SURVEY OF POPULATION PARAMETERS OF MARINE RECREATIONAL FISHES IN NORTH CAROLINA

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ABSTRACT

The "Survey of Population Parameters of Marine Recreational Fishes in North Carolina" grant objective is to develop a long-term database of population parameters essential for stock assessments and management of important North Carolina recreational fishes. Data collected from 2006 to 2010 include age composition, juvenile abundance indices, recreational catch information for adult finfish, and tournament catch and/or release information for adult pelagic finfish. A total of 41,054 ageing structures were collected from 14 finfish species from fishery independent surveys, recreational and commercial catches. A total of 27,572 ageing structures were successfully aged to determine the age composition for southern flounder (*Paralichthys lethostigma*) (4,630), summer flounder (*Paralichthys dentatus*) (3,658), red drum (*Sciaenops ocellatus*) (2,821), spotted seatrout (*Cynoscion nebulosus*) (3,577), weakfish (*Cynoscion regalis*) (2,547), Atlantic croaker (*Micropogonias undulatus*) (3,130), spot (*Leiostomus xanthurus*) (1,801), American shad (*Alosa sapidissima*) (3,115), southern kingfish (*Menticirrhus americanus*) (1,895), Gulf kingfish (*Menticirrhus littoralis*) (273) and northern kingfish (*Menticirrhus saxatilis*) (125). A stratified random trawl survey was conducted in Pamlico Sound to determine the annual juvenile abundance indices (JAI) for summer flounder, southern flounder, weakfish, Atlantic croaker, and spot. A total of 51 to 54 randomly selected stations are sampled over a two week period, usually the second and third week of the month in both June and September. A fall seine survey was conducted to determine the annual index of juvenile abundance for red drum at 20 fixed sampling sites from September through November of each year. Juvenile red drum catch per unit effort values ranged from a low of 1.58 in 2008 to a high of 5.46 in 2007. An angler award program recognized 5,076 outstanding recreational catches in 2010. Anglers received catch certificates for 36 finfish species on landed or released fish meeting program minimums. Length, girth, weight and date data were collected aiding in monitoring large adult and rare event finfish. Length, weight, and sex data on landed fish, dolphin (*Coryphaena hippurus*) (58), wahoo (*Acanthocybium solanderi*) (4), yellowfin tuna (*Thunnus albacares*) (6), and catch and gear data on released fish, blue marlin (*Makaira nigricans*) (12), white marlin (*Tetrapturus albidus*) (52), sailfish (*Istiophorus albicans*) (66), were collected from four billfish tournaments as part of the North Carolina Governor's Cup Billfishing Conservation Series. Data from this grant were incorporated into long-term databases which have been and will be used in North Carolina and regionally to evaluate the effectiveness of current management measures, implement additional measures, and modify existing measures, as needed, to conserve stocks of important marine recreational finfish.

TABLE OF CONTENTS

ABSTRACT II

LIST OF TABLES AND FIGURES IV

JOB 1: RECREATIONAL FINFISH ANNUAL AGE COMPOSITION SURVEY 1

JOB 2: PAMLICO SOUND SURVEY 3

JOB 3: NORTH CAROLINA RED DRUM SEINE SURVEY 6

JOB 4: NORTH CAROLINA SALTWATER FISHING TOURNAMENT, CITATION PROGRAM . 7

JOB 5: NORTH CAROLINA GOVERNOR'S CUP BILLFISHING CONSERVATION SERIES 9

REFERENCES 10

APPENDIX A 34

LIST OF TABLES AND FIGURES

Tables

Table 1.1 – Number of samples collected for all species compared to the number aged by NCDMF from 2006-2010……..……...13

Table 1.2 – Primary ageing structures and min, max, and mean lengths for all species collected by NCDMF from 2006-2010…….…….. 14

Table 1.3 – Age-length key of southern flounder, *Paralichthys lethostigma,* from otolith ages obtained by NCDMF from 2006-2010 (n=4,630)…….……... 15

Table 1.4 – Age-length key of summer flounder, *Paralichthys dentatus,* from otolith ages obtained by NCDMF from 2006-2010 (n=3,658)……16

Table 1.5 – Age-length key of red drum, *Sciaenops ocellatus*, from otolith ages obtained by NCDMF from 2006-2010 (n=2784). Aged fish were 19 ≤ years old……..…….17

Table 1.5 cont. – Age-length key of red drum, *Sciaenops ocellatus*, from otolith ages obtained by NCDMF from 2006-2010 (n=139). Aged fish were ≥ 20 years old……..…….....18

Table 1.6 – Age-length key of weakfish, *Cynoscion regalis,* from otolith ages obtained by NCDMF from 2006-2010 (n=2,547)……..….……...19

Table 1.7 – Age-length key of Atlantic croaker, *Micropogonias undulatus,* from otolith ages obtained by NCDMF from 2006-2010 (n=3,130)…….20

Table 1.8 – Age-length key of American shad, *Alosa sapidissima,* from otolith ages obtained by NCDMF from 2006-2010 (n=3,115)……. .....…….21

Table 1.9 – Age-length key of spot, *Leiostomus xanthurus,* from otolith ages obtained by NCDMF from 2006-2010 (n=1801)……...21

Table 1.10 – Age-length key of spotted seatrout, *Cynoscion nebulosus,* from otolith ages obtained by NCDMF from 2006-2010 (n=3577)…….22

Table 1.11 – Age-length key of southern kingfish, *Menticirrhus americanus,* from otolith ages obtained by NCDMF from 2006-2010 (n=1895)……..…...23

Table 1.12 – Age-length key of northern kingfish, *Menticirrhus saxatilis,* from otolith ages obtained by NCDMF from 2006-2010 (n=125)…….…….....23

Table 1.13 – Age-length key of gulf kingfish, *Menticirrhus littoralis,* from otolith ages obtained by NCDMF from 2006-2010 (n=273)…….…24

Table 1.14 – Species that have Fishery Management Plans (FMPs) developed by NCDMF and/or other governing bodies……..24

Table 2.1 – Trawl samples collected from June 2006-September 2010, in Pamlico Sound, NC. A sample consisted of two trawls pulled simultaneously at each station…….……...25

Table 2.2 – North Carolina Pamlico Sound Survey juvenile indices for selected species, including proportional standard error (PSE), 2001-2010…….……..26

Table 2.3 – North Carolina Estuarine Trawl Survey juvenile abundance indices for selected species, including proportional standard error (PSE), 2001-2010…….…..27

Table 3 – Juvenile red drum catch and CPUE (number of drum/seine sample) from the red drum seine survey in North Carolina, 1991-2010…….…28

Table 4 – Number of citations NCDMF issued (n=5,076) by species from 2006-2010…….29

Table 5 – Number of fish weighed and released (n=198) by species from the 2010 North Carolina's Governor's Cup Billfishing Conservation Series…….....30

Figures

Figure 1 – All stations for the NCDMF Pamlico Sound Trawl Survey…….……31

Figure 2 – Geometric mean by species for the Pamlico Sound Survey (PSS) and the North Carolina Estuarine Trawl Survey (P120), (2001-2010)……...…..32

Figure 3 – Sampling sites of the juvenile red drum survey in North Carolina, 2006 to 2010……...33

Figure 4 – Red drum releases in North Carolina Waters from 1993-2010…….…34

Figure 5 – Hook type for released billfish from the 2010 North Carolina's Governor's Cup Billfishing Conservation Series…….…….34

JOB 1: RECREATIONAL FINFISH ANNUAL AGE COMPOSITION SURVEY

INTRODUCTION

Management actions proposed in fishery management plans (FMP's) are usually based on stock assessments, which evaluates whether or not a stock is overfished. Data necessary to prepare stock assessments include age-length keys, growth information, and catch-at-age matrices. This study determined the age composition of 14 recreationally important finfish in North Carolina: southern flounder (*Paralichthys lethostigma*), summer flounder (*Paralichthys dentatus*), red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), weakfish (*Cynoscion regalis*), Atlantic croaker (*Micropogonias undulatus*), spot (*Leiostomus xanthurus*), American shad (*Alosa sapidissima*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*Scomberomorus maculatus*), bluefish (*Pomatomus saltatrix*), southern kingfish (*Menticirrhus americanus*), Gulf kingfish (*Menticirrhus littoralis*) and northern kingfish (*Menticirrhus saxatilis*).

METHODS

Ageing structures (otoliths and/or scales) were taken from target species obtained from the North Carolina Division of Marine Fisheries (NCDMF) fishery independent sampling, and from recreational and commercial catches. Sampling effort was distributed to cover the size range of fish encountered over a range of fishing gears and fishing months (seasonally). Target species were southern flounder, summer flounder, red drum, weakfish, Atlantic croaker, king mackerel, Spanish mackerel, American shad, spot, spotted seatrout, bluefish, southern kingfish, northern kingfish, and gulf kingfish (Table1.1). Samples were collected according to projected ages derived from age length keys (20 mm intervals) completed for each species individually. The number of samples needed per month was derived for each species depending on the spawning season and other life history parameters. Ageing structures were processed and aged. Year class was recorded and uploaded to the NCDMF Biological Database. The resultant age and length data was made available for the use in stock status reports, stock assessments and FMP's.

Biological Samples

Biological information and samples were collected from each species. Biological information recorded included fork length (FL mm), total length (TL mm), fish weight (kg), sex (male or female), and maturity (gonad staging is species specific). For some species gonad weight (g) was recorded. Biological samples collected include otoliths and scales used for ageing. Additional information was recorded for each sample which included location, capture date, time, gear and the fishery.

