FISHERY MANAGEMENT PLAN UPDATE
RED DRUM
AUGUST 2019

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:	None
Recommended Schedule Change:	None
Benchmark Review:	Completed February 2017
Next MFC Scheduled Review:	July 2022

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 implemented 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 expanded 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 developed. 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 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 was approved in March of 2001 and maintained all the interim measures. 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 of Amendment 2 to the ASMFC plan. 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 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 2015).

Management Unit

The 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 these goals, the FMP lists the following objectives:

1. 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.
2. 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.
3. 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.
4. Develop regulations that while maintaining sustainable harvest from the fishery, considers the needs of all user groups and provides adequate resource protection.
5. Promote harvest practices that minimize the mortality associated with regulatory discards of red drum.
6. In a manner consistent with Coastal Habitat Protection Plan, restore, improve and protect essential red drum habitat and environmental quality to increase growth, survival, and reproduction of red drum.
7. 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.
8. Initiate, enhance, and continue studies to collect and analyze the socio-economic data needed to properly monitor and manage the red drum fishery.

STATUS OF THE STOCK

Life History

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 the state's saltwater fish. Large red drum (up to 90 pounds) inhabit the coastal waters throughout the year, are often 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 new 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.

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 years' fishing mortality rate relative to the spawning stock biomass survival rates if no fishing mortality was occurring. An assessment was last completed by the ASMFC in 2017. Based on the results of this 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).

STATUS 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 Landings

North Carolina's commercial landings in 2018 were 144,464 pounds; below 2017 landings (186,907 pounds) and 10-year mean (154,209 pounds; Table 1 and Figure 2). Since 1989, landings have fluctuated but have generally been constrained by commercial harvest cap of 250,000 pounds. Gill nets have traditionally dominated the harvest of red drum in the commercial fishery. In 2018, gill nets accounted for 89% of the commercial landings (Figure 4).

Amendment 2 to the North Carolina Red Drum FMP 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 146,941 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 2017/2018 fishing year resulted in 198,401 pounds of red drum landings, well below the 250,000-pound annual cap.

Recreational Landings

Recreational fishing activity is monitored through the Marine Recreational Information Program. In this report, 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 methodology changes see https://www.fisheries.noaa.gov/topic/recreational-fishing-data. Recreational landings in 2018 were 1,452,358 pounds; above the 2008-2017 10-year average (1,126,775 pounds) and very near 2017 landings (1,475,852 pounds; Table 1 and Figure 2). Releases totaled 1,729,260 fish in 2018; slightly below the ten-year average of 1,982,133 fish but well above the time-series average of 1,011,018 (Table 1). Recreational releases have increased over time averaging around 250,000 releases per year for the period of 1989 to 1998 compared to nearly 2 million releases per year in the most recent 10-year period (2009-2018).

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 2,884 awarded in 2018 (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 2018, 89% of the red drum harvest was taken in gill nets, followed by pound nets with 9% (Figure 4). In all, 561 red drum, primarily from set gill nets, were measured from the commercial fishery in 2018 (Table 3). The average size was 23 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. 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 2018, the average size recreational fish harvested was 23 inches fork length. From 1989 to 2017 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 with sampling occurring 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 2018, 1,146 juvenile red drum were taken in 111 seine samples for an overall state mean catch per unit effort (CPUE) of 10.32 red drum per haul. The 2018 overall mean CPUE was higher than 2017 (2.72) and well above the long term average of the survey of 10.32 (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 stocks without relying solely on commercial and recreational fishery dependent data. The overall red drum CPUE was 1.38 red drum per set in 2018, lower than the time series average of 2.78 (Figure 9). The survey is currently used in the ASMFC Atlantic coast red drum stock assessment as an annual index of relative abundance for age-1 and age-2 red drum.

North Carolina initiated an adult red drum longline survey in 2007 that has operated continuously since. 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 gangion placed at 15 meter intervals (100 hooks/set). Soak times are approximately 30 minutes. All random sampling takes place in Pamlico Sound. During the 2018 season, 388 red drum were captured out of 70 stratified random sets (5.54 red drum per set) which is slightly above the time series average of 4.94 red drum per set (Figure 10). Red drum ranged from 29 to 48 inches fork length with most being >40 inches in length. Sampling is scheduled to continue in 2019 and 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 2018, 594 red drum were collected ranging in age from 0 to 42 years

(Table 5). The majority of red drum collected from harvest (18 to 27 inches total length) are ages 1 to 3. Red drum over 27 inches are protected by no 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).

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). Stock status 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 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 (Table 6).

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).
- Improved catch and effort data for the red drum recreational fishery, particularly for the fishery that occurs at night (needed).
- Development of independent surveys to monitor both the sub-adult and adult red drum populations. (ongoing through NCDMF gillnet and longline surveys).
- Continued 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).
- Identification of 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).

FISHERY MANAGEMENT PLAN SCHEDULE RECOMMENDATION

The management program currently in place for red drum has resulted in a stock that has met ongoing management targets. Therefore, the division recommended and the Marine Fisheries Commission accepted the 2016 annual FMP update as the formal review of Amendment 1 to the North Carolina Red Drum FMP. All management strategies that have led to management targets being met will be maintained as outlined in both the state FMP and the ASMFC FMP. Stock conditions will be monitored and reported through each subsequent annual FMP update and the Marine Fisheries Commission will continue to have the option to modify the review schedule annually. The next scheduled formal review of this plan will begin in July 2022.

