North Carolina
Division of Marine Fisheries

2024 Fishery Management Plan Review

August 2025

INTRODUCTION

The Fishery Management Plan Review is a compilation of annual updates for each State, Federal, and Atlantic States Marine Fisheries Commission managed species where North Carolina is directly involved in the fishery management plan. The updates are based on data through the previous calendar year and the document is presented to the Marine Fisheries Commission at its annual August business meeting.

The Fishery Management Plan Review is an invaluable reference document about the latest status of fisheries in North Carolina. The document is organized into two primary sections: State managed species and interjurisdictional managed species which are managed by either a Federal or Atlantic States Marine Fisheries Commission management plan. The interjurisdictional section is further divided into species which do or do not directly use North Carolina surveys to produce indices. Indices are indirect measurements used to assess stocks in Fishery Management Plans.

There are 13 State Fishery Management Plans, 12 of which are updated annually in this document. The North Carolina Fishery Management Plan for Interjurisdictional Fisheries does not require annual updates. This plan adopts, by reference, management measures appropriate for North Carolina contained in Federal Council or Atlantic States Marine Fisheries Commission fishery management plans.

Management measures for interjurisdictional fisheries are implemented by Marine Fisheries Commission and the Division to provide compliance or consistency with approved interjurisdictional plans and amendments. The goals of these plans, established under the Magnuson-Stevens Fishery Conservation and Management Act (federal Councils plans) and the Atlantic Coastal Fisheries Cooperative Management Act (Atlantic States Marine Fisheries Commission plans), are similar to the goal of the North Carolina Fisheries Reform Act of 1997 to "ensure long-term viability" of these fisheries. The state interjurisdictional plan reduces duplication of effort while meeting the requirements of North Carolina General Statute 113-182.1, Fishery Management Plans.

Each update in the Fishery Management Plan Review contains information about the:

- Fishery Management Plan History
- Management Unit
- Goal and Objectives
- Description of the Stock
- Description of the Fishery
- Monitoring Program Data (fishery-dependent and fishery-independent data)
- Research Needs
- Management Strategy; and
- Fishery Management Plan Schedule Recommendations.

Due to the COVID-19 pandemic, several sampling programs were disrupted in 2020 and portions of 2021. Specific impacts are provided in each species update as needed.

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FISHERY MANAGEMENT PLAN UPDATE
BAY SCALLOP
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	November 2007	
Amendments:	Amendment 1	November 2010
	Amendment 2	February 2015
Revisions:	None	
Supplements:	None	
Information Updates:	August 2020	
Schedule Changes:	None	
Comprehensive Review:	2026	

The North Carolina Bay Scallop Fishery Management Plan (FMP) was adopted in November 2007. The FMP implemented prohibited take from 2006 to 2008 until a fishery-independent sampling re-opening indicator was established in 2009. Amendment 1 of the Bay Scallop FMP was finalized in November 2010 to provide more flexibility (adaptive management) to open the fisheries as the bay scallop population recovers. Target indices were established from fishery-independent data collected before a red tide (toxic dinoflagellate) event in late autumn 1987 and early 1988 in Core, Back, and Bogue sounds that decimated the population. A separate sampling indicator for re-opening was developed in 2009 for Pamlico Sound. Amendment 2, adopted in February 2015, continues to use the abundance thresholds for opening the harvest season and defining the harvest levels for all areas, except areas south of Bogue Sound. Areas south of Bogue Sound will not be managed with a specific abundance opening level but will be opened or remain closed based on North Carolina Division of Marine Fisheries (DMF) evaluation of sampling results in this region. Expanded sampling is to occur in all areas including areas south of Bogue Sound and will improve the reliability of the data for the recreational bay scallop harvest. For private culture and enhancement, the current management strategy is to modify rules for bottom culture and aquaculture operations to be consistent with rules for other shellfish species. The Shellfish Research Hatchery in Wilmington, N.C. has established a pilot program to distribute cultured bay scallop seed on private bottom and, depending on the results, potentially expand the pilot program to include enhancement for public bottom. Due to an extended period of low abundance and lack of open seasons in any area or sector, no new management was deemed necessary during the formal review in 2020. Subsequently, the 2020 FMP update served as the Bay Scallop 2020 FMP Information Update.

Management Unit

Includes the bay scallop (*Argopecten irradians*) and its fisheries in all waters of coastal North Carolina.

Goal and Objectives

The goal of the N.C. Bay Scallop FMP is to implement a management strategy that restores the stock, maintains sustainable harvest, maximizes the social and economic value, and considers the needs of all user groups. To achieve this goal, it is recommended that the following objectives be met:

- Develop an objective management program that restores and maintains sustainable harvest.
- Promote the protection, restoration, and enhancement of habitats and water quality necessary for enhancing the fishery resource.

- Identify, enhance, and initiate studies to increase our understanding of bay scallop biology, predator/prey relationships, and population dynamics in North Carolina.
- Investigate methods for protecting and enhancing the spawning stock.
- Investigate methods and implications of bay scallop aquaculture.
- Address social and economic concerns of all user groups.
- Promote public awareness regarding the status and management of the North Carolina bay scallop stock.

DESCRIPTION OF THE STOCK

Biological Profile

Bay scallops are estuarine-dependent mollusks found in seagrass beds. Bay scallops are hermaphroditic (contain both sex cells) bivalves and mature and spawn in a year (Brousseau 2005). Their lifespan is approximately 12 to 26 months. In North Carolina, bay scallops spawn predominantly from August through January and again from March through May (Gutsell 1930). The larvae go through several swimming stages before attaching to a suitable substrate such as seagrass. Upon reaching a size of approximately 1 inch (20–30 mm), bay scallops drop to the bottom. Although other benthic structures can be used for attachment, bay scallops use seagrass beds almost exclusively and are therefore highly dependent on this habitat for successful recruitment (Thayer and Stuart 1974). Bay scallops are filter feeders and feed on benthic diatoms (Davis and Marshall 1961). Predators of the bay scallop include cownose rays, blue crabs, starfish, whelks, and sea birds (Gutsell 1930; Peterson et al. 1989).

Stock Status

There are insufficient data to conduct a traditional stock assessment for bay scallop in North Carolina. Bay scallops in North Carolina are a species of concern because of population declines caused by previous red tide events and the additive impacts from environmental factors and predation. Annual commercial landings of bay scallops show large fluctuations through time and are presumed to be driven by changing climate conditions (e.g., winter freezes, high freshwater runoff), predation, and the red tide event of 1987. Bay scallops are vulnerable to overharvest because of these factors affecting their survival.

Bay scallop fishery-independent data have been collected by the DMF since 1975 and consistently collected since 1998 to evaluate recruitment into the population and into the fishery for the current fishing season. Analyses of these data have demonstrated trends between DMF fishery-independent data and landings data from the following year. The long-term landings data (1972–2005) most likely reflected population abundance because harvest was allowed to continue until scallop densities reached levels below those that make the fishing economically viable (Peterson and Summerson 1992). However, during 2006 and after implementation of the 2007 Bay Scallop FMP, a prohibited take on harvest went into effect to rebuild the stock until a standardized relative abundance measure could be determined (NCDMF 2007). Therefore, using landings data is no longer an effective tool to monitor population size.

Bay scallop abundance from fishery-independent sampling is evaluated annually. Standardized bay scallop relative abundance indicators were first established as progressive triggers for opening the harvest season in Amendment 1 of the N.C. Bay Scallop FMP in 2010 (NCDMF 2010). These triggers are based on DMF sampling that occurred between the pre-red tide months of October and December in 1984 and 1985 for Back, Bogue, and Core sounds and in post-red tide January 2009 in Pamlico Sound (Table 1).

Table 1. Target and progressive triggers based on the lnCPUE (natural log of the number of bay scallops per 1-minute tow) for the October–December 1984–1985 period for Back, Bogue, and Core sounds. Target and progressive triggers for lnCPUE in Pamlico Sound are based on sampling in January 2009.

	Pamlico Sound	Core Sound	Back Sound	Bogue Sound
Target lnCPUE	-0.18	1.72	2.02	2.33
Progressive trigger 50%	-0.27	0.86	1.01	1.17
Progressive trigger 75%	-0.23	1.29	1.52	1.75
Progressive trigger 125%	-0.14	2.15	2.53	2.91

These triggers allow for flexibility to open the fisheries as the bay scallop population recovers and determines harvest limits based on 50, 75, and 125% of the natural log of the Catch Per Unit Effort (lnCPUE) target (Tables 2 and 3).

Fishery-independent data shows most samples have small or zero catch, while only a few samples exhibit large catches producing a lognormal distribution, which is usual for most fishery-independent data. Each sample is averaged to get the estimated mean lnCPUE and standard deviation for the October-December time period for all areas to produce indices of abundance.

Trends in the past 10 years show that bay scallop abundance has generally been low in all regions (Figures 1, 2, and 3). Bogue Sound has consistently seen exceptionally low scallop abundance since 2014. Core Sound showed an upswing in abundance for three years from 2020 through 2022, and in 2021 Back Sound saw the greatest scallop abundance since 2011. Similarly, in areas south of Bogue Sound, 2022 marked some of the highest scallop levels recorded since sampling commenced at those stations; levels south of Bogue Sound in 2022 were second only to those seen during the first year of sampling there in 2009. In Pamlico Sound, scallop levels in 2024 were the highest observed since 2010, but still well shy of the lowest abundance trigger that would allow opening. Since the inception of the harvest opening index of relative abundance, the season has opened for six years (2009, 2010, 2013, 2021, 2022, and 2023) in specific regions, and at the lowest allowed harvest level. Four of the six open harvest seasons saw very little catch (Figure 4).

Expanding the sampling coverage or number of stations in all areas was recommended in Amendment 2 of the FMP and implemented to improve estimates of bay scallop relative abundance. As the bay scallop population expands and retracts from year to year, broader sampling coverage of these areas has helped identify more precisely what is happening to the population prior to a potential harvest season.

Table 2. Adaptive management measures for opening the bay scallop commercial fishery as the selected management strategy of the Marine Fisheries Commission. The harvest levels are based on progressive triggers derived from the lnCPUE1984–1985 (natural log of the number of bay scallops per 1-minute tow, Oct–Dec) target indicators for Core, Bogue, and Back sounds and the lnCPUE Jan 2009 target indicator for Pamlico Sound.

Progressive triggers and target	Trip limit	Days open in the week	Allowed gears	Season
Less than 50% of target	No allowed harvest			
50% or greater of target but less than 75% of target	5 bushels per person per day not to exceed 10 bushels per fishing operation	Mon and Wed	By hand, hand rakes, hand tongs, dip net, and scoops	Last Monday in January to April 1st
75% or greater of target but less than 125% of target	10 bushels per person per day not to exceed 20 bushels per fishing operation	Mon, Tues, Wed, and Thurs	By hand, hand rakes, hand tongs, dip net, and scoops	Last Monday in January to April 1st
	10 bushels per person per day not to exceed 20 bushels per fishing operation	Mon and Wed	Bay scallop dredges as described by rule 15A NCAC 03K .0503	Delay opening until first full week in March after hand harvest removes scallops from shallow waters to April 1st
125% or greater of target	15 bushels per person per day not to exceed 30 bushels per fishing operation	Mon, Tues, Wed, and Thurs	By hand, hand rakes, hand tongs, dip net, and scoops	Last Monday in January to April 1st
	15 bushels per person per day not to exceed 30 bushels per fishing operation	Mon and Wed	Bay scallop dredges as described by rule 15A NCAC 03K .0503	Delay opening until the third full week in February after hand harvest removes scallops from shallow waters to April 1st

Table 3. Adaptive management measures for opening the bay scallop recreational fishery as the selected management strategy by the Marine Fisheries Commission. The harvest levels are based on progressive triggers derived from the lnCPUE 1984–1985 (natural log of the number of bay scallops per 1-minute tow, Oct–Dec) target indicators for Core, Bogue, and Back sounds and the lnCPUE Jan 2009 target indicator for Pamlico Sound.

Progressive triggers and target	Trip limit	Days open in week	Allowed gears	Season
Less than 50% of target	No allowed harvest			
50% or greater of target	1/2 bushel per person per day not to exceed 1 bushel per recreational fishing operation	Seven days a week	By hand, hand rakes, hand tongs, dip net, and scoops	Last Monday in January to April 1st

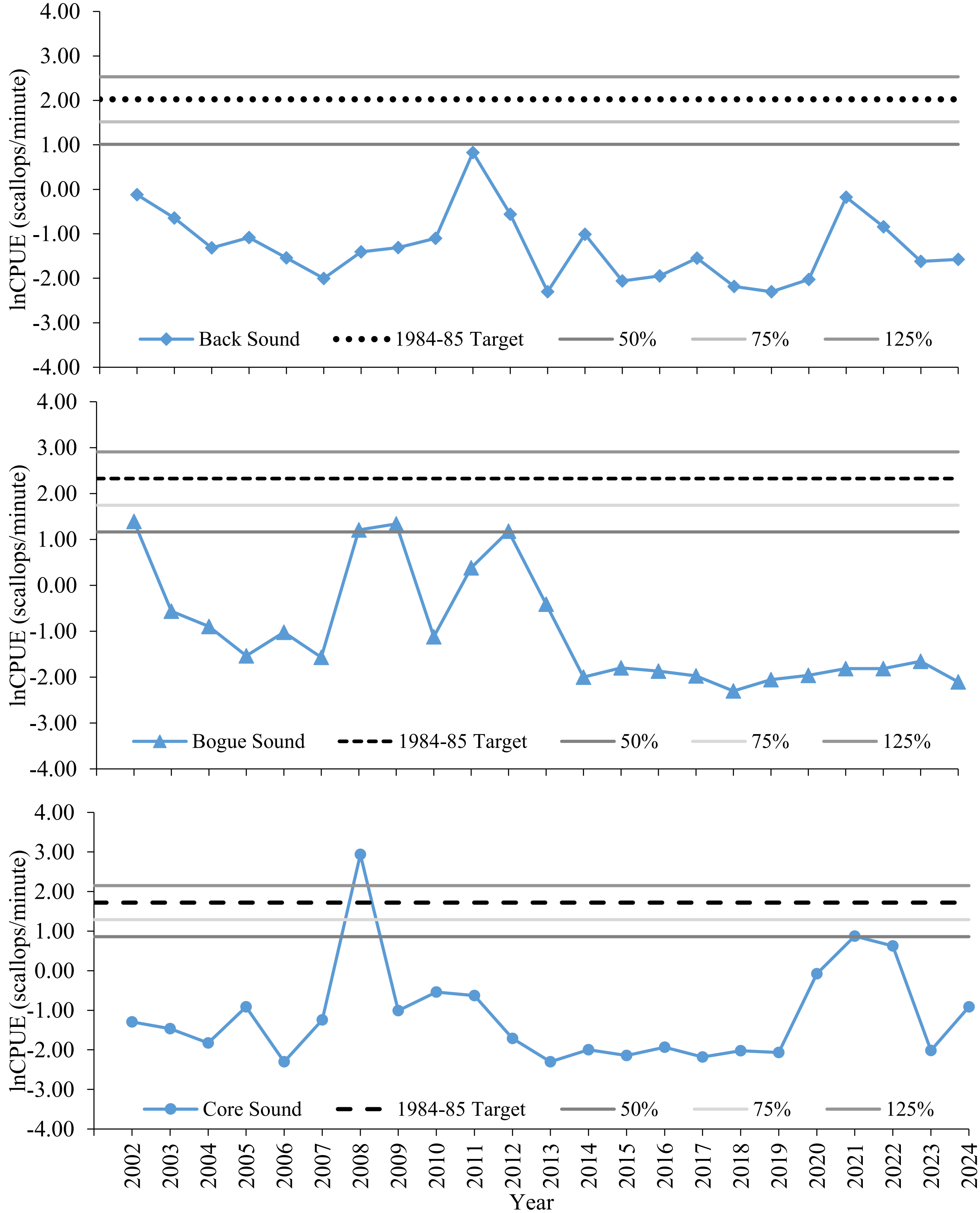

Figure 1. The mean number of bay scallops (lnCPUE; bay scallops/minute) for Back, Bogue, and Core sounds during the October–December sampling time-period and average lnCPUE (natural log of the number of bay scallops per 1-minute tow, target) for the 1984–1985 period showing progressive triggers at 50, 75, and 125% of the target. Year indicates the sampling year which is used to determine the harvest season for the next calendar year.

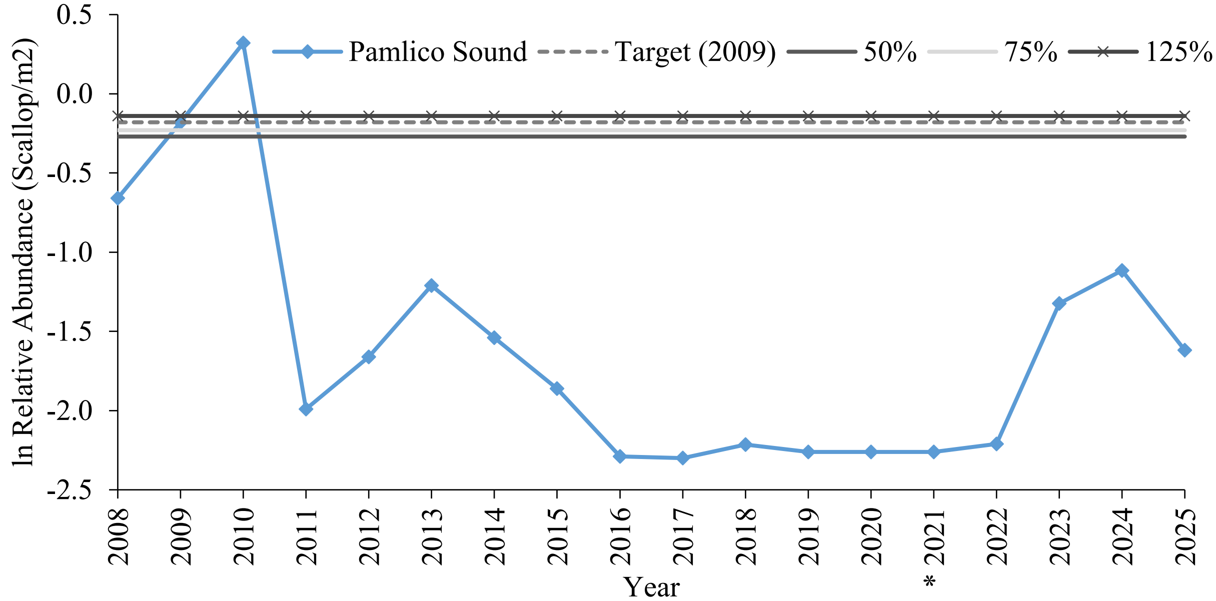

Figure 2. The mean number of bay scallops, lnCPUE (natural log of the number of bay scallops per 1-minute tow), for Pamlico Sound during the January sampling time period and target for the January 2009 period showing progressive triggers at 50, 75, and 125% of the target. Year indicates the sampling year which is used to determine the harvest season for the same calendar year. *Sampling in 2021 was not conducted until March due to staffing issues and inclement weather.

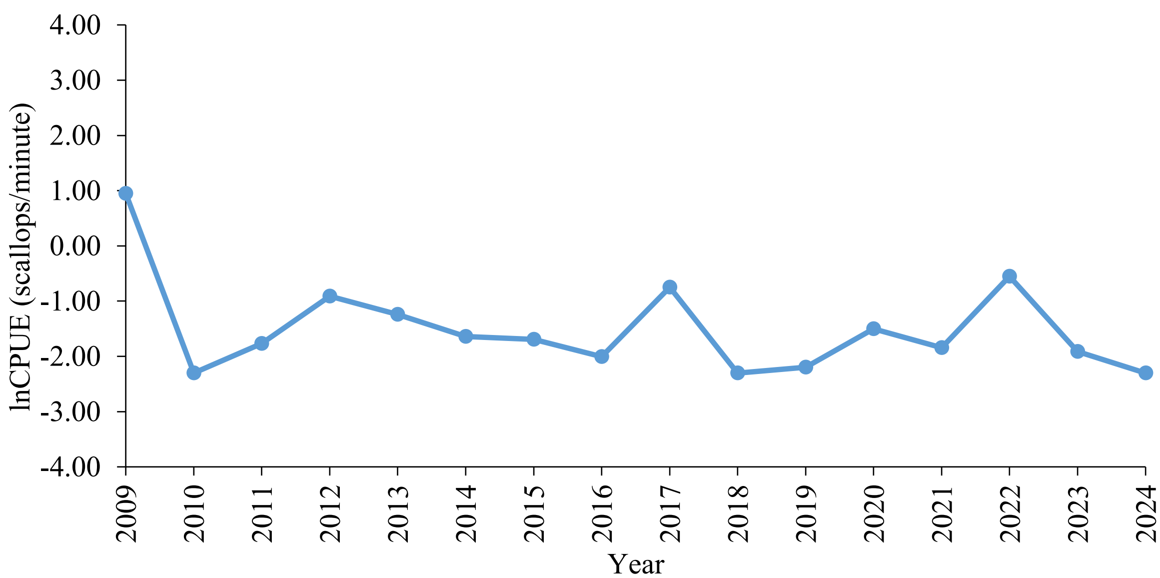

Figure 3. The mean number of bay scallops (lnCPUE; bay scallops/minute) for areas south of Bogue Sound in October 2009–2024. Target opening estimates and progressive triggers will not be defined for this region until sampling is expanded and a longer time series is established.

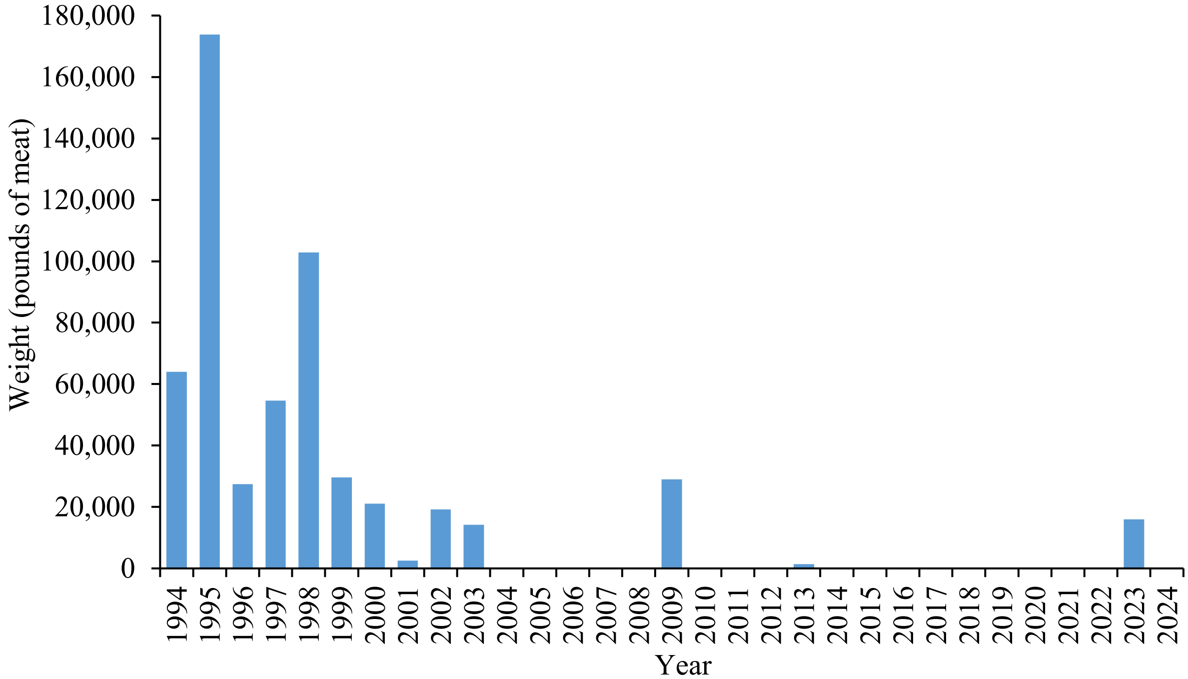

Figure 4. Bay scallop landings (wild and aquaculture in pounds of meat) in North Carolina, 1994–2024. Landings occurred in 2010, 2013, 2019, 2020, and 2022 but are not evident in the figure due to the scale required to show the range of landings for the time series.

Stock Assessment

A stock assessment is not available for this species.

DESCRIPTION OF THE FISHERY

Current Regulations

The season can occur from the last Monday in January through April 1st and there is no minimum size limit for both the commercial and recreational fisheries. Specific trip limits, number of days to harvest, and specific gear allowances are implemented within the open season. Both the opening of the season and the harvest restrictions within the open season are based on DMF fishery-independent sampling relative abundance levels determining the appropriate level of harvest (NCDMF 2015). There was no open harvest season for bay scallops in any area in 2024 due to low abundance levels statewide.

Commercial Fishery

Bay scallop abundance and harvest have fluctuated widely since landings have been recorded (MacKenzie 2008). Landings are closely linked to weather and other environmental factors. Landings ranged from a peak of approximately 1.4 million pounds of meats in 1928 when North Carolina led the nation in scallop production, to a low of zero landings in 2005 even though there was an open harvest season. Landings have been virtually non-existent since 2005.

The red tide (toxic dinoflagellate) event of late autumn 1987 and early 1988 caused mortality to approximately 21% of the adult bay scallops in Bogue and Back sounds and reduced recruitment of juvenile bay scallops the following spring to only 2% of normal (the mean of the previous three red tide-free years; Summerson and Peterson 1990). This event has had lasting impacts on the bay scallop fishery and the populations in Bogue, Back, and Core sound regions have not fully recovered. Landings in recent years have been extremely low due to the failure of bay scallop stocks to recover after the red tide event, fishing pressure, and predation.

A prohibited take on harvest occurred from 2006 to 2008 through proclamation and continued by the 2007 FMP (NCDMF 2007). Amendment 1 initiated relative abundance estimates to determine if the fishery should open and at what level harvest would occur based on the relative abundance estimates by region (NCDMF 2010). An open commercial and recreational harvest season occurred in Core and Pamlico sounds in 2009, and in Pamlico Sound in 2010 (less than 500 pounds of meat were landed commercially; Figure 4). Bogue Sound and all areas south of Bogue Sound were opened to harvest to the NC/SC state line in internal waters in 2014 (less than 1,500 pounds of meat were landed commercially; Figure 4). In 2019 and 2020 a small amount (less than 300 pounds of meat) was landed from commercial private leases (Figure 4). Despite an open harvest season in Core Sound in 2021, no commercial harvest was reported in the state (Figure 4). In 2022 a small amount (less than 300 pounds of meat) was landed from public bottom in Core Sound during the open harvest season. In 2023 just under 16,000 pounds of meat were harvested from Core Sound during the open harvest season; the most since 2009.

Recreational Fishery

The state recreational shellfish survey added a question about bay scallop harvest in 2016, but only three open seasons in 2021, 2022, and 2023 have occurred since. There was no reported recreational harvest from the open season in 2021, 2022, or 2023. Due to this, no estimation of recreational harvest can be made.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

There are no fishery-dependent sampling programs that collect information on the commercial or recreational fisheries for bay scallops.

Fishery-Independent Monitoring

Fishery-independent sampling of bay scallops for fisheries management information has been conducted since 1975 and has varied from monthly sampling at 20 stations to seasonal monitoring at fewer locations.

Sampling occurs four times a year in Pamlico, Core, Back, and Bogue sounds and areas south of Bogue Sound during the second or third week of the month in January, April, July, and October. In Pamlico Sound, standardized sampling occurs using a one meter-square (m^2) quadrat, and in Core, Back, and Bogue sounds, and areas south of Bogue Sound, a bay scallop dredge is towed. A fixed set of eight stations are towed three times for two minutes with a scallop dredge in Core, Back, and Bogue sounds and additional stations are also sampled three times for two minutes where bay scallops have historically been found. A set of three fixed stations, two in New River and one in Topsail Sound, are towed three times for two minutes with a scallop dredge beginning in 2009 in areas south of Bogue Sound. Sampling also occurs at five fixed stations and five non-core stations off Hatteras Island. Bay scallops are collected with a rake or by hand for ten 1-m^2 samples within the station in Pamlico Sound. The PVC 1 m^2 quadrat is randomly placed 10 separate times within the area. Catch per unit effort (CPUE) is defined as the number of bay scallops (juvenile and adult combined) per one-minute tow if a dredge is used or per quadrat. Additional stations (non-fixed) are sampled in most areas dependent on bay scallop abundance at the given time of year. The natural log (ln) of the catch per unit effort (lnCPUE), measured as the number of bay scallops per minute (dredges) and number of bay scallops per meter squared (quadrat), is taken to avoid bias towards occasional large catches. A constant of 0.1 is added to all catches so that tows/quadrats with zero catches can be included in the estimate of the mean. All tows/quadrats taken at a station are averaged to get a single value for each station and are referred to as a sample. Each sample is averaged to get the estimated mean lnCPUE and standard deviation for the October-December time period for all areas except Pamlico Sound and for the January time period for Pamlico Sound to produce indices of abundance (Figures 1 and 2).

Trends in the past 10 years show that bay scallop abundance is low in all regions except for a three-year period from 2020 to 2022 in Core Sound (Figures 1, 2, and 3). There was a significant increase in bay scallop abundance in Core Sound in 2020, resulting in an open harvest season at the 50% progressive trigger level (Tables 1 and 4). This increasing trend in Core Sound continued in 2021 and 2022 with abundances exceeding the 50% harvest trigger. In 2023, relative abundance in Core Sound dropped back to the historically low levels observed prior to 2020, but 2024 sampling shows that scallop abundances there may be increasing again. Back Sound and areas South also showed a decline in 2023 and 2024. Bogue Sound relative abundance remained relatively stable in 2023 compared to previous years but showed continued decline in 2024. Pamlico Sound showed a significant increase in 2024 to the highest levels observed since 2010, but surveys in January of 2025 indicate scallop abundance there is declining again.

Table 4. Fishery independent sampling annual lnCPUE and standard error. Pamlico Sound sampling is conducted in January with a 1 m^2 quadrat, all other areas are sampled in October with a scallop dredge.

	Pamlico Sound		Core Sound		Back Sound		Bogue Sound		South	
Year	LnCPUE	Standard Error	lnCPUE	Standard Error	lnCPUE	Standard Error	lnCPUE	Standard Error	lnCPUE	Standard Error
2006			-2.3	0	-1.54	0.5	-1.02	0.34		
2007			-1.24	0.5	-2	0.3	-1.57	0.34		
2008			2.94	0.35	-1.41	0.4	1.21	0.57		
2009	-0.18	0.79	-1.01	0.42	-1.31	0.45	1.34	0.27	0.94	0.75
2010	0.32	0.67	-0.54	0.39	-1.1	0.54	-1.12	0.54	-2.3	0
2011	-1.99	0.13	-0.63	0.57	0.83	0.26	0.38	0.34	-1.77	0.37
2012	-1.66	0.26	-1.71	0.38	-0.56	0.78	1.18	0.25	-0.91	0.36
2013	-1.21	0.11	-2.3	0	-2.3	0	-0.41	0.71	-1.19	0.42
2014	-1.54	0.31	-2	0.3	-1.01	0.42	-2	0.2	-1.64	0.34
2015	-1.86	0.39	-2.14	0.16	-2.06	0.16	-1.8	0.19	-1.69	0.16
2016	-2.29	0.01	-1.93	0.25	-1.94	0.19	-1.87	0.16	-2	0.2
2017	-2.3	0	-2.18	0.12	-1.55	0.25	-1.97	0.14	-0.75	0.26
2018	-2.21	0.08	-2.02	0.75	-2.18	0.46	-2.3	0	-2.3	0
2019	-2.26	0.24	-2.06	0.16	-2.3	0	-2.05	0.11	-2.19	0.09
2020	-2.26	0.24	-0.07	0.49	-2.02	0.19	-1.96	0.14	-1.5	0.26
2021	-2.26	0.24	0.87	0.74	-0.18	0.92	-1.81	0.2	-1.84	0.31
2022	-2.21	0.06	0.62	1.01	-0.84	0.66	-1.81	0.19	-0.55	0.75
2023	-1.32	0.14	-2.02	0.2	-1.62	0.29	-1.66	0.28	-1.91	0.24
2024	-1.11	0.15	-0.91	0.47	-1.58	0.32	-2.1	0.14	-2.3	0

RESEARCH NEEDS

The list below is presented in order as it appears in Amendment 2 of the Bay Scallop FMP. Prioritization of each research recommendation is designated either a HIGH, MEDIUM, or LOW standing. A low ranking does not infer a lack of importance but is either already being addressed by others or provides limited information for aiding in management decisions. A high ranking indicates there is a substantial need, which may be time sensitive in nature, to provide information to help with management decisions.

Proper management of the bay scallop resource cannot occur until some of these research needs are met. The research recommendations include:

High

- Develop better methods to quantify the population including the means to have more precise measures of spatial and temporal variability both within and between sound scales.
- Identify viable stock enhancement techniques.

Medium

- Continue to identify strategic coastal habitats that will enhance protection of bay scallops and accelerate mapping of all shell bottom in North Carolina.
- Develop surveys of recruitment and spat settlement and identify critical areas for these.
- Identify the role water quality and nutrient loading has in failed recruitment and develop methods for improvement.

MANAGEMENT

The current management strategy for the bay scallop fisheries is to allow the DMF Director to open a region to limited bay scallop harvest when sampling indicates bay scallop abundance is at 50% of the lnCPUE level it was in 1984-1985 in the main harvest areas (Core, Bogue, and Back sounds; Table 1). A separate sampling indicator for re-opening was developed in 2009 for Pamlico Sound (Table 1). Trip limits and fishing days will progressively increase if sampling shows bay scallop abundance is at 75% or 125% of 1984-1985 lnCPUE levels (Tables 2 and 3). The open season may occur from the last Monday in January through April 1 to ensure spawning is complete and the economic yield is at an optimum for fishermen. See Table 5 for current management strategies and the status on the implementation of each.

Table 5. Summary of the management strategies and their implementation status from Amendment 2 of the Bay Scallop Fishery Management Plan.

Management Strategy	Implementation Status
ENVIRONMENTAL CONCERNS	
Status quo (manage fishing gear based on scallop densities)	No action required
Continue to support CHPP recommendations that enhance protection of existing bay scallop habitat	No action required; Already support the CHPP
Support programs that enhance bay scallop habitat by planting sea grass or other suitable settlement substrate	No action required; Already support the CHPP
Identify and designate SHAs that will enhance protection of the bay scallop	Ongoing through CHPP implementation plan
Remap and monitor SAV coverage in North Carolina to assess distribution and change over time.	Ongoing through CHPP implementation plan
Restore coastal wetlands to compensate for previous losses and enhance water quality conditions for the bay scallop	Ongoing through CHPP implementation plan
Work with CRC to revise shoreline stabilization rules to adequately protect riparian wetlands and shallow water habitat and significantly reduce the rate of shoreline hardening	Ongoing through CHPP implementation plan
Develop and implement a comprehensive coastal marina and dock management plan and policy to minimize impacts to SAV and other fish habitats	Ongoing through CHPP implementation plan
Evaluate dock criteria siting and construction to determine if existing requirements are adequate for SAV survival and growth, and modify if necessary	Ongoing through CHPP implementation plan
Assess the distribution, concentration, and threat of heavy metals and other toxic contaminants in freshwater and estuarine sediments and identify the areas of greatest concern to focus water quality improvement efforts	Ongoing through CHPP implementation plan

Management Strategy	Implementation Status
Shallow areas where trawling is currently allowed should be re-examined to determine if additional restrictions are necessary	Ongoing through CHPP implementation plan
Accelerate and complete mapping of all shell bottom in coastal North Carolina	Ongoing through CHPP implementation plan
Improve methods to reduce sediment and nutrient pollution from construction sites, agriculture, and forestry	Ongoing through CHPP implementation plan
Reduce impervious surfaces and increase on-site infiltration of storm water through voluntary or regulatory measures	Ongoing through CHPP implementation plan
Provide more incentives for low-impact development	Ongoing through CHPP implementation plan
Aggressively reduce point source pollution from wastewater through improved inspections of wastewater treatment facilities, improved maintenance of collection infrastructure, and establishment of additional incentives to local governments for wastewater treatment plant upgrading	Ongoing through CHPP implementation plan
Aggressively reduce point and non-point nutrient and sediment loading in estuarine waters, to levels that will sustain SAV habitat, using regulatory and non-regulatory actions	Ongoing through CHPP implementation plan
ENVIRONMENTAL CONCERNS	
Provide proper disposal of unwanted drugs, reduce insecticide and heavy metal run-off, and develop technologies to treat wastewater for antibiotics and hormones	Ongoing through CHPP implementation plan
Discourage use of detergents in coastal waters, especially detergents with antimicrobial components	Ongoing through CHPP implementation plan
INSUFFICIENT DATA	
Support improving the reliability of the data for the recreational scallop harvest	Ongoing through recreational shellfish survey, but limited to CRFL holders
MANAGEMENT	
Eliminate the August 1 through September 15 season open period in rule	Rule change required to 15A NCAC 03K .0501; Rule change completed on May 1, 2015
Expand sampling in all regions and manage harvest conditionally in areas south of Bogue Sound until adequate sampling can determine a harvest trigger for management.	Existing authority
Continue current progressive triggers with adaptive harvest levels in all areas, except areas south of Bogue Sound, and modify harvest management measures as shown in Table 12.7 and Table 12.8 in the issue paper. And continue to improve the statistical rigor of the abundance index.	Existing proclamation authority
Keep dredges at the 75% trigger harvest level in Table 12.7	Existing proclamation authority

Management Strategy	Implementation Status
Modify the daily commercial harvest possession limit in Rule 15A NCAC 03K .0501 to a quantity of no more than 15 standard U.S. bushels per person per day not to exceed 30 standard U.S. bushels in any combined commercial fishing operation per day to be consistent with the adaptive management measures trip limits.	Requires rule change to rule 15A NCAC 03K .0501; Rule change completed on May 1, 2015
Exempt bay scallop harvest from leases from the regular season and harvest limits	Requires rule change to rules 15A NCAC 03K .0111, 03K .0206, 03K .0303, 03K .0501, 03K .0502, 03K .0507, 03K .0508, 03O .0501; Rule changes completed on May 1, 2015
Support an exemption from G.S. 113-168.4 (b) (3) when the sale is to lease or Aquaculture Operations permit holders for further rearing	Requires statutory change to G.S. 113-168.4; Not yet implemented
STOCK ENHANCEMENT	
Establish a pilot program with the Shellfish Research Hatchery to distribute cultured seed on private bottoms	Shellfish Hatchery staff has begun providing juveniles to interested private culturists
Contingent on results to distribute seed on private bottom, expand the pilot program to include public bottom	Dependent on results from previous management strategy.

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

The 2020 FMP update served as the formal review of Amendment 2 to the North Carolina Bay Scallop FMP. All management strategies in Amendment 2 will be maintained as outlined in the state FMP. Stock conditions will be monitored and reported through each subsequent annual FMP update and the Marine Fisheries Commission will continue to receive the FMP review schedule annually. The next scheduled comprehensive review of this plan will begin in July 2026.

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FISHERY MANAGEMENT PLAN UPDATE
BLUE CRAB
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	December 1998	
Amendments:	Amendment 1	December 2004
	Amendment 2	November 2013
	Amendment 3	May 2020
Revisions:	Revision to Amendment 2	May 2016
	Revision to Amendment 3	May 2020 & May 2023
Supplements:	None	
Information Updates:	None	
Schedule Changes:	August 2024	
Comprehensive Review:	2026	

The original North Carolina Blue Crab Fishery Management Plan (FMP) was adopted in December 1998 (NCDMF 1998). The plan adopted several management changes including: (1) requiring sinking lines to be used on all crab pot buoys, (2) prohibited commercial gears (except attended gill nets) in crab spawning sanctuaries March 1–August 31, (3) prohibited baiting peeler pots except with live legal-size male blue crabs, (4) repealed the exemption for culling peelers before reaching shore in the hard crab fishery, (5) prohibited the possession of white line peelers June 1–30, (6) changed the unattended pot rule from ten days to seven days, (7) prohibited setting pots in any navigation channel marked by State or Federal agencies, (8) modified crab pot area regulations to use depth instead of distance from shore, (9) implemented marking requirements for recreational pots, (10) defined collapsible traps as non-commercial gear, and (11) established a permit for shedding operations.

Amendment 1 was adopted in December 2004 (NCDMF 2004). The amendment implemented several management changes including: (1) established a 6.75-inch maximum size limit for mature females from September 1 through April 30 if the spawner index fell below the threshold for two consecutive years, (2) established a 5.25-inch maximum size limit for female peeler crabs from September 1 through April 30 if the spawner index fell below the threshold for two consecutive years, (3) prohibited the sale of white-line peelers but allow possession by licensed peeler operations and requiring white-line peelers to be kept separate from pink and red-line peelers, (4) extended the pot cleanup period by nine days, (5) changed the unattended pot rule from seven days to five days, (6) required a four-inch stretch mesh tail bag for crab trawls in western Pamlico Sound (including the Pamlico, Pungo, Bay, and Neuse rivers), (7) separated hard and peeler crab trawl landings on trip tickets, (8) modified channel net rule to incorporate limited blue crab bycatch provisions identical to those for shrimp trawls, (9) modified user conflict rule to resolve user conflicts on a regional basis, (10) allowed crab pots in all designated long haul areas in Hyde, Beaufort, and Pamlico counties, (11) modified the dates for designated crab pot areas from May 1–October 31 to June 1–November 30, (12) changed designated pot area boundary description to a standardized six foot depth contour in many areas, and (13) prohibited the use of trawls in designated pot areas.

Amendment 2 was adopted in November 2013 (NCDMF 2013). The amendment implemented several management changes including: (1) repealed the spawner index trigger (and associated maximum size limits for mature female and peeler blue crabs) and replaced it with adaptive management framework based on the results of the annual Traffic Light Stock Assessment update, (2) opened long haul areas in the Pungo River to pots, (3) added Lower Broad Creek to non-pot areas in rule, (4) modified crab dredging rule to conform to current harvest management, (5) incorporated Pamlico Sound four-inch crab trawl line into rule, (6) redefined criteria for exempting escape rings in crab pots from the 1.5-inch pot mesh size to un-baited pots and pots baited with a male crab, (7) repealed proclamation authority that allowed for the exemption of escape ring requirement to allow harvest of peeler crabs, (8) adopted the no trawl line in Pamlico Sound and Newport River boundary in rule as new boundary for areas where closure of escape rings to take small mature female crabs is allowed, (9) modified trawl nets rule to identify Pamlico, Back, and Core sounds as areas that can open to peeler trawling by proclamation, (10) modified rule to clearly state the intent of the exceptions, culling tolerance, and separation requirements for various crab categories, and (11) established proclamation authority to require terrapin excluders in crab pots and establish a framework for developing criteria and terrapin excluder specifications.

The North Carolina Marine Fisheries Commission (MFC) adaptive management strategy for blue crabs under Amendment 2 relied on the Traffic Light Stock Assessment to provide information on relative condition of the stock. The reference years (1987–2009) for assigning the signals in the Traffic Light Stock Assessment remained constant and the analysis was updated annually by July each year. The name of this analysis comes from assigning a color (red, yellow, or green) to categorize relative levels of different indicators for either a fish population or a fishery. The Traffic Light Stock Assessment effectively illustrates long-term trends in the population.

Based on results of the annual Traffic Light update with 2015 data, management action was required by the MFC. At its May 19, 2016, business meeting, the MFC was presented with several management options identified in the adaptive management framework in Amendment 2 to the N.C. Blue Crab FMP (NCDMF 2016). To improve the condition of the blue crab stock, the MFC adopted the following management measures: (1) require one additional escape ring in crab pots and one of the three escape rings must be located within one full mesh of the corner of the pot and within one full mesh of the bottom of the apron/stairs (divider) of the upper chamber of the pot; (2) eliminate the harvest of v-apron immature female hard crabs (excluding peeler crabs); and include v-apron immature female hard crabs in the culling tolerance; (3) prohibit the harvest of dark sponge crabs (brown and black) April 1–April 30 each year; and include dark sponge crabs in the culling tolerance; (4) lower the culling tolerance from 10% to 5% for all crabs, except mature females; and (5) prohibit the harvest of crabs with dredges except incidental to lawful oyster dredging as outlined in rule 15A NCAC 03L .0203(a)(2).

All adaptive management measures became effective June 6, 2016, except for the additional escape ring requirement which was postponed until January 15, 2017 (NCDMF 2016). This delay coincided with the annual pot closure period to allow fishermen time to modify pots. The above actions taken by the MFC are documented in the May 2016 Revision to Amendment 2 to the N.C. Blue Crab FMP (NCDMF 2016).

Comprehensive Review of the Blue Crab FMP was originally scheduled to begin in July 2018, but at its August 2016 business meeting, the MFC voted to begin the review immediately to assess the status of the blue crab stock and identify more comprehensive management strategies. Consequently, review of the Blue Crab FMP for development of Amendment 3 began in August 2016. The stock assessment was completed and accepted for management use, and Amendment 3 was adopted by the MFC at its February 19, 2020, business meeting (NCDMF 2020a). The amendment maintained measures implemented with the May 2016 Revision to the Blue Crab FMP and implemented several management changes including: 1) crab harvest and pot closure periods (January 1–31 north of the Highway 58 bridge to Emerald Isle and March 1–15 south of the Highway 58 bridge), 2), a 5-inch minimum size limit for mature female crabs statewide, 3) replacing the annual Traffic Light Stock Assessment update with an adaptive management framework based on an interim update of the 2018 benchmark assessment, 4) removal of all cull ring exempted areas, 5) revised the boundaries for crab spawning sanctuaries in Drum Inlet and Barden Inlet and established new crab spawning sanctuaries in Beaufort, Bogue, Bear, Browns, New River, Topsail, Rich, Mason, Masonboro, Carolina Beach, Cape Fear River, Shallotte, Lockwoods Folly, and Tubbs inlets with March

1–October 31 closure, 6) crab trawling prohibition in areas of the Pamlico, Pungo, and Neuse rivers where trawling for shrimp was prohibited, 7) crab bycatch allowance in oyster dredges reduced to 10% of the total weight of the combined oyster and crab catch or 100 pounds, whichever is less 8) adopted a framework to designate Diamondback Terrapin Management Areas, and 9) addressed water quality issues requiring partnering with other commissions and state agencies.

The Diamondback Terrapin Management Area (DTMA) framework in Amendment 3 contains the criteria required to identify areas of the state where terrapin excluder devices are required. Two DTMAs were established in May 2020 in Masonboro Sound and the lower Cape Fear River. This action, taken by the MFC, is documented in the May 2020 Revision to Amendment 3 to the N.C. Blue Crab FMP and implemented by Proclamation PT-1-2021 (NCDMF 2020b). These areas have documented terrapin populations and waterbody characteristics in which diamondback terrapins are susceptible to incidental capture. Beginning in March 2021, all pots in these areas are required to be modified with a North Carolina Division of Marine Fisheries (DMF) approved diamondback terrapin excluder device in each funnel March 1–October 31. The May 2023 revision to Amendment 3 to the Blue Crab FMP updated the approved list of terrapin excluder device types and sizes required or gear modifications to be used in crab pots fished within designated DTMAs implemented by proclamation PT-1-2024.The Blue Crab FMP, Amendments, and Revisions are available on the DMF website at: https://deq.nc.gov/about/divisions/marine-fisheries/managing-fisheries/fishery-management-plans#state-managed-species

Management Unit

The management unit includes the blue crab (*Callinectes sapidus*) and its fisheries in North Carolina coastal waters.

Goal and Objectives

The goal of Amendment 3 to the North Carolina Blue Crab FMP is to manage the blue crab fishery to achieve a self-sustaining population that provides sustainable harvest using science-based decision-making processes. The following objectives will be used to achieve this goal:

- Implement management strategies that maintain/restore the blue crab spawning stock with multiple cohorts and adequate abundance to prevent recruitment overfishing.
- Restore, enhance, and protect habitat and environmental quality necessary to maintain or increase growth, survival, and reproduction of the blue crab population.
- Use biological, environmental, habitat, fishery, social, and economic data needed to effectively monitor and manage the blue crab fishery and its ecosystem impacts.
- Promote stewardship of the resource through increased public awareness regarding the status and management of the blue crab fishery, including practices that minimize bycatch and discard mortality.

DESCRIPTION OF THE STOCK

Biological Profile

The blue crab is common to all North Carolina coastal waters but are most abundant in the Albemarle and Pamlico sounds and their tributaries. Blue crabs mature at approximately 12–18 months of age and have an average lifespan of three years with some living as long as eight years (Fischler 1965; Johnson 2004; Rugolo et al. 1997). Mating occurs in brackish areas of the estuary and lower portions of rivers from late spring to early fall, and spawning occurs in high-salinity waters near ocean inlets from early summer to fall (Forward et al. 2003; Whitaker 2006). The first larval stage is carried offshore by ocean currents where several stages of development occur (Van Engel 1958; Epifanio 1995). Settlement of larval blue crabs occurs in the estuaries after winds and tides transport them through the inlets from the ocean. Once within the estuary, larval blue crabs settle in beds of submerged aquatic vegetation and other complex habitats, like salt marsh and oyster shell, where they become juvenile blue crabs. Juvenile blue crabs gradually migrate to lower salinity waters in the upper estuaries and rivers to grow (molt) and mature (Etherington and Eggleston 2000). Molting is a process of growth in blue crabs that requires shedding the hard exoskeleton. Following each molt, the shell is soft for several hours until it hardens, during this time the crab is more vulnerable to predators. Juvenile and adult blue crabs typically eat what is available to them such as dead and live fish, crabs, shrimp, and shellfish (Laughlin 1982; Williams 1984; Hines et al. 1990; Cordero and Seitz 2014) and serve as food for predator species such as striped bass and red drum (Binion-Rock 2018). Male and female blue crabs are easily identified by the shape of the apron on their abdomen. A mature male crab is called a "jimmy" and is easily recognized by the blue shading on its shell and claws and a T-shaped apron on its underside. Female crabs are called "sooks" as adults and "she-crabs" when immature. The immature female apron is triangular-shaped and held tightly against the abdomen. The mature female's apron becomes rounded and can be easily pulled away from the body after the final molt. The "sponge crab" is a female that has an egg mass on its abdomen.

Stock Status

Results of the 2018 benchmark blue crab stock assessment (2016 terminal year) indicate the stock is overfished and overfishing is occurring (NCDMF 2018).

Stock Assessment

The 2018 benchmark blue crab stock assessment used a sex-specific two-stage model applied to available data to assess the status of North Carolina's blue crab stock for 1995–2016 (NCDMF 2018). Data were available from commercial fishery monitoring and several fishery-independent surveys (Program 100, Program 120, Program 195). Only hard crab landings were incorporated in the model, neither recreational nor soft/peeler landings were included, primarily due to their minimal contribution to the overall harvest. The two-stage model was developed based on the catch-survey analysis designed for species lacking information on the age structure of the population. The model synthesized information from multiple sources, tracked population dynamics of male and female recruits and fully recruited animals, estimated critical demographic and fishery parameters such as natural and fishing mortality, and thus, provided a comprehensive assessment of blue crab status in North Carolina. The hierarchical Bayesian approach was used to estimate model parameters, which can incorporate uncertainty associated with the data and model assumptions.

The model estimated an overall declining trend in catch, relative abundance indices, population size of both male and female recruits and fully recruited crabs, with a rebound starting in 2007 (Figure 1). Females had higher natural mortality estimates than males. The estimated fishing mortality remained high before 2007 and decreased by approximately 50% afterward (Figure 1).

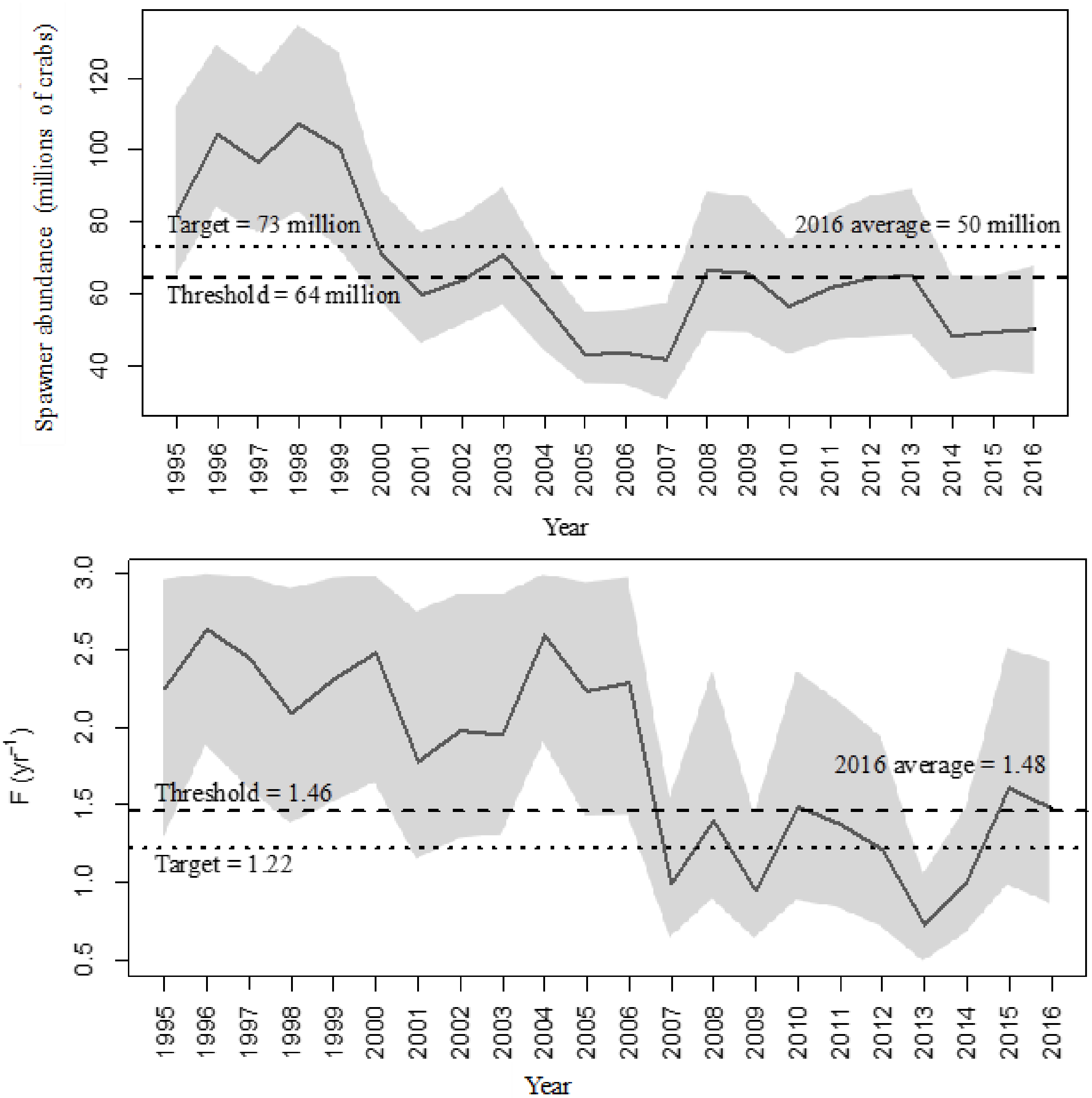


Figure 1. Estimated spawner abundance (mature female blue crabs; top) and fishing mortality (F; bottom) from the 2018 blue crab stock assessment (NCDMF 2018). The solid lines represent the posterior mean and the shaded area represents the 95% credible interval. The threshold and target values are the posterior means (dashed lines).

The status of the blue crab stock was evaluated using biological reference points (BRPs) based on maximum sustainable yield (MSY). The MSY-based BRPs have been widely used in fishery stock assessments including blue crabs, e.g., Chesapeake Bay 2001 (Miller et al. 2011), Florida 2007 (Murphy et al. 2007), and Gulf of Mexico 2013 assessments (VanderKooy 2013).

The fishing mortality that maximizes the total yield (FMSY) was set to be the threshold for overfishing, and 0.75 FMSY was set to be the target fishing mortality. The spawner abundance at FMSY (SPMSY) and 0.75 FMSY were set to be the threshold and target for an overfished population, respectively. In the stock assessment, the population is determined to be overfished if the average spawner abundance in 2016 falls below SPMSY and is determined to be undergoing overfishing if the average F in 2016 is above FMSY.

An update to the 2018 benchmark stock assessment for blue crab in North Carolina was completed in October 2023 (2022 terminal year). In the update, the magnitude and trends for estimated recruitment, female spawner abundance and fishing mortality were similar to those in the benchmark stock assessment. However, the estimated maximum sustainable yield-based reference points for both female spawner abundance and fishing mortality drastically changed. Given concerns with model specifications and results identified by the division and external peer reviewers, the 2023 stock assessment update is not being used to provide guidance on the level of harvest reduction needed to achieve sustainable harvest.

The 2018 benchmark stock assessment report is available on the DMF website here.

DESCRIPTION OF THE FISHERY

Current Regulations

General Statutes

All management authority for North Carolina's blue crab fishery is vested in the State of North Carolina. Statutes that have been applied to the blue crab fishery include:

- Definitions relating to resources. G.S. 113-129
- Definitions relating to activities of public. G.S. 113-130
- Jurisdiction of fisheries agencies. G.S. 113-132
- It is unlawful for any person without the authority of the owner of the equipment to take fish from said equipment. G.S. 113-268(a)
- It is unlawful for any vessel in the navigable waters of the State to willfully, wantonly, and unnecessarily do injury to any seine, net or pot. G.S. 113-268(b)
- It is unlawful for any person to willfully destroy or injure any buoys, markers, stakes, nets, pots, or other devices or property lawfully set out in the open waters of the state in connection with any fishing or fishery. G.S. 113-268(c)

Marine Fisheries Commission Rules

The MFC has established several rules that directly govern the harvest of blue crabs. Below are rules and excerpts from rules that directly affect the blue crab fishery. The rules below do not cover all gear, area, or other rules which may impact the blue crab fishery. As regulations may change, please contact the DMF for the most current regulations.

Definitions

Blue crab shedding: The process whereby a blue crab emerges soft from its former hard exoskeleton. A shedding operation is any operation that holds peeler crabs in a controlled environment. A controlled environment provides and maintains throughout the shedding process one or more of the following: (i) food, (ii) predator protection, (iii) salinity, (iv) temperature controls, or (v) water circulation, utilizing technology not found in the natural environment. A shedding operation does not include transporting pink or red-line peeler crabs to a permitted shedding operation. 15A NCAC 03I .0101(2)(c).

Peeler crab: A blue crab that has a soft shell developing under a hard shell and having a white, pink, or red-line or rim on the outer edge of the back fin or flipper. 15A NCAC 03I .0101(2)(f).

Commercial fishing equipment or gear: All fishing equipment used in coastal fishing waters except: (i) cast nets; (ii) collapsible crab traps, a trap used for taking crabs with the largest open dimension no larger than 18 inches and that by design is collapsed at all times when in the water, except when it is being retrieved from or lowered to the bottom; (iii) dip nets or scoops having a handle not more than eight feet in length and a hoop or frame to which the net is attached not exceeding 60 inches along the perimeter; (iv) gigs or other pointed implements which are propelled by hand, whether or not the implement remains in the hand; (v) hand operated rakes no more than 12 inches wide and weighing no more than six pounds and hand operated tongs; (vi) hook and line and bait and line equipment other than multiple hook or multiple bait trotline; (vii) landing nets used to assist in taking fish when the initial and primary method of taking is by the use of hook and line; (viii) Minnow traps when no more than two are in use; (ix) seines less than 30 feet in length; (x) spears, Hawaiian slings or similar devices, that propel pointed implements by mechanical means, including elastic tubing or bands, pressurized gas or similar means. 15A NCAC 03I .0101(3)(c).

Mesh length: The diagonal distance from the inside of one knot to the outside of the other knot, when the net is stretched hand tight. 15A NCAC 03I .0101(3)(k).

Crab Harvest Restrictions

Hard crab minimum size limit of five inches measured from tip of spike to tip of spike for all hard blue crabs. It is unlawful to possess mature female hard crabs with a dark (brown or black) sponge from April 1 through April 30 statewide. Juvenile female hard crabs may not be harvested. Soft crabs shall be separated where taken and placed in a separate container. Peeler crabs shall be separated where taken and placed in a separate container. White-line peeler crabs shall be separated from pink and red-line peeler crabs where taken and placed in a separate container. Male crabs to be used as peeler bait are exempt from the five-inch size limit from March 1 through October 31 and shall be placed in a separate container. A culling tolerance of not more than five percent by number shall be allowed for white-line peelers in the pink and red-line peeler container. It is unlawful to sell white-line peelers, possess white-line peelers unless they are to be used by the harvester in the harvester's permitted blue crab shedding operation, possess male white line peelers from June 1 through September 1. It is unlawful to possess more than 50 crabs per person per day not to exceed 100 blue crabs per vessel per day for recreational purposes. To comply with management measures in the N.C. Blue Crab Fishery Management Plan, the Director of the DMF, may by proclamation, close the harvest of blue crabs and may impose any or all the following restrictions on the commercial and recreational harvest of blue crab: specify, areas, season; time periods, means and methods, culling tolerance, and limit harvest based on size, quantity, sex, reproductive stage, or peeler stage. 15A NCAC 03L .0201.

From January 1 to January 31, it is unlawful to possess blue crabs taken from all Coastal Fishing Waters of the state north and east of a line extending southeast from the Highway 58 Bridge to a point offshore at 34° 36.3292’N, 77° 2.5940’W to the North Carolina/Virginia state line (15A NCAC 03R .0118(1)). From March 1 to March 15, it is unlawful to possess blue crabs taken from all Coastal Fishing Waters of the state south and west of a line extending southeast from the Highway 58 Bridge to a point offshore at 34° 36.3292’N, 77° 2.5940’W to the North Carolina/South Carolina state line (15A NCAC 03R .0118(2)). 15A NCAC 03L .0201 (a) and (b).

Spawning Sanctuaries

It is unlawful to set or use trawls, pots, and mechanical methods for oysters or clams or take crabs with the use of commercial fishing equipment from crab spawning sanctuaries from March 1 through August 31 for the crab spawning sanctuaries described in 15A NCAC 03R .0110(1) and from March 1 through October 31 for the crab spawning sanctuaries described in 15A NCAC 03R .0110(2). During the remainder of the year the Director may, by proclamation, close these areas and may impose any or all the following restrictions: areas, time periods, means and methods, and limit harvest based on size, quantity, sex, reproductive stage, or peeler stage. 15A NCAC 03L .0205. Proclamation M-13-2024 prohibits the use of trawls year-round within all Crab Spawning Sanctuaries in accordance with Amendment 2 to the N.C. Shrimp Fishery Management Plan.

Peeler and Soft Crabs

It is unlawful to possess more than 50 blue crabs in a shedding operation without first obtaining a Blue Crab Shedding Permit from the DMF. 15A NCAC 03O .0503(c).

Recreational Harvest

- Blue crabs may be taken without a commercial license if the following gears are used; cast nets, collapsible crab traps with the largest open dimension no larger than 18 inches, a dip net having a handle not more than eight feet in length and a hoop or frame to which the net is attached not exceeding 60 inches along the perimeter; single bait-and-line equipment, or seines less than 30 feet. 15A NCAC 03I .0101(3)(c)(i), (ii), (iii), (vi), and (ix).
- Recreational crab pot buoys must be any shade of hot pink in color, be no less than five inches in diameter and length and be engraved with the owner's last name and initials. If a vessel is used the buoy must also be engraved with the gear owner's current motorboat registration number or owner's U.S. vessel documentation name. 15A NCAC 03J .0302(a)(1) and (2).
- It is unlawful for a person to use more than one crab pot attached to the shore along privately owned land or to a privately-owned pier without possessing a valid Recreational Commercial Gear License. 15A NCAC 03J .0302(b).
- Up to five crab pots may be used by holders of the Recreational Commercial Gear License. 15A NCAC 03O .0302(a)(3).
- Peeler pots are not permitted to be used by holders of the Recreational Commercial Gear License. 15A NCAC 03O .0302(a)(3).
- One multiple hook or multiple bait trotline up to 100 feet in length may be used to harvest blue crabs. 15A NCAC 03O .0302(a)(4).
- Trotlines must be marked at both ends with any shade of hot pink in color, be no less than five inches in diameter and length, and be engraved with the owner's last name and initials. If a vessel is used the buoy must also be engraved with the gear owner's current motorboat registration number or owner's U.S. vessel documentation name. 15A NCAC 03J .0302.

Trawls

- It is unlawful to use trawl nets in designated pot areas opened to the use of pots within an area bound by the shoreline to the depth of six feet. 15A NCAC 03J .0104(b)(6).
- It is unlawful to use shrimp trawls for the taking of blue crabs in internal waters, except that it shall be permissible to take or possess blue crabs incidental to commercial shrimp trawling provided the weight of the crabs shall not exceed; 50% of the total weight of the combined crab and shrimp catch; or 300 pounds, whichever is greater. For individuals using shrimp trawls authorized by a Recreational Commercial Gear License, 50 blue crabs, not to exceed 100 blue crabs if two or more Recreational Commercial Gear License holders are on board may be possessed. The Fisheries Director may, by proclamation, close any area to trawling for specific time periods in order to secure compliance with this rule. 15A NCAC 03J .0104(f)(1), (f)(2)(A), and (B), and (g).
- From December 1 through March 31, it is unlawful to possess finfish caught incidental to shrimp and crab trawling in the Atlantic Ocean unless the weight of the combined catch of shrimp and crabs exceeds the weight of finfish; except that trawlers working south of Bogue Inlet may keep up to 300 pounds of kingfish, regardless of their shrimp or crab catch weight. 15A NCAC 03J .0202(5).
- It is unlawful to take or possess crabs aboard a vessel in internal waters except in areas and during such times as the Fisheries Director may specify by proclamation. 15A NCAC 03L .0202(a).
- It is unlawful to take crabs with crab trawls with a mesh less than three inches, except in areas of western Pamlico Sound where the minimum mesh length is four inches. The Director may, by proclamation, specify other areas for trawl mesh length and increase the minimum mesh length to no more than four inches. 15A NCAC 3L .0202(b)(1) and (2).

- It is unlawful to use trawls with a mesh length less than two inches or with a combined total headrope length exceeding 25 feet for taking soft or peeler crabs. 15A NCAC 03L .0202(c).
- It is unlawful to use trawl nets for any purpose in any of the special secondary nursery areas, except that the Fisheries Director, may, by proclamation, open any or all of the special secondary nursery areas, or any portion thereof to crab trawling from August 16 through May 14. 15A NCAC 03N .0105(b), 03R .0105, 03L .0100 and .0200.
- It is unlawful to use trawl nets in areas listed in 15A NCAC 03R .0106, except that certain areas may be opened to peeler trawling for single-rigged peeler trawls or double-rigged boats whose combined total headrope length does not exceed 25 feet. 15A NCAC 03J .0104(b)(4) and 03R .0106(1).

<u>Crab Pots</u>

- It is unlawful to leave pots in any coastal fishing waters for more than five consecutive days, when such pots are not being employed in fishing operations, except upon a timely and sufficient showing of hardship. 15A NCAC 03I .0105(b)(1), (b)(2)(A) and (B), (b)(3), and (c).
- From January 1 to January 31, it is unlawful to use crab pots in Coastal Fishing Waters of the state north and east of a line extending southeast from the Highway 58 Bridge to a point offshore at 34° 36.3292’N, 77° 2.5940’W to the North Carolina/Virginia state line (15A NCAC 03R .0118(1)). From March 1 to March 15, it is unlawful to use crab pots in Coastal Fishing Waters of the state south and west of a line extending southeast from the Highway 58 Bridge to a point offshore at 34° 36.3292’N, 77° 2.5940’W to the North Carolina/South Carolina state line (15A NCAC 03R .0118(2)). 15A NCAC 03J .0301 (a)(1)(a) and (b).
- From June 1 through November 30 the use of crab pots is restricted in certain areas north and east of the Highway 58 Bridge at Emerald Isle. These areas are described in 15A NCAC 03R .0107(a). To allow for the variable spatial distribution of crustacea and finfish, the Fisheries Director may, by proclamation, specify time periods for or designate the areas described in 15A NCAC 03R .0107(b); or any part thereof, for the use of pots. From May 1 through November 30 in the Atlantic Ocean and west and south of the Highway 58 Bridge at Emerald Isle in areas and during time periods designated by the Fisheries Director by proclamation.15A NCAC 03J .0301(a)(2)(A) and (B), (a)(3), and 03R .0107(a) and (b).
- It is unlawful to use pots in any navigation channel maintained and marked by State or Federal agencies. 15A NCAC 03J .0301(b)(1).
- It is unlawful to use pots in any turning basin maintained and marked by the North Carolina Ferry Division. 15A NCAC 03J .0301(b)(2).
- It is unlawful to use pots in a commercial fishing operation unless each pot is marked by attaching a floating buoy which shall be of solid foam or other solid buoyant material no less than five inches in diameter and no less than five inches in length. Buoys may be any color except any shade of yellow or any shade of hot pink, or any combination of colors that include any shade of yellow or any shade of hot pink. The pot owner’s last name and initials shall be engraved on the attached buoy or identified by attaching engraved metal or plastic tags to the buoy. If a vessel is used, the identification shall include either the pot owners current motor boat registration number or vessel documentation name. 15A NCAC 03J .0301(c)(1) and (2)
- It is unlawful to use crab pots in coastal fishing waters unless each pot contains no less than three unobstructed escape rings that are at least 2 and 5/16 inches inside diameter and two must be located in the opposite outside panels of the upper chamber of the pot and at least one must be located within one full mesh of the corner and one full mesh of the bottom of the divider in the upper chamber of the pot except: unbaited pots, pots baited with a male crab 15A NCAC 03J .0301(g).
- It is unlawful to use more than 150 pots per vessel in the Newport River. 15A NCAC 03J .0301(i).

- It is unlawful to remove crab pots from the water or remove crabs from pots between one hour after sunset and one hour before sunrise. 15A NCAC 03J .0301(j).
- It is unlawful to use pots to take crabs unless the line connecting the pot to the buoy is non-floating. 15A NCAC 03J .0301(k).

Crab Dredging

- It is unlawful to take blue crabs with dredges except incidental to lawful oyster dredging operations provided the weight of the crabs does not exceed 10% of the total weight of the combined oyster and crab catch or 100 pounds, whichever is less. 15A NCAC 03L .0203 (1) & (2)

Diamondback Terrapin Management Areas

- For areas described in Proclamation PT-1-2024 including the Masonboro Island and Bald Head Island areas, from March 1 through October 31 it is unlawful to set or use crab pots without the correct use of Division of Marine Fisheries Approved Diamondback Terrapin Bycatch Reduction Devices. PT-1-2024.

Miscellaneous

- It is unlawful to possess, sell, or purchase fish under four inches in length except for use as bait in the crab pot fishery in North Carolina with the following provision: such crab pot bait shall not be transported west of U.S. Interstate 95 and when transported, shall be accompanied by documentation showing the name and address of the shipper, the name and address of the consignee, and the total weight of the shipment. 15A NCAC 03M .0103(1).

Wildlife Resources Commission Rules

Blue Crab 15A NCAC 10C .0413

- Blue crabs shall have a minimum carapace width of five inches (point to point) and it is unlawful to possess more than 50 crabs per person per day or to exceed 100 crabs per vessel per day. 15A NCAC 10C .0413(a)(b).
- There is no closed season. 15A NCAC 10C .0413(c)
- Blue crabs shall not be sold. 15A NCAC 10C .0413 (d).

Taking Nongame Fishes By Special Device For Bait Or Personal Consumption 15A NCAC 10C .0402

- A single, multiple bait line for taking crabs not to exceed 100 feet in length, marked on each end with a solid float no less than five inches in diameter, bearing legible identification of the user's name and address, and under the immediate control and attendance of the person using the device, with a limit of one line per person and no more than one line per vessel. 15A NCAC 10C .0402(b)(12).
- A collapsible crab trap with the largest open dimension not greater than 18 inches, and that by design is collapsed at all times when in the water, except when being retrieved or lowered to the bottom, with a limit of one trap per person. 15A NCAC 10C .0402(b)(13).
- It is unlawful to sell nongame fishes or aquatic animals. 15A NCAC 10C .0402(c).

Special Devices 15A NCAC 10C .0404

- It is unlawful to use crab pots in inland fishing waters, except by persons owning property adjacent to the inland fishing waters of coastal rivers and their tributaries who are permitted to set two crab pots to be attached to their property and not subject to special device license requirements. 15A NCAC 10C .0404(e).

Commercial Fishery

Since 1994, the North Carolina Trip Ticket Program (NCTTP) has collected data on the commercial harvest of blue crab. Commercial blue crab landings (hard, soft, and peeler crabs) averaged 36.6 million pounds for the period 1995–2016 (benchmark stock assessment years; Table 1). Generally, commercial blue crab landings have been lower since around 1996 with a high of 67.1 million pounds harvested to a low of 9.5 million pounds in 2022. In 2024 the commercial landings increased to 18.9 million pounds which was 17.0% higher than 2023 but 42.7% lower than the 38-year average (Table 1; Figure 2). The number of trips recorded in 2024 increased to 31,608, which is 3.8% higher than in 2023 but 55.4% lower than the 30-year average (Figure 2). Crab pots account for most commercial blue crab landings (96.1% in 2024) followed by peeler pots (1.5% in 2024), crab/peeler trawls (2.0% in 2024), and other gears, including gill nets and shrimp trawls (<0.1% in 2024; Figure 3). Most crabs landed in 2024 were hard crabs (98.1%), followed by peeler (1.5%) and soft (0.44%) crabs (Figure 4).

Table 1. Blue crab recreational harvest (number and weight) and releases (number; Recreational Mail Survey) and commercial harvest (weight; North Carolina Trip Ticket Program), 1987–2024. Recreational harvest weight is calculated using a standard conversion of three crabs per pound. *2023–2024 Recreational data not available

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1987	-	-	-	32,423,604	32,423,604
1988	-	-	-	35,604,423	35,604,423
1989	-	-	-	34,724,673	34,724,673
1990	-	-	-	38,070,328	38,070,328
1991	-	-	-	41,829,676	41,829,676
1992	-	-	-	41,068,374	47,068,374
1993	-	-	-	43,672,732	43,672,732
1994	-	-	-	53,513,124	53,513,124
1995	-	-	-	46,443,653	46,443,541
1996	-	-	-	67,080,200	67,080,200
1997	-	-	-	56,090,109	56,090,109
1998	-	-	-	62,076,170	62,076,171
1999	-	-	-	57,545,843	57,546,676
2000	-	-	-	40,638,384	40,638,384
2001	-	-	-	32,179,345	32,180,390
2002	-	-	-	37,736,319	37,736,319
2003	-	-	-	42,769,797	42,769,797
2004	-	-	-	34,130,739	34,130,608
2005	-	-	-	25,430,119	25,430,119
2006	-	-	-	25,343,158	25,343,158
2007	-	-	-	21,424,960	21,424,960
2008	-	-	-	32,916,691	32,916,691
2009	-	-	-	29,707,232	29,707,232
2010	-	-	-	30,683,011	30,683,011
2011	114,426	81,763	38,142	30,035,392	30,073,534
2012	120,979	79,072	40,326	26,785,669	26,825,995
2013	94,174	61,452	31,391	22,202,623	22,234,014
2014	100,597	67,413	33,532	26,231,112	26,264,644
2015	71,587	60,135	23,862	32,099,633	32,150,905
2016	72,645	82,781	24,215	25,462,943	25,491,033
2017	72,645	67,667	24,215	19,263,758	19,297,371
2018	47,766	57,024	15,922	17,015,659	17,028,276
2019	81,815	78,784	27,272	23,027,008	23,014,642
2020	78,646	78,742	26,215	13,548,381	13,575,299
2021	48,675	42,561	16,225	12,819,840	12,806,644
2022	72,910	37,768	24,303	9,509,242	9,531,991
2023*	-	-	-	15,738,994	15,738,994
2024*	-	-	-	18,943,488	18,943,488
Mean	77,582	66,264	25,861	33,047,011	33,212,661

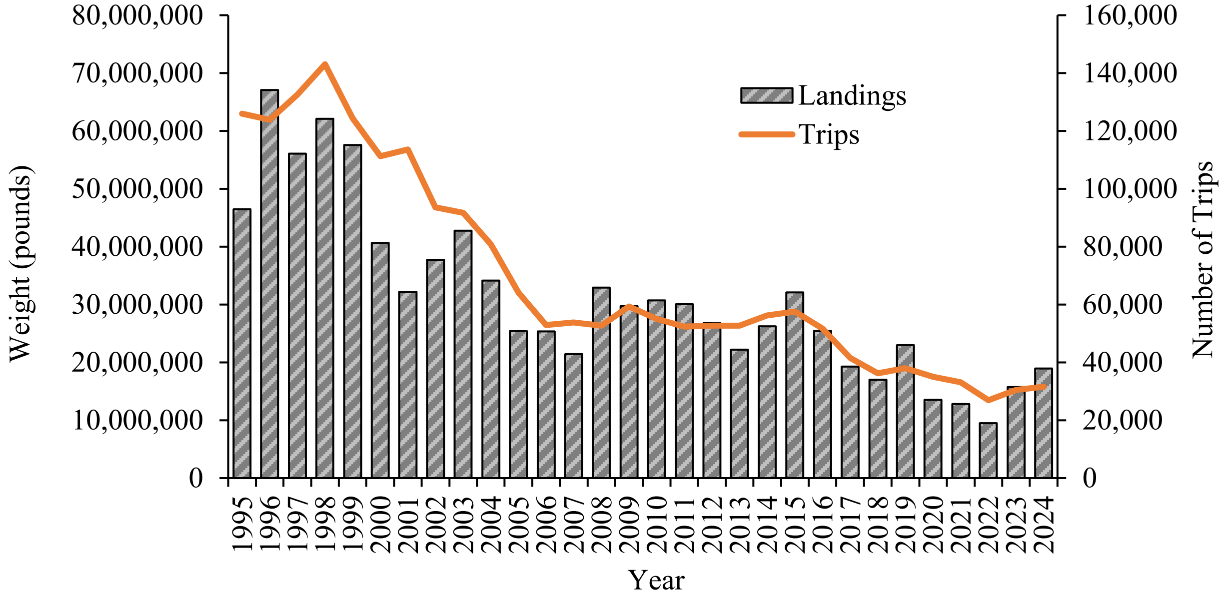


Figure 2. Annual blue crab commercial landings (North Carolina Trip Ticket Program) and number of trips, 1995–2024. Landings include hard, soft, and peeler crabs.

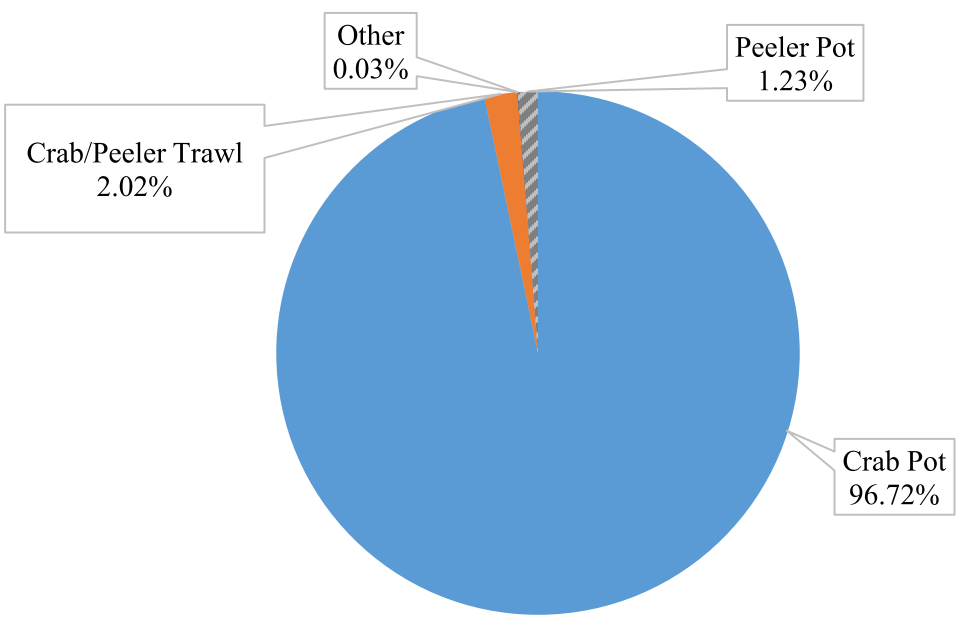


Figure 3. Commercial harvest (pounds) of blue crab by gear, 2024.

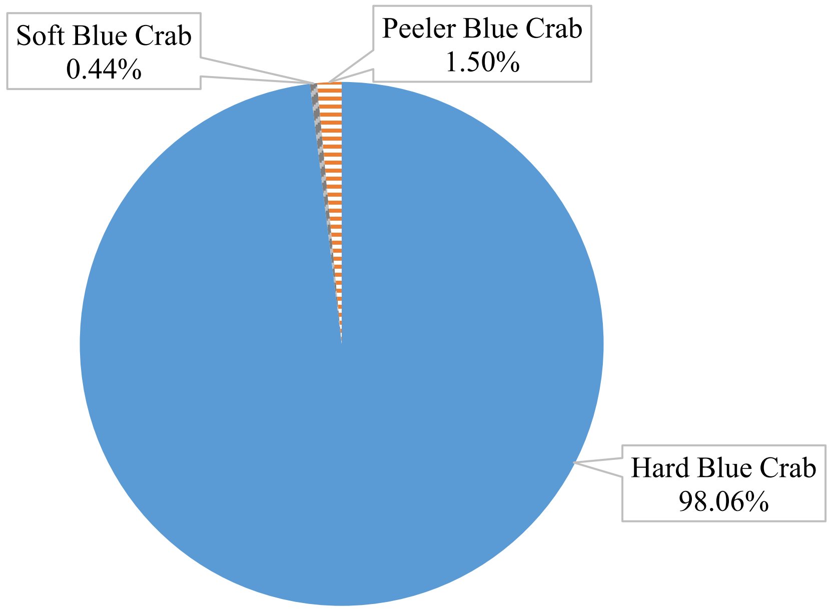


Figure 4. Commercial harvest (pounds) of blue crab by crab type, 2024.

Recreational Fishery

A survey of Recreational Commercial Gear License (RCGL) holders conducted during 2002–2008 by the division indicated blue crabs were the most abundant species landed (by weight) by RCGL participants. During this time, on average, blue crabs accounted for 20% (116,797 pounds) of the total poundage (587,172 pounds) of all species landed by RCGL holders. This survey was discontinued in 2009 due to lack of funding; meaning more recent estimates of RCGL harvest are unavailable. The harvest of RCGL exempted shore and pier-based pots, as well as other non-commercial gear is unknown.

The Marine Recreational Information Program is primarily designed to sample anglers using rod and reel as the mode of capture. Since blue crab are also harvested recreationally throughout coastal North Carolina, primarily by pots, this program does not provide precise estimates of recreational harvest. To address this, the division began a mail survey of Coastal Recreational Fishing License (CRFL) holders in the fall of 2010 to generate recreational harvest estimates for blue crab. One weakness of the survey is that a CRFL is not required to harvest blue crab, so harvest from the recreational sector is likely underestimated. Full year results from this survey are available for 2011–2022 (Table 1; Figure 5). In 2023, a new licensing system was implemented and the license database was restructured. This restructuring disrupted the division's ability to query the full license dataset to establish a sampling frame of eligible anglers for the mail surveys. As a result, the division was unable to administer the mail surveys and expand potential responses. As a result survey estimates are not available since this new system has been initiated. Generally, recreational blue crab harvest estimates are low, ranging from 47,766 blue crabs (approximately 15,922 pounds, using an average of three crabs per pound) in 2018 to 120,979 blue crabs (approximately 40,326 pounds) in 2012. During 2011–2022, the average annual recreational harvest of blue crab was 66,744 blue crabs (approximately 22,248 pounds).

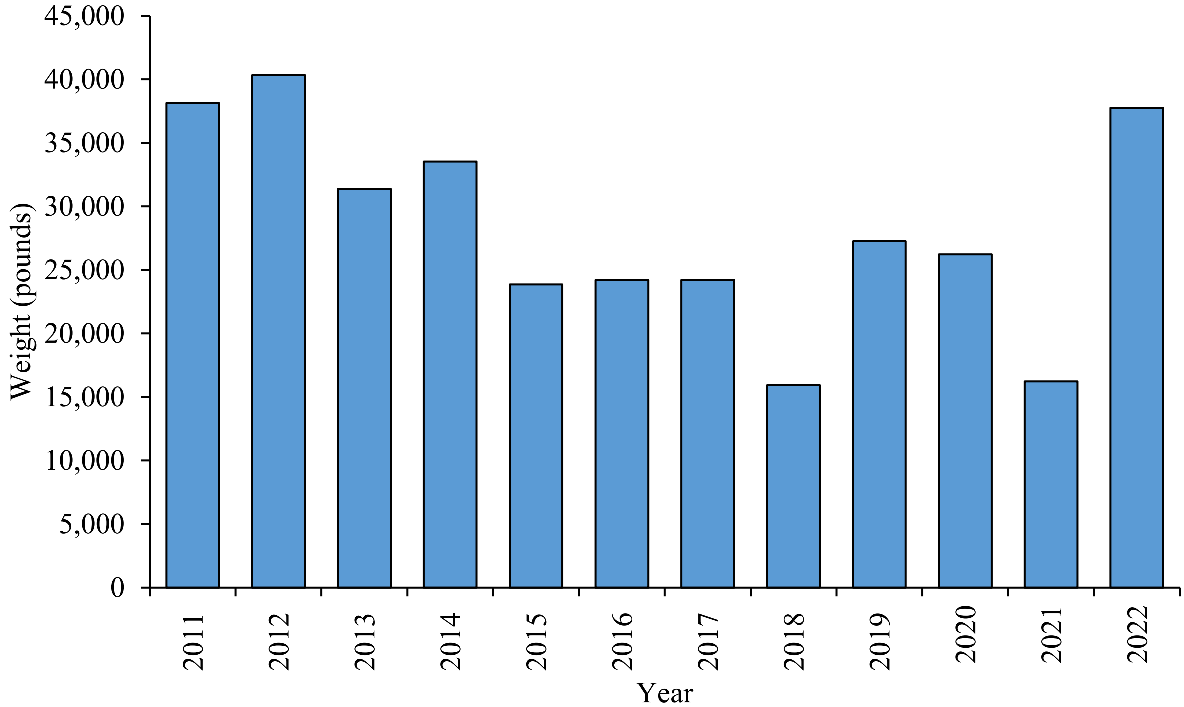


Figure 5. Annual blue crab recreational harvest, 2011–2022. Recreational mail survey began in October 2010 with the first full year of data available for 2011. *2023–2024 Recreational data not available.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

The number of blue crab lengths obtained from fishery-dependent sources from 2015 through 2024 ranged from 7,330 in 2020 to 14,711 in 2015 (Table 2). Mean carapace width (CW) varied little and ranged from 5.6 inches to 5.9 inches. Minimum CW ranged from 1.9 to 3.9 inches. Maximum CW ranged from 7.8 inches to 9.0 inches. In general, the commercial fishery harvests a narrow size range of blue crab, with most crabs ranging from 4.5 to 6.5 inches CW. The length composition and modal length of blue crab caught in the commercial fishery has varied little over time (Figure 6).

The annual length of 50% maturity is compared to the mean from the stock assessment years of 1995–2016 (113.4 mm CW [4.5 inches]). In 2024, the length of 50% maturity was 122.1 mm CW (4.8 inches), above the mean for the stock assessment years. (Figure 7).

Table 2. Blue crab length (carapace width [CW], inches) data from commercial fish house samples, 2015–2024.

Year	Mean CW	Minimum CW	Maximum CW	Total Number Measured
2015	5.8	2.2	9.0	14,711
2016	5.8	3.5	9.0	13,456
2017	5.8	3.6	8.1	10.105
2018	5.8	3.7	8.1	7,771
2019	5.7	3.9	8.4	11,844
2020	5.6	1.9	7.9	7,832
2021	5.7	3.3	7.8	10,438
2022	5.9	3.6	8.7	7,330
2023	5.9	2.6	8.3	8,660
2024	5.9	2.6	8.3	8,841

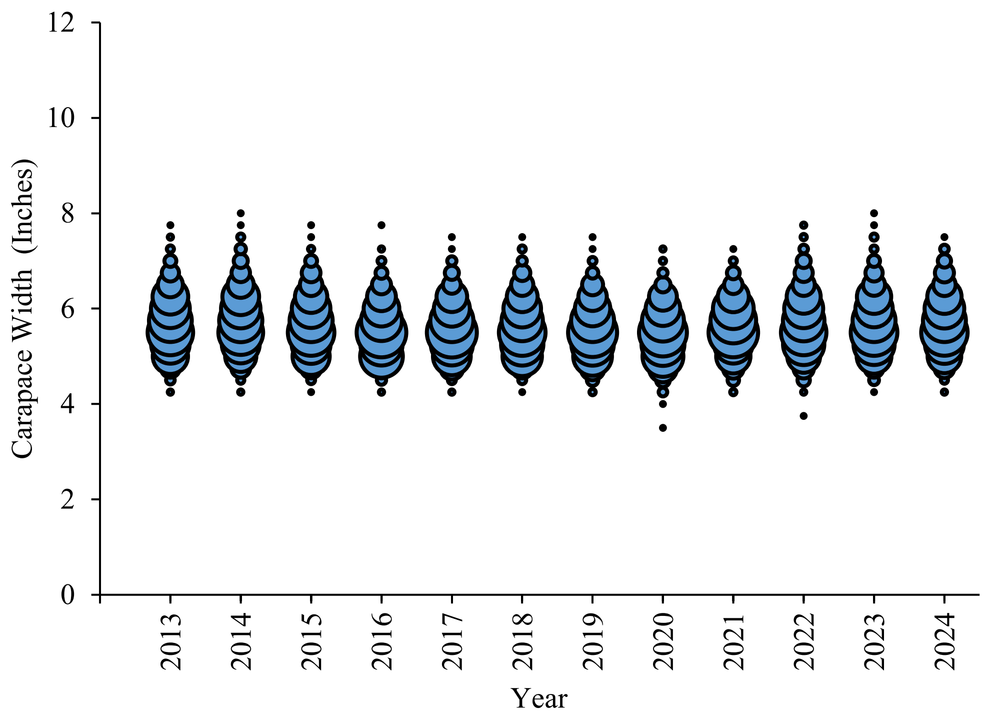


Figure 6. Commercial length frequency (carapace width, inches) of hard blue crab harvested, 2015–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

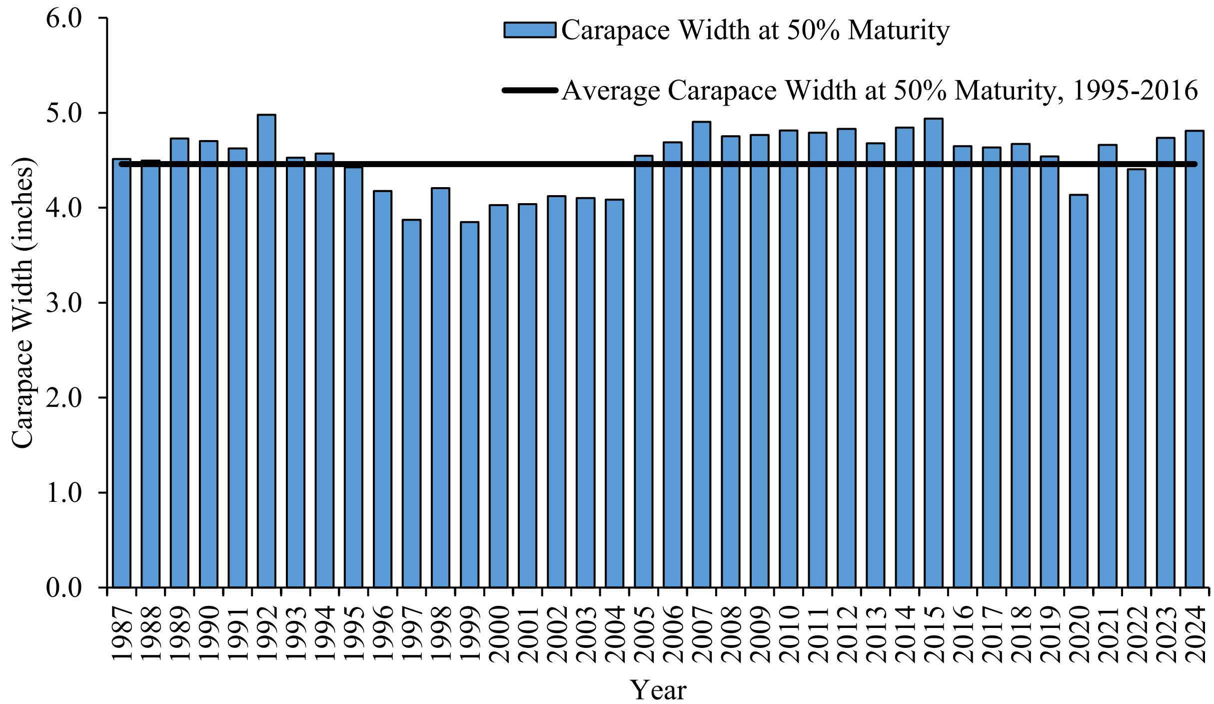


Figure 7. Length at 50% maturity for female blue crabs compared to stock assessment years, 1995–2016. Fishery-dependent and independent data were included in the analysis.

Fishery-Independent Monitoring

The blue crab stock assessment uses several fishery-independent indices for the recruit and fully recruited indices, including the Estuarine Trawl Survey (Program 120), the Pamlico Sound Survey (Program 195), and the Juvenile Anadromous Trawl Survey (Program 100). The base years used for the blue crab stock assessment were 1995–2016.

Recruit Abundance

The recruit indices use data from the Estuarine Trawl Survey and the Pamlico Sound Survey to monitor blue crab recruit abundance. Each index consists of blue crabs less than 127 mm CW (5.0 inches). Two indices are derived from Program 120: a male recruit index and a female recruit index (Figure 8). Four recruit indices are derived from Program 195: June indices by sex and September indices by sex (Figures 9 and 10).

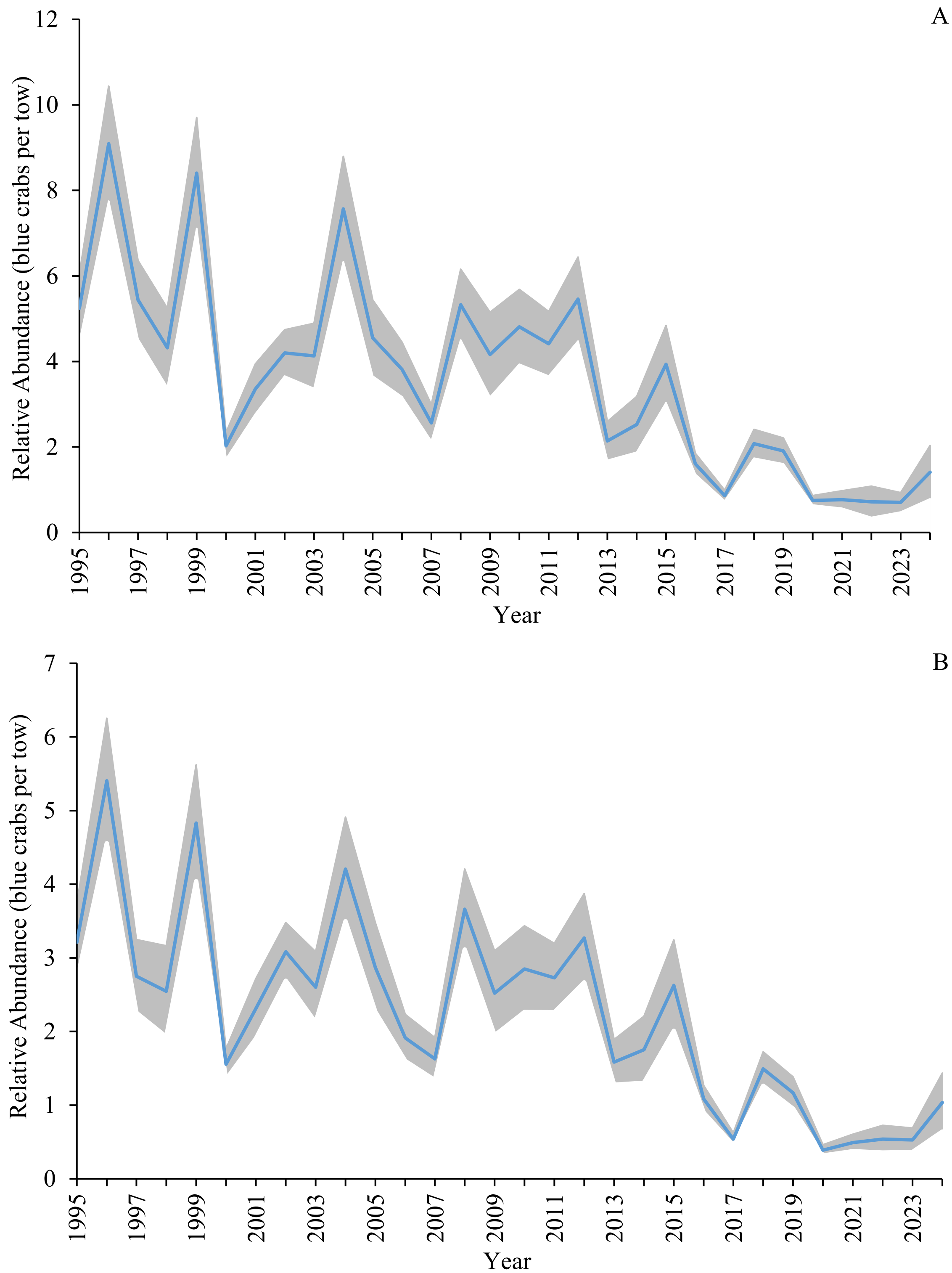


Figure 8. Nominal index (number of crabs per tow) of recruit crab relative abundance (<127 mm CW) captured in Program 120 in May and June by male (A) and female (B), 1995–2024.

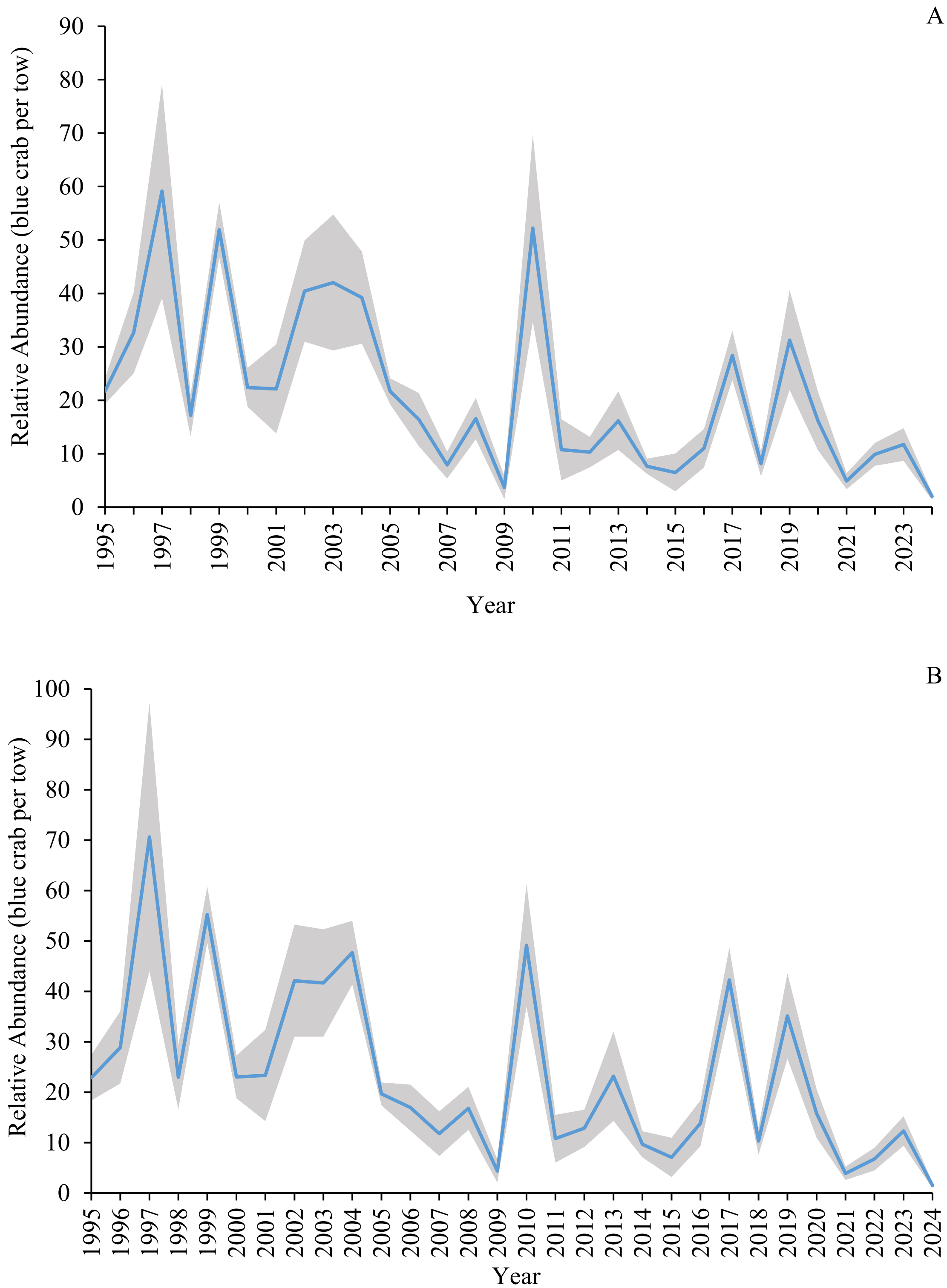


Figure 9. Nominal index (number of crabs per tow) of recruit crab relative abundance (<127 mm, 5 inches, CW) captured in Program 195 by June male (A), June female (B), 1995–2024 for all strata combined [Note: in 2020 and 2021 less than 54 stations were sampled].

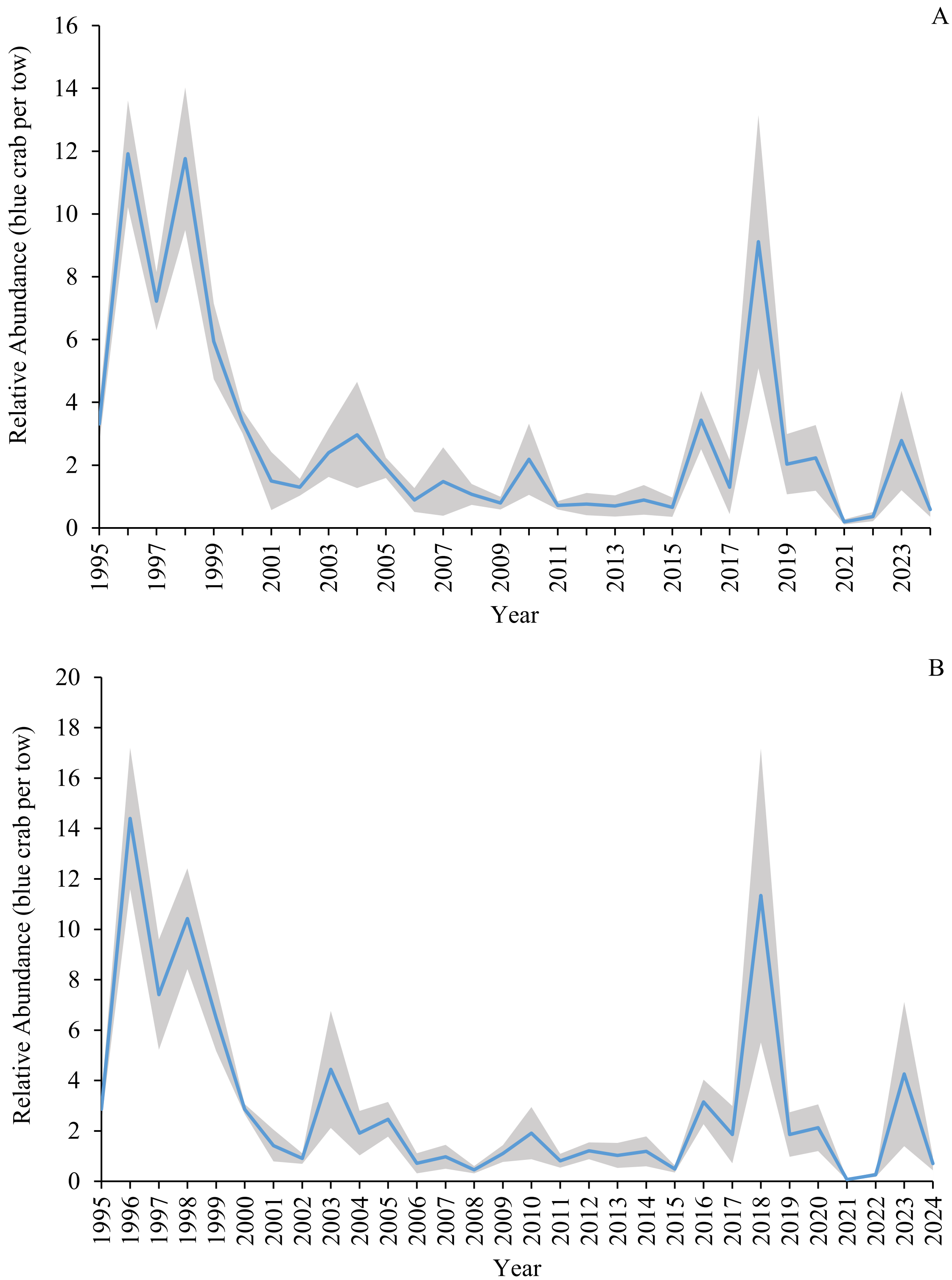


Figure 10. Nominal index (number of crabs per tow) of recruit crab relative abundance (<127 mm, 5 inches, CW) captured in Program 195 by September male (A), September female (B), 1995–2024 for all strata combined [Note: 2018 September sampling was conducted in October and in 2020 and 2021 less than 54 stations were sampled in both months].

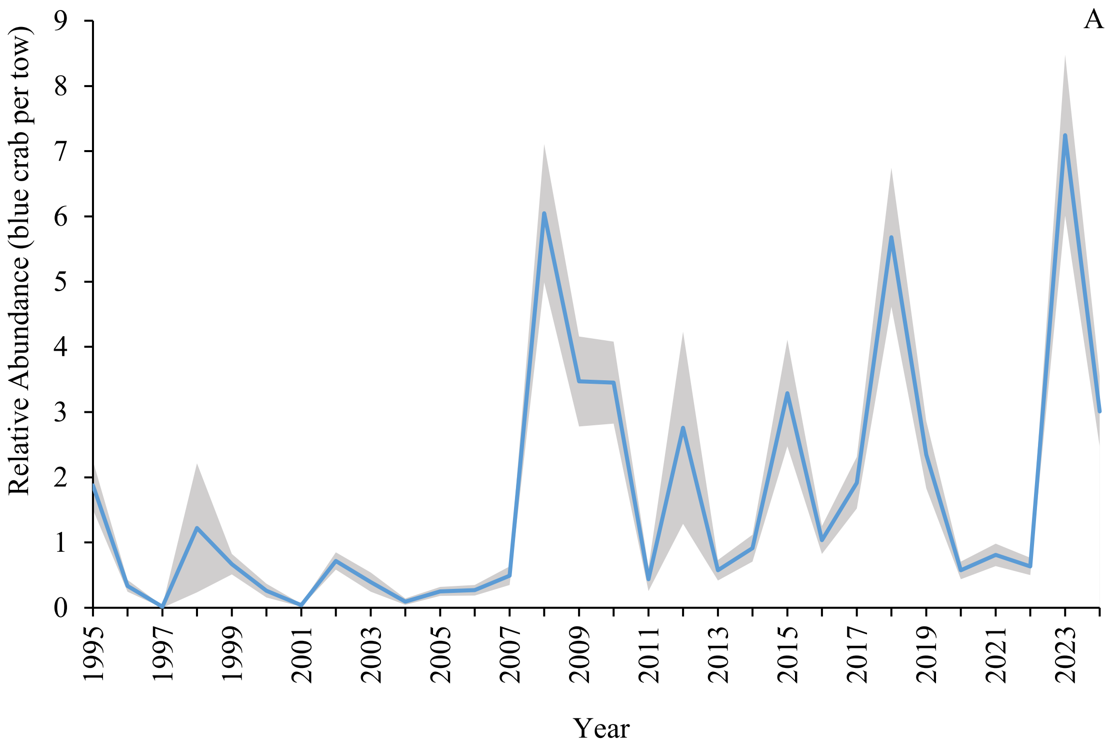
Male recruit abundance in Program 120 has been below the stock assessment years' mean (4.5 crabs/tow) since 2012 when relative abundance was 5.5 crabs/tow (Figure 8A). Female recruit abundance has also been below the stock assessment years' mean (2.8 crabs/tow) since 2012 (3.3 crabs/tow; Figure 8B). In 2024, male recruit abundance increased from 2023 to 1.4 crabs/tow. The lowest female recruit abundance was in 2020 at 0.4 crabs/tow. In 2024, female recruit abundance increased to 1.0 crabs/tow.

Recruit abundance for Program 195 varies greatly from year to year. In June 2024, male recruit abundance decreased to 2.0 crabs/tow becoming the lowest in the time series (Figure 9A). In June 2024, female recruit abundance also decreased to 1.5 crabs/tow, the lowest level of the time series (Figure 9B).

In September 2024, both male and female recruit abundance decreased compared to previous years sampling, however abundance remained higher than the time series lows in 2021. Male recruit abundance decreased to 5.9 crabs/tow and female recruit abundance decreased to 0.7 crabs/tow in 2024. It should be noted the COVID pandemic impacted sampling in 2020 and 2021. In 2020, sampling was limited to 28 stations sampled in June and 35 stations sampled in September. A total of 35 stations were sampled in June 2021, and 32 stations were sampled in September 2021. Limited sampling likely impacted abundance indices calculated from Sound Survey data in these years.

Fully Recruited Abundance

The adult indices include data from the Juvenile Anadromous Trawl Survey (Program 100) and the Pamlico Sound Survey (Program 195). Indices consist of blue crabs greater than or equal to 127 mm CW (5.0 inches). Four indices are derived from Program 100, a male fully recruited index and a female fully recruited index by season (summer and fall; Figures 11 and 12). Program 195 is also used to derive June fully recruited indices by sex and September fully recruited indices by sex (Figures 13 and 14).



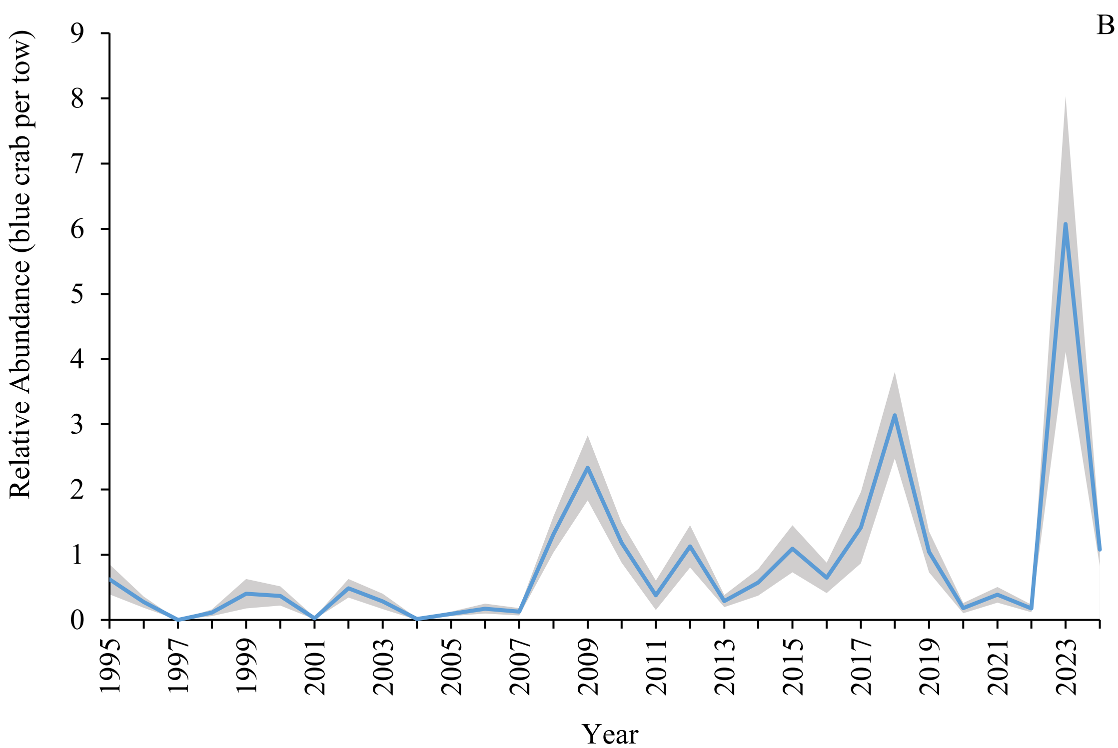


Figure 11. Nominal index (number of crabs per tow) of fully recruited crab relative abundance (≥127 mm, 5 inches; CW) captured in Program 100 in summer for male (A) and female (B), 1995–2024.

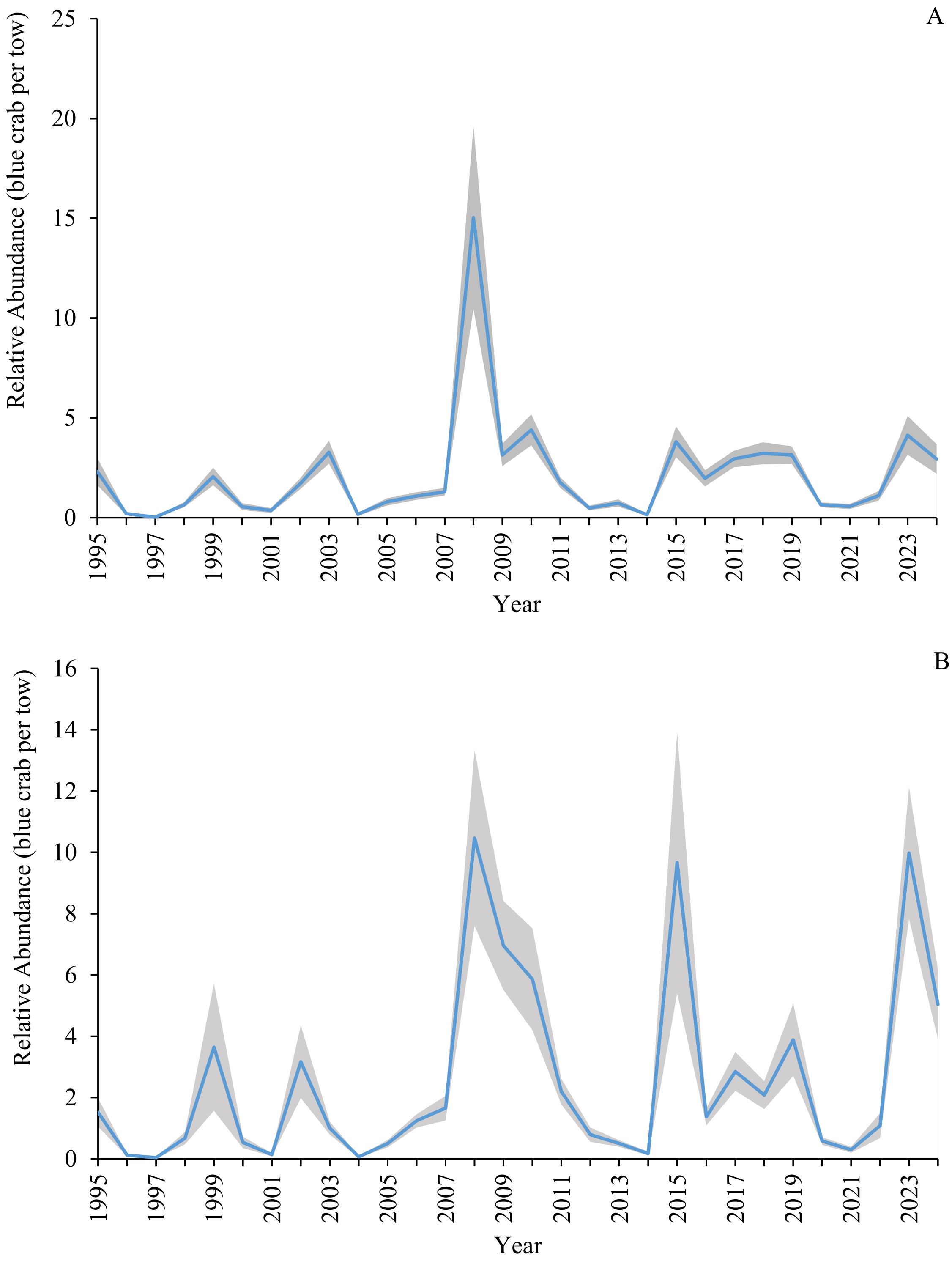


Figure 12. Nominal index (number of crabs per tow) of fully recruited crab relative abundance (≥127 mm, 5 inches; CW) captured in Program 100 in fall for male (A) and female (B), 1995–2024.

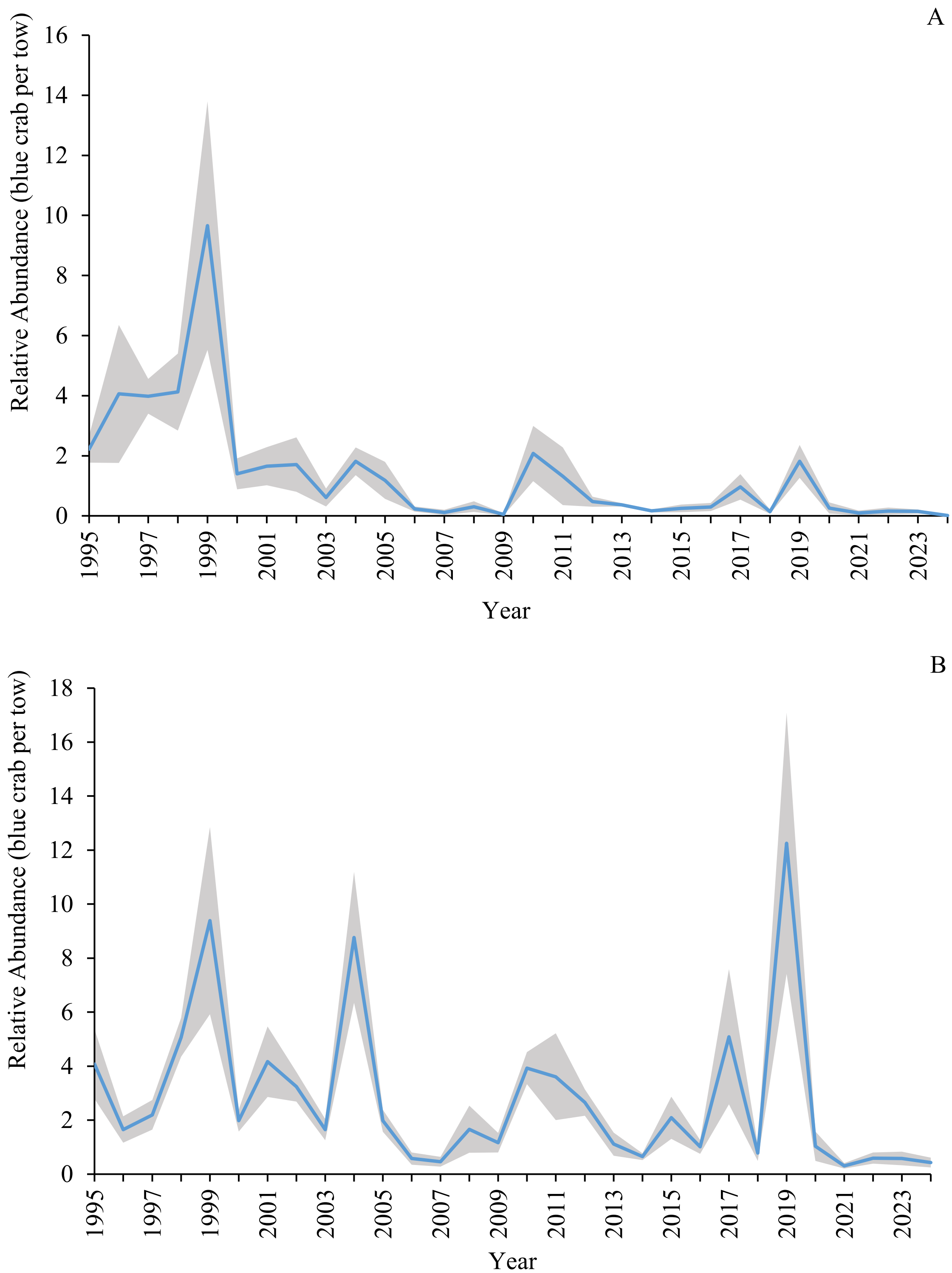


Figure 13. Nominal index (number of crabs per tow) of fully recruited crab relative abundance (≥127 mm, 5 inches, CW) captured in Program 195 for June male (A) and female (B), 1995–2024 for all strata combined [Note: in 2020 and 2021 less than 54 stations were sampled in both months].

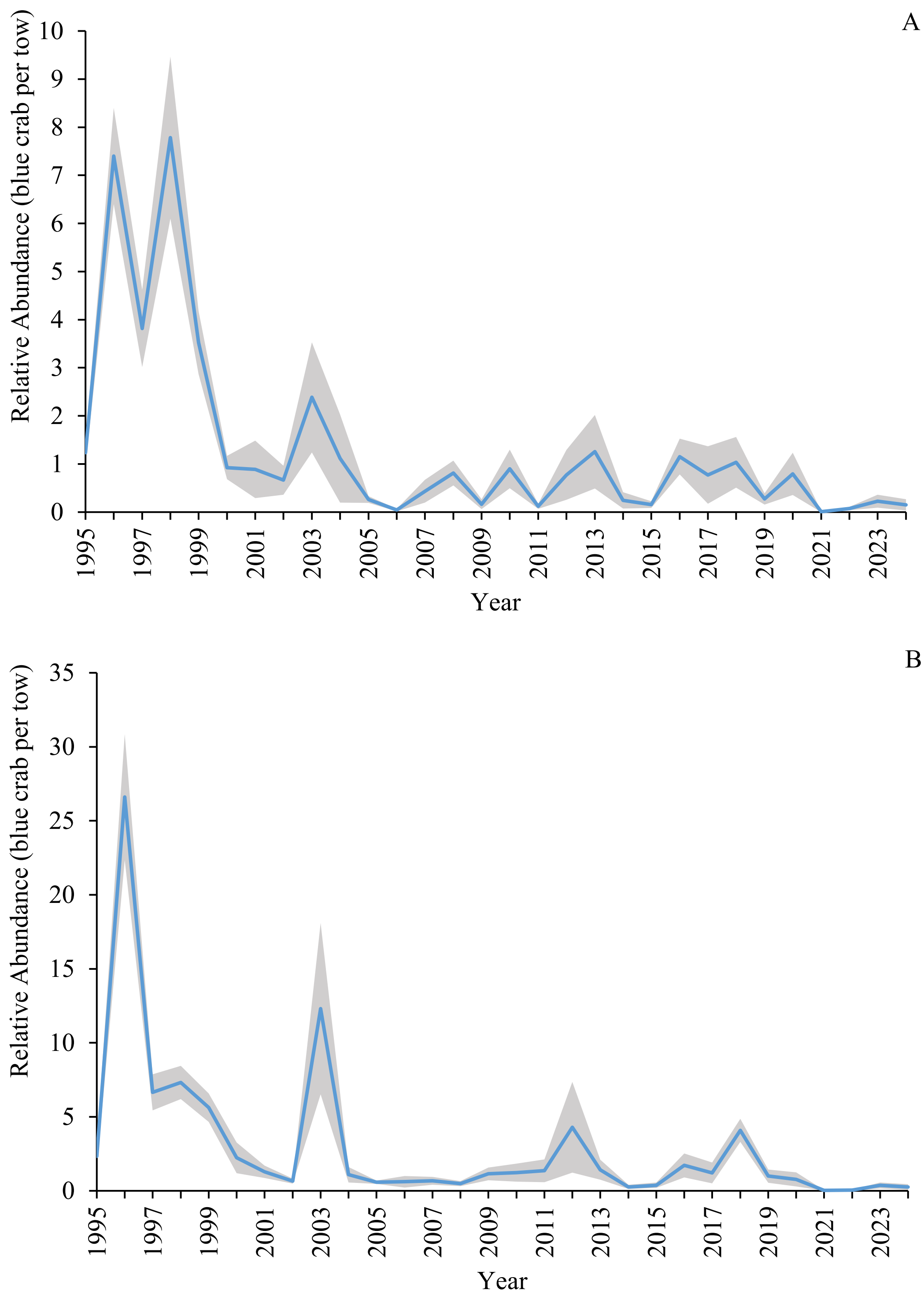


Figure 14. Nominal index (number of crabs per tow) of fully recruited crab relative abundance (≥127 mm, 5 inches, CW) captured in Program 195 for September male (A) and female (B), 1995–2024 for all strata combined [Note: 2018 September sampling was conducted in October and in 2020 and 2021 less than 54 stations were sampled in both months].

In 2024, male fully recruited summer abundance in Program 100 decreased to 3.0 crabs/tow which is above the stock assessment years' mean (1.3 crab/tow) and female fully recruited summer abundance was 1.1 crabs/tow which is above the stock assessment years' mean (0.5 crabs/tow; Figure 11). In 2024, male fully recruited fall abundance decreased from 2023 (4.1 crabs/tow) to 2.9 crabs/tow but remained above the stock assessment years' mean (2.1 crabs/tow). Female fully recruited fall abundance decreased from 2023 (10.0 crabs/tow) to 5.0 crabs/tow, which is still above the stock assessment years' mean (2.4 crabs/tow; Figure 12).

Program 195 fully recruited abundance is more variable in June compared to September for female blue crabs. In 2024, male fully recruited June abundance was < 0.1 crabs/tow which is below the stock assessment years' mean (1.6 crabs/tow; Figure 13A). Female fully recruited June abundance was 0.4 crabs per/tow in 2024 which is below the stock assessment years' mean (3.2 crabs/tow; Figure 13B). In 2024, male fully recruited September abundance was 0.2 crabs/tow which is below the stock assessment years' mean (1.6 crabs/tow; Figure 14A). The female fully recruited September abundance was 0.3 crabs/tow in 2024 which is below the stock assessment years' mean (3.4 crabs/tow; Figure 14B).

RESEARCH NEEDS

Several research needs were identified in N.C. Blue Crab Fishery Management Plan Amendment 3; the bulleted list below outlines the specific needs and highlights the priority of each management and research need.

High

- Implement long-term monitoring of blue crab discards in other fisheries (e.g., gill net, trawl).
- Develop statewide fishery-independent survey(s) to monitor the abundance of all blue crab life stages.
- Expand time and area coverage of existing fishery-independent surveys.
- Better characterize the magnitude of recreational harvest.
- Develop better estimates of life-history parameters, especially growth and natural mortality.
- Explore alternative biological reference points.
- Research interaction rates of non-target species in the blue crab fishery and identify factors that may lead to interactions (e.g., migration patterns, habitat utilization).
- Identify biological characteristics of submerged aquatic vegetation beds of ecological value to blue crab and implement restoration and conservation measures.
- Research mature female migration routes and seasonal habitat use (e.g., inlets, staging areas).
- Research gear modifications to minimize interactions with non-target species (e.g., diamondback terrapin) in the blue crab fishery.
- Research the impacts of land use activities and shoreline clearing on water quality and the blue crab stock.
- Research the impact of endocrine disrupting chemicals on the various life stages of blue crabs and ways to reduce their introduction into estuarine waters, including discharge from wastewater treatment plants.

Medium

- Characterize the harvest and discard of blue crabs from crab shedding operations.
- Explore alternative model types.
- Research the impact of increased predator abundance on the blue crab stock.

- Identify key environmental factors that significantly impact North Carolina’s blue crab stock and investigate assessment methods that can account for these environmental factors.
- Identify, map, and protect habitat of ecological value to blue crab (in particular juvenile habitat) and implement restoration and conservation measures.
- Assess the impact of inlet dredging activities on mature female blue crabs.
- Implement monitoring of hazardous events (e.g., hurricane, extreme hot or cold weather) affecting blue crab population dynamics and harvest.
- Research the extent, causes, and impacts of hypoxia and anoxia on blue crab behavior and population abundance in estuarine waters.
- Research the impact of invasive species (e.g., blue catfish) on the blue crab stock.

Low

- Investigate and support research on promising methods to age blue crabs.
- Evaluate the genetic stock structure of blue crabs within North Carolina and the magnitude of mixing between populations.
- Identify programs outside the DMF that collect data of potential use to the stock assessment of North Carolina’s blue crabs.
- Research and identify key market forces and their effects on the blue crab industry.

MANAGEMENT

Following full implementation of Amendment 3 management measures in 2021, division monitoring programs continued to observe historically low commercial landings, coupled with continued low abundance of all blue crab life stages (e.g., male and female juveniles, male and female adults, mature females). In response to stock concerns expressed by commercial crabbers and continued poor trends in abundance since adoption of Amendment 3, the division began updating the stock assessment with data through 2022, adding six years of data to the benchmark assessment. Results of the model update indicate the magnitude and trends for estimated recruitment, female spawner abundance, and fishing mortality were similar to the prior benchmark assessment, however, the Maximum Sustainable Yield (MSY) based reference points used to determine stock status for both female spawner abundance and fishing mortality both drastically changed with the updated timeseries. All available information suggests the blue crab stock has continued to decline since adoption of Amendment 3 management measures.

The Amendment 3 adaptive management framework can be used to immediately address the overall declining trends in the blue crab stock. Because the 2023 stock assessment update cannot be used to inform harvest reduction decisions, the division developed management options to reduce blue crab harvest based on results of the 2018 stock assessment. Using 2018 assessment results provides guidance on what harvest reductions should be in lieu of a current stock assessment. As prescribed by the Amendment 3 adaptive management framework the division presented options and initial recommendations to the Northern, Southern, and Shellfish/Crustacean Advisory Committees in March 2025. The MFC is tentatively scheduled to take final action on Amendment 3 adaptive management in November 2025. Any management changes will be implemented as a revision to Amendment 3.

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

Comprehensive review of the Blue Crab FMP is scheduled to begin in July 2026. The Amendment 3 adaptive management framework allows for management changes between comprehensive plan reviews. The MFC is scheduled to take final action on Amendment 3 adaptive management in November 2025.

Given the current adaptive management timeline and upcoming comprehensive review, no schedule changes are recommended.

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FISHERY MANAGEMENT PLAN UPDATE
EASTERN OYSTER
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	August 2001	
Amendments:	Amendment 1	January 2003
	Amendment 2	June 2008
	Amendment 3	April 2014
	Amendment 4	February 2017
	Amendment 5	May 2025
Revisions:	None	
Supplements:	Supplement A to Amendment 2	November 2010
Information Updates:	None	
Schedule Changes:	None	
Comprehensive Review:	2030	

The original Oyster Fishery Management Plan (FMP) was adopted by the North Carolina Marine Fisheries Commission (MFC) in 2001. This FMP set up a process for designation of additional areas limited to hand harvest methods around Pamlico Sound and recommended several statutory changes to the shellfish lease program including higher fees, training requirements, and modified lease production requirements (NCDMF 2001).

The Oyster FMP Amendment 1 changed one of the criteria for designation of hand harvest areas from waters generally less than 10 feet deep to waters less than six feet deep (NCDMF 2003). Highlights of the management measures developed in the Oyster FMP Amendment 2 included adopting a 15-bushel harvest limit in the Pamlico Sound and a 10-bushel harvest limit for all gears (hand and mechanical) in designated areas around the sound, reducing the available harvest season, changing the way lease production averages were calculated, limited lease applications to five acres and had a recommendation to expand oyster sanctuary construction efforts (NCDMF 2008).

Supplement A raised the potential harvest limit in the Pamlico Sound to 20 bushels and created a monitoring system for determining when to close mechanical harvest in that area (NCDMF 2010).

The Oyster FMP Amendment 3 created two seed oyster management areas in Onslow County (NCDMF 2014).

Amendment 4 was adopted in February 2017 with selected management measures that included: the continuation of the monitoring system for when to close mechanical harvest off public bottom in an area, a reduction of the culling tolerance from 10 to five percent in the commercial fisheries off public bottom, a reduction of the daily harvest limit for holders of the Shellfish License off public bottom to two bushels per person per day maximums four bushels per vessel, the continuation of the six-week open season to mechanical harvest off public bottom in the bays with changes in the timing of the six-week opening, modifications to shellfish lease provisions, and adding convictions of theft on shellfish leases and franchises to the types of violations that could result in license suspension or revocation (NCDMF 2017).

The Eastern Oyster FMP Amendment 5 adopted in May 2025 is only focused on managing wild oyster stocks. The ending of the relay program and the transition into the use of farming cages and hatchery sourced seed, have nearly eliminated the private industry’s reliance on wild oysters. These changes to private culture practices reduce the need to consider aquaculture in the management of wild oyster stocks. Management strategies from Amendment 5 will potentially be implemented at the start of the 2025–2026 oyster harvest season. To balance the value of oysters as both a fishery resource and essential habitat for oysters and other estuarine species, a three-tiered management strategy was adopted in Amendment 5 for oyster mechanical harvest management in Pamlico Sound. The first tier prioritizes the ecological value of oysters with the designation of Deep-water Oyster Recovery Areas (DORAs) at the mouth of the Pamlico and Neuse rivers closed to mechanical harvest. The closures protect 81% of the identified deep-water oyster habitat, preventing further height loss and damage to recovering oyster reefs. Monitoring efforts will be used to evaluate the effectiveness of the closure within the next FMP amendment. The second tier is a Cultch Supported Harvest strategy that incorporates industry input to guide DMF pre-season sampling locations to assess the percentage of legal-sized oysters. This approach uses data to set fixed season lengths by proclamation, which may only be extended after further in-season sampling, balancing habitat and fishery value and providing harvesters with greater certainty on the season length. To evaluate the effectiveness of the second tier, an adaptive management framework is included to evaluate fixed season lengths if participation in the mechanical harvest fishery changes by 25%. The third tier is the Rotational Cultch Site strategy, which uses rotational openings available to harvest for the full extent of the mechanical season, at 10-acre planting sites across four management areas in Pamlico Sound. This tier further strengthens the integration of the DMF ’s Cultch Planting Program into management of the oyster fishery, prioritizing the fishery value of these sites. (NCDMF 2025).

Amendment 5 maintains from the previous plans the daily harvest limit of two bushels of oysters per person with a maximum of four bushels of oysters per vessel off public bottom for Shellfish License holders, the six-week opening timeframe for mechanical harvest in the bays in Pamlico Sound, and 15-bushel hand/mechanical harvest limit in Pamlico Sound outside the bays and 10-bushel hand/mechanical harvest limits in the bays, and the 10-bushel hand harvest limit in the Mechanical Methods Prohibited Areas along the Outer Banks of Pamlico Sound as specified in MFC Rule 15A NCAC 03R .0108(1) and (2)(a), (b), (c), and (d).

Management Unit

The management unit of this FMP includes the Eastern Oyster (*Crassostrea virginica*) and its fisheries in all public coastal fishing waters of North Carolina. This FMP pertains only to oysters from wild stocks and does not address managing farmed oysters originating from private aquaculture leases and franchises.

Goal and Objectives

The goal of the N.C. Oyster FMP Amendment 5 is to manage the oyster resource to maintain oyster populations that provide long-term harvest and continue to offer protection and ecological benefits to North Carolina's estuaries. To achieve this goal, it is recommended that the following objectives be met:

- Use the best available biological, environmental, habitat, fishery, social, and economic data to effectively monitor and manage the oyster fishery and its environmental role.
- Support and implement the restoration and protection of oyster populations as both a fishery resource and an important estuarine habitat through the actions of the Cultch Planting and Oyster Sanctuary programs.
- Coordinate with DEQ and stakeholders to implement actions that protect habitat and environmental quality consistent with the Coastal Habitat Protection Plan (CHPP) recommendations.
- Manage oyster harvesting gear use to minimize damage to habitat.
- Promote stewardship of the resource through public outreach to increase public awareness regarding the ecological value of oysters and encourage stakeholder involvement in fishery management and habitat enhancement activities.

DESCRIPTION OF THE STOCK

Biological Profile

The Eastern Oyster (*Crassostrea virginica*) is an immobile filter feeding bivalve mollusk occurring naturally along the western Atlantic Ocean from the Gulf of St. Lawrence to the Gulf of Mexico (Figure 1; Bahr and Lanier 1981; Carlton and Mann 1996; Jenkins et al. 1997; MacKenzie et al. 1997). Recent research suggests several related oyster species are distributed throughout the Caribbean and coastal South America; however, the Eastern Oyster's southern range extends only to the northern Yucatan Peninsula Caribbean (Gaffney 2005; Amaral and Simone 2014).

Initial molecular analysis indicates North Carolina's stock is part of the Atlantic coast stock, which extends from Maine to Key Biscayne, Florida (ASMFC 1988). Additional genetic analyses suggest a population division occurs in the Mid-Atlantic region, subdividing the Atlantic coast stock into northern and southern groups (Wakefield and Gaffney 1996; Hoover and Gaffney 2005; Varney and Gaffney 2008). North Carolina represents a transition zone within the Atlantic stock of Eastern Oyster, with a shift between northern and southern types occurring approximately at the southern boundary of the Pamlico Sound (Sackett 2002).

Eastern Oysters (hereafter, "oysters") inhabit waters across a wide range of temperatures (0 to 32°C; Butler 1954). Though oysters can also tolerate extreme salinities (as low as 5 ppt and as high as 40 ppt) depending on temperature, their optimum salinity range is 14 and 28 ppt (Galtsoff 1964; Loosanoff 1965; Wallace 1966; Shumway 1996; Rybovich 2014). The distribution and survival of oysters is further influenced by abiotic factors such as oxygenation, flow, and tide (Stanley and Sellers 1986; Roegner and Mann 1995; Kennedy et al. 1996; Lenihan 1999), as well as biotic factors such as disease, bioeroders, and predation (Barnes et al. 2010; Johnson and Smee 2012; Pollack et al. 2012; Dunn et al. 2014).

North Carolina's oysters are composed of both subtidal populations (below the mean low tide water level, up to 26 ft deep) and intertidal populations (between the mean high and low tide levels; MacKenzie et al. 1997). Throughout the Croatan, Roanoke, and Pamlico sounds, oyster resources are almost exclusively subtidal. This region is primarily influenced by wind-driven tides, with intertidal oysters found occasionally near the inlets. Scattered subtidal populations may be found in larger systems farther south (Newport, White Oak, and New rivers systems). Conversely, intertidal populations are predominantly observed south of Cape Lookout and throughout estuaries extending to the state's southern border. The horse or crested oyster (*Ostrea equestris*) may be confused with small Eastern Oysters and can be locally abundant in both intertidal and subtidal habitats in southeastern North Carolina (Markwith et al. 2009).

Oyster bodies (meats) have a small foot, a relatively small adductor muscle, fillibranch gills with interlamellar junctions, and lack a siphon (Galtsoff 1964). The interior of the Eastern Oyster shell contains a purple-pigmented adductor muscle scar that does differentiate Eastern Oysters from other similar species within its range (Figure 2). The left valve is generally more cupped than the right that is normally found on top, and there is no gap between the shells when the valves are completely closed (Figure 2; Yonge 1960; Galtsoff 1964). Shell morphology can vary greatly depending on substrate and habitat conditions. For instance, oysters grown in subtidal and lower salinity environments tend to have thick, rounded shells with visible radial ridges (Stanley and Sellers 1986). In the presence of predators, oysters may allocate more energy to shell growth, resulting in thicker and heavier shells (Johnson and Smee 2012; Lord and Whitlatch 2012). Shell thickness has also been found to correlate with latitude and water temperature along the Atlantic coast, with warmer southern locations having oysters with thicker shells than colder northern locations (Lord and Whitlatch 2014).

Oysters are typically hermaphroditic, as they first develop and spawn as males in the first few years and may ultimately develop as females as individuals get larger and older (Galtsoff 1964; Kennedy 1983). Oysters may change sexes once each year when the gonad is undifferentiated (Thompson et al. 1996). Research suggests natural oyster populations maintain balanced sex ratios (Kennedy 1983). However, certain environmental conditions, such as limited food availability and extreme salinity gradients, have been attributed to skewing sex ratios to high abundances of males (Bahr and Hillman 1967; Davis and Hillman 1971; Powell et al. 2013). The sex of nearby oysters may also influence individual oyster sex determination (Smith 1949; Menzel 1951). Age or size selective mortality (e.g., from disease or harvest pressure) can alter oyster population demographics and result in a local shift from male to female majority (Harding et al. 2012).

The formation of eggs and sperm is initially stimulated by increasing water temperatures during the spring (Galtsoff 1964; Kennedy et al. 1996). In North Carolina, oyster broadcast spawning peaks twice, once in June at 20°C, with a second spawning event in August at 25°C (Chestnut 1954). Salinities greater than 10 ppt are also typically required for mass spawning (Breuer 1962). Gonads may be developed in oysters at two to three months old, but most of these sub-adult oysters will not be sexually mature (Galtsoff 1964; Kennedy 1983). Fecundity estimates range from 2 million eggs for a 4-cm (1.5 in) oyster to 45 million for an oyster 7 cm (2.8 in) in length (Kennedy et al. 1996). These estimates range widely as oysters can spawn several times per season and gonads may expand into other tissues (Kennedy et al. 1996). However, it's accepted that larger oysters allocate greater energy towards egg production and therefore have increased fecundity (Kennedy et al. 1996). For instance, oysters collected from North Carolina's no-take sanctuaries have demonstrated that fecundity increases exponentially with size, reaching the highest levels in May (Mroch et al. 2012).

Under normal conditions, male oysters spawn first in response to various physical stimuli and environmental conditions. Female oysters are stimulated to spawn specifically by the presence of oyster sperm. Fertilization must take place shortly thereafter in the surrounding waters, or the unfertilized eggs lose their viability. Fertilized eggs develop into a free-swimming larva, which can migrate vertically in the water column in response to temperature and salinity changes (Hopkins 1931; Galtsoff 1964). Oyster larvae have also been documented to travel up to 30 miles, with dispersion strongly dependent on prevailing winds (Bahr and Lanier 1981; Andrews 1983). Patterns of larval distribution in North Carolina estuaries remain relatively unstudied; however, predictive models of Pamlico Sound larval dispersal from oyster sanctuaries have been developed (Haase et al. 2012).

An oyster larva may visit several sites before it cements itself to the substrate (Kennedy et al. 1996). Several environmental factors, including light, salinity, temperature, acoustic signature, and current velocity may influence the setting of larvae (Hidu and Haskins 1971; Lillis et al. 2013). Oyster larvae also respond positively to a protein on the surface of oyster shells as well as other recently set spat (Kennedy et al. 1996). Larval oysters tend to settle in the intertidal zone where salinities are above 20 ppt whereas in subtidal areas they settle when salinities are below 20 ppt (Mackin 1946; Loosanoff 1952; Menzel 1955). Generally, spatfall is higher in intertidal areas and in areas boasting salinities in the upper range of tolerance (Bahr and Lanier 1981).

Chestnut (1954) reported recruitment peaks generally occurring in June, the latter part of August, and possibly another peak in October. Ortega et al. (1990) found recruitment in western Pamlico Sound to be continuous, concentrated in one or two peaks depending on the year and location. Generally, peaks occurred in June (lesser) and September–October (greater). Munden (1975) reported that spat monitors located in Morehead City and Wilmington did not show a decline in availability of spat during the summer of 1972 until September.

Oyster growth is highest during the first six months after settling and gradually declines throughout the life of the oyster (Galtsoff 1964). Seasonally, adult oysters grow most rapidly during spring and fall in North Carolina. Shell growth was found to cease when water temperatures reached 28°C and slowed when temperatures decreased to 5°C (Chestnut 1954). Ortega et al. (1990) examined data from 1979–1989 and found that spat from western Pamlico Sound sites attained lengths of 10–40 mm during the first year and reached marketable size (76 mm) by the end of three years. Varying growth rates have been observed between and within different regions of North Carolina and under different environmental conditions (Godwin 1981; Kennedy and Breisch 1981; Roegner and Mann 1995; Puckett and Eggleston 2012).

Stock Status

Data limitations prevent the DMF from conducting an Eastern Oyster stock assessment and calculating sustainable harvest metrics. Data available for the stock include commercial landings and fishing effort (i.e., trips) reported to the Trip Ticket Program, biological data collected from the commercial catch, and voluntary responses to an annual recreational survey. For information on the methodology used in previous stock assessment attempts, see Amendment 4 of the Oyster FMP (NCDMF 2017).

Stock Assessment

An oyster stock assessment was attempted in 1999, but the necessary data were lacking to determine levels of sustainable harvest (NCDMF 2001). Since there were no significant changes in the types and quantity of data collected, an oyster stock assessment could not be achieved in 2006, 2014, and again in 2022 (NCDMF 2008, 2017, 2025). The DMF partnered with researchers at North Carolina State University and The Nature Conservancy to design statistically robust fishery-independent population survey methodologies for oysters in North Carolina to inform a potential future stock assessment. While methods have been developed, DMF does not currently have the staff or equipment resources to implement the recommended sampling programs (NCDMF 2025).

While the oyster is managed by 18 other states along the Atlantic Coast and Gulf of Mexico, it is worth noting that only Louisiana, Maryland, and Virginia have extensive long term sampling programs and data sets needed to complete stock assessments. Louisiana's most recent stock assessment in 2023 utilized 1,700 dredge samples and 1,000 diver quadrat samples collected during summer months. Maryland conducts a stock assessment within the northern region of Chesapeake Bay and its tributaries (north of Smith Island, following the state-boundary); while Virginia's stock assessment of oysters includes the southern portion of the Chesapeake and its tributaries, including the James River. In addition to a stock assessment, Virginia employs a rotational harvest management system for oysters.

In the absence of a formal stock assessment, Delaware and New Jersey use other metrics to inform their management strategies. Delaware conducts a population survey to set quotas; New Jersey does an annual assessment of Delaware Bay. In North Carolina, management is focused on habitat protection measures and extensive restoration and enhancement measures that have maintained harvestable oyster populations.

DESCRIPTION OF THE FISHERY

Current Regulations

Oysters cannot be taken from any public bottom in areas designated as polluted by proclamation except for special instances for: Shellfish Management Areas (NCMFC Rule 15A NCAC 03K .0103), and for the depuration of shellfish (NCMFC Rule 15A NCAC 03K .0107). Beginning in April 2014, time and temperature control measures were initiated for oysters to prevent post-harvest growth of naturally occurring Vibrio spp. bacteria that can cause serious illness in humans between April 1 and September 30 of each year. Oysters cannot be taken between the hours of sunset and sunrise of any day. Beginning in the 2017–2018 season, the culling tolerance was reduced from 10% to 5% off public bottom based on management measures adopted in 2017 as a part Amendment 4 of the Oyster FMP and formalized in MFC Rule 15A NCAC 03K .0202 (NCDMF 2017).

<u>Wild Harvest</u>

The minimum size limit for oysters from public bottom is three-inch shell length. Both the hand and mechanical oyster harvest season from public bottom are opened annually by proclamation. It shall be unlawful to sell oysters taken on Saturday and Sunday from public bottom. The hand-harvest season for commercial and recreational harvest begins on October 15 each year with commercial harvest limited to

Monday through Friday each week and recreational harvest is allowed seven days a week. Hand-harvest methods to take oysters are allowed in all areas found suitable for shellfish harvest by the Shellfish Sanitation and Recreational Water Quality Section of the DMF during the open season. Beginning in 2013 through statutory changes, the Shellfish License was restricted to hand harvest only, and harvest by mechanical methods was prohibited. Recreational harvest is only allowed by hand methods. The hand harvest season typically continues until it is closed by rule on March 31.

The daily hand harvest limit for oysters in the Pamlico Sound outside the bays is 15 bushels per day per commercial fishing operation and 10 bushels per day per commercial fishing operation in the bays and in the Mechanical Methods Prohibited area along the Outer Banks of Pamlico Sound. Areas from Core Sound south have a daily hand harvest limit of five bushels per person, not to exceed 10 bushels in any combined fishing operation regardless of the number of persons, license holders, or boats involved. Recreational daily harvest limits in 2024 were one bushel per person per day, not to exceed two bushels per vessel per day.

Beginning in October of the 2017–2018 season, hand harvest for Shellfish License holders was limited to two bushels per person per day, not to exceed four bushels per vessel per day if two or more Shellfish License holders are onboard the vessel (NCDMF 2017). Hand harvesters with the Standard Commercial Fishing License (SCFL) could continue landing the higher daily harvest limits in all areas.

The mechanical harvest season for oysters opens on Monday the week before Thanksgiving (mid-November), and is restricted to deeper portions of the sounds, rivers, and bays north of the Pamlico Sound. These mechanical harvest areas are designated by rule (MFC Rule 15A NCAC 03R .0108). Mechanical methods for oysters are only allowed to operate from sunrise to 2:00 p.m. Beginning in the 2017–2018 harvest season, the six-week open period for the bays was split into two potential open periods. The first opening in the bays could begin on the Monday of the week prior to the Thanksgiving holiday and runs through the Friday after Thanksgiving. The second opening of the bays could begin two weeks before Christmas and remain open for the remaining four weeks.

Areas outside the bays open to mechanical harvest are limited to a daily harvest limit of 15-bushels of oysters per operation and limited to 10 bushels of oysters per operation within the bays.

The mechanical harvest season can potentially run through March 31st; however, the total number of weeks which mechanical harvest is allowed for each management area is determined by the condition of the oyster resource as evaluated by DMF sampling during the open season.

There are also further restrictions for mechanical oyster harvesters to make sure that cultch material and culled oysters are either put back into the water where they were taken or remain on the existing rocks. North Carolina has a rule in place (MFC Rule 15A NCAC 03K .0202) requiring culling on site. The following restrictions were put in place beginning with the 2012–2013 oyster season to discourage harvesters from not culling and removing extra cultch material.

- It shall be unlawful to possess more than five bushels of unculled catch onboard a vessel. Only material on the culling tray is exempt from culling restrictions.
- It shall be unlawful to possess accumulated dead shell or accumulated oyster cultch material while underway and not engaged in mechanical harvesting.

Some harvesters did not have vessels or dredges rigged for circular dredging patterns which work best with towing points over the side of the vessel or for short tows to allow for culling between pickups. The following restrictions were put in place to encourage circular dredging patterns and shorter tows to keep the cultch and culled oysters on the existing rocks.

- It shall be unlawful for the catch container (bag, cage) attached to a dredge to extend more than two feet in any direction from the tooth bar.
- It shall be unlawful to tow a dredge unless the point where the tow line or cable exits the vessel and goes directly into the water is on the port or starboard side of the vessel forward of the transom.

Private Culture (Shellfish Farms and Aquaculture)

There is a specific application process and public comment period required for an individual to obtain a franchise or lease for the culture of oysters. Owners of shellfish leases and franchises must provide annual production reports to the division. Failure to furnish production reports can constitute grounds for termination, and cancellation proceedings will begin for failure to meet production requirements and interfering with public trust rights. Public bottom must meet certain criteria to be deemed suitable for leasing for shellfish cultivation and there are specific planting, production, and marketing standards for compliance to maintain a shellfish lease or franchise. There are also management practices that must be adhered to while the lease is in operation, such as: marking poles and signs, spacing or markers, and removal of markers when the lease is discontinued.

The minimum size limit for oysters from private bottom is a three-inch shell length with a five percent culling tolerance, which is only required during the open public harvest season. During the rest of the year there is no minimum size or culling requirement for oysters taken from private bottom. There is no daily maximum harvest limit applied to the taking of oysters from private bottom. Permits are required to use mechanical methods for oysters on a lease or franchise.

Possession and sale of oysters by a hatchery or aquaculture operation and purchase and possession of oysters from a hatchery or aquaculture operation are exempt from the daily harvest limit and minimum size restrictions. The possession, sale, purchase, and transport of such oysters must be in compliance with the Aquaculture Operation Permit. Leases that use the water column must also meet certain standards as outlined in G.S. 113-202.1 to be deemed suitable for leasing and aquaculture purposes.

Commercial Fishery

Landings in the North Carolina oyster fishery are impacted by both biotic and abiotic factors that influence oyster survival and growth.

Data on landings from public bottom by gear indicates that, prior to 1960, most of the oysters were taken by dredge when compared to all hand methods. Chestnut (1955) reported that 90% of the oysters landed in North Carolina came from Pamlico Sound. The Pamlico Sound area is largely dependent on dredging. The resurgence of the dredge landings in 1987 was due, in part, to increased oyster populations and in part to increased effort, as displaced mechanical clam harvesters turned to oyster dredging due to closure of southern clam areas by a red tide. The red tide was a neurotoxic dinoflagellate bloom (*Karenia brevis*) that caused closure of over 361,000 acres of public bottom to shellfish harvest from November 1987 to May 1988. Hand harvest landings of oysters failed to reach their potential that same year since many of the hand-harvest-only areas were also closed because of the red tide. Hand harvest landings are the most consistent contributor to the state's oyster fishery. Hand harvest landings have exceeded dredge landings for significant periods between 1961 and 1970 and between 1989 and 2008 (NCDMF 2017).

The oyster parasite *Perkinsus marinus*, also known as Dermo disease, has been responsible for major oyster mortalities in North Carolina during the late 1980s to mid-1990s. Once infected with this protist, oysters suffer reduced growth, poor condition, diminished reproductive capacity and ultimately mortality (Ray and Chandler 1955; Haskin et al. 1966; Ford and Figueras 1988; Ford and Tripp 1996). Chestnut (1955) may have been the first to report its occurrence in North Carolina. However, no extensive assessments were attempted until large-scale oyster mortalities prompted investigations during the fall of 1988, and Dermo infection was determined to be the cause by the Virginia Institute of Marine Science (VIMS) and the Cooperative Oxford Laboratory (NCDMF 2008).

Throughout the 1990s, DMF sampling indicated that Dermo infections were on the rise in southern estuaries. However, moderate and high Dermo infection levels during late summer did not reduce oyster populations. Hand harvest landings in the south from 1991 through 2002 did not decline in the same manner as landings from the Pamlico Sound during the same time. It is suspected that the small, high salinity estuaries may inhibit mortality by flushing out parasites at a higher rate or by exceeding the salinity tolerance of the Dermo parasite, allowing for a higher survival rate compared to the Pamlico Sound. The link between low dissolved oxygen, increased availability of iron and increased parasite activity may also be a factor in the different mortality rates as the smaller, high salinity estuaries are less prone to low dissolved oxygen events than the Pamlico Sound (Leffler et al. 1998). Dermo infection intensity levels since 2005 have remained low; however, prevalence appears to be increasing (NCDMF unpublished data; Colosimo 2007). Dermo infection intensity has remained low and mechanical harvest landings in the Pamlico Sound continued to recover from the extremely high Dermo mortality levels and hurricane impacts of the mid-1990s until additional environmental impacts (i.e., low dissolved oxygen and hurricanes) began affecting the fishery in 2011.

Bioeroders (organisms that tunnel into oyster shell), in particular boring sponge (*Cliona* spp.), are also of concern for their impacts to oyster reefs in North Carolina. Boring sponges can cause mortality by weakening the shell, preventing the oyster from protecting itself from predators. Once the oyster reef has been compromised, there is a loss of material for spat attachment and eventually a reduction in the vertical height of the reef. Dunn et al. (2014) examined the distribution and abundance of oyster reef bioerosion by Cliona sp. in North Carolina. The study examined levels of boring sponge infestations across salinity gradients in multiple oyster habitats from New River through the southern portions of the Pamlico Sound. The study found boring sponge infestations in all oyster communities sampled, except for those found in the upper reaches of some tidal creeks in the Newport and North rivers in Carteret County. Low salinity areas had mean salinity levels of 15 ppt while the higher salinity areas had a mean salinity of 20 ppt or greater. High salinity areas were infested by the high salinity tolerant boring sponge *Cliona celata*. The study found that as salinities increased, infestations increased.

Current Commercial Fishery

Commercial oyster landings from private bottom (oyster farms) have generally been increasing annually while landings off public bottom (wild harvest) have been much more variable (Figure 1). Over the last seven years an increasing trend in landings from production on private bottom coupled with decreased landings from public bottom has led to landed bushels from farmed private culture exceeding public wild harvest landings every year since 2017 (Figure 1). Given the expansion of the private culture industry beyond the scope of FMPs, and changes in oyster farming practices which have reduced the reliance on wild oyster seed, private oyster culture will not be managed in the Eastern Oyster FMP. Private culture of oyster is managed by the DMF Shellfish Lease and Franchise Program, for more information visit: https://www.deq.nc.gov/about/divisions/marine-fisheries/licenses-permits-and-leases/shellfish-lease-and-franchise.

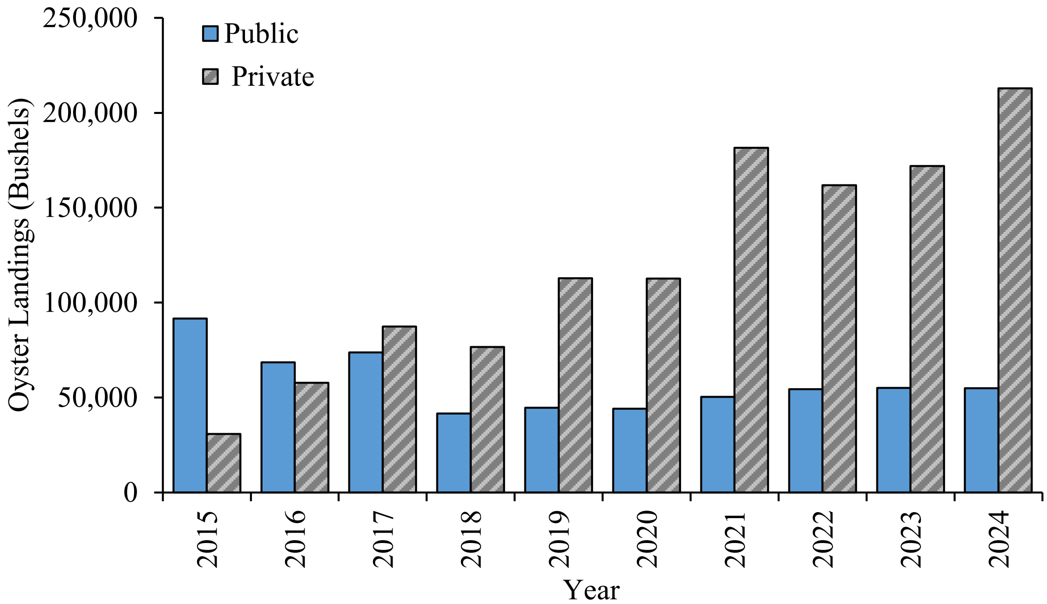

Figure 1. Annual commercial oyster landings (bushels) separated by private (farmed) and public (wild) bottom in North Carolina, 2015–2024 (Source: DMF Trip Ticket Program).

Hand harvest landings exceeded the mechanical landings from wild harvest public bottom in the past ten years (Figure 2). In 2013, General Statute 113-169.2 limited the use of the Shellfish License to hand harvest methods only, this license is available to all residents of North Carolina for a lower fee than the SCFL. Hand harvest landings are relatively stable across years when compared to the fluctuations in landings from the mechanical fishery and are an important component of the public bottom oyster fishery. In 2019, due to hurricane impacts to subtidal oyster populations in the mechanical harvest area, commercial landings by hand harvest were over three times higher than mechanical harvest landings off public bottom (Figure 2).

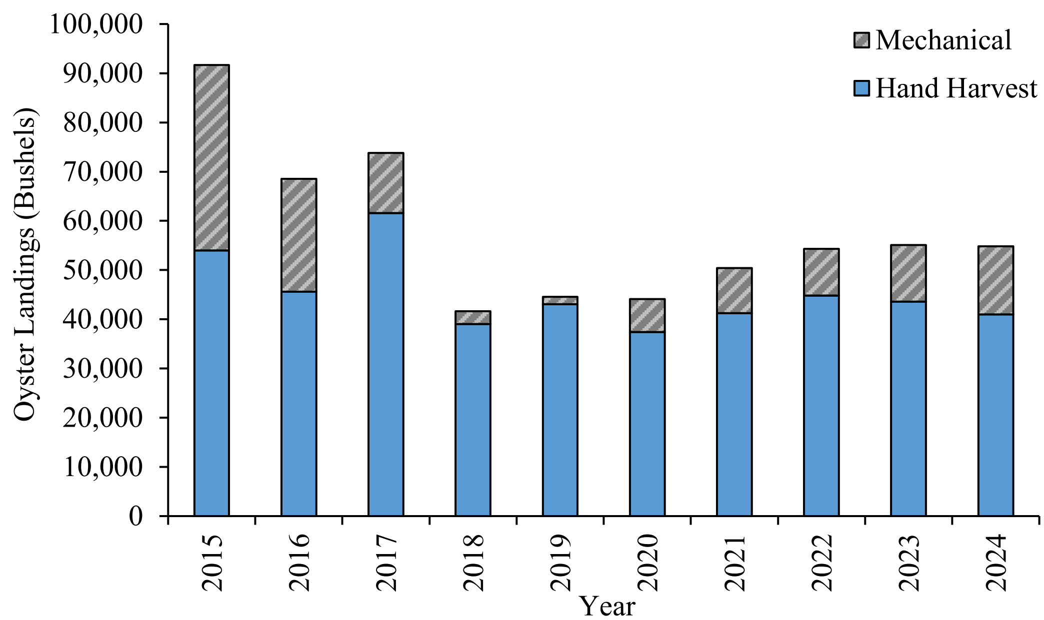

Figure 2. Annual commercial oyster landings (bushels) from public bottom separated by mechanical and hand harvest methods 2015–2024 (Source: DMF Trip Ticket Program).

Mechanical Harvest Fishery Off Public Bottom

Water temperatures were quite warm throughout the 2015–2016 season and not a lot of new growth was observed until January. Some areas in Northern Hyde County were covered in tunicates the previous year and little spat was seen in these locations during this season. The Neuse River area was limited in locations to harvest oysters and closed early during this season. Effort was highest in the Pamlico River at the beginning of the season and then after Christmas, effort shifted to areas outside of Northern Hyde area.

Like the previous season, water temperatures were quite warm and little growth was observed in the oysters until January in the 2016–2017 season. In the Neuse River, live oysters were present in only a few locations. A confirmed low dissolved oxygen event occurred earlier that summer over a prolonged period near the mouth of the Neuse River which may have had an impact on oysters in this area. Within a few weeks of the season opening, only a few oyster harvesters were working in the Neuse River area, and most live oysters were found in shallow water (less than 20 feet deep). By late December the few oyster harvesters seen on the water were having to move around a lot to find oysters. Mechanical harvest was closed for the remainder of the season in mid-January for the Neuse River and Northern Dare areas. The Pamlico River and Northern Hyde County areas remained open for the entire 2016–2017 season, but only a few fishermen remained harvesting oysters in early February and by mid-February no effort was seen in the open areas while sampling.

Pre-season sampling in October-November 2017 showed a lot of spat and small oysters in all areas, and two areas (Neuse River and Northern Dare County) were below the threshold (<26%) of legal-sized oysters in the samples. The 2017–2018 mechanical harvest season began Monday, November 13, 2017, and the six-week open period in the bays was split into two. The culling tolerance was also reduced from 10 to five percent following the adoption of Amendment 4. Oysters were small according to the dealers at the beginning of the season and showed little growth. The Neuse River only had a few areas with live oysters available and closed on December 7, 2017, after reaching the legal-sized threshold for closure. Small oysters that would not grow into legal-size this season were also pre-dominant in the Pamlico River and Northern Dare County areas sampled early in the season. Both Pamlico River and Northern Dare County areas were closed to mechanical oyster harvest on December 25, 2017. Only Northern Hyde County remained open into 2018 but closed to mechanical harvest by late January. All mechanical harvest areas for oysters remained closed for the rest of the season. In addition, starting the first week of January 2018 and for the next two weeks, coastal North Carolina experienced record low temperatures, with at least one consecutive 72-hour period where air temperatures were below freezing. Most inshore areas and some of the deeper water areas had ice and some areas retained ice for two weeks. In mid-January, reports were coming in that some of the subtidal oysters in Pamlico Sound had been impacted by the freezing, particularly in shallow water areas where oysters are exposed to the air for a period caused by wind-driven tides.

In September 2018, Hurricane Florence made landfall in North Carolina and caused significant impacts on the oyster resource. Extended periods of hypoxic (dissolved oxygen < 2–3 mg/L) or anoxic (dissolved oxygen = 0 mg/L) conditions occurred in many of the deep-water areas of Pamlico Sound during the following weeks. Dive surveys of reefs on the Middle Grounds were conducted by NC State University researchers and they observed large-scale oyster mortality due to Hurricane Florence. Observations by their team did not suggest that oyster reefs in the shallow bays were as impacted. During initial sampling, the Neuse River, Pamlico River, and Northern Dare County areas all showed low numbers of living oysters and were all below the 26% legal size threshold. The initial sampling at Northern Hyde County areas showed a legal percentage of 27%, just above the threshold. Mechanical fishing effort was relatively low due to poor catch, and the mechanical season was closed in all management areas on December 13, 2018. This closure prevented the second opening period of the bays to mechanical harvest. Impacts from Hurricane Florence are reflected in both reduced mechanical and overall oyster landings for the 2018–2019 season (Figures 1 and 2).

In September 2019, a decline in water quality from Hurricane Dorian negatively impacted the already reduced subtidal oyster populations in Pamlico Sound. All mechanical harvest management areas were below the 26% legal management trigger during pre-season sampling in 2019. The percentage of legal oysters in both Neuse River and Dare County management areas was lower in the 2019–2020 pre-season sampling than it was at the close of the 2018–2019 mechanical season, showing the deep-water oyster mortality that occurred in these areas from the storm event. Following the protocol established in Amendment 4 of the Oyster FMP (NCDMF 2017), the mechanical harvest season was opened on November 18, 2019, and closed on November 29, 2019, for all areas except Northern Hyde County, which closed January 6, 2020. While open to mechanical harvest, the small amount of effort and landings occurred in the shallow water bays where oyster populations were not as significantly reduced by the storm events of 2018–2019 season. Mechanical landings for 2019 were the lowest reported during the last 25 years (Figure 2).

Pre-season sampling in the deep-water areas in both the Neuse and Pamlico management areas showed very low percentages of legal oyster prior to the start of the 2020–2021 mechanical harvest season, and these areas both tripped the management trigger twice and closed to mechanical harvest on December 14, 2020. The bays in the Pamlico management area maintained relatively high legal percentages for the entire possible six-week season, and harvesters reported harvesting a full limit before noon, even up to the last few days of the possible season. The Northern Dare Management Area remained above the management trigger threshold for a relatively long time when compared to the previous three oyster seasons and remained open to mechanical harvest until February 14, 2021.

The Northern Hyde and Dare management areas started the 2021–2022 mechanical harvest season below the management trigger and were closed to mechanical harvest on December 13, 2021, after the management trigger was tripped during first in-season trigger sampling event. Abundance and size of oysters in the deep-water areas of the Neuse and Pamlico River management areas continued to be very low. Mechanical harvest in these two management areas was supported by oysters found in the bays during the six-week season.

The Neuse River, Pamlico River, Northern Hyde, and Northern Dare management areas were all below 26% legal management trigger during the 2022–2023 pre-season sampling. However, due to no fishery effort occurring at the time of data collection, pre-season sampling did not originally count towards the management trigger at the onset of this sampling program. In 2018, the Director made the decision to count the pre-season data towards the management trigger. This decision was made in response to the impacts to the sub-tidal oyster population from hurricane and storm events. For the 2022–23 mechanical oyster season, after several years of recovery post major impact events, the Director made the decision to revert to the original management approach of not including the pre-season sampling data to better align the management trigger with fishery effort.

The Northern Hyde and Northern Dare management areas started the 2023–2024 mechanical harvest season below the management trigger and closed to mechanical harvest the first week of 2024. The abundance and size of oysters in the deep-water areas of the Neuse and Pamlico rivers have continued to be very low since 2017. Mechanical harvest in these two management areas was supported for the full six-week possible season by high percentages of legal oysters found in the bays.

The season opened for all areas on November 18, 2024, for the 2024–2025 mechanical harvest season. The first in-season sampling in November showed the Northern Dare Management Area below the 26% legal size management trigger. Sampling conducted in December showed further growth in the oysters and all areas were above the 26% legal management trigger, except for the Neuse River Management Area having one sampling event below the 26% trigger. All deep-water mechanical harvest management areas remained open for the entire 2024–2025 season through March and the bays for their regular six-week open season.

Hand Harvest Fishery Off Public Bottom

Hand harvest gear accounts for most of the landings and has been the dominant harvest gear for oysters in North Carolina since the 1960s. Hand harvest oyster landings are also less variable than landings from mechanical gears (Figure 2). These higher, more consistent landings come from Core Sound south to the state line. The hand harvest areas in the northern region of the state are exclusively subtidal reefs with depths of two to six feet in which hand tongs are used. Hand harvest gear has not been extensively used in the northern area since oyster dredging was allowed in 1887. In Amendment 2 to the Oyster FMP in 2008, the MFC adopted the strategy to promote a more habitat friendly fishery by increasing the hand harvest limits to match dredging limits in the bay areas of the Pamlico Sound (NCDMF 2008). Amendment 2 put in place a 15-bushel per day hand/mechanical harvest limit per commercial fishing operation in the Pamlico Sound mechanical harvest areas outside the bays, a 10-bushel per day hand/mechanical harvest limit per commercial fishing operation in the bays and in the Mechanical Methods Prohibited area along the Outer Banks of the Pamlico Sound. This management option raised the limits of hand harvest to encourage less destructive harvest methods in those particular bays and open waters.

Hand harvest limits are five bushels per person, not exceeding 10 bushels per commercial fishing operation from Core Sound south to the North Carolina-South Carolina border for holders of the SCFL. As of October 2018, harvesters holding a Shellfish License statewide are limited to two bushels of oysters per person per day and no more than four bushels per vessel, following the selected management strategy adopted by the MFC in Amendment 4 of the Oyster FMP and continues through Amendment 5 (NCDMF 2017 & 2025). Areas in the southern region from Core Sound south are closed to mechanical harvest of oysters.

Other factors affecting the hand harvest fishery are the loss of harvest area due to pollution closures. Many shellfish waters in North Carolina are permanently or conditionally closed due to bacterial contamination associated with urban development (Table 1). The greatest proportion of closed shellfish waters occur in the southern district (Onslow, Pender, New Hanover, and Brunswick counties) where over half of the waters are closed and can be attributed to small, narrow waterbodies and more developed watersheds. The area north of Core Sound with the higher hand harvest limits does not have the same problem with large percentages of the available harvest area closed by pollution so oyster harvest is not impacted.

Table 1. Classification of shellfish waters in acreage, 2015–2024 (Source: DMF Shellfish Sanitation and Recreational Water Quality Section).

	Open Area		Closed Area		
Year	Approved	Conditionally Approved Open	Conditionally Approved Closed	Restricted	Prohibited
2015*	1,418,373	43,849	11,739	-	745,169
2016	1,416,960	44,785	12,008	-	745,597
2017	1,414,709	44,425	12,209	-	747,759
2018**	1,414,525	44,122	11,859	18,933	729,761
2019	1,415,007	43,216	12,721	20,260	730,550
2020	1,416,683	43,085	9,919	18,117	736,128
2021	1,459,163	42,801	9,917	18,168	736,690
2022	1,415,971	43,309	5,914	6,683	752,266
2023	1,413,846	45,326	5,798	6,463	752,687
2024***	1,368,691	35,266	3,813	2,622	735,797

* 314,710 acres administratively closed on 2/4/15 due to budget cuts and office closures.
** First year "Restricted" waters were differentiated from "Prohibited" waters.
*** The GIS classification layer that is used to calculate water acreage was updated in early 2024 to reflect improved aerial imagery, improved digital mapping technology, and changes to the shoreline that have occurred since the layer was last updated. This led to notable changes in the calculated water acreage coast-wide that are not reflective of any changes in water quality in shellfish growing waters.

Hand-harvest oyster landings have generally increased in recent years (Figure 2). Oyster hand harvest south of the Highway 58 Bridge generates a significant amount of the overall oyster landings even though the area only encompasses five percent of the total area open to harvest of shellfish in the state.

During the 2017–2018 season, the intertidal oysters in the southern region of the state were impacted by record low temperatures that lasted over two weeks in early January. Reports were received that the cold temperatures and low tides during this period caused the oysters to die. In September 2018, Hurricane Florence caused oyster mortality in many of the hand harvest areas south of the Highway 58 Bridge. Market demand for local North Carolina oysters early in the 2018–2019 season in the southern region of the state was low due to public perception of water quality issues which may have been caused by the storm.

Permanent and Temporary Shellfish Closures

Microbial contamination from fecal matter is important to the DMF because it affects the opening and closing of waters to shellfish harvest. Fecal coliform bacteria occur in the digestive tract of, and are excreted in the solid waste from, warm-blooded animals including humans, wildlife, and domesticated livestock (Mallin 2009). Because consumption of shellfish containing high levels of fecal coliform bacteria and associated pathogens can cause serious illness in humans, shellfish growing waters must be closed to shellfish harvest when fecal coliform counts increase above the geometric mean standard of 14 MPN/100 mL [NCMFC Rules 15A NCAC 18A Section .0900 Classification of Shellfish Waters], where MPN denotes "most probable number." The DMF closes waters where a high potential for bacterial contamination exists, such as around marinas and point source discharges. Shellfish harvest closures have continued to occur over time, which has led to a reduction in available shellfish harvest areas. Long term shellfish closures due to bacterial contamination remove available harvest areas for shellfish and concentrate those activities on remaining resources compounding harvest related impacts on the oyster habitat in those areas.

Between 2011 and 2014, there were 1,427 acres of water permanently closed to shellfish harvesting in North Carolina, while between 2015 and early 2019, 6,876 additional acres were closed (Table 1). On February 4, 2015, approximately 314,710 acres were closed administratively in lower resource areas because of the inability to sample due to budget constraints. The areas closed to shellfish harvest because of the inability to meet federal sampling requirements caused by funding cuts were approximately 11,834 acres in the Neuse River, approximately 3,042 acres in the Pungo River, and approximately 299,107 acres in Albemarle Sound.

In addition to the areas that are permanently closed to the harvest of shellfish, other areas are temporarily closed during periods of high rainfall due to runoff. The rainfall closure threshold varies by growing area as detailed in each management plan and can vary from 1 inch to 2.5 inches of rain in a 24-hour period. Closures last from several days to more than a month and reopen when bacteriological water sample results show the area has returned to normal conditions. Large storms, such as hurricanes, result in harvest closures covering much larger areas, sometimes including all of North Carolina's estuarine waters. The conditionally approved areas are concentrated in the Core-Bogue, New-White Oak, and Southern Estuaries management units. Within these watersheds, permanent closures are most common in the upper reaches of tidal creeks and rivers, with conditionally approved areas occurring downstream of those areas or in the upper portions of less degraded creeks. As temporary closures have increased in frequency and length, they have become an issue of great concern to the public, particularly in the southern area of the coast. For 2019, an additional classification of "restricted" was adopted for "areas that do not meet approved area criteria but is not grossly polluted" and can be used for limited shell fishing activities such as relay.

Throughout the North Carolina coast, 2018 was a record year for precipitation, with the landfall of Hurricane Florence contributing greatly to the total rainfall amounts. Temporary closures during the beginning of the oyster season were directly attributed to that event, with some area closures in the southern portion of the state lasting for over 30 days past the storm.

Private Culture

Authority to lease bottomland for private shellfish cultivation can be traced back to a state statute adopted in 1909. The DMF administers the shellfish lease program whereby state residents may apply to lease estuarine bottom and water columns for the commercial production of shellfish. The DMF does not differentiate between clam, oyster, bay scallop, and mussel leases; therefore, allowing shellfish growers to grow out multiple species simultaneously or as their efforts and individual management strategy allows. For the period of 2003–2013, roughly 40% of all private culture operations harvested only oysters (NCDMF 2017).

Since 1994, there has been an overall increase in oyster harvest from private culture operations. Oyster harvest from private culture operations in the period from 1994 to 2013 only accounted for 12% of all oyster landings (NCDMF 2017). However, due to increased interest in private culture of oysters and lower landings off public bottom, private culture harvest accounted for 80% of the total oyster landings in 2024 (Figure 2).

Recreational Fishery

Recreational landings for oysters in North Carolina are unavailable because there are no license requirements to take shellfish for personal consumption and therefore there is no way to fully determine the user group to collect their harvest information. Since 2011, the division has collected effort and catch data from the recreational oyster harvesters by surveying those individuals that indicate participation when purchasing a recreational fishing license. This survey does not include recreational oyster harvesters that do not purchase a recreational fishing license. As part of Amendment 5, adopted in May 2025, the MFC supported the DMF to further explore potential options and develop a solution to estimate recreational shellfish participation and landings with the intent to move towards a stock assessment and stock level management for oysters and to establish a mechanism to provide all recreational shellfish harvesters with Shellfish Sanitation and Recreational Water Quality Section health and safety information outside of the FMP process.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Currently, the only data available for the stock in all areas are the commercial landings and associated effort from the Trip Ticket Program. No fishery-dependent monitoring programs occur for oysters.

Fishery-Independent Monitoring

Public Bottom Mechanical Harvest Area Oyster Sampling

Supplement A to Amendment 2 established the trigger for closing areas to mechanical harvest to protect the resource and habitat, which was approved to continue under Amendment 4 of the Oyster FMP (NCDMF 2017). The management trigger was established and defined as when the sampling indicates the number of legal-sized (three-inch) oysters in the area has declined to 26% of the live oysters sampled. The management areas are divided geographically into four areas: the Neuse River Area, Pamlico River Area, Northern Hyde Area, and Northern Dare Area (Figure 3). Sampling targets areas and oyster rocks being worked by commercial oystermen, directly before the opening of and throughout the mechanical harvest oyster season. The sampling sites are selected based on the presence/absence of commercial oystermen working in the area. Only areas where commercial oystermen are working are sampled to determine localized depletion and address habitat protection. From each sample, the first 100 live oysters, including spat and any recently deceased oysters (known as “boxes”), are collected for workup. Each oyster, up to a maximum of 100, is measured to the nearest mm and inspected for any damage. Shell damage is denoted as none, minor, or substantial for further evaluation.

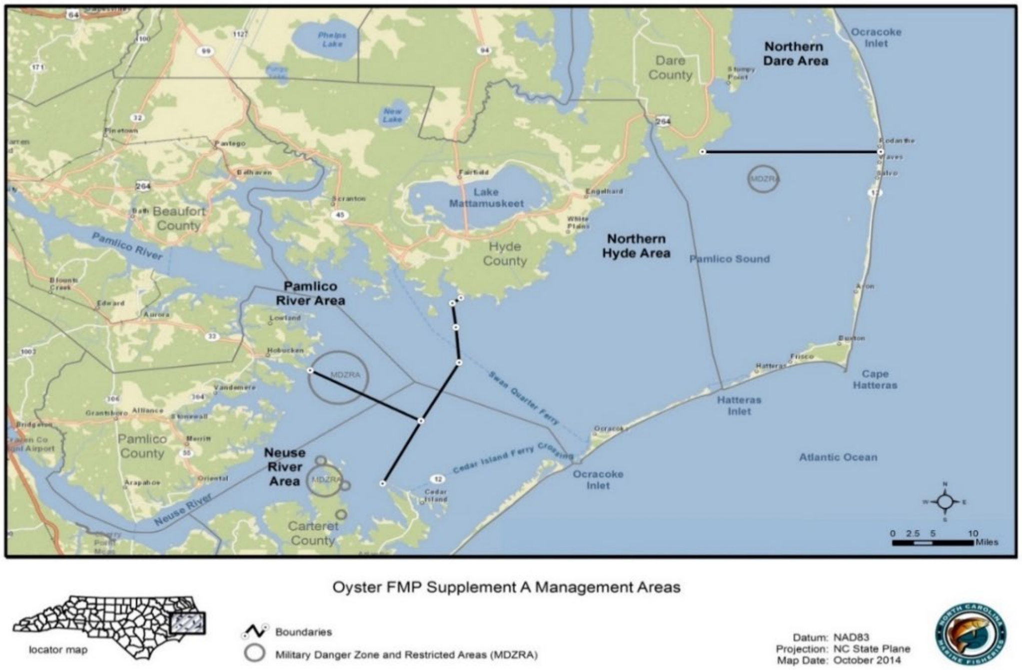

Figure 3. Mechanical harvest management areas from Amendment 4 of the Oyster Fishery Management Plan. These management areas will continue under Amendment 5 (NCDMF 2025).

Sampling began on September 23, 2009, with pre-season oyster sampling, in four management areas, using mechanical harvesting methods. Sampling has consistently continued with a target of 10 sites per management area, throughout the four management areas. All sampling is conducted using DMF vessels and standard oyster dredges with comparable construction to those used by commercial oystermen. Samples are collected at least bi-monthly in each management area (weather permitting) before, during, and after the open mechanical oyster harvest season. More intensive sampling is conducted if samples are near the trigger percentage. Sampling continues after an area is closed to assess the possibility of reopening. Sampling is discontinued when it is apparent that reopening is not likely to occur. Mean oyster shell height (commonly referred to as length) is calculated for each 100-oyster sample. The number of legal-sized (> 3 inches) and undersized (< 3 inches) oysters is determined for each sample. The total legal-sized oysters for all the samples taken in a management area on a sampling trip is divided by the total of all oysters sampled on that trip to calculate the percentage used to assess compliance with the harvest closure trigger. Oyster sizes are also sorted into five-mm size bins and the size distribution for the area is presented as a bar graph. Sampling results are reported to interested dealers/fishermen and staff after each sampling event. This sampling is not intended for use as a species abundance index, but instead to reflect the conditions of the habitat during the open oyster mechanical harvest season to determine closure of an area as a protection measure.

Amendment 5 adopted a three-tiered management strategy in the mechanical harvest areas to balance the value of oysters as a fishery resource and essential habitat and potentially will begin during the 2025–2026 oyster harvest season. The first tier prioritizes the ecological value of oysters with the designation of Deep-water Oyster Recovery Areas (DORAs) at the mouth of the Pamlico and Neuse rivers by closing these areas to mechanical harvest. The DORA closures protect 81% of the identified deepwater oyster habitat, preventing further height loss and damage to recovering oyster reefs. The second tier is a Cultch Supported Harvest strategy that incorporates industry input to guide DMF pre-season sampling locations used to assess the percentage of legal-sized oysters to set fixed season lengths, which may only be extended, balancing habitat and fishery value and providing harvesters with greater certainty on the season length. DMF's extensive cultch planting program will continue to support the fishery by replenishing lost material through mechanical harvesting. The third tier is the Rotational Cultch Site strategy, which uses rotational openings for 10-acre planting sites across four management areas in Pamlico Sound to further strengthen the integration of the DMF ’s Cultch Planting Program into management of the oyster fishery, prioritizing the fishery value of these sites. To evaluate the effectiveness of the second tier, an adaptive management framework is included to evaluate fixed season lengths if participation in the mechanical harvest fishery changes by 25%. If adaptive management is triggered, season lengths may be lengthened, shortened, or maintained as previously adopted due to changes seen in effort in the fishery.

Spatfall Evaluation

DMF conducts spatfall sampling (Program 610) annually on cultch planting sites from the previous three years during January, but samples may be collected through April if required. Subtidal sites are sampled by towing a standard oyster dredge over the planting site until, at a minimum, 30 pieces of cultch are collected. Patent tongs and hand tongs may also be used to obtain cultch samples. Intertidal sites are sampled by hand at low tide in all applicable intertidal areas of the Southern District and patent or hand tongs are used in the more northerly subtidal areas of Stump Sound and New River. Three tong grabs per location are usually taken to obtain the minimum amounts of cultch required. Gear type and any other valuable gear parameters are recorded. Prior to 2005, data was not collected south of New River.

Thirty pieces of cultch are randomly selected from each sample and the type of cultch (oyster, calico scallop, surf clam, sea scallop, or marl) is noted. The total number of spat on each piece of cultch is counted, with each spat being measured to nearest millimeter shell length. The average number of spat per piece of cultch is calculated by summing the number of spat per cultch piece, divided by the total number of cultch pieces sampled. An annual spatfall index is calculated as the average number of spat per site and then averaged across all sites within that year. The 10-year average is calculated by averaging the annual index over the last 10 years.

The spatfall index has been somewhat variable from year to year but overall showing a declining trend for the past 10 years (Figure 4). The 2018 and 2019 indices were the lowest and below the 10-year average (annual average number of spat across all sampling sites; Figure 4). The spatfall evaluation program was discontinued in 2020. Beginning in 2021, new methodology was adopted to better quantify recruitment and abundance of oysters on cultch planting sites.

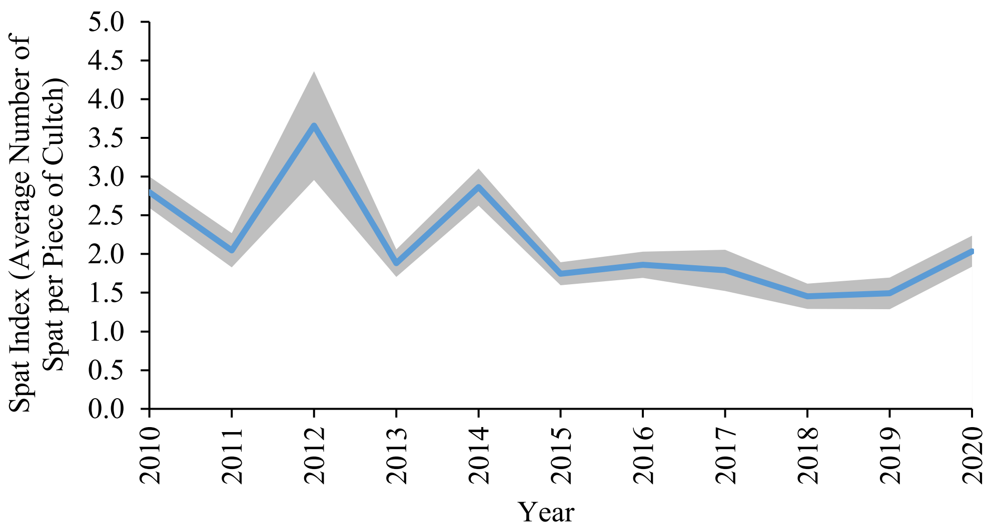

Figure 4. The annual average number of oyster spat across all sampling sites with standard error shaded in gray, 2010–2020 (Source: DMF Habitat and Enhancement Section). Shaded area represents + one standard error. This sampling program was discontinued and replaced with improved methodology in 2021.

Habitat and Enhancement Programs

To improve and preserve the diverse ecosystem functions provided by oyster reef habitat, and support and maintain the oyster fishery, reef enhancement and restoration is an essential component of management in North Carolina. In recognition of this need, DMF's Habitat and Enhancement section coordinates ongoing habitat enhancement activities to improve statewide oyster populations and subsequently enhance the ecosystem services they provide. These efforts began with the Cultch Planting program in 1915 with the goal to rebuild oyster beds on public bottom by planting shells for substrate, thereby creating state-subsidizing harvest areas for the fishery. Over 21 million bushels of cultch material have been planted in the form of small-scale, low-relief, harvestable oyster reefs. Since the 1980s, over 2,000 cultch sites have been planted throughout North Carolina's coastline, with each area ranging in size from 0.5 to 10 acres. In 1996, the Oyster Sanctuary Program was established to construct large, no-take reserves that support oyster brood stock and supply both wild and cultch planting sites with oyster larvae. As of 2023, over 395 acres are protected across 14 no-take Oyster Sanctuaries.

RESEARCH NEEDS

The list below outlines the specific research needs and highlights the priority and status of each from Amendment 4 and Amendment 5 to the North Carolina Oyster FMP (NCDMF 2017, 2025). Many environmental considerations are applied throughout the CHPP and are not part of this list but are still considered very important to oyster.

High

- Improve the reliability for estimating recreational shellfish harvest — Ongoing
- Establish and monitor sentinel sites for shell bottom habitat conditions; develop shell bottom metrics to monitor – Ongoing
- Explore the effects of water quality on oyster population dynamics.
- Survey commercial shellfish license holders without a record of landings to estimate oyster harvest from this group — Needed
- Develop regional juvenile and adult abundance indices (fisheries-independent) — Needed
- Determine alternative substrates for reef development and monitoring of intertidal and subtidal reefs (cost-benefit analysis for reefs and cultch planting) — Ongoing
- Quantify the impact of current fishing practices on oyster habitat suitability in North Carolina —Needed
- Develop a program to monitor oyster reef height, area, and condition — Ongoing
- Estimate longevity and yield of oysters on cultch planting sites — Needed
- Develop methods to monitor abundance of the oyster population — Pilot study completed with the Nature Conservancy and N.C. State University (Bowling et al. 2023)

Medium

- Complete socioeconomic surveys of recreational oyster harvesters — Needed
- Support collaborative research to track bacterial sources more efficiently for land-based protection and restoration efforts — Ongoing
- Quantify the relationship between water quality parameters and the cumulative effect of shoreline development units (e.g., docks, bulkhead sections) — Needed
- Develop peer reviewed, standardized monitoring metrics and methodologies for oyster restoration and stock status assessments — Needed

Low

- Continue to complete socioeconomic surveys of commercial oyster fishermen — Needed
- Identify number and size of sanctuaries needed — Ongoing
- Identification of larval settlement cues which influence recruitment to restored reefs (i.e., sound, light, current, etc.) — Ongoing
- Further studies on the effects of dredge weight and size on habitat disturbance and oyster catches — Needed
- Support all proposed implementation actions under the priority habitat issue on sedimentation in the CHPP — Completed by external researcher

MANAGEMENT

There are no management triggers or methods to track stock abundance, fishing mortality, or recruitment between comprehensive reviews in the current FMP.

Amendment 5 was adopted in May 2025. The selected management strategies of the MFC in Amendment 5 of the Eastern Oyster FMP can be found in Table 2.

Table 2. Summary of the N.C. Marine Fisheries Commission management strategies and their implementation status for Amendment 5 of the Oyster Fishery Management Plan adopted May 2025 (NCDMF 2025).

Management Strategy	Implementation Status
RECREATIONAL HARVEST	
Support the DMF to further explore potential options and develop a solution to estimate recreational shellfish participation and landings, with the intent to move towards a stock assessment and stock level management for both hard clams and oysters; and to establish a mechanism to provide all recreational shellfish harvesters with Shellfish Sanitation and Recreational Water Quality health and safety information outside of the FMP process.	Ongoing
MECHANICAL HARVEST MANAGEMENT	
Deep-water Oyster Recovery Areas (DORAs) - Adopt the proposed Pamlico and Neuse River Deep-water Oyster Recovery Areas (DORAs), which are bound by existing navigational aids as presented to the MFC Advisory Committees, to protect deep subtidal oyster reefs from continued physical disturbance by mechanical gear. These areas will be closed to mechanical oyster dredging and monitoring efforts will be used to evaluate the effectiveness of closure within the next FMP amendment. The DORAs cover 681 acres of potential oyster habitat (500 acres in Pamlico River and 180 acres in Neuse River), which represents approximately 81% of the vulnerable deep-water oyster habitat.	Existing proclamation authority; Potentially to begin in 2025.
Cultch Supported Harvest - Adopt the Cultch Supported Harvest strategy outlined in Appendix 2 of Amendment 5, which would set the season length based on pre-season sampling aided by	Existing proclamation authority; Potentially to begin in 2025-2026 harvest season.

Management Strategy	Implementation Status
industry input on sampling locations with the 10 bushel per day and 15 bushel per day areas considered separately.	
Rotational Cultch Site Strategy - Adopt the inclusion of Rotational Harvest Cultch Sites strategy outlined in Appendix 2. This strategy would create a rotating series of readily available cultch areas available to harvest for the full extent of the mechanical season length each year with the intent of reducing harvest pressure on natural reefs.	Existing proclamation authority; Potentially to begin in 2025-2026 harvest season.
Adaptive Management - Adopt the proposed adaptive management framework to allow for modification of set season length based on changes to participation in the fishery.	Existing proclamation authority; Potentially to begin in 2025-2026 harvest season.
MANAGEMENT FROM PREVIOUS PLANS CONTINUING THROUGH AMENDMENT 5	
A daily limit of two bushels of oysters per person with a maximum of four bushels of oysters per vessel off public bottom for Shellfish License holders statewide (NCDMF 2017).	Existing proclamation authority
A six-week opening timeframe for mechanical harvest in deep bays to begin on the Monday of the week prior to Thanksgiving week through the Friday after Thanksgiving. Reopen two weeks before Christmas for the remainder of the six-week season (NCDMF 2017).	Existing proclamation authority
A 15-bushel hand/mechanical harvest limit in Pamlico Sound mechanical harvest areas outside the bays, 10-bushel hand/mechanical harvest limit in the bays, and 10-bushel hand harvest limit in the Mechanical Methods Prohibited area along the Outer Banks of Pamlico Sound. Areas as defined and adopted in Amendment 2 of the Oyster FMP (NCDMF 2008).	Existing proclamation authority

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

The division recommends maintaining the current timing of the scheduled review.

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FISHERY MANAGEMENT PLAN UPDATE
ESTUARINE STRIPED BASS
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	January 1994	
First FMP post FRA:	May 2004	
Amendments:	Amendment 1 Amendment 2	May 2013 November 2022
Revisions:	Revision to Amendment 1 Revision to Amendment 1 Revision to Amendment 2	November 2014 November 2020 2024
Supplements:	Supplement A	February 2019
Information Updates:	None	
Schedule Changes:	August 2016	
Comprehensive Review:	2027	

Estuarine striped bass (*Morone saxatilis*) in North Carolina are managed under Amendment 2 to the North Carolina Estuarine Striped Bass Fishery Management Plan (FMP). It is a plan jointly developed between the North Carolina Marine Fisheries Commission (MFC) and the North Carolina Wildlife Resources Commission (WRC). The Striped Bass FMP, Revisions, Amendments, and Supplement (DMF and WRC 1994, 2004, 2013, 2014, 2019, 2020, and 2022) are available on the North Carolina Division of Marine Fisheries (DMF) website.

The MFC and the WRC implemented a Memorandum of Agreement in 1990 to address management of the striped bass stock in the Albemarle Sound and Roanoke River (A-R). The original Estuarine Striped Bass FMP was approved by the MFC in November 1993 and was targeted at the continued recovery of the A-R stock, which was at historically low levels of abundance and experiencing chronic spawning failures (Laney et. al. 1993). The comprehensive plan addressed the management of all estuarine striped bass stocks in the state, satisfying a recommendation contained in the Report to Congress for the North Carolina Striped Bass Study (U.S. Fish and Wildlife Service 1992) that such a plan be prepared.

The North Carolina Estuarine Striped Bass FMP approved in May 2004, was the first FMP developed under the criteria and standards of the 1997 Fisheries Reform Act (NCDMF 2004). The plan focused on identifying water flow, water quality, and habitat issues throughout the state, reducing discard mortality in the commercial anchored gill net fisheries, continued stocking of striped bass in the Central and Southern areas of the state, and developing creel surveys in the Tar-Pamlico, Neuse, and Cape Fear rivers to estimate recreational harvest in those systems.

Amendment 1, adopted in 2013, lays out separate management strategies for the A-R stock and the Central and Southern stocks in the Tar-Pamlico, Neuse, and Cape Fear rivers. Management programs in Amendment 1 consist of daily possession limits, open and closed harvest seasons, gill net mesh size and yardage restrictions, seasonal attendance requirements, barbless hook requirements in some areas, minimum size limits, and slot limits to maintain a sustainable harvest and reduce regulatory discard mortality in all sectors. Amendment 1 also maintains the stocking regime in the Central and Southern systems (Central Southern Management Area, CSMA) and the harvest moratorium on striped bass in the Cape Fear River and its tributaries (NCDMF 2013). Striped bass fisheries in the Atlantic Ocean of North

Carolina are managed under the Atlantic States Marine Fisheries Commission's (ASMFC) Amendment 7 to the Interstate FMP for Atlantic Striped Bass.

In response to the 2013 benchmark A-R striped bass stock assessment that indicated fishing mortality was above the target, the MFC approved a Revision to Amendment 1 in November 2014 (NCDMF 2014). The November 2014 Revision reduced the total allowable landings (TAL) for the A-R stock from 550,000 pounds to 275,000 pounds, split evenly between the commercial and recreational sectors. Stock assessment projections indicated a TAL of 275,000 pounds would maintain fishing mortality and spawning stock at their respective targets, providing a sustainable harvest. The November 2014 Revision maintained the 25,000-pound commercial TAL for the CSMA, daily possession limits and a closed summer season to control recreational harvest, and a total harvest moratorium in the Cape Fear River and its tributaries. The November 2014 Revision utilizes the term TAL instead of total allowable catch (TAC). The term TAC does not accurately describe the existing management strategy, because the term "catch" refers to landings and discards. Since its inception, the quota used to maintain striped bass harvest at sustainable levels in the A-R and the CSMA is for landings only, not landings and discards. Discards are accounted for in the stock assessment model but are not part of the TAL.

In August 2016, the MFC approved a change to the FMP review schedule so the comprehensive review of the Estuarine Striped Bass FMP would begin in July 2017 instead of July 2018 due to concerns about the high percentage of stocked fish and minimal natural recruitment in the CSMA systems.

On June 1, 2018, a WRC rule change implementing a 26-inch total length minimum size limit in the Inland Fishing Waters of the Tar-Pamlico and Neuse rivers became effective. At the November 2018 MFC business meeting, the division recommended development of temporary management measures to supplement the FMP providing for a no-possession provision for striped bass in the internal coastal and joint waters of the CSMA to protect important year classes of striped bass while Amendment 2 to the N.C. Estuarine Striped Bass Fishery Management Plan was developed. Supplement A to the Estuarine Striped Bass FMP was adopted by the MFC at their February 2019 business meeting and by the WRC in March 2019 (NCDMF 2019). Supplement actions implemented March 29, 2019, consisted of the following:

- Commercial and recreational no possession measure for striped bass (including hybrids) in internal coastal and joint fishing waters of the CSMA (FF-6-2019). The WRC hook and line closure proclamation had the effect of suspending rules 15A NCAC 10C .0107 (l) and 10C .0314 (g). A no-possession requirement already exists for the Cape Fear River by rule.
- Additionally, consistent with Amendment 1, commercial anchored gill-net restrictions requiring tie-downs and distance from shore (DFS) measures will apply year-round (M-5-2019).

On March 13, 2019, the MFC held an emergency meeting that directed the division to issue a proclamation regarding gill nets, beyond what was contained in Supplement A. Proclamation (M-6-2019) implemented the following:

- Prohibits the use of ALL gill nets upstream of the ferry lines from the Bayview Ferry to Aurora Ferry on the Pamlico River and the Minnesott Beach Ferry to Cherry Branch Ferry on the Neuse River.
- Maintains tie-down (vertical net height restrictions) and distance from shore restrictions for gill nets with a stretched mesh length 5 inches and greater in the western Pamlico Sound and rivers (superseded M-5-2019).

An emergency meeting called under North Carolina General Statute section 113-221.1(d), authorizes the MFC to review the desirability of directing the fisheries director to issue a proclamation. Once the MFC votes under this provision to direct issuance of a proclamation, the fisheries director has no discretion to choose another management option and is bound by law to follow the MFC decision. In these cases, under existing law, the decision of the MFC to direct the director to issue a proclamation is final and can only be overruled by the courts.

The most recent A-R striped bass benchmark stock assessment (Lee et al. 2020) was completed and approved for management use in 2020. The assessment indicated the stock is overfished and is experiencing overfishing (Lee et al. 2020). In response to the overfished and overfishing stock status, the MFC approved a Revision to Amendment 1 in November 2020 (NCDMF 2020). The November 2020 Revision to Amendment 1 to the North Carolina Estuarine Striped Bass Fishery Management Plan reduced the striped bass TAL from 275,000 pounds to 51,216 pounds in the Albemarle Sound and Roanoke River Management Areas to remain in compliance with Amendment 1 to the North Carolina Estuarine Striped Bass Fishery Management Plan (FMP) and the ASMFC Addendum IV to Amendment 6 to the Interstate FMP for Atlantic Striped Bass. The new TAL was effective January 1, 2021.

The CSMA Estuarine Striped bass Stocks report (Mathes et al. 2020), completed in 2020, is a collection of (1) all data that have been collected, (2) all management efforts, and (3) all major analyses that have been completed for CSMA stocks to serve as an aid in development of Amendment 2. No stock status determination was performed, and no biological reference points were generated for CSMA striped bass stocks.

Amendment 2 to the North Carolina Estuarine Striped Bass FMP was developed collaboratively by the DMF and WRC and adopted by the MFC in November 2022 (NCDMF 2022). Management measures for the A-R stock in Amendment 2 include continuing to use the stock assessment to set a TAL for sustainable harvest, implementing pound-for-pound payback in the following year if a TAL is exceeded by a fishery, continuing to manage the ASMA commercial harvest as a bycatch fishery, implementing an 18-25 inch slot limit with no fish above 25 inches in the ASMA, and prohibiting harvest of fish over 22 inches in the RRMA.

Amendment 2 management measures for the Tar-Pamlico and Neuse rivers stocks carried forward the Supplement A no-possession measure to Amendment 1. Amendment 2 also maintained the gill net closure above the ferry lines and the use of 3-foot tie-downs below the ferry lines. Additionally, in 2025, data through 2024 will be reviewed to determine if populations are self-sustaining and if sustainable harvest can be determined. In addition, the approved motion included language to: “maintain the gill net prohibition through 2024 to allow for assessment of its performance”.

In the Cape Fear River, Amendment 2 maintained the harvest moratorium. Under adaptive management, juvenile striped bass surveys and parentage-based tagging (PBT) analysis will be used to monitor natural reproduction and if levels of natural reproduction increase or decrease, management measures may be re-evaluated and adjusted using the proclamation authority of the DMF and WRC directors. Management measures which may be adjusted include means and methods, harvest area, season, size and creel limit (as allowed for in rule). Management measures may be adjusted contingent on evaluation by the Striped Bass Plan Development Team (PDT) and consultation with the Finfish Advisory Committee (AC).

The 2024 Revision to Amendment 2 was required based on results of the 2022 update to the Albemarle-Roanoke (A-R) striped bass benchmark stock assessment that indicates overfishing is still occurring in the terminal year (2021) of the assessment and the stock continues to be overfished. (Lee et al. 2022). An additional concern is the eight consecutive years (2017–2024) of very poor A-R stock spawning success. The DMF and an external peer review panel of experts concluded the stock assessment update is suitable for management use and represents the current stock status. The peer review panel recognized factors in addition to fishing mortality are likely contributing to the chronic poor recruitment observed since the early 2000s and the current low abundance of the stock. Contributing factors may include river flow, water quality, water temperatures, habitat conditions, predation (i.e. blue catfish), and competition for food.

The 2024 Revision to Amendment 2 implemented a harvest moratorium effective January 1, 2024, until the population improves to a level capable of supporting sustainable harvest. The revision and all other management strategies contained in Amendment 2 will remain in effect until further changes are implemented through the adaptive management framework of the North Carolina Estuarine Striped Bass FMP Amendment 2 and its Revisions or another Amendment is adopted.

Management Unit

There are two geographic management units and four striped bass stocks included in Amendment 2 to the North Carolina Estuarine Striped Bass FMP. The northern management unit is comprised of two striped bass harvest management areas: the Albemarle Sound Management Area (ASMA) and the Roanoke River Management Area (RRMA). The ASMA includes the Albemarle Sound and all its coastal, joint and inland water tributaries, (except for the Roanoke, Middle, Eastmost and Cashie rivers), Currituck, Roanoke, and Croatan sounds and all their joint and inland water tributaries, including Oregon Inlet, north of a line from Roanoke Marshes Point across to the north point of Eagle Nest Bay in Dare County. The RRMA includes the Roanoke River and its joint and inland water tributaries, including Middle, Eastmost and Cashie rivers, up to the Roanoke Rapids Dam. The striped bass stock in these two harvest management areas is referred to as the A-R stock, and its spawning grounds are in the Roanoke River in the vicinity of Weldon, NC. Implementation of recreational and commercial striped bass regulations within the ASMA is the responsibility of the MFC. Within the RRMA, commercial regulations are the responsibility of the MFC while recreational regulations are the responsibility of the WRC. The A-R stock is also included in the management unit of Amendment 7 to the ASMFC Interstate FMP for Atlantic Striped Bass.

The southern geographic management unit is the CSMA and includes all internal coastal, joint, and contiguous inland waters of North Carolina south of the ASMA to the South Carolina state line. There are spawning stocks in each of the major river systems within the CSMA; the Tar-Pamlico, the Neuse, and the Cape Fear. These stocks are collectively referred to as the CSMA stocks. Spawning grounds are not clearly defined in these systems as access to spawning areas is influenced by river flows as well as impediments to migration. Management of striped bass within the CSMA is the sole responsibility of the MFC and the WRC and is not subject to compliance with the ASMFC Interstate FMP for Atlantic Striped Bass.

To ensure compliance with interstate requirements, North Carolina also manages the A-R striped bass stock under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). 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 FMPs 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 (NCDMF 2015).

Goal and Objectives

The goal of Amendment 2 is to manage the estuarine striped bass fisheries to achieve self-sustaining populations that provide sustainable harvest based on science-based decision-making processes. If biological and/or environmental factors prevent a self-sustaining population, then alternate management strategies will be implemented that provide protection for and access to the resource. The following objectives will be used to achieve this goal.

- Implement management strategies within North Carolina and encourage interjurisdictional management strategies that maintain and/or restore spawning stock with adequate age structure and abundance to maintain recruitment potential and to prevent overfishing.
- Restore, enhance, and protect critical habitat and environmental quality in a manner consistent with the Coastal Habitat Protection Plan (CHPP), to maintain or increase growth, survival, and reproduction of the striped bass stocks.
- Use biological, social, economic, fishery, habitat, and environmental data to effectively monitor and manage the fisheries and their ecosystem impacts.

- Promote stewardship of the resource through public outreach and interjurisdictional cooperation regarding the status and management of the North Carolina striped bass stocks, including practices that minimize bycatch and discard mortality.

DESCRIPTION OF THE STOCK

Biological Profile

Striped bass are an estuarine dependent species found from the lower St. Lawrence River in Canada to the west coast of Florida through the northern shore of the Gulf of Mexico to Texas. In North Carolina, the species is also known as striper, rockfish, or rock. The only stocks considered migratory are the stocks from Maine to the Albemarle Sound-Roanoke River in North Carolina. Migratory striped bass are considered anadromous, meaning they spend most of their adult life in the waters of the estuaries and nearshore ocean, migrating to fresh water to spawn in the spring. For more southern stocks down through Florida, including the CSMA (Tar-Pamlico, Neuse, and Cape Fear stocks), striped bass are riverine, meaning they do not make extensive seasonal ocean migrations like northern striped bass stocks and, instead, spend their entire life in the upper estuary and riverine system.

Females in the A-R stock are 29% mature at age 3 and 97% mature at age 4, while females in the Tar-Pamlico and Neuse rivers are 50% mature at 2.7 years and 98% mature by age 3 (Knight 2015). The length at 50% maturity for striped bass in the A-R stock is 16.8 inches (Boyd 2011). Female striped bass in both systems produce large quantities of eggs which are broadcast into riverine spawning areas and fertilized by mature males, age 2 and older. In the Tar-Pamlico and Neuse rivers, fecundity ranges from 223,110 eggs for Age-3 females to 3,273,206 eggs for Age-10 females (Knight 2015). Fertilized eggs drift with downstream currents and need 1.5 to 3 days to hatch and then continue to develop through the larval stage for several more days, eventually arriving at river mouths and the inland portions of coastal estuaries where they develop into juveniles. Striped bass require flowing, freshwater habitats to spawn successfully, allowing the eggs to remain suspended until they hatch, and to transport larvae to nursery areas. Environmental conditions including temperature, rainfall and river flows are important factors in determining the number of juveniles produced annually. Spawning in North Carolina takes place from late March until early June. Peak spawning activity for the A-R stock occurs when water temperature reaches 62 to 67 degrees Fahrenheit in the Roanoke River at Weldon. Spawning grounds are not clearly defined in CSMA systems as access to spawning areas is influenced by river flows as well as impediments to migration. Natural reproduction and successful juvenile recruitment occur infrequently and at low levels in the Tar-Pamlico, Neuse and Cape Fear rivers. The CSMA stocks are supported by continuous stocking efforts as evidenced by stocked fish comprising nearly 100% of the striped bass on the spawning grounds and in internal coastal fishing waters of the Tar-Pamlico, Neuse, and Cape Fear rivers (O'Donnell and Farrae 2017).

Striped bass are relatively long-lived and capable of attaining moderately large sizes. Fish weighing 50 or 60 pounds are not exceptional. In general, females grow larger than males with reported maximum lengths of 60 inches and 45 inches. The oldest observed striped bass in the A-R stock was 31 years. The oldest observed striped bass within the CSMA were 7 years in the Cape Fear River and 12 years in the Tar-Pamlico and Neuse rivers. The largest striped bass on record are several females caught in the early 1900s in Albemarle Sound which weighed 125 pounds each. Large Roanoke River striped bass (>900 mm TL) rapidly emigrate (~59 km/d) after spawning to distant (>1,000 km) northern ocean waters (New Jersey to Massachusetts), where they spend their summers and migrate southward in the fall to overwintering habitats off Virginia and North Carolina and complete their migration circuit the following spring by returning to the Roanoke River to spawn (Callihan et al. 2015). Estuarine striped bass from the A-R stock contribute minimally to the total coastal migratory stock when compared to the contributions from larger systems like the Chesapeake Bay, Delaware, and Hudson rivers. Striped bass populations in the CSMA are considered to have a primarily endemic riverine life history, having limited adult oceanic migration (Setzler et al. 1980; Rulifson et al. 1982a; Callihan 2012).

Striped bass can form large schools feeding on whatever fishes are seasonally and geographically available. They also feed on a wide variety of invertebrates. In general, oily fish such as Atlantic menhaden, herrings and shads are very important prey items, but they will also readily eat spot, mullet, Atlantic croaker, American eel, and various invertebrates like blue crab.

Albemarle Sound-Roanoke River Management Area

Stock Status: A-R Stock

The most recent assessment update of the A-R striped bass stock was completed in 2022, utilizing data from 1991–2021. Results from the 2022 A-R striped bass stock assessment update indicate the stock is overfished and overfishing is occurring (Lee et. al 2022). The estimate of *F* in the terminal year of the assessment (2021) was 0.77, above the $F_{35\%SPR\ Threshold}$ of 0.18 (Figure 1) and the estimate of SSB was 35,494 pounds, below the $SSB_{35\%SPR\ Threshold}$ of 267,390 pounds (Figure 2). Estimates of *F* have been above the $F_{35\%SPR\ Threshold}$ in 20 out of the 30 years of the time period of the assessment (Figure 1). Female SSB declined steadily from a high of 587,516 pounds in 2000 to 45,418 pounds in 2013. Female SSB increased through 2015 to 167,053 pounds and has declined since to a low of 35,494 pounds in 2021 (Figure 2). Results of the assessment also show a period of strong recruitment (as measured by the number of age-0 fish coming into the stock each year) from 1993 to 2000, then a period of much lower recruitment from 2001 to 2021, which has contributed to the decline in SSB since 2003. Average recruitment during 1993–2000 was 1,085,650 age-0 fish per year while average recruitment for years 2001–2021 was 333,745 age-0 fish per year (Figure 2).

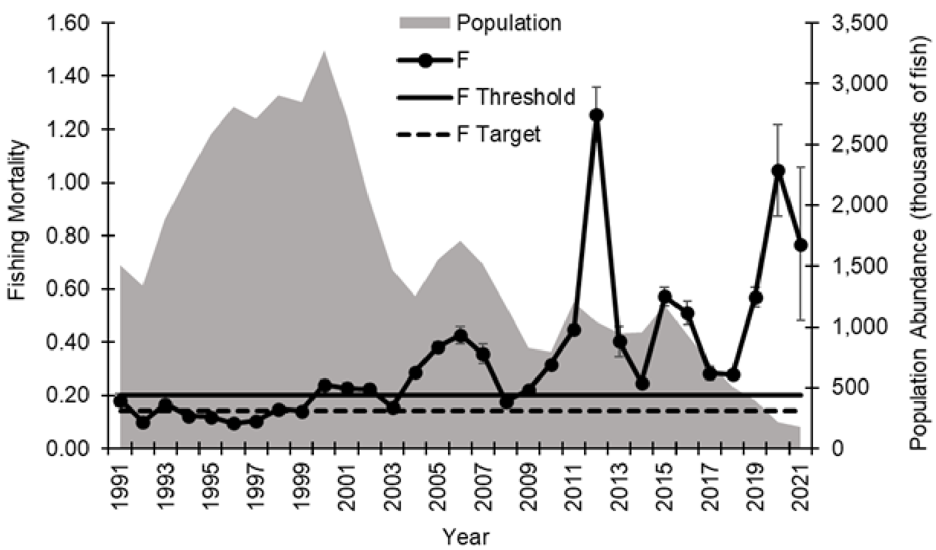


Figure 1. Estimates of fishing mortality (*F*) Albemarle-Roanoke striped bass stock, 1991–2021. Error bars represent ± two standard errors. Source: Lee et al. 2022.

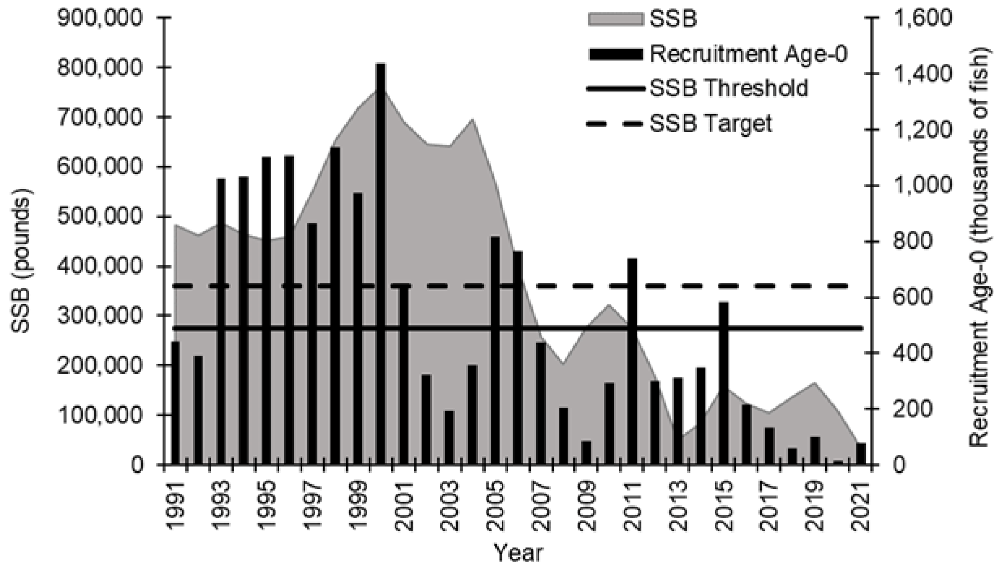


Figure 2. Estimates of spawning stock biomass (SSB) each year for the Albemarle-Roanoke striped bass stock, 1991–2021. Error bars represent ± two standard errors. Source: Lee et al. 2022

Several years of poor recruitment occurred during 2001–2004 at a time when SSB was at high levels, indicating factors other than abundance of SSB may be contributing to poor spawning success in some years. Appropriate river flow during the spawning period has long been recognized as an important factor in spawning success for A-R striped bass (Hassler et. al 1981; Rulifson and Manooch 1990). Low to moderate flows have been identified as favorable to strong year-class production while high flows (10,000 cubic feet per second or greater) are unfavorable to the formation of strong year classes. The peer reviewers of the 2022 assessment recognized the importance of river flow on recruitment and noted declining recruitment in the time series does not appear to result solely from reduced abundance due to harvest (Lee et. al 2022).

Stock Assessment: A-R Stock

Stock Synthesis text version 3.30 (Methot 2000, 2012; Methot and Wetzel 2013) was used to model the striped bass stock and to calculate reference points (Lee et al. 2020). The Stock Synthesis model incorporates information from multiple fisheries and surveys and both length and age composition data. The structure of the model allows for a wide range of model complexity depending upon available data. The strength of the model is that it explicitly models both the dynamics of the population and the processes by which one observes the population and its fisheries. That is, the comparison between the model and the data is kept close to the natural basis of the observations, instead of manipulating the observations into the format of a simpler model. Another important advantage is the model allows for (and estimates) selectivity patterns for each fishing fleet and survey. The model was peer reviewed and approved for use in management by an outside panel of experts and the ASMFC Atlantic Striped Bass Management Board. The DMF also approved it for management use.

DESCRIPTION OF THE FISHERY: ASMA/RRMA

Annual spawning success of striped bass is largely dependent upon environmental conditions, both natural and manmade. Even when female spawning stock biomass is high, poor reproductive success can occur due to unfavorable environmental conditions. This fact is important to keep in mind when discussing trends in landings data and stock abundance. For species that have long term juvenile abundance surveys, this phenomenon is evident when we observe a year with above average spawning success (termed a "strong year class") followed by a year when practically no eggs survive to the juvenile stage (a "weak year class").

This cycle of spawning success and failure results in annual harvests that increase and decrease depending on the abundance of the year classes available to the fishery.

Current Regulations: ASMA/RRMA

Harvest in the ASMA commercial sector was closed in 2024. An 18–25 inch total length (TL) harvest slot limit began in 2023. The commercial fishery is prosecuted as a non-directed bycatch fishery, with most landings occurring in large mesh (≥ 5-inch stretched mesh) floating gill nets during the spring American shad fishery. Pound nets and flounder nets account for the remainder of the harvest. Harvest in the newly developing strike net fishery for blue catfish has also increased in recent years. Daily trip limits are set by proclamation. Daily reporting of the number and pounds of striped bass landed from all licensed striped bass dealers ensure the TAL is not exceeded. Dependent on available quota, a fall harvest season can be opened from October 1 through December 31, and a spring harvest season can be opened from January 1 through April 30. The harvest season is closed from May 1 through September 30 each year. The seasons may be closed early by proclamation if the TAL is reached. There is mandatory attendance of all small mesh (< 5-inch stretched mesh) gill nets during May 1–November 30 to reduce discard mortality in that fishery. There are areas within the ASMA that are closed to all gill netting to further reduce undersize discards and to protect females as they enter the mouth of the Roanoke River during their spring spawning migration.

Harvest by the ASMA recreational sector was closed in 2024. The recreational sector also has an 18–25-inch TL harvest slot limit and a one fish per person daily possession limit. The allowable harvest seasons are the same as the commercial sector, but the actual length of the season depends on available quota. Harvest is estimated via a creel survey designed for striped bass in the ASMA. The daily possession limit may be changed and/or seasons closed early by proclamation to ensure the TAL is not exceeded.

Commercial harvest in the RRMA is prohibited. The harvest season was also closed in the RRMA in 2024. The harvest season can be open March 1–April 30, but the actual length of the season depends on the available quota. There is an 18–22-inch TL harvest slot limit. Only a single barbless hook may be used in inland waters of the RRMA upstream of the U.S. Highway 258 Bridge April 1–June 30.

The 2024 Revision to Amendment 2 implemented a harvest moratorium in the ASMA and RRMA effective January 1, 2024, until the population improves to a level capable of supporting sustainable harvest (NCDMF 2024).

Commercial Fishery: ASMA

Commercial landings in the ASMA have been controlled by an annual TAL since 1991 (Table 1). Due to gill net mesh regulations and minimum size limits in place, most harvest consists of fish 3–7 years of age. From 1990 through 1997 the TAL was set at 98,000 pounds because the A-R stock was at historically low levels of abundance. The stock was declared recovered in 1997 and the TAL was gradually increased as stock abundance increased. The TAL reached its maximum level of 275,000 pounds in 2003 as the stock reached record levels of abundance.

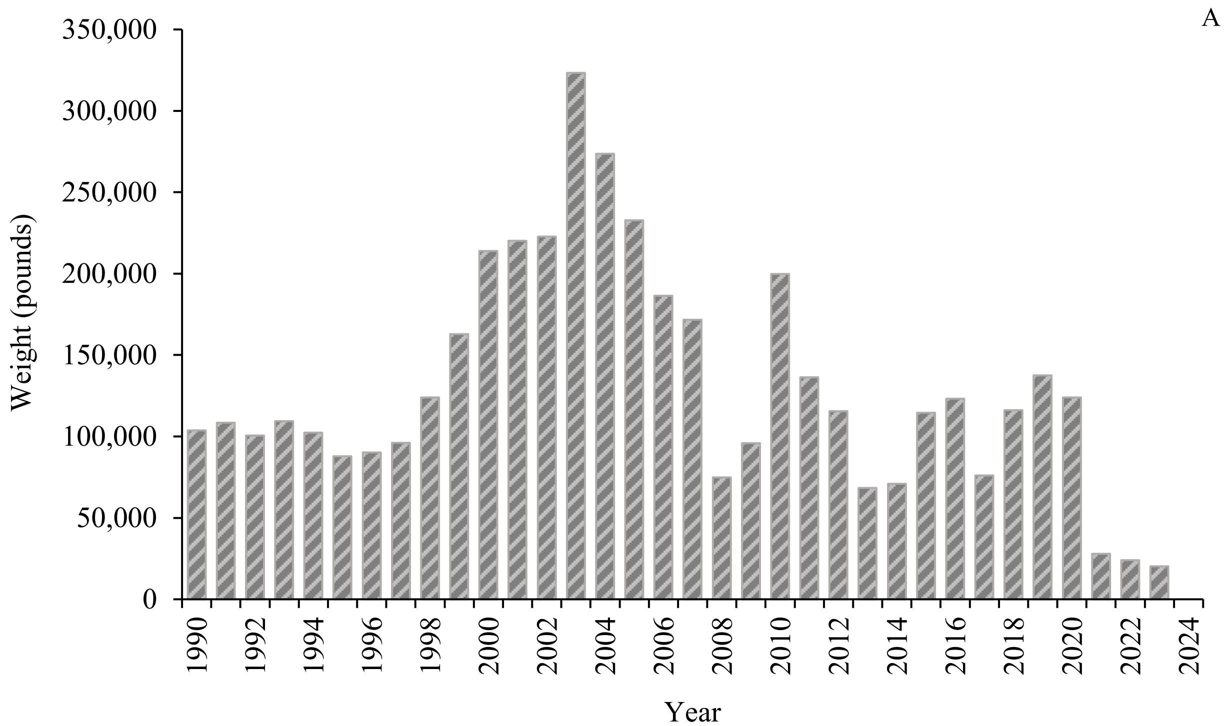
Through 2004, the TAL was reached easily. As stock abundance declined, commercial landings no longer reached the annual TAL, even with increases in the number of harvest days and daily possession limits. During 2005–2009 landings steadily declined and averaged about 150,000 pounds, even though gill net trips remained steady during that period (Figure 3).

The decline in landings during 2005–2009 was due to poor year classes produced from 2001 to 2004. The increase in landings in 2010 to over 200,000 pounds was due to the strong 2005-year class. Since 2013, landings have been reduced in part because of a shortened American shad season resulting from sustainability parameters being exceeded in the American Shad Sustainable Fishery Plan. Most landings traditionally have come during the American shad season. Length frequency distribution in 2023 is presented in Figure 4. Length at age for all commercial samples collected 1972–2023 are presented in Figure 5. Commercial length frequencies are represented in Figure 6. Modal length increased in 1991 and has stayed steady due to the 18-inch minimum size limit. A larger abundance of older fish was present in 2004 and there was a decrease in modal length in 2018. Fish between 18–24 inches TL dominate the fishery.

Table 1. ASMA and RRMA recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and ASMA commercial harvest (weight in pounds) of striped bass from North Carolina, 1990–2024.

	ASMA Recreational			RRMA Recreational			ASMA Commercial	
Year	Number Landed	Number Released	Weight Landed (lb)	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1990	-	-	-	-	-	-	103,757	103,757
1991	14,395	23,540	35,344	26,934	-	72,529	108,460	216,333
1992	10,542	19,981	30,758	13,372	-	36,016	100,549	167,323
1993	11,404	13,241	36,049	14,325	-	45,145	109,475	190,669
1994	8,591	-	30,217	8,284	-	28,089	102,370	160,676
1995	7,343	-	30,564	7,471	52,698	28,883	87,836	147,283
1996	7,433	-	29,186	8,367	163,452	28,178	90,133	147,497
1997	6,901	30,771	26,581	9,364	291,765	29,997	96,122	152,700
1998	19,566	91,888	64,580	23,109	189,978	73,541	123,927	262,048
1999	16,967	40,321	61,338	22,479	163,555	72,967	162,870	297,175
2000	38,085	78,941	116,158	38,206	93,148	120,091	214,023	450,272
2001	40,127	61,418	118,506	35,231	71,003	112,805	220,233	451,544
2002	27,896	51,555	92,649	36,422	55,775	112,698	222,856	428,203
2003	15,124	25,281	51,794	11,157	38,256	39,170	323,337	414,301
2004	28,004	41,041	97,097	26,506	187,331	90,191	273,565	460,853
2005	17,954	21,220	63,477	34,122	157,697	107,530	232,693	403,700
2006	10,711	9,455	35,997	25,355	65,524	84,521	186,399	306,917
2007	7,143	13,599	26,633	19,306	52,501	62,492	171,682	260,807
2008	10,048	36,975	31,628	10,541	189,638	32,725	74,890	139,243
2009	12,069	40,563	37,313	23,248	135,964	69,581	95,794	202,688
2010	3,504	16,200	11,470	22,445	123,910	72,037	199,829	283,336
2011	13,341	21,572	42,536	22,102	107,693	71,561	136,266	250,363
2012	22,345	24,971	71,456	28,847	63,018	88,271	115,605	275,332
2013	4,299	16,381	14,897	7,718	74,221	25,197	68,338	108,432
2014	5,529	23,086	16,867	11,058	165,539	33,717	70,989	121,573
2015	23,240	49,534	70,008	20,031	108,240	58,962	114,488	243,458
2016	4,794	10,352	14,487	21,260	52,644	65,218	123,147	202,852
2017	4,214	24,659	15,480	9,899	78,447	32,569	75,991	124,040
2018	3,465	25,639	11,762	8,741	187,214	26,796	116,144	154,702
2019	8,502	34,968	29,005	16,582	187,192	53,379	137,555	219,939
2020*	6,849	50,009	22,951	20,376	10,999	27,243	123,933	174,122
2021	2,258	7,782	8,258	7,795	57,188	27,546	27,930	63,728
2022	2,789	6,166	8,417	1,949	123,704	6,069	24,026	38,512
2023	2,101	24,148	10,249	2,778	56,085	9,477	20,283	39,169
2024	0	6,467	0	0	32,378	0	0	0
Mean	12,682	31,164	41,302	18,042	111,225	55,915	131,041	225,398

*Due to Covid restrictions, the creel surveys during the spring of 2020 were cut short. Creel estimate for the spring ASMA survey is for the period January 1–March 27, 2020. Creel estimate for the spring RRMA survey is for the period March 1 to March 18, 2020 with data imputed for April based on harvest in April 2015 and 2016.



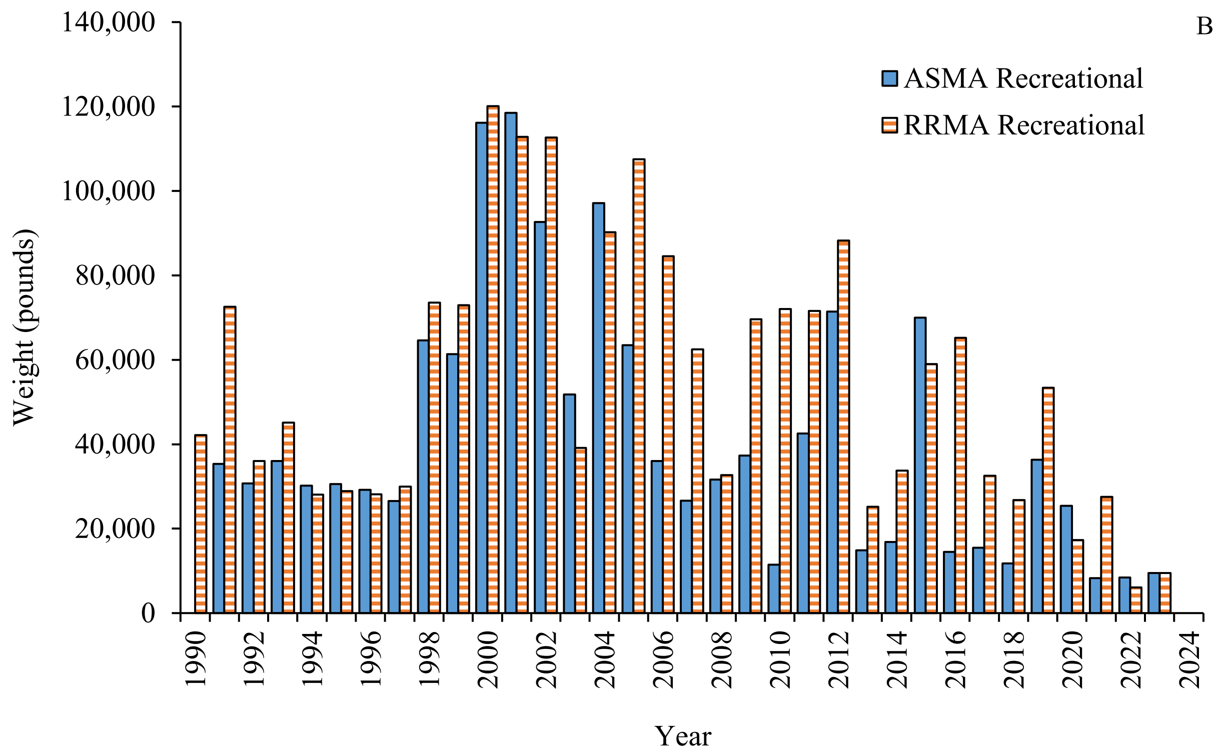


Figure 3. ASMA commercial (A), ASMA recreational (Blue) (B), and RRMA recreational (Orange stripes) (B) striped bass landings in pounds, NC, 1990–2024. RRMA 2020 recreational landings are for March only. ASMA 2020 landings are from January–March.