Ageing Structures

Otoliths were collected from various NCDMF independent and dependent sampling programs for ageing purposes. The species in which otoliths are used as the primary ageing structure include southern flounder, red drum, weakfish, spotted seatrout, Atlantic croaker, spot, king mackerel, Spanish mackerel, southern kingfish, northern kingfish, Gulf kingfish, and bluefish (Table 1.2). Whole otoliths were used to age southern flounder, and spot, and as a secondary ageing structure for summer flounder. For the remaining species, otolith cross-sections were made using a Hillquist High-Speed Thin Sectioning Saw (Cowan et al. 1995) and mounted on frosted slides. Otoliths were aged under a microscope viewed through a mounted video camera

linked to a high resolution monitor. Year class was assigned for each species. All king mackerel and Spanish mackerel otoliths were organized, labeled, and sent to the National Marine Fisheries Service (NMFS) Panama City Lab for ageing. Bluefish otoliths will not be aged until the Atlantic States Marine Fisheries Commission (ASMFC) Bluefish Technical committee determines processing and ageing protocols.

Scales were used as the primary ageing structure for summer flounder and American shad (Table 1.2). Scales were collected from various NCDMF independent and dependent sampling programs. Scale impressions were made with acetate slides and a press for summer flounder as per Dery et al. (1988) and ages assigned as per Bolz et al. (1999). American shad scales were cleaned and read whole. Age determination was based on methods established by Cating (1953) and Judy (1961). All scales were read using a microfiche reader which magnifies and projects the images.

Age was determined by two independent readers to assess the age of each individual. If agreement could not be made or if the structure was unreadable, the structure was excluded and not recorded with the total number aged.

Data Analysis

Species data were analyzed to determine length at age in the form of age-length keys. The proportion at each age was reported in 20 mm length intervals by year and/or by sex. Results were provided to the various bodies charged with ruling on and implementing the FMPs: NCDMF, NMFS, ASMFC, the Mid-Atlantic Fishery Management Council (MAMFC), and the South Atlantic Fishery Management Council (SAMFC).

RESULTS

The total number of samples collected for the 14 target species from 2006 through 2010 was 41,054 (Table 1.1). The total number of fish aged from the number collected was 27,572. The number of samples collected does not reflect the number of samples aged. For species that have higher collection values a subsample is aged from each location and/or 20 mm size class to ensure a normal distribution of samples aged. An age-length key was completed for each species using 20 mm size class intervals based on the ages assigned.

The minimum length (mm), maximum length (mm), and mean lengths (mm) were calculated for each species (Table 1.2). Southern flounder ranged from age 0 to 8 and from 130 mm to 912 mm (TL) (Table 1.3). Summer flounder ranged from age 1 to 13 and from 165 mm to 848 mm (TL) (Table 1.4). Red drum had the oldest ages ranging from 0 to 43 and from 199 mm to 1,238 mm (FL) (Table 1.5). Weakfish ranged from age 0 to 15 and from 118 mm to 857 mm (FL) (Table 1.6). Atlantic croaker ranged from age 0 to 15 and from 97 mm to 559 mm (TL) (Table 1.7). American shad ranged from age 3 to 10 and from 285 mm to 517 mm (FL) (Table 1.8). Spot ranged from age 0 to 5 and from 65 mm to 322 mm (FL) (Tables 1.9). Spotted seatrout ranged from age 0 to 8 and from 96 mm to 751 mm (FL) (Table 1.10). Southern kingfish ranged from age 0 to 6 and from 92mm to 440 mm (TL) (Tables 1.11). Northern kingfish ranged from age 0 to 5 and from 110 mm to 421 mm (TL) (Table 1.12). Gulf kingfish ranged from age 0 to 5 and from 178 mm to 422 mm (TL) (Table 1.13).

DISCUSSION

Fisheries managers use data collected from the field to assess and determine the status of a fishery. Important biological information, such as length, weight, sex and age, is critical to the process of assessing a stock. Additional biological information needed for stock assessments and fishery management plans (FMP's) include age-at-maturity, age structure of the stock, and a general knowledge of the growth of individuals and the population. All of these biological parameters incorporate fish ages and could not be completed without them. Long-term databases of age composition from the fisheries allow the NCDMF and other managing bodies to assess the status of important marine recreational fish stocks.

The results from the data collected are provided to the management agencies, regional councils and commission charged with ruling on and implementing the FMP's. These organizations create and implement rules and regulations based on the analysis of the data collected. The Fisheries Reform Act of 1997 (FRA) requires the NCDMF to prepare FMPs for adoption by the NCMFC for all commercially and recreationally significant species or fisheries that comprise state marine or estuarine resources. Currently, NCDMF and other governing bodies have FMP's for fourteen species included here (Table 1.14). The rules that are passed by the Councils and Commissions are implemented by state government (NCDMF) and the federal government (NMFS). Age data collected from these species by NCDMF is a crucial part of the FMPs. Fish age is a critical component to local, regional, and national fisheries management.

RECOMMENDATIONS

- Continue to collect age samples to determine age composition for southern flounder, summer flounder, red drum, spotted seatrout, weakfish, Atlantic croaker, spot, king mackerel, Spanish mackerel, American shad, kingfishes, and bluefish.
- Develop target collection numbers, processing techniques and age determination methods to reflect needs for current and future FMP's.
- Utilize new technologies to improve techniques for collection, processing and age determination of samples.

JOB 2: PAMLICO SOUND SURVEY

INTRODUCTION

The Pamlico Sound Survey has been running uninterrupted for 24 years and is used to determine annual indices of juvenile abundance for summer flounder, southern flounder, weakfish, Atlantic croaker, and spot in North Carolina. The original survey began in March 1987 with funding provided by the NCDMF and additional funds provided by the SM-18 SEAMAP program. Since 1990, funding has been provided through the USFWS Sport Fish Restoration Grant F-42. Data collected from the survey have provided juvenile abundance indices and long-term population parameters for interstate and statewide stock assessments of recreationally and commercially important fish stocks.

Sampling began in 1987 and was conducted over two weeks during the months of March, June, September and December from 1987 to 1989. In 1990, sampling occurred over two weeks

during the months of March, June, and September. From 1991 to present, the Pamlico Sound Survey has been conducted during the same two weeks in June and September. There are only four years in which the survey did not occur over the same time series: 1988, 1999, 2003, and 2009. In 1988, the December leg of the cruise was partially extended into January 1989 because of scheduling conflicts and adverse weather conditions. In 1999, samples were collected during the month of July and the end of September and October because vessel repairs and hurricanes prevented following the normal schedule. In September 2003, hurricane Isabel caused a delay and sampling was completed two days in October. In September 2009, vessel repairs caused a delay and sampling was completed during the first week of October.

METHODS

From 1987 to 1989 the sample area covered all of Pamlico Sound and its bays, Croatan Sound, Roanoke Sound, Albemarle Sound east of a line from the mouth of Alligator River to the mouth of North River, the Pamlico River up to Bath Creek and the Neuse River up to Minnesott Beach. A Mongoose or Falcon Trawl was used for comparison with SEAMAP data of inshore and offshore catches.

From 2006 to 2010, 52 to 54 randomly selected stations (one-minute by one-minute grid system equivalent to one square nautical mile) were sampled over a two week period, usually the second and third week of the month in both June and September. The stations sampled were randomly selected from strata based upon depth and geographic location. The seven designated strata are: Neuse River (NR); Pamlico River (PR), Pungo River (PUR); Pamlico Sound east of Bluff Shoal, shallow (PSE) and deep (PDE); and Pamlico Sound west of Bluff Shoal, shallow (PSW) and deep (PDW) (Figure 1). Shallow water is considered water depth between 6 to 12 feet and deep water is considered water greater than 12 feet depth.

Tow duration was 20 minutes at 2.5 knots using the R/V Carolina Coast pulling double rigged demersal mongoose trawls. The R/V Carolina Coast is a 44 ft fiberglass hulled double rigged trawler owned and operated by NCDMF. The body of the trawl is constructed of #9 twine with 1.875 in (47.6 mm) stretch mesh. The cod end of the net is constructed of #30 twine with 1.5 in (38.1 mm) stretch mesh. The tailbag is 80 meshes around and 80 meshes long (approximately 10 ft). A 120 ft (36.58 m) three-lead bridle is attached to each of a pair of wooden, chain doors that measure 4 ft by 2 ft (1.22 m X .061 m) and to a tongue centered on the headrope. A 60 cm "polyball" is attached between the end of the tongue and the tongue bridle cable. A 0.1875 in (4.76 mm) tickler chain that is 3.0 ft (0.9. m) shorter than the 34 ft (10.36 m) foot-rope, is connected to the door next to the foot-rope. All species were sorted and a total number and weight is recorded for each species. For target species, 30 to 60 individuals were measured (mm) and weighed (kg).

Physical and environmental conditions such as temperature (^{o}C), salinity (ppt), dissolved oxygen (mg/L), bottom composition, a qualitative assessment of sediment size, and water clarity (began 2008) were recorded at the end of each tow.

Selected species were retained and taken to the lab where ageing structures were removed and sex and maturity stage of gonads were determined.

