



**NOAA
FISHERIES**

A woman with dark hair tied back, wearing sunglasses and a grey zip-up jacket, is smiling broadly while holding a large striped bass vertically by its mouth. She is on a white boat with fishing rods and reels visible. The background shows a blue body of water and a sandy beach under a clear blue sky.

**Biennial Report to Congress
on the Progress and Findings
of Studies of Striped Bass
Populations**

2017

Introduction

The 1997 reauthorization of the Atlantic Striped Bass Conservation Act mandated biennial reports to Congress and to the Atlantic States Marine Fisheries Commission (Commission) from the secretaries of the Department of Commerce and the Department of the Interior. The report highlights the progress and findings of studies of migratory and estuarine Atlantic striped bass (*Morone saxatilis*). This document is the ninth such report to Congress and includes catch and landings data available through 2016 with an emphasis on calendar years 2015 and 2016, and stock status information through 2015.

Status of the Stock

The coast-wide Atlantic striped bass population includes four major components: the Hudson River, Delaware River/Bay, Chesapeake Bay, and Albemarle Sound/Roanoke River. The Atlantic stock includes primarily Hudson River, Delaware River/Bay, and Chesapeake Bay origin fish, and is managed by the Commission. The Commission delegated management authority of the Albemarle Sound/Roanoke River origin fish to the State of North Carolina.

Atlantic Stock (Commission Managed)

- The Atlantic striped bass stock is not overfished, and overfishing is not occurring.
- The most recent stock assessment update was completed in October 2016 (see Figure 1). The next benchmark stock assessment is scheduled for 2018.
- In 2015, female spawning stock biomass was estimated at 129 million pounds (58,853 metric tons), which is just above the spawning stock biomass threshold of 127 million pounds (57,626 metric tons), but below the target of 159 million pounds (72,032 metric tons) (see Figure 2).
- The spawning stock biomass has declined since a time-series high in 2003. The decrease in abundance is reflected in a declining trend of coast-wide catch from 2007 to 2016, particularly in the increasing recreational discards comprised of smaller fish (see Figure 3).
- In 2015, total fishing mortality was estimated at 0.16, which is below both the target (0.18) and threshold (0.22) fishing mortality reference points (see Figure 4).



Commercial striped bass catch. Photo credit: Kate Taylor, NOAA Fisheries.

Definitions

Fishing mortality (F) – 1. Roughly the proportion of the fishable stock that is caught in a year. 2. A measurement of the rate of removal from a population by fishing.

Migratory – Individuals that leave the inshore rivers and estuaries and move into offshore habitats along the Atlantic Coast.

Resident – Individuals that remain in nearshore river and estuarine systems year-round and contribute minimally to the Atlantic complex.

Spawning Stock Biomass (SSB) – The total weight of the fish in a stock that are large enough to spawn; the biomass of all fish beyond the age or size class in which 50 percent of the individuals are mature.

Figure 1. Atlantic Striped Bass Stock Recruitment (Abundance of Age-1 Fish) and Total Abundance Estimates from 1982 to 2015.
 Source: Atlantic States Marine Fisheries Commission Atlantic Striped Bass Stock Assessment Update, 2016

