

**FISHERY MANAGEMENT PLAN UPDATE  
BLACK DRUM  
AUGUST 2020**

**STATUS OF THE FISHERY MANAGEMENT PLAN**

**Fishery Management Plan History**

Original FMP Adoption:	June 2013
Amendments:	Addendum I – May 2018
Revisions:	None
Supplements:	None
Information Updates:	February 2016
Schedule Changes:	None
Next Benchmark Review:	Benchmark scheduled 2022

In June 2013, the Atlantic States Marine Fisheries Commission (ASMFC) adopted the Interstate Fishery Management Plan (FMP) for Black Drum and required all states to maintain their current regulations and implement a maximum possession limit and minimum size limit (of no less than 12 inches) by January 1, 2014 (ASMFC 2013). States were also required to further increase the minimum size limit (to no less than 14 inches) by January 1, 2016. In response to the ASMFC requirement, the North Carolina Marine Fisheries Commission implemented a 14- to 25-inch total length slot size limit (with one fish over 25 inches), 10-fish recreational bag limit and a 500-pound commercial trip limit effective January 1, 2014. The FMP also includes a management framework to adaptively respond to future concerns or changes in the fishery or population. Concern about the increase in harvest by both recreational and commercial were alleviated by the findings of the 2015 stock assessment. The ASMFC Interstate Fisheries Management Program Policy Board chose to not make any additional changes to the FMP at the time given the findings of the assessment. The next benchmark stock assessment is anticipated to begin in early 2022.

In May 2018, ASMFC approved Addendum I to the Black Drum FMP to allow Maryland to reopen its black drum commercial fishery in the Chesapeake Bay with a daily vessel limit of up to 10 fish and a 28-inch minimum size (ASMFC 2018). The Black Drum Technical Committee noted that reopening the fishery would not likely lead to overfishing due to the relatively small size of the fishery and recommended that biological monitoring be conducted in the commercial fishery.

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP).

The goal of the IJ FMP is to adopt fishery management plans, consistent with N.C. law, approved by the Mid-Atlantic Fishery Management Council, South Atlantic Fishery Management Council, or the ASMFC by reference and implement corresponding fishery regulations in North Carolina to provide compliance or compatibility with approved fishery management plans and amendments, now and in the future. The goal of these plans, established under the Magnuson-Stevens Fishery Conservation and Management Act (federal council plans) and the Atlantic Coastal Fisheries Cooperative Management Act (ASMFC plans) are like the goals of the Fisheries Reform Act of 1997 to “ensure long-term viability” of these fisheries (NCDMF 2015).

### **Management Unit**

The ASMFC FMP includes all states from Florida to New Jersey. The management unit is defined as the black drum (*Pogonias cromis*) resource throughout the range of the species within U.S. waters of the northwest Atlantic Ocean from the estuaries eastward to the offshore boundaries of the U.S. Exclusive Economic Zone (EEZ) (ASMFC 2015).

### **Goal and Objectives**

The goal of the Black Drum FMP is to provide an efficient management structure to implement coastwide management measures. The objectives of the FMP include:

1. Provide a flexible management system to address future changes in resource abundance, scientific information, and fishing patterns among user groups or area.
2. Promote cooperative collection of biological, economic, and sociological data required to effectively monitor and assess the status of the black drum resource and evaluate the management efforts.
3. Manage the black drum fishery to protect both young individuals and established breeding stock.
4. Develop research priorities that will further refine the black drum management program to maximize the biological, social, and economic benefits derived from the black drum population.

### **STATUS OF THE STOCK**

#### **Life History**

Black drum is the largest member of the drum family (Sciaenidae), reaching sizes of over 46 inches and 120 pounds. The range of black drum extends along the nearshore western Atlantic coast from the Gulf of Maine to Florida, into the Gulf of Mexico, and as far south as Argentina. Along the Atlantic Coast, black drum are thought to migrate northward and inshore each spring and southward and offshore by late fall. Juvenile black drum can be found throughout the estuarine waters of North Carolina, while adults tend to congregate around structure including

bridge and dock pilings. They are primarily bottom feeders; juvenile diets consist mainly of small fish and invertebrates, while the adult diet consists primarily of mollusks and crustaceans. Spawning is thought to occur in the offshore waters of the Mid-Atlantic during the winter and early spring. The number of juvenile fish entering the population annually (recruitment) is thought to be highly variable and dependent on natural environmental conditions. Females are sexually mature between the ages of 4 and 6 (25 to 28 inches) and spawn yearly through adulthood. An average-sized female may spawn 32 million eggs each year. At ages 4 and 5 (22 to 25 inches) males are mature. The species is long-lived, reaching up to 60 years of age. Black drum are approximately 11 to 14 inches at age 1, 15 to 17 inches at age 2, and 19 to 21 inches at age 3.

### **Stock Status**

The 2015 ASMFC Black Drum Stock Assessment determined that the stock is not overfished and not experiencing overfishing (ASMFC 2015).

### **Stock Assessment**

Variable catch history in state surveys and fisheries, coupled with complex migratory patterns, made the use of traditional statistical catch-at-age models difficult. A data-poor modeling approach was used for the first coastwide benchmark stock assessment (ASMFC 2015). Data-poor models estimate reference points based on historical catch data and life history information. A Depletion-Based Stock Reduction Analysis (DB-SRA) model was used to estimate biomass and maximum sustainable yield (MSY). Median MSY was estimated to be 2.12 million pounds and the median overfishing limit (OFL) is estimated to be 4.12 million pounds (see Management Strategy section below). While the median biomass has declined steadily from the 1900s, the median biomass in 2012 was well above the level needed to produce maximum sustainable yield ( $B_{MSY}$ ; 47.26 million pounds; Figure 1). The DB-SRA results determined that black drum is not overfished and not experiencing overfishing based on their life history, indices of abundance, and history of exploitation (ASMFC 2015).

## **STATUS OF THE FISHERY**

### **Current Regulations**

All harvest is limited to black drum between a 14-inch total length minimum size and 25-inch total length maximum size for both the recreational and commercial fisheries, except that one black drum over 25-inches total length may be retained. The recreational bag limit is ten fish per day. A daily commercial possession limit of no more than 500 pounds per trip is allowed for a commercial fishing operation, regardless of the number of persons, license holders, or vessels involved in the operation.