Recreational Fishery: ASMA/RRMA

The recreational sector's landings in the ASMA are dominated by fish aged 3 to 5. Landings in the ASMA have been controlled by a TAL since 1991 (Table 1). Starting in 1998 the TAL was split evenly between the commercial and recreational sectors. The recreational TAL increased incrementally from 29,400 pounds in 1997 to 137,500 pounds in 2003. The recreational sector reached its TAL consistently until 2002, when landings started declining. Recreational landings peaked in 2001 at 118,506 pounds. (Figure 3). The harvest season increased from four days a week to seven in the fall of 2005 and the daily recreational possession limit increased from two to three fish in the fall of 2006, but landings continued to decline. Several poor year classes produced since 2001 have accounted for the decline in stock abundance and recreational harvest since 2006. The recreational limit was decreased to two fish per person per day in January 2016 and further to one fish in January 2021. Releases are usually greater than harvest and are dominated by fish less than the 18-inch minimum length limit (Table 2). Length frequency distribution in 2023 is presented in Figure 4. ASMA recreational length frequencies for 1996–2023 are presented in Figure 7.

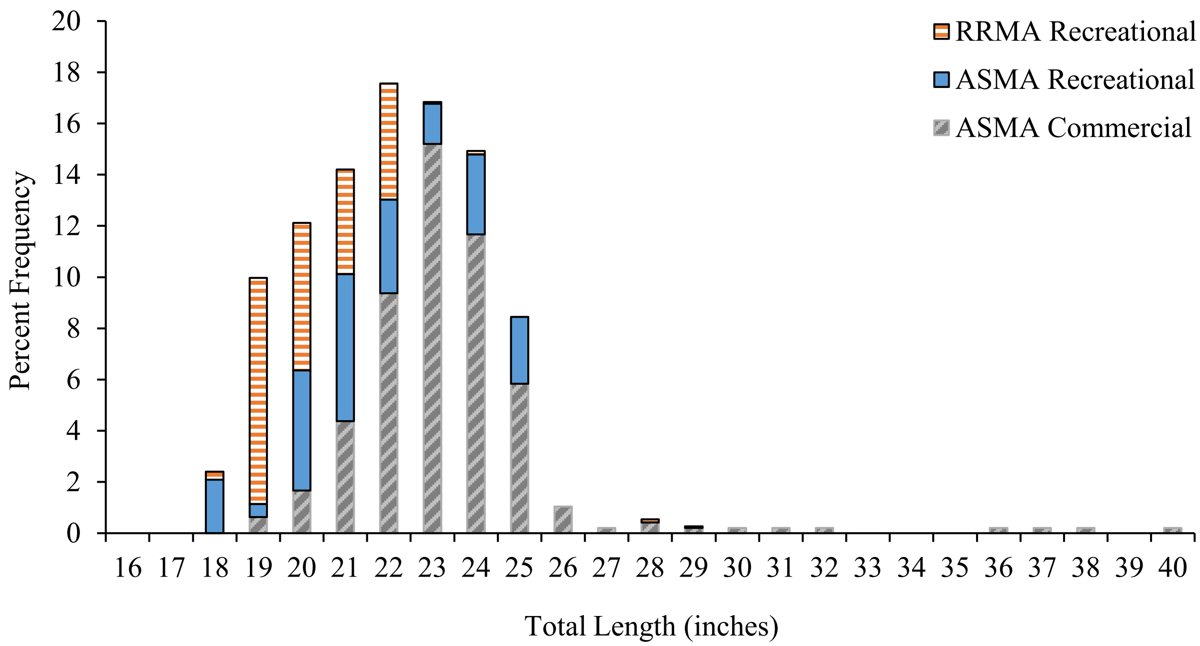


Figure 4. ASMA commercial, ASMA recreational, and RRMA recreational length frequency distribution from striped bass harvested in 2023.

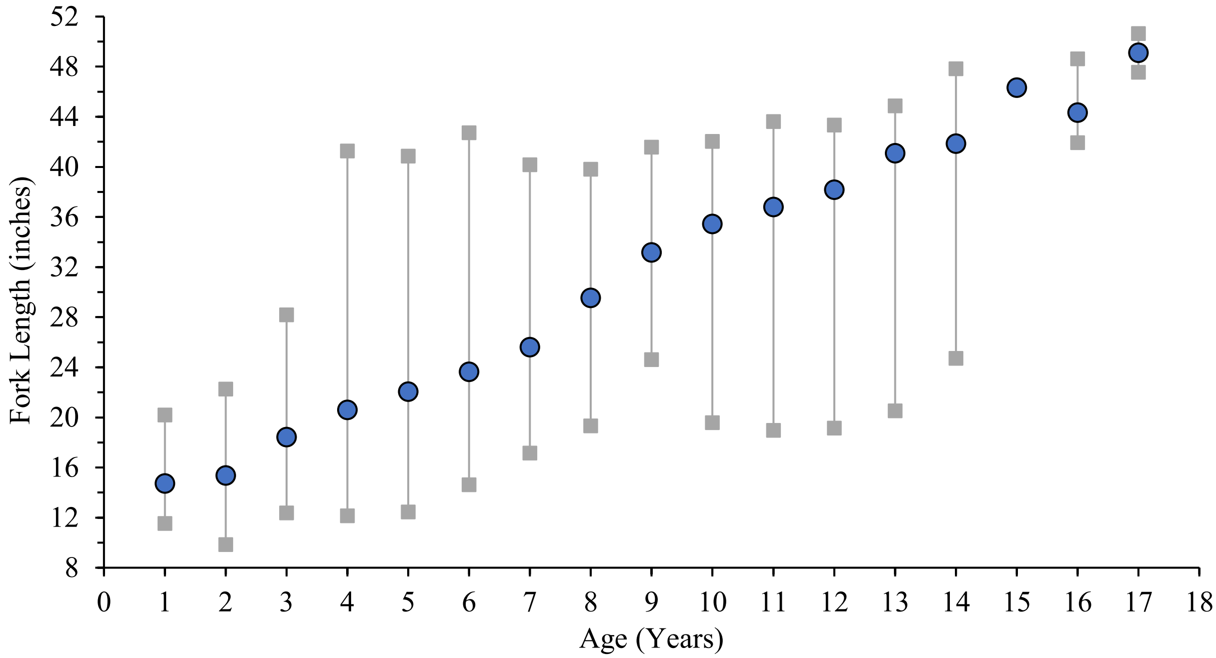


Figure 5. Striped bass length at age based on all commercial samples, 1972–2023. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.

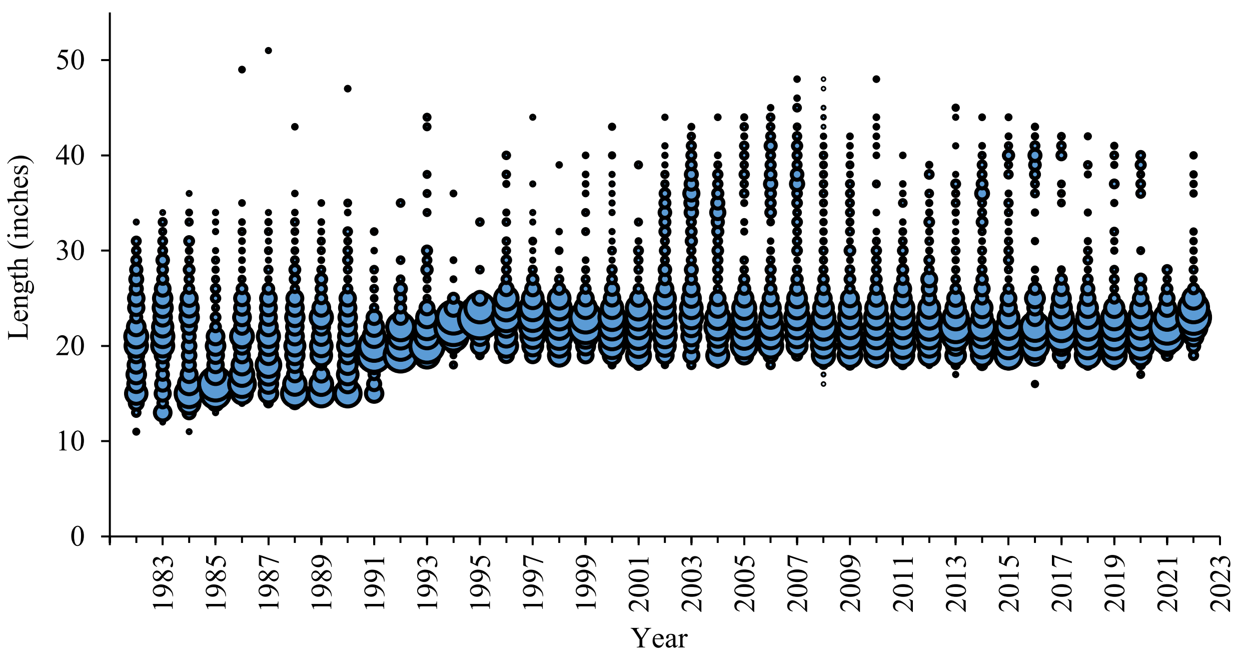


Figure 6. Commercial length frequency (total length, inches) of striped bass harvested in the ASMA, NC, 1982–2023. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

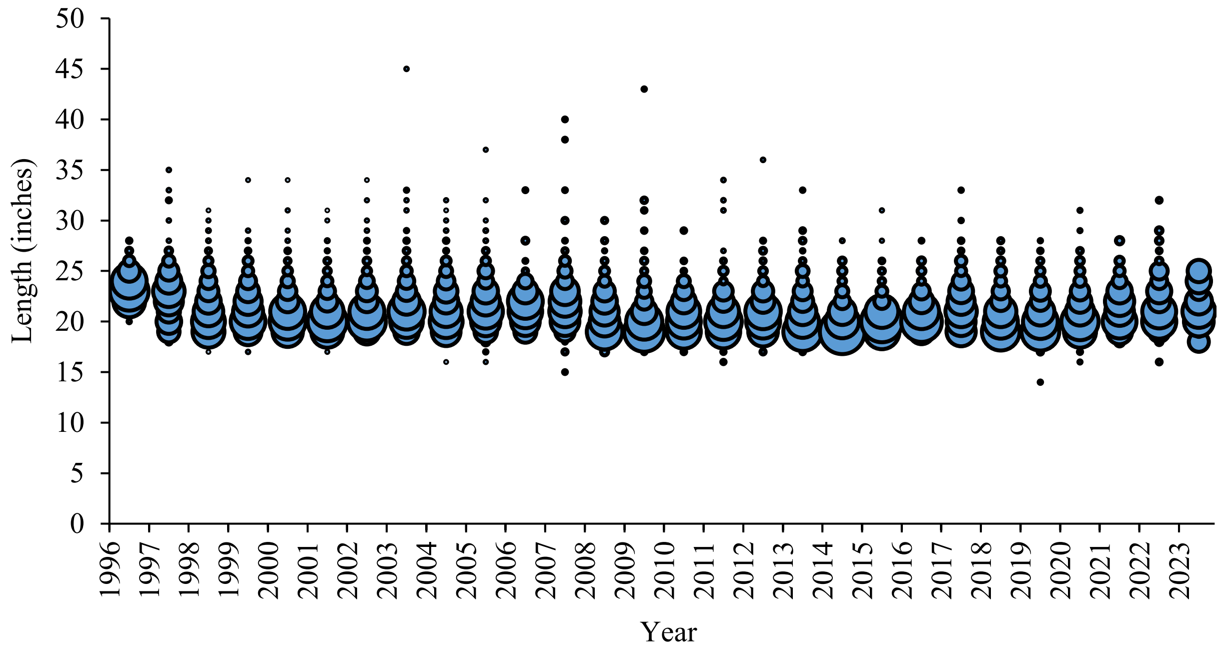


Figure 7. Recreational length frequency (total length, inches) of striped bass harvested in the ASMA, NC, 1996–2023. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Since 1996 the shift in abundance of younger fish is apparent with older fish still showing up in the fishery. Since 2014 the abundance of younger fish has increased likely due to the large 2014- and 2015-year classes with a slight uptick in landings for 2019 and 2020 from the previous several years (2016–2019). Landings were substantially lower from 2021–2023 than previous years as a result of a reduced TAL.

The recreational sector's landings in the RRMA are dominated by fish aged 3 to 5 due to a no possession rule of fish 22–27 inches TL in the RRMA, a statewide rule that prohibits possession of river herring cut bait or whole river herring over six inches in length while engaged in fishing activities, and general angling techniques in the RRMA. Very few anglers use the large size artificial lures or natural bait required to catch striped bass over 28 inches, so very few fish over nine or 10 years old are observed in the creel survey. Plus, these older fish make up a relatively small portion of the total overall stock abundance. Harvest from 1991 through 2022 has averaged 57,366 pounds in the RRMA (Table 1). Many more striped bass are caught and released by recreational anglers each year than are harvested, especially in the RRMA where concentrations of fish on the spawning grounds can be dense. Harvest and discard statistics for the harvest and post-harvest season are presented in Table 3.

Landings in the RRMA followed the TAL closely through 2002. From 2003 through 2016 landings averaged 64,389 pounds, with a few noticeable low years (2003, 2008, 2013, and 2014; Figure 3). The total number of fish caught per angler during the spring fishery in the RRMA can be large; catches of 100 fish per day are not uncommon, but angler catch rates can be impacted by spring water flows.

Table 2. Estimates of striped bass angling effort, harvest, and numbers caught and released from the Albemarle Sound Management Area, 1991–2024. Dashes (-) indicate estimates were not generated in that year. Estimates of discards are not available during the closed harvest period (May–September).

Year	Fishing Angler Trips	Effort Angler Hours	Number Harvested	Pounds Harvested	Discard (#over-creel)	Discard (#under-sized)	Discard (#legal-sized)	Discard (#over-slot)	Total Discards
1991	-	-	14,395	35,344	-	-	-	-	23,540
1992	-	-	10,542	30,758	-	-	-	-	19,981
1993	-	-	11,404	36,049	-	-	-	-	13,241
1994	-	-	8,591	30,217	-	-	-	-	-
1995	-	-	7,343	30,564	-	-	-	-	-
1996	-	6,349	7,433	29,186	-	-	-	-	-
1997	-	13,656	6,901	26,724	-	-	-	-	30,771
1998	-	90,820	19,566	64,761	-	-	-	-	91,888
1999	-	64,442	16,967	61,447	-	-	-	-	40,321
2000	-	100,425	38,085	116,414	-	-	-	-	78,941
2001	-	109,687	40,127	118,645	-	-	-	-	61,418
2002	-	97,480	27,896	92,649	-	-	-	-	51,555
2003	-	87,292	15,124	51,794	-	-	-	-	25,281
2004	-	102,505	28,004	97,097	9,877	28,859	2,305	-	41,041
2005	13,735	86,943	17,954	63,477	11,333	7,032	2,855	-	21,220
2006	10,707	65,757	10,711	35,985	2,490	6,339	626	-	9,455
2007	9,629	61,679	7,143	26,633	1,148	12,259	192	-	13,599
2008	11,793	72,673	10,048	31,628	391	36,324	260	-	36,975
2009	11,326	72,021	12,069	37,313	20	38,683	1,860	-	40,563
2010	9,660	66,893	3,504	11,470	569	15,398	233	-	16,200
2011	13,114	85,325	13,341	42,536	317	20,114	1,141	-	21,572
2012	14,490	102,787	22,345	71,456	1,024	19,977	3,970	-	24,971
2013	7,053	50,643	4,299	14,897	31	16,034	316	-	16,381
2014	7,264	40,478	5,529	16,867	18	22,558	510	-	23,086
2015	11,132	75,009	23,240	70,008	1,573	45,559	2,402	-	49,534
2016	7,023	42,276	4,794	14,486	252	8,822	1,278	-	10,352
2017	8,822	41,371	4,214	15,479	55	24,003	599	-	24,657
2018	9,057	34,764	3,465	11,763	281	21,388	3,970	-	25,639
2019	19,864	61,645	8,502	34,968	2,301	34,452	1,625	-	38,378
2020*	20,559	84,584	6,849	22,951	32,805	15,256	1,947	-	50,008
2021	8,080	29,174	2,258	8,258	689	5,684	1,408	-	7,781
2022	14,175	49,949	2,789	8,417	967	4,626	573	-	6,166
2023	5,211	26,653	2,101	10,249	1,793	11,663	10,456	235	24,148
2024	3,366	16,264	0	0	0	2,604	3,863	0	6,467
Total	229,657	1,889,640	418,511	1,372,751	68,704	399,187	39,730	235	944,558

* Creel estimate for the spring survey is for the period January 1–March 27, 2020.

Table 3. Estimates of striped bass angling effort, harvest, and numbers caught and released from the Roanoke River Management Area, 1988–2024. Dashes (-) indicate data was not collected in that year. **For 1989–2009 number of trips was calculated by dividing the angler hours by 4.75 (assumes each trip was 4.75 hours long). Since 2010, number of trips were estimated based on creel survey data sampling probabilities.

	Open Season (Harvest Estimates)					Post-Harvest Period (Catch and Release Only)		
Year	Number harvested	Weight (lb)	Effort Angler Hours	Angler Trips	Number released	Number released	Effort Angler Hours	Fishing Angler Trips
1988	-	74,639	-	-	-	-	-	-
1989	8,753	32,107	46,566	9,803	-	-	-	-
1990	15,694	42,204	56,169	11,825	-	-	-	-
1991	26,934	72,529	74,596	15,704	-	-	-	-
1992	13,372	36,016	49,277	10,374	-	-	-	-
1993	14,325	45,145	52,932	11,144	-	-	-	-
1994	8,284	28,089	44,693	9,409	-	-	-	-
1995	7,471	28,883	56,456	11,885	-	52,698	20,639	4,345
1996	8,367	28,178	46,164	9,719	-	148,222	32,743	6,893
1997	9,364	29,997	23,139	4,871	-	271,328	47,001	9,895
1998	23,109	73,541	72,410	15,244	-	102,299	26,367	5,551
1999	22,479	72,967	72,717	15,309	-	113,394	30,633	6,449
2000	38,206	120,091	95,622	20,131	-	-	-	-
2001	35,231	112,805	100,119	21,078	-	-	-	-
2002	36,422	112,698	122,584	25,807	-	-	-	-
2003	11,157	39,170	77,863	16,392	-	-	-	-
2004	26,506	90,191	145,782	30,691	-	-	-	-
2005	34,122	107,530	130,755	27,527	-	68,147	24,146	5,083
2006	25,355	84,521	120,621	25,394	-	24,719	15,235	3,207
2007	19,305	62,492	141,874	29,868	-	11,622	9,254	1,948
2008	10,541	32,725	110,608	23,286	-	47,992	17,764	3,740
2009	23,248	69,581	120,675	25,405	-	-	-	-
2010	22,445	72,037	125,495	24,347	77,882	46,028	31,281	5,111
2011	22,102	71,561	122,876	27,311	80,828	26,865	15,110	2,707
2012	28,847	88,539	110,982	27,151	40,772	22,246	8,935	1,881
2013	7,718	25,197	100,391	19,539	49,148	25,074	12,423	2,246
2014	11,058	33,717	80,256	15,960	93,471	72,068	17,542	2,972
2015	20,031	58,962	111,419	22,827	78,401	29,839	12,229	2,207
2016	21,260	65,218	129,132	25,036	34,753	17,891	11,291	2,087
2017	9,899	32,569	101,565	19,688	68,693	9,754	7,446	1,317
2018	8,741	26,797	95,447	18,280	121,969	65,245	14,499	2,462
2019	16,582	53,379	99,259	20,633	117,550	69,642	26,867	5,283
2020†	20,376	27,243	131,565	26,648	10,999	-	-	-
2021	7,795	27,546	69,281	12,976	25,775	31,413	21,778	4,513
2022	1,949	6,069	17,014	3,373	25,427	98,278	34,449	6,657
2023	2,778	9,477	27,352	5,403	13,149	42,936	35,668	6,111
2024	0	0	18,794	3,644	32,378	-	-	-

† Creel estimate for the spring survey is for the period March 1–March 18, 2020 with data imputed for April based on harvest in April 2015 and 2016. The number released is only for March 1–March 18.

The hydropower company operating the dams on the Roanoke River, along with the U.S. Army Corps of Engineers and biologists with the USFWS and WRC, coordinate releases to best mimic natural flow conditions during the spring spawn. However, droughts or heavy rainfall may still result in very low, i.e., 2,000–3,000 cubic feet per second (cfs) or very high, (≥20,000 cfs) flood stage flow conditions in some years. During these low or high flow years, angler success can be greatly diminished. Length frequency distribution in 2023 is presented in Figure 4. RRMA recreational length frequencies for 2005–2023 are presented in Figure 8. Since 2005, abundance of older fish in the recreational creel survey has decreased.

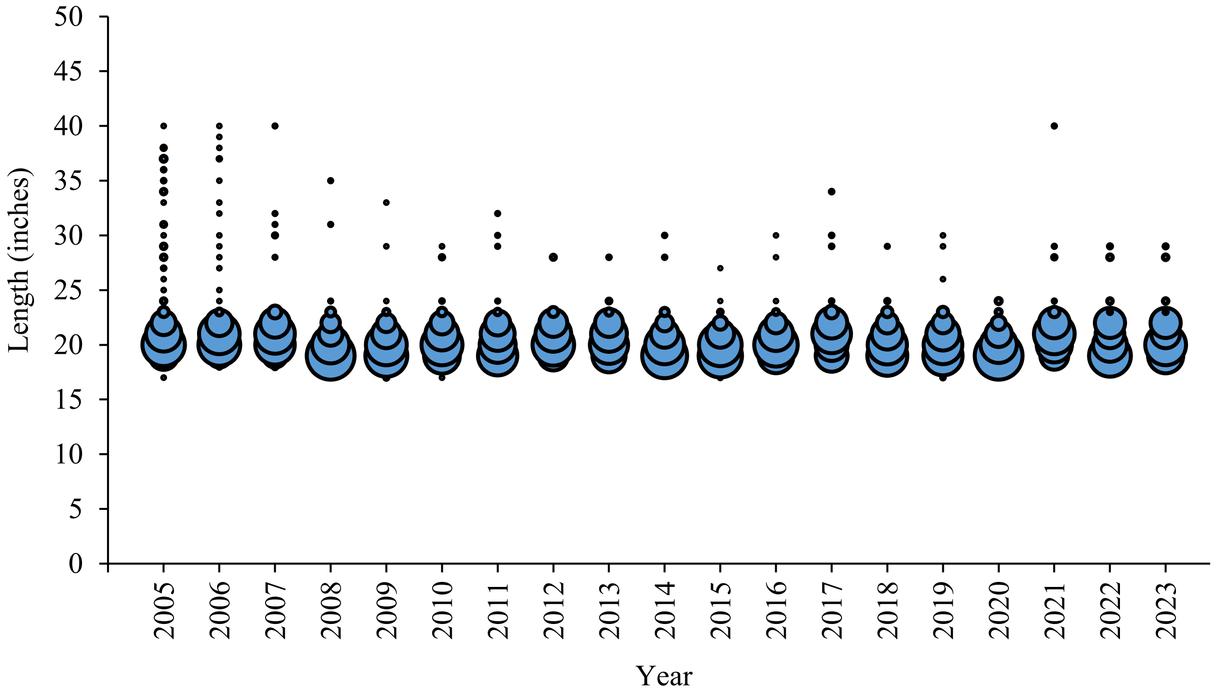


Figure 8. Recreational length frequency (total length, inches) of striped bass harvested in the RRMA, NC, 2005–2023. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

MONITORING PROGRAM DATA: A-R STOCK

Fishery-Dependent Monitoring: A-R Stock

The length, weight, sex, and age of the commercial harvest of striped bass has been consistently monitored through sampling at fish houses conducted by the division since 1972. Since 1994 anchored gill nets have accounted for 87.8% of the harvest in the ASMA (Figure 9). Pound nets account for most of the remaining landings with minor catches coming from fyke nets, hoop nets, and pots. The mean total length from 2005 to 2022 was 21.6 inches (Table 4).

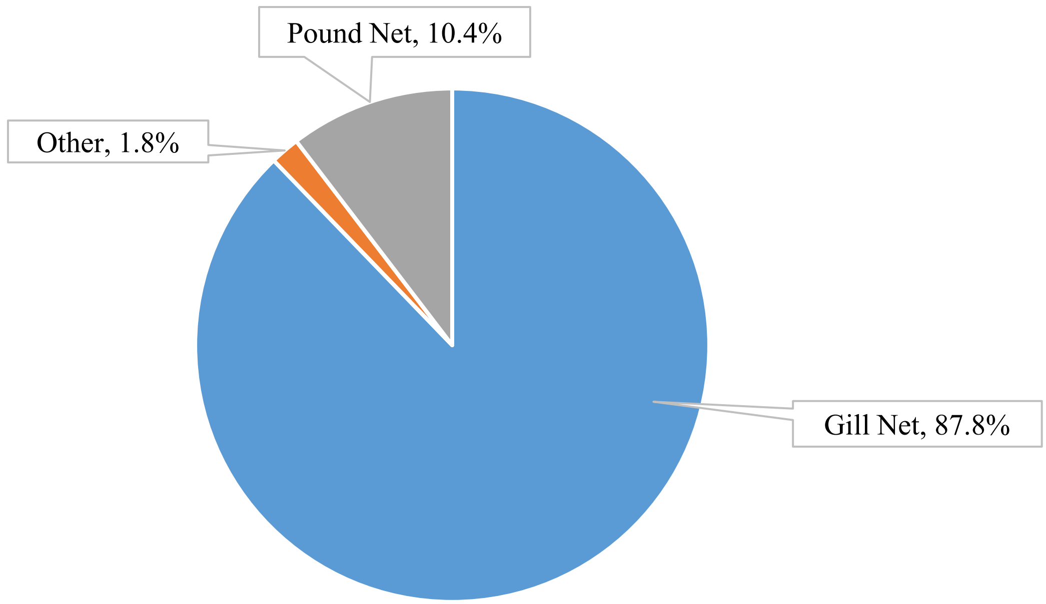


Figure 9. Commercial striped bass landings by gear in the ASMA, NC, 1994–2023.

Table 4. Striped bass total length (inches) data from commercial fish house sampling from the Albemarle Sound Management Area (ASMA), North Carolina, 2005–2023.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2013	22	18	45	543
2014	23	18	43	484
2015	22	18	43	794
2016	22	18	43	604
2017	22	18	41	246
2018	20	16	41	456
2019	20	17	40	566
2020	22	17	40	191
2021	22	19	28	165
2022	23	18	40	250
2023	22	18	26	339

The recreational harvest of striped bass in the ASMA and RRMA has been consistently monitored by the DMF since 1990 and the WRC since 1988 respectively. The mean total length during 2005–2022 was 20 inches total length for the ASMA and RRMA (Tables 5 and 6). Age data from the dependent and independent surveys in the ASMA are presented in Table 7. The minimum and maximum age for the independent and dependent surveys are 1 and 17 years respectively with an average age of 5.

Table 5. Striped bass total length (inches) data from recreational landings from the Albemarle Sound Management Area (ASMA), North Carolina, 2014–2023.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2014	19	18	28	802
2015	20	17	30	1,523
2016	21	18	28	423
2017	21	18	32	489
2018	18	17	29	312
2019	18	17	27	555
2020	20	16	30	683
2021	21	17	28	290
2022	21	11	31	242
2023	23	19	26	46

Table 6. Striped bass total length (inches) data from recreational landings from the Roanoke River Management Area (RRMA), North Carolina, 2014–2023.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2014	19	17	30	559
2015	19	16	27	1,340
2016	20	17	29	1,133
2017	20	17	34	498
2018	20	17	28	688
2019	20	17	30	1,032
2020	19	18	24	155
2021	20	18	40	630
2022	20	18	28	374
2023	20	18	29	464

Table 7. Striped bass age data from dependent (commercial) and independent (independent gill net survey) surveys from the ASMA, North Carolina, 2014–2024. Aging not complete for 2024

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
2014	4	2	11	728
2015	4	1	11	713
2016	5	2	12	555
2017	2	2	13	504
2018	4	1	10	674
2019	5	1	14	482
2020	5	1	11	301
2021	5	4	9	120
2022*	3	1	11	551
2023	3	1	11	599
2024	-	-	-	-

Fishery-Independent Monitoring: A-R Stock

A young-of-year (age-0) A-R striped bass juvenile abundance survey used to calculate a juvenile abundance index (JAI) was initiated by Dr. William Hassler of North Carolina State University in 1955. The DMF took over this critical long-term survey in 1987 at Dr. Hassler's retirement. Sampling occurs at seven fixed stations in the western Albemarle Sound July–October. Sampling gear is an 18-foot semi-balloon trawl towed for 15 minutes. Catch per unit effort is the number of striped bass captured per tow. The JAI provided by the survey is usually a reliable indicator of relative abundance and future harvest potential. Data from the survey reveal the highly variable inter-annual spawning success of striped bass. The long time-series of data also clearly shows the extended period of spawning failure that occurred when the stock was at historical levels of low abundance during the 1980s. Starting in 1993 the stock began producing successful spawns once again, due to improved water quality, agreements about water flow regimes on the Roanoke River during the spawning season, favorable environmental conditions during the spawning season, and severe management restrictions that allowed stock abundance to increase. Within an eight-year period spanning 1993–2000, the stock produced the four highest JAI values in the entire time series. The average JAI during 1993–2000 was 24.04, over three times higher than the average of the JAI prior to the stock crashing (1955–1977 JAI = 7.9; Figure 10). However, from 2001 to 2010 the JAI was below average for most years, above average for only one year (2010), and several years including some back-to-back (2003 and 2004), which were considered spawning failures. This cycle starting in 1993 led to overall stock abundance increasing steadily through the mid-2000s to all-time highs, followed by a period of stock decline. From 2010 to 2016 the stock saw improved annual spawning success, with above average JAI values in 2011, 2014, and 2015, with one year (2013) below the spawning failure threshold. However, the JAI values 2018–2023 averaged 0.51 and are all below the spawning failure threshold of 1.33 (ASMFC 2010). The JAI in 2024 increased slightly to 2.16 (Figure 10).

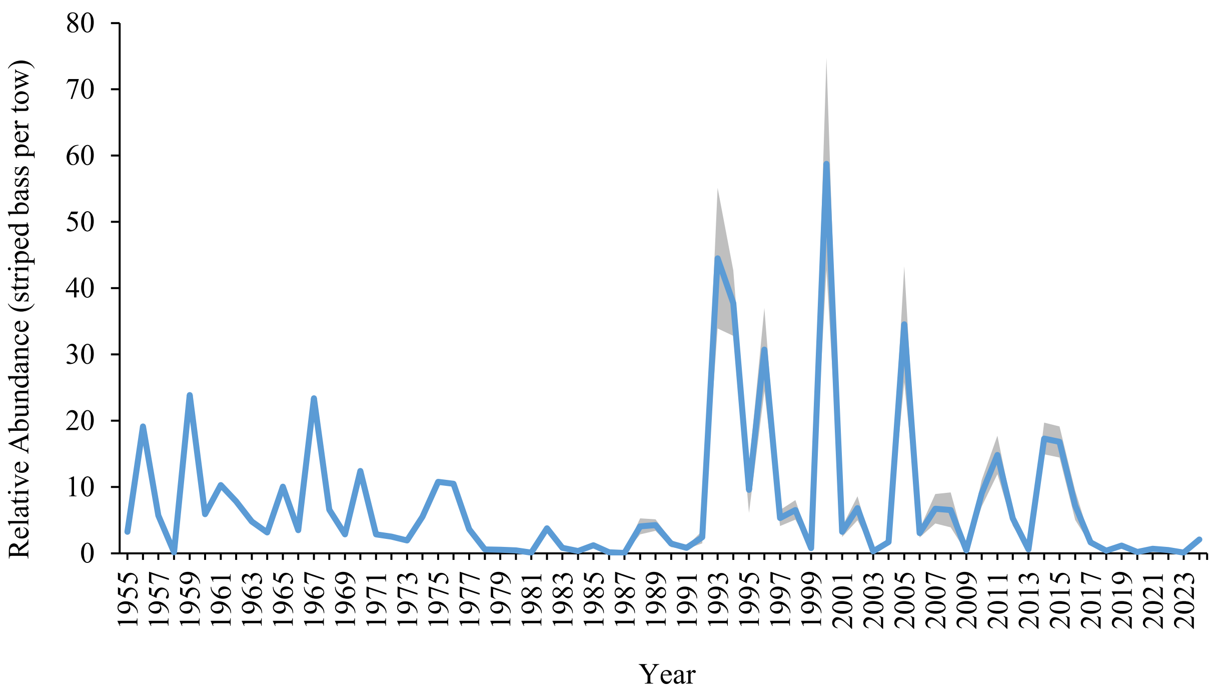


Figure 10. Juvenile abundance index (JAI) of Albemarle-Roanoke striped bass from the DMF juvenile trawl survey, western Albemarle Sound, NC, 1955–2024.

A fall/winter fishery independent gill-net survey (IGNS) has been conducted by the DMF throughout the Albemarle and Croatan sounds since the fall of 1990 (Program 135). The survey utilizes a stratified random sampling design, employing mesh sizes from 2½-inch to 10-inch stretch mesh to characterize the resident and overwintering portion of the A-R stock. The survey is conducted from November through February. Catch per unit of effort is measured as the abundance of fish per 40-yard net soaked for 24 hours. Sampling in 2020 was suspended due to COVID-19 restrictions and Atlantic sturgeon protected species interactions but resumed in the fall of 2021. After resuming sampling in 2021, survey methods were altered to decrease sturgeon interactions. As a result of these changes from 2021 onward, catch per unit of effort is measured as the abundance of fish per 40-yard net soaked for 12 hours.

A spring survey employs the same methodology as the fall/winter survey but is conducted in the western Albemarle Sound only, near the mouth of the Roanoke River. The goal of the survey is to characterize the spawning portion of the A-R stock. The survey is conducted from March 1 through the end of May. Data from the surveys are used in the A-R stock assessment as an independent measure of stock abundance. No index of abundance is available for the spring survey in 2020 and 2021 or the winter survey in 2021. Sampling did not occur in 2020 due to COVID-19 restrictions and Atlantic sturgeon protected species interactions but resumed in March of 2022.

The independent gill net surveys do a good job of tracking relative abundance, but the trend in total abundance is often masked by the highly variable and often very large number of two- and three-year-old fish captured in the survey, so trends in total abundance are often less informative than trends in 4–6-year-old abundance. The trend in abundance of 4–6-year-old shows the stock increasing in abundance through the 1990s, to a high in 1999 of about 90 fish per 100 net days for the spring survey and 72 fish in the fall/winter survey. The 4–6-year-old abundance has fluctuated since 2000 but has been on a general downward trend with abundance for both surveys at about 20 fish per 100 net days in 2014 (Figure 11). One weakness of the gill net surveys is they collect very few older fish and under-represent the expansion of fish in the 9+ age group that has occurred since 2000. They also don’t capture the decline in abundance of age 9+ fish that has occurred since the period of poor spawning success during 2001–2010. In 2024 the fall/winter survey increased slightly, while the spring survey decreased from the 2023 value (Figure 11).

It should be noted that beginning in November of 2022, required changes were made to the independent gill-net survey that have the result of increasing the relative abundance of striped bass compared to previous years, <u>making the relative abundance values derived from the survey from 2022 forward not directly comparable to previous years.</u>

An electrofishing survey has been conducted by the WRC on the spawning grounds since the spring of 1990. The survey goals are the same as the spring gill net survey but takes place on the Roanoke River in the vicinity of Weldon, the location of the fall line and historical center of spawning activity for A-R striped bass. The survey uses a stratified random sampling design. Catch per unit of effort is measured as the number of fish captured per hour of electrofishing. The survey is used in the A-R stock assessment as an independent measure of stock abundance. The trend in total abundance from the electrofishing survey is similar to the trends of age 4–6 fish in the gill net surveys; increasing from low levels of abundance in the early 1990s to a peak in the early 2000s of 380 fish per hour, then has been on a relative decline since. The abundance of fish in 2024 was 18 fish per hour, the lowest value in the 34 year time-series of the survey (Figure 12). Both surveys exhibit a few years with high inter-annual variability, but this is common with fisheries surveys in which environmental conditions affect relative abundance in the survey area and the catch efficiency of the gear.

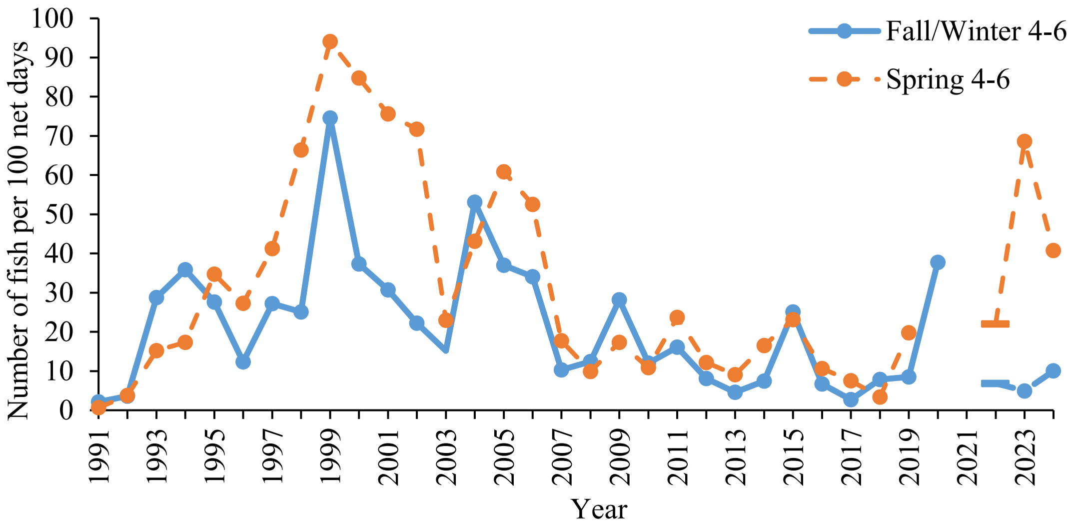


Figure 11. Relative abundance of age 4–6 Albemarle-Roanoke striped bass from the DMF fall/winter and spring independent gill net surveys, Albemarle Sound area, NC, 1991–2023. **It should be noted that beginning in November of 2022, required changes were made to the independent gill-net survey that have the result of increasing the relative abundance of striped bass compared to previous years, <u>making the relative abundance values derived from the survey from 2022 forward not directly comparable to previous years.</u>**

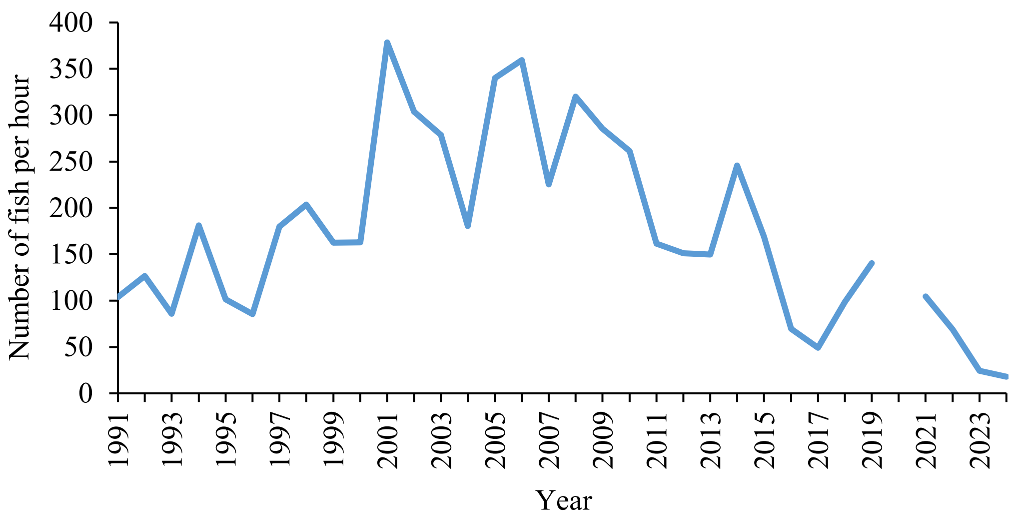


Figure 12. Relative abundance of Albemarle-Roanoke striped bass from the WRC spawning grounds electrofishing survey, Roanoke River at Weldon, NC, 1991–2024.

The electrofishing survey does a better job at tracking the abundance of the age 9+ group compared to the IGNS, and clearly shows the emergence of the 1993 cohort into this age group in 2002. The age 9+ group has been on a downward trend since the 2006 peak of 14 fish per hour. In 2018 no age 9+ fish were captured. In 2022 the survey caught 0.99 fish per hour which was the highest rate since 2015 but well below the time series average of 3.88 fish per hour (Figure 13). The strong year classes produced during 1993–2000 supported the increased abundance of fish in the 9+ age group, but since the below average spawning and several years of spawning failure during 2001–2011, the abundance of the 9+ age group is declining. The oldest fish seen recently in the population is a 31-year-old fish based on a tag returned by an angler in 2019 in the Roanoke River. When the survey started in 1990, fish older than seven were rarely observed in the survey. Age 9+ fish abundance has decreased in recent years and for years 2016–2024 is similar to the abundance levels seen in the early to mid-90's.

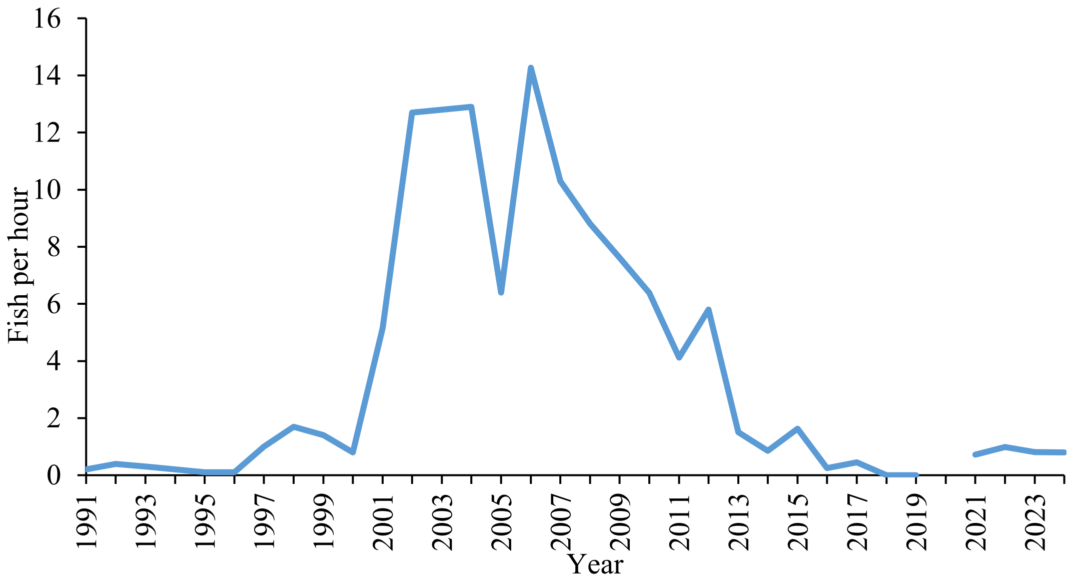


Figure 13. Relative abundance of age 9+ Albemarle-Roanoke striped bass from the WRC spawning grounds electrofishing survey, Roanoke River at Weldon, NC, 1991–2024.

Tagging Program: A-R Stock

In 2014, a mark-recapture tagging program was initiated utilizing both volunteer anglers and DMF staff throughout the state. Striped bass collected in good condition during DMF fishery independent and electrofishing sampling are tagged with conventional internal anchor tags. The total number of striped bass tagged in 2022 in the ASMA, was 1,234 resulting in 59 recaptures (Table 8; Figure 14). The time series average was 203 days at large with an average distance travelled of 61 miles (Table 8). Most recaptures occur within the state of North Carolina, however, the maximum distance travelled was 579 miles off the coast of New Jersey (Figure 14). The maximum days between release and recapture was 1,905 days or just over five years (Table 8). Data collected from the tagging programs may serve as a recovery indicator and help guide future research needs for the ASMA striped bass stocks. The tagging data from this survey will be used to help determine hatchery contribution to the stocks, as well as movement and migration patterns.

Table 8. Summary of ASMA/RRMA striped bass tagging and recapture data, 2015–2024. Tagging for 2024 includes Phase II hatchery fish stocked into the Albemarle Sound.

Year Tagged	Total Fish Tagged (n)	Total Fish Recaptured (n)	Average Days At Large	Max Days At Large	Average Distance Traveled (miles)	Max Distance Traveled (miles)
2015	2,330	281	278	1,905	76	279
2016	1,177	107	192	1,538	43	242
2017	1,094	101	185	1,311	57	189
2018	1,494	194	165	1,829	42	165
2019	1,814	256	194	1,082	57	272
2020	336	44	284	1,130	64	217
2021	1,208	130	228	948	65	579
2022	1,235	79	130	486	67	378
2023	484	18	61	204	56	135
2024	3,392	7	68	213	108	327

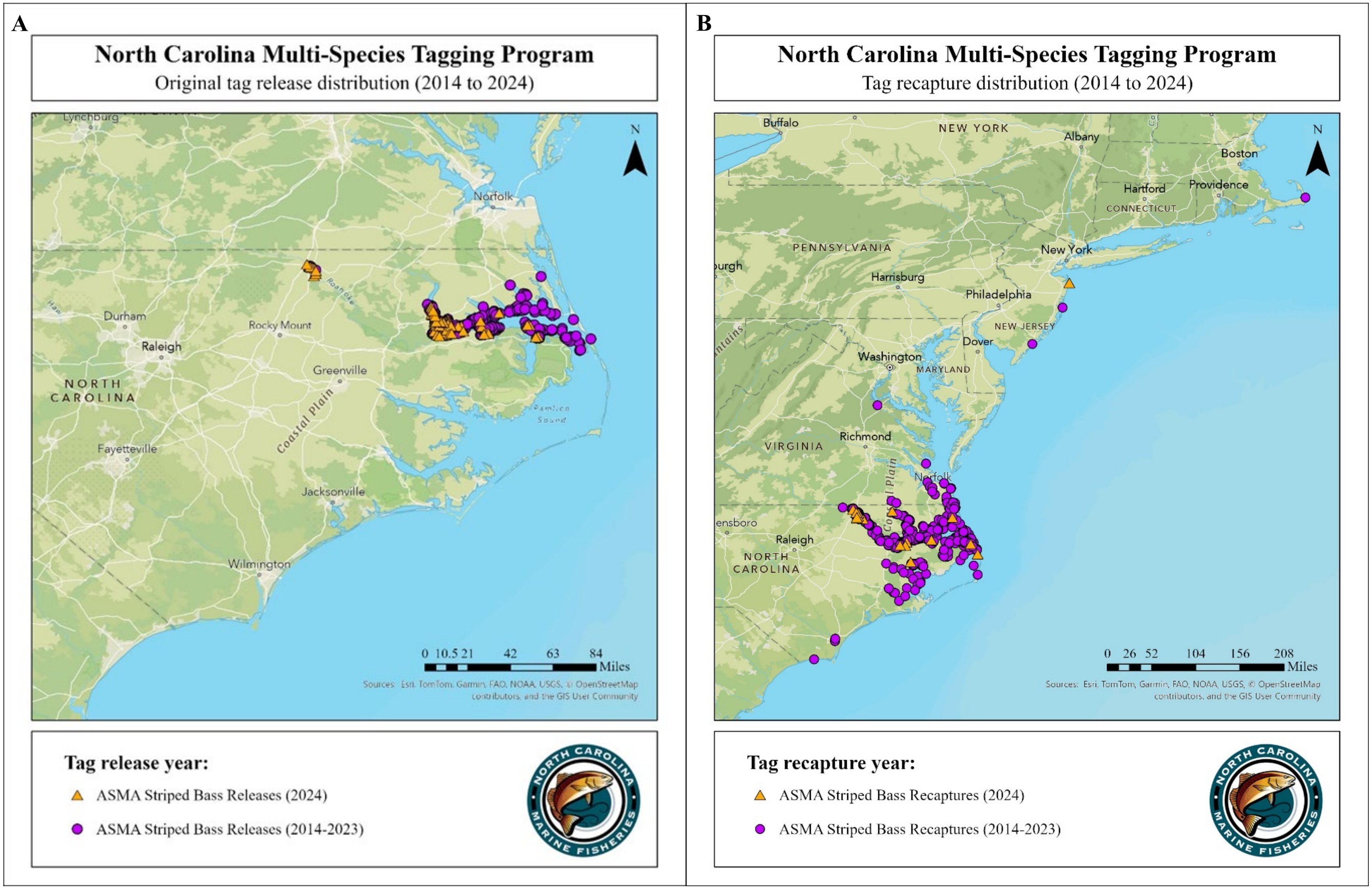


Figure 14. ASMA (Roanoke River and Albemarle Sound) striped bass tagging release (A) and recapture (B) locations, 2014–2023.

RESEARCH NEEDS: A-R STOCK

The research recommendations listed below (in no particular order) are intended to improve future assessments of the A-R striped bass stock. The bulleted items outline the specific issue and are organized by priority ranking.

High

- Identify environmental factors (e.g., flow, salinity, predation, dissolved oxygen, algal blooms) affecting survival of striped bass eggs, larvae, and juveniles and investigate methods for incorporating environmental variables into stock assessment models.
- Expand, modify, or develop fishery-independent sampling programs to fully encompass all bass life stages (egg, larval, juvenile, and adult). (Ongoing through preliminary larval tows)
- Collect data to estimate catch-and-release discard losses in the ASMA recreational fishery during the closed harvest season (initiated 2024).
- Investigate relationship between river flow and striped bass recruitment for consideration of input into future stock assessment models.

Medium

- Improve estimates of discard mortality rates and discard losses from the ASMA commercial gill-net fisheries (ongoing through observer program).
- Transition to an assessment that is based on ages derived from otoliths.
- Improve estimates of catch-and-release discard losses in the RRMA recreational fishery during the closed harvest season.
- Incorporate tagging data directly into the statistical catch-at-age model.
- Improve the collection of length and age data to characterize commercial and recreational discards.
- Explore the direct input of empirical weight-at-age data into the stock assessment model in lieu of depending on the estimated growth relationships.

Low

- Re-evaluate catch-and-release mortality rates from the ASMA and RRMA recreational fisheries incorporating different hook types and angling methods at various water temperatures (e.g., live bait, artificial bait, and fly fishing) (WRC conducted study in the RRMA in 2024).
- Investigate the potential impact of blue catfish on the A-R striped bass population (e.g., habitat, predation, forage).

MANAGEMENT: A-R STOCK

Estuarine striped bass in North Carolina are managed under Amendment 2 to the North Carolina Estuarine Striped Bass FMP and subsequent revisions. Striped bass fisheries in the Atlantic Ocean of North Carolina are managed under ASMFC's Amendment 7 to the Interstate FMP for Atlantic Striped Bass. The A-R stock is managed using biological reference points for spawning stock biomass and fishing mortality that are aimed at maintaining a sustainable harvest and adequate spawning stock biomass. Stock status is determined through a formal, peer reviewed stock assessment process that evaluates annual estimates of fishing mortality and biomass against their target and threshold values. The 2020 A-R striped bass stock assessment indicated that the A-R striped bass stock is overfished with overfishing occurring in the terminal year (2017). Adaptive management measures within Amendment 2 to the Striped Bass FMP required a reduction in TAL to reduce fishing mortality (F) to the target level. The new TAL required to reduce F is 8,349 pounds.

A TAL of 8,349 pounds divided among three harvest sectors is too low to effectively manage and emphasizes the need to prioritize stock recovery over a very limited recreational fishery and commercial bycatch fishery. At such a low allowable TAL, either sector could harvest their entire TAL in one day. In addition, any harvest season for striped bass will result in additional dead discards from both the commercial and recreational sectors. With the stock abundance at the lowest level in the stock assessment time series, compounded by the recent consecutive years of recruitment failure, it is necessary to reduce fishing mortality on the stock to provide the greatest potential for stock recovery and allow as many females to return to the spawning grounds each year.

Therefore, effective January 1, 2024, a harvest moratorium is required until the population improves to a level capable of supporting sustainable harvest. This revision and all other management strategies contained in Amendment 2 will remain in effect until further changes are implemented through the adaptive management framework of the North Carolina Estuarine Striped Bass FMP Amendment 2 and its Revisions. Adaptive management in Amendment 2 provides the management framework to reopen the fishery when a stock assessment indicates a TAL that allows for harvest between the three sectors (NCDMF 2024).

Central Southern Management Area

Stock Status: CSMA Stocks

There is no stock status determination for the CSMA stocks in the Tar-Pamlico, Neuse, and Cape Fear rivers. No formal peer-reviewed stock assessments have been conducted for CSMA striped bass.

A demographic matrix model was developed to evaluate different stocking and management scenarios for striped bass in all three CSMA river systems. Results from the matrix model indicate striped bass populations in the CSMA are depressed to an extent that sustainability is unlikely at any level of fishing mortality, and it also provides evidence that natural recruitment is the primary limiting factor influencing Tar-Pamlico and Neuse River stocks and if stocking was stopped the populations would decline (Mathes et al. 2020). The demographic matrix model does not provide population abundance or mortality estimates. A tagging model was developed to estimate striped bass abundance in the Cape Fear River. Tagging model results showed a consistent decline in abundance estimates for striped bass (2012–2018), and that abundance in 2018 was reduced to less than 20% of the abundance in 2012, even with a total no-possession provision for striped bass in place in the Cape Fear River since 2008.

Stock Assessment: CSMA Stocks

A stock assessment is not available for these stocks.

Current Regulations: CSMA

Commercial and recreational harvest in the CSMA is prohibited. Amendment 2 to the Estuarine Striped Bass FMP adopted by the MFC in November 2022 maintained the no-possession and gill net measures in Supplement A to Amendment 1. The WRC hook-and-line closure proclamation had the effect of suspending rules 15A NCAC 10C .0107 (l) and 10C .0314 (g), and the measures maintained in Amendment 2 included:

- Commercial and recreational no possession measure for striped bass (including hybrids) in coastal and inland fishing waters of the CSMA (FF-6-2019). A no-possession requirement already exists for the Cape Fear River by rule.
- Additionally, consistent with Amendment 1, commercial set gill-net restrictions requiring tie-downs and distance from shore (DFS) measures will apply year-round (M-5-2019). Proclamation M-6-2019 maintained the year-round tie-down and distance from shore restrictions for large mesh gill nets and prohibited the use of all gill nets upstream of the ferry lines from the Bayview Ferry to Aurora Ferry

on the Tar-Pamlico River and the Minnesott Beach Ferry to Cherry Branch Ferry on the Neuse River to further reduce bycatch of striped bass.

Commercial Fishery: CSMA

Due to the no possession measure approved in Supplement A and maintained in Amendment 2, the commercial striped bass fishery has been closed since 2019. From 1994–2018 commercial landings in the CSMA were constrained by an annual TAL of 25,000 pounds. Landings closely follow the annual TAL, except for 2008 when less than half of the TAL was landed. From 2004 through 2018 striped bass commercial landings in the CSMA averaged 24,179 pounds and ranged from a low of 10,115 pounds in 2008 to a high of 32,479 pounds in 2004 (Table 9; Figure 15A). Most commercial landings come from the Tar-Pamlico and Pungo rivers and the Neuse and Bay rivers, with the remainder coming from Pamlico Sound. From 2004 to 2018, there was only a spring harvest season, opening March 1 each year and closing when the TAL was reached.

Table 9. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of CSMA striped bass from North Carolina, 1994–2024.

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1994	-	-	-	19,858	19,858
1995	-	-	-	14,325	14,325
1996	-	-	-	33,250	33,250
1997	-	-	-	28,520	28,520
1998	-	-	-	25,973	25,973
1999	-	-	-	33,959	33,959
2000	-	-	-	31,048	31,048
2001	-	-	-	24,705	24,705
2002	-	-	-	37,585	37,585
2003	-	-	-	41,384	41,384
2004	6,141	13,557	22,958	32,479	55,437
2005	3,832	16,854	14,965	27,132	42,097
2006	2,481	14,895	7,352	21,149	28,501
2007	3,597	23,527	10,794	25,008	35,802
2008	843	17,966	2,990	10,115	13,105
2009	895	6,965	3,061	24,847	27,908
2010	1,757	7,990	5,537	23,888	29,425
2011	2,728	24,188	9,474	28,054	37,528
2012	3,922	43,313	15,240	22,725	37,964
2013	5,467	32,816	19,537	28,597	48,134
2014	3,301	30,209	13,368	25,245	38,613
2015	3,934	31,353	14,269	27,336	41,605
2016	6,697	75,461	25,260	23,041	48,301
2017	7,334	131,129	26,973	23,018	49,991
2018	3,371	49,122	10,884	20,057	30,941
2019	959	36,080	3,562	0	3,562
2020	0	19,420	0	0	0
2021	0	23,199	0	0	0
2022	0	30,026	0	0	0
2023	0	13,536	0	0	0
2024	0	9,794	0	0	0
Mean	2,727	31,019	9,820	21,074	27,726

Recreational Fishery: CSMA

The DMF started collecting recreational striped bass data in the major rivers of the CSMA in 2004. In 2013, due to comparatively low recreational striped bass catch in the Cape Fear River, creel survey methodology was adjusted for American and hickory shad to become the target species. Due to the recreational no possession measure in Supplement A, there was minimal recreational harvest in February 2019 (959 pounds) until the recreational season closed in March 2019, with the no recreational possession measure continuing through 2023. Recreational landings fluctuated during 2004–2018, ranging from lows in 2008 and 2009 to a high of 26,973 pounds in 2017 (Table 9; Figure 15B).

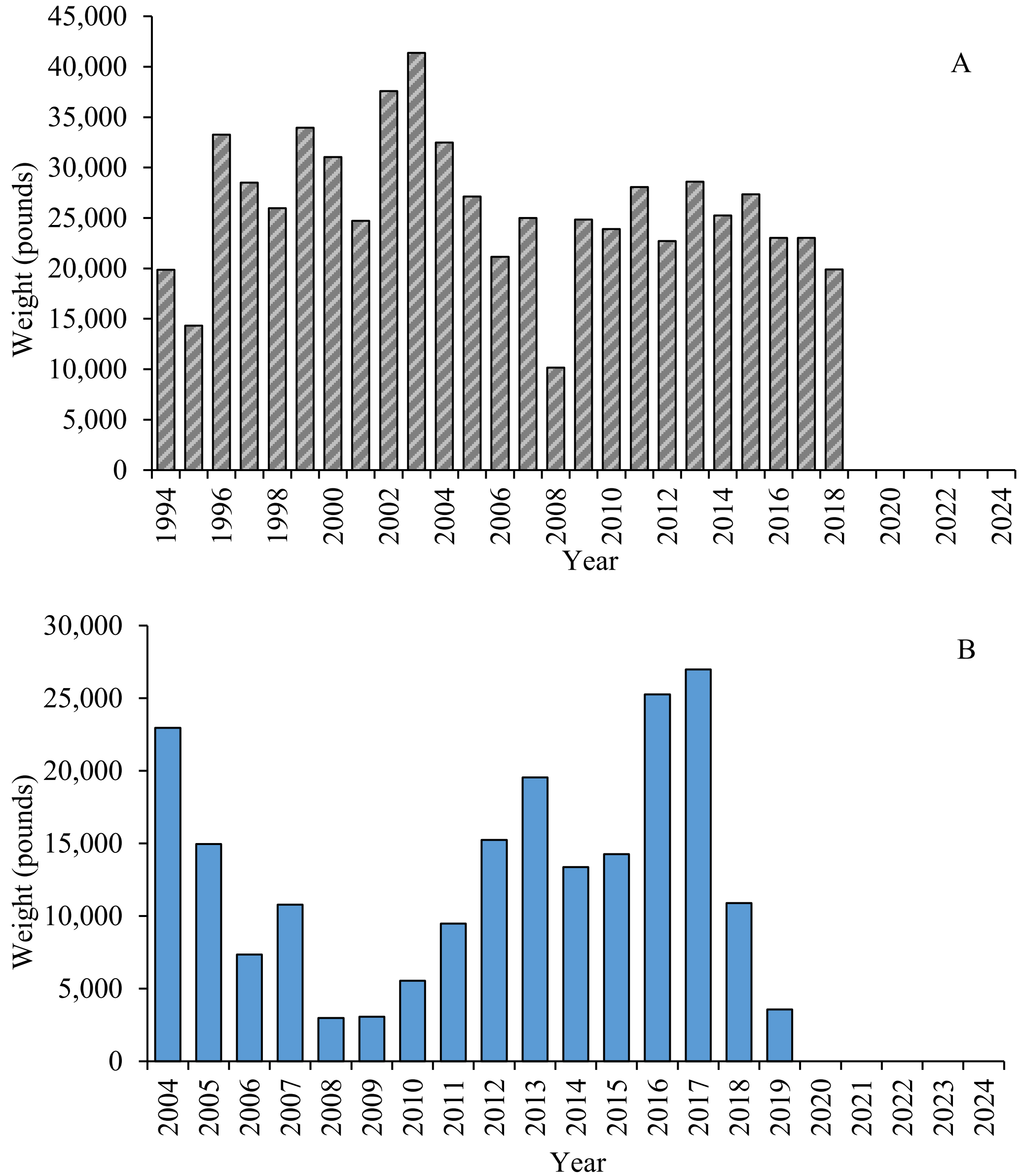


Figure 15. Annual commercial landings (pounds) reported through the North Carolina Trip Ticket Program, 1994–2024 (A), and recreational landings (pounds) estimated from the CSMA Recreational Creel Survey, 2004–2024 (B). There was no commercial season and a limited recreational season in 2019, lasting from January 1 to March 19, 2019. Commercial and recreational seasons remained closed in 2024.

Since 2011, harvest in the Tar-Pamlico and Neuse rivers has fluctuated little, ranging from 4,000 pounds to 9,000 pounds, however in 2016 and 2017 there was a sharp increase in recreational harvest (25,260 and 26,973 pounds, respectively). In 2018, recreational harvest dropped sharply by more than half of the 2016 and 2017 values (Table 9). Harvest on the Pungo River remained consistent at a relatively low level compared to fluctuations in the Tar-Pamlico and Neuse rivers. In 2016 and 2017 the number of trips and hours spent targeting striped bass in the CSMA increased although there was a moderate decline observed in 2018 (Table 10).

Table 10 Recreational striped bass effort (trips and hours), harvest, and discards from the CSMA (2004–2024). In the CSMA, there was a limited recreational harvest season in 2019 prior to closing (January 1–March 19, 2019). The recreational season remained closed in 2024.

					Striped Bass Discards				
Year	Angler Trips	Angler Hours	Number Harvested	Pounds Harvested	Number Over-Creel	Number Under-Sized	Number Legal-Sized	Number Slot-Sized	Total Discards
2004	12,782	63,791	6,141	22,958	85	11,729	1,743	0	19,698
2005	16,414	69,370	3,832	14,965	152	15,609	1,016	77	20,671
2006	10,611	42,066	2,481	7,352	33	12,548	2,314	0	17,376
2007	10,971	46,655	3,597	10,794	147	21,673	1,707	0	27,124
2008	6,621	28,413	843	2,990	2,838	11,721	3,316	91	18,809
2009	5,642	26,611	895	3,061	7	4,471	1,769	718	7,860
2010	6,559	25,354	1,757	5,537	29	5,200	2,401	360	9,747
2011	12,606	51,540	2,728	9,474	9	16,659	5,397	2,123	26,916
2012	18,338	71,964	3,922	15,240	439	26,343	13,621	2,910	47,236
2013	20,394	86,918	5,467	19,537	539	19,302	10,619	2,357	38,283
2014	15,682	70,316	3,301	13,368	1,449	19,185	7,934	1,641	33,510
2015	18,159	79,398	3,934	14,269	217	22,272	8,052	813	35,287
2016	23,675	110,453	6,697	25,260	215	57,874	10,593	6,779	82,157
2017	26,125	119,680	7,334	26,973	549	101,787	26,501	2,293	138,464
2018	16,393	69,917	3,371	10,884	871	34,128	12,232	1,890	52,493
2019*	8,820	40,580	959	3,562	924	24,857	7,817	2,481	37,039
2020**	2,846	13,272	0	0	0	10,440	7,575	1,406	19,420
2021**	4,772	18,241	0	0	0	9,124	12,322	1,769	23,216
2022**	5,200	17,885	0	0	0	10,639	14,685	4,701	30,026
2023**	3,118	11,276	0	0	0	5,268	6,439	1,829	13,536
2024**	1,697	8,110	0	0	0	944	4,796	4,055	9,794
Total	247,425	1,071,811	57,259	206,224	8,503	441,773	162,849	38,293	708,661

* limited harvest season (Jan 1–March 19, 2020)
** closed harvest season

Although the recreational striped bass season in the CSMA has remained closed since March 2019, data collection characterizing fishing effort and release dispositions have continued. Within the CSMA there is a significant catch-and-release fishery and releases during the past ten years (2015–2024) have averaged 44,143 fish annually (Table 10; Figure 16). In 2024, the number of striped bass caught and released as discards was 9,794 fish which was a decrease from 13,356 fish in 2023, and well below the ten-year average.

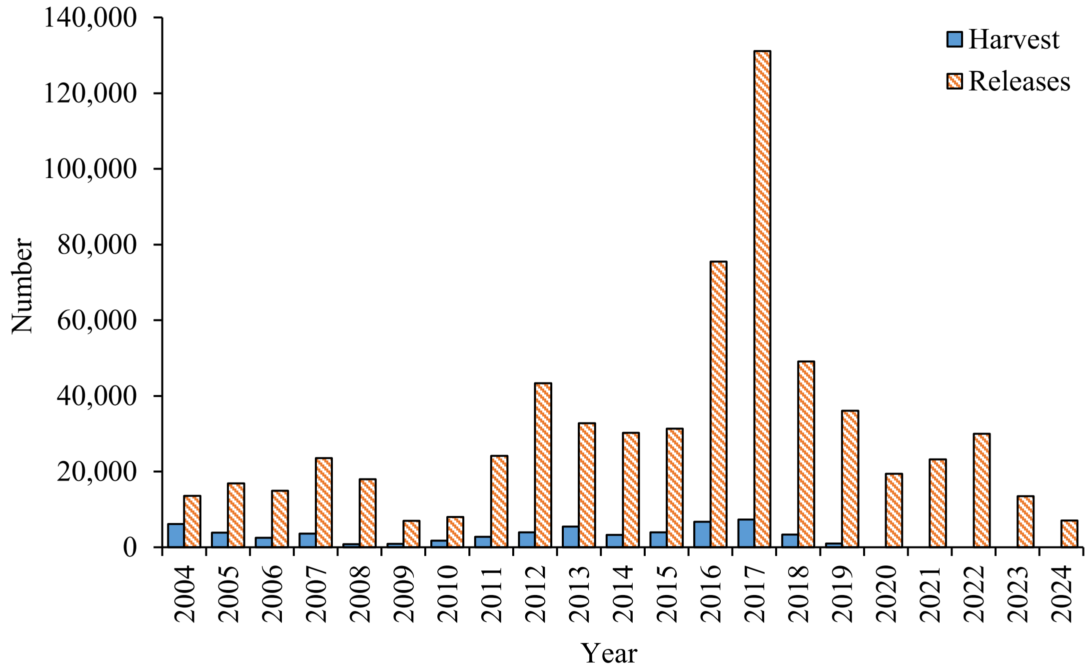


Figure 16. Annual recreational catch (harvested and/or released) of striped bass in the CSMA, 2004–2024. There was a limited recreational harvest season in 2019 prior to the closure, lasting from Jan 1 to Mar 19, 2019. The harvest season remained closed in 2024.

Undersized discards peaked in 2017 mainly due to the large number of undersized striped bass available in the Tar-Pamlico River system and have continued a declining trend since then. In 2024, undersized discards decreased by over 82% (n=944) compared to the 2023 value and remained below the ten-year average of 27,733 fish. Legal-sized striped bass discards decreased from 6,439 in 2023 to 4,796 striped bass in 2024 after a high of 26,501 fish in 2017. Striped bass released within the slot limit have fluctuated since 2004 and have ranged from lows in 2004, 2006, and 2007 of zero fish to a high of 6,779 fish in 2016 (Table 10). In 2024, there were approximately 4,055 discarded striped bass that were within the slot limit.

Recreational length frequencies of CSMA striped bass harvested in the Tar-Pamlico/Pungo and Neuse rivers (2004–2019) are presented in Figure 17. In 2018, the last full year open to harvest, the modal length of striped bass in the recreational harvest from the Tar-Pamlico/Pungo rivers was 18 inches with few fish over 22 inches harvested, and the modal length from the Neuse River was 19 inches with few fish over 20 inches harvested (Figure 18). Commercial length frequencies of CSMA striped bass harvested in the Tar-Pamlico/Pungo and Neuse rivers (2004–2018) are presented in Figure 18. In 2018, the last full year open to harvest, the modal length of striped bass in the commercial harvest from the Tar-Pamlico/Pungo rivers was 20 inches with few fish over 25 inches harvested, and the modal length from the Neuse River was 23 inches with few fish over 27 inches harvested (Figure 18).

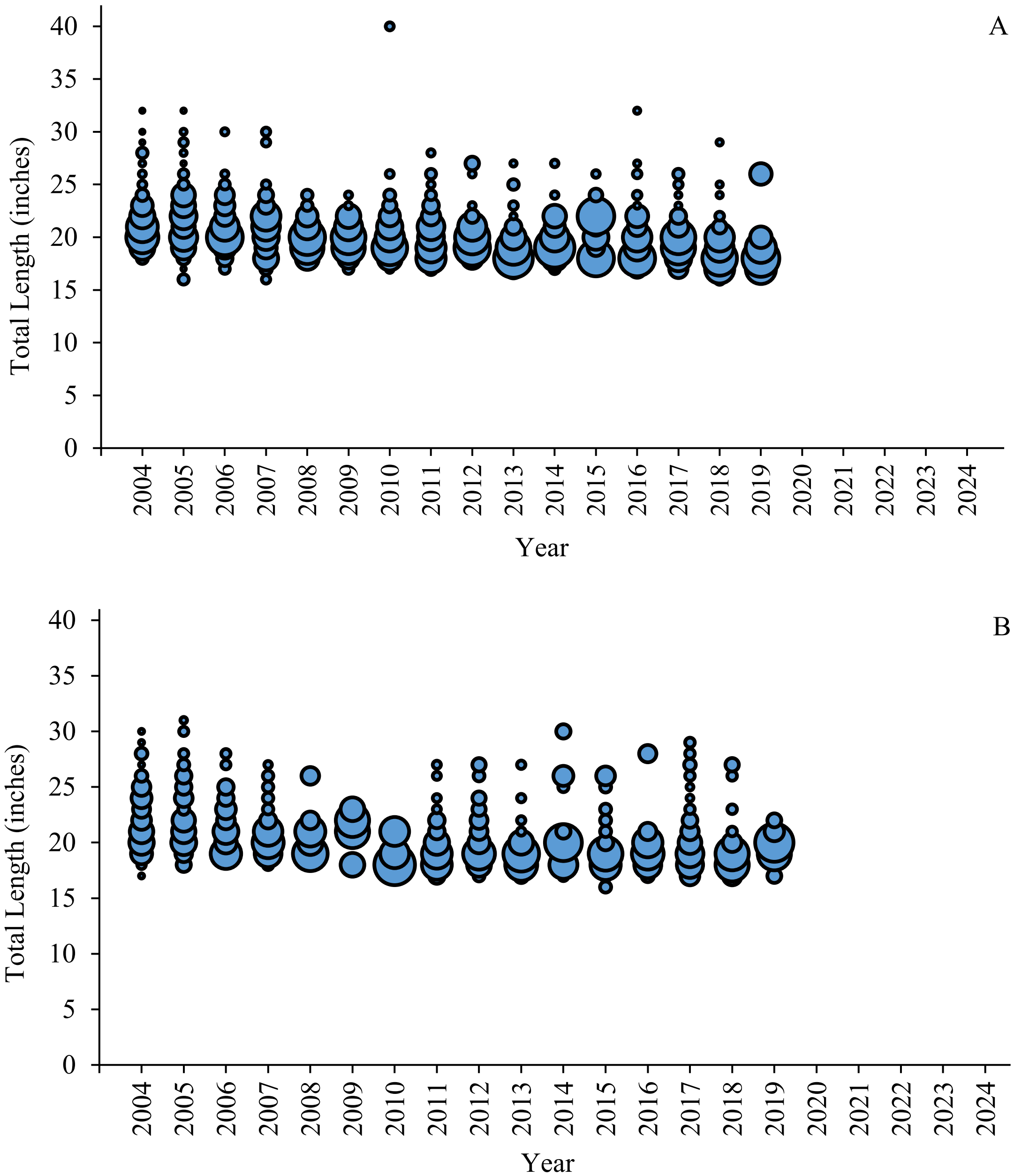
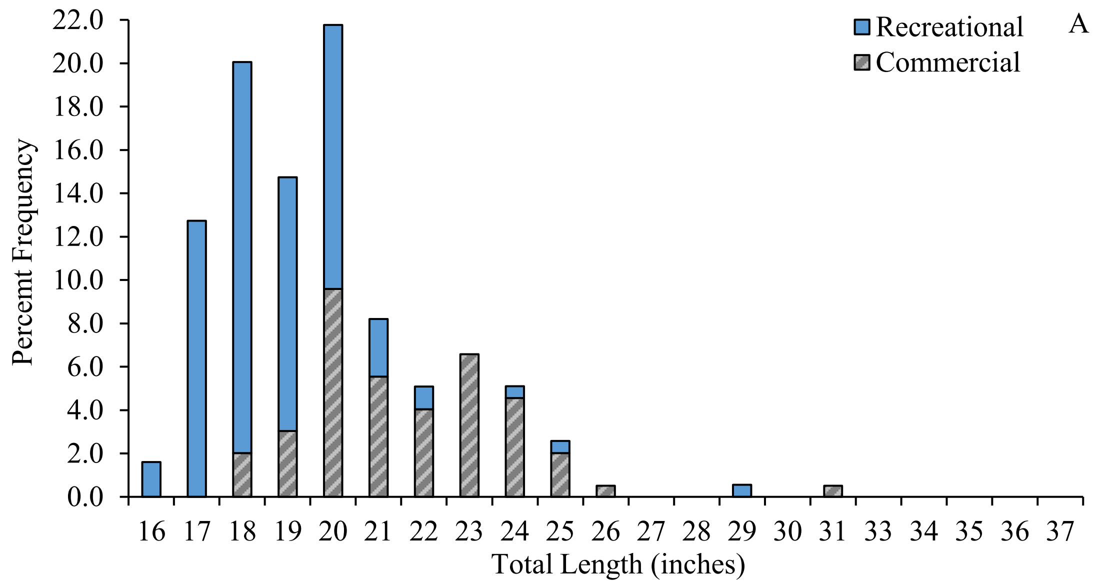


Figure 17. Recreational length frequency of CSMA striped bass harvested in the Tar-Pamlico/Pungo rivers (A), and the Neuse River (B), 2004–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length. There was a limited recreational season in 2019 prior to the closure, lasting from Jan 1 to Mar 19, 2019. The recreational season remained closed in 2024.



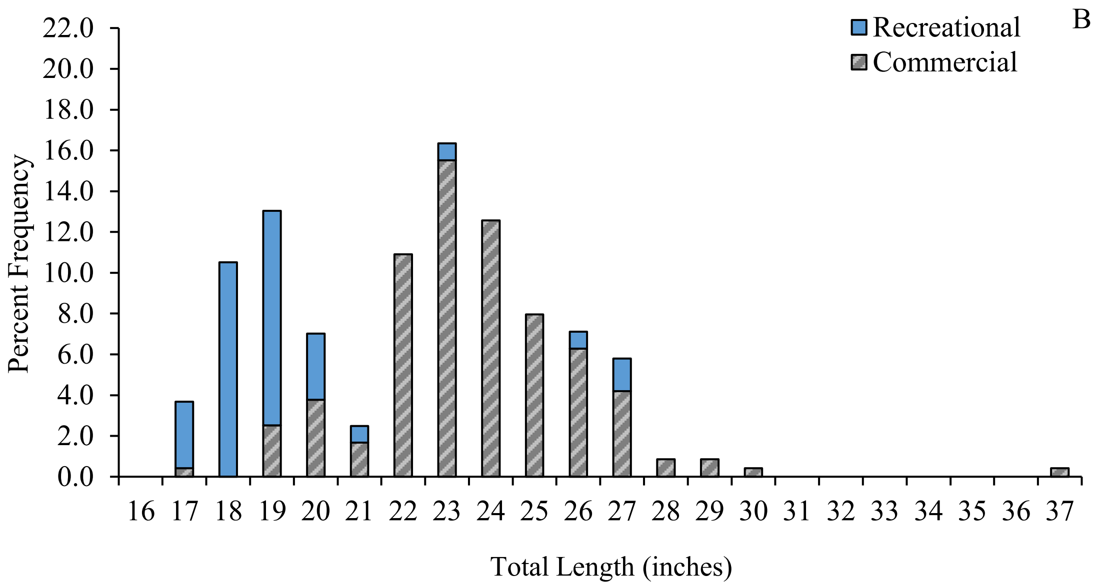


Figure 18. Commercial and recreational length frequency distributions from CSMA striped bass harvested in 2018 from the Tar-Pamlico/Pungo rivers (A) and the Neuse/Bay rivers (B).

MONITORING PROGRAM DATA: CSMA STOCKS

Fishery-Dependent Monitoring: CSMA

Monitoring of the commercial fishery in the CSMA follows the same methodology as in the ASMA. There has been a commercial and recreational harvest moratorium in the Cape Fear River since 2008 and in the Tar-Pamlico/Pungo and Neuse rivers since March 2019. From 2004 to 2018, length data from the commercial harvest shows that on average striped bass harvested in the Neuse and Bay rivers are slightly larger than fish harvested in the Pamlico and Pungo rivers (Table 11). Additionally, maximum lengths are generally larger in the Neuse and Bay rivers compared to the Tar-Pamlico and Pungo rivers.

In 2018, the modal length of CSMA striped bass in the commercial harvest from the Tar-Pamlico/Pungo rivers was 20 inches with few fish over 25 inches harvested and, in the Neuse/Bay rivers striped bass modal length was 23 inches with few fish over 27 inches harvested (Figure 18). CSMA commercial length frequencies are represented in Figure 19 and show that striped bass are routinely harvested up to 30 inches total length, and that few fish under the 18-inch total length minimum size limit are harvested.

Table 11. Mean, minimum, and maximum length of striped bass (total length – inches) and number (N) collected from the commercial harvest, 2000–2024.

	Tar-Pamlico/Pungo rivers				Neuse/Bay rivers			
	Length (inches)				Length (inches)			
Year	Mean	Min	Max	N	Mean	Min	Max	N
2000	23	20	35	126	25	22	31	5
2001	23	21	26	116	25	23	31	12
2002	24	19	39	96	25	19	29	31
2003	23	18	37	173	24	19	37	19
2004	24	20	42	131	25	19	37	74
2005	23	20	37	127	24	20	36	70
2006	22	18	37	119	24	19	36	144
2007	22	19	33	112	22	19	27	63
2008	22	18	43	84	23	19	44	39
2009	22	19	31	99	22	18	31	85
2010	22	19	26	194	23	19	32	263
2011	23	18	27	284	23	19	42	195
2012	24	15	30	254	24	19	29	96
2013	25	18	40	225	25	18	39	301
2014	22	18	39	52	24	20	38	56
2015	24	19	40	97	24	19	44	97
2016	24	17	29	257	23	19	28	78
2017	24	19	31	151	24	19	50	97
2018	23	19	32	76	24	18	38	163
2019	-	-	-	-	-	-	-	-
2020	-	-	-	-	-	-	-	-
2021	-	-	-	-	-	-	-	-
2022	-	-	-	-	-	-	-	-
2023	-	-	-	-	-	-	-	-
2024	-	-	-	-	-	-	-	-

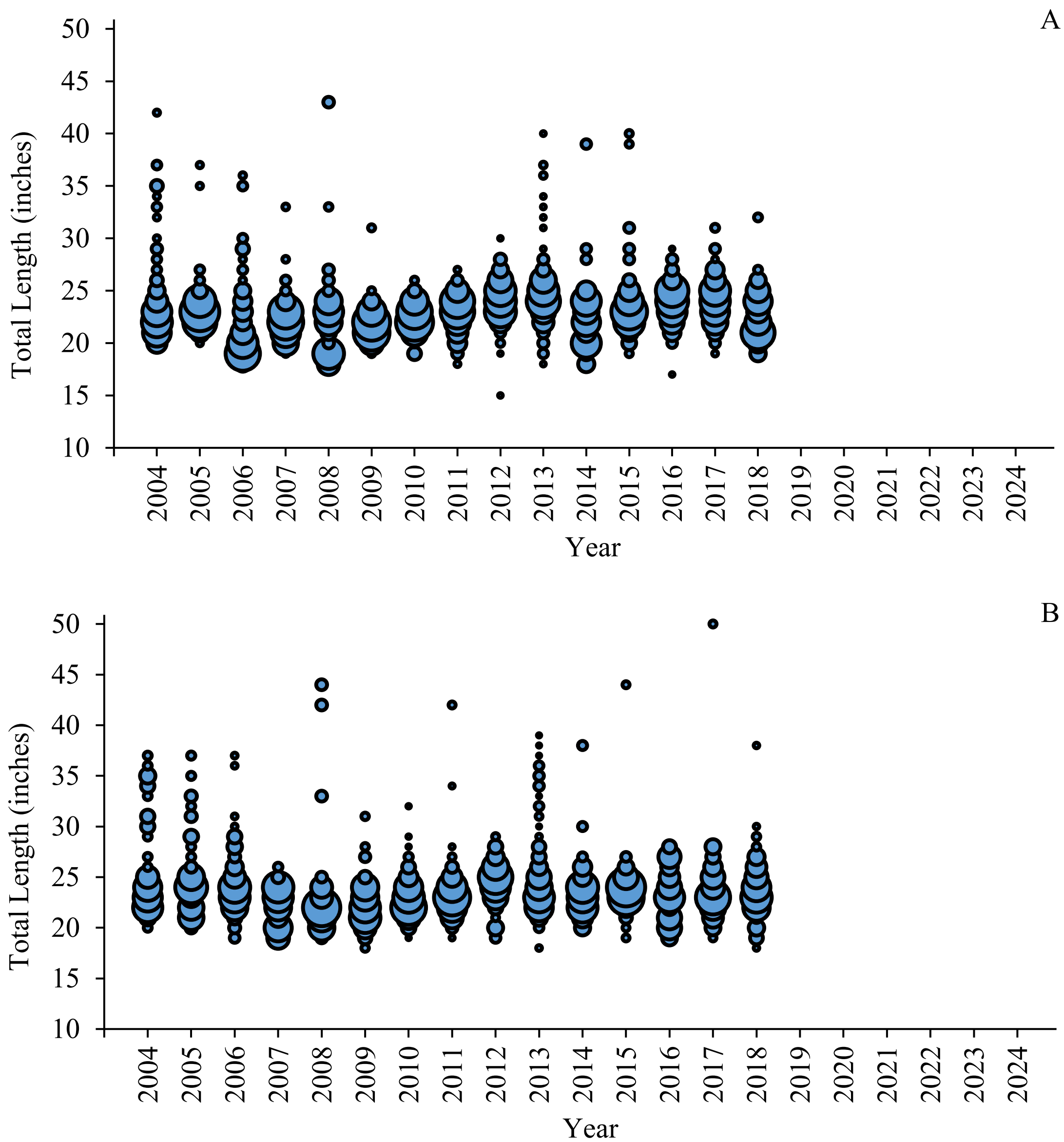


Figure 19. Commercial length frequency of CSMA striped bass landed in the Tar-Pamlico/Pungo rivers (A), and the Neuse/Bay rivers (B) from 2004–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length. The commercial season remained closed in 2024.

From 2004 to 2018, the CSMA recreational creel survey sampled on average 160 striped bass per year. In 2018, the creel survey measured 155 striped bass that averaged 19 inches and ranged in length from 16 to 29 inches, however, only 27 striped bass were measured in 2019 that averaged 20 inches and ranged in length from 16 to 26 inches due to the season closure in March 2019 (Table 12).

Table 12. Mean, minimum and maximum length of striped bass (total length; inches) and number collected from the recreational harvest, 2004–2024 (includes striped bass and hybrid striped bass). There was a limited recreational season in 2019 (Jan 1–March 19) and the season remained closed in 2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2004	22	17	32	430
2005	22	18	32	318
2006	22	18	30	132
2007	22	17	30	129
2008	21	18	26	50
2009	21	17	24	95
2010	21	18	26	74
2011	21	18	28	140
2012	21	18	28	153
2013	20	17	28	169
2014	21	18	30	115
2015	21	16	27	106
2016	20	18	33	144
2017	20	17	30	202
2018	19	16	29	155
2019	20	17	26	27
2020	-	-	-	-
2021	-	-	-	-
2022	-	-	-	-
2023	-	-	-	-
2024	-	-	-	-

Fishery-Independent Monitoring: CSMA

The Fishery Independent Gill Net Survey (Program 915) was initiated by the DMF in May of 2001 in Pamlico Sound. The survey was expanded to the Tar-Pamlico, Pungo, and Neuse rivers in 2003, expanded to the Cape Fear and New rivers in 2008, and expanded into Core Sound, Bogue Sound, and the White Oak River in May 2018. Pamlico Sound and Pungo River data is excluded from striped bass abundance calculations due to mixed stock concerns (Mathes et al. 2020). Overall, the percent frequency of occurrence is lower and PSE values are typically higher in the deep stratum; thus, only the shallow stratum was used in the relative abundance calculations for striped bass. The months of April and October–November are used in index calculation because striped bass are most available to the survey during these months. In the Cape Fear River, although striped bass catch rates are low, data were used to calculate relative abundance. New River data were not used to calculate relative abundance because striped bass are seldom captured. P915 sampling in 2020 was suspended due to COVID-19 restrictions and protected species interactions and was not resumed until July 2021.

Over the past twenty years (2004–2024), striped bass relative abundance has been higher in the Tar-Pamlico and Neuse rivers when compared to the Cape Fear River and New rivers (Table 13). Since 2004, striped bass relative abundance in the Tar-Pamlico and Neuse rivers ranged from 0.83 to 9 fish per sample, whereas relative abundance in the Cape Fear River ranged from 0 to 0.35 fish per sample (Table 13). In 2024, striped bass relative abundance in the Tar-Pamlico River (1.28 fish per set) was well below the time series average of 3.8 striped bass per set (Table 13; Figure 20). In the Neuse River, striped bass relative abundance was 0.79 fish per set, the second lowest value in the time series and well below the time series average of 3.4 striped bass per set (Table 13; Figure 21). In 2024, relative abundance in the Cape Fear River (0.01 fish per set) was below the time series average of 0.10 striped bass per set (Table 13; Figure 22).

Table 13. Relative abundance (Index) of striped bass (number of individuals per sample), total number of striped bass collected, and the number of gill net samples (N) in the Tar-Pamlico and Neuse rivers (April, and October–November, shallow water sets (2004–2024), and in the Cape Fear River (February–December, all sets; 2008–2024) The Percent Standard Error (PSE) represents a measure of precision. No sampling occurred in 2020 and limited sampling occurred in 2021 (July–December).

	Tar-Pamlico River				Neuse River				Cape Fear			
Year	Index	Striped Bass	N	PSE	Index	Striped Bass	N	PSE	Index	Striped Bass	N	PSE
2004	3.94	71	18	24	2.83	68	24	44	-	-	-	-
2005	4.61	83	18	17	3.75	90	24	42	-	-	-	-
2006	4.06	73	18	41	2.33	56	24	25	-	-	-	-
2007	3.56	64	18	49	2.83	68	24	28	-	-	-	-
2008	4.61	83	18	37	3.21	77	24	44	0.1	3	30	100
2009	2.78	50	18	36	2.13	51	24	41	0.07	3	43	71
2010	5.67	102	18	26	6.25	150	24	39	0.03	1	40	100
2011	7.72	139	18	32	4.75	114	24	30	0.08	3	40	75
2012	3.28	59	18	39	2.25	54	24	36	0.08	3	40	75
2013	3.22	58	18	36	2.54	61	24	31	0.05	2	40	60
2014	4.56	82	18	20	6.75	162	24	28	0	0	40	-
2015	2.67	48	18	33	5.33	128	24	27	0.35	14	40	37
2016	2.44	44	18	27	2.04	49	24	24	0.3	12	40	43
2017	2.44	44	18	29	3.21	77	24	24	0.23	9	40	43
2018	9.00	162	18	29	3.75	90	24	31	0.08	3	37	75
2019	5.06	91	18	33	4.21	101	24	32	0.01	1	80	100
2020	-	-	-	-	-	-	-	-	-	-	-	-
2021	0.92	11	12	43	4.25	68	16	38	0.07	3	44	71
2022	0.83	15	18	73	1.17	28	24	82	0.05	4	80	40
2023	0.44	8	18	45	0.21	5	24	64	0.01	1	79	100
2024	1.28	23	18	52	0.79	19	24	39	0.01	1	80	100

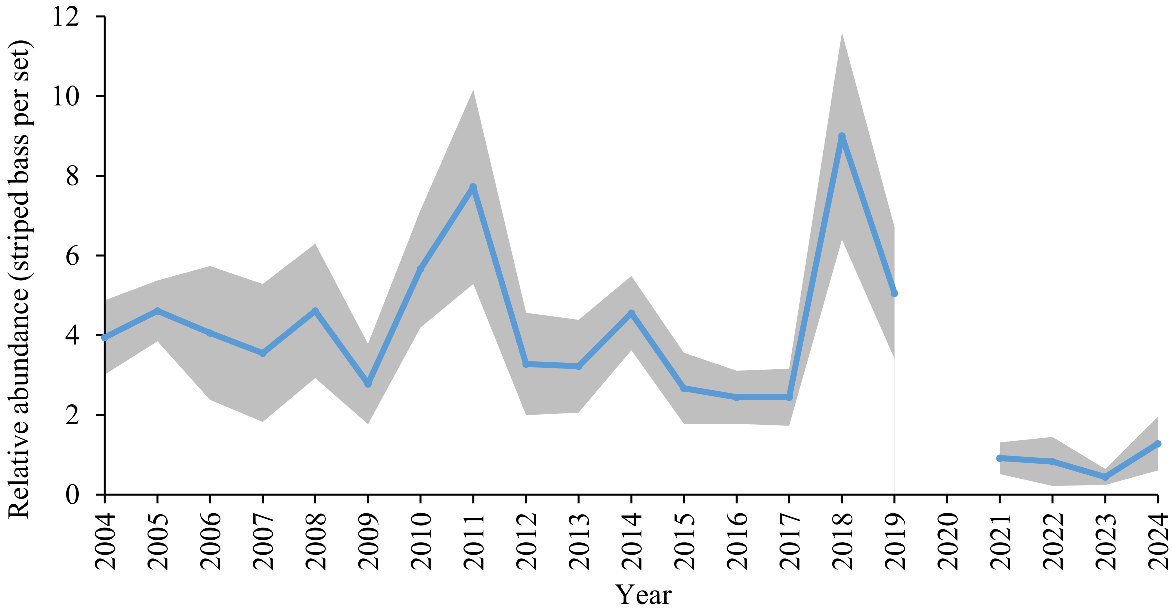


Figure 20. Annual index of adult striped bass relative abundance from the Fisheries Independent Gill Net Survey (P915) in the Tar-Pamlico River during April, and October–November, in shallow water sets, 2004–2024. No sampling occurred in 2020, and limited sampling occurred in 2021 (July–December). Shaded error bars represent ± 1 standard error.

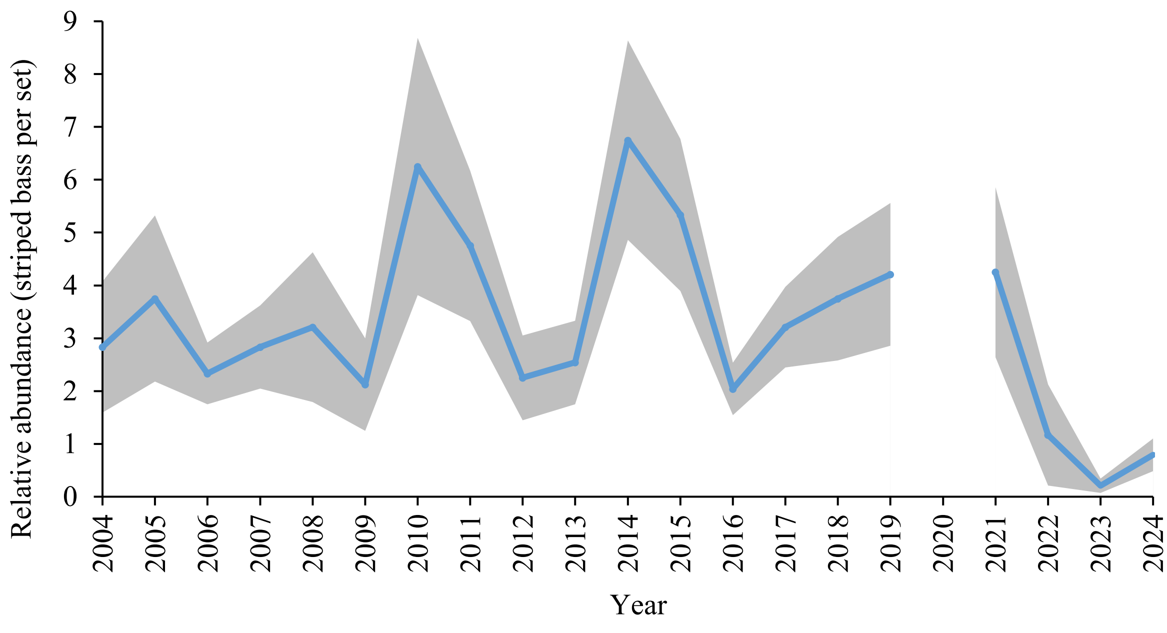


Figure 21. Annual index of adult striped bass relative abundance in the Fisheries Independent Gill Net Survey (P915) in the Neuse River during April, and October–November, in shallow water sets, 2004–2024. No sampling occurred in 2020, and limited sampling occurred in 2021 (July–December). Shaded error bars represent ± 1 standard error.

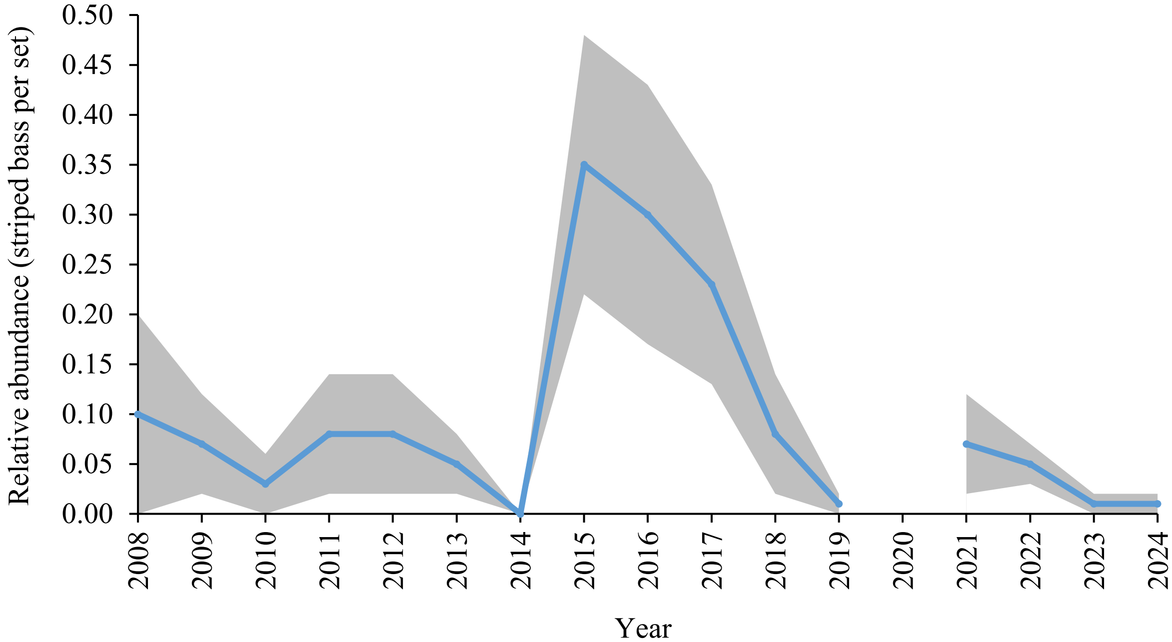


Figure 22. Annual index of adult striped bass relative abundance in the Fisheries Independent Gill Net Survey (P915) in the Cape Fear and New rivers, 2008–2024. No sampling occurred in 2020 and limited sampling occurred in 2021 (July–December). Shaded error bars represent ± 1 standard error.

Length frequencies from P915 are represented in Figure 23. Length frequency distributions are variable between years but generally range 10–25 inches TL, however in 2016–2017 in the Tar-Pamlico/Pungo River and 2015–2017 in the Neuse River there was a higher percentage of small fish that could represent two year classes of striped bass thought to be the result of successful natural reproduction in 2014 and 2015. In 2023, catch was composed of high percentages of fish greater than 20 inches which could be tracking continued growth and perpetuation of the 2014 and 2015 year classes (Figure 23). During 2021–2023 there were few smaller fish, less than 15 inches, in the gill net survey catch. In 2024, there was an even distribution of striped bass lengths in the Tar-Pamlico River ranging from 12–29 inches TL, while lengths in the Neuse River were centered around 20 inches TL. The decrease in the proportion of larger fish may be reflective of A-R fish from the 2014 and 2015 year classes leaving the rivers and entering the Atlantic Ocean migratory stock. Due to the low numbers of striped bass captured (N=17 during April, and October–November from shallow water sets), the length-frequency distribution may not be reflective of the populations size distribution. Length frequency distributions are not provided for the Cape Fear and New rivers due to low numbers of striped bass captured in the fishery independent gill net survey. Samples collected from P915 on the Tar-Pamlico and Neuse rivers show most striped bass were captured in the upper and middle portions of the rivers.

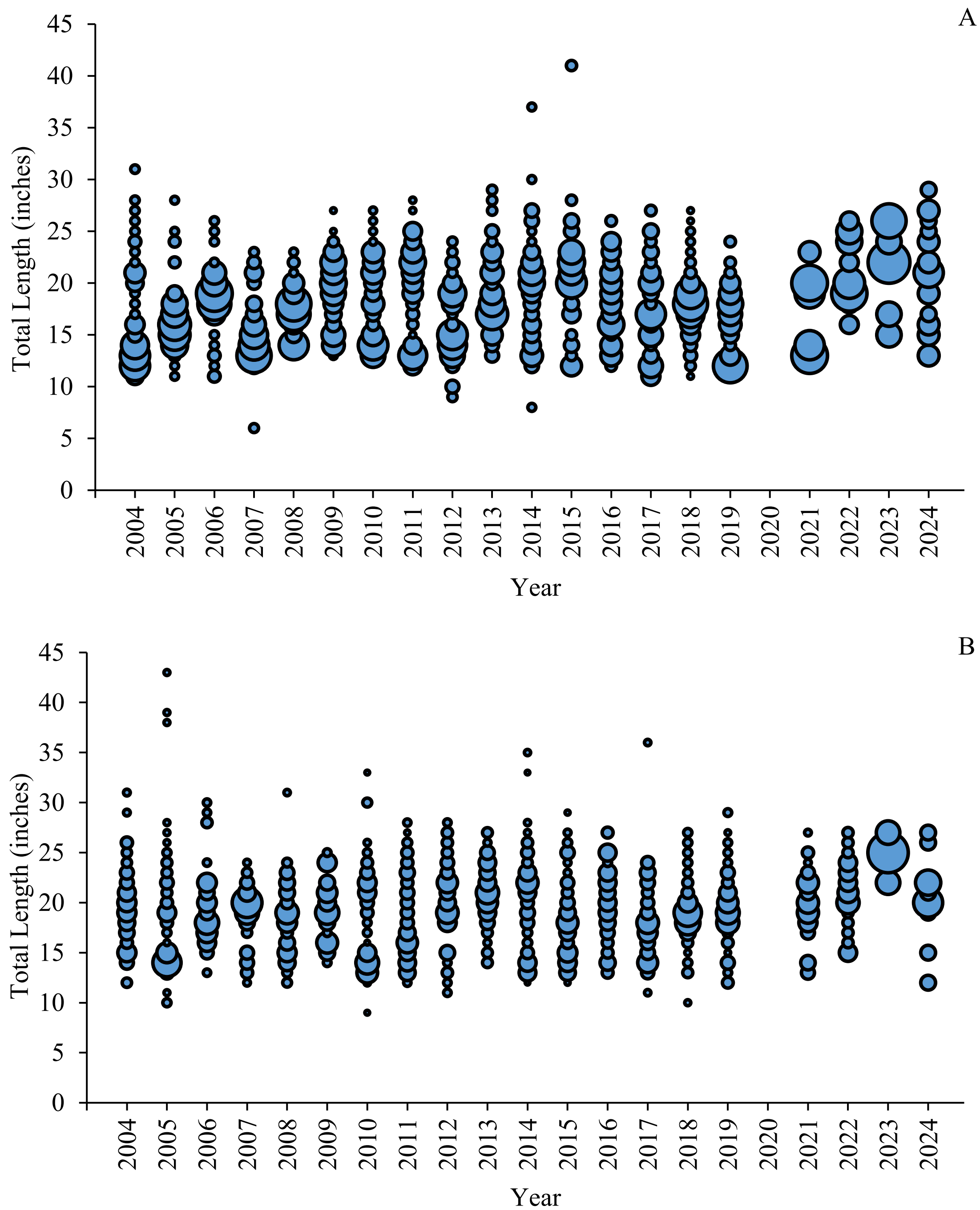


Figure 23. Length frequency of striped bass captured in the Fisheries Independent Gill Net Survey (P915) in the Tar-Pamlico River (A), and the Neuse River (B) during April, and October–November, in shallow water sets (2004–2024). No sampling occurred in 2020, and limited sampling occurred in 2021 (July–December). Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

In 2017, the Juvenile Anadromous Survey (Program 100) was expanded to include the Tar-Pamlico, Neuse, Cape Fear, and Northeast Cape Fear rivers. The survey employs seines (June–July) and trawls (July–October) to monitor the status of the striped bass stocks in North Carolina and to assess the effectiveness of management measures aimed at promoting natural reproduction within the CSMA.

In 2021, two juvenile striped bass were captured on the Tar-Pamlico River, which PBT analysis indicated were not of hatchery origin (Table 14). In 2022, 25 juvenile striped bass were collected in the Tar-Pamlico and Neuse rivers. Subsequent PBT analysis of 24 juvenile striped bass captured in 2022 revealed all these fish were hatchery origin released as phase-I size (25–50 mm; 1–2 in) striped bass fingerlings. In 2023, 18 juvenile striped bass were captured in the Tar-Pamlico and Neuse rivers, and similar to 2022, all were hatchery origin released as phase-I size striped bass fingerlings. No juvenile striped bass were captured in the Tar-Pamlico or Neuse rivers in 2024 (Table 14).

No juvenile striped bass have been captured in the Cape Fear River since the start of the survey in 2017. In the Northeast Cape Fear River, 24 juvenile striped bass were captured in 2018, four in 2019, and one in 2020 (Table 15). Subsequent PBT analysis of five of the 24 juvenile striped bass captured in 2018 revealed these striped bass were not hatchery origin and therefore were most likely ‘wild’ fish. From 2021–2023 no juvenile striped bass were collected; however, in 2024, one ‘wild’ juvenile striped bass was captured in the Northeast Cape Fear River (Table 15).

Table 14. Relative abundance of striped bass (number of individuals per sample), total number of striped bass collected, and the number of beach seine and trawl samples (N) in the Tar-Pamlico and Neuse rivers, 2017–2024. Trawl sampling was discontinued in 2023.

Year	Tar-Pamlico River						Neuse River					
	Seine			Trawl			Seine			Trawl		
	Striped bass (N)	Samples (N)	Relative Abundance	Striped bass (N)	Samples (N)	Relative Abundance	Striped bass (N)	Samples (N)	Relative Abundance	Striped bass (N)	Samples (N)	Relative Abundance
2017	0	54	0.00	0	48	0.00	0	54	0.00	0	48	0.00
2018	0	30	0.00	0	36	0.00	0	30	0.00	0	36	0.00
2019	0	36	0.00	0	48	0.00	0	36	0.00	0	48	0.00
2020	0	48	0.00	0	48	0.00	0	48	0.00	0	48	0.00
2021*	2	48	0.04	0	48	0.00	0	48	0.00	0	48	0.00
2022†	21	48	0.44	0	36	0.00	4	48	0.08	0	36	0.00
2023†	14	71	0.20	-	-	-	4	70	0.06	-	-	-
2024†	0	63	0.00	-	-	-	0	64	0.006	-	-	-
Total	37	398	0.09	0	264	0.00	8	398	0.02	0	264	0.00

* PBT analysis: natural reproduction 'wild'
† PBT analysis: hatchery origin

Table 15. Relative abundance of striped bass (number of individuals per sample), total number of striped bass collected, and the number of beach seine and trawl samples (N) in the Cape Fear and Northeast Cape Fear rivers, 2017–2024.

Year	Cape Fear River						Northeast Cape Fear River					
	Seine			Trawl			Seine			Trawl		
	Striped bass (N)	Samples (N)	Relative Abundance	Striped bass (N)	Samples (N)	Relative Abundance	Striped bass (N)	Samples (N)	Relative Abundance	Striped bass (N)	Samples (N)	Relative Abundance
2017	0	25	0.00	0	32	0.00	0	29	0.00	0	32	0.00
2018*	0	58	0.00	0	10	0.00	0	34	0.00	24	27	0.89
2019	0	47	0.00	0	23	0.00	4	32	0.13	0	40	0.00
2020	0	11	0.00	0	24	0.00	1	8	0.13	0	40	0.00
2021	0	44	0.00	0	21	0.00	0	22	0.00	0	27	0.00
2022	0	34	0.00	0	19	0.00	0	19	0.00	0	31	0.00
2023	0	23	0.00	0	21	0.00	0	20	0.00	0	28	0.00
2024*	0	43	0.00	0	24	0.00	0	25	0.00	1	32	0.03
Total	0	285	0.00	0	174	0.00	5	189	0.03	24	257	0.10

* PBT analysis: natural reproduction 'wild' (n=5 of 24 striped bass analyzed; 2018)

Age data are presented in Table 16 and Figure 24; from 2004 to 2024, a total of 2,648 otolith samples were aged and from 2016 to 2024, 1,374 genetic samples were collected to provide striped bass ages and hatchery origin (Table 16). Figure 24 shows an increasing trend of size at length with a maximum age of 12 years old. Limited age data was collected in 2019 from the recreational creel survey (n=15) and no commercial samples have been collected since 2018. Otolith age data in 2024 had a modal age of four and a maximum age of ten. Genetic ages for 2024 are not currently available.

Table 16. CSMA striped bass otolith and genetic age data from fishery dependent (commercial and recreational creel survey) and independent (independent gill net survey) surveys, 2004–2024. Genetic ages (*) for 2024 are not currently available.

	Modal Age		Minimum Age		Maximum Age		Total Number Aged	
Year	Otolith	Genetic	Otolith	Genetic	Otolith	Genetic	Otolith	Genetic
2004	3	-	1	-	11	-	50	-
2005	2	-	1	-	9	-	78	-
2006	3	-	1	-	9	-	111	-
2007	3	-	1	-	9	-	86	-
2008	3	-	1	-	8	-	103	-
2009	4	-	1	-	6	-	37	-
2010	5	-	1	-	9	-	154	-
2011	3	-	1	-	6	-	56	-
2012	3	-	1	-	7	-	205	-
2013	3	-	1	-	8	-	156	-
2014	3	-	1	-	11	-	172	-
2015	3	-	1	-	9	-	113	-
2016	2	3	1	2	8	6	38	323
2017	2	4	1	1	9	7	98	247
2018	3	4	1	1	12	8	109	201
2019	4	3	1	1	11	9	307	183
2020	5	4	1	1	9	9	147	99
2021	3	3	1	1	10	10	352	109
2022	3	4	1	0	11	11	114	128
2023	3	3	1	0	9	8	95	84
2024	4	-	1	-	11	-	67	45*

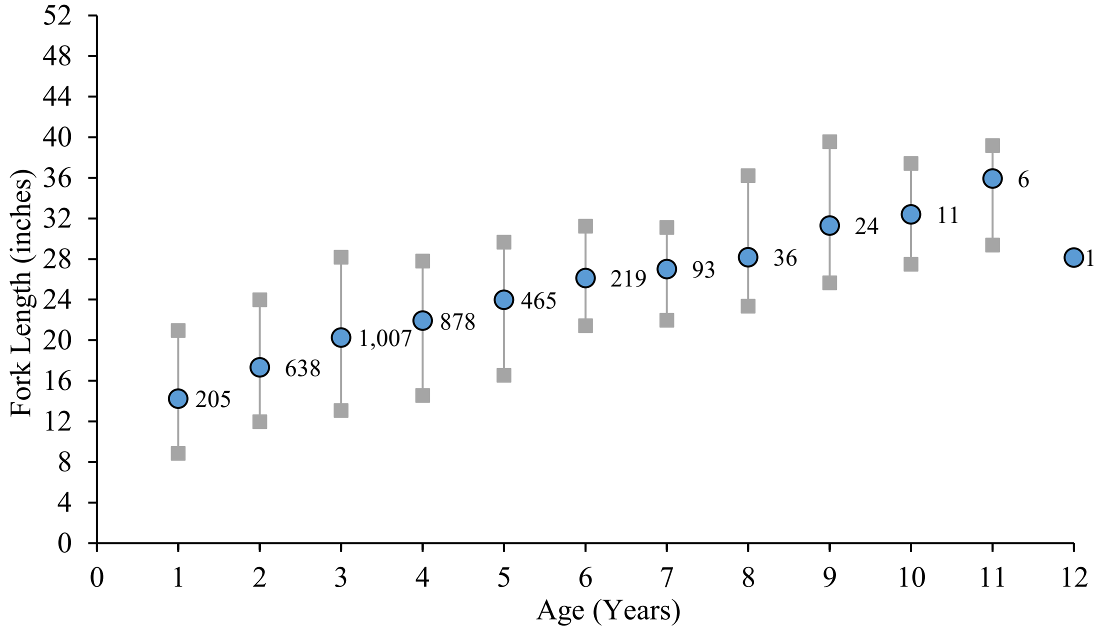


Figure 24. CSMA striped bass length at age based on otolith and genetic age samples collected, 2004–2024. Blue circles represent the mean size at a given age with the number of samples. The grey squares represent the minimum and maximum observed size for each age. Genetic ages from 2024 are not currently available.

Electrofishing surveys have been conducted by the WRC on CSMA spawning grounds since 1996 (Figure 25; Tar-Pamlico River), 1994 (Figure 26; Neuse River), and 2003 (Figure 27; Cape Fear River). The objectives of the WRC spawning ground surveys are to monitor and quantify population metrics of striped bass migrating to the spawning grounds during spring of each year. The survey uses a stratified random sampling design in the Tar-Pamlico and Neuse rivers, and a fixed station survey design in the Cape Fear River. Relative abundance is measured as the number of fish captured per hour of electrofishing. The WRC did not sample in 2020. Since 1996, striped bass abundance in the Tar-Pamlico River has ranged from a low of 18.2 striped bass per hour to a peak of 100.0 per hour in 2010 (Figure 25). In 2024, the relative abundance was 44.7 fish, which was above the time series average of 39.2 fish per hour. Since 1994, striped bass abundance in the Neuse River has been highly variable ranging from a low of 4.4 fish per hour to a high of 20.4 striped bass (Figure 26). In 2024, Neuse River striped bass relative abundance was 3.1 fish, which was below the time-series average of 11 fish per hour. Since 2003, striped bass relative abundance in the Cape Fear River has ranged from a low of 6.5 striped bass to a high of 25.4 fish per hour (Figure 27). In 2024, relative abundance was 7.3 fish per hour which was a decrease from the 2023 relative abundance value and was below the time series average of 12.3 fish per hour.

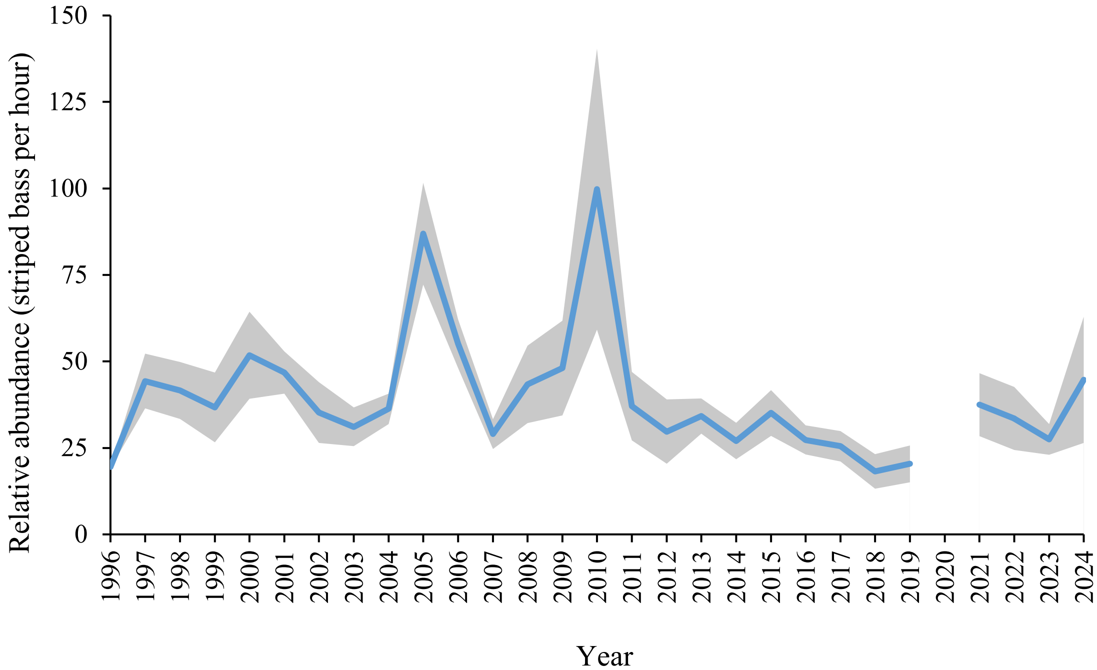


Figure 25. Relative abundance of Tar-Pamlico River striped bass from the WRC spawning grounds electrofishing survey, 1996–2024. No sampling occurred in 2020. Shaded error bars represent ± 1 standard error.

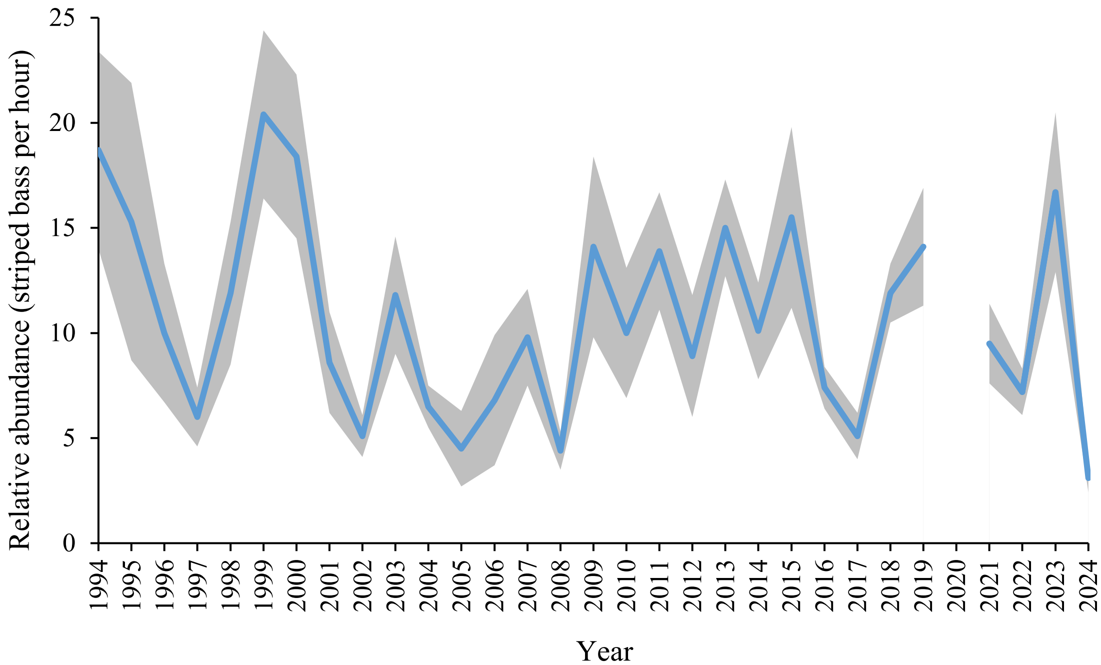


Figure 26. Relative abundance of Neuse River striped bass from the WRC spawning grounds electrofishing survey, 1994–2024. No sampling occurred in 2020. Shaded error bars represent ± 1 standard error.

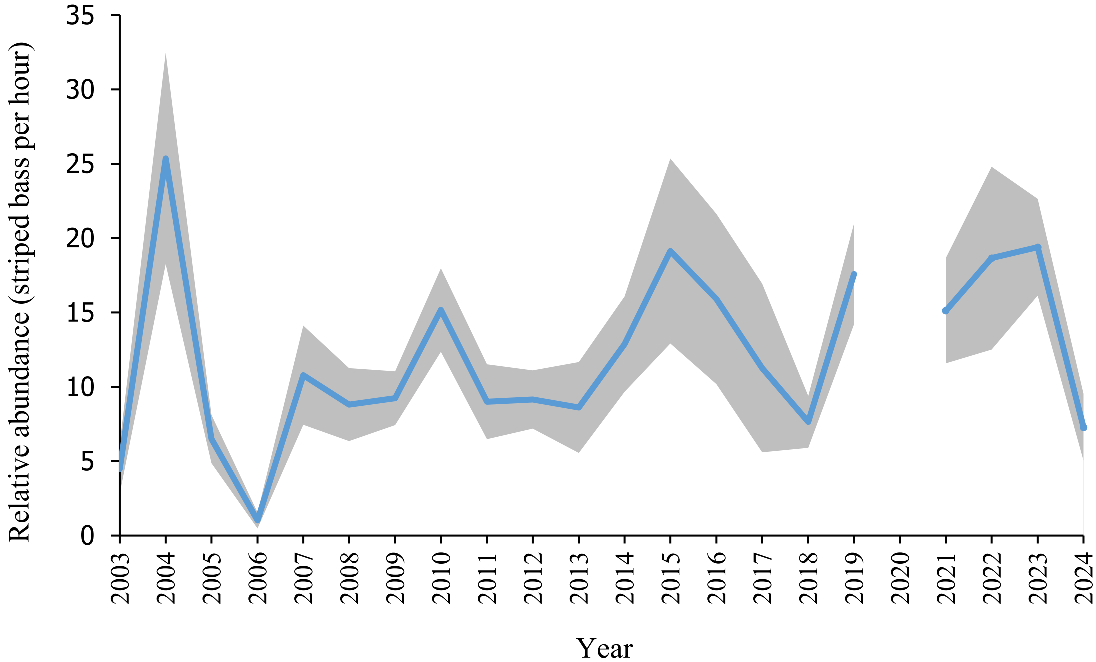


Figure 27. Relative abundance of Cape Fear River striped bass from the WRC spawning grounds electrofishing survey, 2003–2024. No sampling occurred in 2020. Shaded error bars represent ± 1 standard error.

Tagging Program: CSMA

In 2014, a mark-recapture tagging program was initiated utilizing both volunteer anglers and DMF staff throughout the state. Striped bass collected in good condition during DMF fishery independent and electrofishing sampling are tagged with conventional internal anchor tags. In addition, approximately 9,000 (3,000 per system) phase-II (125–200 mm; 5–8 in) size striped bass fingerlings are tagged annually prior to stocking in the Tar-Pamlico, Neuse, and Cape Fear river systems. The total number of striped bass tagged in 2024 from CSMA systems, excluding the Cape Fear River, was 430 resulting in 39 recaptures (Table 17; Figure 28A). The time series average was 296 days at large with an average distance travelled of 28 miles (Table 17). Most recaptures occur within the state of North Carolina, however, the maximum distance travelled was 527 miles off the coast of Rhode Island (Figure 28B). The maximum days between release and recapture was 2,192 days or just under six years (Table 17).

In the Cape Fear River, the total number of striped bass tagged in 2024 was 247 resulting in 20 recaptures (Table 18; Figure 29A). The time series average was 332 days at large with an average distance travelled of 19 miles (Table 18). Most recaptures occur within the state of North Carolina; however, the maximum distance travelled was 566 miles into Long Island Sound, Connecticut (Figure 29B). The maximum days between release and recapture was 2,474 days or over six and a half years (Table 18). Data collected from the tagging programs may serve as a recovery indicator and help guide future research needs for the CSMA striped bass stocks. The tagging data from this survey will be used to help determine hatchery contribution to the stocks, movement and migration patterns, as well as age determination. For instance, two hatchery produced Tar-Pamlico River striped bass that were tagged as phase-II size striped bass fingerlings in 2008 were recaptured in November 2023 in Washington, N.C. The 15-year-old striped bass represent the oldest known striped bass in the CSMA.

Table 17. Summary of CSMA striped bass tagging and recapture data, excluding Cape Fear River, 2014 – 2024.

Year Tagged	Total Fish Tagged (#)	Total Fish Recaptured (#)	Average Days At Large	Max Days At Large	Average Distance Traveled (miles)	Max Distance Traveled (miles)
2014	6,229	46	556	2,129	37	133
2015	6,738	153	369	1,643	29	527
2016	6,614	154	336	1,848	44	223
2017	6,973	234	256	2,077	32	180
2018	6,884	130	228	1,002	33	203
2019	6,738	155	356	1,690	35	248
2020	6,707	185	257	1,401	21	208
2021	6,935	173	322	1,145	28	177
2022	6,643	116	226	1,098	23	201
2023	6,713	148	277	767	8	89
2024	430	39	179	454	9	87
Total	67,604	1,533	296	2,129	28	527

Table 18. Summary of Cape Fear River striped bass tagging and recapture data, 2014 – 2024.

Year Tagged	Total Fish Tagged (#)	Total Fish Recaptured (#)	Average Days At Large	Max Days At Large	Average Distance Traveled (miles)	Max Distance Traveled (miles)
2014	3,047	13	489	1,382	22	129
2015	3,693	159	483	1,944	17	281
2016	3,600	155	368	1,328	15	566
2017	3,367	75	291	2,474	11	98
2018	3,422	64	237	1,443	14	78
2019	3,279	74	394	1,763	16	157
2020	3,265	95	266	1,325	15	138
2021	3,323	84	253	1,297	16	270
2022	536	115	278	1,077	13	194
2023	324	49	260	779	17	122
2024	247	20	194	428	19	154
Total	28,103	903	332	2,474	15	566

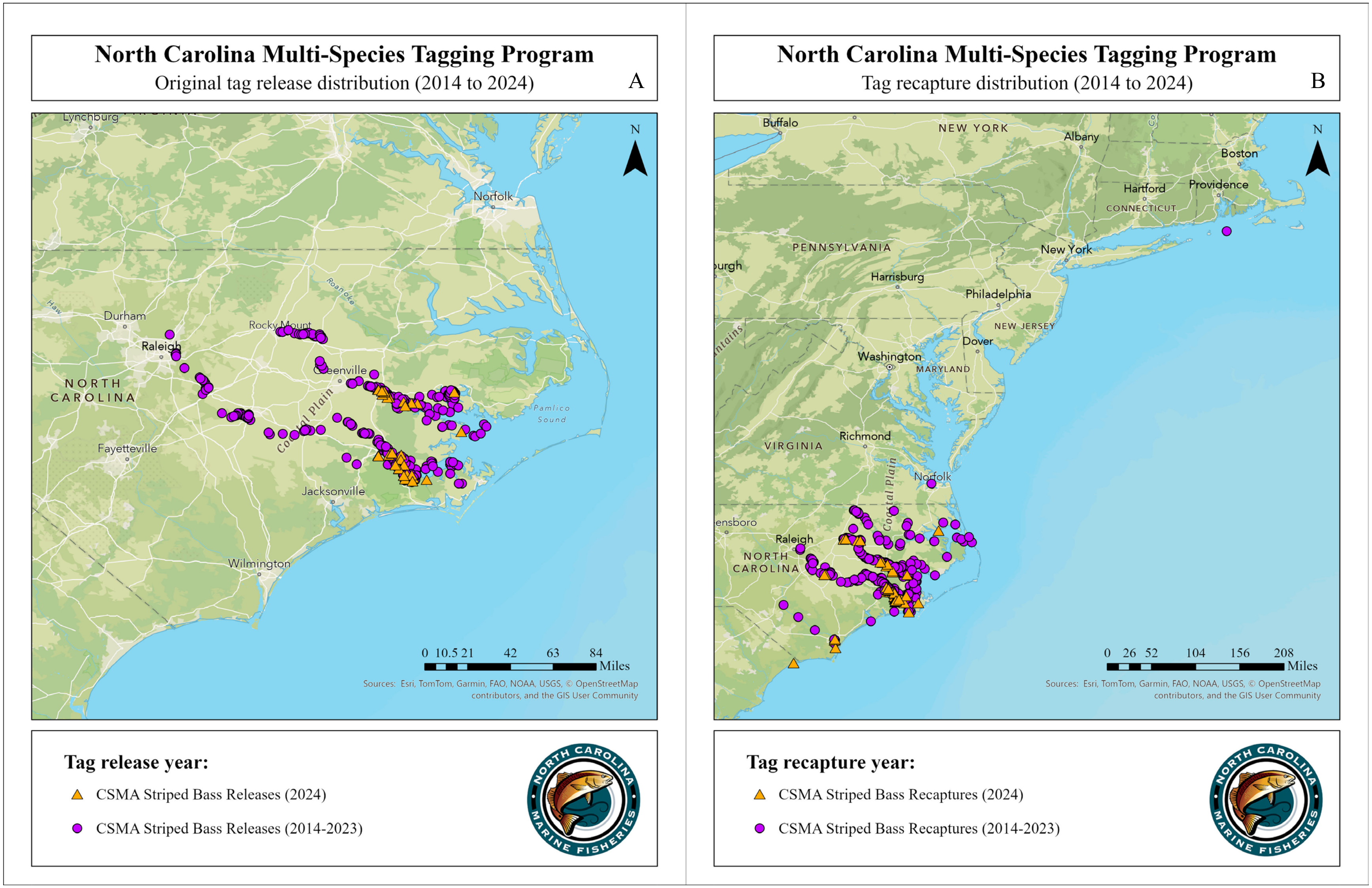


Figure 28. CSMA striped bass tagging release (A) and recapture (B) locations, excluding Cape Fear River, 2014-2024.

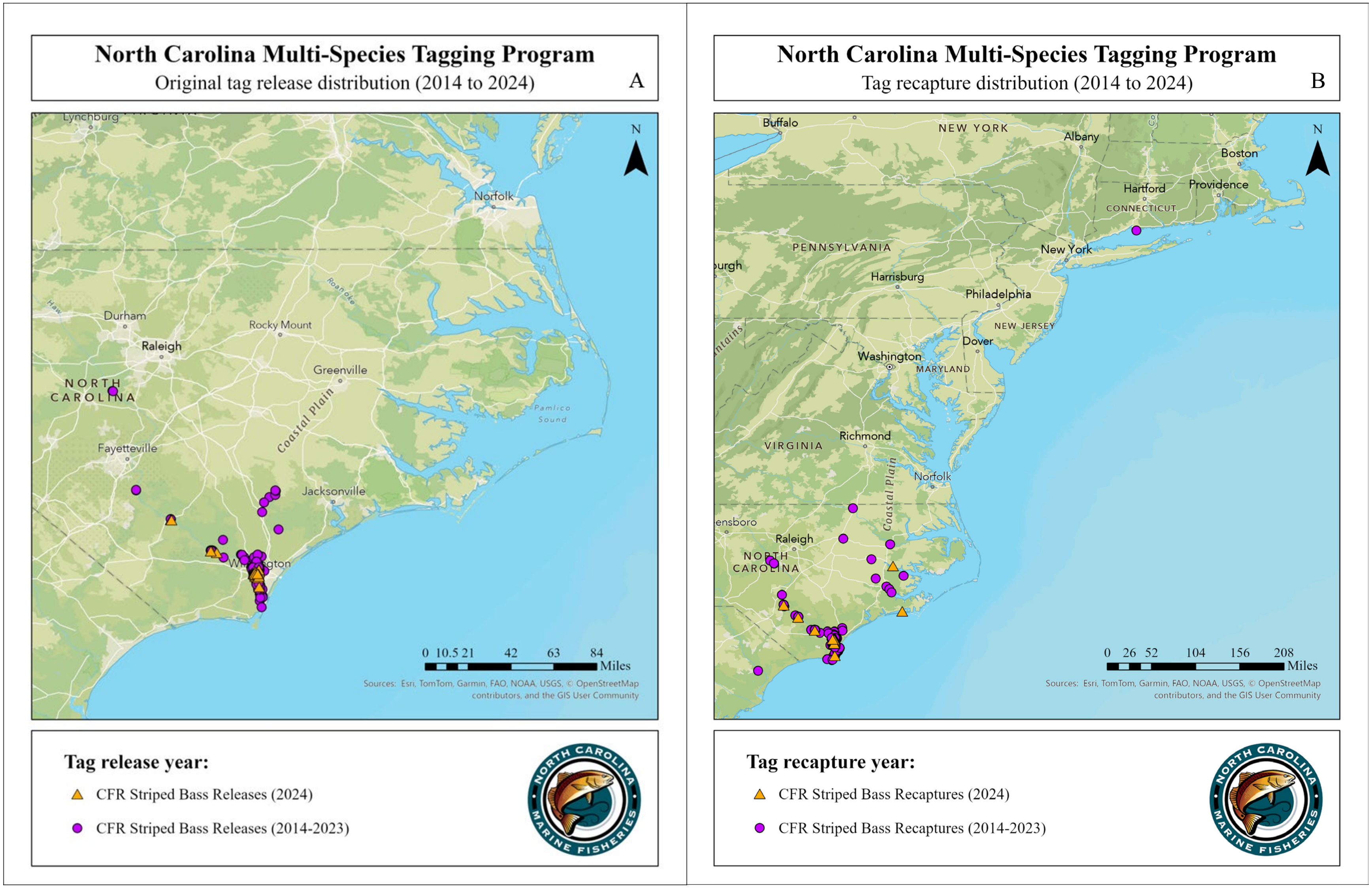


Figure 29. CSMA (Cape Fear River) striped bass tagging release (A) and recapture (B) locations, 2014-2024.

RESEARCH NEEDS: CSMA

The research recommendations listed below are intended to improve future assessments of the CSMA striped bass stocks. The bulleted items outline the specific issue and are organized by priority ranking.

High

- Acquire life history information: maturity, fecundity, size and weight at age, egg, and larval survival (ongoing through CRFL funded projects and DMF P930 data collection; see Knight, 2015 for recent work on maturation and fecundity in the Neuse and Tar-Pamlico rivers).
- Conduct delayed mortality studies for recreational and commercial gear during all seasons factoring in relationships between salinity, dissolved oxygen, and water temperature.
- Develop better estimates of life-history parameters, especially growth and factors influencing rates of natural mortality for all striped bass life stages (growth is ongoing through DMF P930 data collection; for natural mortality, see recent publications Bradley 2016 and Bradley et al. 2018b).

Medium

- Determine factors impacting survivability of stocked fish in each system (Bradley et al. 2018b).
- Implement a random component to DMF program 100 juvenile sampling in the CSMA.
- Conduct a power analysis to determine minimum sample sizes needed for determining the representative age structure.

Low

- Determine if contaminants are present in striped bass habitats and identify those that are potentially detrimental to various life history stages (ongoing through N.C. Division of Water Quality but could be expanded; in 2017, NCSU was awarded a CRFL grant to conduct research on striped bass eggs, including evaluating for Gen X).
- Identify minimum flow requirements in the Tar-Pamlico, Neuse, and Cape Fear rivers necessary for successful spawning, egg development, and larval transport to nursery grounds.
- Evaluate factors influencing catchability of striped bass, particularly larger striped bass, in electrofishing surveys conducted on the spawning grounds.
- Obtain improved commercial discard estimates from the estuarine gill-net fisheries (i.e., anchored, runaround, and strike gill nets) in the CSMA systems to better characterize harvest and discards.
- Investigate factors influencing mixing rates between A-R and CSMA striped bass stocks.
- Identify water quality parameters that impact spawning, hatching, and survival of striped bass in CSMA systems.
- Develop a consistent ageing approach across agency sampling programs.
- Continue PIT tagging striped bass in the Cape Fear River and expand PIT tagging to the Tar-Pamlico and Neuse rivers to estimates of spawning population size.
- Investigate factors influencing rates of natural mortality for all striped bass life stages in the CSMA systems.

MANAGEMENT: CSMA STOCKS

Estuarine striped bass in North Carolina are managed under Amendment 2 to the North Carolina Estuarine Striped Bass FMP. Due to concerns about the high percentage of stocked fish and minimal natural recruitment in the CSMA systems, the comprehensive review of the Estuarine Striped Bass FMP began in

July 2017 instead of as originally scheduled in 2018. Since adoption of the 2004 FMP, there has been little change in the size and age distribution, with few age-6 and older fish observed in any system. The need for continued conservation management efforts is supported by the constrained size and age distributions, low abundance, the absence of older fish in all stocks, and the high percentage of stocked fish in the population (Cushman et al. 2018; Farrae et al. 2018). Results from genetic testing of sampled fish in 2017 suggest there were two recent naturally spawned year classes and in February 2019, Amendment 2 maintains a recreational and commercial no-possession limit in the CSMA initially implemented under Supplement A to Amendment 1 in March 2019. The measure provides additional protection for non-hatchery fish.

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

The next comprehensive FMP review is scheduled to begin in 2027. In 2025, data through 2024 from the Tar-Pamlico and Neuse Rivers will be reviewed to determine if populations are self-sustaining and if sustainable harvest can be determined. In addition, the review will allow for the assessment of the gill net provision through 2024.

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FISHERY MANAGEMENT PLAN UPDATE
FALSE ALBACORE
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	None
Amendments:	None
Revisions:	None
Supplements:	None
Information Updates:	None
Schedule Changes:	None
Comprehensive Review:	None

Until 2011, false albacore (*Euthynnus alletteratus*), also known as “little tunny”, was part of the South Atlantic Fishery Management Council's (SAFMC) Coastal Migratory Pelagics Fishery Management Plan (FMP). Although there were no management measures under the plan, data collection was an important component. Amendment 18 to the plan removed false albacore from the management unit since data would still be collected through current sampling regimes (SAFMC 2011). Based on data available at the time, false albacore did not appear to meet the federal national standard guidance for stocks in need of conservation and management. In North Carolina, false albacore was managed through N.C. Marine Fisheries Commission Rule (MFC) Rule 15A NCAC 03M .0512; however, no limits were put in place. Authority to manage under this rule ended when the species was removed from SAFMC's Coastal Migratory Pelagics FMP and subsequently the N.C. FMP for Interjurisdictional Fisheries (IJ FMP), which adopts management measures within approved SAFMC, Mid-Atlantic Fishery Management Council (MAFMC), and Atlantic States Marine Fisheries Commission (ASMFC) FMPs by reference as the minimum standard. In February 2023, the MFC requested a rule be developed for precautionary management of false albacore to limit the expansion of new and existing false albacore fisheries within North Carolina. The MFC approved the rule in February 2024, giving the Director proclamation authority to implement bag, vessel, and trip limits, if landings of false albacore in a calendar year exceed 200 percent of the five-year average of combined commercial and recreational landings from 2018–2022. This rule is undergoing review with an earliest effective date of early to mid-June 2026. There currently is no state or federal FMP for false albacore.

Management Unit

None

Goal and Objectives

None

DESCRIPTION OF THE STOCK

Biological Profile

False albacore (*Euthynnus alletteratus*), also known as "little tunny", is one of the most common members of the mackerel/tuna family Scombridae. It is a tuna-shaped fish that is steel blue on top and silver below with wavy stripes along the posterior portion of the dorsal side of the body and scattered dark spots below the pectoral fin. Anglers often confuse false albacore with Atlantic bonito (*Sarda sarda*) due to similarity in size and coloration. False albacore is typically found in tropical to temperate waters of the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea; it is also found in the Mediterranean and Black seas. False albacore is a schooling species that migrates north in the spring and south in the fall and winter (Collette and Nuan 1983). Both sexes are fast-growing, with males attaining larger sizes than females (Kerstetter and Adams 2014). There is variability in the life history of false albacore throughout their range and little work has been done in the western Atlantic. In the Gulf of Mexico, the length at 50 percent maturity (L50) for females and males is 13.6 inches fork length (FL; Cruz-Castan et al. 2019) and off the Brazilian coast, fish as young as one year old are capable of spawning (Vieira et al. 2021). False albacore spawn April through November in the Atlantic Ocean (Collette and Nuan 1983). Most studies estimate the maximum age of false albacore at five years (Adams and Kersetter 2014; Vieira et al. 2021); however, Kahraman and Oray (2001) estimate maximum age up to nine years in Turkish waters.

Stock Status

The stock status of false albacore is unknown; however, there appears to be no biological concern for the stock since there is no evidence of size truncation in the commercial and recreational fisheries and the majority are well above L50. The division is continuing to collect data from recreational and commercial sampling efforts to monitor trends in landings.

Stock Assessment

There is not an approved stock assessment for false albacore in North Carolina or the western Atlantic coast.

DESCRIPTION OF THE FISHERY

Current Regulations

Currently, there are no rules in place for false albacore management in North Carolina.

Commercial Fishery

False albacore tend to have low commercial value in the United States; however, it is a commercially important species in many other countries and is sold fresh, dried, canned, smoked, and frozen. Along the Atlantic coast, false albacore is commercially landed with multiple gears, including longlines, gill nets, hook and line, and trolling. In North Carolina, false albacore is incidentally caught by commercial fishers pursuing other species and is mainly harvested by gill net and hook and line gear. Other gears including pound nets, longlines, seines, and trawls make up a small percentage of the total commercial landings. Much of the commercially caught fish in North Carolina are shipped out of state.

In 2024, commercial landings were 114,089 pounds. Landings of false albacore averaged 154,750 pounds during 1997–2024, ranging from 77,798 in 2002 to 370,814 pounds in 1997 (Table 1; Figure 1). During 2015–2024, the average landings equaled 177,108 pounds. Statewide, landings by gear have varied annually over the last 25 years (Table 2). In 2024, 46% of the false albacore harvest was taken by hook and line while the remaining 54% was harvested in gill nets (Table 2; Figure 2). Less than 1% of false albacore were landed with gears other than hook and line and gill net.

Table 1. Recreational harvest (number of fish released and weight) and releases (number of fish; MRIP) and commercial harvest (weight in pounds; Atlantic Coastal Cooperative Statistics Program and N.C. Trip Ticket Program) of false albacore from North Carolina, 1997–2024. All weights are in pounds.

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1997	31,786	48,107	222,310	370,814	593,124
1998	25,206	75,618	200,844	153,797	354,641
1999	15,895	77,884	90,008	143,359	233,367
2000	13,931	41,590	85,778	106,777	192,555
2001	8,702	78,517	53,955	98,352	152,307
2002	13,717	89,706	61,385	77,798	139,183
2003	12,294	24,662	79,071	86,568	165,639
2004	7,955	62,965	95,088	92,319	187,407
2005	6,938	68,636	69,868	88,741	158,609
2006	3,319	39,901	29,943	106,617	136,560
2007	3,098	115,324	29,494	134,666	164,160
2008	12,376	33,205	76,228	103,743	179,971
2009	17,018	83,453	139,433	146,088	285,521
2010	7,373	66,459	49,290	147,337	196,627
2011	7,807	30,347	55,290	131,549	186,839
2012	18,393	59,160	140,026	157,849	297,875
2013	28,669	108,149	218,470	189,746	408,216
2014	27,469	273,165	189,270	225,797	415,067
2015	22,855	87,239	207,889	164,964	372,853
2016	41,076	145,700	337,842	233,501	571,343
2017	39,213	119,648	334,363	216,557	550,920
2018	47,892	110,716	315,758	204,177	519,935
2019	27,360	80,205	185,094	232,879	417,973
2020	92,899	171,564	594,794	230,685	825,479
2021	17,096	52,788	118,784	105,306	224,090
2022	38,772	127,255	234,922	147,079	382,001
2023	31,443	25,405	168,654	121,842	290,496
2024	16,695	117,595	167,766	114,089	282,743
Mean	23,286	82,956	162,589	154,750	317,339

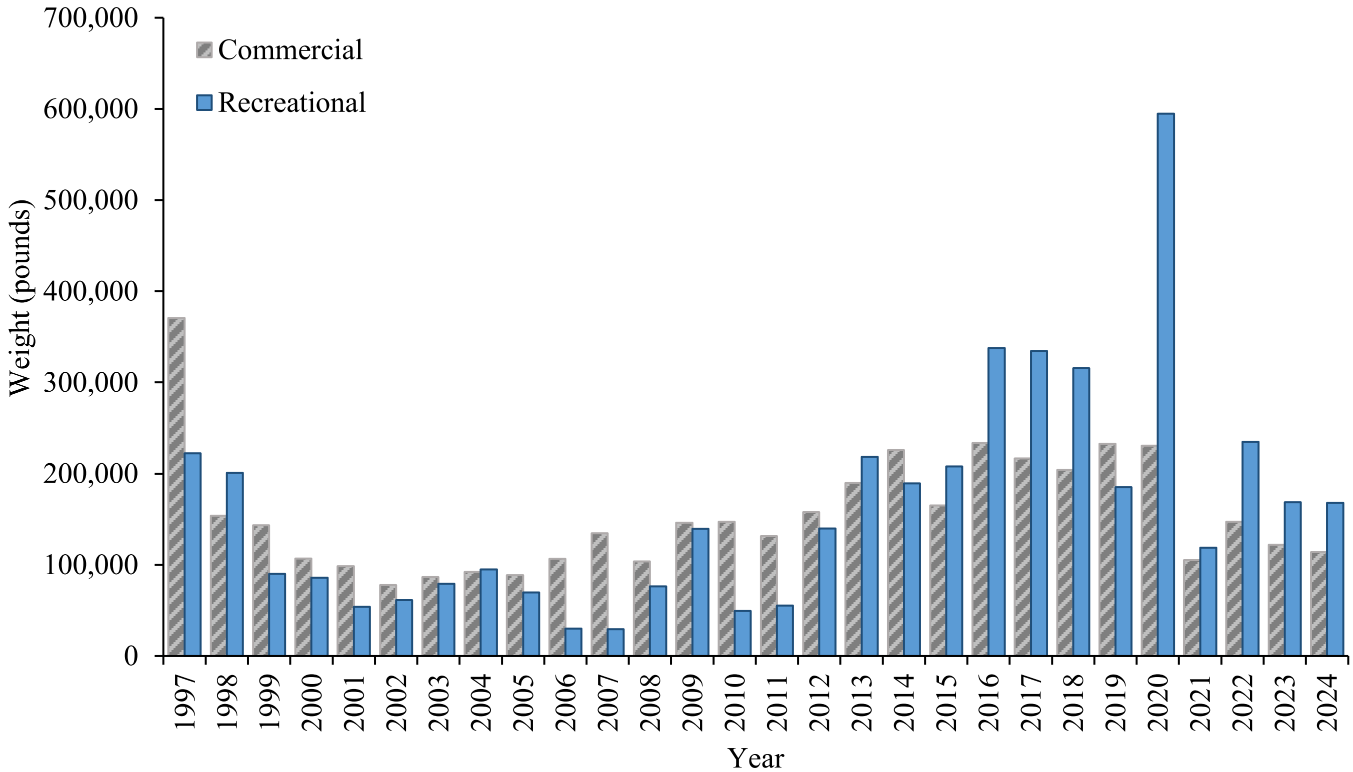

Figure 1. Annual commercial (Atlantic Coastal Cooperative Statistics Program and N.C, Trip Ticket Program) and recreational (MRIP) landings in pounds for false albacore in North Carolina from 1981 – 2024.

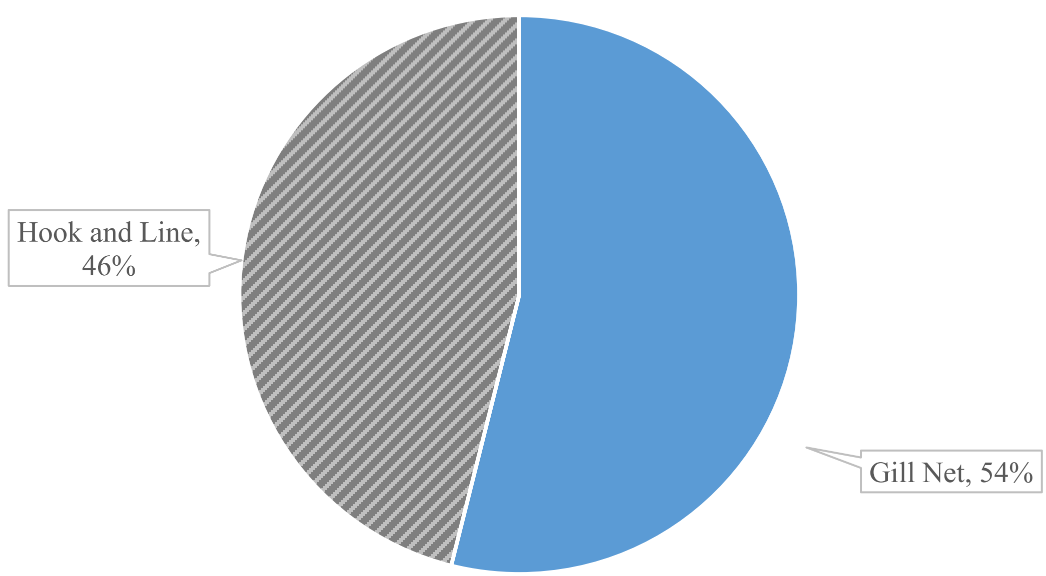

Figure 2. Commercial harvest in 2024 by gear type.

Table 2. North Carolina commercial landings in pounds by gear and value, 1997–2024. (Source: North Carolina Trip Ticket Program)

	Gear					
Year	Gill Nets	Hook & Line	Other	Total	Value	Price/Pound
1997	338,260	23,981	8,574	370,814	$80,901	$0.22
1998	122,849	26,273	4,676	153,797	$42,981	$0.28
1999	111,193	30,973	1,193	143,359	$23,318	$0.16
2000	81,908	20,415	4,455	106,777	$18,590	$0.17
2001	65,787	26,422	6,144	98,352	$18,154	$0.18
2002	54,457	18,709	4,632	77,798	$15,685	$0.20
2003	50,419	22,372	13,777	86,568	$16,172	$0.19
2004	58,294	27,580	6,444	92,319	$15,496	$0.17
2005	55,284	29,682	3,775	88,741	$24,183	$0.27
2006	60,062	44,887	1,668	106,617	$35,703	$0.33
2007	63,996	69,110	1,560	134,666	$48,745	$0.36
2008	35,346	66,794	1,603	103,743	$40,280	$0.39
2009	56,584	84,496	5,008	146,088	$61,559	$0.42
2010	54,129	88,131	5,077	147,337	$76,491	$0.52
2011	41,755	77,602	12,193	131,549	$66,986	$0.51
2012	85,009	71,003	1,837	157,849	$89,798	$0.57
2013	81,426	100,885	7,435	189,746	$114,416	$0.60
2014	101,489	123,707	601	225,797	$107,605	$0.48
2015	91,795	71,473	1,696	164,964	$85,493	$0.52
2016	130,824	76,301	26,376	233,501	$110,271	$0.47
2017	124,697	89,529	2,331	216,557	$112,474	$0.52
2018	97,303	106,212	662	204,177	$127,204	$0.62
2019	153,176	78,848	854	232,879	$132,982	$0.57
2020	171,089	58,691	905	230,685	$193,782	$0.84
2021	66,075	38,919	312	105,306	$106,813	$1.01
2022	86,668	60,182	227	147,079	$165,188	$1.12
2023	48,273	72,942	627	121,842	$141,668	$1.16
2024	61,359	52,453	277	114,089	$154,209	$1.35

Recreational Fishery

Recreational landings of false albacore are estimated from the Marine Recreational Information Program (MRIP). Recreational estimates across all years have been updated and are now based on the MRIP new Fishing Effort Survey-based calibrated estimates. For more information on MRIP see: https://www.fisheries.noaa.gov/topic/recreational-fishing-data. Recreational catch of false albacore has been trending upward over the last decade (Table 1; Figure 1), as false albacore is a popular targeted species because of its strength and speed. The predominant gear for the recreational fishery is hook-and-line, and the most popular methods are either sight casting or trolling. While most fish are released alive, some recreational anglers use false albacore as bait (strip or live) for other fisheries such as shark, billfish, and wahoo; it is unknown how prevalent this practice is.

Anglers harvested 16,695 fish (167,766) pounds of false albacore in 2024. Recreational landings in North Carolina have been low but variable since 1997, though they have started to trend upwards since 2012 (Table 1; Figure 1). Landings have ranged from 3,098 fish (29,494 pounds) in 2007 to 92,899 fish (594,794 pounds) in 2020. In the last ten years, an average of 37,530 fish (266,587 pounds) have been landed in North Carolina. Since 2015 recreational releases have accounted for approximately 74% of the catch in North Carolina. The number of fish released has ranged from 24,662 fish in 2003 to 273,165 fish in 2014.

The DMF offers award citations for exceptional catches of false albacore. False albacore greater than 20 pounds or 34 inches FL are eligible for an award citation. In 2024, 10 citations were awarded (Figure 3).

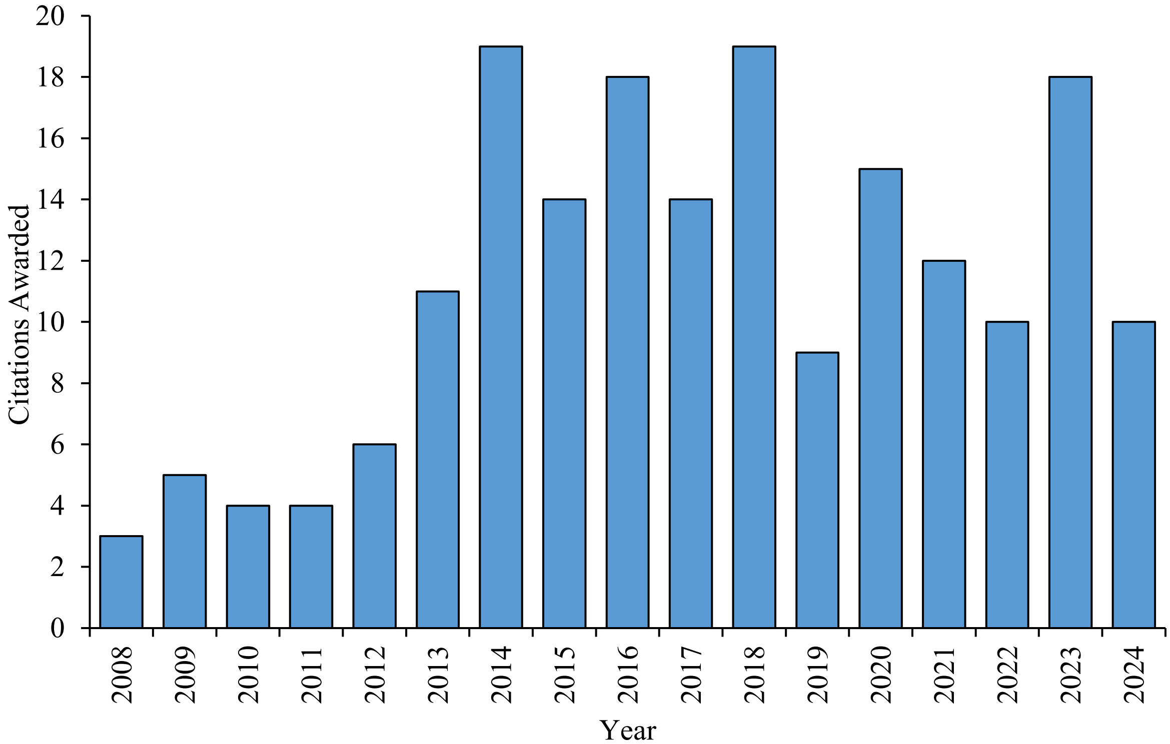

Figure 3. North Carolina Saltwater Fishing Tournament citations awarded for false albacore, 2008–2024. Citations are awarded for false albacore greater than 20 pounds or 34 inches fork length.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Length-frequency information for the commercial false albacore fishery in North Carolina is collected through the division's Program 434 (Ocean Gill Net Fishery), Program 438 (Offshore Live Bottom Fishery) and Program 439 (Coastal Pelagic). Through these programs, 85 false albacore were measured with a mean length of 23.9 inches FL (Table 3; Figure 4). Length and weight information for the recreational fishery are collected through the MRIP dockside sampling (Table 4; Figure 5).

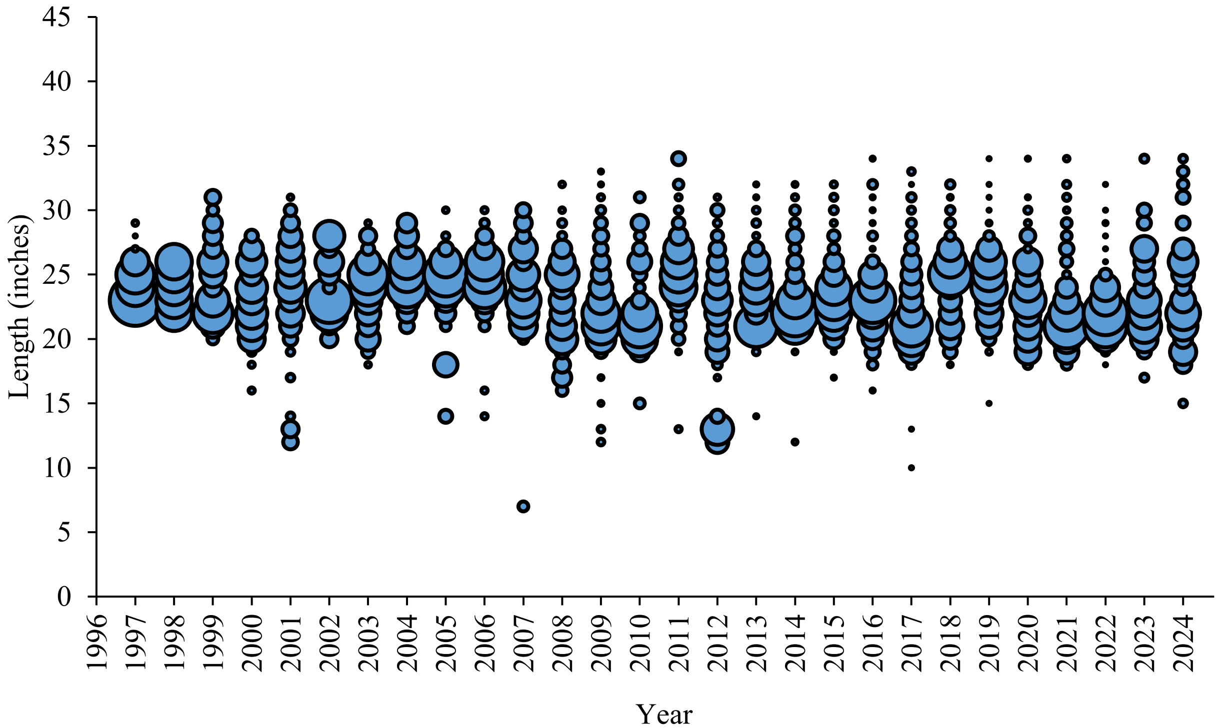

Figure 4. Commercial length frequency (fork length, inches) of harvested false albacore harvested, 1997–2024. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

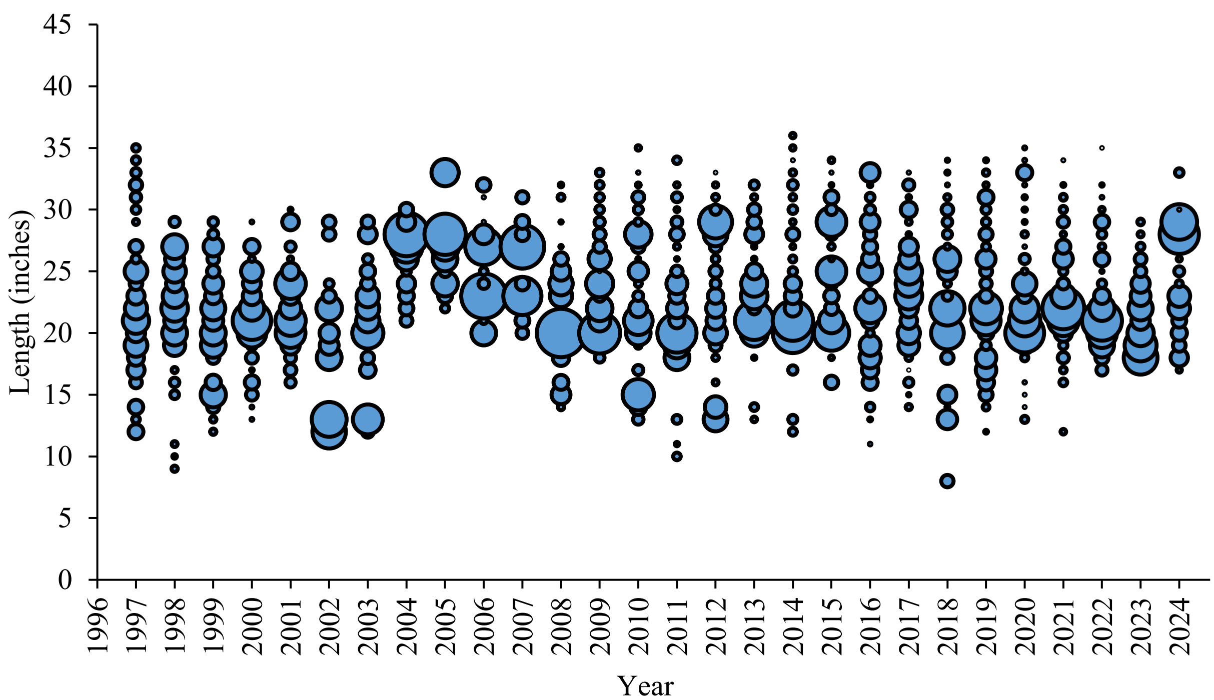

Figure 5. Recreational length frequency (fork length, inches) of harvested false albacore, 1997–2024. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length

Table 3. False albacore length (fork length, inches) data from commercial fish house samples, 1997–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1997	25.1	22.4	29.8	41
1998	24.5	22.4	26.5	5
1999	24.7	20.5	31.2	59
2000	23.8	16.5	28.7	73
2001	24.2	12.2	31.2	200
2002	25.0	20.8	28.9	37
2003	24.0	18.9	29.4	94
2004	25.3	21.4	29.9	147
2005	24.3	14.1	30.1	95
2006	25.2	14.7	30.3	92
2007	24.5	7.8	30.7	59
2008	23.4	16.5	32.2	180
2009	23.6	13.0	33.3	409
2010	22.7	15.4	31.7	72
2011	25.3	19.6	34.1	133
2012	22.4	12.6	30.9	196
2013	24.2	14.2	32.3	230
2014	23.9	12.0	32.5	417
2015	24.1	17.2	32.8	281
2016	23.2	16.2	34.6	228
2017	22.8	10.6	33.7	393
2018	24.2	19.0	32.6	159
2019	23.8	16.0	34.1	417
2020	22.8	18.8	34.3	236
2021	22.5	18.3	34.2	222
2022	22.8	18.9	32.4	242
2023	30.6	17.8	46.5	142
2024	23.9	15.1	34.2	85

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Table 4. Total number measured, mean, minimum, and maximum length (inches) of false albacore measured by MRIP sampling in North Carolina, 1981–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1997	22.1	12.1	35.7	125
1998	23.1	9.4	29.5	164
1999	21.2	12.6	29.4	74
2000	22.0	13.4	29.1	35
2001	22.5	16.9	30.6	67
2002	17.5	12.0	29.4	28
2003	20.7	12.9	29.4	34
2004	27.3	21.3	30.4	28
2005	28.0	22.8	33.5	24
2006	25.0	20.1	32.1	4
2007	25.7	20.2	31.6	19
2008	21.3	14.9	32.8	28
2009	23.3	18.3	33.9	81
2010	21.8	13.9	35.4	72
2011	21.8	10.9	34.3	49
2012	23.1	13.4	33.5	85
2013	23.4	14.0	33.0	34
2014	22.2	12.4	36.1	93
2015	24.3	16.9	34.4	63
2016	23.7	12.0	33.3	136
2017	24.0	14.8	33.3	81
2018	21.8	8.5	34.3	102
2019	22.3	12.4	35.0	149
2020	22.4	12.4	35.7	261
2021	22.9	12.6	34.4	147
2022	22.0	17.2	35.6	146
2023	21.1	18.3	29.8	66
2024	26.0	18.0	33.5	43

Fishery-Independent Monitoring

Currently, the division does not have any fishery-independent sampling programs that target or catch false albacore in great numbers.

RESEARCH NEEDS

The following have been identified as research needs for false albacore in North Carolina.

- Support tagging programs to develop estimates of growth, natural mortality, fishing mortality, and track the movement of adults throughout the stock's range; include methods to estimate tag retention, reporting rate, and tagging-induced mortality.
- Conduct reproductive studies including spawning periodicity, age- and size-specific fecundity, maturity schedule, and conduct spawning area surveys throughout the stock's range.
- Expand discard sampling to collect information on gear, depth, location, and age and size distribution of discarded fish for the recreational and commercial sectors.

MANAGEMENT

In North Carolina, false albacore was managed through MFC Rule 15A NCAC 03M .0512; however, no limits were put in place. Authority to manage under this rule ended when the species was removed from the SAFMC's Coastal Migratory Pelagics FMP and subsequently the N.C. IJ FMP, which adopts management measures within approved SAFMC, MAFMC, and ASMFC FMPs by reference as the minimum standard.

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FISHERY MANAGEMENT PLAN UPDATE
HARD CLAM
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	August 2001	
Amendments:	Amendment 1	June 2008
	Amendment 2	February 2017
	Amendment 3	May 2025
Revisions:	None	
Supplements:	None	
Information Updates:	None	
Schedule Changes:	None	
Comprehensive Review:	2030	

The 2001 N.C. Hard Clam Fishery Management Plan (FMP) recommendations included adding a new mechanical clam harvest area in Pamlico Sound and rotating openings in this area with northern Core Sound, decreasing the daily harvest limit for mechanical harvest in Core Sound, changing some of the lease requirements, increasing relay of clams, and increasing funding for Shellfish Sanitation (NCDMF 2001).

The N.C. Hard Clam FMP Amendment 1, adopted in 2008, recommended the hard clam fishery from public bottom continue harvesting at current daily limits, eliminating the mechanical clam harvest rotation in Pamlico Sound, instituting a resting period in the northern Core Sound mechanical clam harvest area, and developing sampling programs to collect information necessary for the completion of a hard clam stock assessment (NCDMF 2008). Amendment 1 also endorsed several changes to the shellfish lease program to increase the accountability of the leaseholders and to improve public acceptance of the program.

The N.C. Hard Clam FMP Amendment 2, adopted by the N.C. Marine Fisheries Commission (MFC) in February 2017, recommended maintaining status quo on recreational harvest limits, eliminating mechanical harvest in Pamlico Sound by rule, instituting shading requirements for harvesters from April 1 to September 30, implementing modifications to shellfish lease provisions, and adding convictions of theft on shellfish leases and franchises to the types of violations that could result in license suspension or revocation.

The N.C. Hard Clam FMP Amendment 3, adopted by the MFC in May 2025, includes a three-year phase out of mechanical clam harvest on public bottom to be completed in May of 2028, discontinued the allowance for mechanical clam harvest in conjunction with maintenance dredging, and supports the North Carolina Division of Marine Fisheries (DMF) in further exploring potential options and developing a solution to quantify recreational shellfish harvest in order to move towards a stock assessment and stock level management for hard clams and to establish a mechanism to better provide recreational shellfish harvesters with important Shellfish Sanitation and Recreational Water Quality health and safety information (NCDMF 2025).

Management Unit

Includes the hard clam (*Mercenaria mercenaria*) and its fisheries in all waters of coastal North Carolina.

Goal and Objectives

The goal of the N.C. Hard Clam FMP is to manage the hard clam resource to provide long-term harvest and continue to offer protection and ecological benefits to North Carolina's estuaries. To achieve this goal, it is recommended that the following objectives be met:

- Use the best available biological, environmental, habitat, fishery, social, and economic data to effectively monitor and manage the hard clam fishery and its environmental role.
- Manage hard clam harvesting gear use to minimize damage to the habitat.
- Coordinate with DEQ and stakeholders to implement actions that protect habitat and environmental quality consistent with the Coastal Habitat Protection Plan (CHPP) recommendations.
- Promote stewardship of the resource through public outreach to increase public awareness regarding the ecological value of hard clams and encourage stakeholder involvement in fishery management and habitat enhancement activities.

DESCRIPTION OF THE STOCK

Biological Profile

Hard clams are mostly estuarine-dependent, filter-feeding shellfish found in sandy and vegetated bottoms from Prince Edward Island, Canada to the Yucatan Peninsula, Mexico (Eversole et al. 1987). Spawning occurs from May through November when water temperatures are between 68 degrees and 86 degrees Fahrenheit (Loosanoff and Davis 1950). The larvae go through several stages before settling onto a suitable bottom. During the juvenile stages, hard clams tend to be dominantly male and then become either male or female as they mature into adults. Sexual maturity is reached in hard clams when individuals reach a shell length of about 1.3 inches, and the timing is therefore dependent on the rate of growth (Eversole et al. 1987). Growth rates are highly variable because of temperature, food availability, and genetic disposition. Legal size (one inch thick) is typically reached at age-3 in North Carolina, with the oldest individual known living to 46 years.

Stock Status

The status of the hard clam stock in North Carolina is unknown due to the lack of available data to assess the population, therefore benchmark reference values cannot be determined for the stock (NCDMF 2017). Amendments 2 and 3 of the FMP also define stock status as unknown due to the continued lack of data needed to conduct a reliable stock assessment (NCDMF 2017; NCDMF 2025).

Data limitations prevent DMF from conducting a hard clam stock assessment and calculating sustainable harvest. Currently, the only data available for the stock in most areas are the commercial landings and associated effort. For this reason, the current assessment focused on trends in catch rates in the commercial hard clam fishery from 1994 through 2022 (NCDMF 2025). Commercial landings of hard clams are considered a biased index of population size. Fisheries-dependent data, such as commercial landings, are often not proportional to population size due to a number of caveats including area closures and market fluctuations. As such, landings should be interpreted with caution if the interest is tracking relative changes in the population size.

Commercial landings data were obtained from the North Carolina Trip Ticket Program for 1994 through 2022. Catch rates were estimated for both hand harvest and mechanical harvest in each of the major water bodies from which hard clams are harvested, and where sufficient data were available. Hand harvest occurs year-round and is summarized by calendar year. The majority of mechanical harvest occurs from December through March with some harvest occasionally allowed during other times of the year in specific areas; therefore, mechanical harvest is summarized by fishing year (December through March). Only landings from public bottom were examined because planting of seed clams, grow-out availability, and market demand often artificially drives landings from private leases. Fisheries-dependent catch rates were expressed as numbers harvested per transaction. Catch rates were consistently higher for mechanical harvest than for hand harvest.

Trends observed in fishery-dependent indices must be interpreted with strong caveats. For a fisheries-dependent index to be proportional to abundance, fishing effort must be random with respect to the distribution of the population and catchability must be constant over space and time. Other factors affecting the proportionality of fishery-dependent indices to stock size include changes in fishing power, gear selectivity, gear saturation and handling time, fishery regulations, gear configuration, fishermen skill, market prices, discarding, vulnerability and availability to the gear, distribution of fishing activity, seasonal and spatial patterns of stock distribution, change in stock abundance, and environmental variables. Many agencies, such as DMF, do not require fishermen to report records of positive effort with zero catch; lack of these "zero catch" records in the calculation of indices can introduce further bias.

The statutory obligation to manage hard clams according to sustainable harvest cannot be met until the appropriate data are collected. While landings records reflect population abundance to some extent, the relationship is confounded by changes in harvest effort and efficiency.

Stock Assessment

A stock assessment is not available for this species.

DESCRIPTION OF THE FISHERY

Current Regulations

Hard clams cannot be taken from any public or private bottom in areas designated as prohibited (polluted) by proclamation except for special instances for: Shellfish Management Areas (NCMFC Rule 15A NCAC 03K .0103), with a permit for planting shellfish from prohibited areas (NCMFC Rule 15A NCAC 03K .0104), and for the depuration of shellfish (NCMFC Rule 15A NCAC 03K .0107). Hard clams cannot be taken between the hours of sunset and sunrise of any day. Beginning in April 2014, time and temperature control measures were initiated for hard clams to prevent post-harvest growth of naturally occurring bacteria that can cause serious illness in humans.

Public Bottom

The recreational and commercial minimum size limit for hard clams is one-inch thickness (shell width). Daily commercial harvest limits on public bottom are no more than 6,250 hard clams (25 bags at 250 clams per bag) per fishing operation in Coastal Fishing Waters regardless of the harvest methods employed. Size, daily harvest limits, and season and area limitations do not apply in some situations on public bottom for temporary openings made on the recommendation of shellfish sanitation.

The daily hand harvest limit on public bottom is 6,250 hard clams and the fishery is open year-round. Rakes no more than 12 inches in width or weighing no more than six pounds can be used to take hard clams in any live oyster bed, in any established bed of submerged aquatic vegetation or in an established bed of saltwater cordgrass.

Mechanical hard clam harvest on public bottom can occur from December 1 through March 31 and is opened by proclamation in specific locations. The mechanical harvest season usually begins the second Monday in December and extends through the week of March 31st. Harvest is allowed from 7:30 a.m. to 4:00 p.m. on Monday through Friday until December 25th and then Monday through Wednesday after December 25th for the remainder of the open harvest season.

Internal waters that can open to mechanical hard clam harvest include areas in Core and Bogue sounds, Newport, North, White Oak, and New rivers, and the Intracoastal Waterway north of "BC" Marker at Topsail Beach which were opened at any time from January 1979, through September 1988. Harvest in

Bogue Sound was discontinued in 2020 due to SAV encroachment. Hard clam mechanical daily harvest limits vary by waterbody. In some instances, mechanical harvest areas are rotated (alternately open and close) with other areas (Table 1). The White Oak River, New River, and the Intracoastal Waterway of Onslow and Pender counties (Marker 65 to the BC Marker at Banks Channel) are fished mainly with escalator dredges and are rotated on a yearly basis with maximum daily limits of 6,250 hard clams (25 bags at 250 hard clams per bag) per operation. The mechanical harvest area from Marker 72A to the New River Inlet is opened annually with a maximum daily harvest limit of 6,250 hard clams. A maximum daily harvest of 3,750 hard clams is allowed in North River and Newport River (Table 1). Since 2008, upon adoption of Amendment 1 to the Hard Clam FMP, Core Sound has been divided into two areas and the northern area is open every other year while the southern area is opened annually. Each area in Core Sound has a daily harvest limit of 5,000 hard clams per operation.

With the adoption of Amendment 3 to the Hard Clam FMP, mechanical clam harvest on public bottom is undergoing a 3-year phase out. Mechanical clam harvest seasons will continue to open via proclamation in specific locations until May of 2028, at which point mechanical clam harvest will no longer occur on public bottom in North Carolina.

Recreational harvest limits from public bottom are 100 hard clams per person per day and no more than 200 hard clams per vessel. Hard clams can only be taken by hand for recreational purposes.

Private Bottom

Leases and franchises in internal waters must adhere to the minimum one-inch-thick size limit for the sale of hard clams for consumption. There is no daily maximum harvest limit applied to the taking of hard clams from private bottom in internal waters. Public bottom must meet certain criteria to be deemed suitable for leasing for shellfish cultivation and there are specific planting, production, and marketing standards for compliance to maintain a shellfish lease or franchise. Also, there are management practices that must be adhered to while the lease is in operation, such as: marking poles and signs, spacing or markers, and removal of markers when the lease is discontinued.

Possession and sale of hard clams by a hatchery or aquaculture operation, and purchase and possession of hard clams from a hatchery or aquaculture operation are exempt from the daily harvest limit and minimum size restrictions. The possession, sale, purchase, and transport of such hard clams must comply with the Aquaculture Operation Permit. Leases that use the water column must also meet certain standards as outlined in G.S. 113-202.1 to be deemed suitable for leasing and aquaculture purposes.

Table 1. Current daily mechanical hard clam harvest limits by water body. Seasons can be opened from December 1 through March 31 by proclamation until May of 2028.

Waterbody	Daily harvest limit (Number of clams)	Additional information
Northern Core Sound	5,000	Rotates one year open and one year closed opposite the open/close rotation of the New River
Southern Core Sound	5,000	Open annually
North River	3,750	Open annually
Newport River	3,750	Open annually
White Oak River	6,250	Rotates one year open and one year closed opposite the open/close rotation of the New River
New River	6,250	Rotates one year open and one year closed opposite the open/close rotation of Northern Core Sound, the White Oak River and the ICW in the Onslow/Pender counties areas
New River Inlet	6,250	Open annually from Marker 72A to the New River Inlet
ICW Onslow/Pender counties area	6,250	Intracoastal Waterway (maintained marked channel only) from Marker #65, south of Sallier's Bay, to Marker #49 at Morris Landing. All public bottoms within and 100 feet on either side of the Intracoastal Waterway from Marker #49 at Morris Landing to the "BC" Marker at Banks Channel. Open every other year when the New River is closed.

There is a specific application process to obtain a lease and a public comment process is required before a shellfish lease is granted, allowing any member of the public to protest the issuance of a lease. Owners of shellfish leases and franchises must provide annual production reports to DMF. Failure to furnish production reports can constitute grounds for termination. Cancellation proceedings will begin for failing to meet production requirements and interfering with public trust rights. Corrective action and appeal information is given prior to lease termination. A lease may be transferred to a new individual before the contract term ends, however there are specific requirements to do so.

For more information on the private culture of hard clams in North Carolina visit the NCDMf Shellfish Lease and Franchise webpage at https://www.deq.nc.gov/about/divisions/marine-fisheries/licenses-permits-and-leases/shellfish-lease-and-franchise.

Commercial Fishery

Hard clam harvest has fluctuated historically, often in response to changes in demand, improved harvesting, and increases in polluted shellfish area closures. Since 1994 about 88% (1994–2013 combined estimates; NCDMF 2025) of the total commercial hard clam harvest came from public bottom in North Carolina. It is assumed that trends in hard clam landings from both sources (private and public bottom) combined can be attributed to changes in hard clam landings from public bottom since they make up the largest component to the overall harvest. Adverse weather conditions (i.e., hurricanes, heavy rain events) can impact the annual landings. One of the greatest environmental impacts to hard clam harvest occurred in 1987–1988 due to red tide. The red tide bloom caused the closure of over 361,000 acres of public bottoms to shellfish harvest from November 1987 to May 1988. These closures affected 98% of the clam harvesting areas and had its greatest impact on the clam fishermen. The dinoflagellate responsible for the red tide, *Karenia brevis*, produced a neurotoxin, which was concentrated in shellfish, making them unfit for consumption. Seventeen hurricanes have made landfall in North Carolina since 1996 (North Carolina State Climate Office 2025). Freshwater runoff after storm events often increase shellfish harvest area closures and cause a reduction in hard clam harvest effort for short periods. Hard clams are a live product and must go to market relatively quickly after harvest. Competition with hard clams grown in private culture from other states is a known contributor to reduced market demand for wild harvested hard clams since a more consistent product can be provided from private grow out facilities.

Annual average hard clam landings from 1994–2024 was 20.9 million clams (Figure 1). Annual landings in 2024 were the third lowest in the 31-year period at 3.9 million clams. This continues the trend of the low harvest levels seen in 2020–2023. There has been a steady decline in commercial landings since the early 2000s. The landings during the last ten years are less than one third of the peak seen from 1994–2001.

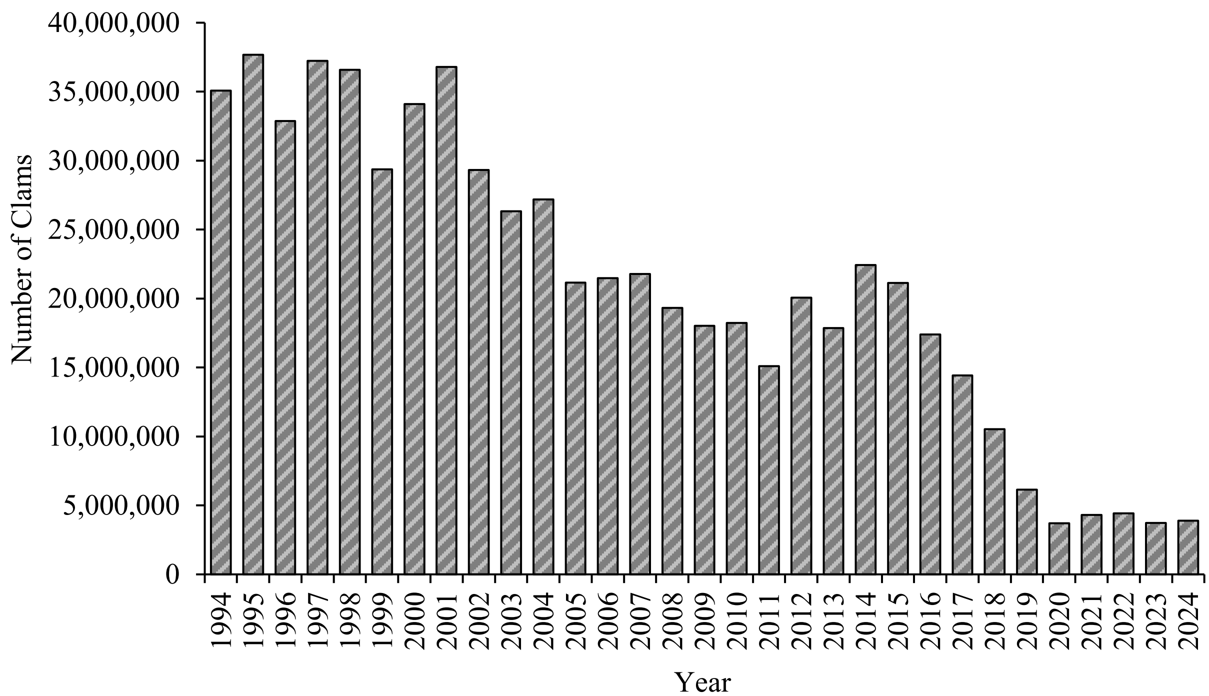

Figure 1. Combined annual commercial (1994–2024) hard clam landings (number of clams) from private and public bottom in North Carolina.

<u>Hand Harvest Fishery</u>

Hand harvest is a year-round fishery and has average landings of 17.2 million hard clams a year (1994–2024) from public and private bottom (Figure 2; NCDMF 2025). Most hand harvest for hard clams occurs in the spring and summer when warm water is conducive to wading. Annual hand harvest for hard clams has declined steadily over the 31-year time series to its lowest level of 3.2 million hard clams in 2024 (Figure 2; NCDMF 2025).

<u>Mechanical Harvest Fishery</u>

Hard clam landings from mechanical methods have averaged 3.7 million hard clams each fishing year (1994–2024) from public and private bottom (Figure 2). The mechanical clam harvest season usually has the highest landings at the beginning of the fishing season in December and declines as the season progresses. Landings outside of the usual mechanical clam harvest season are from temporary openings for the maintenance of channels and temporary openings in Core Creek when bacteriological levels are at acceptable levels to harvest hard clams. Hard clam landings and trips fluctuate from fishing year to fishing year and have often been greatly influenced by harvest from the New River mechanical harvest area. From 1994 to 2022, over 80% of the total mechanical hard clam harvest came from the New River and Core Sound (NCDMF 2025). The New River accounted for most mechanical clam harvest from 2000 to 2016 but, following a series of clam kill events in the 2010s, contributions from this area to total mechanical landings have declined (NCDMF 2025).

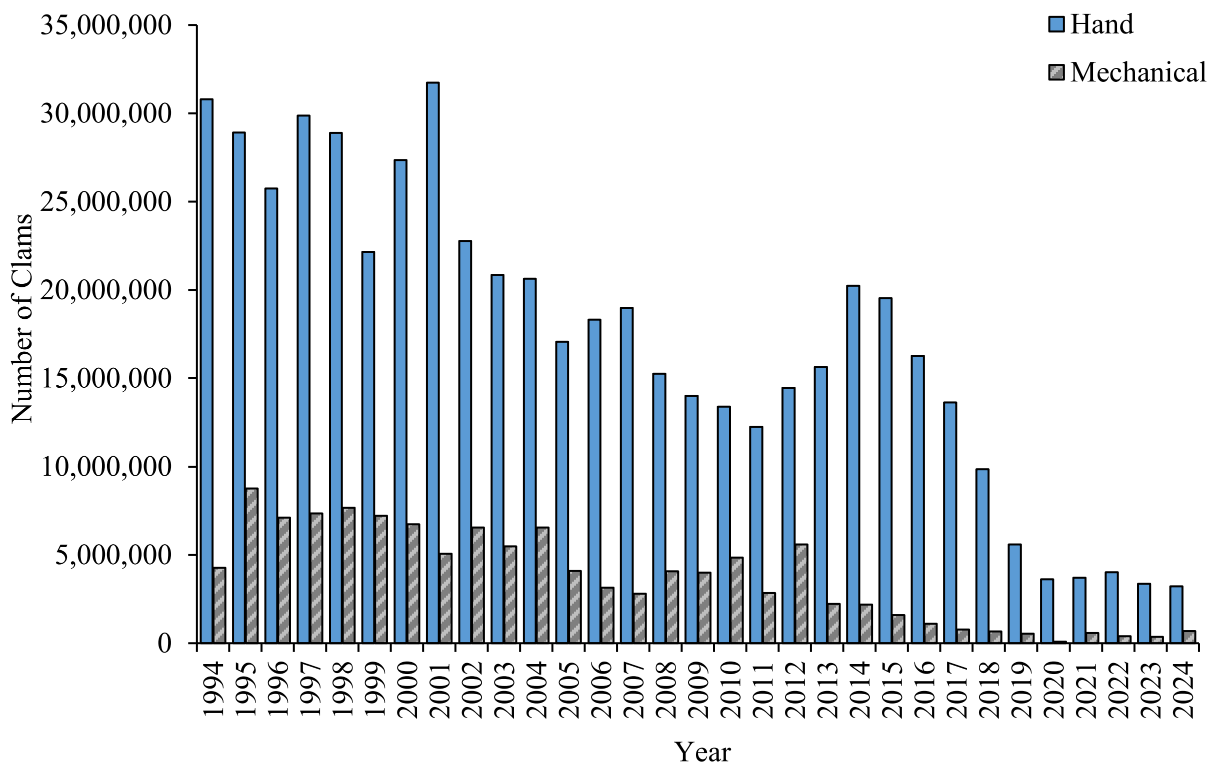

Figure 2. Annual hard clam landings (number of clams) from hand and mechanical harvest in North Carolina from public and private bottom, 1994–2024.

Private Culture

DMF administers the shellfish lease program whereby state residents may apply to lease estuarine bottom and water columns for the commercial production of shellfish. DMF does not differentiate between clam, oyster, bay scallop, and mussel leases; allowing shellfish growers to grow out multiple species simultaneously or as their efforts and individual management strategy allows. Since 1994, roughly 35% of all private culture operations harvested only clams (NCDMF 2017).

Private enterprise has provided roughly 12.3% of the total commercial hard clam harvest in North Carolina between 1994 and 2024 (Figure 3). The annual average hard clam landings from 1994 to 2024 from private production were 2.4 million hard clams. In 2024, harvest from private culture was 1.1 million hard clams, the highest since 2018.

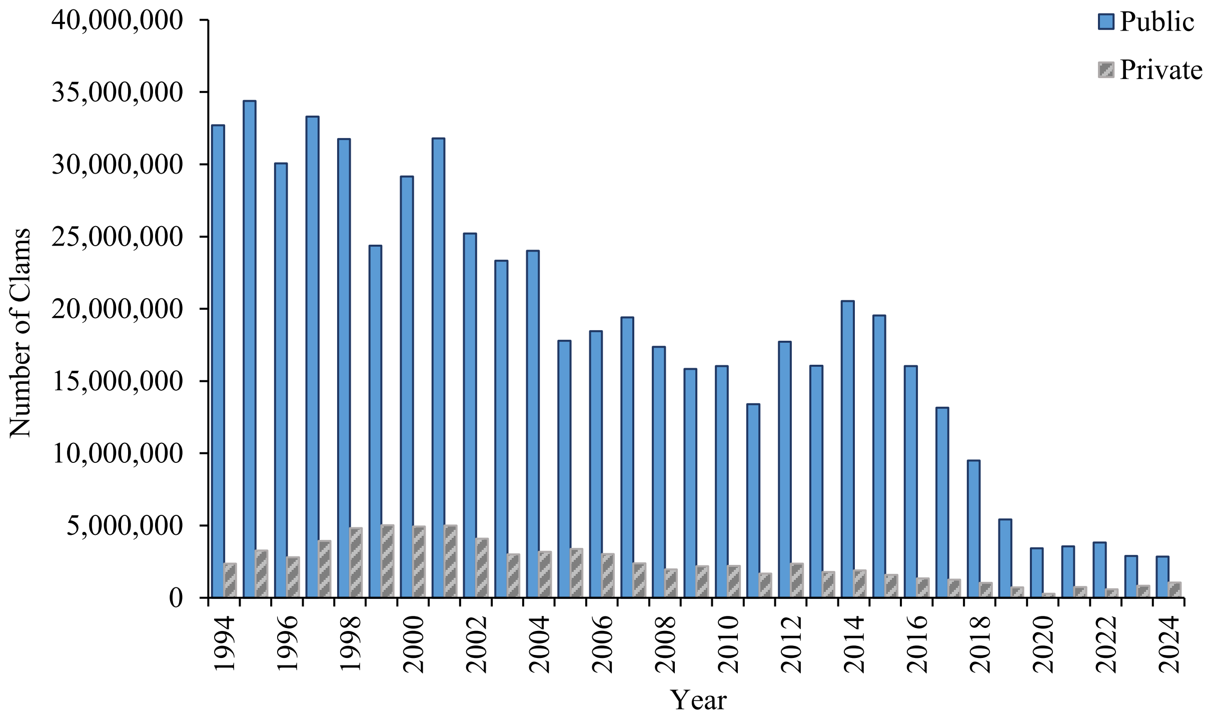

Figure 3. Annual hard clam landings (number of clams) from private and public bottom, 1994–2024.

Recreational Fishery

The recreational harvest of hard clams in North Carolina does not require a fishing license, and due to this the total amount of recreational landings cannot be estimated and remains unknown. However, a mailout survey was used from 2010 to 2022 to estimate harvest from Coastal Recreational Fishing License holders. This population of recreational harvesters makes up an unknown proportion of total recreational harvest, but still provides insight into catch rates, harvest trends, and scale of harvest. In 2010, surveys were only mailed out November and December, so harvest and effort estimates are very low (Table 2). Harvest and catch rate have been declining since 2013 (Figure 4). In 2022 recreational harvest was roughly one half of that in 2020 and only 30% of the time series average.

In 2023, a new licensing system was implemented, and the license database was restructured. This restructuring disrupted our ability to query the full license dataset to establish a sampling frame of eligible anglers for the mail surveys. As a result, we were unable to administer the mail surveys and expand potential responses and survey estimates are not available for 2023 or 2024. In 2025, the mail surveys resumed and these data will be included in the 2026 annual Hard Clam FMP update.

Table 2. Estimated number of trips, number of clams harvested, and catch rate (clams per trip) per year of Coastal Recreational Fishing License holders, 2012–2022. Survey estimates not available for 2023 or 2024.

Year	Number of Trips	Harvest (number of clams)	Catch Rate (number of clams/trip)
2012	6,726	146,151	27.3
2013	8,644	191,842	26.2
2014	6,325	162,656	28.8
2015	7,637	166,419	27.4
2016	8,456	84,199	12.3
2017	3,435	75,171	21.8
2018	2,362	26,769	11.3
2019	5,088	114,042	22.4
2020	6,557	62,164	9.5
2021	1,765	15,471	8.8
2022	7,087	31,707	4.5

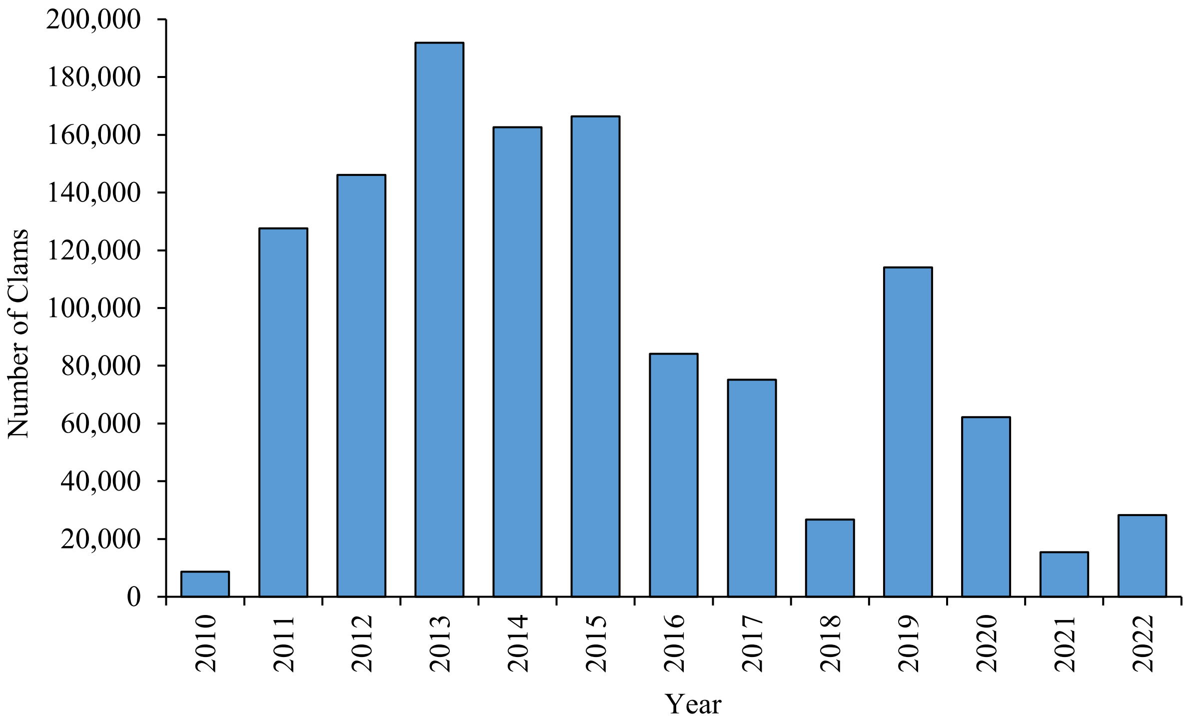

Figure 4. Annual recreational hard clam landings (number of clams) in North Carolina, 2010–2022. Data from 2010 represent a partial year of sampling. No recreational harvest estimates are available in 2023 and 2024 due to disruptions in the survey caused by the implementation of a new licensing system.

As part of Amendment 3 to the Hard Clam FMP adopted by the Marine Fisheries Commission in May of 2025, DMF will further explore potential options and develop a solution to estimate recreational shellfish participation and landings, with the intent to move towards a stock assessment and stock level management for hard clams and to establish a mechanism to provide all recreational shellfish harvesters with Shellfish Sanitation and Recreational Water Quality health and safety information outside of the FMP process.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Sampling of commercial catches of hard clams has been ongoing in the Southern District, Morehead City Office since 1998. Additional sampling of other areas followed later as funding became available for expansion.

The number of hard clam shell lengths from fishery dependent sources from 1999 through 2024 ranged from 114 in 2023 to 10,670 in 2011 (Table 3). Mean shell length ranged from 53 mm (2.10 inches) in 1999 to 70 mm (2.77 inches) in 2020, with a minimum shell length of 27 mm (1.06 inches) to a maximum shell length of 126 mm (4.96 inches) for clams measured from the commercial fishery (Table 3). In 2024, the mean shell length of hard clams caught in the commercial fishery was 2.64 inches, generally consistent with mean shell lengths seen in previous years (Table 3; Figure 5).

Table 3. Observed annual mean, minimum and maximum shell length (inches) of hard clams measured from commercial catches at the dealer, 1999–2024. In the 2025 update, an error from previous updates was corrected, so numbers in this table may be different as compared to hard clam FMP annual updates from prior years.

Year	Mean Shell Length	Min Shell Length	Max Shell Length	Total Number measured
1999	2.10	1.14	3.94	4003
2000	2.43	1.14	4.72	2138
2001	2.62	1.42	4.96	3265
2002	2.51	1.46	4.13	1900
2003	2.45	1.57	4.09	836
2004	2.62	1.57	3.78	1214
2005	2.61	1.81	3.78	304
2006	2.67	1.26	4.02	1558
2007	2.60	1.61	4.37	1405
2008	2.73	1.61	4.72	1383
2009	2.51	1.54	4.41	1859
2010	2.50	1.54	4.09	5358
2011	2.51	1.50	4.37	10670
2012	2.45	1.57	4.29	5851
2013	2.48	1.57	4.25	4750
2014	2.35	1.06	4.53	7447
2015	2.36	1.34	4.37	6218
2016	2.38	1.18	4.13	6460
2017	2.69	1.61	4.57	3420
2018	2.71	1.54	4.06	1946
2019	2.67	1.57	4.17	1786
2020	2.77	1.61	4.06	684
2021	2.64	1.57	4.02	646
2022	2.65	1.69	3.82	418
2023	2.74	1.77	3.54	114
2024	2.64	1.65	3.90	532

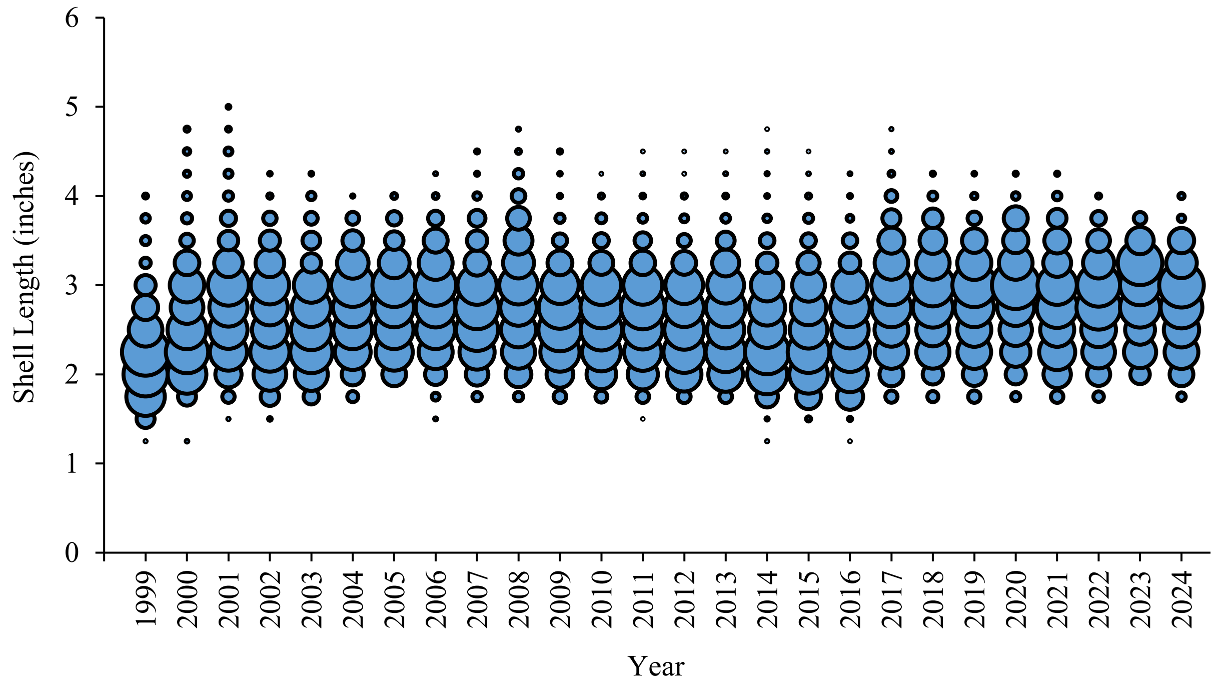

Figure 5. Length frequency (shell length, inches) of hard clams harvested, 1999–2024. Bubbles represent hard clams binned by ¼ inch up to that length and the bubble size is proportional to the number of hard clams at that length. In the 2025 update, an error from previous updates was corrected, so values displayed in this figure may be different compared to hard clam FMP annual updates from prior years.

Fishery-Independent Monitoring

A fisheries-independent monitoring program (Program 640) in Core Sound to provide baseline data on hard clam abundance and gather environmental information was conducted from 2007 to 2023 (Table 4). Thirty randomly selected stations were sampled each year in August within three strata. The three designated strata were: Shellfish Mapping Strata (ST), Known Fishing Areas (FA), and Closed Shellfish Areas (CA). Sampling was performed at each station location within each stratum using small patent tongs with an opening of 0.51 square meters on a 25-ft flat bottom boat. Samples were taken by station with three samples taken per station.

Very few hard clams were caught in this program due to the nature of the gear and random stratified sampling design. The relative abundance, or number of clams per station, ranged annually from 0.03 clams per station in 2023 to 1.27 clams per station in 2009 (Table 4). No trend is apparent from this sampling and due to these concerns coupled with significant safety risks posed by sampling gear, Program 640 was discontinued in 2024 (Figure 6). New fishery-independent programs for monitoring relative abundance of hard clams are being considered by the division.

Table 4. Fishery-independent hard clam sampling (Program 640) annual estimates of relative abundance (number of clams per station) and their standard deviations, 2007–2023 for Core Sound.

Year	Total number of stations	Number of stations with zero catch	Number of hard clams	Relative abundance (Number of clams/station)	Standard deviation
2007	30	22	20	0.67	1.54
2008	31	24	12	0.39	0.80
2009	30	15	38	1.27	1.82
2010	30	19	22	0.73	1.36
2011	30	26	14	0.47	2.03
2012	30	17	21	0.70	1.21
2013	30	25	16	0.53	1.53
2014	30	24	21	0.70	1.78
2015	30	22	15	0.50	0.50
2016	30	22	16	0.53	0.23
2017	30	22	35	1.17	2.57
2018	30	23	8	0.27	0.52
2019	30	23	9	0.30	0.13
2020	30	27	3	0.10	0.31
2021	30	27	6	0.20	0.76
2022	30	27	3	0.10	0.31
2023	30	29	1	0.03	0.03
Mean	30	23	15	0.51	

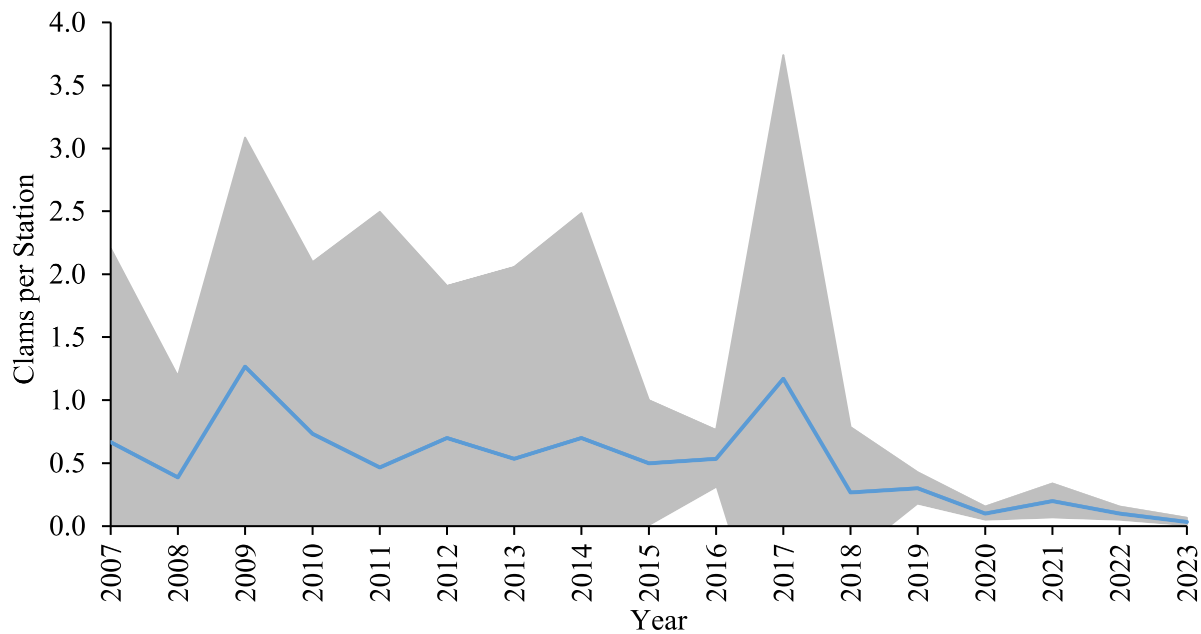

Figure 6. Annual relative abundance (number of clams per station) of hard clams in Core Sound from fishery-independent sampling (Program 640), 2007–2023. Shaded area represents standard deviation. Program 640 was discontinued after 2023 as it ultimately did not provide reliable estimates of hard clam relative abundance and posed significant safety risks to staff.

RESEARCH NEEDS

The specific research recommendations from Amendments 2 and 3, with their priority ranking, are provided below. The prioritization of each research recommendation is designated either High or Medium. A lower ranking does not infer a lack of importance but is either already being addressed by others or provides limited information for aiding in management decisions. A high ranking indicates there is a substantial need, which may be time sensitive in nature, to provide information to help with management decisions. Proper management of the hard clam resource cannot occur until some of these research needs are met. The research recommendations include:

High

- Develop hard clam sampling methodology to monitor regional adult abundance.
- Map and characterize hard clam habitat use by bottom type.
- Develop a survey to better quantify recreational harvest.
- Determine natural mortality estimates.
- Investigate causes of recent clam-kills and overall decline in hard clam abundance in the New River

Medium

- Survey commercial shellfish license holders without a record of landings to estimate hard clam harvest from this group.

MANAGEMENT

There are no management triggers or methods to track stock abundance, fishing mortality, or recruitment between benchmark reviews of the FMP. Landings and effort have decreased over time. There are no data to track the recreational fishery.

Amendment 3 was adopted in May 2025 with rule changes effective June 1, 2028 (Table 5). The selected management strategies of the Marine Fisheries Commission from Amendment 3 for hard clams included:

- Phase out mechanical clam harvest in three years (May 2028) to be consistent with G.S. 113 221 (d) without participation and landing triggers
- Discontinue allowance for mechanical clam harvest in conjunction with maintenance dredging upon adoption of this plan
- Support the DMF to further explore potential options and develop a solution to estimate recreational shellfish participation and landings, with the intent to move towards a stock assessment and stock level management for both hard clams and oysters; and to establish a mechanism to provide all recreational shellfish harvesters with Shellfish Sanitation and Recreational Water Quality health and safety information outside of the FMP process.

Additionally, Amendment 3 included the following management measures carried forward from Amendment 2:

- Daily harvest limit for recreational purposes is 100 clams per person per day not to exceed 200 per clams per vessel per day.
- Maintain shading requirements for clams on a vessel, during transport to a dealer, or storage on a dock during June through September. These requirements would be implemented as a public health protection measure under 15A NCAC 03K .0110.
- Maintain management of the Ward Creek Shellfish Management Area as described in the Hard Clam FMP Amendment 1.

- Maintain current daily mechanical Hard Clam harvest limits by waterbody (Table 1).
- Institute a resting period within the mechanical clam harvest area in the northern part of Core Sound.
- Take latitude/longitude coordinates of the poles marking the open mechanical clam harvest area boundary in the New River, still with the flexibility to move a line to avoid critical habitats.
- Maintain management of the mechanical clam harvest in existing areas from Core Sound south to Topsail Sound, including modifications to the mechanical clam harvest lines to exclude areas where oyster habitat and submerged aquatic vegetation (SAV) habitat exist based on all available information.

Table 5. Summary of MFC selected management strategies from Amendment 3 of the N.C. Hard Clam Fishery Management Plan.

Management Strategies	Implementation Status
MANAGEMENT OF PUBLIC BOTTOM	
Continue the daily harvest limit for recreational purposes at 100 clams per person per day not to exceed 200 per clams per vessel per day (NCDMF 2017).	No action required
Maintain management of the Ward Creek Shellfish Management Area as described in the Hard Clam FMP Amendment 1 (NCDMF 2008).	No action required
MECHANICAL HARVEST	
Phase out mechanical clam harvest in three years (May 2028) to be consistent with G.S. 113 221 (d) without participation and landing triggers	Existing proclamation authority; will begin in May 2028
Discontinue allowance for mechanical clam harvest in conjunction with maintenance dredging upon adoption of this plan	
Maintain management of the mechanical clam harvest in existing areas from Core Sound south to Topsail Sound, including modifications to the mechanical clam harvest lines to exclude areas where oyster habitat and SAV habitat exist based on all available information (NCDMF 2017).	No action required
Take latitude/longitude coordinates of the poles marking the open mechanical clam harvest area boundary in the New River, still with the flexibility to move a line to avoid critical habitats (NCDMF 2017).	Completed in 2015
Maintain current daily mechanical Hard Clam harvest limits by waterbody (NCDMF 2017).	No action required
Institute a resting period within the mechanical clam harvest area in the northern part of Core Sound.	No action required
ENVIRONMENT AND PUBLIC HEALTH	
Maintain shading requirements for clams on a vessel, during transport to a dealer, or storage on a dock during June through September. These requirements would be implemented as a public health protection measure under 15A NCAC 03K .0110 (NCDMF 2017).	Existing proclamation authority, implemented beginning April 1, 2017

Management Strategies	Implementation Status
RECREATIONAL HARVEST	
Support the DMF to further explore potential options and develop a solution to estimate recreational shellfish participation and landings, with the intent to move towards a stock assessment and stock level management for both hard clams and oysters; and to establish a mechanism to provide all recreational shellfish harvesters with Shellfish Sanitation and Recreational Water Quality health and safety information outside of the FMP process.	Ongoing

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

The Marine Fisheries Commission adopted Amendment 3 to the North Carolina Hard Clam Fishery Management Plan in May of 2025. All management strategies in Amendment 3 will be maintained and implemented as outlined in the state FMP, with mechanical clam harvest phase out to be completed in May of 2028. The next scheduled comprehensive review of this plan will begin in July of 2030.

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FISHERY MANAGEMENT PLAN UPDATE
KINGFISHES
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	November 2007
Amendments:	None
Revisions:	None
Supplements:	None
Information Updates:	December 2015 August 2020
Schedule Changes:	None
Comprehensive Review:	2025

The original 2007 North Carolina Kingfish Fishery Management Plan (FMP) developed management strategies that ensure a long-term sustainable harvest for recreational and commercial fisheries in North Carolina. The plan established the use of trend analysis and management triggers to monitor the viability of the stock. The N.C. Marine Fisheries Commission (NCMFC) also approved a rule which included proclamation authority for the North Carolina Division of Marine Fisheries (NCDMF) Director to impose restrictions on season, areas, quantity, means and methods, or size of kingfish (NCMFC Rule 15A NCAC 03M .0518), if needed. An Information Update was completed for the Kingfish FMP in November 2015. The best available data and techniques used for the trend analysis and management triggers were refined and modified to better assess population trends as part of the 2015 Information Update. The annual FMP Update in 2020 served as the formal review of the Kingfish FMP. The next review will begin in July 2025.

Management Unit

The Kingfish FMP includes the kingfishes in all coastal fishing waters of North Carolina. The fishery includes three species: southern kingfish (*Menticirrhus americanus*), gulf kingfish (*M. littoralis*), and northern kingfish (*M. saxatlis*). Southern kingfish is designated as the indicator species for this assemblage. The management unit identified in this plan does not encompass the entire unit stock range for any of the three species of kingfishes inhabiting North Carolina. For this reason, a state-specific stock assessment cannot be conducted, and a regional stock assessment approach is recommended as the most appropriate mechanism for determining stock status and the long-term viability of these stocks (NCDMF 2007).

Goal and Objectives

The goal of the 2007 Kingfish FMP was to determine the health of the stocks and ensure the long-term sustainability of the kingfish stocks in North Carolina (NCDMF 2007). 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 that the spawning stock is of sufficient capacity to prevent recruitment overfishing.
- Address socio-economic concerns of all user groups.
- Restore, improve, and protect critical habitats that affect growth, survival, and reproduction of the North Carolina stock of kingfishes.

- Evaluate, enhance, and initiate studies to increase our understanding of kingfishes' biology and population dynamics in North Carolina.
- Promote public awareness regarding the status and management of the North Carolina kingfishes stocks.

DESCRIPTION OF THE STOCK

Biological Profile

Three species of kingfishes occur in North Carolina: southern, gulf, and northern. Kingfish refers to a single species while kingfishes refers to multiple species. Kingfishes are demersal (live near and feed on the bottom) members of the drum family. Southern kingfish is the most abundant kingfish species from North Carolina to the east coast of Florida and Gulf of Mexico with a range extending as far as Cape May, New Jersey southward to Buenos Aires, Argentina. Northern kingfish is the most abundant kingfish species from Massachusetts to North Carolina, with a range extending from the Gulf of Maine into the Gulf of Mexico. Gulf kingfish is the most abundant kingfish species in the surf zone south of Cape Hatteras, North Carolina, and has a range extending from Virginia to Rio Grande, Brazil. The northern and southern kingfishes prefer mud or sand-mud bottom types while gulf kingfish prefer the sandy bottoms of the surf zone. Kingfishes move from estuarine and nearshore ocean waters to deeper offshore waters as water temperature cools. Spawning takes place in the ocean from April to October. The kingfishes have several regional names including sea mullet, king whiting, king croaker, sea mink, roundhead, hard head, whiting, hake, Carolina whiting, and Virginia mullet.

Stock Status

The stocks of kingfishes are unassessed, thus overfishing and overfished status cannot be determined. A coast-wide stock assessment is a high research priority that needs to be addressed before biological reference points relative to overfished and overfishing can be determined.

Stock Assessment

A quantitative stock assessment is not available for kingfishes in North Carolina; therefore, no determination can be made relative to an overfishing or overfished status. Prior attempts at a stock assessment during the 2007 FMP development were not successful, primarily due to limited data. From these prior attempts, all reviewers noted a lack of migration (mixing) data to determine the movement patterns of kingfishes along North Carolina and the entire Atlantic coast. A regional (multi-state) stock assessment approach is likely needed to best determine the stock status for kingfishes along the Atlantic coast including North Carolina. In 2008 and 2014, Atlantic States Marine Fisheries Commission (ASMFC) South Atlantic Board met to consider regional management by reviewing data on kingfishes. However, due to no major concerns with kingfish stocks, it was decided no further action was necessary. As a result, kingfishes management in North Carolina continues to fall solely within the framework of the state FMP process.

The 2007 Kingfish FMP selected the use of trend analysis with management triggers as the management strategy to monitor the viability of the kingfish stocks in North Carolina (NCDMF 2007). During the review of the 2007 Kingfish FMP as part of the 2015 FMP Information Update and 2020 FMP Information Update, best available data and techniques used for the trend analysis and management triggers were refined and modified to better assess population trends. The trend analysis incorporates management triggers to alert the NCDMF and NCMFC to the potential need for management action based on stock conditions. The activation of any two management triggers (regardless of trigger category) two years in a row warrants further evaluation of the data and potential management action. The analysis is updated each year and all trends relative to management triggers are provided as part of this annual update. Current management triggers based on southern kingfish use fishery independent indices of relative abundance for young-of-year (YOY) and adult fish, the proportion of adults greater than size at 50% maturity (L50), and a relative fishing mortality index. Young-of-year fish includes new fish that enter the population that year. L50 is the length at which 50% of the adult population is sexually mature and ready to spawn.

DESCRIPTION OF THE FISHERY

Current Regulations

For shrimp or crab trawls, there is a three-hundred-pound trip limit for kingfishes south of Bogue Inlet from December 1 through March 31 (NCMFC Rule 15A NCAC 03J .0202 (5)). No other harvest limits are in place specific to kingfishes in any other fisheries.

Commercial Fishery

Commercial landings for kingfishes include southern, northern, and gulf kingfishes combined. Landings have fluctuated historically but have generally been increasing since 2018. However, in 2024, landings (630,953 pounds) decreased 24.5% from 2023 (835,594 pounds; Table 1; Figure 1). The average landings from 2012 to 2024 was 737,618 pounds. Harvest of kingfishes is seasonal with peak landings in April and November. Peaks in landings coincide with seasonal movements of kingfishes along the Atlantic coast.

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of kingfishes from North Carolina for the period 2012–2024.

	Recreational			Commercial	
Year	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
2012	3,444,198	3,665,650	1,868,626	596,249	2,464,875
2013	5,878,620	6,069,055	2,914,871	605,953	3,520,824
2014	5,545,372	6,959,626	3,474,746	955,087	4,429,833
2015	5,503,438	4,850,505	3,112,815	784,753	3,897,568
2016	4,149,467	4,076,760	2,245,869	839,001	3,084,870
2017	3,387,471	4,075,827	2,023,647	942,946	2,966,593
2018	1,731,339	2,180,732	1,101,203	407,201	1,508,404
2019	3,370,636	4,152,005	1,972,754	703,288	2,676,042
2020	3,865,040	3,461,090	2,428,095	641,166	3,069,261
2021	8,425,767	5,593,293	5,495,468	808,066	2,391,698
2022	5,594,759	4,197,190	3,253,978	838,784	4,092,762
2023	3,003,876	2,817,382	1,826,559	835,588	2,662,150
2024	3,041,110	3,874,384	2,141,436	630,953	2,772,389
Mean	4,380,084	4,305,654	2,604,621	737,618	3,041,328

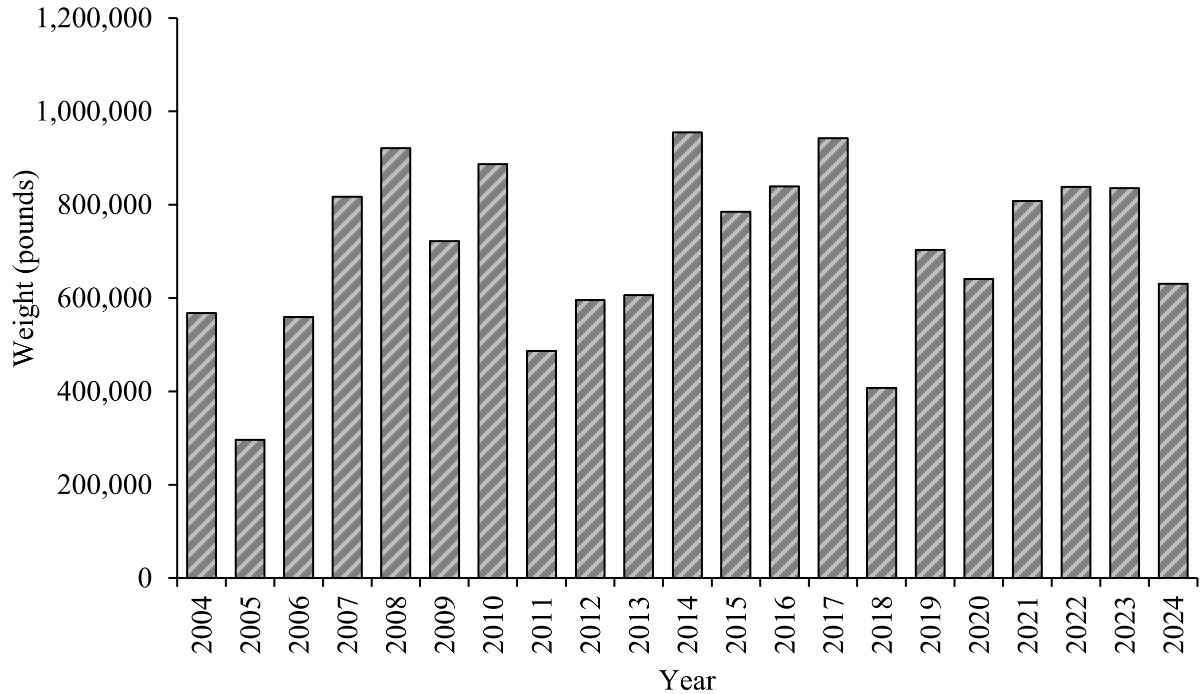

Figure 1. Commercial landings (pounds) of kingfishes reported through the North Carolina Trip Ticket Program, 2004–2024.

Recreational Fishery

Recreational landings of kingfishes are estimated from the Marine Recreational Information Program (MRIP). Recreational estimates across all years have been updated and are now based on the new Fishing Effort Survey-based calibrated estimates. For more information on MRIP see here.

Recreational landings for kingfishes include southern, northern, and gulf kingfishes. A portion of landings are reported to MRIP as kingfish at the genus level. When calculating total landings, a weighted average across the three species was used to calculate the weight for unidentified kingfish for total landings. Total recreational landings have fluctuated but have been generally increasing since 2018 (Table 1; Figure 2). Low landings in 2018 were likely due to impacts from Hurricane Florence. In 2024, recreational landings (2,141,436 pounds) increased 17.2% from 2023 (1,826,559 pounds; Table 1; Figure 2). The average recreational landings from 2012–2024 was 2,604,621 pounds. Most kingfishes are landed from the ocean and are caught from man-made structures, such as piers, jetties, or bridges, or from beaches. A smaller portion of kingfishes are caught in estuarine waters by anglers fishing from private vessels. Recreational harvest of kingfishes is seasonal with most fish harvested during the spring and the fall, and the lowest numbers harvested during the summer.

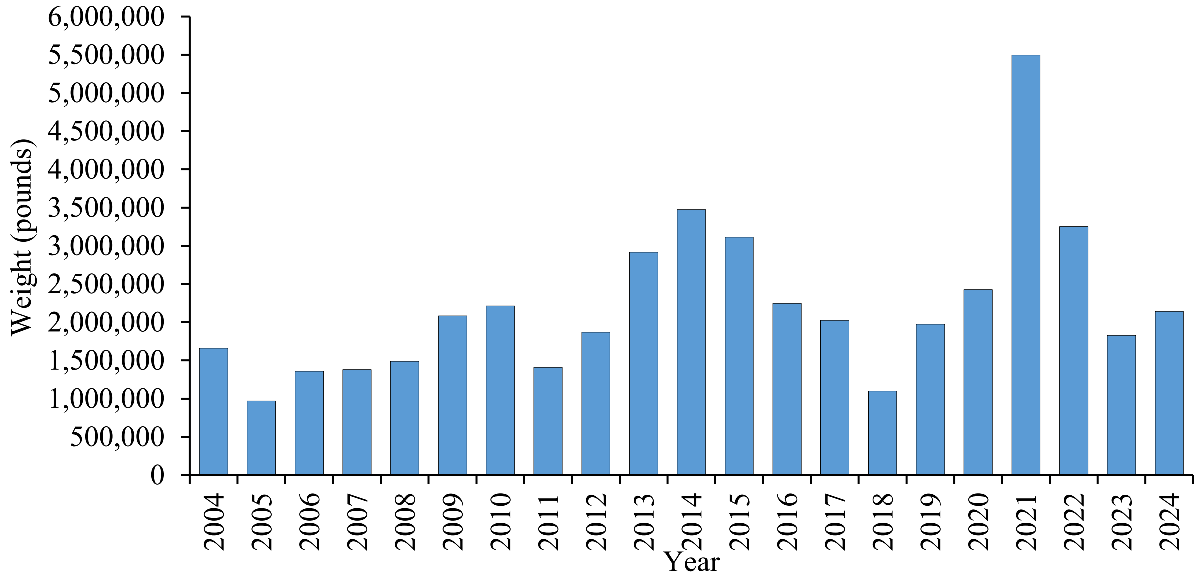

Figure 2. Recreational landings (Type A + B1; pounds) of kingfishes estimated from the Marine Recreational Information Program survey for North Carolina from 2004–2024.

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 were awarded for kingfishes landed larger than one and one-half pounds prior to May 1, 2021, and since then have been awarded to kingfishes landed larger than two pounds. Citations awarded through the North Carolina Saltwater Fishing Tournament for kingfishes have varied by year throughout the time series (1991–2024), averaging 225 citations (Figure 3). The number of citations awarded in 2024 (159 citations) increased sharply to more than four times the number of citations awarded in the previous year (39 citations in 2023). The decrease in awarded citations beginning in 2021 may be partially due to the increase in weight required to qualify for a citation effective May 1, 2021.

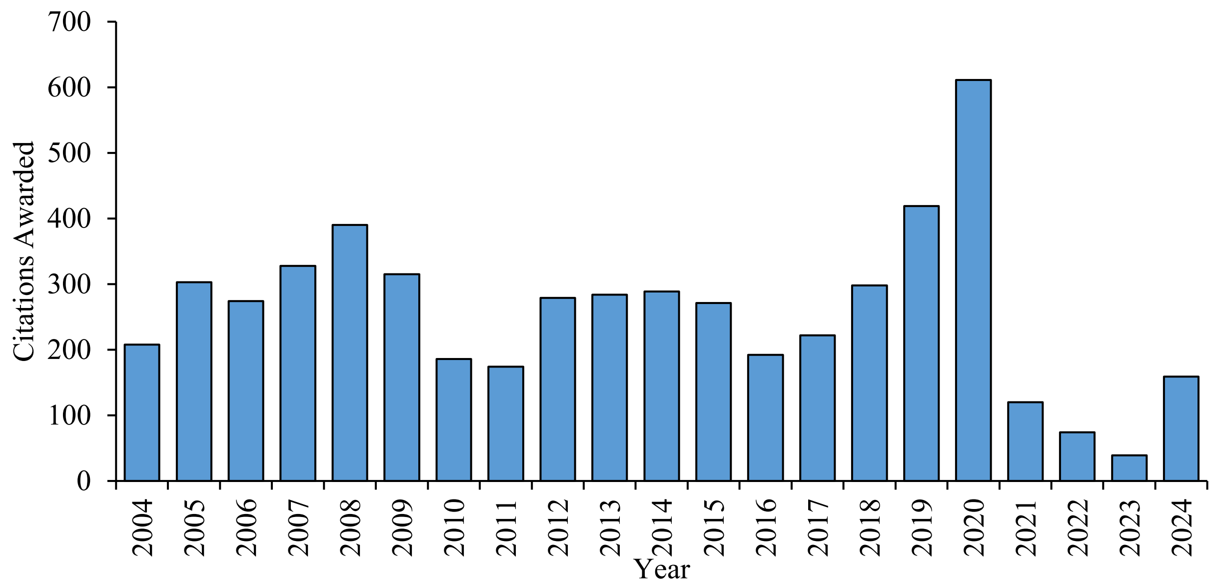

Figure 3. North Carolina Saltwater Fishing Tournament citations awarded for kingfishes, 2004–2024. Citations are awarded for kingfishes > two pounds landed. Prior to May 1, 2021, citations were awarded for kingfishes > one and one-half pounds landed.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Kingfishes are sampled from a variety of commercial fishery surveys, including the estuarine long haul, ocean trawl, pound net, ocean gill net, estuarine gill net, and ocean beach seine fisheries in North Carolina. No Kingfish were sampled from the shrimp trawl fishery; however, the length frequencies typically observed in that fishery were similar to those from the estuarine long haul fishery. Therefore, length distributions from the estuarine long haul fishery were applied to the landings associated with the shrimp trawl fishery. A total of 33,631 kingfishes were measured from 2013 to 2024 (29,441 southern, 2,081 northern and 2,109 gulf; Table 2; Figure 4). Mean total length for southern kingfish ranged from 11.3 to 12.0 inches, with a minimum of 6.5 inches and a maximum of 24.8 inches. Mean length for northern kingfish ranged from 12.1 to 14.1 inches, with a minimum of 8.1 inches and a maximum of 18.6 inches. Mean length for gulf kingfish ranged from 12.0 to 12.9 inches with a minimum of 6.4 inches and a maximum of 18.3 inches. The length composition and modal length of kingfishes caught in the commercial fishery has been stable since 2004 (Figure 4). Most of the commercial catch consists of kingfishes from 10 to 12 inches total length (Figure 4). The length frequency distribution of kingfishes harvested in the commercial and recreational fisheries are generally similar; however, recreational anglers harvested a wider length range of kingfishes in 2024 (Figure 5). In 2023, unidentified kingfish were not included in the length-frequency proportions. In 2024, unidentified kingfish accounted for 76% (2,304,630) of the total kingfish recreational landings (3,041,110) and omitting them significantly impacted the recreational-commercial length-frequency proportions, so they were included in Figure 5.

Recreational lengths are collected as part of MRIP by recreational port agents. A total of 5,144 kingfishes were measured from 2013 to 2024 (3,974 southern, 110 northern and 1,060 gulf; Table 3; Figure 6). Mean total length for southern kingfish ranged from 10.4 to 12.1 inches, with a minimum of 6.1 inches and a maximum of 19.9 inches. Mean length for northern kingfish ranged from 9.2 to 13.2 inches, with a minimum of 6.2 inches and a maximum of 14.8 inches. Mean length for gulf kingfish ranged from 10.4 to 12.2 inches, with a minimum of 4.4 inches and a maximum of 17.2 inches. The length composition and modal length of kingfishes caught in the recreational fishery has been stable since 2004 (Figure 6). Most of the recreational catch consists of kingfishes from 8 to 12 inches (Figure 6).

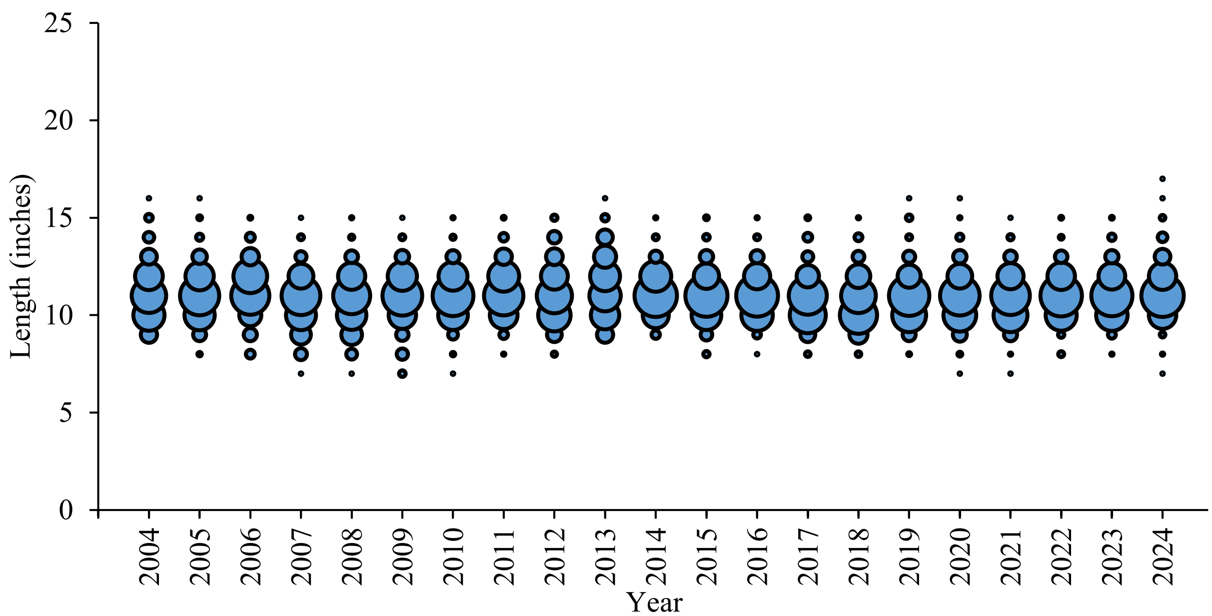

Figure 4. Commercial total length frequency of kingfishes harvested, 2004–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

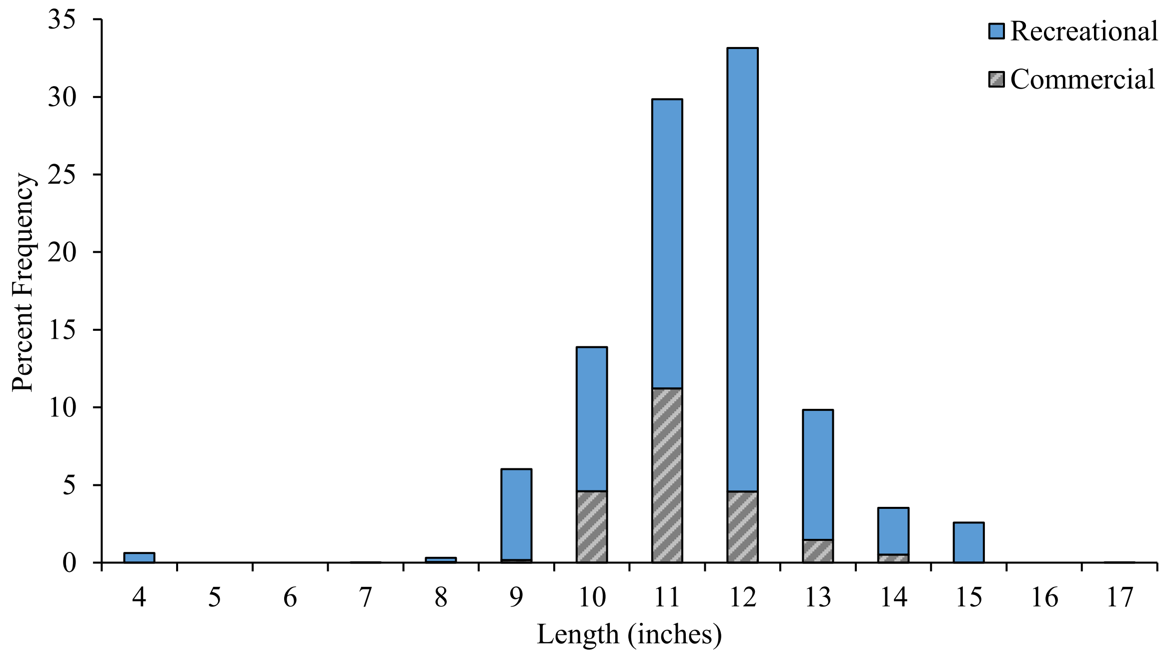

Figure 5. Commercial and recreational total length frequency distribution of kingfishes harvested in 2024.

