

## STATE MANAGED SPECIES – RED DRUM

### FISHERY MANAGEMENT PLAN UPDATE RED DRUM AUGUST 2022

#### 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:	August 2017
Schedule Changes:	None
Comprehensive Review:	2024

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 that 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 to reduce the impact of discard mortality. These included requiring circle hooks along with fixed weights and short leaders in the summer adult red drum recreational fishery in Pamlico Sound and further expanding the gill net attendance requirements that were originally implemented as part of the original 2001 North Carolina Red Drum FMP (NCDMF 2001).

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 under development. Harvest restrictions included: restricting all harvest of red drum to fish between 18- and 27-inches total length (previously allowed one fish over 27 inches); 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 (NCDMF) 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. The North Carolina Red Drum FMP final approval occurred in March of 2001 and interim measures implemented in October of 1998 were maintained. Stock assessments conducted since the implementation of the 2001 FMP have all indicated that management measures have

been effective at preventing overfishing (Takade and Paramore 2007; SAFMC 2009; ASMFC 2017).

In addition to the state FMP, red drum in North Carolina also 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 of 2003. Further, the plan also continues to require that states maintain management strategies that ensure that overfishing is not occurring and that optimum yield (OY) in the red drum fishery can be obtained. Amendment 2 compliance requirements to 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 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 the requirements when Amendment 2 to the ASMFC plan was passed. Since that time, both the 2009 and 2017 assessments for red drum have indicated that the 40% static spawning potential ratio continues to be met or exceeded (SAFMC 2009; ASMFC 2017). Therefore, the ASMFC, to date, has continued with the current management strategy developed under Amendment 2 to the ASMFC plan.

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, 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 the coastal waters throughout the year and are observed in the surf during the spring and fall seasons and 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 the 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 indicates that the red drum stock in North Carolina is not experiencing overfishing (ASMFC 2017). The overfished status remains undetermined due to uncertainty in the adult stock size estimates. A new benchmark assessment is scheduled to begin in 2022 and will be complete in 2024.

### **Stock Assessment**

Only the overfishing and not the overfished status can currently be determined for red drum. 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. 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. Based on the results of the 2017 benchmark assessment, the static spawning potential ratio was at or above target levels (Figure 1). 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 the harvest rates (relaxation of current regulations) of red drum should only be allowed if those increases are not anticipated to lower the static spawning potential ratio below the management goal (40%). Reviewer comments from the most recent stock assessment provide caution that relaxation of current regulations, particularly those that increase fishing mortality on adult red drum, could quickly lead to an overfishing status (ASMFC 2017).

## **DESCRIPTION OF THE FISHERY**

### **Current Regulations**

All harvest is limited to red drum between an 18-inch total length minimum size and 27-inch total length 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. Check with the NCDMF for the most recent proclamation on red drum harvest limits including trip limits and bycatch requirements.

### **Commercial Fishery**

North Carolina's commercial landings in 2021 were 200,364 pounds; an increase over 2020 landings (165,670 pounds) and the 10-year mean (144,071 pounds; Table 1 and Figure 2). Since

1989, landings have fluctuated with no consistent trend. Gill nets have traditionally dominated the harvest of red drum in the commercial fishery. In 2021, gill nets accounted for 89% of the commercial landings (Figure 4).

The North Carolina Red Drum FMP (2001) maintained the 250,000-pound annual cap in the commercial fishery 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 143,298 pounds. The 2007/2008, 2009/2010 and 2013/2014 fishing years had overages (Table 2). All overages were deducted from the following year's cap allowance. The 2020/2021 fishing year resulted in 207,694 pounds of red drum landings, well below the 250,000-pound annual cap.

### **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 2021 were 1,479,550 pounds; above the 2012-2021 10-year average (1,234,098 pounds) and just below 2020 landings (1,758,789 pounds; Table 1 and Figure 2). Releases totaled 2,545,371 fish in 2021: above the ten-year average of 2,453,323 fish and well above the time-series average of 1,241,180 (Table 1). Recreational releases have increased over time, averaging around 340,000 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 (2012-2021).

The NCDMF offers award citations for exceptional catches of red drum. Red drum captured and released that measure greater than 40 inches total length are eligible for an award citation. Since 1991, award citations for red drum have been steadily increasing from just over 300 awarded in 1991 to a time-series high of 3,461 awarded in 2021 (Figure 3).

## **MONITORING PROGRAM DATA**

### **Fishery-Dependent Monitoring**

Commercial fishing activity is monitored through fishery-dependent sampling conducted by the NCDMF since 1982. Data collected in this program allow the size and age distribution of red drum to be characterized by gear/fishery. 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 harvest. In 2021, 89% of the red drum harvest was taken in gill nets, followed by pound nets with 9% (Figure 4). In all, 759 red drum, primarily from set gill nets, were measured from the commercial fishery in 2021 (Table 3). The average size was 22 inches fork length. Average size has varied little over time ranging from 17 to 23 inches fork length since 1989. Due to the slot limit of 18 to 27 inches total length, red drum harvested in both the commercial and recreational fishery are of similar size (Figure 5). 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 (Figure 6). Additionally, as the harvest of larger fish was disallowed during the 1990's, fish above 27 inches are now rarely observed in landings due to regulations. With the current slot limit on harvest for both the commercial and recreational fisheries, nearly all landings consist of age-1 and age-2 fish. Similar to the commercial fishery, average size varies little from year to year in the recreational fishery

(Table 4; Figure 7). Harvest of red drum over 27 inches was eliminated in 1998, although occasional larger fish are still sometimes observed in the recreational harvest (Figure 7). In 2021, the average size recreational fish harvested was 22 inches fork length. From 1989 to 2020, this range varied little (17 to 23 inches fork length).

