

Status of Research and Management of Red Drum
***Sciaenops ocellatus* in Georgia**

June 2021

Updated October 2021

Coastal Resources Division
Georgia Department of Natural Resources

Introduction

The Red Drum *Sciaenops ocellatus* is the state saltwater fish of Georgia and one of the most popular saltwater angling species in the state. The Coastal Resources Division (CRD) of Georgia Department of Natural Resources (DNR) is responsible for management and monitoring the Red Drum population within the state.

Red Drum are long-lived and have a complex life history. Red Drum eggs are deposited in estuaries where the young remain for several years. At approximately 2-3 years old Red Drum leave estuaries and enter the ocean, where they spend most of their adult life, returning to estuaries to spawn. Red Drum can live to be over 60 years old and greater than 40.8 kg (90 lb). Males mature between ages 1-4 and females between 3-6. This life history means Red Drum use a variety of habitats and are exposed to a range of threats and fishing pressures.

In order to manage Red Drum in Georgia, CRD has several research and monitoring programs to inform us about the status of the population and inform management. These data are used internally to monitor population trends and used externally in regional stock assessments. Improvements are made to sampling programs as limitations and needs are identified. The recent License Enhancement Funding initiative has also been an important source of funds for project improvements and expansions.

Red Drum data are presented regularly at meetings of Georgia's Finfish Advisory Panel (FAP). The FAP serves as a conduit between the public and CRD. At these meetings panel members, representing different angling sectors, can provide their input about observations in the fishery, comments from other members of the public, and ongoing fishery management.

Fishery Background

Recreational Fishery

Anglers consistently rate Red Drum in the top three most targeted species based on the NOAA Fisheries Marine Recreational Information Program (MRIP). The estuarine fishery is prosecuted throughout the year from piers, private boats, and for-hire anglers. Since the mid-1990s, the for-hire sector has increasingly targeted large Red Drum in a catch-and-release trophy fishery. There is some limited effort directed at Red Drum in offshore waters, but generally the species is an incidental catch of anglers targeting demersal fishes. Through MRIP data, we are able to collect fisheries dependent information about the fishery, such as Red Drum catch and harvest (Figure 1) and size at harvest (Figure 2) through time. We can also use MRIP data to evaluate regional differences across the state, such as comparing catch and harvest in the northern (South Carolina to Altamaha River) and southern (Altamaha River to Florida) portions of the coast (Figure 3). This fishery dependent information, combined with our inhouse fisheries surveys, helps to provide a fuller picture of the Red Drum fishery.

Georgia has a long history of implementing regulations to protect Red Drum and their habitat in order to conserve the population and provide angler opportunities (Table 1). Harvest of Red Drum in the exclusive economic zone (EEZ) has been prohibited since 1989. The state implemented gamefish status for Red Drum in 2013 which prohibits sale, purchase, and transport of the species, effectively ending commercial harvest.

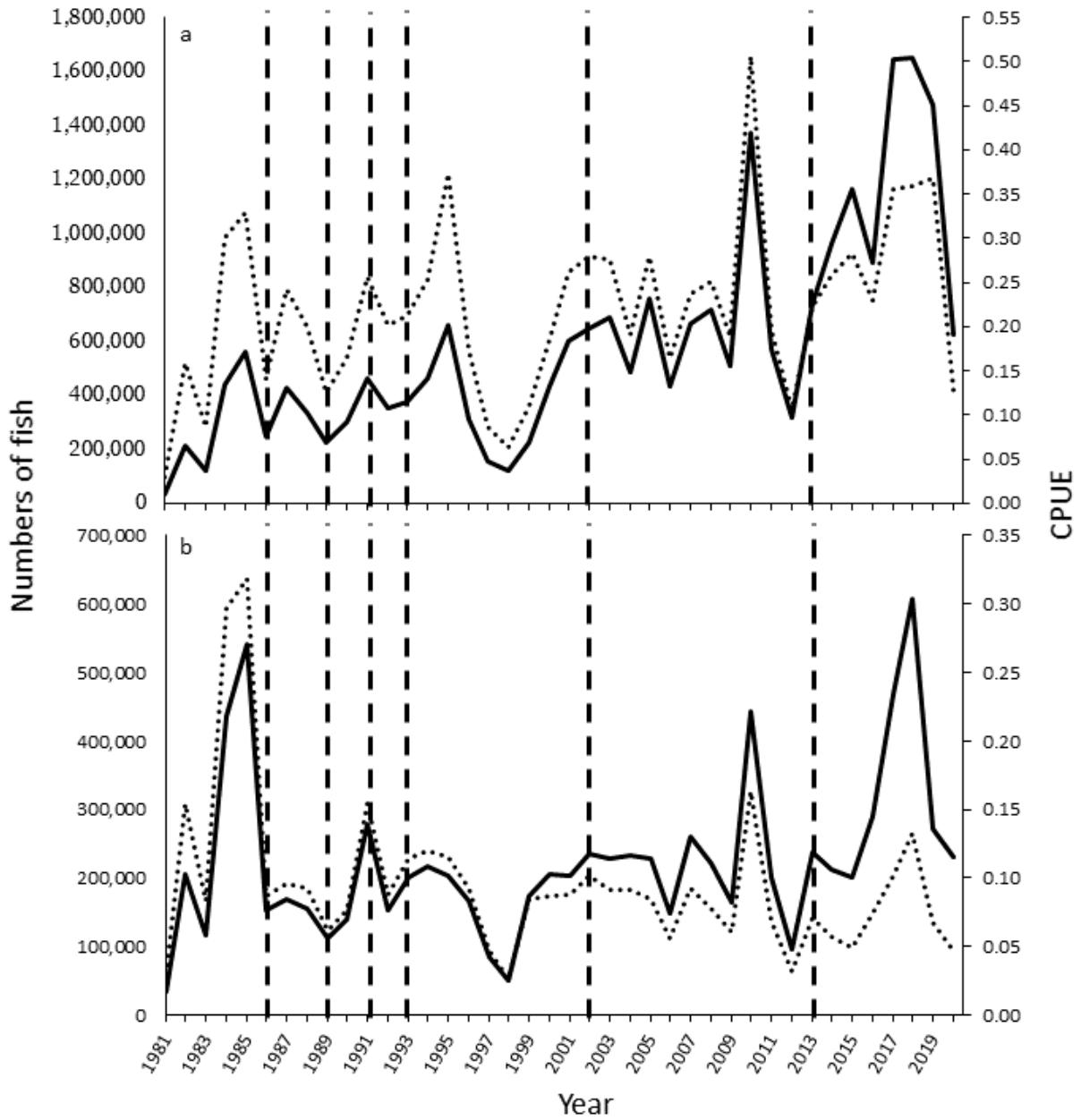


Figure 1. Estimated Red Drum catch (a; total number of fish caught and kept or released) and harvest (b; number of fish kept) from 1981-2020. Solid lines are numbers of fish, while dotted lines are catch-per-unit-effort (CPUE). Vertical dashed lines indicate changes in management regulations.

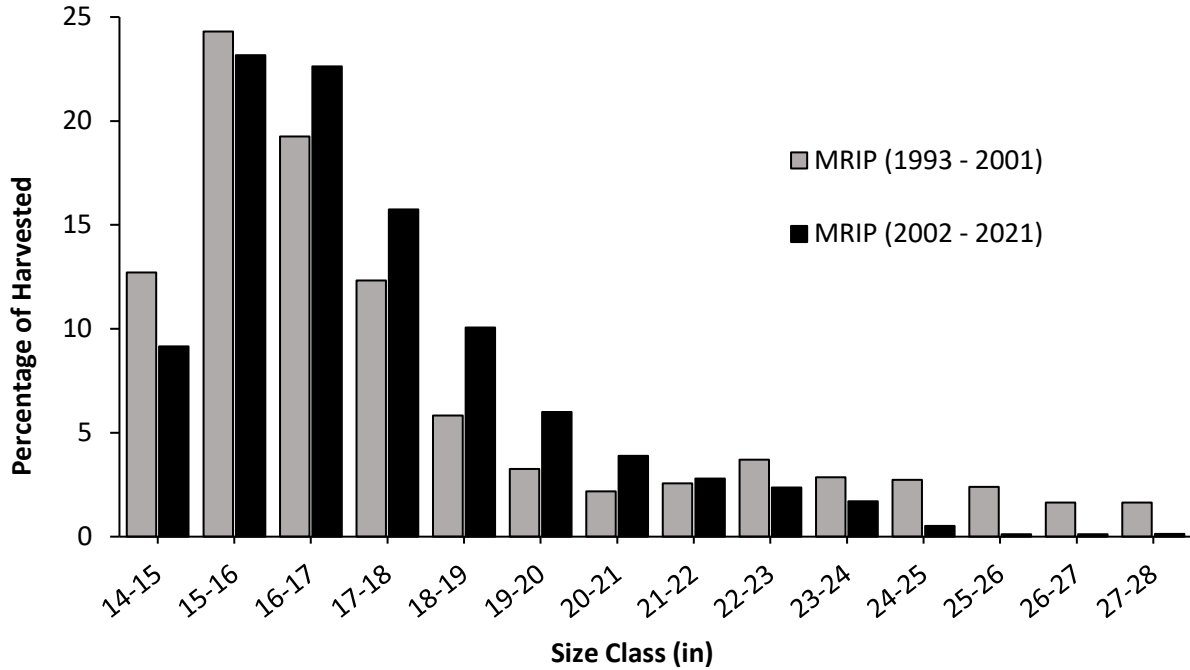


Figure 2. Size distribution of Red Drum harvested in Georgia based on MRIP Data. Data from 1993-2001 were based on a 14-27 in slot, while data from 2002-2021 were based on a 14-23 in slot.

