

Fishery Management Plans

August 2023 Business Meeting

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Annual Fishery Management Plan Update
Division of Marine Fisheries and Marine Fisheries Commission
July 30, 2023

Authority and Process

The Fisheries Reform Act of 1997 and its amendments established the requirement to create fishery management plans (FMPs) for all of North Carolina's commercially and recreationally significant species or fisheries. Plan contents are specified, advisory committees are required, and oversight by the Department of Environmental Quality (DEQ) secretary, Joint Legislative Oversight Committee on Agriculture and Natural and Economic Resources (AgNER), and legislative Fiscal Research Division are mandated.

Annually, the Division of Marine Fisheries (hereafter the Division) reviews all State FMP's as well as all federally-managed FMPs where North Carolina is represented at the regional Fisheries Management Councils and Atlantic States Marine Fisheries Commission. Depending on the outcome of the annual FMP reviews, a schedule change may be recommended. All FMP schedule changes are subject to DEQ Secretarial approval.

Status of State FMPs

Review is underway for four of the 13 State FMPs: Spotted Seatrout, Striped Mullet, Eastern Oyster, and Hard Clam.

The 2022 Stock Assessment for the **Striped Mullet FMP** was completed with data through 2019. The Division and a peer review team deemed the assessment suitable for management use. The stock assessment indicated the stock is overfished and overfishing was occurring. The Division plans to begin an update of the stock assessment once data through at least 2024 are available. Based on the current stock assessment results, the Division held a public scoping period in 2022 to inform Amendment 2. The Marine Fisheries Commission (MFC) gave scoping input at its November 2022 business meeting and approved Amendment 2 Goal and Objectives. The Division, with consideration of the public and completed a first draft of the Striped Mullet FMP Amendment 2. Development of Amendment 2 continued in collaboration with the Striped Mullet FMP Advisory Committee in July 2023. Amendment 2 will be presented to the MFC in November 2023 for its approval for public and advisory committee review.

The 2022 Stock Assessment for the **Spotted Seatrout FMP** was completed with data through February 2020. The Division and a peer review team deemed the assessment suitable for management use. The stock assessment indicated the stock was not overfished; however, overfishing was occurring. The Division plans to update the stock assessment which will be addressed in Amendment 1. Public scoping was held in March 2023 and the public input from scoping was presented to the MFC at its May 2023 business meeting. At that time the MFC also reviewed and approved Amendment 1 Goal and Objectives. With scoping comments in mind, the Division is drafting the Spotted Seatrout FMP Amendment 1.

The **Hard Clam FMP** Amendment 2 and the **Eastern Oyster FMP** Amendment 4 were approved in February 2017. A traditional stock assessment are not available for these species due to data limitations. While the Division continues to work towards improving data collection efforts towards the goal of performing stock assessments, currently the population size and the rate of removals are unknown. For the Hard Clam FMP, harvest fluctuates, often in response to changes in demand, improved harvesting methods, and polluted shellfish area closures. For the Oyster FMP, commercial landings from public bottom have been variable, and landings from private bottom have increased due to increased participation in aquaculture. Review of both FMPs began in 2022. A public scoping period will be held September 11-22, 2023 to inform development of the FMP amendments.

The **Red Drum FMP** management continues to meet targets. The next review of the Red Drum FMP is planned to begin in 2024 following completion of the ASMFC red drum stock assessment, which will inform management. Stock conditions and management are monitored and reported through annual FMP updates.

The **Blue Crab FMP** Amendment 3 was approved in February 2020 to address the overfished status and end overfishing, indicated by the 2018 stock assessment. The Division is currently working on updating the stock assessment with data through 2022. Amendment 3 provides adaptive management measures to address changes in stock status based on the stock assessment update. The next scheduled review of the FMP will begin in 2025.

The **Bay Scallop FMP** 2020 annual FMP update fulfilled the scheduled review of the plan. Management continues to be maintained as outlined in the State FMP. Stock conditions are monitored and reported through the annual FMP update. After many years of low abundance, the season was opened in specific regions in 2021 and 2022 at the lowest allowed harvest levels. The next scheduled review of the plan will begin in 2025.

The **Kingfishes FMP** monitors the stock using management evaluation triggers. Annual trends indicate continued monitoring is appropriate without management changes. Therefore, the MFC approved the 2020 annual FMP update to fulfill the scheduled review of the Kingfishes FMP. Management strategies continue to be maintained as outlined in the State FMP. Stock conditions are monitored and reported through the annual FMP update. The next scheduled review of the plan will begin in 2025.

The **Shrimp FMP** Amendment 2 was adopted by the MFC at its February 2022 business meeting. Amendment 2 management has been implemented through proclamations. The Division is continuing work on habitat conservation and gear improvements as defined in Amendment 2. The 2019–2020 submerged aquatic vegetation (SAV) imaging has been completed. The shrimp biologists and Coastal Habitat Protection Plan staff are reviewing the data for collaboration with the Habitat and Water Quality Advisory Committee to develop recommendations on addressing SAV impacts. Additionally, the Division is working on an information paper investigating the feasibility of a long-term shrimp trawl observer program. The Division continues to identify and test gear modifications to reduce bycatch in the shrimp trawl fishery. The Division will be seeking shrimpers to participate in an industry workgroup to collaborate on continued gear efforts. The next scheduled review of the plan will begin in 2027.

The **Southern Flounder FMP** Amendment 3 was adopted by the MFC at its May 2022 business meeting. Amendment 3 addresses long-term, comprehensive management for the flounder fishery, and is implemented by proclamation. The Division is working in partnership with the other states to update the regional stock assessment with data through 2022. Amendment 3 adaptive management allows flexibility in adjusting management based on results of the stock assessment update. The next scheduled review of the plan will begin in 2027.

The 2022 information update for the **North Carolina FMP for Interjurisdictional Fisheries** was adopted by the MFC at its May 2022 business meeting. The goal of the FMP for Interjurisdictional Fisheries is to adopt FMPs, consistent with state law, approved by the federal Councils or the ASMFC by reference and implement corresponding fishery regulations in North Carolina to provide compliance or compatibility with approved FMPs and amendments, now and in the future. The next scheduled review of the plan will begin in 2027.

The **River Herring FMP** 2022 Annual FMP Review fulfilled the scheduled five-year review of the plan. The 2017 Atlantic coast-wide stock assessment update indicated river herring remain depleted and at near historic lows on a coast-wide basis. The Atlantic States Marine Fisheries Commission is currently working on a river herring stock assessment which is expected to be completed in 2024. All river herring management strategies have been maintained as outlined in the State and ASMFC FMPs. The next scheduled review of the plan will begin in 2027.

The **Estuarine Striped Bass FMP** Amendment 2 jointly developed with the Wildlife Resources Commission, was adopted by the MFC at its November 2022 business meeting. The 2022 Albemarle-Roanoke (A-R) stock assessment update indicated the stock has continued to decline since the previous assessment and remains overfished with overfishing occurring. Amendment 2 adaptive management allows flexibility in management based on results of the stock assessment update. No stock status is available for the Central Southern Management Area; however, a population model indicates the stock is depressed to a level where sustainability is unlikely. A data review of the Tar-Pamlico and Neuse rivers will begin in 2025 to assess natural reproduction and if harvest is appropriate. The next scheduled review of the plan will begin in 2027.

N.C. Division of Marine Fisheries

2022 Fishery Management Plan Review

August 2023

Follow the link below to review the full document:

**[https://www.deq.nc.gov/marine-fisheries/
fisheries-management/annual-fmp-review/2022/
annual-fmp-book/open](https://www.deq.nc.gov/marine-fisheries/fisheries-management/annual-fmp-review/2022/annual-fmp-book/open)**

STATE MANAGED SPECIES – SPOTTED SEATROUT

**FISHERY MANAGEMENT PLAN UPDATE
SPOTTED SEATROUT
AUGUST 2022**

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	February 2012
Amendments:	None
Revisions:	None
Supplements:	Supplement A to the FMP February 2014
Information Updates:	None
Schedule Changes:	None
Comprehensive Review:	2019 — Ongoing

Spotted seatrout (*Cynoscion nebulosus*) is managed under the authority of two state and one interstate fishery management plans (FMP). The North Carolina Marine Fisheries Commission (NCMFC) currently manages spotted seatrout under the North Carolina Spotted Seatrout FMP (NCDMF 2012) and the North Carolina FMP for Interjurisdictional Fisheries (NCDMF 2022). Supplement A to the 2012 North Carolina Spotted Seatrout FMP (NCDMF 2014) maintains short-term measures in the spotted seatrout fishery (40% reduction at 14-inch total length minimum size) to address several sources of uncertainty in the 2009 stock assessment through acquisition and assessment of additional data. The supplement examined sources of uncertainty in the assessment, the rationale for not implementing on schedule the North Carolina Spotted Seatrout FMP February 2014 management measures and presented possible interim management measures. At the February 2014 NCMFC meeting the commission voted to maintain short-term management measures in the spotted seatrout fishery (Proclamation FF-38-2014: 14-inch minimum size, 75-fish commercial trip limit with weekend closures in joint waters except in Albemarle and Currituck sounds; Proclamation FF-39-2014: 14-inch minimum size, four-fish recreational bag limit). These measures will remain in effect until a new amendment is completed.

As required in the approved 2012 FMP, a stock assessment (NCDMF 2015a) was completed on schedule (2014-2015), peer reviewed, approved for management, and was presented to the NCMFC at its May 2015 business meeting. A new benchmark stock assessment began in late 2020. The North Carolina Division of Marine Fisheries (NCDMF) will review the state FMP for spotted seatrout to determine if changes to management are needed through the FMP amendment process, after the stock assessment is complete and accepted for management use.

The Atlantic States Marine Fisheries Commission (ASMFC) manages spotted seatrout in all Atlantic States who have a declared interest in the species. In addition to the state FMP, the

ASMFC manages spotted seatrout under the Omnibus Amendment to the Interstate Fishery Management Plans for Spanish Mackerel, Spot, and Spotted Seatrout (ASMFC 2011). The goals for the Omnibus Amendment are to bring the FMPs for the three species under the authority of the ASMFC Interstate Fishery Management Program Charter and bringing compliance requirements to each state. Because the intent of the Omnibus amendment was to bring the ASMFC spotted seatrout FMP into compliance with the new ASMFC charter, management measures were not adjusted and the identified objectives and compliance requirements to the states of the Omnibus Amendment are the same as Amendment 1 to the ASMFC spotted seatrout FMP (ASMFC 1990) and are as follows:

- Manage the spotted seatrout fishery restricting catch to mature individuals (12-inch minimum size limit).
- Manage the spotted seatrout stock to maintain appropriate spawning stock biomass (20% SPR).
- Develop research priorities that will further refine the spotted seatrout management program to maximize the biological, social, and economic benefits derived from the spotted seatrout population.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP; NCDMF 2022). The goal of the IJ FMP is to adopt fishery management plans, consistent with N.C. law, approved by the Mid-Atlantic Fishery Management Council, South Atlantic Fishery Management Council, or the ASMFC by reference and implement corresponding fishery regulations in North Carolina to provide compliance or compatibility with approved fishery management plans and amendments, now and in the future. The goal of these plans, established under the Magnuson-Stevens Fishery Conservation and Management Act (federal council plans) and the Atlantic Coastal Fisheries Cooperative Management Act (ASMFC plans) are like the goals of the Fisheries Reform Act of 1997 to “ensure long-term viability” of these fisheries.

