SEAMAP-SA

RESULTS OF TRAWLING EFFORTS IN THE COASTAL HABITAT OF THE SOUTH ATLANTIC BIGHT, 2005

Prepared By

SEAMAP - SA Shallow Water Trawl Survey

South Carolina Department of Natural Resources
Marine Resources Division
Marine Resources Research Institute
PO Box 12559
Charleston, South Carolina 29422-2559

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The Southeast Area Monitoring and Assessment Program - South Atlantic (SEAMAP-SA) Shallow Water Trawl Survey, funded by the National Marine Fisheries Service (NMFS) and conducted by the South Carolina Department of Natural Resources - Marine Resources Division (SCDNR-MRD), began in 1986. This survey provides long-term, fishery-independent data on seasonal abundance and biomass of all finfish, elasmobranchs, decapod and stomatopod crustaceans, sea turtles, horseshoe crabs, and cephalopods that are accessible by high-rise trawls. Additional data recorded for priority species include measurements of length or width for all priority species, sex and individual weights for sharks, sea turtles, and horseshoe crabs, and reproductive information on commercially important penaeid shrimp and blue crabs. Otolith and gonad samples were taken from three species of priority finfish.

Field data collected by the SEAMAP-SA Shallow Water Trawl Survey are available to users within a few weeks of collection. SEAMAP-SA trawl data collected from 1986 to the present are now available through the SEAMAP-SA Data Management Office at NMFS[1]. Management agencies and scientists currently have access to sixteen years (1990-2005) of comparable trawl data from near-shore coastal areas of the South Atlantic Bight.

This report summarizes information on species composition, abundance, and biomass from SEAMAP-SA trawls. Length-frequency distributions of commercially and ecologically important priority species, along with reproductive attributes of the commercially important penaeid species and ageing and maturity of selected sciaenids, are presented.

[1]Data are available through the SEAMAP Data Manager (NMFS Mississippi Laboratory, P.O. Box 1207, Pascagoula, MS 39568-1207).

Data Collection

Samples were taken by trawl from the coastal zone of the South Atlantic Bight (SAB) between Cape Hatteras, North Carolina, and Cape Canaveral, Florida (Figure 1). Multi-legged cruises were conducted in spring (April), summer (July), and fall (October - November).

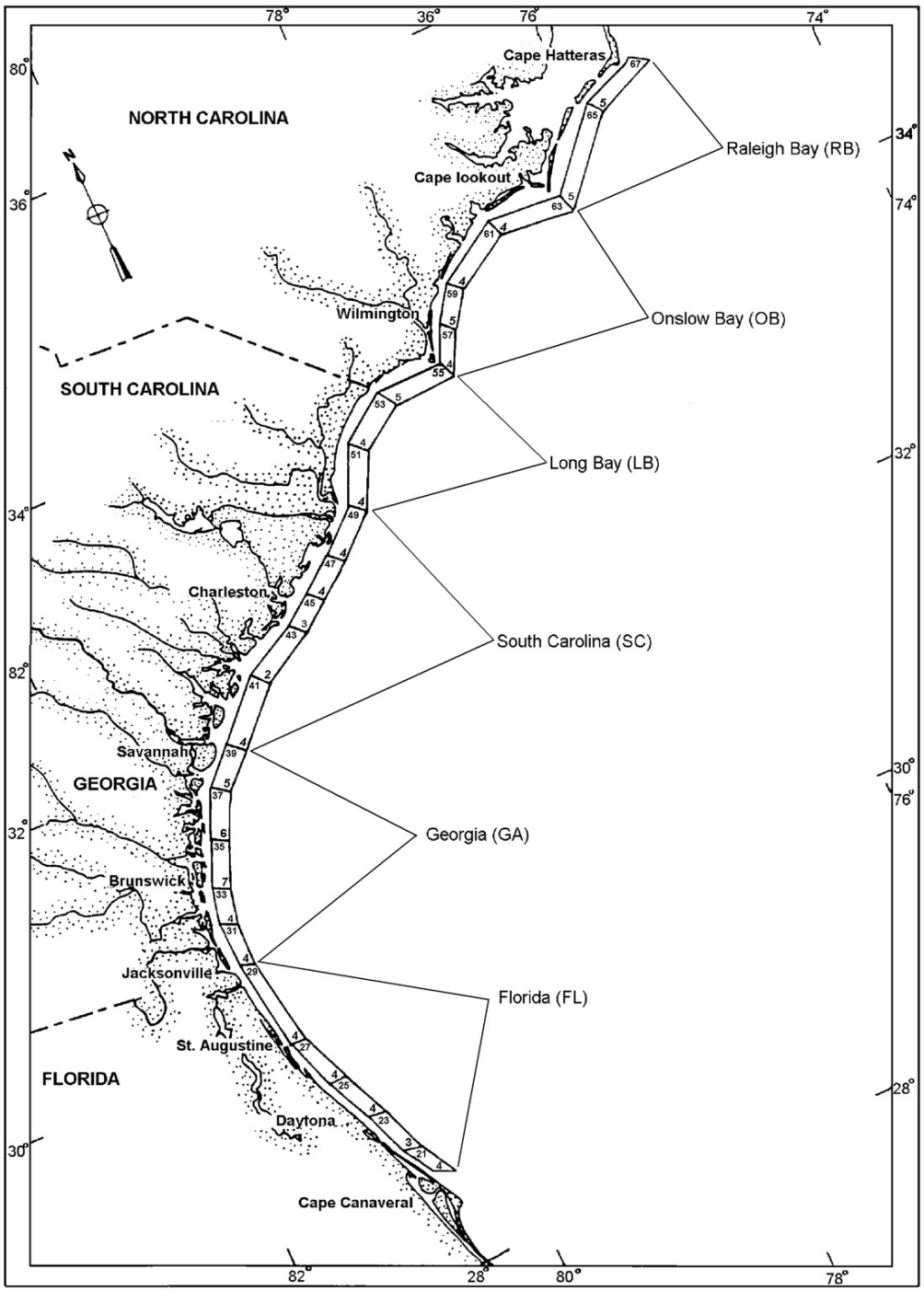

Figure 1. Strata sampled by the SEAMAP-SA Shallow Water Trawl Survey in 2005. Stratum number is indicated at the top of each rectangle and number of trawls towed is located in the lower portion of each stratum. (Strata are not drawn to scale.)

Stations were randomly selected from a pool of stations within each stratum. The number of stations sampled in each stratum was determined by optimal allocation. A total of 102 stations were sampled each season within twenty-four shallow water strata, representing an increase from 78 stations previously sampled in those strata by the trawl survey (1990-2000). Strata were delineated by the 4 m depth contour inshore and the 10 m depth contour offshore. In previous years (1989-2000), stations were also sampled in deeper strata with station depths ranging from 10 to 19 m in order to gather data on the reproductive condition of commercial penaeid shrimp. Those strata were abandoned in 2001 in order to intensify sampling in the more shallow depth-zone.

The R/V *Lady Lisa*, a 75-ft (23-m) wooden-hulled, double-rigged, St. Augustine shrimp trawler owned and operated by the South Carolina Department of Natural Resources (SCDNR), was used to tow paired 75-ft (22.9-m) mongoose-type Falcon trawl nets (manufactured by Beaufort Marine Supply; Beaufort, S.C.) without TED's. The body of the trawl was constructed of #15 twine with 1.875-in (47.6-mm) stretch mesh. The cod end of the net was constructed of #30 twine with 1.625-in (41.3-mm) stretch mesh and was protected by chafing gear of #84 twine with 4-in (10-cm) stretch "scallop" mesh. A 300 ft (91.4-m) three-lead bridle was attached to each of a pair of wooden chain doors which measured 10 ft x 40 in (3.0-m x 1.0-m), and to a tongue centered on the head-rope. The 86-ft (26.3-m) head-rope, excluding the tongue, had one large (60-cm) Norwegian "polyball" float attached top center of the net between the end of the tongue and the tongue bridle cable and two 9-in (22.3-cm) PVC foam floats located one-quarter of the distance from each end of the net webbing. A 1-ft chain drop-back was used to attach the 89-ft foot-rope to the trawl door. A 0.25-in (0.6-cm) tickler chain, which was 3.0-ft (0.9-m) shorter than the combined length of the foot-rope and drop-back, was connected to the door alongside the foot-rope.

Trawls were towed for twenty minutes, excluding wire-out and haul-back time, exclusively during daylight hours (1 hour after sunrise to 1 hour before sunset). Each net was processed separately and assigned a unique collection number. Contents of each net were sorted to species or genus, and total biomass and number of individuals were recorded for all species of finfish, elasmobranchs, decapod and stomatopod crustaceans, cephalopods, sea turtles, xiphosurans, and cannonball jellies. Only total biomass was recorded for all other miscellaneous invertebrates and algae, which were treated as two separate taxonomic groups.

Where large numbers of individuals of a species occurred in a collection, the entire catch was sorted and all individuals of that species were weighed, but only a randomly selected subsample was processed and total number was calculated. For large trawl catches, the contents of each net were weighed prior to sorting and a randomly chosen subsample of the total catch was then sorted and processed.

In every collection, each of the priority species was weighed collectively and individuals were measured to the nearest centimeter (Appendix 1). For large collections of any of the priority species, a random subsample consisting of thirty to fifty individuals was weighed and measured.

Additional data were collected on individual specimens of penaeid shrimp (total length in mm, sex, female ovarian development, male spermatophore development, occurrence of mated females), blue crabs (carapace width in mm, individual weight, sex, presence and developmental stage of eggs), sharks (total and fork lengths in cm, individual weight, sex), horseshoe crabs (prosoma width in mm, individual weight, sex), and sea turtles (curved and straight lengths and widths in cm, individual weight, PIT and flipper tag numbers). Marine turtles were released in good condition according to NMFS permitting guidelines.

Gonad and otolith specimens from three sciaenid species were also collected during seasonal cruises. A representative sample of specimens from each centimeter size range within each stratum were measured to the nearest mm (TL and SL), weighed to the nearest gram, and assigned a sex and maturity code (Wenner et al., 1986). Sagittal otoliths and a representative series of gonadal tissue were removed, preserved, and transported to the laboratory at MRRI, where samples were processed (Walton, 1996). Results of data collected from specimens of *Cynoscion regalis, Menticirrhus americanus,* and *Micropogonias undulatus* are presented in this report.

Hydrographic data collected at each station included surface to bottom temperature and salinity measurements taken with a Seabird SBE-19 CTD profiler, sampling depth, and an estimate of wave height. Additionally, atmospheric data on air temperature, barometric pressure, precipitation, and wind speed and direction were also noted at each station.

Data Analysis

The SAB was separated into six regions for data analysis (Figure 1). Raleigh Bay (RB), Onslow Bay (OB) and Long Bay (LB) were each considered to be regions. South Carolina, excluding Long Bay (SC); Georgia, including northern Florida south to the St. Johns River (GA), and Florida from the St. Johns River to Cape Canaveral (FL) were also treated as separate regions.

Data from the paired trawls were pooled for analysis to form a standard unit of effort (tow). In an effort to reduce the variability of the data, in 2001 the method of allocating the number of stations within each stratum was changed from proportional allocation to optimal allocation (Thompson, 1992). The coefficient of variation (CV), expressed as a proportion, was used to compare relative amounts of variation in abundance among years and among species (Sokal and Rohlf, 1981). Density estimates, expressed as number of individuals or kilograms per hectare (ha), were standardized by dividing the mean catch per tow by the mean area (ha) swept by the combined trawls. Mean area swept by a net was calculated by multiplying the width of the net opening (13.5 m), as determined by Stender and Barans (1994), by the distance (m) trawled and dividing the product by 10,000 m^2/ha.

Results for priority species are presented and discussed individually in this report. Statistically significant differences in lengths of individuals among seasons and regions were determined using the non-parametric Kruskal-Wallis test (Sokal and Rohlf, 1981). Size differences among shark genders were tested for statistical differences with the non-parametric Wilcoxon test. Contingency tables using the G-statistic were used to determine if occurrence of ripe penaeid shrimp were independent of season and region.

Seasonal age-length keys for *Cynoscion regalis, Menticirrhus americanus,* and *Micropogonias undulatus* (Appendix 2) were generated and applied to expanded seasonal length-frequencies to determine the age composition of those species in SEAMAP-SA trawl samples.

RESULTS AND DISCUSSION

Hydrographic Measurements

Hydrographic patterns of temperature and salinity in the SAB are driven by four major influences which fluctuate seasonally: river run-off, the Gulf Stream, a southerly flowing coastal current, and atmospheric conditions. The warm, highly saline waters of the Gulf Stream, in close proximity to coastal waters off Florida and in Raleigh Bay, elevate temperatures and salinities in those areas (Pietrafesa et al., 1985). Most of the river run-off in the SAB occurs south of Cape Fear (Blanton and Atkinson, 1983; McClain et al., 1988). Water of lower salinity created by freshwater influx is pushed southward by the southerly flowing coastal current; however, this movement is impeded by the northerly flowing Gulf Stream off northern Florida (Blanton, 1981; Blanton and Atkinson, 1983). The result of this process is a concentration of lower salinity water off southern South Carolina and Georgia. Seasonal fluctuations in river run-off, atmospheric conditions, and migrations of the Gulf Stream dictate the magnitudes of these hydrographic patterns.

Typical seasonal and regional patterns of temperature and salinity were observed during the 2005 survey (Table 1). Both annual and seasonal mean temperatures and mean salinities were slightly lower than the estimates calculated for 1989-2005 ($\bar{x}$ = 22.8 °C, 34.3 ‰).

Table 1. Seasonal mean bottom temperatures (°C) and salinities (‰) from each region for 2005. Regions are abbreviated as follows: Raleigh Bay (RB), Onslow Bay (OB), Long Bay (LB), South Carolina (SC), Georgia (GA), and Florida (FL).

	RB	OB	LB	SC	GA	FL	ALL REGIONS
SPRING							
$\bar{x}$ Temperature	12.2	15.0	15.9	15.6	16.6	20.2	16.2
$\bar{x}$ Salinity	32.4	33.5	33.9	33.1	32.0	34.9	33.2
SUMMER							
$\bar{x}$ Temperature	25.4	26.1	28.2	27.9	28.3	25.9	27.1
$\bar{x}$ Salinity	36.0	35.3	35.1	34.5	33.5	36.0	34.9
FALL							
$\bar{x}$ Temperature	19.7	21.9	24.7	21.0	22.9	26.8	23.0
$\bar{x}$ Salinity	32.4	34.2	33.2	33.5	31.9	33.0	33.0
ALL SEASONS							
$\bar{x}$ Temperature	19.1	21.1	22.9	21.1	22.5	24.4	22.1
$\bar{x}$ Salinity	33.7	34.4	34.0	33.7	32.5	34.6	33.7

Species Composition

The 2005 sampling effort resulted in the collection of 175 species (Appendix 3). Trawls produced 107 species of finfish, 28 species of elasmobranchs, 29 species of decapod crustaceans, 3 species of stomatopod crustaceans, 3 genera of cephalopods, 4 species of marine turtles, and one species of xiphosuran.

The number of species collected varied seasonally (Table 2), with greatest diversity from trawls towed in fall. Summer cruises produced the lowest number of species. Regionally, the greatest diversity was found in Onslow Bay, whereas the lowest number of species was taken in Raleigh Bay.

Table 2. Summary of effort (number of trawl tows), diversity (number of species), abundance (number of individuals), biomass (kg), density of individuals (number/ha), and density of biomass (kg/ha), excluding miscellaneous invertebrates, cannonball jellies, and algae, by region and season.

	Effort	Diversity	Abundance		Density	
	(Tows)	(Species)	Individuals	Biomass	Individuals	Biomass
Region						
RALEIGH BAY	30	91	265,600	19695	2368.3	175.6
ONSLOW BAY	54	122	105,022	8536	530.3	43.1
LONG BAY	39	120	57140	3926	408.4	28.1
S. CAROLINA	51	112	55942	3957	286.8	20.3
GEORGIA	78	113	84198	5962	290.8	20.6
FLORIDA	54	114	135,676	6893	694.0	35.3
Season						
SPRING	102	128	169,397	14812	444.3	38.8
SUMMER	102	126	169,994	9463	446.3	26.6
FALL	102	135	370,187	24394	997.9	65.8

Abundance, Biomass, and Density Estimates

The 2005 SEAMAP-South Atlantic Shallow Water Trawl Survey caught 703,549 individuals (CV= 6.4; 2318 individuals/tow), with a biomass of 48,966 kg (160.0 kg/tow). Miscellaneous invertebrates, cannonball jellies, and algae contributed an additional 8807 kg of biomass. The overall density of individuals (608 individuals/ha) in 2005 (excluding cannonball jellies) represents the highest abundance observed in the history of the survey (Figure 2). This increase was accompanied by an increase in variability.

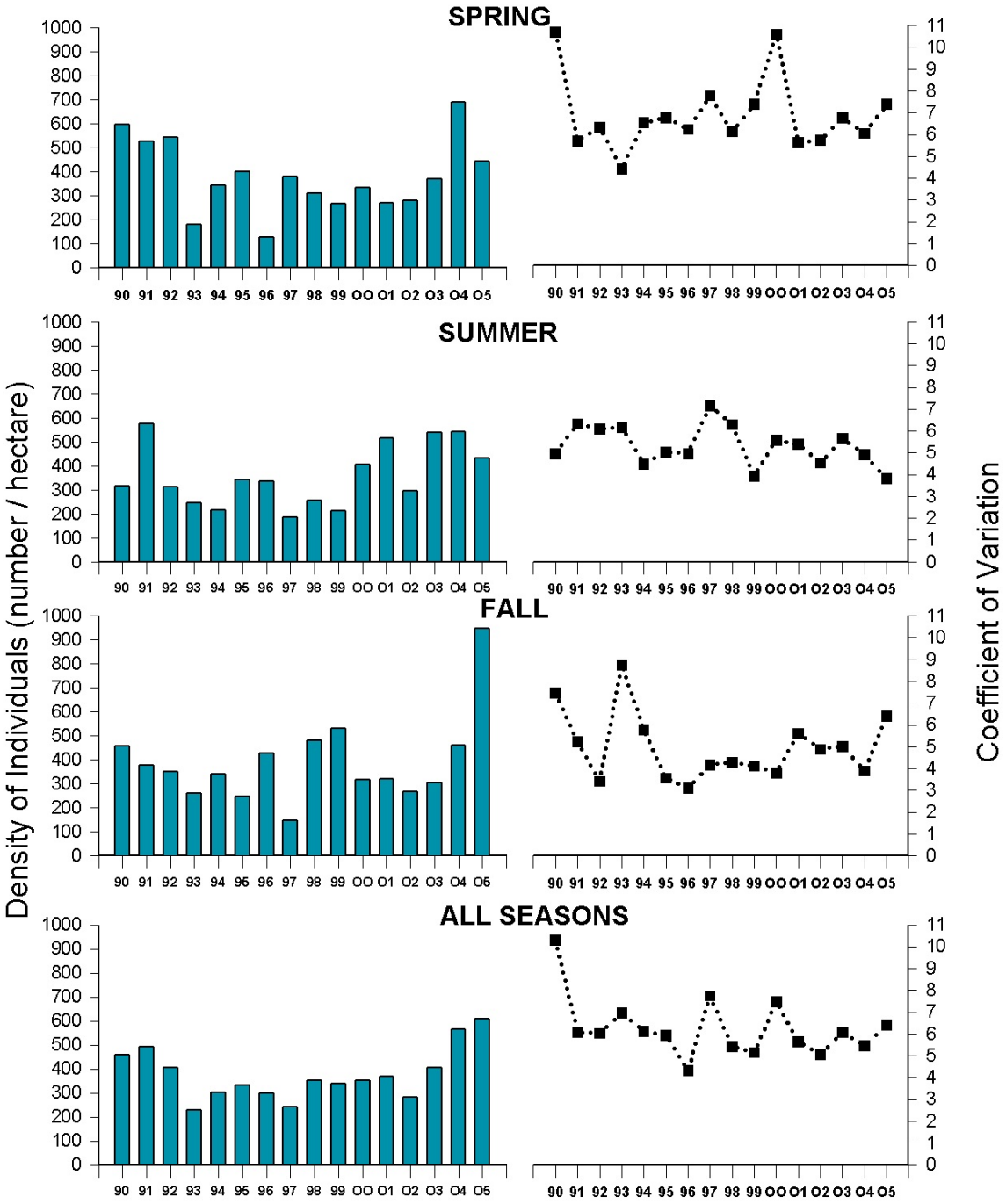

Figure 2. Annual and seasonal densities of abundance from inner strata.

In 2005, both densities of individuals and densities of biomass peaked in fall collections (Table 2). The highest regional densities of individuals and biomass occurred in Raleigh Bay, reflecting relatively large catches of sciaenids. South Carolina and Georgia had the lowest densities of individuals and biomass.

Historically, patterns of abundance in the SAB generally reflect the abundance of two members of the sciaenid family, the spot, *Leiostomus xanthurus*, and the Atlantic croaker, *Micropogonias undulatus,* which have been consistent in their numerical dominance among years. These two species constituted approximately 35% of the total catch during the 2005 survey. *Leiostomus xanthurus* ranked first in both abundance and biomass, followed by *Micropogonias undulatus* and *Cynoscion regalis* (Table 3). Other species of numerical importance included the white shrimp, *Litopenaeus setiferus*; the Atlantic thread herring, *Opisthonema oglinum*; and the striped anchovy, *Anchoa hepsetus*..

Table 3. Regional and seasonal estimates of density of abundance (individuals/ha) and biomass (kg/ha), excluding miscellaneous invertebrates, cannonball jellies, and algae, for dominant species in 2005.

	All	Region						Season		
	Strata	**RB**	**OB**	**LB**	**SC**	**GA**	**FL**	**SPR**	**SUM**	**FAL**
Abundance										
Leiostomus xanthurus	119.9	836.4	95.5	22.3	45.2	12.4	33.0	38.5	45.5	2.2
Micropogonias undulatus	99.7	456.5	161.3	135.1	26.2	7.1	14.2	60.2	120.8	119.6
Cynoscion regalis	40.3	371.5	9.5	1.4	1.2	0.8	4.6	59.2	9.5	51.3
Litopenaeus setiferus	31.9	2.5	14.7	16.9	11.7	9.1	129.9	0.7	5.6	90.1
Opisthonema oglinum	29.7	3.2	1.1	3.2	5.2	84.2	35.4	73.3	5.6	8.9
Anchoa hepsetus	29.2	66.9	24.7	32.9	34.2	26.5	8.8	56.2	9.5	51.3
Biomass										
Leiostomus xanthurus	7.2	49.7	4.7	1.5	3.8	0.5	2.3	1.8	2.2	17.6
Micropogonias undulatus	5.1	25.2	7.8	5.9	1.4	0.3	0.8	2.3	6.5	6.6
Cynoscion regalis	3.5	32.5	0.6	0.09	0.1	0.1	0.4	5.2	0.7	4.4
Mustelus canis	2.9	9.6	9.6	1.5	0	0	0	8.4	0.01	0
Rhinoptera bonasus	2.5	0	2.4	4.3	2.4	4.4	0.2	3.0	0.1	4.3
Raja eglanteria	1.7	11.3	2.8	0.5	0.2	0.006	0.2	3.9	0.008	1.3

Distribution and Abundance of Priority Finfish Species

Archosargus probatocephalus

The sheepshead, *Archosargus probatocephalus*, exhibited an increase in abundance in 2005. Catches of sheepshead peaked in 1992 and dropped to the lowest level in 2003 (Figure 4). Only 27 sheepshead (CV=6.5; 0.02 individuals/ha), weighing a total of 68 kg, were taken in 2005. Sheepshead were most abundant in Raleigh Bay in fall (Table 4). Fork lengths ranged from 27 to 53cm ($\bar{x}$ = 46.3).

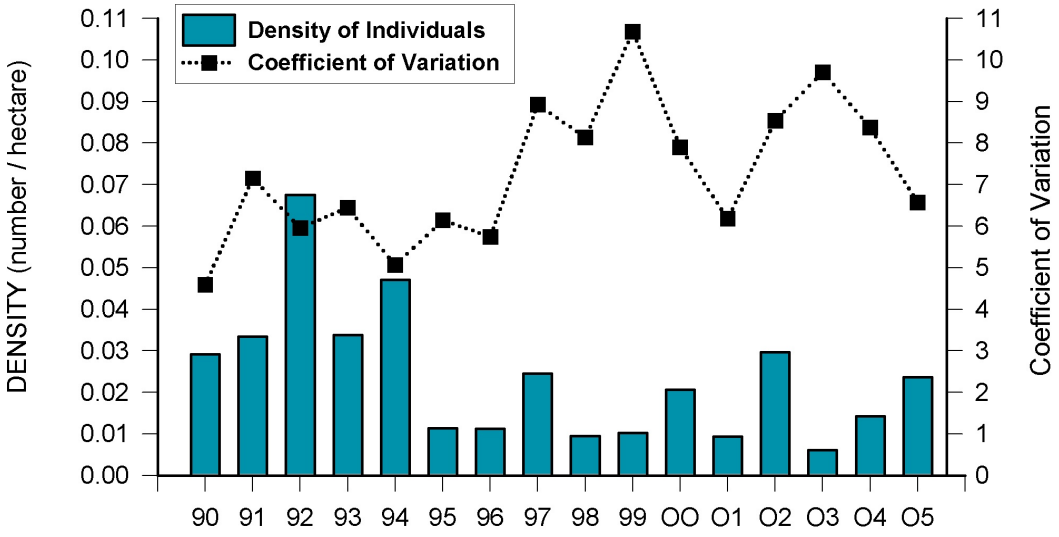

Figure 3. Annual densities of *Archosargus probatocephalus*

Table 4 . Estimates of density (number of individuals/hectare) in 2005.

Archosargus probatocephalus

	Spring	Summer	Fall	Region
Raleigh Bay	0	0.03	0.3	0.1
Onslow Bay	0	0	0.2	0.06
Long Bay	0.02	0.04	0	0.02
South Carolina	0	0	0	0
Georgia	0	0	0.02	0.007
Florida	0	0	0	0
Season	0.003	0.008	0.06	0.02

Brevoortia smithi

A total of only 3 yellowfin menhaden (CV=13.1; 0.003 individuals/ha), weighing 1 kg, were collected by the SEAMAP-SA Shallow Water Trawl Survey in 2005. Although density of individuals for this species peaked in 1991 (Figure 4), abundance of *Brevoortia smithi* is generally low in SEAMAP-SA trawl samples. In 2005, all yellowfin menhaden were caught in waters off Florida in spring and fall (Table 5). Fork lengths of *B. smithi* ranged from 27 to 30 cm ($\bar{x}$ = 28.3).

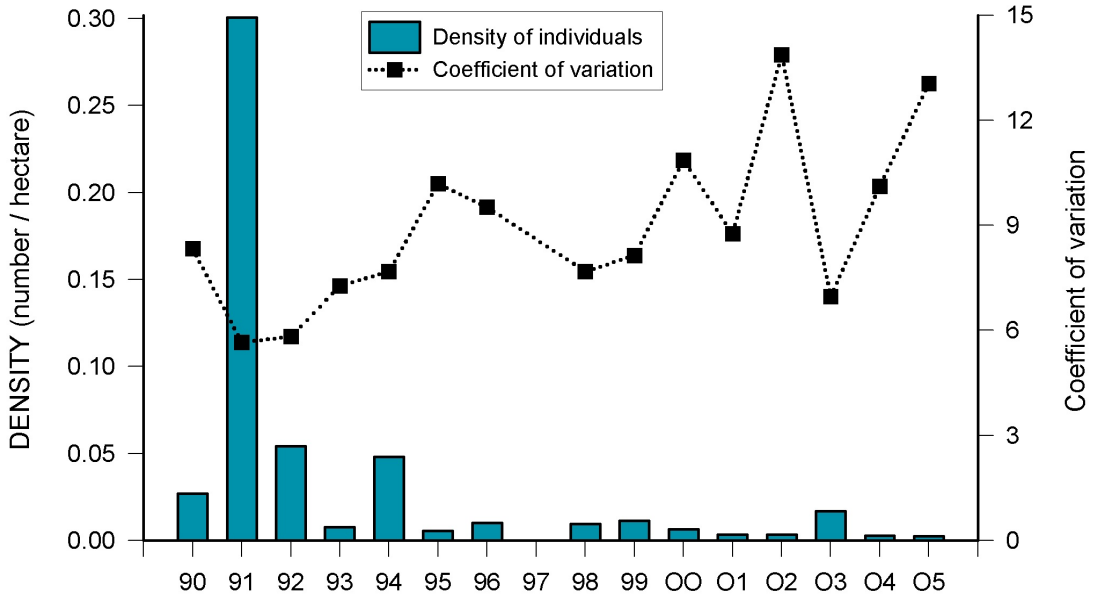

Figure 4. Annual densities of *Brevoortia smithi*

Table 5 . Estimates of density (number of individuals/hectare) in 2005.

Brevoortia smithi

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0	0
Onslow Bay	0	0	0	0
Long Bay	0	0	0	0
South Carolina	0	0	0	0
Georgia	0	0	0	0
Florida	0.02	0	0.03	0.01
Season	0.003	0	0.005	0.003

Brevoortia tyrannus

A total of 3977 Atlantic menhaden (CV=8.8; 3.5 individuals/ha), weighing 127 kg (0.1 kg/ha), were taken in SEAMAP-SA trawls. Density of individuals in 2005 was second only to the peak in abundance observed in 1990 (Figure 5). In 2005, density was greatest in spring and in waters off Georgia (Table 6).

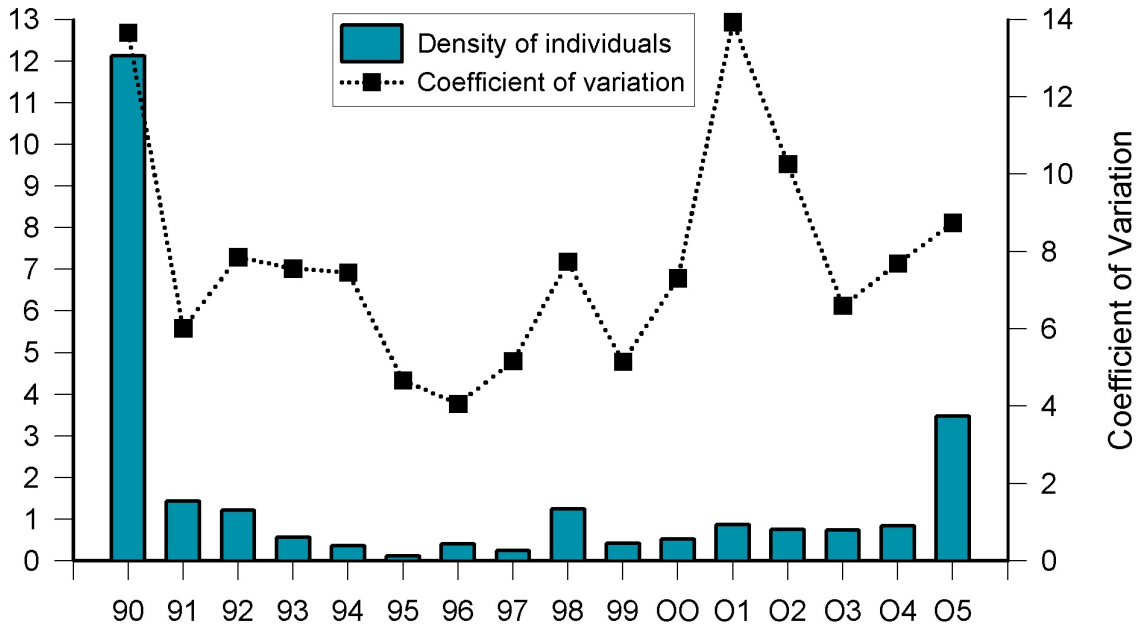

Table 6 . Estimates of density (number of individuals/hectare) in 2005.

Brevoortia tyrannus

	Spring	Summer	Fall	Region
Raleigh Bay	14.8	0	0	4.7
Onslow Bay	1.6	0	0	0.6
Long Bay	1.1	0	0.7	0.6
South Carolina	0.03	0	0	0.01
Georgia	21.9	0.2	0.09	7.5
Florida	13.3	0.3	2.0	5.2
Season	9.8	0.1	0.5	3.5

Fork lengths of *Brevoortia tyrannus* ranged from 10 to 22 cm ($\bar{x}$ = 12.7). Length was found to be significantly different among seasons ($X^2 = 367$, $p < 0.0001$) and regions ($X^2 = 1117$, $p < 0.0001$). Mean length increased from spring to summer, an indication of juvenile growth, and decreased from summer to fall, due to the recruitment of YOY (Figure 6). The mean length of Atlantic menhaden was greatest in collections in waters off South Carolina, where few individuals were taken (Figure 7). The length-frequency distributions of Atlantic menhaden in the SAB were numerically dominated by individuals taken in spring when few large specimens were taken.

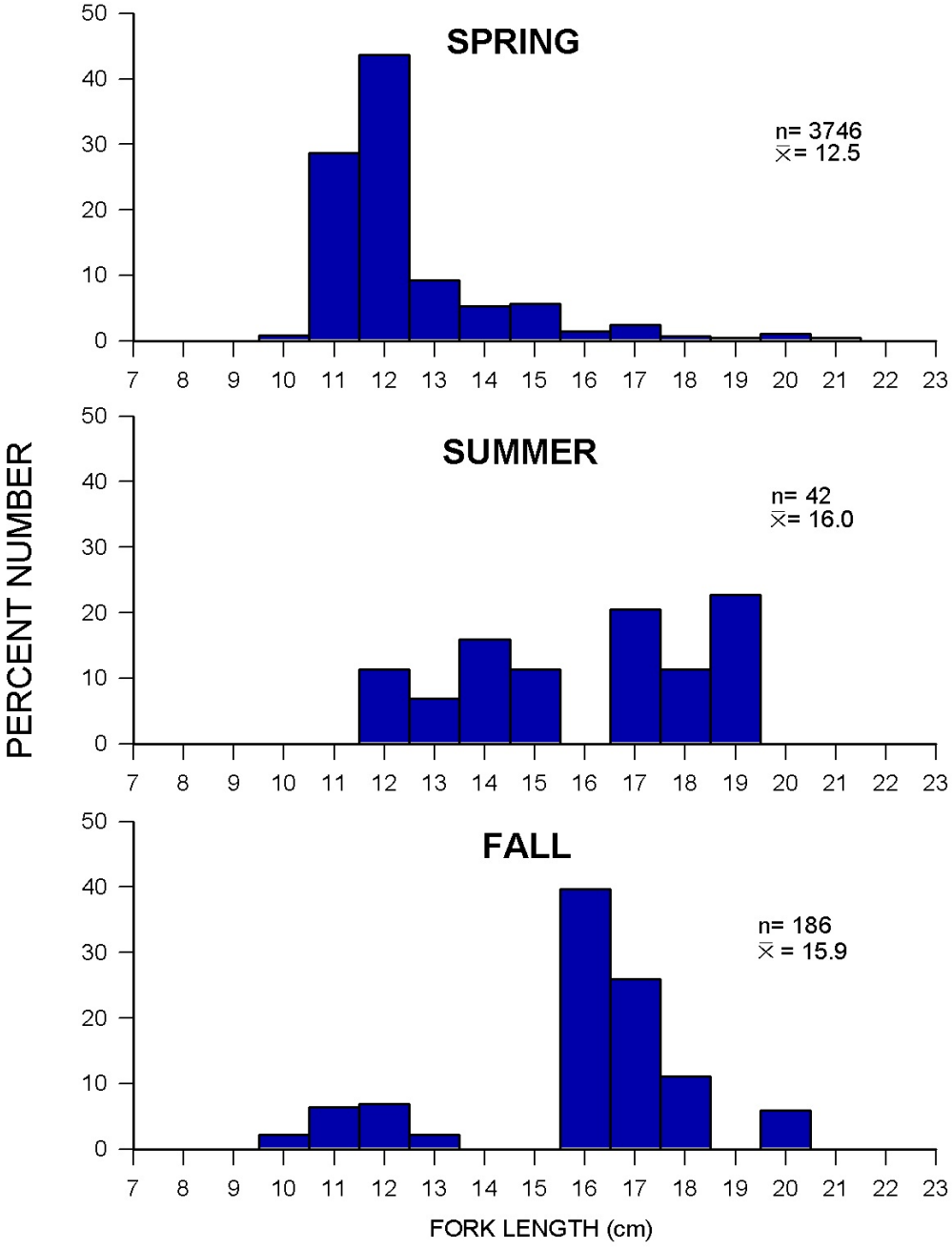

Figure 6. Seasonal length-frequencies of *Brevoortia tyrannus* in 2005.

