

**Georgia Department of Natural Resources
Coastal Resources Division
Management Plan: Red Drum
October 2012**

General Objective

Manage Georgia's red drum fishery to ensure the maximum aggregate social, economic, and ecological benefits to the citizens of Georgia.

Life History and Reproductive Biology:

The red drum is a euryhaline (i.e., well adapted to a wide range of salinity) teleost found throughout the year in estuarine and nearshore Atlantic Ocean waters along the Georgia coast. Spawning occurs during the late summer and early fall in nearshore coastal waters. Males engage females in a courtship ritual characterized by drumming and physical contact. Female red drum release hydrated oocytes simultaneously with the release of sperm by males. Fertilization occurs externally and larvae are passively transported into the estuary where they are believed to settle in oligohaline (low salinities: 0.5 to 5.0 ppt) areas. Individual fish may spawn several times during a season. Following settlement, juvenile red drum will remain in the nursery areas for approximately six to ten months. During the first summer of life, red drum can be found in dense schools in the larger waterways of the mesohaline (salinities ranging from 5.0 to 18.0 ppt) areas of an estuary. They remain in these habitats until the onset of sexual maturity approximately four years later at a length of 27-30 inches (686 – 762mm). At maturity, red drum will leave the estuary proper and join the adult segment of the population comprised of individuals from over 35 cohorts. Tagging and biotelemetry studies conducted by GADNR have shown that while some adult red drum may make latitudinal movements as far south as Cape Canaveral they will return to the vicinity of their natal estuaries to spawn (John Pafford GADNR, personal communication).

Description of the Fishery:

Recreational Fishery

The red drum is a recreationally important species in Georgia. Anglers consistently rate red drum in the top five most targeted species based on creel surveys. The estuarine fishery is prosecuted throughout the year by bridge, pier, private boat anglers, 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. Harvest of red drum in the exclusive economic zone (EEZ) has been prohibited

since 1989. According to the Marine Recreational Information Program (MRIP), the annual recreational harvest over the last 22 years has been highly variable ranging from a low of 24,929 fish in 1998 to a high of 194,826 in 2010. The average annual harvest for the period 1990 – 2011 was 100,792 fish.

Commercial Fishery

A small-scale gillnet fishery for red drum existed in the 1950s; however, the use of gillnets in Georgia's territorial waters was prohibited by statute in 1957. Since that time the commercial fishery for red drum has been comprised predominately of hook and line recreational anglers and for-hire fishers that sell their catch. This catch is often sold directly to restaurants and not documented. Reported landings have decreased overall from 1,426 pounds in 1990 to less than 250 pounds in 2011. During the past 22 years, the annual value of the commercial catch has not exceeded \$2,200.

Current Regulations

Georgia Regulations:

O.C.G.A 27-4-130.1

Minimum-size:	14-inch TL
Maximum-size	23-inch TL
Daily creel limit:	5 fish per person per day
Season:	Open all year

Federal Regulations:

Exclusive Economic Zone (3 - 200 miles offshore)

No harvest allowed

Chronology of Red Drum Management Actions in Georgia

1957 Prohibition of the use of gill nets in Georgia's estuarine waters (except for shad and diamond back terrapins)

1986 State of Georgia Game and Fish Law: 27-4-10 and –11

Red Drum

14-inch minimum-size and only 2 fish over 32-inches

1989 State implements authority of Board of Natural Resources to establish open/closed seasons, daily creel limits, and minimum-size requirements for designated marine species. (O.C.G.A. 27-4-130.1)

Red Drum

Season:	All year
Minimum-size:	14-inches
Daily creel limit:	10 fish (2 over 32-inches)

Exclusive Economic Zone (3-200 miles) closed to harvest of red drum

1991 Creel limit reduced through Board of Natural Resources action
Red Drum

Season:	All year
Minimum-size:	14-inches
Daily creel limit:	5 fish (1 over 27-inches)

