



Fishery Management Plans
Report to the Legislative Committees

Prepared by

Maryland Department of Natural Resources
Fisheries Service
Fishery Management Plan Program

June 2010



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Fishery Management Plan (FMP) Updates

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. Additional information on stock status and fishery management measures for these migratory fish species can be found at www.asmfc.org and 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.

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. 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.

Improving Recreational Data Collection

Over the past few years efforts have been focused on improving recreational fishery statistics. The Marine Recreational Information Program (MRIP) is being implemented by NOAA Fisheries in conjunction with the Atlantic coastal states, to collect data to characterize recreational catch and effort in marine waters. MRIP is designed to support ecosystem-based management and will replace the Marine Recreational Fisheries Statistics Survey (MRFSS). MRIP has been under development since 2005 and addresses issues that existed in the MRFSS such as data gaps, bias, consistency, accuracy, and timeliness. MRIP should provide a comprehensive and detailed picture of the number of trips being taken by recreational anglers, the amount and species of fish caught, where and when the fish are being caught, and the economic impact of recreational fishing on local, regional and national economies. Data collection will address regional differences in management and

stakeholder needs. The MRIP program is Maryland's major source of information for recreational fishery statistics and is an important component of all coastal stock assessments.

As a result of the amended Magnuson-Stevens Act to enhance data collection for fisheries management purposes, a new federal law went into effect January 1, 2010. The new law requires most saltwater fishermen to sign up with the National Saltwater Angler Registry. The registry is part of an overall program to enhance recreational fishing data. It is similar to a "phone book" of recreational anglers. It will help create an efficient method for obtaining recreational data and create a solid statistical foundation for estimating catch and effort. Reliable recreational data is essential for achieving sustainable fishery resources and prevent overfishing.

Maryland did not have a system to capture the contact information for all salt water recreational anglers as required by the National Saltwater Angler Registry. The Department has the appropriate information for individuals who have fishing licenses, but does not have any data for those who are not currently required to possess a license. Consequently, Maryland needed to change its recreational fishing license to comply with the National Saltwater Angler Registry requirements. During the 2010 legislative session, House Bill 1345, concerning recreational fishing licenses, was passed. This licensing bill is consistent with the NOAA licensing requirements but will not go into effect until 2011. For 2010, recreational fishermen are required to register with NOAA without paying any fee. Next year, the NOAA requirements will be addressed by the new licensing requirements mandated by Maryland DNR.

Section 1. American Eel (*Anguilla rostrata*)

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 ASMFC adopted a coastal FMP for American Eel in 1999. 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. YOY surveys have been completed in Maryland since 1998. Each jurisdiction is required to complete an ASMFC annual compliance report (See www.asmfc.org for more information).

Stock Status

The status of the American eel stock is poorly understood along the Atlantic coast and in the Chesapeake Bay. There are limited data to determine reliable indices of abundance. It is difficult to make correlations between landings data and population abundance because the fishery is market driven and fluctuates from year to year. In 2005, a peer reviewed coastal stock assessment was completed. Biological reference points were not established during the stock assessment due to a lack of abundance data and fishery exploitation rates. The coastal states will continue monitoring and assessment efforts in order to develop biological reference points in the future.

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 now consider whether or not eels would benefit from implementing a proposed project.

The Fishery

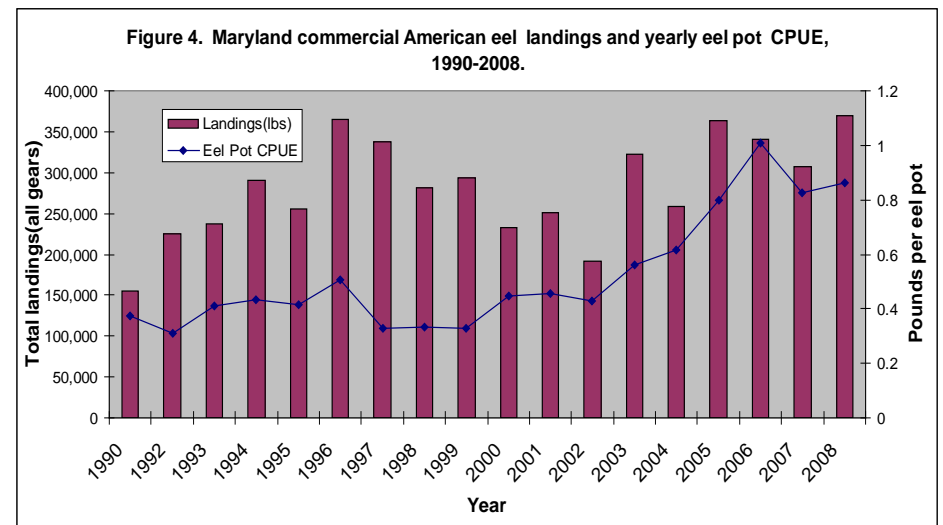
In 2008, total reported commercial eel landings for Maryland were 369,890 pounds (see figure). This amount was higher than the mean annual landings of 247,637 (1983-2008). Preliminary landings for 2009 are 306,563 pounds. Current data suggests that Chesapeake Bay catch per unit effort (CPUE) is increasing while trawl survey indices are decreasing. However, there is a lot of variability in how CPUE is estimated. There is a need to standardize the reporting of effort. Fishermen with a recreational crab license can use up to 10 pots for bait for personal use.

Current Management Measures

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.

Issues/Concerns

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.



(From Whiteford 2009)

1991 Chesapeake Bay American Eel Management Plan Implementation Table (updated 12/09)			
Problem Area	Action	Date	Comments
1. Stock Status	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 1993 Continue	Stock status of eels is poorly understood but there are indications that abundance has declined & the stock is at low levels. A coastal stock assessment was conducted in 2005/2006 but failed some of the terms of reference. A new coastal stock assessment is scheduled for completion in 2011. 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 eel/day. Recreational limit in VA and by PRFC is 50 eel/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 ² 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 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. Commercial landings during 2008 were 369,890 lbs and 76,000 lbs from MD & VA, respectively.
	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 have been added to the 2009 draft SRAFRC plan with specific actions for eel passage on the Susquehanna River.
2. Bait Fishery	2.1 MD will require the reporting of eels used for crab bait on crab reporting forms	1993 2007 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.
3. Research Needs	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 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.

1991 Chesapeake Bay American Eel Management Plan Implementation Table (updated 12/09)			
Problem Area	Action	Date	Comments
	3.2 Encourage research to collect basic biological and socioeconomic information	Continue 2000 2001 2004 2006 Continue	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). 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.
4. Habitat and Water Quality Issues	4.1 Continue to provide stream passage	2000 2005 2009	A new CBP fish passage goal was adopted in 2005 to open additional 1,000 miles of tributary by 2014. ASMFC approved Addendum II to the Coastal FMP (Oct. 2009) which places increased emphasis on improving upstream and downstream eel passage. USFWS is currently conducting a study to determine the timing & 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.
	4.2 Continue to set specific objectives for water quality goals and habitat requirements.	Continue	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.

Acronymns:

ASMFC= Atlantic States Marine Fisheries Commission

CBP = Chesapeake Bay Program

FMP= Fishery Management Plan

C2K= Chesapeake 2000 agreement

DO = Dissolved oxygen

PRFC= Potomac River Fisheries Commission

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

A Coastal Bays Blue Crab Fishery Management Plan (FMP) was adopted in 2001 to conserve the coastal blue crab stock, protect its ecological and socio-economic values, and optimize the long-term utilization of the resource. The development of an FMP was triggered by the Comprehensive and Conservation Management Plan 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.

Stock Status

Analysis of the Coastal Bays Finfish Investigation (CBFI) Trawl Survey data (Figure 1) 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.

Fishery Statistics

Maryland's Coastal Bays support both a commercial and recreational blue crab fishery. Since 1994, annual commercial harvest of blue crabs from the Coastal Bays has ranged from 0.54 to 1.9 million pounds with an average harvest of 1.2 million pounds (Figure 2). 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 indicate that the number of infected crabs follow 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 (data from MDNR)

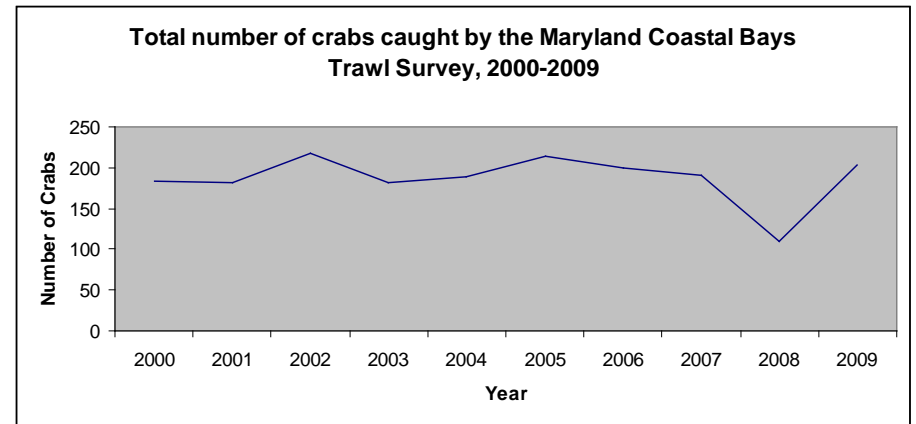
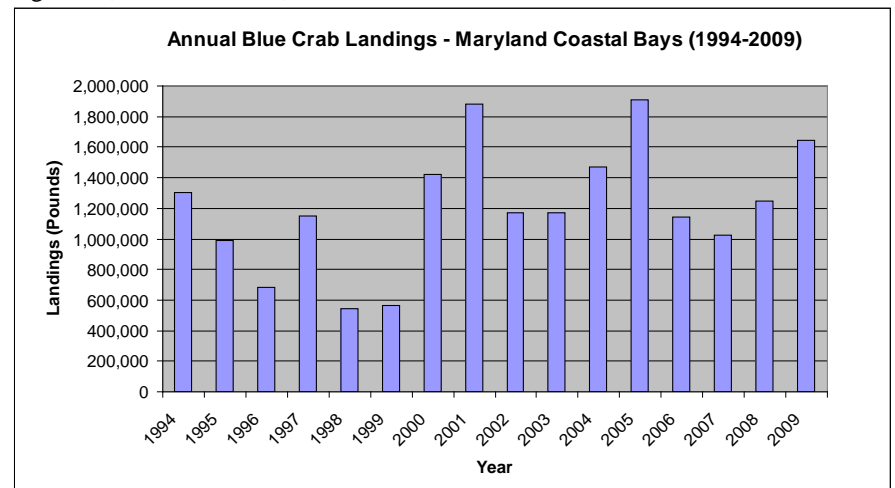


Figure 2 (data from MDNR)



2001 Coastal Bays Blue Crab Fishery Management Plan Implementation (last update 3/10)		
Objective/Problem	Action	Implementation
Obj. 1. Improve our understanding of how <i>Hematodinium</i> contributes to the mortality and population abundance of blue crabs. Prob. 1.1: Research and Monitoring.	1.4.1 DNR and MCBP will identify potential funding sources to support the following research and monitoring activities: 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>). 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. c) Examine how crabs become infected with <i>Hematodinium</i> .	Current research includes monitoring prevalence in MD coastal bays. Research is ongoing with the NOAA Oxford Cooperative Lab and the University of Maryland Biotechnology Institute Center of Marine Biotechnology.
	1.4.2 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. Prob. 2.1: Stock Status	Action 2.1.1: Adopt an overfishing threshold consistent with Chesapeake Bay that preserves a minimum of 10 percent of the blue crab's spawning potential (F ₁₀ percent), and a fishing target that preserves 20 percent of an unfished stock. (F ₂₀ percent).	No targets and thresholds have been determined for Coastal Bays blue crabs. Reported landings of hard, soft and peeler crabs from the Coastal Bays was 1.6 million lbs (2009). Average landings have been approximately 1.3 million lbs.
	2.1.2: 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 ₂₀ 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. Research needs have not been defined.
	2.1.3: 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.
	2.1.4: 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	Not yet initiated.

2001 Coastal Bays Blue Crab Fishery Management Plan Implementation (last update 3/10)		
Objective/Problem	Action	Implementation
	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).	
	2.1.5: 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.	2.2.1: 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. a) Evaluate the effectiveness of the A pilot@ daily logbook reporting system implemented in 2000 for commercial crab harvesters and dealers in Worcester Co 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.
	2.2.2: 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.	2.3.1: 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.
	2.3.2: DNR will identify potential funding mechanisms to fund and complement monitoring efforts outlined in Strategies 2.3.1 and 2.1.1.	Not yet initiated. .
Prob. 2.4: Invasive, Non-indigenous	2.4.1: 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

2001 Coastal Bays Blue Crab Fishery Management Plan Implementation (last update 3/10)		
Objective/Problem	Action	Implementation
Species		America, green crabs have been shown to significantly reduce populations of shellfish including soft shell clams, scallops and hard clams.
	2.4.2: DNR will evaluate the following management strategies related to green crabs: a) DNR will prohibit the possession and sale of imported green crabs, and promote the harvest and sale of locally harvested green crabs. b) DNR will prohibit the importation and sale of green crabs.	Green crabs have not be prohibited as bait. They are prohibited from being transported (COMAR 08.02.19.04)
	2.4.3: 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.
	2.4.4: 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 (2009)</u>, a book about the Coastal Bays.
Prob. 2.5: Functional Role of Blue Crabs in the Natural Ecological Community.	2.5.1: 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.	Not yet initiated
Obj.3. Maintain an economically stable and sustainable commercial blue crab fishery.	3.1.1: 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.
	3.1.2: 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 other management strategies as necessary, to prevent further increases in fishing effort. a) Gear Restrictions - 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	Completed. Prohibition of scrapes & dredges has been enacted. (COMAR.08.02.03.06E)

2001 Coastal Bays Blue Crab Fishery Management Plan Implementation (last update 3/10)		
Objective/Problem	Action	Implementation
	habitat; b) Time Restrictions - 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. 1) For 2001 - Prohibit the taking of crabs for commercial purposes between 2:00 p.m. and 5:30 a.m.	Time restrictions have been enacted. (COMAR.08.02.03.06D2) Closed season enacted: November 1 to April 1. (COMAR 08.02.03.06C)
Prob. 3.2: Harvest of Female Crabs,	3.2.1: 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. a) Area Closures - 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: 1) The Convention Hall site, bayside of Ocean City roughly between 36 th and 50 th Street; and 2) The Thorofare site, in southern Isle of Wight Bay; 3) The Bridge site, just north of the Verrazano Bridge on the barrier island side. b) Catch and Size Limits - Determine if the current catch and size limits for female crabs are appropriate.	Ongoing.
	3.2.2: DNR will investigate the economic impact of prohibiting the possession and sale of sponge crabs within the state.	Completed. (Lipton and Sullivan 2002).
Prob. 3.3: Wasteful Harvest Practices.	3.3.1 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).	Ongoing
	3.3.2: 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).	Hydraulic Clam Dredging is currently prohibited in Maryland's Coastal Bays, 2007. Natural Resource Article § 4-1002
	3.3.3: 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 investigate the feasibility (i.e. effects on catch; economic impact) of requiring terrapin excluders in all crab pots set in the coastal bays.	Ongoing. (Lukacovic et al. 2005)

2001 Coastal Bays Blue Crab Fishery Management Plan Implementation (last update 3/10)		
Objective/Problem	Action	Implementation
	3.3.4: MCBP will coordinate an annual/seasonal volunteer effort to locate and remove derelict pots.	Ongoing.
Obj. 4. Improve the recreational crabbing experience. Prob. 4.1: Satisfaction of Recreational Crabbers.	4.1.1: DNR and MCBP will obtain information on satisfaction levels of recreational crabbers in the coastal bays to evaluate the effectiveness of management measures.	Not yet initiated.
	4.1.2: DNR will examine the effects of habitat quality on the success rates of recreational crabbing in the coastal bays.	Not yet initiated.
	4.1.3: DNR and MCBP will develop and distribute the following information pertaining to the recreational crab fishery in the coastal bays: a) Recreational crabbing brochure summarizing crabbing restrictions; b) Recreational crabbing sign for access points (i.e. boat ramps and fishing/crabbing piers); 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.
	4.1.4: 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. Prob. 5.1: Submerged Aquatic Vegetation (SAV).	5.1.1: DNR will alleviate the impact of hydraulic clam dredging and prop scarring to SAV in the coastal bays by: a) Prohibit hydraulic clam dredging in SAV; b) Annually documenting the areas and extent of impact; c) Researching seagrass recovery time; 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 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
	5.1.2: 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.
	5.1.3: DNR and MCBP will continue to identify SAV species needing protection and activities needing restrictions.	Ongoing.
	5.1.4: MCBP will expand surveys/citizens monitoring to ground truth SAV species	Not yet initiated.

2001 Coastal Bays Blue Crab Fishery Management Plan Implementation (last update 3/10)		
Objective/Problem	Action	Implementation
	composition and determine accuracy of photo interpretive maps.	
	<p>5.1.5: DNR and Natural Resources Conservation Service (NRCS) will develop habitat requirements for the growth of seagrasses in the coastal bays by:</p> <p>a) DNR will develop water quality requirements for seagrasses;</p> <p>b) DNR will identify areas that meet water quality requirements for restoration purposes;</p> <p>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</p> <p>d) NRCS will complete soil mapping effort for entire coastal bays</p>	<p>a) Completed (Maryland Department of Natural Resources 2004).</p> <p>b) Ongoing.</p> <p>c) Completed by MGS & DNR.</p> <p>d) Not yet initiated.</p>
Prob. 5.2: Overwintering Habitat.	<p>5.2.1: DNR will identify and protect blue crab overwintering areas in the coastal bays by:</p> <p>a) Delineating and mapping overwintering areas; and</p> <p>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)).</p> <p>c) DNR will define the criteria under which a Marine Protected Area can be effective in protecting blue crab overwintering areas.</p>	No mapping has occurred. Hydraulic clam dredging is prohibited (2007).
Prob. 5.3: Shallow Water and Shoreline Habitats.	<p>5.3.1: 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.</p>	Ongoing.
Prob. 5.4: Dissolved Oxygen.	<p>5.4.1: 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.</p>	Ongoing. (Maryland Department of Natural Resources 2004).
	<p>5.4.2: DNR will identify areas which have unsuitable levels of dissolved oxygen (i.e. < 3 mg/L) for blue crabs.</p>	Ongoing. (Maryland Department of Natural Resources 2004).
Prob. 5.5: Nutrient, Sediment and Chemical Inputs.	<p>5.5.1: 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.</p>	Ongoing. (Maryland Department of Natural Resources 2004).
Obj. 6. Improve enforcement of crabbing restrictions. Prob. 6.1: Enforcement	<p>6.1.1: DNR will consider increasing the number of enforcement personnel in the coastal bays, specifically during the crabbing season.</p>	NRP hires seasonal staff to increase patrols during summer months.

2001 Coastal Bays Blue Crab Fishery Management Plan Implementation (last update 3/10)		
Objective/Problem	Action	Implementation
of Conservation Measures.		
	6.1.2: 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

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

Coastal Bays FMP

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.

Stock Status

In 2008, hard clam densities were low in all regions of the Coastal Bays. Reasons for poor density conditions have not been determined but could be the result of unfavorable water quality conditions for hard clam survival (Ecocheck, Univ. Md 2008) and possible increased predation by blue crabs (Tarnowski 2007).

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 exclusion of hydraulic escalator dredges from the Coastal Bays, which were used in conducting stock assessments, potentially creates difficulties in evaluating the impact of this legislation on the hard clam population.

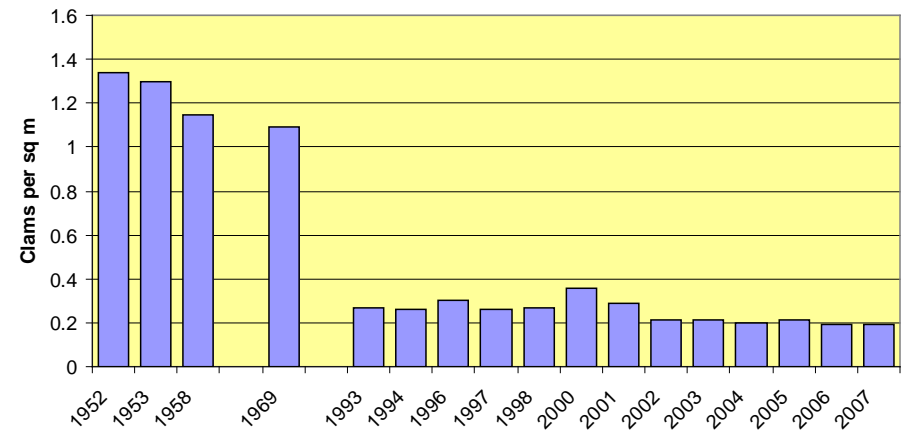
The Fishery

Harvests in the mid-1990's were below 25,000 pounds per year. Successful recruitment during this period resulted in an increase in landings, exceeding 100,000 pounds in 1999 and peaking at 163,000 pounds in 2002. Commercial effort has varied over the years and consequently, impacted annual harvest numbers. Since the implementation of the prohibition on hydraulic dredging, commercial fishery landings have been negligible. Information from the recreational fishery is largely unknown. The minimum size for hard clams is 1" with a 250/person/day limit.

Issues and/or Concerns

A large number of 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. The recommendation for 2010 is to begin to develop a new hard clam management plan.

Chincoteague Bay Hard Clam Densities



(figure from M.Tarnowski, MDNR)

2001 Coastal Bays Hard Clam Fishery Management Plan (updated 02/10)		
Objective/Problem	Action	Implementation
Obj.1. Enhance and perpetuate hard clam stocks. Prob 1.1: Mortality of Small Clams	1.1.1 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 2 seasons.
	1.1.2 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: a) Planting materials and sources; b) Enhancement areas; and 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 2 years.
Obj.2. Manage for a viable commercial hard clam harvest to maintain an economically stable fishery. Prob. 2.1: Potential Economic Harship to Commercial Clammers Caused by the “Boom and Bust” Nature of the Fishery	2.1.1 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.
	2.1.2 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.	There has been no commercial harvesting during the past 2 seasons.
Obj. 3. Evaluate the feasibility of hard clam aquaculture opportunities. Prob 3.1: Establishing Hard Clam Aquaculture	3.1.1 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.
	3.1.2 Identify problems with the permitting process, and make recommendations to specific agencies to solve those problems.	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.

2001 Coastal Bays Hard Clam Fishery Management Plan (updated 02/10)		
Objective/Problem	Action	Implementation
	<p>3.1.3 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.</p>
	<p>3.1.4 DNR will evaluate the feasibility of hard clam aquaculture in Maryland’s coastal bays by:</p> <ul style="list-style-type: none"> a) Identifying potential areas and size of area for hard clam aquaculture; b) Initiating and providing funding for pilot hard clam aquaculture studies; c) Investigating the economic impact of hard clam aquaculture; and d) Assessing the ecological impacts associated with hard clam aquaculture 	<ul style="list-style-type: none"> a) This was not meant to designate where shellfish farmers would be compelled to site their operations – that is already taken care of in Maryland 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. We have learned a great deal to date about where these grow and thrive and these factors are necessary for an economically healthy industry. Pre-approved leasing areas have been evaluated and proposed. b) This has been done through the development of a shellfish nursery at Gordon’s Shellfish that was supported by the MIPS program, as well as 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 are considered. c) This is ongoing but it can be seen that hard clam aquaculture has revolutionized the Florida fishing industry and kept many former fishermen in business when they had few other options, as well as being a multi-million dollar industry in neighboring Virginia where the production of high quality shellfish runs ahead of MD. d) We concluded a study of the incidence of the clam disease QPX in cooperation with VIMS and continue to monitor mortality in farmed clams for

2001 Coastal Bays Hard Clam Fishery Management Plan (updated 02/10)		
Objective/Problem	Action	Implementation
		disease (there has been none). We cooperated with MDNR on a study of hard clam growth in the presence of brown tide. A proposal was submitted to both Maryland Sea Grant and the Maryland Ag Experiment Station to fund a two-year study into commercial hard clam aquaculture and the relationship to SAV in the coastal bays. 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. Prob. 4.1: Limited Access and Knowledge of Recreational Clamming Opportunities in Maryland's Coastal Bays	4.1.1 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.
	4.1.2 DNR will work with the Town of Ocean City and Worcester County to improve access to recreational clamming areas	In recent years MDNR has completed 4 projects to improve or replace boat ramps and attendant facilities and have 4 additional boat ramp facility projects in the works.
	4.1.3 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.
	4.2.1 DNR will reduce the recreational catch limit for hard clams from 1 bushel to 250 hard clams per person per day.	Effected in 2002.
Obj.5. Minimize conflicts between coastal bay user groups and commercial hard clam fishermen. Prob. 5.1: Conflict Between Recreational Fishermen and Commercial Clammers.	5.1.1 DNR will prohibit commercial clamming in the area between the Ocean City Airport 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.	Effected in 2002.

2001 Coastal Bays Hard Clam Fishery Management Plan (updated 02/10)		
Objective/Problem	Action	Implementation
	5.1.2 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).
	5.1.3 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.
Prob. 5.2: Conflict Between Shoreline Property Owners and Commercial Clammers.	5.2.1 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.
Obsolete – Mechanical harvesting now prohibited.	5.2.2 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.
	5.2.3 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.
	5.2.4 DNR will investigate the impacts of prohibiting or restricting the written permission provision that allows an individual to catch hard shell clams with an 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. Prob. 6.1: Community Concern on the Ecological Effects of Commercial Hydraulic Clam Dredging.	6.1.1 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.
Obsolete – hydraulic escalator dredges now prohibited.	6.1.2 DNR will encourage studies to evaluate the ecological impacts of hydraulic clam dredging in Maryland coastal bays.	Ongoing
	6.1.3 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	Legally inadvisable (see Sec. 2.1.1).

2001 Coastal Bays Hard Clam Fishery Management Plan (updated 02/10)		
Objective/Problem	Action	Implementation
	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.	
Prob. 6.2: Direct Impact to Submerged Aquatic Vegetation (SAV) by Commercial Hydraulic Clam Dredging	6.2.1 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.
Obsolete – hydraulic escalator dredges now prohibited.	6.2.1a 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.
	6.2.1b 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.
	6.2..2 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 2 years. No action to date.
Prob. 6.3: Potential Impact to Overwintering Blue Crabs by Commercial Hydraulic Clam Dredging. Obsolete – hydraulic escalator dredges prohibited.	6.3.1 DNR will evaluate the need to restrict hydraulic dredging in important female blue crab overwintering areas by: a) Delineating female blue crab overwintering areas; <i>b) Determining the significance or contribution of these overwintering crabs to the coastal bays blue crab population;</i> c) Determining the magnitude of overwintering blue crab bycatch in the hydraulic clam dredge fishery; and 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. Prob. 7.1: Water Quality	7.1.1 Develop strategies to restore water quality in areas closed to harvesting hard clams because of pollution	Ongoing.
Prob. 7.2: Hard Bottom Habitat	7.2.1 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: a) Planting materials and sources; b) Enhancement areas; and 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	7.3.1 The MD Coastal Bays Navigation and Dredging Advisory Group (NADAG) will seek	MDNR is routinely consulted during

2001 Coastal Bays Hard Clam Fishery Management Plan (updated 02/10)		
Objective/Problem	Action	Implementation
Channel Dredging and Edge Disposal.	comments from DNR's Shellfish Program on the potential impacts of proposed dredging activities on hard clams.	the permitting process on projects that may impact hard clams.
Prob. 7.4: Growth of Noxious Algal Blooms.	7.4.1 DNR and MCBP will identify potential funding sources to support the following research and monitoring activities: 1) Assess the potential impact that noxious algal blooms have on hard clam populations; and 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. Prob. 8.1: Green Crabs.	8.1.1 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
	8.1.2 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	Ongoing.
Obj. 9. Implement fisheries dependent and independent monitoring programs to obtain sufficient and accurate data for managing hard clams Prob. 9.1: Stock Assessment	9.1.1 DNR will continue to survey the hard clam resource on annual basis in Maryland's coastal bays to facilitate management decisions.	Ongoing.
Prob. 9.2: Assessment of Bottom Enhancement Activities.	9.2.1 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.	9.3.1 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 2 seasons.
Prob. 9.4: Recreational Catch, Effort and Economic Data.	9.4.1 DNR will facilitate the design and implementation of a recreational clamming survey in Maryland's coastal bays.	Questions on recreational clamming were included as part of a broader 2006 angler survey by UMES.