### **Commercial Landings**

Black drum is primarily caught as bycatch in several North Carolina commercial fisheries; however, they are predominantly landed in the estuarine gill net (53%) and pound net (43%)

fisheries (Figure 2). The annual commercial harvest of black drum has been highly variable (Table 1; Figure 3). On average 118,787 pounds of black drum were landed annually from 1994 to 2019. Commercial landings have ranged from a low of 27,750 pounds in 1998 to a high of 497,479 pounds in 2002. Commercial landings decreased 27% from 2018 to 2019.

### **Recreational Landings**

Recreational estimates across all years have been updated and are now based on the Marine Recreational Information Program (MRIP) new Fishing Effort Survey-based calibrated estimates. For more information on MRIP see <https://www.fisheries.noaa.gov/topic/recreational-fishing-data>.

The recreational landings have been highly variable, ranging from a low of 164,280 pounds in 1998 to a high of 2,709,269 pounds in 2013 (Table 1; Figure 3). In 2019, 404,452 pounds of black drum were harvested, below the time-series average of 790,598 pounds. The harvest (pounds of fish) decreased 6% from 2018 to 2019. Recreational releases (number of fish) decreased 48% from 2018 to 2019.

The NCDMF offers award citations for exceptional catches of black drum. Black drum greater than 35 pounds or 40 inches total length are eligible for an award citation. In 2019, 24 citations were awarded, 20 of which were released alive (Figure 4).

Harvest data from the Recreational Commercial Gear License (RCGL) were collected from 2002 to 2008. The program was discontinued in 2009 due to lack of funding. From 2002-2008, an average of 6,101 pounds of black drum were harvested per year (Table 2).

## **MONITORING PROGRAM DATA**

### **Fishery-Dependent Monitoring**

Commercial black drum landings are monitored through the North Carolina trip ticket program. Under this program, licensed fishermen can only sell commercial catch from coastal fishing waters to licensed NCDMF fish dealers. The dealer is required to complete a trip ticket every time a licensed fisherman lands fish. Trip tickets capture data on gears used to harvest fish; area fished, species harvested, and total weights of each species/market grade category. Trip tickets are submitted to NCDMF on the 10<sup>th</sup> of the month following the month in which the landings occurred. Landings are available approximately 30 to 45 days after they are submitted from the dealers.

Commercial fishing activity is monitored through fishery dependent sampling conducted under Title III of the Interjurisdictional Fisheries Act and has been ongoing since 1982. Biological samples (lengths, aggregate weights) are obtained from several NCDMF commercial fisheries dependent sampling programs. Black drum lengths and aging structures are collected at local fish houses. After sampling a portion of the catch, the total weight of the catch by species and market grade are obtained for each trip, either by using the trip ticket weights or some other reliable estimate.

Since the implementation of the 14- to 25-inches slot limit in 2014, as would be expected the mean total length (TL) of commercially harvested black drum has increased. The mean TL has ranged from 11-inches to 19-inches (Table 3). In 2019, the minimum TL was 12-inches and the maximum TL was 39-inches (Figure 5). Undersized black drum continue to be harvested since the implementation of the 14-inch minimum size limit established in 2014, likely due to fishermen confusing their identity between black drum and sheepshead (Figure 6). The minimum size limit of sheepshead is smaller than the minimum size limit for black drum at 10-inches fork length (FL).

The mean TL of recreational harvested black drum ranged from a low of 10-inches in 1990 to a maximum of 19-inches 1989 (Table 4). In 2019, the minimum TL was 8-inches and the maximum TL was 26-inches (Figure 5). Similar to the commercial fishery, undersized black drum continued to be harvested since the implementation of the 14-inch minimum size limit established in 2014 (Figure 7).

### **Fishery-Independent Monitoring**

A fishery independent gill net survey (Program 915) 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 black drum this survey will help managers assess the black drum stocks without relying solely on commercial and recreational fishery dependent data. Additionally, data collected is used to help improve bycatch estimates, evaluate the success of management measures, and look at habitat usage.

The annual weighted black drum relative index of abundance from the independent gill net survey has ranged from a high of 3.52 in 2002 to a low of 0.38 in 2012 (Table 5; Figure 8). In 2019, the relative index was 0.94, below the time-series average (0.98 black drum per set). Proportional Standard Error (PSE) has ranged from 12 to 39. This survey was used in the ASMFC benchmark stock assessment for black drum as annual index of relative abundance for sub-adult and adult black drum.

Black drum age structures are collected from various fishery independent (scientific surveys) and dependent (fisheries) sources throughout the year. In 2019, 450 black drum were aged. Ages ranged from 0 to 46 years; however, a majority of the age structures were collected from independent sources and may not be representative of fish caught in North Carolina's recreational and commercial fisheries (Table 6). Beyond age 4, there is significant overlap in the length at age for black drum (Figure 9).

### **MANAGEMENT STRATEGY**

Data poor models such as the one used for 2015 ASMFC Black Drum Stock Assessment are designed to estimate reference points based on historical catch data and the life history of a particular species. Due to the uncertainty of the inputs and the nature of data poor methods the ASMFC Stock Assessment Subcommittee (SAS) recommended that a precautionary maximum sustainable yield (MSY) estimate of 2.12 million pounds with an interquartile range of 1.60 to 3.05 million pounds as the recommended target reference point (Figure 1). The threshold MSY

or overfishing limit (OFL) was set at 4.12 million pounds. The SAC also noted that the stock assessment could be improved by incorporating a more complex, data-rich assessment method such as a statistical catch-at-age model once several data limitations are met (ASMFC 2019).

Additional biological sampling (length and age) of recreational and commercial fisheries and the development of a fishery-independent survey to track abundance and age structure of the mature stock are needed to make this transition. Estimates of commercial discards and movement patterns along the coast would further improve the assessment.

