SEAMAP-SA

RESULTS OF TRAWLING EFFORTS IN THE COASTAL HABITAT OF THE SOUTH ATLANTIC BIGHT, 2003

Prepared By

SEAMAP - SA Shallow Water Trawl Survey

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This report was funded by a grant from the National Oceanic and Atmospheric Administration. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its sub-agencies.

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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 fourteen years (1990-2003) 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 (early April - mid-May), summer (mid-July - early August), and fall (October - mid-November).

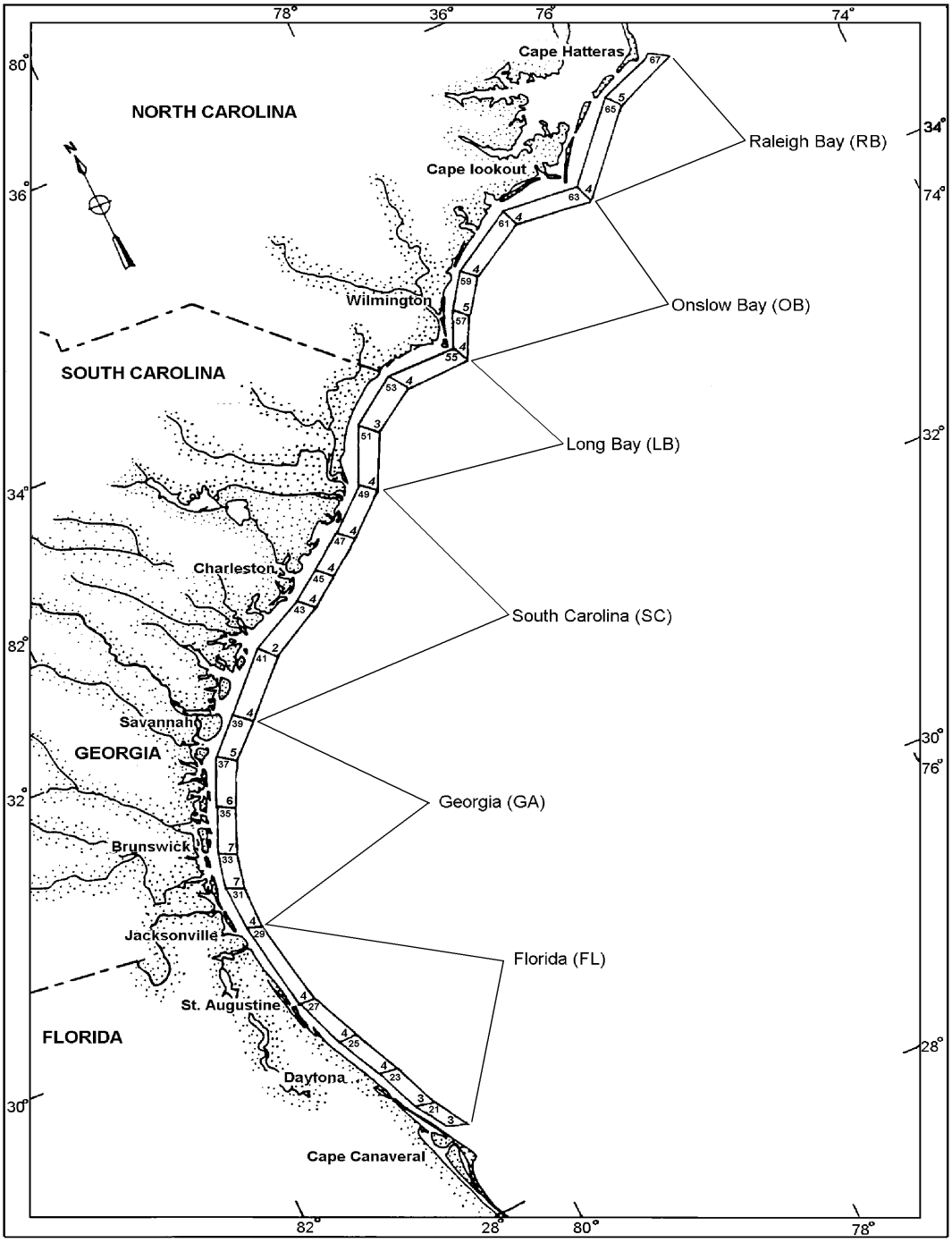

Figure 1. Strata sampled by the SEAMAP-SA Shallow Water Trawl Survey in 2003. Stratum number is indicated at the top of each rectangle and number of trawls towed is located in the lower portion of each stratum. (Strata are not drawn to scale.)

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 (Table 1), 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 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). Contents of each net were sorted separately to species (or genus in a few cases), 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 (excluding cannonball jellies) 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 trawl catches where visual estimation of weight of total catch per trawl exceeded 500 kg, 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. Depending on the species, measurements were recorded as total length, fork length, or carapace width.

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 and length 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 and 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.

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.

Water temperatures were considerably colder in Summer 2003 than during previous summer cruises. These cold water temperatures were most notable in Florida waters (Table 1) and may be associated with an upwelling event caused by unusually high freshwater runoff due to unusually high precipitation. Runoff was accompanied by compensatory onshore intrusion of cold and dense upwelled waters near the bottom, and southerly, upwelling-favorable winds facilitated the offshore spreading of the low-salinity water near surface, and thus increased shoreward advection of the cold upwelled water (pers. comm., O. Pashuk, MRRI/SCDNR).

Table 1. Seasonal mean bottom temperatures (°C) and salinities (‰) from each region for 2003. 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	14.1	16.4	16.1	19.4	21.2	21.6	19.0
$\bar{x}$ Salinity	31.9	34.4	33.6	31.7	29.7	33.3	32.1
SUMMER							
$\bar{x}$ Temperature	22.6	22.7	23.9	24.5	24.5	18.6	22.9
$\bar{x}$ Salinity	36.2	36.2	35.8	35.6	35.5	36.1	35.8
FALL							
$\bar{x}$ Temperature	23.1	22.8	22.6	22.4	23.7	25.9	23.5
$\bar{x}$ Salinity	31.7	34.9	34.8	34.0	32.9	33.7	33.6
ALL SEASONS							
$\bar{x}$ Temperature	19.9	20.6	20.8	22.1	23.1	22.0	21.8
$\bar{x}$ Salinity	33.3	35.2	34.7	33.8	32.7	34.3	33.8

Species Composition

The 2003 sampling effort resulted in the collection of 181 species (Appendix 3). Trawls produced 112 species of finfish, 28 species of elasmobranchs, 32 species of decapod crustaceans, 2 species of stomatopod crustaceans, 3 genera of cephalopods, 3 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 spring. Summer, the season of peak abundance, produced the fewest species. Regionally, the greatest number of species was found in Onslow Bay and in waters off Georgia, 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	27	89	39665	4250.6	397.4	42.6
ONSLOW BAY	51	118	108794	8240.9	538.7	40.8
LONG BAY	33	120	43383	3479.9	331.0	26.6
S. CAROLINA	54	117	78351	5247.3	366.0	25.5
GEORGIA	87	126	76346	5821.0	253.8	19.4
FLORIDA	54	127	116351	9064.2	594.9	46.3
Season						
SPRING	102	137	141195	18616.2	370.7	37.5
SUMMER	102	132	204848	14111.4	537.1	32.2
FALL	102	140	113847	12082.9	305.2	25.5

Abundance, Biomass, and Density Estimates

The 2003 SEAMAP-South Atlantic Shallow Water Trawl Survey caught 459,890 individuals (CV=2.6; 1503 individuals/tow), with a biomass of 36,104 kg (118.0 kg/tow). Miscellaneous invertebrates, cannonball jellies, and algae contributed an additional 18,246 kg of biomass. The overall density of individuals (405 individuals/ha) in 2003 (excluding cannonball jellies) represents the highest abundance since 1992 (Figure 2). This increase was accompanied by a decrease in variability.

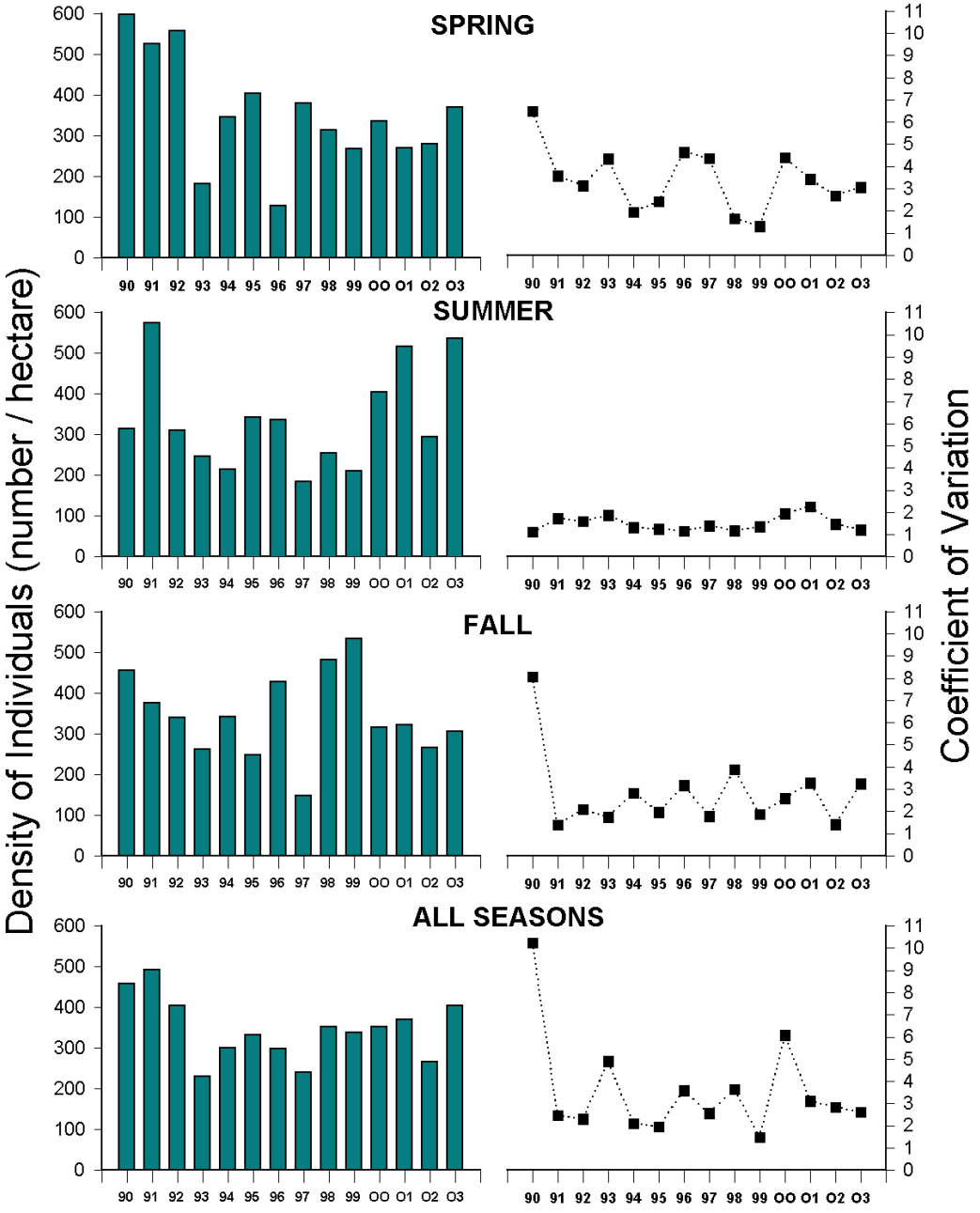

Figure 2. Annual and seasonal densities of abundance from inner strata.

In 2003, densities of individuals were highest in summer (Figure 2), whereas densities of biomass peaked in spring collections (Table 2). The highest regional densities of individuals and biomass occurred off Florida, reflecting relatively large catches of sciaenids. 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 38% of the total catch during the 2003 survey. *Leiostomus xanthurus* ranked first in both abundance and biomass, followed by *Micropogonias undulatus* (Table 3). Other species of numerical importance included the silver seatrout, *Cynoscion nothus*; the banded drum, *Larimus fasciatus*; the butterfish, *Peprilus triacanthus*; and the pinfish, *Lagodon rhomboides*.

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 2003.

	All	Region						Season		
	Strata	**RB**	**OB**	**LB**	**SC**	**GA**	**FL**	**SPR**	**SUM**	**FAL**
Abundance										
Leiostomus xanthurus	93.0	131.2	118.8	80.1	143.2	47.6	78.5	111.4	136.0	30.3
Micropogonias undulatus	59.4	23.6	147.2	39.7	29.2	21.4	98.9	37.1	88.9	52.2
Cynoscion nothus	22.3	0	0.5	1.6	0.9	6.5	116.5	1.4	60.4	4.8
Larimus fasciatus	19.8	8.8	9.6	6.6	15.2	20.2	47.8	13.8	28.1	17.5
Peprilus triacanthus	19.1	19.2	15.6	69.9	19.4	8.4	9.2	42.5	9.0	5.6
Lagodon rhomboides	18.0	10.1	64.1	32.7	13.7	0.4	1.6	14.5	21.4	18.2
Biomass										
Leiostomus xanthurus	4.2	3.3	5.1	3.5	5.6	3.3	4.5	5.5	5.4	1.7
Micropogonias undulatus	4.0	1.5	10.1	2.3	2.3	1.8	5.8	2.8	5.3	3.9
Rhinoptera bonasus	2.8	2.0	8.9	1.3	4.9	0.2	0.07	6.9	0.01	1.4
Cynoscion nothus	2.4	0	0.08	0.2	0.08	0.8	12.5	0.02	6.6	0.7
Mustelus canis	1.8	17.3	1.5	0.3	0.005	0	0	. 5.4	0.003	0.004
Larimus fasciatus	1.6	0.5	1.0	0.7	1.3	1.6	3.8	1.1	2.4	1.3

Distribution and Abundance of Priority Finfish Species

Archosargus probatocephalus

The sheepshead, *Archosargus probatocephalus*, exhibited a decrease in abundance in 2003. Catches of sheepshead peaked in 1992 and dropped to the lowest level in 2003 (Figure 4). Only 7 sheepshead (CV=9.7; 0.006 individuals/ha), weighing a total of 20 kg, were taken in 2003. Sheepshead were taken only in spring and fall in 2003 and were most abundant in Onslow Bay in spring (Table 4). Lengths ranged from 39-51 cm ($\bar{x}$ = 48.1).

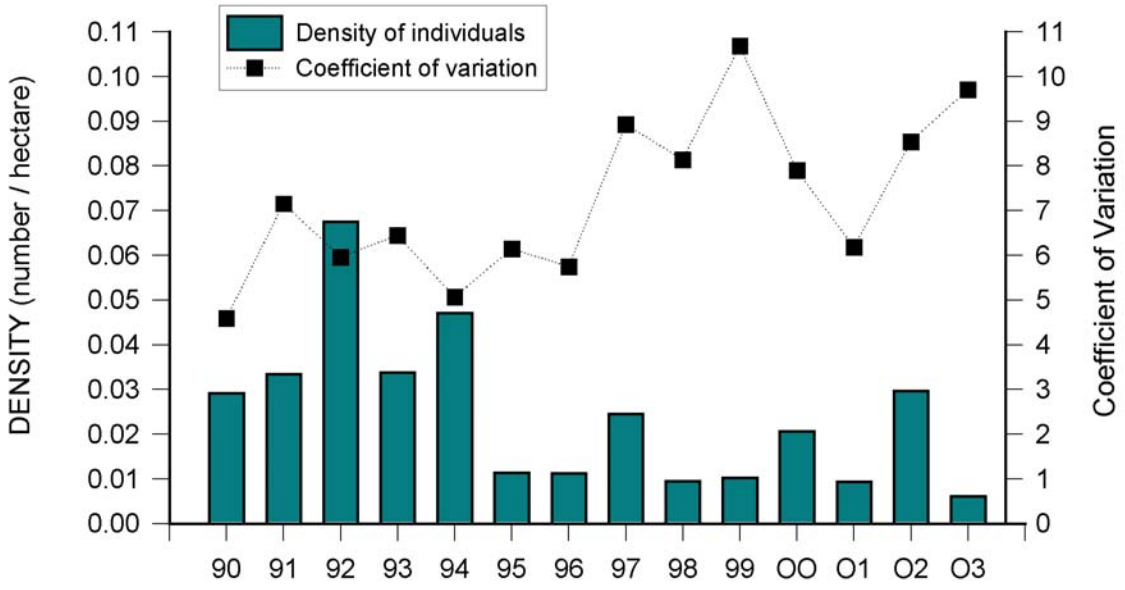

Figure 3. Annual densities of *Archosargus probatocephalus*

Table 4 . Estimates of density (number of individuals/hectare) in 2003.

Archosargus probatocephalus

	Spring	Summer	Fall	
Raleigh Bay	0	0	0	0
Onslow Bay	0.08	0	0.02	0.03
Long Bay	0	0	0.02	0.008
South Carolina	0	0	0	0
Georgia	0	0	0	0
Florida	0	0	0	0
Season	0.001	0	0.005	0.006

Brevoortia smithi

A total of only 19 yellowfin menhaden (CV=7.0; 0.02 individuals/ha), weighing 5.0 kg, were collected by the SEAMAP-SA Shallow Water Trawl Survey in 2003. 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 2003, all yellowfin menhaden were caught in waters off Florida in spring and fall (Table 5). Fork lengths of *B. smithi* ranged from 22 to 28cm ($\bar{x}$ = 24.5).

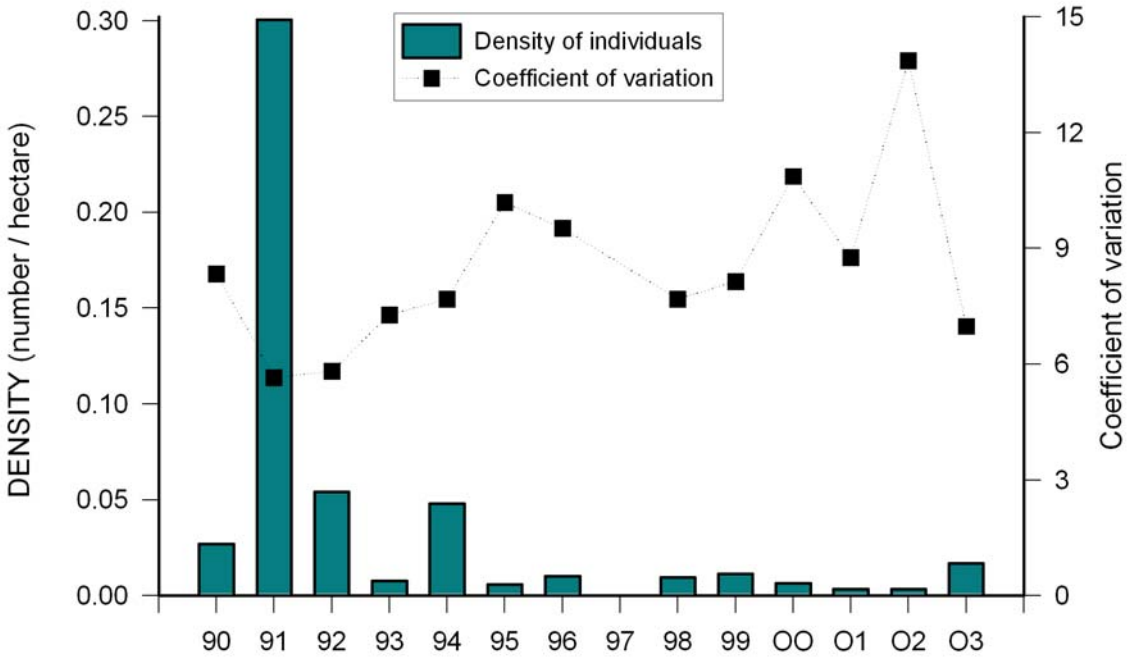

Figure 4. Annual densities of *Brevoortia smithi*

Table 5 . Estimates of density (number of individuals/hectare) in 2003.

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	0.1	0	0.2	0.1
Season	0.02	0	0.03	0.02

Brevoortia tyrannus

A total of 850 Atlantic menhaden (CV=6.6; 0.7 individuals/ha), weighing 41 kg (0.04 kg/ha), were taken in SEAMAP-SA trawls. Density of individuals was at the highest level in the history of the survey in 1990 (Figure 5), with much lower abundance observed during the subsequent thirteen years. In 2003, density was greatest in spring and in Onslow Bay (Table 6).

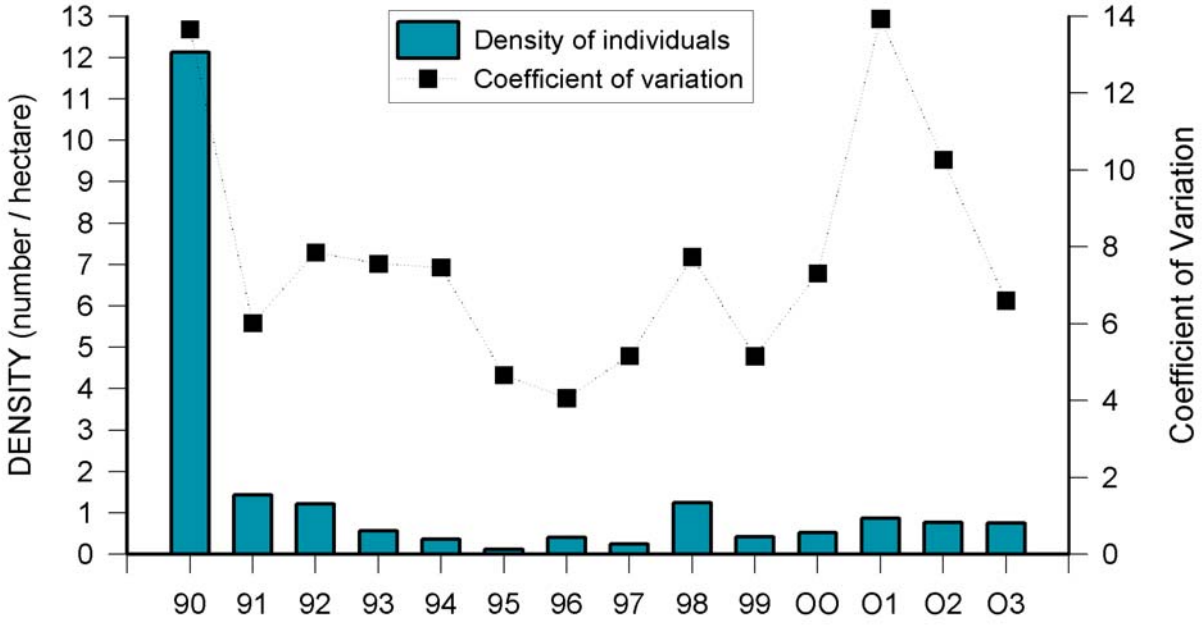

Figure 5. Annual densities of *Brevoortia tyrannus*

Table 6 . Estimates of density (number of individuals/hectare) in 2003.

Brevoortia tyrannus

	Spring	Summer	Fall	Region
Raleigh Bay	0.4	0.4	1.2	0.7
Onslow Bay	6.0	0.2	0.02	2.0
Long Bay	0.2	0.1	0	0.09
South Carolina	0.7	0	0	0.2
Georgia	2.6	0.05	0.3	1.0
Florida	0.08	0.03	0.03	0.05
Season	2.0	0.09	0.2	0.8

Fork lengths of *Brevoortia tyrannus* ranged from 9 to 20 cm ($\bar{x}$ = 14.2). Length was not found to be significantly different among seasons ($X^2 = 4$, $p > 0.1$), although mean length did increase from spring to fall, an indication of juvenile growth (Figure 6). Length did vary significantly among regions ($X^2 = 75$, $p < 0.0001$). The mean length of Atlantic menhaden was greatest in collections in Long Bay and in waters off Florida, 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.

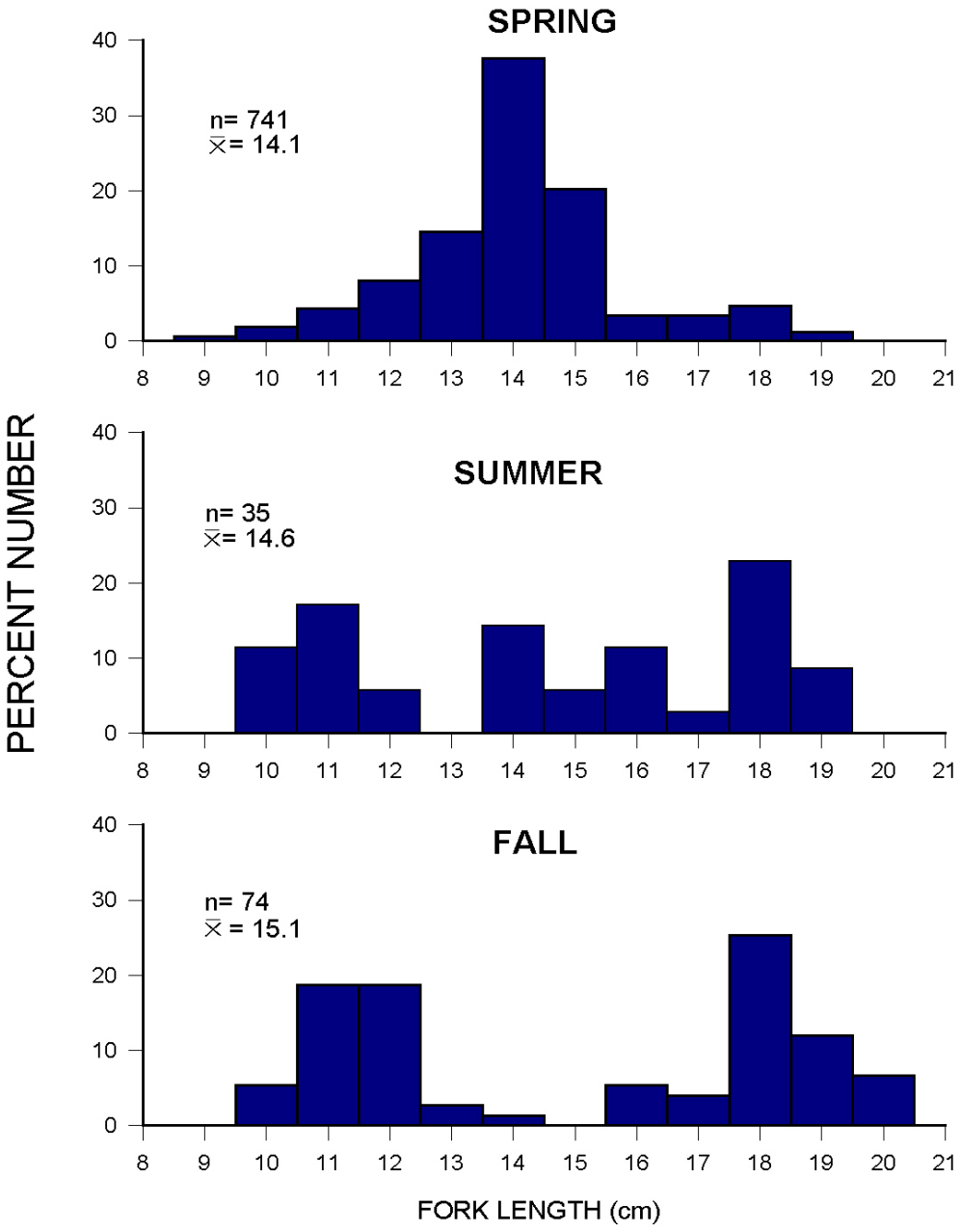

Figure 6. Seasonal length-frequencies of *Brevoortia tyrannus* in 2003.

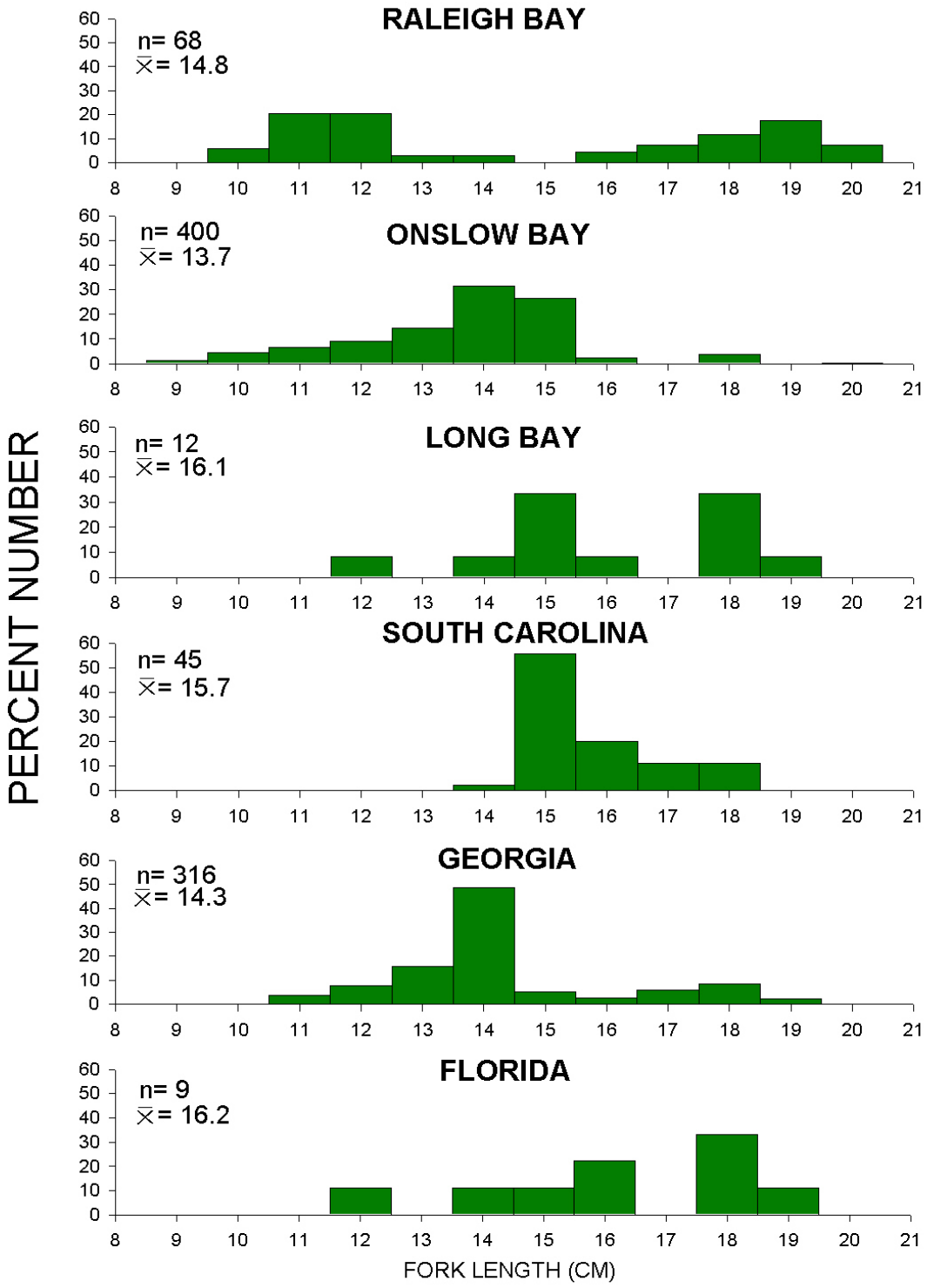

Figure 7. Regional length-frequencies of *Brevoortia tyrannus* in 2003

Centropristis striata

A total of 95 black sea bass (CV=9.3; 0.08 individuals/ha), weighing 5 kg (0.004 kg/ha), were collected in 2003. The density of abundance in 2003 represented a slight increase over the record low density observed in 2002 (Figure 8). Black sea bass were taken in all regions; however, density was greatest in Onslow Bay (Table 7). Total lengths of *Centropristis striata* ranged from 8 to 26 cm ($\bar{x}$ = 14.3).

