FISHERY MANAGEMENT PLAN UPDATE
STRIPED MULLET
AUGUST 2022

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	April 2006	
Amendments:	Amendment 1	November 2015
Revisions:	None	
Supplements:	None	
Information Updates:	None	
Schedule Changes:	None	
Comprehensive Review:	July 2020	

The North Carolina Striped Mullet Fishery Management Plan (FMP) was adopted in April 2006. The management plan established minimum and maximum commercial landings triggers of 1.3 and 3.1 million pounds (NCDMF 2006). If annual landings fall below the minimum trigger, the North Carolina Division of Marine Fisheries (NCDMF) would determine whether the decrease in landings is attributed to stock decline, decreased fishing effort, or both. If annual landings exceed the maximum trigger, NCDMF would determine whether harvest is sustainable and what factors are driving the increase in harvest. The striped mullet FMP established a daily possession limit of 200 mullets (white and striped in aggregate) per person per day in the recreational fishery.

Amendment 1 to the FMP was adopted in November 2015, and the subsequent rules were implemented in April 2016. Amendment 1 resolved issues with Newport River gill net attendance, mitigated known user group conflicts, updated the management framework, and updated minimum and maximum commercial landings triggers to 1.13 and 2.76 million pounds (NCDMF 2015). Amendment 1 maintains the 200-mullet possession limit per person in the recreational fishery.

Commercial landings in 2016 were 965,198 pounds, which is below the minimum landings trigger of 1.13 million pounds (Figure 3A). As required by the FMP, the NCDMF initiated data analysis in July 2017 to determine whether the decrease was attributed to a stock decline, decreased fishing effort, or both. The NCDMF presented preliminary findings and recommendations to the North Carolina Marine Fisheries Commission (NCMFC) during its November 2017 business meeting. It was determined by the NCDMF that no management actions were necessary at that time, but a more comprehensive analysis with data through 2017 was needed.

The NCDMF presented results of their comprehensive analysis at the February 2018 NCMFC business meeting and concluded the stock had likely declined since completion of the 2013 stock

assessment, which had a terminal year of 2011. The NCDMF recommended updating the 2013 stock assessment model to include data through 2017 prior to taking management action. As an assessment update, there were no changes to model parameters and peer review was not required, as the configuration of the model that previously passed peer review was maintained. Results of the stock assessment indicated overfishing was not occurring through 2017 but could not determine if the stock was overfished (NCDMF 2018).

Subsequent management options were developed by the NCDMF and presented to the Finfish, Southern, and Northern advisory committees in July 2018 to receive input prior to finalizing the NCDMF recommendation. Recommendations were then presented to the NCMFC at its August 2018 business meeting. The NCDMF and the advisory committees recommended no management action be taken since the stock assessment update indicated overfishing was not occurring. The NCDMF would, however, continue to monitor trends in the commercial fishery and fishery-independent indices. The recommendation was approved by the NCMFC.

Review of the 2021 commercial landings indicate neither the maximum or minimum triggers have been exceeded. Review of the FMP was initiated in 2020, following the FMP review schedule.

Management Unit

Coastal and joint waters of North Carolina.

Goal and Objectives

The goal of Amendment 1 to the North Carolina Striped Mullet FMP is to manage the striped mullet fishery to preserve the long-term viability of the resource, maintain sustainable harvest, maximize social and economic value, and consider the needs of all user groups. The following objectives will be used to achieve this goal:

- Use a management strategy that provides for conservation of the striped mullet resource and promotes sustainable harvest while considering the needs of all user groups.
- Promote the protection, enhancement, and restoration of habitats and water quality necessary for the striped mullet population.
- Minimize conflict among user groups, including non-fishing user groups and activities.
- Promote research to improve the understanding of striped mullet population dynamics and ecology to improve management of the striped mullet resource.
- Initiate, enhance, and/or continue studies to collect and analyze the socio-economic data needed to properly monitor and manage the striped mullet fishery.
- Promote public awareness regarding the status and management of the North Carolina striped mullet stock.

DESCRIPTION OF THE STOCK

Biological Profile

Striped mullet are found in a wide range of depths and habitats but primarily inhabit freshwater to estuarine environments until migrating to the ocean to spawn in the fall (Able and Fahay 1998; Pattillo et al. 1999; Cardona 2000; Whitfield et al. 2012). Striped mullet serve as an ecological link between some of the smallest aquatic organisms and the highest-level predators in the marine food chain. Striped mullet feed on microorganisms such as bacteria and single-celled algae found on aquatic plants, in mud, silt, sand and decaying plant material (Odum 1968; Moore 1974; Collins 1985a; Larson and Shanks 1996; Torras et al. 2000). In turn, striped mullet are prey to top predators such as birds, fish, sharks, and porpoises (Breuer 1957; Thomson 1963; Collins 1985a; Barros and Odell 1995; Fertl and Wilson 1997).

The male and female maximum ages for striped mullet in North Carolina are 14 and 13 years old and a 15-year-old striped mullet of unknown sex was observed in 2017 by NCDMF (NCDMF 2022). The maximum size of striped mullet in North Carolina is recorded at 27.5 inches' total length (NCDMF 2022).

Striped mullet are highly fecund (upwards of 4 million eggs for a large female: Bichy 2000) and spawn in large aggregations near inlets to offshore areas (Collins and Stender 1989). Spawning individuals have been reported from September to March; however, peak spawning activity occurs from October to early December (Bichy 2000). Skipped spawning has been exhibited by striped mullet on the east coast of Florida (Myers et al. 2020) and on the eastern coast of Australia (Fowler et al. 2016). Striped mullet in North Carolina appear to mature at a younger age and larger size than other striped mullet populations (Bichy 2000). Length at 50 percent maturity occurs at 11.1 inches fork length for males (Bichy 2000) and 12.6 inches fork length for females (NCDMF 2021a).