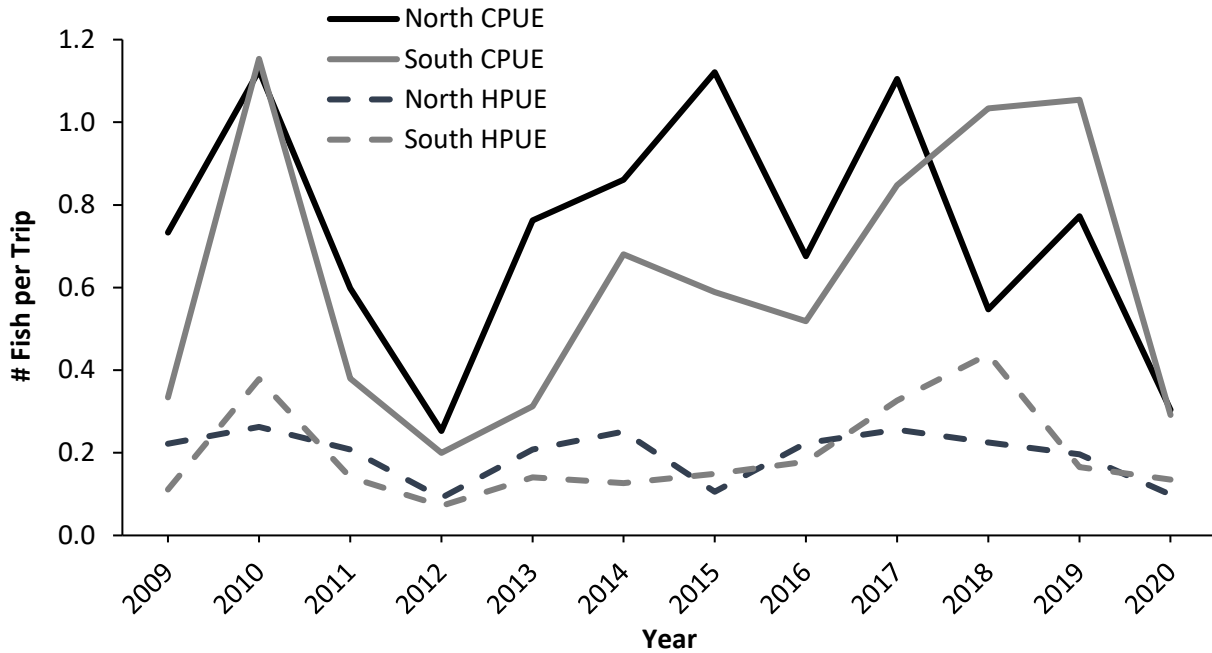


Figure 3. Red Drum catch-per-unit effort (CPUE) and harvest per-unit effort (HPUE) in northern and southern areas of the Georgia Coast from 2009-2020. The northern area includes Dobby Sound to the South Carolina border while the southern area includes from the Altamaha River to the Florida border.

Table 1. Key events in the management and regulation of the Red Drum fishery in Georgia.

Year	Regulation
1957	Prohibition of the use of gill nets in Georgia's estuarine waters (except for shad and diamond back terrapins)
1986	14-inch minimum-size and only 2 fish over 32-inches
1989	Year-round season; 14-inch minimum-size, 10 fish daily creel and only 2 fish over 32 inches
1989	Exclusive economic zone (3-200 miles) closed to harvest of Red Drum
1991	Year-round season; 14-inch minimum-size, 5 fish daily creel and only 1 fish over 27 inches
1992	Possession limit of 5 fish
1993	Year-round season; 14-27 inch slot; 5 fish daily creel and 5 fish possession limit
2002	Year-round season; 14-23 inch slot; 5 fish daily creel and 5 fish possession limit
2013	State implements game fish status for Red Drum

Regional Stock Assessments

2009 Atlantic States Marine Fisheries Commission (ASMFC) Benchmark Assessment

A benchmark stock assessment performed by ASMFC determined that overfishing was not occurring in the southern stock (South Carolina to Florida). There was not enough information to determine if the stock was overfished. Juvenile recruitment was seen to be stable and Spawning Potential Ratio (SPR; the proportion of the unfished reproductive potential left at any given level of fishing pressure) was estimated to be 49.5% - above the 30% management threshold. There was limited data on adult fish (age-4+) and a high degree of uncertainty in estimates that prevented an estimate of absolute abundance. The exploitation rate in the southern stock was variable but showed a slight increasing trend since the early 1990s. Tagging data in the northern region (New Jersey to North Carolina) provided fishing mortality data that improved estimates in that region. Georgia recreational landing data and gill net survey data were used in the assessment.

2017 Atlantic States Marine Fisheries Commission (ASMFC) Benchmark Assessment

A benchmark stock assessment performed by ASMFC determined that overfishing was not occurring in the southern stock. The mean SPR from 2011 to 2013 was 53.5% in the southern stock, above the 30% overfishing and 40% target thresholds. Annual recruitment variability was high with little net increase or decrease. As with the 2009 assessment, limited adult data meant that absolute abundance could not be estimated for northern or southern stocks. Georgia recreational landing data, gill net, and longline survey data were used in the assessment.

2022 Atlantic States Marine Fisheries Commission (ASMFC) Simulation Assessment

A simulation assessment is currently underway to evaluate stock assessment models for the next ASMFC benchmark stock assessment. This is a two-stage assessment consisting of creating a simulated fish population based on real data and running candidate assessment models to evaluate which assessment model best represents the population. The best model from this exercise will then be used for the actual benchmark assessment beginning in 2024.

Research and Survey Project Overviews

As part of Red Drum management in Georgia, there are several active surveys and research projects that focus on different aspects of the Red Drum fishery and biology. Data collected are used to create long term uninterrupted indexes of relative abundance, monitor trends in populations and determine the efficacy of current management practices. Descriptions of these projects are provided here.

Marine Sportfish Population Health Survey (MSPHS)

In early 2000, staff from the Marine Fisheries Section of Coastal Resources Division (CRD) recognized the need for long-term, uninterrupted fishery surveys to monitor trends in population abundance and to determine the efficacy of current management practices. Based on that need, the MSPHS began in 2003. The purpose of the survey was to collect timely and relevant data on the age structure, abundance, and habitat preferences of selected marine finfish species popular with inshore and nearshore recreational anglers through two random stratified efforts with different gears: gill and trammel nets.

The survey area consisted of three Georgia estuarine systems: Wassaw and St. Andrew sounds and the Altamaha River System.

- Wassaw Sound, located in Chatham County, is bordered by the city of Savannah, the largest metropolitan area on the Georgia coast. The northern portion of Wassaw Sound exhibits moderate variability in salinity and water temperature due to influence from the Savannah River.
- The Altamaha River lies within the northern and southern portions of Glynn and McIntosh counties. Most of the land surrounding the Altamaha River System is undeveloped and managed by the state of Georgia and the federal government as wildlife management areas and a national wildlife refuge. Due to freshwater influence of the Altamaha River, salinity and water temperature are highly variable in the estuary. Altamaha River System sampling is divided into three regions: Doboy Sound in the northern part of the system, the Altamaha River proper along the main channel, and the Hampton River in the southern part of the system.
- St. Andrew Sound was added to the survey in 2019 to provide information from a sound system in the southern part of the state. Data from this survey are still preliminary and an index has not been established yet.

Gill Net Survey (Young-of Year Red Drum Survey)

To determine Red Drum relative abundance and recruitment, the gill net survey was conducted in the Altamaha River System and Wassaw Sound from June through August annually. In the Altamaha River System, 36 stations were sampled each month from a pool of 60

total sites using a hybrid stratified random and fixed station design (Figure 4). There were 8 fixed stations, with twenty-eight stations randomly selected from the remaining 52 stations. The stations within the Altamaha River System were divided between the areas of Hampton River, Altamaha River, and Doboy Sound. A total of 108 gill net sets are performed in the Altamaha River, Hampton River, and Doboy Sound regions annually. In Wassaw Sound, 36 stations are selected and sampled from a pool of 70 total stations using a hybrid stratified random and fixed station design (Figure 5). There were five fixed stations and 31 stations were randomly selected from the remaining 65 stations. A total of 108 gill net sets are performed in Wassaw Sound annually.

Survey gear was a single panel gill net. The net measured 91 m by 3 m (300 ft long by 9 ft deep). The panel had 64 mm (2.5 in) stretched mesh. The net had a 12.7 mm (0.5 in) diameter float rope and a 34 kg (75 lb) lead line. An 11 kg (25 lb) anchor chain was attached to each end of the lead line, and a large bullet float was attached to each end of the float line.

Trammel Net Survey

The trammel net survey was conducted in the Altamaha River System and Wassaw Sound from September through November annually. In Altamaha, 25 stations were sampled each month from a pool of 64 total stations; in Wassaw, 25 stations were selected and sampled each month from a pool of 38 total stations. A total of 150 trammel net sets were performed during the sampling season. No stations were sampled more than once each month. Stations were selected and sampled using a stratified random sampling design.

The trammel net was 91 m by 2.1 m (300 ft long by 7 ft deep). The two outer panels had 356 mm (14 in) stretched mesh, and the inner panel had 70 mm (2.75 in) stretched mesh. The net had a one-inch diameter float rope and a 75 kg (165 lb) lead line. An 11 kg (25 lb) anchor chain was attached to each end of the lead line, and a large bullet float was attached to each end of the float line.

General Sampling Methods

A sampling event consisted of a single net set. All sampling occurred during the last three hours of ebb tide during daylight hours. The net was deployed in a semi-circle along the shore by boat. Net deployment was done against the tidal current. Immediately after deployment, the net was actively fished by making two to three passes with the boat in the area enclosed by the net. After the last pass was made, the net was retrieved starting with the portion that was deployed first. All fish caught in the net were placed in a floating mesh holding pen. After the net was fully retrieved, the entire catch was processed for biological data and released.



Figure 4. Altamaha River System pool of available sampling stations. Gill net stations are represented by yellow dots. Trammel net stations are represented by green dots. Stations surveyed by both gear types are represented by blue dots.



Figure 5. Wassaw Sound pool of available sampling stations. Gill net stations are represented by yellow dots. Trammel net stations are represented by green dots. Stations surveyed by both gear types are represented by blue dots.

Marine Sportfish Carcass Recovery Project (MSCRP)

Overview

In the fall of 1997, CRD initiated the MSCRP. This project takes advantage of the fishing efforts of hundreds of anglers by recycling filleted fish carcasses, normally discarded by anglers, into a source of much needed data on Georgia's marine sportfish. The information provided by fish carcasses was used in a variety of analyses, all of which help biologists and managers better understand the status of Georgia's coastal fish populations. These data can be used in a descriptive manner to examine trends in the size and age structure of a population such as tracking changes in the mean size of Red Drum over time. Data were used in regional and coastwide stock assessments.

Methods

Chest freezers were placed near the fish cleaning stations at selected locations along the Georgia coast. Each freezer was marked with an identifying sign and a list of target fish species. Inside the freezer was a supply of plastic bags, information cards, and pens. Cooperating anglers placed the filleted carcasses, with head and tail intact, in a bag, drop in a completed angler information card, and then place the bag in the freezer. Anglers who participated were provided rewards such as hats, t-shirts, stickers, and other items to help promote the project.

CRD staff thawed bags and processed the donated fish carcasses for biological information. Each fish was identified to species, the fish length measured, sex determined when possible, and the otoliths (commonly called ear bones) were removed. The otoliths were then evaluated using computer-aided image analysis to determine an accurate age of the fish. This was accomplished by taking a thin section of the otolith and counting the rings like the rings on a tree.