Acronyms:

DNR = Department of Natural Resources

MIPS = Maryland Industrial Partnerships

NRP = Natural Resource Police

UMES = University of Maryland Eastern Shore

VIMS = Virginia Institute of Marine Science

Section 12. Horseshoe Crab (*Limulus polyphemus*)

Chesapeake Bay FMP

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.

ASMFC's Interstate Fishery Management Plan for Horseshoe Crab and Addendum I established state-by-state quotas on bait landings. The quotas were set at 25% below reference period landings. Addendum II allowed quota transfer between states. Addendum III further reduced commercial harvest of horseshoe crabs for bait in and around Delaware Bay. This action was taken because horseshoe crab eggs are a major dietary component for migratory shorebirds including the rufa red knot (*Calidris canutus*), whose population has decreased since the 1980s. Addendum IV placed a two-year harvest restriction (October 1, 2006 to September 30, 2008) on Delaware and New Jersey fisheries. Since a portion of Maryland and Virginia's horseshoe crabs landings originate from Delaware Bay, Maryland and Virginia (Federal waters only) were required to have a January 1 through June 7 harvest restriction during the same time period as Delaware and New Jersey. Addendum V extended harvest restrictions until October 31, 2010. Addendum VI was initiated in 2010 to develop management options prior to the expiration of Addendum V. Maryland is required to submit an annual compliance report to ASMFC.

Stock Status

Tag and release studies have demonstrated that a significant proportion of horseshoe crabs caught in coastal Maryland waters are from the Delaware Bay stock. Spawning survey results from Delaware Bay detected a significant increase in male spawning activity, but it did not detect any trend in female spawning activity. Available data indicate that the Delaware Bay stock is undergoing positive population growth. Juvenile and adult male horseshoe crab abundance has increased significantly since 1998. An increase in adult female abundance was detected by one of the five monitoring surveys. These demographic patterns match expected abundance trends for a recovering population. No biological reference points to determine overfishing and overfished conditions have been developed due to limited data. However, a relative biomass index and a relative fishing mortality index were developed for the 2009 stock assessment to estimate trends since 1998 (Figure 1). Relative biomass decreased during 1994 to 2001. By 2009, horseshoe crab relative biomass increased to 1991 levels. Relative fishing mortality peaked in 1998, but has since decreased to the 1991 level.

In 2009, the ASMFC Horseshoe Crab Technical Committee and Shorebird Technical Committee jointly developed a multi-species management framework for horseshoe crab harvest based on structured decision making and adaptive management paradigms. This multi-species management framework is unique because it links the demographics of each species by incorporating biological and habitat metrics. The multi-species management policy is primarily for harvest in Delaware Bay, but it relies on multi-state monitoring efforts.

Current Management Measures

Addendum IV (2006) to the ASMFC FMP established the current January 1 through June 7 harvest restriction in Maryland. Male horseshoe crabs may be harvested from May 1 to June 7. Maryland's 2009 harvest total was 165,344 crabs. The fishery start date for 2010 was delayed until July 13. Maryland's harvest quota has remained at 170,653 horseshoe crabs since 2004. Maryland horseshoe crab landings have varied between 200,000 and 700,000 crabs since 1998 (Figure 2).

The biomedical uses of horseshoe crabs have advanced eye research, surgical suture wound dressing development, detection of bacterial endotoxins in pharmaceuticals and cancer research. Currently, horseshoe crabs are bled to isolate *Limulus* Amebocyte Lysate which is used to screen injectable drugs, biologics, medical devices, and raw materials for the presence of endotoxins. Mortality is low during the bleeding process (Figure 3) but is estimated to be 15% when release mortality is included. Since 2004, crabs collected for the biomedical industry can also be used for the bait market as long as the crabs are counted towards the bait quota. Coast wide, biomedical harvest has increased from 343,126 crabs (292,760 were bled) in 2004 to 511,478 crabs (423,614 were bled) in 2008.

Issues/Concerns

Horseshoe crab spawning stock and egg production are being monitored for sufficient egg production to support migratory shorebird feeding (esp. red knot *Calidris canutus*). The coastal states need to continue developing and using the multi-species management framework that includes red knot population status to modify horseshoe crab harvest policy. Increased catch for the biomedical industry has caused increases in horseshoe crab mortality. Catch limits for the biomedical industry will need to be developed. Only limited funds are available to collect population data for the Delaware Bay stock which is necessary for developing a stock assessment.

The Fisheries

Figure 1. Horseshoe crab relative biomass (B/BMSY) and fishing mortality (F/FMSY) with 50% and 80% confidence intervals (CI) as estimated by the surplus production model.

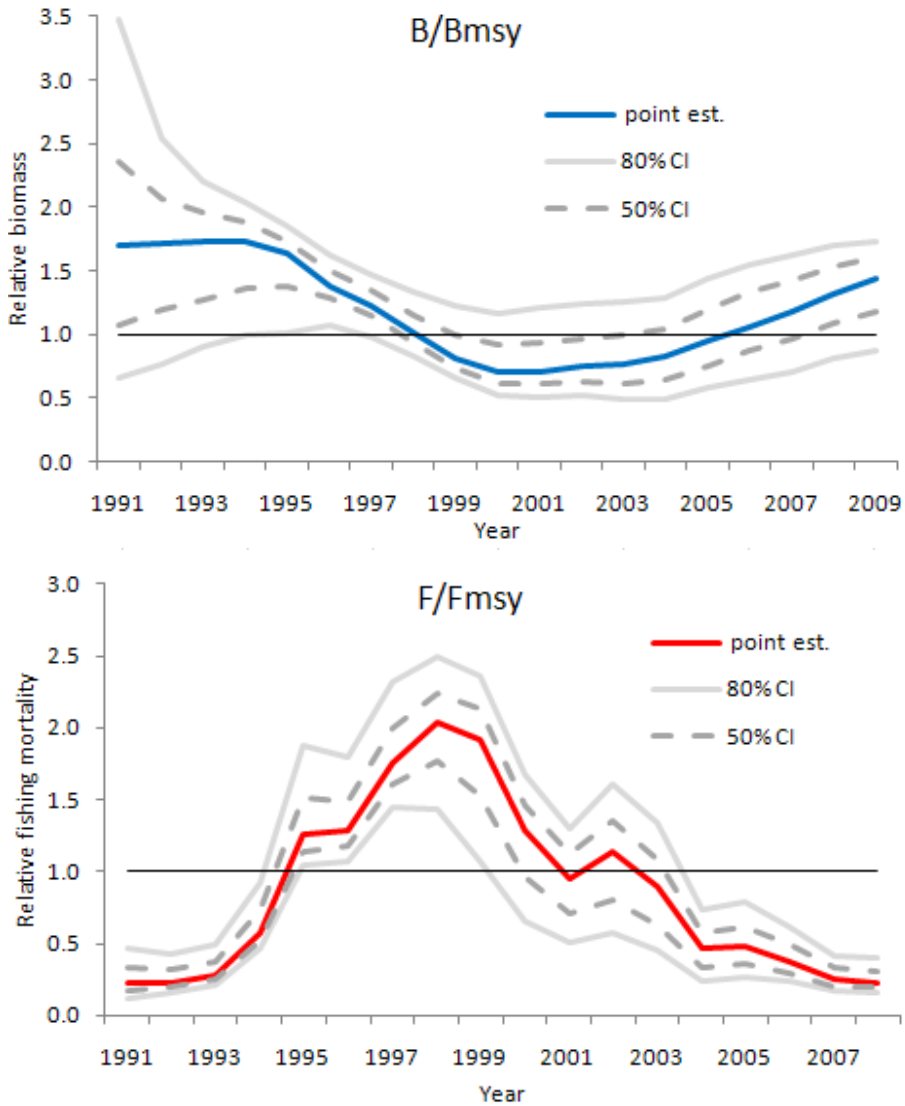


Figure 2. Commercial horseshoe crab landings in Maryland and Virginia since 1975.

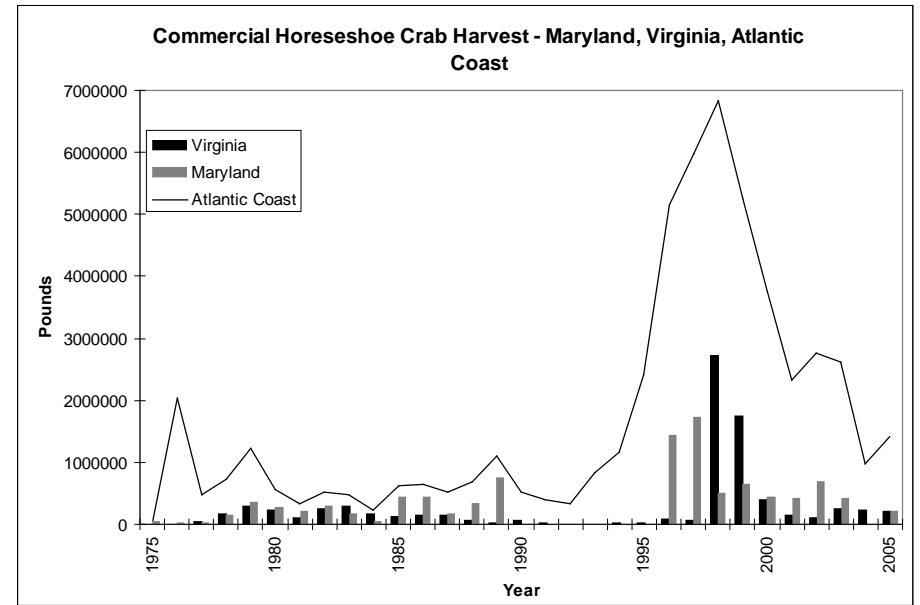
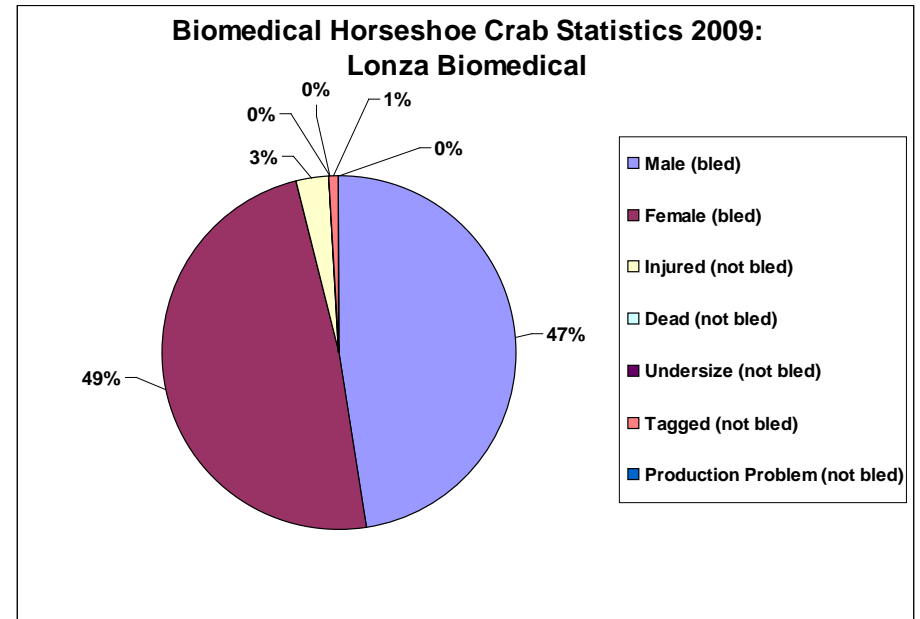


Figure 3. 2009 statistics for horseshoe crabs landed in Maryland for biomedical use.



1994 Chesapeake Bay and Atlantic Coast Horseshoe Crab Management Plan Implementation Table (updated 5/10)			
Problem Area	Action	Date	Comments
Strategy 1.1 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 (Action to prohibit hand collection of HSCs between May 1 and June 7 was changed based on MD spawning survey data. In January, 1996, MD adopted measures to restrict the hand collection of HSC between April 1 and June 30 to Monday and Thursday only.
		1998	Since the CBP Horseshoe Crab FMP was adopted in 1994, a coastal ASMFC was adopted in 1998.
		2009	The coastal commercial harvest during 2009 was below the allowable quota. The jurisdictions are in compliance with all of the ASMFC harvest restrictions for HSCs.
		Open	VA restricts hand collection unless a person has a \$16 HSC hand harvester license. 5 HSCs/person may be harvested for personal use without a license. VA prevents HSC harvest within 1000 ft of mean low water May 1 through June 7.
		2006	
	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 with the Chesapeake Bay, coastal bay areas, 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.
	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 and since then additional harvest restrictions have been implemented. An amendment to the CBP FMP has been recommended.
Strategy 2.1 Maryland and Virginia will coordinate with Delaware and begin to develop a spawning stock census of horseshoe crabs which will serve as the basis for determining	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 1994-2000 in MD. The Delaware spawning survey provides data on assessing the status of the spawning population.
		2002	Maryland Coastal Bays program began a volunteer spawning survey. In 2008, male:female ratio was approximately 4:1.
		Continue	Biomedical industry is collaborating with USFWS
		2008	Coast wide Tagging Program for HSC.

1994 Chesapeake Bay and Atlantic Coast Horseshoe Crab Management Plan Implementation Table (updated 5/10)

Problem Area	Action	Date	Comments
		<p>2008</p> <p>2008</p> <p>2009</p>	<p>bait fishery will be included in that states allowable harvest.</p> <p>Biomedical industry will make available all HSC that expire prior to live release to the bait fishery.</p> <p>Harvest closure was Dec 1 – March 31 and May 1 - June 7. Harvest was allowed >1 mile offshore during April 1 – 30 & June 8 - 30. Harvest was allowed from July 1 – Nov 30 in all MD tidal waters. HSC seasonal catch limits continue from 2005.</p> <p>Quota reduced by 1,464 HSC due to 2007 overage. Male:female landings were 1.5:1, within the 1:1 minimum requirement.</p> <p>No MD commercial landings were listed in the NMFS database. VA commercial landings were 132,024 lbs (NMFS).</p> <p>MD changed the HSC harvest ratio to 2:1 male:female ratio (issued by public notice)</p>
	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	<p>1995</p> <p>2001</p>	<p>MD requires a special HSC permit to land HSCs.</p> <p>ASMFC allows state to state transfer of quotas.</p>
	3.2 Virginia will continue their mandatory reporting procedures implemented in January, 1993.	<p>Continue</p> <p>2000</p> <p>2006</p>	<p>Implemented in January of 1993. VA has a commercial quota based on coastal reference period.</p> <p>ASMFC instituted a 25% reduction in horseshoe crab bait landings using 1995-1997 as the reference period.</p> <p>ASMFC Addendum IV changed the start of harvest closure from May 1 to January 1 through 2008. It also required that Virginia trawl harvest not exceed a certain percentage from a specified area and must maintain at a 2:1 male:female harvest ratio to protect the Delaware stock. Commercial quota is 152,495 HSCs. Quota can be transferred from other jurisdictions with a combined cap.</p>
	3.3 Maryland and Virginia will survey American eel harvesters and their use of horseshoe crabs by sex for bait.	<p>1995</p> <p>2000</p>	<p>No longer an issue. Both eels and horseshoe crabs are managed through an ASMFC coastal FMP.</p>
4.1.1 The jurisdictions	4.1 Maryland and Virginia will initiate a study to	Open	A HSC hotline and spawning beach survey was

1994 Chesapeake Bay and Atlantic Coast Horseshoe Crab Management Plan Implementation Table (updated 5/10)			
Problem Area	Action	Date	Comments
will define and protect horseshoe crab spawning areas that are used by migrating shorebirds.	delineate the geographic distribution of horseshoe crab spawning habitat in the Chesapeake Bay and coastal bays if funding is available.		developed in 1994 to delineate spawning habitat in Maryland. The survey is available through the DNR website. VA has also established a hotline.
	4.2 The jurisdictions will promote research to define the water quality requirements for horseshoe crabs.	Open	In addition to water quality, the coastal states support and Adaptive Resource Management Modeling (ARM) approach to managing HSCs. The modeling efforts take into consideration the ecological interaction between HSCs and shorebirds plus the economic and biological value of the commercial fishery and the biomedical uses of HSCs.
	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:

HSC = Horseshoe Crab

ASMFC= Atlantic States Marine Fisheries Commission

FMP= Fishery Management Plan

USFWS= US Fish and Wildlife Service

NMFS = National Marine Fisheries Service

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

Chesapeake Bay FMP

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. 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. For Spanish mackerel, population levels are high and overfishing is not occurring. Management measures have been successful at rebuilding the stock.

Current Management Measures

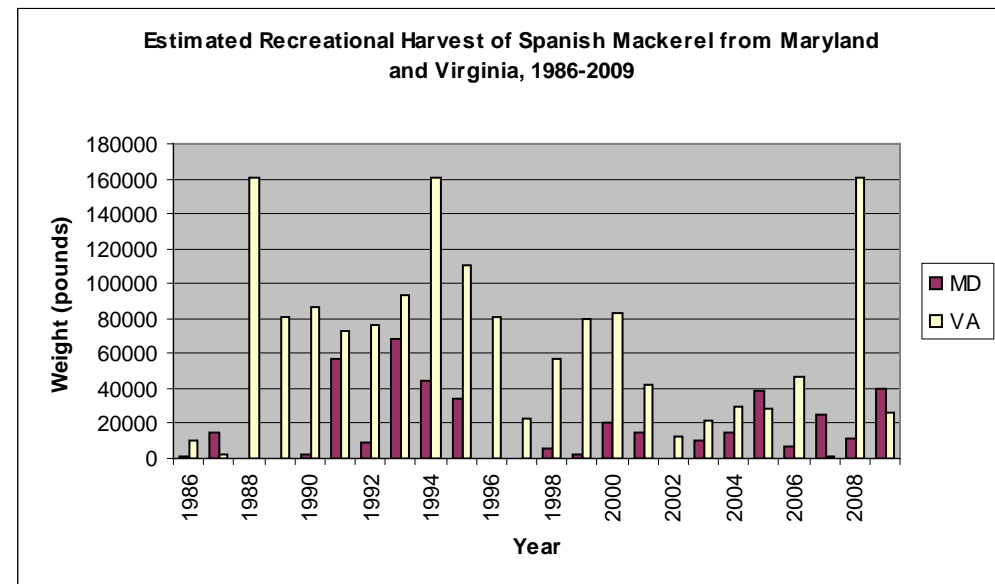
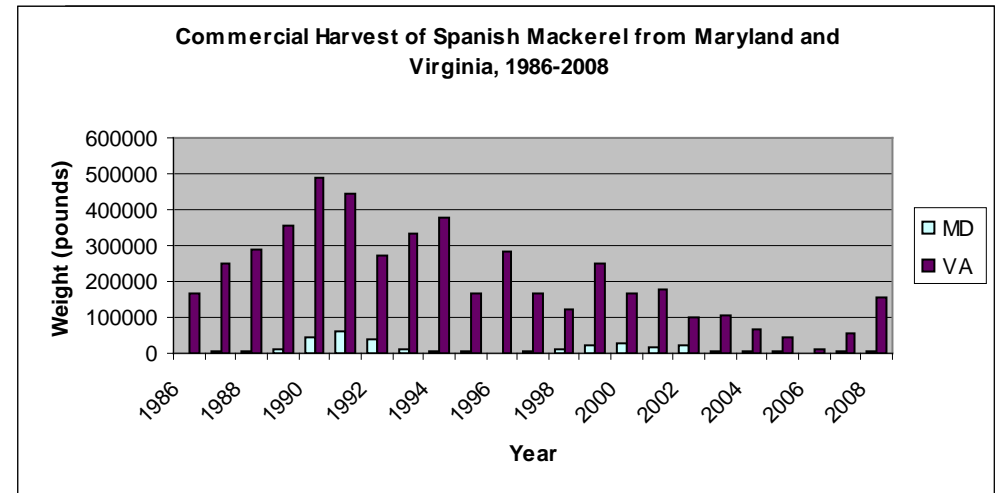
The Chesapeake Bay states manage Spanish mackerel through size and creel limits and closures consistent with actions taken in Federal waters and the SAFMC. Maryland and Virginia require a 14" minimum size limit with a creel limit of 15 fish. The king mackerel size limit is 27" in both states with a creel 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. Escape panels are used to reduce bycatch from pound nets.

Issues/Concerns

The 2008 Review of the ASMFC FMP for Spanish mackerel identified research and monitoring recommendations. 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.

The Fisheries

Preliminary Spanish mackerel commercial landings from Maryland for 2009 are 11,416 pounds. There were no commercial landings reported for king mackerel.



(data from NMFS and MRFSS)

1994 Chesapeake and Atlantic Coast King and Spanish Mackerel Management Plan Implementation Table (update 12/09)			
Section	Action	Date	Comments
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 Continue	Minimum size and creel limits in place. 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 Continue	Minimum size and creel limits in place. Creel limit increased to 15 fish/person/day. VA has a commercial limit of 3500 pounds Spanish Mackerel per vessel per day
	Action 1.1.2 A) Virginia will enforce a 5 fish/person/day bag limit for king mackerel.	1991 Continue	Minimum size and creel limits in place. 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.
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.

1994 Chesapeake and Atlantic Coast King and Spanish Mackerel Management Plan Implementation Table (update 12/09)			
Section	Action	Date	Comments
	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 www.chesapeakebay.net

Acronyms:

CBP = Chesapeake Bay Program

EEZ = Exclusive Economic Zone

UMCES = University of Maryland Center for Environmental Studies

Section 14. Eastern Oyster (*Crassostrea virginica*)

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.

Since the development of the 2004 OMP, there have been multiple efforts to assist in identifying the best oyster restoration strategies for re-establishing a self-sustaining oyster population in the Chesapeake Bay. The Programmatic Environmental Impact Statement (PEIS) conducted over a 5-year period (2005-2009) evaluated the ecological, economic, and cultural impacts of a variety of strategies to restore the native oysters and the benefits of introducing a non-native oyster species. The results of the PEIS facilitated a recommitment to expand and improve native oyster restoration efforts, the implementation of a more restrictive oyster management program for the public oyster fishery, and an expansion of native oyster aquaculture.

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 new 10-point Oyster Restoration and Aquaculture Development Plan for 2010. The new plan will significantly increase the network of oyster sanctuaries; identify areas for oyster aquaculture with a streamlined permitting process; and allow a more targeted, scientifically managed, sustainable public fishery.

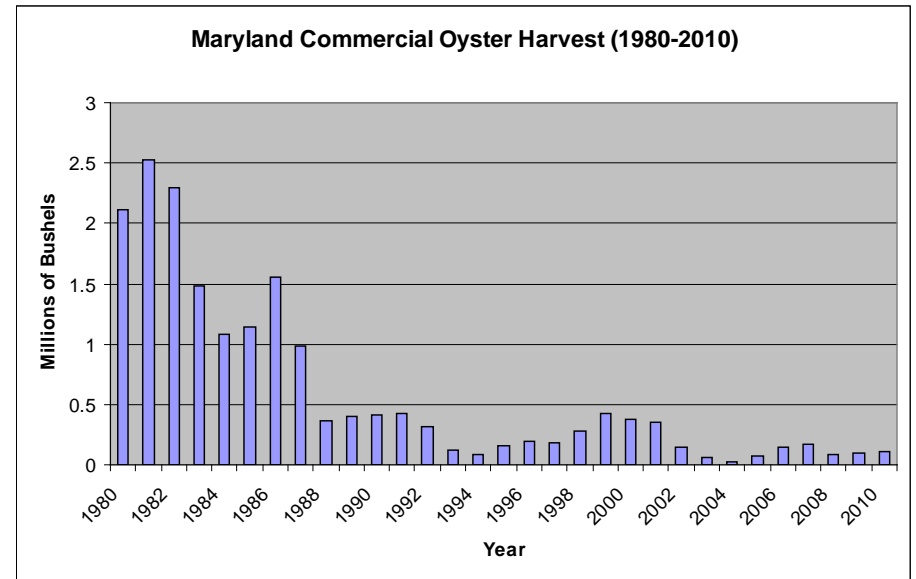
Stock Status

The oyster stock in the Chesapeake Bay is currently estimated at less than 1% of its historic abundance. Estimates of small and market oysters in the Maryland portion of the Bay have been around 1.2 million oysters over the last few years (2006 to present). Approximately 750 million hatchery-raised oysters were planted in the Bay in 2009 to augment natural reproduction.

Current Management Measures

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) (see figure). Both harvest seasons and catch limits by gear type are enforced for the public fishery. The average number of annual license holders is 550 (2002-2010) and there are fewer than 18 oyster processing companies in operation. The proposed new sanctuary expansion will maintain 167,720 acres of natural oyster bars for the wild oyster fishery.



(data from MDNR)

Issues/Concerns

There are three major issues for oyster recovery. First, there has been a continued degradation and loss of habitat. Approximately 80% of oyster habitat has been lost over the last 25 years. Maryland DNR believes at least 10,000 acres of habitat need to be rehabilitated for oyster recovery. Another major issue is oyster disease. Disease is responsible for a significant amount of non-fishing mortality. DNR will use a restoration approach that facilitates the development of natural disease resistance in the wild oyster population. Thirdly, with an increase in sanctuary areas and aquaculture activities, there will be a need to enhance law enforcement. All of these issues are addressed in the proposed 10-point oyster plan. As a result of the newly proposed initiatives, the 2004 OMP will need to be reviewed and revised.

2004 Oyster Management Plan (OMP) Implementation Table (updated 2/2010)

Section	Action	Date/ Responsible agencies	Comments
<p>Disease Strategy 3.1A. Utilize disease management in all aspects of restoration & harvest to minimize spreading disease</p> <p>3.1B. Develop & implement disease strategies within each of the 3 designated salinity zones.</p>	<p>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?</p>	<p>Continue Univ. of MD, VIMS, MDNR, and VMRC.</p>	<p>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.</p>
	<p>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)</p>	<p>Continue Univ. of MD, VIMS, MDNR, aquaculture industry</p>	<p>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 and a record production of 750 million in 2009. 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).</p>
	<p>3.3 Establish broodstock sanctuaries in heavily infected areas to possibly produce disease resistant seed. (see Chapter IV Sanctuaries for more details).</p>	<p>Open MDNR, VMRC, ORP, VA Corps</p>	<p>Sanctuaries will be established in a variety of areas throughout the Bay to produce self-sustaining populations of oysters.</p>
	<p>3.4 Develop, implement and maintain a seed policy to reduce and minimize disease impacts.</p>	<p>2004 2007 Continuing</p>	<p>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.</p>

	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 is funding a project (UMCEES) to develop spatially-explicit assessment tools for the oyster stock in Chesapeake Bay. The project will develop a framework for stock assessment, evaluate current data collection, recommend improvements to data collections and evaluate the feasibility of including environmental factors into assessment models. A final report is expected from UMCEES in 2010. DNR/ MGS & NOAA are continuing to coordinate field operations to characterize benthic habitat.
Sanctuaries Strategy 4.1 A network of clearly marked oyster sanctuaries will be established throughout the Chesapeake Bay and its tributaries	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	2004 On-going 2009	MDNR supported a study to determine the best productive oyster bars within Maryland and has used the results to develop a 10 point Oyster Restoration and Aquaculture Development Plan. Based on this study, new sanctuaries areas have been proposed and are in the process of being finalized.
Strategy 4.2. Utilize the steps outlined in the OMP for establishing oyster sanctuaries throughout the bay.	4.2.2 Utilize existing protocols & standard operating procedures for recording or charting GPS coordinates for oyster sanctuaries in order to verify locations and track restoration progress.	Beginning in 2005 2008/2009	Protocols have been developed to delineate and mark sanctuary areas.
	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 & future sanctuary initiative.	On-going	A study in MD was conducted in various salinities & 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 new approach to obtain additional materials is to clean exposed shell on natural bars and extract previously planted and shallow buried shells.
	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.	2005 2009	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.
	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).	2005	See comment for Action 3.2. The question of what is an effective quantity of hatchery seed in sanctuaries is unknown.