### **Fishery-Independent Monitoring**

The NCDMF 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 is highly variable with both high and low abundance occurring in recent years (Figure 8). In 2021, 703 juvenile red drum were taken in 120 seine samples for an overall state relative abundance index of 5.86 red drum per haul. The 2021 overall mean index was similar to 2020 (6.56) and above the long-term average of the survey of 5.66 (Figure 8). Information gathered from this survey is currently used as an input parameter in the ASMFC Atlantic coast red drum stock assessment.

A fishery-independent gill net survey was initiated by the NCDMF in May of 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 will help managers assess the red drum stock without relying solely on commercial and recreational fishery-dependent data. The overall red drum index was 3.65 red drum per set in 2021, above the time series average of 2.81 (Figure 9). It should be noted that during all of 2020 and until June of 2021, no sampling occurred in this survey. 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. The survey is currently used in the ASMFC Atlantic coast red drum stock assessment as an annual index of relative abundance for sub-adult red drum.

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. A standard sample consists of 1,500 meters of mainline set with 100 gangions placed at 15-meter intervals (100 hooks/set). Soak times are approximately 30 minutes. All random sampling takes place in Pamlico Sound. During the 2021 season, 219 red drum were captured out of 72 stratified random sets (3.04 red drum per set) which is below the time series average of 4.61 red drum per set (Figure 10). 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 and negatively impacted the survey. During 2020, sampling did not occur due to the COVID pandemic. This survey is used in the ASMFC red drum stock assessment.

In order to describe the age structure of harvest and indices, red drum age structures are collected from various fishery-independent (scientific surveys) and dependent (fisheries) sources throughout the year. In 2021, 998 red drum were collected, ranging in age from 0 to 43 years (Table 5). The majority of red drum collected from dependent sources (18 to 27 inches total length) are ages 1 to 2. Red drum over 27 inches are protected from harvest in North Carolina, a measure designed to protect the spawning portion of the population. 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 total length). 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 11).

## **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):

- Assess the size distribution of recreational discards —Needed
- Improve catch and effort data for the red drum recreational fishery, particularly for the fishery that occurs at night — Needed
- Develop independent surveys to monitor both the sub-adult and adult red drum populations — Ongoing through NCDMF gillnet and longline surveys
- Continue life history studies for age and growth. Additional work needed to update maturity schedule and collect diet information specific to North Carolina — Age and growth ongoing through NCDMF; maturity through NCDMF; recent diet work through NCSU
- Identify spawning areas in North Carolina — Studies conducted for Pamlico Sound; additional work needed
- Characterize the adult recreational fishery with regard to tackle, geographic location, bait, water temperature, seasonality, hook types, etc. —Needed
- Obtain discard estimates from the commercial fisheries including information on size and disposition — Ongoing through NCDMF observer program, recent expanded coverage
- Collect data to determine the catch rates of red drum and targeted species with regard to distance from shore in the gill net fishery — Needed, some data through Fishery Resource Grants and NCDMF Independent Gill Net Survey
- 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
- 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 captured in gill nets — Needed
- Economic analysis of the adult red drum fishery — Needed
- Improved social and economic data collection on the recreational and commercial fishery, including information on current conflicts and potential for future conflicts in these fisheries — Needed
- Determine juvenile habitat preference and examine if recruitment is habitat limited — Needed; study conducted by UNCW

- Examine ecological use and importance of shell bottom to red drum — Needed; some work through CRFL by UNC
- 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
- Assess cumulative impact of large-scale beach nourishment and inlet dredging on red drum and other demersal fish that use the surf zone — Needed
- Determine location and significance of spawning aggregation sites throughout the coast — Needed
- Determine if navigational dredging between August and October significantly impacts spawning activity — Needed
- Determine if designation of spawning areas is needed, and if specific protective measures should be developed — Needed

## **MANAGEMENT STRATEGY**

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). *s* is determined by a formal, peer reviewed stock assessment. Amendment 2 to the ASMFC Red Drum FMP requires specific compliance criteria, including Stock Status harvest restrictions designed to achieve the management target. Any changes to harvest that deviate from those options provided in this plan must be approved by the ASMFC South Atlantic Board. Amendment 1 to the North Carolina Red Drum FMP maintained measures for compliance and also implemented measures to reduce losses from discards in both the recreational and commercial fisheries.

## **FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATIONS**

No schedule change recommended. Both the state and ASMFC red drum plans have identical management goals (30% threshold and 40% target static spawning potential ratio). Stock status is determined by the formal, peer reviewed stock assessment conducted by the ASMFC. The next red drum stock assessment is scheduled for completion in 2024 and will coincide with the next planned formal review of the North Carolina Red Drum FMP set to begin in July of 2024. It should be noted that any changes to the state FMP must consider compliance requirements of the ASMFC plan.

## **LITERATURE CITED**

- ASMFC (Atlantic States Marine Fisheries Commission). 2002. Amendment 2 to the Interstate Fishery Management Plan for Red Drum. ASMFC, Washington, DC, Fishery Management Report No. 38, 141 pp.
- ASMFC. 2017. Red Drum Stock Assessment and Peer Review Report. Atlantic States Marine Fisheries Commission, Stock Assessment Report, 126 pp.