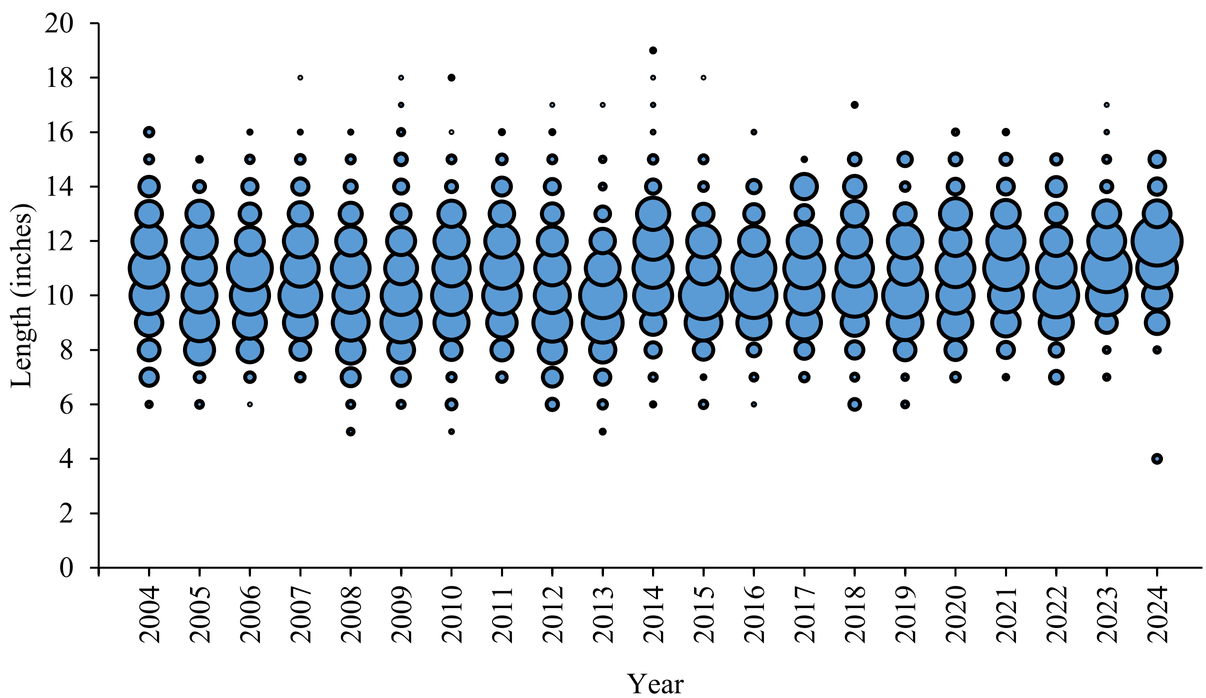

Figure 6. Recreational total length frequency of kingfishes harvested, 2004–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Table 2. Summary of length data (total length, inches) sampled from kingfishes in the commercial fishery, 2013– 2024.

Southern Kingfish				
Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2013	12.0	6.5	16.1	1,357
2014	11.8	8.3	20.9	2,831
2015	11.7	7.7	15.8	3,276
2016	11.9	7.1	17.2	3,095
2017	11.4	7.9	16.1	2,486
2018	11.3	6.8	16.1	1,254
2019	11.4	8.0	24.8	4,342
2020	11.4	7.8	20.0	2,086
2021	11.4	7.5	16.0	2,485
2022	11.6	7.9	17.9	2,516
2023	11.7	7.9	20.7	1,950
2024	11.6	7.5	15.6	1,763
Northern Kingfish				
Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2013	13.2	8.6	16.0	754
2014	13.3	10.9	16.7	155
2015	12.7	10.0	16.6	84
2016	12.4	8.8	17.0	213
2017	13.4	10.0	17.4	165
2018	14.1	12.4	17.7	56
2019	12.1	8.1	16.1	148
2020	13.5	10.0	18.6	175
2021	13.5	9.9	18.4	153
2022	13.2	10.6	18.0	29
2023	12.9	10.8	15.6	69
2024	13.5	11.2	17.5	80
Gulf Kingfish				
Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2013	12.9	9.7	17.4	469
2014	12.2	9.2	15.5	181
2015	12.8	10.6	16.3	161
2016	12.4	8.1	18.3	192
2017	12.3	9.4	16.7	256
2018	12.5	9.0	18.0	160
2019	12.0	8.9	16.9	154
2020	12.8	9.3	17.0	130
2021	12.7	6.4	16.8	138
2022	12.5	10.5	16.1	80
2023	12.8	8.6	17.1	152
2024	12.2	10.6	14.3	36

Table 3. Summary of length data (total length, inches) sampled from kingfishes in the recreational fishery, 2013–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
Southern Kingfish				
2013	10.4	6.1	15.8	370
2014	11.7	7.8	19.9	383
2015	10.7	6.4	18.7	258
2016	11.2	7.8	16.5	490
2017	11.0	7.8	15.4	472
2018	11.5	7.8	15.2	290
2019	10.9	6.3	15.7	374
2020	11.2	7.6	16.9	467
2021	11.5	7.5	16.1	347
2022	11.0	7.5	15.6	256
2023	11.6	8.8	16.4	179
2024	12.1	8.1	15.4	88
Northern Kingfish				
Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2013	10.9	6.2	14.8	26
2014	11.2	9.3	13.5	2
2015	10.9	8.5	14.1	7
2016	10.8	7.9	11.8	3
2017	13.2	9.8	14.4	24
2018	9.2	6.4	13.1	2
2019	10.9	10.9	10.9	1
2020	11.7	10.7	12.4	7
2021	10.6	8.3	13.1	15
2022	11.1	8.3	13.7	12
2023	11.7	10.5	13.9	6
2024	13.0	10.5	14.2	5
Gulf Kingfish				
Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2013	10.4	6.0	17.2	180
2014	11.5	6.5	17.2	203
2015	11.3	8.5	16.0	63
2016	10.7	6.9	14.1	81
2017	12.1	7.5	15.8	126
2018	11.6	6.5	17.1	83
2019	11.1	6.2	15.0	72
2020	12.1	7.4	16.0	92
2021	12.2	7.9	15.5	44
2022	11.5	7.8	15.2	65
2023	11.1	7.6	17.1	26
2024	11.2	4.4	15.7	25

Fishery-Independent Monitoring

Fishery-independent data are collected through the NCDMF Pamlico Sound Survey (Program 195), the Southeast Area Monitoring and Assessment Program – South Atlantic (SEAMAP-SA) Coastal Trawl Survey and the NCDMF Independent Gill Net Survey (Program 915).

Pamlico Sound Survey

The Pamlico Sound Survey catches the most kingfishes of the NCDMF fishery independent sampling programs, and the majority of those are southern kingfish. This survey has been running uninterrupted since 1987. From 1991 to present, the Pamlico Sound Survey has been conducted during the middle two weeks in June and September. The stations sampled are randomly selected from strata based upon depth and geographic location. The sample area covers all of Pamlico Sound, Croatan Sound up to the Highway 64 Bridge, the Pamlico River up to Blounts Bay, the Pungo River up to Smith Creek, and the Neuse River up to Upper Broad Creek. However, since most kingfishes are caught in Pamlico Sound, only those stations are used for the associated triggers.

The June portion of the Pamlico Sound Survey is used to calculate an annual maturity index tracking the proportion of adults larger than the length at which 50% of the adult population is sexually mature (L50, southern kingfish = 8.25 inches TL). This index has been variable throughout the time series; however, southern kingfish abundance generally increased through 2003, then entered a more stable lower period from 2004 through 2019 (Table 4; Figure 7). During 2020 and 2021, sampling was impacted during June due to the COVID-19 pandemic. All stations were not sampled as only day trips were permitted. In June 2020, 15 of the 41 stations used in the L50 index were sampled, and in June 2021, 22 of the 41 stations used in the L50 index were sampled. Thus, the L50 indices may not be representative of the population and were not included for those years. In 2022, the L50 index abundance was the highest on record (0.79) since 2003, decreased in 2023 to 0.48, then increased again in 2024 to 0.73 (Table 4; Figure 7).

The September portion of the Pamlico Sound Survey is used to calculate an annual YOY index of relative abundance because YOY southern kingfish are more abundant in the fall. Similar to the L50 abundance index, the YOY relative abundance in 2020 and 2021 is not included due to the COVID-19 pandemic impacting sampling. The Pamlico Sound Survey YOY relative abundance index peaked in 2009, was on a decreasing trend through 2016, and has remained low since then, dropping significantly in 2024 (Table 4; Figure 8).

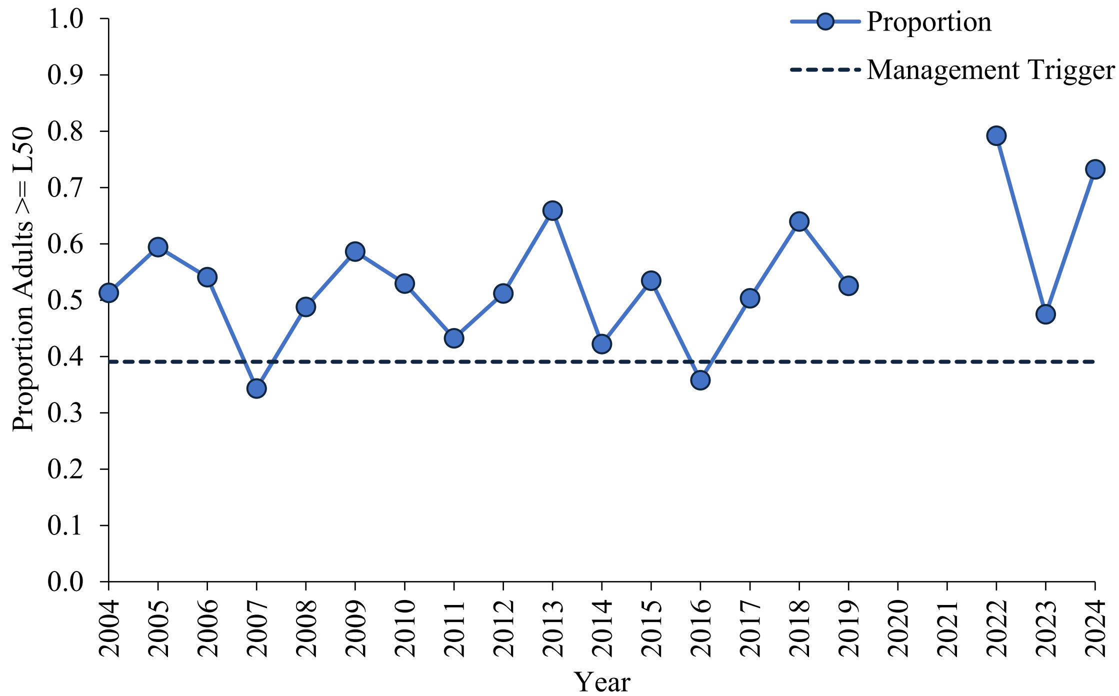

Figure 7. Annual proportion of adults (southern kingfish) greater than or equal to the length at 50% maturity occurring in the June component of the NCDMF Program 195 survey (excluding strata from the Neuse, Pamlico, and Pungo rivers), 2004–2024. The dotted line represents 2/3 of the average of the base years, 1987–2017. *Data for 2020 and 2021 are not included due to incomplete sampling in those years.

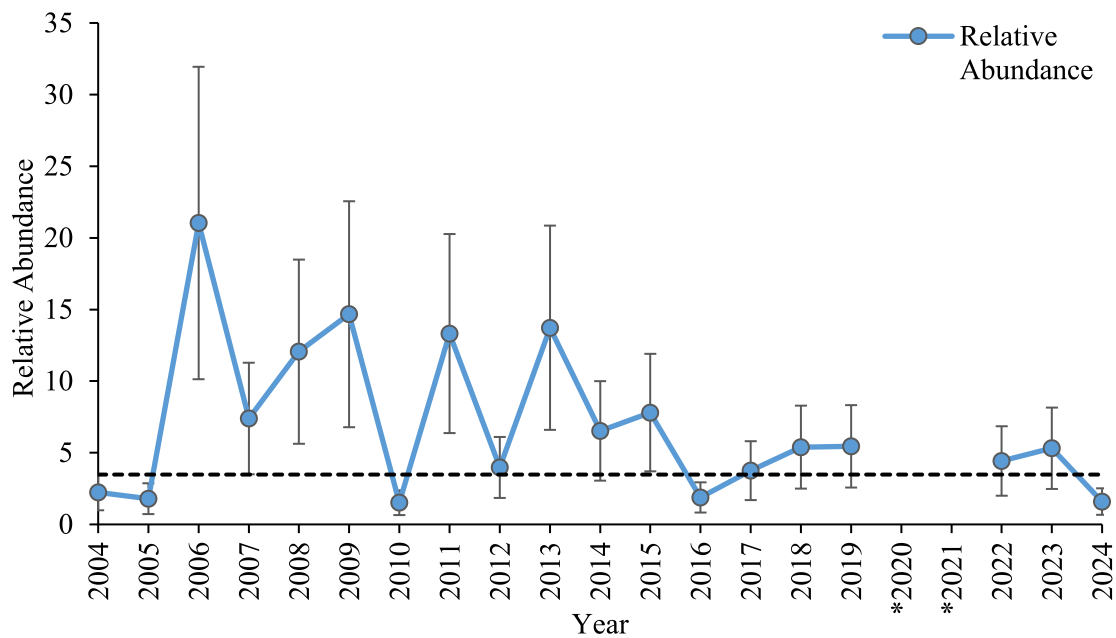

Figure 8. Annual index of relative YOY abundance for southern kingfish derived from the September component of the NCDMF Program 195 survey (excluding strata from the Neuse, Pamlico, and Pungo rivers), 2004–2024. The dotted line represents 2/3 of the average of the base years, 1987–2017. *Data for 2020 and 2021 are not included due to incomplete sampling in those years.

Table 4. Summary of management triggers organized by category. Bold values indicate years a trigger was activated.

Year	Biological Monitoring			Fisheries-Independent Surveys			Other
	Proportion of Adults >= L50			YOY Indices		Adult Index	
	Program 195 June	Program 915 July–September	SEAMAP Summer	Program 195 September	SEAMAP Fall	SEAMAP Summer	Relative *F*
2012	0.51	1.00	**0.37**	3.98	**13.42**	46.80	6,870
2013	0.66	0.95	0.56	13.73	**16.02**	28.74	9,275.5
2014	0.42	0.98	0.54	6.53	**13.36**	28.25	31,893
2015	0.53	0.98	0.56	7.81	325.06	24.56	12,124
2016	**0.36**	0.95	**0.35**	**1.88**	28.45	22.01	3,790
2017	0.50	0.96	0.68	3.75	26.23	10.84	2,468
2018	0.64	1.00	0.40	5.39	**6.60**	11.99	5,765
2019	0.53	0.97	0.45	5.45	32.91	34.22	6,417
2020	*	*	*	*	*	*	*
2021	*	1.00	*	*	32.60	*	*
2022	0.79	1.00	0.77	4.43	35.58	**8.95**	15,256
2023	0.48	1.00	0.73	5.31	**2.97**	**7.98**	**156,027**
2024	0.73	0.98	0.75	**1.60**	**1.30**	**1.50**	**1,009,650**
Threshold	<0.39	<0.65	<0.39	<3.48	<17.73	<10.36	>40,723
Total Years	36	23	34	36	35	34	33
Years Trigger Activated	3	0	5	14	21	14	9

<u>SEAMAP-SA Coastal Trawl Survey</u>

The Southeast Area Monitoring and Assessment Program-South Atlantic (SEAMAP-SA) Coastal Trawl Survey is conducted by the South Carolina Department of Natural Resources-Marine Resources Division and provides long-term fishery independent data on the distribution and relative abundance of coastal species (Cowen and Zimney 2016). Historically, SEAMAP-SA Coastal Trawl Survey cruises were conducted each year in spring (April to the end of May), summer (mid-July to mid-August), and fall (September to mid-November). Beginning in 2023, sampling for the survey is conducted during spring/summer (April–June) and summer/fall (August–October). In 2024, the survey transitioned to a new vessel, which necessitated the use of a smaller trawl net. The change also imposed constraints on the timing and geographic scope of the survey. The spring (April–May) portion of the SEAMAP-SA Coastal Trawl Survey is used to calculate a relative fishing mortality (F) index. The summer (July–August) portion of SEAMAP-SA Coastal Trawl Survey is used to calculate an annual adult index of abundance as well as an annual maturity index. The fall (September–November) portion of SEAMAP-SA Coastal Trawl Survey is used to calculate an annual YOY index of abundance. After a peak in 2012, the SEAMAP-SA Coastal Trawl Survey adult index of relative abundance has been on a declining trend, which continued until 2017, peaking again in 2019 and then declining in 2022, 2023, and 2024 (Table 4; Figure 9). The YOY index of relative abundance increased to well above the average in 2015 and has since dropped well below the average in 2023 and 2024 (Table 4; Figure 10). The L50 index has fluctuated throughout the time series, ranging from 0.28 to 0.93, but was well above the average in 2022, 2023, and 2024 (Table 4; Figure 11). Relative F was generally on a declining trend since a peak in 2000 but increased again and reached the maximum level in the time-series in 2024 (Table 4; Figure 12). The survey did not occur in 2020 or in spring and summer of 2021, due to the COVID-19 pandemic.

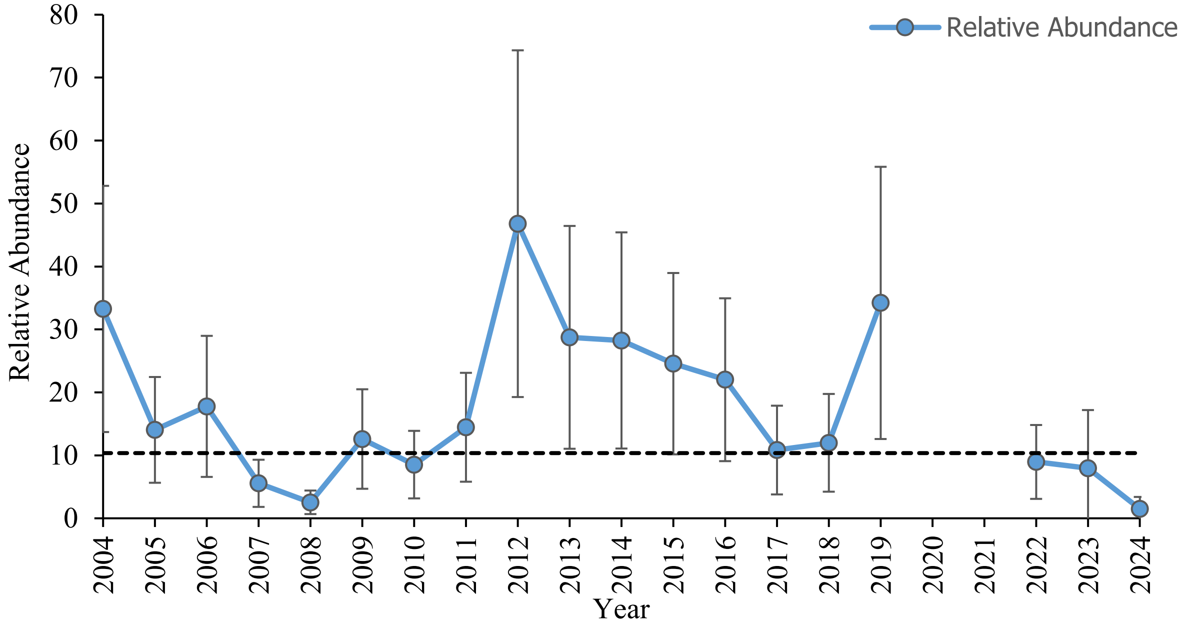

Figure 9. Annual index of relative adult abundance for southern kingfish derived from the summer component of the SEAMAP-SA Coastal Trawl Survey (Onslow, Raleigh, and Long bays, inner—shallow—strata), 2004–2024. The summer component of the survey was not conducted in 2020 or 2021. The dotted line represents 2/3 of the average of the base years, 1989–2017.

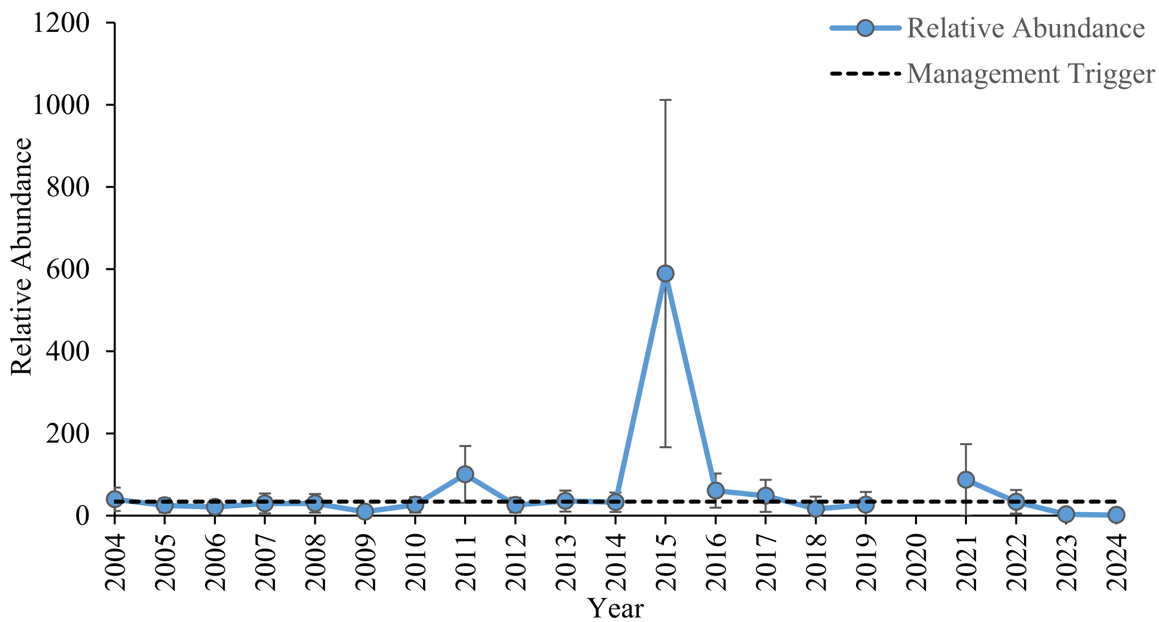

Figure 10. Annual index of relative YOY abundance for southern kingfish derived from the fall component of the SEAMAP-SA Coastal Trawl Survey (Onslow, Raleigh, and Long bays, inner—shallow—strata), 2004–2024. The fall component of the survey was not conducted in 2020. The dotted line represents 2/3 of the average of the base years, 1989–2017.

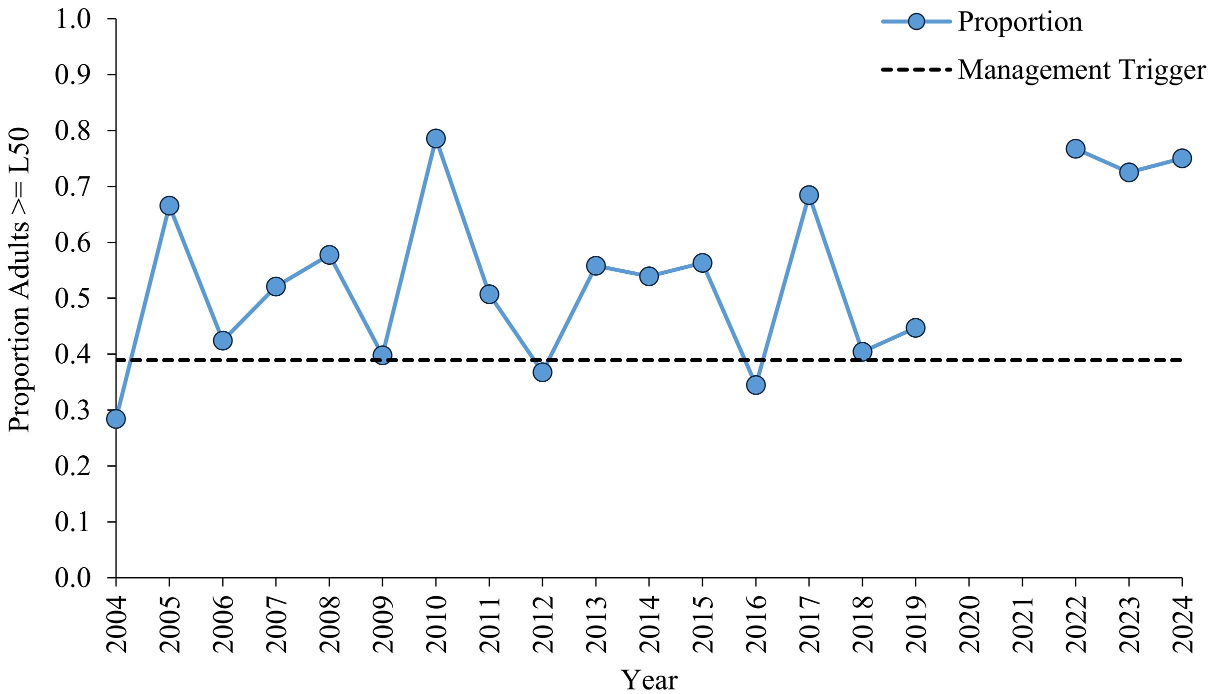

Figure 11. Annual proportion of adults (southern kingfish) greater than or equal to the length at 50% maturity occurring in the summer component of the SEAMAP-SA Coastal Trawl Survey (Onslow, Raleigh, and Long bays, inner—shallow—strata), 2004–2024. The summer component of the survey was not conducted in 2020 or 2021. The dotted line represents 2/3 of the average of the base years, 1989–2017.

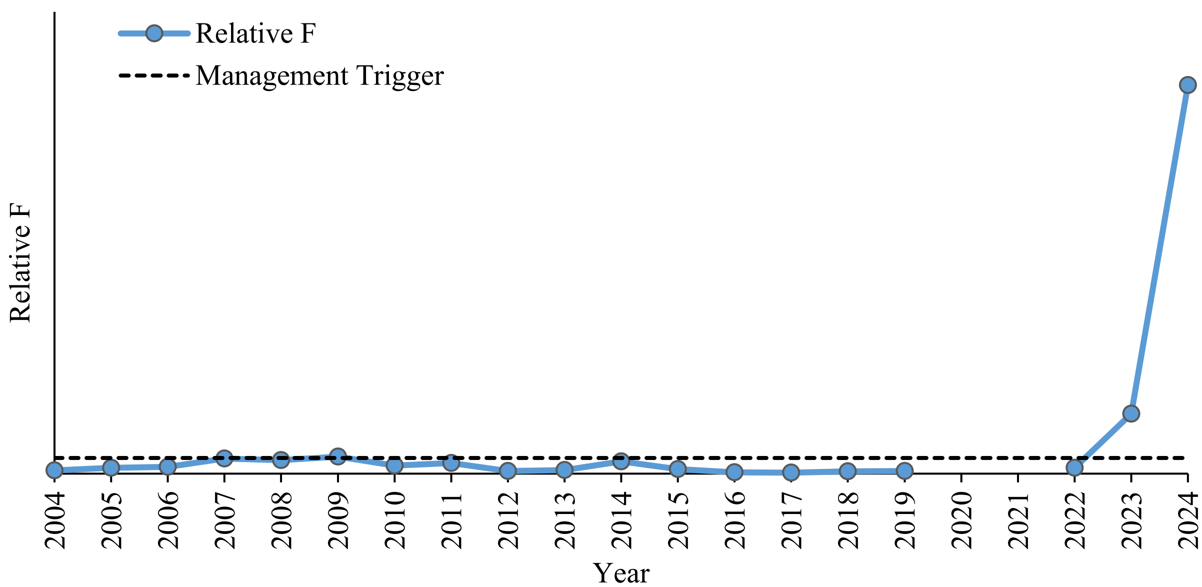

Figure 12. Relative F, as estimated as harvest (commercial and recreational) divided by the SEAMAP-SA Coastal Trawl Survey spring index (Onslow, Raleigh, and Long bays, inner—shallow—strata) of relative abundance for southern kingfish, 1990–2024. The spring component of the survey was not conducted in 2020 or 2021. The dotted line represents the average plus 1/3 of the average of the base years, 1990–2017.

<u>Independent Gill Net Survey</u>

The Independent Gill Net Survey (Program 915) is designed to characterize the size and age distribution for key estuarine species in Pamlico Sound and its major river tributaries. Sampling began in Pamlico Sound in 2001 and was expanded to the current sampling area (including tributaries) in 2003. Gill net sets are determined using a random stratified survey design, based on area and water depth. The Program 915 maturity index management trigger is based on a conservative proportion of adults in the population from July through September. During 2020 no maturity index was available for southern kingfish from the Independent Gill Net Survey (Program 915). Sampling in Program 915 was suspended in February 2020 due to COVID-19 restrictions and protected species interactions, so no 2020 maturity index was available from this program. Program 915 sampling resumed in July 2021. The L50 index has been stable over the time series, ranging from 0.947 to 1.00, and has never fallen below the management trigger threshold (Figure 13).

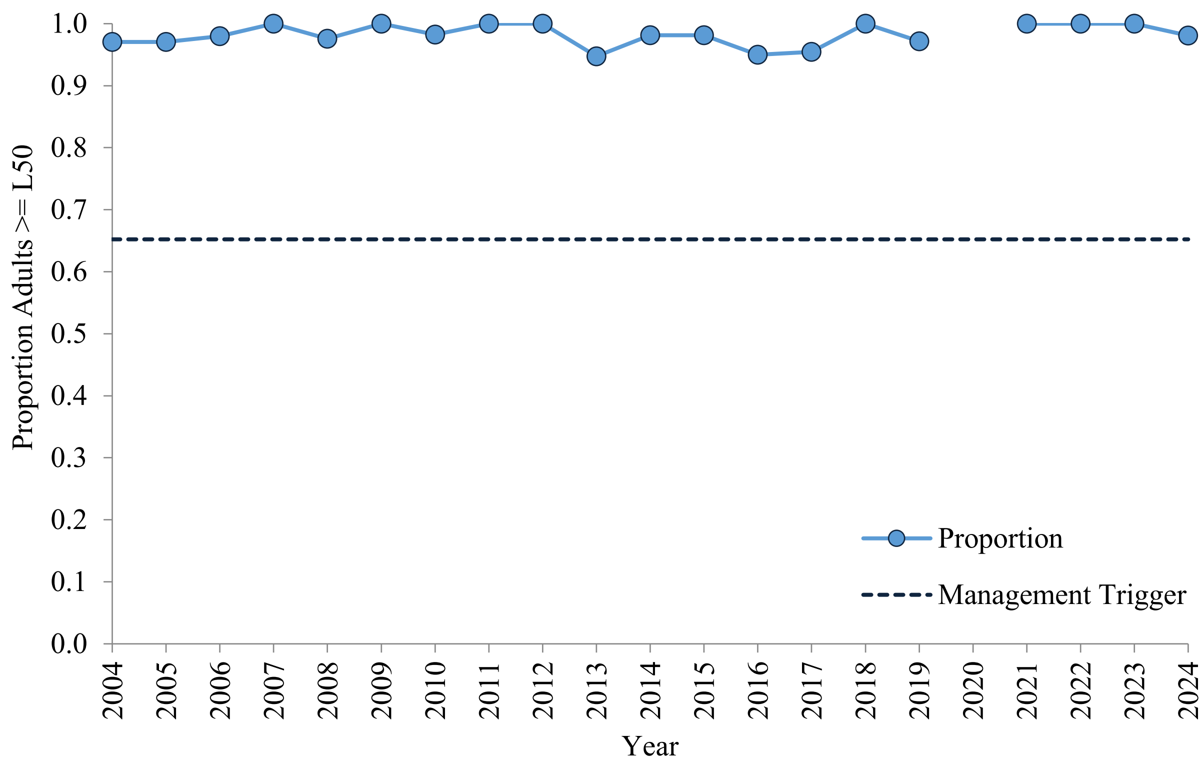

Figure 13. Annual proportion of adults (southern kingfish) greater than or equal to the length at 50% maturity occurring in the July through September component of the NCDMF Program 915 survey (Pamlico Sound, deep strata only), 2004–2024. The dotted line represents 2/3 of the average of the base years, 2001–2017.

Table 5 summarizes the age data for kingfishes (southern, northern, and gulf), collected from 2013 through 2024. The majority of kingfishes age samples came from Independent Gill Net Survey (Program 915), followed by the commercial ocean gill net fishery. Southern kingfish ages ranged from 0 to 7 years old (Figure 14). The length at age for all southern kingfish samples are presented in Figure 14. Northern kingfish ages ranged from 0 to 9 years old. Gulf kingfish ages ranged from 0 to 7 years old. The modal age has ranged from 0 to 5 years for southern, gulf, and northern kingfishes (Table 5).

Table 5. Kingfishes age data collected from all sources (commercial and recreational fisheries and fishery independent sampling programs) combined, 2013–2024.

Southern Kingfish				
Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
2013	2	1	5	290
2014	3	0	6	263
2015	1	0	6	339
2016	1	0	7	531
2017	2	0	6	413
2018	1	0	7	303
2019	2	1	7	385
2020	2	0	7	242
2021	3	1	6	398
2022	3	1	7	514
2023	3	0	7	650
2024	2	0	7	778
Northern Kingfish				
Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
2013	2	1	4	25
2014	3	3	3	1
2015	0	0	2	27
2016	1	1	4	49
2017	2	1	3	13
2018	3	3	3	1
2019	-	-	-	0
2020	5	1	7	5
2021	3	1	5	9
2022	2	1	4	29
2023	3	1	5	19
2024	2	1	9	17
Gulf Kingfish				
Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
2013	1	1	4	39
2014	3	1	4	36
2015	1	1	6	62
2016	1	0	5	116
2017	2	0	5	168
2018	2	0	6	98
2019	1	0	6	183
2020	2	0	5	163
2021	2	0	7	205
2022	3	1	7	298
2023	2	0	6	156
2024	2	1	7	208

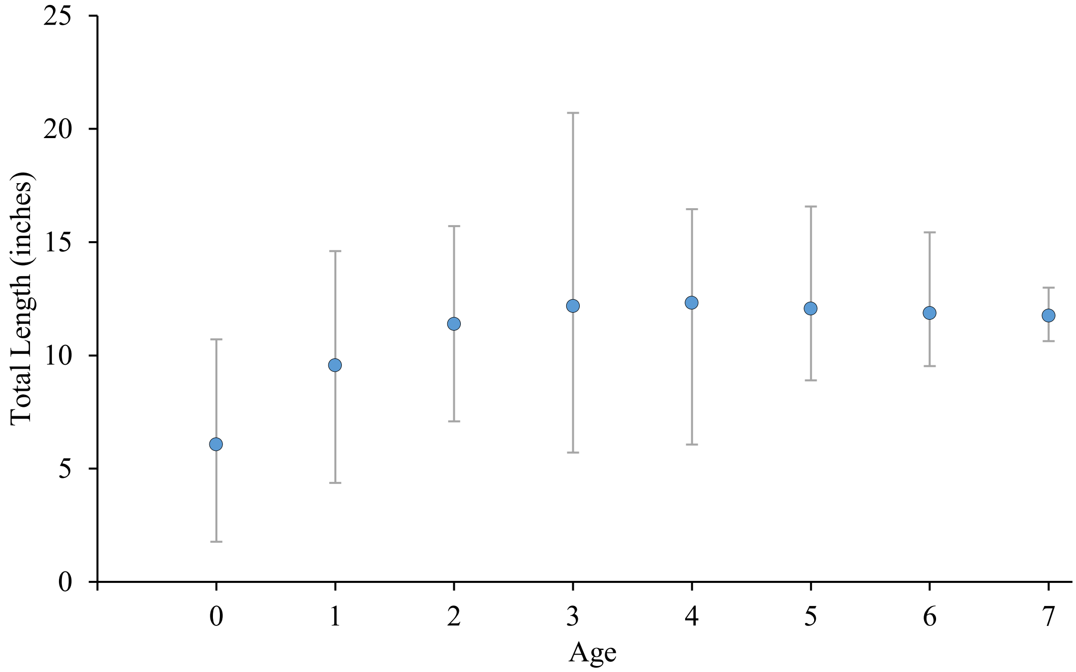

Figure 14. Southern kingfish total length at age based on all samples collected, 1997–2024. Blue circles represent the mean size at a given age while the grey horizontal lines represent the minimum and maximum length observed for each age.

RESEARCH NEEDS

The division reviewed and prioritized the research recommendations during the 2015 FMP Information Update (NCDMF 2015). The prioritization of each research recommendation is designated as a high, medium, or low priority. A low ranking does not infer a lack of importance but is either already being addressed by others or provides limited information for aiding in management decisions. A high ranking indicates there is a substantial need, which may be time sensitive in nature, to provide information to help with management decisions. Completion of these research recommendations will provide for increased understanding of the kingfish stock status and improved management:

High

- Update management triggers and find other sources for YOY indices and adult indices due to changes in the SEAMAP-SA survey.
- Conduct a coast-wide stock assessment of southern kingfish along the Atlantic Coast including estimation of biological reference points for sustainable harvest. — No Action
- Validate YOY and adult indices used in trend analysis. — UNCW has conducted seine surveys in the ocean to determine trends for all three species.
- Develop a fisheries-independent survey in the ocean for juvenile and adult kingfishes. — No Action
- Collect observer data from commercial fishing operations to estimate at-sea species composition of the catch, discard rates, and lengths. — NCDMF has previously had observers collect data at-sea for the shrimp fishery and actively collects data from all anchored gill net fisheries.
- Improve recreational data collection, particularly the species composition of discards, discard rates and associated biological data. — Steps have been taken to improve sampling in recreational fisheries, including a carcass collection program.

- Develop a tagging study to estimate natural and fishing mortality, to investigate stock structure, and to understand movement patterns. — No Action
- Collect histological data to develop a maturity schedule with priority to southern kingfish. — NCDMF is currently collecting histology samples in order to validate and update maturity schedules.
- Conduct an age validation study with priority to southern kingfish. — No Action

Medium

- Improve fishery-dependent commercial data collection of more sample sizes for life history information. — NCDMF ageing study collects kingfish for life history data.
- Evaluate and potentially expand the NCDMF fishery-independent gill net survey to provide data on species composition, abundance trends, and population age structure by including additional areas of North Carolina's estuarine and nearshore ocean waters. — No Action
- Continue bycatch reduction device studies in the shrimp trawl fishery to decrease bycatch. — Ongoing research through NCDMF and various federal agencies.
- Conduct a study to estimate fecundity with priority to southern kingfish. — No Action
- Conduct a study to identify spawning areas with priority for southern kingfish. — No Action

Low

- Determine stock structure using genetics of kingfishes along North Carolina and the Atlantic Coast. — Grant approved for UNCW and NCDMF to use genetic markers to delineate the population structure.
- Sample inlets and river plumes to determine the importance of these areas for kingfishes and other estuarine-dependent species. — Sampling in the nearshore ocean through N.C. Adult Fishery Independent Survey was initiated in 2008 but discontinued in 2015. Gill net sampling in Cape Fear, New, Neuse, Pamlico, and Pungo rivers continues.
- Determine the effects of beach re-nourishment on kingfishes and their prey. — Grant approved for UNCW to investigate effects of beach renourishment.
- Conduct a study to investigate how tidal stages and time of day influence feeding in kingfishes. — No Action
- Increase the sample size of surveyed participants in the commercial kingfish fishery to better determine specific business characteristics and the economics of working in the fishery. — NCDMF conducted a study of CRFL holders in 2009/2010.
- Update information on the participants in the recreational kingfish fishery. — Socioeconomic study was conducted by NCDMF on piers.

MANAGEMENT

The 2007 Kingfish FMP selected the use of trend analysis and management triggers as the management strategy to monitor the viability of the southern kingfish stock in North Carolina (NCDMF 2007; Table 6). A second management strategy promotes work to enhance public information and education. The trend analysis and management triggers are updated annually, and results are presented to the NCMFC as part of the annual FMP Update. The trend analysis incorporates triggers to alert managers to the potential need for management action based on stock conditions. The activation of any two management triggers two years in a row (regardless of category) warrants further data evaluation and potential management action. The NCMFC will be notified should this criterion be met. Southern kingfish is designated as the indicator species for this assemblage. The Pamlico Sound Survey, the Independent Gill Net Survey and the SEAMAP-SA Coastal Trawl Survey data are currently used for management triggers for kingfishes in North Carolina.

Table 6. Summary of the N.C. Marine Fisheries Commission management strategies and their implementation status for the 2007 Kingfish Fishery Management Plan.

Management Strategy	Implementation Status
Fisheries Management	
The proposed management strategy for kingfishes in North Carolina is to 1) maintain a sustainable harvest of kingfishes over the long-term and 2) promote public education. The first strategy will be accomplished by developing management triggers based on the biology of kingfishes, landings of kingfishes, independent surveys, and requesting a stock assessment of kingfishes be conducted by Atlantic States Marine Fisheries Commission (ASMFC). The second strategy will be accomplished by the NCDMF working to enhance public information and education.	Accomplished
Recommend ASMFC conduct a coastwide stock assessment on sea mullet.	ASMFC determined a stock assessment for the kingfishes was not necessary due to the positive trends in SEAMAP southern kingfish CPUE.
Endorse additional research to reduce bycatch in the shrimp trawl fishery, primarily shrimp trawl characterization studies involving at-sea observers and investigations into fish excluder devices with a higher success rate for reducing the harvest and retention of kingfish in shrimp trawls.	Accomplished
Implement rule giving NCDMF director proclamation authority to manage kingfish.	Accomplished. Rule 15A NCAC 3M .0518 in effect since October 1, 2008
Habitat and Water Quality	
The NCDCM should continue promoting the use of shoreline stabilization alternatives that maintain or enhance fish habitat. That includes using oyster cultch or limestone marl in constructing the sills (granite sills do not attract oyster larvae).	Endorsed through the Coastal Habitat Protection Plan (CHPP)
To ensure protection of kingfish nursery areas, fish-friendly alternatives to vertical stabilization should be required around primary and secondary nursery areas.	Endorsed through the CHPP
The location and designation of nursery habitats should be continued and expanded by the NCDMF.	Endorsed through the CHPP
No trawl areas and mechanical harvest prohibited areas should be expanded to include recovery/restoration areas for subtidal oyster beds and SAV.	Endorsed through the CHPP
Expansion and coordination of habitat monitoring efforts is needed to acquire data for modeling the location of potential recovery/restoration sites for oysters and SAV.	Endorsed through the CHPP
Any proposed stabilization project threatening the passage of kingfish larvae through coastal inlets should be avoided.	Endorsed through the CHPP
All coastal-draining river basins should be considered for NSW classification because they all deliver excess nutrients to coastal waters, regardless of flushing rate.	Endorsed through the CHPP
Efforts to implement phase II stormwater rules must be continued.	Endorsed through the CHPP
The EEP process should be extended to other development projects.	Endorsed through the CHPP

Management Strategy	Implementation Status
Reduce sediment and nutrient loading by addressing multiple sources, including: • improvement and continuation of urban and agricultural BMPs, • more stringent sediment controls on construction projects, and • implementation of additional buffers along coastal waters.	Endorsed through the CHPP

The L50 management triggers are based on the conservative proportion of adults in the population. This is the length at which 50 percent of the population is mature. For southern kingfish, this is 8.25 inches (210 mm) in total length. Data sources for these management triggers come from three fisheries-independent surveys: the summer component of the SEAMAP-SA Coastal Trawl Survey, the July–September component of Independent Gill Net Survey, and the June component of the Pamlico Sound Survey.

Relative F is a simple method for estimating trends in fishing mortality (Sinclair 1998). It is estimated as harvest (commercial landings plus recreational harvest) divided by a fisheries-independent index of relative abundance. Here, harvest (commercial landings plus recreational harvest) was divided by the SEAMAP-SA Coastal Trawl Survey spring index (Onslow, Raleigh, and Long bays; inner-shallow-strata) of relative abundance, given the majority of harvest occurs in the spring.

The southern kingfish management triggers are summarized as follows:

Biological Monitoring

Proportion of adults ≥ length at 50 percent maturity (L50) for NCDMF Program 195 June (Figure 7)

Proportion of adults ≥ L50 for NCDMF Program 915 July–September (Figure 13)

Proportion of adults ≥ L50 for SEAMAP-SA Coastal Trawl Survey summer (Figure 11)

- If the proportion of adults ≥ L50 falls below 2/3 of the average proportion of adults ≥ L50 for the base years (through 2017), then the trigger will be considered tripped.

Fisheries-Independent Surveys-Juvenile and Adult

NCDMF Program 195 September index of YOY relative abundance (Figure 8)

SEAMAP-SA Coastal Trawl Survey summer index of adult relative abundance (Figure 9)

SEAMAP-SA Coastal Trawl Survey fall index of YOY relative abundance (Figure 10)

- If a fisheries-independent survey falls below 2/3 of the average abundance for the base years (through 2017), then the trigger will be considered tripped.

Other

Relative fishing mortality rate (F) (Figure 12)

- If relative F rises above the average +1/3 of relative F for the base years (through 2017), the trigger will be considered tripped.

A summary of the management triggers by year is provided in Table 4. Bold values indicate years when a particular management trigger was activated. For 2020, none of the seven triggers were able to be updated with 2020 data due to impacts from the COVID-19 pandemic. For 2021, only two of the seven triggers were able to be updated with 2021 data due to impacts from the COVID-19 pandemic and staffing issues with the division’s survey vessel. Neither of the two updated triggers were activated in 2021. For 2022, all seven triggers were able to be updated, with one management trigger activated (the adult index from the summer SEAMAP-SA Coastal Trawl Survey). For 2023, all seven triggers were able to be updated, and three management triggers were activated (the YOY index from the fall SEAMAP-SA Coastal Trawl Survey, the adult index from the summer SEAMAP-SA Coastal Trawl Survey, and relative F). For 2024, all seven triggers were able to be updated, and four management triggers were activated (the YOY index from the fall portion of P195 [Pamlico Sound Survey], the YOY index from the fall SEAMAP-SA Coastal Trawl Survey, the adult index from the summer SEAMAP-SA Coastal Trawl Survey, and relative F). While two or more triggers have now been activated for two consecutive years, it is important to consider that the data used to inform all three out of four triggers activated in 2024 were from the SEAMAP-SA Coastal Trawl Survey. Recent spatial and temporal adjustments in the sampling design for the SEAMAP-SA Coastal Trawl Survey likely impacted the 2024 southern kingfish indices of relative abundance, including the spring portion used to calculate Relative F. Specifically, in 2024 sampling only occurred in the months June, August, and September, greatly limiting the data available for each season. Similar issues occurred in 2023, with all three triggers of concern based on data from the SEAMAP-SA Coastal Trawl Survey. Sampling was again limited in both time and space, with only one month of sampling in summer and fall, respectively, and one of the three regions where kingfishes are typically found was not sampled. Given these considerations, further evaluation of the best indices used to assess the North Carolina stock of kingfishes will occur during the 2025 formal review of this plan and prior to the assessment of possible management needs.

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

The management program currently in place for kingfishes has resulted in a stock that has met ongoing management targets. All management strategies in place will be maintained as outlined in the state FMP. Stock conditions will be monitored and reported through each subsequent annual FMP update and the NCMFC will continue to receive the FMP review schedule annually. The next scheduled review of this plan will begin in July 2025.

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FISHERY MANAGEMENT PLAN UPDATE
RED DRUM
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	March 2001	
Amendments:	Amendment 1	November 2008
Revisions:	None	
Supplements:	None	
Information Updates:	2024	
Schedule Changes:	None	
Comprehensive Review:	2025	

Red drum (*Sciaenops ocellatus*) in North Carolina are currently managed under Amendment 1 to the North Carolina Red Drum Fishery Management Plan (FMP; NCDMF 2008). When Amendment 1 was developed, the 2007 stock assessment indicated overfishing was not occurring in North Carolina (Takade and Paramore 2007). As a result, no new harvest restrictions for either the commercial or recreational fisheries were required when this amendment was adopted in 2008. Amendment 1 did implement regulations requiring circle hooks along with fixed weights and short leaders in the summer adult red drum recreaitonal fishery in Pamlico Sound; and expanded gill net attendance requirements originally implemented as part of the 2001 North Carolina Red Drum FMP (NCDMF 2001) to reduce the impact of discard mortality.

Prior to Amendment 1, restrictive harvest measures due to overfishing were implemented through the 2001 North Carolina Red Drum FMP. These measures were first implemented in October of 1998, as interim measures, while the full plan was developed. Harvest restrictions included: restricting all harvest to fish between 18- and 27-inches total length (TL; previously allowed one fish over 27 inches TL); implemented a one fish recreational bag limit (previously a five fish bag limit); implemented a daily trip limit for the commercial fishery that is set by the North Carolina Division of Marine Fisheries (DMF) director (previously no daily limit); and maintained the existing 250,000-pound annual commercial cap. The trip limit was designed to reduce harvest and to deter targeting of red drum commercially. The original FMP also implemented seasonal small mesh gill net attendance requirements to reduce discard mortality of red drum. Final approval of the North Carolina Red Drum FMP occurred in March 2001 and interim measures implemented in October of 1998 were maintained. Stock assessments conducted since adoption of the 2001 FMP have all indicated management measures have been effective at preventing overfishing in the Northern stock (Takade and Paramore 2007; SAFMC 2009; ASMFC 2017; ASMFC 2024).

In addition to the state FMP, red drum in North Carolina fall under Amendment 2 to the Atlantic States Marine Fisheries Commission (ASMFC) Red Drum FMP (ASMFC 2002). Adopted in 2002, Amendment 2 required all states to implement management measures projected to result in a 40% static spawning potential ratio (sSPR). Each state was required to implement these measures no later than January 2003. Further, the plan also continues to require that states maintain management strategies that ensure overfishing is not occurring and that optimum yield (OY) in the red drum fishery can be obtained. Amendment 2 compliance requirements for the states include:

- Implementing bag and size limits projected by bag and size limit analysis to achieve the minimum 40% sSPR.
- Establishing a maximum size limit of 27 inches TL or less in all red drum fisheries.

- Maintaining current or more restrictive commercial fishery regulations.
- Requires any commercial cap overages from one fishing year to be subtracted from the subsequent year's commercial cap.

The management measures already in place through the 2001 North Carolina Red Drum FMP were deemed sufficient to meet all requirements when Amendment 2 to the ASMFC plan was passed. Since that time, the 2009, 2017 and 2024 assessments for red drum have indicated the current management strategy developed under Amendment 2 to the ASMFC plan have been sufficient to meet targets (SAFMC 2009; ASMFC 2017, ASMFC 2024).

To ensure compliance with interstate requirements, North Carolina also includes red drum as part of the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). 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 (NCDMF 2022).

Management Unit

Amendment 1 to the North Carolina Red Drum FMP applies to all joint and coastal waters throughout North Carolina, while the interjurisdictional plan through ASMFC applies to all states from Florida to Maine. Under the ASMFC plan, the management unit for red drum along the Atlantic coast is divided into a northern and southern stock. North Carolina and all areas north along the Atlantic coast represent the northern stock.

Goal and Objectives

The goal of Amendment 1 to the North Carolina Red Drum FMP is to prevent overfishing in the red drum stocks by allowing the long-term sustainable harvest in the red drum fishery. To achieve this goal, the FMP lists the following objectives:

- Achieve and maintain a minimum overfishing threshold where the rate of juvenile escapement to the adult stock is sufficient to maintain the long-term sustainable harvest in the fishery.
- Establish a target spawning potential ratio to provide the optimum yield from the fishery in order to maintain a state FMP that is in compliance with the requirements of the ASMFC Red Drum FMP.
- Continue to develop an information program to educate the public and elevate their awareness of the causes and nature of problems in the red drum stock, its habitat and fisheries, and explain the rationale for management efforts to solve these problems.
- Develop regulations that while maintaining sustainable harvest from the fishery, consider the needs of all user groups and provides adequate resource protection.
- Promote harvest practices that minimize the mortality associated with regulatory discards of red drum.
- In a manner consistent with the Coastal Habitat Protection Plan, restore, improve and protect essential red drum habitat and environmental quality to increase growth, survival, and reproduction of red drum.
- Improve our understanding of red drum population dynamics and ecology through the continuation of current studies and the development of better data collection methods, as well as, through the identification and encouragement of new research.
- Initiate, enhance, and continue studies to collect and analyze the socio-economic data needed to properly monitor and manage the red drum fishery.

DESCRIPTION OF THE STOCK

Biological Profile

Red drum are estuarine dependent members of the drum family that includes Atlantic croaker, spot, black drum, weakfish, and spotted sea trout. Ranging from Florida to Massachusetts along the Atlantic coast, red drum are most abundant from Virginia to Florida. Red drum, also called channel bass or red fish, are common throughout the coastal waters of North Carolina and is designated as the state's official saltwater fish. Large red drum (up to 90 pounds) inhabit coastal waters throughout the year and are observed in the surf during the spring and fall seasons and are commonly found in the Pamlico Sound during the summer months. Spawning takes place in the fall around coastal inlets and in Pamlico Sound. Larval and juvenile red drum use various shallow estuarine habitats in coastal sounds and rivers during the first few years of life. Upon maturity (age 4 and around 32 inches in length), red drum move out of estuaries to join the adult spawning stock in the ocean. Red drum are a long-lived species commonly reaching ages in excess of 40 years. The oldest red drum recorded was taken in North Carolina and was 62 years old. Red drum are opportunistic feeders and diet can shift with changes in age and habitat. Various types of small crabs and shrimp make up a large portion of juvenile red drum diets; while crabs and shrimp continue to make up a portion of the adult diet, adults will also frequently eat various fish species.

Stock Status

The 2017 benchmark stock assessment indicated the red drum Northern stock (including NC) was not experiencing overfishing (ASMFC 2017). The overfished status was undetermined due to uncertainty in the adult stock size estimates. A new benchmark assessment was completed in 2024 with data through terminal fishing year 2021. The assessment indicated the red drum Northern stock (including NC) was not overfished and overfishing is not occurring (ASMFC 2024).

Stock Assessment

The threshold (below which the stock is experiencing overfishing) and the target fishing mortality rates correspond to those rates that achieve 30% and 40% static spawning potential ratio (SPR). Static spawning potential ratio is a measure of spawning stock biomass survival rates when fished at the current year's fishing mortality rate relative to the spawning stock biomass survival rates if no fishing mortality was occurring; more detailed methodologies are available in the full stock assessment report (ASMFC 2024). Based on results of the 2017 benchmark assessment, the static spawning potential ratio was at or above target levels (ASMFC 2017). The 2024 assessment showed divergent SPRs between the previous statistical catch-at-age model using calendar year and the new stock synthesis (SS) model using fishing year. Divergence was primarily in the beginning of the time series with the scale of the SPR estimates from the two models converging around 2010 (Figure 1). This early divergence highlights uncertainty with scale and initial condition estimates for the northern stock, which contributed to the decision not to use the northern SS model for stock status determination in this assessment (ASMFC 2024).

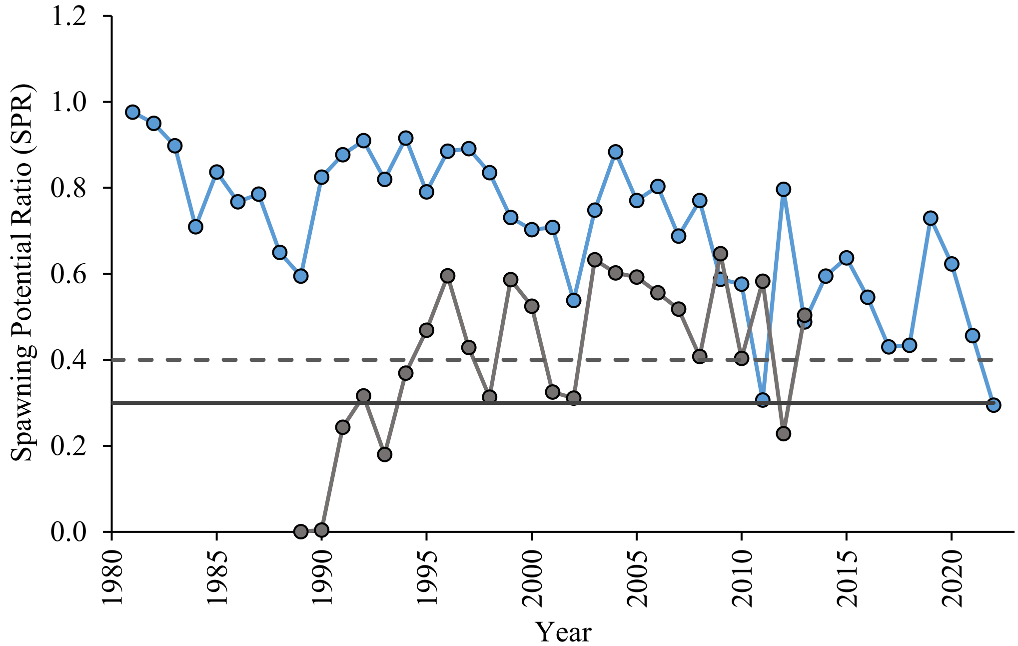

Figure 1. Northern region (including North Carolina) spawning potential ratio (SPR) estimates for the northern stock from the previous benchmark stock assessment using a custom statistical catch-at-age calendar year model (ASMFC 2017; gray) and the current benchmark assessment SS estimated selectivity fishing year model (blue; not approved for use in management of 2024 stock assessment).

For the northern stock, the traffic light analyses (TLA) is comparable to the SS model in making spawning stock biomass status determinations and outperforms SS when characterizing recruitment condition. A TLA approach can also be used during interim periods between formal assessments to update stock status for management advice.

The TLA framework used in the assessment was previously developed for the simulation assessment (ASMFC 2022). The TLA uses colors like that of a traffic light to represent the state of a fishery based on appropriate indicators (i.e., an index or time-series of relevant data). Three key characteristics were analyzed including recruitment, adult abundance, and fishery performance (Figure 2). Abundance and recruitment indicators were developed from fishery-independent surveys. Fishery performance was defined as the relative harvest fishing mortality which was calculated by dividing the harvest by an appropriate survey (same state or stock where the fleet is operating) derived index of slot-sized fish for each year. Stock status determinations are made from the TLA results according to the following scenarios: If fishery performance is red in any of the past three years, overfishing is occurring. If adult abundance is red in any of the past three years, the stock is overfished (ASMFC 2024).

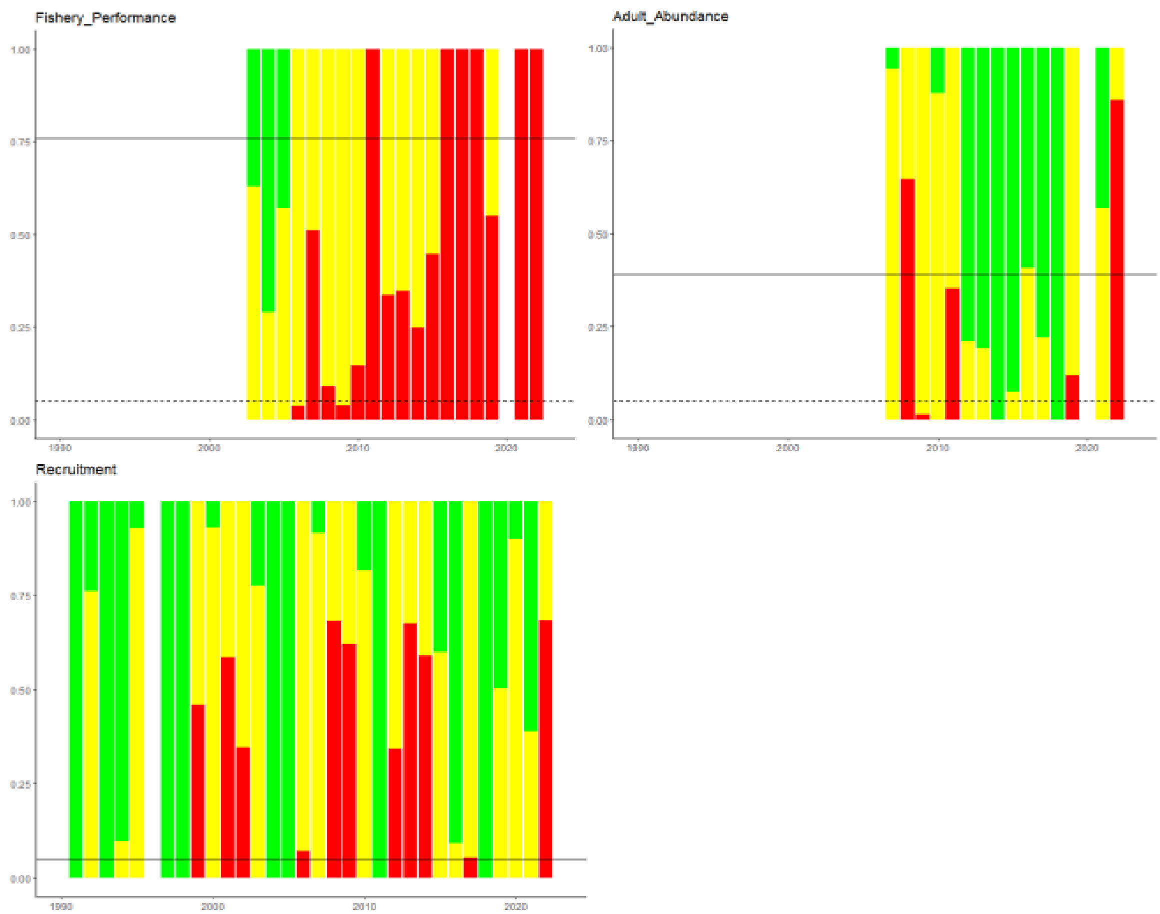

Figure 2. Northern region (including North Carolina) annual traffic light analysis (TLA results for each selected characteristic. Threshold values are represented by the solid horizontal line. The color at the threshold is the color determination for that year.

Management measures have effectively controlled fishing mortality to a level sufficient to meet management targets. It is critical to note that reaching the target is only the first step in maintaining this fishery. For the red drum stock to be considered healthy and viable, the 40% static spawning potential ratio must be maintained continuously over time. Increases in harvest rates (relaxation of current regulations) of red drum should only be allowed if increases are not anticipated to lower the static spawning potential ratio below the management goal (40%).

Current Regulations

All harvest is limited to red drum between an 18-inch TL minimum size and 27-inch TL maximum size for both the recreational and commercial fisheries. The recreational bag limit is one fish per day. A daily commercial bycatch allowance and an annual cap of 250,000 pounds, with payback of any overage, constrain the commercial harvest. The commercial annual cap is monitored from September 1 to August 31. Within a fishing year, 150,000 pounds is allocated to the period between September 1 and April 30, and the remainder is allocated to the period of May 1 to August 31. Harvest of red drum is limited to bycatch where the weight of the combined catch of flounder, bluefish, black drum and/or striped mullet must exceed the daily weight of red drum landed (Proclamation F-33-2022). Check with the DMF for the most recent proclamation on red drum harvest limits including trip limits and bycatch requirements (Proclamations).

Commercial Fishery

North Carolina's commercial landings combined from all months of 2024 were 184,564 pounds; a slight decrease from 2023 landings (186,465 pounds; Table 1; Figure 3A). Landings were greater than the 10-year average (140,820 pounds). Since 1991, landings have fluctuated with no consistent trend.

Table 1. Red drum recreational harvest and number released (Marine Recreational Information Program) and commercial harvest (North Carolina Trip Ticket Program), 1991–2024. All weights are in pounds.

	Recreational			Commercial	
Year	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1991	111,787	336,524	345,911	96,045	441,956
1992	48,099	140,866	233,100	128,497	361,597
1993	107,235	442,230	538,175	238,099	776,274
1994	72,245	185,906	349,317	142,169	491,486
1995	151,145	373,695	692,063	248,122	940,185
1996	90,177	97,663	391,364	113,338	504,702
1997	22,829	426,993	98,079	52,502	150,581
1998	164,693	388,288	843,571	294,366	1,137,937
1999	151,062	633,951	701,002	372,942	1,073,944
2000	127,165	443,747	655,251	270,953	926,204
2001	57,929	538,370	290,901	149,616	440,517
2002	127,559	1,515,679	571,102	81,370	652,472
2003	73,202	215,277	359,181	90,525	449,706
2004	58,543	369,326	245,163	54,086	299,249
2005	103,275	967,892	470,914	128,770	599,684
2006	127,412	1,042,564	569,699	169,206	738,905
2007	157,577	818,037	789,430	243,658	1,033,088
2008	112,938	1,510,133	523,607	229,809	753,416
2009	214,317	1,238,158	1,028,339	200,296	1,228,635
2010	179,828	1,670,693	835,143	231,828	1,066,971
2011	156,484	587,369	737,853	91,980	829,833
2012	152,005	4,939,534	648,342	66,519	714,861
2013	520,758	1,892,171	2,214,045	371,949	2,585,994
2014	324,303	1,086,967	1,674,595	90,650	1,765,245
2015	143,876	1,308,072	567,730	80,388	648,118
2016	169,195	3,203,452	633,496	77,101	710,597
2017	353,716	2,165,656	1,475,852	187,039	1,662,891
2018	299,577	1,729,260	1,452,358	144,647	1,597,005
2019	97,186	2,976,601	436,219	56,419	492,638
2020	413,419	2,686,150	1,758,789	165,666	1,924,455
2021	325,662	2,545,371	1,479,550	200,825	1,680,375
2022	336,280	2,160,742	1,615,108	175,090	1,790,198
2023	232,133	1,439,370	1,120,661	186,465	1,307,126
2024	322,307	1,809,302	1,354,244	184,564	1,538,808
Mean	186,282	1,076,016	836,616	165,162	979,872

The North Carolina Red Drum FMP (2001) maintained the 250,000-pound annual commercial landings cap but shifted the commercial fishing year to September 1 through August 31. Since that time, North Carolina's commercial landings during this fishing year have averaged 150,296 pounds. The 2007/2008, 2009/2010, and 2013/2014 fishing years had cap overages (Table 2). All overages were deducted from the following year's cap allowance. The 2023/2024 fishing year resulted in 185,259 pounds of red drum landings, well below the 250,000-pound annual cap.

Table 2. North Carolina's annual commercial harvest based on a fishing year beginning September 1 and ending August 31. September 1 fishing year began through FMP in 2001/2002 fishing year.

Fishing Year	Landings (lb)	Annual Cap
2001/2002	61,504	250,000
2002/2003	105,704	250,000
2003/2004	70,175	250,000
2004/2005	61,838	250,000
2005/2006	159,379	250,000
2006/2007	172,166	250,000
2007/2008	326,211	250,000
2008/2009*	134,161	173,789
2009/2010	275,924	250,000
2010/2011**	126,185	224,142
2011/2012	94,298	250,000
2012/2013	134,372	250,000
2013/2014	262,756	250,000
2014/2015***	140,887	237,244
2015/2016	64,150	250,000
2016/2017	109,954	250,000
2017/2018	198,648	250,000
2018/2019	105,818	250,000
2019/2020	54,175	250,000
2020/2021	207,694	250,000
2021/2022	216,528	250,000
2022/2023	189,013	250,000
2023/2024	185,259	250,000
Mean	150,296	

* Adjusted to pay back overage in 2007/2008 fishing year
** Adjusted to pay back overage in 2009/2010 fishing year
*** Adjusted to pay back overage in 2013/2014 fishing year

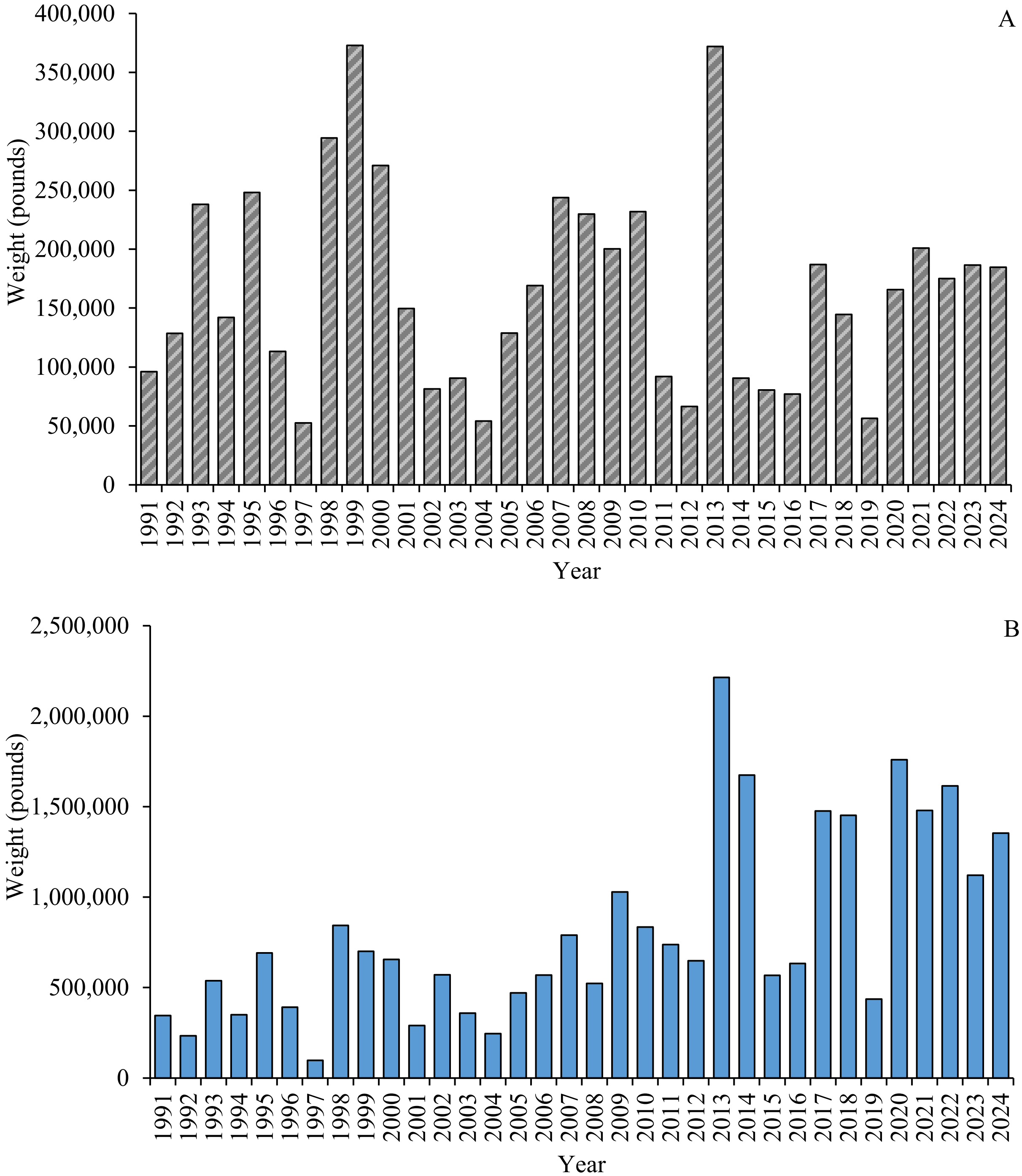

Figure 3. Annual commercial (A) and recreational (B) landings in pounds for red drum in North Carolina, 1991–2024.

Recreational Fishery

Recreational fishing activity is monitored through the Marine Recreational Information Program. For information on MRIP methodology see https://www.fisheries.noaa.gov/topic/recreational-fishing-data. Recreational landings in 2024 were 1,354,244 pounds; above the 10-year average (1,189,401 pounds) and above 2023 landings (1,120,661 pounds; Table 1; Figure 3B). Recreational releases totaled 1,809,302 fish in 2024: below the ten-year average of 2,202,398 fish. Recreational releases have increased over time, averaging around 300,000 releases per year for the period of 1991 to 1998 compared to over 2 million releases per year in the most recent 10-year period.

The DMF offers award citations for exceptional catches of red drum. Red drum captured and released that measure greater than 40 inches TL are eligible for an award citation. Since 1991, award citations for red drum have steadily increased from just over 300 awarded in 1991 to a time-series high of 3,634 awarded in 2022. The total number of citations awarded in 2024 was 2,546 (Figure 4).

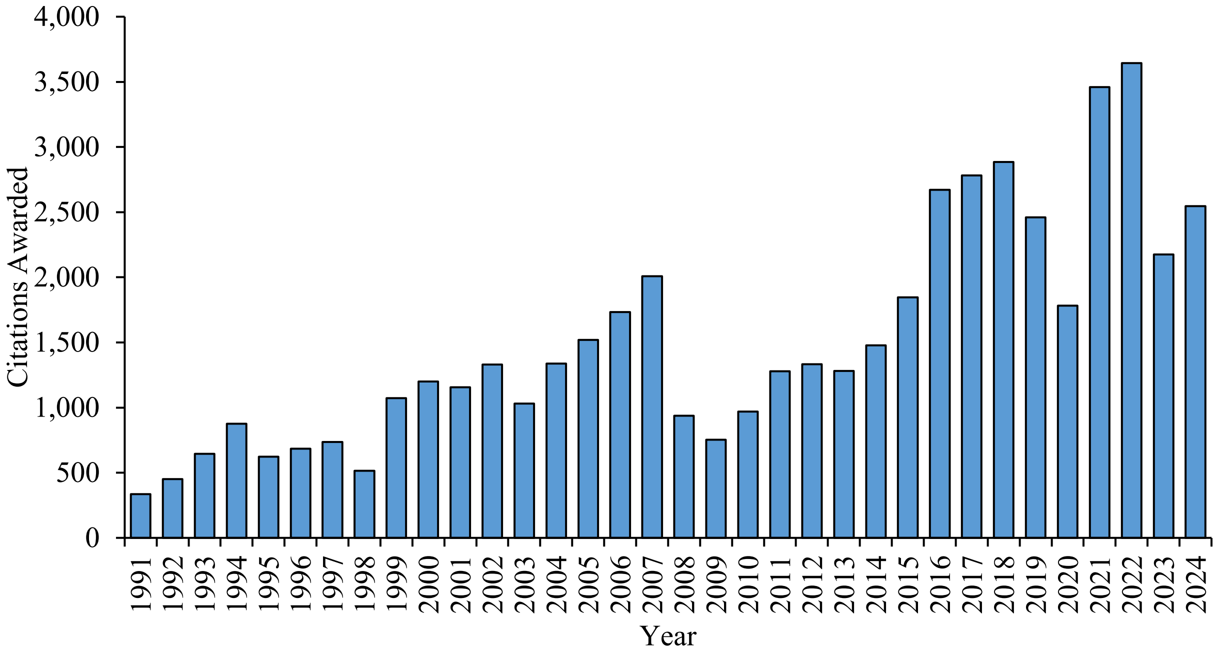

Figure 4. North Carolina Saltwater Fishing Tournament citations awarded for red drum, 1991–2024. Citations are awarded for red drum greater than 40 inches TL. Prior to 1998, citations were awarded for either a red drum released (≥40 inches TL) or harvested (≥40 pounds). Since 1998, all citations are for released fish only.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Commercial fishing activity is monitored through fishery-dependent sampling conducted by the DMF since 1982. Data collected in this program allows the size and age distribution of red drum to be characterized by gear and fishery. Historically, predominant fisheries for red drum include estuarine gill nets, long haul seine/swipe nets, pound nets, and beach haul seines. Over the past decade gill nets have been the dominant gear used for red drum, accounting for >90% of the overall commercial harvest. In 2024, 92% of the red drum commercial harvest was taken in gill nets, followed by pound nets with 7% (Figure 5). In 2024, 484 red drum, primarily from set gill nets, were measured from the commercial fishery (Table 3). The average size in 2024 was 23 inches fork length (FL). Average size has varied little over time ranging from 17 to 23 inches FL since 1989. Due to the slot limit of 18 to 27 inches TL, red drum harvested in both the commercial and recreational fishery are of similar size (Figure 6). In the commercial fishery, a shift in the size of harvest is apparent between 1991 and 1992, when the minimum size limit was increased from 14 to 18 inches TL (Figure 7). Additionally, as the harvest of larger fish was disallowed during the 1990's, fish above 27 inches TL are now rarely observed in landings due to regulations. With the current slot limit on harvest for both commercial and recreational fisheries, nearly all landings consist of age-1 and age-2 fish. In 2024, 158 red drum were measured from recreational harvest. The average size of recreational fish harvested was 22 inches FL (Table 4). From 1989 to 2024, this average varied little (17 to 23 inches FL), however, the length frequencies of harvested red drum vary more from year to year than the commercial fishery (Figure 7 and 8).

Table 3. Red drum length (fork length, inches) data from commercial fish house samples, 1989–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1989	22	11	51	123
1990	17	13	46	511
1991	18	12	48	183
1992	23	11	49	311
1993	23	16	45	602
1994	23	12	41	142
1995	22	16	31	496
1996	23	16	26	120
1997	20	10	37	272
1998	19	12	37	1,082
1999	21	13	30	1,008
2000	22	16	31	725
2001	22	17	28	419
2002	21	13	30	483
2003	21	17	28	387
2004	22	16	28	326
2005	21	14	28	811
2006	22	14	29	1,258
2007	22	16	31	1,502
2008	23	13	29	1,206
2009	22	14	35	1,166
2010	22	14	31	1,134
2011	22	17	31	646
2012	21	16	28	359
2013	21	12	27	1,664
2014	23	18	28	444
2015	23	17	28	429
2016	21	16	27	681
2017	21	17	28	672
2018	23	12	28	561
2019	22	14	29	174
2020	21	17	27	549
2021	22	13	27	759
2022	23	17	28	550
2023	22	15	29	517
2024	23	17	27	484

Table 4. Red drum length (fork length, inches) data from Marine Recreational Information Program recreational samples, 1989–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1989	18	10	44	101
1990	17	11	43	73
1991	18	6	46	101
1992	22	13	43	42
1993	22	10	46	117
1994	21	12	45	90
1995	21	8	47	240
1996	20	13	46	114
1997	19	8	44	30
1998	23	9	42	534
1999	22	14	29	199
2000	23	16	28	130
2001	23	16	47	73
2002	22	16	36	86
2003	23	18	31	52
2004	21	16	27	38
2005	22	14	26	48
2006	21	14	30	79
2007	23	17	27	71
2008	22	16	27	90
2009	22	18	28	136
2010	22	11	27	193
2011	22	17	29	147
2012	21	14	41	132
2013	22	17	28	335
2014	23	17	28	319
2015	21	14	27	101
2016	20	12	28	106
2017	21	8	27	293
2018	23	17	28	206
2019	21	13	27	87
2020	21	10	38	419
2021	22	17	27	430
2022	22	14	28	266
2023	23	17	27	203
2024	22	17	27	154

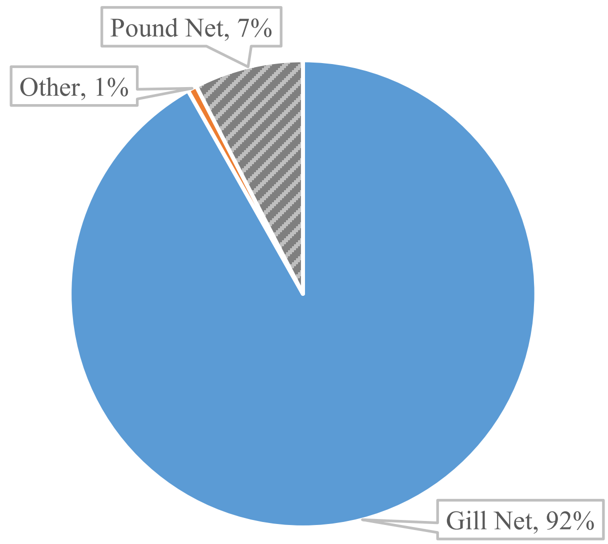

Figure 5. Red drum commercial harvest in 2024 by gear type.

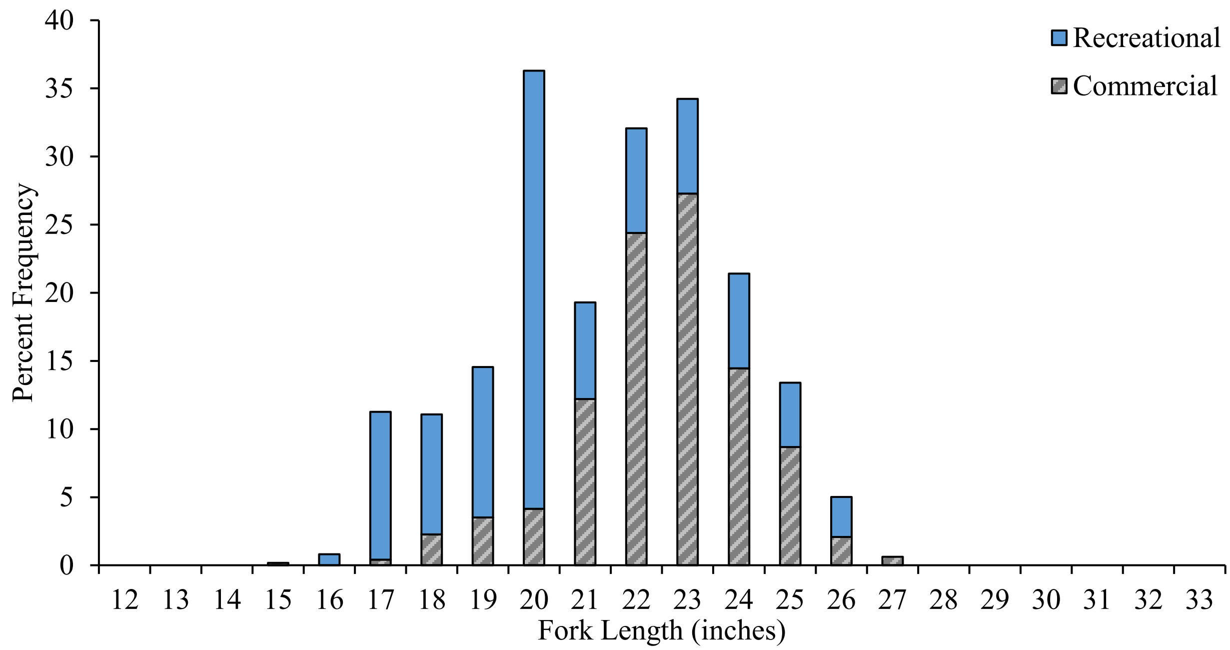

Figure 6. Commercial and recreational length frequency distribution from red drum harvested in 2024.

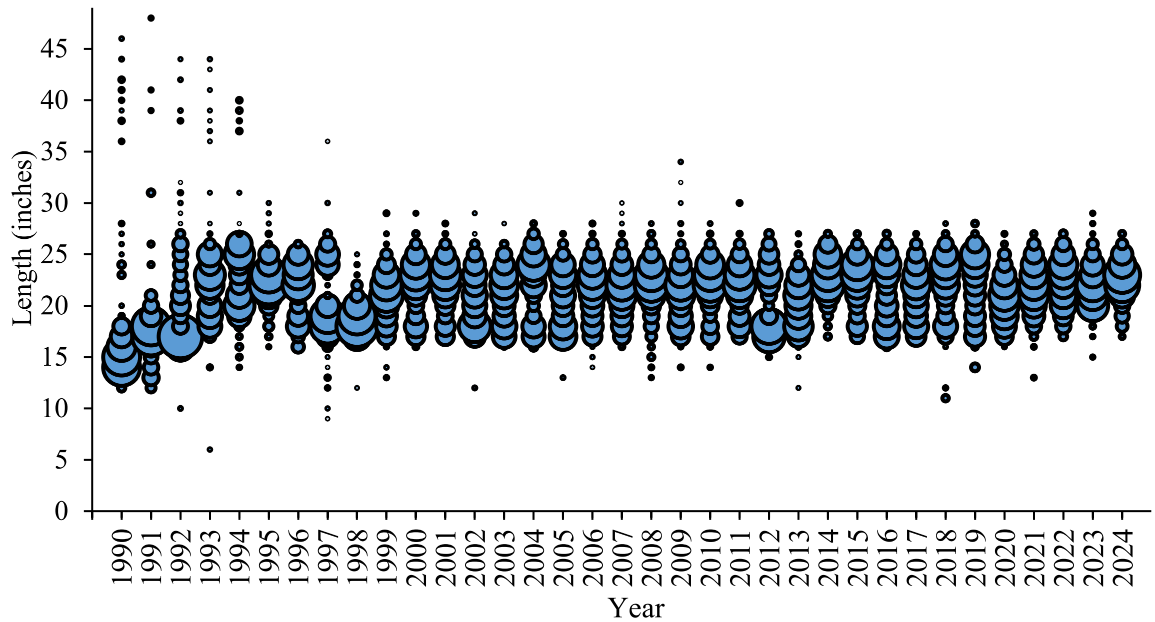

Figure 7. Commercial length frequency (fork length, inches) of harvested red drum, 1990–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

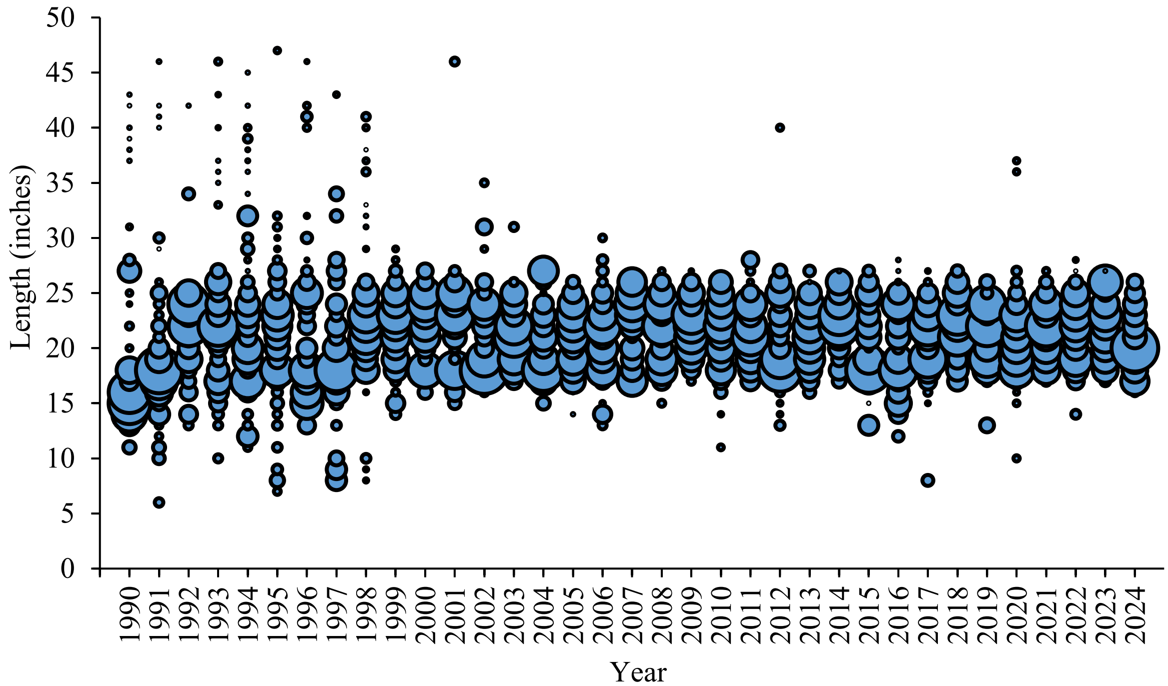

Figure 8. Recreational length frequency (fork length, inches) of harvested red drum, 1990–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Fishery-Independent Monitoring

The DMF has conducted a juvenile red drum seine survey on an annual basis since 1991. The seine survey provides an index of abundance for juvenile (age-0) red drum; sampling occurs from September through

November. The relative abundance of juvenile red drum from fixed stations is highly variable with both high and low abundance occurring in recent years (Figure 9).

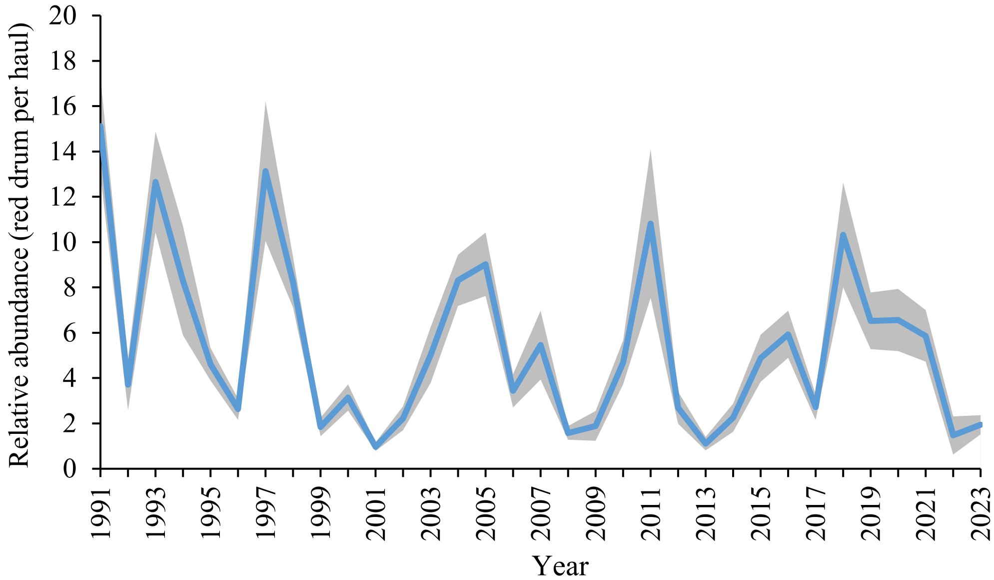

Figure 9. The annual juvenile (age-0) abundance index from fixed stations with standard error shaded in gray from the North Carolina Red Drum Juvenile Seine Survey, 1991–2023.

In 2016, the juvenile red drum seine survey was updated to include an additional 126 random grids to the survey. The grids were selected based on habitat characteristics that ensured consistent gear efficiency (bottom topography for beach seine) and likelihood of red drum. Fixed station surveys have inherent sample bias (i.e. variability in samples can be caused by temporal shifts in fish spatial distribution). Adding a partial replacement design (supplementing fixed sites with random samples) can reduce sample bias and produce a more accurate estimate of annual catch rates.

After a DMF program evaluation in 2023, the juvenile red drum seine survey was adjusted to only proceed with random grid sampling in 2024. The partial replacement survey design change formalized in 2016 aimed to reduce bias from the fixed station survey and explore any unexplained variation while maintaining the historical integrity of the survey. The JAI calculated as the arithmetic mean for both the fixed and random stations aligns closely in both scale and trend. This evaluation has provided valuable information in support of moving forward with a completely random survey that effectively captures recruitment cues. The updated station selection procedures maintain an annual 126 stations encompassing the original spatial and temporal sampling design of the program.

In 2024, the relative abundance of juvenile red drum from random grids was 3.60 red drum per haul (Figure 10). This was below the random grid time-series average of 4.16 red drum per haul (2016–2024), but an increase from 2023 abundance of 1.61 red drum per haul.

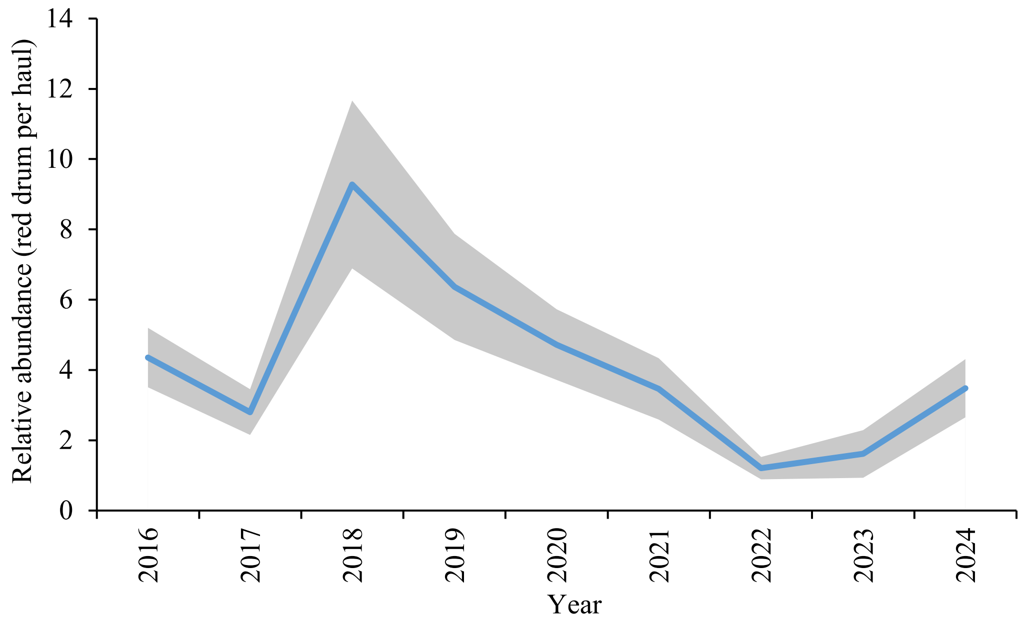

Figure 10. The annual juvenile (age-0) abundance index from random grids with standard error shaded in gray from the North Carolina Red Drum Juvenile Seine Survey, 2016–2024.

A fishery-independent gill net survey was initiated by the DMF in May 2001. The survey uses a stratified random sampling scheme designed to characterize the size and age distribution for key estuarine species in Pamlico Sound. By continuing a long-term database of age composition and developing an index of abundance for red drum, this survey allows managers to assess the red drum stock without relying solely on commercial and recreational fishery-dependent data. The overall red drum index in 2024 was 4.24 red drum per set, above the 2023 index of 2.33 and the time series average of 2.80 (Figure 11). It should be noted that sampling in this program was suspended in February 2020 due to COVID-19 restrictions and protected species interactions. Sampling resumed July 2021 (168 sets). The survey has been used in ASMFC Atlantic coast red drum stock assessments as an annual index of relative abundance for sub-adult red drum.

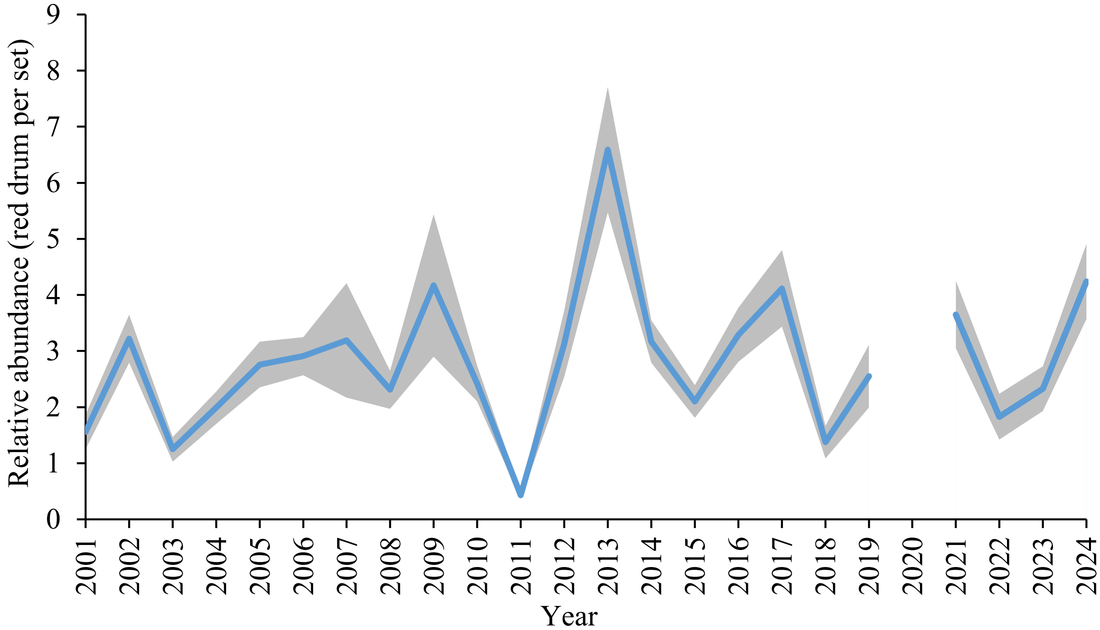

Figure 11. Annual weighted red drum index (number captured ages combined) with standard error shaded in gray from the North Carolina Pamlico Sound Independent Gill Net Survey, 2001–2024. Survey was not conducted in 2020 due to COVID pandemic and resumed July 2021 (168 sets for the year).

North Carolina initiated an adult red drum longline survey in 2007. The primary objective of the survey is to provide a fisheries-independent index of abundance for adult red drum occurring in North Carolina. From July through October, a standardized, stratified random sample design is employed. Following a programmatic evaluation in 2023 and 2024, changes to the sampling protocol were made to increase survey efficiency. In 2023, two regions with the lowest red drum catches in recent years were dropped from the sampling universe. In 2024, the mainline was shortened to 805-meter mainline, with gangions placed at 15-meter intervals (50 hooks/set). While it has been noted that adult red drum catch has been lower in the past few years, comparison of CPUE (red drum caught per hook) shows little change with hook reduction. Each of the ten regions is sampled once per period covering the Pamlico Sound and mouth of the Neuse River.

The annual adult abundance in 2024 was 2.50 red drum per 50 hook reduced set which is below the 2023 abundance (2.79 red drum per 100 hook set) and below the time series average of 4.24 red drum per set (Figure 12). Red drum were captured from 20 of the 60 sets (33%). The study has recently been impacted by significant events. Samples in 2019 were adversely impacted by Hurricane Dorian which hit the North Carolina coast at the peak of the sampling season. During 2020, sampling did not occur due to the COVID pandemic. Sampling efforts in 2022 were limited to the months of August and September due to mechanical issues with sampling gear. Sampling efforts in 2023 were reduced primarily in the month of October due to staff limitations. Sampling efforts in 2024 were reduced due to programmatic changes. This survey is used in the ASMFC red drum stock assessments as an annual index of relative abundance for adult red drum.

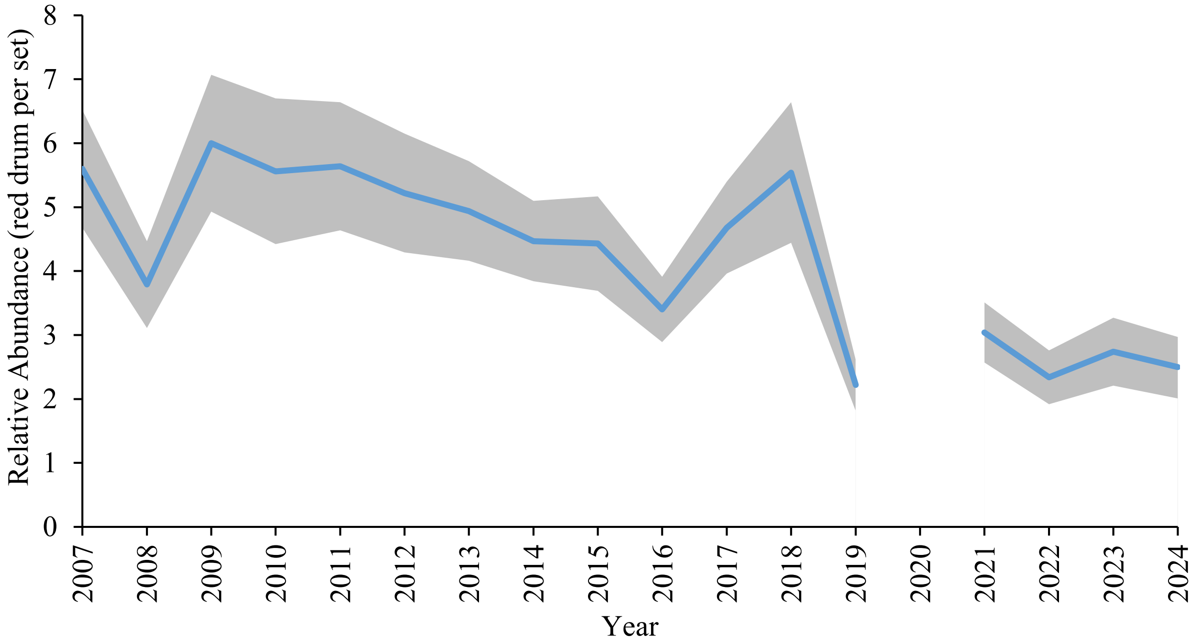

Figure 12. Annual adult red drum index (number captured for ages combined) with standard error shaded in gray from the North Carolina Red Drum Longline Survey, 2007–2024.

To describe the age structure of harvest and indices, red drum age structures are collected from various fishery-independent (scientific surveys) and dependent (commercial and recreational fisheries) sources throughout the year. In 2024, 760 red drum age structures were processed, ranging in age from 0 to 36 years (Table 5). Most red drum collected from dependent sources (18 to 27 inches TL) are age 1 or 2. Red drum over 27 inches TL are protected from harvest in North Carolina, a measure designed to protect the spawning portion of the population, so age samples from larger fish come almost exclusively from fishery-independent sources. Red drum in North Carolina are long-lived with the oldest red drum being aged at 62 years. Growth in length is rapid for the first several years of life and then slows as fish reach maturity (100% mature by age 4- and 32-inches TL). Beyond age-4, the relationship of length and age for red drum is less predictable with much overlap in age for a given length (Figure 13).

Table 5. Summary of red drum age samples collected from both dependent (commercial and recreational fisheries) and independent (surveys) sources, 1989–2024. Age sampling was limited in 2020 due to the adult long line survey not being conducted.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1989	1	0	56	312
1990	1	0	52	345
1991	1	0	48	259
1992	1	0	56	440
1993	1	0	62	428
1994	1	0	41	297
1995	1	0	47	482
1996	1	0	54	383
1997	1	0	56	465
1998	1	0	31	612
1999	1	0	26	530
2000	1	0	17	470
2001	1	0	41	466
2002	1	0	24	361
2003	1	0	28	262
2004	1	0	25	342
2005	1	0	34	484
2006	1	0	32	641
2007	1	0	37	495
2008	1	0	35	574
2009	1	0	36	644
2010	1	0	37	516
2011	1	0	38	256
2012	1	0	39	605
2013	1	0	41	721
2014	1	0	41	560
2015	1	0	42	428
2016	1	0	38	653
2017	1	0	39	726
2018	1	0	42	594
2019	1	0	33	722
2020	1	0	16	315
2021	1	0	43	998
2022	2	0	43	773
2023	1	0	32	831
2024	1	0	36	760

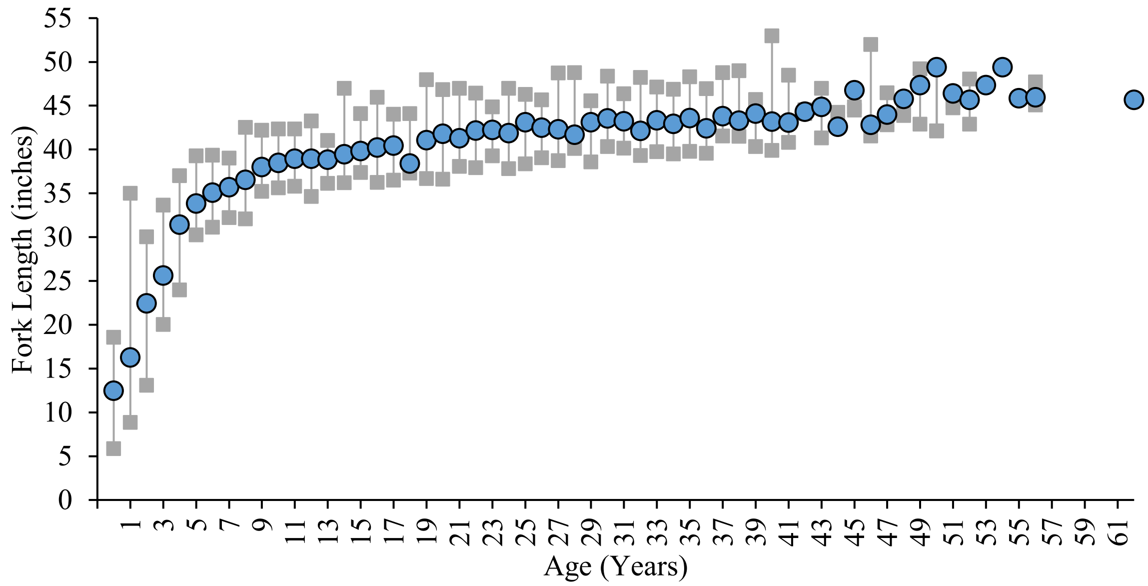

Figure 13. Red drum length-at-age based on all age samples collected from fishery-independent and dependent sources, 1989–2024. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.

Tagging Program

In 2014, a mark-recapture tagging program was initiated utilizing both volunteer anglers and DMF staff throughout the state. Red drum under 27 inches TL are tagged with an internal anchor tag, and red drum over 27 inches TL are tagged with a stainless-steel dart tag. The total number of red drum tagged in 2024 was 847 resulting in 98 recaptures (Table 6; Figure 14A). The time series average was 248 days at large with an average distance travelled of 16 miles (Table 6). Most recaptures occur within the state of NC, however, the maximum distance travelled was 276 miles into New Jersey waters (Figure 14B). The maximum days between release and recapture was 3,214 days or just over 8 years (Table 6). Information gathered from this survey is being considered as an input parameter in future ASMFC Atlantic coast red drum stock assessments.

Table 6. Total tagged, total recaptured, average days at large, maximum days at large, average distance traveled (miles), and maximum distance traveled (miles) for red drum tagged in the DMF Multi-Species Tagging Program from calendar year 2014–2024.

Year Tagged	Total Fish Tagged (#)	Total Fish Recaptured (#)	Average Days At Large	Max Days At Large	Avg. Distance Traveled (miles)	Max Distance Traveled (miles)
2014	1,157	54	344	3,192	33	174
2015	1,864	192	288	3,214	23	230
2016	2,200	227	274	2,059	18	276
2017	2,161	224	277	2,407	17	137
2018	1,406	159	255	2,340	19	135
2019	1,119	163	325	1,850	16	141
2020	950	193	226	1,423	12	126
2021	973	146	223	1,266	13	111
2022	877	144	204	838	13	153
2023	935	158	185	737	12	132
2024	847	98	122	353	10	102
Total	14,489	1,758	248	3,214	16	276

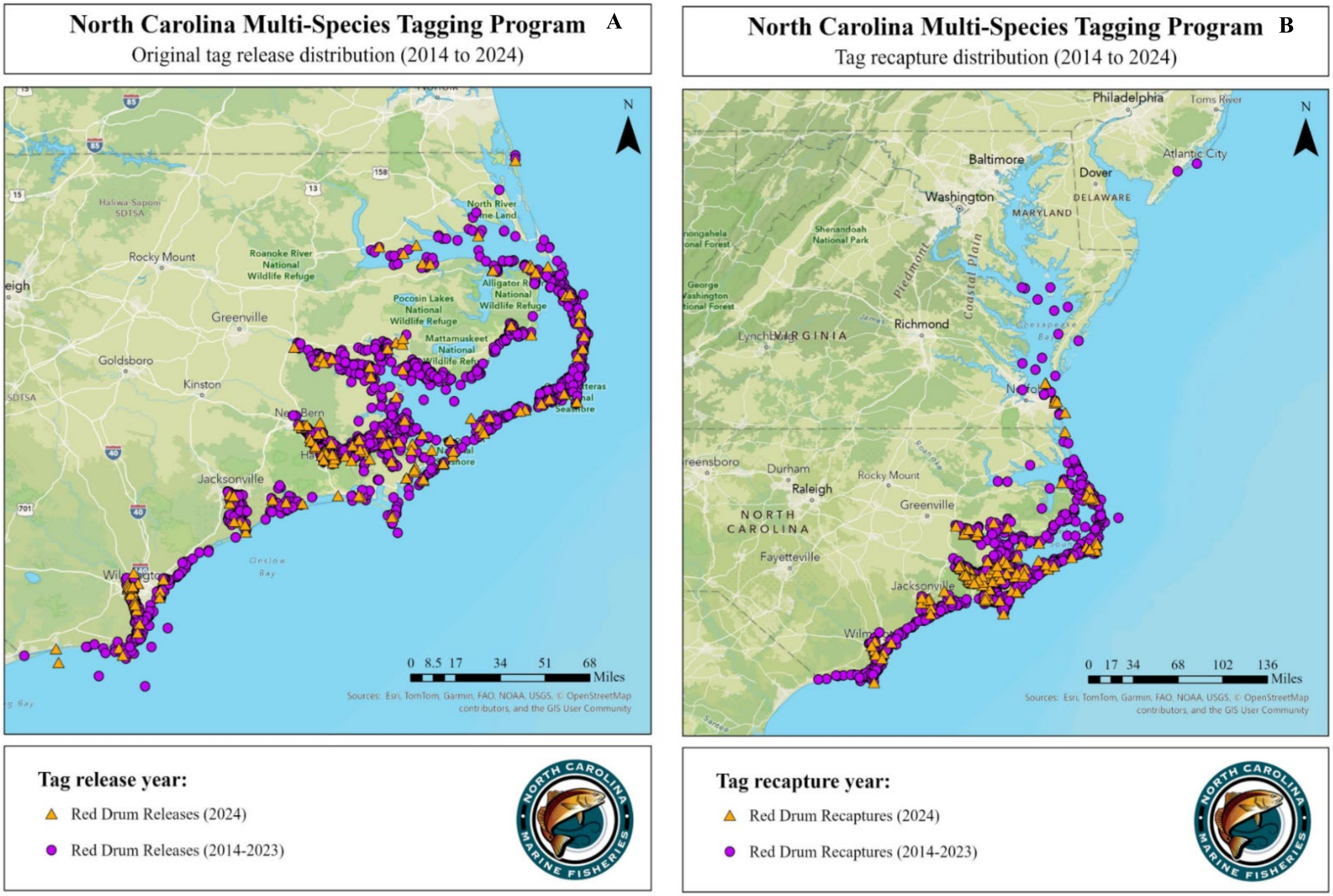

Figure 14. Red drum tagging release (A) and recapture locations (B), DMF Multi-Species Tagging Program from calendar year 2014–2024.

RESEARCH NEEDS

The following management and research needs are summarized from Amendment 1 to the North Carolina Red Drum FMP (status of need provided in parenthesis):

High

- Improve catch and effort data for the red drum recreational fishery, particularly for the adult fishery that occurs at night. Assess the size distribution of recreational discards (needed).
- Improved socio-economic data collection on the recreational and commercial fishery, including information on current conflicts and potential for future conflicts in these fisheries (needed).
- Conduct studies to explore ways to reduce red drum regulatory discards with commercial gear while allowing the retention of targeted species (needed).
- Conduct additional research to determine the release mortality of red drum (needed).
- Identify coastal wetlands and other habitats utilized by juvenile red drum and assess relationship between changes in recruitment success and changes in habitat conditions (needed).

Medium

- Obtain discard estimates from the commercial fisheries including information on size and disposition (ongoing through DMF observer program, recent expanded coverage).
- Conduct a comprehensive study of gill net fishers including information on species targeted, gear characteristics and areas fished (needed, valuable ongoing data from fish house sampling and commercial observer program).
- Examine ecological use and importance of shell bottom to red drum. Determine if designation of spawning areas is needed, and if specific protective measures should be developed (needed; some work through CRFL by UNC).
- Assess cumulative impact of large-scale beach nourishment and inlet dredging on red drum and other demersal fish that use the surf zone. Determine if navigational dredging between August and October significantly impacts spawning activity (needed).

Low

- Evaluate and improve independent surveys to monitor both the sub-adult and adult red drum populations (ongoing through DMF gillnet and longline surveys).
- Continue life history studies for age and growth. Additional work needed to update maturity schedule for the Northern Stock (age, growth, and maturity ongoing through DMF previous diet work through NCSU).
- Collect data to estimate movement rates of sub-adults in inshore waters and the adult population in offshore/nearshore waters for development of a multiarea assessment model (needed, ongoing NCDMF and NCMEF satellite tagging project).

MANAGEMENT

Red drum in North Carolina are managed under Amendment 1 to the North Carolina Red Drum FMP and Amendment 2 to the ASMFC Red Drum FMP. Both plans have an identical management threshold (overfishing) and management target (30% and 40% static spawning potential ratio) which is determined by a formal, peer reviewed stock assessment. Amendment 2 to the ASMFC Red Drum FMP requires specific compliance criteria, including harvest restrictions designed to achieve the management target. Any changes to harvest that deviate from options provided in the plan must be approved by the ASMFC South

Atlantic Board. Amendment 1 to the North Carolina Red Drum FMP maintained measures for compliance and implemented measures to reduce losses from discards in both the recreational and commercial fisheries.

As of May 7th, 2025, the Atlantic States Marine Fisheries Commission's Sciaenid's Management Board initiated Draft Addendum II to Amendment 2 to the Interstate Fishery Management Plan for Red Drum.

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

The most recent red drum stock assessment was completed in 2024. The next planned formal review of the North Carolina Red Drum FMP is set to begin in July 2025 to accommodate 2024 stock assessment results and any potential ASMFC management changes. It should be noted that any changes to the state FMP must consider compliance requirements of the ASMFC plan.

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FISHERY MANAGEMENT PLAN UPDATE
RIVER HERRING
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	February 2000	
Amendments:	Amendment 1	September 2007
	Amendment 2	May 2015
Revisions:	None	
Supplements:	None	
Information Updates:	August 2022	
Schedule Changes:	None	
Comprehensive Review:	2027	

In North Carolina blueback herring (*Alosa aestivalis*) and alewife (*Alosa pseudoharengus*), collectively known as river herring, are managed under Amendment 2 to the North Carolina Fishery Management Plan (FMP) for River Herring. The original FMP, adopted February 2000, focused on issues pertaining to stock conditions (overfished and recruitment overfishing), habitat degradations, and research/monitoring expansion to provide assessment and socioeconomic data (NCDMF 2000). Amendment 1 implemented a no-harvest provision for commercial and recreational fisheries of river herring in coastal waters of the state, effective in 2007 (NCDMF 2007). This was a result of the North Carolina Division of Marine Fisheries (NCDMF) 2005 stock assessment of river herring (data through 2003) that determined blueback herring and alewife were overfished and overfishing was occurring. There was minimal recruitment with continued declines in abundance for both species and high fishing mortality rates (Grist 2005). Additional management strategies included gear restrictions and stock recovery indicators (based on blueback herring). Amendment 1 also included a 7,500 pounds limited research set-aside harvest to be used for data collection and to provide product to local herring festivals. The DMF Director allocated a maximum of 4,000 pounds to be used for this discretionary harvest season by permitted fishermen, which occurred in the Chowan River Herring Management Area around Easter week each year. Additional outcomes of Amendment 1 included implementing monitoring programs; endorsing additional research on predation, restoration, impediments, bycatch; and supporting spawning area habitat protection.

Amendment 2 was finalized in 2015 with three management issues: 1) eliminating the discretionary river herring harvest season and permit since it was not serving the intended purposes of providing biological data for stock analysis and local product; 2) moving the Albemarle Sound/Chowan River Herring Management Areas to 15A NCAC 03R .0202, which corrected a reference and corrected the boundary of the Cashie River Anadromous Fish Spawning Area, and 3) removing alewife and blueback herring from exceptions in the Mutilated Finfish Rule 15A NCAC 03M .0101 (NCDMF 2015a).

Due to the Rules Review Committee receiving at least 10 letters requesting legislative review (pursuant to G.S. 150B), a portion of the third issue to prohibit possession of river herring (alewife and blueback herring) greater than six inches aboard a vessel or while engaged in fishing from the shore or a pier underwent legislative review during the 2016 spring short session. Since a bill was not introduced specifically disapproving the rule, the rule was effective June 13, 2016, in the River Herring Rule 15A NCAC 03M .0513.

Due to an extended period of low abundance and harvest moratorium, no new management was deemed necessary during the formal review in 2022. Subsequently, the 2022 FMP update served as the River Herring 2022 FMP Information Update.

In addition to the State FMP, river herring are managed through Amendment 2 of the Atlantic States Marine Fisheries Commission (ASMFC) Interstate FMP for Shad and River Herring. Adopted in 2009, Amendment 2 requires management measures from the ASMFC be adopted by North Carolina as the minimum standard for the fishery, while the North Carolina plan can adopt additional measures (ASMFC 2009). Additionally, Amendment 2 requires that states and jurisdictions develop sustainable FMPs to maintain a commercial and/or recreational river herring fishery past January 2012. Since a no-harvest provision is in place, North Carolina does not have a sustainable FMP. If Amendment 2 established targets are met in the future and allowing harvest is desired, a sustainable FMP would need to be developed by the state and approved by the ASMFC.

To ensure compliance with ASMFC interstate requirements, North Carolina also manages river herring under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). 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 (NCDMF 2015b).

Management Unit

Blueback herring and alewife management authority lies with the ASMFC. Responsibility for management action in the Economic Exclusive Zone (EEZ), located 3–200 miles from shore, lies with the Secretary of Commerce through the Atlantic Coastal Fisheries Cooperative Management Act in the absence of a federal FMP. The DMF also has a state FMP in place for statewide management of river herring.

Goal and Objectives

The goal of Amendment 2 to the North Carolina River Herring FMP is to restore the long-term viability of the river herring population. To achieve this goal, the plan adopts the following objectives:

- Identify and describe population attributes necessary to sustain long-term stock viability.
- Protect, restore, and enhance spawning and nursery area habitats.
- Initiate, enhance, and/or continue programs to collect and analyze biological, social, economic, fishery, and environmental data needed to effectively monitor and manage the river herring fishery.
- Promote education and public information to help the public understand the causes and nature of problems in the river herring stocks, its habitats and fisheries, and the rationale for management efforts to solve these problems.

The goal of Amendment 2 to the ASMFC Interstate FMP for Shad and River Herring (River Herring Management) is to protect, enhance, and restore east coast migratory spawning stocks of alewife and blueback herring in order to achieve stock restoration and maintain sustainable levels of spawning stock biomass. To achieve this goal, the plan adopts the following objectives:

- Prevent further declines in river herring (alewife and blueback herring) abundance.
- Improve our understanding of bycatch mortality by collecting and analyzing bycatch data.

- Increase our understanding of river herring fisheries, stock dynamics and population health through fishery-dependent and independent monitoring, in order to allow for evaluation of management performance.
- Retain existing or more conservative regulations for American shad and hickory shad.
- Promote improvements in degraded or historic alosine critical habitat throughout the species' range.

DESCRIPTION OF THE STOCK

Biological Profile

River herring is a collective term for alewife and blueback herring. River herring are anadromous fish, meaning they migrate from the ocean, into coastal bays and sounds, and into freshwater rivers and streams to spawn. Alewife spawn in rivers, lakes, and tributaries from northeastern Newfoundland to South Carolina, but are most abundant in the Mid-Atlantic and the Northeast. Blueback herring prefer to spawn in swift flowing rivers and tributaries from Nova Scotia to northern Florida but are most abundant in waters from the Chesapeake Bay south. Mature alewife (ages 3–9) and blueback herring (ages 3–9) migrate rapidly downstream after spawning. Juveniles remain in tidal freshwater nursery areas in spring and early summer but may also move upstream with the encroachment of saline water. As water temperatures decline in the fall, juveniles move downstream to more saline waters. Little information is available on the life history of river herring after they emigrate to the sea and before they mature and return to freshwater to spawn.

Adult river herring feed primarily on zooplankton (small, often microscopic animals floating in the water column) although they may also feed on fish eggs, crustacean eggs, insects and insect eggs, and small fish in some areas and in larger individuals. In general, alewife are larger than blueback herring of the same age and with each species females are larger than males. Total length for either species in North Carolina rarely exceeds 12 inches.

Stock Status

An Atlantic coastwide river herring stock assessment update was completed in August 2024, with data through 2022, by the ASMFC. Results indicate that river herring remain depleted and at near historic lows on a coastwide basis (ASMFC 2017). The North Carolina portion of the coastwide stock assessment is for the Chowan River blueback herring stock only, due to the long-term data available for this area. River herring in other parts of the state are currently listed as unknown by the ASMFC due to the lack of data for these systems. The stock assessment update found that, although the North Carolina stock in the Chowan River was not experiencing overfishing (harvesting from a stock at a rate greater than the stock's reproductive capacity to replace fish removed through harvest), the stock remains overfished. The factors leading to the stock status remain largely unchanged since the 2024 stock assessment, despite insignificant fishing pressure. The spawning stock biomass (SSB) for blueback herring, a stock status indicator, remains below 40% of the amount necessary to replace itself in the complete absence of fishing (Figure 1).

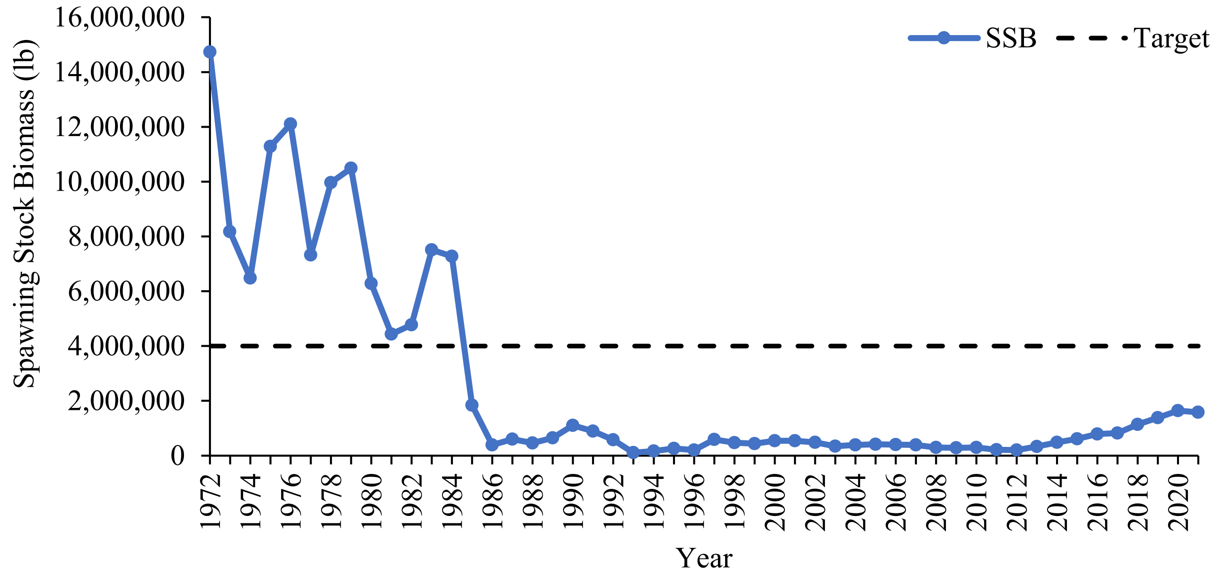


Figure 1. Annual predicted spawning stock biomass (SSB) in pounds for the Chowan River blueback herring stock, compared to the SSBTarget, 1972–2021. SSB is a stock status indicator and 2021 is the terminal year for the last river herring stock assessment update (ASMFC 2024).

Stock Assessment

The ASMFC stock assessment update used a forward-projecting, age-structured statistical catch-at-age model for the Chowan River blueback herring stock. The stock assessment incorporated blueback herring data from total in-river catches, age compositions, length compositions, and a fisheries-independent juvenile index to estimate age-3 abundance and mortality rates, from 1972 to 2021. Based on the 2021 fishing mortality rate and female spawning stock biomass estimates, the Chowan River blueback herring population is overfished but over-fishing is not occurring. Estimates of fishing mortality have been close to zero since the moratorium. Juvenile abundance is well below the North Carolina Amendment 2 target of 60 fish per haul with no increasing pattern evident. The percentage of repeat spawners varied from 2007 through 2010, remaining below the target of 10%, but has exceeded the target since 2011 to the highest level in 22 years of 16.8% in 2015. The SSB for blueback herring has been increasing since 2010 but remains at approximately 40% of the target of 3.9 million pounds.

It is worth noting the importance habitat and water quality play in the recovery of the river herring stocks in North Carolina and coastwide (NCDMF 2009). In North Carolina, considerable habitat has been lost through wetland drainage, stream channelization, and conversion to other uses. Some streams are blocked by dams, storm debris, and other physical barriers. Migration and spawning may be affected by the replacement of small road bridges and culverts. Oxygen consuming wastes are discharged into several streams and practices to control non-point discharges are inadequate causing nuisance algal blooms, fish kills, and fish diseases over the years. The DMF initiated a survey of culverts and obstructions following Amendment 1 to the North Carolina River Herring FMP. The list created from the survey has resulted in the replacement of failing culverts and prioritized others for replacement or repair.

DESCRIPTION OF THE FISHERY

Current Regulations

In 2007, Amendment 1 to the North Carolina River Herring FMP implemented a no-harvest provision for commercial and recreational fisheries of river herring in coastal waters. The North Carolina River Herring

FMP Amendment 2, adopted by the North Carolina Marine Fisheries Commission (MFC) in May 2015, eliminated the discretionary river herring harvest season and permit, removed alewife and blueback herring from exceptions in the Mutilated Finfish Rule, and prohibited the possession of river herring (blueback herring and alewife) greater than six inches aboard a vessel or while engaged in fishing from the shore or a pier.

Commercial Fishery

North Carolina landings of river herring from 1972 through the mid-1980s peaked at 11.5 million pounds (Table 1; Figure 2). Most landings occurred in the Chowan River and Albemarle Sound system. River herring landings declined sharply starting in 1986, prior to the implementation of regulations specific to river herring, first implemented in 1995.

Table 1. Commercial harvest (weight in pounds) of river herring from North Carolina, 1972–2006. Commercial harvest prohibited since 2007.

Year	Weight Landed (lb)	Year	Weight Landed (lb)
1972	11,237,143	1990	1,157,625
1973	7,925,898	1991	1,575,378
1974	6,209,542	1992	1,723,178
1975	5,952,067	1993	916,235
1976	6,401,360	1994	644,334
1977	8,523,813	1995	453,984
1978	6,607,153	1996	529,503
1979	5,119,150	1997	334,809
1980	6,218,523	1998	521,930
1981	4,753,723	1999	443,494
1982	9,437,703	2000	332,336
1983	5,868,332	2001	306,761
1984	6,516,109	2002	174,860
1985	11,548,278	2003	199,716
1986	6,814,323	2004	188,541
1987	3,194,975	2005	250,021
1988	4,191,211	2006	109,847
1989	1,491,077		
		Mean	3,114,461

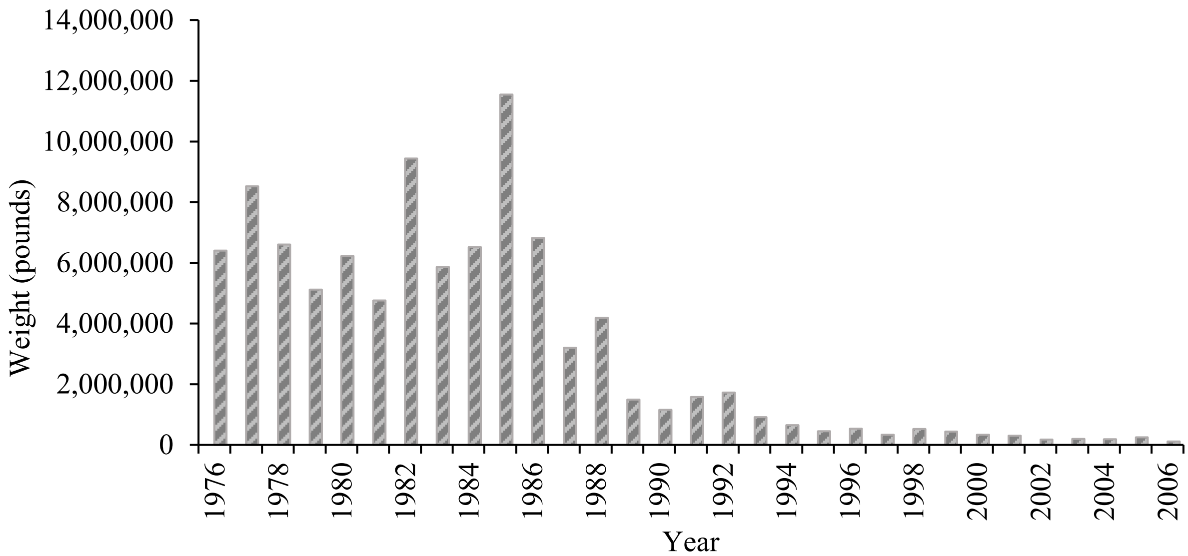


Figure 2. Commercial harvest (weight in pounds) of river herring from North Carolina, 1972–2006. Commercial harvest prohibited since 2007.

Amendment 1 implemented a no-harvest provision in 2007, allowing only for a limited discretionary harvest to provide local herring to festivals and continue DMF data collection from commercial fisheries. Table 2 includes information on landings data from 2007 through 2014 when the limited research set-aside season was prosecuted before being eliminated under Amendment 2 in 2015.

Table 2. Harvest (weight in pounds) and value of river herring from the North Carolina discretionary river herring harvest season, 2008–2014.

Year	Permits Issued	Quota (lb/permit/period)	Weight Landed (lb)	Value ($)
2008	13	250	1,292	775
2009	27	125	643	836
2010	30	125	1,765	1,765
2011	23	150	1,611	1,611
2012	18	150	678	678
2013	12	150	743	743
2014	27	150	989	1,319

Recreational Fishery

There is currently no recreational fishery for river herring per the no harvest provision outlined in Amendment 2. Formerly, most river herring caught recreationally were likely used for personal consumption and/or for bait. For the years leading up to the 2007 harvest closure, the extent of river herring harvest for personal consumption and bait in coastal North Carolina is unknown.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Commercial fishing activity is monitored through fishery-dependent sampling conducted by the DMF since 1972 in the Chowan River. The dominant gears for river herring were gill nets and pound nets. In 2007, the no-harvest provision essentially eliminated commercial landings. However, the Chowan River Pound Net survey was implemented in 2008, for the 2009 sampling year, to provide estimates of commercial catch-per-unit effort (CPUE), percent of repeat spawners, and age and sex data for alewife and blueback herring.

Table 3 and Table 4 describe the mean, minimum, and maximum length data for blueback herring and alewife from 1972 to 2024. In 2024, a total of 817 blueback herring and 623 alewife were measured from the Chowan River pound net survey. The overall average size of blueback herring was 9.00 inches fork length and 9.75 inches fork length for alewife.

Table 3. Mean, minimum, and maximum lengths (fork length, inches) of blueback herring measured from the Chowan River commercial fisheries, 1972–2024. *In 2007 a no-harvest provision for river herring went into effect and the Chowan River Pound Net survey began in 2009.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1972	9.75	7.00	11.50	2,564	1998	9.25	6.00	11.00	1,361
1973	9.75	5.50	11.50	2,208	1999	9.50	7.75	11.00	720
1974	9.75	7.25	11.50	1,622	2000	9.00	7.75	11.00	1,213
1975	9.50	6.00	11.00	2,428	2001	9.25	7.75	10.75	667
1976	9.75	8.25	11.25	1,564	2002	9.25	8.00	10.75	338
1977	9.75	5.50	11.75	1,425	2003	9.00	7.50	10.50	304
1978	10.00	8.25	11.75	1,342	2004	9.00	7.75	10.25	245
1979	10.00	8.25	12.25	1,218	2005	9.00	7.75	10.75	305
1980	10.00	8.25	11.50	1,229	2006	8.75	7.75	10.00	156
1981	10.00	8.50	12.00	1,469	2007	9.00	7.75	10.75	231
1982	9.75	8.75	11.50	851	2008	8.75	7.50	11.00	928
1983	9.50	8.25	11.25	482	2009*	9.00	7.75	10.50	546
1984	9.25	7.75	11.25	450	2010*	8.75	7.50	10.25	833
1985	9.50	8.50	11.25	388	2011*	9.00	7.50	10.50	500
1986	9.50	7.25	10.75	347	2012*	9.00	7.00	10.50	412
1987	9.50	8.00	11.00	318	2013*	9.00	7.75	10.75	492
1988	9.25	8.00	11.25	314	2014*	8.50	7.50	10.25	691
1989	9.25	8.25	10.75	273	2015*	8.75	7.75	10.75	589
1990	9.25	8.00	10.75	275	2016*	8.75	7.75	11.00	456
1991	9.25	8.00	11.00	357	2017*	9.00	7.50	10.25	528
1992	9.25	8.00	10.75	368	2018*	9.00	7.75	10.50	1,232
1993	9.25	7.50	10.50	160	2019*	9.25	8.00	10.50	868
1994	8.75	8.00	10.75	84	2020*	9.25	8.00	10.75	733
1995	9.25	8.25	10.50	322	2021*	9.00	7.50	10.25	525
1996	9.50	8.00	11.25	626	2022*	8.75	7.50	10.75	601
1997	9.50	8.00	11.25	625	2023*	9.00	7.75	10.75	1,069
1998	9.25	6.00	11.00	1361	2024*	9.00	7.75	10.75	817
1999	9.50	7.75	11.00	720					

Table 4. Mean, minimum, and maximum lengths (fork length, inches) of alewife measured from the Chowan River commercial fisheries, 1972–2024. *In 2007 a no-harvest provision for river herring went into effect and the Chowan River Pound Net survey began in 2009.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1972	10.25	6.25	12.25	1,337	1999	9.25	8.25	10.00	6
1973	10.00	7.75	12.25	1,471	2000	9.25	7.75	10.50	798
1974	9.00	5.75	11.25	616	2001	9.50	8.25	10.75	835
1975	9.75	7.75	12.00	2,440	2002	9.75	7.75	10.75	963
1976	9.75	8.25	12.00	2,029	2003	9.50	7.75	11.50	1,004
1977	10.00	5.00	12.25	2,024	2004	9.50	8.00	11.25	720
1978	10.25	7.75	11.50	997	2005	9.50	7.75	11.25	539
1979	10.00	7.75	11.50	1,143	2006	9.50	7.75	12.25	553
1980	10.00	8.50	12.25	551	2007	9.00	7.75	11.00	45
1981	9.75	8.50	11.25	1,052	2008	9.00	7.50	11.25	1,872
1982	9.75	8.50	12.00	752	2009*	9.25	7.75	10.75	1,000
1983	9.75	8.00	11.00	457	2010*	9.50	8.00	11.00	822
1984	9.75	8.75	11.75	351	2011*	9.75	8.00	11.25	806
1985	9.75	8.25	11.00	272	2012*	9.75	7.50	11.25	641
1986	9.25	8.25	11.00	203	2013*	9.25	7.75	13.00	854
1987	9.25	8.00	11.50	389	2014*	9.25	8.00	11.50	1,037
1988	9.50	8.00	10.75	312	2015*	9.25	8.00	11.00	998
1989	9.50	8.25	10.75	262	2016*	9.25	7.75	11.25	773
1990	9.50	8.00	11.00	194	2017*	9.25	7.75	14.00	1,336
1991	9.50	7.75	11.25	502	2018*	9.25	7.75	11.25	1,360
1992	9.25	7.75	11.00	300	2019*	9.50	8.00	11.25	1,004
1993	8.50	7.50	10.00	183	2020*	9.50	8.00	11.25	1,266
1994	8.50	8.00	9.00	2	2021*	9.25	7.50	11.00	873
1995	9.75	8.75	10.25	41	2022*	9.25	8.00	11.25	1,101
1996	9.50	8.50	10.50	42	2023*	9.50	8.00	11.50	1,572
1997	9.50	8.75	10.75	47	2024*	9.75	8.00	11.50	623
1998	9.50	7.75	11.00	55					

Variation in modal, minimum, and maximum ages throughout the fishery-dependent monitoring is described in Table 5 for blueback herring and Table 6 for alewife, with little variation across the time-series.

Table 5. Modal age, minimum age, maximum age, and number aged for blueback herring collected through DMF fishery-dependent sampling programs, 1972–2022. *In 2007 a no-harvest provision for river herring went into effect and the Chowan River Pound Net survey began in 2009. **Age data for 2023–2024 are unavailable.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged	Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1972	5	2	8	1,215	1999	5	3	7	389
1973	5	3	8	1,092	2000	4	3	9	512
1974	4	3	8	920	2001	5	3	7	311
1975	4	3	8	951	2002	5	3	7	164
1976	4	3	9	862	2003	5	3	7	147
1977	5	3	8	767	2004	4	3	6	130
1978	4	3	7	694	2005	4	3	6	162
1979	5	3	8	942	2006	4	3	5	86
1980	5	3	8	1,079	2007	5	3	6	143
1981	5	3	9	794	2008	4	3	7	474
1982	4	3	9	478	2009*	4	3	7	251
1983	4	3	8	314	2010*	4	3	7	247
1984	4	3	8	283	2011*	4	3	6	175
1985	5	3	7	249	2012*	4	3	7	189
1986	5	3	7	230	2013*	5	3	7	217
1987	4	3	7	208	2014*	4	3	7	198
1988	4	3	7	201	2015*	4	3	7	184
1989	4	3	6	184	2016*	4	3	8	226
1990	4	2	7	189	2017*	5	3	7	250
1991	4	2	7	242	2018*	4	3	6	272
1992	4	3	7	220	2019*	4	3	7	276
1993	5	2	8	112	2020*	4	3	7	253
1994	4	3	7	71	2021*	5	3	7	221
1995	5	3	7	192	2022*	4	3	7	243
1996	5	3	7	279	2023**	-	-	-	-
1997	4	3	7	180	2024**	-	-	-	-
1998	5	2	7	462					

Table 6. Modal age, minimum age, maximum age, and number aged for alewife collected through DMF fishery-dependent sampling programs, 1972–2024. *In 2007 a no-harvest provision for river herring went into effect and the Chowan River Pound Net survey began in 2009. **Age data for 2023–2024 are unavailable.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged	Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1972	4	3	9	783	1999	3,6	3	6	6
1973	4	3	9	721	2000	5	3	7	300
1974	4	2	7	417	2001	5	3	7	369
1975	4	2	9	842	2002	5	3	7	341
1976	4	3	7	853	2003	4	2	7	350
1977	5	3	8	759	2004	5	2	7	318
1978	4	3	8	736	2005	5	3	7	253
1979	4	3	8	701	2006	4	3	7	260
1980	5	3	8	492	2007	4	3	6	30
1981	5	4	8	532	2008	5	4	8	588
1982	4	3	7	444	2009*	5	3	7	342
1983	4	3	7	295	2010*	6	3	7	277
1984	4	3	7	248	2011*	6	3	8	211
1985	5	3	7	195	2012*	6	3	8	259
1986	4	3	6	146	2013*	5	2	7	308
1987	4	3	7	266	2014*	4	2	6	328
1988	4	2	6	228	2015*	4	3	7	206
1989	4	3	7	179	2016*	4	3	8	311
1990	4	2	7	153	2017*	5	3	7	346
1991	5	3	7	319	2018*	4	3	7	375
1992	5	2	8	242	2019*	4	3	7	286
1993	4	2	7	130	2020*	4	4	8	310
1994	4	4	4	2	2021*	4	3	9	335
1995	5	4	6	40	2022*	4	3	7	328
1996	4	3	7	41	2023**	-	-	-	-
1997	4	3	7	18	2024**	-	-	-	-
1998	-	-	-	-					

Figure 3 and Figure 4 illustrate the overall length at age (mean, minimum, and maximum) for blueback herring and alewife from all age samples collected at any given age from 1972 to 2022. Age data for 2023 and 2024 are not available for this update and will be provided when aging is complete.

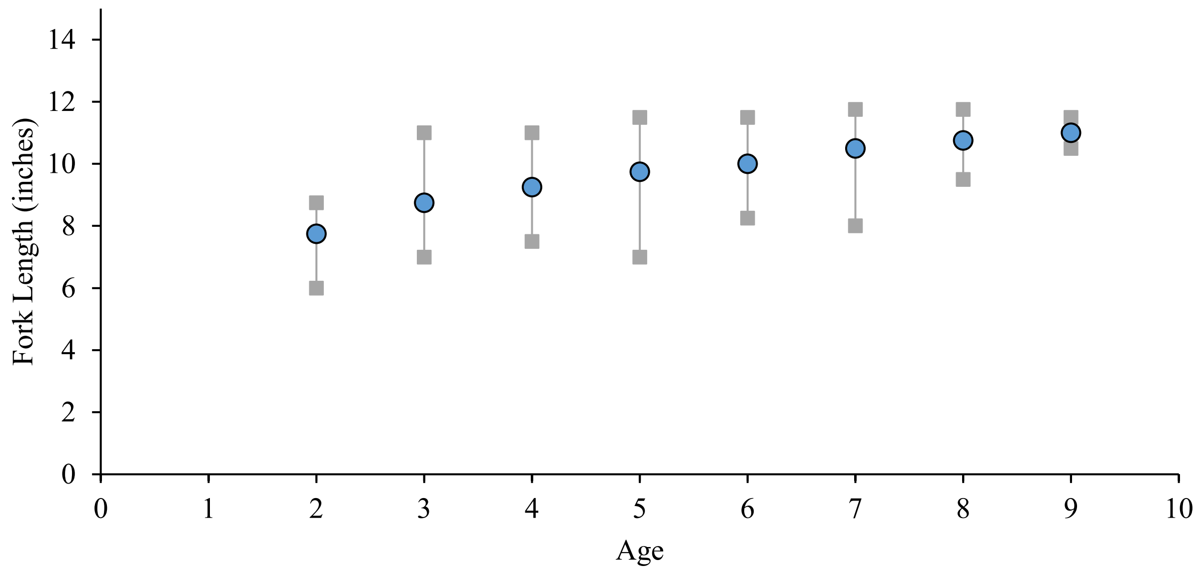


Figure 3. Blueback herring length at age from all age samples collected from fishery-dependent monitoring, 1972–2022. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. Age data from 2023–2024 is unavailable.

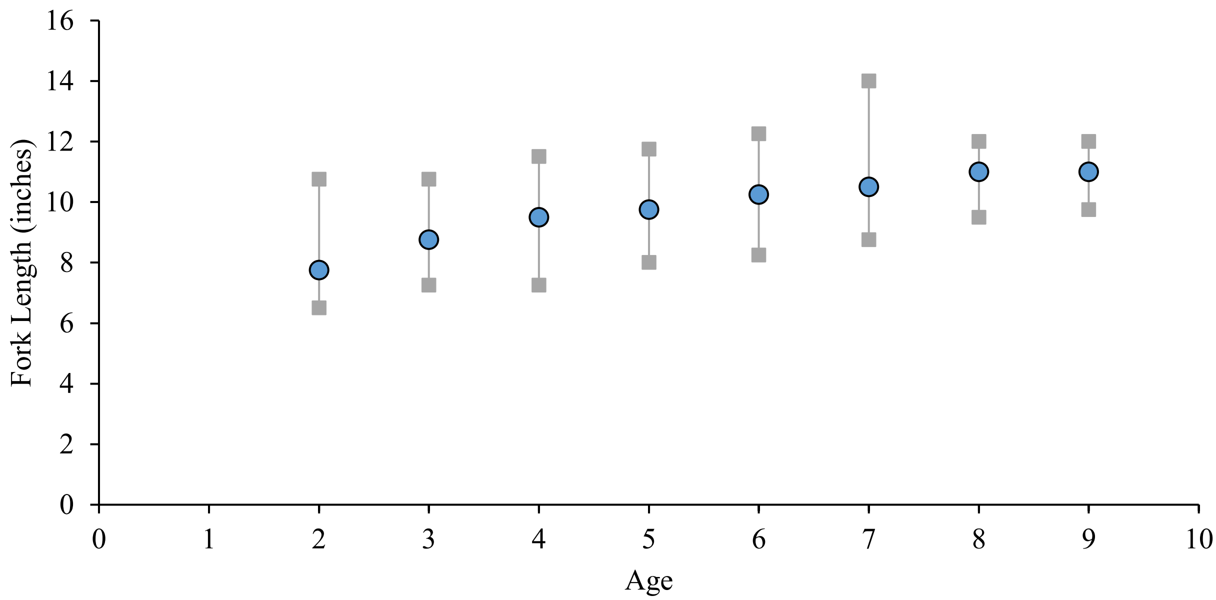


Figure 4. Alewife length at age from all age samples collected from fishery-dependent monitoring, 1972–2022. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. Age data from 2023–2024 is unavailable.

The DMF has monitored river herring repeat spawning since 1972 (Table 7; Figure 5). Percent repeat spawners for blueback herring from the Chowan River spawning stock is one of the stock recovery indicators identified in North Carolina River Herring FMP Amendment 2. The Chowan River blueback herring spawning stock should contain at least 10% repeat spawners (percent of the spawning stock that have spawned more than once). Since 2011, percentages of blueback herring have increased to levels above the restoration target, except for 2017 and 2022. For alewife percentages have been above the restoration target since 2007, except for 2014. Repeat spawner data for 2023 and 2024 are not available for this update and will be provided when aging is completed.

Table 7. Blueback herring and alewife percent (%) repeat spawners from the Chowan River pound net survey, 1972–2024. Blueback herring percent repeat spawner is a stock status indicator. *Repeat spawner data are unavailable for 2023–2024.

	Percent (%)			Percent (%)	
Year	Blueback Herring	Alewife	Year	Blueback Herring	Alewife
1972	22	15	1999	13	67
1973	17	14	2000	14	8
1974	18	4	2001	9	13
1975	6	10	2002	13	38
1976	11	8	2003	16	30
1977	9	5	2004	9	20
1978	6	8	2005	13	15
1979	16	9	2006	0	9
1980	19	18	2007	9	10
1981	48	29	2008	5	14
1982	11	1	2009	3	14
1983	14	2	2010	6	41
1984	7	34	2011	12	27
1985	10	12	2012	13	29
1986	16	4	2013	14	11
1987	22		2014	13	5
1988	11	6	2015	17	18
1989	4	9	2016	16	20
1990	12	17	2017	7	33
1991	31	21	2018	11	31
1992	26	48	2019	13	24
1993	12	5	2020	11	35
1994	5		2021	16	37
1995	6	8	2022	3	19
1996	13	29	2023*	-	-
1997	15	29	2024*	-	-
1998	7				

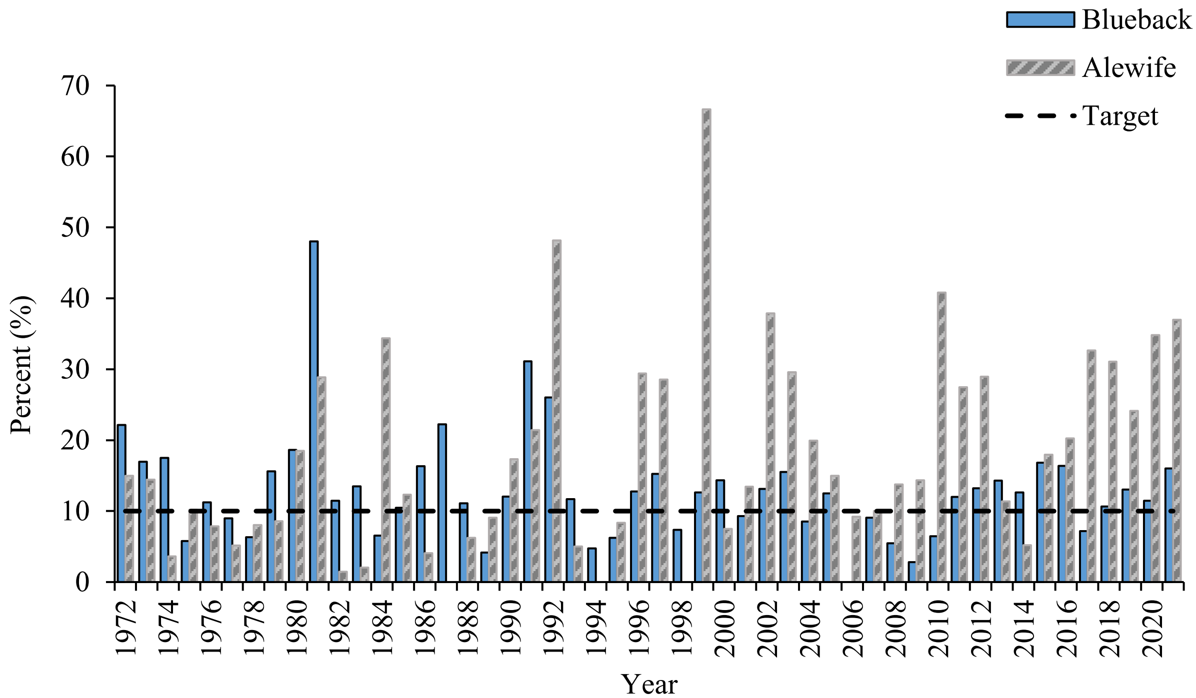


Figure 5. Annual percent of repeat spawners (blueback herring and alewife) and target from the Chowan River Pound Net Survey, 1972–2023. Blueback herring percent repeat spawner is a stock status indicator. Repeat spawner data from 2023–2024 is unavailable.

Total pound-net effort (operable nets per week) estimated total river herring catch (pounds), and CPUE for the Chowan River Pound Net Survey (Table 8) shows a downward trend through 2012 followed by an increasing trend through 2017. CPUE declined from 2017 through 2021, with 2021 having the lowest CPUE in the time series. The participating pound net fishermen contributed environmental conditions, such as drought and a warm spring, to the decrease in estimated river herring landings in 2021. The CPUE exhibited an inclining trend for 2022 and 2023.

In 2024, the CPUE decreased however remained above average for the time series. Approximately 57% of the estimated total river herring catch were blueback herring, based on the weekly subsample of river herring from the survey. The Chowan River Pound Net Survey was operated for 16 weeks in 2024, from late January to middle of May. Alewife were present in the weekly subsample starting in late January. Catches of alewife peaked in mid-February through mid-March before declining in April. Bluebacks appeared in the weekly subsample starting mid-February, with catches peaking in early April and declining through the end of the survey in mid-May.

Table 8. River herring total pound net effort estimated catch (weight in pounds) and catch per unit effort for the Chowan River pound net survey, 2009–2024.

Year	Total Effort (# of Active Sets)	Total RH (lb)	Total CPUE
2009	217	89,245	411.3
2010	260	71,532	275.1
2011	286	74,485	260.4
2012	315	18,415	58.5
2013	238	27,396	115.1
2014	271	45,619	168.3
2015	253	49,560	195.9
2016	228	77,372	339.4
2017	231	137,374	594.7
2018	276	86,605	313.8
2019	238	54,932	230.8
2020	249	53,810	216.1
2021	233	9,090	39.0
2022	215	84,497	393.0
2023	267	118,875	445.2
2024	194	59,510	306.8
Total	248.2	66,144.8	272.7

Fishery-Independent Monitoring

The DMF has conducted the Juvenile Anadromous Survey (Program 100) for river herring, annually since 1972. The survey has been conducted twice a month, using seines, at eleven fixed sites, in the Albemarle Sound-Chowan River area from June through October. Only the first sample from each month is used to calculate the CPUE for juvenile river herring (age 0). CPUE of blueback herring is one of the stock status indicators identified in Amendment 2. The blueback herring CPUE should exceed the three-year moving average threshold of 60-fish per haul, the average for 2022–2024 is 4.26 blueback herring per haul. The three-year average CPUE of juvenile blueback herring has remained well below the threshold of 60-fish per haul since the mid-1980's (Figure 6). In 2024 overall CPUE was 1.62 for blueback herring, which was an increase from the previous year (0.11 blueback herring per haul).

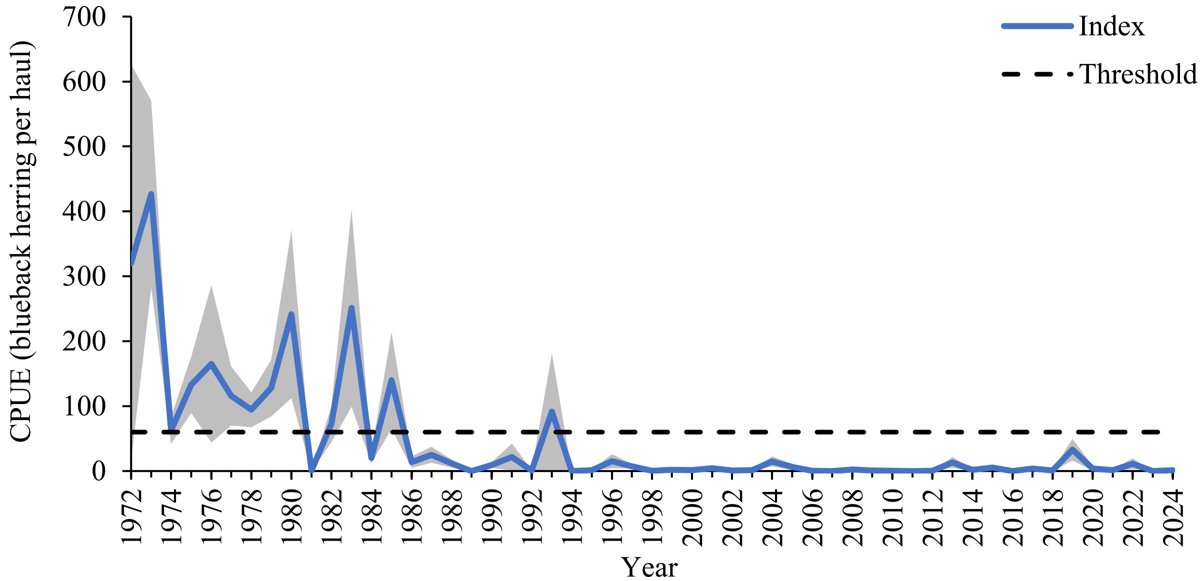


Figure 6. Catch per unit effort (fish per haul) and target of blueback herring collected from Program 100 in Albemarle Sound during June through October 1972–2024. Error bars represent ± 1 standard error. Blueback herring relative abundance is a stock status indicator.

Due to the low numbers of juvenile alewife caught across the time series, these data have not been used for management and are only shown here as an illustration of the trend in abundance (Figure 7). The 2024 overall CPUE was 0.05 for alewife, which was a decrease from the previous year (0.07 alewife per haul).

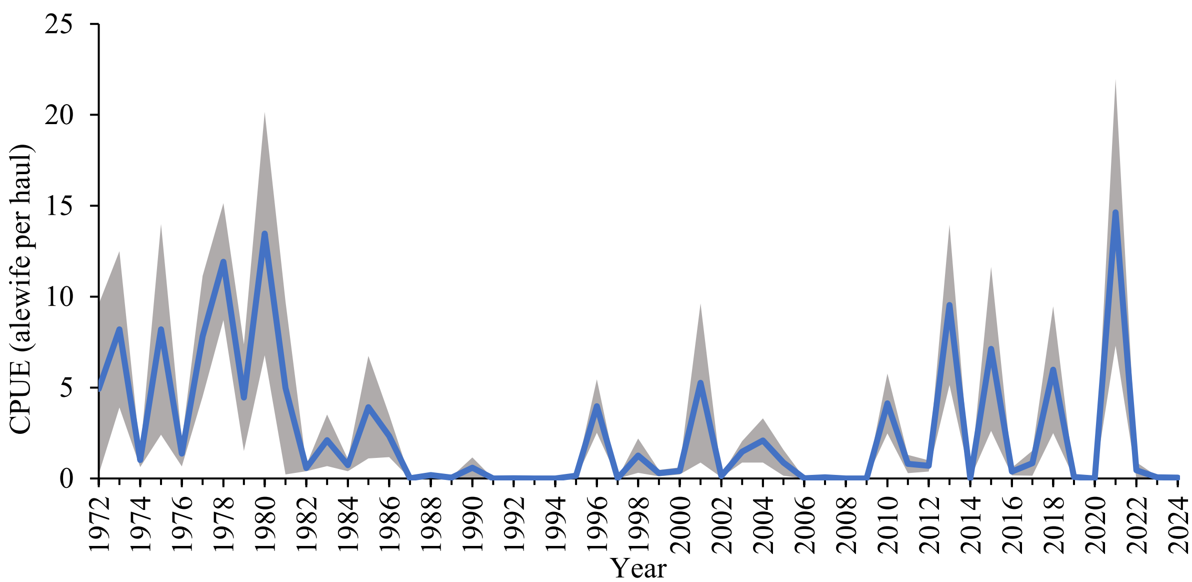


Figure 7. Catch per unit effort (fish per haul) of alewife collected from Program 100 in Albemarle Sound during June through October 1972–2024. Error bars represent ± 1 standard error.

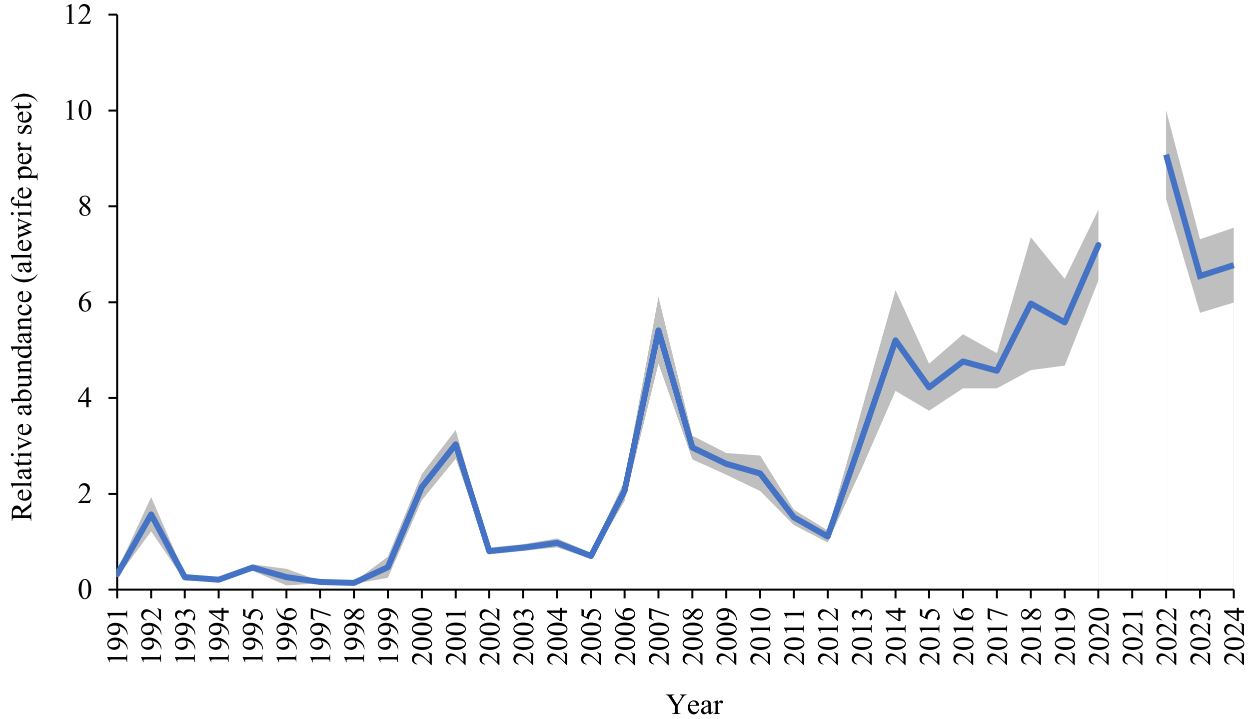
Adult river herring are monitored using the DMF Albemarle Sound Independent Gill Net Survey (Program 135). Program 135 began collecting biological data on adult river herring in 1991 but did not start collecting aging structures until 1999. The survey uses a stratified random sampling scheme designed to characterize the size and age distribution for key estuarine species in the Albemarle Sound.

Program 135 was suspended in February 2020 due to COVID-19 restrictions and protected species interactions. The survey resumed in the fall of 2021. In November 2021, the Albemarle Sound Independent Gill Net Survey (IGNS) expanded from six to eight zones and reduced soak time from 24-hours to 12-hours. Additionally, in March 2022, sink gill nets were removed from the survey, reducing effort to 480 yards per set (12 units of effort). Additional zones were added to meet DMF research priorities to expand the spatial coverage of the survey. Soak times were reduced and sink nets were removed to reduce interactions with endangered species through ongoing consultation with the United States Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Association (NOAA Fisheries). It should be noted that with such a major change in survey design, the index derived from this survey starting in November 2021 will not be directly comparable to the prior historical time series. When calculating blueback herring and alewife relative abundance using historical IGNS data, all sink gill nets were removed. It is important to note that most blueback herring and alewife intercepted in the IGNS survey are from float gill nets. Therefore, the removal of sink gill nets from the data set did not significantly impact the relative abundance estimates of American shad from the survey.

The river herring relative abundance index has been calculated from Program 135 since 1991 from the 2.5 and 3.0 inch stretched mesh (combined, float net only). Blueback herring and alewife relative abundance index from January through May for the period 1991–2024, are shown in Table 9 and Figure 8. Catch of both species has increased since 2012. No index of abundance is available for 2020 and 2021.

Table 9. Relative abundance index (fish per net) of river herring collected January–May in Program 135 (2.5- and 3.0-inch stretch mesh) in the Albemarle Sound, 1991–2024. *Survey suspended February 20, 2020, and did not resume until fall 2021.

	Alewife				Blueback Herring			
Year	Effort	Sum	CPUE	PSE	Effort	Sum	CPUE	PSE
1991	235	76	0.32	22	235	1,249	5.31	15
1992	273	429	1.57	18	273	1,230	4.51	12
1993	279	72	0.26	36	279	827	2.96	15
1994	264	54	0.20	30	264	305	1.16	25
1995	257	118	0.46	21	257	978	3.81	14
1996	256	67	0.26	46	256	825	3.22	16
1997	262	42	0.16	23	262	1,093	4.17	14
1998	257	36	0.14	21	256	939	3.67	15
1999	270	126	0.47	31	272	1,246	4.58	13
2000	260	556	2.14	15	260	1,447	5.57	12
2001	246	746	3.03	12	246	989	4.02	15
2002	251	202	0.80	14	251	821	3.27	15
2003	276	242	0.88	15	276	1,118	4.05	13
2004	249	243	0.98	16	249	740	2.97	16
2005	252	177	0.70	14	252	786	3.12	17
2006	258	533	2.07	13	258	873	3.38	14
2007	253	1,369	5.41	10	253	707	2.79	16
2008	252	748	2.97	11	250	482	1.93	19
2009	222	583	2.63	12	225	522	2.32	18
2010	207	502	2.43	14	207	409	1.98	21
2011	214	323	1.51	18	211	262	1.24	20
2012	178	197	1.11	13	181	174	0.96	23
2013	188	590	3.14	14	188	677	3.60	17
2014	195	1,014	5.20	11	193	505	2.62	19
2015	223	942	4.22	11	223	839	3.76	15
2016	229	1,091	4.76	11	229	1,019	4.45	14
2017	227	1,037	4.57	10	225	888	3.95	15
2018	189	1,128	5.97	11	189	1,124	5.95	13
2019	228	1,272	5.58	11	230	1,104	4.80	13
2020*	73	525	7.19	15	73	74	1.01	34
2021*	-	-	-	-	-	-	-	-
2022	126	1,144	9.08	10	126	482	3.83	18
2023	132	864	6.55	12	132	710	5.38	16
2024	136	921	6.77	12	136	455	3.35	19



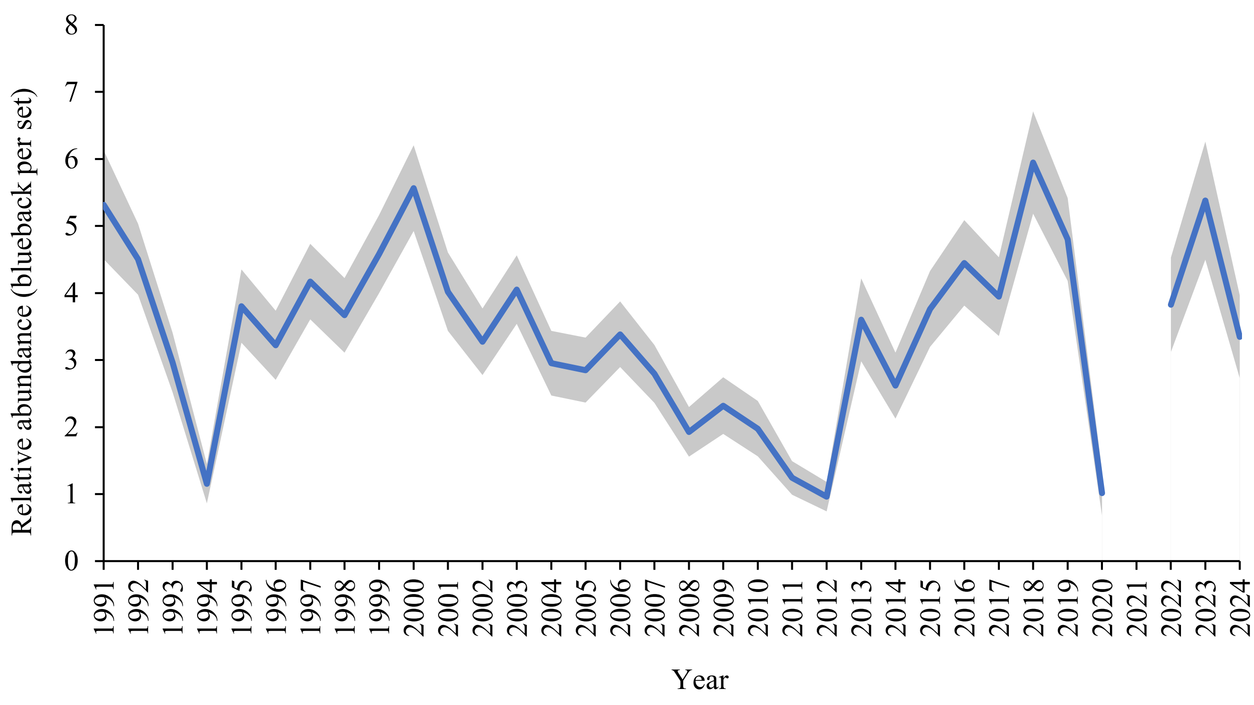


Figure 8. Relative abundance index of river herring (fish per net, 2.5- and 3.0-inch stretch mesh only) collected from Program 135 in Albemarle Sound during January through May 1991–2024. *Survey suspended February 20, 2020, and did not resume until fall 2021.

Tables 10 and 11 provide the mean, minimum and maximum length data for blueback and alewife from Program 135 for the period 1991–2024.

Table 10. Mean, minimum, and maximum lengths (fork length, inches) of blueback herring measured from Program 135, 1991–2024. *Survey suspended February 20, 2020, and did not resume until fall 2021.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1991	9.75	6.50	13.25	2,315
1992	9.75	8.00	11.75	2,140
1993	9.75	7.50	13.25	1,334
1994	9.75	8.25	13.25	555
1995	9.50	6.50	11.25	1,324
1996	9.50	5.75	13.25	1,090
1997	9.25	5.00	12.75	1,530
1998	9.50	8.00	11.25	1,230
1999	9.50	6.50	14.50	1,918
2000	9.50	8.25	11.25	2,740
2001	9.50	6.50	11.50	1,862
2002	9.75	5.50	11.00	1,339
2003	9.50	7.75	11.75	1,924
2004	9.50	8.25	17.25	1,157
2005	9.25	5.00	15.00	1,040
2006	9.25	7.25	13.25	1,790
2007	9.25	8.00	10.75	1,202
2008	9.25	4.75	10.75	694
2009	9.25	5.25	11.00	814
2010	9.25	7.75	12.25	609
2011	9.25	7.25	13.75	439
2012	9.50	8.00	10.75	295
2013	9.00	7.75	14.25	1,163
2014	9.25	7.75	13.00	797
2015	9.25	8.00	13.50	1,203
2016	9.50	4.25	17.00	1,555
2017	9.50	8.00	14.25	1,431
2018	9.50	8.00	11.25	1,764
2019	9.50	7.75	17.75	1,689
2020*	9.50	8.50	10.75	92
2021*	-	-	-	-
2022	9.50	7.75	11.50	711
2023	9.50	8.25	13.75	715
2024	9.50	8.00	11.00	456

Table 11. Mean, minimum, and maximum lengths (fork length, inches) of alewife measured from Program 135, 1991–2024. *Survey suspended February 20, 2020, and did not resume until fall 2021.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1991	10.00	5.75	12.00	235
1992	10.00	8.50	13.75	860
1993	9.50	8.00	13.25	143
1994	9.25	8.50	11.00	99
1995	9.50	6.75	15.00	212
1996	9.75	4.50	13.50	102
1997	10.00	8.25	14.25	65
1998	9.75	7.75	11.50	64
1999	9.00	8.00	15.25	228
2000	9.25	8.25	15.75	1,437
2001	9.75	5.25	17.75	1,934
2002	10.00	8.00	11.00	477
2003	9.75	7.75	14.50	553
2004	9.75	8.00	14.00	388
2005	9.50	5.75	17.00	275
2006	9.25	8.00	14.25	1,008
2007	9.25	4.50	15.50	2,344
2008	9.50	6.25	12.00	1,218
2009	9.50	5.75	14.25	995
2010	9.75	8.00	13.75	1,035
2011	10.00	8.00	11.75	491
2012	10.25	7.75	12.00	359
2013	9.25	7.75	13.50	1,004
2014	9.50	8.00	13.75	1,929
2015	9.75	4.50	12.50	1,780
2016	9.75	7.75	14.75	2,043
2017	9.75	7.75	12.75	1,529
2018	9.25	7.75	12.00	1,950
2019	9.50	7.75	11.75	2,063
2020*	9.75	8.25	11.50	749
2021*	-	-	-	-
2022	10.00	8.25	11.50	1,673
2023	9.75	8.00	13.50	881
2024	9.50	8.00	12.00	955

Variation in modal, minimum, and maximum ages throughout Program 135 is described in Table 12 for blueback herring and Table 13 for alewife, with little variation since aging began in 2004.

Table 12. Modal age, minimum age, maximum age, and number aged for blueback herring collected from Program 135, 1999–2022. *Survey suspended February 20, 2020, and did not resume until fall 2021. **Age data are unavailable for 2023–2024.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1999	5	3	7	241
2000	-	-	-	0
2001	-	-	-	0
2002	-	-	-	0
2003	-	-	-	0
2004	4	3	6	98
2005	4	2	7	174
2006	4,5	3	7	213
2007	5	3	7	173
2008	4,5	4	7	45
2009	4,5	4	7	72
2010	4	3	5	45
2011	4	3	6	100
2012	4	3	8	80
2013	3	2	7	107
2014	3	2	5	40
2015	4	3	6	139
2016	5,6	3	7	157
2017	5	3	7	176
2018	4	3	7	228
2019	4	3	7	211
2020*	5	3	7	59
2021*	-	-	-	-
2022	3	3	7	208
2023**	-	-	-	-
2024**	-	-	-	-

Table 13. Modal age, minimum age, maximum age, and number aged for alewife collected from Program 135, 1999–2022. *Survey suspended February 20, 2020, and did not resume until fall 2021. **Age data are unavailable for 2023–2024.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1999	5	4	7	18
2000	4	3	7	190
2001	5	3	6	289
2002	6	4	7	81
2003	4	4	7	127
2004	4	3	6	106
2005	5	3	7	148
2006	4,5	3	7	283
2007	4	3	8	266
2008	5	4	7	96
2009	5	2	7	125
2010	6	4	7	122
2011	5	3	8	137
2012	6	3	8	129
2013	4	2	6	168
2014	4	3	6	110
2015	5	3	7	263
2016	5	3	7	173
2017	5	3	8	249
2018	4	3	8	331
2019	4	3	8	239
2020*	5	4	7	18
2021*	-	-	-	-
2022	4	3	8	300
2023**	-	-	-	-
2024**	-	-	-	-

Figure 9 and Figure 10 illustrate the overall length at age (mean, minimum, and maximum) for blueback herring and alewife from all age samples collected from Program 135 for the period 1999–2022. Age data for 2023 and 2024 are not available for this update and will be provided when aging is completed.

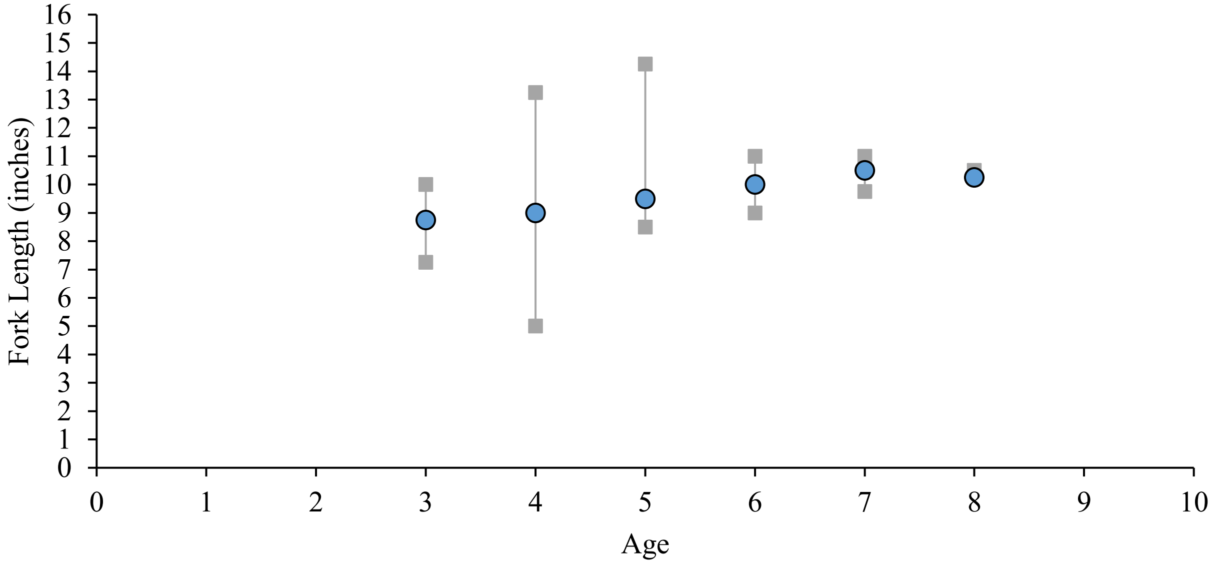


Figure 9. Blueback herring length at age from all age samples collected from Program 135 in the Albemarle Sound, 1999–2022. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. *Survey suspended February 20, 2020, and did not resume until fall 2021. Age data from 2023–2024 is unavailable.

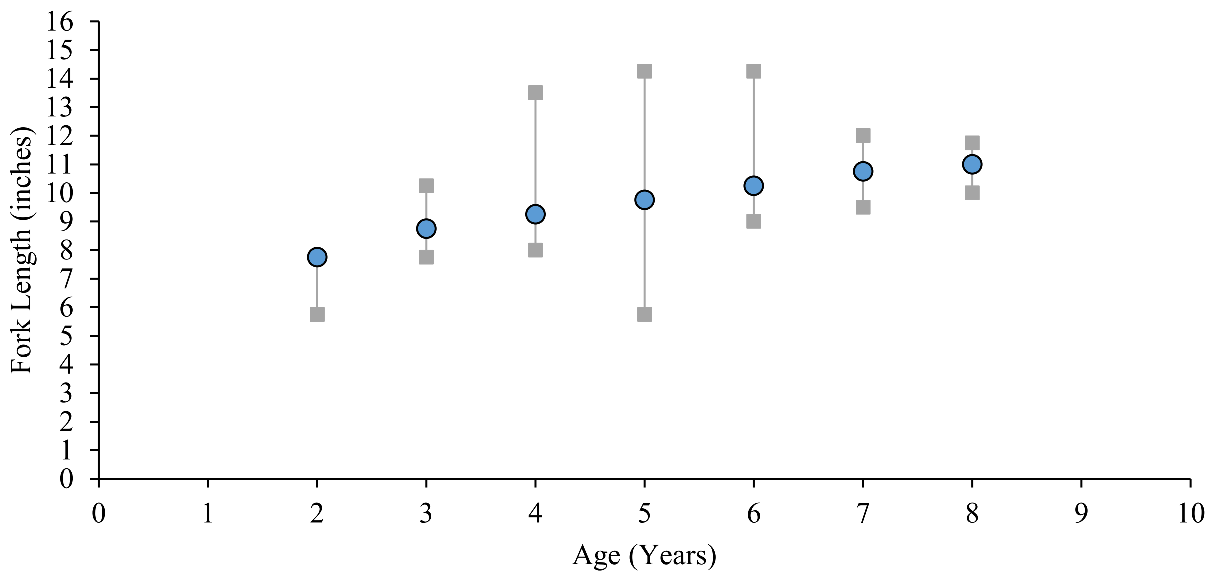


Figure 10. Alewife length at age from all age samples collected from Program 135 in the Albemarle Sound, 1999–2022. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. *Survey suspended February 20, 2020, and did not resume until fall 2021. Age data from 2023–2024 is unavailable.

RESEARCH NEEDS

On an annual basis the ASMFC publishes a prioritized list of short term and long-term research needs for American shad and river herring in the Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for Shad and River Herring (ASMFC 2020).

For more information on research needs for River herring please see: https://asmfc.org/uploads/file/64010087Approved_SRH_FMP_Report_FY_2021_2.2.23.pdf

MANAGEMENT

Amendment 1 to the North Carolina River Herring FMP implemented four stock recovery indicators to evaluate stock status. Under Amendment 2 to the North Carolina River Herring FMP, the plan development team determined that only three of the stock recovery indicators were necessary and decided that the term stock status indicator was more appropriate, using blueback herring as the indicator species. The three stock status indicators were adopted by the North Carolina River Herring FMP plan development team, each based on a three-year moving average. The plan development team recommended using the first two stock status indicators (juvenile abundance and repeat spawners) as a trigger for doing a stock assessment earlier than 10 years. If a three-year moving average of each of the indicators was above the threshold, it would trigger the need for a new stock assessment, which would determine the third stock status indicator. The third stock status indicator sets the threshold that determines when the river herring fishery will re-open.

- Catch per unit effort (CPUE) of 60 young-of-the-year per haul in the Albemarle Sound juvenile abundance survey.
- Ten percent repeat spawners observed in fishery-dependent pound net samples.
- Spawning stock biomass (SSB) of 30% unfished SSB, estimated in stock assessment model.

Collectively, these indices represent minimal stock rebuilding goals for the recovery of river herring stocks in the Albemarle Sound and Chowan River. In the 2024 stock assessment update, ASMFC recommended a ten-year interval between stock assessments (ASMFC 2024).

The stock status indicator for percent repeat spawners of blueback herring has exceeded the target of 10% since 2011, except for 2017 and 2022. The increase in the percent repeat spawners is a positive sign, which means that the current management strategy is working. Juvenile abundance has remained well below the threshold since the early 1990s. Spawning stock biomass will need to continue to increase enough to see results in the juvenile index before the fishery could reopen. The Female SSB has declined from a peak of 6,600 metric tons in 1972 to a low of 170 metric tons in 1986, reaching its lowest level of 93 metric tons in 2012 (ASMFC 2024). The model estimated that female SSB, while still low, has been increasing since 2013.

The MFC implemented a series of management strategies under North Carolina River Herring FMP Amendment 2. These management strategies and their implementation status are listed in Table 14.

Table 14. Summary of the N.C. Marine Fisheries Commission management strategies and their implementation status for Amendment 2 of the River Herring Fishery Management Plan.

Management Strategy	Implementation Status
Eliminate the discretionary river herring harvest season and permit	Existing proclamation authority
Moving the Albemarle Sound/Chowan River Herring Management Areas to correct boundary reference for the Cashie River Anadromous Fish Spawning Area	15A NCAC 03R .0202
Remove alewife and blueback herring from the Mutilated Finfish Rule	15A NCAC 03M .0101
Prohibit possession of alewife and blueback herring greater than six inches aboard a vessel or while engaged in fishing from the shore or a pier.	15A NCAC 03M .0513

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

River herring in North Carolina are managed under two separate North Carolina FMPs, Amendment 2 to the North Carolina River Herring FMP and the North Carolina FMP for Interjurisdictional Fisheries, as well as ASMFC's Amendment 2 to the Interstate FMP for Shad and River Herring. The Division recommends transitioning management from the North Carolina River Herring FMP and maintaining their management solely through the North Carolina FMP for Interjurisdictional Fisheries with the ASMFC. This action will achieve efficiencies by addressing any redundancy in management between the ASMFC Interstate FMP and two separate North Carolina FMPs. The Division will begin taking the appropriate steps to facilitate this transfer, whereby river herring management would be addressed solely through the North Carolina FMP for Interjurisdictional Fisheries.

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FISHERY MANAGEMENT PLAN UPDATE
SHEEPSHEAD
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	None
Amendments:	None
Revisions:	None
Supplements:	None
Information Updates:	None
Schedule Changes:	None
Comprehensive Review:	None

Sheepshead (*Archosargus probatocephalus*) was previously managed in the South Atlantic Fishery Management Council (SAFMC) Snapper Grouper Fishery Management Plan (FMP). The plan restricted recreational anglers to an aggregate 20 fish bag limit, no commercial trip limit, and no size limit. In state waters, North Carolina deferred management to the Council regulations. In April 2012, sheepshead was removed from the SAFMC snapper grouper management complex through the Comprehensive Annual Catch Limit Amendment (Amendment 25; SAFMC 2011). Subsequently, N. C. Division of Marine Fisheries (DMF) Director proclamation authority for sheepshead management was invalidated since sheepshead was no longer part of the North Carolina FMP for Interjurisdictional Fisheries or a Council managed species. In November 2012, the N.C. Marine Fisheries Commission (MFC) requested a rule be developed for sheepshead; and approved the rule in November 2013 that specifies the Director's proclamation authority, including the ability to implement size, bag, and trip limits, as well as season and gear restrictions (NCMFC 15A NCAC 03M .0521). In July 2014, the DMF began developing potential management measures for sheepshead to present to the MFC. In 2015, the Commission implemented new regulations that included size, bag, and trip limits to prevent overharvest, as well as to allow a greater number of fish to spawn before being harvested. There currently is no state or federal FMP for sheepshead.

Management Unit

North Carolina manages sheepshead in state waters (internal joint and coastal fishing waters and 0 to 3 miles in the Atlantic Ocean).

Goal and Objectives

None

DESCRIPTION OF THE STOCK

Biological Profile

Sheepshead are a relatively large, long-lived member of the porgy family that ranges from Nova Scotia, Canada to Florida and the Gulf of Mexico south to the Atlantic coast of Brazil. They are generally found year-round in North Carolina coastal waters ranging from inshore brackish waters to offshore rocky bottom (Hildebrand and Cable 1938). Juveniles are associated with shallow vegetated habitat as well as hard structures that offer protection (Parsons and Peters 1987; Johnson 2024). As sheepshead grow larger, they move to typical adult habitat including oyster reefs, rocks, pilings, jetties, piers, and wrecks (Johnson 1978).

While sheepshead exhibit strong site fidelity and tend to stay in the same areas throughout much of the year, they migrate seasonally to spawn (Wiggers 2010; Lohmann et al. 2023). Migration patterns based on mark recapture studies have not documented large scale, north-south movements. Movement instead tends to be towards inlets during the fall and winter when adult sheepshead migrate to ocean waters to spawn (Jennings 1985; Wiggers 2010; Lohmann et al. 2023).

Sheepshead are omnivores, eating plants as well as animals (barnacles, crabs, oysters; Jennings 1985). Sheepshead grow quickly up to age 6, and then their growth slows. After their first year, sheepshead average 10 inches fork length (FL); at this size less than 50% of the fish are sexually mature (McDonough et al. 2011). Most sheepshead mature at age-2 (12 inches fork length) and all sheepshead are mature by ages 3 to 5 (14 inches FL; McDonough et al. 2011). In North Carolina, sheepshead commonly reach a length of 20 to 25 inches FL with average weight ranging from 5 to 15 pounds. The maximum reported age in North Carolina is 34 years.

Stock Status

The Division is continuing to collect data from recreational, commercial, and independent sampling efforts to estimate trends in abundance of sheepshead; age structure, maturity, and other biological information is also being collected.

Stock Assessment

There is not an approved stock assessment for sheepshead in North Carolina. Multiple stock assessment strategies (from Virginia through Georgia) were explored by researchers at North Carolina State University, with data from 1996 through 2019 (Teears 2023). A benchmark stock assessment, with a more recent terminal year, is needed to determine the stock status of sheepshead in North Carolina.

DESCRIPTION OF THE FISHERY

Current Regulations

In 2015, the MFC implemented a 10-inch FL minimum size limit for both recreational and commercial fisheries (Proclamation FF-28-2015). There is a recreational bag limit of 10 fish per person per day or per trip (if a trip occurs over more than one calendar day). Commercial fishing operations are limited to 300 pounds per trip with two exceptions; gig and spear operations are limited to 10 fish per person per day or trip (if a trip occurs over more than one calendar day), and pound net operations are exempt from the commercial trip limits.

Commercial Fishery

Commercial landings of sheepshead in North Carolina have been available since 1950. However, monthly landings were not available until 1974. North Carolina instituted mandatory reporting of commercial landings through the Trip Ticket Program starting in 1994. Landings information collected since 1994 is considered the most reliable. Landings have fluctuated from year to year, ranging from 50,414 pounds in 1997 to 180,343 pounds in 2013 (Figure 1). The number of trips landing sheepshead has shown a general decline since 2013; though, have increased since 2020. In 2024, 129,702 pounds of sheepshead were landed in the commercial fishery, the highest landings since management was implemented in 2015 (Table 1; Figure 1).

Table 1. Recreational harvest (number of fish released and weight) and releases (number of fish; MRIP) and commercial harvest (weight in pounds; Atlantic Coastal Cooperative Statistics Program and N.C. Trip Ticket Program) of sheepshead from North Carolina, 1996–2024. All weights are in pounds.

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1996	77,750	12,798	256,911	82,290	339,201
1997	209,662	55,258	308,381	50,414	358,795
1998	151,473	109,454	209,825	60,184	270,009
1999	255,885	124,676	758,153	60,895	819,048
2000	355,192	94,963	780,622	88,459	869,081
2001	183,781	66,594	654,527	64,522	719,049
2002	181,197	68,317	781,567	57,434	839,001
2003	294,989	85,877	983,640	53,361	1,037,001
2004	86,554	40,263	453,372	82,009	535,381
2005	87,504	65,863	340,227	53,259	393,486
2006	137,312	90,502	445,182	57,481	502,663
2007	433,872	334,014	1,456,396	77,173	1,533,569
2008	503,666	172,604	1,007,914	89,726	1,097,640
2009	362,439	299,221	577,311	132,390	709,701
2010	327,223	190,823	966,467	157,631	1,124,098
2011	196,844	78,821	522,896	120,976	643,872
2012	346,609	269,226	797,963	109,881	907,844
2013	784,747	391,809	1,220,357	180,343	1,400,700
2014	185,267	224,062	389,583	173,376	562,959
2015	181,554	160,447	520,382	124,850	645,232
2016	149,085	212,471	375,328	93,585	468,913
2017	282,480	910,841	810,633	128,608	939,241
2018	343,772	524,967	735,738	90,406	826,144
2019	221,419	312,479	590,150	86,406	676,556
2020	247,390	518,140	592,774	76,608	669,382
2021	324,540	873,080	928,130	85,452	1,013,582
2022	387,924	570,444	1,024,623	69,381	1,094,004
2023	263,328	734,253	619,265	114,751	734,016
2024	461,480	1,131,206	1,427,785	129,702	1,557,487
Mean	276,722	300,809	708,141	94,881	803,023

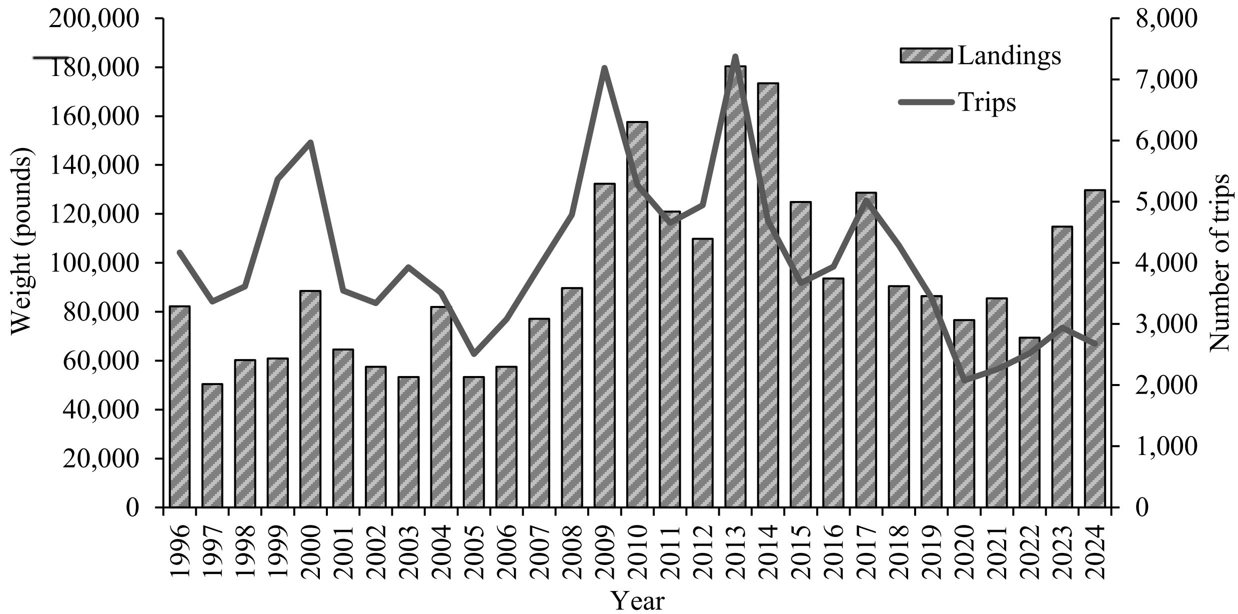

Figure 1. Annual commercial (N.C. Trip Ticket Program) landings in pounds and number of trips for sheepshead in North Carolina from 1996 – 2024.

Sheepshead are primarily caught as bycatch in several of North Carolina's commercial fisheries (e.g., gill net, pound net, haul seine). Estuarine gill nets and pound nets have made up greater than 50% of the landings for most of the time series. A targeted spear fishery developed in the last 15-years, and the gig fishery has also become more popular, though effort has started to decrease in both (Table 2). While the long-haul fishery used to account for up to 20% of the landings, this fishery has accounted for less than one percent of the harvest in recent years. In 2024, 93% of commercial landings came from pound nets (64%) and gill nets (29%; primarily estuarine gill nets). Pound net and estuarine gill net landings doubled between 2022 and 2023. In 2024, landings from estuarine gill nets remained stable compared to 2023 while pound net landings increased by 17%. This increase in pound net landings was the result of several days of high-volume catches during the month of October. An additional 4% was landed by spears and gigs (Table 2), the lowest percent in the last decade.

Table 2. Commercial harvest (weight in pounds) of sheepshead by gear type, 2015 – 2024 (Source N.C. Trip Ticket Program).

Year	Spears and Gigs[$]	Estuarine Gill Net	Long Haul	Ocean Gill Net	Pound Net	Trawls	Other*	Total Harvest
2015	13,695	27,268	421	5,720	73,035	3,998	713	124,850
2016	14,761	30,851	322	2,509	36,839	7,140	1,163	93,585
2017	10,720	33,770	513	1,677	74,246	7,047	636	128,608
2018	9,076	25,722	81	2,895	50,429	1,012	1,191	90,406
2019	13,858	25,309	843	3,437	36,496	5,567	897	86,406
2020	7,391	16,942	839	1,965	47,445	1,600	427	76,608
2021	8,960	18,255	1,658	3,761	48,842	2,850	1,126	85,452
2022	6,497	16,950	1,815	1,615	38,936	1,101	2,467	69,381
2023	5,847	33,642	89	2,834	70,599	316	1,425	114,751
2024	5,235	35,016	148	3,181	82,728	878	2,517	129,702
Mean	9,604	26,372	673	2,959	55,959	3,151	1,256	99,975

* Other gears include fyke nets, crab pots, and hook and line.
[$] Spear and gigs have also been combined due to data confidentiality.

Recreational Fishery

The recreational fishery tends to be more of a targeted fishery compared to the commercial. This fishery is primarily a hook and line fishery, but the species is becoming a favorite of spear fishermen. Recreational harvest estimates have been available since 1981. Recreational estimates across all years have been updated and are now based on the Marine Recreational Information Program (MRIP) new Fishing Effort Survey-based calibrated estimates. For more information see https://www.fisheries.noaa.gov/topic/recreational-fishing-data.

On average, recreational harvest accounts for 87% of North Carolina total harvest (pounds) from 1996 – 2024. In 2024, recreational harvest accounted for 92% of the total harvest (Table 1). Like commercial harvest, landings have fluctuated annually, with a low of 209,825 pounds harvested in 1998 and a high of 1,456,396 pounds in 2007 (Table 1). In 2024, 1,427,785 pounds of sheepshead were landed recreationally; the second highest value in the time series, and the highest since management was implemented in 2015. Recreational releases increased 54% from 2023 to 2024 and were the highest of the time series. Since 2016, a larger targeted fishery has developed for this species. Since 2019, recreational catch (harvest and releases, numbers) has been increasing, potentially the result of normal fluctuations in availability or possibly the result of increased regulations for other species such as southern flounder. Directed trips for sheepshead (trips where anglers indicated sheepshead were the primary or secondary target species) averaged 200,000 per year until 2021, when they increased by 119%; directed trips have remained at this higher level through 2024 (Figure 2). Annual catch, as well as survey data, will continue to be monitored to determine trends for this stock.

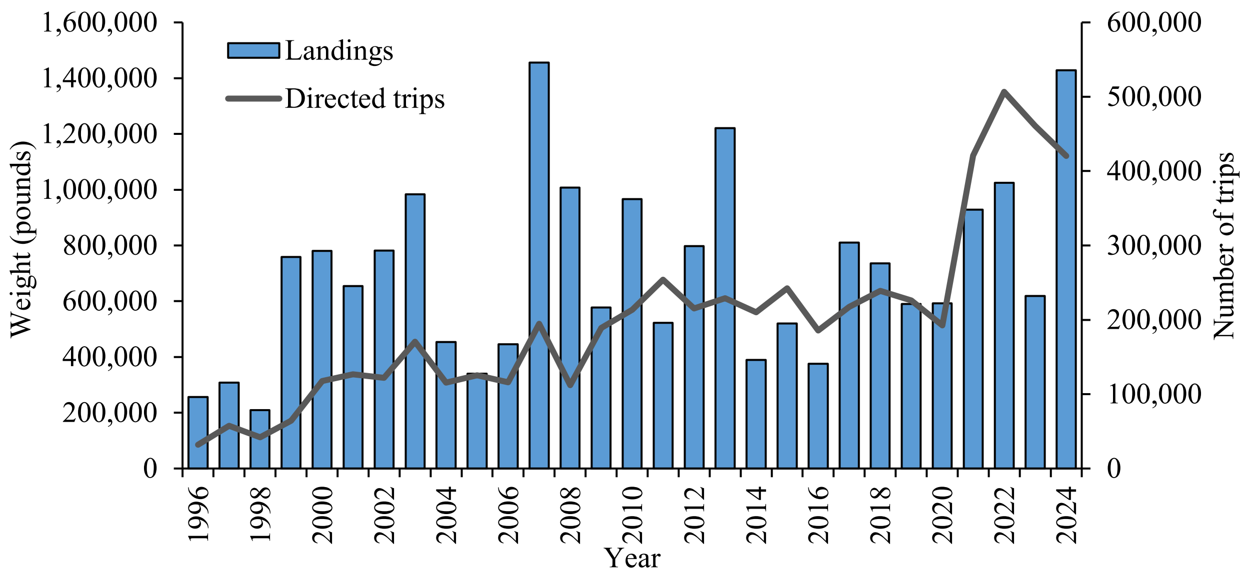

Figure 2. Annual recreational (MRIP) landings in pounds and directed trips for sheepshead in North Carolina, 1996 – 2024.

The DMF offers award citations for exceptional catches of sheepshead. Since 1991, approximately 3,100 citations for sheepshead have been issued. From 1991 through 2007, the number of award citations was under 50 citations per year. From 2008 through 2014, the number of award citations increased steadily but then started to decrease (Figure 3). Between 2021 – 2023, the number of citations increased, and citations issued in 2022 and 2023 represent a 170% increase from 2021. In 2024, the number of citations awarded decreased, though the number is still one of the highest values of the time series; 197 citations were issued, 38 of which were for released fish. Historically, citations for sheepshead were for landed fish but as of 2024 a release category was added along with a minimum size requirement. Citations are awarded for sheepshead that are eight pounds or greater and/or 24-inches total length (TL; equal to 21.6 inches FL).

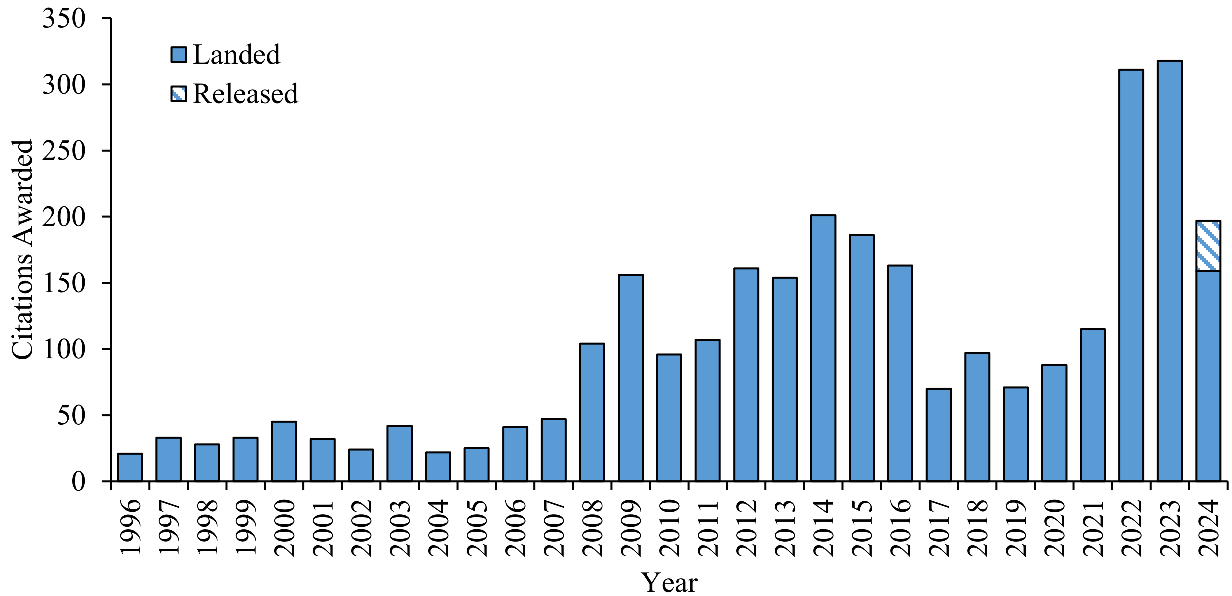

Figure 3. North Carolina Saltwater Fishing Tournament citations awarded for sheepshead from 1991 – 2024. Release citations were awarded for sheepshead for the first time in 2024.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Commercial fishing activity is monitored through fishery-dependent sampling programs conducted by DMF. Data collected in these programs allow the size and age distribution of sheepshead to be characterized by gear and fishery. In 2024, 235 lengths were measured at fish houses or on the water, the majority of which came from the estuarine gill net, spear, and pound net fisheries. The average size of commercial caught sheepshead was 14 inches FL (Table 3). This has varied from year to year (10 to 20 inches FL), with the average and minimum sizes being smaller when there was no size limit prior to 2015. The majority of sheepshead landed in 2024 were between 10 and 18 inches FL (Figure 4).

Similar to the commercial fishery, average size varies little from year to year in the recreational fishery (Table 3). In 2024, the average size recreational sheepshead was 15 inches FL (Table 3). The majority of sheepshead landed in 2024 were between 9 and 21 inches FL (Figure 5). The maximum size observed by MRIP in the recreational fishery was 24 inches FL; however, fish up to 28 inches FL were observed by the citation program in 2024.

In both fisheries, sublegal fish (<10 inches FL) are still being harvested (Table 3; Figures 4 and 5). This is most likely due to fishermen confusing sheepshead and black drum regulations. While the size limits differ, black drum are measured for total length (TL) and sheepshead for FL; a 10-inch TL sheepshead would be just under 9 inches FL.

Table 3. Sheepshead length (fork length, inches) data from commercial fish house and Marine Recreational Information Program samples, 1996 – 2024.

Year	Commercial				Recreational			
	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1996	15	7	22	137	15	9	26	79
1997	16	6	24	102	11	6	24	134
1998	13	6	24	330	11	6	23	191
1999	13	8	24	492	14	7	29	187
2000	16	8	28	1,305	13	8	24	239
2001	15	8	22	306	15	10	30	132
2002	13	8	24	412	16	10	23	56
2003	14	9	24	421	14	8	26	96
2004	16	8	23	305	17	9	24	54
2005	17	7	25	443	16	9	23	34
2006	16	8	24	467	15	7	24	55
2007	14	7	24	850	15	7	24	118
2008	13	6	24	1,420	12	7	21	108
2009	12	6	23	1,399	11	7	21	159
2010	13	7	24	1,743	14	8	26	221
2011	15	9	24	1,247	14	7	25	160
2012	13	7	23	1,161	13	6	23	254
2013	13	7	24	1,283	11	6	24	351
2014	14	7	23	1,296	13	8	25	99
2015	15	8	24	982	14	9	23	134
2016	15	8	24	964	14	8	25	106
2017	14	9	23	348	14	4	22	272
2018	14	8	23	694	13	9	23	386
2019	15	8	24	624	14	10	25	243
2020	14	9	22	426	13	8	25	260
2021	13	8	23	586	14	8	22	177
2022	13	8	22	431	14	8	25	222
2023	13	9	22	336	13	9	22	218
2024	14	10	24	235	15	9	24	118

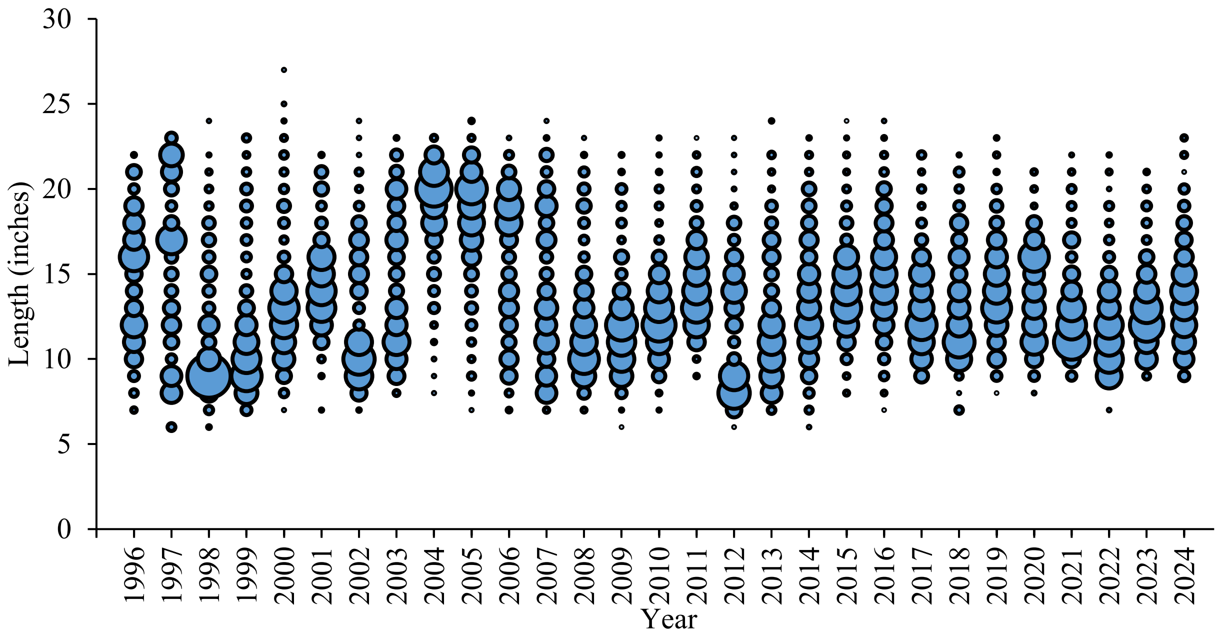

Figure 4. Commercial length frequency (fork length, inches) of sheepshead harvested from 1996 – 2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

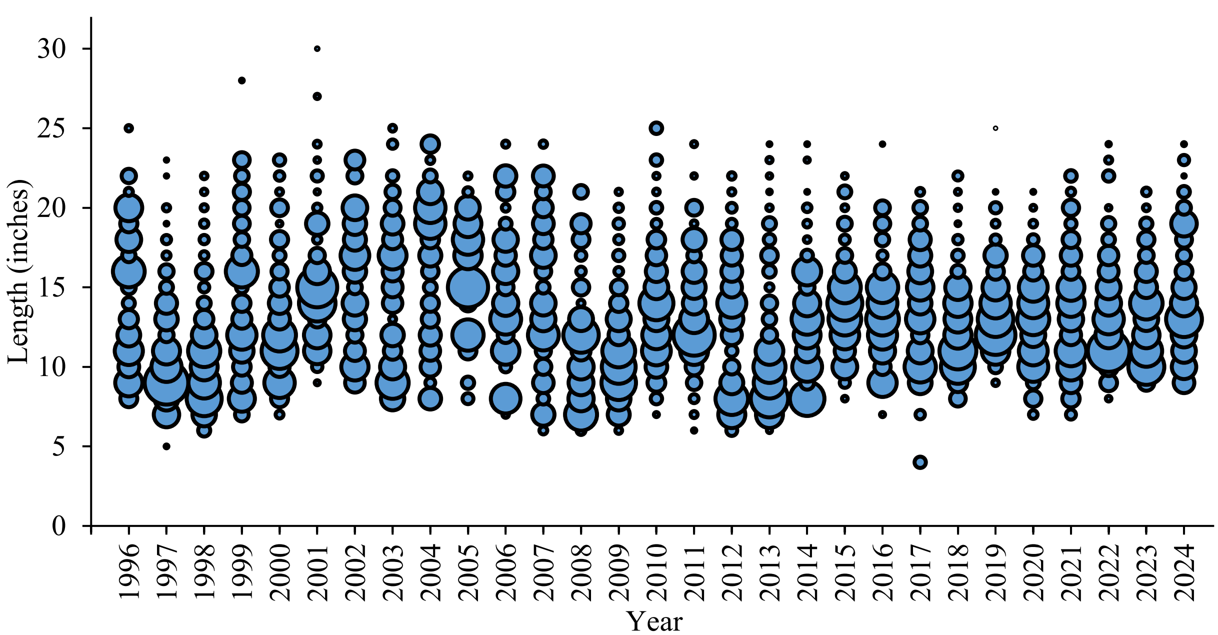

Figure 5. Recreational length frequency (fork length, inches) of sheepshead harvested from 1996 – 2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Fishery-Independent Monitoring

In 2001, the DMF initiated a fishery-independent gill net survey in Pamlico Sound (Program 915). The objective of this project is to provide annual, independent, relative-abundance indices for key estuarine species in the nearshore Pamlico Sound. The survey employs a stratified random sampling design and utilizes multiple mesh gill nets (3.0-inch to 6.5-inch stretched mesh, by half-inch increments). By continuing a long-term database of age composition and developing a relative index of abundance for sheepshead this survey will help managers assess the sheepshead stocks without relying solely on commercial and recreational fishery dependent data. The annual weighted index of abundance (number of sheepshead per set) was 2.34 in 2024 and represents the highest relative abundance in the time series (Figure 6). In previous years, this index was calculated for all of Pamlico Sound for all months sampled. However, in re-examining the data, it was determined it was more appropriate to use samples from the east side of the sound from May – Nov annually. This change does not affect the overall trend of the index just the magnitude.

For 2020, indices of abundance are not available for sheepshead from the Fishery-Independent Gill-Net Survey (Program 915) due to the COVID pandemic. Sampling in this program was suspended in February 2020 due to COVID-19 restrictions and protected species interactions but resumed July 2021.

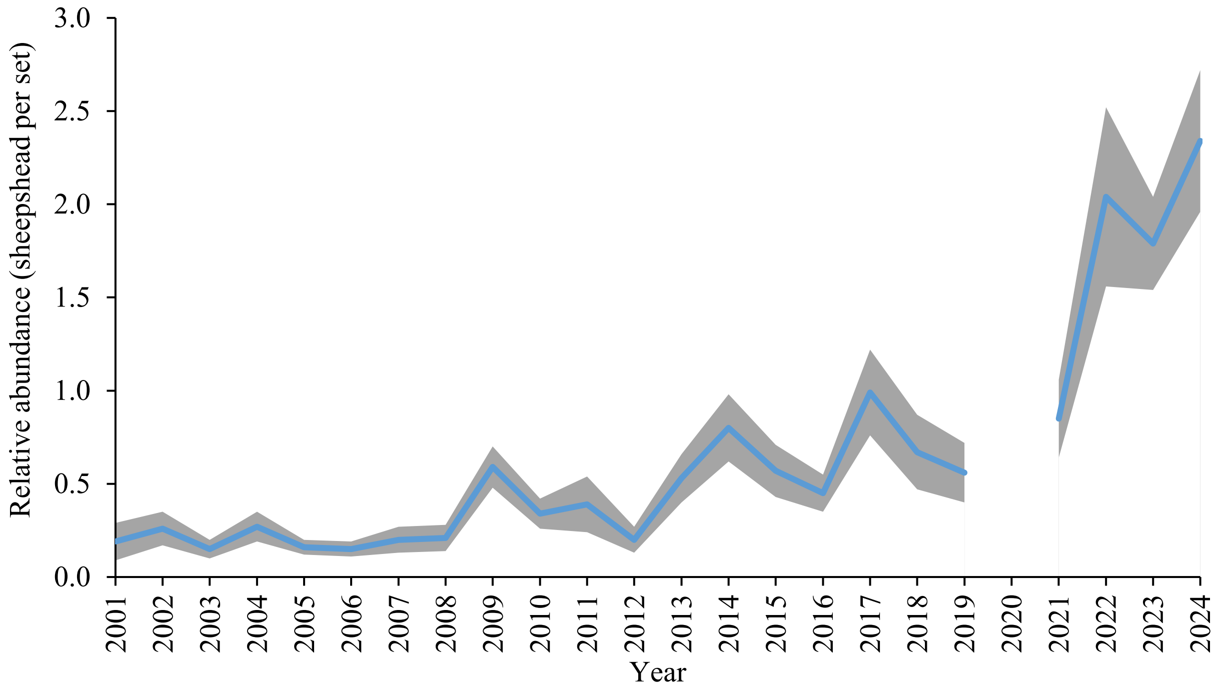

Figure 6. Annual index of abundance of sheepshead in the DMF Pamlico Sound Independent Gill Net Survey, 2001–2024. Pamlico Sound Independent Gill Net Survey sampling did not occur in 2020 and the first half of 2021. Shaded area represents + one standard error.

Data collected by Program 120 (Estuarine Trawl Survey) are used to calculate a relative Juvenile Abundance Index (JAI). Program 120 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 seatrout specific stations are used to generate an index of relative abundance of age zero sheepshead, calculated as the average number of fish per tow; these sites are used as the habitat utilized by species is the same. The resulting relative abundance index for the time series is variable with no significant trend and peaks in 2008 and 2015 suggesting relatively higher recruitment in those years (Figure 7). The Program 120 relative abundance index in 2024 was 0.19, which was an increase from 2023.

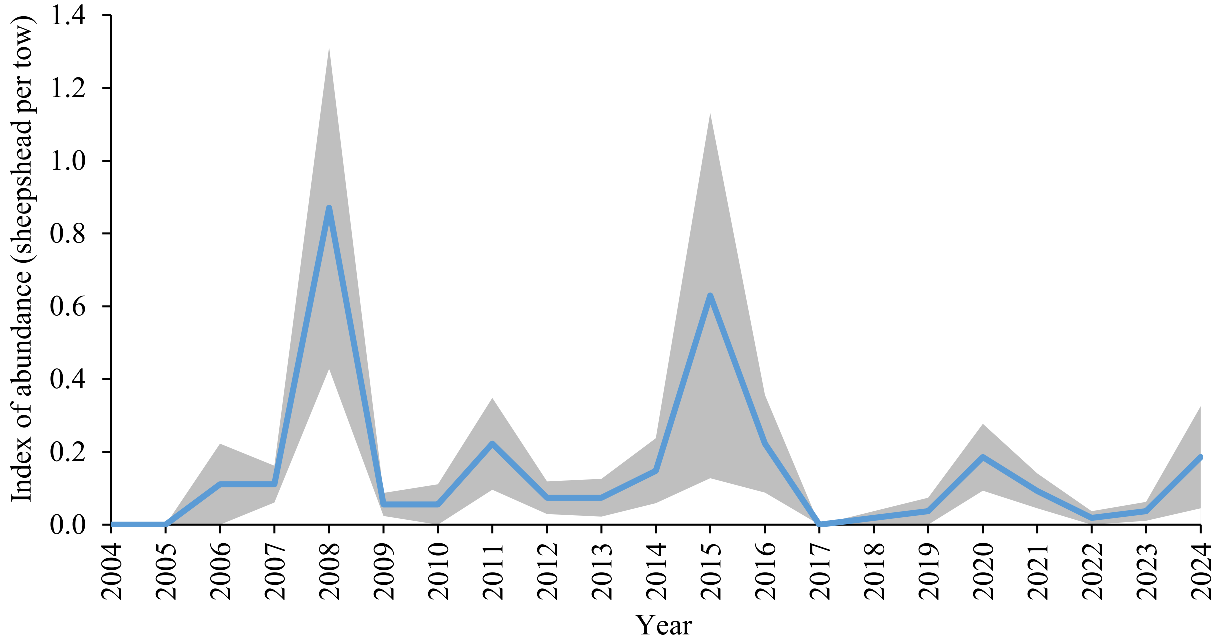

Figure 7. Annual juvenile index of abundance of sheepshead in the DMF Estuarine Trawl Survey, 2004 – 2024. Shaded area represents + one standard error.

In order to describe the age distribution of the harvest and indices, sheepshead age structures are collected from various fishery independent and dependent sources throughout the year. Otolith collection for sheepshead is relatively new, though there are samples going back to 2008. The collection of sheepshead otoliths was not made a sampling priority until 2013. The majority of sheepshead collected are between ages 1 and 8 (Table 4). The maximum reported age is 34 years. In 2024, 389 sheepshead were aged; however, these ages are still considered preliminary as second reads have not yet been completed. The age-length relationship is hard to predict as there is overlap in age for a given length (Figure 8).

Table 4. Summary of sheepshead age samples collected from both fishery-dependent (commercial and recreational) and independent (survey) sources, 2008 – 2024*.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
2008	2	2	8	10
2009	-	3	25	5
2010	6	3	18	10
2011	4	3	10	14
2012	1	1	27	8
2013	2	1	23	151
2014	3	1	24	241
2015	4	1	24	143
2016	5	0	30	212
2017	2	1	29	262
2018	2	0	28	228
2019	3	0	29	356
2020	1	1	34	200
2021	2	0	24	269
2022	3	1	26	439
2023	3	1	22	317
2024*	4	1	23	389

**2024 ages are preliminary*

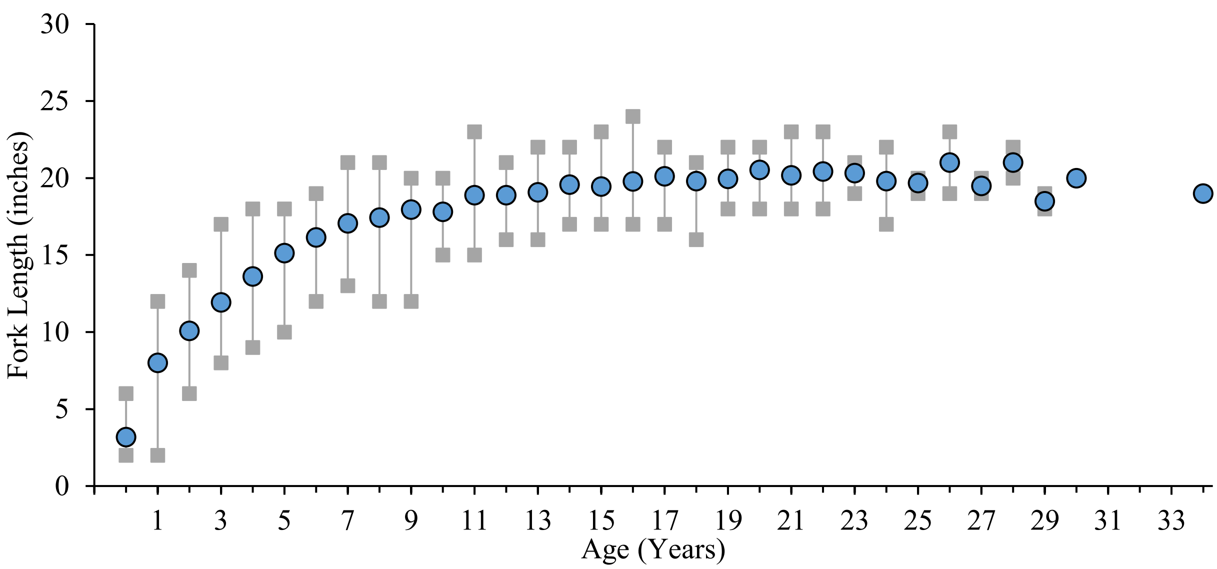

Figure 8. Sheepshead length at age based on all age samples collected from 2008 – 2023. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. Otoliths from 2024 are not included as ages are preliminary, but their inclusion would have minimal impact on the overall trend.

RESEARCH NEEDS

The following have been identified as research needs for sheepshead in North Carolina.

- Initiate a sheepshead tagging program to develop estimates of growth, natural mortality, fishing mortality, and track the movement of adults throughout the stock's range; include methods to estimate tag retention, reporting rate, and tagging-induced mortality.

- Conduct reproductive studies including spawning periodicity, age- and size-specific fecundity, update maturity schedule, and conduct spawning area surveys in North Carolina and throughout the stock's range.
- Expand discard sampling to collect information on gear, depth, location, and age and size distribution of discarded fish for the recreational and commercial sectors.
- Conduct studies on size- and age-specific selectivity by gear type.
- Determine the patterns and triggers of inshore-offshore migrations.

MANAGEMENT

See Table 5 for current management strategies and implementation status for sheepshead.

Table 5. Summary of management strategies and their implementation status for sheepshead.

Management Strategy	Implementation Status
HARVEST MANAGEMENT	
Implement a size limit, recreational bag limit, and commercial trip limit by June 1, 2015	Proclamation authority through Rule 15A NCAC 03M .0521 (FF-28-2015)

At its February 2024 business meeting, the MFC requested that DMF staff provide an update on sheepshead relative to landings and the academic assessment done by North Carolina State University. Following the update at the August 2024 business meeting, the MFC requested the Division further investigate trends in the sheepshead commercial and recreational fisheries to determine if proactive management changes are needed. Internal discussions by staff had identified the need to further look at data trends due to shifts in effort, landing increases, and possible size and age truncation. An information paper is in development including data through 2024.

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

Not Applicable

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IEFISHERY MANAGEMENT PLAN UPDATE
SHRIMP
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	April 2006	
Amendments:	Amendment 1	February 2015
	Amendment 2	February 2022
Revisions:	Revision to Amendment 1	May 2018
	Revision to Amendment 1	May 2021
	Revision to Amendment 2	May 2024
Supplements:	None	
Information Updates:	None	
Schedule Changes:	None	
Comprehensive Review:	2027	

The N.C. Shrimp Fishery Management Plan (FMP) was adopted in April 2006 by the N.C. Marine Fisheries Commission (MFC; NCDMF 2006). The plan included a 90-foot headrope limit in some internal waters and area closures to protect habitats and juvenile finfish. Shrimp management by size was also developed to optimize the use of the resource. Other strategies were implemented to minimize waste through gear modifications, culling practices, and harvest restrictions. The plan allowed the use of skimmer trawls as a Recreational Commercial Gear License (RCGL) gear and established a 48-quart (heads-on) recreational limit. A restriction on the use of shrimp trawls above the Highway 172 Bridge over New River took effect in 2010 and this area above the bridge is limited to skimmer trawls only. This strategy was codified into rule through Amendment 1 in 2015.

Amendment 1 was adopted in February 2015 and was limited in scope to bycatch issues in the commercial and recreational fisheries (NCDMF 2015). The plan recommended a wider range of certified bycatch reduction devices (BRD) to choose from, and the requirement of two BRDs in shrimp trawls and skimmer trawls beginning June 1, 2015 (Proclamation SH-2-2015). It increased the daily harvest limit for cast nets in closed areas. Amendment 1 established a maximum combined headrope length of 220 feet in all internal coastal waters where there were no existing maximum combined headrope requirements, allowing for a phase-out period until January 1, 2017. Shrimp trawling was prohibited, effective May 1, 2015, in the Intracoastal Waterway (IWW) channel from the Sunset Beach Bridge to the South Carolina line, including the Shallotte River, Eastern Channel, and lower Calabash River, to protect small shrimp. Amendment 1 also permitted a live bait shrimp fishery so live bait fishermen with a permit could fish until 12:00 p.m. (noon) on Saturdays; effective May 1, 2017.

Amendment 1 introduced further industry testing of gears in shrimp trawls to reduce bycatch after adoption of the plan. An industry workgroup was formed to test gear modifications to reduce bycatch, to the extent practicable, with a 40% target reduction in the shrimp trawl fishery. Gear combinations with larger tailbag mesh sizes (>1 ½-inches), reduced TED grid size (3-inch), and larger fisheyes significantly reduced finfish bycatch. Four of the 12 gear combinations tested met or exceeded the 40% target reduction in finfish bycatch while also minimizing shrimp loss (Brown et al. 2017, 2018). Overall, finfish bycatch reductions ranged from 4.5% to 57.2%. Shrimp catch between the control and experimental nets ranged from a 16.2% loss to a 9.9% gain.

Results from the industry workgroup testing and recommendation were adopted as a revision to Amendment 1 by the MFC in May 2018 (NCDMF 2018). Under the May 2018 Revision to Amendment 1 and continued through Amendment 2 (NCDMF 2022) fishermen are required to use one of four gear combinations that achieved at least 40% finfish bycatch. The new gear configurations are required in all shrimp trawls, except skimmer trawls, used in inside waters where up to 220 feet of combined headrope is allowed (Pamlico Sound and portions of the Pamlico, Bay, and Neuse rivers) effective July 1, 2019, through Proclamation SH-3-2019 and continues through proclamation SH-1-2022. The commission also recommended to continue the shrimp industry workgroup and explore funding options for more studies, to survey fishermen to determine what bycatch reduction devices the shrimp trawl industry currently uses, and to begin development of Amendment 2 to the Shrimp FMP. In the fall of 2019, two gear configurations were tested in the Atlantic Ocean using the same methods and goals set forth by the MFC in Amendment 1, including a 40% target reduction of finfish bycatch above the industry standard gear at the time. One gear consisting of two inline federal fisheyes with a 1¾-inch tailbag met the management goal of a 40% reduction, achieving a 52% reduction in finfish bycatch. This gear was previously certified for use in the Pamlico Sound and is required in all shrimp trawls used in the Atlantic Ocean since July 1, 2022, through Proclamation SH-3-2022.

The North Carolina Wildlife Federation submitted a petition for rulemaking on November 2, 2016, and a modification to the petition on January 12, 2017. The Petitioner put forth seven rules to designate nursery areas, restrict gear and seasonality in the shrimp trawl fishery to reduce bycatch of fish (including spot, Atlantic croaker, and weakfish), and establish an 8-inch minimum size limit for spot and a 10-inch minimum size limit for Atlantic croaker. In February 2017, the MFC approved the petitioned rules to begin the rulemaking process. Upon review by the Office of State Budget and Management it was determined that sufficient state funds were not available to implement the proposed rule changes without undue detriment to the agency's existing activities and the rules were never adopted.

With the adoption of Amendment 1, a management strategy included the Habitat and Water Quality Advisory Committee to provide input on changing the designation of certain Special Secondary Nursery Areas (SSNAs) that had not been opened to trawling since 1991 to permanent Secondary Nursery Areas (SNAs). Due to overlapping issues associated with petitions for rulemaking related to nursery area designations and shrimp management the development of this management measure was delayed. The MFC selected to change the designation of 10 SSNAs that had not been opened to trawling in many years to permanent SNAs and in the May 2021 Revision to Amendment 1 (NCDMF 2021) the designation of SSNAs in Pungo, Scranton, Slade, South, Bond/Muddy, and Saucepan creeks as well as the Newport, Cape Fear and Lockwood Folly rivers were changed to permanent SNAs.

In August 2019, the FMP schedule moved the timeline forward one year to start development of Amendment 2. The goal of Amendment 2 is to further reduce bycatch of non-target species and minimize ecosystem impacts (NCDMF 2022). The MFC adopted the Shrimp FMP Amendment 2 in February 2022. The amendment retained measures implemented with the May 2018 and 2021 revisions to the Shrimp FMP Amendment 1 and implemented several management changes: 1) prohibit all trawling within all Crab Spawning Sanctuaries year-round (Proclamation SH-1-2023), 2) prohibit trawling in Bogue Sound and the Carolina Beach Boat Basin, except within the Intracoastal Waterway (Proclamations SH-1-2023 and SH-2-2023), 3) establish a single, state-wide recreational creel limit for cast nets (48 quarts, heads on or 30 quarts, heads off; Proclamation SH-4-2022), 4) change the flexible opening date in all SSNAs to a static Sept. 1, 5) continue collaboration with the industry workgroup to identify and test gear modifications to further reduce bycatch in the shrimp fishery, 6) provide for adaptive management for future action to address issues related to submerged aquatic vegetation identified through Division collaboration with the Coastal Habitat Protection Plan support staff, the Habitat and Water Quality Advisory Committee, and stakeholder groups, 7) maintain existing headrope limits for shrimp trawls in internal coastal waters but allow for adaptive management to resolve user conflicts, and 8) investigate the feasibility and use of a long-term shrimp trawl observer program that encompasses all seasons, areas, and gears (Table 1).

Table 1. Summary of management strategies and outcomes from N.C. Shrimp Fishery Management Plan Amendment 2.

Management Strategy	Implementation Status
Prohibit trawling within all Crab Spawning Sanctuaries.	Existing proclamation authority; Proclamations issued SH-1-2024 and SH-2-2024.
Prohibit trawling in Bogue Sound and the Carolina Beach Yacht Basin, except within the Intracoastal Waterway	Existing proclamation authority; Proclamations issued, SH-1-2023 and SH-2-2023.
Establish a single, state-wide recreational creel limit for cast nets (48 quarts, heads on or 30 quarts, heads off).	Existing proclamation authority; Proclamation issued, SH-4-2022.
Change the flexible opening date in all Special Secondary Nursery Areas to a static Sept. 1.	Existing proclamation authority; Proclamations issued SH-1-2024 and SH-2-2024
Continue collaboration with the industry workgroup to identify and test gear modifications to further reduce bycatch in the shrimp fishery.	Ongoing.
Investigate the feasibility and use of a long-term shrimp trawl observer program that encompasses all seasons, areas, and gears.	Ongoing. The MFC will seek additional methods and funding sources.
Provide for adaptive management for future action to address issues related to submerged aquatic vegetation identified through Division collaboration with the Coastal Habitat Protection Plan support staff, the Habitat and Water Quality Advisory Committee, and stakeholder groups.	Further management strategies will be developed under the authority of the MFC.
Maintain existing headrope limits for shrimp trawls in internal coastal waters but allow for adaptive management to resolve user conflicts.	No action required.

As part of the implementation of Amendment 2, an information paper was developed to investigate the feasibility and utility of a long-term shrimp trawl observer program to better estimate the magnitude and composition of discards in the North Carolina shrimp trawl fishery. While the division has conducted limited studies on shrimp trawl vessels using observers to characterize discards in the shrimp trawl fishery (e.g., Brown 2009, 2010, 2015, 2016, 2017, and 2018), participation was voluntary, and the limited scale and scope of these studies make them inadequate to quantify discards across the entire shrimp trawl fishery. At its February 2024 business meeting, the MFC voted to seek alternative methods of monitoring and multiple sources of funding in addition to the Commercial Fishing Resource Fund for a shrimp trawl observer program.

Additionally, an issue paper was developed to use adaptive management to protect SAV habitat, by identifying unprotected SAV habitat using updated imagery and providing additional protection through shrimp trawl area closures. In January 2024, the division presented the draft issue paper to the Habitat and Water Quality (HWQ) AC as requested by the MFC. The HWQ AC endorsed the division's initial recommendations to protect existing and prospective SAV habitat; however, they recommended that the division work with stakeholders to identify where SAV cannot be supported to minimize the impact on stakeholders while maximizing SAV protection. The HWQ AC further recommended that a monitoring program be established to measure the status of SAV habitat in NC. To address concerns raised by the public and the HWQ AC, the division's recommendation was modified to include alternate closures and additional input from the Northern and Southern regional, and Shellfish/Crustacean ACs before making final recommendations to the MFC. DMF staff met with several stakeholders on April 8, 2024, to gain more informal input prior to the April 2024 MFC AC meetings. While the ACs acknowledged the need to protect SAV, they cited that shrimp trawling was not the primary threat to SAV and poor water quality as well as other bottom disturbing activities were also impactful to SAV (e.g., propeller scarring, anchoring, etc.). In May 2024, the MFC voted to accept the division's recommendation to develop more comprehensive management options to protect SAV habitat from all activities under the authority of the MFC, consistent with the CHPP. Action to address SAV protection under the Shrimp FMP Amendment 2 has concluded and the MFC's selected management strategy to protect SAV habitat under the authority of the MFC will serve as the May 2024 Revision to Amendment 2 to the N.C. Shrimp FMP (NCDMF 2024).