	<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 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.</p>
<p>Sanctuaries (cont'd) 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 <12ppt) Increase biomass & 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> <hr/> <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>2005 On-going</p>	<p>MD is implementing a new 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.C (>14ppt) Develop Disease Tolerance: 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>		
Sanctuaries (cont'd)	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	To be determined	The Great Wicomico and Lynnhaven Rivers have been identified as areas of special interest. MD has proposed new sanctuaries based on protecting 24% of the state's most productive areas as identified by a recent analysis of annual fall survey data.
Strategy 4.4 The jurisdictions will establish oyster sanctuaries to promote maximum ecological value			
Strategy 4.5 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	<p>Action 4.5.1 Utilize only SPF hatchery seed in sanctuaries designated for oyster biomass accumulation, Zone 1 and Zone 2.</p> <p>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</p> <p>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</p>	<p>On-going</p> <p>On-going</p>	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.
Sanctuaries (cont'd)	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
Strategy 4.6 To facilitate the enforcement of closed areas, especially	Action 4.6.2 Sanctuaries will be buoyed and marked		

sanctuaries, implement the following actions:	Action 4.6.3 The public and judiciary will be notified about sanctuary areas through educational initiatives, public announcements and stakeholder meetings		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.
	Action 4.6.4 New enforcement measures will be identified and implemented. Additional manpower will be recommended if necessary		
Managing Harvest 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 new MD 10-pt Plan will increase the total area designated as oyster sanctuaries from 9% of quality habitat in 2009 to approximately 24% in 2010. The new plan will leave 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	BRPs have not been developed but the stock assessment project should provide some valuable input (see Action 3.5) .
	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 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 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 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 new 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 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 On-going	MDNR no longer implements a repletion program but puts all of its resources into the new 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 MNDNR, VMRC	The MD Natural Resources Police (NRP) is beginning to implement radar and camera vessel monitoring technology. The system, MD 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 MDNR, VMRC	

Hatchery and Aquaculture Considerations 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 MDNR, ORP, 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, MDNR, Univ. 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 ACOE	This action will be addressed as part of the Native Oyster Master Plan by the ACOE.
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 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 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 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.

<p>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.</p>	<p>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.</p>	<p>2007</p>	<p>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.</p>
	<p>Action 6.3.2 Monitor restoration activities to clarify the interaction between selectively bred strains and wild stocks of oysters.</p>	<p>2005 UnMD, ORP, VMRC</p>	<p>Carlsson et al (2008) evaluated the contribution of a selectively bred, domesticated oyster strain to recruitment in the Great Wicomico, Lynnhaven, Your, and Elizabeth Rivers from 2002 to 2006. They were unable to detect a significant contribution of the domestic strain to wild-produced spat.</p>
<p>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</p>	<p>Action 6.4.1 Amend the OMP as necessary to incorporate new strategies and actions regarding aquaculture.</p>	<p>2009</p>	<p>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.</p>
<p>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.</p>	<p>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.</p>	<p>Continue</p>	<p>Monitoring programs have been reviewed. UMCEES will provide guidance on how to improve existing fishery-independent and fishery-dependent data collection methodology. These improvements will provide better quality data for the stock assessment models.</p>

	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 MDNR, 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 2009	All oyster partners. Oysters are slated for the development of an ecosystem-based fishery management plan (EBFMP) at which time new research recommendations will be developed.

Acronyms:

ACOE = Army Corps of Engineers

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

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. An ASMFC FMP was adopted in 1984 and updated in 1991 and 2002. The Atlantic coastal management process has successfully 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. The 2009 peer reviewed ASMFC stock assessment found the stock to be relatively stable. Presently, 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

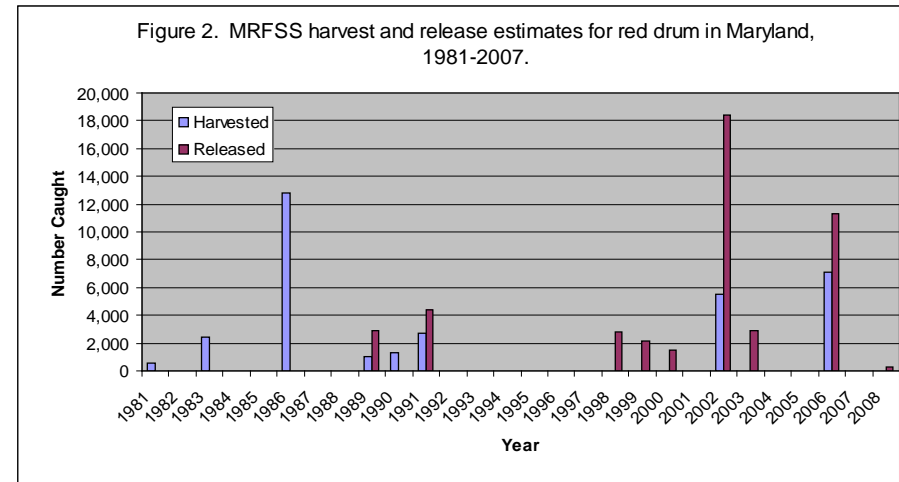
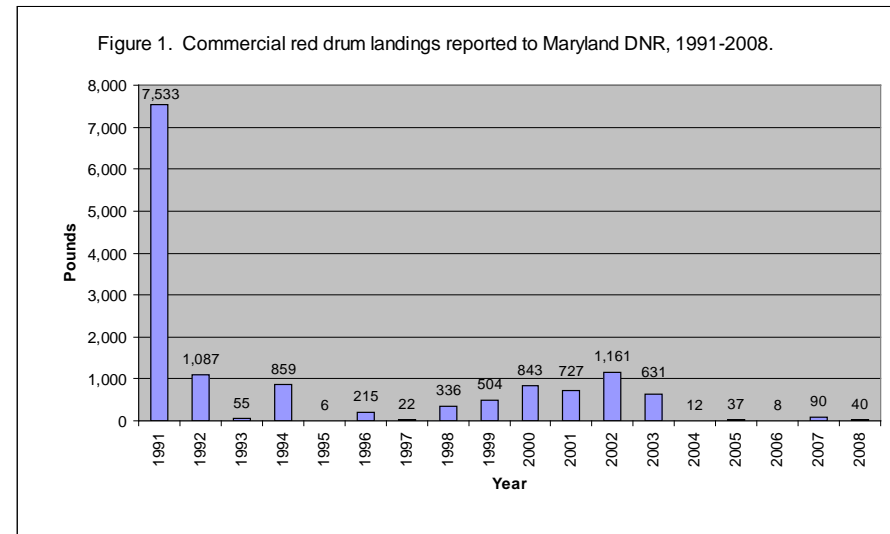
Current Management Measures

Red drum are managed through size limits and creel limits in compliance with coastal recommendations. Maryland allows recreational fishermen to take 1 fish per day between 18 and 27". Commercial fishermen in Maryland are allowed 5 fish per day with the same slot size. Virginia allows a slot limit of 18-26". A possession limit of 3 fish per day applies to 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 both 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 will continue to meet SAV restoration and water clarity goals. Maryland will continue to monitor commercial pound nets and fish houses and measure red drum when they are encountered. Coastal states are developing a cooperative plan to collect more age/length data to improve stock assessment modeling results.

The Fisheries



(Figures by Rickabaugh, 2009)

1993 Chesapeake Bay and Atlantic Coast Red Drum Management Plan Implementation Table (updated 1/10)			
Section	Action	Date	Comments
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 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 Continue 2009	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 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 used 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 Continue	MD and VA appointed representatives to the ASMFC/SAFMC Red Drum Advisory Panel.

1993 Chesapeake Bay and Atlantic Coast Red Drum Management Plan Implementation Table (updated 1/10)			
Section	Action	Date	Comments
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 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. VIMS will continue a trawl survey if funding continues. ASMFC has recommended that all states implement a tagging program for red drum.
	2.2 VMRC Stock Assessment Program will continue to collect biological data from commercial catches of red drum	1993 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	Forty pounds of red drum were reported from MD commercial harvest in 2008 and 90 pounds in 2007. Virginia commercial reports were 6372 in 2008 and 2607 in 2007.
	2.3b Virginia will implement a limited and/or delayed entry program and a mandatory reporting system for commercial licenses.	1993 Continue	Implemented in January 1993.
	2.3c Virginia and Maryland will continue to supplement the Marine Recreational Statistics Program	Continue	In 2008, anglers submitted 17 entries, up to 44" to the MD catch and release tournament award citation program. MD charter boat logs reported 41 red drum in 2008, 17 of which were harvested.
	2.3d Maryland will continue a sampling program using pound nets and trawls.	Continue	No fishery independent monitoring was conducted in 2008 or 2009. 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).

1993 Chesapeake Bay and Atlantic Coast Red Drum Management Plan Implementation Table (updated 1/10)			
Section	Action	Date	Comments
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.

Acronyms:

PFRC= Potomac River Fisheries Commission

SAV= Submerged Aquatic Vegetation

VIMS= Virginia Institute of Marine Science

Section 16. Scup (*Stenotomus chrysops*)

Chesapeake Bay FMP

There is no Chesapeake Bay Program fishery management plan (FMP) for scup and therefore, no implementation table. Scup were listed as a species in need of conservation in Maryland. Scup are jointly managed by the Atlantic States Marine Fisheries Commission (ASMFC) and the Mid-Atlantic Fishery Management Council (MAFMC). Scup is one component of the multispecies FMP addressing summer flounder, scup and black sea bass. The coastal scup FMP and Addendum I were approved in 1996. The recreational fishery was allocated 22% of the landings and 78% was allocated to the commercial fishery. Addendum III in 2001, VII in 2002, IX in 2003, and XI in 2004 implemented a year round 50-fish bag limit and 8-inch minimum size limit. Addendum XIX maintained the fishing mortality from Amendment XII of $F_{max}=0.26$ and also the spring survey index of 2.77kg/tow. Amendment XIV established a rebuilding plan. Maryland is required to submit an annual compliance report to ASMFC.

Stock Status

Current targets for the scup stock are a spawning stock biomass of $SSB_{40\%}=202.92$ million pounds and a fishing mortality rate of $F_{40\%}=0.177$. For 2009, F was 0.054 and SSB was 263.1 million pounds. Overfishing is not occurring and the scup stock is not overfished. The stock was considered rebuilt in 2009.

The Fisheries

Harvest data from Maryland are generally low and vary from year to year. The 2009 estimated landings by recreational anglers were 698 fish and preliminary landings by the commercial fishery were approximately 9,000 pounds.

Current Management Measures

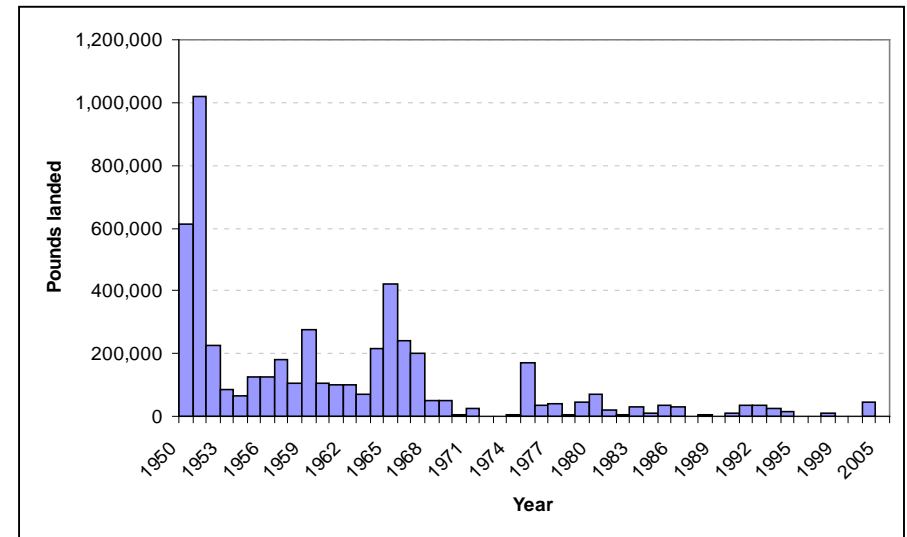
Scup recreational and commercial harvest is reviewed annually to develop the minimum size limits, harvest limits, gear restrictions, and fishing seasons. The recreational fishery is allocated 22% of scup landings while the commercial fishery is allocated 78%. The winter fishery (November-April) is managed by a coast wide quota, while the summer fishery (May-October) is managed with state-by-state quotas. The recreational minimum size is 8" with a limit of 50 fish per person per day. The commercial minimum size is 9".

Issues/Concerns

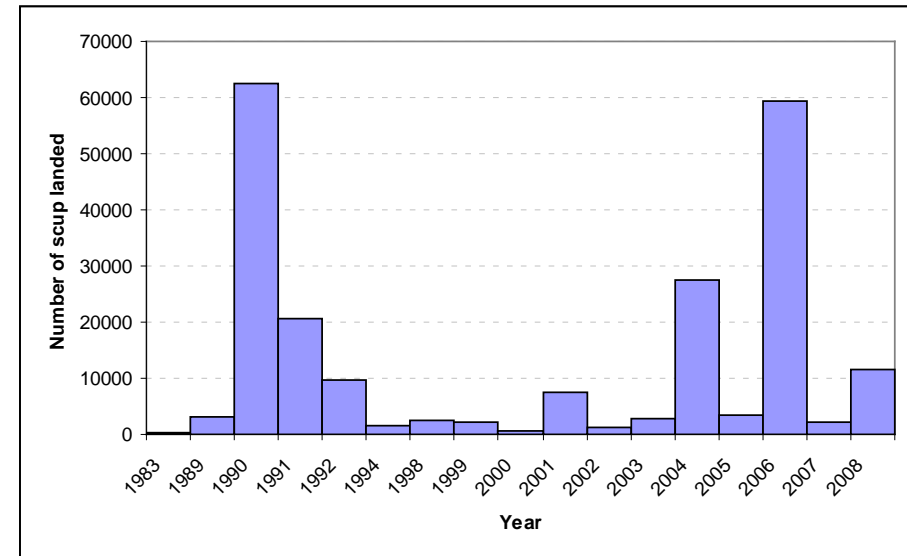
A quantitative stock assessment has not yet been conducted due to insufficient data. Differences exist between state and federal commercial quota management during

the summer fishery. Management needs to be improved to prevent quota overages in the recreational fishery. Current management measures are annually updated rather than designed for multi-year management. Characterization of commercial and recreational discards has not been completed.

Maryland commercial scup landings from 1950-2005 (NMFS). (No data available after 2005)



Maryland recreational scup harvest for 1983-2008 (NMFS).



Section 17. Striped Bass (*Morone saxatilis*)

Chesapeake Bay FMP

The Atlantic States Marine Fisheries Commission (ASMFC) developed the Interstate Fisheries Management Plan for Striped Bass in 1981. The Chesapeake Bay Program developed the Chesapeake Bay Striped Bass Management Plan in 1989 to provide compatible, coordinated management among states to meet ASMFC fishery management plan (FMP) requirements. Amendment 1 to the 1989 Chesapeake Bay Striped Bass Management Plan adopted the ASMFC management framework for the Bay. A new Chesapeake Bay FMP amendment needs to be developed to reflect the most recent changes in management. However, the ASMFC management criteria have been modified several times since 1981. Amendment V to the ASMFC FMP required annual juvenile abundance (JAI) surveys in Maryland and Virginia. Maryland's JAI began in 1954 and VA's JAI began in 1955. Annual variability in juvenile survival has been accounted for by a reduction of acceptable JAI variation from 90% to 75% (Amendment VI, 2003). Several ASMFC addenda have also been adopted to make changes in management measures (See www.asmfc.org for specific details). Maryland is required to submit an annual compliance report to ASMFC.

In 2006, a Fisheries Ecosystem Plan for Chesapeake Bay was agreed upon by the NOAA Chesapeake Bay Fisheries Ecosystem Advisory Panel. Maryland Sea Grant was contracted by the Chesapeake Bay Program to facilitate implementation of the Fisheries Ecosystem Plan. The goal was to develop an ecosystem-based fishery management plan for five keystone Chesapeake Bay species, which includes striped bass. During fall 2008, state, federal, and academic representatives met to develop a striped bass biological background including current and future ecosystem stressors. Issue briefs were developed for four types of 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). Biological briefs were completed in April, 2009. A quantitative ecosystem team is currently reviewing the issue briefs and developing targets and measurable indicators.

Stock Status

The striped bass stock is not overfished and is not undergoing overfishing. Striped bass are managed using a statistical catch-at-age model and biological reference points (BRPs) for female spawning stock biomass (SSB) and fishing mortality (F). Current BRPs were adopted from ASMFC's 2009 Stock Assessment Report for Atlantic Striped Bass: $SSB_{\text{target}}=82,672,500$ lbs and $SSB_{\text{threshold}}=66,138,000$ lbs. For striped bass in Maryland coastal waters, the $F_{\text{target}}=0.30$ and $F_{\text{threshold}}=0.34$. The Chesapeake Bay F_{target} is slightly lower (0.27) because the minimum size limit is smaller in the Bay than along the coast.

Fishing mortality (F) for 18" and larger striped bass in the Chesapeake Bay has declined over the past decade from 0.24 in 1998 to 0.10 in 2008. For fish 28" and larger, F has remained around 0.13. The Maryland age-1 index for 2009 was 0.11 which is below the average of 0.21. The 2009 Age 0 Index (aka juvenile index) was 3.92 and slightly less than the target period average of 4.32. Large year classes of striped bass were observed in 1993, 1996, 2001, and 2003. Coastal stock abundance and biomass have declined slightly since 2004. The 2008 coastal estimate for F was 0.21.

Current Management Measures

Specific management measures for striped bass can change annually based on ASMFC requirements and stakeholder concerns. The commercial fishery is managed through a quota system by gear type. The 2008 and 2009 Maryland Chesapeake Bay commercial fishery had an 18"-36" slot limit with three distinct seasons for pound net and haul seine fisheries, hook and line fishery, and drift gill net fishery. In 2008 and 2009, a Maryland Atlantic coast drift gill net/otter trawl commercial fishery operated under a 24" minimum size limit.

The recreational fishery is managed through minimum size and creel limits. Three distinct recreational fisheries occurred during 2008 and 2009. 1) The Susquehanna Flats catch-and-release and catch-and-keep fisheries, which required anglers to use non-offset circle hooks when fishing ≥ 0.5 " gap baited hooks. 2) The spring trophy season that allowed 1 fish/person/day with a 28" minimum size. 3) The summer-fall recreational/charter boat season that allowed 2 fish/person/day with a 18"-28" slot limit or 1 fish/person/day at 18"-28" and 1 fish greater than 28"/person/day. The 2008 and 2009 Maryland Atlantic coast recreational fishery had a 2 fish/person/day creel limit and a 28" minimum size limit.

The Fisheries

Maryland is allotted ~52% of the Chesapeake Bay striped bass quota or 10,015,705 lbs. The 2008 and 2009 quota were the same with 2,956,436 lbs allocated to the recreational fishery and 2,254,831 lbs allocated to the commercial fishery. The Maryland coastal commercial quota was 126,396 lbs. Harvest of striped bass from Maryland waters are among the highest for Atlantic coastal states. In 2008, Maryland recreational anglers removed approximately 21.6% of the total coastwide recreational harvest (25.69 million lbs or 2.05 million fish), which was the second highest harvest among the states. Estimated recreational harvest of striped bass from Maryland's Chesapeake Bay during 2008 was 2,836,870 lbs (468,997 fish). Of this, approximately 36,166 fish were removed during the Chesapeake Bay spring trophy season. Maryland's 2009 recreational harvest was estimated at 530,394 fish or 4,558,776 lbs.

Maryland's commercial landings have been the highest among Atlantic coastal states since 2004. The 2008 Maryland commercial fishery harvested 32.4% of the 1.01 million fish (7.19 million lbs) coastwide quota. Maryland has separate coastal and Chesapeake Bay commercial quotas. Maryland 2008 commercial landings were 118,005 lbs from the coast and 2,208,018 lbs from the Chesapeake Bay. Maryland 2008 commercial landings were 127,327 lbs from the coast and 2,267,293 lbs from the Bay.

Figure 1. The relative abundance of age-1 striped bass.

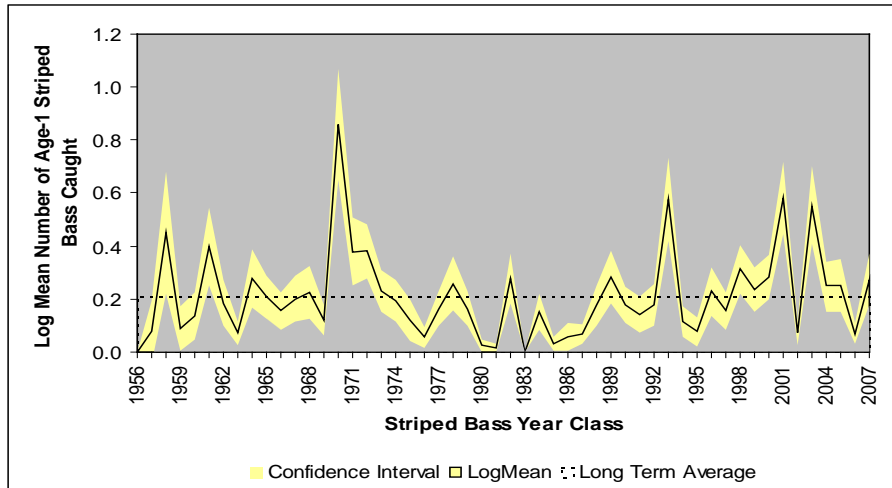
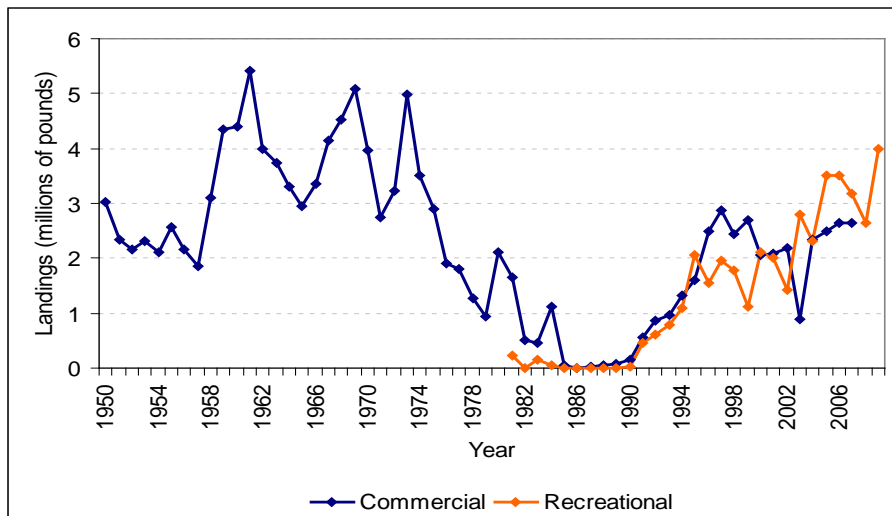


Figure 2. Striped bass landings in Maryland for commercial (1950-2008) and recreational (1981-2009) fisheries (NOAA Fisheries 2010).



Issues/Concerns

The ASMFC Atlantic Striped Bass Technical Committee expressed concern about current estimates of fishing and natural mortality in their 2009 Stock Assessment Report for Atlantic Striped Bass. The technical committee noted that the value of F may be overestimated and abundance and biomass underestimated. These estimates could be caused by errors in catch estimates and changes in natural mortality.

Striped bass tagging data from Chesapeake Bay suggest increased natural mortality for males 18"-28". Increases in natural mortality may be the result of mycobacteriosis, a bacterial infection that began to be noticed around 1997. Mycobacterium disease is not uncommon among a variety of fish species and is particularly problematic for aquaculture operations. The infection is usually associated with external ulcerations and an emaciated appearance but infected fish may not always have external symptoms. All infected fish have grey nodules in internal organs such as the spleen and kidney. The impacts of mycobacterium disease on the striped bass population are not fully known but it is believed to be contributing to increases in natural mortality in the Chesapeake Bay

Recreational fishing for striped bass has increased since the stock was rebuilt. A significant number of anglers practice catch and release fishing, however, not all released fish survive. It is estimated that 8% of released fish do not survive the release process. Coastwide, the added mortality amounts to ≥ 2 million striped bass. Survival of released fish is affected by several factors such as temperature, salinity, gear, angler skill, and bait. Maryland currently lacks an angler education and outreach program to teach best-fishing practices and to reduce the likelihood of release mortality.