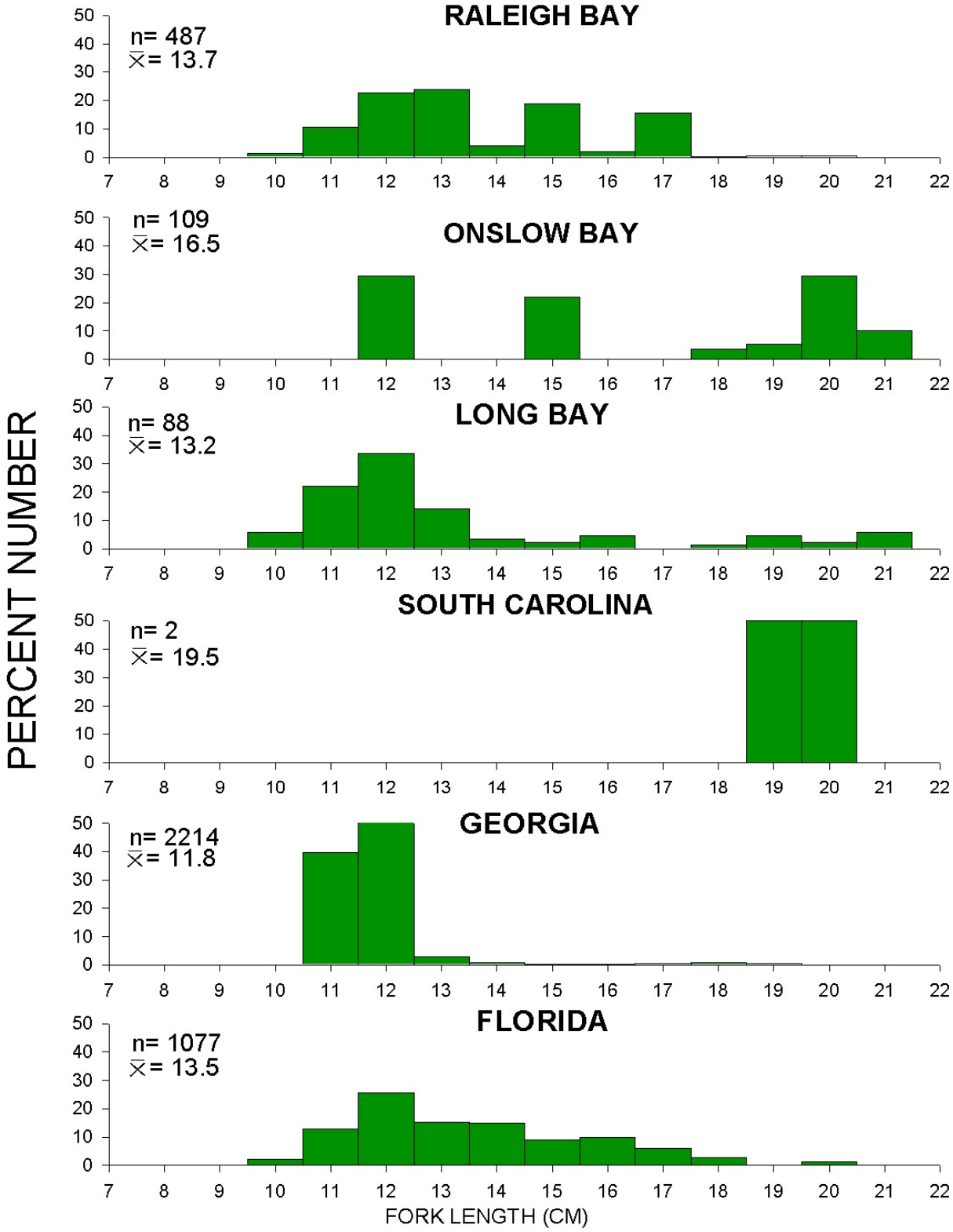

Figure 7. Regional length-frequencies of *Brevoortia tyrannus* in 2005

Centropristis striata

A total of 135 black sea bass (CV=5.1; 0.1 individuals/ha), weighing 9 kg (0.008 kg/ha), were collected in 2005. The density of abundance in 2005 represented a decrease from the density observed in 2004 (Figure 8). Density was greatest in Onslow and Long Bays (Table 7). Black sea bass were absent from collections made in Georgia and Florida. Total lengths of *Centropristis striata* ranged from 8 to 27 cm ($\bar{x}$ = 15.3).

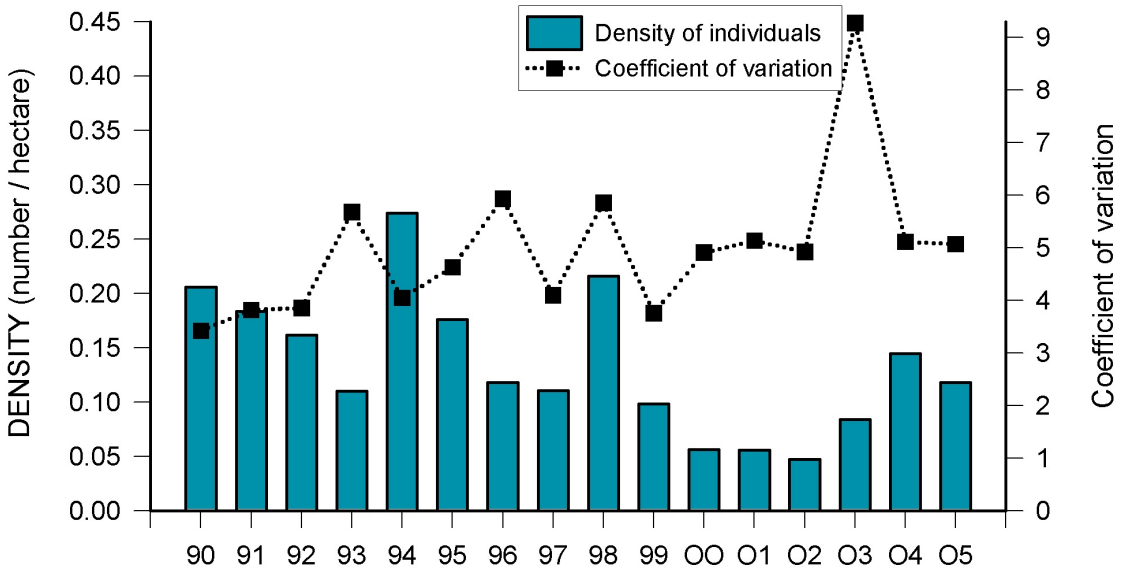

Figure 8. Annual densities of *Centropristis striata*

Table 7 . Estimates of density (number of individuals/hectare) in 2005.

Centropristis striata

	Spring	Summer	Fall	Region
Raleigh Bay	0.03	0.3	0	0.1
Onslow Bay	0.4	0.3	0.2	0.3
Long Bay	0.02	0.3	0.9	0.4
South Carolina	0.03	0.1	0	0.05
Georgia	0	0	0	0
Florida	0	0	0	0
Season	0.07	0.1	0.1	0.1

Chaetodipterus faber

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 908 Atlantic spadefish (CV=3.8; 0.8 individuals/ha), weighing 25 kg (0.02 kg/ha). Density of individuals peaked in 1991, with a general decline in abundance in subsequent years to the lowest level of abundance observed in 2001 (Figure 9). Atlantic spadefish density increased slightly from 2004 to 2005. Density was greatest in fall (Table 8). Atlantic spadefish were most abundant in Raleigh Bay and in waters off Georgia. Total lengths of *Chaetodipterus faber* ranged from 5 to 28 cm ($\bar{x}$ = 7.9).

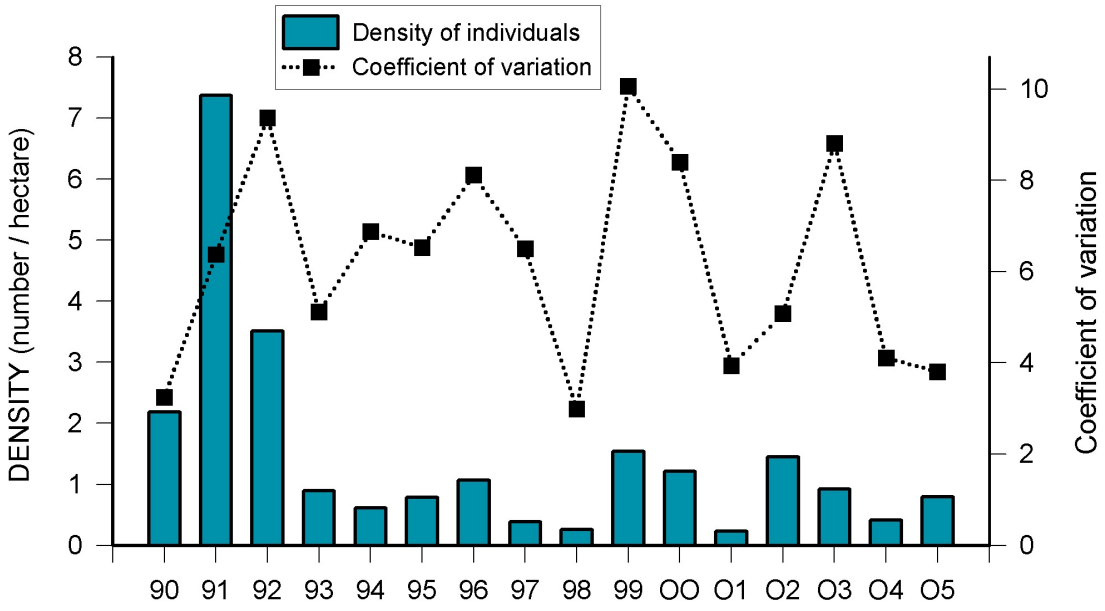

Figure 9. Annual densities of *Chaetodipterus faber*

Table 8 . Estimates of density (number of individuals/hectare) in 2005.

Chaetodipterus faber

	Spring	Summer	Fall	Region
Raleigh Bay	0	0.3	3.7	1.3
Onslow Bay	0	0.1	0.1	0.09
Long Bay	0	0	0.1	0.04
South Carolina	0	0.2	1.6	0.6
Georgia	0	0.1	4.0	1.3
Florida	0.09	0.04	2.3	0.8
Season	0.02	0.1	2.1	0.8

Cynoscion nebulosus

The spotted seatrout, *Cynoscion nebulosus*, has been a rare species in SEAMAP-SA Shallow Water Trawl Survey collections (Figure 10). In 2005 two specimens were taken. Both spotted seatrout were collected during the fall cruise, one in Raleigh and the other in waters off Florida. *Cynoscion nebulosus* measured 26 and 28 cm (TL).

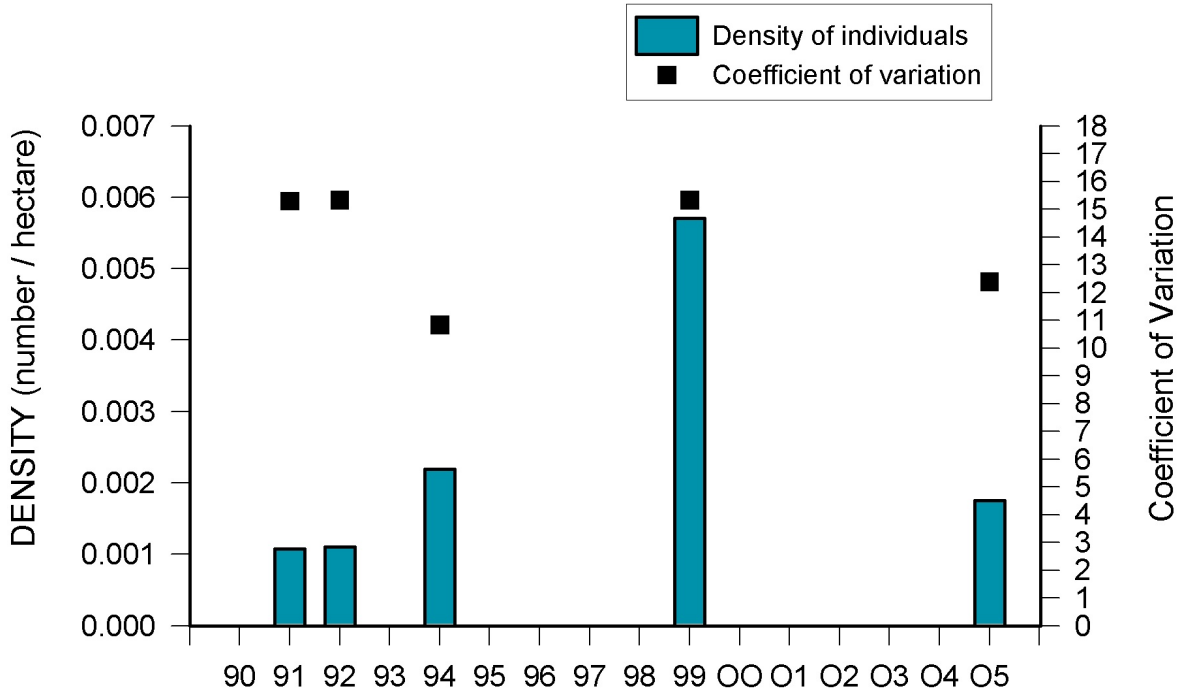

Figure 10. Annual densities of *Cynoscion nebulosus*

Cynoscion regalis

In 2005, SEAMAP strata yielded a total of 45,074 weakfish (CV=9.9; 39.5 individuals/ha), weighing 3898 kg (3.4 kg/ha). The density of abundance in 2005 represented the greatest annual density in the history of the survey (Figure 11). In 2005, density was greatest in spring and lowest in summer collections (Table 9). Weakfish were most abundant in the northern portion of the SAB, with greatest density of individuals found in Raleigh Bay.

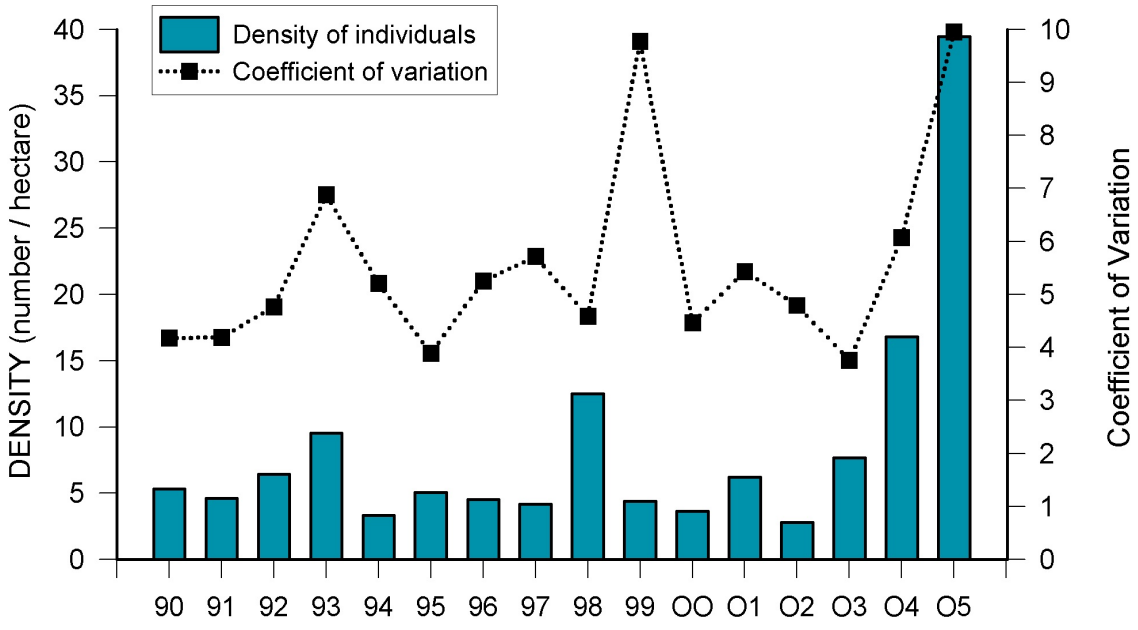

Figure 11. Annual densities of *Cynoscion regalis*

Table 9 . Estimates of density (number of individuals/hectare) in 2005.

Cynoscion regalis

	Spring	Summer	Fall	Region
Raleigh Bay	640.9	74.3	473.7	387.0
Onslow Bay	16.7	7.4	4.1	9.5
Long Bay	0.8	0.4	2.7	1.3
South Carolina	0.2	0.6	2.8	1.2
Georgia	0.3	1.1	0.9	0.8
Florida	3.9	1.3	7.6	4.3
Season	59.3	9.2	49.7	39.5

A total of 471 otolith (spring=185, summer=104, fall=182) and 129 gonad samples from weakfish were taken in 2005. The majority of the weakfish sampled were ages 0 (26%, n=122) and 1 (56%, n=261), followed by age 2 (16%, n=74), age 3 (3%, n=12), and age 4 (<1%, n=1). Weakfish collected in SEAMAP trawl samples ranged from 92 to 223 mm TL for age 0 fish, 117 to 314 mm TL for age 1, 140 to 352 mm TL for age 2, and 253 to 458 mm TL for age 3 individuals. The single age 4 specimen measured 511 mm TL. No specimens older than age 4 were taken in SEAMAP trawl samples.

Total lengths of *Cynoscion regalis* ranged from 9 to 50 cm ($\bar{x}$ = 20.4). Length was significantly different among seasons ($X^2 = 1234$, $p < 0.0001$).Mean length decreased from spring to summer due to the recruitment of YOY, and increased from summer to fall, the result of juvenile growth (Figure 12). The percentage of age 0 fish increased seasonally from none in spring to 99% of the fish sampled in fall. The spring length-frequency distribution comprised mostly age 1 fish (78%). Summer collections included primarily age 1 (64%) and age 2 (31%) fish. The inclusion of smaller specimens in fall collections resulted in a length-frequency distribution representing mostly age 0 specimens (66%) and age 1 fish (28%) that were spawned late.

Mean length also varied significantly among regions ($X^2 = 1470$, $p < 0.0001$), with larger mean lengths occurring in Georgia waters (Figure 13). The majority of specimens caught in spring and summer were determined to be age 1, whereas age 0 in fall throughout the South Atlantic Bight.

Age composition was very similar among male and female weakfish. Approximately 57% (spring: 63%, summer: 51%, fall: 56%) of the individuals sampled were female. Approximately 67% (spring: 76%, summer: 95%, fall: 39%) of the females had developing or mature ovaries, whereas 89% of male weakfish were reproductively mature (spring: 93%, summer: 100%, fall: 77%).

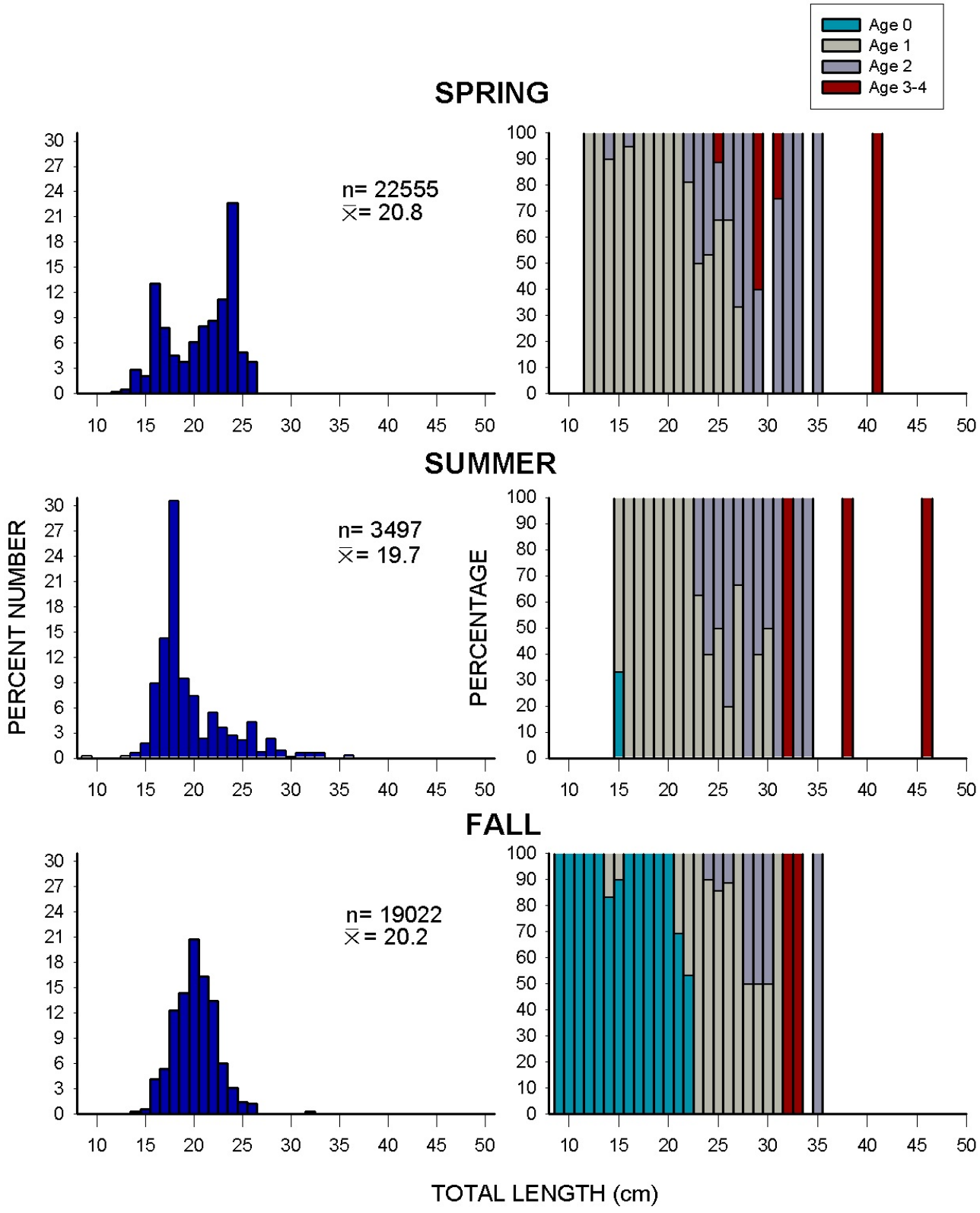

Figure 12. Seasonal length-frequencies and age composition of C*ynoscion regalis* in 2005.

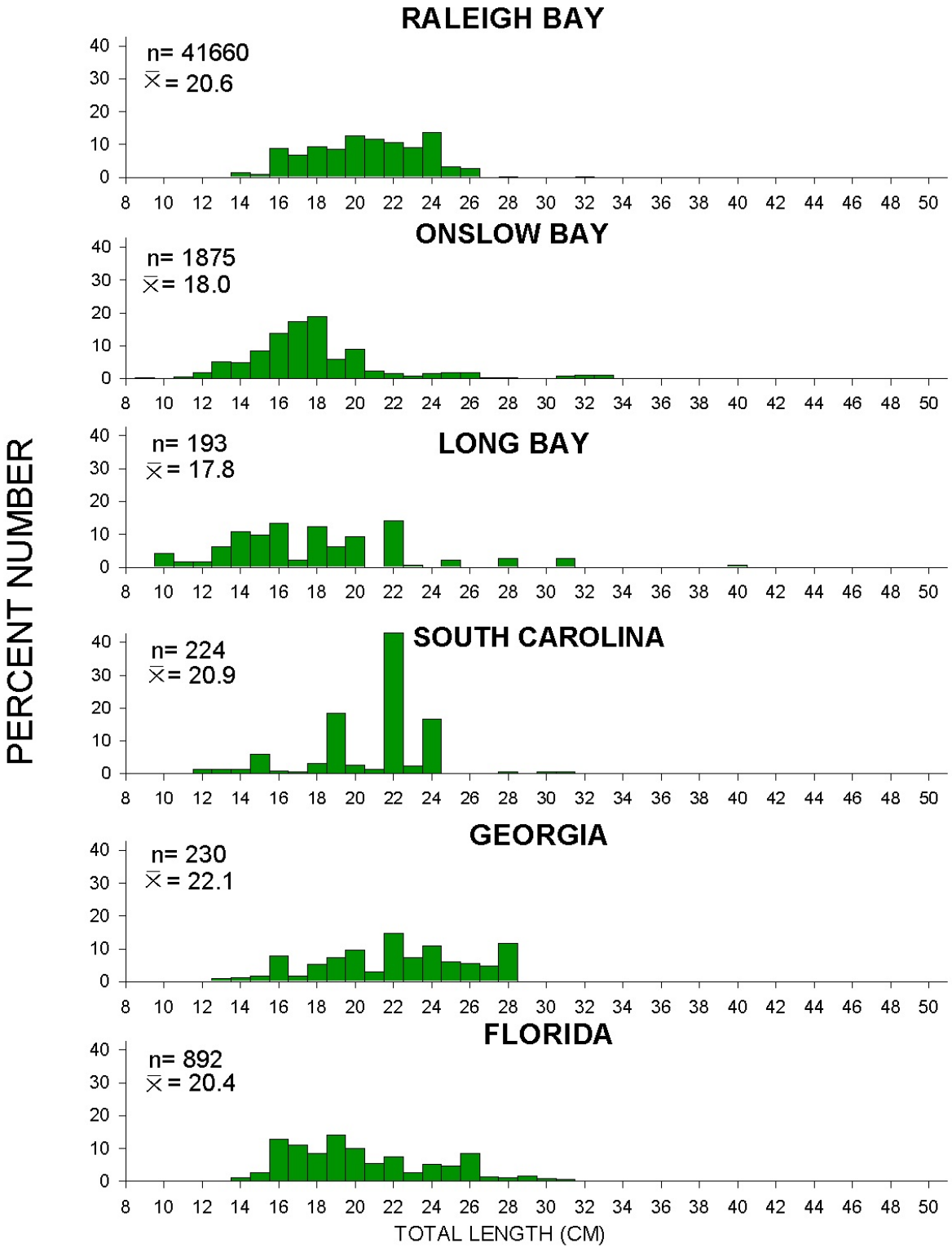

Figure 13. Regional length-frequencies of *Cynoscion regalis* in 2005

Leiostomus xanthurus

Leiostomus xanthurus was the most abundant species collected in SEAMAP-SA trawl samples in 2005. The 134,208 (CV=8.5; 117.5 individuals/ha) spot collected weighed 8,018 (7.0 kg/ha) and constituted 19% of the total number of individuals taken in SEAMAP trawls in 2005. Density of individuals of spot increased in 2005 to the highest level of abundance observed since 1991 (Figure 14). In 2005, the seasonal density of abundance increase from spring to fall (Table 10). The greatest regional density was observed in Raleigh Bay.

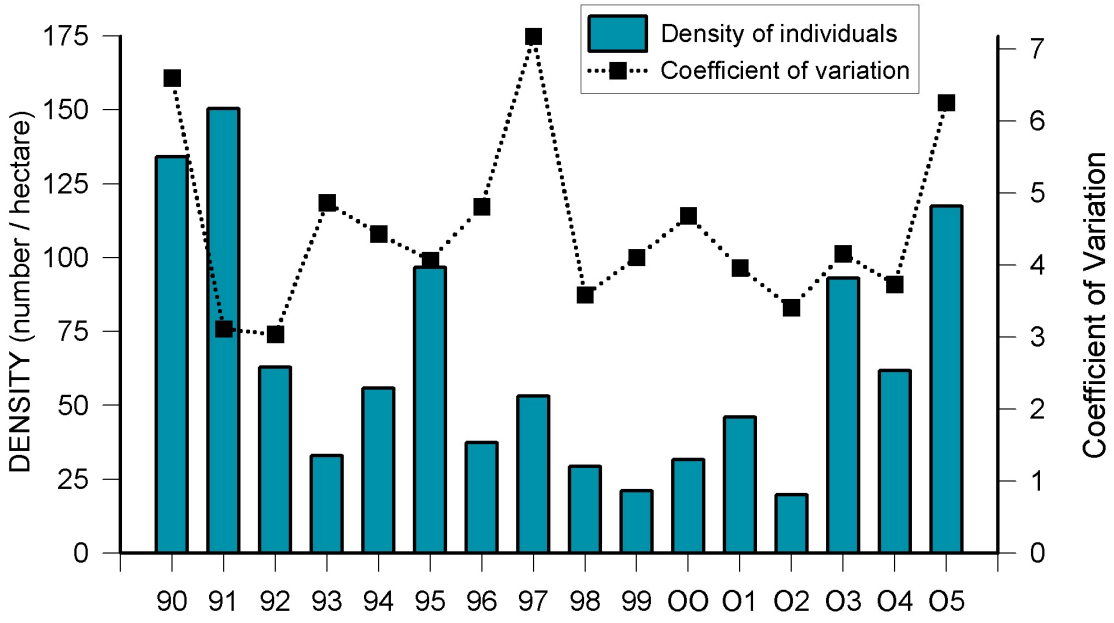

Figure 14. Annual densities of *Leiostomus xanthurus*

Table 10 . Estimates of density (number of individuals/hectare) in 2005.

Leiostomus xanthurus

	Spring	Summer	Fall	Region
Raleigh Bay	57.6	44.1	2400.5	871.3
Onslow Bay	142.4	69.9	73.0	95.8
Long Bay	13.6	40.0	11.1	21.5
South Carolina	2.4	55.2	74.6	43.9
Georgia	0.4	32.2	3.8	12.2
Florida	33.4	29.4	30.8	31.2
Season	38.5	44.1	268.7	117.5

Total centerline lengths of spot from the SEAMAP-SA survey ranged from 8 to 29 cm, with a mean length of 15.1 cm. Lengths varied significantly among seasons ($X^2 = 5531$, $p < 0.0001$). Mean length decreased from spring to summer due to the recruitment of YOY, and increased from summer to fall, the result of juvenile growth (Figure 15). Length also varied significantly among regions ($X^2 = 8385$, $p < 0.0001$). The mean length of spot was greatest in waters off Florida (Figure 16). The length-frequency distribution of spot represents primarily specimens captured in Raleigh and Onslow Bays in all seasons.