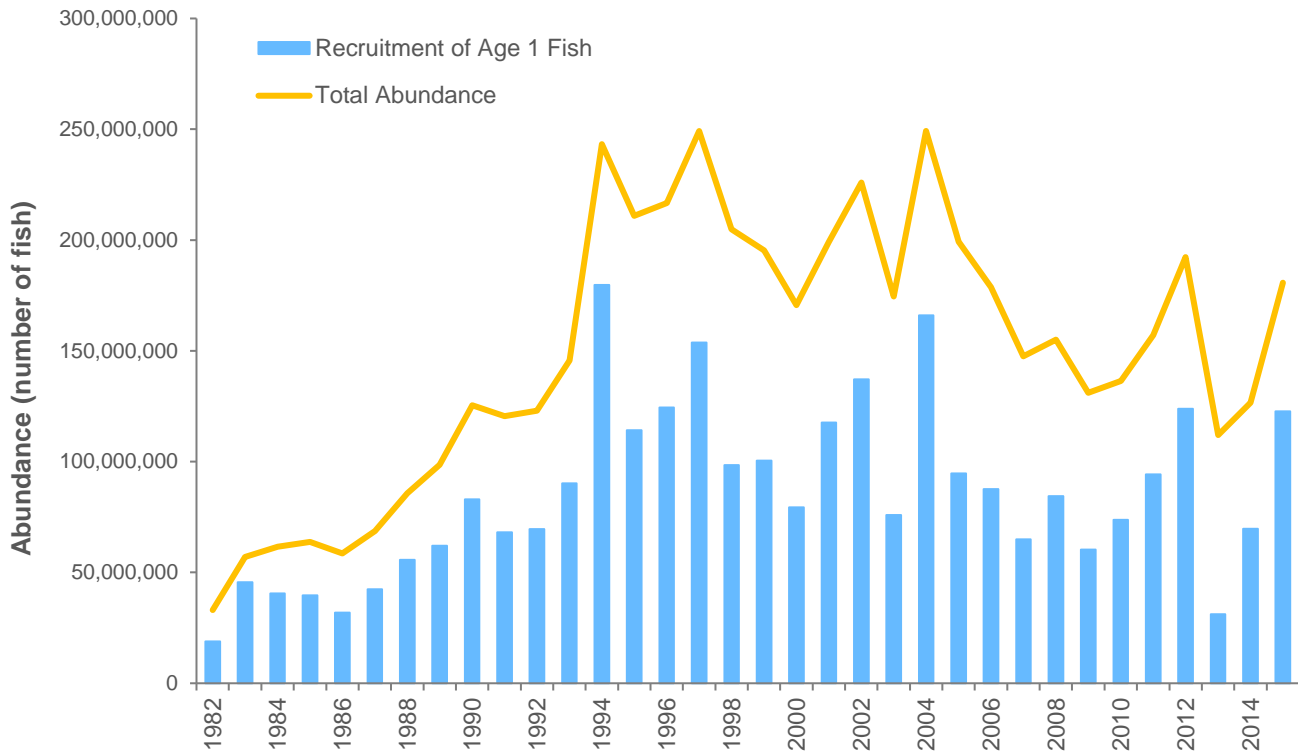


Figure 2. Atlantic Striped Bass Stock Female Spawning Stock Biomass (SSB) Estimates from 1982 to 2015 from the Statistical Catch at Age (SCA) Model and Biological Reference Points.

Source: Atlantic States Marine Fisheries Commission Atlantic Striped Bass Stock Assessment Update, 2016

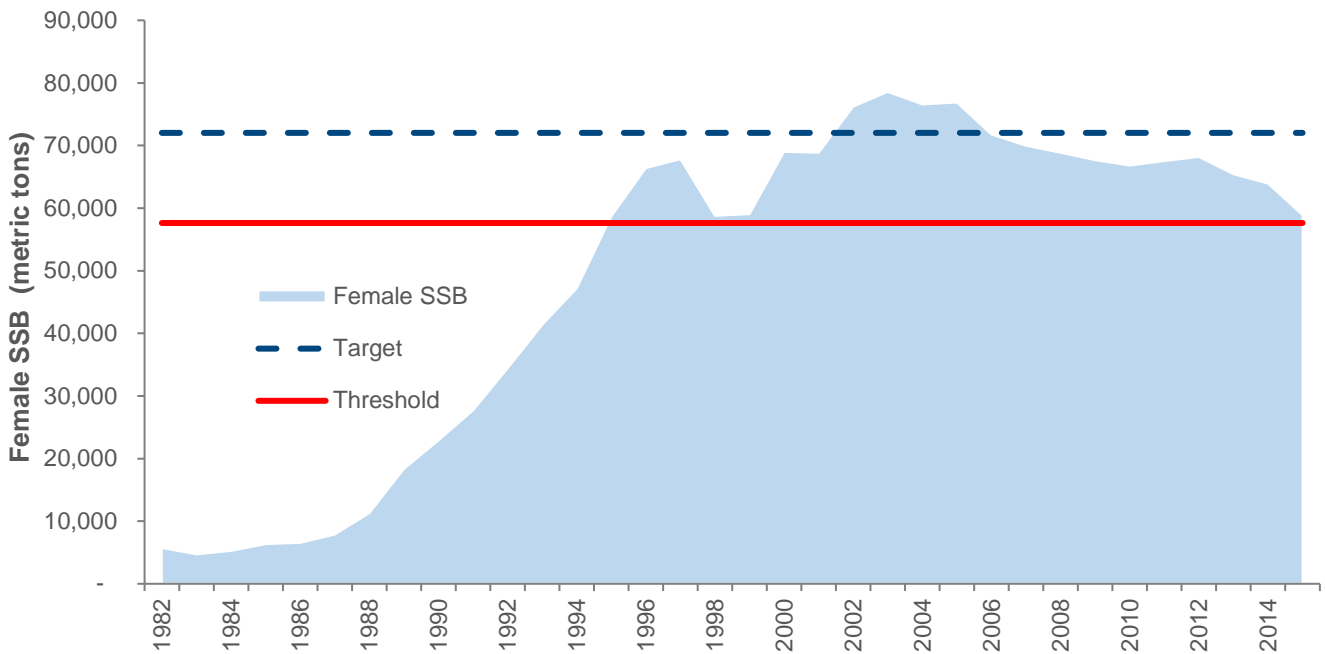


Figure 3. Commercial and Recreational Atlantic Striped Bass Stock Removals.

