FISHERY MANAGEMENT PLAN UPDATE
SHEEPSHEAD
AUGUST 2020

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
Next Benchmark Review:	None

Sheepshead (*Archosargus probatocephalus*) was initially managed as part the South Atlantic Fishery Management Council's (SAFMC) Snapper Grouper Fishery Management Plan (FMP). The plan restricted recreational anglers to an aggregate 20 fish bag limit; there was no commercial trip limit, and neither sector had a size limit. In state waters, North Carolina deferred to the Council and the same regulations were followed. In April 2012, sheepshead was officially removed from the SAFMC's snapper grouper management complex through the Comprehensive Annual Catch Limit Amendment (Amendment 25; SAFMC 2011). Subsequently, North Carolina's proclamation authority for the management of the species was invalidated since sheepshead was no longer part of the North Carolina Fishery Management Plan for Interjurisdictional Fisheries or a Council managed species. In November 2012, the N.C. Marine Fisheries Commission (NCMFC) requested that a rule be developed for sheepshead; and in November 2013, approved the rule (15A NCAC 03M .0521) that specifies the Director's proclamation authority, including the ability to implement size, bag, and trip limits, as well as season and gear restrictions. In July 2014, N.C. Division of Marine Fisheries (NCDMF) began developing potential management measures for sheepshead to present to the NCMFC. In 2015, the Commission implemented new regulations that included size, bag, and trip limits in order to prevent overharvest, as well as to allow a greater number of individuals to spawn before being harvested. There currently is no state or federal FMP for sheepshead.

Management Unit

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

Goal and Objectives

None

STATUS OF THE STOCK

Life History

Sheepshead are a relatively large and 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's coastal waters ranging from inshore brackish waters to offshore rocky bottom. Juveniles are associated with shallow vegetated habitat as well as hard structures that offer protection. As sheepshead grow larger, they move to more typical adult habitat including oyster reefs, rocks, pilings, jetties, piers and wrecks. 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.

Sheepshead are omnivores, meaning they eat plant material as well as animals (barnacles, crabs, oysters). Sheepshead grow quickly up to age 6, and then their growth slows. After their first year, sheepshead average 10 inches, at which less than 50 percent of the individuals are sexually mature. Most sheepshead mature at age 2 (12 inches fork length) and all sheepshead are mature by ages 3 to 5 (14 inches fork length). In North Carolina, sheepshead commonly attain a length of 20 to 25 inches with weights ranging from 5 to 15 pounds. The maximum reported age in North Carolina is 30 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

Currently, there is not a stock assessment for sheepshead in North Carolina. A coast-wide stock assessment (from Virginia through the east coast of Florida) is being developed by a doctoral candidate at North Carolina State University. The assessment is expected to be complete in early 2021.

STATUS OF THE FISHERY

Current Regulations

In 2015, the NCMFC implemented a 10-inch fork length (FL) minimum size limit for both recreational and commercial fisheries. 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 Landings

Commercial landings of sheepshead in North Carolina are available from 1950 to the present. However, monthly landings were not available until 1974. North Carolina instituted mandatory reporting of commercial landings through their 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 9,782 pounds in 1981 to 180,225 pounds in 2013. In 2019, 86,394 pounds of sheepshead were landed in the commercial fishery (Table 1; Figure 1).

Sheepshead are primarily caught as bycatch in several of North Carolina's commercial fisheries (i.e., gill nets, pound nets, haul seines). 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 has developed in the last decade, and the gig fishery has also become more popular in this time (Table 2). While the long haul fishery used to account for up to 20% of the landings, in the last several years landings from this fishery have accounted for less than one percent of the harvest. In 2019, the majority (76%) of the commercial landings came from pound nets (42%) and gill nets (33%; the majority from estuarine gill nets); an additional 16% was landed by spears and gigs, combined (Table 2; Figure 2).

Recreational Landings

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 are available from 1981 to the present. 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, the recreational harvest accounts for 80% of North Carolina's total harvest (pounds); in 2019 the recreational harvest accounted for 87% of the total harvest (Table 1). Like the commercial catch, landings have fluctuated from year to year, with a low of 19,285 pounds harvested in 1983 and a high of 1,456,396 pounds in 2007 (Table 1; Figure 1). In 2019, 590,150 pounds of sheepshead were landed recreationally.

The NCDMF offers award citations for exceptional catches of sheepshead. Harvested sheepshead that weigh greater than eight pounds are eligible for an award citation. Since 1991, approximately 2,000 citations for sheepshead have been issued. From 1991 through 2007 the number of award citations remained under 50 citations per year. From 2007 through 2014 the number of award citations increased steadily but have decreased in recent years (Figure 3).