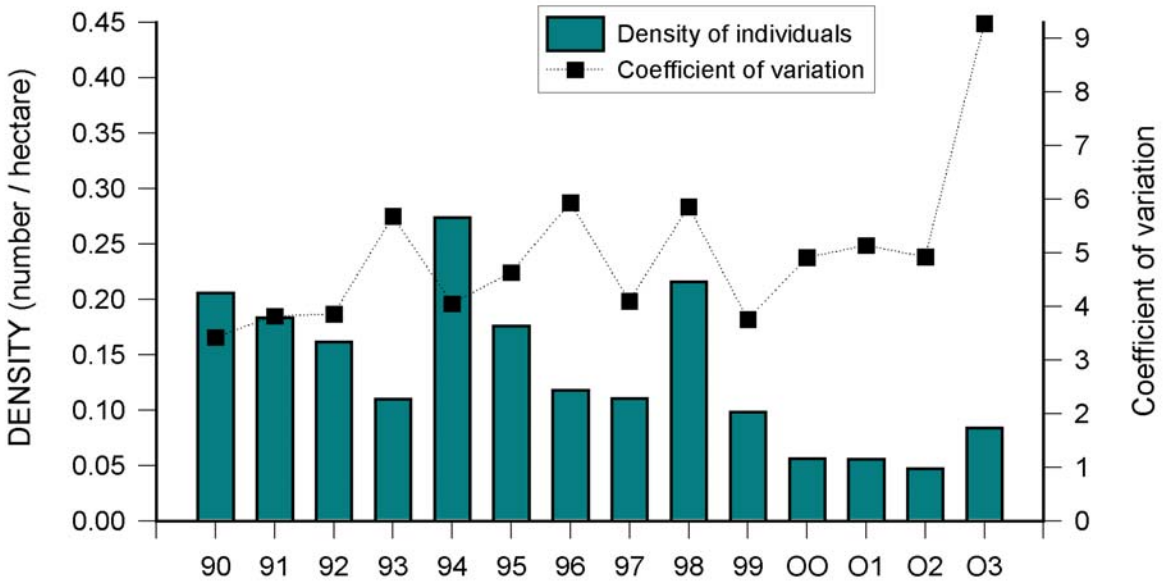

Figure 8. Annual densities of *Centropristis striata*

Table 7 . Estimates of density (number of individuals/hectare) in 2003.

Centropristis striata

	Spring	Summer	Fall	Region
Raleigh Bay	0	0.03	0	0.01
Onslow Bay	0	0.7	0.05	0.2
Long Bay	0.1	0	0.2	0.08
South Carolina	0	0.06	0.03	0.03
Georgia	0	0.02	0	0.007
Florida	0.02	0.4	0.07	0.2
Season	0.01	0.2	0.04	0.08

Chaetodipterus faber

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 1,045 Atlantic spadefish (CV=8.8; 0.9 individuals/ha), weighing 77 kg (0.07 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 decreased slightly from 2002 to 2003. Density was greatest in summer and fall (Table 8). Atlantic spadefish were most abundant in waters off South Carolina and Georgia. Total lengths of *Chaetodipterus faber* ranged from 6 to 19 cm ($\bar{x}$ = 11.2).

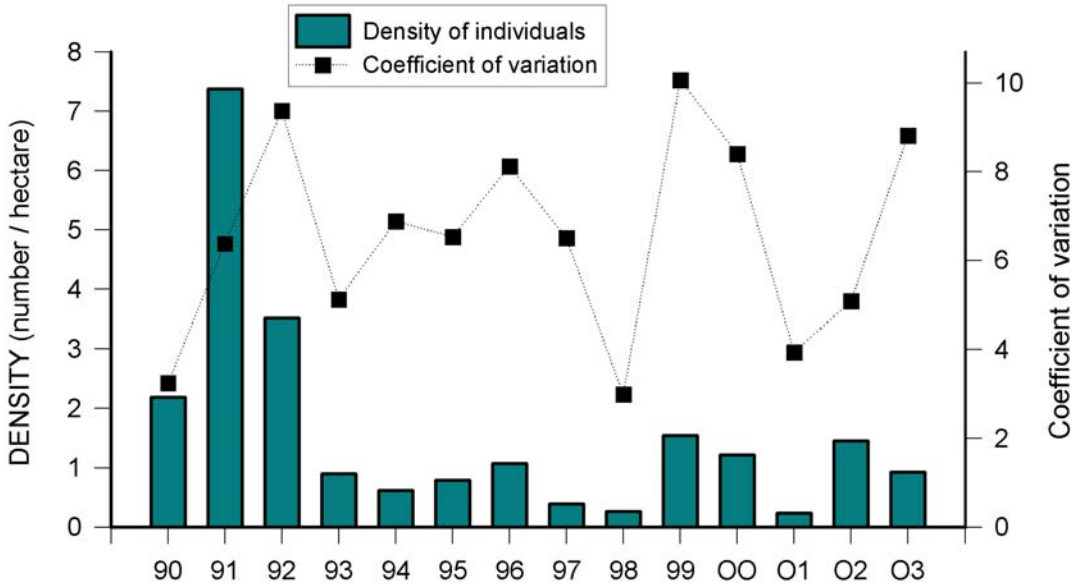

Figure 9. Annual densities of *Chaetodipterus faber*

Table 8 . Estimates of density (number of individuals/hectare) in 2003.

Chaetodipterus faber

	Spring	Summer	Fall	Region
Raleigh Bay	0.03	0	0	0.01
Onslow Bay	0	0.4	0.1	0.2
Long Bay	0	0.05	0.02	0.02
South Carolina	0	0.3	4.4	1.6
Georgia	0.2	4.0	1.6	2.0
Florida	1.0	0	0.1	0.4
Season	0.2	1.2	1.3	0.9

Cynoscion nebulosus

The spotted seatrout, *Cynoscion nebulosus*, has been a rare species in SEAMAP-SA Shallow Water Trawl Survey collections (Figure 10). In the history of the trawl survey only nine specimens have been collected, all in shallow strata. No spotted seatrout were collected in 2003.

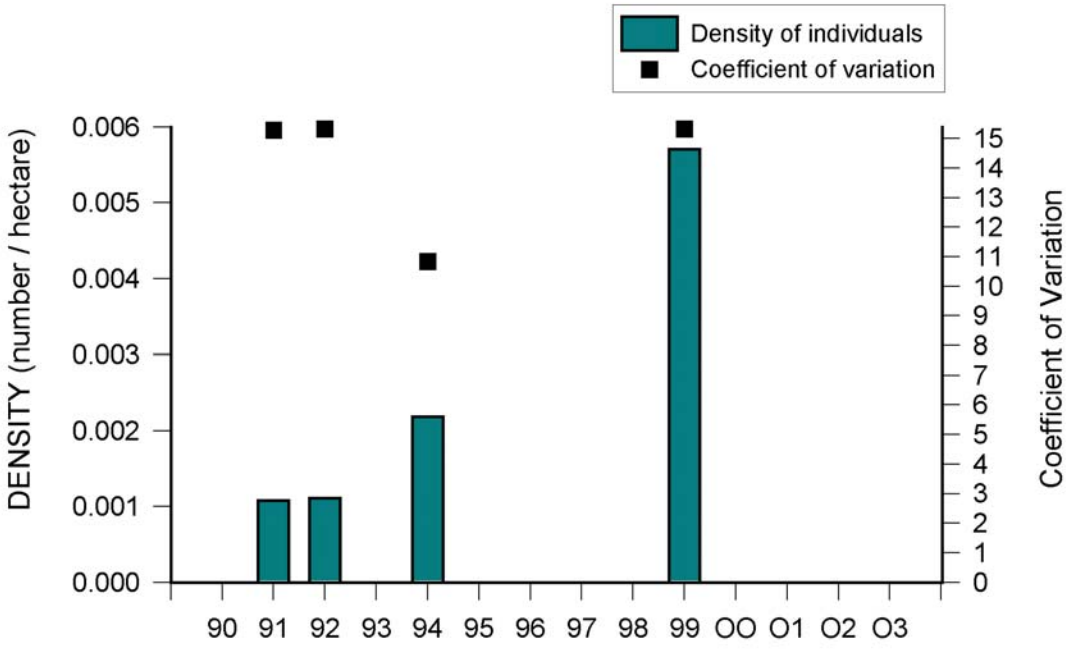

Figure 10. Annual densities of *Cynoscion nebulosus*

Cynoscion regalis

In 2003, SEAMAP strata yielded a total of 8,700 weakfish (CV=3.8; 7.7 individuals/ha), weighing 640 kg (0.6 kg/ha). The density of abundance in 2003, exceeded only in 1993 and 1998, represented an increase from the record low annual density taken in 2002 (Figure 11). In 2003, density was greatest in spring and decreased in subsequent seasons (Table 9). Weakfish were most abundant in the northern portion of the SAB, with greatest density of individuals found in Raleigh Bay.

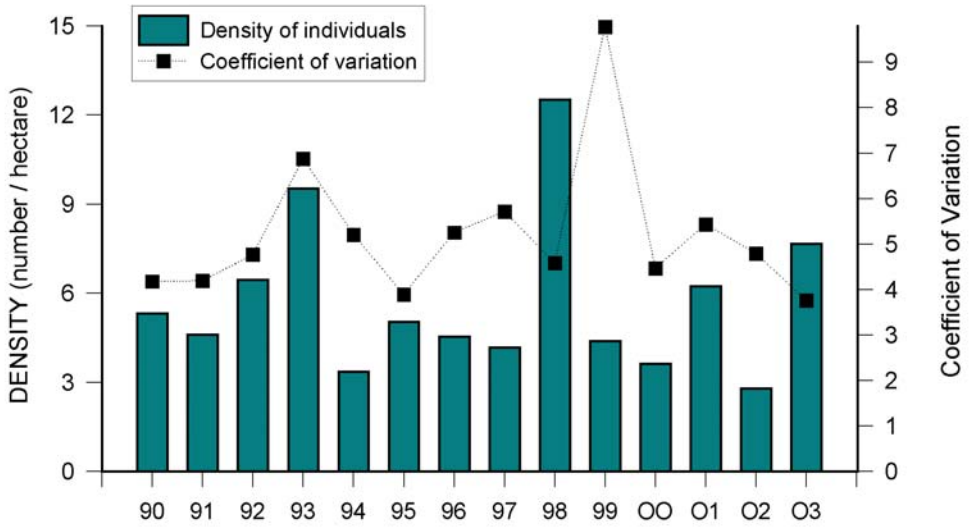

Figure 11. Annual densities of *Cynoscion regalis*

Table 9 . Estimates of density (number of individuals/hectare) in 2003.

Cynoscion regalis

	Spring	Summer	Fall	Region
Raleigh Bay	84.3	17.7	26.5	42.3
Onslow Bay	13.3	13.7	2.2	9.2
Long Bay	5.4	11.1	1.3	5.4
South Carolina	2.1	2.8	1.4	2.1
Georgia	4.3	0.3	4.2	3.1
Florida	5.6	1.1	1.3	2.7
Season	12.6	5.8	4.6	7.7

A total of 676 otolith (spring=258, summer=202, fall=216) and 80 gonad samples from weakfish were taken in 2003. The majority of the southern kingfish sampled were ages 0 (34%) and 1 (60%), followed by age 2 (6%), age 3 (<1%), and age 4 specimens (<1%). Weakfish collected in SEAMAP trawl samples ranged from 82 to 293 mm TL for age 0 fish, 126 to 347 mm TL for age 1, 204 to 320 mm TL for age 2, 256 to 346 mm TL for age 3 individuals, and 299 to 359 mm TL for age 4 individuals. No specimens older than age 4 were taken in SEAMAP trawl samples.

Total lengths of *Cynoscion regalis* ranged from 7 to 36 cm ($\bar{x}$ = 19.3). Length was significantly different among seasons ($X^2 = 590$, $p < 0.0001$). Mean length increased from spring to summer as the result of subsequent juvenile growth , and decreased from summer to fall, indicating the recruitment of YOY individuals (Figure 12). The percentage of age 0 fish increased seasonally from none in spring to 66% of the weakfish sampled in fall. The spring length-frequency distribution comprised mostly age 1 fish (89%). The inclusion of smaller specimens in summer collections resulted in a length-frequency distribution representing mostly age 1 fish that were spawned late and age 0 specimens.

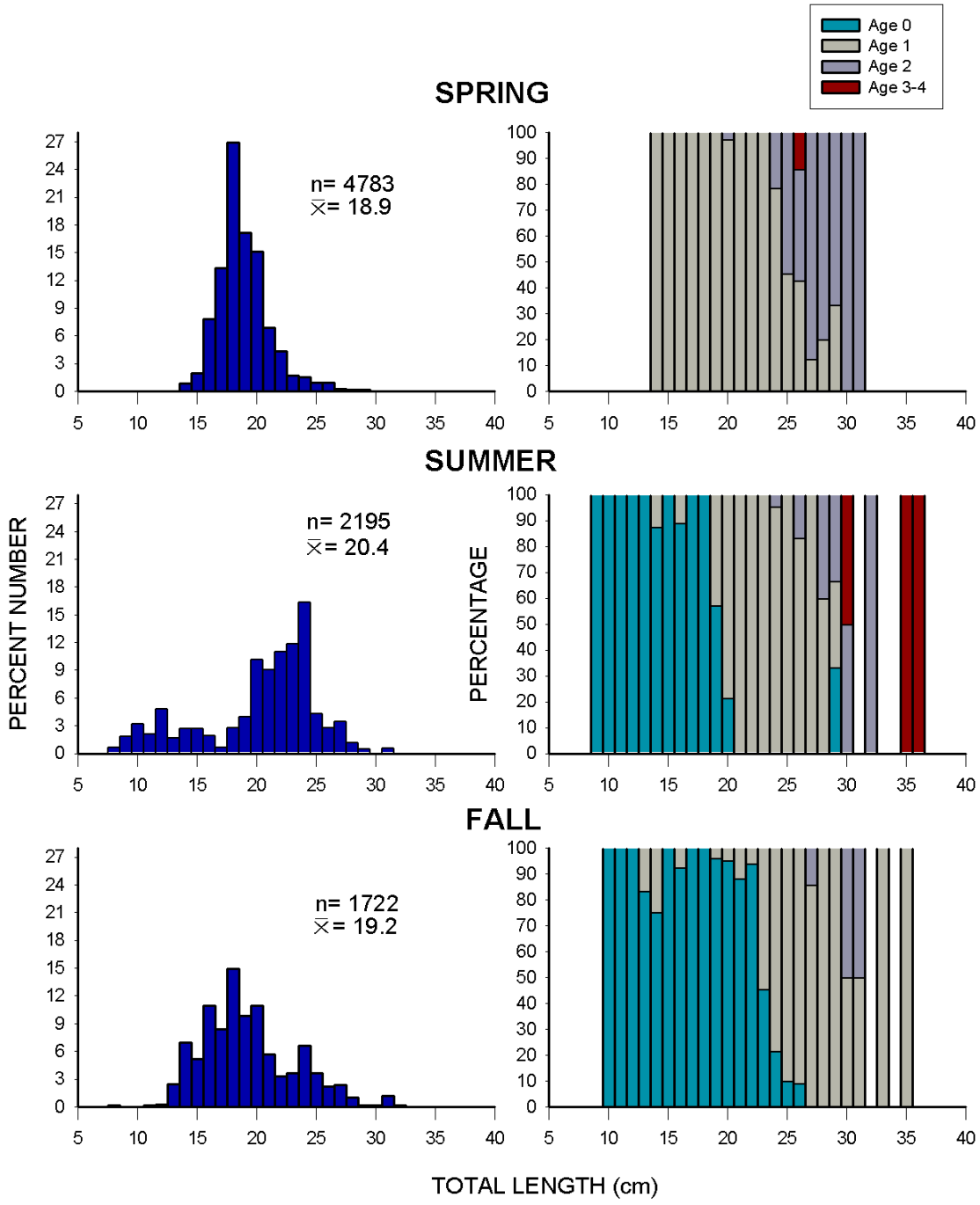

Figure 12. Seasonal length-frequencies and age composition of *Cynoscion regalis* in 2003.

Mean length also varied significantly among regions ($X^2 = 1223$, $p < 0.0001$), with larger mean lengths occurring off Florida (Figure 13). In all regions, the majority of specimens caught in spring were determined to be age 1, and in summer most individuals were age 0 and 1. Fall catches were dominated by age 0 in all regions.

Age composition was very similar among male and female weakfish. More than 70% (spring: 74%, summer: 72%, fall: 50%) of the individuals sampled were female. Approximately 82% (spring: 97%, summer: 76%, fall: 33%) of the females had developing or mature ovaries, whereas only 71% of male weakfish were reproductively mature (spring: 100%, summer: 75%, fall: 16%) .

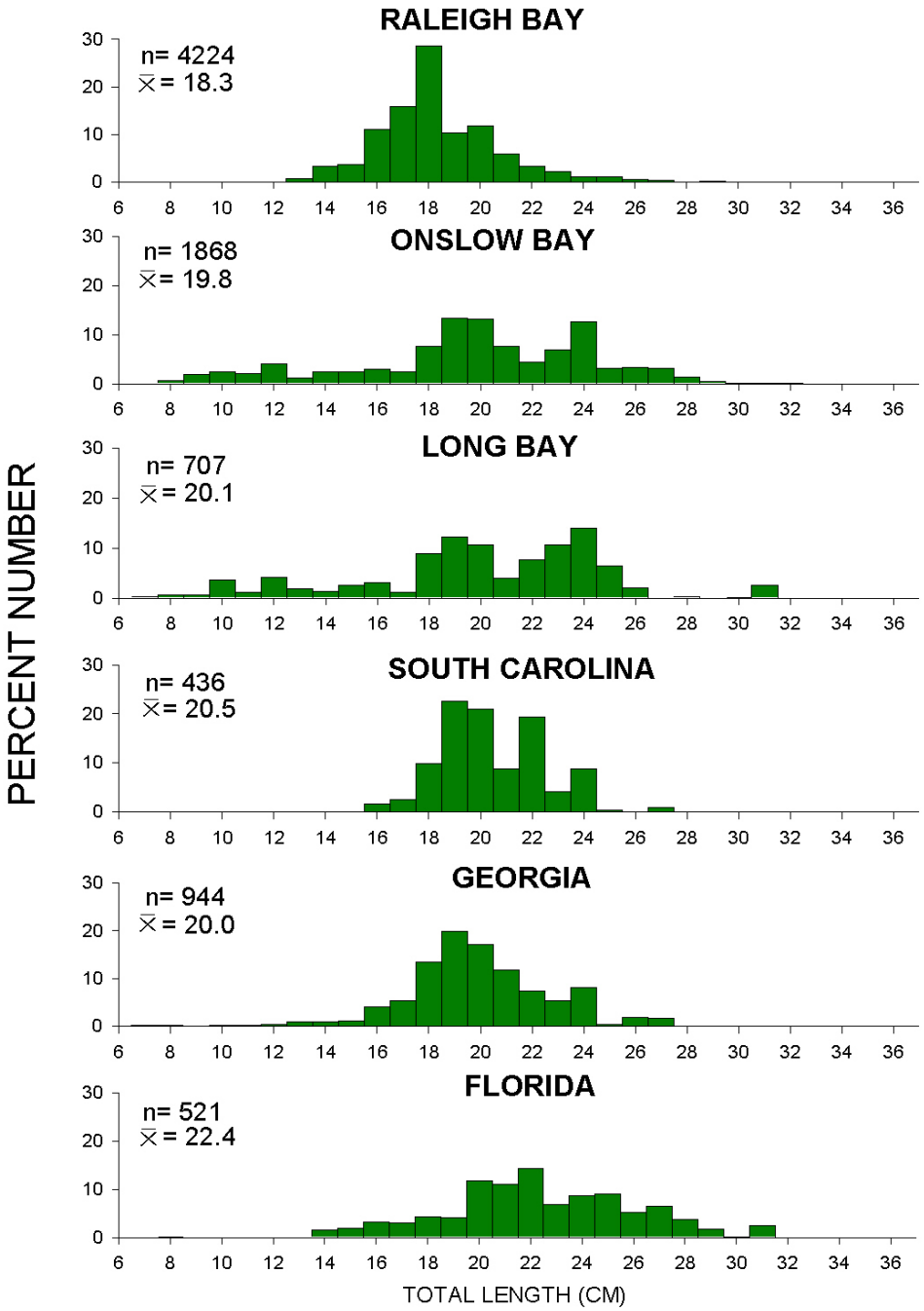

Figure 13. Regional length-frequencies of *Cynoscion regalis* in 2003

Leiostomus xanthurus

Leiostomus xanthurus was the most abundant species collected by SEAMAP-SA Shallow Water Trawl Survey in 2003. The 105,575 (CV=4.2; 93.0 individuals/ha) spot collected weighed 4,788 (4.2 kg/ha) and constituted 23% of the total number of individuals taken in SEAMAP trawls in 2003. Density of individuals was at the highest level observed since 1995 (Figure 14). In 2003, the greatest seasonal density of abundance occurred in summer (Table 10). The greatest regional densities were observed in the Raleigh Bay and in waters off South Carolina.

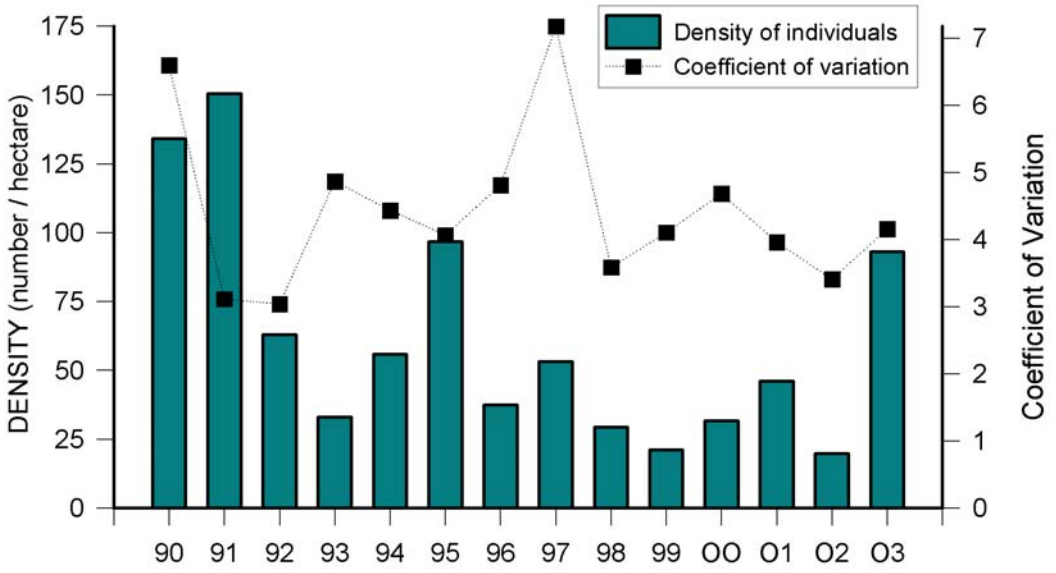

Figure 14. Annual densities of *Leiostomus xanthurus*

Table 10 . Estimates of density (number of individuals/hectare) in 2003.

Leiostomus xanthurus

	Spring	Summer	Fall	Region
Raleigh Bay	10.0	377.5	6.4	131.2
Onslow Bay	69.4	274.0	12.5	112.2
Long Bay	21.3	53.4	163.7	73..4
South Carolina	341.6	74.3	12.8	143.2
Georgia	105.7	17.8	17.6	51.2
Florida	25.7	184.9	14.9	78.5
Season	111.4	136.0	30.3	93.0

Fork lengths of spot from the SEAMAP-SA survey ranged from 7 to 25 cm, with a mean length of 14.0 cm. Lengths varied significantly among seasons ($X^2 = 13252$, $p < 0.0001$). 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 ($X^2 = 26897$, $p < 0.0001$). The mean length of spot was greatest in Long Bay and in waters off Georgia (Figure 16). The length-frequency distribution of spot represents primarily specimens captured during the summer cruises in all regions, except Long Bay, South Carolina and Georgia.

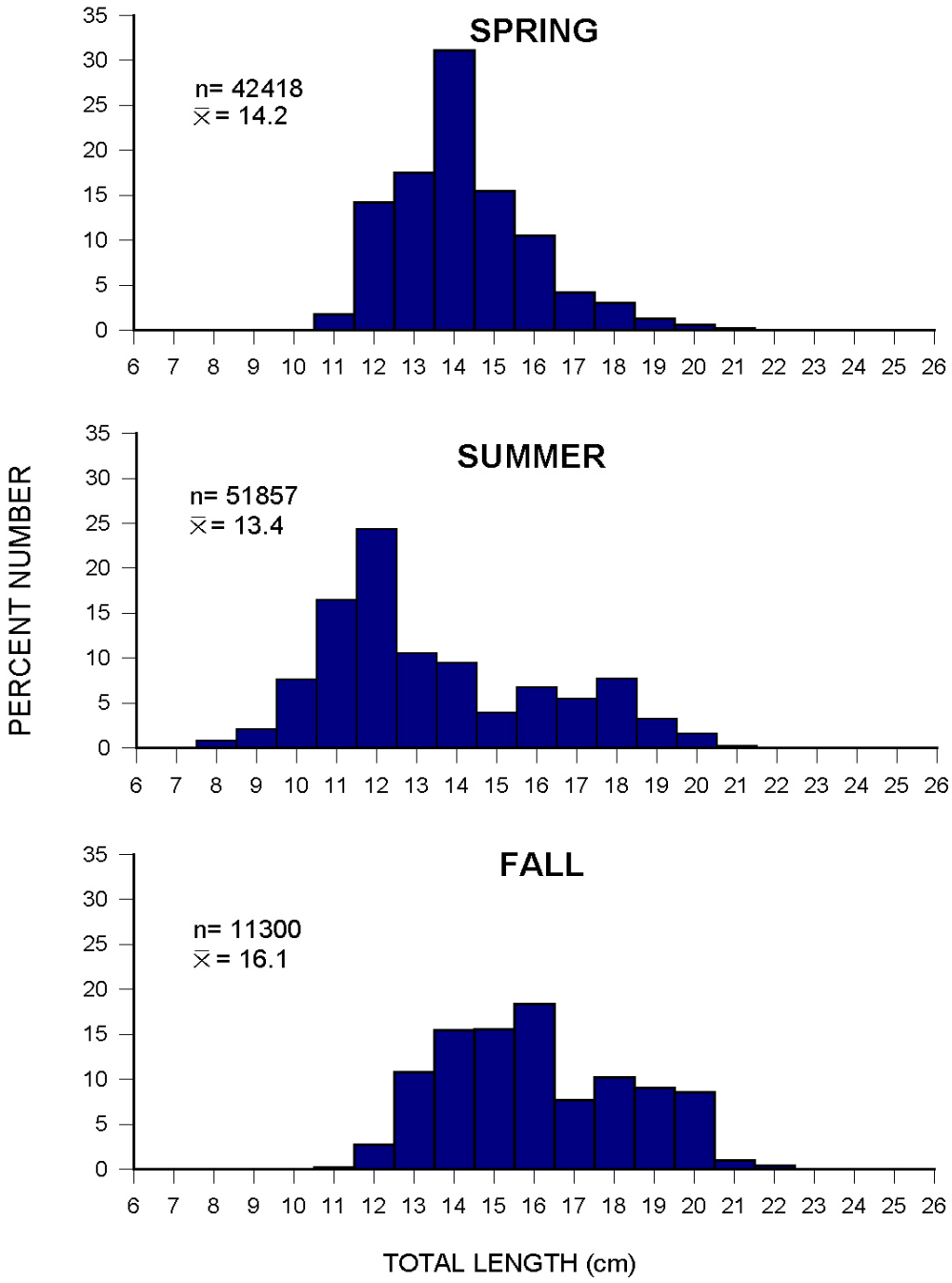

Figure 15. Seasonal length-frequencies of *Leiostomus xanthurus* in 2003

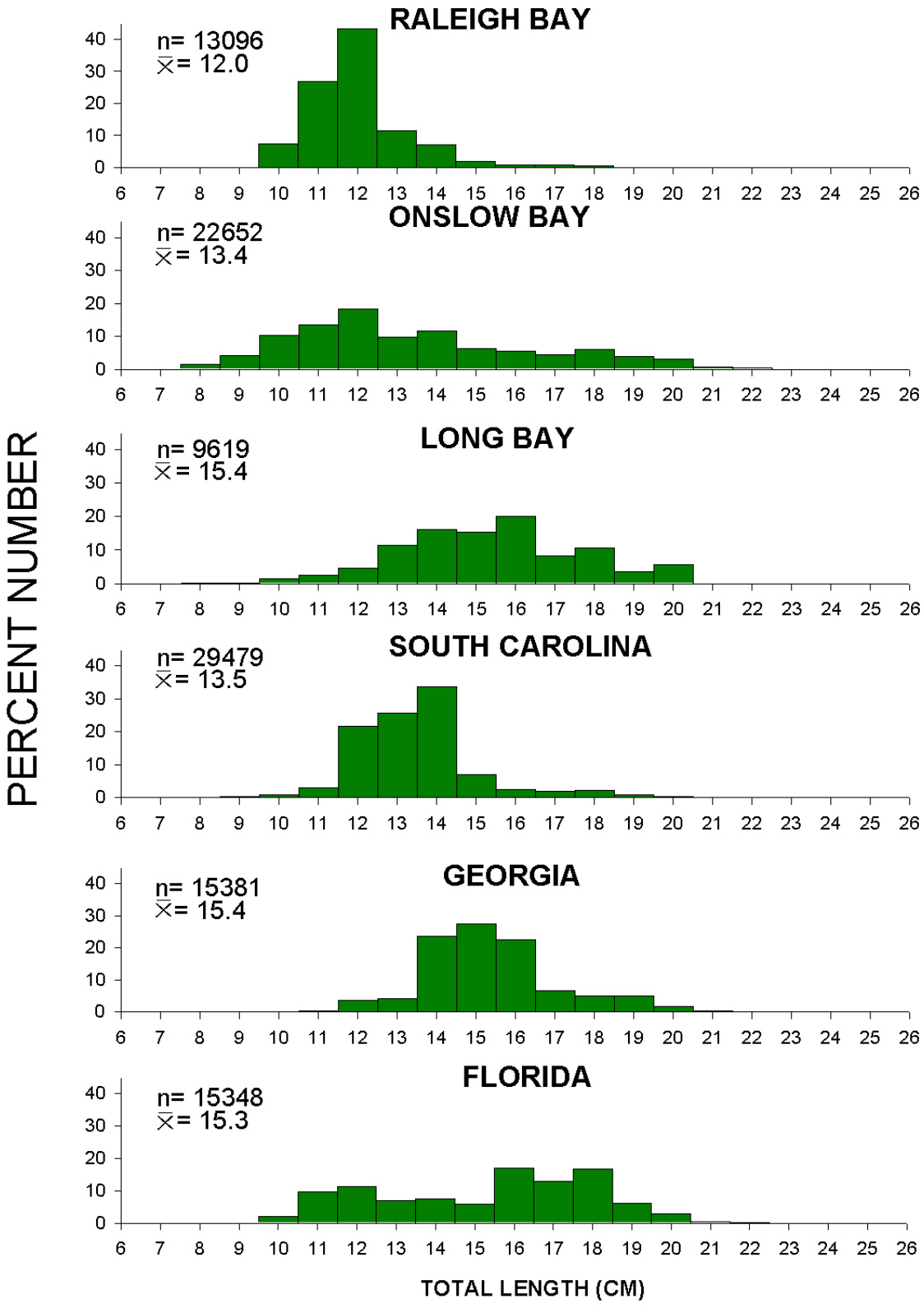

Figure 16. Regional length-frequencies of *Leiostomus xanthurus* in 2003

Menticirrhus americanus

SEAMAP-SA Shallow Water Trawl Survey strata produced a total of 14,471 southern kingfish (CV=2.3; 12.8 individuals/ha), weighing 1406 kg (1.2 kg/ha). In 2003, density of individuals reached the greatest level yet observed by the survey (Figure 17). Density was greatest in spring and in waters off Florida (Table 11). The southern kingfish exhibited the highest percent occurrence of all priority species, being present in approximately 87% of all tows.