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- SAFMC (South Atlantic Fishery Management Council). 2009. Southeast Data, Assessment and Review 18, Stock Assessment Report, Atlantic Red Drum. North Charleston, SC. 544 pp.
- Takade, H., and L Paramore. 2007. Stock Status of the Northern Red Drum Stock. North Carolina Division of Marine Fisheries. In-House Report, 60 pp.

## TABLES

Table 1. Red drum recreational harvest and number released (Marine Recreational Information Program) and commercial harvest (North Carolina Trip Ticket Program), 1989–2021. All weights are in pounds.

Year	Recreational			Commercial	Total Weight (lb)
	Numbers Landed	Numbers Released	Weight Landed (lb)	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	144,610	1,596,968
2019	97,186	2,976,601	436,219	56,419	492,638
2020	413,419	2,686,150	1,758,789	165,670	1,924,459
2021	325,662	2,545,371	1,479,550	200,364	1,679,914
Mean	939,563	1,241,180	737,686	163,512	925,130

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	198,625	250,000
2018/2019	105,804	250,000
2019/2020	54,175	250,000
2020/2021	207,694	250,000
Average	139,909	

\* 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

Table 3. Red drum length (fork length, inches) data from commercial fish house samples, 1989–2021.

Year	Mean Fork Length	Minimum Fork Length	Maximum Fork 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

Table 4. Red drum length (fork length, inches) data from Marine Recreational Information Program recreational samples, 1989–2021.

Year	Mean Fork Length	Minimum Fork Length	Maximum Fork Length	Total Number Measured
1989	19	13	44	101
1990	17	15	39	73
1991	18	11	42	101
1992	22	17	43	42
1993	22	10	41	117
1994	23	12	40	90
1995	22	18	29	240
1996	21	14	30	114
1997	20	9	44	30
1998	22	15	42	534
1999	23	15	27	199
2000	23	18	26	130
2001	23	17	26	73
2002	21	18	29	86
2003	22	19	26	52
2004	21	18	27	38
2005	22	18	26	48
2006	22	14	30	79
2007	22	17	27	71
2008	22	16	27	90
2009	23	18	28	136
2010	21	11	27	193
2011	22	17	29	147
2012	22	14	41	132
2013	21	17	28	333
2014	23	17	28	316
2015	22	14	27	95
2016	20	12	28	102
2017	21	8	27	288
2018	23	17	28	206
2019	21	13	27	87
2020	21	10	38	419
2021	22	17	27	430

Table 5. Summary of red drum age samples collected from both dependent (commercial and recreational fisheries) and independent (surveys) sources, 1989–2021.

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

## FIGURES

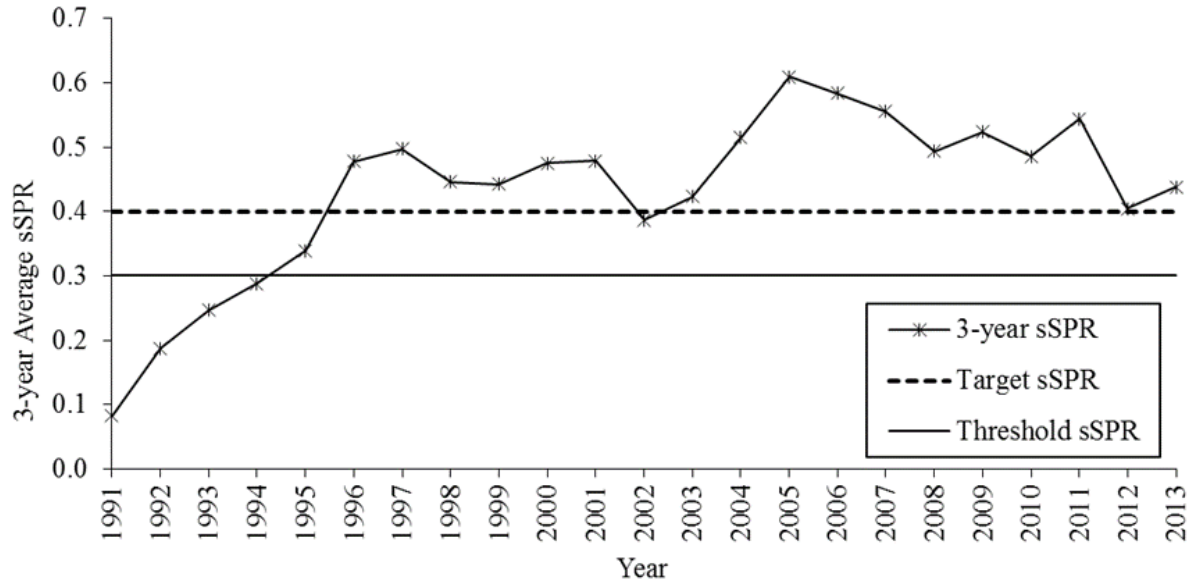


Figure 1. Northern region (North Carolina north) red drum estimates of three-year average static spawning potential ratios (sSPR). Three-year average includes current and previous two year's sSPR estimates. The dashed line shows the 30% overfishing threshold and the solid line shows the 40% target sSPR (Source: ASMFC 2017).