Management Unit

The management unit includes the three major species of shrimp: brown (*Farfantepenaeus aztecus*), pink (*F. duorarum*), and white (*Penaeus setiferus*) and its fisheries in all coastal fishing waters of North Carolina, which includes the Atlantic Ocean offshore to three miles.

Goal and Objectives

The goal of Amendment 2 is to manage the shrimp fishery to provide adequate resource protection, optimize long-term harvest, and minimize ecosystem impacts (NCDMF 2022). The following objectives will be used to achieve this goal.

- Reduce by catch of non-target species of finfish and crustaceans, as well as protected, threatened, and endangered species.
- Promote the restoration, enhancement, and protection of habitat and environmental quality in a matter consistent with the Coastal Habitat Protection Plan (CHPP).
- Develop a strategy through the CHPP to review current nursery areas and to identify and evaluate potential areas suitable for designation.
- Use biological, environmental, habitat, fishery, social, and economic data to effectively monitor and manage the shrimp fishery and its ecosystem impacts (i.e., bycatch, habitat degradation).
- Promote implementation of research and education programs designed to improve stakeholder and the general public's understanding of shrimp trawl by catch impacts on fish population dynamics.

DESCRIPTION OF THE STOCK

Biological Profile

There are three shrimp species that make up the fishery in North Carolina. They are the brown shrimp, pink shrimp, and white shrimp. The lifecycles of these species are similar in that adult shrimp spawn offshore and eggs are hatched into free-swimming larvae. Larvae develop through several stages into post-larvae. Once post-larval shrimp enter estuaries, growth is rapid and is dependent on salinity and water temperature. As shrimp increase in size, they migrate from the upper reaches of small creeks to deeper saltier rivers and sounds. By late summer and fall, they return to the ocean to spawn. Batchelder et al. (2024) note that patterns of seasonal use and function of estuarine nursery habitats of penaeid shrimp may be shifting as winter water temperatures rise in southeastern USA, potentially resulting in a more continuous reproductive strategy as observed in subtropical regions. The maximum life span of shrimp can range from 16 to 24 months and maximum size can range from seven to 11 inches, depending on species (Eldred et al. 1961; Gunter 1961; McCoy 1968, 1972; McCoy and Brown 1967; Williams 1984).

Stock Status

Population size is controlled by environmental conditions, and while fishing reduces the population size over the season, fishing is not believed to impact year class strength unless the spawning stock has been reduced below a minimum threshold level by environmental conditions. Because of high fecundity and migratory behavior, the three shrimp species are capable of rebounding from very low population sizes in one year to large populations the next, provided environmental conditions are favorable (MacArthur and Wilson 1967; McCoy and Brown 1967; McCoy 1968, 1972; Perez-Farfante 1969; Purvis and McCoy 1972; Whitaker 1981, 1982, 1983; Morley et al. 2022; Schlenker et al. 2023).

Stock Assessment

Estimates of population size are not available but since the fishery is considered an annual crop and fished at near maximum levels, annual landings are probably a good indication of relative abundance. Annual variations in catch are presumed to be due to a combination of prevailing environmental conditions, fishing effort, and the effects of changes in the economics of the fishery.

DESCRIPTION OF THE FISHERY

Current Regulations

The MFC has established several rules that directly govern the harvest of shrimp and the use of trawls. Below are rules and excerpts from rules that directly apply to the shrimp fishery. The rules below do not cover all gear, area, or other rules which may impact the shrimp fishery. As state and federal regulations may change, please contact the North Carolina Division of Marine Fisheries (DMF) for the most current regulations.

Shrimp cannot be taken by nets until the division Director opens the season by proclamation (NCMFC Rule 15A NCAC 03L .0101). The Director has the proclamation authority to specify hours of day or night or both and any other conditions appropriate to manage the fishery. Areas open to trawling are also considered open areas for shrimp harvest for all other gears including cast nets. Proclamations identifying areas open and closed to the harvest of shrimp can be found at: https://deq.nc.gov/fisheries-management-proclamations#currentprocs.

Area Restrictions

Shrimp and crab trawl nets cannot be used in any primary or permanent SNA; however, the DMF Director can open SSNAs to trawling by proclamation from August 16 through May 14 (NCMFC Rule 15A NCAC 03N .0104 and .0105). With the adoption of Amendment 2, a static season was established to open all SSNAs, at the Director's discretion, no earlier than September 1. In the Albemarle Sound and its tributaries, the use of shrimp trawls is prohibited (NCMFC Rule 15A NCAC 03J .0104). Additional trawl net prohibited areas are established in parts of Pamlico, Core, and Back sounds (NCMFC Rule 15A NCAC 03J .0104 and 03R .0106). Shrimp trawling is prohibited in military danger zones and restricted areas throughout all internal coastal waters (NCMFC Rule 15A NCAC 03R .0102).

With the adoption of Amendment 2, trawling at all coastal inlets in Crab Spawning Sanctuaries was prohibited year around (SH-1-2024 and SH-2-2024). In designated pot areas, the use of trawls is prohibited from June 1 to November 30 (NCMFC Rule 15A NCAC 03J .0104(b)(6), 03J .0301(a)(2), 03R .0107 and Proclamation SH-1-2024) and within the shoreline to the depth of six feet [NCMFC Rule 15A NCAC 03J .0104(6)]. Trawling is prohibited in oyster seed management areas (NCMFC Rule 15A NCAC 03K .0208 and 03R .0116) and oyster sanctuaries (NCMFC Rule 15A NCAC 03K .0209 and 15A NCAC 03R .0117). In the Pamlico, Pungo, and Neuse rivers as well as portions of New Hanover and Brunswick counties, shrimp trawl prohibited areas were implemented as part of the 2006 Shrimp FMP and Amendment 1 to protect habitat, reduce bycatch, reduce use conflict, and protect small shrimp (NCMFC Rule 15A NCAC 03L .0103(e) and 03R .0114). With the adoption of Amendment 2, shrimp trawling in Bogue Sound and the Carolina Beach Boat Basin was prohibited, except within the Intracoastal Waterway (Proclamations SH-1-2024 and SH-2-2024).

In the Atlantic Ocean, the use of commercial gear is prohibited within 750 feet of licensed fishing piers [NCMFC Rule 15A NCAC 03J .0402(a)(1)(ii)]. Commercial fishing gears are also restricted within 750 feet from piers at specified times of the year in Onslow, Pender, New Hanover counties [NCMFC Rule 15A NCAC 03J .0402(a)(2)(A)(B)(i)(ii)(iii)]. All trawls are restricted from use within one-half mile of the beach between the Virginia line and Oregon Inlet in the Atlantic Ocean (NCMFC Rule NCAC 03J .0202(2). Additional area restrictions have been implemented in the Southport Boat Harbor, Brunswick County and at the Progress Energy intake canal at the Brunswick County Nuclear Power Plant for public safety (NCMFC Rule 15A NCAC 03J .0206 and .0207).

Gear Restrictions

The use of otter trawls upstream of Highway 172 Bridge in the New River was prohibited as part of the 2006 Shrimp FMP, limiting trawling to skimmer trawls [NCMFC Rule 15A NCAC 03J .0208(a)]. The 2006 FMP also established a maximum combined headrope limit of 90 feet in internal coastal waters of North Carolina, except in the Pamlico Sound and mouths of the Pamlico and Neuse rivers where up to 220 feet of combined headrope may be used [NCMFC Rule 15A NCAC 03L .0103(c)(d)]. The 220 feet maximum headrope limit was implemented in Pamlico Sound to cap fleet capacity as part of Amendment 1 [NCMFC Rule 15A NCAC 03L .0103(d)(1) (2)(3)]. Recreational fishermen possessing a Recreational Commercial Gear License (RCGL) are limited to one shrimp trawl with a maximum headrope length of 26 feet [NCMFC Rule 15A NCAC 03O .0302(2)].

Minimum mesh size requirements for shrimp trawls (otter and skimmer) are one and one-half inches (NCMFC Rule 15A NCAC 03L. 0103L). However, in the Pamlico Sound and portions of the Pamlico and Neuse rivers where up to 220 feet of headrope is allowed as well as the Atlantic Ocean the minimum tail bag mesh size is one and three-quarter inches (Proclamations SH-1-2022 and SH-3-2022). Net material used as chafing gear must be four inches mesh length, except smaller mesh may be used along the bottom half of the tailbag (NCMFC Rule 15A NCAC 03L .0103). The minimum mesh size for channel nets, float nets, butterfly nets, and hand seines is one and one-quarter inches [NCMFC Rule 15A NCAC 03L. 0103L(a)(2)]. The minimum mesh size for shrimp pots is one and one-fourth inches stretch or five-eighths inch bar [NCMFC Rule 15A NCAC 03J .0301(e)].

Bycatch reduction devices are required in all trawls used to harvest shrimp [NCMFC Rule 15A NCAC 03J .0104(d)]. Proclamation SH-1-2022 describes the BRD requirements for otter trawls in Pamlico Sound and the Pamlico, Bay, and Neuse rivers where up to 220 feet of combined headrope is allowed. Otter and skimmer trawls in all other waters statewide are required to have two BRDs installed on each net (Proclamation SH-2-2022). Primary and secondary BRD requirements for the Croatan and Roanoke sounds, portions of the Pamlico, Bay, and Neuse rivers, and Core Sound south to the SC-NC state line are listed in Proclamation SH-2-2022. Proclamation SH-3-2022 describes the BRD requirements for otter trawls in the Atlantic Ocean.

All shrimp trawls must conform with the federal requirements for Turtle Excluder Devices (TEDs) [NCMFC Rule 15A NCAC 03L .0103(h)]. All otter trawl nets are required to have a federally approved TED with bar spacing up to four inches if using mechanical retrieval methods. Federally approved TEDs are listed in United States Code of Federal Regulations Title 50, Section 223.207. Effective August 1, 2021, all skimmer trawls 40 feet and greater must have a federally approved TED installed with a bar spacing no greater than three inches in each net. Skimmer trawls less than 40 feet will not be required to use TEDs but must limit tow times to 55 minutes from April 1 through October 31, and 75 minutes from November 1 through March 31 [50 CFR 223.206 (d)(2)(ii)(A)].

Channel nets or other fixed or stationary nets in the IWW are prohibited from blocking more than two-thirds of any natural or manmade waterway, in the middle third of any marked navigation channel [NCMFC

Rule 15A NCAC 03J .0101(1)(2)(3)]. Channel nets cannot be set with any portion of the set within 50 feet of the center line of the IWW channel or in the middle third of any navigation channel marked by the Corps of Engineers or the Coast Guard. Channel nets must be always attended [NCMFC Rule 15A NCAC 03J .0106(a)(3)(4)(5)] and not exceed 40 yards in length. No channel net, net buoys or stakes can be left in coastal waters from December 1 through March 1. From March 2 through November 30, cables and any attached buoy must be connected with a non-metal line when not attached to the net; metallic floats or buoys to mark sets are prohibited [NCMFC Rule 15A NCAC 03J .0106(b)(c)(d)(e)].

The leads or any fixed or stationary net or device to direct shrimp into shrimp pots is prohibited [NCMFC Rule 15A NCAC 03J .0301(l)]. Recreational fishermen holding a RCGL may use up to five shrimp pots [NCMFC Rule 15A NCAC 03O .0302(a)(3)]. Recreational pots must be marked with a hot pink buoy and owner's identifying information [NCMFC Rule 15A NCAC 03J .0302(a)]. The use of more than one shrimp pot attached to the shore along privately owned land or to a privately owned pier is prohibited without possessing a valid RCGL [NCMFC Rule 15A NCAC 03J .0302(b)]. A pound net permit is required to deploy a shrimp pound and the set must be operational for a minimum of 30 consecutive days during the permit period [NCMFC Rule 15A NCAC 03J .0501(b)(1)(2)]. Shrimp pounds are defined as pound net set with all pounds (holding pen) constructed of stretch mesh equal to or greater than one and one-fourth inches and less than or equal to two inches [15A NCAC 03J .0501(6)]. RCGL holders may use one pound net with leads up to 10 feet in length with an enclosure up to 36 inches; attendance is required at all times and all gear must be removed from the water when not being fished [NCMFC Rule 15A NCAC 03O .0302(8)]. Shrimp pound sets must be properly marked with the permittee's identification and Pound Net Set Permit number, marked with a yellow light reflective tape or yellow light reflective devices on each pound, and have a marked navigational opening at least 25 feet wide at the end of every third pound [NCMFC Rule 15A NCAC 03J .0501(b)(c)]. Shrimp pound net sets must be set a minimum of 100 yards from a RCGL shrimp pound net set or 300 yards from an operational permitted shrimp pound net set [NCMFC Rule 15A NCAC 03J .0501(d)(2)].

Effort Restrictions

Shrimp trawling is prohibited in internal coastal waters from 9:00 p.m. on Friday through 5:00 p.m. on Sunday [NCMFC Rule 15A NCAC 03J .0104(b)(1)]. However, weekend shrimp trawling is allowed in Atlantic Ocean, with the use of fixed and channel nets, hand, seines, shrimp pots, and cast nets, or for a holder of a Permit for Weekend Trawling for Live Shrimp [NCMFC Rule 15A NCAC 03L .0102, 03O .0503(1)(2)(3)]. In portions of the Pungo, Pamlico, Bay, Neuse, and New rivers the use of trawl nets is prohibited from one hour after sunset to one hour before sunrise prohibited from December 1 through February 28 [NCMFC Rule 15A NCAC 03J .0208]. Upstream of the Highway 172 Bridge in New River shrimp trawling (skimmer only) is prohibited from 9:00 p.m. through 5:00 a.m. when opened by proclamation from August 16 through November 30 (NCMFC Rule 15A NCAC 03J .0208(b)).

Incidental Catch

The possession of more than 500 pounds of finfish from December 1 through February 28 and 1,000 pounds of finfish from March 1 through November 30 is prohibited while using a trawl in internal waters [NCMFC Rule 15A NCAC 03J .0104(a)]. Shrimp trawls cannot be used to take blue crabs in internal waters, except when the weight of the crabs does not exceed 50% of the total weight of the combined crab and shrimp catch or 300 pounds, whichever is greater [NCMFC Rule 15A NCAC 03J .0104(f)(2)]. From December 1 through March 31, it shall be unlawful to possess finfish caught incidental to shrimp and crab trawling in the Atlantic Ocean unless the weight of the combined catch of shrimp and crabs exceeds the weight of finfish; except that crab trawlers working south of Bogue Inlet may keep up to 300 pounds of kingfish, regardless of their shrimp or crab catch weight [NCMFC Rule 15A NCAC 03J .0202(5)]. Channel nets are prohibited from to taking blue crabs in internal waters, except when the weight of the crabs does not exceed 50% of the total weight of crab and shrimp or 300 pounds, whichever is greater [NCMFC Rule 15A NCAC 03J .0106(h)(1)(A)(B)].

Recreational Creel Limits

Recreational fishermen using cast nets are limited to no more than 48 quarts (heads on) or 30 quarts (heads off) of shrimp per person per day or per vessel per day if a vessel is used in all Coastal Fishing Waters (Proclamation SH-4-2022). Recreational fishermen using limited amounts of commercial gear authorized under the Recreational Commercial Gear License (NCMFC Rule 15A NCAC 03O .0302) are limited to 48 quarts (heads on) or 30 quarts (heads off) of shrimp per person per day or if vessel is used, per vessel per day. If more than one RCGL holder are on a vessel, a maximum of two limits per vessel are allowed in areas open to shrimping [NCMFC Rule 15A NCAC 03O .0303(e)(f) and Proclamations SH-1-2024 and SH-2-2024].

Commercial Fishery

Landings in the North Carolina shrimp fishery vary from year to year and are dependent primarily on environmental conditions. Environmental factors, especially severity of winter temperatures, and salinity can have a major influence on the yearly harvest. North Carolina's shrimp fishery is unusual in the southeast because all three species are taken here and most of the effort occurs in internal waters. While South Carolina, Georgia, and Florida allow limited inside waters shrimping, much of their fisheries are conducted in the Atlantic Ocean and white shrimp comprise most of their harvest (NCDMF 2015).

Commercial activity occurs in all waters. The shrimp fishery in the northern portion of the state is conducted in Pamlico, Croatan, and Roanoke sounds and Pamlico, Pungo, Bay, and Neuse rivers. The otter trawl is the predominant gear used in this portion of the state. The shrimp fishery in the central coastal area of the state occurs in Core and Bogue sounds, and the North, Newport, and White Oak rivers. In the southern portion of the state, the fishery is characterized by a large number of small boats fishing internal waters (primarily the IWW, New and Cape Fear rivers) and larger vessels fishing the Atlantic Ocean primarily off New River, Carolina Beach, and Brunswick County. Many of the small boats are fished by individuals who shrimp part-time or for personal consumption.

A variety of methods are used to catch shrimp including otter trawls, skimmer trawls, channel nets, shrimp pounds, and cast nets. Otter trawls derived their name from the two trawl doors (otter doors/boards) that attach to the bridle that are hydro-dynamically designed to hold the wings of the net open. As the net is pulled along the bottom, the otter boards plane in opposite directions holding the net open. Otter trawls are used for all three species in both the estuary and the ocean. Two-seam trawls are used for brown and pink shrimp and four-seam and tongue trawls for white shrimp, which tend to swim higher in the water column and will jump to the surface when disturbed. Skimmer trawls consist of two rigid frames attached to each side of a vessel with nets attached along the two sides of the frame. Metal skids keep the frames off the bottom as the nets are pushed through the water column. Unlike otter trawls, the tailbags of skimmer trawls can be checked while fishing. Skimmer trawls are primarily used for white shrimp and are capable of fishing waters as shallow as two feet.

Use of gears other than trawls has increased primarily in the area from New River to Rich's Inlet. Channel nets are stationary nets that use tidal currents to fish the surface and middle depths of the water column. The mouth of the nets is held open by upright wooden shafts attached to a buoy and anchor on one side and a small vessel on the other. Float and butterfly nets also make use of tidal currents to push shrimp into the nets and offer the advantages of less fuel consumption and less bycatch than traditional shrimp trawls. To shrimp with a “float net”, fishermen attach large floats to the doors and top lines of trawls to make the net fish up in the water column and are pulled slowly forward to harvest shrimp that are migrating to the inlets at night. Butterfly nets use this same harvest strategy but are attached to a metal frame and are held stationary in the water column to capture shrimp as the current carries them into the net. Trawls, cast nets, and seines are used to harvest live shrimp for the commercial bait fishery.

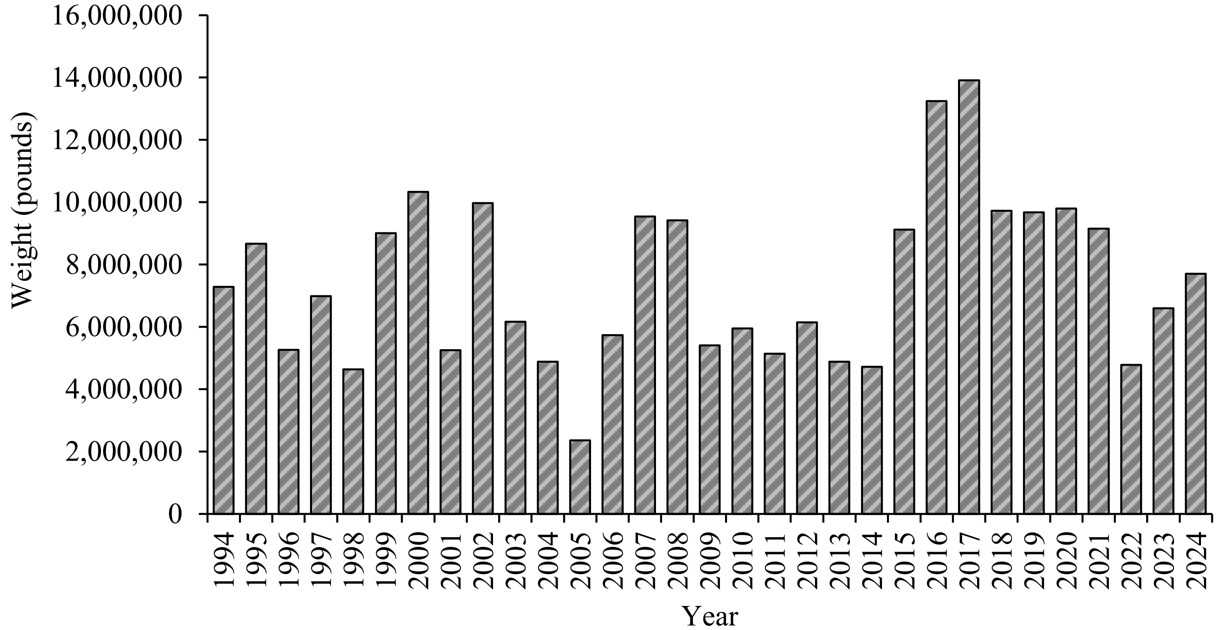

Figure 1. Annual commercial shrimp landings (pounds) from all three shrimp species combined in North Carolina, 1994–2024. Data from the DMF Trip Ticket Program.

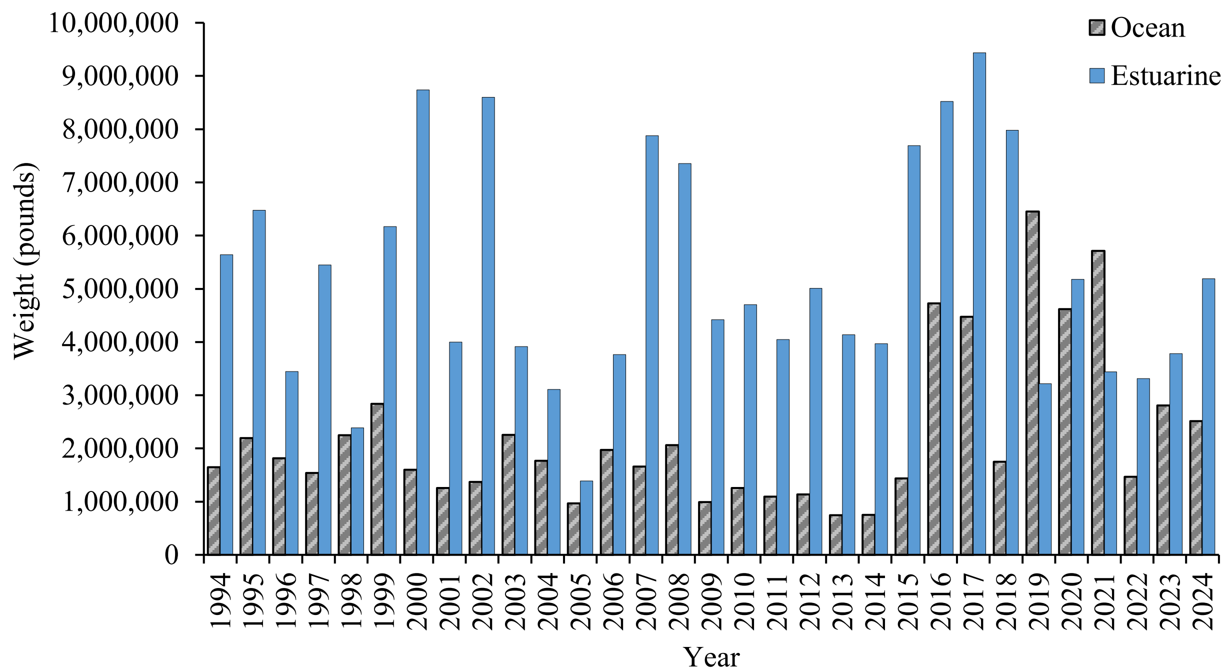

Figure 2. Annual commercial shrimp landings (pounds) by area from all three shrimp species combined in North Carolina, 1994–2024. Data from the DMF Trip Ticket Program.

Landings provided by the trip ticket program are combined for the three shrimp species (Figure 1). Total landings from 1994 to 2024 averaged 7,466,298 pounds per year. In 2024, 7,704,214 pounds of shrimp were landed. Total landings increased 17% from 2023 to 2024. In 2024, 67% of the harvest occurred in estuarine waters, with the remainder occurring in the Atlantic Ocean (less than 3 miles from shore).

Landings in estuarine waters increased 37% and landings in the Atlantic Ocean (less than 3 miles from shore) decreased 11% from 2023 to 2024 (Figure 2).

Annual shrimping effort (number of trips) has fluctuated with shrimp abundance but appears to have declined since 1994 (NCDMF 2015, 2022). This may be due to a number of factors including cheaper imported shrimp prices, increasing fuel prices, and fishermen retiring. Landings in 2005 were lowest on record, likely from several reasons; many large trawlers remained scalloping instead of shrimping because prices were high and the days at sea were extended (NCDMF 2015). Hurricanes Katrina (8/29/05) and Rita (9/4/05) hit the Gulf Coast, negatively affecting the fishing industry. Shrimp breading operations in the Gulf shut down with only one operational in September 2005 and some North Carolina shrimpers could not sell their product (NCDMF 2015). Hurricane Florence (9/17/18) directly hit North Carolina, likely contributing to the decrease in landings in 2018. The number of trips increased 4% from 2023 to 2024 (Figure 3). Poor ex-vessel prices, cheap imported shrimp, and high fuel prices are presumed to have contributed to the decline in effort in recent years.

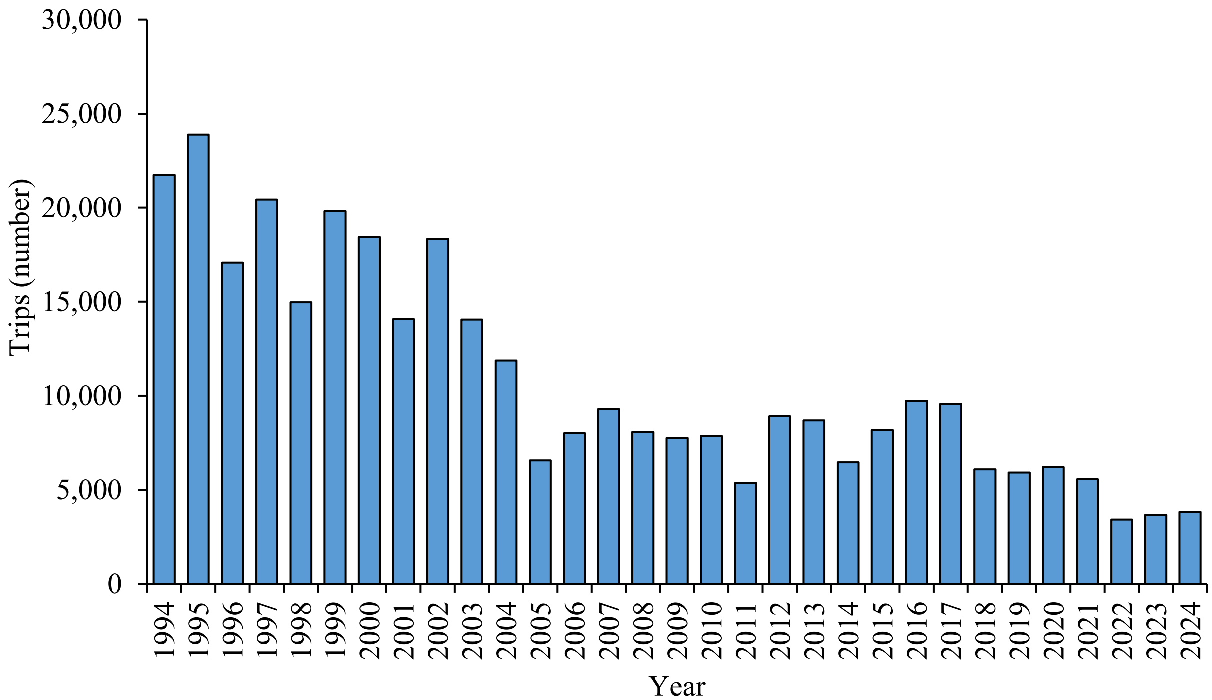

Figure 3. Annual number of commercial trips reported for all three species combined in inside and ocean waters, 1994–2024. Data from the DMF Trip Ticket Program.

Recreational Fishery

Shrimp are harvested recreationally throughout the state by otter trawls, skimmer trawls, seines, cast nets, shrimp pots and shrimp pounds with specific gear limitations. The NC Coastal Angling Program uses multiple surveys to obtain recreational harvest and landings data; however, the recreational harvest of shrimp is limited to the Cast Net and Seine Mail Survey and the RCGL Survey.

Anyone harvesting shrimp recreationally with commercial gear are required to purchase a Recreational Commercial Gear License (RCGL). The RCGL is an annual license that allows recreational fishermen to use limited amounts of commercial gear to harvest seafood for personal consumption. Seafood harvested under this license cannot be sold. Fishermen using this license are held to recreational size and possession limits, gear marking and gear limit and configuration requirements. Recreational landings of shrimp from RCGL gears are currently unknown since there is no directed survey for this gear.

In October of 2011, DMF began surveying Coastal Recreational Fishing License (CRFL) holders to determine if they used cast nets or seines. This mail survey was implemented to develop catch and effort estimates for recreational harvest with these specific gear types, including recreational shrimp harvest. Catch refers to the number of shrimp harvested by each angler and effort is the number of trips taken by the angler. This data is then extrapolated to represent the population of CRFL holders and presented as catch and effort estimates. The estimated annual average number of shrimp caught (harvest and released) using a cast net and/or seine was 158,441 shrimp from 2012 to 2022 (Figure 4). In 2023, a new licensing system was implemented, and the license database was restructured. This restructuring disrupted our ability to query the full license dataset to establish a sampling frame of eligible anglers for the mail surveys. As a result, DMF was unable to administer the mail surveys and expand potential responses and survey estimates are not available for 2023 and 2024. The mail surveys were reinstated in January 2025.

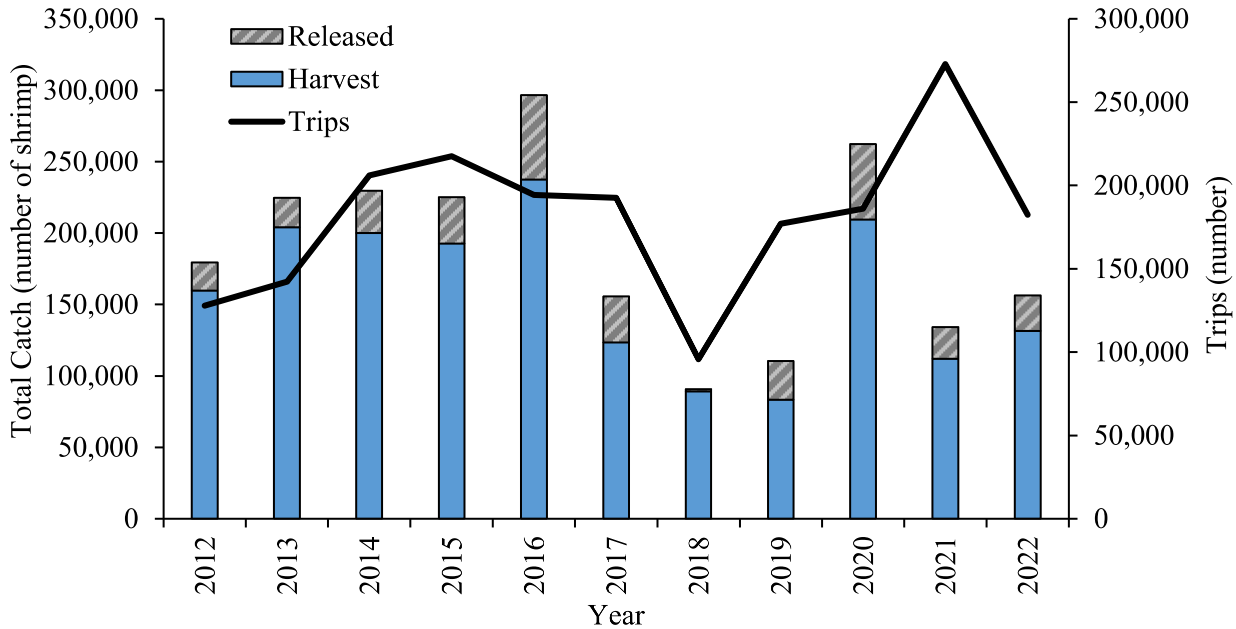

Figure 4. Annual number of trips and shrimp taken from cast nets and seines for recreational purposes, 2012–2022. In 2023, a new licensing system was implemented, and the license database was restructured. This restructuring disrupted our ability to query the full license dataset to establish a sampling frame of eligible anglers for the mail surveys. As a result, we were unable to administer the mail surveys and expand potential responses and survey estimates are not available for the last few years.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Currently, the only data available for the stock in all areas are the commercial landings and associated effort from the N.C. Trip Ticket Program. No fishery dependent monitoring program exists for shrimp.

Fishery-Independent Monitoring

The Estuarine Trawl Survey (Program 120) 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 fixed stations, a set of 104 core stations with additional stations as needed. The core stations are sampled from western Albemarle Sound south through the South Carolina border each year without deviation two times in the months of May and June. This survey targets juvenile finfish, blue crabs, and penaeid shrimp. A two-seam 10.5 feet headrope trawl with a 1/4-inch mesh in the body and 1/8-inch mesh in the tailbag is used. A one-minute tow is conducted covering 75 yards. All species taken are sorted, identified, and a total number is recorded for each species. For target species, a subset of at least 30 to 60 individuals is measured. Environmental data are collected, including salinity, dissolved oxygen, temperature, wind speed, and direction. During 2020, sampling was impacted due to the COVID pandemic. Executive Order (EO) 116, issued on March 10, 2020, declared North Carolina under a State of Emergency and was soon followed by EO 120 which implemented a statewide Stay at Home Order for all non-essential State employees. During this time, sampling did not occur in May, but did occur in early and late-June. In 2021, sampling resumed in the months of May and June.

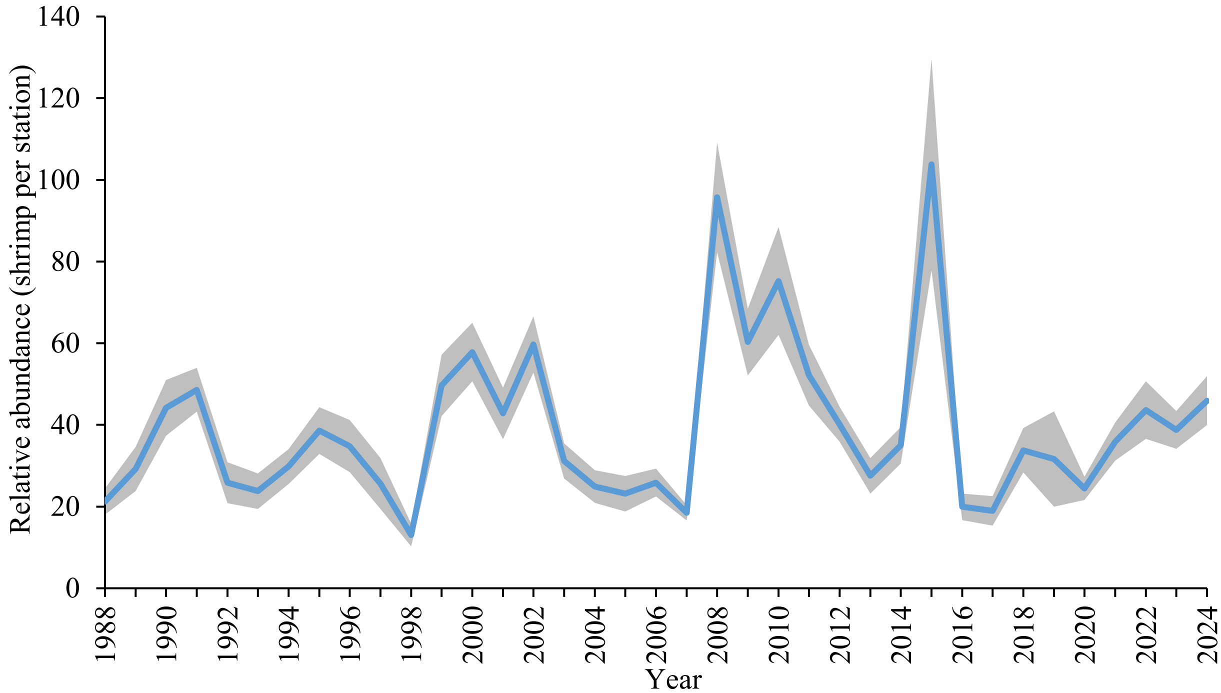

Figure 5. Annual index of relative abundance (shrimp per station) of brown shrimp from Program 120 estuarine trawl survey, 1988–2024. Shaded area represents standard error.

Annual trends in brown shrimp relative abundance, measured as the number of brown shrimp per station in Program 120 sampling, show fluctuations from year to year (Figure 5). In 2024, the relative index of abundance was 45.9 and increased 18% from 2023 to 2024 (Figure 5). The proportional standard error was below 20 in all but four years from 1988 to 2024. As indicated in the stock status section, annual landings are a good indication of relative abundance of shrimp in the coastal fishing waters of North Carolina. Estimates of recruitment calculated from the annual brown shrimp index of relative abundance can also be used to determine year class strength. Trends in overall shrimp landings from June and July, months that brown shrimp make up most of the harvest, show similar trends as the Program 120 data (Figure 6). Currently, there are no juvenile indices of abundance for white and pink shrimp in North Carolina.

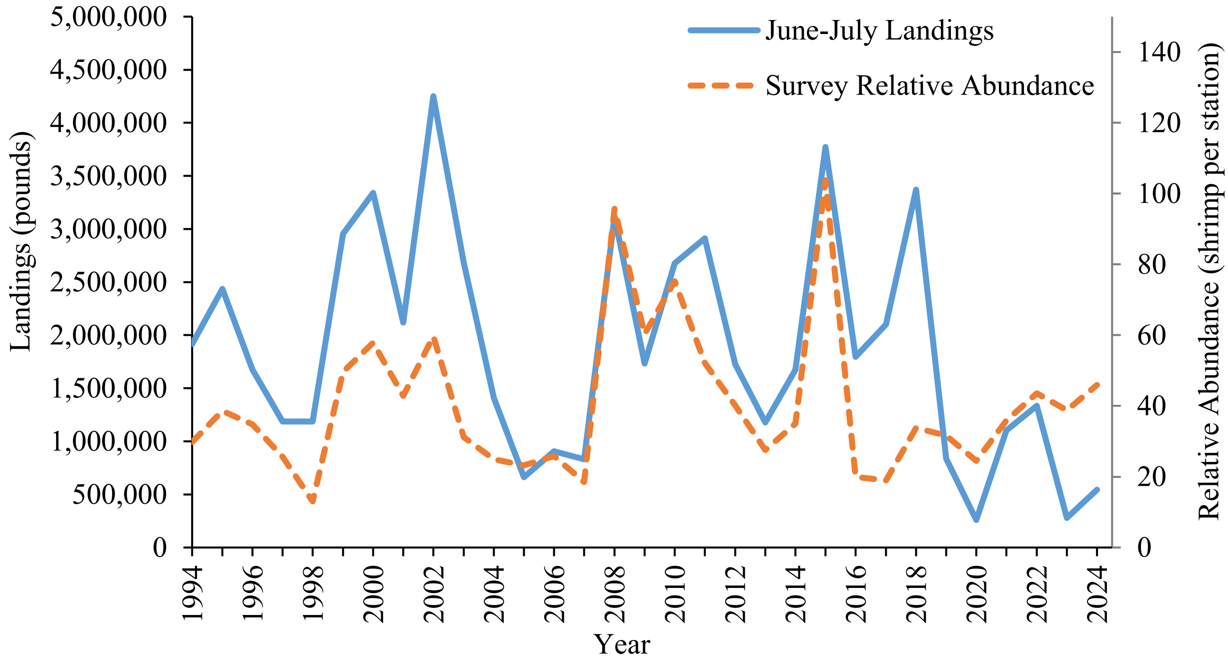

Figure 6. Comparison of brown shrimp commercial shrimp landings (pounds) in the months of June and July to the brown shrimp Program 120 index of relative abundance (shrimp per station), 1994–2024.

RESEARCH NEEDS

The following research needs are from Amendment 2 to the N.C. Shrimp FMP (NCDMF 2022). The list below outlines the specific needs and highlights the prirority and status of each.

High

- Create a long-term shrimp trawl observer program to characterize bycatch across all strata (for example: dominant species, protected species, season, areas, gear type, vessel type, number of nets/rigs, headrope length, TED position, etc.). — Needed
- Improve accuracy of self-reported license gear survey data or investigate other means of accurately obtaining shrimp fleet characteristics. — Needed
- Collect improved effort data (e.g., headrope length, number of nets, tow time, number of tows) to provide bycatch estimates based on actual time fished (or number of tows), rather than number of trips. — Needed
- Create and validate juvenile abundance indices for white and pink shrimp. — Needed
- Determine the cumulative impacts of shrimp trawl bycatch on individual species population dynamics and the ecosystem. — Needed
- Determine the spatial, temporal, and biological characteristics of submerged aquatic vegetation that maximize their ecological value to shrimp for restoration and conservation purposes. — Needed
- Determine how the resuspension of sediment, siltation, and non-point source pollution from adjacent land use practices impacts trends in shrimp abundance and habitat degradation.
- Develop alternative non-bottom disturbing gears to efficiently catch shrimp. — Needed

Medium

- Determine the influence of current bottom disturbing gears patterns (location, frequency, etc.) on sub-tidal shell, and SAV in Pamlico Sound. — Needed
- Continue to locate, map, and quantify the bottom habitat structure, bathymetry, and sediment types in North Carolina estuaries. — Ongoing
- Measure the effects of trawling on sediment size distribution and organic carbon content.
- Establish continuous water quality monitoring in the Pamlico system to evaluate water quality effects on shrimp and the fish habitats in which they rely. — Needed
- Develop research methods to understand costs and benefits of maintaining shrimp habitat and water quality to inform decision-making on shrimp management. — Needed

Low

- Initiate research to determine the impacts of endocrine disrupting chemicals (EDCs) on the various life stages of shrimp. — Needed
- Expand current social and economic surveys to specifically collect information on shrimp fishermen. — Needed

MANAGEMENT

There are no management triggers or methods to track stock abundance, fishing mortality, or recruitment between benchmark reviews from the current FMP. Several management issues were explored in Amendment 2; Table 1 outlines the specific issues and the implementation status of each strategy.

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

The division recommends maintaining the next scheduled review of this plan in July 2027.

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FISHERY MANAGEMENT PLAN UPDATE
SOUTHERN FLOUNDER
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	February 2005	
Amendments:	Amendment 1	February 2013
	Amendment 2	August 2019
	Amendment 3	May 2022
Revisions:	None	
Supplements:	Supplement A to the FMP	February 2011
	Supplement A to Amendment 1	August 2017
Information Updates:	None	
Schedule Changes:	None	
Comprehensive Review:	2024	

Southern flounder (*Paralichthys lethostigma*) in North Carolina are managed under Amendment 3 to the North Carolina Southern Flounder Fishery Management Plan (FMP; NCDMF 2022). Development of Amendment 3 began upon approval of Amendment 2 to address comprehensive, long-term management strategies to continue the rebuilding of the southern flounder stock started under Amendment 2. Amendment 2 was intended to reduce harvest pressure on the North Carolina portion of the stock quickly before more robust measures were developed (NCDMF 2019). Amendment 2 and Amendment 3 management was based on the 2019 coast-wide stock assessment. The original assessment pooled-sex model (Lee et al. 2018) was updated with data through 2017 and incorporated the new Marine Recreational Information Program (MRIP) estimates that were available (Flowers et al. 2019).

At its May 26, 2022, business meeting, the North Carolina Marine Fisheries Commission (MFC) adopted Amendment 3 to the Southern Flounder FMP as proposed by the North Carolina Division of Marine Fisheries (DMF).

Amendment 3 actions to achieve sustainable harvest include:

- Combine mobile gears (gill nets, gigs, and “other” gears) into one gear category and maintain pound nets as their own separate commercial fishery.
- Divide mobile gears into two areas using the Incidental Taker Permit (ITP) boundary line for management units B-D.
- Divide the pound net fishery into three areas maintaining consistency with areas in Amendment 2.
- Maintain 72% reduction and current sub-allocation for the pound net fishery with direction from the MFC as follows: “In 2024, as the shift in allocation is set to start the Division will provide recommendations to the MFC on approaches to maintaining a sustainable sub-allocation for the commercial pound net fishery, as needed based on the economic and biotic conditions at that time”.
- Implement trip limits for pound nets and gigs only to maximize reopening after reaching division closure threshold.
- Implement a single season for the recreational gig and hook-and-line fisheries to constrain them to an annual quota.

- Reduce the recreational bag limit of flounder to one fish per person per day.
- Do not allow harvest of southern flounder using a Recreational Commercial Gear License (RCGL).
- One-fish recreational ocellated bag limit during March 1 through April 15 in ocean waters only using hook-and-ling gear and a one-fish bag limit consisting of any species of flounder during the southern flounder recreational season.
- Do not establish inlet corridors for southern flounder during spawning migrations.
- Adopt the adaptive management framework based on the peer-reviewed and approved stock assessment.
- At the November 2020 business meeting, the MFC requested analysis of various recreational and commercial allocation percentages. In March 2021, the MFC voted on and approved sector allocations of 70/30 commercial to recreational for 2021 and 2022 and shifting to 60/40 for 2023, and 50/50 parity beginning in 2024.
- Based on recognition of a series of coincident concerns specific to the initial steps in rebuilding the southern flounder fishery, the MFC voted in February 2022 to delay the transition to 50/50 parity by two years (time for at least one cycle of larval to female maturity). The selected allocations will be 70/30 for 2023 and 2024, 60/40 for 2025, and 50/50 parity starting in 2026.
- Do not implement a slot limit and maintain the 15-inch total length (TL) current minimum size limit.
- Continue to allow anchored large-mesh gill nets to harvest southern flounder in the North Carolina southern flounder fishery.

At the August 2024 MFC business meeting, the Commission passed a motion "to ask the DMF Director to ask the DEQ Secretary to modify the Annual FMP Review Schedule to amend the Southern Flounder FMP for the review of the plan to begin in 2024. The intent is to allow for more recreational access while maintaining the rebuilding requirements of the North Carolina Southern Flounder FMP Amendment 3". The DEQ Secretary approved the schedule change in November 2024, which included the development of a focused amendment to give the MFC the opportunity to consider implementing the 50/50 sector allocation in 2025 instead of 2026 as prescribed in Amendment 3. Additionally, the Secretary approved the concurrent development of a more comprehensive amendment to explore long-term solutions to the issue of recreational access while maintaining Amendment 3 rebuilding requirements. Amendment 4 (the focused amendment) is scheduled for final approval at the August 2025 MFC business meeting. Amendment 5 (the comprehensive amendment) is currently being developed.

Management Unit

In Amendment 3 to the North Carolina Southern Flounder FMP, the management unit was defined as North Carolina internal coastal and joint fishing waters and the Atlantic Ocean 0 – 3 miles. However, due to increased information relative to genetic identification and tagging studies the unit stock for the 2018 stock assessment was changed to include all waters from North Carolina through the East coast of Florida (Lee et al. 2018; Ross et al. 1982; Monaghan 1996; Schwartz 1997; Craig and Rice 2008; Anderson and Karel 2012; Midway et al. 2014; Wang et al. 2015, 2018).

Goal and Objectives

The goal and objectives of Amendment 3 to the North Carolina Southern Flounder FMP were approved by the MFC at its February 2020 business meeting (NCDMF 2022). The goal is to manage the southern flounder fishery to achieve a self-sustaining population that provides sustainable harvest using science-based decision-making processes. The following objectives will be used to achieve this goal:

- Implement management strategies within North Carolina and encourage interjurisdictional management strategies that maintain/restore the southern flounder spawning stock with expansion of age structure of the stock and adequate abundance to prevent overfishing.
- Restore, enhance, and protect habitat and environmental quality necessary to maintain or increase growth, survival, and reproduction of the southern flounder population.
- Use biological, environmental, habitat, fishery, social, and economic data needed to effectively monitor and manage the southern flounder fishery and its ecosystem impacts.
- Promote stewardship of the resource through increased public outreach and interjurisdictional cooperation throughout the species range regarding the status and management of the southern flounder fishery, including practices that minimize bycatch and discard mortality.
- Promote the restoration, enhancement, and protection of habitat and environmental quality in a manner consistent with the Coastal Habitat Protection Plan.

DESCRIPTION OF THE STOCK

Biological Profile

Southern flounder is a bottom dwelling species of left eyed flounder found in the Atlantic Ocean, Gulf of Mexico, and estuaries from Virginia to northern Mexico (Blandon et al. 2001). This species is one of three commonly caught left eyed flounder in North Carolina; southern flounder, Gulf flounder (*P. albigutta*), and summer flounder (*P. dentatus*). Southern flounder supports important commercial and recreational fisheries along the U.S. South Atlantic and Gulf coasts and is particularly important to fisheries in North Carolina. Based on tagging and genetic data and aging structures, the biological unit stock for southern flounder includes fish from North Carolina to the east coast of Florida. Evidence also suggests some adult southern flounder return to the estuaries after spawning in the ocean, while others remain in the ocean (Watterson and Alexander 2004; Taylor et al. 2008; Loeffler et al. 2024; NCDMF, unpublished data). Tagged fish are typically recaptured south of original tagging locations and often in other states once in the ocean (Craig et al. 2015; Loeffler et al. 2019). Limited data from South Carolina and Georgia tagging programs suggest a low probability of adult movement from South Carolina or Georgia to North Carolina waters (Wenner et al. 1990; SCDNR Inshore Fisheries Section, unpublished data; Flowers et al. 2019).

DMF data collected from fall fisheries suggests that with the onset of maturity, females migrate out of inlets to ocean waters in the fall. Spawning locations in the Atlantic Ocean are unknown; however, Benson (1982) observed the pelagic larval stage over the continental shelf where spawning is reported to occur (NCDMF, unpublished data). Southern flounder can produce approximately three million eggs per female in multiple spawning events in a season, and spawning is thought to take place between November and April (Midway and Scharf 2012; Watanabe et al. 2001; Gunther 1945; Hettler and Barker 1993; Hollensead 2018). Larval southern flounder pass through inlets within 30 to 45 days of hatching and settle throughout the sounds and rivers in the winter and early spring (Daniels 2000; Glass et al. 2008). Larvae enter inlets in winter and early spring to settle throughout the sounds and rivers (Burke et al. 1991; Miller et al. 1991; Taylor et al. 2010; Lowe et al. 2011). Not much is known about the movement of juveniles less than eight inches, but these fish may primarily remain near settlement locations. Some larger juveniles have been shown to move short distances within a water body and some studies have shown limited movements while southern flounder are residing within an estuary (Monaghan 1996; McClellan 2001; Craig et al. 2015). Juveniles likely spend at least one year in inshore waters before migrating to the ocean (McKenna and Camp 1992; Hannah and Hannah 2000; Watterson and Alexander 2004; Taylor et al. 2008).

Nearly half of female flounder are mature by ages 1 and 2 (at approximately 16 inches TL; Monaghan and Armstrong 2000; Midway and Scharf 2012). Fish collected in the ocean tend to be larger and older, with females growing larger than males. The largest female southern flounder observed in North Carolina was a 33-inch TL and largest male was 20-inch TL (Lee et al. 2018; Flowers et al. 2019; Schlick et al. 2024). The maximum observed age was 9 years for a female and 6 years for a male; southern flounder captured in North Carolina represent the oldest ages observed throughout the range (Lee et al. 2018; Flowers et al. 2019; Schlick et al. 2024).

Juvenile and adult southern flounder typically feed by camouflaging themselves on the bottom and ambushing their prey with a quick upward lunge (Burke 1995; Arrivillaga and Baltz 1999). Southern flounder diets switch to fish when they are between 3- and 4-inches TL (Ellis 2007; Fitzhugh et al. 1996; Wenner et al. 1990). Adult southern flounder feed almost exclusively on other fish but will consume shrimp as well.

Stock Status

Following the recommendation of the peer review panel (Lee et al. 2018), the southern flounder working group recommended that the stock size threshold and target be defined in terms of Spawning Stock Biomass (SSB) associated with the fishing mortality target and threshold. Based on the results of the 2019 stock assessment, the probability that fishing mortality in 2017 is above the threshold value of 0.53 is 96.4%, whereas there is a 100% chance the fishing mortality in 2017 is above the target value of 0.35. The probability that the SSB in 2017 is below the threshold or target value (3,900 and 5,452 metric tons, respectively) is 100%. Therefore, the current status of the southern flounder stock is overfished, and overfishing is occurring (Figures 1 and 2).

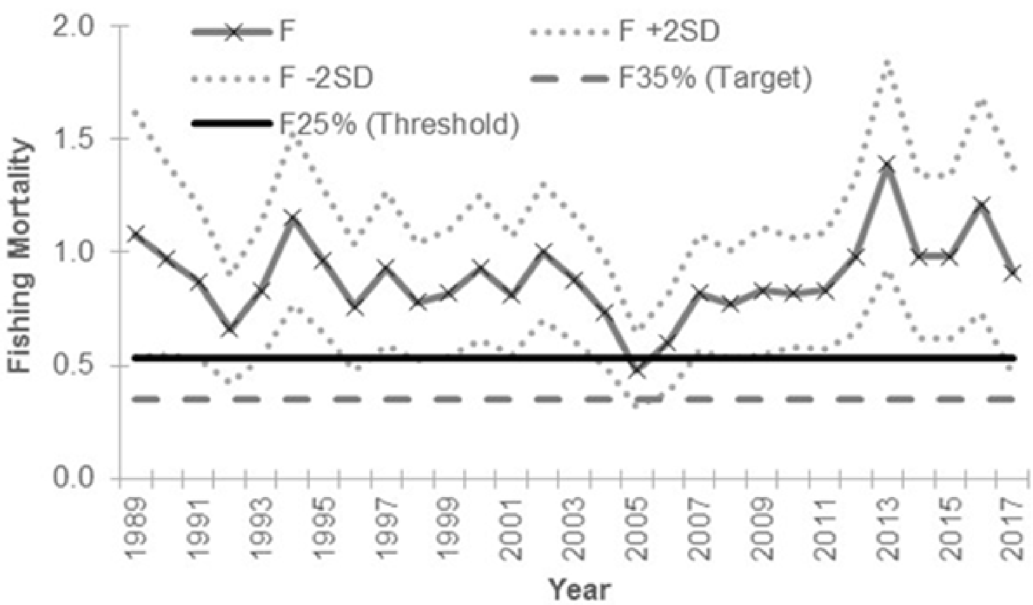

Figure 1. Estimated fishing mortality rates (numbers-weighted, ages 2–4) compared to established reference points, 1989–2017. (Source: Flowers et al. 2019)

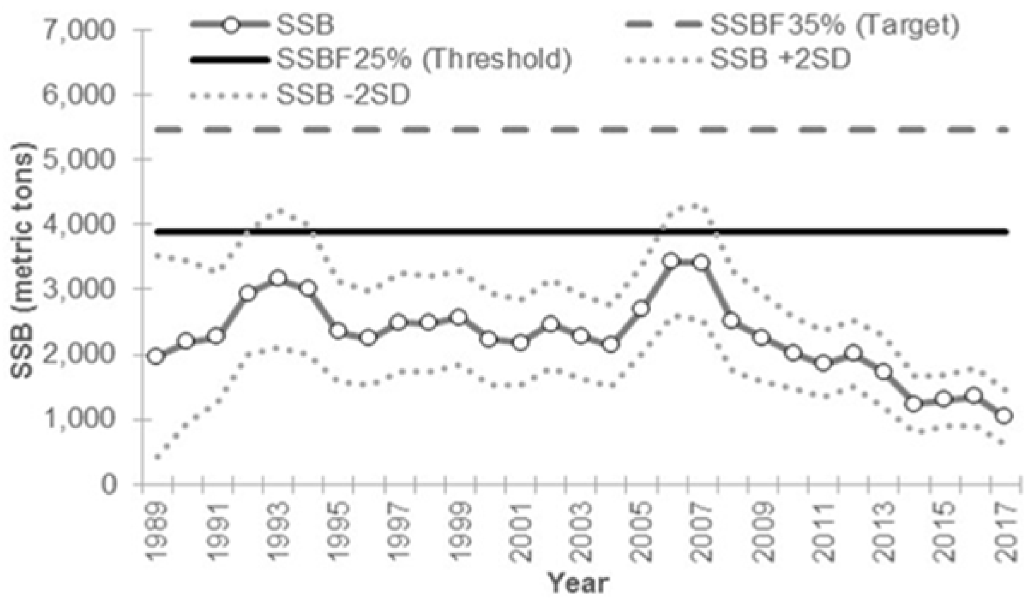

Figure 2. Estimated spawning stock biomass compared to established reference points, 1989–2017. (Source: Flowers et al. 2019)

Stock Assessment

Over the last 20 years several stock assessments have been conducted by division staff. Southern flounder stock assessments were completed in 2005 (Grist 2005), 2009 (Takade-Heumacher and Batsavage 2009), 2014 (NCDMF 2015), with each concluding that southern flounder was overfished, and that overfishing was occurring. These assessments were for North Carolina only. Upon review of the 2014 assessment, external peer reviewers and the DMF determined the model could not fully account for stock mixing during spawning, nor quantify migration of southern flounder to and from North Carolina waters. Consequently, the assessment was not accepted for management and stock status could not be determined.

As a result, a coast-wide southern flounder stock assessment was developed and included data and expertise of state agency staff from North Carolina. South Carolina, Georgia, and Florida, as well as researchers from the University of North Carolina at Wilmington and Louisiana State University. The multistate assessment was an attempt to further address the geographical distribution of the unit stock and was peer reviewed in December 2017. This assessment used a statistical catch-at-age model run using the Age Structured Assessment Program (ASAP; Lee et al. 2018).

The Southern Flounder Review Panel accepted the pooled-sex run of the ASAP model presented at the Review Workshop and was approved as a valid basis of management for at least the next five years, with the expectation that the model will be updated with data through 2017 to provide the best, most up to date estimate of stock status for management. The reviewers also noted that management advice based on the 2015 terminal year would be out of date by the time it could be implemented and that expected changes to recreational catch estimates (MRIP) should be incorporated into the assessment model and management response.

During 2018, the southern flounder stock assessment sub-committee updated all necessary data inputs for the ASAP model. The pooled-sex model was updated with data through 2017 and incorporated the new MRIP estimates that were available; the results indicated the stock is overfished and overfishing is still occurring (Figures 1 and 2; Flowers et al. 2019). Analyses that provided projections of reductions to fishing mortality necessary to end overfishing and to determine what reductions would be necessary to rebuild the spawning stock biomass and end the overfished status were completed (Flowers et al. 2019).

In early 2024, the southern flounder stock assessment sub-committee conducted a second update to the ASAP model with data through 2022. The 2024 update continued to show declining trends in spawning stock biomass (SSB) and recruitment since 2006; however, fishing mortality (*F*) decreased significantly in the last two years of the assessment (Schlick et al. 2024). Several trends and diagnostics from the model raised concerns, and division staff and partners from the other states decided to not use the new update for management. A new benchmark stock assessment is needed to address the concerns raised and the model configuration changed to account for the differential management practices used across the stock.

DESCRIPTION OF THE FISHERY

Current Regulations

Commercial regulations include a 15-inches TL minimum size limit from internal waters and 14-inches TL minimum size limit from ocean waters, 6-inch stretched mesh minimum mesh (ISM) size for gill nets, closed season in internal waters unless opened by proclamation. The 2025 commercial season opening date has yet to be determined, though paybacks will be required for any overage to the TAC. The commercial fishery has operated under a quota since the fall of 2022 with two gear categories; mobile gears which are divided into two management areas using the B-D boundary line from the turtle and sturgeon ITPs and the pound net fishery which will be divided into three management areas consistent with Amendment 2. In late September 2024, the National Marine Fisheries Service issued the new turtle and sturgeon ITPs for the division which changed the B-D boundary line for the ITPs. However, the old line is still the dividing line between the southern flounder mobile gear management areas (a line in Core Sound at 34° 48.2700' N latitude which runs approximately from the Club House on Core Banks westerly to a point on the shore at Davis near Marker "1"). There are no current trip limits in internal waters, but they can be implemented for pound nets and gigs only upon reaching a predetermined division closure threshold to reopen the fishery without exceeding the quota and a 100-pound trip limit in ocean waters unless the individual has a License to Land Flounder from the Atlantic Ocean; commercial ocean landings are allowed using trawl gear only.

Recreational regulations include a 15-inches TL minimum size limit, one-fish creel limit from all joint and coastal fishing waters, closed season for internal and ocean waters except if opened by proclamation. The recreational flounder fishery has operated under seasons to constrain the fishery to a quota since 2022. There will be a 2025 recreational season, but the length will be determined based on whether Amendment 4 is adopted at the August 2025 MFC business meeting.

Commercial Fishery

All landings reported as caught in internal coastal and joint fishing waters are considered to be southern flounder by the DMF Trip Ticket Program. Data from the fishery-dependent sampling program indicates that southern flounder make up less than one percent of the catch from ocean waters, while summer flounder and Gulf flounder account for approximately two percent or less of the flounder harvested from internal waters (NCDMF, unpublished data). Most southern flounder landings are from gill nets and pound nets, although gigs and other inshore gears (e.g., trawls) catch flounder in smaller numbers. Peak commercial landings occurred in 1994 (Table 1; Figure 3). Historically, pound nets were the dominant gear but landings from gill nets were higher from 1994 to 2013 (Figure 3). Since 1994, pound net landings decreased greatly, while gill net landings remained relatively high until 2010. Decreases in gill net landings from 2010 to 2012 were mainly due to lower landings in the Albemarle Sound. The Sea Turtle Settlement Agreement (2010) added regulations to gill nets in portions of the state, resulting in lower effort in many areas; however, the Albemarle Sound was mostly unaffected by these regulations. The Albemarle Sound is typically where the majority of southern flounder gill net harvest occurs. In 2013, gill net harvest increased in the Albemarle Sound, but decreased in Pamlico Sound and Core Sound; pound net landings also increased in 2013. Since 2014, gill net harvest has decreased in all areas of the state, especially in the Albemarle Sound due to widespread gill net closures to avoid catches of red drum and protected species interactions. Pound net harvest surpassed gill net harvest 2014 through 2020 (Figure 3). Gig harvest of southern flounder has generally increased, especially since 2010. Harvest by other commercial gears has generally decreased and currently makes up a small portion of commercial harvest. Commercial harvest from 2019 to 2024 was impacted due to regulations implemented through Amendment 2 and Amendment 3 to the NC Southern Flounder FMP. Amendment 2 implemented seasons in the commercial southern flounder fishery for the first time, and Amendment 3 introduced quota management of the fishery. Under Amendment 3 the commercial fishery was separated into two mobile gear management areas (northern and southern) and three-pound net management areas (northern, central, and southern). In 2024, the northern and southern mobile gear management areas were open a total of 11 and 10 days, respectively. The northern pound net management area was open for 28 days, the central 19 days, and the southern 12 days. The central pound net and southern mobile gear management areas exceeded their allowed landings. Additionally, the commercial southern flounder fishery exceeded their total allowable landings for 2024.

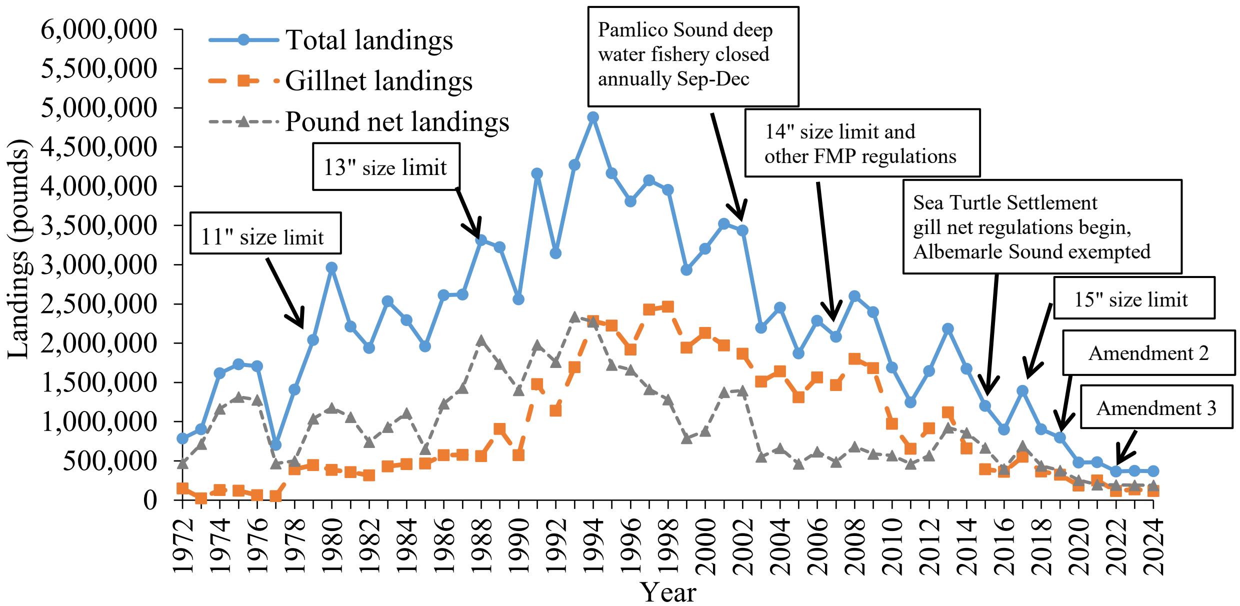

Figure 3. Southern flounder harvest (pounds) for total commercial fishery and top two gears (gill nets and pound nets) from North Carolina Trip Ticket Program 1972–2024 with major fishery regulation changes.

Table 1. Southern flounder recreational harvest and number released (Marine Recreational Information Program for hook and line and the DMF Gig Mail Survey) and commercial harvest (North Carolina Trip Ticket Program) for 1989–2024. All weights are in pounds.

Year	Recreational						Commercial	
	Hook and Line			Gig				
	Number Landed	Number Released	Weight Landed (lb)	Number Landed	Number Discards	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1989	119,047	125,192	199,850	-	-	-	3,225,955	3,425,805
1990	138,106	152,895	216,960	-	-	-	2,560,459	2,777,419
1991	257,319	791,778	489,865	-	-	-	4,163,374	4,653,239
1992	115,329	433,576	219,720	-	-	-	3,145,020	3,364,740
1993	83,811	370,372	127,860	-	-	-	4,272,368	4,400,228
1994	168,237	562,915	323,869	-	-	-	4,878,606	5,202,475
1995	127,106	459,800	271,703	-	-	-	4,166,947	4,438,650
1996	173,400	449,876	339,228	-	-	-	3,807,009	4,146,237
1997	209,038	873,901	560,323	-	-	-	4,076,791	4,637,114
1998	96,124	411,939	205,569	-	-	-	3,952,563	4,158,132
1999	78,321	209,956	184,969	-	-	-	2,933,276	3,118,245
2000	326,712	942,560	607,053	-	-	-	3,205,789	3,812,842
2001	304,791	990,335	567,568	-	-	-	3,522,136	4,089,704
2002	366,671	1,415,247	789,539	-	-	-	3,436,751	4,226,290
2003	293,793	860,052	621,985	-	-	-	2,198,501	2,820,486
2004	347,492	1,537,924	827,593	-	-	-	2,454,585	3,282,178
2005	298,307	997,132	675,856	-	-	-	1,870,754	2,546,610
2006	352,942	1,287,601	761,069	-	-	-	2,287,823	3,048,892
2007	279,916	1,075,735	572,064	-	-	-	2,083,043	2,655,107
2008	349,860	2,532,079	807,867	-	-	-	2,602,274	3,410,141
2009	329,117	1,889,921	692,704	-	-	-	2,396,240	3,088,944
2010	556,812	2,835,142	1,149,899	18,079	3,051	41,582	1,689,557	2,881,038
2011	388,647	2,087,604	942,373	51,954	9,726	119,494	1,247,450	2,309,317
2012	290,035	2,434,621	701,698	46,338	2,674	106,577	1,646,137	2,454,413
2013	374,215	2,357,529	869,223	54,419	2,759	125,164	2,186,579	3,180,966
2014	209,228	1,856,280	447,337	42,306	2,715	97,304	1,673,511	2,218,152
2015	249,166	1,709,189	558,303	28,707	2,356	66,026	1,202,952	1,827,281
2016	299,273	2,178,145	695,713	29,642	3,737	68,177	899,932	1,663,822
2017	221,321	1,988,000	451,126	24,136	655	55,513	1,396,384	1,903,023
2018	217,805	1,002,753	495,289	23,243	525	53,459	903,842	1,452,590
2019*	163,045	1,353,286	387,203	20,179	1,042	46,412	800,080	1,233,695
2020*	152,244	1,678,494	398,769	11,511	90	26,475	479,905	905,150
2021*	266,421	1,940,051	560,440	11,338	926	26,077	485,024	1,071,541
2022*	70,945	2,792,144	166,102	3,422	109	7,871	366,510	540,483
2023*§	77,885	2,185,629	192,168	3,422	109	7,871	376,031	576,070
2024*§	5,713	1,677,039	9,446	.	.	.	368,517	377,963
Mean	232,172	1,345,741	502,453	26,335	2,177	60,572	2,304,519	2,830,527

* Years with harvest seasons in place; 2022 was the start of quota management.
§2023 gig survey estimates are not available, so 2022 values were used as proxies for quota management purposes. No gig estimates are available for 2024 as no season occurred in coastal fishing waters, and hook and line was only allowable gear in inland and joint fishing waters.

Trends in commercial trips have generally followed landings trends (Figure 4). Trips include the number of trip ticket records with landings reported; some trips may represent more than one day of fishing. The majority of trips that harvest flounder are from gill nets. Gill net trips have been variable around a decreasing trend since 2010. Pound net trips decreased until 2002, since they have been variable on a lower level. Gigging trips have been variable around an increasing trend since 2010. The number of trips for all gears targeting southern flounder have decreased since regulatory changes due to Amendment 2 (seasonal management) and Amendment 3 (quota management) were implemented limiting the number of days flounder could be harvested.

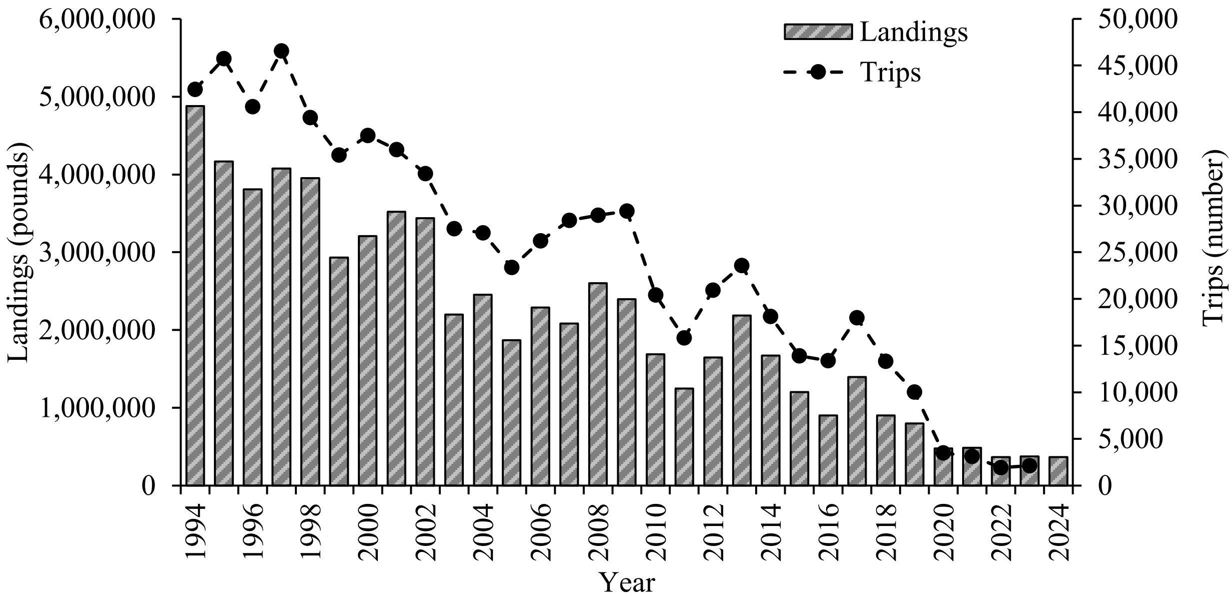

Figure 4. Southern flounder commercial trips (numbers) and landings (pounds) from N.C. Trip Ticket Program, 1994–2024.

Recreational Fishery

Recreational harvest of southern flounder is mainly by hook and line and gigs, with a small amount of harvest by spearfishing or RCGL gears (prior to 2022). DMF does not have information on long-term trends of the gig fishery; MRIP rarely encounters gig fishermen. A DMF mail-based survey of gigging that began in 2010 indicates the gig harvest from 2010–2022 averaged 10% of the recreational harvest (with hook-and-line harvest making up the remainder). In 2023, a new licensing system was implemented, and the license database was restructured. This restructuring disrupted the division's ability to query the full license dataset to establish a sampling frame of eligible anglers for the mail surveys. As a result, we were unable to administer the mail surveys and expand potential responses and survey estimates are not available for this year. Since the mail survey estimates are used in determining if the recreational fishery exceeded their TAC, data from 2022 was used as a proxy for the unavailable 2023 data in determining the total removals for the year. In 2024, there are no gig estimates as there was not a season in coastal fishing waters where gigging typically occurs. Additionally, hook and line was the only allowed gear in inland and joint fishing waters where a season did occur.

Hook-and-line harvest can be split into ocean and inshore harvest, with most southern flounder harvested inshore (Figure 5). Hook-and-line harvest peaked in 2010 (Table 1). Recreational harvest was impacted in 2020 and 2021 due to regulations implemented through Amendment 2 to the North Carolina Southern Flounder FMP. In addition, the season was shortened from 45 days in 2020 to 14 consecutive days in 2021 due to excessive overages that occurred during the 2020 season. Like the commercial fishery, Amendment 3 implemented a quota for the recreational fishery through a season. The season in 2022 was 30 days. In 2023, the season for the recreational fishery was 14 days; due to overages in 2022, the 2023 total allowable catch (harvest plus discards) was adjusted from 170,655 pounds to 114,315 pounds. The recreational fishery exceeded its expected harvest in 2023. Due to the overage in 2023, the 2024 TAC was adjusted from 170,655 pounds to 43,361 pounds. No season occurred in coastal fishing waters as the available quota would account for anticipated dead discards that occur due to incidental catch and release. A four-day season occurred in inland and joint fishing waters in September. While originally allowed by Wildlife

Resources Commission, DMF mirrored the opening in joint fishing waters to avoid confusion for anglers and law enforcement.

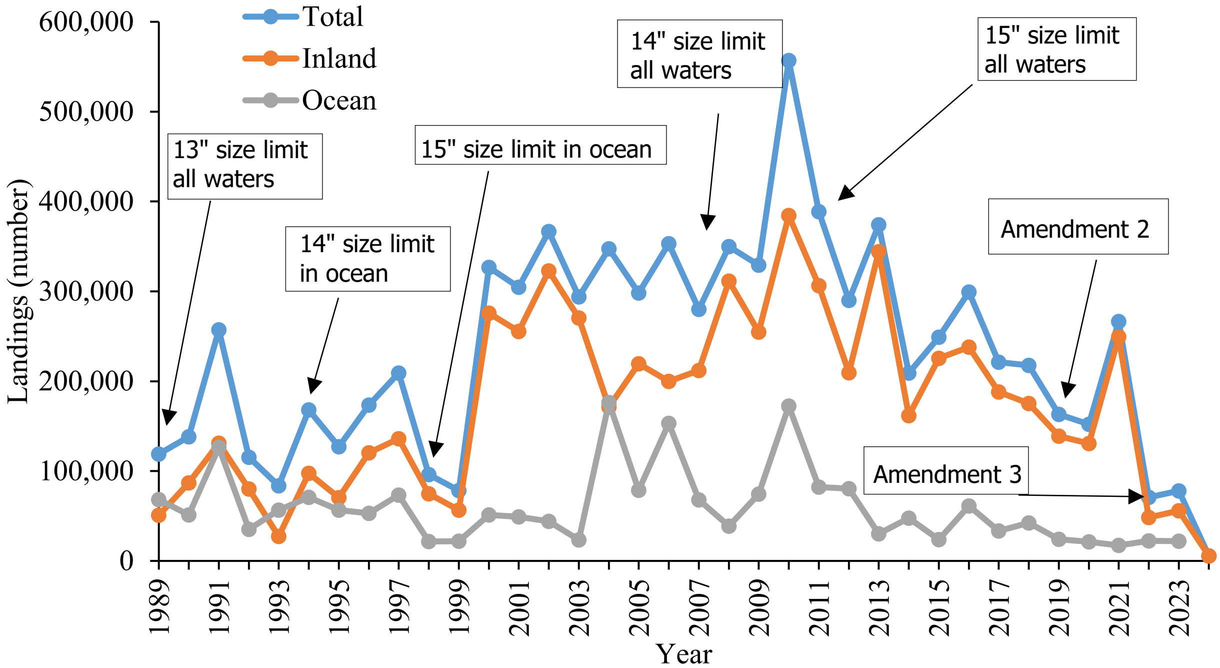

Figure 5. Southern flounder recreational hook and line harvest in numbers of fish from MRIP data 1989–2024 and major fishery regulation changes.

Trends in recreational trips are somewhat difficult to interpret because they represent all *Paralichthid* flounder species commonly caught in North Carolina (southern, summer, and Gulf). This is because anglers simply report targeting 'flounder' rather than a particular species of flounder. Trips can be defined in several ways, but in this document all trips that harvested or released any *Paralichthid* flounder species were included. Trends in trips and harvest are roughly similar throughout most of the time-series, but trips have been declining since 2014 while harvest has been variable (Figure 6). Recreational estimates across all years have been updated and are now based on the Marine Recreational Information Program (MRIP) new Fishing Effort Survey-based calibrated estimates. For more information on MRIP see https://www.fisheries.noaa.gov/topic/recreational-fishing-data.

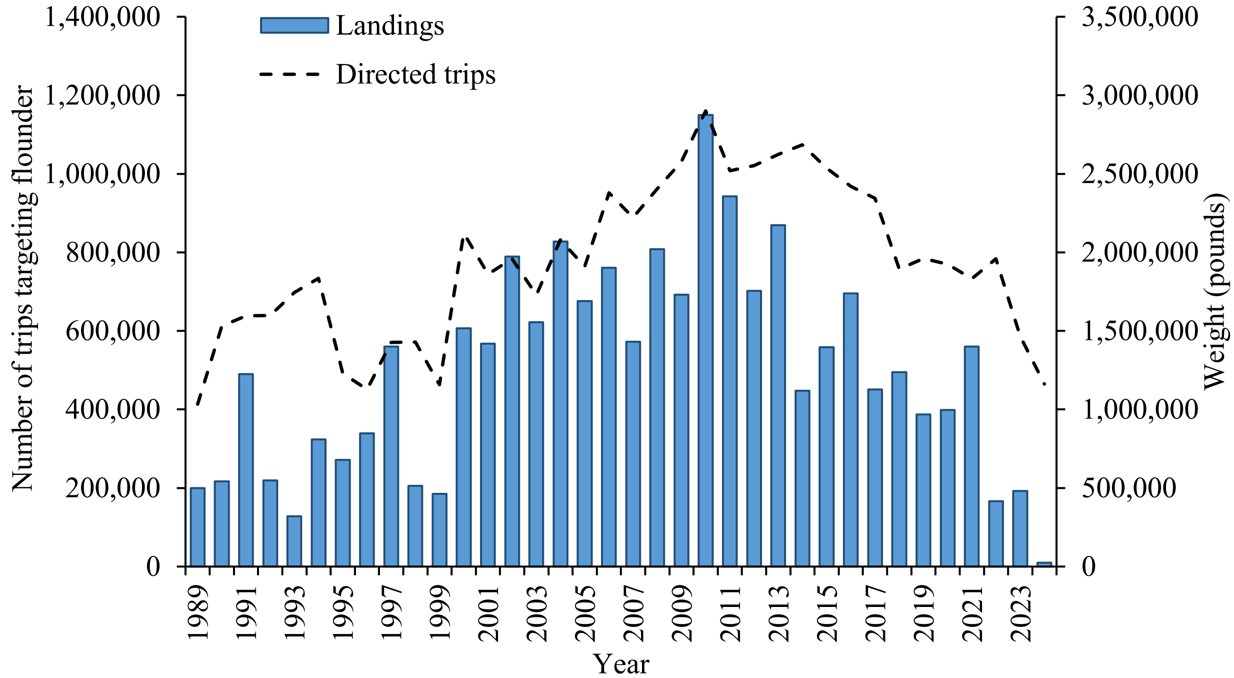

Figure 6. Recreational hook and line harvest (pounds) and directed trips (all trips that harvested or released Paralichthid flounder species), from MRIP data 1989–2024. Data from prior to 2004 were calibrated to align with MRIP estimates post-2004.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Commercial fishing activity is monitored through fishery-dependent sampling conducted by the division since 1982. Data collected in this program allows the size and age distribution of southern flounder to be characterized by gear and fishery. Several DMF sampling programs collect biological data on commercial and recreational fisheries that catch southern flounder. The primary programs that collect length and age data for harvested southern flounder include: 461 (gill net and seine), 476 (gig and spear), 432 (pound net), and 437 (long haul seine). Programs 466 the North Carolina Onboard Observer Program and 570 the North Carolina Shrimp Trawl Characterization Study collect length data on harvested and discarded flounder. Other commercial sampling programs focusing on fisheries that do not target southern flounder rarely collect biological data. The DMF sampling of the recreational fishery through the MRIP collects length data on southern flounder. The DMF mail-based gigging survey collects harvest data for the recreational gig fishery but does not collect length or age data. Age data from the recreational fishery are collected mainly via voluntary angler donations through the DMF Carcass Collection Program.

In 2024, 52% of southern flounder were harvested by pound nets, followed by gill nets (32%), gigs (15%), and “other” gear accounted for >1% (Figure 7). There were no clear trends in commercial length data from 2005 to 2024, though the mean TL increased slightly in 2024 (Table 2). An increase in mean TL was observed due to the changes in minimum commercial size regulation, increasing to 15-inches TL in 2016 (Table 2; Figure 8). During 2024, a greater proportion of the total catch consisted of 17- and 18-inch fish than in previous years (Figure 8).

Table 2. Southern flounder total length (inches) data for DMF commercial fishery sampling programs 2005–2024 (includes harvest and some discard information).

Year	Mean Length	Minimum Length	Maximum Length	Total Measured
2005	16	2	31	28,972
2006	16	5	31	39,572
2007	16	4	29	23,768
2008	16	1	28	39,302
2009	16	4	28	33,403
2010	16	5	29	27,176
2011	16	5	30	32,000
2012	16	4	30	29,865
2013	16	1	32	33,776
2014	16	1	28	26,354
2015	16	2	30	19,717
2016	17	6	27	14,712
2017	17	3	30	14,775
2018	17	2	27	8,892
2019	16	8	26	8,355
2020	17	10	28	4,163
2021	16	11	27	4,360
2022	17	7	27	4,133
2023	17	2	36	5,225
2024	18	12	28	2,464

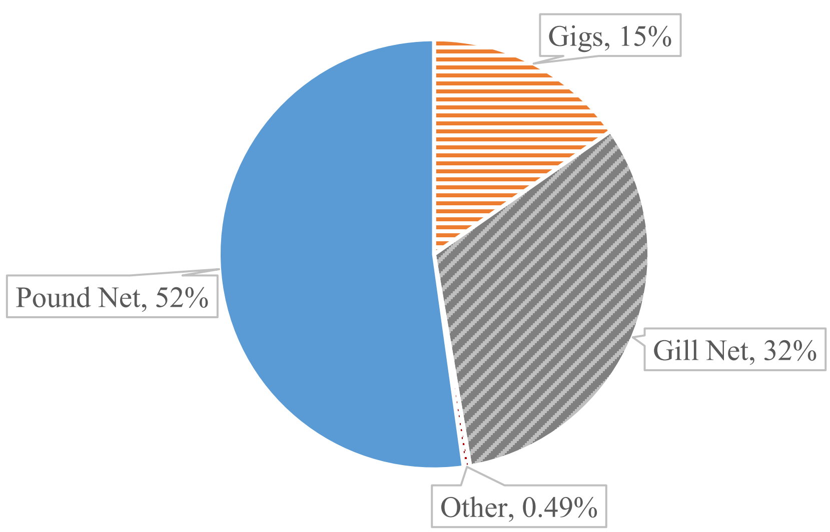

Figure 7. North Carolina commercial harvest of southern flounder in 2024 by gear type.

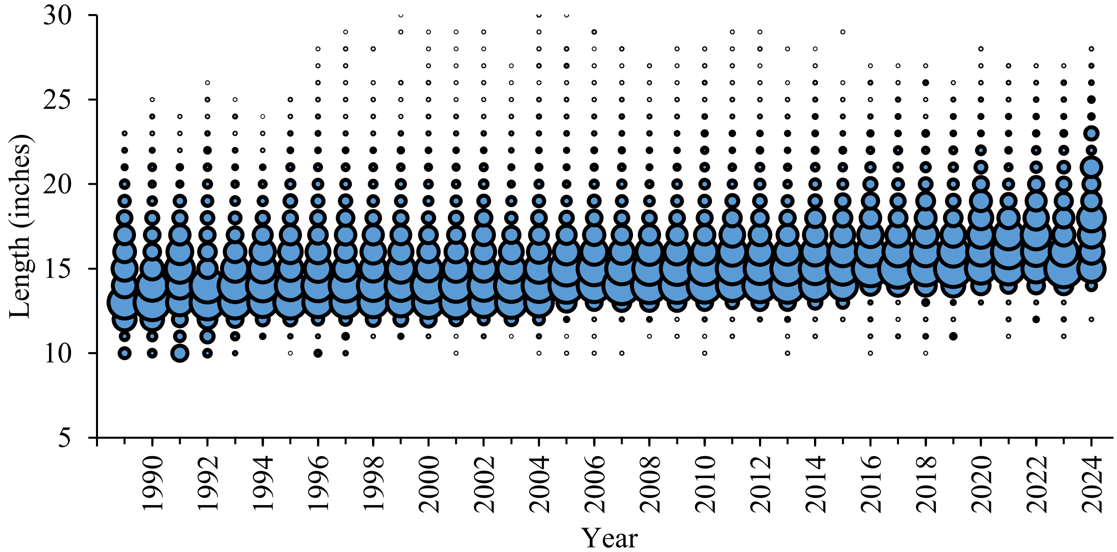

Figure 8. Commercial length frequency (total length, inches) of southern flounder harvested in North Carolina, 1991–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

There were no clear trends in recreational length data from 2005 to 2021 (Table 3), starting in 2022 a higher proportion of fish greater than 20-inches has been observed. Annual mean lengths collected through age sampling programs have been consistent. In 2024, only one southern flounder was measured. MRIP length frequency data show harvest of smaller fish has declined as changes to minimum size limits have occurred (Table 3; Figure 9).

Table 3. Southern flounder total length (inches) data for MRIP recreational fishery sampling in North Carolina, 2005–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Measured
2005	17	13	26	202
2006	16	10	31	343
2007	17	14	24	220
2008	17	13	27	311
2009	17	12	26	306
2010	17	11	28	754
2011	17	14	26	478
2012	18	14	30	400
2013	17	13	27	390
2014	17	14	26	199
2015	17	14	24	177
2016	17	14	25	225
2017	17	14	26	215
2018	17	13	27	276
2019	18	14	24	131
2020	18	12	26	187
2021	17	15	26	168
2022	18	15	24	110
2023	18	15	24	61
2024	16	-	-	1

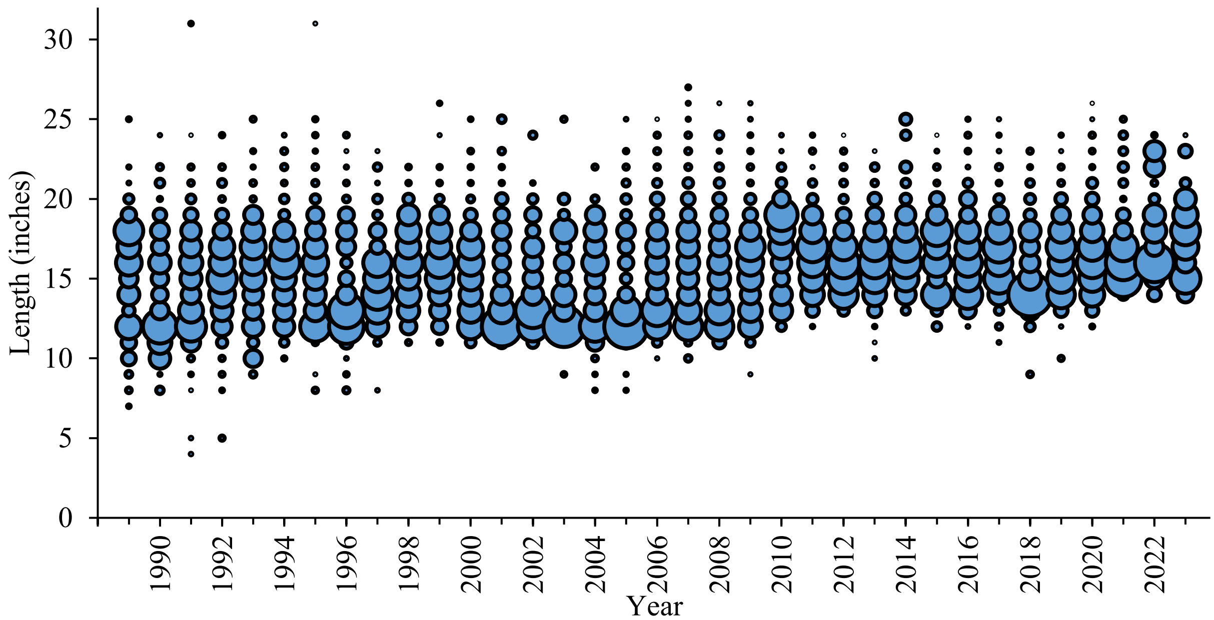

Figure 9. Recreational length frequency (total length, inches) of southern flounder harvested in North Carolina from MRIP, 1989–2023. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length. The 2024 data is not included due to the lack of measured intercepted fish.

Fishery-Independent Monitoring

Several DMF independent sampling programs collect biological data on southern flounder. The primary surveys that collect length data for southern flounder and that were evaluated as indices of abundance in recent stock assessments were programs: 120 (Estuarine Trawl Survey), 195 (Pamlico Sound Survey), 135 (Albemarle Sound Independent Gill Net Survey, and 915 (Pamlico Sound and Rivers Independent Gill Net Surveys). Program 135 was dropped from this update as the program has had significant changes in sample design that limits its catches of southern flounder; thus, reducing its usefulness as a data source for this species moving forward. Age data primarily is collected in Program 915, although the other three surveys do collect age data. Methodology for analyzing trends in relative abundance for each survey changed with the 2018 stock assessment when generalized linear models (GLMs) were used to calculate relative yearly relative abundance index values. These indices were not updated, as a result, nominal relative abundance index values have been included in this report.

There were no clear trends in fishery-independent length data from 2005 to 2024 (Table 4). Annual mean lengths were fairly consistent and 2022 had the second largest mean length in the time-series. However, the number of fish measured in 2020 was the lowest of any year from 2005 to 2022. The reduced number of measurements from independent samples is reflective of the sampling impacts due to the pandemic.

Table 4. Southern flounder total length (inches) data for DMF fishery-independent sampling programs 2005–2024. 2020/2021 sampling impacted by Executive Order (EO) 116, issued March 10, 2020; most lengths in 2020 were collected in the juvenile sampling programs.

Year	Mean Length	Minimum Length	Maximum Length	Total Measured
2005	8	0	25	3,769
2006	9	0	23	3,560
2007	7	0	22	3,812
2008	10	0	27	4,270
2009	10	1	27	3,230
2010	9	1	23	4,168
2011	12	1	28	2,604
2012	10	1	26	4,878
2013	9	1	27	3,534
2014	9	1	25	2,339
2015	9	1	24	2,133
2016	11	2	30	1,426
2017	9	1	22	2,238
2018	9	0	24	2,123
2019	10	0	24	2,664
2020	5	1	18	595
2021	9	0	24	2,529
2022	11	0	24	3,733
2023	11	1	27	2,835
2024	10	0	26	3,161

In 2001, the DMF initiated a fishery-independent gill net survey in Pamlico Sound (Program 915) and was expanded into the Pamlico, Pungo, and Nuese rivers in 2003. The objective of this project is to provide annual, independent, relative-abundance indices for key estuarine species. The survey employs a stratified random sampling design and utilizes multiple mesh gill nets (3.0-inch to 6.5-inch stretched mesh, by half-inch increments). While the survey occurs from February – December annually and consists of two depth strata [shallow (less than six feet) and deep (greater than six feet)], only August and September data were used to analyze the index of abundance trends because these months had the peak catches of southern flounder. The relative abundance index for Program 915 peaked in 2010 and the low point was in 2016 for the time-series analyzed and has an overall decreasing trend (Figure 10). The relative abundance index for 2021 was above the series average (3.68 southern flounder per set) for the first time since 2013, but 2022 had the lowest relative abundance since 2016. In 2024, the relative abundance index was 2.78, below the time series average.

Figure 10. Annual nominal relative abundance index with standard error shaded in gray for southern flounder (juveniles and adults) caught in the North Carolina Pamlico Sound Independent Gill Net Survey, 2003–2024. Note: 2020 and 2021 sampling impacted by Executive Order (EO) 116, issued March 10, 2020.

During 2020, and the first part of 2021, no index of abundance is available for southern flounder 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.

Data collected by Program 120 were used for a relative Juvenile Abundance Index (JAI) in the January 2019 stock assessment. The Estuarine Trawl Survey (Program 120) 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 fixed stations, a set of 104 core stations with additional stations as needed. The core stations are sampled from western Albemarle Sound south through the South Carolina border each year without deviation one sample for each station each month during the months of May and June. Data from this survey were used to produce a southern flounder JAI from 1989 to 2024. The JAI for Program 120 peaked in 1996 and the low point was in 2023 for the time-series analyzed and shows a declining but variable trend (Figure 11). The JAI has been below the time-series average (2.59 flounder per tow) for the last 10 years. The JAI in 2024 (1.47 southern flounder per tow) increased 194% compared to 2023. The 2020 JAI was the second lowest in the 30-year time series, however, sampling was impacted by the COVID pandemic, and the full sampling regime was not completed. Sampling typically occurs over the months of May and June. Due to the pandemic all sampling was conducted in June. The impact to the JAI due to the changes to the sampling regime are unknown.

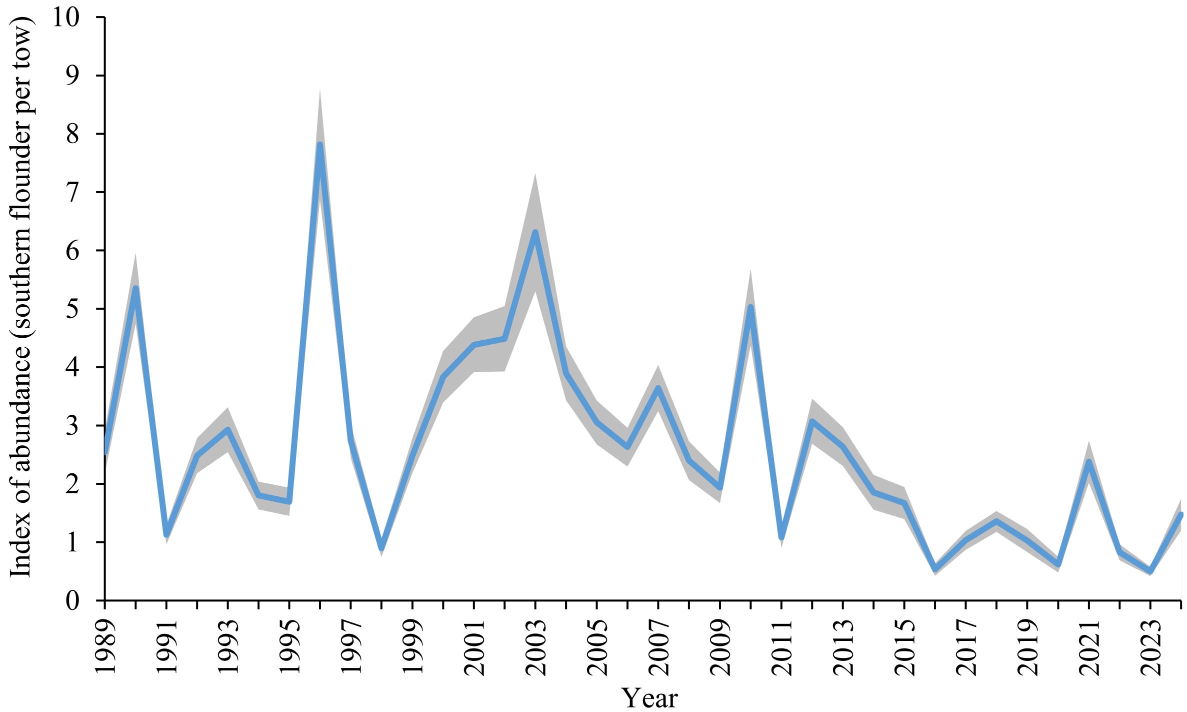

Figure 11. Annual nominal relative abundance index with standard error shaded in gray for southern flounder (juveniles and adults) caught in the North Carolina Estuarine Trawl Survey, 1989–2024. Note: 2020 sampling impacted by Executive Order (EO) 116, issued March 10, 2020.

Data collected by Program 195 were not used as a JAI in the January 2019 stock assessment but continues to provide an additional data source to monitor trends in the population. Program 195 conducts trawls using a random-stratified survey design in waters of Pamlico Sound and major river tributaries in June and September. Only data from September were used for the JAI in the 2014 stock assessment. Stations are randomly selected from strata based upon depth and geographic location. Randomly selected stations are optimally allocated among the strata based upon all previous sampling in order to provide the most accurate abundance estimates (PSE <20). Data from this survey were used to produce a southern flounder JAI from 1989 to 2024. The JAI for Program 195 peaked in 1996 and the low point was in 1998 for the time-series analyzed (1989–2024; Figure 12). However, annual relative abundance for six of the last 10 years has been above the time series average (2.28 southern flounder per tow). The JAI for 2020 and 2021 are incomplete as sampling was conducted only in a portion of the areas typically sampled due to the pandemic. The impacts to the JAI due to the changes to the sampling regime are unknown.

In order to describe the age structure of harvest and indices, southern flounder age structures are collected from various fishery independent (scientific surveys) and dependent (fisheries) sources throughout the year. In 2024, ages ranged from 0 to 6 years; ages for 2024 are still preliminary (Table 5). Growth in length is rapid for the first year of life and then slows. The relationship of length and age for southern flounder is unpredictable with much overlap in age for a given length (Figure 13).

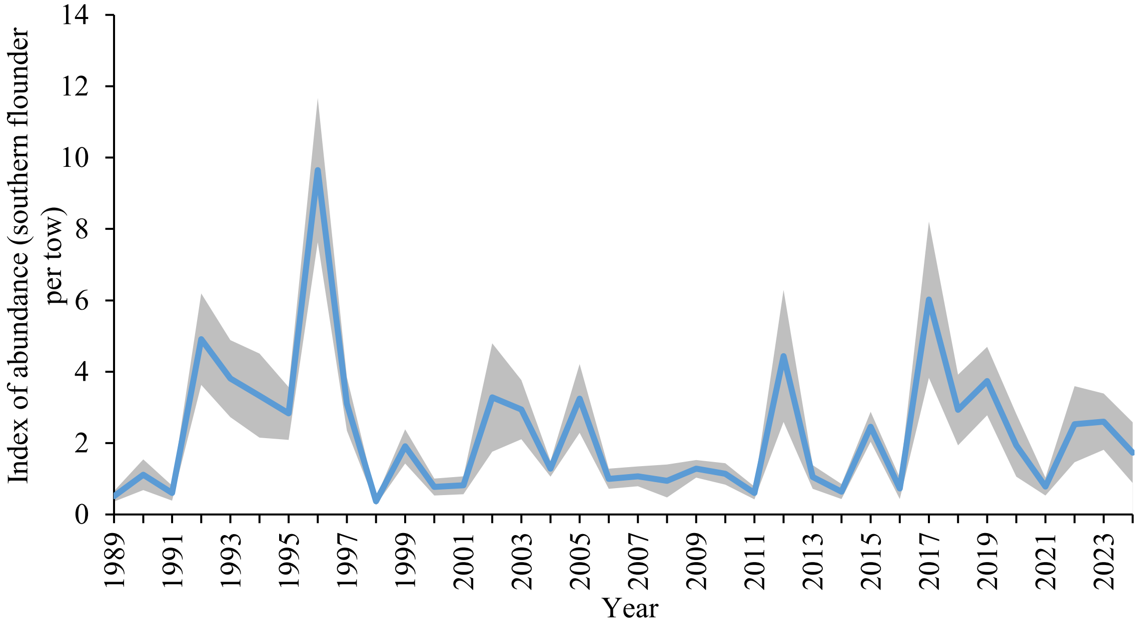

Figure 12. Annual nominal relative abundance index with standard error shaded in gray for southern flounder (juveniles and adults) caught in the North Carolina Pamlico Sound Survey, 1991–2024. Note: 2020 and 2021 sampling impacted by Executive Order (EO) 116, issued March 10, 2020.

Table 5. Summary of southern flounder age samples collected from both fishery dependent (commercial and recreational fisheries) and independent (surveys) sources from 2005–2024. Samples collected from partial carcasses were not included.

Year	Mean Age	Minimum Age	Maximum Age	Total Aged
2005	2	0	7	803
2006	2	0	6	877
2007	2	0	8	744
2008	2	0	7	1,107
2009	1	0	6	492
2010	1	0	7	1,233
2011	1	0	6	912
2012	1	0	6	1207
2013	1	0	6	972
2014	1	0	7	1,280
2015	2	0	6	834
2016	2	0	5	773
2017	1	0	7	1,178
2018	1	0	5	965
2019	1	0	6	2,119
2020	2	0	5	1,210
2021	2	0	7	1,739
2022	2	0	7	1,478
2023	1	0	7	1,364
2024*	2	0	6	886

**Preliminary ages*

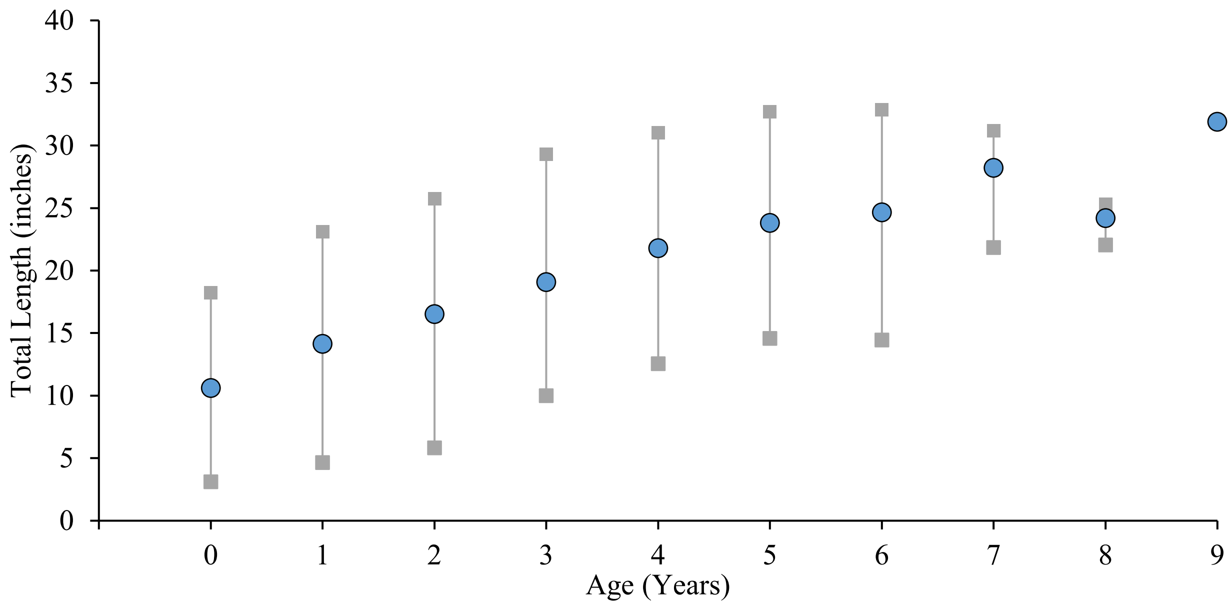

Figure 13. Southern flounder length at age based on all age samples collected in North Carolina, 1991–2023. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. Otoliths from 2024 are not included in this figure as ages are still preliminary.

Tagging Data

Since 2014, 9,219 southern flounder have been tagged (Table 6; Figure 14A). Six-hundred and thirty of these fish have been recaptured (Table 6; Figure 14B). The average time that a southern flounder is at large (time between the initial tagging event and recapture) is approximately five months or 145 days, though some fish have been at large for as long as five years. On average, southern flounder travel less than 18 miles between the initial tagging event and recapture, and most are caught in the same water body they are tagged. There have been several flounder over the last nine years that have been recaptured south of North Carolina. In 2024, 601 fish were tagged and 59 fish were recaptured. The number of days at large, as well as the distance the flounder traveled, were the lowest in the time series.

From 2014 to 2021, tagging of southern flounder was done by division staff, with the help of several universities. In 2022, a pilot program was started for southern flounder to incorporate volunteer taggers. Initial results from this program have been positive and the division plans to incorporate more volunteer taggers for southern flounder.

Table 6. Total number of southern flounder tagged and recaptured, 2014–2024. Recapture information includes average and maximum days at large and distance traveled.

Year Tagged	Total Fish Tagged (#)	Total Fish Recaptured (#)	Average Days At Large	Max Days At Large	Average Distance Traveled (miles)	Max Distance Traveled (miles)
2014	930	128	168	904	25	518
2015	730	58	179	1,753	21	238
2016	716	73	132	697	19	262
2017	1,455	47	188	1,038	17	130
2018	466	69	108	780	6	109
2019	729	33	219	1,377	20	157
2020	1,054	65	151	414	14	195
2021	1,107	54	130	755	17	155
2022	824	44	113	431	18	143
2023	607	40	93	389	21	406
2024	601	19	59	217	5	38

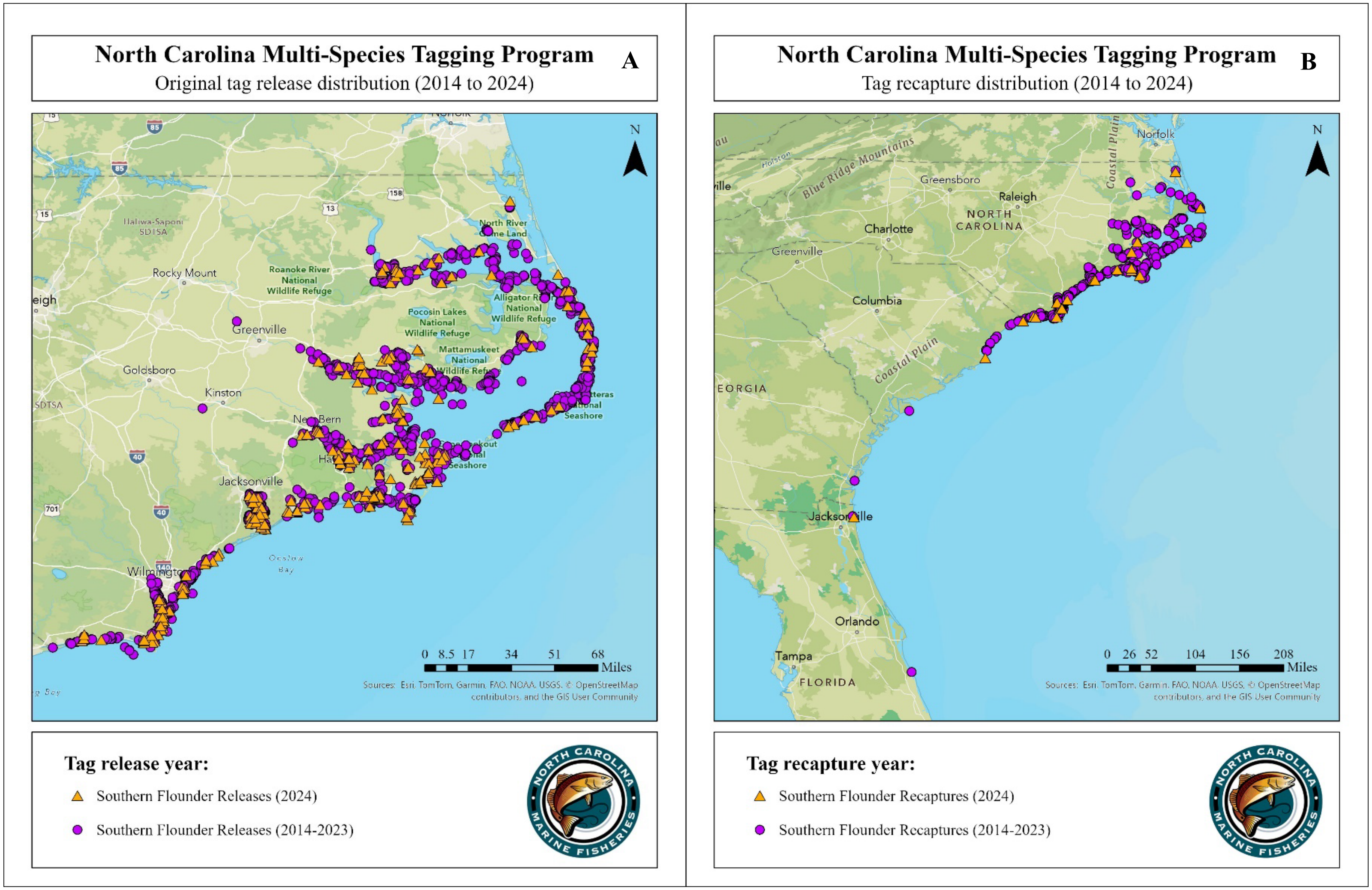

Figure 14. Release (A) and recapture (B) locations of southern flounder tagging events, 2014–2024.

RESEARCH NEEDS

The management strategies and implementation status from Amendment 3 to the N.C. Southern Flounder FMP can be found in Table 6. The following research recommendations were included in Amendment 3; status of need is provided in parentheses. Those recommendations followed by an asterisk (*) were identified as the top five high priority research recommendations and are discussed further below.

High

- Conduct studies to quantify fecundity and fecundity-size/age relationships in Atlantic southern flounder.*
- Improve estimates of the discard (B2) component (catches, lengths, and ages) for southern flounder from MRIP. — Underway*
- Expand, improve, or add fisheries-independent surveys of the ocean component of the stock.*
- Determine locations of spawning aggregations of southern flounder. — Underway*
- Complete an age validation study using known age fish.*
- Research and evaluate data on the sub-legal fish in the recreational fishery as it relates to potential future reductions in minimum size limits. — Underway

Medium

- Promote data sharing and research cooperation across the South Atlantic southern flounder range (North Carolina, South Carolina, Georgia, and Florida).
- Further research on factors that impact release mortality of southern flounder in the recreational hook-and-line fishery.
- Research on deep hooking events of different hook types and sizes on southern flounder.
- Coast-wide at-sea observations of the flounder pound net fishery.
- Develop a survey that will provide estimates of harvest and discards for the recreational gig fisheries in North Carolina, South Carolina, Georgia, and Florida.
- Develop a survey that will provide estimates of harvest and discards from gears used to capture southern flounder for personal consumption.
- Collect additional discard data (ages, species ratio, lengths, fates) from other gears (in addition to gill nets) targeting southern flounder (pound net, gigs, hook and line, trawls).
- Expand, improve, or add inshore and offshore surveys of southern flounder to develop indices for future stock assessments.
- Collect age and maturity data from the fisheries-independent Southeast Area Monitoring and Assessment Program (SEAMAP) Trawl Survey given its broad spatial scale and potential to characterize offshore fish.
- Conduct studies to better understand ocean residency of southern flounder.
- Consider the application of areas-as-fleets models in future stock assessments given the potential spatial variation (among states) in fishery selectivity and fleet behavior in the southern flounder fishery.
- Consider the application of a spatial model to account for inshore and ocean components of the stock as well as movements among states.
- Work to reconcile different state-level/regional surveys to better explain differences in trends.
- Evaluate the utility of circle hooks in the southern flounder recreational hook-and-line fishery.

- Development of alternative gears to catch southern flounder. — some research completed; more may be needed
- Study revenue variability and profitability of commercial southern flounder fishing in North Carolina based on catch characteristics.
- Generate a stated preference survey of North Carolina recreational anglers to understand perceived value of targeting southern flounder compared to other estuarine finfish species.

Low

- Develop a recreational catch per unit effort (CPUE; e.g., from MRIP intercepts or the Southeast Regional Headboat Survey if sufficient catches are available using a species guild approach to identify trips, from headboat logbooks, etc.) as a complement to the more localized fishery independent indices.
- Explore reconstructing historical catch and catch-at-length data prior to 1989 to provide more contrast in the removals data.
- Study potential species interactions among Paralichthid flounders to explain differences in population trends where they overlap.
- Explore potential impacts stocking may have on the southern flounder population and the costs associated with implementing a stocking program.
- Continued otolith microchemistry research to gain a better understanding of ocean residency of southern flounder. — Underway
- Implement fishery dependent sampling of the commercial spear fishery for flounder in the ocean.
- Determine harvest estimates and implement fishery dependent sampling of the recreational spear fishery for flounder in the ocean.
- Further research on flatfish escapement devices in crab pots that minimize undersized flounder bycatch and maximize the retention of marketable blue crabs.
- Expand tagging study to ocean component of the stock to estimate emigration, immigration, movement rates, and mortality rates throughout the stock's range.
- Develop protocol for archiving and sharing data on gonads for microscopic observation of maturity stage of southern flounder for North Carolina, South Carolina, Georgia, and Florida.
- Examine the variability of southern flounder maturity across its range and the effects this may have on the assessment model.
- Further research on the size distribution of southern flounder retained in pound nets with 5.75-Inch Square Mesh (ISM) and 6-ISM escape panels.
- Research on the species composition and size distribution of fish and crustaceans that escape pound nets through 5.75-ISM and 6-ISM escape panels.
- Develop a survey that will estimate harvest and discards from commercial gears used for recreational purposes.
- Continue at-sea observations of the large-mesh gill-net fishery including acquiring biological data on harvest and discards. — Underway
- Develop survey that better represents the for-hire industry.
- Continued gear research in the design of gill nets and pound nets to minimize protected species interactions. — some research completed; more may be needed
- Investigate the impacts of warming water temperature on the southern flounder stock.
- Develop a study that evaluates inlets and their relationship to southern flounder migration.

- Develop studies to investigate the impacts of emerging compounds on southern flounder.

Research recommendations from the January 2018 stock assessment:

- Develop a survey that will provide estimates of harvest and discards for the recreational gig fisheries in North Carolina, South Carolina, Georgia, and Florida.
- Conduct sampling of the commercial and recreational ocean spear fishery harvest and discards.
- Develop a survey that will estimate harvest and discards from commercial gears used for recreational purposes.
- Develop a survey that will provide estimates of harvest and discards from gears used to capture southern flounder for personal consumption.
- Improve estimates of the B2 component (catches, lengths, and ages) for southern flounder from the MRIP.
- Collect additional discard data (ages, species ratio, lengths, fates) from other gears (in addition to gill nets) targeting southern flounder (pound net, gigs, hook-and-line, trawls).
- Develop and implement consistent strategies for collecting age and sex samples from commercial and recreational fisheries and fisheries-independent surveys to achieve desired precision for stock assessment.
- Complete an age validation study using known age fish.
- Implement a tagging study to estimate emigration, movement rates, and mortality rates throughout the stock's range.
- Expand, improve, or add inshore and offshore surveys of southern flounder to develop indices for future stock assessments.
- Expand, improve, or add fisheries-independent surveys of the ocean component of the stock.
- Collect age and maturity data from the fisheries-independent SEAMAP Trawl Survey given its broad spatial scale and potential to characterize offshore fish.
- Conduct studies to better understand ocean residency of southern flounder.
- Determine locations of spawning aggregations of southern flounder.
- Develop protocol for archiving and sharing data on gonads for microscopic observation of maturity stage of southern flounder for North Carolina, South Carolina, Georgia, and Florida.
- Examine the variability of southern flounder maturity across its range and the effects this may have on the assessment model.
- Investigate how environmental factors (wind, salinity, temperatures, or oscillations) may be driving the stock-recruitment dynamics for southern flounder.
- Promote data sharing and research cooperation across the South Atlantic southern flounder range (North Carolina, South Carolina, Georgia, and Florida).
- Consider the application of areas-as-fleets models in future stock assessments given the potential spatial variation (among states) in fishery selectivity and fleet behavior in the southern flounder fishery.
- Consider the application of a spatial model to account for inshore and ocean components of the stock as well as movements among states.

The peer review panel concluded that the working group's research recommendations were appropriate and endorsed all of them. In addition to identifying some research needs as high priority, the peer review panel offered the following additional research recommendations:

- Conduct studies to quantify fecundity and fecundity-size/age relationships in Atlantic southern flounder.
- Work to reconcile different state-level/regional surveys to better explain differences in trends.
- Develop a recreational CPUE (e.g., from MRIP intercepts or the Southeast Regional Headboat Survey if sufficient catches are available using a species guild approach to identify trips, from headboat logbooks, etc.) as a complement to the more localized fishery independent indices.
- Explore reconstructing historical catch and catch-at-length data prior to 1989 to provide more contrast in the removals data.
- Study potential species interactions among Paralichthid flounders to explain differences in population trends where they overlap.

MANAGEMENT

Amendment 3 was adopted by the MFC in May 2022. This Amendment includes more comprehensive management strategies which will be implemented via proclamation throughout 2022 (Table 7).

In concurrence with the incorporated actions from Amendment 1, Supplement A to Amendment 1 as modified by the August 17, 2017, settlement agreement, and Amendment 2, sustainable harvest was implemented in Amendment 3 to maintain 72% reductions in fishing mortality (F=0.18) in the commercial and recreational fisheries to a level that ends overfishing within two years and allows the SSB to increase between the threshold and the target within 10 years of adoption of Amendment 2.

To meet the reduction in fishing mortality, quotas with accountability measures were established for the commercial and recreational sectors for the first time in the North Carolina Southern Flounder Fishery as well as a reduction in the recreational bag limit from four fish per person per day to one fish per person per day and the elimination of RCGL holders from harvesting southern flounder (Table 7). These reductions in total removals allow for increased escapement of spawning stock and expansion of the age structure to continue rebuilding of the stock.

Table 7. Management action taken as a result of Amendment 3 to the N.C. Southern Flounder FMP.

MANAGEMENT STRATEGY	OUTCOME
Management measures limiting the number of fishing days per week and the amount of yardage allowed for large mesh gill nets in various areas of the state	Implemented through proclamation (refer to Amendment 1)
A minimum distance (area dependent) between gill net and pound net sets, per NCMFC Rule 15A NCAC 03J .0103 (d)	Implemented through proclamation (refer to Amendment 1)
A recreational minimum size limit of 15 inches TL	Implemented through proclamation (Refer to Amendment 1)
Increase minimum mesh size to harvest southern flounder to 6.0-inch stretched mesh	Implemented through Proclamation (Refer to Supplement A to Amendment 1)
Increase minimum size limit for commercial fisheries to 15 inches	Implemented through Proclamation (Refer to Supplement A to Amendment 1)
Increase minimum mesh size for escape panels to 5.75-inch stretched mesh	Implemented through Proclamation (Refer to Supplement A to Amendment 1)

MANAGEMENT STRATEGY	OUTCOME
Removal of all commercial gears targeting southern flounder from the water (e.g., commercial and RCGL anchored large mesh gill nets and gigs) or make them inoperable (flounder pound nets) in areas and during times outside of the seasons implemented. Exceptions will be allowed for commercial large mesh gill net fisheries that target American and hickory shad and catfish species if these fisheries are only allowed to operate during times of the year and locations where bycatch of southern flounder is unlikely	Implemented through Proclamation (Refer to Amendment 2)
Making it unlawful to possess flounder in internal and ocean waters during the closed recreational season.	Implemented through Proclamation (Refer to Amendment 2)
Making it unlawful to possess flounder harvested from the internal waters of the state during the closed commercial season	Implemented through Proclamation (Refer to Amendment 2)
Making it unlawful to use any method of retrieving live flounder from pound nets that cause injury to released fish (no picks, gigs, spears, etc.)	Implemented through Proclamation (Refer to Amendment 2)
Reduce commercial anchored large-mesh gill net soak times to single overnight soaks where nets may be set no sooner than one hour before sunset and must be retrieved no later than one hour after sunrise the next morning in the Neuse, Tar/Pamlico rivers and the Albemarle Sound areas that have previously been exempt	Implemented through Proclamation (Refer to Amendment 2)
Reduce the maximum yardage allowed in the commercial anchored large-mesh gill net fishery by 25% for each Management Unit; allowing a maximum of 1,500-yards in Management Units A, B, and C, and a maximum of 750-yards in Management Units D and E unless more restrictive yardage is specified through adaptive management through the sea turtle or sturgeon Incidental Take Permits (ITP).	Implemented through Proclamation (Refer to Amendment 2)
Reduce daily bag limit for recreational harvest of southern flounder to 1 flounder per person per day	Implemented through Proclamation (Amendment 3)
Implement quota for the commercial mobile gear and pound net fisheries and define management areas	Implemented through Proclamation (Refer to Amendment 3)
Implement recreational (hook and line, gig) seasons to constrain them to an annual quota	Implemented through Proclamation (Refer to Amendment 3)
Eliminate harvest of southern flounder through the use of a Recreational Commercial Gear License	Implemented through Proclamation (Refer to Amendment 3)
Implement trip limits for gigs and pound nets only to maximize reopening only after reaching division closure threshold	Implemented through proclamation (Refer to Amendment 3)
Implement a one-fish ocellated bag limit during March 1 through April 15 in ocean waters only using hook-and-ling gear	Implemented through proclamation (Refer to Amendment 3)

MANAGEMENT STRATEGY	OUTCOME
Adopt the adaptive management framework based on the peer-reviewed and approved stock assessment	Implemented through proclamation (Refer to Amendment 3)
The MFC approved a motion to set the allocation for Amendment 3 at 70% commercial and 30% recreational at the February 26, 2021, business meeting	Implemented through proclamation (Refer to Amendment 3)
Continue to allow anchored large-mesh gill nets to harvest southern flounder in the North Carolina southern flounder fishery	Implemented through proclamation (Refer to Amendment 3)

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

At its May 2022 business meeting the MFC adopted Amendment 3 to the N.C. Southern Flounder FMP. Actions approved through this plan were implemented through proclamation in 2022.

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FISHERY MANAGEMENT PLAN UPDATE
SPOTTED SEATROUT
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	February 2012	
Amendments:	Amendment 1	March 2025
Revisions:	None	
Supplements:	Supplement A	February 2014
Information Updates:	None	
Schedule Changes:	None	
Comprehensive Review:	July 2030	

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 Amendment 1 to the North Carolina Spotted Seatrout FMP (NCDMF 2025) and the North Carolina FMP for Interjurisdictional Fisheries (NCDMF 2022). The MFC adopted Amendment 1 at its March 2025 business meeting with management to begin in 2025. However, the spotted seatrout fishery was managed under Supplement A to the Spotted Seatrout Fishery Management Plan for all of 2024 (NCDMF 2014). At its February 2014 business meeting, the MFC voted to adopt Supplement A and 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).

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) completed Amendment 1 to the state FMP for spotted seatrout in 2024 and the MFC adopted Amendment 1 in March of 2025 with management to reduce overall spotted seatrout harvest by approximately 27%, end overfishing, and ensure sustainable harvest.

Management Unit

The management unit for Amendment 1 to the North Carolina Spotted Seatrout FMP (NCDMF 2025) includes all spotted seatrout within the Coastal and Joint Fishing 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 Amendment 1 to the North Carolina Spotted Seatrout FMP (NCDMF 2025) is to manage the spotted seatrout fishery to maintain a self-sustaining population that provides sustainable harvest based on science-based decision-making processes. The following objectives will be used to achieve this goal:

- Implement management strategies within North Carolina that end overfishing and maintain the spotted seatrout spawning stock abundance and recruitment potential.
- Promote restoration, enhancement, and protection of critical habitat and environmental quality in a manner consistent with the Coastal Habitat Protection Plan, to maintain or increase growth, survival, and reproduction of the spotted seatrout stock.
- Monitor and manage the fishery in a manner that utilizes biological, socioeconomic, fishery, habitat, and environmental data.
- Promote outreach and interjurisdictional cooperation regarding the status and management of the spotted seatrout stock in North Carolina and Virginia waters, including practices that minimize bycatch and discard mortality.

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).

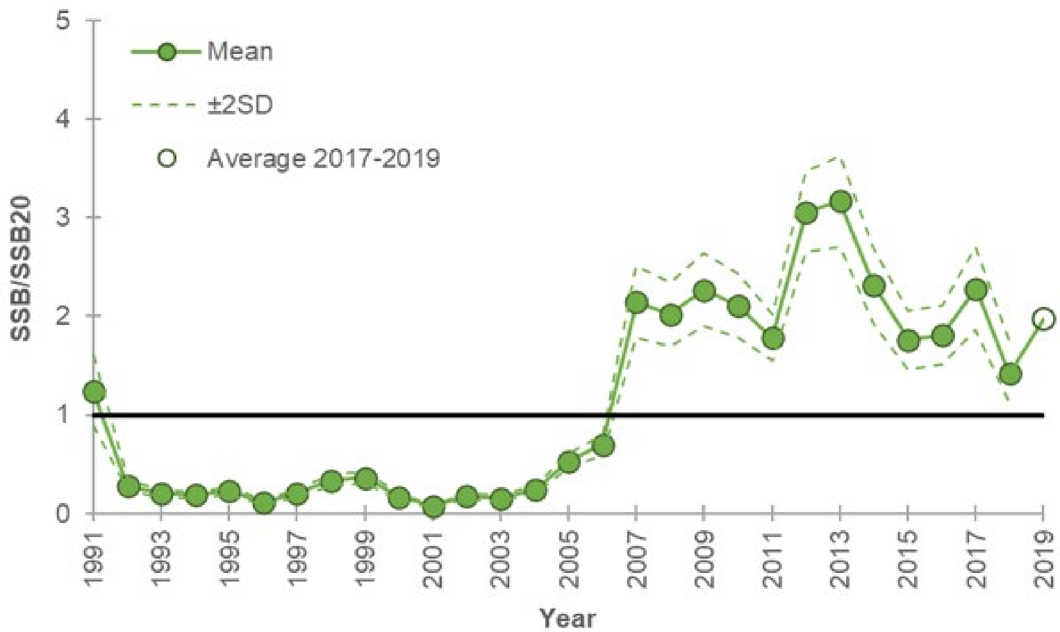

Figure 1. Annual predicted spawning stock biomass (metric tons), relative to the spawning stock biomass threshold reference point ($SSB/SSB_{20\%}$), 1991–2019. 2019 is the terminal year for the most recent spotted seatrout stock assessment (NCDMF 2022). The horizontal black line shows a ratio of one 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.

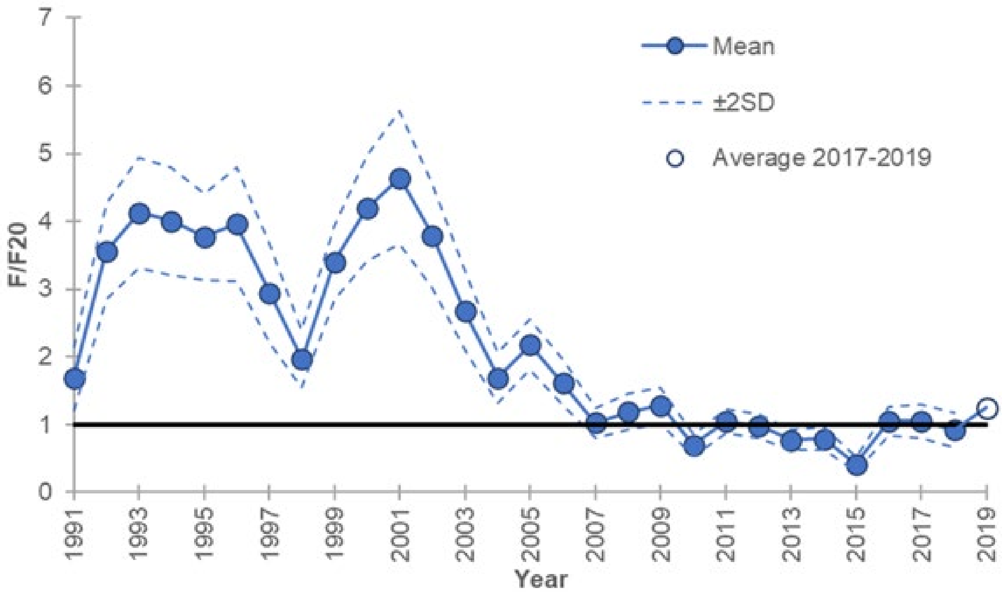

Figure 2. Annual predicted fishing mortality rates relative to the fishing mortality threshold reference point ($F/F_{20\%}$), 1991–2019. 2019 is the terminal year for the most recent spotted seatrout stock assessment (NCDMF 2022). The horizonal, black line shows a ratio of one where $F = F_{20\%}$. 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

In 2024, DMF managed spotted seatrout through a combination of recreational bag limits, commercial trip limits, and a 14-inch minimum size limit for both sectors. Recreational harvest was allowed seven days per week with a daily bag limit of four fish. Commercial harvest was allowed seven days a week in coastal waters with a daily trip limit of 75 fish. It was 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 had 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.

Amendment 1 was adopted by the MFC at their March 2025 business meeting and management consistent with Amendment 1 will be implemented in 2025. Recreational management includes a bag limit of three fish, a 14- to 20-inch slot limit with an allowance for one fish over 26-inches, and harvest allowed seven days a week. Commercial management includes a 14-inch minimum size limit, a trip limit of 75 fish, a Saturday to Sunday commercial harvest closure from January through September, and a Saturday through Monday commercial harvest closure October through December. Additionally, the DMF Director's authority to close the fishery by proclamation in the event of a serve cold stun was extended through June 30. The MFC also adopted an adaptive management framework to allow for flexible management between FMP updates and a cold stun adaptive management framework for additional, temporary management in the event of an especially severe cold stun.

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 2025 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 2024 (602,677 pounds) increased by about 38% compared to the previous year (437,310 pounds; Table 1; Figure 3) Commercial spotted seatrout landings vary annually but have remained high compared to other years in the current management period (2012–2024) since landings increased sharply in biological year 2019. Commercial landings in biological year 2024 are similar to landings in biological years 2021 and 2020 which 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. 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), recreational 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 1991–2024. 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 2024 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	1,852,135	11,462,872	3,463,284	520,950	3,984,234
2023	952,547	3,686,253	1,835,950	437,310	2,273,260
2024	1,273,509	5,368,175	2,418,680	602,677	3,021,357
Mean	1,027,660	3,593,008	1,669,091	342,596	2,011,687

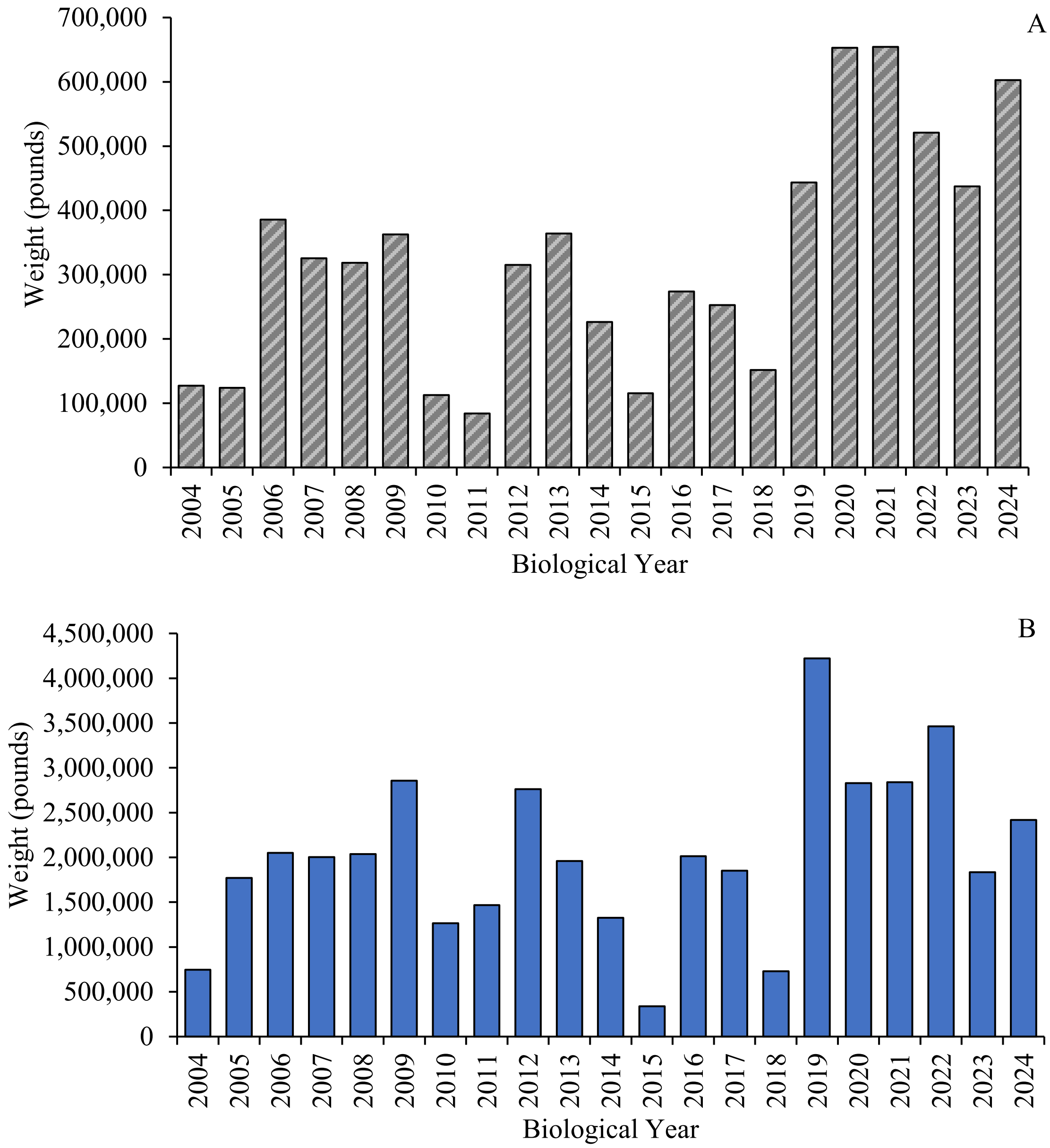

Figure 3. Commercial landings (pounds) reported through the North Carolina Trip Ticket Program (A) and recreational landings (Type A + B1; pounds) estimated from the Marine Recreational Information Program survey (B) for North Carolina, Biological Year 1991–2024. Biological Year is from March through 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 2024 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 2024 was 1,273,509 fish corresponding to 2,418,680 pounds representing an increase from biological year 2023 (Table 1; Figure 3). The DMF Director issued Proclamation FF-15-2025 on January 22, 2025 to close harvest of spotted seatrout due to a severe cold stun which likely resulted in much lower recreational harvest in 2024 than would have been expected. Prior to the cold stun closure, recreational harvest in pounds was on pace to be the highest in the timeseries. Despite lower than expected harvest, biological year 2024 represents the sixth highest year of recreational harvest in pounds in the timeseries with five of the six highest years occurring since 2019 (2019–2022 and 2024; Table 1). Estimated recreational releases in biological year 2024 (5,368,175 Table 1) were well above releases in 2023 and more similar to releases in recent years (Table 1).

The North Carolina Saltwater Fishing Tournament (the 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 annually throughout the time series with a generally increasing trend since 2012, averaging 421 citations (Figure 4). Calendar year 2024 (1,240 citations) represents the sixth year in a row of increased citations and the third year in a row of a new record number of citations. In 2008, the Tournament began awarding release citations for spotted seatrout over 24-inches that are released. The number of release citations awarded has generally increased since release citations began in 2008. Release citations in calendar year 2024 (736 release citations) were the highest number awarded since release citations began in 2008 and represent the sixth year in a row of a new release citation high. The percent of spotted seatrout release citations compared to total citations awarded for spotted seatrout (59%) was the time-series high, represents the third year in a row of a time-series high for release citations, and the first year of more release citations than harvest citations in the Tournament (Figure 4).

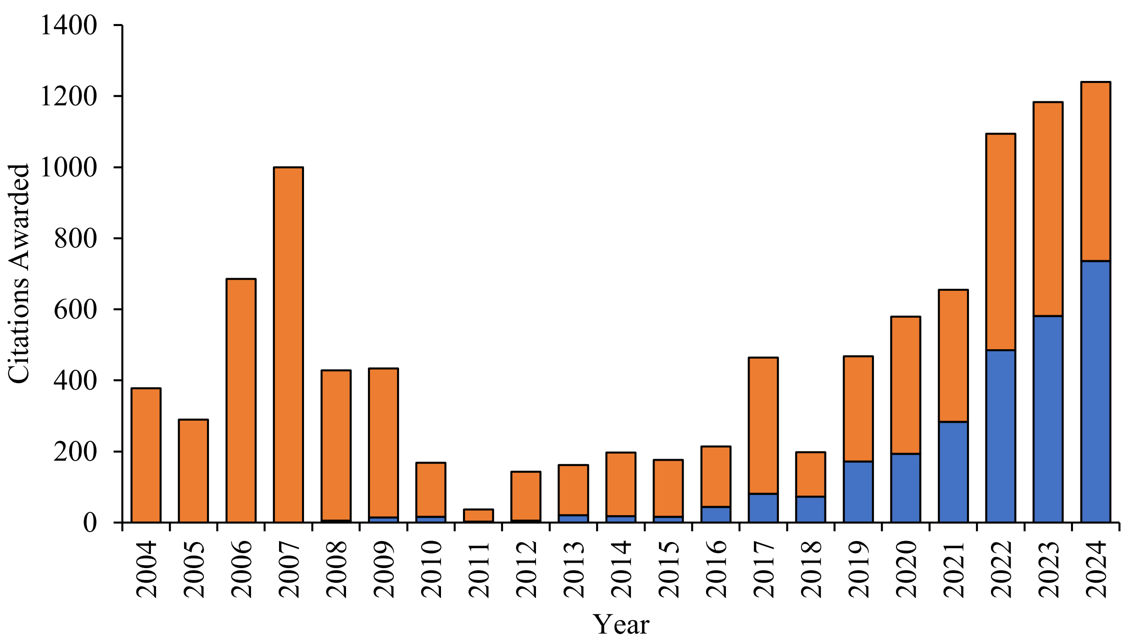

Figure 4. North Carolina Saltwater Fishing Tournament harvest citations (orange portion of bar) and release citations (blue portion of bar) awarded for spotted seatrout, calendar years 2004–2024. Citations are awarded for spotted seatrout >24-inches total length for release or >5 pounds landed. Release 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 (Table 3; Figure 5). Undersized fish represent a small portion of the harvest in both sectors; 0.6% of commercial harvest and 1.4% of recreational harvest was below the 14-inch size limit in 2024 (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	1465	15.1	4.9	31.9	745
1992	16.0	8.4	27.9	2468	15.6	5.1	24.2	543
1993	16.3	8.5	29.7	2264	15.7	9.3	25.0	485
1994	15.6	7.0	29.1	1442	16.0	10.6	24.0	1,076
1995	17.1	8.5	29.1	2944	15.6	8.5	31.6	853
1996	16.0	7.0	27.6	1159	14.6	8.9	24.3	307
1997	14.9	8.1	29.9	4268	15.3	8.9	23.1	622
1998	14.5	8.0	29.9	4696	16.4	11.0	36.5	551
1999	15.6	7.6	30.2	6152	16.4	11.6	26.8	699
2000	17.5	6.0	30.7	2899	15.6	11.3	25.2	330
2001	16.3	7.6	30.7	1548	14.8	11.5	26.0	326
2002	16.1	8.0	28.9	3822	14.9	11.8	24.8	283
2003	17.2	9.5	29.6	2205	14.6	9.9	25.0	130
2004	16.6	9.0	27.9	2557	15.3	8.9	22.5	294
2005	16.8	8.5	27.5	2283	14.2	8.7	25.2	664
2006	16.3	8.9	29.3	6155	15.5	10.1	25.9	706
2007	17.3	9.6	31.0	8315	15.9	10.8	27.7	521
2008	17.0	7.3	30.3	5645	15.6	11.5	26.5	790
2009	16.7	5.4	29.5	6268	16.0	9.1	26.0	779
2010	17.5	11.4	30.9	3730	17.5	12.4	24.8	336
2011	16.6	8.8	27.8	1085	17.0	12.3	24.2	638
2012	16.5	7.4	31.1	4268	16.5	13.0	24.1	939
2013	16.7	8.7	28.5	4736	16.8	10.1	23.5	865
2014	17.3	5.5	28.3	2877	17.6	13.1	26.0	381
2015	18.3	8.9	30.9	1824	16.9	12.8	25.0	154
2016	17.3	9.4	31.7	2623	16.8	13.0	25.2	647
2017	17.6	7.6	32.9	2289	17.0	11.6	25.8	864
2018	17.2	10.5	28.0	805	15.7	9.3	23.3	274
2019	17.3	10.1	28.9	2587	16.7	10.7	24.6	1,574
2020	17.5	10.9	33.4	2861	17.0	12.1	26.8	1,119
2021	17.5	10.9	29.9	3432	17.0	11.1	26.5	1,019
2022	17.9	13.2	28.3	3316	17.4	12.6	28.0	632
2023	17.4	8.7	27.9	2586	17.3	12.6	25.9	516
2024	18.1	10.8	29.4	2790	17.1	12.0	26.5	575

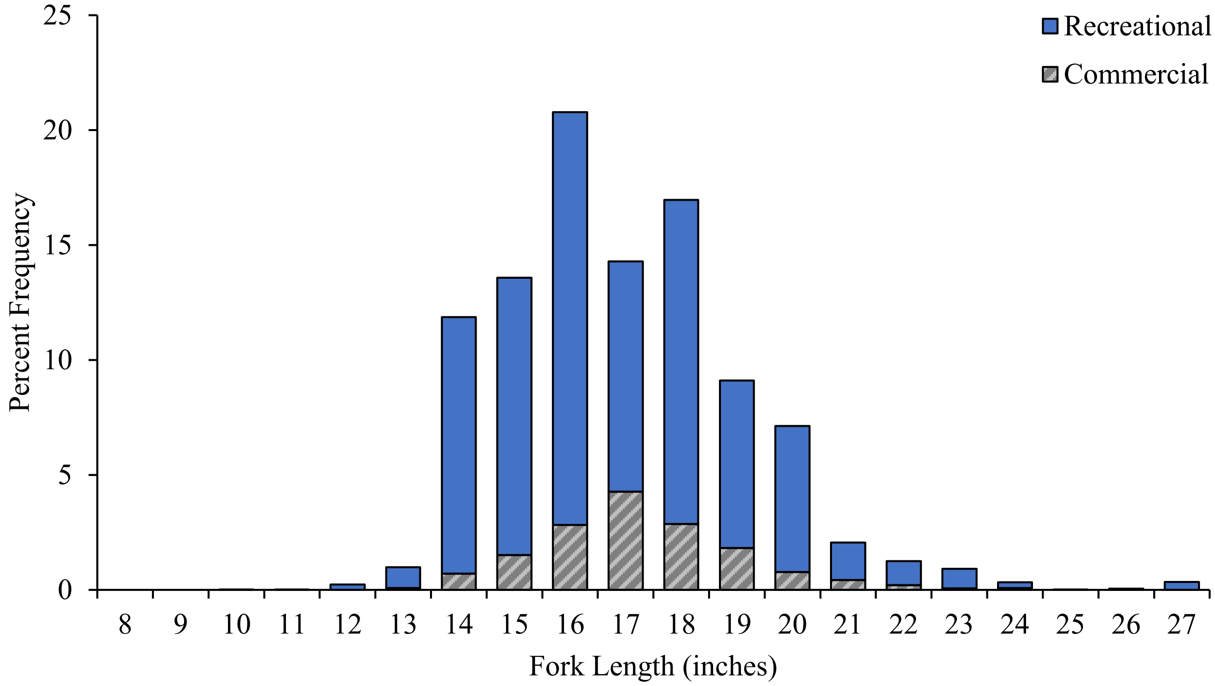

Figure 5. Commercial and recreational length frequency distribution from spotted seatrout harvested in biological year 2024.

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 2024 (18.1 inches fork length) was higher than the mean length in the current management period (2012–2024, 17.4 inches fork length) and the mean length in 2023 (17.4 inches fork length). Minimum length (10.8 inches fork length) was higher than the minimum length in 2022 and more in line with the current management period (8.7 inches fork length; Table 3; Figure 6). Maximum length in 2024 increased to 29.4 inches fork length and was similar to the current management period average (~29 inches fork length). Most spotted seatrout landings by the commercial fishery in 2024 came from the run around and anchored gill net fisheries (63% and 30% respectively) with pound nets (2%), and all other gears (5%; mainly beach seines, swipe nets, and haul seines) accounting for the rest.

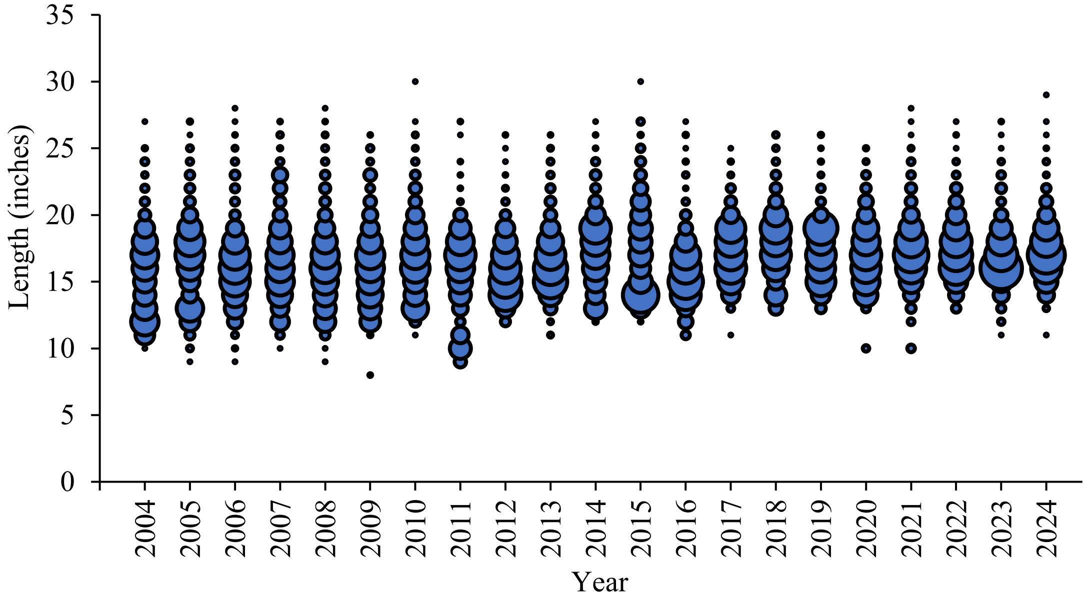

Figure 6. Commercial length frequency (fork length, inches) of spotted seatrout harvested biological year 2004–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Recreational catch is almost exclusively hook-and-line. The mean length (17.1 inches fork length), minimum length (12.0 inches fork length), and maximum length (26.5 inches fork length) from the recreational fishery in 2024 were all similar to the previous four years (Table 3). About ninety-four percent of the spotted seatrout sampled from the recreational fishery in 2022 were between 14 and 20 inches (Figure 5 and Figure 7).

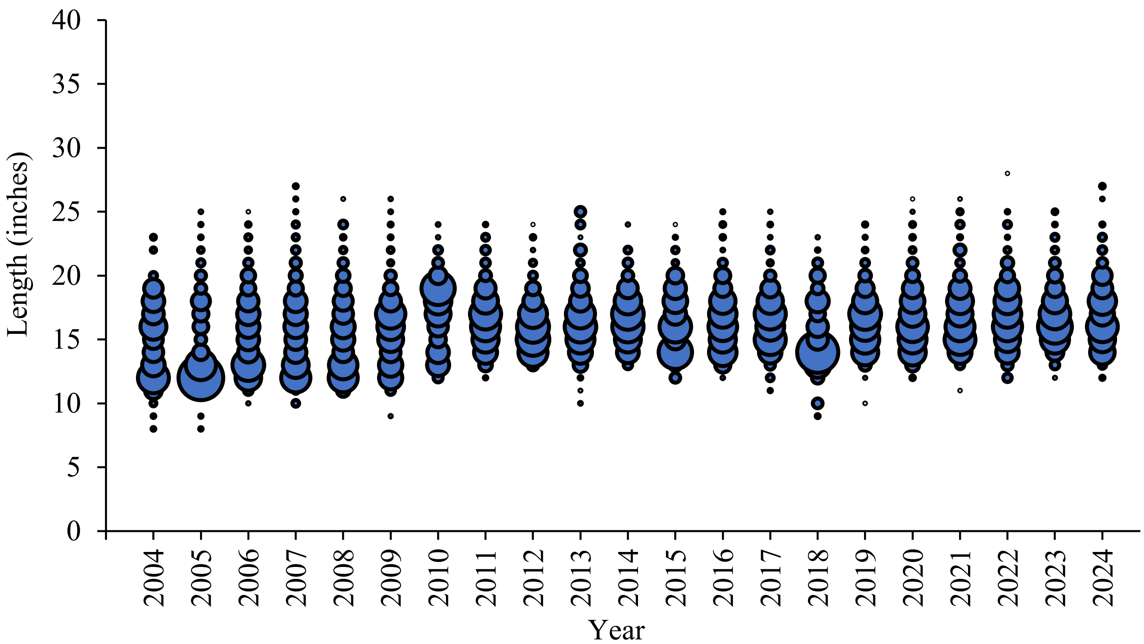

Figure 7. Recreational length frequency (fork length, inches) of spotted seatrout harvested biological year 2004–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

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 2024 was 2.56 spotted seatrout per tow, which was an increase from the 2023 value (1.04 spotted seatrout per tow) and was greater than the time series mean (1.90 spotted seatrout per tow).

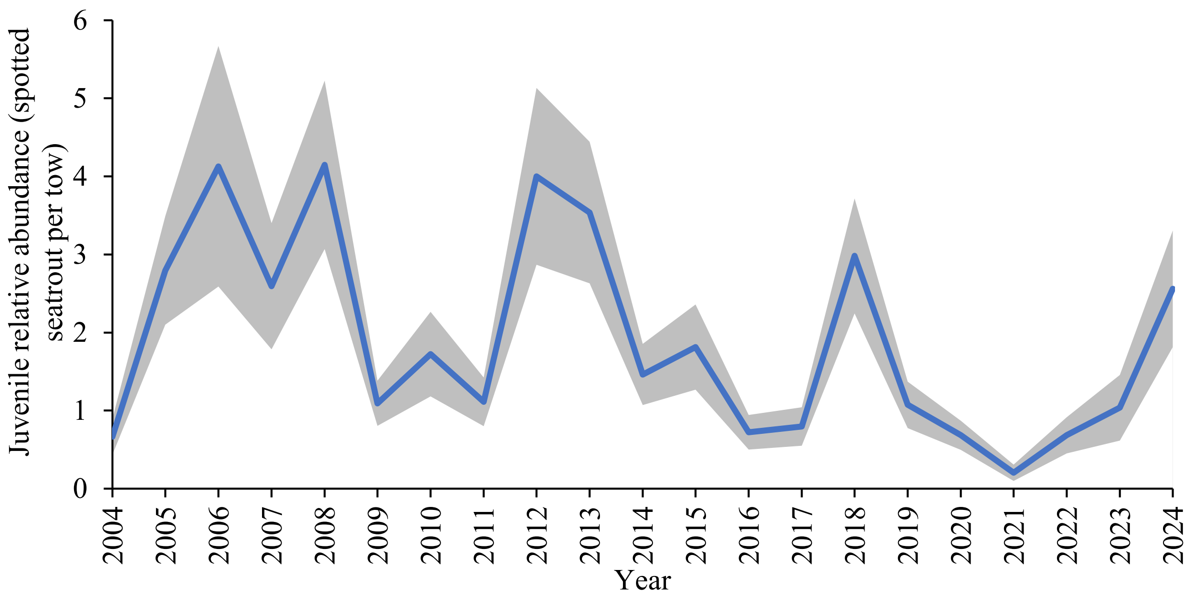

Figure 8. Relative abundance index (fish per tow) from the North Carolina Estuarine Trawl Survey (Program 120) during June and July, 2004–2023. Error bars represent ± 1 standard error.

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 stock 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 (1.00 spotted seatrout per set) with a large spike in relative abundance in 2019 (2.10 spotted seatrout per set). Fall relative abundance in 2024 was the highest in the time series (2.20 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 2024 (1.33 spotted seatrout per set) was the second highest relative abundance in time series and remained well above the mean relative abundance value in the time series (0.62 spotted seatrout per set).

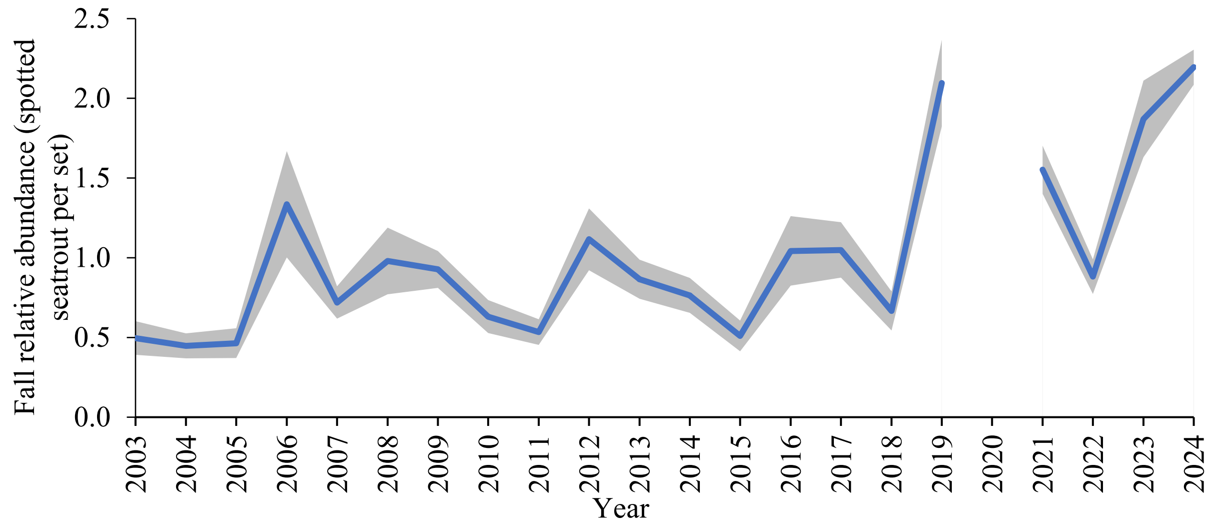

Figure 9. Fall relative abundance index (fish per set) of spotted seatrout collected from Program 915 in Pamlico Sound, Pamlico River, Pungo River, and Neuse River during September, October, and November 2003–2024. Error bars represent ± 1 standard error. Sampling not conducted in 2020 for the Fall Index.

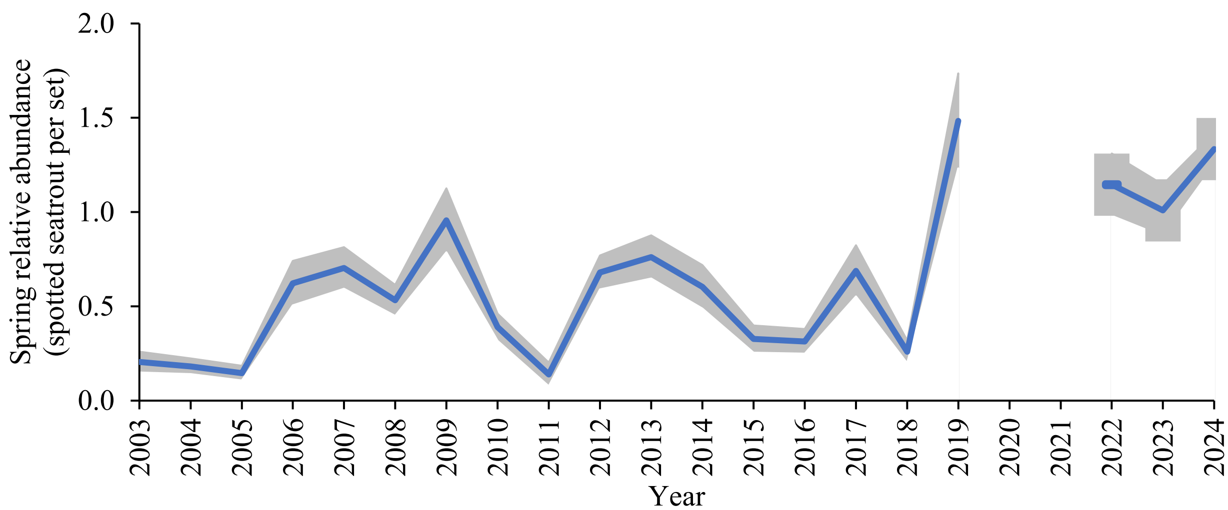

Figure 10. Spring relative abundance index (fish per set) of spotted seatrout collected from Program 915 in Pamlico Sound, Pamlico River, Pungo River, and Neuse River during April, May, and June 2003–2024. Error bars represent ± 1 standard error. *Sampling not conducted in 2020 or April, May, and June of 2021.

Spotted seatrout age samples are collected from numerous DMF fishery independent and dependent sources. To date, a total of 23,873 otoliths from spotted seatrout have been aged since 1991 (Table 4). Except for 2003, the minimum age of sampled spotted seatrout has been age zero for every year DMF has recorded this information. Maximum ages have varied every year, ranging from age five to age nine. Modal ages give 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 (1991–2024; 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 2024, the number of fish aged (1,352 fish) increased from the previous year (1,045 fish). Spotted seatrout sampled in 2024 had a modal age of 2 and maximum age of 7.

Table 4. Modal age, minimum age, maximum age, and number aged for spotted seatrout collected through DMF sampling programs, calendar years 1991–2024.

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
2024	2	0	7	1,352

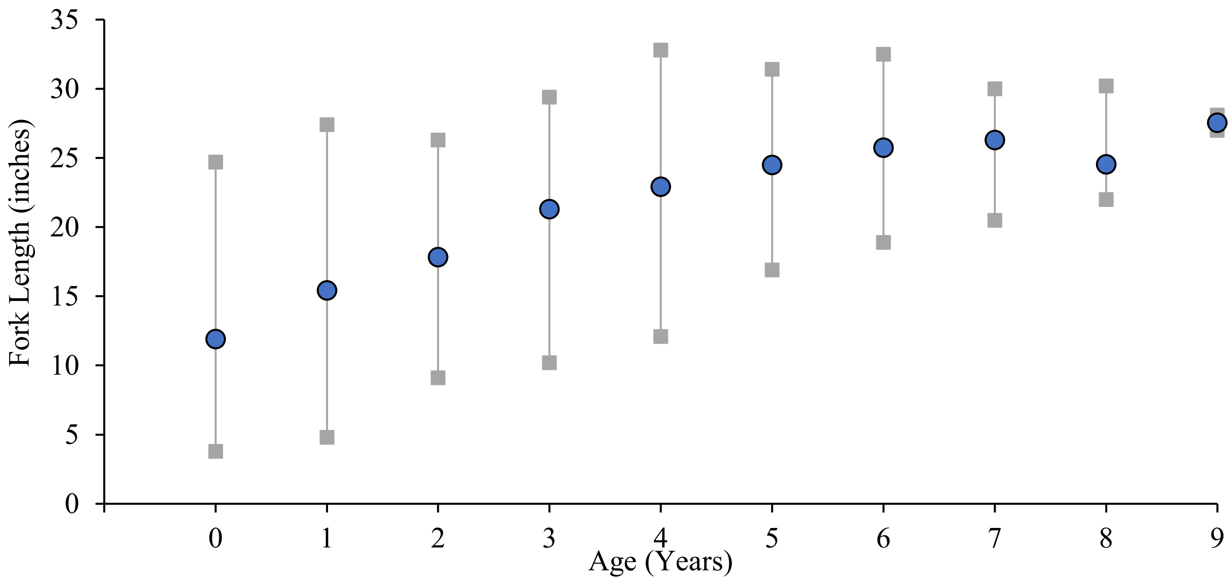

Figure 11. Spotted seatrout length at age based on all age samples collected from calendar year 1991 to 2024. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.

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 14,171 spotted seatrout with 910 recaptures reported (Table 5). In 2024 specifically, Division staff and volunteers tagged 1,003 (Figure 12A) spotted seatrout with 32 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	37	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	59	202
2019	2619	257	169	1091	36	223
2020	1389	104	156	884	37	298
2021	518	35	144	777	32	151
2022	821	50	148	774	32	117
2023	789	53	89	515	32	231
2024	1003	32	78	508	22	249

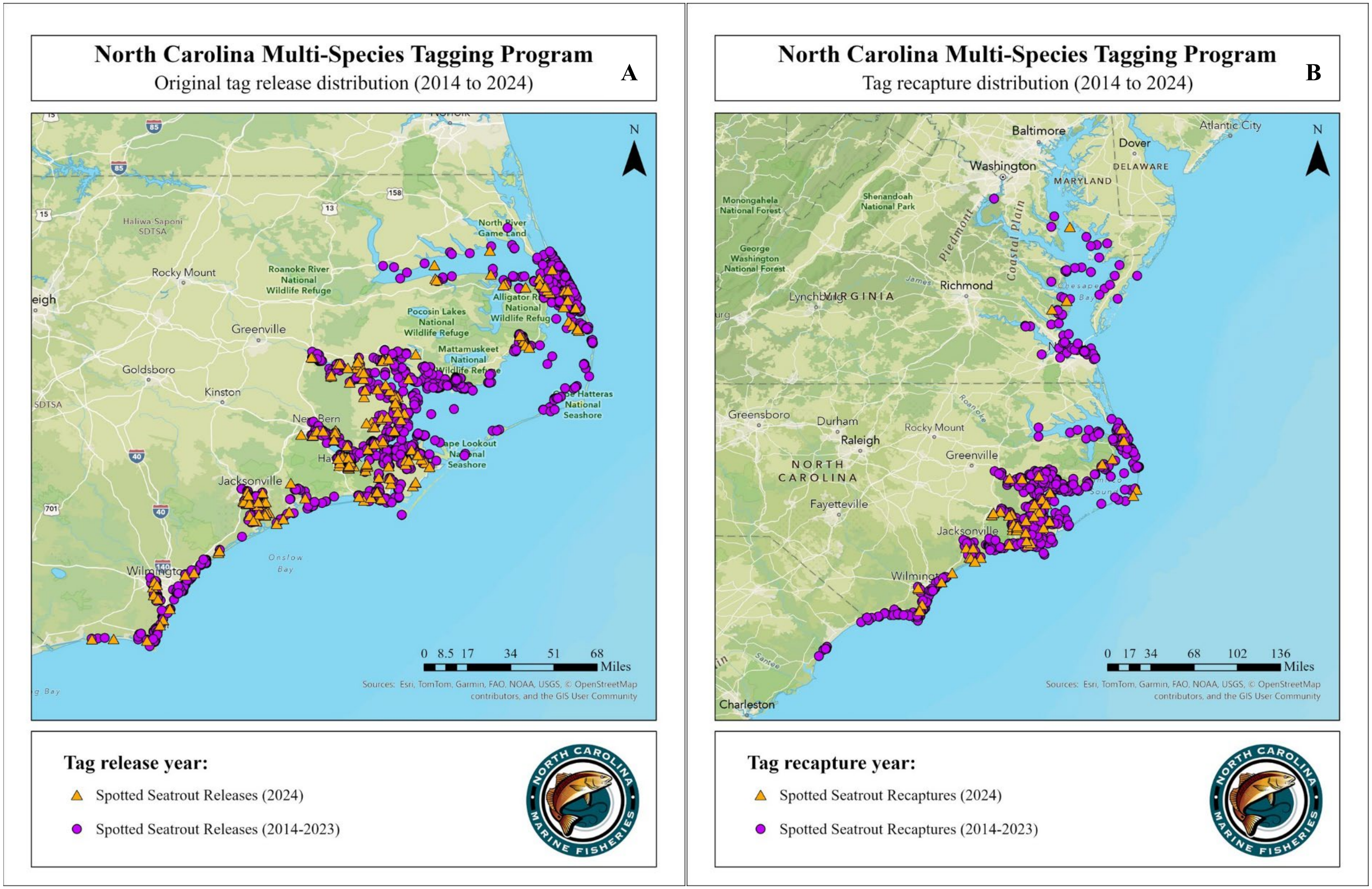

Figure 12. Spotted seatrout release (A) and recapture (B) locations for spotted seatrout tagged in the DMF Multi-Species Tagging Program from calendar year 2014–2024.

RESEARCH NEEDS

The following research needs were compiled from the original Spotted Seatrout FMP, the 2022 North Carolina Spotted Seatrout Stock Assessment Report, and 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; exploratory seine sampling started in 2024 and will continue in 2025
- 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. — Completed in Ellis et al. 2017a, 2017b, CRFL project 2F40-F024
- 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, 2025; 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 reduce fishing mortality (F) and increase the likelihood of sustainability (see Table 6 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 through June 30. 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 2025 Amendment 1 to the N.C. Spotted Seatrout FMP.

Management Strategy	Implementation Status
Recreational management: 19.9%–39.9% reduction in harvest needed, 14-inch to 20-inch recreational slot limit with allowance for one fish >26-inches, 3-fish bag limit	Accomplished; Proclamation authority
Commercial management: 19.9%–39.9% reduction in harvest needed, harvest closed Sat–Sun Jan–Sep and Sat–Mon Oct–Dec, 75-fish trip limit and 14-inch minimum size limit maintained	Accomplished; Proclamation authority

Management Strategy	Implementation Status
Adopt an adaptive management framework to allow for management adjustments between FMP updates to ensure sustainable harvest	Accomplished
Cold Stun Management: Extend season closure in event of severe cold stun through June 30, adopt an adaptive management framework to allow for additional management measures to speed stock recover in event of especially severe cold stun	Accomplished

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

A comprehensive review of the plan was completed in March 2025. A benchmark stock assessment was completed October 2022, incorporating data through February 2020.

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FISHERY MANAGEMENT PLAN UPDATE
STRIPED MULLET
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	April 2006	
Amendments:	Amendment 1	November 2015
	Amendment 2	May 2024
Revisions:	None	
Supplements:	Supplement A	May 2023
Information Updates:	None	
Schedule Changes:	None	
Comprehensive Review:	2029	

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 (DMF) would determine whether the decrease in landings is attributed to stock decline, decreased fishing effort, or both. If annual landings exceed the maximum trigger, DMF 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. As required by the FMP, the DMF initiated data analysis in July 2017 to determine whether the decrease was attributed to a stock decline, decreased fishing effort, or both. The DMF presented preliminary findings and recommendations to the North Carolina Marine Fisheries Commission (MFC) during its November 2017 business meeting. It was determined by the DMF that no management actions were necessary at that time, but a more comprehensive analysis with data through 2017 was needed.

The DMF presented results of their comprehensive analysis at the February 2018 MFC business meeting and concluded the stock had likely declined since completion of the 2013 stock assessment, which had a terminal year of 2011. The DMF recommended updating the 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 peer reviewed model 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 DMF and presented to the Finfish, Southern, and Northern advisory committees in July 2018 to receive input prior to finalizing the DMF recommendation. Recommendations were then presented to the MFC at its August 2018 business meeting. The DMF and the advisory committees recommended no management action be taken since the stock assessment update indicated overfishing was not occurring. The DMF would, however, continue to monitor trends in the commercial fishery and fishery-independent indices. The recommendation was approved by the MFC.

The 2022 North Carolina striped mullet stock assessment indicated the North Carolina striped mullet stock is overfished and overfishing is occurring in the terminal year of 2019 (NCDMF 2022). In response to stock assessment results, the MFC adopted Supplement A to Amendment 1 to the Striped Mullet FMP in May 2023 to end overfishing (NCDMF 2023). Supplement A established season closures for the striped mullet commercial and recreational fisheries that occurred from November 7 through December 31, 2023, north of the Highway 58 Bridge and from November 10 through December 31, 2023, south of the Highway 58 Bridge. Supplement A management remained in place until adoption of Amendment 2 to the Striped Mullet FMP in May 2024. With the adoption of Supplement A, the commercial landings triggers established by Amendment 1 were no longer used to monitor the stock.

Amendment 2 to the Striped Mullet FMP was adopted in May 2024. The plan implemented day of week closures projected to achieve a 34.9% reduction in commercial harvest relative to 2019 landings, to end overfishing and achieve sustainable harvest within 10 years. Commercial harvest is closed Saturday and Sunday for January through September, and Saturday through Monday for October through December. The plan also implemented a 100-fish recreational individual bag limit, a 400-fish recreational vessel limit, and provided an exception for For-Hire Operations to possess a bag limit for the number of anglers fishing up to the 400-fish maximum, including in advance of a trip. Finally, the plan implements an adaptive management framework that allows the Director to use proclamation authority to specifically adjust season closures, day of week closures, trip limits and gill net yardage or mesh size restrictions to help ensure management targets are being met, based on results of stock assessment updates or in response to concerning stock conditions or fishery trends observed outside of a stock assessment update.

Management Unit

Coastal and joint waters of North Carolina.

Goal and Objectives

The goal of Amendment 2 is to manage the striped mullet fishery to achieve a self-sustaining population that provides sustainable harvest using science-based decision-making processes. The following objectives will be used to achieve this goal:

- Implement management strategies within North Carolina that sustain and/or restore the striped mullet spawning stock with adequate age structure abundance to maintain recruitment potential and prevent overfishing.
- Promote the restoration, enhancement, and protection of critical habitat and environmental quality in a manner consistent with the Coastal Habitat Protection Plan, to maintain or increase growth, survival, and reproduction of the striped mullet stock.
- Use biological, social, economic, fishery, habitat, and environmental data to effectively monitor and manage the fishery and its ecosystem impacts.
- Advance stewardship of the North Carolina striped mullet stock by promoting practices that minimize bycatch and discard mortality.

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 and 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 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 respectively and a 15-year-old striped mullet of unknown sex was observed in 2017 by the DMF (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 (FL) for males (Bichy 2000) and 12.6 inches FL 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 estimates, fisheries-independent survey indices (Program 915), and biological data collected.

Both the observed data and 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 because of 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 are 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.

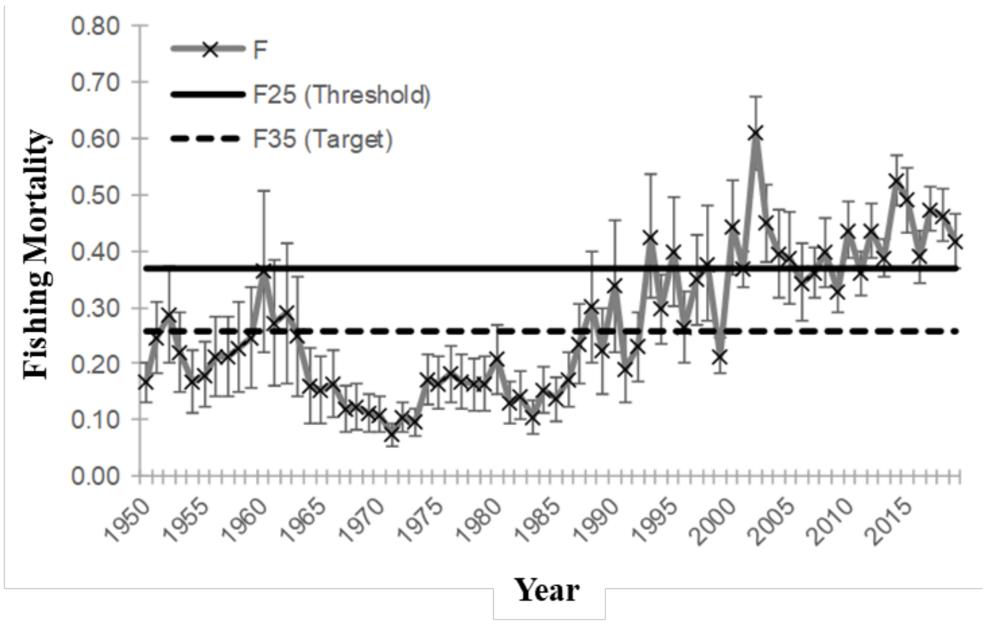

Figure 1. Annual predicted fishing mortality rates (numbers-weighted, ages 1–5) compared to estimated FThreshold (F25%) and FTarget (F35%), 1950–2019. 2019 is the terminal year for the most recent striped mullet stock assessment (NCDMF 2022).

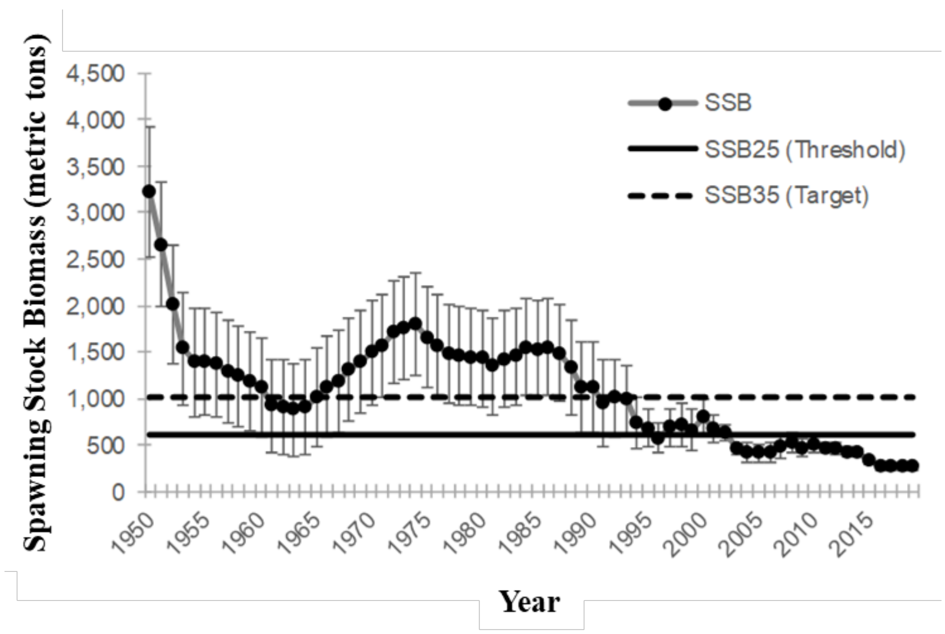

Figure 2. Annual predicted spawning stock biomass in metric tons, compared to estimated SSBThreshold (SSB25%) and SSBTarget (SSB35%), 1950–2019. 2019 is the terminal year for the most recent striped mullet stock assessment (NCDMF 2022).

DESCRIPTION OF THE FISHERY

Current Regulations

Amendment 2 was adopted in May of 2024 and implemented commercial harvest closures on Saturday and Sunday for January through September and on Saturday through Monday for October through December.

The plan also implemented a 100-fish recreational individual bag limit, a 400-fish recreational vessel limit, and provided an exception for For-Hire Operations to possess a bag limit for the number of anglers fishing up to the 400-fish maximum, including in advance of a trip. Striped mullet are exempt from the Mutilated Finfish Rule (15A NCAC 03M .0101).

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). Typically, stop nets have only been 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, 2021, and 2022, and 2024 the stop net fishery was open from October 15 through December 31 (Proclamations M-17-2020, M-21-2021, M-23-2022, M-17-2024). In 2023, the stop net fishery opened on October 15 and closed on November 7 as part of Supplement A management (Proclamations M-19-2023, FF-36-2023). 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 1994, commercial landings have ranged from a low of 965,198 pounds in 2016 to a high of 2,829,086 pounds in 2000 (Table 1; Figure 3). 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 and to lowest value in the time series (965,337 pounds). Commercial landings remained around 1.3 million pounds per year from 2017 to 2020, then increased in 2021 to 2,140,620 pounds and again in 2022 to 2,720,440 pounds. Landings in 2023 fell to 1,863,337 pounds, a 31.5% reduction from 2022 landings. This drop in landings was likely a result of Supplement A management that implemented harvest closures in November and December of 2023. In 2024, landings increased to 2,357,880 pounds, a 27% increase over 2023. This increase occurred despite day of week closures for commercial harvest implemented as part of Amendment 2 to the striped mullet FMP in May of 2024. It is possible that the fish that escaped harvest in 2023 due to Supplement A harvest restrictions contributed to increased abundance and availability to the fishery in 2024.

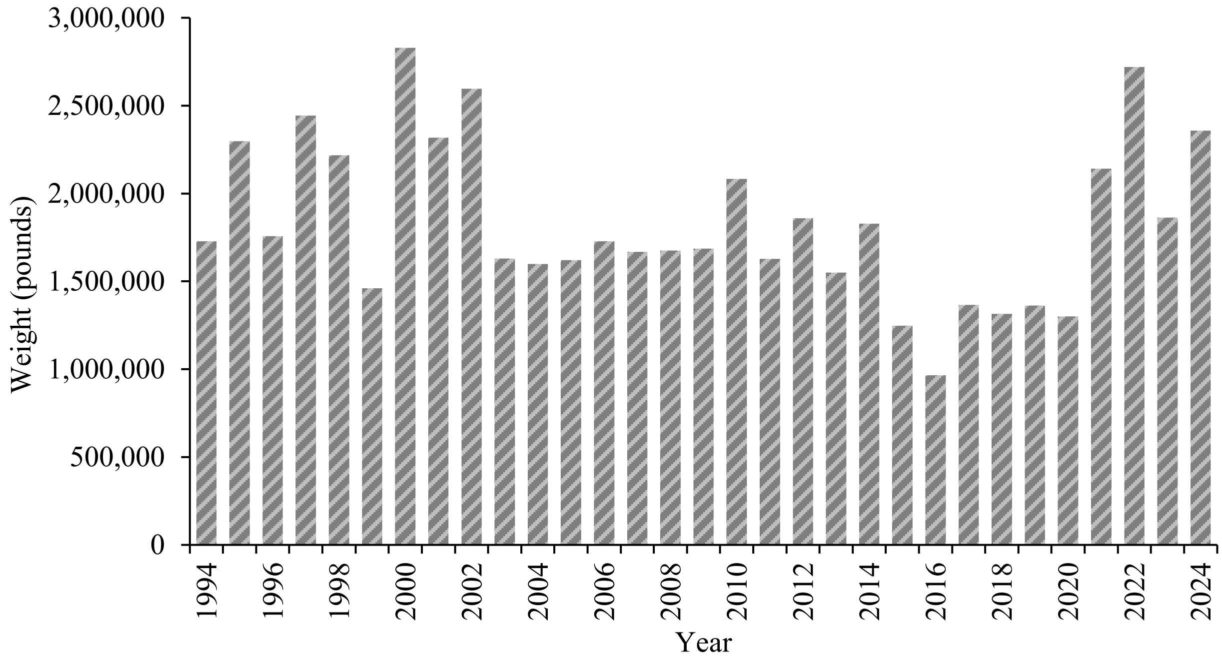

Figure 3. Striped mullet commercial landings (pounds) reported through the North Carolina Trip Ticket Program, 1994–2024.

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish), 2002–2024, and commercial harvest (weight in pounds) of striped mullet from North Carolina, 1994–2024. Number released and weight landed cannot be determined because of uncertainty in reported species identification.

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight(lb)
1994	-	-	-	1,728,551	1,728,551
1995	-	-	-	2,298,446	2,298,446
1996	-	-	-	1,756,863	1,756,863
1997	-	-	-	2,442,657	2,442,657
1998	-	-	-	2,218,108	2,218,108
1999	-	-	-	1,460,850	1,460,850
2000	-	-	-	2,829,086	2,829,086
2001	-	-	-	2,317,655	2,317,655
2002	5,967,684	-	-	2,596,304	2,596,304
2003	4,090,368	-	-	1,629,314	1,629,314
2004	1,394,707	-	-	1,598,617	1,598,617
2005	1,312,234	-	-	1,620,394	1,620,394
2006	1,059,444	-	-	1,728,607	1,728,607
2007	1,766,373	-	-	1,668,804	1,668,804
2008	1,191,633	-	-	1,675,859	1,675,859
2009	1,167,086	-	-	1,685,615	1,685,615
2010	1,319,070	-	-	2,082,832	2,082,832
2011	1,139,786	-	-	1,627,894	1,627,894
2012	1,369,975	-	-	1,859,587	1,859,587
2013	1,453,038	-	-	1,549,083	1,549,083
2014	1,352,690	-	-	1,828,351	1,828,351
2015	1,420,378	-	-	1,247,129	1,247,129
2016	1,491,533	-	-	965,337	965,337
2017	1,537,183	-	-	1,366,351	1,366,351
2018	489,321	-	-	1,314,431	1,314,431
2019	562,089	-	-	1,362,227	1,362,227
2020	531,875	-	-	1,299,500	1,299,500
2021	1,484,850	-	-	2,140,620	2,140,620
2022	292,708	-	-	2,720,440	2,720,440
2023	124,559	-	-	1,863,337	1,863,337
2024	194,619	-	-	2,357,880	2,357,880
Mean	1,422,313	-	-	1,833,572	1,833,572

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 DMF 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 4). 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 increased in 2021 to 1,484,850 fish before declining in 2022 to 292,708 fish, and in 2023 to 124,559 fish which was the lowest value in the time series. This decrease may be the result of a short recreational flounder fishing season and Supplement A management that implemented harvest closures in November and December of 2023. Recreational harvest remained low in 2024 at 194,619 fish, the second lowest value in the time series.

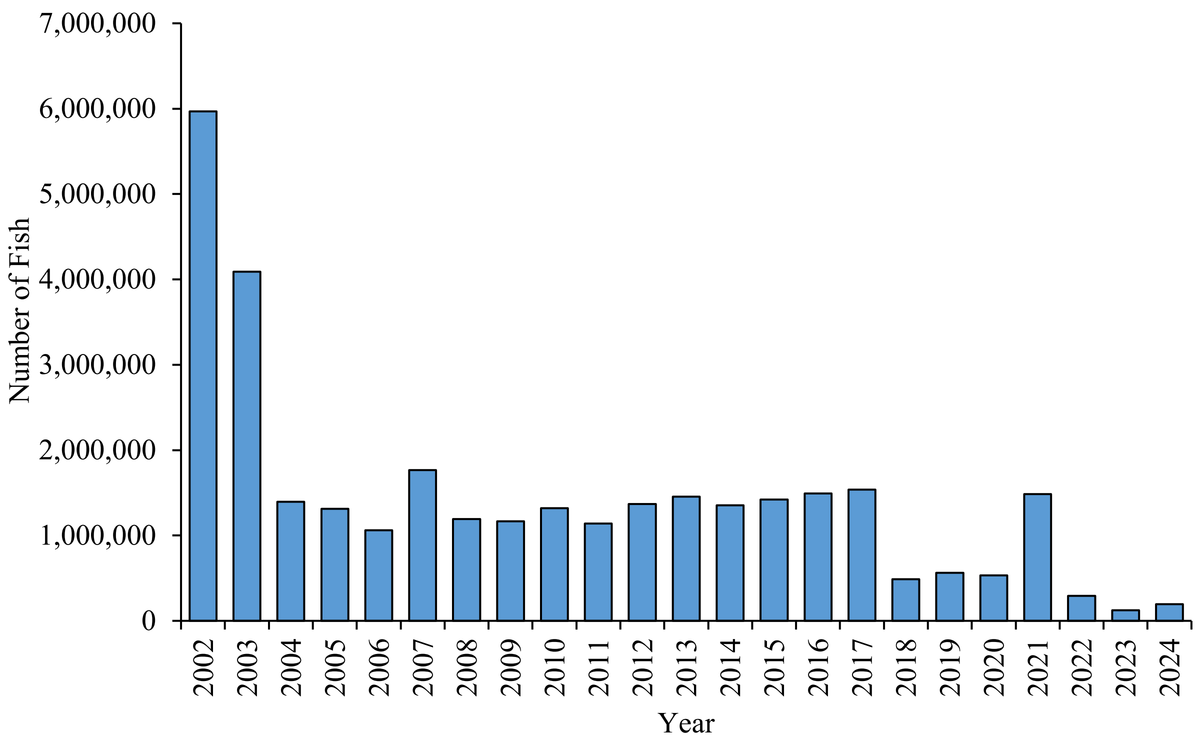

Figure 4. Recreational landings (Type A + B1; numbers of fish) includes estimates of striped mullet plus 29% of the mullet genus harvest from the Marine Recreational Information Program survey for North Carolina, 2002–2024.

Length-frequency distributions collected in North Carolina's MRIP survey are considered 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 2024 ranged from 124 to 13,263 with the lowest number measured in 1996 (124; Table 2). In 2024, 8,183 striped mullet were measured from commercial catches. Variation in mean length was low, usually falling between 13.0- and 14.5-inches FL, with the lowest mean length occurring in 1997 (12.8 inches FL). In 2024, mean FL was 15.4-inches FL, the highest value in the time series. Mean fork lengths in 2023 (14.9-inches) and 2022 (15.1-inches) were the second and third highest values in the time series. Minimum and fork lengths generally fell within a small range and maximum lengths ranged from 19.1 to 27.5 inches FL, though in 1994 and 1996, maximum length was below 20.0 inches (Table 2).

From 1994 through 2024 the size range of striped mullet captured in the commercial fishery as determined from commercial fish house samples ranged from 5.9 to 25.4 inches FL (Figure 5). Modal length generally falls between 12.0 and 15.0 inches. In all years there are few striped mullet over 18.0 inches present in the catch. Since 2022, there has been a noticeable shift toward higher percentages of larger fish captured in the commercial fishery.

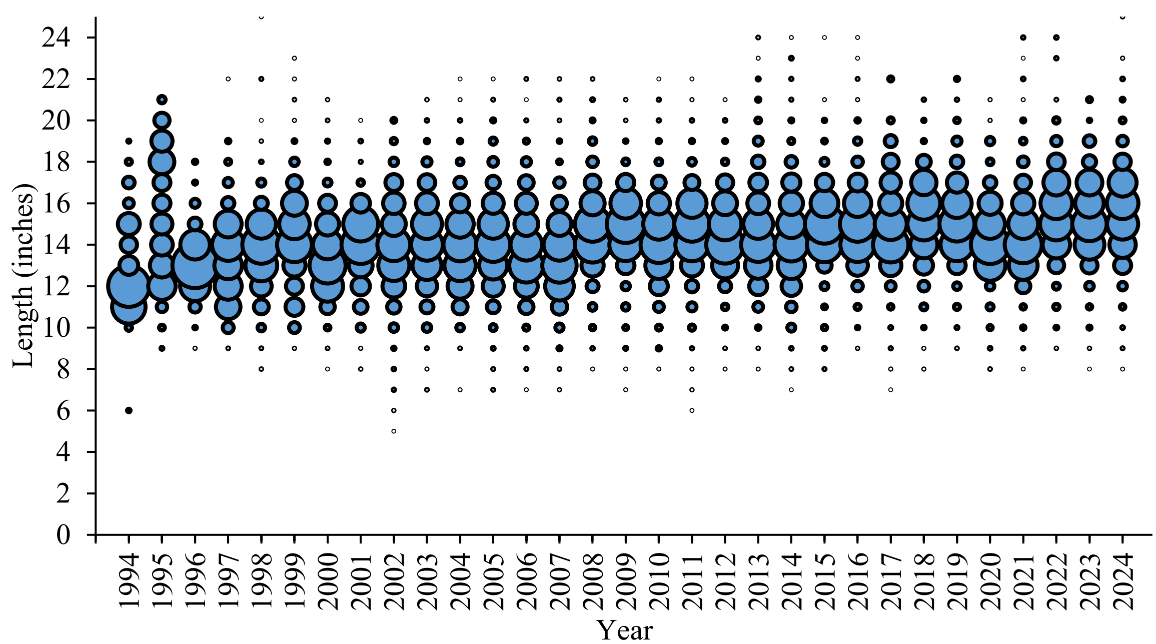

Figure 5. Commercial length frequency (fork length, inches) of striped mullet harvested, 1994–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length (n=211,234). Bait samples are not included.

Table 2. Mean, minimum, and maximum lengths (fork length, inches) of striped mullet measured from the commercial fisheries, 1994–2024. Bait samples are not included.

Year	Mean Length	Minimum Length	Maximum Length	Number Measured
1994	13.0	6.1	19.1	302
1995	14.5	9.3	21.6	256
1996	13.5	9.2	18.5	124
1997	12.8	8.5	22.8	2,049
1998	12.9	8.6	25.4	1,705
1999	13.3	7.0	23.9	1,823
2000	13.4	6.1	23.5	7,582
2001	14.1	8.1	20.9	5,726
2002	13.2	5.9	21.3	10,990
2003	12.9	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	12,188
2008	14.1	8.2	24.1	13,263
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	7,751
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	6,527
2015	14.2	8.1	24.9	5,923
2016	14.3	8.9	24.1	5,661
2017	14.2	7.8	22.4	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	7,241
2022	15.1	9.1	24.7	7,774
2023	14.9	8.1	22.0	5,481
2024	15.4	8.6	25.4	8,183

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, then declined until 2015 (Figure 6). From 2015 through 2021 abundance increased, peaking in 2021. Abundance declined substantially in

2022 to the lowest value in the time series but increased again in 2023 and 2024 to values close to those observed in 2017 and 2018. Greater abundance of adult striped mullet in 2024 may have contributed to the increase in commercial landings in 2024 relative to 2023.

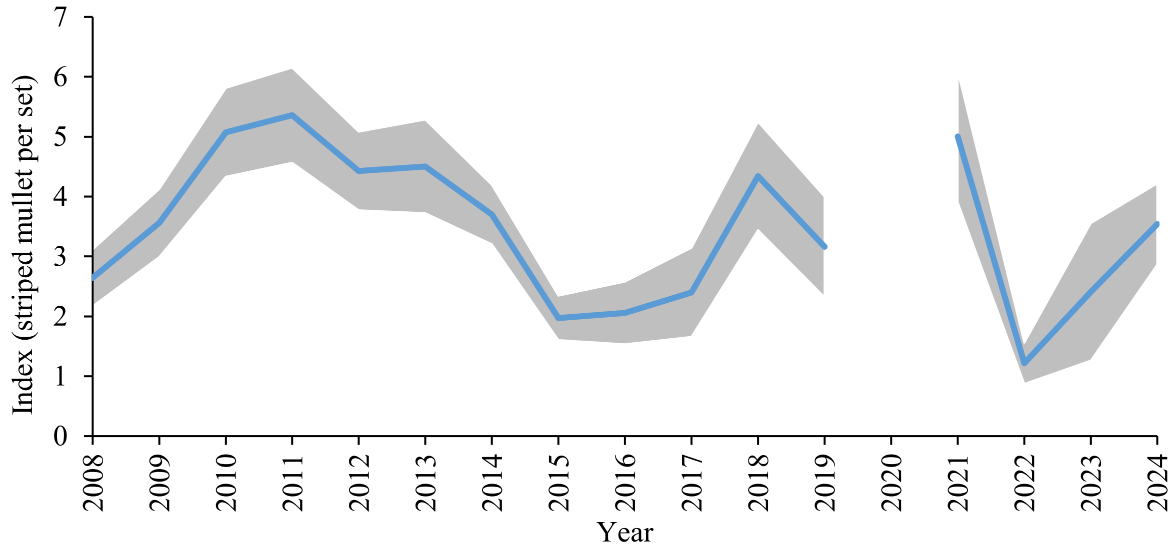

Figure 6. Relative Abundance index (fish per set) of striped mullet collected from Program 915 in Pamlico Sound, Pamlico, Pungo, Neuse and New rivers from August–December 2008–2024. Gray shading represent ± 1 standard error. Sampling was not conducted in 2020.

From 2008 to 2024, the size of striped mullet captured during the August to December portion of Program 915 in the Pamlico Sound, Pamlico River, Pungo River, Neuse River, and New River ranged from 7 to 26 inches FL (juveniles excluded, see NCDMF 2022 for juvenile length cut offs; Figure 7). Modal length ranged from 11 to 13 inches FL. Few striped mullet less than 10 inches FL and greater than 15 inches FL are captured in this survey. In 2024, more striped mullet in the 13 inch and 14 inch size classes were observed relative to recent years, but fewer were observed in size classes over 15 inches.

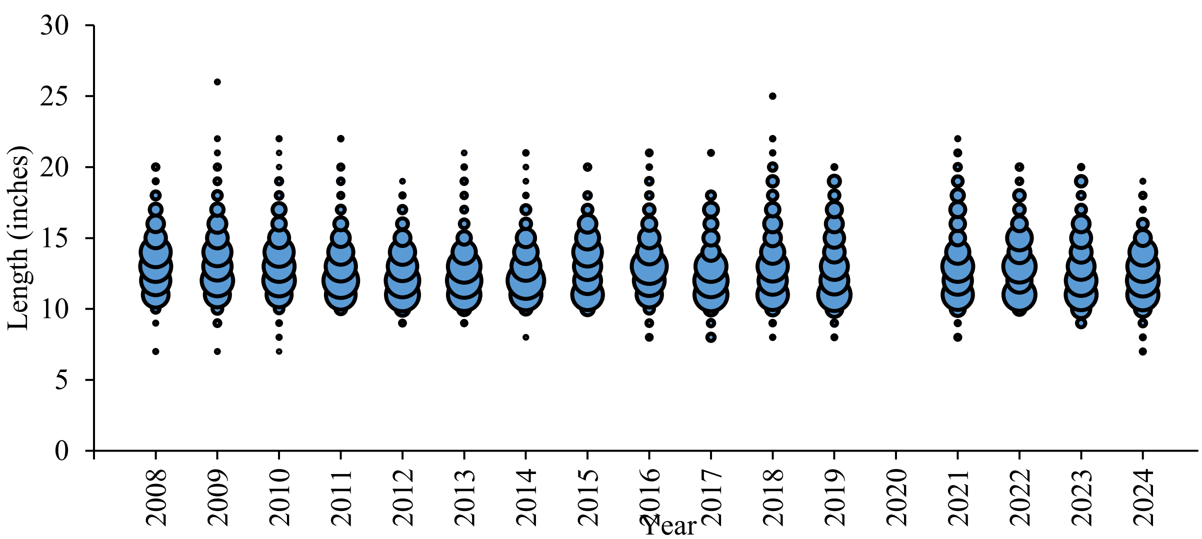

Figure 7. Length frequency (fork length, inches) of striped mullet collected from Program 915 in Pamlico Sound, Pamlico, Pungo, Neuse and New rivers from August–December (juveniles excluded), 2008–2024. Sampling was not conducted in 2020. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

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 DMF 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 one and two (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 8). Striped mullet grow quickly from age zero to age four before growth slows after age four.

Table 3. Modal age, minimum age, maximum age, and number aged for striped mullet collected through DMF sampling programs, 1996–2024. Only ages taken from otoliths and samples for which a length was also recorded were included.

Modal Age	Minimum Age	Maximum Age	Total Number
1	0	6	163
2	0	7	344
2	0	7	717
1	0	8	753
2	0	10	1122
1	0	11	705
2	0	7	625
1	0	13	765
2	0	9	1142
1	0	10	654
2	0	10	685
2	0	10	699
2	0	10	771
2	0	13	349
2	1	8	748
2	0	14	633
2	0	6	873
2	0	7	850
2	0	6	855
2	0	6	769
2	0	8	956
1-2	0	15	695
2	0	10	770
2	0	13	827
2	0	7	269
2	0	11	940
2	0	9	843
2	0	9	781
2	0	10	936

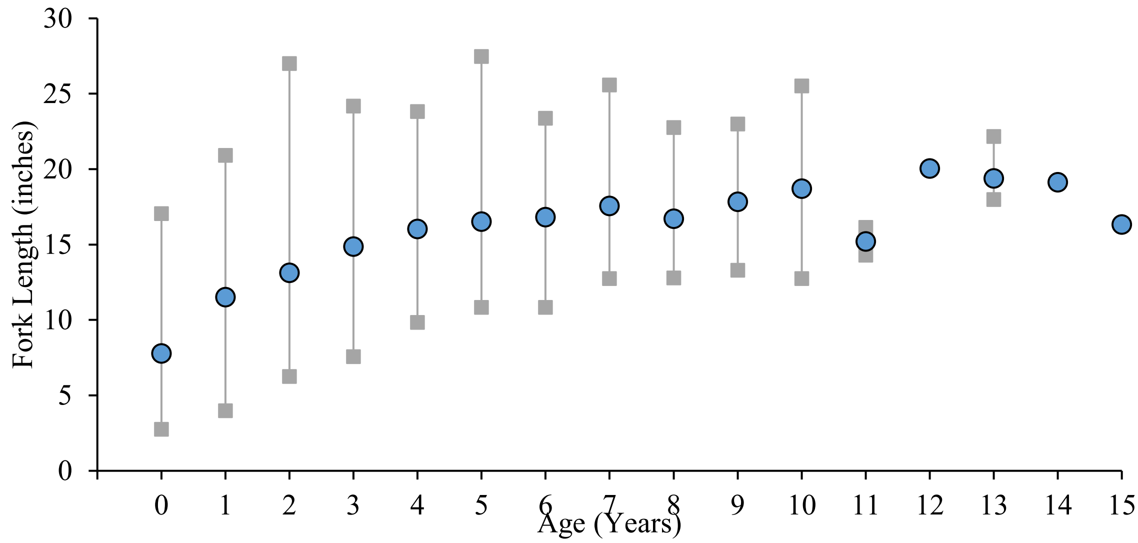

Figure 8. Striped mullet length at age based on all age samples collected, 1996–2024 (n = 21,035). Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. Only ages taken from otoliths are included.

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 and explore movement patterns 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

Striped mullet are managed under Amendment 2 to the North Carolina Striped Mullet FMP which was adopted in May 2024. The plan implemented day of week closures projected to achieve a 34.9% reduction in commercial harvest relative to 2019 landings, to end overfishing and achieve sustainable harvest within 10 years. Commercial harvest is closed Saturday and Sunday for January through September, and Saturday through Monday for October through December. The plan also implemented a 100-fish recreational individual bag limit, a 400-fish recreational vessel limit, and provided an exception for For Hire Operations to possess a bag limit for the number of anglers fishing up to the 400-fish maximum, including in advance of a trip. Finally, the plan implements an adaptive management framework that allows the director to use proclamation authority to specifically adjust season closures, day of week closures, trip limits and gill net yardage or mesh restrictions to help ensure management targets are being met, based on results of stock assessment updates or in response to concerning stock conditions or fishery trends observed outside of a stock assessment update. The commercial landings triggers established by Amendment 1 are no longer used to monitor the stock.

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS

Amendment 2 to the Striped Mullet FMP was adopted in May 2024 to end overfishing and rebuild the spawning stock. The next plan review is scheduled to begin in July 2029.

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FISHERY MANAGEMENT PLAN UPDATE
AMERICAN EEL
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	ASMFC FMP	November 1999
	Addendum I	February 2006
	Addendum II	October 2008
	Addendum III	August 2013
	Addendum IV	October 2014
	Addendum V	August 2018
	Addendum VI	May 2024
	Addendum VII	May 2024
Comprehensive Review:	2023	

American eel is managed under the Atlantic States Marine Fisheries Commission (ASMFC) Interstate Fishery Management Plan (FMP) for American Eel. The FMP was approved in 1999 (ASMFC 2000) and implements management measures to protect the American eel resource to ensure ecological stability while providing for sustainable fisheries. The FMP required all states and jurisdictions to implement an annual young-of-year (YOY) abundance survey to monitor annual recruitment of each year's cohort. In addition, the FMP required a minimum recreational size, a possession limit and a state license for recreational fishermen to sell eels. The FMP requires that states and jurisdictions maintain existing or more conservative American eel commercial fishery regulations for all life stages, including minimum size limits.

Addendum I, approved in November 2006, required states to establish a mandatory trip-level catch and effort monitoring program, including documentation of the amount of gear fished and soak time (ASMFC 2006). Addendum II, approved in October 2008, placed increased emphasis on improving the upstream and downstream passage of American eel (ASMFC 2008). No new management measures were implemented by Addendum II.

Addendum III was approved for management use in August 2013, with the goal of reducing mortality on all life stages of American eel. The Addendum was initiated in response to results of the 2012 Benchmark Stock Assessment, which found the American eel stock along the US East Coast was depleted. This addendum predominately focused on commercial yellow eel and recreational fishery management measures (ASMFC 2013). Addendum III implemented new size and possession limits as well as new pot mesh size requirements and seasonal gear closures.

Following approval of Addendum III, the ASMFC American Eel Management Board (Board) initiated development of Addendum IV, which was approved in October 2014 (ASMFC 2014). As the second phase of management in response to the 2012 stock assessment, the goal of Addendum IV is to continue to reduce overall mortality and increase overall conservation of American eel stocks. The addendum addresses concerns and issues in the commercial glass and silver eel fisheries, and domestic eel aquaculture. Addendum IV established a coastwide catch cap and a mechanism for implementation of a state-by-state commercial yellow eel quota if the catch cap is exceeded. Under Addendum IV, the coast wide catch cap was set at 907,671 pounds (1998–2010 harvest level, ASMFC 2014). Addendum IV established two management triggers:

- The coastwide catch cap is exceeded by more than 10 percent in a given year (998,438 pounds)
- The coastwide catch cap is exceeded for two consecutive years, regardless of the percent overage.

If either trigger is exceeded, a state-by-state commercial yellow eel quota would be implemented with North Carolina receiving an 11.8 percent allocation (107,054 pounds).

The aquaculture provision in Addendum IV allows states to submit an Aquaculture Plan to allow for limited harvest of glass eels for use in domestic aquaculture facilities. Specifically, states are allowed to request a harvest of up to 200 pounds of glass eels provided the state can objectively show the harvest will occur from a watershed that minimally contributes to the spawning stock of American eel.

In 2017, the 2012 stock assessment was updated with data from 2010–2016, however, neither reference points nor stock status could be determined. The trend analysis and stable low commercial landings support the conclusion that the American eel population in the assessment range remains depleted (ASMFC 2017).

Addendum V was initiated in response to results of the 2017 stock assessment update and concerns that current management triggers do not account for annual fluctuations in landings. If a management trigger is exceeded, immediate implementation of state-by-state quotas would pose significant administrative challenges (ASMFC 2019). Adopted in January 2019, Addendum V increases the yellow eel coastwide catch cap beginning in 2019 to 916,473 pounds due to a correction in the historical harvest; adjusts the method (management trigger) to reduce total landings to the coastwide catch cap when the cap has been exceeded; and removes the implementation of state-by-state allocations if the management trigger is met. The addendum maintains Maine's glass eel quota of 9,688 pounds.

Under Addendum V, management action is initiated if the yellow eel coastwide catch cap is exceeded by 10% or more in two consecutive years (10% of the coastwide catch cap = 91,647 pounds; coastwide catch cap + 10% = 1,008,120 pounds). If management is triggered, only those states accounting for more than 1% of the total yellow eel landings are responsible for adjusting their management measures.

The aquaculture provision in Addendum V allows states to harvest a maximum of 200 pounds of glass eels annually for use in domestic aquaculture facilities under an approved Aquaculture Plan. The provision from Addendum IV requiring states to demonstrate harvest would occur in watersheds that minimally contribute to the spawning stock was dropped in Addendum V and replaced with considerations that preferred harvest sites; have established or proposed glass eel monitoring programs, are favorable to law enforcement, and are in watersheds that are prone to relatively high mortality rates.

In December 2015, the DMF submitted an American Eel Aquaculture Plan to the ASMFC requesting approval to harvest up to 200 pounds of glass eels from coastal fishing waters which was approved in February 2016 (1 year). A second plan was submitted by DMF in 2016 and approved by ASMFC that allowed for harvest in 2017 (1 year). The third plan submitted by the DMF in 2017 and approved by the ASMFC covered a 2-year period that allowed for harvest in 2018 and 2019. In May 2019, the DMF submitted another 2-year plan but was only approved by ASMFC for one harvest season (November 2019 through March 2020). The DMF has not submitted an American Eel Aquaculture Plan to the ASMFC since 2020.

For an approved aquaculture operation to legally harvest eels less than 9 inches, the facility needs to have a Declaratory Ruling from the NC Marine Fisheries Commission (MFC) exempting them from the 9-inch minimum size limit to possess, sell or take American eels. The approved aquaculture operation received Declaratory Rulings (2) that allowed for legally harvested American eels less than 9 inches in length to be cultivated or reared in a facility from: 1) outside of North Carolina and imported into the State, and 2) from Coastal Fishing Waters in the State of North Carolina.

In support of American eel aquaculture in North Carolina, several legal actions were taken by North Carolina legislatures. Senate Bill 513 (North Carolina Farm Act of 2015; Section 22.(a)) directed the DMF and the North Carolina Wildlife Resources Commission (WRC) to jointly develop a pilot American Eel Aquaculture Plan for the harvest and aquaculture of American eels. Senate Bill 410 (Marine Aquaculture Development Act; Section 3.1.(c)) allows American eels to be imported from Virginia or South Carolina for aquaculture purposes, and House Bill 374 (Section 17) allows American eels to be imported from

Maryland for aquaculture purposes. The use of American eels imported from Maryland, Virginia, or South Carolina in an aquaculture operation are exempt from the permitting requirements of the Importation of Marine and Estuarine Organisms Rule (15A NCAC 03I .0104).

The ASMFC began work on a benchmark stock assessment in 2020 which was peer-reviewed in late 2022. The stock assessment and peer review report were presented to the Board in February 2023 and accepted for management use in August 2023. The assessment indicated the stock is at lower levels than the previous assessment and near historically low levels due to a combination of historical overfishing, habitat loss, food web alterations, predation, turbine mortality, environmental changes, toxins, contaminants, and disease (ASMFC 2023). The assessment and peer review report recommended reducing fishing mortality on the yellow eel life stage. Similar to previous assessments, a statistical model could not be developed to determine stock status or give management advice. However, the assessment explored several index-based methods and recommended a new tool called I_{TARGET} to provide advice on the coastwide catch cap. I_{TARGET} is an index-based method that needs only catch and abundance index data to provide management advice on coastwide landings. In August 2023, the Board initiated addendum VI to address Maine's commercial glass eel quota and Addendum VII to consider using I_{TARGET} to recommend various yellow eel coastwide catch caps.

In May 2024, the Board adopted Addendum VI which set Maine's annual commercial glass eel fishery quota, starting in the 2025, at 9,688 pounds (ASMFC 2024a) and Addendum VII which reduced the coastwide commercial landings cap for yellow eel to 518,281 pounds. Addendum VII keeps the coastwide catch cap for yellow eel of 518,281 pounds in place for three years (2025–2027). After three years, prior to the 2028 fishing year, the Board may update the coastwide catch cap with additional years of catch and abundance data, or maintain the same coastwide cap. Under Addendum VII, management action is initiated if the yellow eel coastwide catch cap is exceeded by 10% or more in two consecutive years (10% of the coastwide catch cap = 51,828 pounds; coastwide catch cap + 10% = 570,109 pounds) (ASMFC 2024b). If management is triggered, only those states accounting for more than 1% of the total yellow eel landings are responsible for adjusting their management measures. In addition to reducing harvest, Addendum VII modified biological sampling requirements of the annual YOY abundance survey by removing the requirement to collect individual lengths and pigment stage of the YOY catch during the surveys.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). There are two main goals of the IJ FMP; first 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. Second, to 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 goals of these plans, established under the Magnuson-Stevens Fishery Conservation and Management Act (federal council) and the Atlantic Coastal Fisheries Cooperative Management Act (ASMFC), are similar to the goals of the N.C. Fisheries Reform Act of 1997 to "ensure long-term viability" of these fisheries (NCDMF 2015).

Management Unit

American eel is managed as a coastwide stock, from Maine through Florida, under the ASMFC Interstate FMP for American Eel (ASMFC 2000). The American eel's range extends beyond U.S. borders and more specifically ASMFC member states' territorial waters. However, the management unit is limited to ASMFC member states' territorial waters.

Goal and Objectives

The goals of the ASMFC American Eel FMP are to protect and enhance the abundance of American eel in inland and territorial waters of the Atlantic states and jurisdictions and contribute to the viability of the American eel spawning population with the aim to provide sustainable commercial, subsistence, and recreational fisheries by preventing over-harvest of any eel life stage. The following objectives will be used to achieve this goal:

- Improve knowledge of eel utilization at all life stages through mandatory reporting of harvest and effort by commercial fishers and dealers and enhanced recreational fisheries monitoring.
- Increase understanding of factors affecting eel population dynamics and life history through research and monitoring.
- Protect and enhance American eel abundance in all watersheds where eel now occur.
- Where practical, restore American eel to those waters where they had historical abundance but may now be absent by providing access to inland waters for glass eel, elvers, and yellow eel and adequate escapement to the ocean for pre-spawning adult eel.
- Investigate the abundance level of eels at the various life stages necessary to provide adequate forage for natural predators to support ecosystem health and food chain structure.

DESCRIPTION OF THE STOCK

Biological Profile

The American eel (*Anguilla rostrata*) is a catadromous species meaning they are born in saltwater, then migrate into freshwater as juveniles where they grow into adults before migrating back to the ocean to spawn. All American eel comprise one panmictic population meaning they are a single breeding population that exhibits random mating. For example, an American eel from the northern portion of the range could mate with an American eel from the southern portion of the range, and their offspring could inhabit any portion of the range. As a result, recruits to a particular system are likely not the offspring of the adults that migrated out of that system (ASMFC 2000).

American eels require multiple habitats including the ocean, estuaries, freshwater streams, rivers and lakes. While American eels spend most their life in brackish and freshwater systems from South America to Canada, spawning occurs in the Sargasso Sea (a large portion of the western Atlantic Ocean south of Bermuda and east of the Bahamas; Facey and Van den Avyle 1987). Larvae develop at sea and change from glass eels (transparent post-larval stage) into elvers (pigmented young eels) in nearshore ocean waters and estuaries (ASMFC 2000). Elvers either remain in the estuary or migrate upstream. At approximately two years of age, they change to the yellow eel stage and resemble the adult form (Ogden 1970). Individuals can remain in the yellow phase for five to 20 years. In the yellow phase, American eels are nocturnal, feeding at night on a variety of invertebrates and smaller fish, but will also eat dead animal matter.

American eels live in a variety of habitats but prefer areas where they can hide with soft bottom and vegetation. Females can grow to five feet in length, and males usually reach about three feet (ASMFC 2000). The mature silver eel life stage occurs at the time of downstream migration when individuals leave the estuaries to spawn and die in the Sargasso Sea (Facey and Van den Avyle 1987). This spawning migration occurs annually in the late summer and fall. Information about abundance and status at all life stages, as well as habitat requirements, is very limited. The life history of the species, such as late age of maturity and a tendency for certain life stages to aggregate, can make this species particularly vulnerable to overharvest.

Stock Status

The 2023 benchmark stock assessment found the American eel population remains depleted in U.S. waters (ASMFC 2023). No overfishing status determination can be made based on the analyses performed.

Stock Assessment

Since completion of the first American eel stock assessment in 2005, available data have not allowed overfishing or overfished determinations to be made. In 2020, a benchmark stock assessment began for American eel and was completed in 2023. All potential data sources were reviewed, and the terminal year of the assessment was 2019 for fishery-independent surveys and 2020 for commercial datasets. The 2023 assessment explored additional approaches for assessing American eel that were suggested in past stock assessments including a delay-difference model, traffic light analysis and surplus production models, and developing an egg-per-recruit model, but overfished and overfishing determinations still could not be made due to data limitations. However, many of the analyses explored in this benchmark assessment indicate decreasing yellow eel population trends. Unlike previous assessments, the 2023 assessment and peer review identified an index-based tool (I_{TARGET}) to provide management advice without requiring an assessment model.

DESCRIPTION OF THE FISHERY

Current Regulations

Management measures for yellow eels went into effect on January 1, 2014, under North Carolina Marine Fisheries Commission (MFC) Rule 15A NCAC 03M .0510. These measures included a nine-inch total length (TL) minimum size limit for both the commercial and recreational fisheries, a 25 eels per person per day bag limit for the recreational fishery, and crew members involved in for-hire employment are allowed to maintain the current 50 eels per day bag limit for bait purposes. The rule also made the possession of American eels illegal from September 1 through December 31 except when taken by baited pots. NCMFC Rule 15A NCAC 03J .0301 established a ½-by-½ inch minimum mesh size requirement for the commercial eel pot fishery. Eel pots with an escape panel consisting of a 1 by ½ inch mesh are allowed until January 1, 2017. In June 2021, the NCWRC modified Rule 15A NCAC 10C .0401 to allow eels greater than nine inches in length and with a minimum body depth greater than ½ inch to be cut for use as bait in Inland Fishing Waters.

Commercial Fishery

Average commercial landings over a ten year period from 2014 through 2023 was 22,399 pounds and in 2024, commercial landings were 2,477 pounds (Table 1). Commercial landings have fluctuated since 1974 with a peak in 1980 followed by significant declines beginning in the late 1980s (Figure 1). In 1979 and 1980, over 900,000 pounds were landed, however, since the late 1980s landings have averaged less than 100,000 pounds and in 2023 landings were the lowest recorded in the time-series.

Table 1. Commercial landings of American eel (in pounds) in North Carolina, 1974–2024.

Year	Weight Landed (lb)	Year	Weight Landed (lb)
1974	451,956	2000	127,099
1975	237,684	2001	107,070
1976	510,083	2002	59,940
1977	258,296	2003	172,065
1978	695,605	2004	128,875
1979	954,534	2005	49,278
1980	960,196	2006	33,581
1981	436,007	2007	37,937
1982	475,524	2008	23,833
1983	404,157	2009	65,481
1984	706,298	2010	122,104
1985	224,263	2011	61,960
1986	338,377	2012	64,110
1987	127,964	2013	33,980
1988	57,369	2014	60,755
1989	152,565	2015	57,791
1990	56,494	2016	39,911
1991	12,082	2017	24,753
1992	17,739	2018	18,058
1993	32,711	2019	9,139
1994	95,991	2020	3,291
1995	173,698	2021	5,505
1996	141,592	2022	3,602
1997	128,668	2023	1,109
1998	91,084	2024	2,477
1999	99,939		
		Mean	179,503

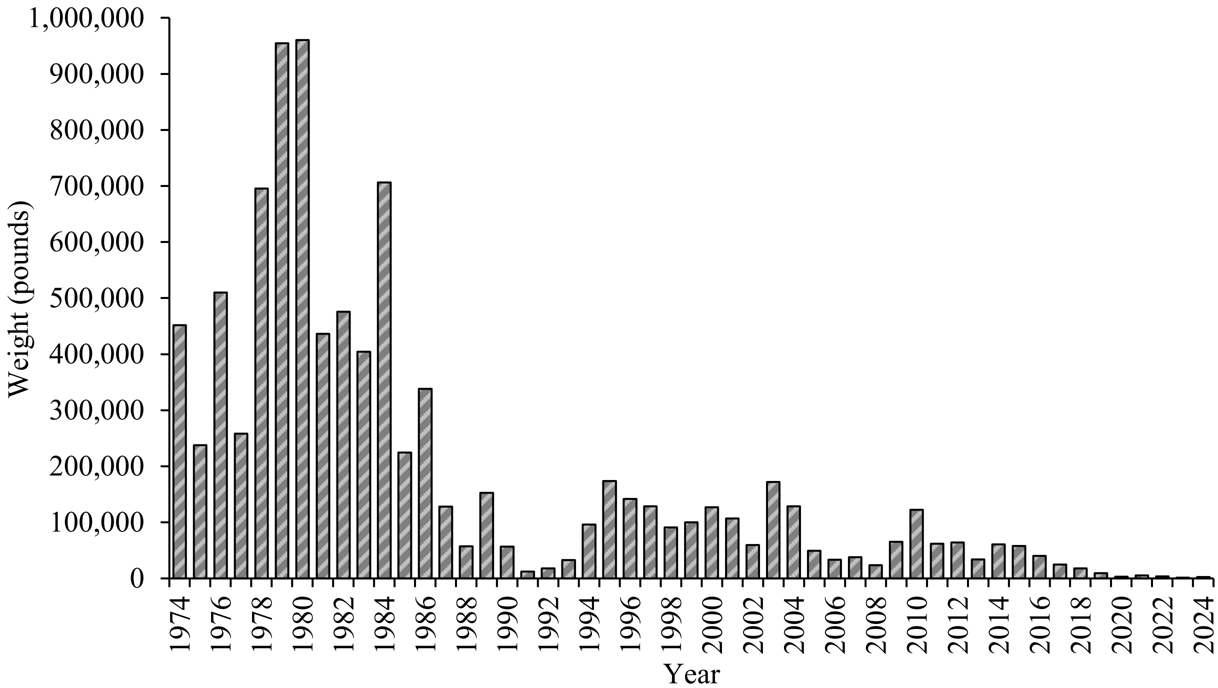

Figure 1. American eel commercial landings (pounds) reported through the North Carolina Trip Ticket Program, 1974–2024.

Recreational Fishery

There are no recreational landings data available for American eels, which are not typically a recreationally targeted species. Since American eels are caught incidentally in the estuarine environment by recreational fishermen using hook and line, the Marine Recreational Information Program (MRIP) does not provide reliable harvest data. Also, the MRIP survey design does not provide information on the recreational harvest of American eel in inland waters. American eels are popular bait for many important recreational fisheries such as striped bass and cobia.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

To comply with Addendum I to the American Eel Fisheries Management Plan, the DMF initiated (January 2007) mandatory reporting of harvest and effort information for American eels harvested by commercial eel pots, including eel pot soak time and number of eel pots fished. Commercial fishermen are required to participate in a monthly logbook program designed to monitor the harvest of American eels by eel pots. Soak time and number of eel pots fished are not reported on trip tickets.

Fishery-Independent Monitoring

The National Oceanic and Atmospheric Administration (NOAA) conducts the Beaufort Bridgenet Ichthyoplankton Sampling Program (BBISP), an ichthyoplankton survey at Beaufort Inlet, which is used to develop a North Carolina young-of-year relative abundance index for American eel. The BBISP samples once-weekly at night during floodtide from a fixed platform on Pivers Island Bridge, Beaufort, NC during October–May. Larvae are collected using a 2 m^2 plankton net fitted with a flow meter. Four replicate sets (tows) are made, with each filtering about 100 m^3. Between 1987 and 2023, relative abundance of American eel (glass eel) has fluctuated from a low in 1991 to a high in 2005, with a 35-year time series average of 0.012 eels per cubic meter (Figure 2). In 2023, American eel relative abundance (0.007 eels per cubic meter) remained below the time-series average for the third year. BBISP sampling continues to occur; however, currently there is one year backlog since the 2024 samples have not been processed.

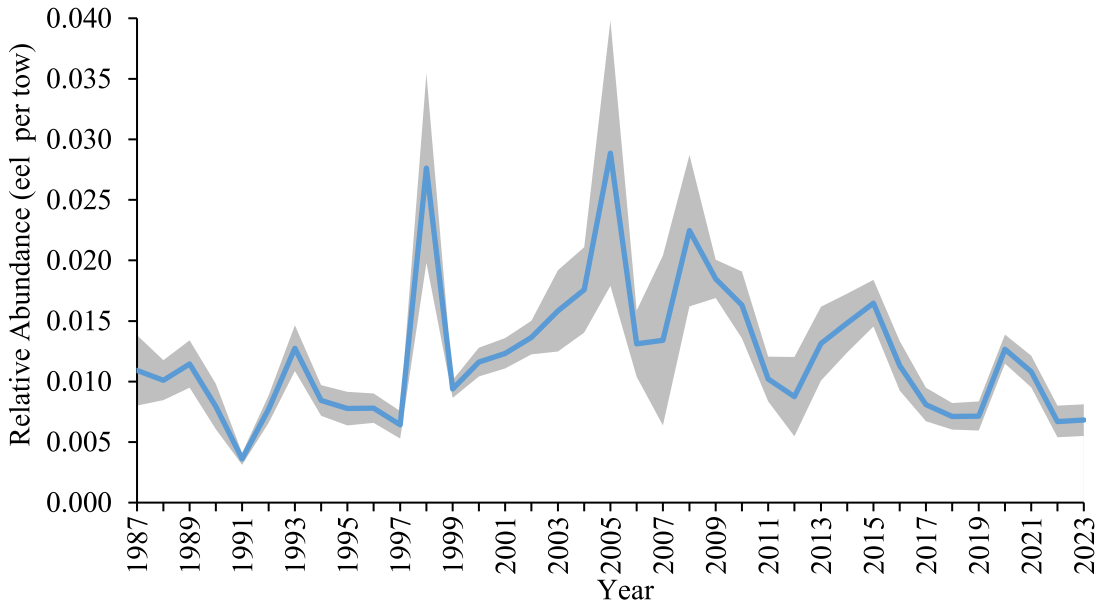

Figure 2. Relative abundance index (larval fish per tow) of American eel collected from the BBISP, 1987–2023. Error bars represent ± 1 standard error.

Lengths of American eels captured in the BBISP from 2001 to 2023 (n=702) ranged from 41 to 153 millimeters (1.6 to 6.0 inches; Figure 3) and averaged 52 millimeters total length (2.0 inches; note: the 60+ millimeter category includes pooled fish lengths of 62, 91, and 153 millimeters). The BBISP continued their long-term sampling program in 2020 (January to March); however, no samples were collected in April and May, or in November and December due to COVID-19 restrictions.

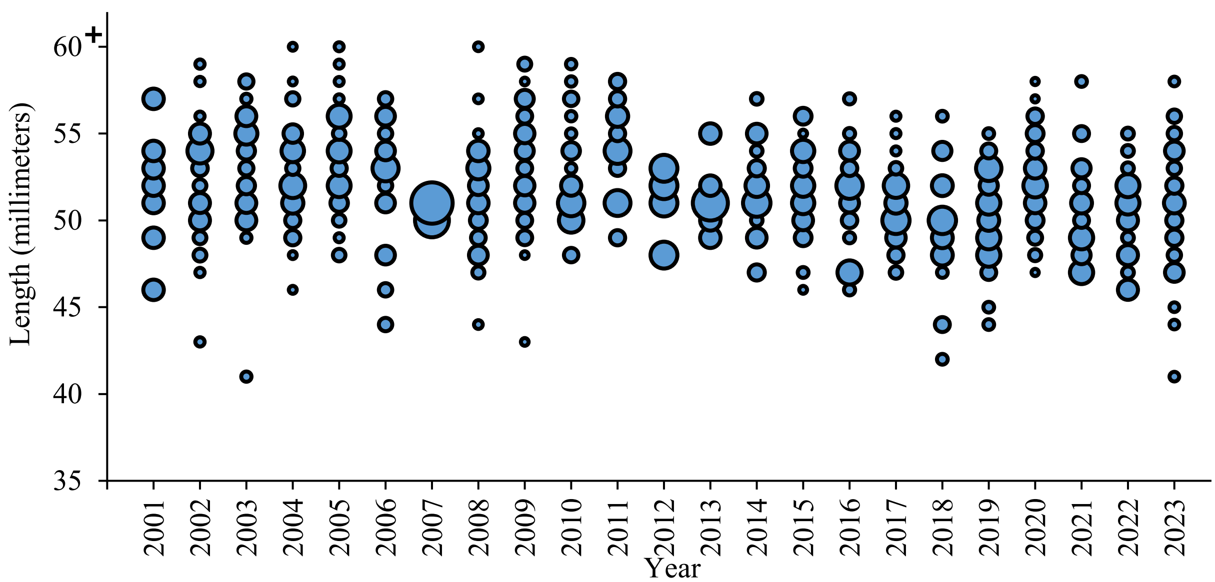

Figure 3. Length frequency (total length, millimeters) of American eel collected in the BBISP, 2001–2023. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length (Note: the 60+ category includes four fish; 61, 62, 91, and 153 millimeters).

The North Carolina Division of Marine Fisheries (DMF) has no fishery-independent monitoring programs specifically for American eel; however, the North Carolina Estuarine Trawl Survey (Program 120) collects information on American eels caught incidentally. American eel catch data from Program 120 were used in the 2012 benchmark stock assessment; however, it was not included in the 2023 benchmark stock assessment. From 1973 to 2024, relative abundance has fluctuated from lows in 1973, 2000, 2020, and 2023 to a peak in 2011, and a 52-year average of 0.13 American eels per tow (Figure 4). Due to COVID restrictions all 2020 sampling was conducted in June. In 2024, 0.03 eels were captured in the survey (Figure 4).

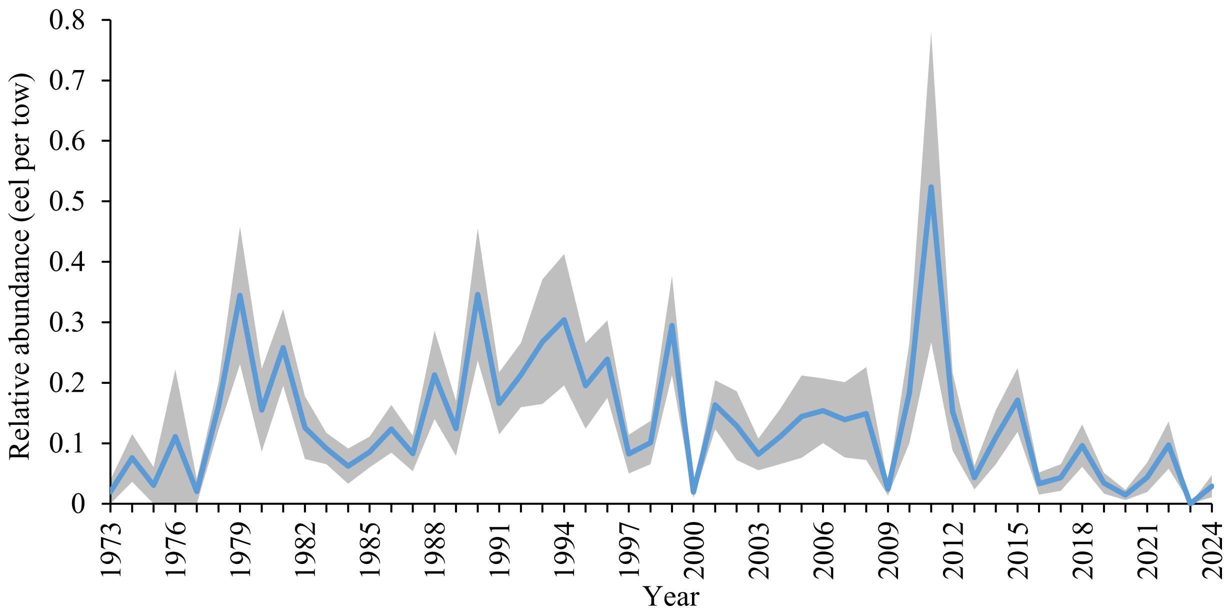

Figure 4. Relative abundance index (fish per tow) of American eel collected from the North Carolina Estuarine Trawl Survey (Program 120) from 1973–2024. Error bars represent ± 1 standard error.

RESEARCH NEEDS

Research recommendations from the 2023 benchmark stock assessment are listed below and are broken down into future research and data collection and assessment methodology. Research recommendations from ASMFC 2012, 2017 remain important, but the following list is specific to what the SAS thinks could improve the next stock assessment. The SAS recommends an update be considered in five years and a new benchmark be considered in ten years.

Future Research and Data Collection

- Improve upstream and downstream passage for all life stages of American eels.
- Continue to improve the accuracy of commercial catch and effort data through ACCSP and state partners.
- Characterize the length, weight, age, and sex structure of commercially harvested American eels along the Atlantic Coast over time.
- Research coastwide prevalence of the swim bladder parasite *Anguillacolla crassus* and its effects on the American eel's growth and maturation, migration to the Sargasso Sea, and spawning potential.
- Improve understanding of the spawning contribution of unexploited portions of the stock (i.e., freshwater areas of coastal US).
- Characterize the length, weight, and sex structure in unharvestable habitats.

- Conduct a tagging study throughout the species range.
- Quantify recreational removals in marine and freshwater habitats and characterize length, weight, and sex structure.
- Evaluate the passage/passage efficiency of American eels though existing fishways at dams/barriers and evaluate barrier physical attributes (height, material) that can be passed by eel without fishways.
- Evaluate the use vs. availability of habitat in the inland portion of the species range, and how habitat availability has changed through time, including opening of habitat from recent dam and barrier removals. This could and should include assisted migration by trucking around dams.
- To the extent that the data allows, account for the proportion of the population (yellow, silver phase) represented by the inland portion of the species range.
- Evaluate the relative impact that commercial harvest has on population status versus the accessibility to inland habitats.

Assessment Methods

- Develop methods to assess spawner escapement and biological information pertinent to silver eels in major river basins.
- Perform a range-wide American eel assessment with various countries and agencies (e.g., Canada DFO, ASMFC, USFWS, Caribbean, US Gulf and inland states).
- Explore methods to characterize data by sex to support a female-only delay-difference model.

MANAGEMENT

The provisions of Addendum VII are effective January 1, 2025. Starting January 1, the yellow eel coastwide cap is 518,281 pounds and the management trigger is two consecutive years exceeding the coastwide cap by 10% (570,109 pounds). The management trigger has never been tripped. If the management trigger is exceeded, only those states accounting for more than 1% (5,182 pounds) of the total yellow eel landings will be responsible for adjusting their measures. In 2023, the commercial landings in North Carolina were 1,109 pounds (0.10 %), therefore if the coastwide management trigger was exceeded in 2023, North Carolina would not be required to work with other states to adjust harvest.