Source: Atlantic States Marine Fisheries Commission Fishery Management Plan Review for Atlantic Striped Bass, 2017

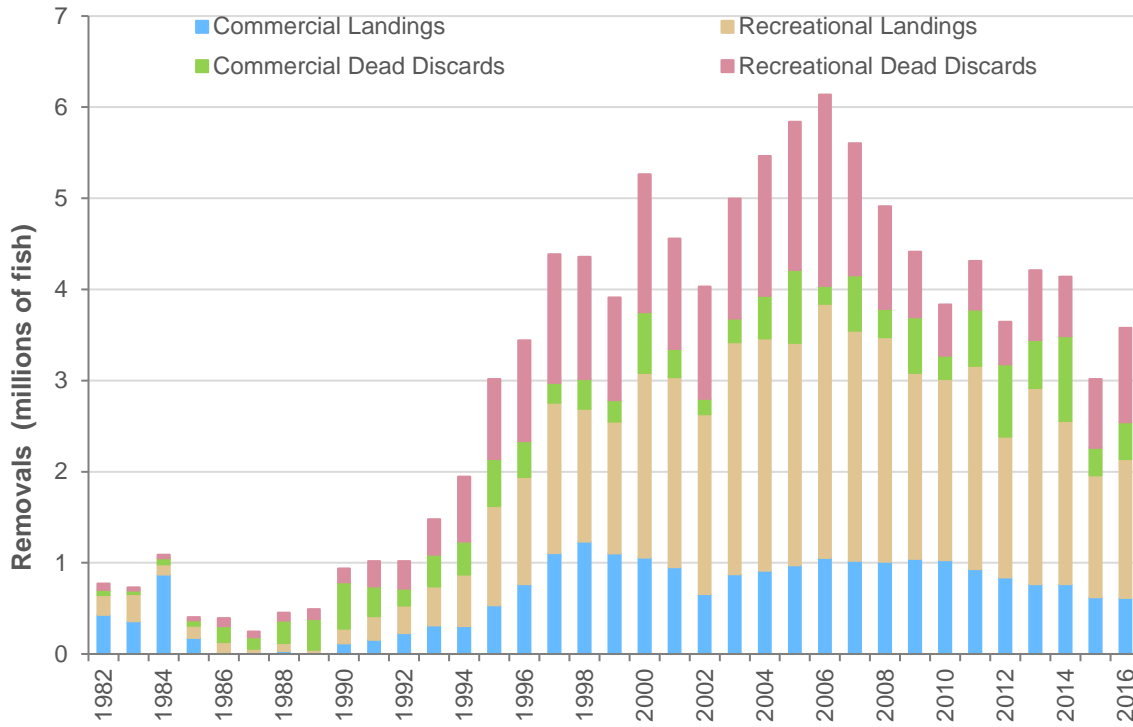
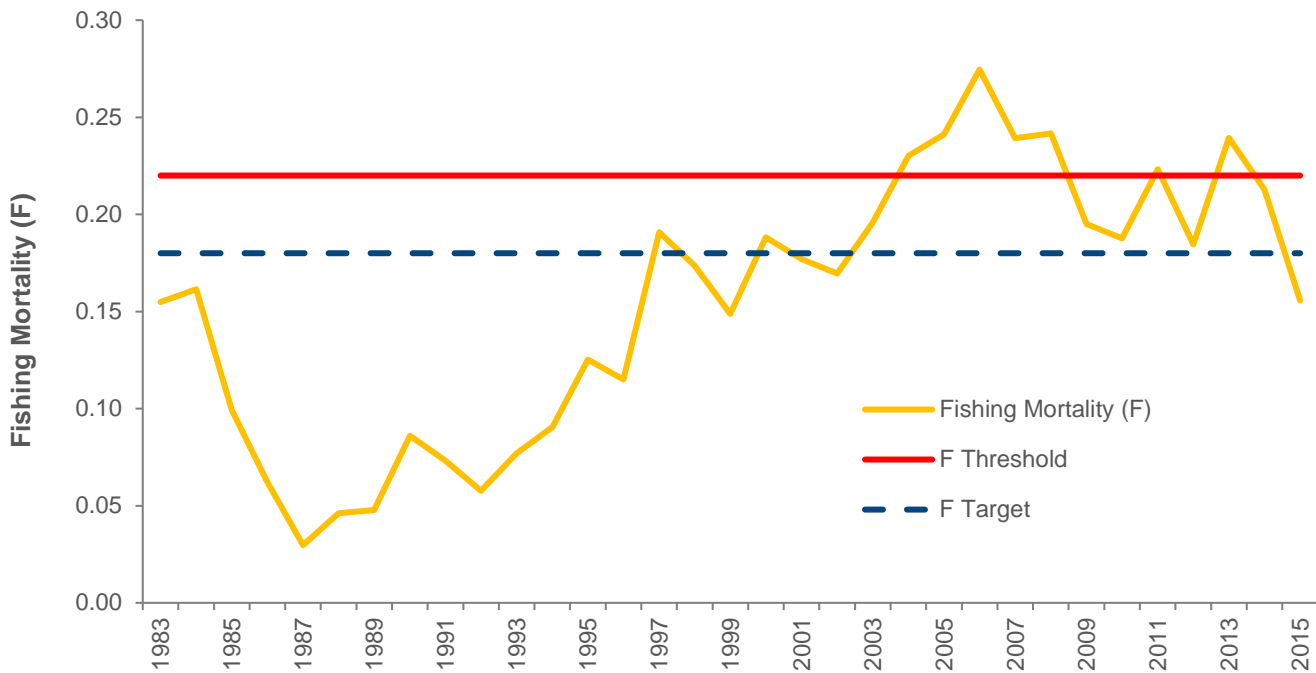