Coastal Longline Survey (CLS)

Overview

CRD utilized a near shore Red Drum bottom longline survey encompassing state and federal waters off the coast of Georgia. Recent sampling occurred in waters of Doboy Sound to St. Marys River annually in Georgia from June to December. Stations were randomly chosen from a subset of sites identified as areas with high encounter probabilities. Three strata were delineated off Georgia (inshore; near shore; offshore) and sampling efforts were proportionally allocated to match the emigration pattern of adult Red Drum. All stations were sampled during daylight hours and are generally located in water depths between 4 and 19 m (13 and 65 ft).

Methods

The longline was deployed from the R/V Marguerite, a 14.3 m (47 ft) offshore vessel. The mainline was made of 600 lb monofilament and was approximately 0.5 NM (0.9 km) in length. A total of 60 droplines were attached to the mainline, where each dropline consisted of a longline snap, 0.46 m (1.5 ft) of 200 lb monofilament, and a 12/0 circle hook on the terminal end. Hooks were not offset and had barbs depressed. The total soak time was 30 minutes with half of the hooks baited with squid and the other half baited with mullet. Red Drum were

measured, weighed, fin clipped, and tagged. All other specimens were identified and counted. All Red Drum and other specimens were released.

Red Drum Escapement Project

Overview

Starting in fall 2019 CRD began an autonomous acoustic telemetry project to study the movement of Red Drum in Wassaw Sound (Chatham County, GA). This project was started with the goal of learning about behavior, primarily the age and size of Red Drum as they emigrate from estuaries and move offshore. This includes information about habitat use within estuaries and fate of Red Drum in sounds. Autonomous acoustic telemetry is the use of stationary, passive receivers (Vemco™ VR2W) to monitor the movements of animals tagged with coded acoustic transmitters (Vemco™ V13 & V16) 24 hours/day. These tags are internally implanted and can have battery lifespans of up to 6 years. Fewer telemetry tags are needed to collect a similar amount of data as compared to conventional tags.

Acoustic telemetry studies can provide some of the same types of information as conventional tagging studies with the added benefit of providing more detailed information about specific movements, seasonality, aggregation areas, home ranges, and interstate migrations. Collecting information from telemetry tags does not rely on anglers to recapture fish that have been tagged. Instead, information is logged by underwater receivers deployed as part of a study. Receivers are retrieved, maintained, and downloaded routinely by project personnel. These receivers can be placed within the study area or can be deployed as part of a separate study in a different region.

Tags and receivers are compatible across different studies. For example, a fish tagged in Georgia can be tracked by receivers deployed by other researchers in South Carolina or Florida, if the fish migrates into those areas. This makes the technology useful for studying both local movements as well as long range migrations.

Capture and Implantation Techniques

Fish are captured using conventional hook and line techniques to minimize handling stress. Once caught, fish are placed in a temporary holding ring, then brought onboard for implantation. Fish are placed in a V-shaped cradle and submerged in a live well system that keeps their head and gills underwater but exposes their ventral surface. A scalpel is used to make a 3-4 cm incision mid-body of the fish and slightly offset from the ventral midline. Then, a sterilized acoustic transmitter is inserted into the peritoneal cavity and the incision is closed with an absorbable Vicryl™ suture. After surgery, fish are tagged with a conventional dart tag that includes a unique number and instructions for reporting in the event of an angler recapture. Finally, fish are evaluated for condition and released near the original capture site.

Study Area

In fall 2019, an array of receivers was established in Wassaw Sound to continuously monitor fish movements throughout estuary. As of spring 2021, there were 12 receivers operational in the Wassaw Sound array. An additional receiver array was under construction in St. Simons Sound.

Receivers were deployed using a 2.4 m (8 ft) piece of 5mm (2 in) aluminum channel tube bolted directly to a piling or fixed structure, approximately 1 m above the mean low water mark. The receiver was then bolted to the bottom of the channel tube and submerged. This technique allowed receivers to be maintained and serviced routinely from small vessels. Additional

receivers may be added to the array as needed to fill in any coverage gaps as the project continues. Deployed receivers continuously monitored the area for telemetered fish and when those fish are present, receivers recorded the date, time, and unique ID for each fish within range (approx. 300 m).

In addition to the Wassaw array CRD maintains an array of 24 autonomous acoustic receivers in Georgia's nearshore and offshore waters along St. Simons Island. The purpose of the Coastal Receiver Array (CRA) project is to track the movements of coastal migratory animals tagged with Vemco™ telemetry tags. The array consists of a nearshore component where 8 VR2W receivers are attached to navigation buoys along the St. Simons shipping channel and an offshore component consisting of 16 VR2W receivers anchored to the seafloor, ranging from 6-24 miles offshore. This array is beneficial to the Wassaw project because it will capture any movements of Red Drum that move south from the Wassaw array.

Regional Collaborations

Fish movement is often unpredictable, and the direction or distance fish travel can be unexpected. Fortunately, CRD is an active participant in the FACT Network; a collaborative partnership among researchers representing 99 different organizations and 283 members, all conducting acoustic telemetry research. Members of FACT collaborate on projects, share data and exchange design concepts on a variety of projects including site fidelity studies, habitat preference, and investigations into seasonal migrations of fishes. Collaborators all agree to use similar equipment, locate receivers in priority areas and share data with the proper owners (recognized as the person that deployed the tag). By participating in the consortium, researchers have access to a network of more than 1,500 receivers distributed throughout freshwater and marine habitats (both inshore and offshore) ranging from the Dry Tortugas to the mid-Atlantic. Any movements of Red Drum outside of Georgia will likely be captured and recorded by another participating researchers' array and shared.

The first download of array receivers was conducted spring 2020. Data from this study will help improve the understanding of habitat use, seasonality, and movements of Red Drum in coastal Georgia. This project will be used as a template for future acoustic projects on other species and/or other systems throughout Georgia. Specifically, for Wassaw Sound, the Escapement Project will give us an idea about the fate and behavior of Red Drum as it relates to angler activity. This information, in conjunction with information from the Cooperative Angler Tagging Program, will help us improve our management efforts.

Cooperative Angler Tagging (CAT)

Introduction

Georgia's CAT Project began in 1987 and was created to involve anglers in tagging adult Red Drum as part of in-house research on the species. Tagging has proven to be a useful tool for promoting fish conservation as well as collecting valuable data on movement and migration, growth rates, habitat preference, and post-release survival. Partnering with recreational anglers is an efficient and cost-effective way for researchers to collect fisheries data and often creates a sense of ownership towards fisheries management decisions.

From 1987 through 2020, around 200 cooperating anglers tagged and released over 9,000 Red Drum. The number of cooperating anglers has changed from year to year and does not correlate with the number of fish that will be tagged each year. The number and species of fish tagged has varied over time as research objectives and staff have changed.

For 2020, several improvements were made to the CAT Project to improve and enhance the project. Two new tag types were introduced, high reward tags and double tags, with specific purposes for each. High reward (\$100 cash value) tags are used to obtain estimates of tag reporting rate while double tags provide estimates of tag retention. Past studies have produced estimates of these rates, but these may change over time. In addition to adding new tags, cooperative angler tags were being supplemented by CRD biologists tagging during the course of normal survey operations. The goal was for biologist tagging to fill in size and geographic gaps in angler tagging to increase the number of tags for anglers to return and further improve our estimates.

Ongoing Project Results

MSPHS

Gill Net Survey

Since 2009, annual catch per unit of effort (CPUE) has varied widely for Red Drum in the gill net survey ranging from a survey low of 0.33 fish/set in 2020 to a survey high of 1.55 fish/set in 2010 (Figure 6). The Altamaha River System and Wassaw Sound have traditionally shown similar trends through the years, with some exceptions. One thing to keep in mind is that the MSPHS gill net survey is designed to target juvenile Red Drum. The mean size of fish caught in the survey is 282 mm (11.1 in) fork length (Figure 7). The survey samples Red Drum before they recruit into the recreational fishery and are available for harvest. Essentially this survey was a measure of annual recruitment and was largely driven by spawning success and environmental impacts on larval/juvenile fish survivability through the winter/spring.

Trammel Net Survey

Although designed for Spotted Seatrout, the trammel net does encounter Red Drum of varying sizes. This provides information about the Red Drum fishery as fish enter the recreational fishery (“slot”) and are impacted by anglers. Red Drum CPUE was generally lower and not as consistent between systems as the gillnet survey (Figure 8). The mean size of Red Drum sampled in the trammel net survey was 393 mm (15.5 in) fork length (Figure 9). Most fish sampled during the survey were those smaller reds that are just entering the recreational slot and were subject to harvest. Larger/older fish can be captured by the gear and were sometimes sampled giving us a small glimpse into the status of the fishery after the impacts from recreational fishing.

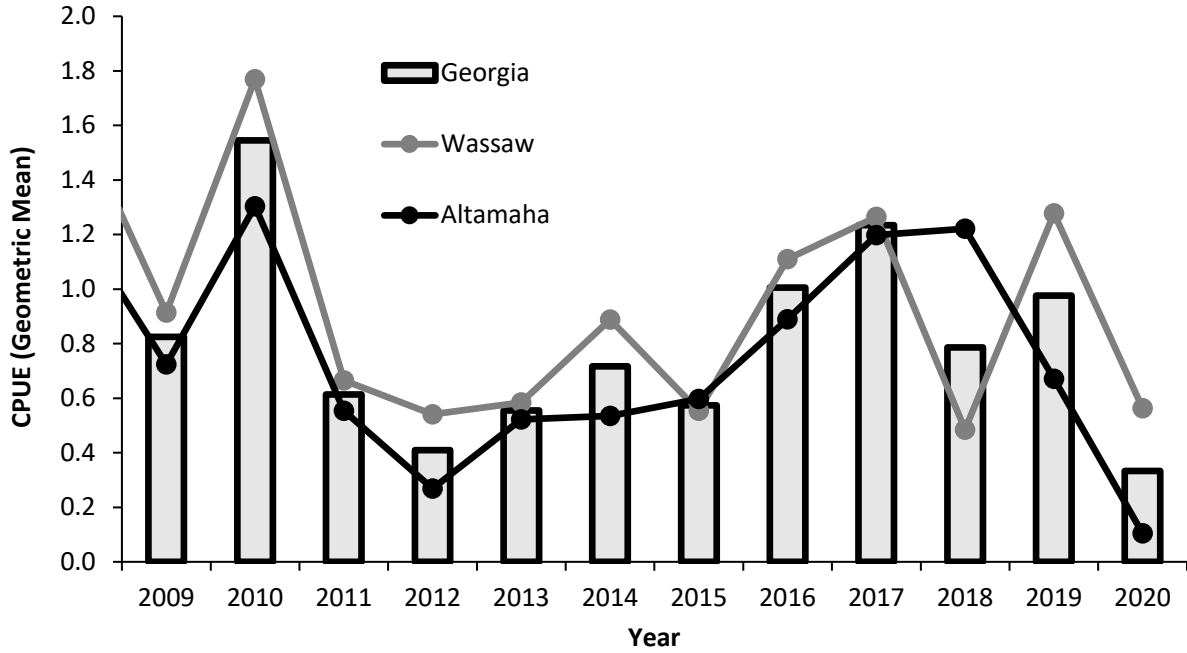


Figure 6. CPUE (geometric mean) of Red Drum captured in Georgia in the Gill Net Survey 2009 – 2020. Vertical bars represent Georgia mean, black line represents Altamaha River System and gray line represents Wassaw Sound.

