2015 Maryland FMP Report (July 2016)
Section 3. Atlantic croaker (*Micropogonias undulatus*) and Spot (*Leiostomus xanthurus*)

The ASMFC 2015 traffic light analysis (a method to evaluate fishery and abundance trends) for both Atlantic croaker and spot indicated declining trends in almost all indices for both species. Thresholds representing moderate and significant concern were established in 2014. Although there were declining trends, they were low to moderate and did not trigger any management action. Both species have a coast wide benchmark stock assessment in progress with peer reviews scheduled in late 2016. Maryland juvenile indices have declined to very low level for both species over the past few years. Croaker and spot are important commercial, recreational and forage species.

Fishery Management Plans (FMPs)

The Chesapeake Bay Atlantic Croaker and Spot Fishery Management Plan (CBCS FMP) was adopted in 1991. The FMP's goal is to: "Protect the Atlantic croaker and spot resource in the Chesapeake Bay, its tributaries, and coastal waters, while providing the greatest long term ecological, economic, and social benefits from their usage over time." To accomplish this goal, management strategies were developed to prohibit the harvest of small fish (age 1 and younger) of both species and to recommend monitoring and research programs for stock assessments and habitat needs. The CBCS FMP was reviewed in 2014 by the Maryland Plan Review Team. It was determined that the plan is an appropriate framework for managing the croaker and spot resources. The team recommended that the plan be reviewed again in 2017 after the completion of coastal stock assessments and the development of new management triggers.

The Atlantic States Marine Fisheries Commission (ASMFC) adopted coastal FMPs for each species in 1987. The main purpose of the plans was to decrease the number of small fish caught as bycatch in the coastal shrimp trawl fishery. Bycatch reduction devices were required in the offshore coastal areas and have reduced the number of small fish caught in the trawl fishery. Amendment 1 to the croaker FMP was adopted in November 2005, which replaced the original FMP, and established spawning stock biomass target and threshold.[1] Addendum I (2010) to Amendment I modified the management area and biological reference points. Addendum II to Amendment I for croaker (2014) established a precautionary management framework using the Traffic Light Approach.

An Omnibus Amendment to the Interstate Fishery Management Plans for Spanish Mackerel, Spot, and Spotted Seatrout was adopted in 2011 to allow these species to be managed under the authority of the Atlantic Coastal Fisheries Cooperative Management Act[2]. Addendum I to the Fishery Management Plan for Spot (2014) established a similar precautionary management approach using the Traffic Light Approach for spot.. There have been no interstate management requirements for either Atlantic croaker or spot.

Atlantic croaker - Biological reference points (BRPs) were established for croaker in the mid-Atlantic region in 2005. The BRPs were revised in 2011 (Addendum I) following the 2010 ASMFC stock assessment and now apply to the entire Atlantic coastal stock.[3] The BRPs set targets for fishing mortality (F) and spawning stock biomass (SSB), and are ratio-based. For the threshold, if $F/F_{MSY}=1$, overfishing is occurring. If $SSB/ (SSB_{MSY} (1-M))) =1$, the coastal stock is overfished. The 2011 ASMFC Atlantic Stock Assessment Technical Committee evaluated the stock assessment triggers in 2014 and found no evidence to alter management.[1] The 2013 ASMFC Action Plan called for the development of an addendum to consider alternate croaker trigger mechanisms. Existing management triggers were not considered an effective method to respond to changes in the fisheries. The Atlantic Croaker technical committee supported a new approach – a traffic light analysis, to evaluate the fishery.[4] The traffic light approach (TLA) was approved in Addendum II to Amendment 1 of the Atlantic Croaker FMP (August 2014).[5] The TLA incorporates multiple data sources into a single metric to provide management guidance. The TLA is useful for data-poor species management and replaces past assessment triggers. The development of state specific harvest reductions will occur if the harvest and abundance indices thresholds are exceeded for three consecutive years.

Maryland is required to submit an annual ASMFC Atlantic croaker compliance report. This report describes the fishery management program for Atlantic croaker, including fishery dependent and independent monitoring, regulations, commercial harvest reports and recreational catch estimates.[3] Juvenile indices (seine and trawl) for the Maryland portion of the Chesapeake Bay have been calculated for every year since 1959. Maryland started a new gill net survey in the Choptank River to sample adult Atlantic croaker and spot in 2013.