In 2018, the Addendum I was approved to allow Maryland to reopen their commercial fishery in the Chesapeake Bay with a daily vessel limit of up to 10 fish and a 28-inch minimum size limit. The fishery reopened on February 25, 2019. Each year the ASMFC Black Drum Plan Review Team (PRT) monitors each states' compliance with the FMP during its annual review. States must demonstrate that the compliance criteria of the FMP are satisfied and submit an annual report concerning its fisheries and management programs. Following the review of the 2018 fishing year, the PRT determined that all states were compliant with the FMP (ASMFC 2019).

See Table 7 for current management strategies and implementation status of the ASMFC Black Drum FMP.

## **RESEARCH NEEDS**

The FMP outlines research needs for black drum. The ASMFC black drum PRT will annually review and prioritize the research needs as part of the ASMFC FMP review process. The research recommendations outlined in the 2019 Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for Black Drum include:

- Update the 2015 stock assessment or conduct a new benchmark stock assessment that includes the recalibrated MRIP recreational harvest estimates based on the new, mail-based FES – HIGH (needed)
- Age otoliths that have been collected and archived – HIGH (ongoing)
- Collect information to characterize the size composition of fish discarded in recreational fisheries – HIGH (ongoing).
- Collect information on the magnitude and sizes of commercial discards. Obtain better estimates of black drum bycatch in other fisheries, especially juvenile fish in south Atlantic states – HIGH (ongoing)
- Increase biological sampling in commercial fisheries to better characterize the size and age composition of commercial fisheries by state and gear – HIGH (ongoing).
- Increase biological sampling in recreational fisheries to better characterize the size and age composition by state and wave – HIGH (ongoing)
- Obtain estimates of selectivity-at-age for commercial fisheries by gear, recreational harvest, and recreational discards – HIGH (ongoing).
- Continue all current fishery-independent surveys and collect biological samples for black drum on all surveys – HIGH (ongoing)
- Develop fishery-independent adult surveys. Consider long line and purse seine surveys – HIGH (ongoing).

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- Collect age samples, especially in states where maximum size regulations preclude the collection of adequate adult ages – HIGH (ongoing).
- Conduct reproductive studies, including: age and size-specific fecundity, spawning frequency, spawning behaviors by region, and movement and site fidelity of spawning adults – HIGH (needed).
- Conduct a high reward tagging program to obtain improved return rate estimates. Continue and expand current tagging programs to obtain mortality and growth information and movement at size data – HIGH (needed).
- Conduct tagging studies using implanted radio tracking tags that are compatible with coastal tracking arrays along the Atlantic coast in order to track movement and migration of adults – HIGH (needed).
- Conduct studies to estimate catch and release mortality rates in recreational fisheries – HIGH (needed).
- Improve sampling of night time fisheries – MEDIUM (needed).
- Collect genetic material (i.e., create “genetic tags”) over a long time span to obtain information on movement and population structure, and potentially estimate population size – MEDIUM (needed).
- Obtain better estimates of harvest from the black drum recreational fishery, especially in states with short seasons – MEDIUM (ongoing).

### LITERATURE CITED

ASMFC (Atlantic States Marine Fisheries Commission). 2013. Interstate Fishery Management Plan for Black Drum. Arlington, VA. 72 pp.

ASMFC. 2015. Black Drum Stock Assessment and Peer Review Reports. Atlantic States Marine Fisheries Commission, Stock Assessment Report. 352 ASMFC (Atlantic States Marine Fisheries Commission). 319 pp.

ASMFC. 2018. Addendum I to the Black Drum Interstate Fishery Management Plan. Atlantic States Marine Fisheries Commission. Arlington, VA. 4 pp.

ASMFC. 2019. 2019 Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for Black Drum (*Pogonias cromis*) 2018 Fishing Year. Arlington, VA. October 2018. 17 pp.

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.

ASMFC AND FEDERALLY-MANAGED SPECIES WITH N.C. INDICES – BLACK DRUM

**TABLES**

Table 1. Black drum recreational harvest and number released (Marine Recreational Information Program) and commercial harvest (North Carolina Trip Ticket Program) for 1994-2019. All weights are in pounds.

Year	Recreational		Commercial Weight (lb)	Total Weight (lb)	
	Numbers Landed	Released			Weight (lb) Landed
1994	132,517	9,122	272,820	33,536	306,356
1995	931,269	227,608	713,652	128,221	841,873
1996	468,766	176,061	608,460	122,837	731,297
1997	106,854	62,498	277,316	86,610	363,926
1998	105,349	95,834	164,280	27,750	192,030
1999	374,245	267,723	561,678	122,771	684,449
2000	293,983	112,470	685,687	98,784	784,471
2001	400,983	325,234	446,202	77,892	524,094
2002	846,855	215,810	1,791,703	497,479	2,289,182
2003	1,265,995	481,742	1,926,671	148,785	2,075,456
2004	296,531	255,753	566,484	62,445	628,929
2005	465,076	376,363	509,328	44,989	554,317
2006	276,257	265,369	431,212	125,214	556,426
2007	876,178	832,132	697,822	148,231	846,053
2008	925,963	548,931	1,232,589	301,998	1,534,587
2009	449,901	411,358	421,788	148,994	570,782
2010	650,010	427,577	812,699	69,194	881,893
2011	1,259,216	711,755	823,423	56,083	879,506
2012	556,482	397,155	879,401	94,352	973,753
2013	1,511,995	497,334	2,709,269	127,170	2,836,439
2014	109,307	1,964,749	230,834	51,217	282,051
2015	276,126	1,791,758	780,876	51,097	831,973
2016	459,078	2,530,596	1,322,547	90,055	1,412,602
2017	355,544	2,336,352	856,081	182,937	1,039,018
2018	134,624	1,450,855	428,273	109,771	538,044
2019	156,401	756,749	404,452	80,036	484,488
Average	526,366	674,188	790,598	118,787	909,385

Table 2. North Carolina RCGL harvest of black drum 2002-2008. Estimates of trips and landings are from a RCGL survey conducted from 2002-2008; funding was discontinued in 2009.