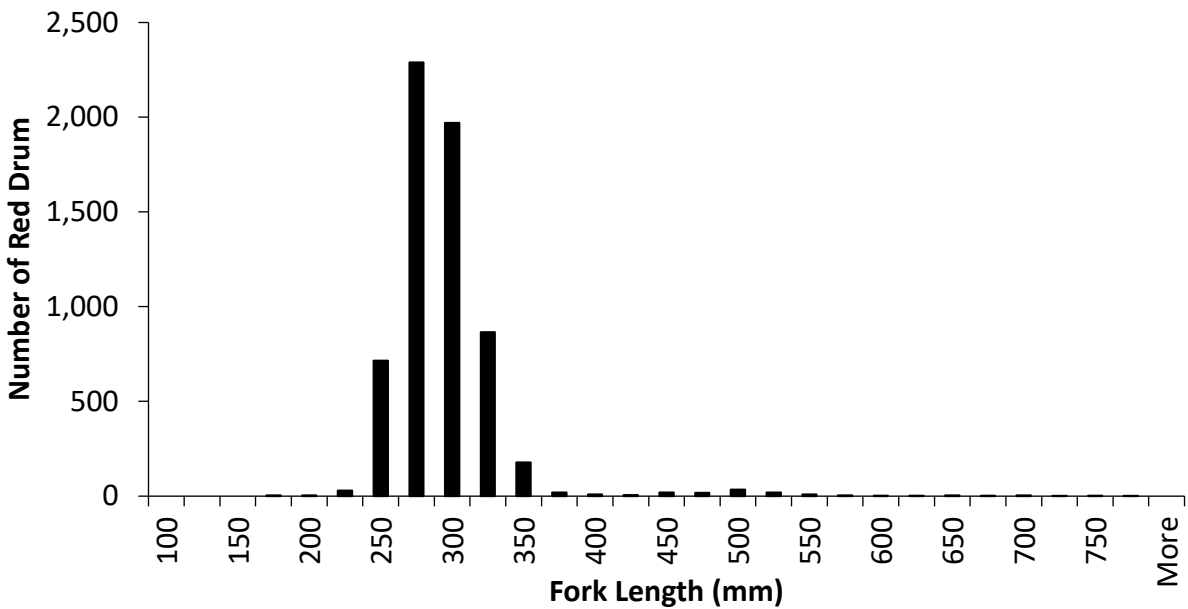


Figure 7. Observed lengths of captured Red Drum in the Gill Net Survey 2003 – 2020 (N = 6,217)

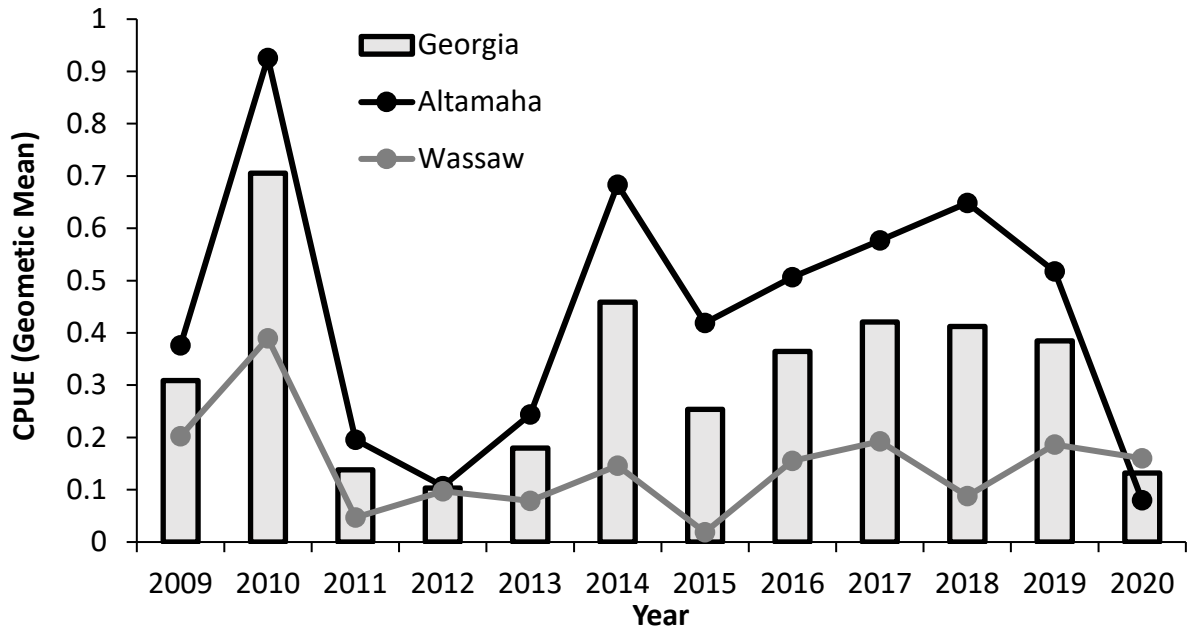


Figure 8. CPUE (geometric mean) of Red Drum captured in Georgia in the Trammel Net Survey 2009 – 2020. Vertical bars represent Georgia mean, black line represents Altamaha River System and gray line represents Wassaw Sound.

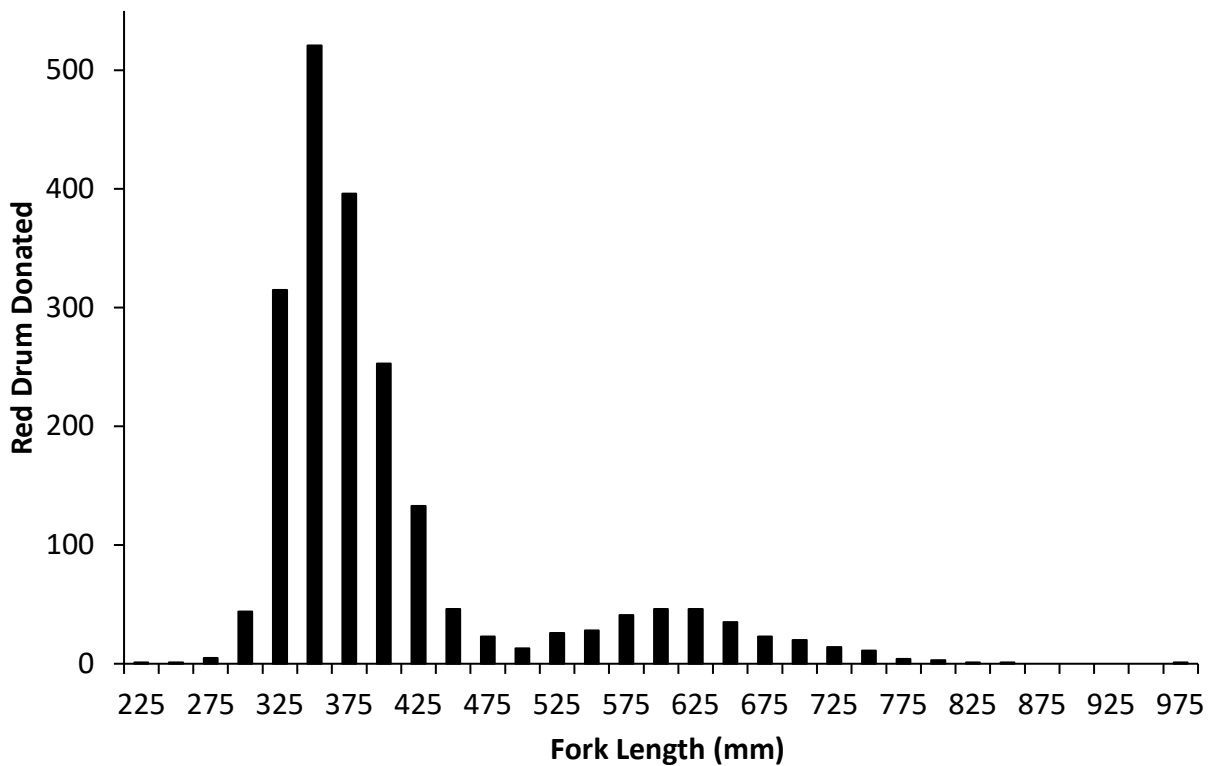


Figure 9. Observed lengths of captured Red Drum in the Trammel Net Survey 2003 – 2020 (N = 2,014).

MSCRP

To date, more than 79,000 sportfish carcass samples have been donated. From that, more than 14,600 Red Drum have been sampled with a mean of 612 donations per year (Figure 10). Because it was voluntary, data from the carcass program cannot be reliably used to provide an index of harvest, but annual numbers may correlate with other surveys. There were strong seasonal patterns in size and numbers of fish donated to the MSCRP. The most and smallest fish tended to be caught in late summer into fall, while fewer, larger fish were caught in the first half of the year. Red Drum were donated every month with most occurring September through December (Figure 11). The mean size Red Drum donated since 1997 was 404.2 mm fork length (FL; 15.9 inches) (Figure 12). Most fish donated to the project were between age-0 and age-3 (Figure 13). Mean age of harvested Red Drum varied throughout the year, with the youngest mean fish (0.64 year old) observed in September and oldest mean fish (1.65 years old) in June (Figure 14).

Angler donations under both a 14-27 inch slot limit and a 14 inch-23 inch slot limit showed little difference in the mean size of Red Drum donated at 407.3 mm (16.0 in) FL and 403.6 mm (15.9 in) FL, respectively.