1998 Amendment 1 to the 1989 Chesapeake Bay Striped Bass Management Plan Implementation Table (updated 5/10)			
Management Areas	Action	Date	Comments
Stock Status	Amendment 1 to the Chesapeake Bay Program FMP augments the 1989 Plan. CBP jurisdictions adopted coastal ASMFC management scenarios for the Bay. The coastal stock was declared restored to historic levels in 1995. ASMFC approved Amendment VI of the Interstate Fisheries Management Plan for Atlantic Striped Bass in February 2003.	February 2003 Continue 2008 2009	CBP jurisdictions have option of maintaining current regulations or implementing stricter regulations than required under ASMFC Amendment VI. SARC determined stock is not overfished is not undergoing overfishing.
Monitoring Requirements	Amendment V of the Interstate FMP requires CBP jurisdictions to compile results of their commercial and recreational fisheries and submit them to ASMFC. Specific monitoring requirements may be changed as necessary. Amendment VI modifies the monitoring requirements by adding a mandatory discard data collection program.	1995 February 2003 Continue 2007 2008 2009	ASMFC requirements are part of a bycatch reduction program. CBP jurisdictions are tracking commercial and recreational fishing mortalities and will add bycatch data to their fishery statistics information. Monitoring programs include the juvenile striped bass seine survey, spring spawning stock survey, spring tagging, commercial pound net, haul seine, hook and line, drift gill net, and recreational Susquehanna Flats catch and release, spring trophy, spring-early summer, summer-fall recreational/charter boat seasons. Addendum 1 to Amendment 6 of ASMFC FMP requires increased bycatch data quality control (ACCSP standards) and bycatch mortality information. 2008 MD CB commercial landings estimates were 2,300,374 lbs (NMFS); recreational landings = 2,637,998 lbs(NMFS); recreational discards = 1,402,619 fish or 6,718,545 lbs (4.79 lbs/fish) with 8% discard mortality (ASMFC compliance report). 2009 MD commercial estimate was 2,267,293 lbs; recreational landings estimate was 4,494,832. 2008 VA CB commercial landings estimates were 2,152,970 lbs (NMFS); recreational

1998 Amendment 1 to the 1989 Chesapeake Bay Striped Bass Management Plan Implementation Table (updated 5/10)			
Management Areas	Action	Date	Comments
			landings = 1,106,345 lbs (NMFS); recreational discards = 421,770 (NMFS) or 2,020,278 lbs (4.79 lbs/fish).
Assessment of Recruitment	Amendment V of the Interstate FMP requires MD and VA to conduct annual juvenile abundance (JAI) surveys. Amendment VI modifies the acceptable level of variation allowed in the JAI from 90% to 75%. If MD and VA juvenile indices are lower than 75% of all other values in the data set for three consecutive years additional actions may be taken.	1995 2003 Continue	Juvenile abundance data is used by ASMFC to estimate coastal SSB and VPA of coastal stock Strong recruitment of 1993, 1996, 2001, and 2003 year classes. The MD 2009 juvenile index was 3.92 which was slightly lower than the average 4.32.
Spawning Stock Biomass (SSB)	If SSB decreases below the (1960-1972) reference level, additional actions may be taken. SSB_{threshold} was changed to the 1995 SSB = 36,297.	1997 Continue 2009	MD and VA provide data to ASMFC to estimate SSB and conduct VPA. SSB has remained above 1995 B_{target} from 1996-2009.
Fishing Mortality (F)	The current target fishing mortality rate is $F=0.30$ and the overfishing definition is $F_{msy}=0.34$. If coastwide estimated mortality rates exceed the target rate for 2 consecutive years the ASMFC Management Board will recommend harvest reductions	2000 Continue 2009	All CBP jurisdictions have implemented regulations to insure the target mortality is not exceeded. MD and VA have instituted tagging programs to estimate migration and mortality rates. F has remained at or below F_{target} of 0.30 since 1997.
Stocking	The coastal stock has been restored	1995	Maryland and Virginia discontinued stocking of striped bass
Bycatch reduction	CBP jurisdictions are required to estimate discard mortality to ASMFC	1995 Continue 2007	CBP jurisdictions are in full compliance. Estimates of bycatch discard mortalities are used in VPA of coastal stock. Addendum 1 to Ammendment 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 ACCSP standards, coordinate data collection from Federal waters

1998 Amendment 1 to the 1989 Chesapeake Bay Striped Bass Management Plan Implementation Table (updated 5/10)			
Management Areas	Action	Date	Comments
			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.
Habitat	CBP jurisdictions are required to delineate essential fish habitat and habitat areas of concern	2001 Continue	CBP jurisdictions have developed and implemented management strategies to protect striped bass habitat. Maryland spawning areas are protected from harvest March through May. An ecosystem-based fishery management process has been facilitated through MD Sea Grant. Habitat issues/stressors have been defined for SB.

Acronyms:

SARC – Stock Assessment Review Committee
SSB – Spawning Stock Biomass of females
F – Fishing mortality
VPA – Virtual Population Assessment
ACCSP – Atlantic Coastal Cooperative Statistics Program
ASMFC – Atlantic States Marine Fisheries Service
NMFS – National Marine Fisheries Service

Section 18. Summer Flounder (*Paralichthys dentatus*)

Chesapeake Bay FMP

A Chesapeake Bay Program (CBP) Summer Flounder Fishery Management Plan (FMP) was developed and adopted in 1991. At that time, the Atlantic coast stock was overfished and the stock was depleted. The 1991 CBP plan implemented a number of management measures that were successful at reducing mortality and increasing the size of the stock. The plan followed the guidelines established by the Atlantic Marine Fisheries Commission (ASMFC) and the Mid-Atlantic Fisheries Management Council (MAFMC) and focused on making Bay regulatory actions compatible where possible. As the stock began to improve, the Bay jurisdictions adopted Amendment # 1 to the 1991 CBP Summer Flounder FMP. The 1997 amendment updated the status of the stock and adopted new targets proposed by the MAFMC. It expanded how the Chesapeake Bay jurisdictions would implement the coastal quota and recreational harvest limits; allocate between the Bay and coast; and implement summer flounder commercial permits.

Summer flounder, scup and black sea bass are managed under a joint AMFSC and MAFMC fisheries management plan. The state/federal plan was adopted by ASMFC in 1982. The MAFMC completed and adopted a federal plan for summer flounder in 1988 based on ASMFC's management plan. Several amendments have been jointly developed by ASMFC and the MAFMC since the adoption of the plans, and provide a comprehensive management program. Maryland is required to submit an annual compliance report to ASMFC.

Stock Status

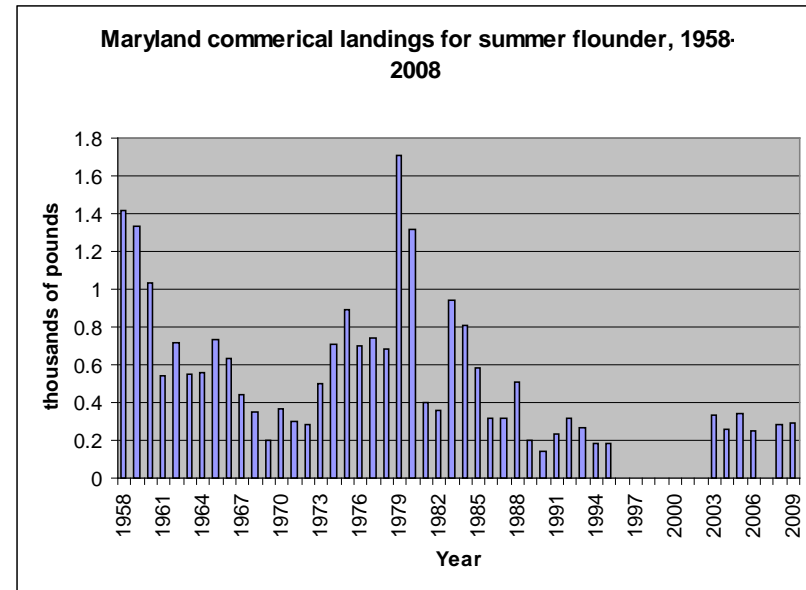
The coastal summer flounder stock is not overfished and overfishing is not occurring. Biological reference points (BRPs), i.e., targets and thresholds, have been developed for spawning stock biomass and fishing mortality rates. The stock biomass was about 77% of the target level in 2008. The rebuilding schedule was extended to 2013 and the stock is expected to be rebuilt by that time. The age structure of the coastal population has improved with larger and older fish available.

Management Measures

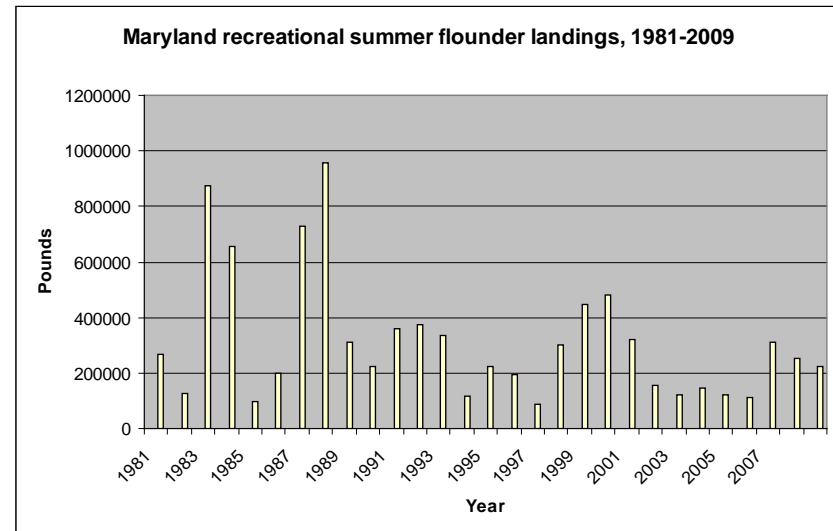
An annual total allowable landings (TAC) is determined for the coastal stock and divided into a commercial quota (60% of the TAC) and recreational harvest limit (40% of the TAC). The TAC for 2010 was 22.13 million pounds. Amendment 13 was approved in 2002 and implemented the federal coast wide, annual quota using a state-by-state allocation system. Maryland receives 11% of the TAC and Virginia receives a 20% share. The Maryland commercial quota for 2009 was 218,957 pounds. Maryland allocates portions of their commercial quota to the Atlantic coastal waters, the Chesapeake Bay, and the Potomac River. Commercial quotas and recreational harvest limits have been successful at reducing fishing mortality.

Minimum size limits have been successful at allowing more fish to reach maturity and spawn, thus increasing the stock size.

The Fisheries



(from NMFS data)



(from MRFSS data)

Issues/Concerns

Continue to monitor the stock and implement necessary management measures to ensure the stock is rebuilt by 2013. Identify ways to quantify and reduce discards.

1998 Amendment 1 to the 1991 Chesapeake Bay Summer Flounder Management Plan Implementation Table (updated 12/09)			
Problem	Action	Implementation	Comments
<p>Strategy 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>Action 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>1992 - Initiated 1993 – ASMFC State allocations changed. 1995 –ASMFC capped coastwide quota & adjusted stock rebuilding schedule. 1998 – ASMFC revised overfishing definition. 2004 – ASFMC allowed a change in allocation</p> <p>Actions are annually evaluated and adjusted to meet coastal stock rebuilding targets.</p>	<p>The Atlantic States Marine Fisheries Commission’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.</p> <p>The increase was the result of data reported at the 2008 June Stock Assessment Workshop (SAW) and Peer Review. As of 2008, officials have announced that summer flounder is no longer overfished and is not experiencing overfishing, but has not been rebuilt to target levels.</p>
	<p>Action 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.</p>	<p>2001 – ASMFC implements coastwide system for conservation equivalency 2003 – ASMFC sets State-specific recreational harvest targets 2005 – ASMFC established a program to allow the recreational summer flounder coastwide allocations to be</p>	<p>2009 regulations: Maryland:Atlantic & Coastal Bays – 18” size limit & 3 fish creel and Chesapeake Bay 16.5” size limit and a 1 fish creel; open season - April 15-September 13. PRFC: 16.5” size limit with a 1 fish creel, open season -April 15-September 13; Virginia: 19” size limit with a 5 fish, open season - all year.</p>

1998 Amendment 1 to the 1991 Chesapeake Bay Summer Flounder Management Plan Implementation Table (updated 12/09)			
Problem	Action	Implementation	Comments
		subdivided into regions.	
	Action 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 2003 Continue	A summer flounder permit system has been determined and is being implemented.

Acronyms:

ASMFC = Atlantic States Marine Fisheries Commission

MAFMC = Mid-Atlantic Fishery Management Council

PRFC = Potomac River Fisheries Commission

Section 19. Tautog (*Tautoga onitis*)

Chesapeake Bay FMP

The Chesapeake Bay and Atlantic Coast Tautog Fishery Management Plan (FMP) was adopted in 1998 by the Chesapeake Bay Program (CBP). The purpose of the tautog FMP was to conserve habitat and to perpetuate the stock while maintaining a commercial and recreational fishery. The CBP FMP recognizes ASMFC guidelines and requirements, and implements actions to improve catch and effort data, to ensure fair harvest allocation, to improve water quality, and to conserve and protect habitat.

The ASMFC tautog management plan was adopted in 1996 and established an interim fishing mortality of $F = 0.24$, a final target of $F = 0.15$, and a minimum size of 14". Addendum I extended the timeframe for meeting the interim F to 1998. Addendum II extended the final target F to 2000. Addendum III adjusted biological reference points and the compliance reporting schedule. Addendum IV established a fishing mortality rate of $F = 0.20$ and $SSB = 14,300$ metric tons to rebuild the spawning stock biomass based on a fishing pressure of 90% recreational and 10% commercial. Addendum V was adopted in August 2007 which required states to reduce the exploitation rate by 25.6%. Maryland is required to submit an annual compliance report to ASMFC.

Prior to the adoption of Addendum V, the tautog recreational and commercial season was open from January 1 through November 30 with a 5 fish per person per day possession limit.

Stock Status

The status of tautog in Maryland is largely unknown. Limited data suggests that the tautog population is stable. Commercial tautog fishermen reported 3,213 pounds landed in 2008 (Figure 1). These values are well below reported landings since 1996. Eighty six percent of tautog landed were caught using lobster pots. The recreational fishery landed an estimated 24,127 tautog in 2008 (Figure 2). Excluding the 2007 landings, 2008 landings were comparable to landings since 2000. Preliminary 2009 commercial landings were 1,239 pounds.

Current Management Measures

Maryland has addressed ASMFC Addendum V's requirement for a 25.6% reduction in exploitation. The requirement has been met by reducing the possession limit to 2 fish per person per day from May 16 to October 30; 4 fish from January 1 through May 15; and keeping the December season closed.

Issues/Concerns

Oyster reef and submerged aquatic vegetation are important tautog habitat. Restoration of these habitats in the Chesapeake Bay is particularly important for juveniles especially in the lower bay. Hard bottom and coral habitats are important

ocean water habitat and are in need of conservation. The location and extent of these habitats are largely unknown.

The Fisheries

Figure 1. Commercial tautog landings from Maryland, 1996-2008.

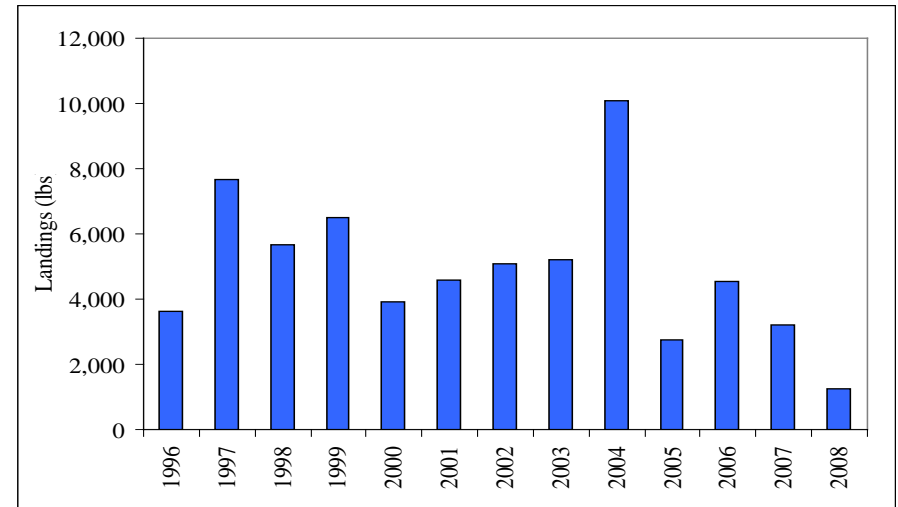
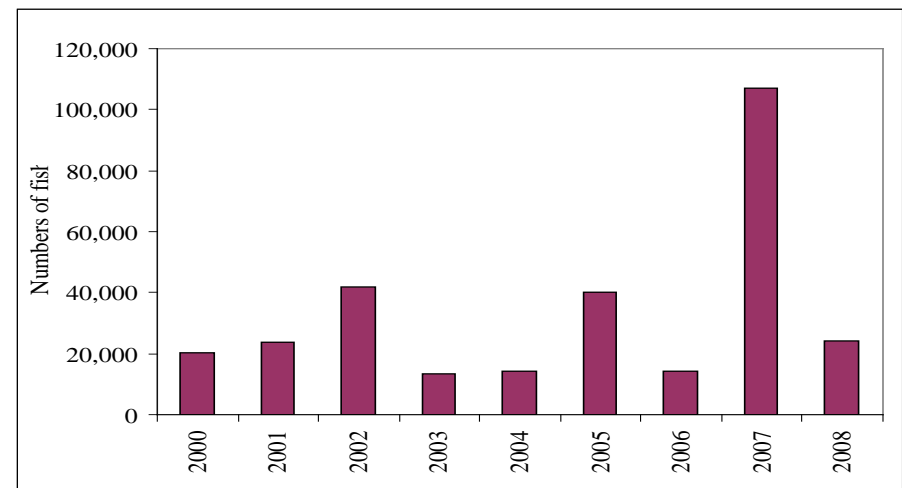


Figure 2. Estimated recreational tautog harvest from Maryland, 2000 to 2008 (MRFSS).



(Figures from Bolinger 2009)

1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 2/10)

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 2003 2005 Continue</p>	<p>The 14" minimum size limit is in effect for MD, VA and PRFC. MD commercial and recreational creel is 4 fish/person/day during January 1- May 15 and November 1-30, 2 fish/person/day during May 16 - October 31, and a December closure. VA has a closed commercial season from April 16 – October 2 and December 1-15. VA recreational fishery is closed from May 1 – June 24 and has a 4 fish/person/day creel limit.</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 ASMFC. The jurisdictions will continue to work towards a unified, Baywide management strategy.</p>	<p>1998 2000 2003 2005 Continue 2008 2009</p>	<p>The most recent coastal stock assessment was completed in 2005 (using data from 1981-2004). Results indicate that F has declined from 0.71 to 0.299. Overfishing has been redefined as $F_{40\%SSB}=0.29$. Since the 2003 rate and the most recent 3-year average ($F=0.389$) exceed the ASMFC rebuilding target ($F=0.2$), tautog were considered overfished. Abundance indices indicate a slight increase in biomass & recruitment. The stock is believed to be at a stable level.</p> <p>MD 2008 CB commercial landings were 2,806 lbs; recreational landings were 53,349 lbs; recreational discards were 326,197 fish (NMFS). Preliminary commercial landings for 2009 were 1,239 lbs. VA 2008 CB commercial landings were 10,502 lbs; recreational landings were 160,947 lbs; recreational discards were 16,103 fish (NMFS).</p>
	<p>1.3) VA and MD waters will continue to require degradable fasteners in tautog pots and traps utilizing either:</p> <ul style="list-style-type: none"> • Untreated hemp, jute, or cotton string of 3/16" (0.48 mm) or smaller • Magnesium alloy, timed float releases (pop-up devices) or similar magnesium alloy fasteners • Ungalvanized or uncoated iron wire of 0.09" (2.39 mm) or smaller. 	<p>1997 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 ungalvanized/uncoated iron wire of 0.094" (2.39 mm) diameter.</p>
<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 taitog in the Chesapeake Bay. The agencies' stock</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 1989- 1999 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>

1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 2/10)

Strategy	Action	Date	Comments
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.	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.	continue	Commercial reporting has been improved through more stringent penalties for not reporting and for late reporting.
	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.	continue	The MRFSS survey is being improved through the MRIP program (see FMP update 2010 introduction for more details). In addition, NMFS is requiring that all states register their recreational fishermen in order to create a more robust data base to calculate recreational harvest estimates.
	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.	1972 continue 1999 continue	Juvenile tautog are sampled during the summer and fall coastal bays trawl and seine survey (not designed to target tautog). MD Coastal Bays Fisheries Investigation annually collects age, length and sex data for tautog purchased from several commercial fisherman.
2.2)The jurisdictions will promote research to determine the extent of migration and mortality 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 encourages.	2.2) Research on migration of tautog between areas is encouraged. Tagging experiments to provide data on tautog migration may be funded from sales of saltwater fishing licenses. The Virginia Game Fish Tagging Program will be continued.	Continue 2007	A study on the seasonal occurrence of tautog in the lower CB indicates that most fish tagged and released in inshore waters remain inshore for the winter rather than move offshore (Arendt, Lucy and Munroe, 2001). 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. VA initiated VA Saltwater Fisherman’s Journal where anglers can keep track of their fishing experience and provide anecdotal information
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	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 & MD have taken a new	Continue 2003 2004	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

1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 2/10)			
Strategy	Action	Date	Comments
success.	focus as the programs intensify efforts to manage around the devastating oyster diseases, Dermo and MSX, currently infecting Chesapeake Bay oysters.	2008	is being restored. Crasostrea virginica (native oyster) and not Crasostrea 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.
	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.”	Continue 2003 2004 2007 Continue	Habitat concerns for oysters and other ecologically valuable species are addressed in the 2004 Oyster Management Plan. Artificial Reef Committee, Maryland Artificial Reef Initiative, and Maryland’s Artificial Reef Management Plan were created and several reefs were built in the Bay.
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	Building of artificial reefs is no longer a priority program. 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.
		2006	MD DNR & CCA MD acquired Woodrow Wilson bridge concrete debris deploying it at the Point No Point reef.
		2007	MD Artificial Reef Committee and the MD Artificial Reef Initiative (MARI) were established to develop reefs in cooperation with the Ocean City Reef Foundation (OCRF). Both MARI and OCRF accept private donations while MD contributes funds when available for reef development projects.
	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.	2008	44 NY subway cars deployed off Ocean City.
	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.
3.2.1) Jurisdictions will continue efforts to:	3.2.1.1A) Protect existing SAV beds from further	Continue	The revised SAV goal adopted by Chesapeake Bay

1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 2/10)

Strategy	Action	Date	Comments
<p>“achieve a net gain in SAV distribution, abundance, and species diversity in the Chesapeake Bay and its tributaries over current populations”.</p>	<p>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.</p>	2003	<p>Program is restoration of 185,000 acres of SAV by 2010 and planting 1,000 acres of SAV by 2008. In 2009, there were 85,899 acres of bay grasses throughout the Bay, which was 46% of the goal.</p>
	<p>3.2.1.1B) The Guidance for Protecting Submerged 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"> 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. 2. Avoid dredging, filling or construction activities that create turbidity sufficient to impact nearby SAV beds during SAV growing season. 3. Establish an appropriate undisturbed buffer around SAV beds to minimize the direct and indirect impacts on SAV from activities that significantly increase turbidity. 	<p>Continue</p> <p>2003</p> <p>2008</p>	<p>MD implemented a living shorelines program in 1970 to 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>	Continue	<p>Water quality criteria have been adopted http://www.chesapeakebay.net/restoringwaterquality.aspx?menuitem=14728.</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>	Continue	<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</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,</p>	Continue

1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 2/10)

Strategy	Action	Date	Comments
<p>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>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>3.3) In 1998, the Chesapeake Executive Council 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>3.3) The jurisdictions should strive towards achieving the following, especially in the salinity range of tautog.</p> <ul style="list-style-type: none"> a) define the resource through inventory and mapping activities b) protect existing wetlands c) rehabilitate, restore and create wetlands d) improve education e) further research. 	<p>Continue</p> <p>2006</p> <p>Continue</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.</p> <p>MD is developing a Blue Infrastructure that includes mapping structural habitat and SAV.</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:</p> <ul style="list-style-type: none"> a) expand program efforts to include the tributaries b) intensify efforts to control nonpoint sources of pollution from agriculture and developed areas c) improve on current point and nonpoint source control technologies. 	<p>Continue</p> <p>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. http://www.chesapeakebay.net/status_reducingpollution.aspx?menuitem=19859.</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:</p> <ul style="list-style-type: none"> a) pollution prevention: target “regions of concern” & “areas of emphasis” b) regulatory program implementation: insure that revised strategies are consistent with and supplement pre-existing regulatory mandates c) regional focus: identify and classify regions according to the level of contaminants d) directed toxics assessment: identify areas of low level contamination, improve tracking and control 	<p>Continue</p>	<p>See Chesapeake Bay Program website for updates on nutrient reduction. http://www.chesapeakebay.net/status_reducingpollution.aspx?menuitem=19859</p> <p>Chesapeake Bay Program is monitoring levels of mercury, PCBs, PAHs, organophosphate and organochloride pesticides.</p>

1998 Chesapeake and Atlantic Coast Tautog Fishery Management Plan Implementation Table (updated 2/10)

Strategy	Action	Date	Comments
	nonpoint sources.		
	3.4.1C) The jurisdictions will continue to develop, implement, and monitor their tributary strategies designed to improve bay water quality.	Continue April 2003	Ambient water quality criteria of DO, water clarity, and chlorophyll-a have been adopted for the Chesapeake Bay.
3.4.2 The Chesapeake Bay Program partners will “Plan for and manage the adverse 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.	3.4.2) Encourage efficient development patterns which reduce nutrient and sediment loads to the Chesapeake Bay and promote responsible land management practices and decisions regarding present and future development by pursuing the following: 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. 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. 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.	Continue	See Chesapeake Bay Program website for updates on land stewardship. http://www.chesapeakebay.net/status_protectingwater_sheds.aspx?menuitem=19876 MD developed curriculum “Where Do We Grow from Here?” about population growth and its impacts on the Bay.

Acronyms:

ASMFC – Atlantic States Marine Fisheries Commission
 CCA MD – Coastal Conservation Association of Maryland
 DO – Dissolved Oxygen
 F – Fishing Mortality
 GIS – Geographic Information System
 MD DNR – Maryland Department of Natural Resources
 PAH – Polycyclic Aromatic Hydrocarbon
 PRFC –Potomac River Fishery Commission
 USACE – United States Army Corps of Engineer

CB – Chesapeake Bay
 CPUE – Catch per Unit Effort
 EEZ – Exclusive Economic Zone
 FMP – Fishery Management Plan
 MAFMC – Mid-Atlantic Fishery Management Council
 NMFS – National Marine Fisheries Service
 PCB – Polychlorinated Biphenyl
 SAV – Submerged Aquatic Vegetation
 USFWS – United States Fish and Wildlife Service

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

Chesapeake Bay FMP

The Atlantic States Marine Fisheries Commission (ASMFC) adopted the Interstate Fishery Management Plan for Shad and River Herring in 1985. The Chesapeake Bay Alosid Management Plan (CBFMP) was implemented in 1989 to coordinate shad and river herring management among Chesapeake Bay states. 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, to remove stream blockages and reopen historic habitat, and to continue stocking hatchery-raised fish. Amendment 1, developed in 1998, recommended evaluating the criteria to reopen a fishery, emphasized opening spawning habitat, and recommended maintaining or lowering fishing mortality rates.

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 with a closure by 2005. It also limited in-river commercial fisheries. ASMFC Addendum I in 2002 clarified hatchery-rearing requirements. ASMFC Amendment 3 to the FMP (2010) adopted a requirement for an American shad sustainability plan including bycatch monitoring, issues with shared rivers and a new definition for juvenile recruitment failure. Maryland is required to complete an annual compliance report for ASMFC.

In 2006, a Fisheries Ecosystem Plan for Chesapeake Bay was signed by the National Oceanic and Atmospheric Administration (NOAA) Chesapeake Bay Fisheries Ecosystem Advisory Panel. Maryland Sea Grant was contracted by the Chesapeake Bay Program to facilitate the implementation of the Fisheries Ecosystem Plan. The goal was to develop an ecosystem-based fisheries management (EBFM) plan for five keystone species. Alosines, fish in the genus *Alosa*, are grouped together as a single keystone species and include American shad, hickory shad, alewife herring, and blueback herring. During fall 2008, state, federal, and academic representatives met to develop an *Alosa* biological background document detailing current and future stressors. Three background briefs are being developed to address resource valuation, life history, and management. Issue briefs are being developed for four types of stressors: habitat (migratory barriers, flow, land use, physical alteration, and water quality), food web (community, competition, forage, predation, and system vectors), stock assessment (exploitation, connectivity, fish condition, mortality, population demographics, and population structure), and socioeconomic (ecological, economic, management considerations, restoration, and social). Issue briefs will be sent to the quantitative evaluation team for the development of targets and indicators.

Work on the Alosine EBFM is slated for completion in 2010. 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. With closure of the American shad fisheries in 1980, stocks began to increase until 2001 when abundance started to decrease. Estimating American shad population size (Conowingo Dam tailrace) has been problematic. Two separate models have produced significantly different abundance estimates. In 2009, 29,272 adult American shad were passed at Conowingo Dam (Figure 1).

Natural reproduction has been variable among river systems. Nineteen percent of American shad caught in the Conowingo Dam tailrace during 2009 had spawned in previous years (repeat spawners). Forty percent of the Nanticoke River stock and 73% of the Potomac River stock were repeat spawners. In Maryland, most juvenile American shad collected in 2008 were hatchery reared: 96% in the Patuxent River, 83% in the Choptank River, and 92% in the Nanticoke River. For hickory shad, stock age structure and proportion of repeat spawners has been consistent and ideal. Repeat spawners in Deer Creek were 83% male and 86% female in 2008.