Year	Number Harvested	Pounds Harvested	Number Released	Total Catch	
2002		8,970	16,101	1,375	10,345
2003		2,224	3,821	1,767	3,990
2004		1,480	3,651	1,338	2,819
2005		1,374	1,518	1,267	2,641
2006		2,939	4,496	2,549	5,488
2007		2,418	4,450	1,413	3,831
2008		3,470	8,670	2,069	5,539

ASMFC AND FEDERALLY-MANAGED SPECIES WITH N.C. INDICES – BLACK DRUM

Table 3. Mean, minimum, maximum total length (TL; inches), and total number of black drum measured from North Carolina commercial fish house samples, 1994-2019.

Year	Mean TL (inches)	Minimum TL (inches)	Maximum TL (inches)	Total Measured (number)
1994	14	9	17	51
1995	11	8	43	224
1996	14	8	26	262
1997	16	8	23	141
1998	17	6	25	92
1999	14	8	48	692
2000	16	8	30	888
2001	16	8	36	471
2002	15	8	47	1,968
2003	17	8	49	631
2004	16	8	48	297
2005	15	5	44	331
2006	14	7	48	1,543
2007	14	7	50	1,919
2008	15	7	50	2,695
2009	16	7	48	1,060
2010	17	8	49	658
2011	13	7	33	1,204
2012	15	6	37	1,123
2013	16	5	36	866
2014	17	10	47	381
2015	19	10	44	310
2016	17	10	47	810
2017	18	10	30	549
2018	19	14	46	422
2019	18	12	39	365

ASMFC AND FEDERALLY-MANAGED SPECIES WITH N.C. INDICES – BLACK DRUM

Table 4. Mean, minimum, maximum total length (TL; inches), and total number of black drum measured from Marine Recreational Information Program recreational samples, 1989-2019.

Year	Mean TL (inches)	Minimum TL (inches)	Maximum TL (inches)	Total Measured (number)
1989	18	12	26	1
1990	10	7	28	6
1991	11	9	22	22
1992	13	9	19	7
1993	11	8	25	61
1994	15	9	32	121
1995	11	7	30	390
1996	12	7	25	339
1997	15	9	33	144
1998	12	7	26	167
1999	13	8	31	248
2000	15	8	24	178
2001	11	8	25	173
2002	14	8	30	219
2003	11	7	52	198
2004	14	8	27	127
2005	11	7	34	89
2006	13	9	33	104
2007	11	7	20	191
2008	12	7	48	363
2009	11	8	25	191
2010	11	7	29	258
2011	10	7	24	567
2012	13	7	26	237
2013	13	7	26	154
2014	15	7	24	33
2015	17	11	25	75
2016	17	10	28	116
2017	16	9	27	162
2018	16	8	26	128
2019	16	10	44	106

ASMFC AND FEDERALLY-MANAGED SPECIES WITH N.C. INDICES – BLACK DRUM

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

Year	N	Index	SE	PSE
2001	237	1.91	0.41	21
2002	320	3.52	0.46	13
2003	320	1.16	0.3	26
2004	320	0.46	0.09	20
2005	304	0.49	0.13	27
2006	320	0.78	0.09	12
2007	320	0.76	0.16	21
2008	320	0.87	0.16	18
2009	320	0.79	0.16	20
2010	320	0.54	0.18	33
2011	298	0.84	0.15	18
2012	308	0.38	0.07	18
2013	308	0.42	0.07	17
2014	308	0.76	0.17	22
2015	306	1.04	0.41	39
2016	308	1.33	0.21	16
2017	308	1.17	0.26	22
2018	308	0.42	0.07	17
2019	306	0.94	0.17	18

Table 6. Summary of black drum age samples collected from both dependent (commercial and recreational fisheries) and independent (surveys) sources from 2011-2019\*<sup>+</sup>.

Year	Modal Age	Minimum Age	Maximum Age	Total Number Aged
2011	0	0	60	140
2012	1	0	3	327
2013	2	0	4	187
2014	1	0	31	409
2015	0	0	2	398
2016	1	0	13	667
2017	1	0	43	738
2018	1	0	46	430
2019*	1	0	32	450

\*Preliminary ages, pending second read.

<sup>+</sup>Samples collected from partial carcasses were not included

ASMFC AND FEDERALLY-MANAGED SPECIES WITH N.C. INDICES – BLACK DRUM

Table 7. Summary of ASMFC management strategies and their implementation status for Black Drum Fishery Management Plan.

Management Strategy	Implementation Status
<i>HARVEST MANAGEMENT</i>	
Implement a maximum possession limit and size limit (of no less than 12 inches) by January 1, 2014	Accomplished (other states)
Implement a maximum possession limit and size limit (of no less than 14 inches) by January 1, 2016	Proclamation FF-73-2013
Implement a 10 fish and 28-inch minimum size limit for Maryland’s commercial fishery by February 25, 2019	Accomplished (Maryland)