The ASMFC adopted Addendum IV in 2014 that contained a provision allowing states to submit an Aquaculture Plan allowing for the limited harvest of glass eels for use in domestic aquaculture facilities. Specifically, states are allowed to request harvest of up to 200 pounds of glass eels under an Aquaculture Plan. The DMF submitted an American eel Aquaculture Plan to ASMFC requesting approval to harvest up to 200 pounds of glass eels from coastal fishing waters in 2015, 2016, 2017 and 2019. The DMF did not submit an American Eel Aquaculture Plan to the ASMFC in 2023 and does not have an active glass eel fishery.

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FISHERY MANAGEMENT PLAN UPDATE
AMERICAN SHAD
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	October 1985	
	Amendment 1	April 1999
	Technical Addendum 1	February 2000
	Addendum I	August 2002
	Amendment 3	February 2010
Supplements:	Supplement	October 1988
Comprehensive Review:	To be determined	

The first Atlantic States Marine Fisheries Commission (ASMFC) Fishery Management Plan (FMP) for Shad and River Herrings was adopted in 1985. The FMP did not require any specific management approach or monitoring programs within the management unit, asking only that states provide annual summaries of restoration efforts and ocean fishery activity. It specified four management objectives: regulate exploitation, improve habitat accessibility and quality, initiate programs to introduce alosine stocks into historic waters, and recommend and support research programs. The 1988 Supplement (ASMFC 1988) reassessed the research priorities identified in the original 1985 plan and created a new listing of research priorities.

Amendment 1 (ASMFC 1999) reported that the majority of American shad (*Alosa sapidissima*) stocks were not overfished, but almost all were believed to be at or near historically low levels. Therefore, Amendment 1 required increased annual reporting requirements on juveniles, adult spawning stocks, annual fishing mortality, and habitat. A fishing mortality threshold (overfishing) was defined as a reference point of F_{30}. A fishing mortality rate of F_{30} will result in 30% of the maximum spawning potential in the female component of an unfished population. Amendment 1 also implemented the phase-out of the ocean intercept fishery for American shad (effective in 2005). Eliminating the North Carolina ocean intercept fishery was important to controlling harvest to specific river origins.

Technical Addendum 1 (ASMFC 2000) modified several technical errors and provided clarification of several monitoring requirements in Amendment 1.

Addendum I (ASMFC 2002) changed the conditions for marking hatchery-reared alosines. The addendum clarifies the definition and intent of de minimis status for the American shad fishery. It also further modifies and clarifies the fishery-independent and fishery-dependent monitoring requirements of Technical Addendum 1.

The ASMFC coastwide stock assessment completed in 2007 found that American shad stocks were at all-time lows and did not appear to be recovering to acceptable levels. Therefore, under ASMFC's Amendment 3 to the Interstate FMP for Shad and River Herring, individual states were required to develop Implementation Plans (ASMFC 2010). Implementation Plans consisted of two parts: 1. Review and update of the fishing/recovery plans required under Amendment 1 for the stocks within their jurisdiction; and 2. Habitat plans. North Carolina submitted fishing/recovery plans that meet the requirements of Amendment 3, known as the North Carolina American Shad Sustainable Fishery Management Plan (SFMP) (NCDMF 2011, NCDMF 2017, and NCDMF 2023). North Carolina submitted habitat plans that meet the requirements of Amendment 3, known as the North Carolina American Shad Habitat Plan (NCDMF 2014 and NCDMF 2020).

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). 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 (NCDMF 2015).

Management Unit

The management units for American shad are all the migratory American shad stocks of the Atlantic coast of the United States. American shad and hickory shad management authority lies with the ASMFC and is coordinated by Atlantic coastal states from Maine through Florida through approved Sustainable Fishery Management Plans for American Shad. Responsibility for management action in the Economic Exclusive Zone (EEZ), located from three to 200 miles from shore, lies with the Secretary of Commerce through the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA) in the absence of a federal FMP.

Goal and Objectives

Migratory stocks of American shad have been managed under the ASMFC since 1985. These species are currently managed under Amendment 3 (American shad) and Amendment 1 (American and hickory shad (*Alosa mediocris*) to the ASMFC FMP, Technical Addendum 1, and Addendum I. Because of the scarcity of data on hickory shad populations, the ASMFC member states decided to focus Amendment I on American shad regulations and monitoring programs. However, the amendment requires states to initiate fishery-dependent monitoring programs for hickory shad while recommending continuance of current fishery-independent programs for these species. The goal of Amendment 3 is to protect, enhance, and restore Atlantic coast migratory stocks and critical habitat of American shad in order to achieve levels of spawning stock biomass that are sustainable, can produce a harvestable surplus, and are robust enough to withstand unforeseen threats. To achieve this goal, the plan adopts the following objectives:

- Maximize the number of juvenile recruits emigrating from freshwater stock complexes.
- Restore and maintain spawning stock biomass and age structure to achieve maximum juvenile recruitment.
- Manage for an optimum yield harvest level that will not compromise Objectives 1 and 2.
- Maximize cost effectiveness to the local, state, and federal governments, and the ASMFC associated with achieving Objectives 1 through 3.

DESCRIPTION OF THE STOCK

Biological Profile

American shad are anadromous fish, meaning they spend most of their adult lives at sea, only returning to freshwater in the spring to spawn. Shad young leave their home river within the first year and will spend the next few years at sea, schooling in large numbers with shad from other regions and feeding on plankton, small fish, and crustaceans. Upon reaching maturity, at about age 4, they return to the streams in which they were born to spawn. Males or "buck shad" return first, followed by females or "roe shad." They spawn usually at night or during overcast days. In the southern range (Cape Fear River to Florida), females release as many as 700,000 eggs during the spawning season, but both males and females normally die after spawning. In the northern range, females typically release 300,000 eggs or less during the spawning season; however, most shad will return to spawn in the following years, with some shad living up to 10 years.

Stock Status

The most recent coastwide stock assessment of American shad stated that populations in the Albemarle Sound, including Roanoke River, are sustainable and not depleted, whereas a determination of stock status could not be assigned for the Tar-Pamlico, Neuse, and Cape Fear rivers due to limited information (ASMFC 2020).

Stock Assessment

The 2020 American shad benchmark stock assessment found coastwide populations of American shad to be depleted. Factors such as overfishing, inadequate fish passage at dams, predation, pollution, water withdrawals, channelization of rivers, changing ocean conditions, and climate change are likely responsible for the decline from historic shad abundance levels. The assessment found that American shad recovery is limited by restricted access to spawning habitat, with 40% of historic habitat in the U.S. and Canada currently blocked by dams and other barriers possibly equating to a loss of more than a third of spawning adults. The abundance of American shad relative to historic levels is unknown for most systems but was determined to be depleted for the Potomac River and Hudson River, and not depleted for the Albemarle Sound. Coastwide adult mortality is largely unknown and juvenile mortality status cannot be determined due to insufficient data collection. The stock assessment chose to use the 'depleted' determination instead of 'overfished' because of the impact of fishing on American shad stocks cannot be separated from all other factors that impact abundance. The status for adult mortality rate and abundance could not be determined for the Tar-Pamlico and Cape Fear rivers. The Neuse River adult mortality rate was found to be sustainable (ASMFC 2020). The 2020 benchmark assessment for American shad was endorsed by the Peer Review Panel and accepted by the ASMFC Shad and River Herring Board for management use in August 2020. The ASMFC has not conducted a coastwide assessment of hickory shad.

DESCRIPTION OF THE FISHERY

Current Regulations

The MFC enacted a rule in 1995, which established a closed season for American shad and hickory shad. It is unlawful to take these species by any method except hook-and-line April 15–December 31. The ocean intercept fishery for American shad was closed to all harvest January 1, 2005 (ASMFC 2002).

In the Albemarle, Croatan, Roanoke, and Currituck sounds and tributaries (Albemarle Sound Management Area; ASMA), floating gill nets of 5.25-inch stretch mesh (ISM) to 6.5 ISM, were limited to 500 yards, could only be utilized from March 2 through March 17, and must be fished at least once during a 24-hour period (no later than noon each day; M-5-2023). A portion of the Albemarle Sound from the lower Chowan River to the western Albemarle Sound was closed to the use of all gill nets. The area closure was implemented to prolong the striped bass quota by reducing gear in hot spot areas, which also impacted harvest for American shad. The closing date for this gear occurred when the ASMA striped bass harvest quota was met to prevent additional striped bass discards. While American shad could still be harvested using other commercial gears February 15 through April 14, 2023, the gill net gear restriction, coupled with the area closure, had an impact on harvest for the remainder of the open commercial season for American shad.

The western portion of Albemarle Sound near the mouth of the Roanoke River (including Roanoke, Cashie, Middle and Eastmost Rivers) is closed to gill netting year-round. Gill nets with a mesh length of 3.25–4.0 ISM could not exceed 800 yards and were allowed from January 1 through April 30, 2023 (M-2-2023). Attendance for fixed or stationary small mesh gill nets (3.0–3.75 ISM) was required September 1–November 30 when the area reopened to this gear (M-10-2023). The ASMA was closed to all other gill nets except for 3.0–4.0 ISM run-around, strike, drop, and drift gill nets until the area was opened for estuarine flounder season on October 2, 2023 (M-16-2023). During the 2023 estuarine flounder season, the ASMA was open to gill nets configured for flounder, single overnight soaks, Monday night through Thursday morning until the commercial quota for this area was met and gear removed on October 21 (M-21-2023).

Since May 2016, in other areas outside of the ASMA (excluding the Cape Fear River), a statewide rule limits the amount of large mesh (4.0-inch and greater) gill net set in internal Coastal Fishing Waters to no more than 1,500 yards per vessel (M-4-2023). A prior version of the rule (3,000 yards maximum) was suspended for most internal Coastal waters as a result of sea turtle conservation measures to institute no more than 2,000 yards per vessel of 4.0–6.5-inch gill net in the Tar-Pamlico and Neuse rivers systems in earlier years. Additionally, in certain sections of the Tar-Pamlico and Neuse rivers, gill nets with a mesh size less than five inches must be attended at all times. Also, it is unlawful to use any gill nets in Joint Fishing Waters from midnight on Friday to midnight on Sunday each week (except for portions of Albemarle and Currituck sounds). These existing gill net measures have likely reduced American shad harvest since they have remained in effect since the spring 2012 fishing season and remain in effect indefinitely.

In the Cape Fear River there are different gill net restrictions than described above for the Tar-Pamlico and Neuse river systems (i.e., mesh lengths, spacing, set/retrieval days and times). Large mesh gill nets (4.0–6.5-inch) are prohibited in the Cape Fear River (north of the Railroad Bridge) and Northeast Cape Fear River (north of I-40 bridge) north of Wilmington, NC. Run-around, strike, drop, drift, and trammel gill net commercial operations are limited to 800 yards per commercial fishing operation (M-5-2023). It is unlawful to use gill nets of any mesh size on weekends in the Cape Fear system. This measure will remain in effect indefinitely.

A management response for striped bass has been in effect since March 18, 2019, prohibiting the use of all gill nets upstream of the ferry lines from the Bayview to Aurora ferry in the Tar-Pamlico River and the Minnesott Beach and Cherry Branch ferry in the Neuse River (Proclamation M-6-2019). This prohibition directed by the N.C. Marine Fisheries Commission was in response to Supplement A to Amendment 1 to the N.C. Estuarine Striped Bass FMP, and was intended to reduce striped bass fishing mortality, and has essentially protected American shad as well by removing gill nets from the normal fishing grounds for American shad in the Tar-Pamlico River.

At its August 2022 business meeting, the MFC approved Notice of Text for Rulemaking to begin the process to amend the Mutilated Finfish Rule (15A NCAC 03M .0101). The amended rule would provide flexibility to manage variable conditions for the use of finfish, including hickory shad, as cut bait by simplifying the rule such that only species subject to a possession limit are subject to the requirements unless otherwise specified in a MFC rule or a proclamation issued under the authority of a MFC rule. The MFC gave final approval of the rule at its February 2023 business meeting and the rule was scheduled to be reviewed for final approval by the Rules Review Commission (RRC) in June 2023.

At its June 15, 2023, meeting, the RRC objected to the Mutilated Finfish Rule in accordance with N.C.G.S. § 150B-21.10. At its August 25, 2023, business meeting, the MFC moved to keep the mutilated finfish rule as it was originally and grant proclamation authority to the Fisheries Director as Item (4) in the rule to add exemptions for other species. Following its October 5, 2023, special meeting, the RRC returned the mutilated finfish rule to the MFC in accordance with Session Law 2023-134, Section 21.2(m). Since the returned rule was a proposed amendment at the June 15, 2023, meeting, and the objection was not to existing language, there was no change to the N.C. Administrative Code. The mutilated finfish rule remains in force as readopted effective April 1, 2019.

Commercial Fishery

North Carolina's commercial landings in 2024 were 25,624 pounds (Table 1; Figure 1). Anchored gill nets configured for harvesting American shad were prohibited in the ASMA effective March 17, 2023, due to the ASMA striped bass commercial quota being met (Proclamation M-6-2023). While American shad could still be landed commercially until April 14, 2024, anchored gill nets are the primary gear used for shad in the ASMA and the gear and area restriction did have an impact on landings.

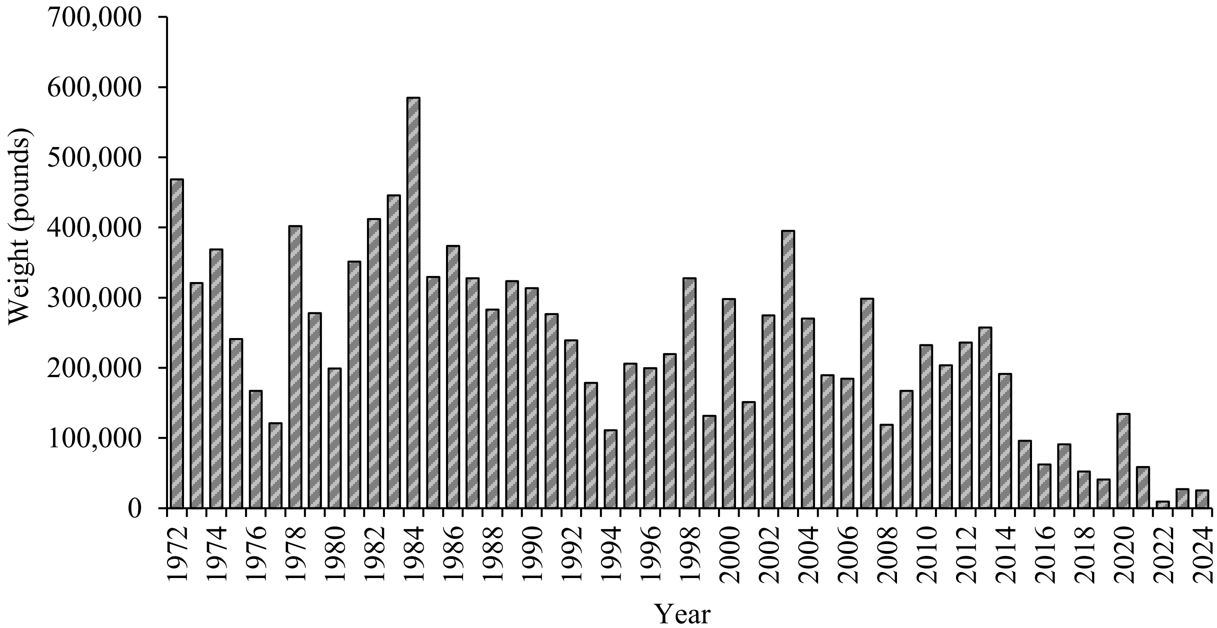

Figure 1. Commercial harvest (weight in pounds) of American shad from North Carolina, 1972–2024.

Table 1. Commercial harvest (weight in pounds) of American shad from North Carolina, 1972–2024. Commercial harvest from the Atlantic Ocean has been prohibited since 2007.

Year	Weight Landed (lb)	Year	Weight Landed (lb)
1972	468,484	1999	131,617
1973	321,000	2000	297,990
1974	368,833	2001	151,075
1975	241,240	2002	274,657
1976	167,190	2003	395,251
1977	121,022	2004	270,245
1978	402,017	2005	189,462
1979	278,070	2006	184,710
1980	199,206	2007	298,597
1981	351,500	2008	118,855
1982	411,852	2009	167,114
1983	445,879	2010	232,326
1984	584,843	2011	203,755
1985	329,639	2012	235,795
1986	373,794	2013	257,348
1987	327,646	2014	191,302
1988	283,050	2015	95,926
1989	323,396	2016	62,245
1990	313,550	2017	90,868
1991	276,507	2018	52,113
1992	239,162	2019	40,975
1993	178,790	2020	134,590
1994	110,975	2021	58,884
1995	205,867	2022	9,443
1996	199,638	2023	27,341
1997	219,526	2024	25,624
1998	327,556		
		Mean	231,478

Overall, landings show a decreasing trend until 2013 when average landings leveled off with the implementation of the American Shad SFMP. Commercial harvest is sporadic and cyclical and annual trends show these changes. Figure 2 describes the landings break down by the four areas of the state, as stated in the American Shad SFMP. The Albemarle Sound area accounted for approximately 89% of total state landings in 2024.

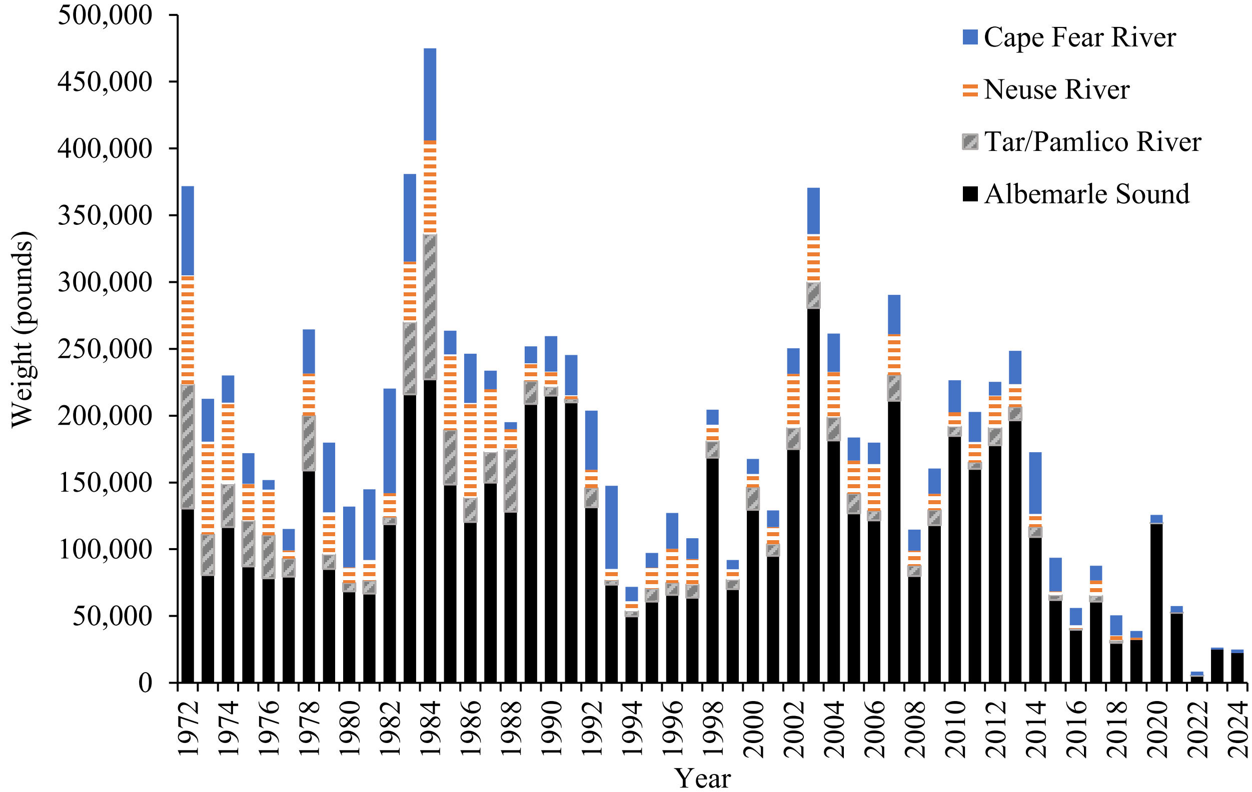

Figure 2. Commercial harvest (weight in pounds) of American shad from North Carolina by major waterbody, 1972–2024.

Recreational Fishery

Recreational fishing activity is monitored through coordination with the North Carolina Wildlife Resources Commission (WRC) and the DMF. Methods were developed to conduct recreational creel surveys on the Roanoke, Tar-Pamlico, and Neuse rivers starting in 2012, and for the Cape Fear River in 2013. Recreational landings for American shad are minimal throughout the Albemarle Sound-Roanoke River due to limited to no effort focused on American shad in this system. The bulk of the North Carolina recreational fishery occurs in the Cape Fear River system where substantial effort is targeted on American shad with an estimated harvest of 1,141 fish in 2024 (Table 2).

Table 2. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of American shad from the North Carolina Central Southern Management Area (CSMA), 2012–2024.

Neuse River					
	Recreational			Commercial	
Year	Numbers Landed	Numbers Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
2012	968	511	2,277	23,985	26,262
2013	1,388	2,699	2,920	17,255	20,175
2014	413	995	992	9,778	10,770
2015	94	132	293	3,022	3,314
2016	252	1,389	426	2,568	2,994
2017	518	2,828	1,328	11,451	12,779
2018	112	356	286	3,987	4,273
2019	215	91	455	1,531	1,986
2020	830	1,933	1,770	109	1,879
2021	36	53	74	16	90
2022	36	170	123	248	371
2023	155	1,009	133	0	133
2024	85	511	83	19	102
Tar-Pamlico River					
	Recreational			Commercial	
Year	Numbers Landed	Numbers Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
2012	899	4,257	1,711	12,982	14,693
2013	2,479	7,053	6,830	9,776	16,606
2014	168	1,314	453	7,472	7,925
2015	1,006	2,784	3,262	3,418	6,680
2016	1,051	2,820	3,408	765	4,173
2017	898	2,217	2,159	4,412	6,571
2018	685	2,767	1,588	1,580	3,168
2019	544	3,028	944	-	944
2020	209	562	362	129	491
2021	731	4,236	1,945	59	2,004
2022	464	995	1,211	59	1,270
2023	717	2,096	821	0	821
2024	444	586	637	0	637
Cape Fear River					
	Recreational			Commercial	
Year	Numbers Landed	Numbers Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
2012	-	-	-	10,341	10,341
2013	18,484	6,154	42,571	24,888	67,459
2014	7,256	0	23,084	46,148	69,232
2015	4,136	6,125	11,504	25,039	36,543
2016	10,244	10,740	28,393	12,937	41,330
2017	1,352	2,669	3,787	11,049	14,836
2018	5,384	3,992	13,088	14,931	28,019
2019	2,266	1,101	5,786	5,076	10,862
2020	3,582	3,740	7,645	6,038	13,683
2021	2,624	6,914	6,623	4,838	11,461
2022	2,666	953	6,103	2,899	9,002
2023	2,079	5,775	2,444	1,428	3,872
2024	1,141	1,133	1,303	2,497	3,800

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Commercial fishing activity is monitored through fishery-dependent sampling conducted by the DMF since 1972, with a sampling gap during 1994–2000 due to lack of funding. Data collected in this program allow the size and age distribution of American Shad to be characterized by sex (female and male). The predominant fishery for American shad is estuarine gill nets and harvest is primarily focused on female American Shad, as they are harvested for their roe (eggs). In 2024, gill nets accounted for greater than 89% of the commercial landings. A total of 81 females and 30 males were measured from the commercial fishery in 2024 (Tables 3 and 4). The average size was 17 inches fork length for female and 15 inches fork length for male American shad (Figures 3 and 4).

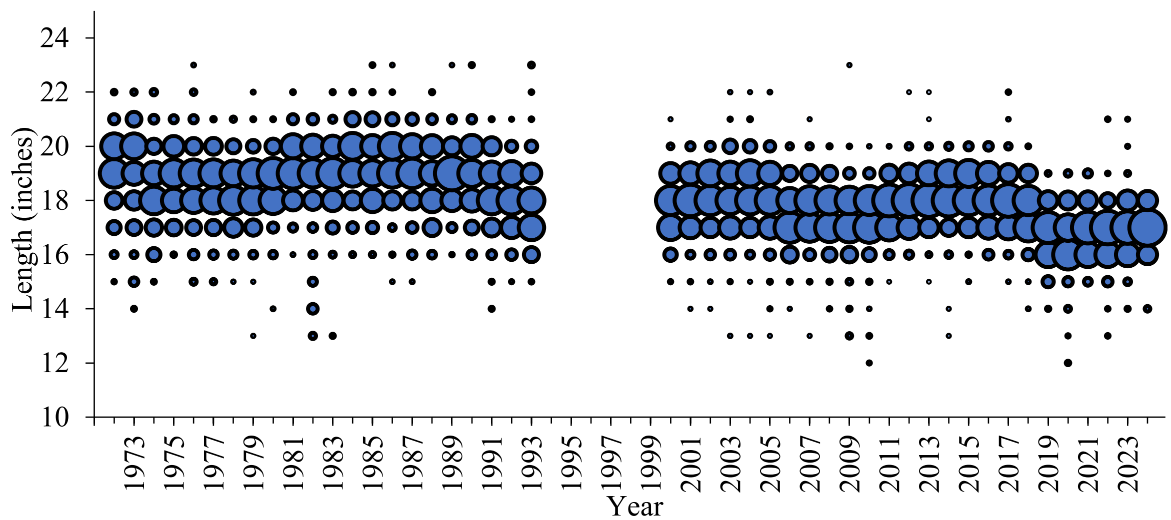

Figure 3. Commercial length frequency (fork length, inches) of female American shad harvested, 1972–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

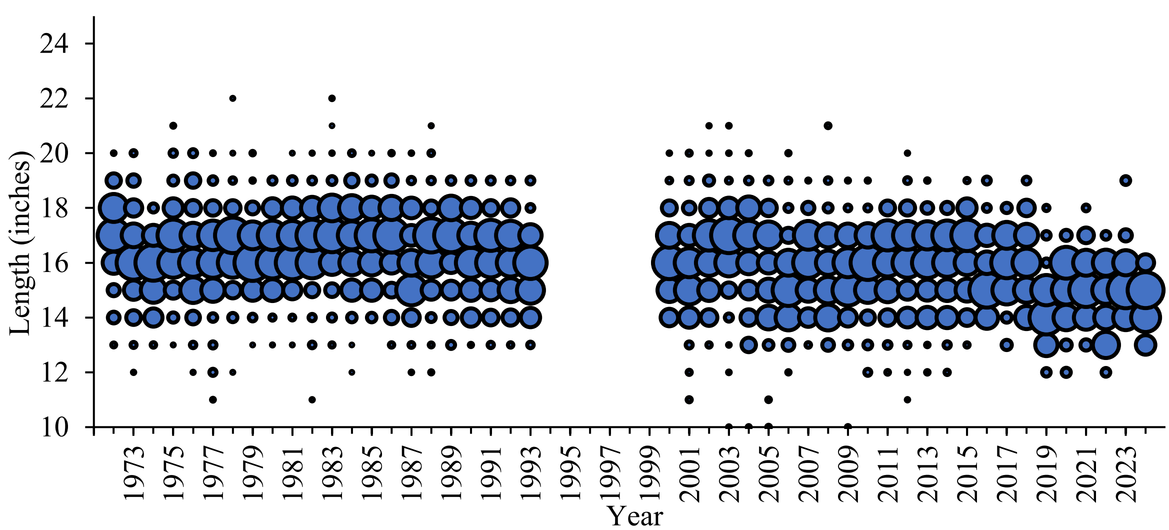

Figure 4. Commercial length frequency (fork length, inches) of male American shad, 1972–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Table 3. Mean, minimum, and maximum lengths (fork length, inches) of female American shad measured from the commercial fisheries, 1972–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1972	19	14	22	244
1973	18	14	21	345
1974	18	15	21	177
1975	18	15	21	774
1976	18	14	23	404
1977	18	14	20	515
1978	18	14	20	554
1979	18	10	22	691
1980	18	14	21	367
1981	19	16	21	374
1982	18	13	21	247
1983	18	12	21	464
1984	19	15	21	613
1985	19	15	23	561
1986	19	15	23	419
1987	19	14	21	360
1988	18	15	22	607
1989	18	15	23	470
1990	18	15	23	156
1991	18	13	20	330
1992	18	15	20	299
1993	17	15	22	220
2000	17	14	20	836
2001	17	13	20	711
2002	18	13	20	794
2003	18	13	22	545
2004	18	12	22	727
2005	17	13	21	847
2006	17	14	20	667
2007	17	12	20	785
2008	17	14	20	740
2009	17	12	22	702
2010	17	12	20	948
2011	17	15	19	1,103
2012	17	15	21	1,169
2013	18	15	21	1,363
2014	18	13	20	870
2015	18	14	20	678
2016	17	15	20	396
2017	17	15	22	456
2018	17	14	20	388
2019	17	14	19	444
2020	15	12	19	281
2021	17	15	19	415
2022	17	13	21	225
2023	17	14	21	316
2024	17	14	18	81

Table 4. Mean, minimum, and maximum lengths (fork length, inches) of male American shad measured from the commercial fisheries, 1972–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1972	17	13	19	285
1973	16	12	20	365
1974	15	13	18	225
1975	16	12	20	466
1976	16	12	20	392
1977	16	11	19	253
1978	16	11	22	470
1979	16	13	20	533
1980	16	12	19	429
1981	16	13	19	486
1982	16	11	19	367
1983	16	13	21	630
1984	16	12	19	608
1985	16	13	19	475
1986	16	12	19	348
1987	16	12	19	299
1988	16	11	20	422
1989	16	12	18	346
1990	16	13	19	204
1991	16	12	19	248
1992	16	12	19	232
1993	15	12	19	153
2000	16	13	20	315
2001	15	11	20	130
2002	16	13	21	352
2003	16	10	20	284
2004	16	8	19	239
2005	15	7	18	160
2006	15	11	20	192
2007	15	12	18	216
2008	15	5	20	152
2009	15	12	18	213
2010	15	12	18	199
2011	15	12	18	159
2012	16	10	19	353
2013	15	11	19	175
2014	15	11	18	120
2015	16	12	18	124
2016	15	13	18	50
2017	15	12	17	58
2018	15	13	18	53
2019	14	12	18	85
2020	15	12	17	74
2021	15	13	18	71
2022	15	12	17	41
2023	15	13	19	40
2024	15	13	16	30

Variation in modal, minimum, and maximum ages throughout the fishery-dependent monitoring is described in Table 5, for both sexes combined. The modal age has increased over the time series, while the minimum and maximum ages have remained relatively unchanged.

Table 5. Modal age, minimum age, maximum age, and number aged for American shad (male and female combined) collected through DMF fishery-dependent sampling programs, 1972–2022. *Age data unavailable for 2023–2024.

Year	Modal Age	Min Age	Max Age	Total Number Aged	Year	Modal Age	Min Age	Max Age	Total Number Aged
1972	5	3	9	465	2002	5	3	8	580
1973	4	3	8	656	2003	6	3	8	543
1974	4	3	7	389	2004	5	3	8	645
1975	5	2	9	1,138	2005	5	3	8	477
1976	5	4	9	664	2006	6	3	8	499
1977	5	3	7	585	2007	6	3	8	439
1978	6	3	7	953	2008	6,7	3	9	447
1979	5	4	9	1,060	2009	7	4	10	431
1980	6	4	9	685	2010	6	3	9	453
1981	6	4	9	528	2011	6	3	8	403
1982	5	3	9	328	2012	5	3	8	526
1983	5	3	9	626	2013	7	3	9	449
1984	5	3	9	707	2014	7	3	9	418
1985	5	3	8	624	2015	7	4	8	406
1986	5	4	9	475	2016	7	4	8	280
1987	5	4	9	403	2017	7	4	9	382
1988	5	4	9	604	2018	7	3	8	278
1989	5	3	8	238	2019	6	4	8	273
1990	6	3	9	233	2020	6	4	8	255
1991	5	4	8	321	2021	6	4	8	301
1992	5	4	9	295	2022	6	4	8	180
1993	5	4	9	221	2023	*	*	*	*
2000	5	3	7	401	2024	*	*	*	*
2001	5	3	8	423					

Figure 5 and Figure 6 illustrate the American Shad length at age (mean, minimum, and maximum) for females and males from all age samples collected at any given age from 1972 to 2022. Age data for 2023 and 2024 are incomplete and will be provided when aging is complete.

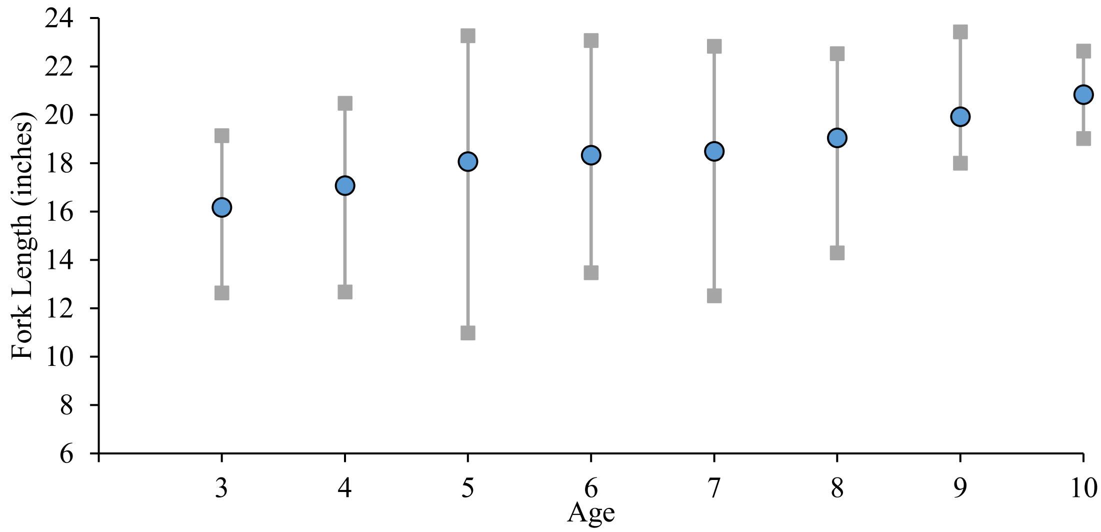

Figure 5. Female American shad length at age from all age samples collected from fishery-dependent monitoring, 1972–2022. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. Age data unavailable for 2023–2024.

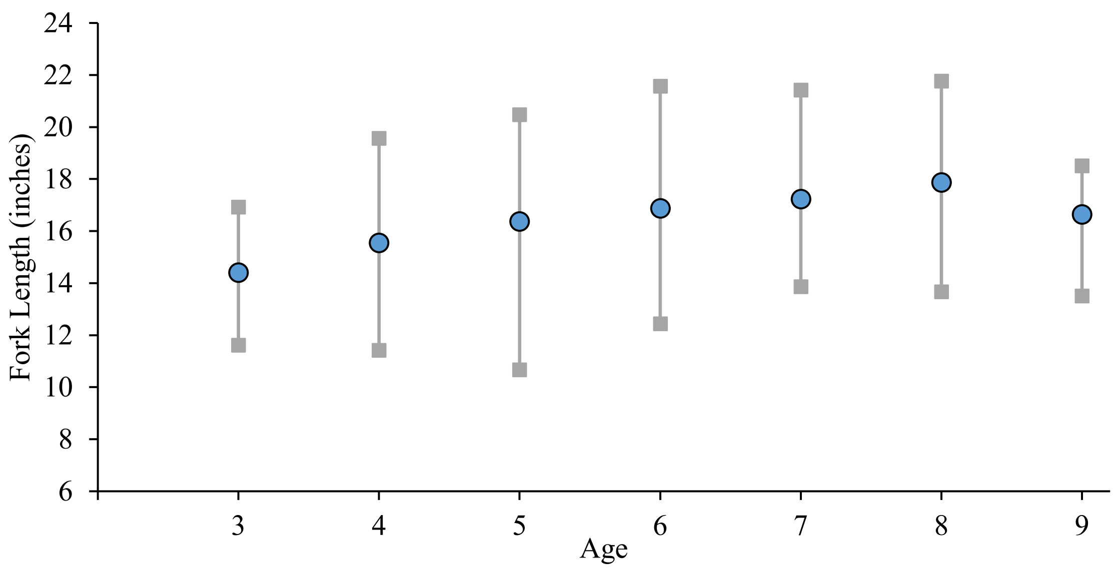

Figure 6. Male American shad length at age from all age samples collected from fishery-dependent monitoring, 1972–2022. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. Age data unavailable for 2023–2024.

Fishery-Independent Monitoring

The DMF does not have a dedicated juvenile (age 0) survey for American Shad but conducts two juvenile beach seine surveys in the Albemarle Sound area, Juvenile Anadromous Survey (Program 100). Although the surveys were designed to monitor river herring [blueback herring (*Alosa aestivalis*) and alewife (*Alosa pseudoharengus*)] and striped bass, both surveys capture American shad. The river herring beach seine survey has been conducted in the Chowan River and Albemarle Sound area to monitor Blueback Herring and Alewife abundance since 1972. The survey established 11 stations in the near-shore nursery areas of the Chowan River and Albemarle Sound, sampled twice a month. The striped bass beach seine survey has been conducted in the western Albemarle Sound to monitor juvenile striped bass since 1993. The survey established nine stations in the near-shore nursery areas of the western Albemarle Sound, where early-stage juvenile striped bass would be settling after larval metamorphosis from spawning grounds on the Roanoke River. The stations are sampled once a week, for six weeks (starting the first week in June). American shad captured are recorded but not consistently until 1995. Following the six weeks of sampling, the stations are sampled bimonthly through October.

The ASFMC 2007 benchmark assessment for American Shad only considered the juvenile river herring beach seine survey data for a relative abundance index for American Shad. Due to the consistently low level of catch since 1972, the authors felt that the survey did not adequately reflect the true abundance of juvenile American Shad and should not be used for management. During the ASMFC 2020 benchmark stock assessment for American Shad a combination of seine stations from the river herring survey (five stations) and the striped bass survey (nine stations), all samples June through October, were selected to determine a juvenile abundance starting in 1996 (zero catches in 1995). A Zero-inflated Negative Binomial GLM model was determined as the best recommended predictions of relative annual abundance. Water temperature, salinity, month and cloud cover were all shown to significantly impact catch rates and presence. The best performing model was Counts ~ Year + water temperature + salinity | salinity + cloud cover + month. Updates to annual trends in abundance are illustrated in Figure 7 as arithmetic mean, in lieu of updating the model annually. The relative abundance for 2024 was 1.27 (American Shad per tow) which is an increase from the 2023 relative abundance of zero (American Shad per tow).

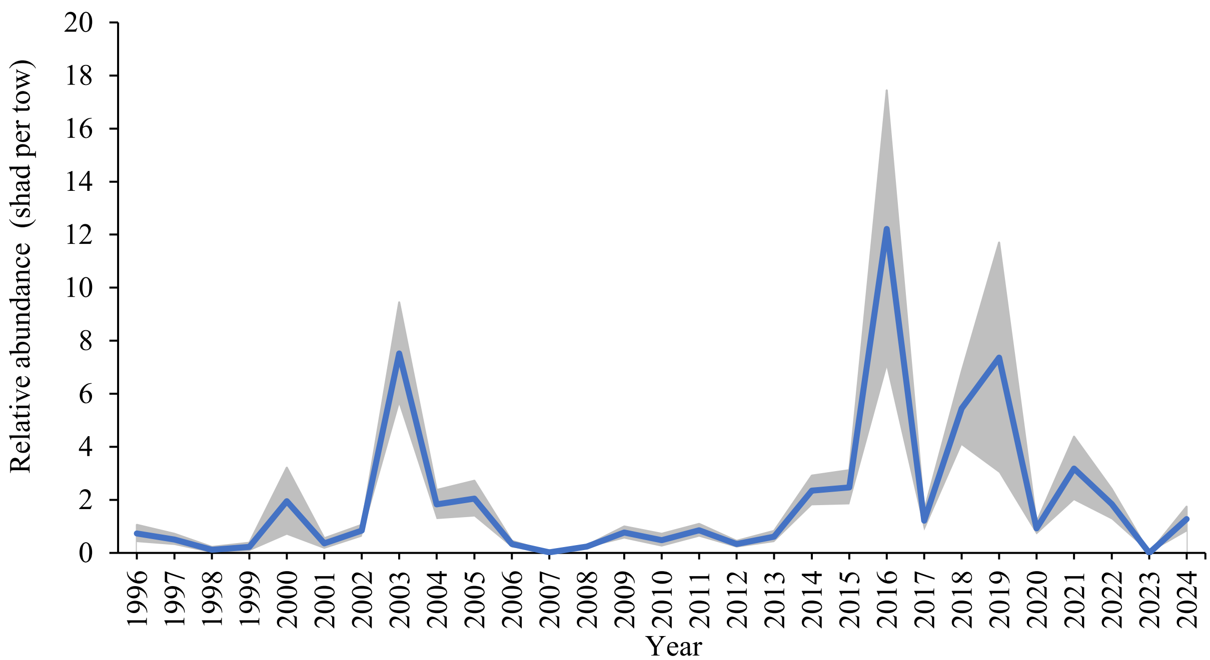

Figure 7. Relative abundance index (fish per tow) of American shad collected from Program 100 in Albemarle Sound during June through October 1996–2024. Error bars represent ± 1 standard error.

Adult American shad are monitored using the DMF Albemarle Sound Independent Gill Net Survey (Program 135) and WRC electrofishing surveys to estimate female relative abundance and relative fishing mortality in the Albemarle Sound-Roanoke River area. In other areas of the state, WRC conducts electrofishing surveys to estimate abundance and the relative fishing mortality. These data are incorporated into the North Carolina SFMP for American Shad described in more detail in the Management Strategy section.

Program 135 began collecting biological data on adult American Shad in 2000, sex was not recorded until 2004. The survey uses a stratified random sampling scheme designed to characterize the size and age distribution for key estuarine species in the Albemarle Sound. American Shad intercepted by DMF gill net surveys outside to the Albemarle Sound-Roanoke River area are reported annually to the ASMFC, due to low numbers of catch relative abundance is not estimated.

Program 135 was suspended in February 2020 due to COVID-19 restrictions and protected species interactions. The survey resumed in the fall of 2021. In November 2021, the Albemarle Sound Independent Gill Net Survey (IGNS) expanded from six to eight zones and reduced soak time from 24-hours to 12-hours. Additionally, in March 2022, sink gill nets were removed from the survey, reducing effort to 480 yards per set (12 units of effort). Additional zones were added to meet DMF research priorities to expand the spatial coverage of the survey. Soak times were reduced and sink nets were removed to reduce interactions with endangered species through ongoing consultation with the United States Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Association (NOAA Fisheries). It should be noted that with such a major change in survey design, the index derived from this survey starting in November 2021 will not be directly comparable to the prior historical time series. When calculating female relative abundance using historical IGNS data, all sink gill nets were removed. It is important to note that most American shad intercepted in the IGNS survey are from float gill nets. Therefore, the removal of sink gill nets from the data set did not significantly impact the relative abundance estimates of American shad from the survey.

The female index of abundance for American shad from Program 135 uses the January through May catch of female American shad from float nets in the western Albemarle Sound. For 2024, the female index of abundance for American shad was 0.079 fish per net (Figure 8). Due to the survey suspension index values are not available for 2020 and 2021.

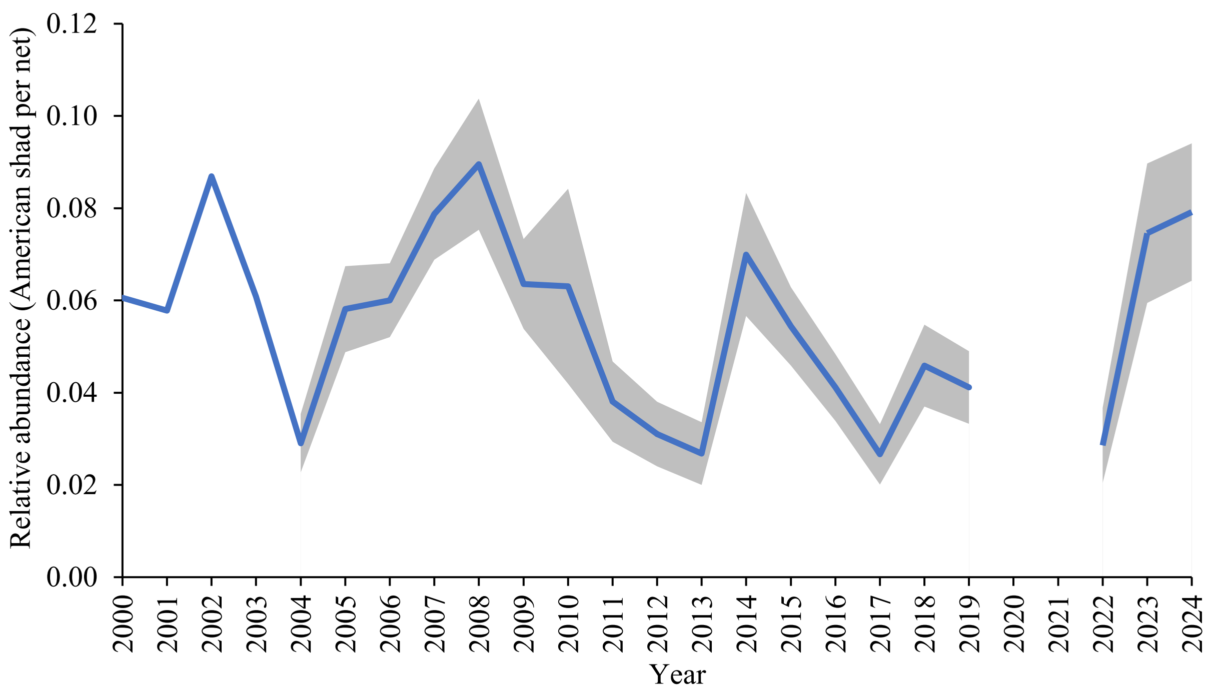

Figure 8. Relative abundance index of female American shad (fish per net, all float net mesh sizes) collected from Program 135 in Albemarle Sound during January through May 2000–2024. Error bars represent ± 1 standard error. * Survey suspended February 20, 2020, and did not resume until fall 2021.

A total of 201 females and 177 males were measured from the DMF fishery-independent monitoring (Tables 6 and 7) from all areas of the state. The average size of female American Shad is 16 inches fork length and male are 14 inches fork length.

Table 6. Mean, minimum, and maximum lengths (fork length, inches) of female American shad measured from DMF fishery-independent sampling programs, 2000–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2000	18	14	20	74
2001	17	15	21	198
2002	18	14	20	144
2003	18	15	20	161
2004	18	15	20	149
2005	18	15	20	106
2006	17	15	20	52
2007	17	14	18	35
2008	16	13	19	45
2009	17	16	19	22
2010	17	15	19	83
2011	17	15	19	14
2012	17	14	19	59
2013	17	13	19	73
2014	17	16	19	28
2015	17	16	18	18
2016	17	13	18	19
2017	17	14	19	65
2018	16	12	19	76
2019	16	6	19	95
2020	17	15	18	41
2021	17	15	18	9
2022	16	14	18	55
2023	16	9	18	66
2024	16	10	19	201

Table 7. Mean, minimum, and maximum lengths (fork length, inches) of male American shad measured from DMF fishery-independent sampling programs, 2000–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2000	16	13	19	173
2001	15	13	18	84
2002	15	12	18	135
2003	16	12	19	87
2004	17	12	19	14
2005	15	13	17	30
2006	15	13	18	14
2007	15	13	17	34
2008	14	12	17	33
2009	15	13	17	18
2010	15	12	16	40
2011	15	14	17	12
2012	15	13	17	23
2013	15	13	16	34
2014	15	14	16	11
2015	15	14	16	3
2016	15	15	16	7
2017	15	11	17	57
2018	15	12	18	80
2019	15	11	17	91
2020	15	12	16	32
2021	15	13	16	6
2022	14	12	16	36
2023	15	12	17	39
2024	14	12	17	177

Variation in modal, minimum, and maximum ages throughout the fishery-independent sampling is described in Table 8, for both sexes combined. The modal age has fluctuated over the time series, while the minimum and maximum ages have remained relatively stable.

Figure 9 and Figure 10 illustrate the American Shad length at age (mean, minimum, and maximum) for females and males from all age samples collected from the fishery-independent monitoring at any given age during 2000–2022. Age data for 2023 through 2024 are incomplete and will be provided when aging is complete

Table 8. Modal age, minimum age, maximum age, and number aged for American shad (male and female combined) collected through DMF fishery-independent sampling programs, 2000–2023. *Age data unavailable for 2024.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
2000	5	3	7	247
2001	5	3	7	282
2002	4	3	8	279
2003	6	3	8	248
2004	6	3	8	163
2005	5	3	7	136
2006	4	3	8	66
2007	4	4	7	69
2008	5	3	8	78
2009	6	4	8	40
2010	6	3	8	123
2011	6	3	8	26
2012	6	4	8	82
2013	5	3	8	107
2014	6	4	7	39
2015	6,7	3	7	21
2016	6	3	8	26
2017	6	3	8	122
2018	5	3	8	146
2019	5	3	7	152
2020	6	3	8	71
2021	5	4	7	15
2022	6	4	8	90
2023	5	3	8	123
2024	*	*	*	*

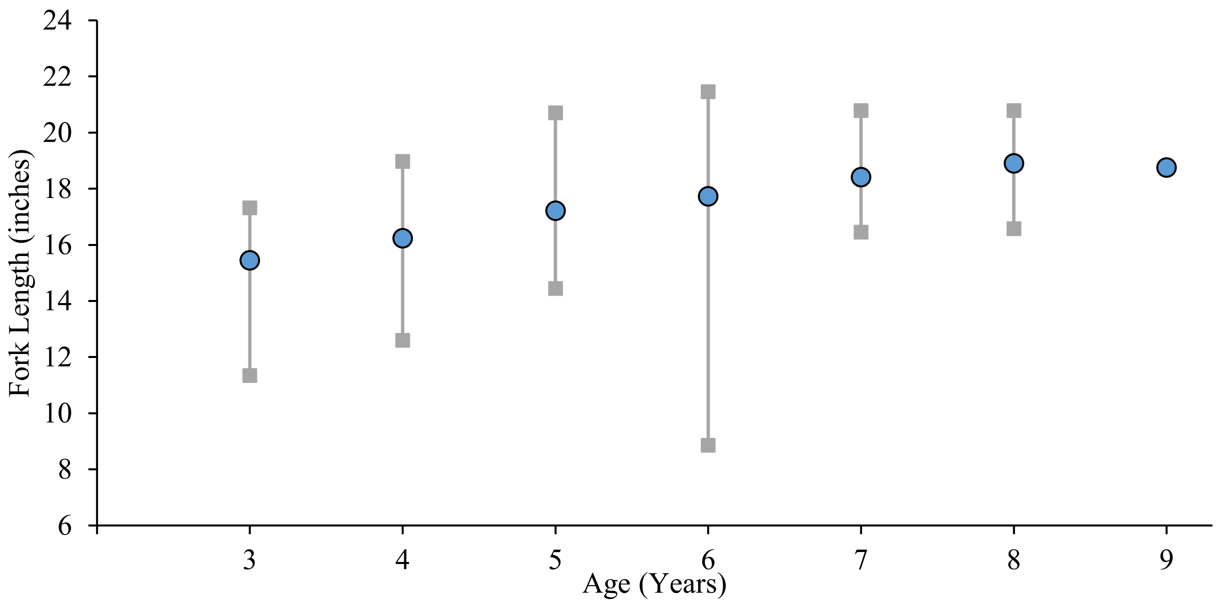

Figure 9. Female American shad length at age from all age samples collected through DMF fishery-independent sampling programs, 2000–2023. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. Age data unavailable for 2024.

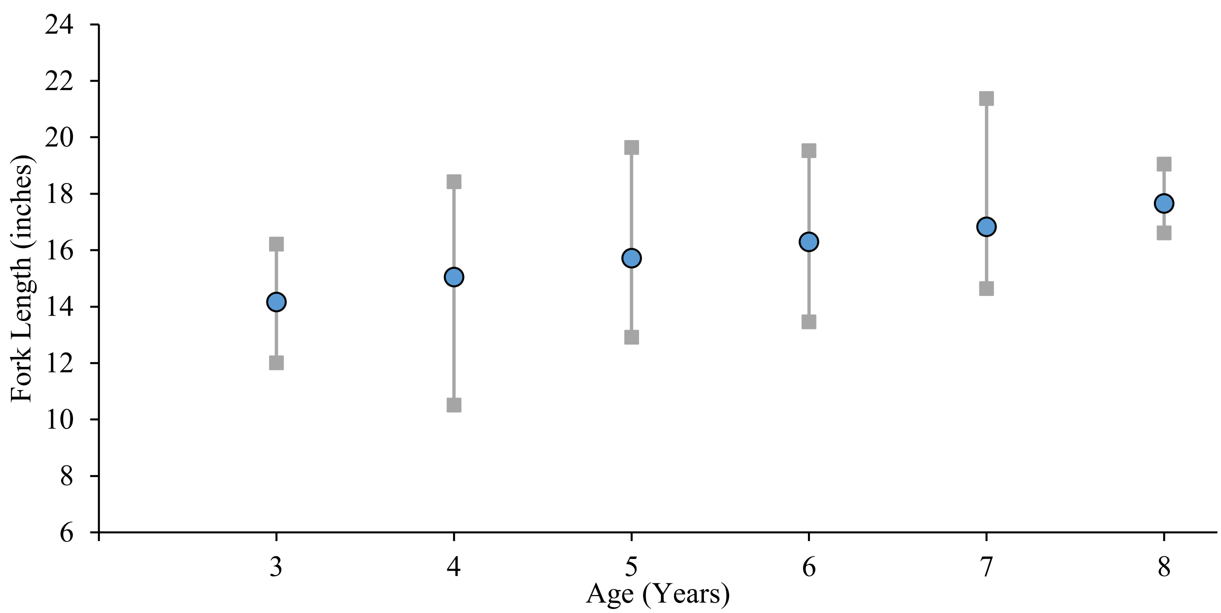

Figure 10. Male American shad length at age from all age samples collected through DMF fishery-independent sampling programs, 2000–2023. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. Age data unavailable for 2024.

RESEARCH NEEDS

On an annual basis the ASMFC publishes a prioritized list of short term and long-term research needs for American shad and river herring in the Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for Shad and River Herring (ASMFC 2020).

For more information on research needs for River herring please see: https://asmfc.org/uploads/file/653bf9e9ShadRiverHerringFMP_ReviewFY2022.pdf

MANAGEMENT

Shad are managed under Amendment 3 to the ASMFC Interstate FMP for Shad and River Herring. The Amendment requires states and jurisdictions to develop sustainable fishery management plans, which are reviewed by the ASMFC Technical Committee and approved by the ASMFC Shad and Herring Management Board, in order to maintain commercial and recreational fisheries past January 2013. The ASMFC requires that these plans be re-evaluated every five years to update and modify sustainable management measures. The first NC American Shad SFMP, effective in 2013 through 2017, identified sustainability parameters for four regions of the state: Albemarle-Roanoke River, Tar-Pamlico, Neuse, and Cape Fear River systems. Sustainability parameters are based on the female portion of the stock because the commercial fishery targets roe shad; roe landings can account for as much as 90% of the total American shad landings in a year. The second NC American Shad SFMP, approved October 2017 for 2018 through 2022, maintained the original sustainability parameters of relative fishing mortality (F) and abundance indices, but relative *F* will now be computed by dividing commercial landings by a hind cast 3-year average of a survey index. The previous plan used a centered 3-year average.

The third NC American Shad SFMP, approved January 2023 for 2023 through 2027 added a sustainability parameter for juvenile abundance in the Albemarle Sound-Roanoke River and updated female relative F parameters to include the commercial and recreational harvest for the Tar-Pamlico, Neuse, and Cape Fear river systems. Previously, relative F was computed for these systems using only information from the commercial harvest of roes (females), in pounds of fish. Commercial harvest of American shad has continued to decline due to management regulations and reduced participation in the fishery in these areas. The addition of recreational data to the relative F calculation has shortened the time-series, but the estimates are more informative of total removals from the Tar-Pamlico, Neuse, and Cape Fear river systems. Thresholds have been established for indices in each system to define levels needed to reduce mortality and avoid diminishing potential stock reproduction and recruitment. Thresholds for sustainability parameters are fixed using available survey data through 2022 and will remain fixed during the next 5-year management period.

Albemarle Sound-Roanoke River

The Albemarle Sound-Roanoke River system has four sustainability parameters: juvenile abundance, female CPUE based on the DMF Albemarle Sound Independent Gill Net Survey (IGNS, Program 135), female CPUE based on the WRC electrofishing survey, and female relative fishing mortality (F) computed by dividing commercial landings by a hind cast 3-year average of the DMF IGNS index. As written in the 2023 SFMP, exceeding the juvenile abundance, female CPUE based on Albemarle Sound IGNS or the female relative *F* parameters for three consecutive years will trigger management action. The female CPUE based on the WRC electrofishing survey will be used in conjunction with a second index for triggering management action.

Figure 11 shows the juvenile abundance index from the DMF juvenile seine survey. The juvenile abundance index did not exceed the threshold in 2024. Figure 12 shows the female CPUE based on the DMF Albemarle Sound IGNS. Figure 13 shows the CPUE based on the WRC electrofishing survey. Figure 14 shows the female relative *F* based on commercial landings and a hind cast three-year average of the DMF IGNS index.

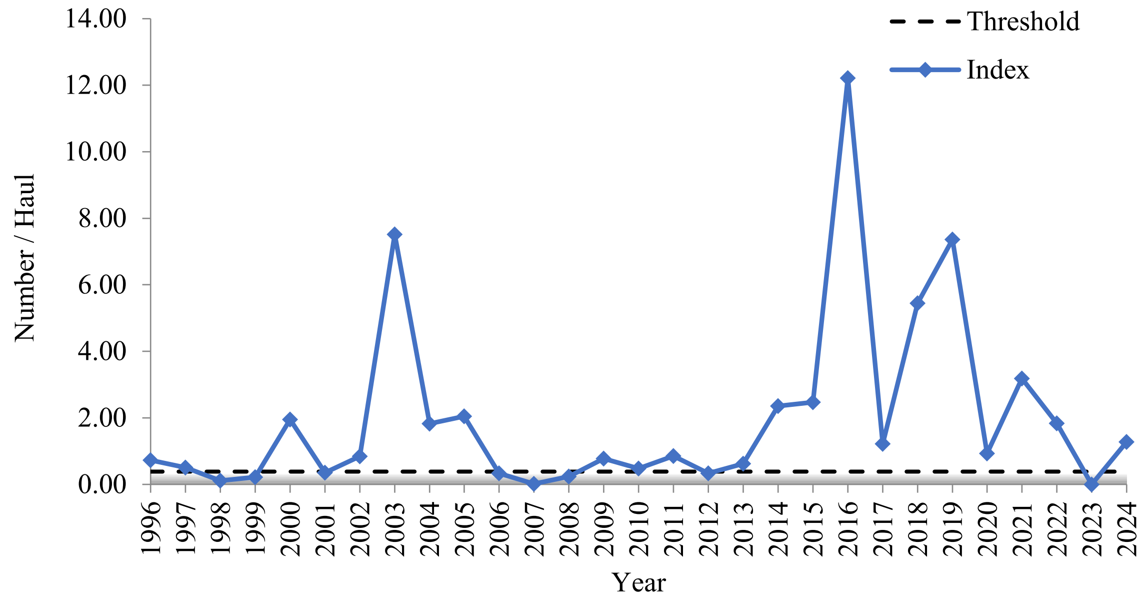

Figure 11 Juvenile abundance index from the DMF juvenile seine survey (Jun–Oct) for the Albemarle Sound, 1996–2024. Threshold represents 25th percentile (where 75% of all values are greater). Values in gray are below the threshold.

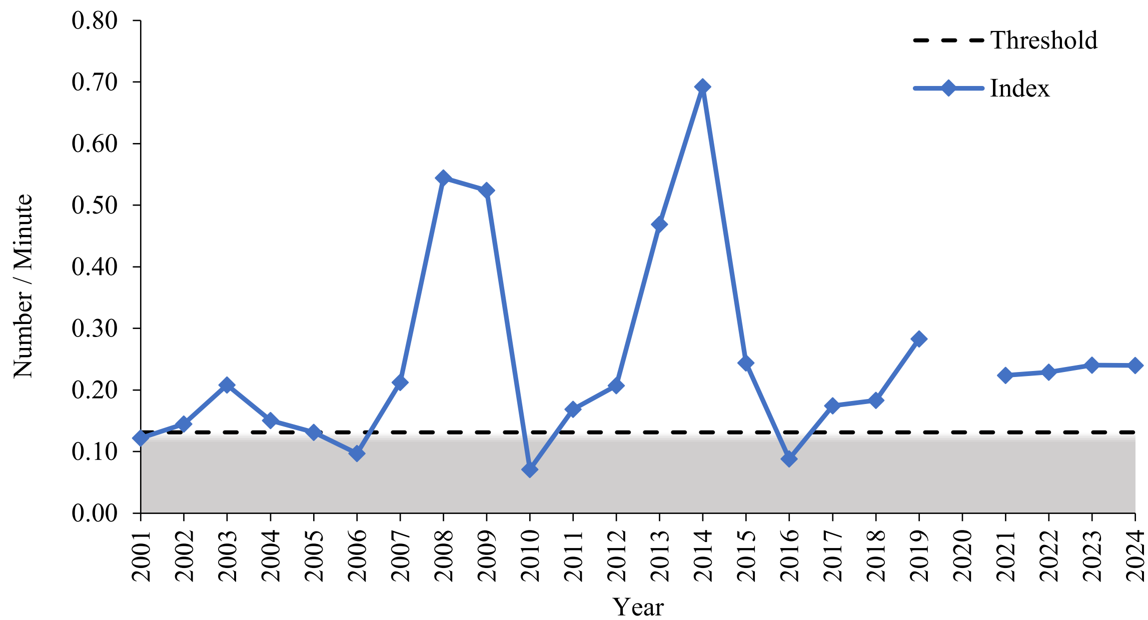

Figure 12. Female index from WRC electrofishing survey (March–May) for Roanoke River, 2001–2024. Threshold represents 25th percentile (where 75% of all values are greater). Values in gray are below the threshold. No survey data available for 2020.

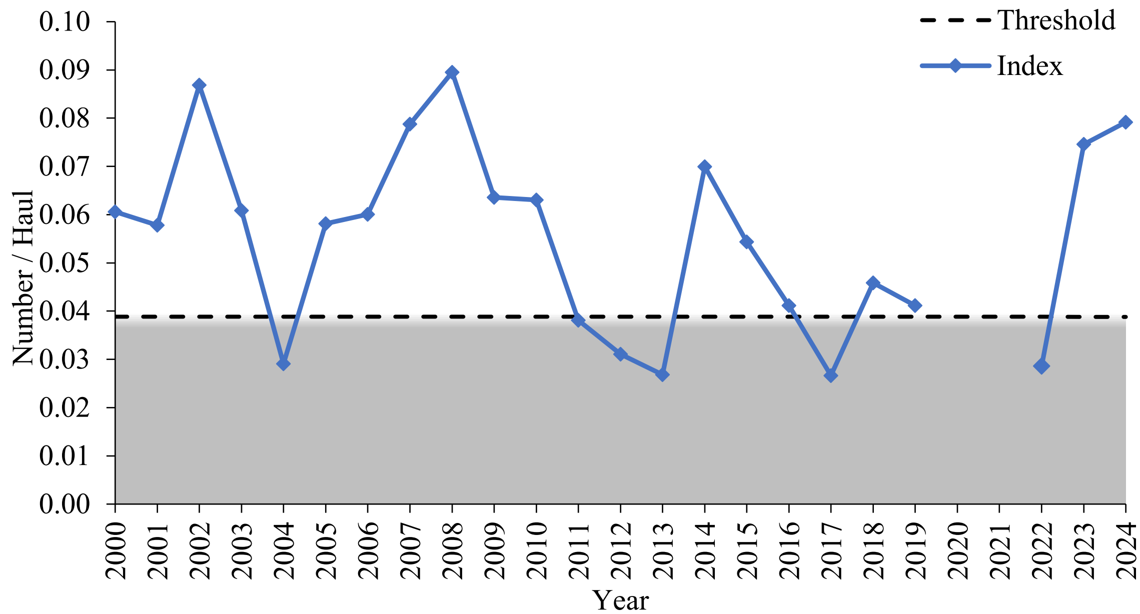

Figure 13. Female index from IGNS (January–May) for Albemarle Sound, 2000–2024. Threshold represents 25th percentile (where 75% of all values are greater. Values in gray are below the threshold. No survey data available for 2020–2021.

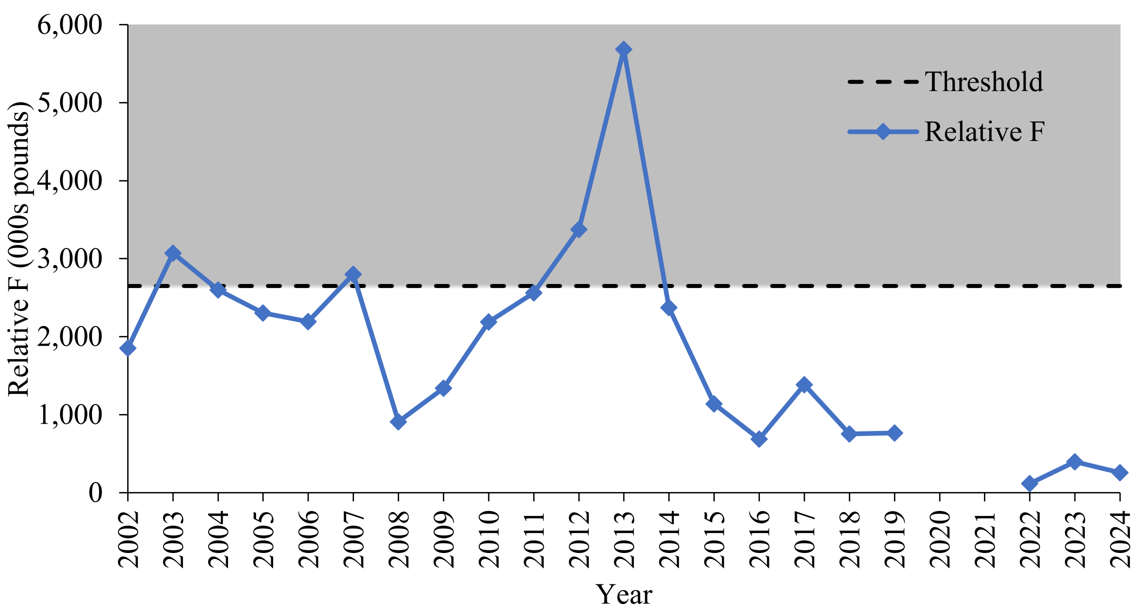

Figure 14. Albemarle Sound sustainability parameter for female relative *F* expressed in pounds of female fish, 2002–2024. The threshold represents the 75th percentile (where 25% of all values are greater), values in gray are exceeding the threshold. No survey data available for 2020 and 2021.

Tar-Pamlico River system

The Tar-Pamlico system has two sustainability parameters: female CPUE based on the WRC electrofishing survey, and female relative *F* based on the WRC electrofishing survey. Female relative *F* is calculated using the combined commercial and recreational harvest from the Tar-Pamlico River and the female CPUE index from the Tar-Pamlico River electrofishing survey.

Figure 15 shows the female CPUE based on the WRC electrofishing survey and Figure 16 shows the female relative *F* based on the WRC electrofishing survey.

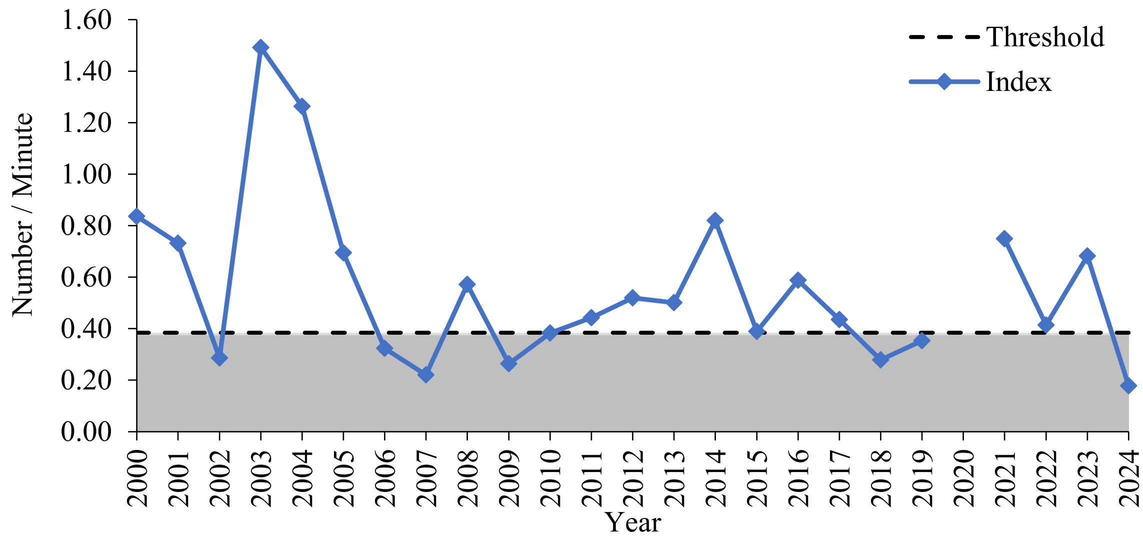

Figure 15. Female electrofishing index (March–May) for the Tar-Pamlico River, 2000–2024. The threshold represents the 25th percentile (where 75% of all values are greater). Values in gray are below the threshold. No survey data available for 2020.

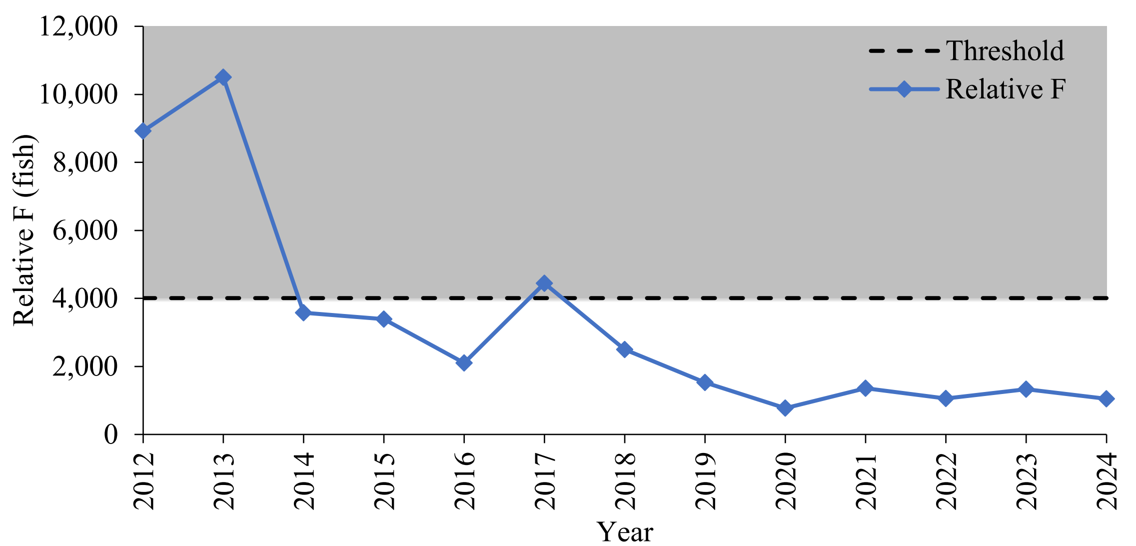

Figure 16. Tar-Pamlico River system sustainability parameter for female relative *F* in WRC electrofishing survey, 2002–2024. The threshold represents the 75th percentile (where 25% of all values are greater), values in gray are exceeding the threshold.

Neuse River system

The Neuse River system has two sustainability parameters: female CPUE based on the WRC electrofishing survey, and female relative *F* based on the WRC electrofishing survey. Female relative F is calculated using the combined commercial and recreational harvest from the Neuse River and the female CPUE index from the Neuse River electrofishing survey.

Figure 17 shows the female CPUE based on the WRC electrofishing survey and Figure 18 shows the female relative *F* based on the WRC electrofishing survey.

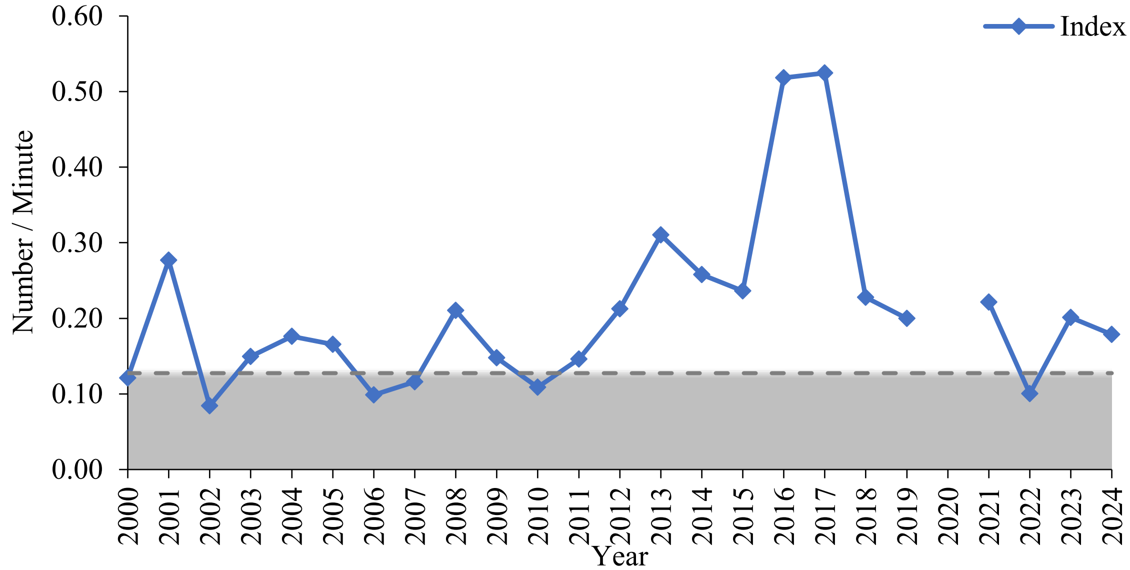

Figure 17. Female electrofishing index (March–May) for the Neuse River, 2000–2024. The threshold represents the 25th percentile (where 75% of all values are greater). Values in gray are below the threshold. No survey data available for 2020.

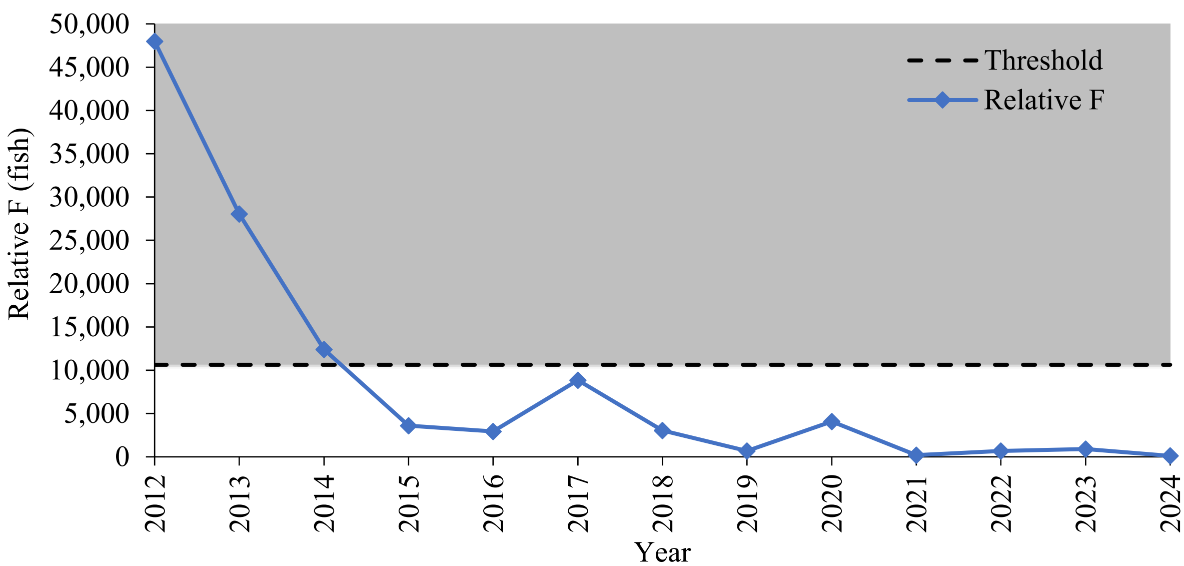

Figure 18. Neuse River system sustainability parameter for female relative F in WRC electrofishing survey, 2002–2024. The threshold represents the 75th percentile (where 25% of all values are greater), values in gray are exceeding the threshold.

Cape Fear River system

The Cape Fear River system has two sustainability parameters: female CPUE based on the WRC electrofishing survey, and female relative *F* based on the WRC electrofishing survey. Female relative F is calculated using the combined commercial and recreational harvest from the Cape Fear River and the female CPUE index from the Cape Fear River electrofishing survey.

Figure 19 shows the female CPUE based on the WRC electrofishing survey and Figure 20 shows the female relative *F* based on the WRC electrofishing survey.

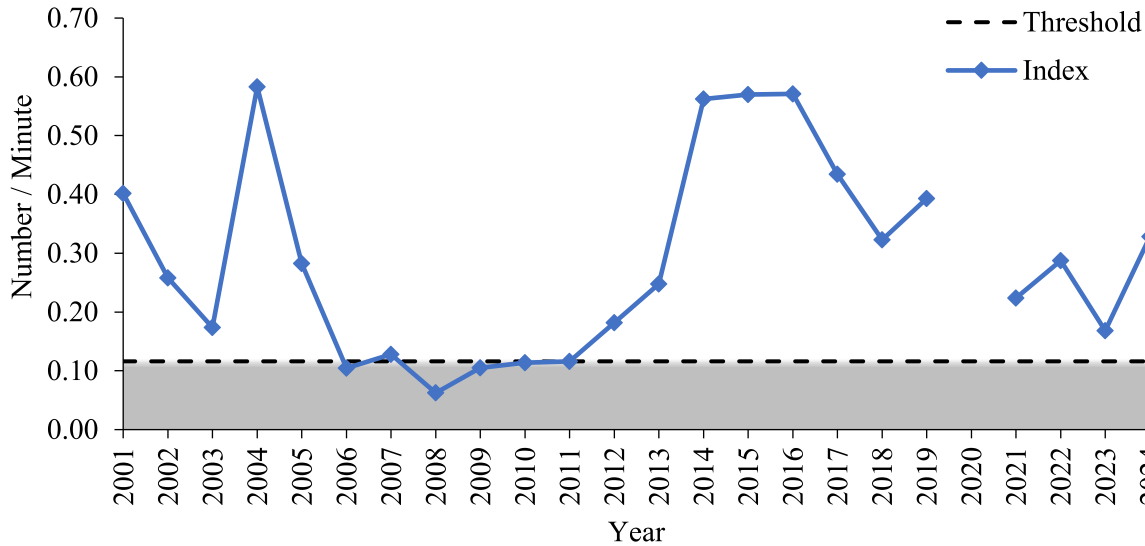

Figure 19. Female electrofishing index (March–May) for the Cape Fear River (LD-1 and LD-2, only), 2001–2024. The threshold represents the 25th percentile (where 75% of all values are greater). Values in gray are below the threshold. No survey data available for 2020.

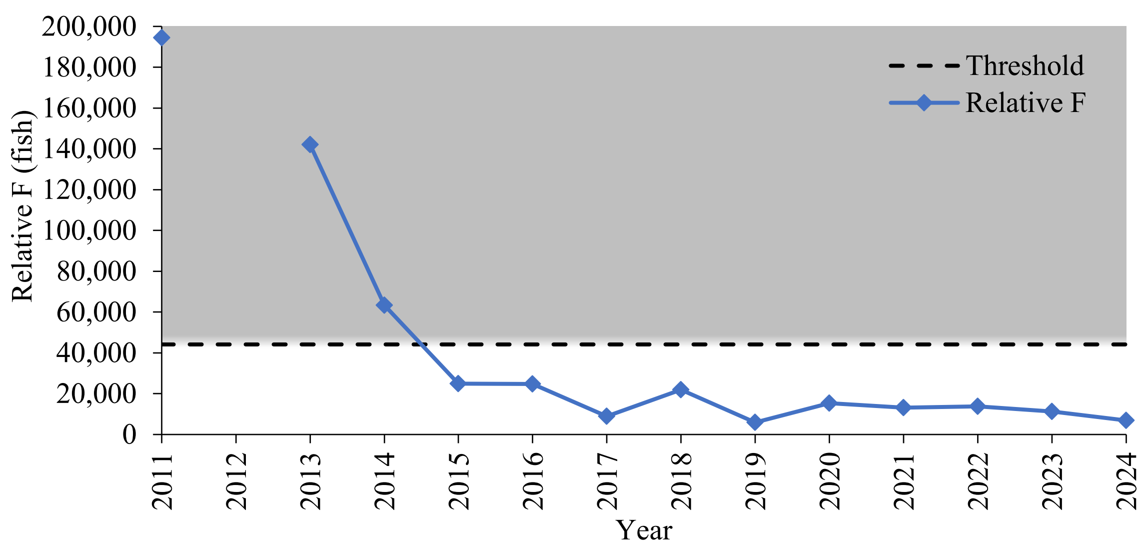

Figure 20. Cape Fear River system sustainability parameter for female relative F in WRC electrofishing survey, 2011–2024. The threshold represents the 75th percentile (where 25% of all values are greater), values in gray are exceeding the threshold.

All Other Internal Coastal and Joint Fishing Waters

The areas without specified sustainability parameters will fall under statewide management measures listed in the following section. The DMF monitors commercial landings through the North Carolina Trip Ticket Program to ensure landings remain low. Dedicated monitoring programs or area closures will be implemented if sudden increases in landings, indicating targeted effort, occur.

Management Measures for 2025

Recreational

Statewide Internal Waters including Albemarle Sound-Roanoke River, Neuse River, except as exempted below:

- It is unlawful to possess more than ten (10) American shad or hickory shad in the aggregate, per person per day taken by hook-and-line or for recreational purposes and only one (1) of the ten (10) may be an American shad.

Tar-Pamlico River, Pee Dee River

- It is unlawful to possess more than ten (10) American shad or hickory shad, in the aggregate, per person per day taken by hook-and-line or for recreational purposes.

Cape Fear River

- It is unlawful to possess more than ten (10) American shad or hickory shad in the aggregate, per person per day taken by hook-and-line or for recreational purposes and only five (5) of the ten (10) may be an American shad.

Commercial

Albemarle Sound Coastal and Joint Fishing Waters

- For 2025, a commercial season of February 15–April 14 has been established based on sustainability parameters for this system.
- The commercial season may occur anytime between January 1–April 14 for the 5-year tenure of this plan.

Tar-Pamlico River, Neuse River Coastal and Joint Fishing Waters

- For 2025, a commercial season of February 15–April 14 has been established based on sustainability parameters for this system.
- The commercial season may occur anytime between February 15–April 14 for the 5-year tenure of this plan.

Cape Fear River Coastal and Joint Fishing Waters

- For 2025, a commercial season of February 20–April 11 has been established based on sustainability parameters for this system.
- The commercial season may occur anytime between February 20–April 11 for the 5-year tenure of this plan.

All Other Internal Coastal and Joint Fishing Waters

- For 2025, a commercial season of February 15–April 14 has been established based on the Tar-Pamlico River, Neuse River, and Cape Fear River sustainability parameters.
- The commercial season may occur anytime between February 15–April 14 for the 5-year tenure of this plan.

While none of the selected sustainability parameters for any of the river systems have exceeded the triggers for management since 2013, the above measures for 2024 are considered prudent given the results of the 2020 stock assessment as they pertain to North Carolina. The Albemarle Sound is the only system in North Carolina where abundance status, relative to historic levels, was determined to be not depleted. The overall status for the other areas remains unknown, in large part due to a lack of juvenile data. The Albemarle Sound adult total mortality rate was determined sustainable, and abundance determined to be not overfished. Additionally, the Albemarle Sound juvenile abundance demonstrated an increasing trend during 2005–2017, the selected time period for abundance trends (ASMFC 2020). Given the Albemarle Sound status determination and the management measures in place for striped bass conservation also benefiting American shad (Section 4.2.1), the ASWG elected to expand the potential time frame in which the Albemarle Sound commercial fishery can occur from March 3–24 to January 1–April 14. The expanded time frame allows for flexibility in management to ensure that the fishery remains sustainable while maximizing the opportunity to stakeholders impacted by management restrictions for striped bass in this area. Commercial seasons, for all areas, will be determined after DMF and WRC jointly review the performance of the plan, annually, to determine management measures for the following season. Future changes to creel limits for American shad in the Inland Fishing Waters of the other river systems will also be complemented by DMF for Joint and Coastal Fishing Waters.

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FISHERY MANAGEMENT PLAN UPDATE
ATLANTIC CROAKER
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	ASMFC FMP	October 1987
	Amendment 1	November 2005
	Addendum I	March 2011
	Addendum II	March 2014
	Addendum III	February 2020
Comprehensive Review:	In Progress	

The original Fishery Management Plan (FMP) for Atlantic croaker was adopted in 1987 by the Atlantic States Marine Fisheries Commission and included states from Maryland through Florida (ASMFC 1987). Upon review of the FMP, the South Atlantic State/Federal Fisheries Management Board (here after referred to as the Board) determined the management recommendations were vague and that an amendment was needed to better define the management measures necessary to achieve the FMP goals. The Interstate Fisheries Management Program Policy Board adopted the finding that the original FMP did not contain any management measures that states were required to implement (ASMFC 2014).

In 2002, the Board directed the Atlantic Croaker Technical Committee to conduct the first coast wide stock assessment in preparation for an amendment. The stock assessment was developed in 2003 and approved by a Southeast Data Assessment Review panel for management use in June 2004. Amendment 1 was approved in November 2005 and fully implemented by January 1, 2006 (ASMFC 2005).

Amendment 1 expanded the original management area to include the states of Delaware and New Jersey and defined two management regions: the mid-Atlantic region which included states from New Jersey through North Carolina and the south-Atlantic region, which included states from South Carolina through the east coast of Florida (ASMFC 2005).

Amendment 1 established biological reference points to define the overfished and overfishing stock statuses for the mid-Atlantic region only. Amendment 1 did not require specific measures to restrict recreational or commercial harvest, though states with more conservative measures in place were encouraged to maintain those regulations. Amendment 1 also specified that, through adaptive management, the Board may revise Amendment 1. Regulatory and/or monitoring requirements could be included in the resulting addendum along with procedures for determining de minimis status and implementing alternative management programs via conservation equivalency.

Amendment 1 specified triggers for assessment of the stock in non-assessment years. However, if the technical committee felt there was sufficient evidence of changes in the stock, a stock assessment could be initiated in the absence of hitting the triggers. The triggers considered by the technical committee included relative percent change in landings, biological data monitoring, effort vs. landings, Marine Recreational Information Program catch per unit effort (CPUE), along with state and regional surveys.

Addendum I to Amendment 1 was initiated in August 2010 to modify the management area and biological reference points for Atlantic croaker, based on results from the 2010 stock assessment. The assessment evaluated the Atlantic croaker population as a single coast wide stock, whereas Amendment 1 divided the coast into two management regions. To fully utilize the stock assessment in managing the population, Addendum I consolidated the stock into one management unit and established a procedure by which the Board could approve peer-reviewed biological reference points without a full administrative process such as an amendment or addendum (ASMFC 2011).

Addendum II to Amendment 1 was initiated in February 2014 and approved in August 2014. Addendum II established the use of the Traffic Light Approach (TLA) as a precautionary management framework (Caddy and Mahon 1995; Caddy 1998, 1999; Caddy 2002). The TLA is preferred for fast-growing, early maturing species like Atlantic croaker because it is more important to respond to multi-year trends rather than annual changes. The TLA more effectively illustrates long term trends than the triggers established by Addendum I. The management framework utilizing the TLA replaced the management triggers stipulated in Addendum I (ASMFC 2014). The harvest component of the TLA is a composite of commercial and recreational harvest data. The population, or adult abundance, component is a composite of fishery independent survey indices (e.g., Northeast Fishery Science Center (NEFSC) and Southeast Area Monitoring and Assessment Program (SEAMAP)). If thresholds for both population characteristics meet or exceed thresholds for a three-year period, management measures are triggered.

In February 2020, the Board approved Addendum III to Amendment 1, which revised the TLA's trigger mechanism and management response for the recreational and commercial fisheries (ASMFC 2020a). Addendum III incorporated the use of a regional approach (Mid-Atlantic NJ-VA and South Atlantic NC-FL) to better reflect localized fishery trends and changed the TLA to trigger management action if three of the four terminal years exceed threshold levels. State-specific management action is initiated when the proportion of red exceeds specified thresholds (30% or 60%) for both harvest and abundance. If management action is triggered, the coastwide response includes recreational bag limits and quantifiable measures to achieve percent reductions in commercial harvest. Response requirements vary depending on which threshold is exceeded. Addendum III also defines the mechanism by which triggered management actions may be removed, after abundance characteristics are no longer triggering management action. The TLA is reviewed annually in September. For additional information and links to the above-mentioned FMP, amendment, and addendums please refer to the ASMFC webpage for Atlantic croaker (http://www.asmfc.org/species/atlantic-croaker).

The North Carolina Wildlife Federation submitted a petition for rulemaking on November 2, 2016, and a modification to the petition on January 12, 2017. The petitioner put forth seven rules to designate nursery areas, restrict gear and seasonality in the shrimp trawl fishery to reduce bycatch of fish (including spot, Atlantic croaker, and weakfish), and establish an eight-inch minimum size limit for spot and a 10-inch minimum size limit for Atlantic croaker. At its February 2017 business meeting, the North Carolina Marine Fisheries Commission passed a motion to approve the petitioned rules to begin the rulemaking process. Upon review by the Office of State Budget and Management it was determined that sufficient state funds are not available to implement the proposed rule changes without undue detriment to the agency's existing activities and the rules were never adopted.

To ensure compliance with interstate requirements, North Carolina also manages Atlantic croaker under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries. The goal of the North Carolina FMP for Interjurisdictional Fisheries is to adopt FMPs, consistent with North Carolina Law, approved by the Mid-Atlantic Fishery Management Council (MAFMC), South Atlantic Fishery Management Council (SAFMC), or the Atlantic States Marine Fisheries Commission (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 goal of the councils and ASMFC plans, established under the Magnuson-Stevens Fishery Conservation Management Act (federal councils) and the Atlantic Coastal Fisheries Cooperative Management Act (ASMFC) are similar to the goals of the N.C Fisheries Reform Act of 1997 to "ensure long-term viability" of the fisheries (NCDMF 2015).

Management Unit

New Jersey through the east coast of Florida.

Goal and Objectives

The goal of Amendment 1 is to utilize interstate management to perpetuate the self-sustaining Atlantic croaker resource throughout its range and generate the greatest economic and social benefits from its commercial and recreational harvest and utilization over time. The four objectives of Amendment 1 are to:

- Manage the fishing mortality rate to provide adequate spawning potential to sustain long-term abundance of the population.
- Manage the stock to maintain the spawning stock biomass above the target biomass levels and restrict fishing mortality to rates below the threshold.
- Develop a management program for restoring and maintaining essential habitat.
- Develop research priorities that will further refine the management program to maximize the biological, social, and economic benefits derived from the population.

DESCRIPTION OF THE STOCK

Biological Profile

Atlantic croaker (*Micropogonias undulatus*) inhabit marsh, submerged aquatic vegetation, mud, and sand-bottom areas (Odell et al. 2017) from the Gulf of Maine to Argentina, but are most abundant from the Chesapeake Bay to northern Florida. However, the center of Atlantic croaker distribution is forecast to shift northward due to climate change (Hare et al. 2010). Atlantic croaker feed on shrimp, crabs, worms, shellfish, and small fishes (Powers et al. 2005; Nye et al. 2011). Atlantic croaker have a protracted spawning season beginning in the early fall and extending through December with a peak during September and October (White and Chittenden 1977; Barbieri et al. 1994). Eggs and recently hatched larvae spawned in ocean waters drift toward land and the advanced larval stages and juveniles continue their migration inshore by actively swimming into estuarine nursery areas (Odell et al. 2017). Maximum recruitment (the number of fish entering the population) of juveniles is usually in the spring, with movement to offshore waters in the fall (Haven 1959; Norcross and Austin 1988). Higher overwinter survival of juvenile Atlantic croaker has been linked to increased winter water temperatures (Hare and Able 2007; Morley et al. 2016).

Atlantic croaker grow quickly and can reach sizes over 20 inches (Ross 1988). Most Atlantic croaker are mature by the end of their first year (White and Chittenden 1977; Barbieri et al. 1994; ASMFC 2010), with length at 50 percent maturity generally falling between seven- and nine-inches total length (Barbieri et al. 1994; ASMFC 2010; NCDMF 2021a). While it is uncommon to see Atlantic croaker over age 10 (NCDMF 1999; Bobko et al. 2003), the oldest observed specimen, caught in the Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAP), was 17 years.

Stock Status

Currently, because there is no approved stock assessment, the stock status for Atlantic Croaker with relation to overfishing or overfished is unknown.

To evaluate the status of the stock between stock assessments, the TLA established under Addendum II and revised under Addendum III, is reviewed annually in years when an assessment is not already being conducted.

Results of the 2024 TLA (2023 terminal year) indicated harvest indices for both regions exceeded 30% in at least three of the last four years, with the Mid-Atlantic harvest composite index exceeding 60% red in all four years and the South Atlantic index exceeding 30% in all four terminal years (Figure 1, ASMFC 2024). The harvest composite index exceeded 30% in the South Atlantic for the ninth year in a row. For both regions, 2023 trends were consistent with recent years but cannot be used as trigger mechanisms because catch restrictions have been in place since 2021. The adult abundance (age 2+) composite characteristic exceeded the 30% red threshold in all four terminal years, and 60% threshold in two of the four terminal years in the Mid-Atlantic region, indicating moderate concern (ASMFC 2024). The South Atlantic abundance index did not trigger at the 30% or 60% levels (Figure 2, ASMFC 2024). The adult composite index in the South Atlantic has indicated an increasing or stable trend for several consecutive years.

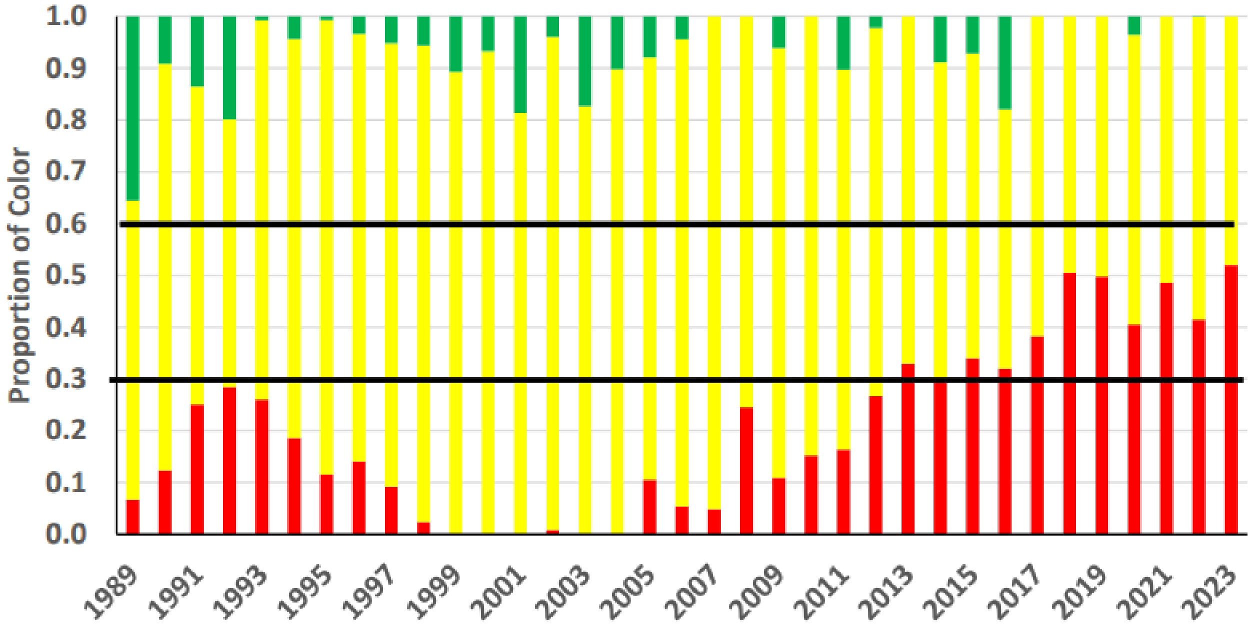

Figure 1. Annual color proportions for the harvest composite TLA of South Atlantic region (NC-FL) Atlantic croaker recreational and commercial landings, 1989–2023 (ASMFC 2024). The reference period is 2002–2012.

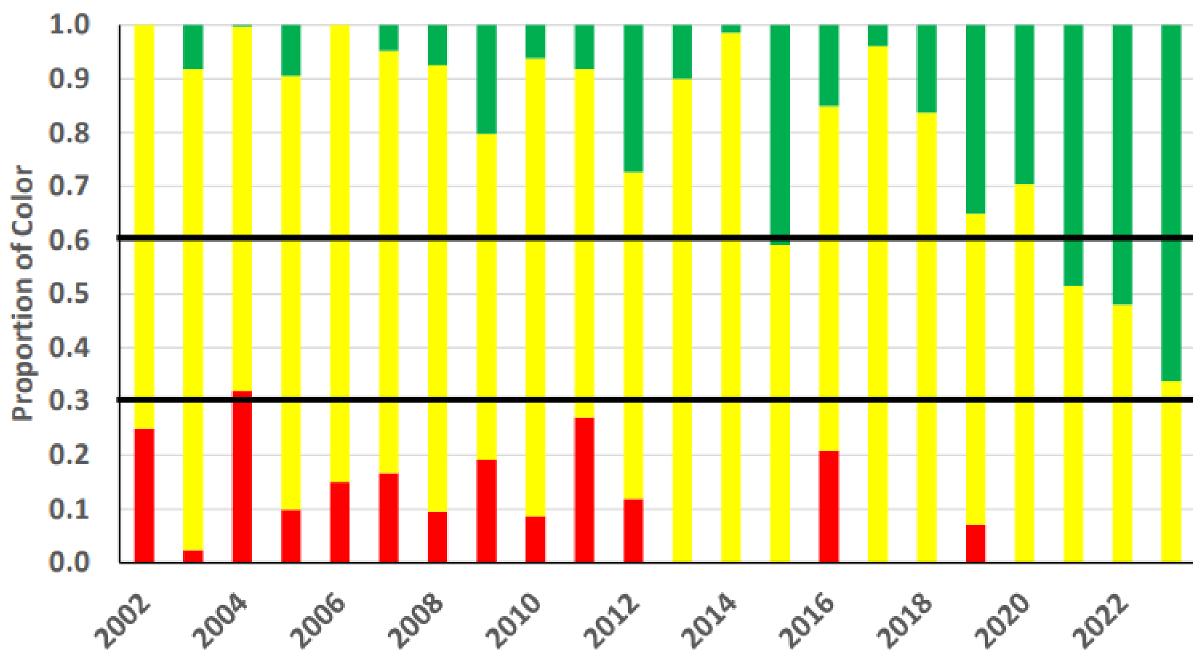

Figure 2. Annual color proportions for the abundance composite TLA of South Atlantic region (NC-FL) for adult (age 2+) Atlantic croaker fishery independent indices (SEAMAP and SCDNR trammel survey), 2002–2023. The reference period is 2002–2012.

Stock Assessment

The next Atlantic croaker Benchmark Stock Assessment is currently in progress and is scheduled for completion in 2026. The most recent benchmark stock assessment, completed in 2017, did not pass peer review and will not be used for management. The assessment was not recommended for management because of concern over uncertainty in biomass estimates due to conflicting signals among abundance indices and catch time series as well as sensitivity of model results to assumptions and model inputs (ASMFC 2017, ASMFC 2019). The review panel noted that discard estimates from the shrimp trawl fishery was an improvement from the last assessment and recommended shrimp trawl discard estimates be incorporated into annual monitoring using the TLA.

For reference, the most recent stock assessment accepted for use in management was completed in 2010 (ASMFC 2010). Results of the 2010 stock assessment indicated the population was not experiencing overfishing and was likely not overfished. The assessment indicated biomass had been increasing and the age-structure of the population had been expanding since the late 1980s. Biological reference points in the 2010 stock assessment are ratio based. Overfishing is occurring if F/FMSY is greater than 1 and the stock is considered overfished if SSB/(SSBMSY(1-M)) is less than 1.

DESCRIPTION OF THE FISHERY

Current Regulations

The 2020 TLA update (2019 terminal year) for Atlantic croaker triggered at the 30% threshold and coastwide management action as outlined in Addendum III was enacted in March 2021. The management response outlined in Addendum III specifies, non de minimis states are required to implement a 50 fish bag limit for their recreational fishery and must reduce commercial harvest by 1% of the average state commercial harvest from the previous 10 years.

In North Carolina, the 50 fish per person per day recreational bag limit became effective April 15th, 2021 (FF-24-2021) and has remained in place. The Atlantic croaker commercial fishery closed December 16th through December 31st, in 2021, 2022, 2023, and 2024 to meet the required 1% reduction (FF-65-2021, FF-58-2022, FF-59-2023, FF-50-2024). Measures were required to remain in place for at least three years and future TLA updates could determine future management action after this time. The TLA was not updated until 2024 because of missing data due to the COVID-19 pandemic, vessel changes in contributing surveys, and because the benchmark stock assessment was originally planned for completion in 2024. Given that the stock assessment is now scheduled for completion in 2026, the Atlantic Croaker Technical Committee recommended and the Sciaenid Board approved current management measures to remain in place until results from the stock assessment are available.

Commercial Fishery

Data collected from the North Carolina Trip Ticket program indicates commercial harvest was at its greatest in the late 1990's to early 2000s' peaking at 14,429,197 pounds in 2003 and has generally declined over the past two decades (Table 1; Figure 4). Commercial landings in 2024 increased by 201,059 pounds from 2023 landings and were the highest since 2021. Landings in 2023 (249,468 lb) were the lowest since 1994. The sharp increase in landings was contributed primarily by the ocean gill net fishery, which harvested 123% more fish in 2024 relative to 2023 (Figure 5). The ocean gill net fishery overtook the flynet fishery as the predominant source of Atlantic croaker landings in 2011 and accounted for 81% of the total commercial landings in 2024. The estuarine gill net fishery is the second most dominant fishery for Atlantic croaker and contributed 18% of landings in 2024. Atlantic croaker are a component of the scrap or bait fishery in North Carolina, but this component generally makes up a small percentage of landings.

Table 1. Atlantic croaker recreational harvest and number released (Marine Recreational Information Program) and commercial harvest (North Carolina Trip Ticket Program), 1994–2024. All weights are in pounds.

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1994	1,921,848	4,302,429	557,403	4,615,754	5,173,157
1995	1,632,366	2,024,031	602,628	6,021,304	6,623,932
1996	1,224,357	2,051,175	564,016	9,961,842	10,525,858
1997	1,142,169	2,367,265	550,949	10,711,667	11,262,616
1998	865,487	2,038,932	376,255	10,865,897	11,242,152
1999	1,042,224	2,848,626	525,970	10,185,507	10,711,477
2000	860,246	3,475,554	394,037	10,122,627	10,516,664
2001	1,285,029	2,387,491	647,119	12,017,424	12,664,543
2002	1,265,031	2,218,039	651,611	10,189,153	10,840,764
2003	1,127,298	2,765,303	708,487	14,429,197	15,137,684
2004	1,218,206	3,407,280	683,113	11,993,003	12,676,116
2005	672,437	3,038,472	323,380	11,903,292	12,226,672
2006	1,376,403	6,381,434	498,741	10,396,554	10,895,295
2007	1,058,663	3,933,603	336,486	7,271,163	7,607,649
2008	678,638	3,274,873	275,052	5,791,769	6,066,821
2009	958,128	5,623,278	359,703	6,135,452	6,495,155
2010	1,280,446	4,571,287	638,817	7,312,159	7,950,976
2011	873,659	7,005,152	360,390	5,054,186	5,414,576
2012	848,495	3,878,710	307,338	3,106,616	3,413,954
2013	1,300,804	6,729,556	453,881	1,927,938	2,381,819
2014	1,935,961	10,347,332	758,751	2,629,908	3,388,659
2015	1,437,019	9,632,560	557,735	1,819,020	2,376,755
2016	1,109,570	7,254,382	443,728	2,092,287	2,536,015
2017	666,930	4,631,445	237,160	1,008,015	1,245,175
2018	472,917	4,311,368	164,644	1,650,316	1,814,960
2019	651,268	3,634,211	224,337	1,278,340	1,502,677
2020	673,377	5,560,605	223,685	570,423	794,108
2021	1,066,533	9,539,047	376,121	540,619	916,740
2022	1,110,382	7,914,042	481,721	357,281	839,002
2023	597,690	4,722,440	201,056	249,463	450,519
2024	852,372	6,976,866	363,595	450,527	814,122
Mean	1,071,160	4,801,509	446,707	5,892,216	6,338,923

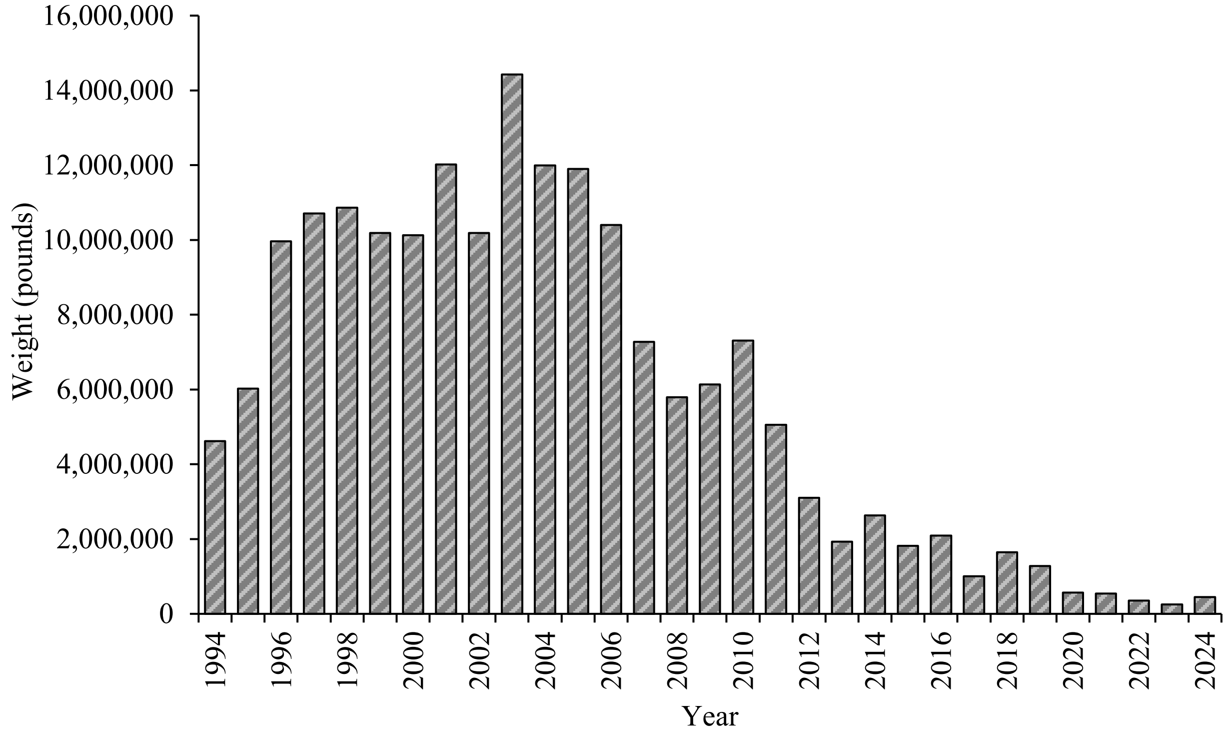

Figure 4. Annual commercial landings (North Carolina Trip Ticket Program) in pounds for Atlantic croaker in North Carolina, 1994–2024.

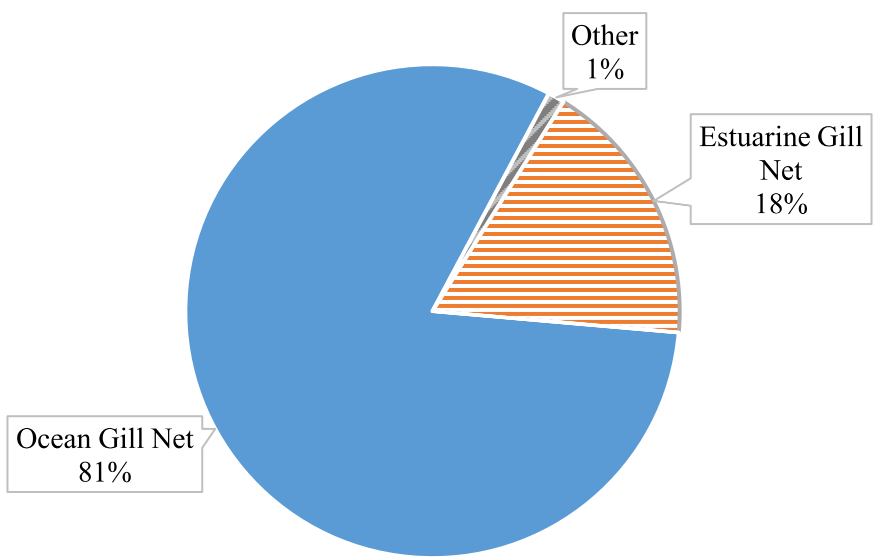

Figure 5. Commercial harvest of Atlantic croaker by gear, 2024. Other gears include swipe net, beach seine, crab pots, haul seines and pound nets.

Recreational Fishery

Atlantic croaker are targeted recreationally by shore-based anglers and those fishing from private vessels during the summer and fall. From 1994 through 2024 recreational harvest of Atlantic croaker in North

Carolina ranged from 164,644 to 758,751 pounds or between 472,917 and 1,935,961 fish (Table 1; Figure 6). Harvest by weight declined between 2014 and 2018 before increasing from 2019 to 2022 and decreasing again in 2023. Recreational harvest by weight increased in 2024 by 81% over 2023. The lowest harvest by weight in in the time series occurred in 2018, and the second lowest value occurred in 2023. The number of individuals harvested followed similar trends, declining from 2014 to the lowest value in the time series in 2018, then increasing until 2022, decreasing in 2023, and increasing in 2024 (43% increase over 2023).

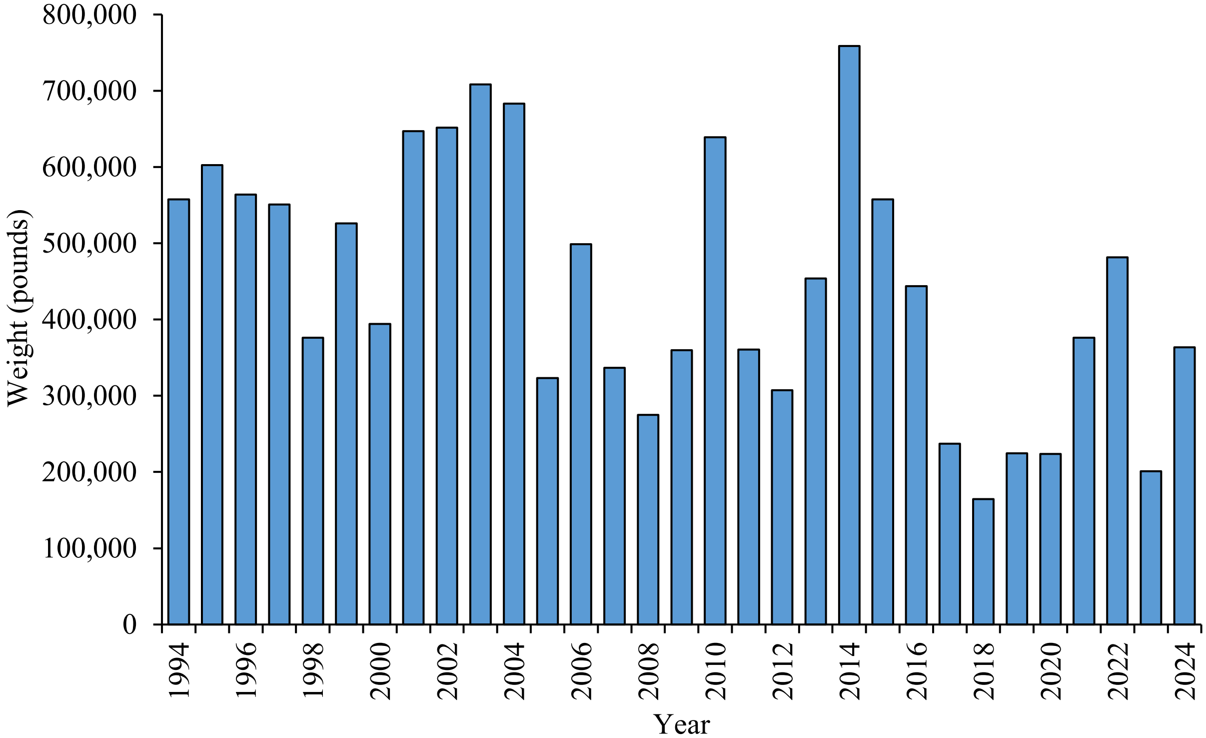

Figure 6. Annual recreational harvest (Marine Recreational Information Program) in pounds for Atlantic croaker in North Carolina, 1994–2024.

The number of recreational releases has been variable over the time series with noticeable peaks in 2014 and 2021 (Table 1; Figure 7). The percentage of releases steadily increased between 1994 and 2024, ranging from 30% in 1989 to 90% in 2020. In 2024, anglers released 6,976,866 fish, a 48% increase from 2023, with the percentage of fish released remaining at 89% for both 2023 and 2024.

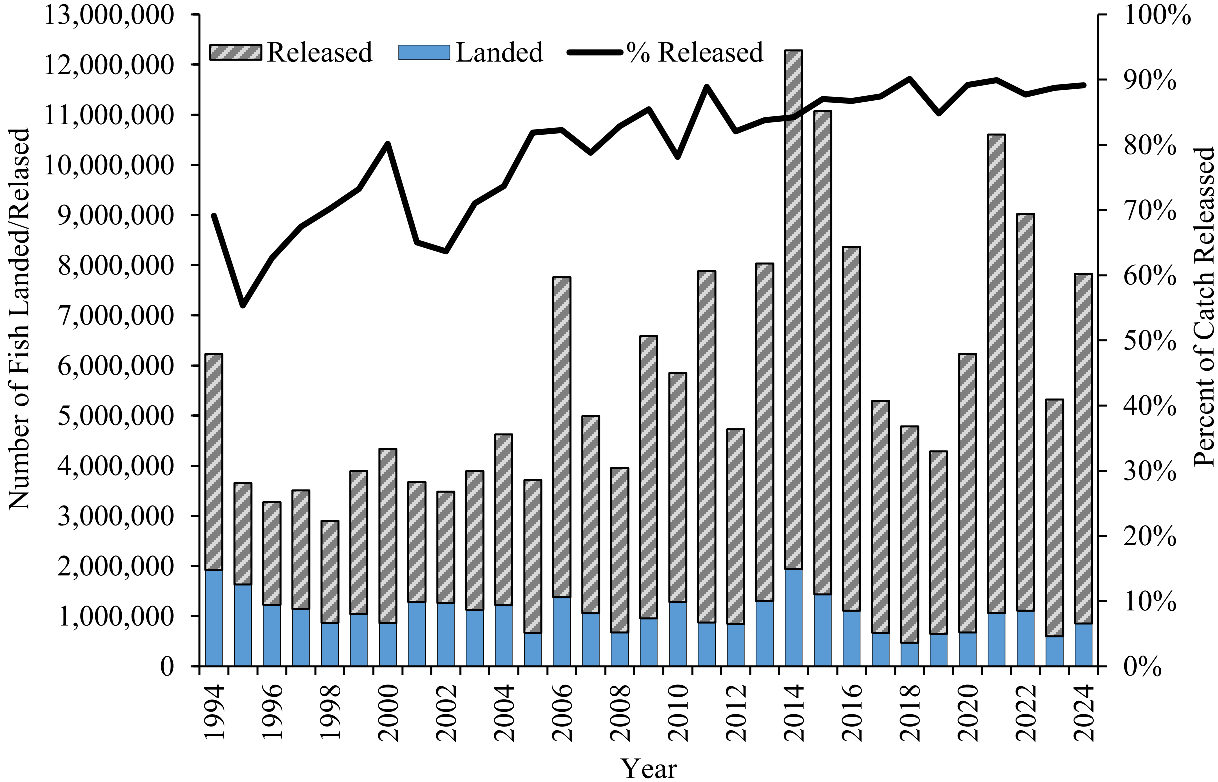

Figure 7. Recreational catch (landings and releases, in numbers) and the percent of catch that is released, 1994–2024 from the MRIP.

The number of Atlantic croaker measured during Marine Recreational Information Program (MRIP) sampling has generally declined, with 56 individuals measured in 2024, the lowest in the time series after 2022 when only 76 individuals were measured (Table 2). Mean total length (TL) in 2024 was 9.6 inches, the greatest value since 2011. Mean TL has fluctuated little since 1989 ranging from 8.3 inches to 10.4 inches. The maximum length observed in 2024 was 13.5 inches, greater than that of 2023, but lower than maximum lengths observed in other years since 2017. Most of the recreational catch consists of fish from 6.0 to 10.0 inches TL (Figure 8). There was a wider range of lengths harvested during the 1990's and early 2000's relative to recent years. Length distribution from the 2024 recreational harvest ranged from 6.1 to 13.5 inches (Figure 9). More fish around 10 inches total length were observed in 2024 relative to recent years.

Table 2. Mean, minimum, maximum total length (inches), and total number of Atlantic croaker measured by Marine Recreational Information Program sampling in North Carolina, 1994–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1994	8.6	4.8	15.6	2,065
1995	9.2	4.3	15.6	1,268
1996	10.0	5.3	16.7	1,169
1997	9.6	5.0	16.5	937
1998	9.3	6.0	16.7	599
1999	9.7	6.3	17.2	681
2000	9.6	6.7	17.6	360
2001	10.0	6.5	15.8	529
2002	9.7	6.0	15.0	255
2003	10.4	7.3	18.4	289
2004	10.1	7.0	17.4	263
2005	9.6	6.7	17.2	140
2006	8.8	4.8	14.9	198
2007	8.4	4.1	13.9	113
2008	9.4	4.3	15.4	188
2009	8.9	5.7	15.8	210
2010	9.8	6.2	16.8	330
2011	9.6	4.9	14.3	255
2012	9.2	4.9	14.1	230
2013	9.1	5.9	15.4	267
2014	9.1	4.1	14.1	215
2015	9.2	5.8	13.9	142
2016	9.3	6.3	13.2	219
2017	9.0	6.7	12.5	169
2018	8.9	6.5	19.1	119
2019	9.0	5.9	19.1	147
2020	8.9	5.9	19.1	127
2021	8.9	6.6	12.8	122
2022	9.3	6.3	15.7	76
2023	9.1	7.4	12.9	91
2024	9.6	6.1	13.5	56

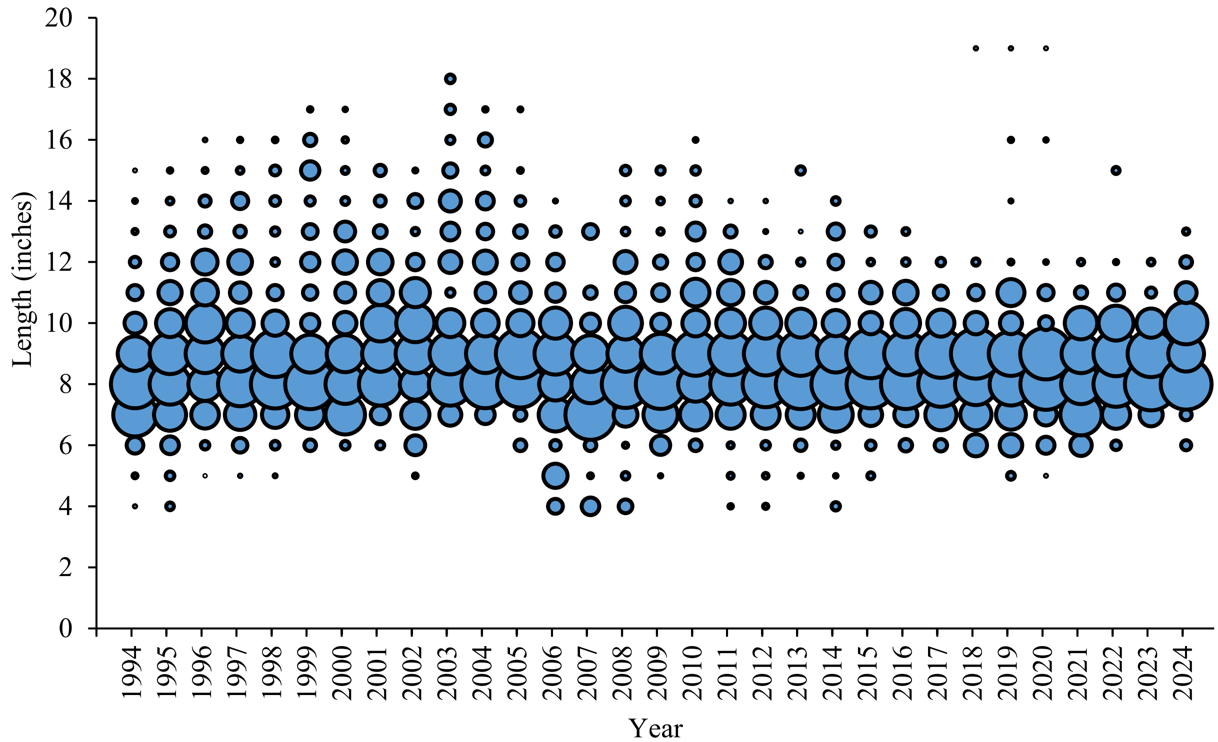

Figure 8. Recreational length frequency (total length, inches) of Atlantic croaker harvested, 1994–2024 (MRIP, n=16,056). Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Harvest data from the Recreational Commercial Gear License (RCGL) were collected from 2002 to 2008. The program was discontinued in 2009 due to lack of funding. From 2002 to 2008, an average of 14,534 pounds were harvested per year (NCDMF 2021b). Recreational estimates across all years have been updated and are now based on the MRIP Fishing Effort Survey-based calibrated estimates. For more information on MRIP see https://www.fisheries.noaa.gov/topic/recreational-fishing-data.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

In 2024, 1,450 Atlantic croaker lengths were obtained from commercial fish house sampling with a mean TL of 9.7 inches, and lengths ranging from 7.7 to 16.9 inches (Table 3). Mean TL has varied little, ranging from 9.3 inches to 12.1 inches and has generally declined since 2005. Minimum TL ranged from 3.9 inches to 7.7 inches and maximum TL ranged from 13.3 inches to 20.0 inches. The minimum total length of 7.7 inches observed in 2024 was the greatest minimum length sampled in the time series. Bait samples are not included in calculations of mean, minimum and maximum length.

Table 3. Mean, minimum, maximum total length (inches), and total number of Atlantic croaker measured from North Carolina commercial fish house samples, 1994–2024. Bait samples are not included.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1994	9.3	4.6	15.2	20,162
1995	9.7	4.6	18.0	18,897
1996	11.0	4.3	18.3	32,310
1997	11.1	4.3	17.9	26,233
1998	11.7	3.9	19.7	22,815
1999	11.8	3.9	19.1	20,976
2000	11.6	4.0	19.8	29,022
2001	12.0	4.5	19.7	30,506
2002	12.0	5.1	19.7	22,007
2003	12.1	4.9	18.6	25,881
2004	12.0	3.9	20.0	23,330
2005	12.0	4.9	19.7	21,719
2006	11.3	4.7	19.2	20,533
2007	11.3	4.6	19.4	15,011
2008	11.1	4.6	19.5	15,032
2009	11.2	4.8	19.1	20,448
2010	11.3	5.0	17.8	21,511
2011	11.5	4.6	16.6	15,948
2012	11.2	5.7	17.9	10,923
2013	11.2	5.6	17.2	9,059
2014	10.3	4.4	16.7	11,523
2015	10.6	5.4	15.5	9,593
2016	10.7	7.4	15.2	6,960
2017	10.0	6.6	15.2	6,023
2018	10.3	6.2	15.2	3,771
2019	9.9	6.1	15.2	4,775
2020	9.4	5.4	13.3	1,807
2021	9.6	5.9	13.7	4,242
2022	9.7	7.1	13.9	2,851
2023	9.6	4.7	15.5	1,875
2024	9.7	7.7	16.9	1,450

Modal length generally increased from 1994 to the early 2000s (Figure 9). There is a noticeable decline and contraction in size classes beginning in 2015, with most fish falling between 7.0 and 11.0 inches. Size trends in 2024 commercial samples indicate a dominance of 8.5-inch to 9.5-inch fish with few over 10.0 inches or under 8.0 inches (Figure 10).

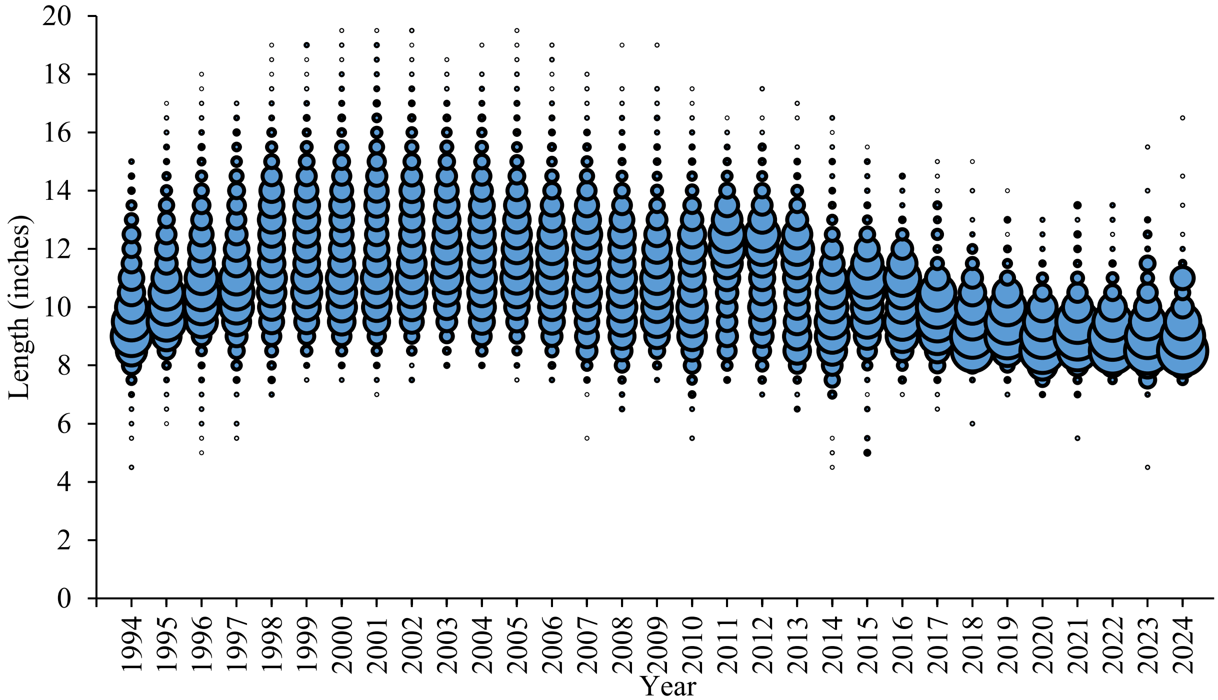

Figure 9. Commercial length frequency (total length, inches) of Atlantic croaker harvested from 1994–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length. Bait samples not included.

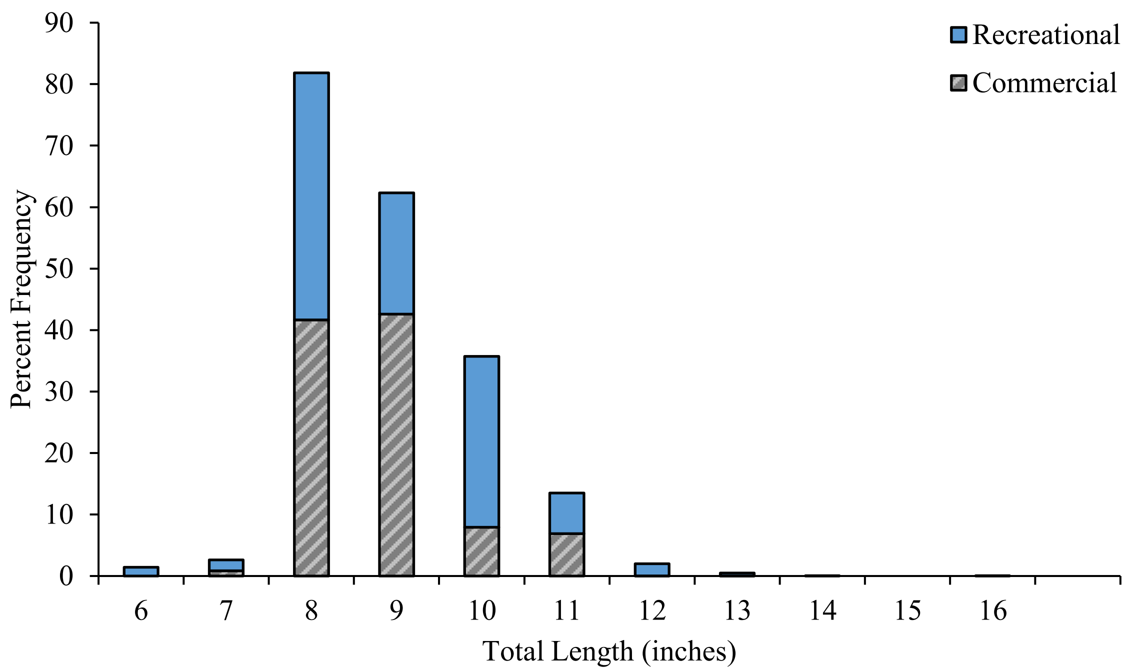

Figure 10. Commercial (n=1,450) and recreational (n=56) length frequency (TL, inches) distribution from Atlantic croaker harvested in 2024.

Fishery-Independent Monitoring

The number of Atlantic croaker aged in North Carolina's comprehensive life history program (P930) from 1997 through 2024 has ranged from 237 in 2011 to 1,070 in 2014 (Table 4). Modal age was one or two in most years but has been zero in some years including 2008, 2016, 2017, and 2020. Minimum age was zero in every year while maximum age ranged from six to 15 years. Maximum age was between 11 and 15 years from 2001–2010 and between six and ten from 2011–2024. A total of 459 fish were aged in 2024 with a modal age of one and a maximum age of seven. There is significant overlap in length at age for most observed ages, though length does not exceed 22 inches in any age class (Figure 11).

Table 4. Modal, minimum, maximum age, and total number of Atlantic croaker aged in North Carolina from fishery dependent and fishery independent sampling, 1997–2024. Includes otolith ages only, from only samples where a length was obtained.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1997	1	0	9	471
1998	1	0	9	1,030
1999	1	0	9	671
2000	1	0	9	815
2001	2	0	12	793
2002	1	0	11	605
2003	1	0	12	516
2004	2	0	13	681
2005	3	0	14	597
2006	1	0	13	658
2007	5	0	15	321
2008	0	0	15	739
2009	1	0	14	709
2010	4	0	13	703
2011	1	0	8	237
2012	2	0	7	349
2013	1	0	8	577
2014	2	0	8	1,070
2015	1	0	9	993
2016	0	0	6	474
2017	0	0	7	451
2018	1	0	8	544
2019	2	0	10	537
2020	0	0	7	380
2021	1	0	9	486
2022	2	0	9	580
2023	1	0	6	553
2024	1	0	7	459

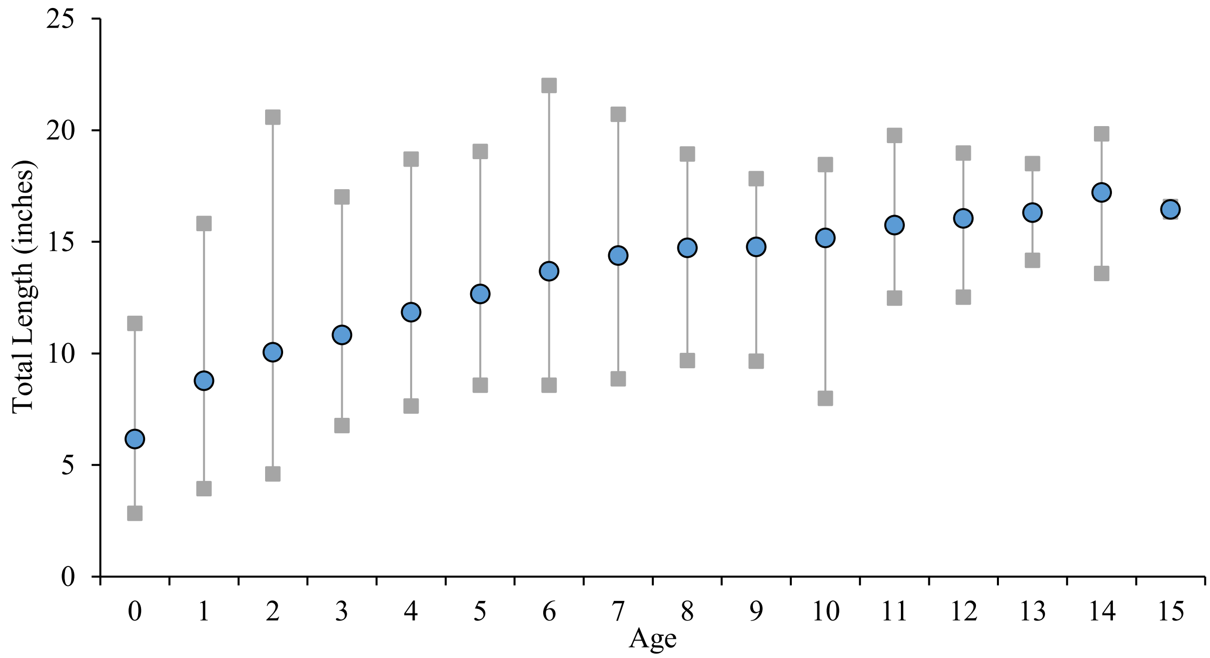

Figure 11. Atlantic croaker length at age based on age samples collected from 1990 to 2024 (n=16,959). Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. Only ages derived from otoliths and from samples where lengths were obtained were used.

The Pamlico Sound Survey (P195) samples 54 stations (grids) annually in June and September. Stations are randomly selected from strata based upon depth and geographic location. Tow duration is 20 minutes, using double rigged demersal mongoose trawls (9.1 m headrope, 1.0 X 0.6 m doors, 2.2-cm bar mesh body, 1.9-cm bar mesh cod end and a 100-mesh tailbag extension). Data from this survey are used to produce juvenile abundance indices (JAI) that are incorporated into ASMFC stock assessments and reported annually to ASMFC as part of compliance reports and for incorporation into the juvenile composite TLA. Juvenile Atlantic croaker are defined as fish <140 mm TL (5.5 inches) in June, and fish <210 mm TL (8.3 inches) in September.

The COVID pandemic impacted sampling in 2020 and 2021. Executive Order (EO) 116, issued on March 10, 2020, declared North Carolina under a State of Emergency and was soon followed by EO 120 which implemented a statewide Stay at Home Order for all non-essential State employees. In 2020, sampling was limited to 28 stations sampled in June and 35 stations sampled in September. A total of 35 stations were sampled in June 2021 and 33 stations were sampled in September 2021. Limited sampling likely impacted abundance indices calculated from Sound Survey data. An initial analysis of this impact was conducted for the 2020 Atlantic croaker abundance indices and concluded the magnitude of abundance may be overestimated slightly but limited sampling was likely able to capture general abundance trends.

The Atlantic croaker weighted JAI from the Pamlico Sound Survey from 1987 through 2024 has been variable in both June and September. Annual fluctuations in the June JAI are most notable after 2009 when steep increases in abundance are followed by steep declines (Figure 1A). The June JAI has ranged from 66 individuals per tow in 1996 to 1,149 individuals per tow in 2010 with a time series average of 361 individuals per tow. The time series average in September is greater at 525 individuals per tow ranging from 96 individuals per tow in 1987 to 1,376 individuals per tow in 2020 (Figure 1B). The September JAI fluctuates around the time series average. The JAI for September increased sharply from 657 individuals per tow in 2023 to 1,068 individuals per tow in 2024. The June JAI in 2024 was 115 individuals per tow, continuing the decline from June 2020.

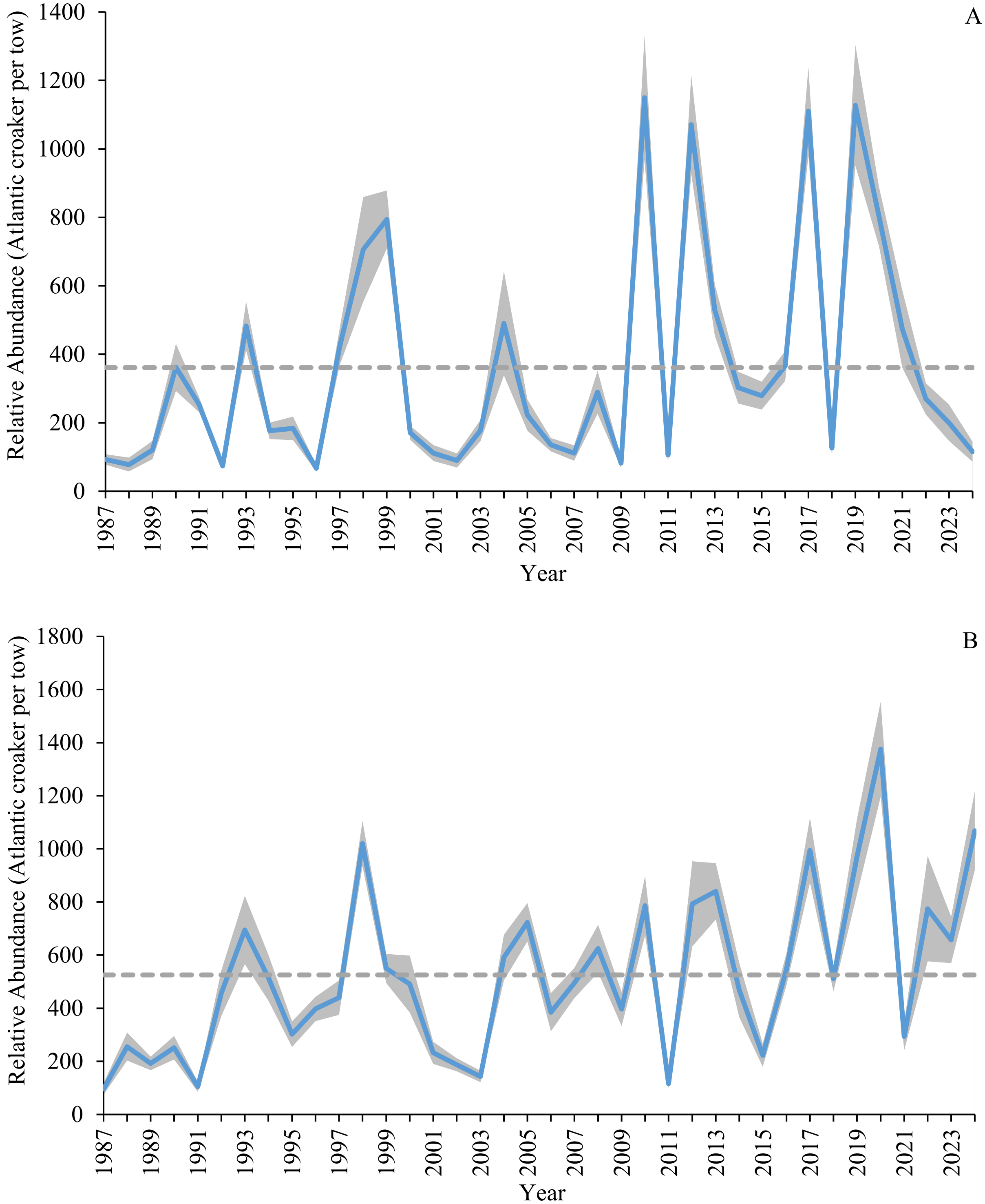

Figure 12. Atlantic croaker weighted juvenile relative abundance for A) June and B) September from the Pamlico Sound Survey, 1987–2024. The shaded area represents standard error. Dashed line represents the time series average. Length cutoffs are <140 mm TL (5.5 in) in June and <210 mm TL (8.3 in) in September.

Most Atlantic croaker captured in the Pamlico Sound Survey are juveniles (age 0), but because of the protracted spawning and recruitment period, the length composition of Atlantic croaker captured in the survey can be variable. There is more variability in length compositions of Atlantic croaker caught in the June portion of the survey compared to the September portion of the survey (Figure 13). Modal length in June is generally 3.0 to 5.0 inches while modal length in September is around 5.0 to 5.5 inches with little fluctuation between years. In many years, two distinct size classes are apparent from the length frequencies of fish captured in June.

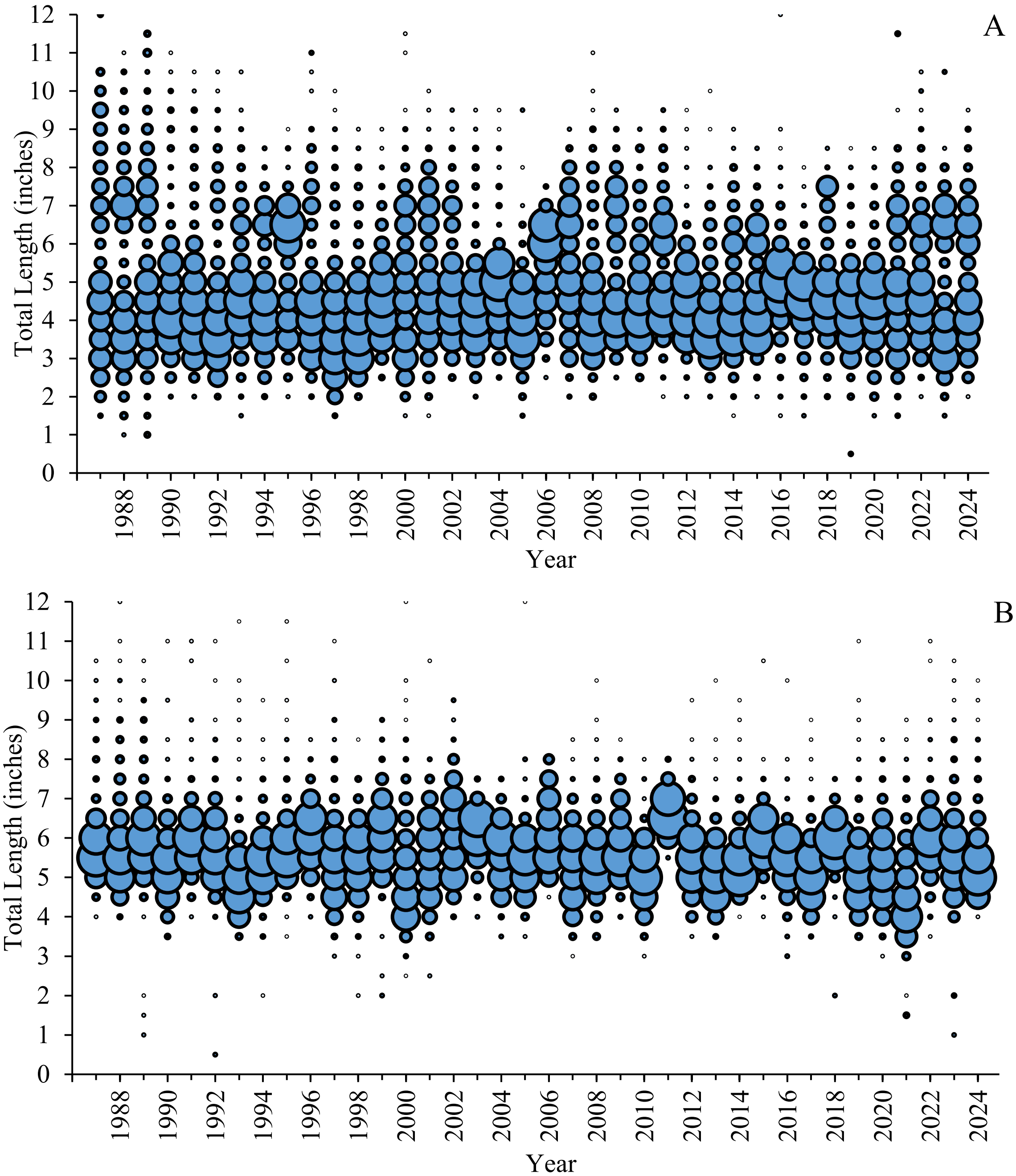

Figure 13. Length frequency (total length, inches) of all Atlantic croaker captured in Pamlico Sound Survey sampling during A) June and B) September 1987–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

RESEARCH NEEDS

There is no research or monitoring programs required of the states except for the submission of an annual compliance report. However, several coastwide and state specific research recommendations have been identified and ranked through the ASMFC FMP and stock assessment process. The high priority research recommendations are reported below. Additional research and monitoring recommendations can be found in the 2016 Atlantic Croaker Stock Assessment Peer Review Report here under Term of Reference 8 (ASMFC 2017).

- Describe the coast-wide distribution, behavior, and movement of croaker by age, length, and season, with emphasis on collecting larger, older fish.
- Continue state and multi-state fisheries-independent surveys throughout the species range and subsample for individual lengths and ages. Ensure NEFSC trawl survey continues to take lengths and ages. Examine potential factors affecting catchability in long-term fishery independent surveys.
- Quantify effects of BRDs and TEDs implementation in the shrimp trawl fishery by examining their relative catch reduction rates on Atlantic croaker.
- Continue to develop estimates of length-at-maturity and year-round reproductive dynamics throughout the species range. Assess whether temporal and/or density- dependent shifts in reproductive dynamics have occurred.
- Re-examine historical ichthyoplankton studies for an indication of the magnitude of estuarine and coastal spawning, as well as for potential inclusion as indices of spawning stock biomass in future assessments. Pursue specific estuarine data sets from the states (NJ, VA, NC, SC, DE, ME) and coastal data sets (MARMAP, EcoMon).

MANAGEMENT

The TLA established under Addendum II and revised under Addendum III (approved February 2020) to Amendment 1 is used as a precautionary management framework for Atlantic croaker. The TLA provides guidance in lieu of a current stock assessment. Addendum III incorporated the use of a regional approach (Mid-Atlantic NJ-VA and South Atlantic NC-FL) to better reflect localized fishery trends. Under this management program, if the amount of red in the Traffic Light for both population characteristics (adult abundance and harvest) meet or exceed the threshold for any three of the four most recent years, then management action is required. The harvest composite index triggered at the 30% threshold in both regions in 2019. The adult abundance characteristics for the Mid-Atlantic exceeded the threshold in 2019 while the South Atlantic abundance composite characteristic did not exceed the trigger in 2019. Since both population characteristics were above the 30 percent threshold in at least three years from 2016–2019, management actions were implemented in March 2021. Management measures will remain in place for at least three years and future TLA updates will determine future management action after this time. The ASMFC Sciaenids Board has selected to maintain current management measures until results of the benchmark stock assessment planned for completion in 2026 may be considered.

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FISHERY MANAGEMENT PLAN UPDATE
ATLANTIC MENHADEN
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	August 1981	
	Amendment 1	July 2001
	Addendum I	August 2004
	Addendum II	October 2005
	Technical Addendum I	February 2006
	Addendum III	November 2006
	Addendum IV	November 2009
	Addendum V	November 2011
	Amendment 2	December 2012
	Technical Addendum I	May 2013
	Addendum I	August 2016
	Amendment 3	November 2017
	Addendum I	November 2022
Revisions:	Revision to the FMP	September 1992
Supplements:	Supplement to the FMP	October 1986
Comprehensive Review:	2026	

The first fishery management plan (FMP) for Atlantic menhaden (*Brevoortia tyrannus*) was approved by the Atlantic States Marine Fisheries Commission (ASMFC) in August 1981. The objective of the original plan was to achieve a coastwide age composition of landings in the purse seine fishery by spawners and achieve the greatest continuing yield for each area by determining age at harvest and eliminating other restrictions not contributing to management goals. A Revision to the FMP was approved in 1992 and was the result of an updated stock assessment. The 1992 FMP also included a suite of objectives intended to improve data collection and increase awareness of the fishery and its research needs. In 2001, Amendment 1 to the FMP was approved. This Amendment adopted a new stock assessment and new overfishing definition, as well as required mandatory reporting for all menhaden purse seine fisheries. Addendum I to Amendment 1 was approved in August 2004 to modify the biological reference points, stock assessment schedule and revise the habitat section. The 2003 stock assessment used a new model with a fecundity-based biological reference point to determine stock status. Addendum II was approved by the ASMFC Atlantic Menhaden Management Board in 2005 and established a five-year annual cap on reduction fishery landings in Chesapeake Bay and was implemented in 2006. Addendum II also established a research program to determine the menhaden population abundance in the Chesapeake Bay and to address localized depletion. Passed in November of 2006, Addendum III mirrored the intent and provisions of Addendum II, but incorporated 2005 landings data and allowed for the transfer of under-harvest to the following year's harvest. The Board then approved Addendum IV in November of 2009 which extended the Chesapeake Bay reduction fishery harvest cap, established through Addendum III, for an additional three years (2011–2013). In 2010, the Board tasked the Atlantic Menhaden Technical Committee (TC) to develop alternative reference points. In addition, the ASMFC Policy Board directed the Multispecies TC to work with the Menhaden TC to explore reference points that account for predation. Addendum V was approved in November 2011 and established a new interim fishing mortality threshold and target (based on maximum spawning potential or MSP) with the goal of increasing abundance, spawning stock biomass, and menhaden availability as a forage species. The new threshold and target equated to a MSP of 15% and 30%, respectively.

The development of Amendment 2 established a 170,800 metric ton (MT) (376,549,543 pounds) total allowable catch (TAC) beginning in 2013 that continued until completion of and Board action on the 2015 benchmark stock assessment. The TAC was based on a 20% reduction from the 2009 to 2011 three-year average of total coastwide catch. Additionally, a bycatch allowance of 6,000 pounds per vessel per day was established when states met their TAC. The Board adopted new biological reference points for biomass based on MSP, with the goal of increasing abundance, spawning stock biomass, and menhaden availability as a forage species. In 2013, Technical Addendum I to Amendment 2 established a set aside program for episodic events. The 2015 Atlantic menhaden stock assessment update indicated menhaden are not overfished and overfishing is not occurring, which resulted in Board action to increase the TAC for both 2015 and 2016 to 187,880 MT (414,204,497 pounds), a 10% increase. Addendum I, approved in August 2016, modified the bycatch allowance to authorize two individuals fishing stationary gear from the same vessel to land 12,000 pounds per day. This Addendum supported a history, especially in the pound net industry, of cooperative fishing which enables fishermen to pool resources. In October 2016, the Atlantic Menhaden Board increased the TAC by 6.45% setting the 2017 TAC at 200,000 MT (440,924,523 pounds).

Amendment 3 maintained the single-species biological reference points management program until the review and adoption of Ecological Reference Points (ERPs). The intent of menhaden-specific ERPs is to provide a method to assess the status of menhaden not only in regard to their own sustainability, but also in regard to their interactions with predators and the status of other prey species. This approach allows fishery managers to consider the harvest of menhaden within a broad ecosystem context, which includes other fish, birds, mammals, and humans who utilize and depend on marine resources. The TAC for the 2018 and 2019 fishing seasons was set at 216,000 MT (476,198,485 pounds) and maintained that TAC for 2020 with the expectation that it would be set in future years using ERPs. Subsequent years' TAC will be guided by menhaden-specific ERPs. Amendment 3 allocated a baseline quota of 0.5 % to each jurisdiction, and then additional TAC was allocated based on historic 2009–2011 landings. Additionally, the quota transfer program was maintained, quota rollover was prohibited, the 6,000-pound trip limit for non-directed and small-scale gears following the closure of the directed fishery was maintained, and 1 % of the TAC was set aside for episodic events from New York through Maine. Finally, the Chesapeake Bay reduction fishery cap was reduced from 87,216 MT (192,278,366 pounds) to 51,000 MT (112,435,753 pounds).

Atlantic menhaden are currently managed under Addendum I to Amendment 3. Addendum I addresses commercial allocations, the Episodic Event Set Aside (EESA) Program, and the Incidental Catch/Small-Scale Fishery (IC/SSF) Provision. Regarding allocations, the Addendum creates a three-tiered system for minimum allocations to the states, with Pennsylvania receiving 0.01%; South Carolina, Georgia, Connecticut, Delaware, North Carolina, and Florida receiving 0.25%; and the remaining states continuing to receive a minimum of 0.5%. Furthermore, the Addendum allocates the remainder of the TAC, excluding the 1% for episodic events in the states of New York through Maine under the EESA Program, on a state-by-state basis based on landings history of the fishery from 2018, 2019, and 2021. Under the IC/SSF provision, the Addendum codifies the ability for states to elect to divide their quotas into sectors, enabling individual sectors to enter into the provision at different times. Additionally, the Addendum removes purse seines as a permitted small-scale directed gear, thereby, prohibiting them from harvesting under the IC/SSF provision. Finally, the Addendum counts IC/SSF landings against the TAC and if IC/SSF landings cause the TAC to be exceeded, then the Board must take action to modify one or both of permitted gear types and trip limits under the provision. The Addendum also continues to prohibit the rollover of unused quota, maintains the 6,000 pounds trip limit for applicable gear types following the closure of a directed fishery, and keeps the current Chesapeake Bay Cap, which was first implemented in 2006 to limit the amount of reduction harvest within the Bay, at 51,000 mt. This recognizes the importance of the Chesapeake Bay as nursery grounds for many species by capping reduction landings from the Bay to current harvest levels.

The current TAC for the 2023 through 2025 fishing seasons is 233,550 mt, which is an approximate 20% increase from the 2021–2022 TAC based on the positive stock status of the resource under ecological reference point-based management. According to Technical Committee analysis, this increase has a less than 40% probability of exceeding the target set by the ecological reference points (ERPs) adopted in 2020. Given the positive results of the 2022 Stock Assessment Update, the Board approved this modest increase to provide additional fishing opportunities, while maintaining a conservative risk level of exceeding the ERP target.

To ensure compliance with the ASMFC Interstate FMP for Atlantic Menhaden, North Carolina manages this species under the North Carolina FMP for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt FMPs, 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) is like the goal of the Fisheries Reform Act of 1997 to "ensure long-term viability" of these fisheries (NCDMF 2015).

Management Unit

The management unit is defined as the Atlantic menhaden resource throughout the range of the species within U.S. waters of the northwest Atlantic Ocean from the estuaries eastward to the offshore boundary of the Exclusive Economic Zone (EEZ). The Atlantic states from Maine through Florida including Pennsylvania are included in the management unit.

Goal and Objectives

The goal of Addendum I to Amendment 3 is to manage the Atlantic menhaden fishery in a manner which equitably allocates the resource's ecological and economic benefits between all user groups. The primary user groups include those who extract and utilize menhaden as a source of prey, and those whose livelihood depends on the health of the marine ecosystem (ASMFC 2022).

DESCRIPTION OF THE STOCK

Biological Profile

Atlantic menhaden are an estuarine-dependent species with a single stock along the Atlantic coast that range from northern Florida to Nova Scotia. Menhaden form large nearshore schools from early spring through early winter. By summer, schools divide by size and age, with older and larger menhaden distributed farther north. During fall and early winter, menhaden migrate south to the North Carolina capes to spawn 20–30 miles offshore. Sexual maturity is reached between ages 1 and 3. Floating egg masses hatch within two to three days of spawning and ocean currents carry larvae into estuarine nursery areas where they develop into juveniles and remain during their first year. Research indicates that the number of new fish that enter the fishery annually (year-class strength) is likely determined by environmental factors (currents, temperature, predation, etc.) acting on larvae as they approach and enter inlets and nursery areas. Atlantic menhaden can live up to 10 years. Atlantic menhaden strain microscopic organisms drifting or floating in the water column (plankton) while swimming in schools near the surface. Atlantic menhaden are important prey to many species including striped bass, bluefish, birds, dolphins, and whales.

Stock Status

In February 2020, the ASMFC accepted the results of the Atlantic Menhaden Single-Species and Ecological Reference Point (ERP) Benchmark Stock Assessments and Peer Review Reports for management use. The Single-Species Assessment, acting as a traditional stock assessment, indicates the Atlantic menhaden stock is not overfished or experiencing overfishing relative to the current single-species reference points under

Amendment 3 (SEDAR 2020). These reference points used historical performance of the population during the 1960–2012-time frame, representing a period where the population was fished sustainably. Fishing mortality rates have remained below the overfishing threshold (0.6) since the mid–1970s, and below the overfishing target (0.22) since the mid–1990s. Fishing mortality was estimated to be 0.11 in 2017 (terminal year of the assessment). The reference point used to determine the population fecundity is defined as the mature egg production one would expect when the population is being fished at the threshold fishing mortality rate. Population fecundity was highest in the early 1960s and from the 1990s to present. In 2017, fecundity was estimated at 2.60×10^{15} eggs, above the Single-Species Assessment threshold (1.46×10^{15} eggs) and target (1.95×10^{15} eggs).

The Ecological Reference Points Stock Assessment evaluates the health of the stock in an ecosystem context and indicates that the fishing mortality (*F*) reference points for menhaden should be lower to account for menhaden's role as a forage fish (SEDAR 2020). The fishing mortality rate in 2017, terminal year of the assessment, was below both ERP target and threshold, indicating that the stock was not experiencing overfishing. Fecundity (a measure of reproductive capacity) in 2017 was above both the ERP target and threshold, indicating the stock was not overfished.

In August 2022, the ASMFC Board accepted the results of the Single-Species Update Assessment. Under the ERPs, Atlantic menhaden are neither overfished nor experiencing overfishing.

Stock Assessment

The 2020 Atlantic Menhaden Benchmark Stock Assessments, which were endorsed by an independent panel of fisheries scientists, used the Northwest Atlantic Coastal Shelf Model of Intermediate Complexity for Ecosystems (NWACS-MICE) in combination with the single-species model (Beaufort Assessment Model or BAM) to develop Atlantic menhaden ERPs by evaluating trade-offs between menhaden harvest and predator biomass (SEDAR 2020). The SEDAR 2020 document is comprised of two reports: the 2019 Atlantic Menhaden Single-Species Benchmark Assessment and the Ecological Reference Points Stock Assessment. The Beaufort Assessment Model (BAM), which was used in the previous stock assessment, was used in the single-species assessment. The BAM again incorporated a "fleet as areas" based model configuration, such that the reduction and bait fisheries were divided into northern, mid-Atlantic, and southern regions, creating three fleets. The Single-Species Assessment, acting as a traditional stock assessment, indicates the Atlantic menhaden stock is not overfished or experiencing overfishing relative to the current single-species reference points. The Ecological Reference Points Stock Assessment uses the NWACS-MICE to develop Atlantic menhaden ERPs. NWACS-MICE is an ecosystem model that focuses on four key predator species (striped bass, bluefish, weakfish, and spiny dogfish) and three key prey species (Atlantic menhaden, Atlantic herring, and bay anchovy).

In August 2020, the ASMFC approved the use of ERPs in the management of Atlantic menhaden. Atlantic striped bass was the focal species for the ERP definitions because it was the most sensitive predator fish species to Atlantic menhaden harvest in the model, so an ERP target and threshold that sustained striped bass would likely provide sufficient forage for other predators under current ecosystem conditions. By adopting ERPs, the Board will be accounting for the species' role as an important forage fish. The ERPs for Atlantic menhaden are:

- ERP target: the maximum fishing mortality rate (*F*) on Atlantic menhaden that sustains Atlantic striped bass at their biomass target when striped bass are fished at their *F* target.
- ERP threshold: the maximum *F* on Atlantic menhaden that keeps Atlantic striped bass at their biomass threshold when striped bass are fished at their F target.
- ERP fecundity target and threshold: the long-term equilibrium fecundity that results when the population is fished at the ERP *F* target and threshold, respectively.

Since the stock assessment peer review process was adopted by the ASMFC in 1998, Atlantic menhaden have been assessed several times. Prior to the 2020 Atlantic Menhaden Benchmark Stock Assessments, the most recent peer reviewed benchmark stock assessment was SEDAR 40 (2015), which was updated in 2017 (ASMFC 2017b). The BAM was used to provide management advice during the 2015 benchmark stock assessment and the 2017 update. The 2015 benchmark stock assessment and 2017 update found that Atlantic menhaden were neither overfished nor experiencing overfishing. Stock status was evaluated against the assessment's reference points, which used historical performance of the population during 1960–2012.

The ASMFC updated the 2019 Atlantic Menhaden Single Species Benchmark Stock Assessment in 2022. The stock assessment update added data through 2021, reran the peer reviewed BAM, and determined stock status of Atlantic menhaden using the ERPs that were accepted for management use in 2020. The ERP assessment was not updated. The single species assessment update is the best information available on the status of the coastwide Atlantic menhaden stock for use in fisheries management. Both assessments are scheduled for benchmark assessments together in 2025. More information on the stock assessment update can be found here.

DESCRIPTION OF THE FISHERY

Current Regulations

In 2023, under Addendum 1 to Amendment 3, North Carolina's annual quota dropped from 1,840 MT (4,056,588 lbs.) or 0.96% of the coastwide allocation of 192,456 MT (424,292,851 pounds), to 864 MT (1,905,000 lbs.) or 0.37% of the coastwide allocation of 233,550 MT (514,889,613 pounds).

Effective January 1, 2013, a law was passed making it unlawful to harvest menhaden with a purse seine net deployed by a mother ship and one or more runner boats within North Carolina's three-mile jurisdiction.

Commercial Fishery

North Carolina's Atlantic menhaden landings have been on a decline, especially since the last menhaden processing factory in North Carolina closed in 2005. Landings have remained relatively constant since 2012 (Table 1; Figure 1). The average landings over the last 10 years is 586,340 pounds. Since 2013, landings have been regulated under the TAC initiated in Amendment 2. Prior to 2023, the previous three years (2020–2022), North Carolina has landed 10–14% of the state allocated portion of the TAC. In 2024, with the decrease in quota from 0.96% to 0.37% under Addendum 1 to Amendment 3, North Carolina landed 19% of the states allocated portion of the overall coastwide TAC. The majority of landings are used for bait in the blue crab and recreational fisheries. The decline in commercial landings is due to the loss of North Carolina's last processing facility in 2005, which in turn led to the North Carolina General Assembly banning purse seines from near shore state waters in 2007 (15A N.C. Admin. Code 3J.0105). Gill nets are now the most common gear used to harvest menhaden throughout the state.

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of Atlantic menhaden from North Carolina, 1991–2024. Recreational weight landed for 2012–2022 are based on North Carolina's recreational cast net and seine mail survey and an estimated individual fish weight of 0.35 pounds derived from Fishery-Independent sampling. Commercial landings based on North Carolina Trip Ticket Program, 1991–2024. *2023–2024 Recreational data not available.

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1991	-	-	-	110,528,754	110,528,754
1992	-	-	-	57,515,712	57,515,712
1993	-	-	-	64,711,384	64,711,384
1994	-	-	-	73,853,901	73,853,901
1995	-	-	-	58,374,081	58,374,081
1996	-	-	-	53,850,943	53,850,943
1997	-	-	-	97,727,057	97,727,057
1998	-	-	-	57,976,455	57,976,455
1999	-	-	-	42,799,080	42,799,080
2000	-	-	-	56,280,112	56,280,112
2001	-	-	-	56,012,396	56,012,396
2002	-	-	-	69,190,596	69,190,596
2003	-	-	-	48,936,502	48,936,502
2004	-	-	-	50,577,983	50,577,983
2005	-	-	-	13,387,423	13,387,423
2006	-	-	-	962,651	962,651
2007	-	-	-	1,134,208	1,134,208
2008	-	-	-	645,231	645,231
2009	-	-	-	2,124,734	2,124,734
2010	-	-	-	1,299,150	1,299,150
2011	-	-	-	3,530,003	3,530,003
2012	169,926	68,303	59,474	538,792	598,266
2013	221,014	96,004	77,355	454,206	531,561
2014	131,419	64,493	45,997	917,905	963,902
2015	271,824	162,539	95,138	898,322	993,460
2016	278,213	100,998	97,375	398,044	495,418
2017	261,203	96,573	91,421	752,799	844,220
2018	130,441	52,000	45,654	713,978	759,632
2019	152,247	83,285	53,286	551,849	605,136
2020	126,126	60,988	44,144	599,742	643,886
2021	152,722	37,343	53,453	430,623	484,076
2022	119,393	59,721	41,788	539,499	581,286
2023	*	*	*	619,374	619,374
2024	*	*	*	359,167	359,167
Mean	183,139	80,204	64,099	27,329,196	27,349,933

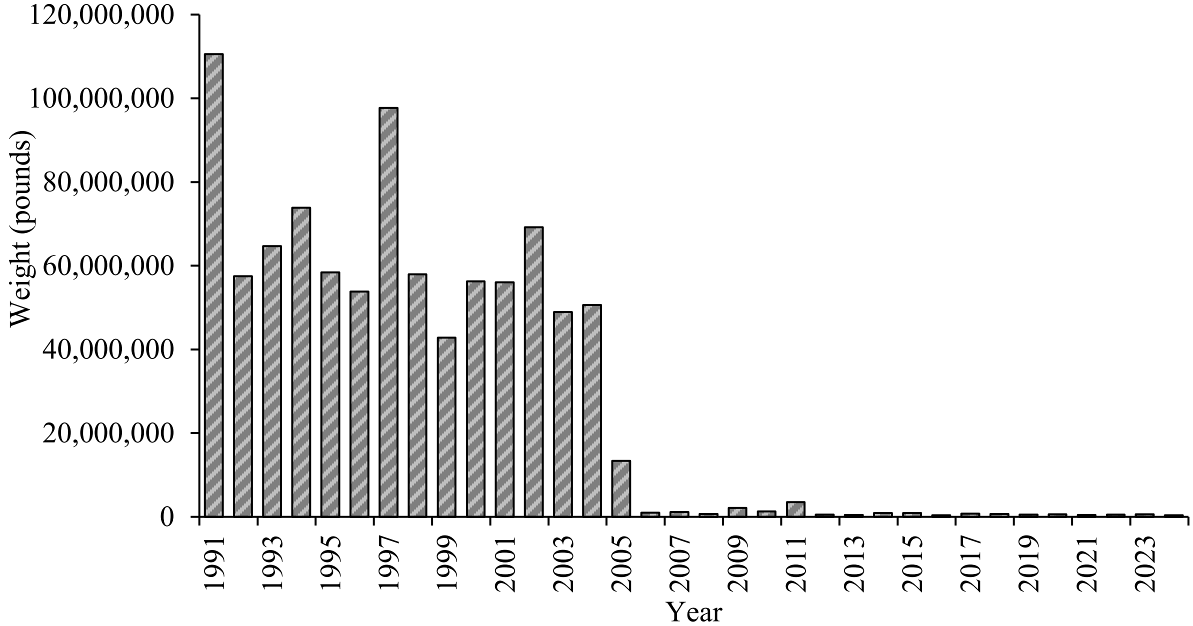

Figure 1. Atlantic menhaden commercial landings (pounds) reported through the North Carolina Trip Ticket Program, 1991–2024.

Recreational Fishery

In October 2011, the North Carolina Division of Marine Fisheries (DMF) implemented a recreational cast net and seine mail survey to develop catch and effort estimates for various species, including menhaden. During the 2012–2022 recreational annual harvest averaged 183,139 fish harvested and 80,204 fish released (Table 1; Figure 2). In 2023, a new licensing system was implemented and the license database was restructured. This restructuring disrupted our ability to query the full license dataset to establish a sampling frame of eligible anglers for the mail surveys. As a result, we were unable to administer the mail surveys and expand potential responses and survey estimates are not available since this new system has been initiated.

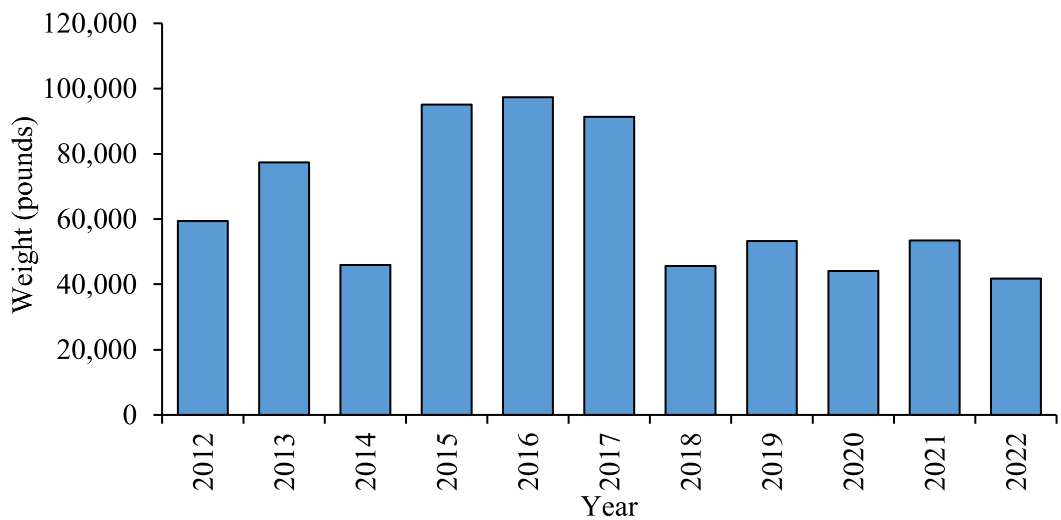

Figure 2. Atlantic menhaden recreational landings (pounds) estimated from the North Carolina recreational cast net and seine mail survey, 2012–2022. * 2023–2024 Recreational data not available.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Commercial fishing activity is monitored in a variety of DMF fishery-dependent sampling programs for compliance with ASMFC. Monitoring includes the ocean sink net fishery, winter trawl fishery, estuarine gill net fishery, long haul seine fishery, and sciaenid pound net fishery. Commercial landings of Atlantic menhaden are monitored through the DMF Trip Ticket Program. Mean lengths in the menhaden commercial fishery have remained fairly consistent, with the exception of 2020–2022 where mean lengths increased (Table 2; Figure 3).

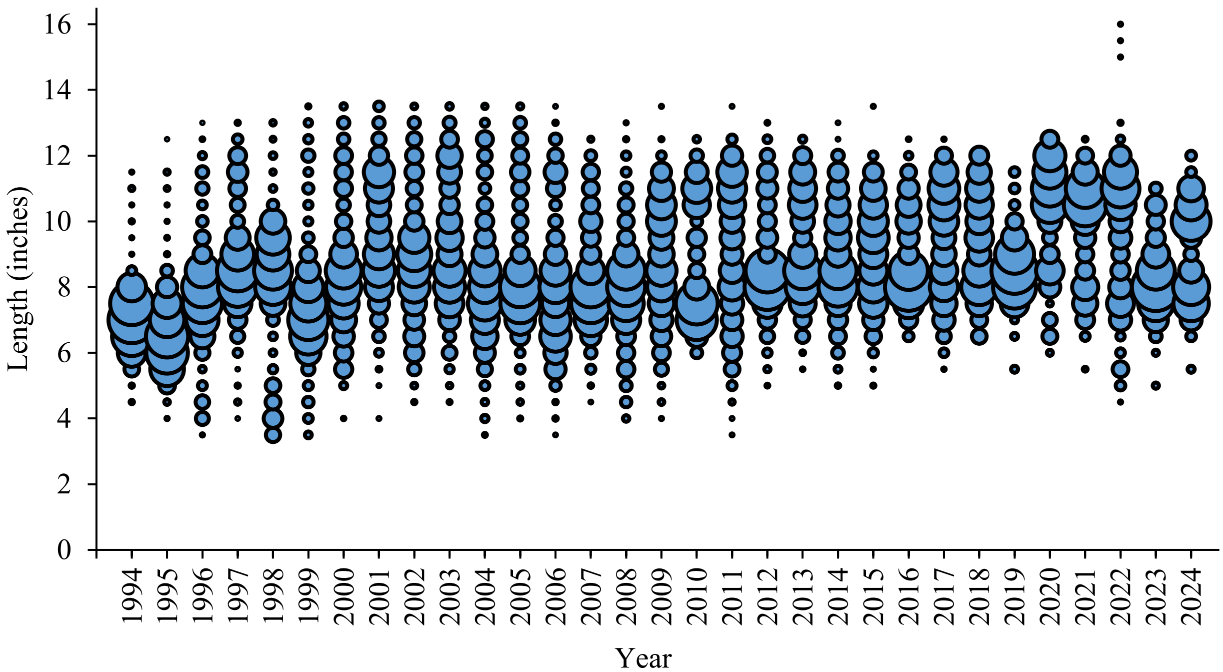

Figure 3. Commercial length frequency (fork length, inches) of Atlantic menhaden harvested, 1994–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Table 2. Mean, minimum, and maximum lengths (fork length, inches) of Atlantic menhaden measured from the commercial fisheries, 1991–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1991	6.2	6.2	11.0	3,588
1992	7.0	7.0	17.3	1,831
1993	6.9	6.9	13.8	3,163
1994	7.0	7.0	11.4	1,077
1995	6.5	6.5	12.5	2,045
1996	7.7	7.7	12.9	2201
1997	8.8	8.8	15.6	1,623
1998	8.1	8.1	12.9	1,570
1999	7.4	7.4	14.9	1,702
2000	8.5	8.5	13.5	868
2001	9.6	9.6	15.9	1,266
2002	8.8	8.8	14.0	1075
2003	9.3	9.3	14.4	621
2004	8.2	8.2	14.2	644
2005	8.5	8.5	13.4	1197
2006	8.1	8.1	13.7	1445
2007	8.3	8.3	15.7	1424
2008	8.0	8.0	12.8	1063
2009	8.9	8.9	13.5	1124
2010	8.6	8.6	12.6	210
2011	9.2	9.2	13.7	1346
2012	8.7	8.7	14.3	705
2013	9.3	9.3	15.2	845
2014	8.8	8.8	12.8	1477
2015	9.1	9.1	13.7	1165
2016	8.7	8.7	12.3	760
2017	9.4	9.4	12.4	891
2018	9.3	9.3	12.2	441
2019	8.5	8.5	11.3	179
2020	10.3	10.3	12.7	250
2021	9.9	9.9	12.5	416
2022	9.7	9.7	19.6	1091
2023	8.7	8.3	11.1	236
2024	9.1	9.1	13.7	175

Fishery-Independent Monitoring

Atlantic menhaden are sampled in a variety of DMF independent surveys for compliance with ASMFC requirements. Atlantic menhaden are sampled in the North Carolina Estuarine Trawl Survey (Program 120), Pamlico Sound Survey (Program 195), the Juvenile Anadromous Survey (Program 100), the Albemarle Sound Independent Gill Net Survey (Program 135), and the Fishery Independent Gill Net Survey (Program 915). The Estuarine Trawl Survey (Figure 4) and Fishery Independent Gill Net Survey (Pamlico Sound only; Figure 5) were used as data sources in the 2019 Atlantic Menhaden Single-Species Benchmark Stock Assessment.

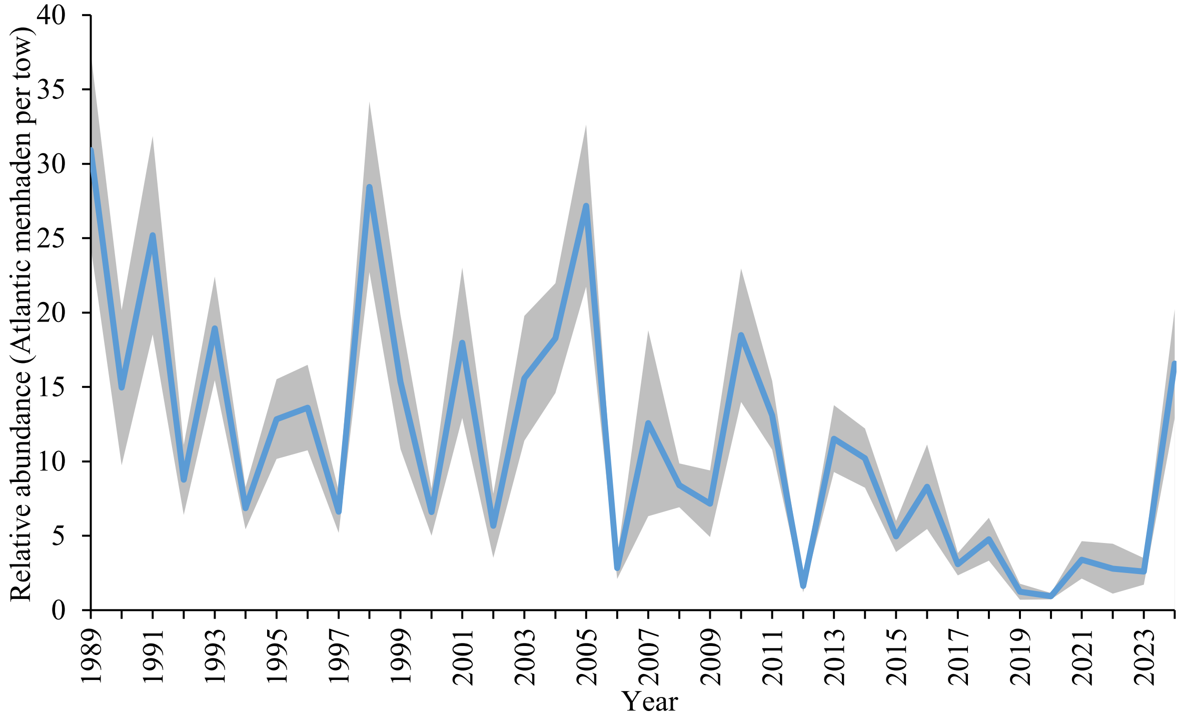

Figure 4. Relative abundance index (fish per tow) of Atlantic menhaden collected from the North Carolina Estuarine Trawl Survey (Program 120) during May and June 1989–2024.

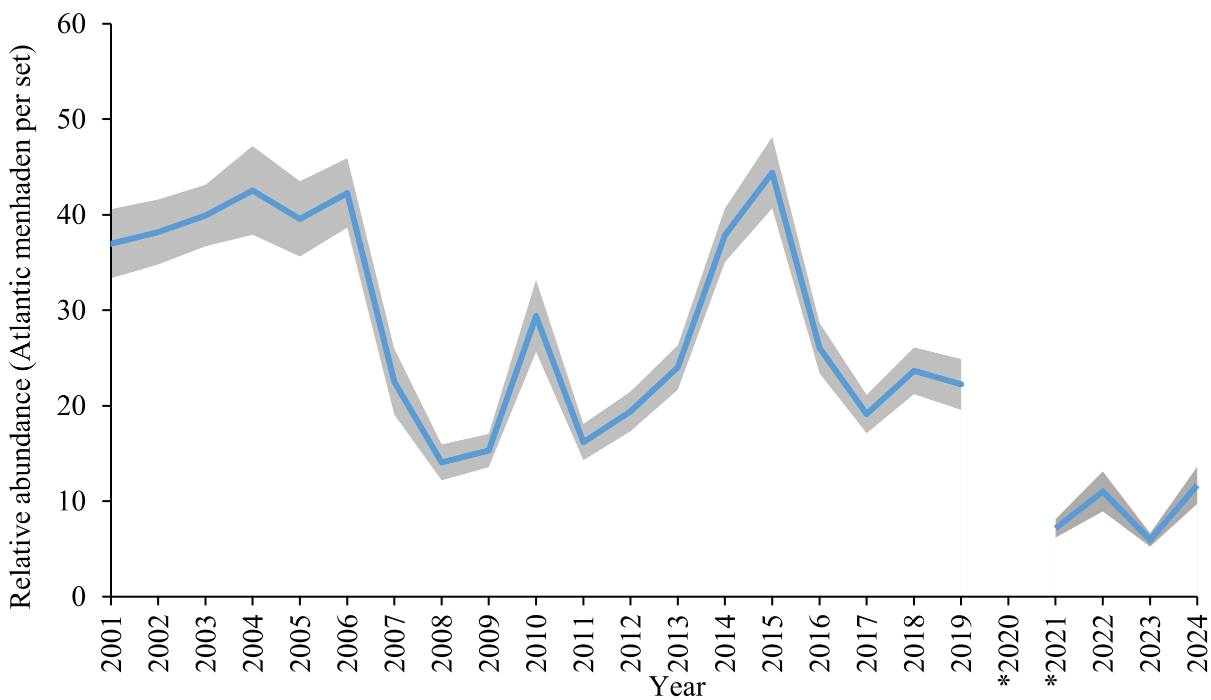

Figure 5. Relative abundance index (fish per set) of Atlantic menhaden collected from the Fishery-Independent Gill Net Survey (Program 915, Pamlico Sound only), 2001–2024. *Survey suspended February 20, 2020, through June 30, 2021.

The Program 120 relative abundance index for Atlantic menhaden in 2024 was 16.6, which was an increase from 2023 (2.60 Atlantic menhaden per tow) and was above the ten-year average (2015–2024, 4.86 Atlantic menhaden per tow). The program 915 relative abundance index for Atlantic Menhaden in 2024 was 11.67, which is an increase from 2023 (5.95 Atlantic menhaden per tow).

RESEARCH NEEDS

- Continue current level of sampling from bait fisheries, particularly in the Mid-Atlantic and New England. Analyze sampling adequacy of the reduction fishery and effectively sample areas outside of that fishery.
- Conduct aging validation study to confirm scale to otolith comparisons. Use archived scales to do ratio isotope analysis.
- Develop a menhaden specific coastwide fishery independent index of adult abundance at age.
- Conduct studies on spatial and temporal dynamics of spawning.
- Conduct Management Strategy Evaluation (MSE) on the various reference point options for menhaden.
- Continue to develop an integrated length and age-based model.
- Develop a seasonal spatially explicit model, once sufficient age-specific data on movement rates of menhaden are available.
- Continue exploring the development of multispecies models that can take predator-prey interactions into account. This should inform and be linked to the development of assessment models that allow natural mortality to vary over time.
- Continue to improve methods for incorporation of natural mortality (e.g., multi-species statistical catch-at-age model).
- Study specific habitat requirements for all life history stages.
- Develop habitat maps for all life history stages.
- Develop a mechanism for estimating or obtaining data for economic analysis on the reduction fishery, due to the confidential nature of the data.
- Conduct studies to fully recognize the linkages between the menhaden fishery and the numerous other fisheries which it supports and sustains.

MANAGEMENT

In 2017, the ASMFC set the TAC at 216,000 MT (476,198,485 pounds) for 2018–2019 and maintained that TAC for 2020 with the expectation that it would be set in future years using ERPs. In October 2020, following the adoption of ERPs, the ASMFC approved a TAC of 194,400 MT (428,578,637 pounds) for 2021–2022, which represents a 10% reduction from the 2018–2020 TAC level. Based on projections, the TAC is estimated to have a 58.5% and 52.5% probability of exceeding the ERP F target in the first and second year, respectively. One percent of the TAC is set aside for episodic events. The remaining 192,456 MT (424,292,851 pounds) will be made available to the states based on the state-by-state allocation established by Amendment 3 of which North Carolina receives 0.96%. For 2021–2022, North Carolina's annual quota was set at 1,840 MT (4,056,588 pounds).

In November of 2022, the ASMFC set the 2023–2025 TAC at 233,550 MT, which is an approximate 20% increase from the 2021–2022 TAC based on the positive stock status of the resource under ecological reference point-based management. According to ASMFC Technical Committee analysis, this increase has a less than 40% probability of exceeding the target set by the ERPs adopted in 2020.

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FISHERY MANAGEMENT PLAN UPDATE
ATLANTIC STURGEON
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	November 1990	
	Amendment 1	July 1998
	Technical Addendum #1	October 2000
	Addendum I	January 2001
	Addendum II	May 2005
	Addendum III	November 2006
	Addendum IV	September 2012
Comprehensive Review:	To Be Determined	

Amendment 1 to the Interstate Fishery Management Plan (FMP) for Atlantic sturgeon was developed by the Atlantic States Marine Fisheries Commission (ASMFC) with a goal to restore Atlantic sturgeon spawning stocks to population levels that will provide for sustainable fisheries and ensure viable spawning populations. Addendum I was completed to allow importation of non-indigenous Atlantic sturgeon and permit the development of private aquaculture facilities. Addendum II required compliance with ASMFC Terms, Limitations, Enforcement and Reporting Requirements for each exemption to the harvest and possession moratoria as outlined in Section 4 of the FMP. It also allowed LaPaz, Inc. to import Atlantic sturgeon fingerlings, produce fish, and sell the meat. Another exemption was provided to Acadian Sturgeon and Caviar to import Atlantic sturgeon from Canada to North Carolina. Addendum III complements Addendum II and provides authority for LaPaz Inc. to import Atlantic sturgeon from Supreme Sturgeon and Caviar for commercial aquaculture. Addendum IV is the Atlantic sturgeon Habitat Addendum.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). 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 Federal 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 (NCDMF 2015).

Management Unit

Atlantic sturgeon from Maine through Florida.

Goal and Objectives

The goal is to restore Atlantic sturgeon spawning stocks to population levels that will provide for sustainable fisheries and ensure viable spawning populations (ASMFC 1998). In order to achieve this goal, the plan sets forth the following objectives:

- Establish 20 protected year classes of females in each spawning stock.
- Close the fishery for a sufficient time period to reestablish spawning stocks and increase numbers in current spawning stocks.
- Reduce or eliminate bycatch mortality of Atlantic sturgeon.

- Determine the spawning sites and provide protection of spawning habitats for each spawning stock.
- Where feasible, re-establish access to historical spawning habitats for Atlantic sturgeon.
- Conduct appropriate research as needed.

DESCRIPTION OF THE STOCK

Biological Profile

Atlantic sturgeon (*Acipenser oxyrinchus*) is an anadromous species, which means once mature, adults reside primarily in oceans for most of the year and migrate up rivers to spawn. The species is found from Labrador, Canada, south to the St. Johns River, Florida. Atlantic sturgeon spend their first few years of life in their natal estuary before becoming highly migratory and travelling throughout coastal Atlantic waters and various estuaries to feed.

Once mature, Atlantic sturgeon exhibit natal homing, returning to the specific river where they were spawned to reproduce. Migratory patterns are seasonal, with northern migrations in spring as water temperatures rise and southern migrations in fall as water temperatures decrease. Some adult sturgeon will return to spawning grounds in consecutive years, but others may only spawn once every two or three years. In NC, adult fish that reproduce in the Roanoke River enter the Albemarle Sound basin during spring. They spend the summer in western Albemarle Sound and lower Roanoke River. Once temperatures begin to decrease around September, the fish ascend the Roanoke River to the rapids near Weldon to spawn. When spawning is complete and as water temperatures decrease further, sturgeon leave the river and proceed to the ocean through the Albemarle Sound.

Atlantic sturgeon are thought to have historically spawned within the Roanoke, Tar-Pamlico, Neuse, and Cape Fear rivers. Currently, the Roanoke River is the only North Carolina river with a known spawning population. Evidence from the collection of young-of-year fish exists for other North Carolina rivers but collection of eggs has only been documented in the Roanoke River (Smith et al. 2015). Additionally, adult sturgeon fitted with radio-telemetry tags have been documented within the Cape Fear and Northeast Cape Fear rivers potentially making a spawning run.

Atlantic sturgeon at various life stages are found within most estuarine waters of North Carolina throughout the entire year. Due to their highly migratory behavior, Atlantic sturgeon spawned in other regions often enter North Carolina waters. Sturgeon from the Hudson, Chesapeake, Carolina, and South Atlantic Distinct Population Segments have been identified in North Carolina waters.

Atlantic sturgeon are opportunistic bottom feeders that prey on various types of worms, shrimps, crabs, snails, and small fishes. Atlantic sturgeon may live to a maximum age of 70 years; however, in more southern locations the maximum age may be only 30–40 years. Age at which Atlantic sturgeon reach sexual maturity is unknown for specimens in North Carolina, but other fish within the Carolina and South Atlantic Distinct Population Segments mature as early as 5–13 years for males and 7–19 years for females. In contrast, sturgeon in more northern latitudes (Hudson River) mature at 11–20 years for males and 20–30 years for females. Research conducted in South Carolina show spawning intervals of one to five years for males and three to five years for females.

Stock Status

Depleted.

Stock Assessment

The Atlantic States Marine Fisheries Commission completed a benchmark assessment on Atlantic sturgeon in July 2017. Due to limited data availability, this assessment employed a number of approaches including Mann-Kendall test, Autoregressive Integrated Moving Average (ARIMA) model, and power, cluster, dynamic factor, and population viability analyses for the coastwide stock and by Distinct Population Segment (DPS). The 2024 stock assessment update concluded that Atlantic sturgeon remain depleted coastwide. The “depleted” status was used instead of “overfished” because many factors (such as bycatch, habitat loss, and ship strikes), not just directed historical fishing, have contributed to the continued low abundance of Atlantic sturgeon. While overall levels of Atlantic sturgeon remain low, the population has shown signs of improvement with a significant positive trend over the time series and a high probability that abundance in 2022 was greater than abundance in 1998 at the start of the 40-year moratorium on harvest. Additionally, total mortality was low and had a low probability of exceeding the reference point. While Atlantic sturgeon is still considered a “data-poor” species, a tremendous amount of information has been collected on the species since 1998 that improves the abilities of managers and scientists to manage the species.

DESCRIPTION OF THE FISHERY

Current Regulations

Coast-wide commercial and recreational harvest moratorium since 1998.

Commercial Fishery

No landings recorded in NC since 1991. Reported coastwide landings peaked in the 1890s at around 7,495,717 pounds, but by 1905 coastwide landings were below 550,000 pounds and remained below that level until the harvest moratorium was implemented in 1998.

Recreational Fishery

No recreational fishery.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

The North Carolina Division of Marine Fisheries (DMF) provides at-sea observer coverage for the estuarine anchored gill-net fisheries throughout North Carolina.

In October 2024, the DMF received an Incidental Take Permit (ITP) to address incidental takes of Atlantic sturgeon (*Acipenser oxyrinchus*) in anchored gill-net fisheries operating in estuarine waters across the state (NMFS 2024). The permit application included analysis using a zero-inflated Poisson general linear model that estimated bycatch in the fisheries. This model divided the state estuarine waters into management units and estimated takes (live and dead) within each of these units, by season and mesh size (Rawls 2022).

During 2024, on-board and alternate platform observers documented one Atlantic sturgeon caught in anchored gill nets that measured 50 inches total length (TL) (Table 1).

Fishery-Independent Monitoring

The DMF currently has three independent gill-net surveys that encounter and tag Atlantic sturgeon. The Albemarle Sound Independent Gill Net Survey (IGNS) is a stratified random gill-net survey that employs gill nets with mesh sizes that range from 2.5-inch stretch mesh (ISM) through 7 ISM (at 0.5 ISM increments) and 8 ISM and 10 ISM of floating and sinking nets. A total of 24 gill nets is fished that are each 40-yards long totaling 960 yards per sampling event. Each set is fished for approximately 24 hours before retrieval. Nets were fished from January through May, November, and December each year from 1991 through February 2020.

Table 1. Atlantic sturgeon length data (total length, inches) collected from the North Carolina Division of Marine Fisheries Onboard Observer Program, 2003–2024, (includes data from Alternate Platform Observer Program 2013–2024).

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Total Number Caught
2003	-	-	-	0	1
2004	23	13	32	24	25
2005	25	18	32	27	28
2006	24	13	45	38	39
2007	-	-	-	0	0
2008	25	19	33	18	18
2009	-	-	-	0	0
2010	-	-	-	0	0
2011	30	18	55	4	4
2012	26	18	35	8	10
2013	26	19	36	28	30
2014	28	16	65	50	59
2015	28	18	40	61	73
2016	26	15	62	76	81
2017	26	17	41	45	53
2018	28	19	40	22	24
2019	35	21	72	5	6
2020	31	18	47	17	18
2021**	33	20	38	6	10
2022	31	21	47	32	39
2023	42	39	50	4	43
2024	50	50	50	1	1

**Based on alternate platform trips only

Major changes to the Albemarle Sound IGNS survey design were incorporated beginning in November 2021 with the objective of decreasing sturgeon interactions within the survey. The number of nets used in the survey initially remained the same, with the change being that nets were fished for a reduced 12-hours of soak time before retrieval. Nets were set at sunset and fished 12-hours later. Beginning in March 2022, the 12 sinking nets were removed from the survey to further decrease sturgeon interactions. The changes in the survey design have likely resulted in the survey no longer tracking the abundance of Atlantic sturgeon sub-adults in the Albemarle Sound as the majority of sturgeon were captured in the sink nets. Lengths of sturgeon collected in 2024 ranged from 13 to 41 inches Fork Length (FL) and averaged 29 inches FL (Table 2). The relative abundance index shows an increasing trend between 1991 and 2020, but annual values are variable (Figure 1). Following changes to reduce sturgeon interactions, CPUE decreased as expected beginning in 2021 and continuing through 2024. This result supports the success of sturgeon bycatch reduction methods.

The Fishery Independent Assessment Survey (FIAS) is conducted in Pamlico Sound, Neuse, Tar-Pamlico and Pungo rivers, and consists of gill-net sets, ranging in mesh size from 3.0 ISM through 6.5 ISM (0.5 ISM increments) and are fished for approximately 12 hours before retrieval. The Pamlico Sound surveys have been conducted since 2001 and the river surveys since 2003. Starting in 2018 sampling areas in West Bay, Core and Bogue sounds, and Newport and White Oak rivers were added to the FIAS.

Table 2. Atlantic sturgeon length data (fork length, inches) collected from the Albemarle Sound Independent Gill Net Survey, 1991–2024. Total sturgeon includes recaptures. Note: survey methodology changed in November 2021 to reduce sturgeon interactions.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Total Number Caught
1991	20	10	28	26	26
1992	18	8	23	17	17
1993	18	9	37	13	13
1994	18	10	29	40	41
1995	19	10	30	21	21
1996	17	8	22	27	27
1997	17	9	27	60	61
1998	19	6	29	92	92
1999	21	11	28	55	55
2000	15	7	30	139	139
2001	19	12	27	132	132
2002	21	9	29	29	29
2003	20	10	39	22	22
2004	19	10	31	30	30
2005	20	9	33	48	48
2006	22	9	58	62	63
2007	21	9	30	66	71
2008	21	10	33	124	128
2009	25	15	31	55	56
2010	23	16	32	32	32
2011	24	15	59	47	47
2012	23	12	42	64	65
2013	22	11	55	139	140
2014	24	14	46	70	72
2015	23	14	39	86	86
2016	21	10	37	124	124
2017	22	14	40	173	173
2018	23	15	67	152	155
2019	21	8	52	212	212
2020	22	15	43	148	148
2021	22	13	52	107	107
2022	25	15	39	53	53
2023	31	18	52	47	47
2024	29	13	41	22	22

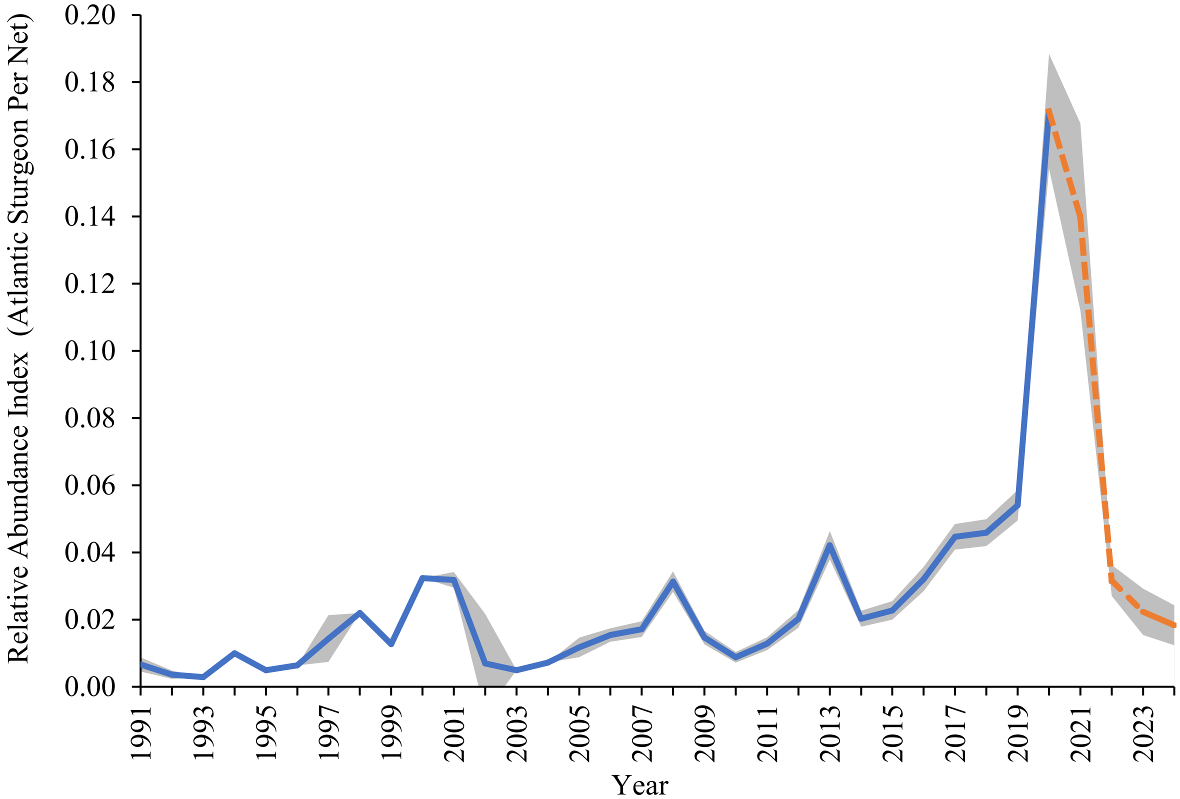

Figure 1. Annual nominal relative abundance index with standard error shaded in gray for Atlantic sturgeon collected from the Albemarle Sound Independent Gill Net Survey, 1991–2024. Note: survey methodology changed in November 2021 to reduce sturgeon interactions.

In 2024, three sturgeon ranging from 31 to 38 inches FL with an average FL of 34 inches were caught in Pamlico Sound area of the survey (Table 3). In the Tar-Pamlico, Neuse, and Pungo rivers area in 2024, five sturgeon were captured that had an average FL of 34 inches and ranged 25 to 39 inches FL (Table 4). And in the West Bay, Core and Bogue sounds, and Newport and White Oak regions area of the survey, no sturgeon were caught in 2024 (Table 5).

The Southern Independent Gill Net Survey is modeled after the (FIAS) but with periods of reduced soak times. The areas fished include the New and Cape Fear rivers. Two-hundred forty yards were fished per sample and 120 samples were completed per year. Effort has been ongoing since 2008. Additional sampling occurred in the coastal ocean waters off the New and Cape Fear rivers. Two-hundred and seventy yards were fished per sample in these ocean waters. However, sampling in the coastal ocean waters was discontinued on July 1, 2015. During 2024, three fish were collected in the Cape Fear River IGNS that ranged from 21 to 30 inches FL and averaged 24 inches FL (Table 6).

During 2010, the DMF joined a multi-state grant entitled "Research and Management of Endangered and Threatened Species in the Southeast: Riverine Movements of shortnose and Atlantic sturgeon" cooperating with South Carolina Department of Natural Resources, The University of Georgia, and North Carolina State University. Funding was provided through NOAA Fisheries, Section 6. Ninety-four Atlantic sturgeon were tagged with acoustic transmitters from 2011 through 2013 in the Cape Fear River and Albemarle Sound. These fish ranged from 24 to 69 inches FL and averaged 37 inches FL (Table 7).

Table 3. Atlantic sturgeon length data (fork length, inches) collected from the Pamlico Sound Independent Gill Net Survey, 2001–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Total Number Caught
2001	-	-	-	0	0
2002	26	26	26	1	1
2003	-	-	-	0	0
2004	20	18	21	5	5
2005	26	23	31	18	18
2006	27	21	31	12	13
2007	33	26	59	5	5
2008	31	25	37	2	2
2009	38	38	38	1	1
2010	24	20	27	2	2
2011	-	-	-	0	0
2012	56	56	56	1	1
2013	-	-	-	0	0
2014	-	-	-	0	0
2015	*	*	*	0	1
2016	30	29	30	2	2
2017	61	61	61	1	1
2018	24	21	27	3	3
2019	38	38	38	1	1
2020**	-	-	-	0	0
2021***	-	-	-	0	0
2022	30	19	42	7	8
2023	36	21	54	10	10
2024	34	31	38	3	3

*Length not recorded
**No sampling occurred
***Limited sampling occurred (July–December)

Table 4. Atlantic sturgeon length data (fork length, inches) collected from the Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey, 2003–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Total Number Caught
2003	-	-	-	0	0
2004	24	19	32	9	9
2005	18	14	31	29	29
2006	25	19	29	4	4
2007	20	16	28	3	3
2008	21	21	21	1	1
2009	28	28	28	1	1
2010	-	-	-	0	0
2011	-	-	-	0	0
2012	25	25	25	1	1
2013	-	-	-	0	0
2014	*	*	*	0	1
2015	24	14	56	23	23
2016	28	18	38	8	8
2017	45	45	45	1	1
2018	34	22	56	5	5
2019	19	13	25	2	2
2020**	-	-	-		
2021***	22	14	38	43	44
2022	27	22	34	7	8
2023	26	15	37	10	10
2024	34	25	39	4	5

*Length not recorded
**No sampling occurred
***Limited sampling occurred (July–December)

Table 5. Atlantic sturgeon length data (fork length, inches) collected from the West Bay, Core and Bogue sounds, and White Oak and Newport rivers Independent Gill Net Survey, 2018–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Total Number Caught
2018	-	-	-	0	0
2019	-	-	-	0	0
2020	-	-	-	0	0
2021	-	-	-	0	0
2022	22	19	25	2	2
2023	31	31	31	1	1
2024	-	-	-	0	0

Table 6. Atlantic sturgeon length data (fork length, inches) collected from the Cape Fear and New rivers Independent Gill Net Survey, 2008–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Total Number Caught
2008	28	28	28	1	1
2009	22	22	22	1	1
2010	34	34	34	1	1
2011	30	30	30	1	1
2012	-	-	-	0	0
2013	-	-	-	0	0
2014	-	-	-	0	0
2015	26	26	26	1	1
2016	29	25	37	5	5
2017	30	27	37	3	3
2018	25	21	28	3	3
2019	29	25	33	2	2
2020*	-	-	-	0	0
2021**	-	-	-	0	0
2022	-	-	-	0	0
2023	26	21	36	8	8
2024	24	21	30	3	3

*No sampling occurred

**Limited sampling occurred (July–December)

Table 7. Atlantic sturgeon length data (fork length, inches) collected through Section 6 funding in the Cape Fear River and Albemarle Sound, North Carolina, 2011–2013.

Year	Mean Length	Minimum Length	Maximum Length	Number Collected
2011	38	25	64	45
2012	37	30	69	21
2013	34	24	46	28

RESEARCH NEEDS

Biological/Captive Propagation

- Standardize and obtain baseline data on population status for important sturgeon rivers. Data should include assessment of stock status in various rivers, size and composition of the spawning population, reproductive success and juvenile production.
- Develop long-term marking/tagging procedures to provide information on individual tagged Atlantic sturgeon for up to 20 years.
- Establish success criteria in order to evaluate the effectiveness of stocking programs.
- Determine size at maturity for North, Mid- and South Atlantic sturgeon.
- Monitor catch/effort and size/age composition of landings of any future authorized directed fisheries.
- Determine length at age by sex for North, Mid- and South Atlantic stocks.
- Determine maturity at age by sex for North, Mid- and South Atlantic stocks.
- Determine fecundity at age, length, and weight for North, Mid-, and South Atlantic stocks.

- Characterize size and condition of Atlantic sturgeon by gear and season taken as bycatch in various fisheries.
- Establish environmental tolerance levels (dissolved oxygen, pH, temperature, etc.) for different life stages.
- Establish coastal tagging projects to delineate migratory patterns (this measure is being implemented by the USFWS and member states).
- Expand tagging of juveniles in major spawning rivers to allow estimates of rates of loss to bycatch.
- Establish a tag recovery clearinghouse and database for consolidation and evaluation of tagging and tag return information including associated biological, geographic, and hydrographic data (this measure is being implemented by the USFWS through the Maryland Fisheries Resources Office located in Annapolis, Maryland).
- Encourage shortnose sturgeon researchers to include Atlantic sturgeon research in their projects.
- Establish methods for the recovery of tags and associated information (this measure is being implemented through ASMFC/USFWS cooperative efforts).
- Evaluate existing groundfish survey data to determine what can be learned about at-sea migratory behavior.
- Conduct basic culture experiments to provide information on: (a) efficacy of alternative spawning techniques, (b) egg incubation and fry production techniques, (c) holding and rearing densities, (d) prophylactic treatments, (e) nutritional requirements and feeding techniques, and (f) optimal environmental rearing conditions and systems.
- Determine the extent to which Atlantic sturgeon are genetically differentiable among rivers.
- Conduct research to identify suitable fish sizes, and time of year for stocking cultured fish.
- Conduct and monitor pilot-scale stocking programs before conducting large-scale efforts over broad geographic areas.
- Determine effects of contaminants on early life stages.
- Develop methods to determine sex and maturity of captured sturgeon.
- Develop sperm cryopreservation techniques and refine to assure availability of male gametes.
- Refine induced spawning procedures.
- Develop the capability to capture wild broodstock and develop adequate holding and transport techniques for large broodstock.
- Conduct studies to identify tissue(s) suitable for genetic analyses and the techniques for their collection and storage. In those states which permit future harvest of Atlantic sturgeon, material for genetic analysis should be collected from up to 50% of the fish landed in the commercial fisheries. In states with no future directed fisheries, federal and state programs which encounter sturgeon should be encouraged to collect specified tissues for genetic analysis.
- Standardize collection procedures to obtain biological tissues and identify a suitable repository to archive all materials.
- Conduct research to determine the susceptibility of Atlantic sturgeon to sturgeon adenovirus and white sturgeon iridovirus. Methods should be developed to isolate the sturgeon adenovirus and an Atlantic sturgeon cell line should be established for infection trials.
- Conduct research to identify the major pathogens of Atlantic sturgeon and a cell line for this species should be developed,

Social

- To evaluate the social impacts the needed data might include the following for consumptive and non-consumptive users: demographic information (e.g., age, gender, ethnicity/race, etc.), social structure information (e.g., historical participation, affiliation with NGOs, perceived conflicts, etc.), other cultural information (e.g., occupational motivation, cultural traditions related to resource's use), and community information.
- A cost and benefit analysis of possible stocking protocols is needed.

Assessment

- Identify spawning units along the Atlantic coast at river or tributary and coastwide level.
- **Expand and improve the genetic stock definitions of Atlantic sturgeon, including developing and updated genetic baseline sample collection at the coastwide, DPS, and river-specific level for Atlantic sturgeon, with the consideration of spawning season-specific data collection.
- Determine habitat use by life history stage including adult staging, spawning, and early juvenile residency.
- Expand the understanding of migratory ingress of spawning adults and egress of adults and juveniles along the coast.
- Identify Atlantic sturgeon spawning habitat through the collection of eggs or larvae.
- Investigate the influence of warming water temperatures on Atlantic sturgeon, including the effects on movement, spawning, and survival.
- Evaluate the effects of predation on Atlantic sturgeon by invasive species (e.g., blue and flathead catfish).
- **Establish regional (river or DPS-specific) fishery-independent surveys to monitor Atlantic sturgeon abundance or expand existing regional surveys to include annual Atlantic sturgeon monitoring. Estimates of abundance should be for both spawning adults and early juveniles at age.
- **Establish coastwide fishery-independent surveys to monitor mixed stock abundance or expand existing surveys to include annual Atlantic sturgeon monitoring.
- **Continue to collect biological data, PIT tag information, and genetic samples from Atlantic sturgeon encountered in surveys that require it (e.g., NEAPMAP). Consider including this level of data collection from surveys that do not require it.
- **Encourage data sharing of acoustic tagged fish, particularly in underrepresented DPSs, and support program that provide a data sharing platform such as The Atlantic Cooperative Telemetry Network. Data sharing should be accelerated if it was required or encouraged by funding agencies.
- **Maintain and support current networks of acoustic receivers and acoustic tagging programs to improve the estimates of total mortality.
- **Collect DPS-specific age, growth, fecundity, and maturity information.
- **Collect more information on regional vessel strike occurrences, including mortality estimates. Identify hot spots for vessel strikes and develop strategies to minimize impacts on Atlantic sturgeon.
- **Monitor bycatch and bycatch mortality at the coastwide level, including international fisheries where appropriate (i.e., the Canadian weir fishery). Include data on size, health condition at capture, and number of fish captured.
- **Establish recovery goals for Atlantic sturgeon to measure progress of and improvement in the population since the moratorium and ESA listing.
- **Expand the acoustic tagging model to obtain abundance estimates and incorporate movement.

- Evaluate methods of imputation to extend time series with missing values.

Recommendations with asterisks (**) indicate improvements that should be made before initiating another benchmark stock assessment.

Monitoring population trends through juvenile abundance indices, characterizing the incidence of bycatch and mortalities in various fisheries, and conducting tag/recapture studies for estimates of bycatch loss are being addressed through current sampling. It should be noted that any sampling or research that encounters Atlantic sturgeon whether incidental or targeted now require Section 10 permits through NOAA Fisheries or a Section 7 consultation if funded through a federal grant program. These permit requirements directly influence the data collection abilities of the DMF, potentially impacting the completion of research recommendations.

MANAGEMENT

Atlantic coastal states implemented a moratorium on harvest and possession of Atlantic sturgeon in coastal waters (0–3 miles) in 1998, while NOAA Fisheries banned harvest in the exclusive economic zone. The best available data indicate that river-specific populations are appropriate management units. It is recommended that the moratorium remain in place for each population until it can be documented that the spawning population includes at least 20-year classes of mature females (half the number of year classes that probably existed in unfished populations). Given that female Atlantic sturgeon do not mature until about 20 years of age, the moratorium can be expected to remain in place for several decades from when harvest of a given population ended. As populations increase during restoration, bycatch of sturgeon will increase; hence, managers should ensure that mechanisms are in place to monitor the level of bycatch and make reductions where necessary.

In 2012, NOAA Fisheries listed the Carolina DPS of Atlantic sturgeon as an endangered species under the 1973 Endangered Species Act (ESA). This listing determination drastically influenced the management strategy in North Carolina. The largest influence was the requirement of the DMF to obtain a Section 10 Incidental Take Permit to allow the estuarine anchored gill-net fisheries to continue. Without the Section 10 Permit, interactions in the fishery would have been illegal. In 2016, NOAA Fisheries published a proposed rule to designate Atlantic sturgeon critical habitat (specific areas that are considered essential to the conservation of the species) in each of the DPSs. The final rule to designate critical habitat was published in September 2017. This rule designated approximately 1,939 km (1,205 miles) of aquatic habitat for the Carolina DPS, including the following rivers in North Carolina: Roanoke, Tar-Pamlico, Neuse, Cape Fear, Northeast Cape Fear, and Pee Dee. Any future fishery for Atlantic sturgeon without Federal Permits will only be possible when NOAA Fisheries removes Atlantic sturgeon from the ESA. However, additional protections provided through the ESA listing should increase the potential for stock recovery.

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FISHERY MANAGEMENT PLAN UPDATE
BLACK DRUM
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	ASMFC FMP	June 2013
	Addendum I	May 2018
Information Updates:	October 2024	
Comprehensive Review:	2028	

In June 2013, the Atlantic States Marine Fisheries Commission (ASMFC) adopted the Interstate Fishery Management Plan (FMP) for Black Drum and required all states to maintain their current regulations and implement a maximum possession limit and minimum size limit (of no less than 12 inches) by January 1, 2014 (ASMFC 2013). States were also required to further increase the minimum size limit (to no less than 14 inches) by January 1, 2016. In response to the ASMFC requirement, the North Carolina Marine Fisheries Commission (MFC) implemented a 14- to 25-inch total length slot size limit (with one fish over 25 inches), 10-fish recreational bag limit, and a 500-pound commercial trip limit effective January 1, 2014 (Proclamation FF-73-2013). The FMP also includes an adaptive management framework to respond to future concerns or changes in the fishery or population. Concerns about the increase in harvest by both recreational and commercial were alleviated by the findings of the 2015 stock assessment which determined the stock was not overfished and overfishing was not occurring (ASMFC 2015). In May 2018, ASMFC approved Addendum I to the Black Drum FMP to allow Maryland to reopen its black drum commercial fishery in Chesapeake Bay with a daily vessel limit of up to 10 fish and a 28-inch minimum size (ASMFC 2018). The Black Drum Technical Committee noted reopening the fishery would not likely lead to overfishing due to the relatively small size of the fishery and recommended that biological monitoring be conducted in the commercial fishery. In 2023, a benchmark stock assessment concluded the stock was not overfished and not experiencing overfishing (ASMFC 2023). The ASMFC Interstate FMP Policy Board determined no immediate management action was needed. However, due to relatively high level of uncertainty in qualitative estimates of stock status, stock indicators should be closely monitored between assessments.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). 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 (NCDMF 2022).

Management Unit

The ASMFC FMP includes all states from Florida to New Jersey. The management unit is defined as the black drum (*Pogonias cromis*) resource throughout the range of the species within U.S. waters of the northwest Atlantic Ocean from the estuaries eastward to the offshore boundaries of the U.S. Exclusive Economic Zone (ASMFC 2015).

Goal and Objectives

The goal of the Black Drum FMP is to provide an efficient management structure to implement coastwide management measures (ASMFC 2013). The objectives of the FMP include:

- Provide a flexible management system to address future changes in resource abundance, scientific information, and fishing patterns among user groups or area.
- Promote cooperative collection of biological, economic, and sociological data required to effectively monitor and assess the status of the black drum resource and evaluate the management efforts.
- Manage the black drum fishery to protect both young individuals and established breeding stock.
- Develop research priorities that will further refine the black drum management program to maximize the biological, social, and economic benefits derived from the black drum population.

DESCRIPTION OF THE STOCK

Biological Profile

Black drum is the largest member of the drum family (Sciaenidae), reaching sizes of over 46 inches and 120 pounds (Jones and Wells 1998). The range of black drum extends along the nearshore western Atlantic coast from the Gulf of Maine to Florida, into the Gulf of Mexico, and as far south as Argentina (Bigelow & Schroeder 1953; Simmons & Breuer 1962). Along the Atlantic Coast, black drum are thought to migrate northward and inshore each spring and southward and offshore by late fall (Jones & Wells 1998). Juvenile black drum can be found throughout the estuarine waters of North Carolina, while adults tend to congregate around structures including bridge and dock pilings. They are primarily bottom feeders; juvenile diets consist mainly amphipods, polychaetes, mollusks, crustaceans, and small fish, while the adult diet consists primarily of worms, bivalves, mollusks, crustaceans, and fish (Peters & McMichael 1990; Murphy & Muller 1995; Rubio et al. 2018). Spawning is thought to occur in the offshore waters of the mid-Atlantic during the winter and early spring (Richards 1973; Joseph et al. 1964; Wells & Jones 2002; Chesapeake Bay Program 2004). The number of juvenile fish entering the population annually (recruitment) is thought to be highly variable and dependent on natural environmental conditions (Murphey & Muller 1995). Females are sexually mature between the ages of 4 and 6 (25 to 28 inches) and spawn yearly through adulthood (Murphy & Taylor 1989). An average-sized female may spawn 32 million eggs each year (Fitzhugh et al. 1993). At ages 4 and 5 (22 to 25 inches) males are mature (Murphy & Taylor 1989). The species is long-lived, reaching up to 67 years of age (Jones & Wells 1998; Campana & Jones 1998; ASMFC 2023). Black drum are approximately 11 to 14 inches at age-1, 15 to 17 inches at age-2, and 19 to 21 inches at age-3 (Murphy & Taylor 1989; Murphy & Muller 1995; Jones & Wells 1998).

Stock Status

The 2023 ASMFC Black Drum Stock Assessment determined the stock is not overfished and not experiencing overfishing (ASMFC 2023).

Stock Assessment

Variable catch history in state surveys and fisheries, coupled with complex migratory patterns, made the use of traditional statistical catch-at-age models difficult. In 2023, a benchmark stock assessment was completed and approved for use for management by the ASMFC (ASMFC 2023). The assessment model, JABBA-Select, was developed as an extension to the Just Another Bayesian Biomass Assessment (JABBA) surplus production modeling framework as a means of incorporating life history and fishery selectivity information into an age-structured production type model (Winker et al. 2020). The JABBA-Select model allowed the inclusion of the recalibrated Marine Recreational Information Program (MRIP) data as an index of abundance and catch history (Dettloff and Matter 2019). Annual spawning abundance (SB), annual exploitation (H), and biological reference points are estimated internally in the model, using an index of abundance (MRIP), total fishery removals, life history information, and selectivity information to describe black drum's vulnerability to fisheries. The stock is considered overfished when SB falls below the SB_{MSY} threshold ($SB_y / SB_{MSY} < 1$). Overfishing is occurring when H exceeds the H_{MSY} threshold ($H_y / H_{MSYy} > 1$). In 2020, the median relative spawning biomass value was 2.92 and the median relative exploitation value was 0.29, indicating the stock was not overfished and not experiencing overfishing in the terminal year (ASMFC 2023; Figure 1). Results indicated greater certainty that the stock is not overfished; however, there was less certainty regarding the exploitation status. While overall stock indicators that monitor year class strength, sub-adult abundance, exploitable abundance, range expansion, and regional catch do not appear negative at this time, they will be closely monitored between assessments. The next benchmark stock assessment is scheduled to occur in 2028.

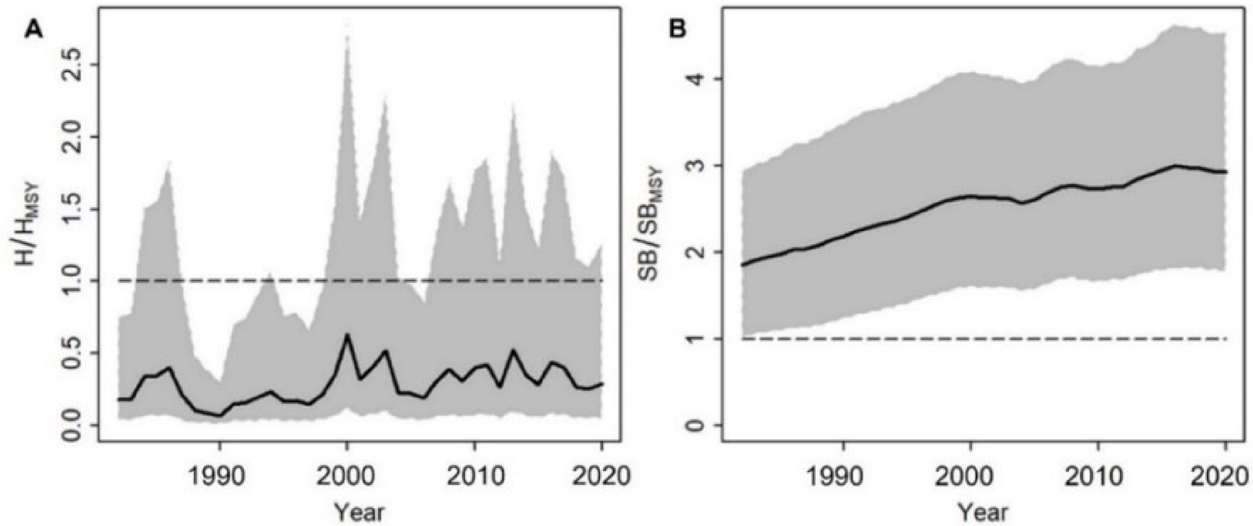


Figure 1. Black drum exploitation (A) and spawning biomass (B) relative to threshold reference points estimated in JABBA-Select. The solid line is the median and the shaded region is the 95% credible interval. The dashed line indicates the estimate at its respective threshold level. (Source: ASMFC 2023 Black Drum Stock Assessment and Peer Review Report).

DESCRIPTION OF THE FISHERY

Current Regulations

All harvest is limited to black drum between a 14-inch total length (TL) minimum size and 25-inch TL maximum size for both the recreational and commercial fisheries, except that one black drum over 25-inches TL may be retained. The recreational bag limit is ten fish per day. A daily commercial possession limit of no more than 500 pounds per trip is allowed for a commercial fishing operation, regardless of the number of persons, license holders, or vessels involved in the operation (Proclamation FF-73-2013).

Commercial Fishery

Since 1994, the North Carolina Trip Ticket Program (NCTTP) has collected data on the commercial harvest of black drum. Black drum is primarily caught as bycatch in several North Carolina commercial fisheries; however, the majority are landed in the gill net (69%) and pound net (29%) fisheries (Figure 2). The annual commercial harvest of black drum has been highly variable (Table 1; Figure 3A). On average 127,217 pounds of black drum were landed annually from 1994 to 2024. Commercial landings have ranged from a low of 27,750 pounds in 1998 to a high of 497,479 pounds in 2002. Commercial landings decreased 0.3% from 2023 to 2024. In 2024, 240,029 pounds of black drum were landed in the commercial fishery.

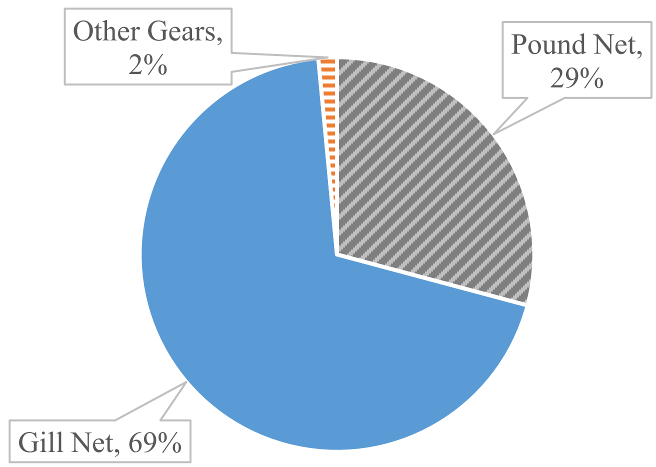
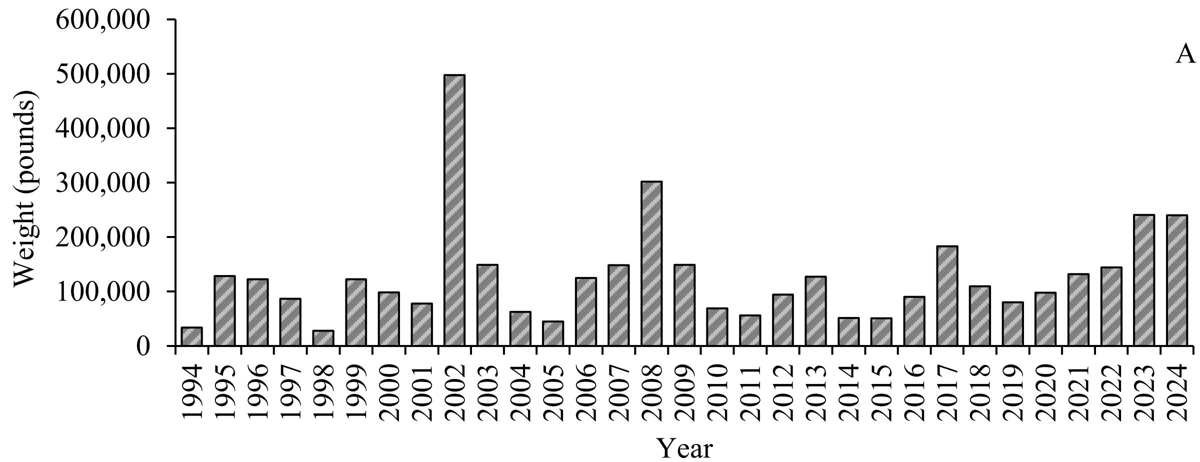


Figure 2. Black drum commercial harvest in 2024 by gear type. “Other Gears” includes haul seines, crab pots, channel nets, and fyke nets.



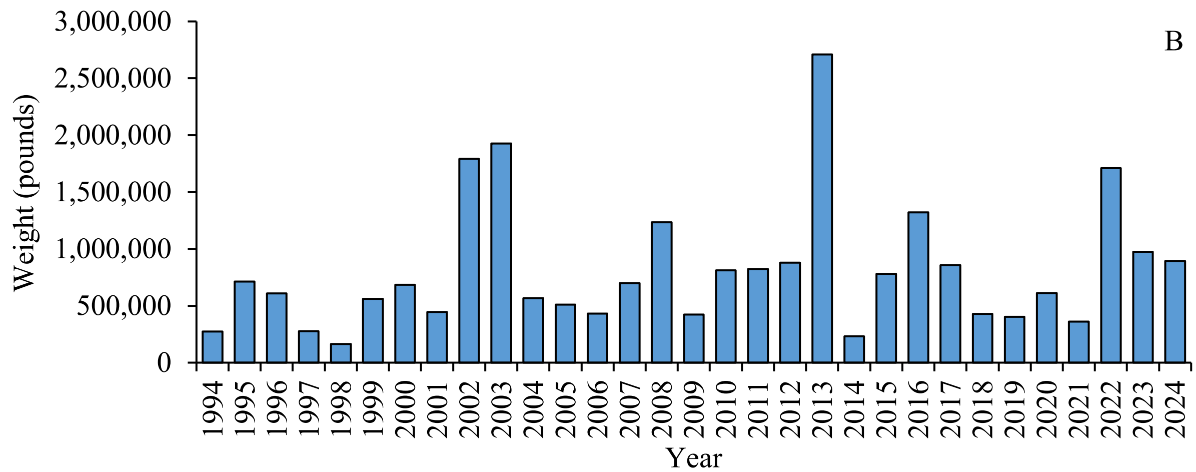


Figure 3. Annual commercial (A) and recreational (B) landings in pounds for black drum in North Carolina from 1994 to 2024.

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of black drum from North Carolina for the period 1994–2024.

	Recreational			Commercial	
Year	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1994	132,517	9,122	272,820	33,536	306,356
1995	931,269	227,608	713,652	128,221	841,873
1996	468,766	176,061	608,460	122,837	731,297
1997	106,854	62,498	277,316	86,610	363,926
1998	105,349	95,834	164,280	27,750	192,030
1999	374,245	267,723	561,678	122,772	684,450
2000	293,983	112,470	685,687	98,784	784,471
2001	400,983	325,234	446,202	77,892	524,094
2002	846,855	215,810	1,791,703	497,479	2,289,182
2003	1,265,995	481,742	1,926,671	148,785	2,075,456
2004	296,531	255,753	566,484	62,445	628,929
2005	465,076	376,363	509,328	44,989	554,317
2006	276,257	265,369	431,212	125,214	556,426
2007	876,178	832,132	697,822	148,231	846,053
2008	925,963	548,931	1,232,589	301,998	1,534,587
2009	449,901	411,358	421,788	148,994	570,782
2010	650,010	427,577	812,699	69,194	881,893
2011	1,259,216	711,755	823,423	56,083	879,506
2012	556,482	397,155	879,401	94,352	973,753
2013	1,511,995	497,334	2,709,269	127,170	2,836,439
2014	109,307	1,964,749	230,834	51,217	282,051
2015	276,126	1,791,758	780,876	51,097	831,973
2016	459,078	2,530,596	1,322,547	90,055	1,412,602
2017	355,544	2,336,352	856,081	182,989	1,039,070
2018	134,624	1,450,855	428,273	109,781	538,054
2019	156,401	756,749	404,452	80,049	484,501
2020	213,320	704,357	612,932	98,143	711,075
2021	121,454	681,121	359,481	131,825	491,306
2022	264,634	647,304	1,710,528	144,417	1,854,945
2023	348,374	591,980	973,869	240,799	1,214,668
2024	187,457	558,226	893,292	240,029	1,133,321
Mean	478,089	668,125	809,860	127,217	937,077

Recreational Fishery

Recreational estimates across all years have been updated and are now based on the MRIP new Fishing Effort Survey-based calibrated estimates. For more information on MRIP see https://www.fisheries.noaa.gov/topic/recreational-fishing-data.

The recreational landings have been highly variable, ranging from a low of 164,280 pounds in 1998 to a high of 2,709,269 pounds in 2013 (Table 1; Figure 3B). In 2024, 893,292 pounds of black drum were harvested, above the time-series average of 809,860 pounds. The harvest (pounds of fish) decreased 8%; however, harvest (number of fish) decreased 46% 2023 to 2024. Which indicates more larger fish were landed in 2024 than in 2023. In 2023, the mean weight of fish harvest was 2.8 pounds, and the maximum weight was 15 pounds; whereas, in 2024 mean weight was 4.8 pounds and the maximum weight was 21 pounds. Recreational releases (number of fish) decreased 6% from 2023 to 2024.

The division offers award citations for exceptional catches of black drum. Prior to 2021, citations were awarded for black drum greater than 35 pounds or fish released greater than 40-inches TL. Released black drum greater than 40 inches TL are now only eligible for an award citation. In 2024, 36 citations were awarded (Figure 4).