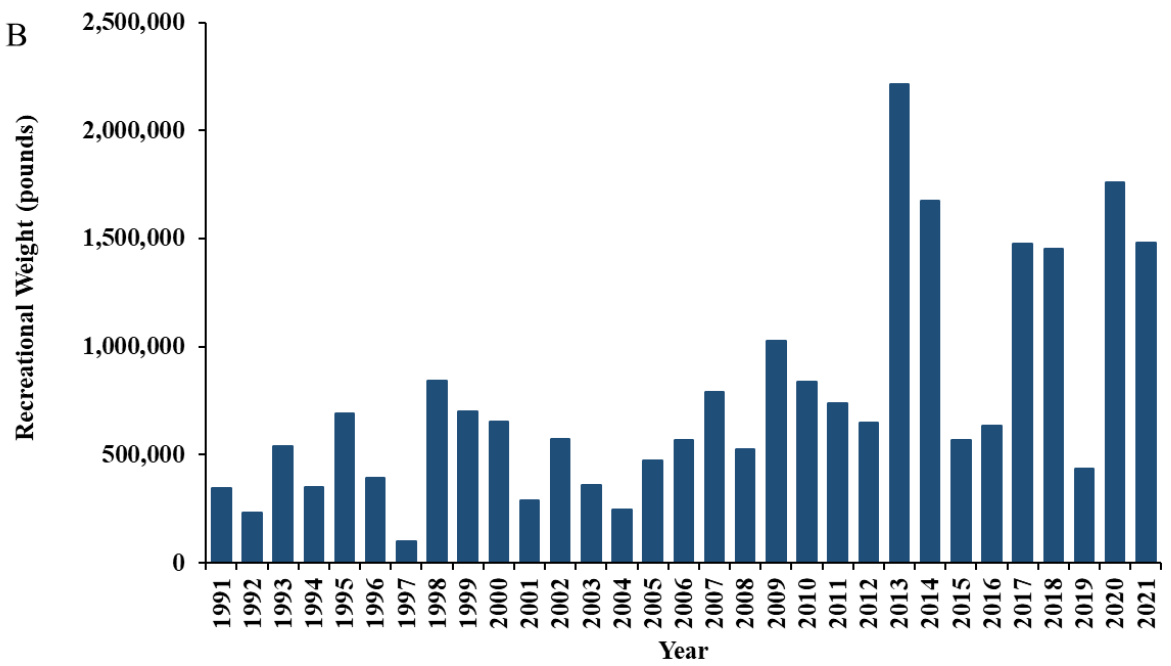
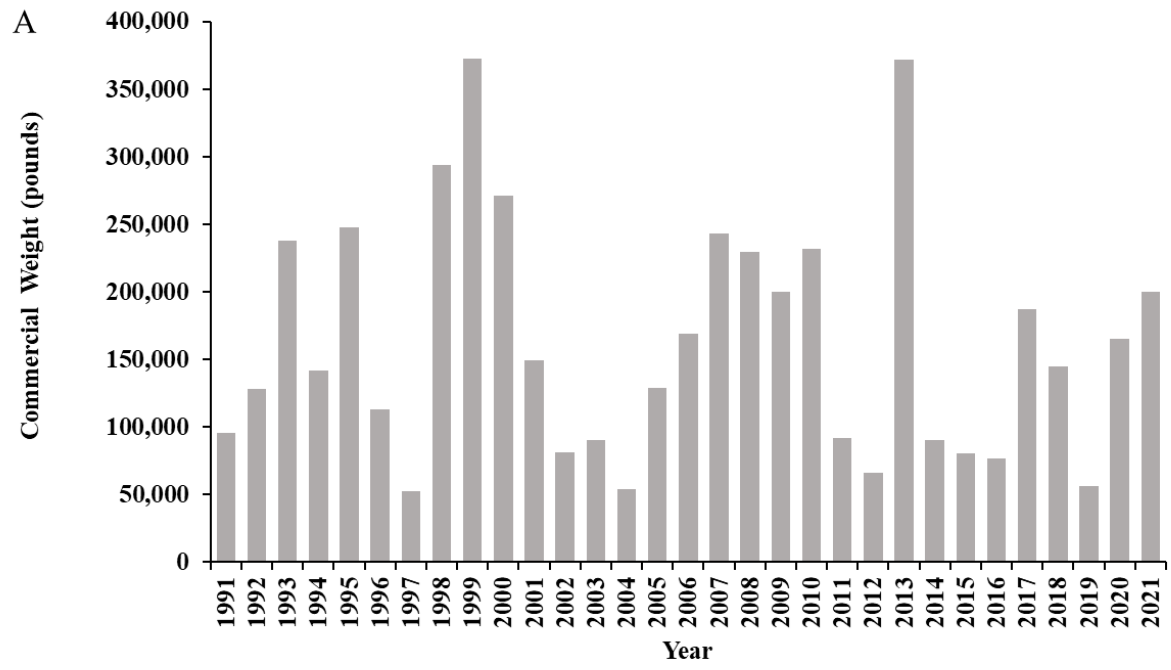


Figure 2. Annual commercial (A) and recreational (B) landings in pounds for red drum in North Carolina from 1991–2021.