LITERATURE CITED

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NCDMF (North Carolina Division of Marine Fisheries). 2015. Fishery Management Plan for Interjurisdictional Fisheries: Information Update. North Carolina Department of Environmental Quality. North Carolina Division of Marine Fisheries. Morehead City, North Carolina. 85 pp.

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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) for 1989-2018. All weights are in pounds.

	Recreational				
	Numbers		Weight (lb)		
Year	Landed	Released	Landed	Commercial Weight (lb)	Total Weight (lb)
1989	234,788	15,246	718,961	274,356	993,317
1990	98,374	46,812	261,688	183,216	444,904
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	80,397	648,127
2016	169,195	3,203,452	633,496	77,101	710,597
2017	353,716	2,165,656	1,475,852	186,907	1,662,759
2018	299,577	1,729,260	1,452,358	144,464	1,596,822
Average	157,070	1,011,018	671,168	170,124	867,332

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	64,159	250,000
2016/2017	109,878	250,000
2017/2018	198,401	250,000
Average	146,941	

*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, 1989-2018.

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

Table 4. Red drum length (fork length, inches) data from Marine Recreational Information Program recreational samples, 1989-2018.

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

Table 5. Summary of red drum age samples collected from both dependent (commercial and recreational fisheries) and independent (surveys) sources from 1989-2018.

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

Table 6. Management action taken as a result of Amendment 1 to the N.C. Red Drum FMP.

MANAGEMENT STRATEGY	OUTCOME
Adult harvest limits: Status quo (no harvest over 27 inches TL)	No action required
Recreational targeting of adult red drum: It is unlawful to use any hook larger than 4/0 from July 1 through September 30 in the internal coastal fishing waters of Pamlico Sound and its tributaries south of the Albemarle Sound Management Area as defined in 15A NCAC 03R .0201 and north of a line beginning at a point 34° 59.7942' N - 76° 14.6514' W on Camp Point; running easterly to a point at 34° 58.7853' N - 76° 09.8922' W on Core Banks while using natural bait from 7:00 p.m. to 7:00 a.m. unless the terminal tackle consists of: A circle hook defined as a hook with the point of the hook directed perpendicularly back toward the shank, and with the barb either compressed or removed. A fixed sinker not less than two ounces in weight, secured not more than six inches from the fixed weight to the circle hook. (also continued education on fishing methods that minimize risk to fish). During July through September, unlawful to use J-hooks larger than 4/0 while fishing natural bait in Pamlico Sound and its tributaries.	Rule change implemented 15A NCAC 03J .0306
Recreational bag and size limits: Status quo (one fish per day between 18 and 27 inches TL)	No action required

MANAGEMENT STRATEGY	OUTCOME
Commercial limits: Trip Limit and Bycatch Provision Status quo (7 fish trip limit with 50% bycatch provision). Director retains authority to modify trip limit and bycatch provision as needed.	Implemented by proclamation
Allow the possession of up to 3 fish while engaged in fishing without requiring that they be subject to the bycatch provision. Upon landing/sale all red drum possessed would be subject to bycatch provision.	
Commercial Cap: Continue 250,000 lb annual cap monitored from September 1 to August 31. Implement a split season on the annual commercial cap, capping the period of September 1 to April 30 at 150,000 lb and conserving the remaining portion of the cap for the period of May 1 to August 31. Unused cap in period one would be available for period two. Any annual commercial harvest limit that is exceeded one year will result in the poundage overage being deducted from the subsequent year's commercial harvest limit.	Rule change implemented 15A NCAC 03M .0501
Estuarine gill net discarded bycatch of red drum: Small Mesh Attendance (<5" stretch mesh) Year-round Attendance Expand year-round attendance within 200 yards of shore to include the area of the lower Neuse out to the mouth of the river.	Rule change implemented 15A NCAC 03R .0112
Seasonal Attendance Modify the seasonal attendance requirements for small mesh gill nets (currently May 1 to October 31) to include the period of May 1 through November 30 in the following locations: a) All primary and permanent secondary nursery areas and modified no-trawl areas	Rule change implemented 15A NCAC 03J .0103 & 15A NCAC 03R .0112

MANAGEMENT STRATEGY	OUTCOME
b) Within 200 yards of any shoreline for the areas of Pamlico, Pungo, Neuse and Bay Rivers and bays	
c) Within 50 yards of any shoreline in the areas of Pamlico and Core Sound south to the NC/SC line	
d) Area Core Sound and south is excluded from 50 yard shoreline attendance requirement during October and November	
Modification to current small mesh seasonal attendance area along the Outer Banks (i.e. modified no-trawl area)	Rule change implemented 15A NCAC 03R .0112
Large Mesh (>5" stretch mesh) Require all unattended large mesh gill nets to be set a minimum of 10 feet from any shoreline from June through October	Rule change implemented 15A NCAC 03J .0103
The use of gigs, gaffs or spears to take red drum: Continue to prohibit and move Proclamation FF-40-2001 into rule	Rule change implemented 15A NCAC 03M .0501