The juvenile index is the annual geometric mean (weighted by strata) of the number of individuals per tow for young of the year (YOY). Quarterly length frequency distributions were examined to determine the size range for YOY of each species. YOY size ranges for each species were as follows: Atlantic croaker <120 mm TL in June and <200 mm TL in September;

weakfish <140 mm FL in June and <200 mm FL in September; spot <110 mm FL in June and <130 FL mm in September; summer flounder <130 mm TL in June and <230 mm TL in September; and southern flounder <160 TL mm in June and <230 TL mm in September. The Pungo River stratum was excluded from juvenile index calculations because it was not sampled throughout the entire time span of the survey. Pamlico Sound Survey (PSS) indices were compared to the state-funded estuarine trawl survey (NCDMF Program 120). Data from 2001 to 2010 have been included in this report to show the long-term trends of each index.

RESULTS

Analysis and results from this study are reported for calendar years 2006 to 2010, while sampling has occurred continuously since 1987. Samples collected from 2006 to 2010 included 198 PDE, 90 PDW, 69 PSE, 48 PSW, 50 NR, 50 PR, and 30 PUR samples (Table 2.1).

Weighted means calculated for target species are reported for the previous 10-year time period in order to provide the long-term trends in relative abundance.

Summer flounder has varied without trend over the time series ranging from 3.0 to 16.6 individuals per station, with peak abundances in 2001 and 2008 (Table 2.2). Due to infrequent occurrence in the estuarine juvenile trawl survey, a comparison index was not available for summer flounder.

Southern flounder had low catch rates throughout the time series with the highest catch occurring in 2005 (Table 2.2). Catch rates were higher in the estuarine trawl survey throughout the time series (Table 2.3). There is a general downward trend in abundance through the time series, though both indices show some of their highest catch rates in 2010 (Figure 2).

Spot were consistently one of the most abundant species, with annual catch rates ranging from 134.2 to 960.3 (Table 2.2). Catch rates in the estuarine trawl survey were also high, ranging from 94.9 to 255.9 individuals per station (Table 2.3). Abundance trends through the time series were similar with the indexes following the same trend from 2005 to 2009 (Figure 2).

Atlantic croaker abundance was fairly consistent (with the exception of 2010), ranging from 121.9 to 1,020.2 individuals per station (Table 2.2). Catch rates were also consistent in the estuarine trawl survey ranging from 9.6 to 59.4 individuals per station (Table 2.3). There was a steady trend through the time series for each survey, with each showing a spike in abundance in 2010 (Figure 2).

Weakfish showed a general upward trend through the time series, ranging from 12.1 to 29.5 individuals per station (Table 2.2). In the estuarine trawl survey, catch rates were generally low with the exception of 2008, and ranged from 0.0 to 15.2 individuals per station (Table 2.3). There was no apparent trend in the estuarine trawl survey, though it does appear catch rates are moving upward in the Pamlico Sound Survey in the more recent years of the time series (Figure 2).

There were no sea turtle interactions during this five-year grant period.

DISCUSSION

The primary objective of this survey is to provide indices of juvenile abundance for recreationally important species from Pamlico Sound and its tributaries. The NCDMF currently has several independent indices in and around Pamlico Sound but this is the only one that samples offshore habitat (>50 yards from shore). Data in the current study were used to calculate indices of abundance for several recreationally important species in Pamlico Sound including: southern flounder, weakfish, spotted seatrout, Atlantic croaker, and spot. Such indices are now available for assessing trends over time and for use in federal and state stock assessments and management plans.

An advantage of this study is it can be used to validate juvenile abundance indices developed from nursery area sampling programs.

RECOMMENDATIONS

- The Pamlico Sound Survey should continue in order to provide indices of juvenile abundance in Pamlico Sound that can be used in future stock assessments.
- Collection of age structures should continue with an effort made to ensure a representative sample of all size ranges of target species is taken.
- Continue to document by-catch taken in trawls.
- Consider evaluating and updating the survey in order to enhance data collection.

JOB 3: NORTH CAROLINA RED DRUM SEINE SURVEY

INTRODUCTION

Red drum is an estuarine dependent fish occurring along the Atlantic coast including North Carolina. Spawning occurs in inlets from late summer to early fall (Pearson 1929; Peters and McMichael 1987), and more recent evidence suggests that spawning can occur far upstream from inlets near the mouths of bays and rivers (Johnson and Funicelli 1991). In North Carolina, spawning has been documented to occur in Pamlico Sound near the mouth of the Neuse River (Ross et al. 1995; Luzkovich et al. 1999). In 1991, NCDMF began a fall seining survey in order to generate an annual index of age-0 juvenile red drum abundance (JAI) and to identify and characterize red drum nursery areas. The primary objective of this study is to determine the annual index of juvenile abundance for red drum in North Carolina.

METHODS

A red drum seine survey was conducted at 20 fixed sampling sites throughout coastal North Carolina (Figure 3) from September through November of each year during 2006 to 2010. Each of these sites was sampled in approximately two week intervals for a total of six samples with an 18.3 m (60 ft) x 1.8 m (6 ft) beach seine with 3.2 mm (1/8 in) mesh in the 1.8 m x 1.8 m bag. One “quarter sweep” pull was made at each location. This was done by stationing one end of the net onshore and stretching it perpendicularly as far out as water depth allowed. The deep end was brought ashore in the direction of the tide or current, resulting in the sweep of a quarter circle quadrant. All species were counted and identified; red drum were counted and measured

to the nearest mm FL. Salinity (ppt), water temperature (^{o}C), tidal state or water level, and presence of aquatic vegetation were recorded. Locations of fixed stations were determined in 1990 based on previous catch rates and practicality for beach seining (Ross and Stevens 1991). The juvenile index, or CPUE, is the arithmetic mean catch/seine haul of young-of-the-year (YOY) individuals.

RESULTS

Results are reported for the current sampling period of 2006 to 2010. Annual CPUE values ranged from a low of 1.58 in 2008 to a high of 5.46 in 2007 (Table 3.1). Over the length of the survey, annual catch rates have been variable, ranging from 0.97 in 2001 to 15.12 in 1991. The average catch rates from 2006 to 2010 (3.41) were lower than the average observed over the length of the survey (5.80). All fish included in the index represented only young of year (age 0) red drum. Age 0 red drum ranged in size from 9 to 86 mm fork length from 2006 to 2010. These size ranges were similar to those reported in prior years.

DISCUSSION

The North Carolina red drum seine survey has provided a long term annual index of juvenile abundance of red drum for input into stock assessments used by both North Carolina and the ASMFC (Takade and Paramore 2007; SAFMC 2009). A recent study analyzing data from this survey was conducted to validate its use as an index of abundance for red drum (Bacheler et al. 2008). Results showed that the timing of the survey (September through November) was adequate to capture the peak abundance levels each year and that the spatial coverage of the stations appeared to provide reasonable coverage. Additionally, a positive correlation was found between age 0 recruits from the survey and harvest of age 2 fish two years later. This indicates that the survey is a good early indicator of year class strength and that year class strength is set at an early age. The continuation of this survey in the future will provide valuable information for assessing the red drum population in North Carolina. Currently the survey provides the only juvenile (age 0) index of abundance available for this region.

RECOMMENDATIONS

- Continue survey to provide age 0 index of abundance for red drum.
- Evaluate if this survey can provide indices of abundance for other commonly captured species.
- Further validate the survey by evaluating any correlations that exist between cohort specific relative abundance indices that may exist with other fishery independent surveys (i.e. Pamlico Sound Independent Gill Net Survey).

JOB 4: NORTH CAROLINA SALTWATER FISHING TOURNAMENT, CITATION PROGRAM

INTRODUCTION

The North Carolina Saltwater Fishing Tournament, also known as the Citation Program, recognizes recreational anglers with award certificates for exceptional, trophy-size catches and

releases of recreationally important finfish. Certificates are issued to recreational anglers and the data collected from the angler's application is entered and verified in a NCDMF database for stock status reports and fishery management plans. The objective during this grant period was to issue 5,000 recreational angler citations. The Citation Program has been run by the NCDMF since 1987, and was added under grant F-42 in July 2010.

METHODS

NCDMF personnel worked with recreational anglers and weigh stations (tackle shops, piers, and marinas) to collect information and offer award certificates on 36 different species of recreationally important finfish in North Carolina (Appendix A). The program collected date, length (in), girth (in), weigh station and frequency of trophy finfish. State record marine finfish were awarded and certified by NCDMF fishery biologists as part of this program.

The Citation Program utilized volunteer weigh stations (106 participated in 2010). Weigh stations are recreational fishing businesses (tackle shops, marinas, piers, etc.) which weigh fish on certified scales and provide recreational anglers with citation forms for data collection. After weighing or releasing an exceptional catch fish meeting the minimum requirements in the Citation Program Guidelines (Appendix A), an angler enters the catch on the application form at the weigh station. The weigh stations submit the entries to NCDMF. Potential state records are certified through an additional application and approved by a panel of NCDMF fishery biologists.

All citation forms received were reviewed for required data fields and that each catch submitted meets program requirements. Data was entered into an Access database, and from this database, certificates were printed and then mailed. Data was uploaded to the NCDMF mainframe for stock status reviews and fishery management plans.

RESULTS

Award certificates were issued to recreational anglers for catches and releases of trophy recreational finfish. Certificates were issued for 36 recreationally important finfish, provided that the fish met minimum weight or release length requirements (Appendix A). There were 5,076 citations issued to recreational anglers from 2006 to 2010 (Table 4). Data was reviewed and entered into an Access database and uploaded to the NCDMF mainframe to be used in stock assessments. Due to the closure of several weigh stations there are now 102 weigh stations in eastern North Carolina.