Figure 4. Atlantic Striped Bass Stock Fishing Mortality (F) Estimates from 1983 to 2015 from the Statistical Catch at Age (SCA) Model and Biological Reference Points.

Source: Atlantic States Marine Fisheries Commission Atlantic Striped Bass Stock Assessment Update, 2016

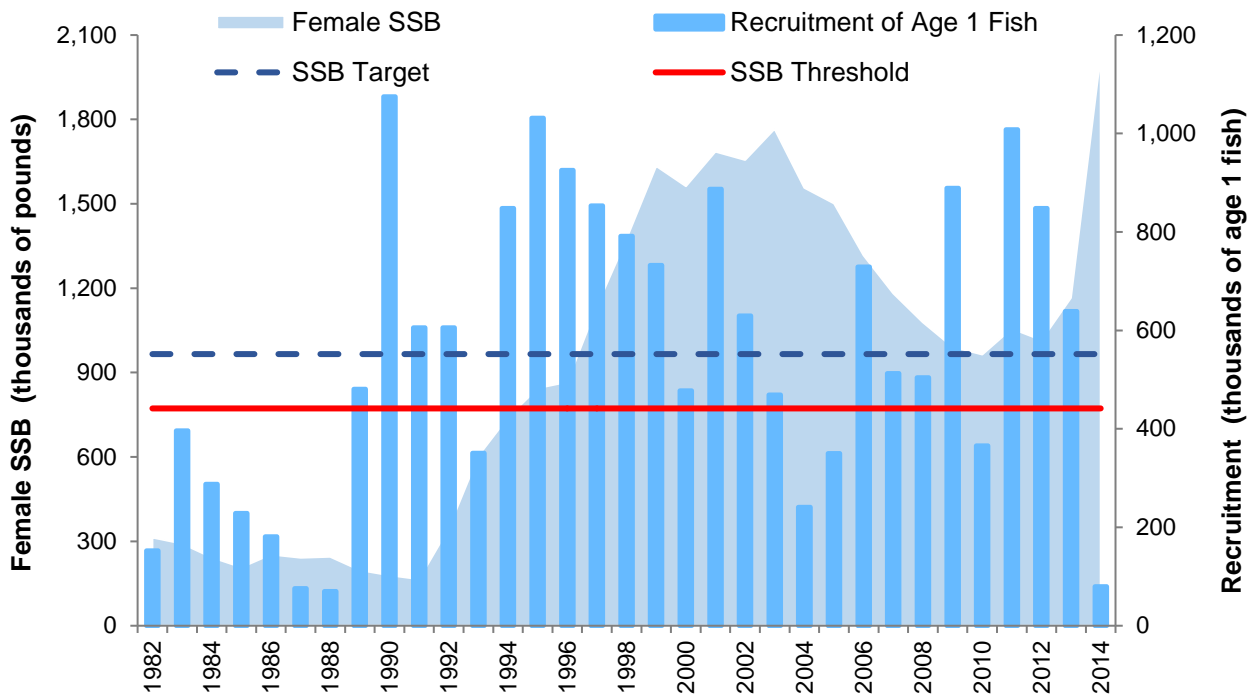


Albemarle Sound/Roanoke River Stock (North Carolina Managed)

- Based on results of the 2015 North Carolina state-specific stock assessment update, the Albemarle Sound/Roanoke River striped bass stock is not overfished and overfishing is not occurring.
- The Atlantic stock has declined steadily since 2003, but the Albemarle Sound/Roanoke River female spawning stock biomass increased in 2014 (see Figure 5).
- Female spawning stock biomass in 2014 was estimated at 2,028,837 pounds (920 metric tons), which is above the spawning stock biomass threshold of 772,588 pounds (350 metric tons) and above the target of 965,735 pounds (438 metric tons). These spawning stock biomass reference points are specific to the Albemarle Sound/Roanoke River stock (see Figure 5).*
- In 2014, fishing mortality for the Albemarle Sound/Roanoke River stock was estimated at 0.06, which is below the target of 0.33 and below the threshold of 0.41. These fishing mortality reference points are also specific to the Albemarle Sound/Roanoke River stock (see Figure 6).
- The next stock assessment for the Albemarle Sound/Roanoke River stock is a benchmark assessment scheduled for 2018.