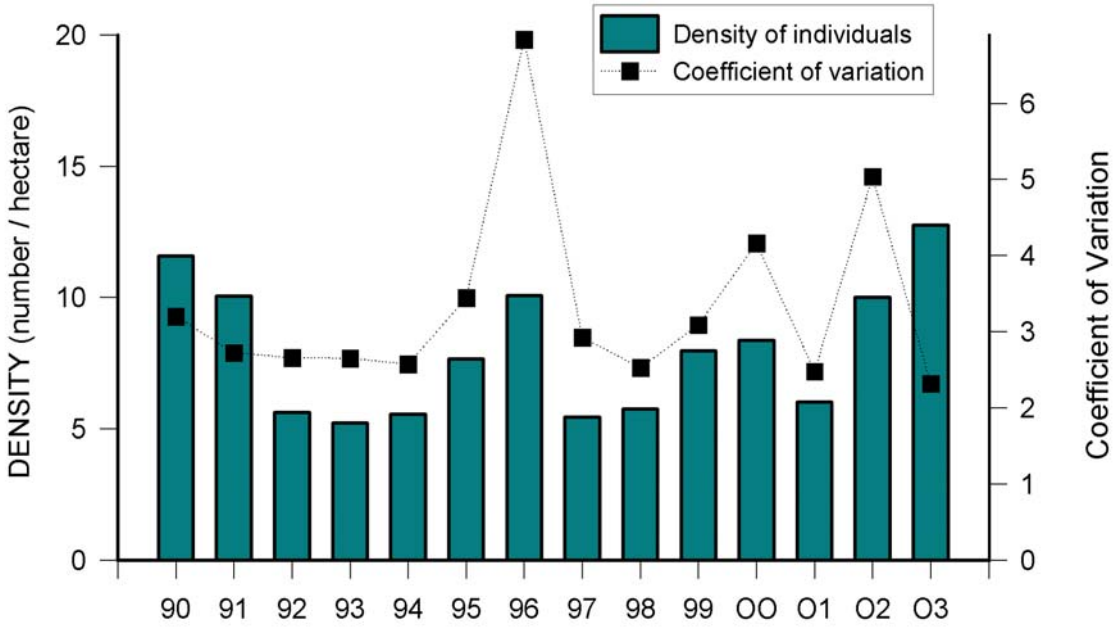

Figure 17. Annual densities of *Menticirrhus americanus*

Table 11 . Estimates of density (number of individuals/hectare) in 2003.

Menticirrhus americanus

	Spring	Summer	Fall	Region
Raleigh Bay	24.4	10.6	1.6	11.7
Onslow Bay	33.7	1.7	2.1	11.9
Long Bay	15.6	6.0	5.3	8.2
South Carolina	11.9	4.7	9.7	8.8
Georgia	19.0	9.8	10.7	14.2
Florida	22.1	14.8	20.9	19.2
Season	20.7	8.1	9.3	12.8

In 2003, a total of 1372 otolith (spring=540, summer=383, fall=449) and 135 gonad samples were taken from southern kingfish. Kingfish of age 1 constituted the largest percentage (52%) of the individuals sampled, followed by age 0 (21%), age 2 (19%), age 3 (5%), age 4 (2%), and age 5 (<1%). Only single specimens of age 6 and age 7 fish were sampled. *Menticirrhus americanus* ranged from 58 to 265 mm TL for age 0, from 112 to 325 mm TL for age 1, from 209 to 351 for age 2, from 230 to 362 mm TL for age 3, from 250 to 380 mm TL for age 4, and from 274 to 341 mm TL for age 5. Only one age 6 individual (299 cm) and one age 7 individual (313 cm) were taken in SEAMAP trawl samples.

Total lengths of *Menticirrhus americanus* ranged from 8 to 38 cm ($\bar{x}$ = 20.8). Length was significantly different among seasons ($X^2 = 624$, $p < 0.0001$). Mean length increased from spring to summer, the result of subsequent juvenile growth, and decreased in fall, indicating the recruitment of YOY individuals (Figure 18). The percentage of age 0 fish increased from none in spring to 49% of the southern kingfish sampled in fall. The spring length-frequency distribution comprised mostly age 1 fish. 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.

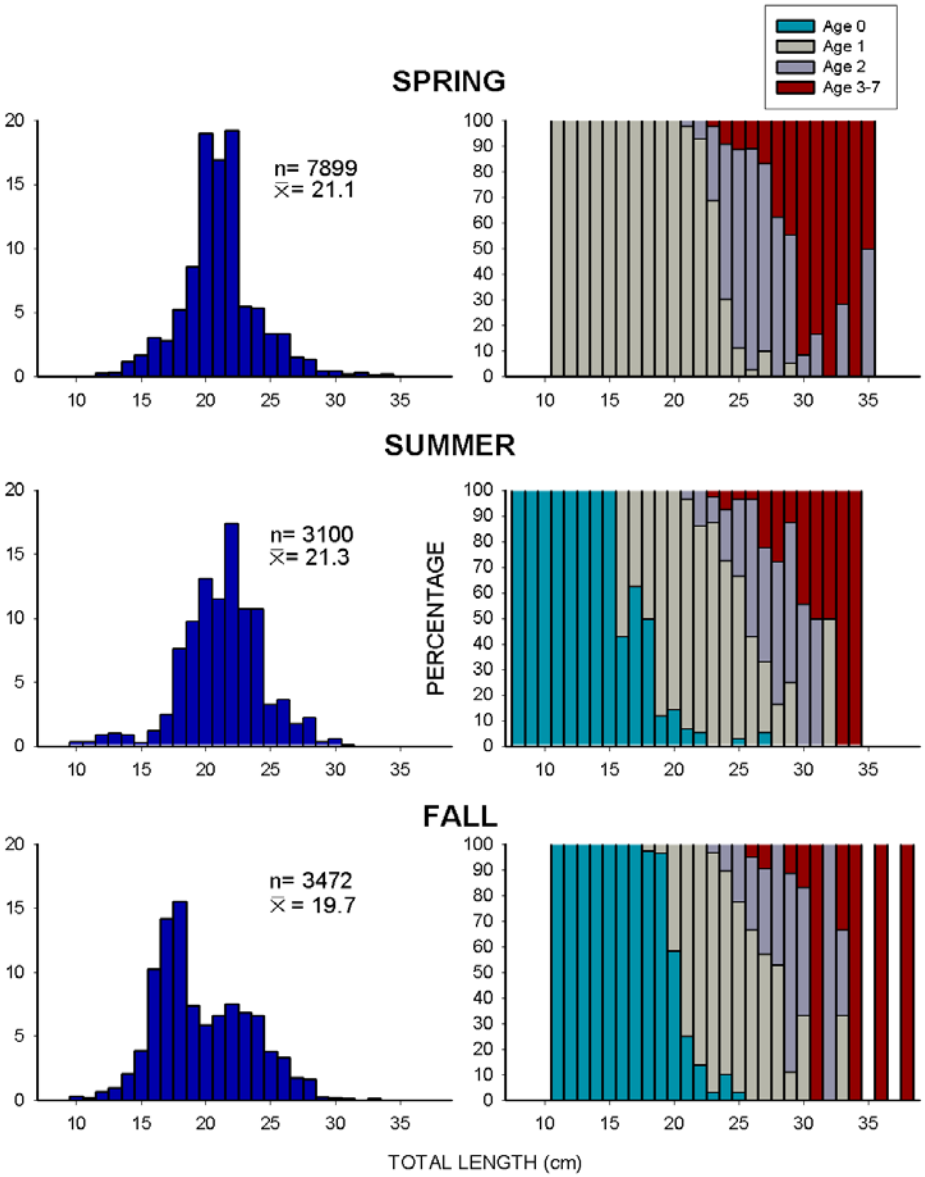

Figure 18. Seasonal length-frequencies and age composition of *Menticirrhus americanus* in 2003

Length also varied significantly among regions ($X^2 = 1666$, $p < 0.0001$), with greatest mean length observed in Onslow Bay (Figure 19). In all regions, age 1 individuals made up the greatest percentage of the population in spring and summer, whereas fall trawls produced individuals that were primarily age 0.

Age composition was very similar among male and female southern kingfish. More than 73% (spring: 71%, summer: 71%, fall: 68%) of the individuals sampled were female. Most of the females (76%) (spring: 76%, summer: 90%, fall: 41%) had developing or mature ovaries and most of the males (94%) were reproductively mature as well.

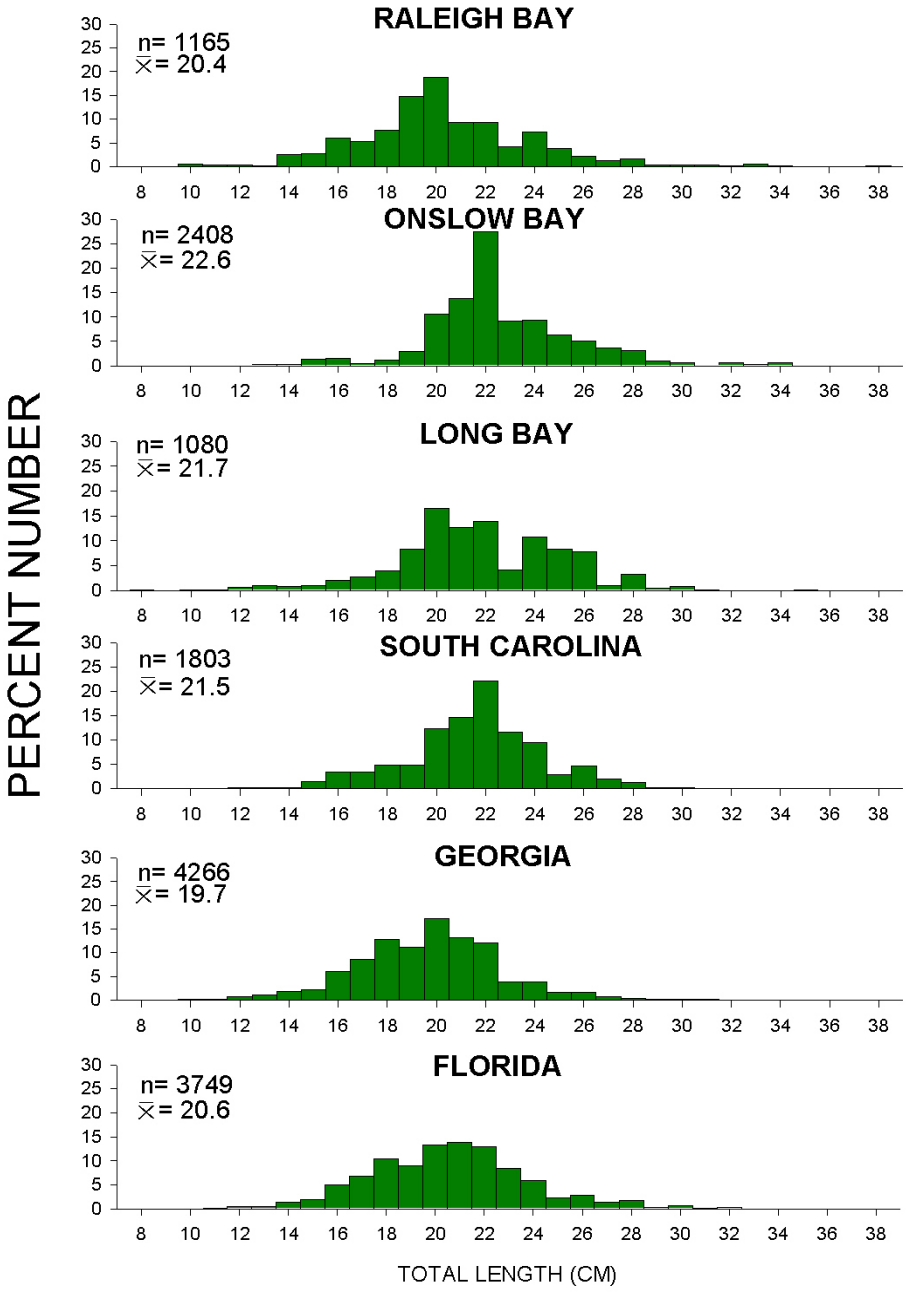

Figure 19. Regional length-frequencies of *Menticirrhus americanus* in 2003

Menticirrhus littoralis

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 574 gulf kingfish (CV=5.3; 0.5 individuals/ha), weighing 68 kg (0.06 g/ha) in 2003. Density of individuals for *Menticirrhus littoralis* peaked in 2003 (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 8 to 36 cm ($\bar{x}$ = 22.4), with greatest mean length in summer.

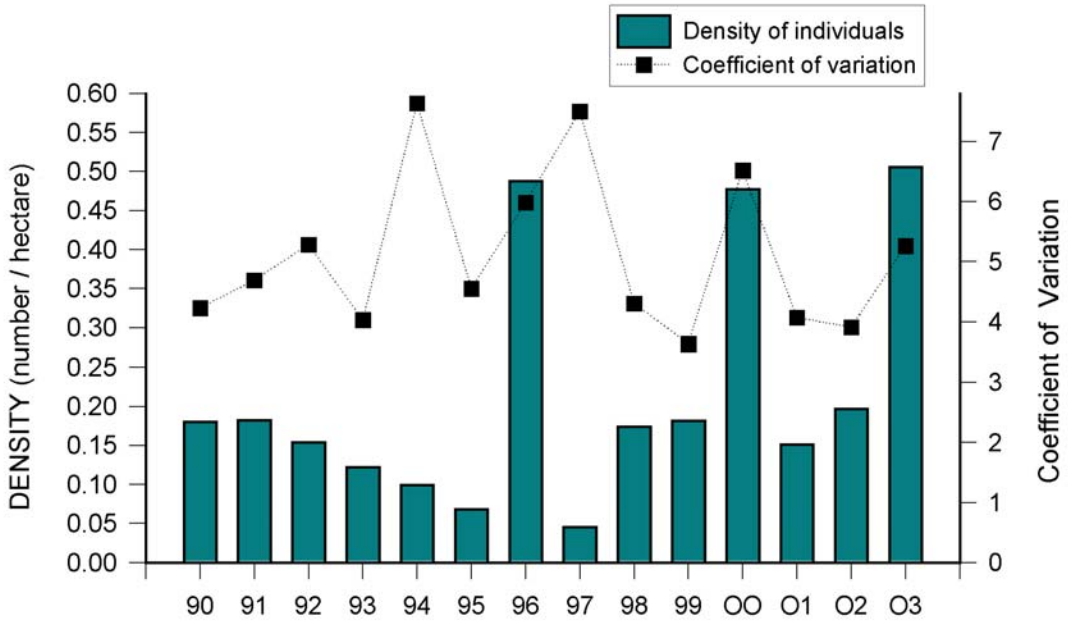

Figure 20. Annual densities of *Menticirrhus littoralis*

Table 12 . Estimates of density (number of individuals/hectare) in 2003.

Menticirrhus littoralis

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0.2	0.06
Onslow Bay	0.2	0.02	0.02	0.06
Long Bay	0	0	0	0
South Carolina	0	0	0.01	0.05
Georgia	0.2	0	0.06	0.1
Florida	3.2	0.4	4.8	2.7
Season	0.6	0.08	0.8	0.5

Menticirrhus saxatilis

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 83 northern kingfish (CV=9.1; 0.07 individuals/ha), weighing 13 kg (0.01 kg/ha) in 2003. Density of individuals decreased in 2003, after the record level of abundance observed in 2002 (Figure 21). Density was greatest in spring (Table 13). Northern kingfish were not taken in Georgia waters. Density of individuals was greatest in Raleigh and Onslow Bays. Total lengths of *Menticirrhus saxatilis* ranged from 12 to 34 cm ($\bar{x}$ = 23.6), with greatest mean length in spring and in Onslow Bay.

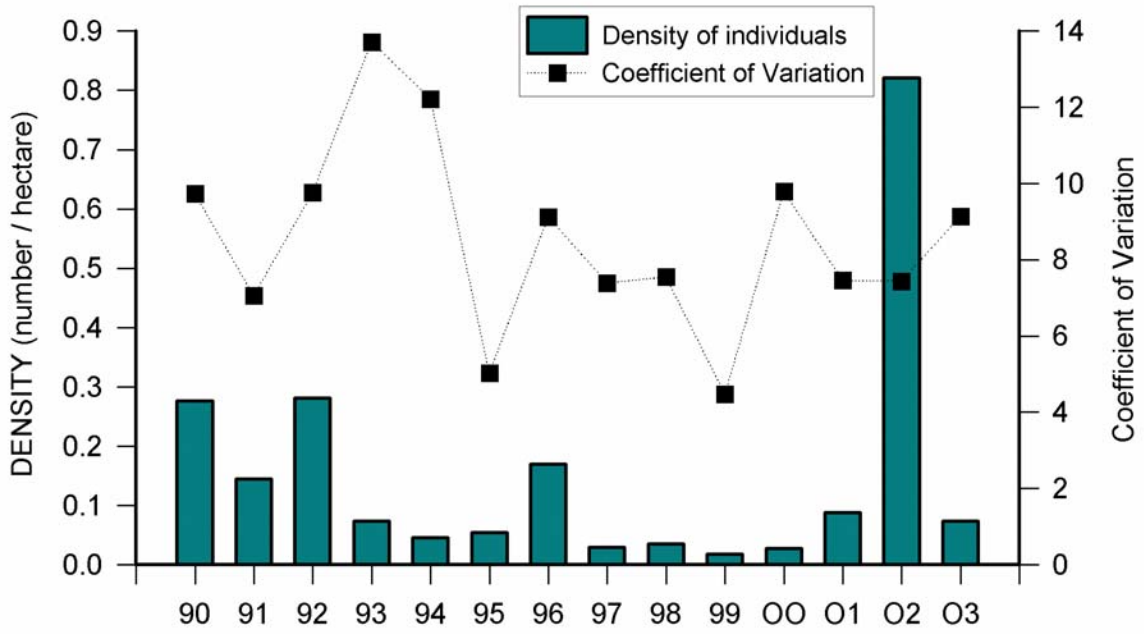

Figure 21. Annual densities of *Menticirrhus saxatilis*

Table 13 . Estimates of density (number of individuals/hectare) in 2003.

Menticirrhus saxatilis

	Spring	Summer	Fall	Region
Raleigh Bay	0.3	0.1	0	0.1
Onslow Bay	0.8	0.1	0.02	0.3
Long Bay	0	0.03	0	0.008
South Carolina	0	0	0.09	0.03
Georgia	0	0	0	0
Florida	0	0.09	0	0.03
Season	0.2	0.05	0.02	0.07

Micropogonias undulatus

Micropogonias undulatus was the second most abundant species collected in SEAMAP-SA trawl samples in 2003. The 67,491 individuals (CV=4.4), weighing 4,544 kg, made up15% of the total number of specimens taken in SEAMAP strata. Density estimates for the entire SAB were 59.4 individuals/ha and 4.0 kg/ha, an increase from 2002 and well below the peak years of 1991-1992 (Figure 22). With the exception of Onslow Bay (spring) and Florida (summer), seasonal densities of individuals were greatest in fall, although overall seasonal density was greatest in summer. Regional densities were highest in Onslow Bay, primarily due to large catches of Atlantic croaker in spring (Table 14).

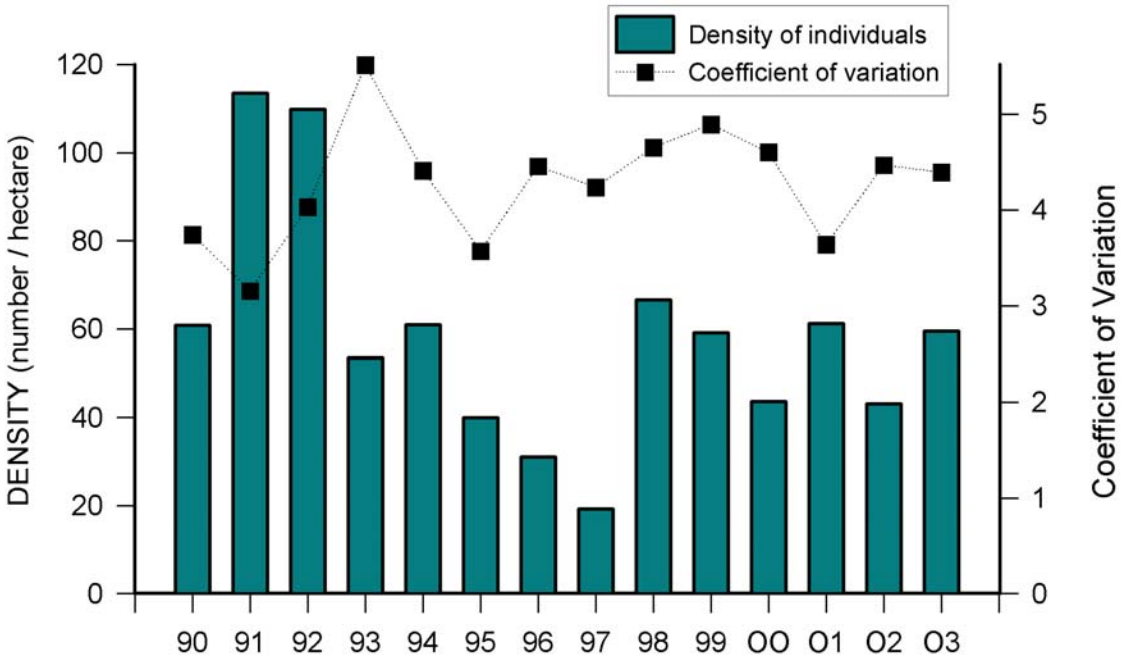

Figure 22. Annual densities of *Micropogonias undulatus*

Table 14. Estimates of density (number of individuals/hectare) in 2003.

Micropogonias undulatus

	Spring	Summer	Fall	Region
Raleigh Bay	1.4	15.9	52.1	23.6
Onslow Bay	206.6	14.9	58.6	139.0
Long Bay	1.6	55.7	61.4	36.4
South Carolina	1.8	19.0	67.2	29.2
Georgia	1.8	6.5	57.0	23.1
Florida	6.6	261.6	14.3	98.9
Season	37.1	88.9	52.2	59.4

In 2003, a total of 698 otolith (spring=165, summer=287, fall=246) and 111 gonad samples were taken from Atlantic croaker. The majority of the Atlantic croaker sampled were age 0 (47%) and age 1 (47%). Other age-classes included age 2 (4%), age 3 (1%), age 4 (<1%), and age 7 (<1%). Atlantic croaker ranged from 89 to 222 mm TL for age 0, from 132 to 243 mm TL for age 1, from 122 to 254 for age 2, from 195 to 252 mm TL for age 3, from 227 to 232 TL for age 4 individuals, and from 231 to 253 TL for age 5 individuals.

Total lengths of Atlantic croaker ranged from 6 to 33 cm ($\bar{x}$ = 18.1 cm). Lengths differed significantly among seasons ($X^2 = 4203$, $p < 0.0001$), with the mean length of Atlantic croaker increasing from summer to fall (Figure 23). The spring length-frequency distribution comprised mostly age 1 fish (83%). The inclusion of smaller specimens in summer collections resulted in a length-frequency distribution representing mostly age 0 fish (47%), with ages 1-5 also present in trawl samples. Seasonally, the percentage of age 0 fish increased from 10% in spring to 70% in fall, when the majority of fish were ages 0 and 1, with few age 2 and 3 fish taken.

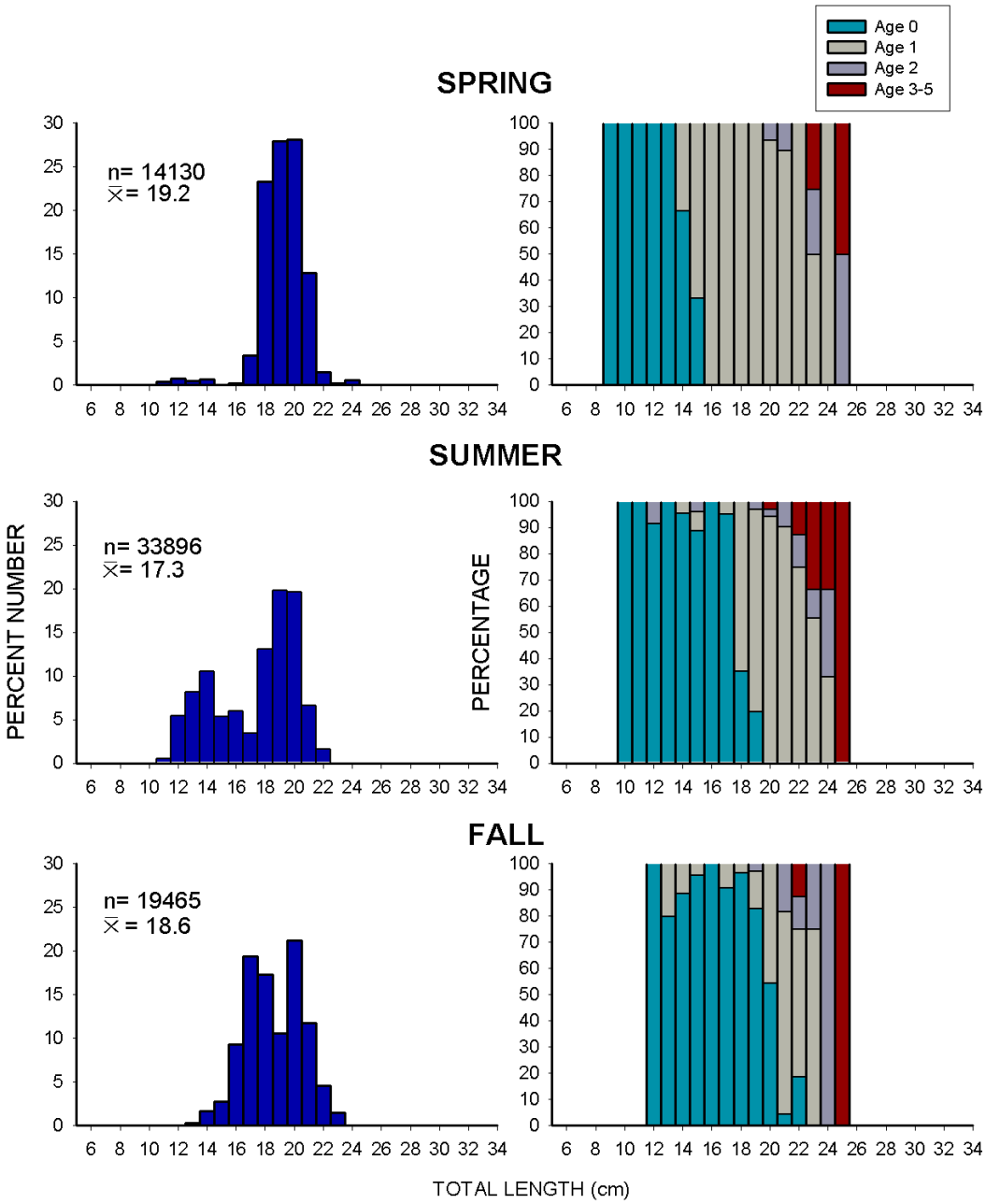

Figure 23. Seasonal length-frequencies and age composition of *Micropogonias undulatus* in 2003

Length also varied significantly among regions ($X^2 = 3620$, $p < 0.0001$), and mean lengths ranged from 17.4 cm off Florida to 19.2 cm off Georgia (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 58% (spring: 72%, summer: 48%, fall: 59%) of the individuals sampled were female. The percentage of females with developing or mature ovaries increased from spring to fall (spring: 29%, summer: 54%, fall: 68%), and more male croaker were found to be reproductively mature later in the year as well (spring: 38%, summer: 65%, fall: 69%).