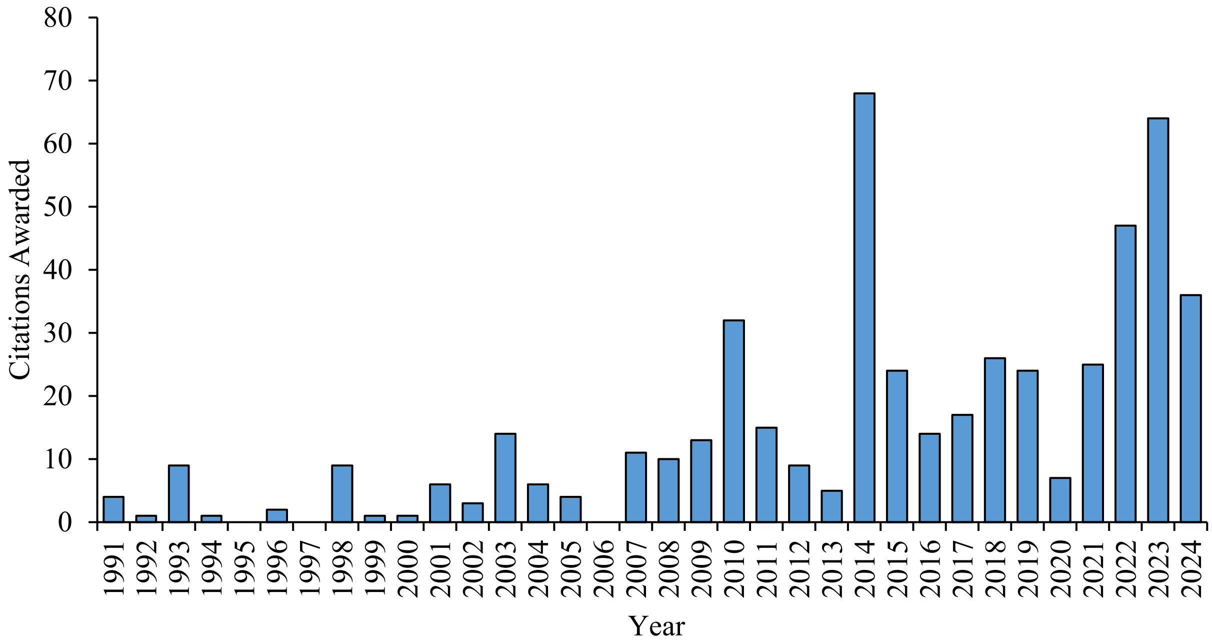


Figure 4. North Carolina Saltwater Fishing Tournament citations awarded for black drum from 1991 to 2024. Citations are awarded for released black drum greater than 40 inches total length.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Commercial fishing activity is monitored through fishery dependent sampling conducted under Title III of the Interjurisdictional Fisheries Act ongoing since 1982. Biological samples (lengths, aggregate weights) are obtained from several DMF commercial fisheries dependent sampling programs. Black drum lengths and aging structures are collected at local fish houses. After sampling a portion of the catch, the total weight of the catch by species and market grade are obtained for each trip, either by using the trip ticket weights or some other reliable estimate.

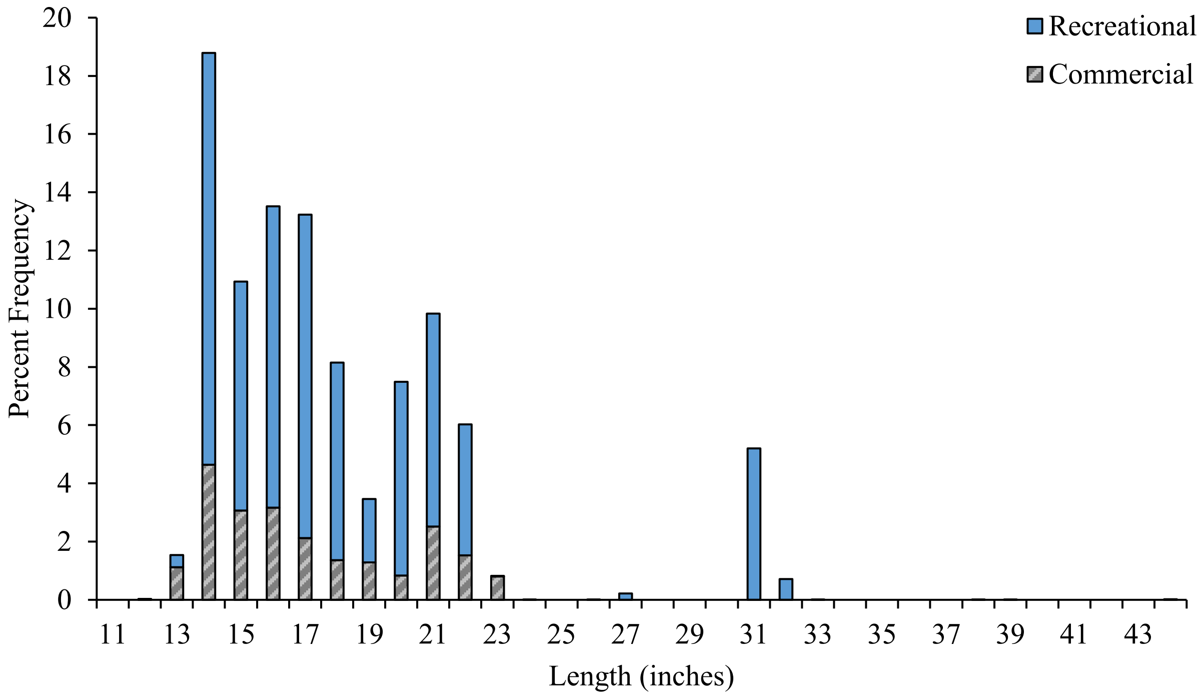


Figure 5. Commercial and recreational expanded length frequency (total length, inches) of black drum harvested in 2024.

Since the implementation of the 14- to 25-inch slot limit in 2014, as would be expected the mean total length (TL) of commercially harvested black drum has increased. The mean TL has ranged from 10-inches to 19-inches (Table 2). In 2024, the minimum TL was 12-inches, and the maximum TL was 42-inches (Table 2; Figure 5).

The mean TL of recreational harvested black drum ranged from 10-inches to 19-inches (Table 2). In 2024, the minimum TL was 13-inches, and the maximum TL was 33-inches (Table 2; Figure 5). Undersized black drum continued to be harvested in both commercial and recreational fisheries since the implementation of the 14-inch TL minimum size limit established in 2014 (Figures 6 and 7). Likely due to fishermen confusing black drum with sheepshead. The minimum size limit of sheepshead is smaller than the minimum size limit for black drum at 10-inches fork length (FL).

Table 2. Mean, minimum, maximum total length (TL; inches), and total number of black drum measured from North Carolina commercial fish house and Marine Recreational Information Program recreational samples, 1994–2024.

	Commercial				Recreational			
Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1994	14	9	17	43	15	9	32	121
1995	10	8	42	209	11	7	30	390
1996	13	8	26	223	12	7	25	339
1997	15	8	23	102	15	9	33	144
1998	17	6	24	76	12	7	26	167
1999	14	7	47	673	13	8	31	248
2000	15	7	29	878	15	8	24	178
2001	15	7	36	432	11	8	25	173
2002	14	7	46	2,151	14	8	30	219
2003	16	7	49	609	11	7	52	198
2004	15	8	47	276	14	8	27	127
2005	14	4	44	314	11	7	34	89
2006	13	6	47	1,510	13	9	33	104
2007	13	7	50	2,086	11	7	20	191
2008	14	7	49	2,863	12	7	48	363
2009	15	7	47	1,072	11	8	25	191
2010	16	8	48	619	11	7	29	258
2011	12	7	32	1,467	10	7	24	567
2012	14	5	37	1,096	13	7	26	237
2013	15	5	35	806	13	7	26	154
2014	17	10	47	369	15	7	24	33
2015	18	9	43	299	17	11	25	75
2016	17	10	47	777	17	10	28	116
2017	17	10	29	494	16	9	27	162
2018	19	14	45	397	16	8	26	128
2019	17	12	43	421	16	10	44	106
2020	17	10	31	437	16	10	44	215
2021	16	8	27	579	16	9	46	155
2022	16	12	29	503	19	13	37	122
2023	16	8	45	657	17	9	36	133
2024	17	12	42	510	19	13	33	127

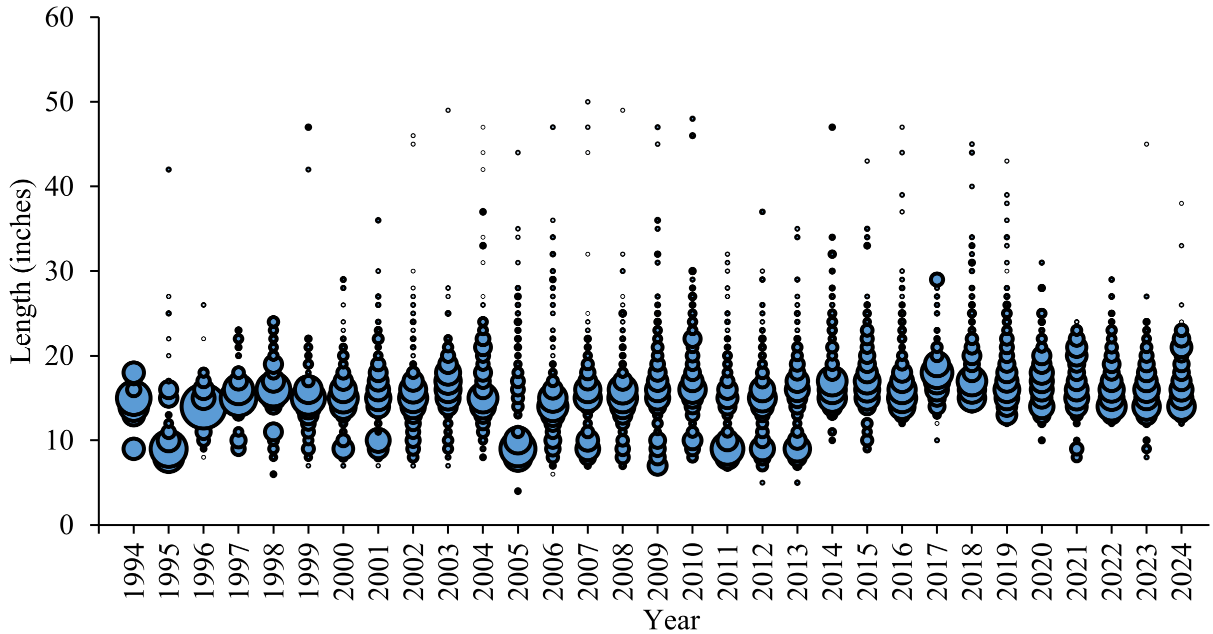


Figure 6. Commercial length frequency (total length, inches) of black drum harvested from 1994 to 2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

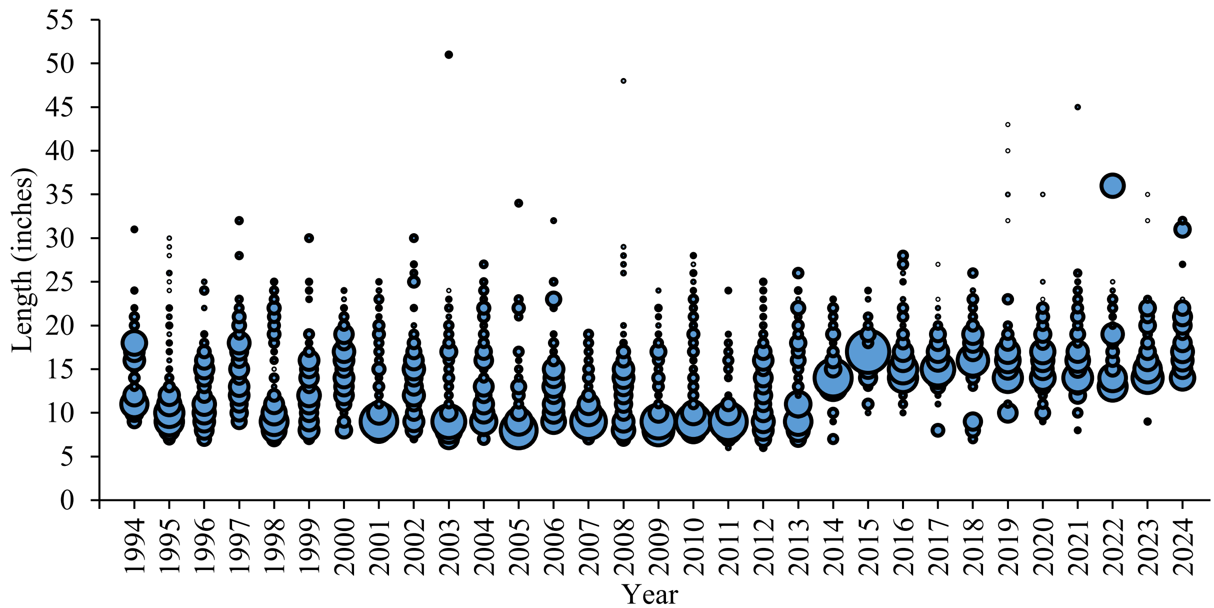


Figure 7. Recreational length frequency (total length, inches) of black drum harvested from 1994 to 2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Fishery-Independent Monitoring

A fishery-independent gill net survey (Program 915) was initiated by the DMF in May of 2001. The survey utilizes a stratified random sampling scheme designed to characterize the size and age distribution for key estuarine species in Pamlico Sound and the Neuse, Pamlico, and Pungo rivers. By continuing a long-term database of age composition and developing a relative index of abundance for black drum this survey will help managers assess the black drum stocks without relying solely on commercial and recreational fishery dependent data. Additionally, data collected is used to help improve bycatch estimates, evaluate the success of management measures, and look at habitat usage. Sampling in this program was suspended in February 2020 due to COVID-19 restrictions and protected species interactions but resumed July 2021.

The annual weighted black drum relative index of abundance from the independent gill net survey has ranged from a high of 1.12 in 2016 to a low of 0.32 in 2013 (Figure 8). Proportional Standard Error (PSE) has ranged from 10 to 36. In 2024, the relative index of abundance was 0.90, above the time-series average (0.64 black drum per set). Survey data from the Pamlico Sound and Neuse, Pamlico, and Pungo river systems is used in the 2023 ASMFC benchmark stock assessment for black drum as annual index of relative abundance for sub-adult and adult black drum.

Black drum age structures are collected from various fishery independent (scientific surveys) and dependent (fisheries) sources throughout the year. In 2024, 471 black drum were aged. Ages ranged from 0 to 34 years (Table 3). The oldest black drum harvested in North Carolina was age-60. Beyond age 3, there is significant overlap in the length at age for black drum (Figure 9).

Table 3. Summary of black drum age samples collected from both dependent (commercial and recreational fisheries) and independent (surveys) sources from 2011–2024. Samples collected from partial carcasses were not included.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
2011	0	0	60	235
2012	1	0	3	324
2013	2	0	4	190
2014	1	0	31	407
2015	0	0	2	397
2016	1	0	13	667
2017	1	0	42	742
2018	1	0	46	429
2019	1	0	32	444
2020	1	1	4	104
2021	1	0	5	415
2022	1	0	4	367
2023	1	0	31	485
2024	2	0	34	471

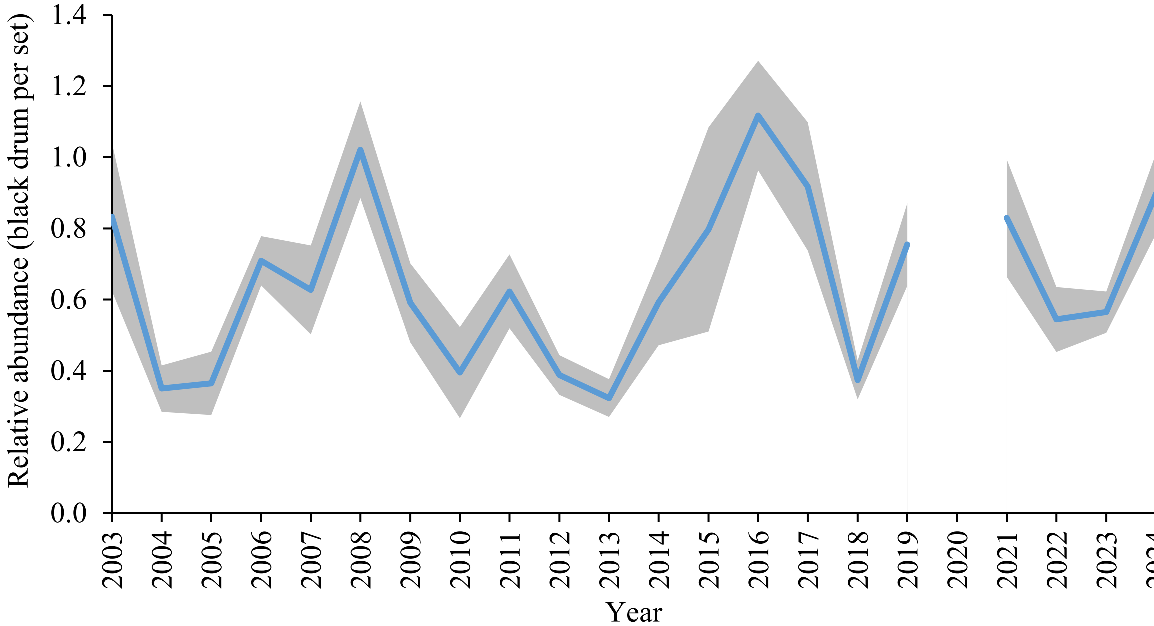


Figure 8. Annual weighted black drum index of relative abundance (number per set) from the DMF Independent Gill Net Survey (Program 915) in the Pamlico Sound and Neuse, Pamlico, and Pungo river systems from 2003–2024. Shaded area represents + one standard error. Sampling in this program was suspended in February 2020 due to COVID-19 restrictions and protected species interactions but resumed July 2021.

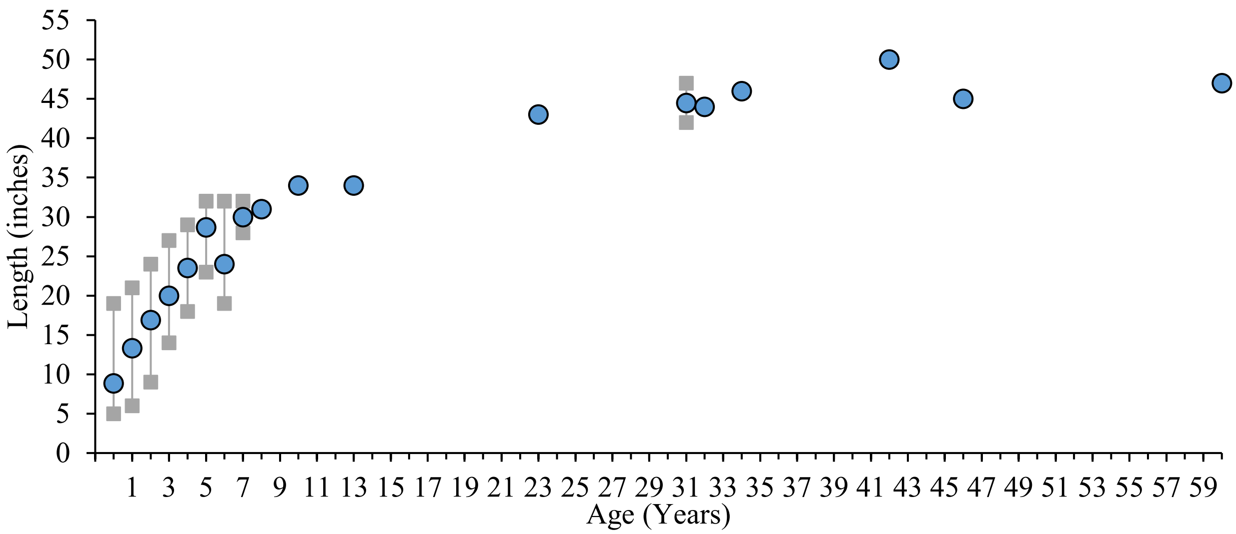


Figure 9. Black drum length (total length, inches) at age based on all age samples collected from 2011 to 2024. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. Samples collected from partial carcasses were not included.

RESEARCH NEEDS

The 2023 Benchmark Stock Assessment Report (ASMFC 2023) recommends a new benchmark stock assessment be completed by 2027. However, if stock indicators identify any concerning trends an expedited assessment should be completed before 2027. The research recommendations identified in the 2023 assessment include:

High Priority

- Develop fishery-independent adult surveys. Consider purse seine and long line surveys with bait and sampling areas appropriate to target black drum. Collect age samples, especially in states where maximum size regulations preclude the collection of adequate adult ages. **long-term**
- Conduct a high reward tagging program to obtain return rate estimates. Continue and expand current tagging programs to obtain total mortality, catch and release mortality, and growth information and movement-at-size data. **long-term**
- Increase biological sampling in commercial fisheries, particularly gill nets in Virginia, to better characterize size and age composition of commercial landings. These data would help improve data sets for selectivity estimates and eventual extensions to length/age-structured assessment approaches. **long-term**
- Increase biological sampling in recreational fisheries, particularly harvest in the Mid-Atlantic region and releases coastwide, to better characterize size and age composition of recreational catch. These data would help improve data sets for selectivity estimates and eventual extensions to length/age-structured assessment approaches. **long-term**
- Continue all current fishery-independent surveys recommended as stock indicators for black drum and collect biological samples for black drum on all surveys. **long-term**
- Evaluate use of MRIP site-use weighting factors to improve CPUE estimates. **short-term**
- Evaluate data the use of data poor models as annual indicators to show current relationships between stock and removals (Itarget) and the ongoing trend of relative *F* (Skate). **short-term**
- A process should be developed for appropriately combining MRIP and supplemental recreational sampling program data for characterizing the size structure of the recreational harvest. The process needs to consider spatial information, as there are likely spatial effects within states' supplemental sampling programs (e.g., VMRC Freezer Program representing Eastern Shore harvest). **short-term**

Medium Priority

- Age otoliths that have been collected and archived (~500 sub-adults samples from GA). **short-term**
- Improve sampling of concentrated, targeted nighttime fisheries in the Mid-Atlantic region (e.g., Delaware Bay). Although the MRIP APAIS design changed to expand to nighttime sampling, data are too limited (e.g., only four potential nighttime black drum intercepts in Delaware's APAIS data) to evaluate whether this change was sufficient for black drum fisheries. **long-term**
- The recreation released alive trend and harvest trend provided a mixed signal. In order to identify which factor, a change in stock abundance vs. a change in fishing behavior, drove the mixed signal, we analyzed the released alive data by breaking them down by wave. However, such an analysis may provide limited information on fishing behavior change, therefore, we recommend to directly collect such information via a one-time pilot study (≈three years) during existing creel surveys (e.g., MRIP APAIS). For example, anglers may report if they know where, when, and how to catch legal black drum (potentially increasing catch rate) meanwhile deliberately avoiding catching sublegal fish (potentially decreasing released alive quantity). Anglers don't need to share their specific skills during the creel survey by simply checking a box before "When", "Where", and "How" along with targeted species data currently collected. Such information may potentially provide better information to understand drivers of these trends in the future stock assessment. **short-term**
- Conduct tagging study to determine survival, migration, and contribution of YOY fish spawned in the Mid-Atlantic to the overall sub-adult stock. **long-term**

Low Priority

- Expand simulation-based power analysis to other index data sets used for stock indicators of black drum. **short-term**
- Conduct reproductive studies that provide updated estimates and an expanded spatial coverage, including age and size-specific fecundity, spawning frequency, spawning behaviors by region, and movement and site fidelity of spawning adults. **long-term**
- There is uncertainty about selectivity between gill net types fished (anchor and drift) in Virginia and the appropriateness of combining these gears into a fleet. There are no composition data collected from drift gill nets, so this remains an uncertainty that should be researched in the future. **short-term**

Partially Addressed

- Collect genetic material (i.e., create "genetic tags") over a long time span to obtain information on movement and population structure, and potentially estimate population size.
- Obtain better estimates of harvest from the black drum recreational fishery (especially in states with short seasons). **MRIP changes were generally seen as improvements to catch estimates, though the exception remains nighttime fishery sampling identified as a moderate research recommendation above.**
- Collect information on the magnitude and sizes of commercial discards. Obtain better estimates of bycatch of black drum in other fisheries, especially juvenile fish in south Atlantic states. **An ongoing observer program now provides monitoring of the primary suspected commercial black drum discard fishery. Recent estimates have been small in comparison to total fishery removals, but this source of catch should continue to be monitored in future stock assessments for signs of increase. South Atlantic shrimp trawl fishery observer data were also reviewed during this assessment and do not indicate these fisheries are a significant source of black drum fishery removals.**

MANAGEMENT

The management strategies currently in place for black drum have resulted in a stock that has met ongoing management targets (Table 6). Each year the ASMFC Black Drum Plan Review Team monitors each states' compliance with the FMP during its annual review. States must demonstrate the compliance criteria of the FMP are satisfied and submit an annual report concerning its fisheries and management programs. Following the review of the 2023 fishing year, the PRT determined all states were compliant with the FMP (ASMFC 2024a).

Table 6. Summary of ASMFC management strategies and their implementation status for Black Drum Fishery Management Plan.

Management Strategy	Implementation Status
Harvest Management	
Implement a maximum possession limit and size limit (of no less than 12 inches) by January 1, 2014	Accomplished (other states)
Implement a maximum possession limit and size limit (of no less than 14 inches) by January 1, 2016	Proclamation FF-73-2013
Implement a 10 fish and 28-inch minimum size limit for Maryland's commercial fishery by February 25, 2019	Accomplished (Maryland)

In October 2024, the ASMFC Black Drum Technical Committee (TC) reviewed the stock indicators developed to monitor the stock with an additional three years of data through 2023 (ASMFC 2024b). The indicators included abundance (young-of-year, age 0–1, subadult, and exploitable abundance), range expansion, recreational live releases and harvest, and commercial landings. Overall, there were mixed signs of stability and declines in some of the indicators, but the three additional years of data were within the historical range of the times series and that there were no concerning trends in the indicators relative to coastwide stock status. The TC also noted that increases in recreational and commercial landings in the south could indicate higher availability of fish, that fishing pressure is increasing, or both, and that some of these increases may be driven by more state-specific regulations for other species (i.e., southern flounder); thus, causing concern at these localized levels. The TC recommended scheduling the next data update to the indicators in 2026 and moving the scheduled black drum stock assessment from 2027 to 2028. The Sciaenids Board agreed with the TC's recommendations at its October 2024 meeting (ASMFC 2024c).

At its February 2024 business meeting, the MFC requested DMF staff to investigate if changes to black drum size, bag and trips limits are needed due to ongoing concerns with the growth of North Carolina's recreational and commercial black drum fisheries. An issue paper is currently being drafted and is scheduled to be presented to the MFC in the fall of 2025.

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FISHERY MANAGEMENT PLAN UPDATE
BLUEFISH
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	1990		
	Amendment 1		2000
		Framework 1	2001
	Amendment 2		2007
	Amendment 3		2011
		Addendum I	2012
	Amendment 4		2013
	Amendment 5		2015
	Amendment 6		2017
		Framework 2	2017
		Framework 3	2018
		Framework 4	2020
		Framework 5	2020
	Amendment 7		2021
		Framework 6	2023
Comprehensive Review:	2023		

The Fishery Management Plan (FMP) for bluefish was developed through a joint management effort between the interstate Atlantic States Marine Fisheries Commission (ASMFC) and the federal Mid-Atlantic Fishery Management Council (MAFMC). Amendment 1 initiated a 10-year rebuilding schedule to eliminate overfishing and allow for stock rebuilding which was achieved in 2009. Amendment 1 also established commercial and recreational quota allocations, state-specific commercial allocations, and allowed for the transfer of unused recreational quota to the commercial fishery. Framework 1 established annual harvest allocations specifically for biological monitoring programs. Amendments 2 and 5 were implemented to establish a strategy for monitoring bluefish bycatch. Amendment 3 added a formalizing process to incorporate scientific and management uncertainty when establishing catch limits. Addendum I established a coast-wide biological monitoring program to improve the quantity and quality of information available for use in bluefish stock assessments. Amendment 4 modified the accountability measures for the recreational bluefish fishery. Amendment 6 addressed considerations for examining potential influence of the removal of forage fish species by increasing directed fishing and advocated for future ecosystem-based management approaches. Framework 2 required for-hire vessels with federal permits for species managed by MAFMC to submit electronic vessel trip reports to the National Oceanic and Atmospheric Administration. Framework 3 established a process to specify constant multi-year acceptable biological catches. Framework 4 established a requirement for commercial vessels with federal permits for any species managed by the Mid-Atlantic and New England Councils to submit vessel trip reports electronically within 48 hours after entering port at the conclusion of a trip. Framework 5 modified the Council's acceptable biological catch control rule and risk policy. The revised risk policy is intended to reduce the probability of overfishing as stock size falls below the target biomass while allowing for increased risk and greater economic benefit under higher stock biomass conditions. This action also removed the typical/atypical species distinction currently included in the risk policy. Amendment 7, the Bluefish Allocation and Rebuilding Amendment, revised the goals and objectives of the fishery management plan, reallocated quota between the commercial and recreational fisheries, reallocated commercial quota among the states, implemented a rebuilding plan, revised the sector quota transfer process, and revised how management uncertainty is applied during the specifications process. Amendment 7 took effect on January 1, 2022. Framework 6 established a new process for setting recreational bag, size, and season limits for summer flounder, scup, black sea bass, and bluefish. This action also modified recreational accountability measures for these species. Framework 6 took effect on March 9, 2023. The bluefish FMP, associated amendment documents, and framework information can be found at MSFMC.org.

To ensure compliance with interstate requirements, North Carolina also manages bluefish under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt fishery management plans consistent with N.C. law and approved by the MAFMC, 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 (NCDMF 2022a).

Management Unit

The FMP defines the management unit of bluefish as a single stock occurring in U.S. waters of the western Atlantic Ocean. All member Atlantic states participate in the ASMFC bluefish FMP process except for Pennsylvania and the District of Columbia.

Goal and Objectives

Amendment 7 revised the goals and objectives of the bluefish FMP to the following:

- Goal 1: Conserve the bluefish resource through stakeholder engagement to maintain sustainable recreational fishing and commercial harvest.
    - Objective 1.1: Achieve and maintain a sustainable spawning stock biomass and rate of fishing mortality.
    - Objective 1.2: Promote practices that reduce release mortality within the recreational and commercial fishery.
    - Objective 1.3: Maintain effective coordination between the National Marine Fisheries Service, Council, Commission, and member states by promoting compliance and to support the development and implementation of management measures.
    - Objective 1.4: Promote compliance and effective enforcement of regulations.
    - Objective 1.5: Promote science, monitoring, and data collection that support and enhance effective ecosystem-based management of the bluefish resource.
- Goal 2: Provide fair and equitable access to the fishery across all user groups throughout the management unit.
    - Objective 2.1: Ensure the implementation of management measures provides fair and equitable access to the resource across all user groups within the management unit.
    - Objective 2.2: Consider the economic and social needs and priorities of all groups that access the bluefish resource in the development of new management measures.
    - Objective 2.3: Maintain effective coordination with stakeholder groups to ensure optimization of economic and social benefits.

DESCRIPTION OF THE STOCK

Biological Profile

Bluefish (*Pomatomus saltatrix*) are a migratory, open water (pelagic) species found throughout the Atlantic Ocean. Bluefish migrate seasonally, moving north as water temperatures rise during spring and summer and south during the fall and winter to areas along the South Atlantic Bight (Shepherd et al. 2006). During the summer, bluefish mostly concentrate in waters from Maine to Cape Hatteras (Klein-MacPhee 2002). During the winter, they are found in offshore waters between North Carolina and Florida (Goodbred and Graves 1996). Within North Carolina's estuarine waters, bluefish are most common from March through October. Bluefish generally school with similarly sized fish (Austin et al. 1999). Bluefish are fast growers (Wilk 1977) and opportunistic predators. Over 70 different marine species have been documented in bluefish stomach contents including Atlantic menhaden, butterfish, silversides, spotted seatrout, Atlantic croaker, spot, shrimp, lobster, squid, crabs, worms, and clams (Buckel et al. 1999; Scharf et al. 2004). The maximum documented age for bluefish is 14 years (Robillard et al. 2009). Bluefish can exceed 39 inches and 31 pounds (NCDMF 2022b). Bluefish usually reach sexual maturity by age two around a length of 13 inches (Robillard et al. 2008). They spawn offshore from Massachusetts through Florida. Bluefish born each year typically fall into two distinct size classes, suggesting that there are two distinct spawning events, with one group spawning during the spring and a second spawning during the summer (Lassiter 1962). However, more recent research suggests that bluefish spawning is a single, continuous event that occurs as they migrate northward during the spring and summer, but that bluefish spawned in the middle of this time period do not have high survivability, resulting in two distinct size groups (Smith et al. 1994; Robillard et al. 2008).

Stock Status

The 2023 management track stock assessment determined that bluefish are not overfished and are not experiencing overfishing.

Stock Assessment

Results from the 2023 management track assessment indicate that the Atlantic bluefish stock was not overfished and not experiencing overfishing in 2022. SSB in 2022 was estimated at 0.152, or 64% of the overfishing threshold of 0.239. Although fishing mortality was below the threshold in 2022, fishing mortality exceeded the updated threshold every year from 1985 to 2017, except 2008. Recruitment has increased annually since 2019 but has remained below the time series average over the past 12 years, except in 2022. The next management track assessment for bluefish is scheduled for 2025.

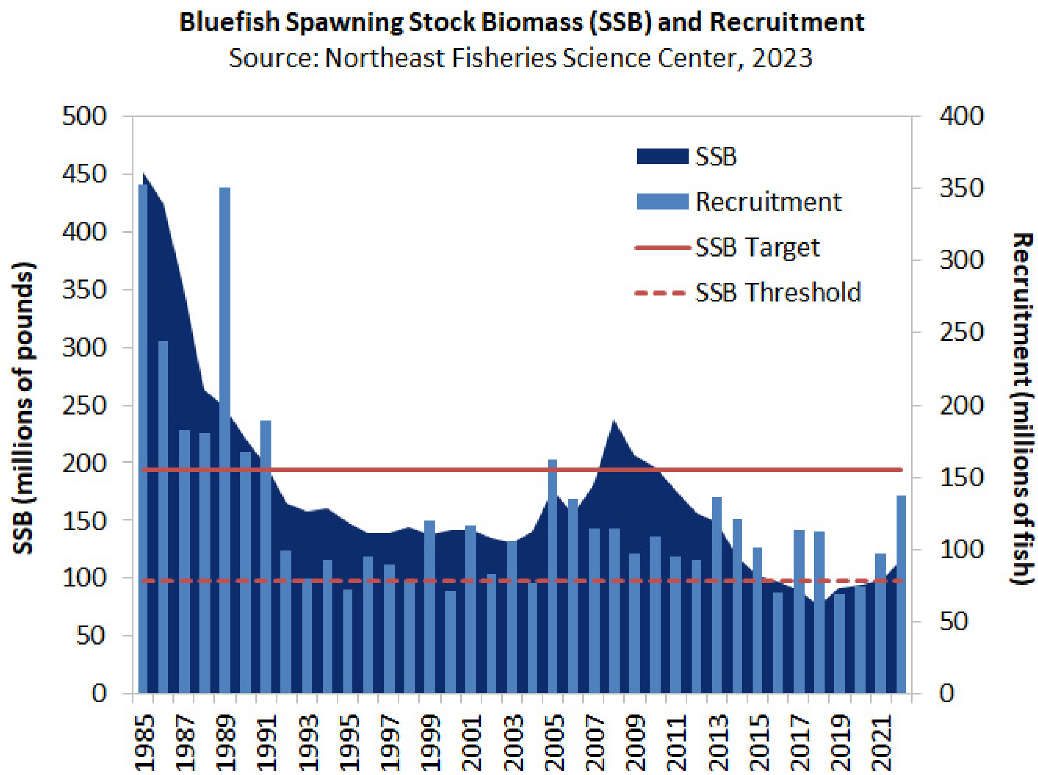

Figure 1. Bluefish spawning stock biomass and recruitment at age 0 by calendar year. The horizontal dashed red line is the SSB Threshold = 100,865 mt.

DESCRIPTION OF THE FISHERY

Current Regulations

In North Carolina, the private recreational (all persons not fishing on a for-hire vessel) bag limit is three bluefish per person per day and the recreational for-hire (all persons fishing on a for-hire vessel) is five bluefish per person per day. These regulations have been in effect since 2020. Commercial fishery landings are monitored and if necessary, trip limits are implemented to prevent exceeding the annual quota. The commercial fishery was opened on January 1, 2024, with no possession limit. Commercial possession limits were decreased three times during 2024: 800-pound limit on February 22, 400-pound limit on May 21, 50-pound limit and then increased to a 300-pound limit on September 6.

Commercial Fishery

In North Carolina, bluefish have been harvested commercially using a variety of gears including estuarine long haul, ocean trawl, pound net, ocean beach seine, ocean gill net, and estuarine gill net. Capture methods have shifted primarily to gill nets over the last few decades. Gill nets, especially estuarine gill nets, have been the primary mode of harvest. Estuarine and ocean gill nets combined represent the largest commercial landings of bluefish, accounting for ~96% of the harvest in 2024 (Figure 2).

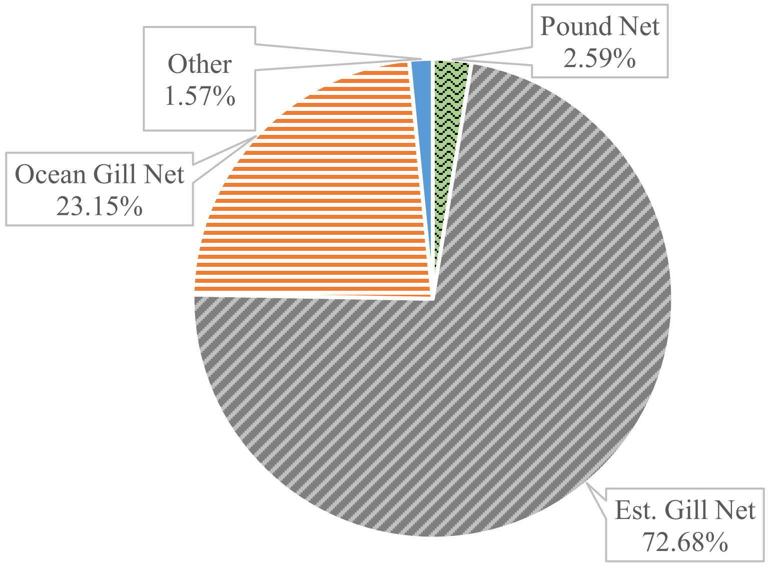

Figure 2. Commercial harvest of bluefish in North Carolina during 2024 by gear type.

The commercial quota allocated to North Carolina for 2024 was 776,452 pounds. Additionally, North Carolina received a total of 394,544 pounds of quota transfers from Massachusetts, New York, New Jersey, Maryland, and Virginia totaling 1,170,996 pounds. North Carolina's 2024 commercial bluefish landings totaled 1,193,181 pounds at a dockside value of $745,588. Bluefish commercial landings have fluctuated annually since 1985 (Figure 3); however, landings in 2024 decreased slightly from 2023 (Table 1).

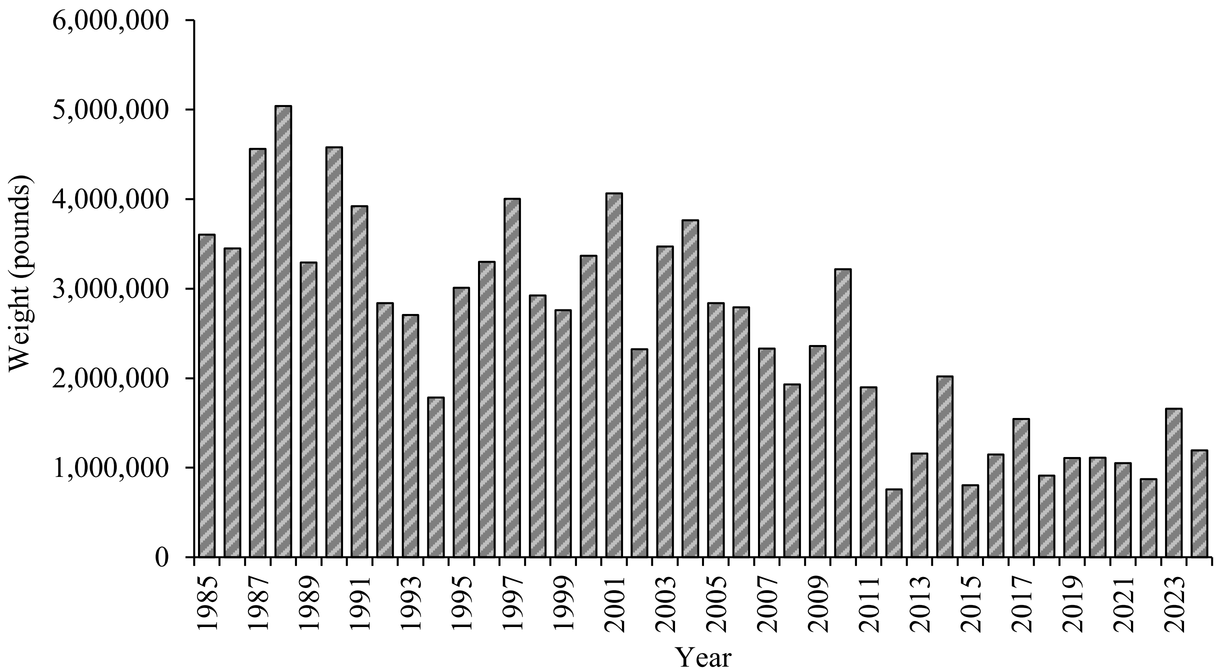

Figure 3. North Carolina commercial landings of bluefish, 1985–2024.

Table 1. Bluefish recreational harvest and number released (Marine Recreational Information Program) and commercial harvest (North Carolina Trip Ticket Program) in North Carolina, 2015–2024.

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
2015	4,123,461	6,356,252	3,754,577	804,847	4,559,424
2016	4,489,223	6,802,960	3,356,049	1,148,643	4,504,692
2017	3,173,218	8,255,510	3,634,502	1,544,053	5,178,555
2018	3,304,587	7,912,210	2,630,685	910,262	3,540,947
2019	2,752,589	7,162,431	3,011,480	1,108,205	4,119,685
2020	2,108,296	6,557,751	2,124,224	1,112,966	3,237,190
2021	982,389	3,539,333	1,031,760	1,051,019	2,082,779
2022	1,533,911	9,336,045	1,645,410	872,042	2,517,452
2023	1,261,404	4,775,374	1,492,689	1,658,869	3,151,558
2024	1,574,579	6,390,035	2,512,747	1,193,181	3,705,928
Mean	2,535,818	6,724,129	2,510,379	1,140,409	3,650,788

There is a wide distribution of bluefish harvested in the commercial fishery, however the majority of commercially caught bluefish are between 12 and 18 inches (Figure 4). In the last decade, bluefish longer than 20 inches are harvested less often than compared to the rest of the time series (Figure 5B).

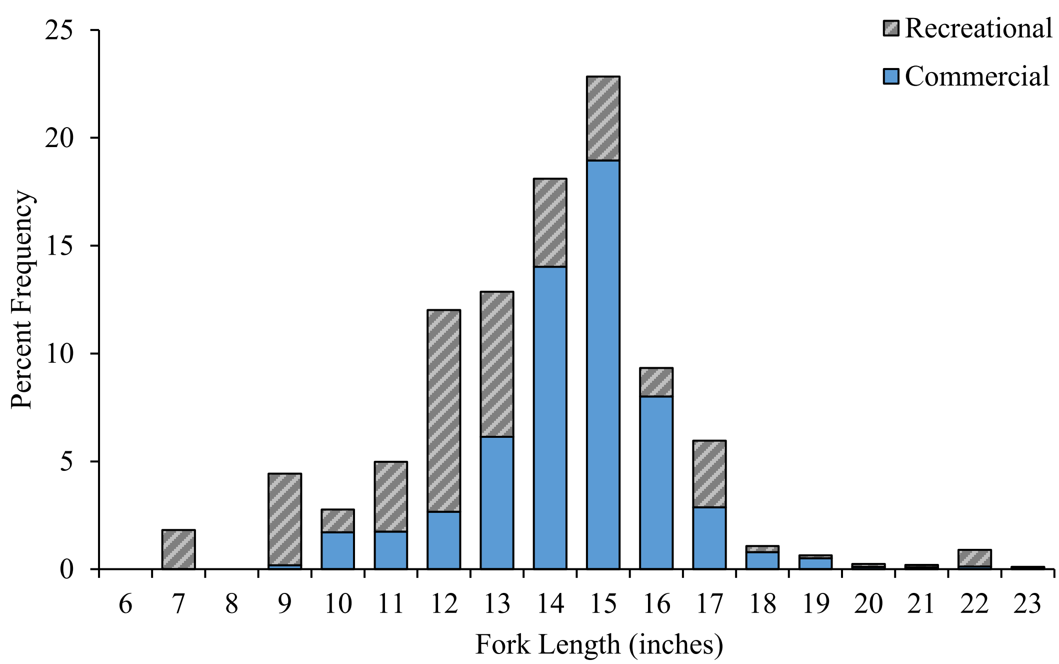

Figure 4. Commercial and recreational length frequency distribution from bluefish harvested in North Carolina, 2024.

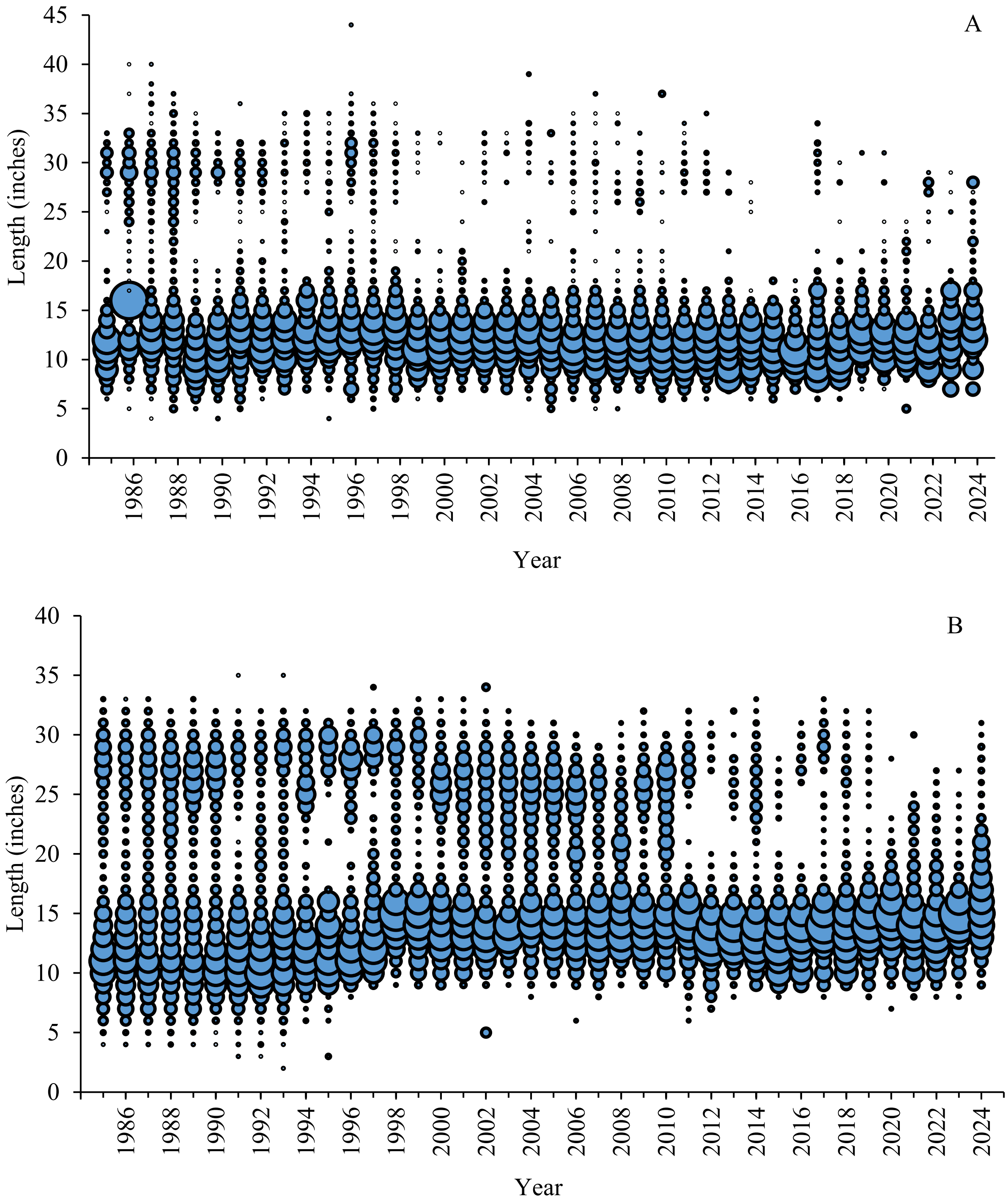

Figure 5. Recreational (A) and commercial (B) length frequency (fork length, inches) of bluefish harvested from 1985–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Recreational Fishery

Bluefish are caught recreationally from shore, pier, and boat and can be targeted with lures as well as live and dead bait. Discards are a large part of the Bluefish fishery as they are not highly sought after for eating.

In 2024, approximately 80% of landed fish were released (Table 1). Recreational landings of bluefish vary annually but have declined in the last decade (Figure 6).

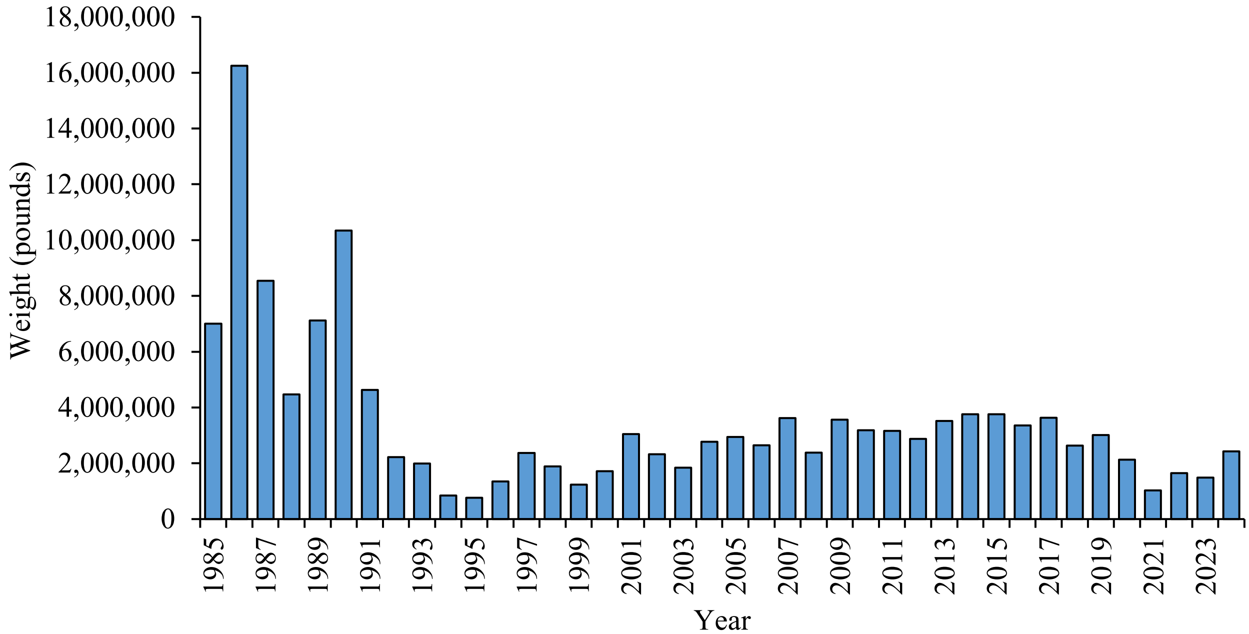

Figure 6. North Carolina recreational landings of bluefish, 1985–2024.

In 2024, the size distribution of fish taken in the recreational fishery was similar to the distribution of fish harvested in the commercial fishery (Figure 4). However, the percentage of bluefish harvested at each size was less consistent across the distribution (Figure 5A). For bluefish exceeding 15 pounds or 34 inches, the NCDMF offers award citations. The number of citations awarded was highest in 1991 (n=187), with fewer citations awarded in the last 20 years (Figure 7). Approximately 61% of the citations awarded since 2017 have been for released fish.

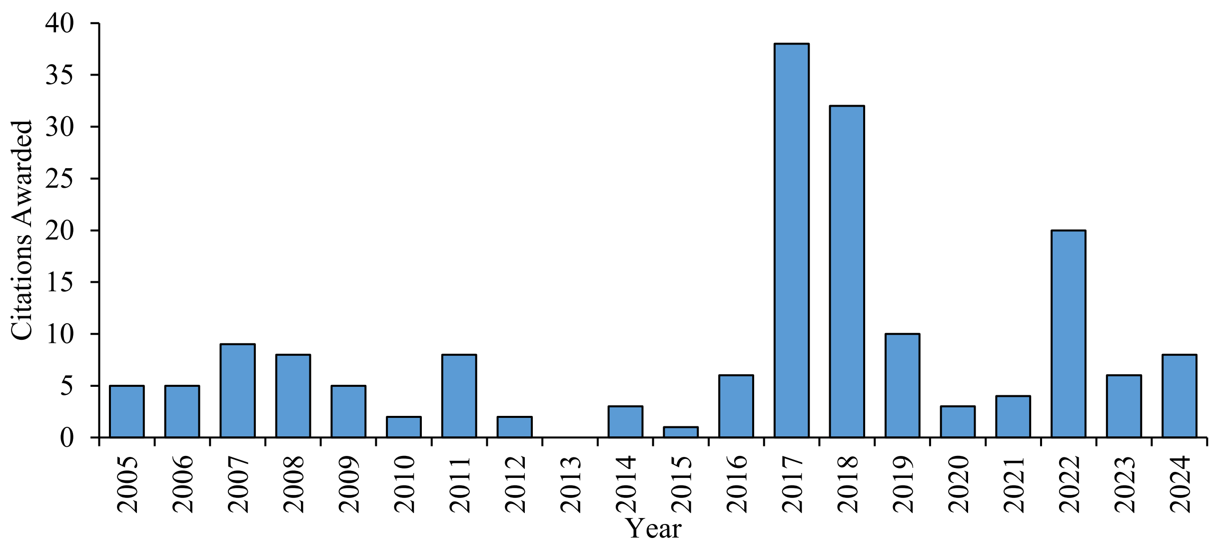

Figure 7. North Carolina recreational award citations for bluefish, 2005–2024.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Commercial bluefish landings from a broad range of gears are sampled through the Division's fish house sampling programs. Information collected includes location, gear type and gear-specifics, soak time, and water depth. Commercial catches are also subsampled to collect biological information on bluefish including fork length (FL) and aggregate weight (kg) by market grade. Trip ticket information (total weight of catch) is also recorded and reported to DMF by licensed dealers. A total of 2,672 bluefish were measured from commercial landings in 2024 (Table 2). Mean fork length was 17 inches and ranged from 9 to 32 inches. Mean size and size ranges have varied minimally over the last few decades. Since 1985, the mean size of bluefish landed is 13 inches fork length with a mean minimum fork length of 6 inches and a mean maximum fork length of 34 inches.

The number and size of fish harvested as well as number of fish released recreationally is characterized through NOAA Fisheries' Marine Recreational Information Program (MRIP). In 2024, approximately 2.5 million pounds of bluefish were recreationally harvested (Table 1). The mean length of fish harvested and measured by MRIP in the recreational fishery in 2024 was 14 inches and ranged from 8 to 32 inches fork length (Table 2). Since 1985, the annual length distribution of harvest in both the commercial and recreational fisheries has varied little with most fish harvested ranging from 7 to 16 inches fork length (Figure 5). Larger bluefish (>20 inches) have been less common in recent years in both the commercial and recreational fisheries. See NOAA for more information on the collection of recreational fishing data.

Table 2. Summary of fork length (inches) data sampled from all sources of length data (harvest and bait) from the bluefish commercial fishery and the bluefish recreational fishery in North Carolina, 2004–2024.

	Commercial				Recreational			
Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2004	19	6	33	9,608	13	6	40	1,149
2005	19	5	33	9,766	12	6	35	1,056
2006	18	5	33	10,255	12	6	36	1,028
2007	15	6	33	8,856	12	6	37	1,048
2008	16	5	33	8,035	12	5	35	894
2009	18	6	34	7,471	13	7	34	778
2010	17	6	35	6,721	12	6	38	1,323
2011	16	6	33	5,768	12	6	34	1,784
2012	14	5	34	7,030	12	7	35	1,190
2013	14	6	33	6,928	11	7	29	563
2014	15	8	34	6,459	12	7	29	660
2015	14	7	31	6,100	12	7	18	577
2016	14	3	33	7,616	11	8	23	732
2017	16	7	35	5,580	12	6	35	657
2018	15	7	34	3,778	11	6	30	846
2019	15	8	33	4,812	13	8	32	910
2020	16	7	35	3,396	12	8	32	713
2021	16	8	34	4,203	12	6	26	299
2022	14	4	31	3,945	12	8	29	433
2023	15	7	29	4,701	13	7	29	413
2024	17	9	32	2,672	14	8	32	269

Fishery-Independent Monitoring

The Division's Pamlico Sound Independent Gill Net Survey was initiated in May of 2001 and has been sampled continuously throughout 2019. Sampling in this program was suspended in February 2020 due to COVID-19 restrictions - but resumed continuous sampling July 2021. This survey provides fishery-independent indices of relative abundance along with associated length and age data. The relative abundance index, defined as the number of bluefish per set, provides essential data for input into the coastwide bluefish stock assessment. The relative abundance index in 2024 was 13.8, which is more than double the time-series average of 6.1 (Figure 8). The 2023 and 2024 abundance indices are the highest in the time series, with the lowest being 2.8 in 2015. It should be noted that the index in 2021 is calculated from samples collected from Jul–Dec while the index for all other years was calculated for Feb–Dec.

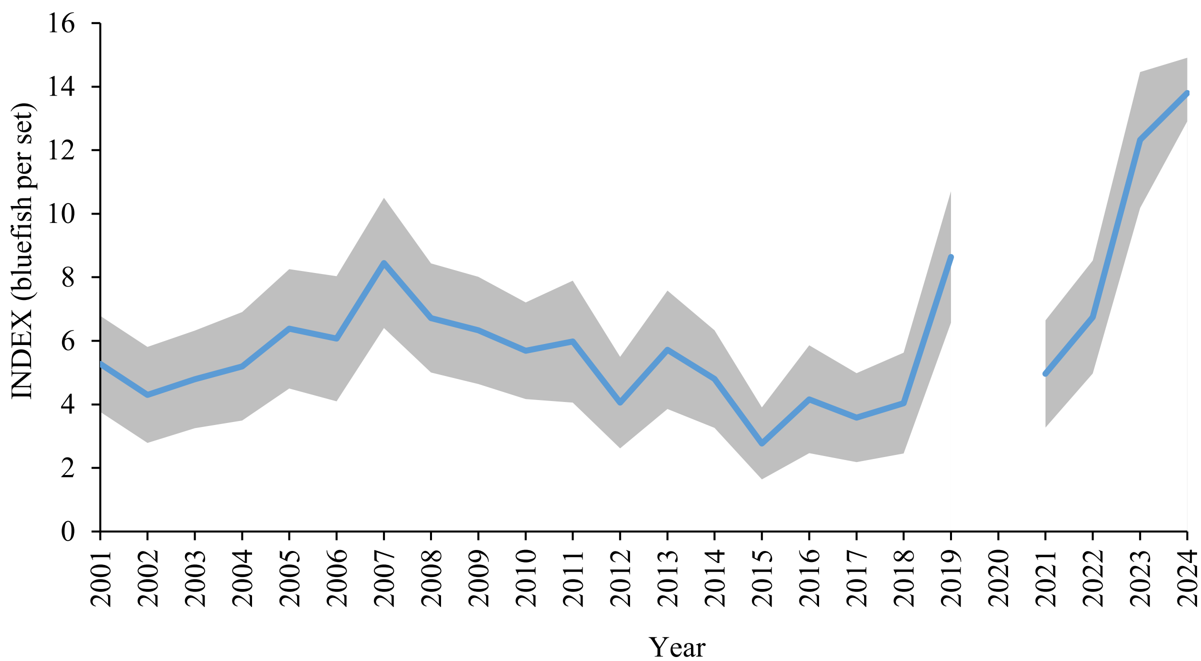

Figure 8. Relative abundance index of bluefish, from the North Carolina Pamlico Sound Independent Gill Net Survey, 2001–2024. Shading represents the standard error about the annual relative abundance index estimates.

North Carolina is one of the states subject to compliance of the biological monitoring program implemented under Addendum I to Amendment 1. To comply with these monitoring requirements, DMF must collect at least 100 ageing structures from bluefish each year with at least 50 fish collected from January-June and 50 fish from July–December. Most bluefish age samples are collected from the Pamlico Sound Independent Gill Net Survey. Other age sample sources include commercial and recreational fisheries. In 2024, 998 age samples were collected (Table 3). The maximum age in 2024 was 8 years of age. The maximum age observed in the time-series is 12 years. Bluefish length increases with age, although the size at a given age is variable (Figure 9).

Table 3. Summary of bluefish age samples collected in North Carolina from both dependent and independent sources, 2009–2024.

Year	Modal Age	Min. Age	Max. Age	Number of Samples
2009	3	0	10	488
2010	3	0	8	527
2011	3	0	9	551
2012	1	0	9	818
2013	0	0	9	742
2014	1	0	9	803
2015	1	0	10	622
2016	1	0	11	678
2017	2	0	10	630
2018	1	0	10	669
2019	1	0	8	853
2020	2	0	12	244
2021	1	0	5	793
2022	1	0	8	1,210
2023	1	0	6	1,170
2024	2	0	8	998

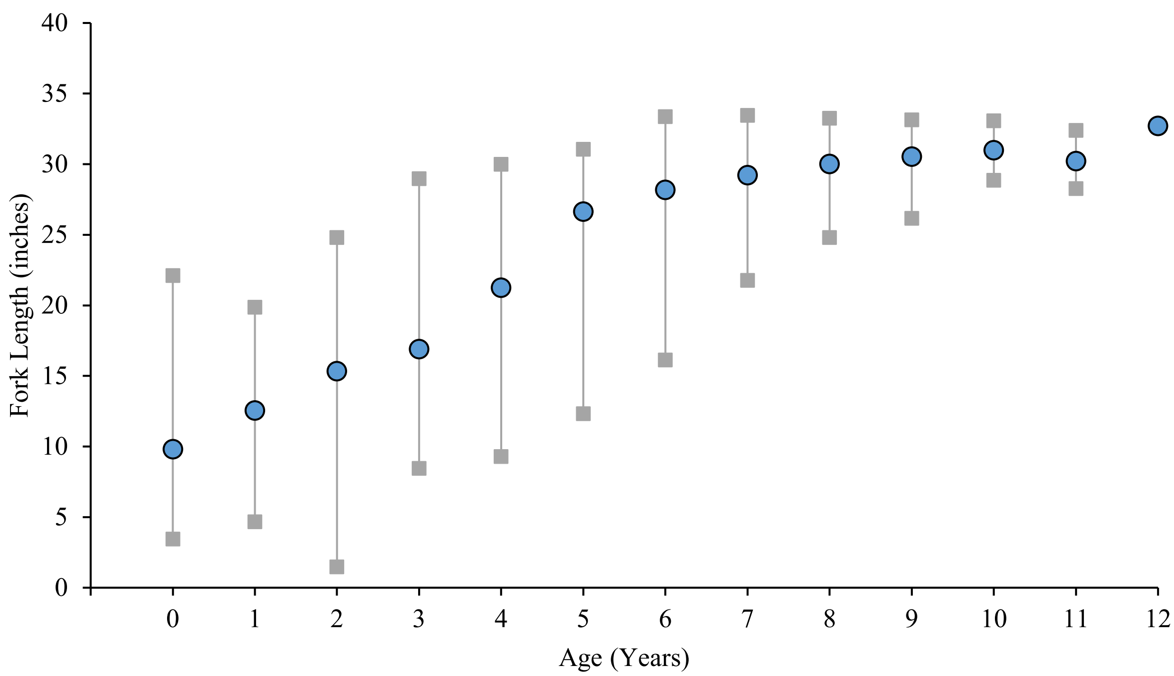

Figure 9. Bluefish length at age based on all age samples collected in North Carolina, 1985–2024. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.

RESEARCH NEEDS

- Evaluate magnitude and length frequency of discards from the commercial and recreational fisheries, especially recreational discard lengths in the mid-Atlantic and southern regions

- Develop additional adult bluefish indices of abundance (e.g., broad spatial and temporal scale longline survey or gill-net survey) to better characterize dynamics of older bluefish not well sampled by fisheries-independent surveys
- Explore age- and time-varying natural mortality from, for example, predator-prey relationships; quantify effects of age- and time-varying mortality on the assessment model
- Investigate potential spatial distribution shifts of the Atlantic stock
- Initiate coastal surf zone seine study to provide more complete indices of juvenile abundance.
- Expand age structure of Southeast Area Monitoring and Assessment Program index.
- Investigate species associations with recreational angler trips targeting bluefish (on a regional and seasonal basis) to potentially modify the MRIP index used in the assessment model.
- Continue to evaluate the spatial, temporal, and sector-specific trends in bluefish growth and quantify their effects in the assessment model.
- Continue to examine alternative models that take advantage of length-based assessment frameworks.
- Evaluate the source of bimodal length frequency in the catch (e.g., migration, differential growth rates).
- Modify thermal niche model to incorporate water temperature data more appropriate for bluefish in a timelier manner [e.g., sea surface temperature data & temperature data that cover the full range of bluefish habitat (South Atlantic Bight and estuaries)].
- Investigate potential spatial distribution shifts of the Atlantic stock.

MANAGEMENT

Bluefish in North Carolina are jointly managed by ASMFC and MAFMC under Amendment 2 of the FMP. Amendment 2 uses annual catch limits (ACLs) for both the recreational and commercial sectors. The recreational quota is a coast-wide quota while the commercial quota is further divided into state-specific quotas. Amendment 2 allows quota transfers between states and between sectors. Additionally, daily limits are used to manage recreational harvest and trip limits can be implemented for commercial fishermen if needed to prevent exceeding North Carolina’s commercial quota.

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FISHERY MANAGEMENT PLAN UPDATE
SPOT
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	ASMFC FMP	October 1987
Amendments:	Omnibus Amendment	August 2012
	Addendum II	August 2014
	Addendum III	February 2020
Comprehensive Review:	2027	

The original interstate Fishery Management Plan (FMP) for spot was adopted in 1987 by the Atlantic States Marine Fisheries Commission with recommendations to improve data collection to produce a stock assessment and improve information for management (ASMFC 1987). The original FMP was adopted prior to the passage of the Atlantic Coastal Fisheries Cooperative Management Act (1993) and the Atlantic States Marine Fisheries Commission (ASMFC) Interstate Fishery Management Program (ISFMP) Charter (1995). After passage of the Act, the ASMFC adopted the Charter to establish standards and procedures for the preparation and adoption of FMPs. Once an FMP was amended to incorporate the standards and procedures in the ISFMP Charter, the Commission could adopt management requirements that can be enforced through the Act.

In August 2011, the South Atlantic State/Federal Fisheries Management Board (hereafter referred to as the Board) approved the Omnibus Amendment for Spot, Spotted Seatrout, and Spanish Mackerel. The Omnibus Amendment updated the FMP with the Act and Charter requirements and initiated annual trigger exercises to monitor the status of the spot resource while also directing the board to consider management action depending on results of the trigger exercise (ASMFC 2012). Without coast-wide minimum management measures, the trigger exercises did little to provide effective management between stock assessments.

In August 2014, the Board approved Addendum II to the Omnibus Amendment which established the use of the Traffic Light Approach (TLA; Caddy and Mahon 1995; Caddy 1998; Caddy 1999; Caddy 2002) as a precautionary management framework. The TLA is preferred for fast-growing, early maturing species like spot, where it is more important to respond to multi-year trends rather than annual changes. The TLA more effectively illustrates long term trends than the triggers established by the Omnibus Amendment. The management framework utilizing the TLA (ASMFC 2014) replaced the management triggers established in the Omnibus Amendment.

In February 2020, the Board approved Addendum III to the Omnibus Amendment, which revised the TLA's trigger mechanism and management response for the recreational and commercial fisheries (ASMFC 2020a). Addendum III incorporated the use of a regional approach (Mid-Atlantic NJ-VA and South Atlantic NC-FL) to better reflect localized fishery trends and changed the TLA to trigger management action if two of the three terminal years exceed threshold levels. State-specific management action is initiated when the proportion of red exceeds specified thresholds (30% or 60%) for both harvest and abundance. If management action is triggered, the coastwide response includes recreational bag limits and quantifiable measures to achieve percent reductions in commercial harvest. Response requirements vary depending on which threshold is exceeded. Addendum III also defines the mechanism by which triggered management actions may be removed, after abundance characteristics are no longer triggering management action. The TLA is reviewed annually in September. For additional information and links to the above-mentioned FMP, amendments, and addendums please refer to the ASMFC webpage for spot (http://www.asmfc.org/species/spot).

The North Carolina Wildlife Federation submitted a petition for rulemaking on November 2, 2016, and a modification to the petition on January 12, 2017. The petitioner put forth seven rules to designate nursery areas, restrict gear and seasonality in the shrimp trawl fishery to reduce bycatch of fish (including spot, Atlantic croaker, and weakfish), and establish an eight-inch minimum size limit for spot and a 10-inch minimum size limit for Atlantic croaker. At its February 2017 business meeting, the North Carolina Marine Fisheries Commission passed a motion to approve the petitioned rules and begin the rulemaking process. Upon review by the Office of State Budget and Management, it was determined that sufficient state funds are not available to implement the proposed rule changes without undue detriment to the agency's existing activities, and the rules were never adopted.

To ensure compliance with interstate requirements, North Carolina also manages spot under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries. The goals of the North Carolina FMP for Interjurisdictional Fisheries is to adopt FMPs, consistent with North Carolina Law, approved by the Mid-Atlantic Fishery Management Council (MAFMC), South Atlantic Fishery Management Council (SAFMC), or the Atlantic States Marine Fisheries Commission (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 goal of the councils and ASMFC plans, established under the Magnuson-Stevens Fishery Conservation Management Act (federal councils) and the Atlantic Coastal Fisheries Cooperative Management Act (ASMFC) are similar to the goals of the N.C. Fisheries Reform Act of 1997 to "ensure long-term viability" of the fisheries (NCDMF 2015).

Management Unit

Delaware through the east coast of Florida.

Goal and Objectives

The primary goal of the Omnibus Amendment is to bring the FMPs for Spanish mackerel, spot, and spotted seatrout under the authority of the Act, providing for more efficient and effective management and changes to management in the future. The objectives for spot under this amendment are to:

- Increase the level of research and monitoring of spot bycatch in other fisheries, and to complete a coast-wide stock assessment.
- Manage the spot fishery to encourage reduced mortality on spot stocks until age-1.
- Develop research priorities that will further refine the spot management program to maximize the biological, social, and economic benefits derived from the spot population. The Omnibus Amendment does not require specific fishery management measures in either the recreational or commercial fisheries for states within the management unit range.

DESCRIPTION OF THE STOCK

Biological Profile

Spot (*Leiostomus xanthurus*) are short-lived, estuarine dependent members of the drum family, ranging from the Gulf of Maine to Florida but are most abundant from Chesapeake Bay to South Carolina. Spot generally reach maturity by age one or two, rarely reaching a maximum age of six years. Length at 50 percent maturity is generally between seven- and 11-inches total length. Juvenile and adult spot are bottom feeders, eating mostly worms, small crustaceans, and mollusks. Post-larvae and young-of-the-year spot prey on planktonic organisms (ASMFC 2010).

Adult spot migrate seasonally between estuarine and nearshore ocean waters but are rarely found in the upper reaches of the estuary (Hildebrand and Schroeder 1928; Dawson 1958; Hoese 1973; Odell et al.

2017). Spot move offshore to spawn during cooler months from late fall to early spring (Hildebrand and Schroeder 1928; Roelofs 1951; Dawson 1958; Hoese 1973). Wind and currents carry the young into the upper reaches of the estuaries where they remain throughout the spring (Warlen and Chester 1985; Govoni and Spach 1999; Hare et al. 1999; Odell et al. 2017). Spot are most susceptible to commercial and recreational fishing activity during the fall when schools migrate from estuarine to oceanic waters (Pacheco 1962).

Stock Status

Currently, there is no approved stock assessment and the stock status for spot with relation to overfishing or overfished is unknown.

To evaluate the status of the stock between stock assessments, the TLA established under Addendum II and revised under Addendum III, is reviewed annually in years when an assessment is not already being conducted.

Results of the 2024 TLA (2023 terminal year) indicated that landings remain low relative to the reference period (2002–2012), but it is unclear if this is due to harvest restrictions implemented in 2021 or changes in the stock. The harvest composite characteristic index exceeded the 30% red threshold in two of the three terminal years for the Mid-Atlantic region, while the South Atlantic index exceeded 30% red in all three terminal years (Figure 1; ASMFC 2024). Harvest composite indices for 2023 cannot be used to trigger management because catch restrictions have been in effect since 2021. The adult abundance composite characteristic index, which combines fishery independent surveys, triggered at the 30% level in the Mid-Atlantic region, but not in two of the three terminal years, so overall the abundance index did not trigger for that region. The South Atlantic abundance index did not trigger at the 30% or 60% levels in any of the three terminal years (Figure 2; ASMFC 2024).

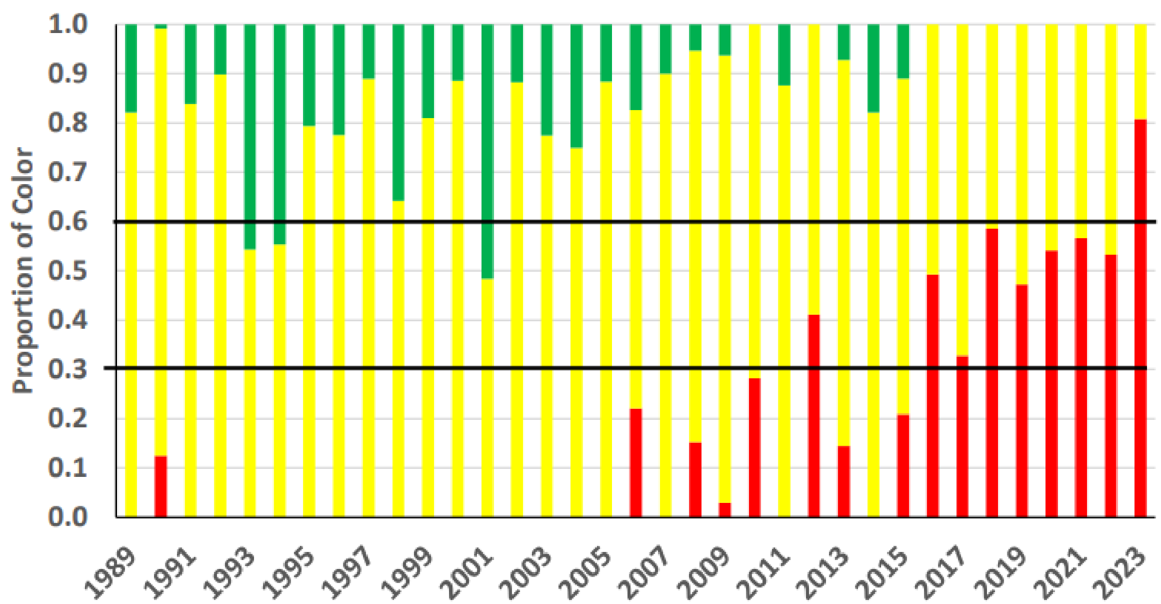


Figure 1. Annual harvest composite TLA color proportions for South Atlantic region (NC-FL) spot recreational and commercial landings, 1989 – 2023 (ASMFC 2024). The reference period is 2002–2012.

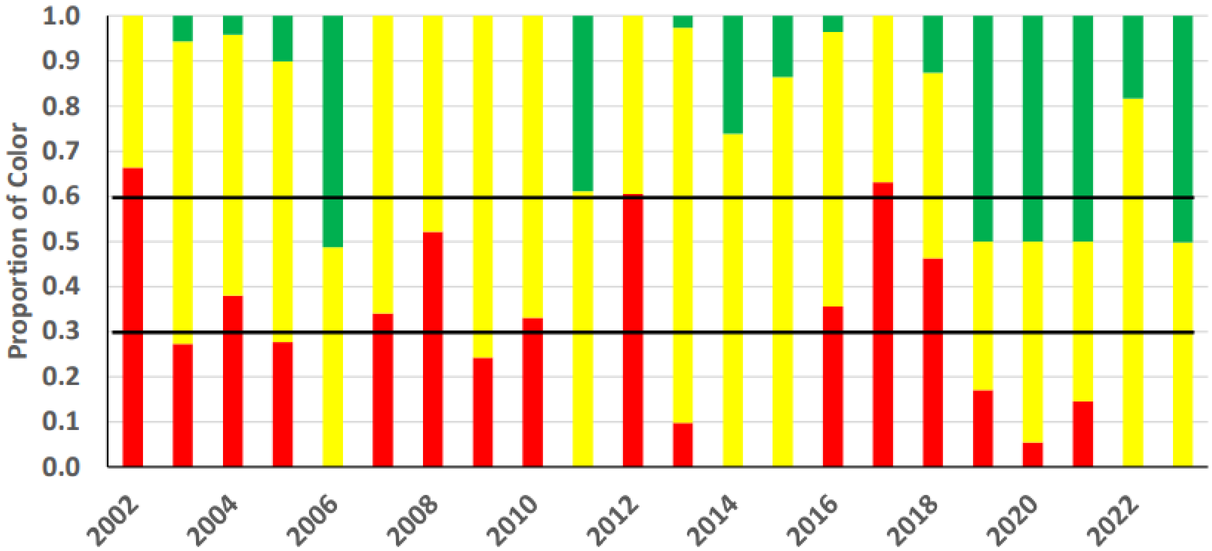


Figure 2. Annual abundance composite TLA color proportions for the South Atlantic region (NC-FL) adult spot (age 1+) from fishery-independent indices (SEAMAP and NCDMF Program 195), 2002–2023 (no 2020 or 2021 data due to limited sampling; ASMFC 2024). The reference period is 2002–2012.

Stock Assessment

The next Spot Benchmark Stock Assessment is scheduled for 2027. The most recent and first benchmark Stock Assessment, completed in 2017, did not pass peer review and will not be used for management (ASMFC 2017, ASMFC 2020). The assessment was not recommended for management because of concern over uncertainty in assessment results due to disagreement between trends in harvest and abundance. Abundance in fishery-independent surveys has generally been increasing whereas commercial and recreational harvest has been declining. The review panel noted that discard estimates from the shrimp trawl fishery were an improvement, and recommended shrimp trawl discard estimates be incorporated into annual monitoring using the TLA.

DESCRIPTION OF THE FISHERY

Current Regulations

The 2020 TLA review (2019 terminal year) for spot triggered at the 30% threshold and coastwide management action as outlined in Addendum III was enacted in March 2021 (ASMFC 2020b). The management response outlined in Addendum III specifies, non de minimis states are required to implement a 50 fish bag limit for their recreational fishery and must reduce commercial harvest by 1% of the average state commercial harvest from the previous 10 years.

In North Carolina, the 50 fish per person per day recreational bag limit was effective April 15th, 2021 (FF-23-2021) and has remained in place. The commercial spot fishery closed December 10th, 2021, through April 4th, in 2021, 2022, 2023, and 2024, to meet the required 1% reduction (FF-66-2021; FF-57-2022; FF-60-2023; FF-51-2024). Management measures are required to remain in place for at least two years and future TLA updates will determine future management action after this time. In 2024, the ASMFC Sciaenids Board selected to maintain current management measures for longer than the required two years, until results of the benchmark stock assessment planned for completion in 2027 are available for consideration.

Commercial Fishery

Two gear types (gill nets and haul seines) are used in directed commercial trips and harvest of spot. Other gear types, including sciaenid pound nets, beach seines, swipe nets, and crab pots contribute minimally to commercial landings. Higher commercial landings were reported in the 1990's but declined from 2001 to 2018 to the lowest value in the time series (Table 1; Figure 4). Landings have increased in recent years (since 2018), averaging 556,473 pounds since 2019 (Table 1; Figure 4). In 2024, commercial landings were 571,590 pounds, which is a 25% decrease from 2023, when 761,604 pounds were landed. 2023 landings were the highest since 2014. Commercial spot landings have exceeded recreational harvest since 2020. Spot are a component of the scrap or bait fishery in North Carolina, but this component generally makes up a small percentage of landings.

Table 1. Spot recreational harvest and number released (Marine Recreational Information Program), commercial harvest (North Carolina Trip Ticket Program), and total harvest, 1994–2024. All weights are in pounds.

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1994	14,032,650	2,365,031	4,571,386	2,937,311	7,508,697
1995	8,199,743	2,214,819	3,214,061	3,006,845	6,220,906
1996	6,729,366	2,234,354	2,461,892	2,290,000	4,751,892
1997	4,529,620	1,110,650	2,129,481	2,627,925	4,757,406
1998	11,797,824	2,379,578	4,596,119	2,396,979	6,993,098
1999	5,736,185	2,343,795	2,565,546	2,262,175	4,827,721
2000	6,121,384	1,366,746	2,598,813	2,829,818	5,428,631
2001	10,043,845	2,804,349	4,519,545	3,093,872	7,613,417
2002	8,456,981	1,569,579	3,017,466	2,184,032	5,201,498
2003	9,717,824	2,970,990	4,220,534	2,043,387	6,263,921
2004	7,845,322	2,899,319	3,682,623	2,317,169	5,999,792
2005	10,105,205	4,407,100	3,652,186	1,714,597	5,366,783
2006	11,109,551	8,196,592	3,995,432	1,364,743	5,360,175
2007	8,728,295	4,049,250	2,737,144	879,091	3,616,235
2008	3,970,431	3,817,529	1,382,428	736,484	2,118,912
2009	4,197,640	4,847,202	1,427,956	1,006,500	2,434,456
2010	3,830,384	3,615,808	1,173,173	572,315	1,745,488
2011	6,480,714	4,993,544	2,201,947	936,970	3,138,917
2012	2,677,082	2,995,879	760,276	489,678	1,249,954
2013	6,120,985	5,513,732	1,789,251	768,943	2,558,194
2014	8,343,467	4,043,710	2,877,483	766,224	3,643,707
2015	2,572,738	2,984,629	833,390	377,028	1,210,418
2016	1,928,716	1,831,415	558,799	241,044	799,843
2017	2,418,331	1,902,281	909,796	415,465	1,325,261
2018	2,068,865	2,062,163	597,511	167,696	765,207
2019	2,822,884	2,356,120	851,998	392,206	1,244,204
2020	920,512	1,673,676	297,813	542,870	840,683
2021	1,199,080	2,357,567	435,231	527,464	962,695
2022	1,197,145	2,331,484	375,168	543,104	918,272
2023	855,729	2,737,778	300,052	761,604	1,061,656
2024	388,715	1,690,124	120,652	571,590	692,242
Mean	5,649,910	2,989,251	2,092,102	1,347,262	3,439,364

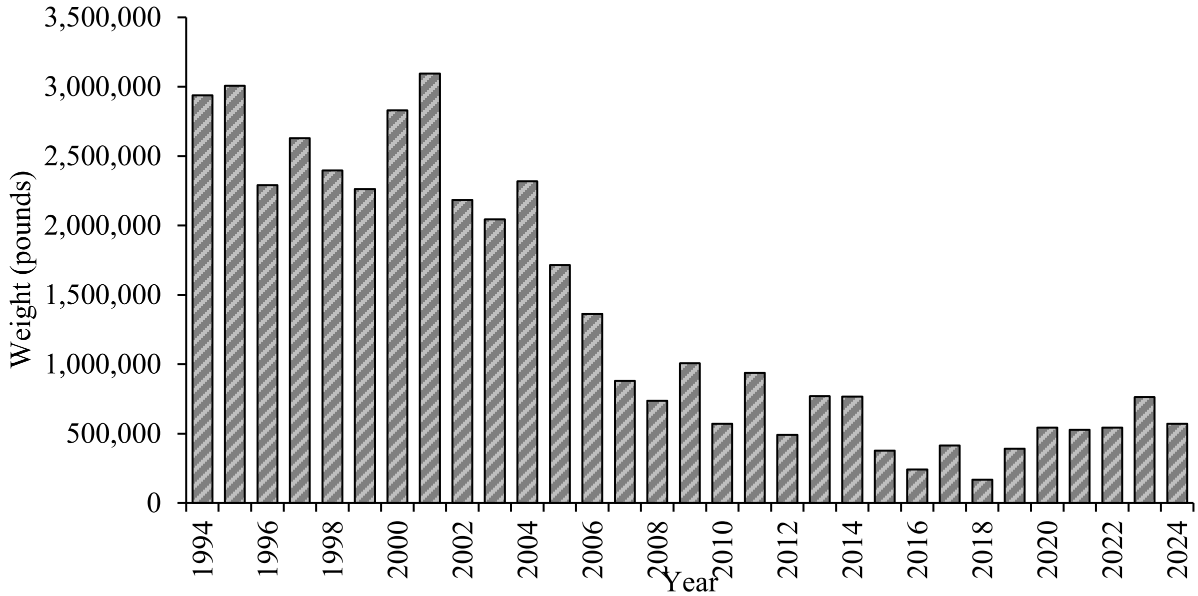


Figure 4. Annual commercial landings (North Carolina Trip Ticket Program) in pounds for spot in North Carolina, 1994–2024.

Recreational Fishery

Recreational estimates across all years have been updated and are based on the Marine Recreational Information Program (MRIP) Fishing Effort Survey-based calibrated estimates. For more information on MRIP see https://www.fisheries.noaa.gov/topic/recreational-fishing-data. From 1994 through 2024 recreational harvest of spot in North Carolina ranged from 120,652 to 4,596,119 pounds or between 388,715 and 11,797,824 fish, with the lowest landings in both count and weight occurring in 2024 (Table 1; Figures 5 and 6). Harvest by weight was generally stable prior to 2007 when there was a notable decline in the time series. Harvest in the last 10 years has been consistently low. The three lowest values in the time series occurred in the last five years. Recreational harvest in 2024 was 388,715 fish or 120,652 pounds, a 55% decrease in number of fish and a 60% decrease in weight from 2023. Recreational harvest in 2023 was the third lowest in the time series, with harvest in 2020 being the second lowest (297,813 pounds).

The number of recreational releases were relatively low from 1994 to 2004, remaining below 4 million fish. In 2005, there was a noticeable increase in releases peaking at 8,196,592 fish in 2006. Releases remained relatively high until dropping in 2016, remaining between 1.6 million fish and 2.7 million fish into 2024 (Figure 6). The percentage of released recreational catch has steadily increased over the time series from 14% in 1994 to 81% in 2024, when anglers released 1,690,124 fish. The number of released fish has exceeded the number of fish landed recreationally since 2020.

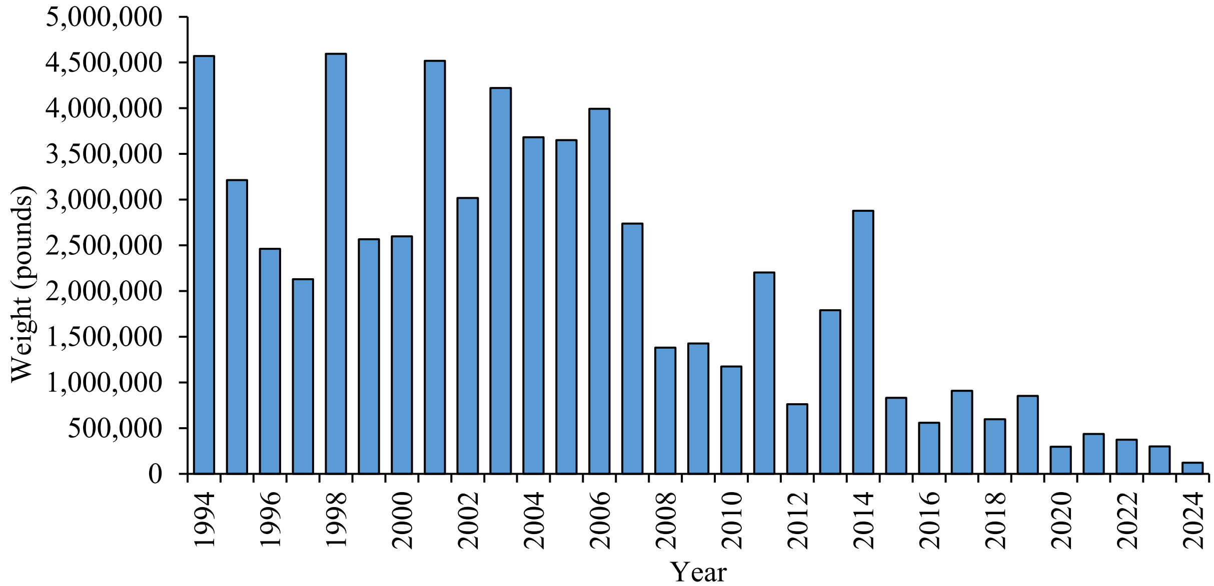


Figure 5. Annual recreational harvest (Marine Recreational Information Program) in pounds for spot in North Carolina, 1994–2024.

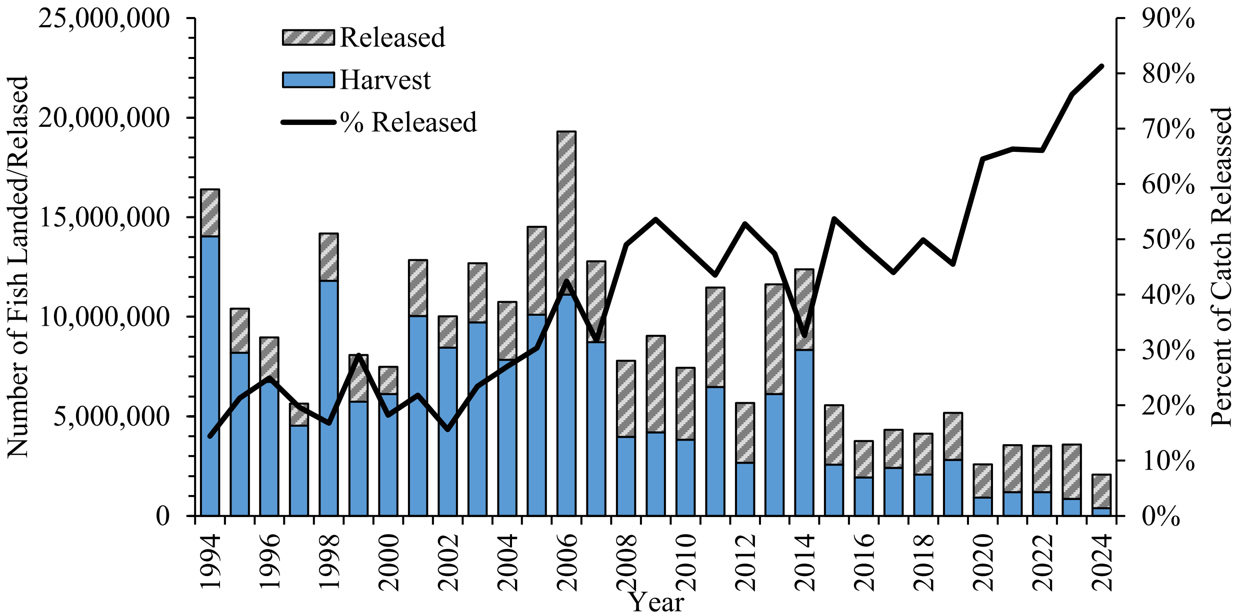


Figure 6. Recreational catch (landings and releases, in numbers) and the percent of catch that is released, 1994–2024 from the MRIP.

The number of spot measured during MRIP sampling has generally declined since 2011, with only 61 individuals measured in 2023 and 23 individuals measured in 2024, which is the lowest in the time series (Table 2). Mean fork length (FL) in 2024 was 8.1 inches and there has been little fluctuation since 1994 with mean length ranging from 7.6 to 9.2 inches. Maximum FL in 2024 was 10.5 inches, and minimum FL was 8.1 inches. Most of the recreational catch consists of spot from 6.0 to 9.0 inches FL with little change in length composition since 1994 (Figure 7; Figure 8). However, in the 1990s and early 2000s, a wider range of lengths were harvested in the recreational fishery relative to recent years. Primarily, spot over 12 inches FL have not been observed in the recreational fishery for over ten years. Length distribution from

2024 recreational catches ranged from 6 to 10 inches (Figure 8). The modal length class observed in recreational harvest for 2024 was 7 inches with 55 percent of the recreational catch within this size class.

Table 2. Mean, minimum, maximum fork length (inches), and total number of spot measured by Marine Recreational Information Program (MRIP) sampling in North Carolina, 1994–2024.

Year	Mean Fork Length	Minimum Fork Length	Maximum Fork Length	Total Number Measured
1994	8.2	5.7	35.5	2,633
1995	8.5	4.3	19.4	2,040
1996	8.5	4.9	11.6	2,376
1997	8.7	5.7	15.6	1,762
1998	8.6	6.3	12.4	1,632
1999	9.1	5.5	11.5	1,159
2000	8.6	5.5	20.5	1,223
2001	8.8	5.4	13.9	1,627
2002	8.3	6.3	12.0	860
2003	8.7	4.6	14.2	1,403
2004	9.2	4.8	12.8	2,034
2005	8.4	5.2	16.2	1,286
2006	8.9	4.8	13.5	1,216
2007	9.1	5.7	12.0	1,243
2008	8.3	5.0	12.2	1,344
2009	8.4	5.0	10.8	682
2010	8.1	5.8	12.0	1,096
2011	8.2	5.9	11.1	1,534
2012	7.9	5.6	11.7	611
2013	7.9	4.5	11.5	484
2014	8.2	4.8	11.9	344
2015	8.1	6.1	11.9	214
2016	8.0	6.3	11.0	107
2017	8.1	6.3	10.6	98
2018	8.4	5.7	10.9	125
2019	7.7	5.0	10.1	276
2020	8.1	5.0	10.1	131
2021	8.0	4.7	10.1	67
2022	8.1	6.4	11.8	69
2023	7.8	4.4	11.0	61
2024	8.1	6.5	10.5	23

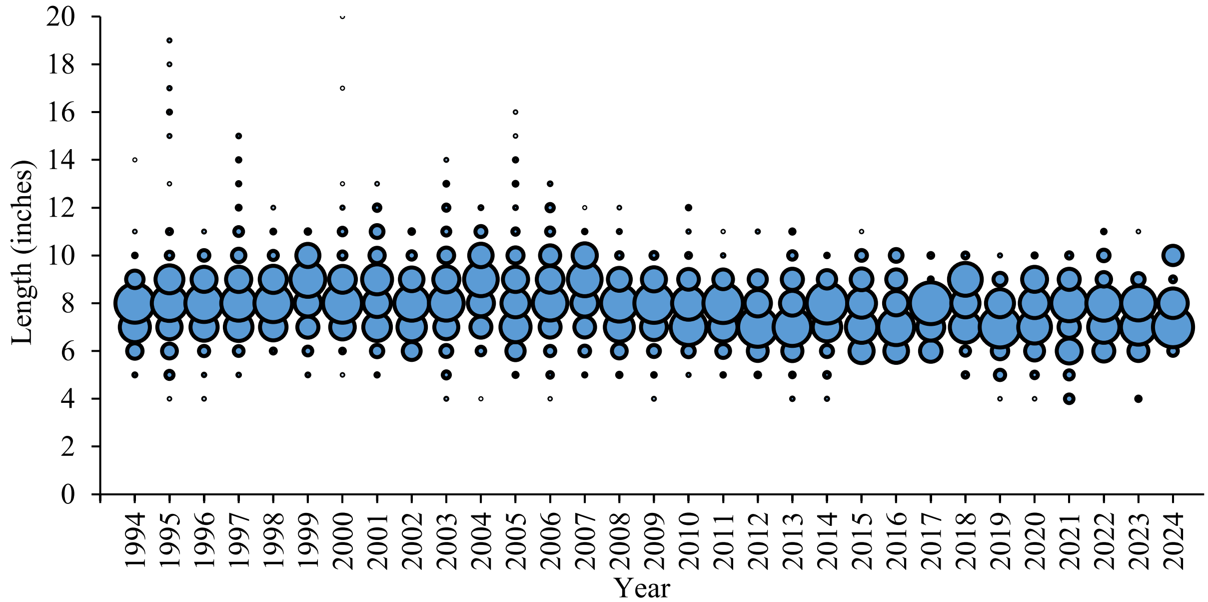


Figure 7. Recreational length frequency (fork length, inches) of spot harvested in North Carolina, 1994–2024 (MRIP, n= 29,760). Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

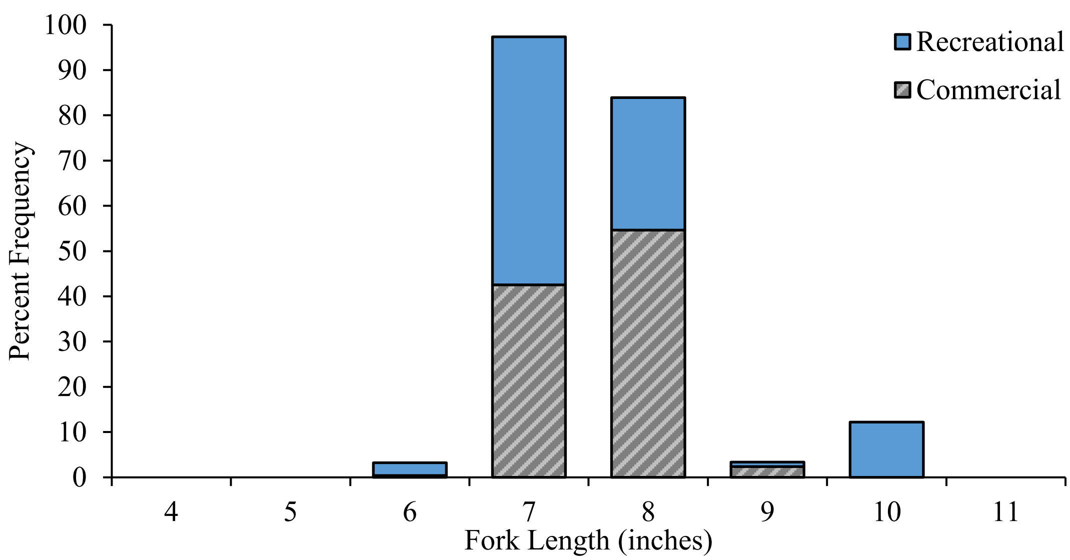


Figure 8. Commercial (n=1,135) and recreational (n=23) length frequency distribution for spot harvested in North Carolina, 2024.

Spot are targeted recreationally by shore-based anglers and those fishing from private vessels during the fall. 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. From 2002 to 2008, an average of 203,383 pounds was harvested per year, ranging from 97,753 to 339,077 pounds (NCDMF 2021).

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

In 2024, 1,135 spot lengths were obtained from commercial fish house sampling with a mean FL of 8.1 inches, and lengths ranging from 6.7 to 9.8 inches. The minimum length observed in 2024 was 6.7 inches and was the highest minimum length for any year in the time series. Mean FL has been relatively stable across the time series ranging from 6.7 to 8.9 inches. The number of spot lengths obtained from commercial fish house sampling has generally decreased since 2005 ranging from a low of 1,135 lengths in 2024 to 15,616 in 2000 (Table 3). Bait samples are not included in minimum, maximum, and mean length calculations.

Table 3. Mean, minimum, maximum fork length (inches), and total number of spot measured from North Carolina commercial fish house samples, 1994–2024. Bait samples are not included.

Year	Mean Length	Minimum Length	Maximum Length	Number Measured
1994	6.7	3.9	11.9	9,066
1995	6.7	3.9	11.4	11,026
1996	7.3	3.9	11.8	14,010
1997	7.3	3.9	13.3	15,331
1998	7.4	3.9	12.2	11,726
1999	7.7	3.9	11.7	9,176
2000	7.9	3.9	17.6	15,616
2001	8.5	3.9	12.4	15,584
2002	8.4	3.9	17.8	13,029
2003	8.6	3.9	13.9	12,907
2004	8.8	3.9	15.0	12,366
2005	8.9	4.0	13.1	15,532
2006	8.3	4.1	13.2	13,503
2007	7.9	3.9	12.0	13,889
2008	7.9	3.9	13.3	10,744
2009	8.1	3.9	11.7	9,087
2010	8.1	3.9	11.6	7,491
2011	8.1	4.3	13.1	8,906
2012	8.0	4.1	11.8	4,457
2013	8.3	4.2	13.3	4,699
2014	8.2	4.1	13.1	6,650
2015	8.3	4.3	11.6	4,543
2016	8.0	4.9	12.8	2,250
2017	8.3	4.4	11.7	2,648
2018	7.9	4.2	10.9	2,241
2019	7.9	4.4	12.9	3,719
2020	8.0	5.0	12.5	3,200
2021	8.0	4.9	12.0	3,085
2022	8.0	4.4	11.7	2,587
2023	8.1	4.4	10.5	2,070
2024	8.1	6.7	9.8	1,135

Modal length generally increased from 1994 to the early 2000's (Figure 9). The range of lengths harvested narrowed in the late 2000s with little change since. Size composition in 2024 commercial samples indicate a dominance of spot from the 7.0- and 8.0-inch size classes (Figure 9).

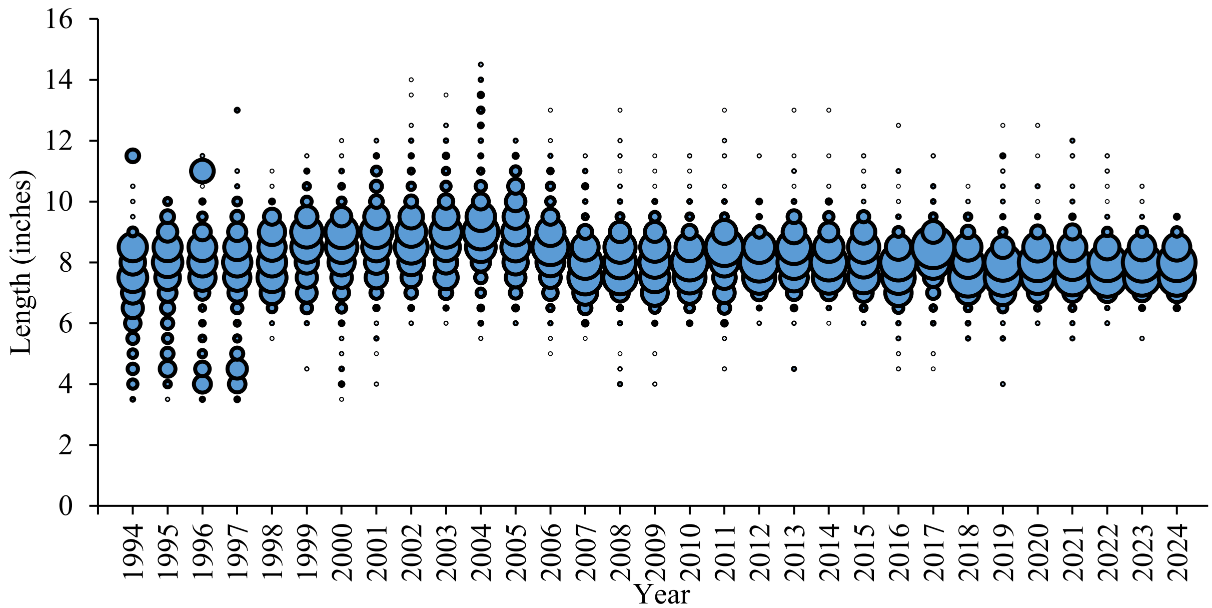


Figure 9. Commercial length frequency (fork length, inches) of spot harvested from 1994 to 2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length (n=262,273). Bait samples not included.

Fishery-Independent Monitoring

The number of spot aged in North Carolina's comprehensive life history program (P930) using otoliths from 1997 through 2024 has ranged from 230 to 776 (Table 4). In 2024, 680 spot were aged with a modal age of one and maximum age of four. The maximum age observed was three from 2013 to 2022. Modal age was one in every year except 2004 when modal age was two and 2016 when modal age was zero. Minimum age was zero in every year, while maximum age ranged from two to six and is most frequently three. There is substantial overlap in length at age for ages zero through three with length at age becoming less variable after age four (Figure 10).

Table 4. Modal, minimum, maximum age, and total number of spot aged in North Carolina from fishery dependent and fishery independent sampling, 1997–2024. Includes otolith ages only and only samples for which a length was recorded.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1997	1	0	3	263
1998	1	0	3	603
1999	1	0	2	522
2000	1	0	3	551
2001	1	0	4	555
2002	1	0	5	603
2003	1	0	4	354
2004	2	0	6	455
2005	1	0	6	529
2006	1	0	5	501
2007	1	0	3	284
2008	1	0	3	408
2009	1	0	3	365
2010	1	0	3	268
2011	1	0	3	413
2012	1	0	4	230
2013	1	0	3	360
2014	1	0	3	687
2015	1	0	3	505
2016	0	0	3	373
2017	1	0	3	528
2018	1	0	3	516
2019	1	0	3	440
2020	1	0	3	452
2021	1	0	3	776
2022	1	0	3	392
2023	1	0	4	585
2024	1	0	4	680

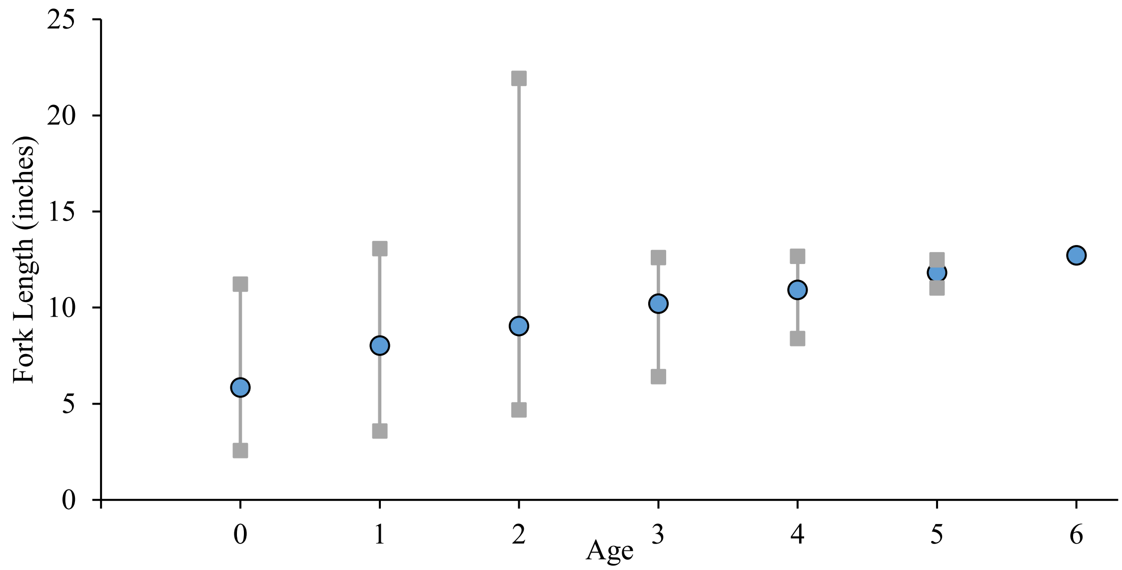


Figure 10. Spot fork length at age based on age samples collected from 1997 to 2024 (n=13,200). Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size at age. Only ages derived from otoliths and from samples for which a length was recorded were used.

The Pamlico Sound Survey (Program 195) samples 54 randomly selected stations (grids) annually in June and September. Stations are randomly selected from strata based upon depth and geographic location. Tow duration is 20 minutes, using double rigged demersal mongoose trawls (9.1 m headrope, 1.0 X 0.6 m doors, 2.2-cm bar mesh body, 1.9-cm bar mesh cod end, and a 100-mesh tailbag extension). Data from this survey are used to produce juvenile abundance indices (JAI) that are incorporated into ASMFC stock assessments and reported annually to ASMFC as part of compliance reports and for incorporation into the juvenile composite TLA. Length cutoffs for juvenile spot were updated in 2022 after analyzing length distribution of age-0 and age-1 spot in P930. Juvenile spot are defined as fish <140 mm TL (5.5 inches) in June, and fish <190 mm TL (7.5 inches) in September.

The COVID pandemic impacted sampling in 2020 and 2021. Executive Order (EO) 116, issued on March 10, 2020, declared North Carolina under a State of Emergency and was soon followed by EO 120 which implemented a statewide Stay at Home Order for all non-essential State employees. In 2020, sampling was limited to 28 stations sampled in June and 35 stations sampled in September. A total of 35 stations were sampled in June 2021 and 33 stations were sampled in September 2021. Limited sampling likely impacted abundance indices calculated from Sound Survey data. An initial analysis of this impact was conducted for the 2020 spot abundance indices, and concluded the magnitude of abundance may be overestimated slightly but limited sampling was likely able to capture general abundance trends.

The spot weighted JAI from the Pamlico Sound Survey is highly variable in both June and September with a time series average of 459 and 411 respectively (Figure 11). Throughout the time series, large peaks tend to be followed by large declines. JAI reached a peak of 1,285 individuals per tow in June 2008 and 774 individuals per tow in September 2005. The June JAI declined from 2018 to 2021, dropping below the time series average in 2020 to 254 individuals per tow and 255 individuals per tow in 2021. The June JAI increased to 632 individuals per tow in 2022 before dropping to 444 individuals per tow in 2023 and again in 2024 to 249 individuals per tow. The September JAI also declined from 2018 to 2021, dropping below the time series average in 2021 to 326 individuals per tow before increasing to 582 individuals per tow in 2022 and 755 individuals per tow in 2023. The JAI for September 2023 was the second highest in the time series. The JAI for September 2024 decreased to 563 individuals per tow.

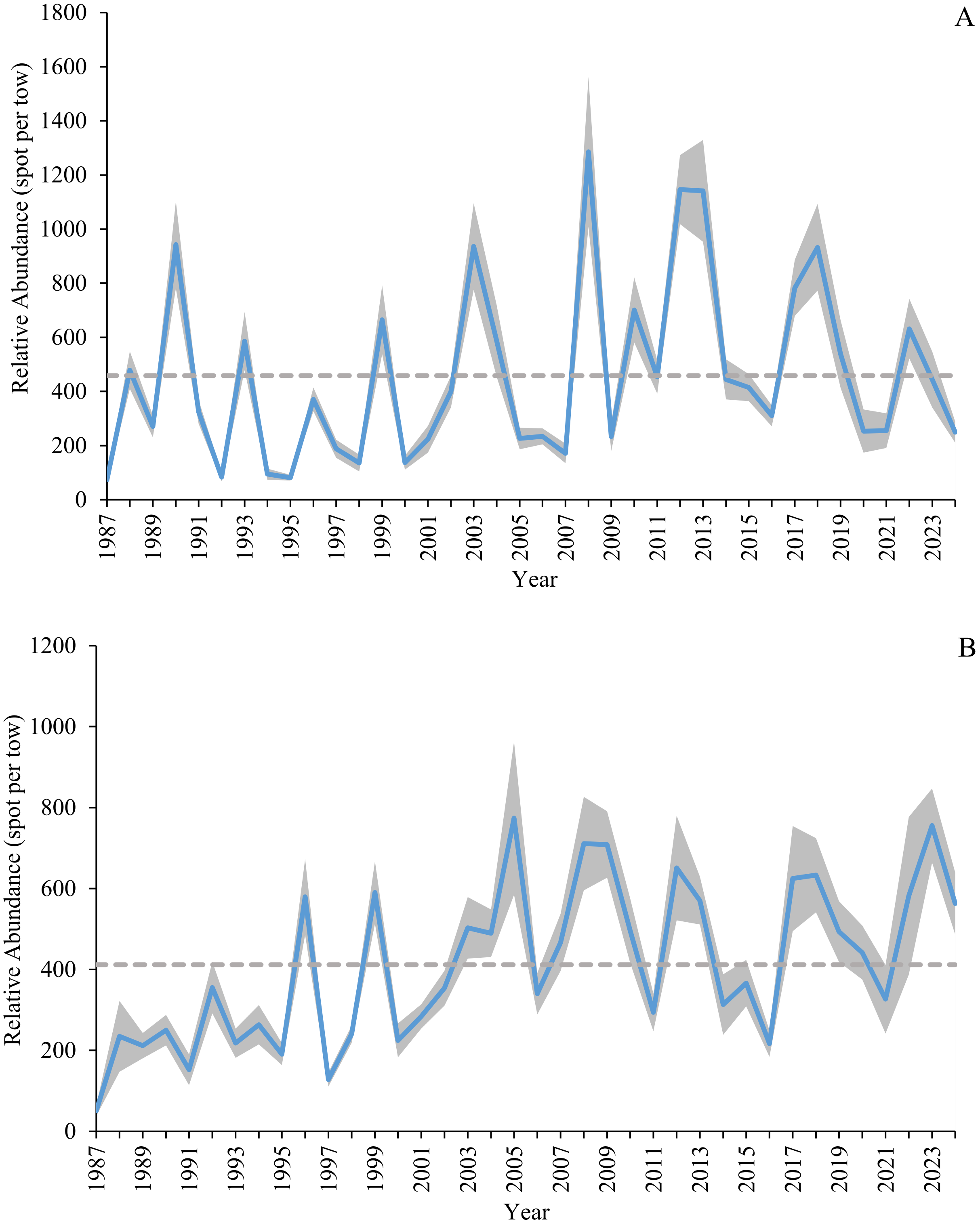
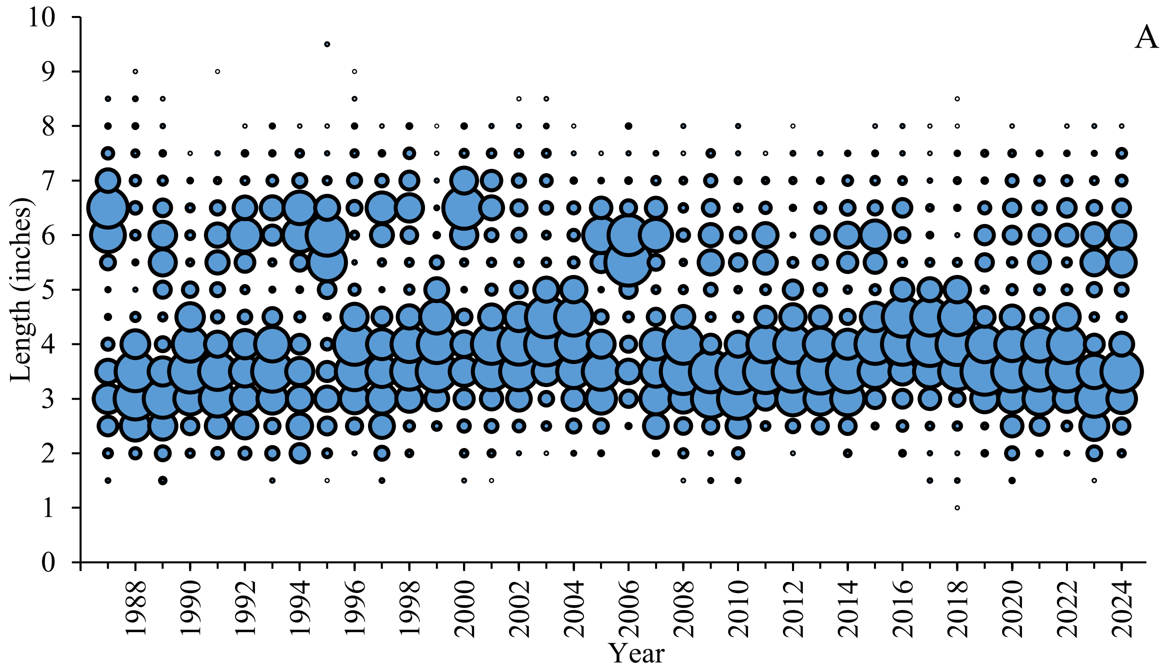


Figure 11. Spot juvenile weighted abundance index (number per tow) for A) June and B) September from the Pamlico Sound Survey, 1987–2024. Shaded area represents standard error. Dashed lines represent the time series average. Length cutoffs are <140 mm FL (5.5 in) in June and <190 mm TL (7.5 in) in September.

Most spot captured in the Pamlico Sound Survey are juveniles (age 0), but a number of age one or greater fish are captured as well, producing two distinct length modes, particularly in June. One mode is around 3.5 inches FL (age 0), and the other is around 6.0 inches FL (age 1 or greater; Figure 12). Modal length from the September portion of the Pamlico Sound Survey is more variable than June ranging from 3.0 to 5.5 inches FL with a wider range of lengths captured.



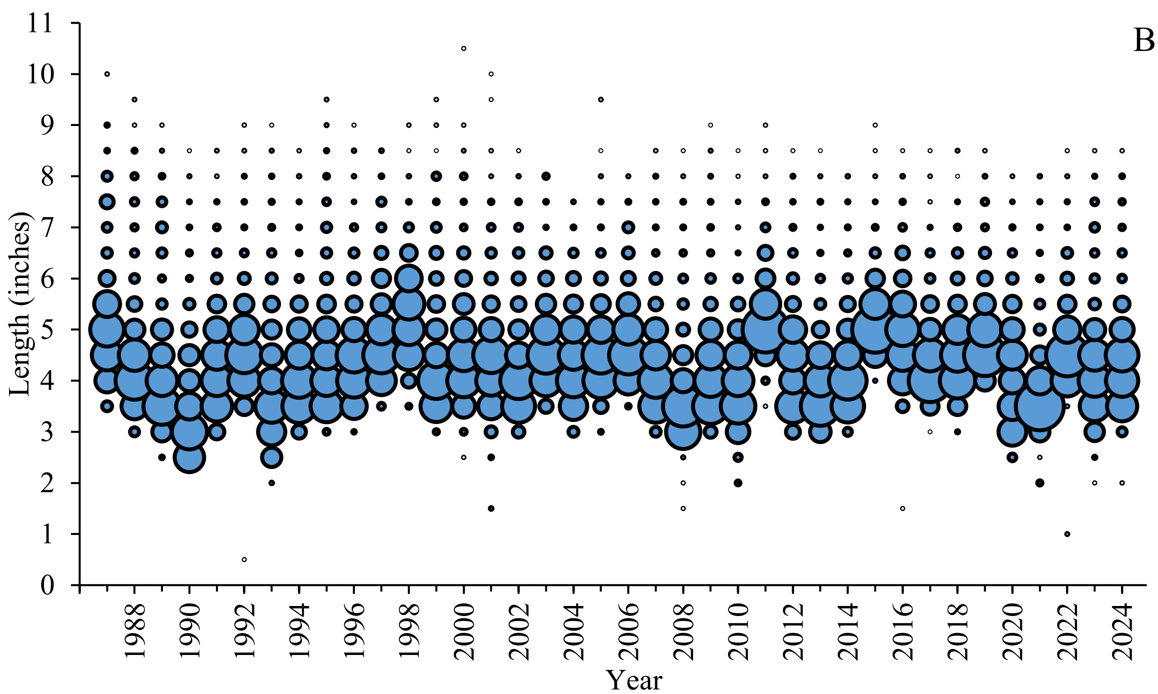


Figure 12. Length frequency (fork length, inches) of all spot captured in Pamlico Sound Survey sampling during A) June and B) September, 1987–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

RESEARCH NEEDS

There are no research or monitoring programs required of the states except for the submission of an annual compliance report. The top three recommendations are reported below (ASMFC 2023). Additional research and monitoring recommendations can be found in the 2017 Spot Stock Assessment Peer Review Report (ASMFC 2017).

- Expand collection of life history data (age, growth, and reproduction data) from fishery dependent sources while maintaining these collections from ongoing state level fishery independent sources as well as multistate monitoring surveys. In addition, investigate identification of coastal stocks and their movement through tagging and genetic studies.
- Increase efforts to characterize commercial discards through expanded observer coverage, particularly within the shrimp trawl fishery, and develop a standardized bycatch protocol with collection of lengths and ages of discards and by-catch. Other sources for discard mortality studies include scrap and bait fisheries, commercial gears and recreational gear, and direct research and engagement of commercial harvesters.
- Investigate environmental impacts of temperature shifts, climate change and large-scale oceanic cycles (e.g., Atlantic Multi-Decadal Oscillation, AMO, and El Nino Southern Oscillation, El Nino) on recruitment SSB, stock distribution and maturity schedules for incorporation into stock assessment models.

MANAGEMENT

The TLA established under Addendum II and revised under Addendum III (approved February 2020) to the Omnibus Amendment is used as a precautionary management framework for spot. The TLA provides guidance in lieu of a current stock assessment. Addendum III incorporated the use of a regional approach (Mid-Atlantic NJ-VA and South Atlantic NC-FL) to better reflect localized fishery trends. Under this management program, if the amount of red in the Traffic Light for both population characteristics (adult abundance and harvest) meet or exceed the threshold for any two of the three most recent years, then management action is required. The harvest composite triggered at the 30% threshold in both regions in 2019. The adult abundance composite exceeded the 30% threshold in the Mid-Atlantic region but not in the South Atlantic region. Since both population characteristics were above the 30 percent threshold in at least two years (2017–2019), management actions were implemented in March 2021. Because both abundance composite indices were missing data for 2020 and 2021, a determination of whether the TLA triggered in 2021 or if management measures can be removed could not be made. The TLA was updated in 2024; however, the ASMFC Sciaenids Board selected to maintain current management measures for longer than the required two years, until results of the benchmark stock assessment planned for completion in 2027 are available for consideration.

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FISHERY MANAGEMENT PLAN UPDATE
SUMMER FLOUNDER
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	1982 – ASMFC	
	1988 – MAFMC	
Amendments:	Amendment 1	1991
	Amendment 2	1993
	Amendment 3	1993
	Amendment 4	1993
	Amendment 5	1993
	Amendment 6	1994
	Amendment 7	1995
	Amendment 10	1997
	Amendment 11	1998
	Amendment 12	1999
	Framework 1	2001
	Framework 2	2001
	Addendum III	2001
	Addendum IV	2001
	Framework 5	2004
	Addendum VIII	2004
	Addendum XIV	2004
	Addendum XV	2004
	Addendum XVI	2005
	Addendum XVII	2005
	Framework 6	2006
	Addendum XVIII	2006
	Framework 7	2007
	Addendum XIX	2007
	Amendment 16	2007
	Amendment 15	2011
	Amendment 19 (Recreational Accountability Amendment)	2013
	Addendum XXV	2014
	Amendment 17	2015
	Addendum XXVI	2015
	Amendment 18	2015
	Addendum XXVII	2016
	Addendum XXVIII	2017
	Amendment 20	2017
	Framework 10	2017
	Framework 11	2018
	Framework 13	2018
	Addendum XXXI	2018
	Addendum XXXII	2018
	Framework 14	2019

Framework 15	2020
Amendment 21	2020
Framework 16	2020
Amendment 22	2022
Framework 17 & Addendum XXXIV	2022/2023
Addendum XXXVI	2025

Comprehensive Review: 2023

Because of their presence in, and movement between state waters (0–3 miles) and federal waters (3–200 miles), the Mid-Atlantic Fishery Management Council (MAFMC) manages summer flounder (*Paralichthys dentatus*) cooperatively with the Atlantic States Marine Fisheries Commission (ASMFC). The two management entities work in conjunction with the National Marine Fisheries Service (NMFS) as the federal implementation and enforcement entity.

Specific details for each Amendment include:

Amendment 1 established an overfishing definition for summer flounder.

Amendment 2 established rebuilding schedule, commercial quotas, recreational harvest limits, size limits, gear restrictions, permits, and reporting requirements for summer flounder; created the summer flounder monitoring committee.

Amendment 3 revised the exempted fishery line for summer flounder; increased the large mesh net threshold for summer flounder; established otter trawl retention requirements for large mesh use in the summer flounder fishery.

Amendment 4 revised state-specific shares for summer flounder commercial quota allocation.

Amendment 5 allowed states to combine or transfer summer flounder commercial quota.

Amendment 6 set criteria for allowance of multiple nets on board commercial vessels for summer flounder; established deadline for publishing catch limits; established commercial management measures for summer flounder.

Amendment 7 revised the fishing mortality rate reduction schedule for summer flounder.

Amendment 10 modified commercial minimum mesh requirements; continued commercial vessel moratorium permit; prohibited transfer of summer flounder at sea; established a special permit for the summer flounder party/charter sector.

Amendment 11 modified certain provisions related to vessel replacement and upgrading, permit history transfer, splitting, and permit renewal regulations.

Amendment 12 revised Summer Flounder, Scup, and Black Sea Bass FMP to comply with the Sustainable Fisheries Act and established a framework adjustment process; established quota set-aside for research for summer flounder, scup and black sea bass; established state-specific conservation equivalence measures; allowed the rollover of the winter scup quota; revised the start date for the scup summer quota period; established a system to transfer scup at sea.

Framework 1 established quota set-aside for research for summer flounder, scup and black sea bass.

Framework 2 established state-specific conservation equivalency measures for the recreational summer flounder fishery.

Addendum III established recreational fishing specifications for 2001 for summer flounder and scup.

Addendum IV provided that upon the recommendation of the relevant monitoring committee and joint consideration with the Mid-Atlantic Fishery Management Council, the ASMFC's Summer Flounder, Scup, and Black Sea Bass Management Board will decide the state regulations rather than forward a recommendation to the National Marine Fisheries Science Center; made states responsible for implementing the ASMFC's Summer Flounder, Scup, and Black Sea Bass Management Boards decisions on regulations.

Framework 5 established multi-year specification setting of the quotas for summer flounder, scup, and black sea bass.

Addendum VIII established a program wherein any state which exceeds its recreational harvest limit for summer flounder in 2003 and beyond will receive a reduction from its future recreational harvest limits.

Addendum XIV implemented a system of conservation equivalency for the recreational fishery of summer flounder to achieve the annual recreational harvest limit.

Addendum XV established an allocation program for the increase in commercial total allowable landings in the summer flounder fishery for 2005 and 2006 only.

Addendum XVI provided a species-specific mechanism of ensuring that a state meets its obligations under the plan in a way that minimizes the probability that a state's delay in complying does not adversely affect other states fisheries or conservation of the resource.

Addendum XVII established a program wherein the ASMFC Management Board has the ability to sub-divide the recreational summer flounder coast-wide allocations into voluntary regions.

Framework 6 established region-specific conservation equivalency measures for summer flounder.

Addendum XVIII stabilized fishing rules as close to those that existed in 2005, in part, to minimize the drastic reductions facing three states.

Framework 7 built flexibility into process to define and update status determination criteria for summer flounder, scup, and black sea bass.

Addendum XIX continued the state-by-state black sea bass commercial management measures, without a sunset clause; broadened the descriptions of stock status determination criteria contained within the Summer Flounder, Scup, and Black Sea Bass FMP to allow greater flexibility in those definitions, while maintaining objective and measurable status determination criteria for identifying when stocks or stock complexes covered by the fishery management plan are overfished.

Amendment 16 standardized bycatch reporting methodology.

Amendment 15 established annual catch limits and accountability measures.

Amendment 19 modified the accountability measures for the MAFMC recreational fisheries.

Addendum XXV established regional management for the 2014 recreational black sea bass and summer flounder fishery.

Amendment 17 implemented standardized bycatch reporting methodology.

Addendum XXVI established alternate regional management for the 2015 recreational summer flounder fishery.

Amendment 18 eliminated the requirement for vessel owners to submit "did not fish" reports for the months or weeks when their vessel was not fishing; removed some of the restrictions for upgrading vessels listed on federal fishing permits.

Addendum XXVII continued regional management of the recreational summer flounder fishery extended ad hoc regional management of the black sea bass recreational fishery for the 2016 and 2017 fishing year and addressed the discrepancies in recreational summer flounder management measures within Delaware Bay.

Addendum XXVIII initiated an addendum to consider adaptive management, including regional approaches, for the 2017 summer flounder recreational fishery.

Amendment 20 implemented management measures to prevent the development of new, and the expansion of existing, commercial fisheries on certain forage species in the Mid-Atlantic.

Framework 10 implemented a requirement for vessels that hold party/charter permits for Council-managed species to submit vessel trip reports electronically (eVTRS) while on a trip carrying passengers for hire.

Framework 11 established a process for setting constant multi-year Acceptable Biological Catch (ABC) limits for Council-managed fisheries, clarified that the Atlantic Bluefish, Tilefish, and Atlantic Mackerel, Squid, and Butterfish FMPs will now automatically incorporate the best available scientific information in calculating ABCs (as all other Mid-Atlantic management plans do) rather than requiring a separate management action to adopt them, clarified the process for setting ABCs for each of the four types of ABC control rules.

Framework 13 modified the accountability measures required for overages not caused by directed landings (i.e., discards) in the summer flounder, scup, and black sea bass fisheries.

Addendum XXXI established conservation equivalency for black sea bass and transit provisions in federal waters around Block Island, Rhode Island for recreational and commercial fishermen which allows permitted fishermen to pass through federal waters legally.

Addendum XXXII established a specifications process instead of an addendum process to implement recreational management measures more quickly for summer flounder and black sea bass.

Framework 14 gives the Council the option to waive the federal recreational black sea bass measures in favor of state measures through conservation equivalency; implements a transit zone for commercial and recreational summer flounder, scup, and black sea bass fisheries in Block Island Sound; and allows for the use of a maximum size limit in the recreational summer flounder and black sea bass fisheries.

Framework 15 established a requirement for commercial vessels with federal permits for all species managed by the Mid-Atlantic and New England Councils to submit vessel trip reports electronically within 48 hours after entering port at the conclusion of a trip.

Amendment 21 modified the summer flounder commercial state quota allocation system and FMP goals and objectives.

Framework 16 modified MAFMC's ABC control rule and risk policy. The revised risk policy is intended to reduce the probability of overfishing as stock size falls below the target biomass while allowing for increased risk and greater economic benefit under stock biomass conditions. This action also removed the typical/atypical species distinction currently included in the risk policy.

Amendment 22 revised the commercial and recreational sector allocations for all three species.

Framework 17/Addendum XXXIV Recreational Harvest Control Rule established a new process for setting recreational bag, size, and season limits (i.e., recreational measures) for summer flounder, scup, black sea bass, and bluefish. This action also modified the recreational accountability measures for these species.

Addendum XXXVI which made further modifications to the process for setting recreational measures and accountability measures for these four species. The changes, which include modifications the Percent Change Approach based on lessons learned over the past few years, will be implemented in two phases.

Specific details for each amendment under development include:

The Percent Change Approach was implemented in 2023 (new process for setting recreational measures bag, size, and season limits), and will sunset at the end of 2025.

In April 2025, the Policy Board and Council adopted Addendum XXXVI to the Summer Flounder, Scup, and Black Sea Bass FMP and Addendum III to the Bluefish FMP, which made further modifications to the process for setting recreational measures and accountability measures for these four species. The changes, which include modifications the Percent Change Approach based on lessons learned over the past few years, will be implemented in two phases. The first phase of changes aims to better account for stock status when setting measures and will create more opportunities for stability in management measures. The second phase of modifications, which will be implemented for setting 2030 recreational measures and beyond, will update the process to use a catch-based target. For further information see the management plan at asmfc.org.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt fishery management plans, consistent with N.C. law, approved by the MAFMC, 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. These plans were established under the Magnuson-Stevens Fishery Conservation and Management Act (federal council plans) and the Atlantic Coastal Fisheries Cooperative Management Act (ASMFC plans) with the goal, like the Fisheries Reform Act of 1997 to "ensure long-term viability" of these fisheries (NCDMF 2022).

Management Unit

U.S. waters in the western Atlantic Ocean from the southern border of North Carolina northward to the U.S.-Canadian border.

Goal and Objectives

Amendment 21 in 2020 approved the proposed revised FMP Goals and Objectives for Summer Flounder and are as follows:

- Goal 1: Ensure the biological sustainability of the summer flounder resource in order to maintain a sustainable summer flounder fishery.
    - Objective 1.1: Prevent overfishing and achieve and maintain sustainable spawning stock biomass levels that promote optimum yield in the fishery.
- Goal 2: Support and enhance the development and implementation of effective management measures.
    - Objective 2.1: Maintain and enhance effective partnership and coordination among the Council, Commission, Federal partners, and member states.
    - Objective 2.2: Promote understanding, compliance, and the effective enforcement of regulations.
    - Objective 2.3: Promote monitoring, data collection, and the development of ecosystem-based science that support and enhance effective management of the summer flounder resource.
- Goal 3: Optimize economic and social benefits from the utilization of the summer flounder resource, balancing the needs and priorities of different user groups to achieve the greatest overall benefit to the nation.
    - Objective 3.1: Provide reasonable access to the fishery throughout the management unit. Fishery allocations and other management measures should balance responsiveness to changing social, economic, and ecological conditions with historic and current importance to various user groups and communities.

DESCRIPTION OF THE STOCK

Biological Profile

Summer flounder are estuarine-dependent members of the left eyed flounder family (*Paralichthyidae*) that also includes southern flounder (*Paralichthys lethostigma*) and gulf flounder (*Paralichthys albigutta*), all of which occur in North Carolina waters. Summer flounder are found in both inshore and offshore waters from Nova Scotia, Canada to Florida but are most abundant from Cape Cod, Massachusetts to Cape Fear, North Carolina. Spawning typically occurs at age 2 to 3 during the months of November to March as they move offshore. Juveniles move inshore to coastal and estuarine areas for about one year and later begin to join adults offshore. Summer flounder typically mature by age 1 with females maturing at 11 inches total length and males maturing at 10 inches total length. Summer flounder have a maximum age of 19 years. They like to burrow into sandy substrates and ambush prey such as small fish, crabs, shrimp, squid and worms (Packer 1999).

Stock Status

The 2023 management track stock assessment indicates that summer flounder is not overfished but is experiencing overfishing.

Stock Assessment

The 2023 assessment indicates that current recruitment values have been below average for the last 10 years. This assessment also noted a decreasing mean length and weight at age and decreasing maturity.

Spawning stock biomass (SSB) is approximately 83% of the SSB target and fishing mortality is approximately 103% of the fishing mortality threshold. The stock assessment report can be found on the summer flounder page on the ASMFC website for further information.

DESCRIPTION OF THE FISHERY

Current Regulations

Commercial: There is a 14-inch total length minimum size limit in Atlantic Ocean waters and a 15-inch total length minimum size limit in internal coastal waters as well as harvest seasons and minimum mesh size requirements for the flounder trawl fishery. Trip limits replaced harvest limits to provide additional opportunities to land the quota, which are established by proclamation [see most recent North Carolina Division of Marine Fisheries (DMF) proclamation on commercial summer flounder fishery]. At the end of 2024 (Dec 1–31), individual trip limits were set due to a low amount of quota remaining. A bycatch trip limit of 100 pounds is in place for shrimp trawls during closed flounder trawl harvest periods. A license to land flounder from the Atlantic Ocean is required to land more than 100 pounds per trip.

Recreational: Season closures are currently in effect for North Carolina. The recreational flounder fishery did not open in 2024 for all flounder species in North Carolina in coastal fishing waters. The 2023 recreational season exceeded its southern flounder quota, and paybacks were required in accordance with Amendment 3 to the North Carolina Southern Flounder Fishery Management Plan. In 2025 the recreational season is still to be determined but will occur sometime between August 16 and September 30.

Commercial Fishery

All landings reported as caught in the Atlantic Ocean are considered to be summer flounder by the North Carolina Trip Ticket Program. Since 2019, summer flounder have only been allowed to be harvested by trawls from the Atlantic Ocean (Figure 1). Although in history's past other gears were also comparable in summer flounder landings coming from the Atlantic Ocean. Commercial state allocations were modified via Amendment 21, which became effective on January 1, 2021. The revised allocation system modifies the state-by-state commercial quota allocations in years when the annual coastwide commercial quota exceeds the specified trigger of 9.55 million pounds. North Carolina has an allocation of 27.4% (baseline quota) and an additional allocation of 12.37% if the 9.55 million pounds of coastwide commercial quota is triggered. In the last 20 years, landings peaked in 2004 and have been generally stable since 2007, aside from 2012 and 2013, when landings were lower than average (Table 1; Figure 2). The low landings in 2012 and 2013 were primarily due to the closure of Oregon Inlet to large vessels (such as trawlers) due to shoaling and the consequent transfer of most of North Carolina's quota allocation to Virginia and other states. Dredging efforts in 2024 has helped mitigate shoaling and has made navigation through Oregon Inlet passable for larger trawlers. In 2024 there were more trips and higher landings for summer flounder.

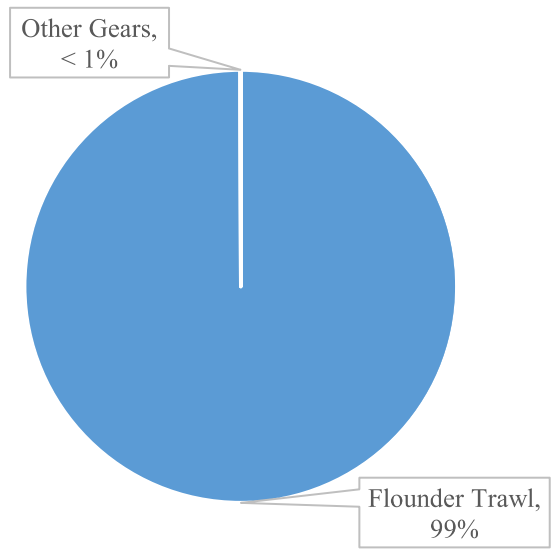

Figure 1. Commercial harvest of summer flounder in North Carolina by gear type in 2024.

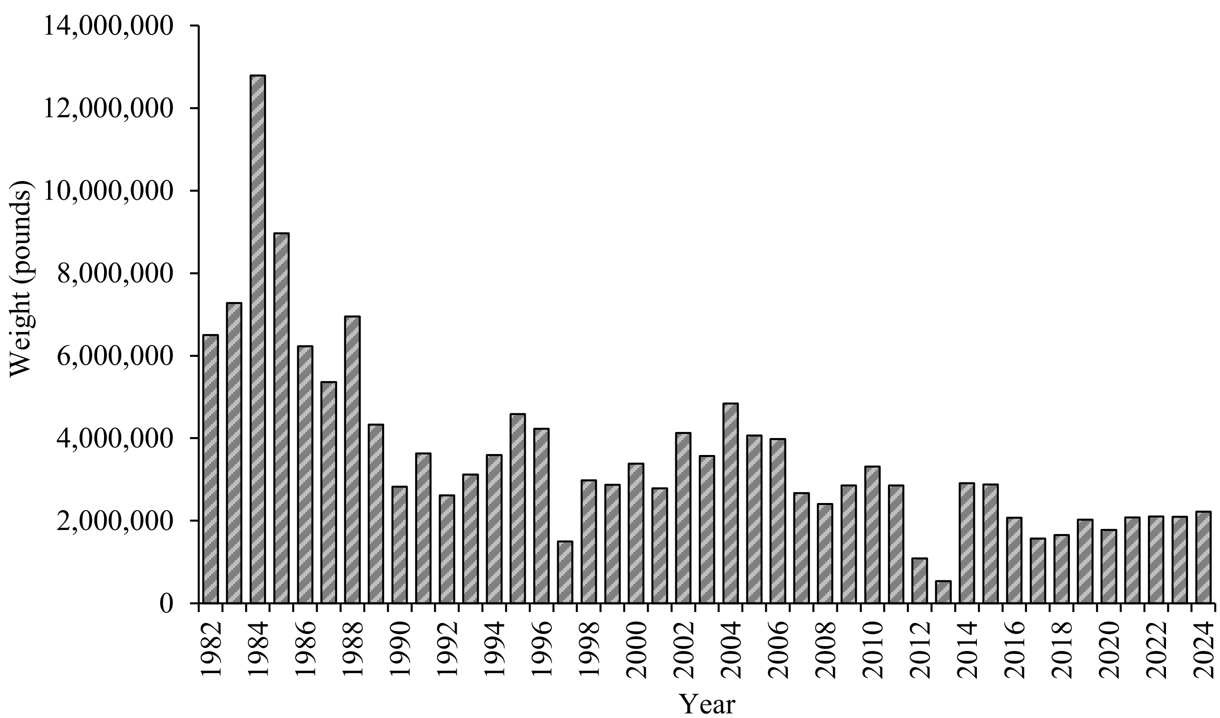

Figure 2. Annual commercial landings in pounds for summer flounder in North Carolina from 1982–2024.

Recreational Fishery

Summer flounder harvest is reported through the NOAA Marine Recreational Information Program (MRIP). Recreational estimates across all years have been updated and are now based on the new MRIP Fishing Effort Survey-based calibrated estimates. For more information on MRIP, see https://www.fisheries.noaa.gov/topic/recreational-fishing-data. Recreational harvest of summer flounder has varied annually but has seen a decline over the years (Table 1; Figure 3). Some of this decline in landings is likely the result of increases in size limits and the lack of these larger summer flounder being prevalent in this area. The limited harvest opportunities and closed and shortened seasons in accordance with Amendment 2 and 3 to the North Carolina Southern Flounder FMP have also contributed to the decline in landings. In 2024, there was no recreational flounder season.

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of summer flounder from North Carolina for the period 2015–2024.

	Recreational			Commercial	
Year	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
2015	99,263	856,849	157,437	2,878,743	3,036,180
2016	65,494	664,388	110,392	2,071,100	2,181,492
2017	91,193	977,285	147,426	1,572,707	1,720,133
2018	57,913	440,676	92,032	1,654,569	1,746,601
2019	34,895	467,942	52,872	2,025,401	2,078,273
2020	24,699	705,247	37,935	1,779,865	1,817,800
2021	13,863	1,187,109	27,492	2,081,420	2,108,912
2022	10,591	314,007	22,151	2,107,650	2,129,801
2023	20,164	511,094	34,192	2,096,443	2,130,635
2024	0	0	0	2,223,062	2,223,062
Mean	41,808	612,460	68,193	2,049,096	2,117,289

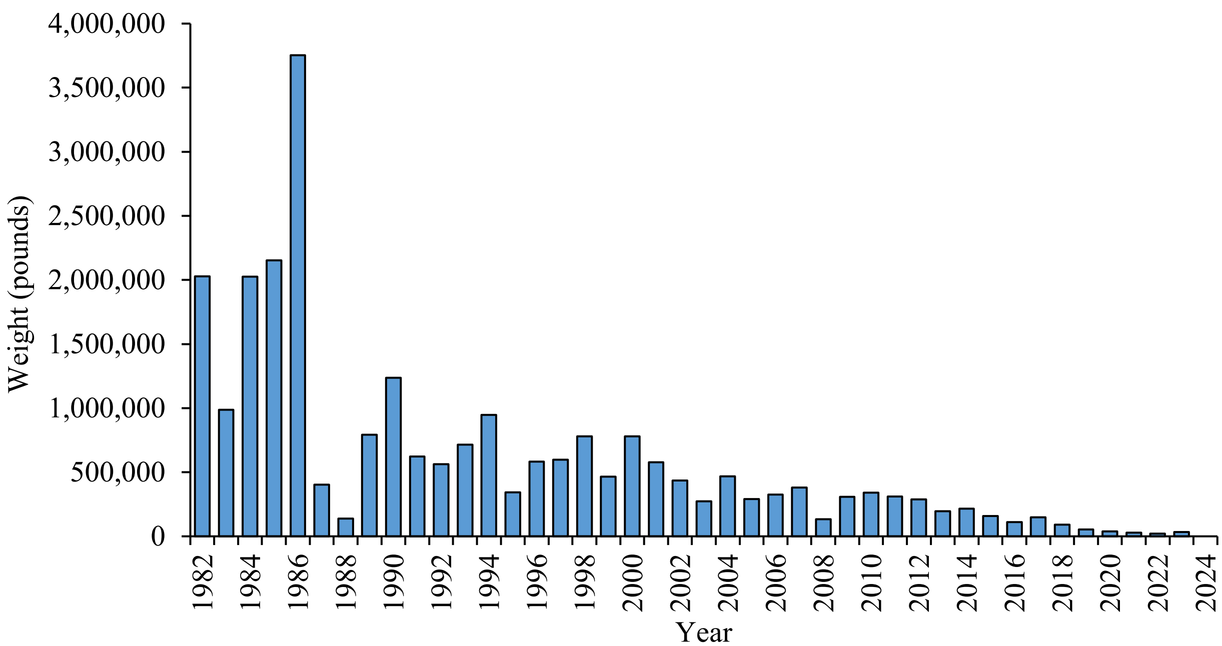

Figure 3. Annual recreational landings in pounds for summer flounder in North Carolina from 1982–2024. Note: No landings data for 2024.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Several DMF sampling programs collect biological data on commercial and recreational fisheries that catch summer flounder. Program 433 (ocean trawl fishery) is the primary program that collects commercial length and age data for harvested summer flounder. Other programs that collect information include: 432 (flounder pound net), 434 (ocean gill net), 435 (beach seine), 461 (estuarine gill net), and 437 (long haul seine). Programs 466 (sea turtle bycatch monitoring) and 570 (commercial shrimp trawl fishery characterization) collect length data on harvested and discarded flounder. Recreational fishery sampling for harvest, releases and lengths occurs through the NOAA Marine Recreational Information Program. Age data from the recreational fishery are collected through the North Carolina Carcass Collection Program.

From 1991 to 2024, annual mean length in the commercial fishery fluctuated from 17 to 20 inches total length (TL). Summer flounder harvested commercially during 2024 ranged from 13 to 34 inches TL with 21% being the mode at 15 inches TL (Figure 4). From 1991 to 2024, summer flounder harvested commercially ranged from 12 to 35 inches TL (Figure 5).

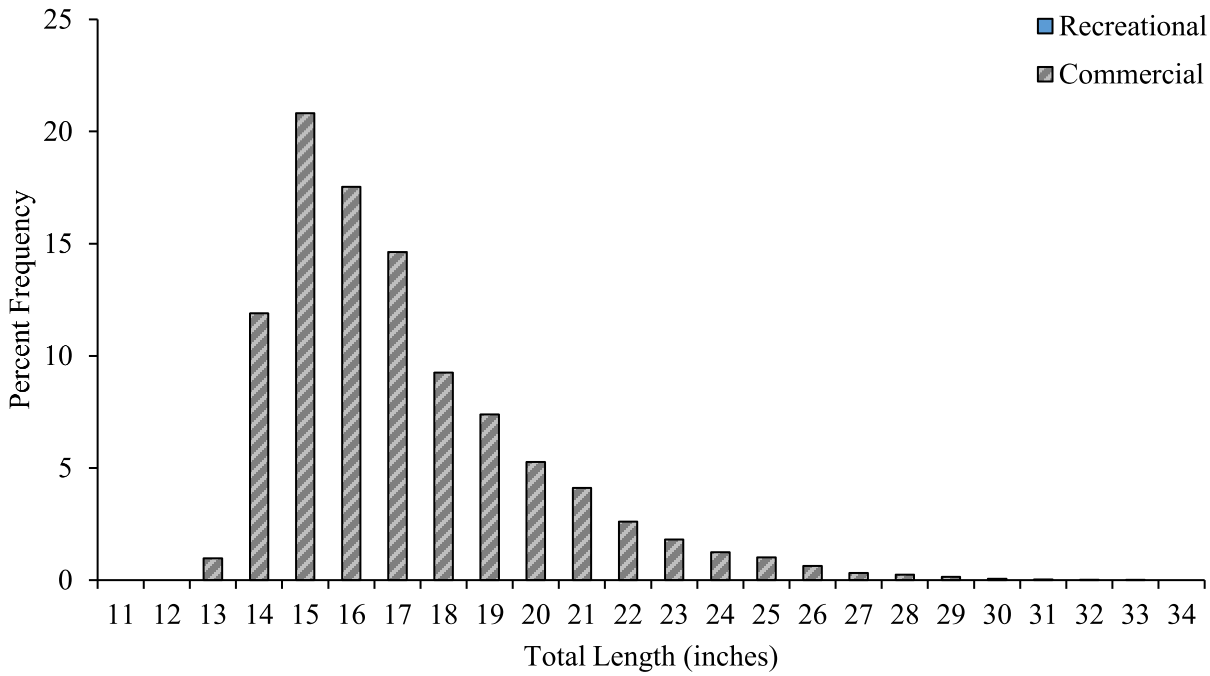

Figure 4. Commercial and recreational length frequency distribution from summer flounder harvested in North Carolina in 2024. Note: No recreational data for 2024.

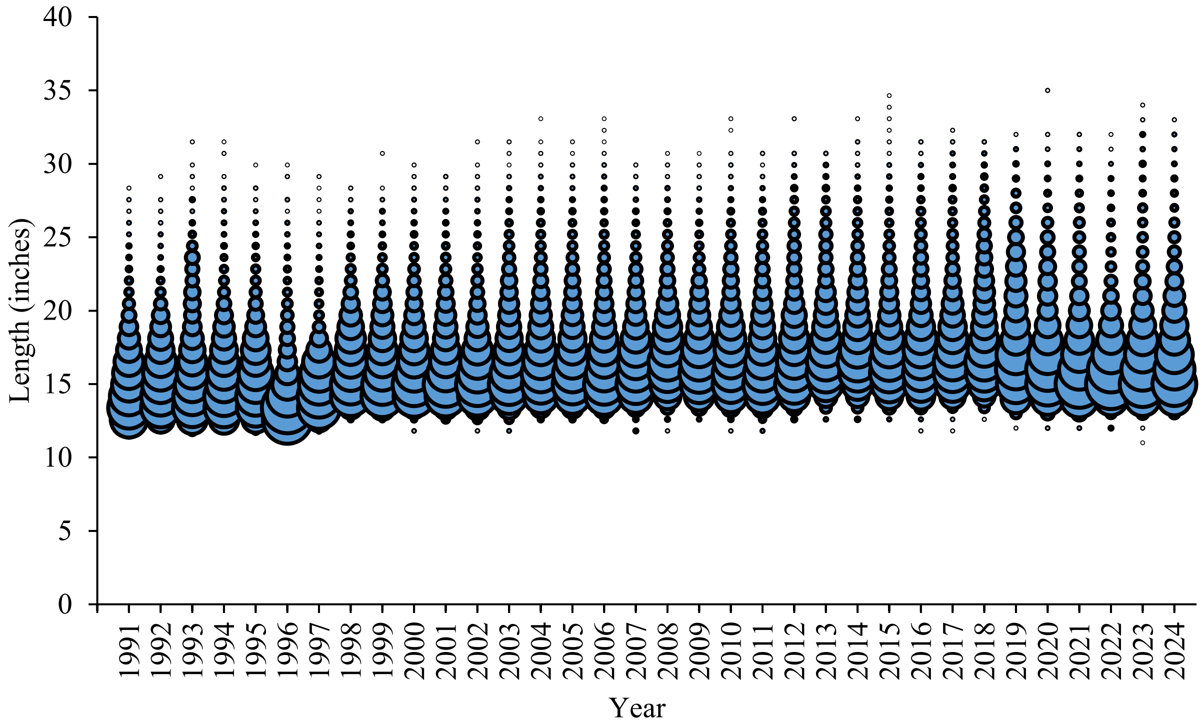

Figure 5. Commercial length frequency (total length, inches), of summer flounder harvested in North Carolina from 1991–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

As for recreational fishery length data from 1982 to 2023, annual mean lengths increased over time as size limits have been implemented. With the exception of 2024 (no length data), the number of fish measured from 1991 to 2023 were variable. From 1991 to 2023, summer flounder harvested recreationally ranged from 5 to 29 inches TL, but in the last 10 years have measured 16–17 inches TL (Table 2; Figure 6).

Table 2. Summer flounder length (total length, inches) data from NOAA Marine Recreational Information Program recreational samples in North Carolina, 2015–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2015	16	13	20	116
2016	16	13	21	59
2017	16	13	24	129
2018	16	13	20	91
2019	16	13	19	65
2020	16	8	24	38
2021	17	15	19	13
2022	17	15	21	34
2023	16	15	24	10
2024	-	-	-	-

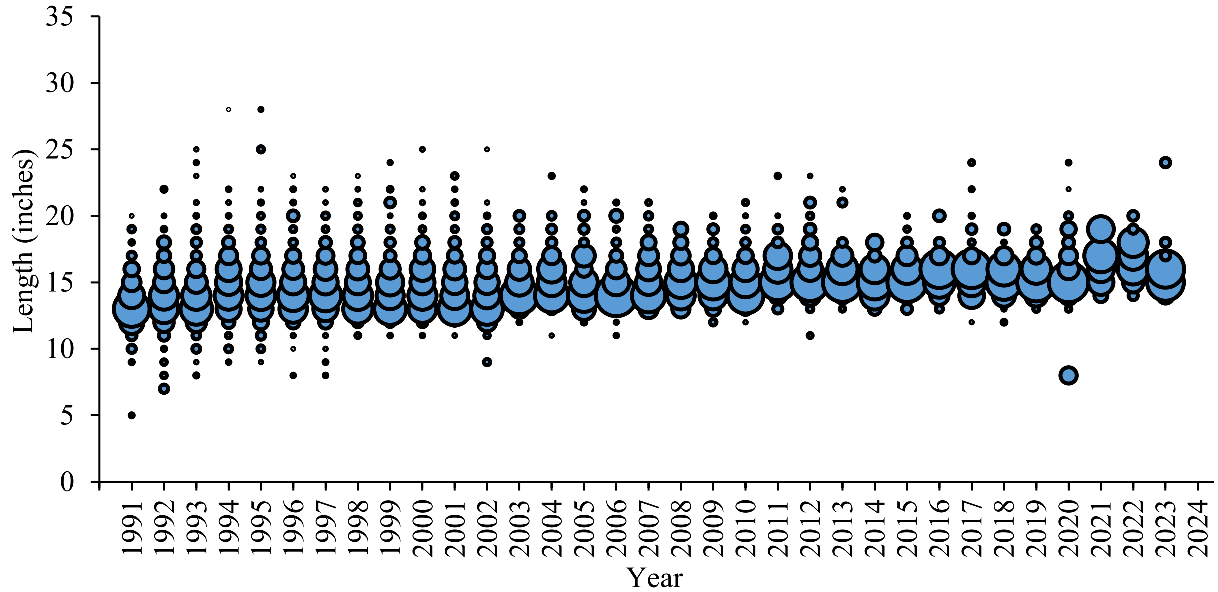

Figure 6. Recreational length frequency (total length, inches), of summer flounder harvested in North Carolina from 1991–2024*. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length. *Note: No length data for 2024.

Fishery-Independent Monitoring

Several DMF independent sampling programs collect biological data on summer flounder. However, most surveys do not catch summer flounder regularly enough to provide consistent length, age, or abundance data. The main exception is Program 195 (the Pamlico Sound Trawl Survey), which employs a random stratified survey design in waters of Pamlico Sound and its major river tributaries. Stations are randomly selected from strata based upon depth and geographic location. Randomly selected stations are optimally allocated among the strata based upon all previous sampling in order to provide the most accurate abundance estimates (PSE <20). Tow duration is 20 minutes and use double rigged demersal mongoose trawls (9.1m headrope, 1.0m X 0.6m doors, 2.2-cm bar mesh body, 1.9-cm bar mesh cod end and a 100-mesh tail bag extension). The survey takes place in June and September with the samples collected in June serving as a juvenile abundance index (JAI) for summer flounder in North Carolina. Annual mean lengths ranged from 6 to 8 inches TL in the last 10-year time series (Table 3).

Table 3. Summer flounder length (total length, inches) data from Program 195 (Pamlico Sound Survey) samples in North Carolina, 2015–2024. *Note: Data for 2020 and 2021 not usable due to staffing issues and insufficient sampling during COVID-19.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2015	7	3	17	477
2016	6	3	12	272
2017	6	3	14	559
2018	6	3	12	618
2019	6	3	15	400
2020*	7	4	13	56
2021*	8	3	14	30
2022	8	2	17	319
2023	6	1	14	880
2024	6	3	16	262

During 2020 and 2021, sampling was impacted during scheduled sampling months due to staffing issues and the COVID pandemic. During this time, sampling did not occur in 2020 and incomplete sampling in 2021. Data from 1999 is also excluded from the average due to sampling occurring in July instead of June (Figure 7).

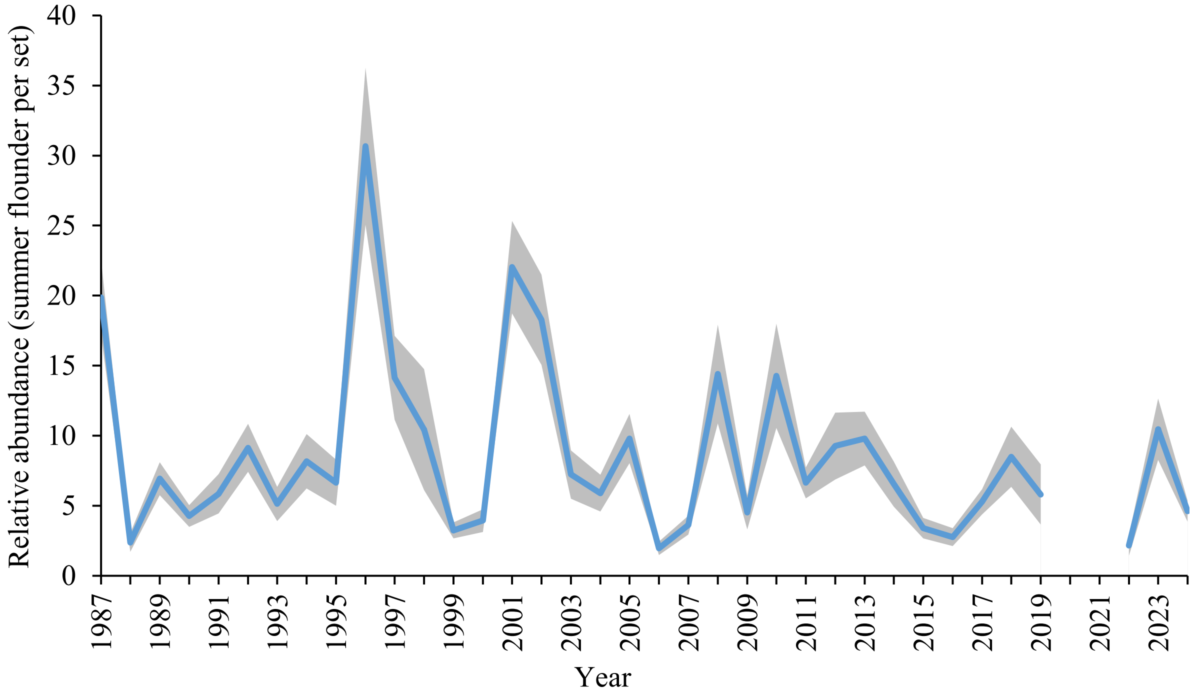

Figure 7. The annual summer flounder juvenile abundance index with standard error shaded in the gray from the North Carolina Program 195 (Pamlico Sound Survey) Survey for the period of 1987–2024. Data from 2020 and 2021 will not be used due to staffing issues and incomplete sampling corresponding with the COVID-19 pandemic.

The summer flounder JAI from the Pamlico Sound Survey is one of the recruitment indices provided for the annual coast-wide stock assessment of summer flounder and was used in the 2018 summer flounder benchmark stock assessment. The summer flounder CPUE in 2024 was 4.61 (Figure 7).

The Pamlico Sound Trawl Survey (Program 195) is suspended indefinitely starting in 2025. NCDMF lost use of the research vessel, RV Carolina Coast (used for the survey since its inception in 1987), when it was found to be structurally unsound following completion of 2024 sampling. Alternate survey designs and methods are being explored by the NCDMF to fulfill data needs provided by this survey. No implementation date has been determined. It is important to note that the Program 195 data time series, collected by the RV Carolina Coast and current gear, concluded with the completion of the 2024 survey (1987–2024). The JAI for summer flounder in North Carolina will not be estimated from the Pamlico Sound Survey in 2025.

To characterize age structure, summer flounder otoliths are primarily collected from the commercial ocean trawl fishery but are also collected from other dependent (recreational) and various independent (scientific surveys) sources throughout the year. While scales were used to determine the age of summer flounder historically, otoliths are now preferred and have been collected exclusively since 2016. In 2024, 768 summer flounder otoliths were aged yielding a range in age from 0 to 19 years. Maximum ages since 2010 were higher than previous years, suggesting expansion of the stock age structure. Modal age ranged from 2 to 7 during 1991 through 2024. From 2015 through 2024 modal age range increases from 4 to 7 (Table 4).

Table 4. Summer flounder age samples collected from both dependent (commercial and recreational fisheries) and independent (surveys) sources in North Carolina from 2015–2024.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
2015	6	0	17	890
2016	7	0	18	998
2017	4	0	19	1,179
2018	5	0	19	882
2019	5	0	19	925
2020	4	0	17	761
2021	4	1	12	628
2022	5	0	16	468
2023	5	0	15	606
2024	5	0	19	781

The age data suggests that summer flounder grow very quickly during their first year of life with an average TL of 13 inches at age 1. They continue to grow to an average TL of 27 inches by age 14 (Figure 8).

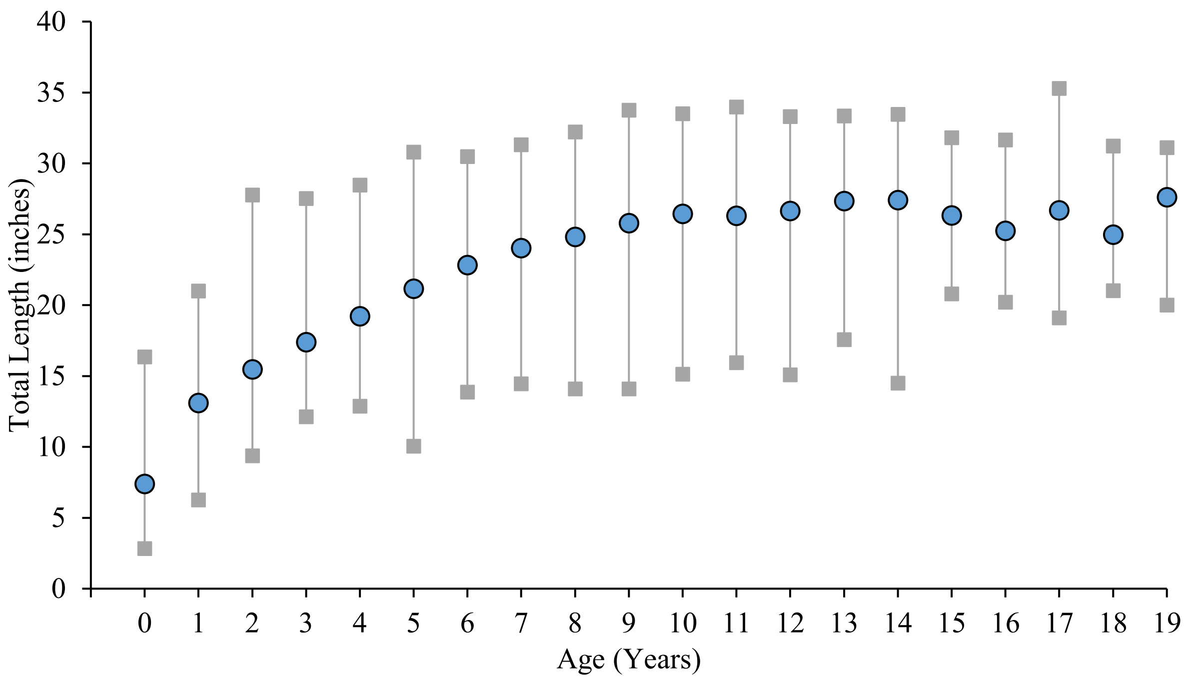

Figure 8. Summer flounder length at age based on age samples collected in North Carolina from 1991–2024. Blue circles represent the mean size at a given age while the gray squares represent the minimum and maximum observed size for each age.

RESEARCH NEEDS

Updated research needs from the 2018 summer flounder benchmark 66th Stock Assessment Workshop are provided below. The research needs listed below start with the most recent. Text in parenthesis indicates known progress made to address these needs.

- Continue to explore changes in the distribution of recruitment. Develop studies, sampling programs, or analyses to better understand how and why these changes are occurring, and the implications to stock productivity (progress unknown at this time).

- The reference points are internally consistent with the current assessment. It may be useful to carry uncertainty estimates through all the components of the assessment, biological reference points, and projections (progress unknown at this time).
- Explore the potential mechanisms for recent slower growth that is observed in both sexes (progress unknown at this time).
- Evaluate uncertainties in biomass to determine potential modifications to OFL CV employed (research is ongoing)
- Evaluate fully the sex- and size distribution of landed and discarded fish, by sex, in the summer flounder fisheries (research is ongoing).
- Incorporate sex-specific differences in size at age into the stock assessment (progress has been made and research is ongoing)
- Determine and evaluate the sources of the over-optimistic stock projections (progress has been made)
- Evaluate the causes of decreased recruitment and changes in recruitment per spawner in recent years (progress has been made)
- Further work examining aspects that create greater realism to the summer flounder assessment (e.g., sexually dimorphic growth, sex-specific F, differences in spatial structure [or distribution by size?] should be conducted. This could include: (a) Simulation studies to determine the critical data and model components that are necessary to provide reliable advice and need to determine how simple a model can be while still providing reliable advice on stock status for management use and should evaluate both simple and most complex model configurations. (b) Development of models incorporating these factors that would create greater realism. (c) These first steps (a or b) can be used to prioritize data collection and determine if additional investment in data streams (e.g., collection of sex at age and sex at length and maturity data from the catch, additional information on spatial structure and movement, etc.) are worthwhile in terms of providing more reliable assessment results. (d) The modeling infrastructure should be simultaneously developed to support these types of modeling approaches (flexibility in model framework, MCMC/bootstrap framework, projection framework) (some progress has been made and research is ongoing).
- Develop an ongoing sampling program for the recreational fishery landings and discards (i.e., collect age, length, sex) to develop appropriate age-length keys for ageing the recreational catch (research is needed).
- Apply standardization techniques to all of the state and academic-run surveys, to be evaluated for potential inclusion in the assessment (progress has been made and research is ongoing).
- Continue efforts to improve understanding of sexually dimorphic mortality and growth patterns. This should include monitoring sex ratios and associated biological information in the fisheries and all ongoing surveys to allow development of sex-structured models in the future (research is ongoing).

MANAGEMENT

An update of the summer flounder stock assessment is completed every two years by NMFS Northeast Fisheries Science Center (NEFSC). Data are analyzed from the previous year based on decisions made for the previous benchmark assessment. Projections based on stock assessments are used to set the coast-wide quota each year. Amendments to the FMP are undertaken as issues arise that require action. The Summer Flounder, Scup and Black Sea Bass Fishery Management Plan (FMP) and amendments use output controls (catch and landings limits) as the primary management tool, with landings divided between the commercial (60 percent) and recreational (40 percent) fisheries. Since 2023, revised allocations have been implemented and transitioned to catch-based allocations with 55 percent being commercial and 45 percent being recreational. The FMP also includes minimum fish sizes, bag limits, seasons, gear restrictions, permit requirements, and other provisions to prevent overfishing and ensure sustainability of the fisheries. Recreational bag and size limits and seasons are determined on a regional basis using conservation equivalency. The commercial quota is divided into state-by-state quotas. North Carolina has several specific management strategies for summer flounder (Table 5).

In 2024, the Board and Council jointly approved modifications to two exemptions from the summer flounder commercial minimum mesh size requirements, which require a minimum mesh size of 5.5-inch diamond mesh or 6.0-inch square mesh to retain more than 200 pounds of summer flounder from November through April, or 100 pounds of summer flounder from May through October. The Small Mesh Exemption Program provides an exemption from these requirements for authorized vessels fishing in a designated area from November 1 through April 30. Through this action, the Board and Council agreed to expand the exemption area by moving the boundary of the northern portion of the area approximately five miles west, then connecting the western boundary to the southern scup Gear Restricted Area. The Board and Council approved a revised definition of the term "flynet" as it relates to the flynet exemption from the summer flounder commercial minimum mesh size requirements. The revised definition encompasses similar high-rise net types which have very large mesh in the wings, with mesh size decreasing through the body of the net. These nets are not designed to catch flatfish and generally catch small amounts of summer flounder.

Table 5. Summary of management strategies by North Carolina for summer flounder.

Management Strategy	Outcome
14-inch total length (Atlantic Ocean waters) and 15-inch total length (internal coastal waters) minimum size limit for the commercial fishery	Size limit accomplished by rule 3M.0503(a)
Minimum trawl stretched mesh size of ≥5 ½-inches (diamond) or ≥6-inches (square) throughout the body, extensions and tailbag required to possess more than 100 pounds of flounder May 1 through October 31 or more than 200 pounds of flounder November 1 through April 30 (flynets are exempt from minimum trawl mesh requirements)	Rules 3M.0503(b) 3M.0503(f) 3M.0503(g) 3M.0503(h)(1-3)
Owner of a vessel required to possess a Licenses to Land flounder from the Atlantic Ocean and in order for a dealer to purchase or offload ≥ 100 pounds of flounder from the Atlantic Ocean.	Rules 3M.0503(c)(1-4)
Commercial seasons that allocate 80 percent of the quota to the winter season (starting January 1), a bycatch trip limit of 100 pounds during the closed season and the remaining quota allocated to the fall season (starting no earlier than November 1)	Rules 3M.0503(i)(1-3). Rule suspended for 2013 and 2014 fishing seasons.
Trip limits established for the open seasons	Rule 3M.0503(j) Specific trip limits by Proclamation Authority
15-inch total length (Atlantic Ocean and internal coastal waters) minimum size and 4 fish creel limit for recreational fishery in all joint and coastal waters	Proclamation FF-4-2017

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FISHERY MANAGEMENT PLAN UPDATE
WEAKFISH
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	ASMFC	October 1985
	Amendment 1	March 1992
	Amendment 2	October 1994
	Amendment 3	May 1996
	Addendum I	October 2000
	Amendment 4	November 2002
	Technical Addendum 1	March 2003
	Addendum I	December 2005
	Addendum II	February 2007
	Addendum III	May 2007
	Addendum IV	November 2009
Comprehensive Review:	No comprehensive review scheduled. ASMFC Stock Assessment Update currently underway and scheduled for completion in mid-2025.	

Weakfish *(Cynoscion regalis)* are managed under Amendment 4 to the Interstate Fishery Management Plan (FMP) for Weakfish [Atlantic States Marine Fisheries Commission (ASMFC) 2002] and the subsequent addenda to Amendment 4 (ASMFC 2002, 2003). ASMFC adopted its first FMP for weakfish in 1985 (ASMFC 1985). Amendment 1 to the FMP (ASMFC 1992) unsuccessfully aimed to improve the status of weakfish. Amendment 2 (ASMFC 1994) resulted in some improvement to the stock, but several signs indicated further improvement was necessary leading to the implementations of Amendment 3 (ASMFC 1996) to increase the sustainability of the fishery. Addendum I to Amendment 3 was approved in 2000 to extend the existing management program until the Weakfish Management Board could approve Amendment 4 (ASMFC 2000). Addendum I to Amendment 4 (ASMFC 2005) was adopted to replace the biological sampling program. The Weakfish Management Board approved Addendum II to Amendment 4 (ASMFC 2007a) in response to a significant decline in stock abundance and increasing total mortality since 1999. Addendum II reduced the recreational creel limit and commercial bycatch limit, and set landings levels that, when met, will trigger the Board to re-evaluate management measures. Addendum III to Amendment 4 (ASMFC 2007b) altered the bycatch reduction device certification requirements of Amendment 4 for consistency with the South Atlantic Fishery Management Council's (SAFMC) Shrimp FMP. The findings of the 2009 weakfish stock assessment indicated weakfish were in a severely depleted state (NEFSC 2009a and 2009b) with natural mortality (M) rather than fishing mortality (F) believed to be the primary culprit in the decline (ASMFC 2016) prompting the ASMFC Weakfish Management Board to pass Addendum IV to Amendment 4 (2009).

Addendum IV required all states along the east coast to implement severe harvest restrictions on weakfish. The Weakfish Management Board, as part of Addendum IV, noted that reductions in harvest would not be adequate to rebuild the depleted weakfish stocks until other confounding factors (i.e. natural mortality) become more favorable for weakfish survival; however, the Board opted to reduce harvest and poise weakfish for a recovery in the event of a change in confounding factors. Harvest restrictions in Addendum IV included a one fish daily recreational bag limit and a 100 pound daily commercial trip limit. North Carolina requested to implement a 10% bycatch allowance for weakfish in lieu of the 100 pound daily trip limit. This request was considered conservationally equivalent to the 100 pound daily trip limit and was approved by the Weakfish Management Board in August of 2010. The alternate management action allowed landing of weakfish provided they make up less than 10% of the weight of all finfish landed up to 1,000 pounds per trip or day, whichever is larger. In November of 2012, based on the recommendation of the North Carolina Marine Fisheires Commission (MFC), the alternate management was halted and North Carolina reverted back to the 100 pound daily trip limit consistent with Addendum IV.

A benchmark stock assessment for weakfish was completed in 2016 (ASMFC 2016) and approved for management by the Weakfish Management Board at the 2016 Spring Meeting of the ASMFC. Results from the 2016 assessment indicate weakfish are depleted and identified continued high levels of M rather than F the cause of the decline. F has decreased substantially since 2010 and overfishing on the stock is not occuring. The Board reviewed the results of the assessment at their May 2016 meeting and decided no new management action was warranted.

An update to the peer-reviewed 2016 assessment was completed in 2019 (ASMFC 2019) and presented at the 2019 ASMFC Fall Meeting. Results of the assessment update show the weakfish stock is depleted and has been since 2003. Estimates of recruitment, spawning stock biomass, and total abundance remain low in recent years. Estimates of F were moderately high in recent years, although lower than the time-series highs of the mid- to late-2000's or the earliest years, and M remained high. The Board reviewed the results of the assessment update at their October 2019 meeting and decided no new management action was warrented. The management program implemented under Addendum IV remains in effect. An additional update to the 2016 assessment is expected in 2025 with the bulk of the work completed in 2024.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). 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, SAFMC, 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 similar to the goals of the Fisheries Reform Act of 1997 to "ensure long-term viability" of these fisheries (NCDMF 2022).

Management Unit

Weakfish are managed under this plan as a single stock throughout their coastal range. All Atlantic coast states from Massachusetts through Florida and the Potomac River Fisheries Commission have a declared interest in weakfish. Responsibility for the FMP is assigned to the ASMFC Weakfish Management Board, Plan Review Team, Technical Committee, Stock Assessment Sub-Committee, and Advisory Panel.

Goal and Objectives

The goal of Amendment 4 of the ASMFC FMP is to utilize interstate management so that Atlantic coastal weakfish recover to healthy levels that will maintain commercial and recreational harvest consistent with a self-sustaining spawning stock and to provide for restoration and maintenance of essential habitat (ASMFC 2002). The management objectives are to:

- Establish and maintain an overfishing definition that includes target and threshold fishing mortality rates and a threshold spawning stock biomass to prevent overfishing and maintain a sustainable weakfish population.
- Restore the weakfish age and size structure to that necessary for the restoration of the fishery.
- Return weakfish to their previous geographic range.
- Achieve compatible and equitable management measures among jurisdictions throughout the fishery management unit, including states' waters and the federal EEZ.
- Promote cooperative interstate research, monitoring and law enforcement necessary to support management of weakfish.

- Promote identification and conservation of habitat essential for the long-term stability in the population of weakfish.
- Establish standards and procedures for both the implementation of Amendment 4 and for determination of states' compliance with provisions of the management plan

DESCRIPTION OF THE STOCK

Biological Profile

Weakfish, also called gray trout, are known to inhabit waters of the Atlantic from southern Florida to Nova Scotia, Canada but are most prevalent from North Carolina to New York (Wilk 1979). They are members of the drum family and are closely related to spotted seatrout. Compared to spotted seatrout, weakfish occur in higher salinity areas of the estuary and are seasonally encountered around coastal inlets and in offshore waters. Weakfish migrate into more inshore environments and north along the U.S. Atlantic Coast in the spring and summer as water temperatures rise (Bigelow and Schroeder 1953; Wilk 1979). Spawning occurs during this time in higher salinity environments around the coastal inlets (Luczkovich et al. 1999; Luczkovich et al. 2008). Males drum to attract females and spawning activity usually occurs around dusk. Juvenile weakfish use the estuarine waters as a nursery area until the fall when water temperatures drop, and they move into the offshore environment (Wilk 1979). Peak spawning in North Carolina is typically around April or May but females are batch spawners and will spawn multiple times throughout the spring and summer months (Lowerre-Barbieri et al. 1996; Merriner 1976). Most weakfish are sexually mature by age 1 and at 11 to 12 inches in length (Lowerre-Barbieri et al. 1996; Nye et al. 2008). Juvenile weakfish are opportunistic feeders, feeding on invertebrates and microscopic animals early in their life, then switching to mostly piscivorous feeding on small to moderately sized fish, depending on their size (Merriner 1975).

Stock Status

According to the 2019 stock assessment update, spawning stock biomass (SSB) in 2017 was 4.24 million pounds, well below the SSB threshold of 30% (13.6 million pounds), indicating the stock is depleted (Figure 1; ASMFC 2019). The weakfish Technical Committee recommended total mortality (Z) benchmarks, which includes fishing and natural mortality. Total mortality in 2017 was 1.45, which was above both the 20% target (1.03) and the 30% threshold (1.43), indicating total mortality was too high (Figure 2). However, fishing mortality in 2017 (0.62) was above the 20% target but below the 30% threshold (0.97), indicating the stock is not experiencing overfishing.

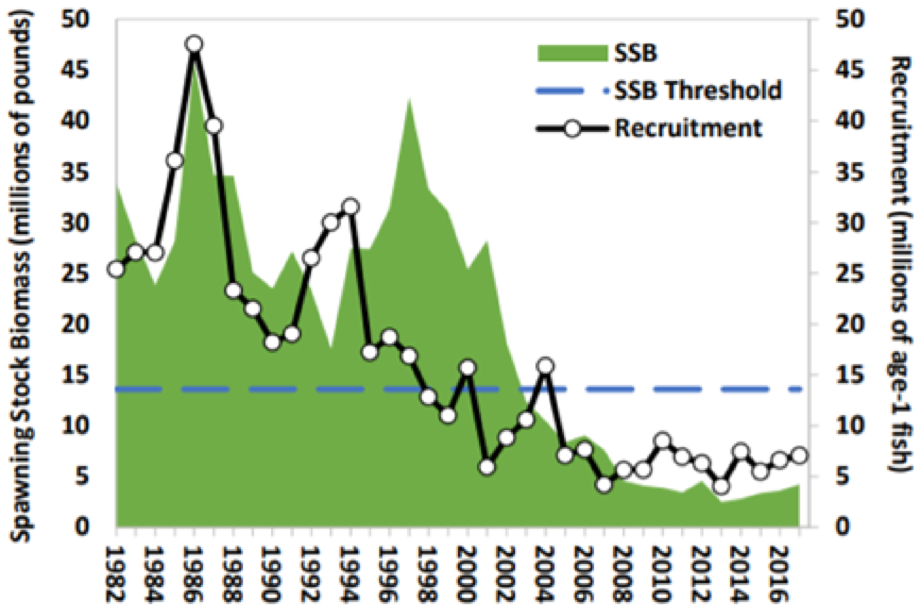

Figure 1. Spawning stock biomass (SSB) and recruitment of age-1 weakfish estimated along the U.S. Atlantic coast from 1982 to 2017 (ASMFC 2019). Dashed line represents the 30% spawning stock biomass (SSB) threshold of 13.6 million pounds.

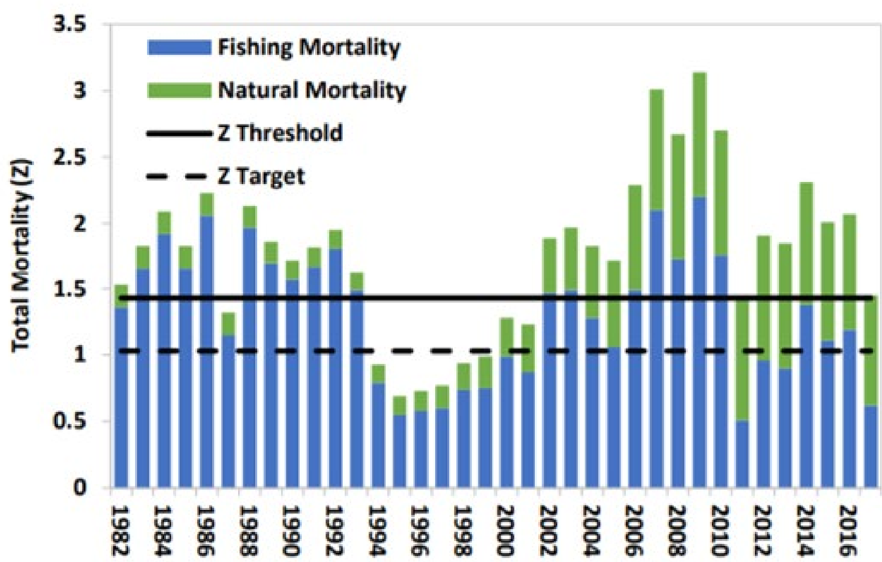

Figure 2. Natural mortality (M) and fishing mortality (F) estimated for all weakfish along the U.S. Atlantic east coast, 1982 to 2017 (ASMFC 2019). Solid and dashed lines represent total mortality target (Z30% = 1.03) and threshold (Z20% = 1.43) used to determine if the stock is being overfished.

Stock Assessment

The assessment completed in 2016 and updated in 2019 employed a spatially structured forward projecting statistical catch at age model with time-varying natural mortality, with a terminal year of 2017. This model accounts for varying population spatial distribution and changing natural mortality through time. Results of the assessment show the weakfish stock is depleted and has been for the past 15 years. Under conditions of time-varying natural mortality, there is no long-term stable equilibrium population size, so an SSB target is not informative for management. After reviewing the assessment results, the Weakfish Technical Committee (TC) recommended an SSB threshold of 13.6 million pounds that is equivalent to 30% of the projected SSB under average natural mortality and no fishing (SSB30%). When SSB is below the threshold, the stock is considered depleted. Despite SSB showing a slight increasing trend in recent years, SSB was 4.24 million pounds in 2017 (Figure 1), which is well below the threshold. The model indicated natural mortality has been increasing since the mid-1990s, from approximately 0.17 at the beginning of the time-series to an average of 0.92 from 2007–2017 (Figure 2). The weakfish population has been experiencing very high levels of total mortality which has prevented the stock from recovering. Fishing mortality has increased in recent years but was below the threshold in 2017.

DESCRIPTION OF THE FISHERY

Current Regulations

The DMF allows the recreational harvest of weakfish year-round with a 12-inch total length minimum size and a one fish per day bag limit. The commercial harvest of weakfish is limited to a 100 pound daily limit and 12-inches total length minimum size with the following exceptions: from April 1 through November 15, weakfish 10 inches total length or more may lawfully be taken in North Carolina internal waters by use of long haul seines or pound nets only and commercial flounder trawl and flynet operations are allowed to land a tolerance of no more than 100 undersized (less than 12 inch total length) weakfish per day or trip, whichever is longer and it is unlawful to sell undersized weakfish.

Commercial Fishery

Commercial landings of weakfish peaked in 1988 at 15,091,878 pounds and have steadily dropped since. In 2009 Addendum IV reduced commercial harvest to 100 pounds per trip achieving an estimated reduction of 61% from the 2005–2008 harvest levels. Recent years have shown little increase due to low abundance and commercial harvest restrictions. Landings stayed approximately the same in 2024 (106,571 pounds) compared to the previous year (106,131 pounds; Table 1; Figure 3).

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of weakfish from North Carolina for the period 1982–2024.

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1982	255,080	61,048	348,645	12,052,232	12,400,877
1983	596,354	16,387	749,910	10,233,738	10,983,644
1984	555,640	35,101	252,873	12,990,726	13,243,599
1985	1,010,772	2,638	796,974	9,825,498	10,594,708
1986	2,049,746	694,759	1,455,912	14,309,372	15,765,284
1987	2,403,361	250,581	3,442,746	11,882,362	14,951,135
1988	650,224	175,284	175,178	15,091,878	15,267,056
1989	456,191	65,500	331,840	10,115,747	10,447,587
1990	149,508	30,295	104,761	5,802,159	5,906,920
1991	358,273	32,083	286,349	5,308,647	5,594,923
1992	72,064	69,585	53,214	4,862,551	4,915,765
1993	293,966	157,478	230,010	4,309,249	4,247,275
1994	336,188	477,521	276,435	3,489,930	3,766,364
1995	103,190	225,976	118,177	4,113,260	4,231,437
1996	138,577	361,153	121,291	3,977,641	4,098,924
1997	333,852	506,509	313,767	3,561,060	3,874,827
1998	450,645	669,125	487,884	3,354,008	3,841,892
1999	313,427	687,884	420,706	2,617,582	3,038,286
2000	147,397	852,262	179,599	1,869,043	2,048,641
2001	317,974	2,831,044	325,447	1,960,324	2,285,771
2002	214,040	917,803	215,402	1,828,150	2,043,552
2003	291,168	422,294	309,412	848,822	1,158,234
2004	395,268	614,762	428,627	685,463	1,114,090
2005	297,605	702,685	281,710	421,984	703,694
2006	343,092	1,047,135	302,775	363,087	665,861
2007	191,192	600,987	202,583	175,593	378,176
2008	203,779	470,805	209,470	162,516	371,986
2009	204,814	626,742	245,358	163,148	408,506
2010	110,770	914,004	103,903	106,328	210,231
2011	48,727	380,366	62,543	65,998	128,541
2012	96,947	396,620	95,952	91,384	187,336
2013	63,090	257,367	66,720	120,191	186,911
2014	71,912	1,067,344	70,988	105,247	176,235
2015	143,543	1,652,582	157,269	80,272	237,511
2016	77,341	1,097,615	83,702	79,667	163,369
2017	51,795	351,613	55,944	85,462	141,406
2018	30,935	300,195	29,924	35,142	65,058
2019	39,061	366,518	43,252	115,665	158,917
2020	82,124	386,364	105,729	87,645	197,103
2021	91,032	1,030,829	103,449	59,534	162,983
2022	112,095	1,921,985	105,060	62,201	167,256
2023	75,329	833,559	89,115	106,131	195,235
2024	87,273	717,139	115,496	106,571	222,067
Mean+	78,798	778,273	85,936	87,163	173,344

+ Mean value is from 2010–2024 reflecting the current weakfish management period.

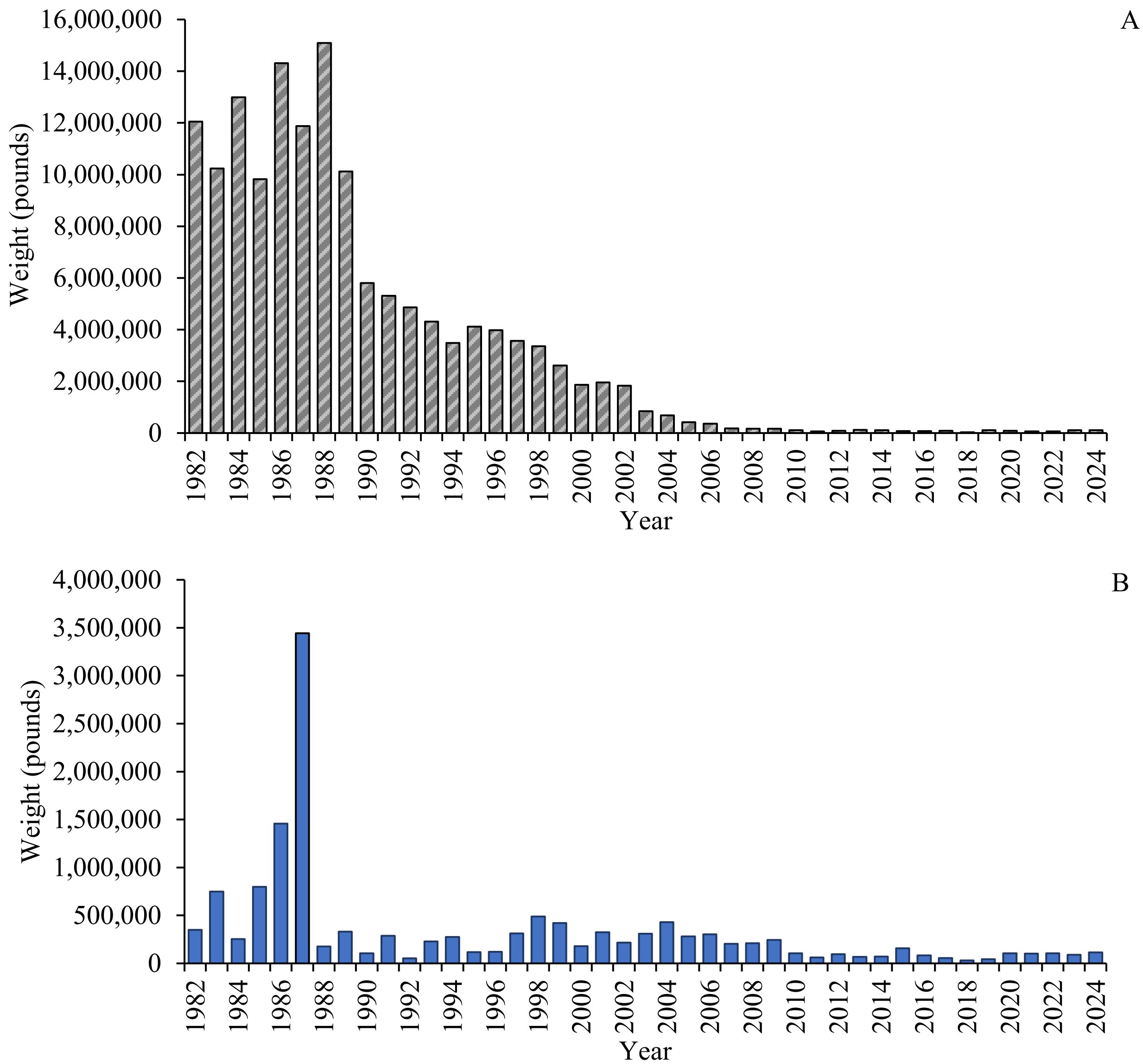

Figure 3. Annual commercial (A) and recreational (B) landings in pounds for weakfish in North Carolina from 1982 to 2024.

Recreational Fishery

Recreational landings of weakfish 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.

Estimated recreational harvest has been variable since 1982 with a peak in 1987 at 3,442,746 pounds. Harvest since 2009 has decreased considerably due to the implementation of a one-fish bag limit in November 2009 as part of the harvest reductions from Addendum IV, which was estimated to reduce recreational harvest by 53% for North Carolina. The average harvest since 2010 is 85,936 pounds and has varied from a high of 157,269 pounds in 2015 to a low of 29,924 in 2018. Recreational harvest remained relatively consistent around 104,000 pounds in 2020, 2021, and 2022, decreased to 89,115 pounds in 2023, and increased to the highest values since 2015 in 2024 (115,496 pounds; Table 1; Figure 3). The number of weakfish released remained relatively stable from 2017–2020, varying between a low of 300,195 fish in 2018 and a high of 386,364 fish in 2020 but increased dramatically in 2021 to 1,030,829 fish and increased again in 2022 to 1,921,985 fish, the highest since 2001 (2,831,044 fish). Recreational releases decreased in 2023 (833,559 fish) and 2024 (717,139 fish) but remained well above the 2017–2019 period (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. A total of 30 citations were handed out for weakfish in 2024 including 17 release citations (greater than 24 inches total length released) and 13 harvest citations (greater than five pounds landed) (Table 2; Figure 4). Saltwater Fishing Tournament citations decreased in 2024 but remained well above the number of citations in most years throughout the time series (1991–2024).

Table 2. Total number of awarded citations for weakfish (>24-inches total length for release or > 5 pounds landed) from the North Carolina Saltwater Fishing Tournament from 1991–2024.

Year	Total Citations	Release Citations[+]	Percent Release
1991	1	-	0
1992	2	-	0
1993	10	-	0
1994	2	-	0
1995	3	-	0
1996	2	-	0
1997	0	-	0
1998	6	-	0
1999	6	-	0
2000	8	-	0
2001	8	-	0
2002	0	-	0
2003	124	-	0
2004	9	-	0
2005	3	-	0
2006	1	-	0
2007	2	-	0
2008	4	0	0
2009	3	0	0
2010	1	0	0
2011	1	0	0
2012	2	1	50
2013	4	0	0
2014	3	0	0
2015	2	0	0
2016	7	0	0
2017	16	16	100
2018	3	0	0
2019	8	3	38
2020	10	3	30
2021	49	30	61
2022	59	37	63
2023	50	29	58
2024	30	17	57

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

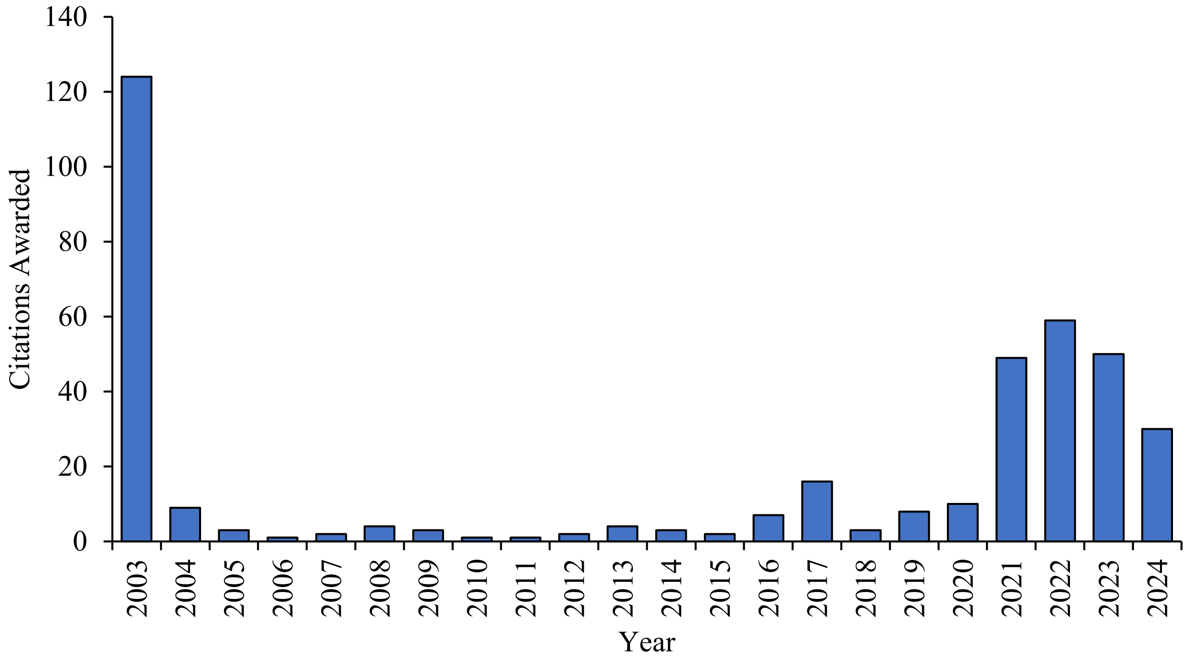

Figure 4. North Carolina Saltwater Fishing Tournament citations awarded for weakfish from 1991 to 2024. Citations are awarded for weakfish greater than 24 inches total length released or greater than 5 pounds landed.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Commercial fish houses are sampled monthly to provide length, weight, and age data to describe the commercial fisheries. The number of weakfish samples from commercial fish houses has generally declined since 2000, following a similar trend to commercial landings (Tables 1 and 3). Samples are collected from ocean fisheries as well as estuarine fisheries. The ocean sink net fishery and estuarine gill net fishery land the majority of weakfish accounting for more than 84% of the overall commercial catch in 2024.

Mean and minimum lengths of fish harvested in the commercial fishery have remained relatively consistent throughout the time series (Table 3; Figure 5). Since 2012, the mean length has been approximately 14 inches fork length. However, since 2010, there has been a noticeable decline in maximum lengths, from an average of 33 inches (1982–2010) to an average of approximately 26 inches (2011–2024).

Table 3. Mean, minimum, and maximum lengths (fork length, inches) of weakfish sampled from the commercial and recreational fisheries of North Carolina from 1982–2024. Commercial lengths include both marketable and scrap finfish.

	Commercial				Recreational			
Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1982	13.8	4.4	34.1	4,485	13.9	7.8	22.8	55
1983	13.8	4.6	33.7	10,357	13.9	7.7	25.6	29
1984	14.2	5.1	36.6	14,952	10.9	4.7	18.9	90
1985	12.9	4.7	34.4	15,310	12.0	7.7	22.4	34
1986	13.9	5.4	34.9	17,446	13.0	8.7	20.1	164
1987	12.9	4.4	34.2	22,943	15.1	7.9	22.4	253
1988	13.8	5.3	33.7	18,116	12.7	8.3	20.5	208
1989	14.8	4.8	35.2	14,853	12.0	7.5	23.2	182
1990	12.2	4.1	35.4	18,613	12.2	7.1	21.7	181
1991	11.1	4.2	26.1	24,772	12.0	7.3	18.6	136
1992	12.1	5.2	29.8	21,050	12.3	7.6	17.2	64
1993	11.9	4.0	29.2	23,679	12.6	8.6	16.0	196
1994	13.2	4.6	28.0	15,011	13.2	6.2	20.8	573
1995	12.7	4.4	29.5	18,526	15.2	10.0	20.2	231
1996	13.1	4.6	28.1	18,906	14.0	9.9	19.2	336
1997	13.1	4.1	29.7	20,583	13.7	8.3	20.7	602
1998	13.5	6.5	27.4	13,963	14.3	9.9	27.0	518
1999	13.2	5.1	29.1	16,490	15.4	10.6	26.0	258
2000	13.2	4.1	29.8	19,382	14.8	9.8	22.4	122
2001	14.0	6.5	31.5	15,182	14.1	10.6	19.9	180
2002	13.7	6.1	31.5	13,531	13.9	9.4	19.1	106
2003	12.7	4.2	33.3	9,721	14.1	8.6	27.5	131
2004	13.2	5.8	33.5	10,500	14.4	11.1	25.5	164
2005	13.2	5.6	34.4	9,893	14.0	11.7	19.8	104
2006	12.7	5.6	32.5	11,649	13.6	9.8	20.1	240
2007	12.3	4.8	26.1	6,817	14.2	10.5	20.7	76
2008	12.3	5.0	26.3	3,851	13.8	11.7	20.4	145
2009	12.8	6.3	33.7	3,318	14.8	9.7	21.9	132
2010	12.3	5.1	34.6	2,568	13.6	9.3	17.3	96
2011	12.7	7.8	25.1	2,044	14.6	11.6	30.7	41
2012	13.5	5.0	23.3	2,754	13.8	10.2	20.8	81
2013	14.0	8.0	28.3	3,466	14.2	7.6	22.8	74
2014	14.0	5.0	24.4	3,348	13.8	10.9	20.3	72
2015	14.0	5.4	27.7	2,212	14.0	12.2	19.0	34
2016	14.1	8.7	23.6	2,743	14.0	10.3	18.0	76
2017	14.3	8.5	28.2	1,240	14.2	8.7	17.0	51
2018	13.7	7.0	26.9	770	13.4	8.6	18.5	34
2019	14.1	8.7	26.3	1,923	14.5	9.8	18.1	62
2020	14.0	9.0	26.0	1,004	15.0	9.8	22.9	65
2021	13.9	10.2	24.3	870	14.4	8.7	22.7	70
2022	13.6	8.0	23.7	850	13.3	9.3	19.8	73
2023	13.4	6.0	25.0	375	14.6	11.4	20.8	66
2024	14.2	8.5	27.9	851	15.0	10.7	21.8	43

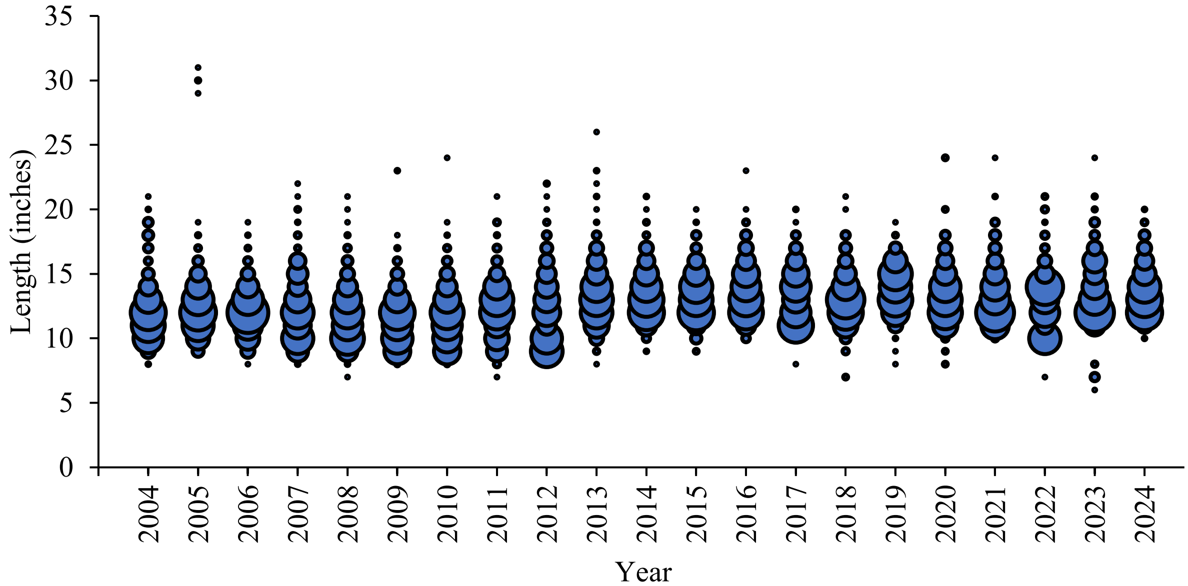

Figure 5. Commercial length frequency (fork length, inches) of weakfish harvested from 2004–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Recreational lengths and weights are collected as part of the MRIP by recreational port agents. While the mean lengths of weakfish sampled from the recreational fishery are similar to those sampled from the commercial fishery in recent years, the average maximum observed length is smaller in the recreational fishery by approximately 9 inches (Table 3; Figure 6). The maximum observed length in the recreational fishery in 2024 (22 inches) was similar to the previous year (21 inches).

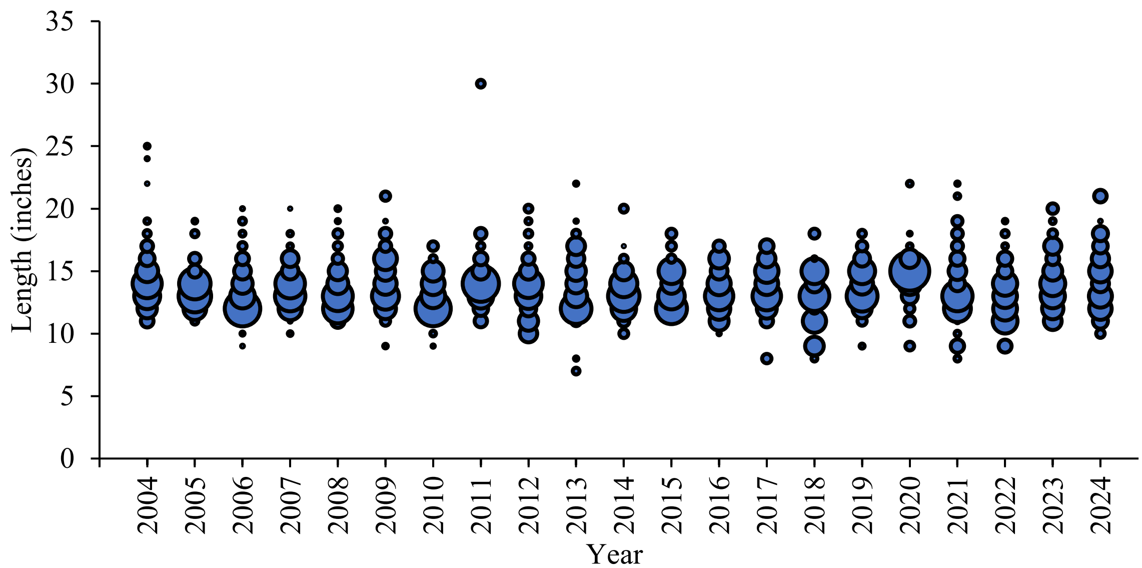

Figure 6. Recreational length frequency (fork length, inches) of weakfish harvested from 2004–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

The recreational modal length was 13 inches and the commercial modal length was12 inches in 2024. Most harvest in both sectors was between 12 and 16 inches in 2023 (Figure 7).

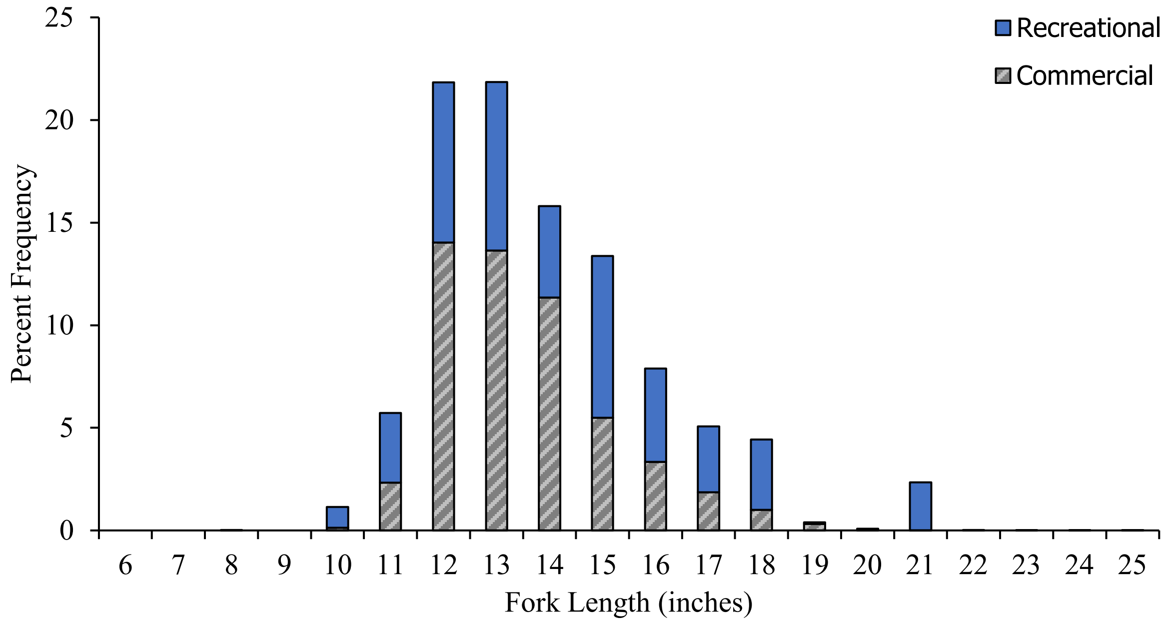

Figure 7. Commercial and recreational length frequency distribution from weakfish harvested in 2024.

Fishery-Independent Monitoring

Fishery independent data are collected through both the Program 195 Pamlico Sound Survey and Program 915 Independent Gill Net Survey. The Pamlico Sound Survey provides an age-0 relative abundance index calculated from the September stations and an age-1+ index calculated from the June stations. Although the ASMFC stock assessment only uses the age-0 index, both are provided here to assess overall trends in both groups. The Pamlico Sound Survey indices show a variable trend over the years (Figures 8 and 9). During 2021, sampling was impacted during June and September due to the COVID pandemic. Not all stations were able to be sampled as only day trips were permitted. In June, only 35 of the 54 stations were sampled, and in September, only 33 of the 54 stations were sampled. Thus, the relative abundance indices from 2021 should be viewed with caution. The 2024 age-0 relative abundance index (25.30 fish per tow) decreased from 2023 (51.62 fish per tow). The 2024 age-1+ relative abundance index (31.42 fish per tow) also decreased from the previous year (43.11 fish per tow). However, the 2023 age-0 relative abundance index and age-1+ relative abundance index were both the highest values since 2013 and 2014 respectively.

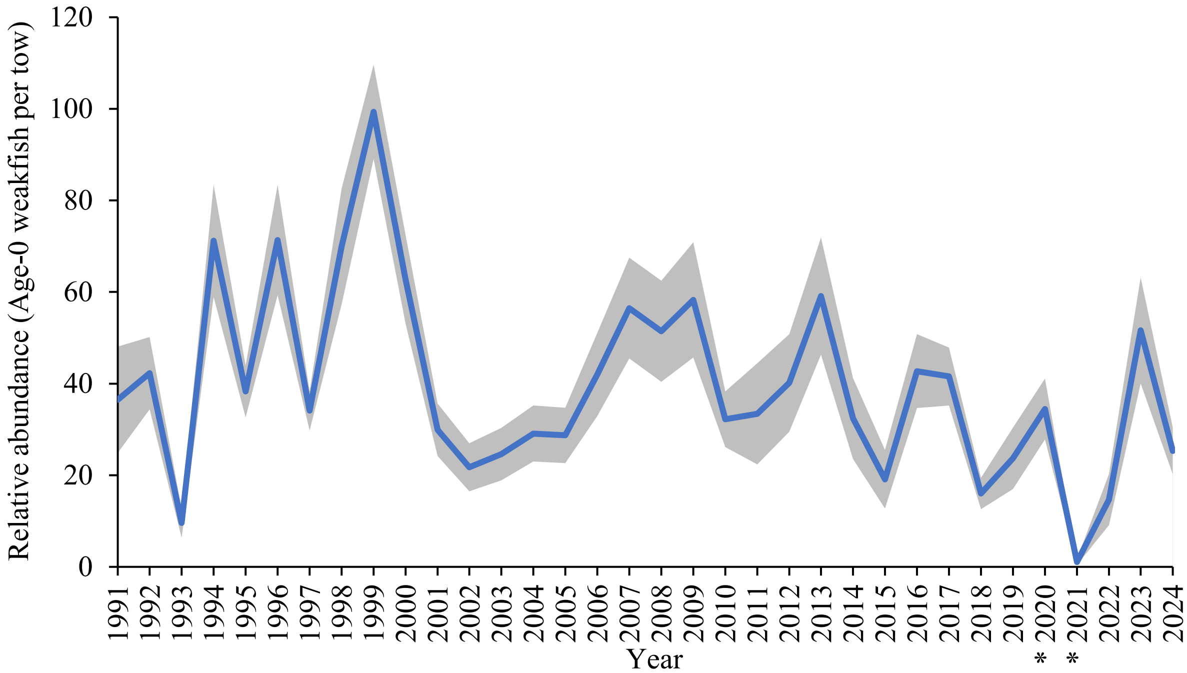

Figure 8. Relative abundance index (fish per tow) from the Pamlico Sound Survey (Program 195) in North Carolina of Age-0 weakfish collected during September with a total length less than 200 mm from 1991 through 2024. Shading represents ± one standard error (SE). *Not all samples were completed in 2020 and 2021.

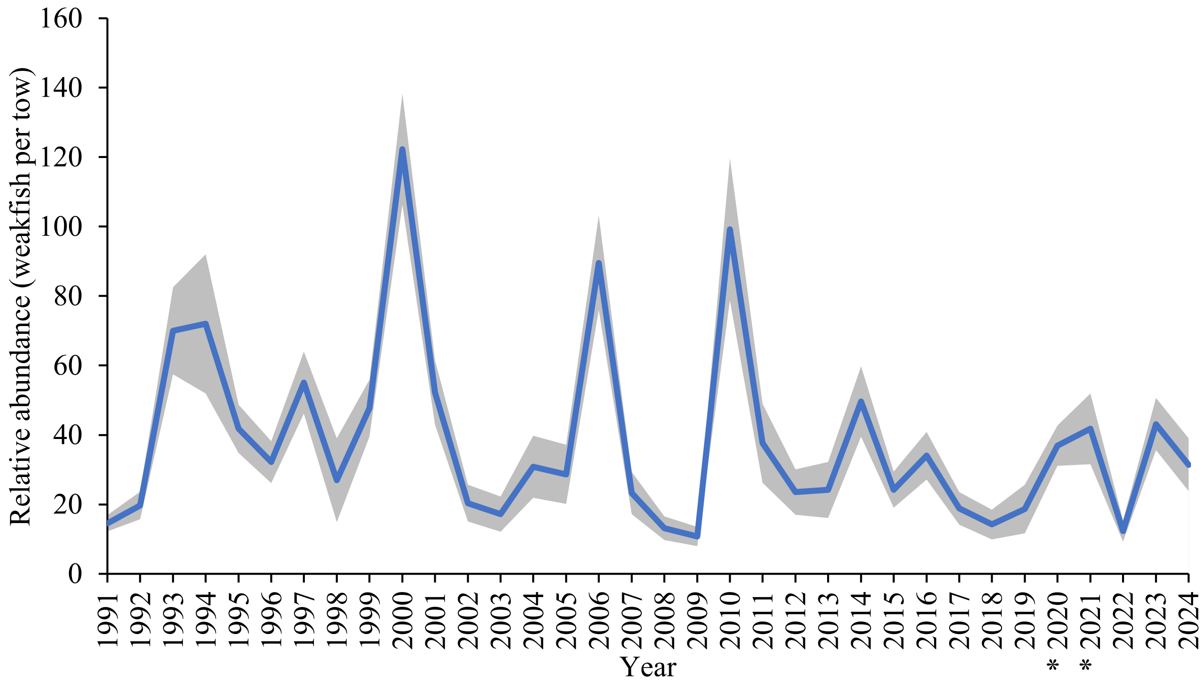

Figure 9. Relative abundance index (fish per tow) from the Pamlico Sound Survey (Program 195) in North Carolina of Age-1+ weakfish collected during June with a total length of 140 mm and greater from 1991 through 2024. Shading represents ± one standard error (SE). *Not all samples were completed in 2020 and 2021.

The Independent Gill Net Survey collects size, age, and abundance data for commercially and recreationally important species in the Pamlico Sound, Pamlico, Pungo, and Neuse rivers, and the Cape Fear and New rivers using multi-mesh gill nets. The relative abundance index from the Pamlico Sound portion is used in the ASMFC stock assessment and had been showing a declining trend with occasional peaks in abundance since the beginning of the time series, but it has remained relatively stable since 2015 (Figure 10). The data from the Pamlico, Pungo, and Neuse rivers and the Cape Fear and New rivers are not used in the assessment as these regions have minimal catches of weakfish. During 2020 no index of relative abundance was available for weakfish from the Independent Gill Net Survey. Sampling in this program was suspended in February 2020 due to COVID-19 restrictions and protected species interactions but resumed July 2021. The 2021 relative abundance index should be used with caution as just over 50% of the samples were completed for the year. The relative abundance index for 2024 was 0.6 fish per set and was an decrease from 2023.

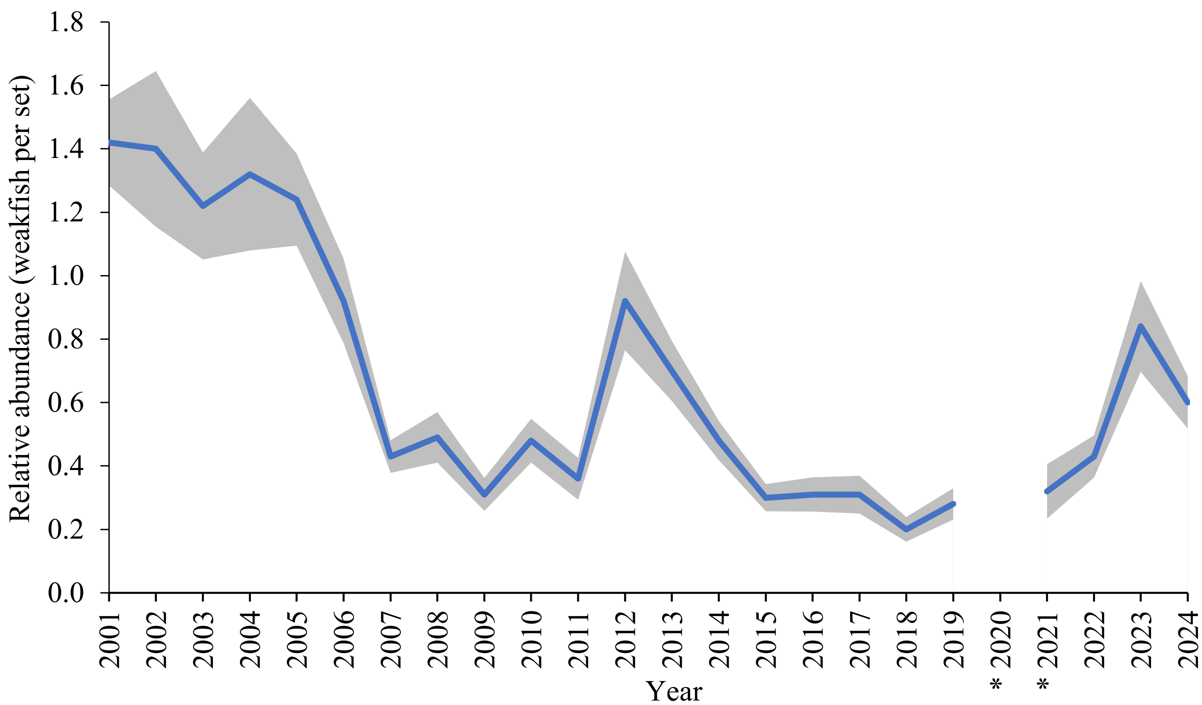

Figure 10. Relative abundance index (fish per station set) from the Pamlico Sound portion of the Independent Gill Net Survey (Program 915) in North Carolina, 2001–2024. Shading represents ± one standard error (SE). *Sampling not conducted in 2020 and not all samples completed in 2021.

Weakfish age samples (otoliths) are collected through both fishery dependent and independent sampling. Sampling for weakfish has been ongoing since 1991. Age samples are collected from all possible gears and during all months. The number of samples collected yearly has ranged from 170 to 1,319, with a total of 19,726 otoliths aged to date. Ages have ranged from 0 to 15 years with a mean modal age of two years (Table 4; Figure 11). Based on average age-at-lengths, weakfish growth likely does not plateau until age-10 (Figure 11). The maximum age of the weakfish sampled in 2024 was age 6 (Table 4). Since 2007, the maximum age of weakfish has fluctuated between four and six with the exception of 2009 (age 15).

Table 4. Modal age, minimum age, maximum age, and number aged for weakfish collected through DMF sampling programs from 1995 through 2024.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1995	1	0	5	898
1996	4	0	6	1,319
1997	3	0	7	1,059
1998	3	0	7	703
1999	3	0	8	659
2000	1	0	9	616
2001	2	0	10	630
2002	3	0	10	512
2003	4	0	8	491
2004	2	0	11	589
2005	2	0	12	561
2006	3	0	7	752
2007	2	0	6	560
2008	1	0	5	480
2009	1	0	15	263
2010	2	0	5	507
2011	2	0	4	378
2012	3	0	4	497
2013	2	0	5	546
2014	1	0	4	508
2015	3	0	4	425
2016	1	0	5	570
2017	1	0	5	353
2018	2	0	4	170
2019	2	0	6	551
2020	2	0	4	724
2021	1	0	6	426
2022	2	0	5	521
2023	1	0	6	664
2024	2	0	6	489

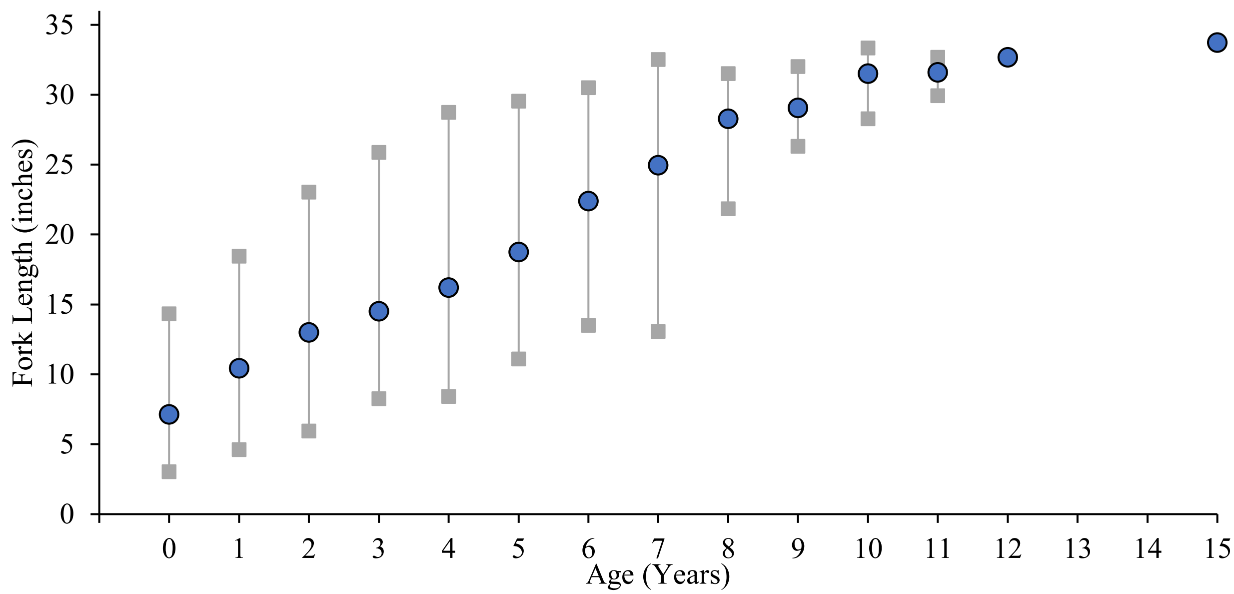

Figure 11. Weakfish length at age based on all age samples collected from 1995 to 2024. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.

RESEARCH NEEDS

High

- Increase observer coverage to identify the magnitude of discards for all commercial gear types from both directed and non-directed fisheries.
- Continue studies on temperature, size, and depth specific recreational hook and release mortality rates, particularly catches from warm, deep waters. Investigate methods to increase survival of released fish.
- Continue studies on mesh size selectivity, particularly trawl fisheries.
- Improve methods to estimate commercial bycatch. Refine estimates of discard mortality based on factors such as distance from shore and other geographical differences for all sizes including below minimum size.
- Evaluate predation of weakfish with a more advanced multispecies model (e.g., the ASMFC MSVPA or Ecopath with Ecosim).
- Develop a bioenergetics model that encompasses a broader range of ages than Hartman and Brandt (1995) and use it to evaluate diet and growth data.
- Analyze the spawner-recruit relationship and examine the effects of the relationship between adult stock size and environmental factors on year class strength.
- Develop a coast-wide tagging program to identify stocks and determine migration, stock mixing, and characteristics of stocks in over wintering grounds. Determine the relationship between migratory aspects and the observed trend in weight-at-age.
- Monitor weakfish diets over a broad regional and spatial scale, with emphasis on new studies within estuaries.
- Continue to investigate the geographical extent of weakfish hybridization.

- Estimate weakfish mortality through independent approaches (e.g., alternative models, tagging) to corroborate trends in mortality from the assessment model.
- Conduct a meta-analysis of all factors likely to influence changes in natural mortality to see if the aggregate effect shows stronger statistical likelihood of occurrence than the significance shown by each individual driver effect on its own.
- Improve implementation of the process for organizing and collecting data from different agencies and sources to assure timely and high-quality data input into the model.

Moderate

- Identify and delineate weakfish spawning habitat locations and environmental preferences to quantify spawning habitat.
- Compile data on larval and juvenile distribution from existing databases to obtain preliminary indications of spawning and nursery habitat location and extant.
- Examine geographical and temporal differences in growth rate (length and weight-at-age).
- Determine the impact of power plants and other water intakes on larval, post larval, and juvenile weakfish mortality in spawning and nursery areas. Calculate the resulting impact on adult stock size.
- Monitor predation on weakfish from both fish and marine mammal species.
- Determine the impact of scientific monitoring surveys on juvenile weakfish mortality. Calculate the resulting impact on adult stock size.
- Assemble socioeconomic data as it becomes available from ACCSP.

Low

- Determine the onshore versus offshore components of the weakfish fishery.
- Collect catch and effort data including size and age composition of the catch, determine stock mortality throughout the range, and define gear characteristics. In particular, increase length frequency sampling in fisheries from Maryland and further north.
- Develop latitudinal, seasonal, and gear specific age length keys coast wide. Increase sample sizes for gear specific keys.
- Define restrictions necessary for implementation of projects in spawning and over wintering areas and develop policies on limiting development projects seasonally or spatially.

MANAGEMENT

Weakfish are currently managed under Addendum IV to Amendment 4 of the Weakfish FMP and requires all the Atlantic States to implement a one fish per person bag limit, a 100-pound commercial bycatch trip limit, and a 100 fish undersized trip limit allowance for the trawl fishery. Based on results from the 2016 assessment, the Weakfish Technical Committee (TC) recommended a 30% SSB threshold be used as a reference point to determine whether the stock is depleted. The TC noted there is no long-term stable equilibrium population of weakfish due to time varying natural mortality and recommended managing the stock using Z-based (total mortality) targets and thresholds of 20% and 30%. In addition, total mortality (Z) benchmarks are used to prevent an increase in fishing pressure when F is low, but M is high. Z was above both the Z_{Target} and $Z_{Threshold}$ in the terminal year of the 2017 stock assessment update; however, the TC recommended – and the Weakfish Board approved – no new management measures given the restrictive weakfish management program currently in place.

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FISHERY MANAGEMENT PLAN UPDATE
BLACK SEA BASS NORTH OF CAPE HATTERAS
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	Incorporated into the Summer Flounder FMP through Amendment 9 in 1996	
Amendments:	Amendment 9	1996
	Amendment 10	1997
	Amendment 11	1998
	Amendment 12	1999
	Framework 1	2001
	Addendum IV	2001
	Addendum VI	2002
	Amendment 13	2003
	Framework 5	2004
	Addendum XII	2004
	Addendum XIII	2004
	Addendum XVI	2005
	Amendment 16	2007
	Framework 7	2007
	Addendum XIX	2007
	Addendum XX	2009
	Amendment 15	2011
	Addendum XXI	2011
	Addendum XXII	2012
	Amendment 19	2013
	Addendum XXIII	2013
	Addendum XXV	2014
	Amendment 17	2015
	Framework 8	2015
	Amendment 18	2015
	Addendum XXVII	2016
	Amendment 20	2017
	Framework 10	2017
	Addendum XXX	2018
	Framework 11	2018
	Framework 13	2018
	Addendum XXXI	2018
	Addendum XXXII	2018
	Framework 14	2019
	Framework 15	2020
	Framework 16	2020
	Addendum XXXIII	2021
	Amendment 22	2022
	Framework 17 & Addendum XXXIV	2022/2023
	Addendum XXXVI	2025

Comprehensive Review: 2024

Because of their presence in, and movement between, state waters (0–3 miles) and federal waters (3–200 miles), the Mid-Atlantic Fishery Management Council (MAFMC) manages black sea bass (*Centropristis striata*) north of Cape Hatteras cooperatively with the Atlantic States Marine Fisheries Commission (ASMFC). The two management entities work in conjunction with the National Marine Fisheries Service (NMFS) as the federal implementation and enforcement entity. Black sea bass went through preliminary FMP development from 1978–1993 by the MAFMC. In 1996 NMFS requested that black sea bass regulations be incorporated into another FMP to reduce the number of separate fisheries regulations. As a result, the black sea bass FMP was incorporated into the summer flounder FMP as Amendment 9.

Specific details for each Amendment include:

Amendment 9 incorporated black sea bass into the Summer Flounder FMP; established black sea bass management measures including commercial quotas, recreational harvest limits, size limits, gear restrictions, permits, and reporting requirements.

Amendment 10 modified commercial minimum mesh requirements; continued commercial vessel moratorium permit; prohibited transfer of summer flounder at sea; established a special permit for the summer flounder party/charter sector.

Amendment 11 modified certain provisions related to vessel replacement and upgrading, permit history transfer, splitting, and permit renewal regulations.

Amendment 12 revised the Summer Flounder, Scup, and Black Sea Bass FMP to comply with the Sustainable Fisheries Act and established a framework adjustment process; established quota set-aside for research for summer flounder, scup and black sea bass; established state-specific conservation equivalency measures; allowed the rollover of the winter scup quota; revised the start date for the scup summer quota period; established a system to transfer scup at sea.

Framework 1 established quota set-aside for research for summer flounder, scup and black sea bass.

Addendum IV provided that upon the recommendation of the relevant monitoring committee and joint consideration with the Mid-Atlantic Fishery Management Council, the ASMFC's Summer Flounder, Scup, and Black Sea Bass Management Board will decide the state regulations rather than forward a recommendation to the National Marine Fisheries Science Center; made states responsible for implementing the ASMFC's Summer Flounder, Scup, and Black Sea Bass Management Boards decisions on regulations.

Addendum VI provided a mechanism for initial possession limits, triggers, and adjusted possession limits to be set during the annual specification setting process without the need for further Emergency Rules.

Amendment 13 revised black sea bass commercial quota system; addressed other black sea bass management measures; established multi-year specification setting of quota for summer flounder, scup and black sea bass; established region-specific conservation equivalency measures for summer flounder; built flexibility into process to define and update status determination criteria for each plan species. Amendment 13 also removed the necessity for fishermen who have both a Northeast Region (NER) black sea bass permit and a Southeast Region (SER) snapper/grouper permit to relinquish their permits for a six-month period prior to fishing south of Cape Hatteras during the northern closure.

Framework 5 established multi-year specification setting of quota for summer flounder, scup, and black sea bass.

Addendum XII continued the use of a state-by-state allocation system, managed by the ASMFC on an annual coastwide commercial quota.

Addendum XIII modified the Summer Flounder, Scup, and Black Sea Bass FMP so that Total Allowable Landings for summer flounder, scup, and/or black sea bass can be specified for up to three years.

Addendum XVI established guidelines for delayed implementation of management strategies.

Amendment 16 standardized bycatch reporting methodology.

Framework 7 built flexibility into process to define and update status determination criteria for each plan species.

