



## Introduction

This document presents a summary of the 2024 stock assessment update for Atlantic striped bass. This is an update of the assessment model that was peer-reviewed by an independent panel of scientific experts at the 66<sup>th</sup> Northeast Regional Stock Assessment Workshop/Stock Assessment Review Committee (SAW/SARC66) meeting in November 2018 and includes data through 2023. The assessment is the latest and best information available on the status of the coastwide Atlantic striped bass stock for use in fisheries management.

## Management Overview

Atlantic coast migratory striped bass live along the eastern coast of North America from the St. Lawrence River in Canada to the Roanoke River and other tributaries of Albemarle Sound in North Carolina. Historical tagging data suggest stocks that occupy coastal rivers from the Tar-Pamlico River in North Carolina south to the St. Johns River in Florida do not undertake extensive Atlantic Ocean migrations when compared with stocks from the Roanoke River north.

The Atlantic States Marine Fisheries Commission (ASMFC) manages the coastal migratory striped bass stock, which inhabits all coastal and estuarine areas from Maine through Virginia, and the coastal areas of North Carolina. Estuarine striped bass stocks in North Carolina, which contribute minimally to the coastal migratory stock, are managed separately by the State of North Carolina under the auspices of the Commission. The North Carolina estuarine striped bass management unit is defined as the striped bass inhabiting the Albemarle Sound and Roanoke River and their tributaries.

The stock assessment includes data from both state (0 – 3 miles from shore) and federal waters (3 – 200 miles from shore). Amendment 7 to the Interstate Fishery Management Plan, approved in May 2022, and its Addenda I-II set the management program for striped bass. Amendment 7 implements a number of changes to improve management of the species and rebuild the stock, including establishing a more conservative recruitment trigger and requiring the 2024 stock assessment's rebuilding projections to conservatively account for the possibility of future low recruitment. Amendment 7 also builds on the mandatory circle hook provision by implementing additional measures intended to increase the chance of survival after a striped bass is released alive in the recreational fishery. Addendum II to Amendment 7, approved in January 2024, implemented recreational and commercial measures to reduce fishing mortality in 2024 and support stock rebuilding. The striped bass stock is currently under a rebuilding plan with a 2029 rebuilding deadline.

## What Data Were Used?

The stock assessment used both fishery-dependent and -independent data collected through state, federal, and academic research programs. The assessment includes final catch and index data through 2023.

## Life History

Atlantic striped bass are anadromous, meaning they spend most of their adult life in ocean waters, but return to their natal rivers to spawn in the spring. The rivers that feed into the Chesapeake Bay and the Delaware and Hudson Rivers are the major spawning grounds for the coastal migratory population. Female striped bass typically grow larger and heavier than males. Based on sampling efforts, 45% of female striped bass mature at age 6 and 100% mature by age 9. Striped bass can live to a maximum of 31 years.

## Commercial and Recreational Data

The stock assessment used total catch (harvest, commercial discards, and dead recreational discards) and catch-at-age split into two components: Chesapeake Bay removals and ocean removals. Removals include harvest and dead discards from both fishing sectors. Ocean removals include removals from inland areas like the Delaware Bay, Long Island Sound and the Hudson River.