Atlantic croaker Stock Status – Atlantic croaker is considered a single stock along the Atlantic Coast. Based on the 2010 ASMFC benchmark stock assessment, overfishing is not occurring but whether the stock is overfished could not be determined due to data limitations.[7] The 2010 stock assessment indicated that biomass was increasing and the age-structure of the population was expanding from the late 1980's through 2008. A new benchmark stock assessment is currently being developed, and is slated for peer review in late 2016. MD DNR staff participated in the data workshop in September 2015 and will participate in both assessment workshops in 2016. Analysis of TLA for 2014 showed that the population characteristic (commercial and recreational landings) tripped for the second year in a row. The abundance characteristic also declined in 2014 but the proportion of metrics was below the 30% threshold. No management action was required but the declining values in all adult indices is concerning. The benchmark stock assessment should provide a better indication of current stock status and whether any

management action is warranted. Atlantic croaker ages were determined from fish captured in Maryland pound nets and 2015 was the first year in which no fish older than age seven were present.

Atlantic Croaker Fisheries – Commercial landings from Maryland and Virginia followed a similar trend (Figures 1 and 2) with periods of high harvest in the 1950s, late 1970s and late 1990s through the 2000s.[8] Commercial landings have declined to more moderate levels in recent years. Maryland's 2014 landings were 552,000 pounds and Virginia landings were 4.8 million pounds: both, a decrease from 2013 (NMFS data). Recreational harvest and release estimates from the Marine Recreational Information Program (MRIP) are higher for Virginia than Maryland for the majority of years and decreased in both states in 2015 (Figures 3 and 4).[9]

Figure 1. Maryland commercial landings of Atlantic croaker from 1950-2014.[8]

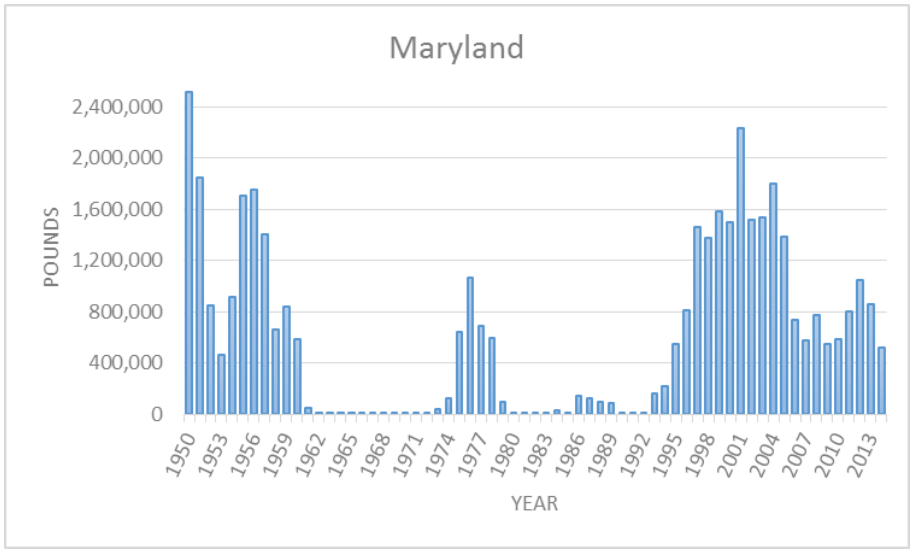


Figure 2. Virginia commercial landings of Atlantic croaker: 1950-2014.[8]