FIGURES

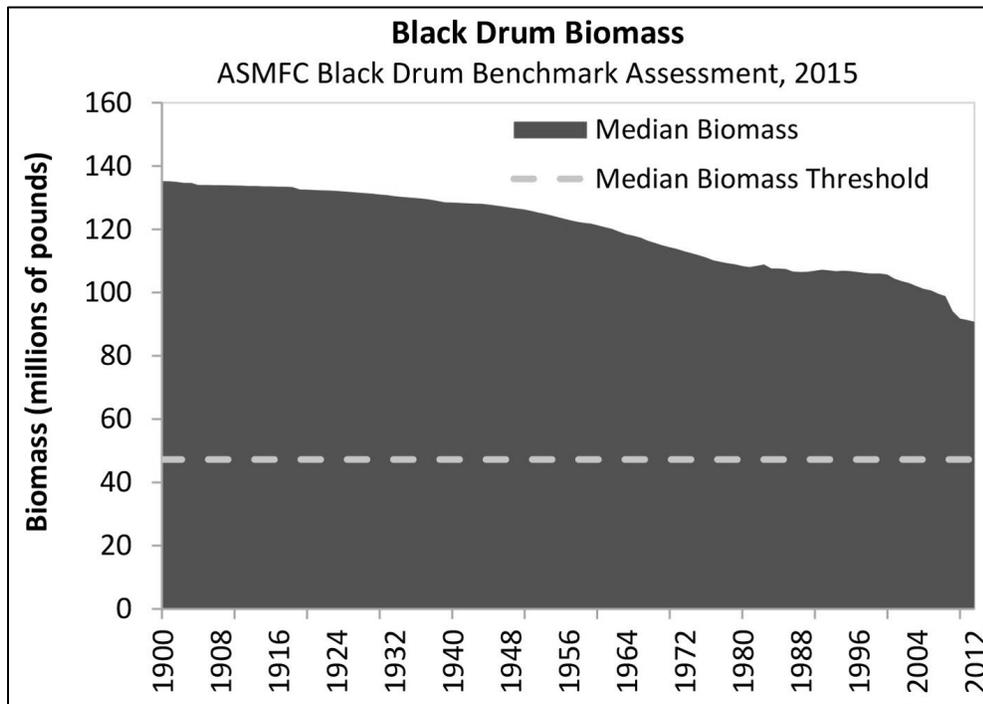


Figure 1. Depletion-Based Stock Reduction Analysis (DB-SRA) median biomass and threshold, 1900-2012 (ASMFC 2019).

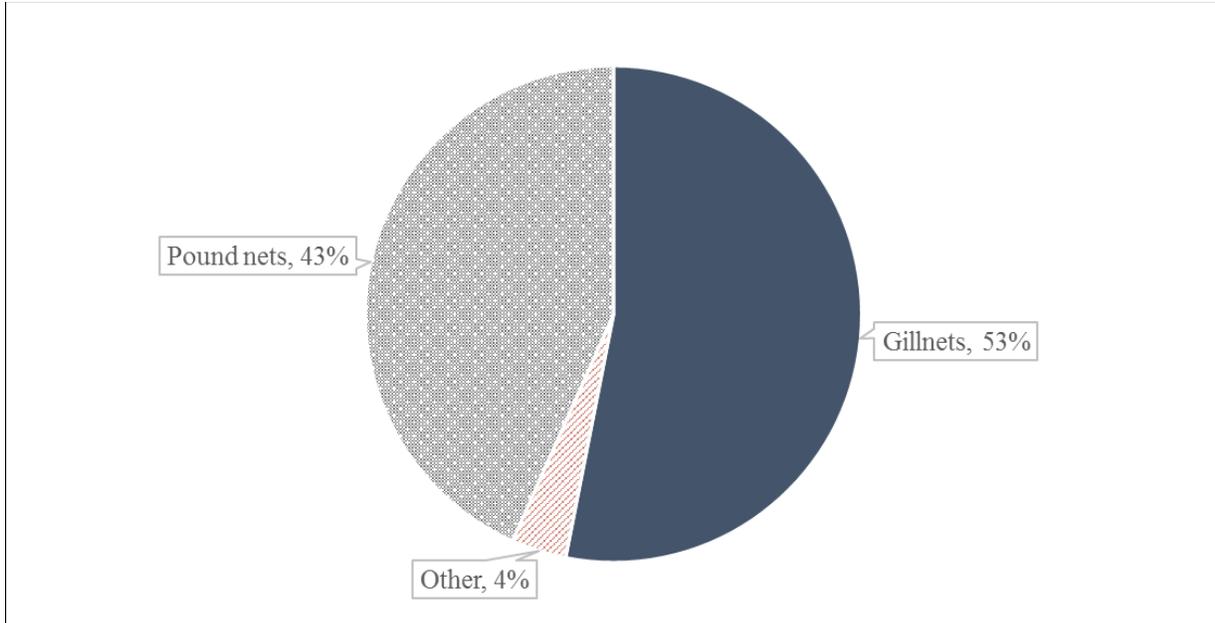


Figure 2. Black drum commercial harvest in 2019 by gear type. “Other” includes haul seines, crab pots, channel nets, and fyke nets.

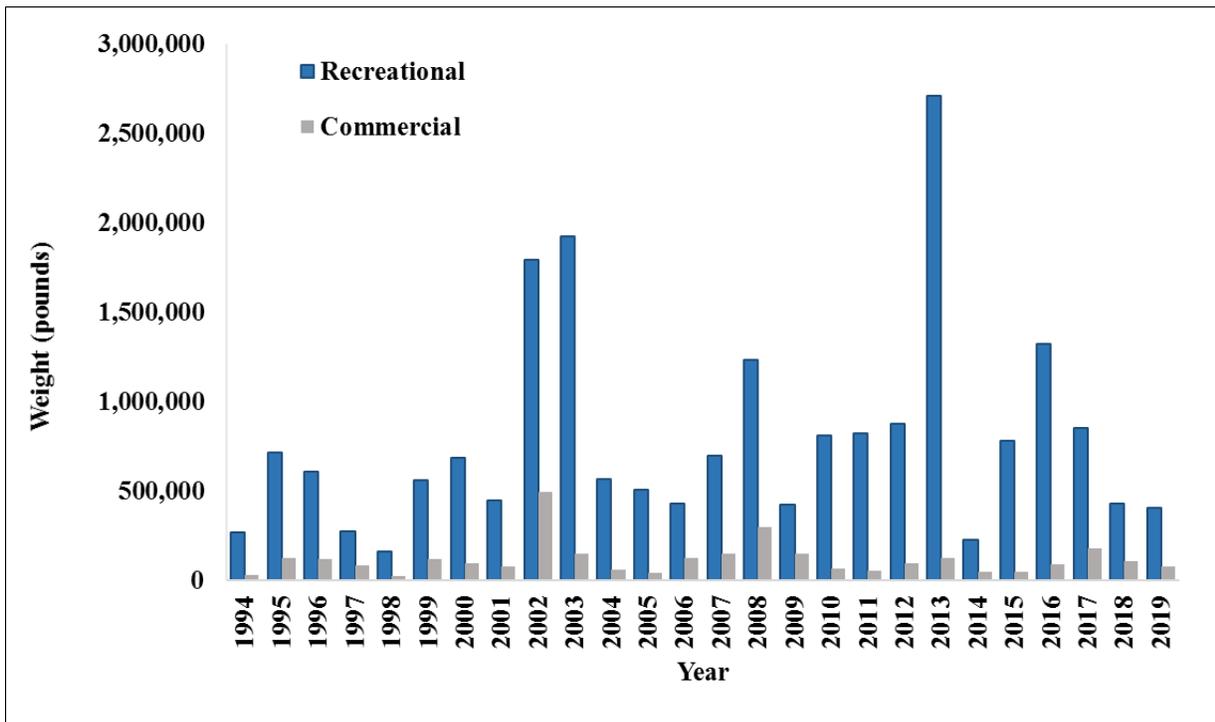


Figure 3. Annual commercial and recreational landings in pounds for black drum in North Carolina from 1994 to 2019.