Management Unit

The management unit for the North Carolina Spotted Seatrout FMP (NCDMF 2012) includes all spotted seatrout within the coastal and joint waters of North Carolina. The unit stock, or population unit, for North Carolina’s assessment of spotted seatrout include all spotted seatrout caught in North Carolina and Virginia. Virginia landings were included in the stock assessment of spotted seatrout because of the high rate of mixing observed between North Carolina and Virginia.

Goal and Objectives

The goal of the North Carolina Spotted Seatrout FMP (NCDMF 2012) is to determine the status of the stock and ensure long-term sustainability for the spotted seatrout stock in North Carolina. To achieve this goal, it is recommended that the following objectives be met:

- Develop an objective management program that provides conservation of the resource and sustainable harvest in the fishery.
- Ensure the spawning stock is of sufficient capacity to prevent recruitment-overfishing.
- Address socio-economic concerns of all user groups.

- Restore, improve, and protect important habitats that affect growth, survival, and reproduction of the North Carolina spotted seatrout stock.
- Evaluate, enhance, and initiate studies to increase understanding of spotted seatrout biology and population dynamics in North Carolina.
- Promote public awareness regarding the status and management of the North Carolina spotted seatrout stock.

DESCRIPTION OF THE STOCK

Biological Profile

Spotted seatrout range from Massachusetts to southern Florida and the Bahamas on the U.S. Atlantic Coast and continue through the Gulf of Mexico to the Yucatan Peninsula, Mexico (Murphy et al. 2006). Genetic data supports a single unit stock in Virginia and North Carolina (Ellis et al. 2019). In addition, based on genetic data, New River, North Carolina is an area of complex, seasonal mixing between two genetically distinct populations (Ellis et al. 2019): Georgia through Cape Fear River, North Carolina, and Bogue Sound, North Carolina and north (O'Donnell et al. 2014; Ellis et al. 2019). They inhabit shallow coastal and estuarine waters throughout their range and are considered a euryhaline species (Deaton et al. 2010). In North Carolina, the current state record was recorded at 12.3 pounds in 1961. The maximum reported age of spotted seatrout is 9 years in North Carolina for both male and female fish (NCDMF 2012). Most spotted seatrout in North Carolina are mature by age 1 and 7.9 inches for males and 9.9 inches for females. All males are mature at 12 inches and females at 15 inches. Spawning in North Carolina occurs from April to October with peak spawn around May (Burns 1996). Spawning occurs within the first few hours after sunset (Luczkovich et al. 1999) and a single fish is capable of spawning multiple times (batch spawners) throughout the season. In Florida, it has been observed that during peak spawning, spotted seatrout older than 3 years old may spawn every two days while younger fish may spawn as frequently as every four days (Roumillat and Brouwer 2004). Estimates of the number of eggs a female can produce in a year from the Southeast and Gulf Coasts vary, based on size and age and range, from 3 million to 20 million per year (Nieland et al. 2002; Roumillat and Brouwer 2004; Murphy et al. 2011).

Stock Status

The 2014 North Carolina spotted seatrout stock assessment (NCDMF 2015b) indicated the spotted seatrout stock in North Carolina and Virginia is not overfished and overfishing is not occurring (Figures 1 and 2).

Stock Assessment

The 2014 assessment of spotted seatrout in North Carolina and Virginia was conducted using a Stock Synthesis model that incorporated data collected from commercial and recreational fisheries, two fishery-independent surveys, and a tagging study (NCDMF 2015b). Data included 1991 through 2012 and relied on expanded fishery-independent data sources, including Virginia age, a juvenile abundance index, and North Carolina State University tag-return data (Ellis 2014). The

fishing year was defined as the biological year, March 1 through February 28 or 29, to incorporate cold stun mortalities within a single model year.

The results of this assessment suggest the age structure of the spotted seatrout stock has been expanding during the last decade. However, an abrupt decline is evident in the model's estimate of recruitment after 2010, although this is not mirrored in the empirical survey data. Spawning stock biomass (SSB) has declined since 2007. In 2012, estimated SSB was 2,513,270 pounds (1,140 metric tons), which is greater than the threshold ($SSB_{30\%}=868,621$ pounds or 395 metric tons; Figure 1), indicating the stock is not overfished. There is no trend in fishing mortality (F), but periods of high F seem to coincide with spawning stock biomass declines and may be attributed to cold stun events. The 2012 estimate of fishing mortality was 0.40, which is less than the threshold ($F_{20\%}=0.66$), indicating the stock is not experiencing overfishing; however, the 2012 estimate of fishing mortality (0.40) is very near the target fishing mortality of $F_{30\%}=0.42$ (Figure 2).

A benchmark stock assessment for spotted seatrout began in 2020 coinciding with the scheduled FMP review and is scheduled to be completed in late 2022.

DESCRIPTION OF THE FISHERY

Current Regulations

The NCDMF currently allows the recreational harvest of spotted seatrout seven days per week with a minimum size limit of 14-inches total length (TL) and a daily bag limit of four fish. The commercial harvest is limited to a daily limit of 75 fish with a minimum size limit of 14-inches TL). It is unlawful for a commercial fishing operation to possess or sell spotted seatrout for commercial purposes taken from Joint Fishing Waters of the state from midnight on Friday to midnight on Sunday each week; the Albemarle and Currituck sounds are exempt from this weekend closure. In the event of a catastrophic cold stun, the NCDMF has the authority to close the fishery until the following spawning period. In 2018, the spotted seatrout commercial and recreational fishery was closed from January 5 through June 15 by proclamation due to a state-wide cold stun event.

Commercial Fishery

Annual landings have been variable throughout the time series (Table 1; Figure 3). Commercial landings in 2021 (694,784 pounds) increased by 22% compared to the previous year (568,574 pounds; Table 1; Figure 3). Commercial landings in 2021 were the highest since 1991. This sharp increase in commercial landings is most likely due to several strong year classes of fish and mild winters in 2019, 2020 and 2021, resulting in high numbers of available fish. During the early to mid-1990s, landings in the ocean and estuarine areas were more similar than in the remainder of the time series (1995-2021) in which estuarine landings have dominated. The primary gear of harvest are estuarine gill nets (set, drift, and run around).

Recreational Fishery

Recreational landings of spotted seatrout are estimated from the Marine Recreational Information Program (MRIP). Recreational estimates across all years have been updated and are now based on the MRIP's new Fishing Effort Survey-based calibrated estimates. For more information on MRIP see <https://www.fisheries.noaa.gov/topic/recreational-fishing-data>.

Recreational harvest of spotted seatrout estimated by MRIP (Type A + B1) in 2020 was 2,241,421 pounds, or 1,223,508 fish, much higher than the time series average of 1,535,506 pounds, or 976,689 but lower than the previous year (Table 1; Figure 3). Estimated recreational releases in 1(6,332,064 fish) were well above the time series average of 3,484,026 fish, and slightly higher than the previous year's releases of 6,215,778 fish (Table 1).

The North Carolina Saltwater Fishing Tournament recognizes anglers for landing and/or releasing fish of exceptional size or rarity by issuing citations that document the capture for the angler. Citations awarded through the North Carolina Saltwater Fishing Tournament for spotted seatrout have varied by year throughout the time series, averaging 338 citations (Table 2; Figure 4). The number of awarded citations in 2021 (655 citations) increased from the previous year (579 citations) and was the highest number of citations since 2007 (1,000 citations). The number of release citations (fish over 24 inches that are released) awarded (283 release citations) was the highest since release citations began in 2008. The percent of spotted seatrout release citations (43%) was the highest since 2018 and 2019 (both at 37%; Table 2).

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Commercial fish houses are sampled monthly to provide length, weight, and age data. This information is used to characterize the commercial fishery for stock assessments and to monitor trends in the size and age of fish being removed from the stock. The average sizes of fish landed by the commercial fishery are typically larger than the recreational fishery and is primarily driven by the larger maximum size observed in the commercial landings; in addition, modal length for the commercial fishery was slightly higher (17 inches fork length) than the recreational fishery (15 inches fork length; Table 3; Figure 5). Undersized fish represent a small portion of the harvest in both sectors; 4.5% of commercial harvest and 1.3% of the recreational harvest was below the 14-inch size limit in 2021 (Figure 5).

The number of fish sampled by division staff at commercial fish houses has varied over time due to annual variability in landings of the fishery. The mean length of spotted seatrout in 2021 (17.5 inches fork length) was similar to the time series (1991-2020) average (16.6 inches fork length) and the mean and minimum lengths in 2021 (17.5 and 10.9-inches fork length, respectively) were all approximately equal to the previous two years (Table 3; Figure 6). In addition, for the past three years (2019-2021), minimum length has been consistently greater than the time series average (9.3 inches fork length). Maximum length in 2021 decreased to 29.9 inches fork length and was just above the time series average (29.3 inches fork length). The bulk of spotted seatrout landings by the commercial fishery in 2021 came from the ocean and estuarine gill net fishery (95%) with

pound nets (2%), gigs (1%), and all other gears (mainly beach seines, swipe nets, and haul seines) accounting for the rest (2%).

Recreational catch is almost exclusively hook-and-line with few fish being landed by gigs. The mean (17.0 inches fork length), minimum (11.1 inches fork length), and maximum (26.5 inches fork length) lengths of fish measured in 2021 from the recreational fishery were similar to the previous year (17.0, 12.1, 26.8 inches fork length, respectively) and greater than the time series (1991-2020) average of each (16.0, 10.4, 25.8 inches fork length, respectively; Table 3; Figure 7). Ninety-two percent of the spotted seatrout sampled from the recreational fishery in 2021 were between 14 and 19 inches (Figure 5).

Fishery-Independent Monitoring

The NCDMF utilizes numerous independent monitoring programs to provide indices of juvenile (Program 120) and adult (Program 915) abundance to include in stock assessments. Program 120, the North Carolina Estuarine Trawl Survey, is a fishery independent multispecies monitoring program that has been ongoing since 1971 in the months of May and June. One of the key objectives of this program is to provide a long-term database of annual juvenile recruitment for economically important species. This survey samples a fixed set of 104 core stations with additional stations as needed. The core stations are sampled from western Albemarle Sound south to the South Carolina border each year without deviation two times in the months of May and June. An additional set of 27 spotted seatrout juvenile stations in Pamlico Sound and its major tributaries were added in 2004 and are sampled during the months of June and July. Data from the spotted seatrout specific stations are used to generate an index of relative abundance of age zero spotted seatrout, calculated as the average number of fish per tow. The resulting relative abundance index for the time series is variable with no significant trend overall, and peaks in 2006, 2008, 2012, 2013, and 2018 suggesting relatively higher recruitment in those years (Figure 8). The Program 120 relative abundance index in 2021 was 0.20, which was a 70% decrease from the previous year, and the lowest value since the beginning in 2004 (0.67 spotted seatrout per tow). The 2021 relative abundance index was a 90% decrease from the time series average (2004-2020; 2.08 spotted seatrout per tow).

The NCDMF started a fishery independent gill net survey (Program 915) in 2001 to generate a long-term database of age composition and to develop indices of abundance for numerous commercial and recreationally important finfish species, including spotted seatrout. The survey utilizes a stratified random sampling scheme of multi-mesh gill nets designed to characterize the size and age distribution for key estuarine species in Pamlico Sound and help managers assess the spotted seatrout stocks without relying solely on commercial and recreational fishery dependent data. Three regions encompassing most of the estuarine waters in North Carolina are sampled monthly from February to December. Pamlico Sound stations include waters on the backside of the barrier islands and the bays of Hyde and Dare counties. Relative abundance from Pamlico Sound has remained relatively steady from 2001 to 2015 (averaged 0.51 fish per set), increased to a time series high in 2019 (1.81 fish per set) and remained high in 2021 (1.46 fish per set; Figure 9). For the central river stations that include Pamlico, Pungo and Neuse rivers, abundance rose sharply in 2021 to the highest value in the time series (1.38 fish per set). Spotted seatrout abundance in the Cape Fear and New rivers has fluctuated without trend throughout the time series (Figure 11). Relative abundance in 2021 in the Cape Fear and New rivers was 0.91 fish per set,

the second highest value in the time series. During 2020 no indices of abundance are available for spotted seatrout from the fishery-independent assessment (Program 915). Sampling in this program was suspended in February 2020 due to COVID-19 restrictions and protected species interactions but resumed July 2021.

