point and nonpoint source control technologies.</li> </ul>  | 2009       | reduction.<br><a href="http://www.chesapeakebay.net/status_reducingpollution.aspx?menuItem=19859">http://www.chesapeakebay.net/status_reducingpollution.aspx?menuItem=19859</a> .<br><br>President Obama executive order recommitting federal agencies to Bay restoration and regulatory enforcement.  |
|  | 3.4b) Based on the 1994 Chesapeake Bay Toxics Reduction Strategy Reevaluation Report, the jurisdictions will emphasize the following four areas: <ul style="list-style-type: none"> <li>• Pollution Prevention: Target “Regions of Concern” and “Areas of Emphasis.</li> <li>• Regulatory Program Implementation: Insure that revised strategies are consistent with and supplement pre-existing regulatory mandates.</li> <li>• Regional focus: Identify and classify regions according to the level of contaminants.</li> <li>• Directed Toxics Assessment: Identify areas of low level contamination, improve tracking and control of non-point sources.</li> </ul> | Continue   | See Chesapeake Bay Program website for updates on nutrient reduction.<br><a href="http://www.chesapeakebay.net/status_reducingpollution.aspx?menuItem=19859">http://www.chesapeakebay.net/status_reducingpollution.aspx?menuItem=19859</a><br><br>Chesapeake Bay Program is monitoring levels of mercury, PCBs, PAHs, organophosphate and organochloride pesticides. |
|  | 3.4c) The jurisdictions will continue to develop, implement and monitor their tributary strategies to improve bay water quality.   | Continuing | Ambient water quality criteria of DO, water clarity, and chlorophyll-a have been adopted for the Chesapeake Bay (April 2003).  |

**Acronyms**

ASMFC – Atlantic Marine Fisheries Commission  
 BSB – Black Sea Bass  
 CB – Chesapeake Bay  
 COMAR – Code of Maryland  
 CPUE – Catch per Unit Effort  
 DO – Dissolved Oxygen  
 F – Fishing Mortality  
 FMP – Fisheries Management Plan  
 GIS – Geographic Information System  
 MAFMC – Mid-Atlantic Fisheries Management Council  
 MDE – Maryland Department of the Environment  
 MDNR – Maryland Department of Natural Resources  
 MRFSS – Marine Recreational Fisheries Statistics Survey  
 NMFS – National Marine Fisheries Service  
 PAH – Polycyclic Aromatic Hydrocarbon

PCB – Polychlorinated Biphenyl  
 PRFC – Potomac River Fisheries Commission  
 SAV – Submerged Aquatic Vegetation  
 SSB – Spawning Stock Biomass  
 STAC – Scientific and Technical Advisory Committee  
 TAL – Total Allowable Catch  
 USACE – U.S. Army Corps of Engineers  
 USFWS – U.S. Fish and Wildlife Service  
 VAC – Code of Virginia  
 VIMS – Virginia Institute of Marine Science  
 VMRC – Virginia Marine Resource Commission  
 YPR – Yield per Recruit

## 2011 Maryland FMP Report (July 2012)

### Section 7. Blue Crab (*Callinectes sapidus*)

During 2011, new female-specific biological reference points were endorsed by the Chesapeake Bay Program's Sustainable Goal Implementation Team (GIT) to manage the Chesapeake Bay blue crab population. Based on the most recent monitoring results, the juvenile blue crab population is at its highest level on record and the overall blue crab population is at its highest level since 1993 (Figure 1). However, the number of spawning-age female crabs has decreased so conservative management measures need to continue during 2012.

The Chesapeake Bay Program (CBP) adopted a Blue Crab Fishery Management Plan (FMP) in 1989. The plan was revised in 1997 with the following objectives: provide long-term protection for the blue crab stock and maintain a stable stock; establish quantitative targets (such as abundance, biomass, or other indices) and biological reference points. In 2003, Amendment #1 to the 1997 CBP Blue Crab FMP was adopted. The purpose of Amendment #1 was to formally adopt biological reference points for managing the resource; to reaffirm strategies for reducing fishing effort; and to recognize the importance of biological monitoring, habitat protection and ecosystem processes. Amendment #2 was developed in 2011 to formally adopt the new female-specific reference points and to recognize the importance of fishery-independent and fishery-dependent monitoring. The new amendment is scheduled for incorporation by reference into Maryland regulation in September 2012.

#### Stock Status

The Chesapeake Bay blue crab stock is currently not overfished and overfishing is not occurring based on data through 2010<sup>1</sup>. A new stock assessment was completed and peer reviewed in 2011. The 2011 stock assessment used an integrated estimate of reference points and stock status. Previous stock assessments did not directly link the two parameters. As a result of the 2011 stock assessment, new female-specific biological reference points (BRPs) based on estimates of age 0+ female crabs (the exploitable stock) and the abundance of age 1+ female crabs (an index of the spawning stock) were adopted. A comparison of the old and new BRPs can be found in Table 1. In order to ensure that male abundance does not drop below a critical level relative to female abundance, the Bay jurisdictions will be developing a threshold reference point for male crabs that will provide a management trigger for male conservation. The new BRPs have changed the historical perspective of the stock. Under the new BRPs, the female spawning stock would have been considered overfished from 2001-2003.

The Baywide winter dredge survey (WDS) is the primary indicator of blue crab stock status in Chesapeake Bay. The WDS provides an annual estimate of over-wintering blue crab abundance by age and gender. The abundance of female spawning age crabs (age 1+) is used to determine if the population is overfished. The results of the

2011-2012 WDS indicated that there were 79 million age 1+ blue crabs. This number is below the recommended target but above the new threshold (Figure 2). The number of spawning-age female crabs is currently below the 23 year average of 117 million crabs.

#### Management Measures

A control rule for the blue crab stock has been used to assess the status of the stock since 2001. Control rules describe a variable as a function of another variable that management can influence or have some control over<sup>2</sup>. Determining the variables depends on the characteristics of the stock and the fishery. These variables are then used to develop definitions of biological reference points, i.e., targets and thresholds. In developing a control rule, the selection of a target is risk-averse even though it is expected that the target may be exceeded because of natural annual variability. Currently, the control rule for blue crabs is based on spawning stock biomass and exploitation.

In Maryland, catch limits and closed periods are implemented to maintain an allowable female harvest that is associated with the 46% exploitation target. The allowable female harvest changes with estimated annual abundance. Maryland DNR determines the allowable harvest and then develops a suite of limits designed to achieve but not exceed the allowable harvest. The crabbing industry provides input on which combinations of limits work best for the industry via the Blue Crab Industry Advisory Committee.

#### The Fishery

As the population level increases, maintaining the exploitation target results in an increase in harvest. The 2011 baywide (Maryland & Virginia) commercial harvest was approximately 67.2 million pounds (Figure 3) which resulted in a 45% exploitation rate. The percentage of females removed by harvest in 2011 was approximately 25% which was around the recommended target of 25.5% and well below the threshold of 34% (Table 1). Recreational harvest is assumed to be approximately 8% of the total harvest. Since recreational crabbers can no longer harvest female crabs the estimated harvest is now based on 8% of the male harvest or 4.4 million pounds baywide. Adding up the harvest from each fraction of the harvesting sectors and across the entire Chesapeake Bay, the 2011 total harvest was approximately 71.6 million pounds. This was the second highest harvest since 1999.

#### Issues/Concerns

Although management measures have successfully allowed the blue crab population to increase over the last few years, conservation measures need to remain in place to ensure that the population remains robust and at target levels. Although there was high recruitment (number of crabs that survive to become juveniles) in 2011/2012,

the abundance of female crabs has decreased over the last two years. The blue crab population is subject to naturally high variability from year to year due to environmental factors. For example, during 2010-2011, the extremely cold winter weather resulted in about a 30% winter kill of adult crabs. In the previous winter season there was about an 11% mortality rate. In addition, recruitment is strongly influenced by environmental factors which can affect the number of juveniles that enter into the population. These factors emphasize the need to determine an appropriate margin of conservation to account for environmental variability.

Latent effort – the number of people holding fishing licenses that have not been actively harvesting crabs but could return to the fishery at any time – continues to be a management concern. Maryland and Virginia have been successful at reducing the number of people holding crabbing licenses through a federally funded license buy-back program in 2009 and 2010 but more could still be done. New methods for calculating recreational catch and effort is also needed to fully characterize total removals by the fishery.

Maryland DNR received federal disaster funding in 2008 (through 2012) to assist management efforts and to mitigate impacts to watermen from a declining blue crab fishery. The Maryland General Assembly also directed capital funds towards these efforts. Funding has been used for buying back commercial blue crab licenses; evaluating alternative management systems for the blue crab fishery; providing quality assurance of crabmeat products; creating new marketing programs and economic opportunities; removing derelict (ghost) pots; and seeking sustainability certification for the blue crab fishery and industry. During 2012, a pilot study led by an industry-based group, will be testing a new way to accurately report harvest data in a more timely fashion using electronic technology. This is a new co-management approach between the crab harvesters and MDNR. It is hoped that the new electronic reporting method will result in more management flexibility and accountability.

Maryland began a text messaging system to help watermen stay abreast of blue crab regulations and any seasonal changes that may occur. Watermen can subscribe to receive text message reminders a day or two before a regulation change goes into effect.

### Enforcement

The enforcement of commercial and recreational fishing regulations is critical to management success. Some of the federal disaster money has been directed to improving enforcement of blue crab conservation/management measures. In Maryland, the Natural Resource Police (NRP) hired additional officers to provide a dedicated enforcement effort for crab management. The NRP has successfully increased the total number of enforcement hours, dedicating over 11,000 hours to crab enforcement.

### Conclusion

The Bay jurisdictions will continue to investigate alternative strategies to improve management of the blue crab resource. The jurisdictions will continue to examine ways to address effort in the fishery. Since female abundance has decreased over the last two years, the jurisdictions may need to adjust management measures to ensure that harvest levels correspond to the abundance indices. In order to protect the male portion of the blue crab population, a workshop will be held to determine appropriate thresholds.

**Table 1. Comparison of the 2011 female-specific biological reference points to the 2005-2010 biological reference points.**

|   | Target       | Threshold  | 2011 Stock Status | 2012 Stock Status |
|---|--------------|------------|-------------------|-------------------|
| <b>2011 Female-specific Exploitation Fraction</b>     | <b>25.5%</b> | <b>34%</b> | 25%               | TBD               |
| 2005-2010 Exploitation Fraction (males & females)     | 46%          | 53%        | 45%               | TBD               |
| <b>2011 Abundance (millions of female crabs)</b>      | <b>215</b>   | <b>70</b>  | 190               | 97                |
| 2005-2010 Abundance (millions of male & female crabs) | 200          | 86         | 254               | 178               |

(from 2012 Chesapeake Bay Blue Crab Advisory Report)

### References

- <sup>1</sup>Miller, T., Wilberg, M., Davis, G., Sharov, A., Colton, A., Lipcius, R., Ralph, G., Johnson, E., and Kaufman, A. 2011. Stock Assessment of the Blue Crab in Chesapeake Bay. Tech. Rept. Series No. TS-614-11 of the University of Maryland Center for Environmental Science
- <sup>2</sup>Restrepo, V. and J. Powers. 1999. Precautionary control rules in US fisheries management: specification and performance. ICES Journal of Marine Science, 56:846-852

Figure 1. Index of total blue crab abundance (density of all crabs, all sizes) from the Winter Dredge Survey 1990-2012 with 95% confidence interval bars.

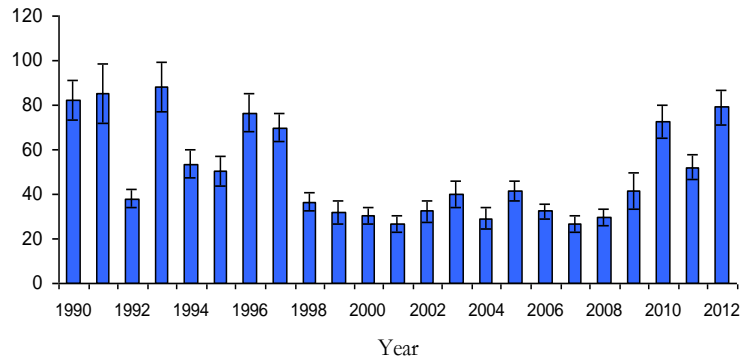
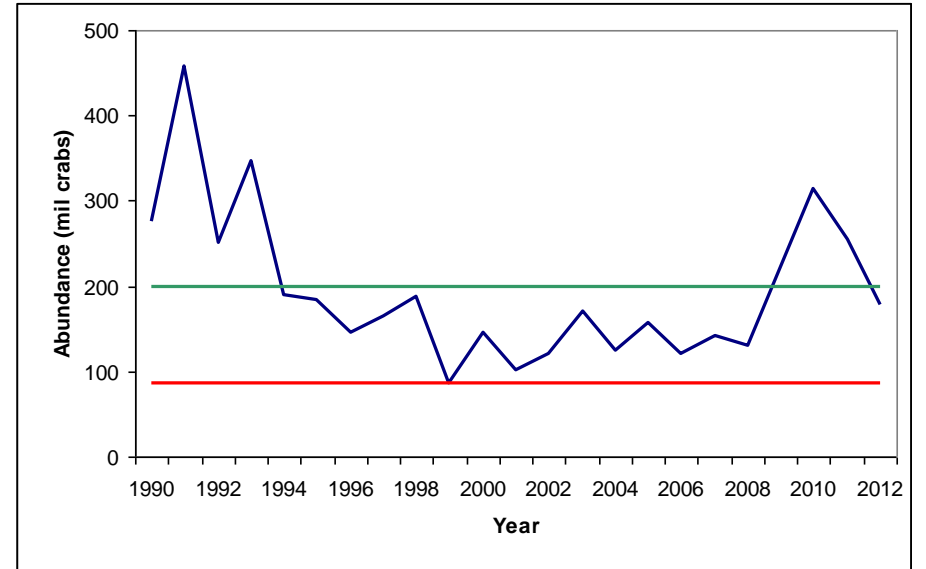
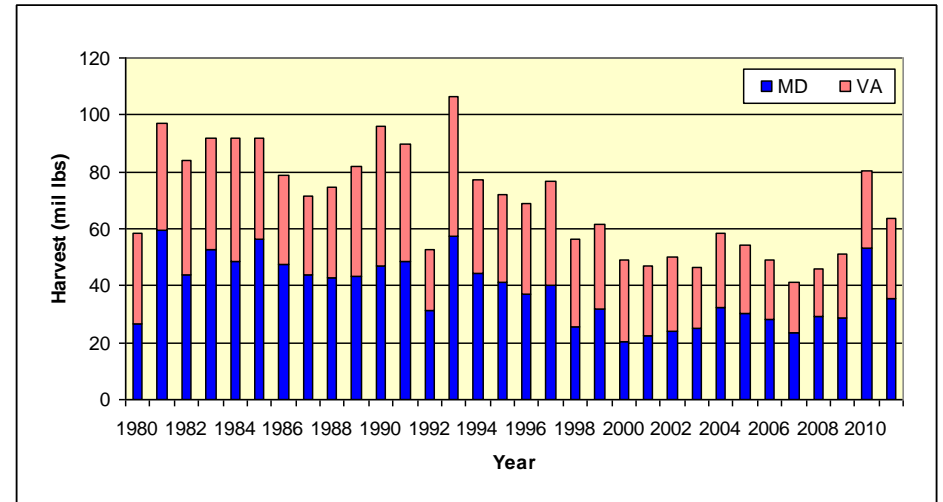


Figure 2. Number of spawning age crabs in Chesapeake Bay, 1990-2012



MDNR/VIMS Data

Figure 3. Chesapeake Bay Commercial Blue Crab Harvest, 1980-2011



MDNR & VMRC data

| <b>2003 Chesapeake Bay Program Blue Crab Fishery Management Plan Amendment</b> (updated 07/2012)   |   |  |  |
|--|---|--|--|
| <b>Problem Area</b>  | <b>Action</b>   | <b>Date</b>  | <b>Comments</b>  |
| Stock Status Strategy<br>Chesapeake Bay stock has stabilized at historically low levels but continues to be at risk for recruitment failure. | Action 1<br>CBP jurisdictions will adopt a threshold fishing mortality rate that preserves 10% of the blue crab spawning potential, relative to an unfished stock, and a minimum stock size threshold.  | Began in 2001;<br>formally adopted in 2003<br>2011<br>Continue | The 2005 Stock Assessment recommended using the exploitation fraction (the proportion of the vulnerable population that is harvested each year) instead of F for evaluating BRPs. The overfishing threshold is 53%. The 2010 exploitation estimate was below the threshold and has been below the threshold since 2008. <b>As a result of the 2011 stock assessment results, new female-specific targets and thresholds have been adopted. The new female target and threshold are 215 million female crabs and 70 million female crabs, respectively. Female abundance is currently below the target level.</b> |
|  | Action 2<br>CBP jurisdictions will adopt a target fishing mortality of $F_{20}$ , which if achieved, will increase the blue crab spawning potential from 10% to 20% relative to that of an unfished stock.  | Began in 2001;<br>formally adopted in 2003<br>Continue         | The target fishing mortality (F) was replaced by the exploitation target of 46%. <b>As a result of the 2011 stock assessment results, the exploitation target and threshold are 25.5% and 34%, respectively. The 2011 female-specific exploitation was 25%, very close to the target level.</b>  |
|  | Action 3<br>CBP jurisdictions will develop control rules based on the biological reference points (BRPs) for managing the blue crab resource. (The control rule was adopted in 2001 and updated in the 2005 stock assessment. It represents the relationship between adult crab abundance, exploitation and management reference points. <b>The new 2011 control rule is a major improvement over the previous model because it integrated the calculation of reference points within the model rather than using two separate processes as in the 2005 assessment.</b> ) | 2003<br>2005<br>2006<br>2008<br><b>2011</b>                    | In 2006 the overfishing limit was defined as 86 million age 1+crabs (threshold value). An interim target of 200 million age 1+ crabs was established in 2008. The blue crab stock was not overfished in 2010. <b>Based on the new female-specific BRPs, the blue crab stock is not overfished and overfishing is not occurring.</b>  |

**2003 Chesapeake Bay Program Blue Crab Fishery Management Plan Amendment** (updated 07/2012)

| Problem Area  | Action   | Date  | Comments   |
|---|--|---|--|
|   | <p>Action 4<br/>                     CBP jurisdictions will utilize the results of fishery-independent surveys to determine stock status.</p>                                | <p>On going</p>   | <p><b>Results of the 2011-2012 Winter Dredge Survey (WDS) indicated the abundance of female age 1+ crabs was 97 million crabs. Spawning-age crab abundance was below the target but above the threshold. This is the second year of decreasing female abundance.</b></p>   |
| <p>Fishing Effort Strategy<br/>                     CBP jurisdictions will adjust fishing effort to achieve the adopted BRPs.</p>                           | <p>Action 5<br/>                     CBP jurisdictions will reduce the exploitation rate of legal-sized blue crabs to meet the target BRPs.</p>                              | <p>Began in 2001;<br/>                     continue 2008<br/> <b>2011</b></p> | <p>The Bay jurisdictions implemented new regulations in 2008 &amp; 2009 to reduce exploitation on female crabs. The 2008 baywide harvest was approximately 48.6 million lbs (average = 74 million lbs.). The 2009 baywide harvest was 53.9 million lbs. The 2010 baywide harvest was 89 million lbs. <b>The 2011 baywide harvest was 71.6 million lbs.</b></p> <p>There is a large amount of latent effort in the blue crab fishery (latent effort = fishing effort not currently utilized). In MD there are approximately 6,000 individuals with commercial crab licenses but only about 2,000 are actively crabbing. MD has implemented a buy-back program for LCC (limited crab catcher) licensees. VA has also implemented a buy-back program and utilized a reverse auction system. Between 2009 and 2010, MD reduced the LLC by about 700 licensees resulting in about a 35,000 pot reduction in effort. <b>The states will continue to explore other methods of reducing latent effort.</b></p> |
| <p>Monitoring Strategy<br/>                     CBP jurisdictions will collect fishery - dependent and fishery-independent data on blue crab resources.</p> | <p>Action 6<br/>                     CBP jurisdictions will continue to monitor blue crab resources in the bay and work towards developing a baywide monitoring approach</p> | <p>On going</p>   | <p>In 2010/2011, recruitment, as measured by the abundance of age 0 crabs in the WDS, remained low and was below the average recruitment of 258 million crabs. Although the number of juveniles had declined, it was one of the largest juvenile abundance indices since 1998. <b>In 2011/2012,</b></p>  |

**2003 Chesapeake Bay Program Blue Crab Fishery Management Plan Amendment** (updated 07/2012)

| Problem Area  | Action  | Date     | Comments   |
|---|---|----------|--|
|   |   |          | <b>recruitment was the highest on record.</b>  |
| Habitat Strategy<br>CBP jurisdictions will identify and protect critical blue crab habitat. | Action 7<br>MD and VA will consider designating additional sanctuary areas to protect blue crab habitat based on new research data.   | Continue | Closure of the VA blue crab spawning sanctuary (928 square miles) was extended an additional month (May-Sept) to protect female crabs. The EBFM life history brief indicates that blue crabs occupy a wide range of estuarine habitats and utilize a series of habitats sequentially along a salinity gradient.  |
|   | Action 8<br>CBP jurisdictions will continue to protect SAV in potential, post-larval settlement areas.  | Continue | Sav beds in near shore habitats provide essential habitat for blue crabs, especially during their post larval and juvenile stages. SAVs provide critical shelter for many key species besides crabs. SAVs help improve water clarity, add oxygen to the water, and reduce shoreline erosion.   |
|   | Action 9<br>CBP jurisdictions will restore and protect SAV in the Chesapeake Bay to achieve the new goal of 185,000 acres by 2010.  | Continue | Actions have been identified by CBP jurisdictions to achieve this goal, including the attainment of water quality in shallow-water bay grass designated use areas. In 2009, there were 85,899 acres of bay grasses throughout the Bay, which was 46 percent of the goal and an increase of 9,039 acres from 2008. <b>SAV in 2011 decreased by 21% to an estimated 63,074 acres compared to an estimated 79,664 acres in 2010. Three factors contributed to the decrease: the hot summer in 2010 caused a die-off of grasses; heavy rains in spring 2011 decreased water clarity; and then fall 2011 the hurricane added additional sediment.</b> |
|   | Action 10<br>CBP jurisdictions recognize the value of salt marsh-fringed habitats and will promote the protection and restoration of marsh-fringed shorelines, creeks and coves | Continue | Salt marsh habitats protect molting blue crabs and support many other prey species. These areas are susceptible to shoreline development and should be protected.  |

**2003 Chesapeake Bay Program Blue Crab Fishery Management Plan Amendment** (updated 07/2012)

| Problem Area  | Action  | Date                             | Comments  |
|---|---|----------------------------------|---|
| Ecosystem strategy<br>CBP jurisdictions will incorporate information on ecosystem processes relating to blue crabs as it becomes available and utilize the information to determine management actions as necessary | Action 11<br>Utilize the guidelines from the Fisheries Ecosystem Plan (FEP) to incorporate multi-species and ecosystem considerations into existing CBP fishery management plans. | Began<br>2005<br><b>Continue</b> | A new EBFM operational structure was facilitated through MSG. An EBFM blue crab species team was formed in late 2008. The team completed biological briefs on important blue crab issues. This information is available at <a href="http://www.mdsg.umd.edu/programs/policy/ebfm/">http://www.mdsg.umd.edu/programs/policy/ebfm/</a><br><b>The recommendation from the group is to use the briefs when the Blue Crab FMP is revised.</b>  |
|   | Action 12<br>As data becomes available on food web dynamics, adjust fishing mortality rates on the blue crab population to include predator and prey needs.                       | On-going                         | Blue crabs play an important role in the food web of the bay. They are prey for important species of finfish and are predators on other species such as mollusks. Blue crabs play a key role in the trophic dynamics of the Bay & are considered the foremost benthic consumer in the Bay foodweb.  |
|   | Action 13<br>Evaluate the impact of non-native crab introductions on the blue crab population and develop recommendations accordingly.  | On-going                         | There is concern over the interaction of blue crabs with non-native species of crabs, which include the green, mitten and Japanese shore crab. In 2006 MD adopted regulations that prohibit the transport of green or Japanese crabs. MD also adopted regulations to prohibit the import, transport, purchase, possession, sale or release of mitten crabs. The states have implemented education and outreach programs to highlight the problems associated with invasive species. |

Acronyms:

BRP= biological reference points  
 CBSAC= Chesapeake Bay Stock Assessment Committee  
 CBP= Chesapeake Bay Program  
 EBFM = Ecosystem based fisheries management

FMP = Fishery Management Plan  
 MSG = Maryland Sea Grant  
 QET = Quantitative Ecosystem Team



## 2011 Maryland FMP Report (April 2012)

### Section 8. Bluefish (*Pomatomus saltatrix*)

#### Chesapeake Bay FMP

Bluefish are pelagic and migrate seasonally between Maine and Florida. Estuarine and nearshore habitats are used as nurseries for larvae and juveniles. They are ferocious fighters making them popular among hook and line anglers. Bluefish are harvested commercially; but the commercial fishery is relatively minor. Bluefish have a lower food value because the flesh is less firm, spoils quickly in warm weather, and does not freeze well.

The Chesapeake Bay Bluefish Fishery Management Plan (CBFMP) was adopted in 1990. The CBFMP was developed in response to the Atlantic coastal FMP for bluefish and provides the framework for management within the Chesapeake Bay. Amendment 1 to the CBFMP, developed in 2003, adopted the Mid-Atlantic Fisheries Management Council (MAFMC) and the Atlantic States Marine Fisheries Commission (ASMFC) coastal overfishing definition and rebuilding schedule. The amendment introduced ecosystem based management through two new objectives: 1) water quality and habitat goals and 2) multi-species interactions.

The coastal bluefish stock is jointly managed under the MAFMC/ASMFC FMP. The coastal FMP was developed to address the concerns raised by recreational fishermen about harvest by tuna purse seine fisheries. The bluefish FMP is the first FMP developed jointly by an interstate commission and regional fishery management council. Maryland is required to submit an annual compliance report to ASMFC. The compliance report describes the fishery dependent and independent monitoring, current regulations, commercial and recreational landings, and planned management actions<sup>1</sup>. Results from the stock assessment model are hampered by uncertainty associated with the model, and, insufficient and inconsistent age/length data. Addendum I to Amendment 1 was approved in February of 2012. The goal of Addendum 1 is to significantly increase the amount of bluefish age and length data collected annually<sup>2</sup>. States allocated 5+% of bluefish harvest, plus Virginia, are required to increase sampling; Maryland is not one of those states.

#### Stock Status

There is no formal stock assessment for bluefish from the Chesapeake Bay. The status of the bluefish stock is derived from the Atlantic coast stock assessment. ASMFC completed the most recent bluefish stock assessment in 2005, and was reviewed in 2011<sup>3</sup>. In the 1990s, the coastal bluefish stock was overfished and management measures were implemented to reduce fishing mortality (F) and rebuild the stock. Fishing mortality and biological reference points were developed using an age-structured assessment program (ASAP) model. Annual stock assessment data are used in the ASAP to set annual total allowable landings (TAL). The stock was

declared rebuilt in 2009, two years ahead of the rebuilding deadline. Fishing mortality in 2010 was estimated at 0.14, below the target  $F_{MSY}$  of 0.19, and 95% of the total biomass target<sup>4</sup>. The 2010 stock assessment concluded that the population biomass has a stable trend and F remains low. Bluefish are not overfished and overfishing is not occurring.

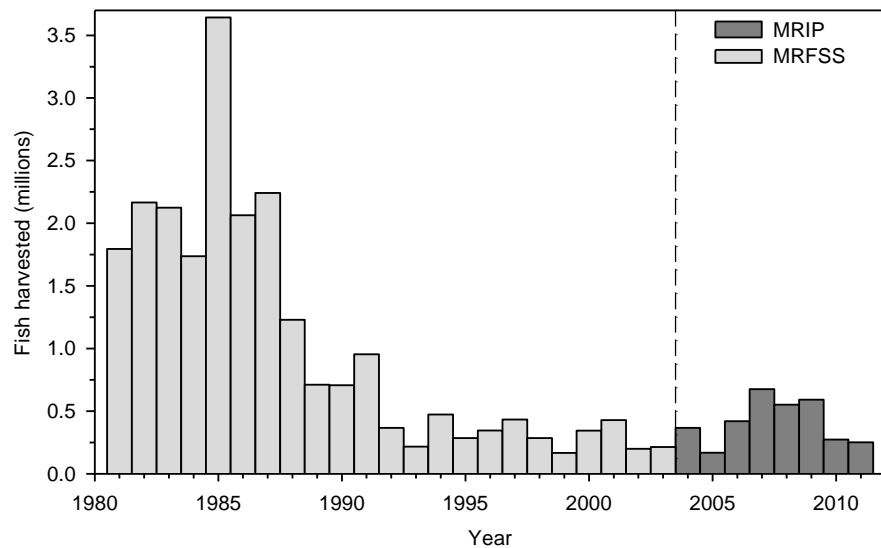
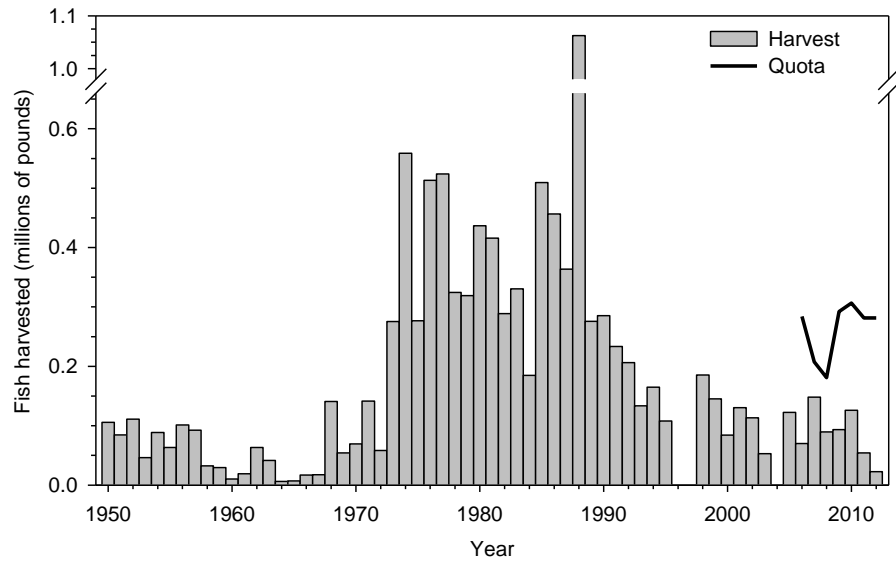
#### Current Management Measures

The commercial fishery has been managed under a coastal quota system since 2000. The MAFMC/ASMFC uses the process in the coastal Amendment 1 to set the state quotas. Maryland receives approximately 3% of the commercial coastwide quota and Virginia receives about 12%. Allocations between fisheries and among coastal jurisdictions are based on historic landings data (1981-1989). Approximately 83% of the quota is allocated to the recreational fishery and 17% to the commercial fishery.

The 2011 Atlantic coast TALs were 4.64 million pounds for the commercial fishery and 22.7 million pounds for the recreational fishery. Maryland's 2011 commercial quota was 281 thousand pounds<sup>1</sup>. National Marine Fisheries Service (NMFS) proposed 2012 coastwide TALs of 5.45 million pounds commercial (306 thousand pounds for Maryland) and 22.2 million pounds recreational (coastwide)<sup>5</sup>. Maryland has an 8" minimum size limit for both the recreational and commercial fisheries. The recreational fishery has a daily creel limit of 10 fish per person and the commercial fishery is under an annual quota. There is no closed season.

#### The Fisheries

Commercial landings in Maryland were 126 thousand pounds in 2010<sup>6</sup>, 54.2 thousand pounds in 2011<sup>7</sup>, and 22.6 thousand pounds in 2012<sup>7</sup> (as of April 4) (Figure 1). Recreational catch estimates have been revised as a part of the Marine Recreational Information Program (MRIP). Catch estimates have been recalculated for 2004-2011 to provide more accurate estimates and replace those previously made by the Marine Recreational Fisheries Statistics Survey (MRFSS) (For more details go to the FMP Introduction). The MRIP estimated that the 2010 recreational harvest was 273 thousand fish (Figure 2) and that recreational anglers released 161 thousand additional bluefish. The preliminary MRIP 2011 harvest estimate is 251 thousand fish<sup>8</sup> (Figure 2) with an additional 398 thousand bluefish released.



## Issues/Concerns

A bluefish ageing workshop was held in Norfolk, VA in May, 2011 and best ageing practices were described<sup>7</sup>. Sufficient bluefish age-at-length data is lacking for the majority of size classes caught commercially<sup>2,7</sup>. Virginia has collected the majority of otolith samples since 1998, but otolith ageing by Virginia Institute of Marine Science (VIMS) is backlogged to 2008. Atlantic coastal states are developing a cooperative plan to collect more age/length data to address shortcomings in the stock assessment model.

NMFS implementation of the MRIP to replace the MRFSS has corrected for spatial bias in data collection. However, the spatial bias correction does not reflect the spatial distribution of fishing effort for all species. Consequently for those fishes, the relationship between the MRIP and MRFSS is not consistent annually.

Total discard mortality may be an important factor for bluefish stock assessment. There is no commercial discard data available although commercial discard mortality is considered negligible<sup>5</sup>. Recreational discard mortality data is limited, but it was estimated at 15% in 2009. Recent studies suggest it could be higher<sup>4</sup>.

Age-0 bluefish have a bi-modal (spring and summer) recruitment pattern. The contribution of spring versus summer recruits to the adult population is uncertain, which increases model complexity. This uncertainty is an additional source of error.

## References

- <sup>1</sup> Durell, E.Q. 2011. Maryland 2010 Bluefish (*Pomatomus saltatrix*) Compliance Report To the Atlantic States Marine Fisheries Commission. Maryland Department of Natural Resources.
- <sup>2</sup> ASMFC. 2011. Addendum I to Amendment 1 to the bluefish fishery management plan. Atlantic States Marine Fisheries Commission. Alexandria, VA.
- <sup>3</sup> Waine, M. 2011. 2011 Review of the Atlantic States Marine Fisheries Commission fisheries management plan for bluefish (*Pomatomus saltatrix*). Atlantic States Marine Fisheries Commission. Alexandria, VA.
- <sup>4</sup> Shepherd, G.R. and J. Nieland 2010. Bluefish stock assessment update. US Dept Commerce, Northeast Fish Sci Cent Ref. Doc 10-15.
- <sup>5</sup> Fisheries of the Northeastern United States; Atlantic Bluefish Fishery; 2012 Atlantic Bluefish Specifications, 77:31 Fed. Reg.8776-8779 (2012) (proposed specifications; request for comments)

<sup>6</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. March 29, 2012: <http://www.st.nmfs.noaa.gov/st1/commercial/>.

<sup>7</sup> Personal communication from the NOAA Fisheries Service, Northeast Regional Office, Fisheries Statistics Office. April 11, 2012:  
[http://www.nero.noaa.gov/ro/fso/reports/reports\\_frame.htm](http://www.nero.noaa.gov/ro/fso/reports/reports_frame.htm).

<sup>8</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. March 29, 2012:  
<http://www.st.nmfs.noaa.gov/st1/recreational/index.html>.

<sup>9</sup> Anon. 2011. Proceedings of the Atlantic States Marine Fisheries Commission Bluefish Ageing Workshop. Norfolk, VA May 4-5, 2011.

| <b>2003 Amendment I to the 1990 Chesapeake Bay Program (CBP) Bluefish Fishery Management Plan (FMP) (updated 04/2012)</b>   |  |                                 |   |
|---|--|---------------------------------|---|
| <b>Problem Area</b>   | <b>Action</b>  | <b>Date</b>                     | <b>Comments</b>   |
| <b>Stock Status</b><br><b>Management Strategy</b><br>CBP jurisdictions will continue to utilize management strategies that decrease fishing mortality and help increase bluefish abundance. | <b>Action 1.0</b><br>CBP jurisdictions will continue to participate in scientific and technical meetings for managing bluefish along the coast and estuarine waters.   | 1999<br><b>Continue</b>         | MAFMC/ASMFC Amendment 1 was adopted in 1999. Amendment 1 to the CBP FMP was drafted in 2003. BRPs based on the 2005 coastal stock assessment were $F_{msy} = 0.19$ and $B_{msy} = 147,052$ mt. The model that calculates population abundance has been annually updated since 2005. The output from the model is used to set the annual TAC. The stock was declared rebuilt in 2009. Current mortality estimates indicate an $F$ (which is below the threshold $F$ (0.4) and target $F$ (0.19)). <b>The stock is not overfished and overfishing is not occurring.</b> |
|   | <b>Action 1.1</b><br>CBP jurisdictions will adopt the MAFMC/ASMFC overfishing definition, and adhere to the 9-year rebuilding schedule for the coast wide management of bluefish   | 1999<br>Continue<br>2009        | The 9-year rebuilding schedule reduced $F$ :<br>$F = 0.51$ (1999-2000)<br>$F = 0.41$ (2001-2003)<br>$F = 0.31$ (2004-2007)<br>Based on the most recent stock assessment and FMP review, the bluefish stock is considered rebuilt.   |
| <b>Fishery</b><br><b>Management Strategy</b><br>CBP jurisdictions will adhere to the coastal commercial and recreational TAL designated by MAFMC /ASMFC.                                    | <b>Action 2.0</b><br>CBP jurisdictions will adhere to the commercial TAL established by MAFMC/ASMFC. Individual state-by-state quotas are based on historic landings from 1981-1989.   | <b>Continue</b>                 | TAL may vary annually. The <b>proposed commercial TAL for 2012 is 10.2 million lbs: 305 thousand lbs for MD and 1.21 million lbs for VA. TALs include research set-aside quota.</b>   |
|   | <b>Action 2.1</b><br>CBP jurisdictions will continue to require licenses for harvest and sale; Virginia requires a license for its commercial hook and line fishery and established a 10 fish creel limit.   | 1991                            | In VA, any species not managed under a coastal quota system is subject to the corresponding recreational creel limit for that species in the commercial hook and line fishery.  |
|   | <b>Action 2.2</b><br>CBP jurisdictions will adhere to the coastal recreational harvest level established by the MAFMC/ASMFC. Virginia and the PRFC instituted a 10 fish creel limit in the summer of 1990. Maryland established a 10 fish recreational creel limit in 1991. Creel limits and minimum legal sizes may be modified as a. | 1990<br>1991<br><b>Continue</b> | Historically, recreational landings have accounted for 80-90% of the total catch. ASMFC sets an annual RHL. The <b>proposed RHL for 2012 is 17.2 million lbs. TAL includes research set-aside quota.</b> A 10 fish creel limit is enforced by CBP jurisdictions. MD also implemented an 8 inch minimum size limit (MD COMAR 08.02.05.10   |

| <b>2003 Amendment I to the 1990 Chesapeake Bay Program (CBP) Bluefish Fishery Management Plan (FMP) (updated 04/2012)</b>  |  |   |   |
|--|--|---|---|
| <b>Problem Area</b>  | <b>Action</b>  | <b>Date</b>   | <b>Comments</b>   |
|  |  |   | April 29 <sup>th</sup> , 1991).   |
| <b>Research and Monitoring Strategy</b><br>Data collected from multiple independent fishery surveys contribute to coastal research and monitoring efforts of bluefish.   | <b>Action 3.0</b><br>CBP jurisdictions will continue to collect catch and effort data from the commercial fishery and expand the economic data to include dollar value of the commercial fishery and the annual dockside value received for bluefish in CBP jurisdictions. | <b>Continue</b>                                     | Mandatory reporting is in effect in all CBP jurisdictions. MAFMC created a RSA program which allows up to 3% of the TAL to be sold to fund research projects. <b>NMFS is soliciting proposals under the 2011 RSA program to address research priorities for several species, including bluefish.</b>  |
|  | <b>Action 3.1</b><br>CBP jurisdictions will assess methods for improving recreational and charter catch/effort data needed to evaluate biological and economic impacts.  | Continue<br><br>2011<br>On-going<br><br><b>2012</b> | MD requires logbooks for charter boats. Beginning in 2004, coastal species managed by quota are electronically reported in real time. The MRIP is now implemented with the new Chesapeake Bay and Coastal sport fishing license to provide a more comprehensive assessment of recreational fishing statistics than the MRFSS. <b>MRIP data includes comparisons with MRFSS data back to 2004.</b> |
|  | <b>Action 3.2</b><br>CBP jurisdictions will continue to collect fishery independent data on bluefish.  | On-going  | The ChesFIMS and ChesMAP surveys provided some data used to help manage bluefish in Chesapeake Bay. The ChesFIMS survey ended in 2005. Bluefish are regularly sampled during the MDNR summer pound net sampling program.  |
| <b>Habitat Management Strategy</b><br>CBP jurisdictions are currently evaluating studies that will identify and delineate bluefish habitat and water quality parameters critical to bluefish in the Chesapeake Bay. The identification and | <b>Action 4.0</b><br>CBP jurisdictions continue to set goals for water quality, habitat restoration and protection to address commitments established under Chesapeake Bay 2000 agreements.  | Continue  | Bluefish habitat was identified in Amendment I to the Chesapeake Bay Bluefish FMP.  |
|  | <b>Action 4.1</b><br>CBP jurisdictions will regulate land and water activities that may negatively impact essential water quality parameters for bluefish such as temperature, dissolved oxygen and turbidity.   | Continue  | The CBP continues to implement strategies to reduce nutrients and improve water quality in the Bay. Planting forest buffers, controlling stormwater runoff and reducing agricultural and urban non-point nutrient inputs are part of the current action plan.   |

| <b>2003 Amendment I to the 1990 Chesapeake Bay Program (CBP) Bluefish Fishery Management Plan (FMP) (updated 04/2012)</b>  |   |             |  |
|--|---|-------------|--|
| <b>Problem Area</b>  | <b>Action</b>   | <b>Date</b> | <b>Comments</b>  |
| development of trophic level relationships will also become possible with the establishment of CHESFIMS in 2001 and ChesMAPP in 2002 and the utilization of coastal multispecies models of Atlantic menhaden, striped bass, weakfish and bluefish. | <b>Action 4.2</b><br>CBP jurisdictions will monitor activities that may negatively impact SAV types where bluefish have demonstrated a significant degree of association.   | Continue    | CBP monitors SAVs in the Chesapeake Bay by annual aerial survey. The 2010 survey estimated ~80,000 acres of SAVs or 43% of the 185,000 acre goal. The 2011 Chesapeake Bay estimate was 63,074 acres, a decrease from 2010. SAVs in the upper Bay were affected by Hurricane Irene and Tropical Storm Lee.  |
|  | <b>Action 4.3</b><br>CBP jurisdictions will monitor important forage species, when identified by fishery independent surveys, to insure that activities such as directed fisheries or incidental by-catch in non-directed fisheries, do not adversely affect forage species abundance. If fishing activities are contributing to higher fishing mortality (F) of important managed forage species, such as Atlantic menhaden, Atlantic croaker, spot and/or blue crab, additional management measures may be necessary. | In progress | Fish collected from ChesFIMS & ChesMAPP surveys may provide stomachs for predator/prey analyses of juvenile and adult bluefish in the Chesapeake Bay. Variability of the abundance of forage fish in the Chesapeake Bay is also being examined by independent research project out of CBL. The ChesFIMS was discontinued after 2005 because of lack of funding |
|  | <b>Action 4.4</b><br>CBP jurisdictions will monitor the abundance of important bluefish forage species that are not managed under CBP FMPs, such as bay anchovies and Atlantic silversides  | On-going    | MD and VA juvenile seine surveys monitor the abundance of anchovies and silver sides. Non-managed forage fish abundance is being examined by an independent, CBL research project.   |
|  | <b>Action 4.5</b><br>CBP jurisdictions will continue to identify predator/prey interactions, both inter- and intra- species competition and other interactions that might effect the management of bluefish.  | On-going    | Data from the ChesFIMS and the ChesMAP surveys will be utilized to identify and delineate ecological relationships. Development of multispecies fishery management plans may result from this data.  |

**Acronyms**

**ASMFC** – Atlantic States Marine Fisheries Commission

**B<sub>msy</sub>** – Biomass maximum sustainable yield

**BRP** – Biological Reference Point

**CBL** – Chesapeake Biological Laboratory

**CBP** – Chesapeake Bay Program

**CHESFIMS** – Chesapeake Bay Fishery Independent Multispecies Survey

**CHESMAP** – Chesapeake Bay Multispecies Monitoring & Assessment Program

**COMAR** – Code of Maryland

**F** – Fishing Mortality

**FMP** – Fishery Management Plan

**F<sub>msy</sub>** – Fishing mortality at the “threshold” biological reference point. If F is at a rate beyond this point (F<sub>msy</sub>), overfishing is occurring because

the fishing of the stock has gone beyond the stock's maximum sustainable yield (MSY).

**MAFMC** – Mid-Atlantic Fisheries Management Council

**MDNR** – Maryland Department of Natural Resources

**MRFSS** – Marine Recreational Fisheries Statistics Survey

**MRIP** – Marine Recreational Information Program

**NMFS** – National Marine Fisheries Service

**PRFC** – Potomac River Fisheries Commission

**RHL** – Recreational Harvest Limit

**RSA** – Research Set-Aside

**SAV** – Submerged Aquatic Vegetation

**TAC** – Total Allowable Catch

**TAL** – Total Allowable Landings

## 2010 Maryland FMP Report (July 2012)

### Section 9. Maryland Catfish Species

#### Introduction

Non-native blue (*Ictalurus furcatus*) and flathead (*Pylodictis olivaris*) catfish populations have spread into nearly every major tributary of the Chesapeake Bay (Figure 1). Their populations have increased in abundance and expanded their range beyond their usual salinity tolerance. Blue and flathead catfish are top apex predators in the ecosystem which raises concerns about their effects on native fish communities. In 2011, the Chesapeake Bay Program's Sustainable fisheries Goal Implementation Team (SFGIT) recognized invasive catfish as a problem. Removing blue and flathead catfish from established areas is not considered possible with current available methods. Both species are listed in Maryland regulations as "Nuisance and Prohibited Species" and are on the "No transport" list which prohibits anglers from moving them to other waters of the state. However, both catfish species have been established in areas outside of what would be considered "normal". It is likely that non-native species have been spread through angler transport. There are conflicting concerns between supporting recreational/ commercial fishing opportunities and curtailing an "invasive" species.

White catfish (*Ameiurus catus*) and brown bullheads (*A. nebulosus*) are native to the area. Channel catfish (*Ictalurus punctatus*) were introduced into the Potomac River around the end of the 19<sup>th</sup> century. The channel catfish spread throughout the Bay region, reaching Maryland's portion of the Chesapeake Bay in the late 1950's. They are now ubiquitous in the region and are considered to be naturalized. Blue catfish were also introduced to the Potomac River in the 1970s and were found in high numbers in the 1990's to present. Flathead catfish were introduced to the James River in Virginia between 1965 and 1977. Additional introductions are believed to have occurred in the upper Chesapeake Bay within the last 10 years and flathead catfish are now commonly found there.

A Fishery Management Plan has not been written for catfish in Chesapeake Bay. A technical report was written in 1998. This technical report summarized catfish knowledge and recommended a survey of catfish populations to determine stock status in the Chesapeake Bay.