ASMFC AND FEDERALLY-MANAGED SPECIES WITH N.C. INDICES – BLACK DRUM

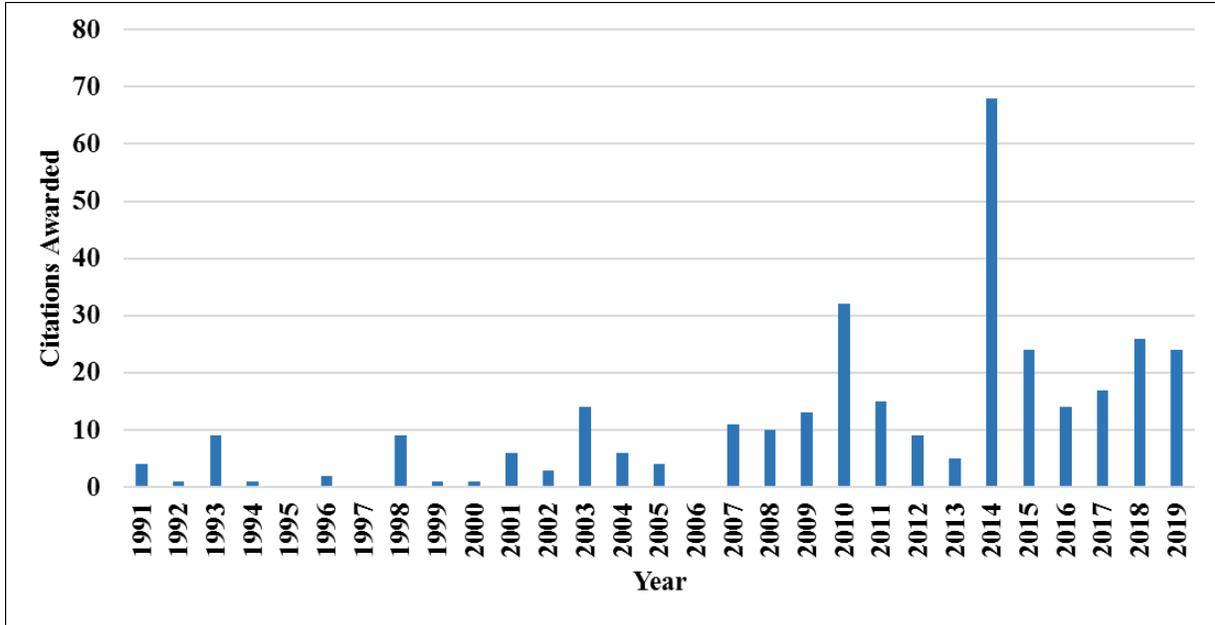


Figure 4. North Carolina Saltwater Fishing Tournament citations awarded for black drum from 1991 to 2019. Citations are awarded for black drum greater 35 pounds or 40 inches total length.

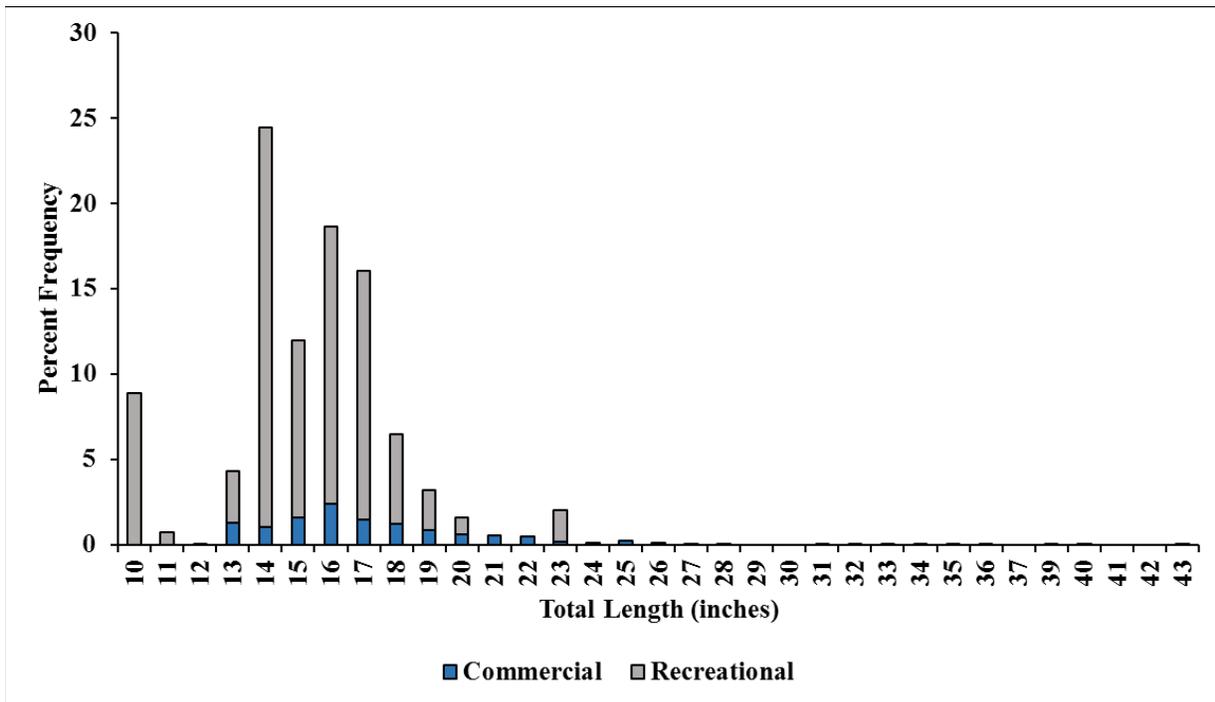


Figure 5. Commercial and recreational length frequency (total length, inches) of black drum harvested in 2019.

