FISHERY MANAGEMENT PLAN UPDATE
SPOTTED SEATROUT
AUGUST 2024

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:	Underway	

Spotted seatrout (*Cynoscion nebulosus*) is managed under the authority of two state and one interjurisdictional fishery management plans (FMP). The North Carolina Marine Fisheries Commission (MFC) 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 February 2014 management measures outlined in the N.C. Spotted Seatrout FMP, and presented possible interim management measures. At its February 2014 business meeting, the MFC 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 Amendment 1 is completed.

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 ASMFC Spotted Seatrout 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 bring 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 (NCDMF 2022). The goal of this 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.

As required in the 2012 FMP, a stock assessment (NCDMF 2015a) was completed on schedule (2014–2015), peer reviewed, approved for management, and presented to the MFC at its May 2015 business meeting. A new benchmark stock assessment began in late 2020 and was completed and accepted for use in management October 2022. Results from the 2022 Spotted Seatrout Stock Assessment showed that the North Carolina and Virginia stock of Spotted Seatrout is not overfished, but overfishing is occurring. The North Carolina Division of Marine Fisheries (DMF) is drafting Amendment 1 to the state FMP for spotted seatrout to end overfishing and ensure sustainable harvest.

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 includes all spotted seatrout in North Carolina and Virginia. Virginia landings were included in the stock assessment of spotted seatrout because of the relatively higher 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), however it is rare north of Virginia, United States. Genetic and tagging data support a single unit stock in Virginia and North Carolina (Ellis et al. 2019). Genetic data also shows 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). Spotted seatrout can tolerate a wide salinity range (euryhaline) and inhabit shallow coastal and estuarine waters throughout their range (Deaton et al. 2010). The North Carolina state record spotted seatrout weighed 12.5 pounds, measured 33.5-inches total length, and was caught in the Lower Neuse River in 2022. The maximum reported age is 9 years in North Carolina for both male and female fish (NCDMF 2012). Most spotted seatrout in North Carolina are mature and reach an average size of 7.9 inches for males and 9.9 inches for females by age 1 with all males 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 South Carolina and Florida, older spotted seatrout were found to spawn more often than younger fish (Roumillat and Brouwer 2004, Lowerre-Barbieri et al. 2009). Estimates of the number of eggs a female can produce in a year from the Southeast and Gulf Coasts vary based on size, age, and range, from 3 million to 18 million per year (Nieland et al. 2002; Roumillat and Brouwer 2004; Murphy et al. 2011).

Stock Status

The 2022 North Carolina spotted seatrout stock assessment (NCDMF 2022) indicated the spotted seatrout stock in North Carolina and Virginia is not overfished but overfishing is occurring (Figures 1 and 2).

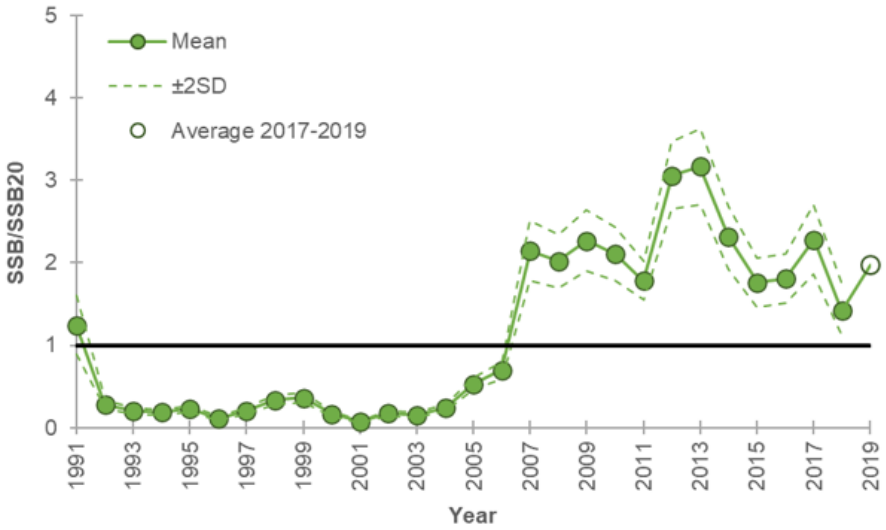

Figure 1. Annual predicted spawning stock biomass (metric tons), relative to the spawning stock biomass threshold reference point ($SSB/SSB_{20\%}$), 1991–2019. 2019 is the terminal year for the most recent spotted seatrout stock assessment (NCDMF 2022). The horizontal black line shows a ratio of one where SSB = $SSB_{20\%}$. The terminal-year estimate (open circle) is an average of the most recent three years weighted by the inverse CV values. Values above the horizontal, black line indicate the stock is not overfished.

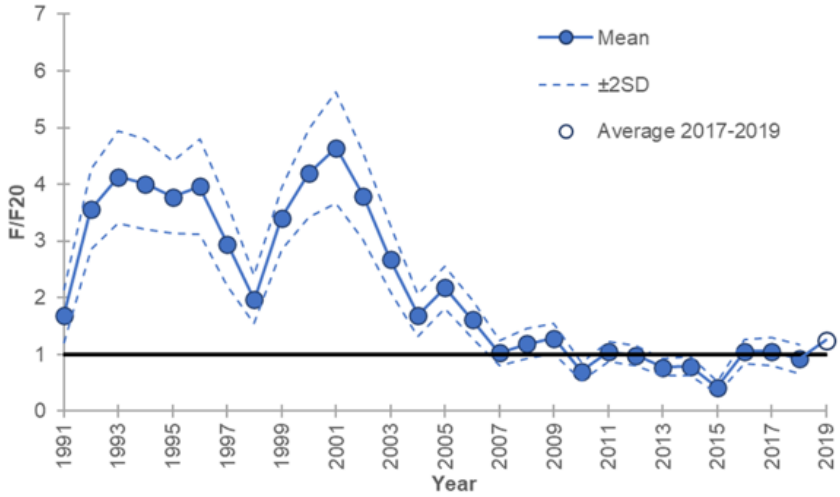

Figure 2. Annual predicted fishing mortality rates relative to the fishing mortality threshold reference point ($F/F_{20\%}$), 1991–2019. 2019 is the terminal year for the most recent spotted seatrout stock assessment (NCDMF 2022). The horizonal, black line shows a ratio of one where F = $F_{20\%}$. The terminal-year estimate (open circle) is an average of the most recent three years weighted by the inverse CV values. Values above the horizontal, black line indicate overfishing is occurring.