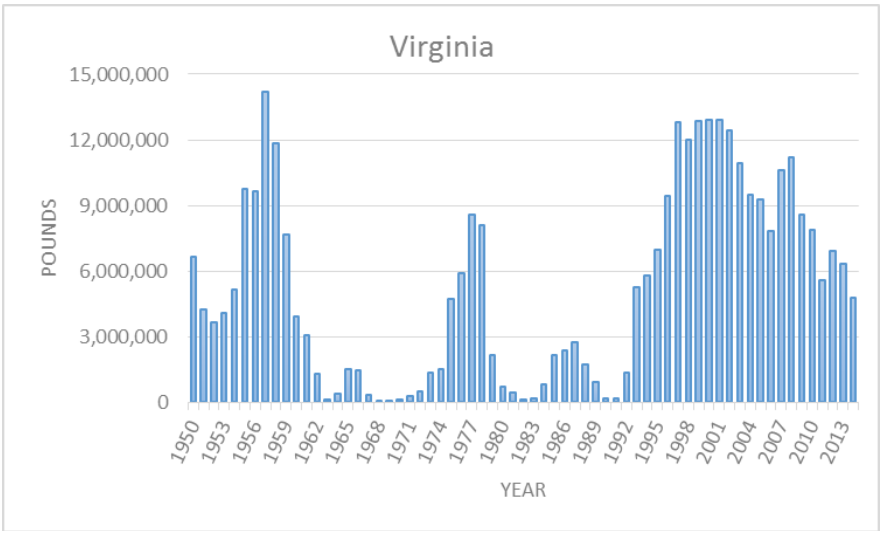


Figure 3. Maryland estimated recreational harvest and release for Atlantic croaker: 1981-2015.[9]

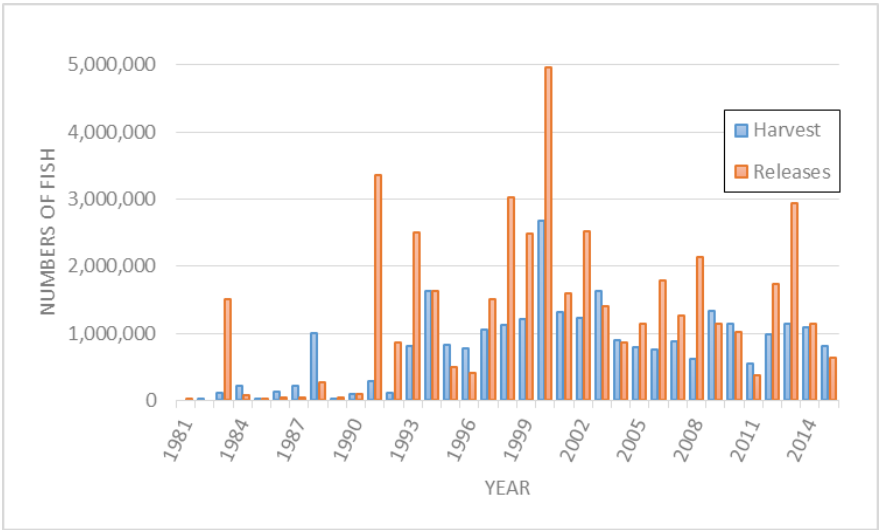
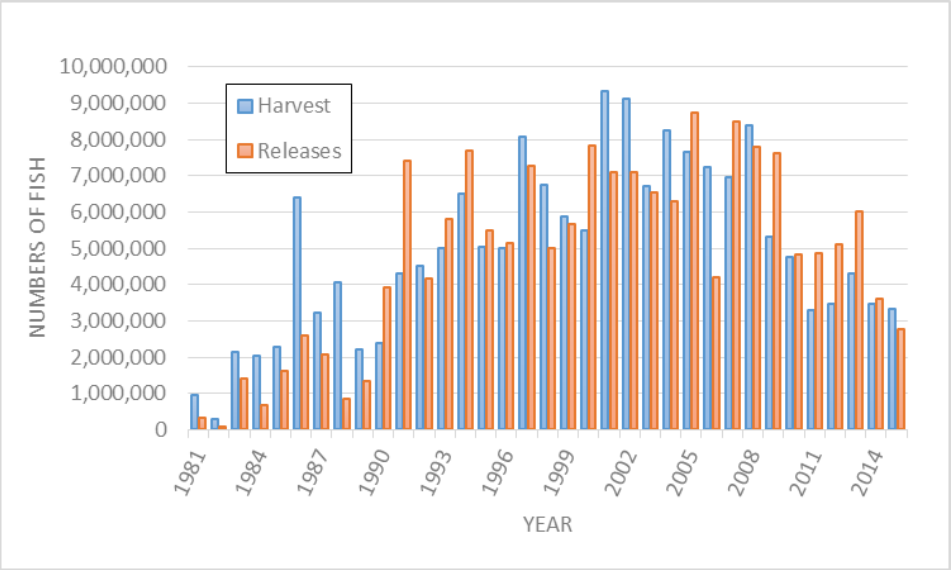