1992 State implements authority of the Board of Natural Resources to establish possession limits for designated marine species

Red drum

Possession limit:	5 fish
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1993 Slot limit (i.e. maximum-size limit) established in amendment to O.C.G.A. 27-4-130.1 (b)

Red Drum

Season:	All year
Minimum-size:	14-inches
Maximum-size:	27-inches
Daily creel limit:	5 fish
Possession limit:	5 fish

2002 Maximum-size limit reduced through amendment to O.C.G.A. 27-4-130.1 (b)

Red Drum

Season:	All year
Minimum-size:	14-inches
Maximum-size:	23-inches
Daily creel limit:	5 fish
Possession limit:	5 fish

Prioritized Issues of Concern

1. As the population of Coastal Georgia continues to increase, so will the number of saltwater anglers and fishing pressure on red drum.
2. The population of coastal Georgia continues to increase with concomitant urbanization of areas adjacent to the estuary.
3. Inland land and water use patterns are changing so that the quality and quantity of freshwater entering the estuaries could be altered to the point of comprising ecosystem function.
4. There are several sources of bias and error in the regional approach to red drum stock assessment. First and foremost among these is the fact that red drum form estuarine-specific populations of immature fish, each of which is subject to unique natural and fishing mortality. Likewise, groups of spawning adults appear to be behaviorally, if not spatially segregated.
5. The regional approach to Atlantic coast red drum stock assessment does not provide specific information on the status of Georgia's red drum populations.

Thus, fishery managers and policy makers lack the information needed to manage the state's red drum fishery for maximum aggregate social, economic, and ecological benefits.

6. There are no timely estimates of the impact of the marine recreational fishery on the economy of Georgia. With these kinds of estimates, an accurate value could be assigned to the recreational red drum fishery and a strong case could be made for investing greater human and fiscal resources in the research and population monitoring needed for effective management.
7. Little is known about the status of the red drum spawning biomass in the coastal waters of Georgia. Samples of adult red drum have been collected twice for the purpose of analyzing the age structure of the spawning population. The first collection occurred over ten years ago. Analysis of these samples revealed a spawning population comprised mostly of red drum older than age 15. Unfortunately, no measure of effort was recorded. In 2002, the first of a periodic collection of adult red drum coupled with effort data began. Red drum samples were collected in the same area as the earlier survey. Analysis of the 2002 samples revealed a spawning population comprised mostly of red drum older than age 11. Additional sampling every fifth year is needed to determine the relative abundance of cohorts within the spawning biomass.
8. The spatial aspects of red drum spawning in Georgia are poorly understood. Spawning aggregations have been documented at only one location, the navigation channel at the entrance to the Cumberland estuary. However, there is anecdotal evidence that aggregations of adult red drum can be found at the mouth of the Savannah River, near McQueen's Inlet, at the Altamaha River delta, and in the St. Andrew estuary. Given the lack of information on red drum reproduction, it is possible these and other important spawning habitats are vulnerable to degradation and/or destruction.
9. There is no estimate of reproductive output (eggs) of the spawning biomass or of the total spawning biomass (weight). Additionally, the relationship between fishing mortality, spawning biomass, and recruitment is unknown.
10. Both private boat anglers and for-hire fishers more frequently target adult red drum during the post-spawning period from September through November. Even though anglers are required to release these fish because of the slot size limit, it is likely that some release mortality occurs. Yet, we have no measurement of this mortality and, thus cannot determine the impact of this mortality on the spawning stock biomass.
11. Very little information exists on the early life history of red drum in Georgia. Thirty plus years of trawl surveys in estuarine and nearshore areas in Georgia's territorial waters have produced only a sparse number of juvenile red drum. Therefore, it appears they are selecting very specific microhabitats or they are not susceptible to the gear. It is possible the juveniles only occur in the low salinity areas of the estuary. These areas are very vulnerable to degradation or destruction from coastal area urbanization, coastal plain silvicultural practices, and reduced fresh water inflow.