Stock Status

The 2022 North Carolina striped mullet stock assessment (NCDMF 2022) indicated the striped mullet stock in North Carolina is overfished and overfishing is occurring.

Stock Assessment

The North Carolina striped mullet stock was modeled using stock synthesis version 3.30, an integrated statistical catch-at-age, forward-projecting, length based, age-structured model using data from 1950 to 2019. Input data included commercial landings, recreational harvest, fisheries-independent survey indices (Program 915), and biological data collected.

Both the observed data and the model predictions suggest a decreased presence of larger, older striped mullet in the population. The model has estimated declining trends in age-0 recruitment and female spawning stock biomass (SSB) over the last several decades. Estimates of fishing mortality (F) exhibit an increasing trend. Model results also indicate consistent overestimation of biomass and the highest risk for overfishing.

A fishing mortality threshold of $F_{25\%}$ and a fishing mortality target of $F_{35\%}$ were maintained from the prior assessment since the fishery continues to target mature female fish during the spawning season and the ecological importance of striped mullet. Complementary reference points for stock size were adopted based on female SSB, $SSB_{25\%}$ and $SSB_{35\%}$. The stock assessment model estimated a value of 0.37 for $F_{25\%}$ and a value of 0.26 for $F_{35\%}$. These estimates represent numbers-weighted values for ages 1 through 5. Predicated F in 2019 is 0.42, which is larger than the $F_{25\%}$ threshold and so suggests that overfishing is occurring (Figure 1). The model estimated a value of 1,364,895 (619 metric tons) for the $SSB_{25\%}$ threshold and a value of 2,238,075 (1,015 metric tons) for the $SSB_{35\%}$ target. Female SSB in 2019 was estimated at 579,915 pounds (263 metric tons), which is smaller than the $SSB_{25\%}$ threshold and so suggests the stock is overfished (Figure 2).

An external peer review was held in April 2022. The panel concluded the assessment model and results ae suitable for providing management advice for at least the next five years. The Panel considers the current model a substantial improvement from the previous assessment, representing the best scientific information available for the stock.

DESCRIPTION OF THE FISHERY

Current Regulations

There are no size restrictions, but as of July 1, 2006, there is a 200 mullet (white and striped aggregate) daily possession limit per person in the recreational fishery and the mutilated finfish rule was modified in 2006 to exempt mullet from the requirements of the rule to continue allowing mullet to be used for cut bait.

Commercial Fishery

Historically, beach seines and gill nets are the two primary gear types used in the striped mullet commercial fishery, with most commercial landings prior to 1978 coming from the beach seine fishery. Gill nets (runaround, set, and drift) replaced seines as the dominant commercial gear type in 1979. Because the commercial fishery primarily targets striped mullet for roe, the fishery is seasonal with the highest demand and landings occurring in the fall when large schools form during their spawning migration to the ocean and females are ripe with eggs. Striped mullet are primarily targeted commercially using runaround gill nets in the estuarine and ocean waters of North Carolina. The striped mullet beach seine fishery primarily occurs in conjunction with the Bogue Banks stop net fishery. The stop net fishery has operated under fixed seasons and net and area restrictions since 1993. Stop nets are limited in number (four), length (400 yards), and mesh sizes (minimum eight inches outside panels, six inches middle section). Stop nets are only permitted along Bogue Banks (Carteret County) in the Atlantic Ocean from October 1 to November 30. However, the stop net season was extended to include December 3 to December 17 in 2015 due to minimal landings of striped mullet (Proclamation M-28-2015). In 2020 and 2021, the stop net fishery was open from October 15 through December 31 (Proclamations M-17-2020 and M-21-2021). Due to the schooling nature of striped mullet, the beach seine fishery has the potential to be, and historically has been, a high-volume fishery with thousands of pounds landed during a single trip. In addition, the use of cast nets in the striped mullet commercial fishery has been increasing since around 2003.

Since 1991, commercial landings have ranged from a low of 965,198 pounds in 2016 to a high 3,063,853 pounds in 1993 (Table 1; Figure 3A). From 2003 to 2009, landings were stable between 1,598,617 and 1,728,607 pounds before increasing to 2,082,832 pounds in 2010. Landings fluctuated annually between 1.5 and 2.0 million pounds from 2010 to 2014 before declining in 2015 and again in 2016, dropping below the minimum commercial landings trigger established by Amendment 1. Commercial landings in 2021 increased to 2,135,952 pounds, which is 1,005,952 pounds above the minimum commercial landings trigger.

Recreational Fishery

The federal Marine Recreational Information Program (MRIP) is primarily designed to sample anglers who use rod and reel as the mode of capture. Since most striped mullet are caught with cast nets for bait, striped mullet recreational harvest data are imprecise. In addition, angler misidentification between striped mullet and white mullet is common, and bait mullet are usually released by anglers before visual verification by creel clerks is possible. As such, mullets are not identified to the species level in the MRIP data (Catch Type B). Beginning in 2002, MRIP began deferring to mullet genus to classify unobserved type B1 (harvested/unavailable catch) and B2 (released/unavailable catch) catch. As a result, the magnitude of recreational harvest for mullet genus in units of numbers far exceeds that of both striped mullet and white mullet. This methodological improvement served to greatly increase the precision of estimates albeit without species level resolution. As such, estimates of recreational harvest for mullet prior to 2002 are considered unreliable.

