



Introduction

This document presents a summary of the 2010 benchmark stock assessment for Atlantic croaker. The assessment was peer-reviewed by an independent panel of scientific experts through the 20th SouthEast, Data, Assessment, and Review (SEDAR) workshop. This assessment represents the latest and

best information available on the status of the coastwide Atlantic croaker stock for use in fisheries management.

Management Overview

Atlantic croaker are managed solely by the Atlantic States Marine Fisheries Commission through Amendment 1 to the Interstate Fishery Management Plan for Atlantic Croaker.

Landings of croaker have fluctuated widely over time. Total reported landings (recreational and commercial) in 2008 were 24.7 million pounds, down from the most recent high of 39.7 million pounds in 2001, but still above the long-term average. Commercial landings make up about 75% of total reported landings. The majority of the landings come from North Carolina, Maryland, and Virginia, which report 78% of the coastwide recreational landings and 95% of coastwide commercial landings.

Croaker are also an important component of scrap or bait fisheries (which do not report species-specific landings) and bycatch from shrimp trawls and other gear. These removals are, in general, not well monitored or documented, and have a high degree of uncertainty. This is a problem because the best estimates that we have of these landings are, in some years, as large or larger than reported landings.

The Commission assesses Atlantic croaker relative to the fishing mortality benchmark F_{MSY} , the fishing mortality necessary to produce the maximum sustainable yield, and the biomass benchmark SSB_{MSY} , the spawning stock biomass necessary to produce the maximum sustainable yield. If fishing mortality is greater than F_{MSY} , overfishing is occurring. If the spawning stock biomass is less than 75% of SSB_{MSY} , the stock is considered to be overfished.

What Data Were Used?

The stock assessment used both fisheries-dependent and independent data, including information on Atlantic croaker biology and life history. Fisheries-dependent data come from recreational and commercial fisheries, while fisheries-independent data are collected through scientific research and surveys.

Atlantic croaker are considered to be a single stock on the Atlantic coast. There is a separate, genetically distinct stock in the Gulf of Mexico. The previous stock assessment divided the stock into Mid-Atlantic and South Atlantic regions and assessed only the Mid-Atlantic region. This assessment used data from both regions to produce a single, coastwide assessment.

Life History

Atlantic croaker are in the same family as red drum and weakfish. They can be found from the Gulf of Maine to Argentina, but along the US Atlantic coast, they are most abundant from the Chesapeake Bay to northern Florida. They get their name from the croaking noises they make

by vibrating their abdominal muscles against their swim bladder as part of their mating ritual during spawning season.

Atlantic croaker spawn in warm pelagic waters during the fall and winter months, and the larvae and juveniles settle in estuaries to mature. The Chesapeake Bay is an important spawning and nursery habitat for croaker.

Most Atlantic croaker are mature by the end of their first year. They grow quickly and may reach sizes of over 20 inches. The world record for Atlantic croaker is 8 lbs 11 oz. The oldest observed age is 17 years, but it is uncommon to see fish older than 10 years in the catch.