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Commercial fishing activity is monitored through fishery dependent sampling programs conducted by NCDMF. Data collected in these programs allow the size and age distribution of sheepshead to be characterized by gear and fishery. In 2019, 571 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 15 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. The majority of sheepshead landed in 2019 were between 12 inches and 17 inches FL (Figure 4).

Similar to the commercial fishery, average size varies little from year to year in the recreational fishery (Table 4). In 2019, the average size recreational sheepshead was 14 inches FL (Table 4). The majority of sheepshead landed in 2019 were between 11 inches and 15 inches FL (Figure 5). In both fisheries, sublegal fish (<10 inches FL) are still being harvested (Tables 3 and 4; Figure 6). This is most likely due to fishermen being unaware of changes in regulations, and/or confusing sheepshead and black drum regulations. While the size limits differ, black drum are measured for total length and sheepshead for FL.

Fishery-Independent Monitoring

A fishery independent gill net survey was initiated by the NCDMF 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. 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 overall sheepshead index of abundance (number of sheepshead per set) was 0.33 in 2019, 36% above the time series average (Table 5; Figure 7).

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, collection of sheepshead otoliths was not made a sampling priority until 2013. The majority of sheepshead collected were ages 1 to 8 (Table 6). In 2019, 345 sheepshead were collected ranging in age from 0 to 29. The age-length relationship is hard to predict as there is overlap in age for a given length (Figure 8).

MANAGEMENT STRATEGY

See Table 7 for current management strategies and implementation status for sheepshead.

RESEARCH NEEDS

The following have been identified as research needs for sheepshead in North Carolina. Those categorized as high priority are formatted in bold font.

- 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

LITERATURE CITED

SAFMC (South Atlantic Fishery Management Council). 2011. Comprehensive Annual Catch Limit (ACL) Amendment (Amendment 25 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region). South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

TABLES

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, 1981-2019. All weights are in pounds.

	Recreational				
	Numbers		Weight (lb)	Commercial	Total
Year	Landed	# Released	Landed	Weight (lb)	Weight (lb)
1981	83,626	12,772	262,503	9,782	272,285
1982	61,765		183,768	13,922	197,690
1983	5,930		19,285	28,224	47,509
1984	21,156		32,152	36,267	68,419
1985	12,691		42,573	61,190	103,763
1986	132,061	8,283	399,925	97,355	497,280
1987	52,061	70,117	172,377	81,101	253,478
1988	152,971	7,766	50,046	63,400	113,446
1989	136,175	17,747	243,496	56,940	300,436
1990	103,041	18,679	161,180	68,029	229,209
1991	67,277	34,505	154,193	52,611	206,804
1992	206,241	48,565	434,509	47,526	482,035
1993	221,442	51,981	289,634	57,884	347,518
1994	92,098	31,965	197,128	83,789	280,917
1995	157,769	39,779	407,729	91,198	498,927
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	180,225	1,400,582
2014	185,267	224,062	389,583	173,376	562,959
2015	181,554	160,447	520,382	124,827	645,209
2016	149,085	212,471	375,328	93,513	468,841
2017	282,480	910,841	810,633	128,269	938,902
2018	343,772	524,967	735,738	90,398	826,029
2019	221,419	312,479	590,150	86,394	676,544
Average	236,268	165,793	487,026	88,160	663,366

Table 2. Commercial harvest (weight in pounds; N.C. Trip Ticket Program) of sheepshead by gear type, 2010-2019.

Year	Spears and Gigs[$]	Estuarine Gillnet	Long Haul	Ocean Gillnet	Pound Net	Trawls	Other*	Total Harvest
2010	2,998	59,271	37,974	1,345	49,205	5,604	1,235	157,631
2011	5,946	40,653	13,143	1,594	55,729	2,015	1,897	120,976
2012	15,916	32,565	9,780	1,974	46,233	2,140	1,274	109,881
2013	15,259	48,194	12,497	3,055	94,780	3,940	2,501	180,225
2014	21,886	39,524	11,777	3,253	92,988	2,581	1,367	173,376
2015	13,695	27,245	337	5,741	73,035	3,998	776	124,827
2016	14,761	30,851	262	2,509	36,839	7,068	1,223	93,513
2017	10,720	33,744	411	1,677	73,933	7,047	738	128,269
2018	9,076	25,686	**	2,936	50,457	1,012	1,231	90,398
2019	13,858	25,272	773	3,462	36,496	5,567	967	86,394
Average	12,411	36,301	8,695	2,754	60,969	4,097	1,321	

** Other gears include fyke nets, crab pots, and hook-and-line.*

*** Long-haul seines are included in the other gears due to data confidentiality.*

[$] *Spear and gigs have also been combined due to data confidentiality.*

Table 3. Sheepshead length (fork length, inches) data from commercial fish house samples, 1982-2019.