#### Stock Status

A population assessment of channel catfish was completed in 2010<sup>1</sup>. It used a surplus production model for the Head of Bay (HOB), Choptank River, and the Potomac River to assess the stock. Fishery dependent and independent relative abundance indices were also calculated. In addition to indices for commercial landings, the spring drift gill net surveys in the HOB, Choptank and Potomac River and fyke net survey index for the

Choptank River was used in the surplus production models. Estuarine Juvenile Finfish Survey (EJFS) data were used to determine relative juvenile catfish abundance and as qualitative supporting data. The HOB surplus production model showed a population biomass decline during the 1990's after a period of population growth in the 1980's. Relative stock density data from fyke nets sampled in the Choptank River indicates that channel and white catfish relative abundance is above the average for the time series (Figures 2 and 3)<sup>2</sup>. Recruitment during 2011 indicated a modest increase over the last few years but below average abundance (Figure 4). Although data was collected on white catfish, sample sizes were low and could not be used to calculate relative stock densities and length frequencies.

#### Management

A 10 inch minimum size limit applies to both commercial and recreational fisheries in tidal waters. There are no creel limits or closed seasons. Area and gear restrictions apply to commercial fishermen. In non-tidal waters, there is a 5 fish/person/day creel limit with a 10 fish possession limit and no minimum size limit for channel catfish.

#### Fishery Statistics

The catfish commercial fishery is important in the Chesapeake Bay region (Figure 5). When harvest peaked in 1996, catfish were the second highest landed species by weight. In 2008, catfish landings were third highest by weight. Since 2009, the catfish commercial fishery is now reported by species. As a result, there is an artificial drop in commercial landings since then. In the last few years, flathead and blue catfish have entered the commercial fishery and an active market exists for these invasive species. Catfish are caught in commercial fish pots, fyke nets, and pound nets. They are sold in both "dead" and "live" markets.

The recreational fishery for catfish is also important, but there are no recent surveys of recreational catfish catch in Maryland. The Marine Recreational Information Program (MRIP) does not collect data on catfish. In some western shore tributaries of Chesapeake Bay, guided trophy fisheries exist and utilize catch-and-release activity especially for the larger, invasive blue catfish. Recreational catfish size records are frequently broken.

#### Issues of Concern

Introduced non-native catfish are invasive species. Both blue and flathead catfish compete with native species for forage. Fishermen most likely have moved these invasive species to different areas within the Bay in misguided attempts to "improve" fishing conditions. Declines of channel catfish biomass have corresponded to the appearance of the blue catfish in Potomac River surveys<sup>1</sup>. Blue catfish inter-specific competition and predation may hinder channel catfish population recovery. The native white catfish have declined in many areas and circumstantial evidence suggests their



decline may be correlated to the expansion of non-native and invasive catfish species. This may also have consequences to the recoveries of ospreys and eagles that rely upon native and naturalized fish species for high quality forage.<sup>3</sup> During 2011, the Sustainable Fisheries Goal Implementation Team (GIT) of the Chesapeake Bay Program developed a policy on invasive catfish species. The policy agrees to develop and implement management strategies to reduce invasive catfish populations and mitigate their spread. The ASMFC adopted a Resolution on Non-Native Invasive Catfish (2011) that does not support the introduction or transport of non-native invasive species; it identifies the need for more research; and supports the development of management efforts to reduce/minimize the impacts of invasive catfish species.

Catfish do not make migrations and can occur throughout the year in degraded habitats. They accumulate toxins, especially PCBs and pesticides, and MDE has posted consumption advisories for many areas such as Patapsco Harbor, Baltimore Harbor, Middle River and portions of the Elk River, Back River, Anacostia River and Potomac River. In addition to the human health advisories, catfish found in some habitats, such as the Anacostia River, exhibit high rates of skin and liver tumors, likely a result of exposure to polynuclear aromatic hydrocarbons (PAHs) in contaminated sediments<sup>4</sup>.

#### References:

<sup>1</sup>Piavis, P. and E. Webb III. 2010. Population assessment of channel catfish in Maryland with special emphasis on Head-of-Bay stocks. In Chesapeake Bay finfish and habitat investigations. Maryland Department of Natural Resources. Report F-61-R-5. Annapolis, Maryland.

<sup>2</sup>Piavis, P. and E. Webb III. 2012. Population vital rates of resident finfish in selected tidal areas of Maryland's Chesapeake Bay. Project No.1, Job No.1 *In* Chesapeake finfish and habitat investigations. Maryland Department of Natural Resources. Report F-61-R. Annapolis, Maryland.

<sup>3</sup>Viverette, C.A., G.C. Garman, S.P. McNinch, A. C. Markham, B.D. Macko. 2007. Finfish-waterbird trophic interactions in tidal freshwater tributaries of the Chesapeake Bay. *Waterbirds* 30 (Special Publications 1):50-62.

<sup>4</sup>Pinkney, A.E., J.C. Harshbarger, E.B. May, and W.L. Reichert. 2002. Tumor prevalence and biomarkers of exposure and response in brown bullheads (*Ameiurus nebulosus*) from the Anacostia River, Washington, D.C. and Tuckahoe River, Maryland. CBFO-C02-07.

Figure 1. Distribution of blue catfish in Chesapeake Bay tributaries from 1996-2012 (Schloesser *et al.*, 2011; Garman *et al.*, unpublished data).

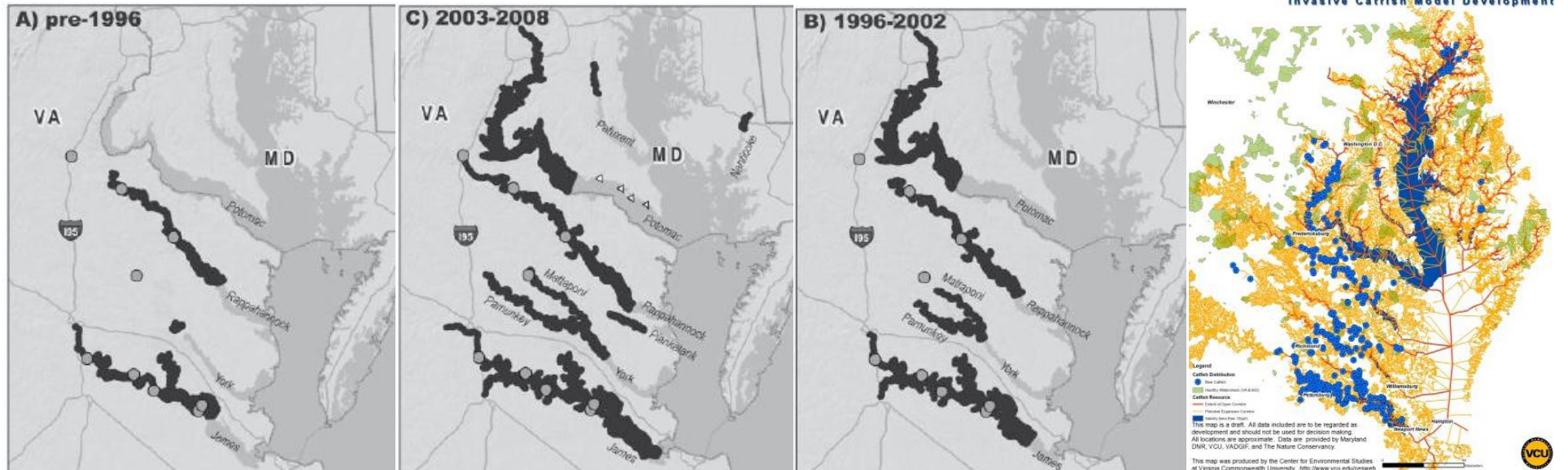
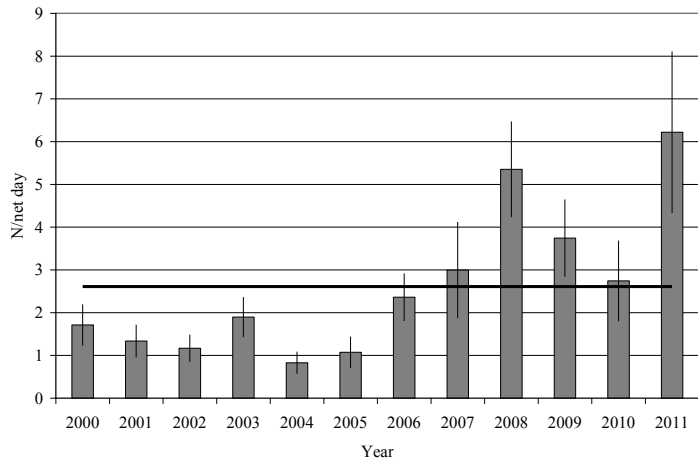
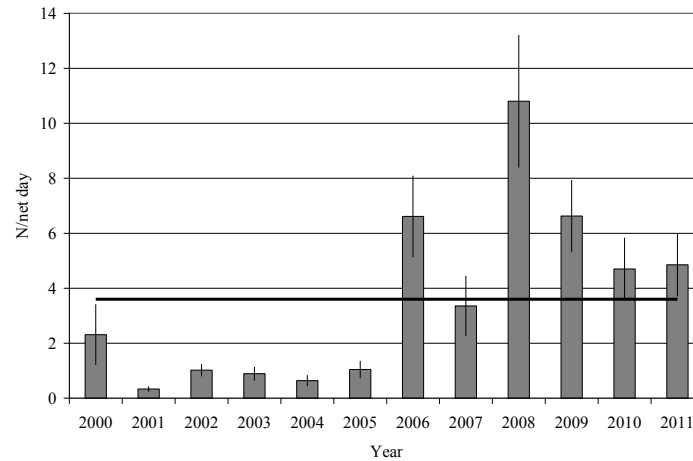


Figure 2. Channel catfish relative abundance (N/net day) from the Choptank River fyke net survey, 2000 – 2011.



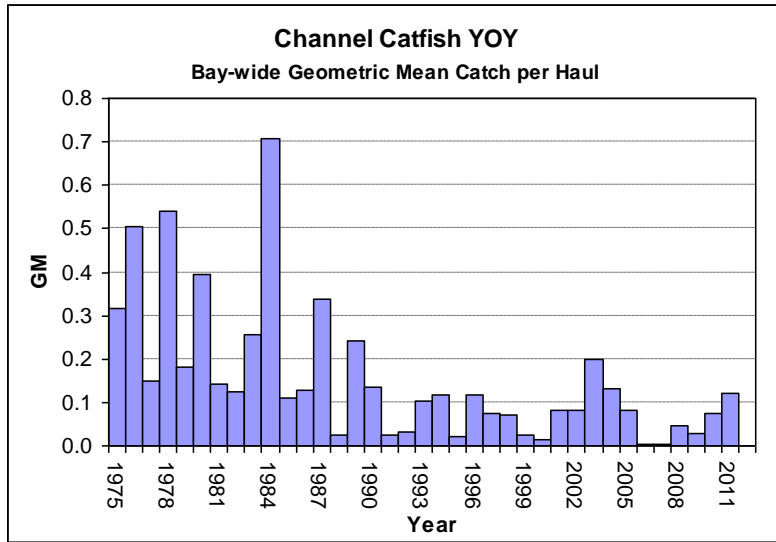
(Horizontal line= time series average relative abundance)

Figure 3. White catfish relative abundance (N/net day) from the Choptank River fyke net survey, 2000 – 2011



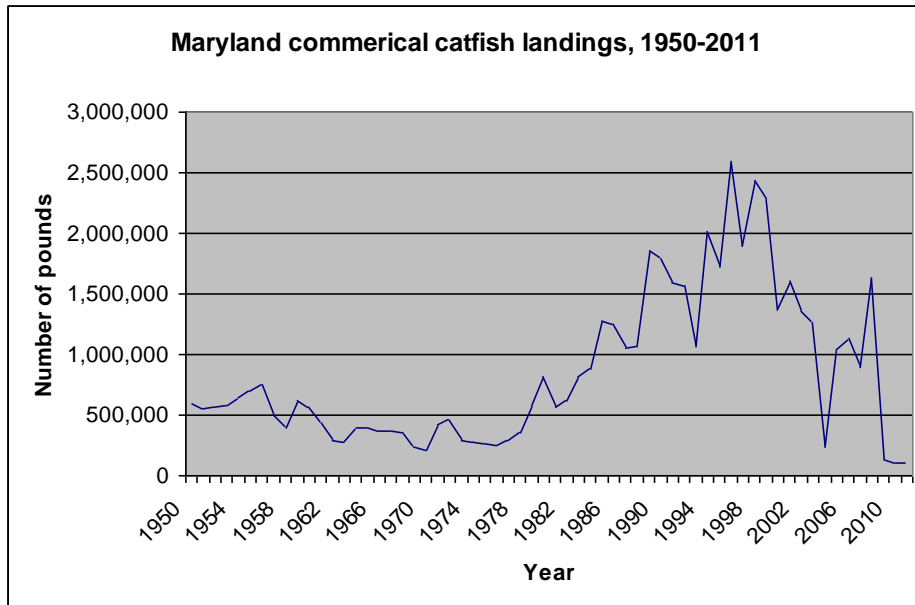
(Horizontal line= time series average relative abundance)

Figure 4. Maryland young-of-year (YOY) geometric mean catch per haul of channel catfish, 1975-2011.



Durell, E.Q., and Weedon, C. 2011. Striped Bass Seine Survey Juvenile Index Web Page. <http://www.dnr.state.md.us/fisheries/juvindex/index.html>. Maryland Department of Natural Resources, Fisheries Service.

Figure 5.



## 2011 Maryland FMP Report (July 2012)

### Section 10. Maryland Coastal Bays Blue Crab (*Callinectes sapidus*)

Both fishery dependent and fishery independent data from the Coastal Bays indicate year-to-year variation in blue crab abundance. Blue crabs in the Coastal Bays are managed under the 2001 Coastal Bays Blue Crab Fishery Management Plan (FMP). The plan sets forth management measures to conserve the coastal blue crab stock, protect its ecological and socio-economic values, and optimize the long-term utilization of the resource. The 2001 Coastal Bay Blue Crab FMP was reviewed during 2010. The Plan Review Team determined that the plan was still an appropriate framework for managing the resource.

The development of an FMP was triggered by the Comprehensive and Conservation Management Plan (CCMP) adopted for Maryland's Coastal Bays in 1999. This plan distinguished Maryland's Coastal Bays as a separate, unique ecosystem from the Chesapeake Bay and recommended that the Maryland Department of Natural Resources address fishery issues specific to Maryland's Coastal Bays. The CCMP is reviewed and updated on an annual basis. A comprehensive review of the CCMP is scheduled for 2012.

#### Stock Status

Analysis of the Coastal Bays Finfish Investigation (CBFI) Trawl Survey data indicates that blue crab relative abundance in the Coastal Bays fluctuates without trend and represents a relatively stable population. Additional fishery independent data collected by the CBFI Trawl Survey indicates that the mean size of blue crabs in the Coastal Bays is smaller than the mean size of blue crabs in the Chesapeake Bay. This is most likely a result of the higher salinities found in the Coastal Bays. Recruitment of juveniles into the Coastal Bays is largely driven by environmental and hydrologic elements of the Atlantic Ocean waters. Although there is evidence that some internal recruitment is occurring, it is hypothesized that the majority of juveniles that take up residence in Maryland's Coastal Bays are transported by ocean currents from the mouth of the Chesapeake and Delaware Bays. Recent climate change analysis indicates that oceanic currents are influenced by

#### Fishery Statistics

Maryland's Coastal Bays support both a commercial and recreational blue crab fishery. The 2011 harvest of hard, soft and peeler crabs from the Coastal Bays decreased from the high in 2010 (Figure 2). Annual commercial harvest of blue crabs from the Coastal Bays has ranged from 0.54 to 2.4 million pounds with an average harvest of 1.4 million pounds. The recreational fishery is primarily a small boat fishery due to limited public shoreline/pier/bulkhead access. Recreational harvest of blue crabs in the Coastal Bays is undocumented. Estimates of recreational harvest from the Chesapeake Bay are believed to be between 8 and 11% of the commercial harvest. Whether or not this estimate is feasible for the Coastal Bays is unknown.

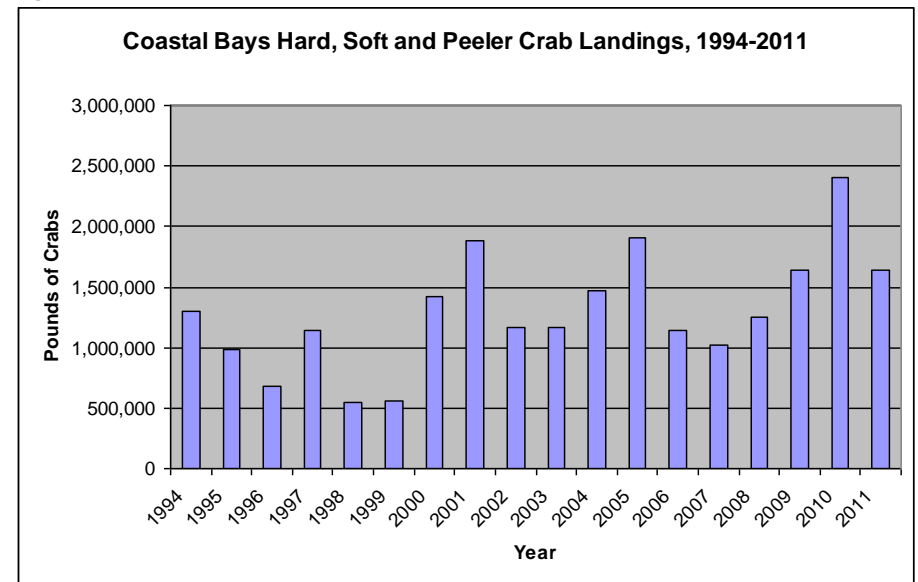
#### Management Measures

DNR manages the Coastal Bays commercial blue crab fishery through daily catch limits (25 bushels/boat/day), seasons (closed between Dec 31 & Apr 1), gear restrictions (no scrapes or dredges), size limits (minimum 5" for hard crabs and 3 1/2" for soft crabs), limited entry, and other management strategies as necessary to control fishing effort. DNR manages the recreational blue crab fishery in the Coastal Bays through daily catch limits (1 bushel/person/day and no more than 2 bushels/boat/day), gear restrictions (no more than 600 ft of trotline/person or two 600 ft. trotlines/boat; 10 collapsible traps or crab net rings/person or 25 trips or rings/boat), and minimum size limits. Special regulations are in place for crabbing in Worcester County and may change annually (see COMAR for a complete list of restrictions).

#### Concerns/Issues

A parasitic dinoflagellate, *Hematodinium* sp., has been found to cause mortality in blue crabs from the Coastal Bays. Studies conducted in 2005 and 2006 indicated that the number of infected crabs follows a seasonal pattern increasing from late summer through December. Results indicated that salinity and water temperature are vital components to the proliferation of the parasite and associated mortality. There is still much that is unknown about *Hematodinium* sp. and its effects on the blue crab population in the coastal bays. Research is needed to better understand the mortality associated with this disease so that fisheries managers can work to maintain optimum sustainable blue crab population from Maryland's coastal bays.

Figure 1



(MDNR data)



| <b>2001 Coastal Bays Blue Crab Fishery Management Plan Implementation</b> (last update 6/12)   |  |  |
|--|--|--|
| <b>Objective/Problem</b>   | <b>Action</b>  | <b>Implementation</b>  |
| Obj. 1. Improve our understanding of how <i>Hematodinium</i> contributes to the mortality and population abundance of blue crabs.<br>Prob. 1.1: Research and Monitoring. | <b>1.4.1</b> DNR and MCBP will identify potential funding sources to support the following research and monitoring activities:<br>a) Assess the impact of <i>Hematodinium</i> in the coastal bays blue crab population (i.e. identify what intensity of <i>Hematodinium</i> infection causes mortality, and identify other factors, environmental and/or biological, that may influence blue crab mortality from <i>Hematodinium</i> ).<br>b) Identify factors which influence <i>Hematodinium</i> proliferation, elucidating different life stages, determining the full life cycle of the parasite, and eventual production of a more specific diagnostic tool either by immunoassay or molecular assay techniques.<br>c) Examine how crabs become infected with <i>Hematodinium</i> . | Current research includes monitoring prevalence in MD coastal bays. <b>Research is ongoing with the NOAA Oxford Cooperative. University of MD Eastern Shore, and VIMS. A 2010/2011 University of MD project found the presence of <i>Hematodinium</i> sp. 9% of the water &amp; sediment samples</b> |
|  | <b>1.4.2</b> DNR will define the criteria under which a Marine Protected Area can be effective in assessing the impacts of <i>Hematodinium</i> on blue crabs   | The Coastal Bays Fisheries Advisory Committee has discussed MPAs without any specific outcome.   |
| Obj. 2. Improve our understanding of blue crab biology and stocks.<br>Prob. 2.1: Stock Status  | <b>Action 2.1.1:</b> Adopt an overfishing threshold consistent with Chesapeake Bay that preserves a minimum of 10 percent of the blue crab's spawning potential (F <sub>10</sub> percent), and a fishing target that preserves 20 percent of an unfished stock. (F <sub>20</sub> percent).   | No targets and thresholds have been determined for Coastal Bays blue crabs. <b>Reported landings of hard, soft and peeler crabs from the Coastal Bays was 2.6 million lbs (2011). Average landings have been approximately 1.4 million lbs.</b>  |
|  | <b>2.1.2:</b> DNR will work towards implementing the necessary research and monitoring programs to determine the appropriate fishing mortality rates that will achieve the established fishing target of F <sub>20</sub> percent. (Chesapeake Bay mortality rates (fishing and natural) are not necessarily transferable to Maryland's coastal bays.)  | There is no direct blue crab monitoring in the Coastal Bays but data is collected through the Coastal Bays fishery independent trawl and seine survey. Research needs have not been defined.   |
|  | <b>2.1.3:</b> DNR will work towards allocating funds specific to the Department's coastal bays blue crab monitoring program and data analysis.   | No specific funds are designated for blue crab monitoring in the Coastal Bays but data is collected through an ongoing fisheries monitoring program.   |

| <b>2001 Coastal Bays Blue Crab Fishery Management Plan Implementation</b> (last update 6/12) |  |   |
|--|--|---|
| <b>Objective/Problem</b>   | <b>Action</b>  | <b>Implementation</b>   |
|  | <b>2.1.4:</b> DNR and MCBP will encourage research that examines the stock - recruitment relationship of blue crabs in the coastal bays, level of localized reproduction and entrapment of larvae, and effects of environmental parameters which influence fluctuations in crab abundance (i.e. including this action in the FMP will identify these research needs as a high priority which will better enable DNR, MCBP, Universities and others to obtain support for funding these research projects).   | No research completed.  |
|  | <b>2.1.5:</b> DNR will examine the utility of developing a public outreach indicator(s) of blue crab abundance that can be used to inform the community on the annual status of blue crab stocks in the coastal bays.  | Dependent on all the actions specified in Objective 2 .   |
| Prob 2.2: Commercial Catch and Effort Data.  | <b>2.2.1:</b> DNR will establish, implement and evaluate a commercial reporting monitoring program to obtain accurate catch and effort data from anyone crabbing commercially in Worcester County consistent with recommendations of the Atlantic Coast Cooperative Statistics Program.<br>a) Evaluate the effectiveness of the A pilot@ daily logbook reporting system implemented in 2000 for commercial crab harvesters and dealers in Worcester Co<br>b) Consider using the Chesapeake Bay's commercial crab reporting system, but make it specific to the coastal bays, including more detailed information on location of harvest and effort data. | As a result of the pilot system, blue crab reporting went from a monthly summary to a daily logbook. The daily logbook program was expanded to the entire state in 2001. <b>A 2012 pilot study being conducted in the Chesapeake Bay is using an electronic system to improve the timely reporting of catch statistics.</b> |
|  | <b>2.2.2:</b> DNR will improve the enforcement of mandatory monthly reporting  | New penalties are now in effect which create a more effective system for commercial fishing licensees who are late or don't turn in their fishing reports. The new penalty system should improve reporting.   |
| Prob. 2.3: Recreational Catch and Effort Data.   | <b>2.3.1:</b> DNR will design and implement a recreational crabbing survey in the coastal bays consistent with the pilot recreational crabbing survey in Chesapeake Bay.   | A project to determine the design of a survey was completed. Implementation limited due to lack of funding. Maryland Blue Crab Volunteer Angler Survey started in 2008 and was expanded in 2009.  |

| <b>2001 Coastal Bays Blue Crab Fishery Management Plan Implementation</b> (last update 6/12) |  |   |
|--|--|---|
| <b>Objective/Problem</b>   | <b>Action</b>  | <b>Implementation</b>   |
|  | <b>2.3.2:</b> DNR will identify potential funding mechanisms to fund and complement monitoring efforts outlined in Strategies 2.3.1 and 2.1.1.   | No funding has been identified.   |
| Prob. 2.4: Invasive, Non-indigenous Species  | <b>2.4.1:</b> DNR will continue to monitor the abundance and impact of green crabs and other invasive, non-indigenous crab species.  | Ongoing but limited due to lack of funding. In eastern North America, green crabs have been shown to significantly reduce populations of shellfish including soft shell clams, scallops and hard clams. |
|  | <b>2.4.2:</b> DNR will evaluate the following management strategies related to green crabs:<br>a) DNR will prohibit the possession and sale of imported green crabs, and promote the harvest and sale of locally harvested green crabs.<br>b) DNR will prohibit the importation and sale of green crabs. | Green crabs have not been prohibited as bait. They are prohibited from being transported (COMAR 08.02.19.04)  |
|  | <b>2.4.3:</b> DNR will continue to work with Maryland's Non-Indigenous Species Task Force to examine invasive species issues, and develop an Aquatic Nuisance Species Plan to become eligible for Federal funding  | A Maryland plan has not been developed. However, the Aquatic Nuisance Species Task Force developed a management plan for green crabs for the entire U.S. in 2002.                                       |
|  | <b>2.4.4:</b> MCBP will develop an outreach program (i.e. brochures) to educate the coastal bays community on the impacts of exotic species.   | Impacts of exotic or non-native species was included in <u>Shifting Sands</u> (2009), a book about the Coastal Bays.  |
| Prob. 2.5: Functional Role of Blue Crabs in the Natural Ecological Community.                | <b>2.5.1:</b> DNR will examine methods/studies to better understand the natural ecological functions of blue crabs in the coastal bays, including the establishment of a Marine Protected Area in the coastal bays.  | No studies have been conducted on marine protected areas.   |
| Obj.3. Maintain an economically stable and sustainable commercial blue crab fishery.         | <b>3.1.1:</b> DNR will improve the accuracy of effort data in the coastal bays' commercial blue crab fishery by implementing actions related to Problem 2.2 - Commercial Reporting.  | See comments Action 2.2.2.  |
|  | <b>3.1.2:</b> DNR will continue to manage the coastal bays commercial blue crab fishery through the use of time limits, seasons, gear restrictions, catch limits, size limits, limited entry, and  | Completed.  |



| <b>2001 Coastal Bays Blue Crab Fishery Management Plan Implementation</b> (last update 6/12) |   |  |
|--|---|--|
| <b>Objective/Problem</b>   | <b>Action</b>   | <b>Implementation</b>  |
|  | <p>other management strategies as necessary, to prevent further increases in fishing effort.</p> <p>a) <b>Gear Restrictions</b> - Prohibit the taking of blue crabs in the coastal bays by scrape and dredge to prevent these fisheries from developing, and lessen the gear impacts on blue crab habitat;</p> <p>b) <b>Time Restrictions</b> - Establish similar time restrictions to those in the Chesapeake Bay to prevent a shift in crabbing effort from the Chesapeake Bay to the coastal bays during years when crab abundance is low in the Chesapeake Bay.</p> <p>1) For 2001 - Prohibit the taking of crabs for commercial purposes between 2:00 p.m. and 5:30 a.m.</p>   | <p>Prohibition of scrapes &amp; dredges has been enacted. (COMAR.08.02.03.06E)</p> <p>Time restrictions have been enacted. (COMAR.08.02.03.06D2)</p> <p>Closed season enacted: November 1 to April 1. (COMAR 08.02.03.06C)</p> |
| Prob. 3.2: Harvest of Female Crabs,  | <p><b>3.2.1:</b> DNR will continue to prohibit the harvest of sponge crabs, and limit the taking of female crabs in the coastal bays through the use of time limits, seasons, area closures, gear restrictions, catch limits, and size limits, as necessary.</p> <p>a) <b>Area Closures</b> - DNR will delineate areas where female blue crabs are concentrated (Action 5.2.1(a)), and determine the appropriate time periods for which commercial crabbing and hydraulic clam dredging should be allowed within these areas. The following areas have been identified as potential closure areas but need to be delineated further:</p> <p>1) The Convention Hall site, bayside of Ocean City roughly between 36<sup>th</sup> and 50<sup>th</sup> Street; and</p> <p>2) The Therefore site, in southern Isle of Wight Bay;</p> <p>3) The Bridge site, just north of the Verrazano Bridge on the barrier island side.</p> <p>b) <b>Catch and Size Limits</b> - Determine if the current catch and size limits for female crabs are appropriate.</p> | Ongoing.   |
|  | <p><b>3.2.2:</b> DNR will investigate the economic impact of prohibiting the possession and sale of sponge crabs within the state.</p>  | Completed. (Lipton and Sullivan 2002).   |
| Prob. 3.3: Wasteful Harvest Practices.   | <p><b>3.3.1</b> DNR will require unobstructed cull rings in crab pots from June 1 through April 30, and will adjust cull ring requirements based upon further research (peeler pot cull ring study being planned on Chesapeake Bay).</p>  | Ongoing  |
|  | <p><b>3.3.2:</b> DNR will determine if measures are necessary to reduce the bycatch mortality of crabs in the hydraulic clam dredge fishery (i.e. Action 3.2.1(a) - prohibition of hydraulic clam dredging in areas where female crabs are concentrated).</p>   | Hydraulic Clam Dredging is currently prohibited in Maryland's Coastal Bays, 2007. Natural Resource Article § 4-1002  |
|  | <p><b>3.3.3:</b> DNR will continue to require terrapin excluders in crab pots set for noncommercial purposes, encourage watermen to install terrapin excluders in commercial crab pots, and</p>   | Ongoing. (Lukacovic et al. 2005)   |

| <b>2001 Coastal Bays Blue Crab Fishery Management Plan Implementation</b> (last update 6/12)               |  |   |
|--|--|---|
| <b>Objective/Problem</b>   | <b>Action</b>  | <b>Implementation</b>   |
|  | investigate the feasibility (i.e. effects on catch; economic impact) of requiring terrapin excluders in all crab pots set in the coastal bays.   |   |
|  | <b>3.3.4:</b> MCBP will coordinate an annual/seasonal volunteer effort to locate and remove derelict pots.   | Ongoing.  |
| Obj. 4. Improve the recreational crabbing experience.<br>Prob. 4.1: Satisfaction of Recreational Crabbers. | <b>4.1.1:</b> DNR and MCBP will obtain information on satisfaction levels of recreational crabbers in the coastal bays to evaluate the effectiveness of management measures.   | No recreational crabbing surveys have been completed.   |
|  | <b>4.1.2:</b> DNR will examine the effects of habitat quality on the success rates of recreational crabbing in the coastal bays.   | No studies have been conducted.   |
|  | <b>4.1.3:</b> DNR and MCBP will develop and distribute the following information pertaining to the recreational crab fishery in the coastal bays:<br>a) Recreational crabbing brochure summarizing crabbing restrictions;<br>b) Recreational crabbing sign for access points (i.e. boat ramps and fishing/crabbing piers);<br>c) Maps of land-based public access and boat based crabbing locations, list of boat ramps and marinas with rental boats, and recreational crabbing tips.   | Ongoing.  |
|  | <b>4.1.4:</b> DNR, MCBP, Town of Ocean City and Worcester County will work towards increasing the number of land-accessible areas for recreational crabbing.   | Ongoing.  |
| Obj. 5. Protect, maintain and enhance blue crab habitat.<br>Prob. 5.1: Submerged Aquatic Vegetation (SAV). | <b>5.1.1:</b> DNR will alleviate the impact of hydraulic clam dredging and prop scarring to SAV in the coastal bays by:<br>a) Prohibit hydraulic clam dredging in SAV;<br>b) Annually documenting the areas and extent of impact;<br>c) Researching seagrass recovery time;<br>d) Investigating the use of buoys to mark beds, SAV setbacks, depth restrictions, GPS equipment to identify boundaries, and education as tools to protect beds from damage; and<br>e) Implementing and enforcing necessary regulations to protect SAV from hydraulic clam dredging. | Hydraulic Clam Dredging is currently prohibited in Maryland's Coastal Bays, 2007. Natural Resource Article § 4-1002 |
|  | <b>5.1.2:</b> By implementing Action 3.1.2, DNR will prohibit the taking of blue crabs in the coastal bays by scrape and dredge to prevent these fisheries from developing and impacting SAV.  | Completed.  |
|  | <b>5.1.3:</b> DNR and MCBP will continue to identify SAV species needing protection and  | Ongoing.  |

| <b>2001 Coastal Bays Blue Crab Fishery Management Plan Implementation</b> (last update 6/12) |  |  |
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| <b>Objective/Problem</b>   | <b>Action</b>  | <b>Implementation</b>  |
|  | activities needing restrictions.   |  |
|  | <b>5.1.4:</b> MCBP will expand surveys/citizens monitoring to ground truth SAV species composition and determine accuracy of photo interpretive maps.  | <b>Most recent survey indicates that SAVs decreased from 12,863 acres (2010) to 9,083 acres (2011). The decrease is due to degraded water quality combined with a hot summer in 2010. The jurisdictions will continue to reduce nutrient and sediment input.</b> |
|  | <b>5.1.5:</b> DNR and Natural Resources Conservation Service (NRCS) will develop habitat requirements for the growth of seagrasses in the coastal bays by:<br>a) DNR will develop water quality requirements for seagrasses;<br>b) DNR will identify areas that meet water quality requirements for restoration purposes;<br>c) NRCS will compile data relating coastal bay soil types to bottom communities and identify other variables having effects on seagrass establishment and maintenance; and<br>d) NRCS will complete soil mapping effort for entire coastal bays | a) Completed (Maryland Department of Natural Resources 2004).<br>b) Ongoing.<br>c) Completed by MGS & DNR.<br>d) Not yet initiated.  |
| Prob. 5.2:<br>Overwintering Habitat.   | <b>5.2.1:</b> DNR will identify and protect blue crab overwintering areas in the coastal bays by:<br>a) Delineating and mapping overwintering areas; and<br>b) Prohibiting hydraulic clam dredging in important overwintering areas year-round, unless data indicates that these areas can be opened on a seasonal basis (see Action 3.2.1(a)).<br>c) DNR will define the criteria under which a Marine Protected Area can be effective in protecting blue crab overwintering areas.   | No mapping has occurred for blue crabs. Hydraulic clam dredging is prohibited (2007). No steps have been taken to define marine protected areas.   |
| Prob. 5.3: Shallow Water and Shoreline Habitats.   | <b>5.3.1:</b> DNR will support actions in the CCMP, specifically “Challenge 1.9 of the Fish and Wildlife Section” to protect and enhance shallow water and shoreline habitats important to blue crabs. DNR and Worcester County are the lead agencies for the majority of these actions. Refer to the CCMP for more specific information on these actions.   | Ongoing.   |
| Prob. 5.4: Dissolved Oxygen.   | <b>5.4.1:</b> DNR will support actions in the CCMP, specifically in the “Water Quality” section and “Fish and Wildlife” section to minimize the impacts of unsuitable dissolved oxygen levels to blue crabs in the coastal bays. Maryland’s Coastal Bays Program, Town of Ocean City, and Worcester County are the lead agencies for the majority of these actions. Refer to the CCMP for more specific information on these actions.  | Ongoing. (Maryland Department of Natural Resources 2004). <b>The CCMP will be undergoing a thorough review in 2012.</b>  |
|  | <b>5.4.2:</b> DNR will identify areas which have unsuitable levels of dissolved oxygen (i.e. < 3   | Ongoing. (Maryland Department  |

| <b>2001 Coastal Bays Blue Crab Fishery Management Plan Implementation</b> (last update 6/12)              |  |   |
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| <b>Objective/Problem</b>  | <b>Action</b>  | <b>Implementation</b>   |
|   | mg/L) for blue crabs.  | of Natural Resources 2004).   |
| Prob. 5.5: Nutrient, Sediment and Chemical Inputs.  | <b>5.5.1:</b> DNR will support actions in the “Water Quality” section of the CCMP to control nutrient, sediment and chemical inputs which will protect and enhance blue crab habitats. Worcester County and Maryland’s Coastal Bays Program are the lead agencies for the majority of these actions. Refer to the CCMP for more specific information on these actions. | Ongoing. (Maryland Department of Natural Resources 2004).   |
| Obj. 6. Improve enforcement of crabbing restrictions.<br>Prob. 6.1: Enforcement of Conservation Measures. | <b>6.1.1:</b> DNR will consider increasing the number of enforcement personnel in the coastal bays, specifically during the crabbing season.   | NRP hires seasonal staff to increase patrols during summer months. Penalties for violating regulations and enforcement procedures have been enhanced over the past several years. |
|   | <b>6.1.2:</b> DNR will consider expanding the Natural Resource Police reserve officer program.   | The reserve officer program is composed of volunteers committed to performing non-law enforcement duties that would otherwise be performed by commissioned police officers.       |

**Acronyms:**

DNR = Department of Natural Resources  
MCBP = Maryland Coastal Bays Program  
NRP = Natural Resources Police

## 2011 Maryland FMP Report (July 2012)

### Section 11. Maryland Coastal Bays Hard Clam (*Mercenaria mercenaria*)

#### Coastal Bays FMP

The Coastal Bays of Maryland have supported hard clam fisheries until recent times... In 1999, a Comprehensive and Conservation Management Plan was adopted for Maryland's Coastal Bays. This plan distinguished Maryland's Coastal Bays as a separate, unique ecosystem from the Chesapeake Bay and recommended that the Maryland Department of Natural Resources (MDNR) address fishery issues specific to Maryland's Coastal Bays. In accordance with this plan, a Coastal Bays Hard Clam Fishery Management Plan (FMP) was adopted in 2002 to conserve the coastal stock, protect its ecological and socio-economic values, and optimize the long-term utilization of the resource. During 2010, the Coastal Bays Hard Clam Plan was reviewed by the Plan Review Team (PRT). The PRT recommended that the plan should be revised because the majority of actions are no longer valid due to the ban on dredging.

#### Stock Status

Since 1993, the MDNR Shellfish Division has conducted fishery-independent hard clam surveys in the Maryland Coastal Bays. During the four years since the enactment of the dredging ban, trends in the survey findings have varied depending on geographic region. However, in 2012, hard clam densities in all five bays either matched the 18-yr average or were above it to varying degrees.

The southern bays (Chincoteague and Newport) continued to experience declining hard clam densities during the first two years following the elimination of hydraulic escalator dredging. Hard clam densities in Chincoteague Bay fell to low levels, a full order of magnitude below the 1952 benchmark. Since 2010 this trend has reversed, with Chincoteague Bay densities doubling, though still well below historic levels (Figure 1). The hard clam population remained unchanged in Sinepuxent Bay, with no difference between pre- and post-dredging ban averages in density. The most encouraging results have been from the northern bays (Assawoman and Isle of Wight), which have shown relatively substantial increases since dredging was eliminated. Particularly in Isle of Wight, which generally experiences good hard clam recruitment, the post-dredging ban average hard clam density has nearly tripled the pre-ban average. The 2012 average hard clam density in Isle of Wight exceeded 1 clam/m<sup>2</sup> for the first time in the Coastal Bays in over 40 years (Figure 2). Note that this positive trend actually began before the dredging ban went into effect with sizable recruitment to the population evidenced in 2008 that subsequently went unharvested.

Despite the improvement in Isle of Wight Bay, hard clam densities remain well below historic benchmarks in all regions of the Coastal Bays. The causes of these poor density conditions have not been determined. Low density could result from unfavorable water quality conditions for hard clam survival<sup>1</sup> (such as brown tide blooms) and possible increased predation by blue crabs<sup>2</sup>, and other predators such as cownose rays.

#### Current Management Measures

In 2007, the Maryland state legislature passed a law prohibiting the harvesting of clams and oysters in the Coastal Bays by hydraulic escalator dredge, power dredging, or other mechanical means. This statute went into effect in September, 2008 and essentially eliminated the commercial fishery. The fishery may resume at some point in the future if stocks build to densities high enough to support manual means of harvesting.

#### The Fishery

Harvests in the mid-1990's were below 25,000 pounds per year. Successful recruitment during this period was followed by an increase in landings, which exceeded 100,000 pounds in 1999 and peaked at 163,000 pounds in 2002. Commercial effort and harvest has varied over the years. Since the prohibition of hydraulic dredging, commercial fishery landings have been negligible. The statewide harvest was reported to be only 368 pounds in 2010<sup>3</sup>. Information from the recreational fishery is largely unknown. The minimum size for hard clams is 1" (transverse measurement) with a 250/person/day limit.

#### Issues and/or Concerns

Most of the strategies and actions in the 2002 Coastal Bays Hard Clam Fishery Management Plan were developed to address hydraulic dredging. Since the use of hydraulic dredges is prohibited, these strategies and actions are now obsolete.

User conflicts and stakeholder opposition, especially from shoreline property owners, continue to hinder the expansion of hard clam aquaculture in the Maryland Coastal Bays.

Non-native green crabs (*Carcinus maenas*) have been introduced, most likely as bait bucket introductions. This species has been recognized by the federal Aquatic Nuisance Species Task Force as an aquatic nuisance species. Green crabs are known clam predators and their impact on the hard clam population is uncertain. Although small pockets of green crabs may be established in the Coastal Bays, they are neither abundant nor widely distributed. The green crab is listed as a "species prohibited from transport" in MD (COMAR 08.02.19.04) and they may not be collected and used as bait in areas where they are not established.

Compliance with the National Shellfish Sanitation Program (NSSP) model ordinance will require regulatory changes that will affect the time of taking and handling of hard clams intended for human consumption. Handlers will be required to cool clams and deliver them to Department of Health and Mental Hygiene (DHMH) certified shellfish dealers within 12 hours after harvest (or cooled to specific temperatures within 12 hours).

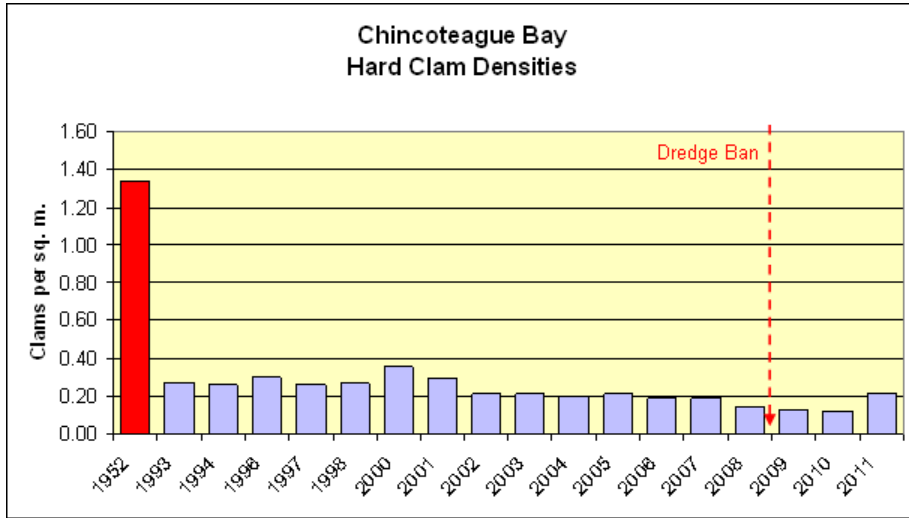


Figure 1. Chincoteague Bay hard clam densities before and after the dredging ban and the historic benchmark density (red bar).

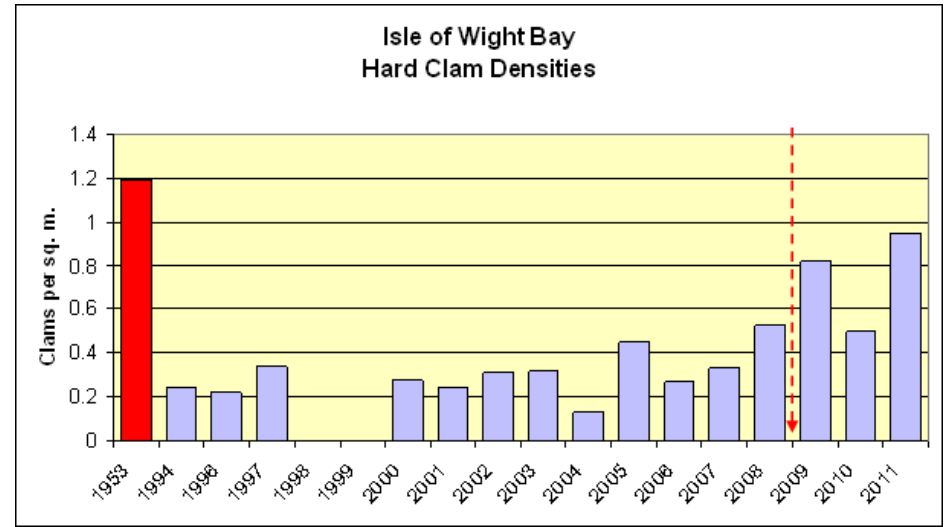


Figure 2. Isle of Wight Bay hard clam densities before and after the dredging ban (indicated by red arrow) and the historic benchmark density (red bar).