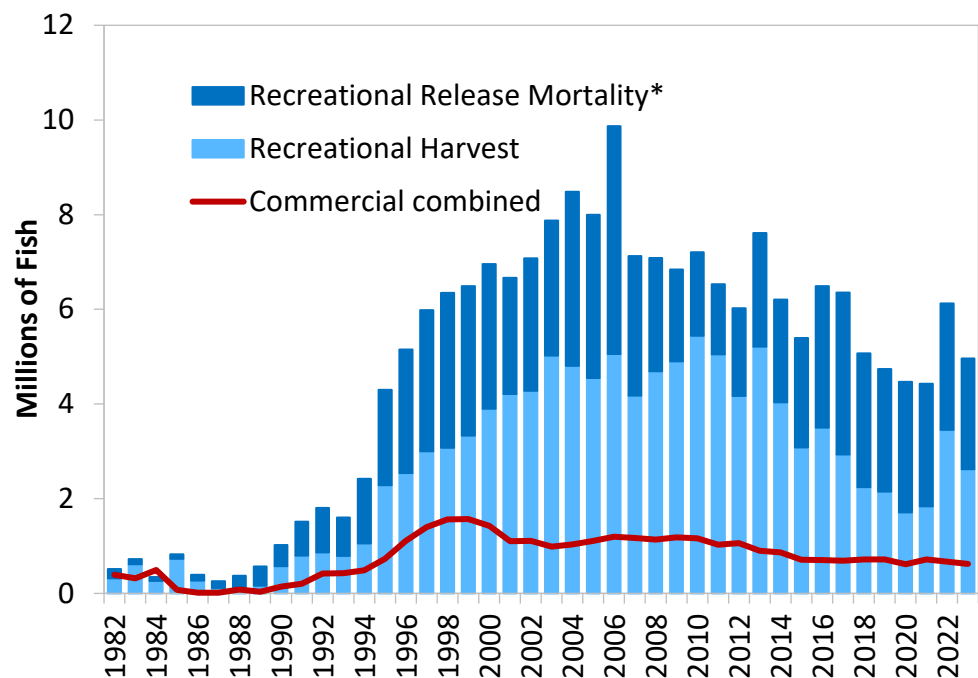
Strict commercial quota monitoring is conducted by states through various state and federal dealer and fishermen reporting systems; landings are compiled annually from those sources by state biologists. Following the stock's collapse in the late 1970s/early 1980s, commercial landings dropped to 151,000 pounds (under 50,000 fish) in 1986. As fishery regulations were liberalized during the 1990s, landings increased, reaching over 7.3 million pounds (about 880,000 fish) in 2004.

From 2004-2014, landings were relatively stable due to the

commercial quota system with average landings of 6.8 million pounds per year (about 943,000 fish). The commercial quota was reduced in 2015 and again in 2020 in response to stock assessment findings that overfishing was occurring. Commercial harvest averaged 4.3 million pounds per year (about 616,000 fish) from 2022-2023. The assessment estimates unreported commercial discards using tag return data from commercial and recreational fisheries. Commercial discards were estimated to be about 5% of total commercial removals from 2022-2023, and less than 1% of total removals.

Recreational catch, effort, and length frequency data were obtained from the Marine Recreational Information Program (MRIP) for 1982-2023. MRIP uses surveys to estimate how many fishing trips recreational anglers take every year and how many fish per trip they catch.

**Figure 1. Atlantic Striped Bass Commercial Landings and Discards & Recreational Landings and Release Mortality**



\* 9% of fish released alive are assumed to die because of being caught.

Recreational harvest increased from 2.4 million pounds (264,000 fish) in 1984 to 61.5 million pounds (5.4 million fish) in 2010. Between 2004 and 2014, harvest remained steady, averaging 54.8 million pounds (4.6 million fish) per year. Following stock declines and implementation of size and bag limit changes in the recreational fisheries through Addendum IV, harvest decreased to an average of 33.6 million pounds (2.8 million fish) for 2015-2019. Recreational harvest increased significantly in 2022, going from 15.8 million pounds (1.8 million fish) in 2021 to 35.8 million pounds (3.5 million fish) in 2022. Harvest decreased somewhat in 2023, due to the Emergency Action, but at 23.8 million pounds (2.6 million fish) was still the highest recreational harvest since 2017. Recreational harvest represents the fish that are landed by anglers, but the vast majority (85-90%) of the annual catch in most years is released alive. The assessment assumes, based on previous studies, that 9% of the fish that are released alive die as a result of being caught. The number of released fish peaked in 2006 at 53.5 million fish, 4.8 million of which were assumed to have died. Total numbers of releases have declined to a low of 16.4 million releases (1.5 million of which died) in 2011 after a series of weak year classes. Live releases have rebounded somewhat since then, averaging 27.8 million fish released leading to 2.5 million release mortalities per year in 2022-2023. From 2022-2023, about 40% of total removals were release mortalities, compared to 2018-2021 where release mortalities made up 50% of total removals. Figure 1 shows commercial and recreational landings and discards (release mortality in the case of the recreational fishery) in numbers of fish (not pounds or metric tons).

Overall, total removals from 2022-2023 averaged 33.8 million pounds (6.18 million fish), a 20% increase from 2021, the last year of the previous assessment update.

MRIP catch per unit effort data was used as a fishery-dependent index of relative abundance.