Year	Mean Fork Length	Minimum Fork Length	Maximum Fork Length	Total Number Measured
1982	10	3	24	13
1983	18	8	24	25
1984	20	11	24	8
1985	10	3	13	3
1986	19	15	23	19
1987	16	8	24	53
1988	16	3	22	29
1989	14	3	23	42
1990	16	8	25	162
1991	15	6	23	124
1992	13	3	22	86
1993	13	4	22	107
1994	16	10	22	22
1995	15	5	23	164
1996	15	9	22	122
1997	16	8	24	97
1998	12	6	24	313
1999	13	8	24	461
2000	14	9	27	642
2001	15	8	22	296
2002	13	8	23	382
2003	14	9	24	406
2004	16	8	23	294
2005	17	9	25	415
2006	16	8	24	445
2007	14	7	24	826
2008	13	7	24	1,366
2009	12	6	23	1,388
2010	13	7	24	1,684
2011	15	9	24	1,246
2012	13	7	37	1,157
2013	13	7	24	1,282
2014	14	7	23	1,294
2015	15	8	24	982
2016	15	9	24	886
2017	14	9	23	333
2018	14	8	23	666
2019	15	8	24	571

Table 4. Sheepshead length (fork length, inches) data from Marine Recreational Information Program samples, 1981-2019.

Year	Mean Fork Length	Minimum Fork Length	Maximum Fork Length	Total Number Measured
1981	18	9	20	13
1982	17	8	21	29
1983	19	15	20	3
1984	11	10	13	2
1985	13	13	13	1
1986	15	7	29	29
1987	15	7	23	70
1988	2	6	25	85
1989	13	7	21	76
1990	11	7	22	93
1991	12	5	23	83
1992	13	8	23	54
1993	11	6	22	176
1994	13	7	21	179
1995	14	7	22	174
1996	15	9	26	79
1997	11	6	24	134
1998	11	6	23	191
1999	15	7	29	187
2000	13	8	24	239
2001	16	10	30	132
2002	17	10	23	56
2003	15	8	26	96
2004	17	9	24	54
2005	16	9	23	34
2006	15	7	24	55
2007	15	7	24	118
2008	12	7	21	108
2009	11	7	21	159
2010	14	8	26	221
2011	14	7	25	160
2012	13	6	23	254
2013	11	6	24	351
2014	13	8	25	99
2015	14	9	23	134
2016	14	8	25	106
2017	14	4	22	272
2018	13	9	23	386
2019	14	9	25	243

Table 5. Annual weighted sheepshead index of abundance (number per set, all ages combined) from the North Carolina Pamlico Sound Independent Gill Net Survey, 2001-2019. N=number of samples; SE=Standard Error; PSE=Proportional Standard Error.

Year	N	Index	SE	PSE
2001	237	0.13	0.06	46
2002	320	0.14	0.04	29
2003	320	0.08	0.02	25
2004	320	0.13	0.03	23
2005	304	0.08	0.02	25
2006	320	0.08	0.02	25
2007	320	0.11	0.03	27
2008	320	0.11	0.03	27
2009	320	0.30	0.05	17
2010	320	0.18	0.04	22
2011	298	0.16	0.06	38
2012	308	0.12	0.03	25
2013	308	0.30	0.07	23
2014	308	0.45	0.09	20
2015	306	0.26	0.06	23
2016	308	0.20	0.04	20
2017	308	0.44	0.10	23
2018	308	0.41	0.11	27
2019	306	0.33	0.09	27

Table 6. Summary of sheepshead age samples collected from both dependent (commercial and recreational) and independent (survey) sources, 2008-2019*.

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	26	8
2013	2	1	22	162
2014	3	1	24	243
2015	4	1	24	140
2016	5	0	29	211
2017	2	1	28	262
2018	2	0	30	227
2019*	3	0	29	345

**2019 ages are preliminary pending second read*

Table 7. 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)