#### References

1. University of Maryland Center for Environmental Science. Integration and Application Network. Indicators – Coastal Bays Health Index – Maryland Coastal Bays Report Card – EcoCheck. 2009. [http://www.eco-check.org/reportcard/mcb/2009/indicators/coastal\\_bays\\_health\\_index/](http://www.eco-check.org/reportcard/mcb/2009/indicators/coastal_bays_health_index/)
2. Tarnowski, M. 2007. Hard-Shell Clam *Mercenaria mercenaria*. [http://www.dnr.state.md.us/fisheries/fishfacts/hardshell\\_clam.asp](http://www.dnr.state.md.us/fisheries/fishfacts/hardshell_clam.asp)
3. Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division, Silver Spring, MD.
4. Waterway Improvement Capital Program Benefits, Needs, and Opportunities. 2011. Legislative report prepared in response to the 2011 Joint Chairman’s Report, Sept. 2011. 23p.

| <b>2002 Coastal Bays Hard Clam Fishery Management Plan (updated 07/12)</b>  |   |  |
|---|---|--|
| <b>Objective/Problem</b>  | <b>Action</b>   | <b>Implementation</b>  |
| Obj.1. Enhance and perpetuate hard clam stocks.<br>Prob 1.1: Mortality of Small Clams   | <b>1.1.1</b> Investigate the importance of habitat closures (MDE restricted areas, SAV closures, and shoreline setback areas) to recognize their benefits as hard clam broodstock protection areas.   | Ongoing. Results to date have not shown significant improvement in clam densities within SAV beds. With the prohibition on mechanical harvesting there has been no commercial activity for the past 4 seasons. Limited recreation-only harvest areas and sanctuaries are preferred alternatives to closures and moratoriums. |
|   | <b>1.1.2</b> Develop an action plan for improving hard bottom habitat (i.e., shell or other suitable substrate) to reduce predation on small clams. The action plan will include the identification of:<br>a) Planting materials and sources;<br>b) Enhancement areas; and<br>c) Funding sources (i.e. improved reporting of commercial hard clam harvest will increase funding generated through the shellfish tax which could be used towards bottom enhancement activities).   | Pilot studies on habitat improvement indicate that clam survivorship is enhanced but not sufficiently high enough to justify the expense and logistical difficulties associated with such activities. The absence of commercial harvesting resulted in no tax revenue for the past 4 years.                                  |
| Obj.2. Manage for a viable commercial hard clam harvest to maintain an economically stable fishery.<br>Prob. 2.1: Potential Economic Harshship to Commercial Clammers Caused by the “Boom and Bust” Nature of the Fishery | <b>2.1.1</b> DNR will limit the number of individuals into the commercial hard clam fishery by permit only based upon those individuals who have landed at least 100 bags of hard clams (as documented by DNR dealer reports) in Maryland’s coastal bays in at least 2 years between the 1990/91 and 2000/01 seasons. Using these criteria, a total of 22 individuals would qualify for this permit. This permit should be transferable with a license, or to an individual who purchases a clam rig from an individual who meets the criteria stated above, and relinquishes their permit to the new clam rig owner. DNR will evaluate this action within 3 years to determine if the desired outcomes are being achieved. This action is consistent with actions 5.1.2 and 6.1.3. | Completed. However, lawyers determined that this was legally inadvisable. This objective and action needs further investigation and discussion given the absence of commercial harvest. Limited entry and IFQs continue to be discussed.   |
|   | <b>2.1.2</b> DNR will develop a plan (i.e. reporting requirement from commercial clammers) to improve the collection of catch, effort and economic data from the commercial hard clam fishery to assist managers in evaluating the impacts of future management decisions.  | <b>There are gaps in the hard clam harvest data and harvest is in the process of estimation from buy tickets. There has been no commercial harvesting during the past 4 seasons. Commercial clam harvesters have been required to report their daily catch of all clam species starting in September 2011.</b>               |
| Obj. 3. Evaluate the feasibility of hard clam aquaculture opportunities.<br>Prob 3.1: Establishing Hard Clam Aquaculture  | <b>3.1.1</b> Evaluate the legal, institutional and economic incentives and barriers to private aquaculture at the local, state, and federal level in Maryland.  | This was done as part of the Maryland Legislative Task Force on Seafood and Aquaculture. DNR will be lead agency as of July 1, 2011 in permit processing. An aquaculture training conference was hosted by UMD, in cooperation with MD DNR, NOAA CBO and the Oyster Recovery   |

| <b>2002 Coastal Bays Hard Clam Fishery Management Plan (updated 07/12)</b> |   |  |
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| <b>Objective/Problem</b>   | <b>Action</b>   | <b>Implementation</b>  |
|  |   | <p>Partnership. Three aquaculture open houses were held in 2010.</p> <p>An aquaculture financing loan program was announced by Gov. O'Malley. Representatives from the Maryland Oyster Aquaculture Financing Program discussed the loan program at the open houses and began the business planning and application processes.</p> <p><b>MD DNR and DHMH launched a commercial shellfish tagging program beginning in October, 2011 to meet the requirements of the National Shellfish Sanitation Program (NSSP). Hard clam tagging will likely be implemented in the 2012-2013 license year. Other changes (such as taking and landing times, cooling, shading) needed to comply with NSSP changes are being implemented through regulation.</b></p> |
|  | <p><b>3.1.2</b> Identify problems with the permitting process, and make recommendations to specific agencies to solve those problems.</p>   | <p>This was done through the above task force, reinforced with information from a range of states at the Maryland Aquaculture Development Conference held in Annapolis in August 2003. Permitting process has improved and will continue to address the myriad laws and regulations of the past 100 years which preserved wild harvest at the expense of aquaculture.</p>  |
|  | <p><b>3.1.3</b> Simplify the application process, and designate a single point contact at DNR to assist potential applicants with aquaculture permits, questions related to the regulatory requirement, guidance through the permitting process and fulfilling of regulatory obligations, tracking permit applications, and coordinating state agency permitting activities to aquaculture permits.</p> | <p>The leasing laws were entirely revised in 2009, including the provision for pre-approved lease areas in the coastal bays to streamline the process. <b>Two areas have since been pre-approved: South Point Shoal and Whale Gizzard Shoal. Because these areas have been pre-screened for leasing conflicts, the application process is shorter.</b></p> <p><b>MD DNR has been designated as the lead agency for coordinating all aquaculture</b></p>  |



| <b>2002 Coastal Bays Hard Clam Fishery Management Plan (updated 07/12)</b> |  |  |
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| <b>Objective/Problem</b>   | <b>Action</b>  | <b>Implementation</b>  |
|  |  | <p>permitting as of 7-01-11 (SB 847 &amp; HB 1053). DNR will issue water column leases and staff the Aquaculture Coordinating Council and Aquaculture Review Board.</p> <p>The lease application was simplified in 2010. It is now a single joint application with the US Army Corps of Engineers, Baltimore Office and the MD DNR.</p> <p>One lease for hard clam aquaculture was approved in 2010. One additional applicant is pursuing a submerged land lease application in 2012.</p> <p>One older lease hard clam aquaculture operation has begun to report harvest under new reporting requirements in effect since June, 2012.</p>  |
|  | <p><b>3.1.4</b> DNR will evaluate the feasibility of hard clam aquaculture in Maryland's coastal bays by:</p> <p>a) Identifying potential areas and size of area for hard clam aquaculture;</p> <p>b) Initiating and providing funding for pilot hard clam aquaculture studies;</p> <p>c) Investigating the economic impact of hard clam aquaculture; and</p> <p>d) Assessing the ecological impacts associated with hard clam aquaculture</p> | <p>a) This was not meant to designate where shellfish farmers would be compelled to site their operations (already taken care of in MD law with regard to leasing). It should be used as a point of reference for the types of bottom most beneficial for the production of hard clams and oysters. Pre-approved leasing areas have been evaluated and proposed.</p> <p>b) This has been done through the development of a shellfish nursery at Gordon's Shellfish (supported by the MIPS program) and trials with several types of production methods. Information on what works best according to the bottom types and circulation patterns in the area, and the management objectives of the operator have been considered.</p> <p>c) Ongoing - but hard clam aquaculture has revolutionized the Florida fishing industry and kept many former fishermen in business when they had few other options. It is a multi-million dollar industry in VA where</p> |

| <b>2002 Coastal Bays Hard Clam Fishery Management Plan (updated 07/12)</b>  |  |  |
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| <b>Objective/Problem</b>  | <b>Action</b>  | <b>Implementation</b>  |
|   |  | the production of high quality shellfish runs ahead of MD.<br>d) A study of the incidence of the clam disease QPX (MDNR/VIMS was completed. Continue to monitor mortality in farmed clams for disease (none reported). MDNR conducted a study of hard clam growth in the presence of brown tide. Proposals were submitted to fund a two-year study on commercial hard clam aquaculture and SAVs but because of budget problems, neither has been funded. A literature review was presented to the coastal bays STAC. |
| Obj 4. Enhance and promote the recreational hard clam fishery.<br>Prob. 4.1: Limited Access and Knowledge of Recreational Clamming Opportunities in Maryland's Coastal Bays | <b>4.1.1</b> DNR will develop and distribute a public outreach brochure illustrating recreational clamming areas, access points, methods and harvest restrictions.           | This is a low priority and has not been initiated. Increased education on recreational harvest should include the responsibility and mechanism to report harvest. This may be an opportunity for Coastal Baykeeper input.  |
|   | <b>4.1.2</b> DNR will work with the Town of Ocean City and Worcester County to improve access to recreational clamming areas   | Boat ramps and associated facilities continue to be constructed and renovated with funding provided in full or in part by the DNR Waterway Improvement Fund, funded by boat taxes. Most recently, the West Ocean City Harbor ramp, built in 1988, was renovated over four months and re-opened, June, 2011. <b>Due to decreased revenues (50% since FY2006), DNR was able to fund only 19% of the state and local boating access and dredging projects<sup>4</sup>.</b>  |
|   | <b>4.1.3</b> DNR will investigate the feasibility of planting seed to establish and/or enhance areas for recreational clamming, and if feasible, develop a seeding strategy. | Not yet initiated. Low priority.   |
|   | <b>4.2.1</b> DNR will reduce the recreational catch limit for hard clams from 1 bushel to 250 hard clams per person per day.   | Effectuated in 2002.   |
| Obj.5. Minimize   | <b>5.1.1</b> DNR will prohibit commercial clamming in the area between the Ocean City Airport  | Effectuated in 2002. Action item to be moved   |

| <b>2002 Coastal Bays Hard Clam Fishery Management Plan (updated 07/12)</b>   |   |   |
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| <b>Objective/Problem</b>   | <b>Action</b>   | <b>Implementation</b>   |
| conflicts between coastal bay user groups and commercial hard clam fishermen.<br>Prob. 5.1: Conflict Between Recreational Fishermen and Commercial Clammers.                               | at Marker 13 northward to the Rt. 90 Bridge on Saturdays (Sundays currently closed) between September 15 through October 15, and April 15 through May 31.   | to history/background in new FMP which will be totally revised to include aquaculture.  |
|  | <b>5.1.2</b> DNR will limit the number of individuals into the commercial hard clam fishery by permit only based upon those individuals who have landed at least 100 bags of hard clams (as documented by DNR dealer reports) in Maryland's coastal bays in at least 2 years between the 1990/91 and 2000/01 seasons. Using this criteria, a total of 22 individuals would qualify for this permit. This permit should be transferable with a license, or to an individual who purchases a clam rig from an individual who meets the criteria stated above, and relinquishes their permit to the new clam rig owner. DNR will evaluate this action within 3 years to determine if the desired outcomes are being achieved. This action is consistent with actions 2.1.2 and 6.1.3 | Legally inadvisable (see Sec. 2.1.1). Action item to be addressed in 2.1.1.   |
|  | <b>5.1.3</b> DNR will reduce the bycatch allowance of hard clams for recreational purposes in the hydraulic dredge fishery from 1 bushel to 250 hard clams per person per day.  | Effected in 2002. Action item is no longer needed.  |
| Prob. 5.2: Conflict Between Shoreline Property Owners and Commercial Clammers.   | <b>5.2.1</b> DNR will establish a maximum noise level limit for commercial vessels consistent with the recreational limit   | Regulation clarified to reference existing reg. (COMAR 08.18.03.03) establishing maximum noise levels all for vessels in Maryland. This action item may be addressed in aquaculture permitting.   |
| <b>Obsolete – Mechanical harvesting now prohibited.</b>  | <b>5.2.2</b> DNR will increase the shoreline setback distance for which a person may not catch hard clams with a hydraulic dredge in front of federal or state-owned property from 150 to 300 feet  | Effected in 2002.   |
|  | <b>5.2.3</b> DNR's Natural Resource Police will monitor the causes of reported noise complaints to facilitate future management decisions related to this issue.  | Study conducted by NRP of 5 clam boats found that all were in compliance with muffler and noise level regulations.  |
|  | <b>5.2.4</b> DNR will investigate the impacts of prohibiting or restricting the written permission provision that allows an individual to catch hard shell clams with a hydraulic dredge within the shoreline setback of 300 feet.  | Written permission provision eliminated in 2002.  |
| Obj. 6. Minimize ecological impacts associated with the commercial and recreational hard clam fisheries.<br>Prob. 6.1: Community Concern on the Ecological Effects of Commercial Hydraulic | <b>6.1.1</b> DNR and Maryland's Coastal Bays Program will educate the public on the ecological effects of hydraulic clam dredging and the importance of the commercial hard clam fishery to the coastal bays community.   | A literature review was compiled documenting the impact of hydraulic escalator dredging and other harvesting and natural disturbances on marine ecosystems. A new FMP will discuss ecosystem based recommendations and habitat improvement. |

| <b>2002 Coastal Bays Hard Clam Fishery Management Plan (updated 07/12)</b>   |  |   |
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| <b>Objective/Problem</b>   | <b>Action</b>  | <b>Implementation</b>   |
| Clam Dredging.   |  |   |
| <b>Obsolete – hydraulic escalator dredges now prohibited.</b>  | <b>6.1.2</b> DNR will encourage studies to evaluate the ecological impacts of hydraulic clam dredging in Maryland coastal bays.  | Action is obsolete and can be deleted.  |
|  | <b>6.1.3</b> DNR will limit the number of individuals into the commercial hard clam fishery by permit only based upon those individuals who have landed at least 100 bags of hard clams (as documented by DNR dealer reports) in Maryland’s coastal bays in at least 2 years between the 1990/91 and 2000/01 seasons. Using this criteria, a total of 22 individuals would qualify for this permit. This permit should be transferable with a license, or to an individual who purchases a clam rig from an individual who meets the criteria stated above, and relinquishes their permit to the new clam rig owner. DNR will evaluate this action within 3 years to determine if the desired outcomes are being achieved. This action is consistent with actions 2.1.2 and 5.1.2. | Legally inadvisable (see Sec. 2.1.1). Action can be deleted as it is addressed in 2.1.1.                                      |
| Prob. 6.2: Direct Impact to Submerged Aquatic Vegetation (SAV) by Commercial Hydraulic Clam Dredging   | <b>6.2.1</b> DNR will continue to prohibit the use of hydraulic clam dredges in SAV beds, and delineate existing SAV beds as necessary to maintain this protection over time.  | Obsolete – hydraulic escalator dredges now prohibited.  |
| <b>Obsolete – hydraulic escalator dredges now prohibited.</b>  | <b>6.2.1a</b> The Maryland Coastal Bays Fishery Advisory Committee shall become the local group to develop and provide recommendations to DNR regarding the delineation of SAV closure areas to harvest from hydraulic clam dredging.  | Obsolete – hydraulic escalator dredges now prohibited.  |
|  | <b>6.2.1b</b> DNR will continue to foster the support among legislators to make recommended changes in the SAV law which would benefit all stakeholder groups by making the delineation and enforcement process more manageable, and the closure areas consistent over a longer period of time   | Ongoing.  |
|  | <b>6.2.2</b> DNR and the National Park Service will investigate the feasibility and funding options for using Global Positioning System (GPS) units to improve the ability for clambers to comply with SAV closure areas and offset the maintenance cost associated with using buoys to identify SAV closure areas.  | There has been no commercial activity for the past 4 years. No action to date.  |
| Prob. 6.3: Potential Impact to Overwintering Blue Crabs by Commercial Hydraulic Clam Dredging. <b>Obsolete – hydraulic escalator dredges prohibited.</b> | <b>6.3.1</b> DNR will evaluate the need to restrict hydraulic dredging in important female blue crab overwintering areas by:<br>a) Delineating female blue crab overwintering areas;<br>b) <i>Determining the significance or contribution of these overwintering crabs to the coastal bays blue crab population;</i><br>c) Determining the magnitude of overwintering blue crab bycatch in the hydraulic clam dredge fishery; and<br>d) Assessing the impact of dredging activity on overwintering female blue crabs.   | Preliminary study was conducted by the MDNR Coastal Fisheries Program. Obsolete – hydraulic escalator dredges now prohibited. |
| Obj. 7. Protect, maintain and enhance important hard clam habitats.<br>Prob. 7.1: Water Quality  | <b>7.1.1</b> Develop strategies to restore water quality in areas closed to harvesting hard clams because of pollution   | Ongoing.  |

| <b>2002 Coastal Bays Hard Clam Fishery Management Plan (updated 07/12)</b>  |  |   |
|---|--|---|
| <b>Objective/Problem</b>  | <b>Action</b>  | <b>Implementation</b>   |
| Prob. 7.2: Hard Bottom Habitat  | <b>7.2.1</b> Develop an action plan for improving hard bottom habitat (i.e shell or other suitable substrate) to reduce predation on small clams. The action plan will include the identification of:<br>a) Planting materials and sources;<br>b) Enhancement areas; and<br>c) Funding sources.      | Studies on habitat improvement indicate that clam survivorship is enhanced but not sufficiently high enough to justify the expense and logistical difficulties associated with such activities. |
| Prob. 7.3: Navigational Channel Dredging and Sediment Disposal.   | <b>7.3.1</b> The MD Coastal Bays Navigation and Dredging Advisory Group (NADAG) will seek comments from DNR's Shellfish Program on the potential impacts of proposed dredging activities on hard clams.  | MDNR is routinely consulted during the permitting process on projects that may impact hard clams.   |
| Prob. 7.4: Growth of Noxious Algal Blooms.  | <b>7.4.1</b> DNR and MCBP will identify potential funding sources to support the following research and monitoring activities:<br>1) Assess the potential impact that noxious algal blooms have on hard clam populations; and<br>2) Identify factors which might contribute to noxious algal blooms. | MDNR conducted a study on the impact of brown tide on clams in culture. Sampling for harmful algal blooms and analyses of causes is ongoing at MDNR.  |
| Obj. 8: Minimize the impacts of non-indigenous invasive species.<br>Prob. 8.1: Green Crabs.   | <b>8.1.1</b> DNR with the advice of Maryland's Coastal Bays Fishery Advisory Committee will implement measures to minimize the impact of green crabs and Japanese shore crab on the hard clam population in Maryland's coastal bays, and coordinate this effort with Delaware and Virginia.          | Not yet initiated   |
|   | <b>8.1.2</b> DNR will continue to work with Maryland's Non-indigenous Species Task Force to examine invasive species issues, and develop an Aquatic Nuisance Species plan to become eligible for Federal funding   | This action is to be deleted and replaced with specific language on green crabs in a new FMP.   |
| Obj. 9. Implement fisheries dependent and independent monitoring programs to obtain sufficient and accurate data for managing hard clams<br>Prob. 9.1: Stock Assessment | <b>9.1.1</b> DNR will continue to survey the hard clam resource on annual basis in Maryland's coastal bays to facilitate management decisions.   | Ongoing. This action will be included in stock assessment discussion in a revised FMP.  |
| Prob. 9.2: Assessment of Bottom Enhancement Activities.   | <b>9.2.1</b> Design and implement a program to monitor the efficacy of bottom enhancement activities.  | The results of pilot studies suggest that such a program would not be cost-effective. See action 7.2.1  |
| Prob. 9.3. Commercial Catch, Effort and Economic Data.  | <b>9.3.1</b> DNR will establish, implement and evaluate a commercial reporting program to obtain accurate catch, effort and economic data from anyone harvesting hard clams in Maryland's coastal bays. This action is consistent with action 2.1.2.   | Not yet initiated. There has been no commercial harvesting during the past 4 seasons.   |
| Prob. 9.4: Recreational   | <b>9.4.1</b> DNR will facilitate the design and implementation of a recreational clamming survey   | Questions on recreational clamming were   |

| <b>2002 Coastal Bays Hard Clam Fishery Management Plan (updated 07/12)</b> |                             |   |
|--|-----------------------------|---|
| <b>Objective/Problem</b>   | <b>Action</b>               | <b>Implementation</b>                                     |
| Catch, Effort and Economic Data.   | in Maryland's coastal bays. | included as part of a broader 2006 angler survey by UMES. |

**Acronyms:**

DNR = Department of Natural Resources

IFQs = Individual Fishing Quotas

MIPS = Maryland Industrial Partnerships

NRP = Natural Resource Police

STAC = Scientific & Technical Advisory Committee

UMES = University of Maryland Eastern Shore

VIMS = Virginia Institute of Marine Science

## 2011 Maryland FMP Report (July 2012)

### Section 12. Horseshoe Crab (*Limulus polyphemus*)

#### Chesapeake Bay FMP

The ASMFC Management Board approved the draft Adaptive Resource Management (ARM) framework. The draft framework will be made available for public comment by fall of 2012. Based on recent survey data, the Atlantic States Marine Fisheries Commission (ASMFC) has concluded that mid-Atlantic horseshoe crab abundance has been increasing.<sup>1,2</sup> Reduced exploitation of mid-Atlantic horseshoe crab populations is credited for the increased abundance. There is an ecological relationship between horseshoe crabs and shorebirds, particularly red knots. Migratory shorebirds rely on horseshoe crab eggs as food on their spring migration to their Arctic breeding grounds. Although horseshoe crab abundance has increased, red knot abundance remains depressed.

The Chesapeake Bay and Atlantic Coast Horseshoe Crab Fishery Management Plan (CBFMP) was adopted in 1994. The CBFMP prohibits the harvest of horseshoe crabs during a specific season to protect loggerhead turtles and shorebirds that rely on horseshoe crabs and their eggs for food. The plan established a spawning stock census of horseshoe crabs, stricter harvest reporting standards, and a program to delineate important spawning areas. The CBFMP was reviewed in 2011. The Maryland horseshoe crab plan review team (PRT) recommends amending the CBFMP to address two issues: adopt the ASMFC's adaptive resource management (ARM) framework for integrated management of shorebird and horseshoe crab populations along with the bait and biomedical industries; and, address the lack of genetic and spawning data for Chesapeake Bay horseshoe crabs.

ASMFC's Interstate Fishery Management Plan for Horseshoe Crab and Addendum I established state-by-state quotas on bait landings. The quotas were set 25% below reference period landings. Addendum II allowed quota transfer between states. The US Fish and Wildlife Service determined that some horseshoe crabs harvested in Maryland and Virginia originate from Delaware Bay, the epicenter of horseshoe crab spawning. Addendum III further reduced commercial harvest and added seasonal closures. These additional restrictions were enacted to increase horseshoe crab egg abundance, a major dietary component for migratory shorebirds including the red knot (*Calidris canutus rufa*). The red knot population has decreased since the 1980s and may be related to horseshoe crab egg abundance.

Addendum IV instituted seasonal and spatial harvest restrictions in Maryland and Virginia. Harvest restrictions apply only to the bait fishery. In addition, no more than 40% of Virginia's quota can be harvested east of the COLREGS line and must have a minimum male to female ratio of 2:1 if landed in Virginia. Addendum VI expires April 30, 2013. Addenda V and VI continued the Addendum IV restrictions for Maryland and Virginia. Addendum VII has been developed to implement an ARM

framework that will optimize horseshoe crab harvest while conserving both shorebird and horseshoe crab abundance. The ASMFC Management Board approved Addendum VII in February 2012 for implementation in 2013.

#### Stock Status

Horseshoe crabs caught in Maryland waters include individuals from three separate spawning stocks: Maryland, Virginia, and Delaware Bay. These spawning stocks show evidence of population recovery.<sup>Xa</sup> Delaware Bay surveys have detected increases in the juvenile index and adult male index. The adult female index has also increased based on Virginia Tech's benthic trawl survey. Horseshoe crab abundance in New York and New England has declined. Index trends from the 2011 surveys support the 2009 stock assessment assertion that relative biomass has been increasing.<sup>3</sup> Increased stock biomass is attributed to harvest closures and decreased fishing mortality.

Delaware Bay egg density increased 3-fold from 2009 to 2010; a significant increase in egg density since 2005. Peak egg density coincided with peak shorebird migration. Current population data is insufficient to develop biological reference points. Reference points are necessary to determine if a stock is undergoing overfishing or are overfished.<sup>3</sup> The next horseshoe crab stock assessment is scheduled for 2014.

#### Current Management Measures

Commercial harvest of horseshoe crabs is allowed Monday through Friday. Commercial harvesters at least one mile from the Atlantic Coast are allowed 100 crabs per person per day per permit from June 8 to July 10. Horseshoe crabs can be harvested from July 13 to November 30 if caught within one mile of the Atlantic coast or in tidal waters of the Bay. Permit holders are issued a quota based on their reported 1996 landings. Harvesters without a permit are limited to 25 crabs per person per day. For every female crab landed, two male crabs must be landed.

The harvest of male horseshoe crab for the biomedical industry is allowed during seasonal closures. *Limulus Amebocyte Lysate*, extracted from horseshoe crab blood, is used to screen injectable drugs, biologics, medical devices, and raw materials for the presence of endotoxins. All crabs harvested for bleeding must be returned to the waters where they were caught within 48 hours. The industry annually tags about 5,000 of these horseshoe crabs each year. Crabs purchased from bait harvesters must be returned to the bait harvester after being bled. Bleeding and release mortality is estimated to be low (15%). The mortality threshold for crabs bled by the biomedical industry is 57,500 crabs. Horseshoe crabs are also used for medical research topics such as the eye, surgical suture wound dressing, and cancer.

For the last several years, Virginia has submitted additional horseshoe crab harvest data after their ASMFC Compliance Report was submitted and after annual quotas

were set. For example, Virginia's 2011 quota was reduced by 21 thousand crabs to compensate for late reporting overages from the 2009 and 2010 seasons.<sup>1</sup>

In 2007, the ASMFC Horseshoe Crab and Shorebird Technical Committees initiated an ARM working group. ARM's objective was to "Manage harvest of horseshoe crabs in the Delaware Bay to maximize harvest but also to maintain ecosystem integrity and provide adequate habitat for migrating shorebirds."<sup>2</sup> A series of abundance scenarios were developed to form an integrated horseshoe crab and red knot adaptive management framework.

The ARM analysis revealed two circumstances that affect red knot demography and annual survival: 1) Horseshoe crab abundance and red knot body mass at departure from Delaware Bay, and 2) Arctic snow conditions upon arrival in the breeding grounds. The importance of body weight versus Arctic snow condition varies annually. The ARM workgroup developed five horseshoe crab management alternatives:<sup>2</sup> 1) a full harvest moratorium on both sexes; 2) a harvest limit of 250,000 males and 0 females; 3) a harvest limit of 500,000 males and 0 females; 4) a harvest limit of 280,000 males and 140,000 females; and 5) a harvest limit of 420,000 males and 210,000 females. An adaptive management approach will be used to determine the appropriate alternative to implement. The current management measures are reflected by scenario #4.

In addition, genetic variability in red knot body mass thresholds may be an important factor for their annual survival. To date, the migratory red knot population has shown no evidence of recovery despite the four-fold reduction in horseshoe crab harvest.<sup>2</sup>

## The Fisheries

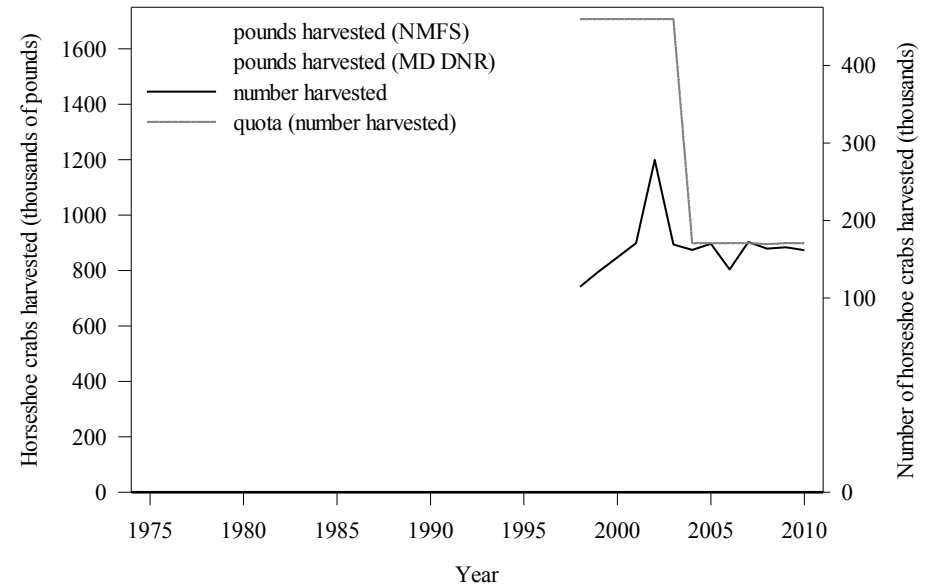
Maryland's commercial quota has remained at 170 thousand horseshoe crabs since 2004. Landings in 2010 were 161,545 horseshoe crabs or 27% of the coastwide landings (Figure 1). Maryland commercial landings have remained relatively stable since 1998 either at or below the quota except in 2002. NMFS no longer tracks horseshoe crab landings, which explains the diminishing availability of landings data since 2004.

ASMFC's horseshoe crab Plan Review Team (PRT) has recommended that Virginia implement area-specific quota reductions in 2011 to reduce their quota by at least 21.6 thousand crabs. The reduction would compensate for quota overages in 2009 and 2010. Late reporting of additional overages was also a concern.

The number of crabs landed coastwide for biomedical bleeding (not bait) has increased since the mid-2000s. Bleeding mortality has been estimated at 15% and a crab mortality threshold of 57,500 crabs was established in 1998. Horseshoe crab mortality has exceeded the threshold each year since 2007 (Figure 2). Due to

consistent violation of the mortality threshold, the ASMFC Plan Review Team recommended consideration of actions to decrease biomedical use and mortality.

Figure 1. Maryland commercial landings for horseshoe crabs by weight (bars) and number (line), 1975-2010.<sup>4</sup> Harvest from 2004 to 2010 differs significantly between



## Issues/Concerns

Future congressional funding for required ASMFC horseshoe crab monitoring and stock assessment programs is uncertain.<sup>6</sup> The biomedical industry provided a large part of the funding for the 2010 trawl survey. The monitoring programs are relatively inexpensive, provide reliable horseshoe crab abundance estimates, and are necessary for the ARM model and stock assessment. These analyses are necessary to ensure that horseshoe crab spawning stock and egg production are sufficient to support migratory shorebird feeding (esp. red knot *Calidris canutus*).

Reductions in Mid-Atlantic harvest quotas, particularly in Delaware Bay, may have redirected harvest to the New York and New England fisheries. If so, then current harvest levels within these regions may be unsustainable<sup>1</sup>.

Biomedical bleeding mortality has exceeded the 1998 threshold mortality of 57,500 crabs since 2007. Recent research in Massachusetts suggests that mortality related to biomedical bleeding is double (30%) the level currently used for management



(15%).<sup>1</sup> An increase in estimated biomedical mortality would significantly increase the extent of mortality overages. The ASMFC Plan Review Team has recommended that the Management Board consider implementation of additional restrictions on the biomedical industry.

In 2007, USFWS determined that the red knot (*Calidris canutus rufa*) is a candidate for ESA protection, but emergency listing was not warranted at that time. Some conservation groups continue to advocate for a horseshoe crab moratorium.

## References

- <sup>1</sup> Eyler, S., S. Michels, and D. Brzezinski. 2011. 2011 review of the fishery management plan in 2010 for horseshoe crab (*Limulus polyphemus*). Atlantic States Marine Fisheries Commission, Washington, DC.
- <sup>2</sup> ASMFC. 2009. A Framework for Adaptive Management of Horseshoe Crab Harvest in the Delaware Bay Constrained by Red Knot Conservation, 2009. Stock Assessment Report No. 09-02 (Supplement B). Atlantic States Marine Fisheries Commission, Washington, DC.
- <sup>3</sup> ASMFC. 2009. Horseshoe Crab Stock Assessment for Peer Review. Stock Assessment Report No. 09-02 (Supplement A). Atlantic States Marine Fisheries Commission, Washington, DC.
- <sup>4</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. June 20, 2012: <http://www.st.nmfs.noaa.gov/st1/commercial/>.
- <sup>5</sup> Doctor, S. 2011. Maryland's 2010 Horseshoe Crab (*Limulus polyphemus*) Compliance Report to the Atlantic States Marine Fisheries Commission. Maryland Department of Natural Resources Fisheries Service, Annapolis, MD.
- <sup>6</sup> ASMFC. 2011. 2011 review of the fishery management plan in 2010 for Horseshoe crab (*Limulus polyphemus*). Atlantic States Marine Fisheries Commission, Alexandria, VA.

**1994 Chesapeake Bay and Atlantic Coast Horseshoe Crab Management Plan Implementation Table (updated 6/2012)**

| <b>Problem Area</b>   | <b>Action</b>  | <b>Date</b>      | <b>Comments</b>  |
|---|--|------------------|--|
| Strategy 1.1<br>Maryland and Virginia will protect the ecological role of horseshoe crabs by protecting horseshoe crab spawning areas and monitoring harvest. | 1.1 Maryland and Virginia will prohibit the hand collection of horseshoe crabs from beaches during the peak time of shorebird migration, May 1-June 7.                                     | 1995             | MD prohibited hand collection of HSCs between May 1 and June 7.  |
|   |  | 1996             | Based on spawning data, MD modified the restriction on hand collection of HSC to between April 1 and June 30 on Monday and Thursday only.  |
|   |  | 1998             | Since the CBP Horseshoe Crab FMP was adopted in 1994, coastal ASMFC requirements were adopted in 1998. Jurisdictions comply with all ASMFC HSC harvest restrictions.   |
|   |  | 2009<br>Open     | MD COMAR 08.02.10.01.01 states that all persons are prohibited from catching or landing HSCs in state waters from December 1 to June 7, and catching or landing HSCs from the Chesapeake Bay and its tidal tributaries, or within 1 mile of the Atlantic coast or its coastal bays shoreline from June 8 to July 12. Person's can collect crabs Monday thru Friday from July 13 to November 30. There are no recreational catch limits but they must abide by the seasonal closures and the 25 crab/person/day for a non-permitted person..  |
|   |  | Open             | VA Chapter 4 VAC 20-900- restricts hand collection unless a person has a hand harvester license. 5 HSCs/person/day may be harvested for personal use without a license.  |
|   |  | 2006             | VA prevents HSC harvest within 1,000 ft of mean low water May 1 through June 7.  |
|   |  | 2011             | VA implemented a license and permit moratorium. Only commercial fishermen who held a HSC harvest permit prior to May 1, 2011 are eligible to purchase a permit after May 1, 2011.  |
|   | 1.2a Maryland will prohibit the scraping, trawling or dredging of horseshoe crabs between May 1 and June 7 within the Chesapeake Bay, coastal bay areas, and 1 mile of the Atlantic Coast. | 1995             | The time period recommended to prohibit the scraping, trawling, and dredging of HSCs within the Chesapeake Bay, coastal bays, and within 1 mile of the Atlantic coast was changed from May 1 and June 7 to April 1 and June 30 based upon MD spawning survey data  |
|   |  | Continue<br>2009 | April catch or harvest restriction was added to the spring fishery. MD COMAR 08.02.10.01.01 states that HSCs cannot be caught or landed in MD state waters from December 1 to June 7. This restriction includes the May 1 to June 7 closure. HSC collection for scientific purposes is allowed during the fishery closure so long as crabs are released alive within 48 hours to waters where they were caught. Scientific collection permits continue to be issued for biomedical bleeding of male crabs. Both male and female crabs can be used for the education outreach program entitled "Green Eggs and Sand." |
|   |  | 2010<br>Continue | The open harvest season was delayed from July 1 to July 13.  |

| <b>1994 Chesapeake Bay and Atlantic Coast Horseshoe Crab Management Plan Implementation Table (updated 6/2012)</b>   |  |                  |   |
|--|--|------------------|---|
| <b>Problem Area</b>  | <b>Action</b>  | <b>Date</b>      | <b>Comments</b>   |
|  | 1.2b Virginia will continue its ban on trawling within state waters.   | 1995             | Virginia prohibits the use of trawls in Virginia's portion of the Territorial Sea.  |
|  | 1.3 Virginia will prohibit a directed horseshoe crab fishery between May 1 and June 7, continue mandatory reporting in the conch dredge fishery and monitor bycatch of horseshoe crabs.                                | 1995             | An ASMFC HSC FMP was adopted in 1998. Since then, additional harvest restrictions have been implemented as needed.  |
| Strategy 2.1 Maryland and Virginia will coordinate with Delaware and begin to develop a spawning stock census of horseshoe crabs that will serve as the basis for determining management recommendations as appropriate. | 2.1 Maryland and Virginia will coordinate and implement a horseshoe crab spawning stock census in Chesapeake Bay, coastal bays, and along the Atlantic coast.  | 1995             | An annual spawning stock survey was initiated from 1994 to 2000 in MD. The Delaware spawning survey provides data on assessing the status of the spawning population. MD's spawning survey is only in the coastal bays (not the Chesapeake Bay). MD Coastal Bays HSC trawl survey has been conducted since 1990.  |
|  |  | 2002<br>Continue | Maryland Coastal Bays program began a volunteer spawning survey. Public reports of HSC spawning in Chesapeake Bay are kept on file.   |
|  |  | 2007             | Adaptive Resource Management Modeling (ARM) is being used to determine the ecological interaction between HSCs and shorebirds, and the economic and biological value of HSCs to the commercial fishery and the biomedical industry.   |
|  |  | 2008<br>Continue | Biomedical industry is collaborating with USFWS Coast wide Tagging Program for HSC.   |
|  | 2.2 Maryland and Virginia will promote and encourage research on horseshoe crab estimates of population abundance, age and size composition, mortality estimates and migration.  | Open             | Continue to participate in the annual HSC meeting of regional biologists and managers. A University of Maryland Eastern Shore project to determine if a spawning stock survey could be used to provide a statistically significant index of abundance was partially funded. CPUE data is collected from MD's offshore and coastal bay trawl survey, and blue crab summer trawl survey within the Chesapeake Bay. Sex data is collected from MD's spawning beach survey. A tagging program was initiated in 1995 to determine migratory patterns, identify stocks, and increase our understanding of the HSCs spawning behavior. USFWS currently directs the effort. |
|  |  | On-going         | ASMFC coastal management actions include a mandatory monitoring program, tagging studies, spawning surveys, and egg surveys.  |
| 3.1 Maryland and Virginia will monitor the commercial and medical harvest of horseshoe crabs to improve the quality of data  | 3.1a Maryland will require horseshoe crab harvesters to provide monthly reports on the size of harvest, area of collection, gear usage, and any other information the Department of Natural Resources deems necessary. | 1995<br>Continue | Reporting was implemented on January 29 <sup>th</sup> , 1996. Permit system currently required and used to monitor commercial harvest.  |
|  |  | 2000             | ASMFC instituted a 25% reduction in horseshoe crab bait landings using 1995-1997 as the reference period.   |
|  |  | 2004<br>On-going | MD has implemented additional restrictions based on ASMFC Addendum III. MD landings limited to 170,653 lbs annually based on 2001 landings.   |

**1994 Chesapeake Bay and Atlantic Coast Horseshoe Crab Management Plan Implementation Table (updated 6/2012)**

| <b>Problem Area</b>                   | <b>Action</b>  | <b>Date</b>   | <b>Comments</b>  |
|---------------------------------------|--|---|--|
| obtained from the commercial fishery. |  | 2005  | MD began implementing a 1:1 male:female harvest ratio issued by public notice. Saturday and Sunday harvest closure. Limit of 100/person/day with permit 1 mile off Atlantic Coast from Jun 8 to Jul 10. From Jul 13 thru Nov 30 in all waters, harvest is quota on permit or 25/person/day without permit. Permittee's catch limit based on ratio of reported 1996 landings applied to total annual allowable landings for the present year. |
|                                       |  | 2006  | ASMFC Addendum IV changed start of harvest closure from May 1 to January 1. This provision was to expire in 2008 but was continued through 2009. All HSC supplied to the bait fishery is included in that states allowable harvest. Biomedical industry will make available all HSC that die prior to live release to the bait fishery.  |
|                                       |  | 2004<br>Continue  | HSC annual bait fishery quota has been 170,653 HSCs since 2004. Harvest closure was Dec 1 – March 31 and May 1 - June 7. Harvest is allowed >1 mile offshore during April 1 – 30 & June 8 - 30. Harvest is allowed from July 1 – Nov 30 in all MD tidal waters.  |
|                                       |  | 2008  | MD changed the HSC harvest ratio to 2:1 male:female ratio (issued by public notice).   |
|                                       |  | 2009<br>Continue  | Biomedical industry is allowed to land male HSCs for bleeding during the May 1 to June 7 harvest closure so long as the crabs are released within 48 hours. Spring harvest closure was extended to include April 30. A “chain of custody” must be documented for every batch of HSCs received.   |
|                                       |  | 2010<br>On-going  | Harvesters are required to submit monthly catch logs. Commercial harvest reports must be submitted to MDNR Fisheries Service within 10 days after the end of the month being reported after which the report is late.  |
|                                       |  | 3.1b Maryland will determine if a special permit to harvest horseshoe crabs is necessary after evaluating the new federal reporting system and the results of the monthly reports | 1995   |
|                                       |  | 2001<br>On-going  | ASMFC allows state-to-state transfer of quotas.  |
|                                       | 3.2 Virginia will continue their mandatory reporting procedures implemented in January 1993. | 1993<br>Continue  | Reporting was implemented in January of 1993. VA has a commercial quota based on coastal reference period.   |
|                                       |  | 2000  | ASMFC instituted a 25% reduction in horseshoe crab bait landings using 1995 to 1997 as the reference period.   |
|                                       |  | 2006  | ASMFC Addendum IV changed the start of harvest closure from May 1 to January 1 through 2008. It required that Virginia trawl harvest not exceed a certain percentage from a specified area and must maintain at least a 2:1 male:female harvest ratio to protect the Delaware stock. Commercial quota is   |

| 1994 Chesapeake Bay and Atlantic Coast Horseshoe Crab Management Plan Implementation Table (updated 6/2012)          |   |                      |   |
|--|---|----------------------|---|
| Problem Area   | Action  | Date                 | Comments  |
|  |   |                      | 152,495 HSCs. Quota can be transferred from other jurisdictions with a combined cap.  |
|  | 3.3 Maryland and Virginia will survey American eel harvesters and their use of horseshoe crabs by sex for bait.   | 1995<br>2000         | No longer an issue. Both eels and horseshoe crabs are managed through ASMFC coastal FMPs.   |
| 4.1.1 The jurisdictions will define and protect horseshoe crab spawning areas that are used by migrating shorebirds. | 4.1 Maryland and Virginia will initiate a study to delineate the geographic distribution of horseshoe crab spawning habitat in the Chesapeake Bay and coastal bays if funding is available. | Open<br><br>Continue | A HSC hotline and spawning beach survey was developed in 1994 to delineate spawning habitat in Maryland. The survey is available through the DNR website. VA has also established a hotline.<br><br>MD DNR Coastal Bays Program and Worcester County staff have cooperative projects that display shoreline stabilization using soft shoreline designs to create or protect HSC spawning habitat. |
|  | 4.2 The jurisdictions will promote research to define the water quality requirements for horseshoe crabs.   | 2010<br>Continue     | Maryland Coastal Bay volunteer spawning survey began recording temperatures to understand the horseshoe crab spawning behavior in the Maryland Coastal Bays.  |
|  | 4.3 The jurisdictions will continue to work with the Chesapeake Bay Program, the Coastal Bay Initiative, and water quality improvement goals for the Bay and coastal areas.                 | Continue             | The Chesapeake 2000 agreement commits to improving habitat and water quality for living resources in the Bay.   |

#### Acronyms

ASMFC- Atlantic States Marine Fisheries Commission  
 CBP - Chesapeake Bay Program  
 COMAR - Code of Maryland Regulations  
 CPUE - Catch per Unit Effort  
 DNR - Department of Natural Resources  
 FMP - Fishery Management Plan  
 HSC - Horseshoe Crab  
 USFWS - US Fish and Wildlife Service  
 VAC - Code of Virginia

## 2011 Maryland FMP Report (July 2012)

### Section 13. King Mackerel (*Scomberomorus cavalla*) and Spanish Mackerel (*Scomberomorus maculatus*)

#### Chesapeake Bay FMP

Anglers in late summer have been enjoying increasingly regular visits of Spanish mackerel to Chesapeake Bay. King mackerel are less common seasonal visitors to Maryland's coastal waters. A Chesapeake Bay and Atlantic Coast King and Spanish Mackerel Fishery Management Plan was adopted in 1994. The plan follows the Atlantic States Marine Fisheries Commission (ASMFC) 1983 FMP for Coastal Migratory Pelagic Resources which includes Spanish mackerel. These two species are also managed jointly under the federal Coastal Migratory Pelagics FMP adopted in 1982 by the South Atlantic Fishery Management Council (SAFMC) and the Gulf of Mexico Fisheries Management Council (GMFMC).

#### Stock Status

There is no formal stock assessment for either species for the Chesapeake Bay or the mid-Atlantic coast. Coastal overfishing occurred in the 1970's and early 1980's and led to regulations to control harvest and rebuild depleted stocks. Stock assessments are performed by the Mackerel Stock Assessment Panel (MSAP) of the joint GMFMC and SAFMC. Based on the 2008 South Atlantic and Gulf of Mexico King mackerel Southeast Data, Assessment, and Review (SEDAR), the king mackerel stock is not experiencing overfishing. At this time, the data are insufficient to determine biomass estimates or size of the stock. Spanish mackerel population levels are high but whether or not overfishing is occurring is unknown. Fishing mortality estimates are currently not available. Biological reference points have not been established. Management measures have been successful at rebuilding the stock. The overfishing ratio (B/B<sub>msy</sub>) has been increasing.

#### Current Management Measures

The annual coastal total allowable catch (TAC) for Spanish mackerel is set at 7.04 million pounds. Fifty five percent of the TAC is allocated to the commercial fishery and 45% to the recreational fishery.

The Chesapeake Bay states manage Spanish mackerel through size and creel limits and closures consistent with actions taken by Federal mandates and the SAFMC. Maryland and Virginia require a 14" minimum size limit with a creel limit of 15 fish. The king mackerel size limit is 27" in both states with a creel limit of 3 fish in Virginia. Maryland has not developed creel regulations for king mackerel because they are rarely encountered in Maryland state waters. Commercial reporting is required. Cull panels are used to reduce bycatch from pound nets by the Potomac River Fisheries Commission (PRFC).

Following public hearings, ASMFC approved an omnibus amendment for spot, seatrout and Spanish mackerel in August, 2011. The amendment includes an update to the coastal plan and includes commercial and recreational management measures and recommendations, adaptive management options, *de minimis* thresholds and exemptions, and monitoring recommendations. Maryland is in the process of changing its regulations to mirror the regulations of the SAFMC. The states will require that recreational fishermen land their catch with the head and fins intact. The commercial fishery will have a limit of 3500 pounds per vessel/day/trip.

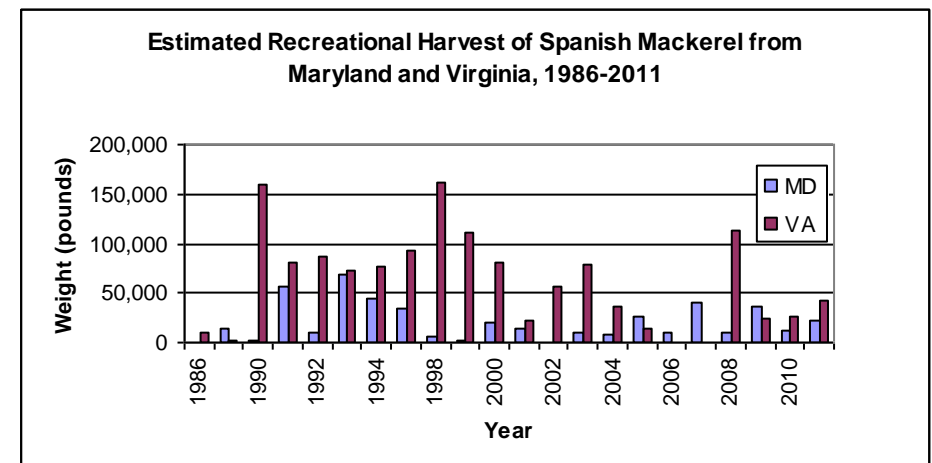
#### Issues/Concerns

The 2010 Review of the ASMFC FMP for Spanish mackerel repeated its recommendations for additional research and monitoring. High priority recommendations included collecting basic fisheries data for better stock assessment accuracy; developing methods for fishery-independent monitoring; determining better estimates of recruitment, natural and fishing mortality rates and stock size; and implementing ecosystem-based management. Catch estimates in the recreational fishery are very imprecise, with proportional standard errors in excess of 50 for most years in both Maryland and Virginia.