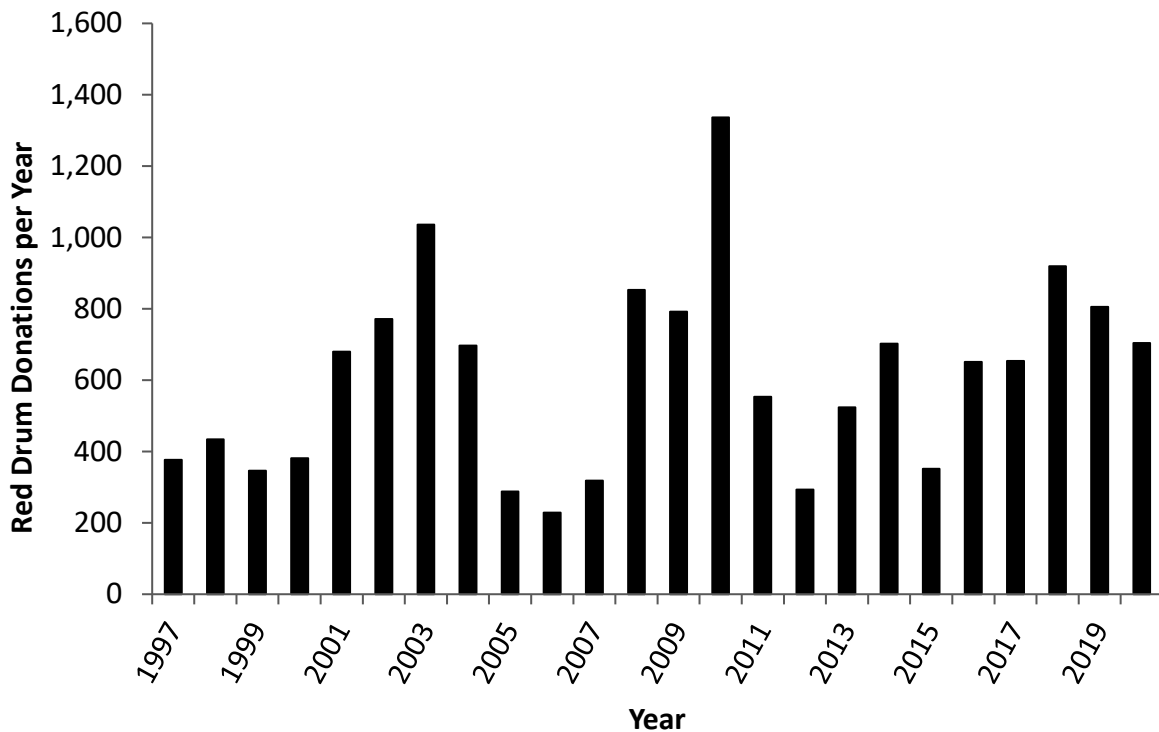


Figure 10. Red Drum donated to the Marine Sportfish Carcass Recovery Project per year 1997 – 2020 (N = 14,695).

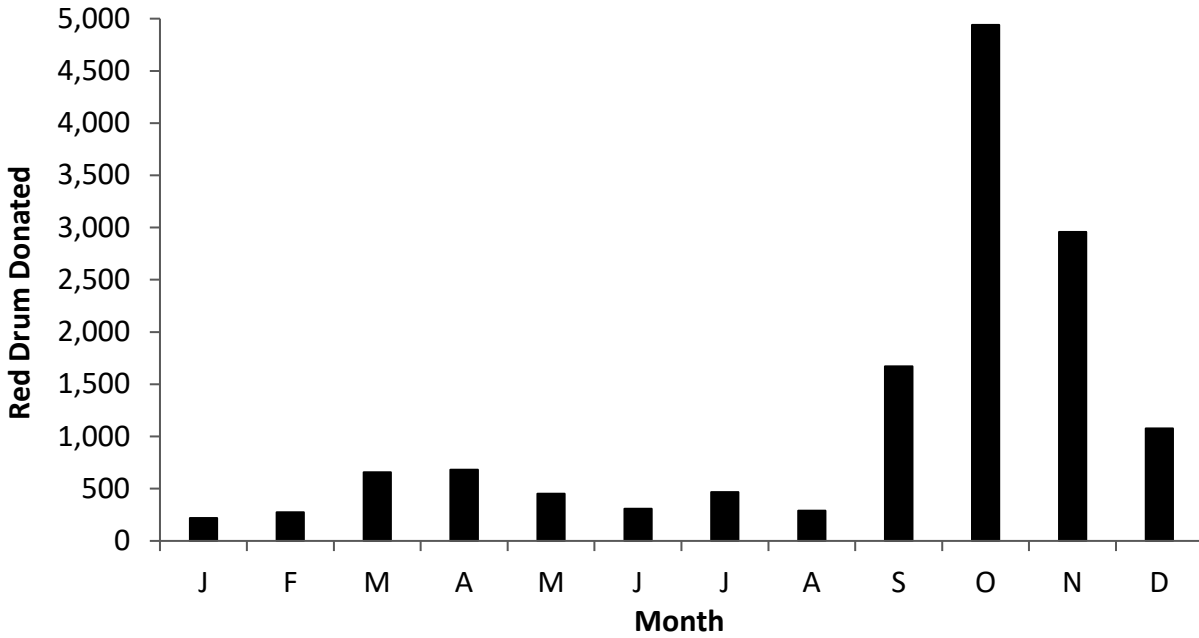


Figure 11. Red Drum donated to the Marine Sportfish Carcass Recovery Project per month 1997 – 2020 (N = 14,695).

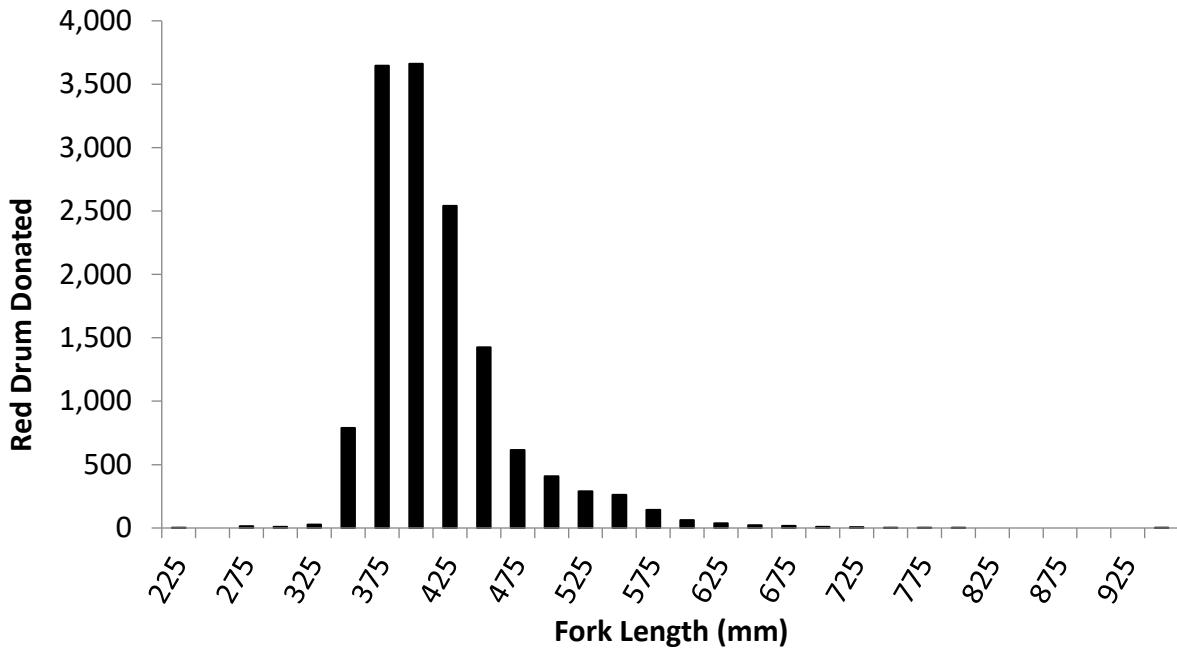


Figure 12. Fork length (mm) of Red Drum donated to the Marine Sportfish Carcass Recovery Project 1997 – 2020.

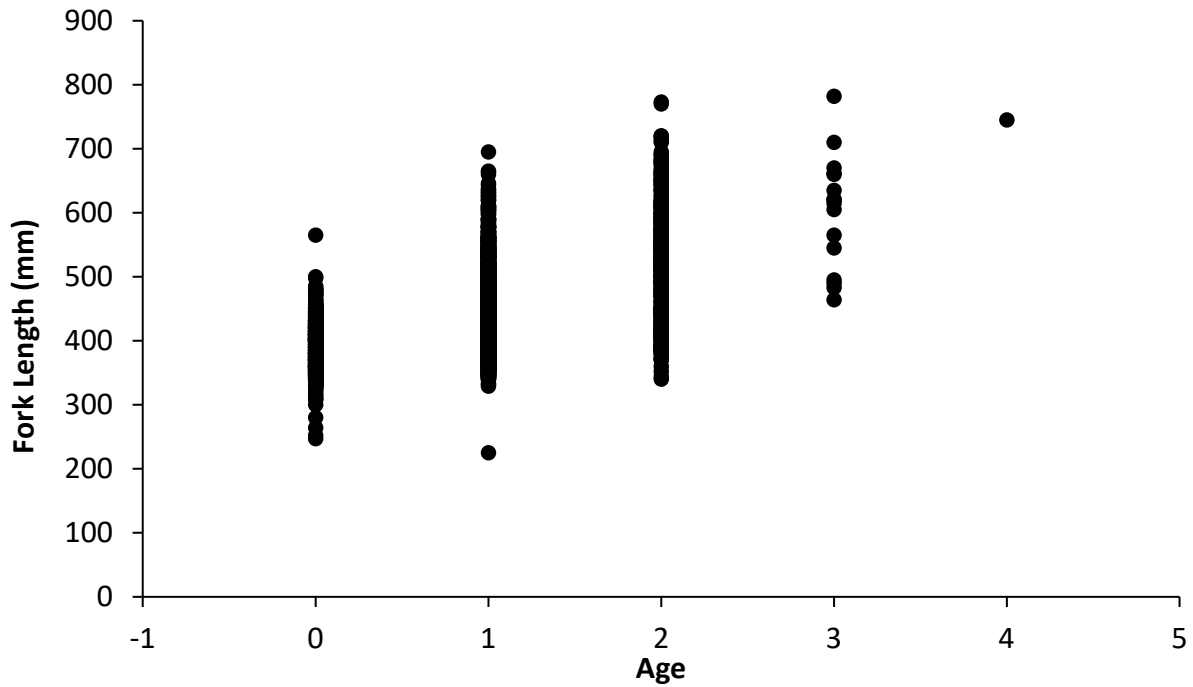


Figure 13. Age, estimated using otoliths, of Red Drum donated to the Marine Sportfish Carcass Recovery Project 1997 – 2019.