Spotted seatrout age samples are collected from numerous NCDMF fishery independent and dependent sources. To date, a total of 20,668 otoliths from spotted seatrout have been aged since 1991 (Table 4). With the exception of 2003, the minimum age of sampled spotted seatrout has been age zero for every year the NCDMF has recorded this information. Maximum ages have varied every year, ranging from age five to age nine. Modal ages, which give an indication of the age of the largest cohort in the fishery, averages age one. Spotted seatrout length-at-age was summarized based on all available age data (1991-2020; Figure 12). Average growth of spotted seatrout slows down around age-4, but fish as large as 24.7 inches have the potential to be young of the year (age-0), demonstrating the species' fast growth. In 2021, the number of fish aged (1,006 fish) increased from the previous year (634 fish), which is to be expected with delays in sampling due to COVID-19 in 2020. Spotted seatrout sampled in 2021 had a modal age of 1 and maximum age of 6, an increase from the previous year (5).

RESEARCH NEEDS

The following research needs were compiled from those listed in the 2012 North Carolina Spotted Seatrout FMP. Improved management of spotted seatrout is dependent upon research needs being met. Research needs are not listed in order of priority.

- Develop a juvenile abundance index to gain a better understanding of a stock recruitment relationship. — Ongoing, using program 120 since 2004; CRFL grant 2F40 is investigating an optimal sampling design for P120
- Research the feasibility of including measures of temperature or salinity into the stock recruitment relationship. — Not Completed
- Determine batch fecundity estimates for North Carolina spotted seatrout. — Not Conducted
- Size specific fecundity estimates for North Carolina spotted seatrout. — Not Conducted
- Area specific spawning surveys could help in the delineation of area specific closures to protect females in spawning condition. — Not Conducted
- Investigation of the relationship of temperature with both adult and juvenile mortality. — Ongoing: Ellis et al. 2017a, 2017b; CRFL project 2F40-F024 started in 2015, monitoring temperatures in overwintering habitat of spotted seatrout
- Incorporate cold stun event information into the modeling of the population. — Unsuccessfully attempted using stock synthesis model from the 2012 stock assessment, is being investigated in the 2019 benchmark stock assessment
- Estimate or develop a model to predict the impact of cold stun events on local and statewide spotted seatrout abundance. — Unsuccessfully attempted using stock synthesis model from the 2012 stock assessment, is being investigated further during 2019 benchmark stock assessment

- Obtain samples (length, age, weight, quantification) of the cold stun events as they occur. — Ongoing: obtained samples in 2001, 2010, 2014, 2015, 2018; length, weight, sex, age; unable to quantify extent of kills
- Define overwintering habitat requirements of spotted seatrout. — Preliminary work completed in Ellis et. al (2017a, 2017b)
- Determine factors that are most likely to influence the severity of cold stun events in North Carolina and separate into low and high salinity areas. — Preliminary work completed in Ellis et. al (2017a)
- Investigate the distribution of spotted seatrout in nursery and non-nursery areas. — Not Completed
- Further research on the possible influences of salinity on release mortality of spotted seatrout. — Not Completed
- Survey of fishing effort in creeks with conflict complaints. — Not Completed
- Determine targeted species in nursery areas and creeks with conflict complaints. — Not Completed
- Microchemistry, genetic, or tagging studies are needed to verify migration patterns, mixing rates, or origins of spotted seatrout between North Carolina and Virginia. — Genetic study completed: NCSU study CRFL grant 2F40-F022; tagging studies ongoing: Tim Ellis data (2008-2013); CRFL project 2F40-F017, NC Multi Species Tagging Study 2014 — Present
- Tagging studies to verify estimates of natural and fishing mortality. — Ongoing: Tim Ellis data (2008-2013); CRFL project 2F40-F017, NC Multi Species Tagging Study 2014 — Present
- Tagging studies to determine if there are localized populations within the state of North Carolina (e.g., a southern and northern stock). — Ongoing: Tim Ellis data (2008-2013); CRFL project 2F40-F017, NC Multi Species Tagging Study 2014 — Present
- A longer time series and additional sources of fishery-independent information. — Longer time series available for P915 as well as P915 surveys for rivers and southern portion of state
- Increased observer coverage in a variety of commercial fisheries over a wider area. — Ongoing
- Expand nursery sampling to include SAV bed sampling in high and low salinity areas during the months of July through September. — Not Completed
- Evaluate the role of shell hash and shell bottom in spotted seatrout recruitment and survival, particularly where SAV is absent. — Not Completed
- Evaluate the role of SAV in the spawning success of spotted seatrout. — Not Completed

MANAGEMENT STRATEGY

Maintain a spawning potential ratio of 20% to increase the likelihood of sustainability through an expanded age structure and an increase in the spawning stock biomass. This strategy should provide a greater cushion for the population and likely lead to faster recovery of the population after cold stun events, which can lead to mass mortalities in the winter months potentially affecting

the number of mature fish available to spawn the following spring. The Director maintains authority to intervene in the event of a catastrophic cold stun event and close the fishery in specific areas or statewide until June 15. This reduces fishing mortality on spotted seatrout until after the peak in their spawning season.

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

The review of the plan is underway. A benchmark stock assessment is being conducted, incorporating data through February 2020.

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TABLES

Table 1: Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of spotted seatrout from North Carolina for the period 1991–2021.

Year	Recreational			Commercial	Total Weight (lb)
	Numbers Landed	Numbers Released	Weight Landed (lb)	Weight Landed (lb)	
1991	988,049	719,372	1,360,530	660,662	2,021,192
1992	908,233	476,405	1,390,746	526,271	1,917,017
1993	569,327	542,137	857,720	449,886	1,307,606
1994	798,937	601,148	1,207,520	412,358	1,619,878
1995	863,057	764,503	1,221,065	574,296	1,795,361
1996	575,357	1,028,974	699,078	226,580	925,658
1997	779,611	480,093	1,025,110	232,497	1,257,607
1998	702,274	351,114	1,125,898	307,671	1,433,569
1999	1,080,411	1,168,909	1,878,913	546,675	2,425,588
2000	728,906	645,107	1,095,729	376,574	1,472,303
2001	499,556	1,210,336	659,893	105,714	765,607
2002	746,908	1,829,880	957,824	175,555	1,133,379
2003	388,715	903,292	515,678	181,462	697,140
2004	560,834	934,206	728,027	130,961	858,988
2005	1,517,647	3,744,921	1,695,036	129,855	1,824,891
2006	1,444,778	2,722,351	2,034,469	312,624	2,347,093
2007	1,241,296	3,558,110	1,998,275	374,722	2,372,997
2008	1,372,973	4,509,440	2,114,130	304,430	2,418,560
2009	1,857,890	5,369,092	2,878,160	320,247	3,198,407
2010	630,748	8,034,670	1,277,174	202,647	1,479,821
2011	723,502	7,486,377	1,353,388	75,239	1,428,627
2012	1,602,836	4,967,987	2,720,028	265,016	2,985,044
2013	1,107,957	4,312,436	1,881,881	367,648	2,249,529
2014	725,086	3,950,447	1,451,592	242,245	1,693,837
2015	249,260	4,883,109	430,579	128,762	559,341
2016	978,624	6,533,887	1,724,492	254,590	1,979,082
2017	1,217,834	5,151,510	2,157,198	299,911	2,457,109
2018	449,473	15,245,249	658,555	128,922	787,477
2019	1,937,250	7,185,562	3,334,163	378,491	3,712,654
2020	2,053,354	6,215,778	3,632,315	568,764	4,201,079
2021	1,223,508	6,332,064	2,241,421	694,784	2,936,205
Mean	976,689	3,484,026	1,535,506	308,709	1,844,215

Table 2: Total number of awarded citations for spotted seatrout (>24 inches total length for release or > five pounds landed) from the North Carolina Saltwater Fishing Tournament for the time period 1991–2021.

Year	Total Citations	Release Citations ⁺	% Release
1991	185		0
1992	203		0
1993	12		0
1994	237		0
1995	483		0
1996	132		0
1997	125		0
1998	332		0
1999	695		0
2000	511		0
2001	518		0
2002	353		0
2003	328		0
2004	378		0
2005	290		0
2006	686		0
2007	1,000		0
2008	428	5	1
2009	434	14	3
2010	168	16	10
2011	37	3	8
2012	143	5	3
2013	162	21	13
2014	197	18	9
2015	176	16	9
2016	214	44	21
2017	464	81	17
2018	198	73	37
2019	468	172	37
2020	579	193	33
2021	655	283	43

⁺ Spotted seatrout release citations (fish released greater than 24 inches total length) began in 2008.

Table 3: Mean, minimum, and maximum lengths (fork length, inches) of spotted seatrout measured from the commercial and recreational fisheries, 1991–2021.

Year	Commercial				Recreational			
	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1991	14.4	7.7	28.7	1,207	15.1	4.9	31.9	745
1992	16.0	8.4	27.9	1,791	15.6	5.1	24.2	543
1993	16.3	8.5	29.7	1,898	15.7	9.3	25.0	485
1994	15.6	7.0	29.1	1,224	16.0	10.6	24.0	1,076
1995	17.1	8.5	29.1	2,728	15.6	8.5	31.6	853
1996	16.0	7.0	27.6	748	14.6	8.9	24.3	307
1997	14.9	8.1	29.9	4,155	15.3	8.9	23.1	622
1998	14.5	8.0	29.9	4,698	16.4	11.0	36.5	551
1999	15.6	7.6	30.2	6,167	16.4	11.6	26.8	699
2000	17.5	6.0	30.7	2,901	15.6	11.3	25.2	330
2001	16.3	7.6	30.7	1,595	14.8	11.5	26.0	326
2002	16.1	8.0	28.9	3,897	14.9	11.8	24.8	283
2003	17.2	9.5	29.6	2,305	14.6	9.9	25.0	130
2004	16.6	9.0	27.9	2,676	15.3	8.9	22.5	294
2005	16.8	8.5	27.5	2,429	14.2	8.7	25.2	664
2006	16.3	8.9	29.3	6,493	15.5	10.1	25.9	706
2007	17.3	9.6	31.0	8,455	15.9	10.8	27.7	521
2008	17.0	7.3	30.3	5,877	15.6	11.5	26.5	790
2009	16.7	5.4	29.5	6,631	16.0	9.1	26.0	779
2010	17.5	11.4	30.9	4,060	17.5	12.4	24.8	336
2011	16.6	8.8	27.8	1,274	17.0	12.3	24.2	638
2012	16.5	7.4	31.1	4,822	16.5	13.0	24.1	939
2013	16.7	8.7	28.5	6,144	16.8	10.1	23.5	865
2014	17.3	5.5	28.3	3,321	17.6	13.1	26.0	381
2015	18.3	8.9	30.9	2,676	16.9	12.8	25.0	154
2016	17.3	9.4	31.7	3,025	16.8	13.0	25.2	647
2017	17.6	7.6	32.9	3,066	17.0	11.6	25.8	864
2018	17.2	10.5	28.0	1,180	15.7	9.3	23.3	274
2019	17.3	10.1	28.9	2,622	16.7	10.7	24.6	1,574
2020	17.5	10.9	33.4	2,851	17.0	12.1	26.8	1,119
2021	17.5	10.9	29.9	3,432	17.0	11.1	26.5	1,019

Table 4: Modal age, minimum age, maximum age, and number aged for spotted seatrout collected through NCDMF sampling programs, 1991–2021

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1991	1	0	7	679
1992	1	0	6	572
1993	1	0	6	645
1994	1	0	9	688
1995	1	0	5	623
1996	1	0	6	734
1997	1	0	6	710
1998	1	0	9	765
1999	1	0	6	869
2000	1	0	7	566
2001	1	0	5	425
2002	1	0	7	713
2003	1	1	7	405
2004	1	0	6	598
2005	1	0	5	727
2006	1	0	8	970
2007	2	0	8	702
2008	1	0	7	616
2009	2	0	6	660
2010	1	0	6	623
2011	1	0	6	421
2012	1	0	5	593
2013	2	0	5	635
2014	1	0	7	530
2015	2	0	5	448
2016	1	0	5	456
2017	1	0	7	881
2018	1	0	5	516
2019	1	0	8	1,167
2020	2	0	5	634
2021	1	0	6	1,006

Table 5: Summary of the NCMFC management strategies and their implementation status for the 2012 N.C. Spotted Seatrout FMP.