#### The Fisheries

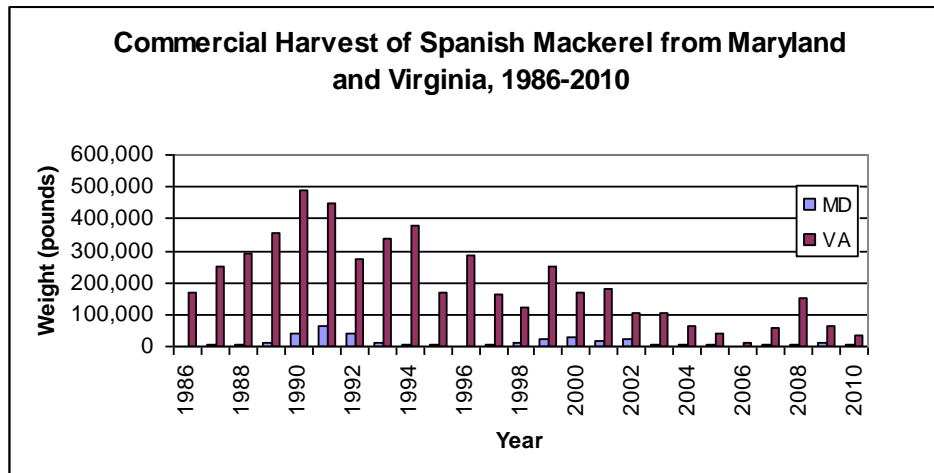
There have been few reports of commercial landings of king mackerel from Maryland since 1993 and from Virginia since 2000.

Figure 1



Estimates from 1986-2003 are from MRFSS. Estimates from 2004-2011 are MRIP.<sup>1</sup>

Figure 2.



Commercial harvest reports from 2010 are preliminary.<sup>2</sup>

## References

1. Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division April 16, 2012.
2. Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division, commercial harvest query April 16, 2012.

| <b>1994 Chesapeake and Atlantic Coast King and Spanish Mackerel Management Plan Implementation Table (update 06/12)</b> |   |                  |   |
|---|---|------------------|---|
| <b>Section</b>  | <b>Action</b>   | <b>Date</b>      | <b>Comments</b>   |
| Stock Status  | Action 1.1.1 A) Virginia will enforce a 14" TL minimum size limit and a 10 fish/person/day bag limit for Spanish mackerel.  | 1991<br>Continue | Minimum size and creel limits in place.<br>Creel limit increased to 15 fish/person/day.   |
|   | Action 1.1.1 B) Maryland will enforce a 14" TL minimum size limit for both the recreational and commercial fisheries and a 10 fish/person/day bag limit for Spanish mackerel.           | 1993<br>Continue | Minimum size and creel limits in place.<br>Creel limit increased to 15 fish/person/day.<br>VA has a commercial limit of 3500 pounds Spanish Mackerel per vessel per day <b>and MD has a 3500 pound commercial limit regulation package in progress.</b>   |
|   | Action 1.1.2 A) Virginia will enforce a 5 fish/person/day bag limit for king mackerel.  | 1991<br>Continue | Minimum size and creel limits in place.<br>Creel limit reduced to 3 fish/person/day.  |
|   | Action 1.1.2 B) Maryland will enforce a 5 fish/person/day bag limit for king mackerel.  |                  | MD has not developed regulations for king mackerel since most of the catch is outside state waters. Fishermen must abide by the limits imposed in the EEZ.  |
|   | Action 1.1.3. Virginia and Maryland will enforce a 20" FL or 23" TL minimum size limit for king mackerel.   |                  | Minimum size limit increased to 27".  |
|   | Action 1.1.4. Virginia and Maryland will close their respective commercial and recreational fisheries for king and Spanish mackerel when such closures are in effect in Federal waters. | 1995             | Closures will be in compliance with South Atlantic Fishery Management Council (SAFMC) recommendations.  |
| Monitoring catch and quotas, and research needs.  | Action 2.1.1. Virginia and Maryland will require mandatory reporting of commercial landings   | Continue         | Completed.  |
|   | Action 2.1.2. Virginia and Maryland will supplement the Marine Recreational Statistics Program. MD will require charter boat logbooks.  | Continue         | Coastal charter boat logbook system was improved in 1994.   |
|   | Action 2.1.3. Jurisdictions will support stock assessment research for mackerel stocks.   | Continue         | VA samples Spanish mackerel for length and weight. A new King Mackerel Stock Assessment Report was completed in March 2009 for South Atlantic and Gulf of Mexico. <b>The ASMFC omnibus amendment was approved in 2011 and will be implemented July 1, 2012. The amendment includes monitoring and management recommendations and requires state regulatory changes now in progress.</b> |
| Waste/sublegal bycatch and hook and release mortalities   | Action 3.1.1. Virginia will evaluate the use of escape panels as a means of reducing undersized bycatch. VA will enforce a 2 7/8 " minimum mesh size for gill nets.                     | Continue         | VA conducted studies on escape panels in pound nets and found they were successful at reducing bycatch.   |



| <b>1994 Chesapeake and Atlantic Coast King and Spanish Mackerel Management Plan Implementation Table (update 06/12)</b> |   |             |   |
|---|---|-------------|---|
| <b>Section</b>  | <b>Action</b>   | <b>Date</b> | <b>Comments</b>   |
|   | Action 3.1.2. Jurisdictions will support angler educational programs.   | Continue    | In 2008, Project FishSmart was organized by UMCES to develop a process for developing a consensus position on fisheries management options by a stakeholder group comprised of biologists, environmental organizations, tackle shop owners, charter boat operators, anglers, commercial fishermen, and tournament organizers. The pilot project species was King Mackerel and the goal of the project was to prevent overfishing and preserve a year-round fishery. A consensus goal that the fishery should be managed to prevent overfishing from occurring and recommendations were adopted Nov 7, 2008. A report was submitted to the South Atlantic Fishery Management Council that recommended three options for consideration (UMCES, 2008). The Council included the three management recommendations in its public scoping document. |
|   | Action 3.1.3. Virginia will monitor bycatch sold as crab bait from the pound net and haul seine fisheries.  | 1995        |   |
| Habitat Issues  | Action 4.1.1. Jurisdictions will continue to work with the Chesapeake Bay Programs, the Coastal Bays initiative, and water quality improvement goals for the Bay and coastal areas. | Continue    | The CBP has adopted new water quality goals and are working towards attaining the goals. Status of the water quality indices can be found on their website at <a href="http://www.chesapeakebay.net">www.chesapeakebay.net</a>  |

Acronyms:

CBP = Chesapeake Bay Program

EEZ = Exclusive Economic Zone

UMCES = University of Maryland Center for Environmental Studies

PRFC = Potomac River Fisheries Commission

## 2011 Maryland FMP Report (July 2012)

### Section 14. Eastern Oyster (*Crassostrea virginica*)

The report of the multi-agency Oyster Metrics Workgroup was adopted in 2011. The workgroup developed a quantitative definition of a restored oyster reef, a necessary step in tracking oyster restoration efforts. Oyster disease prevalence and intensity during 2011 was the lowest since 1990<sup>1</sup>. However, disease is still widespread throughout the Maryland portion of the Chesapeake. The 2011 oyster spatfall index (number of larval oysters that have settled and developed a thin shell) was approximately 20 spat per bushel and above the 27 year median (Figure 1).

#### Chesapeake Bay Oyster Management

The Chesapeake Bay Oyster Management Plan (OMP) was adopted in 1989 and revised in 1994 and 2004. The 2004 OMP provides both a general framework and specific guidance for implementing a strategic, coordinated, multipartner management effort for oysters in the Bay. The *OMP* defines several strategies for rebuilding and managing native oyster populations: evaluating the use of sanctuaries and harvest reserves to obtain optimum ecological and economic benefits; rebuilding habitat; managing harvest; increasing hatchery production; evaluating the impediments to aquaculture; improving coordination among the oyster partners; and developing a baywide database to track restoration projects. Amendment #1 to the OMP was adopted in 2010. The amendment allows aquaculture and clamming activities within the larger, expanded sanctuary (areas closed to shellfish harvest and focused restoration activities) program; the use of new enforcement measures to protect sanctuary areas; and the implementation of sanitation guidelines. The 2004 OMP was reviewed during 2010. The Plan Review Team (PRT) concluded that the framework for managing oysters was still appropriate but that the strategies and actions had changed considerably because of the Maryland 10-point plan. The PRT recommended a complete revision of the plan. However, a timeline for revising the plan has not been developed.

A Maryland Oyster Advisory Commission (OAC) was established in 2007 to provide advice on new strategies for rebuilding and managing the oyster population and fishery. As a result of the OAC recommendations, Maryland is implementing a 10-point Oyster Restoration and Aquaculture Development Plan. The new plan increases the network of oyster sanctuaries from 9% of available habitat to 25%; identifies areas for oyster aquaculture with a streamlined permitting process; and allows a more targeted, scientifically managed, sustainable public fishery.

In 2009, Executive Order 13508 Strategy for Protecting and Restoring the Chesapeake Bay Watershed, established a goal of restoring oyster populations in 20 tributaries by 2025. This order required the development of restoration goals and methodologies to quantify and assess progress toward the goals. The Sustainable Fisheries Goal Implementation Team (GIT) established a workgroup to develop

quantitative oyster restoration metrics; to define sampling protocols and provide assessment techniques for sanctuary reefs. The group completed a science-driven consensus document describing a minimum suite of goals and metrics. The document was formally adopted by the Executive Committee of the GIT in December 2011. A restored oyster reef should have a minimum of 15 oysters and 15 grams of biomass per square meter covering at least 30% of the reef, with at least two year classes of oysters on each reef.<sup>1</sup>

#### Stock Status

The oyster stock in the Chesapeake Bay is currently estimated at less than 1% of its historic abundance. Approximately 500 million hatchery-raised oysters were planted in the Bay in 2011 to augment natural reproduction. In addition, approximately 70,000 bushels of oyster shells were spread over 315 acres of bottom in 6 tributaries (Oyster Recovery Partnership & Chesapeake Bay Program website).

Pre-stock assessment studies were conducted in 2009-2010. The studies included a spatial analysis to determine the appropriate scale for oyster population processes and the development of two oyster stock assessment models. The models were fitted to harvest data from the fishery and relative density data from the fall dredge survey. The models estimated abundance and mortality rates. Both approaches found a substantial decrease in oyster abundance during the study periods<sup>2</sup> Recommendations have been made to improve data collection from the fishery and the fall survey.

A bay-wide approach to oyster stock assessment is currently underway to estimate vital rates and to estimate disease status, standing stock, growth, and mortality (both natural and fishing).

#### Current Management Measures

There are three approaches to managing oysters in the Chesapeake Bay: ecological restoration; a sustainable public fishery; and aquaculture. Ecological restoration will meet the goal of the Executive Order to restore 20 tributaries. The US Army Corps of Engineers (USACE) and partners evaluated 63 tributaries and sub-regions for their potential to support large-scale restoration efforts. As a result, 19 tier I tributaries were identified with 11 sites in Maryland and 8 sites in Virginia. Harris Creek was selected as the primary restoration area. The target for Harris Creek is to restore 360 acres. In 2011, Congress gave the USACE over \$2 million for oyster restoration in Maryland. The funding will be used to place substrate on 22 acres of bottom in Harris Creek. Oysters will be placed on the substrate in 2012. It is projected to take 2 to 5 years to complete the restoration effort if funding is kept at current levels.

Maryland's oyster harvest has been around 100,000 bushels annually since 2002. Historically, the annual harvest averaged 2.5 million bushels (1920-1969) and 1.3 million bushels (1970-2002) (Figure 2). Both harvest seasons and catch limits by

gear type are enforced for the public fishery. The sanctuary expansion allows 167,720 acres of natural oyster bars for the wild oyster fishery. Maryland DNR began implementing a new procedure for tagging each container (bushel) of oysters during the 2011-2012 oyster season. The new procedure follows the requirements by the National Shellfish Sanitation Program.

### Aquaculture

New shellfish legislation was passed in 2011 and included expanding leasing areas; giving DNR the authority to revoke commercial licenses for poaching violations; transferring the Seafood Marketing and Aquaculture Program from the Department of Agriculture to the Department of Natural Resources; and requiring the Department of Environment to use the most reliable data to determine whether shellfish production areas pose risks to consumer health. A \$2.2 million financial assistance program was established to aid watermen in aquaculture endeavors. An aquaculture training and education program is also underway. The program includes a series of training publications and the sponsorship of two statewide aquaculture conferences. Through a partnership with the Oyster Recovery Partnership, DNR provides field support for in-the-water activities of oyster aquaculture production.

Marylanders Grow Oysters (MGO), a program under Governor O'Malley's Smart, Green & Growing Initiative, grew over 2 million oysters that were planted in sanctuaries. Since 2008 the program has grown from nearly 900 oyster cages to about 8,000 oyster cages. This volunteer program involves about 2000 people and has expanded to 24 tributaries. For more details on the program, go to the website <http://www.oysters.maryland.gov>.

Figure 1.

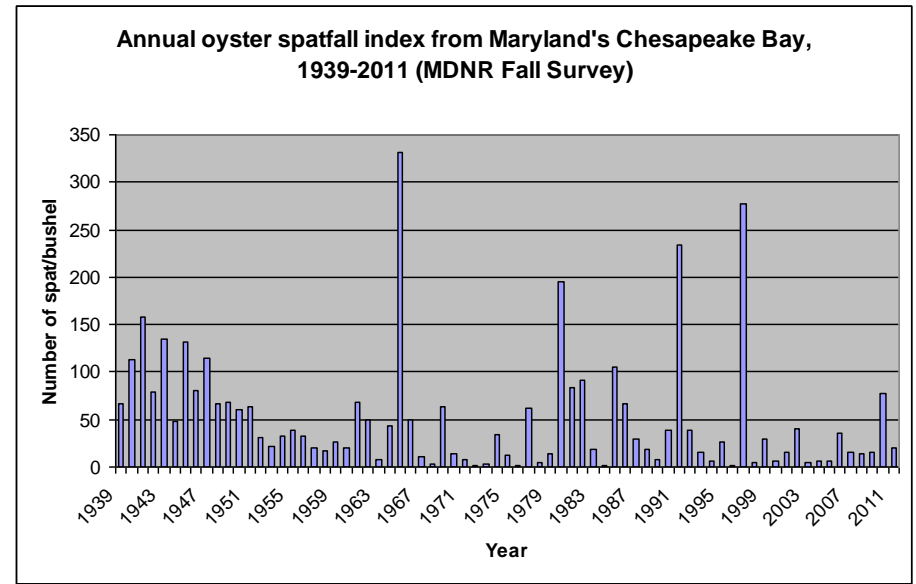
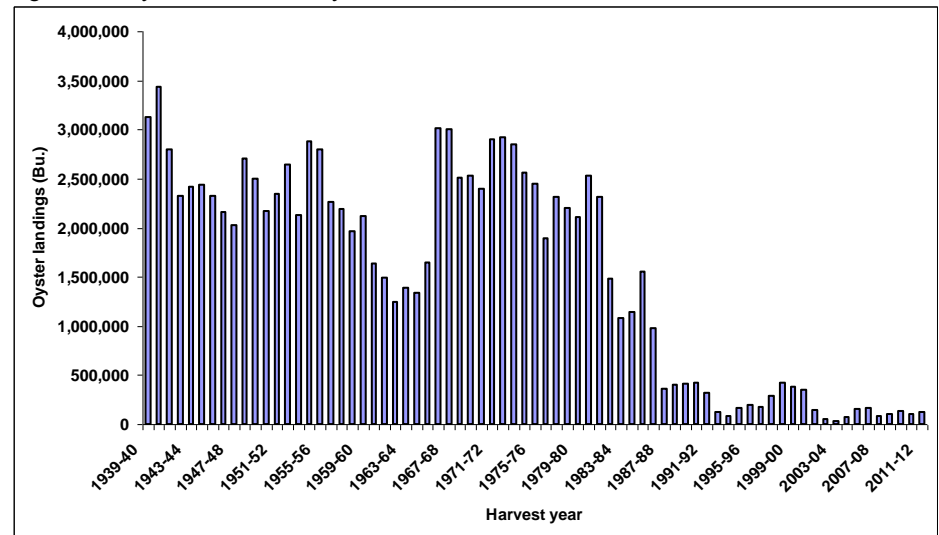


Figure 2. Maryland commercial oyster harvest, 1939-2011.



(MDNR Shellfish Program)

## **Issues/Concerns**

A major issue for oyster recovery is the continued degradation and loss of habitat. Approximately 80% of oyster habitat has been lost over the last 25 years<sup>2</sup>. Maryland DNR believes at least 10,000 acres of habitat need to be rehabilitated for oyster recovery. In addition, a healthy and robust oyster resource in the Bay relies on appropriate substrate for the setting of young oysters. Although dredging for buried shell and shell reclamation activities are underway, the availability of suitable habitat is limited.

The increase in sanctuary areas and aquaculture activities require additional law enforcement. New measures have been adopted to deter and issue citations for oyster poaching. Enforcement requires a continued dedicated effort. The new penalty system has resulted in license suspensions and revocations. It's too early to determine if these measures will be a significant deterrent.

## **References**

<sup>1</sup> Report of the Oyster Metrics Workgroup. 2011. Restoration Goals, Quantitative Metrics and Assessment Protocols for Evaluating Success on Restored Oyster Reef Sanctuaries. Submitted to the Sustainable Fisheries Goal Implementation Team of the NOAA Chesapeake Bay Program, Annapolis, Maryland.

[http://www.chesapeakebay.net/channel\\_files/17932/oyster\\_restoration\\_success\\_metrics\\_final.pdf](http://www.chesapeakebay.net/channel_files/17932/oyster_restoration_success_metrics_final.pdf)

<sup>2</sup> Wilberg, M. and T. Miller. 2010. Developing Spatially-Explicit Assessment Tools for Eastern Oyster in Chesapeake Bay. Technical Report No. TS-599-10 of the University of Maryland Center for Environmental Science.

| 2004 Oyster Management Plan (OMP) Implementation Table (updated 8/2012)  |   |  |   |
|--|---|--|---|
| Section  | Action  | Date/<br>Responsible<br>agencies                                   | Comments  |
| Disease Strategy<br>3.1A. Utilize disease management in all aspects of restoration & harvest to minimize spreading disease<br><br>3.1B. Develop & implement disease strategies within each of the 3 designated salinity zones. | 3.1 Conduct an analysis of how disease management might affect overall survival and productivity. Answer the following question: What management strategies will help increase biomass over a large scale and in the long-term? | Continue<br>Univ. of MD,<br>VIMS, MDNR,<br>and VMRC.               | Modeling and assessment frameworks were utilized through the EIS process to evaluate the benefits of disease management strategies. They included developing and testing of disease tolerant strains for aquaculture; implementing geographically distinct, large-scale oyster restoration (VIMS/NOAA funding); and producing disease-free spat on shell (ORP/UMCES). Scientific research results indicate the need for a cautionary approach to using disease resistant strains for restoration (see Action 6.3.1). Maryland has adopted a new approach for managing against oyster disease. Maryland will use a targeted restoration approach to facilitate the evolution of natural disease resistance, while managing against the spread of disease. Sanctuaries located in areas with salinities >14 ppt will encourage the development of disease resistance through natural selection. |
|  | 3.2 Increase hatchery production to supplement natural recruitment and mitigate the prevalence of <i>P.marinus</i> (refer to Chapter VI Hatchery Production for additional details)   | Continue<br>Univ. of MD,<br>VIMS, MDNR,<br>aquaculture<br>industry | Additional State and Federal funding has resulted in an increase in hatchery production from 38 million spat in 2000 to over 300 million in 2006. There was a record production of 750 million in 2009. During 2010, ~450 million spat were produced and <b>in 2011 over 610 million spat were produced</b> . Production is dependent on spawning success in the hatcheries, availability of cultch, and long-term funding to operate the hatcheries at full capacity. VIMS started an Oyster Aquaculture Training program to provide skilled technicians in oyster husbandry for both hatchery and field operations. During 2008 VA hatcheries produced more than 498 million larvae and seed. ORP has supported UMCES hatchery infrastructure and capacity (MDNR/NOAA funding).   |
|  | 3.3 Establish broodstock sanctuaries in heavily infected areas to possibly produce disease resistant seed. (see Chapter IV Sanctuaries for more details).   | Open<br>MDNR, VMRC,<br>ORP, VA Corps                               | Sanctuaries have been established in a variety of areas throughout the Bay to produce self-sustaining populations of oysters.   |
|  | 3.4 Develop, implement and maintain a seed policy to reduce and minimize disease impacts.   | 2004<br>2007<br>Continuing   | MDNR developed a new policy with additional restrictions, however, beginning in 2007 no seed was available to move and very little was moved in 2008 & 2009. VIMS has a long standing advisory to the state (VMRC) against moving diseased seed. Both MD & VA have oyster advisory committees to provide advice on seed policy issues as they arise.  |
|  | 3.5 Implement oyster surveys as necessary to obtain the best estimates of oyster population data: a) Increase the frequency & spatial intensity of sampling; b) Seek additional funding.  | On-going   | MDNR funded a project (UMCEES) to develop spatially-explicit assessment tools for the oyster stock in Chesapeake Bay. The project develop a framework for stock assessment, evaluated current data collection, recommended improvements to data collections and evaluated the feasibility of including environmental factors into assessment models. A final report was completed in 2010 and available at <a href="http://www.dnr.state.md.us/irc/docs/00016171.pdf">http://www.dnr.state.md.us/irc/docs/00016171.pdf</a> . DNR/ MGS & NOAA are continuing to coordinate field operations to characterize benthic habitat.   |

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| <p>Sanctuaries<br/>Strategy 4.1 A network of clearly marked oyster sanctuaries will be established throughout the Chesapeake Bay and its tributaries</p> | <p>4.2.1 Decisions on where to locate sanctuaries will be guided by the Virginia Oyster Restoration Plan developed by VIMS and VMRC and Maryland's Priority Restoration Areas developed by MDNR and the Maryland Oyster Roundtable Steering Committee. The maps will be used as a preliminary tool to focus restoration activities<br/>(The MD Oyster Roundtable has been replaced by the Oyster Advisory Committee)</p> | <p>2004<br/>2009<br/>On-going</p>      | <p>MDNR supported a study to determine the best productive oyster bars within Maryland and used the results to develop a 10 point Oyster Restoration and Aquaculture Development Plan. Based on this study, new sanctuaries areas have been established. <b>USACOE conducted a study to evaluate 63 tributaries and sub-regions for the purpose of supporting restoration. Nineteen Tier I tributaries have been delineated: 11 sites in MD and 8 sites in VA.</b></p>   |
| <p>Strategy 4.2. Utilize the steps outlined in the OMP for establishing oyster sanctuaries throughout the bay.</p>                                       | <p>4.2.2 Utilize existing protocols &amp; standard operating procedures for recording or charting GPS coordinates for oyster sanctuaries in order to verify locations and track restoration progress.</p>  | <p>Beginning in 2005<br/>2008/2009</p> | <p>Protocols have been developed to delineate and mark sanctuary areas.</p>  |
|  | <p>4.2.3 Evaluate the use of alternative cultch material because all restoration efforts depend on the availability of suitable habitat and traditional shell dredging cannot support the scale of the current &amp; future sanctuary initiative.</p>  | <p>On-going</p>                        | <p>A study in MD was conducted in various salinities &amp; the report is on file with DNR. VIMS and the ACOE released a report on the effectiveness of alternative materials (2006). The function of alternative substrates is to provide a firm base for a constructed oyster bar. To date, alternate materials to replace natural oyster shell cannot be economically manufactured in large quantities. The current approach is to clean exposed shell on natural bars and extract previously planted and shallow buried shells.</p>                               |
|  | <p>4.2.4 Develop and implement techniques to locate and recover buried shell or shell with layers of sedimentation using vacuuming, bar cleaning or other innovative methods.</p>  | <p>2005<br/>2009<br/>On-going</p>      | <p>MD has obtained a permit for a reclamation program that will provide up to 25 million bushels of shell. The MDNR/MGS and NCBO bottom survey program will provide information to prioritize areas and facilitate decisions on shell reclamation techniques. <b>ORP started a Shell Recycling Alliance and collected more than 10,000 bushels of shell in 2011.</b></p>   |
|  | <p>4.2.5 Increase hatchery production to support restoration needs. Current seed levels are too low to effectively stock sanctuaries (see Chapter VI Hatchery and Aquaculture).</p>  | <p>2005</p>                            | <p>See comment for Action 3.2. The question of what is an effective quantity of hatchery seed in sanctuaries is unknown.</p>   |
|  | <p>4.2.6 Monitor areas to evaluate oyster population status and measure progress towards the commitment to increase oyster biomass by 10-fold.</p>   | <p>On-going<br/>MNDR, VIMS</p>         | <p>Utilize the 1994 value as the baseline for measuring the increase in biomass. Provide annual updates. Documentation for MD's methodology for calculating biomass estimates is available in the PEIS. Maryland's biomass is based on the annual fall survey data and an estimate of available oyster habitat. There is a need to improve the data, especially the habitat estimates, that supports the biomass calculations. <b>Criteria for determining a restored oyster reef were adopted in 2011. Jurisdictions are focusing on restoring tributaries.</b></p> |

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| <p>Sanctuaries (cont'd)<br/> Strategy 4.3 Management actions within sanctuaries are primarily based on salinity zones and focus on three key factors: growth, reproduction and disease. The zonal approach to management provides general guidelines for selecting project objectives and anticipating project results in each area</p> | <p>Strategy 4.3.A: Zone 1 (5ppt to &lt;12ppt) Increase biomass &amp; enhance reef habitat. Enhance reef/ bottom habitat to increase oyster biomass and promote the development of living oyster reefs with broad size/age class structure that supports a diverse reef community</p> <p>Action 4.3.A.1 Identify priority areas in Zone 1 that would have the most success at reaching the defined project objectives</p> <p>Action 4.3.A.2 Rehabilitate and maintain oyster bottom habitat to provide planting substrate for seed oysters and optimal conditions for larval settlement</p> <p>Action 4.3.A.3 Plant hatchery produced SPF seed, if necessary, over several years to establish an oyster population with a diverse age class structure</p>                                 | <p>2005<br/> <b>On-going</b></p> | <p>MD is implementing a 10-Point Oyster Restoration Plan that focuses on targeted restoration strategies, expands the sanctuary program, rehabilitates oyster habitat, manages against disease, increases hatchery production, and enhances law enforcement.</p> |
|   | <p>Strategy 4.3.B: Zone 2 (12-14ppt) Transition Area: The boundaries of Zone 2 shift because of variations in rainfall and resulting salinity. Consequently, Zone 2 will exhibit fluctuations in spat settlement and disease mortality. Projects in this zone must utilize current environmental data during planning.</p> <p>Action 4.3.B.1 Critically examine long-term environmental conditions and develop relevant project objectives for sanctuaries in Zone 2.</p> <p>Action 4.3.B.2 In the areas that have predominantly Zone 1 characteristics, utilize Zone 1 guidelines and in areas that have predominantly Zone 3 characteristics, utilize Zone 3 guidelines.</p>   |                                  |  |
|   | <p>Strategy 4.3.C (&gt;14ppt) Develop Disease Tolerance:<br/> It is not certain that disease resistance can develop via a management approach in Zone 3. The strategy will be to promote the development of disease resistance where disease mortality is high</p> <p>Action 4.3.C.1 Reestablish and maintain bottom habitat for oyster spat settlement and growth of disease resistant adults</p> <p>Action 4.3.C.2 Monitor Zone 3 sanctuaries to determine the effects of disease mortality</p> <p>Action 4.3.C.3 Utilize Zone 3 as an area to test laboratory strains of disease resistant oysters</p> <p>Action 4.3.C.4 Limit the use of natural seed to sanctuaries in Zone 3. The use of natural seed in repletion areas is allowed as long as disease protocols are followed.</p> |                                  |  |

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|---|---|----------------------------|--|
| Sanctuaries (cont'd)<br>Strategy 4.4<br>The jurisdictions will establish oyster sanctuaries to promote maximum ecological value   | Action 4.4.1 Identify areas of special interest throughout the Bay, especially areas that may retain larvae (maybe auto-recruiting), and protect them using the sanctuary status    | On-going                   | The Great Wicomico and Lynnhaven Rivers have been identified as areas of special interest. MD has established sanctuaries based on protecting 25% of the state's most productive areas as identified by an analysis of the annual fall survey data. <b>Harris Creek has been designated as Maryland's priority restoration area.</b>   |
| Strategy 4.5<br>Implement the actions described in chapter III to address disease problems. In addition, the jurisdictions will take further action to minimize the spread of disease | Action 4.5.1 Utilize only SPF hatchery seed in sanctuaries designated for oyster biomass accumulation, Zone 1 and Zone 2.   | On-going                   | Two workshops held in 2007 provided guidance on the role of hatchery-based oysters used for restoration. Using domesticated strains has not improved survival or resulted in higher recruitment. Preserving local wild stocks is preferred since data suggests some level of natural disease resistance is occurring. <b>Recent monitoring results provide more evidence of disease resistance.</b>  |
|   | Action 4.5.2 Place hatchery seed on newly created sanctuary bottom and not on top of infected oyster populations in order to prevent rapid infection of the disease-free seed       | On-going                   |  |
|   | Action 4.5.3 Continue to prohibit the movement of infected oysters from higher salinity waters onto newly or previously created sanctuaries in Zone 1                               |                            |  |
| Sanctuaries (cont'd)<br>Strategy 4.6 To facilitate the enforcement of closed areas, especially sanctuaries, implement the following actions:  | Action 4.6.1 Sanctuaries will be placed in geographically distinct areas with enough space to create a buffer zone between harvest and sanctuary areas to enable enforcement        | Began in 2003 and continue | State agencies are responsible for marking sanctuary areas but sanctuaries continue to experience enforcement problems. New enforcement strategies have been developed to address this issue. See strategy 5.4. During 2009, MDNR provided educational materials to the court system and implemented a pilot program in Anne Arundel County to establish a Natural Resource Day in court. This program is expected to be expanded to other counties. MDNR also provided in-service training to NRP officers on all fishery issues especially regarding oysters. <b>The new penalty system has resulted in license suspensions and revocations.</b> |
|   | Action 4.6.2 Sanctuaries will be buoyed and marked  |                            |  |
|   | Action 4.6.3 The public and judiciary will be notified about sanctuary areas through educational initiatives, public announcements and stakeholder meetings                         |                            |  |
|   | Action 4.6.4 New enforcement measures will be identified and implemented. Additional manpower will be recommended if necessary  |                            |  |
| Managing Harvest<br>Strategy 5.1 Establish sanctuaries & special management areas thereby reducing F & develop appropriate biological reference pts.                                  | Action 5.1.1 Establish a network of sanctuaries (refer to Section 1.IV for details) and special management areas throughout the Bay to limit harvest and increase oyster production | Continue                   | The MD 10-pt Plan increased the total area designated as oyster sanctuaries from 9% of quality habitat in 2009 to approximately 25% in 2010. The plan allows approximately 167,720 acres of natural oyster bars for the wild oyster fishery. In 2009, MD added 3 new sanctuaries that more than doubled the area of protected bottom from 1475 to 2581 acres. VA has a combination of 3-dimensional oyster reefs and acreage set aside as sanctuary areas. More than a 100 reefs have been constructed throughout VA's portion of the Chesapeake Bay.  |
|   | Action 5.1.2 Define appropriate biological reference points for the oyster resource based on the results of the bay wide stock assessment   | 2007/2008<br>2010          | BRPs have not been developed but the 2010 assessment study indicates that exploitation rates have been around 25%. <b>A stock assessment project is currently underway to develop estimates of abundance.</b>  |
|   | Action 5.1.3 Utilize the disease guidelines and actions presented in Section 1.III in all aspects of special management areas and the fishery                                       | 2005                       | Continuing   |



|   |   |                                    |   |
|---|---|------------------------------------|---|
|   | Action 5.1.4 Control oyster harvest to reach an appropriate F determined by the Oyster Scientific Committee.  | 2007/2008                          | Oyster harvest is controlled through a number of regulations by MDNR & VMRC. When BRPs are determined, a target and threshold F will be defined.  |
| Strategy 5.2. Develop guidelines for managing fishing effort and monitoring oysters in open and closed areas.   | Action 5.2.1 a) Determine the criteria for opening and closing areas; b) Monitor population; c) Determine level of acceptable exploitation; d) Regulate harvest and gear type; e) Develop additional monitoring if necessary; f) Close area when harvest criteria are met.  | 2005<br>On-going                   | Criteria for opening/closing harvest reserves have been developed. The managed reserves are opened to harvest only upon approval by the State and when 50% or more of the oysters are 4" in size. The 4" size limit allows the oysters an additional year to provide ecological services.   |
|   | Action 5.2.2 Utilize the site selection criteria set forth in the OMP to select special management areas (see Section 2 for details).   | 2005<br>Continuing                 | All oyster partners are managing oysters according to the salinity zones specified in section 2. Zone 1 (5-12 ppt) management involves the enhancement of populations by the planting of shell and seed. Zone 3 (>15 ppt) management involves the development of disease-resistant natural populations as well as the maintenance of hard substrate for spat settlement. Zone 2 (12-14 ppt) involves a mixture of these approaches. |
|   | Action 5.2.3 a) MDNR will utilize the ORT STAC to review & make recommendations on where to locate harvest reserve areas; b) VA will utilize their current system to review and make recommendations on open & closed areas.  | Continue<br>2007                   | The ORT STAC is no longer active. In 2007, MD established an Oyster Advisory Committee (OAC) to develop new strategies for rebuilding and managing the oyster resource. The OAC's recommendations resulted in MD's 10 point oyster management. The plan includes increasing the area and number of sanctuaries, encouraging aquaculture, and the support of a more targeted, sustainable, scientifically-managed oyster fishery.    |
|   | Action 5.2.4 Identify and implement regulatory & legislative changes needed for managing open & closed harvest areas.   | 2006                               | MDNR opens and closes areas via public notice. VMRC utilizes the Commission process.  |
|   | Action 5.2.5 a) Evaluate how rotating open & closed areas contributes to reproduction, oyster biomass & harvest; b) Based on the harvest reserve biological data, reevaluate the criteria (Action 5.2.1) for opening & closing areas & modify actions as necessary.   | 2005<br>On-going                   | Monitoring is underway and evaluation is on-going.  |
| Strategy 5.3 a) Follow project guidance criteria specified in section 2 when developing repletion program work plans; b) Maintain the MDNR work plan review process | Action 5.3.1 Modify the MD repletion program through the established ORT Steering & Scientific Committees to reduce and minimize disease impacts: a) Establish criteria to limit and/or restrict seed movement to certain regions depending on environmental conditions & disease levels; b) Avoid transplanting older year classes that have higher levels of disease than young spat; c) Rotate and/or clean seed areas; d) Allow old seed areas to lie fallow and/or be harvested; e) Utilize the disease results from the Fall survey; f) Transplant wild seed as soon as possible. | 2004<br>On-going                   | MDNR no longer implements a repletion program but puts all of its resources into the 10-point plan.   |
|   | Action 5.3.2 MD will evaluate the effects of the repletion program on oyster population dynamics and habitat; and document how it contributes to an increase in oyster biomass & habitat.   | 2006                               | No repletion effort currently in progress.  |
| Strategy 5.4 Strengthen the enforcement of oyster closures in sanctuaries & special management areas.   | Action 5.4.1 Evaluate and implement the appropriate enforcement measures.   | 2005<br>MNDNR, VMRC<br><b>2010</b> | The MD Natural Resources Police (NRP) is beginning to implement radar and camera vessel monitoring technology. The system, Maritime Law Enforcement Information Network (MLEIN), is largely a national security tool that will be adapted to aide enforcement.  |
|   | Action 5.4.2 Prohibit the culling of oysters while underway to minimize the movement of infected oysters.   | On-going<br>MDNR, VMRC             |   |

|   |   |  |  |
|---|---|--|--|
| Hatchery and Aquaculture Considerations<br>Strategy 6.1 Utilize hatchery-produced seed to augment natural reproduction reduce disease effects & increase biomass.   | Action 6.1.1 Develop an interlab certification program for oyster diseases. Utilize the molecular diagnostic protocols for certifying SPF oyster seed developed by the VIMS Shellfish Pathology Laboratory.   | 2005                                   | VIMS, Univ. of MD, MDNR  |
|   | Action 6.1.2 MD will increase hatchery production of SPF seed to support the 10-fold increase in oyster biomass: a) Increase & maintain as necessary the operating funds for each MD hatchery facility; b) Evaluate & optimize the efficiency of each facility in order to ensure maximum production of spat. | On- going<br>MDNR, ORP,<br>Univ. of MD | See comments for Action 3.2  |
|   | Action 6.1.3 Continue the protocol for certifying and using SPF seed: a) establish standards & refine criteria; b) use only SPF seed in sanctuaries located in Zone 1 (< 12ppt).  | Continue VIMS,<br>MDNR, Univ.<br>of MD | Implemented and continuing.  |
|   | Action 6.1.4 The U.S. Army Corps of Engineers (COE) will conduct an analysis of hatchery project production in relationship to environmental benefits as part of its long-term restoration planning, and determine whether augmenting or building new hatchery (ies) is warranted                             | 2008<br>ACOE                           | The master plan examines and evaluates the problems and opportunities related to oyster restoration and formulates plans for implementing large-scale Baywide restoration. This action was expected to be addressed as part of the Native Oyster Master Plan by the ACOE. However, the plan establishes guidelines for restoration and not specific actions.   |
| Hatchery and Aquaculture Considerations (cont'd)  | Action 6.1.5 Virginia will increase hatchery production of disease resistant seed to support the 10-fold increase in oyster production: a) Increase and maintain as necessary, the operating funds for oyster breeding in Virginia; b) Evaluate the feasibility of a public or a public-private hatchery      | On going<br>VMRC, VIMS                 | VIMS/VMRC conducted a pilot project to promote capacity building of private hatchery and grow-out infrastructures in order to provide oyster spat-on-shell for restoration (NOAA funding FY04 continued in FY06). VIMS is currently training oyster technicians for aquaculture work both in the hatchery and in the field.  |
|   | Action 6.1.6 Virginia will develop strategies for effective seeding of reefs and their effects on recruitment, especially in relation to the spread of disease resistance in the wild population.   | 2005<br>VMRC, VIMS                     | VIMS is conducting research on these questions through NOAA funding.   |
| Strategy 6.2 Continue to track the genetic background of broodstocks used in hatcheries for restoration or replenishment activities   | No specific actions recommended at this time.   | To be determined<br>MDNR, VMRC         | There is some concern about reduced genetic variability of selectively bred oysters compared to wild oysters. In 2007, oyster disease experts recommended to discontinue transplanting infected natural seed; to discontinue bar cleaning for disease; to use hatchery-produced seed for augmenting natural stocks; to create sanctuaries and enforce a harvest moratorium; and consider larval dispersal mechanisms when creating oyster sanctuaries. |
| Strategy 6.3 Develop recommendations for using disease resistant strains of native oysters for restoration. Selectively bred oyster strains should be used for restoration only in areas where native oysters are locally depleted. | Action 6.3.1 Assess and evaluate the use of disease resistant stocks as a tool for increasing disease resistance in the native oyster population in the Bay.  | 2007                                   | The participants at the 2007 OMP Workshop concluded that the development of alternative strains for use in restoration should not be pursued thereby preserving the natural ability of oysters to develop disease resistance. There was also consensus that domesticated disease-resistant strains were acceptable for aquaculture endeavors.  |

|  |  |                             |  |
|--|--|-----------------------------|--|
|  | Action 6.3.2 Monitor restoration activities to clarify the interaction between selectively bred strains and wild stocks of oysters.  | 2005<br>UnMD, ORP,<br>VMRC  | Carlsson et al (2008) evaluated the contribution of a selectively bred, domesticated oyster strain to recruitment in the Great Wicomico, Lynnhaven, York, and Elizabeth Rivers from 2002 to 2006. They were unable to detect a significant contribution of the domestic strain to wild-produced spat.  |
| Strategy 6.4 The members of the OMP drafting team will review the MD task force report & recommend changes to the OMP as appropriate regarding aquaculture strategies & actions  | Action 6.4.1 Amend the OMP as necessary to incorporate new strategies and actions regarding aquaculture.   | 2009<br>2010                | The vision of the new Maryland 10-Point Oyster Plan is “to establish a private aquaculture industry that emerges as a major economic contributor to the State of Maryland while maintaining a more targeted and scientifically managed wild oyster fishery that is sustainable.” Chapter 173 of the Legislative Acts of 2009 passed new aquaculture leasing statutes that completely changes how Maryland regulates, administers, and manages aquaculture and leasing of shellfish. Grants have been secured to help watermen with start-up and operational costs for new oyster farms. The first Aquaculture Enterprise Zone (AEZ) was established by regulation in October 2009 in the Patuxent River near Broomes Island. Amendment #1 to the OMP was adopted in 2010. The amendment allows aquaculture and clamming activities within the larger, expanded sanctuary (areas closed to shellfish harvest and focused restoration activities) program; the use of new enforcement measures to protect sanctuary areas; and the implementation of sanitation guidelines. During 2010, the OMP was reviewed. The PRT recommended that the plan be revised. |
| Monitoring and Information Management Strategy 7.1 A) Utilize the results of the oyster stock assessment as an estimate of oyster abundance in the Bay; B) Use the 1994 biomass value as a baseline to track progress towards the 10-fold objective. | Action 7.1.1 Conduct monitoring programs that are consistent in terms of sampling procedure, timing of sampling, types of data collected, and analysis and provide the results to a central database or databases. | Continue                    | Monitoring programs have been reviewed. UMCEES has provided recommendations on how to improve existing fishery-independent and fishery-dependent data collection methodology. MDNR Shellfish Program will be taking the recommendations under consideration.   |
|  | Action 7.1.2 Establish a Technical Committee to develop data management guidelines for handling oyster data.   | 2005                        | Original committee meeting did not result in specific guidelines.  |
|  | Action 7.1.3 Develop and maintain a database to track oyster restoration projects and provide web-based access.  | open<br>MDNR,<br>VMRC, NOAA | NOAA compiled an inventory of all oyster restoration project implemented in recent years in both states (2007). NOAA also established a full database of implementation and monitoring data for all oyster restoration projects completed with federal funding, beginning in FY07 and ongoing.   |
|  | Action 7.1.4 The Chesapeake Bay Program will conduct an annual oyster symposium  |                             | An Oyster Workshop was convened in December 2007.  |
|  | Action 7.1.5 Promote the research recommendations listed in Section 2.   | 2005<br>2009                | All oyster partners. Research recommendations will be developed during the OMP revision process.   |

Acronyms:

ACOE = Army Corps of Engineers

PRT= Plan Review Team

BRPs = Biological Reference Points

MGS = Maryland Geologic Society

MDNR = Maryland Department of Natural Resources

NCBO = NOAA Chesapeake Bay Office

NOAA = National Oceanographic and Atmospheric Administration

OMP = Oyster Management Plan

ORP = Oyster Recovery Partnership

PEIS = Programmatic Environmental Impact Statement

SPF = Specific Pathogen Free

UMCEES = University of Maryland Center for Environmental & Estuarine Studies

UMCES = University of Maryland Center for Environmental Studies

VIMS = Virginia Institute of Marine Science

VMRC = Virginia Marine Resources Commission

**2011 Maryland FMP Report (July 2012)**  
**Section 15. Red Drum (*Sciaenops ocellatus*)**

**Chesapeake Bay FMP**

The Chesapeake Bay Red Drum Fishery Management Plan was adopted in 1993 to address overfishing and follow the ASMFC guidelines. Management measures since 2000 have resulted in reduced fishing mortality.

**Stock Status**

The status of the red drum stock is derived from the Atlantic coast stock assessment. In the 1980s and 1990's the coastal red drum stock was overfished and management measures were implemented to reduce fishing mortality (F) and rebuild the stock. Two management areas are defined: the northern (NC to NJ) and the southern stock (FL to SC). The 2009 peer reviewed ASMFC stock assessment found the stock to be relatively stable. Overfishing is likely not occurring. The fishing mortality threshold is 30% of a static spawning potential ratio (SPR) and the fishing mortality target is 40% of a static SPR.

There is no formal stock assessment for Chesapeake Bay. Red drum are not frequent visitors to Maryland's portion of the Chesapeake Bay. More red drum are reported from Virginia waters and in Maryland when salinity is high. Schools of red drum over the maximum size limit may be seen in years of low freshwater flow.

**Current Management Measures**

Red drum are managed through size limits and creel limits in compliance with ASMFC state requirements and guidelines in the coastal 1984 FMP and amendments 1 (1991) and 2 (2002). Maryland allows recreational fishermen to take 1 fish per day between 18 and 27". Charter book logs show that anglers on Maryland charterboats release most of the red drum they catch<sup>3</sup>. Commercial fishermen in Maryland are allowed 5 fish per day with a slot limit of 18-25". Virginia allows a slot limit of 18-26" and a possession limit of 3 fish per day for both commercial and recreational fishermen. The Potomac River Fisheries Commission (PRFC) has a slot limit of 18-25" and a possession limit of 5 fish per day for recreational and commercial fishermen. There are no closed seasons for the recreational or commercial fisheries.

**Issues/Concerns**

SAV beds are important red drum habitat and efforts to achieve SAV restoration and water clarity goals will continue. Maryland will continue to monitor commercial pound nets and fish houses and measure red drum when they are encountered. This species has been identified by ASMFS as a priority in need of research. Coastal

states are developing a cooperative plan to collect more age/length data to improve stock assessment modeling results.

**The Fisheries**

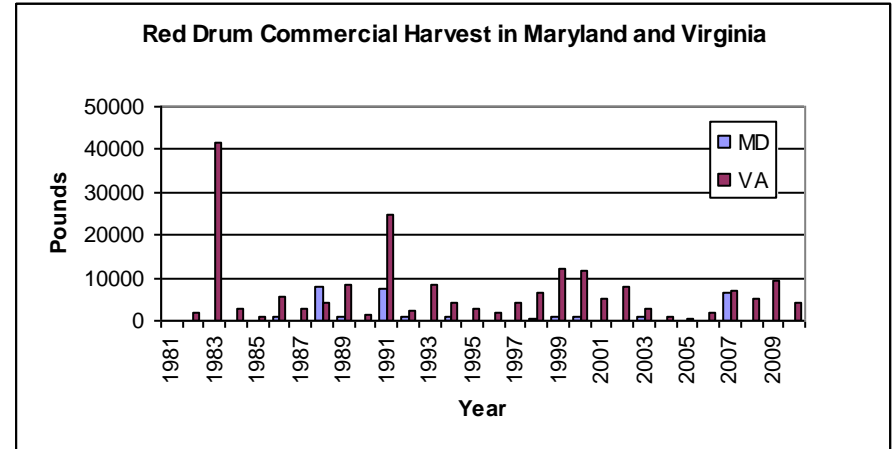


Figure 1. Commercial red drum landings reported to NMFS by Maryland and Virginia 1981-2010.<sup>1</sup>

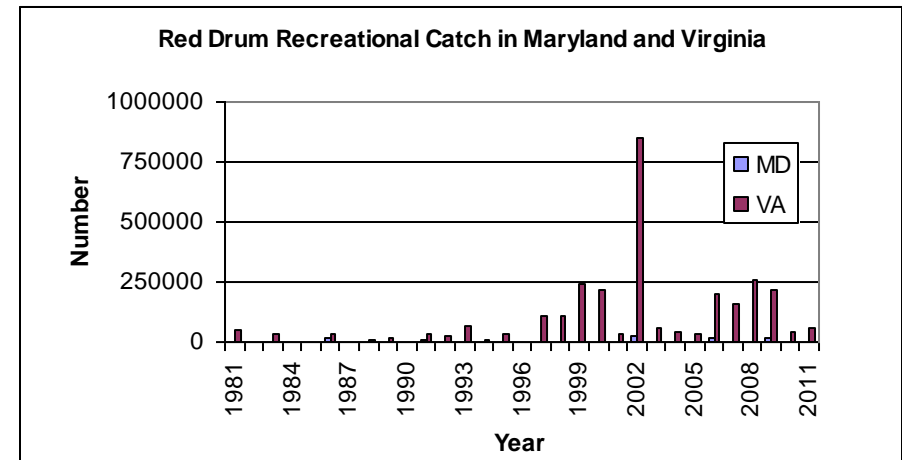


Figure 2. Recreational red drum MRIP catch estimate for Maryland and Virginia, 1981-2011.<sup>2</sup>

References:

<sup>1</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 22, 2012. <http://www.st.nmfs.noaa.gov/st1/commercial/>.