12. Tagging and biotelemetry studies have shown that there are estuarine-specific populations of red drum which exhibit strong fidelity to the waters of Georgia. It is not known if the adult population is segregated into several groups of fish, each of which is comprised only of individuals that originated from a single estuary or, instead, is a composite of adults from several natal estuaries. Likewise, it is unknown whether adult red drum from Georgia may mix with adults whose natal estuaries were in adjacent states.
13. There are nine major estuarine systems along the coast of Georgia. Each has defining biotic and abiotic characteristics. Thus, it is reasonable to assume the suitability of each of these estuaries as red drum habitat might vary greatly from year to year. Similarly, natural and fishing mortality in each of these estuaries can vary from year to year. Consequently, it can be expected that recruitment to the adult population, either on an estuarine-specific or coastwide basis, may vary greatly through time.
14. For years, some anglers and conservation groups have suggested that the red drum should be designated a gamefish. However, it appears that legal sales of red drum are minimal and cause little additional mortality. There is little information on the magnitude of unreported sales of red drum in Georgia.

Current Data Sources

Fishery Dependent Data Sources

Marine Recreational Information Program (MRIP)

Formerly Marine Recreational Fishery Statistics Survey (MRFSS)

Since March of 2000, biologists with the Georgia Department of Natural Resources' Coastal Resources Division (GADNR CRD) have been working in conjunction with the federal National Marine Fisheries Service to conduct a survey of recreational saltwater anglers in coastal Georgia. This survey, entitled the Marine Recreational Information Program (MRIP), produces estimates of recreational finfish catch (including fish released as well as those retained as harvest). Additionally, the MRIP estimates numbers of recreational saltwater anglers (participation) and numbers of fishing trips (effort). These data are necessary for determining appropriate regulations (i.e., creel and length limit laws), provide catch data for fishery management plans, and track trends in angler participation and landings.

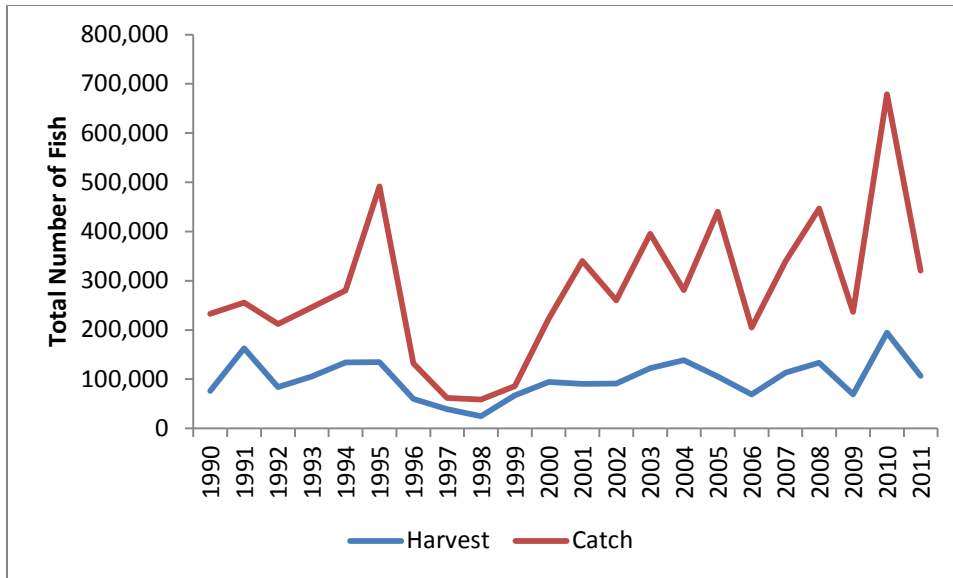


Figure 1. Georgia recreational catch and harvest of red drum.