### ***Fishery-Independent Surveys***

The assessment used several fishery-independent indices of relative abundance for adults (Connecticut Trawl Survey, ChesMMAP Survey, New Jersey Bottom Trawl Survey, New York Ocean Haul Seine Survey, Maryland Spawning Stock Survey, and Delaware Spawning Stock Electrofishing Survey); and for young-of-year (YOY) and age-1 fish (New York and Maryland YOY and Yearling Surveys, and New Jersey and Virginia YOY Surveys). Several surveys were impacted by COVID-19 and other issues, with sampling interrupted or suspended in 2020 and 2021, resulting in missing data points or more uncertain data points for some surveys, but by 2023 all had resumed sampling normally.

### ***Tagging Data***

Eight tagging programs have traditionally participated in the U.S. Fish and Wildlife Service (USFWS) Atlantic coast striped bass tagging program and each have been in progress for at least 18 years. The tagging programs are divided into two categories, producer area programs and coastal programs. Producer area tagging programs primarily operate during spring spawning on spawning grounds in New York, Delaware/Pennsylvania, Maryland, and Virginia. Coastal programs tag striped bass from mixed stocks during fall, winter, or early spring in waters off of Massachusetts, New York, New Jersey, and North Carolina. USFWS maintains the tag release and recapture database and provides rewards to anglers who report the recaptures of tagged fish.

## **How Were the Data Analyzed?**

### ***Statistical catch-at-age (SCA) model***

The accepted model for use in striped bass stock assessments is a forward projecting statistical catch-at-age (SCA) model, which uses catch-at-age data and fishery-dependent and -independent survey indices to estimate annual population size and fishing mortality. Indices of abundance track relative changes in the

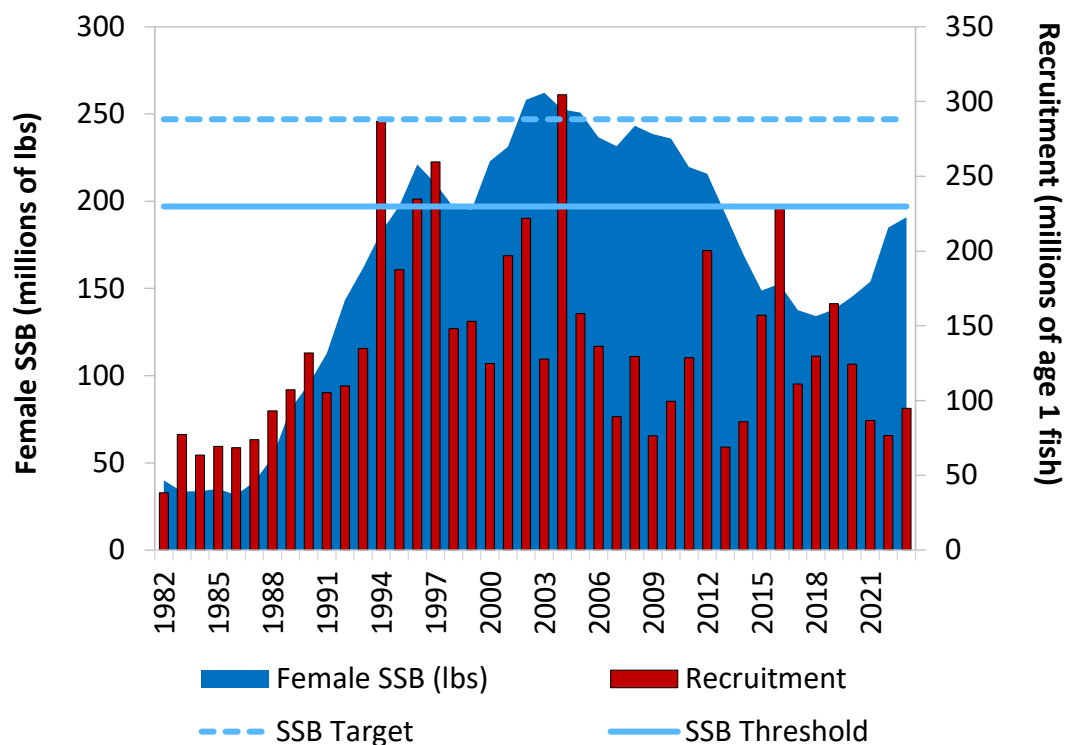
population over time while catch data provide information on the scale of the population size. Age structure data (numbers of fish by age) provide additional information on recruitment (number of age-1 fish entering the population) and trends in mortality.