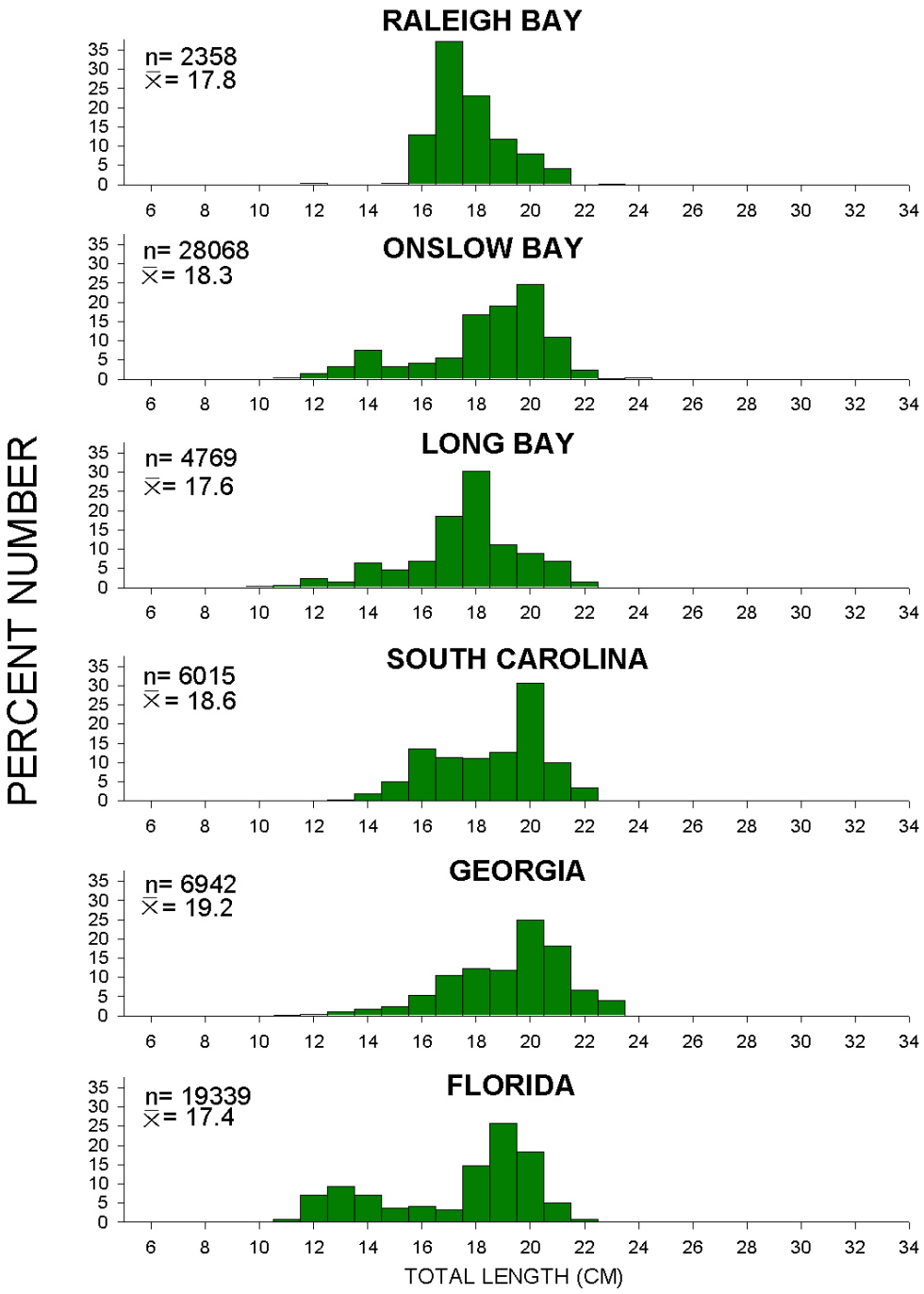

Figure 24. Regional length-frequencies of *Micropogonias undulatus* in 2003

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 2003 (Figure 25).

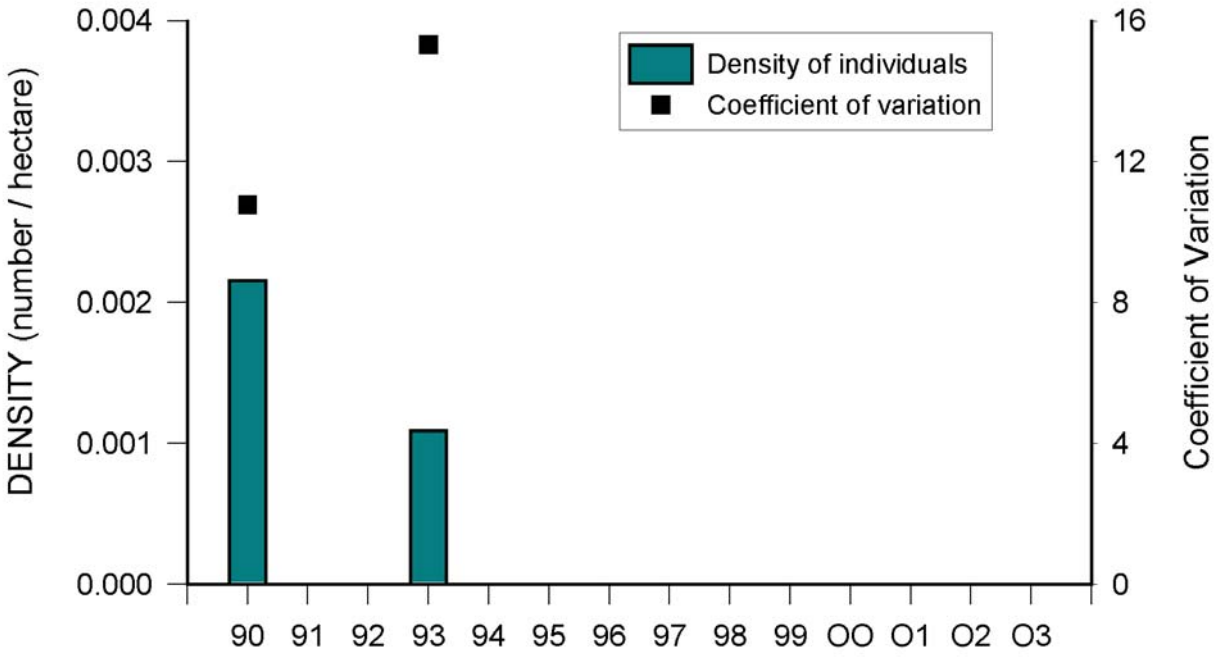

Figure 25. Annual densities of *Mycteroperca microlepis*

Paralichthys albigutta

The gulf flounder, *Paralichthys albigutta*, generally exhibits low abundance in SEAMAP-SA Shallow Water Trawl Survey collections. A total of 38 individuals (CV=6.9; 0.02 individuals/ha), weighing 6 kg (0.005 kg/ha), were taken in 2003. Density of abundance of gulf flounder in 2003 decreased from the second highest abundance observed in 2002 (Figure 26). Gulf flounder were most abundant in fall in Long Bay (Table 15). Lengths ranged from 24 to 49 cm ($\bar{x}$ = 32.2), with greatest mean length in fall and in Raleigh Bay.

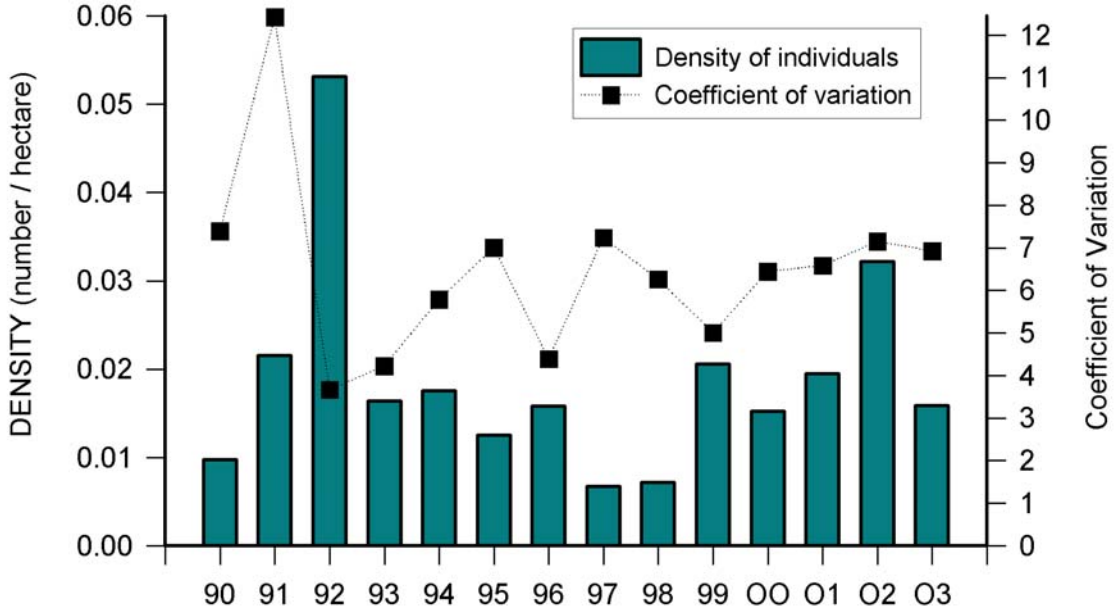

Figure 26. Annual densities of *Paralichthys albigutta*

Table 15. Estimates of density (number of individuals/hectare) in 2003.

Paralichthys albigutta

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0.06	0.02
Onslow Bay	0.02	0.05	0.06	0.04
Long Bay	0.02	0	0.1	0.05
South Carolina	0	0	0.02	0.005
Georgia	0	0.009	0	0.003
Florida	0	0	0	0
Season	0.005	0.01	0.03	0.02

Paralichthys dentatus

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 343 summer flounder (CV=2.8; 0.3 individuals/ha), weighing 63 kg (0.06 kg/ha). Although the density in 2003 did increase from the 2002 level of abundance, density of individuals has not varied much annually, with the exception of a peak in abundance in 1992 (Figure 27). Density was greatest in summer and fall (Table 16). Summer flounder were most abundant in the northern portion of the SAB, with density of individuals decreasing with decreasing latitude. Total lengths of *Paralichthys dentatus* ranged from 11 to 52 cm ($\bar{x}$ = 25.2). Seasonal mean length was lowest in summer when the majority of smaller specimens were taken. Greatest regional mean length occurred in Florida.

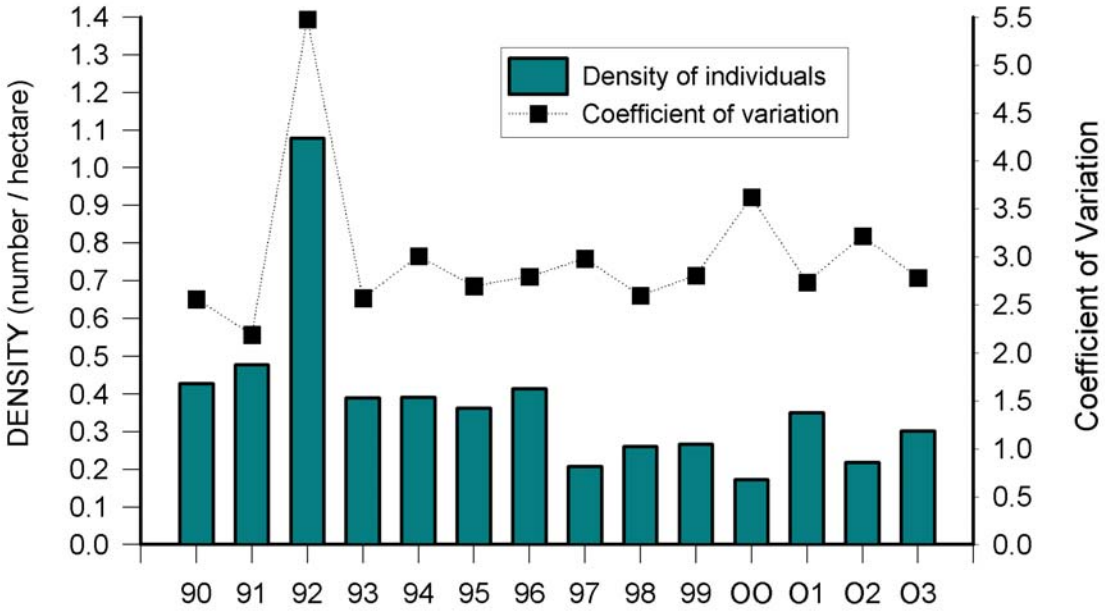

Figure 27. Annual densities of *Paralichthys dentatus*

Table 16. Estimates of density (number of individuals/hectare) in 2003.

Paralichthys dentatus

	Spring	Summer	Fall	Region
Raleigh Bay	0.1	1.0	0.6	0.6
Onslow Bay	0.3	1.0	0.5	0.6
Long Bay	0.2	0.3	0.9	0.5
South Carolina	0.1	0.4	0.7	0.4
Georgia	0.02	0.07	0.08	0.06
Florida	0.03	0	0.03	0.02
Season	0.1	0.4	0.4	0.3

Paralichthys lethostigma

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 56 southern flounder (CV=5.1; 0.05 individuals/ha), weighing 21 kg (0.02 kg/ha) in 2003. Although the density of individuals has not varied much annually, the 2003 estimate did decrease from the 2002 level of abundance (Figure 28). Density was greatest in spring, although densities did not vary a great deal seasonally (Table 17). Total lengths of *Paralichthys lethostigma* ranged from 19 to 43 cm ($\bar{x}$ = 30.1).

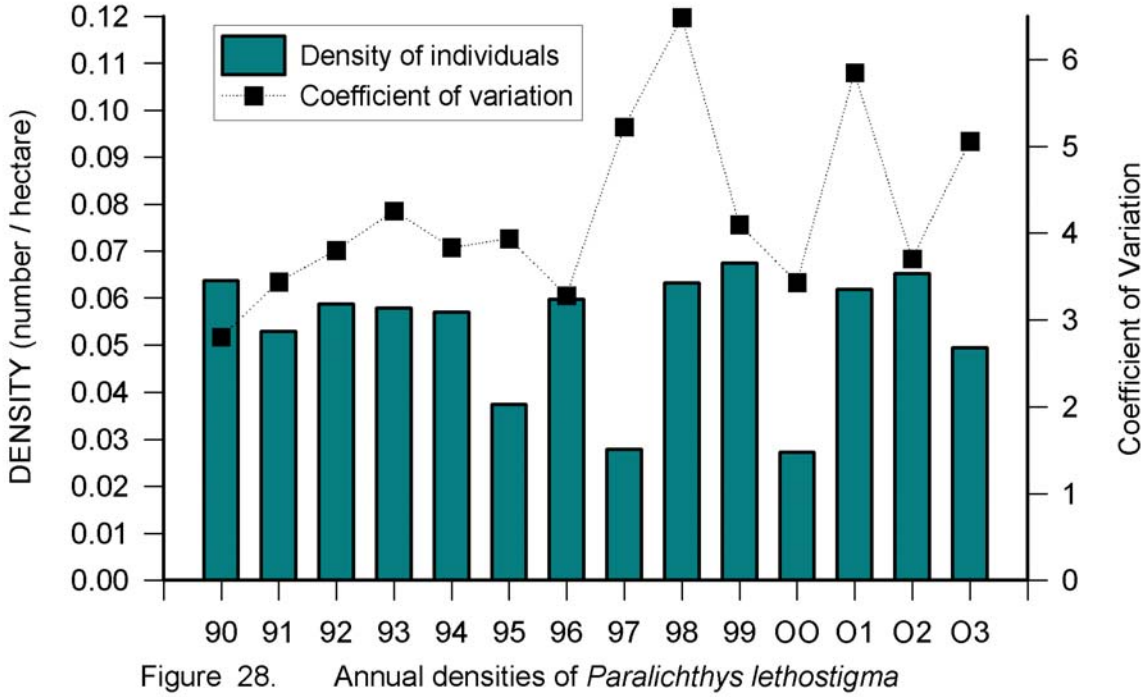

Figure 28. Annual densities of *Paralichthys lethostigma*

Table 17. Estimates of density (number of individuals/hectare) in 2003.

Paralichthys lethostigma

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0.06	0.02
Onslow Bay	0.02	0.2	0.03	0.08
Long Bay	0.3	0	0	0.09
South Carolina	0.01	0.01	0.07	0.03
Georgia	0	0.009	0.04	0.02
Florida	0.1	0.06	0.02	0.07
Season	0.06	0.05	0.04	0.05

Peprilus alepidotus

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 2,961 harvestfish (CV=2.8; 2.6 individuals/ha), weighing 168 kg (0.2 kg/ha). Density of individuals in 2003 represents a decrease in abundance from 2002 (Figure 29). Annual peaks in abundance reflect large catches of harvestfish in fall collections (SEAMAP-SA/SCMRD, 2000). In 2003, harvestfish were most abundant off Florida in fall (Table 18).

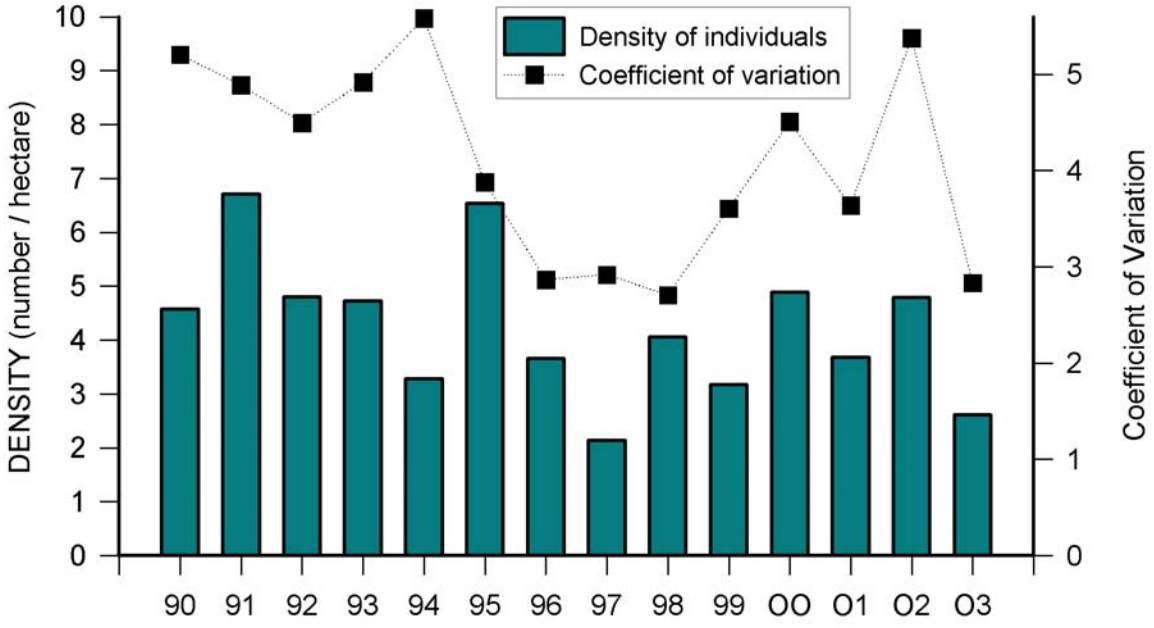

Figure 29. Annual densities of *Peprilus alepidotus*

Table 18 . Estimates of density (number of individuals/hectare) in 2003.

Peprilus alepidotus

	Spring	Summer	Fall	Region
Raleigh Bay	0.09	0.9	4.8	2.0
Onslow Bay	0.09	4.0	4.4	2.7
Long Bay	0.02	4.3	1.9	2.0
South Carolina	1.3	1.6	0.7	1.2
Georgia	2.9	2.4	4.6	3.5
Florida	3.1	0.7	6.8	3.4
Season	1.6	2.3	3.9	2.6

Fork lengths of *Peprilus alepidotus* ranged from 3 to 19 cm ($\bar{x}$ = 10.0). Length was significantly different among seasons (X^2 = 665, p < 0.0001). Mean length decreased from spring to fall, an indication of recruitment of YOY in both summer and fall (Figure 30). Mean length also varied significantly among regions (X^2 = 301, p < 0.0001). Mean lengths of harvestfish were greatest in collections from Onslow Bay and South Carolina (Figure 31).

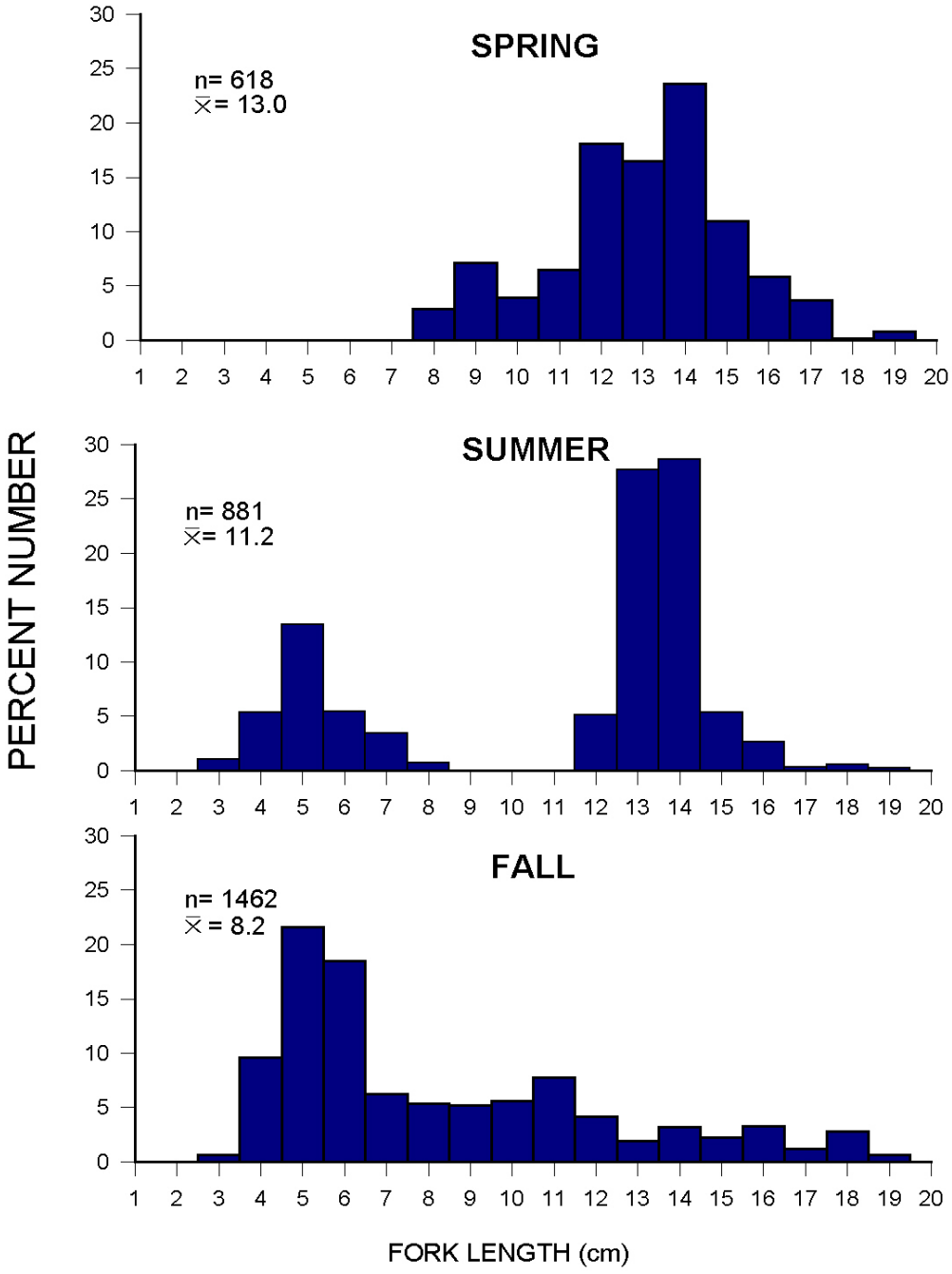

Figure 30. Seasonal length-frequencies of *Peprilus alepidotus* in 2003

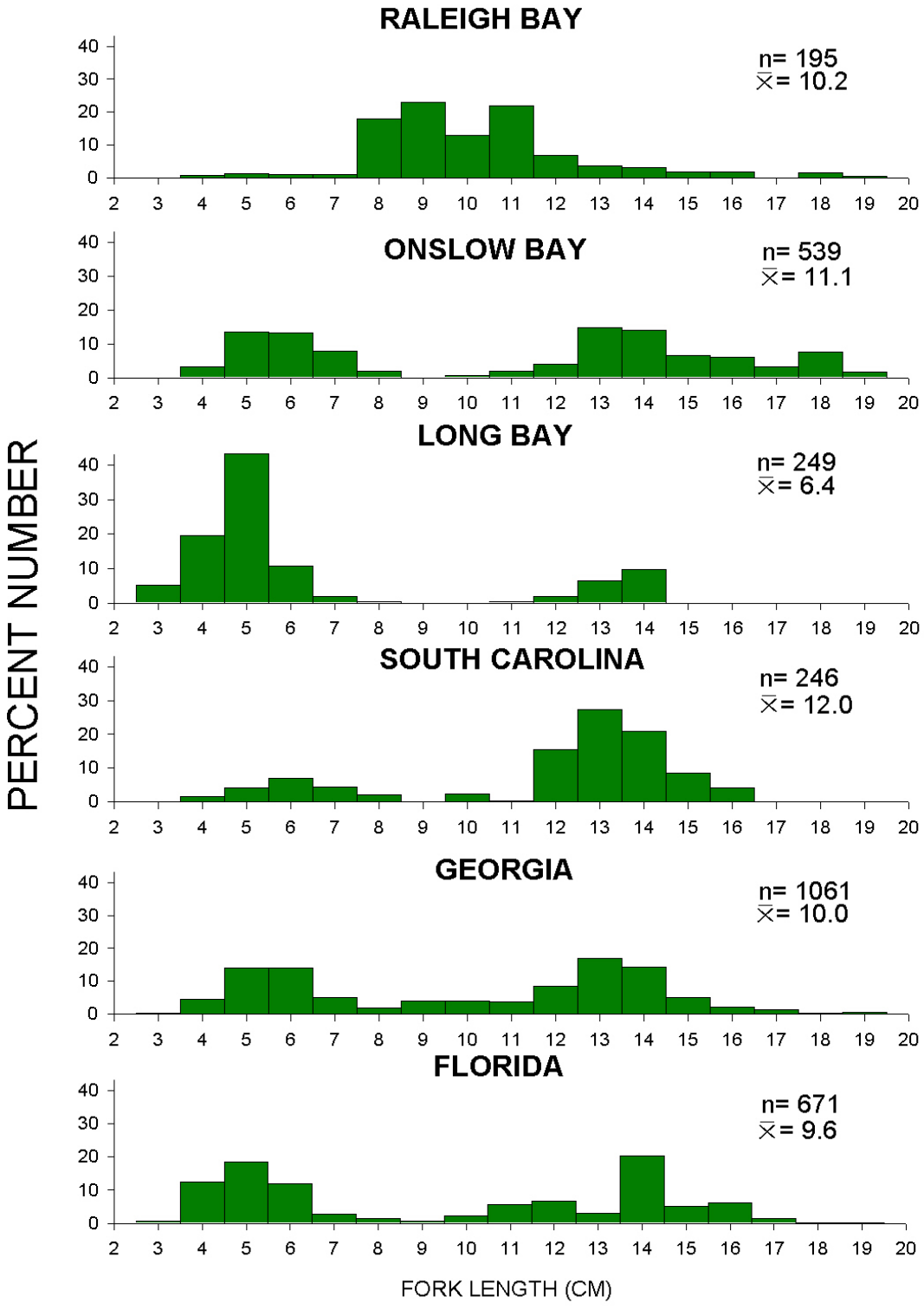

Figure 31. Regional length-frequencies of *Peprilus alepidotus* in 2003

Peprilus triacanthus

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 21,712 *Peprilus triacanthus* (CV=4.7; 19.1 individuals/ha), weighing 408 kg (0.4 kg/ha), in 2003. Density of individuals reached the second highest density in 2003 (Figure 32). Seasonal density was greatest in spring (Table 19). Long 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).

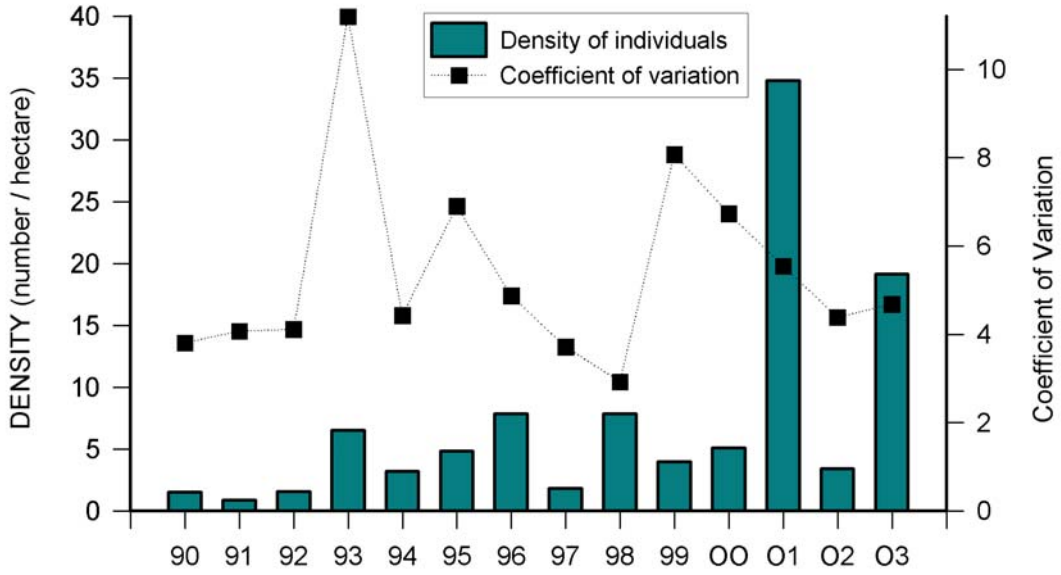

Figure 32. Annual densities of *Peprilus triacanthus*

Table 19 . Estimates of density (number of individuals/hectare) in 2003.

Peprilus triacanthus

	Spring	Summer	Fall	Region
Raleigh Bay	24.1	2.4	30.9	19.2
Onslow Bay	41.3	3.2	1.9	14.8
Long Bay	188.4	19.0	0.5	63.2
South Carolina	39.5	9.4	9.3	19.4
Georgia	20.1	2.5	2.3	9.1
Florida	4.9	21.5	0.02	9.2
Season	42.5	9.0	5.6	19.1

Fork lengths of *Peprilus triacanthus* ranged from 2 to 19 cm ($\bar{x}$ = 8.6). Length was significantly different among seasons (X^2 = 3455, $p < 0.0001$). Mean length increased from spring to fall (Figure 33). Mean length also varied significantly among regions (X^2 = 5551, $p < 0.0001$). Mean lengths of butterfish were greatest in collections from Raleigh Bay (Figure 34).