Carcass Recovery Project (CRP)

Since the autumn of 1997 chest freezers have been placed and maintained near the fish cleaning stations at selected locations along the Georgia coast. Each freezer is marked with an identifying sign and a list of target fish species. Inside the freezer is a supply of plastic bags, information cards, and pens. Cooperating anglers can place 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. Participants are given an incentive award for each three bags of fish carcasses.

These discarded fish carcasses provide valuable data for fisheries managers. Recognizing this opportunity, staff with the Marine Fisheries Section developed a project to gather these fish carcasses. The information provided by fish carcasses is used in a variety of analyses, all of which help us 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. The length and age information collected from donated red drum carcasses have been sent to stock assessment scientists with the National Marine Fisheries Service.

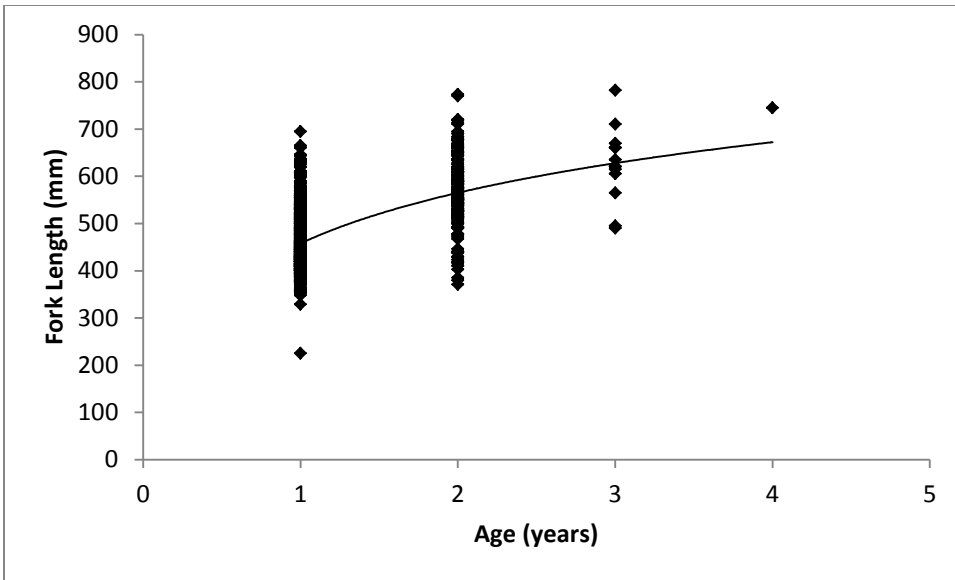


Figure 2. Age and growth of red drum collected in Georgia from 1997-2008 through the carcass recovery program.

Cooperative Angler Tagging Project (CATP)

The Cooperative Angler Tagging Project provides growth, movement, and habitat preference data on selected species. Currently, red drum, tripletail, and Atlantic tarpon are target species of the CATP. Incentives, such as hats and T-shirts, are utilized to encourage anglers to tag as well as report recaptures. To date 2,784 red drum have been tagged through the CATP.