FIGURES

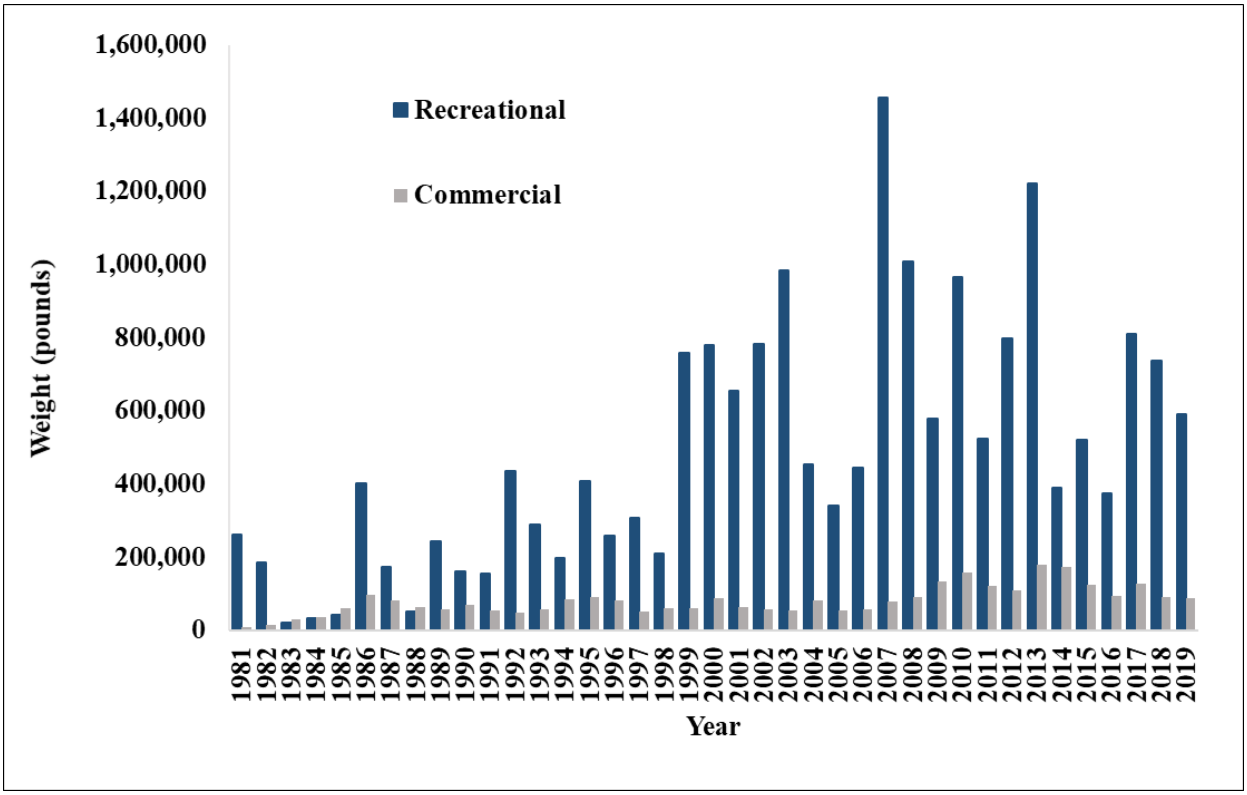

Figure 1. Annual commercial (Atlantic Coastal Cooperative Statistics Program and N.C, Trip Ticket Program) and recreational (MRIP) landings in pounds for sheepshead in North Carolina from 1981 to 2019.

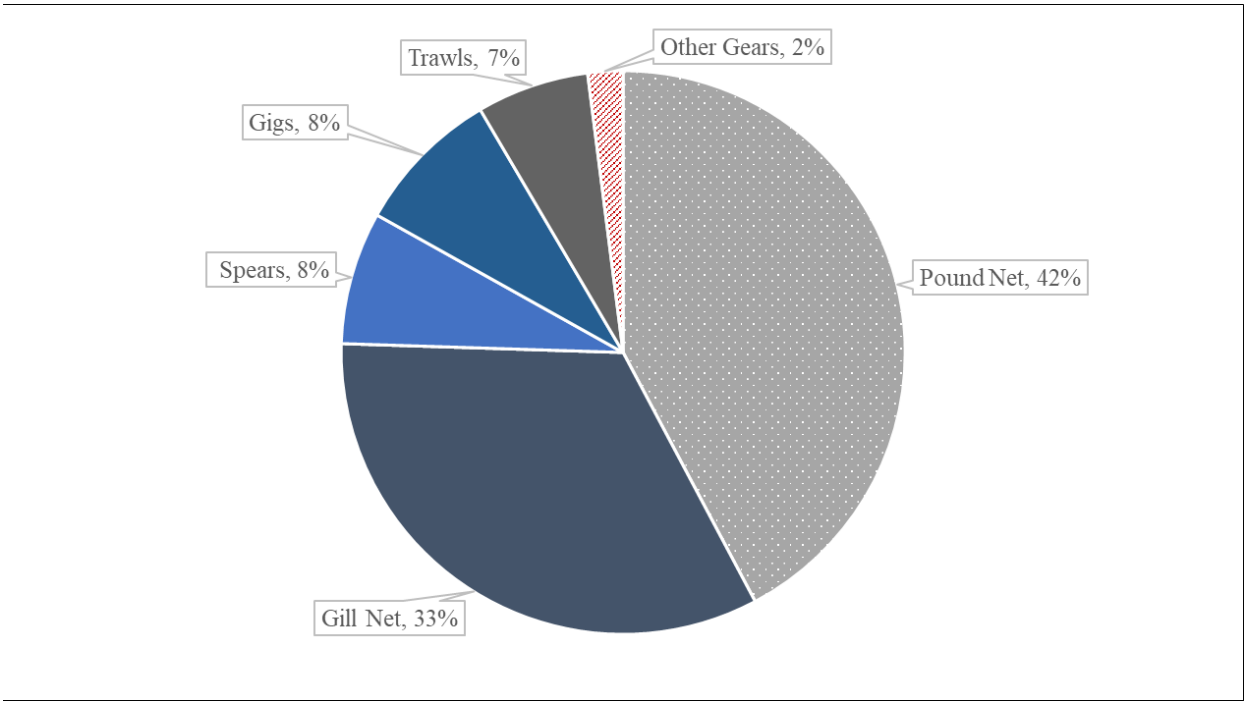

Figure 2. Commercial harvest in 2019 by gear type. Other gears include long haul seines, fyke nets, crab pots, and hook-and-line.