Management Strategy	Implementation Status
50% reduction in harvest needed, six fish bag limit, 14-inch minimum size limit, and weekend closure for commercial gears year-round (no possession on weekends).	Accomplished; Proclamation authority
A maximum of two fish over 24 inches for recreational fishermen	Proclamation authority
The small mesh gill net attendance requirement is extended to include weekends, December through February	Accomplished
Development of a mutual aid agreement between NCDMF Marine Patrol and WRC Wildlife Enforcement Officers for Inland fishing waters	Accomplished
Move forward with the mediation policy process to resolve conflict between spotted seatrout fishermen	Conflict resolution process established under Rule 15A NCAC 03I .0122.
Remain status quo with the assumption that the Director will intervene in the event of a catastrophic event and do what is necessary in terms of temporary closures by water body	Repealed Rule 15A NCAC 03M .0504 and used proclamation authority in 15A NCAC 03M .0512; Beginning in May 2017 re-established spotted seatrout Rule 15A NCAC 03M .0522 due to ASMFC considering retiring Interstate Spotted Seatrout FMP
More extensive research on cold stun events by NCDMF, Universities, etc.	Preliminary research accomplished (Ellis et al. 2017a, 2017b), additional work ongoing.

Table 6: Summary of the NCMFC management strategies and their implementation status for Supplement A to the 2012 N.C. Spotted Seatrout FMP adopted in 2014.

Management Strategy	Implementation Status
2014: 14-inch minimum size limit, four recreational bag limit, 75 fish commercial trip limit, no gill nets in joint waters on weekends, unlawful for a commercial operation to possess or sell spotted seatrout taken from joint waters on weekends.	Proclamation authority
2014: 14-inch minimum size limit, three fish recreational bag limit with a December 15- January 31 closure, 25 fish commercial trip limit (no closure)	Delay in management strategy
If a cold stun occurs close spotted seatrout harvest through June 1 and retain four fish recreational bag limit and 75 fish commercial trip limit	Proclamation authority
Revisit the Spotted Seatrout FMP in three years to determine if sustainable harvest measures are working	On schedule to begin July 2017*

* The NCMFC approved the 2017 FMP schedule in August 2017, which included a schedule change for spotted seatrout to begin in 2019, two years later than originally planned.

FIGURES

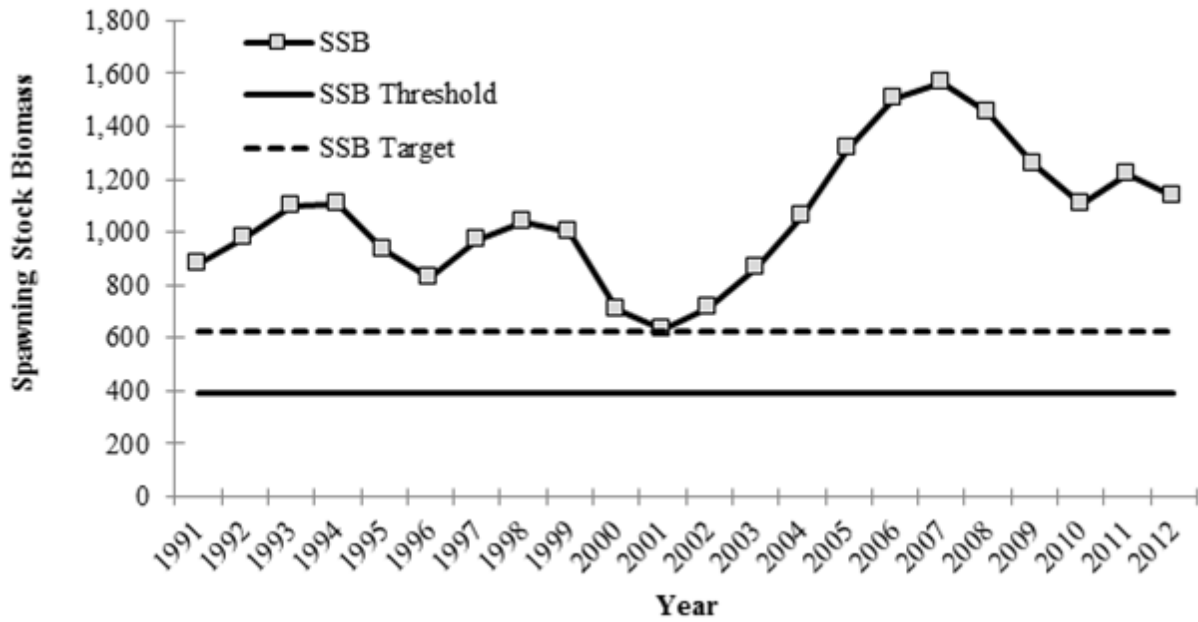


Figure 1. Annual predicted spawning stock biomass in metric tons, compared to estimated $SSB_{Threshold}$ ($SSB_{20\%}$) and SSB_{Target} ($SSB_{30\%}$), 1991–2012. 2012 is the terminal year for the last spotted seatrout stock assessment (NCDMF 2015b).

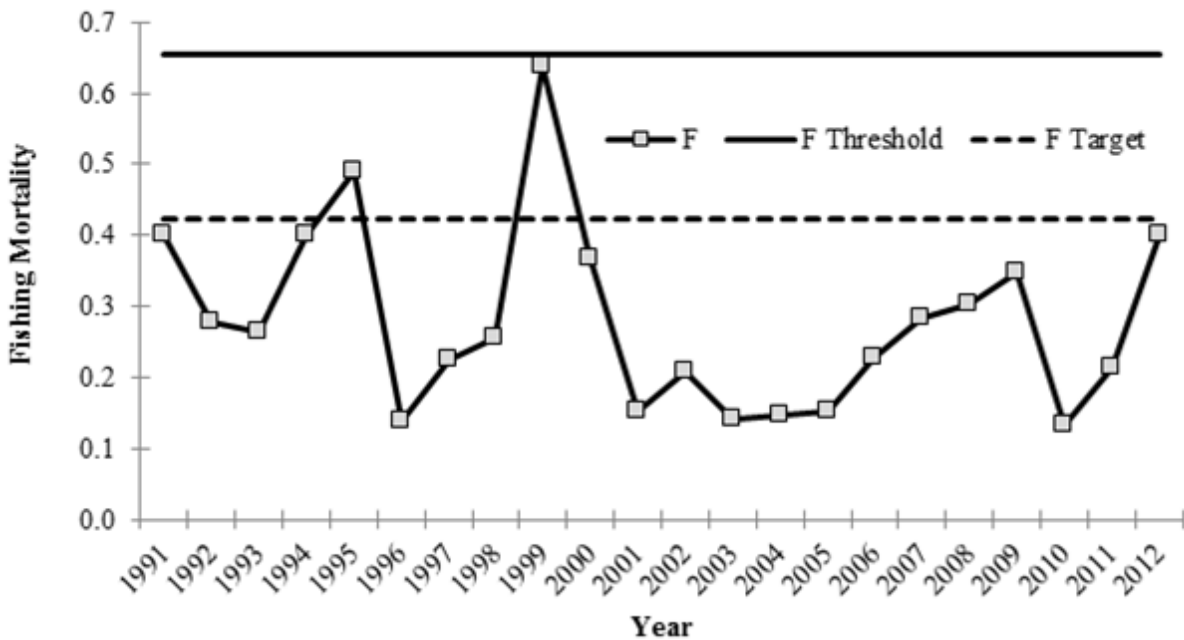


Figure 2. Annual predicted fishing mortality rates (numbers-weighted, ages 1–4) compared to estimated $F_{Threshold}$ ($F_{20\%}$) and F_{Target} ($F_{30\%}$), 1991–2012. 2012 is the terminal year for the last spotted seatrout stock assessment (NCDMF 2015b).