### What is the Status of the Stock?

In 2023, the Atlantic striped bass stock was overfished but not experiencing overfishing relative to the updated reference points defined in the 2024 assessment (see below). Female spawning stock biomass (SSB) was estimated at 191 million pounds, just below the updated SSB threshold of 197 million pounds. Total fishing mortality was estimated at 0.18, below the updated fishing mortality threshold of 0.21 but above the updated fishing mortality target of 0.17.

Although the stock remains below the SSB threshold, the stock is still above the SSB levels observed during the moratorium that was in place in the mid-late 1980s, and has increased since the last assessment update.

**Figure 2. Atlantic Striped Bass Female Spawning Stock Biomass and Recruitment**



### Recruitment

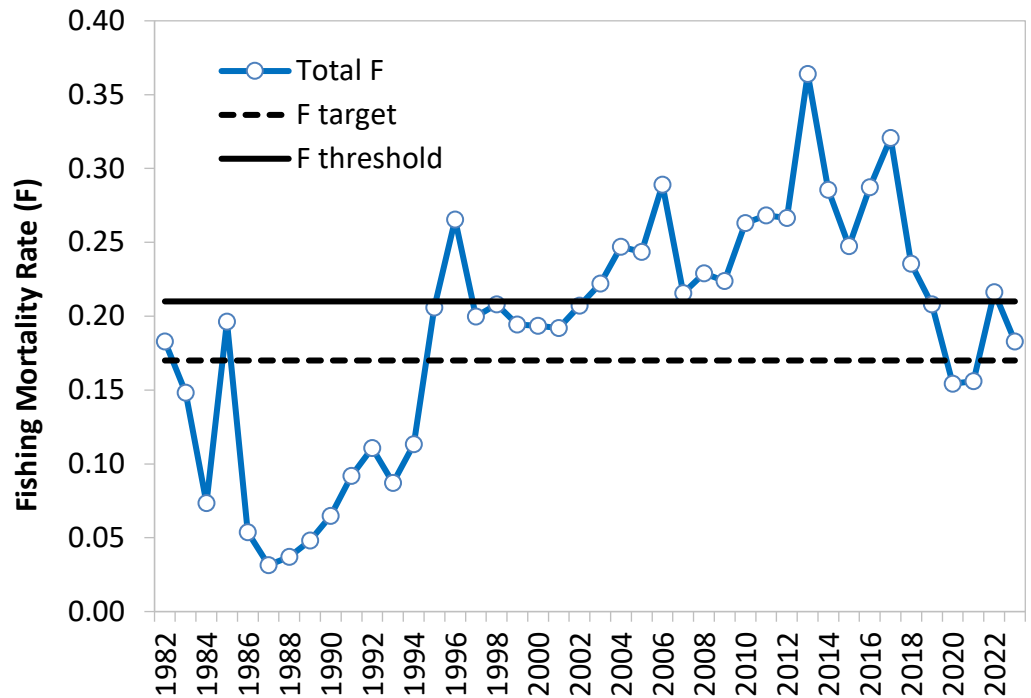
As shown in Figure 2, striped bass experienced a period of strong recruitment (age-1 fish entering the population) from 1994-2004, followed by a period of lower recruitment from 2005-2011 (although not as low as the early 1980s, when the stock was considered collapsed). This period of low recruitment contributed to the decline in SSB that the stock has experienced since 2010. Recruitment of age-1 fish was high in 2012, 2015, 2016, and 2019 (corresponding to strong 2011, 2014, 2015, and 2018 year classes), but estimates of age-1 striped bass were below the long-term average for 7 of the last 10 years. Recruitment in 2023 was estimated at 95 million age-1 fish, below the time series average of 137 million fish.

### Biological Reference Points

The reference points currently used for management are based on the 1995 estimate of female SSB. The 1995 female SSB is used as the SSB threshold because many stock characteristics (such as an expanded age structure) were reached by this year and the stock was declared recovered. To estimate the associated fishing mortality threshold and target, population projections were made by using a constant fishing mortality rate and changing the value until the SSB threshold or target value was achieved.