Figure 4. Virginia estimated recreational Atlantic croaker harvest and release, 1981-2015.[9]



Spot - The 2013 ASMFC Action Plan called for the evaluation of spot management triggers. As described above for Atlantic croaker, a similar TLA was approved for spot at the 2014 summer meeting of the ASMFC through an addendum to the Omnibus Amendment for Spanish Mackerel, Spot and Spotted Seatrout.[2],[11]. The TLA will provide management guidance until a stock assessment is completed in 2016. The TLA incorporates multiple data sources into a single metric and includes both population abundance and harvest data. If the threshold of 30% is triggered for two consecutive years, then state-specific management actions will be developed.[5] The ASMFC Spot Plan Review Team met in 2015 to review the trigger indices[10]. The review team found that the harvest composite index (recreational and commercial harvest) was above the threshold in 2012 and 2013 but was below the threshold in 2014. The abundance composite index (SEAMAP and NNFS surveys) was triggered in 2014 since it was above the 30% threshold but both harvest and abundance indices need to be over the threshold before management action is triggered Although the PRT did not recommend any management actions at this time, there was concern over declining harvest trends and low fishery independent index values.[10]

Spot Stock Status– Overfishing and overfished status remain unknown. The first benchmark stock assessment for spot is currently being developed and is slated for peer review in late 2016. MD DNR staff participated in the data workshop in September 2015 and will participate in both assessment workshops in 2016. Two juvenile indices (JI) are calculated to evaluate recruitment of spot in Maryland's portion of Chesapeake Bay. A JI is calculated for spot from the MD DNR Blue Crab Trawl Survey (BCS) and another from the Maryland Estuarine Juvenile Finfish Survey (EJFS). These indices are highly variable. Chesapeake Bay juvenile indices were near their time series means in 2012, but have declined steadily to a level near the time series low for both surveys.

Spot Fisheries

There is an order of magnitude difference in the commercial harvest of spot in Virginia and Maryland (Figures 5 & 6). However, commercial landings from both states indicate similar fluctuations across the years. Landings were higher in the 1950s, decreased in the 1960s and 1970s, and rebounded in the 1990s. Variability in spot landings is expected since it is a short-lived species. Year-class strength is impacted by annual environmental conditions. Recreational landings have been variable with additional fish caught but released (Figures 7 & 8). Compared to the other coastal states, Virginia recreational anglers have caught between 30% and 50% of the total coastal catch and Maryland recreational anglers have caught between 12% and 35% of the coastal catch based on the last ten years of estimated harvest data.

Figure 5. Maryland commercial landings of spot: 1950-2015.[8]

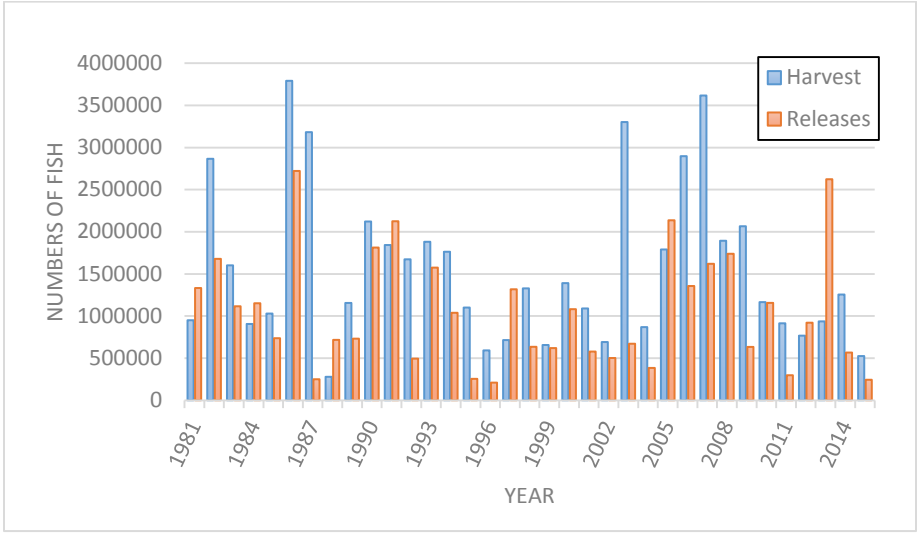


Figure 6. Virginia commercial landings of spot: 1950-2015.[8]