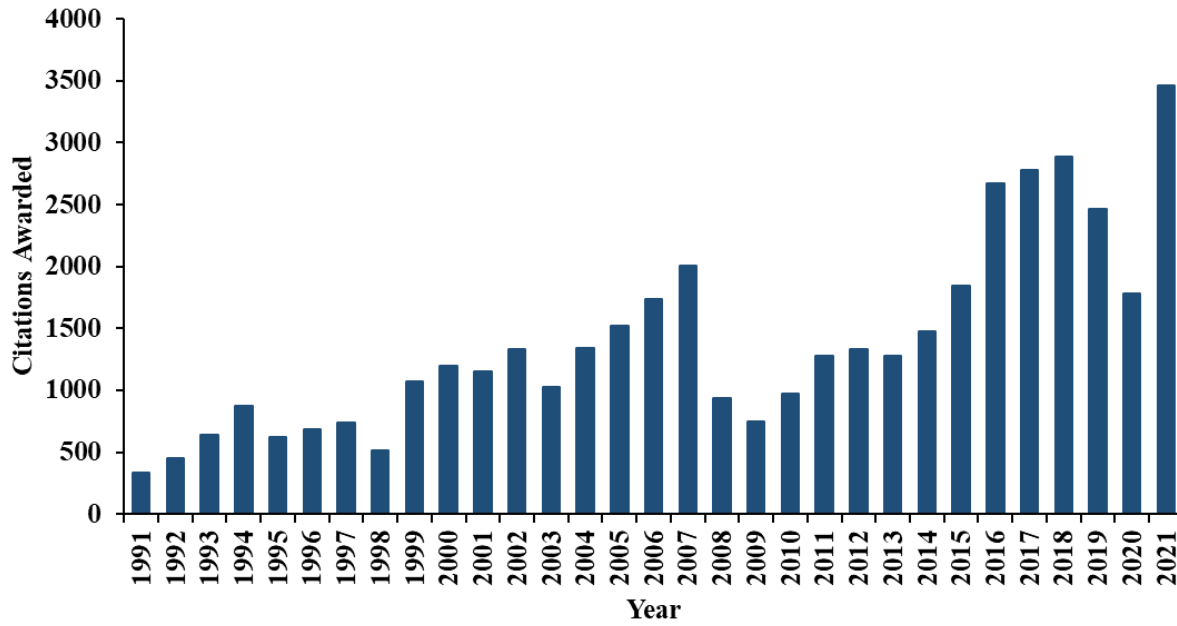


Figure 3. North Carolina Saltwater Fishing Tournament citations awarded for red drum, 1991–2021. Citations are awarded for red drum greater than 40 inches total length. Prior to 1998, citations were awarded for either a red drum released ( $\geq 40$  inches total length) or harvested ( $\geq 40$  pounds). Since 1998, all citations are for released fish only.

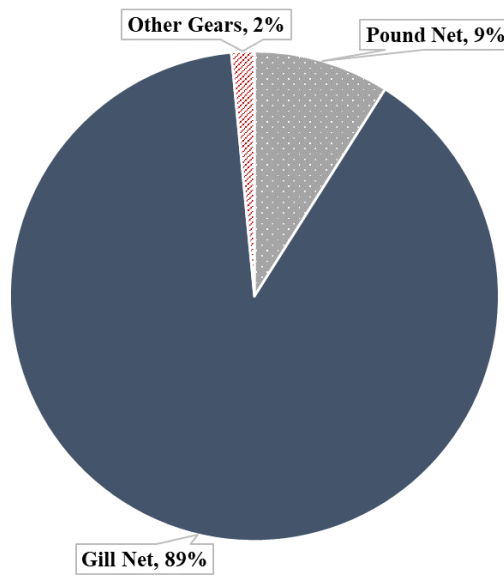


Figure 4. Red drum commercial harvest in 2021 by gear type.

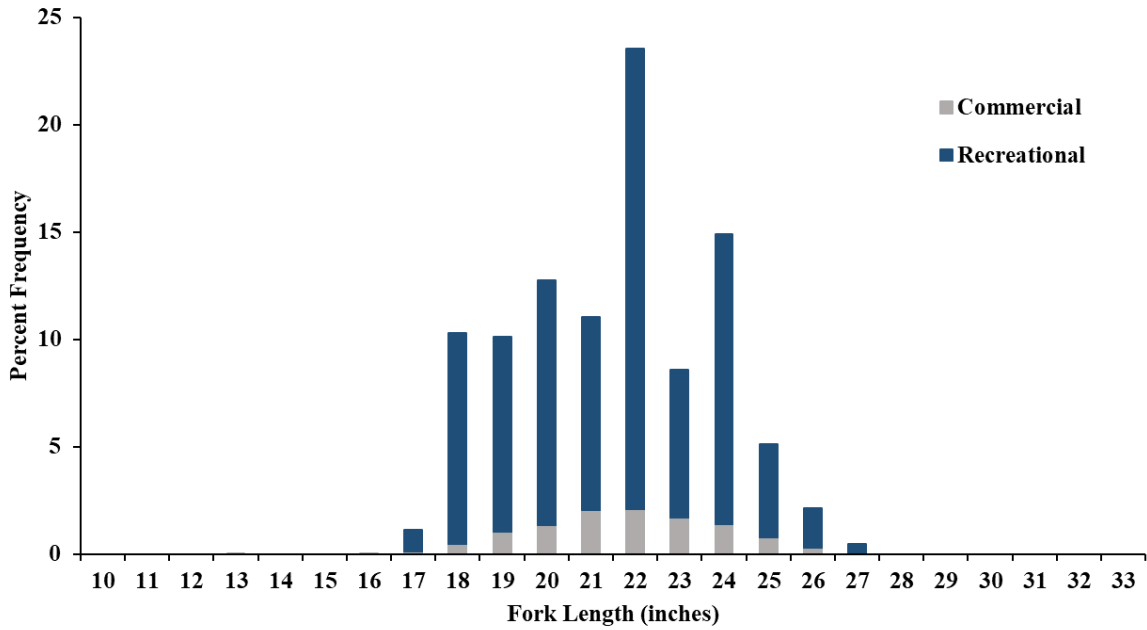


Figure 5. Commercial and recreational length frequency distribution from red drum harvested in 2021.