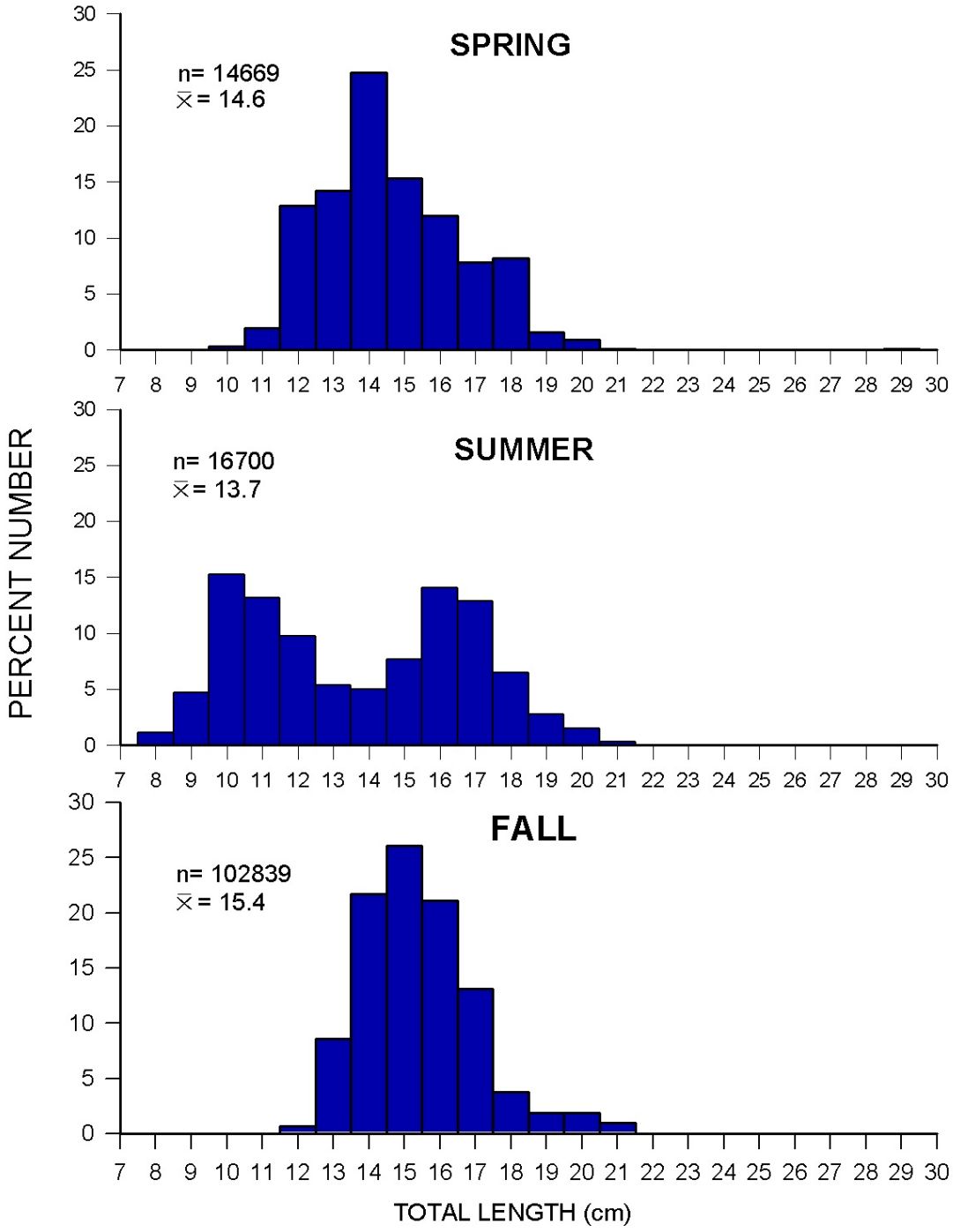

Figure 15. Seasonal length-frequencies of *Leiostomus xanthurus* in 2005

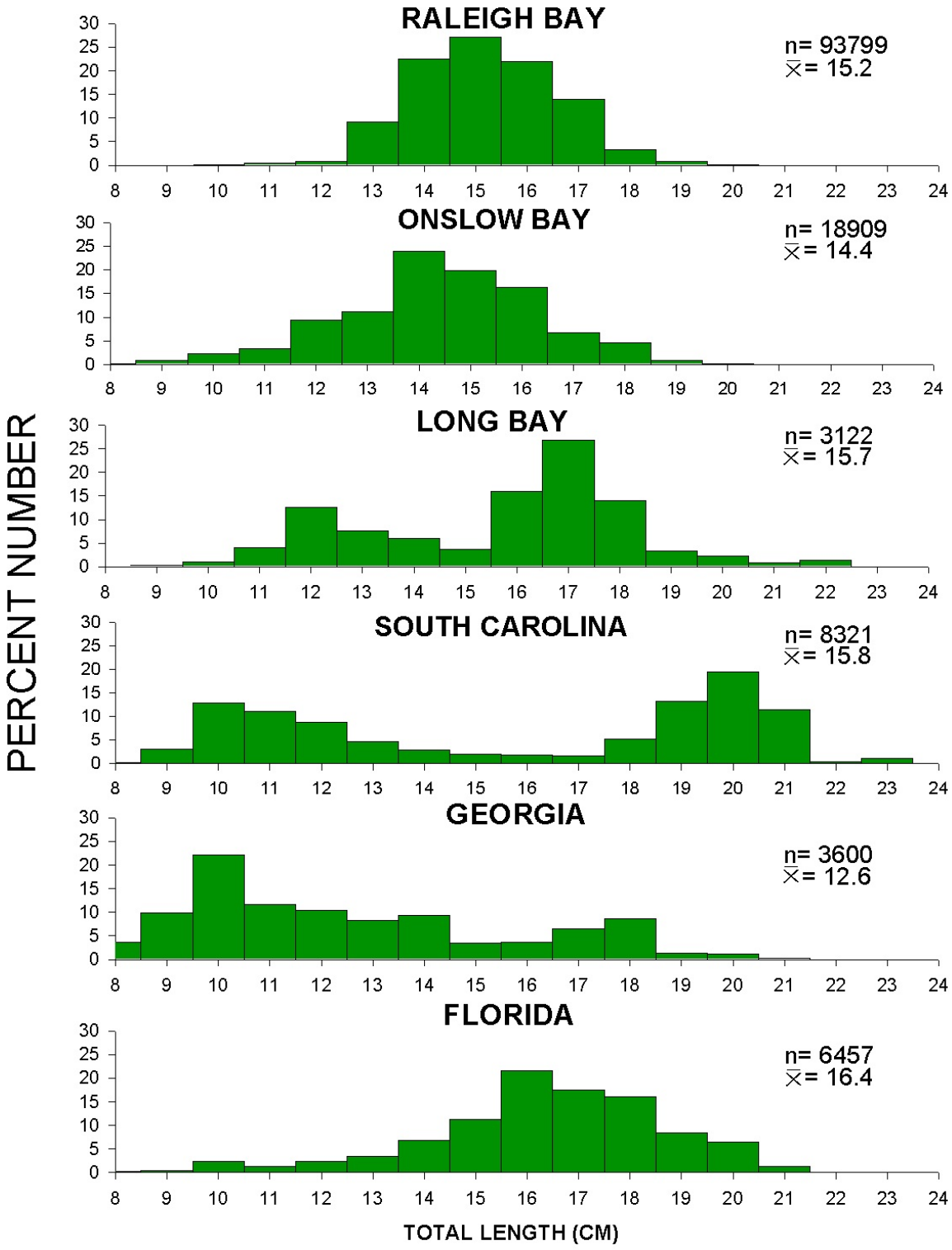

Figure 16. Regional length-frequencies of *Leiostomus xanthurus* in 2005

Menticirrhus americanus

SEAMAP-SA Shallow Water Trawl Survey strata produced a total of 16,228 southern kingfish (CV=2.5; 14.2 individuals/ha), weighing 1639 kg (1.4 kg/ha). Although density of individuals decreased in 2005 (Figure 17), abundance was second only to the peak recorded in 2004. Density was greatest in spring and in Raleigh Bay (Table 11). The southern kingfish exhibited the highest percent occurrence of all priority species, being present in approximately 75% of all tows.

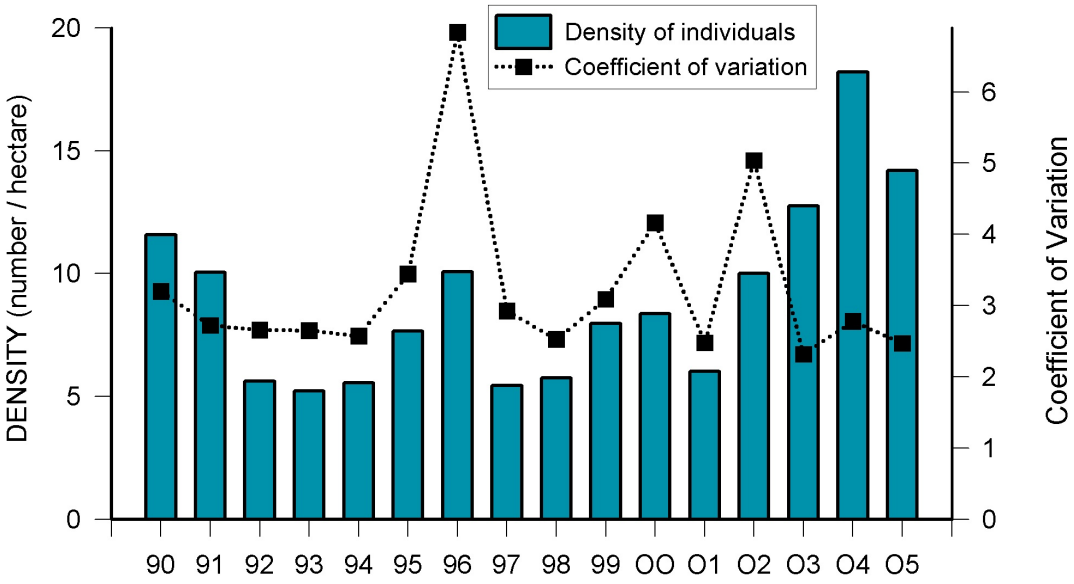

Figure 17. Annual densities of *Menticirrhus americanus*

Table 11 . Estimates of density (number of individuals/hectare) in 2005.

Menticirrhus americanus

	Spring	Summer	Fall	Region
Raleigh Bay	80.7	12.4	27.2	38.8
Onslow Bay	19.2	1.4	5.8	9.0
Long Bay	4.2	3.0	1.4	2.9
South Carolina	1.2	4.5	12.7	6.1
Georgia	7.0	15.9	12.1	11.7
Florida	24.0	18.0	32.2	24.8
Season	17.3	9.9	14.8	14.2

In 2005, a total of 1203 otoliths (spring=409, summer=363, fall=431) and 132 gonad samples were taken from southern kingfish. Southern kingfish of age 1 constituted the largest percentage (47%) of the individuals sampled, followed by age 0 (23%), age 2 (15%), age 3 (12%), age 4 (3%), and age 5 (<1%). *Menticirrhus americanus* ranged from 77 to 280 mm TL for age 0, from 95 to 325 mm TL for age 1, from 202 to 338 mm TL for age 2, from 225 to 357 mm TL for age 3, from 185 to 370 mm TL for age 4, and from 288 to 360 mm TL for age 5. No individuals greater than age 5 were taken in SEAMAP trawl samples.

Total lengths of *Menticirrhus americanus* ranged from 6 to 37 cm ($\bar{x}$ = 19.7). Length was significantly different among seasons ($X^2 = 907$, $p < 0.0001$). Mean length increased from spring to fall, the result of juvenile growth (Figure 18). The percentage of age 0 fish increased from none in spring to 24% in summer and to 76% of the southern kingfish sampled in fall. The spring length-frequency distribution comprised mostly age 1 fish (52%). The inclusion of smaller specimens in summer and fall collections resulted in a length-frequency distribution representing mostly age 1 fish that were spawned late and age 0 specimens.

Length also varied significantly among regions ($X^2 = 25023304$, $p < 0.0001$), with greatest mean length observed in Onslow Bay (Figure 19). The majority of specimens caught in spring were determined to be age 1, with the exception of Georgia (only one individual, age 2, taken in spring). In the northern SAB, most individuals were age 1 in summer, whereas in the southern SAB, the southern kingfish were predominately age 0. In fall, age 0 fish were predominate in all regions.

Age composition was very similar among male and female southern kingfish. More than 52% (spring: 55%, summer: 55%, fall: 46%) of the individuals sampled were male. Most of the males (99%) (spring: 100%, summer: 100%, fall: 96%) were reproductively mature and approximately 49% of females had developing or mature ovaries as well.

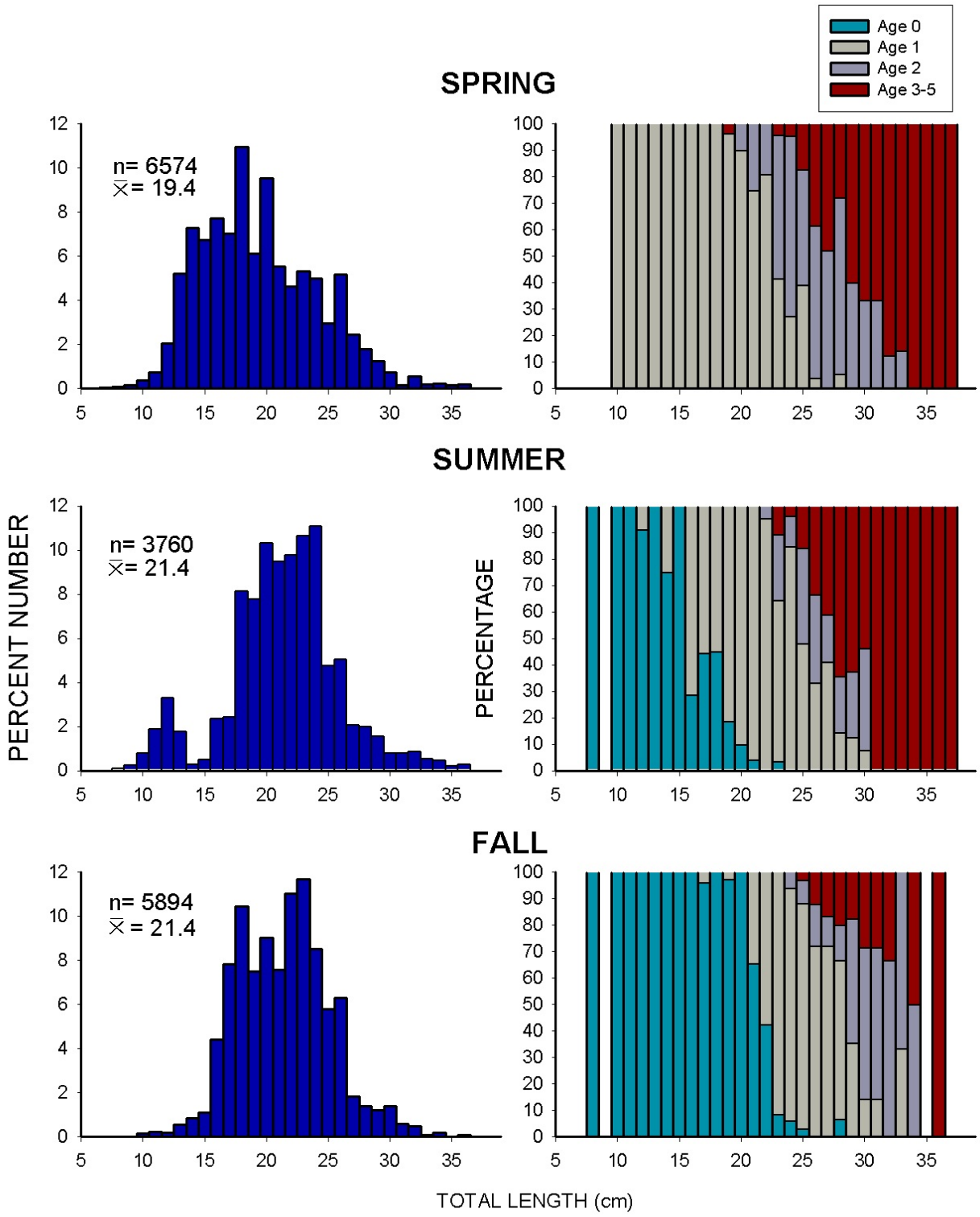

Figure 18. Seasonal length-frequencies and age composition of *Menticirrhus americanus* in 2005

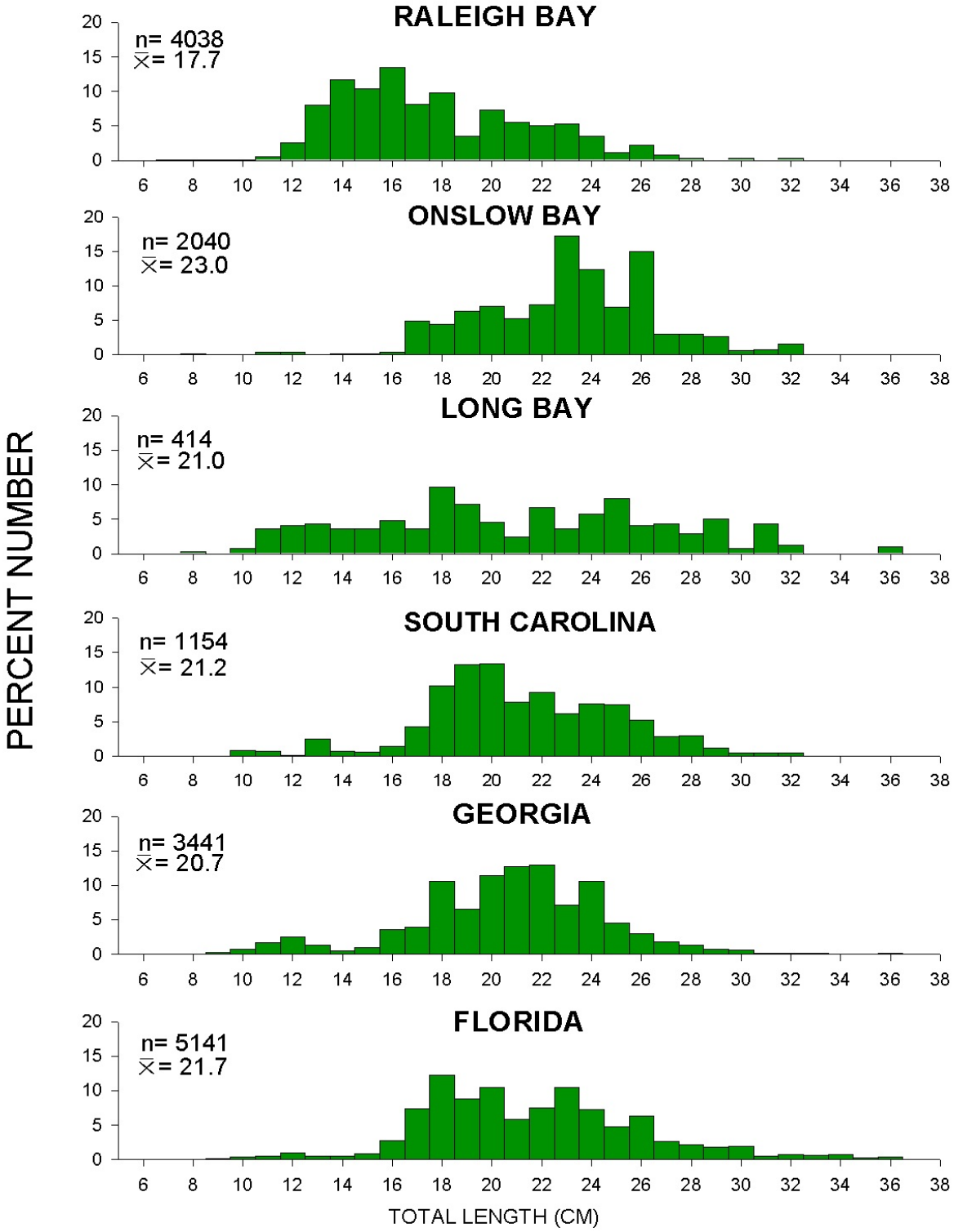

Figure 19. Regional length-frequencies of *Menticirrhus americanus* in 2005

Menticirrhus littoralis

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 606 Gulf kingfish (CV=4.9; 0.5 individuals/ha), weighing 137 kg (0.1 kg/ha) in 2005. Like *Menticirrhus americanus*, density of individuals for *Menticirrhus littoralis* decreased in 2005, after reaching record abundance in 2004 (Figure 20). Density was greatest in fall and Gulf kingfish were most abundant in the southern portion of the SAB, especially in Florida waters (Table 12). Total lengths of *Menticirrhus littoralis* ranged from 16 to 40 cm ($\bar{x}$ = 27.3), with greatest mean length in fall.

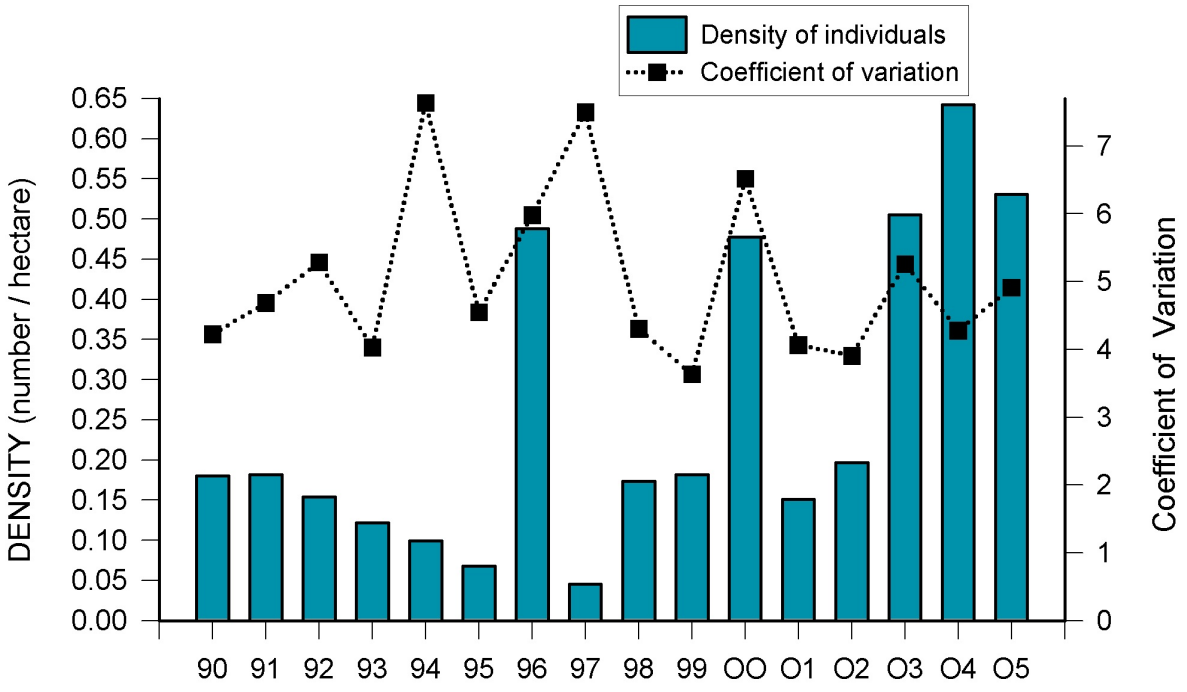

Figure 20. Annual densities of *Menticirrhus littoralis*

Table 12 . Estimates of density (number of individuals/hectare) in 2005.

Menticirrhus littoralis

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0	0
Onslow Bay	0	0	0.3	0.09
Long Bay	0.04	0	0.06	0.03
South Carolina	0.02	0.03	0	0.02
Georgia	0.02	0.01	0.1	0.05
Florida	2.5	1.5	4.1	2.7
Season	0.5	0.3	0.9	0.5

Menticirrhus saxatilis

SEAMAP-SA Shallow Water Trawl Survey strata yielded only 2 northern kingfish (CV=12.4; 0.002 individuals/ha). Density of abundance in 2005 was the lowest abundance recorded by the survey (Figure 21). Northern kingfish were taken in spring in South Carolina waters and in fall in Onslow Bay (Table 13). The two individuals measured 28 and 26 cm.

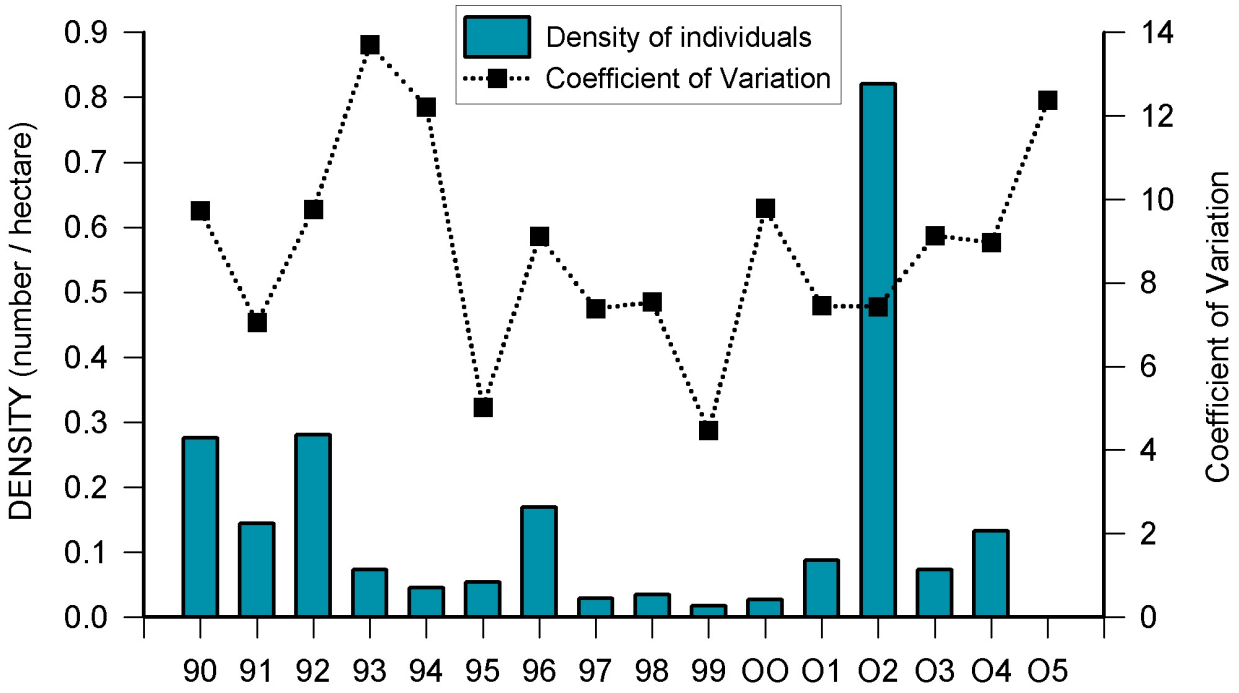

Figure 21. Annual densities of *Menticirrhus saxatilis*

Table 13 . Estimates of density (number of individuals/hectare) in 2005.

Menticirrhus saxatilis

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0	0
Onslow Bay	0	0	0.02	0.005
Long Bay	0	0	0	0
South Carolina	0.02	0	0	0.005
Georgia	0	0	0	0
Florida	0	0	0	0
Season	0.003	0	0.003	0.002

Micropogonias undulatus

Micropogonias undulatus was the second most abundant species collected by the SEAMAP-SA Shallow Water Trawl Survey in 2005. The 111,680 individuals (CV=3.5), weighing 5703 kg, made up16% of the total number of specimens taken in SEAMAP strata. Density estimates for the entire SAB were 97.8 individuals/ha and 5.0 kg/ha, a slight increase from 2004 and exceeded only in the peak years of 1991-1992 (Figure 22). Seasonal densities of individuals were greatest in summer and fall. Regional densities were highest in the northern portion of the SAB, primarily due to large catches of Atlantic croaker in summer and fall, primarily in Raleigh Bay (Table 14).

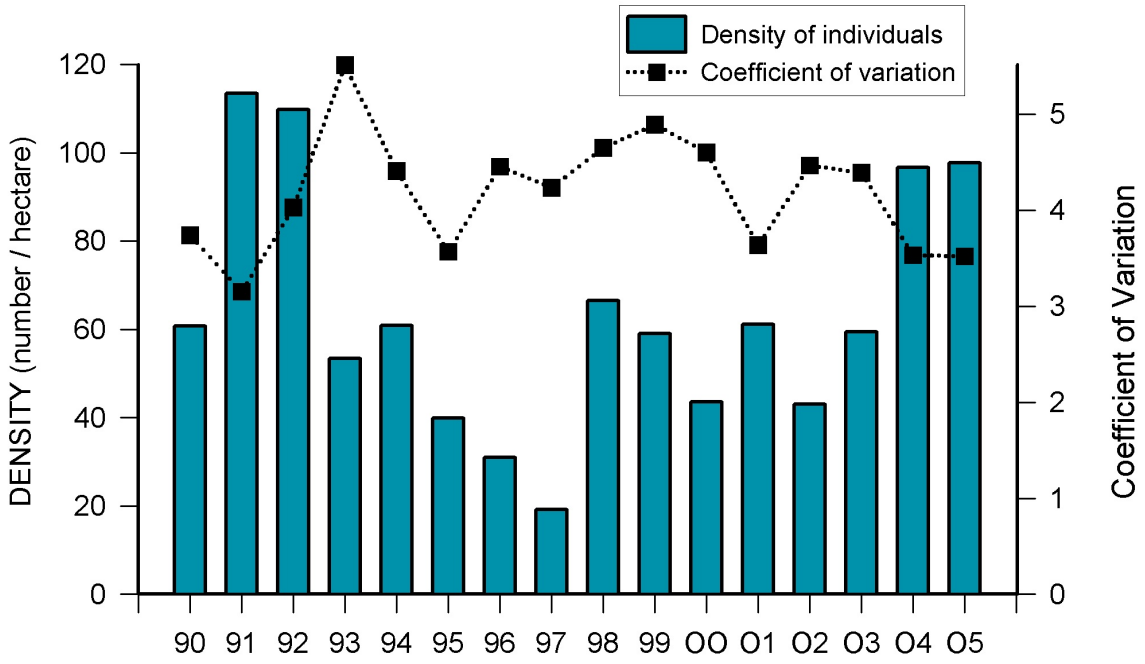

Figure 22. Annual densities of *Micropogonias undulatus*

Table 14. Estimates of density (number of individuals/hectare) in 2005.

Micropogonias undulatus

	Spring	Summer	Fall	Region
Raleigh Bay	80.6	575.7	719.2	475.5
Onslow Bay	225.0	158.6	99.8	161.8
Long Bay	102.8	137.3	150.0	130.1
South Carolina	0.3	42.4	33.8	25.4
Georgia	0.01	12.7	8.3	7.0
Florida	1.1	32.9	6.9	13.4
Season	60.3	117.1	115.9	97.8

In 2005, a total of 665 otolith (spring=141, summer=243, fall=281) and 143 gonad samples were taken from Atlantic croaker. The majority of the Atlantic croaker sampled were age 0 (44%, n=294) and age 1 (39%,n=257). Other age-classes included age 2 (12%,n=81), age 3 (3%, n=22), age 4 (1%, n=6), age 5 (<1%, n=4), and age 7 (<1%, n=1) Atlantic croaker ranged from 102 to 231 mm TL for age 0, from 106 to 250 mm TL for age 1, from 107 to 270 mm TL for age 2, from 105 to 291 mm TL for age 3, from 223 to 257 mm TL for age 4 individuals, and from 235 to 360 mm TL for age 5 individuals. The age 7 specimen measured 374 mm TL.

Total lengths of Atlantic croaker ranged from 6 to 37 cm ($\bar{x}$ = 16.4 cm). Lengths differed significantly among seasons (X^2 =9482, $p < 0.0001$), although mean length did not vary much seasonally (Figure 23). Seasonally, the percentage of age 0 fish increased from 2% in spring to 34% in summer and 64% in fall. The spring length-frequency distribution comprised mostly age 1 fish (67%). The inclusion of smaller specimens in summer collections resulted in a length-frequency distribution representing mostly age 0 and age 1 fish, with ages 2-5 also present in trawl samples. In fall the majority of Atlantic croaker were age 0.

Length also varied significantly among regions (X^2 =3913, $p < 0.0001$), and mean lengths ranged from 15.2 cm off Georgia to 16.6 cm in Raleigh Bay (Figure 24). In strata off North Carolina, age 1 made up the greatest percentage of the population, whereas in waters off South Carolina, Georgia, and Florida age 0 specimens were more numerous. Collections consisted of mostly age 0, age 1, and a few larger specimens.

Age composition was very similar among male and female Atlantic croaker. More than 61% (spring: 65%, summer: 45%, fall: 54%) of the individuals sampled were female. The percentage of females with developing or mature ovaries increased from spring to fall (spring: 35%, summer: 52%, fall: 58%), as did male Atlantic croaker (spring: 38%, summer: 65%, fall: 69%), and more male croaker were found to be reproductively mature later in the year as well (spring: 12%, summer: 83%, fall: 80%).

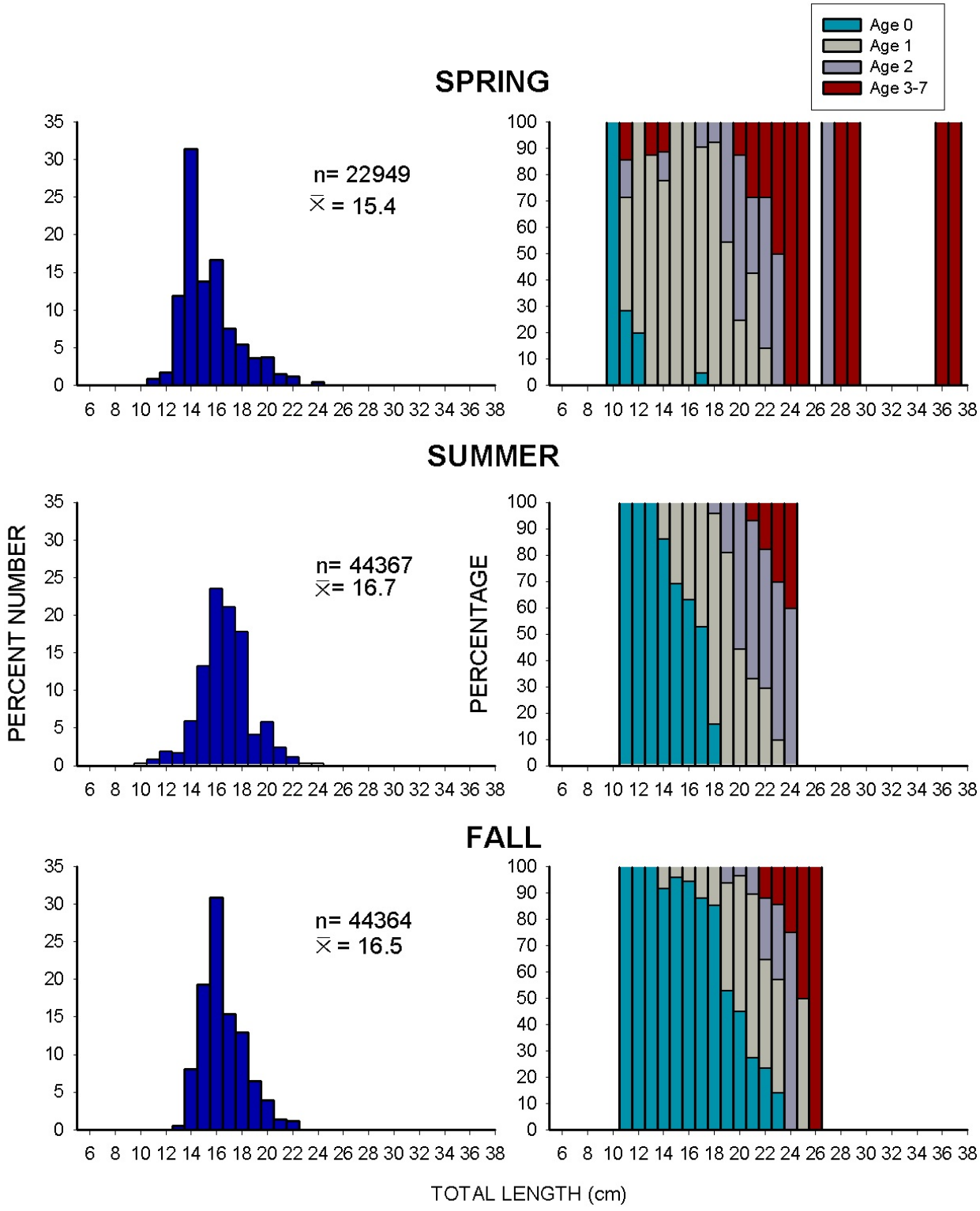

Figure 23. Seasonal length-frequencies and age composition of *Micropogonias undulatus* in 2005

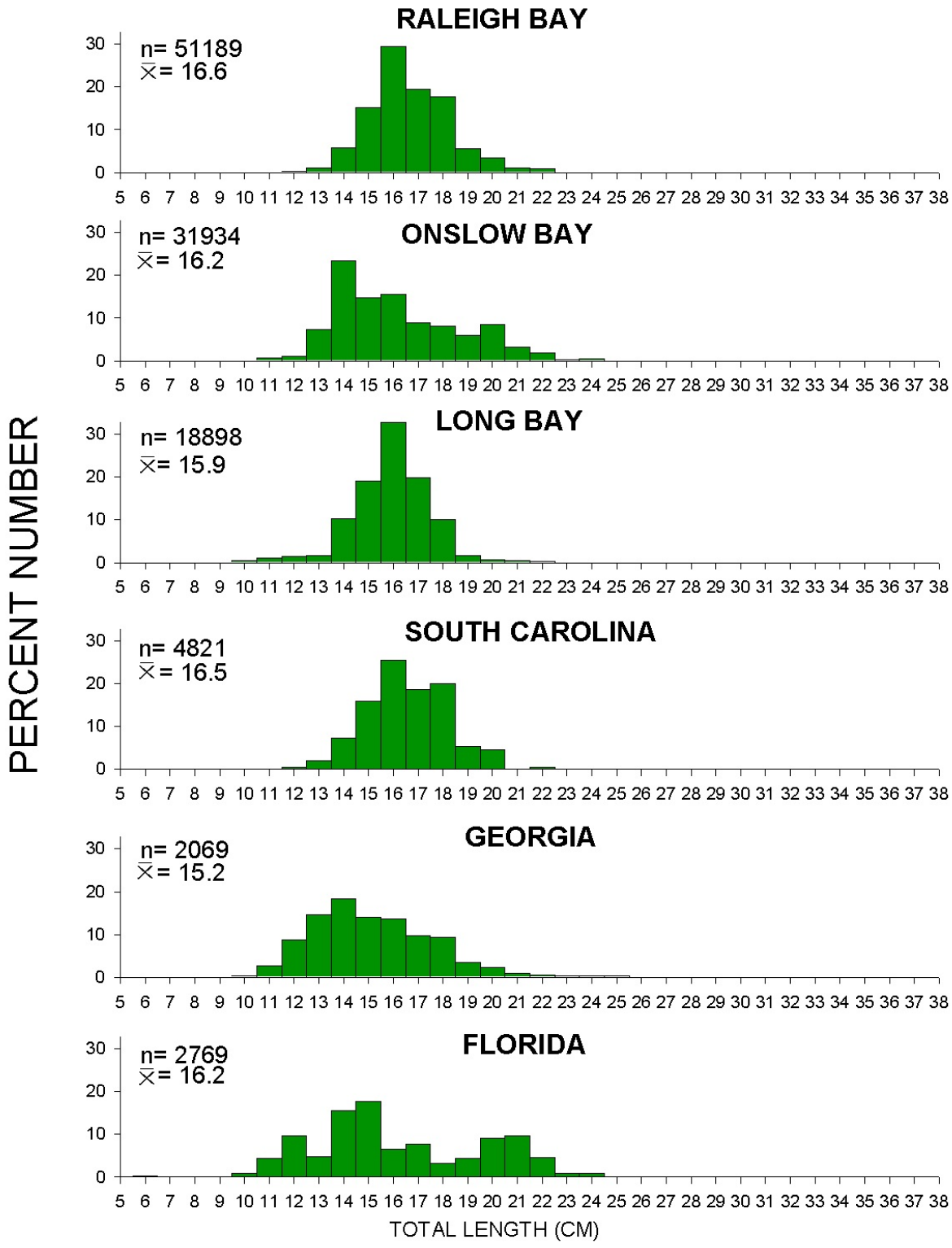

Figure 24. Regional length-frequencies of *Micropogonias undulatus* in 2005

Mycteroperca microlepis

The gag grouper, *Mycteroperca microlepis*, has been rare in SEAMAP-SA Shallow Water Trawl Survey collections (SEAMAP-SA/SCMRD, 2000). Only three individuals have been taken by the survey. No gag grouper were collected in 2005 (Figure 25).