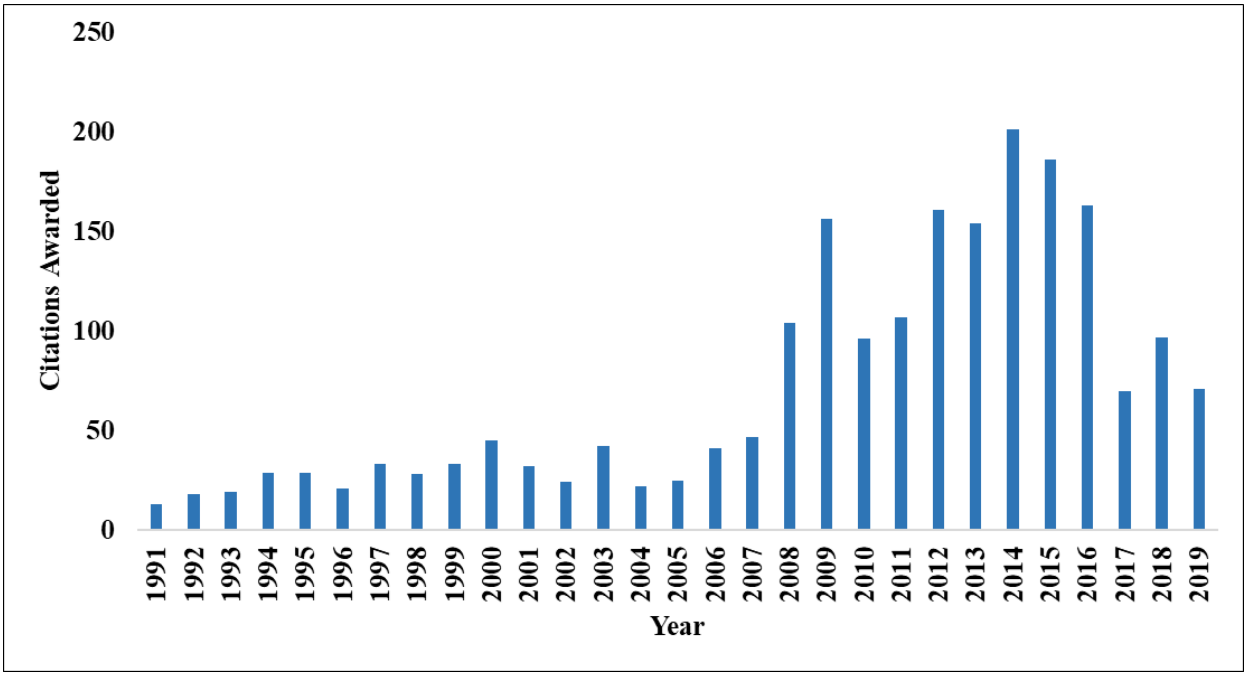

Figure 3. North Carolina Saltwater Fishing Tournament citations awarded for sheepshead from 1991 to 2019.