Current Management Measures

American shad harvest in Chesapeake Bay waters was prohibited by Maryland in 1980, Potomac River Fisheries Commission in 1982, and Virginia in 1994. Harvest of American shad is prohibited in Pennsylvania. Maryland enacted a hickory shad moratorium in 1981. A small bycatch is allowed during commercial fishing activities. A catch and release recreational shad fishery exists in Maryland portions of the Susquehanna River during the spring spawning run (Figure 2).

In response to the 1980 stock declines, Maryland implemented population monitoring, fish passage projects, and stocking programs. Maryland monitors American shad at the Conowingo Dam on the Susquehanna River and in the Nanticoke, Choptank, and Patuxent rivers.

Issues/Concerns

American shad are subject to multiple sources of mortality such as directed fishing (F), fish passage mortality at dams, pollution, and bycatch. Currently, American shad are managed based on fishing mortality rates (F). ASMFC Amendment 3 modified the F=30% benchmark to include all sources of mortality (Z=30%). This benchmark measures excessive mortality but not overfishing. Additional data are required to develop target and threshold biological benchmarks to prevent overfishing.

Dams prevent migrating shad from reaching suitable spawning habitat. The inability

to reach suitable spawning habitat has had a negative effect on shad stocks. Multiple types of fish passageways have been installed at dams with varying rates of success. Fishway efficiency data are lacking in MD and are needed to identify effective fishway designs. Presently an American shad radio telemetry study is being conducted in the Susquehanna River to quantify catchability at Conowingo and York Haven dams. The results from these studies will be used to estimate catchability in relation to hydro-power generation.

Figure 1. American shad population estimates from the Conowingo Dam tailrace, 1986-2009, using two different calculations.

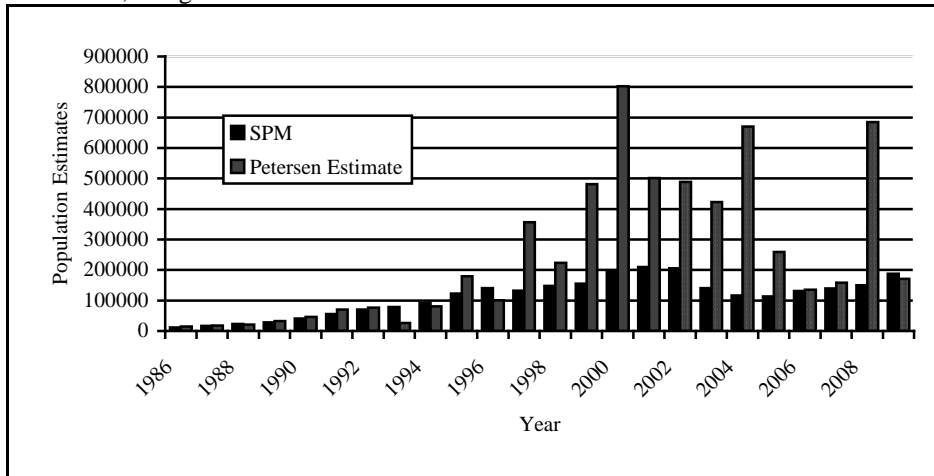
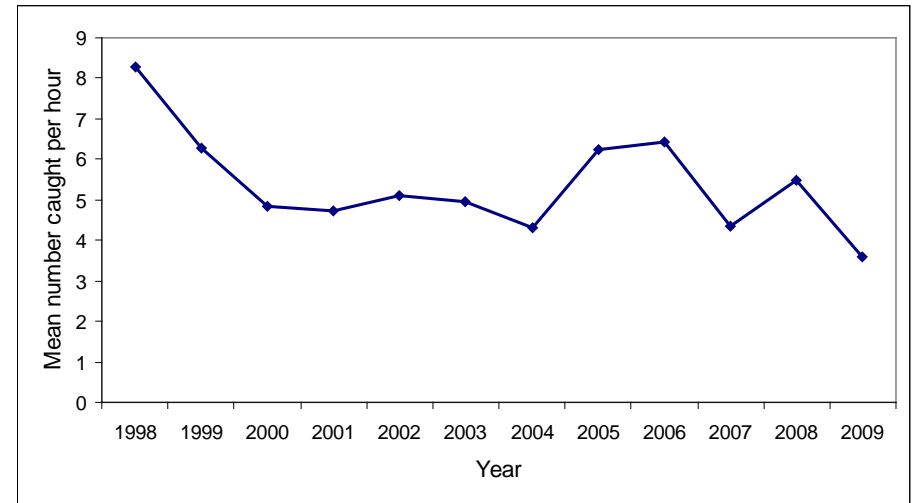


Figure 2. Recreational angler log book data for the spring hickory shad fishery in Deer Creek,, Maryland from 1998-2009.



Alewife herring (*Alosa pseudoharengus*) and Blueback herring (*Alosa aestivalis*)

Chesapeake Bay FMP

The Atlantic States Marine Fisheries Commission (ASMFC) adopted the Interstate Fishery Management Plan for Shad and River Herring in 1985. The Chesapeake Bay Alosid Management Plan was implemented in 1989 to coordinate shad and river herring management among Chesapeake Bay states. The Chesapeake Bay Program fishery management plan (CBFMP) identified declining abundance, over-fishing, insufficient research and monitoring, and habitat loss as problems. The CBFMP set guidelines to reduce herring fishing mortality and remove impediments to accessing historic habitat. Amendment 2 (2009) to the ASMFC FMP requires states to have a Board approved river herring sustainability plan by 2012 or their river herring fisheries will be closed. An approved river herring 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. It also encourages stocking programs. Maryland is required to complete an annual compliance report for ASMFC.

In 2006, a Fisheries Ecosystem Plan for Chesapeake Bay was agreed upon by the National Oceanic and Atmospheric Administration NOAA Chesapeake Bay Fisheries Ecosystem Advisory Panel. Maryland Sea Grant was contracted by the Chesapeake Bay Program to facilitate implementation of the Fisheries Ecosystem Plan. The goal was to develop an ecosystem-based fisheries management (EBFM) plan for five keystone Chesapeake Bay species. Alosines, fish in the genus *Alosa*, are grouped together as a single keystone species and include: American shad, hickory shad, alewife herring, and blueback herring. River herring life history has been included in the Alosine biological background document but environmental stressors for herring have yet to be determined. For more information on the EBFM process, go to <http://www.mdsg.umd.edu/programs/policy/ebfm>.

Stock Status

A 2008 ASMFC river herring stock status report indicated coast wide declines in mean length and age. In Maryland, river herring are monitored in the Nanticoke River. The amount of river herring caught by commercial fishermen has significantly decreased since 1989. Adult river herring stocks in Maryland are projected to remain at low abundance levels for the near future.

Current Management Measures

There are no harvest restrictions for herring in Maryland other than a commercial closure from June 6 to December 31. Amendment 2 to the ASMFC FMP requires

states to have an ASMFC approved river herring management plan by 2012. Without an approved FMP, commercial and recreational fisheries will be closed.

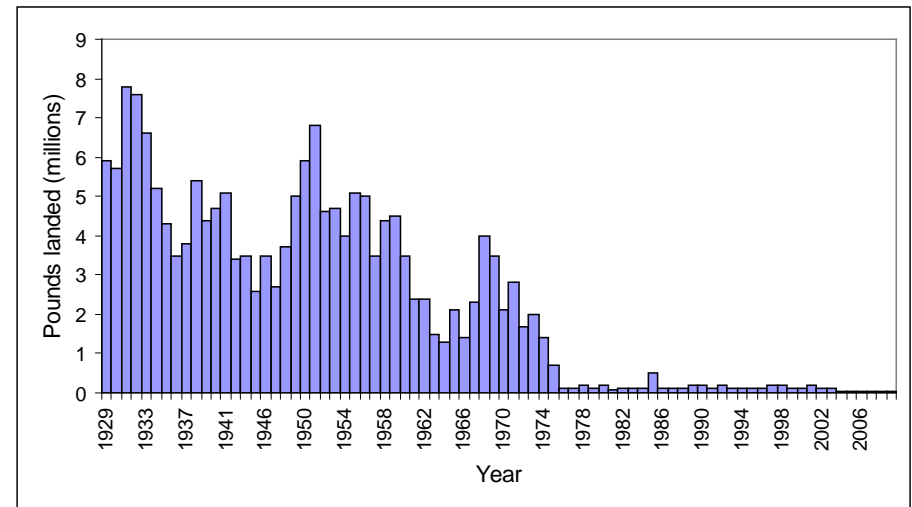
Issues/Concerns

River herring are subject to multiple sources of mortality such as directed fishing (F), fish passage mortality at dams, pollution, and bycatch. Insufficient fishery and non-fishery data exist to develop any management benchmarks. Significant improvement in monitoring river herring is necessary for successful management.

Dams prevent migrating river herring from reaching suitable spawning habitat. The inability to reach spawning habitat has had a negative effect on the stocks. Multiple types of fish passageways have been installed at dams with varying rates of success. Fishway efficiency data is lacking in MD and is needed to identify effective fishways and those in need of improvement.

The Fisheries

The amount of river herring caught commercially from Maryland Chesapeake Bay waters during 1929-2009.



(data from NMFS)

1998 Amendment 1 to the 1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 1/2010)

Problem Areas	Action	Date	Comments
1.1 Stock Status	1.1 The Bay jurisdictions will continue the moratorium on American shad in Chesapeake Bay.	1989 Continue 2009	The Bay jurisdiction will reevaluate the criteria for reopening a fishery in Chesapeake Bay during the Alosine FMP revision process. Until new criteria are determined, the moratorium will remain in place for American and hickory shad in Chesapeake Bay. Coastal fishery scheduled for closure December 2004. Development of a Chesapeake Bay EBFMP began in 2009 and will continue through 2010.
1.2 Establish Targets	1.2 The bay jurisdictions will incorporate the shad restoration targets into the revised Alosine FMP	1999 Continue 2007	River specific targets were proposed in 1997, but need to reevaluated. STAC conducted a workshop on alosine targets during 2001. Recommendations from the workshop will be considered. A target-setting white paper is under development. The CBP shad abundance index has been expanded from one source of data from the head of the bay to four areas; including the James, York and Potomac Rivers. The index is based on fish passage on the Susquehanna and James Rivers and based on commercial bycatch on the Potomac and York Rivers.
Reduced Spawning Stock	The Bay jurisdictions are continuing stocking efforts to help increase alosine spawning stock biomass. Bay jurisdictions are trapping, transporting and stocking American shad in Chesapeake Bay tributaries.	1986 1996 2003 Continue	Between 1986 and 2000, more than 289 million shad fry and fingerlings were cultured and restoration efforts on the Susquehanna, Pamunky, Mattaponi and Potomac rivers, and several Maryland tributaries. Most recent stocking has occurred in the Nanticoke and Choptank rivers. Stocking began on the Rappahannock River in 2003.
Fish Passage	The Bay jurisdictions set 2 fish passage goals; 1) a five year goal to open 731 miles of stream habitat by 1998; 2) a 10-year goal to open 1357 miles of stream habitat by 2003	1993 1998 Continue	1,838 miles of stream habitat was reopened for anadromous fish from 1988 through 2005. The revised fish passage goal is now 2,807 miles of steam opened by 2014.

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 1/2010)

Problem Area	Action	Date	Comments
1. Declining Alosine abundance	1.1.1) Continue shad moratorium in Maryland's portion of the Chesapeake Bay.	Continue	The 2004 population estimate for adult American shad in the Conowingo Dam tailrace exceeded 1,000,000 fish. Upper Bay shad estimates are no longer possible with the loss of a commercial pound net in the Susquehanna Flats. Shad stocks in the upper Bay have been increasing since the moratorium in 1980. DCFM implemented a moratorium on shad during 1992. PRFC has a moratorium on directed shad harvest since 1982. ASMFC allows a limited Hickory and American shad in Potomac pound net and gill net.
	1.1.2) VA will follow ASMFC recommendation to limit exploitation rate on shad and herring to 25%	1994 2005 continue 2010	VA implemented a moratorium in harvest of American shad from the Bay in 1994. No harvest restrictions on hickory shad and herring. ASMFC allows a limited American shad commercial bycatch in the James, York, and Rappahannock rivers for the anchored and stacked gill net fisheries. PRFC adopted a moratorium on directed harvest of river herring.
	1.2) Control river herring catch, including: by system, regulate areas slated for restoration, gear and/or seasonal restrictions	1990	No restrictions have been implemented for river herring. Commercial harvest has been declining due to low market demands and questionable stock status.
	1.3) Hickory shad fishery will follow the same management actions for shad fishery (see Action 1.1.1)	Continue	MD (1981) and DC (1992) and PRFC (1995) will continue moratorium on hickory shad. Recent monitoring results suggest hickory shad are rebuilding in the Bay. Stocking of larval and juvenile hickory shad has occurred on the Patapsco, Patuxent, Choptank, and Nanticoke rivers.
	1.4) Protection will be given to alosines in the Susquehanna as restoration efforts continue.	Continue	PA prohibits the harvest of shad. MD has a recreational catch and release fishery below Conowingo Dam.

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 1/2010)

Problem Area	Action	Date	Comments
2. Overfishing	2.1) Jurisdictions will participate in the ongoing ASMFC alosine management program, with the goal of providing adequate protection to the component of the coastal stock which returns to Chesapeake Bay to spawn.	Continue	MD, VA, and PRFC participate in the ASMFC shad management board and technical committee. ASMFC conducted a stock assessment in 1997. In 1999, Amendment #1 to the ASMFC coastal shad plan adopted a strategy to keep fishing mortality below F_{30}. The next stock assessment update to be peer-reviewed is scheduled for 2005.
	2.2 A) Implement a coast shad tagging program to determine which stocks are being exploited in the intercept fishery	1991-1992	Results from the tagging study indicate that the coastal fishery is mixed and highly variable from year to year
	2.2 B) Control the coastal intercept fishery through a combination of gear restrictions, seasonal and area closures, and harvest limits	1993 2005	ASMFC Amendment #1 requires a closure of the coastal intercept fishery by December 2004. Moratorium on the harvest of shad from coastal waters as of January 1, 2005
	2.2 C) Continue to monitor and document the territorial seas intercept fishery for American shad	1993 2004	MD and VA are required to monitor coastal commercial harvest. Completed Dec.2004
	2.3.1) Virginia will control river herring harvest during spawning migrations through gear restrictions and spawning area closures.	1992	The harvest of river herring has declined for a number of reasons.
	2.3.2) MD and VA will monitor river herring bycatch through the MAFMC.	In effect	River herring bycatch is being monitored under the MAFMC Squid, Mackerel and Butterfish FMP.
	3. Stock Assessment	3.1 A) Continue to collect alosine data, collect alosine juvenile data.	Continue 2009
3.1 B) MD will continue project in upper Bay to estimate adult shad		Continue 2009	Adult shad project on the Nanticoke River was discontinued because lack of tag returns. ASMFC Amendment 2 requires adult river herring spawning/population assessment.

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 1/2010)

Problem Area	Action	Date	Comments
	3.1 C) VA will improve the assessment of shad stocks in territorial waters and improve catch and effort data through mandatory reporting.	Continue	Commercial landing data has been improved on a coastwide basis with the establishment of ACCSP. Shad still caught as bycatch.
	3.1 D) Continue VMRC stock assessment	Continue	VA & MD provide important data to coastal stock assessment
	3.1 E) VA will initiate ocean intercept tagging program	1991-1992	Tagging work completed in 1992. Results indicated coastal catch is mixed and highly variable. Other tagging work has been discussed
	3.1 F) MD will examine exploitation rates of herring in selected tributaries and improve landing data	Continue	Mortality rates have been calculated for herring on the Nanticoke River. Exploitation rates for river herring have not been a priority.
	3.1 G) VA will implement a survey of alosine spawning grounds and associated biological data	2009	A map of historic shad and herring spawning areas has been completed. Tributary-specific targets are being considered. The FMPC and ad hoc Fish Passage workgroups have met to discuss how to address the development of targets. CBSAC sponsored a workshop to evaluate different methodologies and recommended a multi-metric approach. A 'white paper' to address the C2K is being drafted and scheduled for completion by December 2004. ASMFC Amendment 2 requires adult river herring spawning/population assessment.
	3.1 H) A joint effort will be made to investigate the status of shad in the Potomac	Continue	DCFM has been sampling the upper Potomac for shad and river herring since 1991. A juvenile survey on the Potomac indicates shad are increasing in abundance. The 2003 JI was 2.73 (GM)
4. Habitat loss and degradation	4.1 A) Implement the Chesapeake Bay Fish Passage Plan A-I) Implement various fish passage projects	Variable 2009	Over 1,400 miles of historic spawning areas have been reopened as of Dec. 2004. A new goal has been developed. ASMFC Amendment 2 requires assessment of fishway passage efficiency/inefficiency for river herring.
	4.1 B) Coordinate resources for restocking efforts	1986 continue	Between 1986 and 2003, more than 340 million American shad fry and fingerlings were cultured and released in Susquehanna, James, Pamunky, Mattaponi, Rappahanock, Potomac & Choptank rivers.
	4.1 C) Establish measures to protect reintroduced fish	1990	Regulations to protect reintroduced herring have not been implemented. Moratorium in effect for shad.

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 1/2010)

Problem Area	Action	Date	Comments
	4.1 D) Monitor impact of fish passage projects	Continue 2009	Fishways are monitored on a limited basis as new ladders are constructed. A new 10 year fish passage goal will require all new fish passage projects be monitored to ensure they are passing fish. ASMFC Amendment 2 requires assessment of fishway inefficiency for river herring.
	4.1 E) Demonstration fish ladder project in Elkton.		Elkton dam was built in 1993, 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 stream area around the ladder was dredged in 2005 to increase its effectiveness.
	4.1 F) Implement guidance and avoidance techniques to reduce turbine mortality.	2009-2013	Under consideration during the FERC relicensing for Conowingo and Holtwood dams.
	4.1 G) Establish fish passage on the James and Rappahannock rivers.	1999 2005	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 mainstem James and over 150 miles of major tributaries. Embrey Dam was removed from the Rappahannock River reopening 106 miles of the Rappahannock and Rapidan rivers.
	4.1 H) Evaluate effectiveness of Chickahominy River Walker's Dam fish passage facility.	1989	A double Denil fishway on Walkers Dam was rebuilt in 1989 by the City of Newport News to allow passage of migratory fish. Striped bass, blueback herring, alewife and American shad have been documented using the fishway.
	4.1 I) Establish fish passage at Little Falls Dam (10 miles spawning habitat) and Rock Creek Park (5 miles spawning habitat).	2002	A hydraulic model study of Little Falls Dam fish passage was completed.
	4.1 J) Jurisdictions coordinate brood stock collection.	Continue	Standardized hatchery-rearing methods in practice.
	4.1 K) Draft regulations to conserve stocked fish until population recovery.	Continue	Moratorium in place for American and hickory shad.
	4.1 L) Monitor fish passage projects.	1999 continue	Boshers Dam vertical slot fishway is monitored for passage each spring. American shad plus 23 other species are known to use the passage.

1989 Chesapeake Bay Alosid Management Plan Implementation Table (updated 1/2010)

Problem Area	Action	Date	Comments
	4.2.1) MD and PA will continue to work within SRAFRFC's ongoing programs to ensure downstream passage for juveniles and adults	Continue 2002 2010	SRAFRFC adopted a new Alosine Management and Restoration Plan for the Susquehanna River Basin in 2002. A revised SRAFRFC Management and Restoration Plan is under review and should be available by spring 2010.
	4.2.2 A) Promote use of Susquehanna brood stock for PA restocking	Continue	PA broodstock are being collected from the Susquehanna River.
	4.2.2 B) VA will expand funding for Pamunky/Mattaponi shad hatcheries	1993	CBP provided limited funds for hatchery work
	4.3 A-E) Technical issues regarding water quality at Conowingo Dam	Continue	Standards were implemented in 1989 and have been monitored ever since. New water quality criteria for living resources have been adopted. During the present FERC relicensing of Conowingo Dam on the Susquehanna River, Maryland is insisting on establishing sampling protocols for water quality.
	4.4). Establish new water classification system based on living resources, habitat and water quality	2007	Maps delineating particular habitats of concern have been utilized for developing water quality standards. Revised habitat prioritization maps are being produced by CBP.
	4.5) Promote Bay Agreement water quality commitments	Variable May 12, 2009	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. STAC sponsored a workshop during 2001 to address targeting efforts. A document to address the targets is under development. 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.

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 – Distric of Columbia Fisheries Management

EBFMP – Ecosystem Based Fisheries Management

FERC – Federal Energy Regulatory Commission

FMP - Fishery Management Plan

FMPC – Fisheries Management Planning and Coordination

GM – Geometric Mean

JI – Juvenile 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

VIMS – Virginia Institute of Marine Science

VMRC – Virginia Marine Resource Commission

Section 20. Weakfish (*Cynoscion regalis*)

Chesapeake Bay FMP

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. Spawning stock biomass (SSB) was estimated at 3% of an unfished stock, and exceeded the biomass threshold. 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 2008 showed both a decrease in mean adult age and the lowest juvenile abundance since the survey was standardized in 1989. The ASMFC Weakfish Management Board revised and adopted new percentage-based spawning stock biomass biological reference points (BRPs) in November 2009.

Current Management Measures

Management measures to reduce commercial and recreational exploitation by over 50% are required by ASMFC's Addendum IV. It requires states to implement a 1 fish recreational creel limit and a 100 pound commercial trip and bycatch limit. Maryland and Virginia have drafted new regulations for 2010 to implement the 1 fish creel limit. Both states will impose more restrictive limits on commercial harvest and bycatch to meet or exceed the ASMFC requirements.

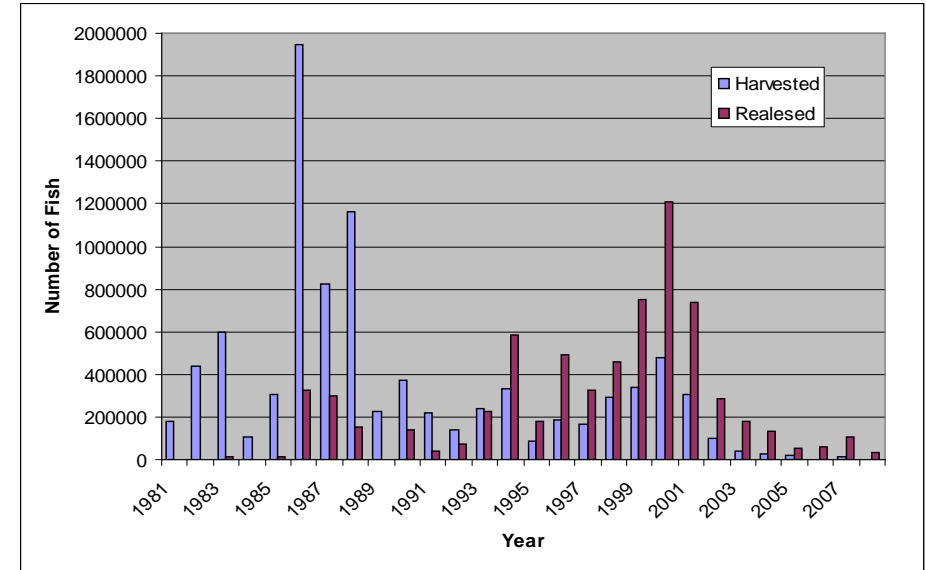
Issues/Concerns

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 Weakfish Management Board "received a significant amount of public comment supporting a coastwide moratorium". The Board chose

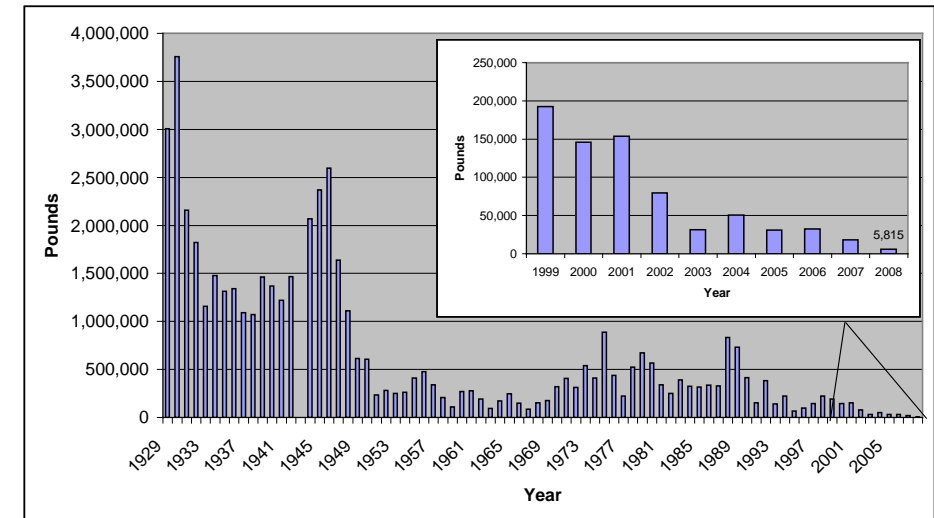
to implement restrictions that would allow for limited directed fishing that would also allow sampling programs to continue.

The Fisheries

Maryland's recreational weakfish harvest and releases in numbers, 1981-2008.



Maryland's total commercial weakfish landings 1929-2008.



(Figures from Rickabaugh 2009)

2003 Chesapeake Bay Program Weakfish Fishery Management Plan Implementation (updated 12/09)			
Section	Action	Implementation	Comments
<p>Stock Status 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> 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 most recent assessment found the stock to be depleted, with SSB estimated to be 3% of an unfished stock, well below the 20% threshold and 30% target reference points 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 panel for the 2009 weakfish stock assessment recommended developing new reference points for future management.</p>
	<p><u>Action 1.2</u> 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. States must submit programs to implement Addendum IV for approval by the Weakfish Management Board by Jan. 1, 2010 and must implement approved programs by May 1, 2010.</p>

2003 Chesapeake Bay Program Weakfish Fishery Management Plan Implementation (updated 12/09)			
Section	Action	Implementation	Comments
<p>The Fishery Management Strategy: The CBP jurisdictions will regulate the commercial and recreational fishery based on the most recent status of the stock and the established fishing targets.</p>	<p><u>Action 2.1</u> The CBP jurisdictions will consider regional differences when determining state allocation issues and regulations.</p>	As necessary	The Maryland Sport Fish Advisory Commission has recommended a weakfish moratorium.
	<p><u>Action 2.2</u> 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.</p>	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.
	<p><u>Action 2.3</u> 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.</p>	Annually	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.

2003 Chesapeake Bay Program Weakfish Fishery Management Plan Implementation (updated 12/09)			
Section	Action	Implementation	Comments
<p>The Fishery Research and Monitoring: 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> 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	Monitoring data provides information on abundance; age structure and Y-O-Y recruitment. Total commercial landings in MD decreased 68% from 2007 harvest levels to a low of 5815 pounds, well below the MD average annual harvest of 651,827 pounds from 1929-2007. The MD recreational harvest estimate is 2590 weakfish. Only 41 weakfish were sampled in MD Chesapeake Bay pound nets and their length was nearly identical from 2007 to 2008 (275 and 276 mm) although mean age decreased in 2008.
	<p><u>Action 3.2</u> The CBP jurisdictions will conduct fishery independent sampling and collect data on abundance, age structure and recruitment.</p>	Continue	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 Addendum 1 to Amendment 4. In addition, MD calculated geometric mean juvenile catch per hectare in coastal bays decreased from 2.32 in 2007 to 0.23 in 2008. The Chesapeake Bay juvenile geometric mean of 0.79 was the second lowest of the time series.
	<p><u>Action 3.3</u> CBP jurisdictions will continue to coordinate state activities with the Atlantic Coast Cooperative Statistics Program (ACCSP).</p>	Continue	Since 2003, data requirements have been based on a 2 year average.
	<p><u>Action 3.4</u> The CBP jurisdictions will begin to collect and examine stomach contents data and examine the effects of environmental variables upon weakfish growth rates.</p>	On-going	Data from the ChesMMAP Survey, CHESFIMS project and the MD Winter Trawl Survey will be used to delineate species interactions and predator/prey 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.