FIGURES

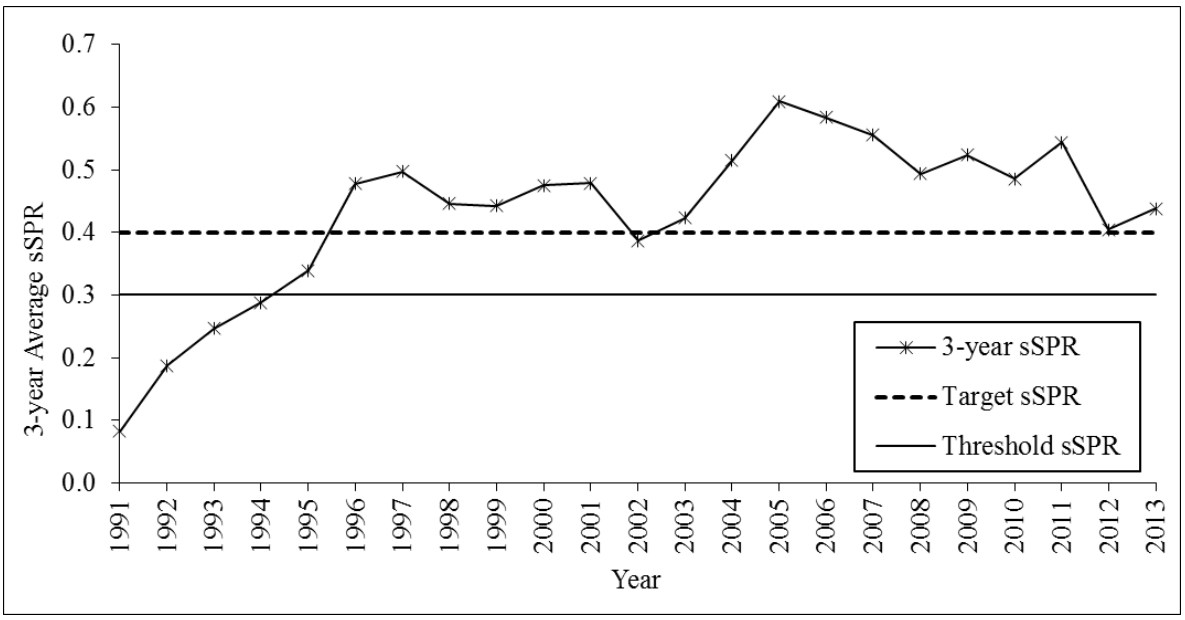

Figure 1. Northern region (North Carolina north) red drum estimates of three-year average static spawning potential ratios (sSPR). Three-year average includes current and previous two year's sSPR estimates. The dashed line shows the 30% overfishing threshold and the solid line shows the 40% target sSPR.

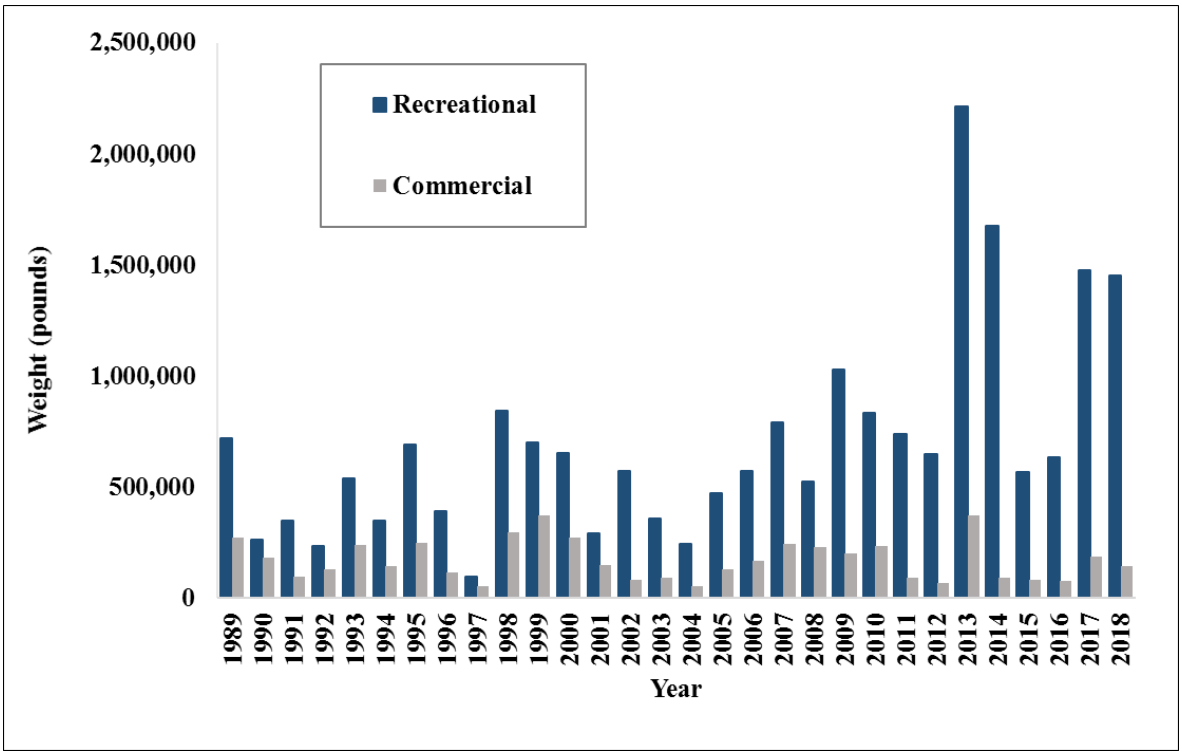

Figure 2. Annual commercial and recreational landings in pounds for red drum in North Carolina from 1989 to 2018.