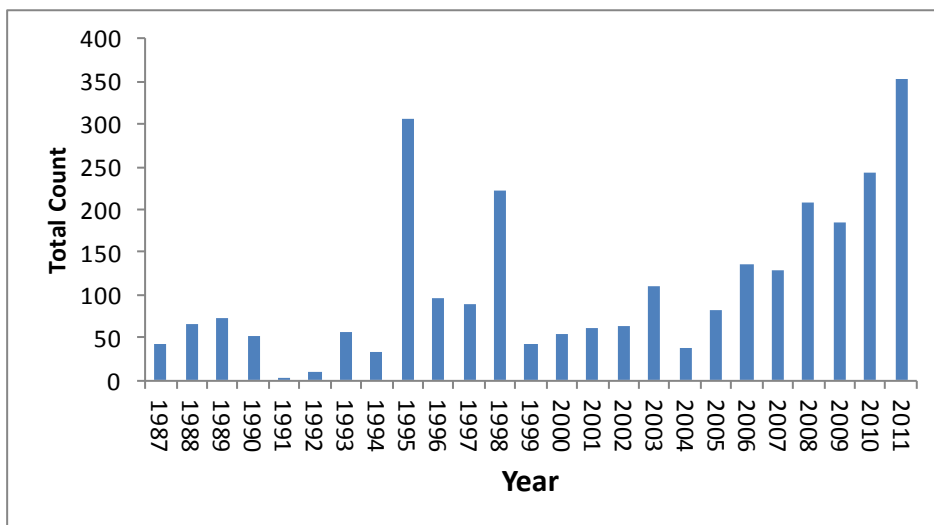


Figure 3. Total number of red drum tagged by year.

Fishery Independent Data Sources

Marine Sportfish Population Health Surveys (MSPHS)

The Georgia Department of Natural Resources' Coastal Resources Division (CRD) has management responsibility for more than 40 species of saltwater fish, ranging from sharks to sheepshead. Although federal agencies such as the National Marine Fisheries Service provide the information used to manage some of these species, the responsibility for determining the health of Georgia's populations of red drum, spotted seatrout, Atlantic croaker, sheepshead, whiting, tripletail, and tarpon rests solely on CRD.

The Wassaw, Altamaha River Delta, and Cumberland systems have been identified as the estuaries that should be surveyed annually. A biologist/technician team is required for each system. They conduct field operations, fish sample processing, fish age determination, and data analysis/interpretation. Federal Aid in Sportfish Restoration is used for the Altamaha River Delta and Wassaw system activities. Originally, the Wassaw system sampling activities were funded by State monies; however, budget cuts required the shift to Federal funds. The Cumberland estuary cannot be surveyed until additional funding is made available.

The following tasks are accomplished during the study: (1) collect biological data from estuarine fishes, particularly those of recreational importance; (2) characterize the essential habitats needed by the various life history stages of these fishes; (3) analyze these data to determine the health of marine sportfish populations; and (4) summarize this information for use in stock assessments and other status reports which will be available to fishery managers, policymakers, and the public.

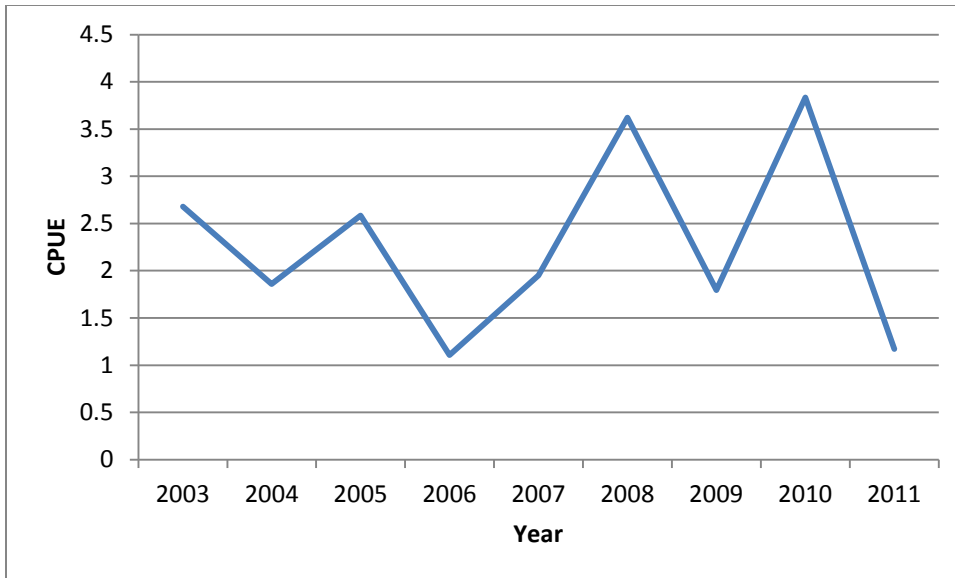


Figure 4. Catch per unit effort (total fish per net set) of red drum from MSPHS.