<sup>2</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 22, 2012.  
<http://www.st.nmfs.noaa.gov/st1/recreational/index.html>.

<sup>3</sup> Rickabaugh, H.W. Jr. 2012. Maryland Red Drum (*Sciaenops ocellatus*) compliance report to the Atlantic States Marine Fisheries Commission – 2011. Maryland Department of Natural Resources, Fisheries Service, June 2012. 5p.

| <b>1993 Chesapeake Bay and Atlantic Coast Red Drum Management Plan Implementation Table (updated 6/12)</b> |   |   |  |
|--|---|---|--|
| <b>Section</b>   | <b>Action</b>   | <b>Date</b>                             | <b>Comments</b>  |
| 1. Overfishing   | 1.1.1 Virginia will continue to enforce a 5 fish creel limit and an 18 inch minimum size limit with one fish over 27in in the recreational fishery.                                     | 1992<br>Modified in<br>2003<br>Continue | In compliance with coastal recommendations. VA has decreased its size limit and now allows fishing of 18-26" red drum. A new possession limit of 3 fish has been adopted for both recreational and commercial harvest. The 2009 peer reviewed ASMFC stock assessment found the resource to be relatively stable with overfishing not occurring.                      |
|  | 1.1.2 Maryland and the PFRC will implement a 5 fish creel limit and an 18 in minimum size limit with one fish over 27in in the recreational fishery                                     | 1994<br>Modified in<br>2003<br>Continue | In compliance with coastal recommendations. MD has a recreational size limit for red drum of 18-27" and a commercial size limit of 18-25". The possession limit is 1 fish/day for the recreational fishery and 5 fish/day for the commercial fishery. PRFC has a size limit of 18-25" and a possession limit of 5 fish for both recreational and commercial harvest. |
|  | 1.2a Jurisdictions will investigate the potential for using bycatch reduction devices in nonselective fisheries   | 1992<br>Continue                        | The bycatch of immature red drum has not been a problem in Chesapeake Bay fisheries because small fish are infrequently encountered. Bycatch reduction devices that are currently in place should indirectly increase the escapement of juvenile red drum.   |
|  | 1.2b Virginia and Maryland will work with the South Atlantic Fishery Management Council (SAFMC) and ASMFC to develop and require more efficient gear to reduce bycatch and/or discards. | 1992<br>Continue                        | MD and VA appointed representatives to the ASMFC/SAFMC Red Drum Advisory Panel.  |

| <b>1993 Chesapeake Bay and Atlantic Coast Red Drum Management Plan Implementation Table (updated 6/12)</b> |  |                  |  |
|--|--|------------------|--|
| <b>Section</b>   | <b>Action</b>  | <b>Date</b>      | <b>Comments</b>  |
| 2. Stock Assessment and Research Needs   | 2.1 Jurisdictions will support fecundity research and tagging studies to determine movements of juvenile red drum and develop juvenile indices. Maryland and Virginia will continue the Baywide trawl survey of estuarine finfish species and crabs. | 1993<br>Continue | The VA red drum tagging program is ongoing The tagging program includes a fishery independent study and a volunteer recreational study. Tag recapture data indicates a southward, late fall migration of juvenile red drum out of the Bay and along the Virginia coast. Future tag returns should provide information about the movements of these fish upon reaching sexual maturity. The Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAP) continues but the collection of red drum is not sufficient to guide any stock assessment. The Maryland Shoal Water (blue crab) Trawl Survey continues (data for fish and crabs). ASMFC has recommended that all states implement a tagging program for red drum. <b>In 2011, ASMFC continued to facilitate standardized ageing protocols and consistency among laboratories.</b> |
|  | 2.2 VMRC Stock Assessment Program will continue to collect biological data from commercial catches of red drum   | 1993<br>Ongoing  | There is little fishery dependent information on larger, reproductive red drum and limited fishery-independent information (ASMFC). The large adults are primarily found offshore where fishing for red drum is prohibited.  |
|  | 2.3a Jurisdictions will continue collecting commercial fisheries statistics.   | Continue         | Maryland's Chesapeake Bay red drum harvest remains insignificant . Virginia commercial reports were <b>3992 pounds in 2010, a wet year, down from 9425 pounds in 2009.</b>   |
|  | 2.3b Virginia will implement a limited and/or delayed entry program and a mandatory reporting system for commercial licenses.  | 1993<br>Continue | Implemented in January 1993.   |



| <b>1993 Chesapeake Bay and Atlantic Coast Red Drum Management Plan Implementation Table (updated 6/12)</b> |   |             |   |
|--|---|-------------|---|
| <b>Section</b>   | <b>Action</b>   | <b>Date</b> | <b>Comments</b>   |
|  | 2.3c Virginia and Maryland will continue to supplement the Marine Recreational Statistics Program   | Continue    | <b>Maryland awarded 10 citations for red drum that were caught and released in 2011. In 2010, VA anglers caught and released 755 red drum over 46" in length in 2011, compared to 717 for 2010. The Marine Recreational Information Program (MRIP) is replacing MRFSS and is being refined. Proportional standard errors (PSE) were in excess of 50 for every year except one, indicating that recreational estimates are very imprecise.</b>   |
|  | 2.3d Maryland will continue a sampling program using pound nets and trawls.   | Continue    | Maryland conducts fishery dependent sampling from pound nets in the Chesapeake Bay. Twenty-one red drum were sampled in 2008 (mean 361mm TL, range 237-541mm TL). <b>None were collected in 2009 and 2010 and only two were collected and released in 2011<sup>3</sup>.</b>   |
| 3. Habitat Issues  | 3.1 Jurisdictions will continue to set specific objectives for water quality goals and review management programs established under the Chesapeake 2000 agreement | Continue    | SAV beds are important red drum habitat. Water clarity and water quality goals were adopted by the Chesapeake Bay Program signatory states in 2003 that will help in achieving a SAV restoration goal of 185,000 acres by 2010. In 2008, there were nearly 77,000 acres of bay grasses, or 42% of the goal. By 2009, this had grown to nearly 86,000 acres but decreased to just under 80,000 acres in 2010 due to warmer water temperatures. <b>Bay grasses decreased 21% in 2011 to 63,074 acres after high spring flows, Hurricane Irene and Tropical Storm Lee. Grasses in the coastal bays of Maryland decreased by 35% in 2011.</b> |

Acronyms:

PFRC= Potomac River Fisheries Commission

SAV= Submerged Aquatic Vegetation

VIMS= Virginia Institute of Marine Science

## 2011 Maryland FMP Report (April 2012)

### Section 16. Scup (*Stenotomus chrysops*)

#### Chesapeake Bay FMP

Scup are a relatively minor component of Maryland fisheries. Commercial landings were minimal prior to the stock's collapse in the 1990s. Recreational harvest surged from no reported harvest in 1988 to 52.6 thousand fish in 1990. The Atlantic coast scup stock has rebounded and is no longer at low levels. No Chesapeake Bay Program fishery management plan (FMP) has been developed for scup. Maryland has authority to manage scup as a species in need of conservation established in 1994<sup>1</sup>. Scup are jointly managed by the Atlantic States Marine Fisheries Commission (ASMFC) and the Mid-Atlantic Fishery Management Council (MAFMC). The ASMFC manages scup fisheries in state waters (out to three miles) while the MAFMC manages scup fisheries in federal waters. Scup were incorporated into the summer flounder FMP in 1996. Since then, a series of amendments and addenda have been implemented to modify management measures. Addenda III (2001), VII (2002), IX (2003), and XI (2004) implemented a 50-fish per person per day catch limit and 8-inch minimum size limit for recreational fisheries. Addendum XIX (2007) maintained the 1999 Amendment XII's fishing mortality ( $F_{max}$ ) of 0.26 and a spring spawning stock survey index of 2.77kg per tow. In 2007, the MAFMC established a seven year rebuilding plan with Amendment XIV and implemented a standardized bycatch reporting and monitoring system with Amendment XVI.

#### Stock Status

Based on the 2009 assessment, the scup stock was determined to be rebuilt and not undergoing overfishing. The stock assessment methods and biological reference points (BRPs) were revised in 2009. The revised BRPs are a threshold fishing mortality ( $F_{40\%}$ ) of 0.177 and a target spawning stock biomass ( $SSB_{40\%}$ ) of 202 million pounds. Coastwide in 2010,  $F_{40\%}$  was 0.043 and  $SSB_{40\%}$  was 342 million pounds. The scup stock assessment was updated in 2011 using the peer-reviewed methodology developed in 2009. The stock assessment results support maintaining a cautious approach to increasing quotas because of the uncertainty in recruitment<sup>2</sup>.

#### Current Management Measures

The majority of coastwide scup harvest is allocated to the commercial fishery (78%). The remaining 22% of harvest is allocated to the recreational fishery. Maryland manages commercial harvest with a three season system. The commercial minimum size limit is 9" and all commercial harvesters must have a federal permit<sup>3,4</sup>. The annual coastwide commercial quota is divided among three fishing seasons: January through April (Winter I = 45%), May-Oct (Summer = 39%), and November through December (Winter II = 16%). Winter fisheries are also managed with trip limits (Winter I is 1,000 pounds per trip and Winter II is 2,000 pounds per trip). The

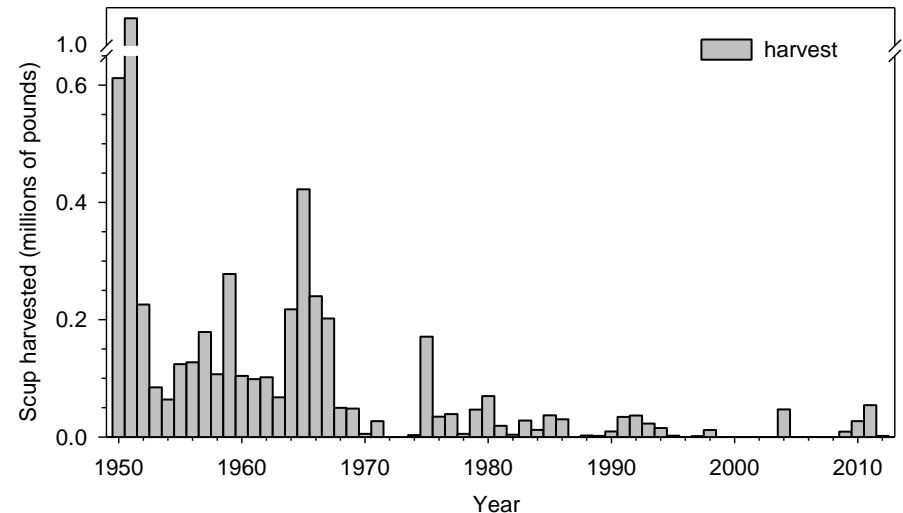
summer fishery is managed with state-by-state quotas based on historical landings<sup>5</sup>. Regulations for commercial fishing gear mesh size and escape panels have been enacted.

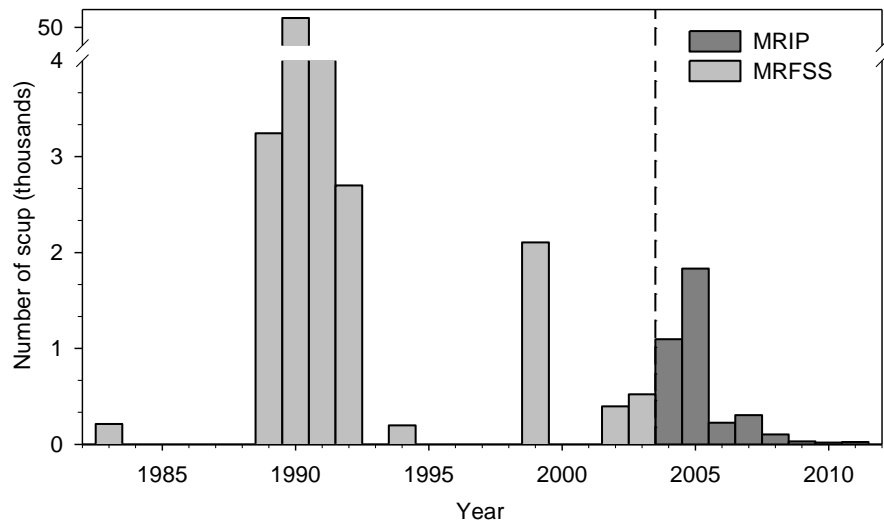
Recreational harvest regulations differ between state and federal waters. In Maryland waters the minimum harvest length is 8" while in federal waters the minimum length is 10.5"<sup>4</sup>. The 10.5" minimum length requirement also applies to the Party and Charter boat fisheries. Both jurisdictions have a 50 fish per person per day limit.

#### The Fisheries

Scup harvest is generally low and varies from year to year. They are harvested in winter as part of the mixed black sea bass/scup/summer flounder trawl fishery. Estimated commercial scup harvest was 27.2 thousand pounds in 2010<sup>6</sup>, 54 thousand pounds in 2011<sup>7</sup>, and 1,900 pounds by April, 2012<sup>7</sup> (Figure 1).

Recreational catch estimates have been revised as a part of the Marine Recreational Information Program (MRIP). Catch estimates have been recalculated for 2004-2011 to provide more accurate estimates and replace those previously made by the Marine Recreational Fisheries Statistics Survey (MRFSS) (For more details go to the FMP Introduction). Recreational anglers harvested 18 scup in 2010 and 24 scup in 2011<sup>8</sup> (Figure 2).





### Issues/Concerns

The MAFMC’s FMP designates a coastwide commercial quota in federal waters rather than state-by-state quota allocation. In contrast, ASMFC’s FMP allocates the coastwide quota for state waters on a state-by-state basis according to historical landings.

The MAFMC has funded an economic analysis of the scup fishery to explore two concerns: the existing allocation between the recreational and commercial fisheries; and the allocation among the three fishing seasons. The two allocation scenarios may not reflect the current needs of the fisheries<sup>2</sup>.

Scup population data collected by MDNR does not support the Northeast Data Poor Stocks Working Group’s conclusion that the scup population has recovered<sup>3</sup>. Larger sized scup are uncommon in commercial and recreational harvests.

### References

<sup>1</sup> Maryland Office of the Secretary of the State. COMAR 08.02.12.03. Retrieved July 25, 2011: <http://www.dsd.state.md.us/comar/comarhtml/08/08.02.12.03.htm>

<sup>2</sup> Atlantic States Marine Fisheries Commission 2011 Annual Report. TIL Berger (editor). March 2012. Arlington, VA.

<sup>3</sup> Doctor, S. 2011. Maryland’s 2010 annual compliance report for scup. Maryland Department of Natural Resources. Stevensville, MD.

<sup>4</sup> Electronic Code of Federal Regulations. Title 50: Wildlife and Fisheries Part 648— Fisheries of the Northeastern United States subpart H—Management measures for the scup fishery. Retrieved April 10, 2012: <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=dd4468bf812e272051a3cc0b893c69cc&rgn=div6&view=text&no de=50:10.0.1.1.6.8&idno=50.Washington, DC>.

<sup>5</sup> Kerns, T., P. Caruso, and J. Coakley. 2010. 2010 review of the Atlantic States Marine Fisheries Commission fishery management plan for the 2009 scup fishing year scup (*Stenotomus chrysops*). Atlantic States Marine Fisheries Commission.

<sup>6</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. April 10, 2012: <http://www.st.nmfs.noaa.gov/st1/commercial/>.

<sup>7</sup> Personal communication from the NOAA Fisheries Service, Northeast Regional Office, Fisheries Statistics Office. April 11, 2012: [http://www.nero.noaa.gov/ro/fso/reports/reports\\_frame.htm](http://www.nero.noaa.gov/ro/fso/reports/reports_frame.htm).

<sup>8</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. April 10, 2012: <http://www.st.nmfs.noaa.gov/st1/recreational/index.html>.

## 2011 Maryland FMP Report (July 2012)

### Section 17. Striped Bass (*Morone saxatilis*)

#### Chesapeake Bay FMP

Atlantic coast striped bass continue to have a broadening diversity of ages even though the female spawning stock has declined 26% since 2003. The declines are attributed to several years of below average juvenile year classes. The 2011 juvenile abundance index was more than double the target value signaling a strong year class. Commercial watermen and the Maryland Department of Natural Resources (MD DNR) continue efforts to implement a catch shares management system. The 2010 review of the 1989 Chesapeake Bay Striped Bass Management Plan (CB FMP) identified harvest and quota enforcement, fishing sector allocation, regulatory decision rules, and the integration of habitat management reference points as issues that need to be addressed within the management framework.

The Atlantic States Marine Fisheries Commission (ASMFC) developed the Interstate Fisheries Management Plan for Striped Bass in 1981 (ASMFC FMP). In 1989 the Chesapeake Bay Program (CBP) developed the CB FMP to coordinate management among jurisdictions to comply with ASMFC FMP requirements. Amendment #1 to the CB FMP formally adopted ASMFC's management framework for the Chesapeake Bay. A new CB FMP amendment will be needed to reflect the significant changes to ASMFC's FMP since 1998. Several amendments and addenda have been adopted to make adjustments to management measures ([www.asmfc.org/strippedBass.htm](http://www.asmfc.org/strippedBass.htm)). Amendment 5 to the ASMFC FMP required an annual juvenile abundance index (JAI) survey in Maryland and Virginia to monitor for recruitment failure. Maryland's JAI began in 1954 and Virginia's in 1955. Addendum II to Amendment 6 revised the recruitment failure threshold from an annually variable value (1957 – present) to a set value (1957 – 2009) of 1.60. A third addendum to Amendment 6 that addresses illegal harvest was released in June 2012 for public comment.

A NOAA Chesapeake Bay Fisheries Ecosystem Advisory Panel agreed to develop a Fisheries Ecosystem Plan (FEP) for CB in 2006. Chesapeake Bay Program contracted Maryland Sea Grant to facilitate the FEP development process for five keystone Chesapeake Bay species, which includes striped bass. State, federal, and academic representatives met in 2008 to draft a striped bass biological background that included current and future ecosystem stressors: habitat (warming, flow, eutrophication/ hypoxia, pollution/contamination, and watershed development), food web (forage and predation), stock assessment (recruitment variability, exploitation, disease, and connectivity), and socioeconomic (livelihoods, recreation, and consumption). The briefs were completed in 2009 and forwarded to a Quantitative Ecosystem Team (QET) tasked with development of measurable targets and reference points. The QET identified some short-term issues but no targets or reference points were developed. For more information on the EBFM process, go to ([www.mdsg.umd.edu/programs/policy/ebfm/](http://www.mdsg.umd.edu/programs/policy/ebfm/)).

#### Stock Status

The striped bass stock is not overfished and is not undergoing overfishing. Striped bass are managed with biological reference points (BRPs) for fishing mortality (F) and female spawning stock biomass (SSB). Current BRPs are defined in ASMFC's 2009 Stock Assessment Report for Atlantic Striped Bass: Target F for striped bass in coastal waters is 0.30 and the  $F_{\text{threshold}}$  is 0.34. Chesapeake Bay has a slightly lower  $F_{\text{target}}$  (0.27) because of the smaller minimum size (18" used to manage the fishery. Coastwide, current levels of F remain low at 0.23.<sup>1</sup> In Chesapeake Bay, F for legal sized striped bass (>18") was 0.16.<sup>1</sup> Target spawning stock biomass is 102 million pounds and  $SSB_{\text{threshold}}=81.3$  million pounds. Coastwide SSB was 111 million pounds, a 26% decline from the 2003 high of 140 million pounds.<sup>1</sup> Spawning stock biomass is forecast to decline during the years 2012 - 2017.<sup>1</sup> The next benchmark stock assessment is currently under development. A draft for public comment is scheduled for 2013.

The striped bass JAI is a predictor of year class strength. Annual recruitment success is monitored with the JAI. Three consecutive years of the JAI below its 25<sup>th</sup> percentile (JAI = 1.6) is defined as recruitment failure. JAI values are calculated as the geometric mean of age-0 fish caught per seine haul. The 2011 JAI was 9.57 (Figure 1), the fourth highest since the juvenile survey began. The 2011 JAI is significant because the index had been below  $JAI_{\text{target}}$  (4.32) four of the previous five years (Figure 1).

#### Current Management Measures

Maryland's 2011 striped bass quota was 4.7 million lbs. and was distributed among three fishing sectors: commercial (42.5%), recreational (42.5%), and charter (15%).<sup>2</sup> The Maryland Chesapeake Bay commercial quota was 1.96 million lbs for 2011, a reduction of 7% from 2010.<sup>3</sup> The 2011 commercial quota was allocated among three sectors: drift gill net 884 thousand lbs, hook and line 589 thousand lbs, and pound net/haul seine 491 thousand lbs. The 2011 coastal commercial quota was 126 thousand lbs.<sup>3</sup> The 2011 quota for recreational and charter Chesapeake Bay fisheries was reduced by 7% to 2.66 million lbs.<sup>3</sup> The recreational Atlantic Coast harvest is managed with a coastwide F. Striped bass regulations may be adjusted annually based on ASMFC requirements and stakeholder concerns.

Commercial fisheries are managed using quotas and time restrictions for all four fishing sectors: pound net, haul seine, hook and line, and drift gill net. Maryland's 2011 Chesapeake Bay commercial fisheries operated with an 18"-36" total length slot limit. Chesapeake Bay seasons varied among the fisheries. The pound net fishery was open Monday – Saturday from June 1 – November 30. The haul seine fishery was open on Monday – Friday from June 7 – November 30. The hook and line fishery was open on Monday – Thursday from June 7 – November 30. The drift gill net fishery was open on Monday – Friday from January 1 – February 28 and December 1 – 31. The Atlantic Ocean drift gill net and otter trawl fisheries had a 24" total length minimum size limit. Atlantic coast fisheries were open on Monday – Friday from January 1 – April 30 and November 1 – December 31.

Striped bass commercial harvest is monitored by having all fish individually tagged and landed at a certified check station prior to sale.<sup>3</sup> Each fish is counted and weighed. Check stations verify each fisherman's daily harvest record on the fisherman's harvest permit. Fishermen submit monthly harvest reports to MD DNR and check stations call in daily and submit a weekly report to MD DNR. Check stations are randomly sampled by MD DNR to validate reporting.<sup>3</sup>

The recreational fishery is managed with minimum size limits, creel limits, tackle and bait restrictions, seasonal closures, and area closures.<sup>3</sup> Regulations to control catch and release effort during the pre-spawn season period (March 1 - the third Friday in April) were implemented in 2010. Anglers are prohibited from the use of stinger hooks, required to use barbless hooks when trolling, required to use circle hooks or J hooks with a gap < 1/2" when using bait, and allowed up to six lines per boat when trolling.

The upper Chesapeake Bay (Susquehanna Flats) catch and release season was from March 1 – May 3 and the catch and keep season was from May 16 – 31. During catch and keep, anglers were restricted to one fish per person per day that was 18" – 26". The spring trophy season is restricted to the Chesapeake Bay mainstem south of Brewerton Channel (Baltimore), Pocomoke Sound, and Tangier Sound. The season ran from April 16 – May 15. Anglers were restricted to one fish per person per day that was ≥28". The summer – fall recreational/charter boat season had a two fish per person per day of 18" – 28"; or one fish per person per day that was 18" - 28" and one fish per person per day that was >28". This fishery was split into two seasons. The first was May 16 – 31 and was limited to the Chesapeake Bay mainstem south of Hart-Miller Island (Baltimore); the lower five miles of the Chester, Choptank, and Patuxent rivers; Pocomoke Sound, and Tangier Sound. The second season was open from June 1 – December 15 in all tidal waters. The Atlantic Coast recreational fishery is year round allowing two fish per person per day and a 28" total length minimum size.

**The Fisheries**

The Maryland commercial fishery landed an estimated 1.98 million lbs in 2011 (Figure 2).<sup>3</sup> Chesapeake Bay harvest was estimated at 1.96 million lbs; gill net was 866 thousand lbs, hook and line was 441 thousand lbs, and pound net/haul seine was 648 thousand lbs. Atlantic coast landings were 21.4 thousand lbs..

Recreational anglers in Maryland harvested an estimated 2.64 million lbs<sup>3,4</sup> from Chesapeake Bay and 2,590 lbs from the Atlantic Coast (Figure 3).<sup>3</sup> An estimated 1.12 million fish were released with an estimated 8% mortality (89.9 thousand fish). Recreational catch estimates have been revised as a part of the Marine Recreational Information Program (MRIP). Catch estimates have been recalculated for 2004-2011 to provide more accurate estimates and replace those previously made by the Marine Recreational Fisheries Statistics Survey (MRFSS) (For more details go to the FMP Introduction).

Figure 2

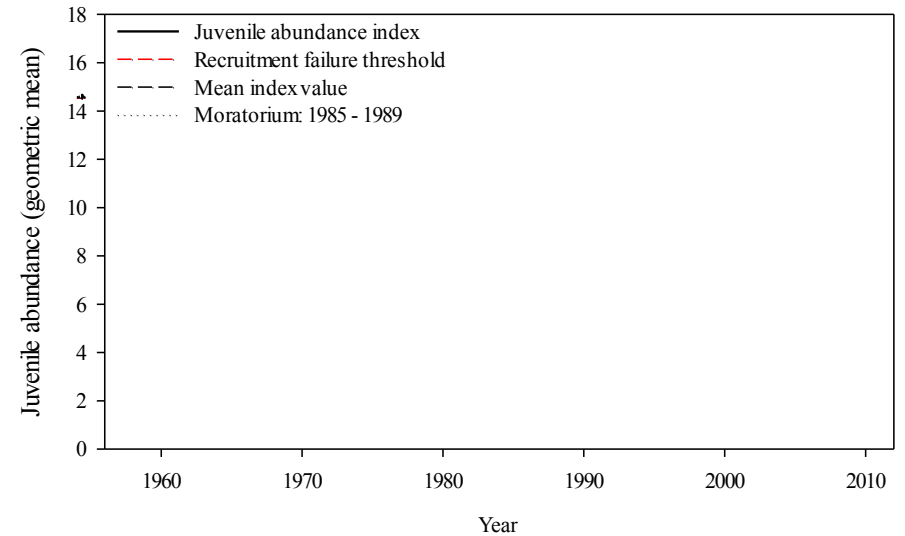


Figure 2. Maryland commercial striped bass landings and quotas: 1950 - 2012.<sup>3,5,6</sup> Five percent of the 2012 quota is being withheld to account for management uncertainties (1.98 million lbs. in 2011 vs. 2.05 million lbs. in 2012).<sup>3</sup>

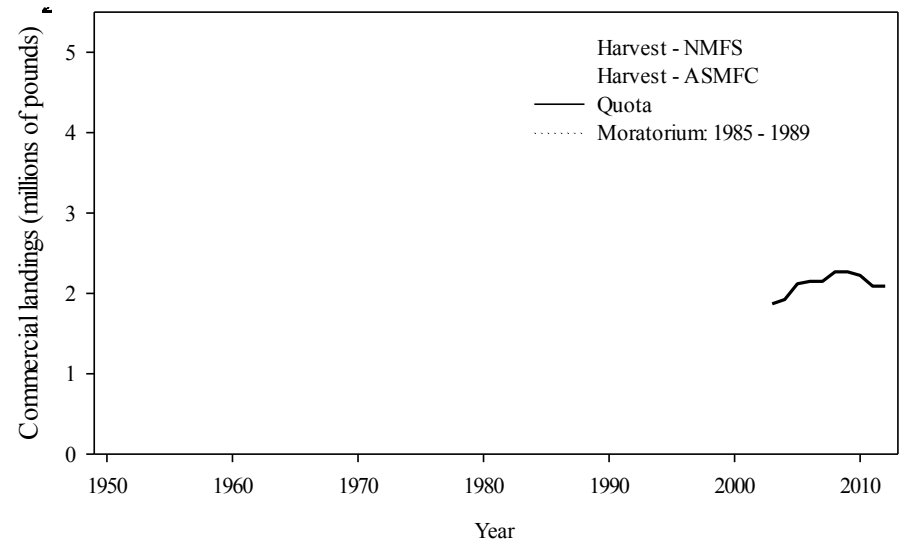
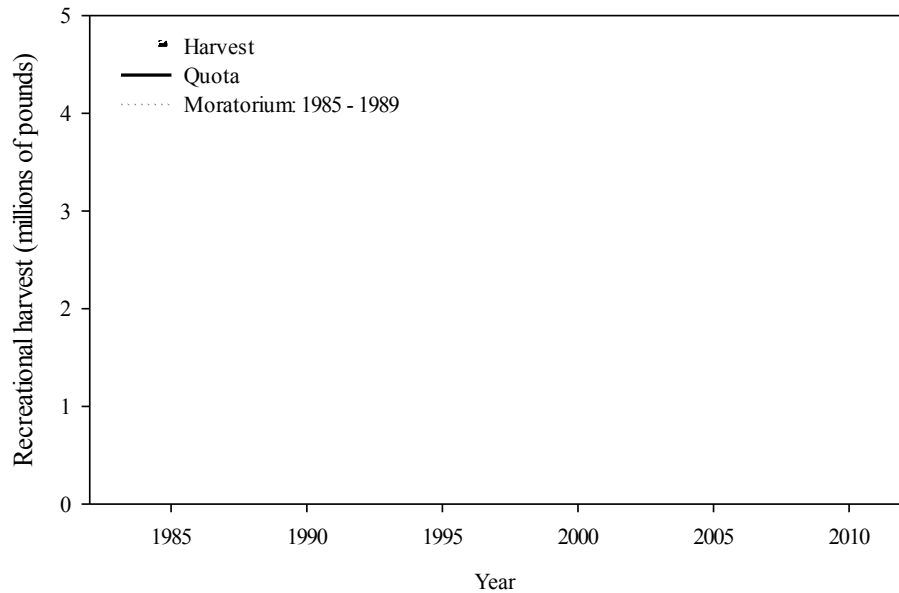


Figure 3. Maryland recreational (including charters) striped bass landings and quotas: 1981 - 2012.<sup>3,4</sup> Landings for 2012 are an estimate as of July 2012.<sup>4</sup> Maryland's 1985 -



### Issues/Concerns

Recent analyses of tagging data indicate that natural mortality (M) has been increasing in Chesapeake Bay since 1997 and coastwide since 2003.<sup>1</sup> A constant M was used during the catch-at-age based stock assessment process. Recent tagging-based estimates showing low F in Chesapeake Bay are not consistent with harvest data. These results also call into question the tagging analysis assumption that all 18” -28” males are resident to Chesapeake Bay, as well as patterns of emigration. Further study of mycobacteriosis infections in striped bass and its relation to M is needed.

Maryland commercial watermen and the MD DNR continue to explore implementation of a catch-share management system. The commercial fishing industry has requested using February 29, 2012 as the cut-off date for calculation of a waterman’s historical landings.

Commercial harvest reporting has been streamlined and reporting and compliance rates have improved. New penalty legislation and regulations were adopted in 2011. DNR continues to review enforcement options and available resources.

Recreational anglers and catch and release practices have increased. Roughly 8-9% of fish released do not survive. Education and outreach programs to teach best-fishing practices continue.

### References

- <sup>1</sup> Striped Bass Stock Assessment Subcommittee and Striped Bass Tagging Subcommittee. 2011. Atlantic States Marine Fisheries Commission striped bass stock assessment update 2011. Atlantic States Marine Fisheries Commission. Alexandria, VA.
- <sup>2</sup> Chesapeake Executive Council. 1989. Chesapeake Bay striped bass management plan. Chesapeake Bay Program, Annapolis, MD.
- <sup>3</sup> MDNR. 2011. Maryland Striped Bass (*Morone saxatilis*) Compliance Report to the Atlantic States Marine Fisheries Commission 2010. MDNR, Annapolis, MD
- <sup>4</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 10, 2011. Recreational
- <sup>5</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 10, 2011. Commercial
- <sup>6</sup> ASMFC. 2011. 2011 review of the Atlantic States Marine Fisheries Commission fishery management plan for Atlantic striped bass (*Morone saxatilis*) 2010 fishing year. Atlantic States Marine Fisheries Commission, Washington, DC.

**1989 Chesapeake Bay Striped Bass Management Plan Implementation Table (updated 7/2012)**

**Amendment 1 to the 1989 FMP adopts current and future ASMFC management scenarios for Chesapeake Bay.**

| Strategy  | Action   | Date  | Comments   |
|---|--|---|--|
| <p>1 - Overharvesting, Reduced Spawning Stock and Poor Recruitment: Controlling fishing mortality will be the primary method of maintaining adequate striped bass stocks. Optimum yield per fish will be more closely approached by establishing minimum sizes greater than historic limits. Long term fishery maintenance must be based on a management objective commensurate with reproductive success. The number of eggs per striped bass is directly related to fish size and age. Females will be protected so that more can reach their spawning potential. As reproductive potential is protected and spawning stock increases, more young striped bass should enter the fishery.</p> <p>Two types of fisheries have been defined by the ASMFC: 1) A conservative transitional fishery, which would go into effect after the Maryland striped bass juvenile index has reached a 3-year-average of 8.0; and (2) A more robust recovered fishery, to be considered when a certain percentage of the female spawning stock is composed of striped bass females equal to or greater than age VIII. The percentage will be determined by the ASMFC.</p> |  | <p>Completed 1995</p> <p>1995 On-going</p> <p>2003</p> <p>2009</p>  | <p>Targeted 1990 for a transition fishery.</p> <p>The coastal stock was declared restored.</p> <p>Juvenile abundance data is used by ASMFC to estimate coastal SSB and VPA of coastal stock.</p> <p>Amendment VI changed the JAI recruitment failure definition from 90% to 75% of the index for three consecutive years.</p> <p>Strong recruitment of 1993, 1996, 2001, and 2003 year classes.</p> <p>Overharvesting is not an issue at this time/</p>  |
| <p>1.1 Fishing mortality will be controlled by several means to protect striped bass stocks. Harvest restrictions will be set to provide a fishing mortality rate of 0.25 (equivalent to about 18% of the legal sized fish being harvested) during a <u>transition</u> fishery and a rate of 0.5 (equivalent to about 32% of the legal sized fish being harvested) during a <u>recovered</u> fishery, in accordance with ASMFC guidelines (these percentages may change slightly as additional calculations are made by the ASMFC). Adult stock levels, stock composition, and the Maryland striped bass young-of-the-year index (or other juvenile indices as approved by ASMFC) will be used in determining needed restrictions.</p>  | <p>1.1.1 The District of Columbia, Maryland, Virginia, and the Potomac River Fisheries Commission will utilize a combination of harvest restrictions to meet target fishing mortality rates. Controls may include seasonal quotas, daily bag limits, minimum size limits, seasons, time restrictions, gear restrictions, license requirements, and other actions. Maryland's annual quota will be presented as total sport and commercial landings.</p> <p>1.1.2 Maryland, the Potomac River Fisheries Commission and Virginia will cap commercial harvest during the transitional fishery with a quota not to exceed 20% of the average annual commercial harvest as reported for the period 1972-1979. No commercial fishing is permitted in the District of Columbia.</p> | <p>2000 Continue</p> <p>February 2003 Continue</p> <p>Since the fishery reopened 2009</p> <p>1990, 1995 Completed</p> <p>On-going</p> | <p>All CB jurisdictions have implemented regulations to prevent exceeding <math>F_{target}</math>.</p> <p>CBP jurisdictions have option to implement stricter regulations than required under ASMFC Amendment VI.</p> <p>CB F has remained below the coastal <math>F_{target}</math> of 0.30 and CB <math>F_{target}</math> of 0.27 since 1997. The overfishing definition is <math>F_{msy}=0.34</math>. If coastwide estimated mortality rates exceed the target rate for 2 consecutive years, the ASMFC will develop management measures. Bay jurisdictions are in compliance with ASMFC guidelines.</p> <p>Implemented. The stock was deemed restored in 1995.</p> <p>Commercial fishing is prohibited in the District of Columbia.</p> |



**1989 Chesapeake Bay Striped Bass Management Plan Implementation Table (updated 7/2012)**

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| <b>Strategy</b>   | <b>Action</b>  | <b>Date</b>  | <b>Comments</b>   |
|---|--|--|---|
| 1.2 Size limits and fishing mortality rates will be set to allow sufficient recruitment to the spawning stock.  | 1.2.1 The District of Columbia, Maryland, Virginia and the Potomac River Fisheries Commission will establish a minimum size limit of 18 inches total length in the Chesapeake Bay and tributaries during the transition fishery. Maryland may establish a larger minimum legal size during a May trophy fishery beginning in 1991. | On-going   | ASMFC requires that the recreational minimum size limit for striped bass in Chesapeake Bay is 18” except for the spring trophy season. The minimum legal size of striped bass during the spring trophy season is 28”.                                     |
|   | 1.2.2 Maryland, Virginia and the Potomac River Fisheries Commission will prohibit the keeping and sale of sublegal (fish smaller than the minimum size) striped bass by-catch.   | On-going   | ASMFC prohibits the sale of sub-legal striped bass. All striped bass are individually weighed, measured, and tagged at certified check in stations.   |
|   | 1.2.3 As a conservation measure, the District of Columbia, Maryland, Virginia and the Potomac River Fisheries Commission will establish a consistent maximum legal size for striped bass in the Chesapeake Bay and its tributaries.  | On-going   | Striped bass in Chesapeake Bay and its tributaries are managed with a combination of the 18” – 28” slot limit and a 28” minimum size limit: 2 fish 18” - 28”, or 1 fish 18” - 28” and 1 fish ≥28”. MD’s spring trophy season is managed with 1 fish ≥28”. |
| 1.3 Fishing mortality rates will be set to ensure a viable female spawning stock of age VIII and older females, and stocks will continue to be enhanced with hatchery production. | 1.3.1 During a transition fishery, mortality will be controlled to protect age VIII or older females until they comprise at least a certain percentage (as determined by the ASMFC) of the female spawning population.   | <b>2011</b>  | <b>There has been an expansion in age structure of female fish ages 9+. A 17 year old fish was caught in 2008.</b>  |
|   | 1.3.2 A fishery on a recovered stock will be controlled so that females age VIII or older continue to comprise at least a certain percentage (as determined by the ASMFC) of the female spawning stock.  | Discontinued   | MD and VA provide data to ASMFC to estimate SSB using a VPA.  |
|   |  | 2008 Ongoing   | SSB is estimated using a statistical catch at age (SCA) model. The VPA model is no longer used. As of 2008, SSB <sub>threshold</sub> = 102 million lbs and SSB <sub>target</sub> = 81.3 million lbs.  |
|   | 1.3.3 Maryland and Virginia will continue hatchery production to enhance striped bass spawning stocks in areas that are still depleted. The District of Columbia will work with the Maryland and Virginia hatchery programs to enhance striped bass spawning stocks.   | 1993 VA<br>1995 MD   | MD and VA discontinued stocking striped bass.   |
| 1.3.4 Hybrid striped bass stocking and the introduction of non-native stocks will be restricted in the Chesapeake Bay and its   | Magothy - 1982<br>Patuxent - 1984<br>Pennsylvania -  | MD, PA, and USFWS discontinued stocking hybrid striped bass. |   |



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|  | tributaries in accordance with ASMFC guidelines. The Maryland Department of Natural Resources, the Pennsylvania Fish and Boat Commission and the U.S. Fish & Wildlife Service will discuss stocking issues regarding the Susquehanna River.   | 1990     |   |
| <p>2 - Regulatory and Enforcement Issues: In order to control fishing effort and fishing mortality rates, harvest and sale regulations will be developed and implemented. Guidelines will be set for monitoring the resource and harvest restrictions. The individual jurisdictions will comply with ASMFC goals and criteria for the striped bass fishery and, where possible, have compatible fishing regulations. Areas of harvest pressure and times when harvesting pressure will be heaviest will be defined in order to facilitate adequate enforcement.</p> <p>2.1 The striped bass harvest will be equitably allocated among user groups on a yearly basis.</p> | <p>2.1.1 The Maryland quota will be allocated as follows – 42.5% commercial; 42.5% recreational; 15% charter. Virginia and the Potomac River Fisheries Commission will use various restrictions in fishing seasons and bag limits to equitably allocate and restrict harvest among the commercial, recreational and charter boat fisheries.</p>   | On-going | Quota allocation is periodically reviewed. MD has legislation requiring the quota allocation: 42.5% commercial, 42.5% recreational, 15% charter.              |
|  | <p>2.1.2 Maryland will terminate the fishing season for each of its three component fisheries when their individual quota is reached, regardless of time during the season. Virginia will terminate its commercial fishing component when its harvest quota is reached, regardless of time during the season. The Potomac River Fisheries Commission will terminate its fishing seasons when the allowable harvest under ASMFC’s Striped Bass Plan is reached, regardless of the time during that season.</p> | On-going | MD Department of Natural Resources, VA Marine Resources Commission, and PRFC have authority to close their fisheries when quotas are projected to be reached. |
| <p>2.2 Maryland, Potomac River Fisheries Commission and Virginia will establish commercial gear restrictions to limit fishing effort and sublegal by-catch, and to facilitate enforcement.</p>   | <p>2.2.1 Maryland, the Potomac River Fisheries Commission and Virginia will establish a minimum gill net mesh size designed to reduce sublegal by-catch mortality to negligible levels.</p>   | On-going | CB jurisdictions are in compliance.   |
|  | <p>2.2.2 Maryland and Virginia will require that gill nets be marked, tended, and recovered (except for Virginia’s stake nets) daily. The Potomac River Fisheries Commission will continue a fixed location for each gill net licensed in the Potomac.</p>  | On-going | CB jurisdictions are in compliance.   |
|  | <p>2.2.4 Maryland and Virginia will establish annual quotas for their commercial fisheries.</p>   | On-going | Quotas are established by ASMFC. CB jurisdictions are in compliance.  |
| <p>2.3 Selling and buying procedures and timely reporting requirements will be established to monitor and regulate harvest.</p>  | <p>2.3.1 A) Maryland will establish check-in stations for the commercial sale of striped bass.</p>  | On-going | CB jurisdictions are in compliance.   |
|  | <p>2.3.1 B) Virginia dealers and commercial watermen that harvest striped bass will be</p>  | On-going | CB jurisdictions are in compliance.   |

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|  | required to have a special permit to sell striped bass.   |                                    |   |
|  | 2.3.1 C) The sale of striped bass caught by recreational or charter boat fishermen will be prohibited.  | On-going                           | CB jurisdictions are in compliance.   |
|  | 2.3.2 Maryland and Virginia will establish a weekly reporting system for licensed commercial fishermen and a daily reporting system for buyers during the commercial season. Maryland and Virginia will provide the Potomac River Fisheries Commission with information obtained through their mandatory buyer reporting provisions. The Potomac River Fisheries Commission will reduce the time period required for the finfish reporting system from monthly to weekly. | 2010                               | Commercial Harvest Reports must be submitted to MDNR Fisheries Service within 10 days after the end of the month being reported. After 10 days the report is late. Watermen having late reports will be identified on the MDNR commercial webpage and in the Maryland Watermen's Gazette. Official violations are recorded of a license if a harvest report is not received within 50 days after the due date. Two of more reporting violations may result in license suspension. |
|  |   | 2011                               | <b>MD Senate Bill 655 and House Bill 1225 increased the penalty for commercial fishing with a suspended license, a revoked license, or without a license. The fine is up to \$25,000 and imprisonment for up to one year.</b>   |
|  |   | 2011                               | <b>MD House Bill 1252, established a misdemeanor charge and up to two years imprisonment for the unlawful capture of &gt;\$20,000 worth of striped bass (based on sale proceeds).</b>   |
| 2.4.1 Fishing seasons will be established for the recreational, charter boat and commercial fisheries. The length of the season may be adjusted as needed, including when quotas are reached (see Action 2.1.2), by opening and closing areas to fishing, or with other actions as appropriate. Seasons will be consistent among jurisdictions to the extent possible. | 2.4.1 A) The District of Columbia will establish a recreational fishing season within the period June through December.   | Completed                          | The season opens in May and concludes at the end of December.   |
|  | 2.4.1 B) Maryland will establish fishing seasons within the following periods: <ul style="list-style-type: none"> <li>o The commercial gill net season will be within the period November through March 15.</li> <li>o The commercial pound net/haul seine/fyke net/hook and line seasons will be within the period June through November.</li> <li>o The recreational and charter boat seasons will be within the period June through</li> </ul>                         | On-going                           | Fishing season dates are annually reviewed by ASMFC.  |
|  |   | Dates modified & subject to change | Pound net: Monday – Saturday from June 1 – November 30. Haul seine: Monday – Friday from June 7 – November 30. Hook and line: Monday – Thursday from June 7 – November 30. Drift gill net: Monday – Friday from January 1 – February 28 and December 1 – 31. Atlantic coast: Monday – Friday from January 1 – April 30 and  |

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|  | <p>November.</p> <ul style="list-style-type: none"> <li>○ There may be a May trophy fishery for recreational and charter boat fishing, effective May 1991, limited to a single trophy fish per boat per day.</li> </ul>  | <p>Dates modified &amp; subject to change</p>   | <p>November 1 – December 31.</p> <p>Upper Chesapeake Bay (Susquehanna Flats) catch and release: March 1 – May 3, and the catch and keep: May 16 – 31. Spring trophy: 3<sup>rd</sup> Saturday in April – May 15. Summer – fall recreational/charter boat: May 16 – 31 and June 1 – December 15.</p>   |
|  | <p>2.4.1 C) Virginia will establish fishing seasons within the following periods:</p> <ul style="list-style-type: none"> <li>○ The commercial netting season will be within the period September through February.</li> <li>○ The recreational and charter boat seasons will be within the period June through December.</li> </ul>  | <p>Dates modified &amp; subject to change</p> <p>Dates modified &amp; subject to change</p> | <p>Commercial season is February 1 – December 31 (&gt; 18”) and March 26 – June 15 (&lt; 28”).</p> <p>Recreational Chesapeake Bay spring trophy fishery: May 1 - June 15. Spring/summer fishery: May 16 - June 15. Fall fishery: October 4 - December 31</p>   |
|  | <p>2.4.1 D) The Potomac River Fisheries Commission will establish fishing seasons within the following periods:</p> <ul style="list-style-type: none"> <li>○ The commercial gill net season will be within the period November through March.</li> <li>○ The commercial pound net/haul seine/hook and line seasons will be within the period June through December.</li> <li>○ The recreational and charter season will be within the period June through December.</li> </ul> | <p>Dates modified &amp; subject to change</p>   | <p>Pound net, Haul Seine, and miscellaneous gear: February 15 – March 25 (18” – 36”) and June 1 – December 15 (&gt; 18”). Hook and line: February 15 – March 25 (18” – 36”) and June 1 – December 31 (&gt; 18”). Gill net: November 14 – February 14 (18”) and February 15 – March 25 (18” – 36”).</p> <p>Recreational seasons differ by size, possession, and bait limits. Spring season: April 21 – May 15. Fall season: May 16 – December 31.</p> |
|  | <p>2.4.1 E) Maryland, the Potomac River Fisheries Commission and Virginia will annually review the need for a Bay spawning season fishery in relationship to the issue of parity with the coastal states.</p>  | <p>Continue</p>   | <p>Addressed by ASMFC.</p>   |
| <p>2.4.2 Establish time periods when fishing is allowed to aid law enforcement and monitoring.</p>                               | <p>2.4.2 Maryland will prohibit commercial fishing on weekends and at night during the transitional fishery.</p>   | <p>Completed</p>  | <p>Weekend and evening fishing have been prohibited.</p>   |
| <p>2.4.3 Maryland, the Potomac River Fisheries Commission and Virginia will maintain appropriate striped bass fishing areas.</p> | <p>2.4.3 Maryland will continue to restrict fishing for striped bass in spawning areas and rivers, and spawning reaches as defined in COMAR 08.02.05.02. Virginia will continue to restrict fishing within the spawning reaches defined in VMRC Regulation 450-01-0034. The Potomac River Fisheries Commission</p>   | <p>On-going</p>   | <p>Jurisdictions follow ASMFC harvest restrictions.</p>  |