The 2022 striped mullet stock assessment used the sum of recreational striped mullet harvest and a proportion of the recreational harvest of mullet genus for removals by the recreational fleet (NCDMF 2022). The proportion of mullet genus assumed to be striped mullet in the recreational harvest was 29%, a value derived from a study by the NCDMF of cast net recreational harvest for striped mullet (NCDMF 2006).

Recreational harvest peaked in 2002 and 2003 at greater than four million fish harvested (Table 1, Figure 3B). From 2004 to 2017 recreational harvest remained stable at around one million fish before declining in 2018, 2019 and 2020 to around 500,000 fish. This decline was likely related to decreased abundance of striped mullet and regulations that drastically shortened the recreational fishing season for southern flounder, a fishery where live mullet is a popular bait. Recreational harvest in 2021 was 1,484,850 fish.

The length-frequency distributions collected in North Carolina's MRIP survey are considered to be an inaccurate representation of the recreational fishery. This is due to biases in the methodology of the program and angler behavior. Lengths collected in North Carolina's MRIP survey are recorded at the dock and therefore only represent fish brought back to be kept by the angler. Anglers typically only keep the largest mullet, whether it be for personal consumption, or to be saved for use as cut bait. This bias toward keeping only the largest striped mullet has caused them to be disproportionately represented in the MRIP data. The vast majority of striped mullet harvested in the recreational fishery are used as live bait for other fisheries. For this type of fishing, "finger mullet", or age-0 fish, approximately four inches in total length are used.

Striped mullet harvest data from the Recreational Commercial Gear License (RCGL) were collected from 2002 to 2008. The program was discontinued in 2009 due to a lack of funding and the minimal contributions from RCGL to overall harvest. From 2002 through 2008, an average of 41,512 pounds of striped mullet were harvested per year using a RCGL (NCDMF 2021b).

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

The number of striped mullet measured per year in fishery-dependent programs between 1994 and 2021 ranged from 123 to 13,212 with the lowest number measured in 1996 (Table 2). In 2021, 7,239 striped mullet were measured from commercial catches; a more than 70% increase from the previous year. Variation in mean length was low, usually falling between 12.0- and 14.5-inches fork length (FL), with the lowest mean length occurring in 1997 (12.8 inches FL). Minimum and maximum lengths fell within a small range with maximum length ranging from 20.0 to 28.0 inches fork length, though in 1994 and 1996, maximum length was below 20.0 inches (Table 3).

From 1994 through 2021 the size range of striped mullet captured in the commercial fishery as determined from commercial fish house samples ranged from 6.0 to 28.0 inches FL (Figure 4). Modal length generally falls between 11.0 and 15.0 inches. In all years there are few striped mullet over 18.0 inches present in the catch.

Fishery-Independent Monitoring

The Fishery-Independent Gill-Net Survey (Program 915), began in 2001 and included sampling in the Pamlico Sound along the Hyde and Dare County shorelines. In July 2003, sampling was expanded to include the Neuse, Pamlico, and Pungo rivers. Additional areas in the Southern District including the New and Cape Fear rivers were added in April 2008. A stratified random sampling design is used based on area and water depth. Sampling occurs from mid-February to mid-December using an array of gill nets with stretched mesh sizes ranging from 3.0 inches to 6.5 inches.

To provide the most relevant indices for use in the 2022 stock assessment, Program 915 data were limited to those collected from shallow water during August through December. A combined index, with a starting year of 2008 and data collected from the Pamlico Sound, Pamlico River, Pungo River, Neuse River, and New River was calculated. Relative abundance increased through 2011 before declining to its lowest point in 2015 (Figure 5). Since 2015, abundance has increased with peaks in 2018 and 2021.

From 2008 to 2021, the size of striped mullet captured during the August to November portion of Program 915 in the Pamlico Sound, Pamlico River, Pungo River, Neuse River, and New River ranged from 7.0 to 26.0 inches FL (juveniles excluded, see NCDMF 2022 for juvenile length cut offs; Figure 6). Modal length ranged from 11.0 to 13.0 inches FL and was 12.0 inches FL in most years. Few striped mullet less than 10.0 inches FL and greater than 15.0 inches FL are captured in this survey.

During 2020 no indices of abundance are available for striped mullet from Program 915. Sampling in this program was suspended in February 2020 due to COVID-19 restrictions and protected species interactions but resumed July 2021.

Striped mullet age samples are collected from numerous NCDMF fishery independent and dependent sources. Modal age was two in all years except 1996, 1999, 2001, 2003 and 2005 when modal age was one, and 2017 when modal age was 1-2 (Table 3). Minimum age was zero in every year except 2010 when the minimum age was one. Maximum age ranged from six in 1996, 2012, 2014, and 2015 to 15 in 2017. There is substantial overlap in length at age for striped mullet (Figure 7). Striped mullet grow quickly from age 0 to age 2 before growth slows after age 3.

RESEARCH NEEDS

The following research needs were compiled from those listed in the 2022 Striped Mullet Stock Assessment (NCDMF 2022). Improved assessment and management of striped mullet is dependent upon research needs being met. Research needs are broken into high, medium, and low priority.