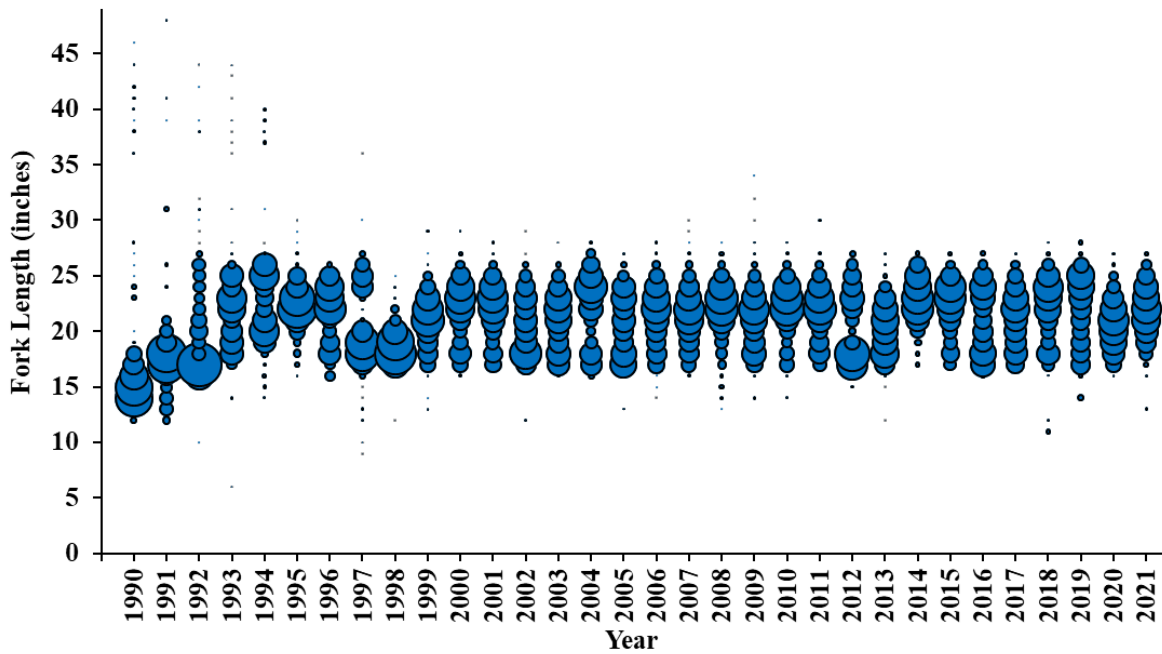


Figure 6. Commercial length frequency (fork length, inches) of red drum harvested, 1990–2021. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

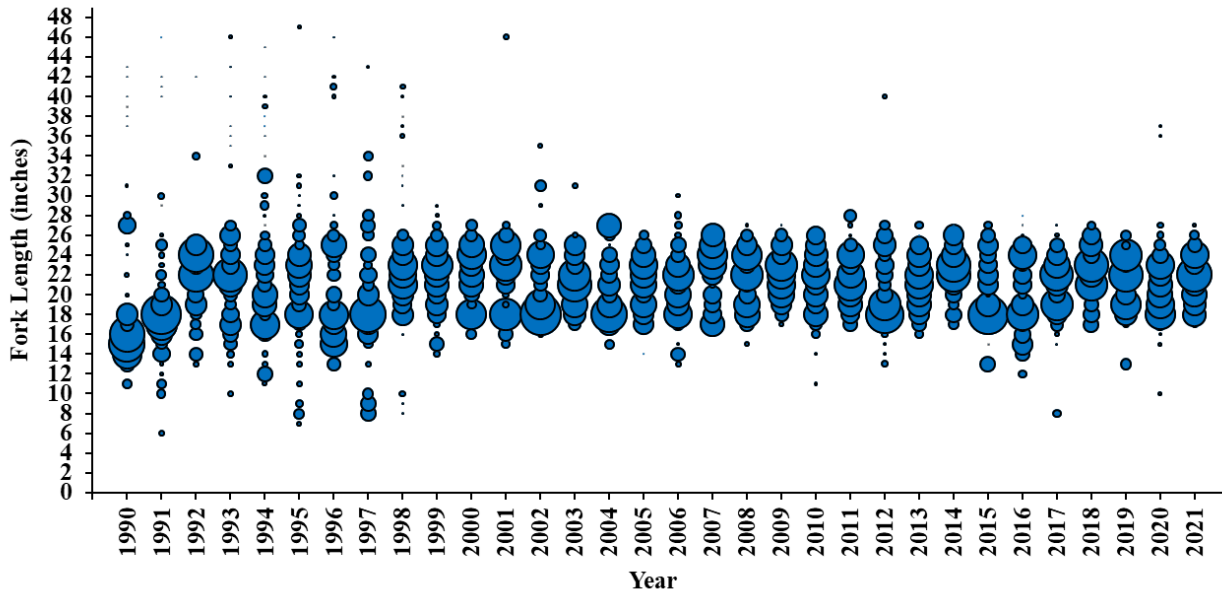


Figure 7. Recreational length frequency (fork length, inches) of red drum harvested, 1990–2021. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