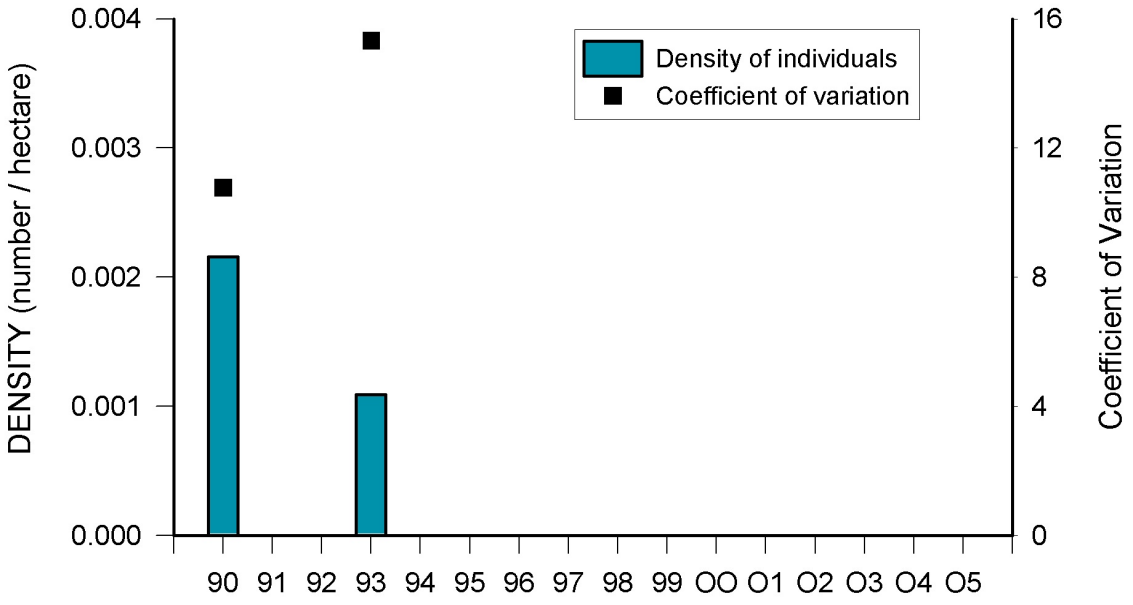

Figure 25. Annual densities of *Mycteroperca microlepis*

Paralichthys albigutta

The gulf flounder, *Paralichthys albigutta*, generally exhibits low abundance in SEAMAP-SA Shallow Water Trawl Survey collections. A total of 25 individuals (CV=6.5; 0.02 individuals/ha), weighing 7 kg (0.006 kg/ha), were taken in 2005. Density of abundance of gulf flounder decreased in 2005 (Figure 26). Gulf flounder were most abundant in fall in Onslow Bay (Table 15). Lengths ranged from 14 to 51 cm ($\bar{x}$ = 26.0).

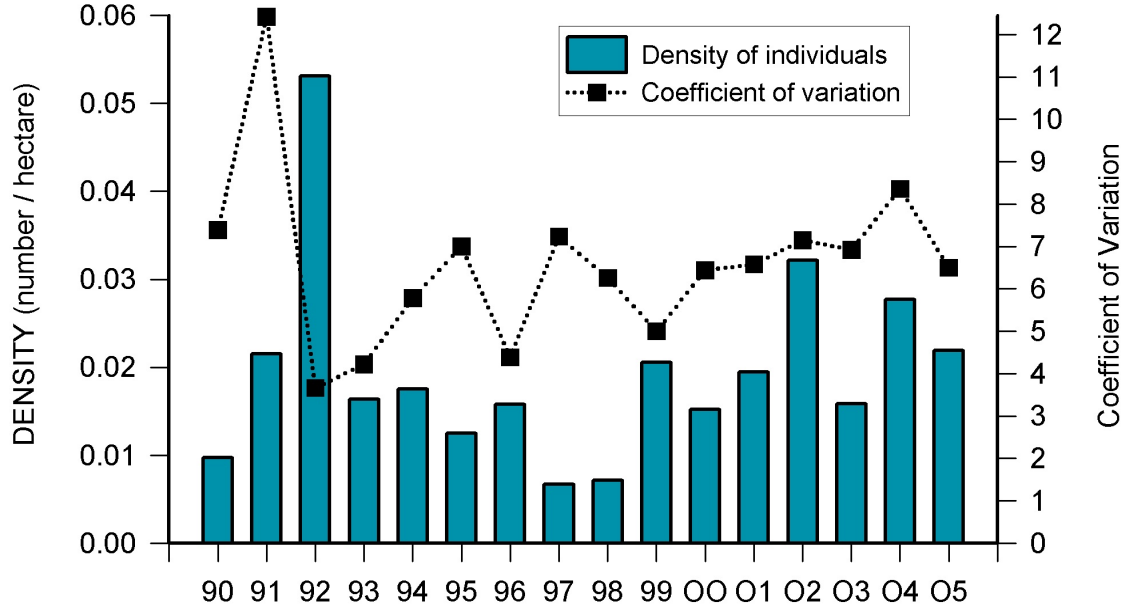

Figure 26. Annual densities of *Paralichthys albigutta*

Table 15. Estimates of density (number of individuals/hectare) in 2005.

Paralichthys albigutta

	Spring	Summer	Fall	Region
Raleigh Bay	0.03	0	0	0.01
Onslow Bay	0.01	0.09	0.1	0.07
Long Bay	0	0	0.06	0.02
South Carolina	0	0	0	0
Georgia	0	0.05	0	0.02
Florida	0	0.03	0	0.01
Season	0.005	0.03	0.03	0.02

Paralichthys dentatus

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 762 summer flounder (CV=3.2; 0.7 individuals/ha), weighing 121 kg (0.1 kg/ha). The density of abundance recorded in 2005 was the second highest in the history of the survey (Figure 27). Density was greatest in summer (Table 16). Summer flounder were most abundant in the Raleigh Bay. Total lengths of *Paralichthys dentatus* ranged from 11 to 48 cm ($\bar{x}$ = 22.6). Seasonal mean length was lowest in summer when the majority of smaller specimens were taken. Greatest regional mean length occurred in Onslow Bay.

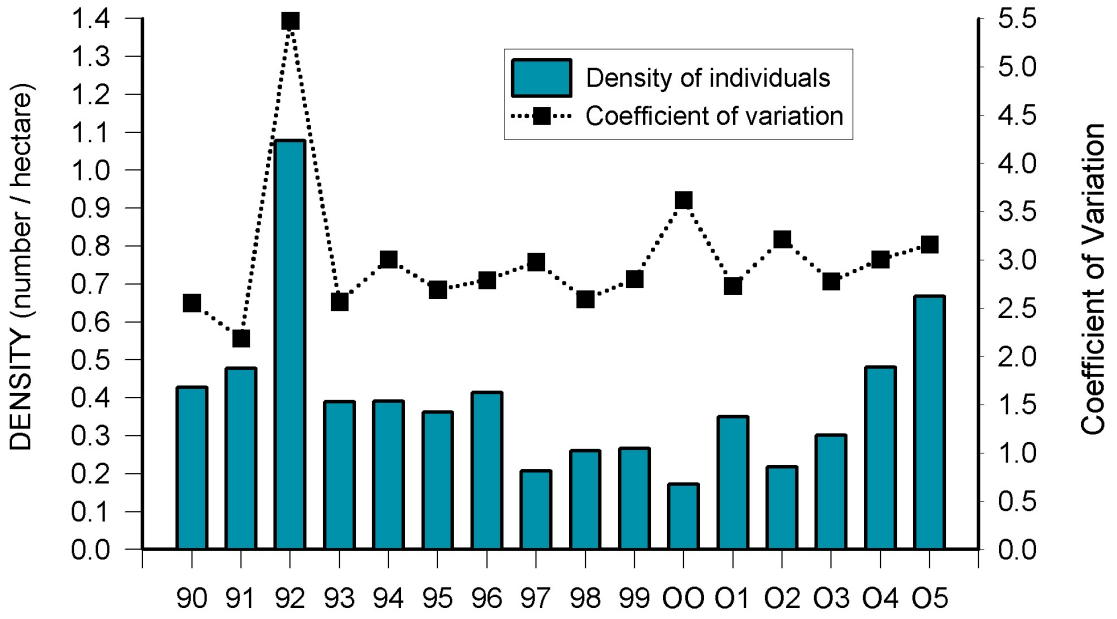

Figure 27. Annual densities of *Paralichthys dentatus*

Table 16. Estimates of density (number of individuals/hectare) in 2005.

Paralichthys dentatus

	Spring	Summer	Fall	Region
Raleigh Bay	0.2	3.4	0.4	1.4
Onslow Bay	0.2	1.8	1.4	1.1
Long Bay	0.4	1.4	0.7	0.8
South Carolina	0.5	1.0	0.4	0.6
Georgia	0.04	0.2	1.0	0.4
Florida	0.3	0.2	0.06	0.2
Season	0.2	1.1	0.7	0.7

Paralichthys lethostigma

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 116 southern flounder (CV=3.8; 0.1 individuals/ha), weighing 52 kg (0.05 kg/ha) in 2005. In 2005, density of individuals decreased f rom the peak in abundance observed in 2004 (Figure 28). Seasonal densities did not vary a great deal (Table 17). Southern flounder were most abundant in the Raleigh Bay and Florida. Total lengths of *Paralichthys lethostigma* ranged from 17 to 47 cm ($\bar{x}$ = 33.5).

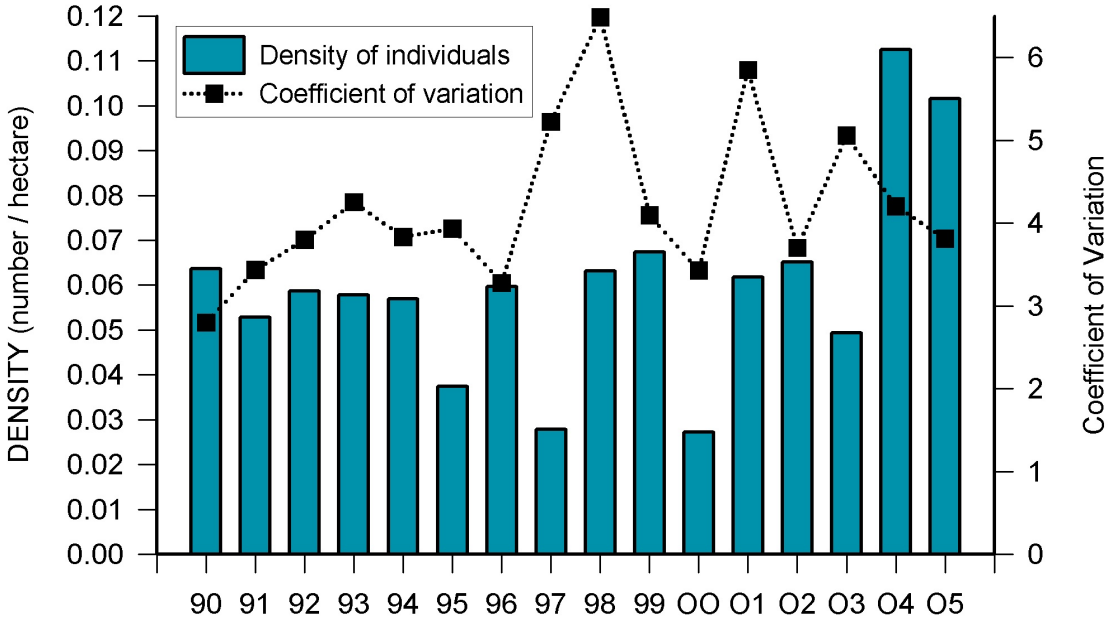

Figure 28. Annual densities of *Paralichthys lethostigma*

Table 17. Estimates of density (number of individuals/hectare) in 2005.

Paralichthys lethostigma

	Spring	Summer	Fall	Region
Raleigh Bay	0.3	0.2	0	0.2
Onslow Bay	0.1	0.05	0.09	0.08
Long Bay	0.2	0.02	0.2	0.1
South Carolina	0.04	0.03	0	0.02
Georgia	0.2	0.4	0.1	0.05
Florida	0.2	0.09	0.01	0.2
Season	0.1	0.1	0.08	0.1

Peprilus paru

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 15,967 *Peprilus paru* , previously referred to as *Peprilis alepidotus*, (CV=6.4; 14.0 individuals/ha), weighing 693 kg (0.6 kg/ha). Density of individuals in 2005 represents the greatest abundance recorded (Figure 29). Annual peaks in abundance reflect large catches of harvestfish in fall collections (SEAMAP-SA/SCMRD, 2000). In 2005, harvestfish were most abundant in Raleigh Bay and Florida waters in the fall (Table 18).

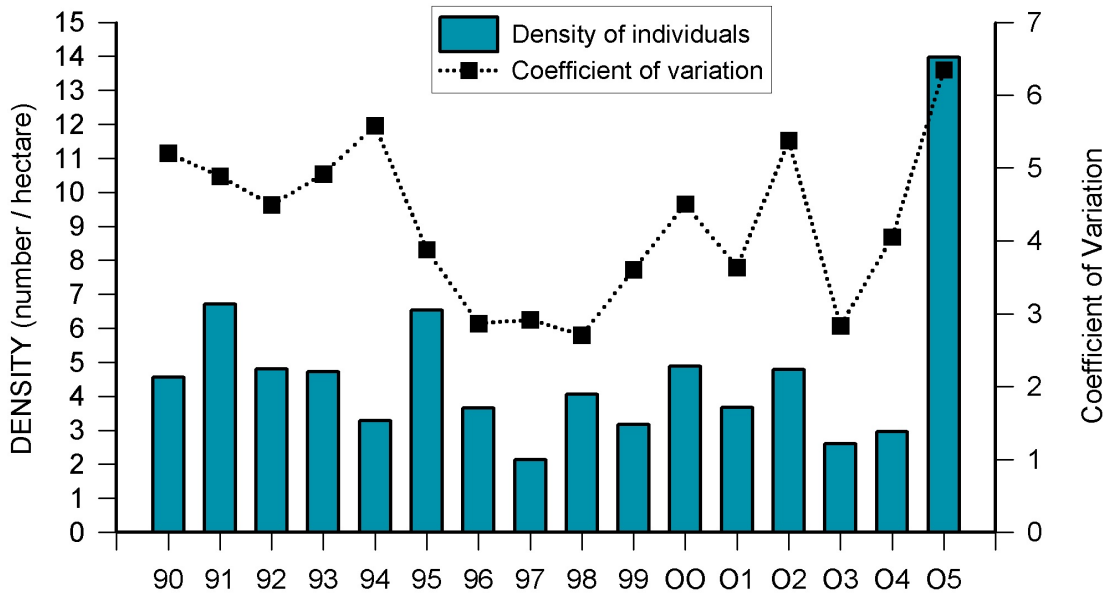

Figure 29. Annual densities of *Peprilus paru*

Table 18 . Estimates of density (number of individuals/hectare) in 2005.

Peprilus paru

	Spring	Summer	Fall	Region
Raleigh Bay	5.2	4.6	120.8	42.6
Onslow Bay	1.1	0.9	3.3	1.8
Long Bay	0.5	3.0	2.1	1.9
South Carolina	0.4	1.4	2.7	1.5
Georgia	1.5	2.6	11.5	5.1
Florida	10.1	8.2	110.3	44.0
Season	3.0	3.4	35.8	14.0

Fork lengths of *Peprilus paru* ranged from 3 to 19 cm ($\bar{x}$ = 9.2). Length was significantly different among seasons (X^2 = 1295, $p < 0.0001$). Mean length decreased from spring to fall, an indication of recruitment of YOY in summer and fall (Figure 30). Mean length also varied significantly among regions (X^2 = 4314, $p < 0.0001$). Mean lengths of harvestfish were greatest in collections from Long Bay (Figure 31).

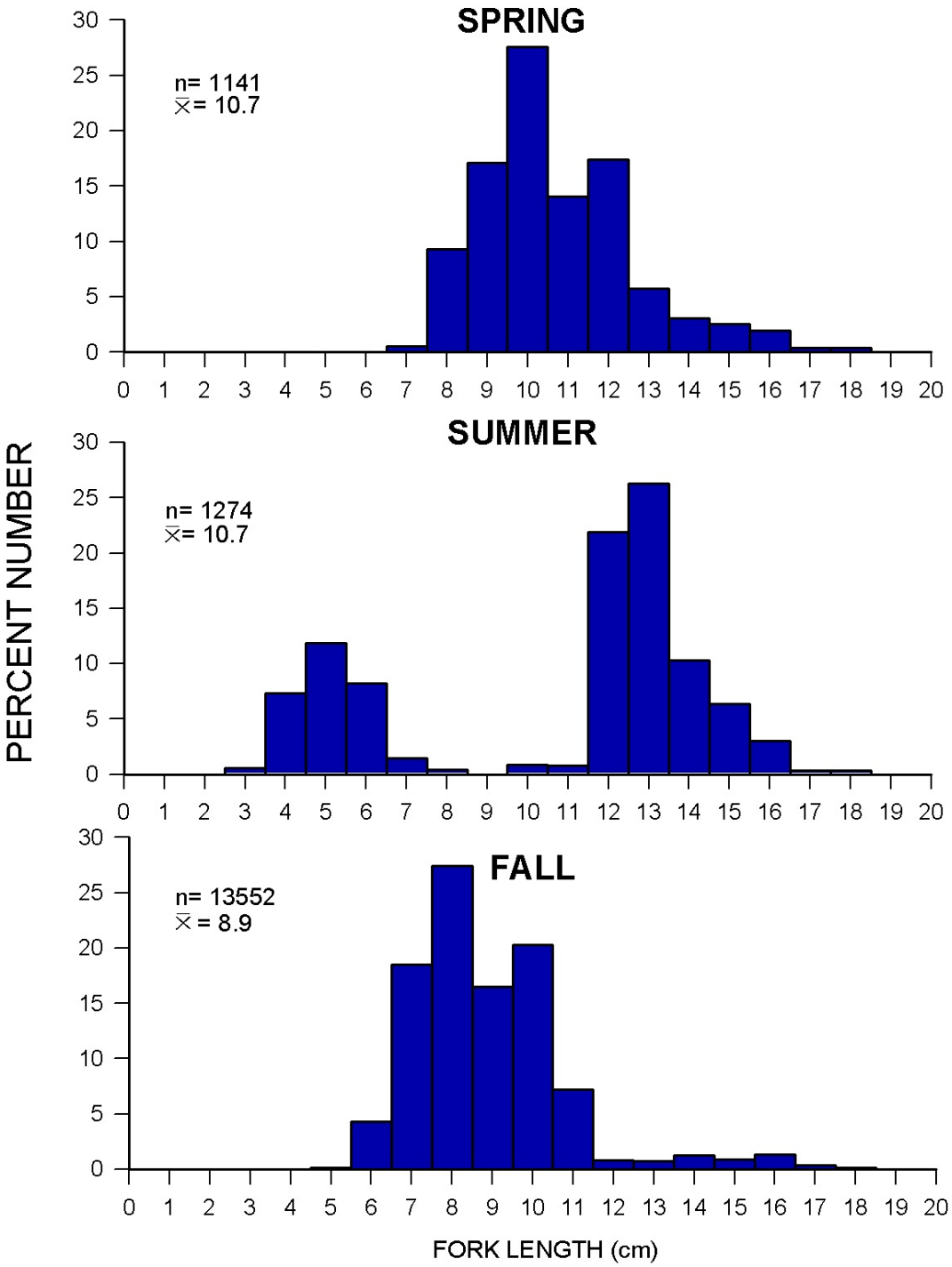

Figure 30. Seasonal length-frequencies of *Peprilus paru* in 2005

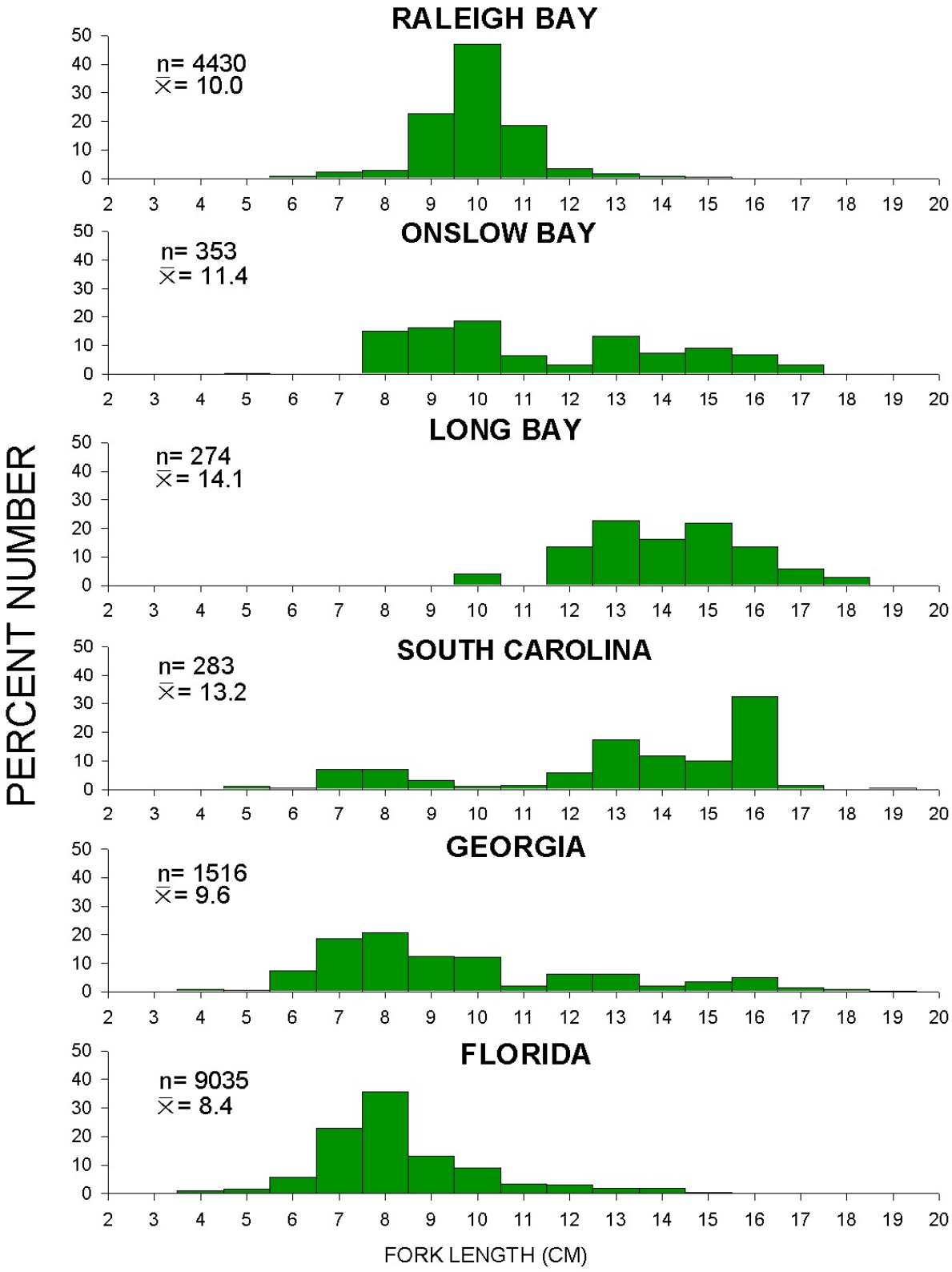

Figure 31. Regional length-frequencies of *Peprilus paru* in 2005

Peprilus triacanthus

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 25,142 *Peprilus triacanthus* (CV=9.9; 22.0 individuals/ha), weighing 932 kg (0.8 kg/ha), in 2005. Density of individuals decreased in 2005 (Figure 32). Seasonal density was greatest in fall (Table 19). Raleigh Bay exhibited the highest regional density. Butterfish are generally most abundant in the northern portion of the SAB, with density decreasing with decreasing latitude (SEAMAP-SA/SCMRD, 2000).

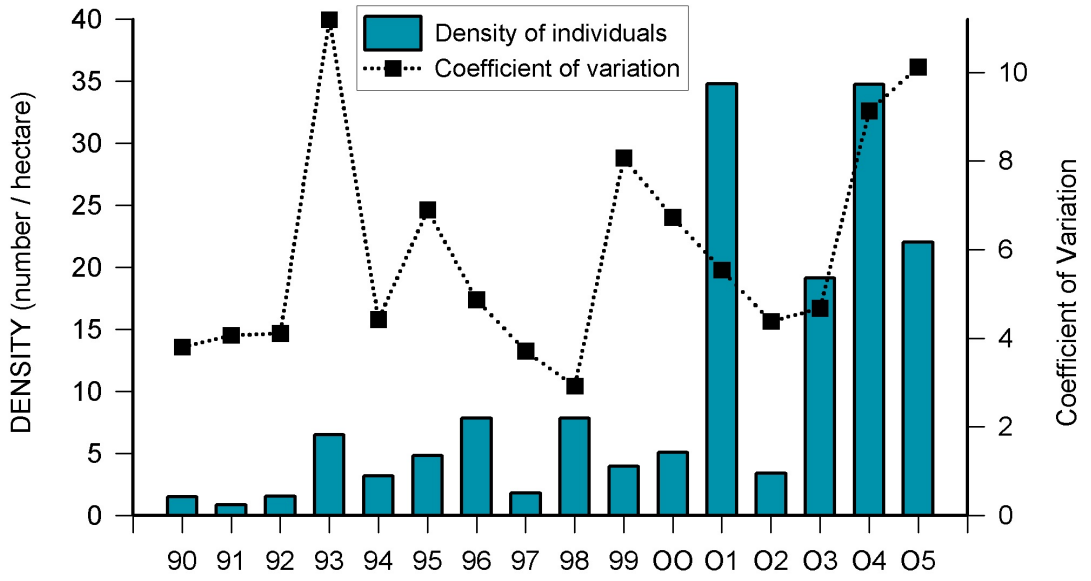

Figure 32. Annual densities of *Peprilus triacanthus*

Table 19 . Estimates of density (number of individuals/hectare) in 2005.

Peprilus triacanthus

	Spring	Summer	Fall	Region
Raleigh Bay	2.3	18.5	617.7	208.2
Onslow Bay	3.9	4.0	1.7	3.2
Long Bay	2.9	1.0	0.02	1.3
South Carolina	22.1	0.3	0.06	7.5
Georgia	3.8	0.6	0.2	1.5
Florida	0.3	1.3	0	0.5
Season	6.0	3.1	55.5	22.0

Fork lengths of *Peprilus triacanthus* ranged from 2 to 18 cm ($\bar{x}$ = 11.3). Length was significantly different among seasons ($X^2 = 5009$, $p < 0.0001$). Mean length increased from spring to fall (Figure 33). Mean length also varied significantly among regions ($X^2 = 4697$, $p < 0.0001$). Mean lengths of butterfish were greatest in collections from Raleigh and Onslow Bays (Figure 34).

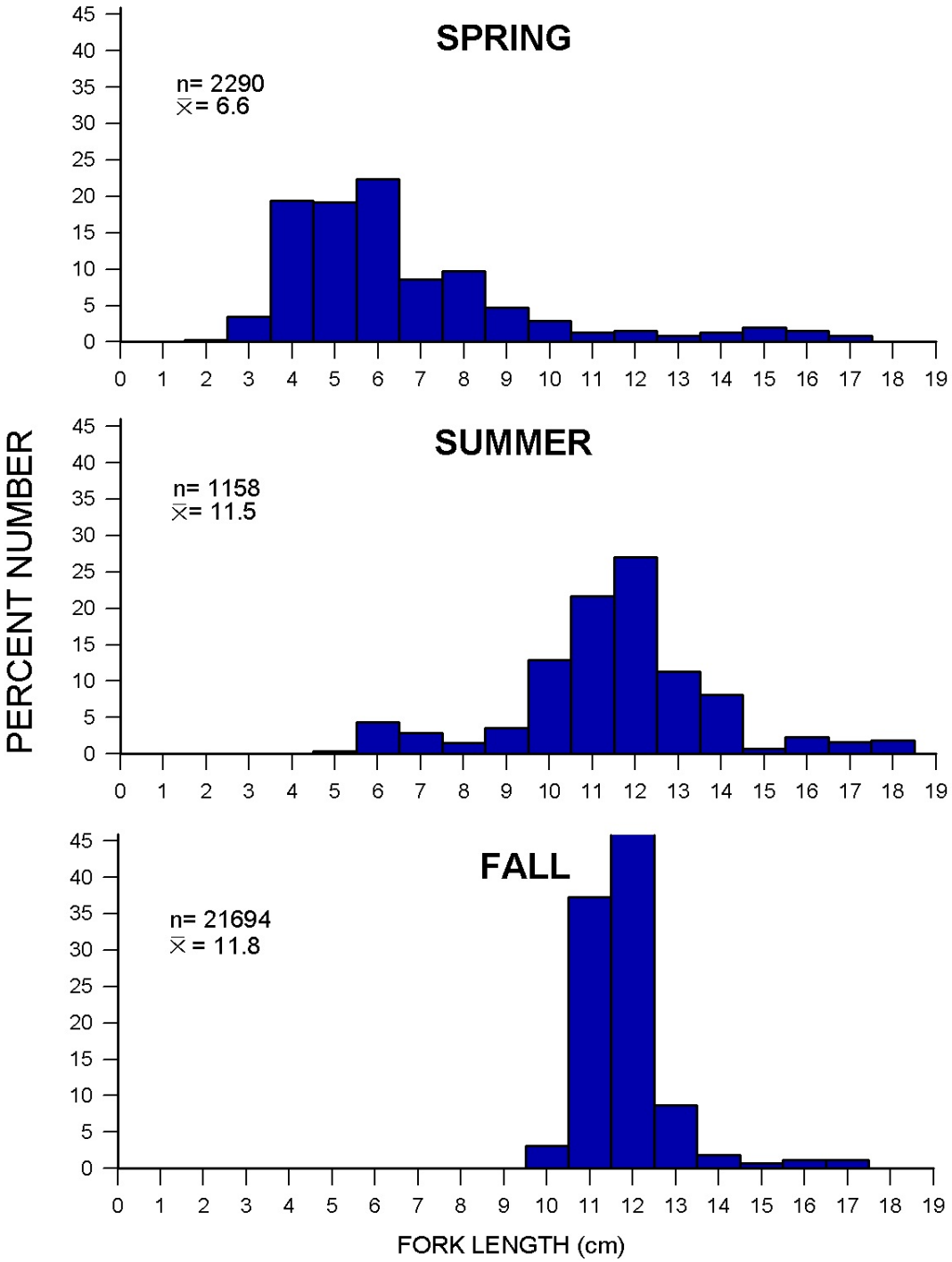

Figure 33. Seasonal length-frequencies of *Peprilus triacanthus* in 2005

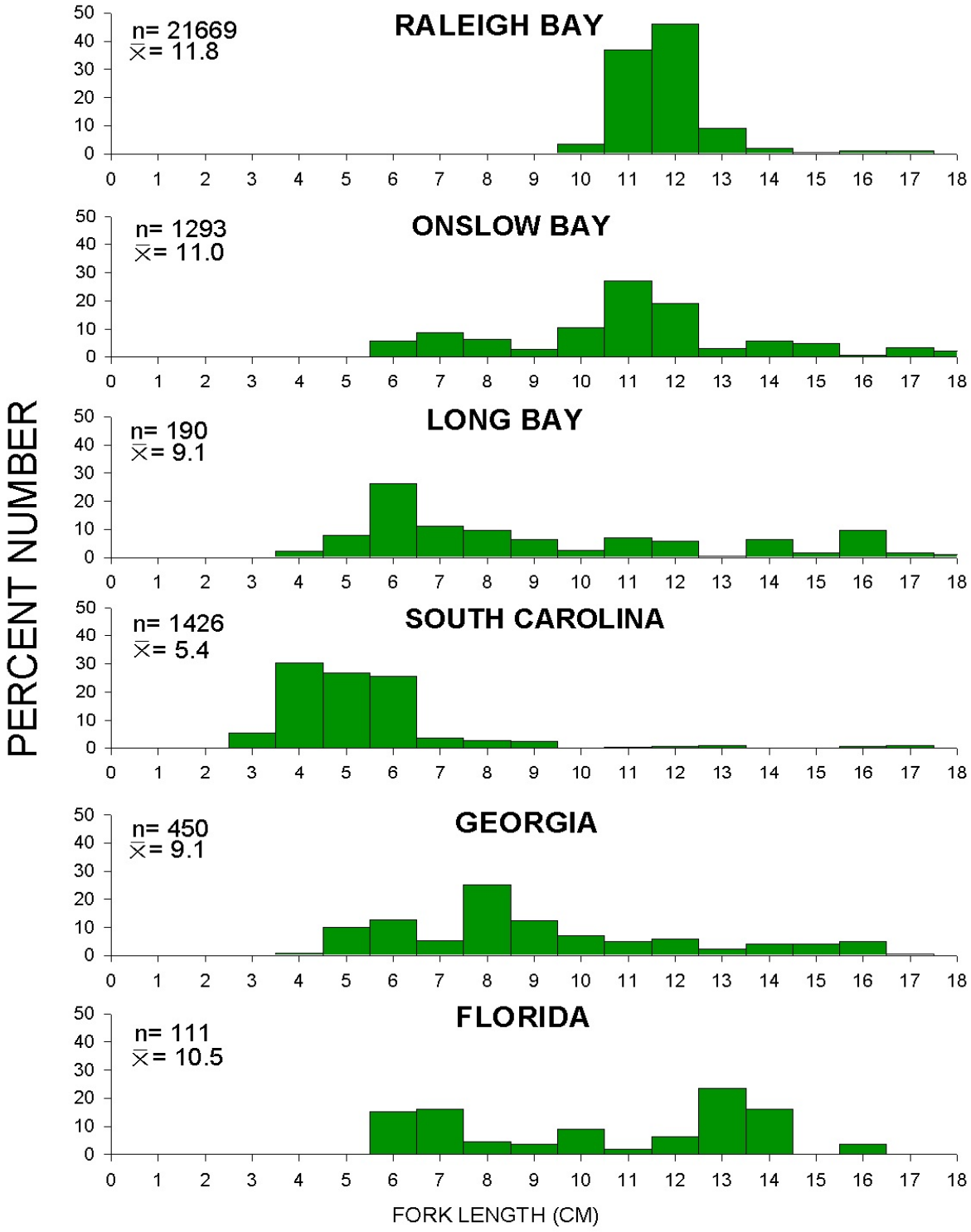

Figure 34. Regional length-frequencies of *Peprilus triacanthus* in 2005

Pogonias cromis

The black drum, *Pogonias cromis*, has been a relatively rare species in SEAMAP-SA Shallow Water Trawl Survey collections (SEAMAP-SA/SCMRD, 2000). In 2005 a total of 29 (CV=17.0; 0.03 individuals/ha) black drum were taken in SEAMAP trawls (Figure 35). All black drum were collected in waters off North Carolina during the fall cruise.