High

- Increase sampling of recreational mullet catches to determine the proportion of striped versus white mullet and improve estimates of recreational landings.
- Improve characterization of the length and age structure of recreational fisheries removals by increasing the number of age samples and number of trips sampled for lengths and ages from fisheries-dependent sources.
- Develop a reliable fisheries-independent abundance index for larger juveniles to characterize trends in recruitment.
- Consider expanding Program 915 to include the northern part of the state (Albemarle sound and major tributaries).
- Evaluate the current sampling methodology of Program 146 and effectiveness for sampling striped mullet; since this survey was not considered useful for the assessment of striped mullet, consider dropping this survey and focusing effort elsewhere if it is not contributing to management of other species.
- Consider running a simpler, single-sex version of the stock assessment model.

Medium

- Consider a tagging program to provide estimates of stock size, F, and M.
- Consider genetic and/or tagging studies to examine extent of the unit stock on a regional basis for the south Atlantic as well as the Gulf of Mexico.
- Expand ichthyoplankton survey to other inlets throughout the state.
- Conduct an age validation study of known age fish to provide estimates of ageing error.

- Consider alternative weighting of data sources in future stock assessments.
- Develop estimates of fecundity for North Carolina striped mullet.

Low

- Perform an acoustic tagging study to evaluate spatial and temporal variation in habitat use to more effectively design and conduct fisheries-independent surveys.
- Investigate the predation impact on striped mullet; striped mullet is widely believed to be an important forage species but there is little evidence to support this claim in the North Carolina stock.
- Investigate environmental factors that influence the spatial and temporal distribution of larval striped mullet.

MANAGEMENT STRATEGY

The management strategy for the striped mullet fisheries in North Carolina is to: 1) optimize resource utilization over the long-term; 2) reduce user group conflicts; 3) promote public education. The first strategy will be accomplished by protecting critical habitats and monitoring stock status. To address user group conflicts, a rule change was made to limit how much of a waterway may be blocked by runaround, drift, or other non-stationary gill nets. Specific user group conflicts will continue to be dealt with on a case-by-case basis and management actions will be implemented to address specific fishery-related problems. Issues addressed in formulating Amendment 1 of the management plan for North Carolina's striped mullet fishery included: 1) resolution of the Newport River gill net attendance; 2) user group conflicts; 3) updating the management framework for the N.C. striped mullet stock.

Minimum and maximum landings triggers of 1.13 and 2.76 million pounds have been established to monitor the striped mullet fishery. If landings fall below the minimum landings trigger or exceed the maximum landings trigger, the NCDMF will determine if a new stock assessment and/or interim management action is needed. The management strategy is under review as part of the scheduled review of the plan and the overfished and overfishing stock status determined from the most recent stock assessment.

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

Striped mullet commercial landings in 2021 were 2,135,952 pounds, which is above the minimum and below the maximum commercial landing triggers established in Amendment 1. Review of the plan is underway. Results of the 2022 striped mullet stock assessment (NCDMF 2022) indicate the North Carolina striped mullet stock is overfished and overfishing is occurring through the terminal year of 2019. As statutorily required, management measures will be developed through Amendment 2 to end overfishing and rebuild spawning stock biomass.

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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, 1991–2021. Number released and weight landed cannot be determined because of uncertainty in reported species identification.

	Recreational			Commercial	
Year	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight (lb)
1991	.	.	.	1467448	1467448
1992	.	.	.	1820494	1820494
1993	.	.	.	3063853	3063853
1994	.	.	.	1726242	1726242
1995	.	.	.	2298446	2298446
1996	.	.	.	1756863	1756863
1997	.	.	.	2442657	2442657
1998	.	.	.	2218108	2218108
1999	.	.	.	1460850	1460850
2000	.	.	.	2829086	2829086
2001	.	.	.	2317655	2317655
2002	5967684	.	.	2596304	2596304
2003	4090368	.	.	1629314	1629314
2004	1394707	.	.	1598617	1598617
2005	1312234	.	.	1620394	1620394
2006	1059444	.	.	1728607	1728607
2007	1766373	.	.	1668804	1668804
2008	1191633	.	.	1675859	1675859
2009	1167086	.	.	1685615	1685615
2010	1319070	.	.	2082832	2082832
2011	1139786	.	.	1627894	1627894
2012	1369975	.	.	1859587	1859587
2013	1453038	.	.	1549157	1549157
2014	1352690	.	.	1828351	1828351
2015	1420378	.	.	1247044	1247044
2016	1491533	.	.	965337	965337
2017	1537183	.	.	1366351	1366351
2018	489321	.	.	1314385	1314385
2019	562089	.	.	1362217	1362217
2020	531875	.	.	1299464	1299464
2021	1484850	.	.	2135952	2135952
Total	1671366	.	.	1803594	1803594

Table 2. Mean, minimum, and maximum lengths (fork length, inches) of striped mullet measured from the commercial fisheries, 1994–2021.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1994	13.0	6.1	19.1	302
1995	14.5	9.3	21.6	255
1996	13.5	10.0	18.5	123
1997	12.8	9.2	22.8	2,048
1998	13.1	8.6	25.4	1,600
1999	13.4	8.7	23.9	1,759
2000	13.4	8.3	23.5	7,522
2001	14.1	8.1	20.9	5,726
2002	13.2	5.9	21.3	10,989
2003	13.2	6.3	24.5	7,170
2004	13.1	7.6	24.4	12,778
2005	13.5	7.8	22.6	10,270
2006	13.7	7.8	22.2	12,108
2007	13.5	7.1	27.5	12,141
2008	14.1	8.4	24.1	13,212
2009	14.1	8.0	22.4	8,241
2010	13.9	8.1	22.7	10,991
2011	13.9	6.5	22.1	7,750
2012	14.0	7.9	22.2	12,833
2013	14.2	8.3	24.3	8,535
2014	13.8	7.7	24.0	6,517
2015	14.2	8.1	24.9	5,923
2016	14.3	8.9	24.1	5,661
2017	14.2	7.8	28.6	4,480
2018	14.5	8.3	22.5	4,111
2019	14.6	8.7	22.8	4,922
2020	13.8	8.3	21.9	4,246
2021	14.3	8.8	24.7	7,239