DISCUSSION

The Citation Program provides information on adult finfish for NCDMF's stock status reports and FMP's. Anglers assist in the collection of biological data from the recreationally important finfish in the Citation Program. These fish are large and/or rare event adult finfish and are population indices of adult finfish. At the beginning of this activity period there were 37 recreationally important finfish species in the citation program. However, the South Atlantic Marine Fisheries Commission closed the red snapper fishery in 2010. Due to this closure, red snapper was removed from the program and only 36 species are issued certificates.

Red drum is included in the Citation Program. In 1993, the Citation Program rules were amended requiring red drum to be released with a length of 40 inches or greater to qualify for a certificate. Since 1993, anglers have released 19,112 adult red drum (Figure 4). Without this red drum release data, limited information on the adult population would be available due to

interim rules which were put in place in 1998 for stock management until the FMP for red drum was finalized in 2001 (NCDMF 2001). State records and the Citation Program allow fishery managers access to information on the largest fish of a species supplying estimates of maximum age and natural mortality.

RECOMMENDATIONS

- Continue to change the minimum requirements and species offered to meet needs of FMP's.
- Encourage the practice of catch and release by offering release certificates.
- Expand the program through the addition of weigh stations.
- Use technology to update the data entry system.

JOB 5: NORTH CAROLINA GOVERNOR'S CUP BILLFISHING CONSERVATION SERIES

INTRODUCTION

The North Carolina Governor's Cup Billfishing Conservation Series is comprised of the major billfish tournaments held annually along the North Carolina coast. Biological data on pelagic sport fish species is reported to the National Marine Fisheries Service Highly Migratory Species (HMS) Division and the South Atlantic Fishery Management Council for stock status reports and fishery management plans. The North Carolina Governor's Cup Billfishing Conservation Series has been run by the NCDMF since 1991, and the program was added under grant F-42 in July 2010.

METHODS

NCDMF personnel attended four billfish tournaments (Cape Fear Blue Marlin, Boys and Girls Club, NC Ducks Unlimited Band the Billfish and Pirates Cove Billfish) in July and August to collect weight (kg), length (mm), girth (mm), sex, and frequency data on fish weighed at tournament weigh stations, including dolphin (*Coryphaena hippurus*), yellowfin tuna (*Thunnus albacores*), wahoo (*Acanthocybium solanderi*), and blue marlin (*Makaira nigricans*). Anglers provided information about all released billfish during the tournaments through surveys. These surveys collected from anglers at the end of a fishing day included species, estimated length, weight, location caught, hook type, hook location, fight time, and tackle information. One of the elements monitored in the billfish release survey is circle hook use versus J-hook use. Tournament data were submitted to the NMFS HMS Division. NCDMF personnel also provided educational information to recreational anglers about conserving billfish and other pelagic species during tournaments.

RESULTS

A total of 68 game fish was weighed and 130 billfish were released in the July and August tournaments in the 2010 Series (Table 5). Using surveys, anglers provided information about all billfish released during the tournaments. Of the 12 blue marlin released, 11 were released on J-hooks (Figure 5). A total of 118 white marlin and sailfish was released and 106 of those fish were caught using circle hooks. Tournament data were submitted to the NMFS HMS Division

summarizing landed and released catches. Six newsletters were issued to the captain and crews of the 60 participating Governor's Cup boats. Newsletters contained information on catch and release techniques, conservation efforts, changes in regulations and tournament results.

DISCUSSION

The North Carolina Governor's Cup tournaments provide access to important recreational pelagic finfish landings and for the collection of biological data on pelagic sport fish species. NCDMF staff works with the tournaments to collect this important fishery dependent information as well as to provide education on regulations, conservation efforts, and research being conducted in recreational fisheries. NCDMF has collected information on circle and J-hook use during billfish tournaments through angler release surveys since 2006. This information on circle catch techniques and catch rates has been shared with tournament participants to encourage practices that reduce billfish release mortality.

RECOMMENDATIONS

- Expand data collected from landed fish.
- Expand data collected from released billfish.
- Work with tournaments to further educate anglers.
- Expand the promotion of ethical fishing and release techniques.
- Continue work with anglers to promote the use of circle hooks.

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Table 1.1 Number of samples collected for all species compared to the number aged by NCDMF from 2006-2010.

Species	Collected	Aged
Southern Flounder	5,061	4,630
Summer Flounder	6,539	3,658
Red Drum	2,925	2,821
Weakfish	2,649	2,547
Atlantic Croaker	3,227	3,130
King Mackerel	2,193	*
Spanish Mackerel	1,644	*
American Shad	6,041	3,115
Spot	1,859	1,801
Spotted Seatrout	3,654	3,577
Bluefish	2,805	**480
Southern Kingfish	2,036	1,895
Northern Kingfish	136	125
Gulf Kingfish	285	273
Total	41,054	27,572

[1]Excludes unreadable otoliths
*Species aged by another lab
**Species aged by another lab except for 2006

Table 1.2 Primary ageing structures and minimum (min), maximum (max), and mean lengths (FL=fork length, TL=total length) for all species collected by NCDMF from 2006-2010.

	Measurement	Length (mm)			Primary structure	
Species	FL or TL	Min	Max	Mean	Scales	Otoliths
Southern flounder	TL	130	912	384		X
Summer flounder	TL	165	848	518	X	
Red drum	FL	199	1238	502		X
Weakfish	FL	118	857	321		X
Atlantic croaker	TL	97	559	272		X
King mackerel	FL	433	1452	933		X
Spanish mackerel	FL	174	805	377		X
American shad	FL	285	517	410	X	
Spot	FL	65	322	210		X
Spotted seatrout	FL	96	751	446		X
Bluefish	FL	123	824	373		X
Southern kingfish	TL	92	440	258		X
Northern kingfish	TL	110	421	272		X
Gulf kingfish	TL	178	422	301		X

Table 1.3 Age-length key of southern flounder, *Paralichthys lethostigma,* from otolith ages obtained by NCDMF from 2006-2010 (n=4,630).

TL size classes	Age									Total
20 mm bins	0	1	2	3	4	5	6	7	8	Per bin
140	100%									4
180	59%	41%								17
200	75%	25%								24
220	55%	43%	3%							77
240	63%	34%	3%							123
260	52%	41%	4%	2%						143
280	32%	50%	13%	5%						187
300	22%	54%	22%	3%						224
320	15%	57%	22%	6%						340
340	11%	55%	26%	7%						447
360	4%	61%	29%	5%						511
380	1%	52%	38%	8%						465
400		41%	47%	10%	1%					435
420		34%	46%	18%	3%					424
440		25%	46%	23%	5%	1%				320
460		17%	47%	25%	9%	2%				234
480		13%	39%	32%	12%	4%				170
500		5%	43%	36%	15%	2%				129
520		1%	49%	29%	15%	4%	1%			78
540			45%	38%	15%	2%				55
560			31%	44%	18%	7%				61
580			24%	37%	22%	16%	2%			51
600			12%	38%	35%	12%	4%			26
620			3%	24%	48%	21%	3%			29
640				15%	70%	5%	5%		5%	20
660				25%	25%	25%	25%			8
680				27%	27%	18%	27%			11
700					33%	50%	17%			6
720					100%					2
740					33%	33%		33%		3
760							50%	50%		2
780					33%	33%		33%		3
820							100%			1

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths

Table 1.4 Age-length key of summer flounder, *Paralichthys dentatus,* from otolith ages obtained by NCDMF from 2006-2010 (n=3,658).

TL size classes	Age													Total
20 mm bins	1	2	3	4	5	6	7	8	9	10	11	12	13	Per bin
320	10%	90%												10
340	9%	60%	25%	6%										77
360	13%	47%	33%	7%										124
380	8%	34%	41%	13%	5%									234
400	4%	30%	43%	18%	4%	2%								274
420	1%	22%	41%	28%	8%									227
440	1%	8%	38%	38%	9%	6%	1%							232
460		9%	34%	36%	16%	5%	1%							239
480		5%	32%	36%	19%	7%	2%	1%						199
500		2%	16%	46%	24%	9%	2%	1%						176
520			11%	37%	33%	15%	3%	1%						154
540			10%	29%	39%	16%	6%							143
560			5%	27%	33%	26%	6%	1%	1%					186
580			1%	16%	36%	32%	11%	3%						232
600			1%	11%	37%	33%	12%	5%	1%					214
620			1%	4%	21%	37%	28%	8%	1%					169
640				1%	13%	33%	24%	24%	3%	1%				143
660					5%	24%	33%	29%	6%	3%				174
680					1%	15%	33%	29%	17%	4%				150
700					1%	4%	23%	36%	25%	8%	3%			103
720						1%	19%	34%	34%	3%	7%	1%		90
740						2%	14%	25%	25%	25%	8%			51
760							3%	20%	49%	20%	9%			35
780								13%	13%	38%	31%		6%	16
800								50%		50%				2
820									50%	50%				2
840									50%	50%				2

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths/scales

Table 1.5 Age-length key of red drum, *Sciaenops ocellatus*, from otolith ages obtained by NCDMF from 2006-2010 (n=2,784). Aged fish were 19 ≤ years old.