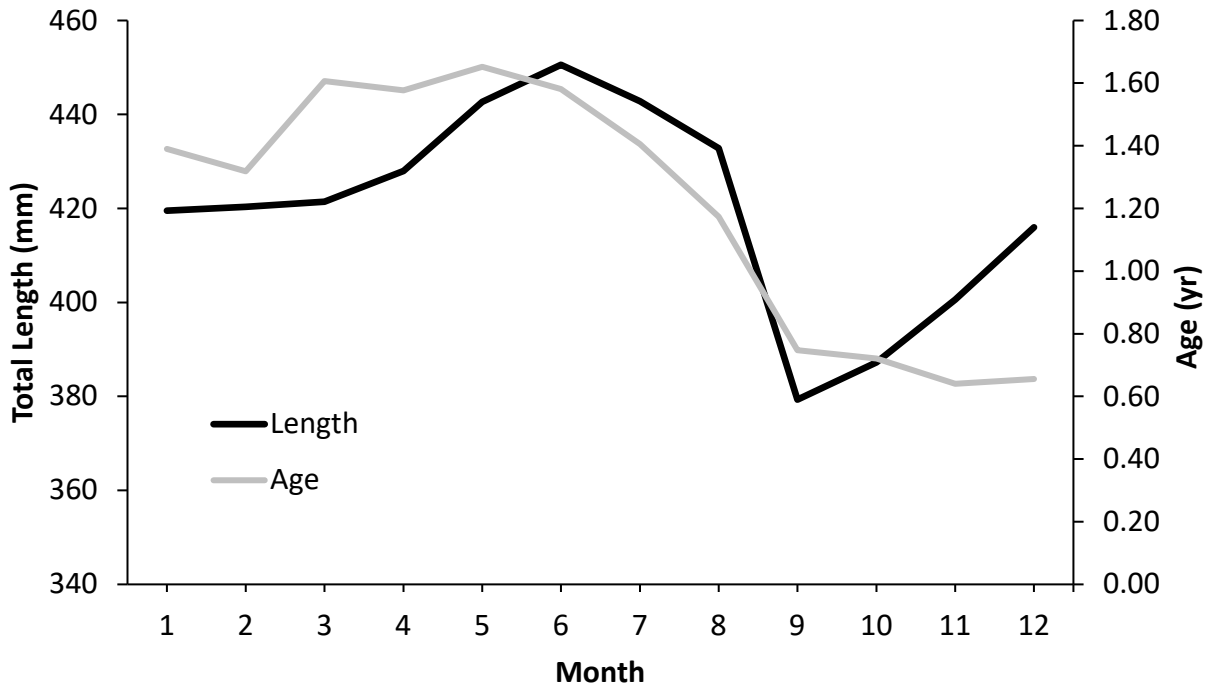


Figure 14. Mean age and total length per month of Red Drum donated to the Marine Sportfish Carcass Recovery Project, 1997-2020.

CLS

The survey has been successful at capturing large, adult Red Drum. The mean FL of Red Drum in this survey was 917 mm (36.1 in) (Figure 15), much larger than that of the MSPHS. Annual CPUE has been variable, but steady over time (Figure 16). The consistent presence of adult Red Drum suggests that younger individuals are successfully surviving and escaping the angling pressure found in inshore waters.

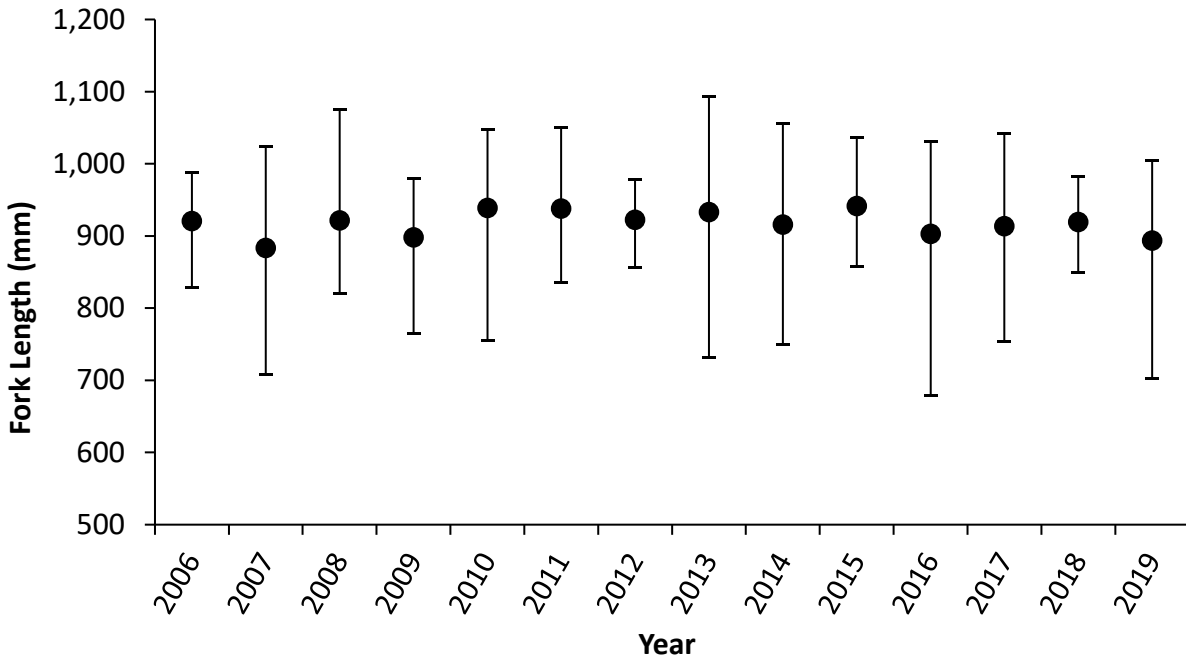


Figure 15. Annual size (FL) range and mean for Red Drum caught in the Coastal Longline Survey, 2006-2019. Vessel issues in 2020 prevented successful completion of the survey.

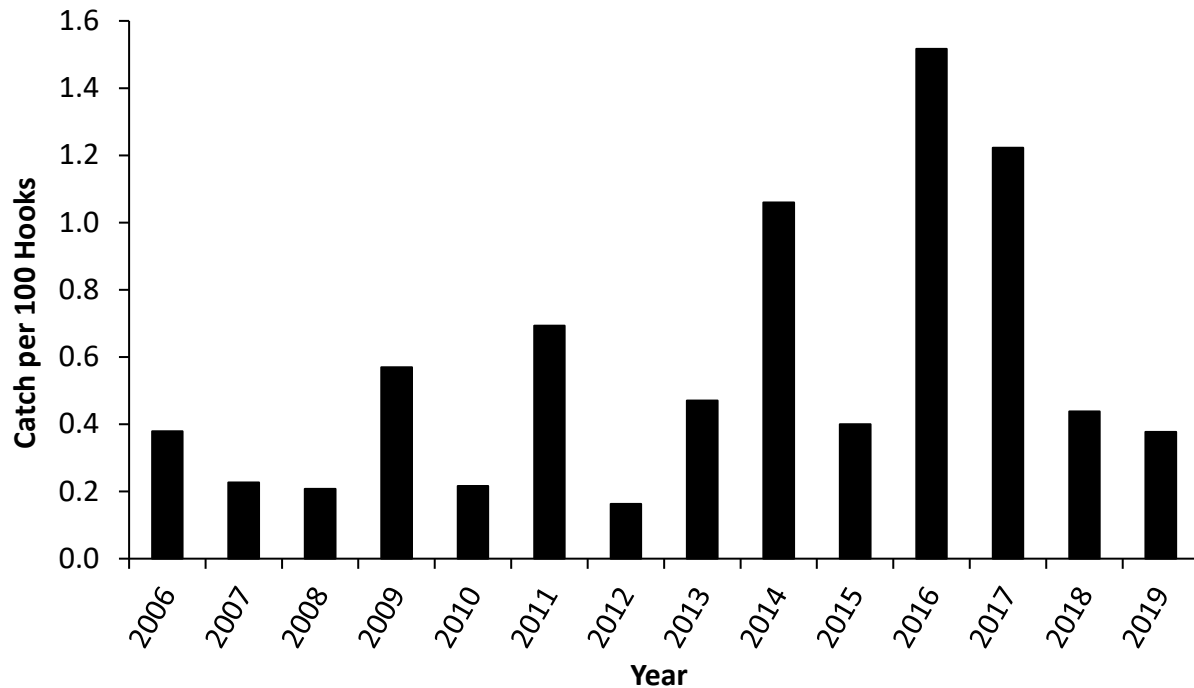


Figure 16. Red Drum CPUE (catch per 100 hooks deployed) by year 2006-2019 in the Coastal Longline Survey. Vessel issues in 2020 prevented successful completion of the survey.

Red Drum Escapement Project

As of spring 2021, a total of 50 Red Drum had been acoustically tagged in Wassaw Sound (345 mm FL – 753 mm [13.6-29.6 in] FL). Additional fish will be tagged through 2021 as part of this project. At least 25 were detected by the array through May 2021. Generally, it appeared that the fish were not moving greatly, and no fish had been detected yet offshore in other acoustic arrays. But, of the tagged fish, two were harvested by anglers shortly after release and a third fish was caught and released offshore in South Carolina. This fish was at large for 459 days, was 711.2 mm (28 in) long, and had grown 44.45 mm (1.75 in) since tagging.

The base Wassaw Sound receiver array was established at end of 2019 (Figure 17). Beginning spring 2021, a second array was established in St. Simons Sound. Red Drum will be tagged in this sound system as well to provide greater regional coverage for the study.



Figure 17. Locations of VR2 passive receiver stations in Wassaw Sound, spring 2020. Receiver number and positions can vary over time as receivers are lost, added, and relocated to improve efficiency.

CAT

In recent years the number of Red Drum tags deployed by the CAT had increased (Figure 18). A total of 5,515 tags were released since 2017, ranging between 950-1,640 annually. Tag returns also increased, with 832 total during this time. Based on tag returns, Red Drum that were recaptured were at large for a mean of 152.9 days (range 1 to 3,466 days) and mean daily growth was 0.39 mm/day.

Historically cooperative tagging anglers tended to tag larger Red Drum, with a bimodal distribution of fish at the upper end and above the slot (Figure 19). The addition of staff tagging in 2020 improved our tag coverage of Red Drum below and at the lower end of the slot. The mean FL of Red Drum tagged by cooperative anglers was 493 mm (19.4 in), while the mean FL was 423 mm (16.7 in) for staff tagging.

At present, 156 double tags have been released with 16 returns, all having both tags (Table 2). A 2-week tank tag retention study also had 100% retention, suggesting that tag retention was high. A total of 44 high reward tags have been released, with 11 returns. This suggests a tag reporting rate of around 70%, which is very good and similar to previous studies in the state.

Since 2020, a total of 321 out of 1,753 (18%) tagged Red Drum were recaptured by anglers. Of those, 172 legal-sized Red Drum were caught and 94 (30%) were harvested, while 78 (24%) were released (Figure 20). An additional 149 (8%) tagged fish were caught but were either too small or too large to harvest.