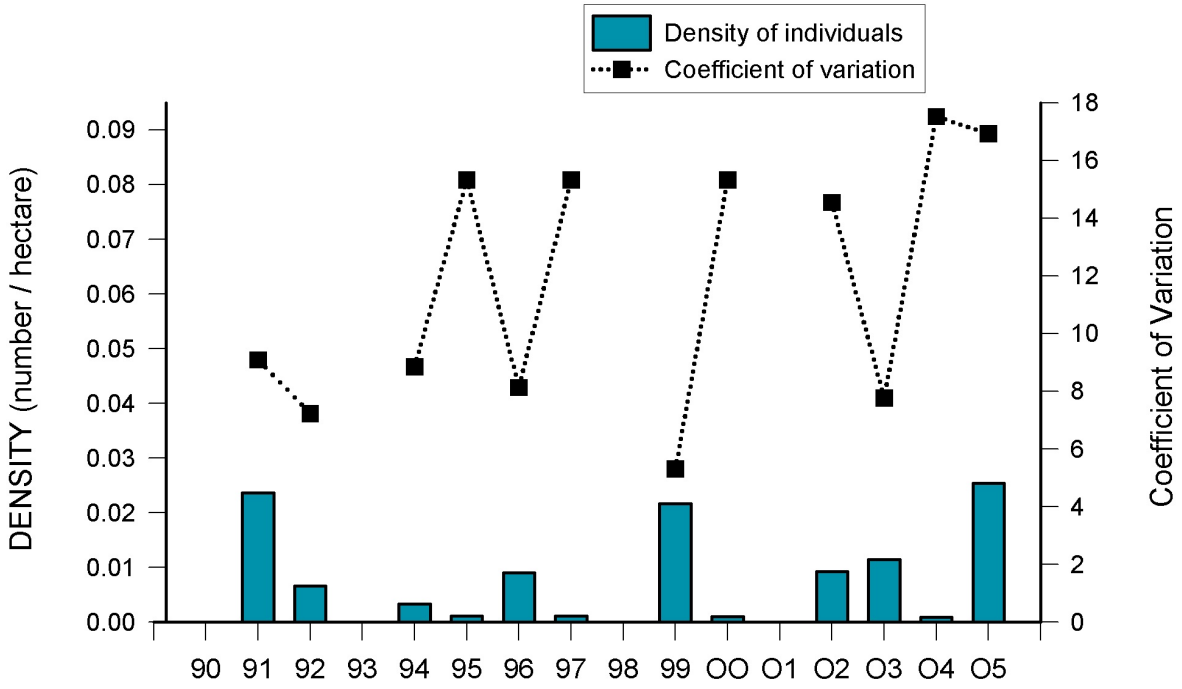

Figure 35. Annual densities of *Pogonias cromis*

Pomatomus saltatrix

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 4,463 bluefish (CV=4.6; 3.9 individuals/ha), weighing 340 kg (0.3 kg/ha). Density in 2005 decreased from the record abundance observed in 2004 (Figure 36). In 2005, density was greatest in fall (Table 20). Bluefish were most abundant in Raleigh and Onslow Bays in fall.

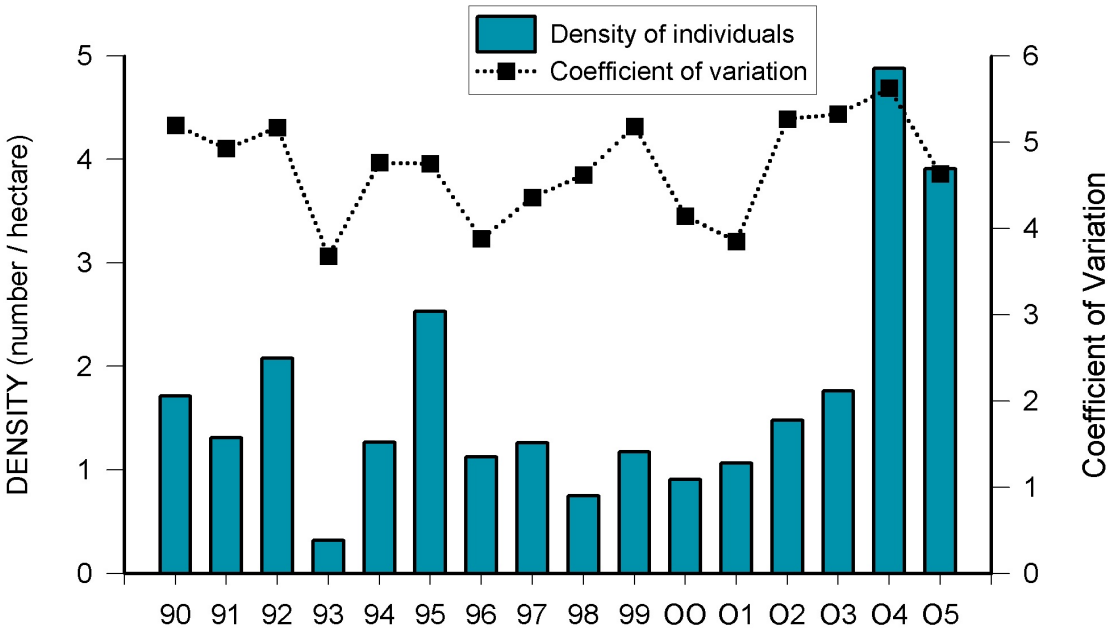

Figure 36. Annual densities of *Pomatomus saltatrix*

Table 20 . Estimates of density (number of individuals/hectare) in 2005.

Pomatomus saltatrix

	Spring	Summer	Fall	Region
Raleigh Bay	0.2	0.8	54.6	18.1
Onslow Bay	10.6	0.6	22.4	11.3
Long Bay	1.4	0	0.1	0.5
South Carolina	0.8	0.06	0.5	0.5
Georgia	0.6	0.06	0.02	0.2
Florida	0.09	0.3	1.2	0.6
Season	2.4	0.3	9.1	3.9

Fork lengths of *Pomatomus saltatrix* ranged from 10 to 34 cm ($\bar{x}$ = 17.4). Length was significantly different among seasons (X^2 =139, $p < 0.0001$). Mean length decreased from summer to fall, an indication of the ingress of YOY (Figure 37). Length also varied significantly among regions (X^2 = 319, $p < 0.0001$), with larger fish occurring in the southern portion of the SAB, especially in Florida waters (Figure 38).

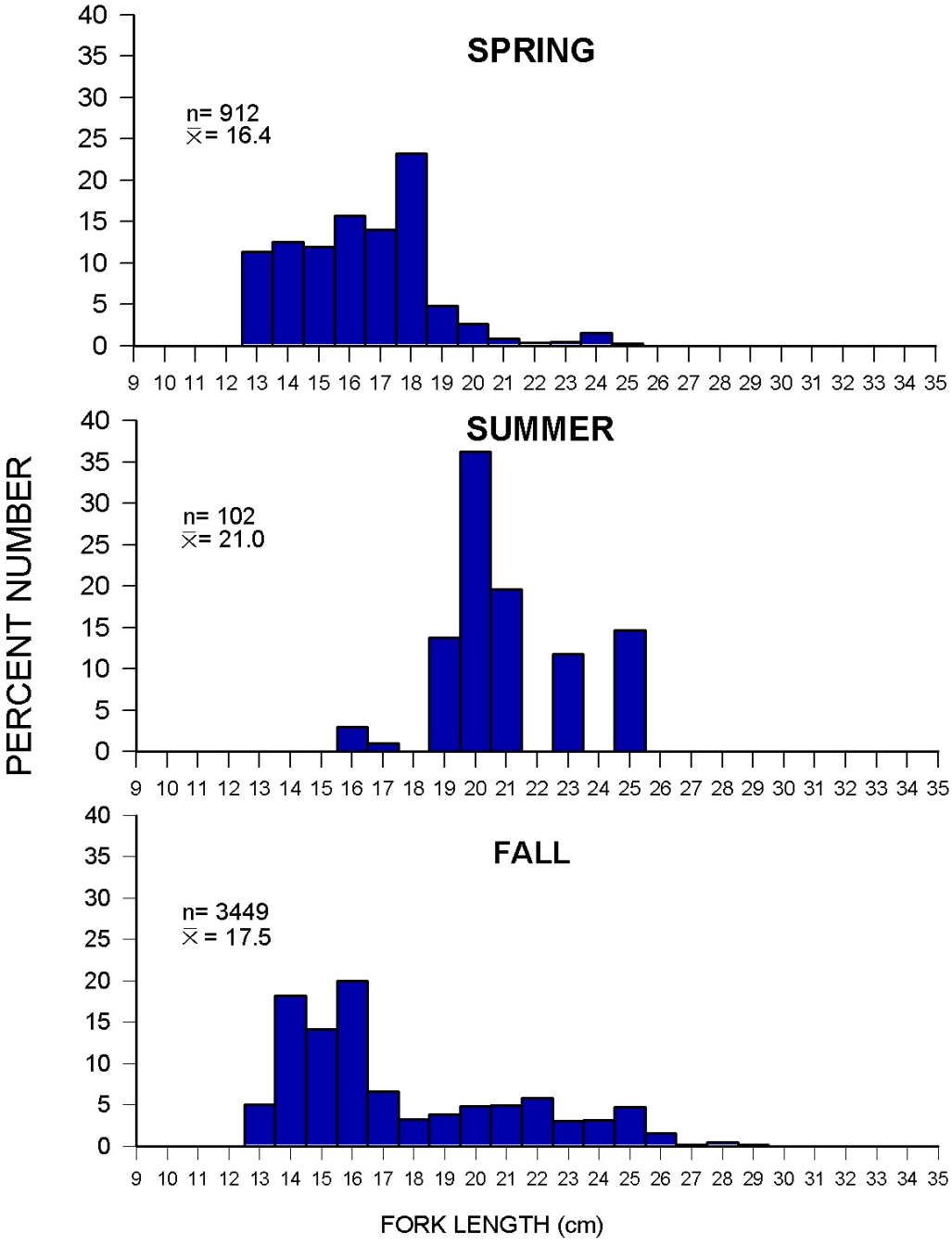

Figure 37. Seasonal length-frequencies of *Pomatomus saltatrix* in 2005

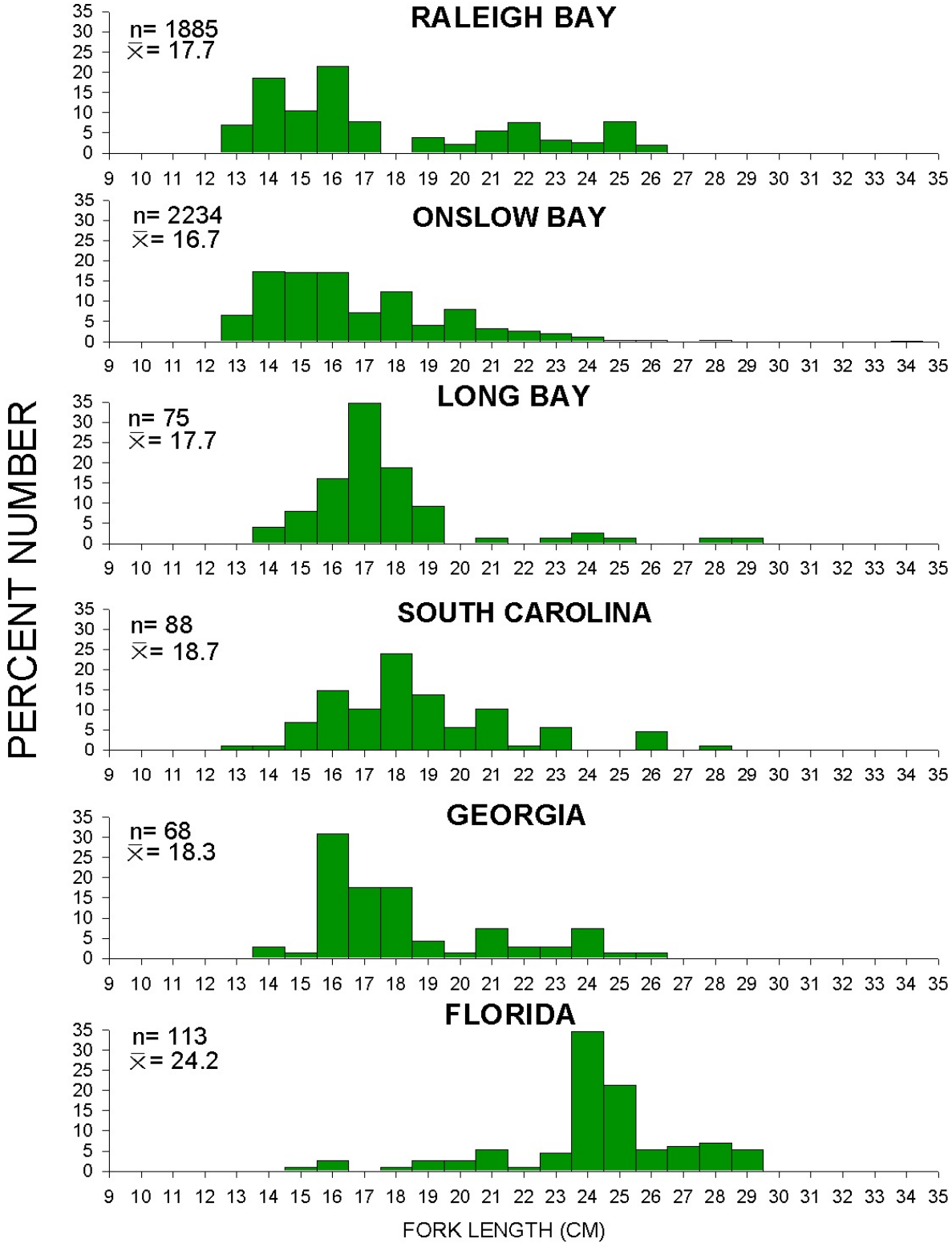

Figure 38. Regional length-frequencies of *Pomatomus saltatrix* in 2005

Sciaenops ocellatus

The red drum has been a very rare species in SEAMAP-SA trawls (SEAMAP-SA/SCMRD, 2000). In the history of the trawl survey only six specimens have been collected (ranging from northern Georgia to southern Long Bay). In 2005, no red drum was taken in SEAMAP collections (Figure 39).

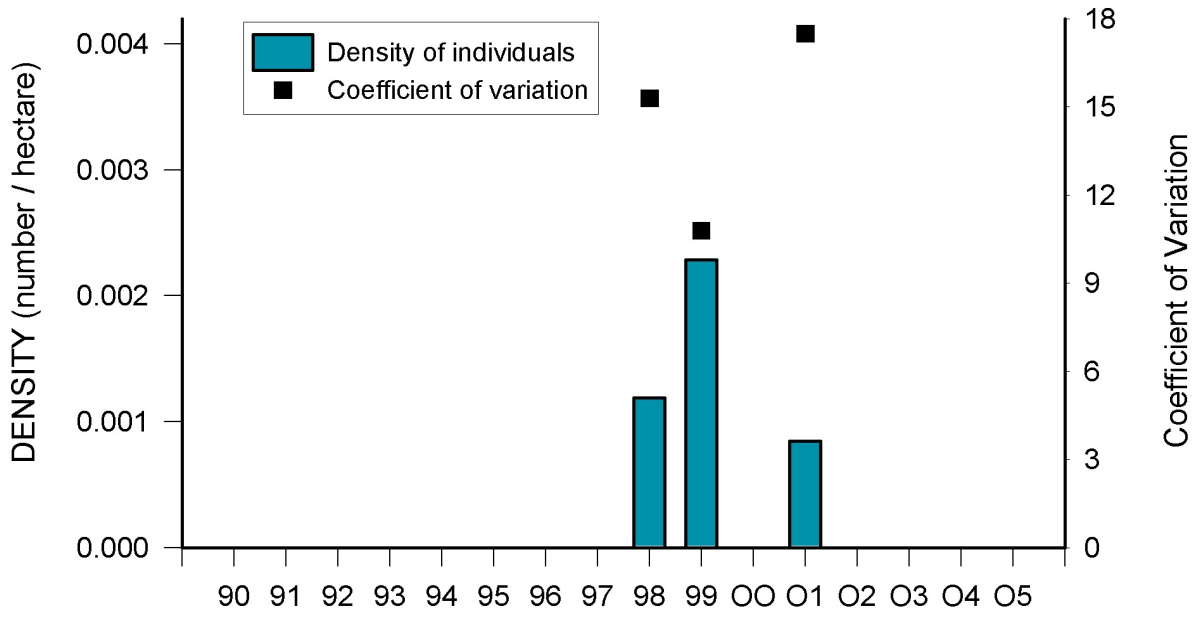

Figure 39. Annual densities of *Sciaenops ocellatus*

Scomberomorus cavalla

The 1,110 (CV=5.0; 1.0 individuals/ha) king mackerel collected from SEAMAP-SA Shallow Water Trawl Survey strata in 2005 weighed 42 kg (0.04 kg/ha). The density of king mackerel decreased in 2005 (Figure 40). Abundance was greatest in fall trawls (Table 21). Greatest density of king mackerel occurred in Florida waters. No *S. cavalla* were taken in Raleigh Bay. King mackerel tend to be most abundant in fall in the southern SAB (SEAMAP-SA/SCMRD, 2000).

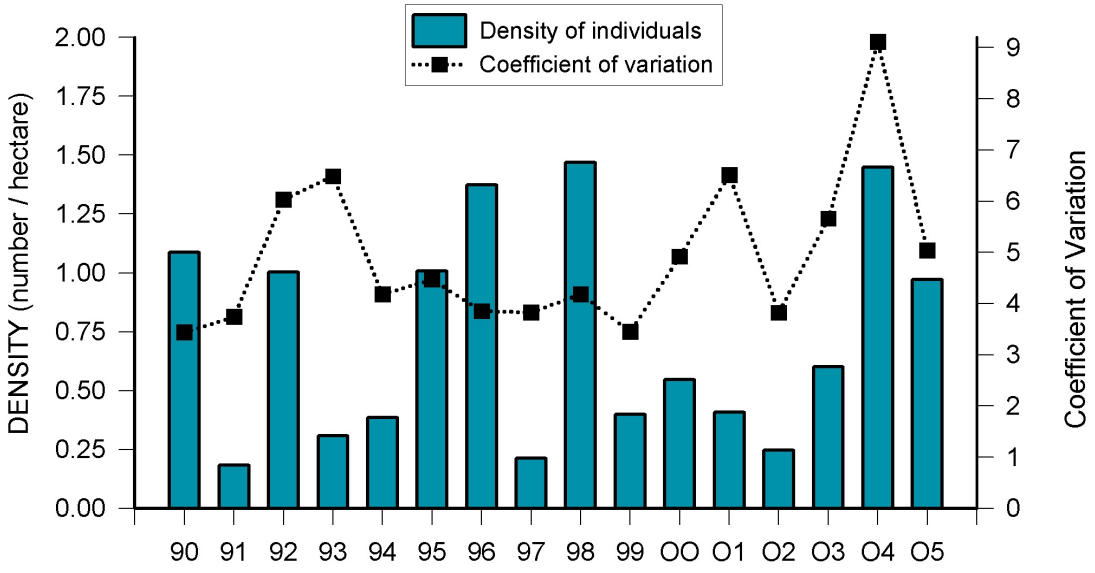

Figure 40. Annual densities of *Scomberomorus cavalla*

Table 21 . Estimates of density (number of individuals/hectare) in 2005.

Scomberomorus cavalla

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0	0
Onslow Bay	0	0.06	0.5	0.2
Long Bay	0	0	0.6	0.2
South Carolina	0	0	1.3	0.4
Georgia	0	0.2	1.8	0.6
Florida	0.06	1.1	9.9	3.8
Season	0.01	0.2	2.7	1.0

Fork lengths of *Scomberomorus cavalla* ranged from 6 to 41 cm ($\bar{x}$ = 15.0) and represented two year-classes. Annual cohorts of king mackerel are spawned in spring and summer (Finucane et al., 1986) and reach mean lengths greater than 40 cm by the end of their first year (Collins et al., 1989). Lengths were significantly different among seasons ($X^2 = 42$, $p < 0.0001$) and mean length deceased from spring to fall, as the result of recruitment of YOY (Figure 41). The fish less than 15 cm and greater than 34 cm in summer suggest that recruitment was beginning and that a few specimens in older year classes were still present. Lengths varied significantly among regions ($X^2 = 155$, $p < 0.0001$), with greatest mean length in Onslow and Long Bays (Figure 42).

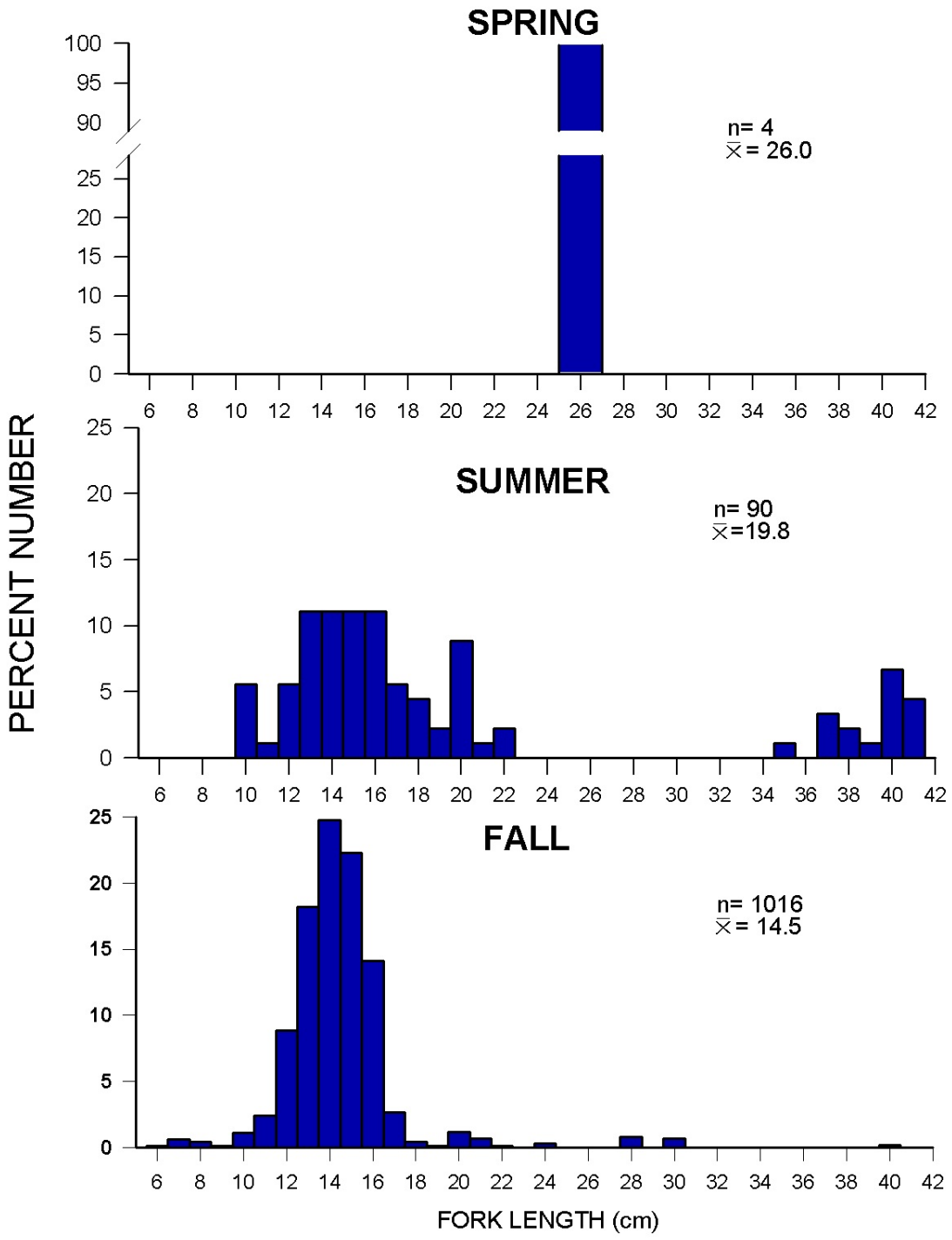

Figure 41. Seasonal length-frequencies of *Scomberomorus cavalla* in 2005

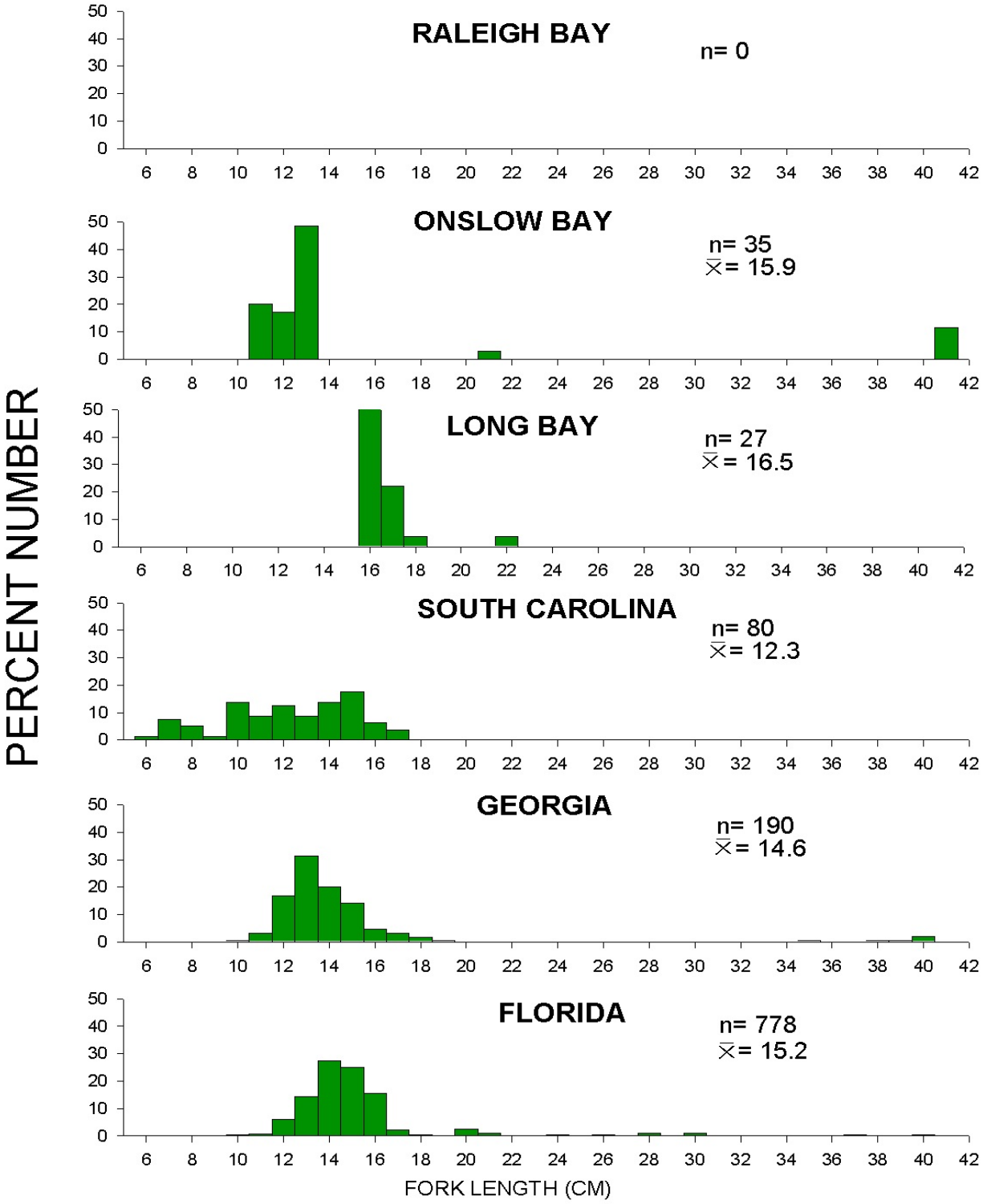

Figure 42. Regional length-frequencies of *Scomberomorus cavalla* in 2005

Scomberomorus maculatus

Sampling in 2005 produced 1,341 Spanish mackerel that weighed a total of 130 kg (CV=3.3; 1.2 individuals/ha; 0.1 kg/ha). The density of individuals of Spanish mackerel in 2005 increased slightly from the level observed in 2004 (Figure 43). Spanish mackerel were most abundant in fall (Table 22). Highest density of Spanish mackerel is generally found in the southern SAB (SEAMAP-SA/SCMRD, 2000), as was the case in 2005.

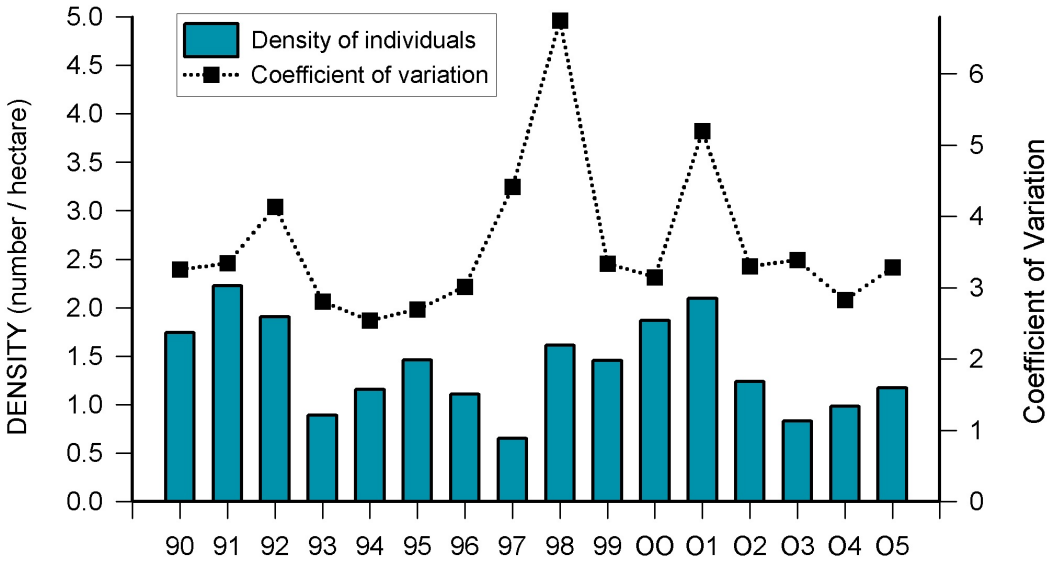

Figure 43. Annual densities of *Scomberomorus maculatus*

Table 22. Estimates of density (number of individuals/hectare) in 2005.

Scomberomorus maculatus

	Spring	Summer	Fall	Region
Raleigh Bay	0	0.2	0	0.06
Onslow Bay	0.01	0.03	0.9	0.3
Long Bay	0	0.8	0.6	0.5
South Carolina	1.7	0.2	0.6	0.8
Georgia	0.3	1.1	2.0	1.1
Florida	2.2	0.6	7.3	3.4
Season	0.8	0.6	2.2	1.2

Fork lengths of Spanish mackerel ranged from 4 to 48 cm ($\bar{x}$ = 19.5 cm). Lengths differed significantly among seasons ($X^2 = 34$, $p < 0.0001$). Mean length increased from spring to summer, an indication of juvenile growth, whereas mean length decreased in fall when fewer older individuals were taken (Figure 44). By the end of their first year, Spanish mackerel reach lengths greater than 30 cm (Powell, 1975). Specimens collected in spring and summer were generally those ending their first year. Fall collections contained primarily newly recruited YOY with a few representatives of the previous year-class still present. Length also varied significantly among regions ($X^2 = 265$, $p < 0.0001$), and mean lengths ranged from a low of 9.2 cm in South Carolina waters to 31.0 cm in Raleigh Bay (Figure 45).