Table 3. Modal age, minimum age, maximum age, and number aged for striped mullet collected through NCDMF sampling programs, 1996–2021. Age data from 2021 are preliminary.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1996	1	0	6	163
1997	2	0	7	344
1998	2	0	7	717
1999	1	0	8	753
2000	2	0	10	1,122
2001	1	0	11	705
2002	2	0	7	625
2003	1	0	13	765
2004	2	0	9	1,142
2005	1	0	10	654
2006	2	0	10	685
2007	2	0	10	699
2008	2	0	10	771
2009	2	0	13	349
2010	2	1	8	748
2011	2	0	14	633
2012	2	0	6	873
2013	2	0	7	850
2014	2	0	6	855
2015	2	0	6	769
2016	2	0	8	956
2017	1-2	0	15	695
2018	2	0	10	770
2019	2	0	13	827
2020	2	0	7	269
2021	2	0	10	933

FIGURES

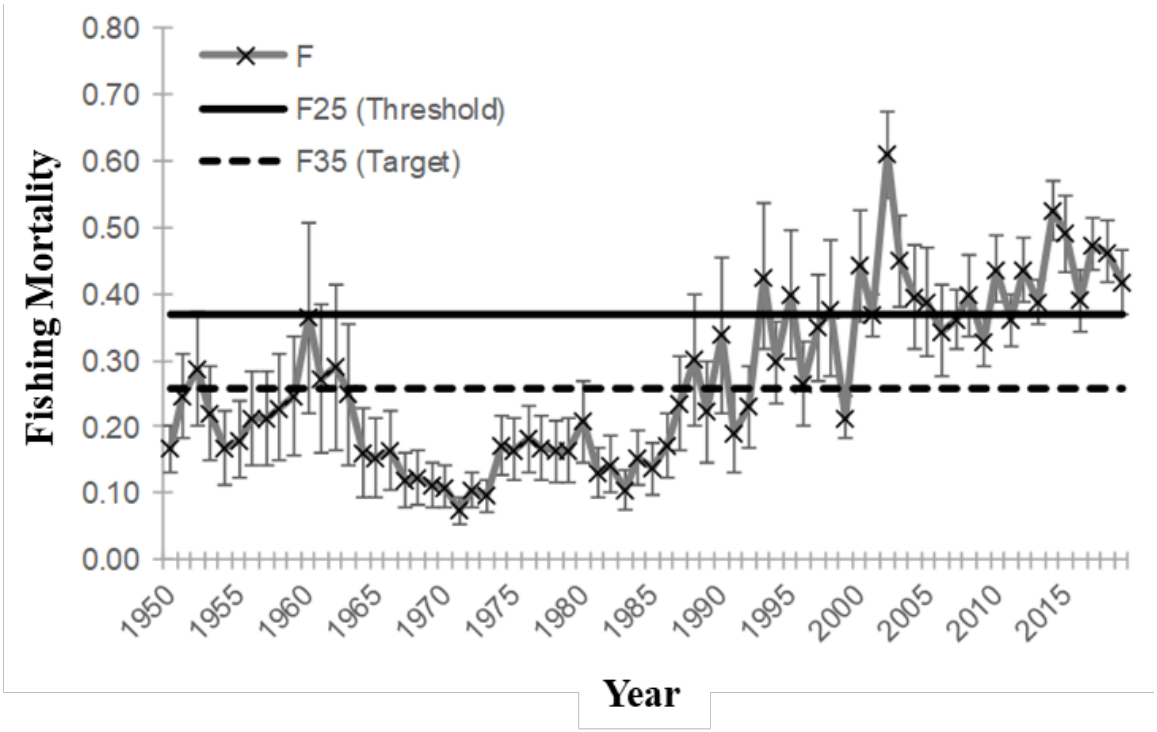

Figure 1. Annual predicted fishing mortality rates (numbers-weighted, ages 1–5) compared to estimated FThreshold (F25%) and FTarget (F35%), 1950–2019. 2019 is the terminal year for the most recent striped mullet stock assessment (NCDMF 2022).