Figure 5. Albemarle/Roanoke Striped Bass Female Spawning Stock Biomass (SSB) and Recruitment (Abundance of Age-1 Fish) Estimates from 1982 to 2014 and Biological Reference Points.

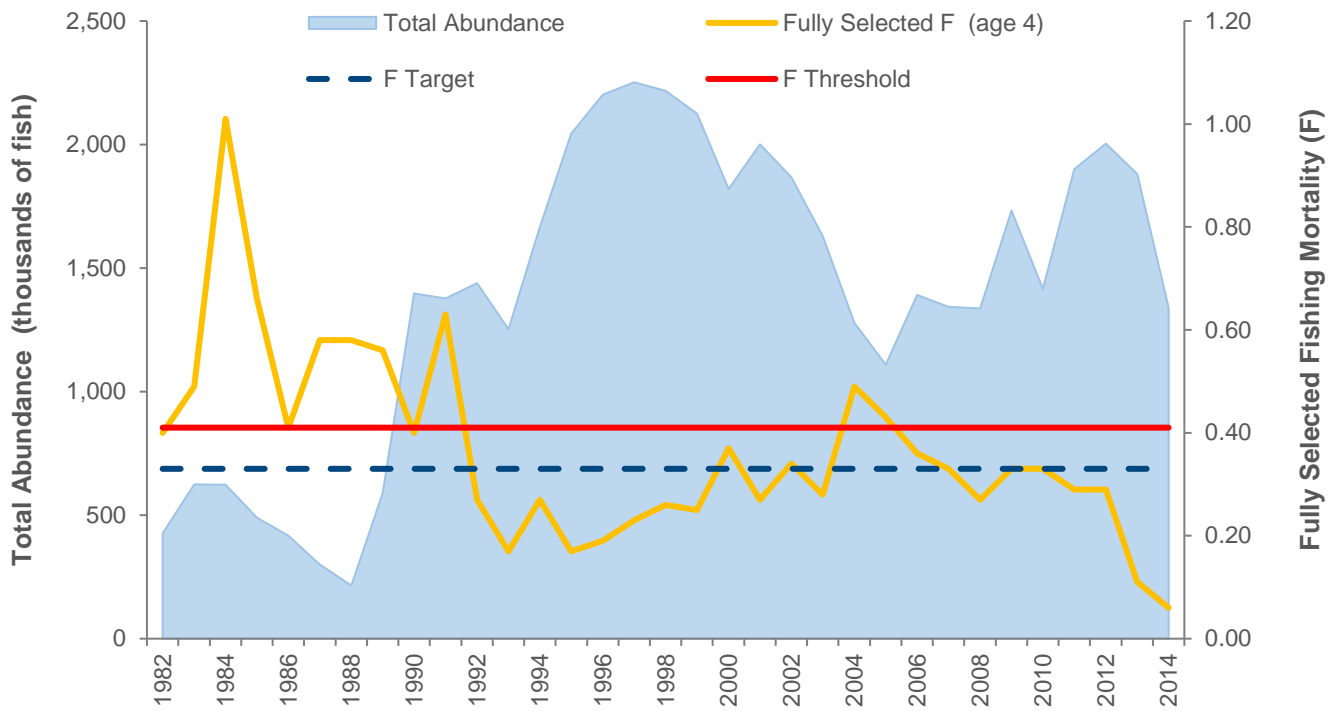
Source: Albemarle Sound/Roanoke River Striped Bass Stock Assessment Update, 2015



* Caution should be used when evaluating the estimate of spawning stock biomass in the last year of the assessment based on past years of retrospective bias exhibited by the model. Subsequent assessments incorporating additional years of data may reduce the magnitude of the 2014 value.

Figure 6. Albemarle/Roanoke Striped Bass Total Stock Abundance and Fishing Mortality (F) Estimates from 1982 to 2014 and Biological Reference Points.

Source: Albemarle Sound/Roanoke River Striped Bass Stock Assessment Update, 2015



Tagging Atlantic striped bass. Photo credit: Charlton Godwin, North Carolina Department of Environment and Natural Resources.

Status of the Fishery

Atlantic Stock (Commission Managed)

- Total commercial removals (landings and dead discards) in 2015 and 2016 were 0.92 million and 1.02 million fish, respectively (see Figures 3 and 7).
- The commercial landings for 2015 were 4.96 million pounds (2,251 metric tons) with a landed value of \$17.35 million. For 2016, commercial landings were 4.98 million pounds (2,258 metric tons) with a landed value of \$19.85 million.
- Total recreational removals (landings and dead discards) in 2015 and 2016 were 2.09 million and 2.56 million fish, respectively (see Figure 3).
- For all recreationally targeted species in the United States, Atlantic striped bass were the largest harvests by weight for 2015 at 17.14 million pounds (7,774 metric tons) and for 2016 at 20.04 million pounds (9,087 metric tons).
- Total Atlantic striped bass removals (commercial and recreational catch and discards) in 2015 and 2016 is estimated at 3.02 million and 3.58 million fish, respectively.