Stock Assessment

The 2022 benchmark stock assessment of spotted seatrout in North Carolina and Virginia was conducted using a seasonal size-structured assessment model applied to data characterizing commercial and recreational landings and discards, fisheries-independent survey indices, and biological data collected from 1991 through 2019. The model included a seasonal time step (winter and non-winter seasons), and a nonstationary process was assumed for growth and

winter natural mortality meaning growth and winter natural mortality were not set inputs but were estimated by the stock assessment model. The seasonal time step and nonstationary winter natural mortality assumption allows for capturing the cold-stun signals that have been observed for spotted seatrout. Both the observed data and the model predictions suggest a shift in population dynamics around the year 2004 when the survey index data became available. Lower fishing mortality (F) and higher spawning stock biomass (SSB) and recruitment with greater variation were predicted for the time period after 2004. This trend was also observed in the recreational landing and discards data, with higher values in the time period after 2004. 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.

In 2019, estimated SSB was 4,980,243 pounds (2,259 metric tons), which is greater than the threshold ($SSB_{20\%}$=2,519,884 pounds or 1,143 metric tons; Figure 1), indicating the stock is not overfished. The terminal year estimate of F (F_{2019}) was based on an inverse-variance weighted average of 2017-2019 F values. The 2019 estimate of fishing mortality was 0.75, which is higher than the threshold (F20%=0.60), indicating the stock is experiencing overfishing (Figure 2).

DESCRIPTION OF THE FISHERY

Current Regulations

DMF currently manages spotted seatrout through a combination of recreational bag limits, commercial trip limits, and a 14-inch minimum size limit for both sectors. Recreational harvest is allowed seven days per week with a daily bag limit of four fish. Commercial harvest is allowed seven days a week in coastal waters with a daily trip limit of 75 fish. 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 except from the Albemarle and Currituck Sounds. Additionally, the DMF Director has the authority to close the fishery by proclamation through June 15 in the event of a severe cold stun. For example, 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. For both commercial and recreational sectors of the spotted seatrout fishery, landings are reported on the biological year which is from March through February of the following year (e.g., biological year 2023 is from March 2023 through February 2024). It is important to note that data from January and February of 2024 included in this annual update are preliminary.

Commercial Fishery

Annual landings have been variable throughout the time series (Table 1; Figure 3). Commercial landings in biological year 2023 (437,160 pounds) decreased by 16% compared to the previous year (520,937 pounds; Table 1; Figure 3) marking back-to-back years of decreased landings. Despite the decrease in landings from 2021, commercial landings of spotted seatrout have remained higher since they increased sharply in biological year 2019 than other years since the current management measures were adopted (2012). Commercial landings in biological years 2021 and 2020 were similar and represent the two highest years since biological year 1999. The increase in commercial landings since 2019 is most likely due to several strong year classes and mild winters from 2019-2022, resulting in high numbers of available fish. Additionally, regulations limiting fall commercial fishing for other species – specifically southern flounder – likely influenced commercial spotted seatrout effort. However, multiple years of declines in harvest, especially when paired with a harvest decline in both sectors (Table 1), could potentially be a warning sign of a decline in stock abundance, though there are many factors which influence commercial

harvest (e.g., weather; price of spotted seatrout; price of other species; etc.). 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 - 2022) in which estuarine landings have dominated. The primary gear of harvest are estuarine gill nets (anchored and run around).

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish), commercial harvest (weight in pounds), and combined recreational and commercial harvest (weight in pounds) of spotted seatrout from North Carolina for the biological years 1991–2023. The biological year is from March through February of the following year (e.g., biological year 2022 is from March 2022 through February 2023). *Data from the January and February portion of biological year 2023 is preliminary.

	Recreational			Commercial	
Biological Year	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1991	973,624	576,139	1,334,162	738,338	2,072,500
1992	908,233	449,085	1,390,746	482,192	1,872,938
1993	569,327	462,573	857,720	487,612	1,345,332
1994	798,937	443,785	1,207,520	479,249	1,686,769
1995	863,057	708,851	1,221,065	540,890	1,761,955
1996	575,357	638,588	699,078	142,742	841,820
1997	779,611	245,747	1,025,110	229,168	1,254,278
1998	702,274	112,315	1,125,898	372,674	1,498,572
1999	1,080,411	718,987	1,878,913	675,136	2,554,049
2000	728,906	170,075	1,095,729	192,130	1,287,859
2001	499,556	515,433	659,893	89,880	749,773
2002	746,908	1,349,460	957,824	222,625	1,180,449
2003	388,715	546,960	515,678	144,086	659,764
2004	570,836	597,766	744,870	127,443	872,313
2005	1,574,164	3,149,889	1,772,342	123,938	1,896,280
2006	1,432,937	1,581,255	2,050,493	385,530	2,436,023
2007	1,242,654	2,232,904	2,002,059	325,267	2,327,326
2008	1,331,397	2,219,488	2,035,508	318,413	2,353,921
2009	1,850,581	4,461,889	2,855,284	362,781	3,218,065
2010	623,597	7,739,240	1,264,714	112,703	1,377,417
2011	758,250	7,580,380	1,466,310	83,875	1,550,185
2012	1,666,056	4,819,440	2,762,953	315,128	3,078,081
2013	1,055,564	4,521,077	1,958,333	364,123	2,322,456
2014	737,345	3,655,134	1,325,748	226,394	1,552,142
2015	202,703	5,426,396	339,433	115,553	454,986
2016	1,130,681	6,225,783	2,013,905	273,848	2,287,753
2017	1,054,500	4,725,746	1,852,474	252,803	2,105,277
2018	499,562	16,426,445	728,401	151,750	880,151
2019	2,415,392	7,050,239	4,221,440	443,638	4,665,078
2020	1,605,722	5,428,135	2,827,646	653,092	3,480,738
2021	1,495,384	6,859,777	2,839,919	654,327	3,494,246
2022	1,802,527	11,462,872	3,358,921	520,937	3,879,858
2023	953,400	3,688,517	1,831,274	437,160	2,268,434
Mean	1,020,236	3,539,284	1,646,234	334,710	1,997,781