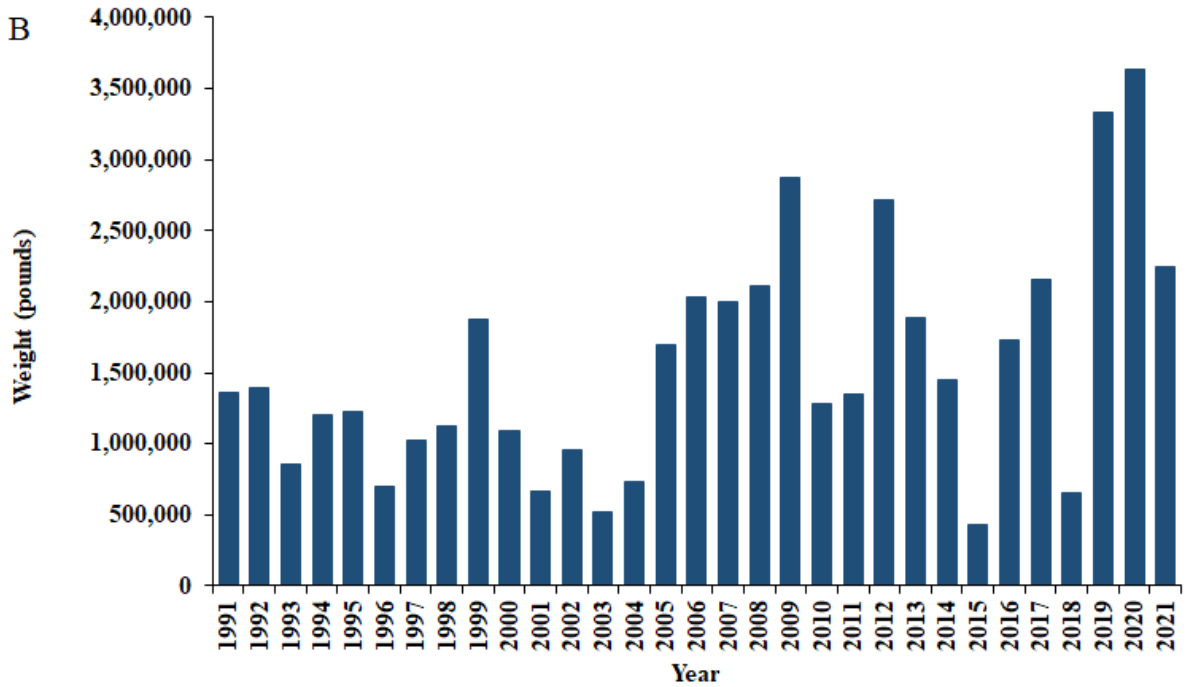
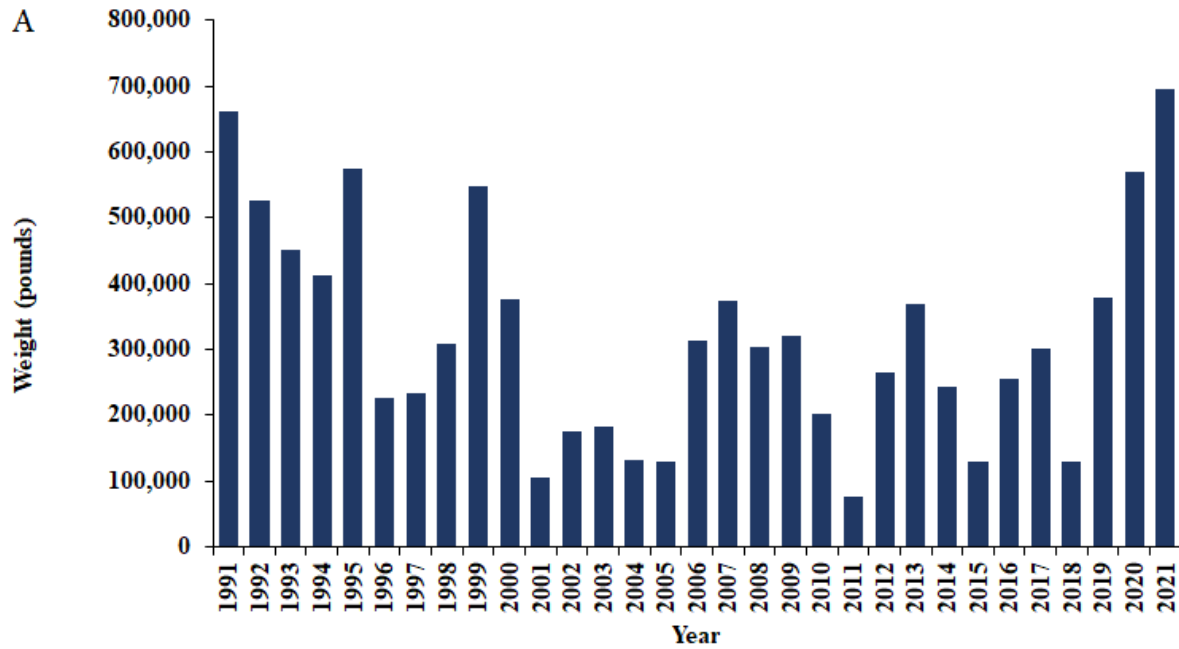


Figure 3. Commercial landings (pounds) reported through the North Carolina Trip Ticket Program (A) and recreational landings (Type A + B1; pounds) estimated from the Marine Recreational Information Program survey (B) for North Carolina, 1991–2021.

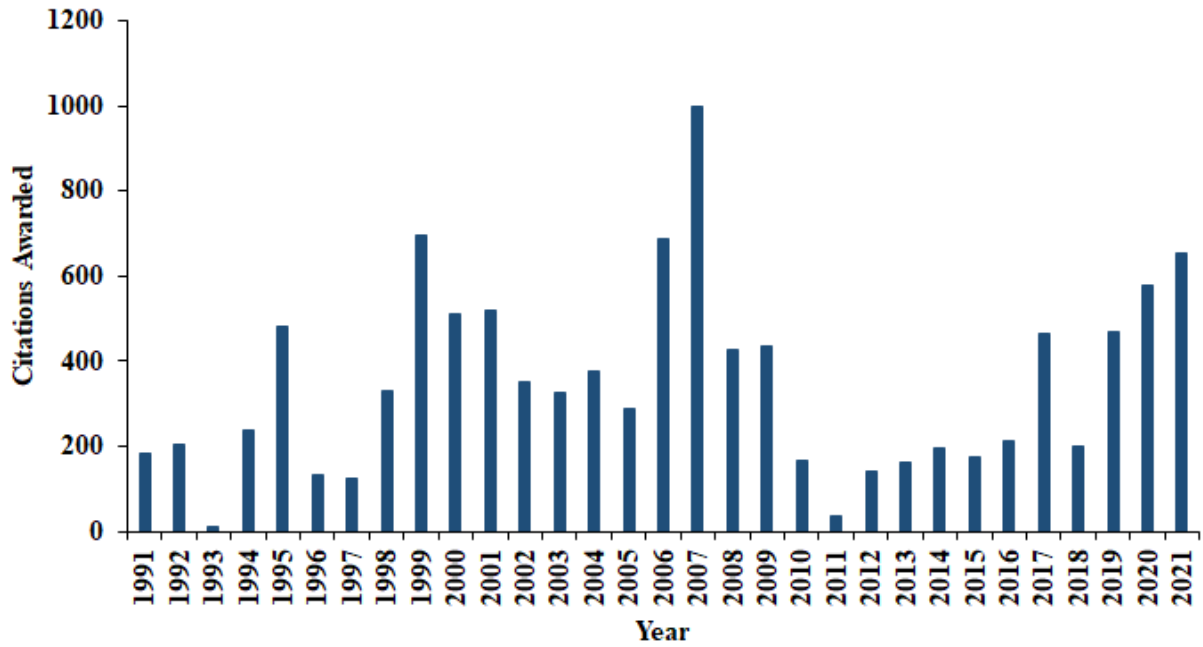


Figure 4. North Carolina Saltwater Fishing Tournament citations awarded for spotted seatrout, 1991–2021. Citations are awarded for spotted seatrout >24 inches total length for release or > five pounds landed.

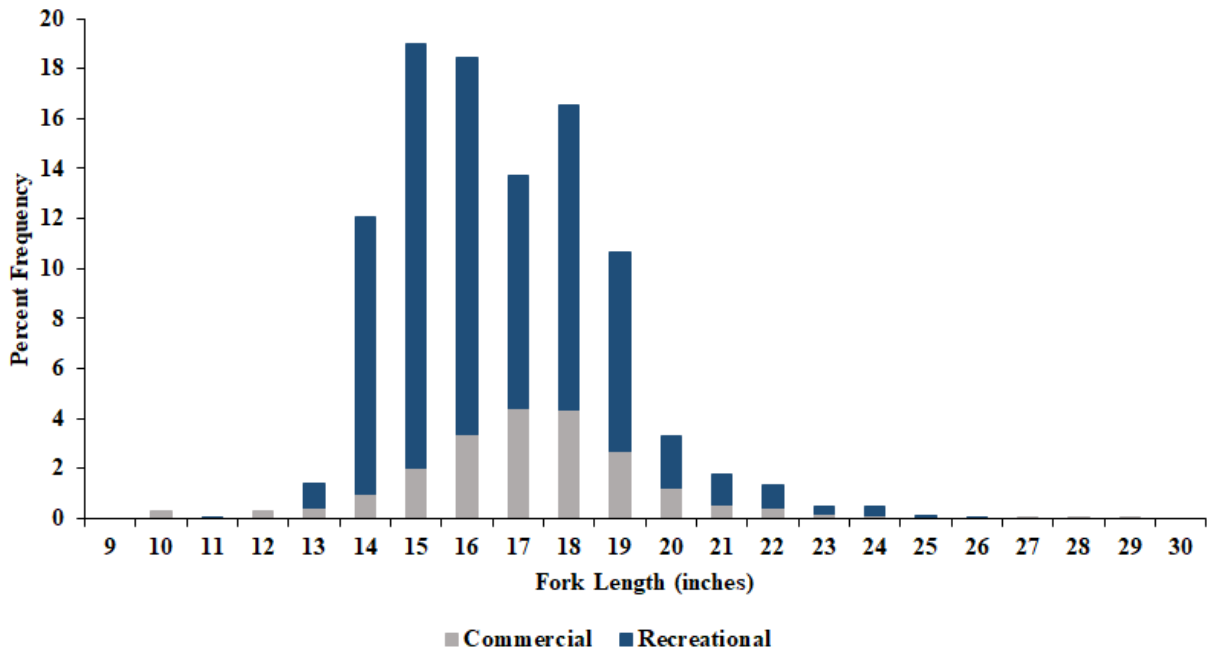


Figure 5. Commercial and recreational length frequency distribution from spotted seatrout harvested in 2021.

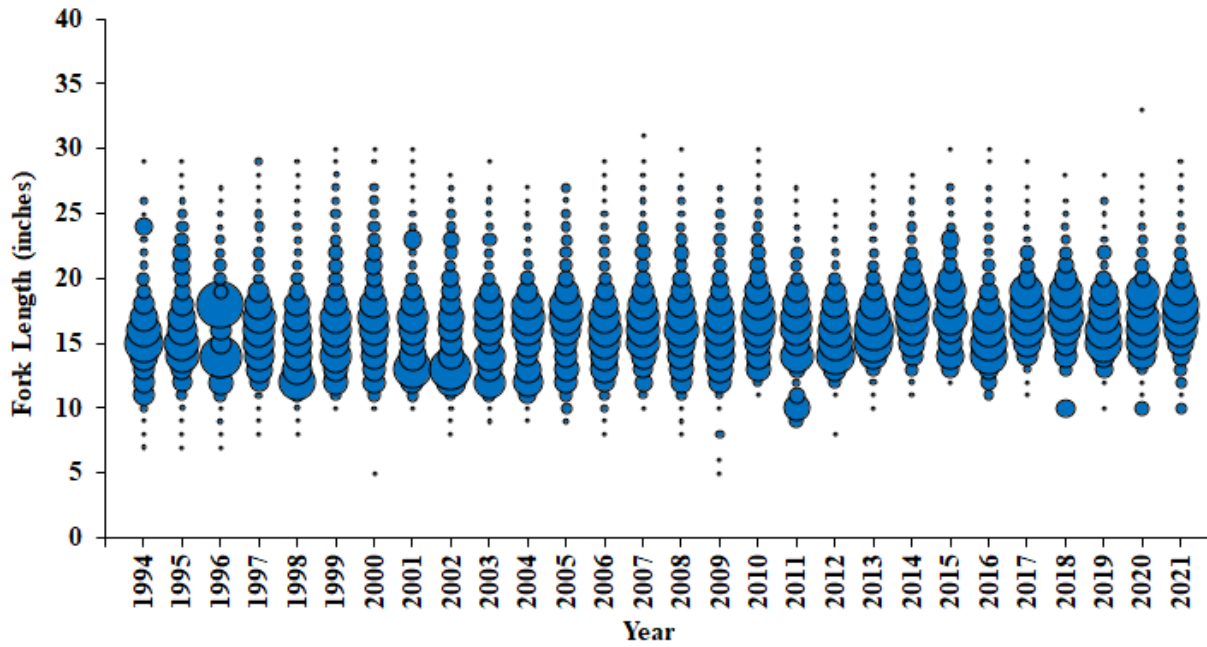


Figure 6. Commercial length frequency (fork length, inches) of spotted seatrout harvested, 1994–2021. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