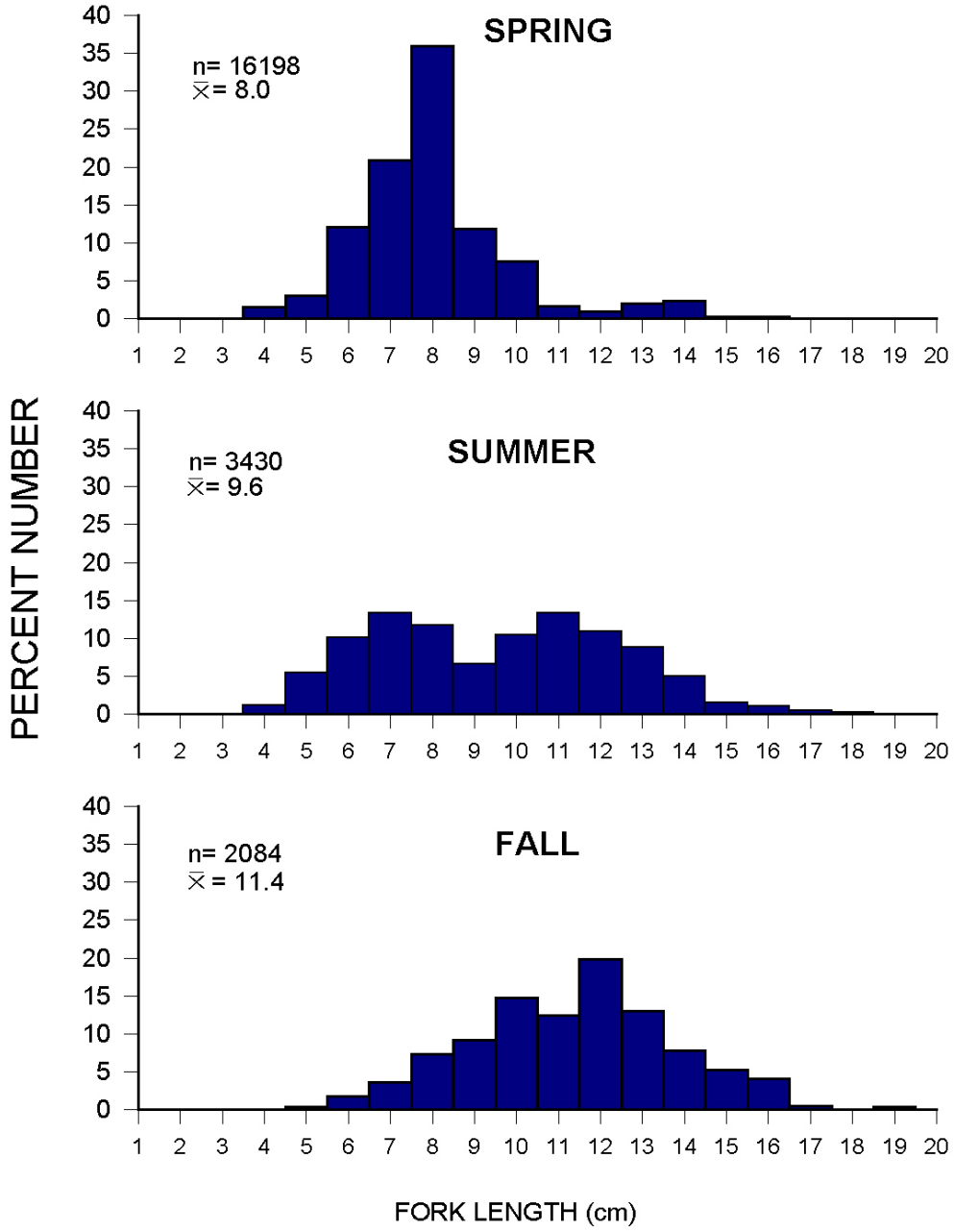

Figure 33. Seasonal length-frequencies of *Peprilus triacanthus* in 2003

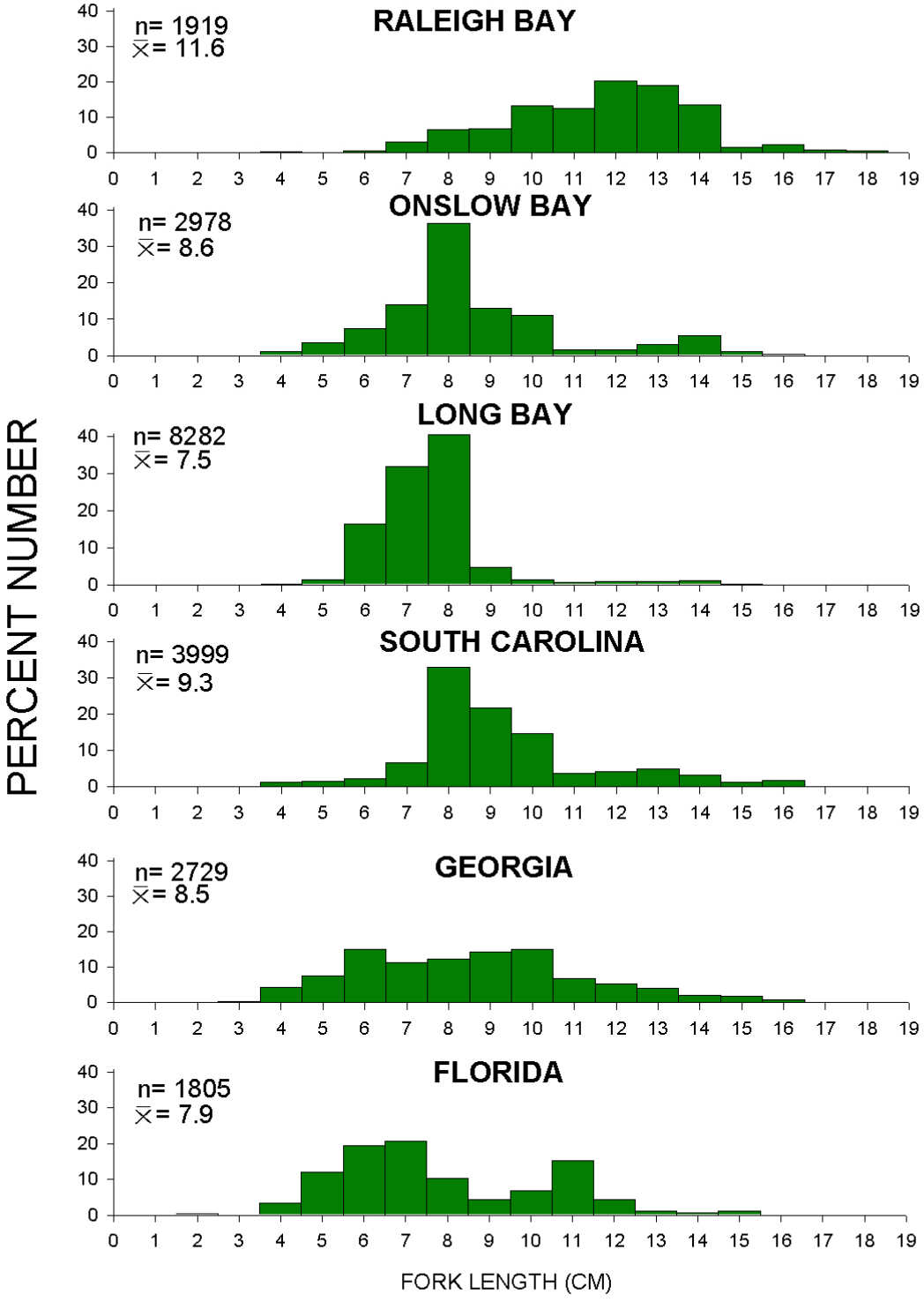

Figure 34. Regional length-frequencies of *Peprilus triacanthus* in 2003

Pogonias cromis

The black drum, *Pogonias cromis*, has been a rare species in SEAMAP-SA Shallow Water Trawl Survey collections (SEAMAP-SA/SCMRD, 2000). Thirteen (CV=7.8; 0.01 individuals/ha) black drum, weighing 76 kg (0.07 kg/ha), were collected in 2003 (Figure 35). All individuals were taken in spring trawls, with the exception of fall specimens taken in Raleigh Bay (Table 20). Total lengths of *Pogonias cromis* ranged from 17 to 125 cm ($\bar{x}$ = 49.6).

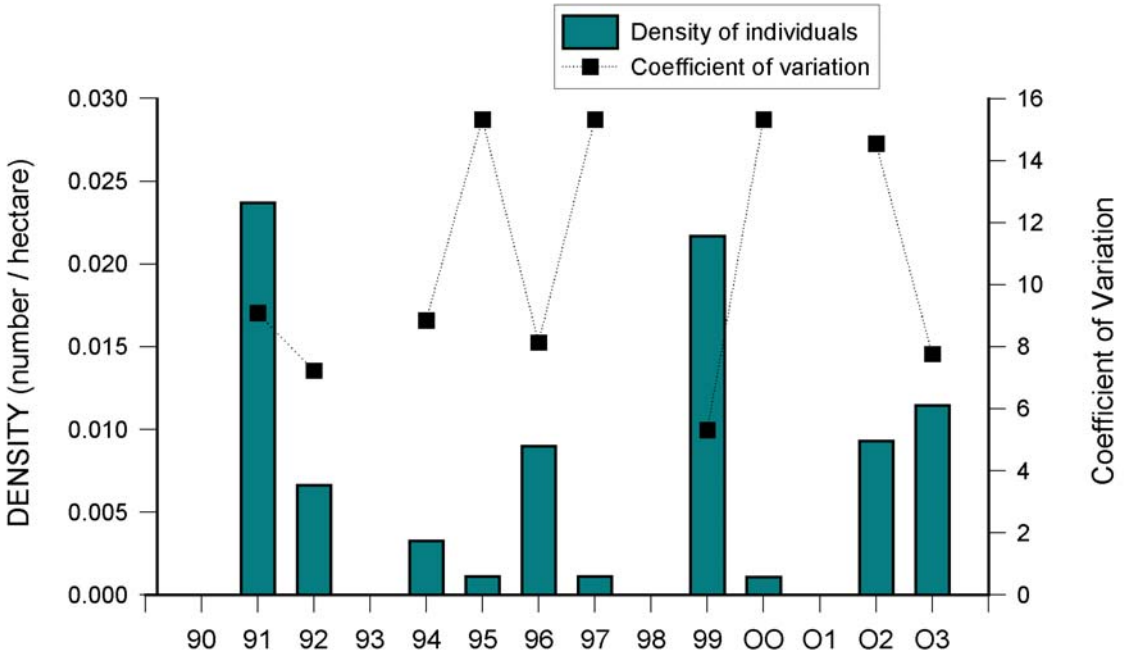

Figure 35. Annual densities of *Pogonias cromis*

Table 20 . Estimates of density (number of individuals/hectare) in 2003.

Pogonias cromis

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0.2	0.08
Onslow Bay	0	0	0	0
Long Bay	0.02	0	0	0.008
South Carolina	0.01	0	0	0.005
Georgia	0.03	0	0	0.01
Florida	0	0	0	0
Season	0.01	0	0.02	0.01

Pomatomus saltatrix

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 2,001 bluefish (CV=5.3; 1.8 individuals/ha), weighing 136 kg (0.1 kg/ha). Density in 2003 was the highest observed since 1995 (Figure 36). In 2003, density was greatest in summer (Table 21). Bluefish were most abundant in Onslow Bay and off Florida.

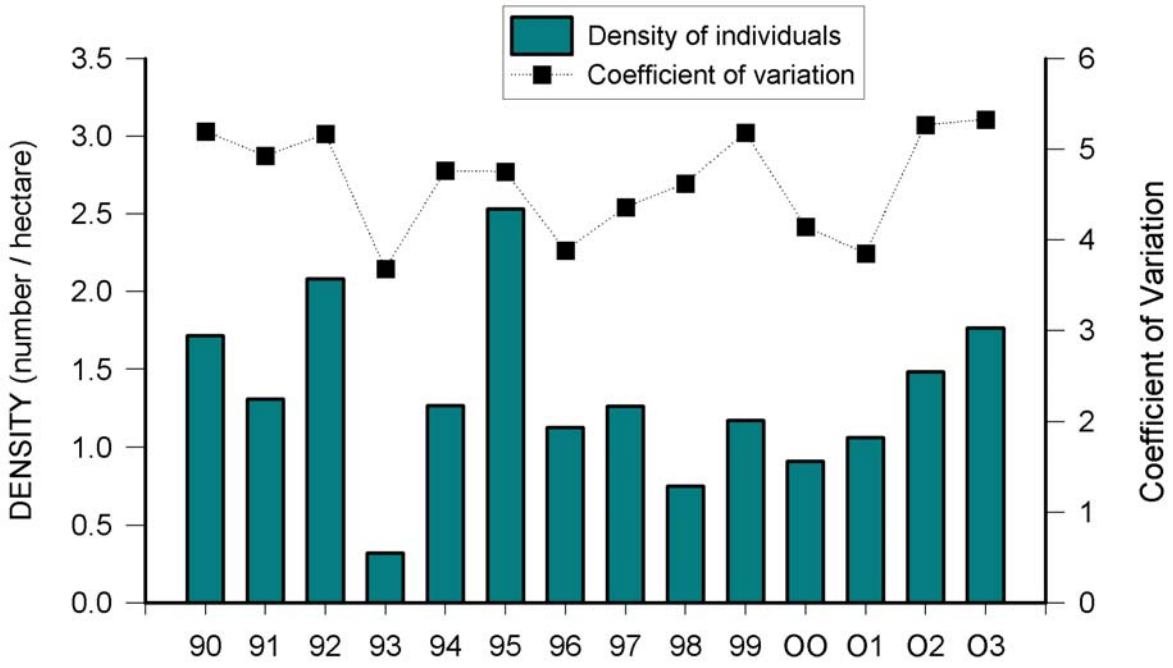

Figure 36. Annual densities of *Pomatomus saltatrix*

Table 21 . Estimates of density (number of individuals/hectare) in 2003.

Pomatomus saltatrix

	Spring	Summer	Fall	Region
Raleigh Bay	1.1	1.1	2.9	1.7
Onslow Bay	4.2	5.6	1.4	3.5
Long Bay	0.5	1.4	0.9	0.9
South Carolina	1.9	2.3	1.7	2.0
Georgia	0.5	0.1	0.4	0.4
Florida	0.4	6.3	0.2	2.4
Season	1.4	2.8	1.1	1.8

Fork lengths of *Pomatomus saltatrix* ranged from 7 to 32 cm ($\bar{x}$ = 16.5). Length was significantly different among seasons (X^2 =708, $p < 0.0001$). Mean length decreased from spring to summer, reflecting the recruitment of YOY , and increased from summer to fall, indicating juvenile growth (Figure 37). Length also varied significantly among regions (X^2 =739, $p < 0.0001$), with larger fish occurring in Long Bay, South Carolina, Georgia (Figure 38).

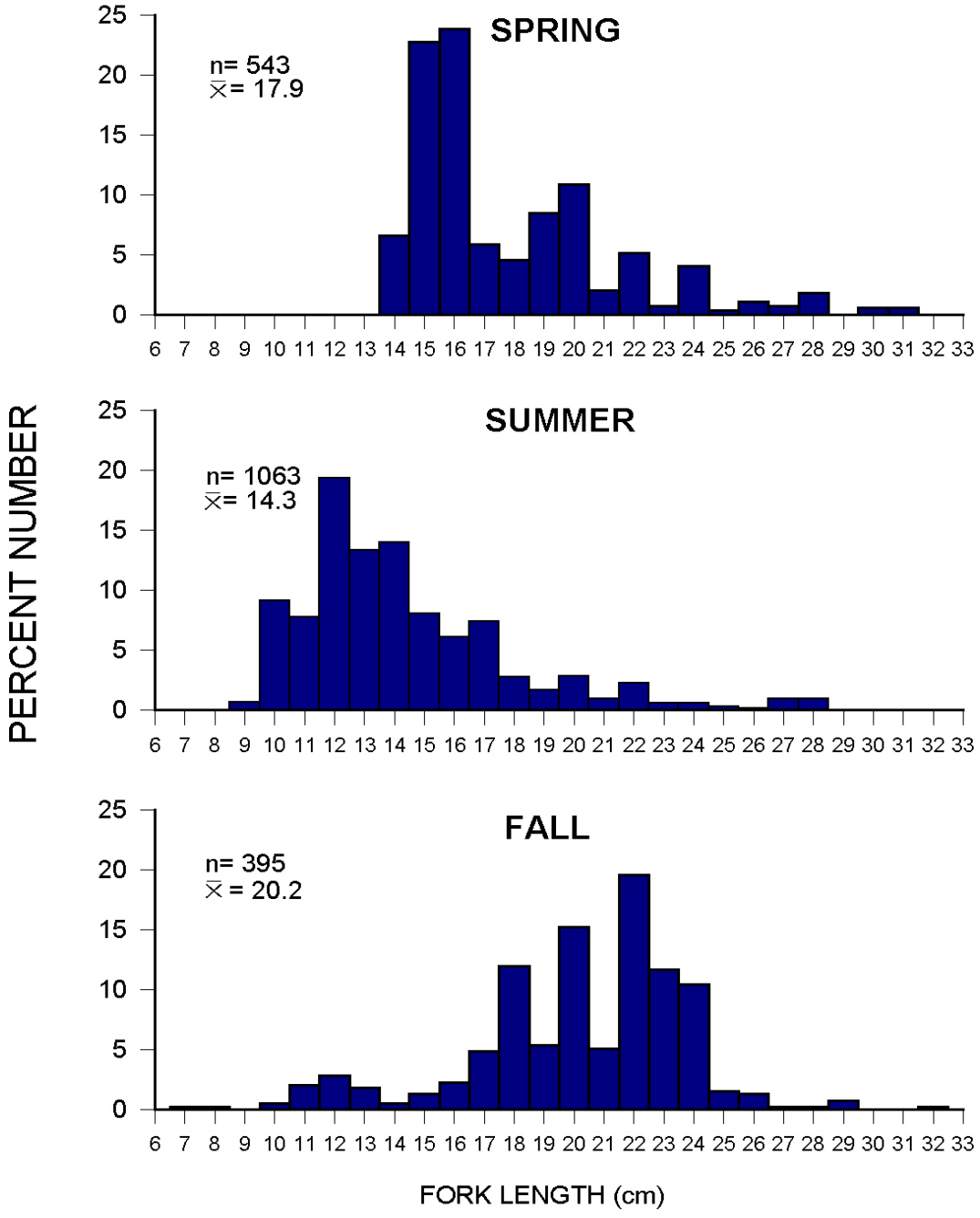

Figure 37. Seasonal length-frequencies of *Pomatomus saltatrix* in 2003

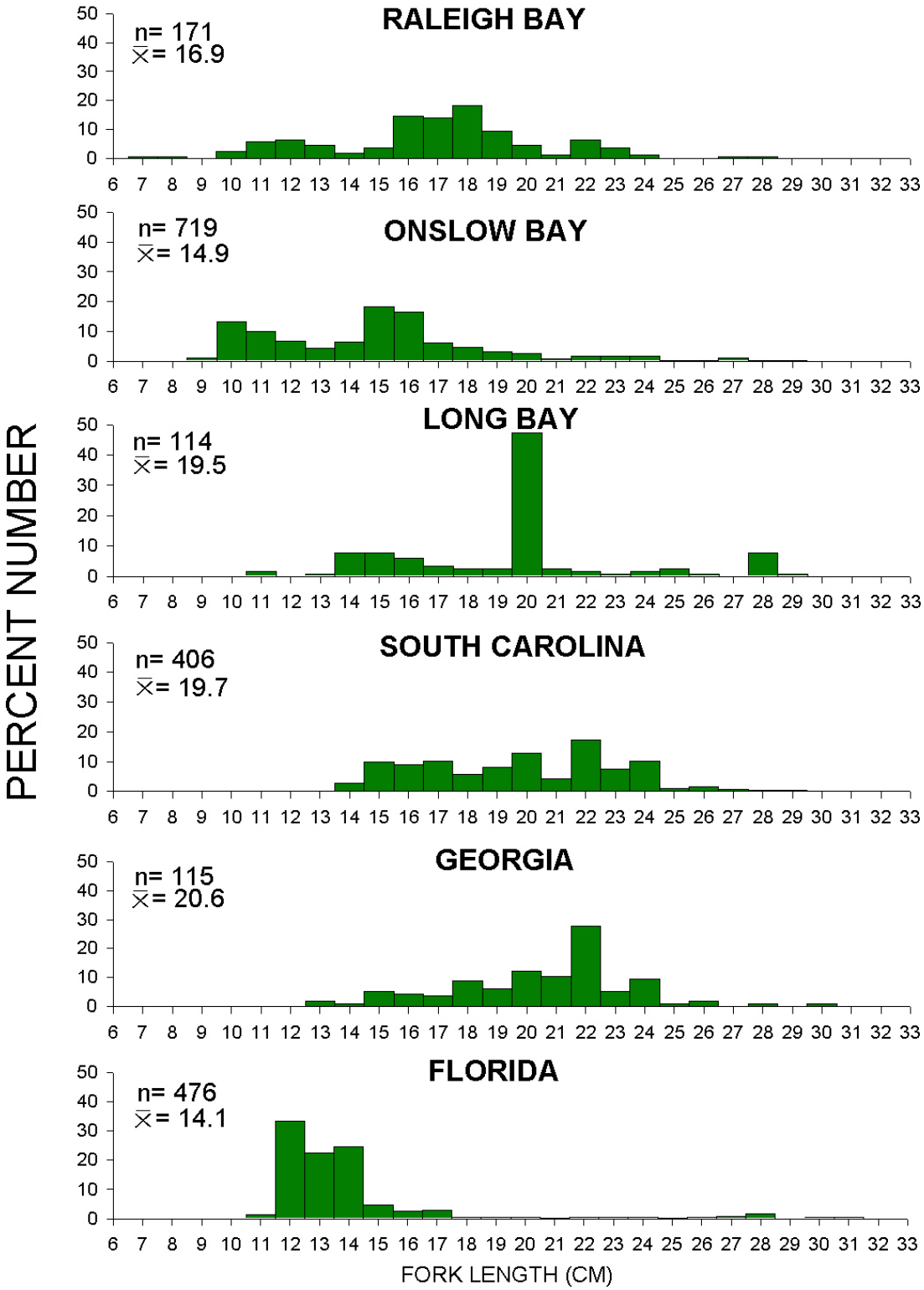

Figure 38. Regional length-frequencies of *Pomatomus saltatrix* in 2003

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 2003, no red drum were taken in SEAMAP collections (Figure 39).

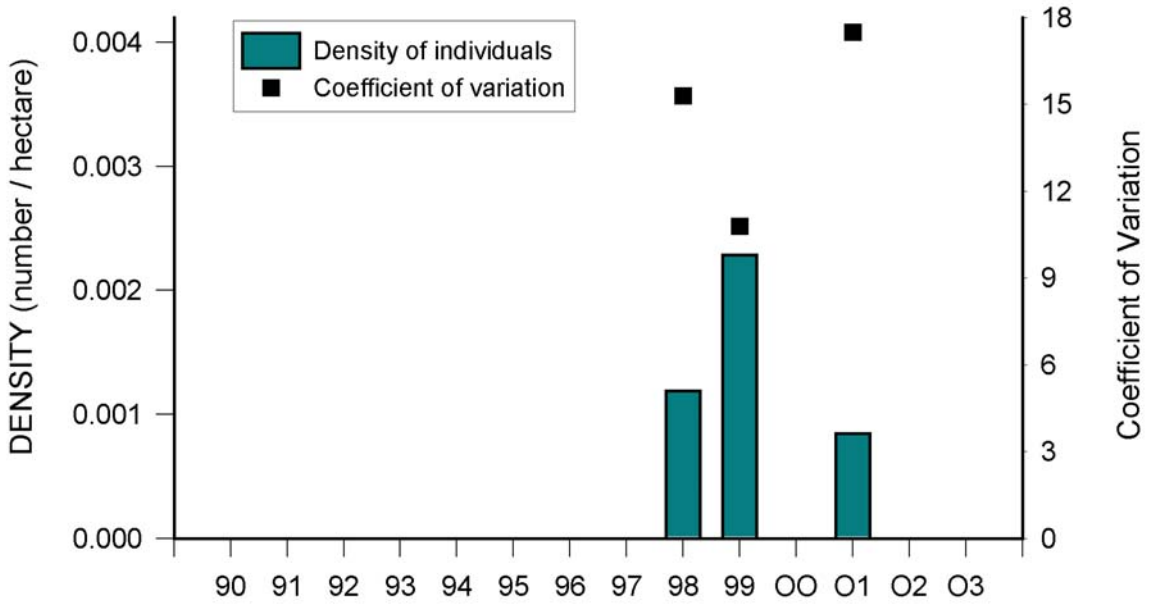

Figure 39. Annual densities of *Sciaenops ocellatus*

Scomberomorus cavalla

The 684 (CV=5.7; 0.6 individuals/ha) king mackerel collected from SEAMAP-SA Shallow Water Trawl Survey strata in 2003 weighed 41 kg (0.04 kg/ha). The density of king mackerel in 2003 increased over the 2002 level of abundance, but was well below the peak observed in 1998 (Figure 40). In 2003, density was greatest in summer (Table 22), although king mackerel tend to be most abundant in fall in the southern SAB (SEAMAP-SA/SCMRD, 2000). Greatest density of king mackerel occurred in Onslow Bay, as well as in waters off Florida in 2003.

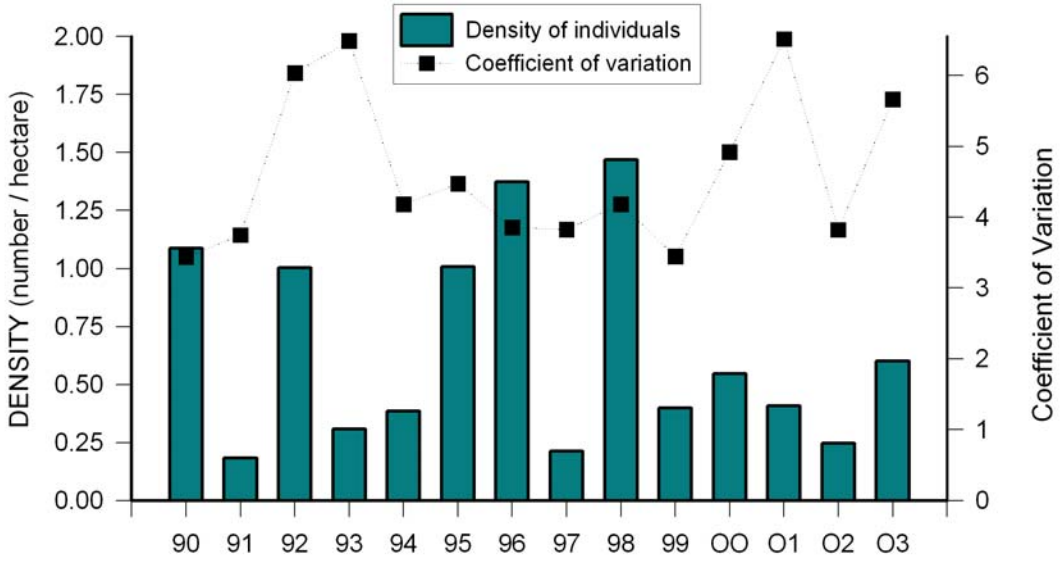

Figure 40. Annual densities of *Scomberomorus cavalla*

Table 22 . Estimates of density (number of individuals/hectare) in 2003.

Scomberomorus cavalla

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0.3	0.1
Onslow Bay	0	0.09	0.4	1.2
Long Bay	0	0.6	0.3	0.3
South Carolina	0	0.7	1.3	0.6
Georgia	0	0.5	0.2	0.2
Florida	0.8	4.0	1.2	2.0
Season	0.1	1.1	0.6	0.6

Fork lengths of *Scomberomorus cavalla* ranged from 4 to 38 cm ($\bar{x}$ = 17.2) 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 ($X^2 = 173$, $p < 0.0001$) 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 from the age 2 year class were still present. Lengths varied significantly among regions ($X^2 = 87$, $p < 0.0001$), with greatest mean length in the southern portion of the SAB and and mean size decreasing northward of Georgia (Figure 42).