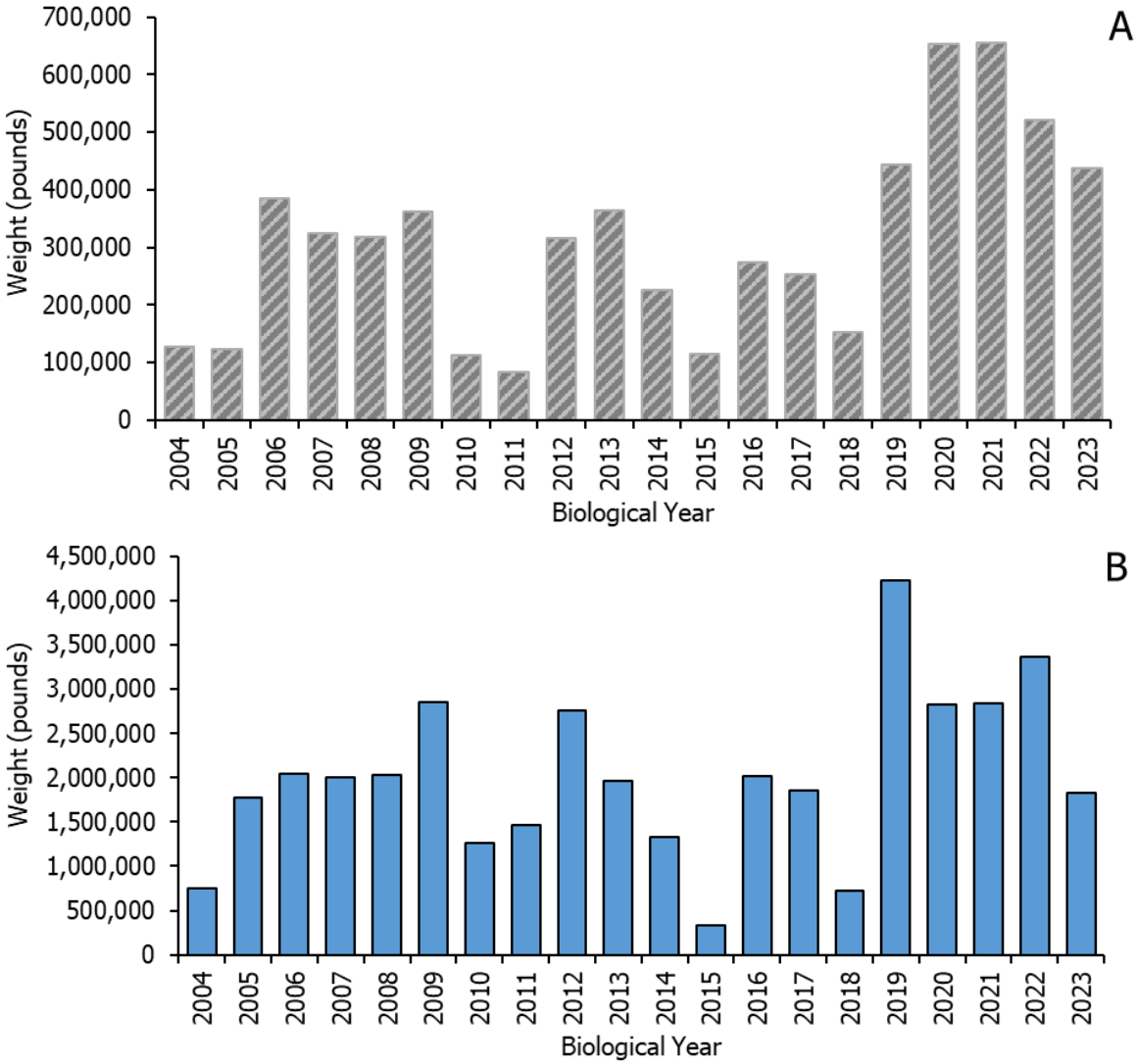

Figure 3. Commercial landings (pounds) reported through the North Carolina Trip Ticket Program (A) and recreational landings (Type A + B1; pounds) estimated from the Marine Recreational Information Program survey (B) for North Carolina, Biological Year 1991–2023. Biological Year is from March through February of the following year (e.g., Biological Year 2022 starts March 2022 and ends February 2023). *Data from the January and February portion of biological year 2023 is preliminary.

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 biological year 2023 was 953,400 fish corresponding to 1,831,274 pounds representing a sharp decrease from recent years (Table 1; Figure 3). Recent years (biological years 2019-2022) represent four of the top five recreational pounds landed in the time series. Estimated recreational releases in biological year 2023 (3,688,517 fish; Table 1) were also well below recent years and more in line with the

time series average of 3,539,102 fish (Table 1). There are many potential reasons for a decrease in recreational landings, some of which could indicate early warning signs of problems. For example, less fish landed because there are less fish available for harvest would indicate a decline in the population. However, other possible reasons could indicate benefits to the stock. For example, less fish landed because less people are fishing for spotted seatrout would indicate a decrease in fishing effort but not necessarily a decline in abundance. While the landings decrease in 2023 could be yellow flag, harvest alone is not a good indicator of abundance, therefore other indicators should be examined (see Monitoring Program section).

Table 2. Total number of awarded citations for spotted seatrout (>24 inches total length for release or >5 pounds landed) from the North Carolina Saltwater Fishing Tournament, calendar years 1991–2023.