Commercial Data

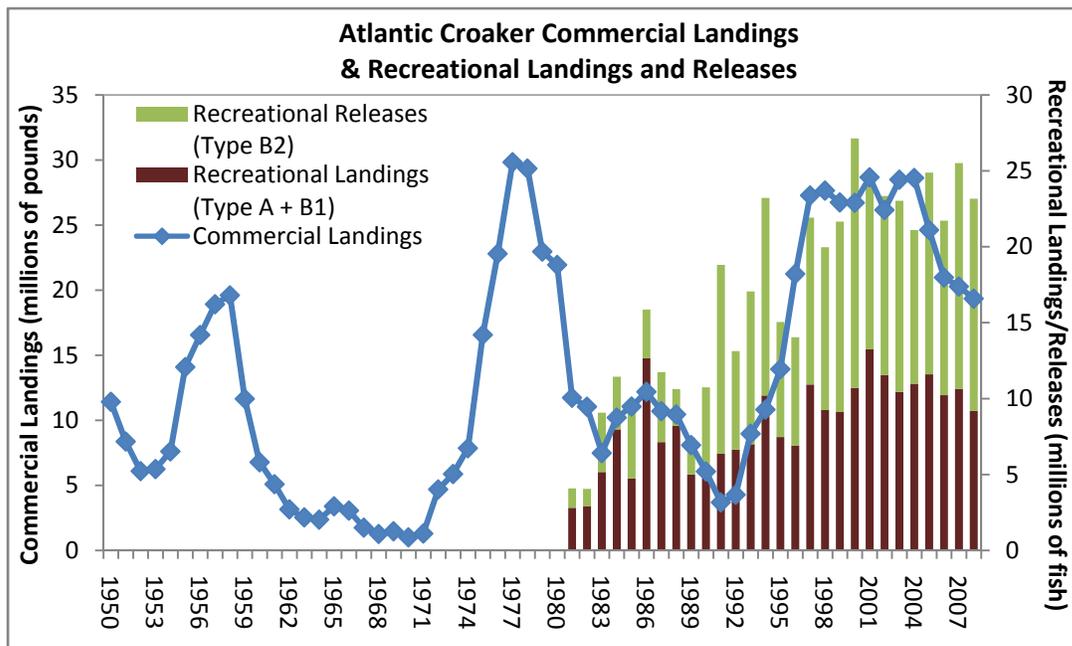
Commercial landings of croaker show a “boom-and-bust” pattern going back to the start of the time series in 1950, with periods of high landings alternating with periods of low landings. Historically, most landings came from pound nets, seines, and trawls, but landings from gillnets and other gear have increased in recent decades. North Carolina, Virginia, and Maryland account for almost all commercial landings of croaker, but New Jersey has contributed a higher percentage in recent years.

Biological samples, including length, weight, and either scales or otoliths to determine age, were taken from the commercial landings in Maryland, Virginia, and North Carolina. This represents the core of the commercial fishery. Since the biological sampling was only adequate to develop the catch-at-age from 1988 onwards, the model only uses data from 1988 – 2008. Over this time period, more and more older fish have been observed in the catch. This expansion of the age-structure is a good sign for the stock because it means more fish are living longer and able to reproduce more times before being caught.

Recreational Data

The Atlantic croaker assessment used recreational catch and effort data from the Marine Recreational Fisheries Statistics Survey (MRFS) for 1988 – 2008. Recreational catches are divided into Type A catch (fish that are landed and able to be measured), Type B1 catch (fish that are killed but unavailable to be measured – filleted, discarded dead, etc.), and Type B2 catch (fish that are released alive). MRFS surveyors measure the Type A fish they encounter to develop a length-frequency of the recreational catch, which can then be used to develop recreational catch-at-age.

Recreational catches have been increasing since 1981 when the MRFS time series



began. The proportion of fish that are released alive has been increasing as well, going from 30% in 1981 to 60% in 2008. Based on studies and stock assessments of other related species, the assessment assumed that 10% of all fish released alive die as a result of being caught.

Starting in 2005, MRFSS also measured fish released alive from for-hire vessels. On average, the croaker that anglers released alive were smaller than the croaker they kept. The ratio of the size of released croaker to retained croaker was used to estimate the total weight of croaker that were released alive in years where no size measurements were available.

The age-structure of the recreational catch has also been expanding over this time period, with a higher proportion of older and larger fish observed in recent years.

Scrap and Discard Data

Atlantic croaker smaller than market grade may be combined with other undersized or undesirable fish and sold as bait or scrap. These landings are not reported at the species level, but instead as “unclassified finfish.” North Carolina is the only state that samples its scrap/bait fishery to estimate the proportions of different species in the total scrap landings. The assessment used North Carolina’s estimates of scrap landings in the model and did not attempt to estimate scrap/bait landings for any other state.

Atlantic croaker may also be discarded at sea. The National Marine Fisheries Service (NMFS) Observer Program uses on-board observers to record the number of fish caught and discarded at sea. From the ratio of discarded croaker to landed croaker on observed trips, estimates of total croaker discards in gillnet and trawl fisheries were developed. The low sample size of observed trips made these estimates uncertain.