For the 2024 assessment, the definitions of the targets and thresholds remain the same, but the values have been updated. In addition, because the Amendment 7 recruitment trigger was tripped in 2024, with the New Jersey, Maryland, and Virginia juvenile abundance indices being below the recruitment trigger for three consecutive years (2021-2023), the fishing mortality target and threshold were calculated using the low recruitment assumption. This means that the population was projected using the age-1 recruitment estimated from 2008-2023, which was lower

**Figure 3. Atlantic Striped Bass Fishing Mortality**



than the long-term recruitment from 1993-2023. The updated fishing mortality target and threshold were lower than the reference points estimated during the benchmark assessment, due to the low recruitment assumption, with  $F_{Threshold}=0.21$  and  $F_{Target}=0.17$ . The SSB threshold was estimated at 197 million pounds, with an SSB target of 247 million pounds. This was slightly higher than the SSB target and threshold from the previous assessment update, as the 2024 update estimated SSB in 1995 slightly higher than the 2022 update.

### Rebuilding Projections

The population was projected forward under several different scenarios to estimate the probability of rebuilding by the 2029 deadline. The projections took into account the management measures implemented through Addendum II in 2024 to reduce catch and increase the probability of rebuilding after the increase in landings in 2022. While fishing mortality in 2023 was above the target, preliminary recreational catch estimates for January – June 2024 indicated that fishing mortality in 2024 would be below the target and would allow the population to have a 50% probability of being at or above the SSB target by 2029. However, if fishing mortality increased in 2025, as it is expected to do because of the above-average 2018 year-class entering the ocean slot limit that year, then the probability of rebuilding would be less than 50% and a reduction in catch would be needed. The extent to which fishing mortality will increase in 2025 and whether it will remain high or decline afterwards without management action is highly uncertain.

### Next steps

The Atlantic Striped Bass Board tasked the Technical Committee with updating the projections using 2024 data through August and developing options for management measures to meet any necessary reductions to increase the probability of stock rebuilding to at least 50%. The Board will reconvene on December 16, 2024 to review the results and decide on next steps for management.

### Data and Research Priorities

The Technical Committee identified several high priority research recommendations to improve the assessment. These included continued development of a two-stock spatial assessment model; better

characterization of commercial discards; expanded collection of sex ratio data and paired scale-otolith samples; development of an index of relative abundance for the Hudson River stock; better estimates of tag reporting rates; continued collection of mark-recapture data to better understand migration dynamics; and additional work on the impacts of *Mycobacteriosis* on striped bass population dynamics and productivity.

In addition, given the uncertainty around removals in 2024, 2025, and subsequent years, the TC recommended prioritizing improvements in methods to estimate removals as a function of regulations, year-class strength, and, to the extent possible, angler behavior, during the next benchmark, to better predict future removals and improve projections.

The Technical Committee recommended the next benchmark stock assessment be conducted in 2027, which will allow time to work on issues like state-specific scale-otolith conversion factors and directly incorporating tagging data into the two-stock assessment model.

## Glossary

**Age structure:** the separation of a fish population into distinct age groups

**Benchmark stock assessment:** A full analysis and review of stock condition, focusing on the consideration of new data sources and newer or improved assessment models. This assessment is generally conducted every 3-5 years and undergoes a formal peer review by a panel of independent scientists who evaluate whether the data and the methods used to produce the assessment are scientifically sound and appropriate for management use.

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

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

**Overfished:** Occurs when stock biomass falls below the threshold established by the FMP, impacting the stock's reproductive capacity to replace fish removed through harvest, and that decline is driven primarily by fishing mortality

**Overfishing:** Removing fish from a population at a rate that exceeds the threshold established in the FMP, impacting the stock's reproductive capacity to replace fish removed through harvest

**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.

**Stock assessment update:** Incorporates data from the most recent years into a peer-reviewed assessment model to determine current stock status (abundance and overfishing levels)

**Recruitment:** a measure of the weight or number of fish that enter a defined portion of the stock, such as the spawning stock or fishable stock. For this stock assessment, recruitment refers to the number of age-1 fish entering the population.

**Year class:** All of the individuals in a given stock spawned or hatched in the same year; also known as an 'age class' or 'cohort'.

**Young-of the-year (YOY):** an individual fish in its first year of life; for most species, YOY are juveniles

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