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
2022	1,094	485	44
2023	1,183	581	49

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

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 396 citations (Table 2; Figure 4) with a generally increasing trend since 2012. The number of awarded citations in calendar year 2023 (1,183 citations) increased for the fifth year in a row and was the highest number of citations in the time-series. The number of release citations (fish over 24 inches that are released) awarded has generally increased since release citations began in 2008. Calendar year 2023 (581 release citations) was the highest since release citations began in 2008 and represents an increase of just under 100 citations from calendar year 2022 (485 release citations). The percentage of spotted seatrout release citations (49%) was the time-series high and represents the third year in a row of a time-series high and an almost even split between release and harvest citations (Table 2).

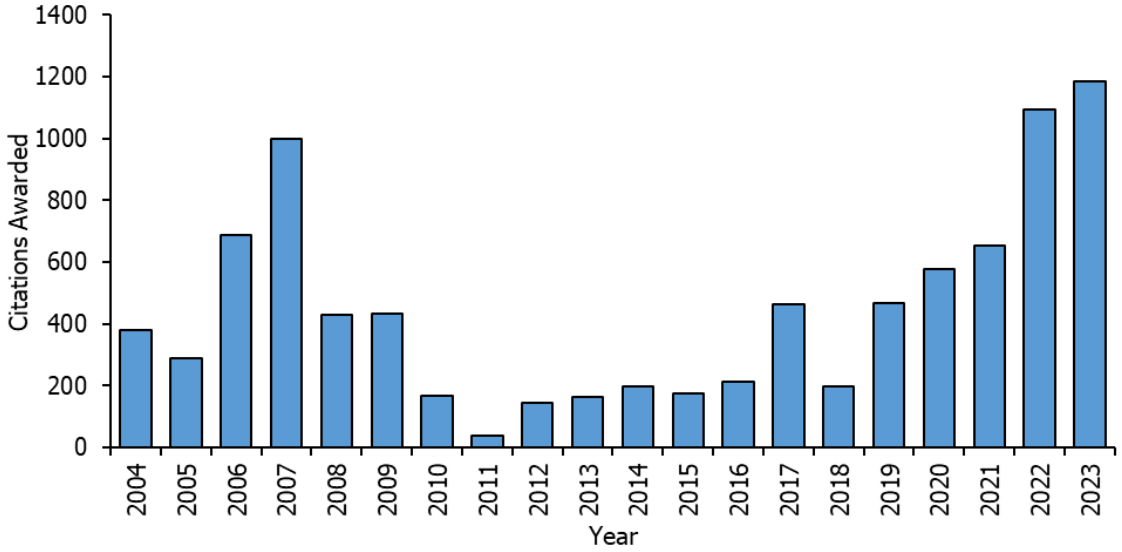

Figure 4. North Carolina Saltwater Fishing Tournament citations awarded for spotted seatrout, calendar years 1991–2023. Citations are awarded for spotted seatrout >24-inches total length for release or >5 pounds landed. Release citations began in 2008.

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; however, modal length for the commercial fishery in 2023 was the same as the recreational fishery (both 16 inches fork length) and was likely driven by an increase in larger fish caught recreationally in recent years (Table 3; Figure 5). Undersized fish represent a small portion of the harvest in both sectors; 2.0% of commercial harvest and 1.5% of the recreational harvest was below the 14-inch size limit in 2023 (Figure 5).

Table 3. Mean, minimum, and maximum lengths (fork length, inches) of spotted seatrout measured from the commercial and recreational fisheries, calendar years 1991–2022.

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
2022	17.9	13.2	28.3	3,314	17.4	12.6	28.0	632
2023	17.4	8.7	27.9	2,585	17.3	12.6	25.9	516

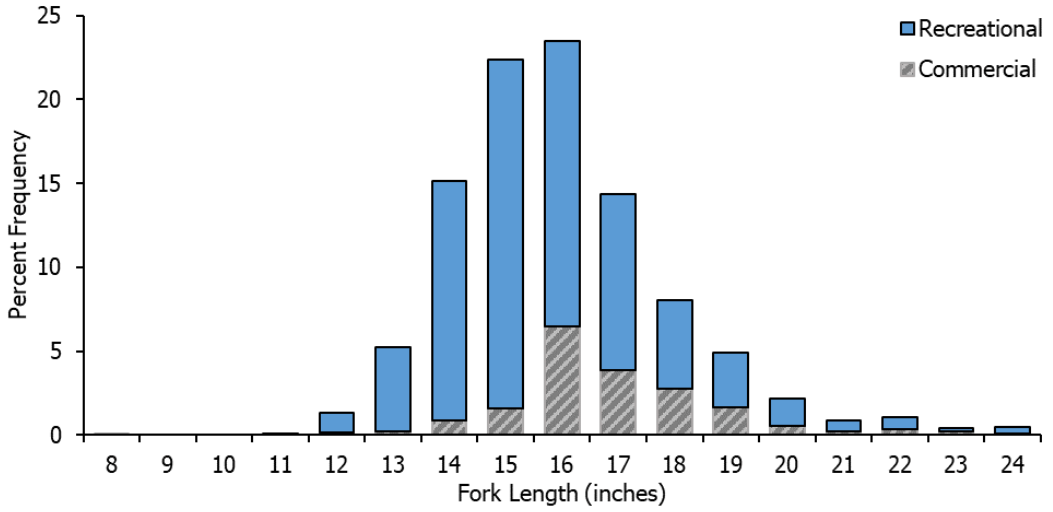

Figure 5. Commercial and recreational length frequency distribution from spotted seatrout harvested in biological year 2023.

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 2023 (17.4 inches fork length) was slightly higher but similar to the time series (1991-2022) average (16.7 inches fork length) and the mean length in 2022 (17.9 inches fork length). Minimum length (8.7 inches fork length) was well below the minimum length in 2022 (13.2 inches fork length; Table 3; Figure 6); however, 2022 minimum length is somewhat of an outlier for the timeseries. The 2023 minimum length is around the time series average (~8 inches fork length). Maximum length in 2023 decreased slightly to 27.9 inches fork length and was slightly below the time series average (~29 inches fork length). Most spotted seatrout landings by the commercial fishery in 2023 came from the run around and anchored gill net fisheries (61% and 32% respectively) with pound nets (2%), and all other gears (5%; mainly beach seines, swipe nets, and haul seines) accounting for the rest.