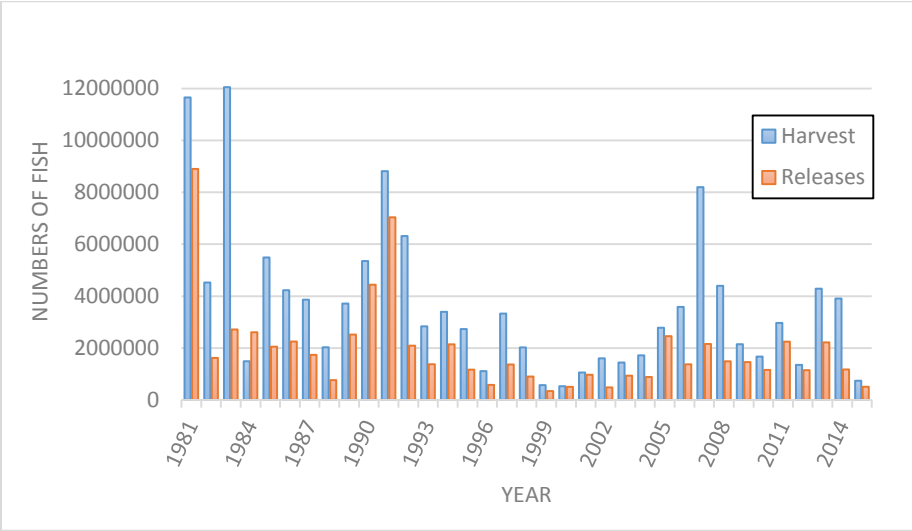


Figure 7. Maryland estimated recreational spot harvest and releases: 1983-2014.[8]

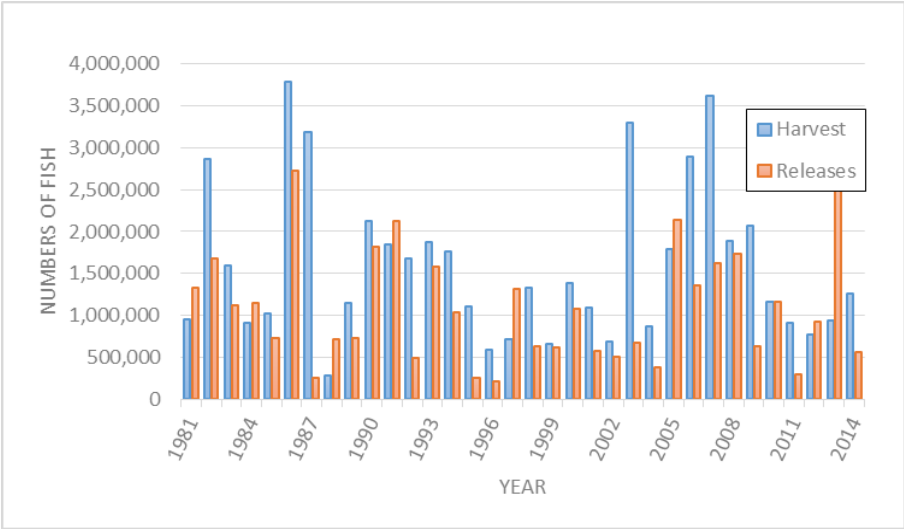
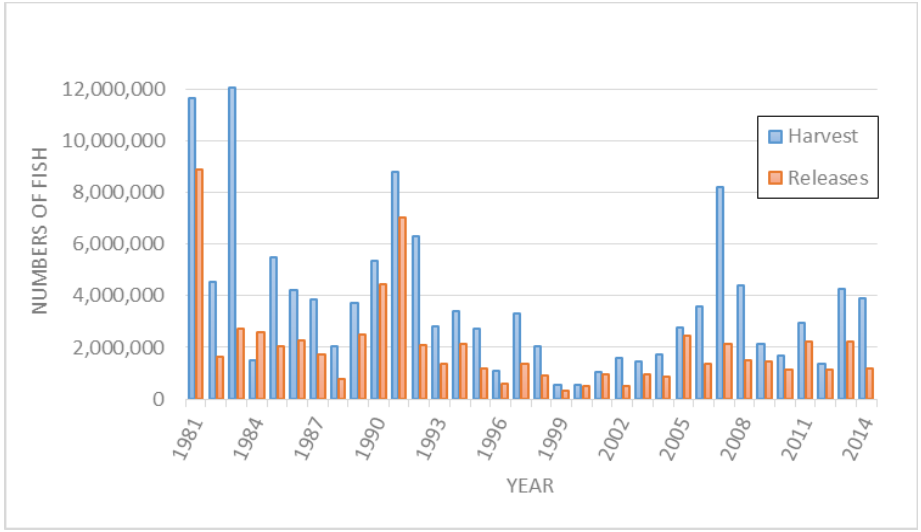