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| <b>Strategy</b>   | <b>Action</b>   | <b>Date</b>             | <b>Comments</b>   |
|   | will continue its prohibition on gill netting or striped bass fishing during April and May throughout the entire Potomac River during the transitional fishery.   |                         |   |
| 2.4.4 The District of Columbia, Maryland, the Potomac River Fisheries Commission and Virginia will establish recreational and charter boat creel limits consistent with ASMFC guidelines and dependent on length of season. | 2.4.4.1 The District of Columbia, Maryland, the Potomac River Fisheries Commission and Virginia will establish creel limits for the recreational and charter boat fisheries of up to five (5) fish per person per day within the established season.  | On-going                | Jurisdictions follow ASMFC harvest restrictions.  |
|   | 2.4.4.2 Maryland may allow one trophy fish per boat during a May trophy season.   | On-going                | Anglers are allowed 1 fish/person/day >28".   |
| 2.5 Maryland, Virginia and the Potomac River Fisheries Commission will establish monitoring programs to provide timely knowledge of harvest and effort data.  | 2.5.1 Maryland, the Potomac River Fisheries Commission and Virginia will monitor harvest for the striped bass fishery by one or a combination of the following: <ul style="list-style-type: none"> <li>o Utilize daily trip tickets for commercial and charter fishermen.</li> <li>o Conduct port sampling of commercial vessels.</li> <li>o Conduct onboard sampling of commercial catches.</li> <li>o Utilize check-in station sampling to characterize exploited stocks.</li> <li>o Require dealer logs</li> <li>o Maintain Natural Resource Police activity reports.</li> <li>o Utilize aerial overflights to estimate recreational effort.</li> <li>o Conduct port and onboard sampling of recreational vessels.</li> <li>o Conduct telephone surveys to estimate recreational participation.</li> <li>o Utilize mail surveys to estimate recreational catch and effort.</li> <li>o Utilize an enhanced National Marine Fisheries Service survey and/or Chesapeake Bay Stock Assessment Committee recreational monitoring data.</li> </ul> | 1995 - 2003<br>On-going | Amendment V of the ASMFC FMP requires MD and VA to conduct annual juvenile abundance (JAI) surveys. CB jurisdictions are required to compile and submit commercial and recreational fisheries data.   |
|   |   | On-going                | Monitoring programs include the juvenile striped bass seine survey (JAI); spring spawning stock survey; spring tagging; commercial pound net, haul seine, hook and line, and drift gill net; and recreational Susquehanna Flats catch and release, spring trophy, spring-early summer and summer-fall recreational/charter boat seasons. Monitoring requirements may be changed as necessary. |
|   |   | 2007                    | Data collected from Federal waters is coordinated with NOAA Fisheries. Addendum I to Amendment 6 of the ASMFC FMP requires commercial and recreational catch, bycatch, discard, and mortality data. Discard mortality data gaps will be identified. Coastal stock data was used in a VPA model, but is now used in an SCA model.  |
|   |   | 2008                    | Addendum 1 to Amendment 6 of ASMFC FMP requires states to address bycatch and angler education. States are required to collect commercial and recreational catch and bycatch data that is consistent with   |

| 1989 Chesapeake Bay Striped Bass Management Plan Implementation Table (updated 7/2012)  |   |                  |   |
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|   |   | 2011             | ACCSP standards, coordinate data collection from Federal waters with NOAA Fisheries, and review discard mortality studies for information gaps. States are to implement angler education about best practices for catch and release fishing.<br><br><b>MD Senate Bill 414 and House Bill 396 authorize NRP officers to inspect licensed commercial vessels, vehicles, and premises where MD fishery resources may be stored. NRP officers are authorized to issue electronic citations. The law allows MDNR to suspend or revoke a license after providing the opportunity for a hearing.</b> |
|   | 2.5.2 The District of Columbia will conduct an angler survey to determine striped bass fishing effort and harvest.  | On-going         | District Department of the Environment conducts monthly angler surveys.   |
| 2.6.1 The District of Columbia, Maryland and Virginia will establish regulatory procedures that allow for: 1) recognition of and incorporation of ASMFC requirements into state management, and 2) a periodic cycle of public review of management options. The Potomac River Fisheries Commission will promulgate regulations necessary to comply with the ASMFC and Chesapeake Bay Striped Bass Management Plans. | 2.6.1 Maryland will propose legislation to authorize timely management actions and will develop guidelines for regulations. Virginia will promulgate regulations for timely management and seek legislation to correct any deficiencies if noted.               | 1990<br>On-going | Jurisdictions are in compliance with ASMFC and are coordinating through the Chesapeake Bay Program.   |
|   | 2.6.2 The District of Columbia, Maryland, the Potomac River Fisheries Commission and Virginia will adopt consistent enforcement policies for the striped bass fishery throughout the Chesapeake Bay. Strategies to address enforcement needs will be developed. | On-going         | ASMFC's Law Enforcement Committee develops minimum enforcement policies.  |
|   |   | 2011             | Additional enforcement resources have been made available. Resources include additional officers, equipment, access to state of the art surveillance tools, legislation and regulation, increased penalty system, and a streamlined judicial framework.   |
|   |   | 2011             | MD Senate Bill 635 (Senator Frosh) and House Bill 1154 (Delegate Jim Gilchrist), require the revocation of an individual's commercial fishing license if found by an Administrative Law Judge to have knowingly committed an egregious or repeat violation against striped bass including: using illegal gear; harvesting during closed seasons; harvesting from a closed area;   |

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| <b>Strategy</b>  | <b>Action</b>   | <b>Date</b>  | <b>Comments</b>   |
|  |   |  | violating established harvest, catch or size limits; or violating tagging and reporting requirements.   |
| 3 - Stock Assessment and Research Needs: The Chesapeake Bay Stock Assessment Committee (CBSAC) will continue to improve the coordination of stock assessment pursuant to the Chesapeake Bay Stock Assessment Plan. Stock identification studies should be expanded, especially for the Chesapeake & Delaware Canal and along the coast, to provide information on stock mixing. The contribution of hybrids and hatchery produced fish to the wild population needs to be determined. A review of hooking mortality and other by-catch mortality rates would allow greater precision in establishing fishing mortality controls. Studies on larval survival and growth in relation to environmental variables would provide a better understanding of the factors affecting year class strength. |   | On-going<br><br>Completed<br><br>2008 - 2011             | MD and VA have instituted tagging programs to estimate migration and mortality rates.<br><br>Gillnet survey is used to collect population data.<br><br>Studies demonstrating the effectiveness of circle hooks for reduced gut hooking and release mortality have been completed.<br><br>SARC determined stock is not overfished is not undergoing overfishing.   |
| 3.1 The jurisdictions will continue to obtain stock information on striped bass in Chesapeake Bay.   | 3.1 The District of Columbia will continue monitoring aspects of striped bass population dynamics. Maryland will continue surveys of the spawning and premigratory striped bass stock in the Chesapeake Bay. Virginia will initiate surveys on its spawning stock of striped bass. Collection of tissue and scale samples to augment tagging information and stock identification will be considered. | On-going<br><br>On-going                                 | MD has a gill net survey to monitor the spring spawning stock.<br><br>MD and VA tag fish for the USFWS Cooperative Coastal Striped Bass Tagging Program to monitor migratory and resident striped bass population dynamics. ASMFC does not require DC to tag fish.  |
| 3.2 Efforts will be made to improve our understanding of factors that affect reproduction and recruitment to the fishery.  | 3.2 The District of Columbia, Maryland and Virginia, in cooperation with federal agencies, will review and update existing data, and initiate new studies that target: striped bass reproduction and early life history, especially in relation to environmental parameters; natural mortality; and catch-release mortality induced by various fishing methods.                                       | 2007<br>Continue<br><br>2009<br>Continue<br><br>On-going | Addendum I to Amendment 6 of the ASMFC FMP requires states to implement angler education about catch and release best practices.<br><br>Tagging data indicates striped bass M <u>may</u> be increasing unless CB emigration has increased. Increased M may reflect an increased incidence of mycobacteriosis, decreased prey availability, or poor water quality.<br><br>Tagging study design and implementation requirements are coordinated with ASMFC. |
| 4 – Declining Water Quality: Adequate spawning and nursery areas with good water quality are critical for striped bass survival. Although causes for the decline in reproduction may differ between years and between  | 4.1 The first four action items are commitments under the 1987 Chesapeake Bay Agreement. The DCFM, MDNR, PRFC and VMRC are not the agencies responsible   | 1990<br>On-going   | Water quality issues are also addressed in the Chesapeake 2000 Agreement and most recently in the 2009 Executive Order.   |

**1989 Chesapeake Bay Striped Bass Management Plan Implementation Table (updated 7/2012)**

**Amendment 1 to the 1989 FMP adopts current and future ASMFC management scenarios for Chesapeake Bay.**

| Strategy   | Action  | Date  | Comments  |
|--|---|---|---|
| spawning areas, several water quality aspects are identified as reducing survival of young. State and Federal studies will continue to examine the effects of environmental contaminants on striped bass.<br>4.1 Identify those water quality factors, both natural and man-induced, which affect striped bass reproduction and survival, and focus on the control of those factors. | for carrying out the actual commitments, but are involved in setting the objectives of the programs to fulfill the commitments. The achievement of these commitments will lead to improved water quality and enhanced biological production that can only benefit striped bass populations. The DCFM, MDNR, PRFC and VRMC fully support these commitments.  |   |   |
|  | 1 - The first commitment adopted under the 1987 Chesapeake Bay Agreement was a report titled, "Habitat Requirements for Chesapeake Bay Living Resources". This document listed the habitat requirements for selected target species including striped bass. The report is being revised and updated by a workgroup of the Living Resources Subcommittee. When complete in May, 1990, the habitat requirements contained in the report will be used to aid managers in improving water quality:<br>a) Assist in the revision of water quality standards and criteria as needed,<br>b) Develop a Habitat Requirements Use Report which will detail resource needs by river segment,<br>c) Assist in the 1991 Nutrient Re-evaluation by providing living resource habitat requirement for use in the 3-D Model (The model will compare existing water quality with the habitat requirements and project whether the requirements would be met under various nutrient removal scenarios), and<br>d) Assist in the implementation of the nutrient, toxics and conventional pollutant control strategies by identifying critical habitat needs. | 1991<br><br><br>2001<br>2007<br>Completed<br><br>1990<br>On-going | Document published.<br><br>CB jurisdictions have implemented management strategies to protect striped bass habitat. MD spawning areas are protected from harvest March through May.<br><br>An ecosystem-based fishery management process has been facilitated through MD Sea Grant. Habitat issues/stressors have been defined for striped bass.<br><br>Chesapeake Bay Program develops, revises, and monitors goals and strategies for living resources (blue crab, menhaden, oyster, shad, and striped bass. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/blue_crabs">http://www.chesapeakebay.net/issues/issue/blue_crabs</a><br><a href="http://www.chesapeakebay.net/issues/issue/menhaden">http://www.chesapeakebay.net/issues/issue/menhaden</a><br><a href="http://www.chesapeakebay.net/issues/issue/oysters">http://www.chesapeakebay.net/issues/issue/oysters</a><br><a href="http://www.chesapeakebay.net/issues/issue/shad">http://www.chesapeakebay.net/issues/issue/shad</a><br><a href="http://www.chesapeakebay.net/issues/issue/striped_bass">http://www.chesapeakebay.net/issues/issue/striped_bass</a> |
|  | 4.1 2 –Development and adoption of a basinwide plan that will achieve a reduction of nutrients entering the Chesapeake Bay:<br>a) Construct public and private sewage facilities.<br>b) Reduce the discharge of untreated or inadequately treated sewage.   | 1990<br>On-going  | Currently addressed through the Chesapeake Bay Program's 2 year milestones towards reaching the 2025 water quality goals.<br><br>Chesapeake Bay Program develops, revises, and monitors goals and strategies for nutrient reduction. For more information:  |

**1989 Chesapeake Bay Striped Bass Management Plan Implementation Table (updated 7/2012)**

**Amendment 1 to the 1989 FMP adopts current and future ASMFC management scenarios for Chesapeake Bay.**

| Strategy | Action  | Date             | Comments  |
|----------|---|------------------|---|
|          | c) Establish and enforce nutrient and conventional pollutant limitations in regulated discharges.<br>d) Reduce levels of nutrients and other conventional pollutants in runoff from agricultural and forested lands.<br>e) Reduce levels of nutrients and other conventional pollutants in urban runoff.  |                  | <a href="http://www.chesapeakebay.net/issues/issue/nutrients">http://www.chesapeakebay.net/issues/issue/nutrients</a>   |
|          | 4.1 3 – Development and adoption of a basinwide plan for the reduction and control of toxic materials entering the Chesapeake Bay system from point and nonpoint sources and from bottom sediments:<br>a) Reduce discharge of metals and organic compounds from sewage treatment plants receiving industrial wastewater.<br>b) Reduce the discharge of metals and organic compounds from industrial sources.<br>c) Reduce levels of metals and organic compounds in urban and agricultural runoff. Reduce chlorine discharges to critical finfish areas.  | 1990<br>On-going | Chesapeake Bay Program develops, revises, and monitors goals and strategies for chemical contaminants. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/chemical_contaminants">http://www.chesapeakebay.net/issues/issue/chemical_contaminants</a>   |
|          | 4.1 4 – Development and adoption of a basinwide plan for the management of conventional pollutants entering the Chesapeake Bay from point and nonpoint sources:<br>a) Manage sewage sludge, dredge spoil and hazardous wastes.<br>b) Improve dissolved oxygen concentrations in the Chesapeake Bay through the reduction of nutrients from both point and nonpoint sources.<br>c) Continue study of the impacts of acidic conditions on water quality.<br>d) Manage groundwater to protect the water quality of the Chesapeake Bay.<br>e) Continue research to refine strategies to reduce point and nonpoint sources of nutrient, toxic and conventional pollutants in the Chesapeake Bay. | 1990<br>On-going | Chesapeake Bay Program develops, revises, and monitors goals and strategies for sediment, wastewater, stormwater runoff, and agriculture. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/sediment">http://www.chesapeakebay.net/issues/issue/sediment</a><br><a href="http://www.chesapeakebay.net/issues/issue/wastewater">http://www.chesapeakebay.net/issues/issue/wastewater</a><br><a href="http://www.chesapeakebay.net/issues/issue/sediment">http://www.chesapeakebay.net/issues/issue/sediment</a><br><a href="http://www.chesapeakebay.net/issues/issue/stormwater_runoff">http://www.chesapeakebay.net/issues/issue/stormwater_runoff</a> |
|          | 4.1 5 – The development and adoption of a plan for continued research and monitoring of the impacts and causes of acidic atmospheric  | 1990<br>On-going | Chesapeake Bay Program develops, revises, and monitors goals and strategies for air pollution. For more information:  |



| <b>1989 Chesapeake Bay Striped Bass Management Plan Implementation Table (updated 7/2012)</b>               |  |             |   |
|---|--|-------------|---|
| <b>Amendment 1 to the 1989 FMP adopts current and future ASMFC management scenarios for Chesapeake Bay.</b> |  |             |   |
| <b>Strategy</b>   | <b>Action</b>  | <b>Date</b> | <b>Comments</b>   |
|   | deposition into the Chesapeake Bay and its tributaries. This plan is complemented by Maryland's research and monitoring program on the sources, effects, and control of acid deposition as defined by Natural Resources Article Title 3, Subtitle 3A, (Acid Deposition: Sections 3-3A-01 through 3-3A-04):<br>a) Determine the relative contributions to acid deposition from various sources of acid deposition precursor emissions and identify any regional variability.<br>b) Assess the consequences of the environmental impacts of acid deposition on water quality.<br>c) Identify and evaluate the effectiveness and economic costs of technologies and mitigative techniques that are feasible to control acid deposition into the Chesapeake Bay. |             | <a href="http://www.chesapeakebay.net/issues/issue/air_pollution">http://www.chesapeakebay.net/issues/issue/air_pollution</a> |

#### Acronyms

VPA – Virtual Population Assessment

ACCSP – Atlantic Coastal Cooperative Statistics Program  
ASMFC – Atlantic States Marine Fisheries Commission  
CB – Chesapeake Bay  
CBP – Chesapeake Bay Program  
COMAR – Code of Maryland Regulations  
DCFM – District of Columbia Department of Consumer and Regulatory Affairs,  
Fisheries Management Section  
F – Fishing Mortality  
FMP – Fishery Management Plan  
JAI – Juvenile Abundance Index  
M – Natural Mortality  
MDNR – Maryland Department of Natural Resources  
MSY – Maximum Sustainable Yield  
NOAA – National Oceanic and Atmospheric Administration  
NRP – Maryland Natural Resources Police  
PRFC – Potomac River Fisheries Commission  
SARC – Stock Assessment Review Committee  
SCA – Statistical Catch at Age  
SSB – Spawning Stock Biomass (females)  
USFWS – U.S. Fish and Wildlife Service  
VMRC – Virginia Marine Resources Commission

## 2011 Maryland FMP Report (July 2012)

### Section 18. Summer Flounder (*Paralichthys dentatus*)

#### Chesapeake Bay FMP

The summer flounder stock was declared rebuilt in 2010, but the 2011 stock assessment cautioned that the rebuilt status may be short lived. Estimated 2011 fishing mortality (F) may exceed the  $F_{\text{target}}$  resulting in overfishing. Consequently, interim harvest limits were considered for the 2012 fishery.

In the late 1980s, the Atlantic coast summer flounder stock was overfished and depleted. Chesapeake Bay jurisdictions adopted a regional summer flounder management framework: the 1991 Chesapeake Bay Summer Flounder Fishery Management Plan (CB FMP). The CB FMP implemented management measures that reduced fishing mortality (F) and increased the stock's spawning biomass (SSB). CB FMP strategies and actions were based on guidelines established by the Atlantic States Marine Fisheries Commission (ASMFC) and the Mid-Atlantic Fisheries Management Council (MAFMC). In 1997 as the stock improved, the Chesapeake Bay jurisdictions developed Amendment # 1 to the CB FMP. This amendment adopted all future reference points and quota determined by the ASMFC and MAFMC. Jurisdictions agreed to implement commercial and recreational management measures as needed to meet these requirements. Amendment #1 also included a provision to implement a commercial permit system to maintain traditional Chesapeake Bay and coastal fisheries.

Summer flounder, scup and black sea bass are managed under a joint ASMFC and MAFMC fisheries management plan. ASMFC first developed the coastal Fishery Management Plan for Summer Flounder in 1982. The coastal plan established a 14" minimum size and specified trawl net mesh size for fishing in state waters ( $\leq 3$  miles from shore). The MAFMC developed a complementary Fishery Management Plan for the Summer Flounder Fishery in 1988 to govern the federal waters ( $> 3$  miles from shore). The MAFMC's FMP required fishers to abide by the more conservative state or federal requirements. From 1991 to 1995, MAFMC adopted seven amendments to adjust summer flounder management actions. ASMFC and MAFMC adopted amendments 8 and 9 to incorporate scup and black sea bass, respectively, into the summer flounder FMP. Between 1997 and 2007 ASMFC adopted three amendments (10, 12, and 13) and 8 addenda (III, IV, VIII, and XV to XXIV) to modify summer flounder management. In that same time period, MAFMC adopted five amendments (10 to 13 and 16) and five frameworks (1, 2, and 5 to 7) to modify summer flounder management. Maryland submits an annual compliance report to ASMFC.

#### Stock Status

Summer flounder are managed as a single stock in US Atlantic coast waters from the North Carolina/South Carolina border north to the US/Canadian border. Stock status was last reviewed in 2011 and provided an update of the data through 2010. The review committee determined that the summer flounder stock was rebuilt, is not overfished and overfishing is not occurring. However, the 2011 stock assessment<sup>1</sup> indicated that F may exceed  $F_{\text{target}}$  in 2011 resulting in an overfishing determination<sup>2</sup>. if the established catch level approaches the catch specifications. The 2011 updated stock assessment provided verification that the summer flounder stock was rebuilt in 2010, ending the rebuilding program.

Current biological reference points (BRP) for summer flounder are  $F_{\text{target}} = 0.255$ ,  $F_{\text{threshold}} = 0.310$ , target spawning stock biomass (SSB) = 132.4 million pounds, and  $SSB_{\text{threshold}} = 66.2$  million pounds. Fishing mortality has declined since the 1990s. F was estimated at 0.216 in 2011, which is below  $F_{\text{target}}$ . SSB began increasing in the 1990s. The 2011 SSB estimate was 133 million pounds, which exceeded the  $SSB_{\text{target}}$  of 132 million pounds.

#### Management Measures

National Marine Fisheries Service (NMFS), in conjunction with MAFMC, annually determine the coastwide total allowable landings (TAL). Sixty percent of the TAL is allocated to the commercial fishery and 40% to the recreational fishery. Commercial coastwide quota is allocated among states based on their historic proportion of landings. The recreational fishery has a single coastwide harvest limit. States implement conservation equivalency whereby they are allowed to develop different regulatory combinations so long as they stay within the TAL and biological reference points. Commercial and recreational quota overages are deducted from the following year's quota.

Maryland is allocated 2.04% of the coastwide commercial TAL: 260 thousand pounds for 2012. The majority of Maryland's commercial quota is allocated to the coastal fishery. Portions of the commercial quota are set aside for Chesapeake Bay harvest (primarily bycatch) and the Potomac River Fisheries Commission (PRFC). Maryland implements catch share allocation management to equitably distribute the quota among harvesters in Atlantic coastal waters and Coastal Bays and tributaries. The catch share system assigns a specific individual fishing quota (IFQ) for each fisherman which allows them to manage their business for best economic yield. Commercial hook and line harvest is managed with a 17" minimum length and all other gears have a 14" minimum length. Individuals are either issued an IFQ or are restricted to 100 lbs per day in Coastal waters and 50 lbs per day in tidal waters (Chesapeake Bay). PRFC manages the Potomac River with a 14" minimum size and a 47.8 thousand pound quota. Net design and mesh size are also regulated.

Maryland recreational harvest is allowed from April 14<sup>th</sup> to December 16<sup>th</sup>. Fish are subject to a 17" minimum length. Anglers may harvest 3 fish per person per day.

Recreational harvest from the Potomac River is managed with a 16½” minimum size limit and 4 fish per person per day.

Maryland monitors summer flounder abundance, size, and age with an annual Coastal Bays trawl survey, beach seine survey, and commercial trawl landings from near-shore Atlantic waters. The Maryland Department of Natural Resources (MDNR) initiated the Maryland Volunteer Angler Summer Flounder Survey (MVASFS) in 2005. The results from these four surveys are used to develop regulations for the following year’s summer flounder fishery.

### The Fisheries

Maryland’s 2011 commercial fishery harvested 229 thousand pounds of summer flounder remaining within the 354 thousand pound quota. As of June 1, 2012, 59 thousand pounds of the 260 thousand pound quota had been harvested (Figure 1).

Recreational catch estimates have been revised as a part of the Marine Recreational Information Program (MRIP). Catch estimates have been recalculated for 2004-2011 to provide more accurate estimates and replace those previously made by the Marine Recreational Fisheries Statistics Survey (MRFSS) (For more details go to the FMP Introduction). Recreational landings were 26 thousand fish in 2011 (Figure 2).

Figure 1. Maryland’s commercial summer flounder harvest (1940 to June of 2012)

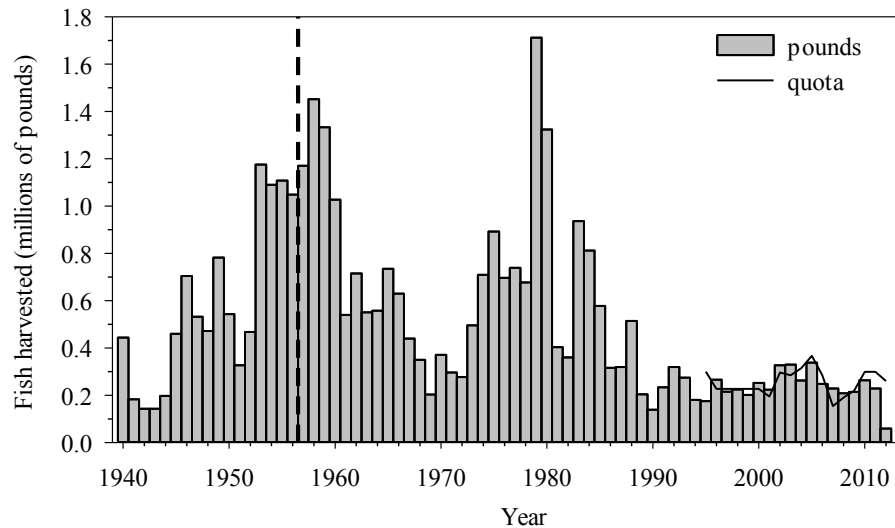
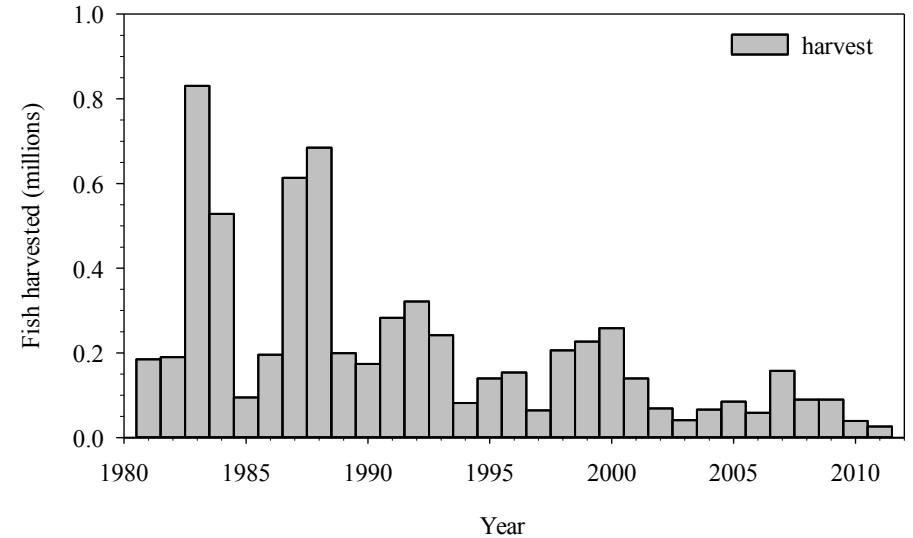


Figure 2. Recreational summer flounder harvest and target in Maryland from 1981 to



### Issues/Concerns

The summer flounder stock is considered rebuilt as of 2010. Recent stock analyses indicated that the 2011  $F$  may end up exceeding the  $F_{target}$ . As a result, the 2012 commercial quota and recreational harvest limit were reevaluated. Interim catch levels and management measures for the 2012 summer flounder fisheries were developed. They were necessary to ensure that fishing quotas for the summer flounder were in place at the start of the 2012 fishing year and to ensure overfishing would not be occurring.

Maryland DNR has submitted a regulatory package to improve regulatory consistency among the black sea bass, summer flounder and horseshoe crab commercial fisheries. Improvements will streamline the coastal commercial permit process while allowing for some flexibility.

### References

<sup>1</sup>Terceiro M. 2011. Stock Assessment of Summer Flounder for 2011. US Dept Commerce, Northeast Fish Sci Cent Ref Doc. 11-20; 141 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at <http://www.nefsc.noaa.gov/nefsc/publications/>

<sup>2</sup> Collins, K. 2011, October 31. New report forces Council to reconsider summer flounder recommendations: 2012 stock size lower than previously estimated. Mid-Atlantic Fishery Management Council. Dover, DE.  
[http://www.mafmc.org/press/2011/pr11\\_17\\_2012\\_Fluke\\_Recommendation.pdf](http://www.mafmc.org/press/2011/pr11_17_2012_Fluke_Recommendation.pdf)

<sup>3</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 23, 2012: <http://www.st.nmfs.noaa.gov/st1/commercial/>.

<sup>4</sup> ASMFC. 2006. 2006 Review of the Atlantic States Marine Fisheries Commission fishery management plan for summer flounder (*Paralichthys dentatus*). Atlantic States Marine Fisheries Commission. Washington, DC

<sup>5</sup> Doctor, S. 2009-2011. Maryland's summer flounder (*Paralichthys dentatus*) compliance report to the Atlantic States Marine Fisheries Commission.

<sup>6</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 23, 2012:  
<http://www.st.nmfs.noaa.gov/st1/recreational/index.html>.

**Amendment 1 to the 1991 Chesapeake Bay Summer Flounder Fishery Management Plan Implementation Table (updated 7/2012)**

| Strategy  | Action   | Date  | Comments  |
|---|--|---|---|
| <p>1.1) The Bay jurisdictions will continue to implement management measures which reduce fishing mortality on the summer flounder stock and equitably allocate the harvest of summer flounder.</p> | <p>1.1a) The jurisdictions will implement annual quotas, individual quotas and/or possession limits in addition to seasonal restrictions, minimum mesh size requirements, minimum size limits, limited entry and license requirements to meet the coastwide commercial quota. The traditional balance of harvest between the Chesapeake Bay and the Atlantic coast will be maintained.</p> | <p>1998, 2004<br/>Continue</p> <p>2008<br/>2009</p> <p>2011</p> | <p>ASMFC revised overfishing definition. Coastwide and state quotas are determined annually. ASFMC allowed a change in allocation. FMP actions are annually evaluated and adjusted to meet ASMFC coastal stock rebuilding targets.</p> <p>The ASMFC’s Summer Flounder, Scup, and Black Sea Bass Board set the 2009 total allowable landings for summer flounder at 18.45 million pounds, up 2.68 millions pounds from 2008. Officials determined from the 2008 June Stock Assessment Workshop (SAW) and Peer Review that summer flounder is no longer overfished, is not experiencing overfishing, but has not been rebuilt to target levels.</p> <p>MD annual commercial quota is determined by NMFS/ASMFC. Atlantic, Coastal Bays, and Chesapeake Bay: 18” minimum for hook and line, 14” minimum for other gear. Commercial IFQ permits are issued. Limit without permit in Ocean and Coastal Bays is 100 lbs/individual/day. Limit without permit in Chesapeake Bay is 50 lbs/individual/day.</p> <p>PRFC annual commercial quota is determined by NMFS/ASMFC and deducted from MD’s total annual quota: 14” minimum, January 1 to December 31.</p> <p>VA annual commercial quota is determined by NMFS/ASMFC. Of the annual quota, 300,000 lbs is set aside for tidal waters; 142,114 lbs is set aside for the Chesapeake Bay waters and the remaining quota is allocated to harvest from non-Virginia waters (typically beyond 3 miles offshore). For the non-VA waters, harvest from 1st Monday in January to the day prior to last Monday in November is allotted 70.7% of this quota. The remaining 29.3% of the quota is allotted to the last Monday of November to December 31. Allocation limits are adjusted for over and under harvest. A series of combined pound/day and pound/species (Atlantic croaker, black sea bass, scup, squid, scallop, and Atlantic mackerel) restrictions have been implemented. Minimum size is 14”.</p> |

**Amendment 1 to the 1991 Chesapeake Bay Summer Flounder Fishery Management Plan Implementation Table (updated 7/2012)**

| Strategy | Action  | Date   | Comments  |
|----------|---|--|---|
|          |   | 2012   | <b>MD's commercial hook and line minimum size was reduced to 17" (from 18"). Minimum size for other gear types is 14". PRFC's minimum size is 14" and has implemented a 47.8 thousand pound quota.</b>  |
|          | 1.1b) The jurisdictions will implement recreational seasons, creel limits and minimum size limits to meet the annual coastal recreational harvest limits recommended by the MAFMC/ASMFC.  | 2001<br><br>2003<br><br>2005<br><br>2009<br><br><br><br>2011<br>2012 | ASMFC implements coastwide system for conservation equivalency.<br><br>ASMFC sets State-specific recreational harvest targets.<br><br>ASMFC established a program to allow the recreational summer flounder coastwide allocations to be subdivided into regions.<br>MD April 15 to September 13: Atlantic & Coastal Bays have ≥18" total length and 3 fish per person per day, and Chesapeake Bay has ≥16½" total length and 1 fish per person per day. PRFC April 15 to September 13: ≥16½" total length and 1 fish per person per day. VA open all year: ≥19" total length and 5 fish per person per day.<br><br><b>MD: April 14 to December 16, 17" minimum length, and 3 fish per person per day. PRFC and VA: 16½" minimum length and 4 fish per person per day.</b> |
|          | 1.1c) Maryland and Virginia will maintain the traditional commercial fishery by requiring a special landings permit for the Atlantic commercial summer flounder fishery. The jurisdictions will develop, define and adopt criteria to determine eligibility for participation in the fishery. | 1998<br>2003<br>Continue<br><br><br><br><br>2005<br>On-going         | A summer flounder permit system has been determined and is being implemented. Maryland implements catch share allocation management to equitably distribute the quota among harvesters. The catch share system assigns a specific individual fishing quota (IFQ) for each fisherman which allows them to manage their business for best economic yield.<br><br>VA issues permits for vessels and dealers.   |

| 1991 Chesapeake Bay Summer Flounder Fishery Management Plan Implementation Table (updated 7/2011)   |  |  |   |
|---|--|--|---|
| Strategy  | Action   | Date   | Comments  |
| 1.1) Maryland, Virginia and the PRFC will propose changes in the minimum size regulations, creel limits and seasons in the recreational fishery to conform to guidelines set by MAFMC. Maryland and Virginia will comply with commercial quotas, mesh sizes and other commercial restrictions enacted by MAFMC. These recommendations are intended to provide greater spawning stock biomass from each flounder year-class and provide a greater yield-per-recruit.   | 1.1a) Maryland, the PRFC and Virginia will propose an increase in their minimum size limit for recreationally caught flounder from 13 inches to 14 inches.   | 1992   | Initiated increasing minimum size 13" to 14"<br>ASMFC revised overfishing definition. |
|   |  | 1998   | See Amendment #1, Strategy 1.1, Action 1.1b   |
|   |  | 2012   | <b>MD: 17", PRFC and VA 16½"</b>  |
|   | 1.1b) Maryland, Virginia and the PRFC will propose creel limits and seasonal restrictions in compliance with MAFMC recommendations. A six fish creel limit will be proposed as one measure to meet these recommendations. A recreational fishing season extending from May 15 – Sept. 30 may also be required to reduce fishing mortality. Virginia will continue to enforce its ten fish per day limit until such time as MAFMC recommendations can be implemented. | 1998   | See Amendment #1, Strategy 1.1, Action 1.1b   |
|   |  | 2012   | <b>MD: 3 fish per person per day. PRFC and VA: 4 fish per person per day.</b>         |
| 1.1c) Commercial size limits will remain at 13" for Virginia and Maryland in conformance with MAFMC recommendations. The PRFC will propose a 14" minimum commercial size limit for its commercial flounder fisheries to provide parity with the recreational fishery. A 5.5 inch diamond or 6 inch square minimum cod end mesh size will be implemented in all directed flounder trawl fisheries.   | 1998   | See Amendment #1, Strategy 1.1, Action 1.1a  |   |
|   | 2012   | <b>MD's commercial hook and line minimum size was reduced to 17" (from 18"). Minimum size for other gear types is 14". PRFC's minimum size is 14" and has implemented a 47.8 thousand pound quota.</b> |   |
| 1.1d) Commercial fisheries will be subject to quotas set by MAFMC and administered by the states. All flounder landed by a vessel registered in a state will be counted towards that state's quota, without regard to the actual fishing location. Commercial fisheries in each state will be closed when that state's quota is reached. The PRFC will propose a moratorium on its commercial flounder fisheries from January through June, inclusive, to compliment the seasonal closure proposed for the recreational fishery, in addition to conforming with MAFMC quota closures. | 1993   | ASMFC State allocations changed.   |   |
|   | 1995   | ASMFC capped coastwide quota & adjusted stock rebuilding schedule.   |   |
|   | 1998   | ASMFC revised overfishing definition.<br>See Amendment #1, Strategy 1.1, Action 1.1a   |   |
|   | 2012   | <b>MD receives 2.04% of the coastwide commercial TAL. A portion of MD's TAL is allocated to PRFC. PRFC implemented a 47.8 thousand pound quota. VA is allocated 21.3% of the coastwide quota.</b>      |   |
| 1.2) Management agencies will   | 1.2a) Virginia and Maryland will implement a 5.5   | On-going   | Mesh size restrictions have been implemented.   |

| 1991 Chesapeake Bay Summer Flounder Fishery Management Plan Implementation Table (updated 7/2011)  |  |                  |  |
|--|--|------------------|--|
| Strategy   | Action   | Date             | Comments   |
| continue to promote the implementation of minimum mesh size in the directed flounder trawl fisheries sufficient to allow escapement of immature female flounder. Management agencies will urge the Mid-Atlantic Fisheries Management Council to enact a mesh size compatible with these management goals in the directed flounder trawl fisheries to complement the mesh size requirements enacted through the Baywide Plan. | inch diamond or 6 inch square minimum cod end mesh size in all directed flounder trawl fisheries to allow escapement of immature female flounder. Virginia and the PRFC will continue their bans on trawling in state waters.  |                  |  |
|  | 1.2b) Virginia and Maryland will work with the Mid-Atlantic Fisheries Management Council to adopt a 5.5 inch diamond or 6 inch square minimum cod end mesh size for the EEZ flounder trawl fishery consistent with the objectives of the Baywide Plan and MAFMC's recommendations for conservation of the resource.  | On-going         | Mesh size restrictions have been implemented.  |
| 1.3) Virginia, Maryland and the Potomac River Fisheries Commission will investigate the incidental bycatch of small flounder in non-directed fisheries and participate in coastal deliberations to protect small flounder in other coastal states.   | 1.3a) Maryland will collect information from its pound net and ocean trawl fisheries to develop management strategies for reducing the non-directed bycatch of small flounder and other species. Options for consideration include minimum mesh sizes, season and area restrictions, culling practices, escape panels and fishing efficiency devices.                                | On-going         | MD collects summer flounder abundance, size, and age data from commercial trawlers fishing near-shore Atlantic waters.   |
|  | 1.3b) Virginia will continue to monitor the species composition and biological characteristics of bait harvested in its pound net fishery. The VMRC will take action, as needed, to reduce the incidental bycatch of small flounder in the bait fishery.   |                  | Monitoring of pound net bait fish harvest is not required.   |
|  | 1.3c) Maryland, PRFC, and Virginia will work through the Mid-Atlantic Fisheries Management Council and the Atlantic States Marine Fisheries Commission to encourage protection of immature flounder.   | On-going         | Immature flounder are conserved via gear and harvest restrictions.   |
| 2.1) Maryland, Virginia and the Potomac River Fisheries Commission will continue to support stock identification research to determine the extent of stock mixing in the Chesapeake Bay flounder population.   | 2.1) The jurisdictions will continue to support stock identification research, particularly stock composition tagging studies being conducted at Virginia's Institute of Marine Science (VIMS) and the University of Maryland. Coordinated studies on the relative contribution of various estuaries, including the Chesapeake Bay, to the coastal flounder stock will be initiated. | 1995<br>On-going | VIMS and the VMRC cooperatively support the Virginia Game Fish Tagging Program. The tagging program trains and maintains an experienced group of volunteer recreational anglers who tag and release the fish they catch. More information is available at:<br><a href="http://www.vims.edu/research/units/centerspartners/map/recfish/index.php">http://www.vims.edu/research/units/centerspartners/map/recfish/index.php</a><br><br>MD does not have a summer flounder tagging program. |



| 1991 Chesapeake Bay Summer Flounder Fishery Management Plan Implementation Table (updated 7/2011)  |   |   |  |
|--|---|---|--|
| Strategy   | Action  | Date  | Comments   |
| 2.2) Virginia will continue to support stock assessment work conducted by the VMRC and index of abundance research performed by Virginia Institute of Marine Science (VIMS).                     | 2.2) VMRC's Stock Assessment Program will continue to collect biological data (age, size, sex) from commercial catches of summer flounder. VIMS will continue to monitor abundance of juvenile flounder through its young-of-the-year and juvenile flounder survey trawl indices.   | On-going  | Data collection is required by ASMFC and MAFMC.  |
| 2.3) Maryland, Virginia and the Potomac River Fisheries Commission will continue to support interjurisdictional efforts to maintain a comprehensive data base on coastwide level.                | 2.3) Maryland, Virginia and the PRFC will continue to collect fisheries landings data on summer flounder as part of ongoing commercial fisheries statistics programs. Virginia will continue to pursue adoption and implementation of a limited and/or delayed entry program and a mandatory reporting system for commercial licensees. Maryland and Virginia will continue to supplement the Marine Recreational Fisheries Statistics Survey to obtain more detailed catch statistics at the state level. Through FISHMAP, Maryland will begin a pound net sampling project to collect information on summer flounder and other species. | On-going  | Data collection is required by ASMFC and MAFMC.  |
| 2.4) Maryland and Virginia will continue their joint and individual efforts in providing the information needed to determine the relationship between abundances of adult and juvenile flounder. | 2.4) Maryland and Virginia will continue the Baywide trawl survey of estuarine finfish species and crabs to measure size, age, sex distribution, abundance and CPUE. Maryland will continue seaside juvenile summer flounder studies utilizing bottom trawls, beach seines and their cooperative sampling of trawl fisheries.   | 1977<br>On-going<br>1989<br>On-going<br><br>2001 – 2005<br><br><br><br><br><br><br><br><br><br>2002 | MD DNR conducts a summer blue crab trawl survey.<br><br>VIMS and MD DNR collaboratively conduct a winter dredge survey of blue crabs.<br><br>University of Maryland Center for Environmental Science Chesapeake Biological Laboratory, University of Maryland - College Park, and the Maryland Department of Natural Resources co-operatively conduct the Chesapeake Bay Fishery-Independent Multispecies Survey (CHESFIMS). More information is available at:<br><a href="http://hjordt.cbl.umces.edu/chesfims.html">http://hjordt.cbl.umces.edu/chesfims.html</a><br><br>VIMS conducts the Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAP) with funding from the VMRC. The trawl survey samples juvenile and adult fishes from the upper Chesapeake Bay to the mouth of the Bay. More information is available at:<br><a href="http://www.vims.edu/research/departments/fisheries/programs/">http://www.vims.edu/research/departments/fisheries/programs/</a> |

| 1991 Chesapeake Bay Summer Flounder Fishery Management Plan Implementation Table (updated 7/2011)  |  |                  |  |
|--|--|------------------|--|
| Strategy   | Action   | Date             | Comments   |
|  |  | 2006<br>On-going | <a href="http://multispecies.fisheries.research.chesmmmap/index.php">multispecies fisheries research/chesmmmap/index.php</a><br>The scope of the CHESFIMS program was reduced to a subset of sites.  |
|  |  | On-going         | Summer flounder juvenile surveys are required by ASMFC.  |
| 3.1) The District of Columbia, Environmental Protection Agency, Maryland, Pennsylvania, the Potomac River Fisheries Commission, and Virginia will continue to promote the commitments of the 1987 Chesapeake Bay Agreement. The achievement of the Bay commitments will lead to improved water quality and enhanced biological production. | 3.1) The District of Columbia, Environmental Protection Agency, Maryland, Pennsylvania, the Potomac River Fisheries Commission, and Virginia will continue to set specific objectives for water quality goals and review management programs established under the 1987 Chesapeake Bay Agreement. The Agreement and documents developed pursuant to the Agreement call for:<br>1) Developing habitat requirements and water quality goals for various finfish species. | 1990<br>On-going | Chesapeake Bay Program develops, revises, and monitors goals and strategies for agriculture, air pollution, bay grasses, blue crabs, chemical contaminants, climate change, development, education, forests, groundwater, invasive species, menhaden, nutrients, oysters, population growth, rivers and streams, sediment, shad, stormwater runoff, striped bass, wastewater, weather, and wetlands. For more information:<br><a href="http://www.chesapeakebay.net/issues">http://www.chesapeakebay.net/issues</a><br><br>Chesapeake Bay Program develops, revises, and monitors goals and strategies for living resources (blue crab, menhaden, oyster, shad, and striped bass. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/blue_crabs">http://www.chesapeakebay.net/issues/issue/blue_crabs</a><br><a href="http://www.chesapeakebay.net/issues/issue/menhaden">http://www.chesapeakebay.net/issues/issue/menhaden</a><br><a href="http://www.chesapeakebay.net/issues/issue/oysters">http://www.chesapeakebay.net/issues/issue/oysters</a><br><a href="http://www.chesapeakebay.net/issues/issue/shad">http://www.chesapeakebay.net/issues/issue/shad</a><br><a href="http://www.chesapeakebay.net/issues/issue/striped_bass">http://www.chesapeakebay.net/issues/issue/striped_bass</a> |
|  | 3.1 2) Developing and adopting basinwide nutrient reduction strategies.  | 1990<br>On-going | Chesapeake Bay Program develops, revises, and monitors goals and strategies for nutrient reduction. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/nutrients">http://www.chesapeakebay.net/issues/issue/nutrients</a>   |
|  | 3.1 3) Developing and adopting basinwide plans for the reduction and control of toxic substances.  | 1990<br>On-going | Chesapeake Bay Program develops, revises, and monitors goals and strategies for chemical contaminants. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/chemical_contaminants">http://www.chesapeakebay.net/issues/issue/chemical_contaminants</a>  |
|  | 3.1 4) Developing and adopting basinwide management measures for conventional pollutants entering the Bay from point and nonpoint sources.   | 1990<br>On-going | Chesapeake Bay Program develops, revises, and monitors goals and strategies for sediment, wastewater, stormwater runoff, and agriculture. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/sediment">http://www.chesapeakebay.net/issues/issue/sediment</a><br><a href="http://www.chesapeakebay.net/issues/issue/wastewater">http://www.chesapeakebay.net/issues/issue/wastewater</a><br><a href="http://www.chesapeakebay.net/issues/issue/sediment">http://www.chesapeakebay.net/issues/issue/sediment</a><br><a href="http://www.chesapeakebay.net/issues/issue/stormwater_runoff">http://www.chesapeakebay.net/issues/issue/stormwater_runoff</a>  |
|  | 3.1 5) Quantifying the impacts and identifying the sources of atmospheric inputs on the Bay system.  | 1990<br>On-going | Chesapeake Bay Program develops, revises, and monitors goals and strategies for air pollution. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/air_pollution">http://www.chesapeakebay.net/issues/issue/air_pollution</a>  |

| 1991 Chesapeake Bay Summer Flounder Fishery Management Plan Implementation Table (updated 7/2011) |   |                  |   |
|---|---|------------------|---|
| Strategy  | Action  | Date             | Comments  |
|   | 3.1 6) Developing management strategies to protect and restore wetlands and submerged aquatic vegetation. | 1990<br>On-going | Chesapeake Bay Program develops, revises, and monitors goals and strategies for wetland and submerged aquatic vegetation restoration. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/wetlands">http://www.chesapeakebay.net/issues/issue/wetlands</a><br><a href="http://www.chesapeakebay.net/issues/issue/bay_grasses">http://www.chesapeakebay.net/issues/issue/bay_grasses</a> |
|   | 3.1 7) Managing population growth to minimize adverse impacts to the Bay.                                 | 1990<br>On-going | Chesapeake Bay Program develops, revises, and monitors goals and strategies for land development. For more information:<br><a href="http://www.chesapeakebay.net/issues/issue/development">http://www.chesapeakebay.net/issues/issue/development</a>  |

### Acronyms

ASMFC – Atlantic States Marine Fisheries Commission  
 CPUE – Catch per Unit Effort  
 EEZ – Exclusive Economic Zone  
 FISHMAP – Fishery Independent Sampling and Habitat Mapping  
 IFQ – Individual Fishing Quota  
 MAFMC – Mid-Atlantic Fishery Management Council  
 MD DNR – Maryland Department of Natural Resources  
 NMFS – National Marine Fisheries Service  
 PRFC – Potomac River Fisheries Commission  
 TAL – Total Allowable Landings  
 VAC – Code of Virginia  
 VMRC – Virginia Marine Resource Commission

## 2011 Maryland FMP Report (July 2012)

### Section 19. Tautog (*Tautoga onitis*)

#### Chesapeake Bay FMP

The Atlantic States Marine Fisheries Commission (ASMFC) determined, during 2011, that the tautog stock was overfished and that overfishing was occurring. A 48% reduction of Maryland's harvest was instituted for 2012. Errors in the stock assessment were discovered in 2012; corrections allowed a downward adjustment of the 2012 harvest reduction to 39%. The Atlantic coast stock is and continues to be overfished.