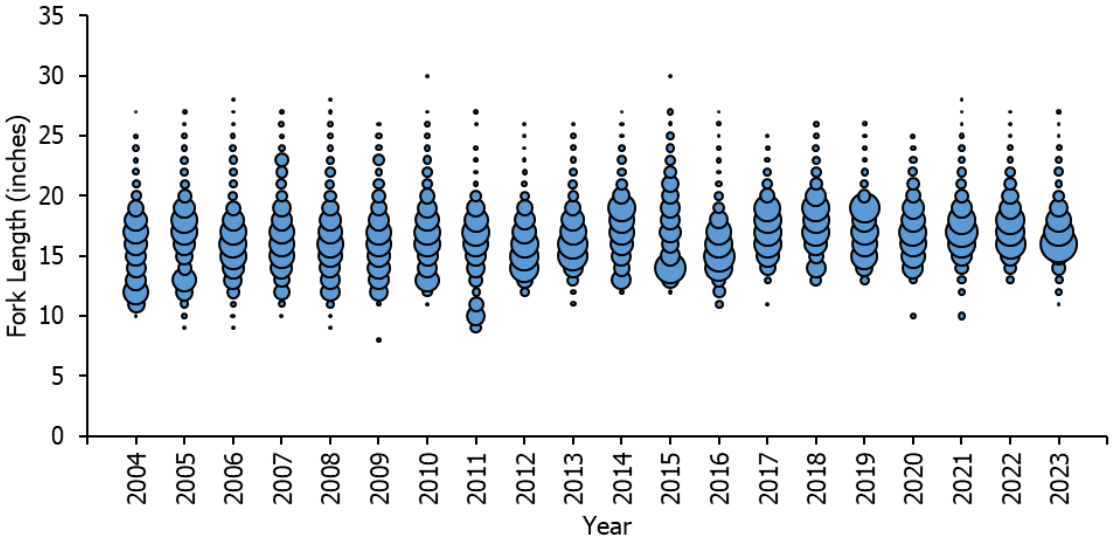

Figure 6. Commercial length frequency (fork length, inches) of spotted seatrout harvested biological year 1993-2023. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Recreational catch is almost exclusively hook-and-line. The mean length from the recreational fishery in 2023 (17.3 inches fork length) was similar to the previous four years while the minimum length (12.6 inches fork length) was the same as the previous year (Table 3). Maximum length (25.9 inches fork length) was a decrease from the previous three years (Table 3). Ninety percent of the spotted seatrout sampled from the recreational fishery in 2022 were between 14 and 19 inches (Figure 5 and Figure 7).

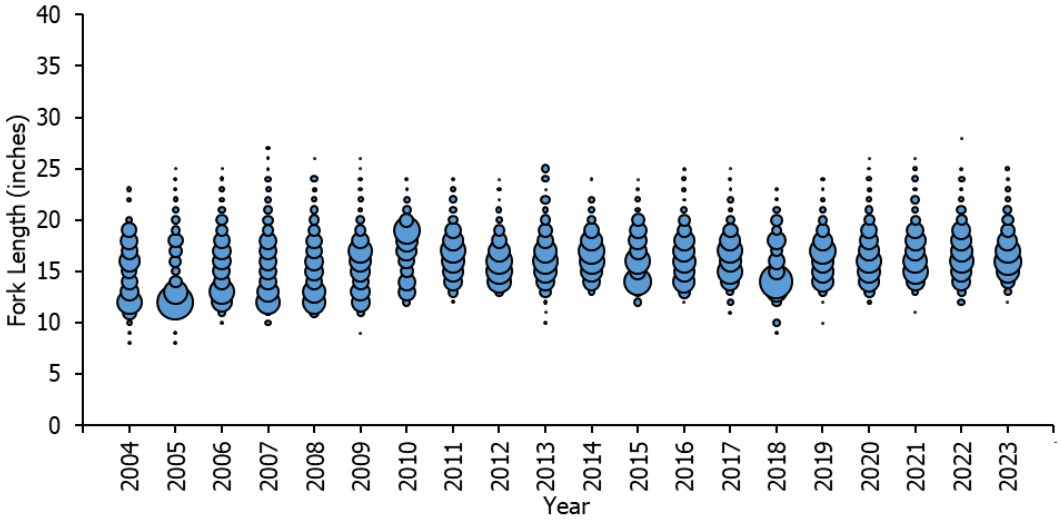

Figure 7. Recreational length frequency (fork length, inches) of spotted seatrout harvested biological year 1991–2023. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Fishery-Independent Monitoring

The DMF utilizes numerous fishery independent monitoring programs to provide indices of juvenile (Program 120) and adult (Program 915) relative 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 2023 was 1.04 spotted seatrout per tow, which was an increase from the 2022 value (0.68 spotted seatrout per tow). The 2023 relative abundance index was somewhat lower than the time series mean (2004 - 2022; 1.91 spotted seatrout per tow) and represents the fifth year in a row of lower than time series average relative juvenile abundance index values.