Using our recapture, tag retention, and reporting rate information, we could estimate fish mortality rates. Estimates of annual fishing mortality based on tagging ranged from 0.03-0.10 for years 2017-2021 (Figure 21). This mortality rate applies to all tagged fish, not just those that are of legal size.

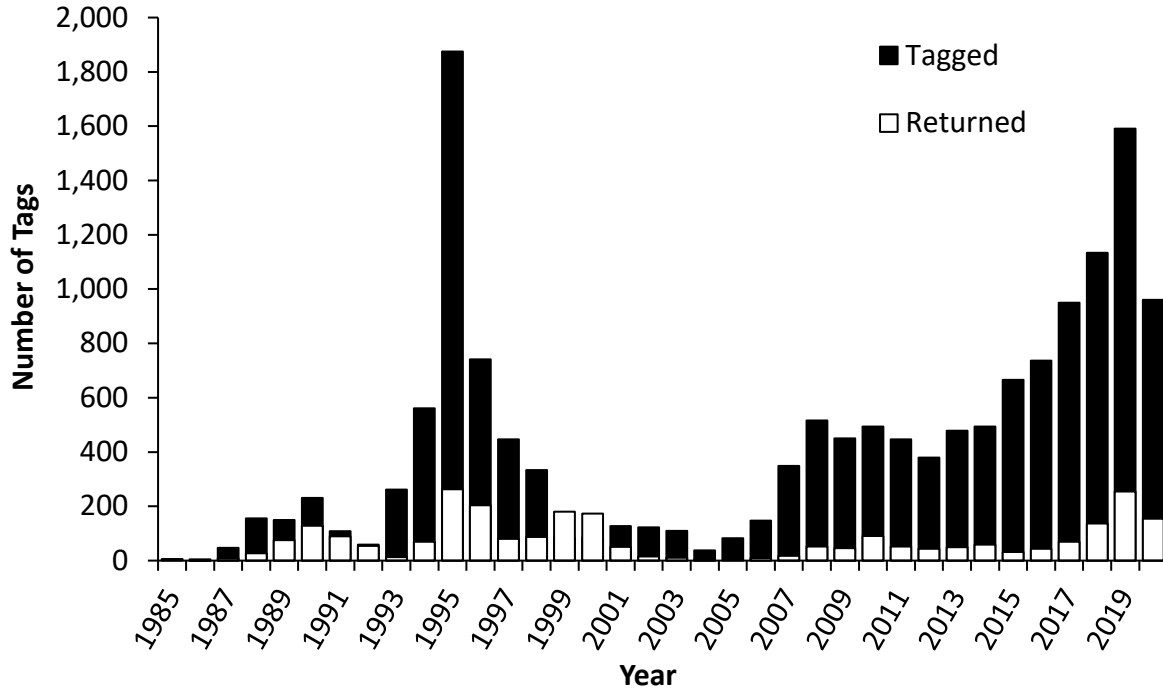


Figure 18. Number of Red Drum tagged and tags returned over the course of the Cooperative Angler Tagging Project.

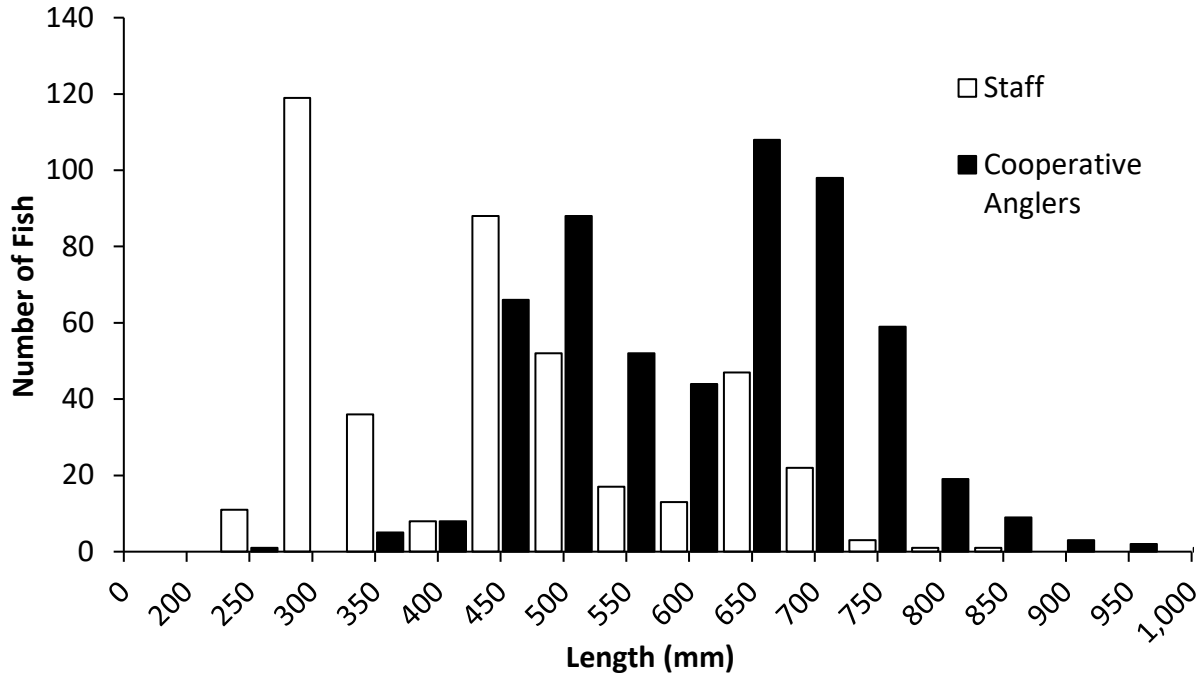


Figure 19. Size distribution of conventional tags deployed by cooperative angler and staff taggers in 2020.

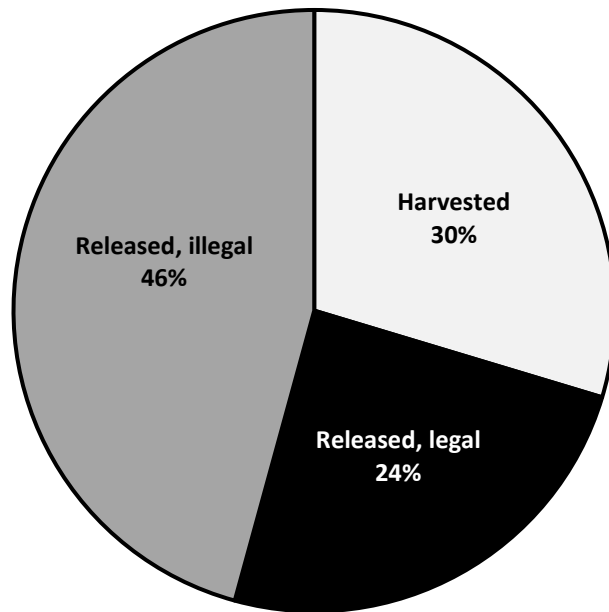


Figure 20. Fate of cooperative angler tagged Red Drum of all sizes caught by anglers from 2020-2021.

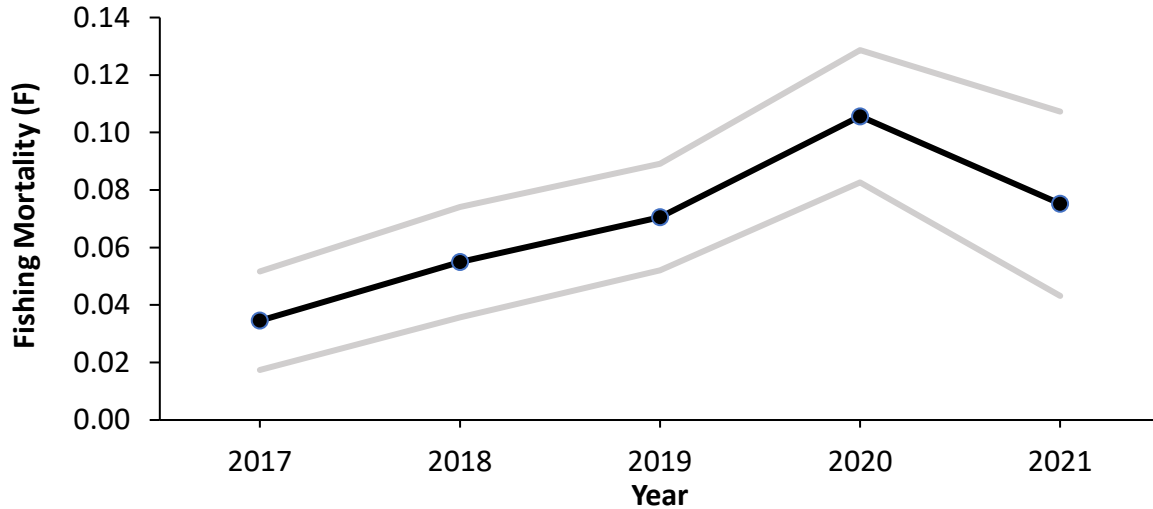


Figure 21. Annual fishing mortality and 95% confidence interval estimates for Cooperative Angler tagged Red Drum from 2017-2021.

Table 2. Number of conventional tags deployed by cooperative anglers and staff taggers throughout the Georgia coast during 2020. Tags include single and double tags. In addition, 41 high reward tags have been distributed throughout the state by staff taggers, but these are not included in the totals here.

	Cooperative Taggers			Staff			2020 Grand Total
	Single	Double	Total	Single	Double	Total	
Savannah River	7	2	9				9
Wassaw	26	1	27	186	14	200	227
Ossabaw	47		47				47
St. Catherines	84		84				84
McQueen Inlet	28	11	39				39
Cabretta Inlet	1		1				1
Sapelo	323	62	385	20	3	23	408
Doboy	79	5	84	13	1	14	98
Altamaha	21		21	4		4	25
Hampton River	26		26	9	1	10	36
Village Creek	36		36	5	1	6	42
St. Simons	296	22	318	66	16	82	400
St. Andrew	72	1	73	165	13	178	251
Cumberland	37		37	31	3	34	71
Offshore	4		4				4
	1,087	104	1,191	499	52	551	1,742

2017 Saltwater Angler and Guide Survey

During 2017, CRD contracted with an independent research company, Responsive Management, to conduct a telephone and online survey of Georgia resident saltwater anglers and guides to determine their participation in various types of fishing, their satisfaction levels, and their attitudes toward CRD management with an emphasis on Red Drum and Spotted Seatrout. Responsive Management used a sample of Georgia residents possessing a CRD Saltwater Information Program permit to represent recreational saltwater anglers. All 134 state-licensed resident saltwater fishing guides were also invited to participate in the survey.