Addendum XIX continued the state-by-state black sea bass commercial management measures, without a sunset clause; broadened the descriptions of stock status determination criteria contained within the Summer Flounder, Scup, and Black Sea Bass FMP to allow greater flexibility in those definitions, while maintaining objective and measurable status determination criteria for identifying when stocks or stock complexes covered by the fishery management plan are overfished.

Addendum XX set policies to reconcile commercial quota overages to address minor inadvertent quota overages; streamlined the quota transfers process and established clear policies and administrative protocols to guide the allocation of transfers from states with underages to states with overages; allowed for commercial quota transfers to reconcile quota overages after a year's end.

Amendment 15 established annual catch limits and accountability measures.

Addendum XXI allowed more flexibility in setting recreational measures for the 2011 fishing year and proposed state-by-state or regional management measures for the 2011 black sea bass fishery.

Addendum XXII divided the recreational black sea bass coastwide allocations into state-by-state management for 2012 only.

Amendment 19 modified the accountability measures for the MAFMC recreational fisheries.

Addendum XXIII established regional management for the 2013 recreational black sea bass fishery.

Addendum XXV established regional management for the 2014 recreational black sea bass and summer flounder fishery.

Amendment 17 implemented standardized bycatch reporting methodology.

Framework 8 allowed the black sea bass recreational fishery to begin on May 15 of each year, instead of May 19, to provide additional fishing opportunities.

Amendment 18 eliminated the requirement for vessel owners to submit "did not fish" reports for the months or weeks when their vessel was not fishing; removed some of the restrictions for upgrading vessels listed on federal fishing permits.

Addendum XXVII continued regional management of the recreational summer flounder fishery extended ad hoc regional management of the black sea bass recreational fishery for the 2016 and 2017 fishing year and addressed the discrepancies in recreational summer flounder management measures within Delaware Bay.

Amendment 20 implemented management measures to prevent the development of new, and the expansion of existing, commercial fisheries on certain forage species in the Mid-Atlantic.

Framework 10 implemented a requirement for vessels that hold party/charter permits for Council-managed species to submit vessel trip reports electronically (eVTRs) while on a trip carrying passengers for hire.

Addendum XXX established 2018 recreational black sea bass management with options for regional allocations that require uniform regulations and other alternatives to the current North/South regional delineation (MA-NJ/DE-NC).

Framework 11 established a process for setting constant multi-year Acceptable Biological Catch (ABC) limits for Council-managed fisheries, clarified that the Atlantic Bluefish, Tilefish, and Atlantic Mackerel, Squid, and Butterfish FMPs will now automatically incorporate the best available scientific information in calculating ABCs (as all other Mid-Atlantic Council management plans do) rather than requiring a separate management action to adopt them, clarified the process for setting ABCs for each of the four types of ABC control rules.

Framework 13 modified the accountability measures required for overages not caused by directed landings (i.e., discards) in the summer flounder, scup, and black sea bass fisheries.

Addendum XXXI established conservation equivalency for black sea bass and transit provisions in federal waters around Block Island, Rhode Island for recreational and commercial fishermen which allows permitted fishermen to pass through federal waters legally.

Addendum XXXII established a specifications process instead of an addendum process to implement recreational management measures more quickly for summer flounder and black sea bass.

Framework 14 gives the Council the option to waive the federal recreational black sea bass measures in favor of state measures through conservation equivalency; implements a transit zone for commercial and recreational summer flounder, scup, and black sea bass fisheries in Block Island Sound; and allows for the use of a maximum size limit in the recreational summer flounder and black sea bass fisheries.

Framework 15 established a requirement for commercial vessels with federal permits for all species managed by the Mid-Atlantic and New England Councils to submit vessel trip reports electronically within 48 hours after entering port at the conclusion of a trip.

Framework 16 modified MAFMC's ABC control rule and risk policy. The revised risk policy is intended to reduce the probability of overfishing as stock size falls below the target biomass while allowing for increased risk and greater economic benefit under stock biomass conditions. This action also removed the typical/atypical species distinction currently included in the risk policy.

Addendum XXXIII modifies the allocation of the coastwide black sea bass commercial quota among the states, which were originally implemented in 2003 through Amendment 13 and extended indefinitely through Addendum XIX. The revised allocation addresses the significant change in the distribution of black sea bass that have occurred since the original allocations were implemented in 2003.

Amendment 22 revised the commercial and recreational sector allocations for all three species.

Framework 17/Addendum XXXIV Recreational Harvest Control Rule established a new process for setting recreational bag, size, and season limits (i.e., recreational measures) for summer flounder, scup, black sea bass, and bluefish. This action also modified the recreational accountability measures for these species.

Addendum XXXVI which made further modifications to the process for setting recreational measures and accountability measures for these four species. The changes, which include modifications the Percent Change Approach based on lessons learned over the past few years, will be implemented in two phases.

Specific details for each amendment and addendum under development include:

The Percent Change Approach was implemented in 2023 (new process for setting recreational measures bag, size, and season limits), and will sunset at the end of 2025.

In April 2025, the Policy Board and Council adopted Addendum XXXVI to the Summer Flounder, Scup, and Black Sea Bass FMP and Addendum III to the Bluefish FMP, which made further modifications to the process for setting recreational measures and accountability measures for these four species. The changes, which include modifications the Percent Change Approach based on lessons learned over the past few years, will be implemented in two phases. The first phase of changes aims to better account for stock status when setting measures and will create more opportunities for stability in management measures. The second phase of modifications, which will be implemented for setting 2030 recreational measures and beyond, will update the process to use a catch-based target. For further information see the management plan at asmfc.org.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt fishery management plans, consistent with N.C. law, approved by the MAFMC, 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. These plans were established under the Magnuson-Stevens Fishery Conservation and Management Act (federal council plans) and the Atlantic Coastal Fisheries Cooperative Management Act (ASMFC plans) with the goal, like the Fisheries Reform Act of 1997, to "ensure long-term viability" of these fisheries (NCDMF 2022).

Management Unit

U.S. waters in the western Atlantic Ocean from Cape Hatteras northward to the U.S.-Canadian border.

Goal and Objectives

The objectives for the Black Sea Bass FMP are to:

- Reduce fishing mortality in the black sea bass fisheries to assure that overfishing does not occur.
- Reduce fishing mortality on immature black sea bass to increase spawning stock biomass.
- Improve the yield from these fisheries.
- Promote compatible management regulations between state and federal jurisdictions.
- Promote uniform and effective enforcement of regulations.
- Minimize regulations to achieve the management objectives stated above.

The 2011 Omnibus Amendment contains Amendment 15 to the Summer Flounder, Scup and Black Sea Bass FMP. The amendment is intended to formalize the process of addressing scientific and management uncertainty when setting catch limits for the upcoming fishing year(s) and to establish a comprehensive system of accountability for catch (including both landings and discards) relative to those limits, for each of the managed resources subject to this requirement. Specifically: (1) Establish allowable biological catch control rules, (2) Establish a MAFMC risk policy, which is one variable needed for the allowable biological catch control rules, (3) Establish annual catch limits, (4) Establish a system of comprehensive accountability, which addresses all components of the catch, (5) Describe the process by which the performance of the annual catch limit and comprehensive accountability system will be reviewed, (6) Describe the process to modify the above objectives (1–5) in the future.

DESCRIPTION OF THE STOCK

Biological Profile

Black sea bass are split into two stocks but together are found along the Atlantic coast from the Gulf of Maine to the Florida Keys. The northern stock is located from the Gulf of Maine to Cape Hatteras, North Carolina while the southern stock is located from Cape Hatteras, North Carolina to the Florida Keys. Black sea bass have a unique life history in that they are protogynous hermaphrodites which means they begin life as female and then change to male once they reach age 2 to 5 or when they reach 9 to 13 inches in total length. During the spawning season, dominant males develop a large nuchal (nape of the neck) hump, whereas subordinate males do not and are typically smaller in size. Spawning for the northern stock typically occurs offshore on the inner continental shelf during the months from May to July. Juveniles and adults move nearshore during the summer. Seasonal migration is common for black sea bass (north of Cape Hatteras). Black sea bass have a maximum age of 12 years. They are likely to stay near rock pilings, wrecks and jetties and prey on fish, crabs, mussels, and razor clams (Steimle 1999).

Stock Status

A management track assessment was peer reviewed in July 2024. The assessment updated a Woods Hole Assessment Model (WHAM) framework developed during the 2023 research track assessment. The assessment found that the black sea bass stock status has not changed and was not overfished and overfishing was not occurring.

Stock Assessment

A management track stock assessment for black sea bass was peer reviewed in June 2024. Spawning stock biomass in 2023 was estimated at about 2.19 times the target level, fishing mortality in 2023 was estimated to be 23% below the threshold level that defines overfishing, and recruitment has fluctuated over time. The estimated number of age 1 fish in 2023 is higher than the prior several years. Stock assessment reports can be found on the black sea bass page on the ASMFC website for further information.

DESCRIPTION OF THE FISHERY

Current Regulations

Commercial: 11-inch total length minimum size limit in Atlantic Ocean and internal coastal waters north of Cape Hatteras. Harvest periods are set by proclamation with variable harvest limits by gear and time-period to prevent landings from exceeding North Carolina's commercial quota [see most recent North Carolina Division of Marine Fisheries (DMF) proclamation].

Recreational: 13-inch total length minimum size limit and a 15-fish creel limit in Atlantic Ocean and internal coastal waters north of Cape Hatteras. The season had two harvest periods which were May 15 – September 30 and October 10 – December 31.

Commercial Fishery

All black sea bass landings are reported through the North Carolina Trip Ticket Program. In 2024 the majority of black sea bass landings from north of Cape Hatteras were from flounder trawls. Other gears that contributed to black sea bass landings were pots and hook-n-line (Figure 1). Landings have been variable throughout the years with landings declining after 2005 through 2012, then seeing landings increase through 2017, and then gradually decreasing through 2023. Landings in 2024 significantly increased from 2023 (Table 1; Figure 2). The low landings in 2012 and 2013 were partly due to shoaling at Oregon Inlet making passage by large vessels (such as trawlers) unsafe and the consequent transfer of large portions of North Carolina's black sea bass quota allocation to Virginia and other states. From 2014 through 2022, more ocean trawl vessels returned to North Carolina to land catches rather than transferring quota to Virginia and other states. Dredging efforts in 2024 has helped mitigate shoaling and has made navigation through Oregon Inlet passable for larger trawlers. In 2024 there were more trips and higher landings for black sea bass.

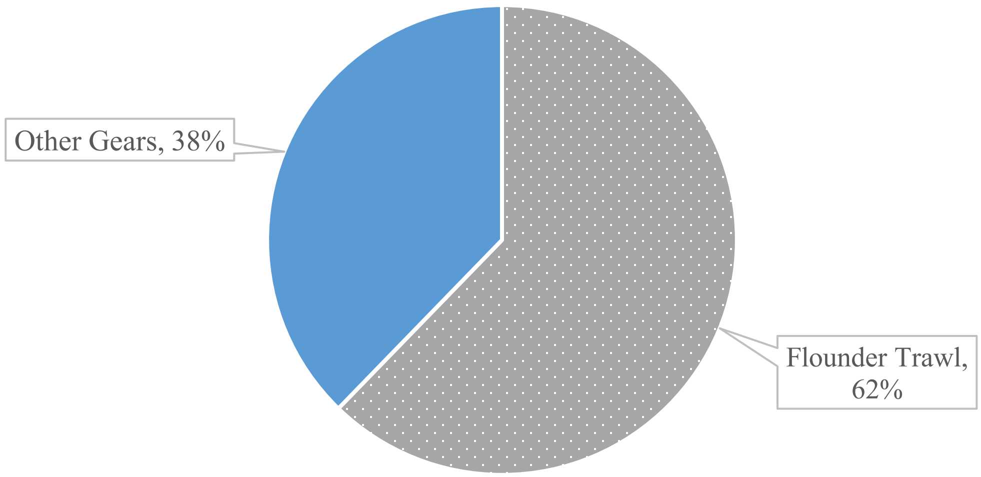

Figure 1. Commercial harvest of black sea bass (north of Cape Hatteras) in North Carolina by gear type in 2024. Note: data for Other Gears are confidential data.

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of black sea bass north of Cape Hatteras from North Carolina for the period 2015 – 2024.

	Recreational			Commercial	
Year	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
2015	2,955	149,347	6,224	241,538	247,762
2016	1,188	117,664	1,591	225,405	226,996
2017	23,720	152,491	33,421	388,865	422,286
2018	6,762	96,604	9,494	315,983	325,477
2019	6,268	159,129	11,638	279,008	290,646
2020	44,475	104,177	74,149	218,756	292,905
2021	4,171	252,992	6,564	200,565	207,129
2022	32,117	1,158,816	57,252	108,991	166,243
2023	79,355	447,190	132,616	61,906	194,522
2024	10,429	257,741	24,556	192,520	217,076
Mean	21,144	289,615	35,751	223,354	259,104

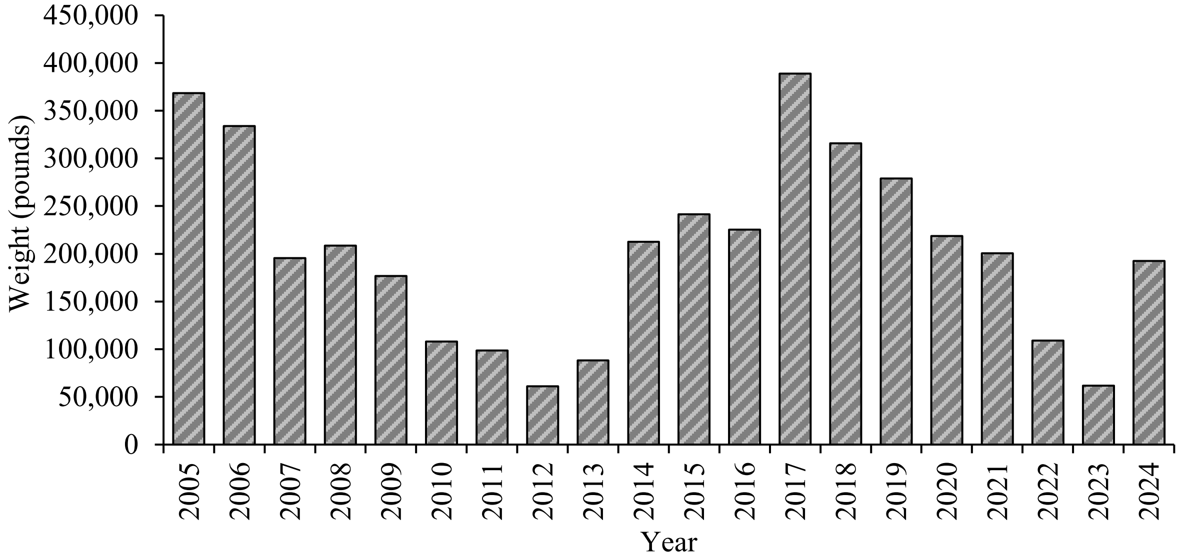

Figure 2. Annual commercial landings in pounds for black sea bass (north of Cape Hatteras) in North Carolina from 2005–2024.

Recreational Fishery

Recreational estimates across all years have been updated and are now based on the new National Ocean and Atmospheric Administration (NOAA) Marine Recreational Information Program (MRIP) Fishing Effort Survey-based calibrated estimates. For more information on MRIP, see https://www.fisheries.noaa.gov/topic/recreational-fishing-data. All black sea bass harvest is reported through the NOAA Marine Recreational Information Program. Recreational harvest of black sea bass from north of Cape Hatteras has been variable since 1994 through 2019, above average harvest occurred in 2020, 2022, and 2023. Harvest in 2024 was lower and about average for the time series (2005–2024) (Table 1; Figure 3).

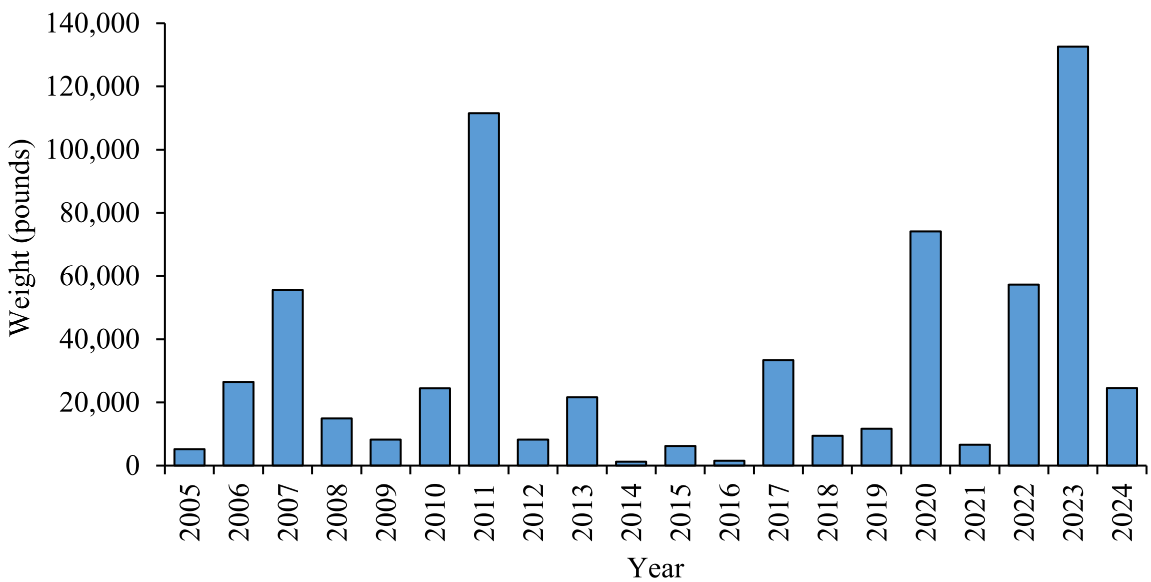

Figure 3. Annual recreational landings in pounds for black sea bass (north of Cape Hatteras) in North Carolina from 2005–2024.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Two DMF sampling programs collect biological data on commercial and recreational fisheries that catch black sea bass north of Cape Hatteras. Program 433 (Ocean Trawl Fishery) is the primary program that collects harvest length data. Additionally, Program 438 (Offshore Live Bottom Fishery) collects harvest length data when black sea bass are landed from using pots, but this gear is not as prevalent as the flounder trawl. Other commercial sampling programs focusing on fisheries that do not target black sea bass rarely collect biological data. DMF sampling of the recreational fishery occurs through the NOAA Marine Recreational Information Program which collects harvest and length data.

There were no clear trends in commercial length data from 2014 through 2024. Annual mean lengths were fairly consistent for the time-series (1994–2024). The number of measurements collected totaled 2,977 in 2024 from the ocean trawl fishery (Table 2). Otoliths have been collected opportunistically from commercial fisheries since 2013, although these data are not currently used in the coastwide stock assessments.

Table 2. Black sea bass (north of Cape Hatteras) length (total length, inches) data from commercial fish house ocean trawl samples in North Carolina, 2015–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2015	15	9	24	7,192
2016	16	9	28	6,526
2017	16	10	24	5,372
2018	16	10	29	6,247
2019	15	9	24	4,124
2020	15	9	23	3,244
2021	16	10	24	3,542
2022	15	11	23	1,529
2023	16	12	24	707
2024	15	11	23	2,977

Length data in the recreational fishery was variable and sample size has been low through 2024. Mean lengths have been variable, ranging from 13 to 17 inches (Table 3). Age data were not collected for black sea bass north of Cape Hatteras from recreational fisheries.

Table 3. Black sea bass (north of Cape Hatteras) length, (total length, inches) data from NOAA Marine Recreational Information Program recreational samples in North Carolina, 2015–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2015	17	13	17	5
2016	14	12	21	16
2017	13	12	17	11
2018	14	13	21	23
2019	17	12	21	32
2020	15	9	21	52
2021	16	13	20	22
2022	15	12	20	35
2023	14	12	22	25
2024	16	12	20	17

Fishery-Independent Monitoring

DMF independent sampling programs rarely encounter black sea bass north of Cape Hatteras and the few fish that are encountered are mostly from Program 120 (Estuarine Trawl Survey) and from Program 195 (Pamlico Sound Survey), which collect samples of black sea bass juveniles from inshore estuarine waters. However, it is not clear that samples collected inshore north of Cape Hatteras are from the northern or southern stock of black sea bass; this combined with the small sample numbers means that these data cannot be used in an abundance index. DMF currently does not have independent sampling programs in Atlantic Ocean waters north of Cape Hatteras.

RESEARCH NEEDS

- Expand on previous genetic studies with smaller spatial increments in sampling. — Progress unknown at this time
- Consider the impact of climate change on black sea bass, particularly in the Gulf of Maine. — Progress unknown at this time
- Evaluate population sex change and sex ratio, particularly comparing dynamics among communities. — Progress unknown at this time
- Study black sea bass catchability in a variety of survey gear types. — Progress unknown at this time
- Investigate and document social and spawning dynamics of black sea bass. — Progress unknown at this time
- Increase work to understand habitat use in sea bass and seasonal changes. — Progress unknown at this time
- Evaluate use of samples collected by industry study fleets. — Progress unknown at this time
- The panel recommended multiple age-structured models be evaluated for use in future models. Examples include a simple separable model with smoothing on F among years, a more complex, spatially structured model with 6-month time step within independent stock areas in spring and mixing in winter with natal homing, and tag return data in an age-structured assessment model. — Some progress has been made
- Continue and expand the tagging program to provide increased age information and increased resolution on mixing rates among putative populations. — Some progress has been made
- Continue and expand genetic studies to evaluate the potential of population structure north of Cape Hatteras. — Some progress has been made
- Continue research on rate, timing, and occurrence of sex-change in this species. Recent research findings discussed at the stock assessment review committee lead to the hypothesis that protogyny is not obligate in this species – some individuals may never have been female before maturing as a male. — Research is ongoing
- The validity of the age data used in the assessment requires further evaluation, in particular the reliability of scale-based ageing needs to be determined. A scale-otolith intercalibration exercise might be of utility. — Some progress has been made

MANAGEMENT

Management of black sea bass (north of Cape Hatteras) has been based on results from NMFS Northeast Fisheries Science Center (NEFSC) stock assessments. Since 2023, revised allocations have been implemented and transitioned to catch-based allocations with 45 percent being commercial and 55 percent being recreational. The FMP also includes minimum fish sizes, bag limits, seasons, gear restrictions, permit requirements, and other provisions to prevent overfishing and ensure sustainability of the fisheries. Recreational bag and size limits and seasons are determined on a state and regional basis in state waters and coastwide basis in federal waters. The commercial quota is divided into state-by-state quotas. Projections based on stock assessments are used to set the coastwide quota level each year. Amendments to the FMP are undertaken as issues arise that require action.

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FISHERY MANAGEMENT PLAN UPDATE
COBIA
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	SAFMC FMP	February 1983
	Amendment 1	September 1985
	Amendment 2	August 1987
	Amendment 3	August 1989
	Amendment 5	August 1990
	Amendment 6	December 1992
	Amendment 8	April 1998
	Amendment 11	December 1999
	Amendment 18	January 2012
	Amendment 20b	March 2015
	Framework Amendment 4	September 2017
	Amendment 31	March 2019
	ASMFC FMP	November 2017
	Amendment 1	August 2019
	Addendum 1	October 2020
	Addendum II	August 2024
Comprehensive Review:	2025	

The Gulf of Mexico Fishery Management Council (GMFMC) and the South Atlantic Fishery Management Council (SAFMC) approved and implemented the Fishery Management Plan (FMP), Final Environmental Impact Statement, Regulatory Impact Review and Final Regulations for the Coastal Migratory Pelagic (CMP) Resources FMP in 1983 which included all cobia (*Rachycentron canadum*) in the Gulf of Mexico and South Atlantic (GMFMC/SAFMC 1983). This plan managed cobia as one unit stock across the entire jurisdictional area of the GMFMC and SAFMC. The stated management objective for cobia in the plan was to institute management measures necessary to increase yield per recruit and average size and to prevent overfishing. To achieve this, a minimum size limit was established for the Fishery Conservation Zone (FSC), which is analogous to the Exclusive Economic Zone (EEZ) of today, locally referred to as ‘federal waters’. The FMP was first amended in 1985 with the adoption of Amendment 1 which established the fishing year as January 1 through December 31 and clarified that the minimum size limit for cobia (GMFMC/SAFMC 1985). This amendment also highlighted the fact that most southeastern states had not yet adopted the recommended minimum size limits for cobia and that populations of cobia in Chesapeake Bay appear to be overfished and that the federal enforcement capability in this case is very limited.

Amendment 2 to the FMP was approved in 1987 and established a permit for charter boats fishing for coastal migratory pelagics (GMFMC/SAFMC 1987a). Amendment 3 prohibited drift gill nets as a gear that could be used to harvest coastal pelagic species (GMFMC/SAFMC 1987b). Amendment 5 addressed the issue of average annual catches from 1981–1986 exceeding the established MSY level and defined the overfishing limit for the cobia stock, as well as set the procedure for rebuilding if the stock was found to be overfished (GMFMC/SAFMC 1990). Cobia were added to the annual stock assessment procedures for the councils, and a bag and possession limit was established for both commercial and recreational sectors in an effort to control harvest. Amendment 6 (GMFMC/SAFMC 1992) removed the total length minimum size limit, specifying that the only minimum size for cobia was fork length (FL) and increased Maximum

Sustainable Yield (MSY) based on results stock assessment analyses done for, and at the recommendation of, the Mackerel Stock Assessment Panel (Isely 1992; MSAP 1992).

In 1998, Amendment 8 extended the management area for cobia through the Mid-Atlantic Fishery Management Council's (MAFMC) jurisdiction which also extended the bag limit and minimum size limit (GMFMC/SAFMC 1996). Overfishing was defined as a fishing mortality rate greater than a static Spawning Potential Ratio (SPR) threshold of 30% and if exceeded, then required that fishing mortality be reduced to rates corresponding to management target levels. Optimum yield (OY) was defined as being equal to MSY. Amendment 11 (SAFMC 1998) redefined OY as the amount of harvest that can be taken by United States fishermen while maintaining the SPR at or above 40% of a static SPR. It also redefined the overfishing level as a fishing mortality rate (*F*) in excess of the *F* at 30% of a static SPR and established a threshold level for all the species in the coastal migratory pelagic unit as 10% of the static SPR.

Amendment 18 separated cobia into two stocks at the jurisdiction boundary between the GSFMC and the SAFMC (GMFMC/SAFMC 2011). The Atlantic stock range was east of the Florida Keys through New York. Annual Catch Limits (ACL) were established for both stocks as required under the federal Magnuson-Stevens Act. The ACL for the Atlantic stock was set to 1,571,399 pounds with a 92% recreational and 8% commercial sector allocation. Amendment 20B (GMFMC/SAFMC 2014) modified the stock boundary based on the results of the 2013 stock assessment (SEDAR 2013) to the Florida-Georgia state line. A new ACL was set at 690,000 pounds for the 2015 fishing season and 670,000 pounds for every year after, with sector allocations shifting appropriately. Accountability Measures (AM) required under the federal Magnuson Stevens-Act were established to ensure that ACLs are not exceeded, and that stock does not become overfished. Accountability measures require the councils to take action to limit the harvest of the species if an ACL is exceeded. For cobia, the recreational AMs did not allow for in-season closures if the ACL was met or projected to be met rather, measures were to be taken the following season to limit the harvest to keep the three-year running average of landings at or below the ACL. If the total ACL was exceeded, the AMs require that the length of the recreational season the following year be reduced to constrain harvest to the ACL for that year. The commercial AMs required an in-season closure if the commercial ACL was met or projected to be met. If the stock was overfished, and the total ACL is exceeded, then the sector-specific ACL for the following year will be reduced by the appropriate sector-specific overage.

Framework Amendment 4 (SAFMC 2016) to Amendment 20B to the CMP FMP was approved by the council in September of 2016 and the final rule went into effect in September 2017. The amendment increased the recreational minimum size limit of cobia to 36 inches FL, reduced the bag limit to one fish per person per day and implemented a vessel limit. The recreational AM were modified to allow for a reduction in vessel limit before a season reduction was implemented. The framework amendment also maintained the existing commercial minimum size limit and established a two fish per person per day or six fish per vessel per day (whichever is more restrictive) commercial trip limit.

Amendment 31 (SAFMC 2018) to the CMP FMP was approved by the council in June of 2018 and the final rule went into effect March of 2019. The amendment removed the Atlantic migratory group cobia (Georgia through New York) from federal management under the Magnuson-Stevens Act and transferred sole management of Atlantic cobia to the Atlantic States Marine Fisheries Commission (ASMFC). The amendment also implemented comparable regulations to the CMP FMP in the federal waters under the Atlantic Coastal Act in order to ensure that Atlantic cobia continues to be managed in federal waters and that there was no lapse in the management of the stock.

The ASMFC approved the Interstate FMP for Atlantic Migratory Group Cobia in November of 2017 (ASFMC 2017). The interstate plan complemented Framework Amendment 4 to the Gulf of Mexico and South Atlantic FMP for cobia and established Recreational Harvest Limits (RHL) for the Atlantic states based on the federal recreational and commercial ACLs. The plan provided states with flexibility in management of the species by allowing the states to define their own season and vessel limits to constrain harvest to the RHL. At a minimum, states must comply with the size limits and bag limits established in Framework Amendment 4 and not exceed the vessel limits for commercial and recreational vessels (SAFMC 2016). State landings will be evaluated against the RHLs every three years to ensure that management measures are constraining coastwide harvest to the Federal ACLs.

To accommodate the removal of Atlantic cobia from federal management, ASMFC approved Amendment 1 in August 2019. Amendment 1 changed several portions of the Commission's FMP that were previously dependent on the CMP FMP and instituted a long-term strategy for managing in the absence of a federal plan (ASMFC 2019). Several of these changes established processes for the Commission to carry out management responsibilities previously performed by the South Atlantic Council, including setting harvest quotas and sector allocations, and defining stock status criteria. Amendment 1 recommended to NOAA Fisheries that fishing in federal waters be regulated according to the state of landing. Amendment 1 changed the units used to measure and evaluate the recreational fishery from pounds to numbers of fish. Additionally, Amendment 1 transitioned responsibilities of monitoring and closing commercial harvest to the Commission and established *de minimis* criteria for the commercial fishery (ASMFC 2019).

When SEDAR 58 was accepted for management, the ASMFC South Atlantic Board approved an increase in the annual total harvest based on the assessment results and harvest projections (SEDAR 2020). Addendum 1 to Amendment 1 was initiated after approval of the assessment. The Board approved the Addendum in October 2020. Addendum 1 modified the sector allocations from a 92% recreational, 8% commercial split to 96% recreational, 4% commercial, respectively (ASMFC 2020). The change was primarily based on new recreational catch estimates that resulted from changes in survey methodology by the Marine Recreational Information Program; estimates were, on average, two times higher than previously estimated. The new commercial allocation allowed the fishery to operate at the current level with some room for landings to increase as the stock range expands further north. Additionally, Addendum 1 modified the calculation of the commercial trigger to determine when an in-season coastwide commercial closure occurs and modified *de minimis* measures including an adjustment to the commercial allocation set aside and the recreational regulations (ASMFC 2020).

In August 2024, the ASMFC approved Addendum II to Amendment I of the Interstate FMP for Atlantic Migratory Group Cobia. The addendum modifies the recreational allocation framework by implementing a regional approach, with two regions defined as Rhode Island through Virginia (northern region) and North Carolina through Georgia (southern region). The regional structure aims to reduce uncertainty in harvest estimates by pooling data across multiple states. Additionally, the addendum allows for quicker updates to allocations should data be revised. Addendum II also extends the evaluation period for comparing harvest to the RHL from every three years to every five years, providing states more time to implement and assess management before adjustments are triggered.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Interjurisdictional Fisheries Management Plan (IJ FMP). The goal of the IJ FMP is to adopt fishery management plans, consistent with N.C. law, approved by the MAFMC, SAFMC, 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 (Atlantic States Marine Fisheries Commission plans) are like the goals of the Fisheries Reform Act of 1997 to "ensure long-term viability" of these fisheries (NCDMF 2022).

Management Unit

The management unit for Atlantic cobia is defined as all waters north of the Florida-Georgia line through New York from coastal estuarine waters eastward to the offshore boundaries of the EEZ (ASMFC 2019; Figure 1).

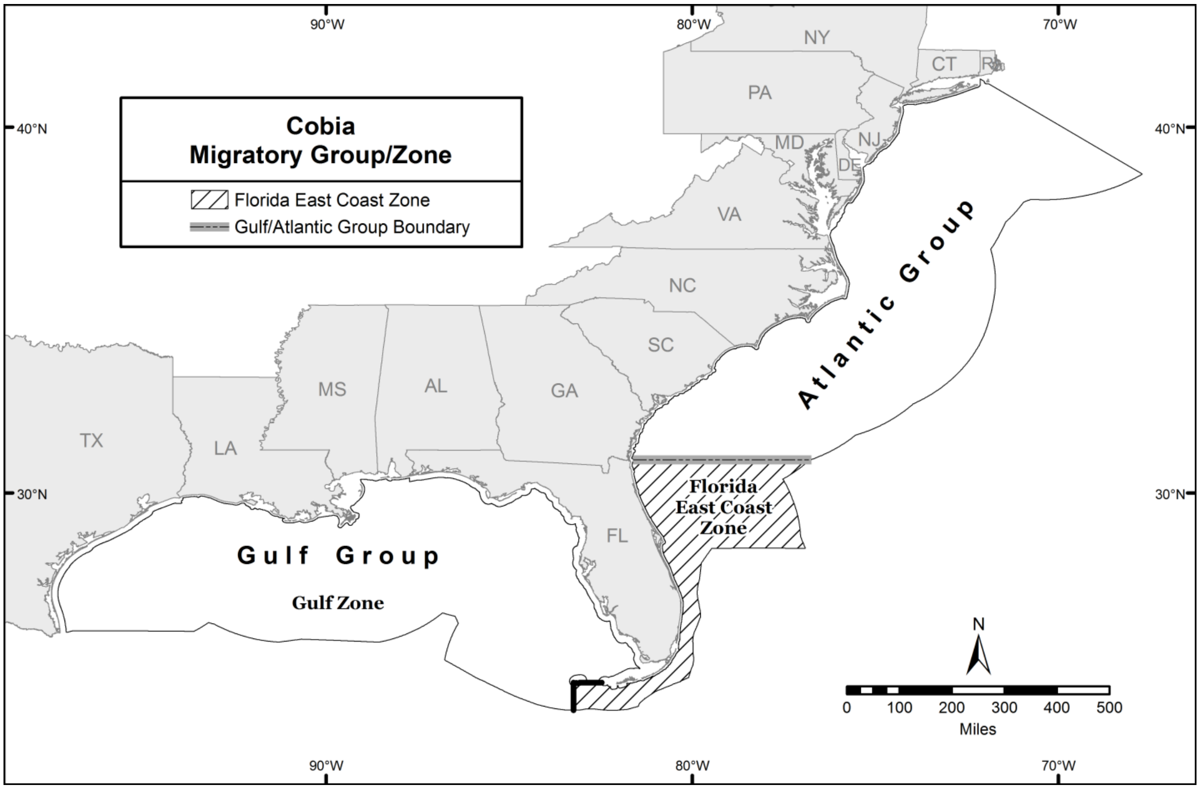

Figure 1. Zone splits for Gulf and Atlantic Migratory Group cobia established in Coastal Migratory Pelagics Fishery Management Plan Amendment 20b (Source: GMFMC/SAFMC 2014).

Goal and Objectives

The goal of Amendment 1 to the Interstate FMP (ASMFC 2019) is to provide for an efficient management structure that implements coastwide management measures, providing equitable and sustainable access to the Atlantic cobia resource throughout the management unit in a timely manner.

The following objectives are intended to support the goal of Amendment 1.

- Provide a flexible management system to address future changes in resource abundance, scientific information, and fishing patterns among user groups or area.
- Implement management measures that allow stable, sustainable harvest of Atlantic cobia in both state and federal waters.
- Establish a harvest specification procedure that will allow flexibility to respond quickly to stock assessment results or problems in the fishery, while also providing opportunities for public input on potential significant changes to management.
- Promote continued, cooperative collection of biological, economic, and social data required to effectively monitor and assess the status of the Atlantic cobia resource and evaluate management efforts.
- Manage the Atlantic cobia fishery to protect both young individuals and established breeding stock.
- Develop research priorities that will further refine the Atlantic cobia management program to maximize the biological, social, and economic benefits derived from the Atlantic cobia population.

DESCRIPTION OF THE STOCK

Biological Profile

Cobia is the sole member of the family Rachycentridae. It is a fast growing and moderately long-lived species with a maximum reported age of 16 years with a worldwide distribution in tropical, subtropical, and warm-temperature waters (SEDAR 2018). In the western Atlantic, cobia occur from Nova Scotia, Canada south to Argentina including the Caribbean Sea. Off the coast of the United States, they are most abundant in nearshore coastal waters from Virginia south through the Gulf of Mexico. They migrate in the spring and fall from inshore and offshore habitats, as well as up and down the Atlantic coast (Perkinson et al. 2019; Crear et al. 2020; Gallagher 2020). Tagging and genetics studies have shown there is the potential for a resident sub-stock off Virginia and northern North Carolina (Darden et al. 2014; Perkinson et al. 2019; Gallagher 2020)

Spawning along the Atlantic coast occurs from April through July, peaking in May and June around inlets and in high salinity estuarine waters (Brown-Peterson et al. 2001). In North Carolina, spawning peaks in June, coinciding with water temperatures of 20 – 25°C (Smith 1995; Lefebrve and Denson 2012; Perkinson et al. 2019). Larval fish settle in the estuaries along the southeast and mid-Atlantic coasts and utilize them as nursery areas. Cobia can grow to as large as 14 inches FL in their first year of life and move offshore as the water temperatures cool in the fall. Most cobia are mature by age-2 and at 31 inches in FL (Smith 1995). Females can spawn multiple times in a season and can produce millions of eggs in a single year. Cobia can grow as large as 100 pounds but are typically encountered by fisherman in the 25-to-40-pound range. Cobia are typically bottom feeders, consuming fish and crabs, but they have been known to consume prey as large as turtles. Cobia are structure oriented and can be found near channel markers, sea walls and jetties, or floating objects like larger marine animals such as leatherback sea turtles and rays.

Stock Status

Results of the 2020 benchmark assessment indicate that cobia are not overfished, and overfishing is not occurring (SEDAR 2020; Figures 2 and 3). An operational assessment updating the benchmark assessment was scheduled for 2025 but is on hold indefinitely.

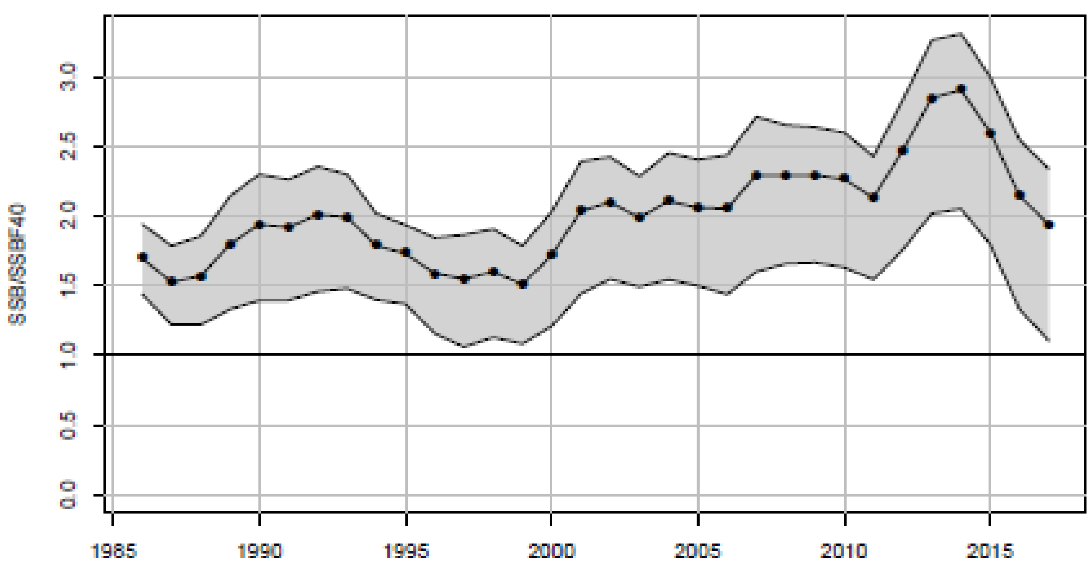

Figure 2. Spawning Stock Biomass (SSB) relative to the established reference point SSBF40% for cobia from SEDAR 58 (SEDAR 2020). The shaded gray error bands indicate 5th and 95th percentiles of the Monte Carlo Bootstrap trials.

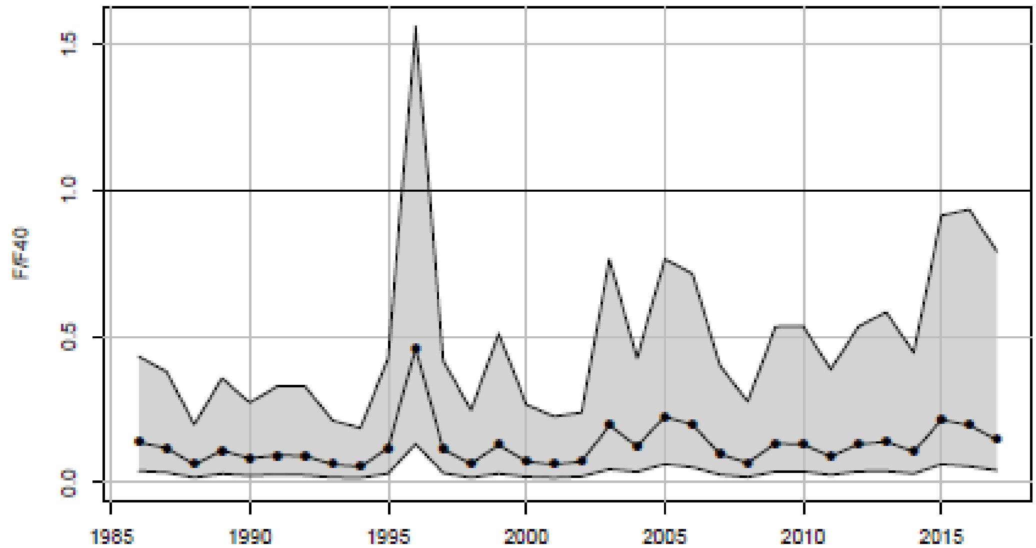

Figure 3. Fishing mortality (F) relative to established reference point $F_{40\%}$ for cobia from SEDAR 58 (SEDAR 2020). The shaded gray error bands indicate 5th and 95th percentiles of the Monte Carlo Bootstrap trials.

Stock Assessment

Cobia were assessed during South East Data, Assessment, and Review (SEDAR) 58 using data through 2017 (SEDAR 2020); this was a benchmark assessment. SEDAR 58 began with a stock identification workshop in April 2018. The workshop maintained the Florida-Georgia state line as the stock boundary since this border is within a transition zone that occurs from the southern boundary of Brevard County, FL to Brunswick, GA (SEDAR 2018).

SEDAR 58 assessed the Atlantic stock of cobia using data from 1986 – 2017 (SEDAR 2020). This assessment included several modifications from the previous assessment (SEDAR 2013). Though more years of data were added to the end of the assessment, overall, the time series was shorted such that the model was started in the year when the best data became available.

The data available for cobia included life history information, commercial and recreational landings and discards, commercial and recreational length and age composition, and the headboat logbook index. The Beaufort Assessment Model (BAM) was selected by the Assessment Workshop as the primary assessment model. The BAM uses a statistical catch-at-age formulation which allows for forward-projecting a fish population through time. The base run of the BAM indicated that cobia were not overfished in the terminal year ($SSB_{2017}/SSB_{40\%} = 1.41$; Figure 2) and overfishing was not occurring ($F_{2015\text{-}2017}/F_{40\%} = 0.29$; Figure 3). Sensitivity runs of the model confirmed these values were consistent.

Sources of uncertainty in the assessment included the lack of a fishery-independent index of abundance and the fact that the sole index used in the model was from a fishery-dependent source. Because the fishery operates in such a way that a trip consists of very few fish, the reliability of fishery-dependent indices as a true indicator of the stock should be approached with caution since they may not track actual abundance well and issues can be exacerbated by management measures. For SEDAR 58, the fishery-dependent index was not extended past 2015 due to seasonal closures. The spawner-recruit relationship was also not well defined and annual recruitment was based on a fixed value. MSY-based management quantities rely heavily on this value, so results should be considered with this uncertainty in mind.

Overall, the model estimated little trend in SSB, though the terminal year was the lowest of the time series (Figure 2). The last strong year class in the model was predicted to have occurred around 2010. Predicted recruitment in the last four years (2014–2017) was below the time series average. If recruitment remains low, the decline in the stock as seen in the last several years of the assessment will continue.

DESCRIPTION OF THE FISHERY

Current Regulations

Under the Interstate Plan, North Carolina must implement seasons and/or vessel limits that constrain harvest to the RHL. State landings will be evaluated against the RHL by averaging landings over a five-year period. The acceptance of SEDAR 58 in 2020 for management meant an increase in the number of fish available for harvest, and the shift of harvest allocation to the recreational sector through Addendum I. Addendum II establishes regional allocations, assigning 68.7% of the recreational quota to the northern region and 31.3% to the southern region. Quota for the 2024–2026 fishing seasons was set in August 2023. With the adoption of Addendum II, the two established regions will share a recreational quota of 76,908 fish and a commercial quota of 73,116 pounds.

North Carolina enforces a 36-inch FL minimum size limit and a one fish per-person per-day possession limit with a season from May 1 to December 31. Vessel limits for private vessels are set to two fish per-vessel from May 1 to June 30 and one fish per-vessel from June 1 to December 31. Charter and for-hire vessels may harvest up to four fish per vessel from May 1 to December 31. The commercial fishery is managed under a 36-inch FL minimum size limit and two fish per-person per-day possession limit, not to exceed six fish per vessel.

Commercial Fishery

Commercial landings of cobia in North Carolina are available from 1950 to the present. However, monthly landings were not available until 1972. North Carolina instituted mandatory reporting of commercial landings through their Trip Ticket Program, starting in 1994. Landings data collected since 1994 are considered the most reliable. Since 1986, commercial landings have ranged from 14,898 pounds in 1989 to 52,684 pounds in 2015 (Figure 4). Over the last decade, commercial landings have averaged 32,418 pounds (Table 1). In 2024, 28,561 pounds were landed commercially in North Carolina.

Table 1. Recreational harvest (number of fish released and weight) and releases (number of fish) and commercial harvest (weight in pounds) of cobia from North Carolina, 2015–2024.

	Recreational			Commercial	
Year	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
2015	47,110	44,254	1,925,762	52,684	1,978,446
2016	26,421	39,237	838,363	48,252	886,615
2017	25,025	125,251	872,861	20,842	893,703
2018	25,331	68,219	685,962	20,629	706,591
2019	10,090	38,285	254,963	21,553	276,516
2020	15,067	51,158	407,883	38,344	446,227
2021	10,970	40,136	356,340	29,301	385,641
2022	12,330	46,777	306,411	32,711	339,122
2023	629	32,590	12,523	31,301	43,824
2024	3,631	23,992	103,272	28,561	131,833
Mean	17,660	50,990	576,434	32,418	608,852

*2020 recreational data contains imputed data as a result of impacts from COVID on sampling during this year.

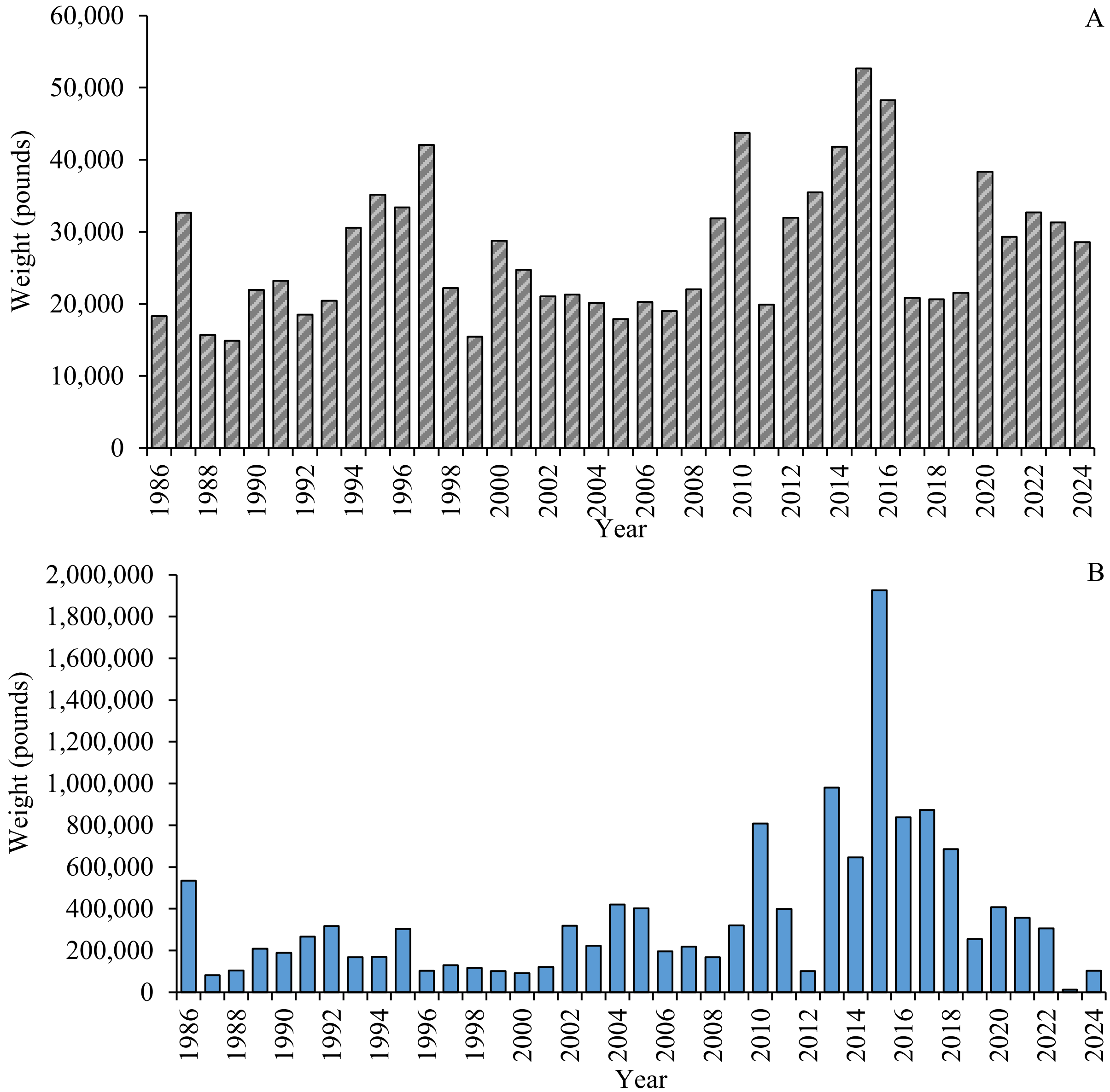

Figure 4. Annual commercial (A) and recreational (B) landings in pounds for cobia in North Carolina from 1986–2024.

The primary fisheries associated with cobia in North Carolina are the snapper-grouper, coastal pelagic troll, and the gill net fisheries. The primary commercial gear used to harvest cobia has changed over time. This is most likely due to changing fisheries and the fact that it is mostly considered a marketable bycatch fishery. From 1950 to the late 1970s, cobia were primarily landed out of the haul seine fishery. Most landings that occurred during the 1980s came from the pelagic troll and hook-and-line fisheries with modest landings from the haul seine and anchored gill net fisheries. Since 1994, most landings have occurred from the gill net and hook and line fisheries with gill nets being the top gear during most of those years. In 2024, gill nets accounted for 53% of the landings, while 34% of the landings were from the hook-and-line (Figure 5).

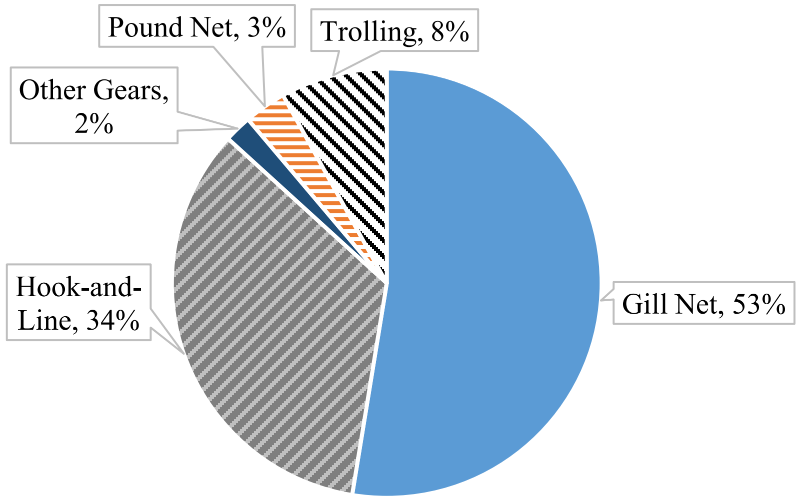

Figure 5. Commercial harvest in 2024 by gear type. Other gears can include beach seines, trawls, crab and fish pots, flynets, fyke nets, spears, longlines, and haul seines.

From 2017–2019, gill-net landings were below average because the cobia season closed in early September. SEDAR 58 resulted in an increase to the commercial quota in 2020. Since then, gill-net landings have increased relative to 2017–2019. This is because fishermen have been able to land cobia incidentally caught during the fall king mackerel fishery. From 2012–2017, landings in the pound net fishery increased, accounting for up to 12% of the total landings dependent on the year; however, since 2017, pound nets landings have contributed less than 5% to the overall landings. Harvest in the hook and line fishery has increased since 2022 (Table 2).

Table 2. Commercial harvest (weight in pounds) by gear, 2015–2024.

	Gear					
Year	Gill Nets	Hook & Line	Trolling	Pound Nets	Other*	Total
2015	32,904	10,624	3,560	4,541	1,055	52,684
2016	32,809	9,041	2,314	3,434	656	48,252
2017	11,768	4,765	1,056	2,541	712	20,842
2018	8,965	7,040	2,552	1,636	436	20,629
2019	9,417	7,752	3,221	473	690	21,553
2020	29,202	3,175	3,780	1,294	894	38,344
2021	21,451	4,146	2,078	1,060	567	29,301
2022	23,028	4,267	3,909	941	541	32,686
2023	21,390	7,006	1,825	557	524	31,302
2024	15,016	9,764	2,291	900	589	28,560
Mean	20,595	6,758	2,659	1,738	666	

*Other can include beach seines, trawls, crab and fish pots, flynets, fyke nets, spears, longlines, and haul seines.

Recreational Fishery

Historically, recreational fisherman targeted cobia from a vessel by anchoring and fishing either dead or live bait, or both near inlets and deep-water sloughs inshore (Manooch 1984). Fish were also harvested from shore or off piers using dead or live bait, most commonly menhaden. In the early 2000s, fisherman began outfitting their vessels with towers to gain a higher vantage point to spot and target free swimming cobia along tidelines and around bait aggregations. This method of fishing actively targets cobia in the nearshore coastal zone and has become the primary mode of fishing in most parts of the state.

Recreational harvest estimates are available from 1981 to the present. Recreational estimates across all years have been updated and are now based on the MRIP new Fishing Effort Survey-based calibrated estimates. For more information on recreational estimates and the survey see: https://www.fisheries.noaa.gov/topic/recreational-fishing-data.

Cobia is enthusiastically pursued by recreational anglers in North Carolina. Over the last 10 years, excluding 2023, recreational harvest has averaged 94% of the total harvest. North Carolina recreational cobia landings have been lower the last several years relative to previous years. Weather conditions, including persistent winds, have hindered fishing efforts by reducing the number of fishable days, most noticeably in 2023 with only 12,523 pounds landed (Table 1; Figure 4). The North Carolina cobia fishery is a pulse fishery, with the primary wave fish historically arriving in early June and being available for about 6 weeks. In recent years, anecdotal observations suggest the cobia are migrating to Chesapeake Bay much earlier, in April and May, and are residing in North Carolina for a shorter period of time. Recreational harvest in 2023 is the lowest in the full time series, with 81,833 pounds landed in 1987 as the second lowest. Recreational harvest of cobia in North Carolina has ranged to a high of 1,925,762 pounds in 2015. Over the past decade, landings have averaged 576,434 pounds.

The North Carolina Division of Marine Fisheries (DMF) offers award citations for exceptional catches of cobia. Harvested cobia that weigh greater than 40 pounds, and cobia captured and released that measure greater than 33 inches FL (prior to May 1, 2021) or 36 inches FL (currently), are eligible for an award citation. Since 1991, just over 10,900 citations have been awarded for cobia. On average, 11% of citations have been from released fish; in 2024, 6% were from releases. From 1991 through 2017 the number of award citations for cobia was variable but steadily increased. The last few years have seen fewer citations (Figure 6).

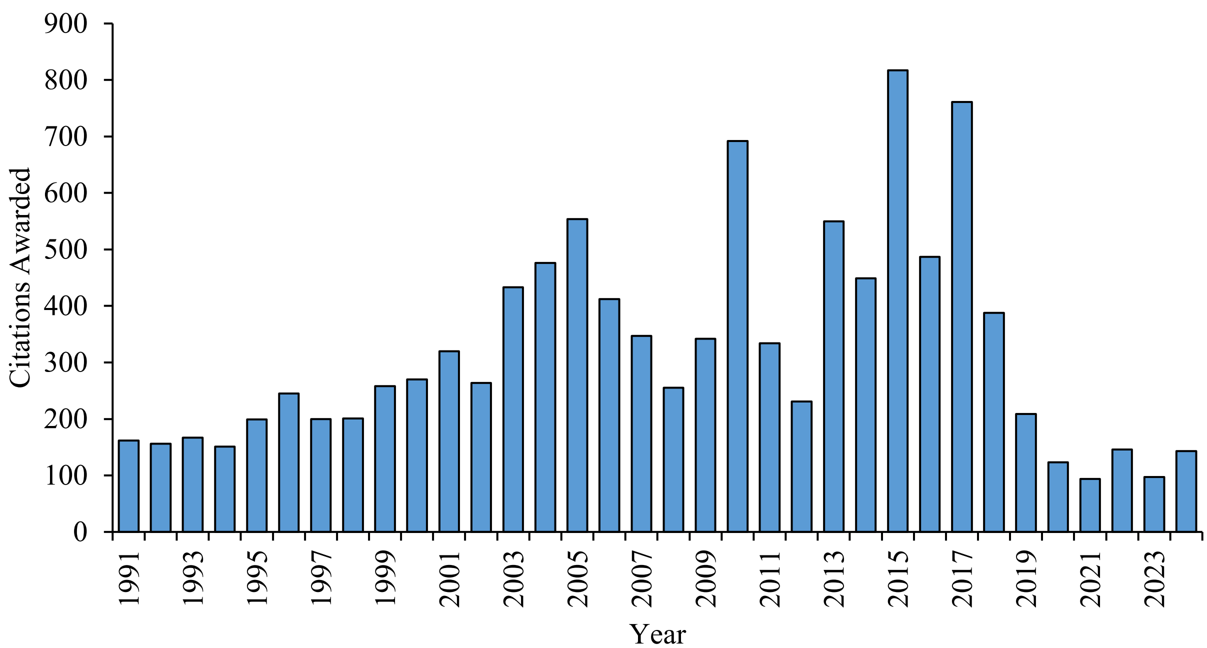

Figure 6. North Carolina Saltwater Fishing Tournament citations awarded for cobia from 1991–2024.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Fishery dependent length-frequency information for the commercial cobia fishery in North Carolina is collected by fish house samplers, the majority of which come DMF Program 438 (Offshore Live Bottom Fishery), as well as Program 431 (Sciaenid Pound Nets) and Program 434 (Ocean Gill Net Fishery). Length-frequency information for the recreational cobia fishery is collected through the DMF Carcass Collection Program and MRIP. Fourty-six cobia were measured from the commercial fishery in 2024 with an average FL of 39 inches (Table 3). Mean FL has ranged from 36 to 43 inches in the last two decades. Cobia landed in the commercial fishery have ranged from 15 to 61 inches FL (Figure 7B).

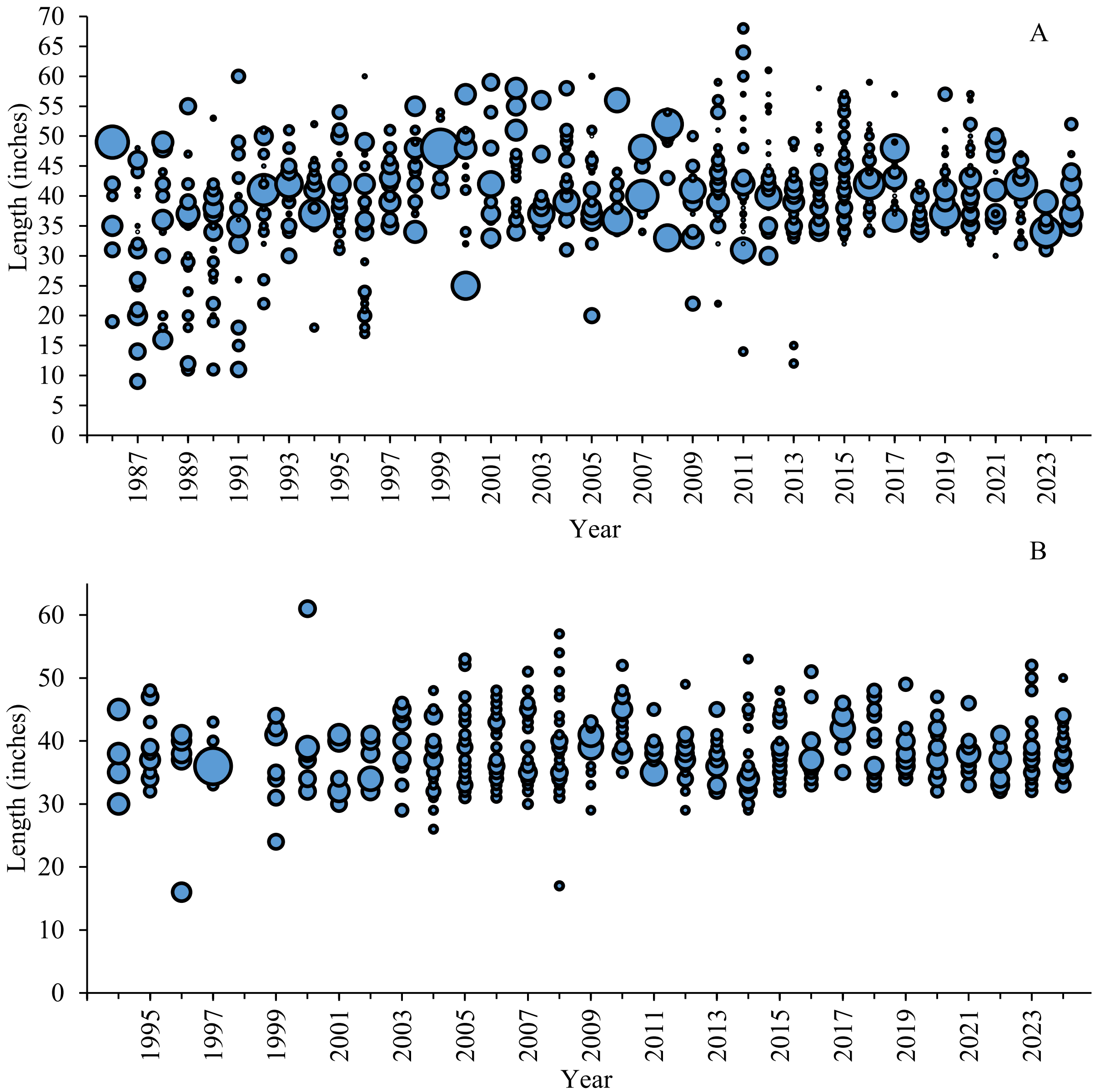

Figure 7. (A) Recreational length frequency (fork length, inches) of cobia harvested from 1986–2024 and (B) Commercial length frequency (fork length, inches) of cobia harvested from 1994–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Fifteen cobia were measured by MRIP in 2024 with an average FL of 40 inches (Table 3). Cobia harvested in the recreational fishery have ranged from 9 to 68 inches FL (Figure 7A). A total of 19 cobia were measured through the carcass collection program in 2023, with an average FL of 39 inches (Table 4). Size trends in commercially landed fish for most years appear to correspond with sizes observed in the recreational fishery (Table 3). The length distribution of the recreational fishery was similar to the commercial fishery in 2024 (Figure 8).

Table 3. Mean, minimum, and maximum lengths (fork length, inches) of cobia sampled from the commercial fisheries and the recreational fisheries (MRIP).

Year	Commercial				Recreational (MRIP)			
	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2004	38	26	49	27	43	32	58	26
2005	39	31	54	16	37	20	61	30
2006	39	32	49	23	43	34	57	12
2007	40	31	52	24	44	34	49	8
2008	40	18	57	28	45	33	55	5
2009	39	34	44	5	38	23	51	8
2010	43	34	52	30	43	23	59	58
2011	38	34	46	11	42	14	68	21
2012	37	29	41	23	39	30	62	11
2013	37	19	48	18	39	12	50	34
2014	36	30	53	32	39	33	58	41
2015	39	32	48	33	44	32	58	65
2016	39	33	51	12	43	35	59	54
2017	42	36	46	9	43	36	58	27
2018	39	33	48	18	41	33	57	60
2019	39	28	49	17	40	34	57	30
2020	40	33	58	20	41	33	57	67
2021	37	31	47	16	43	31	50	9
2022	37	32	42	12	42	32	48	17
2023	39	33	52	37	34	31	39	9
2024	39	33	51	46	40	35	52	15

Table 4. Mean, minimum, and maximum lengths (fork length, inches) of cobia sampled from the NCDMF Carcass Collection Program 2016–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2016	44	36	63	12
2017	41	33	48	38
2018	37	23	47	39
2019	45	35	57	42
2020	41	34	49	9
2021	41	35	49	28
2022	39	33	46	26
2023	40	29	49	19
2024	40	32	53	55

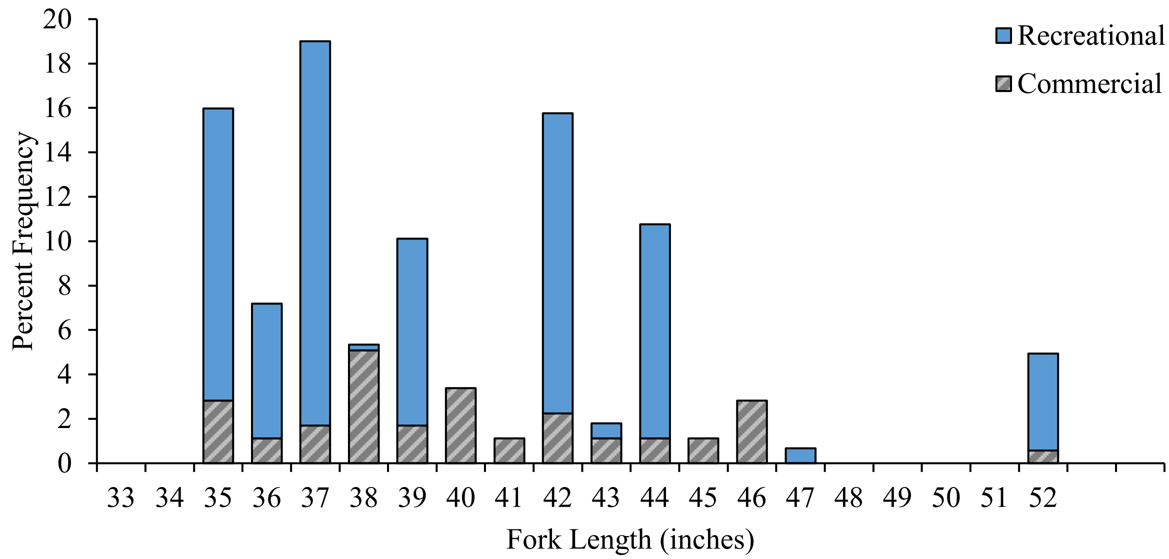

Figure 8. Commercial and recreational length frequency distribution from cobia harvested in 2024.

In order to describe the age structure of harvest and indices, cobia age structures are collected from various fishery-independent and dependent sources throughout the year. Up until 2018, aging structures were provided to the NOAA Beaufort Age Lab for analysis. In 2024, 74 cobia were aged (Table 5). The age-length relationship is less predictable beyond age-3, as there is overlap in age for a given length (Figure 9).

Table 5. Summary of cobia age samples collected from both dependent (commercial and recreational fisheries) and independent (surveys) sources, 2008–2024.

Year	Minimum Age	Maximum Age	Total Number Aged
2008	0	1	7
2009	1	1	4
2010	0	12	13
2011	0	1	6
2012	1	4	5
2013	1	1	1
2014*	-	-	0
2015	1	1	1
2016	0	11	20
2017	0	13	50
2018	0	15	66
2019	0	12	72
2020	1	10	30
2021	0	12	43
2022	0	11	38
2023	0	9	55
2024	0	9	74

*Cobia was not added to the priority species list for sampling until 2016; as a result, no species were collected in 2014.

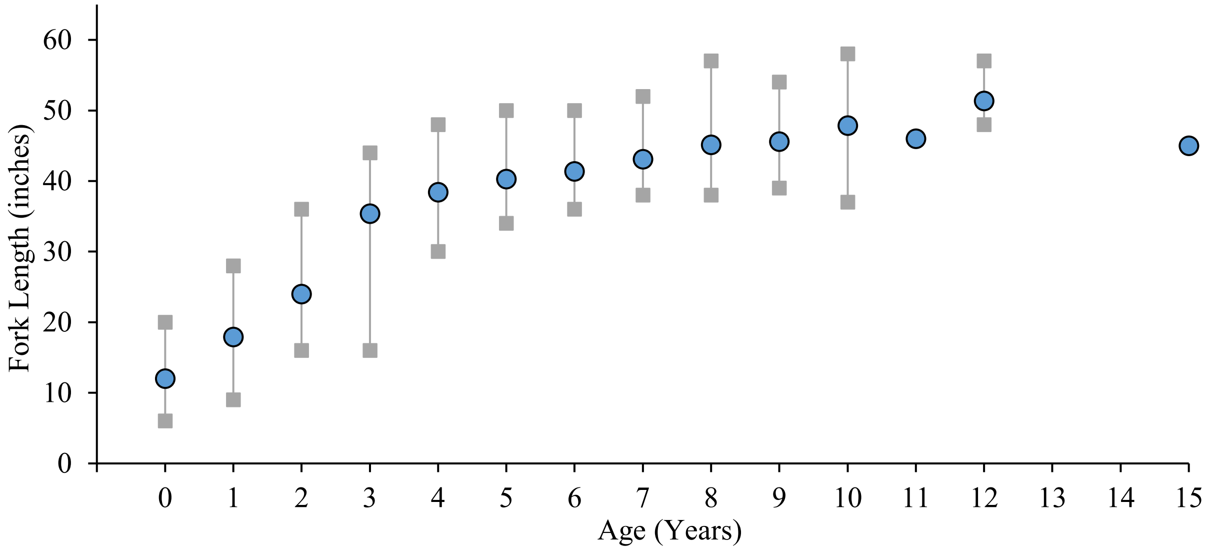

Figure 9. Cobia length at age based on all age samples collected from 2018–2024. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.

Fishery-Independent Monitoring

Currently, the DMF does not have any fishery-independent sampling programs that target cobia. Very few DMF sampling programs observe cobia.

In 2001, the DMF initiated a fisheries-independent gill net survey in Pamlico Sound (Program 915). The objective of this program is to provide annual, independent, relative abundance indices for key estuarine species in the nearshore Pamlico Sound. The survey employs a stratified random sampling design and utilizes multiple mesh gill nets (3.0-inch to 6.5-inch stretched mesh, by half-inch increments). A total of 187 cobia have been captured in the Pamlico Sound Independent Gill Net Survey from 2001–2024. Cobia ranged in size from 6 to 38 inches FL and had a mean size of 19 inches FL. Due to the low number of positive trips (ranging from <1% to 5% of all sets), this survey cannot be used to create an index for cobia. Additionally, cobia have been caught by the independent gill net survey sampling south of Pamlico Sound. The 'Rivers' portion of the survey (Neuse, Pamlico, Tar, and Pungo rivers) was initiated in 2003, the 'Southern' portion (Cape Fear and New rivers) in 2008, and the 'Central' portion (White Oak River through Back Sound) in 2018. Ninety-two cobia have been caught in this sampling, ranging in size from 8 to 29 inches FL, with a mean size of 16 inches FL. While this data cannot be used to create an index of abundance, the gill net sampling program is one of the few programs on the Atlantic coast that catches smaller cobia, providing important life history information that may not otherwise be obtained.

In 2007, the DMF began a longline survey (Program 365) designed to provide a fishery independent abundance index for adult red drum in the Pamlico Sound and mouth of the Neuse River. Since the survey began, 23 cobia have been sampled, ranging in size from 24 to 44 inches FL, with a mean length of 33 inches FL.

Tagging Program

Cobia were added to the North Carolina multi-species tagging program in May of 2017. Cobia have been tagged each year since using both volunteer anglers and DMF staff throughout the coastal waters of the state along with some tags released in Chesapeake Bay. All cobia are tagged with red high reward tags ($100 reward) to maximize returns. Tagging of cobia will allow for information to be gathered on migration patterns and exploitation rates. Tagging of cobia has occurred along the coast ranging from Wilmington to the Chesapeake Bay.

The total number of cobia tagged from 2017 to 2023 is 747 fish (Table 6; Figure 10). There have been 111 recaptures (Table 6; Figure 10). The time series average was 402 days at large with an average distance travelled of 113 miles (Table 6). Most recaptures occur within the state of NC and VA as cobia tend to migrate north in the spring along the NC coast with movement into the Chesapeake Bay common during the summer months. The maximum distance travelled was 696 miles for a cobia tagged north of the Chesapeake Bay bridge in August of 2019 and recaptured 564 days later in February of 2021 off Fort Pierce, Florida (Figure 10). The maximum days between release and recapture was 1,558 days or just over 4 years (Table 6).

Table 6. Summary of cobia tagged as part of the DMF multi-species tagging program, 2017–2024.

Year Tagged	Total Fish Tagged	Total Fish Recaptured	Average Days Out	Max Days Out	Average Distance Traveled (mi)	Max Distance Traveled (mi)
2017	81	24	501	1,198	157	681
2018	214	49	434	1,558	109	370
2019	134	19	279	777	140	696
2020	29	1	357	357	3	3
2021	48	4	119	353	40	157
2022	42	3	375	398	80	144
2023	41	1	45	45	55	55
2024	157	6	46	91	45	144

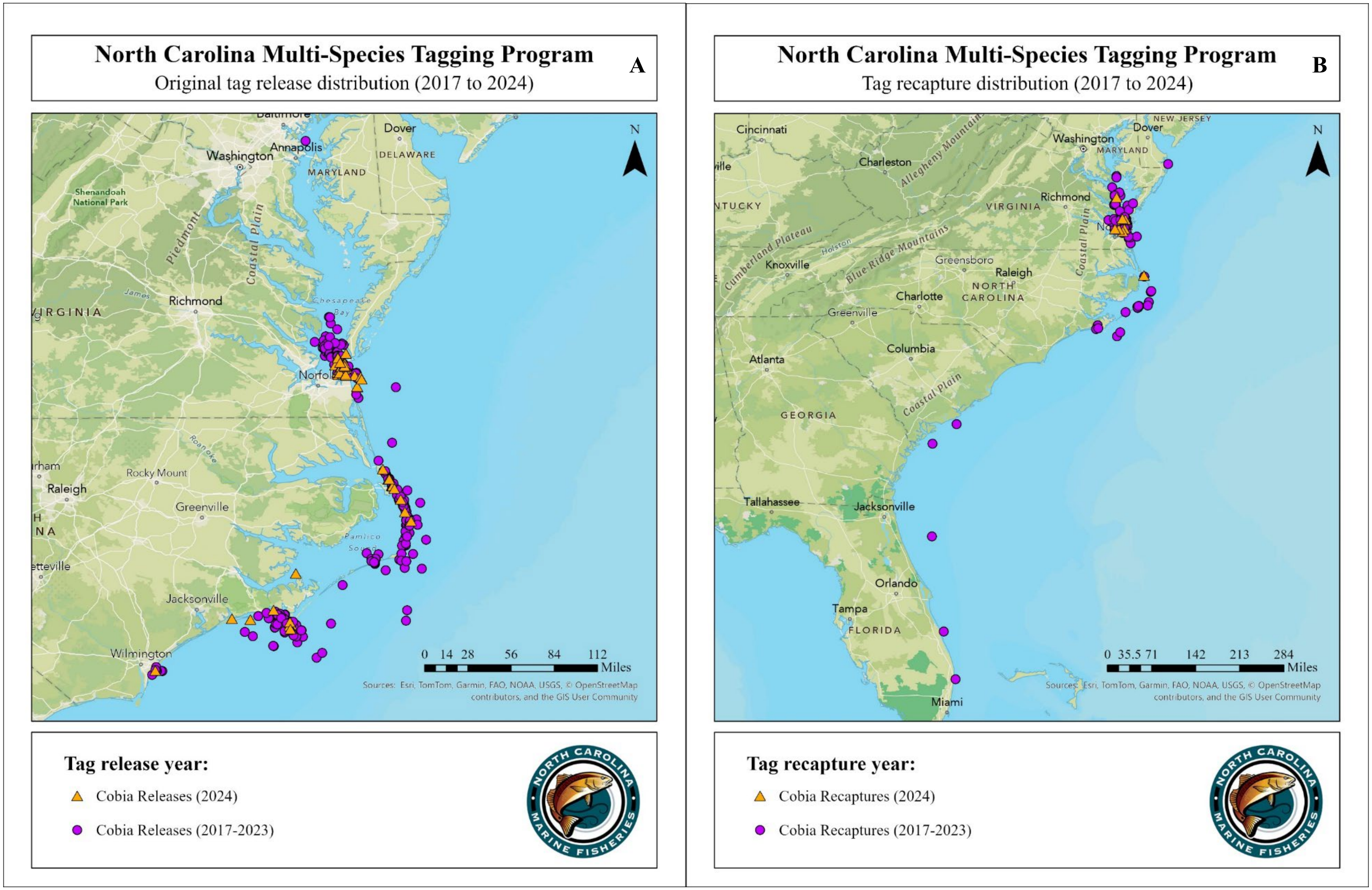

Figure 10. Cobia tagging release (A) and recapture (B) locations, 2017–2024.

RESEARCH NEEDS

Current research needs for cobia can be found in the most recent SEDAR 58 stock assessment report (SEDAR 2020) and Amendment 1 to the Interstate FMP (ASMFC 2019). Below is a list of state prioritized research needs based off the recommendations from SEDAR 58, Amendment 1 to the Interstate Plan, and input from DMF lead staff.

- Institute fisheries independent sampling programs to obtain estimates of cobia abundance.
- Better characterize the life history of cobia including age sampling of the recreational sector, update age- and length-at-maturity, batch fecundity, spawning seasonality, and spawning frequency information.
- Obtain more precise and timely estimates of harvest from the Atlantic cobia recreational fishery.
- Investigate release mortality and fishing mortality within the commercial and recreational fisheries.
- Increase reporting of recreational harvest and better characterize the recreational and for-hire fisheries.

MANAGEMENT

As of March 2019, cobia is managed solely under the ASMFC Interstate Plan requirements. The interstate plan, including Amendment 1 and Addendum 1 to the FMP, aim to maintain SSB above a threshold which allows for surplus recruitment to the stock.

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FISHERY MANAGEMENT PLAN UPDATE
DOLPHIN
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	June 2004	
	Amendment 1	July 2010
	Amendment 2	April 2012
	Amendment 3	August 2014
	Amendment 5	July 2014
	Amendment 6	January 2014
	Amendment 7	January 2016
	Amendment 8	February 2016
	Regulatory Amendment 1	March 2017
	Amendment 12	June 2021
	Amendment 10	May 2022
	Amendment 11	February 2024
Comprehensive Review:	None	

The South Atlantic Fishery Management Council (SAFMC), in cooperation with the Mid-Atlantic (MAFMC) and New England (NEFMC) councils, developed a Dolphin/Wahoo Fishery Management Plan (FMP) for the Atlantic in 2004. While dolphin was not overfished, the SAFMC adopted a precautionary and risk-averse approach to management for this fishery. The original FMP established a 20-inch fork length (FL) minimum size limit off Georgia and Florida; identified allowable gears in the fishery; and prohibited the use of longline gear to harvest dolphin in areas closed to the use of such gear for highly migratory species. Amendment 1 (2010) provided spatial information of SAFMC designated Essential Fish Habitat and Habitat Areas of Particular Concern relative to the dolphin wahoo fishery. Amendment 2 (SAFMC 2011) established acceptable Biological Catch (ABC), Annual Catch Limits (ACL), Accountability Measures (AM), modified the allocations for both commercial and recreational sectors, established Annual Catch Targets (ACT) for the recreational sector, prohibited bag limit sales of dolphin from for-hire vessels, and established a 20-inch FL minimum size limit for South Carolina. Amendment 3 (SAFMC 2014, 79 F.R. 19490) required federal dealer permits, and changed the method and frequency of reporting harvest. In 2013, Amendment 5 (SAFMC 2013) was approved and adopted by the SAFMC and was the most comprehensive amendment to the Dolphin/Wahoo FMP, in terms of process updates. Amendment 5 updated the ACLs and AM for both sectors, as well as the ABC values and ACT for the recreational fishery as a result of improvements to the recreational catch estimation methods used by the Marine Recreational Information Program (MRIP). This amendment also set up an abbreviated framework procedure whereby modifications to the ACLs, ACTs, and AMs can be implemented by the National Oceanic and Atmospheric Administration (NOAA) Fisheries without a full FMP amendment. Amendment 7 (SAFMC 2015a) allowed for dolphin and wahoo filets to enter the U.S. Exclusive Economic Zone (EEZ) after lawful harvest in the Bahamas. Amendment 8 (SAFMC 2015b) adjusted sector allocations and increased the commercial ACL to 10% of the total ACL. Regulatory Amendment 1 (SAFMC 2016), effective March 2017, established a commercial trip limit for vessels with an Atlantic dolphin/wahoo permit of 4,000 pounds for the dolphin commercial sector once 75% of the commercial ACL is landed. This regulatory change was pursued after the 2015 commercial ACL was met and commercial harvest was closed in late June of that year.

Amendment 12 was approved by the SAFMC at its September 2020 meeting and became effective June 6, 2021 (SAFMC 2020). Amendment 12 adds Bullet Mackerel and Frigate Mackerel to the Dolphin/Wahoo

FMP and designates them as ecosystem component species. Amendment 10 was approved by the SAFMC at its September 2021 meeting and became effective May 2, 2022 (SAFMC 2021). Amendment 10 includes actions that accommodate updated recreational data from the MRIP by revising the annual catch limits and sector allocations for dolphin and wahoo. The amendment also contains actions that implement other management changes in the fishery including revising accountability measures, accommodating possession of dolphin and wahoo on vessels with certain unauthorized gears onboard, removing the operator card requirement, and reducing the recreational vessel limit for dolphin and wahoo. Amendment 11 was approved by the SAFMC at its December 2023 meeting and became effective February 2024 (SAFMC 2023). Amendment 11 is included in the Comprehensive Acceptable Biological Catch Control Rule Amendment and modifies the Acceptable Biological Catch (ABC) Control Rule to address scientific uncertainty, management risk, and rebuilding stocks. Amendment 11 specifies criteria and procedures for phase-in of ABC changes and carry-over of unused portions of annual catch limits.

There are multiple amendments currently under development by the SAFMC. Regulatory amendment 3 includes actions that would increase the applicable geographic range of the 20-inch FL minimum size limit, modify bag and vessel limits, and reduce or remove captain and crew bag limits of dolphin. Amendment 4 is included in the Joint Commercial Electronic Logbook Reporting Amendment and modifies reporting requirements for commercial logbooks in dolphin and wahoo fisheries. Lastly, Amendments 13 and 14 are included in the Comprehensive Recreational For-Hire Limited Entry Amendment, which establishes limited entry for the for-hire components and improves for-hire reporting requirements in dolphin and wahoo fisheries.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt fishery management plans, consistent with N.C. law, approved by the MAFMC, SAFMC, or the Atlantic States Marine Fisheries Commission (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 (NCDMF 2015).

Management Unit

The management unit is the population of dolphin (Common Dolphin - *Coryphaena hippurus* and Pompano Dolphin - *Coryphaena equiselis*) from the U.S. South Atlantic, the Mid-Atlantic, and the New England coasts in the 3 to 200-mile EEZ.

Goal and Objectives

The goal of the plan is to maintain the current harvest levels of dolphin and ensure no new fisheries develop (SAFMC 2003(a)). With the potential for effort shifts in the historical commercial longline fisheries for sharks, tunas, and swordfish, these shifts or expansions into nearshore coastal waters to target dolphin could compromise the historical (1994–1997) and current allocation of the dolphin resource between recreational and commercial fishermen. To achieve these goals, the following management objectives were identified:

- Address localized reduction in fish abundance. The councils remain concerned over the potential shift of effort by longline vessels to traditional recreational fishing grounds and the resulting reduction in local availability if commercial harvest intensifies.
- Minimize market disruption. Commercial markets (mainly local) may be disrupted if large quantities of dolphin are landed from intense commercial harvest or unregulated catch and landing by charter or other components of the recreational sector.

- Minimize conflict and/or competition between recreational and commercial user groups. If commercial longlining effort increases, either directing on dolphin and wahoo or targeting these species as a significant bycatch, conflict and/or competition may arise if effort shifts to areas traditionally used by recreational fishermen.
- Optimize the social and economic benefits of the dolphin fishery. Given the significant importance of dolphin to the recreational sector throughout the range of these species and management unit, manage the resources to achieve optimum yield on a continuing basis.
- Reduce bycatch of the dolphin fishery. Bycatch is a problem in the pelagic longline fishery for highly migratory species. Any increase in overall effort, and more specifically shifts of effort into nearer shore, non-traditional fishing grounds by swordfish and tuna vessels, may result in increased bycatch of non-target species. In addition, National Standard 9 requires that: "Conservation and management measures shall, to the extent practicable, (a) minimize bycatch and (b) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch." Therefore, bycatch of the directed dolphin fishery must be addressed.
- Direct research to evaluate the role of dolphin and wahoo as predator and prey in the pelagic ecosystem.
- Direct research to enhance collection of biological, habitat, social, and economic data on dolphin and wahoo stocks and fisheries.

DESCRIPTION OF THE STOCK

Biological Profile

Dolphin, also called mahi-mahi, dorado, or common dolphin, is a pelagic marine species and can be found worldwide in tropical and subtropical waters. They are sight feeders and usually live in the top 50 feet of the water column. They gather around floating debris and flotsam and prefer water temperatures ranging from 21 – 30 degrees Celsius (70–86 degrees Fahrenheit). Adult male and female fish are commonly referred to as 'bulls' and 'cows', respectively, because of their different shapes and appearance. Mature males have a high, flat forehead unlike females. The species is short lived (maximum age is 4) and grow rapidly, with some fish reaching lengths of 36 inches by age-1 (Schwenke et al. 2008). The state record for dolphin was caught off Cape Hatteras in 1993 and weighed 79 pounds; however, most fish landed in North Carolina weigh between 5 and 25 pounds. Dolphin can become sexually mature by four months and as small as 14 inches FL with most fish maturing by 24 inches FL (Schwenke et al. 2008). They are considered batch spawners, meaning they will spawn many times throughout the spawning season, maximizing the survival of larval fish. Spawning occurs offshore of North Carolina around floating grass (brown algae known as Sargassum) and debris during the spring and summer months. In tropical areas, dolphin have been known to spawn year-round.

Stock Status

The stock status of dolphin in the Western Atlantic is unknown.

Stock Assessment

A stock assessment is not available for this species.

DESCRIPTION OF THE FISHERY

Current Regulations

The North Carolina Division of Marine Fisheries (DMF) currently complements the management measures of the Dolphin/Wahoo FMP through rule (15A NCAC 03M .0515) and proclamation (15A NCAC 03M. 0512). It is unlawful to possess more than 10 dolphin per person per day or more than 54 dolphin per vessel per day. Headboats are excluded from the vessel limit requirement. It is also unlawful to sell a recreational bag limit of dolphin harvested by a person on a vessel while it is operating as a charter vessel or headboat or to sell dolphin without a Federal Commercial Dolphin/Wahoo Vessel Permit. Commercially harvested dolphin must be at least 20 inches fork length. There is no trip limit for vessels that possess the Federal Commercial Dolphin/Wahoo Vessel Permit unless 75% of the commercial ACL is reached, at which time a 4,000-pound trip limit is implemented. Commercial vessels federally permitted in another fishery are allowed to land up to 200 pounds of dolphin and wahoo combined.

Commercial Fishery

Commercial landings of dolphin are reported through the mandatory DMF Trip Ticket program. Landings since 1986 have fluctuated with a low of 11,087 pounds in 2024 and a high of 611,962 pounds in 2009 (Table 1; Figure 1). Commercial landings in 2024 (11,087 pounds) were much lower than the time series average (180,298 pounds), and the lowest landings of the time series.

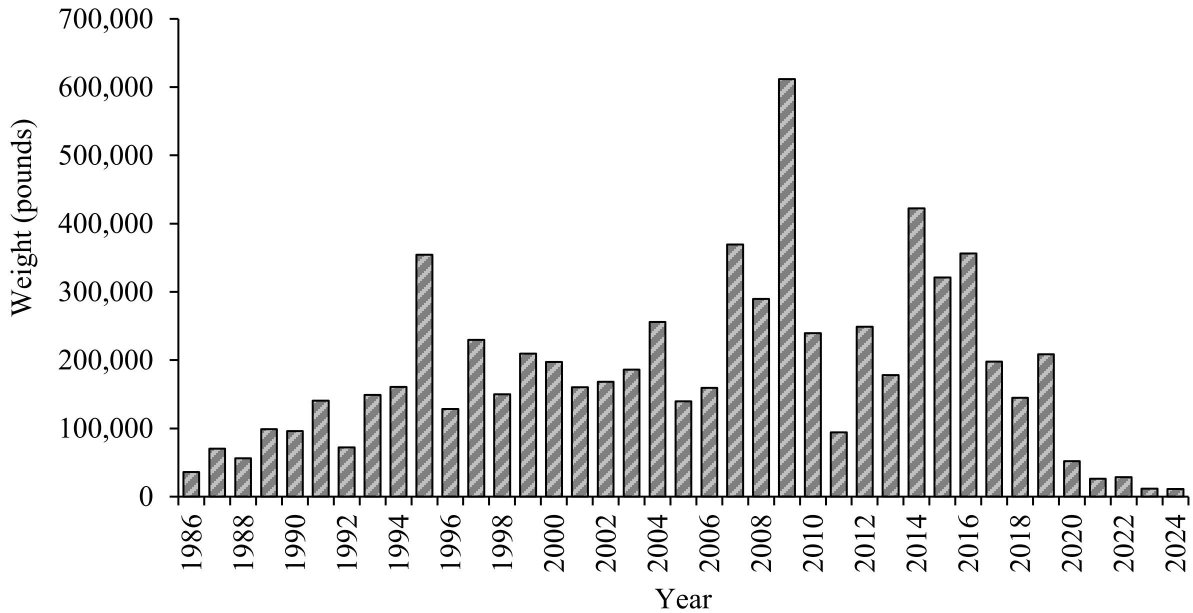

Figure 1. Annual commercial landings in pounds of dolphin in North Carolina, 1986–2024.

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of dolphin from North Carolina, 1986–2024.

	Recreational			Commercial	
Year	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1986	49,810	589	478,136	35,923	514,059
1987	92,582	79	489,338	70,516	559,854
1988	81,487	31,103	205,599	56,098	261,697
1989	231,953	1,696	1,653,574	98,899	1,752,473
1990	209,476	1,452	986,307	96,207	1,082,514
1991	254,975	6,565	1,298,933	140,837	1,439,770
1992	167,690	6,936	927,165	72,119	999,284
1993	291,297	3,190	1,527,078	149,043	1,676,121
1994	268,417	9,402	1,791,880	160,742	1,952,622
1995	294,100	9,620	2,324,560	354,188	2,678,748
1996	213,861	2,154	1,514,866	128,586	1,643,452
1997	372,989	6,320	3,400,820	229,791	3,630,611
1998	241,733	9,249	1,792,198	149,990	1,942,188
1999	395,167	10,406	3,280,273	209,488	3,489,761
2000	516,491	17,396	4,631,849	197,259	4,829,108
2001	344,865	4,781	4,669,172	160,546	4,829,718
2002	400,736	3,699	4,853,768	168,429	5,022,197
2003	245,651	13,985	3,029,205	186,262	3,215,467
2004	323,140	6,905	2,445,482	255,805	2,701,287
2005	634,260	3,264	5,664,028	139,761	5,803,789
2006	551,924	32,911	4,300,459	159,452	4,459,911
2007	591,835	6,908	5,729,879	369,472	6,099,351
2008	362,023	2,393	3,227,899	289,548	3,517,447
2009	595,967	4,480	6,380,552	611,962	6,992,514
2010	615,081	5,759	3,754,430	239,551	3,993,981
2011	638,543	16,217	4,950,235	94,210	5,044,445
2012	426,877	4,800	3,335,644	249,020	3,584,664
2013	322,769	5,315	2,277,519	178,035	2,455,554
2014	403,203	6,731	2,933,166	422,496	3,355,662
2015	740,023	73,872	5,610,008	320,961	5,930,969
2016	480,860	2,520	5,099,647	356,061	5,455,708
2017	279,932	3,035	2,223,509	198,038	2,421,547
2018	495,435	27,959	3,318,532	144,660	3,463,192
2019	458,086	35,286	3,147,384	208,385	3,355,769
2020	262,372	26,902	2,149,038	51,994	2,201,032
2021	268,012	25,108	1,945,342	26,314	1,971,656
2022	117,803	521	962,267	28,375	990,642
2023	292,185	35,353	2,129,648	11,710	2,141,358
2024	143,210	1,194	763,549	11,087	774,636
Mean	350,688	11,950	2,851,357	180,303	3,031,661

Recreational Fishery

Recreational landings of dolphin are estimated from the 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.

From 1986 to 2009, recreational dolphin landings had been steadily increasing. Subsequently, from 2010 to present, dolphin landings have slowly declined. After peaking in 2009 (6,380,552 pounds), landings of dolphin fluctuated between highs in 2015 (5,610,008 pounds) and 2016 (5,099,647 pounds) and lows in 2021 (1,971,454 pounds), 2022 (962,267 pounds), and 2024 (763,549 pounds; Table 1; Figure 2). The recreational landings in 2023 (2,129,648 pounds) were higher than 2024 (763,549 pounds), but below the time series average (2,851,357 pounds).

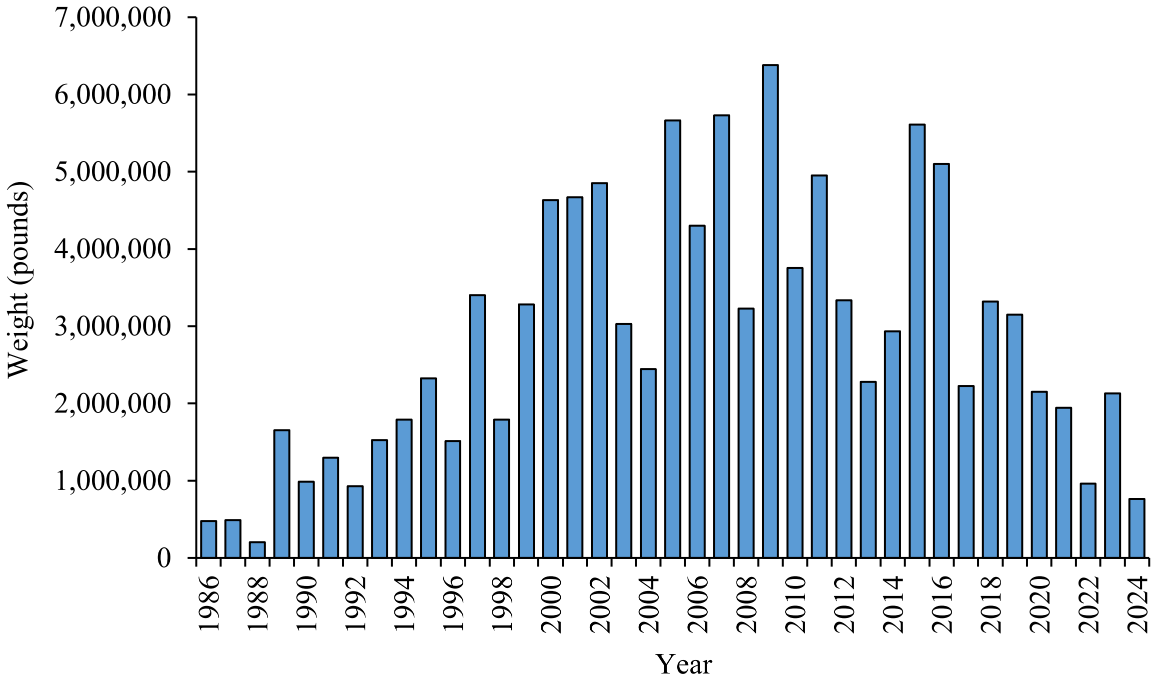

Figure 2. Annual recreational landings in pounds of dolphin in North Carolina, 1986–2024.

The DMF offers award citations for recreational fishermen who land dolphin greater than 35 pounds. The number of citations awarded annually since the program started for dolphin has been variable, with a declining trend observed from 2013–2018 (Table 2; Figure 3). Although the total number of citations awarded through the North Carolina Saltwater Fishing Tournament increased in 2019 (181 citations), citations declined in 2020 (94 citations), 2021 (68 citations), 2022 (61 citations), 2023 (54 citations), and 2024 (45 citations) to the lowest number recorded in the time series (1991–2024).

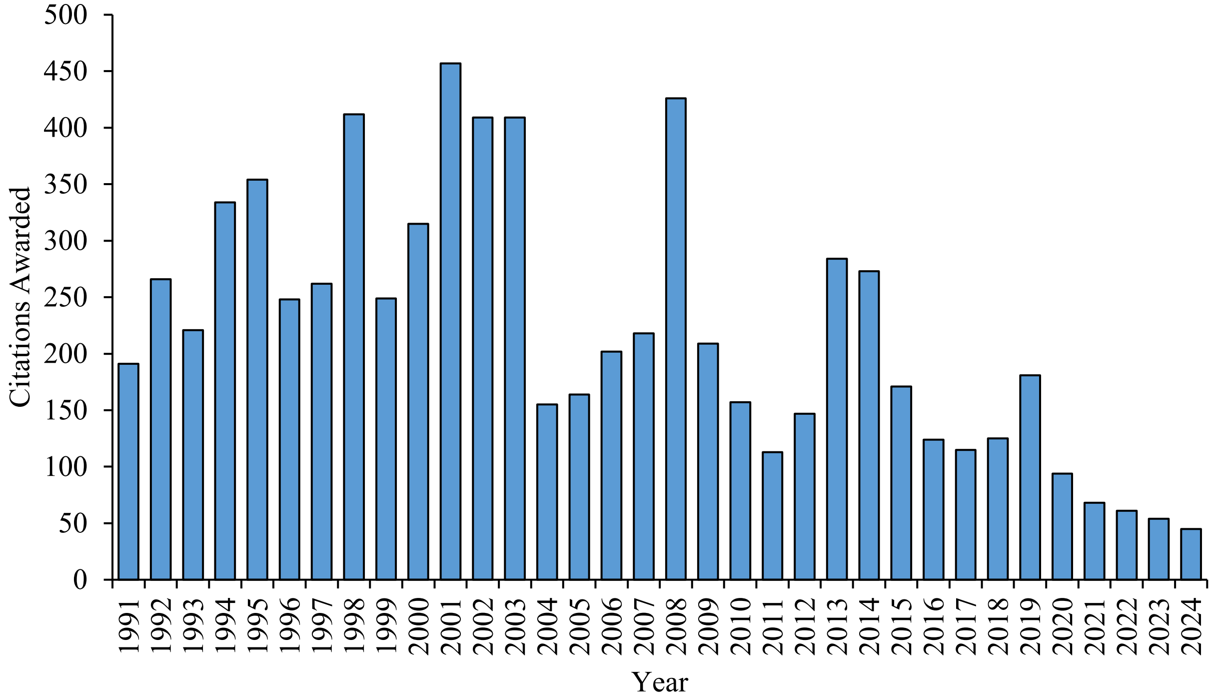

Figure 3. Total number of awarded citations for dolphin (>35 pounds landed) annual from the North Carolina Saltwater Fishing Tournament, 1991–2024.

Table 2. Total number of awarded citations for dolphin (>35 pounds landed) annually from the North Carolina Saltwater Fishing Tournament, 1991–2024.

Year	Total Citations	Year	Total Citations
1991	191	2008	426
1992	266	2009	209
1993	221	2010	157
1994	334	2011	113
1995	354	2012	147
1996	248	2013	284
1997	262	2014	273
1998	412	2015	171
1999	249	2016	124
2000	315	2017	115
2001	457	2018	125
2002	409	2019	181
2003	409	2020	94
2004	155	2021	68
2005	164	2022	61
2006	202	2023	54
2007	218	2024	45

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Fishery dependent length-frequency information for the commercial dolphin fishery in North Carolina is collected by fish house samplers, specifically through DMF programs 438 (Offshore Live Bottom Fishery) and 439 (Coastal Pelagic). The number of commercial dolphin lengths collected in 2024 (85 samples) was below the time series average of 183 samples (Table 3; Figure 4). The average size of dolphin sampled from the commercial fishery decreased in 2024 (25 inches FL) from the previous year (27.3 inches FL) and was below the time series average (27.7 inches FL; Table 3; Figure 5). The maximum size of dolphin sampled from the commercial fishery increased in 2024 (48 inches FL) from 2023 (42.8 inches FL; Table 3; Figure 5).

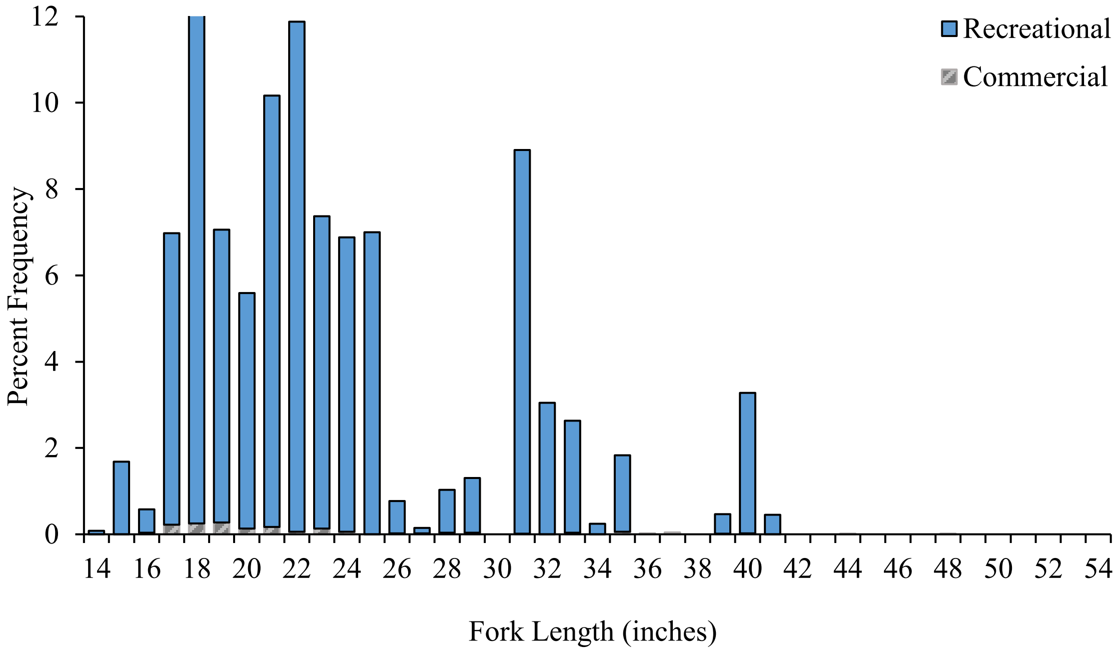

Figure 4. Commercial and recreational length frequency distribution for dolphin harvested in 2024.

Table 3. Mean, minimum, and maximum lengths (fork length, inches) of dolphin collected from the commercial and recreational fisheries, 1986–2024.

Year	Commercial				Recreational			
	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1986	26.9	16.1	45.3	46	28.7	13.8	47.8	101
1987	23.4	5.9	50.4	113	22.8	7.1	50.4	1,038
1988	24.4	14.8	43.3	104	23.8	12.4	52.0	691
1989	25.4	16.1	47.2	229	25.3	13.4	65.7	1,581
1990	23.9	13.0	49.6	201	23.1	13.8	60.0	1,956
1991	28.9	16.1	47.2	99	23.0	8.7	49.2	2,468
1992	32.6	18.1	47.6	30	22.7	7.5	55.9	1,721
1993	24.9	15.7	43.9	154	22.9	12.5	57.0	2,796
1994	27.7	16.1	50.6	136	25.5	11.0	59.1	4,469
1995	28.5	17.5	48.4	156	27.4	11.0	62.0	3,929
1996	26.1	17.5	42.1	57	26.3	12.6	59.0	2,873
1997	29.1	16.1	48.0	30	28.8	13.8	65.7	3,250
1998	23.6	15.0	46.5	143	27.0	9.4	60.0	3,287
1999	33.0	13.6	53.1	454	28.3	7.9	51.3	2,886
2000	26.4	14.6	48.8	208	28.3	15.9	58.0	3,740
2001	26.5	14.6	45.7	93	31.9	10.9	58.2	2,617
2002	25.8	15.7	52.8	100	30.5	15.7	58.0	3,538
2003	27.5	15.7	48.8	190	31.9	13.9	58.0	1,185
2004	25.2	15.6	47.2	146	27.6	18.2	48.6	1,341
2005	25.7	16.5	44.9	229	29.2	16.9	49.0	1,834
2006	27.9	16.8	52.8	172	27.8	11.8	47.8	1,659
2007	29.9	13.7	43.2	232	30.4	17.0	55.3	1,662
2008	26.2	16.3	44.7	231	29.2	12.2	55.3	1,759
2009	32.1	5.5	51.0	555	32.0	15.4	50.8	1,963
2010	24.7	13.6	43.9	451	25.2	15.2	67.9	1,532
2011	26.2	16.1	44.1	269	27.7	11.1	51.0	2,022
2012	29.8	16.9	49.0	579	28.3	15.0	53.5	1,918
2013	27.6	18.8	56.7	176	26.5	11.8	57.8	601
2014	31.0	15.4	53.2	339	27.0	10.6	51.7	896
2015	32.3	19.6	53.5	78	27.0	11.3	52.1	956
2016	33.1	18.2	40.7	125	31.1	7.5	52.2	1,152
2017	25.0	16.9	37.3	161	28.0	12.8	47.4	722
2018	28.8	12.0	47.2	117	25.6	13.1	57.2	1,313
2019	29.3	14.1	45.3	143	25.7	10.3	58.1	877
2020	26.0	17.6	43.5	64	28.0	13.1	55.3	1,092
2021	32.1	15.7	59.8	194	26.1	13.7	55.1	396
2022	28.7	17.8	43.3	195	27.9	11.9	48.1	359
2023	27.3	14.7	42.8	72	26.9	15.9	48.6	234
2024	25.0	16.5	48.0	85	24.1	14.6	41.1	120

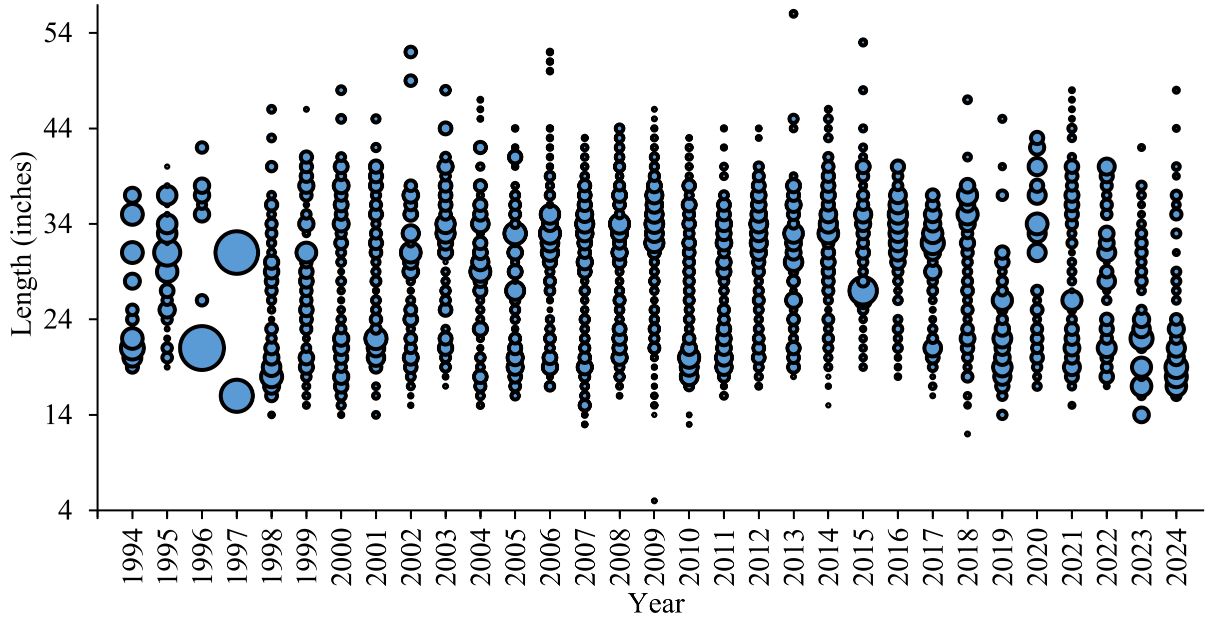

Figure 5. Commercial length frequency (fork length, inches) of dolphin harvested, 1994–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Length and weight information for the recreational fishery are collected through the MRIP dockside sampling. The average size of dolphin sampled from the recreational fishery decreased from 26.9 inches FL in 2023 to 24.1 inches FL in 2024 but overall has remained relatively constant throughout the time series (Table 3; Figure 6). The minimum size of dolphin sampled from the recreational fishery in 2024 (14.6 inches FL) was above the time series average from 1986–2023 (12.6 inches FL), and the maximum size sampled in 2024 (41.1 inches FL) was below the previous year (48.6 inches FL), and below the time series average of 54.7 inches FL.

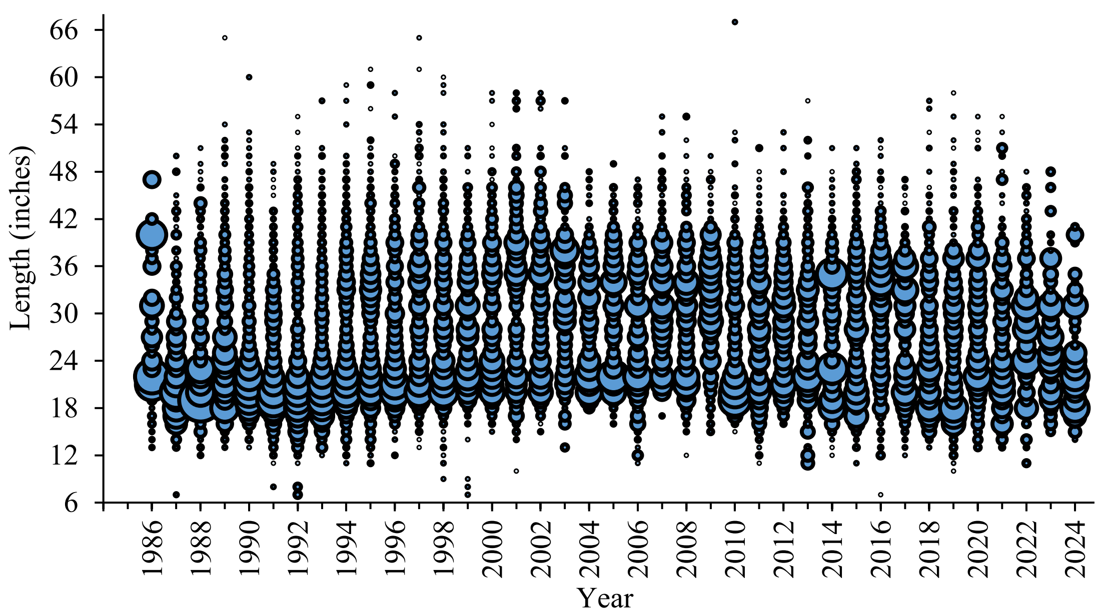

Figure 6. Recreational length frequency (fork length, inches) of dolphin harvested, 1986-2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

The modal length for the commercial fishery (19 inches FL) was larger than the recreational fishery (18 inches FL) in 2024 (Figures 5 and 6). The recreational fishery harvests larger dolphin than the commercial fishery (Figure 5; Figure 6); the maximum length of dolphin sampled from the recreational fishery was 67.9 inches FL in 2010, compared to a maximum length of 59.8 inches FL by the commercial fishery in 2021 (Table 3; Figures 5 and 6).

Fishery-Independent Monitoring

Currently, DMF does not have any fishery-independent sampling programs that target or catch dolphin in great numbers.

RESEARCH NEEDS

The following are research and management needs as determined by the SAFMC and outlined in the FMPs for pelagic Sargassum habitat and the dolphin/wahoo fishery (SAFMC 2002; SAFMC 2003(b)).

Essential Fish Habitat research needs for dolphin in order of priority from highest to lowest:

- What is the areal and seasonal abundance of pelagic Sargassum off the southeast U.S.?
- Develop methodologies to remotely assess Sargassum using aerial or satellite technologies (e.g., Synthetic Aperture Radar).
- What is the relative importance of pelagic Sargassum weedlines and oceanic fronts for early life stages of dolphin?
- Are there differences in dolphin abundance, growth rate, and mortality?
- What is the age structure of all fishes that utilize pelagic Sargassum habitat as a nursery and how does it compare to the age structure of recruits to pelagic and benthic habitats?
- Is pelagic Sargassum mariculture feasible?
- Determine the species composition and age structure of species associated with pelagic Sargassum when it occurs deeper in the water column.
- Additional research on the dependencies of pelagic Sargassum productivity on the marine species using it as habitat.
- Quantify the contribution of nutrients to deepwater benthic habitat by pelagic Sargassum.
- Studies should be performed on the abundance, seasonality, life cycle, and reproductive strategies of Sargassum and the role this species plays in the marine environment, not only as an essential fish habitat, but as a unique pelagic algae.
- Research to determine impacts on the Sargassum community, as well as the individual species of this community that are associated with, and/or dependent on, pelagic Sargassum. Human induced (tanker oil discharge; trash) and natural threats (storm events) to Sargassum need to be researched for the purpose of protecting and conserving this natural resource.
- Develop cooperative research partnerships between the Council, NOAA Fisheries Protected Resources Division, and state agencies since many of the needs to (a) research pelagic Sargassum, and (b) protect and conserve pelagic Sargassum habitat, are the same for both managed fish species and listed sea turtles.
- Direct specific research to further address the association between pelagic Sargassum habitat and post-hatchling sea turtles.

Biological research needs for dolphin in order of priority from highest to lowest:

- In the short-term, effort should be directed at examining all existing seasonality (effort and landings), mean size, and life history data for dolphin from the northern area.

- Additional data are needed to develop and/or improve estimates of growth, fecundity, etc.
- There are limited social and economic data available. Additional data need to be obtained and evaluated to better understand the implications of fishery management options.
- Trophic data should be considered in support of an ecosystem management approach.
- Essential fish habitats for dolphin and wahoo need to be identified.
- An overall design should be developed for future tagging work. In addition, existing tagging databases should be examined.
- Long-term work should continue and expand on current research investigating genetic variability of dolphin populations in the western central Atlantic.
- Observer programs should place observers on longline trips directed on dolphin. Catch and bycatch characterization, condition released (alive or dead), etc. should be collected. Observers could also be used to collect bio profile data (size, sex, hard parts for aging, etc.).
- High levels of uncertainty in inter-annual variation in abundance of dolphin should be investigated through an examination of oceanographic and other environmental factors.
- Release mortality should be investigated as a part of the evaluation of the effectiveness of current minimum size limits in the dolphin fishery.
- Establish a list serve for dolphin and wahoo which would facilitate research and the exchange of information.

MANAGEMENT

In North Carolina, dolphin is included in the North Carolina IJ FMP, which defers to management under the SAFMC Dolphin Wahoo FMP requirements. The SAFMC approved a FMP for dolphin in 2004 and it is currently managed under Amendment 5 (SAFMC 2013), Amendment 7 (SAFMC 2015a), Amendment 8 (SAFMC 2015b), Amendment 12 (SAFMC 2020), Amendment 10 (SAFMC 2021) and Regulatory Amendment 1 (SAFMC 2016).

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FISHERY MANAGEMENT PLAN UPDATE
KING MACKEREL
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	Original FMP Adoption	February 1983
	Amendment 1	September 1985
	Amendment 3	August 1989
	Amendment 5	August 1990
	Amendment 6	December 1992
	Amendment 7	November 1994
	Amendment 8	March 1998
	Amendment 9	April 2000
	Amendment 10	July 2000
	Amendment 11	December 1999
	Amendment 12	October 2000
	Amendment 14	July 2002
	Amendment 15	August 2005
	Amendment 17	June 2006
	Amendment 18	January 2012
	Amendment 19	July 2010
	Amendment 20A	August 2014
	Amendment 20B	March 2015
	Amendment 22	January 2014
	Amendment 23	August 2014
	Amendment 26	July 2016
	Amendment 34	March 2023
Comprehensive Review:	2020	

The original Gulf and South Atlantic Fishery Management Councils' fishery management plan (FMP) for Coastal Migratory Pelagic Resources (mackerels and cobia) was approved in 1983 (SAFMC 1983). This plan treated king mackerel as one U.S. stock. Allocations were established for recreational and commercial fisheries, and the commercial allocation was divided between net and hook and line fishermen. The plan also established procedures for the Secretary of Commerce to act by regulatory amendment to resolve possible future conflicts in the fishery, such as establishing fishing zones and local quotas for each gear or user group. Numerous amendments have been implemented since the first FMP.

Amendment 1 provided a framework for pre-season adjustment of total allowable catch (TAC), revised king mackerel maximum sustainable yield (MSY) downward, recognized separate Atlantic and Gulf migratory groups of king mackerel, and established fishing permits and bag limits for king mackerel (SAFMC 1985). Commercial allocations among gear users were eliminated.

Amendment 3 prohibited drift gill nets for coastal pelagics and purse seines and run-around gill nets for the overfished groups of mackerels (SAFMC 1989). The habitat section of the FMP was updated, and vessel safety considerations were included in the plan. A new objective to minimize waste and bycatch in the fishery was added to the plan.

Amendment 5 extended the management area for the Atlantic groups of mackerels through Mid-Atlantic Fishery Management Council (MAFMC) jurisdiction (SAFMC 1990). The amendment revised problems in the fishery and plan objectives, revised the definition of "overfishing", and provided that the South Atlantic Marine Fisheries Commission (SAFMC) will be responsible for pre-season adjustments of TACs and bag limits for the Atlantic migratory groups of mackerels. It redefined recreational bag limits as daily limits; created a provision specifying the bag limit catch of mackerel may be sold, provided guidelines for corporate commercial vessel permits, established a minimum size of 12 inches fork length (FL) or 14 inches total length (TL) for king mackerel and included a definition of "conflict".

Amendment 6 identified additional problems and an objective in the fishery, provided for rebuilding overfished stocks of mackerels within specific periods, provided for biennial assessments and adjustments, provided for more seasonal adjustment actions, including size limits, vessel trip limits, closed seasons or areas, and gear restrictions (SAFMC 1992). It also changed commercial permit requirements to allow qualification in one of the three preceding years, discontinued the reversion of the bag limit to zero when the recreational quota is filled, modified the recreational fishing year to the calendar year and changed the minimum size limit for king mackerel to 20 inches FL.

Amendment 7 equally divided the Gulf commercial allocation in the Eastern Zone at the Dade-Monroe County line in Florida (SAFMC 1994). The sub-allocation for the area from Monroe County through Western Florida was equally divided between commercial hook and line and net gear users.

Amendment 8 identified additional problems in the fishery, specified allowable gear, established a moratorium on new commercial king mackerel permits and provided for transferability of permits during the moratorium, and allowed retention of up to five damaged king mackerel on vessels with commercial trip limits (these fish cannot be sold, but do not count against the trip limit) (SAMFC 1998). It also revised the seasonal framework procedures to: (a) delete a procedure for subdividing the Gulf migratory group of king mackerel, (b) request the stock assessment panel provide additional information on spawning potential ratios and mixing of king mackerel migratory groups, (c) provide for consideration of public comment, (d) redefine overfishing and allow for adjustment by framework procedure, (e) allow setting zero bag limits, and (f) allow gear regulation including prohibition.

Amendment 9 changed the percentage of the commercial allocation of TAC for the Florida east coast (North Area) and Florida west coast (South/West Area) of the Eastern Zone to 46.15% North and 53.85% South/West (previously, this allocation was split 50% to each zone; SAMFC 2000). Amendment 9 further allowed possession of cut-off (damaged) king mackerel that comply with the minimum size limits and the trip limits in the Gulf, Mid-Atlantic, or South Atlantic exclusive economic zone (EEZ) (sale of such cut-off fish is allowed and is in addition to the existing allowance for possession and retention of a maximum of five cut-off (damaged) king mackerel that are not subject to the size limits or trip limits, but that cannot be sold or purchased, nor counted against the trip limit).

Amendment 10 designated Essential Fish Habitat (EFH) and EFH-Habitat Areas of Particular Concern for coastal migratory pelagics (SAFMC 1998a).

Amendment 11 amended the FMP as required to make definitions of MSY, optimal yield (OY), overfishing and overfished consistent with National Standard Guidelines; identified and defined fishing communities and addressed bycatch management measures (SAFMC 1998b).

Amendment 12 extended the commercial king mackerel permit moratorium from October 15, 2000, to October 15, 2005, or until replaced with a license limitation, limited access, and/or individual fishing quota or individual transferable quota system (ITQ), whichever occurs earlier (SAFMC 1999).

Amendment 13 established two marine reserves in the EEZ of the Gulf of Mexico near the Dry Tortugas, Florida known as Tortugas North and Tortugas South, in which fishing for coastal migratory pelagic species is prohibited (SAFMC 2002a). This action complemented previous actions taken under the National Marine Sanctuaries Act.

Amendment 14 established a three-year moratorium on the issuance of for-hire (charter vessel and head boat) permits for coastal migratory pelagic species in the Gulf of Mexico unless sooner replaced by a comprehensive effort limitation system (SAFMC 2002b). This resulted in separate for-hire permits for the Gulf and South Atlantic. The control date for eligibility was established as March 29, 2001. The amendment also included other provisions for eligibility, application, appeals, and transferability of permits.

Amendment 15 established an indefinite commercial limited access program for king mackerel in the EEZ under the jurisdiction of the Gulf of Mexico, South Atlantic, and Mid-Atlantic fishery management councils (SAMFC 2004). This amendment also changed the fishing year to March 1 through February 28 (29 on leap year) for Atlantic group king and Spanish mackerels.

Amendment 17 (SAFMC 2006) established a permanent limited entry system for Gulf of Mexico coastal migratory pelagics for-hire (charter and head boat) permits, building on the moratorium established under Amendment 14 (SAFMC 2002b).

Amendment 18 established annual catch limits (ACLs), annual catch targets (ACTs) and accountability measures (AMs) for king mackerel (SAFMC 2011) as required under the 2006 Magnuson-Stevens Reauthorization Act (SAFMC 2011).

Amendment 19 updated existing EFH and HAPC designations for South Atlantic species and prohibited the use of certain gear types within Deepwater Coral Habitat Areas of Particular Concern (SAMFC 2010).

Amendment 20A prohibited the sale of king mackerel caught under the bag limit unless the fish are caught as part of a state-permitted tournament and the proceeds from the sale are donated to charity (SAFMC 2013a). In addition, the rule removes the income qualification requirement for king mackerel commercial vessel permits.

Amendment 20B eliminated the 500-pound trip limit that is effective when 75% of the respective quotas are landed for king mackerel in the Florida west coast Northern and Southern Subzones; allows transit of commercial vessels with king mackerel through areas closed to king mackerel fishing, if gear is appropriately stowed; and creates Northern and Southern Zones for Atlantic migratory group king mackerel, each with separate quotas (SAFMC 2014a). Each zone will close when the respective quota is met or expected to be met. The dividing line between the zones is at the North Carolina and South Carolina state line.

Amendment 22 modified head boat reporting regulations to require weekly electronic reporting of all South Atlantic Council managed species (SAFMC 2013b).

Amendment 23 (SAFMC 2013c) required dealers to possess a federal Gulf and South Atlantic universal dealer permit to purchase king and Spanish mackerel and required weekly electronic dealer reporting. It also required federally permitted king and Spanish mackerel fishermen to sell only to a federally permitted dealer.

The 2013 Framework Action (effective 2014) modified commercial king mackerel trip limits in the Florida East Coast subzone to optimize utilization of the resource (SAFMAC 2014b).

Amendment 26 updates the Atlantic king mackerel annual catch limits and adjusts the mixing zone based on the results of the 2014 stock assessment (SAFMC 2016). The amendment allows limited retention and sale of Atlantic migratory group king mackerel incidentally caught in the small coastal shark gill net fishery.

Framework Amendment 6 (effective 2018) modifies the commercial trip limit for Atlantic migratory group king mackerel in the exclusive economic zone from the North Carolina/South Carolina line to the Miami-Dade/Monroe County line (Atlantic Southern Zone) (SAFMC 2018).

Amendment 34 (effective June 2023) updates catch limits for the Atlantic migratory group king mackerel and revises management measures for Atlantic migratory group king mackerel and Atlantic migratory group Spanish mackerel (SAFMC 2023). The amendment also increases the recreational bag and possession limit for Atlantic king mackerel in federal waters off the east coast of Florida from two to three fish per person and allows the recreational sector to keep cut-off (damaged) Atlantic king mackerel and Atlantic Spanish mackerel caught under the recreational bag limit that comply with the minimum size limits.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt fishery management plans, consistent with N.C. law, approved by the MAFMC, SAFMC, or the Atlantic States Marine Fisheries Commission 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 (Atlantic States Marine Fisheries Commission plans) are like the goals of the Fisheries Reform Act of 1997 to "ensure long-term viability" of these fisheries (NCDMF 2022).

Management Unit

The management unit is defined as king mackerel within U.S. waters of the South Atlantic, Mid-Atlantic and Gulf of Mexico. Current management defines two migratory units: Gulf Migratory Group and Atlantic Migratory Group.

Goal and Objectives

The goal of the FMP for Coastal Migratory Pelagics resources was to institute management measures necessary to prevent exceeding maximum sustainable yield (MSY), establish a mandatory statistical reporting system for monitoring catch, and to minimize gear and user conflicts (SAMFC 1983). Amendment 12 to the Gulf and South Atlantic fishery management councils' FMP for Coastal Migratory Pelagics lists eight plan objectives:

- The primary objective of the FMP is to stabilize yield at MSY, allow recovery of overfished populations, and maintain population levels sufficient to ensure adequate recruitment.
- To provide a flexible management system for the resource which minimizes regulatory delay while retaining substantial Council and public input in management decisions and which can rapidly adapt to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups or by areas.
- To provide necessary information for effective management and establish a mandatory reporting system.
- To minimize gear and user group conflicts.
- To distribute the TAC of Atlantic migratory group Spanish mackerel between recreational and commercial user groups based on the catches that occurred during the early to mid-1970s, which is prior to the development of the deep-water run-around gill net fishery and when the resource was not overfished.
- To minimize waste and bycatch in the fishery.
- To provide appropriate management to address specific migratory groups of king mackerel.
- To optimize the social and economic benefits of the coastal migratory pelagic fisheries.

DESCRIPTION OF THE STOCK

Biological Profile

King mackerel (*Scomberomorus cavalla*) are considered coastal pelagic, meaning they live in open ocean waters near the coast. They are found from North Carolina to southeast Florida, making inshore and offshore migrations that are triggered by water temperature and food supply. King mackerel prefer warm waters and seldom enter waters below 68 degrees Fahrenheit. In the winter, they gather just inside the Gulf Stream along the edge of the continental shelf. In the summer and fall, they move inshore along the beaches and near the mouths of inlets and rivers. King mackerel spawn from April to November, with males maturing between age 2 and 3 and females between age 3 and 4. King mackerel in North Carolina grow as large as 60 inches FL, but most recreational catches are between 35- and 45-inches FL. They feed on menhaden, mullet, thread herring, sardines and squid and may be seen leaping out of the water in pursuit of prey (Manooch 1984).

Stock Status

In 2020, the Atlantic king mackerel stock was assessed and peer reviewed through the Southeast Data, Assessment and Review (SEDAR 2020). The results of the assessment indicated the stock size, and the rate of removals are sustainable and predicts Atlantic king mackerel are not overfished, and overfishing is not occurring.

Stock Assessment

An integrated stock assessment approach, Stock Synthesis 3, was used to assess the stock (SEDAR 2014) in a benchmark assessment (SEDAR 2014). The SEDAR 38 assessment was updated in 2020 (SEDAR 2020). The assessment model was constructed using fishery-independent data from the Southeast Area Monitoring and Assessment Program Trawl Survey for the Atlantic, and fishery-dependent information collected from National Oceanic and Atmospheric Administration Fisheries Service Marine Recreational Fisheries Statistics Survey, head boat and logbook surveys, as well as North Carolina Division of Marine Fisheries (DMF) Trip Ticket landings information. The Stock Synthesis approach was used, which integrated fishery and life history indices into a statistical catch-at-age model to produce observed catch, size and age composition, and Catch Per Unit Effort (CPUE) indices. Total biomass and spawning stock biomass estimates have increased steadily since 2013. All fishery indicators (fleet CPUEs and scientific survey) showed positive trends since SEDAR 38. Stock Synthesis estimated an above average age-0 recruitment from 2013 to 2016, contrasting the below average recruitments from 2008 to 2012 that were first detected during SEDAR 38. Two particularly high recruitment years were estimated for 2015 and 2016, supported by the juvenile survey observations in 2016 (SEAMAP trawl survey), as well as fleet length compositions. Observations by stakeholders may help validate the model predictions, given the distinct change in signal from five years of low recruitment up to SEDAR 38 to four years of high recruitment. The fish would have entered the fisheries beginning in the 2015 fishing year, with relatively high abundance beginning in 2017 fishing year, particularly of fish between 24- and 36-inches FL.

DESCRIPTION OF THE FISHERY

Current Regulations

The DMF complements the management measures of the Coastal Migratory Pelagic FMP through rule (NCMFC Rule 15A NCAC 03M .0512) and proclamation authority (NCMFC Rule 15A NCAC 03M .0512). Current regulations include a recreational bag limit of fish per person per day and 24-inch FL minimum size limit (commercial and recreational). Commercial regulations limit trips to 3,500 pounds and require a federal vessel permit for commercial, charter, and head boats. Sale of king mackerel caught under the recreational bag limit are prohibited unless the fish are caught as part of a state-permitted tournament and the proceeds from the sale are donated to charity.

Commercial Fishery

In 2024, commercial landings were 462,299 pounds (Table 1; Figure 1) and 93% of the king mackerel harvest was taken by hook and line while the remaining 7% was harvested in gill nets (Table 2; Figure 2). The commercial fishery has declined since 2008; and the 2024 landings were lower than the 512,791 pound 10-year average (2015–2024).

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of king mackerel from North Carolina, 1994–2024.

Year	Recreational			Commercial	
	Number Harvested	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1994	177,608	5,792	1,709,740	849,909	2,559,649
1995	135,796	7,544	1,240,901	1,013,319	2,254,220
1996	119,418	15,465	1,097,226	793,467	1,890,693
1997	206,601	57,739	1,797,936	1,558,439	3,356,375
1998	112,383	9,155	1,163,739	1,143,342	2,307,081
1999	104,483	120,296	1,034,465	1,082,693	2,117,158
2000	196,979	26,009	2,250,512	1,045,554	3,296,066
2001	145,290	12,381	2,046,022	839,107	2,885,129
2002	104,631	20,811	1,242,058	778,427	2,020,485
2003	153,339	33,774	1,388,145	764,831	2,152,976
2004	191,584	184,384	2,276,035	955,002	3,231,037
2005	175,070	101,507	1,349,536	1,246,088	2,595,624
2006	177,369	45,568	1,805,814	1,185,534	2,991,348
2007	339,278	53,549	3,099,801	1,059,107	4,158,908
2008	164,719	41,283	1,379,450	1,036,852	2,416,302
2009	168,558	23,639	1,822,673	777,585	2,600,258
2010	58,311	9,734	580,505	328,806	909,311
2011	31,589	851	367,896	408,162	776,058
2012	55,529	6,385	613,903	297,423	911,326
2013	48,000	8,868	521,153	345,177	866,330
2014	72,288	35,075	1,213,096	549,981	1,763,077
2015	95,705	16,877	1,168,255	391,751	1,560,006
2016	108,151	43,909	963,139	420,869	1,384,008
2017	110,339	94,655	1,261,775	629,703	1,891,478
2018	102,675	75,614	1,018,459	506,933	1,525,392
2019	184,962	115,350	1,446,939	698,252	2,145,191
2020	146,423	70,879	1,376,229	611,476	1,987,705
2021	58,174	24,069	563,082	430,868	993,950
2022	38,512	12,996	375,164	409,941	785,105
2023	79,987	74,061	1,130,711	565,814	1,696,525
2024	58,954	12,224	730,700	462,299	1,192,999
Mean	126,539	43,885	1,291,454	747,958	2,039,412

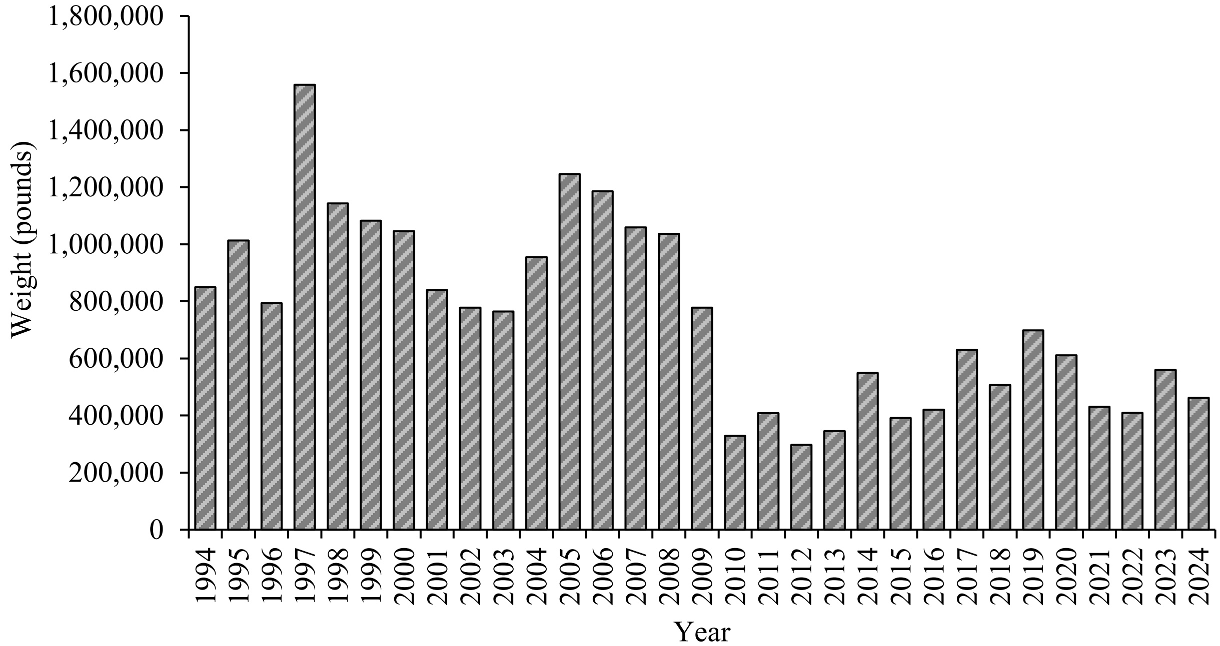

Figure 1. Annual commercial landings in pounds for king mackerel in North Carolina, 1994–2024.

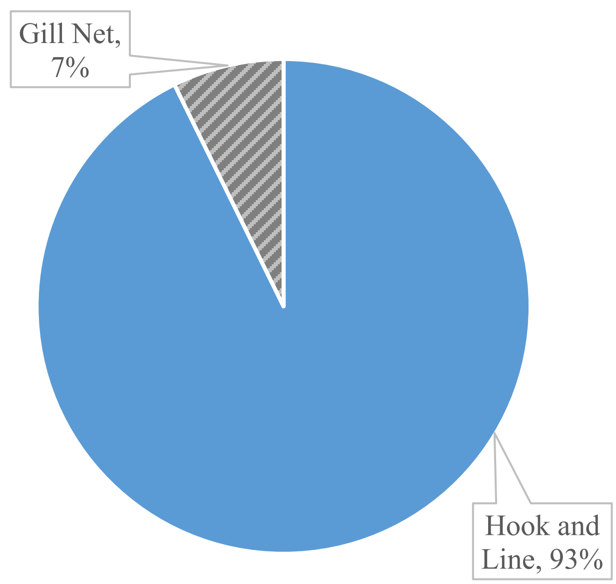

Figure 2. King mackerel commercial harvest in 2024 by gear type.

Table 2. North Carolina commercial harvest of king mackerel with landings in pounds by gear type, 1994–2024.

	Gear Type			
Year	Hook and Line	Gill Net	Other	Total
1994	781,384	61,648	6,877	849,909
1995	952,422	58,104	2,793	1,013,319
1996	737,673	53,211	2,584	793,467
1997	1,386,948	167,973	3,518	1,558,439
1998	1,075,940	65,460	1,942	1,143,342
1999	1,042,466	40,148	79	1,082,693
2000	938,631	105,504	1,420	1,045,554
2001	790,862	47,517	727	839,107
2002	693,105	81,933	3,388	778,427
2003	736,432	26,168	2,231	764,831
2004	829,056	125,826	120	955,002
2005	1,012,580	232,681	828	1,246,088
2006	1,010,448	174,573	514	1,185,534
2007	883,249	175,570	288	1,059,107
2008	820,936	215,793	123	1,036,852
2009	667,902	109,347	337	777,585
2010	235,956	92,739	111	328,806
2011	357,353	50,748	60	408,162
2012	248,959	48,444	20	297,423
2013	311,321	33,856	0	345,177
2014	460,472	88,557	952	549,981
2015	324,011	67,629	111	391,751
2016	336,891	83,794	184	420,869
2017	557,327	72,284	93	629,703
2018	443,996	62,814	123	506,933
2019	616,148	81,944	160	698,252
2020	518,768	92,509	199	611,476
2021	368,767	61,987	113	430,868
2022	344,501	64,344	1,096	409,941
2023	508,376	57,150	288	565,814
2024	427,899	33,629	770	462,299

Recreational Fishery

Recreational landings of king mackerel are estimated from the Marine Recreational Information Program (MRIP). Recreational estimates across all years have been updated and are now based on the MRIP new Fishing Effort Survey-based calibrated estimates. For more information on MRIP see: https://www.fisheries.noaa.gov/topic/recreational-fishing-data. Recreational anglers target king mackerel by trolling spoons and live baits both inshore and offshore. Anglers catch most king mackerel between August and October once the water temperature has begun to cool from the summer heat. Anglers harvested 730,700 pounds of king mackerel in 2024, which is 35% lower than 2023 harvest and 27% lower than the 10-year average of 1,003,445 pounds (Table 1 and Figure 3).

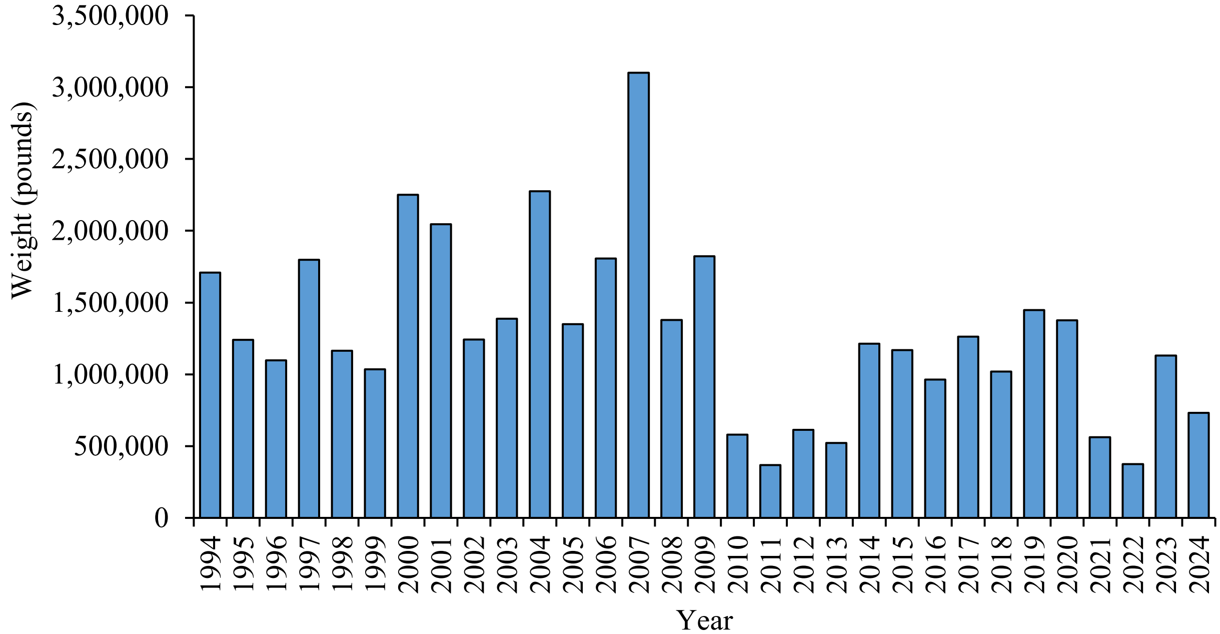

Figure 3. Annual recreational landings in pounds for king mackerel in North Carolina, 1994–2024.

The DMF offers award citations for exceptional catches of king mackerel. King mackerel greater than 30 pounds or 45 inches FL are eligible for an award citation. In 2024, 159 citations were awarded, 4 of which were released alive (Figure 4).

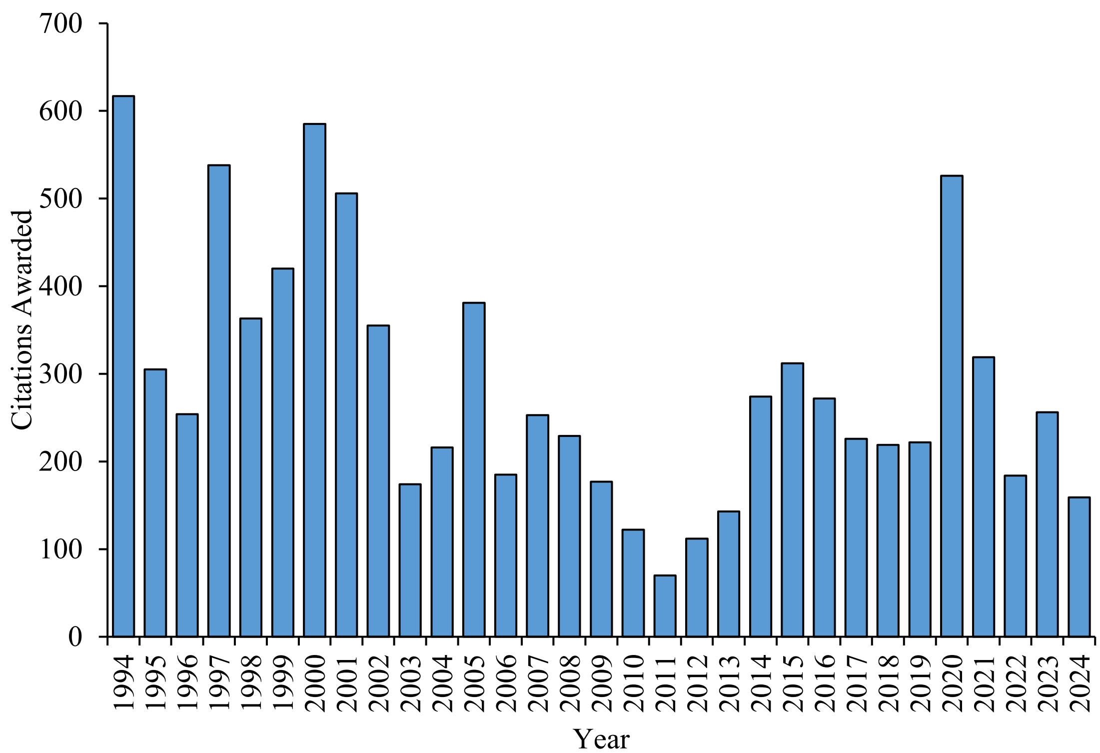

Figure 4. North Carolina Saltwater Fishing Tournament citations awarded for king mackerel, 1994–2024. Citations are awarded for king mackerel greater than 30 pounds or 45 inches fork length.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Length-frequency information for the commercial king mackerel fishery in North Carolina is collected through the division's Program 434 (Ocean Gill Net Fishery), Program 437 (Long Haul Seine Fishery), Program 438 (Offshore Live Bottom Fishery), Program 439 (Coastal Pelagic), and Program 461 (Estuarine Gill Net and Seine). Through these programs, 401 king mackerel were measured with a mean length of 34.6 inches FL (Table 3; Figures 5 and 6). Ageing structures (otoliths) are collected from the commercial and recreational fishery as well as king mackerel fishing tournaments statewide and sent to the Southeast Fisheries Science Center in Panama City, Florida for processing and ageing (Table 4). Length and weight information for the recreational fishery are collected through the MRIP dockside sampling (Table 5; Figures 6 and 7).

Table 3. King mackerel length (fork length, inches) data from commercial fish house samples, 1997–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1997	30.3	21.9	47.2	152
1998	30.0	20.9	42.3	240
1999	30.1	16.3	50.4	722
2000	30.4	16.7	48.8	872
2001	31.8	20.3	51.2	729
2002	33.0	24.0	46.5	217
2003	29.2	21.3	44.1	204
2004	31.5	22.0	45.3	448
2005	29.5	19.7	47.2	397
2006	31.0	21.5	49.4	277
2007	29.3	13.6	48.0	331
2008	27.6	22.2	49.8	1,676
2009	28.4	15.1	55.1	1,005
2010	33.8	23.2	52.6	193
2011	33.1	23.4	48.8	643
2012	32.4	23.1	53.0	313
2013	34.1	24.1	45.5	89
2014	29.8	18.1	47.6	420
2015	32.8	14.7	46.9	229
2016	29.4	20.3	54.3	360
2017	28.4	13.6	53.3	994
2018	28.8	22.6	43.3	459
2019	29.5	16.0	49.8	1,136
2020	30.2	15.7	46.9	439
2021	29.1	17.2	47.2	917
2022	32.9	25.0	60.2	550
2023	33.6	13.4	51.7	249
2024	35.6	23.0	52.7	401

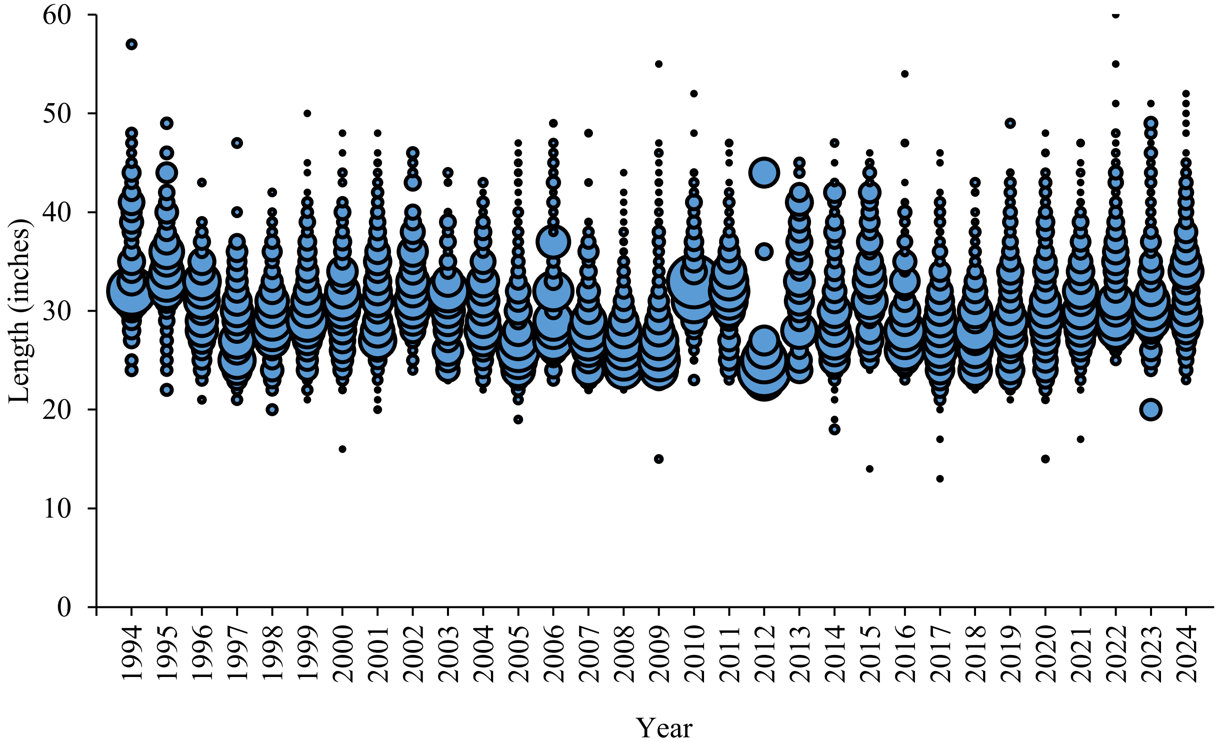

Figure 5. Commercial length frequency (fork length, inches) of king mackerel, 1994–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

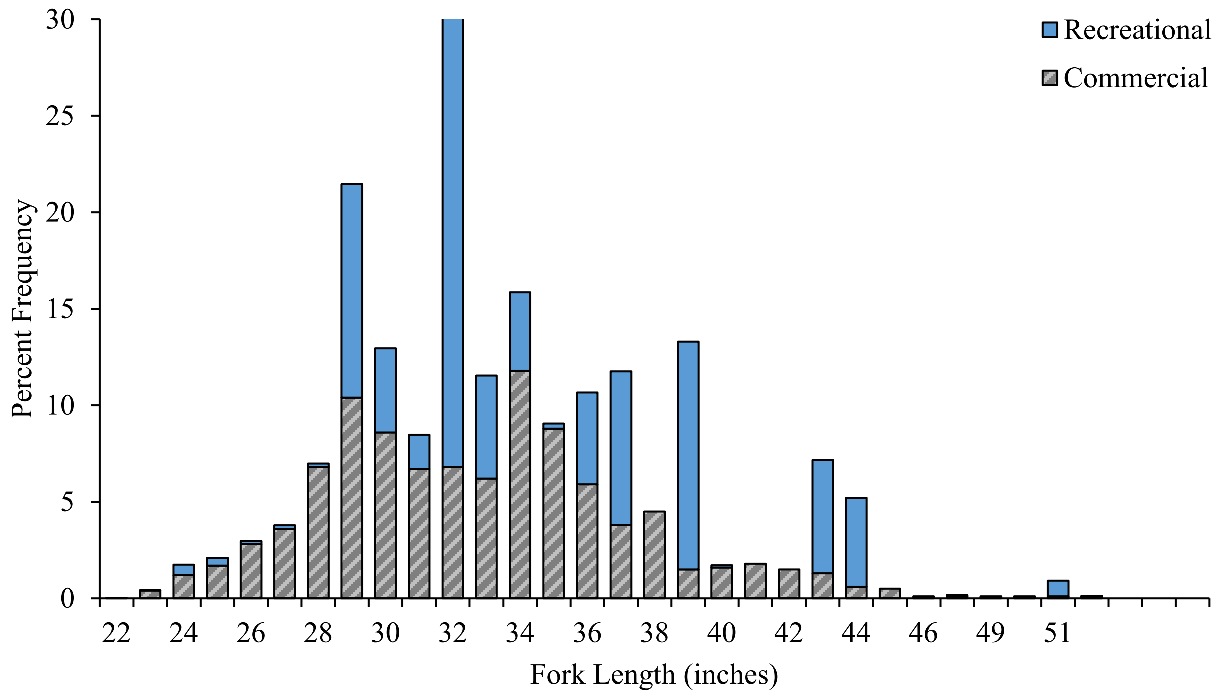

Figure 6. Commercial and recreational length frequency distribution from king mackerel harvested in 2024.

Table 4. King mackerel length (fork length, inches) fishery-dependent data collected by DMF for ageing by the NOAA Southeast Fisheries Science Center, 1997–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1997	35.4	12.6	54.1	363
1998	37.6	21.7	60.2	458
1999	37.4	14.8	57.1	477
2000	38.7	24.3	56.1	541
2001	38.0	25.8	55.7	547
2002	38.2	23.8	54.9	477
2003	37.0	23.3	57.3	488
2004	38.0	13.5	56.7	467
2005	37.3	19.6	55.1	444
2006	37.7	17.0	54.1	435
2007	37.9	19.2	54.7	507
2008	34.3	23.4	53.7	450
2009	36.0	24.2	55.1	415
2010	37.9	23.2	57.2	386
2011	37.4	23.4	57.0	429
2012	37.6	23.1	55.9	597
2013	40.2	24.1	56.3	413
2014	40.0	4.6	59.1	388
2015	39.1	4.4	54.4	446
2016	35.2	13.3	54.3	482
2017	35.8	15.4	56.3	663
2018	36.3	11.0	54.3	568
2019	35.5	17.5	56.3	695
2020	36.2	19.5	56.5	520
2021	36.9	15.9	57.1	549
2022	39.1	21.7	57.3	483
2023	40.3	13.4	55.2	259
2024	38.5	19.2	53.2	259

Table 5. Total number measured, mean, minimum, and maximum length (inches) of king mackerel measured by MRIP sampling in North Carolina, 1981–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1981	38.5	25.0	46.0	47
1982	33.9	15.7	44.1	90
1983	30.1	5.7	36.0	33
1984	31.1	12.2	44.3	71
1985	32.9	22.0	42.5	67
1986	33.1	19.7	48.9	257
1987	31.4	12.6	55.9	1,041
1988	13.5	14.2	58.5	646
1989	33.8	12.2	53.9	765
1990	31.3	12.2	59.5	1,169
1991	31.8	10.1	57.9	1,057
1992	31.1	14.6	57.9	1,037
1993	32.3	12.8	58.3	772
1994	32.2	20.1	65.4	829
1995	31.2	14.6	53.5	959
1996	31.3	20.1	56.0	670
1997	30.5	12.6	54.6	1,814
1998	32.4	13.9	57.8	1,062
1999	32.9	18.3	50.2	452
2000	33.7	19.3	69.6	831
2001	37.0	22.4	59.1	800
2002	34.6	22.7	54.2	218
2003	32.8	20.2	55.0	268
2004	32.2	13.2	55.5	247
2005	29.6	21.7	53.3	277
2006	32.0	19.2	59.2	269
2007	31.1	21.3	49.3	320
2008	30.1	20.6	47.9	317
2009	32.7	21.0	46.9	168
2010	32.5	25.0	50.0	83
2011	34.1	28.0	51.0	36
2012	32.9	23.5	51.0	74
2013	32.6	23.5	54.8	38
2014	38.7	23.9	53.1	106
2015	33.3	22.2	52.9	93
2016	30.4	12.2	60.0	213
2017	31.9	13.4	48.9	278
2018	30.3	14.6	60.4	365
2019	29.7	10.2	49.8	369
2020	31.6	10.4	54.4	363
2021	31.7	17.8	48.4	306
2022	31.8	17.1	50.6	128
2023	35.6	17.1	59.5	144
2024	34.9	22.1	51.2	49

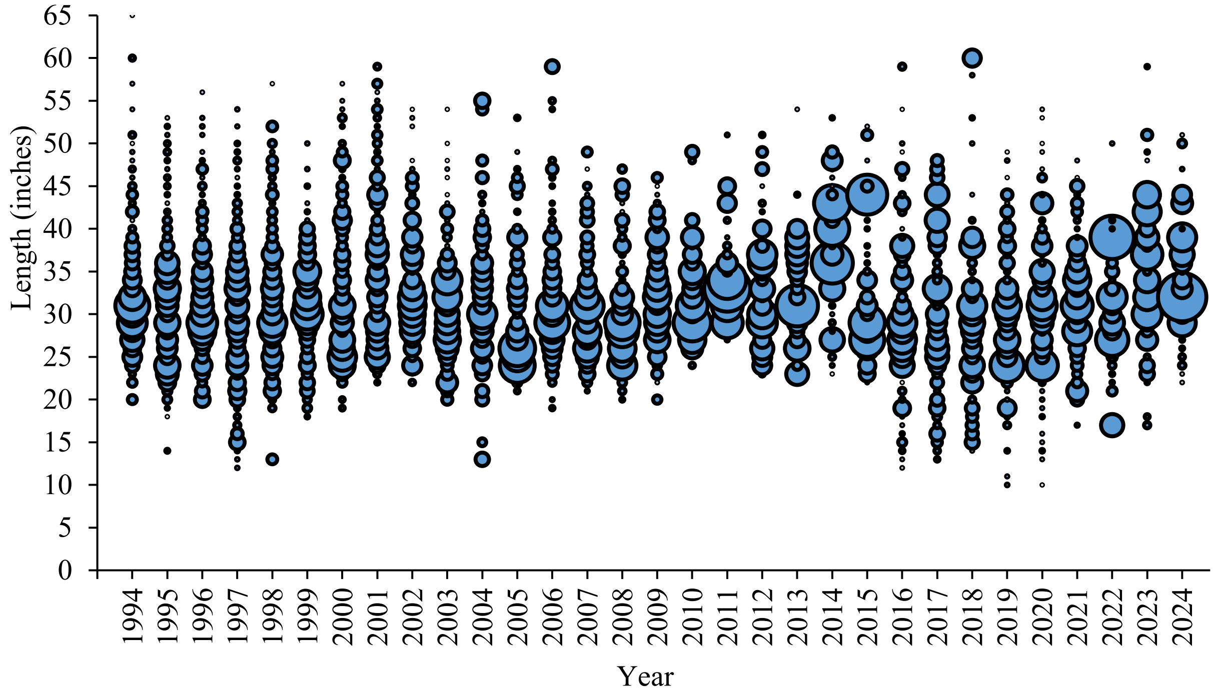

Figure 7. Recreational length frequency (fork length, inches) of king mackerel, 1994–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Fishery-Independent Monitoring

Currently, the division does not have any fishery-independent sampling programs that target or catch king mackerel in great numbers.

RESEARCH NEEDS

From SEDAR 38 (2014) and SEDAR 38 Update (2020):

- Develop a survey to obtain reliable age and size composition data and relative abundance of adult fish. This could be done using gill nets or handlines. The review panel recommends that the design of a scientific survey be peer reviewed.
- Determine most appropriate methods to deal with changing selectivity in fisheries over time, particularly changing selectivity related to management actions or targeting of specific cohorts. The review panel suggests that historical mark-recapture data be used to compare size composition of recaptures for different fishing gears to evaluate selectivity for historic periods.
- Determine stock mixing rates using otolith microchemistry and/or otolith shape analysis on a routine basis that would allow future stock assessments to capture the dynamic spatial and temporal nature of mixing of the Atlantic and Gulf of Mexico stocks and consider evaluating stock mixing within integrated modeling approaches.
- More accurately characterize juvenile growth by increasing samples of age-0 and age-1 fish. Further investigate two-phase growth models including different breakpoints and different growth models to better model size and age. Consider if there is temporal (annual and seasonal) variability in growth rates. Results of this analysis in terms of the best model will need to be implementable in Stock Synthesis to continue with the integrated modeling approach.
- Determine if female spawning periodicity varies by size or age.

- Expand the trawl survey below the Cape Canaveral area and potentially into deeper continental shelf waters.
- Consider conducting an extensive tagging program to: a) better understand migration patterns; b) provide additional and individual growth rate information; c) better understand fishery selectivity; d) provide fishery exploitation rates; and e) provide information about natural mortality rates.
- Research aimed at improving the documentation of data series formatting, including index standardization, for Stock Synthesis 3 would improve modeling efficiency. This includes statistical coding for consistent database querying and data processing.
- Evaluation of alternative age references, or age-specific time series, for the Southeast Area Monitoring and Assessment Program (SEAMAP) fishery-independent survey was recommended by the data providers and noted by the analyst for future assessments. An analysis of the effect of excluding sublegal fish size observations on the assessment should be undertaken. Information on the age-composition of discarded fish from all fleets is needed to validate the assumption of exclusively age-0 discards. The conditional age-at-length data had a significant influence on recent recruitment estimates.

MANAGEMENT

King mackerel is included in the North Carolina IJ FMP, which defers to SAFMC's management plan compliance requirements. Current management measures were established under recent Amendments 20A (SAMFC 2013a), 20B (SMAFC 2014b), and 26 (SAMFC 2016) to the Coastal Migratory Pelagics FMP. Amendment 20A prohibits the sale of all recreational bag-limit-caught king mackerel, except those harvested during a state-permitted tournament. Amendment 20B establishes separate commercial quotas of Atlantic king mackerel for a Northern Zone (north of North Carolina and South Carolina state line) and Southern Zone (south of North Carolina and South Carolina state line). The SAFMC completed Amendment 26 (SAFMC 2016) to update the Atlantic king mackerel annual catch limits and adjust the mixing zone based on the results of the 2014 stock assessment, and to provide an incidental catch allowance of Atlantic king mackerel in the small coastal shark gillnet fishery. Current management strategies for king mackerel in South Atlantic waters are summarized in Table 6.

Table 6. Summary of N.C. Marine Fisheries Commission management strategies for king mackerel.

Management Strategy	Implementation Status
Prohibits Purse Gill Nets when taking king or Spanish mackerel	Rule 15A NCAC 03M .0512
24-inch fork length minimum size limit. Three fish recreational creel limit. Commercial Vessel Permit requirements. Commercial trip limit of 3,500 pounds of king, Spanish, or aggregate. Charter vessels or head boats with Commercial Vessel Permit must comply with possession limits when fishing with more than three persons Unlawful for vessels with both a valid Federal Commercial Directed Shark Permit and a valid Federal King Mackerel Permit, when engaged in directed shark fishing with gill nets south of Cape Lookout, to possess and sell more than three king mackerel per crew member.	Proclamation FF-238-2022

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FISHERY MANAGEMENT PLAN UPDATE
SCUP NORTH OF CAPE HATTERAS
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption: Incorporated into the Summer Flounder FMP through Amendment 8 in 1996

Amendments:	Amendment 8	1996
	Regulatory Amendment	1996
	Amendment 10	1997
	Amendment 11	1998
	Amendment 12	1999
	Framework 1	2001
	Addendum III	2001
	Addendum IV	2001
	Addendum V	2002
	Addendum VII	2002
	Framework 3	2003
	Framework 4	2003
	Addendum IX	2003
	Addendum X	2003
	Amendment 13	2003
	Framework 5	2004
	Addendum XI	2004
	Addendum XIII	2004
	Addendum XVI	2005
	Framework 7	2007
	Addendum XIX	2007
	Amendment 14	2007
	Amendment 16	2007
	Addendum XX	2009
	Amendment 15	2011
	Amendment 19	2013
	Amendment 17	2015
	Amendment 18	2015
	Framework 9	2016
	Amendment 20	2017
	Addendum XXIX	2017
	Framework 10	2017
	Framework 11	2018
	Framework 12	2018
	Framework 13	2018
	Addendum XXXI	2018
	Framework 14	2019
	Framework 15	2020
	Framework 16	2020
	Amendment 22	2022
	Framework 17 & Addendum XXXIV	2022/2023

Addendum XXXVI 2025

Comprehensive Review: 2023

Because of their presence in, and movement between, state waters (0-3 miles) and federal waters (3-200 miles), the Mid-Atlantic Fishery Management Council (MAFMC) manages scup (*Stenotomus chrysops*) north of Cape Hatteras cooperatively with the Atlantic States Marine Fisheries Commission (ASMFC). The two management entities work in conjunction with the National Marine Fisheries Service (NMFS) as the federal implementation and enforcement entity. Scup went through preliminary FMP development from 1978-1993 by the MAFMC. In 1995 MAFMC and ASMFC adopted the scup FMP but sequentially NMFS requested that the scup regulations be incorporated into another FMP to reduce the number of separate fisheries regulations. As a result, the scup FMP was incorporated into the summer flounder FMP as Amendment 8.

Specific details for each Amendment include:

Amendment 8 incorporated scup into the Summer Flounder FMP; established scup management measures, including commercial quotas, recreational harvest limits, size limits, gear restrictions, permits, and reporting requirements.

Regulatory Amendment established seasonal quota periods of the commercial scup fishery.

Amendment 10 modified commercial minimum mesh requirements; continued commercial vessel moratorium permit; prohibited transfer of summer flounder at sea; established a special permit for the summer flounder party/charter sector.

Amendment 11 modified certain provisions related to vessel replacement and upgrading, permit history transfer, splitting, and permit renewal regulations.

Amendment 12 revised the Summer Flounder, Scup, and Black Sea Bass FMP to comply with the Sustainable Fisheries Act and established a framework adjustment process; established quota set-aside for research for summer flounder, scup, and black sea bass; established state-specific conservation equivalency measures; allowed the rollover of the winter scup quota; revised the start date for the scup summer quota period.

Framework 1 established quota set-aside for research for summer flounder, scup, and black sea bass.

Addendum III established recreational fishing specifications for 2001 for summer flounder and scup.

Addendum IV provided that upon the recommendation of the relevant monitoring committee and joint consideration with the Mid-Atlantic Fishery Management Council, the ASMFC's Summer Flounder, Scup, and Black Sea Bass Management Board will decide the state regulations rather than forward a recommendation to the National Marine Fisheries Science Center; made states responsible for implementing the ASMFC's Summer Flounder, Scup, and Black Sea Bass Management Boards decisions on regulations.

Addendum V created state-specific shares of the summer period quota that will remain in place until the ASMFC's Summer Flounder, Scup, and Black Sea Bass Management Board takes direct action to modify them.

Addendum VII established recreational fishing specifications for scup for 2002.

Framework 3 allowed the rollover of winter scup quota; revised the start date for the summer quota period for the scup fishery.

Framework 4 established a system to transfer scup at sea.

Addendum IX established recreational specifications for scup in 2003.

Addendum X established quota rollover and quota period specifications for the commercial scup fishery.

Amendment 13 revised black sea bass commercial quota system; addressed other black sea bass management measures; established multi-year specification setting of quota for summer flounder, scup and black sea bass; established region-specific conservation equivalency measures for summer flounder; built flexibility into process to define and update status determination criteria for each plan species. Amendment 13 also removed the necessity for fishermen who have both a Northeast Region (NER) black sea bass permit and a Southeast Region (SER) snapper/grouper permit to relinquish their permits for a six-month period prior to fishing south of Cape Hatteras during the northern closure.

Framework 5 established multi-year specification setting of quotas for summer flounder, scup, and black sea bass.

Addendum XI proposed that the recreational scup fishery be constrained to the coastwide recreational harvest limit, allow states to customize scup recreational management measures to deal with burden issues associated with the implementation of coastwide measures, minimize the administrative burden when implementing conservation equivalency.

Addendum XIII modified the Summer Flounder, Scup, and Black Sea Bass FMP so that Total Allowable Landings for summer flounder, scup, and/or black sea bass can be specified for up to three years.

Addendum XVI established guidelines for delayed implementation of management strategies.

Framework 7 built flexibility into the process to define and update status determination criteria for summer flounder, scup, and black sea bass.

Addendum XIX continued the state-by-state black sea bass commercial management measures, without a sunset clause; broadened the descriptions of stock status determination criteria contained within the Summer Flounder, Scup, and Black Sea Bass FMP to allow greater flexibility in those definitions, while maintaining objective and measurable status determination criteria for identifying when stocks or stock complexes covered by the fishery management plan are overfished.

Amendment 14 established a rebuilding schedule for scup; scup gear restricted areas made modifiable through framework adjustment process.

Amendment 16 standardized bycatch reporting methodology.

Addendum XX set policies to reconcile commercial quota overages to address minor inadvertent quota overages; streamlined the quota transfers process and established clear policies and administrative protocols to guide the allocation of transfers from states with underages to states with overages; allowed for commercial quota transfers to reconcile quota overages after a year's end.

Amendment 15 established annual catch limits and accountability measures.

Amendment 19 modified the accountability measures for the MAFMC recreational fisheries.

Amendment 17 implemented standardized bycatch reporting methodology.

Amendment 18 eliminated the requirement for vessel owners to submit "did not fish" reports for the months or weeks when their vessel was not fishing; removed some of the restrictions for upgrading vessels listed on federal fishing permits.

Framework 9 modified the southern and eastern boundaries of the southern scup gear restricted area (in effect January 1-March 15).

Amendment 20 implemented management measures to prevent the development of new, and the expansion of existing, commercial fisheries on certain forage species in the Mid-Atlantic.

Addendum XXIX established new start and end dates for the scup commercial quota periods, moved first half of May to Winter I and October to Winter II.

Framework 10 implemented a requirement for vessels that hold party/charter permits for Council-managed species to submit vessel trip reports electronically (eVTRs) while on a trip carrying passengers for hire.

Framework 11 established a process for setting constant multi-year Acceptable Biological Catch (ABC) limits for Council-managed fisheries, clarified that the Atlantic Bluefish, Tilefish, and Atlantic Mackerel, Squid, and Butterfish FMPs will now automatically incorporate the best available scientific information in calculating ABCs (as all other Mid-Atlantic Council management plans do) rather than requiring a separate management action to adopt them, clarified the process for setting ABCs for each of the four types of ABC control rules.

Framework 12 modified the dates of the commercial scup quota periods, moving the month of October from the Summer Period to the Winter II period.

Framework 13 modified the accountability measures required for overages not caused by directed landings (i.e., discards) in the summer flounder, scup, and black sea bass fisheries.

Addendum XXXI expands the suite of tools available for managing summer flounder, scup and black sea bass, and reduces inconsistencies between state and federal regulations. Further, through the Addendum, the Board recommended NOAA Fisheries implement regulations to allow transit through federal waters in Block Island Sound for non-federally permitted vessels in possession of summer flounder, scup and black sea bass.

Framework 14 gives the Mid-Atlantic Council the option to waive the federal recreational black sea bass measures in favor of state measures through conservation equivalency; implements a transit zone for commercial and recreational summer flounder, scup, and black sea bass fisheries in Block Island Sound; and allows for the use of a maximum size limit in the recreational summer flounder and black sea bass fisheries.

Framework 15 established a requirement for commercial vessels with federal permits for all species managed by the Mid-Atlantic and New England Councils to submit vessel trip reports electronically within 48 hours after entering port at the conclusion of a trip.

Framework 16 modified MAFMC's ABC control rule and risk policy. The revised risk policy is intended to reduce the probability of overfishing as stock size falls below the target biomass while allowing for increased risk and greater economic benefit under stock biomass conditions. This action also removed the typical/atypical species distinction currently included in the risk policy.

Amendment 22 revised the commercial and recreational sector allocations for all three species.

Framework 17/Addendum XXXIV Recreational Harvest Control Rule/ Percent Change Approach established a new process for setting recreational bag, size, and season limits (i.e., recreational measures) for summer flounder, scup, black sea bass, and bluefish. This action also modified the recreational accountability measures for these species.

Addendum XXXVI which made further modifications to the process for setting recreational measures and accountability measures for these four species. The changes, which include modifications the Percent Change Approach based on lessons learned over the past few years, will be implemented in two phases.

Specific details for each Amendment under development include:

The Percent Change Approach was implemented in 2023 (new process for setting recreational measures bag, size, and season limits) and will sunset at the end of 2025.

In April 2025, the Policy Board and Council adopted Addendum XXXVI to the Summer Flounder, Scup, and Black Sea Bass FMP and Addendum III to the Bluefish FMP, which made further modifications to the process for setting recreational measures and accountability measures for these four species. The changes, which include modifications the Percent Change Approach based on lessons learned over the past few years, will be implemented in two phases. The first phase of changes aims to better account for stock status when setting measures and will create more opportunities for stability in management measures. The second phase of modifications, which will be implemented for setting 2030 recreational measures and beyond, will update the process to use a catch-based target. For further information see the management plan at asmfc.org.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt fishery management plans, consistent with N.C. law, approved by the MAFMC, 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. These plans were established under the Magnuson-Stevens Fishery Conservation and Management Act (federal council plans) and the Atlantic Coastal Fisheries Cooperative Management Act (ASMFC plans) with the goal, like the Fisheries Reform Act of 1997, to "ensure long-term viability" of these fisheries (NCDMF 2022).

Management Unit

U.S. waters in the western Atlantic Ocean from Cape Hatteras northward to the U.S.-Canadian border.

Goal and Objectives

The objectives of the Scup FMP are to:

- Reduce fishing mortality in the scup fisheries to assure that overfishing does not occur.
- Reduce fishing mortality on immature scup to increase spawning stock biomass.
- Improve the yield from these fisheries.
- Promote compatible management regulations between state and federal jurisdictions.
- Promote uniform and effective enforcement of regulations.
- Minimize regulations to achieve the management objectives stated above.

The 2011 Omnibus Amendment contains Amendment 15 to the Summer Flounder, Scup and Black Sea Bass FMP. The amendment is intended to formalize the process of addressing scientific and management uncertainty when setting catch limits for the upcoming fishing year(s) and to establish a comprehensive system of accountability for catch (including both landings and discards) relative to those limits, for each of the managed resources subject to this requirement. Specifically: (1) Establish allowable biological catch control rules, (2) Establish a MAFMC risk policy, which is one variable needed for the allowable biological catch control rules, (3) Establish annual catch limits, (4) Establish a system of comprehensive accountability that addresses all components of the catch, (5) Describe the process by which the performance of the annual catch limit and comprehensive accountability system will be reviewed, (6) Describe the process to modify the above objectives (1–5) in the future.

DESCRIPTION OF THE STOCK

Biological Profile

Scup are a migratory, schooling species found primarily along the Atlantic coast from Cape Cod, Massachusetts to Cape Hatteras, North Carolina. However, a smaller southern stock is believed to occur in North Carolina south of Cape Hatteras. Scup, north of Cape Hatteras, typically reach sexual maturity at age 2 to 3 or when they reach 7 inches fork length. Spawning for the northern stock typically occurs in estuaries and coastal waters during the months of May to August. They move offshore during the fall and winter. Extensive seasonal migration related to spawning is common for scup (north of Cape Hatteras). Scup have a maximum age of 14 years. Scup are bottom (benthic) feeders and prey on small crustaceans, mollusks, squid, sand dollars and fish (Steimle et al. 1999).

Stock Status

The 2023 scup management track stock assessment is an update of the existing 2021 management track assessment. Based on the previous assessment the stock was not overfished, and overfishing was not occurring. A data update from the NEFSC is expected in June/July 2024 with recent catch and landings information as well as recent NEFSC trawl survey data. The next management track assessment for scup is expected in 2025 to inform 2026–2027 limits, and a scup research track assessment is tentatively scheduled for 2028.

Stock Assessment

The 2023 scup management track stock assessment indicated the spawning stock biomass (SSB) to be estimated at 426 million pounds in 2022, which is two times the target of 173 million pounds. However, below average recruitment occurred in 2017 – 2022. Stock biomass is projected to decrease towards the target unless more above average year classes recruit to the stock in the short term. The 2023 management track assessment report can be found on the scup page on the ASMFC website for further information.

DESCRIPTION OF THE FISHERY

Current Regulations

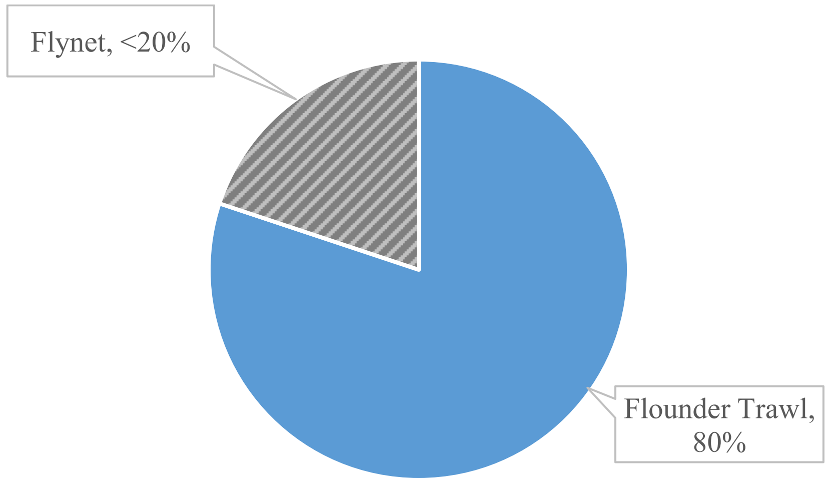
Commercial: 9-inch fork length minimum size limit in Atlantic Ocean and internal coastal waters. Daily trip limits for the different harvest periods (Winter I, Summer, Winter II) are set by proclamation. Winter I and Winter II trip limits follow the coastwide measures, while the summer trip limit is designed to prevent exceeding North Carolina's summer quota allocation [see most recent North Carolina Division of Marine Fisheries (DMF) proclamation].

Recreational: As of April 2024, the minimum size limit remains at a 9-inch fork length and a lower creel limit of 30-fish in coastal waters north of Cape Hatteras, season is year-round. In Federal waters north of cape Hatteras the minimum size is 10-inches fork length, 40-fish creel limit, and a season Jan 1 – Dec 31.

Commercial Fishery

All scup landings are reported through the North Carolina Trip Ticket Program. Since 2007 flounder trawl has been the main gear landing scup from north of Cape Hatteras, with the exception of 2023 being flynets (Figure 1). Annual landings were variable from 1994 through 2024 with very low landings in 2012 and significant low landings from 2020–2023. Low landings in 2012 to 2013 were partly due to shoaling at Oregon Inlet limiting access to large vessels (such as trawlers) and the consequent landing of most of North Carolina's scup in Virginia and other states. In 2024 landings showed an increase (Figure 2). Dredging efforts in 2024 has helped mitigate shoaling and has made navigation through Oregon Inlet passable for larger trawlers. In 2024 there were more trips and higher landings for scup.

Figure 1. Commercial harvest of scup (north of Cape Hatteras) in North Carolina by gear type in 2024. Note: Data for Flynet are confidential data.



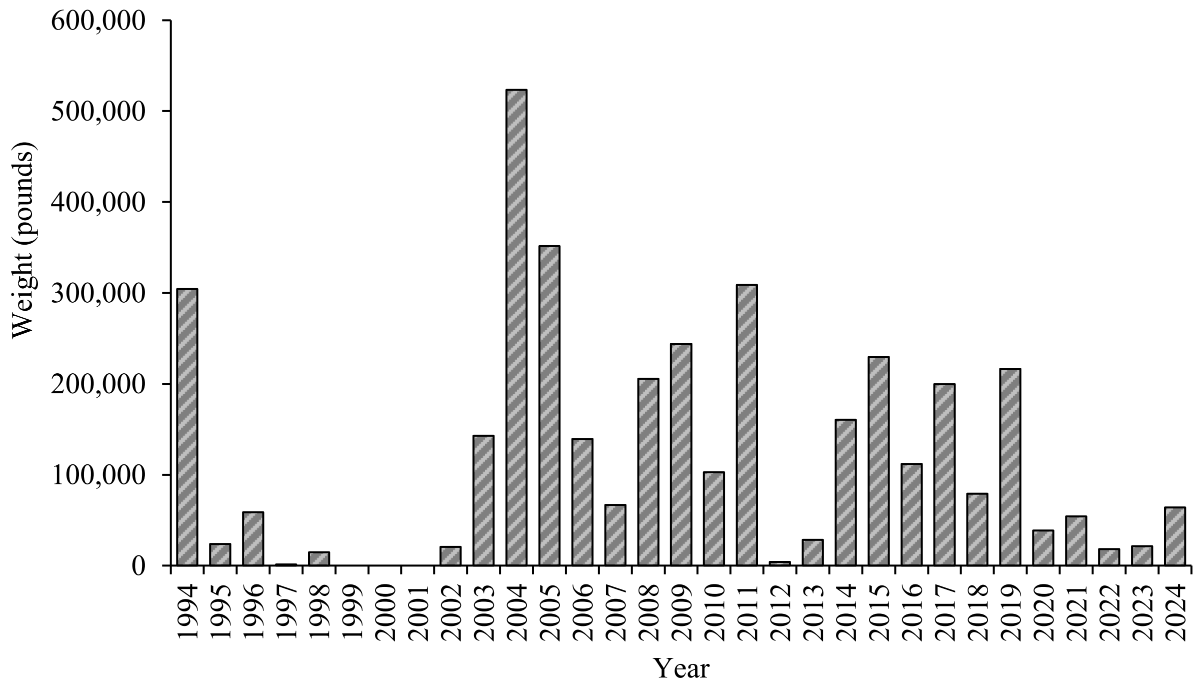


Figure 2. Annual commercial landings in pounds for scup (north of Cape Hatteras) in North Carolina from 1994–2024.

Recreational Fishery

All scup harvest is reported through the National Oceanic and Atmospheric Administration (NOAA) Marine Recreational Information Program. Recreational estimates across all years have been updated and are now based on the new Marine Recreational Information Program (MRIP) Fishing Effort Survey-based calibrated estimates. For more information on MRIP see https://www.fisheries.noaa.gov/topic/recreational-fishing-data. Recreational harvest of scup north of Cape Hatteras was only reported in 1994, 2000, 2011, 2012, 2015, and 2024 (Figure 3).

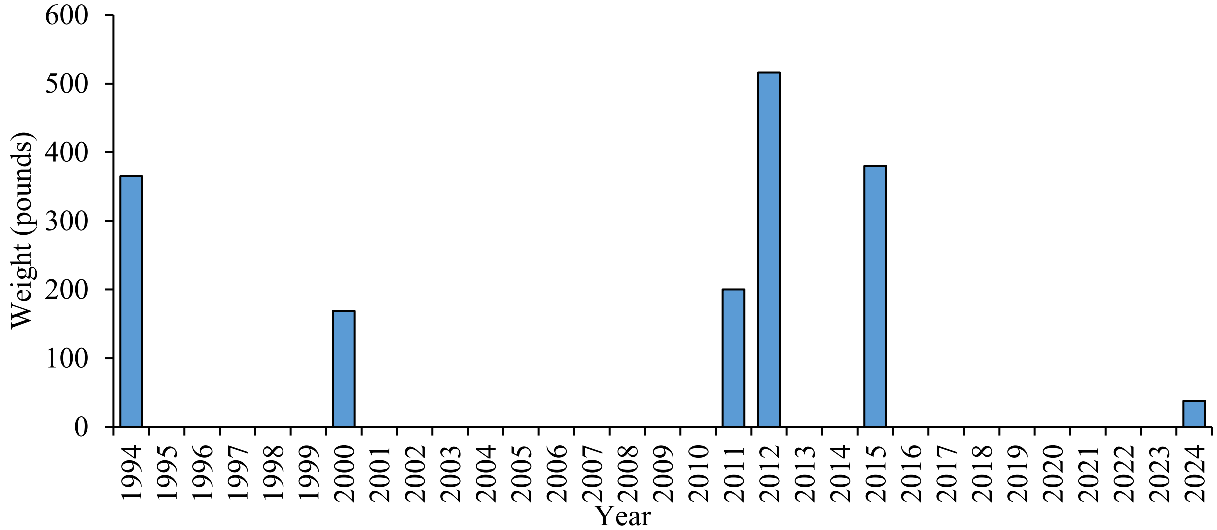


Figure 3. Annual recreational landings in pounds for scup (north of Cape Hatteras) in North Carolina from 1994–2024.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Two DMF sampling programs collect biological data on commercial and recreational fisheries that catch scup north of Cape Hatteras. Program 433 (Ocean Trawl Fishery) is the primary program that collects harvest length data. Other commercial sampling programs focusing on fisheries that do not target scup rarely collect biological data. DMF sampling of the recreational fishery through the NOAA marine recreational information program collects harvest length data. There were no clear trends in commercial length data through the time series and annual mean lengths have been consistent through 2024. The number of scup measured in 2024 increased significantly than the last two years, which could be contributed to the increased number of trips (Table 1). Recreational harvest length data were only collected in 1994, 2000 and 2015 for scup north of Cape Hatteras. While scup were landed in the recreational fishery in 2024, no length data were collected. Age data have not been collected by DMF for scup north of Cape Hatteras as ASMFC has not requested it.

Table 1. Scup (north of Cape Hatteras) length (fork length, inches) data from commercial fish house samples in North Carolina, 2015–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2015	11	5	17	2,998
2016	11	6	15	1,175
2017	11	8	16	2,879
2018	11	7	17	1,940
2019	11	6	17	3,037
2020	11	8	15	891
2021	11	7	16	1,628
2022	10	8	14	291
2023	11	9	15	168
2024	11	9	16	983

Fishery-Independent Monitoring

DMF currently does not have independent sampling programs in the Atlantic Ocean or internal estuarine waters north of Cape Hatteras that encounter scup.

RESEARCH NEEDS

Updated research needs from the 2015 60th Stock Assessment Workshop are provided below. The research needs listed below start with the most recent. Text in parentheses indicates known progress made to address needs.

- A standardized fishery dependent catch per unit effort for tows targeting scup, from either Northeast Fisheries Observer Program observer samples or the commercial study fleet, might be considered as an additional index of abundance to complement survey indices in future benchmark assessments. — Progress unknown at this time
- Explore additional sources of length and age data from fisheries and surveys in the early parts of the time series to provide additional context for model results. — Progress unknown at this time
- Explore experiments to estimate the catchability of scup in NEFSC and other research trawl surveys (side-by-side, camera, gear mensuration, acoustics, etc.). — Progress unknown at this time
- Refine and update the Manderson et al. availability analysis when/if a new ocean model is available (need additional support). Explore alternative niche model parameterizations including laboratory experiments on thermal preference and tolerance. — Progress unknown at this time
- Explore study fleet data in general for information that could provide additional context and/or input for the assessment. — Progress unknown at this time
- A scientifically designed survey to sample larger and older scup would likely prove useful in improving knowledge of the relative abundance of these large fish. — Progress unknown at this time
- Improve estimates of discards and discard mortality for commercial and recreational fisheries. — Some progress has been made
- Evaluate indices of stock abundance from new surveys. — Some progress has been made
- Quantify the pattern of predation on scup. — Some progress has been made
- Conduct biological studies to investigate maturity schedules and factors affecting annual availability of scup to research surveys. — Some progress has been made
- Explore the utility of incorporating ecological relationships, predation, and oceanic events that influence scup population size on the continental shelf and its availability to resource surveys into the stock assessment mode. — Some progress has been made
- Evaluate alternate forms of survey selectivity in the assessment to inform indices of abundance at higher ages. — Some progress has been made
- Evaluation of indicators of potential changes in stock status that could provide signs to managers of potential reductions of stock productivity in the future would be helpful. — Some progress has been made
- A management strategy for evaluation of alternative approaches to setting quotas would be helpful. — Progress unknow at this time
- Current research trawl surveys are likely adequate to index the abundance of scup at ages 0 to 2. However, the implementation of new standardized research surveys that focus on accurately indexing the abundance of older scup (ages 3 and older) would likely improve the accuracy of the stock assessment. — Some progress has been made

- Continuation of at least the current levels of at-sea and port sampling of the commercial and recreational fisheries in which scup are landed and discarded is critical to adequately characterize the quantity, length, and age composition of the fishery catches. — Progress has been made and research is ongoing
- Quantification of the biases in sampling of the catch and discards, including non-compliance, would help confirm the weightings used in the model. Additional studies would be required to address this issue. — Progress unknow at this time
- The commercial discard mortality rate was assumed to be 100 percent in this assessment. Experimental work to better characterize the discard mortality rate of scup captured by different commercial gear types should be conducted to more accurately quantify the magnitude of scup discard mortality. — Progress unknow at this time

MANAGEMENT

Scup stock assessments are completed by the NMFS Northeast Fisheries Science Center (NEFSC). Results from the 2023 management track assessment are used to guide management. Data are analyzed from the previous year based on decisions made for the benchmark assessment. The Summer Flounder, Scup and Black Sea Bass Fishery Management Plan (FMP) and amendments use output controls (catch and landings limits) as the primary management tool. Since 2023, catch-based allocations have continued and revised allocations were implemented with 65 percent being commercial and 35 percent being recreational. The FMP also includes minimum fish sizes, bag limits, seasons, gear restrictions, permit requirements, and other provisions to prevent overfishing and ensure sustainability of the fisheries. Recreational bag and size limits and seasons are determined on a state-by-state basis using conservation equivalency in state waters and coastwide measures in federal waters. The commercial quota is coastwide during the winter seasons (January–April; October–December) and state specific during the summer season (May–September).

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FISHERY MANAGEMENT PLAN UPDATE
COASTAL SHARKS
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	August 2008	
	Addendum I	September 2009
	Addendum II	May 2013
	Addendum III	October 2013
	Addendum IV	August 2016
	Addendum V	October 2018
Comprehensive Review:	2023: Blue shark (ICCAT)	
	2023: Hammerhead sharks Complex (SEDAR 77)	

The Atlantic States Marine Fisheries Commission (ASMFC) adopted a fishery management plan (FMP) for coastal sharks in 2008 (ASMFC 2008) to complement federal management actions and increase protection of pregnant females and juveniles in inshore nursery areas. Prior to the ASMFC FMP, sharks were domestically managed exclusively under National Marine Fisheries Service (NMFS) FMPs (NOAA Fisheries 1993; NOAA Fisheries 1999; NOAA Fisheries 2006). Atlantic highly migratory species (HMS), which includes sharks, are also managed internationally by the International Commission for the Conservation of Atlantic Tunas (ICCAT). The ASMFC FMP regulates 40 different species of coastal sharks found on the Atlantic coast. The ASMFC does not actively set quotas for any shark species and follows NMFS openings and closures for all shark species and management groups.

Addendum I (ASMFC 2009) modified the FMP to allow limited smooth dogfish processing at sea (removal of fins from the carcass), removed smooth dogfish recreational possession limits, and removed gill net check requirements for smooth dogfish fishermen. The goal of Addendum I was to remove restrictive management intended for large coastal sharks (LCS) from the smooth dogfish fishery and to allow fishermen to continue their operations while upholding the conservation measures of the FMP.

In 2012, NOAA Fisheries created the smoothhound complex for the management of both the Florida smoothhound and smooth dogfish. Addendum II (ASMFC 2013a) modified the FMP to allow year-round smooth dogfish processing at sea and allocated state shares of the smooth dogfish federal quota. The goal of Addendum II was to implement an accurate fin-to-carcass weight ratio and prevent the quota of the smoothhound shark complex from being harvested by one state.

Addendum III (ASMFC 2013b) modified the species groups for hammerhead and blacknose sharks to ensure consistency with NOAA Fisheries. The addendum also increased the recreational size limit for all hammerhead shark species to 78 inches fork length (FL) and blacknose and finetooth sharks to 54 inches FL.

Addendum IV (ASMFC 2016) allows smooth dogfish carcasses to be landed with corresponding fins removed from the carcass if the total retained catch, by weight, is composed of at least 25% smooth dogfish, consistent with federal management measures.

Addendum V (ASMFC 2018a) allows the ASMFC to streamline the process of state implementation of federal shark regulations so that complementary measures are seamlessly and concurrently implemented at the state and federal level whenever possible. Previously, any changes, with the exception of those related to commercial quotas, possession limits and season dates, had to be accomplished through an addendum.

To ensure compliance with interstate requirements, North Carolina also manages the coastal shark complex under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt fishery management plans consistent with North Carolina 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 (NCDMF 2022).

Management Unit

The management unit includes the entire coast-wide distribution of the resources from the estuaries eastward to the inshore boundary of the exclusive economic zone (EEZ). The management unit is split between the Atlantic and Gulf of Mexico regions for aggregated LCS, hammerhead, non-blacknose small coastal sharks (SCS), and blacknose sharks. The management units for pelagic sharks and sandbar sharks (Shark Research Fishery) are not split by region; the respective management units are the Atlantic and Gulf of Mexico combined.

Goal and Objectives

The Interstate FMP for Coastal Sharks (ASMFC 2008) established the following goal and objectives. The goal of the Interstate FMP for Coastal Sharks is to promote stock rebuilding and management of the coastal shark fishery in a manner that is biologically, economically, socially, and ecologically sound.

In support of this goal, the following objectives are in place for the Interstate Shark FMP:

- Reduce fishing mortality to rebuild stock biomass, prevent stock collapse, and support a sustainable fishery.
- Protect essential habitat areas such as nurseries and pupping grounds to protect sharks during particularly vulnerable stages in their life cycle.
- Coordinate management activities between state and federal waters to promote complementary regulations throughout the species' range.
- Obtain biological and improved fishery related data to increase understanding of state water shark fisheries.
- Minimize endangered species bycatch in shark fisheries.

DESCRIPTION OF THE STOCK

Biological Profile

Sharks belong to the class Chondrichthyes (cartilaginous fish) that also includes rays and skates. Relative to other marine fish, sharks produce few young in their lifetime. The low reproductive rates are due to slow growth, late sexual maturity of females, one to two-year reproductive cycles, and small litter size (Musick 1999). These biological factors leave many species of sharks vulnerable to overfishing (Stevens et al. 2000).

Sharks exhibit a number of different reproductive strategies ranging from giving birth to live pups (young) to egg laying (Dulvy and Reynolds 1997). Generally, female sharks produce a small number (2–25) of large-body pups (Simpfendorfer 1992). For some species, an increased gestation period allows for larger pups which is thought to increase juvenile survivorship (Stevens and McLoughlin 1991). Adults usually gather in specific areas to mate although little is known about shark mating behavior for most species. Sharks also exhibit a wide variety of life history traits across species. Some pelagic species such as shortfin mako (*Isurus oxyrinchus*) or Atlantic thresher (*Alopias vulpinus*), generally remain in offshore ocean environments their whole lives (Casey and Kohler 1992; Smith et al. 2008). Other shark species have an estuarine-dependent component to their life cycle. For example, mature female Atlantic sharpnose sharks (*Rhizoprionodon terraenovae*) and sandbars (*Carcharhinus plumbeus*) travel from near-shore coastal areas into estuarine habitats to pup (Grubbs et al. 2007; Carlson et al. 2008). Coastal shark nursery areas, such as bays and estuaries, are discrete, productive, and highly structured habitats that provide juveniles ample nutrients and refuge from predators (Heupel et al. 2007). Once mature, these shark species will emigrate into coastal ocean environments to continue their life cycle. The variability of life history traits (growth rate, age-at-maturity, reproduction rate, etc.) and highly mobile nature of sharks makes fisheries management across multiple species difficult (Cortés 2002).

Stock Status

Stock status is assessed by individual species when sufficient data is available (Table 1). For species that are data-limited, they are either assessed at the species complex level or have not been assessed. NOAA Fisheries produces an annual Stock Assessment and Fisheries Evaluation (SAFE) Report that reviews the status of Atlantic HMS fish stocks (tunas, swordfish, billfish, and sharks; NOAA Fisheries 2022). These reports are required under the Magnuson-Stevens Fishery Conservation and Management Act and provide the public with information on the latest updates in Atlantic HMS management.

Stock Assessment

Stock status varies between species and species group (Table 1). Most species that have been assessed, and those that have not been assessed, require a benchmark stock assessment due to new data, changing information on stocks, and improved assessment methodologies.

Table 1. Stock status designations for coastal sharks species groups.

Species or Complex Name	Stock overfished?	Stock undergoing overfishing?	Stock assessment year and comments
Pelagic			
Porbeagle	Yes	No	2020: Rebuilding ends in 2108
Blue (North Atlantic)	No	No	2023
Blue (South Atlantic)	No	Yes	2023
Shortfin Mako	Yes	Yes	2017
All other pelagic species	Unknown	Unknown	
Large Coastal Sharks			
Blacktip	No	No	2020
Aggregated Large Coastal Sharks-Atlantic Region	Unknown	Unknown	2006: Difficult to assess as a species complex due to various life history characteristics/lack of available data
Non-blacknose Small Coastal Sharks			
Atlantic Sharpnose	No	No	2013
Bonnethead	Unknown	Unknown	2013
Finetooth	No	No	2007
Hammerhead			
Scalloped	No	No	2024
Smooth	Unknown	No	2024: Stock assessment suggests rebuilding has been occurring since 2000
Great	Yes	No	2024
Blacknose			
Blacknose	Yes	Yes	2010: Rebuilding ends in 2043
Smoothhound			
Smooth Dogfish	No	No	2015
Research			
Sandbar	Yes	No	2017: Rebuilding ends 2070
Prohibited			
Dusky	Yes	Yes	2016: Rebuilding ends in 2107
All other prohibited species	Unknown	Unknown	

The 2007 SEDAR 13 assessed the SCS complex, finetooth (*Carcharhinus isodon*), Atlantic sharpnose (*Rhizoprionodon terraenovae*), and bonnethead (*Sphyrna tiburo*) sharks (SEDAR 2007). The SEDAR 13 peer reviewers considered the data to be the 'best available at the time' and determined the status of the SCS complex to be adequate. Finetooth, Atlantic sharpnose, and bonnethead were all considered to be not overfished and not experiencing overfishing. Atlantic sharpnose and bonnethead were more recently assessed by SEDAR 34 (SEDAR 2013). Atlantic sharpnose status remained as not overfished or undergoing overfishing. Based on SEDAR 34, bonnethead were not overfished or undergoing overfishing. However, the assessment combined the Gulf of Mexico stock and the Atlantic stock for the assessment. Because data shows that they are in fact two separate stocks, the results of the assessment were rejected and the status of the Atlantic stock is officially considered unknown.

SEDAR 11 (2006) assessed the LCS complex and blacktip sharks (*Carcharhinus limbatus*). The LCS assessment suggested that it was inappropriate to assess the LCS complex as a whole due to the variation in life history parameters, different intrinsic rates of increase, and different catch and abundance data for all species included in the LCS complex. Based on these results, NOAA Fisheries changed the status of the LCS complex from overfished to unknown. As part of SEDAR 11, blacktip sharks were assessed for the first time as two separate populations: Gulf of Mexico and Atlantic. The results indicated that the Gulf of Mexico stock was not overfished and overfishing was not occurring, while the status of blacktip sharks in the Atlantic region was unknown. A new stock assessment for Atlantic blacktip sharks was completed in December 2020 (SEDAR 65) and the stock assessment concluded that the stock is not overfished and overfishing is not occurring. A benchmark assessment for Porbeagle sharks was also completed in 2020 and determined that the Northwest Atlantic stock is still overfished but overfishing is not occurring.

In 2017, ICCAT updated a 2012 stock assessment for shortfin mako sharks (*Isurus oxyrinchus*). This assessment used another modeling approach which incorporated more abundance indices, sex-specific life history data, and tagging information. Based on model results, the population was considered overfished with overfishing occurring (ICCAT 2017). The next stock assessment is scheduled for 2024.

The most recent blue shark stock assessment was completed in 2023 ICCAT (ICCAT 2023). The assessment found that domestically, the north Atlantic stock is not overfished and overfishing is not occurring. The international north Atlantic stock is not likely overfished and overfishing is likely occurring. The next stock assessment is not currently scheduled. A 2009 stock assessment for the Northwest Atlantic and Gulf of Mexico populations of scalloped hammerhead sharks (*Sphyrna lewini*) indicated the stock is overfished and experiencing overfishing (Hayes et al. 2009). This assessment was reviewed by NOAA Fisheries and deemed appropriate to serve as the basis for U.S. management decisions (SEFSC 2010). In response to the assessment findings, NOAA Fisheries established a scalloped hammerhead rebuilding plan that would end in 2023. Since the assessment, research has determined that a portion of animals considered scalloped hammerheads in the US Atlantic are actually a cryptic species, recently named the Carolina hammerhead (*Sphyrna gilberti*; Quattro et al. 2013). Little to no species-specific information exists regarding the distribution, abundance, and life history of the two species. Therefore, both species are currently managed under the name scalloped hammerhead. A research track assessment of the hammerhead complex (SEDAR 2024) was completed in 2024. The assessment indicates that the scalloped hammerhead shark was not overfished and overfishing was not occurring in the terminal year (2019). For smooth hammerheads it suggests overfishing most likely is not occurring and the stock has been rebuilding since 2000. The assessment found that for the great hammerhead shark the stock is overfished, and no overfishing is occurring in the terminal year.

DESCRIPTION OF THE FISHERY

Current Regulations

All non-prohibited shark management groups opened in North Carolina on January 1, 2024, (Table 2) reflecting NOAA Fisheries openings. Commercial fishing shark management groups are outlined in Table 3. NOAA Fisheries closes the management groups' fisheries when 80% of their quota is reached. When the fishery closes in federal waters, the Interstate FMP dictates that the fishery also closes in state waters. No harvest or size restrictions are in place for LCS, but there is a retention limit that is set and changed by NOAA fisheries based on available quota.

Table 2. 2024 (1/1/2024–12/31/2024) coast-wide Atlantic coastal shark commercial fishery landings (Atlantic Coastal Cooperative Statistics Program, ACCSP) and annual quota.

Management Group	Region	2024 Quota (lb dw)	2024 Landings (lb dw)
Aggregated LCS	Atlantic	372,552	185,731
Hammerhead		59,736	39,191
Non-Blacknose SCS		582,333	171,377
Blacknose (South of 34° N. latitude only)		37,921	11,852
Smoothhound		3,973,902	735,890
Aggregated LCS (shark research fishery)	No Regional Quotas	110,230	20,016
Sandbar (shark research fishery)		199,943	123,059
Blue		601,856	<2,205
Porbeagle		3,748	<2,205
Other pelagics[1]		1,075,856	35,963

[1] As of July 5, 2022, the shortfin mako shark retention limit in all commercial and recreational Atlantic HMS fisheries is zero (87 FR 39373, July 1, 2022).

It is unlawful to possess any shark (with the exception of smooth dogfish) without tail and fins naturally attached to the carcass through offloading. Commercial fishermen may completely remove the fins of smooth dogfish, if the total retained catch, by weight, is composed of at least 25% smooth dogfish. If fins are removed, the total wet weight of the shark fins may not exceed 12% of the total dressed weight (dw) of smooth dogfish carcasses landed or found onboard a vessel. It is unlawful for a vessel to retain, transport, land, store, or sell scalloped hammerhead, great hammerhead, or smooth hammerhead sharks with pelagic longline gear onboard. It is unlawful for a vessel to retain sandbar sharks unless the vessel is selected to participate in the shark research fishery, subject to retention limits established by NOAA Fisheries and only when a NOAA Fisheries approved observer is onboard. It is unlawful to use gears other than rod and reel, handlines, large and small mesh gill nets, shortlines (maximum of two shortlines, 500 yards each with 50 hooks or less, hooks shall not be corrosion resistant and must be designated by the manufacturer as circle hooks), pound nets/fish traps, and trawl nets. It is unlawful to use a large mesh (stretched mesh size greater than or equal to five inches) gill net more than 2,734 yards in length to capture sharks. It is unlawful to sell sharks to anyone who is not a federally permitted shark dealer. NOAA Fisheries sets quotas for coastal sharks through their 2006 Consolidated Highly Migratory Species Fishery Management Plan (HMS FMP; NOAA Fisheries 2006). As indicated above, the states follow NOAA Fisheries openings and closings, which are based on available quotas (Table 2). In March 2019, NOAA HMS implemented final measures to address the overfishing and overfished condition of Atlantic shortfin mako under Amendment 11 to the HMS FMP (NOAA Fisheries 2019). The rules respond to the determination by ICCAT that all member countries need to reduce shortfin mako landings by 72–79% to prevent further population decline. The final commercial rule as implemented allows for Atlantic shortfin mako commercial retention only by properly permitted operations using pelagic longline and gillnet gear and only if the shark is dead at haul back. Additionally, retention by pelagic longline gear is only allowed if a functional electronic monitoring system is on board the vessel. Recreational measures included an increase in the minimum size limit from 54 inches FL to 71 inches FL for males and to 83 inches FL for females. In April of 2019, the ASMFC Coastal Shark Board adopted complementary size limit measures for the recreational fishery in state waters to provide consistency with size limits in federal waters. In May 2022, the Board approved a zero-retention limit in state waters for Atlantic shortfin mako sharks for both recreational and commercial fisheries. These measures are consistent with those implemented by NOAA Fisheries for federal highly migratory species

(HMS) permit holders based on the International Commission for the Conservation of Atlantic Tunas (ICCAT) recommendation. This action was taken in response to the 2019 Atlantic shortfin mako stock assessment data update that indicates the resource is overfished and experiencing overfishing, with a rebuild date of 2070. This rule took effect federally on July 5, 2022, and at the state level on July 11, 2022. Additionally, in 2019 the Board moved to require non-offset circle hooks for the recreational shark fishery in state waters with an implementation date of July 1, 2020. The Board chose to do so after NOAA Fisheries requested that the states implement a circle hook requirement for the recreational fishery consistent with the measures approved in HMS Amendment 11. Species authorized for recreational harvest are listed in Table 4 based on management group and recreational size and bag limits are described in Table 5.

Table 3. List of commercial shark management groups.

Management Group	Species Within Group
Prohibited	Sand tiger, bigeye sand tiger, whale, basking, white, dusky, bignose, Galapagos, night, reef, narrowtooth, Caribbean sharpnose, smalltail, Atlantic angel, longfin mako, bigeye thresher, sharpnose sevengill, bluntnose sixgill, and bigeye sixgill
Research	Sandbar
Non-Blacknose Small Coastal	Atlantic sharpnose, finetooth, and bonnethead
Blacknose	Blacknose
Aggregated Large Coastal	Silky, tiger, blacktip, spinner, bull, lemon, and nurse
Hammerhead	Scalloped hammerhead, great hammerhead, and smooth hammerhead
Pelagic	Shortfin mako[1], common thresher, oceanic whitetip[3], porbeagle[2],and blue[2]
Smoothhound	Smooth dogfish (referred to as smoothhound throughout this report)

[1]As of July 5, 2022, the shortfin mako shark retention limit in all commercial and recreational Atlantic HMS fisheries is zero (87 FR 39373, July 1, 2022).
[2]Although porbeagle and blue sharks are in the Pelagic Management Group, they each have their own quota.
[3] As of February 2, 2024 the oceanic whitetip shark retention limit in all commercial and recreational Atlantic HMS fisheries is zero (89 FR 278, February 2, 2024)

Table 4. Recreationally permitted species list (as of January 1, 2024).

SPECIES AUTHORIZED FOR RECREATIONAL HARVEST			
Large Coastal Sharks (LCS) (non-ridgeback LCS & tiger)	Small Coastal Sharks (SCS)	Pelagic Sharks	Other
Blacktip Bull Hammerhead, great Hammerhead, scalloped Hammerhead, smooth Lemon Nurse Spinner Tiger	Atlantic Sharpnose Blacknose Bonnethead Finetooth	Blue Oceanic whitetip[1] Porbeagle Thresher	Smoothhound shark (Smooth dogfish) Spiny dogfish

[1] As of February 2, 2024 the oceanic whitetip shark retention limit in all commercial and recreational Atlantic HMS fisheries is zero (89 FR 278, February 2, 2024)

Table 5. Recreational size and bag limits (as of January 1, 2024). Non-listed species are prohibited.

RECREATIONAL SIZE / BAG LIMITS and SEASONS			
Species*	Minimum Size (FL, inches)	Trip Bag Limit/Calendar Day	Season
Atlantic sharpnose	None	1 per person of each species	Jan. 1 – Dec. 31
Bonnethead	None		
Smooth dogfish	None	None	
Spiny dogfish	None	None	
Hammerheads (Great, Smooth and Scalloped)	78”	1 per vessel <u>OR</u> 1 per person for shore-anglers	
Non-Hammerhead LCS, Tiger, Pelagic, Blacknose, and Finetooth Sharks	54”		

*Check DMF proclamations for most current regulations

Commercial Fishery

Table 2 summarizes coast-wide Atlantic commercial landings data from 2024. Shark management groups with Atlantic region quotas are LCS, hammerhead, non-blacknose SCS, blacknose, and smoothhound. Commercial landings of LCS totaled 185,731 pounds, dressed weight (lb, dw) in 2024, which was an decrease from 265,198 lb, dw from 2023. Total commercial landings of hammerhead sharks were 39,191 lb, dw in 2024, which was a decrease from 53,203 lb, dw reported in 2023. Commercial landings of non-blacknose SCS shark species in 2024 totaled 171,377 lb, dw, an slight decrease from 187,938 lb, dw landed in 2023. The commercial landings total of blacknose sharks south of 34º N latitude (Kure Beach, North Carolina) in 2024 was 11,852 lb, dw a slight decrease from 13,104 lb,dw from 2023. Commercial retention of blacknose sharks is prohibited north of 34º N latitude. Commercial landings of smoothhound sharks in 2024 were 735,890 lb, dw, which decreased from the 903,951 lb dw landed in 2023. Shark management groups with no regional quotas are sandbar (shark research fishery), blue, porbeagle, and other pelagics. Commercial landings in 2024 of porbeagle sharks were <2,205 lb, dw. Commercial landings of blue sharks were <2,205 lb, dw. Other pelagic shark landings were 35,963 lb, dw. The shark research fishery landed 123,059 lb, dw of sandbar sharks and 20,016 lb, dw of LCS.

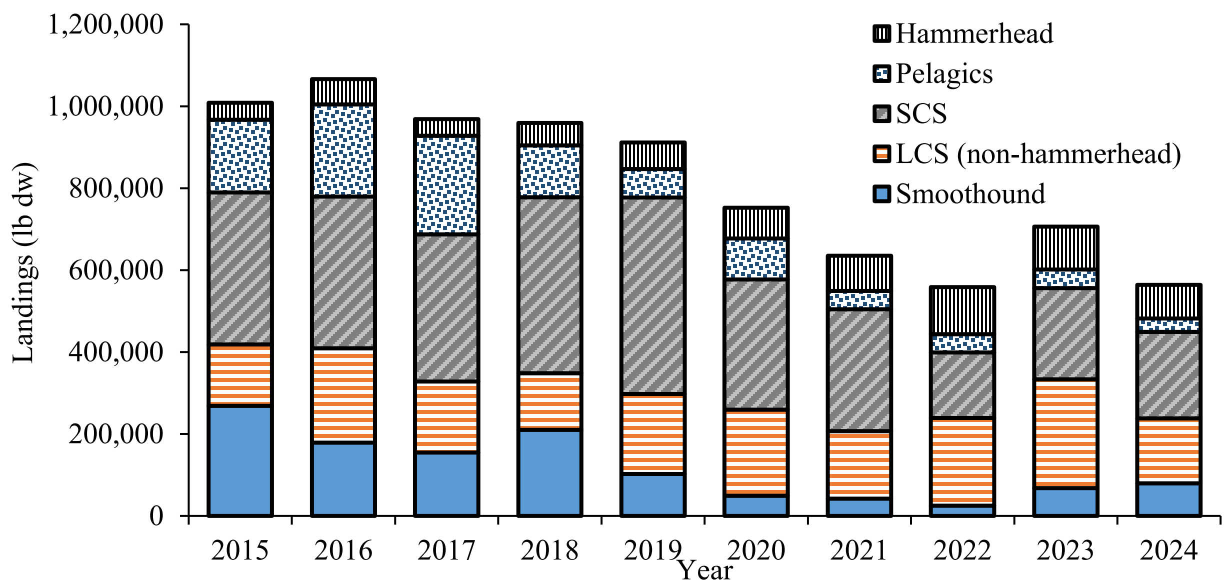

Figure 1. North Carolina commercial shark landings by management group, 2015–2024. In this figure, sandbar shark landings are included with the LCS and SCS includes blacknose landings.

In North Carolina, total shark commercial landings have steadily decreased since 2015 (Figure 1; Table 6). Smoothhound shark landings have steadily decreased from 268,429 lb, dw in 2015 and decreased to a new low of 25,074 lb, dw in 2022 and has increased slightly to 79,376 in 2024. Peak harvest of pelagic sharks was highest in 2017 (240,128 lb, dw) and there has been an overall decreasing trend to 32,596 in 2024. Similarly, peak harvest of SCS was highest in 2019 (479,484 lb, dw) and has decreased since. While total shark landings have decreased, landings of hammerheads have generally increased. LCS (non-hammerhead) harvest has fluctuated annually but has been consistent over the last ten years.

Table 6. Summary of North Carolina commercial landings (pounds) for large coastal sharks (LCS), small coastal sharks (SCS), hammerheads, smoothhound, and pelagics, 2015–2024. In this table, sandbar shark landings are included with the LCS and SCS includes blacknose landings.

Year	LCS (non-hammerhead)	SCS	Hammerhead	Smoothhound	Pelagics	Total
2015	150,394	371,069	41,768	268,429	176,882	1,008,542
2016	230,855	369,948	62,135	178,694	224,746	1,066,378
2017	173,758	359,486	40,743	154,440	240,128	968,555
2018	138,238	430,274	55,004	209,760	125,993	959,269
2019	195,173	479,484	65,104	102,592	69,182	911,535
2020	209,939	318,170	75,339	49,286	99,468	752,202
2021	165,005	297,193	85,966	42,169	44,648	634,981
2022	213,172	160,464	114,848	25,074	44,298	557,856
2023	265,935	222,144	104,056	67,795	45,940	705,870
2024	159,075	210,602	82,267	79,376	32,596	563,916

Recreational Fishery

Recreational harvest estimates for SCS in North Carolina has fluctuated in the past 10 years from a low of 2,545 pounds in 2016 to 106,765 pounds in 2019 (Table 7). The 2024 landings (4,828 pounds) were less than the 10-year average (26,828 pounds). Recreational harvest for LCS in North Carolina tends to be much smaller than for SCS. In 2024, there were an estimated 100 pounds harvested of LCS. From 2015 to 2024, average annual harvest was 3,750 lb, dw (Table 7). The recreational harvest of pelagic sharks in North Carolina is highly variable. Harvest was 0 pounds in 2024 and has ranged from 0 to 479,443 pounds from 2015 to 2024 (Table 7). Recreational harvest of smooth dogfish in North Carolina is also variable and often low, although releases are common. Harvest for smoothhound ranged from 0 to 186,261 from 2015 to 2024 (Table 7). Recreational landing estimates for all shark species across all years have been updated and are now based on the Marine Recreational Information Program (MRIP) new Fishing Effort Survey-based calibrated estimates. Due to small sample sizes and the relatively rare occurrence of landings, the percent standard errors (PSE) is high for many years of recreational shark landings. See NOAA MRIP for more information on methodology.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

North Carolina does not collect individual lengths for sharks other than spiny dogfish; sharks arrive at the dock dressed (i.e., gutted with head and tail removed). Landings in pounds dw are recorded by the Trip Ticket Program.

Table 7. North Carolina small coastal sharks (including blacknose), large coastal sharks, pelagics, and smoothhound recreational harvest, discards, and percent standard error (PSE), 2015–2024. Years with blank entries represent an estimated harvest of zero.

Species Group	Year	Number Harvested	PSE	Weight (lb)	PSE	Number Released	PSE
SCS(including blacknose)	2015	6,656	41.3	38,499	44.3	15,866	70.4
	2016	514	66.6	2,545	63.4	133,214	57.0
	2017	5,768	56.5	19,256	42.3	58,440	60.5
	2018	1,678	38.9	9,097	40.9	4,496	39.5
	2019	13,736	70.8	106,765	75.8	34,952	36.1
	2020	5,074	70.2	21,114	56.0	16,563	50.9
	2021	3,556	57.7	24,241	53.9	21,045	44.9
	2022	1,698	49.1	16,909	51.1	30,202	57.1
	2023	3,771	44.5	25,172	50.4	65,203	14.2
	2024	745	61.5	4,683	59.5	40,566	45.6
LCS	2015	10	99.9	-	-	139,486	66.1
	2016	12	101.0	1,100	101.0	27,885	54.3
	2017	910	79.6	27,367	83.4	43041	43.7
	2018	39	84.5	235	95.8	4,916	59.3
	2019	60	72.1	3,745	72.1	30,032	40.5
	2020	26	74.6	551	100.8	8,567	36.0
	2021	6	100.8	594	100.8	22,576	97.5
	2022	-	-	-	-	18,735	98.4
	2023	19	97.9	62	97.9	46,662	2.4
	2024	13	70.7	100	70.7	707	70.7
Pelagics	2015	5,097	76.1	479,443	75.9	987	91.8
	2016	-	-	-	-	3,512	79.0
	2017	66	64.1	4,917	62.2	33	86.2
	2018	2,043	73.1	160,155	73.1	38	63.0
	2019	-	-	-	-	888	65.7
	2020	-	-	-	-	-	-
	2021	111	98.1	-	-	20	96.9
	2022	-	-	-	-	-	-
	2023	-	-	-	-	-	-
	2024	-	-	-	-	-	-
Smoothhound	2015	1,013	71.2	1,964	71.4	119,678	63.7
	2016	10,879	92.6	186,261	97.0	97,256	44.9
	2017	-	-	-	-	34,722	36.2
	2018	-	-	-	-	29,524	49.3
	2019	2,856	95.6	6,926	95.6	15,301	73.6
	2020	1,289	98.9	3,125	98.9	479,933	49.4
	2021	-	-	-	-	10,815	89.9
	2022	1,310	99.8	2,166	99.8	1,560	79.9
	2023	2,808	77.4	11,671	78.7	295,556	85.0
	2024	402	104.1	1,064	104.1	34,399	48.9

*PSE higher than 50 indicates a very imprecise estimate

Fishery-Independent Monitoring

The North Carolina Division of Marine Fisheries (DMF) established a fishery-independent adult red drum longline survey in 2007 (P365) that operates in Pamlico Sound from July to October. Atlantic coastal shark species captured in the survey are measured, tagged, and released. In total, six coastal sharks, one Atlantic sharpnose, two spinner sharks, and three Sandbar sharks were sampled in 2024. DMF has conducted a fishery-independent gill net survey (P915) which has been conducted in Pamlico Sound since 2001. Sampling was expanded to the Pamlico, Pungo, and Neuse Rivers in 2003 and to the Cape Fear and New Rivers in 2008. Coverage was further expanded to Bogue, Back, and Core Sounds in 2018. The objective of this project is to provide annual indices of relative abundance for key estuarine species in North Carolina estuaries that can be incorporated into stock assessments. Data from this survey are used to improve bycatch estimates, evaluate management measures, and evaluate habitat usage. Results from this project are used by the DMF and other Atlantic coast fishery management agencies to evaluate the effectiveness of current management measures and to identify additional measures that may be necessary to conserve marine and estuarine stocks. Developing fishery independent indices of abundance for target species allows the DMF to assess the status of these stocks without relying solely on commercial and recreational fishery dependent data. The survey employs a stratified random sampling design and utilizes multiple mesh gill nets (3.0 inch to 6.5 inch stretched mesh, by 0.5-inch increments). In 2024, a total of 925 individual coastal sharks were captured in P915 (Table 8), which is much more than the project's annual average of 333 individual sharks.

Table 8. Shark species captured in the DMF 2024 statewide Independent Gill Net Survey (P915).

Species	Total Number Measured	Mean Total Length (inches)	Minimum Total Length (inches)	Maximum Total Length (inches)
Atlantic sharpnose	305	20	11	41
Blacknose	4	48	43	61
Blacktip	21	51	20	67
Bonnethead	97	34	19	61
Bull	168	31	24	79
Finetooth	20	47	21	62
Sand tiger	1	-	-	-
Sandbar	227	32	21	51
Smoothhound	80	25	18	34
Spinner	2	39	38	40

RESEARCH NEEDS

The review of the ASMFC FMP (ASMFC 2022) directs to research needs from the 2018 ASMFC Research Priorities (ASMFC 2018):

Fishery-Dependent Priorities

- Initiate or expand dockside sampling for sharks to verify landings information and species composition.
- The Atlantic menhaden fishery data should be examined to determine shark bycatch estimates, if available.
- Conduct additional length sampling and age composition collection to improve information for developing selectivity.
- Shrimp trawl observer coverage should be expanded to 2 to 5% of total effort, particularly during periods of regulatory or gear changes. The observer coverage program should strive for even spatial coverage (particularly adding more south Atlantic coverage), randomness in vessel selection and full identification of elasmobranch species (continuing on from the 2009 Bycatch Characterization Protocol).
- Increase research on post-release survivorship of all shark species by gear type.
- Continue to acquire better species-specific landings information on number of species, by weight, from dealers.

Fishery-Independent Priorities

- Investigate the appropriateness of using vertebrae for ageing adult sandbar sharks. If appropriate, implement a systematic sampling program that gathers vertebral samples from entire size range for annual ageing to allow tracking the age distribution of the catch as well as updating of age-length keys.
- Develop a fishery-independent porbeagle shark survey to provide additional size composition and catch rate data to calculate an index of abundance.
- All dealers must report landings by species.
- Recent bomb radiocarbon research has indicated that past age estimates based on tagging data for sandbar sharks may be correct and that vertebral ageing may not be the most reliable method for mature individuals.
- Develop a stock wide fishery-independent monitoring program in state coastal waters for
- Dusky sharks that include annual samples of length and age frequencies.

Life History, Biological, and Habitat Priorities

- Re-evaluate finetooth life history in the Atlantic Ocean in order to validate fecundity and reproductive periodicity.
- Develop and conduct tagging studies on dusky and blacknose stock structure with increased international collaboration (e.g., Mexico) to ensure wider distribution and returns of tags.
- Expand research efforts directed towards tagging of individuals in south Florida and Texas/Mexico border to get better data discerning potential stock mixing.
- Examine female sharks during the spawning periods to determine the proportion of spawning females.
- Continue life history studies for all species of the shark complex to allow for additional species specific assessments. Particularly, natural mortality, age, fecundity, and reproductive frequency. Update age, growth, and reproductive studies of blacknose sharks with emphasis on smaller individuals in the Atlantic and larger individuals in the Gulf of Mexico.
- Coordinate a biological study for Atlantic sharpnose so that samples are made at least monthly, and, within each month, samples would be made consistently at distinct geographic locations. For example, sampling locations would be defined in the northern Gulf, west coast of Florida, the Florida Keys (where temperature is expected to be fairly constant over all seasons), and several locations in the South Atlantic, including the east coast of Florida, Georgia, South Carolina, and North Carolina. This same sampling design could be applied to all small coastal sharks.
- Population level genetic studies are needed that could lend support to arguments for stock discriminations using new loci and/or methodology that has increased levels of sensitivity.
- Determine what is missing in terms of experimental design and/or data analysis to arrive at incontrovertible (to the extent that it may be scientifically possible) conclusions on the reproductive periodicity of the sandbar shark stock.

Management, Law Enforcement, and Socioeconomic Priorities

- Conduct species specific assessments for all shark species, with a priority for smooth dogfish.

MANAGEMENT

Most Atlantic shark species are highly mobile and the NOAA Fisheries' HMS Management Division is responsible for managing them under the Magnuson-Stevens Fishery Conservation and Management Act.

In cooperation with an advisory panel, the Division develops and implements FMPs for these species and management groups. The ASMFC adopts NOAA Fisheries regulations in state waters.

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FISHERY MANAGEMENT PLAN UPDATE
SNAPPER GROUPER COMPLEX
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation: August 1983 (SAFMC 1983a, b; 48 FR 39463)

Regulatory Amendment 1	March 1987
Regulatory Amendment 2	March 1989
Amendment 1	January 1989
Regulatory Amendment 3	November 1990
Amendment 2	December 1990
Amendment 3	January 1991
Amendment 4	January 1992
Amendment 5	April 1992
Regulatory Amendment 4	July 1993
Regulatory Amendment 5	July 1993
Amendment 6	July 1994
Amendment 7	January 1995
Regulatory Amendment 6	May 1995
Amendment 8	December 1998
Regulatory Amendment 7	January 1999
Amendment 9	February 1999/October 2000
Amendment 10	July 2000
Amendment 11	December 1999
Regulatory Amendment 8	November 2000
Amendment 12	September 2000
Amendment 13a	April 2004
Amendment 13c	October 2006
Amendment 14	February 2009
Amendment 15a	March 2008
Amendment 15b	February 2010
Amendment 16	July 2009
Amendment 19	July 2010
Amendment 17a	March 2011
Amendment 17b	January 2011
Regulatory Amendment 10	May 2011
Regulatory Amendment 9	July 2011
Regulatory Amendment 11	May 2012
Amendment 25	April 2012
Amendment 24	July 2012
Amendment 23	January 2012
Amendment 18a	July 2012/January 2013
Amendment 20a	October 2012
Regulatory Amendment 12	October 2012
Amendment 18b	May 2013
Regulatory Amendment 13	July 2013
Regulatory Amendment 14	December 2014
Regulatory Amendment 15	September 2013

Amendment 27	January 2014
Amendment 31	January 2014
Amendment 28	August 2013
Regulatory Amendment 18	September 2013
Regulatory Amendment 19	October 2013
Regulatory Amendment 21	November 2014
Amendment 32	March 2015
Amendment 29	July 2015
Regulatory Amendment 22	August/September 2015
Regulatory Amendment 20	August 2015
Amendment 33	January 2016
Amendment 34	February 2016
Amendment 35	June 2016
Regulatory Amendment 25	August 2016
Regulatory Amendment 16	December 2016/March 2017
Amendment 36	July 2017
Amendment 37	August 2017
Amendment 43	July 2018
Amendment 41	February 2018
Regulatory Amendment 28	January 2019
Abbreviated Framework Amendment 1	August 2018
Abbreviated Framework Amendment 2	May 2019
Amendment 42	January 2020
Regulatory Amendment 27	February 2020
Regulatory Amendment 30	March 2020
Regulatory Amendment 26	March 2020
Regulatory Amendment 29	July 2020
Abbreviated Framework Amendment 3	August 2020
Regulatory Amendment 33	November 2020
Amendment 39	January 2021
Regulatory Amendment 34	May 2021
Amendment 50	January 2023
Amendment 49	September 2023
Amendment 53	September 2023
Amendment 52	November 2023
Amendment 51	November 2023
Amendment 45	February 2024
Amendment 55	December 2025

Comprehensive Review: None

Of the 75 species managed by the South Atlantic Fishery Management Council (SAFMC), 55 of these are included in the Snapper Grouper management complex. Because of its mixed species nature, this fishery offers the greatest challenge for SAFMC to manage. Initially, Fishery Management Plan (FMP) regulations consisted of minimum sizes, gear restrictions, and a provision for the designation of Special Management Zones (SMZs). Early attempts to develop more effective management measures were thwarted by lack of data on both the resource and fishery. The condition of many of the species within the snapper grouper complex is unknown. Improved data collection (in terms of quantity and quality) during the 1980s and 1990s has provided more management information on some of the more commercially and recreationally valuable species, but lack of basic management data on many of the species remains the major obstacle to successful management.

Management of the snapper grouper fishery is also difficult because many of these species are slow growing, late maturing, hermaphroditic, and long lived; thus, rebuilding efforts for some species will take years to full recovery. Strict management measures, including prohibition of harvest in some cases, have been implemented to rebuild overfished species in the snapper grouper complex. Such harvest restrictions are beneficial, not only in rebuilding species, but also in helping to prevent species from undergoing overfishing in the future.

Regulatory Amendment 1 (48 FR 9864) prohibited fishing in SMZs, except with hand-held hook and line and spearfishing gear; prohibited harvest of goliath grouper in SMZs; and implemented SMZs off South Carolina and Georgia.

Regulatory Amendment 2 (54 FR 8342) established two artificial reefs off Fort Pierce, Florida as SMZs.

Amendment 1 (SAFMC 1988; 54 FR 1720) prohibited use of trawl gear to harvest fish in the snapper grouper fishery south of Cape Hatteras, North Carolina and north of Cape Canaveral, Florida; defined directed snapper grouper fishery as a vessel with trawl gear and greater than or equal to 200-pounds of snapper grouper species onboard; and established the rebuttable assumption that vessels with snapper grouper species onboard harvested these fish in the U.S. Exclusive Economic Zone (EEZ).

Regulatory Amendment 3 (55 FR 40394) established an artificial reef at Key Biscayne, Florida as an SMZ in Dade County, Florida; prohibited fish trapping, bottom longlining, spearfishing, and harvesting of goliath grouper in SMZs.

Amendment 2 (SAFMC 1990a; 55 FR 46213) prohibited harvest or possession of goliath grouper in or from the EEZ in the South Atlantic and defined overfishing for snapper grouper species according to NMFS 602 guidelines.

Amendment 3 (SAFMC 1990b; 56 FR 2443) established a management program for the wreckfish fishery which: added wreckfish to the snapper grouper management unit; defined Optimum Yield (OY) and overfishing; required an annual permit to fish for, land or sell wreckfish; established a control date of March 28, 1990 for the area bounded by 33 degrees and 30 degrees N latitude; established a fishing year beginning April 16; established a process whereby annual quotas would be specified; implemented a 10,000 pound trip limit and a January 15 – April 15 spawning season closure.

Amendment 4 (SAFMC 1991a; 56 FR 56016) prohibited the use of various gear, including fish traps, the use of bottom longlines for wreckfish, and powerheads in SMZ off South Carolina; established bag limits and minimum size limits for several species; established income requirements to qualify for permits; and required that all snapper grouper species possessed in South Atlantic federal waters must have heads and fins intact through landing.

Amendment 5 (SAFMC 1991b; 57 FR 7886) established an Individual Transferable Quota (ITQ) management program for the wreckfish fishery.