2003 Chesapeake Bay Program Weakfish Fishery Management Plan Implementation (updated 12/09)			
Section	Action	Implementation	Comments
<p>Habitat Management Strategy: CBP jurisdictions will monitor and regulate activities which may be harmful to weakfish habitat.</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.	On-going	CBP jurisdictions support the commitments of 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 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.
	<p><u>Action 4.1</u> 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>	Continue	The MD DNR water quality protection database focuses on watershed lands that are most important for improving water quality.
	<p><u>Action 4.2</u> 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.</p>	Continue	Data from the ChesMMap, CHESFIMS, and the MD Winter Trawl Surveys will provide data on important forage species for weakfish.
	<p><u>Action 4.3</u> 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.</p>	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.

2003 Chesapeake Bay Program Weakfish Fishery Management Plan Implementation (updated 12/09)			
Section	Action	Implementation	Comments
Ecosystem Interactions Management Strategy:	<u>Action 4.4</u> 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 ChesMMAP, CHESFIMS and the MD Winter Trawl Survey will be collected and analyzed by CBP jurisdictions to identify inter- and intra-species weakfish competition and predator/prey interactions. 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
 ChesMMAP = 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 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 to include weakfish only in 2003. Since that time, there has been no management plan for spotted seatrout. 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 adopted the spotted seatrout FMP in 1984 for states from Maryland to Florida.

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 state assessments have been performed (NC, SC, GA, FL) on local stocks, there have been some data limitations. Stock status varies by state. The MD recreational harvest has been approximately 10,000 pounds or less for the past 10 years. The VA recreational fishery has harvested up to 305,599 pounds (2007). 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 41,004 pounds in 2007.

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 12” minimum total length is recommended 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 also 14” with a 10 fish limit and overall quota of 51,104 pounds.

Section 21. White Perch (*Morone americana*)

Maryland FMP

A Chesapeake Bay Fishery Management Plan (CBFMP) for white perch has not been developed. 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

A Maryland assessment was conducted in 2009 with data collected through 2007. This assessment indicated that the estimated biomass was above minimal stock levels and fishing mortality was lower than necessary to maintain stock abundance. The assessment cautiously noted that some indices of commercial CPUE have been trending lower while recreational CPUE has trended higher. The Choptank River assessment showed a 6-fold increase in the population from 1989 to 2007. The Choptank River fishing mortality has been declining and is presently considered to be low. Both Maryland and Virginia calculate juvenile indices for white perch and recent years have shown average to below average juvenile abundance. Biological reference points (BRP) have not been formally established although a BRP was suggested as $F=0.65$, a level of fishing mortality that has not been exceeded since 2000.

Current Management Measures

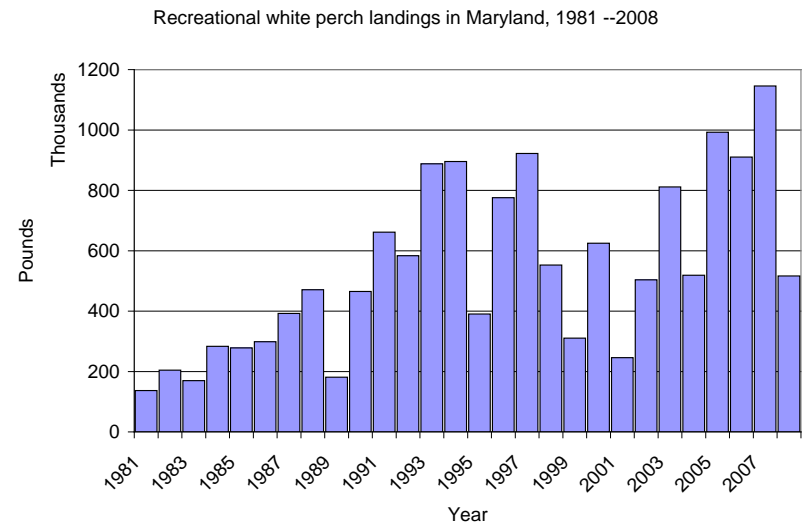
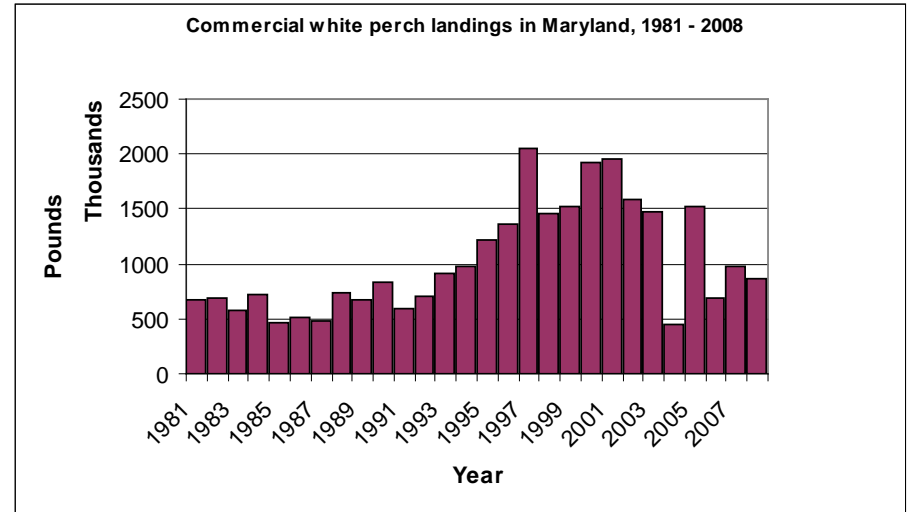
White perch are managed in coordination with striped bass because they overlap in habitat and have some commercial gear types in common, such as drift gill nets. The management unit is the white perch throughout its range in Maryland's portion of the Chesapeake Bay. The commercial fishery is regulated with gear and area restrictions with 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 remains low and the species is considered to be resilient. The juvenile index is variable. In the years since 2002, there have been three relatively poor year-classes, three average year-classes, and only one very good year-class. Declines in abundance are expected as a result of recent low recruitment.

The Fisheries

Preliminary 2009 commercial landings from Maryland are 1,167,828 lbs.



(Figures from Piavis 2009)

White Perch Implementation Table (updated 12/09)			
Problem Area	Action	Date	Comments
Mixed Fishery 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 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 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>Juvenile index was high from 1994-2001. Since 2002, 3 poor year-classes, 3 average and 1 very good year-class.</p> <p>The Choptank River assessment indicated an increase from 1 million white perch in 1989 to 6 million in 2007 with a low fishing mortality rate of 0.20 in 2007. Fishing mortality of white perch remains low. Commercial landings in MD and VA have dropped to about one-half the high levels of 1995-2003. Commercial CPUE indices have been trending lower. Recreational landings have shown an increasing trend for the same period. Recreational CPUE has increased recently.</p> <p>White perch stocks are not overfished and overfishing is not occurring. BRPs have not been adopted.</p>
Habitat Issues 4.1. Water quality impacts distribution and abundance of finfish species in Chesapeake Bay.	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.	Ongoing	<p>Watershed indicators for aquatic systems include water quality as well as components of aquatic systems, biological diversity, hydrologic and terrestrial system indicators (http://www.dnr.state.md.us/watersheds/surf/indic/md_indic.html).</p> <p>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 & strategies and organizations.</p>

Acronyms:

BRPs = Biological Reference Points
DNR = Department of Natural Resources

CPUE = Catch per Unit Effort
H & L = Hook and Line

Section 22. Yellow Perch (*Perca flavescens*)

Maryland FMP

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 scheduled for completion and review in 2010.

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 new 2007 assessment results. The new reference points take into account uncertainty from the model and uses conservative estimates of natural mortality. Yellow perch population numbers and biomass have shown increasing trends over the last two years.

Current Management Measures

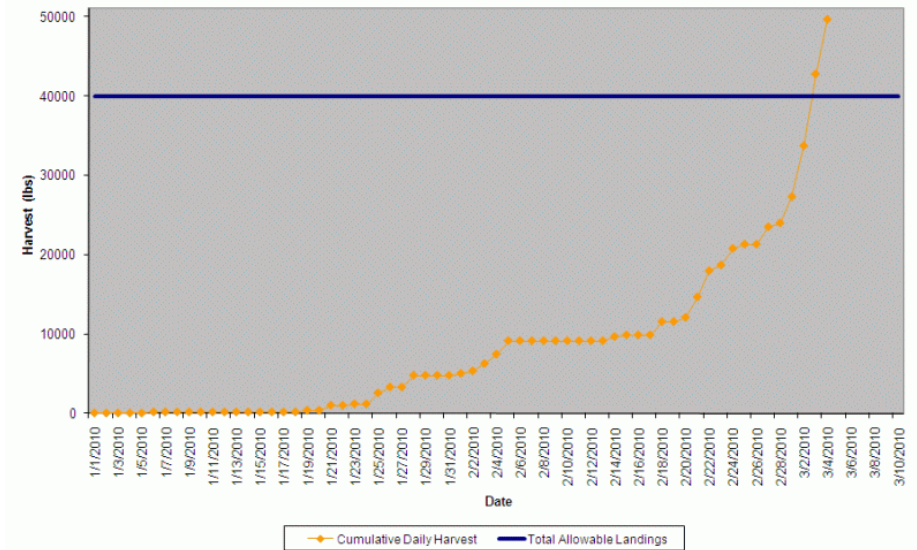
After considerable public input during 2008, the fisheries are now managed on the basis of Total Allowable Catch (TAC). The TAC has been allocated 50:50 between the commercial fishery and the recreational fishery since 2009. The TAC is calculated annually based upon the stock assessment to achieve the target fishing mortality rate ($F=0.48$). Three management areas have been established. When the TAC is reached in early March, the commercial season is closed for that area. 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

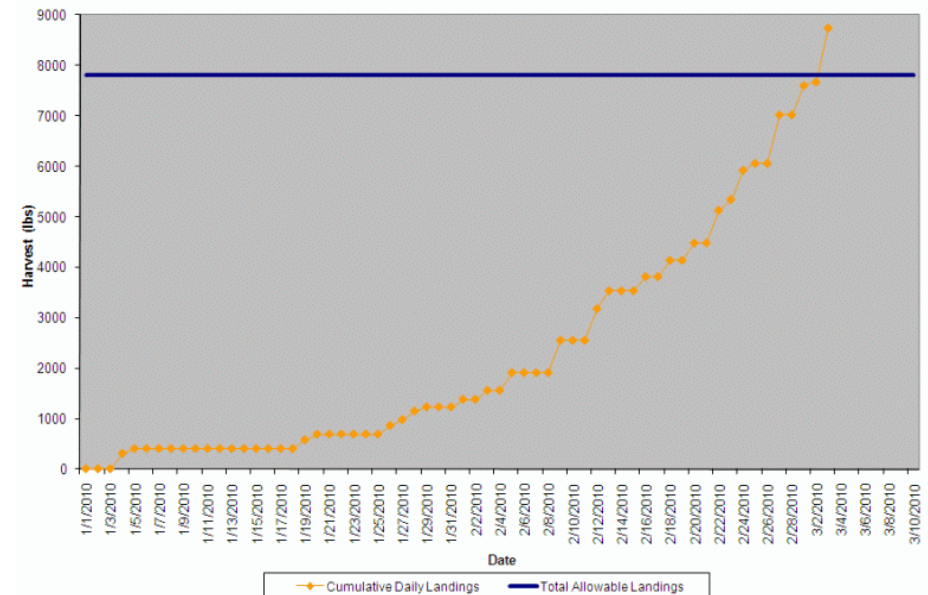
Despite controlled low fishing mortality, recruitment is expected to decrease in 2011-2012 due to poor juvenile year-classes. Commercial seasonal closures presently require a minimum 48 hour notice at a time when catches are highest (see figures). Authority for a 24 hour closure notice or daily harvest limits are options for meeting but not exceeding area TACs. There may be local conflicts where recreational fishing and commercial activity overlap geographically.

The Fisheries

Upper Bay Cumulative Yellow Perch Harvest 2010



Chester River Cumulative Yellow Perch Harvest 2010



2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table (updated 12/09)

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 begun development of "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.
	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. Several meetings have been held with SHA and DNR about mitigation projects for Rte 301 improvements. Several projects in Southern MD that would benefit yellow perch were brought forward and are under consideration.

2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table (updated 12/09)			
Section	Action	Date	Comments
	1.6) Develop research proposals to examine habitat fish linkages.		Impervious surface and its impact on aquatic resources (especially fish) is 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 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 Riverkeeper program (http://www.severnriverkeeper.org/Monitoring07.htm)
	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.
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.		The table has been 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 has collected ichthyoplankton in some historical yellow perch spawning streams and compared 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.

2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table (updated 12/09)

Section	Action	Date	Comments
	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 IS data and development projections to identify potential 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 but will not be available until 2009 at the earliest. 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 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 is underway.
	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 estuary. These results indicate that other spawning locations may be more critical. Maps are being updated to illustrate essential fish habitat at different life stages.
	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 Continue	Continuing analysis indicates current BRPs to be viable. 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.

2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table (updated 12/09)

Section	Action	Date	Comments
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 Continue	Presented to YP Ad hoc group for discussion and adopted. Based on a target fishing mortality rate (F=0.48) a 2010 TAC of 44,900 pounds was calculate. This was an increase in the TAC from 38,000 pounds in 2009. When the 2009 overage of 4951 was subtracted from this TAC, the calculated TAC for the Upper Bay commercial fishery was 39,949 pounds. The Chester River TAC was 7800 pounds and the Patuxent River TAC was 2500 pounds. Improved catch reporting included daily call-ins, verified by tagging. These measures were implemented in 2009 to improve accountability.
	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 Evaluated/ Updated Periodically	Management actions may include size limits, creel limits, closed seasons, area closures, and/or gear restrictions. Updated table (2006). Need to reexamine the table's usefulness in guiding management strategies. Starting with the 2009 seasons, 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 Assessed 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 Assessed 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 12/09)

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. 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 2009.
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) has been 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.
	18) Evaluate the need for increased enforcement of yellow perch regulations, develop strategies to meet the needs and implement actions accordingly.	To be determined 2001 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.

2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table (updated 12/09)

Section	Action	Date	Comments
<p>Stock Status</p> <p>MD DNR will monitor yellow perch stocks in representative areas of the</p>	<p>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.</p>	<p>On-going</p>	<p>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).</p>
<p>Chesapeake Bay in order to assess yellow perch stock status. Assessment and</p>	<p>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.</p>	<p>2003</p>	<p>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.</p>
<p>management efforts will be focused on areas already under special management measures, i.e., closed areas.</p>	<p>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.</p>	<p>2001 2005</p>	<p>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).</p>
	<p>22) Evaluate additional fishery-independent indicators of stock status, such as the trawl survey in the upper Bay.</p>	<p>On going</p>	<p>Implementation of this action is dependent on manpower and funding</p>
	<p>23) Review and evaluate yellow perch monitoring efforts biannually. Recommend changes in monitoring and protocol necessary to implement the yellow perch FMP.</p>	<p>2002 and even years thereafter</p>	<p>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.</p>

2002 Maryland Tidewater Yellow Perch Fishery Management Plan Implementation Table (updated 12/09)

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>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>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>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>Open</p> <p>Open</p> <p>2004</p> <p>On-going</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 will be implemented in 2008. CCA, MSSA will be asked to promote angler participation.</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>Focus has changed to American eel as an educational tool. Experience in Severn River (Arlington Echo) indicated too low viability of local eggs for successful program.</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:

- | | |
|--|--|
| BRPs= Biological Referenc 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 |

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

The Chesapeake Bay Program Atlantic Croaker and Spot Fishery Management Plan (FMP) was adopted in 1991. The goal of the plan 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 and to recommend monitoring and research programs.

The Atlantic States Marine Fisheries Commission (ASMFC) adopted coastal FMPs for each species in 1987. The management measures at that time were not specific and did not have any compliance requirements. 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 successfully reduced the number of small fish caught in the trawl fishery. Since then biological reference points (BRPs) for croaker were established for the mid-Atlantic region in 2006. The BRPs defined overfishing and set targets for female spawning stock biomass and fishing mortality. No stock assessment has been conducted on the coastal spot stock. However, the coastal states have been providing harvest and monitoring data to ASMFC to assess trends in abundance. Maryland is required to complete an annual croaker and spot compliance report for ASMFC.

Stock Status

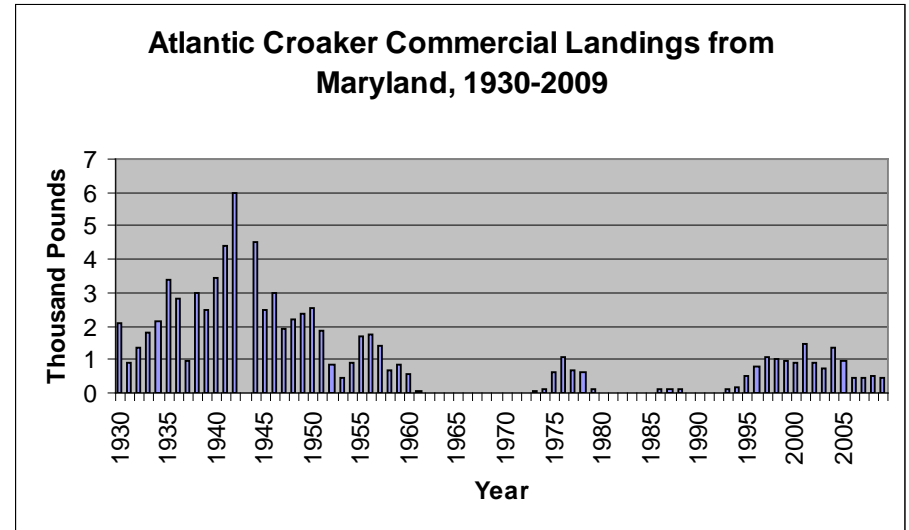
Atlantic croaker – The coastal stock is not overfished and overfishing is not occurring. Monitoring data from Maryland’s portion of the Chesapeake Bay indicate a broadening size and age structure. Recent juvenile indices were some of the highest in a 20 year data set.

Spot – Catch per unit effort (CPUE) data have been used to evaluate the status of spot. However, drawing conclusions from Maryland’s fishery dependent monitoring data is tenuous at best. CPUE values are highly variable and differ by gear type. There is some concern that there is a declining trend.

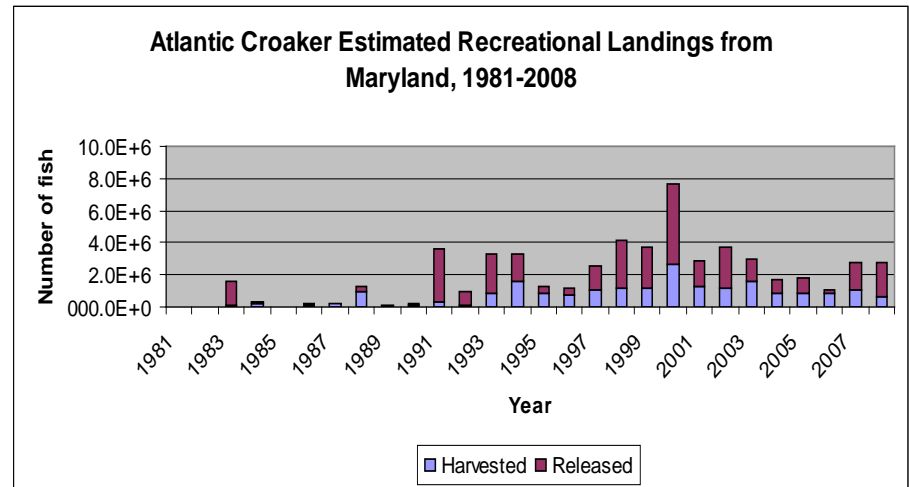
Management Measures

There are currently no management measures required by ASMFC to restrict the commercial or recreational fisheries for either croaker or spot. The coastal states are required to compile commercial and recreational harvest statistics and monitoring data. Maryland has a 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. There are no harvest restrictions for spot.

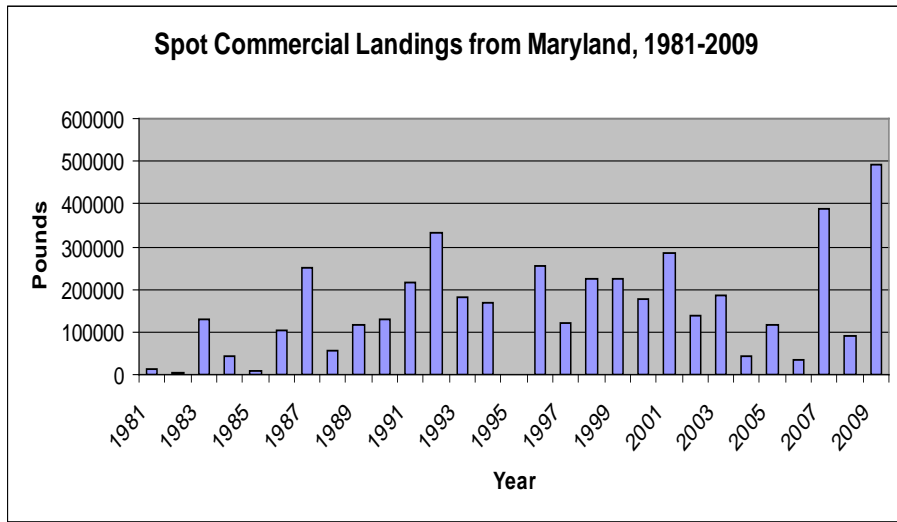
The Fishery



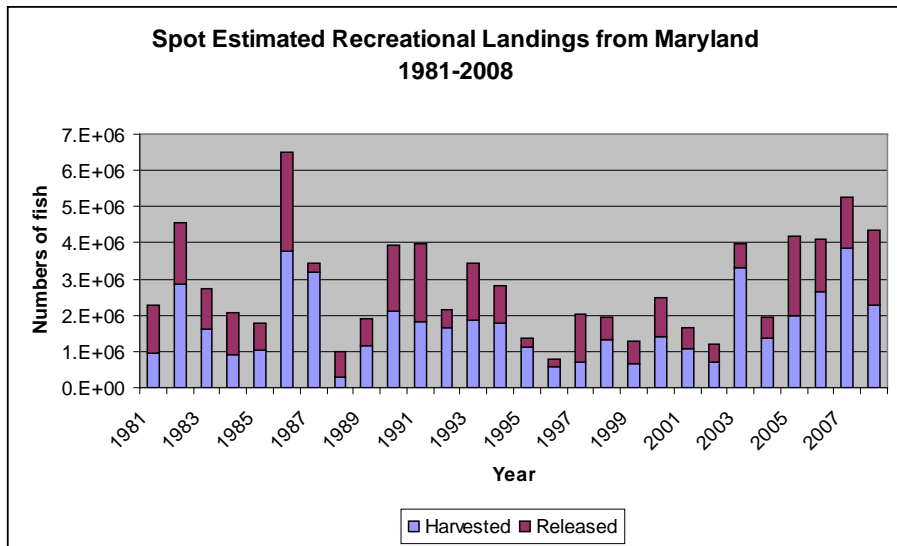
(data from NMFS)



(data from MRFSS)



(data from NMFS)



(data from MRFSS)

Issues/Concerns

Monitoring the commercial and recreational harvest of both croaker and spot are important in order to obtain data for conducting stock assessments and evaluating the status of the stock. Both species are caught indirectly during other fishing activities and bycatch mortality is a continued concern.

1991 Chesapeake Bay Program Atlantic Croaker and Spot Fishery Management Plan Implementation (updated 12/09)			
Problem Area	Action	Date	Comments
Stock Status Annual abundance of Atlantic croaker and spot is highly variable from year-to-year. Little information is available on the causes of stock fluctuations.	Action 1.1 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.	Continue	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. Current estimates of F and SSB indicate that the croaker stock is healthy and overfishing is not occurring (ASMFC 2009). The status of the coastal spot stock is undeterminable. No stock assessment has been completed and available data indicate contradictory trends. Commercial landings for croaker during 2008 were 530,000 lbs, 337,000 lbs & 12 million lbs for MD, PRFC & VA, respectively. Estimated croaker recreational harvest for 2008 from MD & VA were 459,000 lbs & 3.6 million lbs, respectively. Commercial landings for spot during 2008 were 92,000 lbs & 1.9 million lbs for MD & VA, respectively. Estimated spot recreational harvest for 2008 from MD & VA were 763,000 lbs & 2.0 million lbs, respectively.
	Action 1.2.1 A) MD and the PRFC have a minimum size limit for Atlantic croaker. B) VA does not have a minimum size limit for Atlantic croaker.	Continue 1993	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 & PRFC also have a 25 fish/person/day creel limit. MD has an open commercial season from Mar thru Dec. VA does not have any restrictions.
	Action 1.2.2 CBP jurisdictions will evaluate the need to implement a minimum size limit for spot.	1992 2009	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 has proposed the development of an amendment to the coastal spot FMP by 2011.

1991 Chesapeake Bay Program Atlantic Croaker and Spot Fishery Management Plan Implementation (updated 12/09)			
Problem Area	Action	Date	Comments
Harvest of Small Croaker and Spot 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 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. B) Virginia will continue its prohibition on trawling in state waters. Virginia will maintain its 2 ⁷ / ₈ inch minimum mesh size for gill nets 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. D) PRFC will continue its prohibition on gill net fishing in the summer.	Continue Continue 1992 Continue	Commercial trawling is prohibited within the Chesapeake Bay. 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 shows an increasing age distribution with a few fish 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. The shrimp bycatch will be considered as part of the next benchmark assessment (ASMFC 2009).
	Action 2.1.2 CBP jurisdictions will investigate the magnitude of the bycatch problem and consider implementing bycatch restrictions for the non-directed fisheries in the Bay	1992 On-going	
Research and Monitoring Needs There is a lack of stock assessment data for both Atlantic croaker and spot stocks in the Chesapeake Bay.	Action 3.1 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. A benchmark coastal stock assessment is currently underway (2009) and scheduled for a per review in 2010. 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).
	Action 3.2 A) MD and PRFC will encourage research to collect data on croaker and spot biology, especially estimates of population abundance, recruitment, and reproductive biology. 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.	Continue Continue	An Atlantic Croaker Ageing Workshop was held in October 2008 and resulted in a standardized ageing procedure. High priority research & monitoring recommendations include: determining migratory patterns; collecting life history information; evaluating bycatch and discard practices; and examining reproductive strategies. Recommendations for spot include: monitoring data; improving catch and effort statistics; and developing stock assessment analyses.

1991 Chesapeake Bay Program Atlantic Croaker and Spot Fishery Management Plan Implementation (updated 12/09)			
Problem Area	Action	Date	Comments
Habitat and Water Quality Issues Habitat alteration and water quality impact the distribution of finfish species in the Chesapeake Bay	Action 4.1 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: A) Developing habitat requirements and water quality goals for various finfish species. B) Developing and adopting basinwide nutrient reduction strategies. C) Developing and Adopting basinwide plans for the reduction and control of toxic substances. D) Developing and adopting basinwide management measures for conventional pollutants entering the Bay from point source and non-point sources. E) Quantifying the impacts and identifying the sources of atmospheric inputs on the Bay system. F) Developing management strategies to protect and restore wetlands and submerged aquatic vegetation (SAV). G) Managing population growth to minimize adverse impacts to the Bay environment	Continue 2000 on-going	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.