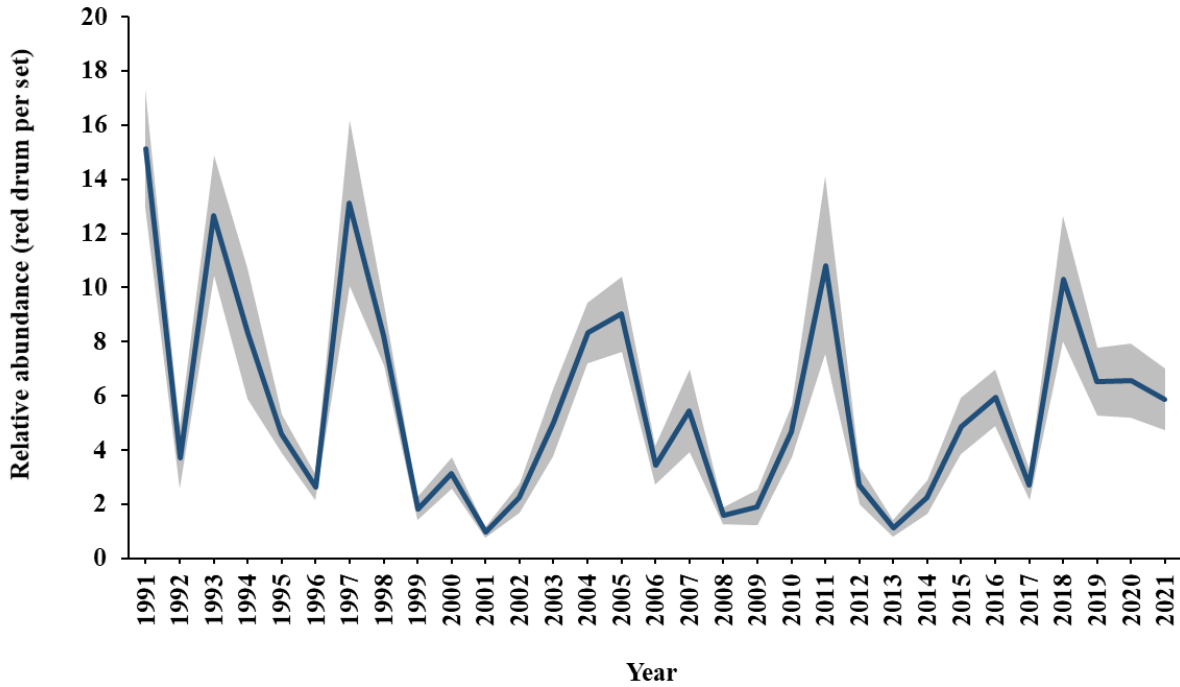


Figure 8. The annual juvenile (age 0) abundance index with standard error shaded in gray from the North Carolina Red Drum Juvenile Seine Survey, 1991-2021.

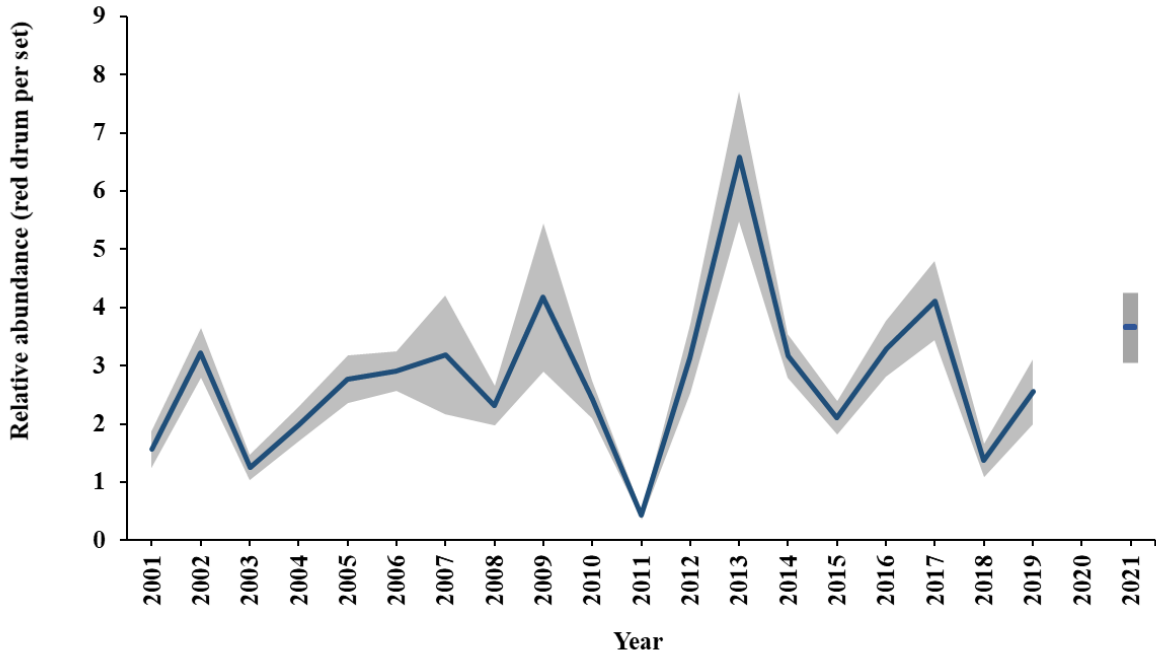


Figure 9. Annual weighted red drum index (number captured ages combined) with standard error shaded in gray from the North Carolina Pamlico Sound Independent Gill Net Survey, 2001–2021. Survey was not conducted in 2020 due to COVID pandemic.