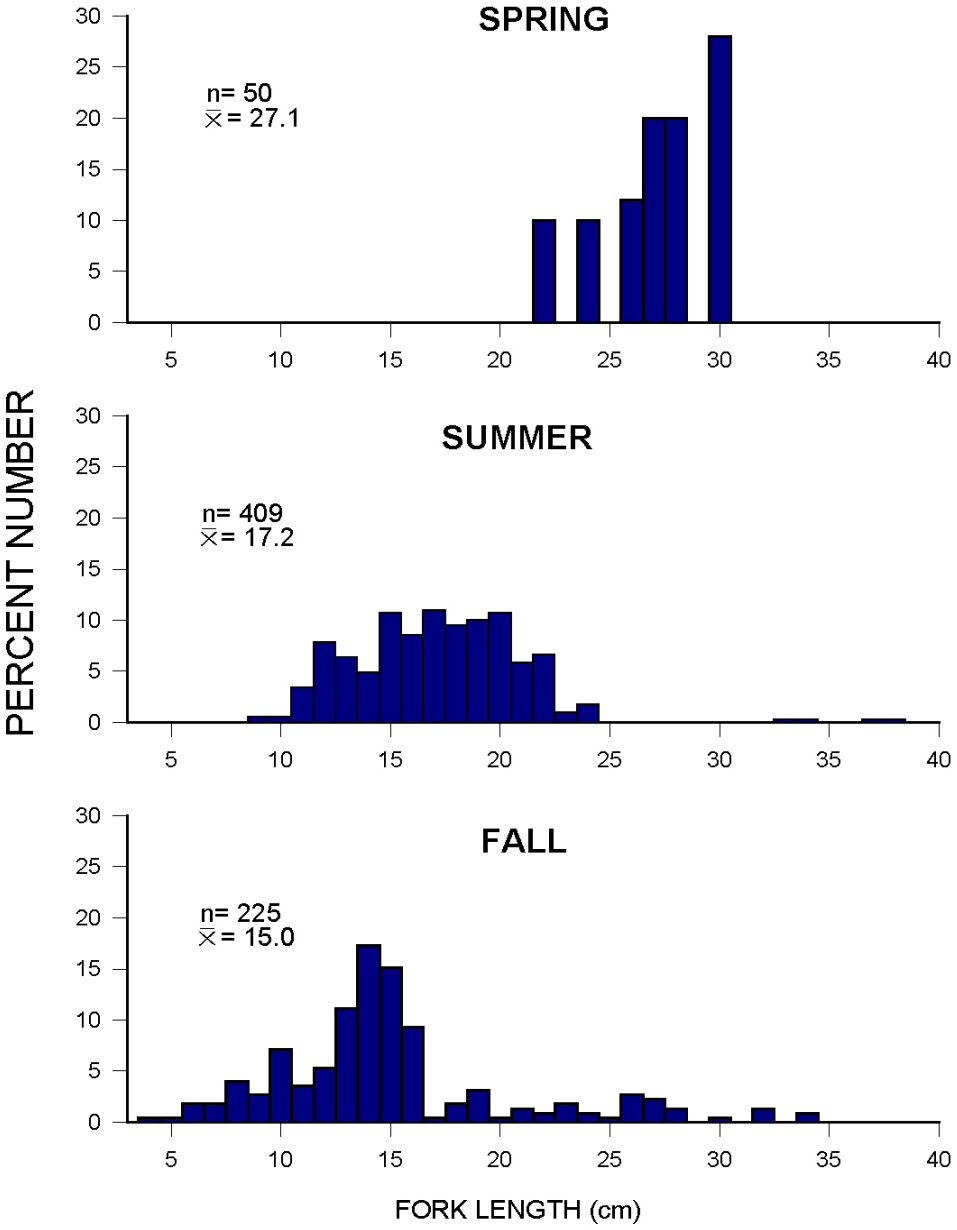

Figure 41. Seasonal length-frequencies of *Scomberomorus cavalla* in 2003

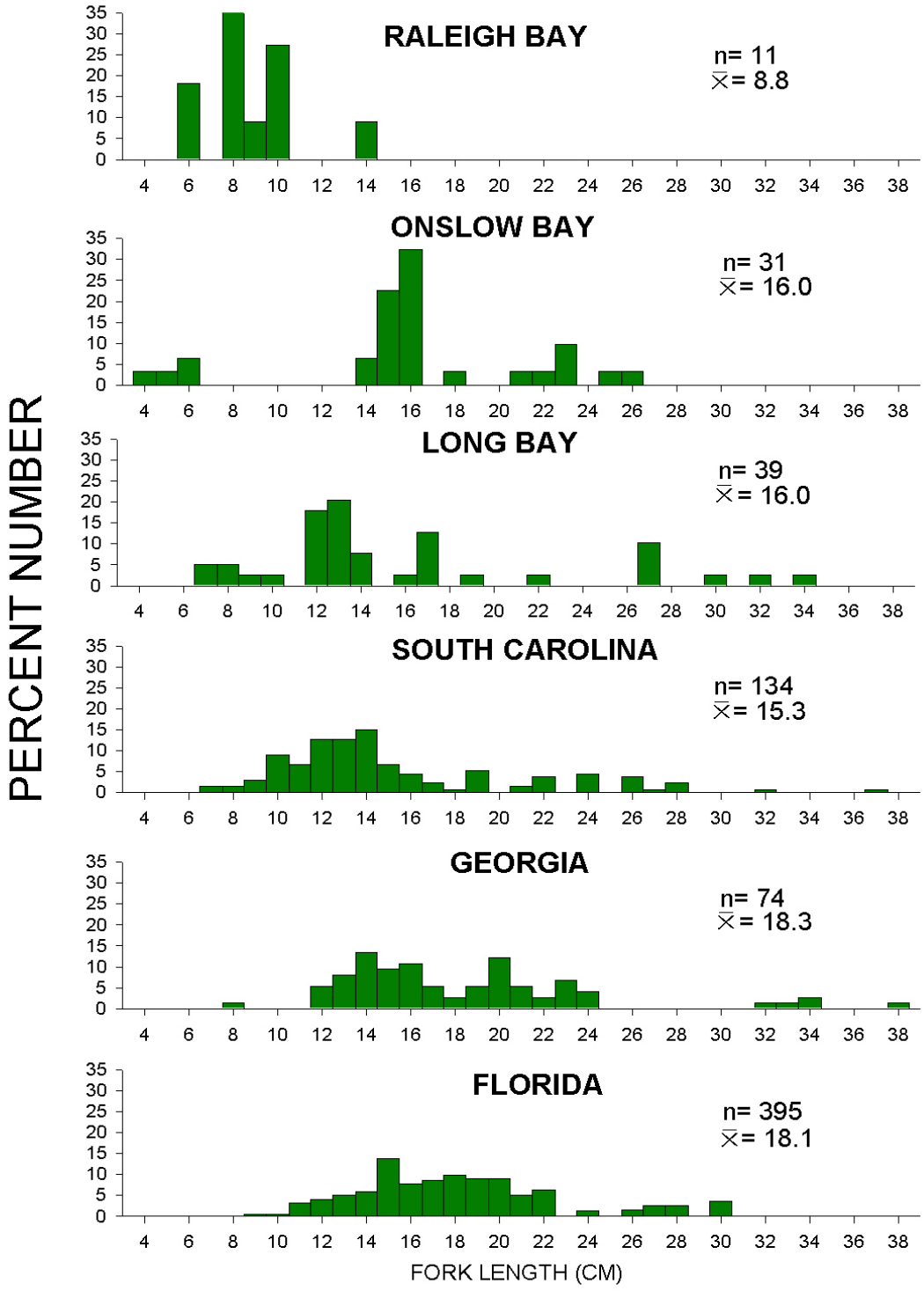

Figure 42. Regional length-frequencies of *Scomberomorus cavalla* in 2002

Scomberomorus maculatus

Sampling in 2003 produced 941 Spanish mackerel that weighed a total of 130 kg (CV=3.4; 0.8 individuals/ha; 0.1 kg/ha). The density of individuals of Spanish mackerel in 2003 decreased from the levels observed in 2001 and 2002 (Figure 43). Highest density of Spanish mackerel is generally found in the southern SAB (SEAMAP-SA/SCMRD, 2000); however, in 2003 a large number of Spanish mackerel were taken in summer in Onslow and Long Bays (Table 23).

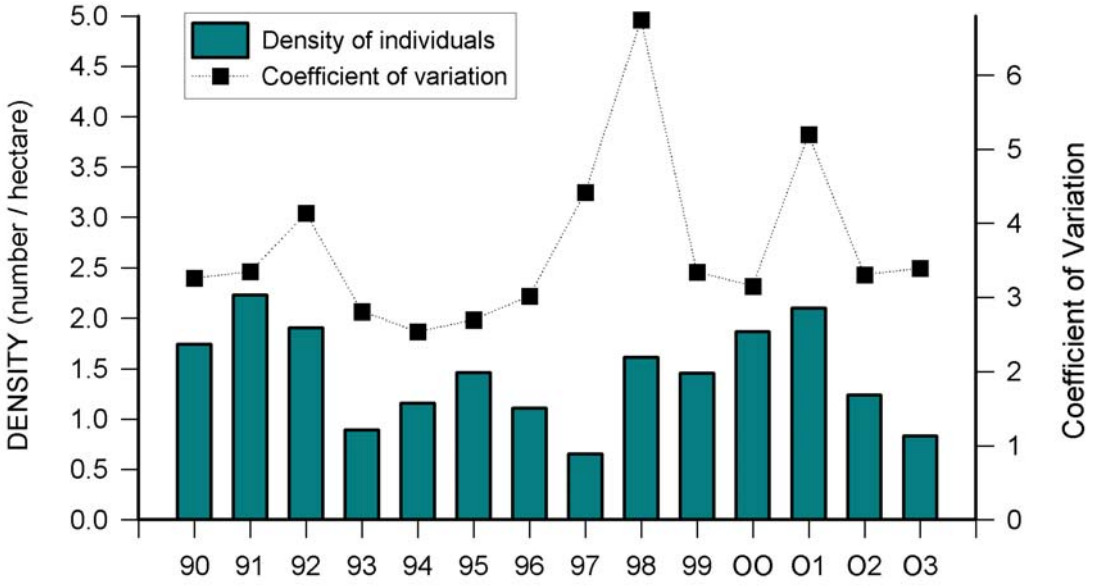

Figure 43. Annual densities of *Scomberomorus maculatus*

Table 23. Estimates of density (number of individuals/hectare) in 2003.

Scomberomorus maculatus

	Spring	Summer	Fall	Region
Raleigh Bay	0	0.06	0.1	0.07
Onslow Bay	0	1.1	0.4	0.5
Long Bay	0	1.0	0.07	0.3
South Carolina	0.2	3.6	0.1	1.3
Georgia	2.1	1.6	0.4	1.5
Florida	0.6	0.09	0.5	0.4
Season	0.8	1.4	0.3	0.8

Fork lengths of Spanish mackerel ranged from 11 to 51 cm ($\bar{x}$ = 23.3 cm). Lengths differed significantly among seasons (X^2 = 384, $p < 0.0001$). Mean length decreased from spring to summer, indicating the recruitment of YOY individuals, and increased in fall as the result of subsequent juvenile growth (Figure 44). By the end of their first year, Spanish mackerel reach lengths greater than 30 cm (Powell, 1975). Specimens collected in spring were generally fish ending their first year. Summer collections contained primarily newly recruited YOY with a few representatives of the previous year-class still present. Fall collections were made up of fish from two year-classes. Length also varied significantly among regions (X^2 = 222, $p < 0.0001$), and mean lengths ranged from a low of 18.5 cm in Long Bay to 28.8 cm off Florida (Figure 45).

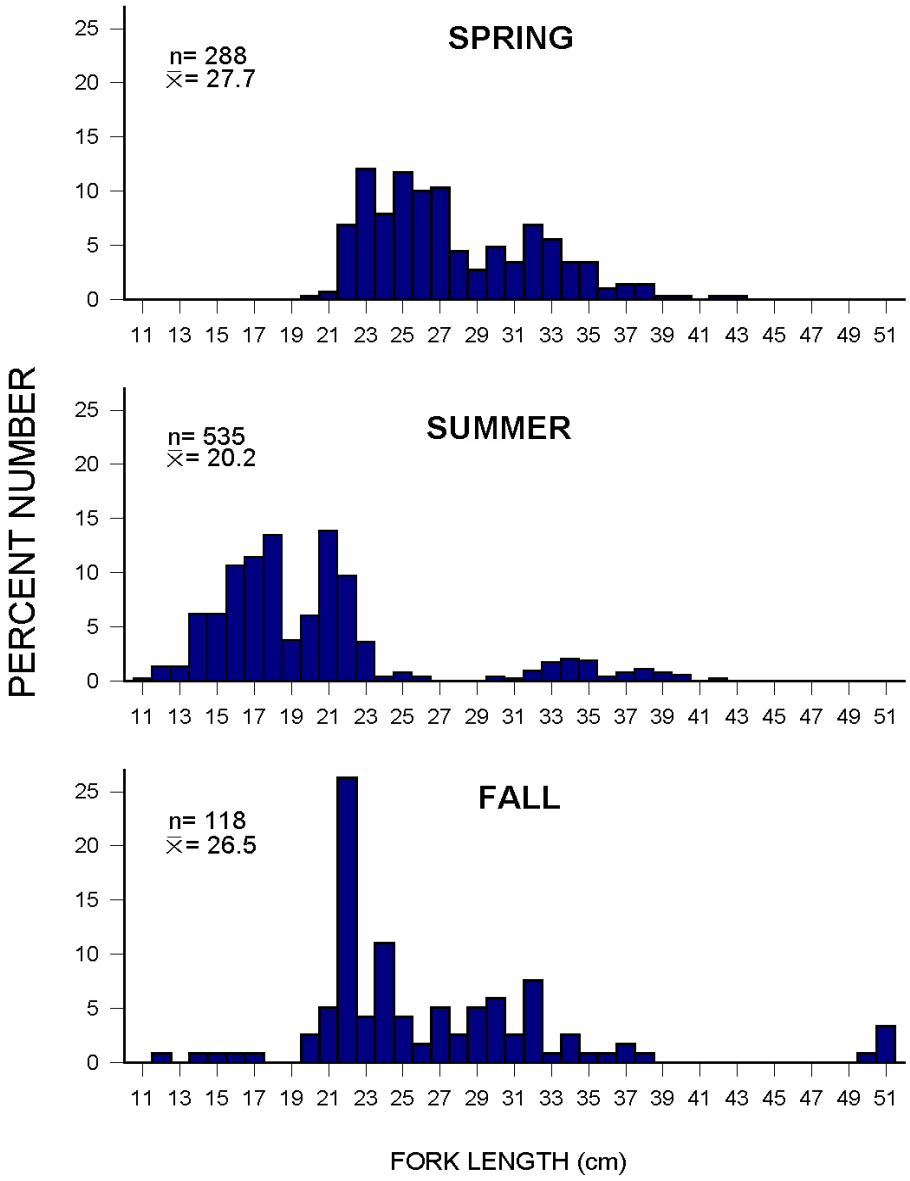

Figure 44. Seasonal length-frequencies of *Scomberomorus maculatus* in 2003

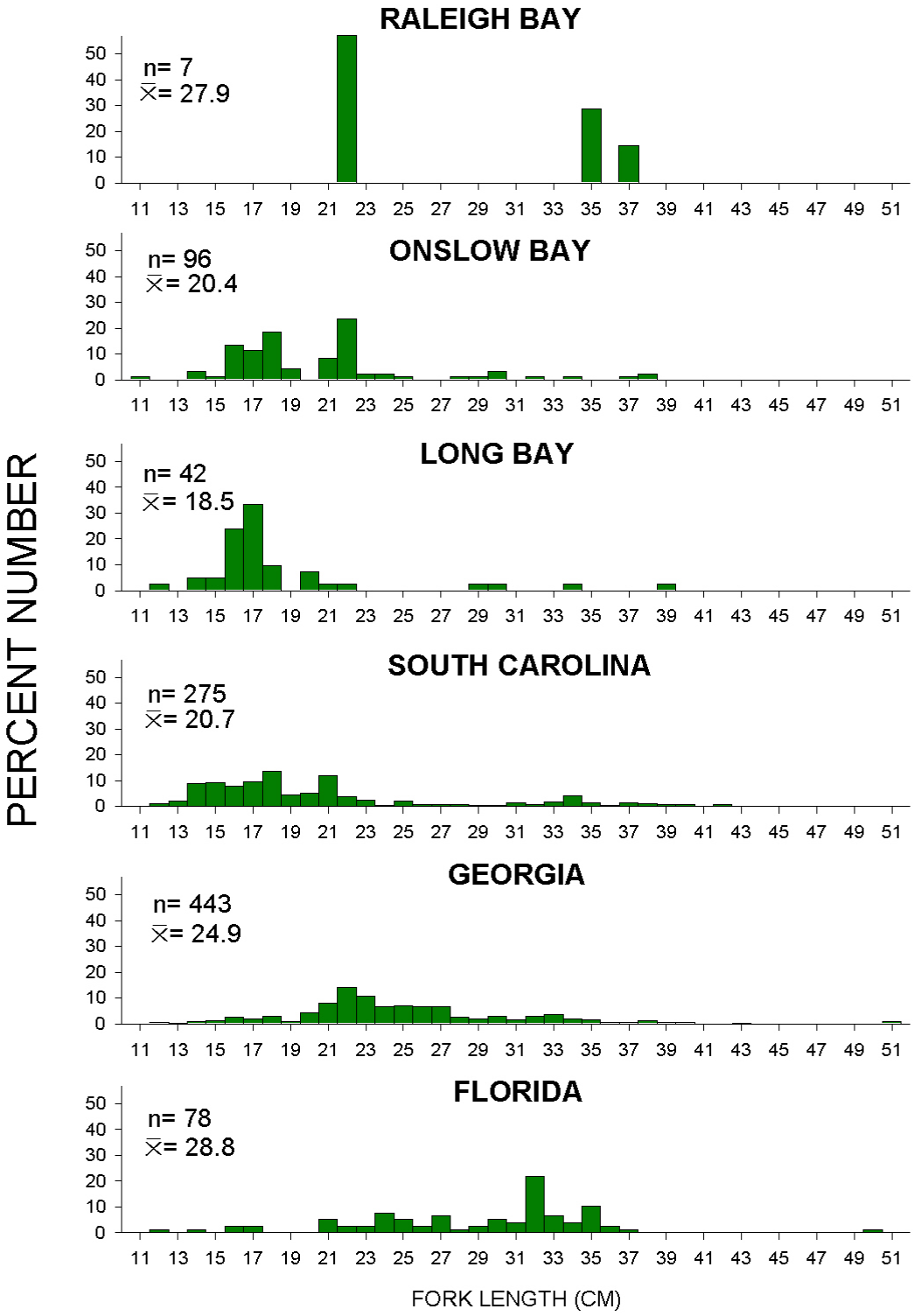

Figure 45. Regional length-frequencies of *Scomberomorus maculatus* in 2003

Callinectes sapidus

SEAMAP-SA Shallow Water Trawl Survey strata yielded a total of 98 (CV=4.2; 0.09 individuals/ha) blue crabs, weighing 15 kg (0.01 kg/ha). Overall density of *C. sapidus* peaked in 1990, followed by several years of low abundance and a secondary peak in 1999 (Figure 46). In 2003, the highest seasonal density was observed during summer cruises and the greatest regional density of individuals occurred in Onslow Bay (Table 24). No blue crabs were taken in waters off Florida. Carapace widths of *C. sapidus* ranged from 6 to 18 cm ($\bar{x}$ = 14.1).

Males constituted only 3% 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 53% of females being ovigerous. Non-ovigerous females outnumbered ovigerous females only in fall.

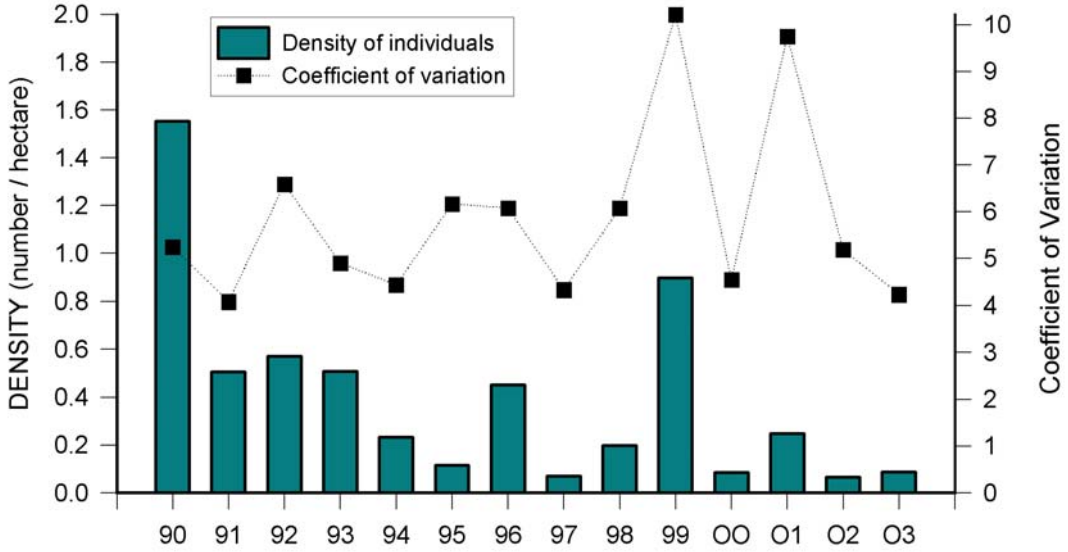

Figure 46. Annual densities of *Callinectes sapidus*

Table 24 . Estimates of density (number of individuals/hectare) in 2003.

Callinectes sapidus

	Spring	Summer	Fall	Region
Raleigh Bay	0	0.4	0.2	0.2
Onslow Bay	0.1	0.7	0.3	0.3
Long Bay	0.08	0	0	0.02
South Carolina	0.07	0	0	0.02
Georgia	0	0	0.009	0.003
Florida	0	0	0	0
Season	0.04	0.2	0.06	0.009

Farfantepenaeus aztecus

The brown shrimp, formerly *Penaeus aztecus* (Perez-Farfante and Kensley, 1997), ranked first among decapod crustaceans, with 10,944 specimens (CV=4.9; 9.6 individuals/ha) collected, weighing 162 kg (0.1 kg/ha). The estimate of density of brown shrimp in 2003 represents the second highest abundance in the history of the survey (Figure 47). Summer collections produced the highest seasonal density (Table 25). The greatest regional density of brown shrimp occurred in Onslow Bay. 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).

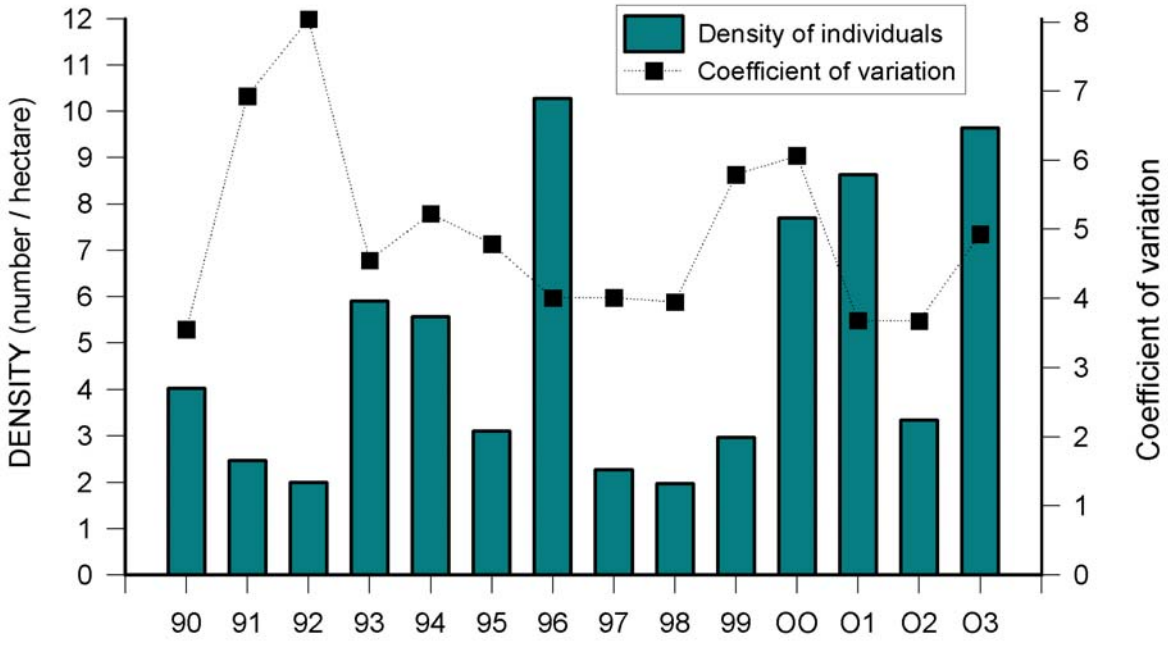

Figure 47. Annual densities of *Farfantepenaeus aztecus*

Table 25 . Estimates of density (number of individuals/hectare) in 2003.

Farfantepenaeus aztecus

	Spring	Summer	Fall	Region
Raleigh Bay	0	8.2	3.3	3.9
Onslow Bay	0	84.4	8.8	29.3
Long Bay	0	23.7	0	4.2
South Carolina	0	16.8	1.5	6.1
Georgia	0.05	8.5	2.1	3.8
Florida	0.2	18.3	0.1	6.6
Season	0.05	26.0	2.7	9.6

Total lengths of *F. aztecus* ranged from 7 to 19 cm with a mean length of 11.9 cm. Total lengths differed significantly among seasons (X^2 =477, $p < 0.0001$). Mean length increased from spring to fall (Figure 48). Lengths were also significantly different among regions (X^2 =1111, $p < 0.0001$). Mean lengths ranged from 11.3 cm in Long Bay to 13.0 cm in Georgia (Figure 49).

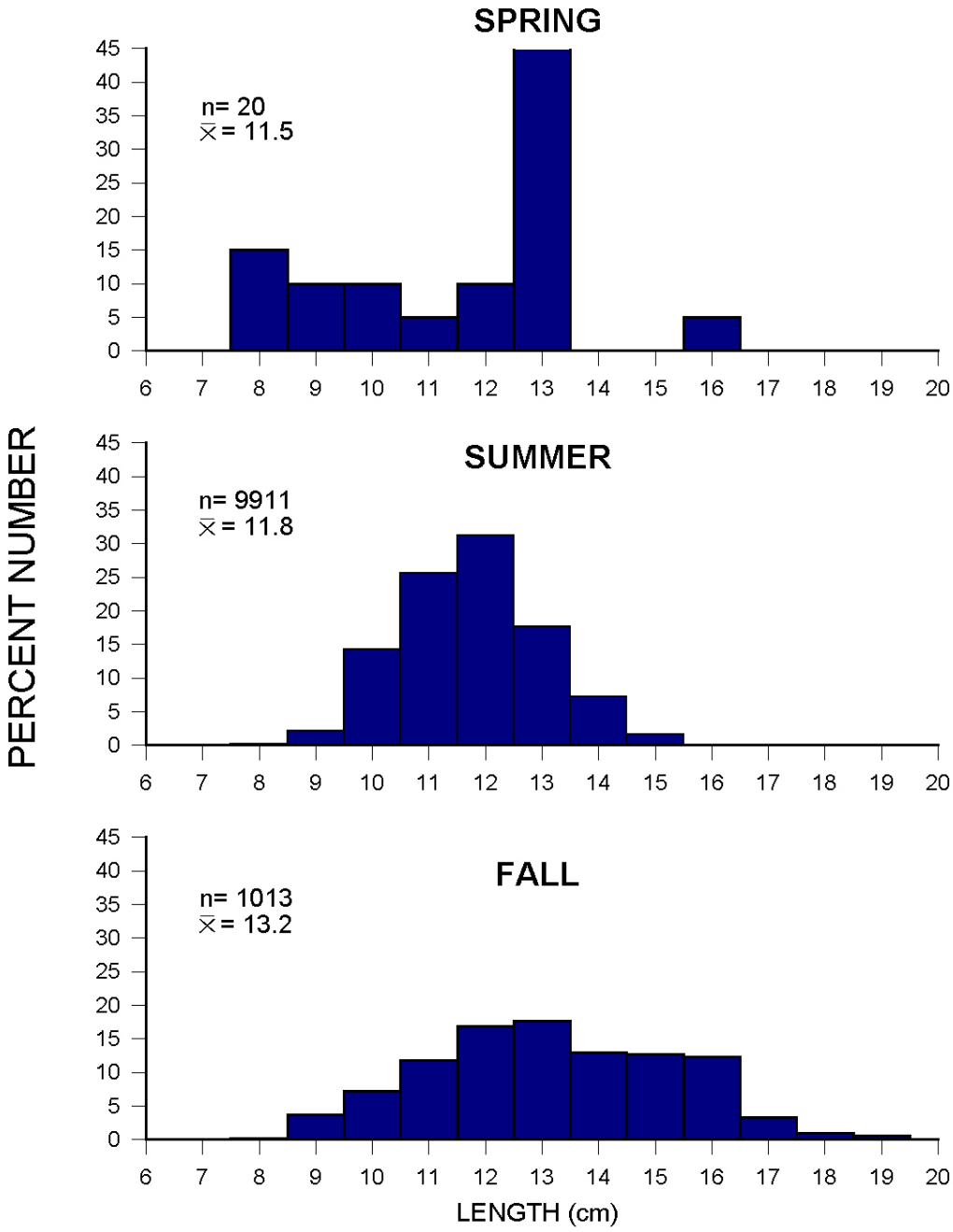

Figure 48. Seasonal length-frequencies of *Farfantepenaeus aztecus* in 2003

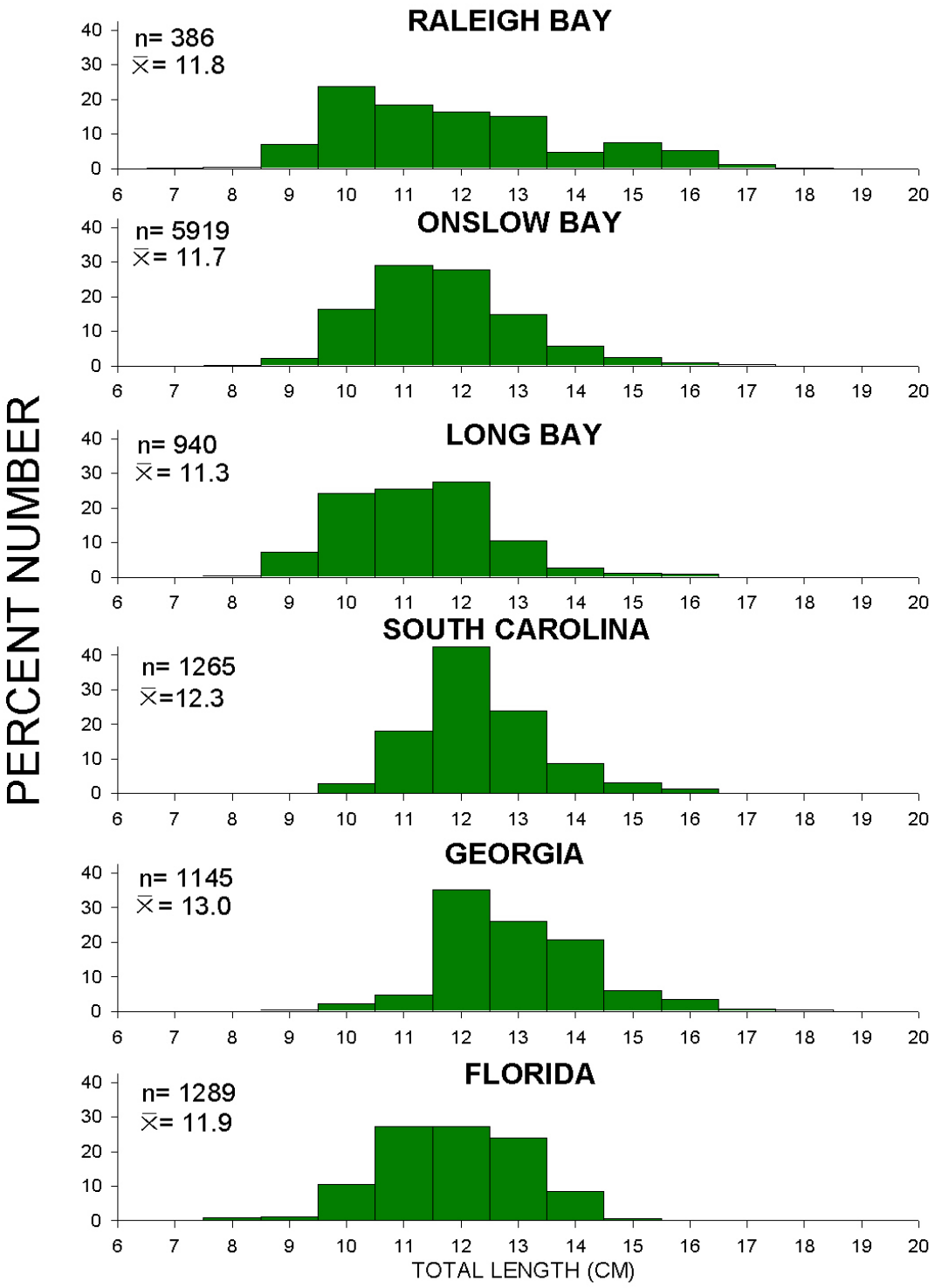

Figure 49. Regional length-frequencies of *Farfantepenaeus aztecus* in 2003

More than 60% of the brown shrimp sampled were female. Only one female brown shrimp with ripe ovaries was sampled in 2003 and less than 1% of the female brown shrimp were found to be mated. Only 3% of the male brown shrimp had fully developed spermatophores (ripe). Spermatophore development was not independent of season ($G = 81$, $p < 0.0001$) or region ($G = 30$, $p < 0.0001$). Although the majority of males with fully developed spermatophores were taken in summer (62%), those taken in fall contributed more to the composition of spermatophore development within that season (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 2003. As in previous years, infestation of brown shrimp occurred in the southern portion of the SAB, in waters off Georgia (n=5).