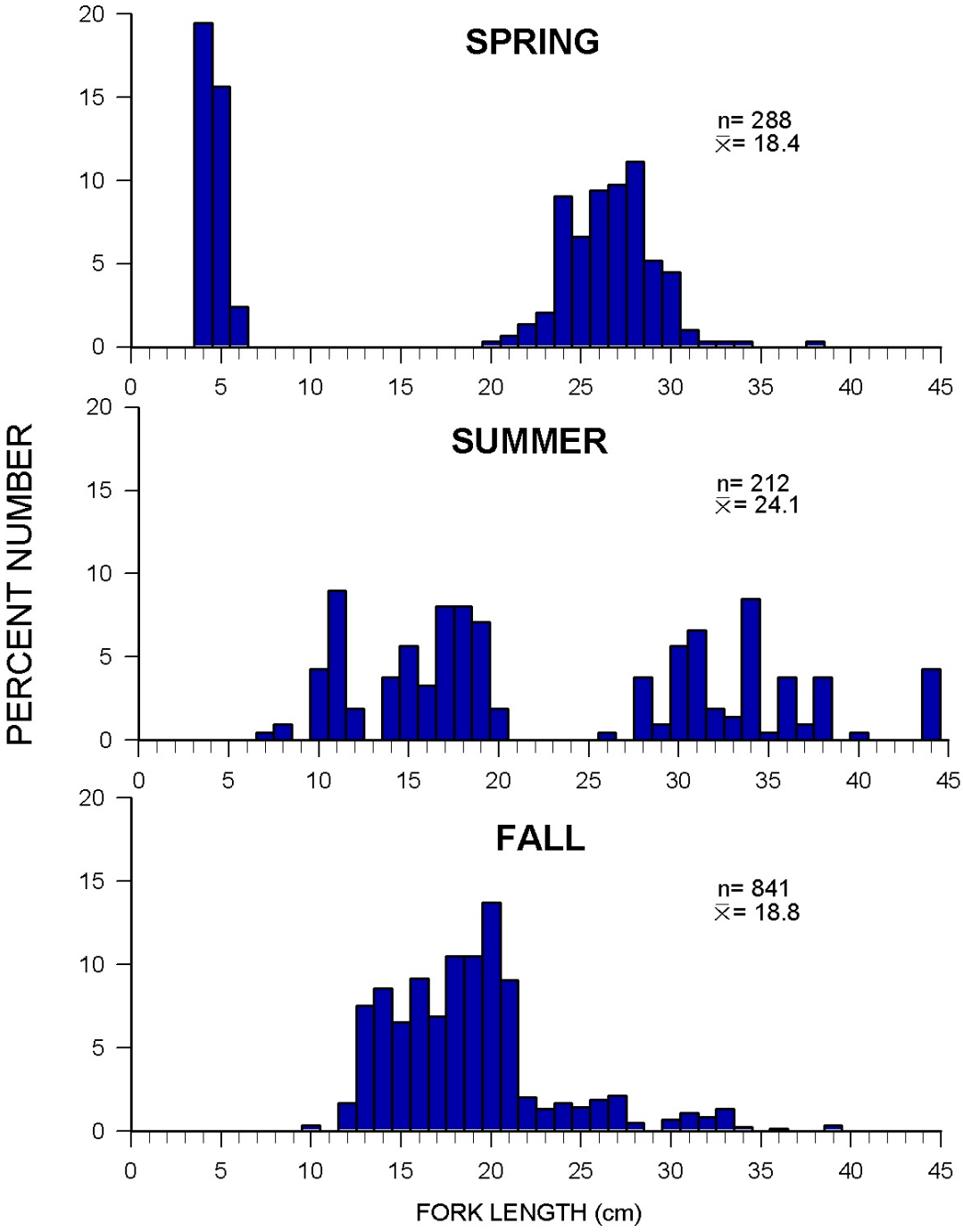

Figure 44. Seasonal length-frequencies of *Scomberomorus maculatus* in 2005

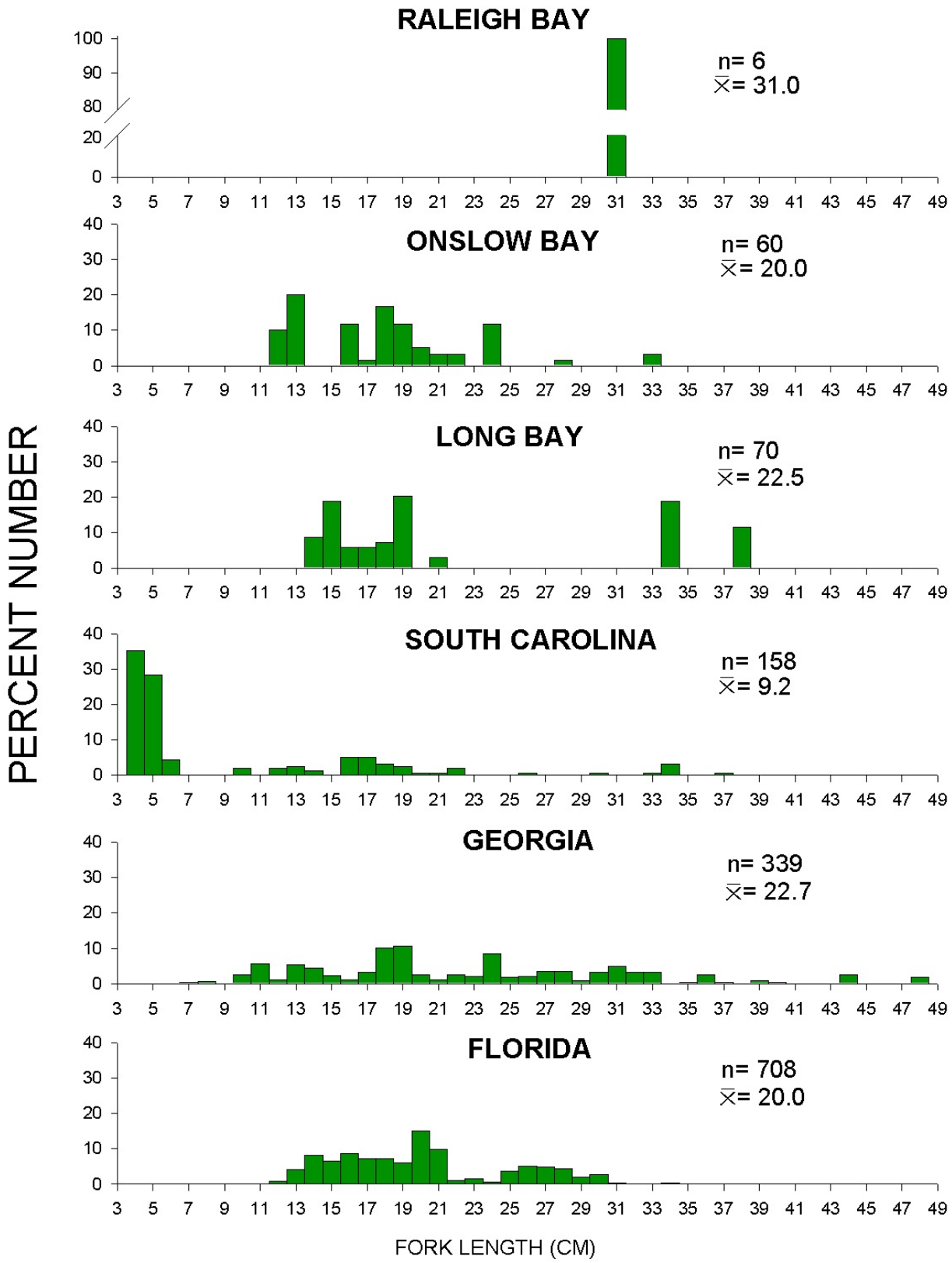

Figure 45. Regional length-frequencies of *Scomberomorus maculatus* in 2005

Callinectes sapidus

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 199 (CV=4.8; 0.2 individuals/ha) blue crabs, weighing 25 kg (0.02 kg/ha). Overall density of *C. sapidus* peaked in 1990, followed by several years of low abundance and secondary peaks in 1999 and 2004 (Figure 46). In 2005, the highest seasonal density was observed during summer cruises and the greatest regional density of individuals occurred in Raleigh and Onslow Bays (Table 23). Carapace widths of *C. sapidus* ranged from 3 to 18 cm ($\bar{x}$ = 12.9).

Males constituted only 11% of the blue crab catch. The tendency of males to inhabit lower salinity estuarine waters explains their lesser importance in offshore catches (Low et al., 1987). Mature female blue crab dominated catches, with approximately 46% of females being ovigerous. Non-ovigerous females outnumbered ovigerous females in all seasons.

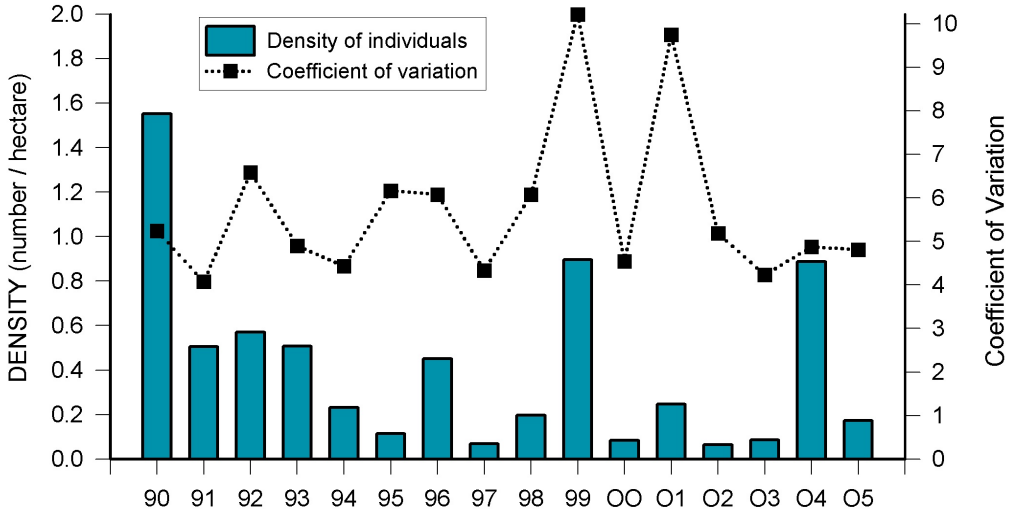

Figure 46. Annual densities of *Callinectes sapidus*

Table 23 . Estimates of density (number of individuals/hectare) in 2005.

Callinectes sapidus

	Spring	Summer	Fall	Region
Raleigh Bay	0.2	1.2	0	0.5
Onslow Bay	0	1.3	0.05	0.4
Long Bay	0	0	0.1	0.03
South Carolina	0	0.03	0.08	0.04
Georgia	0	0.3	0	0.09
Florida	0.09	0.2	0	0.09
Season	0.03	0.5	0.03	0.2

Farfantepenaeus aztecus

The brown shrimp, formerly *Penaeus aztecus* (Perez-Farfante and Kensley, 1997), was the second most abundant decapod crustacean species taken in 2005 by the SEAMAP-SA Trawl Survey, with 19,560 individuals (CV=4.4; 17.1 individuals/ha), weighing 276 kg (0.2 kg/ha). The estimate of density of brown shrimp in 2005 represents the highest abundance in the history of the survey (Figure 47). Summer collections produced the highest seasonal density (Table 24). The overall seasonal pattern of abundance of brown shrimp includes small spring catches, followed by larger summer catches, and moderately-sized fall catches (SEAMAP-SA/SCMRD, 2000). The greatest regional density of brown shrimp occurred in Raleigh and Onslow Bays.

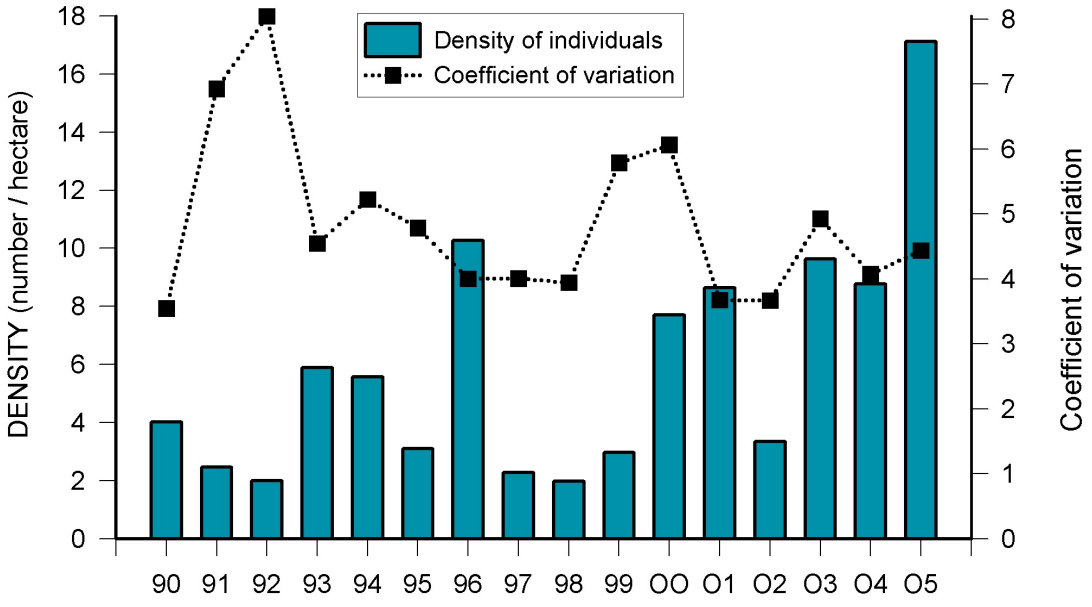

Figure 47. Annual densities of *Farfantepenaeus aztecus*

Table 24 . Estimates of density (number of individuals/hectare) in 2005.

Farfantepenaeus aztecus

	Spring	Summer	Fall	Region
Raleigh Bay	0	49.8	44.5	32.3
Onslow Bay	0	99.6	42.6	46.5
Long Bay	0	13.5	7.1	6.8
South Carolina	0	8.5	4.2	4.2
Georgia	0	20.8	3.5	8.2
Florida	0.2	40.1	0.6	13.2
Season	0.04	37.4	14.0	17.1

Total lengths of *F. aztecus* ranged from 7 to 17 cm with a mean length of 11.5 cm. Total lengths differed significantly among seasons (X^2 =2489, $p < 0.0001$). Mean length increased from spring to fall (Figure 48). Lengths were also significantly different among regions (X^2 =1177, $p < 0.0001$). Mean lengths ranged from 11.2 cm in Onslow Bay to 12.0 cm in waters off South Carolina and Georgia (Figure 49).

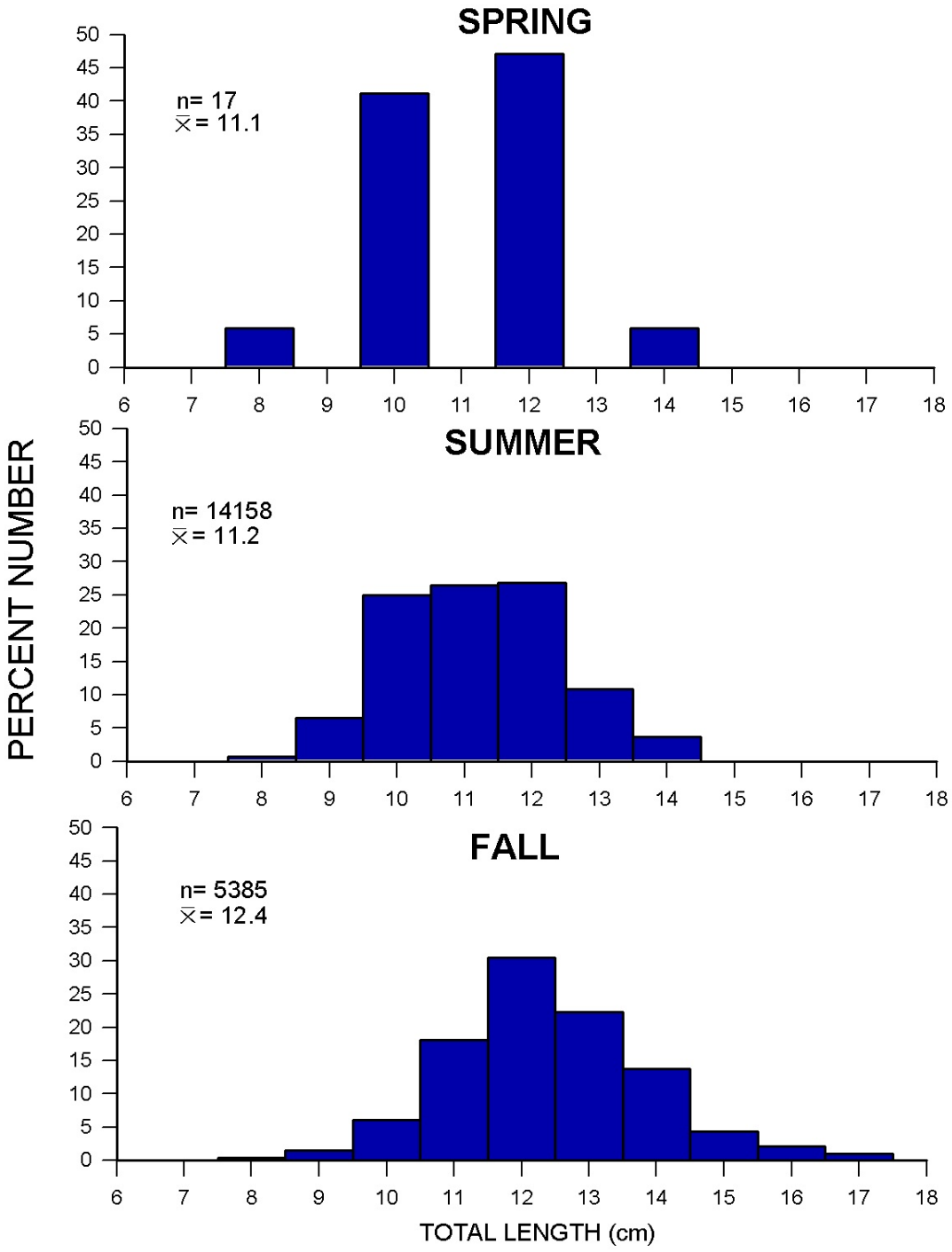

Figure 48. Seasonal length-frequencies of *Farfantepenaeus aztecus* in 2005

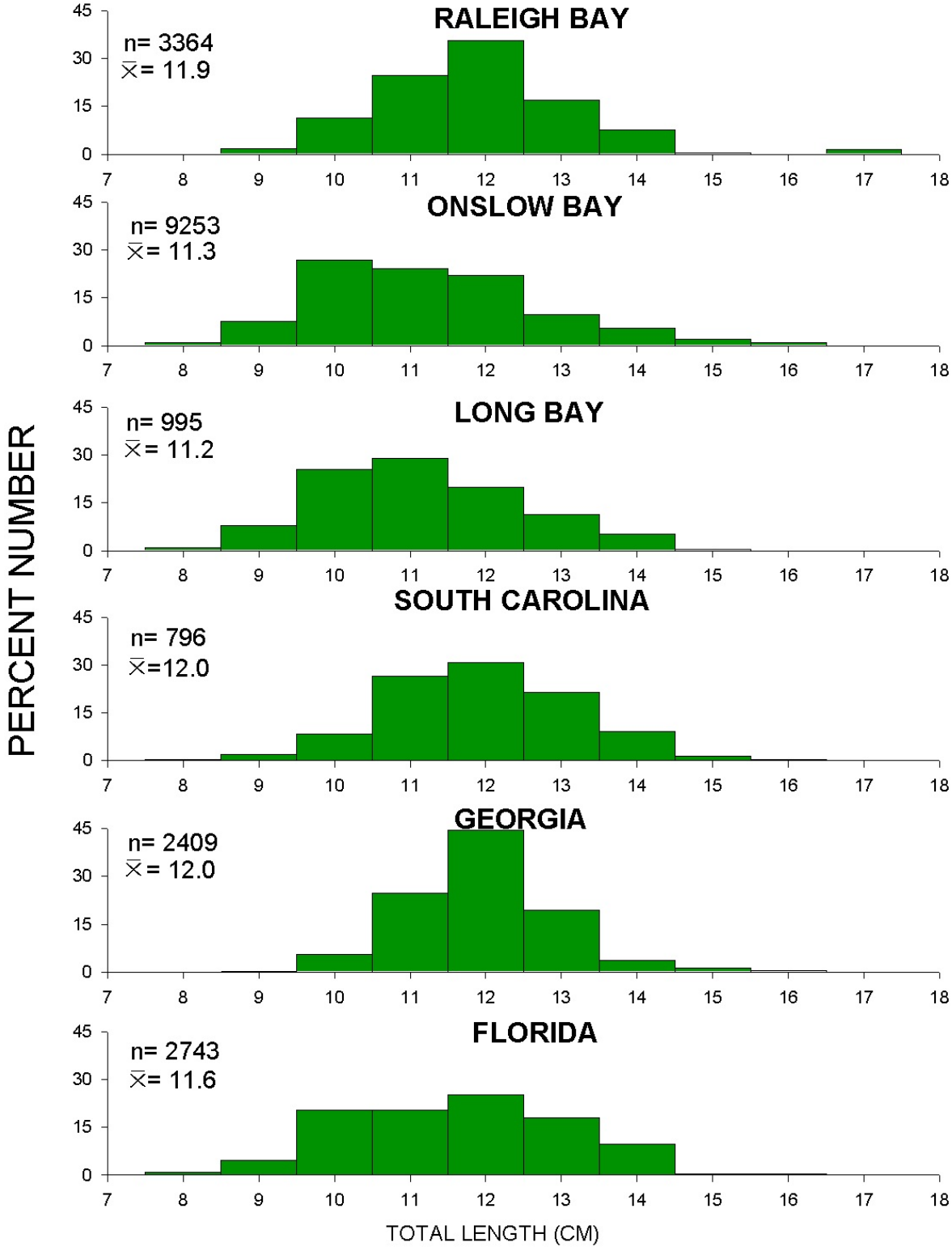

Figure 49. Regional length-frequencies of *Farfantepenaeus aztecus* in 2005

Approximately 52% of the brown shrimp sampled were female. No female brown shrimp with ripe ovaries were sampled in 2005 and less than 1% of the female brown shrimp were found to be mated. The greatest number of female brown shrimp with developing ovaries were taken in fall collections. Less than 1% of the male brown shrimp had fully developed spermatophores (ripe). Spermatophore development was not independent of season ($G = 36$, $p < 0.0001$) or region ($G = 221$, $p < 0.0001$). The majority of males with developing spermatophores were taken in summer and fall (Figure 50).

Occurrence of black gill disease in brown shrimp was observed and recorded. Presence of black gill disease was found in less than 1% of the brown shrimp and only in fall 2005. Infestation of brown shrimp occurred in all regions except Raleigh Bay, but was greatest in waters off South Carolina and Georgia.

Figure 50. Gonadal development of *Farfantepenaeus aztecus* in 2005

Farfantepenaeus duorarum

The pink shrimp, formerly *Penaeus duorarum* (Perez-Farfante and Kensley, 1997), was the least abundant commercially important penaeid shrimp species collected in 2005. The 118 specimens (CV=6.8; 0.1 individuals/ha) taken from SEAMAP trawls weighed 2 kg (0.002 kg/ha). Density of individuals in 2005 was at the lowest level recorded by the SEAMAP Shallow Water Trawl Survey (Figure 51). In 2005, abundance was greatest in spring collections in Onslow Bay (Table 25). Pink shrimp were taken only in Raleigh Bay in summer and only in Onslow Bay in fall.

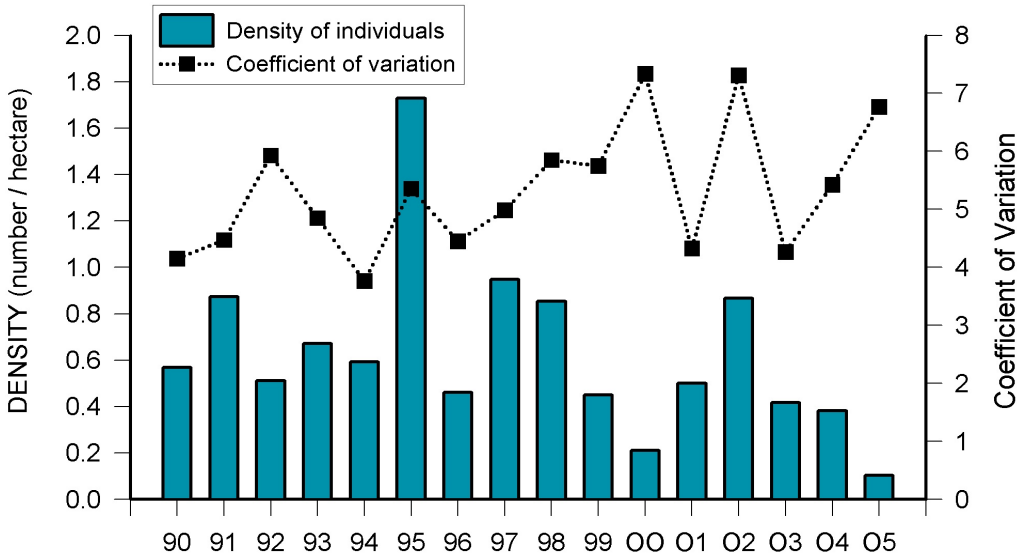

Figure 51. Annual densities of *Farfantepenaeus duorarum*

Table 25 . Estimates of density (number of individuals/hectare) in 2005.

Farfantepenaeus duorarum

	Spring	Summer	Fall	Region
Raleigh Bay	0	0.2	0	0.07
Onslow Bay	1.0	0	0.05	0.4
Long Bay	0.2	0	0	0.06
South Carolina	0.1	0	0	0.04
Georgia	0.06	0	0	0.02
Florida	0.3	0	0	0.1
Season	0.3	0.02	0.008	0.1

Total length of pink shrimp ranged from 9 to 18 cm ($\bar{x}$ =12.3 cm). Total lengths varied significantly among seasons (X^2=10, $p < 0.01$). Mean length was greatest in spring and smallest in fall (Figure 52). Total length differed significantly among regions (X^2 =25, $p < 0.001$). Regionally, mean lengths ranged from 11.3 cm in Florida to 14.0 cm in Georgia (Figure 53).

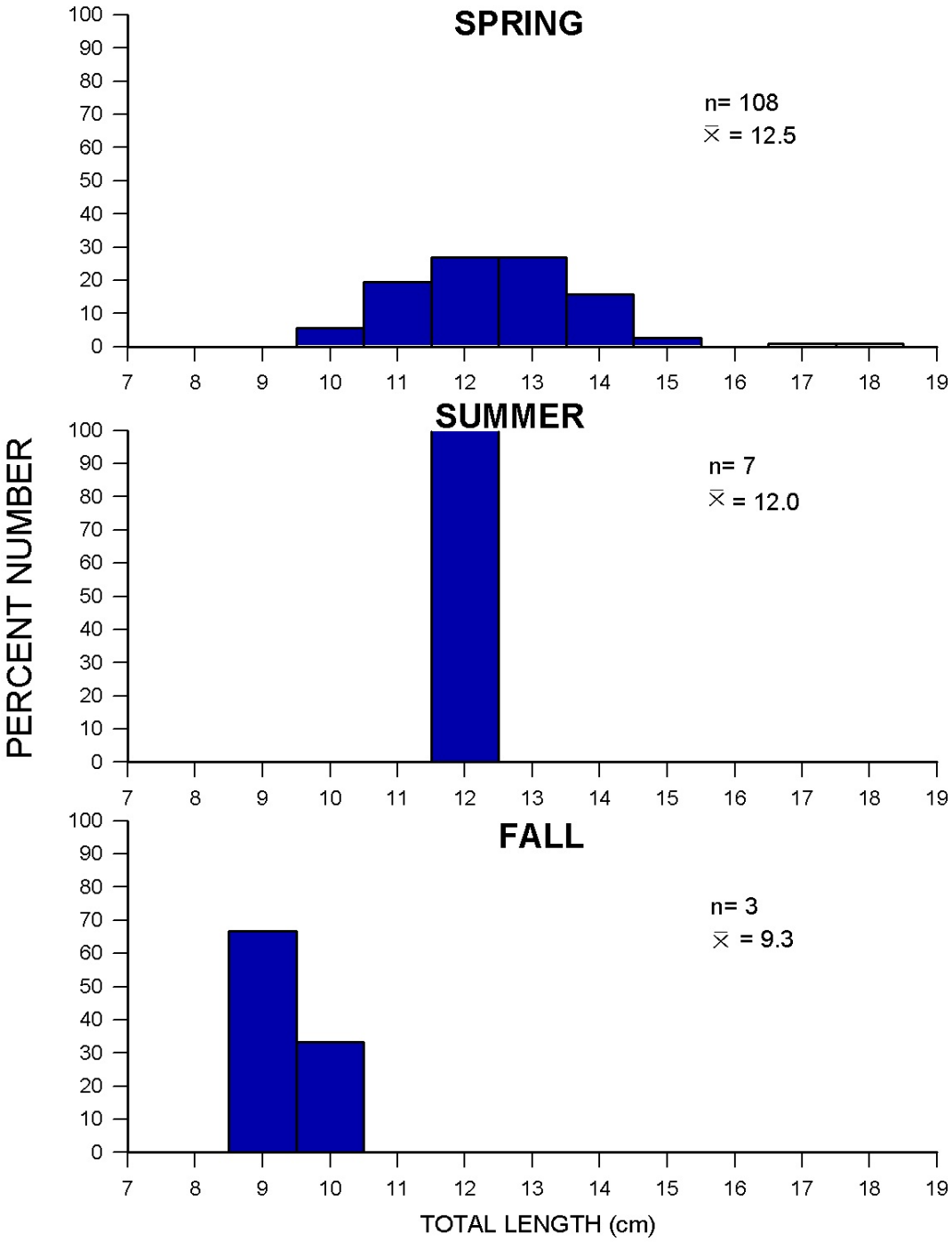

Figure 52. Seasonal length-frequencies of *Farfantepenaeus duorarum* in 2005

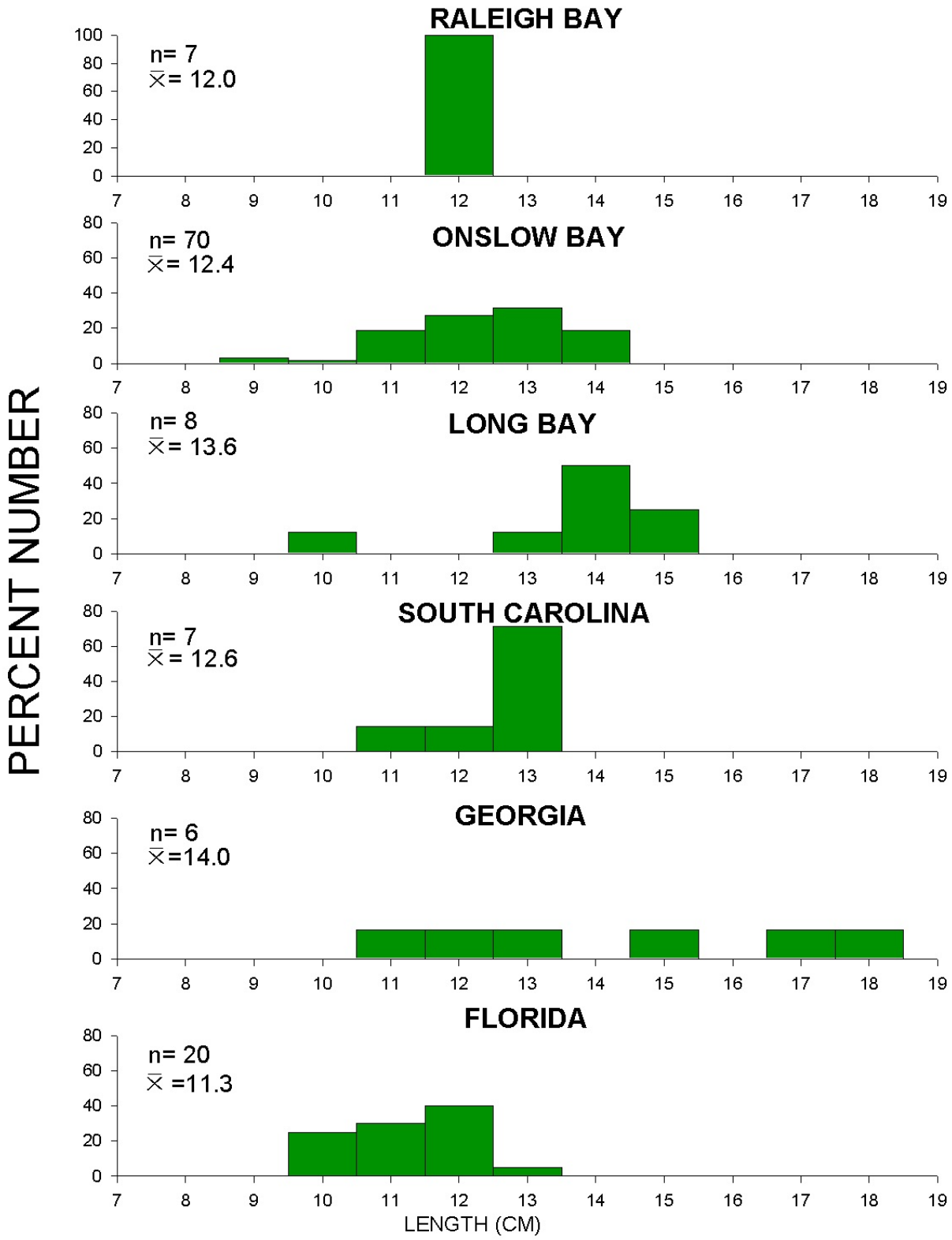

Figure 53. Regional length-frequencies of *Farfantepenaeus duorarum* in 2005

In SEAMAP-SA Shallow Water Trawl Survey strata over 73% of all pink shrimp were found to be female. No ripe female pink shrimp were collected in 2005 (Figure 54) and none were found to be mated. More than 8% of male pink shrimp sampled had fully developed spermatophores. All male pink shrimp were taken in spring. The majority of male specimens had developing spermatophores. Spermatophore development was independent of region ($G = 6$, $p > 0.05$). Presence of black gill disease was not noted in any pink shrimp.