The major source of uncertainty for this assessment is the magnitude of Atlantic croaker bycatch in South Atlantic shrimp trawls. Croaker are one of the largest components of the shrimp trawl catch; some studies found that shrimp trawls caught more croaker than shrimp. Most croaker caught in this fishery are less than 1 year old, too small to be marketed, and thus are discarded. There are no continuous monitoring programs to account for these discards. The studies that have looked at bycatch rates in shrimp trawls occur infrequently, cover small geographical ranges, and often use different methods of sampling and reporting data. This means that to develop a time series of total croaker catch from the shrimp trawl fishery, many assumptions have to be made and data from other areas and years have to be used to fill gaps. Therefore, the estimates of shrimp trawl bycatch of croaker are considered unreliable. This is a concern because for the years that do have adequate estimates, shrimp trawl bycatch of Atlantic croaker is comparable in size to the total reported catch of Atlantic croaker.

Fishery-Independent Surveys

The assessment used four fishery-independent surveys. Two of the surveys catch a range of ages, while two of them target young-of-year (YOY) croaker.

The NMFS Fall Bottom Trawl Survey collects samples from inshore waters from Cape Hatteras, North Carolina north to Cape Cod, Massachusetts every year, and catches a range of ages. The Southeast Area Monitoring and Assessment Program Survey collects samples from inshore waters from Cape Hatteras south to Cape Canaveral, Florida, and catches a range of ages, although mostly younger fish. These surveys provide information on trends in relative abundance of adult croaker and together cover most of the range of the stock.

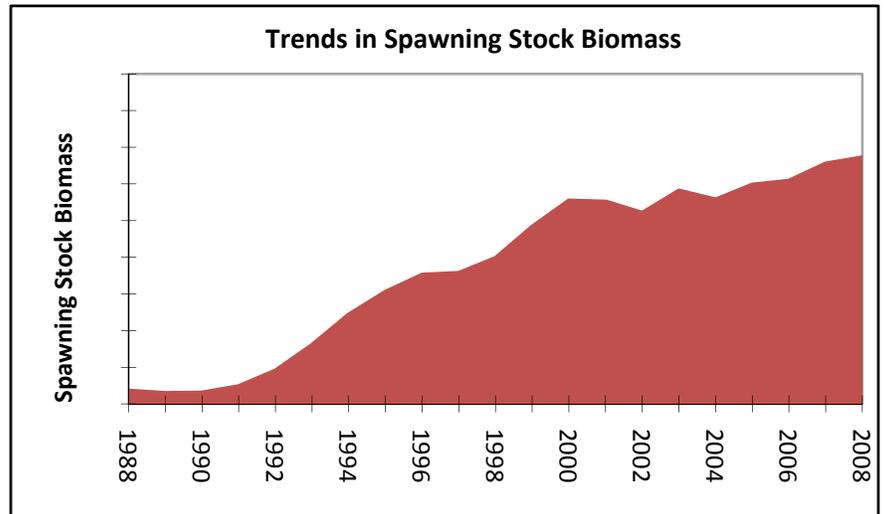
The Virginia Institute of Marine Science Juvenile Trawl Survey samples YOY croaker in the Chesapeake Bay. The North Carolina Division of Marine Fisheries Pamlico Sound Survey samples YOY croaker in Pamlico Sound, eastern Albemarle Sound, and the lower Neuse and Pamlico Rivers. These surveys cover two important croaker nursery grounds and provide information on relative abundance of YOY croaker.

What Models Were Used?

A statistical catch-at-age (SCA) model was used to assess Atlantic croaker. This model combines the catch-at-age data from the commercial and recreational fisheries with information from fishery-independent surveys and biological information such as growth rates and natural mortality rates to estimate the size of each age class and the exploitation rate of the population. The current model is a modified version of the model used for the last assessment. The most important change is that the observed catch-at-age data is incorporated into the calculations.

The model was run with and without bycatch estimates of Atlantic croaker in the shrimp trawl fishery, and the trends were very similar, showing increasing biomass and decreasing fishing mortality. A series of sensitivity runs conducted over a range of plausible values of shrimp-trawl fishing mortality found that the ratio of directed fishing mortality to F_{MSY} was less than one in all cases, indicating overfishing was not occurring.