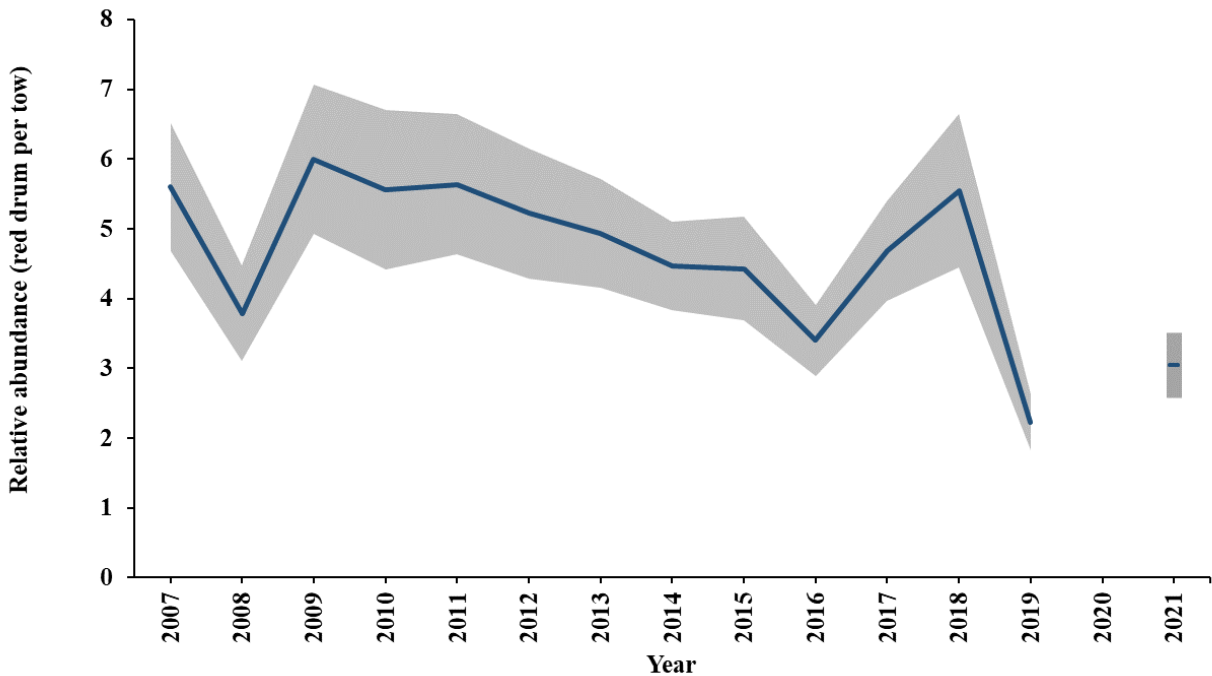


Figure 10. Annual adult red drum index (number captured for ages combined) with standard error shaded in gray from the North Carolina Red Drum Longline Survey, 2007–2021. Sampling in 2019 was adversely impacted by hurricane event and survey was not conducted in 2020 due to COVID pandemic. Sampling resumed in July of 2021.

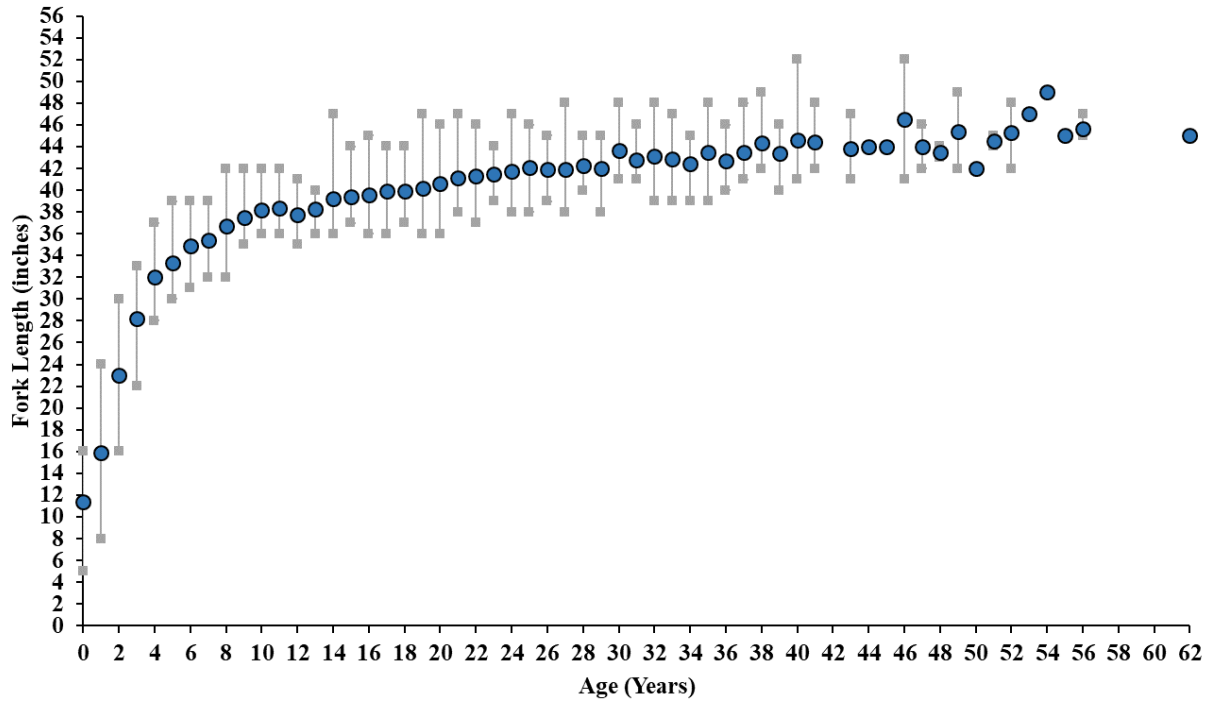


Figure 11. Red drum length-at-age based on all age samples collected, 1983–2021. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.