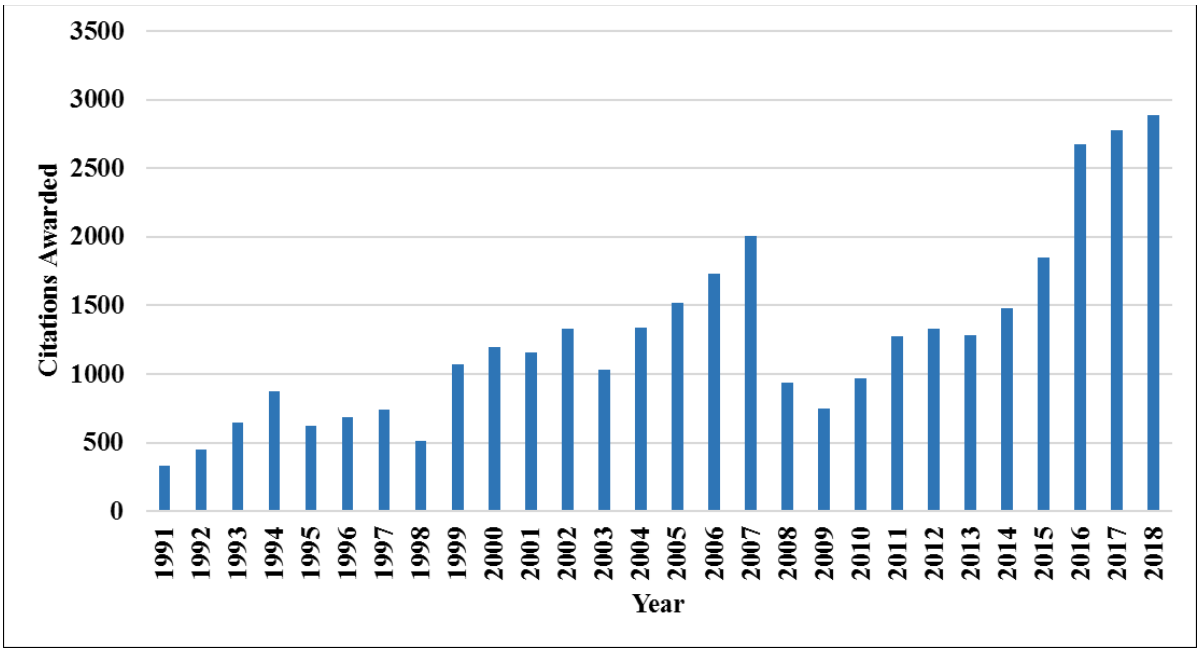

Figure 3. North Carolina Saltwater Fishing Tournament citations awarded for red drum from 1991 to 2018. Citations are awarded for red drum greater than 40 inches total length. Prior to 1998 citations were awarded for either a red drum released (≥40 inches total length) or harvested (≥40 pounds). Since 1998, all citations are for released fish only.

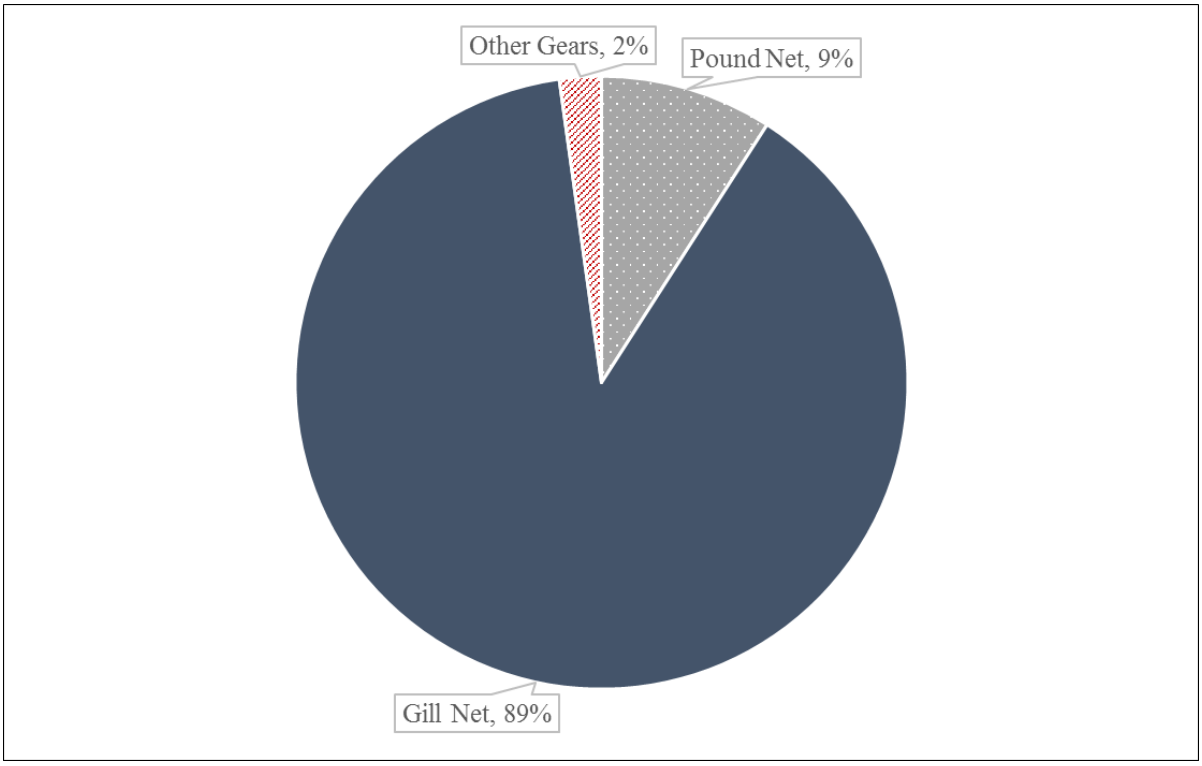

Figure 4. Red drum commercial harvest in 2018 by gear type.