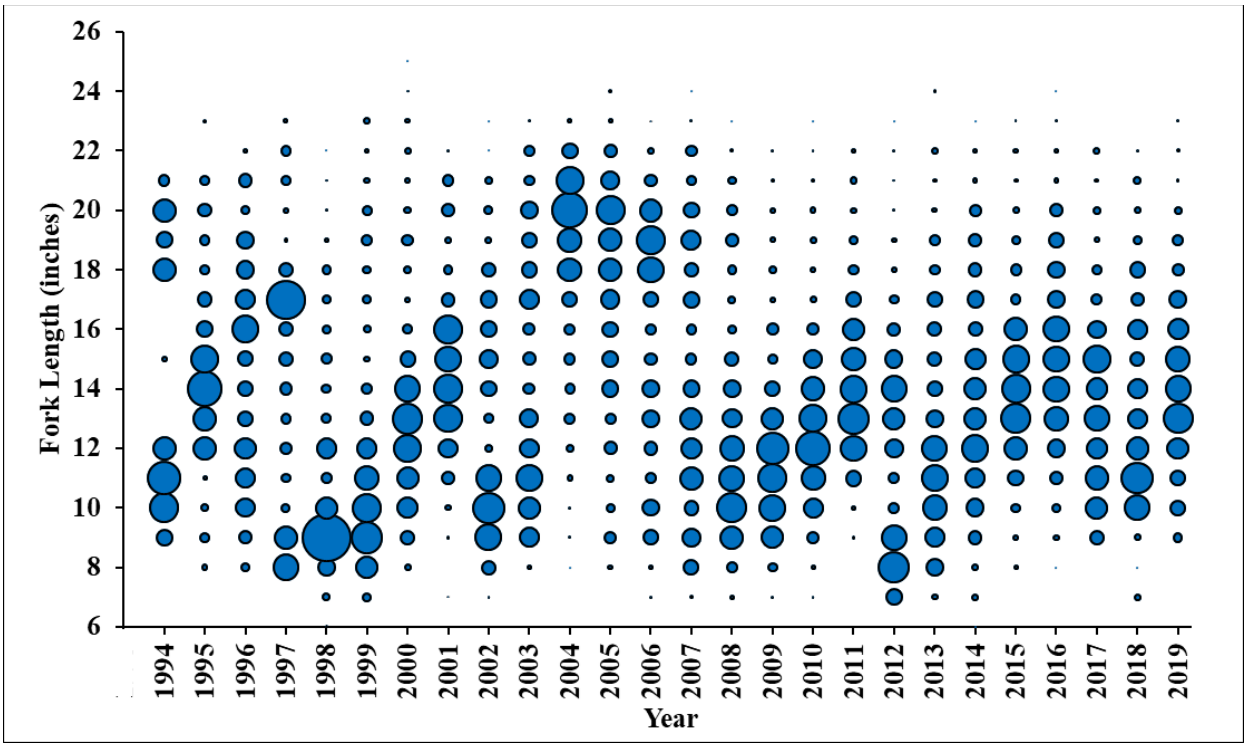

Figure 4. Commercial length frequency (fork length, inches) of sheepshead harvested from 1994 to 2019. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

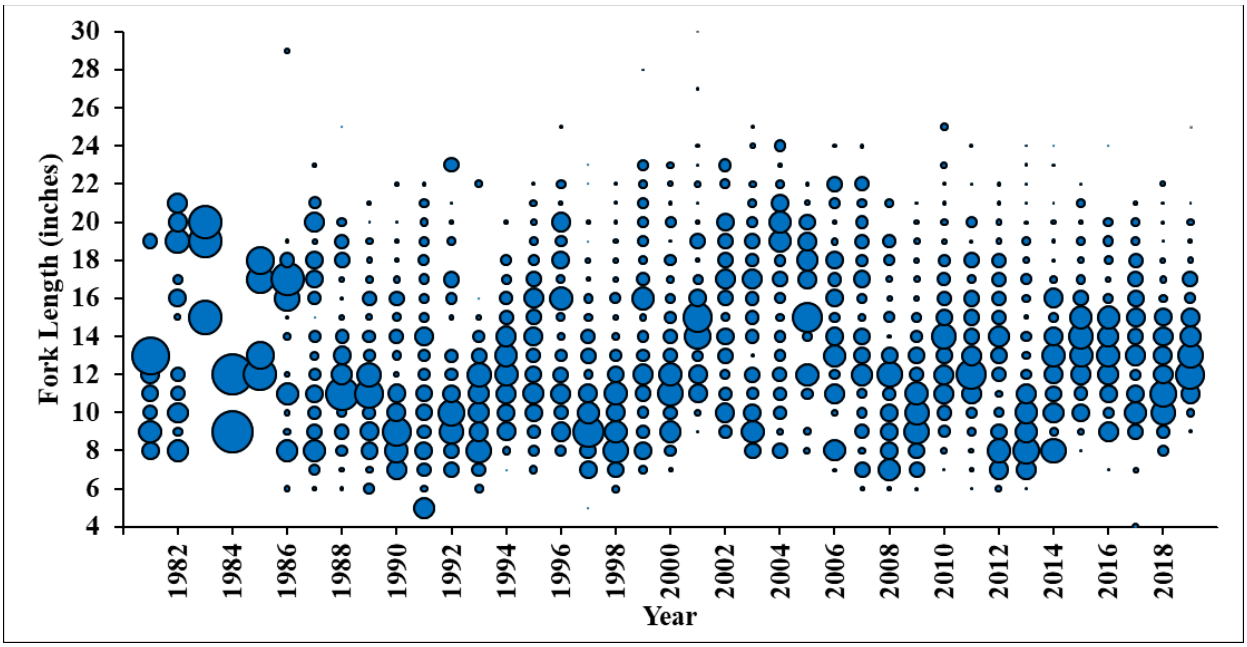

Figure 5. Recreational length frequency (fork length, inches) of sheepshead harvested from 1981 to 2019. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