FL size classes	Age																				Total
20 mm bins	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Per bin
200																					2
220	67%																				3
240	40%																				5
260	25%																				4
280	63%																				8
300	39%																				33
320	80%																				88
340	95%	1%																			136
360	99%																				238
380	99%																				258
400	100%																				299
420	98%	1%																			249
440	99%	1%																			211
460	98%	2%																			169
480	88%	12%																			110
500	74%	26%																			92
520	55%	45%																			89
540	39%	61%																			122
560	18%	82%																			125
580	14%	85%	1%																		103
600	3%	96%	1%																		97
620	4%	96%																			72
640		94%	6%																		49
660		92%	8%																		13
680		43%	57%																		14
700		63%	38%																		8
720		67%	33%																		3
740			67%	33%																	3
760				100%																	1
780			67%	33%																	3
800			60%	40%																	5
820			25%	63%	13%																8
840			25%	75%																	4
860			50%		50%																2
880				100%																	3
900							100%														1
920						100%															1
940						25%		25%		25%	25%										4
960							10%	10%	10%	20%	10%	10%	20%			10%					10
980								13%		19%	6%	19%	6%	6%			19%				16
1000									6%		19%	13%		13%	13%		6%		6%		15
1020								4%		13%	13%			13%				8%		4%	24
1040															15%		5%	10%		15%	20
1060										5%					5%		5%			5%	20
1080																5%		11%			19
1100														4%							25

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths

Table 1.5 cont… Age-length key of red drum, *Sciaenops ocellatus*, from otolith ages obtained by NCDMF from 2006-2010 (n=139). Aged fish were ≥ 20 years old.

FL size classes	Age																			Total
20 mm bins	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	40	43	Per bin
980																					16
1000						6%		6%						6%			6%				15
1020	8%	17%					4%		8%						8%						24
1040	10%	10%				10%	5%	5%	5%					10%							20
1060	10%	5%	10%	5%		5%	5%		10%	5%		5%		15%		5%					20
1080	5%	5%	5%		5%	5%			26%		5%		5%	11%	5%		5%				19
1100		16%	8%	8%	8%	4%	8%	4%	12%	4%					8%	12%		4%			25
1120	7%	13%		7%			13%		13%	7%				20%	7%		7%		7%	7%	15
1140				8%			8%		8%	17%		17%		17%	8%	8%	8%				12
1160									17%	33%		17%		17%		17%					6
1200												50%		50%							2
1240							100%														1

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths

Table 1.6 Age-length key of weakfish, *Cynoscion regalis,* from otolith ages obtained by NCDMF from 2006-2010 (n=2,547).

FL size classes	Age										Total
20 mm bins	0	1	2	3	4	5	6	7	10	15	Per bin
120		100%									2
140	40%	60%									10
160	54%	42%	4%								26
180	52%	48%									63
200	29%	68%	3%								78
220	10%	67%	22%	1%							92
240	3%	48%	43%	5%	1%						129
260		42%	41%	17%							144
280	1%	42%	30%	24%	2%	1%					178
300	1%	36%	33%	27%	2%						277
320	1%	22%	50%	23%	4%	1%					366
340		20%	43%	28%	9%	1%					328
360		14%	44%	31%	8%	2%					288
380		6%	51%	31%	10%	2%					208
400		2%	35%	39%	20%	4%					137
420		2%	28%	42%	23%	5%					93
440	2%		31%	21%	38%	7%					42
460	4%	4%	26%	48%	13%		4%				23
480			38%	31%	31%						13
500				27%	27%	45%					11
520		8%	8%	8%	67%	8%					12
540					33%	67%					3
560	17%			33%	33%	17%					6
580					100%						3
600				20%	60%	20%					5
620					100%						1
640					67%	33%					3
660						100%					1
780							100%				1
820								50%	50%		2
840									100%		1
860										100%	1

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths

Table 1.7 Age-length key of Atlantic croaker, *Micropogonias undulatus,* from otolith ages obtained by NCDMF from 2006-2010 (n=3,130).

TL size classes	Age																Total
20 mm bins	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Per bin
100	100%																17
120	100%																75
140	87%	11%	1%														70
160	64%	36%															91
180	41%	57%	2%														109
200	15%	48%	27%	9%													176
220	2%	36%	37%	17%	5%	1%											297
240	2%	34%	38%	18%	8%	1%											292
260	1%	35%	37%	18%	7%	1%											429
280		30%	32%	19%	12%	6%	1%										330
300		16%	21%	16%	33%	9%	2%	2%		1%							290
320		3%	12%	11%	34%	17%	12%	3%	4%	3%		1%					260
340		1%	3%	2%	32%	24%	12%	6%	11%	6%	1%	1%					251
360			1%	2%	25%	18%	20%	9%	11%	8%	3%	2%	1%				173
380		1%	1%		22%	16%	17%	16%	16%	8%	1%	3%					116
400				1%	6%	6%	12%	31%	22%	10%	1%	7%		1%	1%		68
420					3%	5%	10%	22%	23%	5%	15%	8%	3%	2%		3%	60
440						6%	6%	33%	17%	17%	11%	6%			6%		18
460							20%	20%		20%	20%	20%					5
480									50%				50%				2
560							100%										1

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths

Table 1.8 Age-length key of American shad, *Alosa sapidissima,* from otolith ages obtained by NCDMF from 2006-2010 (n=3,115).

FL size classes	Age								Total
20 mm bins	3	4	5	6	7	8	9	10	Per bin
320	47%	32%	5%	5%	11%				23
340	37%	47%	10%	4%	2%				66
360	23%	41%	28%	6%	1%	1%			146
380	13%	41%	37%	8%	1%				229
400	13%	28%	36%	19%	3%				307
420	5%	13%	38%	34%	8%	2%			639
440		3%	23%	46%	26%	2%			865
460			6%	35%	47%	11%			600
480			3%	22%	47%	27%	1%		187
500			3%	16%	53%	24%	5%		43
520				29%	43%	29%			8
580								100%	2

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths

Table 1.9 Age-length key of spot, *Leiostomus xanthurus,* from otolith ages obtained by NCDMF from 2006-2010 (n=1,801).

FL size classes	Age						Total
20 mm bins	0	1	2	3	4	5	Per bin
100	100%						7
120	57%	43%					30
140	41%	59%					63
160	22%	78%					80
180	21%	77%	2%				201
200	4%	86%	9%	1%			227
220	1%	71%	26%	3%			761
240		29%	56%	14%	1%		317
260		6%	38%	42%	13%		78
280			14%	67%	14%	5%	22
300				69%	23%	8%	13
320					50%	50%	2

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths

Table 1.10 Age-length key of spotted seatrout, *Cynoscion nebulosus,* from otolith ages obtained by NCDMF from 2006-2010 (n=3,577).

FL size classes	Age									Total
20 mm Bins	0	1	2	3	4	5	6	7	8	Per bin
100	100%									1
180		100%								1
200		100%								2
220		100%								2
240	25%	75%								8
260	65%	35%								20
280	64%	36%								45
300	39%	59%	1%		1%					80
320	31%	67%	2%	1%						150
340	19%	74%	7%							207
360	7%	73%	19%	1%						233
380	1%	63%	36%							251
400		54%	44%	2%						314
420		46%	49%	4%						329
440		46%	47%	5%	1%					377
460		42%	50%	7%	1%					292
480	1%	39%	45%	11%	3%	1%				258
500		31%	51%	15%	3%					192
520		23%	48%	23%	4%	1%				145
540		8%	50%	32%	4%	5%	1%			119
560		2%	36%	42%	14%	4%	1%	1%		121
580		1%	32%	55%	8%	2%	2%		1%	104
600			32%	57%	6%	5%	1%			104
620	1%		19%	44%	25%	5%	4%		1%	79
640		2%	9%	41%	39%	7%	2%			44
660				33%	52%	13%	2%			46
680				43%	29%	19%	5%	5%		21
700				44%	38%	6%	6%	6%		16
720				8%	15%	62%	15%			13
740				50%		50%				2
760						100%				1

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths

Table 1.11 Age-length key of southern kingfish, *Menticirrhus americanus,* from otolith ages obtained by NCDMF from 2006-2010 (n=1,895).

FL size classes	Age							Total
20 mm bins	0	1	2	3	4	5	6	Per bin
120	100%							32
140	100%							70
160	100%							73
180	87%	13%						100
200	70%	30%						107
220	51%	45%	3%		1%			129
240	8%	69%	21%	1%	1%			187
260	5%	51%	32%	10%	2%			222
280		40%	39%	13%	6%	2%		284
300		26%	48%	17%	6%	3%		269
320		16%	50%	27%	5%	2%		252
340		9%	44%	34%	8%	3%	2%	108
360		2%	51%	30%	13%	4%		43
380			20%	53%	20%	7%		15
400				25%	75%			4

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths

Table 1.12 Age-length key of northern kingfish, *Menticirrhus saxatilis,* from otolith ages obtained by NCDMF from 2006-2010 (n=125).

FL size classes	Age						Total
20 mm bins	0	1	2	3	4	5	Per bin
140	100%						7
160	100%						5
180	100%						1
200	100%						3
220	100%						3
240	75%	25%					12
260	65%	35%					17
280	45%	55%					22
300	22%	56%	17%	5%			18
320		58%	33%	8%			12
340		43%	43%	14%			7
360		29%	29%	14%	14%	14%	7
380		50%	25%		25%		8
400				100%			1
420				100%			2

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths

Table 1.13 Age-length key of gulf kingfish, *Menticirrhus littoralis,* from otolith ages obtained by NCDMF from 2006-2010 (n=273).