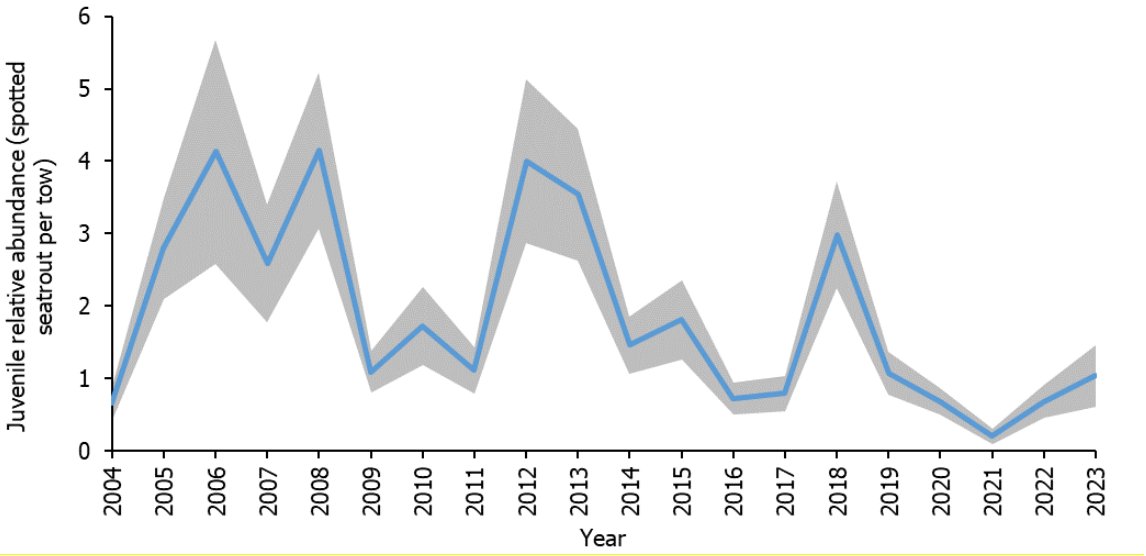

Figure 8. Relative abundance index (fish per tow) from the North Carolina Estuarine Trawl Survey (Program 120) during June and July, 2004–2023. Error bars represent ± 1 standard error.

The DMF 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, the central river stations include the Pamlico, Pungo, and Neuse rivers, and the southern river stations include the Cape Fear and New rivers. In the 2022 Spotted Seatrout Stock Assessment, the northern stations (i.e., the Pamlico Sound and Central River stations) were combined then separated into spring (April - June) and fall (September - November) indices of abundance (NCDMF 2022). 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. Relative abundance in the Fall Index has been relatively consistent since 2006 with some variation around the time series mean (0.95 spotted seatrout per set) with a large spike in relative abundance in 2019 to the time series high (2.10 spotted seatrout per set). Fall relative abundance in 2023 was the second highest in the time series (1.87 spotted seatrout per set; Figure 9). The Spring Index has been more variable throughout the time series. However, 2019 also represented a timeseries high in relative abundance (1.50 spotted seatrout per set; Figure 10). Sampling in Program 915 did not resume until July of 2021, therefore there is no Spring Index in 2021. Relative abundance in 2023 (1.01 spotted seatrout per set) was well above the mean relative abundance value in the time series (0.52 spotted seatrout per set).

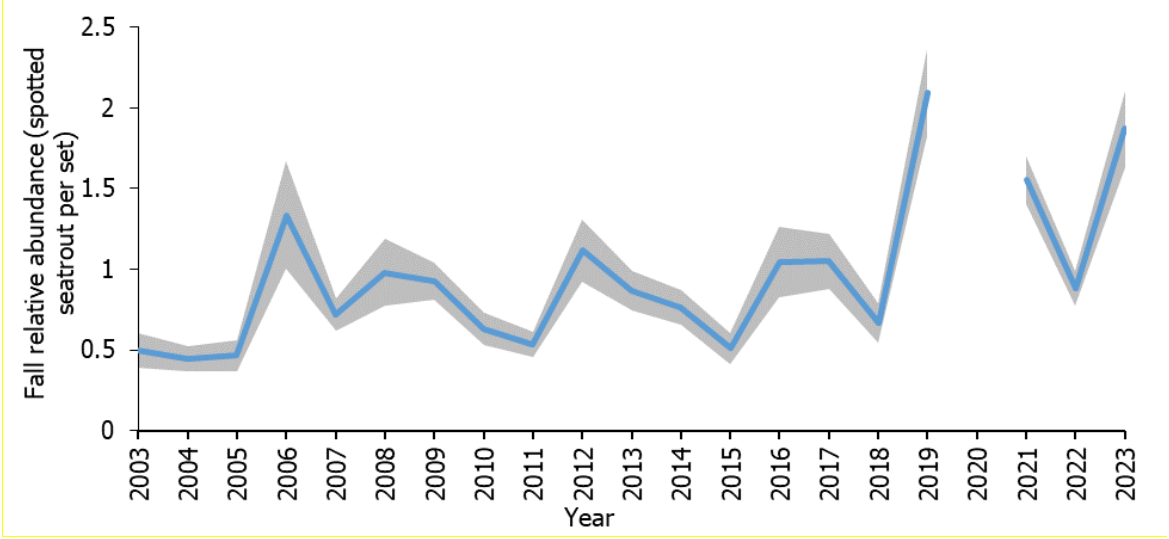

Figure 9. Fall relative abundance index (fish per set) of spotted seatrout collected from Program 915 in Pamlico Sound, Pamlico River, Pungo River, and Neuse River during September, October, and November 2003–2023. Error bars represent ± 1 standard error. Sampling not conducted in 2020 for the Fall Index.

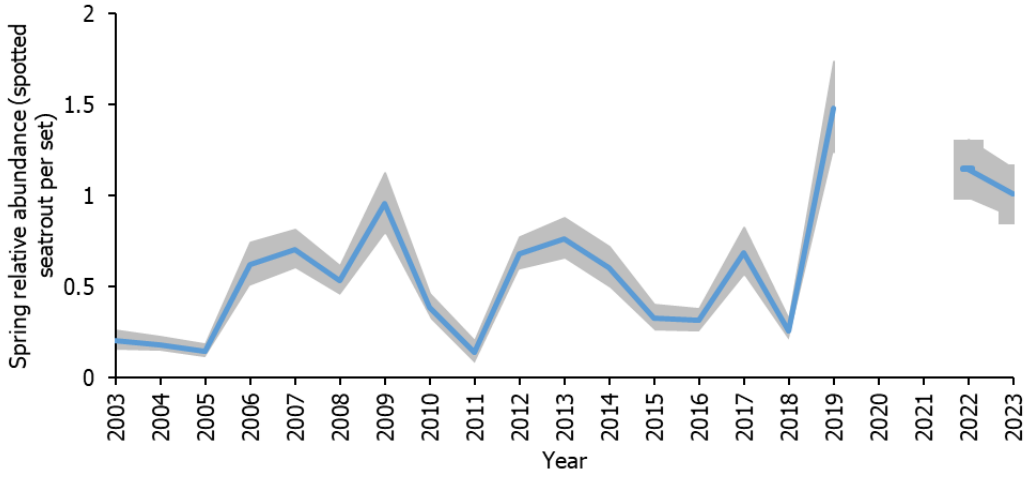

Figure 10. Spring relative abundance index (fish per set) of spotted seatrout collected from Program 915 in Pamlico Sound, Pamlico River, Pungo River, and Neuse River during April, May, and June 2003–2023. Error bars represent ± 1 standard error. *Sampling not conducted in 2020 or April, May, and June of 2021.