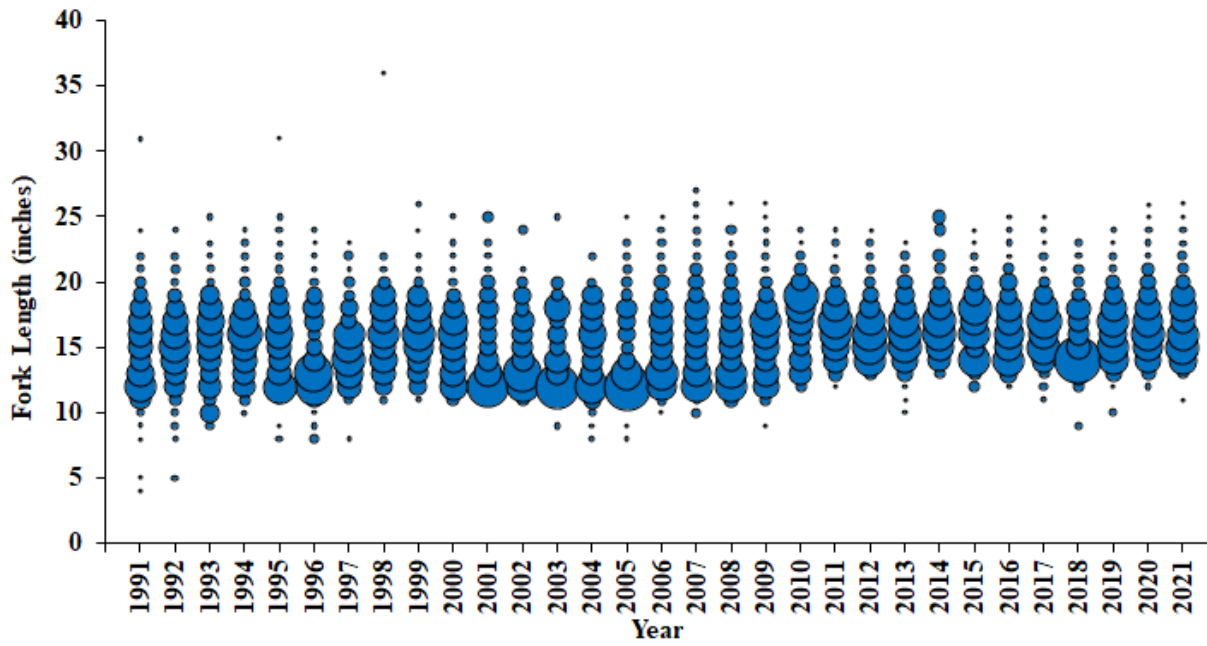


Figure 7. Recreational length frequency (fork length, inches) of spotted seatrout harvested, 1991–2021. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

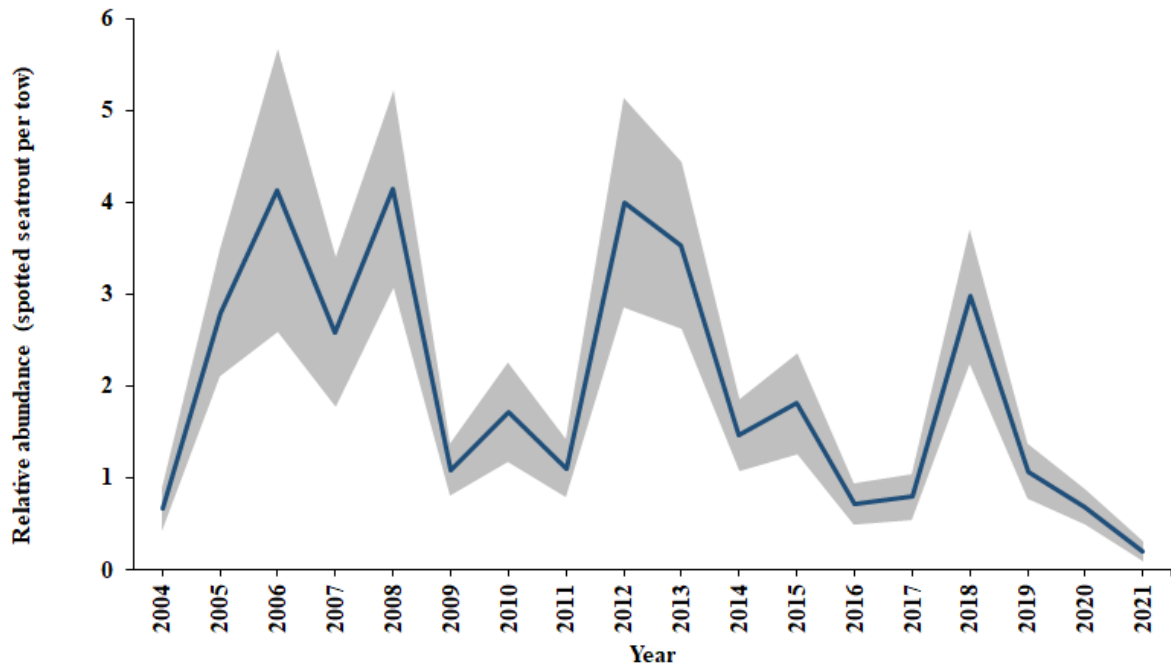


Figure 8. Relative abundance index (fish per tow) from the North Carolina Estuarine Trawl Survey (Program 120) during June and July, 2004–2021. Error bars represent ± 1 standard error.

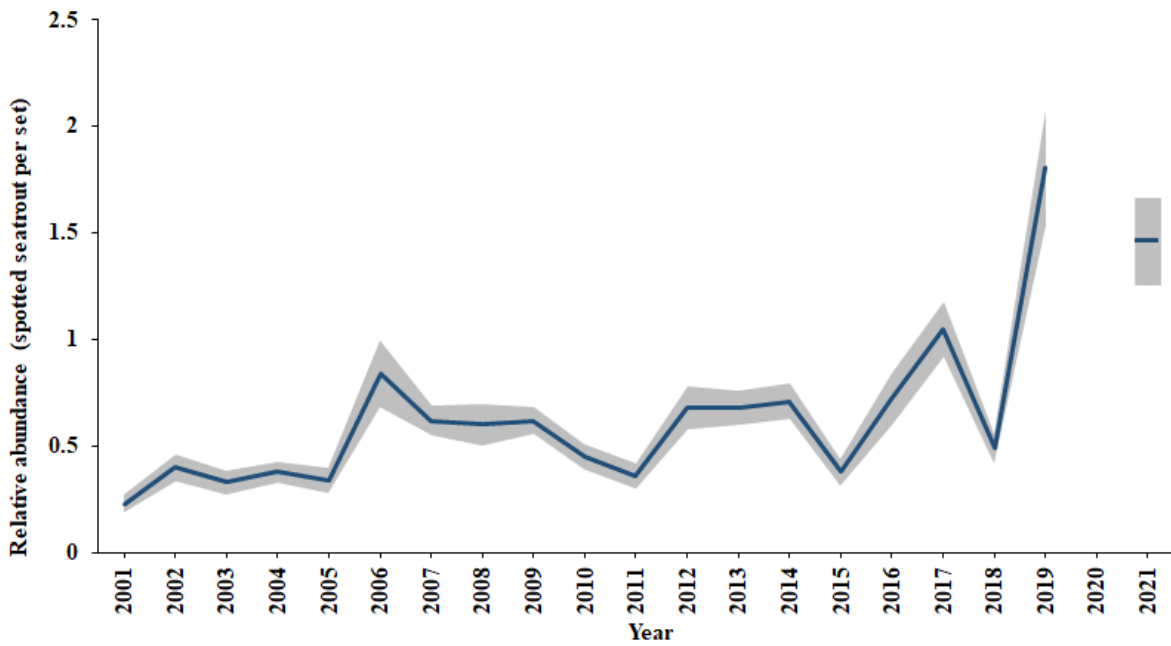


Figure 9. Relative abundance index (fish per set) of spotted seatrout collected from Program 915 in Pamlico Sound, 2001–2021. Error bars represent ± 1 standard error. Sampling not conducted in 2020.

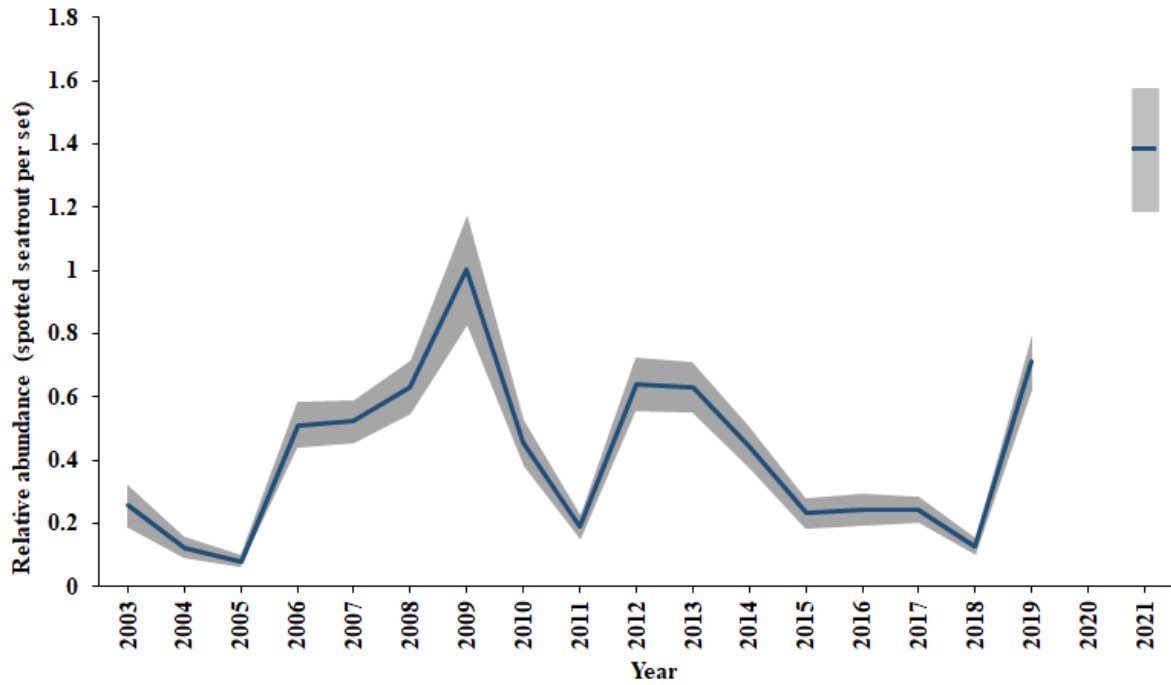


Figure 10. Relative abundance index (fish per set) of spotted seatrout collected from Program 915 in Pungo, Pamlico, and Neuse rivers, 2004–2021. Error bars represent ± 1 standard error. Sampling not conducted in 2020.