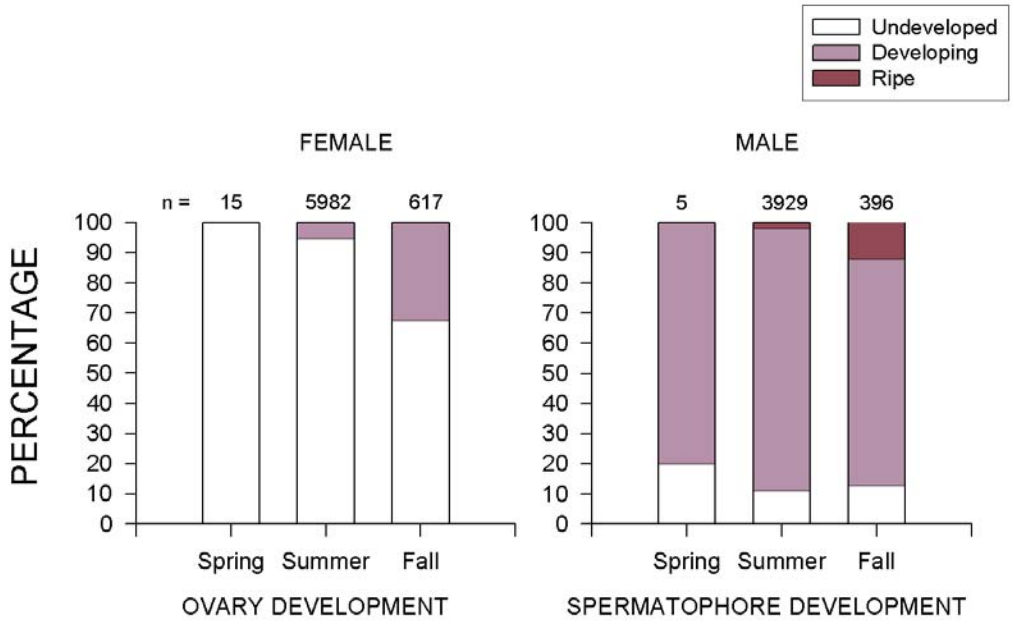

Figure 50. Gonadal development of *Farfantepenaeus aztecus* in 2003

Farfantepenaeus duorarum

The pink shrimp, formerly *Penaeus duorarum* (Perez-Farfante and Kensley, 1997), was the least abundant commercially important penaeid shrimp species collected in 2003. The 474 specimens (CV=4.3; 0.4 individuals/ha) taken from SEAMAP trawls weighed 9 kg (0.008 kg/ha). Density of individuals in 2003 was lower than the 2002 estimate (Figure 51). In 2003, abundance was greatest in spring collections in Onslow and Long Bays. No pink shrimp were taken in Florida waters, nor were any taken south of Onslow Bay in summer (Table 26).

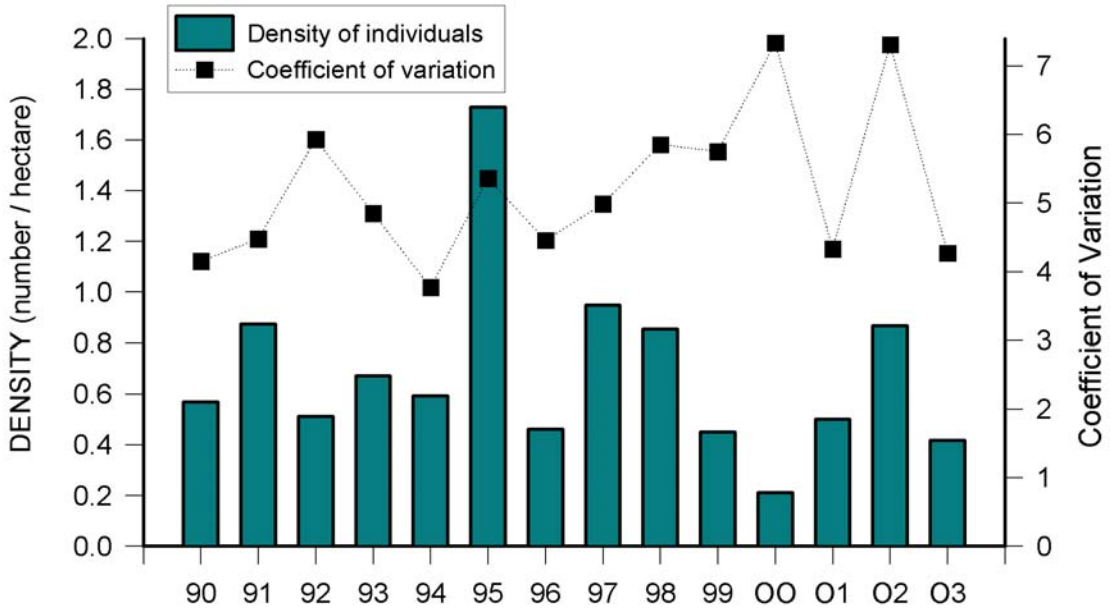

Figure 51. Annual densities of *Farfantepenaeus duorarum*

Table 26 . Estimates of density (number of individuals/hectare) in 2003.

Farfantepenaeus duorarum

	Spring	Summer	Fall	Region
Raleigh Bay	0.03	0.9	0.4	0.4
Onslow Bay	2.8	0.9	0.7	1.4
Long Bay	2.4	0	0	0.7
South Carolina	0.4	0	0.1	0.2
Georgia	0.07	0	0.05	0.04
Florida	0	0	0	0
Season	0.8	0.2	0.2	0.4

Total length of pink shrimp ranged from 6 to 18 cm ($\bar{x}$ =12.3 cm). Total lengths varied significantly among seasons (X^2=149, $p < 0.001$). Mean length was greatest in spring and decreased in summer and fall (Figure 52). Total length differed significantly among regions (X^2 =32, $p < 0.001$). Regionally, mean lengths ranged from 11.0 cm in Raleigh Bay to 12.8 cm in Long Bay (Figure 53).

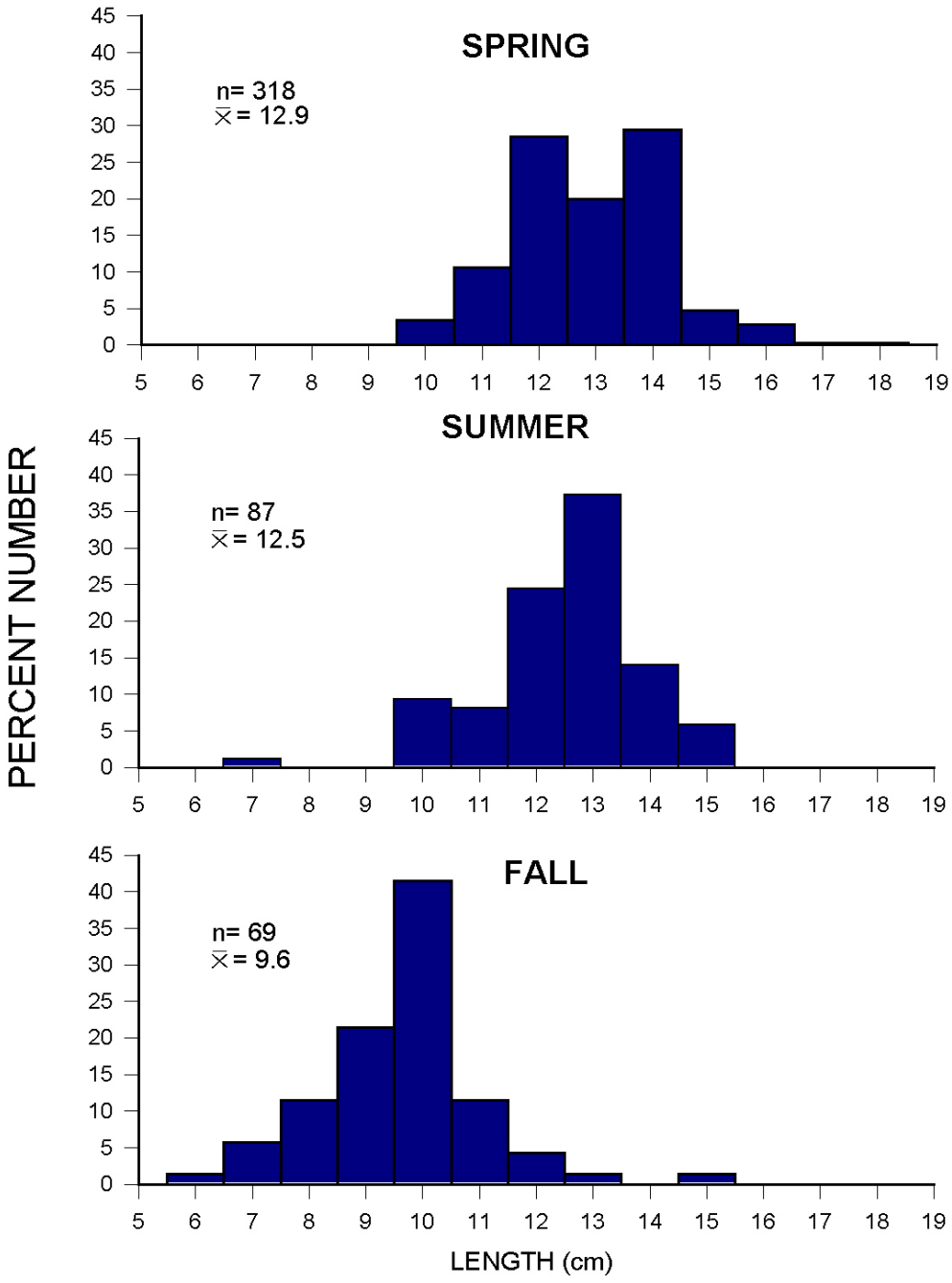

Figure 52. Seasonal length-frequencies of *Farfantepenaeus duorarum* in 2003

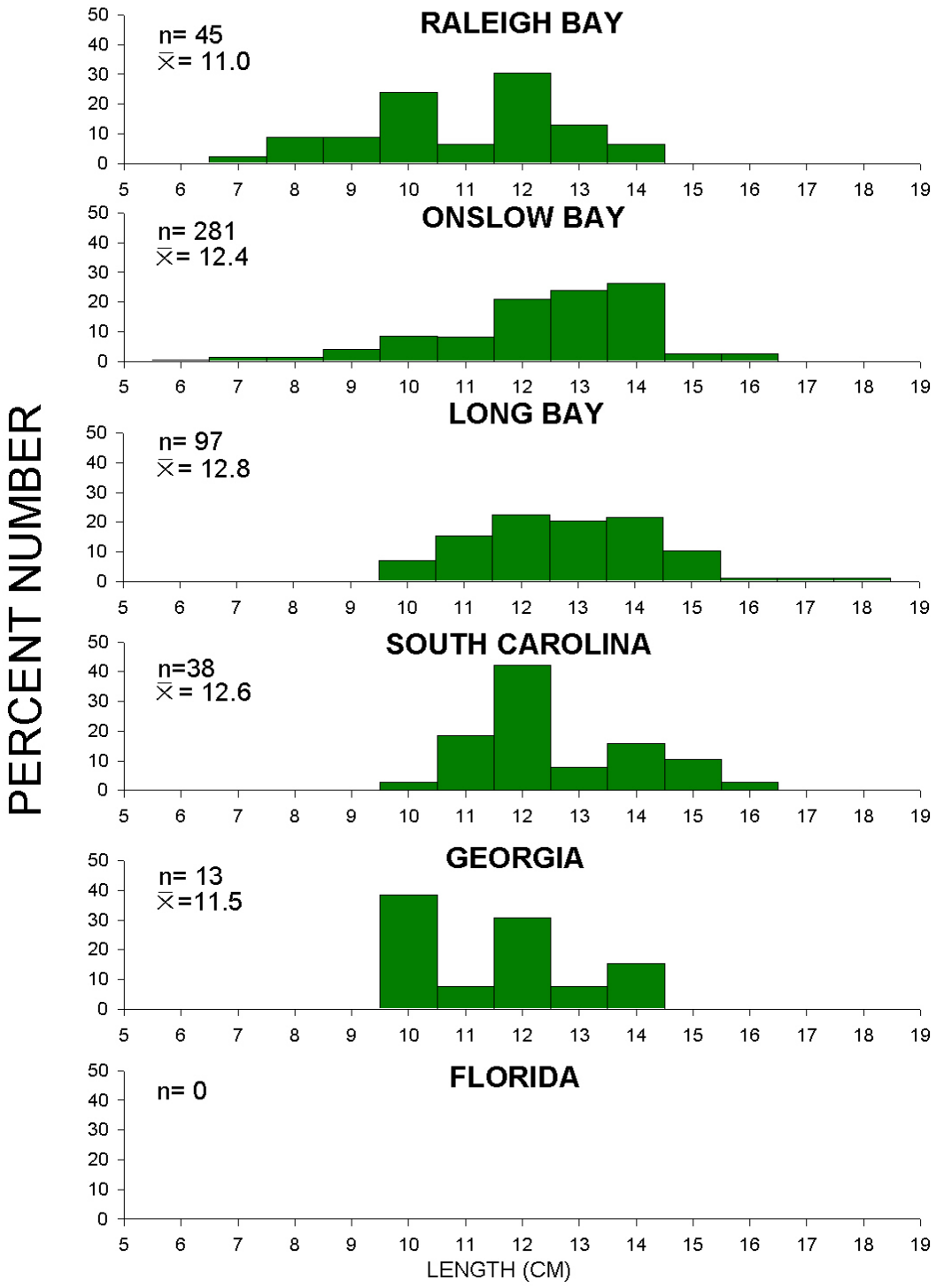

Figure 53. Regional length-frequencies of *Farfantepenaeus duorarum* in 2003

In SEAMAP-SA Shallow Water Trawl Survey strata more than 57% of all pink shrimp were found to be female. No ripe female pink shrimp were collected in 2003 (Figure 54); however, approximately 5% of the total number of female pink shrimp sampled were mated. Like brown shrimp, copulation in pink shrimp may occur regardless of developmental stage of the ovaries (Perez-Farfante, 1969). Approximately 9% of male pink shrimp sampled had fully developed spermatophores. Spermatophore development was not independent of season ($G = 23$, $p < 0.0001$) or region ($G = 10$, $p < 0.05$). Presence of black gill disease was not noted in any pink shrimp.

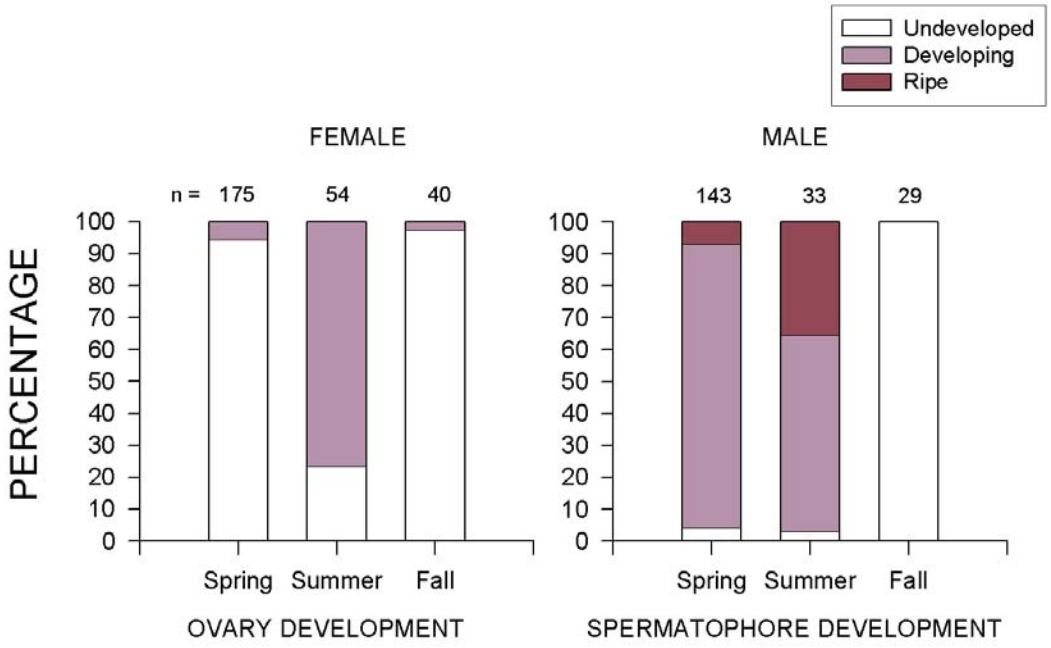

Figure 54. Gonadal development of *Farfantepenaeus duorarum* in 2003

Litopenaeus setiferus

The white shrimp, formerly *Penaeus setiferus* (Perez-Farfante and Kensley, 1997), was the second most abundant decapod crustacean species taken in 2003 by the SEAMAP-SA Trawl Survey, with 8,369 individuals (CV=3.0; 7.4 individuals/ha), weighing 228 kg (0.2 kg/ha). Although the annual density of abundance of *L. setiferus* in 1999 was the greatest annual density in the history of the survey, abundance decreased in each subsequent year (Figure 55). In 2003, density was highest in fall collections (Table 27). Greatest regional densities of abundance were found off Georgia, due to high spring and fall catches.

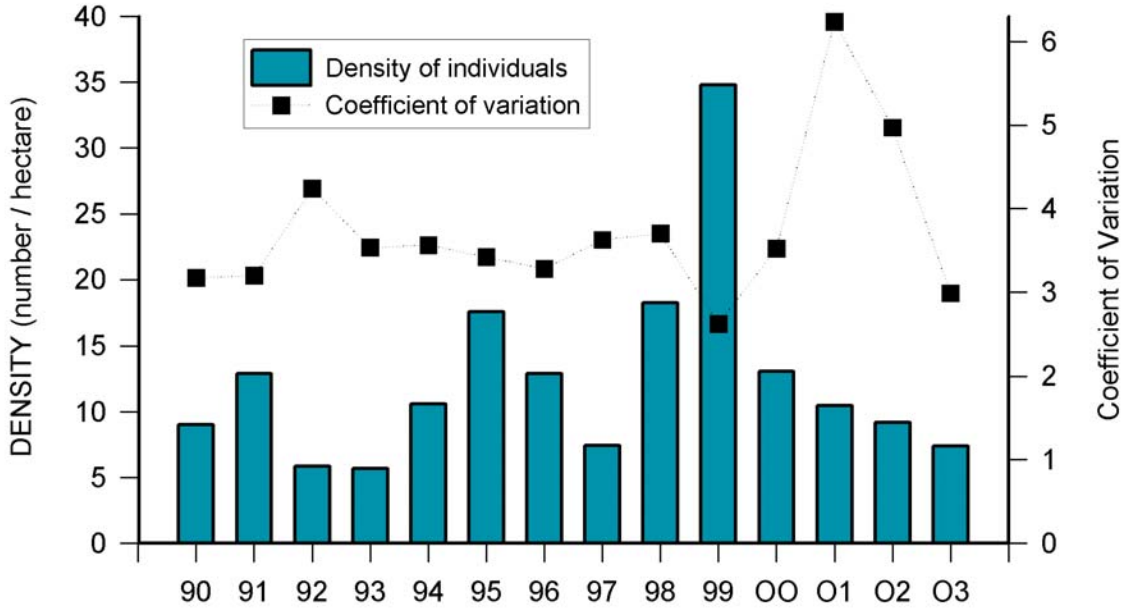

Figure 55. Annual densities of *Litopenaeus setiferus*

Table 27 . Estimates of density (number of individuals/hectare) in 2003.

Litopenaeus setiferus

	Spring	Summer	Fall	Region
Raleigh Bay	0.06	0	0.7	0.3
Onslow Bay	0.4	4.2	17.7	7.0
Long Bay	0.3	0.05	0.2	0.2
South Carolina	0.4	0.8	12.1	4.4
Georgia	20.2	0.2	24.0	15.9
Florida	1.7	12.6	3.8	6.2
Season	6.3	3.2	12.7	7.4

Total lengths of *L. setiferus* ranged from 8 to 19 cm, with a mean length of 15.0 cm. There was a significant difference in mean length among seasons (X^2 =176, $p < 0.0001$) (Figure 56), with mean length greatest in summer. Smaller YOY individuals began moving out of the estuaries in summer and continued to do so into the fall. Regional mean lengths also differed significantly ($X^2 = 1370$, $p < 0.0001$). Onslow Bay produced the smallest mean length (13.8 cm) and Long Bay the greatest (15.9 cm) (Figure 57).

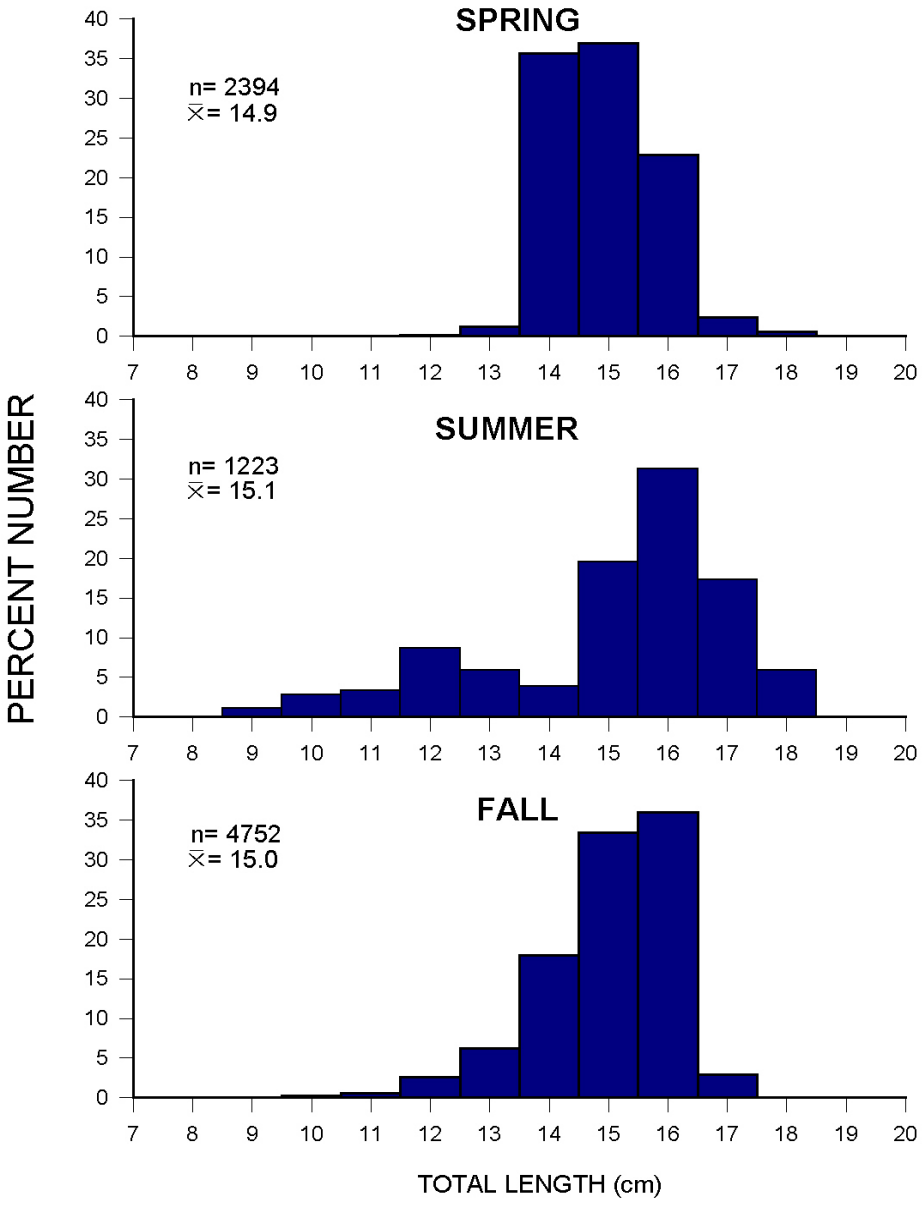

Figure 56. Seasonal length-frequencies of *Litopenaeus setiferus* in 2003

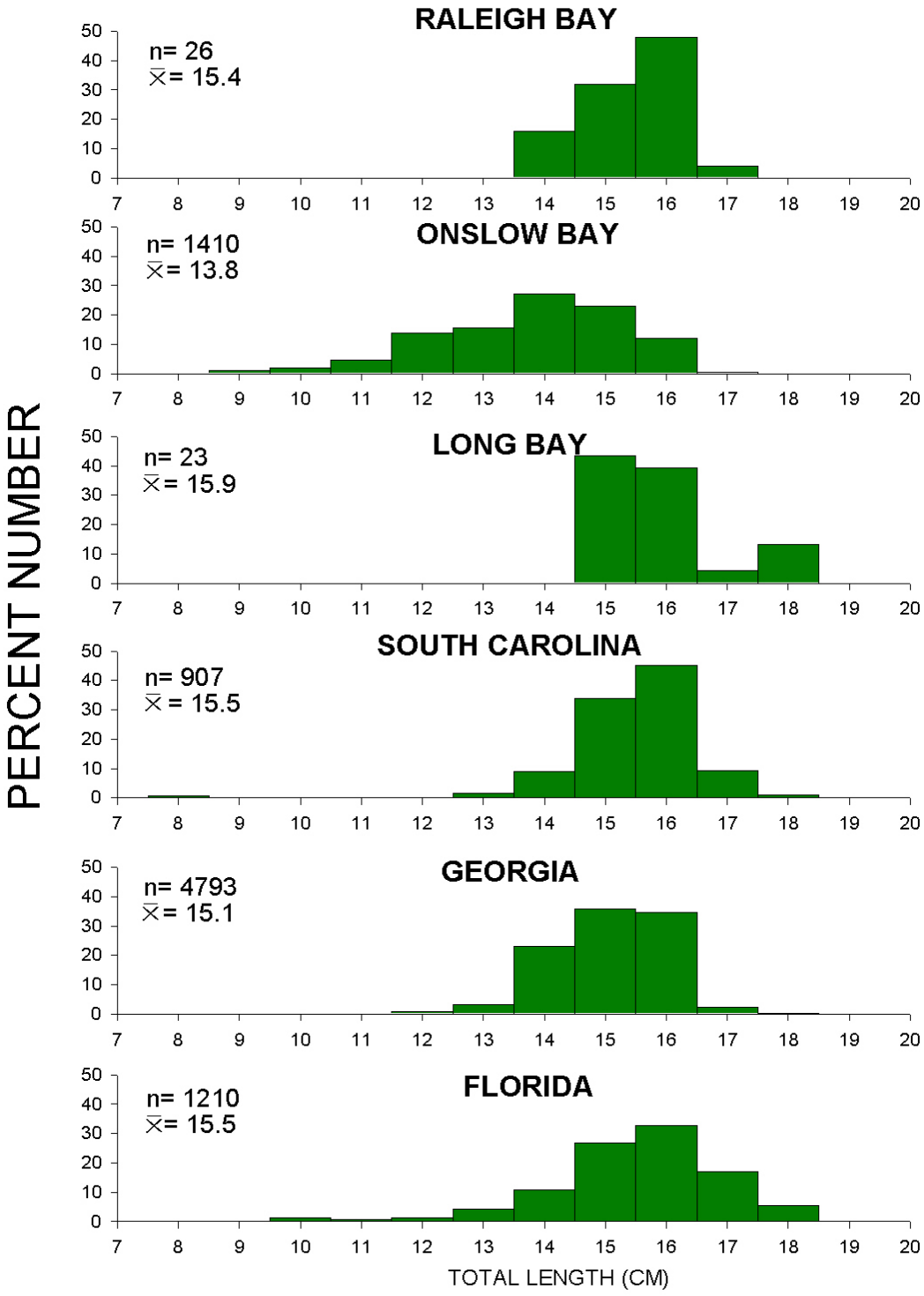

Figure 57. Regional length-frequencies of *Litopenaeus setiferus* in 2003

Most of the white shrimp sampled (53%) were female. Few (9%) 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 66% of the females were taken. The majority of ripe females were taken in spring (72%). The ratio of ripe to nonripe females was not independent of season ($G = 921$, $p < 0.0001$) or region ($G = 309$, $p < 0.0001$) Only 2% 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). Although the majority of males with fully developed spermatophores were taken in spring (60%), those taken in summer contributed more to the composition of spermatophore development within that season (Figure 58). Very few males with fully developed spermatophores were taken in fall, when the majority (47%) 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 ($G = 1980$, $p < 0.0001$) or regions ($G = 860$, $p < 0.0001$).

Occurrence of black gill disease in commercially important penaeids was observed and recorded. White shrimp exhibited the greatest level of infestation, at 9%. All white shrimp with black gill disease were taken in fall trawls (14% of white shrimp taken in fall). Infestation of white shrimp occurred primarily in the southern portion of the SAB, in waters off South Carolina (3%), Georgia (76%), and Florida (21%).

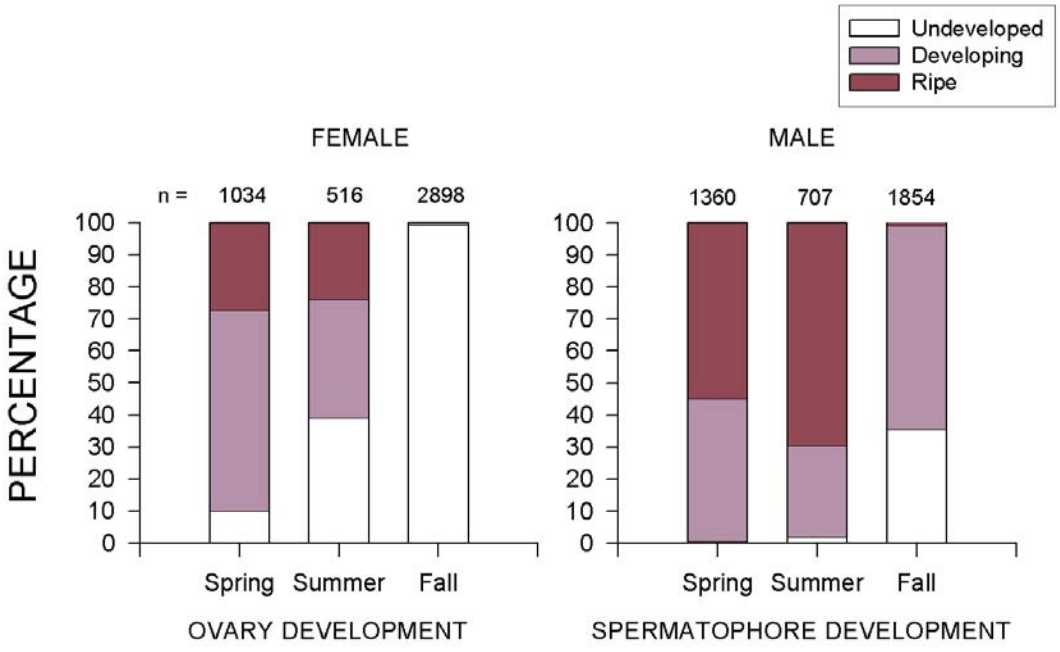

Figure 58. Gonadal development of *Litopenaeus setiferus* in 2003

Distribution and Abundance of Sharks

In 2003, the SEAMAP-SA Shallow Water Trawl Survey collected fourteen species of sharks (Table 28). Both the diversity (number of species) and the overall abundance of sharks were at the greatest level observed in SEAMAP collections. The Atlantic sharpnose shark, *Rhizoprionodon terraenovae*, was the most abundant shark, making up approximately 42% of the shark specimens collected. The smooth dogfish, *Mustelus canis,* ranked second in abundance (34%), followed by the bonnethead shark, *Sphyrna tiburo* (18%), and the spiny dogfish, *Squalus acanthias* (5%). The other ten species contributed less than 2% to the overall number of sharks collected.