The ASMFC Management Board has implemented a sixth addendum to the fishery management plan (FMP) to reduce fishing mortality (F) by 53%. Necessary regulations to achieve the reduction must be implemented by the start of 2012. The Chesapeake Bay and Atlantic Coast Tautog Fishery Management Plan (FMP) was adopted in 1998 by the Chesapeake Bay Program (CBP) to perpetuate the stock and maintain existing fisheries. The CBP FMP adopts ASMFC guidelines and requirements. The CBP FMP was reviewed in 2011. The review evaluated the goals, objectives, strategies and actions within the 1998 FMP and concluded that the current management framework is appropriate for managing the stock.

Tautog harvest in Maryland is primarily recreational (90%). The 1996 ASMFC Tautog FMP established an interim F of 0.24, a final target F = 0.15, and a minimum size of 14". Addenda I and II successively extended the implementation timeframe for  $F_{\text{target}}$ . Addendum III revised the  $F_{\text{target}}$  reference point to 0.21 and a biological reference point of 40% spawning stock biomass (SSB, 0.29). Overfishing was defined as  $F_{\text{threshold}} = 0.29$ . Addendum IV established biological reference points to determine if tautog are overfished:  $SSB_{\text{target}} = 59$  million lbs and  $SSB_{\text{threshold}} = 44$  million lbs. Tautog biomass was below average for 8 years and a rebuilding  $F_{\text{target}}$  of 0.20 was implemented. The addendum stipulated that only recreational regulations could be implemented to reduce F. Addendum V removed the provision that restricted regulations to the recreational fishery. Addendum VI (2011) requires reducing  $F_{\text{target}}$  to 0.15, a 53% coastwide reduction in harvest. Amendment VI provisions must be implemented by January 1, 2012. Following Technical Committee recommendations, the 53% coastwide harvest reduction was revised downward to 39% in early 2012<sup>1</sup>. Maryland is required to submit an annual compliance report to ASMFC.

#### Stock Status

Tautog are managed as a single coastwide stock. During the 2011 stock assessment update and subsequent corrections, the ASMFC determined that coastwide tautog are overfished at  $SSB_{2009} = 24.1$  million lbs ( $SSB_{\text{target}} = 59.1$  million pounds and  $SSB_{\text{threshold}} = 44.3$  million pounds) and overfishing continues to occur with  $F = 0.25$

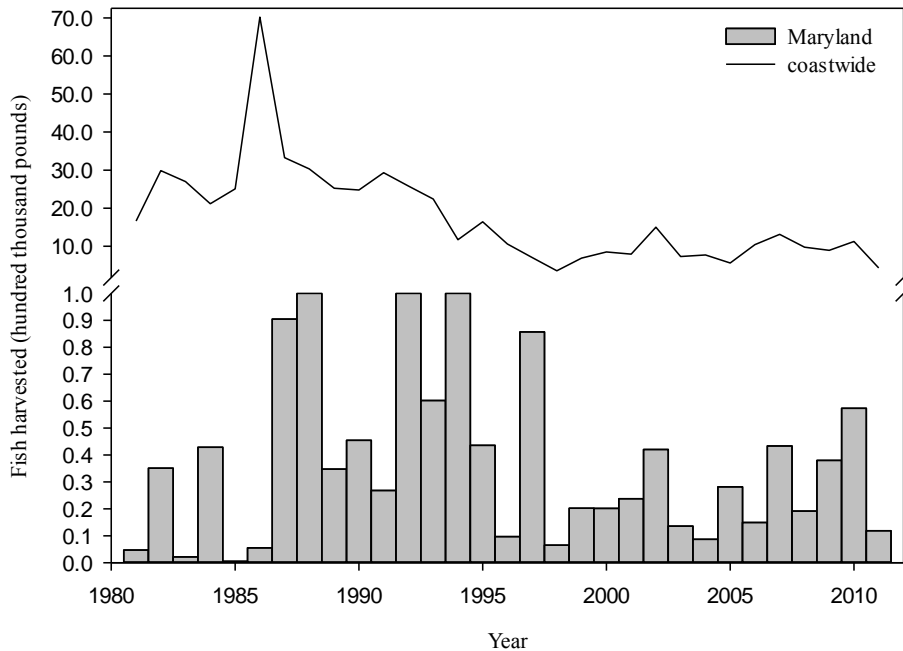
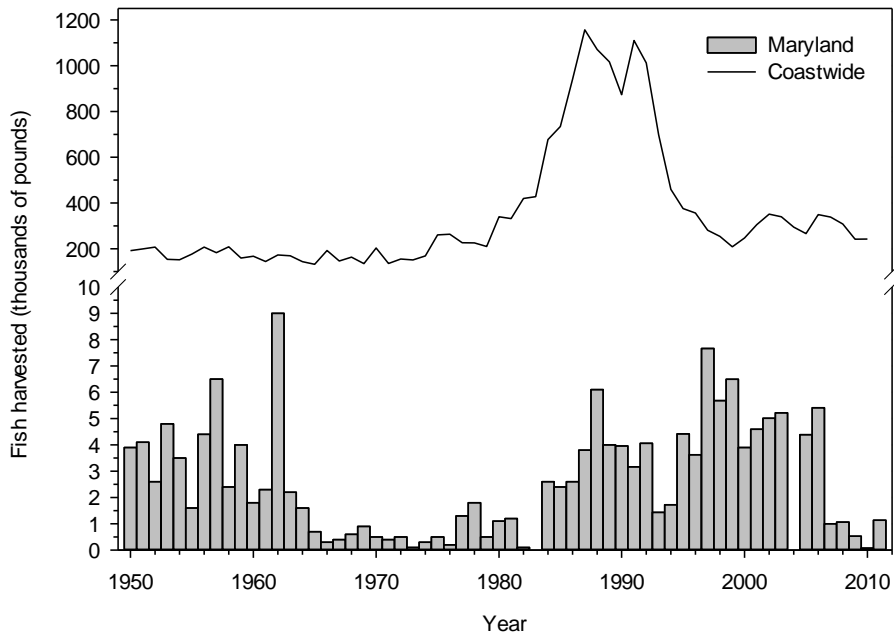
( $F_{\text{target}} = 0.15$ )<sup>1, 2, 3</sup>. Tautog SSB has remained below the threshold value since 1989<sup>2</sup>. Recruitment of age 1 fish has remained at low levels since the early 1990s<sup>3</sup>. A paucity of data continues to challenge the tautog stock assessment committee and has resulted in a coastwide assessment rather than regional assessments. Stock assessment estimates have tended to overestimate F and both over- and underestimate SSB<sup>3</sup>. The status of tautog in Maryland waters is largely unknown.

#### Current Management Measures

Maryland's 2012 tautog regulations have been modified following an error in the estimation of F for 2009. Required harvest reduction is 39%, down from Maryland's initial 48%<sup>4, 5</sup> harvest reduction (53% reduction coastwide). Commercial and recreational fisheries are subject to the same regulations. The minimum size limit is 16", a 2" increase. The allowable harvest is divided among four fishing seasons. Harvest regulations allow 4 fish per person per day from January 1 – May 15, 2 fish per person per day from May 16 – October 31 and 4 fish per person per day from November 1 – 14. The fishery is closed from November 15 – December 31. To be consistent with the necessary coastwide 39% reduction, Maryland has submitted regulations that will change the open season dates to November 1 – November 25<sup>th</sup>. Commercial harvesters are allowed to use hook and line, net, pot, trap, trot line, and seine. One panel on pots and traps must be attached with degrading fasteners to prevent ghost fishing if lost. Recreational anglers are restricted to hook and line.

#### The Fisheries

Maryland's commercial tautog harvest is a minor component (~1%) of coastwide commercial landings. Landings during 2010 dropped to an all time low of 74 pounds in 2010, but rebounded to 1100 pounds in 2011 (Figure 1)<sup>6</sup>. Maryland's average recreational landings from 2000-2010 varied between 1.4% and 14% of tautog landed (Figure 1)<sup>7</sup>. Recreational catch estimates have been revised as a part of the Marine Recreational Information Program (MRIP). Catch estimates have been recalculated for 2004-2011 to provide more accurate estimates and replace those previously made by the Marine Recreational Fisheries Statistics Survey (MRFSS) (For more details go to the FMP Introduction). The majority of recreational anglers (60%) fish along the shoreline.



## Issues/Concerns

Tautog are dependent on bottom structure, but managed as a single Atlantic coast stock. Larval dispersal and juvenile/adult migration among reef areas coastwide is poorly understood. It is conceivable that there are areas that act as a source of production while other areas receive the dispersed larvae/juveniles and act as a sink area for grow-out. If so, then regional management options will be necessary.

Oyster reefs and submerged aquatic vegetation (SAV) are important tautog habitat. Restoration of these habitats in Chesapeake Bay is important for juveniles, especially in the lower bay. Hard bottom and deep water coral habitats in ocean waters are important and in need of conservation. The location and extent of these habitats are poorly documented.

## References

- <sup>1</sup> ASMFC Tautog Board Sets Required Harvest Reduction at 39%. (2012, April 2). ASMFC News Release, PR12-17.
- <sup>2</sup> Atlantic States Marine Fisheries Commission. 2011. Addendum VI to the interstate fishery management plan for tautog. Atlantic States Marine Fisheries Commission. Arlington, Virginia.
- <sup>3</sup> Atlantic States Marine Fisheries Commission. 2011. 2011 Tautog Assessment Update Summary. Atlantic States Marine Fisheries Commission. Arlington, Virginia.
- <sup>4</sup> Maryland Department of Natural Resources. 2011. Maryland's 2011 tautog (*Tautoga onitis*) compliance report to the Atlantic States Marine Fisheries Commission. Maryland Department of Natural Resources, Fisheries Service. Annapolis, Maryland.
- <sup>5</sup> Hoover, A. 2011. Revision to proposal for Tautog management options in Maryland following adoption of Amendment VI. Maryland Department of Natural Resources, Fisheries Service. Annapolis, Maryland.
- <sup>6</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 23, 2012: <http://www.st.nmfs.noaa.gov/st1/commercial/>.
- <sup>7</sup> Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division. May 23, 2012: <http://www.st.nmfs.noaa.gov/st1/recreational/index.html>.

1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 6/2012)

| Strategy  | Action   | Date  | Comments  |
|---|--|---|---|
| <p>1) Implement minimum size and possession limits applicable to the commercial and recreational fisheries to prevent overexploitation. Monitor size composition of landings in the recreational fishery to prevent compression of age structure in the population. Use size composition of fish in the recreational fishery and total landings in the commercial fishery as triggers to implement further management of the fishery, should statistically significant compression of the age structure occur. This plan recommends that the Secretary of Commerce implement minimum size and possession regulations for tautog in the EEZ that are in accordance with state minimum size requirements contained in the plan. It is the intention under the Atlantic Coastal Fisheries Conservation and Management Act to have EEZ fisheries regulated consistent with state possession and landing laws, and that the more stringent of state or federal law will apply regardless of whether fish are caught in the EEZ or in state waters.</p> | <p>1.1) VA, MD and PRFC will implement a minimum size limit of 14" in the recreational and commercial tautog fisheries. Minimum size limits may be changed as more data becomes available on stock condition and biological reference points are re-evaluated.</p>   | <p>1998<br/>2003<br/>2005<br/>Continue</p>  | <p>MD commercial and recreational fisheries have a <b>16" minimum size</b>, 4 fish/person/day from January 1 – May 15, 2 fish/person/day from May 16 – October 31, 4 fish/person/day from <b>November 1 – 14</b>, and is <b>closed from November 15 – December 31</b>. VA has a <b>16" minimum size</b>, 4 fish/person/day creel, and a recreational closure from <b>April 16 – July 31</b>. VA has a <b>15" minimum size, no catch limit, and seasonal closures from January 18 - March 15 and May 1 - August 31, for the commercial fishery</b>. PRFC has a 14" minimum size limit and no harvest restrictions for both commercial and recreational fisheries.</p>  |
|   | <p>1.2) VA, MD and PRFC will reduce fishing mortality to interim and target rates, as defined by ASMFC, through a combination of possession limits, gear, seasons, and/or other restrictions. Target rates may be changed and management measures adjusted as more data becomes available to manage the stock. Due to differences in F between MD and VA, different management strategies may be necessary to reach the target F set by ASFMC. The jurisdictions will continue to work towards a unified, Baywide management strategy.</p> | <p>1998<br/>2000<br/>2003<br/>2005<br/>2011<br/><br/>Continue<br/><br/><br/><br/>2011<br/><br/>2011<br/><br/>2012</p> | <p>A benchmark coastal stock assessment was completed in 2005 (using data from 1981-2004). Results indicate that F declined from 0.71 to 0.299. Overfishing was redefined as <math>F_{40\%SSB}=0.29</math>. Since the 2003 rate and the most recent 3-year average (<math>F=0.389</math>) exceed the ASMFC rebuilding target (<math>F=0.2</math>), tautog are considered overfished. Abundance indices indicate a slight increase in biomass &amp; recruitment. The stock is believed to be at a stable level. ASMFC stock assessment was updated in 2011.</p> <p>MD 2009 commercial landings were 1,132 lbs; recreational landings were 304,045 lbs; recreational releases (discards) were 7,601 fish (NMFS).<br/>VA 2009 commercial landings were 10,897 lbs; recreational landings were 506,154 lbs; recreational releases (discards) were 12,654 fish (NMFS).</p> <p>Tautog continue to be overfished and are now undergoing overfishing. ASMFC Addendum VI was implemented to reduce F to 0.15, a 53% reduction, and prohibit possession of tautog caught in federal waters.</p> <p><b>MD 2011 commercial landings were 1,100 pounds and recreational landings were 11,853 fish.</b></p> <p><b>MD's 2012 harvest reduction was decreased from 48% to 39% due to an overestimate of 2009 harvest.</b></p> |
|   | <p>1.3) VA and MD waters will continue to require degradable fasteners in tautog pots and traps utilizing either:</p>  | <p>1997<br/>Continue</p>  | <p>A pot and trap shall have hinges on one panel/door made of untreated hemp or jute string 3/16" (4.8 mm) diameter or smaller, magnesium alloy fasteners or</p>  |

**1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 6/2012)**

| Strategy  | Action   | Date   | Comments   |
|---|--|--|--|
|   | <ul style="list-style-type: none"> <li>• Untreated hemp, jute, or cotton string of 3/16" (0.48 mm) or smaller</li> <li>• Magnesium alloy, timed float releases (pop-up devices) or similar magnesium alloy fasteners</li> <li>• Ungalvanized or uncoated iron wire of 0.09" (2.39 mm) or smaller.</li> </ul>   |  | ungalvanized/uncoated iron wire of 0.094" (2.39 mm) diameter.  |
| <p>2.1) VA and MD will work with Virginia Institute of Marine Science, Old Dominion University, University of Maryland, Smithsonian Institute and National Marine Fisheries Service's Marine Recreational Fisheries Statistics Survey to conduct research into the size, age and sex composition of tautog in the Chesapeake Bay. The agencies' stock assessment departments will continue to collect information on size composition to monitor the status of tautog stocks. This stock assessment data will be used to determine a baseline of age and sex distribution for the local stock, significant deviation from which will be used as a trigger mechanism to determine the need for future management measures.</p> | <p>2.1) The management agencies will gather data on age, size and sex distribution to be used as a baseline measurement of a healthy population and will encourage research into the possibility of sex-reversal in the tautog population.</p>   | <p>Continue<br/>1989-<br/>1999<br/>Continue</p>  | <p>Annual fecundity estimates are much higher than previously thought. All states are required to collect data to support the coastwide stock assessment.</p>  |
|   | <p>2.1 A) VA will continue the Baywide trawl survey of estuarine finfish species and crabs to measure size, age, sex, distribution, abundance and CPUE.</p>  | <p>Continue</p>  | <p>Data from the trawl survey is used in the ASMFC stock assessment. However, very little data is collected on tautog.</p>   |
|   | <p>2.1 B) VA implemented a mandatory reporting system for commercial licensees beginning January 1, 1993. Maryland's mandatory reporting system has been in effect since 1944 (excluding eel). Improved reporting of commercial landings, along with more detailed information on catch location and effort are some of the expected benefits of these programs.</p> | <p>Continue</p>  | <p>Commercial reporting has been improved through more stringent penalties for not reporting and for late reporting.</p>   |
|   | <p>2.1 C) VA will continue to supplement the Marine Recreational Fisheries Statistics Survey to obtain more detailed catch statistics at the state level. VA's new recreational saltwater fishing license may provide funding for more extensive surveys of the state's recreational fishery.</p>  | <p>Continue<br/><br/>2009<br/>Continue<br/><br/>2011<br/>Continue<br/><br/><b>2012</b></p>   | <p>The MRFSS survey is being improved through the MRIP program. NMFS is requiring that all states register recreational fishermen to create a more robust data base to estimates recreational harvest.<br/><br/>MD contracted to have supplemental MRFSS recreational data collected.<br/><br/>MD implemented a coastal recreational saltwater license requirement.<br/><br/><b>MRIP has been implemented.</b></p> |
| <p>2.1 D) MD's Coastal Bays Fisheries Investigation will be expanded by conducting a creel survey from recreational headboats. The survey will collect biological data on tautog such as sex, length, age and information on recreational fishing effort.</p>   | <p>1972<br/>Continue<br/><br/>1999<br/>Continue</p>  | <p>Juvenile tautog are sampled during the summer and fall coastal bays trawl and seine survey (not designed to target tautog).<br/><br/>MD Coastal Bays Fisheries Investigation annually collects age, length and sex data for tautog purchased from several commercial fishermen.</p> |  |
| <p>2.2) The jurisdictions will promote research to determine the extent of migration and mortality</p>  | <p>2.2) Research on migration of tautog between areas is encouraged. Tagging experiments to provide data</p>   | <p>Continue</p>  | <p>A study on the seasonal occurrence of tautog in the lower CB indicates that most fish tagged and released in inshore</p>  |

**1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 6/2012)**

| Strategy  | Action   | Date   | Comments   |
|---|--|--|--|
| <p>in localized tautog populations. As reliance of this species on structure for both food and shelter may limit populations in the Chesapeake Bay area, studies designed to determine the relationship between population size and available shelter and food sources should likewise be encouraged.</p> | <p>on tautog migration may be funded from sales of saltwater fishing licenses. The Virginia Game Fish Tagging Program will be continued.</p>   | <p>2007</p>  | <p>waters remain inshore for the winter rather than move offshore (Arendt, Lucy and Munroe, 2001).</p> <p>VA initiated Marine Sportfish Collection Project where freezers are set up for recreational anglers to donate whole fish or carcasses to be processed for sex, length, and age.</p> <p>VA initiated VA Saltwater Fisherman’s Journal where anglers can keep track of their fishing experience and provide anecdotal information.</p>   |
| <p>3.1.1) Restoration of aquatic reefs could lead to increased habitat for tautog. Jurisdictions will continue to expand and improve their current oyster restoration programs with periodic program evaluations to ensure maximum success.</p>   | <p>3.1.1A) MD and VA will continue the implementation of the 1994 Oyster FMP which combines the recommendations of both the Virginia Holton Plan and the Maryland Roundtable Action Plan. Strategies in both VA &amp; MD have taken a new focus as the programs intensify efforts to manage around the devastating oyster diseases, Dermo and MSX, currently infecting Chesapeake Bay oysters.</p> | <p>Continue<br/>2003<br/>2004</p> <p>2008</p> <p>2009/2010</p> <p>2012</p> | <p>The 1994 Oyster FMP has been revised. A new Oyster Management Plan was adopted in 2004 and has incorporated concepts from the old FMP and the Aquatic Reef Habitat Plan. Sanctuary and special management areas are being protected from harvest and oyster habitat is being restored.</p> <p>Crassostrea virginica (native oyster) and not Crassostrea ariakensis (Asian oyster) will be used for reef development following the Environmental Impact Statement for Oyster Restoration in Chesapeake Bay Including the Use of a Native and/or Nonnative Oyster.</p> <p>MDNR has expanded the oyster sanctuary network from 9% to 25% (app. 9,000 acres) of the available oyster habitat. Both recreational and commercial fish species are expected to benefit from improved/protected oyster bar habitat.</p> <p><b>Oyster aquaculture is increasing. 785 acres of sanctuary and water column aquaculture have been permitted by Army Corps of Engineers since 9/7/2011. Several hundred acres are in application review.</b></p> |
|   | <p>3.1.1B) MD and VA will continue the implementation of the Aquatic Reef Habitat Plan. “The purpose of the Aquatic Reef Habitat Plan is to guide the development and implementation of a regional program to rebuild and restore reefs as habitat for oysters and other ecologically valuable aquatic species.”</p>   | <p>Continue<br/>2003<br/>2004</p> <p>2007<br/>Continue</p>                 | <p>Habitat concerns for oysters and other ecologically valuable species are addressed in the 2004 Oyster Management Plan.</p> <p>MD ARC, MARI, and Maryland’s Artificial Reef Management Plan were created and several reefs have been built in the Bay.</p>   |



**1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 6/2012)**

| Strategy  | Action   | Date   | Comments   |
|---|--|--|--|
|   |  | Continue<br>2010   | Reefs are qualitatively monitored with underwater video.<br>ARC and MARI have begun support for shallow water (<20 ft.) reef projects.   |
| 3.1.2) The creation of new artificial reefs and the expansion and improvement of preexisting reefs will provide additional habitat for the tautog population.                                 | 3.1.2A) Jurisdictions will continue to maintain, expand, and improve their artificial reef programs. Since 1995, VA has developed 3 new reef sites within the Bay and expanded several existing sites, deploying more than 6,000 designed structures (concrete tetrahedrons) and over 5,000 tons of concrete rubble. MD has designated 3 sites as oyster sanctuaries where harvest is not allowed: Plum Point, lower Severn River and Cambridge. MD will also be examining the efficacy of small hill sanctuaries at 3 sites: Tangier, Choptank and Strong Bay (Chester R.). | Continue<br><br>2006<br><br>2007<br><br>2008<br>Continue | Building artificial reefs have waxed and waned over the years. As materials and sites become available, artificial reef structures may be built. Emphasis has been on rebuilding oyster reefs and oyster habitat. Over 19 areas have been designated as special management areas for oysters in the Chesapeake Bay.<br><br>MD DNR & CCA MD acquired Woodrow Wilson bridge concrete debris deploying it at the Point No Point reef.<br><br>MD ARC and MARI were established to develop reefs in cooperation with the OCRF. Both MARI and OCRF accept private donations while MD contributes funds when available.<br><br>44 NY subway cars were deployed off Ocean City. USN Destroyer <i>Radford</i> is being prepared for reefing. Ship material continues to be tested for contaminants. Additional funding is required & permits are pending. OCRC continues to deploy small steel hulled vessels and concrete material for reef development.<br><br>For the most up-to-date information on the artificial reef program go to:<br><a href="http://www.dnr.maryland.gov/fisheries/reefs/">http://www.dnr.maryland.gov/fisheries/reefs/</a> |
|   | 3.1.2B) VA has recently prohibited the use of all gear except recreational rod and reel, hand-line, spear, or gig on four artificial reefs in state waters. The result of this regulation is similar to the MAFMC/ASMFC Special Management Zones that protect vital tautog habitat.  | Continue   | MD and VA both adopted legislation that prohibits hydraulic clamming (and crab dredging in VA) in or near SAV beds. MD has a prohibition on hydraulic dredging in coastal bays. It is allowed in MD Chesapeake Bay waters, but not within a delineated SAV bed. There is no required setback from the bed.   |
| 3.2.1) Jurisdictions will continue efforts to: “achieve a net gain in SAV distribution, abundance, and species diversity in the Chesapeake Bay and its tributaries over current populations”. | 3.2.1.1A) Protect existing SAV beds from further losses due to increased degradation of water quality, physical damage to the plants, or disruption to the local sedimentary environment as recommended by the Chesapeake Bay Submerged Aquatic Vegetation Policy Implementation Plan.   | Continue<br>2003<br>On-going                             | The revised SAV goal adopted by Chesapeake Bay Program is restoration of 185,000 acres of SAV by 2010 and planting 1,000 acres of SAV by 2008. VIMS annually surveys SAV distribution in Chesapeake Bay. The 2009 acreage was 85,899 (46% goal). <b>The 2011 acreage was 63,074 (43% goal).</b>  |
|   | 3.2.1.1B) The Guidance for Protecting Submerged  | Continue   | MD implemented a living shorelines program in 1970 to  |

**1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 6/2012)**

| Strategy  | Action  | Date                    | Comments   |
|---|---|-------------------------|--|
|   | <p>Aquatic Vegetation in Chesapeake Bay from Physical Disruption was developed in response to the above action and should be used by agencies making decisions that influence SAV survival in Chesapeake Bay. The following recommendations from the guidance document should be strongly considered when making decisions that impact SAV, with special emphasis on SAV that falls within the salinity range of juvenile.</p> <ol style="list-style-type: none"> <li>1. Protect SAV and potential SAV habitat from physical disruption. Implement a tiered approach to SAV protection, giving highest priority to protecting Tier I and Tier II areas but also protecting Tier III areas from physical disruption.</li> <li>2. Avoid dredging, filling or construction activities that create turbidity sufficient to impact nearby SAV beds during SAV growing season.</li> <li>3. Establish an appropriate undisturbed buffer around SAV beds to minimize the direct and indirect impacts on SAV from activities that significantly increase turbidity.</li> </ol> | <p>2003</p> <p>2008</p> | <p>encourage vegetative shoreline stabilization.</p> <p>Regulations are in place to prohibit dredging through SAV beds. Tiered designation and prioritization of SAV beds has not been implemented.</p> <p>Avoidance of dredging, filling and construction impacts to SAV is strictly enforced by MDE and USACE with input from DNR, USFWS, and NMFS.</p> <p>MD has not established undisturbed buffers. VA has established buffer criteria.</p> <p>The revised SAV goal adopted by Chesapeake Bay Program is restoration of 185,000 acres of SAV by 2010 and planting 1,000 acres of SAV by 2008.</p> <p>MD legislated that shoreline stabilization projects must use living shoreline techniques unless demonstrated to be infeasible.</p> |
|   | <p>3.2.1.2) Set and achieve regional water and habitat quality objectives that will result in restoration of SAVs through natural revegetation as recommended by the Chesapeake Bay SAV Policy Implementation Plan.</p>   | <p>Continue</p>         | <p>Water quality criteria have been adopted <a href="http://www.chesapeakebay.net/restoringwaterquality.aspx?menuitem=14728">http://www.chesapeakebay.net/restoringwaterquality.aspx?menuitem=14728</a>.</p>   |
|   | <p>3.2.1.3) Set regional SAV restoration goals in terms of acreage, abundance, and species diversity considering historical distribution records and estimates of potential habitat as recommended by the Chesapeake Bay SAV Policy Implementation Plan.</p>  | <p>Continue</p>         | <p>The new SAV goal is 185,000 acres restored by 2010 and 1,000 acres planted by 2008. (see 3.2.1)</p>   |
| <p>3.2.2) The jurisdictions will use The Submerged Aquatic Vegetation Habitat Requirements and Restoration Targets: A Technical Synthesis as a guide to set quantitative levels of relevant water quality parameters necessary to support continued survival, propagation and restoration of SAV, as well as established the regional SAV restoration target goals defined earlier in this section.</p> | <p>3.2.2) When choices must be made in selecting SAV restoration projects, to fund and support under the Chesapeake Bay SAV Policy Implementation Plan, specific attention should be given to action items that lead to the protection and restoration of SAV found within the juvenile tautog habitat range.</p>   | <p>Continue</p>         | <p>More emphasis is being placed on multispecies benefits when considering restoration projects. Only 15% of restoration target was met by 2008. There's been very little long-term survival from SAV plantings. STAC reviewed the SAV restoration projects and concluded that they were operationally successful but functionally unsuccessful. Currently reviewing next steps.</p>   |
| <p>3.3) In 1998, the Chesapeake Executive Council</p>   | <p>3.3) The jurisdictions should strive towards</p>   | <p>Continue</p>         | <p>GIS mapping activities are underway to target protection</p>  |

**1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 6/2012)**

| Strategy   | Action  | Date  | Comments  |
|--|---|---|---|
| <p>adopted the Chesapeake Bay Wetlands Policy in recognition of the ecological and economic importance that wetlands play in the Chesapeake Bay. The Wetlands Policy establishes an immediate goal of no net loss with a long-term goal of a net resource gain for tidal and nontidal wetlands. It identifies specific actions necessary to achieve both the short term goal of the Policy, “no net loss” and the long term goal of “a net resource gain for tidal and nontidal wetlands.”</p> | <p>achieving the following, especially in the salinity range of tautog.<br/>                     a) define the resource through inventory and mapping activities<br/>                     b) protect existing wetlands<br/>                     c) rehabilitate, restore and create wetlands<br/>                     d) improve education<br/>                     e) further research.</p>  | <p>2006<br/>Continue<br/><br/>2009<br/>Continue<br/><br/>2011</p> | <p>and restoration efforts habitat resources, but habitats are not targeted for a single, specific species’ benefit.</p> <p>MD is developing a Blue Infrastructure that includes mapping structural habitat and SAV.</p> <p>Wetland mosquito ditches from the 1930s-1940s are being plugged to reduce tidal flow and restore wetland hydrology and function.</p> <p>Between 2010 and 2011, 3,775 acres of wetlands were established or re-established and 107,239 acres were enhanced or rehabilitated.</p> |
| <p>3.4.1) Jurisdictions will continue efforts to improve Baywide water quality through the efforts of programs established under the 1987 Chesapeake Bay Agreement. In addition, the jurisdictions will implement new strategies, based on recent program reevaluations, to strengthen deficient areas.</p>  | <p>3.4.1A) Based on 1992 baywide nutrient reduction plan reevaluation, the jurisdictions will:<br/>                     a) expand program efforts to include the tributaries<br/>                     b) intensify efforts to control nonpoint sources of pollution from agriculture and developed areas<br/>                     c) improve on current point and nonpoint source control technologies.</p>   | <p>Continue<br/><br/>2009</p>                                     | <p>Maps that indicate regions of concerns for living resources have been developed.</p> <p>See Chesapeake Bay Program website for updates on nutrient reduction.<br/> <a href="http://www.chesapeakebay.net/status_reducingpollution.aspx?menuitem=19859">http://www.chesapeakebay.net/status_reducingpollution.aspx?menuitem=19859</a>.</p> <p>President Barack Obama’s executive order recommitted federal agencies to Bay restoration and regulatory enforcement.</p>                                    |
|  | <p>3.4.1B) Based on the 1994 Chesapeake Bay Program Toxics Reduction Strategy Reevaluation Report, the jurisdictions will emphasize the following 4 areas:<br/>                     a) pollution prevention: target “regions of concern” &amp; “areas of emphasis”<br/>                     b) regulatory program implementation: insure that revised strategies are consistent with and supplement pre-existing regulatory mandates<br/>                     c) regional focus: identify and classify regions according to the level of contaminants<br/>                     d) directed toxics assessment: identify areas of low level contamination, improve tracking and control nonpoint sources.</p> | <p>Continue</p>   | <p>See Chesapeake Bay Program website for updates on nutrient reduction.<br/> <a href="http://www.chesapeakebay.net/status_reducingpollution.aspx?menuitem=19859">http://www.chesapeakebay.net/status_reducingpollution.aspx?menuitem=19859</a></p> <p>Chesapeake Bay Program is monitoring levels of mercury, PCBs, PAHs, organophosphate and organochloride pesticides.</p>   |
|  | <p>3.4.1C) The jurisdictions will continue to develop, implement, and monitor their tributary strategies designed to improve bay water quality.</p>   | <p>Continue<br/>April<br/>2003</p>                                | <p>Ambient water quality criteria of DO, water clarity, and chlorophyll-a have been adopted for the Chesapeake Bay.</p>   |
| <p>3.4.2 The Chesapeake Bay Program partners will “Plan for and manage the adverse</p>   | <p>3.4.2) Encourage efficient development patterns which reduce nutrient and sediment loads to the</p>  | <p>Continue</p>   | <p>See Chesapeake Bay Program website for updates on land stewardship.</p>  |

| 1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 6/2012)   |  |      |   |
|---|--|------|---|
| Strategy  | Action   | Date | Comments  |
| environmental effects of human population growth and land development in the Chesapeake Bay watershed.” In 1996, the Chesapeake Bay Program accepted the Priorities for Action for Land, Growth and Stewardship in the Chesapeake Bay Region as a framework to address land use and development pressures in the Chesapeake Bay. This approach recognizes that communities are the basic unit for addressing growth, land-use and long-term stewardship of the natural environment. These priorities are voluntary actions which are expected to be accomplished through a variety of public and private partners, including but not limited to the Chesapeake Bay Program. Jurisdictions will forward the goals of the Priorities for Action, which encourage sustainable development patterns. Given the fact that tautog are particularly vulnerable to suspended solids which abrade epithelial tissues and to decreasing SAV and shellfish beds which serve as habitat and feeding areas, the goals of the Priorities for Action which are germane to nutrient and sediment load reduction will be promoted. | <p>Chesapeake Bay and promote responsible land management practices and decisions regarding present and future development by pursuing the following:</p> <ol style="list-style-type: none"> <li>1) Revitalize existing communities. Revitalization efforts can assist existing communities and help reduce sprawl by encouraging the use of state-of-the-art storm water management and pollution prevention strategies.</li> <li>2) Encourage efficient development patterns. Ecologically sound, efficient development patterns encourage higher population density; compact and contiguous development. Benefits to the Bay include reduced impervious surfaces; conservation of farms, forests, and wetlands.</li> <li>3) Foster resource protection and land stewardship. Cooperation and linkages among local watershed protection planning efforts should be increased to foster a regional sense of stewardship toward the bay’s natural resources. The development of new policies that integrate natural and community infrastructure in public and private planning, development and protection efforts will further this goal.</li> </ol> |      | <p><a href="http://www.chesapeakebay.net/status_protectingwatersheds.aspx?menuitem=19876">http://www.chesapeakebay.net/status_protectingwatersheds.aspx?menuitem=19876</a></p> <p>MD developed curriculum “Where Do We Grow from Here?” about population growth and its impacts on the Bay.</p> |

**Acronyms**

ARC - Artificial Reef Committee  
 ASMFC – Atlantic States Marine Fisheries Commission  
 CB – Chesapeake Bay  
 CCA MD – Coastal Conservation Association of Maryland  
 CPUE – Catch per Unit Effort  
 DO – Dissolved Oxygen  
 EEZ – Exclusive Economic Zone  
 F – Fishing Mortality  
 FMP – Fishery Management Plan  
 GIS – Geographic Information System  
 MAFMC – Mid-Atlantic Fishery Management Council  
 MARI - Maryland Artificial Reef Initiative  
 MD DNR – Maryland Department of Natural Resources

NMFS – National Marine Fisheries Service  
 OCRF - Ocean City Reef Foundation  
 PAH – Polycyclic Aromatic Hydrocarbon  
 PCB – Polychlorinated Biphenyl  
 PRFC –Potomac River Fishery Commission  
 SAV – Submerged Aquatic Vegetation  
 USACE – United States Army Corps of Engineer  
 USFWS – United States Fish and Wildlife Service  
 USN – United States Navy  
 VIMS – Virginia Institute of Marine Science

## 2011 Maryland FMP Report (July 2012) Section 20. Weakfish (*Cynoscion regalis*)

### Chesapeake Bay FMP

Weakfish stocks coastwide have not responded to reductions in fishing mortality. Total mortality remains high and natural mortality has increased. The Chesapeake Bay Weakfish and Spotted Seatrout Fishery Management Plan (CBFMP) was adopted in 1990 to enhance and perpetuate the Chesapeake Bay's weakfish and spotted seatrout stocks. Since then, the plan was revised in 2003 and only addresses weakfish. The revised plan was developed in response to the change in the status of the weakfish stock from overfished to fully exploited and included new biological data pertinent to the Chesapeake Bay. The CBP plan follows the compliance requirements set forth in the ASMFC Amendment IV to the Interstate Weakfish Management Plan (2003) and several addenda (2006-2009). Maryland is required to submit an annual compliance report to ASMFC.

### Stock Status

At present, the weakfish stock is considered depleted but overfishing is not occurring. The term "depleted" is used when causes other than fishing mortality have resulted in a biomass decline. If the low biomass level was caused by fishing mortality the stock would be considered overfished. The most recent peer-reviewed stock assessment was completed for the Atlantic coastal stock in 2009. The stock spawning potential was estimated at 3% of an unfished stock. Since 1995, the decline in biomass has been due to a sustained increase in natural mortality and not from an increase in fishing mortality. The increased natural mortality was exacerbated by continued removals by commercial and recreational fisheries. Maryland's fishery dependent and independent monitoring in recent years has shown both a decrease in mean adult age and low juvenile abundance. The ASMFC Weakfish Management Board revised and adopted new percentage-based spawning stock biomass biological reference points (BRPs) in November 2009. The spawning potential threshold was set at 20% and the spawning potential target was set at 30%.

### Current Management Measures

Management measures to reduce commercial and recreational exploitation by over 50% are required by ASMFC's Addendum IV. It resulted in requiring states to implement a 1 fish recreational creel limit and a 100 pound commercial trip and bycatch limit. Chesapeake Bay Program jurisdictions implemented new restrictions in 2010 to meet or exceed the ASMFC requirements on harvest and bycatch. These restrictions continued during 2011.

### Fisheries

Both recreational and commercial harvest of weakfish has significantly decreased over the last few years (Figure 1 & 2). Since 2002, Maryland commercial weakfish landings have been below 100,000 pounds and have decreased to less than 1.000

pounds in 2011. A similar decreasing trend has been seen in other states along the entire Atlantic coast.

### Issues/Concerns

Factors such as predation, competition, and changes in the environment have increased natural mortality and appear to have a stronger influence on weakfish stock dynamics than fishing. The ASMFC Weakfish Management Board "received a significant amount of public comment supporting a coastwide moratorium" Coastwide commercial landings accounted for 74% of total harvest in 2010. The ASMFC Board chose to implement restrictions that would allow for limited directed fishing and allow sampling programs to continue.

The ASMFC weakfish plan review team (PRT) has reported its recommendations for management, biological research, social and economic research and habitat studies. Biological research recommendations were listed under high, medium and low priorities. High priority biological research recommendations include catch and effort data, discard mortality rates, age validation, stock identification and movements, spatial and temporal analysis of the fishery, and analysis of the spawner-recruit relationship and environmental influences on year-class strength<sup>1</sup>.

**Figure 1. Maryland's recreational weakfish harvest and releases in numbers, 1981-2011.**

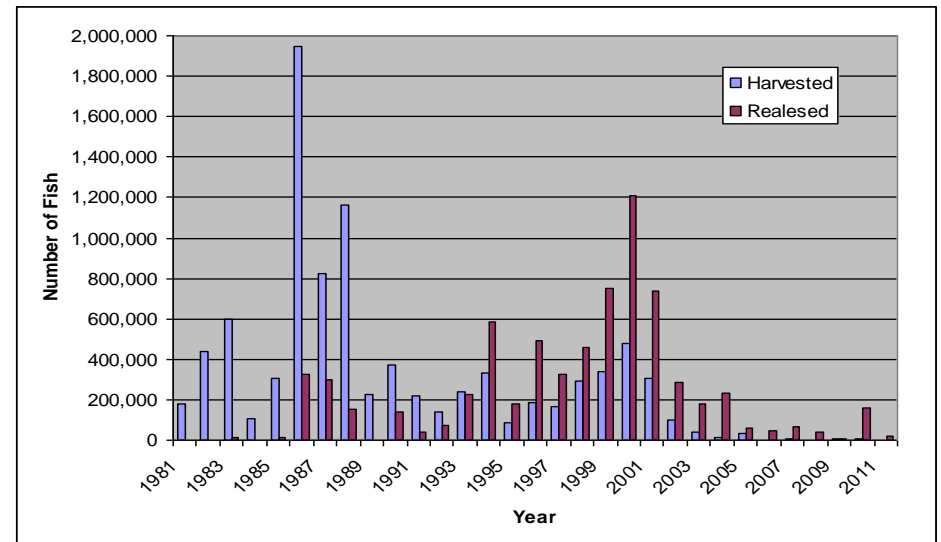
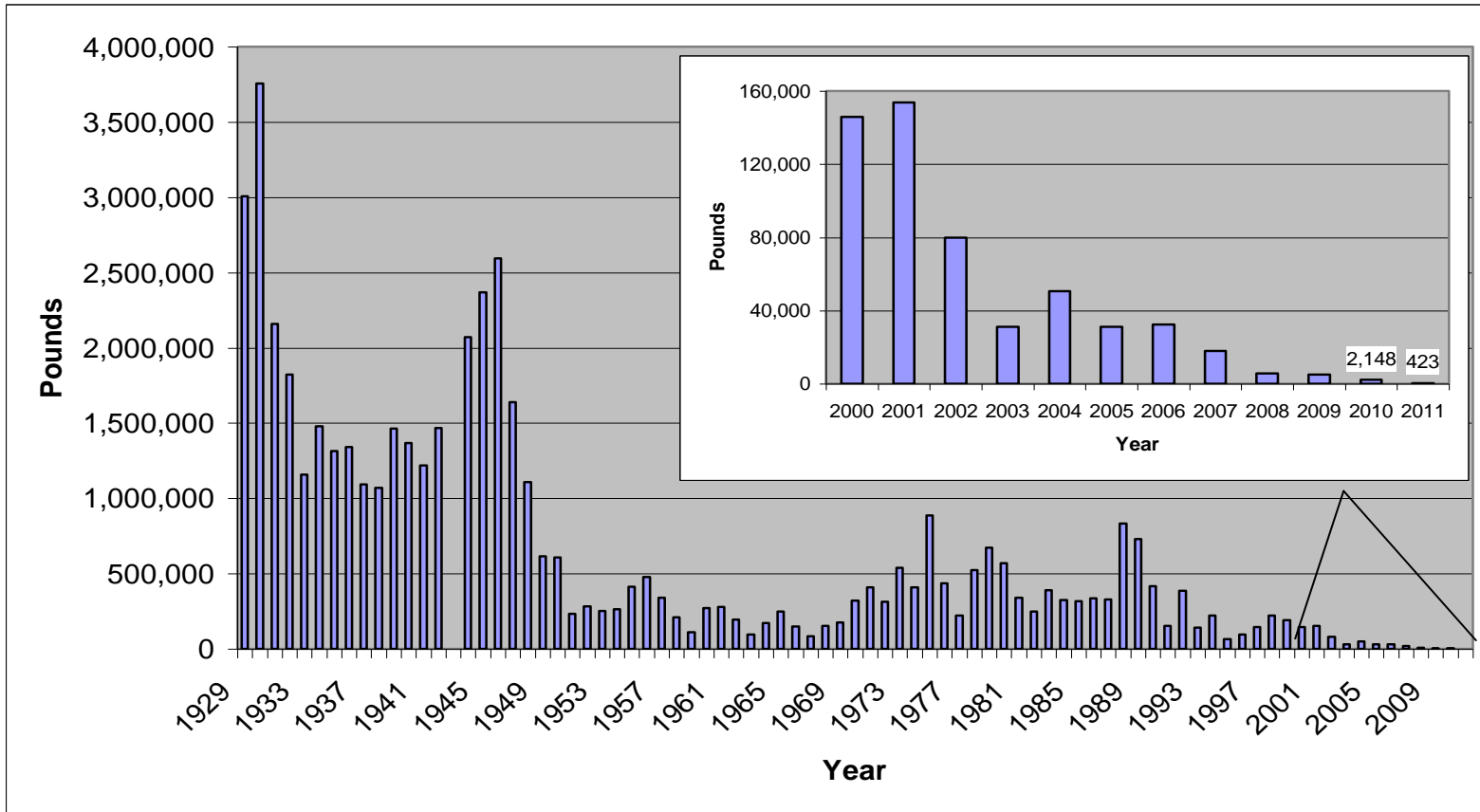


Figure 2. Maryland's total commercial weakfish landings, 1929-2011.



(Figures from Rickabaugh 2012 <sup>2</sup>)

**References**

<sup>1</sup> ASMFC. 2012. 2011 Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for Weakfish (*Cynoscion regalis*) 2010 Fishing Year. ASMFC Board Approved February 9, 2012. 22p

<sup>2</sup> Rickabaugh, H.W. Jr. 2012. Maryland Weakfish (*Cynoscion regalis*) Compliance Report to The Atlantic States Marine Fisheries Commission – 2011. Fisheries Service, Maryland Department of Natural Resources. 13p.