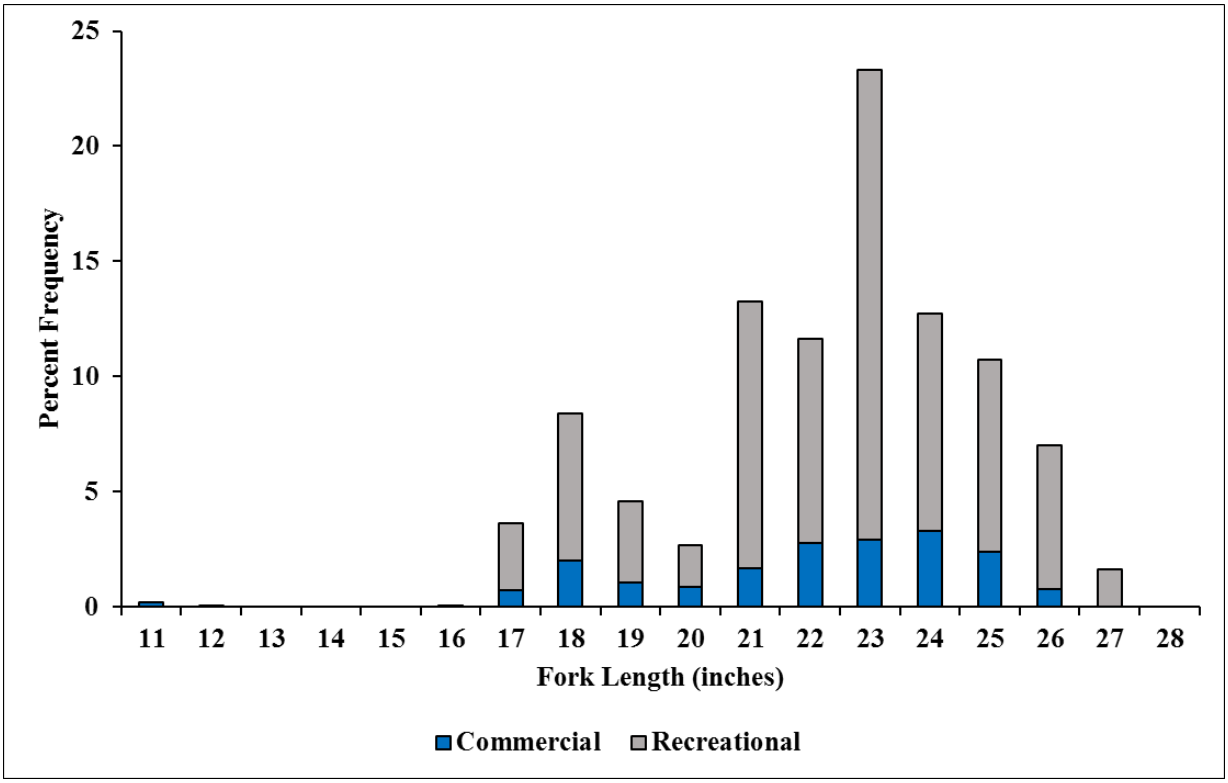

Figure 5. Commercial and recreational length frequency distribution from red drum harvested in 2018.