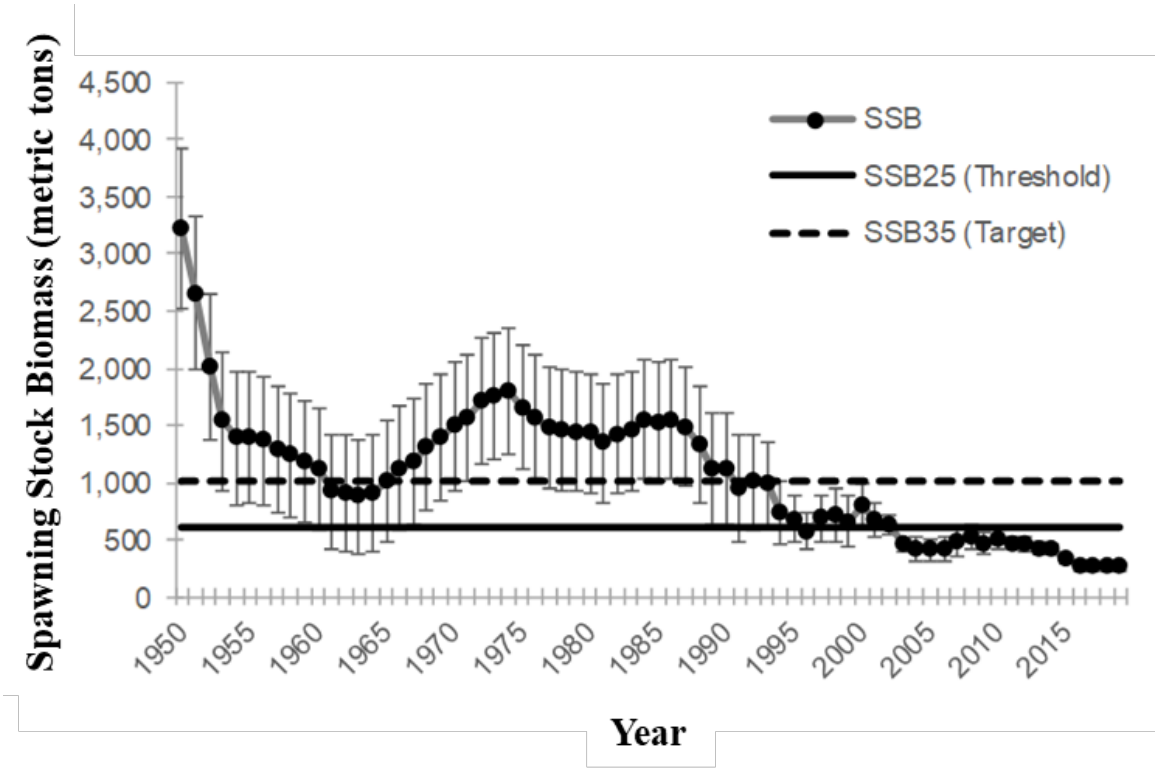

Figure 2. Annual predicted spawning stock biomass in metric tons, compared to estimated SSBThreshold (SSB25%) and SSBTarget (SSB35%), 1950–2019. 2019 is the terminal year for the most recent striped mullet stock assessment (NCDMF 2022).

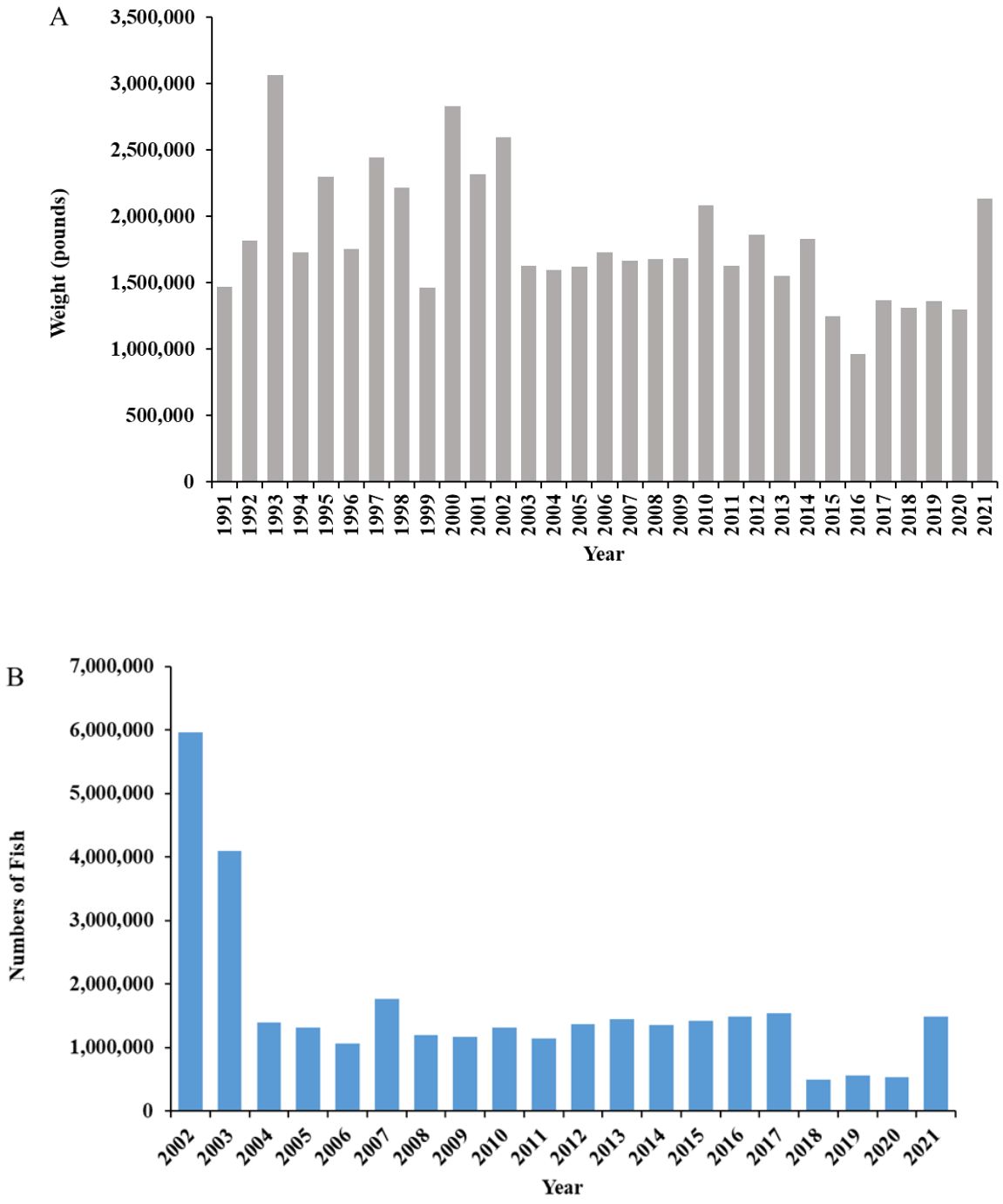

Figure 3. Striped mullet commercial landings (pounds) reported through the North Carolina Trip Ticket Program (A), 1991–2021. Recreational landings (Type A + B1; numbers of fish) includes estimates of striped mullet plus 29% of the mullet genus harvest from the Marine Recreational Information Program survey for North Carolina, 2002–2021 (B).