Figure 8. Virginia estimated recreational spot harvest and releases: 1983-2014.[8]



Management Measures

There are no management measures required by ASMFC to restrict the commercial or recreational fisheries for either croaker or spot. The adoption of the TLA is a precautionary management framework for both species. The coastal states are required to compile commercial and recreational harvest statistics and monitoring data. Annual spot and Atlantic croaker compliance reports have been required since 2012 and 2006, respectively.[6,12] Maryland and PRFC have a recreational minimum size limit of 9 inches for croaker and a creel limit of 25 fish per person per day. Maryland has a commercial season from March through December and a 9 inch minimum size limit. There are no harvest restrictions for Atlantic croaker in Virginia or for spot in any of the Chesapeake Bay jurisdictions.

Issues/Concerns

Continued monitoring of the commercial and recreational harvest of both croaker and spot is important in order to obtain data for conducting stock assessments and evaluating the status of the stocks. There is some concern about the overall decreasing trend in commercial landings of spot along the coast. The ASMFC Spot Plan Review Team will continue to monitor the trend and make management recommendations if necessary. The use of circle hooks to reduce recreational discard mortality is encouraged. Both species are caught indirectly and together during other fishing activities; bycatch mortality is a continued concern. Small spot, for example,

could account for as much as 80% of the shrimp trawl catch by weight and 60% by number, depending on area.[13] States are encouraged to use bycatch reduction devices to reduce bycatch.

Spot are used as live bait in both the commercial hook and line fishery and the recreational striped bass fishery in the Chesapeake Bay. Gear restrictions and/or harvest and size restrictions on spot could significantly impact these striped bass fisheries. The consequences of using small spot as bait are unknown. Spot used for the live bait fishery are harvested in fish pots or by hook and line.

A winter kill in Chesapeake Bay estimated at two million juvenile spot occurred in late December 2010 and was associated with a sudden cold snap. The consequences of this winter kill are unknown but illustrate the vulnerability of this species to sudden cold snaps.

References:

[1] ASMFC 2005. Amendment 1 to the Interstate Fishery Management Plan for Atlantic Croaker. Fishery Management Report No. 44 of the Atlantic States Marine Fisheries Commission. Arlington, VA. 92p.

[2] ASMFC 2011a. Omnibus Amendment to the Interstate Fishery Management Plans for Spanish Mackerel, Spot, and Spotted Seatrout. Fishery Management Report of the Atlantic States Marine Fisheries Commission. Arlington VA 161p.

[3] ASMFC 2011b. Addendum I to Amendment 1 to the Atlantic Croaker Fishery Management Plan. Arlington, VA 7p.

[4] ASMFC 2015a. 2015 Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for Atlantic Croaker (*Micropogonias undulatus*) 2014 Fishing Year. Accepted August 2015. 20P.

[5] ASMFC 2014a. Addendum II to Amendment I to the Interstate Fisheries Management Plan for Atlantic Croaker. Arlington, VA 7p.

[6] Rickabaugh, H., Jr. 2016. Maryland Atlantic Croaker (*Micropogonias undulatus*) Compliance Report to the Atlantic States Marine Fisheries Commission – 2015. Maryland Department of Natural Resources Fisheries Service June 17, 2016.

[7] ASMFC. 2010. Atlantic Croaker 2010 Benchmark Stock Assessment. Washington DC.

[8] Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division, June 29, 2015.

[9] Personal communication from the National Marine Fisheries Service, Recreational Fisheries Statistics Division, Marine Recreational Information Program, June 29, 2016.