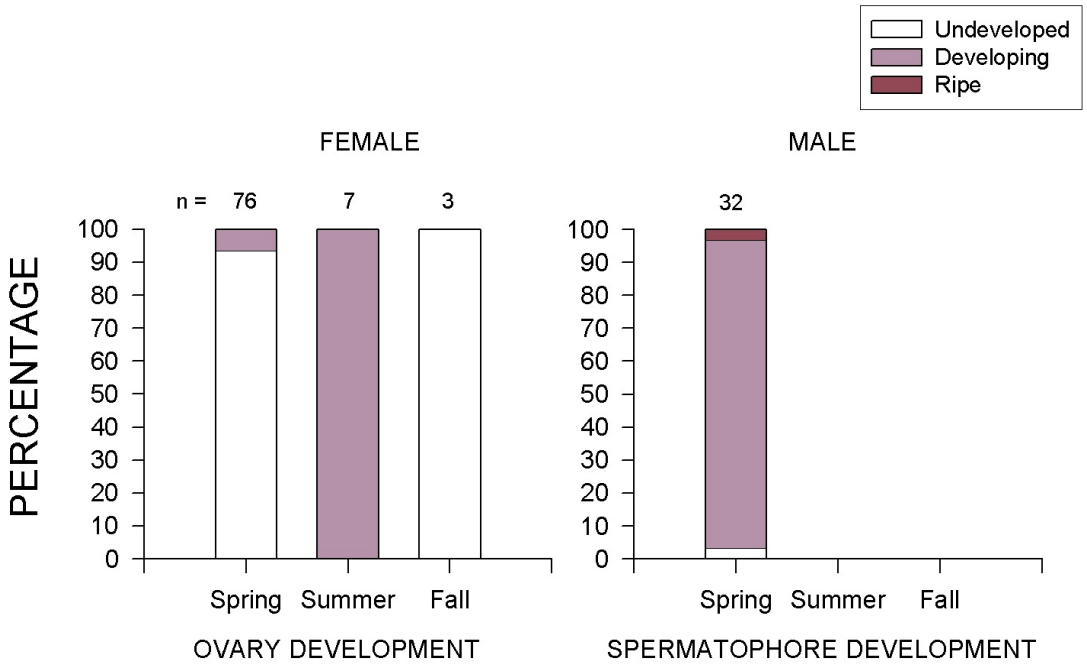

Figure 54. Gonadal development of *Farfantepenaeus duorarum* in 2005

Litopenaeus setiferus

The white shrimp, formerly *Penaeus setiferus* (Perez-Farfante and Kensley, 1997), ranked first among decapod crustaceans, with 35,746 specimens (CV=9.6; 31.3 individuals/ha) collected, weighing 760 kg (0.7 kg/ha). The 2005 estimate of density represents the second highest abundance in the history of the survey (Figure 55). Greatest seasonal density was found in fall (Table 26). Regional density was greatest in Florida waters for all seasons (Table 26).

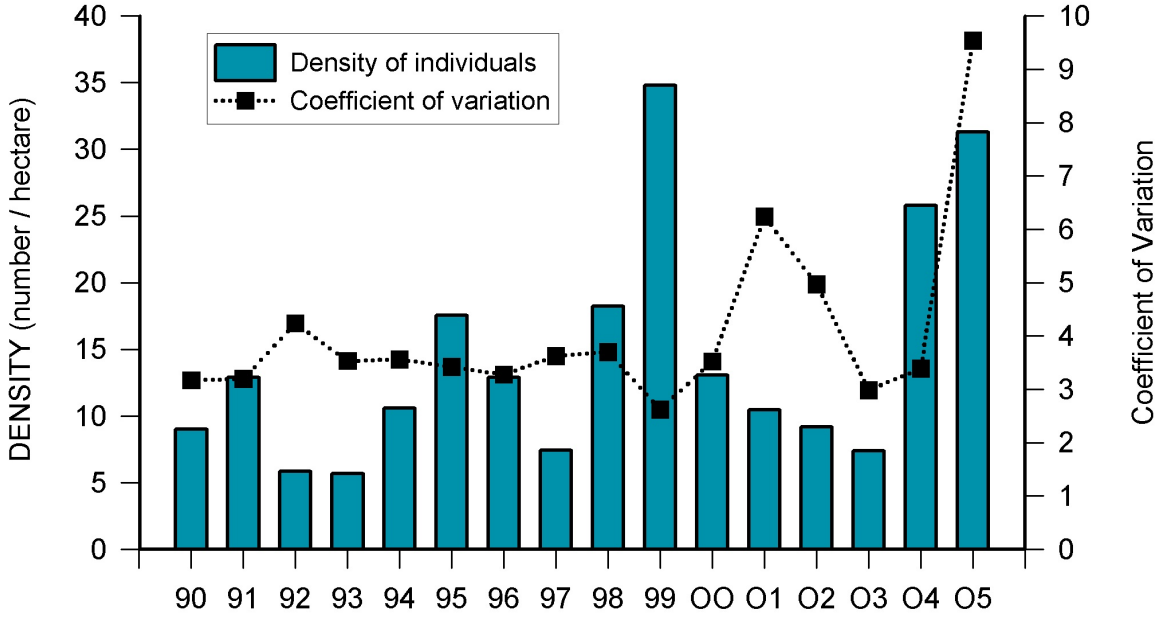

Figure 55. Annual densities of *Litopenaeus setiferus*

Table 26 . Estimates of density (number of individuals/hectare) in 2005.

Litopenaeus setiferus

	Spring	Summer	Fall	Region
Raleigh Bay	0.2	0	8.1	2.7
Onslow Bay	0.09	0	44.1	14.7
Long Bay	0.6	0.5	47.1	16.3
South Carolina	0	4.4	30.1	11.4
Georgia	0.4	3.1	23.7	8.9
Florida	2.7	21.4	333.6	122.6
Season	0.7	5.4	88.2	31.3

Total lengths of *L. setiferus* ranged from 7 to 19 cm, with a mean length of 13.7 cm. There was a significant difference in mean length among seasons (X^2 =1960, $p < 0.0001$), with mean length greatest in summer. Smaller YOY individuals began moving out of the estuaries in fall. Regional mean lengths also differed significantly (X^2 = 878, $p < 0.0001$). Florida produced the smallest mean length (13.6 cm) and Raleigh Bay the greatest (14.9 cm) (Figure 57).

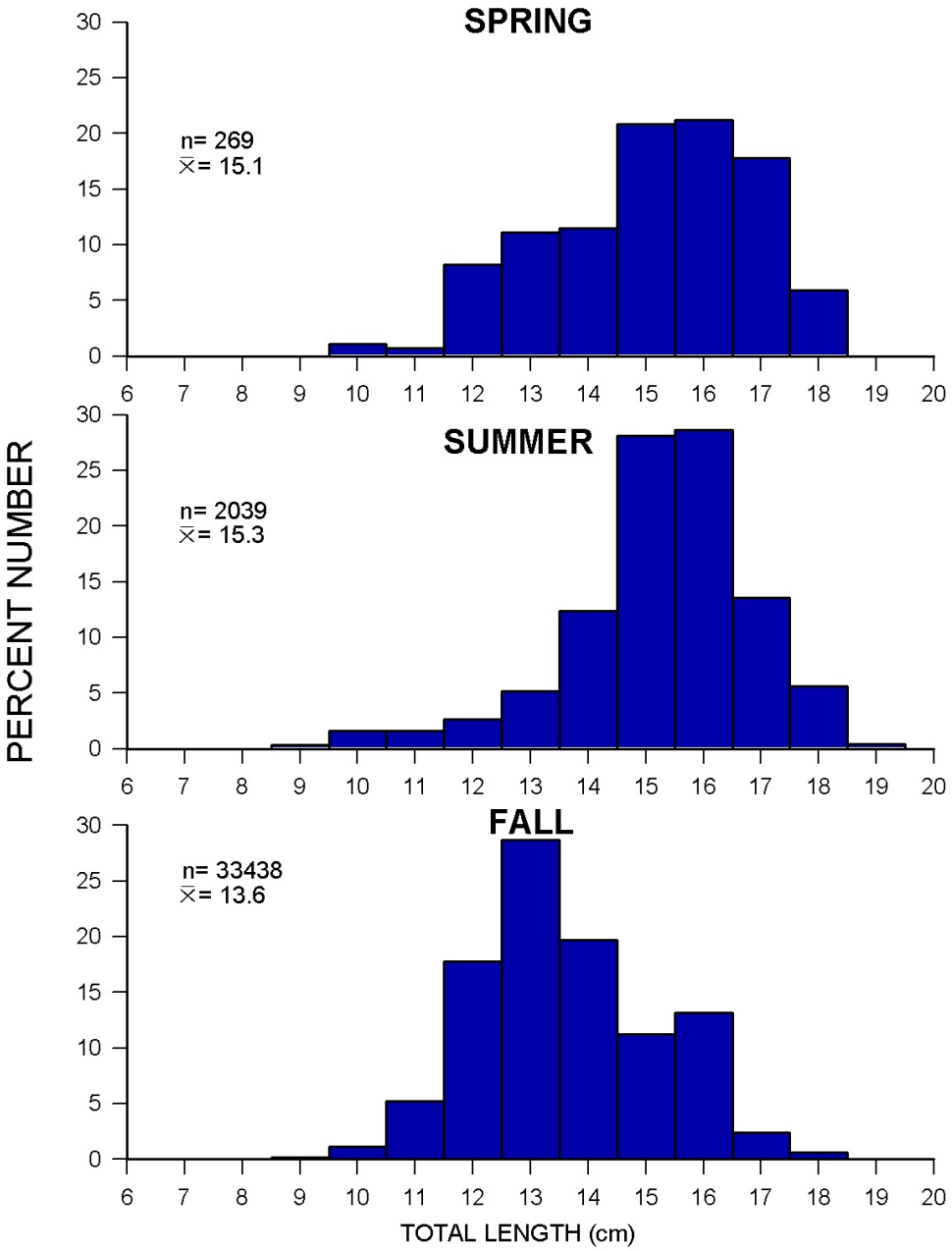

Figure 56. Seasonal length-frequencies of *Litopenaeus setiferus* in 2005

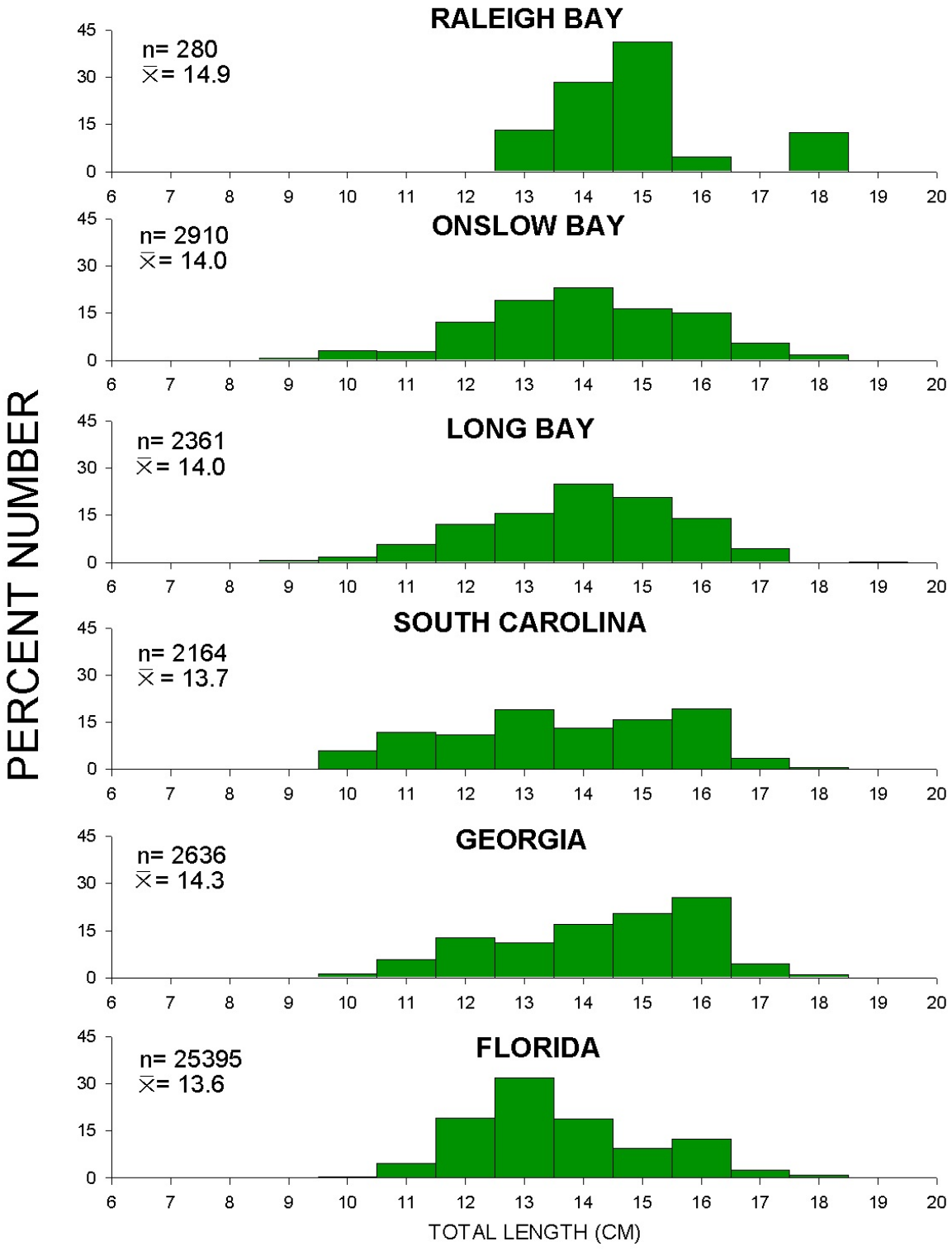

Figure 57. Regional length-frequencies of *Litopenaeus setiferus* in 2005

The majority of the white shrimp sampled (54%) were male (Figure 58). The majority of males with fully developed spermatophores were taken in summer. No males with fully developed spermatophores were taken in fall, when the majority (93%) of the males taken were collected. The ratio of males with fully developed spermatophores to those with spermatophores not yet fully developed was not independent of seasons ($G = 6680$, $p < 0.0001$) or regions ($G = 707$, $p < 0.0001$).

Less than 2% of females collected in SEAMAP-SA Shallow Water Trawl Survey strata had ripe ovaries, and none of the white shrimp females collected were ripe in fall, when 94% of the females were taken. The majority of ripe females were taken in summer. The ratio of ripe to nonripe females was not independent of season ($G = 4602$, $p < 0.0001$) or region ($G = 301$, $p < 0.0001$). Less than 1% of the females taken in SEAMAP-SA trawls were mated. White shrimp are reported to spawn from May through September in the SAB (Lindner and Anderson, 1956; Williams, 1984).

Occurrence of black gill disease in commercially important penaeids was observed and recorded. In previous years, white shrimp has exhibited the greatest level of infestation; however in 2005 less than 1% were found to be infected. All white shrimp with black gill disease were taken in summer and fall trawls. Infestation of white shrimp occurred in all regions except Raleigh and Onslow Bays. The majority of the records of black gill disease (48%) were in Onslow Bay.

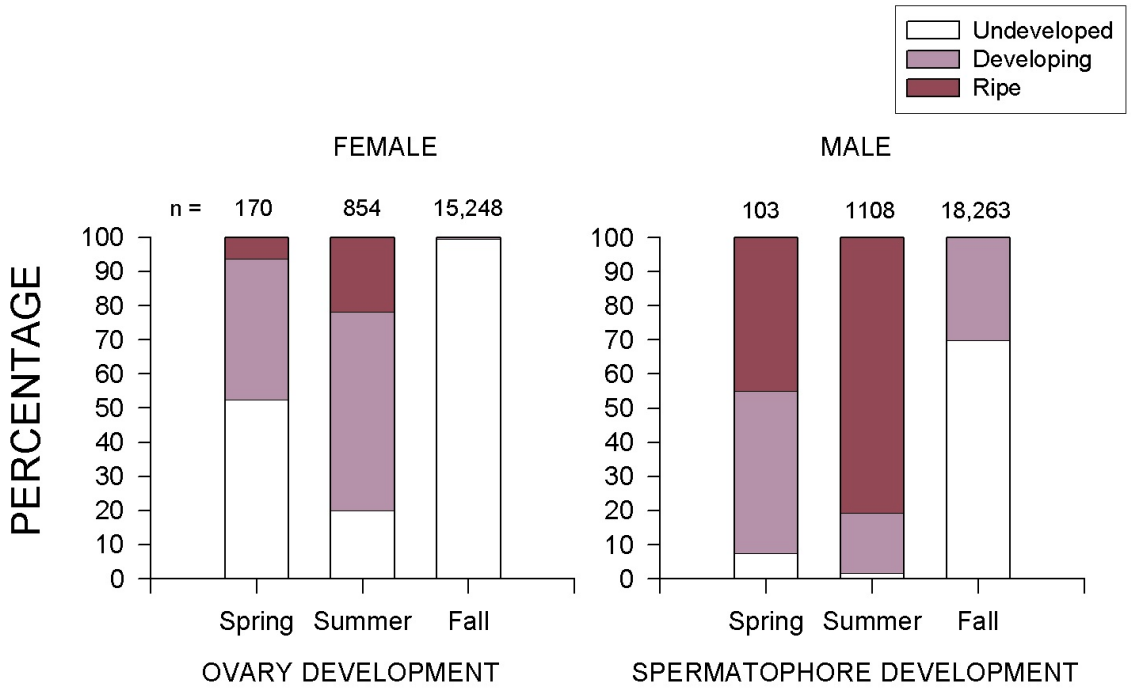

Figure 58. Gonadal development of *Litopenaeus setiferus* in 2005

Distribution and Abundance of Sharks

In 2005, the SEAMAP-SA Shallow Water Trawl Survey collected fourteen species of sharks (Table 27). The smooth dogfish, *Mustelus canis,* was the most abundant shark, making up approximately 47% of the shark specimens collected. The Atlantic sharpnose shark, *Rhizoprionodon terraenovae*, ranked second in abundance (39%), followed by the bonnethead shark, *Sphyrna tiburo* (9%), and the spiny dogfish, *Squalus acanthias* (3%). The other ten species contributed less than 3% to the overall number of sharks collected.

Table 27. Sharks taken by the SEAMAP-SA Shallow Water Trawl Survey in 2005.

Rank	Common name	Species name	Number
1	Smooth dogfish	*Mustelus canis*	1977
2	Atlantic sharpnose	*Rhizoprionodon terraenovae*	1618
3	Bonnethead	*Sphyrna tiburo*	392
4	Spiny dogfish	*Squalus acanthias*	104
5	Scalloped hammerhead	*Sphyrna lewini*	26
6	Spinner shark	*Carcharhinus brevipinna*	19
7	Blacknose shark	*Carcharhinus acronotus*	9
8	Blacktip shark	*Carcharhinus limbatus*	7
9	Sand tiger shark	*Odontaspis taurus*	6
10	Thresher shark	*Alopias vulpinus*	3
11	Nurse hark	*Ginglymostoma cirratum*	2
12	Dusky shark	*Carcharhinus isodon*	2
13	Sandbar shark	*Carcharhinus plumbeus*	1
14	Tiger shark	*Galeocerdo cuvieri*	1

Mustelus canis

The smooth dogfish, *Mustelus canis,* was the most abundant shark species (n=1977; 17 individuals/ha; CV=5.6) collected during the 2005 SEAMAP-SA Shallow Water Trawl Survey. An increase in abundance has been noted over the past several years. The 2005 density of abundance was the highest since the peak observed in 1990 (Figure 59). Over 99% of the individuals were taken in spring. Smooth dogfish were taken only in the northern SAB, with greatest abundance in Onslow Bay (Table 28).

Male *M. canis* outnumbered females (1.8 : 1.0). Size differences between sexes were found to be significant (X^2 = 35, p > 0.00001). Total lengths of the smooth dogfish ranged from 39 to 107 cm for males ($\bar{x}$ = 78.8 cm) and from 41 to 114 cm for females ($\bar{x}$ = 74.5 cm). Regional mean lengths were greatest in Raleigh Bay and decreased southward.

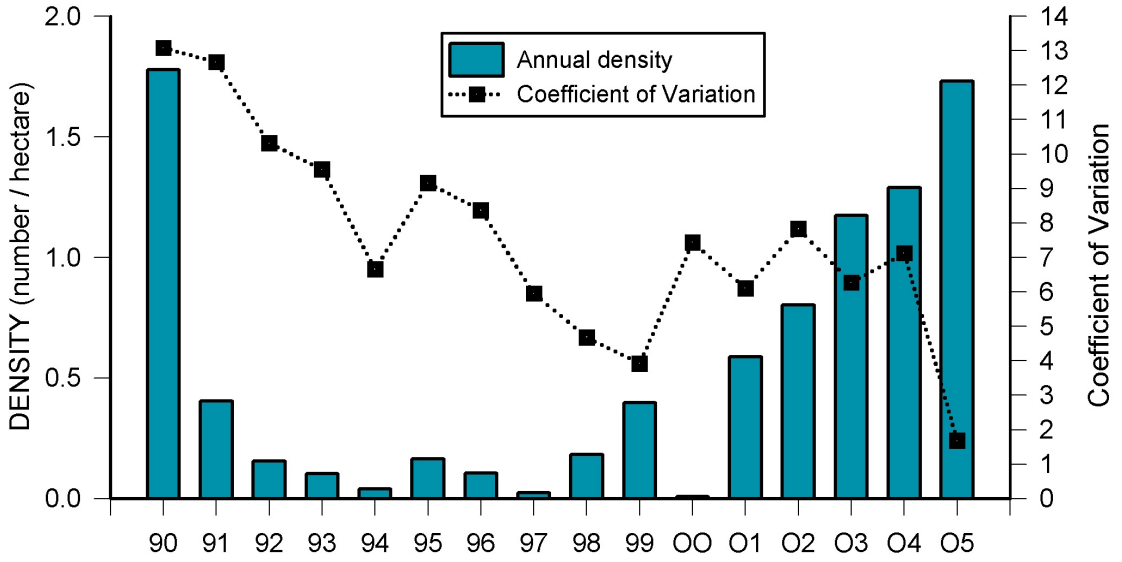

Figure 59. Annual densities of *Mustelus canis*

Table 28 . Estimates of density (number of individuals/hectare) in 2005.

Mustelus canis

	Spring	Summer	Fall	Region
Raleigh Bay	15.5	0.5	0	5.1
Onslow Bay	17.8	0	0	6.1
Long Bay	5.0	0	0	1.7
South Carolina	0	0	0	0
Georgia	0	0	0	0
Florida	0	0	0	0
Season	5.1	0.05	0	1.7

Rhizoprionodon terraenovae

The Atlantic sharpnose shark was the second most abundant shark species collected in 2005 (n=1618; 1.4 individuals/ha; CV=2.4). The density of abundance of *R. terraenovae* increased in 2005 to near record abundance (Figure 60). In 2005, Atlantic sharpnose were taken in all regions and all seasons. The highest densities of abundance were taken in summer and in Florida waters (Table 29).

Males Atlantic sharpnose outnumbered females (1.5:1), and size was found to differ significantly among sexes (X^2 =58, $p < 0.001$). Males ranged from 27 to 98 cm ($\bar{x}$ = 45.0 cm), whereas females ranged in size from 28 to 98 cm total length ($\bar{x}$ = 39.5 cm). Mean length was smallest in summer collections, when the greatest number of individuals were taken. Regional mean lengths were greatest off Florida.

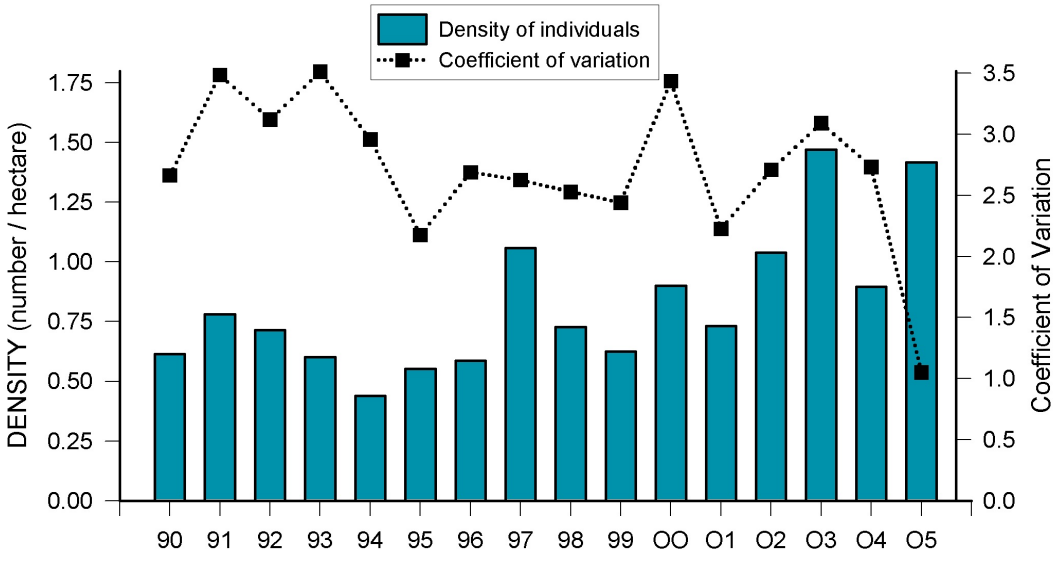

Figure 60. Annual densities of *Rhizoprionodon terraenovae*

Table 29 . Estimates of density (number of individuals/hectare) in 2005.

Rhizoprionodon terraenovae

	Spring	Summer	Fall	Region
Raleigh Bay	0	2.7	0	1.0
Onslow Bay	0.07	5.0	0.1	1.7
Long Bay	0.06	4.4	0.3	1.6
South Carolina	0.3	1.4	0.1	0.5
Georgia	0.3	2.8	0.3	1.1
Florida	0.2	5.1	2.7	2.7
Season	0.07	3.5	0.7	1.4

Sphyrna tiburo

The bonnethead shark, *Sphyrna tiburo,* ranked third in abundance (n=392; 0.3 individuals/ha; CV=2.9) among sharks in 2005. Abudance decreased from the levels observed in the previous three years (Figure 61). Density was greatest in summer and fall collections and in the southern SAB (Table 30). Waters off Florida yielded the highest regional density. No bonnethead sharks were taken in Raleigh Bay in any season.

Males outnumbered female bonnetheads (1.8:1), but were not significantly larger than females (X^2 = 0.7, p > 0.05). Total lengths of male *S. tiburo* ranged from 35 to 110 cm ($\bar{x}$ = 73.6 cm), whereas females ranged from 35 to 123 cm ($\bar{x}$ = 73.7 cm). Greatest mean lengths occurred in South Carolina waters and decreased southward for both sexes.

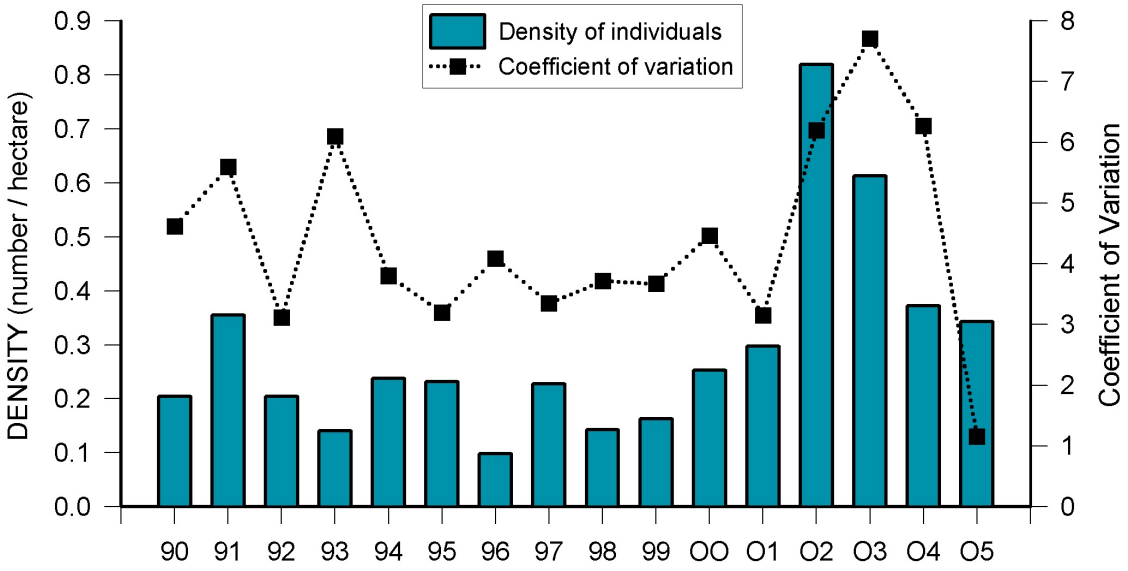

Figure 61. Annual densities of *Sphyrna tiburo*

Table 30 . Estimates of density (number of individuals/hectare) in 2005.

Sphyrna tiburo

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0	0
Onslow Bay	0	0.01	0	0.005
Long Bay	0	0.4	0.2	0.2
South Carolina	0.09	0.5	0.03	0.2
Georgia	0.5	0.8	0.03	0.4
Florida	0.4	0.5	1.8	0.9
Season	0.2	0.4	0.4	0.3

Squalus acanthias

The spiny dogfish, *Squalus acanthias,* was the fourth most abundant shark species (n=104; 0.09 individuals/ha; CV=10.1) collected during the 2005 SEAMAP-SA Shallow Water Trawl Survey. Densities of abundance decreased in 2005 (Figure 62). Spiny dogfish were exclusive to Raleigh and Onslow Bays in spring (Table 31).

Females outnumbered male spiny dogfish (1.2:1) and were significantly larger than males ($X^2 = 32$, $p < 0.0001$). Total lengths of female *S. acanthias* ranged from 24 to 85 cm ($\bar{x} = 77.9$), whereas males ranged from 31 to 82 cm ($\bar{x} = 55.1$ cm).

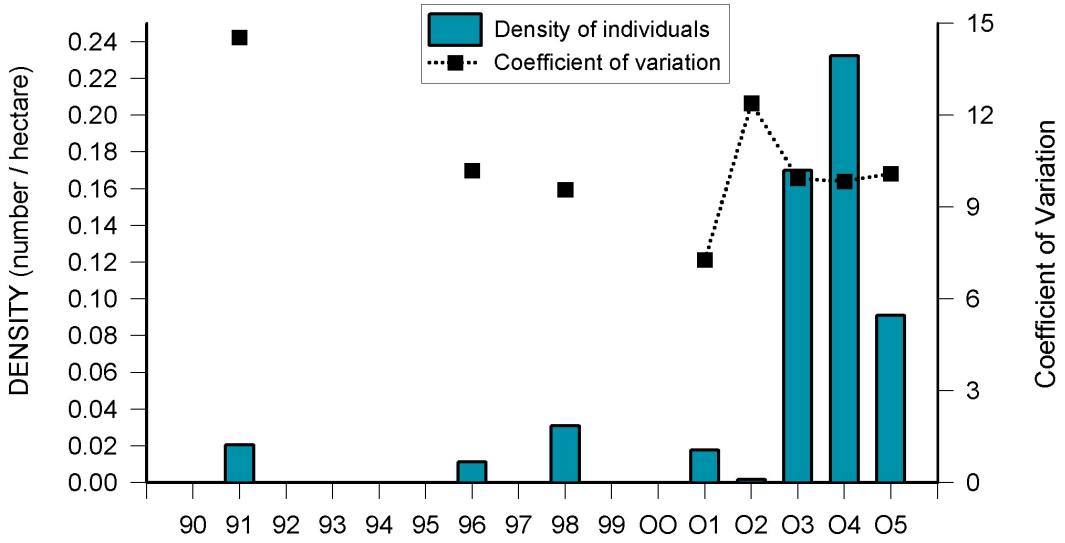

Figure 62. Annual densities of *Squalus acanthias*

Table 31. Estimates of density (number of individuals/hectare) in 2005.

Squalus acanthias

	Spring	Summer	Fall	Region
Raleigh Bay	0.3	0	0	0.1
Onslow Bay	1.4	0	0	0.5
Long Bay	0	0	0	0
South Carolina	0	0	0	0
Georgia	0	0	0	0
Florida	0	0	0	0
Season	0.3	0	0	0.09

Distribution and Abundance of Sea Turtles

Caretta caretta

The loggerhead turtle, Caretta caretta, was the most abundant sea turtle caught in SEAMAP trawls. Twenty-eight loggerhead turtles (CV=3.5; 0.02 individuals/ha), weighing 1241 kg (1.1 kg/ha), were taken in 2005. The 2005 estimate of density represents an increase in abundance from 2004 (Figure 63). In 2005, the overall seasonal densities did not vary a great deal, although abundance was slightly higher in summer (Table 32). Regionally, density was greatest in waters off Florida. The majority of the loggerhead sea turtles taken in SEAMAP collections are considered to be sub-adults, based on size (Dodd, 1988).

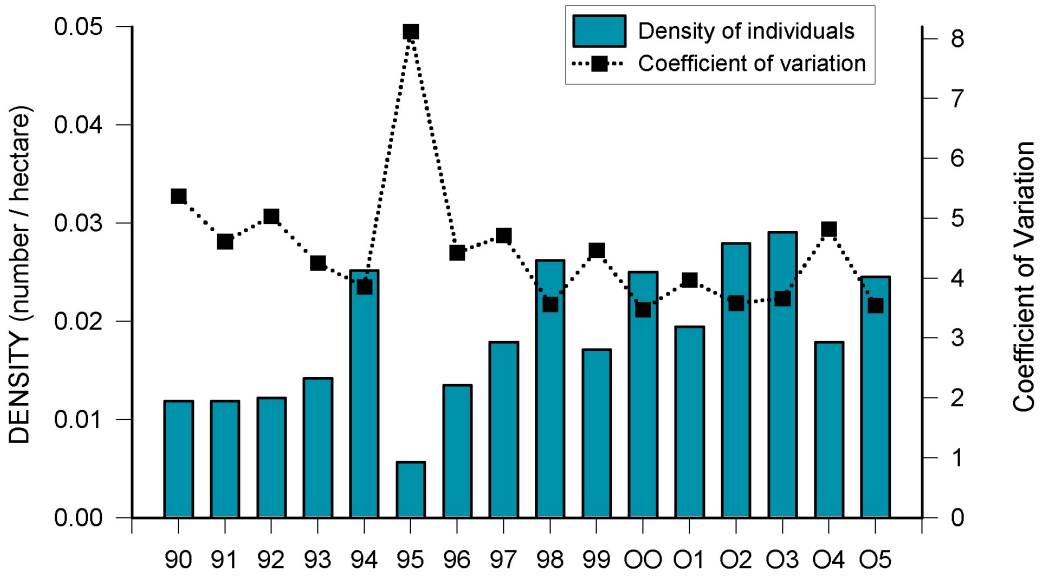

Figure 63. Annual densities of *Caretta caretta*

Table 32. Estimates of density (number of individuals/hectare) in 2005.