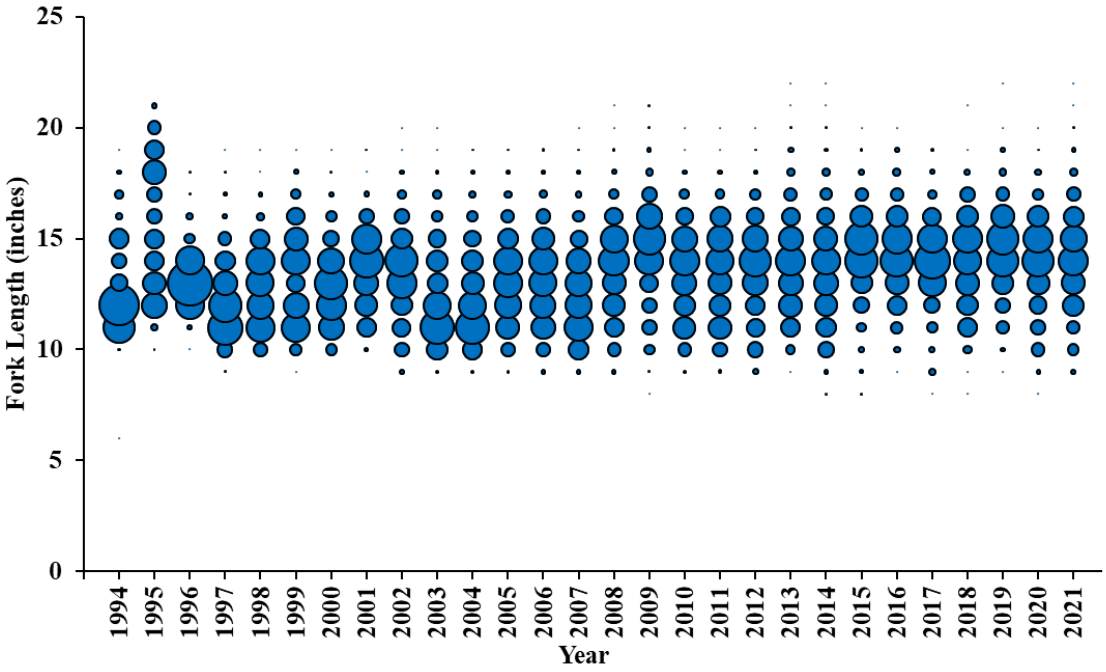

Figure 4. Commercial length frequency (fork length, inches) of striped mullet harvested, 1994–2021. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

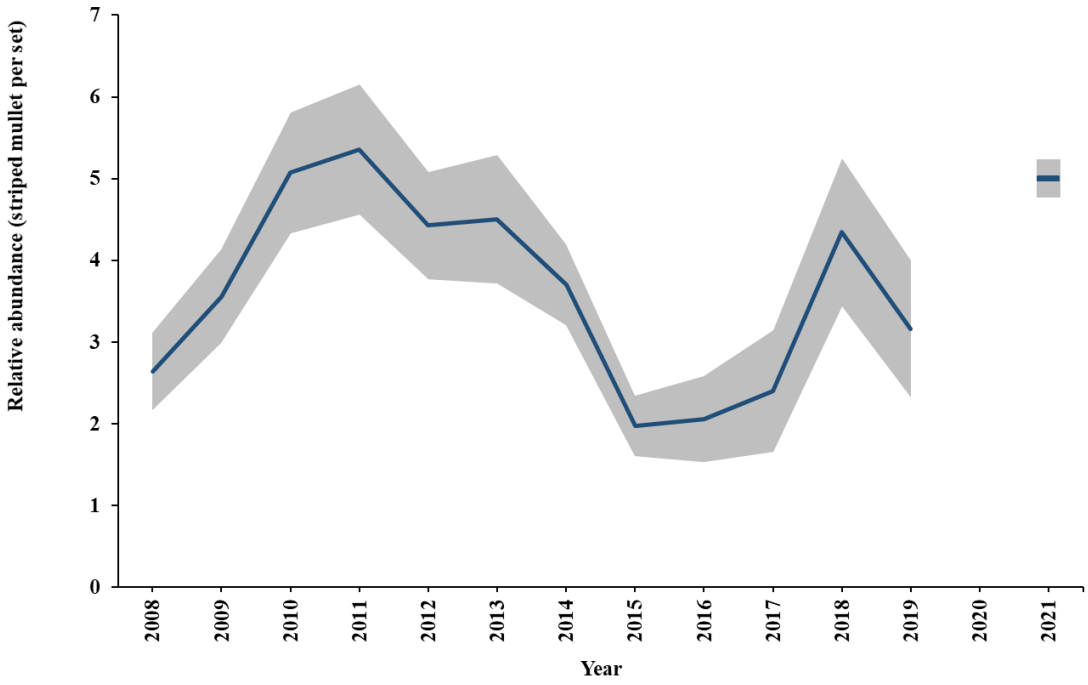

Figure 5. Relative Abundance index (fish per set) of striped mullet collected from Program 915 in Pamlico Sound, Pamlico, Pungo, Neuse and New rivers from August-December 2008–2021. Gray shading represent ± 1 standard error. Sampling was not conducted in 2020.