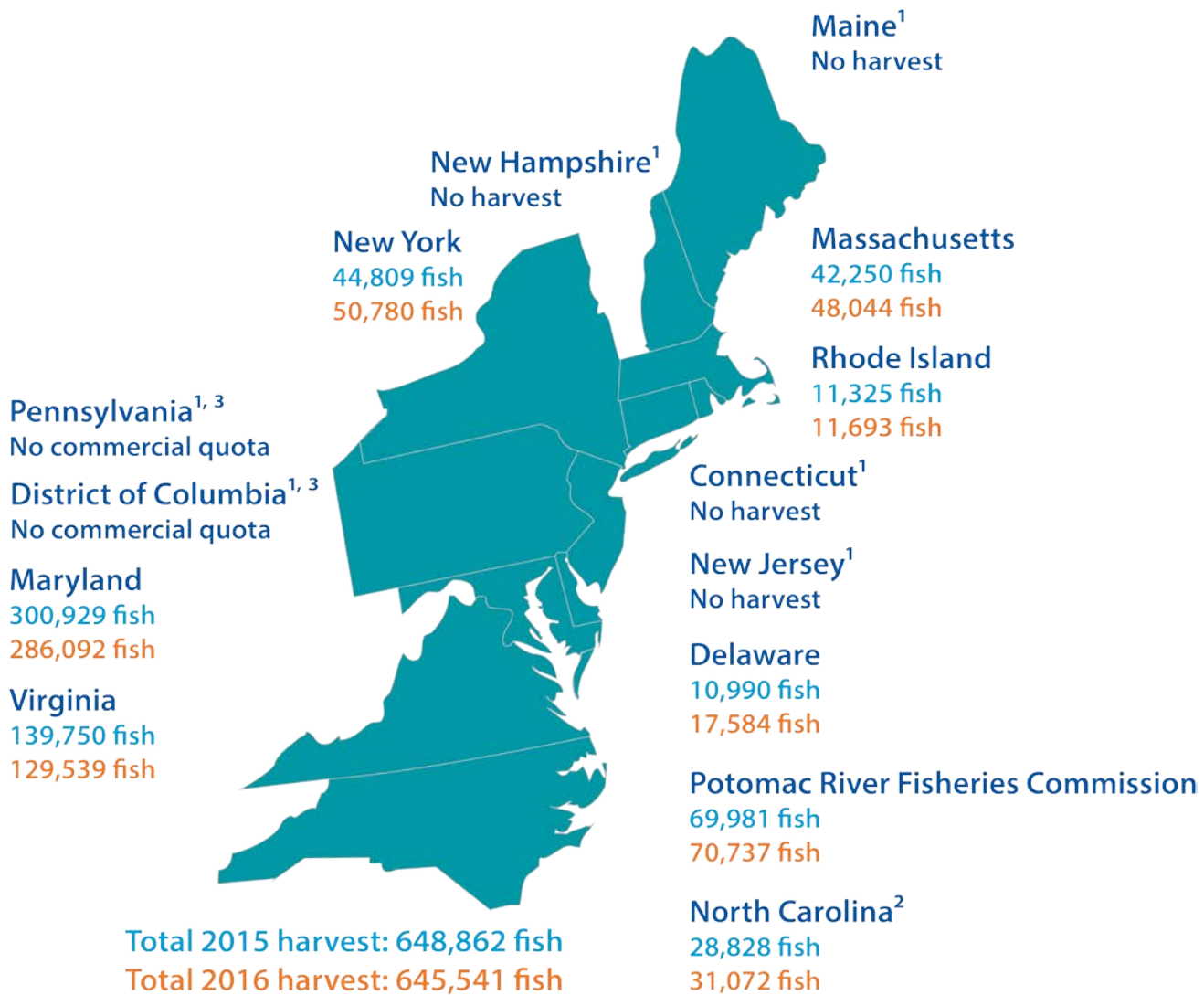
Albemarle Sound/Roanoke River Stock (North Carolina Managed)

- In 2015, commercial harvest in the Albemarle Sound/Roanoke River management area was estimated at 113,475 pounds (28,828 fish), and recreational harvest estimated at 126,970 pounds (43,271 fish).
- Total commercial harvest in the Albemarle Sound and Roanoke River management areas in 2016 was 123,111 pounds (31,072 fish), and recreational harvest estimated at 79,704 pounds (26,054 fish).