The survey resulted in 1,965 completed interviews by recreational saltwater anglers from 124 Georgia counties. The median age for this group was 49 years, and the majority was male. Most had been saltwater fishing in Georgia for 16 years or more. A total of 83 guides (62%) completed the survey with most having 13 years or more of experience. The results of the survey demonstrated some differences between angler and guide groups.

A majority of participating anglers (54%) said they typically fish for Red Drum in Georgia and most guides (80%) fish for Red Drum with their clients. The survey asked about four motivations for fishing for Red Drum and anglers rated the activity of releasing fish above the three options related to catching fish: catching fish for food, catching lots of fish, and catching large fish. A majority of Red Drum anglers were satisfied with their Red Drum fishing in the past 12 months: 75% were satisfied, while only 13% were dissatisfied. Among guides, 73% were satisfied and 24% were dissatisfied.

When asked about legal-size fish, nearly a quarter of Red Drum anglers (23%) release all or nearly all of the Red Drum they catch, while 14% said they keep all the Red Drum they catch. Overall, anglers release half of their catch of Red Drum. Guides indicated that their clients release legal Red Drum much more frequently than not.

Currently, the creel limit for Red Drum in Georgia is five per day per person, with a 14- to 23-inch-slot-length limit and no closed season. Red Drum angler satisfaction with these regulations far exceeded dissatisfaction: 72% are satisfied, while 16% are dissatisfied. Conversely, Red Drum guides are more dissatisfied (53%) than satisfied (44%) with the regulations.

The survey provided a choice of slot-size ranges for Red Drum and asked respondents to select a preference. Red Drum anglers most frequently selected a slot size of 14 to 25 inches (27% chose this), while guides most frequently chose 15 to 23 inches (28%). Over half of Red Drum anglers (56%) would like the creel limit to remain at five fish per person. The response with the second highest percentage was six to ten fish (26%). A total of 51% of Red Drum guides preferred either two or three fish with a three fish median.

Discussion

Our surveys provide important insight into Red Drum population status and the fishery. Based on our survey information, it appears that the trend of the Red Drum population available to anglers in Georgia is stable over time but exhibits annual variability, resulting in inconsistent numbers of legal-sized fish available to anglers in any given year. This was similar to the observations of the regional stock assessments.

An interesting observation was that there were similar patterns in trends of our various surveys (Figure 22). For example, 2012 was a low year for all surveys. This was an important observation that suggested the surveys are all capturing the same overall signal in the

population. Having a clear trend with consensus among surveys reduces the uncertainty for managers when making decisions. It also means that our surveys are effective in monitoring the population.

Environmental variability may play an important role in annual Red Drum abundance at local levels. The trend agreement in the case of the CLS and MSPHS surveys, which assess two different life stages of Red Drum, was noteworthy. The expectation was that there would be a lag, where a low year for the CLS, which samples potentially spawning adults, would be followed by a low year for the MSPHS, sampling young-of-year recruits. This would suggest that there was not a spawner-recruit relationship between these surveys, but some different annual relationship. Also worth noting, in some years, especially 2012, Red Drum harvest in Mid-Atlantic states were estimated to be at record highs, suggesting that there could be regional population dynamics at play.

A majority (65-75%) of harvested Red Drum were sized in the lower half of the slot and a majority of harvest of these smaller fish tended to occur in late-summer into fall. Both the MSCRP and MRIP catch data showed the same length patterns for harvested fish. This harvest characteristic was not observed as strongly in other states, even when regulations were similar. These patterns extend back in time to the 1990s, when prior length regulations were in place (Figure 2). The reason for this pattern was unclear, but likely was related to a combination of growth, habitat use, and behavior of juvenile Red Drum at smaller legal sizes and angler practices. To summarize, smaller Red Drum may be easier to catch in greater numbers than larger Red Drum and those who target them are more likely to harvest them. Despite the concentration of harvest effort on smaller sizes, larger legal fish do appear to persist in the estuaries and to enter the ocean, based on MSCRP, tagging data, and the CLS.

The majority of Red Drum donated to the carcass project were age-0 to -2 with some age-3 fish. This means that harvest pressure was only distributed across 4 different age classes. Based on our tagging data, this fishing pressure does not appear to be oppressive and was similar to estimates from the regional stock assessments. Since Red Drum can live to over 60 years, they are only subject to intense fishing pressure for a short period of their life. It is important to remember that Red Drum populations are resilient to recruitment variability as a result of their long lifespan and protection from harvest at larger sizes. Results from MSPHS suggest juvenile populations have been relatively flat from 2009-2019, but with a downward trend in 2020. This means that even if recruitment is poor in a single or several years, there are still sufficient adults in the population to support reproduction.

The regional MRIP CPUE data (Figure 3) suggested that there are no strong differences between fishing CPUE in the northern and southern regions of the state. While there could be local depletion of Red Drum populations in heavily fished areas, like Wassaw Sound, the data do not support this hypothesis. Estimates of CPUE through MRIP were relatively steady for the entire state (Figure 1). As we collect more data through the tagging and escapement projects, we may be able to tease out more of this regional variation.

The variability in the Cooperative Angler Tagging Project over time limited the usefulness of previous years of tagging; however, the recent improvements to the project will be valuable going forward and can possibly be used in more recent years to provide estimates. Tag returns were already providing some valuable information and our mortality estimates were similar to the estimates from the most recent stock assessment. Our tagging estimates will continue to improve as time passes and more tags are returned. Similarly, the Escapement Project will provide significant results as it continues to expand. Data from both of these projects can be combined to provide important estimates of mortality, movement, and angler behavior as time passes.

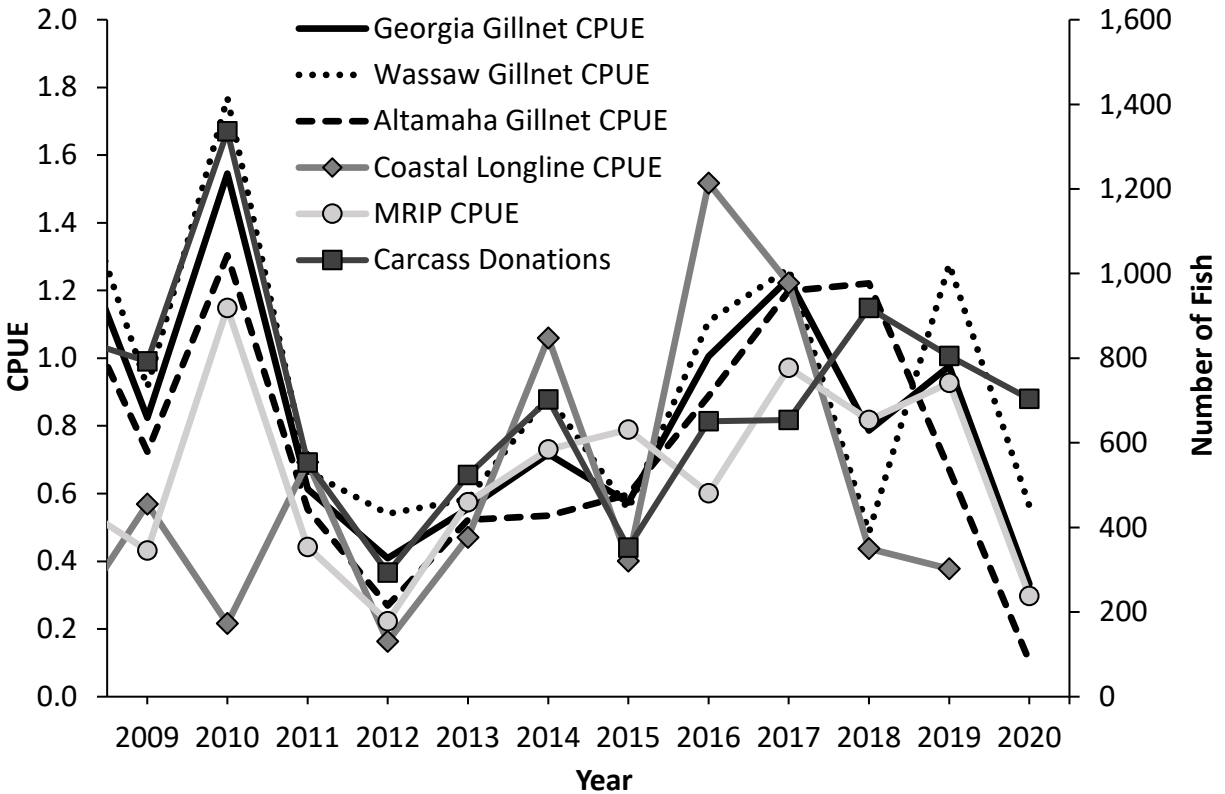


Figure 22. Trends from several GA Coastal Resources Division surveys showing similarity in trends over time, despite sometimes sampling different portions of the population.

Conclusion

The goal of the CRD's multiple projects is to provide a comprehensive picture of Georgia's Red Drum population. Each of the previously described projects provide a specific component of information. The MSPHS provides relative abundance estimates of age-0 and -1 Red Drum, those that are just recruiting to the fishery. The CLS provides information on the presence of adult Red Drum in near- and off-shore state waters. The MSCRP provides information on the size and age of Red Drum harvested by recreational anglers. With the recent enhancements, the CAT project provides information about Red Drum movement, growth, fishing mortality, and angler behavior. Finally, the Escapement Project provides information about Red Drum survival, escapement from the sounds, and broader regional movement.

With regard to the current Red Drum population status in Georgia, there may be some recent decline in the numbers of Red Drum available to anglers. However, at this point it is difficult to determine if this is a short-term dip or a symptom of a longer-term problem. We can see some evidence in recent decline in some of our other surveys, but other information sources, such as tagging, do not show evidence of mortality problems. Results of the 2017 Angler and Guide Survey showed generally positive angler opinions about the state of the fishery and management. An updated survey planned for 2022 could help highlight potential recent angler trends. Without additional information, it is difficult to determine what specific problems might be, what sectors of the fishery do they affect, and what management actions are needed to

address them. It is important moving forward that we continue to closely monitor the population to watch for longer-term trends.

Even with the data available to us, there are still areas of uncertainty with regard to aspects of Red Drum populations. Some of these include estimates of annual recruitment (how many young fish result from eggs that are produced), age and survival of older fish that have moved offshore, and detailed local water quality conditions in sounds. These information gaps do not limit our ability to manage Red Drum populations, but they do limit our ability to perform more complex analyses, such as stock assessments. This is a major reason why we do not perform a state specific stock assessment for Red Drum, although we do contribute a large amount of Georgia data to regional assessments performed by ASMFC. The next ASMFC Red Drum stock assessment has already begun and is scheduled to be completed by 2024.