Caretta caretta

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0.03	0.01
Onslow Bay	0	0	0	0
Long Bay	0.02	0	0.06	0.03
South Carolina	0.02	0.05	0.02	0.03
Georgia	0.02	0.05	0.03	0.03
Florida	0.04	0.04	0.03	0.04
Season	0.02	0.03	0.02	0.02

Chelonia mydas

The green turtle has been a very rare species in SEAMAP-SA trawls A single green turtle was taken in 2005 (Figure 64). Only six green turtles have been taken in previous years.

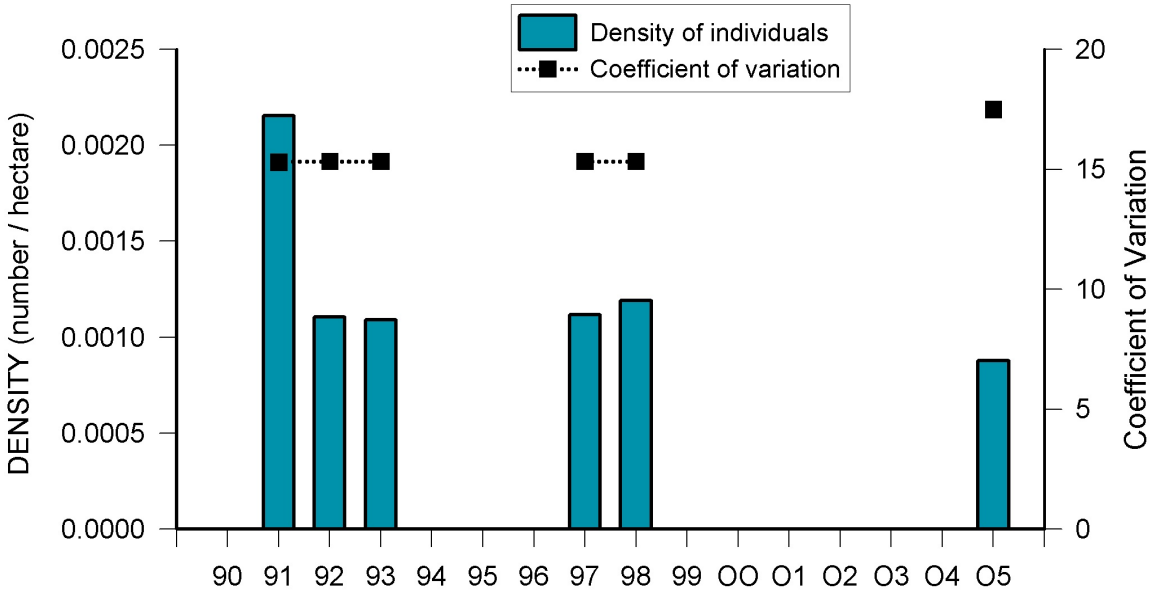

Figure 64. Annual densities of *Chelonia mydas*

Dermochelys coriacea

The leatherback turtle has also been a very rare species in SEAMAP-SA trawls. In 2005, two leatherback turtles were taken in SEAMAP collections (Figure 65). Only four leatherback turtles have been taken previously.

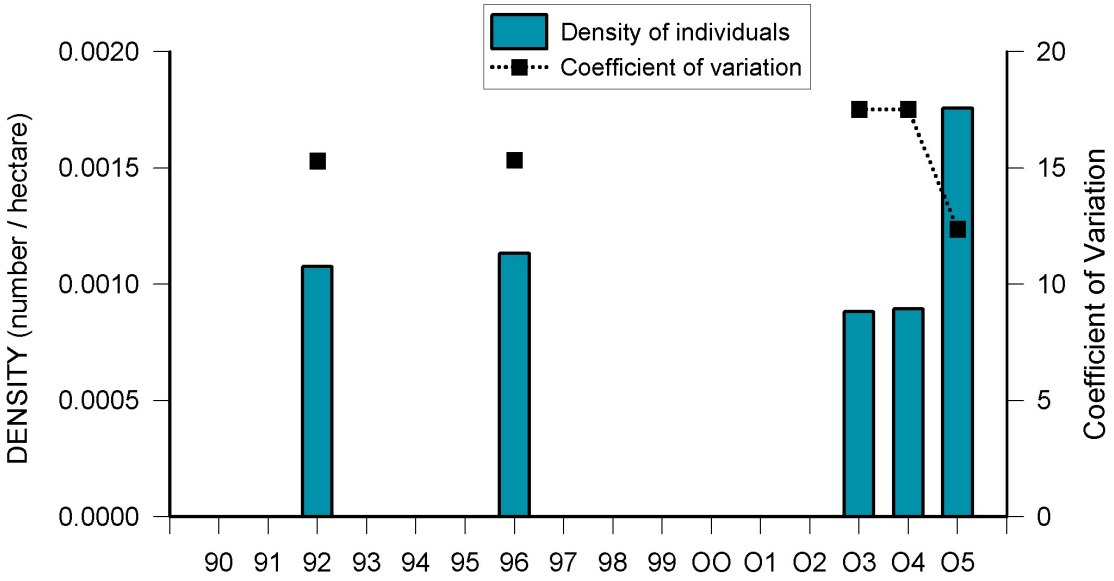

Figure 65. Annual densities of *Dermochelys coriacea*

Lepidochelys kempi

In 2005, six Kemp's ridley turtles were taken in SEAMAP trawls (CV=7.2; 0.005 individuals/ha). The estimate of density of *L. kempi* increased in 2005 to the third highest abundance recorded (Figure 66). No Kemp's ridley turtles were taken in Raleigh Bay or Florida (Table 33).

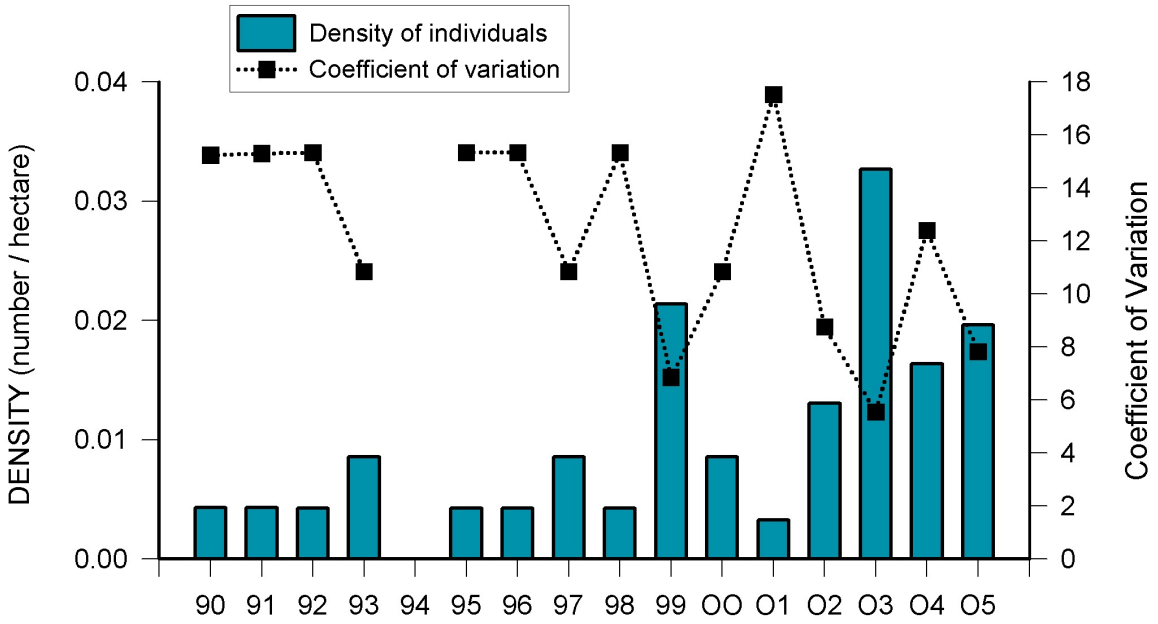

Figure 66. Annual densities of *Lepidochelys kempi*

Table 33. Estimates of density (number of individuals/hectare) in 2005.

Lepidochelys kempi

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0	0
Onslow Bay	0	0.02	0.02	0.005
Long Bay	0	0	0	0.007
South Carolina	0.02	0.01	0	0.005
Georgia	0	0	0.01	0.007
Florida	0	0	0	0
Season	0.003	0.005	0.005	0.005

Distribution and Abundance of Horseshoe Crabs

Limulus polyphemus

A total of 389 horseshoe crabs (CV=4.8; 0.3 individuals/ha) were collected by the SEAMAP-SA Shallow Water Trawl Survey in 2005. Density of individuals in 2005 was the greatest estimate recorded by the survey (Figure 67). In 2005, horseshoe crabs were taken in all regions and seasons (Table 34). Abundance was greatest in spring trawls made in Raleigh Bay.

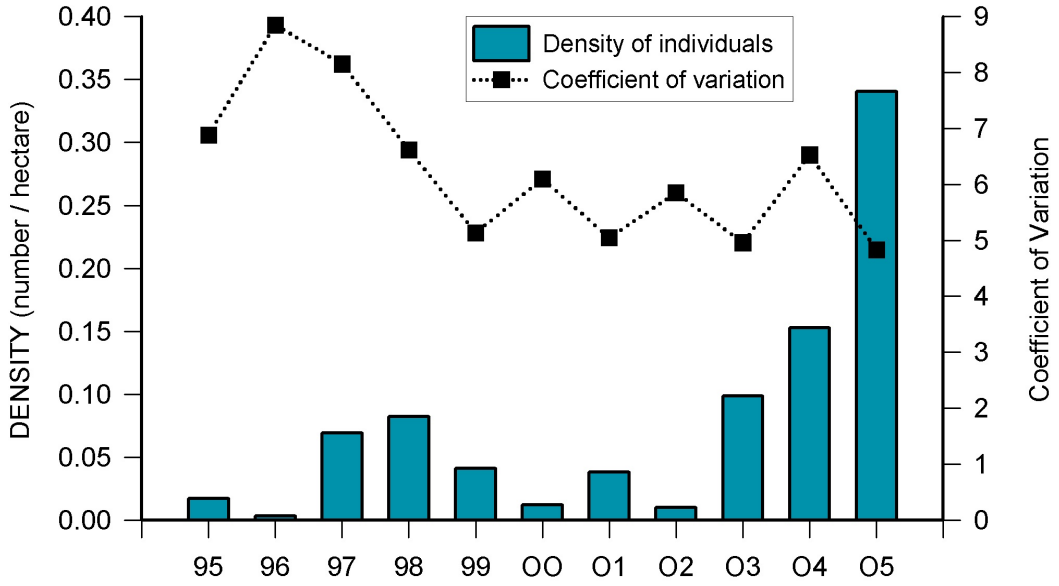

Figure 67. Annual densities of *Limulus polyphemus*

Table 34. Estimates of density (number of individuals/hectare) in 2005.

Limulus polyphemus

	Spring	Summer	Fall	Region
Raleigh Bay	5.7	0.8	0	2.1
Onslow Bay	0.5	0	0	0.2
Long Bay	0.9	0	0	0.3
South Carolina	0.3	0	0.3	0.2
Georgia	0.3	0.04	0.04	0.1
Florida	0.3	0.03	0.01	0.1
Season	0.9	0.09	0.06	0.3

Distribution and Abundance of Cannonball Jellies

In 2001, the cannonball jelly, having been identified as a major component of overall biomass and a species of increasing commercial importance, was separated from other miscellaneous invertebrates and the abundance and biomass of *Stomolophus meleagris* was recorded for the first time by the SEAMAP - South Atlantic Shallow Water Trawl Survey. Cannonball jellies are not, however, considered to be priority species.

The 13,4458 individuals (12 individuals/ha; CV=6.2, weighing 3915 kg (3.4 kg/ha), represented an increase in abundance in 2005. With the exception of 2005, cannonball jelly abundance has declined since 2001 (Figure 68). Seasonal density was greatest in fall (Table 35). *Stomolophus meleagris* was taken in all regions, with highest regional density off Georgia.

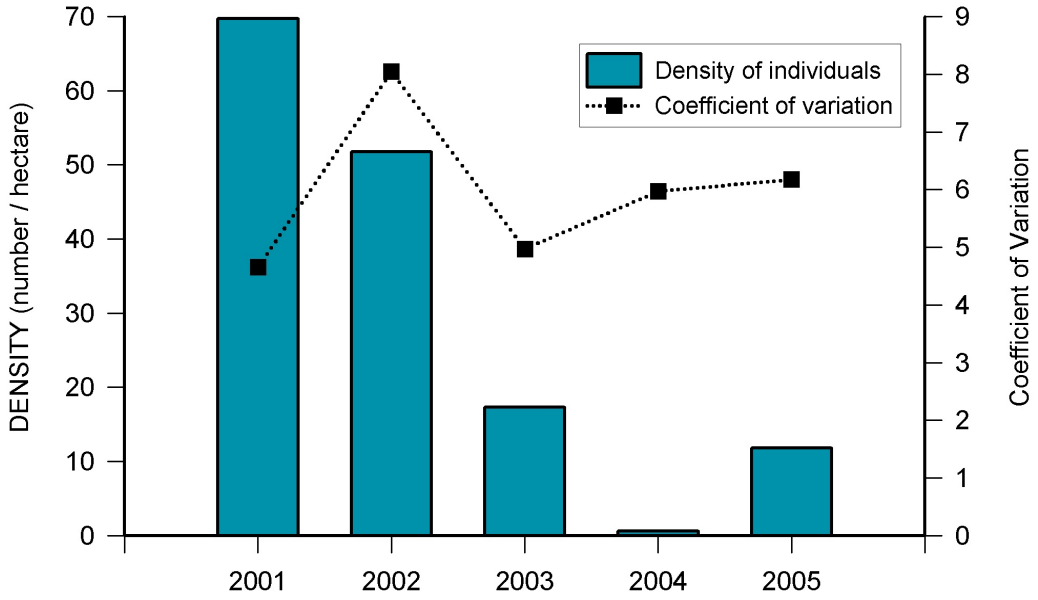

Figure 68. Annual densities of *Stomolophus meleagris*

Table 35. Estimates of density (number of individuals/hectare) in 2005.

Stomolophus meleagris

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	2.7	0.9
Onslow Bay	0.2	0	2.3	0.8
Long Bay	0.4	0.02	3.3	1.2
South Carolina	7.6	2.6	5.3	5.2
Georgia	3.1	0.1	110.5	37.2
Florida	0.04	0	14.9	5.2
Season	2.2	0.5	32.9	11.8

ACKNOWLEDGMENTS

We appreciate the administrative assistance of Dale Theiling , David Whitaker, and the recommendations of the SEAMAP-SA Committee and the Shallow Water Trawl Workgroup. Jeff Jacobs and Rob Dunlap were instrumental in the successful completion of SEAMAP-SA Shallow Water Trawl Survey cruises through their able operation of the R/V *Lady Lisa*. Siobhan Scott, Kristina Thompson, Pat Biondo, Steve Burns, Jeff Siewicki, Jon Richardson, and Wally Bubley assisted with field efforts.

APPLICATIONS OF DATA AND SPECIMENS FROM THE SEAMAP-SOUTH ATLANTIC SHALLOW WATER TRAWL SURVEY IN 2005

Stock Assessment/VPA:

Centropristis striata
Cynoscion regalis
Limulus polyphemus
Menticirrhus americanus
Micropogonias undulatus
Pomatomus saltatrix

Genetics / Stock Identification Studies:

Menticirrhus americanus
Menticirrhus littoralis
Menticirrhus saxatilis
Micropogonias undulatus
Paralichthys albigutta
Paralichthys dentatus
Paralichthys squamilentus

Fecundity

Etropus crossotus
Trinectes maculatus

Life History (Age/Growth, Reproduction):

Cynoscion regalis
Haemulon aurolineatum
Lutjanus analis
Lutjanus campechanus
Lutjanus synagris,
Menticirrhus americanus
Menticirrhus littoralis
Menticirrhus saxatilis
Micropogonias undulatus
Pomatomus saltatrix

Parasite Load Assessment:

Caranx crysos
Chloroscombrus chrysurus
Micropogonias undulatus
Oligoplites saurus
Prionotus carolinus
Prionotus evolans
Prionotus scitulus
Selene setapinnis

Biological Accounts:

Stomolophus meleagris

Data requested by state agencies:

- Specimens of invertebrate species for catalogue of voucher specimens -SCDNR/MRRI -SERTC
- Blue crab sponge crab abundance - SCDNR-Crustacean Management Section
- Shrimp abundance summary - SCDNR-Crustacean Management Section
- Incidence of black gill disease in commercial penaeid shrimp - SCDNR - Crustacean Management Section

- Water temperature data (Summer 2005) - SCDNR/MRRI
- Sea turtle data (2005) - SCDNR / Office of Fisheries Management
- 2005 SEAMAP-SA data collected in North Carolina waters - NC Division of Marine Fisheries
- 2000-2002 SEAMAP-SA data collected in North Carolina waters - NC Division of Marine Fisheries
- 2005 SEAMAP-SA data collected in Georgia waters - GADNR
- Sea turtle data collected in Georgia waters(2005) - GADNR
- 2005 SEAMAP-SA data collected in Florida waters - Florida Fish and Wildlife Conservation Commission
- Sea turtle data collected in Florida waters(2005) - FFWCC - Endangered Species Division
- Cannonball jelly abundance data (1994-2005) for correlation with Leatherback sea turtle sightings-/SCDNR- Endangered Species Office

Data requested by federal agencies:

- Sea turtle data (2005) - NOAA SEFSC
- Sea turtle data (2005) - Cooperative Marine Turtle Tagging Program
- Shark data (2005) - NMFS, Highly Migratory Species, Silver Spring, MD
- Data collected off Canaveral National Seashore (2005) - National Park Service

SEAMAP-SA SHALLOW WATER TRAWL SURVEY PERMITS

The SEAMAP - South Atlantic Shallow Water Trawl Survey applies for required permits each year. In 2005, the survey operated in compliance with the following:

Federal Permits

Letter of Acknowledgment from USDOC/NOAA/NMFS Southeast Regional Office (variance from size, bag, and seasonal limits for monitored stocks).

Letter of Authorization from USDOC/NOAA/NMFS Southeast Regional Office (exemption from federal TED requirements as long as limited tow times are maintained).

Letter of Acknowledgment (LOA-SHK-05-02) from USDOC/NOAA/NMFS Office of Sustainable Fisheries (allows research trawling activity that includes take of shark species).

Permit #1405 from USDOC/NOAA/NMFS Office of Protected Resources (authorizes specified research on marine turtle species collected as a result of otherwise permitted trawling activities).

USDOC/NOAA/NMFS Section 6 Cooperative Agreement (recognizes South Carolina Department of Natural Resources' actions under section 6(c) of the Endangered Species Act).

CANA-2005-SCI-0007 issued by USDOI/NPS Canaveral National Seashore (authorizes trawling activities in the coastal waters adjacent to the park).

STATE PERMITS

North Carolina Division of Marine Fisheries Scientific/Educational Permit (Permit Number 706572).

South Carolina Department of Natural Resources Scientific Collection Permit.

State of Georgia Department of Natural Resources Scientific Collecting Permit (29-WSF-05-114).

Florida Fish and Wildlife Conservation Commission Special Activities License (SAL 04SR-051A).

Florida Fish and Wildlife Conservation Commission / Imperiled Species Management Marine Turtle Permit (TP# 064).

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Appendix 1. Size statistics of priority finfish and decapod species from all SEAMAP-SA collections in 2005.

FINFISH	MEAN LENGTH/WIDTH (CM)	SIZE EXTREMES (CM)
Archosargus probatocephalus	46.3	27 - 53
Brevoortia smithi	28.3	27 - 30
Brevoortia tyrannus	12.7	10 - 22
Centropristis striata	15.3	8 - 27
Chaetodipterus faber	7.9	5 - 28
Cynoscion nebulosus	26.1	26 - 28
Cynoscion regalis	20.4	9 - 50
Leiostomus xanthurus	15.1	8 - 29
Menticirrhus americanus	20.6	7 - 27
Menticirrhus littoralis	27.3	16 - 40
Menticirrhus saxatilis	32.0	28 - 36
Micropogonias undulatus	16.4	6 - 37
Mycteroperca microlepis	**	
Paralichthys albigutta	26.0	14 - 51
Paralichthys dentatus	22.6	11 - 48
Paralichthys lethostigma	33.5	17 - 47
Peprilus paru	9.2	3 - 19
Peprilus triacanthus	11.3	2 - 18
Pogonias cromis	20.0	18 - 21
Pomatomus saltatrix	17.4	10 - 34
Sciaenops ocellatus	**	
Scomberomorus cavalla	15.0	6 - 41
Scomberomorus maculatus	19.5	4 - 48
DECAPOD CRUSTACEANS		
Callinectes sapidus	12.9	3 - 18
Farfantepenaeus aztecus	11.5	7 - 17
Farfantepenaeus duorarum	12.3	9 - 18
Litopenaeus setiferus	13.7	7 - 19

** No specimens of *Mycteroperca microlepis* or *Sciaenops ocellatus* were collected.

Appendix 2. Seasonal age-length keys for weakfish, southern kingfish, and Atlantic croaker taken in SEAMAP-SA trawls in 2005.

Cynoscion regalis

SPRING 2005						
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4
12	4		100			
13	5		100			
14	20		90	10		
15	10		100			
16	38		95	5		
17	11		100			
18	13		100			
19	13		100			
20	13		100			
21	9		100			
22	32		81	19		
23	20		50	50		
24	30		53	47		
25	27		67	22	11	
26	18		67	33		
27	6		33	67		
28	3			100		
29	10			40	60	
31	8			75	25	
32	1			100		
33	1			100		
35	1			100		
41	1				100	

SUMMER 2005						
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4
15	6	33	67			
16	2		100			
17	6		100			
18	7		100			
19	7		100			
20	6		100			
21	6		100			
22	6		100			
23	16		63	38		
24	20		40	60		
25	16		50	50		
26	10		20	80		
27	18		67	33		
28	3			100		
29	10		40	60		
30	8		50	50		
31	2			100		
32	1				100	
33	1			100		
34	1			100		
38	1				100	
46	1				100	
51	1					100

FALL 2005						
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4
9	1	100				
10	1	100				
11	1	100				
12	3	100				
13	3	100				
14	12	83	17			
15	20	90	10			
16	6	100				
17	15	100				
18	17	100				
19	24	100				
20	19	100				
21	26	69	31			
22	30	53	47			
23	4		100			
24	20		90	10		
25	14		86	14		
26	18		89	11		
27	6		100			
28	4		50	50		
29	4		50	50		
30	4		50	50		
31	2		100			
32	1				100	
33	2				100	
35	1			100		

Appendix 2, continued

Menticirrhus americanus

Seasonal age-length keys

SPRING 2005								
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6
10	3		100					
11	5		100					
12	7		100					
13	14		100					
14	10		100					
15	12		100					
16	17		100					
17	20		100					
18	20		100					
19	54		96			4		
20	40		90	10				
21	48		75	25				
22	42		81	19				
23	72		42	54	4			
24	66		27	68	5			
25	69		39	43	17			
26					4	58	27	12
27	69			52	35	13		
28	54		6	67	28			
29	80			40	45	10	5	
30	30			33	67			
31	18			33	67			
32	32			13	63	13	13	
33	21			14	71	14		
34	10				80	20		
35	12				50	25	25	
36	6				67	33		
37	2					100		

SUMMER 2005								
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6
8	1	100						
10	3	100						
11	5	100						
12	22	91	9					
13	12	100						
14	8	75	25					
15	4	100						
16	14	29	71					
17	36	44	56					
18	40	45	55					
19	54	19	81					
20	40	10	90					
21	50	4	96					
22	42		95	5				
23	112	4	60	25	11			
24	78		85	12	4			
25	75		48	36	16			
26	60		33	33	27	7		
27	51		41	18	41			
28	42		14	21	64			
29	64		13	25	50	13		
30	52		8	38	46	8		
31	16				88	13		
32	10				80	20		
33	10				80	20		
34	6				33	67		
35	18				33	50	17	
36	6					33	67	
37	1					100		

FALL 2005								
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6
8	1	100						
10	2	100						
11	3	100						
12	2	100						
13	7	100						
14	10	100						
15	12	100						
16	20	100						
17	50	96	4					
18	31	100						
19	72	97	3					
20	26	100						
21	58	66	34					
22	52	42	58					
23	72	8	92					
24	99	6	88	6				
25				3	85	9	3	
26	75		72	16	12			
27	54		72	11	17			
28	60	7	60	13	20			
29	68		35	47	12	6		
30	21		14	57	29			
31	21		14	57	29			
32	6			67			33	
33	6		33	67				
34	4			50		50		
36	1					100		

Micropogonias undulatus

Seasonal age-length keys

SPRING 2005									
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
10	1	100							
11	28	29	43	14	14				
12	10	20	80						
13	16		88		13				
14	27		78	11	11				
15	14		100						
16	17		100						
17	63	5	86	10					
18	26		92	8					
19	22		55	45					
20	24		25	63	13				
21	21		43	29	29				
22	28		14	57	14	14			
23	12			50	25	25			
24	6				33	67			
25	1						100		
27	1			100					
28	1				100				
29	1				100				
36	1						100		
37	1								100

SUMMER 2005									
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
11	4	100							
12	10	100							
13	15	100							
14	44	86	14						
15	52	69	31						
16	38	63	37						
17	72	53	47						
18	75	16	80	4					
19	42		81	19					
20	36		44	56					
21	45		33	60	7				
22	51		29	53	18				
23	30		10	60	30				
24	15			60		20	20		

FALL 2005									
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
11	1	100							
12	5	100							
13	2	100							
14	24	92	8						
15	52	96	4						
16	72	94	6						
17	84	88	12						
18	68	85	15						
19	96	53	41	6					
20	93	45	52	3					
21	87	28	62	10					
22	68	24	41	24	12				
23	28	14	43	29	14				
24	8			75	25				
25	4		50				50		
26	1					100			

Appendix 3. Number of individuals and biomass (kg) for all species collected in 2005.

Rank	Species Name	Total Number	Total Weight
1	Leiostomus xanthurus	134208	8018.117
2	Micropogonias undulatus	111680	5703.330
3	Cynoscion regalis	45074	3897.721
4	Litopenaeus setiferus	35746	760.134
5	Opisthonema oglinum	33293	514.280
6	Anchoa hepsetus	32691	308.189
7	Stellifer lanceolatus	25701	556.936
8	Peprilus triacanthus	25142	931.970
9	Larimus fasciatus	23483	1747.387
10	Trichiurus lepturus	22418	610.981
11	Farfantepenaeus aztecus	19560	276.036
12	Lagodon rhomboides	16660	719.906
13	Menticirrhus americanus	16228	1638.798
14	Peprilus paru	15967	692.607
15	Selene setapinnis	14345	99.948
16	Chloroscombrus chrysurus	13993	355.463
17	Bairdiella chrysoura	12141	503.502
18	Lolliguncula brevis	11992	130.039
19	Cynoscion nothus	11927	523.952
20	Stenotomus sp.	11004	262.302
21	Prionotus carolinus	7964	104.789
22	Urophycis regius	5038	159.463
23	Pomatomus saltatrix	4463	338.931
24	Brevoortia tyrannus	3977	126.665
25	Orthopristis chrysoptera	3737	223.793
26	Synodus foetens	3706	333.835

Rank	Species Name	Total Number	Total Weight
27	Anchoa mitchilli	3632	6.267
28	Selene vomer	2363	42.521
29	Ovalipes stephensoni	2063	17.220
30	Mustelus canis	1977	3201.167
31	Raja eglanteria	1886	1955.198
32	Callinectes similis	1737	16.960
33	Rhizoprionodon terraenovae	1618	675.618
34	Scophthalmus aquosus	1518	34.352
35	Gymnura micrura	1509	1011.035
36	Scomberomorus maculatus	1341	129.837
37	Trinectes maculatus	1231	31.783
38	Loligo sp.	1127	20.171
39	Scomberomorus cavalla	1110	41.982
40	Portunus gibbesii	1090	9.600
41	Chaetodipterus faber	908	25.409
42	Ovalipes ocellatus	804	8.458
43	Paralichthys dentatus	762	121.116
44	Etropus crossotus	704	14.424
45	Dasyatis sayi	681	694.978
46	Myliobatis freminvillei	632	1583.646
47	Menticirrhus littoralis	606	137.227
48	Anchoa lyolepis	546	0.683
49	Sardinella aurita	541	7.360
50	Sphyraena guachancho	532	47.013
51	Decapterus punctatus	530	36.642
52	Libinia dubia	489	3.210
53	Etrumeus teres	479	1.568

Rank	Species Name	Total Number	Total Weight
54	Rhinoptera bonasus	461	2812.891
55	Sphoeroides maculatus	448	40.271
56	Ancylopsetta quadrocellata	447	16.588
57	Prionotus evolans	444	11.095
58	Prionotus scitulus	395	8.643
59	Sphyrna tiburo	392	746.937
60	Limulus polyphemus	389	257.500
61	Citharichthys macrops	369	5.831
62	Chilomycterus schoepfi	355	95.726
63	Arenaeus cribrarius	328	5.819
64	Harengula jaguana	280	8.601
65	Trachinotus carolinus	279	43.034
66	Eucinostomus sp.	270	6.183
67	Squilla empusa	257	4.841
68	Symphurus plagiusa	222	7.298
69	Squilla neglecta	209	2.627
70	Callinectes sapidus	199	25.261
71	Portunus spinimanus	182	2.694
72	Libinia emarginata	180	5.706
73	Cancer irroratus	175	0.722
74	Centropristis striata	135	9.305
75	Xiphopenaeus kroyeri	127	0.767
76	Caranx hippos	119	7.483
77	Farfantepenaeus duorarum	118	2.158
78	Paralichthys lethostigma	116	52.414
79	Dasyatis sabina	114	48.568
80	Prionotus tribulus	110	3.760
81	Caranx crysos	108	5.262

Rank	Species Name	Total Number	Total Weight
82	Dasyatis centroura	105	985.359
83	Squalus acanthias	104	172.049
84	Pagurus pollicaris	98	3.878
85	Gymnura altavela	95	1135.494
86	Stephanolepis hispidus	86	0.778
87	Hepatus epheliticus	74	2.084
88	Etropus cyclosquamus	70	0.637
89	Bagre marinus	68	7.140
90	Dasyatis americana	63	53.507
91	Centropristis philadelphica	58	2.121
92	Rimapenaeus constrictus	56	0.277
93	Crangon septemspinosa	52	0.190
94	Menippe mercenaria	49	7.408
95	Prionotus salmonicolor	47	0.758
96	Persephona mediterranea	46	0.508
97	Citharichthys spilopterus	44	0.628
98	Echeneis naucrates	42	6.448
99	Oligoplites saurus	31	1.618
100	Pogonias cromis	29	2.972
101	Caretta caretta	28	1240.850
102	Syacium papillosum	28	0.418
103	Archosargus probatocephalus	27	67.968
104	Sphyrna lewini	26	27.239
105	Paralichthys albigutta	25	7.111
106	Trachurus lathami	24	0.414
107	Pilumnus sayi	22	0.276
108	Haemulon aurolineatum	21	0.370
109	Rachycentron canadum	20	22.831

Rank	Species Name	Total Number	Total Weight
110	Carcharhinus brevipinna	19	124.821
111	Astroscopus guttatus	18	0.057
112	Portunus sayi	17	0.121
113	Aetobatus narinari	15	102.440
114	Diapterus olisthostomus	15	0.205
115	Lutjanus griseus	14	0.255
116	Neopanope sayi	14	0.065
117	Callinectes ornatus	13	0.235
118	Hippocampus erectus	13	0.110
119	Hypleurochilus geminatus	12	0.017
120	Umbrina coroides	10	0.343
121	Sphyraena borealis	10	0.157
122	Carcharhinus acronotus	9	98.780
123	Elops saurus	9	1.531
124	Octopus vulgaris	9	1.489
125	Ophichthus gomesi	9	0.270
126	Carcharhinus limbatus	7	54.780
127	Porichthys plectrodon	7	0.298
128	Syngnathus louisianae	7	0.080
129	Odontaspis taurus	6	418.170
130	Lepidochelys kempi	6	82.980
131	Alosa aestivalis	6	0.108
132	Diplectrum formosum	5	0.162
133	Mobula hypostoma	4	107.530
134	Arius felis	4	0.480
135	Alopias vulpinus	3	48.810
136	Strongylura marina	3	2.263
137	Brevoortia smithi	3	1.036

Rank	Species Name	Total Number	Total Weight
138	Scorpaena brasiliensis	3	0.102
139	Lutjanus synagris	3	0.092
140	Upeneus parvus	3	0.054
141	Dermochelys coriacea	2	320.000
142	Ginglymostoma cirratum	2	145.000
143	Carcharhinus isodon	2	6.370
144	Leucoraja ocellata	2	4.400
145	Narcine brasiliensis	2	1.230
146	Menticirrhus saxatilis	2	0.676
147	Cynoscion nebulosus	1	0.344
148	Acanthostracion quadricornis	2	0.303
149	Calappa flammea	2	0.300
150	Pagurus impressus	2	0.231
151	Urophycis floridanus	2	0.141
152	Mugil curema	2	0.063
153	Aluterus schoepfi	2	0.029
154	Lagocephalus laevigatus	2	0.025
155	Membras martinica	2	0.018
156	Ogcocephalus rostellum	2	0.013
157	Dactylopterus volitans	2	0.011
158	Pagurus longicarpus	2	0.007
159	Acipenser oxyrhynchus	1	20.950
160	Carcharhinus plumbeus	1	6.480
161	Chelonia mydas	1	4.270
162	Galeocerdo cuvieri	1	1.730
163	Calamus leucosteus	1	0.910
164	Opsanus tau	1	0.107
165	Rhinobatos lentiginosus	1	0.083

Rank	Species Name	Total Number	Total Weight
166	Lutjanus analis	1	0.046
167	Astroscopus y-graecum	1	0.036
168	Paralichthys squamilentus	1	0.034
169	Fistularia tabacaria	1	0.028
170	Scomber japonicus	1	0.013
171	Lutjanus campechanus	1	0.005
172	Pilumnus floridanus	1	0.005
173	Panopeus herbstii	1	0.002
174	Coronis scolopendra	1	0.002
175	Gobiosoma bosci	1	0.001