Spotted seatrout age samples are collected from numerous DMF fishery independent and dependent sources. To date, a total of 22,521 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 DMF has recorded this information. Maximum ages have varied every year, ranging from age five to age nine. Modal ages gives an indication of the age of the largest age cohort in the fishery and averages just over age one meaning one year old spotted seatrout are consistently the largest age cohort. Spotted seatrout length-at-age was summarized based on all available age data (1991 - 2023; Figure 11). Spotted seatrout grow quickly until around age 4 when growth rates generally slow. For example, fish as large as 24.7 inches have the potential to be young of the year (age 0). In 2023, the number of fish aged

(1,045 fish) increased from the previous year (812 fish). Spotted seatrout sampled in 2023 had a modal age of 2 and maximum age of 8. The maximum age matches the second oldest maximum age in the time series (2006, 2007, and 2019).

Table 4. Modal age, minimum age, maximum age, and number aged for spotted seatrout collected through DMF sampling programs, calendar years 1991–2023.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1991	1	0	7	698
1992	1	0	6	572
1993	1	0	6	654
1994	1	0	9	691
1995	1	0	5	653
1996	1	0	6	734
1997	1	0	6	715
1998	1	0	9	765
1999	1	0	6	876
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	972
2007	2	0	8	703
2008	1	0	7	619
2009	2	0	6	661
2010	1	0	6	623
2011	1	0	6	421
2012	1	0	5	595
2013	2	0	5	635
2014	1	0	7	530
2015	2	0	5	450
2016	1	0	5	457
2017	1	0	7	881
2018	1	0	5	516
2019	1	0	8	1,173
2020	2	0	5	634
2021	1	0	6	1,002
2022	2	0	6	812
2023	1	0	8	1,045

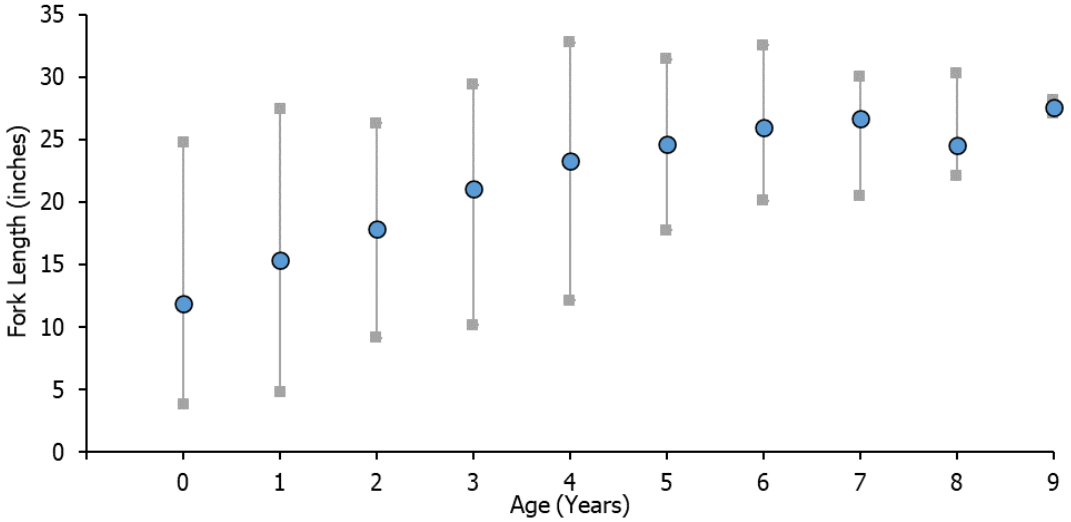

Figure 11. Spotted seatrout length at age based on all age samples collected from calendar year 1991 to 2023. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.

Tagging

DMF established the Multi-Species Tagging Program in 2014 designed to collect data on habitat use, migration patterns, population structure, and morality rates of cobia, red drum, southern flounder, spotted seatrout, and striped bass. Specifically, spotted seatrout are tagged with single yellow tags (low reward), single red tags (high reward), or double yellow tags. Since 2014, Division staff and Division trained volunteer taggers have tagged 13,161 spotted seatrout with 852 recaptures reported (Table 5). In 2023 specifically, Division staff and volunteers tagged 782 (Figure 12A) spotted seatrout with 29 reported recaptures (Figure 12B).

Table 5. Total tagged, total recaptured, average days at large, maximum days at large, average distance traveled (miles), and maximum distance traveled (miles) for spotted seatrout tagged in the DMF Multi-Species Tagging Program from calendar year 2014-2023.

Year Tagged	Total Tagged	Total Recaptured	Average Days at Large	Maximum Days at Large	Average Distance Traveled	Maximum Distance Traveled
2014	634	44	91	431	35	271
2015	1047	37	139	641	17	94
2016	1306	93	133	567	28	214
2017	2581	138	116	1099	29	208
2018	1464	67	200	904	60	202
2019	2619	257	169	1091	37	223
2020	1389	104	156	884	37	298
2021	518	35	144	777	32	151
2022	821	48	148	429	33	117
2023	782	29	89	302	36	231