[10] ASMFC 2015b. 2015 Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for Spot (Leiostomus xanthurus) – 2014 Fishing Year, Arlington, VA 17p.

[11] ASMFC 2014d. Addendum I to the Omnibus Amendment to the Interstate Fishery management Plans for Spanish Mackerel, Spot, and Spotted Seatrout, management of the Spot Fishery using the Traffic Light Approach. Arlington, VA. 7p.

[12] Rickabaugh, H., Jr. 2015. Maryland Spot (Leiostomus xanthurus) Compliance Report to the Atlantic States Marine Fisheries Commission – 2014. Maryland Department of Natural Resources Fisheries Service October, 2015.

[13] Peuser, R (editor). 1996. Estimates of finfish bycatch in the south Atlantic shrimp fishery. Final Report of the SEAMAP-South Atlantic Committee: Shrimp Bycatch Work Group. Washington DC: Atlantic States Marine Fisheries Commission.

1991 Chesapeake Bay Program Atlantic Croaker and Spot Fishery Management Plan Implementation (updated 07/16)			
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.	2005 2009 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 and updated in 2010. Current estimates of F and SSB indicate that the croaker stock is healthy and overfishing is not occurring (ASMFC 2010). The status of the coastal spot stock is undeterminable. No stock assessment has been completed. The ASMFC Spot PRT has been monitoring stock status through reports to the South Atlantic Management Board. Annual spot and Atlantic croaker compliance reports to ASMFC are required. **A coast wide stock assessment for both species was initiated in 2015 and is scheduled for peer review in 2016.**
	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 and PRFC have a 9” minimum size limit and a 25 fish/person/day creel limit for croaker recreational fisheries. MD has an open commercial season from March 16 through December with a 9” minimum size limit. VA does not have any restrictions for Atlantic croaker.
	Action 1.2.2 CBP jurisdictions will evaluate the need to implement a minimum size limit for spot.	1992 2009 Continue	No recommendations have been made for spot. There is some concern over declining juvenile abundance. The ASMFC omnibus amendment, approved in 2011, did not require additional management criteria. With the adoption of addendums to the ASMFC amendments (August 2014), both croaker and spot are managed using the traffic light approach (see text for explanation).

1991 Chesapeake Bay Program Atlantic Croaker and Spot Fishery Management Plan Implementation (updated 07/16)			
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 in both MD and VA. The 2004 Croaker Stock Assessment indicated that the coastal states were successful at reducing mortality on age 1 fish. The commercial & recreational catch-at-age data showed an increasing age distribution with a few croaker at age 12. The stock assessment analyses indicated that the shrimp bycatch estimates are important to consider in the calculations but there needs a more comprehensive evaluation. ASMFC encourages states to use bycatch reduction devices (BRDs). MD currently allows attended gill nets with a stretched mesh size of 3 1/8 to 3 ½ inches from January 1 through March 15 and 2 ½ to 3 ½ inches between March 16 and December 31 in the Chesapeake Bay and tributaries, with location restrictions during striped bass spawning seasons. The minimum stretched gill net mesh size in MD waters is 2 ½ inches. Virginia has a minimum gill net stretched mesh of 2 7/8”**.**
	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	CBP jurisdictions have evaluated the effectiveness of bycatch reduction panels in pound nets and PRFC requires reduction panels for all pound nets. Some coastal states are using panels to reduce bycatch of small fish.
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 has increased since the 2003/2004 coastal stock assessment. The 2010 ASMFC coastal stock benchmark assessment concluded that the coastal Atlantic croaker population is a single stock. Addendum 1 to the ASMFC FMP changed the management unit to a single stock and modified the BRPs. Stock assessment data for Atlantic croaker and spot is collected by the MD Estuarine Juvenile Finfish Survey, and VIMS Juvenile Abundance Surveys (formerly known as the VIMS Trawl Survey and the VIMS Juvenile Seine Survey), NEAMAP and ChesMMAP. Both Maryland and Virginia collect age, length, weight and sex data from commercially harvested spot and croaker.