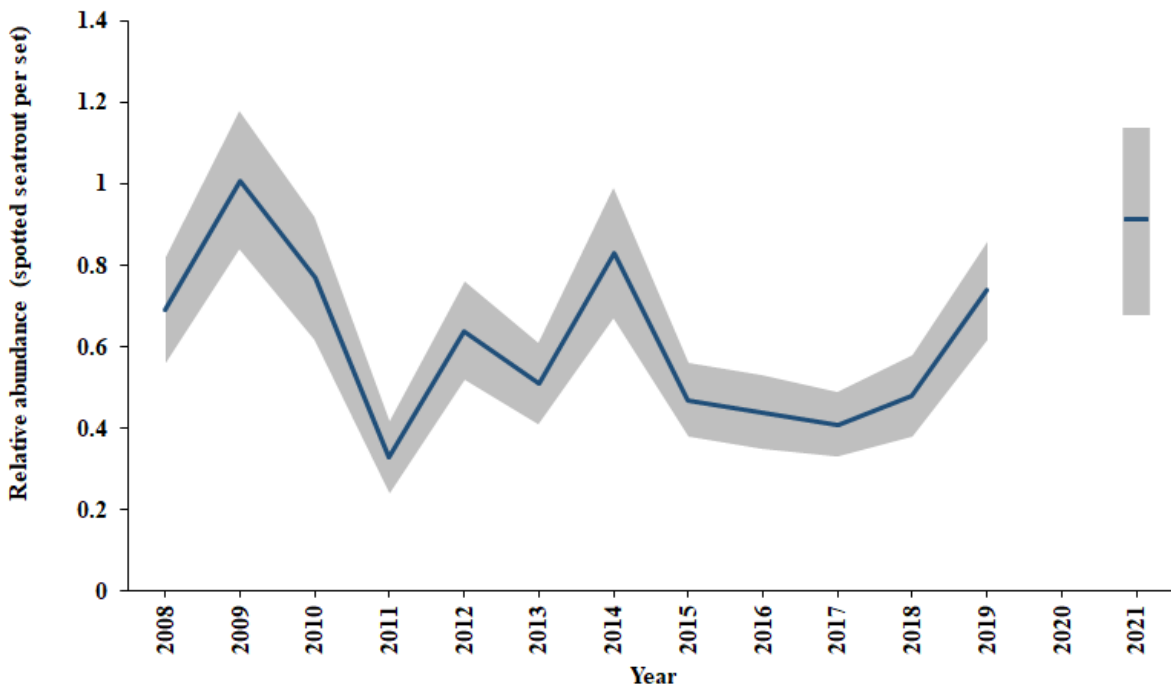


Figure 11. Relative abundance index (fish per set) of spotted seatrout collected from Program 915 in New and Cape Fear rivers, 2008–2021. Error bars represent ± 1 standard error. Sampling not conducted in 2020.

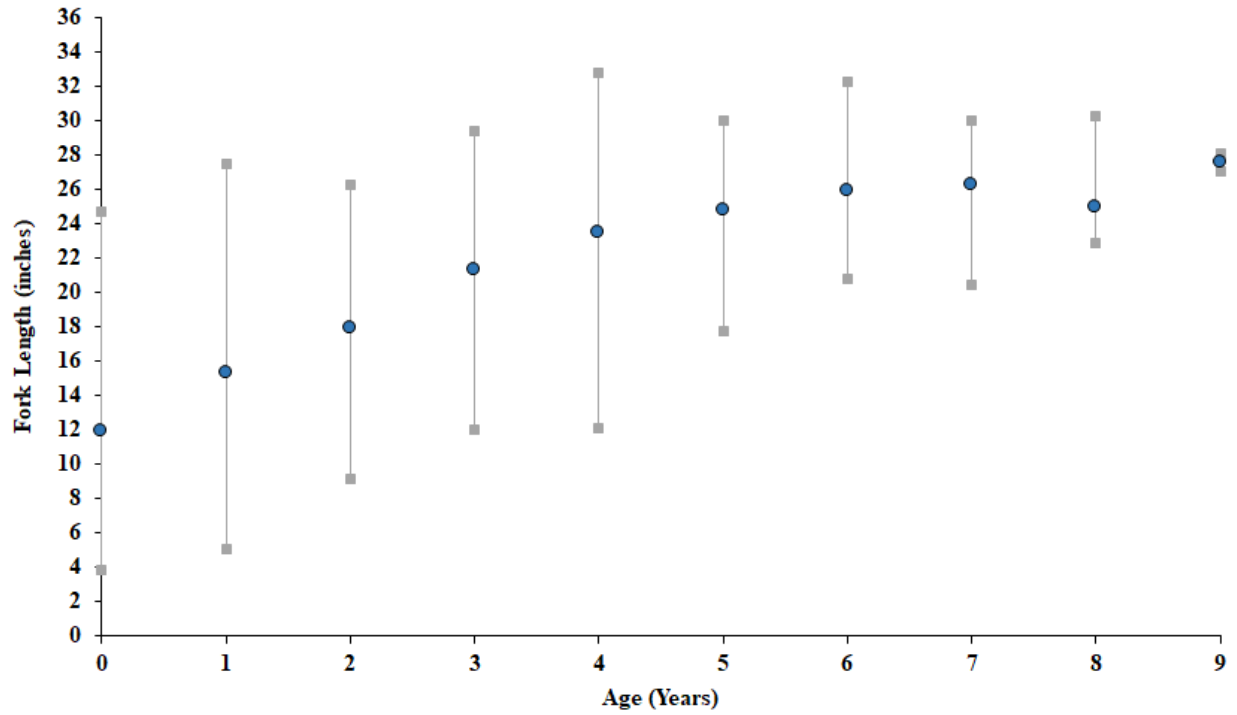


Figure 12. Spotted seatrout length at age based on all age samples collected from 1991 to 2020. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.

DRAFT FOR DEQ SECRETARIAL REVIEW

DRAFT N.C. FISHERY MANAGEMENT PLAN REVIEW SCHEDULE (July 2023 – June 2028) Revised July 30, 2023					
SPECIES (Date of Last Action)	2023-2024	2024-2025	2025-2026	2026-2027	2027-2028
SPOTTED SEATROUT (2/12) *					
STRIPED MULLET (11/15) †					
HARD CLAM (2/17)					
OYSTER (2/17)					
RED DRUM (8/17)					
BLUE CRAB (2/20)					
BAY SCALLOP (8/20)					
KINGFISHES (8/20)					
RIVER HERRING (2/22)*					
INTERJURISDICTIONAL (5/22)*					
SOUTHERN FLOUNDER (5/22)					
SHRIMP (8/22)					
ESTUARINE STRIPED BASS (2/23)					

* Plan review began in FY 2021

† Plans began in FY 2021. MFC adopted Supplement A to Amendment 1 in May 2023.

This schedule assumes no rulemaking is required to implement amendments.



ROY COOPER
Governor

ELIZABETH S. BISER
Secretary

KATHY B. RAWLS
Director

August 4, 2023

MEMORANDUM

TO: N.C. Marine Fisheries Commission
FROM: Nathaniel Hancock, Albemarle-Roanoke (A-R) Striped Bass Species Lead, FMP
Co-Lead Fisheries Management Section
SUBJECTS: Estuarine Striped Bass Amendment 2 Updates

Issue

During the May, 2023 N.C. Marine Fisheries Commission meeting, the Division of Marine Fisheries (hereafter the Division) provided results of the updated stock assessment of the Albemarle Sound-Roanoke River (A-R) Striped Bass stock in North Carolina with data through 2021. Those results are summarized below. In addition this memo provides an update of the indices of abundance through the most recent sampling year of 2022. Adaptive management action required under Amendment 2 to the North Carolina Estuarine Striped Bass Fishery Management Plan (FMP) are also summarized along with an update of current A-R stock striped bass stocking efforts.

Action Needed

For informational purposes only, **no action is needed at this time.**

Findings

- The stock was modeled using data from 1991 to 2021.
- The stock is still undergoing overfishing.
- The stock is still overfished.
- An external peer review by a panel of experts and Division staff concluded the stock assessment is suitable for management use and is a credible representation of current stock status.
- The peer review panel recognized factors in addition to fishing mortality are likely responsible for the chronic poor recruitment observed since the early 2000s and the current low abundance of the stock. These factors may include river flow and/or blue catfish predation and competition.

	Target	Threshold	2021 Value	Status
Fishing Mortality	0.14	0.20	0.77	Overfishing
Female SSB	163.62 mt (360,720 lb)	124.87 mt (275,286 lb)	16.13 mt (35,566 lb)	Overfished

Overview

Results from the stock assessment update indicate the A-R striped bass stock is still undergoing overfishing and the stock is still overfished. The estimate of fishing mortality (F) in 2021 was 0.77, greater than the $F_{\text{Threshold}}$ of 0.20, indicating overfishing (Figure 1). The spawning stock biomass (SSB) was 35,566 pounds, less than the $\text{SSB}_{\text{Threshold}}$ of 275,286 pounds, indicating overfished status (Figure 2).

Evaluation of the trends in survey indices of abundance indicate further concern for the stock. Both observed and predicted recruitment of age-0 fish have been declining and are extremely low in recent years. Female SSB has been declining since 2004. Fisheries-independent data also support the declining trend in overall population abundance observed since the mid-2000s.

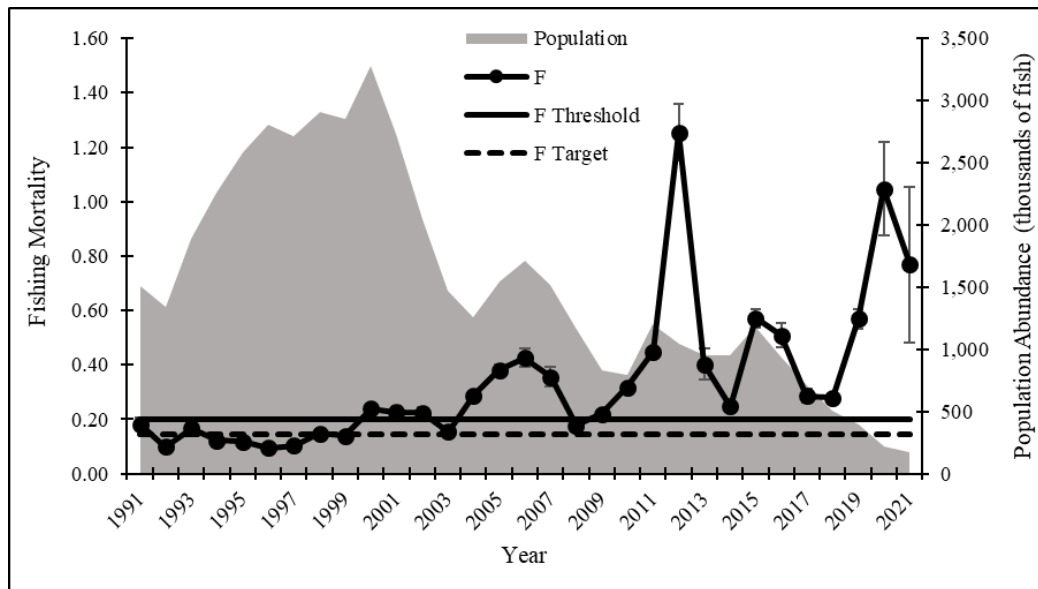


Figure 1. Estimates of fishing mortality (F) and population abundance for the Albemarle-Roanoke striped bass stock. Source: Update of the A-R Striped Bass Stock Assessment 2022.

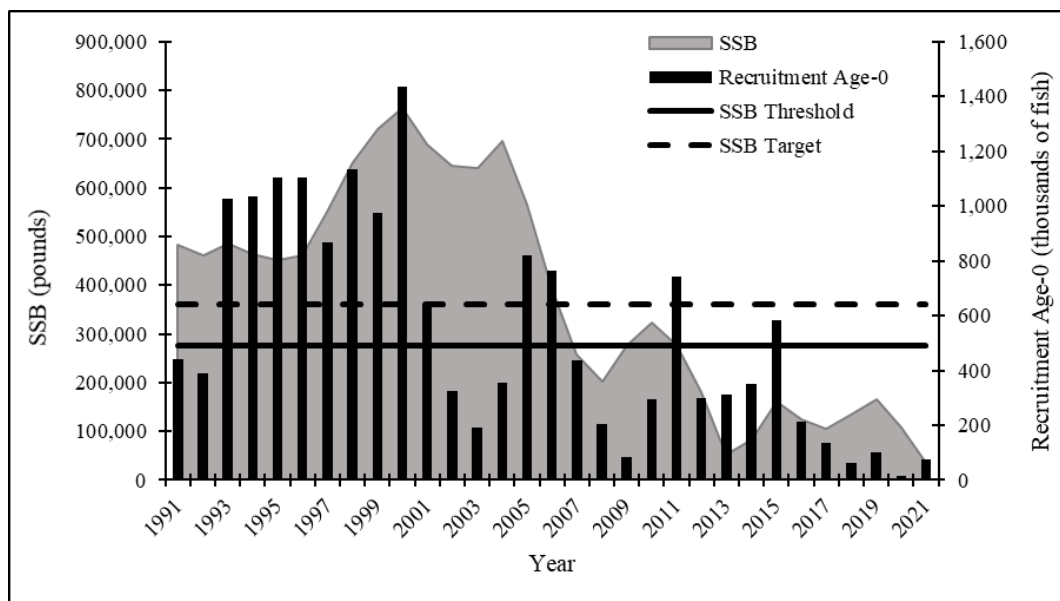


Figure 2. Estimates of spawning stock biomass (SSB) and recruitment of age-0 fish coming into the population each year for the Albemarle-Roanoke striped bass stock. Source: Update of the A-R Striped Bass Stock Assessment 2022.