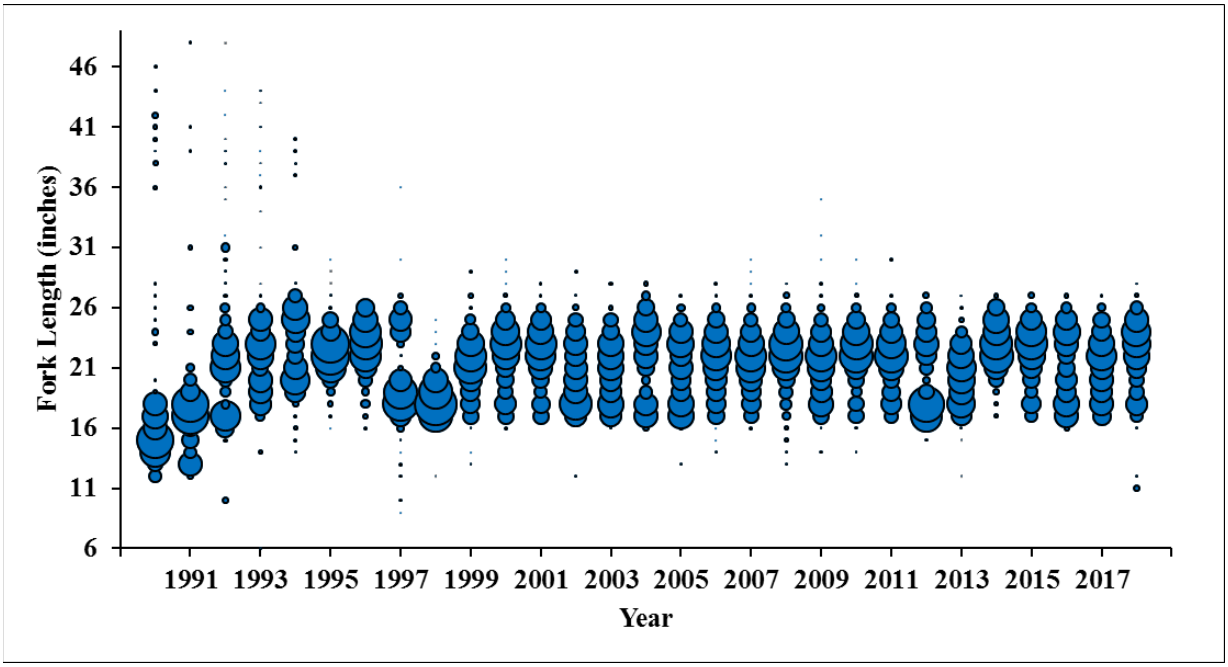

Figure 6. Commercial length frequency (fork length, inches) of red drum harvested from 1990 to 2018. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

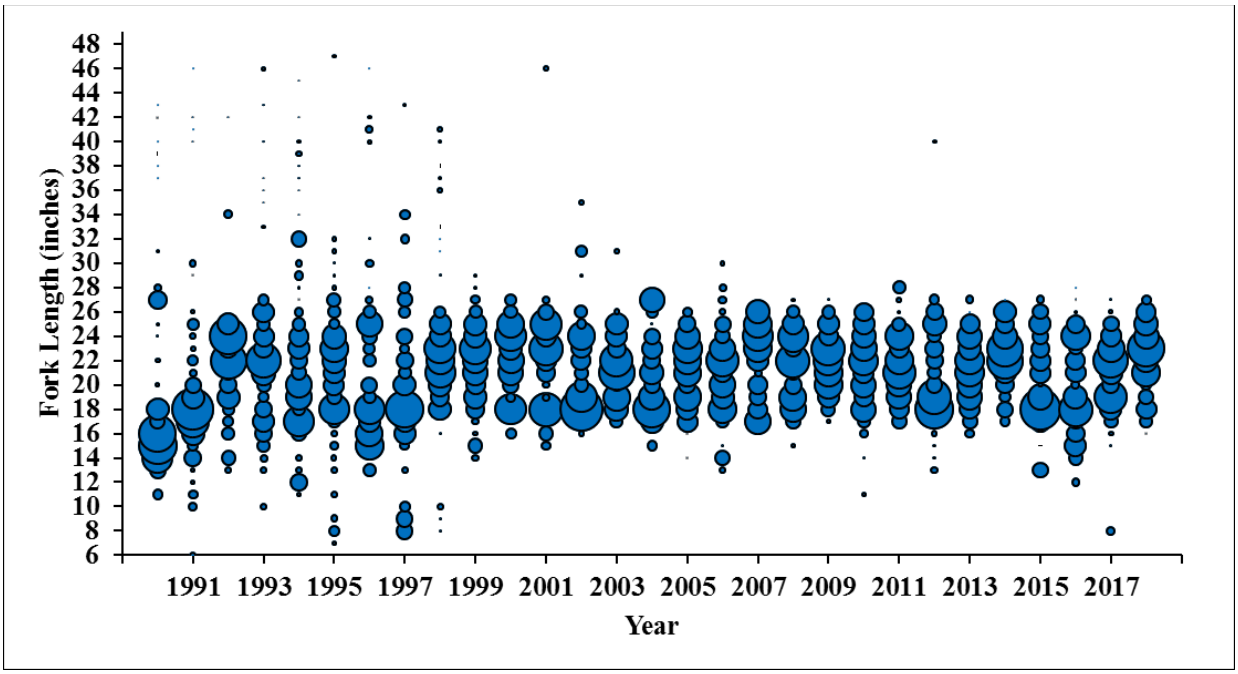

Figure 7. Recreational length frequency (fork length, inches) of red drum harvested from 1990 to 2018. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