Goals and Objectives for Management

1. Manage for Optimum Yield (OY) which is defined as the level of escapement necessary to attain a 40% SPR.
2. Establish a target level of fishing mortality, F_{target} and a maximum level of fishing mortality, F_{max} for Georgia's red drum fishery.
3. Protect the spawning population from directed fishing mortality until the stock is recovered from overfishing.
4. Identify and protect Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC).

Prioritized Research and Monitoring Needs

1. **Develop abundance index for age-0 red drum.**

Field Methods:

During the period from June through August conduct sampling with 2.5" (63.5mm) stretch mesh gill nets to capture age-0 red drum from the estuarine waters of Wassaw, Altamaha, and Cumberland estuaries.

Analytical Methods:

The catch of age-0 red drum will be related to a unit of effort to develop an index of abundance. Over time, this index can provide a meaningful reference point to compare recruitment between years and locations. The index may also provide a meaningful benchmark for evaluating the effects and effectiveness of red drum stocking.

2. Estimate escapement and static spawning potential ratio (SPR) for red drum populations in Georgia.

Field Methods:

Partial implementation of the fishery independent Marine Sportfish Population Health Survey (MSPHS) began in 2003. Age determinations are made on a statistically appropriate subsample. Currently, the survey is conducted in and adjacent to the Altamaha and Wassaw estuaries. Complete implementation of the MSPHS will require funding and personnel to include Cumberland estuary in the survey design. This information will be used to tune the catch matrix developed from fishery dependent data. Otoliths taken from subsamples of fish collected during the fall portion of the trammel net survey coupled with otoliths from red drum carcasses donated to the CRP will be used to develop an age-length key and construct a catch-at-age matrix.

Analytical Methods:

A cross-sectional and cohort-based catch curve would be produced from fishery independent and dependent surveys to estimate overall and year-class specific rates of total annual instantaneous mortality. A virtual population analysis (VPA) would be performed using fishery-dependent based catch matrix to estimate age specific rates of instantaneous mortality. Escapement (survival to age 5) and static spawning potential ratio (SPR) will be estimated using the estimates of age-specific fishing mortality produced from the VPA. Depletion estimation using fishery independent age, gear-specific indexes of relative abundance would be used to estimate overall and age specific rates of total annual instantaneous mortality.

3. Develop abundance index for adult red drum.

Field methods:

During the period from April through December, sampling with modified longline gear will be conducted in areas where post-spawn adult red drum fish have been historically encountered as well as in areas of unknown abundance. Each fish will be measured and tagged with an external and passive integrated transponder (PIT) tags.

Analytical Methods:

The survey will be conducted in such a way that the number of red drum will be related to a unit of effort. This index can be used as a relative measure of abundance and possibly quantify the status of spawning biomass.

4. Sample the spawning population to describe the age structure and relative abundance of cohorts.

Field Methods:

Beginning in 2002 and every fifth year thereafter, that portion of the spawning population exhibiting fidelity to the Altamaha River delta should be sampled to determine the relative abundance of cohorts within the spawning biomass. Each sampling cycle, sampling will be conducted in the same locations and with identical gear.

Analytical Methods:

Each specimen will be measured and weighed. Sagittal otoliths will be removed and used to assign an age and birth year to the specimen. In addition, tissue samples will be removed for DNR profiling and evaluation for the presence of contaminants.

5. Identify estuarine nursery habitats and quantify residence times of juvenile red drum.

Field Methods:

Develop efficient methodology for collecting juvenile red drum (< 6 months chronological age). Conduct surveys in each estuary to determine the presence or absence of juvenile red drum in suitable habitats. The information provided by these surveys could be used to inform scientists about optimal locations for the release of hatchery-reared red drum and to develop a more valid juvenile abundance index.

Analytical Methods:

Use survey data to identify and classify red drum essential nursery habitat.