Acronyms:

ASMFC = Atlantic States Marine Fisheries Commission;
 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
 VIMS = Virginia Institute of Marine Science

Section 4. Atlantic Menhaden (*Brevoortia tyrannus*)

There is no Chesapeake Bay fishery management plan (FMP) for Atlantic menhaden and therefore, no implementation table. However, menhaden is one of the species slated for the development of an ecosystem-based fishery management plan (EBFMP). Maryland Sea Grant is facilitating the EBFM process and biological briefs on key ecosystem topics for menhaden in Chesapeake Bay have been drafted. More information on the EBFM process can be found at the following website address: <http://www.mdsg.umd.edu/programs/policy/ebfm>.

The Atlantic menhaden stock is managed under ASMFC's Amendment 1 to the Interstate Fisheries Management Plan (2001) and several addendums (2004, 2005, 2006). The management goal is "to manage the fishery in a manner that is biologically, economically, socially and ecologically sound while protecting the resource and those who benefit from it." Maryland is required to complete an annual compliance report to ASMFC. For more information on coastal management go to www.asafc.org.

Stock Status

Biological reference points (BRPs) were established in ASMFC Amendment 1 and updated in 2004. The BRPs are based on fecundity (Figure 1) and fishing mortality (Figure 2); and used to assess the status of the stock. The 2006 stock assessment results indicated that the coastwide stock was not overfished and overfishing was not occurring. A new benchmark assessment was conducted during 2009, peer reviewed, and released in 2010. The new assessment included two new components: a factor for aging error and natural mortality rates that varied based on age and time of year. Results from the 2010 suggest that the stock was not overfished in 2008. However, fishing mortality rates are close to the threshold (maximum rate). Other indicators of stock status especially recruitment indices (Figure 3) suggest that the current BRPs may need to be reevaluated. The ASMFC menhaden technical committee will be developing a range of new BRPs and a range of management strategies to achieve the BRPs by late summer 2010. The new BRPs will include a greater degree of protection for the spawning stock and account for predation.

Management Measures

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 harvest

additional fish the following year but not over 122,740 metric tons. The cap was originally in place until 2010 but has been extended to 2013.

The Fishery

Maryland commercial fishermen harvested 5.63 million pounds of Atlantic menhaden in 2008 and 7.13 million pounds in 2009. Virginia commercial fishermen harvested 9.1 million pounds in 2008. Only the first and second quarter harvest for 2009 was available at this time and it was 2.9 million pounds. 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.

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. Menhaden also support a major fishery and are the Bay's largest fishery by weight. There is concern that the current biological reference points for the coastwide stock are not adequate to protect the spawning stock biomass or population fecundity. The ASMFC Menhaden Technical Committee will be considering new potential reference points that also account for predation.

Figure 1. Menhaden Annual fecundity compared to target and limit (from ASMFC Stock Assessment Report 2010).

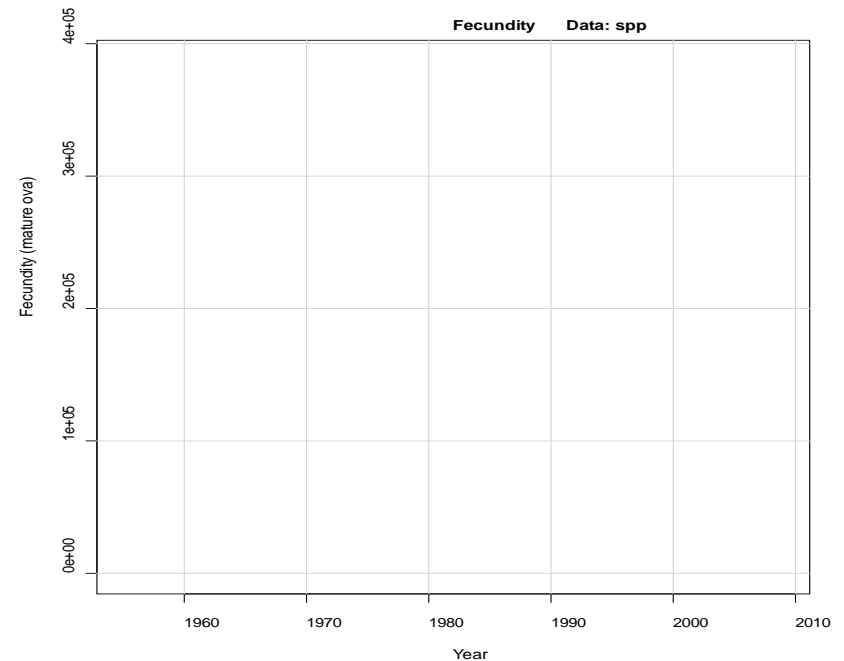


Figure 2. Menhaden Annual fishing mortality rate (full F) relative to $F_{MED} = 1.91$ for base run (for comparison: $F_{target} = 0.79$) (from ASMFC Stock Assessment Report 2010).

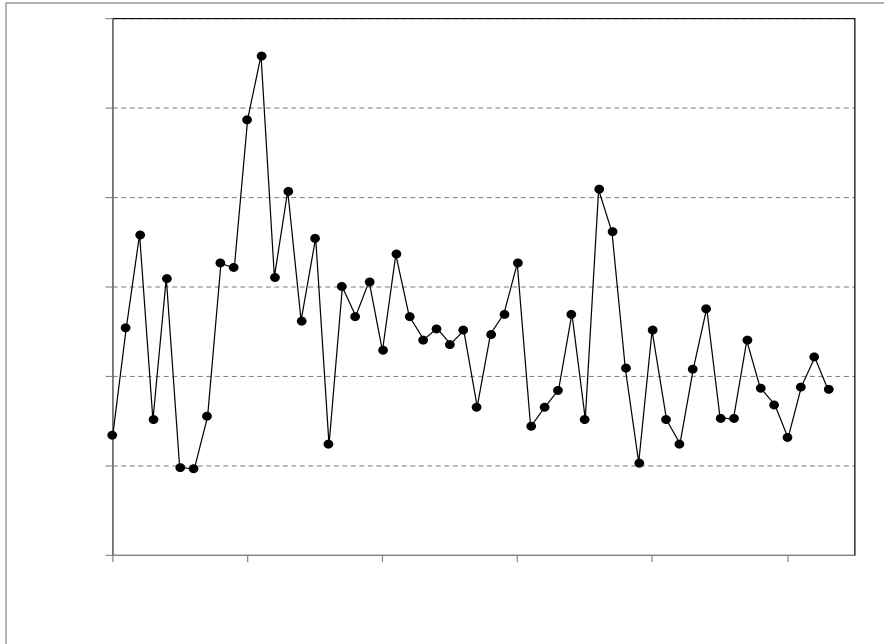
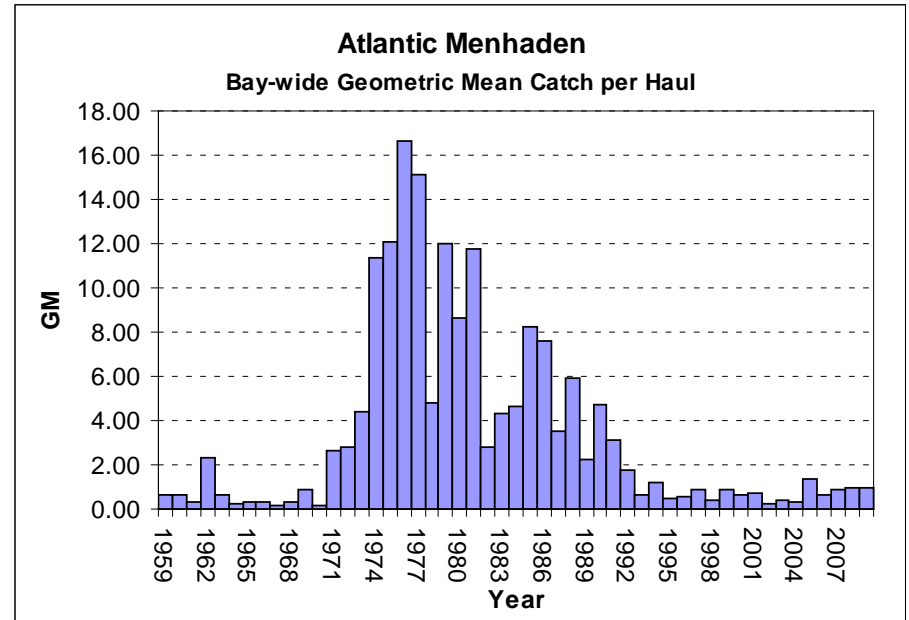


Figure 3. Geometric mean catch per haul of menhaden juveniles in the Maryland portion of the Chesapeake Bay.



(from Durell et al. 2009)

Section 5. Black Drum (*Pogonias cromis*)

Chesapeake Bay FMP

The Chesapeake Bay Fishery Management Plan (CBFMP) for Black Drum was adopted in 1993 and is scheduled for a complete review in 2010. This is currently the only FMP for black drum on the Atlantic Coast. Delaware and New Jersey have recently established their intent to pursue the development of a joint DE-NJ black drum FMP. The ASMFC Interstate Fisheries Management Program Policy Board has discussed the potential for developing a coastal black drum FMP. If an FMP is pursued it would be as a precautionary measure since there probably is insufficient data for a formal stock assessment. The 2010 ASMFC Action Plan goal is to “strengthen cooperative research capabilities, data collection, and the scientific basis for stock assessments to support fisheries management actions”. Strategies listed to achieve this goal include evaluating the extent of fishery-independent and dependent data collections for black drum, evaluating the status of the coastal black drum stock, and determining whether or not coastal management is warranted.

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 suggests that 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.

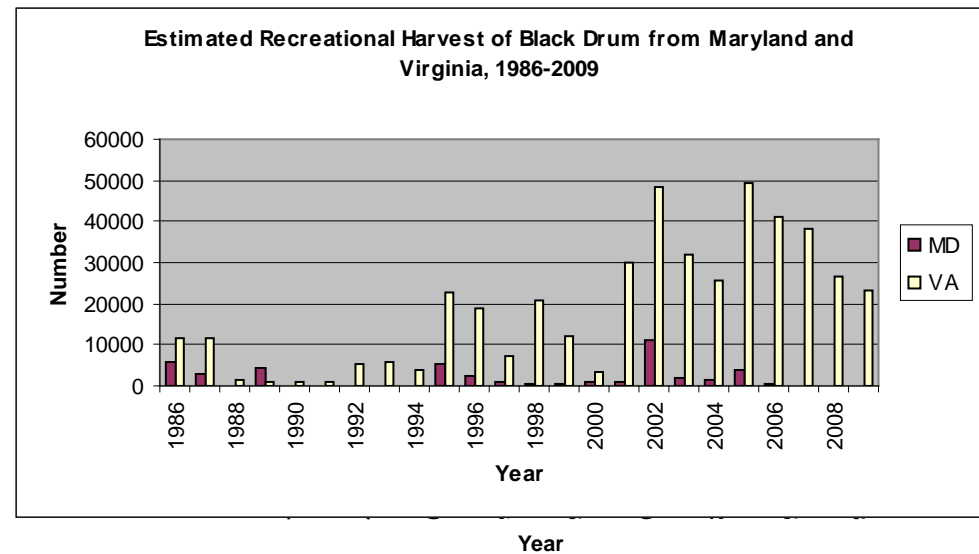
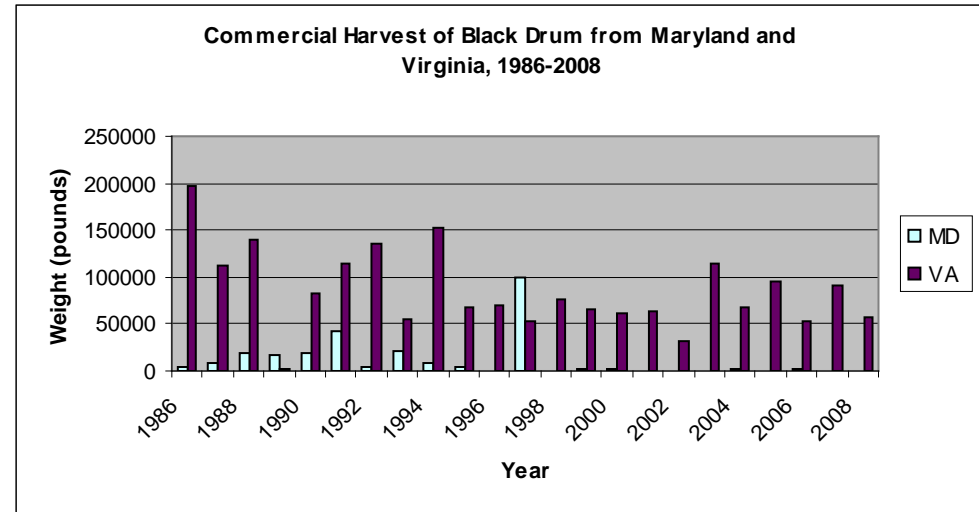
Current Management Measures

Maryland closed its Chesapeake Bay commercial black drum fishery in 1999. 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 at ODU showed an average age of 34 years and as old as 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.

The Fisheries



(data from NMFS and MRFSS)

1993 Chesapeake Bay Program Black Drum Implementation (updated 12/09)

Problem Area	Action	Date	Comments
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 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.
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; 1994; Continue	Fully implemented 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 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 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 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; Continue	Established to address commercial and recreational area and time conflicts
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. Juveniles utilize shallow water. Black drum feed on crabs, oysters, mussels and clams within the Bay.

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

Chesapeake Bay FMP

The Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan (FMP) was adopted in 1996. At that time, the black sea bass stock was overfished. The 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 SAV. Protecting these two habitats is part of the Chesapeake Bay Program's habitat goals.

A joint ASMFC and MAFMC coastal FMP for black sea bass was approved in 1996. Black sea bass north of Cape Hatteras, NC are managed as one stock. Black sea bass are one component of a multispecies FMP addressing summer flounder, scup and black sea bass. Through a series of modifications to the overfishing mortality threshold and target exploitation beginning in 1996, fishing mortality for black sea bass was reduced. After an 8-year rebuilding scenario, the spawning stock biomass has increased and the black sea bass coastal stock is no longer considered overfished. Maryland is required to complete an annual compliance report for ASMFC.

Stock Status

The most recent coastal stock assessment was completed in 2009 and concluded that fishing mortality is below the threshold reference point and the stock is above the optimal level. A new coastal stock assessment approach was used during 2009 because black sea bass are a protogynous hermaphrodite (they begin their life cycle as a female and then change to a male). Since black sea bass have an unusual life cycle the reference points and current stock status should be viewed with caution. In addition to uncertainty associated with stock assessments, there is further uncertainty associated with managing a protogynous species (Shepherd 2009).

Current Management Measures

The coastwide recreational sector is allocated 51% of the total allowable catch and 49% is allocated to the commercial fishery. Maryland receives 11% of the coastwide quota. Recreational anglers are limited by a 12½" minimum size and 25 fish bag limit. The commercial fishery has a minimum size limit of 11" and requires a special permit. Within a given fishing season, excess quota in one state can be transferred to another state that has not exceeded its quota. The Maryland commercial harvest in 2008 was 153,739 pounds (Figure 1) and recreational landings were 33,853 fish or 48,071 pounds (Figure 2). Preliminary landings for 2009 were 93,584 pounds for the commercial fishery and an estimated 492,783 fish for the recreational fishery.

Issues/Concerns

Tagging results suggest that black sea bass are spatially partitioned along the coast. The stock assessment results may not reflect stock conditions at the local level. Recommendations are to continue tagging studies and develop an age-based model.

The Fisheries

Figure 1. Maryland commercial black sea bass landings, 1950-2008.

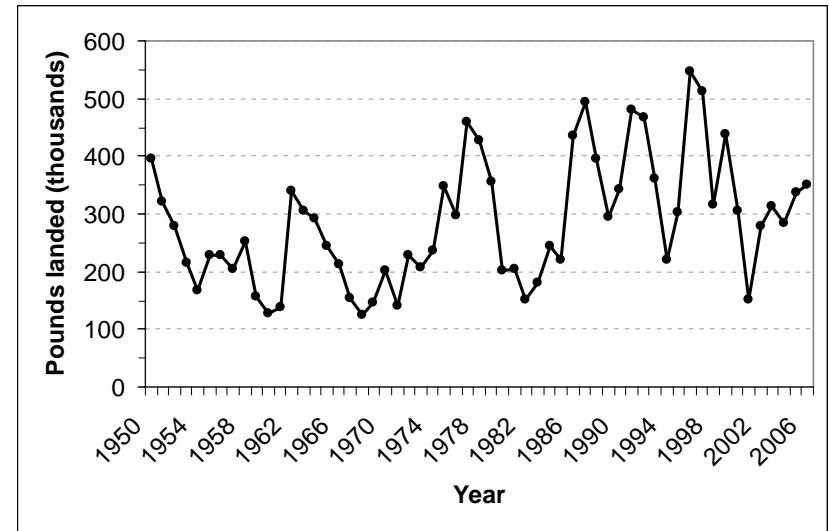
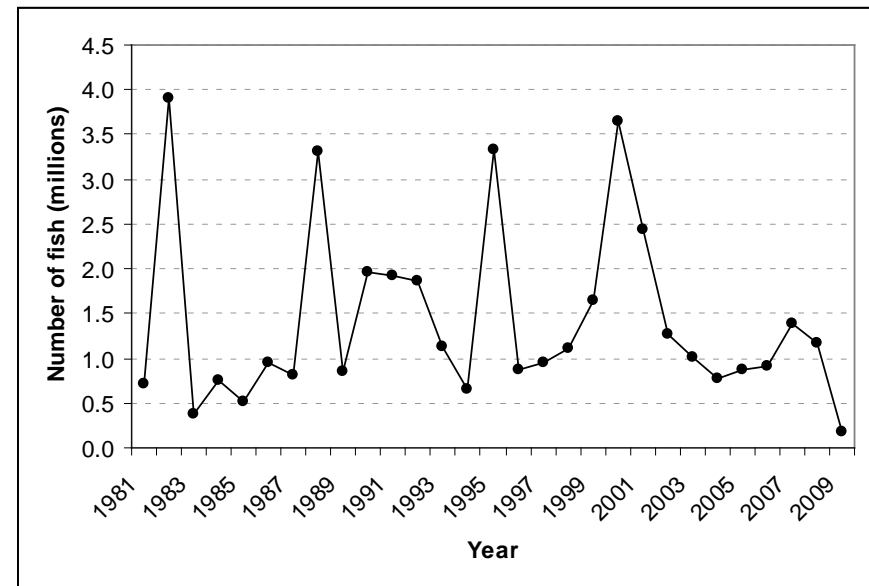


Figure 2. Maryland recreational black sea bass landings, 1981-2009.



(Figures NMFS/ MRFSS data)

1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 01/10)

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 1997 Continuing 2003 2008 2009	Black Sea Bass 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 25fish/day /person creel limit. 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. MD recreational minimum BSB size limit increased to 12.5”with a creel limit of 25/person/day 2008 MD CB commercial landings were 153,739 lbs and recreational landings were 48,071 lbs (ASMFC compliance report). VA CB commercial landings were 216,188 lbs and recreational landings were 31,702 lbs. 2009 MD commercial BSB quota was 120,251 pounds and no recreational regulation changes. VA recreational minimum BSB size limit increased to 12.5”with a creel limit of 25/person/day. In VA, the 2009 directed fishery quota was 168,638 pounds and the 2009 bycatch fishery quota was 40,000 pounds. Quotas vary annually
	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 2000 2002 2003	Amendment 13 of the MAFMC and ASMFC’s Summer Flounder, Scup and Black Sea Bass 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. 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.
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 bycatch.	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.
	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.

1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 01/10)

Strategy	Action	Date	Comments
	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	Mesh size requirements for the commercial fishery are appropriate for the minimum size requirements.
	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 1996	Chesapeake Bay Program (CBP) jurisdictions are in compliance with vent requirements in pots and traps. Requirements include an unobstructed escape vent having either a 2" diameter circular opening, 1.5" x 1.5" square opening, or 1 1/8" x 5 3/4" rectangular opening. MD requires a 2 3/8" diameter circular opening; 2" x 2" square opening; or 1 3/8" x 5-3/4 inch rectangular opening. VA requires two escape vents of 2 1/2 inch circular dimension, or 2 inches square dimension, or 1 3/8 inches by 5 3/4 inches rectangular dimension.
	1.2e) The jurisdictions will define a BSB pot for enforcement requirements as recommended by the MAFMC.	2002	Has not been implemented because CBP jurisdictional commercial fisherman use lobster pots and fish traps to catch both lobster and black sea bass
	1.2f) VA and MD will require that BSB pots and traps have biodegradable hinges and fasteners on one panel or door.	1996 1997 2002	Hinges and fasteners on a ≥ 3"x6" panel or door located on parlor portion of pot or trap must be made of one of the following degradable materials: untreated hemp or jute string of 3/16 inch in diameter or less; magnesium alloy fasteners; or ungalvanized, uncoated iron wire of 0.094 inch diameter or smaller. Pots and traps having wooden slats will remove one set of parlor slats so it is 1 1/8" apart. CBP jurisdictions have implemented bio-degradable hinges and door fasteners on pots and traps.
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	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.	Continuing	Although the stock has been rebuilt, management measures have been kept conservative because of unknown population dynamics due to hermaphroditism.
	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	1997 2002 Continuing	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

1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 01/10)

Strategy	Action	Date	Comments
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.	(CPUE).		spring trawls. BSB caught range from ~70 mm to 270 mm total length. 80%-90% of BSB caught in 2002-2003 were age 1. The age range was 0-2. Females comprised >75% of BSB caught from 2002-2006 except during 2004 where 57% were female. Males ranged from 17%-20% caught from May-September. Size at 50% maturity for females sampled from 2002-2006 was at 228 mm.
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.	Continuing	Biological data is used for the coastal stock assessment.
	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.	Continuing	In VA, black sea bass is 1 of 10 species currently being tagged in the Virginia Volunteer Angler Gamefish Tagging Program.
	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	
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	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.
	2.3b) VA will continue to supplement MRFSS data with more detailed catch statistics at the state level.	1996-1997	
	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	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	CBP jurisdictions developed an Oyster Management Plan (2004) which combines the FMP and habitat objectives which include reef development using reclaimed and fresh oyster shell, oyster repletion and oyster sanctuary and harvest reserve areas.
		2008	Crasostrea virginica (native oyster) and not Crasostrea 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.

1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 01/10)

Strategy	Action	Date	Comments
program evaluations to ensure maximum success. Specific attention should be focused on aquatic reefs in the salinity range of the black sea bass.	3.1aB) MD and VA will continue the implementation of the Aquatic Reef Habitat Plan.	Continued 2007	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.
3.1b) The creation of new artificial reefs and the expansion and improvement of preexisting reefs will provide additional habitat for the BSB population.	3.1bA) Jurisdictions will continue to maintain, expand, and improve their artificial reef programs.	Continuing 1996-2006 2007	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. 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). 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.
	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	MD and VA both adopted legislation in 1998 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">• 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.• Avoid dredging, filling or construction activities that create turbidity sufficient to impact nearby SAV beds during the SAV growing season.• Establish an appropriate undisturbed buffer around SAV beds to minimize the direct and indirect impacts on SAV from activities that significantly increase turbidity.	Continue	MD implemented a living shorelines program in 1970 to encourage vegetative shoreline stabilization. Regulations are in place that prohibit dredging through SAV beds. Tiered designation and prioritization of SAV beds has not been implemented. Avoidance of dredging, filling and construction impacts to SAV is strictly enforced by MDE and USACE with input from DNR, USFWS, and NMFS. MD has not established undisturbed buffers. VA has established buffer criteria.
		2003	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.
		2008	MD legislated that shoreline stabilization projects must use living shoreline techniques unless demonstrated to be infeasible.

1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 01/10)

Strategy	Action	Date	Comments
	<ul style="list-style-type: none"> • Preserve natural shorelines. Stabilize shorelines, 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. • Educate the public about the potential negative effects of recreational and commercial boating on SAV and how to avoid or reduce them. 		
	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 http://www.chesapeakebay.net/restoringwaterquality.aspx?menuitem=14728 .
	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.	Continuing	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.
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"> • Define the resource through inventory and mapping activities. • Protect existing wetlands. • Rehabilitation, restoring and creating wetlands. • Improving education. • Further research. 	Continuing 2006 Continuing	Programs have been expanded to the tributaries. 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.
3.4) 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	3.4a) Based on the 1992 baywide nutrient reduction plan reevaluation, the jurisdictions will: <ul style="list-style-type: none"> • expand program efforts to include tributaries. • Intensify efforts to control nonpoint sources of pollution from agriculture and developed area. • Improve on current point and nonpoint source control technologies. 	Continue 2009	Maps that indicate regions of concerns for living resources have been developed. See Chesapeake Bay Program website for updates on nutrient reduction. http://www.chesapeakebay.net/status_reducingpollution.aspx?menuitem=19859 . 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	Continue	See Chesapeake Bay Program website for updates on nutrient reduction. http://www.chesapeakebay.net/status_reducingpollution.aspx?menuitem=19859

1996 Chesapeake Bay and Atlantic Coast Black Sea Bass Fishery Management Plan Implementation Table (updated 01/10)			
Strategy	Action	Date	Comments
reevaluations, to strengthen deficient areas.	areas: <ul style="list-style-type: none"> • Pollution Prevention: Target “Regions of Concern” and “Areas of Emphasis. • Regulatory Program Implementation: Insure that revised strategies are consistent with and supplement pre-existing regulatory mandates. • Regional focus: Identify and classify regions according to the level of contaminants. • Directed Toxics Assessment: Identify areas of low level contamination, improve tracking and control of non-point sources. 		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
- CPUE – Catch Per Unit Effort
- FMP – Fisheries Management Plan
- GIS – Geographic Information System
- MAFMC – Mid-Atlantic Fisheries Management Council
- MRFSS – Marine Recreational Fisheries Statistics Survey
- PAH – Polycyclic Aromatic Hydrocarbon
- PCB – Polychlorinated Biphenyl
- PRFC – Potomac River Fisheries Commission
- SAV – Submerged Aquatic Vegetation
- VIMS – Virginia Institute of Marine Science
- VMRC – Virginia Marine Resource Commission

Section 7. Blue Crab (*Callinectes sapidus*)

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.

Stock Status

In 2006, the Baywide winter dredge survey (WDS) was adopted as 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 spawning age crabs (age 1+) is used to determine if the population is overfished. The results of the 2008-2009 WDS indicated that there were 223 million age 1+ blue crabs. This was a 70% increase over the 2007-2008 value of 131 million. The results of the 2009-2010 WDS showed another increase in age 1+ crabs to 315 million (Figure 1). Although the abundance of spawning age crabs has increased and exceeded the interim target two years in a row, conservation measures remain in effect. A new stock assessment is scheduled for completion by the end of 2010.

Management Measures

In 2001, the Bi-State Blue Crab Advisory Committee adopted a control rule for managing the blue crab fishery which was incorporated into the 2003 Amendment #1 to the 1997 CBP Blue Crab FMP. The control rule was subsequently updated in the 2005 stock assessment and is the foundation for sustainable management. The control rule sets forth an overfishing definition or exploitation threshold of 53% and a target exploitation of 46%.

In 2008, the Bay jurisdictions (Maryland, Virginia and the Potomac River Fisheries Commission) implemented regulations to reduce the harvest of female crabs by 34%. The new regulations were in response to a harvest removal rate of 57% that took place in 2007, a rate well above the exploitation threshold. The management measures implemented during 2008 and 2009 were successful at allowing the population to rebuild to the highest population levels since 1997. The full extent of these management measures will not be fully known for several years.