The model trends agree with the trends in the fishery-independent data and the expanding age structure that has been observed in the catch. Because of the high degree of uncertainty of the estimates of shrimp trawl bycatch, the model estimates of stock size and fishing mortality were not considered reliable. Therefore, the assessment can only provide trends in spawning stock biomass and estimates of relative fishing mortality and not absolute numbers.

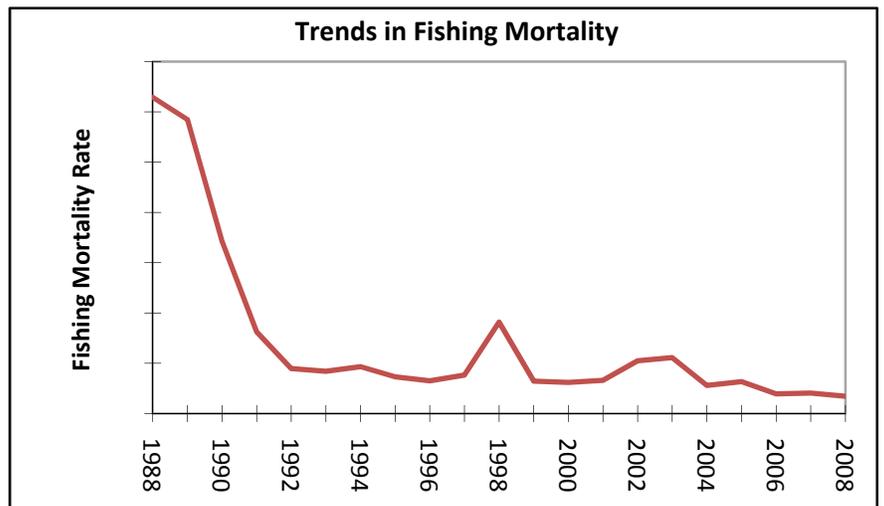


What is the Status of the Stock?

Atlantic croaker is not experiencing overfishing. Model estimates of spawning stock biomass (SSB) were too uncertain to be used to precisely determine overfished stock status. However, given that biomass has been increasing and the age-structure of the population has been expanding since the late 1980s, it is unlikely the stock is in trouble.

Research Needs

A large proportion of Atlantic croaker removals are not adequately documented. This includes the scrap/bait fishery, at-sea discards from directed fisheries and, most importantly, bycatch in shrimp trawls. An observer program needs to be developed to quantify the bycatch of finfish in shrimp trawls, and existing observer coverage of the gillnet, trawl, and other fleets in the Northeast should be increased and expanded to other regions of the Atlantic coast. Additionally, sampling programs similar to North Carolina's should be implemented to estimate scrap/bait landings in other states. Adequate observer coverage and sampling in all of these fleets would provide crucial information not



only for croaker, but for other species such as weakfish, spot, and kingfish that may also experience large, undocumented removals from these fisheries.

Whom Do I Contact For More Information?

Atlantic States Marine Fisheries Commission
1444 Eye St NW 6th Floor
Washington, DC 20005
Phone: (202) 289-6400
Fax: (202) 289-6051
E-mail: info@asmfc.org

Glossary

Age class: all of the individuals in a stock that were spawned or hatched in the same year. This is also known as the year class or cohort.

Catch-at-age: the number of fish of each age that are removed in a year by fishing activity.

Exploitation rate: the percentage of a stock that is removed by fishing over the course of a year

Fishing mortality: the instantaneous rate at which fish are killed by fishing

Length-frequency: a summary of the different lengths of the fish in the stock or the catch that is used to describe the size composition of the stock or the catch

Marine Recreational Fishing Statistics Survey (MRFSS): a national survey conducted by the National Marine Fisheries Service (NMFS), often in conjunction with state agencies, to collect information on the catch, effort, and length frequencies of marine recreational fisheries

Natural mortality: the instantaneous rate at which fish die because of natural causes (predation, disease, starvation, etc)

Otoliths: the inner ear bones of a fish. They form rings as they grow which can be counted to assign an age to the fish.

Spawning stock biomass: The total weight of the mature females within a stock of fish; frequently used instead of total biomass as a better measure of the ability of a stock to replenish itself.

Statistical catch-at-age (SCA) model: an age-structured stock assessment model that works forward in time to estimate population size and fishing mortality in each year.

References

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