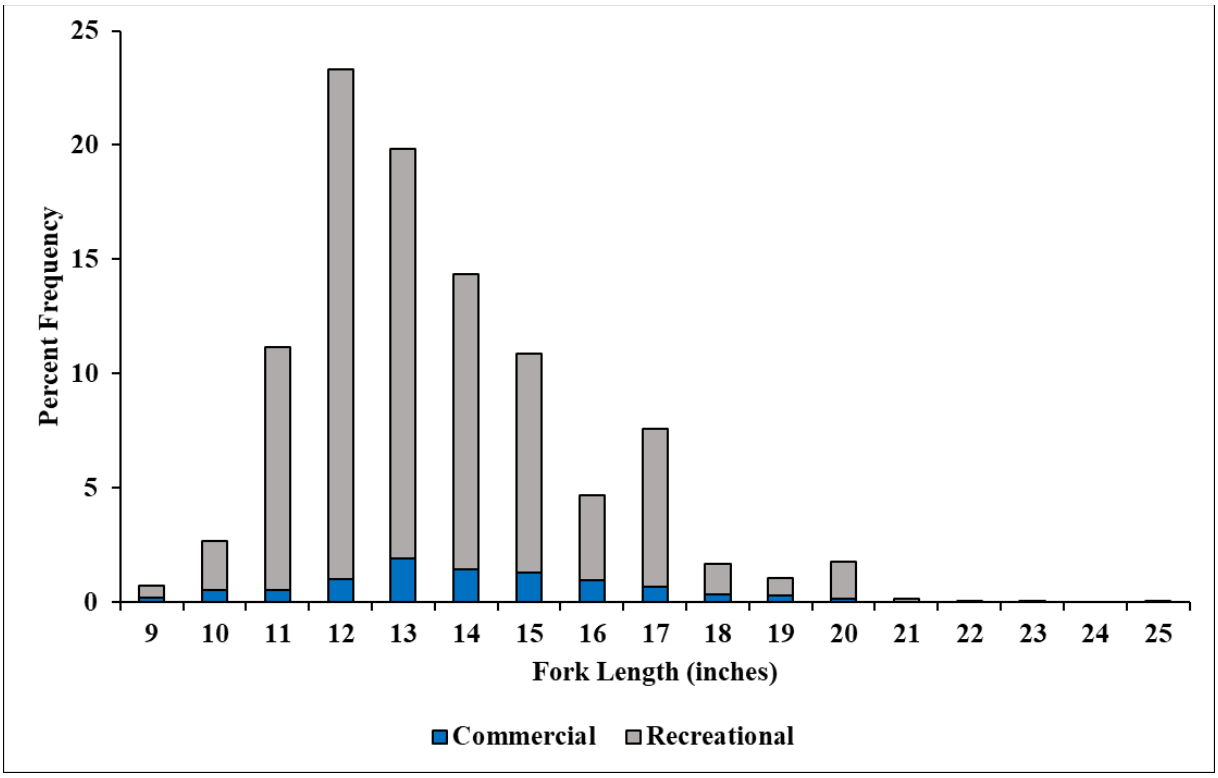

Figure 6. Commercial and recreational length frequency distribution from sheepshead harvested in 2019.