Regulatory Amendment 4 (SAFMC 1992a; 58 FR 36155) modified the definition of black sea bass pots; allowed for multi-gear trips and the retention of incidentally caught fish.

Regulatory Amendment 5 (SAFMC 1992b; 58 FR 35895) established eight additional SMZs off the coast of South Carolina.

Amendment 6 (SAFMC 1993; 59 FR 27242) established commercial quotas for snowy grouper, golden tilefish; established commercial trip limits for snowy grouper, golden tilefish, speckled hind, and Warsaw grouper; included golden tilefish in grouper recreational aggregate bag limits; prohibited sale of Warsaw grouper and speckled hind; created the Oculina Experimental Closed Area; and specified data collection needs for evaluation of possible future Individual Fishing Quota (IFQ) system.

Amendment 7 (SAFMC 1994a; 59 FR 66270) established size limits and bag limits for hogfish and mutton snapper; specified allowable gear; prohibited the use of explosive charges, including powerheads, off South Carolina; and required dealer, charter, and headboat federal permits.

Regulatory Amendment 6 (SAFMC 1994b; 60 FR 19683) includes provisions to rebuild and protect hogfish by implementing a recreational bag limit of five fish per person off Florida; protect cubera snapper by implementing a recreational bag limit of two per person for fish 30-inches total length (TL) or larger off Florida; and protect gray triggerfish by implementing a minimum size limit of 12-inches TL off Florida.

Amendment 8 (SAFMC 1997; 63 FR 38298) established a limited entry system for the snapper grouper fishery.

Regulatory Amendment 7 (63 FR 71793) established ten SMZs at artificial reefs off South Carolina.

Amendment 9 (SAFMC 1998a; 64 FR 3624; 65 FR 55203) increased the minimum size limits on red porgy, black sea bass, vermillion snapper (recreational only), gag, and black grouper; changed bag limits for red porgy, black sea bass, greater amberjack, gag, and black grouper; established an aggregate recreational bag limit of 20 fish per person per day inclusive of all snapper grouper species currently not under a bag limit, excluding tomtate and blue runners; and specified that vessels with bottom longline gear aboard may only possess snowy grouper, Warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish.

Amendment 10 (SAFMC 1998b; 65 FR 37292) identified Essential Fish Habitat (EFH) and EFH - Habitat Areas of Particular Concern (HAPCs) for species in the snapper grouper management unit.

Amendment 11 (SAFMC 1998c; 64 FR 59126) amended the FMP as required to make definitions of Maximum Sustainable Yield (MSY), OY, overfishing and overfished consistent with "National Standard Guidelines"; identified and defined fishing communities; and addressed bycatch management measures.

Regulatory Amendment 8 (65 FR 61114) established 12 SMZs at artificial reefs off Georgia; revised boundaries of seven existing SMZs off Georgia to meet Coast Guard permit specifications; restricted fishing in new and revised SMZs.

Amendment 12 (SAFMC 2000; 65 FR 51248) set regulatory limits for red porgy including a recreational bag limit, a commercial incidental catch limit, and a recreational and commercial size limit. It also permitted the transfer of the 225-pound trip limited commercial permit to another vessel (not another person) regardless of vessel size.

Amendment 13A (SAFMC 2003; 69 FR 15731) extended regulations within the Oculina Experimental Closed Area off the east coast of Florida that prohibit fishing for and retention of snapper grouper species for an indefinite period with a 10-year re-evaluation by the Council. The Council will review the configuration and size of the area within three years of publication of the Final Rule (March 26, 2004).

Amendment 13C (SAFMC 2006; 71 FR 55096) addressed overfishing for snowy grouper, golden tilefish, black sea bass, and vermilion snapper. The amendment also allowed for a moderate increase in the harvest of red porgy as stock continues to rebuild.

Amendment 14 (SAFMC 2007a; 74 FR 1621) established a series of deepwater marine protected areas in the South Atlantic EEZ.

Amendment 15A (SAFMC 2008a; 73 FR 14942) updated management reference points for snowy grouper, black sea bass, and red porgy; modified rebuilding schedules for snowy grouper and black sea bass; defined rebuilding strategies for snowy grouper, black sea bass, and red porgy; and redefined the minimum stock size threshold for the snowy grouper stock.

Amendment 15B (SAFMC 2008b; 74 FR 58902) prohibited sale of bag-limit caught snapper grouper species; reduced the effects of incidental hooking on sea turtles and smalltooth sawfish; changed the commercial permit renewal period and transferability requirements; implemented a plan to monitor and address bycatch; and established management reference points for golden tilefish. Amendment 15B also established allocations between recreational and commercial fishermen for snowy grouper and red porgy.

Amendment 16 (SAFMC 2009a; 74 FR 30964) included measures to end overfishing for gag grouper and vermilion snapper; established commercial and recreational allocations for both species; established a January through April spawning season closure for gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney; reduced the aggregate grouper bag limit from five fish to three fish, and within that, reduced the gag bag limit from two fish to one gag or black grouper, combined; reduced the vermilion snapper bag limit from 10 fish to five fish; established a recreational closed season for vermilion snapper of November through March; excluded captain and crew on for-hire vessels from retaining a bag limit of groupers; and required the use of dehooking tools to reduce bycatch mortality.

Amendment 19 (SAFMC 2009b; 75 FR 35330) was included under the Comprehensive Ecosystem-Based Amendment 1 (CE-BA 1) and included measures to provide presentation of spatial information for EFH and EFH-HAPC designations under the Snapper Grouper FMP; and designation of deep-water coral HAPCs.

Amendment 17A (SAFMC 2010a; 75 FR 76874) addressed management measures to end overfishing of red snapper and rebuild the stock, including Annual Catch Limits (ACLs) and Accountability Measures (AMs). It extended the prohibition of red snapper in federal waters throughout the South Atlantic EEZ effective immediately. Amendment 17A also included a regulation requiring the use of non-stainless circle hooks north of 28 degrees N latitude effective March 3, 2011.

Amendment 17B (SAFMC 2010b; 75 FR 82280) established ACLs and AMs and addressed overfishing for nine species in the snapper grouper management complex: golden tilefish, snowy grouper, speckled hind, Warsaw grouper, black grouper, black sea bass, gag, red grouper, and vermilion snapper. Measures in Amendment 17B included a deep-water closure (240 feet seaward) for deep-water species to help protect Warsaw grouper and speckled hind. Additional measures in the amendment included a reduction in the snowy grouper bag limit; establishment of a combined ACL for gag, black grouper, and red grouper; an allocation of 97% commercial and 3% recreational for the golden tilefish fishery based on landings history; and establishment of AMs as necessary.

Regulatory Amendment 10 (SAFMC 2011a; 76 FR 23728) eliminated the large area closure in Amendment 17A for all snapper grouper species off the coasts of southern Georgia and north/central Florida. The regulatory amendment modified measures implemented in Amendment 17A to end overfishing for red snapper.

Regulatory Amendment 9 (SAFMC 2011b; 76 FR 34892) reduced the bag limit for black sea bass from 15 fish per person to five fish per person, established trip limits on vermilion snapper and gag, and increased the trip limit for greater amberjack.

Regulatory Amendment 11 (SAFMC 2011c; 77 FR 27374) eliminated a restriction on the possession or harvest of some deep-water snapper grouper species in waters greater than 240 feet deep.

Amendment 25 (Comprehensive Annual Catch Limit Amendment) (SAFMC 2011d; 77 FR 15916) met the 2011 deadline mandated by the Magnuson-Stevens Act to establish ACLs and AMs for species managed by the Council that are not undergoing overfishing.

Amendment 24 (SAFMC 2011e; 77 FR 34254) proposed measures to end overfishing and establish a rebuilding plan for red grouper. The amendment also implemented or revised parameters such as Maximum Sustainable Yield (MSY), Minimum Stock Size Threshold (MSST), ACLs, AMs, and specified allocations for the commercial and recreational sectors.

Amendment 23 (Comprehensive Ecosystem-Based Amendment 2) (SAFMC 2011f; 76 FR 82183) included measures to designate the Deepwater MPAs as EFH-HAPCs; limited harvest of snapper grouper species in South Carolina SMZs to the bag limit; and modified sea turtle release gear.

Amendment 18A (SAFMC 2012a; 77 FR 32408; 77 FR 72991) established management actions to limit participation and effort in the black sea bass fishery. Measures included the establishment of an endorsement program and other modifications to the commercial black sea bass pot fishery; establishment of a commercial trip limit (all gear-types) for black sea bass; and increased minimum size limits for both commercial and recreational black sea bass fisheries.

Amendment 20A (SAFMC 2012b; 77 FR 59129) defined and reverted inactive shares within the wreckfish ITQ program; redistributed reverted shares to active shareholders; established a share cap; and implemented an appeals process.

Regulatory Amendment 12 (77 FR 61295) adjusted the ACL and OY for golden tilefish; specified a commercial Annual Catch Target (ACT); and revised recreational AMs for golden tilefish.

Amendment 18B (SAFMC 2012c; 78 FR 23858) addressed management of golden tilefish. Actions included in the amendment are: An endorsement program for the longline sector of the golden tilefish component of the snapper grouper fishery; establishment of landings criteria to determine who will receive endorsements; an appeals process for the golden tilefish endorsement program; establishment of a procedure to allow transferability of golden tilefish endorsements; allocation of 75% of the commercial ACL to the longline sector and 25% to the hook and line sector; and modification of the golden tilefish trip limit.

Regulatory Amendment 13 (SAFMC 2012d; 78 FR 36113) revised the acceptable biological catch (ABC) estimates, ACLs (including sector ACLs), and recreational annual catch targets for 37 un-assessed snapper grouper species. The revisions incorporated updates to the recreational data for these species, as per the new Marine Recreational Information Program (MRIP), as well as revisions to commercial and for-hire landings. Regulatory Amendment 13 was necessary to avoid triggering AMs for these snapper grouper species based on ACLs that were established by the Comprehensive Annual Catch Limit Amendment in April 2012, using recreational data under the Marine Recreational Fisheries Statistics Survey system.

Regulatory Amendment 14 (SAFMC 2013a; 79 FR 66316) modified the fishing year for greater amberjack; revised the minimum size limit measurement for gray triggerfish; increased the minimum size limit for hogfish; modified the commercial and recreational fishing year for black sea bass; adjusted the commercial fishing season for vermilion snapper; modified the aggregate grouper bag limit; and revised the AMs for gag and vermilion snapper.

Regulatory Amendment 15 (SAFMC 2013b; 78 FR 49183) modified the existing specification of OY and ACLs for yellowtail snapper in the South Atlantic; modified existing regulations for yellowtail snapper in the South Atlantic; and modified the existing gag commercial ACL and AM for gag that requires a closure of all other shallow water groupers (black grouper, red grouper, scamp, red hind, rock hind, graysby, coney, yellowmouth grouper, and yellowfin grouper) in the South Atlantic when the gag commercial ACL is met or projected to be met.

Amendment 27 (SAFMC 2013c; 78 FR 78770) assumed management of Nassau grouper in the Gulf of Mexico; modified the crew size restriction for dual-permitted vessels (those with a Snapper Grouper Unlimited or 225-Pound Permit and a Charter/Headboat Permit for Snapper Grouper); modified the bag limit retention restriction for captain and crew of for-hire vessels; changed the existing snapper grouper framework procedure to allow for more timely adjustments to ACLs; and removed blue runner from the fishery management unit.

Amendment 31 (Joint South Atlantic and Gulf of Mexico Generic Headboat Reporting Amendment) (SAFMC 2013d; 78 FR 78779) modified logbook reporting for headboats to require fishing records to be reported electronically for snapper grouper species on a weekly basis.

Amendment 28 (SAFMC 2013e; 78 FR 44461) established a process to determine if a red snapper fishing season will occur each year, including specification of the allowable harvest for both sectors and season length for the recreational sector; an equation to determine the ACL for red snapper for each sector; and management measures if fishing for red snapper is allowed.

Regulatory Amendment 18 (SAFMC 2013f; 78 FR 47574) adjusted the ACL (and sector ACLs) for vermilion snapper and red porgy based on the stock assessment updates for those two species and removed the annual recreational closure for vermilion snapper.

Regulatory Amendment 19 (SAFMC 2013g; 78 FR 58249) adjusted the black sea bass ACLs based on the results of the 2013 assessment. Because the increase to the ACL was substantial, there was concern that this could extend fishing with pots into the calving season for right whales and create a risk of entanglement for large migratory whales during the fall months. To minimize this risk, the amendment also established a closure to black sea bass pot gear from November 1 to April 30.

Regulatory Amendment 21 (SAFMC 2014a; 79 FR 60379) prevents snapper grouper species with low natural mortality rates (red snapper, blueline tilefish, gag, black grouper, yellowtail snapper, vermilion snapper, red porgy, and greater amberjack) from being unnecessarily classified as overfished. For these species, even small fluctuations in biomass due to natural conditions rather than fishing mortality may cause a stock to be classified as overfished. Modifying the minimum stock size threshold definition (used in determining whether a species is overfished) prevents these species from being classified as overfished unnecessarily.

Amendment 32 (SAFMC 2014b; 80 FR 16583) addressed the determination that blueline tilefish are overfished and undergoing overfishing. The amendment removed blueline tilefish from the deep-water complex; established blueline tilefish commercial and recreational sector ACLs and AMs; revised the deep-water complex ACLs and AMs; established a blueline tilefish commercial trip limit; and revised the blueline tilefish recreational bag limit and harvest season.

Amendment 29 (SAFMC 2014c; 80 FR 30947) revised ACLs and recreational ACTs for four unassessed snapper grouper species (bar jack, Atlantic spadefish, scamp, and gray triggerfish) and three snapper grouper species complexes (snappers, grunts, and shallow water groupers) based on an update to the ABC control rule and revised ABCs for 14 snapper grouper stocks (bar jack, margate, red hind, cubera snapper, yellowedge grouper, silk snapper, Atlantic spadefish, gray snapper, lane snapper, rock hind, tomtate, white grunt, scamp, and gray triggerfish). Additionally, this final rule revises management measures for gray triggerfish in federal waters in the South Atlantic region, including modifying minimum size limits, establishing a split commercial season, and establishing a commercial trip limit.

Regulatory Amendment 22 (SAFMC 2015a; 80 FR 48277) adjusted the ACLs and OY for gag and wreckfish. Changes to the gag recreational bag limit were proposed, but status quo was maintained.

Regulatory Amendment 20 (SAFMC 2014d; 80 FR 43033) increased the recreational and commercial ACLs for snowy grouper, increased the commercial trip limit, and modified the recreational fishing season. This amendment also adjusted the re-building strategy for snowy grouper.

Amendment 33 (SAFMC 2015b; 80 FR 80686) updated regulations that allow snapper grouper fillets to be brought into the U.S. EEZ from the Bahamas. Snapper grouper fillets form the Bahamas must have the skin intact, two fillets (regardless of size) will count as one fish towards the bag limit, and fishermen must abide by both U.S. and Bahamian bag/possession limits (whichever is more restrictive). All boats must have the proper permits, and fishermen must carry passports which are required to be stamped and dated to prove vessel passengers were in the Bahamas. All fishing gear must be appropriately stowed while in transit.

Amendment 34 (SAFMC 2015c; 81 FR 3731) revised the AMs for several snapper grouper species (black grouper, mutton snapper, yellowtail snapper, greater amberjack, red porgy, gag, golden tilefish, red grouper, snowy grouper, gray triggerfish, hogfish, scamp, Atlantic spadefish, bar jack, snappers complex, jacks complex, shallow water grouper complex, porgies complex, and wreckfish (recreational).

Amendment 35 (SAFMC 2015d; 81 FR 32249) clarified regulations governing the use of golden tilefish longline endorsements to align them with the SAFMC's intent when the program was originally implemented. Four species were removed from the FMP (black snapper, mahogany snapper, dog snapper, and schoolmaster).

Regulatory Amendment 25 (SAFMC 2016b; 81 FR 45245) revised the commercial and recreational ACLs, the commercial trip limit, and recreational bag limit for blueline tilefish. This amendment also revised the black seabass recreational bag limit and the commercial and recreational fishing years for yellowtail snapper.

Regulatory Amendment 16 (SAFMC 2016a; 81 FR 95893) revised the current seasonal prohibition on the use of black sea bass pot gear in the South Atlantic and added an additional gear marking requirement for black sea bass pot gear.

Amendment 36 (SAFMC 2016c; 82 FR 29772) established spawning special management zones (Spawning SMZs) to enhance protection for snapper grouper species in spawning condition, including speckled hind and Warsaw grouper.

Amendment 37 (SAFMC 2016d; 82 FR 34584) modified the hogfish fishery management unit and specified fishing levels for the two South Atlantic hogfish stocks. It established/revised management measures for both hogfish stocks in the South Atlantic Region, such as size limits, recreational bag limits, and commercial trip limits. Additionally, this amendment established a rebuilding plan for the Florida Keys/East Florida stock.

Amendment 41 (SAFMC 2017n; 83 FR 1305) updated the ABC, ACL, MSY, MSST, OY, and revised management measures for mutton snapper.

Amendment 43 (SAFMC 2017k; 83 FR 35428) revised the commercial and recreational ACLs and allowed for limited harvest of red snapper in federal waters of the South Atlantic.

Abbreviated Framework Amendment 1 (SAFMC 2017i; FR 83 35435) reduced the commercial and recreational ACLs for red grouper to address overfishing.

Regulatory Amendment 28 (SAFMC 2018a; FR 83 62508) revised the commercial and recreational ACLs for golden tilefish. The purpose of this final rule is to end overfishing of golden tilefish while minimizing, to the extent practicable, adverse socio-economic effects and achieve OY on a continuing basis.

Abbreviated Framework Amendment 2 (SAFMC 2018b; FR 84 14021) increased the commercial and recreational ACLs for vermilion snapper and decreased the commercial and recreational ACLs for black sea bass in response to the latest stock assessments.

Amendment 42 (SAFMC 2019a; FR 84 67236) modified the sea turtle handling and release gear requirements for the snapper grouper fishery, clarified the requirements for other release gears, and modified the FMP framework procedure to implement newly approved devices and handling requirements for sea turtles and other protected resources.

Regulatory Amendment 27 (SAFMC 2019b; FR 85 4588) modified the commercial trip limits for blueline tilefish, greater amberjack, red porgy, and vermilion snapper; established commercial split seasons for snowy grouper, greater amberjack, and red porgy; established a commercial trip limit for the "other" jacks complex; established a minimum size limit for almaco jack; and removed the minimum size limits for silk, queen, and blackfin snappers; and reduced the minimum size limit for gray triggerfish in the EEZ off the east coast of Florida.

Regulatory Amendment 30 (SAFMC 2019c; FR 85 6825) revised the rebuilding schedule for red grouper based on the most recent stock assessment and modified the spawning season closure for the commercial and recreational sectors in the EEZ off North Carolina and South Carolina and established a 200-pound commercial trip limit.

Regulatory Amendment 26 (SAFMC 2019d; FR 85 11307) removed the recreational minimum size limits for silk snapper, queen snapper, and blackfin snapper, reduced the recreational minimum size limit for gray triggerfish in the EEZ off the east coast of Florida, and modified the snapper grouper aggregate bag limit for the 20-fish aggregate.

Regulatory Amendment 29 (SAFMC 2020c; FR 85 36166) modified gear requirements for South Atlantic snapper grouper species. Actions include requirements for descending and venting devices, and modifications to requirements for circle hooks and powerheads.

Abbreviated Framework Amendment 3 (SAFMC 2020d; FR 85 43145) increased the commercial and recreational ACLs and increased the recreational ACT for blueline tilefish in the South Atlantic EEZ based on updated information from the 2017 SouthEast Data, Assessment, and Review (SEDAR) benchmark assessment that was completed for the Atlantic stock of blueline tilefish, using data through 2015 (SEDAR 50).

Regulatory Amendment 33 (SAFMC 2020b; FR 85 64978) removed the four-day minimum season length requirement for South Atlantic red snapper (commercial or recreational) to improve access to South Atlantic red snapper, particularly for the recreational sector.

Amendment 39 (SAFMC 2020e; FR 85 10331) established new, and revised existing, electronic reporting requirements for federally permitted charter vessels and headboats, in certain Atlantic fisheries to increase and improve fisheries information collected from federally permitted for-hire vessels in the Atlantic.

Regulatory Amendment 34 (SAFMC 2020a; FR 86 17318) created 34 special management zones (SMZs) around artificial reefs in the EEZ off North Carolina and South Carolina to designate new SMZs and to restrict fishing gear with greater potential to result in high exploitation rates.

Amendment 50 (SAFMC 2023a; FR 87 77742) responded to the overfished and overfishing status of red porgy by establishing a rebuilding plan, revising sector annual catch limits, sector allocations, management measures and accountability measures.

Amendment 49 (SAFMC 2023b; FR 88 65819) adjusted the ABC, catch levels, allocations, and other management measures for greater amberjack, as well as removed recreational ACTs in the snapper grouper fishery based on the results of the latest stock assessment of greater amberjack (SEDAR 59).

Amendment 53 (SAFMC 2023c; FR 88 65135) revised the sector annual catch limits, commercial trip limits, recreational bag, vessel, and possession limits, and recreational accountability measures for gag and revised the recreational bag, vessel, and possession limits for black grouper. In addition, Amendment 53 established a rebuilding plan, and revised the overfishing levels, acceptable biological catch, annual optimum yield, and sector allocations for gag.

Amendment 52 (SAFMC 2023d; FR 88 76696) revised the golden tilefish acceptable biological catch, total annual catch limit, and annual optimum yield; revised sector allocations and sector annual catch limits for golden tilefish; modified recreational accountability measures for golden tilefish; modified blueline tilefish recreational bag limit; and modified recreational accountability measures for blueline tilefish.

Amendment 51 (SAFMC 2023e; FR 88 83860) modified management of South Atlantic snowy grouper by revising the acceptable biological catch, annual catch limits, annual optimum yield, sector allocations, recreational accountability measures, and the recreational season.

Amendment 45 (SAFMC 2024a; FR 89 271) modified the ABC Control Rule, including specification of scientific uncertainty and management risk components, application of the Control Rule to rebuilding stocks, criteria and procedures for phase-in of ABC changes, criteria and procedures for carry-over of unused portions of the annual catch limit, and established a framework procedure to allow carry-overs.

Amendment 55 (SAFMC 2024b FR 90 12287) removed yellowmouth from the other South Atlantic shallow water grouper complex, established a new scamp and yellowmouth grouper complex, established status determination criteria, a rebuilding plan, catch levels, sector allocations, management measures and accountability measures for the scamp yellowmouth complex; and established catch levels for the revised other South Atlantic shallow water grouper complex.

There are several other amendments either in development or under secretarial review (Table 1).

To ensure compliance with interstate requirements, North Carolina also manages this species complex under the North Carolina Interjurisdictional Fisheries Fishery Management Plan (IJ FMP). The goal of the IJ FMP is to adopt FMPs, consistent with North Carolina law, approved by the Mid-Atlantic Fishery Management Council (MAFMC), SAFMC, or the Atlantic States Marine Fisheries Commission (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 (NCDMF 2022).

Table 1. Amendments under consideration/review by the South Atlantic Fishery Management Council (SAFMC). Summaries of the issues the amendment addresses are included; documentation is provided as available.

Amendment	Issue addressed	Where in process	Documentation
Amendment 56	Respond to the most recent black seabass stock assessment (SEDAR 76).	Public Hearing	SAFMC 2024b
Amendment 35	Release mortality issues in the snapper grouper fishery and modifications to red snapper catch levels	Final Approval	SAFMC 2022a
Amendment 57	Limited entry for the for-hire components of the snapper grouper, coastal migratory pelagics, and dolphin wahoo fisheries.	Pre-scoping	SAFMC 2024c
Amendment 36	On-demand pots as an allowable gear for commercial harvest of black sea bass. Revise recreational vessel limits for gag and black grouper.	Secretarial Review	SAFMC 2024d
Amendment 44	Yellowtail snapper catch levels	Public Hearing	SAFMC 2022e
Amendment 46	Private recreational reporting and permitting	Public Hearing	SAFMC 2022f
Amendment 54	Reporting requirements for commercial logbooks in the snapper grouper, coastal migratory pelagics, and dolphin-wahoo fisheries.	Secretarial Review	SAFMC 2022h
Amendment 58	Improve for-hire reporting requirements.	Scoping	SAFMC 2024f

Management Unit

The original SAFMC plan stated the management unit of the snapper grouper fishery is the stocks within the EEZ from North Carolina/Virginia border through the east coast of Florida. In the case of black sea bass, the unit is limited to south of Cape Hatteras, North Carolina. Since the inception of the FMP, there has been the addition of four species: wreckfish, spadefish, banded rudderfish, and lesser amberjack. In recent years, 14 species have been removed: 13 in 2012 (tiger grouper, sheepshead, queen triggerfish, puddingwife, black margate, yellow jack, Crevalle jack, porkfish, grass porgy, small mouth grunt, French grunt, Spanish grunt, and blue striped grunt) and one in 2014 (blue runner). In June 2016, Amendment 35 removed four additional species from the complex (black snapper, mahogany snapper, dog snapper, and schoolmaster).

Goal and Objectives

The following are the FMP objectives for the snapper grouper fishery as specified by the Council. These were last updated in Snapper Grouper FMP Amendment 8 in July 1997 (SAFMC 1997).

- Prevent overfishing.
- Collect necessary data.
- Promote orderly utilization of the resource.
- Provide for a flexible management system.
- Minimize habitat damage.
- Promote public compliance and enforcement.
- Mechanism to vest participants.
- Promote stability and facilitate long-run planning.
- Create market-driven harvest pace and increase product continuity.
- Minimize gear and area conflicts among fishermen.
- Decrease incentives for overcapitalization.
- Prevent continual dissipation of returns from fishing through open access.
- Evaluate and minimize localized depletion.

DESCRIPTION OF THE STOCK

Biological Profile

Fifty-five species make up the snapper grouper complex, which is managed by the SAFMC. Included in the complex are three sea bass species, 17 grouper species, 10 snapper species, seven porgy species, five grunt species, five jack species, three tilefish species, two triggerfish species, hogfish, spadefish and wreckfish. The majority of these species are long lived, slow growing, late maturing and hermaphroditic (can change sexes). Most of these species are considered reef fish and are associated with hard bottom (live bottom) offshore habitats but can be found in waters 1,000 feet deep or shallower. Some are migratory, exhibiting seasonal and/or ontogenetic (occurring during a certain life stage) east to west migratory behavior (black sea bass), as well as some species making north to south migrations (gag grouper). The full list of the species in the complex is available online at: https://safmc.net/fishery-management-plans/snapper-grouper/.

Stock Status

Of the 55 species in the SAFMC management unit, several species are either overfished or experiencing some degree of overfishing. The overfished stocks include gag grouper, red grouper, red porgy, red snapper, hogfish (east Florida), black sea bass, and snowy grouper. Stocks experiencing overfishing are gag grouper, red snapper, black sea bass and snowy grouper.

Stock Assessment

The status of several species within the snapper grouper complex is unknown. However, for some of the species, assessments are available through various federal entities; the snapper grouper complex is regionally (North Carolina south to eastern Florida) managed, and none of the assessments have been conducted by the North Carolina Division of Marine Fisheries (DMF) (Table 2).

Table 2. Stock status of the 55 species within the snapper grouper complex. Documentation is provided for the assessment associated with each species. No assessments have been conducted by North Carolina Division of Marine Fisheries due to the nature of the fishery.

Family (species aggregate)	Species	Overfishing?	Overfished?	Documentation
Serranidae (Sea basses and groupers)	Gag (*Mycteroperca microlepis*)	Yes	Yes	SEDAR 71 (SEDAR 2021a); NMFS 2024
	Red grouper (*Epinephelus morio*)	No	Yes	SEDAR 53 (SEDAR 2017a); NMFS 2024
	Scamp (*Mycteroperca phenax*) and Yellowmouth grouper (*Mycteroperca interstitialis*) Complex	Yes	No	SEDAR 68 (SEDAR 2022)
	Black grouper (*Mycteroperca bonaci*)	No	No	SEDAR 19 (SEDAR 2010); NMFS 2024
	Rock hind (*Epinephelus adcensionis*)	Unknown	Unknown	NMFS 2024
	Red hind (*Epinephelus guttatus*)	Unknown	Unknown	NMFS 2024
	Graysby (*Cephalopholis cruentata*)	Unknown	Unknown	NMFS 2024
	Yellowfin grouper (*Mycteroperca venenosa*)	Unknown	Unknown	NMFS 2024
	Coney (*Cephalopholis fulva*)	Unknown	Unknown	NMFS 2024
	Goliath grouper (*Epinephelus itajara*)	No (Permanent closure)	Unknown	SEDAR 47 (SEDAR 2016d); NMFS 2024
	Nassau grouper (*Epinephelus striatus*)	No (Permanent closure)	Unknown	NMFS 2024
	Snowy grouper (*Epinephelus niveatus*)	Yes	Yes	SEDAR 36 Update (SEDAR 2020c); NMFS 2024
	Yellowedge grouper (*Epinephelus flavolimbatus*)	Unknown	Unknown	NMFS 2024
	Warsaw grouper (*Epinephelus nigritus*)	Unknown	Unknown	SG Amendment 17b (SAFMC 2010b); NMFS 2024
	Speckled hind (*Epinephelus drummondhayi*)	Unknown	Unknown	SG Amendment 17b (SAFMC 2010b); NMFS 2024
	Misty grouper (*Epinephelus mystacinus*)	Unknown	Unknown	NMFS 2024
	Black sea bass (*Centropristis striata*)	Yes	Yes	SEDAR 76 Update (SEDAR 2025a)
	Bank sea bass (*Centropristis ocyurus*)*	N/A	N/A	N/A
	Rock sea bass (*Centropristis philadelphica*)*	N/A	N/A	N/A

Family (species aggregate)	Species	Overfishing?	Overfished?	Documentation
Polyprionidae (Wreckfish)	Wreckfish (*Polyprion americanus*)	No	No	Rademeyer and Butterworth 2014; NMFS 2024
Lutjanidae (Snappers)	Queen snapper (*Etelis oculatus*)	Unknown	Unknown	NMFS 2024
	Yellowtail snapper (*Ocyusus chrysurus*)	No	No	SEDAR 96 (SEDAR 2025); NMFS 2024
	Gray snapper (*Lutjanus griseus*)	Unknown	Unknown	NMFS 2024
	Mutton snapper (*Lutjanus analis*)	No	No	SEDAR 79 (SEDAR 2024); NMFS 2024
	Lane snapper (*Lutjanus synagris*)	Unknown	Unknown	NMFS 2024
	Cubera snapper (*Lutjanus cyanopterus*)	Unknown	Unknown	NMFS 2024
	Vermilion snapper (*Rhomboplites aurorubens*)	No	No	SEDAR 55 (SEDAR 2018a); NMFS 2024
	Red snapper (*Lutjanus campechanus*)	Yes	Yes	SEDAR 73 (SEDAR 2021b); NMFS 2024
	Silk snapper (*Lutjanus vivanus*)	Unknown	Unknown	NMFS 2024
Lutjanidae (Snappers)	Blackfin snapper (*Lutjanus buccanella*)	Unknown	Unknown	NMFS 2024
Sparidae (Porgies)	Red Porgy (*Pagrus pagrus*)	No	Yes	SEDAR 60 (SEDAR 2020a); NMFS 2024
	Knobbed porgy (*Calamus nodosus*)	Unknown	Unknown	NMFS 2024
	Jolthead porgy (*Calamus bajonado*)	Unknown	Unknown	NMFS 2024
	Scup (*Stenotomus chrysops*)	Unknown	Unknown	NMFS 2024
	Whitebone porgy (*Calamus leucosteus*)	Unknown	Unknown	NMFS 2024
	Longspine porgy (*Stenotomus caprinus*)*	N/A	N/A	N/A
Haemulidae (Grunts)	White grunt (*Haemulon plumieri*)	Unknown	Unknown	NMFS 2024
	Margate (*Haemulon album*)	Unknown	Unknown	NMFS 2024
	Tomtate (*Haemulon aurolineatum*)	Unknown	Unknown	NMFS 2024
	Sailor's choice (*Haemulon parra*)	Unknown	Unknown	NMFS 2024
	Cottonwick (*Haemulon melanurum*)*	N/A	N/A	N/A
Carangidae (Jacks)	Greater Amberjack (*Seriola dumerili*)	No	No	SEDAR 59 (SEDAR 2020b); NMFS 2024
	Almaco jack (*Seriola rivoliana*)	Unknown	Unknown	NMFS 2024
	Banded rudderfish (*Seriola zonanta*)	Unknown	Unknown	NMFS 2024
	Bar jack (*Caranx ruber*)	Unknown	Unknown	NMFS 2024
	Lesser Amberjack (*Seriola fasciata*)	Unknown	Unknown	NMFS 2024

Family (species aggregate)	Species	Overfishing?	Overfished?	Documentation
Malacanthidae (Tilefishes)	Golden tilefish (*Lopholatilus chamaeleonticeps*)	No	No	SEDAR 89 (SEDAR 2025b); NMFS 2024
	Blueline (or gray) tilefish (*Caulolatilus microps*)	No	No	SEDAR 92 (SEDAR 2025c); NMFS 2024
	Sand tilefish (*Malacanthus plumier*)	Unknown	Unknown	NMFS 2024
Balistidae (Triggerfishes)	Gray triggerfish (*Balistes capriscus*)	No	Unknown	SEDAR Assessment 41 (SEDAR 2016c); NMFS 2024
Balistidae (Triggerfishes)	Ocean triggerfish (*Canthidermis sufflamen*)*	N/A	N/A	N/A
Labridae (Wrasses)	Hogfish (*Lachnolaimus maximus*)	Unknown (Carolinas); No (Florida)	Unknown (Carolinas); Yes (Florida)	SEDAR 37 (SEDAR 2013b); NFMS 2024
Ephippidae (Spadefishes)	Atlantic spadefish (*Chaetodipterus faber*)	Unknown	Unknown	NMFS 2024

* *Indicates ecosystem component species which do not have management measures in place and are not assessed.*

Since 2002, stock assessments have been conducted through the SEDAR which is the cooperative process by which stock assessment projects are conducted in the National Oceanic and Atmospheric Administration (NOAA) Fisheries' Southeast Region. Currently, stock assessments are available for 16 of the complex species.

Some of the other species have status updates provided by NOAA Fisheries. These updates are based on landings data to determine whether the stock is overfished or undergoing overfishing. This information is updated quarterly by NOAA Fisheries and available on their website at: https://www.fisheries.noaa.gov/national/population-assessments/fishery-stock-status-updates.

DESCRIPTION OF THE FISHERY

Current Regulations

The following species have state and federal regulations for minimum lengths:

- Greater amberjack: 28-inch fork length (FL) (recreational); 34-inch FL (commercial)
- Black and gag groupers: 24-inch TL
- Red, scamp, yellowfin, and yellowmouth groupers: 20-inch TL
- Black sea bass: 13-inch TL (recreational); 11-inch TL (commercial)
- Red porgy: 14-inch TL
- Vermilion, gray, cubera and yellowtail snappers: 12-inch TL
- Hogfish (*Lachnolaimus maximus*): 17-inch FL
- Mutton snapper: 18-inch TL
- Gray triggerfish: 12-inch FL
- Lane snapper: 8-inch TL
- Almaco jack: 20-inch FL (commercial)

All species have sector ACLs and recreational bag limits and/or commercial trip limits. See the SAFMC (https://safmc.net/regulations/) or DMF (https://www.deq.nc.gov/about/divisions/marine-fisheries/rules-proclamations-and-size-and-bag-limits/fisheries-management-proclamations#currentprocs) websites for the most current information.

The fisheries are open year-round, with the exception of:

- Goliath grouper, Nassau grouper, Warsaw grouper, and speckled hind, unlawful to possess/harvest (commercial and recreational)
- Red snapper, unlawful to possess/harvest (commercial and recreational); limited season may occur based on previous years' landings and/or catch data
- January–April shallow water grouper spawning closure (commercial and recreational); red grouper remains closed through May in North and South Carolina
- Wreckfish have commercial spawning closure January 15–April 15; recreational fishery open July 1–August 31 annually.
- April closure for greater amberjack
- Snowy grouper recreational fishery open May 1–June 8
- Gag grouper recreational fishery open May 1–June 25
- Blueline tilefish recreational fishery open May 1–July 22
- Red porgy recreational fishery open May 1–June 30

Temporary closures may result for a species if the ACL is met or projected to be met. NOAA Fisheries monitors the landings for species managed by the SAFMC, and this information is available online for both the commercial and recreational sectors (https://www.fisheries.noaa.gov/southeast/southeast-region-annual-catch-limit-acl-monitoring). See also the SAFMC or DMF websites for more details, and the most current information.

Commercial Fishery

Commercial gear used in the snapper grouper fishery includes bandit reels, electric reels, manual hook and line, long lines, fish pots, spear, and trolling. Bandit reels, followed by electric rods and reels are the two most prevalent gear types used, especially south of Cape Hatteras (NCDMF 2015b). Spear fishing appears to be limited to south of Cape Hatteras, while longlines are primarily fished north of Cape Hatteras (NCDMF 2015b); their use is limited to six deep-water species and depths greater than 50 fathoms. Fish pots are used primarily to target black sea bass. Trip lengths vary dependent on the area fished and the gear used but tended to average between two to three days in length over the past five years; trips ranged from one day to 12 days for the entire commercial snapper grouper fleet (NCDMF 2015b).

The average landings for commercially caught snapper grouper from 1994–2024 was 1,859,203 pounds with a dockside value of $3,959,023 (Table 3). In 2024, 819,323 pounds of snapper grouper species were caught commercially in North Carolina. The highest landings in the past 29 years were in 2008, after which landings dropped; landings have been under two million pounds for the last 14 years (Figure 1). The decline in landings over the past 14 years is most likely due to the removal of species from the complex, as well as the changes to ACLs and trip limits as well as implementation of a seasonal spawning closure by the SAFMC.

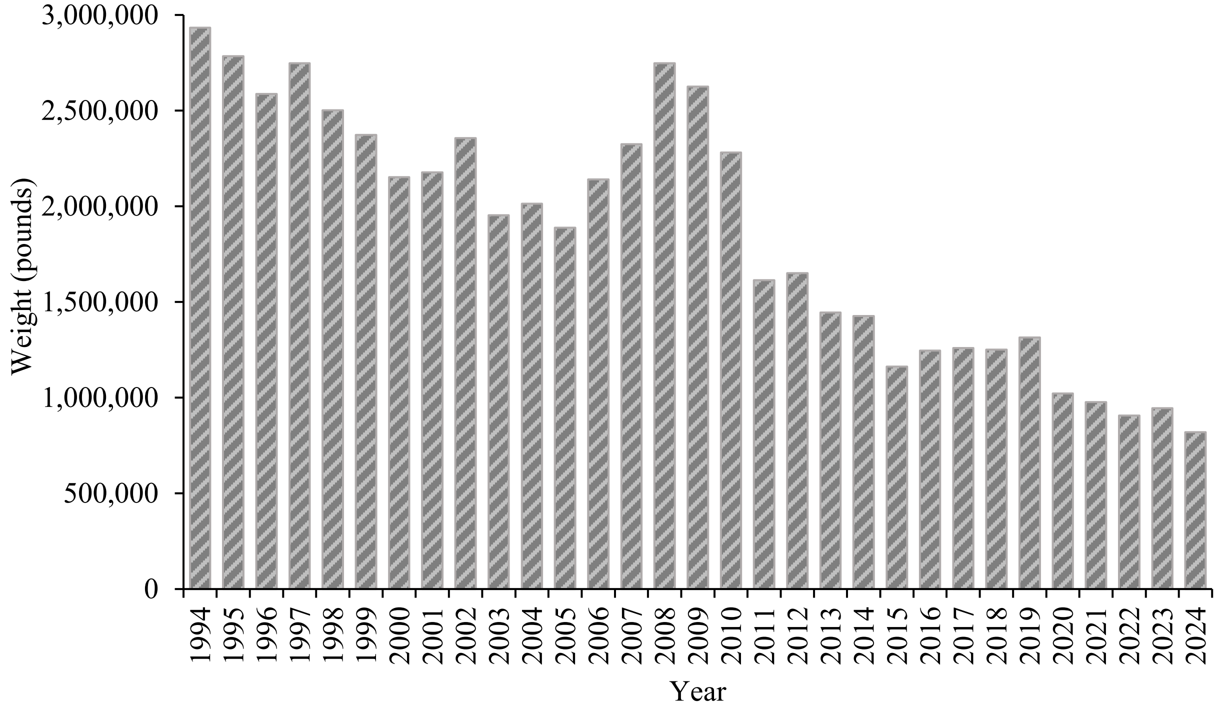

Figure 1. Annual commercial landings in pounds for snapper grouper species in North Carolina, 1994–2024.

Table 3. Landings of all snapper grouper species for the commercial fishery, 1994–2024. Sheepshead were removed from the fishery in 2012 and therefore not included past 2011.

Year	Weight of harvested fish (lb)	Value of Landings (USD)
1994	2,933,539	$4,086,083
1995	2,785,341	$3,844,101
1996	2,587,420	$3,601,653
1997	2,748,108	$4,053,605
1998	2,501,675	$3,931,486
1999	2,372,628	$3,981,018
2000	2,151,794	$3,762,289
2001	2,178,180	$3,652,941
2002	2,356,054	$3,930,576
2003	1,953,932	$3,375,178
2004	2,014,492	$3,522,424
2005	1,889,092	$3,567,878
2006	2,140,637	$4,332,982
2007	2,324,604	$5,247,795
2008	2,748,623	$5,990,469
2009	2,625,263	$5,262,980
2010	2,281,867	$4,877,050
2011	1,613,929	$3,911,719
2012	1,651,545	$4,169,682
2013	1,445,346	$3,918,164
2014	1,427,568	$3,845,196
2015	1,161,861	$3,324,493
2016	1,246,432	$3,715,347
2017	1,259,683	$3,825,047
2018	1,250,722	$3,887,748
2019	1,315,444	$4,452,724
2020	1,021,921	$3,397,185
2021	977,083	$3,278,421
2022	905,945	$3,425,362
2023	945,251	$3,624,800
2024	819,323	$2,977,162
Mean	1,859,203	$3,959,023

Over the last five years, landings have been dominated by six main aggregates; black sea bass, grouper, snapper, triggerfish, jacks, and tilefish (though the dominant group varies by year) (Table 4). The top ten dominant species are: black sea bass, vermillion snapper, blueline tilefish, gag, triggerfish, red grouper, red porgy, amberjack, scamp, and grunts (NCDMF 2015b).

Recreational Fishery

Recreational fishing uses many of the same gear types as the commercial fishery, with the exception of fish pots and longlines. Recreational estimates across all years have been updated and are now based on the MRIP new Fishing Effort Survey-based calibrated estimates. For more information on MRIP see https://www.fisheries.noaa.gov/topic/recreational-fishing-data.

Table 4. Landings (in pounds) of snapper grouper, by aggregate groups, for the commercial fishery, 1994–2024. Aggregate groups are those used by the South Atlantic Fishery Management Council and are done by family (as in Table 2). Sheepshead were removed from the fishery in 2012 and therefore not included past 2011; these are included in the porgy aggregate. Only black sea bass from south of Cape Hatteras are included, as the northern populations are managed by the Atlantic States Marine Fisheries Commission and the Mid-Atlantic Fisheries Management Council. Wreckfish landings are confidential and are excluded.

Year	Black sea bass	Grouper	Snapper	Porgies	Grunts	Jacks	Tilefish	Triggerfish	Hogfish	Spadefish	Unclassified
1994	456,284	775,414	450,221	344,117	202,940	151,984	231,584	271,503	19,133	23,347	7,011
1995	348,030	773,372	403,499	355,210	184,799	171,510	160,860	304,540	33,507	40,873	9,142
1996	489,845	651,105	350,206	338,242	106,851	139,669	158,586	277,741	13,841	55,890	5,445
1997	518,223	719,513	366,482	264,012	131,974	178,310	149,402	342,123	14,010	57,384	6,676
1998	523,253	745,591	352,020	269,092	108,162	101,739	67,770	274,641	12,037	38,994	8,375
1999	491,401	758,059	441,783	178,690	95,008	129,245	76,697	150,387	12,405	34,320	4,634
2000	414,281	636,942	510,897	143,212	81,338	127,116	85,467	88,277	7,727	46,235	10,303
2001	477,123	558,626	523,742	148,513	94,422	121,966	106,674	87,628	8,203	41,994	9,290
2002	432,321	699,579	490,591	145,394	102,158	120,644	220,331	90,934	10,637	38,400	5,067
2003	476,511	651,941	269,230	108,931	65,379	135,991	87,102	117,396	9,135	28,519	3,797
2004	506,376	584,722	339,453	127,543	81,075	106,507	78,126	136,211	8,902	44,521	1,055
2005	321,858	579,194	432,829	101,936	90,364	122,361	44,014	145,636	7,877	35,445	7,578
2006	443,565	708,823	345,071	130,363	118,234	101,722	138,090	126,354	7,296	19,623	1,496
2007	277,453	827,622	550,617	175,215	118,545	133,519	58,218	155,261	7,112	19,567	1,476
2008	275,761	785,429	602,838	204,349	91,292	160,769	404,295	198,724	13,035	11,694	438
2009	437,954	637,438	374,081	231,478	74,054	153,099	469,293	215,757	10,839	20,636	635
2010	292,879	561,753	320,260	242,520	47,219	128,466	430,394	225,682	13,046	18,827	821
2011	173,681	408,332	326,371	211,792	33,451	72,797	133,824	220,204	10,793	21,535	1,149
2012	194,778	381,929	279,368	83,969	49,734	124,325	361,094	143,114	8,256	24,238	739
2013	241,367	311,056	276,533	72,966	44,718	90,122	217,079	160,861	7,847	20,369	2,429
2014	316,421	299,555	251,087	82,918	39,333	193,049	91,074	116,782	9,767	22,761	4,822
2015	226,337	261,031	232,030	54,496	32,702	146,584	45,354	131,536	8,238	15,997	7,556
2016	198,595	257,743	280,043	47,326	39,953	139,061	111,788	135,545	9,195	15,231	11,952
2017	243,356	223,383	286,861	54,531	42,392	128,125	88,754	152,958	15,776	18,834	4,713
2018	180,623	239,135	323,276	59,007	37,269	142,459	68,509	174,047	13,755	9,838	2,803
2019	106,249	302,728	422,970	49,135	44,752	104,756	90,118	165,126	14,486	12,262	2,862
2020	53,562	199,012	277,175	31,842	35,002	152,977	115,363	126,655	11,640	14,903	4,194
2021	53,226	186,870	224,168	28,462	25,051	230,049	119,269	67,353	13,147	27,282	2,207
2022	52,868	152,912	246,279	23,409	19,555	183,902	106,413	88,167	11,987	19,046	1,405
2023	57,004	158,589	259,576	11,779	16,021	209,109	119,909	74,375	11,776	25,657	1,457
2024	23,685	135,074	148,472	12,150	10,349	261,078	128,198	58,276	15,962	24,248	1,830

The average recreational catch of snapper grouper species was 1,835,901 pounds for 1994–2024. Since 2008, the total amount of fish landed declined steadily until 2013 (Table 5; Figure 2). The number of fish harvested declined roughly 60% from 2017 to 2018 and harvest weight decreased 48%. As no major management changes in the recreational sector contributed to this decrease in landings, it is likely due to the impacts of Hurricane Florence on coastal North Carolina. The number of fish harvested decreased 57% from 2023 to 2024 and harvest weight decreased 64%. Recreational landings (by weight) have dropped roughly 85% since a 31-year high (4,773,359 pounds) in 2008. As with the commercial fishery, this is most likely due to the removal of species from the complex, as well as the changes to ACLs and the seasonal spawning closure by the SAFMC. For the last five years, the number of releases has been roughly 54% of the total fish caught (driven by the 13-inch TL size limit for black sea bass implemented in 2013, which has resulted in an increase of sublegal fish being discarded).

Table 5. Landings of all snapper grouper species for the recreational fishery, 1994–2024. Sheepshead were removed from the fishery in 2012 and therefore not included past 2011.

Year	Number Harvested	Weight Harvested (lb)	Number Released	Percent Released
1994	1,122,704	1,536,118	2,085,119	36
1995	760,710	1,272,346	1,017,649	34
1996	520,600	1,035,700	516,966	39
1997	758,210	1,275,604	982,893	39
1998	462,922	638,255	1,180,941	37
1999	512,259	1,115,025	1,279,859	40
2000	814,533	1,875,322	2,070,305	40
2001	885,512	1,951,012	1,793,595	35
2002	763,191	2,119,881	1,385,078	31
2003	1,120,047	2,335,324	1,327,321	29
2004	1,153,460	2,731,095	2,578,785	33
2005	1,157,612	2,736,693	2,562,520	35
2006	885,567	3,378,064	3,380,922	34
2007	1,230,325	4,245,321	3,463,009	49
2008	1,328,295	4,773,359	2,778,672	49
2009	1,179,139	3,986,022	2,519,259	40
2010	933,735	2,803,945	2,763,289	47
2011	611,220	1,361,512	3,132,003	50
2012	592,316	1,375,815	4,942,686	45
2013	383,259	1,004,917	3,413,860	43
2014	527,044	1,119,307	5,665,011	55
2015	585,640	1,236,957	5,585,899	43
2016	629,119	1,354,061	7,792,792	57
2017	851,774	1,659,890	6,795,091	47
2018	342,750	859,989	2,485,376	44
2019	434,400	885,120	3,346,307	63
2020	551,571	1,767,713	3,096,666	44
2021	320,255	1,019,528	3,034,845	59
2022	331,328	706,250	4,224,225	50
2023	732,824	2,016,926	4,451,629	54
2024	314,617	735,857	2,865,508	61

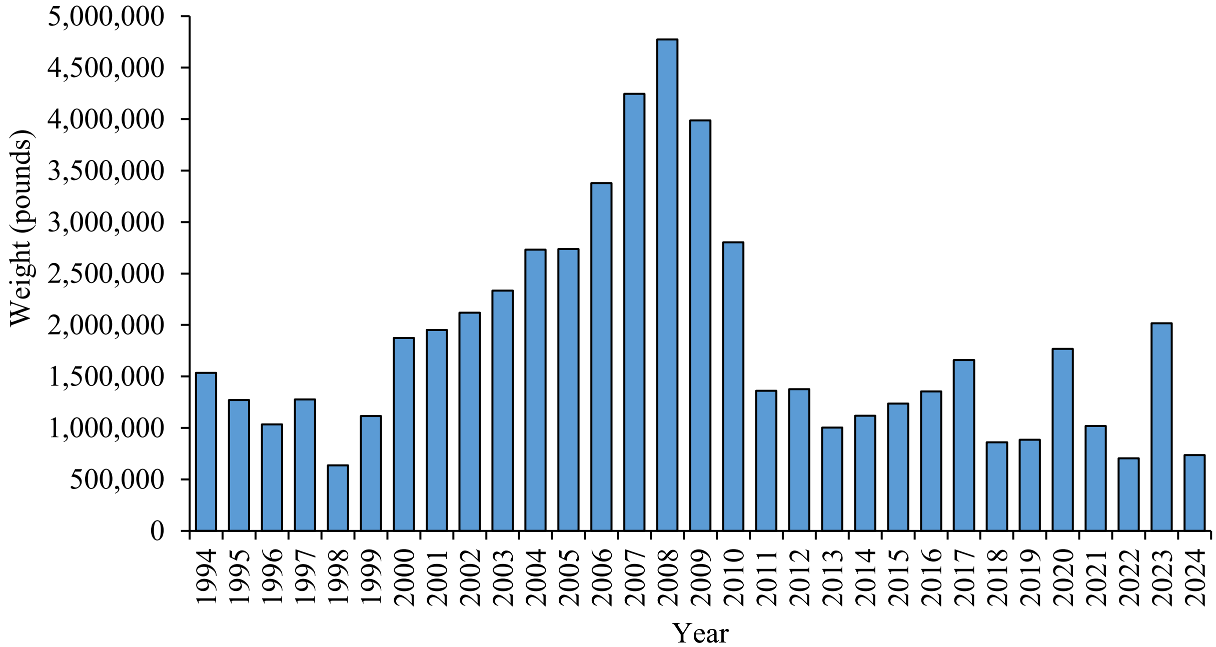

Figure 2. Annual recreational landings in pounds for snapper grouper species in North Carolina, 1994–2024.

In 2024, the dominant species (by pounds) landed were grunts, snappers, jacks, triggerfish, tilefish, and black sea bass (Table 6). This pattern mainly holds true for the last five years; however, other species are occasionally more dominant.

MONITORING PROGRAM DATA

Fishery-dependent and -independent data collected by DMF from the snapper grouper fishery is provided to NOAA Fisheries. In 2006, the division received a Marine Fisheries Initiative Program (MARFIN) grant to collect ageing structures of the snapper grouper species, determine the age structure of the black sea bass stock south of Cape Hatteras, and estimate release mortality of the of the commercial snapper grouper fishery. Funding for the grant ended in 2014. Data collected for this grant is summarized in the final MARFIN reports (NCDMF 2015b, c).

Fishery-Dependent Monitoring

Commercial fisheries are monitored by port agents (state and federal) who collect information on trips, as well as biological information. Information is collected through the Trip Information Program (TIP), seafood dealer reporting, and logbooks (SAMFC 2014e). Recreational fisheries are monitored by creel clerks through the Southeast Region Headboat Survey program and the Marine Recreation Information Program (MRIP) (SAFMC 2014e). North Carolina contributes to this data through the collection of trip and biological information for both fisheries.

Table 6. Recreational landings (in pounds), by aggregate groups, 1994–2024. Aggregate groups are those used by the South Atlantic Fishery Management Council and are done by family (as in Table 2). Sheepshead were removed from the fishery in 2012 and therefore not included past 2011; these are included in the porgy aggregate. Only black sea bass from south of Cape Hatteras are included, as the northern population is managed by Atlantic States Marine Fisheries Council and Mid-Atlantic Fishery Management Council.

Year	Black sea bass	Groupers	Snappers	Porgies	Grunts	Jacks	Tilefish	Triggerfish	Hogfish	Spadefish	Wreckfish
1994	255,936	192,300	86,864	348,920	405,116	142,011	-	96,569	256	8,146	-
1995	192,882	120,308	55,390	484,602	112,911	147,991	27,907	25,071	83,710	21,574	-
1996	222,898	44,050	31,717	289,437	77,503	276,636	540	77,012	-	15,907	-
1997	225,333	175,595	48,080	396,527	77,153	186,042	71,038	72,236	1,146	22,454	-
1998	154,986	60,962	9,577	250,646	37,113	89,045	-	25,188	-	10,738	-
1999	59,202	83,222	14,977	773,977	31,670	71,471	2,332	26,159	-	52,015	-
2000	373,028	52,463	23,294	820,377	9,520	548,623	3,724	26,184	-	18,109	-
2001	401,777	193,874	53,284	722,015	162,741	242,933	22,253	81,602	-	70,533	-
2002	183,634	348,809	143,786	865,924	337,495	159,670	7,290	54,879	11,499	6,895	-
2003	300,241	309,336	54,508	1,055,668	237,379	220,407	20,207	62,147	1,719	73,712	-
2004	507,359	1,022,259	170,615	558,545	266,540	94,406	29,313	64,317	1,300	16,441	-
2005	447,869	883,330	213,954	431,621	345,702	119,282	132,444	56,314	19,319	86,858	-
2006	175,048	1,671,117	54,160	476,295	235,456	316,341	330,140	64,556	19,365	35,586	-
2007	246,920	1,348,151	37,518	1,542,134	277,955	194,892	361,745	127,338	-	108,668	-
2008	104,582	1,946,062	114,550	1,139,132	302,233	468,560	404,734	269,507	1,813	22,186	-
2009	158,882	1,435,703	125,579	678,816	182,410	699,654	161,626	450,795	5,043	87,514	-
2010	206,765	325,422	50,327	1,016,739	84,349	567,382	51,649	257,445	8,658	235,209	-
2011	151,366	190,108	21,234	541,299	67,802	237,212	31,528	107,820	2,431	10,712	-
2012	219,859	215,213	78,050	42,963	171,618	262,534	65,879	221,703	24,243	73,281	472
2013	101,797	98,178	17,303	29,682	44,549	470,545	42,557	146,636	7,116	46,554	-
2014	562,393	28,173	25,717	21,247	86,365	154,373	45,541	102,145	-	93,353	-
2015	448,876	102,038	60,137	26,547	76,945	402,160	8,128	76,733	-	35,393	-
2016	301,334	79,379	46,391	19,455	86,926	356,481	282,035	165,279	466	16,315	-
2017	506,489	55,465	42,040	52,667	60,245	234,338	125,497	397,002	45,064	141,083	-
2018	107,331	9,227	29,406	8,012	16,762	357,661	116,891	178,928	383	35,388	-
2019	208,739	109,848	50,678	11,947	91,273	136,613	121,689	134,476	433	19,424	-
2020	120,950	28,013	83,330	12,831	83,906	361,133	833,910	230,521	305	12,814	-
2021	72,631	107,991	117,205	21,748	34,696	306,312	190,012	130,101	141	38,691	-
2022	196,050	59,021	135,665	11,842	20,702	103,882	13,496	153,763	310	11,519	-
2023	326,339	342,876	180,883	24,357	63,988	503,756	368,676	169,021	212	36,818	-
2024	135,098	12,535	26,637	13,095	69,880	300,870	50,714	106,975	14,745	5,308	-

Fishery-dependent length-frequency information for the commercial snapper grouper fishery in North Carolina is collected by fish house samplers, the majority of which come from DMF Program 438 (Offshore Live Bottom Fishery). Length-frequency information for the recreational snapper grouper fishery is collected through the DMF Carcass Collection Program and MRIP. In 2024, DMF recorded 4,221 lengths from individual fish from the commercial and recreational snapper grouper fishery of which 257 were black sea bass south of Cape Hatteras (Table 7). In 2024, 57 black sea bass were measured from MRIP recreational samples with an average TL of 14 inches (Table 8; Figure 3). TL has ranged from four inches to 21 inches since 1994 (Table 8; Figure 4). In 2024, 170 black sea bass south of Cape Hatteras were measured from the commercial fishery with an average TL of 14 inches (Table 7; Figure 3). Black sea bass landed in the commercial fishery have ranged from 7 to 20 inches TL since 1994 (Figure 5). Differences in the commercial and recreational length frequency distribution of black sea bass south of Cape Hatteras in 2024 can be attributed to the different size limits (13 inches TL for recreational and 11 inches TL for commercial), as well differences in the size selectivity of the gears used (Figure 3).

Table 7. Number of lengths and aging structures collected by DMF Program 438 (Offshore Live Bottom Fishery dependent sampling) for all species landed by the commercial and recreational sectors combined of the snapper grouper fishery in 2024. Many species included in this table are not part of the South Atlantic Snapper Grouper Management Complex but are landed as incidental catch during the prosecution of the fishery.

Species	Number Measured	Number of Aging Structures
African Pompano	9	2
Almaco Jack	341	25
Atlantic Bonito	21	0
Atlantic Spadefish	1	0
Banded Rudderfish	15	1
Bank Sea Bass	24	0
Barrelfish	1	0
Bigeye	21	0
Black Sea Bass	257	148
Blackbar Drum	7	0
Blackbar Soldierfish	1	0
Blackbelly Rosefish	54	18
Blackfin Snapper	74	74
Blackfin Tuna	2	0
Blackline Tilefish	2	2
Blue Runner	2	0
Bluefish	5	0
Blueline Tilefish	128	128
Bluespotted Cornetfish	1	0
Cobia	35	1
Coney	1	1
Conger Eel	2	0
Cottonwick	56	0
Creolefish	10	10
Cubera Snapper	1	1
Dolphinfish	66	0
False Albacore	23	0
Gag	202	192
Golden Tilefish	17	17
Goldface Tilefish	13	12
Gray Snapper	9	8
Gray Triggerfish	227	227
Graysby	54	54
Great Barracuda	16	0

Species	Number Measured	Number of Aging Structures
Greater Amberjack	297	9
Hogfish	40	1
Jolthead Porgy	2	0
King Mackerel	18	0
Knobbed Porgy	77	1
Lane Snapper	1	1
Lesser Amberjack	16	2
Littlehead Porgy	1	1
Longnose Gar	1	0
Marbled Grouper	2	2
Misty Grouper	2	2
Mutton Snapper	8	8
Queen Snapper	1	1
Queen Triggerfish	4	4
Rainbow Runner	2	0
Red Grouper	33	33
Red Hind	8	8
Red Lionfish	20	3
Red Porgy	181	173
Red Snapper	198	198
Reticulate Moray	1	0
Rock Hind	5	5
Sand Perch	11	0
Sand Tilefish	126	0
Scamp	175	171
Scup	34	0
Sheepshead	1	0
Short Bigeye	34	0
Silk Snapper	225	224
Slipper Lobster	2	0
Snowy Grouper	378	378
Spanish Flag	4	0
Spanish Mackerel	1	0
Spiny Lobster	2	0
Spinycheek Scorpionfish	24	0
Spotfin Hogfish	5	0
Spottail Pinfish	63	0
Squirrelfish	54	5
Striped Grunt	1	0
Tomtate	34	0
Vermilion Snapper	257	257
Wahoo	9	0
Wenchman	1	1
White Grunt	95	90
Whitebone Porgy	32	7
Whitespotted Soapfish	2	0
Yellowcheek Wrasse	2	0
Yellowedge Grouper	19	18
Yellowmouth Grouper	7	7
Yellowtail Snapper	2	2
Total	4,221	2,533

Table 8. Black sea bass south of Cape Hatteras length (total length, inches) data from Marine Recreational Information Program recreational samples, 1994–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1994	10	4	21	211
1995	11	6	20	173
1996	11	7	19	177
1997	11	6	18	175
1998	10	6	21	173
1999	10	7	19	139
2000	11	8	15	102
2001	12	8	19	219
2002	12	9	20	46
2003	12	9	18	75
2004	12	9	18	125
2005	13	9	18	90
2006	12	10	19	85
2007	14	11	20	51
2008	14	9	18	72
2009	13	11	20	172
2010	13	6	19	297
2011	14	8	21	206
2012	14	9	19	217
2013	13	7	19	244
2014	13	5	17	135
2015	14	11	20	111
2016	15	12	18	115
2017	15	10	19	139
2018	14	10	17	152
2019	14	12	18	117
2020	14	11	18	152
2021	14	11	18	90
2022	14	9	18	74
2023	15	11	20	120
2024	14	12	18	57

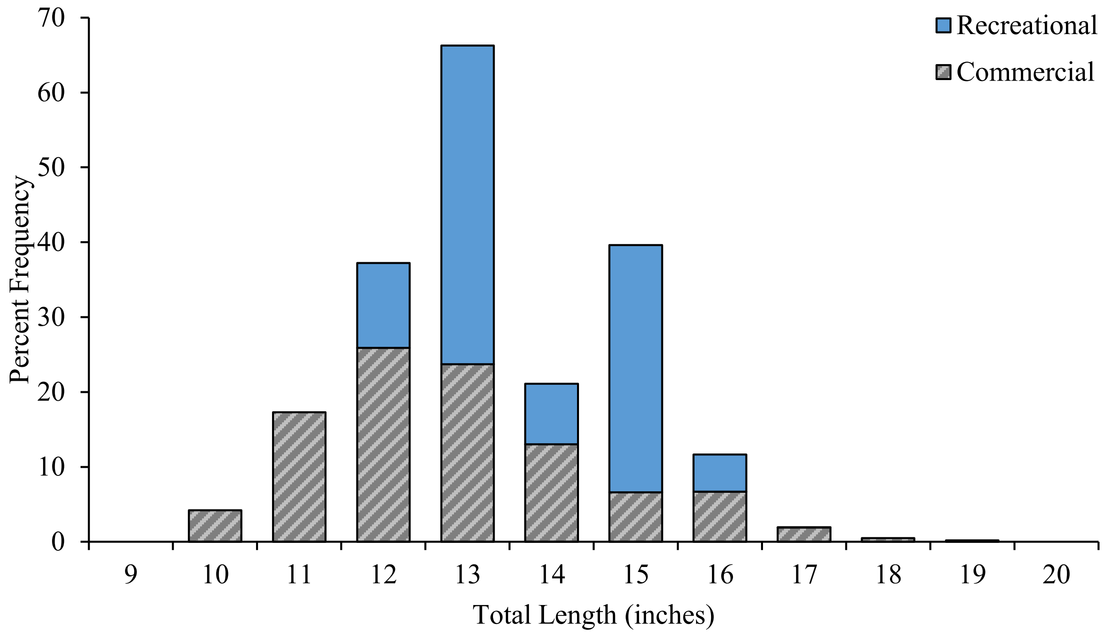

Figure 3. Commercial and recreational length frequency distribution from black sea bass south of Cape Hatteras, North Carolina harvested in 2024.

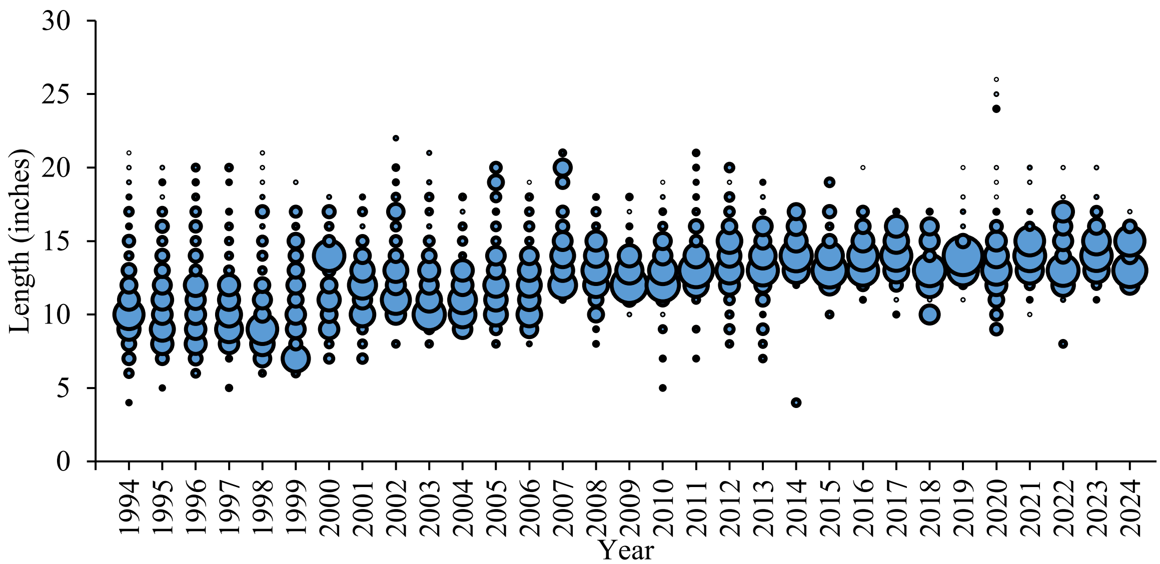

Figure 4. Recreational length frequency (total length, inches) of black sea bass south of Cape Hatteras, North Carolina harvested, 1994–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

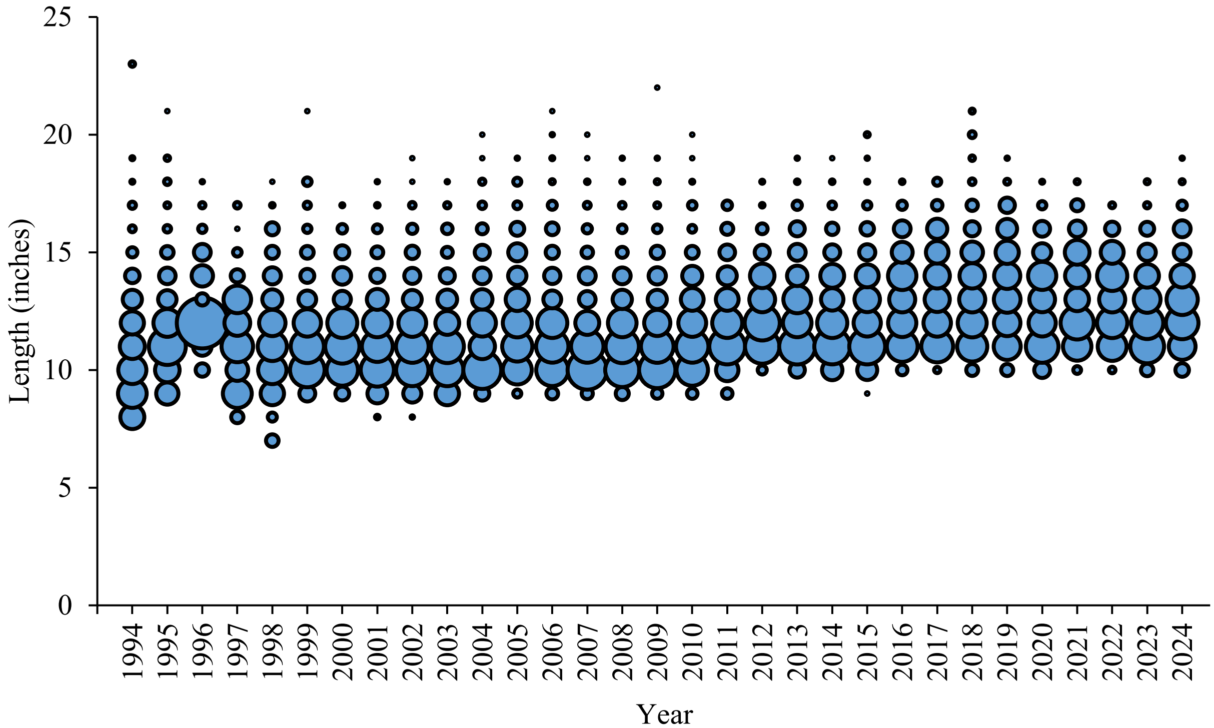

Figure 5. Commercial length frequency (total length, inches) of black sea bass south of Cape Hatteras, North Carolina harvested, 1994–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

In order to describe the age structure of the harvest and indices, age structures are collected from various fishery-independent (scientific surveys) and dependent (fisheries) sources throughout the year. Aging structures are provided to the NOAA Beaufort Age Lab for analysis except for black sea bass caught south of Cape Hatteras, NC which are analyzed by DMF. In 2024, DMF collected 2,533 age structures from the snapper grouper fishery of which 148 came from black sea bass (Table 7). Since 2004, the modal age of black sea bass collected each year is 4 with the exception of 2011, 2018, 2019, and 2021 where the modal age was 3, 5, 6, and 5, respectively (Table 9). The maximum age recorded for black sea bass south of Cape Hatteras is 10. Black sea bass ages for 2024 have not been assessed yet. The age-length relationship for black sea bass is fairly unpredictable, as there is overlap in age for a given length (Figure 6).

Table 9. Summary of black sea bass south of Cape Hatteras age samples collected from both fishery-dependent (commercial and recreational fisheries) and fishery-independent (surveys) sources, 2004–2023. The 2024 otoliths have not been read.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
2004	4	2	8	316
2005	4	2	9	767
2006	4	2	8	699
2007	4	1	10	1837
2008	4	2	10	1452
2009	4	2	8	1473
2010	4	1	8	900
2011	3	1	8	798
2012	4	2	10	1116
2013	4	1	7	1251
2014	4	1	8	1546
2015	4	2	9	1039
2016	4	1	8	708
2017	4	1	7	1025
2018	5	2	7	964
2019	6	2	7	592
2020	4	2	7	314
2021	5	2	9	490
2022	4	1	8	395
2023	4	2	9	622

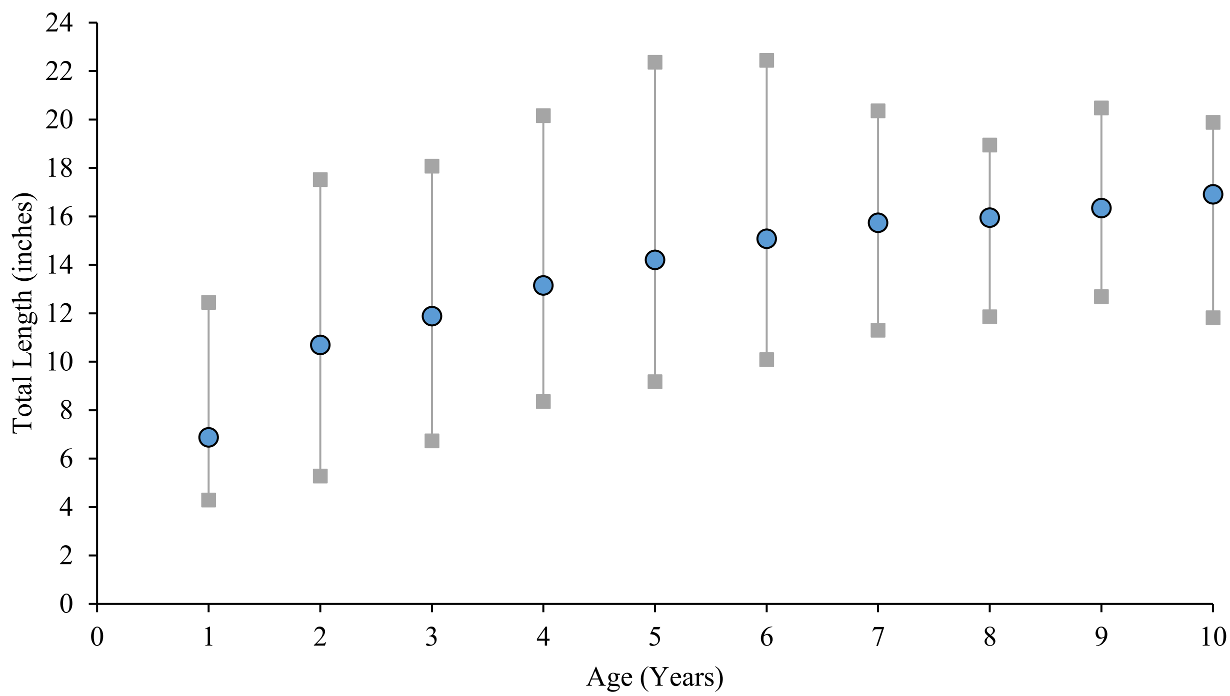

Figure 6. Black sea bass south of Cape Hatteras length at age based on all age samples collected, 2004–2023. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. The 2024 otoliths have not been read.

Fishery-Independent Monitoring

The Southeast Reef Fish Survey (SERFS) maintains the fisheries-independent data for the snapper grouper complex. SERFS is a collective program for gathering fisheries-independent data within the South Atlantic federal waters. There are three primary programs that contribute to the data:

- Marine Resources Monitoring, Assessment, and Prediction (MARMAP) survey,
- Southeast Fisheries-Independent Survey (SEFIS), and
- Southeast Area Monitoring and Assessment Program (SEAMAP) - South Atlantic (SAFMC 2015e).

North Carolina has contributed to the data collected through programs such as the gag ingress and tagging work done in partnership with SEAMAP and MARFIN.

RESEARCH NEEDS

The reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act in 2006 directed that all regional management councils develop a prioritized research plan for annual submission to the Secretary of Commerce. The following (below) are research and management needs as determined by the council in 2007 (SAFMC 2007b). All needs are ongoing; however, the emphasis changes annually based on the SAFMC Science and Statistical Committee review of these needs. The reviewed list and priorities for the year are then approved for submission to the NOAA Fisheries Southeast Fisheries Science Center. The council has a series of research and monitoring needs for the period of 2012–2016 (SAFMC 2012e) and has developed another set of needs for 2015–2019 (SAFMC 2015f, 2017a). Research needs include:

- Continue monitoring of catches. — Ongoing
- Collect otoliths and spines for ageing. — Ongoing
- Estimate mortality rates. — Ongoing
- Determine if stock structure exists for many of the species. — Ongoing
- Note seasonal and spawning migrations. — Ongoing
- Identify and map essential/critical fish habitat. — Ongoing
- Determine spawning locations and seasons. — Ongoing
- Continue life history studies. — Ongoing
- Estimate reproductive parameters including fecundity, age and size of maturity, age and size of sexual transition, and sex ratio. — Ongoing
- Determine reliability of historical landings. — Ongoing
- Expand diet studies. — Ongoing
- Develop juvenile and adult indexes. — Ongoing

MANAGEMENT

The snapper grouper complex is managed under the various amendments of the SAFMC FMP. The fishery is a regional fishery, and the Council has authority within the federal 200-mile limit of the Atlantic Ocean off the coasts of North Carolina, South Carolina, Georgia, and east Florida to Key West with the exception of black sea bass north of Cape Hatteras, North Carolina. In state waters, North Carolina defers to the Council and the same regulations are followed. Thresholds and targets for the species are determined by the SAFMC and are species dependent.

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SAFMC. 2017c. Regulatory Amendment 30 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

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SAFMC. 2017e. Regulatory Amendment 42 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

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FISHERY MANAGEMENT PLAN UPDATE
SPANISH MACKEREL
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	Original FMP Adoption	February 1983
	Amendment 2	July 1987
	Amendment 3	August 1989
	Amendment 4	October 1989
	Amendment 5	August 1990
	Amendment 6	December 1992
	Amendment 8	March 1998
	Amendment 9	April 2000
	Amendment 10	July 2000
	Amendment 11	December 1999
	Amendment 14	August 2005
	Amendment 15	February 2004
	Amendment 18	January 2012
	Amendment 19	July 2010
	Amendment 20A	August 2014
	Framework Action 2013	December 2014
	Amendment 20B	March 2015
	Framework Amendment 1	December 2014
	Amendment 22	January 2014
	Amendment 23	January 2014
	Framework Amendment 5	August 2017
	Omnibus Amendment	August 2011
	Addendum I	August 2013

Comprehensive Review: 2022

Spanish mackerel is managed under the Atlantic States Marine Fisheries Commission (ASMFC) Fishery Management Plan (FMP) for Spanish Mackerel and the South Atlantic Fishery Management Council (SAFMC) Coastal Migratory Pelagics FMP (SAFMC 1982; ASMFC 2011). The original Gulf and South Atlantic fishery management councils' fishery management plan (FMP) for Coastal Migratory Pelagic Resources (mackerels) was approved in 1982 (SAMFC 1982) and went into effect in 1983. This plan treated Spanish mackerel as one U.S. stock. Allocations were established for recreational and commercial fisheries, and the commercial allocation was divided between net and hook and line fishermen. The plan also established procedures for the Secretary of Commerce to act by regulatory amendment to resolve possible future conflicts in the fishery, such as establishing fishing zones and local quotas for each gear or user group. Numerous amendments have been implemented since the first FMP.

Amendment 2 revised Spanish mackerel maximum sustainable yield (MSY) downward, recognized two migratory groups, and set commercial quotas and bag limits (SAFMC 1987). Charter boat permits were required, and it was clarified that total allowable catch (TAC) for overfished stocks must be set below the upper range of acceptable biological catch (ABC). The use of purse seines on overfished stocks was prohibited.

Amendment 3 prohibited drift gill nets for coastal pelagics and purse seines and run-around gill nets for the overfished groups of mackerels (SAMFC 1989a). The habitat section of the FMP was updated, and vessel safety considerations were included in the plan. A new objective to minimize waste and bycatch in the fishery was added to the plan.

Amendment 4 reallocated Spanish mackerel equally between recreational and commercial fishermen on the Atlantic group with an increase in TAC (SAFMC 1989b).

Amendment 5 extended the management area for the Atlantic groups of mackerels through Mid-Atlantic Fishery Management Council (MAFMC) jurisdiction (SAMFC 1990). It revised problems in the fishery and plan objectives, revised the definition of "overfishing", provided that the SAFMC will be responsible for pre–season adjustments of TACs and bag limits for the Atlantic migratory groups of mackerels, redefined recreational bag limits as daily limits, created a provision specifying that the bag limit catch of mackerel may be sold, provided guidelines for corporate commercial vessel permits, and included a definition of "conflict" to provide guidance to the Secretary.

Amendment 6 identified additional problems and an objective in the fishery, provided for rebuilding overfished stocks of mackerels within specific periods, provided for biennial assessments and adjustments, provided for more seasonal adjustment actions, including size limits, vessel trip limits, closed seasons or areas, and gear restrictions, provided for commercial Atlantic Spanish mackerel possession limits, changed commercial permit requirements to allow qualification in one of three preceding years, discontinued the reversion of the bag limit to zero when the recreational quota is filled, modified the recreational fishing year to the calendar year, and changed all size limit measures to fork length (FL) only (SAMFC 1992).

Amendment 8 identified additional problems in the fishery, specified allowable gear, revised qualifications for a commercial permit, revised the seasonal framework procedures to: provide for consideration of public comment, redefine overfishing and allow for adjustment by framework procedure, allow changes in allocation ratio of Atlantic Spanish mackerel, allow setting zero bag limits, and allow gear regulation including prohibition (SAMFC 1996).

Amendment 9 allowed possession of cut-off (damaged) Spanish mackerel that comply with the minimum size limits and the trip limits in the Gulf, Mid-Atlantic, or South Atlantic exclusive economic zone (EEZ; sale of such cut-off fish is allowed if such fish are within the existing allowance for possession; SAFMC 2000).

Amendment 10 designated Essential Fish Habitat (EFH) and EFH-Habitat Areas of Particular Concern (HAPC) for coastal migratory pelagics (SAFMC 1998a).

Amendment 11 amended the FMP as required to make definitions of MSY, optimal yield (OY), overfishing and overfished consistent with National Standard Guidelines; identified and defined fishing communities and addressed bycatch management measures (SAFMC 1998a).

Amendment 14 established a three-year moratorium on the issuance of for-hire (charter vessel and headboat) permits for coastal migratory pelagic species in the Gulf of Mexico unless sooner replaced by a comprehensive effort limitation system. This resulted in separate for-hire permits for the Gulf and South Atlantic. The control date for eligibility was established as March 29, 2001 (SAFMC 2002). The amendment also includes other provisions for eligibility, application, appeals, and transferability of permits.

Amendment 15 changed the fishing year to March 1 through February 28/29 for Atlantic group king and Spanish mackerels (SAFMC 2004).

Amendment 17 (SAFMC 2006) established a permanent limited entry system for Gulf of Mexico coastal migratory pelagics for-hire (charter and headboat) permits, building on the moratorium established under Amendment 14.

Amendment 18 established annual catch limits (ACL), annual catch targets (ACT) and accountability measures (AM) for Spanish mackerel (SAFMC 2011) as required under the 2006 Magnuson Stevens Reauthorization Act.

Amendment 19 updated existing EFH and HAPC designations for South Atlantic species and prohibited the use of certain gear types within Deepwater Coral Habitat Areas of Particular Concern (SAFMC 2010).

Amendment 20A prohibits the sale of Spanish mackerel caught under the recreational bag limit unless the fish are caught as part of a state-permitted tournament and the proceeds from the sale are donated to charity (SAFMC 2014a).

Amendment 22 2013 included in the Generic Headboat Reporting Amendment: Requires weekly electronic reporting for headboats in the South Atlantic (SAFMC 2013a).

Amendment 20B creates Northern and Southern Zones for Atlantic migratory group Spanish mackerel. National Oceanic and Atmospheric Administration Fisheries will close each zone when the respective quota is met or expected to be met (SAMFC 2015). The dividing line between the zones is at the North Carolina-South Carolina state line.

Framework Amendment 1 (SAFMC 2014c) updated the ACL and ACT for Gulf and Atlantic migratory groups of Spanish mackerel based on the results of the 2012 stock assessment.

Amendment 22. modified headboat reporting regulations to require weekly electronic reporting of all SAFMC managed species (SAFMC 2013b).

Amendment 23 (SAFMC 2014b) required dealers to possess a federal Gulf and South Atlantic universal dealer permit to purchase king and Spanish mackerel and required weekly electronic dealer reporting. It also required federally permitted king and Spanish mackerel fishermen to sell only to a federally permitted dealer.

Framework Amendment 5 (SAFMC 2017) modifies the regulations that prohibit fishing for and retaining the bag limit of king and Spanish mackerel on recreational trips on vessels with federal commercial king mackerel and Spanish mackerel permits, when there is a commercial quota closure.

The ASMFC approved the Omnibus Amendment in 2011 (ASMFC 2011). The management goal for the Omnibus Amendment is to bring the FMP for Spanish Mackerel under authority of the Atlantic Coastal Fisheries Cooperative Management Act, providing for more efficient and effective management and changes to management in the future.

Addendum I to the Omnibus Amendment (ASMFC 2013) established a pilot program that would allow states to reduce the Spanish mackerel minimum size limit for the commercial pound net fishery to 11.5 inches FL during the summer months of July through September for the 2013 and 2014 fishing years only. In August 2015, the South Atlantic Board formally extended the provisions of Addendum I for the 2015, 2016, and 2017 fishing seasons. Reports by North Carolina, the only state to reduce their minimum size, are reviewed annually.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt FMPs, consistent with N.C. law, approved by the MAFMC, SAFMC, 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 (NCDMF 2022).

Management Unit

The management unit is defined for South Atlantic Spanish mackerel within U.S. waters north of Miami-Dade/Monroe County line, Florida in the Atlantic Ocean.

Goal and Objectives

The goal of the FMP for Coastal Migratory Pelagics resources was to institute management measures necessary to prevent exceeding maximum sustainable yield (MSY), establish a mandatory statistical reporting system for monitoring catch, and to minimize gear and user conflicts (SAMFC 1982). Amendment 12 to the Gulf and South Atlantic fishery management councils' FMP for Coastal Migratory Pelagics lists eight plan objectives:

- The primary objective of the FMP is to stabilize yield at MSY, allow recovery of overfished populations, and maintain population levels sufficient to ensure adequate recruitment.
- To provide a flexible management system for the resource which minimizes regulatory delay while retaining substantial Council and public input in management decisions and which can rapidly adapt to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups or by areas.
- To provide necessary information for effective management and establish a mandatory reporting system.
- To minimize gear and user group conflicts.
- To distribute the TAC of Atlantic migratory group Spanish mackerel between recreational and commercial user groups based on the catches that occurred during the early to mid-1970s, which is prior to the development of the deep-water, run-around gill net fishery and when the resource was not overfished.
- To minimize waste and bycatch in the fishery.
- To provide appropriate management to address specific migratory groups of king mackerel.
- To optimize the social and economic benefits of the coastal migratory pelagic fisheries.

The primary goal of the ASMFC Omnibus Amendment is to bring the FMPs for Spanish mackerel, spot, and spotted seatrout under the authority of the Act, providing for more efficient and effective management and changes to management for the future (ASMFC 2011). Omnibus Amendment 1 objectives include:

- Manage the Spanish mackerel fishery by restricting fishing mortality to rates below the threshold fishing mortality rates to provide adequate spawning potential to sustain long-term abundance of the Spanish mackerel populations.
- Manage the Spanish mackerel stock to maintain the spawning stock biomass above the target biomass levels.
- Minimize endangered species bycatch in the Spanish mackerel fishery.
- Provide a flexible management system that coordinates management activities between state and federal waters to promote complementary regulations throughout Spanish mackerel's range which minimizes regulatory delay while retaining substantial ASMFC, Council, and public input into management decisions; and which can adapt to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups or by area.
- Develop research priorities that will further refine the Spanish mackerel management program to maximize the biological, social, and economic benefits derived from the Spanish mackerel population.

DESCRIPTION OF THE STOCK

Biological Profile

Spanish mackerel are considered coastal pelagic, meaning they live in the open waters near the coast. They make northern and southern migrations depending on water temperature and seldom enter waters below 68 degrees Fahrenheit. In North Carolina's waters, Spanish mackerel can be found from April to November.

They migrate south to the Florida coast in the late fall. In the summer months, they may be found as far inland as the sounds and coastal river mouths. Spanish mackerel spawn from May to September, are fast growing, and may live to be eight years old. Spanish mackerel in North Carolina grow as large as 30 inches FL, but most recreational catches are between 12- and 15-inches FL. Both sexes are capable of reproduction by age 2. Spanish mackerel feed primarily on small, schooling pelagic fish such as anchovies and herring (Manooch 1984).

Stock Status

In 2022, the Atlantic Spanish mackerel stock was assessed and peer reviewed through the Southeast Data, Assessment and Review (SEDAR 2022). The results of the assessment indicate Atlantic Spanish mackerel are not overfished, and overfishing is not occurring (SEDAR 78).

Stock Assessment

The SEDAR 78 South Atlantic Spanish Mackerel assessment took place over a series of webinars held from May 2021 to March 2022 (SEDAR 2022). This SEDAR was an operational assessment using data from 1986–2020. The assessment estimated that spawning stock has fluctuated near or above the minimum stock size threshold (MSST) level. The base-run estimate of terminal (2020) spawning stock was above the MSST (SSB_{2020}/MSST =1.40). The estimated fishing rate has been at or below the maximum fishing mortality threshold (MFMT), represented by F_{MSY} with the exception of the terminal year (2020). The terminal estimate, which is based on a three-year geometric mean, was below F_{MSY} in the base run ($F_{2018–2020}/ F_{\mathrm{MSY}}$ = 0.77) and in the median of the Monte Carlo/Bootstrap Ensemble ($F_{2018–2020}/F_{\mathrm{MSY}}$ = 0.74), indicating that the stock is not experiencing overfishing. However, if the overfishing rate of 2020 continued in 2021, the geometric mean would indicate overfishing.

DESCRIPTION OF THE FISHERY

Current Regulations

The North Carolina Division of Marine Fisheries (DMF) currently complements the management measures of the Coastal Migratory Pelagic FMP through rules MFC Rule 15A NCAC 03M .0512 and proclamation authority (NCMFC Rule 15A NCAC 03M .0512). Current regulations include a recreational bag limit of 15 Spanish mackerel per person per day and 12-inch FL minimum size. Commercial regulations also include a 12-inch FL minimum size and a trip limit of 3,500 pounds. Federal vessel permits are required for commercial, charter and headboats fishing in the exclusive economic zone (EEZ). Sale of Spanish mackerel caught under the bag limit are prohibited unless the fish are caught as part of a state-permitted tournament and the proceeds from the sale are donated to charity.

Commercial Fishery

In 2024, commercial landings were 841,478 pounds (Table 1; Figure 1) and 98% of the Spanish mackerel harvest were taken in estuarine and ocean gill nets (Figure 2). Landings for 2024 are slightly higher than the 10-year average of 825,989 pounds, with most landings occurring between May and October. Predominant commercial fisheries for Spanish mackerel include gill nets and estuarine pound nets (Table 2). The North Carolina commercial fishery is responsible for landing approximately 20% of the South Atlantic landings annually. Atlantic Spanish mackerel catches are divided into a Northern zone (NC through the Mid-Atlantic) and a Southern zone (SC, GA, and FL east coast to Dade-Monroe County line). On July 28, 2024, the harvest of Spanish mackerel in federal waters was closed when the National Marine Fisheries Service (NOAA) estimated the Northern zone quota had been reached. On July 28, 2024, a harvest period for the commercial Spanish mackerel fishery in North Carolina Coastal Fishing Waters was opened with a 500-pound daily trip limit. The fishery remained closed in federal waters. The state water harvest period closed on November 8, 2024 (Proclamation FF-32-2024).

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of Spanish mackerel from North Carolina, 1994–2024.

	Recreational			Commercial	
Year	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1994	641,980	292,919	724,589	531,371	1,255,960
1995	397,190	239,972	492,096	402,392	894,488
1996	533,333	184,518	709,589	401,830	1,111,419
1997	956,589	304,629	1,444,907	766,958	2,211,865
1998	374,804	145,746	488,951	372,415	861,366
1999	891,001	253,317	1,035,943	459,100	1,495,043
2000	1,102,777	451,910	1,175,351	659,426	1,834,777
2001	942,500	338,918	1,155,788	653,673	1,809,461
2002	787,125	309,546	987,238	698,448	1,685,686
2003	540,399	266,887	641,024	456,784	1,097,808
2004	534,720	317,189	819,978	456,242	1,276,220
2005	561,073	303,641	526,054	446,001	972,055
2006	439,736	165,098	624,488	470,662	1,095,150
2007	604,518	340,027	799,263	487,879	1,287,142
2008	1,013,980	806,280	1,234,030	415,405	1,649,435
2009	1,480,931	752,806	2,155,692	961,811	3,117,503
2010	927,116	701,634	1,116,099	911,866	2,027,965
2011	854,554	479,586	1,100,110	871,217	1,971,327
2012	995,852	591,792	1,327,350	916,439	2,243,789
2013	994,599	685,692	1,242,029	620,752	1,862,781
2014	1,028,925	814,064	1,193,442	673,974	1,867,416
2015	835,011	514,714	981,867	561,714	1,543,581
2016	918,352	546,950	907,400	601,623	1,509,023
2017	995,706	688,062	1,094,778	816,089	1,910,867
2018	1,012,889	1,019,418	1,156,702	796,890	1,953,592
2019	1,478,890	1,340,366	1,694,247	722,398	2,416,645
2020	1,286,131	1,267,210	1,843,314	1,033,526	2,876,840
2021	1,312,929	1,294,525	1,894,535	1,155,289	3,049,824
2022	1,898,755	2,268,283	1,841,527	926,035	2,767,562
2023	1,204,175	1,293,628	1,216,236	804,848	2,021,084
2024	1,954,067	1,528,319	2,710,335	841,478	3,551,813
Mean	951,632	661,537	1,172,095	674,017	1,846,112

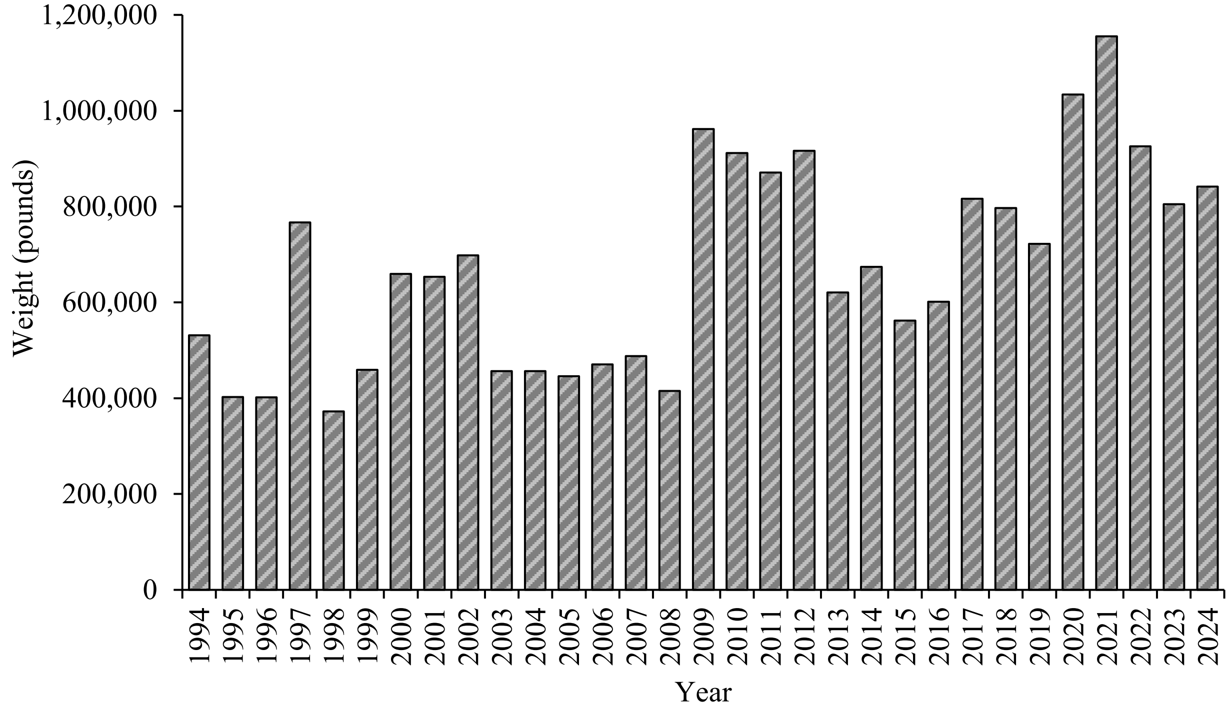

Figure 1. Annual commercial landings in pounds for Spanish mackerel in North Carolina, 1994–2024.

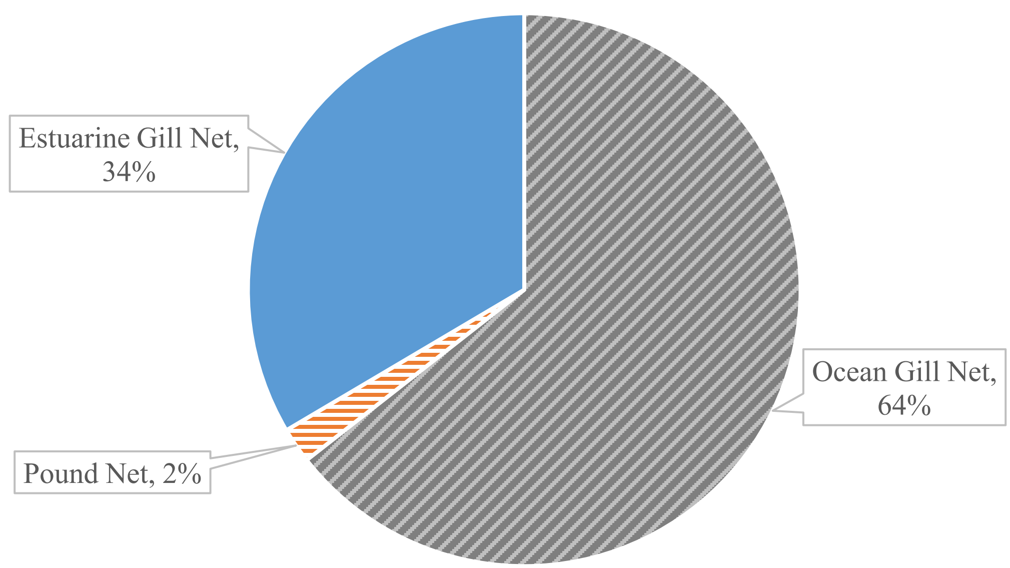

Figure 2. Spanish mackerel commercial harvest in 2024 by gear type.

Table 2. North Carolina commercial harvest of Spanish mackerel with landings in pounds by gear type, 1994–2024.

Year	Gear				Total
	Ocean Gill Net	Estuarine Gill Net	Pound Net	Other	
1994	327,703	137,904	29,708	36,057	531,371
1995	233,384	104,739	49,077	15,192	402,392
1996	215,542	124,008	45,221	17,059	401,830
1997	502,882	173,722	60,898	29,457	766,958
1998	234,621	97,398	26,962	13,435	372,415
1999	297,435	98,855	49,485	13,326	459,100
2000	462,459	162,291	21,792	12,884	659,426
2001	411,974	186,628	33,163	21,909	653,673
2002	463,430	205,865	24,118	5,035	698,448
2003	368,171	80,219	5,218	3,176	456,784
2004	359,467	90,317	3,524	2,934	456,242
2005	257,074	180,874	2,184	5,869	446,001
2006	358,614	100,114	2,783	9,152	470,662
2007	420,680	57,144	3,440	6,615	487,879
2008	268,435	93,579	49,534	3,857	415,405
2009	454,081	266,621	228,201	12,908	961,811
2010	177,091	631,218	96,490	7,068	911,866
2011	287,908	524,967	53,704	4,638	871,217
2012	501,369	372,759	38,644	3,667	916,439
2013	346,810	250,524	18,764	4,654	620,752
2014	422,528	221,799	25,772	3,875	673,974
2015	289,216	229,114	40,032	3,353	561,714
2016	328,622	242,291	27,806	2,904	601,623
2017	507,847	287,434	17,314	3,494	816,089
2018	486,691	280,689	19,931	9,579	796,890
2019	354,891	322,101	39,118	6,288	722,398
2020	600,966	369,436	53,384	9,740	1,033,526
2021	709,163	404,112	31,767	10,247	1,155,289
2022	457,337	432,709	29,953	6,037	926,035
2023	446,273	341,978	13,827	2,770	804,848
2024	540,741	281,084	17,436	2,216	841,478

Recreational Fishery

Recreational landings of Spanish mackerel are estimated from the Marine Recreational Information Program (MRIP). For more information on MRIP see https://www.fisheries.noaa.gov/topic/recreational-fishing-data. Spanish mackerel are a favorite of many anglers due to their exciting behavior when hooked and their delicious taste when cooked. Recreational anglers target Spanish mackerel by trolling spoons and plugs inshore. Anglers catch most Spanish mackerel between May and September once the water temperature has warmed up to 70 degrees Fahrenheit. Recreational anglers harvested 2,710,335 pounds of Spanish mackerel in 2024, the highest value in the time series (Table 1; Figure 3).

The DMF offers award citations for exceptional catches of Spanish mackerel. Spanish mackerel greater than six pounds are eligible for an award citation. In 2024, 84 citations were awarded (Figure 4).

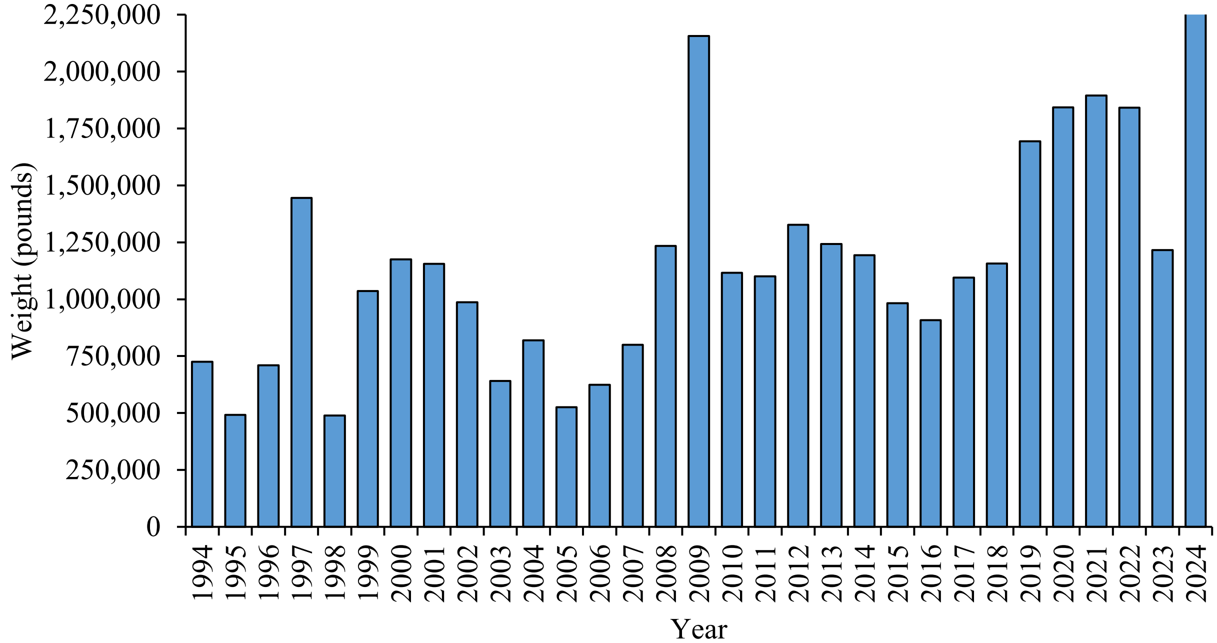

Figure 3. Annual recreational landings in pounds for Spanish mackerel in North Carolina, 1994–2024.

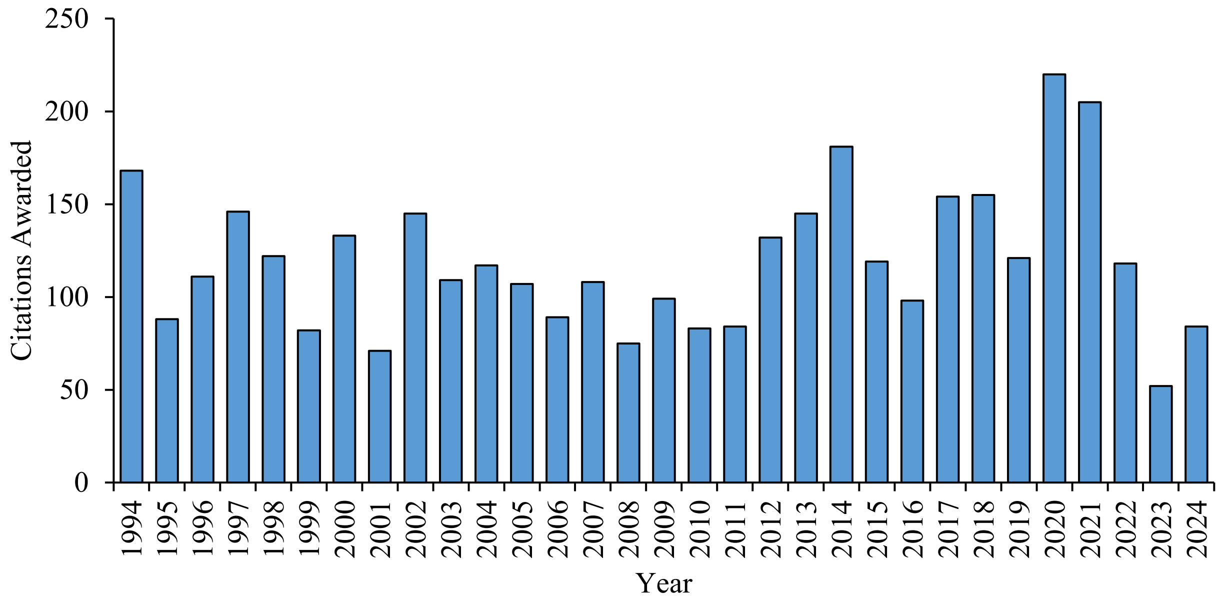

Figure 4. North Carolina Saltwater Fishing Tournament citations awarded for Spanish mackerel from 1994–2024. Citations are awarded for Spanish mackerel greater than six pounds.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Length-frequency information for the commercial Spanish mackerel fishery in North Carolina is collected through DMF's Program 431 (sciaenid pound net), Program 434 (ocean gill net), Program 461 (estuarine gill net), Program 439 (coastal pelagic) and Program 466 (onboard observer program). Through these programs, 2,605 Spanish mackerel were measured in 2024 with a mean length of 16.9 inches FL (Table 3;

Figures 5 and 6). Ageing structures, otoliths, are collected from fishery-dependent sampling programs and are sent to the Southeast Fisheries Science Center in Panama City, Florida for processing and ageing (Table 4). Length and weight information for the recreational fishery are collected through the MRIP dockside sampling which measured 343 Spanish mackerel with a mean length of 15.7 inches FL (Table 5; Figure 7).

Table 3. Spanish mackerel length (fork length, inches) data from commercial fish house samples, 1997–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1997	14.5	7.8	23.7	769
1998	15.0	8.2	26.0	778
1999	14.6	6.8	25.0	968
2000	16.4	8.3	25.4	1,616
2001	15.6	9.6	26.0	861
2002	15.6	11.0	25.4	880
2003	16.3	9.8	26.5	473
2004	17.1	8.6	27.0	989
2005	16.2	9.3	27.4	1,841
2006	16.9	7.0	27.7	2,187
2007	15.8	7.1	31.9	2,072
2008	16.0	7.3	26.3	2,127
2009	15.6	7.5	38.2	3,509
2010	16.2	6.8	26.7	4,759
2011	16.6	10.1	42.5	5,507
2012	16.5	8.2	27.7	5,409
2013	16.6	7.9	28.5	3,902
2014	16.3	8.6	27.7	4,462
2015	16.1	10.0	26.8	5,402
2016	16.3	5.8	28.8	6,888
2017	16.4	10.7	28.0	4,522
2018	16.5	10.8	28.0	3,772
2019	16.5	9.6	28.4	4,427
2020	16.1	8.6	27.9	4,947
2021	16.6	9.9	28.8	5,077
2022	16.7	10.4	26.8	2,778
2023	16.6	9.7	30.6	3,339
2024	16.9	11.4	36.1	2,605

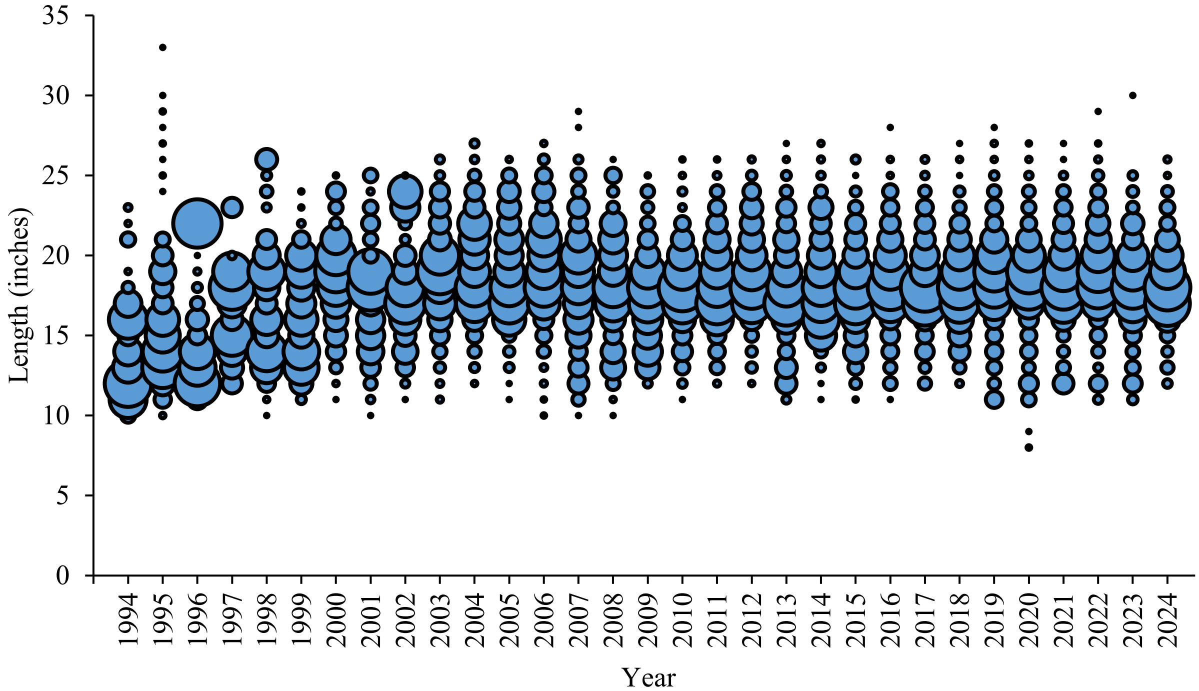

Figure 5. Commercial length frequency (fork length, inches) for Spanish mackerel harvested, 1994–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

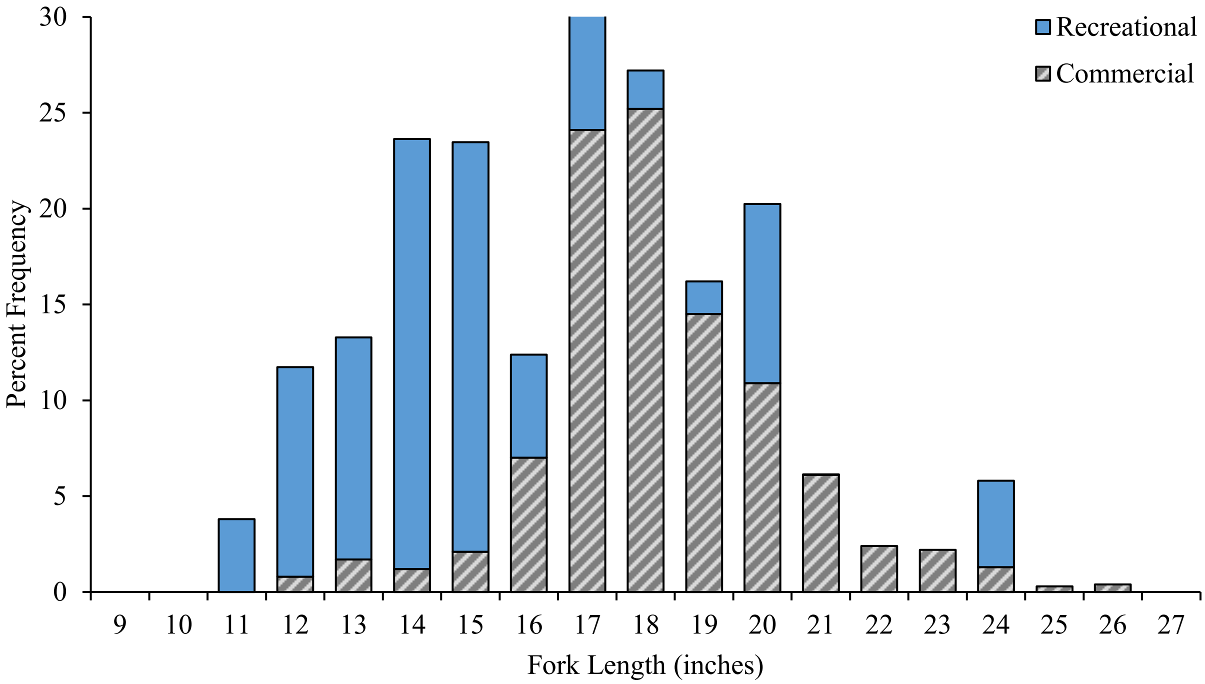

Figure 6. Commercial and recreational length frequency distribution from Spanish mackerel harvested in 2024.

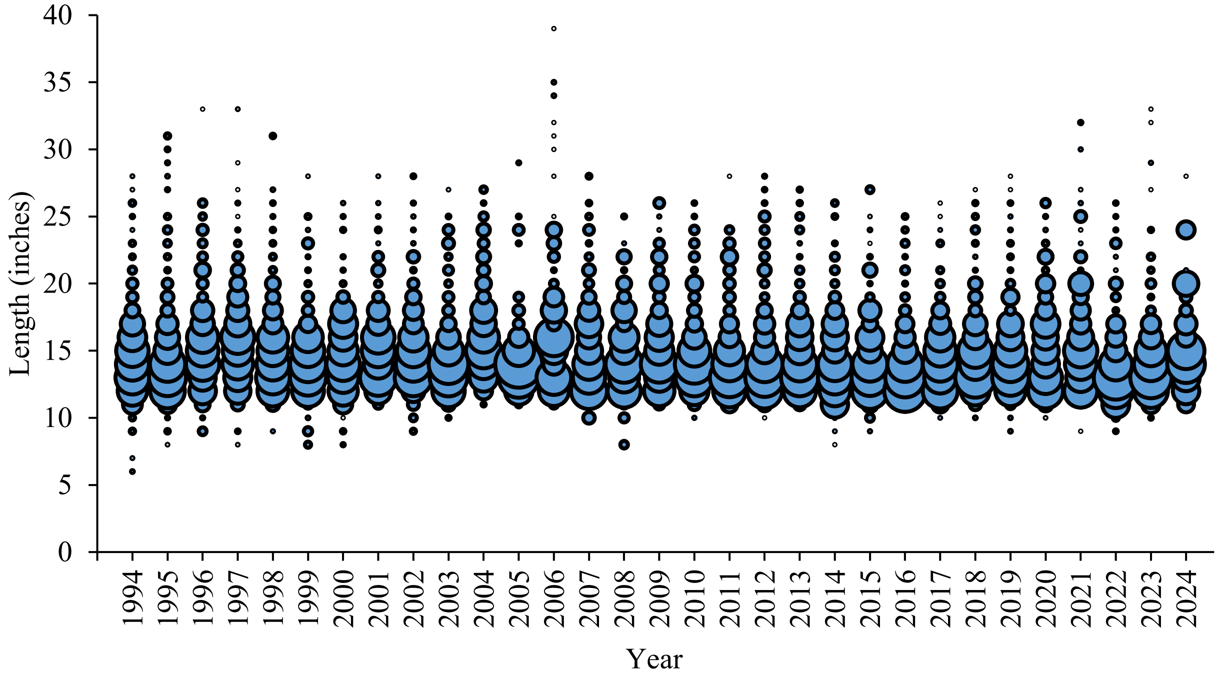

Figure 7. Recreational length frequency (fork length, inches) for Spanish mackerel harvested, 1994–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Table 4. Mean, minimum and maximum fork lengths (inches) and total number sampled of Spanish mackerel collected by DMF from both fishery-dependent (commercial and recreational) and independent (survey) sources for ageing by the NOAA Southeast Fisheries Science Center, 1997–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1997	14.0	5.6	24.3	403
1998	15.5	7.9	28.3	430
1999	14.7	7.4	30.5	294
2000	17.4	8.9	27.2	466
2001	16.3	8.0	26.2	488
2002	16.2	5.7	28.0	337
2003	14.5	9.8	26.0	330
2004	14.9	10.0	26.4	282
2005	14.7	8.7	25.4	303
2006	14.9	10.0	26.9	291
2007	14.9	10.4	31.7	297
2008	14.3	7.7	26.9	328
2009	15.3	9.3	25.1	317
2010	14.9	6.9	25.4	411
2011	15.1	6.1	28.0	430
2012	14.5	6.3	26.4	557
2013	15.2	7.4	27.5	370
2014	14.7	7.6	25.8	515
2015	14.8	7.2	27.6	412
2016	15.1	8.5	29.1	579
2017	18.6	7.0	28.1	451
2018	16.0	7.8	29.0	463
2019	14.3	5.0	28.0	640
2020	16.4	4.8	27.3	337
2021	15.0	5.8	25.7	778
2022	15.4	8.7	24.4	664
2023	14.6	6.3	26.6	672
2024	15.5	9.1	26.5	588

Table 5. Spanish mackerel length (fork length, inches) data from Marine Recreational Information Program samples, 1981–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1986	15.4	8.1	27.2	110
1987	15.5	9.1	34.1	950
1988	5.0	7.9	32.9	1,118
1989	15.3	7.9	33.5	1,799
1990	15.9	8.3	35.5	2,160
1991	15.2	6.3	37.0	2,135
1992	15.4	7.5	33.1	1,354
1993	16.1	9.0	28.5	1,056
1994	15.2	6.4	29.4	2,255
1995	15.1	8.2	31.9	799
1996	16.0	9.8	70.2	1,107
1997	16.2	8.9	33.3	1,846
1998	15.5	9.2	31.1	895
1999	15.3	8.5	28.9	1,286
2000	15.7	9.0	27.2	1,242
2001	16.1	11.4	28.7	858
2002	16.3	9.5	28.0	827
2003	15.9	10.8	28.0	476
2004	16.7	11.1	27.5	298
2005	14.6	11.9	29.2	289
2006	16.0	11.1	39.4	236
2007	15.4	10.6	28.6	240
2008	15.2	8.9	26.2	596
2009	15.8	11.4	26.9	788
2010	15.2	10.7	26.5	763
2011	15.0	11.1	28.1	543
2012	15.1	10.6	28.0	776
2013	15.1	10.1	27.1	454
2014	14.8	9.0	29.9	754
2015	14.8	9.2	27.4	644
2016	14.3	11.0	26.3	1,030
2017	14.8	10.3	26.4	1,023
2018	15.0	9.9	27.2	1,691
2019	15.0	9.3	28.2	1,486
2020	15.6	9.0	27.5	1,914
2021	15.8	9.6	32.3	1,313
2022	14.1	9.7	26.6	1,070
2023	14.4	9.9	35.5	1,100
2024	15.7	10.6	30.4	343

Fishery-Independent Monitoring

Length-frequency information for Spanish mackerel is collected in the division's statewide Independent Gill Net Survey (Program 915) and the Pamlico Sound Trawl Survey (Program 195) (Table 6). Ageing structures, otoliths, are collected from both fishery-independent sampling programs and sent to the Southeast Fisheries Science Center in Panama City, Florida for processing and ageing (Table 4).

Table 6. Mean, minimum and maximum fork lengths (inches) and total number sampled of Spanish mackerel from fishery-independent sampling programs, 1997–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1997	8.1	2.8	13.9	52
1998	8.1	5.6	19.9	77
1999	9.1	3.1	19.3	31
2000	15.8	2.8	23.9	155
2001	15.6	4.1	24.4	158
2002	16.5	8.1	23.4	45
2003	16.6	9.7	22.4	35
2004	14.0	4.8	22.5	17
2005	15.0	3.8	24.1	61
2006	14.1	6.9	21.3	47
2007	11.4	2.2	21.8	163
2008	12.8	5.4	26.8	335
2009	13.9	4.3	22.4	474
2010	13.5	3.0	21.7	361
2011	14.2	2.8	20.5	103
2012	11.5	4.9	22.8	47
2013	10.3	4.6	17.9	46
2014	8.9	2.9	19.0	29
2015	12.3	3.9	21.7	49
2016	15.0	6.9	22.4	47
2017	19.8	2.8	24.6	130
2018	13.6	3.8	21.5	76
2019	12.7	1.9	22.6	517
2020	6.2	2.1	13.4	336
2021	14.1	5.0	22.8	360
2022	15.5	4.8	25.3	612
2023	14.7	4.4	22.2	403
2024	15.4	2.1	25.2	406

RESEARCH NEEDS

From Omnibus Amendment (ASMFC 2011):

- Increase collection of fishery-dependent length, sex, age, and Catch Per Unit Effort (CPUE) data to improve stock assessment accuracy. Simulations on CPUE trends should be explored and impacts on assessment results determined. Data collection is needed for all states, particularly those north of North Carolina.
- Develop fishery-independent methods to monitor stock size.
- Develop methodology for predicting year class strength and determination of the relationship between juvenile abundance and subsequent year class strength.
- To ensure more accurate estimates of theoretical age when size is zero (t^0), increase efforts to collect age-0 specimens for use in estimating von Bertalanffy growth parameters.
- Provide better estimates of recruitment, natural mortality rates, fishing mortality rates, and standing stock. Specific information should include an estimate of the total amount caught and distribution of catch by area, season, and type of gear.

- Commission and member states should support and provide the identified data and input needed to improve the SEDAR process.
- Conduct yield per recruit analyses relative to alternative selective fishing patterns.
- Investigate the discard mortality of Spanish mackerel in the commercial and recreational trolling fisheries and commercial gill net fishery.
- Need observer coverage for Spanish mackerel fisheries: gill nets, cast nets, handlines, pound nets, and shrimp trawl bycatch.
- Evaluate potential bias of the lack of appropriate stratification of the data used to generate age-length keys.
- Evaluate CPUE indices related to standardization methods and management history, with emphasis on greater temporal and spatial resolution in estimates of CPUE.
- Expand Trip Interview Program (TIP) sampling to better cover all statistical areas.
- Complete research on the application of assessment and management models relative to dynamic species such as Spanish mackerel.
- Establish a monitoring program to characterize the bycatch and discards of Spanish mackerel in the directed shrimp fishery in Atlantic Coastal waters.
- Obtain adequate data to determine gutted to whole weight relationships.
- Conduct inter-lab comparisons of age readings from test sets of otoliths in preparation for any future stock assessment.
- Address issue of fish retained for bait (undersized) or used for food by crew (how to capture these as landings).
- Investigate whether catchability varies as a function of fish density and/or environmental conditions.
- Investigate how temporal changes in migratory patterns may influence indices of abundance.
- Investigate the possibility of using models that allow catchability to follow a random walk, which can be useful in tracking longer-term trends in time-varying catchability and thus detect changes over time in CPUE (from SEDAR 2008).

MANAGEMENT

In North Carolina, Spanish mackerel are included in the North Carolina IJ FMP (NCDMF 2022), which defers, to the SAFMC's Coastal Migratory Pelagics FMP (SAFMC 2015) and the ASMFC's Spanish Mackerel FMP (ASMFC 2013).

Spanish mackerel is currently managed under recent Amendment 20A (SAFMC 2014a), Amendment 20B (SAFMC 2015) and Framework Amendment 1 (SAMFC 2014b) to the Coastal Migratory Pelagics FMP. Amendment 20A prohibits the sale of all recreational bag-limit-caught Spanish mackerel, except those harvested during a state-permitted tournament. Amendment 20B establishes separate commercial quotas of Atlantic Spanish mackerel for a Northern Zone (north of NC-SC state line) and Southern Zone (south of NC-SC state line). Framework Amendment 1 modifies the annual catch limits for Spanish mackerel in the U.S. Atlantic and modifies the recreational annual catch target, based on the results of the most recent stock assessments for these stocks. North Carolina currently has a 12-inch FL minimum size limit, a 15 fish per day bag limit for recreational anglers and a 3,500-pound commercial trip limit. The harvest season is open year-round and is based on a fishing year of March 1 to the last day in February with commercial and recreational fisheries closing when the quota is reached.

The ASMFC's South Atlantic State-Federal Fisheries Management Board approved the Omnibus Amendment for Spot, Spotted Seatrout, and Spanish Mackerel in 2011 (ASMFC 2011). For Spanish mackerel, the Amendment includes commercial and recreational management measures, adaptive management measures, and a process for Board review and action in response to changes in the federal regulations. This allows for complementary management throughout the range of the species.

The Board approved Addendum I (ASMFC 2013) to establish a pilot program to allow states to reduce the Spanish mackerel minimum size limit for the commercial pound net fishery to 11.5 inches from July through September for the 2013 and 2014 fishing years. In August 2015, the Board evaluated the success of the pilot program and extended the provisions of Addendum I for the 2015–2018 fishing years. The program was created to reduce waste of these shorter fish, which are discarded dead in the summer months, by converting them to landed fish that will be counted against the quota. The addendum responded to reports about the increased incidence of Spanish mackerel one-quarter to one-half inch short of the 12-inch FL minimum size limit in pound nets during the summer months which die prior to being released, possibly due to a combination of temperature, stress, and crowding. While work has been done to experiment with using wall or panel mesh sizes and escape panels, little success has been made in releasing undersized fish quickly enough to prevent dead discards during this time of year. North Carolina did not implement the Addendum in 2019. Current management strategies for Spanish mackerel in South Atlantic waters are summarized in Table 7.

Table 7. Summary of N.C. Marine Fisheries Commission management strategies for Spanish mackerel.

Management Strategy	Implementation Status
Prohibits Purse Gill Nets when taking king or Spanish mackerel	Rule 15A NCAC 03M .0512
12-inch fork length minimum size limit. Fifteen fish recreational creel limit. Commercial Vessel Permit requirements. Commercial trip limit of 3,500 pounds of king, Spanish, or aggregate. Charter vessels or head boats with Commercial Vessel Permit must comply with possession limits when fishing with more than three persons.	Proclamation FF-14-2024
Established a harvest period for the commercial Spanish mackerel fishery in North Carolina Coastal Fishing Waters and implemented a 500-pound daily trip limit. The fishery closed November 8, 2024.	Proclamation FF-32-2024

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FISHERY MANAGEMENT PLAN UPDATE
SPINY DOGFISH
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	MAFMC/NEFMC FMP	January 2000
	Framework 1	2006
	Amendment 1	2007
	Framework 2	2009
	Amendment 2	2011
	Amendment 3	2014
	Amendment 4	2015
	Amendment 5	2017
	Framework 3	2018
	Framework 4	2020
	Framework 5	2020
	Framework 6	2025
	ASMFC FMP	November 2002
	Addendum I	November 2005
	Addendum II	October 2008
	Addendum III	April 2011
	Addendum IV	August 2012
	Addendum V	October 2014
	Addendum VI	October 2019
	Addendum VII	February 2025
Comprehensive Review:	2023	

Spiny dogfish sharks are interjurisdictionally managed by the Mid-Atlantic and New England Fishery Management Councils (MAFMC/NEFMC) in federal waters and the Atlantic States Marine Fisheries Commission (ASMFC) in state waters. A fishery management plan (FMP) was created for the stock in 2000 (MAFMC and NEFMC 2000). The FMP includes an annual commercial quota allocated for each fishing year (May 1–April 30).

The MAFMC/NEMFC spiny dogfish FMP has had five amendments since initiated in 2000. Amendment 1 required a standardized method to report by-catch, Amendment 2 established annual catch limits (ACLs) and Accountability Measures (AMs), Amendment 3 allowed for updates to essential habitat definitions, established provisions to maintain existing management measures (including quotas) in the event of delayed rulemaking, and eliminated the seasonal allocation of the coast-wide commercial quota, Amendment 4 implemented a standardized bycatch reporting methodology, and Amendment 5 implemented management measures to prevent the development of new, and the expansion of existing, commercial fisheries of certain forage species in the Mid-Atlantic. All amendments were approved by the National Oceanic and Atmospheric Association (NOAA). The MAFMC/NEMFC spiny dogfish FMP, associated amendment documents, and framework information can be found at https://www.mafmc.org/dogfish.

In state waters, the ASMFC 2002 Interstate FMP for spiny dogfish establishes the annual quota and possession limits (ASMFC 2002). The Spiny Dogfish Coast Wide Management Board, Advisory Panel, Technical Committee, and Plan Review Team oversee the management of spiny dogfish in state waters. The management unit includes the U.S. Atlantic coast (Maine-Florida) distribution of spiny dogfish from the estuaries eastward to the inshore boundary of the exclusive economic zone.

There are no amendments to the ASMFC interstate FMP but there are seven addenda. Addendum I allows the Spiny Dogfish Management Board to set multi-year specifications and Addendum II establishes regional allocation of the annual quota (58%) to states from Maine to Connecticut. Addendum III was added to create flexibility in quota shares for southern Atlantic States (New York to North Carolina). Addendum III allows for quota transfer between states, rollovers of up to 5%, state-specified possession limits, and includes a three-year reevaluation of the measures. North Carolina is allocated 14.04% of the quota. Addendum IV standardizes the definitions of overfishing between the three management agencies and adopts a fishing mortality threshold consistent with the federal FMP. Addendum V ensures consistency in spiny dogfish management with the Shark Conservation Act of 2010 by prohibiting processing at-sea, including the removal of fins. Addendum VI allows quota to be transferred between all regions and states to enable full utilization of the coast-wide commercial quota and avoid quota overages. Addendum VII supported consistency with the federal FMP for Spiny Dogfish Framework Adjustment 6 by prohibiting overnight gillnet soaks for state spiny dogfish permit holder on nets 5.25" –10" mesh in November through March in specified areas off of Virginia and Maryland. These were passed to reduce Atlantic sturgeon bycatch in the spiny dogfish gillnet fishery. The ASMFC spiny dogfish FMP and associated addendum documents can be found at http://www.asmfc.org/species/spiny-dogfish.

To ensure compliance with interstate requirements, North Carolina (N.C.) also manages spiny dogfish under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). 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 (NCDMF 2022).

Management Unit

For spiny dogfish, the entire U.S. Atlantic Coast from the estuaries eastward to the inshore boundary of the exclusive economic zone is considered a single stock which is managed by the ASMFC, NEFMC, and MAFMC. North Carolina is allotted a state-specific share of the coast-wide quota and allowed to specify possession limits in state waters.

Goal and Objectives

The overall goal of the joint MAFMC/NEFMC FMP is to conserve spiny dogfish to achieve optimum yield from the resource. In support of this goal, the following objectives were adopted:

- Reduce fishing mortality to ensure that overfishing does not occur.
- Promote compatible management regulations between state and council jurisdictions and the US and Canada.
- Promote uniform and effective enforcement of regulations.
- Minimize regulations while achieving the management objectives stated above.
- Manage the spiny dogfish fishery to minimize the influences of the regulations on the prosecution of other fisheries, to the extent practicable.
- Contribute to the protection of biodiversity and ecosystem structure and function.

The goal of the ASMFC FMP for spiny dogfish is to promote stock rebuilding and management of the spiny dogfish fishery in a manner that is biologically, economically, socially, and ecologically sound. In support of this goal, the following objectives are recommended:

- Reduce fishing mortality and rebuild the female portion of the spawning stock biomass (SSB) to prevent recruitment failure and support a more sustainable fishery.
- Coordinate management activities between state, federal, and Canadian agencies to ensure complementary regulations throughout the species range.
- Minimize the regulatory discards and bycatch of spiny dogfish within state waters.
- Allocate the available resource in biologically sustainable manner that is equitable to all the fishers.
- Obtain biological and fishery related data from state waters to improve the spiny dogfish stock assessment that currently depends upon data from the federal bottom trawl survey.

DESCRIPTION OF THE STOCK

Biological Profile

Spiny dogfish (*Squalus acanthias*) are found across the Atlantic Ocean in temperate and subarctic waters. In the northwest Atlantic, they range from Labrador, Canada to Florida but are most abundant from Nova Scotia, Canada to Cape Hatteras, North Carolina (Nammack et al. 1985). Spiny dogfish migrate to coastal waters of North Carolina in the winter and move north along the Atlantic coast in the spring (Sulikowski et al. 2010). Spiny dogfish are a relatively long-lived and slow growing species, reaching a maximum length of approximately 4 feet. Males are mature at approximately 23.6 inches (6 years old), while females mature at between 29.5 and 31.5 inches (12 years old; Nammack et al. 1985). The maximum recorded age is 35 years for males and 40 years for females (Campana et al. 2006). Spiny dogfish give birth to live young called pups. Spiny dogfish gestation is approximately 22 months with two to 15 pups produced (average of six) in each litter and offspring production (fecundity) increases with fish length (Ketchen 2011). Mating occurs during the fall and winter offshore in the mid-Atlantic and pups are born during the winter in the offshore wintering grounds (Campana et al. 2009).

Stock Status

The 2023 Management Track Stock Assessment indicates that spiny dogfish are not overfished and overfishing is not occurring (NOAA 2023).

Stock Assessment

The 2023 Management Track Stock Assessment indicated that spiny dogfish are not overfished and overfishing is not occurring. The spawning stock biomass estimate of 191 million pups is slightly above the SSB threshold of 188 million pounds. The fishing mortality estimate (0.02) is just below the fishing mortality threshold (0.0246). However, the assessment also found a lower productivity of the stock, requiring reduced quotas to prevent overfishing in the future.

DESCRIPTION OF THE FISHERY

Current Regulations

The fishery is typically opened via proclamation from November through April, as the quota allows; this time period corresponds to the time when spiny dogfish are available in North Carolina waters [see most recent North Carolina Division of Marine Fisheries (DMF) proclamation]. Commercial harvest of spiny dogfish is quota managed with harvest periods and trip limits in federal waters and regional and state quota allocations in state waters. There are no recreational harvest restrictions for spiny dogfish.

Commercial Fishery

In North Carolina, spiny dogfish commercial landings peaked in 1996 and declined sharply through 2001. Landings remained low through 2008 and then steadily increased from 2009 through 2014. Landings have declined since 2014 (Table 1; Figure 1A). In 2024, 156,831 pounds of spiny dogfish were harvested which is well below the last decade's average of 1,656,369 pounds. This was likely due to commercial fishers not targeting spiny dogfish due to the reduced market demand. In 2024, most of the spiny dogfish were landed from the ocean gill net fishery with others landed from estuarine gill nets. Historically, spiny dogfish have also been landed with beach seines, ocean trawls, and hook-and-line gears.

Table 1. Spiny dogfish recreational harvest and number released (NOAA Marine Recreational Information Program) and commercial harvest (North Carolina Trip Ticket Program), 2015–2024.

Year	Recreational Number Landed	Recreational Number Released	Recreational Weight Landed (lb)	Commercial Weight Landed (lb)	Total Weight Landed (lb)
2015	7,302	657,373	36,376	4,247,213	4,283,589
2016	22,611	52,562	173,584	2,271,201	2,472,840
2017	683	44,038	5,616	393,085	398,701
2018	7,514	157,394	43,732	1,168,247	1,211,979
2019	6,106	261,322	43,551	1,124,291	1,167,842
2020	1,785	31,195	13,638	1,501,331	1,514,969
2021	21,587	400,905	117,447	131,501	248,948
2022	3,903	70,502	12,295	70,392	82,687
2023	52,623	456,305	260,605	6,147	266,752
2024	19,317	161,618	93,796	156,831	250,627
Mean	14,343	229,321	80,064,	1,107,024	1,189,893

Recreational Fishery

Recreational estimates across all years have been updated and are now based on the NOAA Marine Recreational Information Program (MRIP) new Fishing Effort Survey-based calibrated estimates. For more information on MRIP, please see MRIP (NOAA). Total annual North Carolina recreational landings, obtained from the NOAA Marine Recreational Information Program, were minimal in the 90s and early 2000s and have been highly variable since (Table 1; Figure 1B). 2024 was above average recreational landings estimate at 93,796 pounds. Mean lengths measured in MRIP have varied in the last decade, likely due to the extremely small sample sizes. The smallest average length was 24 inches in 2022 with 10 fish measured and the highest average length was 35 inches in 2016, and 2019 with two, and three fish measured, respectively (Table 2).

Table 2. Spiny dogfish length (total length, inches) data from NOAA Marine Recreational Information Program recreational samples, 2015–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2015	27	16	40	2
2016	35	31	38	2
2017	33	31	34	5
2018	30	25	38	11
2019	35	32	38	3
2020	32	27	38	11
2021	29	24	35	10
2022	24	18	27	10
2023	27	23	31	7
2024	27	23	32	6

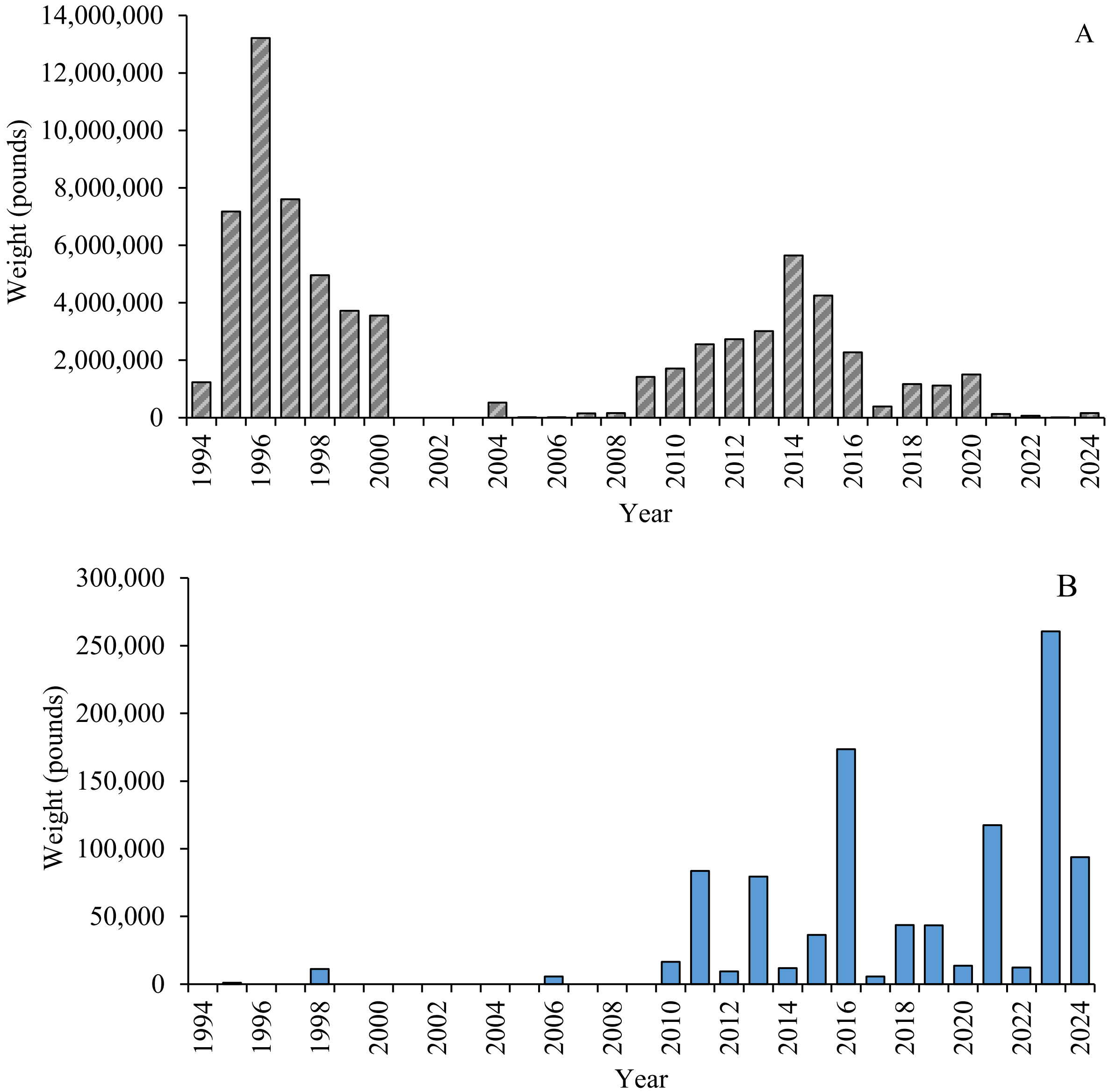

Figure 1. Annual commercial (A) and recreational (B) landings in pounds for spiny dogfish in North Carolina, 1994–2024.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Fishery-dependent monitoring programs for beach seine, estuarine gill net, ocean gill net, and ocean trawl sampled spiny dogfish from 1994 to 2024. Prior to 1999, sampling was minimal, and sex was not recorded. Samples were collected at fish packing houses while the catches were offloaded. Fishing captain or crew members were interviewed to obtain information including area fished, gear specifications, and water depth. For each sample collected, total length (TL) and fork length (FL), aggregate weight (nearest kg), and sex were recorded. From 1999 through 2024, sampled spiny dogfish TL averaged 33 inches and ranged from 19 to 43 inches. In the last decade, there has been much less variability (Table 3). Female spiny dogfish are typically encountered more often during sampling events due to their relatively higher abundance in nearshore areas where fishing occurs (Table 4). Like many elasmobranch species, spiny dogfish exhibit sexual dimorphism; males are generally smaller than females. There were no commercially harvested spiny dogfish measured in 2023 or 2024. Low landings and a very limited number of trips reporting any spiny dogfish harvest contributed to the inability to obtain fishery-dependent biological samples.

Table 3. Spiny dogfish length (total length, inches) data from commercial fish house samples, 2015–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2015	34	19	40	1,365
2016	34	25	40	795
2017	33	24	39	67
2018	34	27	40	380
2019	34	24	39	580
2020	31	23	41	454
2021	34	28	38	76
2022	33	26	38	114
2023	-	-	-	0
2024	-	-	-	0

Table 4. Spiny dogfish length (total length, inches) data by sex from commercial fish house samples, 2015–2024.

	Female				Male			
Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Mean Length	Minimum Length	Maximum Length	Total Number Measured
2015	35	25	40	1,281	31	25	38	84
2016	35	24	40	727	30	26	35	68
2017	34	29	39	53	30	27	32	14
2018	35	27	40	343	30	27	35	37
2019	34	25	39	523	30	24	35	57
2020	32	23	41	362	29	25	37	88
2021	31	31	31	1	34	28	38	75
2022	33	27	38	98	30	26	32	16
2023	-	-	-	0	-	-	-	0
2024	-	-	-	0	-	-	-	0

Fishery-Independent Monitoring

The DMF initiated a fishery-independent gill net survey of Pamlico Sound in 2001 (P915). DMF has conducted a fishery-independent gill net survey (P915) which has been conducted in Pamlico Sound since 2001. Sampling was expanded to the Pamlico, Pungo, and Neuse Rivers in 2003 and to the Cape Fear and New Rivers in 2008. Coverage was further expanded to Bogue, Back, and Core Sounds in 2018. The objective of this project is to provide annual indices of relative abundance for key estuarine species in North Carolina estuaries that can be incorporated into stock assessments. Data from this survey are used to improve bycatch estimates, evaluate management measures, and evaluate habitat usage. Results from this project are used by the DMF and other Atlantic coast fishery management agencies to evaluate the effectiveness of current management measures and to identify additional measures that may be necessary to conserve marine and estuarine stocks. Developing fishery independent indices of abundance for target species allows the DMF to assess the status of these stocks without relying solely on commercial and recreational fishery dependent data. The survey employs a stratified random sampling design and utilizes multiple mesh gill nets (3.0 inch to 6.5 inch stretched mesh, by 0.5-inch increments). A total of 1,883 spiny dogfish have been measured in the Pamlico Sound Independent Gill Net Survey from 2001 to 2024. Total length ranged from 20 to 40 inches and averaged 31 inches during the survey period.

RESEARCH NEEDS

Research needs from the ASMFC's 2022 FMP review are provided below:

Fishery-Dependent Priorities

- Determine area, season, and gear-specific discard mortality estimates coastwide in the recreational, commercial, and non-directed (bycatch) fisheries.
- Characterize and quantify bycatch of spiny dogfish in other fisheries.
- Increase the biological sampling of spiny dogfish in the commercial fishery and on research trawl surveys.
- Further analyses of the commercial fishery is also warranted, especially with respect to the effects of gear types, mesh sizes, and market acceptability on the mean size of landed spiny dogfish.

Fishery-Independent Priorities

- Conduct experimental work on NEFSC trawl survey gear performance, with focus on video work to study the herding properties of the gear for species like dogfish and other demersal groundfish.
- Investigate the distribution of spiny dogfish beyond the depth range of current NEFSC trawl surveys, possibly using experimental research or supplemental surveys.
- Continue to analyze the effects of environmental conditions on survey catch rates

Modeling / Quantitative Priorities

- Continue work on the change-in-ratio estimators for mortality rates and suggest several options for analyses.
- Examine observer data to calculate a weighted average discard mortality rate based on an assumption that the rate increases with catch size.

Life History, Biological, and Habitat Priorities

- Conduct a coastwide tagging study to explore stock structure, migration, and mixing rates.
- Standardize age determination along the entire East Coast. Conduct an ageing workshop for spiny dogfish, encouraging participation by NEFSC, North Carolina Division of Marine Fisheries (NCDMF), Canada DFO, other interested agencies, academia, and other international investigators with an interest in spiny dogfish ageing.
- Identify how spiny dogfish abundance and movement affect other organisms

Management, Law Enforcement, and Socioeconomic Priorities

- Monitor the changes to the foreign export markets for spiny dogfish and evaluate the potential to recover lost markets or expand existing ones.
- Update on a regular basis the characterization of fishing communities involved in the spiny dogfish fishery, including the processing and harvesting sectors, based upon Hall-Arber et al. (2001) and McCay and Cieri (2000).
- Characterize the value and demand for spiny dogfish in the biomedical industry on a state by state basis.
- Characterize the spiny dogfish processing sector

MANAGEMENT

To set the annual spiny dogfish quotas, an annual joint meeting between the ASMFC Technical Committee and MAFMC Monitoring Committee is held. The Technical and Monitoring committees make quota recommendations after considering discards, Canadian landings, and management uncertainty. To ensure effective management, quota recommendations are formed using fisheries data collected from the previous fishing season. These quota recommendations are then communicated to the Spiny Dogfish Management Board and MAFMC for approval. After revision to quotas based on the results of the 2023 management track assessment, the Board approved revised commercial quotas for 2024–2026 seasons. The current 2024/2025 quota (10.7 million pounds) was set by the committee. However, after revision made by the Science and Statistical Committee, MAFMC and NEFMC approved a new recommended quota for the 2025/2026 of 9,338,770-pound coastwide quota a 17.5% reduction in allotment.

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FISHERY MANAGEMENT PLAN UPDATE
ATLANTIC STRIPED BASS
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	October 1981	
Amendments:	Amendment 1	1984
	Amendment 2	1984
	Amendment 3	October 1985
	Amendment 4	October 1989
	Addendum I	1991
	Addendum II	1992
	Addendum III	1993
	Addendum IV	1994
	Amendment 5	March 1995
	Addendum I	January 1997
	Addendum II	October 1997
	Source Document	January 1998
	Addendum III	October 1998
	Addendum IV	October 1999
	Addendum V	January 2001
	Amendment 6	February 2003
	Addendum I	November 2007
	Addendum II	November 2010
	Addendum III	August 2012
	Addendum IV	October 2019 Revised April 2021
	Addendum VI	October 2019
	Amendment 7	May 2022
	Addendum I	May 2023
	Addendum II	May 2024
Comprehensive Review:	2024	

Increased fishing pressure in the 1970s, coupled with degradation and loss of habitat, led to stock collapse and promoted the development of a cooperative interstate fisheries management plan (FMP). While a notable first step, the first FMP (1981) and Amendments 1 and 2 to the plan (1984) only provided recommendations on how to manage the resource. States could take voluntary actions under these management plans but there was no statutory requirement that ensured unified management actions by all the involved states. The passage of the Atlantic Striped Bass Conservation Act in 1984 (Striped Bass Act) changed this by requiring the states, through the Commission, to develop and implement management plans that included mandatory conservation measures. Amendment 3 (1985) was the first plan under the Striped Bass Act with such measures, including regulations to protect the 1982-year class, the first modestly sized cohort for nearly a decade. Some states elected for an even more conservative approach and imposed a total moratorium to protect the 1982-year class. The Amendment contained a mechanism to relax fishery regulations based on a juvenile abundance index. The mechanism was triggered with the recruitment of the 1989-year class and led to the implementation of Amendment 4 (1989), which aimed to rebuild the resource rather than maximize yield. In 1995, with adoption of Amendment 5, the Commission declared Atlantic coastal striped bass stocks fully recovered.

Amendment 6 (2003) introduced a new set of biological reference points based on female spawning stock biomass (SSB), and a suite of management triggers based on the reference points. It also restored the commercial quota for the ocean fishery to 100% of average landings during the 1972–1979 historical period, and recreational fisheries were constrained by a 2-fish bag limit and a minimum size limit of 28 inches, except for the Chesapeake Bay fisheries, Albemarle-Roanoke (A-R) fisheries, and fisheries with approved conservation equivalency proposals. From 2007 to 2014, a series of four Addenda (I–IV) to Amendment 6 were implemented. These addenda addressed a range of issues, including implementation of a bycatch monitoring program, modifying the definition of recruitment failure, implementation of a mandatory commercial harvest tagging program, and establishing one set of F reference points for the coastal migratory population in all management areas. Addendum IV (2014) also formally deferred management of the A-R stock to the State of North Carolina, under the auspices of the Commission, since the A-R stock was deemed to contribute minimally to the coastal migratory population and stock assessments for the A-R stock are conducted separately from the Atlantic coastal stock.

In 2019, a new benchmark assessment which used updated recreational catch estimates, changed our understanding of stock status. The benchmark assessment found the stock to be overfished and experiencing overfishing. As a result, Addendum VI to Amendment 6 was initiated to end overfishing, and bring F to the target level in 2020. Specifically, the Addendum reduced all state commercial quotas by 18%, and implemented a 1-fish bag limit and a 28" to less than 35" recreational slot limit for ocean fisheries and a 1-fish bag limit and an 18" minimum size limit for Chesapeake Bay recreational fisheries. These measures were implemented in 2020 and designed to achieve at least an 18% reduction in total removals at the coastwide level.

In November 2022, the Board reviewed the results of the 2022 Atlantic Striped Bass Stock Assessment Update. The 2022 assessment indicated the resource is still overfished but no longer experiencing overfishing relative to the updated reference points. The updated fishing mortality reference points took into account the period of low recruitment the stock has experienced in recent years.

As it considered its actions under Addendum VI, the Management Board also discussed the development of a new Amendment to the FMP, one that reflected our understanding of the resource and the fisheries that depend on it. This led to the development and approval of Amendment 7 in 2022.

Currently, Atlantic striped bass is managed under Amendment 7 to the Interstate Fishery Management Plan, which consolidates Amendment 6 and its associated addenda into a single document. Amendment 7 establishes new requirements for the following components of the FMP: management triggers, conservation equivalency, additional measures to address recreational release mortality, and the stock rebuilding plan. This Amendment builds upon the Addendum VI to Amendment 6 action to address overfishing and initiate rebuilding in response to the overfished finding from the last stock assessment, requiring the Board to rebuild the stock by 2029. Amendment 7 strengthens the Commission's ability to reach the rebuilding goal by implementing a more conservative recruitment trigger, providing more formal guidance around uncertainty in the conservation equivalency process, and implementing measures intended to increase the chance of survival after a striped bass is released alive in the recreational fishery. All provisions of Amendment 7 are effective May 5, 2022, except for gear restrictions. States must implement new gear restrictions by January 1, 2023.

Amendment 7 also maintains the same recreational and commercial measures specified in Addendum VI to Amendment 6, which were implemented in 2020. As such, all approved Addendum VI conservation equivalency programs and state implementation plans are maintained until such measures are changed in the future.

In May 2023, the Board approved an emergency action to change the recreational size limit, effective immediately for 180 days from May 2, 2023, through October 28, 2023. This action responds to the unprecedented magnitude of 2022 recreational harvest, which was nearly double that of 2021, and new stock rebuilding projections, which estimate the probability of the spawning stock rebuilding to its biomass target by 2029 drops from 97% under the lower 2021 fishing mortality rate to less than 15% if the higher 2022 fishing mortality rate continues each year.

The Board implemented the emergency 31-inch total length (TL) maximum size limit for 2023 to reduce harvest of the strong 2015-year class. The 31-inch TL maximum size limit applies to all existing recreational fishery regulations where a higher (or no) maximum size applies, excluding the May Chesapeake Bay trophy fisheries which already prohibit harvest of fish less than 35 inches. All bag limits, seasons, and gear restrictions will remain the same. Jurisdictions are required to implement the required measure as soon as possible but no later than July 2, 2023. If it deems necessary, the Board may extend the emergency action for two additional periods of up to one year each at a future Board meeting. The Commission is conducting four virtual public hearings between May 17 and May 31, 2023, to inform the public about the emergency action and identify next steps for management.

Addendum I to Amendment 7 was approved in May 2023 to allow for voluntary ocean commercial quota transfers contingent on stock status. When the stock is overfished, no quota transfers will be allowed. When the stock is not overfished, the Board can decide every one-to-two years whether it will allow voluntary transfers of ocean commercial quota. The Board can also set criteria for allowable transfers, including a limit on how much and when quota can be transferred in a given year, and the eligibility of state to request a transfer based on its landings.

Addendum II to Amendment 7 was approved in January 2024 to reduce fishing mortality in 2024 and support stock rebuilding. For the ocean recreational fishery, the Addendum implements a 28”–31” slot limit, 1-fish bag limit, and maintains 2022 season dates for all fishery participants; this maintains the same ocean recreational measures adopted under the 2023 emergency action. For the Chesapeake Bay recreational fishery, the Addendum implements a 19”–24” slot limit, 1-fish bag limit, and maintains 2022 season dates for all fishery participants. For the commercial fishery, the Addendum reduces commercial quotas by 7% in both the ocean and Chesapeake Bay. To address concerns about recreational filleting allowances and compliance with recreational size limits, the Addendum establishes two requirements for states that authorize filleting of striped bass: racks must be retained and possession limited to no more than two fillets per legal fish. Finally, to enable an expedited response process to upcoming stock assessments, the Addendum establishes a mechanism allowing the Board to respond to a stock assessment via Board action if the stock is not projected to rebuild by 2029. All Addendum II measures are required to be implemented by the states no later than May 1, 2024.

To ensure compliance with interstate requirements, North Carolina also includes striped bass in the North Carolina FMP for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt FMPs, 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 (NCDMF 2015).

Management Unit

The management unit includes all coastal migratory striped bass stocks on the East Coast of the United States, excluding the Exclusive Economic Zone (3–200 nautical miles offshore), which is managed separately by NMFS. The coastal migratory striped bass stocks occur in the coastal and estuarine areas of all states and jurisdictions from Maine through North Carolina.

Striped bass in the Chesapeake Bay are part of the coastal migratory stock and are assessed as part of the coastal migratory striped bass management unit. However, Amendment 7 implements a separate management program for the Chesapeake Bay due to the size availability of striped bass in this area.

The Albemarle Sound-Roanoke River (Albemarle-Roanoke) stock is currently assessed and managed separately by the State of North Carolina under the auspices of the ASMFC. The Albemarle-Roanoke stock is not included in the coastwide assessment and management program because it contributes minimally to the coastal migratory stock.

In North Carolina the striped bass stocks in the Tar-Pamlico, Neuse, and Cape Fear rivers are considered estuarine and non-migratory, and are not managed through the ASMFC FMP, rather they are managed under the N.C. Estuarine Striped Bass FMP.

Goal and Objectives

The Goal of Amendment 7 is to perpetuate, through cooperative interstate fishery management, migratory stocks of striped bass (*Morone saxatilis*); to allow commercial and recreational fisheries consistent with the long-term maintenance of a broad age structure, a self-sustaining spawning stock; and to provide for the restoration and maintenance of their essential habitat.

In support of this goal, the following objectives are specified:

- Manage striped bass fisheries under a control rule designed to maintain stock size at or above the target female spawning stock biomass level and a level of fishing mortality at or below the target exploitation rate.
- Manage fishing mortality to maintain an age structure that provides adequate spawning potential to sustain long-term abundance of striped bass populations.
- Provide a management plan that strives, to the extent practical, to maintain coastwide consistency of implemented measures, while allowing the States defined flexibility to implement alternative strategies that accomplish the objectives of the FMP.
- Foster quality and economically viable recreational, for-hire, and commercial fisheries.
- Maximize cost effectiveness of current information gathering and prioritize state obligations in order to minimize costs of monitoring and management.
- Adopt a long-term management regime that minimizes or eliminates the need to make annual changes or modifications to management measures.
- Establish a fishing mortality target that will result in a net increase in the abundance (pounds) of age 15 and older striped bass in the population, relative to the 2000 estimate.

DESCRIPTION OF THE STOCK

Biological Profile

Striped bass are the largest member of the Moronidae family, the temperate basses, which also includes white perch, white bass and yellow bass. Striped bass are a riverine and estuarine dependent species native from the St. Lawrence River in Canada down to the St. Johns River in Florida, and through the Gulf of Mexico, although some taxonomists suggest the striped bass found in the Gulf of Mexico warrant description as a subspecies (GSMFC 2006). Migratory striped bass stocks from Maine through the A-R stock in North Carolina are managed under the jurisdiction of the ASMFC. Striped bass stocks south of the Albemarle Sound are considered estuarine and non-migratory and are not under ASMFC jurisdiction.

Atlantic striped bass under ASMFC jurisdiction are anadromous, meaning they spend most of their adult life in ocean waters, but return to their natal rivers to spawn in the spring. The rivers that feed the Chesapeake Bay, and the Delaware and Hudson rivers are the major spawning grounds for the coastal migratory population. Female striped bass typically grow larger and heavier than males. There are two distinct life history strategies for striped bass from the Chesapeake Bay, Delaware, Hudson, and A-R stocks.

One group consists of mostly females and participate in extensive coastal migrations. Fish travel north as far as Maine and Canada in the spring after spawning takes place, then as water temperatures drop, they move south in the winter where they overwinter off the VA/NC coast before going to their natal rivers to spawn again in the spring. The other group is mostly resident fish and the majority are males, inhabiting the estuaries and near-shore ocean within their natal systems.

Based on sampling efforts from the Chesapeake Bay, 45% of female striped bass mature at age 6 and 100% mature by age 9. The latest maturity study for the A-R stock determined 29% of female striped bass are mature at age 3, 97% are mature at age 4, and 100% are mature at age 5 (Boyd 2011). The oldest striped bass on record is 31 years old, but they would likely live longer than that in the absence of fishing pressure. The oldest fish observed in the Albemarle-Roanoke stock is also 31 years old.

Stock Status

The stock is currently overfished but no longer experiencing overfishing.

Stock Assessment

In November 2022, the Board reviewed the results of the 2022 Atlantic Striped Bass Stock Assessment Update, which uses the same model from the approved, peer-reviewed 2018 Benchmark Stock Assessment. The 2022 assessment indicated the resource is still overfished but no longer experiencing overfishing relative to the updated reference points. Female SSB in the terminal year (2021) was estimated at 143 million pounds, which is below the SSB threshold of 188 million pounds and below the SSB target of 235 million pounds. Fishing mortality (F) in 2021 was estimated at 0.14, which is below the F threshold of 0.20 and below the F target of 0.17. The updated fishing mortality reference points took into account the period of low recruitment the stock has experienced in recent years.

The assessment also indicated a period of strong recruitment (numbers of age-1 fish entering the population) from 1994–2004, followed by a period of lower recruitment from 2005–2011 (although not as low as the early 1980s, which likely contributed to the decline in SSB in recent years. Recruitment of age-1 fish was high in 2012, 2015, 2016, and 2019 (corresponding to strong 2011-, 2014-, 2015-, and 2018-year classes), but estimates of age-1 striped bass were below the long-term average in 2018, 2020, and 2021. Recruitment in 2021 was estimated at 116 million age-1 fish, below the time series average of 135.7 million fish (Figure 1). Fishing mortality (F) was above the target 1995–2019 but had fallen back below the target for 2020 and 2021 (Figure 2).

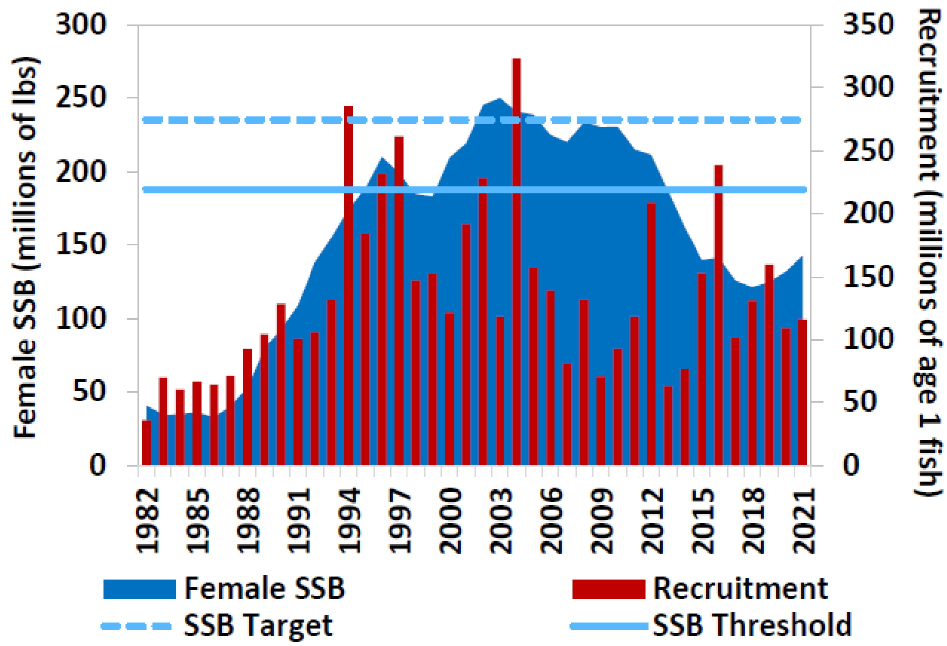

Figure 1. Atlantic striped bass female spawning stock biomass and recruitment (abundance of age-1). Source: ASMFC Atlantic Striped Bass Stock Assessment 2022.

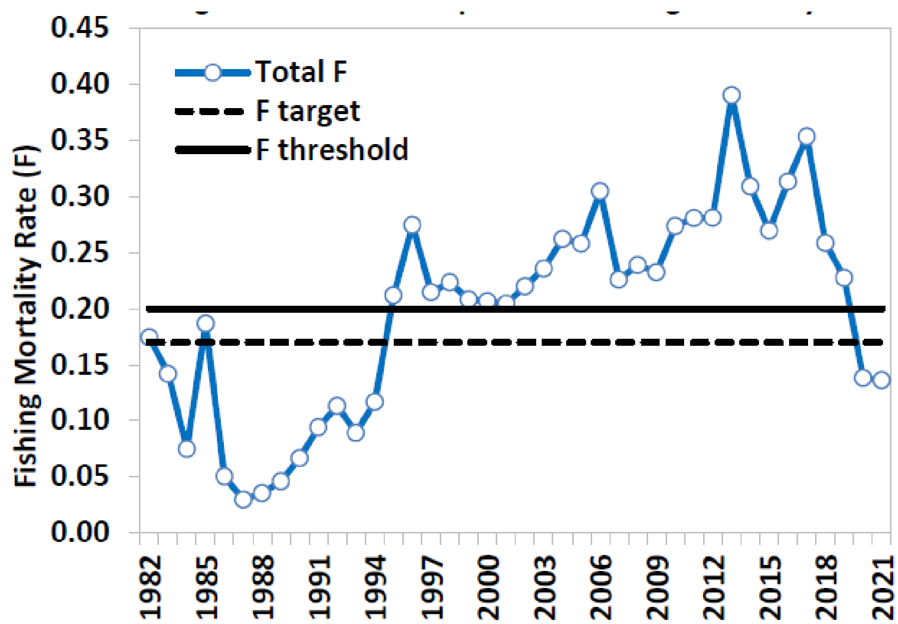

Figure 2. Atlantic striped bass estimates of fishing mortality and the fishing mortality target and threshold reference points. Source: ASMFC Atlantic Striped Bass Stock Assessment 2022.

DESCRIPTION OF THE FISHERY

Current Regulations

Striped bass regulations in the North Carolina coastal waters (0–3 miles) of the Atlantic Ocean are under the jurisdiction of ASMFC, while striped bass regulations in North Carolina's inshore coastal (i.e., estuarine), joint, and inland waters are under the jurisdiction of the North Carolina Division of Marine Fisheries and Wildlife Resources Commission. Striped bass regulations in the EEZ are under the jurisdiction of the NOAA Fisheries. Commercial and recreational harvest of striped bass is not allowed in the EEZ, which is 3–200 miles offshore. Striped bass cannot even be targeted for recreational catch-and-release fishing in the EEZ.

In North Carolina, commercial harvest is currently constrained by a 274,810-pound annual quota and a 28-inch TL minimum length size limit. The quota is split evenly between three gears: ocean beach seine, ocean gill net, and ocean trawl. Usually only one gear is open at a time and any quota overages in a gear are taken away from the offending gear during the next year. Atlantic striped bass overwinter in North Carolina ocean waters during the winter months, from December through February, therefore the quota year is set from December 1 through November 30 each year.

Recreational harvest is constrained by a one fish per person daily possession limit. It is also illegal to harvest striped bass less than 28 inches TL or greater than 31 inches TL. It is also unlawful to fish for or possess striped bass from the Atlantic Ocean for recreational purposes using hook and line gear with natural bait unless using a non-stainless steel, non-offset (inline) circle hook, regardless of tackle or lure configuration. Natural bait is defined as any living or dead organism (animal or plant) or parts thereof. Non-offset circle hook is defined as a hook with the point pointed perpendicularly back towards the shank and the point and barb are in the same plane as the shank. Striped bass may be taken seven days a week and the season is open year-round.

The Atlantic Ocean waters from about Oregon Inlet to the N.C./V.A. state line are the southernmost extension of the overwintering grounds for Atlantic striped bass. Therefore, annual landings are dependent on how far south and inshore striped bass stocks migrate each winter. Since 2011 striped bass have been farther north and offshore than in prior years. In recent years large schools of striped bass have been up to 30 miles offshore. Since 2012 there has been no commercial or recreational harvest of overwintering migratory striped bass in North Carolina's coastal ocean waters during the winter months.

Commercial Fishery

Commercial landings of striped bass in the Atlantic Ocean have been controlled by a quota since 1991. Due to the relatively small individual gear quota and the ability to harvest tens of thousands of pounds in just a single day, specific gear overages were common, but the overall quota was rarely exceeded. Landings reached the quota in most years and averaged 361,555 pound a year from 1995/1996–2006/2007. Starting in 2008/2009 shifting migratory patterns and decreasing stock abundance led to less availability of fish inside three miles. Since 2012/2013 no striped bass have been landed from the Atlantic Ocean because striped bass have stayed outside of three miles and in Virginia waters while overwintering (Tables 1 and 2; Figure 3).

Table 1. Recreational harvest and releases and commercial harvest of striped bass from the Atlantic Ocean, North Carolina, 1982–2024. Recreational data presented from MRIP are for waves 1 (Jan–Feb) and 6 (Nov–Dec).

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Number Landed	Weight Landed (lb)
1982	0	0	0	3,200	92,873
1983	0	0	0	1,405	52,796
1984	0	0	0	532	14,501
1985	0	0	0	-	183*
1986	0	0	0	-	11*
1987	0	0	0	0	0
1988	510*	0	0	-	39*
1989	0	0	0	-	92*
1990	0	0	0	803	8,670
1991	1,032	0	10,240	413	6,186
1992	2,680	928	0	1,745	27,702
1993	531	2,115	6,084	3,414	75,671
1994	6,543	6,340	89,819	7,956	139,672
1995	16,479	28,169	232,043	23,387	344,627
1996	31,709	98,285	391,588	3,289	58,217
1997	60,074	102,395	865,306	25,820	463,144
1998	41,236	130,531	636,090	14,213	272,969
1999	26,388	50,032	339,092	21,119	391,482
2000	18,108	41,812	276,814	6,465	162,369
2001	60,700	23,264	1,081,940	24,955	381,115
2002	56,330	47,328	997,649	23,242	441,018
2003	50,418	19,006	965,671	5,769	201,199
2004	323,239	246,671	6,655,565	31,041	605,356
2005	194,854	179,323	3,947,042	27,288	604,464
2006	134,184	37,204	2,975,348	2,718	74,189
2007	81,777	22,486	1,965,111	16,798	379,467
2008	36,877	26,405	749,673	13,369	288,410
2009	6,548	1,001	186,729	9,030	189,963
2010	67,144	51,400	1,197,988	13,664	276,435
2011	207,610	245,287	4,467,159	10,867	246,366
2012	0	0	0	333	6,226
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	39,248	0	0	0
2017	0	5,149	0	0	0
2018	0	3,490	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	20,836	0	0	0
2022	0	34,518	0	0	0
2023	0	0	0	0	0
2024	0	0	0	0	0
Mean	33,139	34,028	652,022	6,810	135,010

* The Atlantic Ocean striped bass fishery was closed during these years although landings are in the associated databases.

Table 2. Striped bass commercial harvest (pounds) by gear (North Carolina Trip Ticket Program) from the Atlantic Ocean, North Carolina, based on a fishing year beginning December 1 and ending November 30. The fishing year management strategy began with the implementation of a coastwide (states from Maine to North Carolina) commercial quota in 1991.

	Gear					
Fishing Year	Beach Seine	Gill Net	Trawl	Other	Total Landings	Quota
1991/1992	25,438	193	4,033	0	29,664	96,000
1992/1993	0	16,095	22,006	0	38,101	96,000
1993/1994	916	6,740	78,434	0	86,090	96,000
1994/1995	64,077	54,576	4,531	4	123,188	96,000
1995/1996	163,519	130,280	36,250	429	330,478	334,000
1996/1997	76,558	95,337	184,192	100	356,187	334,000
1997/1998	155,633	104,551	92,316	0	352,500	*312,827
1998/1999	68,920	330,784	0	23	399,727	*299,954
1999/2000	61,149	2,055	100,910	0	164,114	*218,000
2000/2001	62,969	117,457	168,456	0	348,882	336,000
2001/2002	100,718	113,515	84,795	452	299,480	*326,787
2002/2003	232,669	93,346	108,141	213	434,369	480,480
2003/2004	0	201,025	220,166	453	421,643	480,480
2004/2005	181,552	233,772	37,598	1,599	454,521	480,480
2005/2006	330,429	981	17,797	2,829	352,036	480,480
2006/2007	0	326,101	98,373	22	424,496	480,480
2007/2008	86,150	138,894	74,118	0	299,162	480,480
2008/2009	4,888	51,677	133,430	0	189,995	480,480
2009/2010	4,097	71,664	196,657	0	272,418	480,480
2010/2011	6,646	139,377	104,360	0	250,383	480,480
2011/2012	0	4,045	2,181	0	6,226	480,480
2012/2013	0	0	0	0	0	480,480
2013/2014	0	0	0	0	0	480,480
2014/2015	0	0	0	0	0	360,360
2015/2016	0	0	0	0	0	360,360
2016/2017	0	0	0	0	0	360,360
2017/2018	0	0	0	0	0	360,360
2018/2019	0	0	0	0	0	360,360
2019/2020	0	0	0	0	0	295,495
2020/2021	0	0	0	0	0	295,495
2021/2022	0	0	0	0	0	295,495
2022/2023	0	0	0	0	0	295,495
2023/2024	0	0	0	0	0	274,810

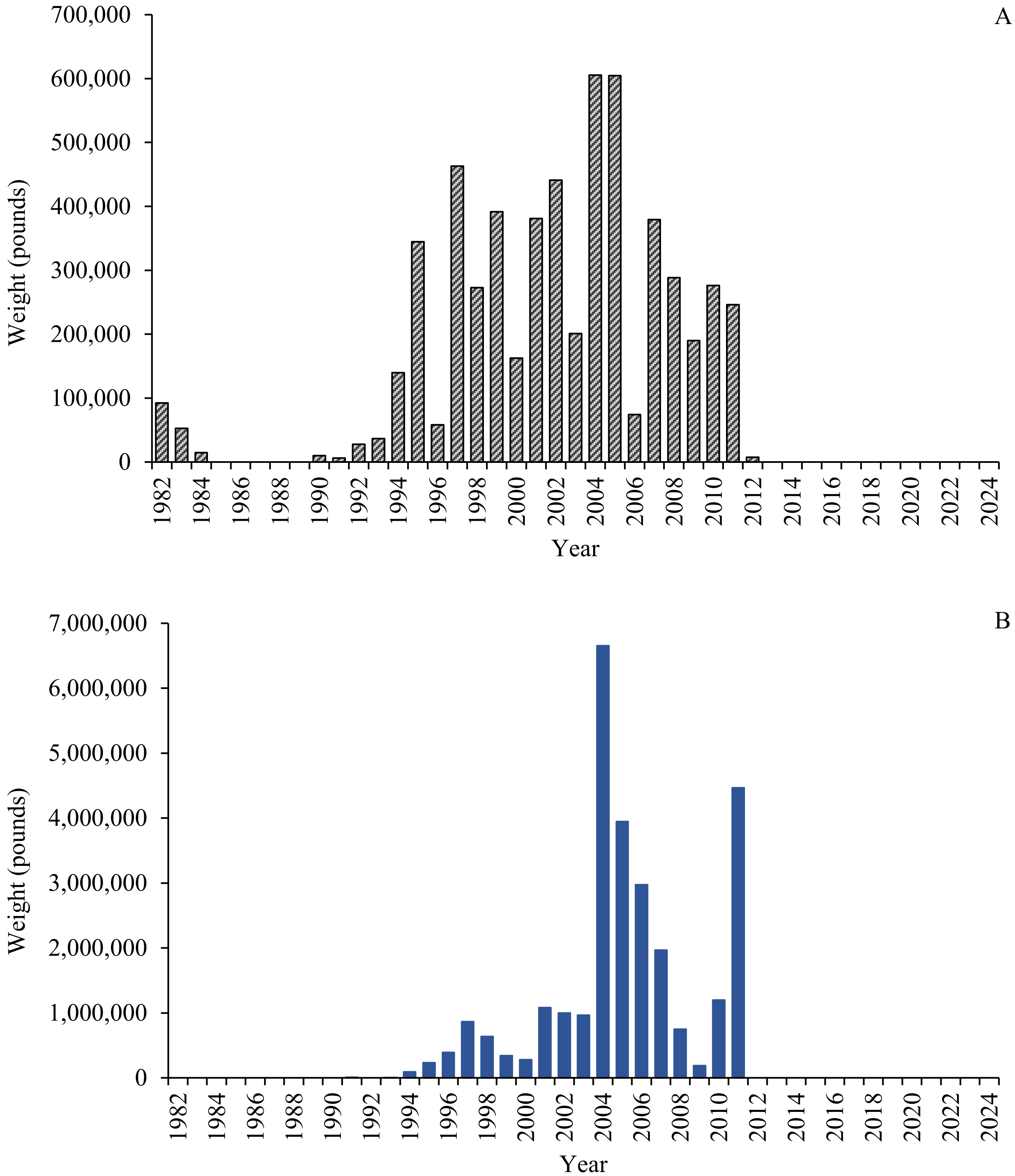

Figure 3. Atlantic striped bass commercial landing (pounds) (A) reported through the North Carolina Trip Ticket Program and (B) recreational landings (Type A + B1; pounds) estimated from the Marine Recreational Information Program survey for North Carolina, 1982–2024.

Recreational Fishery

Recreational landings were low through the early 2000s. As the Atlantic striped bass stock recovered and abundance increased, recreational landings increased as well, with peak landings of 6.6 million pounds in 2004 (Table 1; Figure 3). When striped bass are inside state coastal waters they form large schools that are easily accessed by anglers, and harvest can be significant and releases even larger. From 2001 to 2011 landings averaged about 2.3 million pounds. Due to the stocks being outside of three miles and not migrating down into North Carolina state waters in recent years, no recreational landings have occurred since 2011 (Table 1; Figure 3.).

The DMF offers award citations for exceptional catches of striped bass. Most citations are from fish caught in the Atlantic Ocean. Striped bass that measure greater than 45 inches total length or 35 pounds are eligible for an award citation. Citations peaked in 2004 at over 700 but have declined to near zero since 2011 due to shifting overwintering patterns (Figure 4). Striped bass were removed from the citation program May 1, 2022.

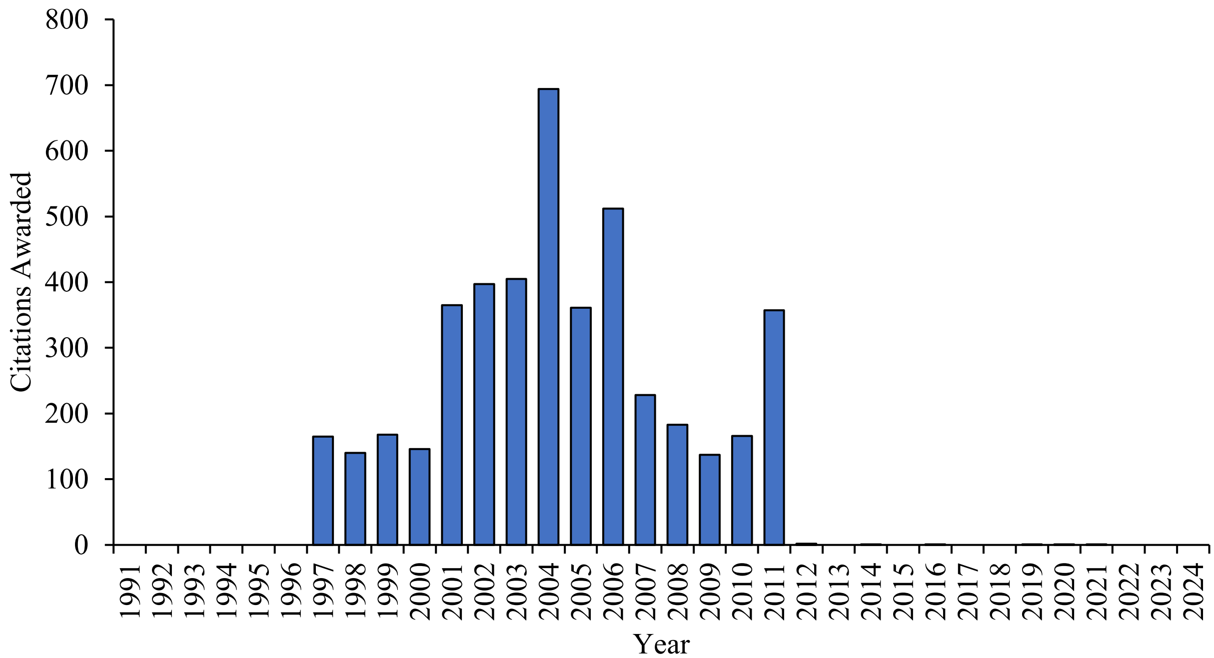

Figure 4. North Carolina Saltwater Fishing Tournament citations awarded for striped bass from the Atlantic Ocean, 1991–2024. Citations are awarded for striped bass greater than 35 pounds or 45 inches total length. Striped bass were removed from the citation program May 1, 2022.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

The length, weight, sex, and age composition of the commercial harvest has been consistently monitored through sampling at fish houses conducted by the division since 1982. The annual harvest quota is split equally between three gear types, beach seine, gill net, and trawl. Any overages from one year are deducted from next year's quota (Table 2). Because of the 28-inch total length minimum size limit and gear regulations, most fish harvested average about 38-inches total length (Table 3; Figure 5).

Table 3. Summary of striped bass total length (inches) samples collected from commercial fisheries from the Atlantic Ocean, North Carolina, 1981/1982–2023/2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1981/1982	43	38	48	53
1982/1983	43	35	50	221
1983/1984	44	29	52	7
1990/1991	31	27	38	203
1991/1992	33	28	51	241
1992/1993	31	24	46	135
1993/1994	33	26	51	351
1994/1995	35	30	39	51
1995/1996	35	22	43	211
1996/1997	35	28	45	358
1997/1998	33	28	40	183
1998/1999	36	29	42	191
1999/2000	37	30	44	290
2000/2001	35	28	43	256
2001/2002	38	29	47	249
2002/2003	36	23	43	573
2003/2004	37	29	47	400
2004/2005	38	29	46	717
2006/2007	38	28	48	843
2007/2008	39	29	49	317
2008/2009	39	30	49	175
2009/2010	37	28	50	456
2010/2011	36	28	48	388
2011/2012	38	34	47	21
2012/2013	-	-	-	0
2013/2014	-	-	-	0
2014/2015	-	-	-	0
2015/2016	-	-	-	0
2016/2017	-	-	-	0
2017/2018	-	-	-	0
2018/2019	-	-	-	0
2019/2020	-	-	-	0
2020/2021	-	-	-	0
2021/2022	-	-	-	0
2022/2023	-	-	-	0
2023/2024	-	-	-	0

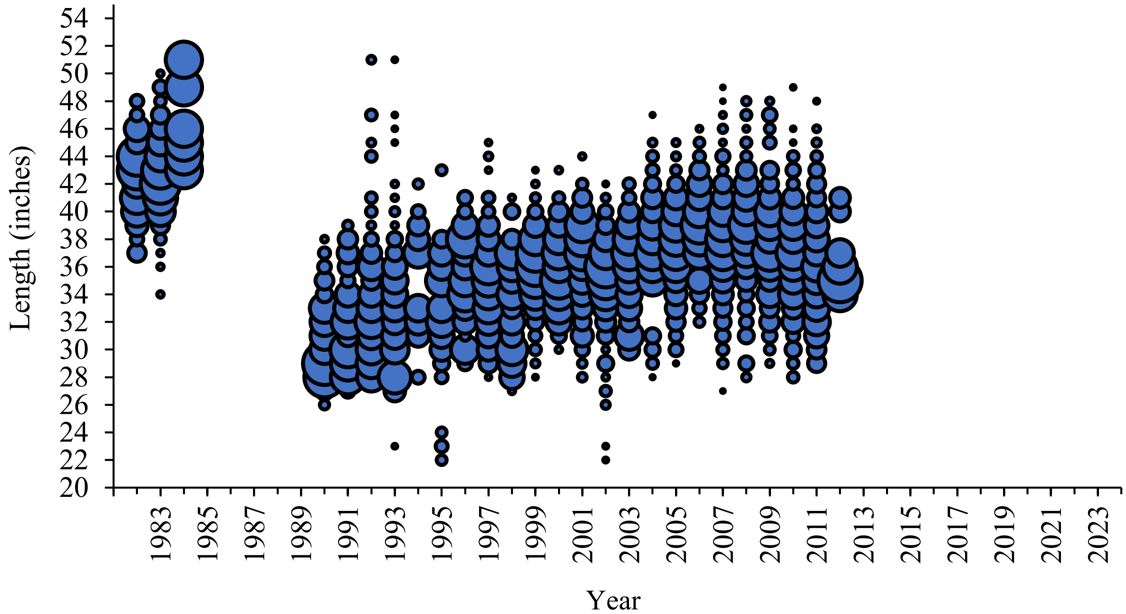

Figure 5. Commercial length frequency (total length, inches) of striped bass harvested from the Atlantic Ocean, 1982–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

North Carolina also augments NOAA Fisheries Marine Recreational Information Program (MRIP) by providing additional funding for increased samplers, which estimates the annual harvest and releases of marine recreational fisheries. Mean total length is usually around 36-inches, with fish as large as 51-inches measured. Total number of fish measured for 2006–2011 ranged from 67 to 609. There has been no estimated harvest (and therefore no fish measured) since 2012 (Table 4; Figure 6).

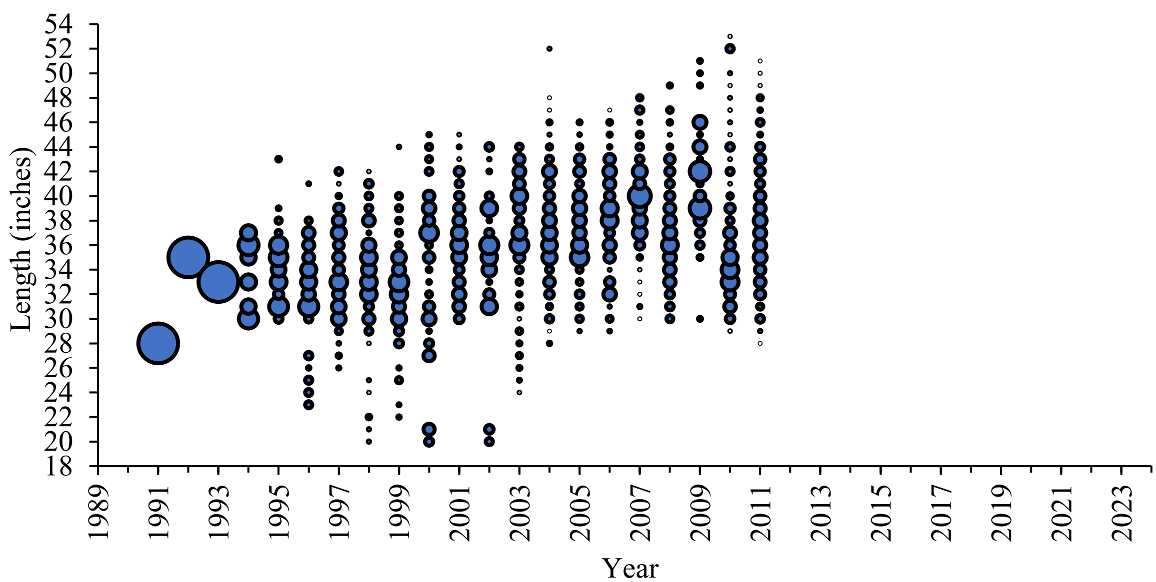

Figure 6. Recreational length frequency (total length, inches) of striped bass harvested from the Atlantic Ocean, 1989–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Table 4. Striped bass total length (inches) data from Marine Recreational Information Program recreational fishery samples, Atlantic Ocean, North Carolina, 1991–2024.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1991	27	27	27	1
1992	33	33	33	1
1993	32	32	32	1
1994	29	20	35	19
1995	32	28	42	69
1996	31	12	39	135
1997	31	19	40	229
1998	32	18	43	272
1999	30	19	42	182
2000	31	19	43	113
2001	33	19	43	267
2002	33	19	43	318
2003	36	23	45	614
2004	36	21	50	1,800
2005	36	28	46	1,106
2006	36	28	45	372
2007	38	28	46	375
2008	36	28	47	303
2009	40	29	49	67
2010	34	28	51	95
2011	36	27	49	609
2012	-	-	-	0
2013	-	-	-	0
2014	-	-	-	0
2015	-	-	-	0
2016	-	-	-	0
2017	-	-	-	0
2018	-	-	-	0
2019	-	-	-	0
2020	-	-	-	0
2021	-	-	-	0
2022	-	-	-	0
2023	-	-	-	0
2024	-	-	-	0

Fishery-Independent Monitoring

North Carolina has no fishery independent sampling indices of abundance for Atlantic striped bass. However, we do participate in the coastwide striped bass tagging program administered through the United States Fish and Wildlife Service (USFWS). Tagging takes place in January and/or February on their overwintering grounds, usually in the vicinity of the VA/NC border. Although in recent years some trips have had to move to Ocean City MD because the striped bass did not move that far south. Dates and actual location of tagging are dependent on striped bass annual migration patterns. Tags used are USFWS tags and all tagging information is housed in the USFWS tagging database. The striped bass Winter Cooperative Tagging Program is a critical component of overall coastwide striped bass management, as it is the only tagging program that tags the mixed, migratory stock on their overwintering grounds. This means that fish from all producer areas, including Chesapeake Bay, Delaware River, Hudson River, and A-R stocks are available for tagging. Tag returns provide managers with an estimate of the percent contribution of the individual producer areas to the migratory portion of the stock and fishing mortality on the stock. Length frequencies are variable depending on the gear used, and the number fish are collected each year is also very variable. (Table 5). Nearly all of these fish are large, mature females that are staging on their overwintering grounds in preparation for the spring spawning run to their respective spawning grounds.

Table 5. Striped bass total length (inches) and tagging data from the Cooperative Winter Tagging Program, trawl and hook-and-line gear, 1988–2024.

	Number Tagged		Mean Length		Minimum Length		Maximum Length	
Year	H&L	Trawl	H&L	Trawl	H&L	Trawl	H&L	Trawl
1988	0	1,338	-	25	-	17	-	53
1989	0	1,156	-	27	-	20	-	46
1990	0	2,010	-	25	-	14	-	48
1991	0	1,780	-	28	-	20	-	40
1992	0	1,016	-	28	-	17	-	39
1993	0	530	-	26	-	17	-	39
1994	0	4,631	-	23	-	14	-	49
1995	0	644	-	29	-	15	-	42
1996	0	698	-	30	-	11	-	44
1997	0	1,356	-	29	-	16	-	45
1998	0	462	-	25	-	18	-	49
1999	0	277	-	30	-	3	-	43
2000	0	6,236	-	20	-	13	-	42
2001	0	2,447	-	25	-	15	-	44
2002	0	4,087	-	23	-	15	-	47
2003	0	1,908	-	31	-	11	-	48
2004	0	2,708	-	25	-	14	-	47
2005	0	4,263	-	23	-	12	-	44
2006	0	4,462	-	28	-	12	-	48
2007	0	370	-	32	-	19	-	48
2008	0	1,033	-	34	-	21	-	47
2009	0	146	-	32	-	22	-	45
2010	0	567	-	30	-	12	-	43
2011	108	-	32	-	26	-	43	-
2012	6	-	36	-	25	-	46	-
2013	1,114	893	37	33	26	24	49	47
2014	921	-	37	-	27	-	53	-
2015	1,042	333	38	35	29	22	52	42
2016	1,241	110	39	38	23	24	48	43
2017	881	-	40	-	21	-	50	-
2018	667	-	41	-	29	-	52	-
2019	44	-	40	-	31	-	45	-
2020	202	-	41	-	37	-	56	-
2021	1,020	-	38	-	26	-	48	-
2022	726	-	43	-	30	-	52	-
2023	400	-	33	-	26	-	43	-
2024	389	-	38	-	29	-	49	-

In order to describe the age structure of harvest and indices, striped bass age structures are collected from various fishery independent (scientific surveys) and dependent (fisheries) sources throughout the year. The length at age data for striped bass display an increasing length at age for striped bass up to about 40 inches in length, although the length at age overlaps between similar ages (Table 6; Figure 7).

Table 6. Summary of striped bass age samples collected from the Atlantic Ocean from both dependent (commercial and recreational fisheries) and independent (surveys) sources 1990–2024.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
1990	7	5	11	133
1991	9	6	13	90
1992	8	4	19	320
1993	8	3	17	638
1994	8	3	23	367
1995	7	3	13	475
1996	8	2	14	467
1997	9	3	15	787
1998	5	4	16	623
1999	9	5	12	449
2000	9	3	13	807
2001	8	2	14	536
2002	10	3	16	782
2003	8	4	18	401
2004	9	3	17	589
2005	10	2	17	614
2006	11	2	17	552
2007	9	4	16	627
2008	10	4	17	411
2009	11	7	17	179
2010	9	6	18	292
2011	8	6	17	226
2012	9	8	15	21
2013	-	-	-	0
2014	-	-	-	0
2015	-	-	-	0
2016	-	-	-	0
2017	-	-	-	0
2018	-	-	-	0
2019	-	-	-	0
2020	-	-	-	0
2021	-	-	-	0
2022	-	-	-	0
2023	-	-	-	0
2024	-	-	-	0

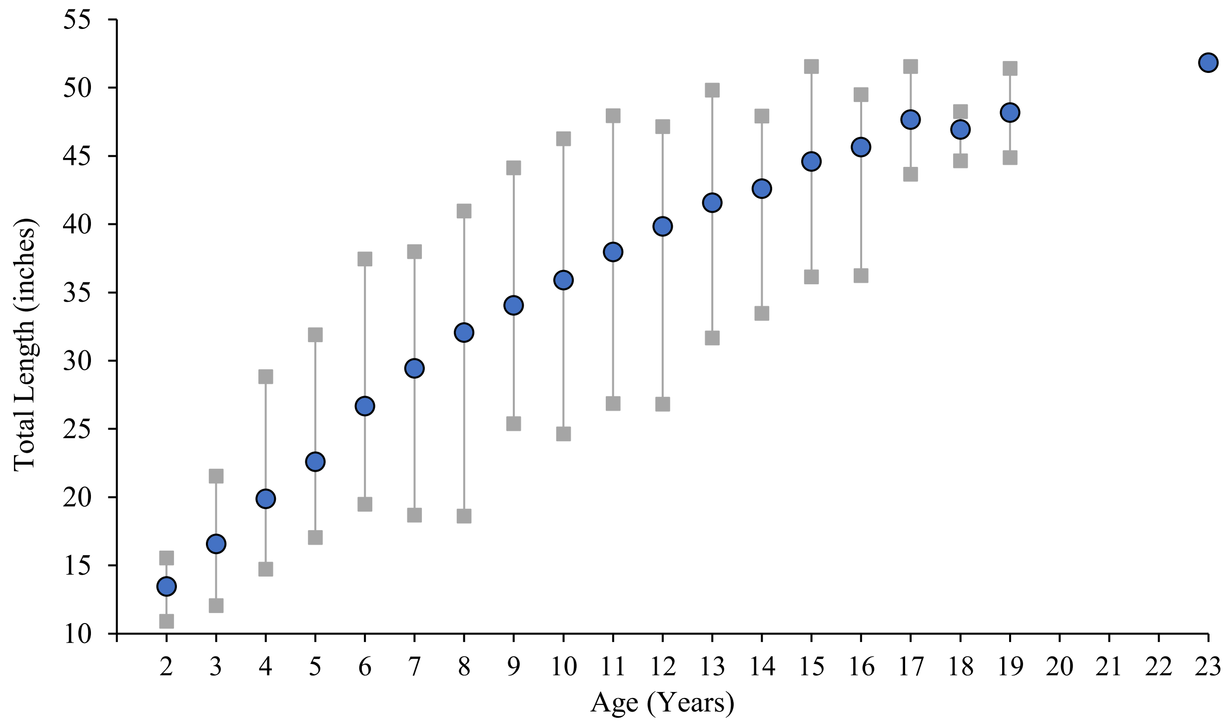

Figure 7. Striped bass length at age samples collected from both dependent (commercial and recreational fisheries) and independent (surveys) sources from the Atlantic Ocean, 1982–2024. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.

RESEARCH NEEDS

The following research recommendations were developed by the 2018 Benchmark Stock Assessment Subcommittee and the 66th SARC (NEFSC 2019).

- Continue collection of paired scale and otolith samples, particularly from larger striped bass, to facilitate development of otolith-based age-length keys and scale-otolith conversion matrices.
- Develop studies to provide information on gear specific (including recreational fishery) discard morality rates and to determine the magnitude of bycatch mortality.
- Conduct study to directly estimate commercial discards in the Chesapeake Bay.
- Collect sex ratio information on the catch and improve methods for determining population sex ratio for use in estimates of female SSB and biological reference points.
- Develop an index of relative abundance from the Hudson River Spawning Stock Biomass survey to better characterize the Delaware Bay/Hudson River stock.
- Improve the design of existing spawning stock surveys for Chesapeake Bay and Delaware Bay.
- Develop better estimates of tag reporting rates; for example, through a coastwide tagging study.
- Investigate changes in tag quality and potential impacts on reporting rate.
- Explore methods for combining tag results from programs releasing fish from different areas on different dates.
- Develop field or modeling studies to aid in estimation of natural mortality and other factors affecting the tag return rate.
- Compare M and F estimates from acoustic tagging programs to conventional tagging programs.

- Continue in-depth analysis of migrations, stock compositions, sex ratio, etc. using mark-recapture data.
- Continue evaluation of striped bass dietary needs and relation to health condition.
- Continue analysis to determine linkages between the Mycobacteriosis outbreak in Chesapeake Bay and sex ratio of Chesapeake spawning stock, Chesapeake juvenile production, and recruitment success into coastal fisheries.
- See Section 4.4 of Amendment 7 asmfc.org/species/atlantic-striped-bass for habitat conservation and restoration recommendations, which include reviewing striped bass habitat use and data (e.g., water quality criteria) to inform habitat conservation and restoration.

MANAGEMENT

Amendment 7 establishes new requirements for the following components of the FMP: management triggers, conservation equivalency, measures to address recreational release mortality, and the stock rebuilding plan. Amendment 7 strengthens the Commission's ability to reach the rebuilding goal by implementing a more conservative recruitment trigger, providing more formal guidance around uncertainty in the management process, and implementing measures designed to reduce recreational release mortality. This Amendment builds upon the Addendum VI action to address overfishing and initiate rebuilding in response to the assessment findings.

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FISHERY MANAGEMENT PLAN UPDATE
WAHOO
AUGUST 2025

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

FMP Documentation:	June 2004	
	Amendment 1	July 2010
	Amendment 2	April 2012
	Amendment 3	August 2014
	Amendment 5	July 2014
	Amendment 6	January 2014
	Amendment 7	January 2016
	Amendment 12	June 2021
	Amendment 10	May 2022
	Amendment 11	February 2024
Comprehensive Review:	None	

The South Atlantic Fishery Management Council (SAFMC), in cooperation with the Mid-Atlantic (MAFMC) and New England (NEFMC) councils, developed a Dolphin/Wahoo Fishery Management Plan (FMP) for the Atlantic in 2004. The SAFMC adopted a precautionary and risk-averse approach to management for the wahoo fishery to maintain the status quo. The original FMP established no minimum size limit for wahoo in the Atlantic Exclusive Economic Zone (EEZ); established a commercial trip limit of 500 pounds; identified allowable gears in the fishery; and prohibited the use of longline gear to harvest wahoo in areas closed to the use of such gear for highly migratory species. Amendment 1 (2010) provided spatial information of SAFMC designated Essential Fish Habitat and Habitat Areas of Particular Concern relative to the dolphin wahoo fishery. Amendment 2 (SAFMC 2011) established acceptable Biological Catch (ABC), Annual Catch Limits (ACL), Accountability Measures (AM), modified the allocations for both commercial and recreational sectors, and established Annual Catch Targets (ACT) for the recreational sector. Amendment 3 (SAFMC 2014, 79 F.R. 19490) required federal dealer permits and changed the method and frequency of harvest reporting. In 2013, Amendment 5 (SAFMC 2013) was approved and adopted by the SAFMC and was the most comprehensive amendment to the Dolphin/Wahoo FMP, in terms of process updates. Amendment 5 updated the ACLs and AM for both sectors, as well as the ABC values and ACT for the recreational fishery as a result of improvements to the recreational catch estimation methods used by the Marine Recreational Information Program (MRIP). This amendment also set up an abbreviated framework procedure whereby modifications to the ACLs, ACTs, and AMs can be implemented by the National Oceanic and Atmospheric Administration (NOAA) Fisheries without a full FMP amendment. Amendment 7 (SAFMC 2015a) allowed for dolphin and wahoo fillets to enter the U.S. EEZ after lawful harvest in the Bahamas.

Amendment 12 was approved by the SAFMC at its September 2020 meeting and became effective June 6, 2021 (SAFMC 2020). Amendment 12 adds Bullet Mackerel and Frigate Mackerel to the Dolphin/Wahoo FMP and designates them as ecosystem component species. Amendment 10 was approved by the SAFMC at its September 2021 meeting and became effective May 2, 2022 (SAFMC 2020). Amendment 10 includes actions that accommodate updated recreational data from the MRIP by revising the annual catch limits and sector allocations for dolphin and wahoo. The amendment also contains actions that implement other management changes in the fishery including revising accountability measures, accommodating possession of dolphin and wahoo on vessels with certain unauthorized gears onboard, removing the operator card requirement, and reducing the bag limit/recreational vessel limit for dolphin and wahoo. Amendment 11 was approved by the SAFMC at its December 2023 meeting and became effective February 2024 (SAFMC

2023). Amendment 11 is included in the Comprehensive Acceptable Biological Catch Control Rule Amendment which modifies the Acceptable Biological Catch (ABC) Control Rule to address scientific uncertainty, management risk, and rebuilding stocks. Amendment 11 specifies criteria and procedures for phase-in of ABC changes and carry-over of unused portions of annual catch limits.

There are multiple amendments currently under development by the SAFMC. Amendment 4 is included in the Joint Commercial Electronic Logbook Reporting Amendment and modifies reporting requirements for commercial logbooks in dolphin and wahoo fisheries. Amendments 13 and 14 are included in the Comprehensive Recreational For-Hire Limited Entry Amendment, which establishes limited entry for the for-hire components and improves for-hire reporting requirements in dolphin and wahoo fisheries.

To ensure compliance with interstate requirements, North Carolina also manages wahoo under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt fishery management plans, consistent with N.C. law, approved by the MAFMC, SAFMC, or the Atlantic States Marine Fisheries Commission (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 (NCDMF 2015).

Management Unit

The management unit is the population of wahoo (*Acanthocybium solandri*) from the U.S. South Atlantic, the Mid-Atlantic, and the New England coasts in the 3 to 200-mile EEZ.

Goal and Objectives

The goal of the plan is to maintain the current harvest levels of wahoo and ensure that no new fisheries develop (SAFMC 2003 (a)). To achieve these goals, the following management objectives were identified:

- Address localized reduction in fish abundance. The councils remain concerned over the potential shift of effort by longline vessels to traditional recreational fishing grounds and the resulting reduction in local availability if commercial harvest intensifies.
- Minimize market disruption. Commercial markets (mainly local) may be disrupted if large quantities of dolphin are landed from intense commercial harvest or unregulated catch and landing by charter or other components of the recreational sector.
- Minimize conflict and/or competition between recreational and commercial user groups. If commercial longlining effort increases, either directing on dolphin and wahoo or targeting these species as a significant bycatch, conflict and/or competition may arise if effort shifts to areas traditionally used by recreational fishermen.
- Optimize the social and economic benefits of the dolphin and wahoo fishery. Given the significant importance of dolphin and wahoo to the recreational sector throughout the range of these species and management unit, manage the resources to achieve optimum yield on a continuing basis.
- Reduce bycatch of the dolphin fishery. Bycatch is a problem in the pelagic longline fishery for highly migratory species. Any increase in overall effort, and more specifically shifts of effort into nearer shore, non-traditional fishing grounds by swordfish and tuna vessels, may result in increased bycatch of non-target species. In addition, National Standard 9 requires that: "Conservation and management measures shall, to the extent practicable, (a) minimize bycatch and (b) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch." Therefore, bycatch of the directed dolphin fishery must be addressed.
- Direct research to evaluate the role of dolphin and wahoo as predator and prey in the pelagic ecosystem.

- Direct research to enhance collection of biological, habitat, social, and economic data on dolphin and wahoo stocks and fisheries.

DESCRIPTION OF THE STOCK

Biological Profile

Wahoo is an epipelagic marine species and can be found worldwide in tropical and subtropical waters and extend seasonally into temperate waters. Wahoo are typically solitary but may form small loose aggregations (Collette and Nausen 1983). They gather around floating debris and flotsam, including sargassum, spending most of their time in water less than 200m in depth, and prefer water temperatures ranging from 17.5 to 27.5 degrees Celsius (63.5 – 81.5 degrees Fahrenheit; Theisen and Baldwin 2012). The species is presumed to be short lived (with a possible lifespan of up to or more than 5–6 years; Oxenford et al. 2003); there is much uncertainty in aging wahoo, and there has been no successful validation of presumed annuli or daily growth checks in otoliths to date. In addition, wahoo grow rapidly, with fish captured off North Carolina reaching a mean length of 44 inches by approximately age-1 (Hogarth 1976). The state record for wahoo was caught off Ocracoke in 1994 and weighed 150 pounds; however, fish landed in North Carolina weigh on average approximately 27 pounds. Wahoo become sexually mature during their first year, at around 34 inches for males and 40 inches for females (Hogarth 1976). They are considered batch spawners, meaning they will spawn many times throughout the spawning season, maximizing the survival of larval fish. Spawning occurs offshore of North Carolina around open-ocean currents from June to August, with a peak in June and July (Hogarth 1976).

Stock Status

The stock status of wahoo in the Western Atlantic is unknown.

Stock Assessment

A stock assessment is not available for this species.

DESCRIPTION OF THE FISHERY

Current Regulations

The North Carolina Division of Marine Fisheries (DMF) currently complements the management measures of the Dolphin/Wahoo FMP through rule (15A NCAC 03M .0517). It is unlawful to possess for recreational purposes more than two wahoo per person per day taken by hook and line. For commercial fishing, there is a 500-pound trip limit (landed head and tail intact). It is unlawful for a commercial fishing operation to take or possess or sell a commercial trip limit of wahoo without a Federal Commercial Dolphin/Wahoo Vessel Permit. Commercial vessels federally permitted in another fishery are allowed to land up to 200 pounds of dolphin and wahoo combined.

Commercial Fishery

Commercial landings of wahoo are reported through the mandatory DMF Trip Ticket program. Landings since 1986 have fluctuated with a low of 6,014 pounds in 1986 and a high of 40,731 pounds in 1995 (Table 1; Figure 1). In the past 10 years, landings have averaged approximately 17,092 pounds; commercial landings in 2024 (7,914 pounds) were lower than the average.

Table 1. Recreational harvest (number of fish landed and weight in pounds) and releases (number of fish) and commercial harvest (weight in pounds) of wahoo from North Carolina, 1986–2024.

Year	Recreational			Commercial	
	Number Landed	Number Released	Weight Landed (lb)	Weight Landed (lb)	Total Weight Landed (lb)
1986	11,085	-	21,298	6,014	480,416
1987	6,400	42	172,708	15,827	188,535
1988	2,043	-	14,342	19,783	34,125
1989	6,674	-	194,287	9,921	204,208
1990	5,290	-	114,060	16,653	130,713
1991	5,068	17	121,382	18,620	140,002
1992	6,326	1,061	1,726,842	14,383	1,741,225
1993	7,673	-	208,325	24,121	232,446
1994	12,182	1,286	308,986	20,319	329,305
1995	21,726	14	476,289	40,731	517,020
1996	15,259	1,300	397,335	26,675	424,010
1997	19,587	152	464,335	20,628	484,963
1998	11,195	51	253,128	22,600	275,728
1999	17,341	-	387,342	28,963	416,305
2000	18,183	1,126	412,824	19,905	432,729
2001	17,889	-	473,926	20,503	494,429
2002	32,783	398	1,056,010	19,952	1,075,962
2003	21,274	-	662,567	17,222	679,789
2004	61,153	-	2,220,765	22,006	2,242,771
2005	41,364	-	1,249,160	14,980	1,264,140
2006	21,834	594	490,904	16,426	507,330
2007	47,890	-	1,495,127	24,306	1,519,433
2008	21,777	-	527,736	11,643	539,379
2009	42,129	48	1,696,717	16,397	1,713,114
2010	19,703	2,532	571,575	12,626	584,201
2011	21,501	40	611,319	15,870	627,189
2012	37,423	12	994,195	23,521	1,017,716
2013	11,951	337	319,866	23,380	343,246
2014	29,362	22	804,473	22,783	827,256
2015	36,920	608	983,232	18,380	1,001,612
2016	39,565	5	1,056,969	25,393	1,082,362
2017	30,305	-	842,604	28,963	871,567
2018	10,690	182	280,644	22,619	303,263
2019	17,098	23	454,391	31,494	485,885
2020	19,055	87	462,937	12,079	475,016
2021	9,760	-	244,078	7,343	251,421
2022	9,657	-	232,436	7,924	240,360
2023	20,434	148	379,586	8,808	388,394
2024	17,214	-	406,136	7,914	414,050
Mean	20,635	438	621,639	18,915	640,554

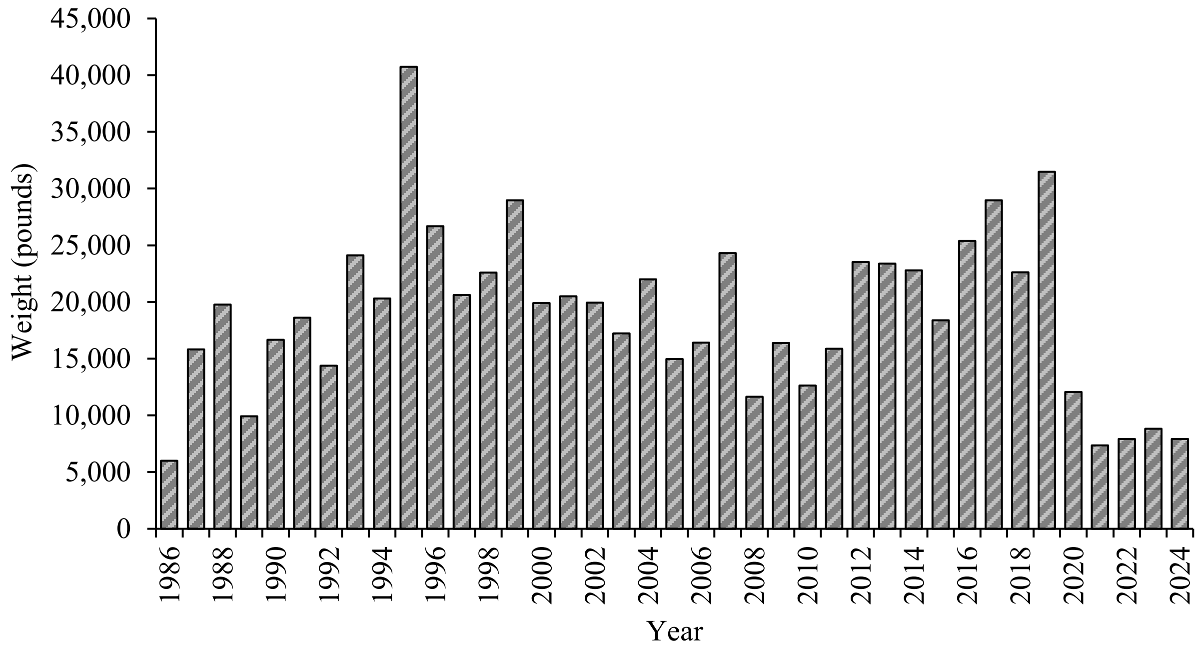

Figure 1. Annual commercial landings in pounds of wahoo in North Carolina, 1986–2024.

Recreational Fishery

Recreational landings of wahoo are estimated from the MRIP. Recreational estimates across all years have been updated and are now based on the MRIP new Fishing Effort Survey-based calibrated estimates. For more information on MRIP see https://www.fisheries.noaa.gov/topic/recreational-fishing-data.

Landings of wahoo, on average, have decreased in the last 10 years (2015–2024 average of 534,301 pounds compared to the 2005–2014 average of 876,107 pounds). After peaking in 2004 (2,220,765 pounds), wahoo landings have fluctuated, declining to low of 232,436 pounds in 2022 (Table 1; Figure 2). Landings increased from 379,586 pounds in 2023 to 406,136 pounds in 2024.

The DMF offers award citations for recreational fishermen who land wahoo greater than 40 pounds. After a period of high, stable number of citations from 2012–2019 (750 citations per year average), the total number of citations awarded through the North Carolina Saltwater Fishing Tournament decreased in 2020 (527 citations), and 2021 (310 citations) before increasing in 2022 (462 citations), then decreasing again in 2023 (388 citations) and 2024 (233 citations; Table 2; Figure 3).

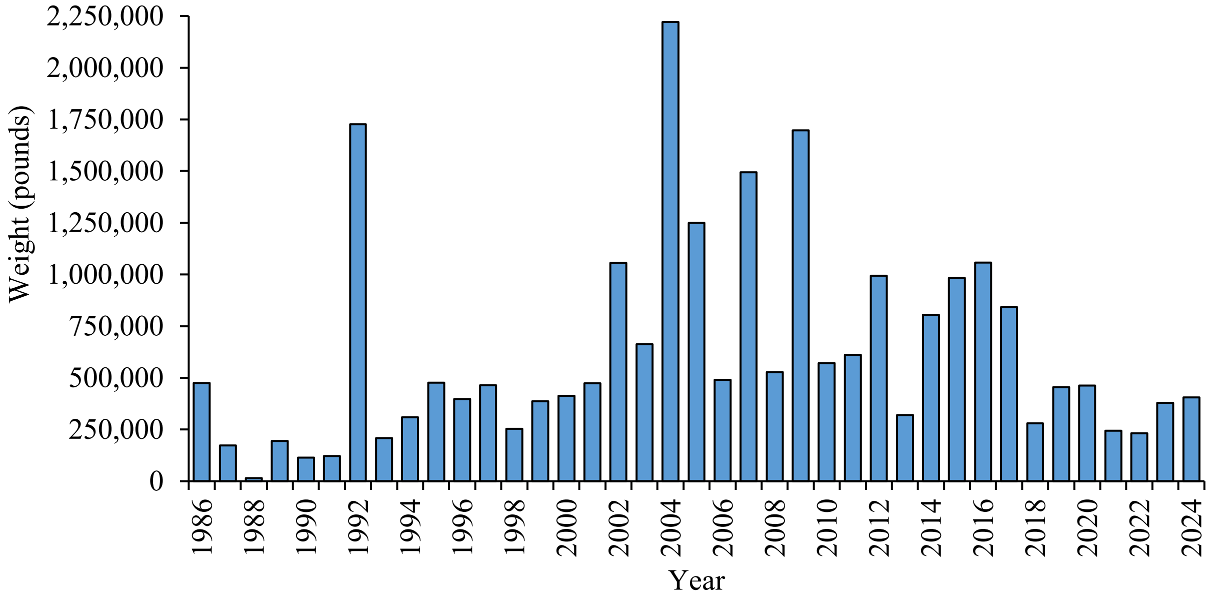

Figure 2. Annual recreational landings in pounds of wahoo in North Carolina, 1986–2024.

Table 2. Total number of awarded citations for wahoo (>40 pounds landed) annually from the North Carolina Saltwater Fishing Tournament, 1991–2024.

Year	Citations	Year	Citations
1991	247	2008	327
1992	349	2009	377
1993	390	2010	419
1994	422	2011	358
1995	400	2012	673
1996	378	2013	737
1997	391	2014	718
1998	474	2015	697
1999	493	2016	694
2000	706	2017	978
2001	501	2018	719
2002	537	2019	786
2003	448	2020	527
2004	827	2021	310
2005	680	2022	462
2006	614	2023	388
2007	913	2024	233

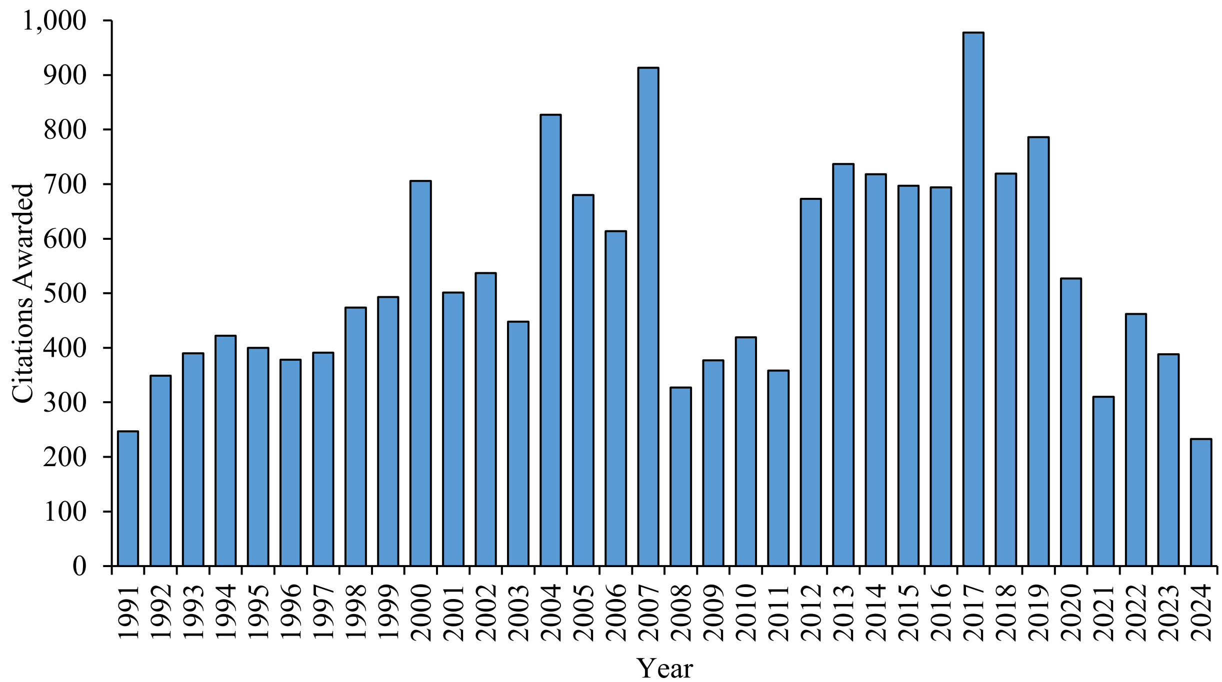

Figure 3. Total number of awarded citations for wahoo (>40 pounds landed) annual from the North Carolina Saltwater Fishing Tournament, 1991–2024.

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Fishery dependent length-frequency information for the commercial wahoo fishery in North Carolina is collected by fish house samplers, specifically through DMF programs 438 (Offshore Live Bottom Fishery) and 439 (Coastal Pelagic). The number of wahoo samples obtained by fish house samplers is generally low, ranging from 1 to 101 samples each year from 1986 to 2024; this is due to it being an incidental catch in other fisheries. In 2024, 14 wahoo lengths were obtained, an increase from the previous year (12 samples in 2023) and above the average number of samples (12 samples; Table 3). The average size of wahoo sampled from the commercial fishery decreased in 2024 (47.1 inches fork length (FL)) from the previous year (50.7 inches FL) and was below the time series average (49.2 inches FL; Table 3). The maximum size of wahoo sampled from the commercial fishery increased in 2024 (62.2 inches FL) from the previous year (61.4 inches FL) and was above the time series average (59.3 inches FL; Table 3).

Length and weight information for the recreational fishery are collected through the MRIP dockside sampling. The average size of wahoo sampled from the recreational fishery was larger in 2024 (45.1 inches FL) compared to the previous year (43.3 inches FL) and overall has remained relatively constant throughout the time series (Table 3). The minimum wahoo size sampled from the recreational fishery was much smaller in 2024 (5.2 inches FL) from the previous year (27.8 inches FL). The maximum wahoo size sampled from the recreational fishery decreased in 2024 (53 inches FL) from the previous year (61.2 inches FL in 2023).

Due to so few commercial samples, there was no modal length for the commercial fishery in 2024; however, in 2019, the commercial modal length was 44 inches FL. The modal length for the wahoo recreational fishery in 2024 was 52 inches FL (Figure 4). On average, the recreational fishery harvests larger maximum sizes of wahoo than the commercial fishery (Table 3; Figure 5); the average maximum length of wahoo sampled from the recreational fishery is 67.7 inches FL, compared to an average of 59.3 inches FL from the commercial fishery. However, on average, the commercial fishery harvests similar size fish (49.2 inches FL) to the recreational fishery (47.4 inches FL; Table 3).

Table 3. Mean, minimum, and maximum lengths (fork length, inches) of wahoo collected from the commercial and recreational fisheries, 1986–2024.

Year	Commercial				Recreational			
	Mean Length	Minimum Length	Maximum Length	Total Number Measured	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1986	51.2	47.6	55.9	3	53.2	31.0	64.0	28
1987	36.2	36.2	36.2	1	46.6	24.0	72.4	72
1988	53.2	39.8	65.4	15	47.9	28.9	72.8	96
1989	53.3	41.9	72.0	20	46.8	28.3	59.8	91
1990	54.6	41.7	68.3	7	44.5	16.9	59.6	143
1991	47.9	41.3	53.5	5	45.6	21.1	64.2	105
1992	55.0	42.9	70.3	11	47.3	29.5	66.0	139
1993	45.3	38.4	57.1	15	46.9	21.9	71.0	154
1994	53.5	40.9	63.4	4	47.0	4.3	66.5	320
1995	51.7	39.4	60.4	6	45.4	3.9	72.1	391
1996	56.5	46.5	63.0	4	48.0	25.6	67.5	253
1997	-	-	-	0	45.6	23.2	70.6	302
1998	-	-	-	0	45.5	28.2	61.0	327
1999	51.9	32.3	65.0	11	44.7	31.7	68.5	275
2000	49.8	40.9	57.1	5	44.9	33.1	83.5	247
2001	45.5	41.7	50.0	3	46.1	36.0	77.1	249
2002	41.3	41.3	41.3	1	48.0	33.0	68.0	260
2003	52.9	44.5	61.8	4	48.2	37.3	68.0	58
2004	41.7	31.9	50.0	4	52.3	35.6	66.1	151
2005	55.1	48.8	62.6	8	48.1	34.4	67.2	75
2006	61.4	61.0	61.8	2	45.0	28.2	67.3	87
2007	26.7	24.6	29.4	4	50.4	24.3	62.0	110
2008	44.8	40.9	52.2	3	46.1	30.3	68.0	113
2009	45.4	39.5	52.0	10	53.6	34.0	68.2	145
2010	50.4	38.1	87.3	6	49.0	28.0	67.6	184
2011	47.9	41.1	63.4	16	49.0	31.0	68.1	227
2012	49.3	35.4	70.0	101	48.2	32.0	70.6	393
2013	45.5	41.3	49.6	2	48.4	39.8	65.6	97
2014	46.2	39.7	54.3	30	48.2	26.0	59.0	133
2015	53.2	50.3	56.5	8	47.9	31.7	78.0	135
2016	49.8	39.5	68.3	18	48.1	30.9	62.6	211
2017	54.4	50.0	60.0	4	48.8	36.3	68.0	163
2018	53.0	35.9	69.5	14	47.7	28.1	68.5	126
2019	55.5	41.7	71.1	50	47.1	32.1	78.4	104
2020	46.9	35.0	65.7	5	46.9	26.0	70.5	93
2021	48.3	43.6	52.6	4	46.0	26.0	71.9	39
2022	46.3	41.0	53.4	5	47.4	5.6	68.0	59
2023	50.7	39.6	61.4	12	43.3	27.8	61.2	26
2024	47.1	31.9	62.2	14	45.1	5.2	53.0	11

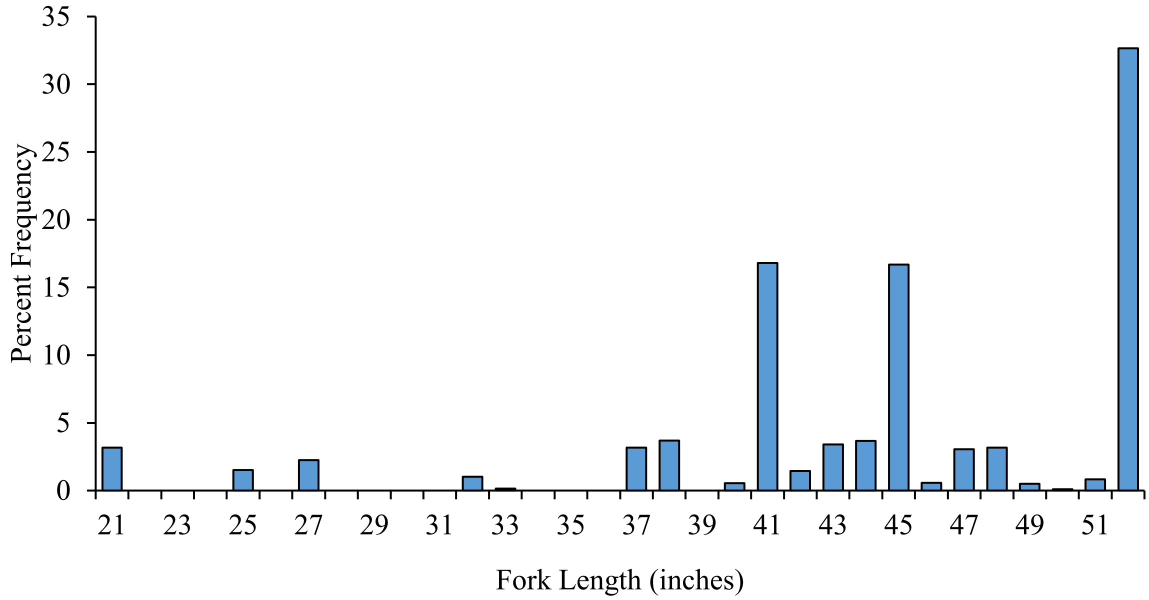

Figure 4. Recreational length frequency distribution for wahoo harvested in 2024.

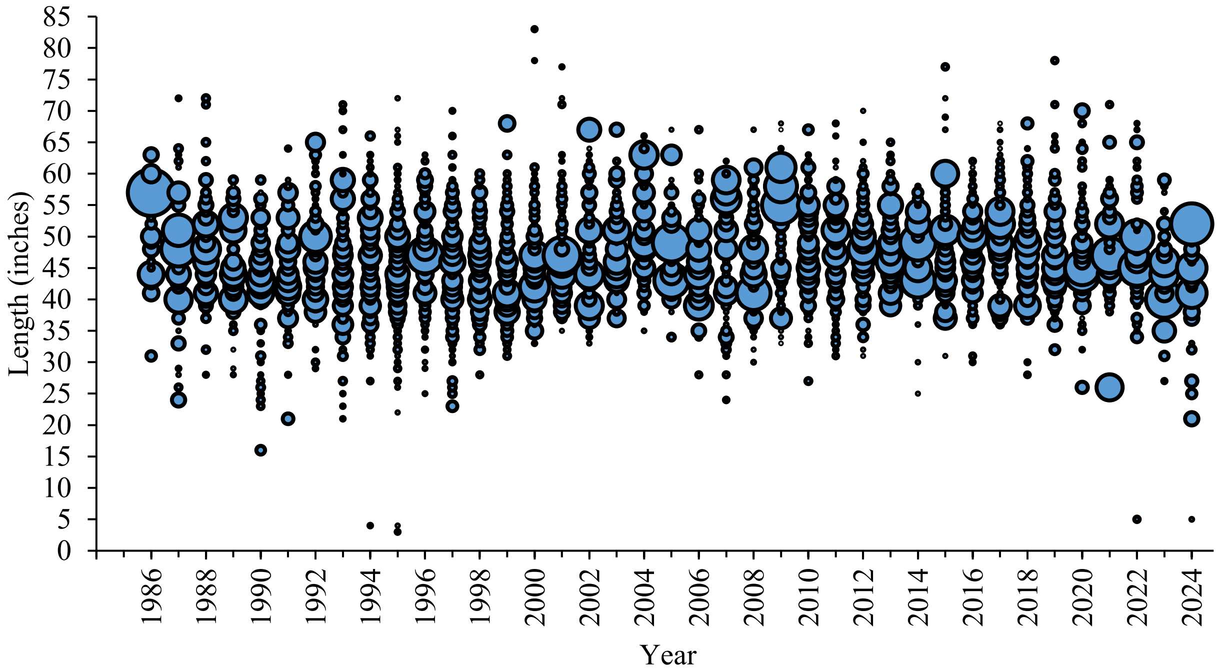

Figure 5. Recreational length frequency (fork length, inches) of wahoo harvested, 1986–2024. Bubbles represent fish at length and the bubble size is proportional to the number of fish at that length.

Fishery-Independent Monitoring

Currently, DMF does not have any fishery-independent sampling programs that target or catch wahoo in great numbers.

RESEARCH NEEDS

The following are research and management needs as determined by the SAFMC and outlined in the FMPs for pelagic Sargassum habitat and the dolphin/wahoo fishery (SAFMC 2002; SAFMC 2003 (b)).

Essential Fish Habitat research needs for wahoo in order of priority from highest to lowest:

- What is the areal and seasonal abundance of pelagic Sargassum off the southeast U.S.?
- Develop methodologies to remotely assess Sargassum using aerial or satellite technologies (e.g., Synthetic Aperture Radar)
- What is the relative importance of pelagic Sargassum weedlines and oceanic fronts for early life stages of wahoo?
- Are there differences in wahoo abundance, growth rate, and mortality?
- What is the age structure of all fishes that utilize pelagic Sargassum habitat as a nursery and how does it compare to the age structure of recruits to pelagic and benthic habitats?
- Is pelagic Sargassum mariculture feasible?
- Determine the species composition and age structure of species associated with pelagic Sargassum when it occurs deeper in the water column.
- Additional research on the dependencies of pelagic Sargassum productivity on the marine species using it as habitat.
- Quantify the contribution of nutrients to deepwater benthic habitat by pelagic Sargassum.
- Studies should be performed on the abundance, seasonality, life cycle, and reproductive strategies of Sargassum and the role this species plays in the marine environment, not only as an essential fish habitat, but as a unique pelagic algae.
- Research to determine impacts on the Sargassum community, as well as the individual species of this community that are associated with, and/or dependent on, pelagic Sargassum. Human induced (tanker oil discharge; trash) and natural threats (storm events) to Sargassum need to be researched for the purpose of protecting and conserving this natural resource.
- Develop cooperative research partnerships between the Council, NOAA Fisheries Protected Resources Division, and state agencies since many of the needs to (a) research pelagic Sargassum, and (b) protect and conserve pelagic Sargassum habitat, are the same for both managed fish species and listed sea turtles.
- Direct specific research to further address the association between pelagic Sargassum habitat and post-hatchling sea turtles

Biological research needs for wahoo in order of priority from highest to lowest:

- Additional data are needed to develop and/or improve estimates of growth, fecundity, etc.
- There are limited social and economic data available. Additional data need to be obtained and evaluated to better understand the implications of fishery management options.
- Trophic data should be considered in support of an ecosystem management approach.
- Essential fish habitats for dolphin and wahoo need to be identified.
- An overall design should be developed for future tagging work. In addition, existing tagging databases should be examined.
- Establish a list serve for dolphin and wahoo which would facilitate research and the exchange of information.

MANAGEMENT

In North Carolina, wahoo is included in the North Carolina IJ FMP, which defers to management under the SAFMC FMP requirements. The SAFMC approved a FMP for wahoo in 2004 and it is currently managed under Amendment 5 (SAFMC 2013), Amendment 7 (SAFMC 2015a), Amendment 12 (SAFMC 2020), and Amendment 10 (SAFMC 2021).

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