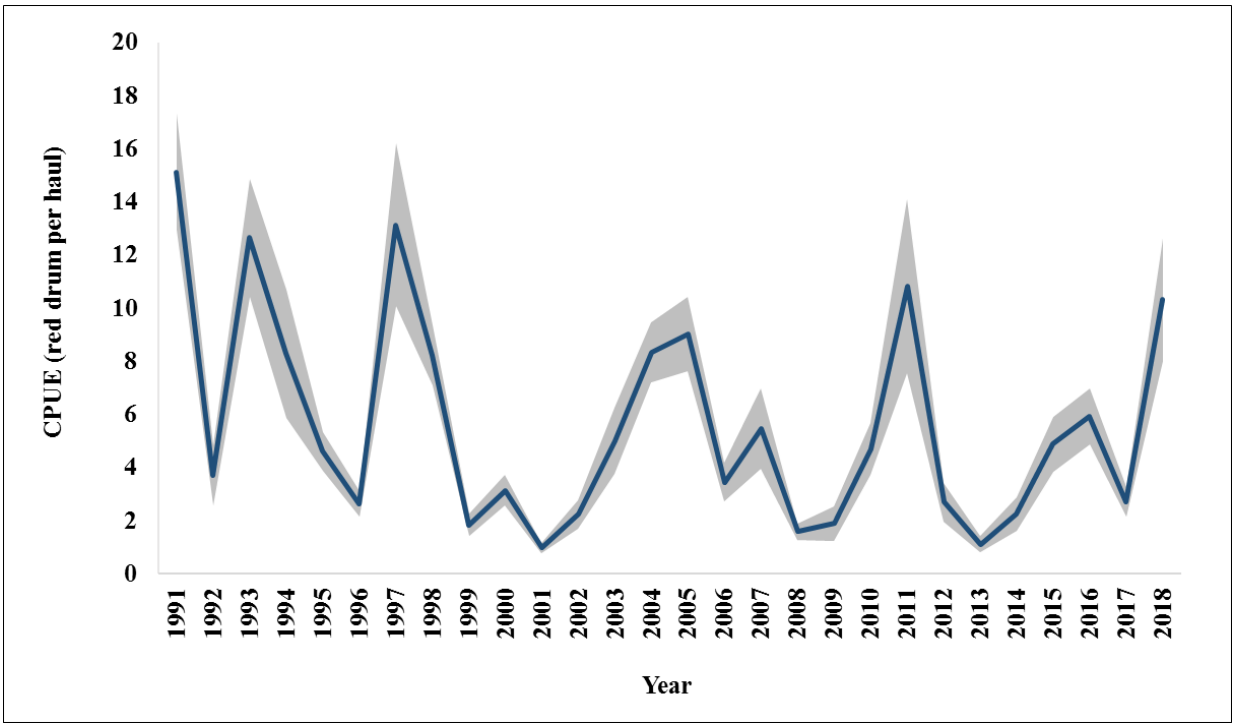

Figure 8. The annual juvenile (age-0) abundance index with standard error shaded in gray from the North Carolina Red Drum Juvenile Seine Survey for the period of 1991-2018.

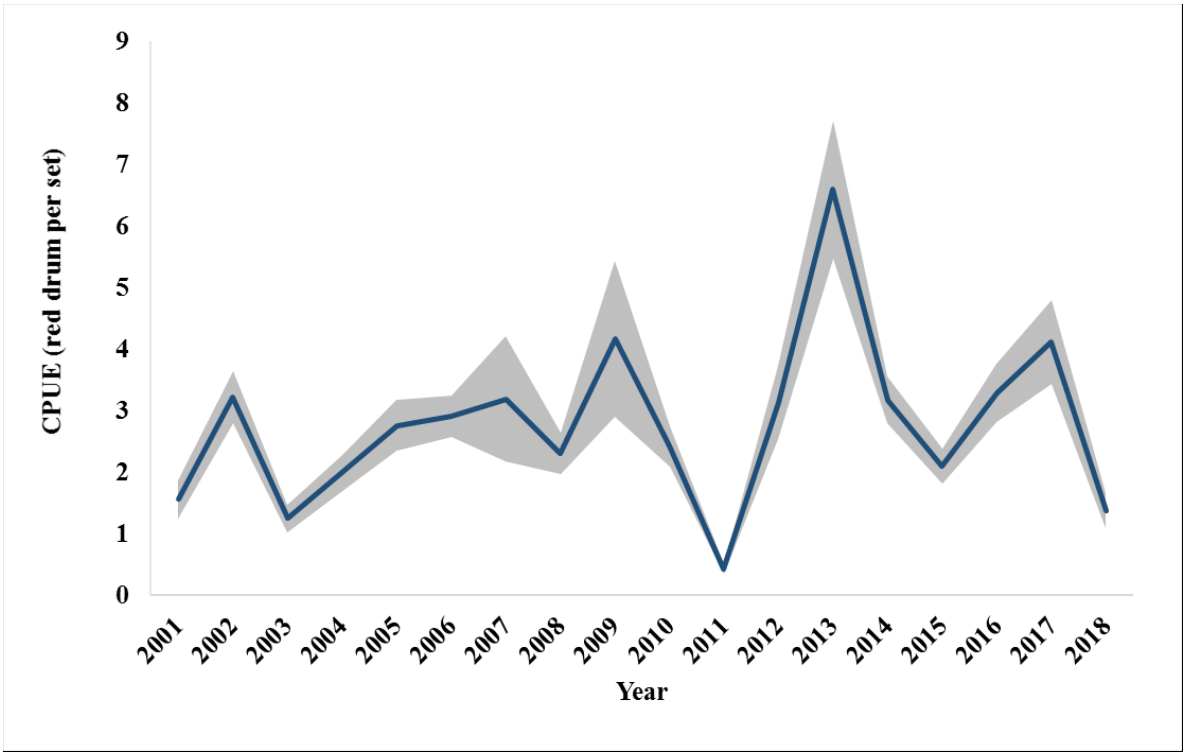

Figure 9. Annual weighted red drum CPUE (number captured ages combined) with standard shaded in gray from the North Carolina Pamlico Sound Independent Gill Net Survey from 2001-2018.