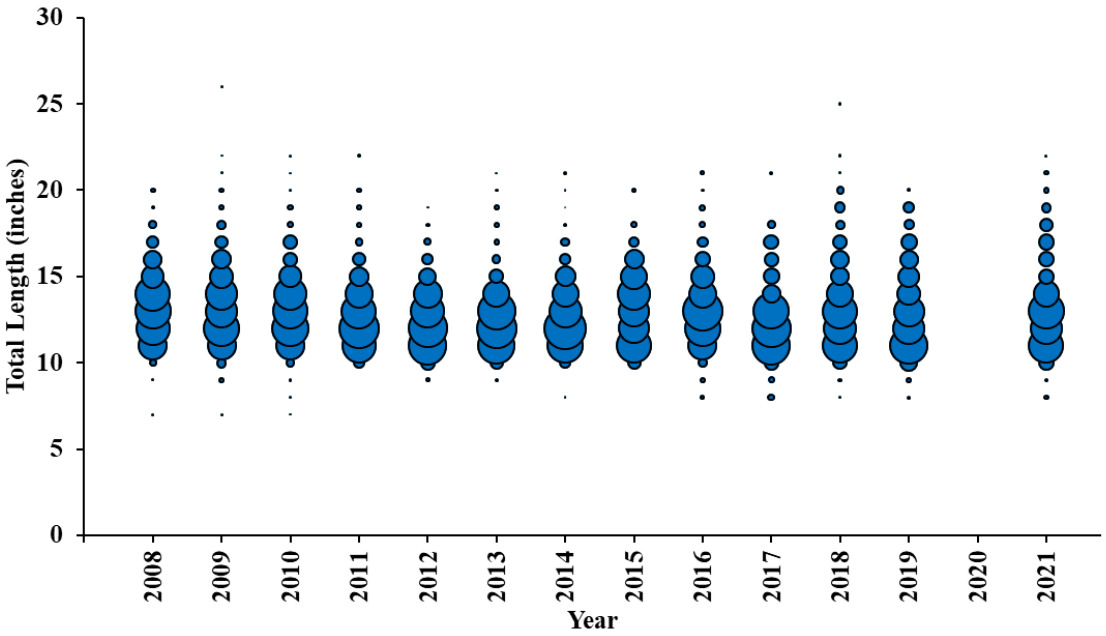

Figure 6. Length frequency (fork length, inches) of striped mullet collected from Program 915 in Pamlico Sound, Pamlico, Pungo, Neuse and New rivers from August-December (juveniles excluded), 2008–2021. Sampling was not conducted in 2020.

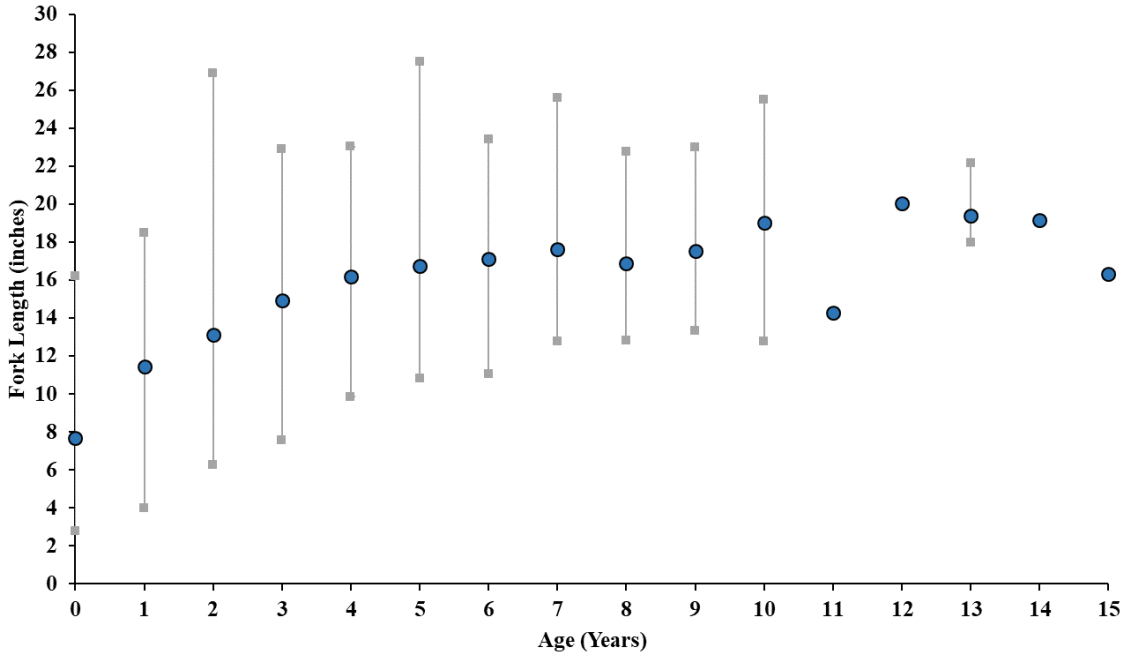

Figure 7. Striped mullet length at age based on all age samples collected, 1996–2021. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.