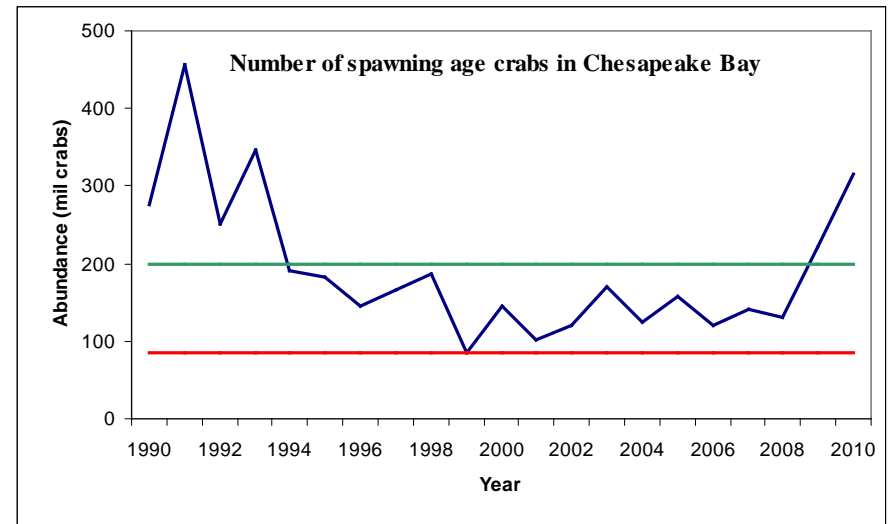
The Fishery

The 2008 and 2009 baywide (Maryland & Virginia) commercial harvest levels were 48.6 and 53.9 million pounds, respectively (Figure 2). Although the commercial harvest levels have increased over the last two years, they were below the exploitation threshold in 2008 (49%) and below the target (43%) in 2009. Recreational harvest is assumed to be approximately 8% of the total harvest.

Issues/Concerns

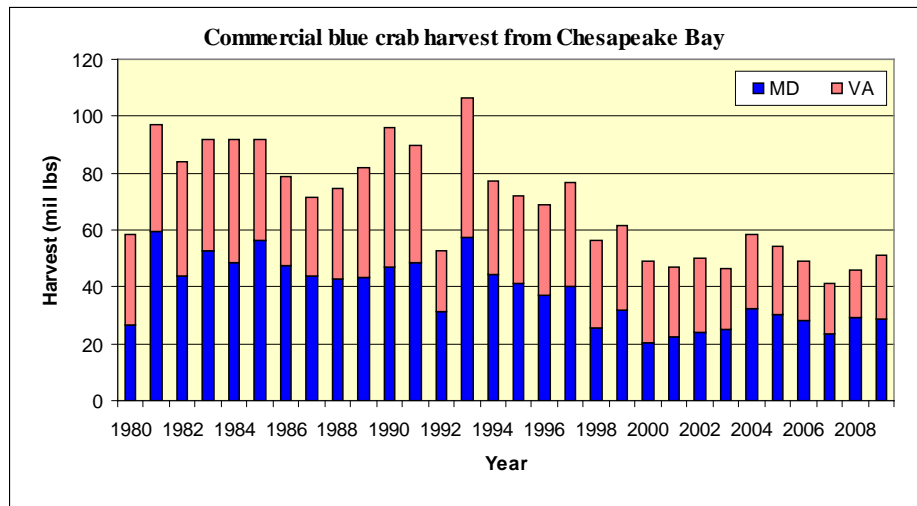
Although management measures have successfully allowed the blue crab population to increase over the last two years, conservation measures are needed to ensure that the population remains robust and at target levels. Recruitment (number of crabs that survive to become juveniles) is strongly influenced by environmental factors and can affect the number of juveniles that enter into the population. Therefore, there needs to be an extra margin of conservation to account for environmental variability. Another concern is 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. Maryland and Virginia have been implementing a license buy-back program but more needs to be done to reduce latent effort. Lastly, new methods for calculating recreational catch and effort is needed to fully characterize total removals by the fishery.

Figure 1.



MDNR/VIMS Data

Figure 2.



MDNR/VMRC data

Stock Assessment - Recommended Analyses (from 2009 Chesapeake Bay Blue Crab Advisory Report)

A blue crab assessment was completed in 2005 with data through 2003. The Chesapeake Bay Stock Assessment Committee (CBSAC) recommended a new benchmark assessment for blue crabs to be completed in 2010. They recommended the following actions:

- 1) Consider updating the following terms of reference from the 2005 assessment:
 - a. Assess and quantify the life history and vital rates of blue crab relevant to a stock assessment
 - b. Describe and quantify patterns in fishery-independent surveys
 - c. Describe and quantify patterns in catch and effort by sector and region
 - d. Develop and implement assessment models for the blue crab fisheries
- 2) Consider additional terms of reference under a new benchmark assessment including:
 - a. Density-dependent exploitation patterns
 - b. Sex-specific biological reference points
 - c. New biological reference points
 - d. Patterns in catch and effort by sector and region including trends in CPUE
 - e. Life-history modeling that characterizes sensitivity to demographic rates

Priority Research (from MDNR, VMRC and CBSAC, June 2009)

In order to make improvements and refinements in the baywide management of blue crabs, additional research information is necessary. The Bay jurisdictions in conjunction with CBSAC, have developed a list of priority research topics. Recommendations include:

- 1) Conduct dredge efficiency studies for the bay-wide winter dredge survey
- 2) Conduct a bay-wide commercial crab pot effort study
- 3) Conduct a bay-wide, year-round tagging study
- 4) Implement a bay-wide juvenile winter sampling survey
- 5) Complete a fecundity study that includes the number of broods/female; the number of eggs by size; density-dependent effects; and sperm limitation.
- 6) Conduct a Virginia trawl efficiency study.

Enforcement

The enforcement of commercial and recreational fishing regulations is critical to management success. In 2009, the Bay jurisdictions received Federal disaster money for the blue crab resource. In Maryland, the Natural Resource Police (NRP) has received disaster money for improving enforcement. The NRP has put together a “Strike Force” team to target blue crab enforcement issues. The teams are successfully increasing the amount of enforcement effort throughout the Maryland portion of the Bay.

Since blue crab regulations change over the season, it is difficult to keep track of the changes. Maryland has begun a text messaging system to help watermen stay abreast of blue crab regulations. Watermen can subscribe to receive text message reminders a day or two before a regulation change goes into effect.

Conclusion

The Bay jurisdictions will continue to investigate alternative strategies to improve management of the blue crab resource. The jurisdictions will be examining ways to address effort in the fishery. Maryland revamped its reporting system. Participants in the fishery are required to submit monthly reports whether they have fished or not fished. The penalties for not abiding the reporting requirements have been revised to include meaningful deterrents. Penalties for late reporting or non-reporting will be enforced.

2003 Chesapeake Bay Program Blue Crab Fishery Management Plan Amendment (updated 04/2010)			
Problem Area	Action	Date	Comments
Stock Status Strategy Chesapeake Bay stock has stabilized at historically low levels but continues to be at risk for recruitment failure.	Action 1 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; formally adopted in 2003 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 exploitation fraction has been above the threshold exploitation 8 of the last 11 years. For 2008, the exploitation was 48% and below the threshold. The reduction in exploitation was due to the reduced harvest of female crabs. For 2009, the exploitation was 43%.
	Action 2 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; formally adopted in 2003 Continue	The target fishing mortality (F) was replaced by the exploitation target of 46%. Derelict (abandoned) crab pots have the potential to impact the blue crab population by adding additional mortality. Some of the Federal Disaster Relief funds will be used for a derelict gear retrieval/watermen compensation program in MD. The program began in Jan/Feb 2010. VA has also been implementing a derelict crab pot retrieval program.
	Action 3 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.)	2003 2005 2006 2008	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. Abundance during 2009 exceeded the interim target level

2003 Chesapeake Bay Program Blue Crab Fishery Management Plan Amendment (updated 04/2010)

Problem Area	Action	Date	Comments
	Action 4 CBP jurisdictions will utilize the results of fishery-independent surveys to determine stock status.	On going	Results of the 2008-2009 Winter Dredge Survey (WDS) indicated the abundance of age 1+ crabs was 223 million crabs. This is a 70% increase over the 2007-2008 value of 131 million crabs. The majority of the increase was due to more females.
Fishing Effort Strategy CBP jurisdictions will adjust fishing effort to achieve the adopted BRPs.	Action 5 CBP jurisdictions will reduce the exploitation rate of legal-sized blue crabs to meet the target BRPs.	Began in 2001; continue 2008	The Bay jurisdictions implemented new regulations in 2008 & 2009 to reduce exploitation on female crabs. The 2008 baywide harvest was approximately 48.6 million lbs, 11% higher than the record-low in 2007 of 43.5 million pounds (average = 74 million lbs.). The 2009 baywide harvest was 53.9 million lbs. 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. The program began in summer 2009. VA has also implemented a buy-back program beginning in fall 2009 and utilized a reverse auction system. The states will continue to explore other methods of reducing latent effort.
Monitoring Strategy CBP jurisdictions will collect fishery -	Action 6 CBP jurisdictions will continue to monitor blue crab resources in the bay and work towards developing a baywide monitoring approach	On going	Recruitment, as measured by the abundance of age 0 crabs in the WDS, remained low and was below the average

2003 Chesapeake Bay Program Blue Crab Fishery Management Plan Amendment (updated 04/2010)

Problem Area	Action	Date	Comments
dependent and fishery-independent data on blue crab resources.			recruitment of 258 million crabs.
Habitat Strategy CBP jurisdictions will identify and protect critical blue crab habitat.	Action 7 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.
	Action 8 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 CBP jurisdictions will restore and protect SAV in the Chesapeake Bay to achieve the new goal of 185,000 acres by 2010.	Continue	Necessary 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 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 percent of the goal and an increase of 9,039 acres from 2008.
	Action 10 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 04/2010)

Problem Area	Action	Date	Comments
Ecosystem strategy 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 Utilize the guidelines from the Fisheries Ecosystem Plan (FEP) to incorporate multi-species and ecosystem considerations into existing CBP fishery management plans.	Began 2005 Continue	A new EBFM operational structure was facilitated through MSG. An EBFM blue crab species team was formed in late 2008. The team has drafted biological briefs on important blue crab issues. The issue briefs were sent to the QETs in 2009 for the development of appropriate blue crab indicators and quantitative measures
	Action 12 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. The EBFM Food Web QET will be addressing blue crab food web dynamics and interacting with the Stock Assessment QET for consideration in the new benchmark stock assessment update in 2009/2010.
	Action 13 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

MSG = Maryland Sea Grant
 EBFM = Ecosystem based fisheries management
 QET = Quantitative Ecosystem Teams

Section 8. Bluefish (*Pomatomus saltatrix*)

Chesapeake Bay FMP

The Chesapeake Bay Fishery Management Plan (CBFMP) for Bluefish was adopted in 1990. The CBFMP was developed in response to the Atlantic coastal FMP for bluefish and facilitates conservation within the Chesapeake Bay. Amendment #1 to the CBFMP was developed in 2003. The amendment adopted the coastal overfishing definition, the rebuilding schedule (MAFMC/ASMFC) and 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 ASMFC/MAFMC FMP. Maryland is required to submit an annual compliance report to ASMFC.

Stock Status

There is no formal stock assessment for Chesapeake Bay. The status of the bluefish stock is derived from the Atlantic coast stock assessment. In the 1990s, the coastal bluefish stock was overfished and management measures were implemented to reduce fishing mortality (F) and rebuild the stock. Since then, stock assessment results (2005) indicate that the bluefish stock is not overfished and overfishing is not occurring. Biological reference points for biomass and fishing mortality were developed using the stock assessment results and are used to set the annual total allowable catch (TAC). Currently, fishing mortality is below the target F and the population biomass is increasing.

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 quota. Approximately 83% of the quota is given to the recreational fishery and 17% to the commercial fishery. Maryland receives approximately 3% of the commercial Federal quota and Virginia receives about 11.8%. Allocations between fisheries and among coastal jurisdictions were based on historic landings data (1981-1989). Maryland has an 8" minimum size limit for both the recreational and commercial fisheries. Both fisheries are opened year-round. The recreational fishery has a 10 person per day creel limit and the commercial fishery is under an annual quota.

Issues/Concerns

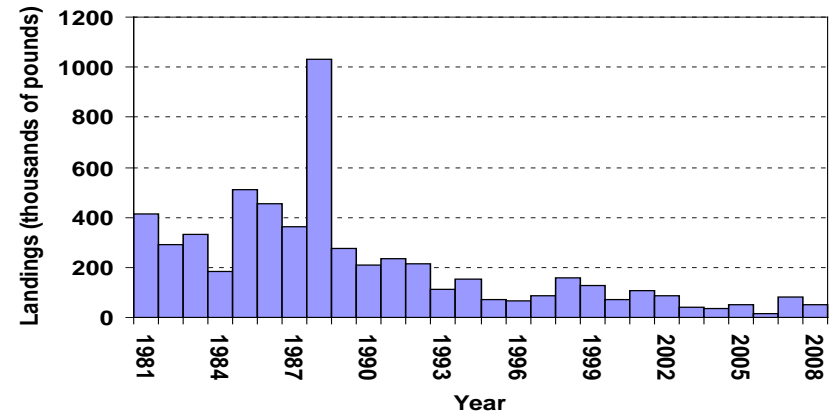
The coastal bluefish stock was declared fully rebuilt in 2009. This was one year ahead of the rebuilding schedule. The Atlantic coastal states are developing a cooperative plan to collect more age/length data to address shortcomings in stock

assessment modeling. Maryland will continue its fishery dependent and independent surveys to monitor stock status.

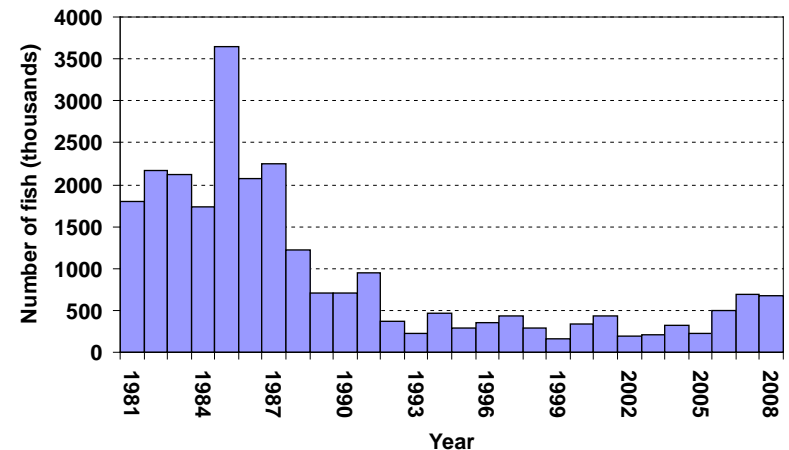
The Fisheries

Preliminary landings from Maryland for 2009 are 143,688 pounds for the commercial fishery (MD DNR data) and an estimated 829,234 fish for the recreational fishery (MRFFS data).

Maryland commercial bluefish landings.



Maryland recreational bluefish harvest (source: MRFFS).



(Figures from Durell 2009)

2003 Amendment I to the 1990 Chesapeake Bay Program (CBP) Bluefish Fishery Management Plan (FMP) (updated 11/09)			
Problem Area	Action	Date	Comments
Stock Status Management Strategy CBP jurisdictions will continue to utilize management strategies that decrease fishing mortality and help increase bluefish abundance.	Action 1.0 CBP jurisdictions will continue to participate in scientific and technical meetings for managing bluefish along the coast and estuarine waters.	1999 Continue	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 Total Allowable Catch (TAC). Stock biomass is slowly increasing. Estimates indicate a low F ($F_{2008}=0.12$) which is below the threshold F ($F_{threshold}=0.4$) and target F ($F_{target}=0.19$). Therefore, the stock is not overfished and overfishing is not occurring.
	Action 1.1 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 Continue 2009	The 9-year rebuilding schedule reduces F: $F=0.51(1999-2000)$ $F=0.41(2001-2003)$ $F=0.31(2004-2007)$ Based on the most recent stock assessment update, the bluefish stock is considered rebuilt.
Fishery Management Strategy CBP jurisdictions will adhere to the coastal commercial and recreational TAL designated by MAFMC /ASMFC.	Action 2.0 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.	Continue	TAL may vary annually. The 2008 coastal commercial bluefish quota was 9 million lbs. MD and VA's commercial landings in 2008 were 80,370 lbs and 528,550 lbs, respectively. MD harvested approximately 30% of its state quota and VA harvested approximately 64% of its quota. The 2009 coastwide commercial quota was slightly increased to 9.7 mil. Lbs.
	Action 2.1 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.

2003 Amendment I to the 1990 Chesapeake Bay Program (CBP) Bluefish Fishery Management Plan (FMP) (updated 11/09)			
Problem Area	Action	Date	Comments
	<p>Action 2.2 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.</p>	<p>1990 1991 Continue</p>	<p>Historically, recreational landings have accounted for 80-90% of the total catch. ASMFC sets an annual recreational harvest limit (RHL). The proposed RHL for 2009 was 19.5 million lbs. 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 April 29th, 1991</p>
<p>Research and Monitoring Strategy Data collected from multiple independent fishery surveys contribute to coastal research and monitoring efforts of bluefish.</p>	<p>Action 3.0 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.</p>	<p>Continue</p>	<p>Mandatory reporting is in effect in all CBP jurisdictions. The coastal FMP created a research set aside (RSA) as part of the overall TAL. The proposed RSA for 2009 was 97,750 lbs.</p>
	<p>Action 3.1 CBP jurisdictions will assess methods for improving recreational and charter catch/effort data needed to evaluate biological and economic impacts.</p>	<p>Continue</p>	<p>MD requires logbooks for charter boats. Beginning in 2004, coastal species managed by quota are electronically reported in real time. The Marine Recreational Information Program (MRIP, formerly MRFSS) is in the process of being phased in to provide a more comprehensive assessment of recreational fishing statistics.</p>
	<p>Action 3.2 CBP jurisdictions will continue to collect fishery independent data on bluefish.</p>	<p>On-going</p>	<p>The CHESFIMS and ChesMMAPP surveys will provide important information, which will be used to help manage bluefish in Chesapeake Bay.</p>
<p>Habitat Management Strategy CBP jurisdictions are currently evaluating studies that will identify and delineate bluefish habitat and water quality parameters critical to bluefish in the Chesapeake Bay.</p>	<p>Action 4.0 CBP jurisdictions continue to set goals for water quality, habitat restoration and protection to address commitments established under Chesapeake Bay 2000 agreements.</p>	<p>Continue</p>	<p>Bluefish habitat was identified in Amendment I to the Chesapeake Bay Bluefish FMP.</p>
	<p>Action 4.1 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.</p>	<p>Continue</p>	<p>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.</p>

2003 Amendment I to the 1990 Chesapeake Bay Program (CBP) Bluefish Fishery Management Plan (FMP) (updated 11/09)			
Problem Area	Action	Date	Comments
The identification and development of trophic level relationships will	Action 4.2 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.
Habitat (Cont.) 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.	Action 4.3 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.	Will begin as soon as data becomes available	Data from CHESFIMS, ChesMAPP will examine stomach contents data 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.
	Action 4.4 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.
	Action 4.5 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 ChesMAPP 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

CHESFIMS=Chesapeake Bay Fishery Independent Multispecies Fishery Survey

ChesMAPP=Chesapeake Bay Multispecies Monitoring and Assessment Program

(F)=Fishing Mortality

(F_{MSY})= Fishing mortality at the “threshold” biological reference point. If (F) is at a rate beyond this point (F_{MSY}), 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

PRFC=Potomac River Fisheries Commission

SAV=Submerged Aquatic Vegetation

TAL=Total Allowable Landings

Section 9. Maryland Catfish Species

Introduction

Native and introduced species of catfish are found within the Chesapeake Bay. White catfish (*Ameiurus catus*) and brown bullheads (*A. nebulosus*) are native to the area. Channel catfish (*Ictalurus punctatus*) and blue catfish (*I. furcatus*) were introduced into the Potomac River around the end of the 19th 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. The blue catfish were also introduced to the Potomac River at about the same time as the channel catfish but were not seen in high numbers until the 1990's. Unlike channel catfish, blue catfish are considered to be an invasive threat to native species by Maryland's Invasive Species Matrix Team (ISMT). Flathead catfish (*Pylodictis olivaris*) 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 encountered in the Upper Bay.

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 to that date and recommended a survey of catfish populations to determine stock status in the Chesapeake Bay.

Stock Status

A population assessment of channel catfish was recently completed (Piavis and Webb, 2010). The 2010 assessment is an update of the 2006 assessment (Piavis and Webb, 2007) with the application of a surplus production model for the Head of Bay (HOB), Choptank River, and the Potomac River. Fishery dependent and independent relative abundance indices were 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 for relative juvenile catfish abundance 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. Since 2000, the model has shown a population increase (Fig. 1). Harvests have been under MSY since 1999 and the population has increased. The HOB catfish harvests have also responded to fishing mortality rates best when using the F ratio of F:Fmsy (Fig. 2). Seine survey recruitment indices do not always agree with the surplus production models (Fig. 3). Since the EJFS seine survey was designed for striped bass, the sample sites or methodology may not be as appropriate to describe channel catfish young of year (YOY) abundance in the Upper Bay. A winter trawl survey suggested strong year class strength for 2004, 2006 and 2008 cohorts, while the seine survey did

not collect any channel catfish YOY from the first two years and a trivial number from 2008 (Fig 3).

Management

A 10 inch minimum size limit applies to both commercial and recreational fisheries. There are no creel limits or closed seasons. Area and gear restrictions apply to commercial fishermen.

Fishery Statistics

The channel catfish commercial fishery is important in the Chesapeake Bay states (Fig.4). When harvest peaked in 1996, catfish were the second most landed species by weight. In 2008, catfish landings were third highest by weight. In the last few years, flathead catfish have entered the commercial fishery and an active market exists for this 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 (Weinrich et al. 1986), although MRFSS estimates have large proportional standard errors (PSE). The recreational fishery for catfish is substantial. In some western shore tributaries of Chesapeake Bay, guided trophy fisheries exist and utilize catch-and-release activity. Recreational catfish size records are frequently broken.

Issues of Concern

Introduced non-native catfish species are considered to be invasive. Both blue and flathead catfish compete with native species for forage. A concern is that fishermen will move these invasive species 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 (Piavis and Webb, 2010). Blue catfish inter-specific competition and predation may hinder channel catfish population recovery (Piavis and Webb, 2010). This may also have consequences to the recoveries of ospreys and eagles that rely upon native and naturalized fish species for high quality forage (Viverette et al. 2007).

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 (Pinkney et al. 2002).

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Figure 1. Biomass estimates of Head-of-Bay channel catfish from a surplus production model with 80 % confidence intervals, 1980 – 2008.

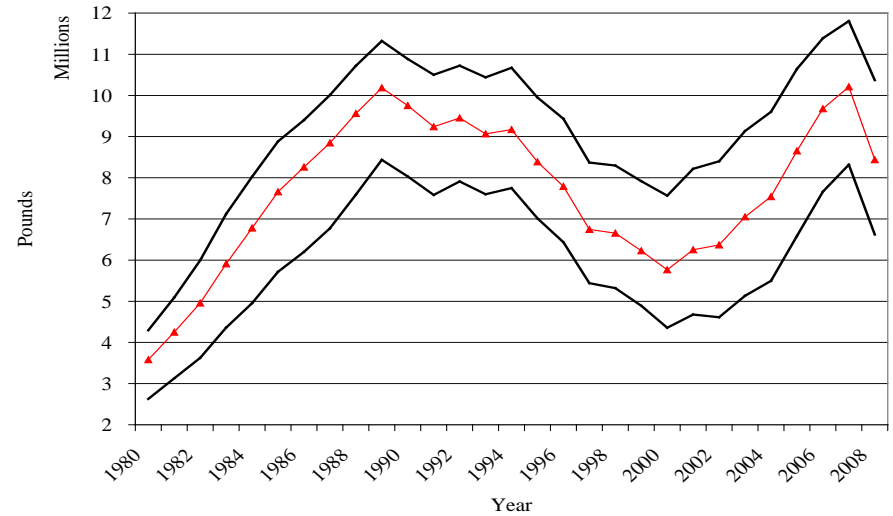


Figure 2. Biomass:Biomass at maximum sustainable yield (B:B_{MSY}) and F:F at maximum sustainable yield (F:F_{MSY}) ratios for Head-of-Bay channel catfish from a surplus production model, 1980 – 2008.

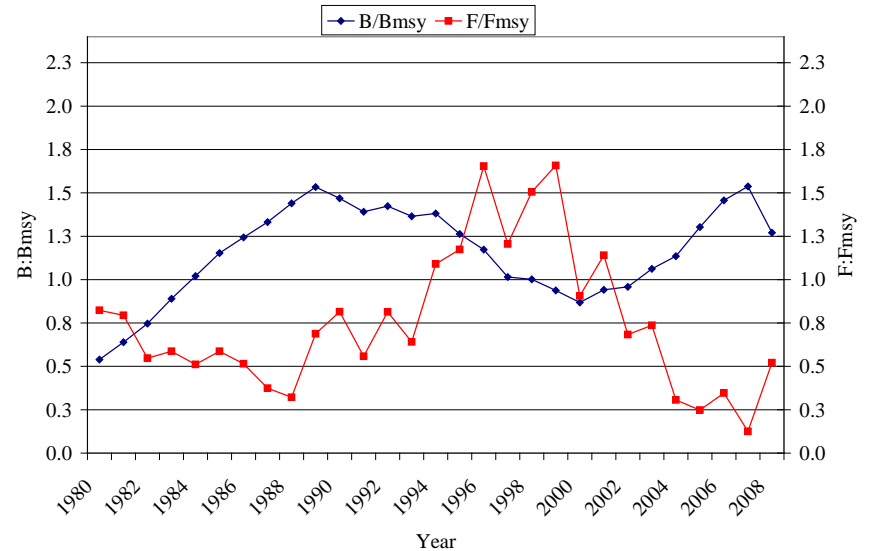


Figure 3. Head-of-Bay channel catfish fishery independent young-of-the-year seine index.

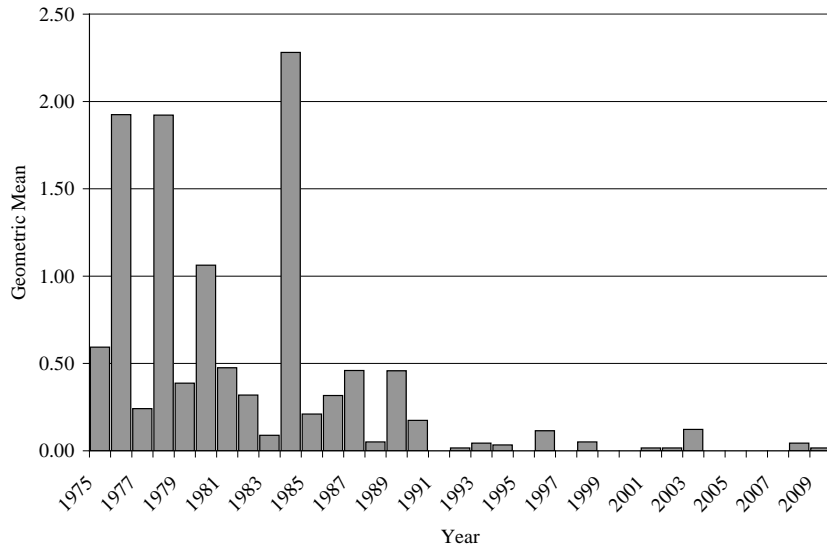


Figure 4. Chesapeake Bay channel catfish landings from the commercial and recreational fisheries, 1929-2008. (All Figures from Piavis and Webb, 2010).