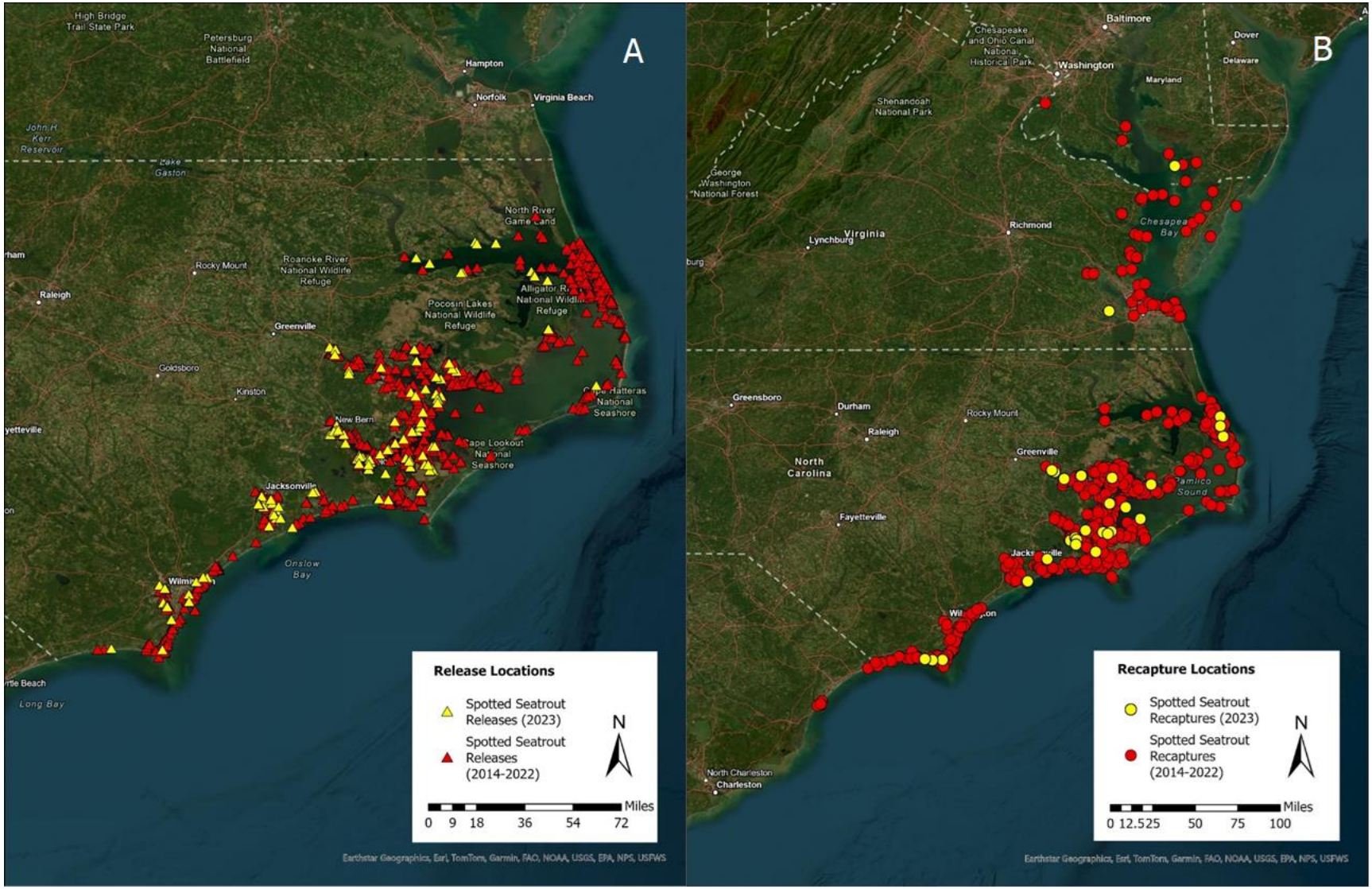

Figure 12. Spotted seatrout release (A) and recapture (B) locations for spotted seatrout tagged in the DMF Multi-Species Tagging Program from calendar year 2014-2023.

RESEARCH NEEDS

The following research needs were compiled from the original Spotted Seatrout FMP, the 2022 North Carolina Spotted Seatrout Stock Assessment Report, and the draft of Amendment 1 to the 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 Completed
- Size specific fecundity estimates for North Carolina spotted seatrout. — Not Completed
- 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, unsuccessfully attempted to directly incorporate cold stun event information into 2022 benchmark assessment but assessment was able to capture the signal of cold stun events, is being investigated further during Johnna Brooks PhD project
- Estimate or develop a model to predict the impact of cold stun events on local and statewide spotted seatrout abundance. — Ongoing. Unsuccessfully attempted using stock synthesis model from the 2012 stock assessment, 2022 benchmark assessment was able to capture the signal of cold stun events but not predict the impact, is being investigated further during Johnna Brooks PhD project
- Integrate tagging data into stock assessment model so both tagging data and other data sources can work together to give a better picture of the population. — Ongoing. Unsuccessfully attempted during benchmark stock assessment update, is being investigated further during Johnna Brooks PhD project
- Obtain samples (length, age, weight, quantification) of the cold stun events as they occur. — Ongoing: obtained samples in 2001, 2010, 2014, 2015, 2018, 2022; 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. — Ongoing. Upcoming job in ACFCMA grant studies

- 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
- Develop estimates of commercial discards for runaround nets. — Not Completed
- Conduct a detailed analysis of the existing Program 915 data to determine the extent to which late fall and spring provide insights into overwinter changes in abundance; this analysis could also provide insights into the magnitude of cold-stun events, which could explain differences in the effects observed in tagging and telemetry studies versus survey and fishery monitoring. — Not Completed
- Improve estimates of recreational discard mortality. — Not Completed

MANAGEMENT

The DMF management strategy is to maintain a spawning potential ratio of at least 20% to increase the likelihood of sustainability through an expanded age structure and an increase in the spawning stock biomass (see Tables 6 and 7 for management details). 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.

Table 6. Summary of the MFC 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 DMF 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 DMF, Universities, etc.	Preliminary research accomplished (Ellis et al. 2017a, 2017b), additional work ongoing.

Table 7. Summary of the MFC 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 15 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 MFC 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.

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

A comprehensive review of the plan is underway and tentatively scheduled for completion in February 2025. A benchmark stock assessment was completed October 2022, incorporating data through February 2020.

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