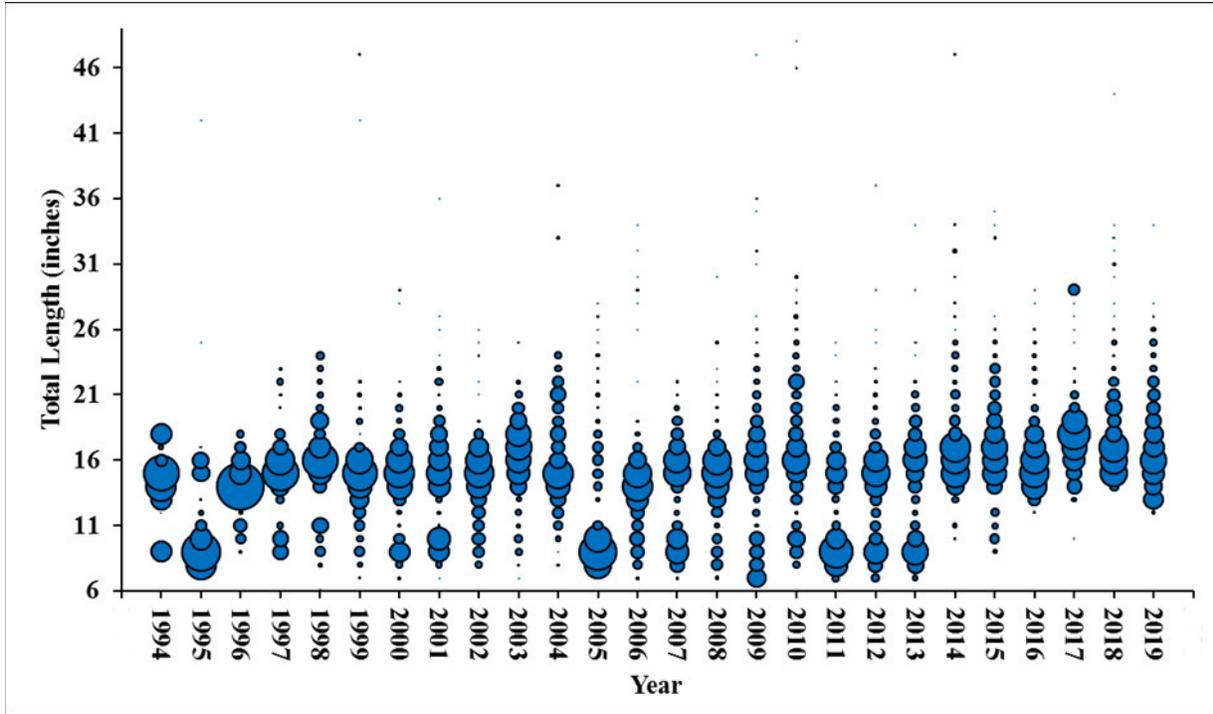


Figure 6. Commercial length frequency (total length, inches) of black drum harvested from 1994 to 2019. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

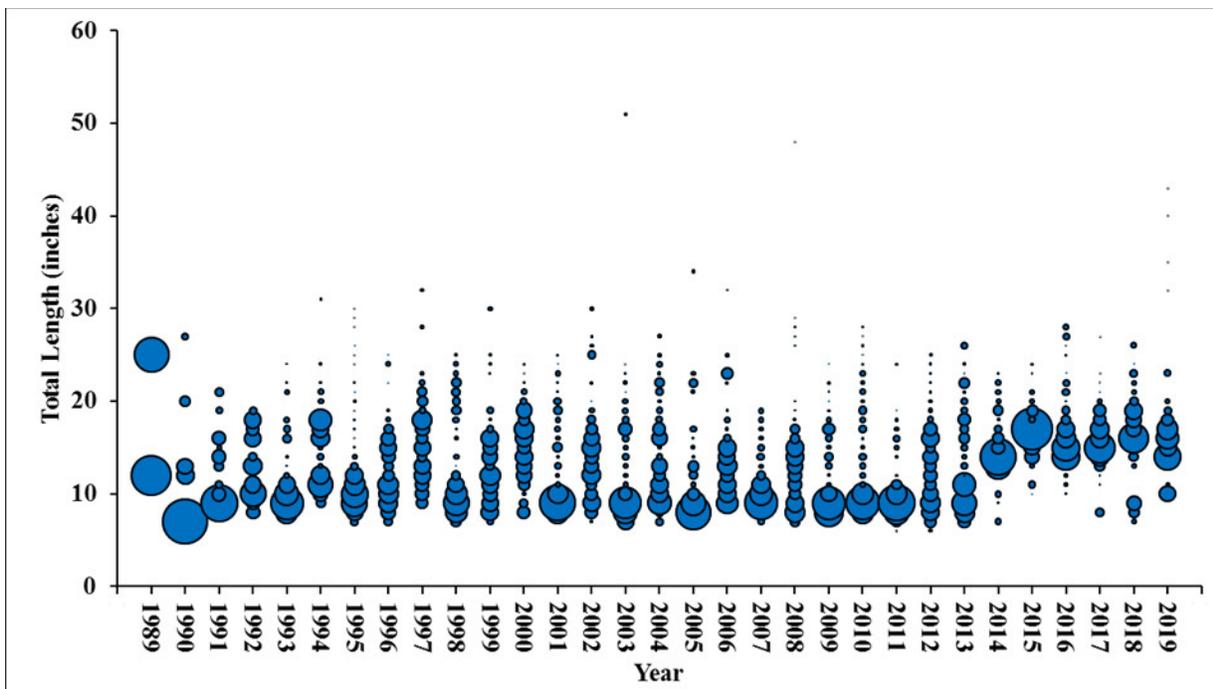


Figure 7. Recreational length frequency (total length, inches) of black drum harvested from 1989 to 2019. Bubbles represent fish harvested at length and the size of the bubble is equal to the proportion of fish at that length.