<sup>3</sup> ASMFC. 2012. Fishery Management Report of the Atlantic States Marine Fisheries Commission. Omnibus Amendment to the Interstate Fishery Management Plans for Spanish Mackerel, Spot, and Spotted Seatrout. Approved February 9, 2012. 161 p.

| <b>2003 Chesapeake Bay Program Weakfish Fishery Management Plan Implementation</b> (updated 6/12)   |   |  |  |
|---|---|--|--|
| <b>Section</b>  | <b>Action</b>   | <b>Implementation</b>                              | <b>Comments</b>  |
| <p><b>Stock Status</b><br/> Management Strategy: CBP jurisdictions will adopt biological reference points (BRPs) that reflect the most current status of the weakfish stock. As data becomes available on multi-species interactions and ecological considerations such as species interactions, food webs, bycatch, biodiversity and habitat, the BRPs should be modified accordingly.</p> | <p><u>Action 1.1</u><br/> MD, PRFC (Potomac River Fisheries Commission) and VA will adopt the Atlantic States Marine Fisheries Commission's (ASMFC) recommendations for the coast wide management of weakfish</p>   | <p>Annually reviewed and adjusted if necessary</p> | <p>The 2009 assessment results indicated that the weakfish stock is depleted, with SSB estimated at 3% of an unfished stock well below the BRPs adopted in Addendum IV. The biomass decline is the result of increasing natural mortality while F remains low. Size and age structure of the stock has decreased. The ASMFC review team (2010) recommended the development of additional methods to analyze the stock in the next assessment.</p>  |
|   | <p><u>Action 1.2</u><br/> In order to achieve the fishing target rates defined by the adopted BRPs, CBP jurisdictions will utilize a combination of size limits and possession limits, and/or seasons or areas to manage the commercial and recreational fishery in state waters.</p> | <p>Annually</p>                                    | <p>Addendum IV to Amendment 4 of the weakfish FMP requires that the recreational creel does not exceed 1 fish in the management unit including CBP jurisdictions. Commercial landings must be limited to 100 pounds and bycatch must be limited to 100 pounds per vessel, per day or trip. The finfish trawl fishery allowance for undersized fish must be reduced to 100 fish. The CBP jurisdictions complied with these requirements in 2010; all met the recreational harvest restrictions and met or exceeded the commercial harvest restrictions. The same requirements were in effect during 2011.</p> |

| <b>2003 Chesapeake Bay Program Weakfish Fishery Management Plan Implementation</b> (updated 6/12)  |   |  |   |
|--|---|--|---|
| <b>Section</b>   | <b>Action</b>   | <b>Implementation</b>                          | <b>Comments</b>   |
| <b>The Fishery Management Strategy:</b><br>The CBP jurisdictions will regulate the commercial and recreational fishery based on the most recent status of the stock and the established fishing targets. | <u>Action 2.1</u><br>The CBP jurisdictions will consider regional differences when determining state allocation issues and regulations.   | As necessary                                   | The Maryland Sport Fish Advisory Commission recommended a weakfish moratorium. Fishing mortality has been decreased over the years but there remains a significant amount of non-fishing mortality  |
|  | <u>Action 2.2</u><br>The CBP jurisdictions will consider the economic impacts of management measures on the fishery and promote the utilization of economic data in the management decision process.              | Dependent on the availability of economic data | Collection of economic data for the commercial fishery should include dockside values, the number of commercial vessels, the number of commercial fishermen and the economic returns from the commercial fishery. Data collection for the recreational fishery should include the number of anglers, the number of directed trips and angler expenditures. Detailed data collection will enable the development of bio-economic models that can estimate costs or benefits to consumers resulting from fishery regulations. |
|  | <u>Action 2.3</u><br>The CBP jurisdictions continue to support the use of BRDs in non-directed fisheries and the appropriate mesh sizes in directed fisheries, to reduce the fishing mortality on small weakfish. | Annually                                       | ASMFC Addendum III to Amendment 4 of the weakfish FMP aligns BRD certification requirements between state and federal waters along with the SAFMC shrimp bycatch reduction device requirements.   |



| <b>2003 Chesapeake Bay Program Weakfish Fishery Management Plan Implementation</b> (updated 6/12)  |  |                       |   |
|--|--|-----------------------|---|
| <b>Section</b>   | <b>Action</b>  | <b>Implementation</b> | <b>Comments</b>   |
| <p><b>The Fishery</b><br/>Research and Monitoring:<br/>The CBP jurisdictions will continue to monitor the biological characteristics of the weakfish stock in the Chesapeake Bay and coordinate monitoring activities within the Bay and the Atlantic coast.</p> | <p><u>Action 3.1</u><br/>The CBP jurisdictions will continue fishery dependent sampling and improve catch data. Economic information from the recreational and commercial fisheries will also be reviewed.</p> | Continue              | <p>Monitoring data provides information on abundance; age structure and Y-O-Y recruitment. <b>Total commercial landings in MD fell to a low of 423 pounds in 2011, the lowest harvest in the 1929-2011 time series (Fig.2) and continuing the trend of declining harvests. Commercial landings in VA are higher than those in MD, but are also at the lowest level in at least the past 30 years, with 65 thousand pounds in 2009 and 61 thousand in 2010. The MD 2011 recreational harvest estimate was only 237 weakfish. More weakfish were caught by VA recreational fishermen, but the 4 thousand caught in 2010 and 2011 are also the fewest in at least 30 years. Only 26 weakfish were sampled in MD Chesapeake Bay pound nets in 2010 and the mean length declined for the third consecutive year.</b></p>                     |
|  | <p><u>Action 3.2</u><br/>The CBP jurisdictions will conduct fishery independent sampling and collect data on abundance, age structure and recruitment.</p>   | Continue              | <p>Amendment 4 to ASMFC's Weakfish FMP stipulates that states, which harvest 150,000 lbs. or more of weakfish, must submit otoliths and fish lengths as data for the coastal stock assessment. The extent of otolith and length data required was revised in ASMFC Addendum 1 to Amendment 4. <b>Otoliths were removed from 25 of 26 MD pound net samples. Of the 25, three were found to be age two and 22 were age one. Fishery independent sampling produced a slight decrease in the calculated mean juvenile index in coastal bays in 2011 with a catch of 1.90 juveniles per hectare, down from 2.16 in 2010. The Chesapeake Bay juvenile geometric mean per tow continued a small increase over the past three years to 2.04 juveniles per tow for 2011, which is still below the time series mean of 3.2 juveniles/tow.</b></p> |

| <b>2003 Chesapeake Bay Program Weakfish Fishery Management Plan Implementation</b> (updated 6/12)   |   |                       |   |
|---|---|-----------------------|---|
| <b>Section</b>  | <b>Action</b>   | <b>Implementation</b> | <b>Comments</b>   |
| <p style="text-align: center;"><b>Habitat</b></p> <p>Management Strategy:<br/>           CBP jurisdictions will monitor and regulate activities which may be harmful to weakfish habitat.</p> | <p><u>Action 3.3</u><br/>           CBP jurisdictions will continue to coordinate state activities with the Atlantic Coast Cooperative Statistics Program (ACCSP).</p>  | Continue              | The ACCSP Coordinating Council approved the Atlantic States Fisheries Data Collection Standards document in May, 2012. This document will be used to direct partner data collection.  |
|   | <p><u>Action 3.4</u><br/>           The CBP jurisdictions will begin to collect and examine stomach contents data and examine the effects of environmental variables upon weakfish growth rates.</p> <p>Activities, which contribute to the degradation and or loss of habitat types that weakfish utilize throughout their life history stages will be monitored and regulated by CBP jurisdictions.</p> | On-going              | Data from the ChesMMAP Survey, CHESFIMS project and the MD Winter Trawl Survey may be used to consider species interactions and relationships. Results and trends can then be incorporated into CBP fishery management plans. ASMFC weakfish stock assessment (2006) incorporated a striped bass predator function allowing weakfish stock decline to be modeled. |
|   | <p><u>Action 4.1</u><br/>           The CBP jurisdictions will monitor and regulate land-based activities and water-based activities that may negatively impact Chesapeake Bay water quality and weakfish spawning, rearing and foraging areas.</p>   | On-going              | On-going  |
|   |   | Continue              | The MD DNR water quality protection database focuses on watershed lands that are most important for improving water quality.  |

| <b>2003 Chesapeake Bay Program Weakfish Fishery Management Plan Implementation</b> (updated 6/12) |  |                       |  |
|---|--|-----------------------|--|
| <b>Section</b>  | <b>Action</b>  | <b>Implementation</b> | <b>Comments</b>  |
| <b>Ecosystem Interactions Management Strategy:</b>  | <u>Action 4.2</u><br>The CBP jurisdictions will monitor important weakfish forage species to insure that activities, such as directed fisheries or incidental bycatch in non-directed fisheries, do not adversely affect abundance. These managed species, which serve as forage for weakfish include Atlantic croaker, spot, Atlantic menhaden, and blue crab. If fishing activities are contributing to higher F's on forage species, additional management measures may be necessary. | Continue              | Data from the ChesMMAAP, CHESFIMS, and the MD Winter Trawl Surveys will provide data on important forage species for weakfish. The CHESFIMS survey was discontinued after 2005 due to lack of funding.   |
|   | <u>Action 4.3</u><br>The CBP jurisdictions will monitor the abundance of weakfish forage species that are not managed under CBP FMPs, such as bay anchovies, and Atlantic silversides, using on-going monitoring and surveys.  | Continue              | The MD Juvenile Striped Bass Survey and VIMS Juvenile Abundance Monitoring Surveys (formerly known as the VIMS Trawl Survey and the VIMS Juvenile Seine Survey) will continue to monitor the abundance of important, non-managed forage species in the Chesapeake Bay.   |
|   | <u>Action 4.4</u><br>The CBP jurisdictions will continue to identify predator/prey interactions, both inter- and intraspecies competition and other interactions that might affect the management of weakfish. As multispecies interactions are evaluated and quantified, biological reference points and management strategies may be adjusted.   | On-going              | Data from the ChesMMAAP, CHESFIMS and the MD Winter Trawl Survey will be collected and analyzed by CBP jurisdictions to identify possible inter-and intra-species relationships. ASMFC weakfish TC has incorporated a striped bass predator function into the 2006 weakfish stock assessment to model the weakfish stock decline since 1998. |

Acronyms:

ASMFC = Atlantic States Marine Fisheries Commission  
 CHESFIMS = Chesapeake Bay Fishery Independent Multispecies Fisheries Survey Program  
 F = mortality due to fishing  
 PRFC = Potomac River Fisheries Commission  
 SSB = spawning stock biomass  
 VIMS = Virginia Institute of Marine Science

BRPs = biological reference points  
 ChesMMAAP = Chesapeake Bay Multispecies Monitoring and Assessment  
 CBP = Chesapeake Bay Program  
 FMP = fishery management plan  
 SAFMC = South Atlantic Fishery Management Council  
 TC = technical committee  
 Y-O-Y = young of the year fish

## Spotted Seatrout Notes:

The ASFMC adopted the spotted seatrout FMP in 1984 for states from Maryland to Florida. The spotted seatrout was included in the original Bay Program Chesapeake Bay *Weakfish and Spotted Seatrout Fishery Management Plan* in 1990. The management plan was revised in 2003 to include only weakfish. Since 1990, there has been no new management plan for spotted seatrout but updates have been completed on a regular basis. A Public Information Document (PID) was issued in November, 2009 by the ASMFC for an amendment to the interstate FMP for Spanish mackerel, spot, and spotted seatrout. The ASFMC approved the omnibus amendment for Spanish mackerel, Spot, and Spotted Seatrout August 4, 2011 and a corrected version with Technical Addendum 1a on February 9, 2012<sup>3</sup>. The omnibus amendment includes recommended measures to protect the spotted seatrout spawning stock and requires a coastal minimum length limit.

### Stock Status:

A coast-wide stock assessment of spotted seatrout has not been done because this species is considered to be largely non-migratory. Where assessments have been completed (NC, SC, GA, FL) on local stocks, there have been data limitations. Stock status varies by state. The estimated MD recreational harvest has been approximately 10,000 pounds or less for the past 10 years. The 2011 MD estimated harvest of 3,058 fish is the time series low. The VA recreational fishery harvested an estimated 247,736 weakfish in 2011, the most since 288,705 were harvested in 1988. The commercial harvest mirrors this pattern, as MD harvests have been approximately 10% of VA commercial harvests. VA commercial harvest of spotted seatrout has varied from a low of 3,773 pounds in 2001 to 84,903 pounds in 2008. The most recent commercial reports from 2010 indicate that only 1,025 pounds were harvested from MD while 21,000 were harvested from VA.

### Management Objectives and Measures:

The ASFMC FMP includes maintaining a spawning potential ratio of 20% or greater to reduce the opportunities for recruitment failures. A size limit of 12" minimum total length is required and all states have complied with this minimum. Net mesh sizes corresponding to this size limit for directed fisheries, data collection, and state stock assessments were also recommended. MD and VA have 14" recreational size limits with 10 fish creels. The MD commercial size limit is 12" with minimum trawl and gill net meshes. The VA commercial H&L limit is 14" with a 10 fish limit and overall quota of 51,104 pounds.

## 2011 Maryland FMP Report (July 2012)

### Section 21. White Perch (*Morone americana*)

#### Maryland FMP

White perch support one of the most important commercial and recreational fisheries in Maryland. In 2011, white perch were the third most valuable finfish species landed in the state, exceeded only slightly by the American eel and about one-third the value of the striped bass landings. An estimated average of  $\frac{3}{4}$  million pounds are caught by recreational fishermen annually and nearly 1 million pounds were caught in 2010<sup>1</sup>.

Despite its local importance, a Chesapeake Bay Fishery Management Plan (CBFMP) for white perch has not been formally adopted. Maryland drafted a white perch plan in 1990 and has been operating under the direction of this draft plan. The biological background includes descriptions of the life history, fisheries, economic perspective, resource status, habitat issues, FMP status and management unit, status of traditional fishery management approaches and data needs. The management framework includes goals and objectives, problem areas and management strategies.

#### Stock Status

The 2009 stock assessment noted that biomass was above minimum stock levels and estimated fishing mortality was lower than necessary to maintain stock abundance. The assessment cautiously noted that some indices of commercial CPUE were trending lower while recreational CPUE trended higher. The 2009 stock assessment used a surplus production model for the Chesapeake Bay and a Catch Survey Analysis (CSA) in the Choptank River<sup>2</sup>. The most recent 2011 white perch stock assessment used a different modeling approach to better describe the white perch stocks regionally. The CSA model results described population dynamics in the Upper Bay and Choptank River from 2000 to 2010. There is less available data for Lower Bay white perch stocks. For those areas, both fishery-dependent and fishery-independent indices were examined.

Both Maryland and Virginia calculate juvenile indices for white perch and recent years have shown average to below average juvenile abundance. In addition to young of the year surveys, an adult white perch index was calculated with data obtained from the Potomac River Striped Bass Spawning Stock Survey.

Biological reference points (BRP) have not been formally established although an F limit was suggested as  $F=0.60$ . In nine years between 2000 and 2010 for which sufficient data was available to estimate F, F did not exceed  $F=0.49$ , well under the F limit of  $F=0.60$ . Therefore, overfishing is not occurring.

#### Current Management Measures

White perch are managed in coordination with striped bass because they overlap in habitat. They also have some commercial gear types in common, such as drift gill nets. The management unit is the white perch stock throughout its range in the Maryland portion of the Chesapeake Bay. The commercial fishery is regulated with gear and area restrictions and an 8" minimum size limit. There is no recreational size or creel limit for fish caught by hook & line. When caught by methods other than hook & line, such as cast net and seine, the minimum size is 8". There is no closed season. Virginia has no size limits for recreational or commercial fishing.

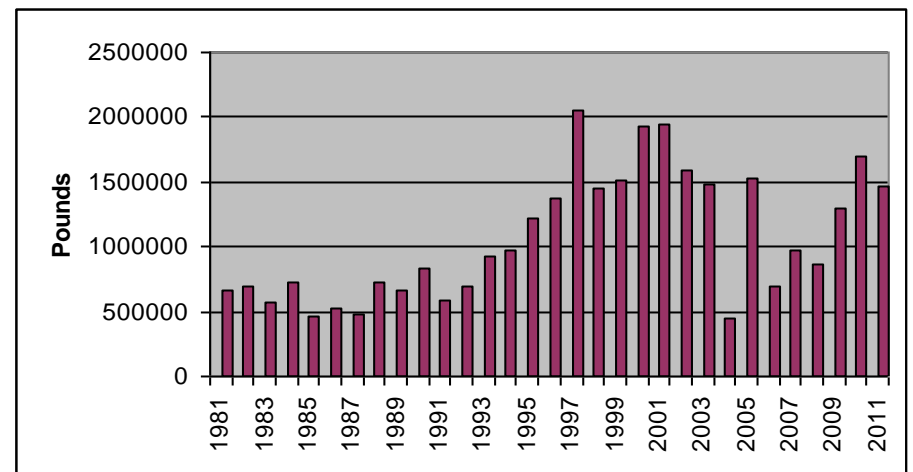
#### Issues/Concerns

White perch populations have recently decreased from a period of high abundance. Fishing mortality has been low except for the most recent years and the species is considered resilient. The juvenile index is variable. High young-of-year CPUE values were found in 2001, 2003 and 2004 and were followed by high gill net catches in 2004 – 2006. Fishery independent sampling after 2007 produced inconclusive results<sup>1</sup>.

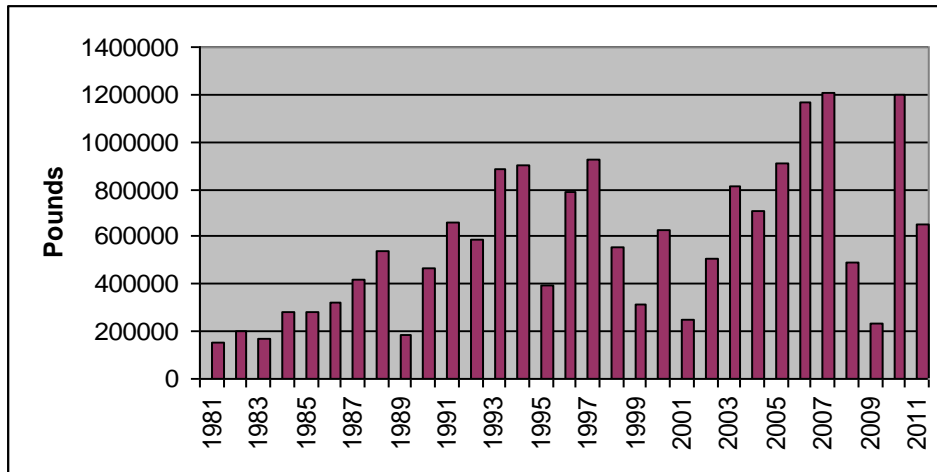
#### The Fisheries

Preliminary 2011 commercial landings from Maryland were 2.04 million pounds with an estimated value of 1.47 million dollars.

Figure 1. Maryland commercial landings of white perch, 1981-2011.



**Figure 2. Maryland recreational MRFSS white perch harvest estimates, 1981-2011.**



**References:**

<sup>1</sup> Piavis, P.G. and E. Webb III. 2012. Population assessment of white perch in Maryland with special emphasis on Choptank River stocks. Maryland Department of Natural Resources, Federal Aid Report F-61-R, Annapolis, Maryland.

<sup>2</sup> Piavis, P.G. and E. Webb III. 2011. Population vital rates of resident finfish in selected tidal areas of Maryland's Chesapeake Bay. Maryland Department of Natural Resources, Federal Aid Report F-61-R, Annapolis, Maryland.

| <b>Draft 1990 White Perch Fishery Management Plan Implementation Table</b> (updated 6/12)  |   |             |  |
|--|---|-------------|--|
| <b>Problem Area</b>  | <b>Action</b>   | <b>Date</b> | <b>Comments</b>  |
| Mixed Fishery<br>1.1. Coordinate management with striped bass actions.   | 1.1. The white perch fishery will abide by striped bass restrictions. Striped bass bycatch will be minimized. | 1990        | Commercial gear restrictions and area restrictions and closures apply.   |
| Optimum Harvest<br>2.1. White perch populations exhibit growth differences.  | 2.1. Consider eliminating minimum size limits.  | 1990        | Minimum size limit for commercial and non-H&L recreational set at 8"; no size limit for recreational H&L.  |
| Stock Assessment<br>3.1. Basic stock information is lacking, including commercial and recreational harvest size and age-composition. | 3.1. Stock assessments will be performed periodically.  | Periodic    | <p><b>White perch stock assessments are performed every three years. The most recent stock assessment survey was conducted in 2011 and employed a catch survey analysis because some assessments have found catch survey analysis to be superior to surplus production models for assessing stock size. Young-of year surveys produced high CPUE values from 1994-2001 and 2003-2004. However, fishery independent indices often conflicted and differed between areas examined.</b></p> <p>The 2011 Choptank River assessment indicated an increase from 1 million white perch in 1989 to over 6 million in 2011 with a low fishing mortality rate of 0.20 in 2007. Fishing mortality rates have decreased since 1997. <b>Since 2000, fishing mortality rates have been under F=0.60 and the population has increased.</b></p> <p>White perch stocks are not overfished and overfishing is not occurring, based on the suggested F limit = 0.60. However, formal BRPs have not been officially adopted.</p> |

|   |  |                |   |
|---|--|----------------|---|
| <p>Habitat Issues<br/>4.1. Water quality impacts distribution and abundance of finfish species in Chesapeake Bay.</p> | <p>4.1. MD will develop objectives for finfish water quality standards under the latest Bay agreements, including, nutrient and toxics reduction strategies on a watershed approach.</p> | <p>Ongoing</p> | <p>Watershed indicators for aquatic systems include water quality as well as components of aquatic systems, biological diversity, hydrologic and terrestrial system indicators<br/> <a href="http://www.dnr.state.md.us/watersheds/surf/indic/md/md_indic.html">http://www.dnr.state.md.us/watersheds/surf/indic/md/md_indic.html</a><br/> This Maryland Integrated Watershed Data and Information System is a cooperative effort between the DNR and Dept. of Environment and provides a comprehensive database of natural resources and biological information for watershed indicators, profiles, bibliography, planning &amp; strategies and organizations.</p> |
|---|--|----------------|---|

Acronyms:

BRPs = Biological Reference Points

DNR = Department of Natural Resources

CPUE = Catch per Unit Effort

H & L = Hook and Line



## 2011 Maryland FMP Report (July 2012)

### Section 22. Yellow Perch (*Perca flavescens*)

#### Maryland FMP

Management of the Maryland yellow perch fishery has resulted in excellent recreational fishing and a smaller, controlled commercial harvest. Maryland's yellow perch fisheries have responded well to new management actions taken in 2009. The Maryland Tidewater Yellow Perch Fishery Management Plan (YPFMP) was adopted in 2002 and reviewed in 2006. The 2002 YPFMP improved on the traditional FMP format by including guidelines for ecosystem-based management. During 2008, stakeholder meetings were conducted to develop objectives for the commercial and recreational fisheries. An amendment to the plan is under development.

#### Stock Status

Yellow perch stocks are not overfished and overfishing is not occurring. Yellow perch stock assessments have been conducted every two years up to 2005 and annually since 2007 for the upper Chesapeake Bay. The biological reference points (targets and thresholds) were updated using the 2007 assessment results. The new reference points take into account uncertainty from the model and uses conservative estimates of natural mortality. The yellow perch assessment model was modified in 2009 and 2010. The updated population estimate remained stable although the population decreased from 1.5 million in 2006 to 913 thousand yellow perch in 2011. The modified model has been fine-tuned using weighting parameters. Recruitment to the population at age three has decreased from an estimated 356,000 in 2010 to 58,000 in 2011<sup>1</sup>. Instantaneous fishing mortality ( $F=0.24$ ) remains under the new target level ( $F=0.53$ )

#### Current Management Measures

After considerable public input during 2008, the fisheries are now managed on the basis of Total Allowable Catch (TAC). The TAC has been allocated 50:50 between the commercial fishery and the recreational fishery since 2009. The TAC is calculated annually based upon the stock assessment to achieve the new target fishing mortality rate ( $F=0.53$ ). Fishing mortality in 2010 was calculated at 0.24. Three management areas have been established: the Upper Bay, the Chester River and the Patuxent River. When the TAC is reached in early March, the commercial season is closed for that area. Any overages are subtracted from the following year's allocation. Commercial fishermen are required to have a special yellow perch permit. Daily reporting is required in the commercial fishery and every fish is tagged for accountability. The commercial fishery has a slot limit of 8.5 to 11 inches and there are areas closed to commercial fishing. The recreational fishery has no closed season or areas, a minimum size limit of 9 inches and a creel limit of 10.

#### Issues/Concerns

Despite controlled low fishing mortality, recruitment is expected to decrease in 2011-2012 due to poor juvenile year-classes in 2008 and 2009. Yellow perch numbers and biomass are subject to decrease as a result of poor year-class strength.

There may be local temporal and spatial conflicts where recreational fishing and commercial activity overlap.

#### The Fisheries

The 2011 TAC of 37,520 pounds for the Upper Bay management area was exceeded by 23 pounds before the season was closed. The TAC was not reached in the Chester River or the Patuxent River management areas.

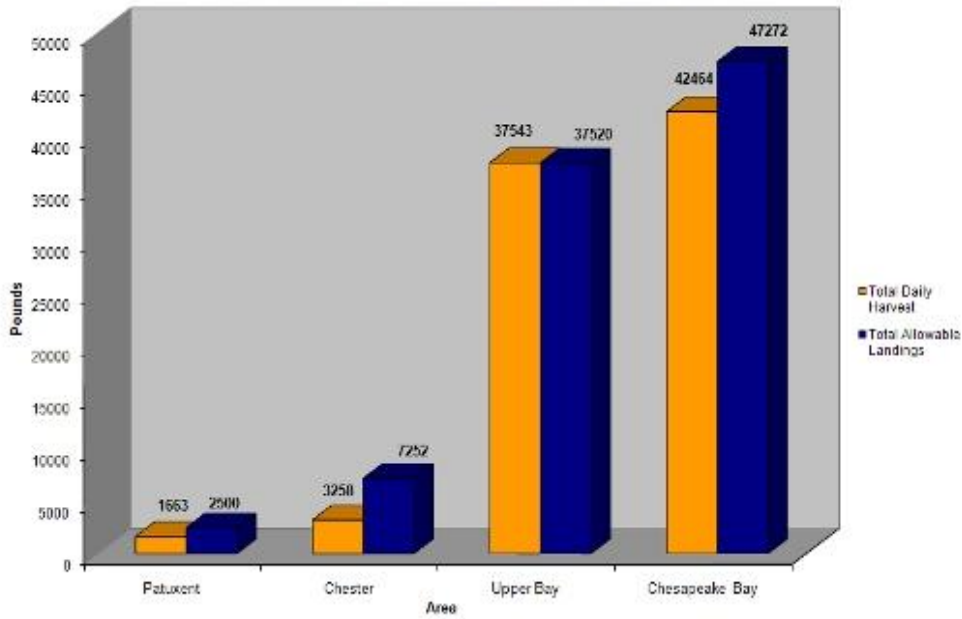
The 2012 TACs were not reached in any management area. Final TACs for 2012 were 38,950 pounds for the Upper Bay, 6770 pounds for the Chester River and 2500 pounds for the Patuxent River. The Upper Bay harvest was under the TAC by 1757 pounds, while the quotas remaining for the Chester and Patuxent Rivers were 1252 and 1213 pounds respectively. The 2012 season was the first season in which there wasn't any harvest overage for any management region.

The 2013 TACs are being calculated and will be announced at the end of August, 2012. Following the announcement of the 2013 TACs, commercial fishermen will have the opportunity to declare their intent to participate in the fishery and to apply for a permit. The declaration period is open for one month. Commercial fishermen who fail to declare their intent will not be eligible to participate in the fishery.

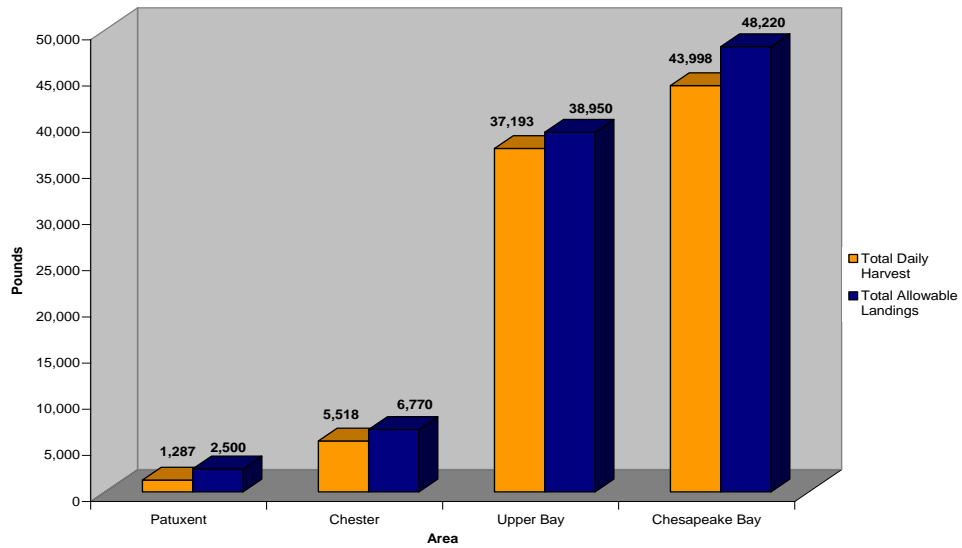
#### References:

<sup>1</sup> Piavis, P.G. and E. Webb, III. 2012. Population and vital rates of resident finfish in selected tidal areas of Maryland's Chesapeake Bay. Maryland Department of Natural Resources, Federal Aid Annual Report, F-61-R, Annapolis, Maryland.

2011 Commercial Yellow Perch Harvest through March 10, 2011



2012 Commercial Yellow Perch Harvest through March 10, 2012



**2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table** (updated 06/12)

| Section                            | Action  | Date         | Comments  |
|------------------------------------|---|--------------|---|
| Implement Ecosystem Considerations | 1) Adopt the following ecosystem guidelines   | 2001         |   |
|                                    | 1.1) Participate in forums, which develop federal or state water quality criteria.  | Ongoing      | Refer to Appendix 1-1 for Chesapeake Bay Program (CBP) efforts. Groups addressing tributary strategies and prioritizing watersheds activities have been made aware of yellow perch. Yellow perch is a focal species for the Corsica River Targeted Watershed project.   |
|                                    | 1.2) Cooperate with the MD Department of Natural Resource's (DNR) Chesapeake and Coastal Watershed Services in the development of watershed assessment surveys, watershed restoration plans and in the implementation of restoration and enhancement projects | Ongoing      | Watershed & tributary groups use the Anadromous and Estuarine Finfish Spawning Locations in Maryland, Technical Rept. # 42 (Mowrer & McGinty 2002) during discussions of strategies and actions. To date, 25 watershed restoration action strategies (WRAS) plans have been developed. Each WRAS includes a watershed characterization report, a synoptic survey (water quality & biological) and a stream corridor assessment. Fisheries staff has been involved in reviewing proposals. Funding for developing additional plans ended in 2006. DNR, OOS has developed the "blue infrastructure". This GIS based analysis identifies and prioritizes tidal aquatic habitat and connected watershed features. Yellow perch habitat has been included. |
|                                    | 1.3) Participate in the review of permits for projects, which have the potential for significant impact on fishery resources.   | Ongoing      | Coordinate with DNR Environmental Review Unit (ERU). The ERU typically reviews 2,500 to 3,000 projects per year. During FY'06 over 800 projects were considered for yellow perch impacts. The ERU has been restructured to include representatives from the major units with DNR. This new structure should aid in improving coordination on restoration and protection projects. As a result of the 2008 Fisheries Task Force recommendations, ERU includes FS staff and fisheries issues are considered in the process.   |
|                                    | 1.4) Cooperate with the CBP and the Atlantic States Marine Fisheries Commission (ASMFC) to develop models, collect and exchange data, and support research projects that explore multispecies management.   | Ongoing      | DNR has provided fishery data for the input parameters of the CBP Ecopath/EcoSim modeling efforts. To date, most of the multispecies initiatives have been focused on migratory species. Yellow perch has not been included in any modeling scenarios but has been recognized as a priority species from a tributary/watershed perspective. Fisheries Ecosystem Project has developed a model of Head-of-Bay yellow perch biomass dynamics that incorporates predation and nutrient management impacts. A cooperative DNR-NMFS CBP effort to develop a Head-of-Bay Ecopath/Ecosim model was initiated for the Yellow Perch Workgroup, but was discontinued.   |
|                                    | 1.5) Develop funding sources for habitat restoration.   |              | No new yellow perch habitat projects have been funded. Corsica River Project will provide some info on watershed management in relationship to yellow perch.  |
|                                    | 1.6) Develop research proposals to examine habitat fish linkages.   |              | Impervious surface and its impact on aquatic resources (especially fish) are currently under study. There appears to be a 10% IS threshold for fish that also relates to other habitat parameters. Letters of endorsement were supplied for proposals researching habitat and development.  |
|                                    | 2) Initiate a Severn River Ecosystem study that focuses on life history stage analysis to assess the effects of degraded habitat on stock abundance.  | 2001<br>2005 | DNR completed field work in 2005. The field results indicated low juvenile survival, low DO and high salinity. Volunteers have been enlisted to monitor yellow perch larvae in the Severn River. These data are incorporated into impervious surface analyses. Severn River habitat has been monitored by the Riverkeeper program ( <a href="http://www.severnriverkeeper.org/Monitoring07.htm">http://www.severnriverkeeper.org/Monitoring07.htm</a> )   |

**2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table** (updated 06/12)

| Section   | Action  | Date             | Comments   |
|---|---|------------------|--|
|   | 3) Use the Yellow Perch FMP as a model for the application of ecosystem-based fishery management principles and develop new methods of application/implementation.  | Ongoing          | The Corsica River Project and Mattawoman Watershed Agreement both use the “best management practice” approach. They include a diverse partnership and strive to minimize development as much as possible. Although Smart Growth is charged with minimizing development, it only addresses infrastructure. Fisheries staff continues to work with citizens and county government on the importance of aquatic health and use the Severn River as an example. It is important to identify prime habitat and aquatic resources and encourage/implement good land management decisions for protection. Impervious surface reference points have been proposed that could directly apply to yellow perch management. Priority habitat areas for fish have been mapped.  |
| Restore Yellow Perch Habitat and Enhance Yellow Perch Populations | 4) Use the table on Stock Status and Exploitation and the watershed planning process, to designate yellow perch areas for restoration, maintenance or enhancement and develop specific habitat strategies for each area.                              | Ongoing          | The table was updated but a more general watershed management approach is necessary. There should be an emphasis on preserving habitat especially in more pristine areas. Blue infrastructure may aid in determining priority areas for preservation and restoration. The Fish Passage Program continues to collect ichthyoplankton in some historical yellow perch spawning streams and compare the results with historical yellow perch ichthyoplankton data, as additional information useful in assessment of fish passage projects and the importance of future blockage removals.  |
|   | 5) Designate the currently closed rivers as yellow perch areas of particular concern, so if resources and funding become available, they can be directed to these areas.  | 2002             | Before 2009, the Magothy, Nanticoke, Patapsco, Severn, South and West Rivers were identified as yellow perch spawning areas because these areas were already closed to harvest not because they were currently areas of high reproduction. It would be more appropriate to use impervious surface (IS) data and development projections to identify potential habitat areas of particular concern (HAPC). Most of the identified areas above have high IS values and degraded habitat except the Nanticoke. This action needs to be reevaluated. Based on current knowledge, Mattawoman Creek should be designated a HAPC. Blue infrastructure may aid in determining priority areas for preservation and restoration. New management strategies for 2009 opened the previously closed areas to recreational fishing only. Migration of yellow perch from Upper Bay areas into the mid-Western shore rivers is responsible for the yellow perch populations in those areas and removals by recreational fishermen will not reduce recruitment in these rivers. |
|   | 6) Form a MD DNR intra- and inter departmental team to implement habitat restoration strategies for yellow perch in prioritized tributaries of the Bay. Coordinate with the Watershed Restoration Action Plans and evaluate five watersheds annually. | 2002<br>Continue | MD FS is working with Tidewater Ecosystem Assessment (TEA) and WRAS to develop habitat recommendations. A Wye Island Yellow Perch Research and Monitoring Coordination Meeting was held in 2003. The meeting resulted in increased participation with state and federal agencies. Currently, the USFWS is conducting research on contaminants in yellow perch from different tributaries when funding is available. MDE is monitoring PCBs and mercury from fish samples and also evaluating disease. The Corsica River Project has been underway since 2005.  |
|   | 7) Identify essential fish habitat (EFH) for utilizing progressively more detailed information.   | On-going         | Results from the Impervious Surface Project of the Bush River indicate that stream habitat in developed regions is no longer viable, but yellow perch larvae are abundant in the estuary. These results indicate that other spawning locations may be more critical. Maps have been updated to illustrate essential fish habitat at different life stages.   |

**2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table** (updated 06/12)

| Section  | Action  | Date  | Comments  |
|--|---|---|---|
|  | 8) Facilitate the implementation of habitat management and restoration practices identified as important to yellow perch.   | On-going  | Working with tributary teams and local riverkeepers but the scope of work should be broadened. DNR will continue to coordinate habitat activities.  |
| Control Fishing Mortality by establishing biological reference points (BRPs) | 9) Adopt BRPs of $F_{35\%}$ and $F_{25\%}$ as a threshold for the yellow perch resource. As more data becomes available, the BRPs may be changed to reflect the most current status of the resource.  | 2002<br>Continue                                  | Continuing analysis indicates current BRPs are appropriate. The Maryland Yellow Perch Stakeholder Committee (YPSC) presented recommendations (2007) to evaluate triggers for yellow perch based on stock biomass or age structure in addition to triggers based on fishing mortality. Triggers were evaluated in 2008. <b>The target fishing mortality rate (F) = 0.53.</b>   |
| that describe the targets and thresholds (limits) for yellow perch stocks.   | 10) Adopt the decision rules for managing the yellow perch resource based on the target and threshold mortality rates and utilize the decision rules to make recommendations regarding the yellow perch systems currently under assessment. | 2002<br>Continue                                  | Decision rules have been adopted. Based on a <b>target fishing mortality rate (F=0.53) a 2012 Chesapeake Bay TAC of 48,220 pounds was calculated. This was an increase from the previous year's TAC of 47,272 pounds. The calculated 2012 TAC for the Upper Bay commercial fishery was 38,950 pounds. The Chester River TAC was 6770 pounds and the Patuxent River TAC was 2500 pounds.</b> Improved catch reporting included daily call-ins, verified by tagging. These measures were implemented in 2009 to improve accountability <b>and have continued.</b>       |
|  | 11) Utilize Table 1 of MD Yellow Perch FMP to guide the development of management strategies and actions for selected river systems within the MD portion of the Bay.   | On-going<br>Evaluated/<br>Updated<br>Periodically | Management actions may include size limits, creel limits, closed seasons, area closures, and/or gear restrictions. The table was updated (2006) but needs to be reexamined for its usefulness in guiding management strategies. Starting with the 2009 season, the annual stock assessment will determine the strategies and actions for three management areas – Upper Bay, Chester River, and Patuxent River for commercial fishing. The stock assessment, creel surveys, and public input will help determine strategies and actions for the recreational fishery. |
|  | 12) Continue the 8.5 -11 inch slot limit for the commercial fishery in all open areas and adjust fishing mortality (F) depending on the most recent stock assessment.   | 2000<br>Assessed<br>annually                      | Slot limit has not changed and is currently in place. Analysis was conducted and evaluated. Slot limit was selected to be the most robust approach. Fishing mortality was below targets in all years. No changes in management recommendations. During stakeholder meetings in 2008, the slot limit was widely supported.   |
|  | 13) Continue the uniform recreational minimum size limit of 9 inches in all open areas. Adjust size and/or creel limits depending on the most recent stock assessment.  | 2000<br>Assessed<br>annually                      | The 9 inch size limit is still in effect. Fishing mortality was below targets in all years. No changes in management recommendations. Based upon recent stock assessments, the creel limit was increased from 5 to 10 yellow perch effective with the 2009 recreational season.   |

**2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table** (updated 06/12)

| Section  | Action   | Date                                 | Comments   |
|--|--|--------------------------------------|--|
| User Conflicts   | 14) Establish an ad hoc yellow perch committee comprising stakeholders to provide input into the yellow perch management process.  | 2001                                 | The ad hoc group will meet as necessary. The Sport Fish & Tidal fish advisory committees will also consider new recommendations. Ad hoc group was empanelled and met during 2006-2007. No progress was made on reducing conflicts. Stakeholder meetings held in 2008 produced compromises that allow both quality recreational fishing and a limited commercial fishery.   |
| Examine the conflict between commercial and recreational uses of yellow perch.<br>Identify | 15) Evaluate the utility of a web-based volunteer angler survey to collect data on the recreational fishery and implement the survey if feasible.  | 2002                                 | A pilot program to utilize angler logbooks was implemented, but the anglers did not return any information. The program was discontinued. A web-based angler survey was implemented in 2008 and continued through 2011. The information provided by anglers in 2010 showed a high perception of success (64%). Larger yellow perch were caught in 2010 than in 2009. The Chester River and Susquehanna River produced the highest catch rates of approximately 6 fish per hour.  |
| any problems and recommend solutions.  | 16) MD DNR has implemented a system to track the use of pound nets in the Bay. Evaluate the pound net system. For tracking fyke nets and make recommendations for their use.   | 2003                                 | Fixed gear restrictions are county specific. DNR has done unofficial counts of fyke nets and over the last few years the number of fyke nets has decreased. The number of nets is recorded on reporting forms but it is difficult to get effort data. Regulations to prohibit the use of fyke nets in tributaries upstream of the first 200 ft. channel width during the month of February were implemented for 2008. The width limit was changed in 2009 to a geographic and temporal restriction by area. Future needs are to better define fyke nets. |
|  | 17) If fishing mortality is too high in relation to the adopted targets, strategies to reduce fishing effort will be explored. Topics to be considered include but are not limited to: capping the number of fyke nets per fishermen, the placement of fyke nets in river systems (i.e., total number per river system; distance between nets); daily harvest restrictions; and seasonal quotas. | As necessary                         | When targets have been exceeded, these types of management strategies to reduce fishing effort will be evaluated. Total Allowable Catch (TAC) is calculated based on the latest stock assessment starting in 2009. Allocation of the TAC between commercial fishing and recreational fishing is determined after considering input from stakeholders. <b>The public notice required to close the commercial fishery has been reduced from 48 hours to 24 hours.</b>  |
|  | 18) Evaluate the need for increased enforcement of yellow perch regulations, develop strategies to meet the needs and implement actions accordingly.   | To be determined<br>2001<br>continue | NRP makes a special effort to enforce yellow perch regulations during spring spawning run. They also conduct a yellow perch creel survey based on random stops and interviews, mostly at road crossings.   |
| Stock Status<br><br>MD DNR will monitor yellow perch stocks in representative areas of the | 19) Continue to sample commercial and recreational harvest of yellow perch and collect basic biological data. Additional biological data may indicate changes in the status of the stocks and require additional management measures.  | On-going                             | Chesapeake Finfish Program (previously FS Multispecies Project) collects yellow perch data from commercial and experimental fyke nets, seine and trawl surveys and uses data to periodically assess stocks. Choptank River and upper Chesapeake Bay populations have increased based on latest assessments (2009) but recruitment is expected to decrease in the future (2011-2012).   |

**2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table** (updated 06/12)

| Section  | Action  | Date                           | Comments  |
|--|---|--------------------------------|---|
| Chesapeake Bay in order to assess yellow perch stock status. Assessment and                                | 20) Develop a method for evaluating yellow perch recruitment and utilize it as one of the parameters for assessing stock status and consequent management actions.  | 2003                           | Yellow perch recruitment has been monitored on the Severn River but no longer a priority. DNR utilizes the EJFS in the upper Bay for information on recruitment. Larval survey methods are being evaluated for use in tributaries. The Nanticoke, Bush, Corsica and Severn rivers were sampled in 2006.   |
| management efforts will be focused on areas already under special management measures, i.e., closed areas. | 21) Yellow perch egg strands are easy to collect and important for hatchery and/or aquaculture endeavors. Maryland will prohibit the removal or selling of egg chains that have been stripped by artificial methods, unless a scientific collection permit has been issued. | 2001<br>2005                   | A person needs a Scientific Collection Permit as described in Natural Resources Article, §08-02.12.02, of the Annotated Code of Maryland, to collect yellow perch eggs. Effective Feb. 2005, a person may not catch or possess yellow perch eggs from any state waters (08.02.05.07F).  |
|  | 22) Evaluate additional fishery-independent indicators of stock status, such as the trawl survey in the upper Bay.  | On going                       | Implementation of this action is dependent on manpower and funding  |
|  | 23) Review and evaluate yellow perch monitoring efforts biannually. Recommend changes in monitoring and protocol necessary to implement the yellow perch FMP.   | 2002 and even years thereafter | Evaluated annually. Added Marshyhope River to fyke net sampling schedule. Contracted with CBL to do a 2008 yellow perch creel survey in Bush River, Mattawoman Creek, Wicomico River (western shore), and Chester River. Additional rivers were surveyed in 2009 – Chester, Bush, Northeast, Patuxent, South, Magothy and 3 tributaries of the Potomac (Mattawoman Ck., Nanjemoy Ck., Wicomico R.). Funding for this creel survey was cut for 2010. <b>DNR Fisheries Service studies fisheries independent and dependent surveys. Fisheries independent efforts include the Upper Bay Winter Bottom Trawl Survey (Sassafras River, Elk River, Upper Bay, Mid Bay, in 2011) and Choptank River Fishery Independent Sampling. Fishery dependent efforts include Upper Chesapeake Bay fyke net surveys (Gunpowder River, Back River and Middle River vicinities) and Nanticoke River fyke and pound net surveys.</b> |

**2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table** (updated 06/12)

| Section  | Action   | Date            | Comments  |
|--|--|-----------------|---|
| <p>Yellow Perch Outreach</p> <p>MD will continue outreach efforts to engage fishing and non-fishing communities in stewardship of the yellow perch resource in tributary basins.</p> | <p>24) Utilize volunteers from the recreational fishing sector, such as the Coastal Conservation Association or watershed community associations, to obtain recreational data in areas not sampled by the MD DNR Multispecies Project. Explore the use of volunteer recreational survey using the web similar to the recreational survey implemented for striped bass.</p> | <p>Open</p>     | <p>Dependent on volunteer recruitment. The volunteer angler survey did not generate any response and was discontinued. A web-based angler survey has been produced and was implemented in 2008. CCA, MSSA will be asked to promote angler participation. <b>The access to the survey and the summary of the 2010 volunteer yellow perch survey can be viewed at:</b><br/> <a href="http://www.dnr.state.md.us/fisheries/survey/index.asp?page=yellow_perch">http://www.dnr.state.md.us/fisheries/survey/index.asp?page=yellow_perch</a></p> |
|  | <p>25) Add yellow perch egg strand sampling in the early spring to river basins with volunteer monitoring programs to obtain data on yellow perch spawning locations.</p>  | <p>Open</p>     | <p>CCA conducts stream walks utilizing citizen volunteers. The information is used to indicate spawning presence, although zero egg sightings does not mean there is no spawning in a particular system. Shifts away from “traditional” spawning locations may be indicative of habitat degradation and subsequent shifts by spawning yellow perch to more suitable spawning habitats.</p>  |
|  | <p>26) MD DNR will continue to partner with the Yellow Perch Hatch, Raise and Release Project by providing assistance and advice in the collecting, raising, releasing, and stocking of yellow perch in all facets of the project.</p>   | <p>2004</p>     | <p>Focus has changed to American eel and bluegill as an educational tool. Experience in Severn River (Arlington Echo) indicated too low viability of local eggs for successful program with yellow perch.</p>   |
|  | <p>27) MD DNR Fisheries Outreach will explore new avenues to involve the public in yellow perch projects, such as a new exhibit on identifying yellow perch egg strands and collecting information on their occurrence and distribution: cooperative efforts with the Team program; and volunteer monitoring opportunities.</p>  | <p>On-going</p> | <p>Volunteer monitoring has occurred in the Bush, Severn and Corsica to monitor eggs, larvae and juveniles and to assess aquatic health (water quality). Fisheries staff has continued to give presentations to fishing clubs, environmental organizations, etc. upon request.</p>  |

Acronyms:

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|--|--|
| BRPs= Biological Reference Points      | CBP = Chesapeake Bay Program                           |
| CCA = Coastal Conservation Association | DNR = Department of Natural Resources                  |
| DO = Dissolved Oxygen                  | EJFS = Estuarine Juvenile Finfish Survey               |
| FMP = Fishery Management Plan          | MSSA = Maryland Saltwater Sportfishermen’s Association |
| NRP = Natural Resources Police         | OOS = Office of Sustainability                         |
| SHA = State Highway Administration     | TAC = Total Allowable Catch                            |