Tagging Atlantic striped bass. Photo credit: R. Wilson Laney, PhD., USFWS.

Figure 7. Coast-Wide Striped Bass Commercial Harvest – 2015 (numbers in blue) and 2016 (numbers in orange).
 Sources: 2016 and 2017 Atlantic States Marine Fisheries Commission State Compliance Reports for Atlantic Striped Bass



¹ Commercial fishing for striped bass within these jurisdictions is prohibited.

² Includes only harvest from within Albemarle Sound/Roanoke River.

³ Pennsylvania and the District of Columbia do not have a striped bass commercial quota.

Status of Monitoring

- Implementation of fishery-dependent monitoring programs for striped bass continued for all jurisdictions with commercial fisheries or substantial recreational fisheries. These programs define the catch and effort composition of these fisheries.
- All states and jurisdictions with a commercial fishery continued to implement commercial fish market tagging programs to stem the illegal harvest of striped bass.
- The Commission Fishery Management Plan requires certain states to monitor the striped bass population independent of the fisheries.
 - Juvenile abundance indices are required from Maine (Kennebec River), New York (Hudson River), New Jersey (Delaware River), Maryland (Chesapeake Bay tributaries), Virginia (Chesapeake Bay tributaries), and North Carolina (Albemarle Sound).
 - The Commission’s Striped Bass Technical Committee annually reviews the juvenile abundance indices for recruitment failure.
 - Spawning stock sampling is mandatory for New York (Hudson River), Pennsylvania (Delaware River), Delaware (Delaware River), Maryland (Upper Chesapeake Bay and Potomac River), Virginia (Rappahannock River and James River), and North Carolina (Roanoke River and Albemarle Sound).
 - NOAA’s National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service, Massachusetts, New York, New Jersey, Maryland, Virginia, and North Carolina will continue their fishery-independent tag and release programs, which provide data used to determine survivorship and migration patterns.
- NMFS’ Marine Recreational Information Program (MRIP) is implementing new ways of collecting, analyzing, and reporting recreational fishing data. The new angler catch and recreational fishing effort surveys will improve the data used to manage striped bass starting in 2018.
- Striped bass compliance reports are submitted annually and are reviewed by the Commission’s Plan Review Team. Compliance reporting requirements are detailed in Amendment 6 and its Addenda I-IV. No compliance issues have been identified at this time.
- Stock assessments are typically updated biennially by adding the most recent catch and survey information to the existing time series and running the Statistical Catch-at-Age (SCA) model. Benchmark stock assessments are conducted every 5 years that explore new analytical advances to model stock dynamics and status.

Additional Resources

Atlantic States Marine Fisheries Commission – Atlantic Striped Bass webpage
www.asmfc.org/species/atlantic-striped-bass

Atlantic States Marine Fisheries Commission – Striped Bass compliance reports
 Available at www.asmfc.org or upon request from Commission staff.

FishWatch – Atlantic Striped Bass profile
www.fishwatch.gov/profiles/atlantic-striped-bass

Marine Recreational Information Program (MRIP)
www.st.nmfs.noaa.gov/recreational-fisheries

Management Changes and Actions*

In 2012, Addendum III to Amendment 6 of the fishery management plan was approved by the Commission. The Addendum requires all states and jurisdictions with a commercial striped bass fishery to implement a commercial harvest market tagging program.

The Commission approved Addendum IV in 2014 in response to the 2013 benchmark assessment, which indicated a steady decline in spawning stock biomass since the mid-2000s. The Addendum established new fishing mortality reference points (fishing mortality target and threshold). It also required coastal states to reduce harvest in order to reduce fishing mortality to a level at or below the new target. Specifically, a 25 percent reduction from 2013 harvest levels was implemented along the coast and a 20.5 percent reduction from 2012 harvest levels was implemented in the Chesapeake Bay. The details of state-specific management

* Though the data in this report is for 2015 and 2016, this section includes management actions through 2017.

measures can be found on the [Commission website](#). Additionally, since the Albemarle/Roanoke stock is thought to contribute less than the other migratory stocks to the coast-wide complex, the Addendum delegated management of the Albemarle/Roanoke stock to the State of North Carolina using stock-specific biological reference points approved by the Commission.

In February 2017, the Commission's Atlantic Striped Bass Management Board initiated development of Draft Addendum V to Amendment 6 to consider relaxing coast-wide commercial and recreational regulations. The Board's action responded to concerns raised by Chesapeake Bay jurisdictions regarding economic hardship endured by its stakeholders since the implementation of Addendum IV and information from the 2016 assessment update indicating fishing mortality is below the target. However, after receiving information that 2016 harvest increased without changing regulations, the Board chose not to advance the draft addendum for public comment due to concerns that relaxing regulations could result in fishing mortality exceeding the target. Instead, the Board decided to wait until the results of the 2018 benchmark stock assessment are released before considering making changes to the management program.