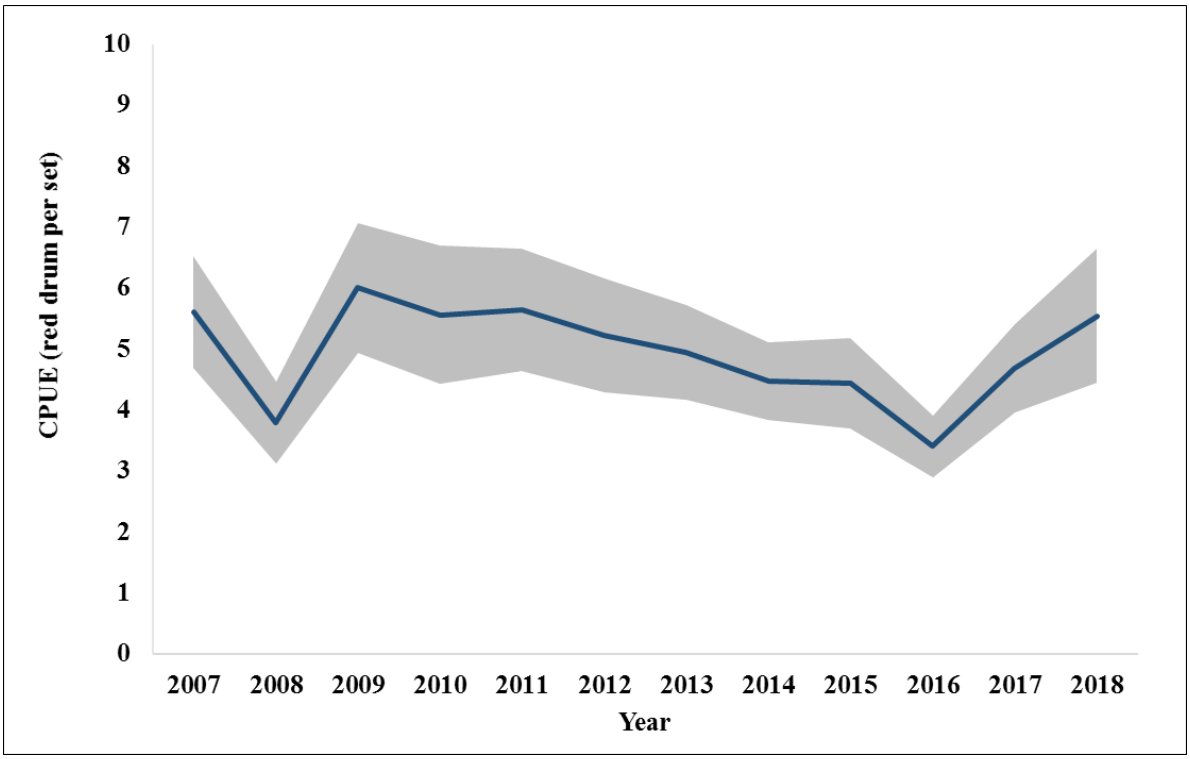

Figure 10. Annual adult red drum CPUE (number captured for ages combined) with standard error shaded in gray from the North Carolina Red Drum Longline Survey from 2007-2018.

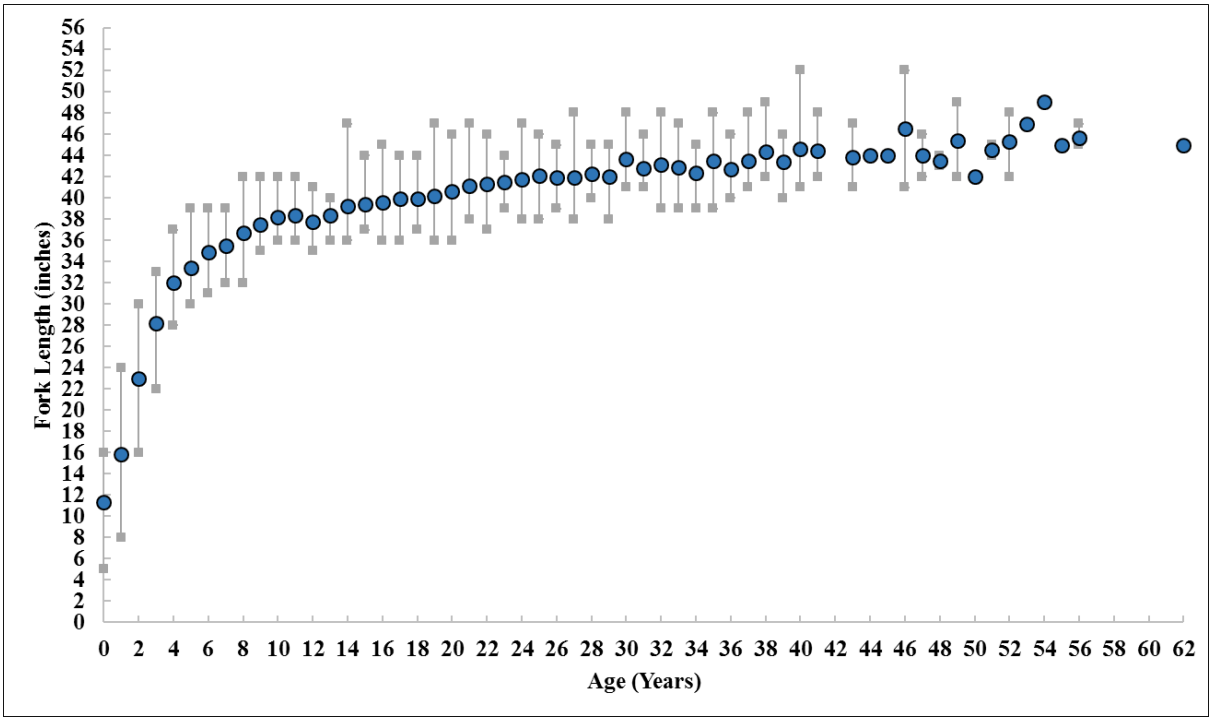

Figure 11. Red drum length at age based on all age samples collected from 1983 to 2018. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age.