Potential Causes for Recruitment and Stock Decline

The Division and peer review panel recommended the updated stock assessment model for management use. The peer review panel was confident in the declining trend in overall population abundance and recent poor recruitment based on assessment results and fishery-independent trends from the North Carolina Wildlife Resources Commission’s (NCWRC) electrofishing spawning stock abundance survey, and the Division’s (NCDMF) independent gill net spawning stock abundance survey and juvenile abundance survey (Figures 3–5). It was acknowledged there was a great deal of uncertainty in the potential causes of the decline in recruitment and overall decline in stock abundance. The benchmark review panel recognized that the decline in recruitment was not solely a result of reduced stock abundance due to harvest (i.e., overfishing). The review panel recommended that future assessments consider key abiotic and biotic drivers of recruitment. Spring flow conditions in the Roanoke River (the spawning grounds for A-R Striped Bass) are believed to influence recruitment and ultimately stock abundance and so was included as a high priority for further evaluation in the stock assessment’s research recommendations. Another area of potential influence on the A-R striped bass stock is the prevalence of the non-native blue catfish. The population of blue catfish in the Roanoke River and Albemarle Sound and tributaries has increased dramatically in recent years. The peer reviewers felt predation by blue catfishes could potentially impact recruitment of striped bass directly or could influence food resources for striped bass through competition for prey. The review panel recognized the degree to which this occurs is not known, but future assessments should consider this as a factor that may influence abundance but is not tied to striped bass harvest.

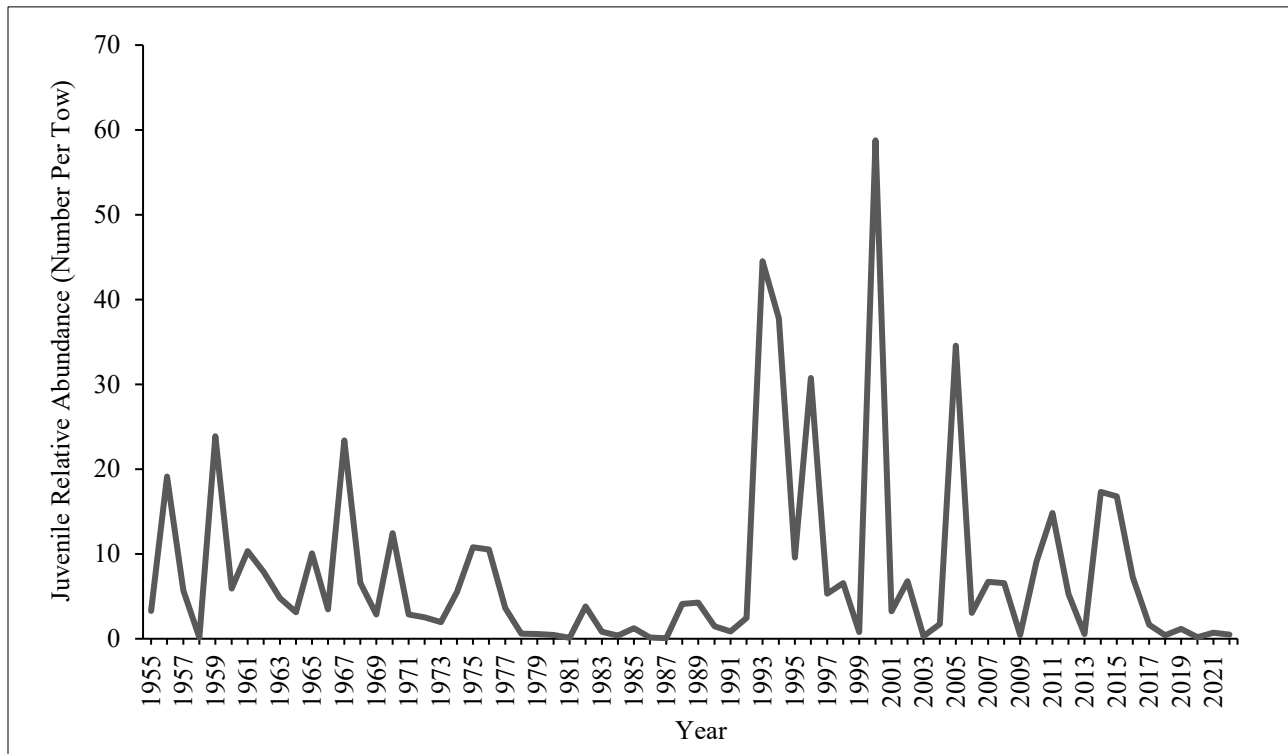


Figure 3. Annual index of relative abundance for young-of-year juvenile striped bass derived from the NCDMF Striped Bass Juvenile Survey, Western Albemarle Sound, 1955–2022.



Figure 4. Annual index of relative abundance for ages 9+ striped bass derived from the NCWRC Electrofishing Spawning Stock Abundance Survey, 1991–2022.

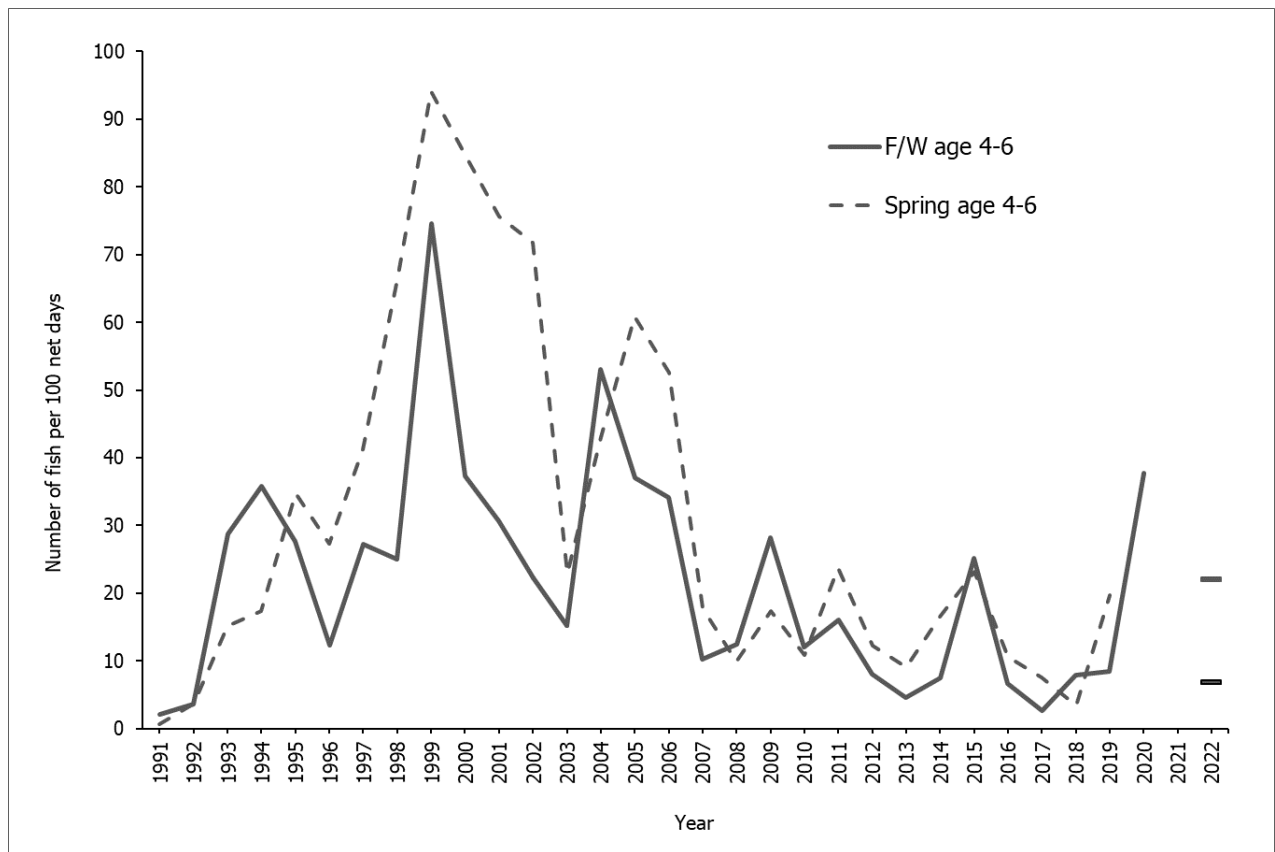


Figure 5. Annual index of relative abundance for ages 4–6 striped bass derived from the NCDMF Fall/Winter and Spring Independent Gill Net Abundance Surveys, 1991–2022.

Adaptive Management actions required under Amendment 2 to lower fishing mortality to the target

Amendment 2 adaptive management states:

- Use peer reviewed stock assessments and updates to recalculate the BRPs and/or TAL. The current TAL of 51,216 lb remains in place until a new TAL is determined. Stock assessments will be updated at least once between benchmarks. Increases or decreases in the TAL will be implemented through Adaptive Management. A harvest moratorium could be necessary if stock assessment results calculate a TAL that is too low to effectively manage, and/or the stock continues to experience spawning failures.
- Use estimates of F from stock assessments to compare to the F BRP and if F exceeds the F_{Target} reduce the TAL to achieve the F_{Target} through Adaptive Management.

Implementing a new, lower harvest level accomplishes the adaptive management set forth in Amendment 2 to the North Carolina Estuarine Striped Bass FMP.

Based on the most recent stock assessment update, a TAL of 8,349 lb is necessary to reduce F to the F_{Target} .

A Revision to Amendment 2 will be presented to the MFC at its November business meeting.

Albemarle Sound-Roanoke River Striped Bass Supplemental Stocking Contingency Plan

The North Carolina Interjurisdictional Fisheries Cooperative, including the Division, Wildlife Resources Commission, U.S. Fish and Wildlife Service, and the Edenton National Fish Hatchery, annually produces a work plan that outlines striped bass stocking activities in North Carolina coastal rivers. Striped bass have not been stocked in the Albemarle Sound since 1996. However, due to six consecutive years (2017–2022) of A-R stock spawning failures, the 2023 Cooperative Work Plan included stocking approximately 500,000 juvenile Phase-I (about 2 inches long) striped bass in the western Albemarle Sound. Juvenile fish were produced from mature A-R striped bass collected on the Roanoke River spawning grounds in Weldon, N.C. Genetic marking technology will be used to determine the percent of the 2023 year class that was supported by hatchery versus wild spawned fish. Stocking of hatchery reared striped bass will continue in the Albemarle Sound for at least the next three years.