ASMFC AND FEDERALLY-MANAGED SPECIES WITH N.C. INDICES – BLACK DRUM

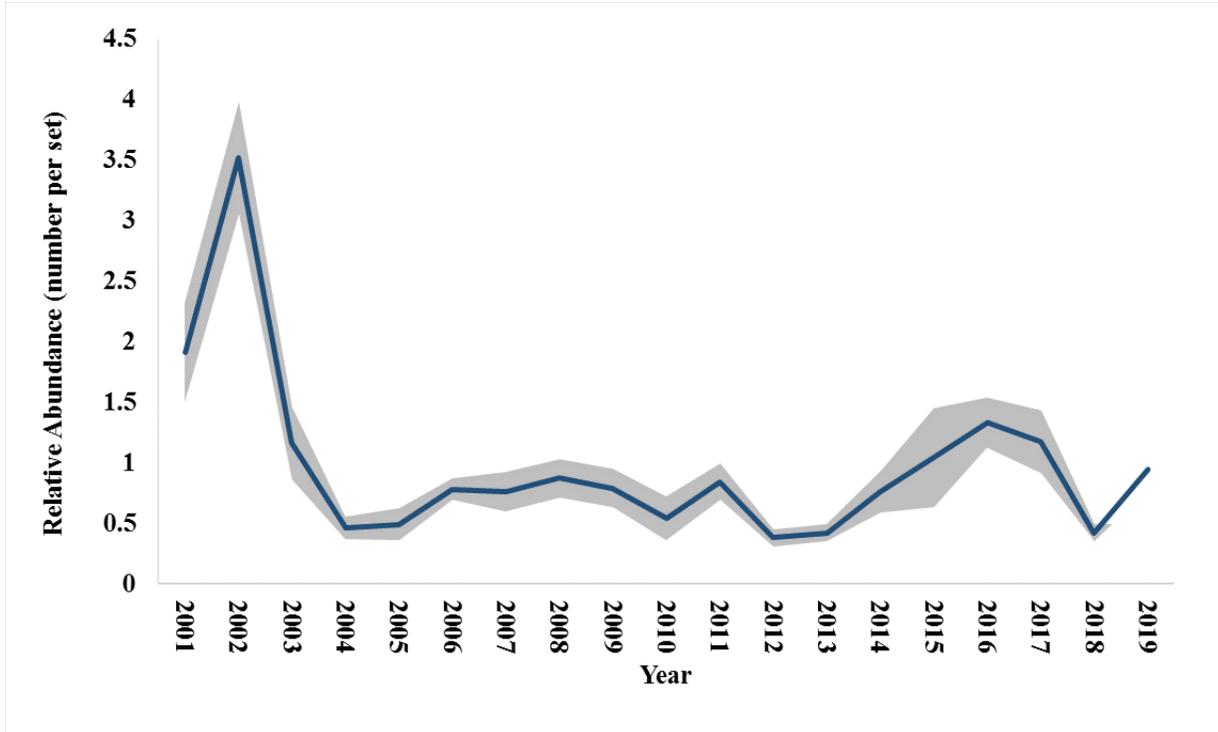


Figure 8. Annual weighted black drum index of relative abundance (number per set) from the Pamlico Sound portion of the Independent Gill Net Survey (Program 915) in North Carolina, 2001-2019. Shaded area represents  $\pm$  one standard error.

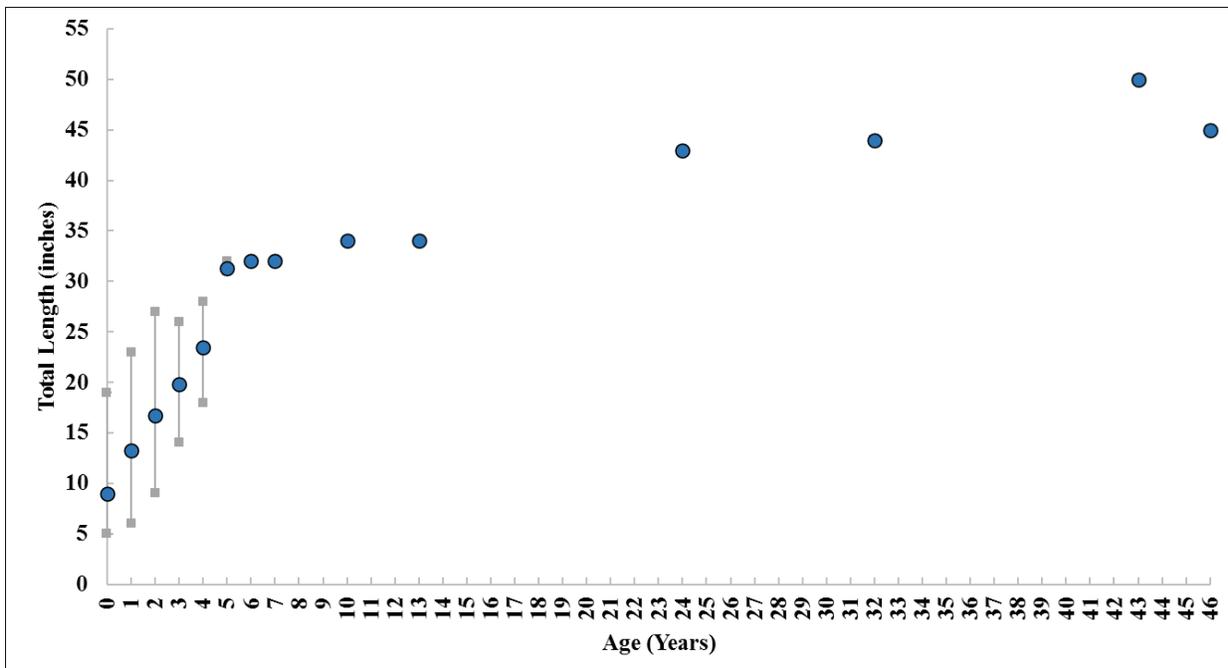


Figure 9. Black drum length (total length, inches) at age based on all age samples collected from 2011 to 2019\*. Blue circles represent the mean size at a given age while the grey squares represent the minimum and maximum observed size for each age. \*Samples collected from partial carcasses were not included.