FL size classes	Age						Total
20 mm bins	0	1	2	3	4	5	Per bin
180	100%						2
200	100%						7
220	75%	25%					16
240	33%	62%	5%				21
260	4%	81%	15%				26
280	3%	69%	26%	3%			34
300		40%	38%	13%	9%		45
320		34%	25%	23%	11%	7%	44
340		48%	20%	20%	12%		25
360		25%	25%	37%		13%	16
380			32%	50%	18%		22
400			8%	77%		15%	13
420					50%	50%	2

[1]Blanks indicate no sample aged
[2]Excludes unreadable otoliths

Table 1.14 Species that have Fishery Management Plans (FMPs) developed by NCDMF and/or other governing bodies.

	Governing Bodies			
Species	NCDMF	ASMFC	SAFMC	MAFMC
Southern flounder	X			
Summer flounder		X		X
Red drum	X	X	X	
Weakfish		X		
Atlantic croaker		X	X	
King mackerel		X	X	
Spanish mackerel		X	X	
American shad	X	X		
Spot		X		
Spotted seatrout	X	X		
Bluefish		X		X
Southern kingfish	X			
Northern kingfish	X			
Gulf kingfish	X			

Table 2.1 Trawl samples collected from June 2006-September 2010, in Pamlico Sound, NC. A sample consisted of two trawls pulled simultaneously at each station.

Cruise	Year	Stations	PUR	NR	PR	PDE	PDW	PSE	PSW
June	2006	52	3	5	5	20	9	7	3
September	2006	54	3	5	5	20	9	7	5
June	2007	51	3	5	5	18	9	6	5
September	2007	54	3	5	5	20	9	7	5
June	2008	54	3	5	5	20	9	7	5
September	2008	54	3	5	5	20	9	7	5
June	2009	54	3	5	5	20	9	7	5
September	2009	54	3	5	5	20	9	7	5
June	2010	54	3	5	5	20	9	7	5
September	2010	54	3	5	5	20	9	7	5
Total Tows		535	30	50	50	198	90	69	48

[1]By stratum

Table 2.2 North Carolina Pamlico Sound Survey juvenile indices for selected species, including proportional standard error (PSE), 2001-2010.

		Summer flounder				Southern flounder			
Year	n*	Arithmetic mean	PSE	Geometric mean	PSE	Arithmetic mean	PSE	Geometric mean	PSE
2001	100	16.6	12	6.6	6	1.2	20	0.5	16
2002	99	8.5	16	4.4	6	2.1	34	0.7	17
2003**	99	5.9	16	2.6	9	2.2	23	0.8	14
2004	99	5.9	15	3	7	1.5	19	0.6	16
2005	98	7.8	12	3.6	7	2.6	21	1	12
2006	102	3	22	1.2	11	1.1	23	0.5	18
2007	99	3.5	13	1.9	8	0.6	23	0.3	20
2008	102	14.3	15	6	6	1	30	0.4	23
2009***	102	5.2	15	2.3	9	0.7	29	0.2	21
2010	102	8.5	20	2.9	9	2	21	0.7	15

		Spot				Atlantic croaker			
Year	n*	Arithmetic mean	PSE	Geometric mean	PSE	Arithmetic mean	PSE	Geometric mean	PSE
2001	100	215.6	15	65.8	4	156.9	17	29.1	6
2002	99	288.1	11	88.6	4	121.9	13	26.7	6
2003**	99	466.8	12	197.4	3	130.9	11	47.7	5
2004	99	394.3	15	78.6	5	374.7	13	71.9	7
2005	98	345.2	15	106.1	4	446.8	12	116.5	5
2006	102	134.2	16	21.4	6	208.8	17	37	6
2007	99	253.5	17	40.3	6	237.2	14	38.7	7
2008	102	960.3	17	132.5	6	411.4	14	64.4	7
2009***	102	365.2	15	56.5	6	232.3	16	33.7	7
2010	102	566.1	15	205.1	4	1,020.20	12	422.5	3

		Weakfish			
Year	n*	Arithmetic mean	PSE	Geometric mean	PSE
2001	100	15.3	23	1.7	16
2002	99	11.4	27	1.6	16
2003**	99	12.1	25	2.5	13
2004	99	14.5	24	2.4	14
2005	98	14.3	24	2.2	15
2006	102	19.8	25	2.2	15
2007	99	29.3	22	3	14
2008	102	25.1	24	2.7	14
2009***	102	29.5	25	2.4	15
2010	102	16.5	23	2.3	13

* Number of trawl samples
** Time delays occurred in September 2003 due to Hurricane Isabel
***Time delays occurred in September 2009 due to mechanical problems

Table 2.3 North Carolina Estuarine Trawl Survey juvenile abundance indices for selected species, including proportional standard error (PSE), 2001-2010.

		Spot				Southern flounder			
		Arithmetic		Geometric		Arithmetic		Geometric	
Year	n*	mean	PSE	mean	PSE	mean	PSE	mean	PSE
2001	209	244.3	6	134.5	2	4.1	11	1.8	7
2002	208	204.5	6	110.2	2	4.1	14	1.5	8
2003	208	135.6	8	57.4	3	6.1	17	2.2	7
2004	208	206.9	9	97.6	2	3.6	12	1.5	8
2005	208	205.3	9	79.3	3	2.9	13	1.2	8
2006	208	94.9	8	37.6	3	2.4	13	1	10
2007	208	140.5	10	54.1	3	3.4	11	1.5	8
2008	208	255.9	8	134.6	2	2.3	14	0.9	10
2009	208	179.1	9	74.1	3	1.8	14	0.8	10
2010	208	251.4	8	93.5	3	4.7	13	1.9	7
		Atlantic croaker				Weakfish			
		Arithmetic		Geometric		Arithmetic		Geometric	
Year	n*	mean	PSE	mean	PSE	mean	PSE	mean	PSE
2001	209	29	17	5.1	7	0.7	63	0.1	49
2002	208	23.3	12	6.9	5	0.6	42	0.2	37
2003	208	28.9	12	8	5	0.1	64	0.1	60
2004	208	44.6	11	11.6	5	1	76	0.2	46
2005	208	49.5	14	11.3	5	0	.	0	.
2006	208	9.6	15	3.1	6	0.1	65	0.1	60
2007	208	48	14	10.7	5	0.1	100	0	100
2008	208	14.9	11	4.5	6	15.2	61	0.7	32
2009	208	13.1	13	4.1	6	0.2	46	0.1	42
2010	208	59.4	11	16.9	4	0	.	0	.

* Number of trawl samples

Table 3 Juvenile red drum catch and CPUE (number of drum/seine sample) from the red drum seine survey in North Carolina, 1991-2010.

Year	No. of Samples	No. of Drum	Samples w/ Drum	% w/ Drum	CPUE	Standard Error	PSE	Length Range (FL, mm)
1991	105	1,588	83	79	15.12	2.18	14	12 – 96
1992	116	430	65	56	3.71	1.13	31	16 – 82
1993	117	1,480	88	75	12.65	2.22	18	18 – 98
1994	93	771	66	71	8.29	2.41	29	13 – 82
1995	119	548	75	63	4.6	0.72	16	15 – 93
1996	104	273	52	50	2.63	0.47	18	16 – 84
1997	126	1,654	83	66	13.13	3.07	23	12 – 89
1998	124	1,020	91	73	8.23	1.12	14	15 – 96
1999	98	180	36	37	1.84	0.41	23	17 – 83
2000	123	386	64	52	3.14	0.58	18	14 – 82
2001	122	118	37	30	0.97	0.19	19	13 – 68
2002	120	268	48	40	2.23	0.53	24	14 – 69
2003	120	601	67	56	5.01	1.23	25	11 – 71
2004	120	998	91	76	8.32	1.13	14	11 – 104
2005	120	1,082	88	73	9.02	1.4	16	12 – 86
2006	120	413	62	52	3.44	0.73	21	13 – 81
2007	119	650	64	54	5.46	1.52	28	12 – 60
2008	120	190	50	42	1.58	0.3	19	18 – 60
2009	120	227	42	35	1.89	0.66	35	12 - 62
2010	120	561	72	60	4.66	0.97	21	9 – 86

Table 4 Number of citations NCDMF issued (n=5076) by species from 2006-2010.

Species	Citations Issued
False albacore	2
Amberjack	56
Atlantic bonito	3
Barracuda	42
Black sea bass	33
Bluefish	1
Cobia	375
Atlantic croaker	1
Dolphin	81
Black drum	17
Red drum	477
Flounder	179
Grouper	122
Crevalle jack	7
King mackerel	53
Spanish mackerel	31
Blue marlin	194
White marlin	1479
Sea mullet	79
Pompano	161
Porgy	4
Sailfish	439
Shark	39
Sheepshead	54
Spot	1
Striped bass	89
Tarpon	35
Gray tilefish	29
Triggerfish	56
Weakfish	1
Spotted seatrout	83
Bigeye tuna	77
Blackfin tuna	102
Bluefin tuna	373
Yellowfin tuna	13
Wahoo	288

Table 5 Number of fish weighed and released

(n=198) by species from the 2010 North Carolina Governor's Cup Billfishing Conservation Series.