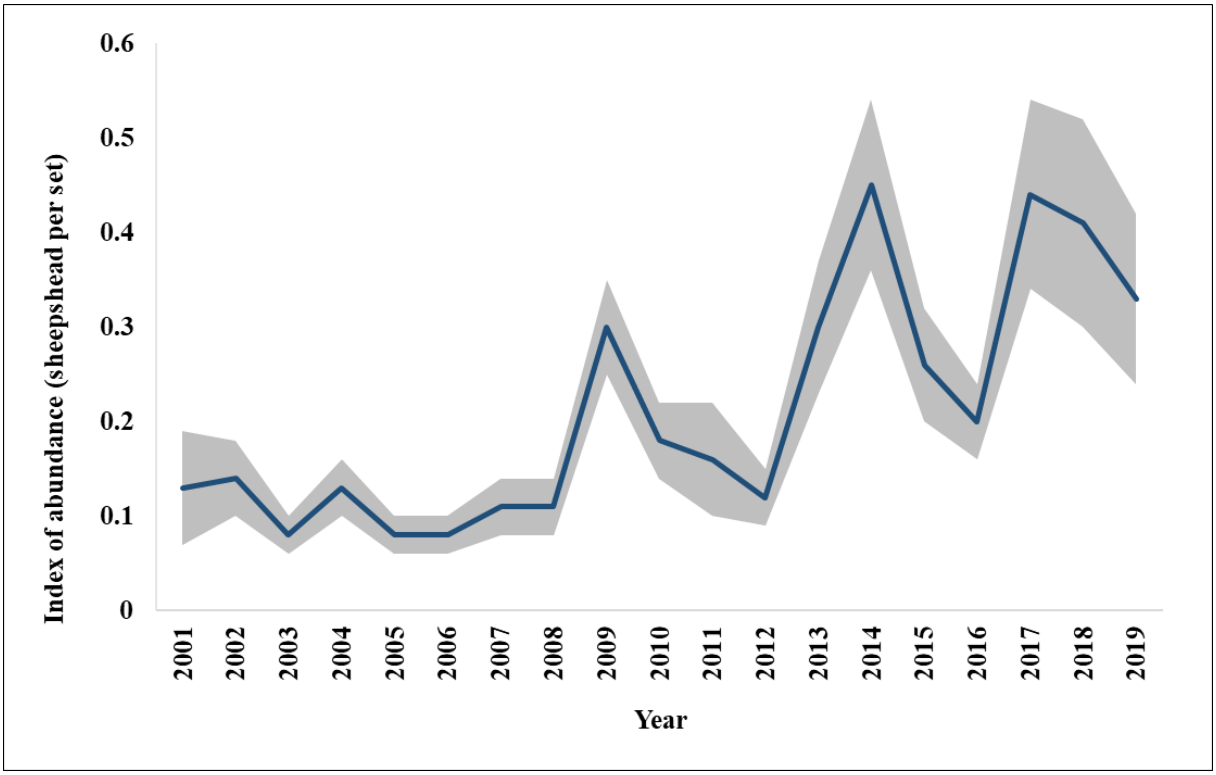

Figure 7. Annual index of abundance of sheepshead in the NCDMF Pamlico Sound Independent Gill Net Survey, 2001-2019.

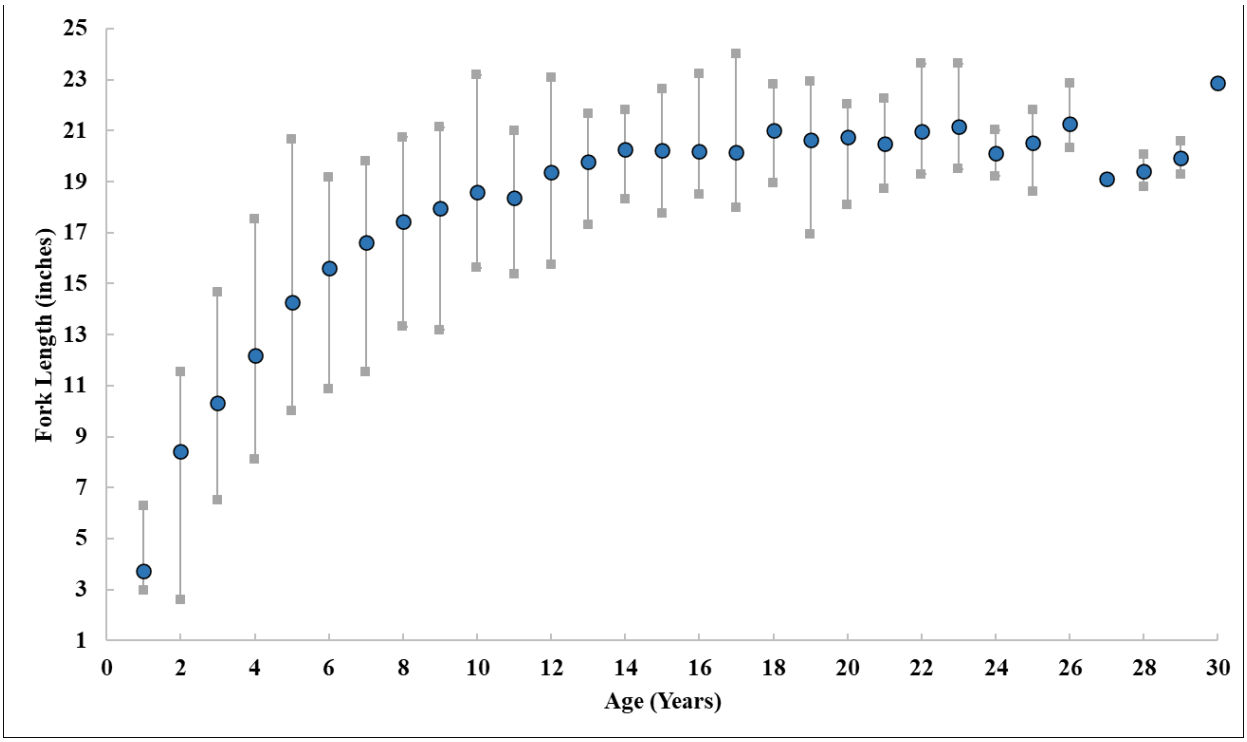

Figure 8. Sheepshead length at age based on all age samples collected from 2008 to 2019. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.