Status of Research

Literature was surveyed in the 2015–2016 period for relevant new information on Atlantic striped bass and citations for those studies are provided below, categorized by topic.

Environmental Quality, Disease, and Contaminants

- Dixon, Rachel L., Paul A. Greco and Timothy E. Targett. 2017. Responses of juvenile Atlantic silverside, striped killifish, mummichog, and striped bass to acute hypoxia and acidification: Aquatic surface respiration and survival. *Journal of Experimental Marine Biology and Ecology* 493:20-30.; <http://dx.doi.org/10.1016/j.jembe.2017.04.001>
- Johnson, Sharleen P. 2015. Field validation and application of two bioenergetics models to evaluate relative habitat quality for coastal striped bass (*Morone saxatilis*) in the southeastern United States. MS thesis, College of Charleston, Charleston, South Carolina. 114 pp.
- Kraus, Richard T., David H. Secor and Rebecca L. Wingate. 2015. Testing the thermal-niche oxygen-squeeze hypothesis for estuarine Striped Bass. *Environmental Biology of Fishes* 98(10):2083-2092.
- Nelson, J.A. and G.K. Lipkey. 2015. Hypoxia tolerance variance between swimming and resting Striped Bass *Morone saxatilis*. *Journal of Fish Biology* 87(2):510-518.

Habitat Use and Distribution

- Baker, Henry K., James A. Nelson, and Heather M. Leslie. 2016. Quantifying Striped Bass (*Morone saxatilis*) Dependence on Saltmarsh-Derived Productivity Using Stable Isotope Analysis. *Estuaries and Coasts* 39:1537–1542; DOI 10.1007/s12237-016-0092-2.
- Bailey, H. and Secor, D. H. 2016. Coastal evacuations by fish during extreme weather events. *Sci. Rep.* 6, 30280; DOI 10.1038/srep30280.
- Conroy, Christian W., Philip M. Piccoli, and David H. Secor. 2015. Carryover effects of early growth and river flow on partial migration in striped bass *Morone saxatilis*. *Mar Ecol Prog Ser* 541: 179–194.
- Callihan, Jody L., Julianne E. Harris and Joseph E. Hightower. 2015. Coastal migration and homing of Roanoke River Striped Bass. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science*, 7 (1):301-315. DOI 0.1080/19425120.2015.1057309.
- Davis, Christopher D., Mary C Fabrizio, and Troy D. Tuckey. 2015. Estimation of Juvenile Striped Bass Relative Abundance in the Virginia Portion of Chesapeake Bay, ANNUAL PROGRESS REPORT: 2014 – 2015. Virginia Marine Resources Commission. May 2015. 53 pp.

Gahagan, Benjamin I., Dewayne A. Fox, and David H. Secor. 2015. Partial migration of Striped Bass: revisiting the contingent hypothesis. *Mar. Ecol. Prog. Series* 525: 185–197. doi: 10.3354/meps11152.

Morissette, Olivier, Frédéric Lecomte, Guy Verreault, Michel Legault, and Pascal Sirois. 2016. Fully Equipped to Succeed: Migratory Contingents Seen as an Intrinsic Potential for Striped Bass to Exploit a Heterogeneous Environment Early in Life. *Estuaries and Coasts* 39:571–582; DOI 10.1007/s12237-015-0015-7.

Species Interactions

Dell'Apa, Andrea, Evan Knight, Anthony S. Overton, Craig E. Landry, Christopher F. Dumas, John C. Whitehead, and James H. Herstine. 2015. The North Carolina Charter Boat Fishery Changing with the Times: A Comparative Analysis of the Catch Composition (1978 and 2007–2008). Pages 222-233.

Hadley, John. 2015. An Economic Analysis of Recreational and Commercial Fisheries Occurring in the Middle and Lower Cape Fear River. North Carolina. North Carolina Department of Environment and Natural Resources; 21pp.

Harris, Julianne, and Joseph E. Hightower. 2016. Estimating mortality rates for Albemarle Sound-Roanoke River Striped Bass using an integrated modeling approach. *Can. J. Fish. Aquat. Sci.* 74: 1061–1076; dx.doi.org/10.1139/cjfas-2016-0141.

Nelson, Gary A., and Jennifer Stritzel-Thomson. 2015. Summary of Recreational Fishery Data for Striped Bass Collected by Volunteer Anglers in Massachusetts. Massachusetts Division of Marine Fisheries Technical Report TR-60. March 2015. 18 pp.

Murphy RD Jr, Scyphers SB, Grabowski JH (2015) Assessing Fishers' Support of Striped Bass Management. *Strategies. PLoS ONE* 10(8): e0136412.

Schloesser, Ryan W., and Mary C. Fabrizio. 2015. Relationships among Proximate Components and Energy Density of Juvenile Atlantic Estuarine Fishes. Pages 942-955.

Appendix

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