	Number	
Species	Weighed	Released
Dolphin	58	
Wahoo	4	
Yellowfin tuna	6	
Blue marlin		12
White marlin		52
Sailfish		66

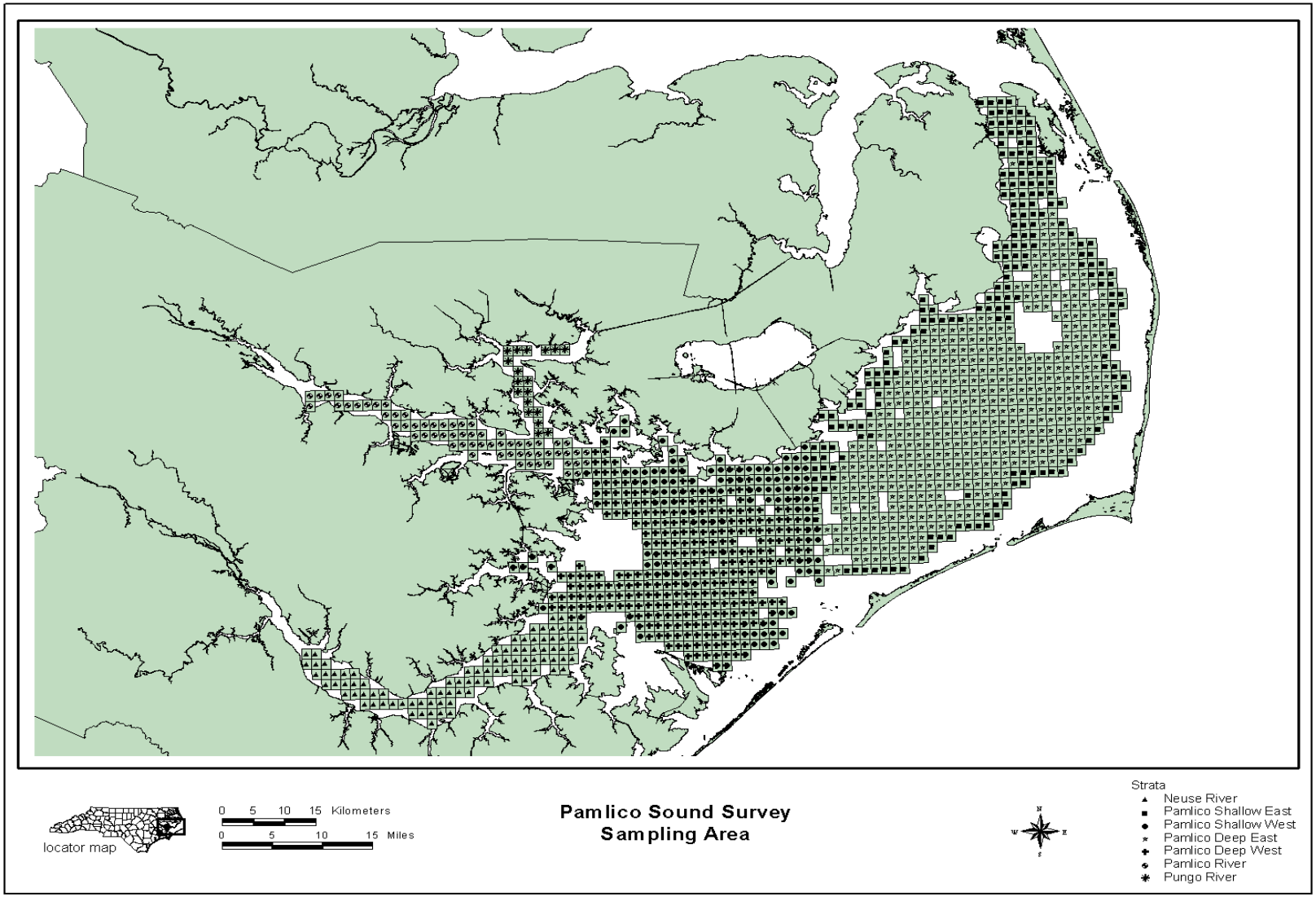

Figure 1 All stations for the NCDMF Pamlico Sound Trawl Survey.

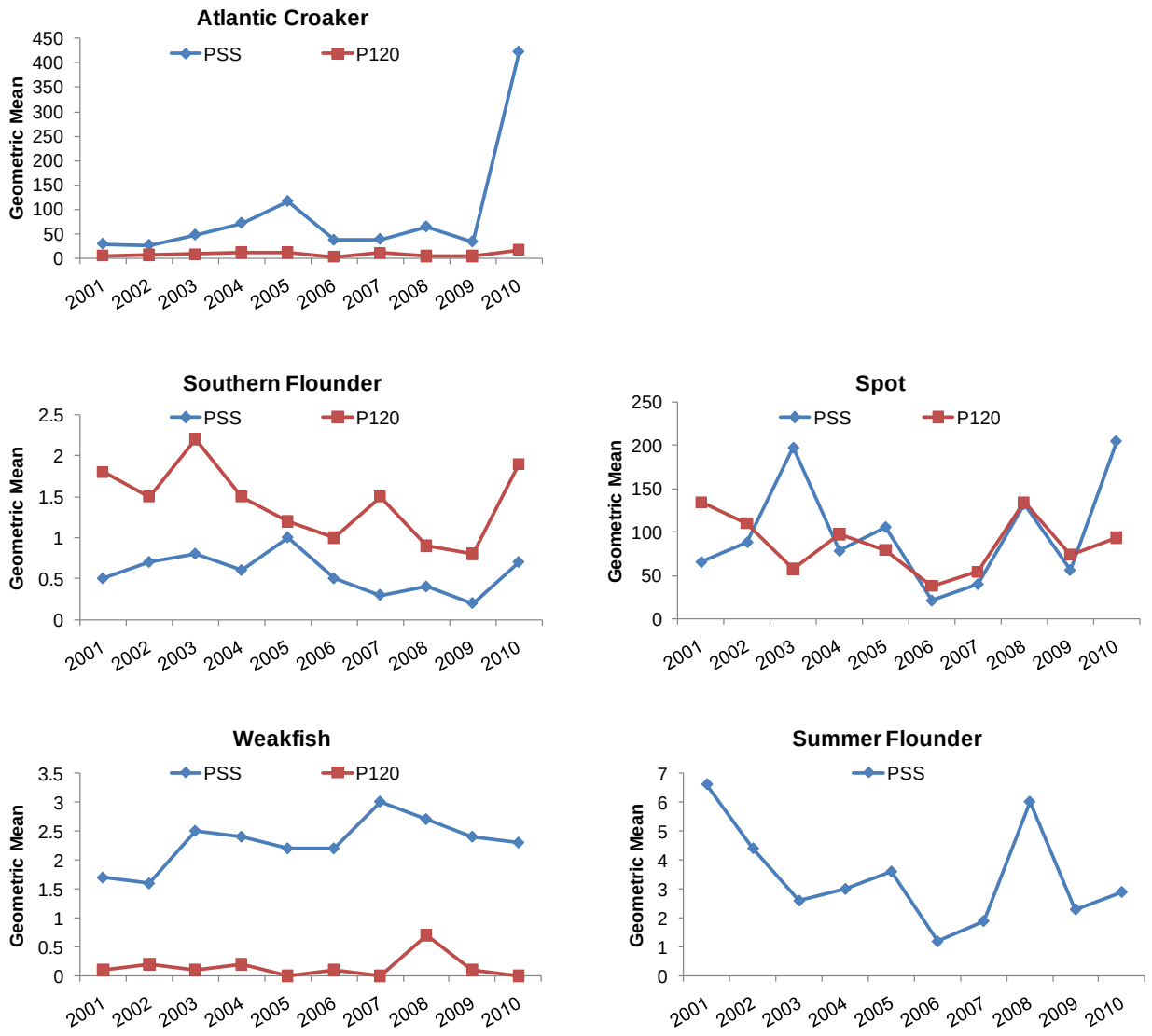

Figure 2 Geometric mean by species for the Pamlico Sound Survey (PSS) and the North Carolina Estuarine Trawl Survey (P120), (2001-2010).