6. Estimate age-specific mortality on an annual basis.

Field Methods:

Conduct a mark-recapture study with concurrent investigations of post hooking /tagging mortality, tag retention and tag non-reporting. Each year a minimum of 1,500 immature red drum would be marked with external tags in three estuarine systems: Wassaw, Altamaha, and Cumberland. Both standard and high value reward tags would be used.

Analytical Methods:

Data from the mark-recapture study will be analyzed using the most advanced techniques suitable for red drum, such as recent variations of the Brownie model used to analyze SCDNR tagging data. The products of this analysis will be used to determine the level of total mortality and the level of fishing mortality relevant to F_{target} and F_{max} .

Activities for FYs 2013 - 2017

Collection of catch/harvest/effort data from the recreational red drum fishery.

Purpose: To describe the size distribution and quantity of red drum caught and landed by recreational anglers.

Method: Continued participation in the Marine Recreational Information Program (MRIP).

Process red drum carcasses collected through the Marine Sportfish Carcass Recovery Project (CRP).

Purpose: To collect biological data from red drum harvested by recreational anglers.

Method: Anglers will be encouraged to donate the filleted carcasses of red drum. Chest freezers are located at selected public access points along the Georgia coast.

Evaluation of modified longline as sampling gear for adult red drum.

Purpose: To determine if a longline can be effectively used to capture red drum from estuarine and nearshore waters. If the gear proves effective, there is potential to use it as the standard sampling method for a long-needed assessment of the relative abundance of adult red drum.

Methods: Proof of concept testing will continue and will be conducted from April through December. The longline gear (approx ½ mile, with 60 hooks) will be soaked for a minimum of 30 minutes during each set.

Collection of age/abundance/habitat preference data through the Marine Sportfish Population Health Survey (MSPHS) and investigate options for including Cumberland estuary.

Purpose: To collect timely and relevant data on the age structure, abundance, and habitat preferences of marine finfish species popular with recreational anglers in order to determine the efficacy of current management practices.

Methods: Job (1) During the period from March through May and September through November, personnel will deploy 600' (182.88m) trammel nets constructed of a 2.75" (69.85mm) stretch mesh inner panel and 14" (355.60mm) stretch mesh outer panels at predetermined fixed and random stations in Wassaw and Altamaha

estuaries. During the fall portion of the survey, size-stratified subsampling and subsequent processing for age determinations of red drum will be conducted.

Job (2) During the period from June through August, personnel will deploy 300' (91.44m) gill nets constructed of 2.5" (63.50mm) stretch mesh at predetermined fixed and random stations in Wassaw and Altamaha estuaries.

Job(3) Investigate potential funding and personnel options for including Cumberland estuary into the spatial coverage of the Marine Sportfish Population Health Survey.

Cooperative Angler Tagging (CATP) / Public Relations Tagging Events.

Purpose: Provide education and outreach opportunities as well as collect growth, movement, habitat preference, and site fidelity data on red drum.

Methods: Charter captains and recreational anglers will be provided with tagging kits and data cards. Incentives such as hats and T-shirts will be utilized to encourage anglers to tag and report tag returns. Additionally, all adult red drum captured during public relations trips and caught on non-standardized sampling gear will be measured and tagged with sequentially-numbered plastic dart tags and released.

Evaluation of trammel gear for young of the year red drum sampling.

Purpose: The current gill net sampling is size specific; using trammel nets has the potential of expanding the species and size classes of fish that can be sampled.

Methods: In addition to the regular young of the year red drum sampling with 300' (91.44m) gill nets constructed of 2.5" (63.50mm) mesh, separate net sets will be performed with 600' (182.88m) trammel nets constructed of a 2.75" (69.85mm) stretch mesh inner panel and 14" (355.60mm) stretch mesh outer panels. A series of side by side net deployments will be used to compare the catches for both net types. If there is no difference between the CPUE of the two net types for young of the year red drum we will consider changing the net over to the 600' trammel net.