1991 Chesapeake Bay Program Atlantic Croaker and Spot Fishery Management Plan Implementation (updated 07/16)			
Problem Area	**Action**	**Date**	**Comments**
	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 included: determining migratory patterns; collecting life history information; evaluating bycatch and discard practices; and examining reproductive strategies. Spot up to age 3 are regularly represented in the commercial fishery. Commercial catch-at-age data has contracted the last several years. Length-at-age and weight-at-age have decreased for ages 1-3. Spot age 4 to 6 years are not seen every year and when present, account for a small percentage of harvest. Recommendations for spot in the 2011 omnibus amendment include: monitoring data and gear studies on discards from the shrimp, recreational and commercial fisheries; expanding sampling; assessing BRDs; continuing development of fishery-dependent and fishery-independent size and sex specific relative abundance estimates; evaluating juvenile indices to predict year class strength; improving catch and effort statistics; and developing stock assessment analyses such as a yield-per-recruit analysis and determining the inshore vs offshore components of the fishery. **Commercial pound net sampling in Maryland's portion of the Chesapeake Bay was conducted from late May through early September, 2015. Atlantic croaker mean length from the onboard pound net survey was 265 mm total length in 2014, below the 23 year time series mean. Ages ranged from 1` to 7 years old, with age 3 fish accounting for the majority of the catch. Atlantic croaker over age 6 have become less abundant since the mid-2000s. Spot mean length from the onboard sampling decreased slightly in 2014 to 194 mm total length, where it remained in 2015, and was below the mean value of 204 mm for the 23 year time series. Atlantic croaker juvenile abundance from the Maryland Chesapeake Bay Blue Crab Trawl Survey was high in 2012 but declined through 2015 to the 2nd lowest value of the 27 year time series. The spot Chesapeake Bay juvenile trawl index declined from 2013 to 2015. The 2015 value was the lowest of the 27 year time series.**

1991 Chesapeake Bay Program Atlantic Croaker and Spot Fishery Management Plan Implementation (updated 07/16)			
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 2014 On-going 2016-2017	Water quality and living resource commitments were updated and renewed in the Chesapeake Bay 2000 Agreement. These activities include the discharge of toxic pollutants or excessive nutrients into the Chesapeake Bay and its tributaries, interruption or changes in water discharge patterns, deposition of solid waste, sewage sludge or industrial waste into the Bay (which may lead to anoxic conditions), rapid coastal development, unregulated agricultural practices, net coastal wetland loss or the dredging of contaminated sub-aqueous soils. Based on the most recent available data, scientists project that 58% of the pollution reduction efforts needed to achieve the Bay restoration goals have been implemented since 1985. Excess nitrogen, phosphorus and sediment are the major pollutants. The greatest challenge to achieving restoration is population growth and development which destroys forests, wetlands and other natural areas. Habitat and water quality objectives and actions were delineated in the President's Executive Order and provide more current strategies for managing resources in the Chesapeake Bay. Estuaries are designated as Habitat Areas of Particular Concern (HAPC) for spot. The CBP developed a new Watershed Agreement in 2014 with outcomes and strategies that address sustainable fisheries, vital habitats, water quality, toxic contaminants, healthy watersheds, stewardship, land conservation, public access, environmental literacy and climate resiliency. For more information see: http://www.chesapeakebay.net/documents/FINAL_Ches_Bay_Watershed_Agreement.withsignatures-HIres.pdf **Of particular interest for croaker and spot is the evaluation of forage in the Chesapeake Bay as part of the sustainable fisheries outcomes. A two-year work plan (2016-2017) was developed to address forage in the Bay and a STAC workshop was held in 2014. Both small spot and croaker were important forage for several of the key predator species**. For more details, go to the workshop report at http://www.chesapeake.org/pubs/346_Ihde2015.pdf

Acronyms:

ASMFC = Atlantic States Marine Fisheries Commission;
BRPs = Biological Reference Points
CHESFIMS = Chesapeake Bay Fishery Independent Multispecies Fisheries Survey
ChesMMAP = Chesapeake Bay Multispecies Monitoring and Assessment Program;
CBP = Chesapeake Bay Program
FMP = Fishery Management Plan
NMFS = National Marine Fisheries Service
ODU = Old Dominion University
PRFC = Potomac River Fisheries Commission
PRT = Plan Review Team
SEAMAP = Southeast Area Monitoring and Assessment Program
STAC = Scientific and Technical Advisory Committee
TLA = Traffic Light Approach VIMS = Virginia Institute of Marine Science