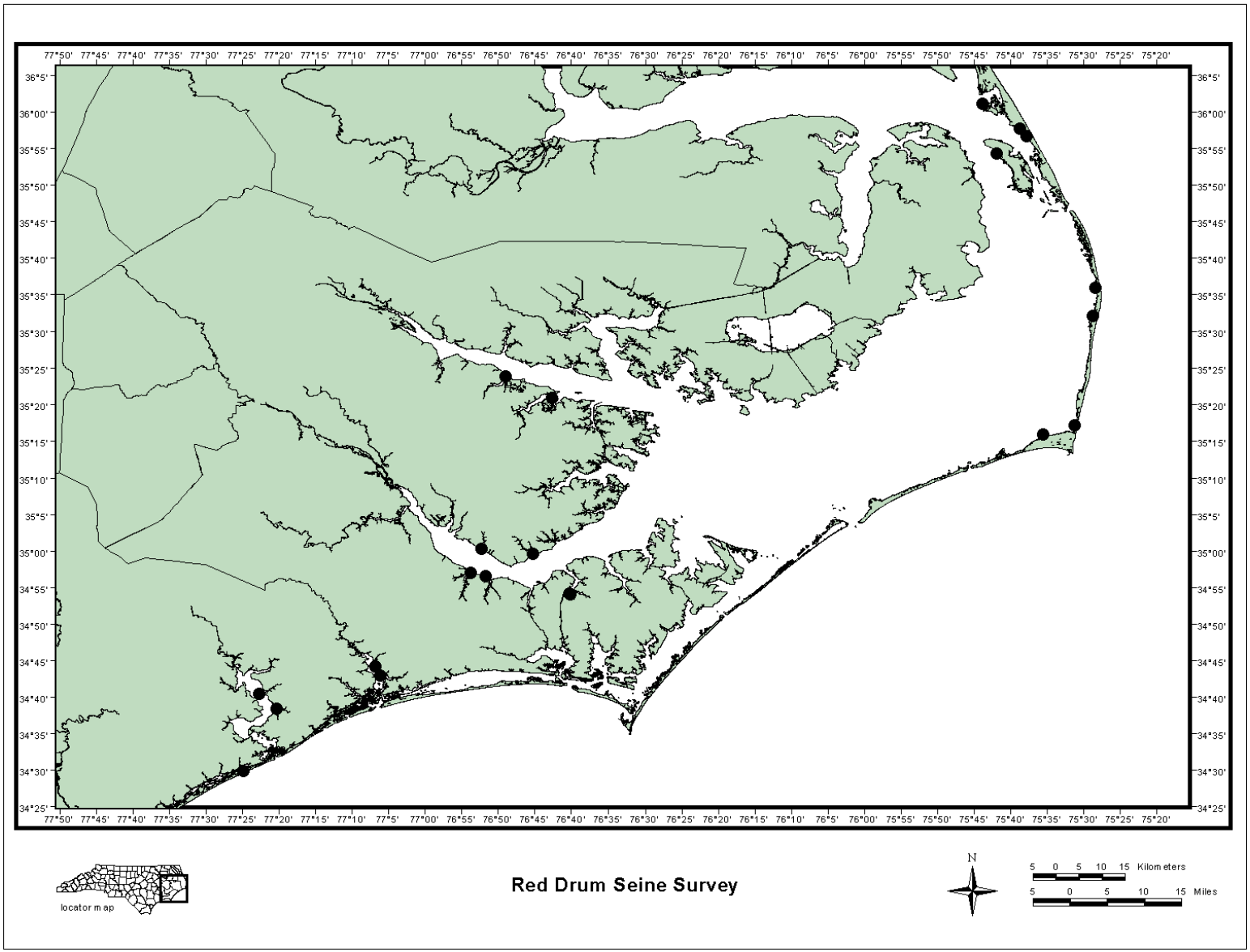

Figure 3 Sampling sites of the juvenile red drum survey in North Carolina, 2006 to 2010.

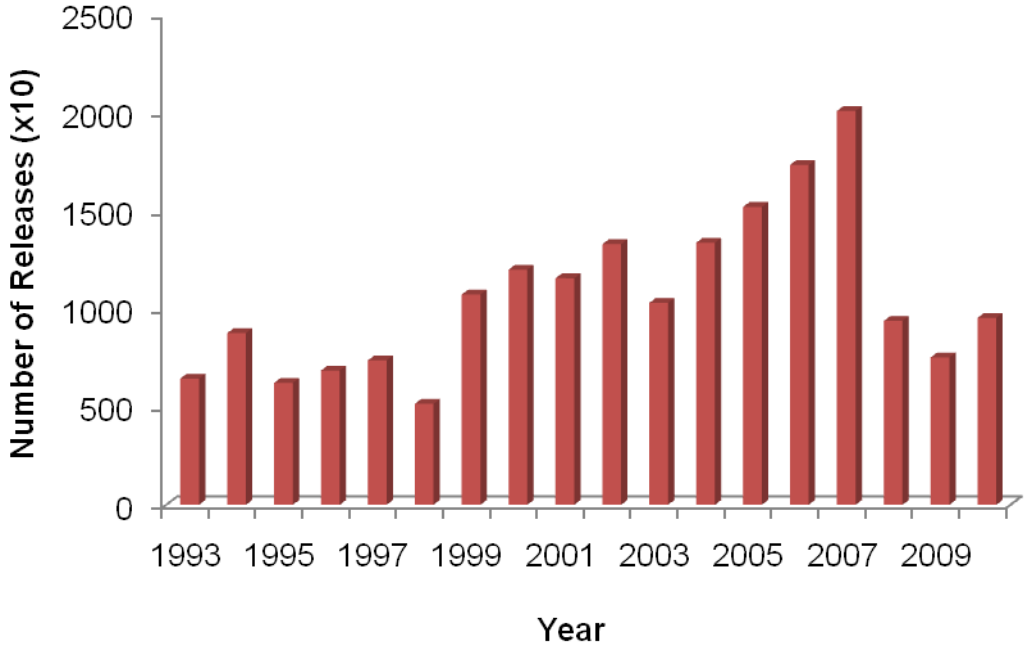

Figure 4 Red drum releases in North Carolina Waters from 1993-2010.

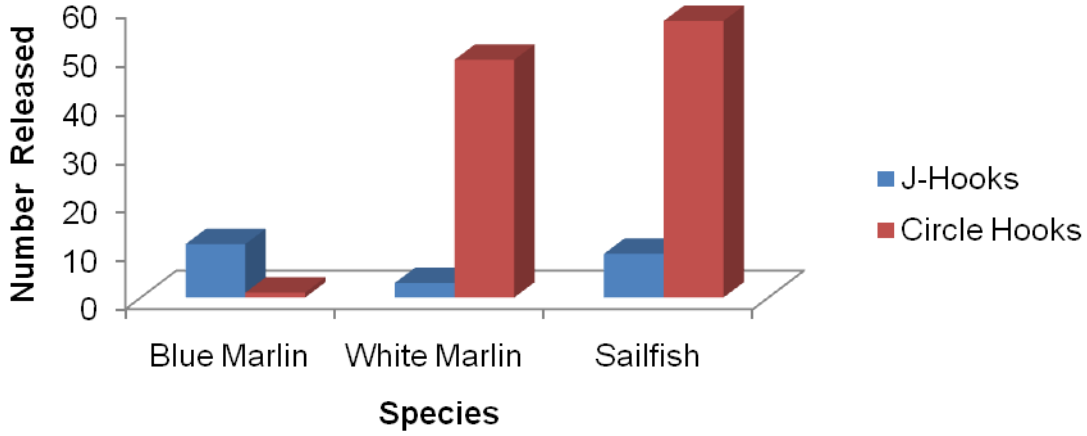

Figure 5 Hook type for released billfish from the 2010 North Carolina Governor's Cup Billfishing Conservation Series.

APPENDIX A

2010 NORTH CAROLINA SALTWATER FISHING TOURNAMENT
MANAGED BY NORTH CAROLINA DIVISION OF MARINE FISHERIES

The Tournament begins January 1, 2010 and ends Midnight, December 31, 2010.
TO BE ELIGIBLE FOR AN AWARD, ALL APPLICATIONS MUST BE RECEIVED BY JANUARY 15, 2011.

Everyone is eligible except a charter boat captain or a crewman of a for-hire boat or anyone who offers fish for sale. Weighmasters or their employees are eligible for awards, provided a witness signs verification. Eligible waters include all North Carolina sounds, estuaries, surf, and the Atlantic Ocean. No registration fee is required.

Certificate Qualifications: All fish must be caught on hook and line and landed or brought to gaff or net by the angler. No electric or hydraulic equipment is allowed. Fish must be weighed by an authorized weighmaster (or his/her representative) at an official weigh station. Each fish must be recorded on an official application form, signed by the angler and by a weighmaster. Snagged, mutilated, scaled, speared, frozen, or shot fish are not eligible. The weighmaster reserves the right to cut, open, or mark the fish after it has been weighed.

Release Rules: Angler or mate must touch the fish or the leader. Application must be completed with exception of length and weight (false albacore, amberjack, atlantic bonito, barracuda, cobia, black drum, jack crevalle, king mackerel, shark, striped bass, gray trout, speckled trout and red drum must have the length recorded). A witness must sign the application.

SPECIES LIST	MINIMUM WEIGHT	SPECIES LIST	MINIMUM WEIGHT
Albacore, False	Release Only E	Pompano, Florida	2 lbs
Amberjack	50 lbs H	Porgy (Silver Snapper)	4 lbs
Atlantic Bonito	8 lbs B	Sailfish	Release Only A
Barracuda	Release Only G	Shark	150 lbs
Bass, Black Sea	4 lbs.	Sheepshead	8 lbs
Bluefish	15 lbs	Snapper, Red	10 lbs
Cobia	40 lbs D	Spot	1 lb
Croaker	3 lbs	Striped Bass	35 lbs G
Dolphin	35 lbs	Tarpon	Release Only A
Drum, Black	35 lbs F	Tilefish, Gray	10 lbs
Drum, Red	Release Only F	Triggerfish	5 lbs
Flounder	5 lbs	Trout, Gray	5 lbs B
Grouper	20 lbs	Trout, Speckled	5 lbs B
Jack, Crevalle	Release Only C	Tuna, Bigeye	100 lbs
Mackerel, King	30 lbs G	Tuna, Blackfin	20 lbs
Mackerel, Spanish	6 lbs	Tuna, Bluefin	80 lbs A
Marlin, Blue	400 lbs A	Tuna, Yellowfin	70 lbs.
Marlin, White	Release Only A	Wahoo	40 lbs.
Mullet, Sea	1 1/2 lbs		

A = Award for live release of fish, regardless of size

B = Award for live release of fish, 24 inches or longer

C = Award for live release of fish, 32 inches or longer

D = Award for live release of fish, 33 inches or longer

E = Award for live release of fish, 34 inches or longer

F = Award for live release of fish, 40 inches or longer

G = Award for live release of fish, 45 inches or longer

H = Award for live release of fish, 50 inches or longer

I = Award for live release of fish, 80 inches or longer

For more information contact:
NC Division of Marine Fisheries
North Carolina Saltwater Citation Fishing Award Program
PO Box 769, Morehead City, NC 28557-0769
1-800-682-2632 or 252-726-7021