Table 28. Sharks taken by the SEAMAP-SA Shallow Water Trawl Survey in 2003.

Rank	Common name	Species name	Number
1	Atlantic sharpnose	*Rhizoprionodon terraenovae*	1670
2	Smooth dogfish	*Mustelus canis*	1333
3	Bonnethead	*Sphyrna tiburo*	696
4	Spiny dogfish	*Squalus acanthias*	193
5	Blacknose shark	*Carcharhinus acronotus*	28
6	Spinner shark	*Carcharhinus brevipinna*	17
7	Scalloped hammerhead	*Sphyrna lewini*	6
8	Blacktip shark	*Carcharhinus limbatus*	5
9	Sand tiger shark	*Odontaspis taurus*	3
10	Sandbar	*Carcharhinus plumbeus*	3
11	Finetooth	*Carcharhinus isodon*	2
12	Nurse shark	*Ginglymostoma cirratum*	1
13	Atlantic angel shark	*Squatina dumerili*	1
14	Thresher shark	*Alopias vulpinus*	1

Mustelus canis

The smooth dogfish, *Mustelus canis,* was the second most abundant shark species (n=1333; 1.2 individuals/ha; CV=6.3) collected during the 2003 SEAMAP-SA Shallow Water Trawl Survey. Densities of abundance were the highest since the peak observed in 1990 (Figure 59). Over 99% of the individuals were taken in spring. Smooth dogfish were almost exclusive to the northern SAB, with abundance decreasing from Raleigh Bay southward to a single individual taken south of Long Bay (Table 29).

Male *M. canis* outnumbered females (1.3 : 1.0). Typical of sharks in general (Hoenig and Gruber, 1990), females were significantly larger than males ($X^2 = 4$, $p = 0.05$). Total lengths of the smooth dogfish ranged from 41 to 121 cm for females ($\bar{x}$ = 77.7 cm, n = 592) and 32 to 112 cm for males ($\bar{x}$ = 76.0 cm, n = 741). Mean length was greatest in Raleigh Bay and decreased southward for both sexes.

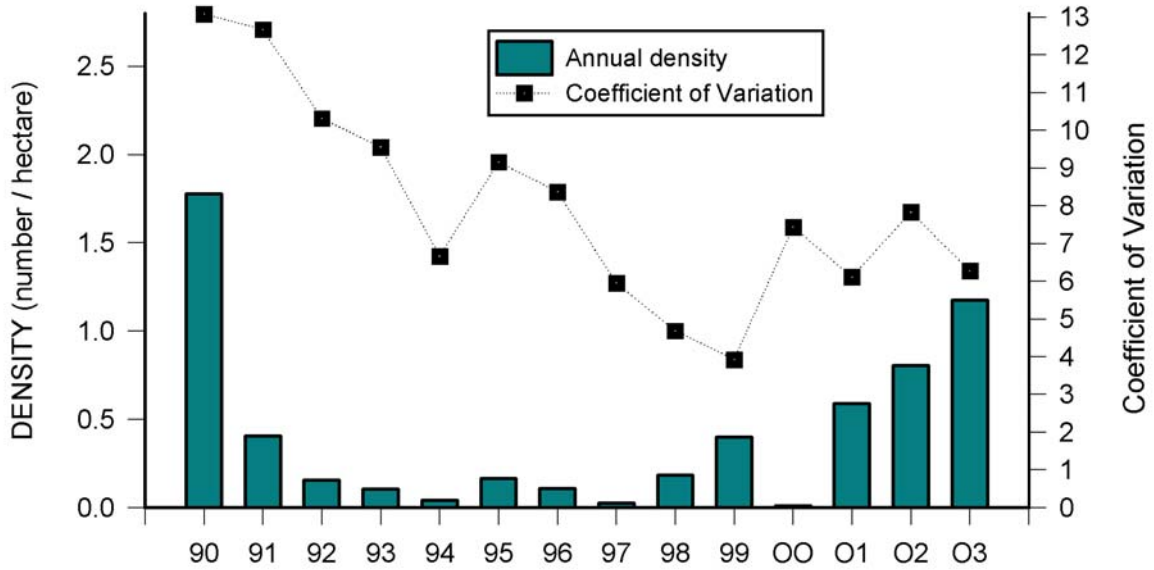

Figure 59. Annual densities of *Mustelus canis*

Table 29 . Estimates of density (number of individuals/hectare) in 2003.

Mustelus canis

	Spring	Summer	Fall	Region
Raleigh Bay	32.7	0.1	0	10.6
Onslow Bay	3.6	0.02	0	1.2
Long Bay	0.8	0	0.05	0.3
South Carolina	0.02	0	0	0.005
Georgia	0	0	0	0
Florida	0	0	0	0
Season	3.5	0.01	0.005	1.2

Rhizoprionodon terraenovae

The Atlantic sharpnose shark was the most abundant shark species collected in 2003 (n=1670; 1.5 individuals/ha; CV=3.1). The density of abundance of *R. terraenovae* in 2003 was the greatest in the history of the survey, with a secondary peak observed in 1997 (Figure 60). In 2003, Atlantic sharpnose were taken in all regions and all seasons. The highest densities of abundance were taken in summer (Table 30).

Although males outnumber females (1.3:1), size did not differ significantly among sexes (X^2 =1, p > 0.5). Females ranged in size from 25 to 125 cm total length ($\bar{x}$ = 47.7 cm, n =732), whereas males ranged from 25 to102 cm ($\bar{x}$ = 48.9 cm, n = 938). Mean length was greatest in spring and smallest in summer collections. Regional mean lengths were greatest off Florida, where the greatest regional density was found.

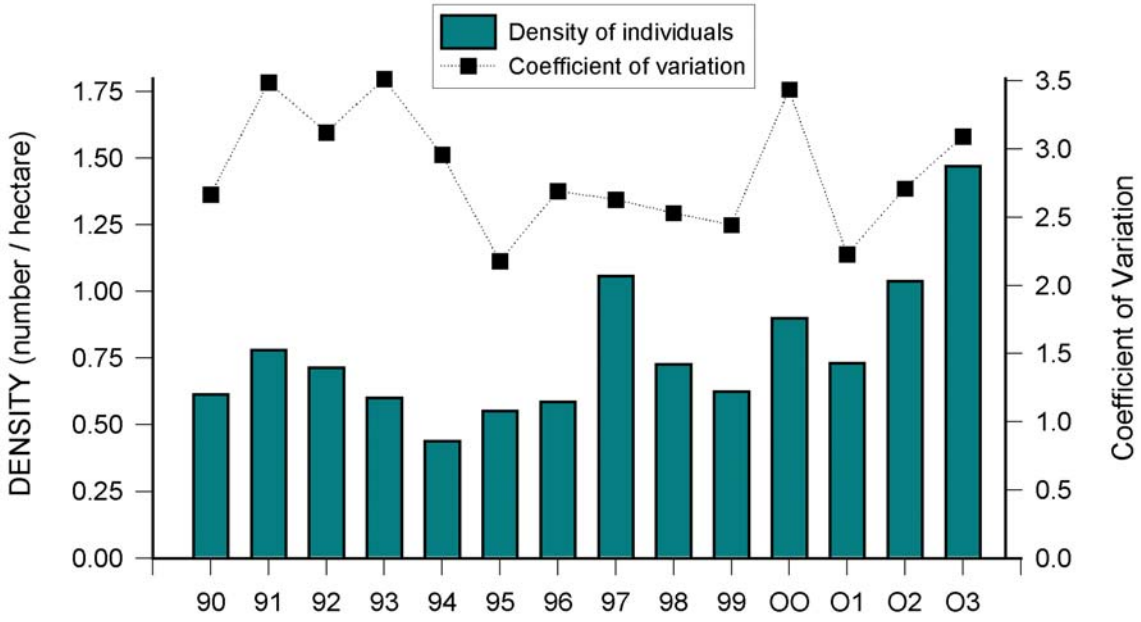

Figure 60. Annual densities of *Rhizoprionodon terraenovae*

Table 30 . Estimates of density (number of individuals/hectare) in 2003.

Rhizoprionodon terraenovae

	Spring	Summer	Fall	Region
Raleigh Bay	0	2.3	0.03	0.8
Onslow Bay	0	4.9	0.6	1.7
Long Bay	0	5.1	1.6	2.0
South Carolina	0.4	3.0	0.6	1.4
Georgia	0.3	1.7	0.3	0.8
Florida	0.4	6.2	0.07	2.3
Season	0.2	3.7	0.5	1.5

Sphyrna tiburo

The bonnethead shark, *Sphyrna tiburo,* ranked third in abundance (n=696; 0.6 individuals/ha; CV=7.7) among sharks in 2003. Although abundance decreased from the record level observed in 2002, the 2003 estimate of density was the second highest abundance taken by the survey (Figure 61). Density was greatest in fall collections and in the southern SAB (Table 31). Waters off Florida yielded the highest density in summer and fall. No bonnethead sharks were taken in Raleigh Bay in any season.

Males outnumbered female bonnetheads (1.3:1), and were significantly larger than females (X^2 = 7, $p < 0.05$). Total lengths of female *S. tiburo* ranged from 28 to 135 cm ($\bar{x}$ = 51.0 cm, n =305), whereas males ranged from 29 to 102 cm ($\bar{x}$ = 52.6 cm, n =391). Mean lengths of both sexes were greatest in summer. Greatest mean lengths occurred in Long Bay and smallest mean length of both sexes occurred off Florida.

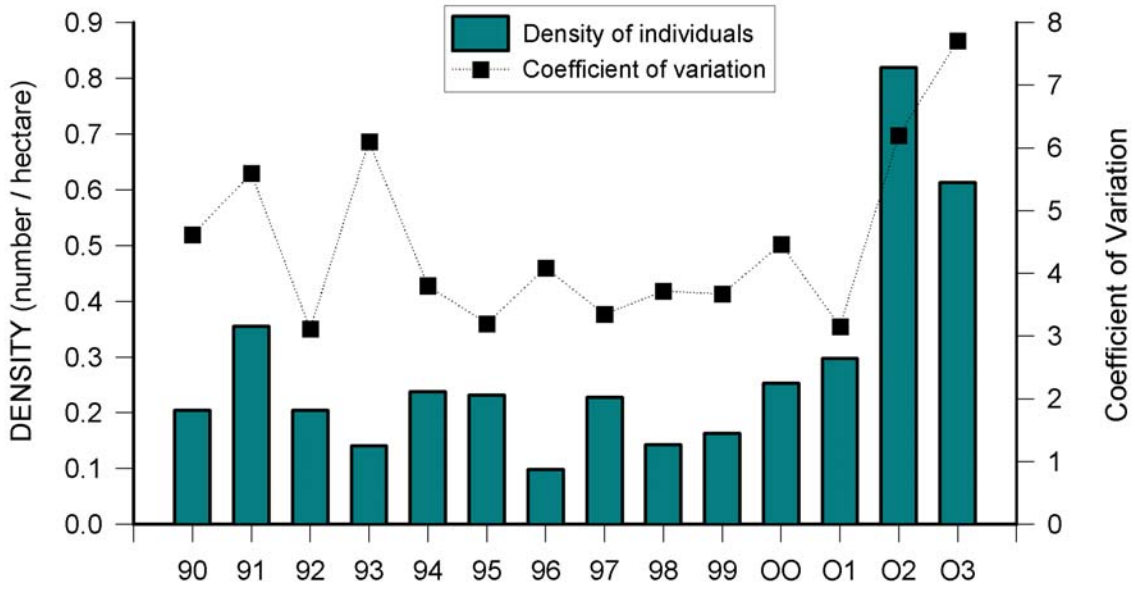

Figure 61. Annual densities of *Sphyrna tiburo*

Table 31 . Estimates of density (number of individuals/hectare) in 2003.

Sphyrna tiburo

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0	0
Onslow Bay	0	0.02	0.02	0.01
Long Bay	0	0.3	0.2	0.1
South Carolina	0.1	0.4	0.06	0.2
Georgia	0.4	0.4	0.1	0.3
Florida	1.0	0.4	7.4	2.8
Season	0.3	0.3	1.3	0.6

Squalus acanthias

The spiny dogfish, *Squalus acanthias,* was the fourth most abundant shark species (n=193; 0.2 individuals/ha; CV=1.2) collected during the 2003 SEAMAP-SA Shallow Water Trawl Survey. Densities of abundance were the highest observed in the history of the survey (Figure 62). Spiny dogfish were exclusive to Raleigh and Onslow Bays in spring (Table 29).

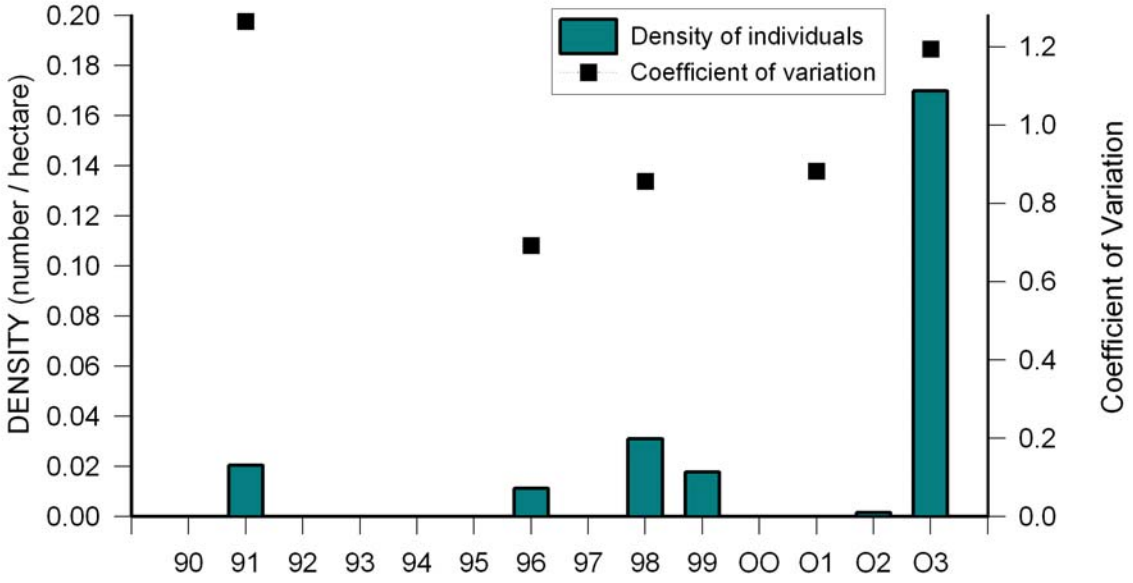

Figure 62. Annual densities of *Squalus acanthias*

Table 32 . Estimates of density (number of individuals/hectare) in 2003.

Squalus acanthias

	Spring	Summer	Fall	Region
Raleigh Bay	5.9	0	0	1.9
Onslow Bay	0.02	0	0	0.005
Long Bay	0	0	0	0
South Carolina	0	0	0	0
Georgia	0	0	0	0
Florida	0	0	0	0
Season	0.5	0	0	0.2

Distribution and Abundance of Sea Turtles

Caretta caretta

The loggerhead turtle, *Caretta caretta*, was the most abundant sea turtle caught in SEAMAP trawls. Thirty-three loggerhead (CV=3.7; 0.03 individuals/ha), weighing 1473 kg (1.3 kg/ha), were taken in 2003. The abundance of the loggerhead turtle has fluctuated annually, with the 2003 estimate of density being the highest recorded (Figure 63). In 2003, the overall seasonal densities did not vary (Table 33). Regionally, density was greatest in waters off Florida and decreased northward. The majority of the loggerhead sea turtles taken in SEAMAP collections are considered to be sub-adults, based on size (Dodd, 1988).

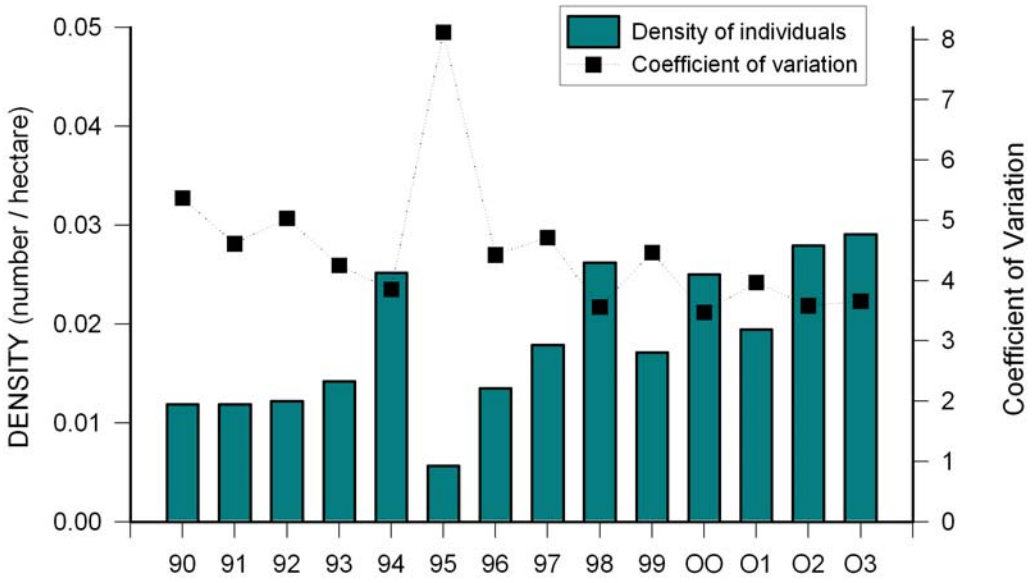

Figure 63. Annual densities of *Caretta caretta*

Table 33. Estimates of density (number of individuals/hectare) in 2003.

Caretta caretta

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0	0
Onslow Bay	0	0.03	0.02	0.02
Long Bay	0.02	0	0.05	0.02
South Carolina	0.01	0.01	0.06	0.03
Georgia	0.02	0.07	0.02	0.04
Florida	0.1	0	0.05	0.05
Season	0.03	0.03	0.03	0.03

Dermochelys coriacea

The leatherback turtle has been a very rare species in SEAMAP-SA trawls. In 2003, one leatherback turtle was taken in SEAMAP collections (off Florida during the fall cruise). Only three leatherback turtles have been taken previously.

Lepidochelys kempi

In 2003, ten Kemp's ridley turtles were taken in SEAMAP trawls (CV=5.5; 0.009 individuals/ha). The estimate of density of *L. kempi* reached a record level in 2003 (Figure 64). Kemp's ridley turtles were most abundant in spring and fall and off South Carolina and Georgia. No Kemp's ridley turtles were taken in Raleigh and Onslow Bays (Table 34).

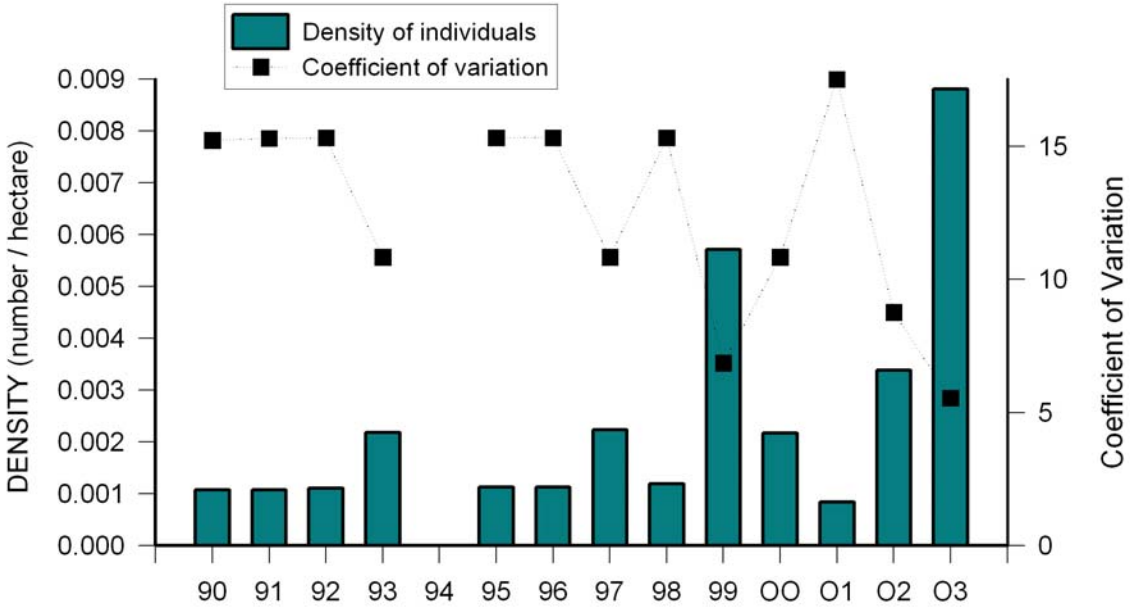

Figure 64. Annual densities of *Lepidochelys kempi*

Table 34. Estimates of density (number of individuals/hectare) in 2003.

Lepidochelys kempi

	Spring	Summer	Fall	Region
Raleigh Bay	0	0	0	0
Onslow Bay	0	0	0	0
Long Bay	0	0	0.02	0.008
South Carolina	0.01	0	0.03	0.02
Georgia	0.02	0.009	0.02	0.02
Florida	0.02	0	0	0.005
Season	0.01	0.003	0.01	0.009

Distribution and Abundance of Horseshoe Crabs

Limulus polyphemus

A total of 112 horseshoe crabs (CV=5.0; 0.1 individuals/ha) were collected by the SEAMAP-SA Shallow Water Trawl Survey in 2003. Density of individuals in 2003 was the greatest estimate recorded by the survey (Figure 65). In 2003, density of abundance was greatest in spring (Table 35). Horseshoe crabs were taken in all regions and seasons. Abundance was greatest in spring trawls made in Raleigh Bay.

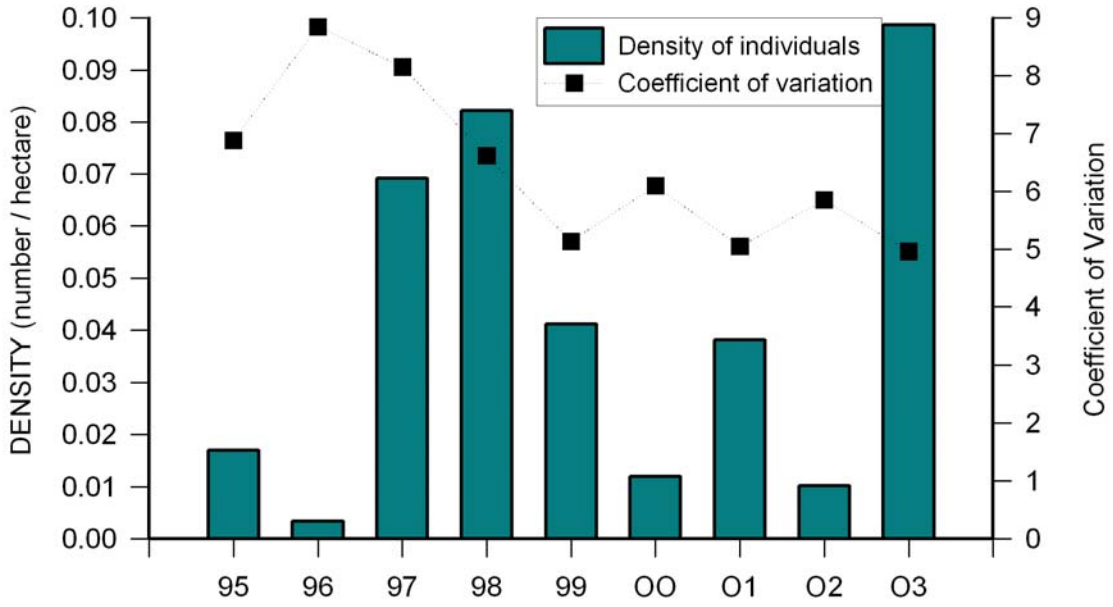

Figure 65. Annual densities of *Limulus polyphemus*

Table 35. Estimates of density (number of individuals/hectare) in 2003.

Limulus polyphemus

	Spring	Summer	Fall	Region
Raleigh Bay	1.4	0	0	0.4
Onslow Bay	0.1	0	0	0.03
Long Bay	0.3	0	0.02	0.1
South Carolina	0.2	0	0.2	0.2
Georgia	0.07	0.009	0.05	0.05
Florida	0.03	0	0	0.01
Season	0.2	0.003	0.06	0.1

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.

The 19,691 individuals (17.3 individuals/ha; CV=5.0), weighing 9,719 kg (8.6 kg/ha), made up 4% of the total number of specimens taken in SEAMAP-SA Shallow Water Trawl Survey strata and 18% of the biomass. Cannonball jelly abundance has declined since 2001 (Figure 66). Seasonal density was greatest in spring (Table 36). *Stomolophus meleagris* was taken in all regions, with highest regional densities off South Carolina and Florida.

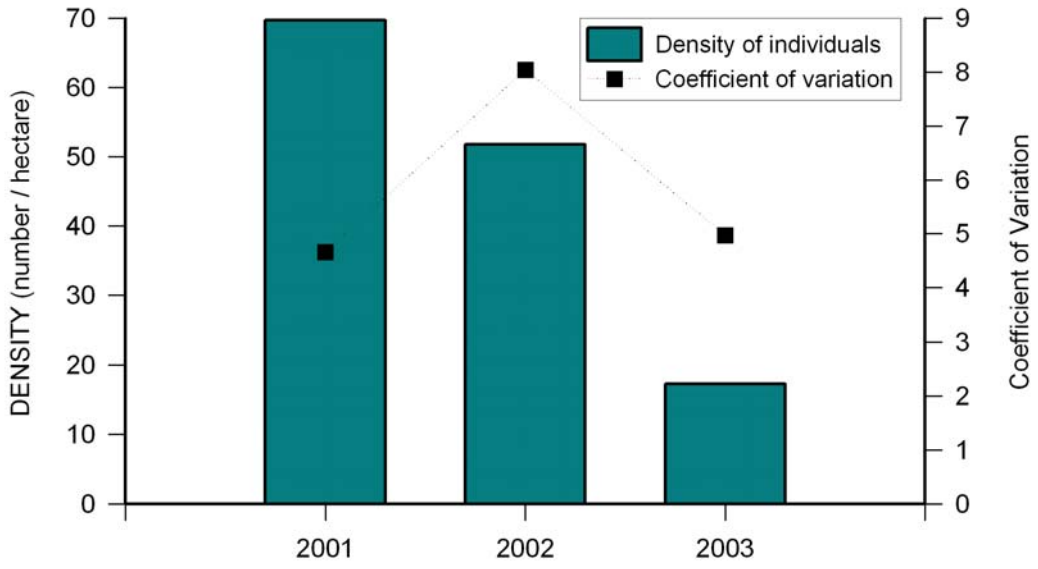

Figure 66. Annual densities of *Stomolophus meleagris*

Table 36. Estimates of density (number of individuals/hectare) in 2003.

Stomolophus meleagris

	Spring	Summer	Fall	Region
Raleigh Bay	0.03	0	0.06	0.03
Onslow Bay	0	0.8	6.2	2.2
Long Bay	0.2	0.5	1.4	0.7
South Carolina	99.5	4.9	5.4	36.7
Georgia	9.9	0.6	24.7	11.7
Florida	83.4	0	38.6	40.1
Season	35.3	1.2	15.5	17.3

ACKNOWLEDGMENTS

We appreciate the administrative assistance of Dale Theiling, David Cupka, Wayne Waltz, and David Whitaker and the recommendations of the SEAMAP-SA Committee and the Shallow Water Trawl Workgroup. Jeff Jacobs, Rob Dunlap, and Paul Tucker were instrumental in the successful completion of SEAMAP-SA Shallow Water Trawl Survey cruises through their able operation of the R/V *Lady Lisa*. Robert Truex, Brooks Charles, and Adam Greer assisted with field efforts.

APPLICATIONS OF DATA AND SPECIMENS FROM THE SEAMAP-SOUTH ATLANTIC SHALLOW WATER TRAWL SURVEY IN 2003

Stock Assessment/VPA:

Brevoortia tyrannus
Centropristis striata
Cynoscion regalis
Limulus polyphemus
Micropogonias undulatus
Pomatomus saltatrix
Scomberomorus cavalla
Scomberomorus maculatus

Life History (Age/Growth, Reproduction):

Cynoscion regalis
Diplectrum formosum
Haemulon aurolineatum
Menticirrhus americanus
Menticirrhus littoralis
Menticirrhus saxatilis
Micropogonias undulatus
Pomatomus saltatrix
Seriola dumeril

Genetics / Stock Identification Studies:

Menticirrhus americanus
Menticirrhus littoralis
Menticirrhus saxatilis
Micropogonias undulatus

Educational Research:

Fistularia and *Ogcocephalus* data for publication on regional abundance

Data requested by state agencies:

Specimens of invertebrate species for catalogue of voucher specimens -SCDNR/MRRI -SERTC
Specimens of fish species for catalogue of voucher specimens -College of Charleston -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 2003) - SCDNR/MRRI
Sea turtle data (2003) - SCDNR / Office of Fisheries Management
2003 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
2003 SEAMAP-SA data collected in Georgia waters - GADNR
Sea turtle data collected in Georgia waters(2003) - GADNR
2003 SEAMAP-SA data collected in Florida waters - Florida Fish and Wildlife Conservation Commission
Sea turtle data collected in Florida waters(2003) - FFWCC - Endangered Species Division
Cannonball jelly abundance data (1994-2003) for correlation with Leatherback sea turtle sightings-/SCDNR-Endangered Species Office

Data requested by federal agencies:

Sea turtle data (2003) - NOAA SEFSC
Sea turtle data (2003) - Cooperative Marine Turtle Tagging Program
Shark data (2003) - NMFS, Narrangansett Lab
Shark data (2003) - NMFS, Highly Migratory Species, Silver Spring, MD
Data collected off Canaveral National Seashore (2003) - 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 2003, the survey operated in compliance with the following:

Federal Permits

Letter of Acknowledgement 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 Acknowledgement (LOA-SHK-03-01) 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-2003-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-WMB-03-190).

Florida Fish and Wildlife Conservation Commission Special Activities License (SAL 03SR-051).

Florida Fish and Wildlife Conservation Commission / Bureau of Protected 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 2003.

FINFISH	MEAN LENGTH/WIDTH (CM)	SIZE EXTREMES (CM)
Archosargus probatocephalus	48.1	39 - 51
Brevoortia smithi	24.5	22 - 28
Brevoortia tyrannus	14.2	9 - 20
Centropristis striata	14.3	8 - 26
Chaetodipterus faber	11.2	6 - 19
Cynoscion nebulosus		
Cynoscion regalis	19.3	7 - 36
Leiostomus xanthurus	14.0	7 - 25
Menticirrhus americanus	20.8	8 - 38
Menticirrhus littoralis	22.4	8 - 36
Menticirrhus saxatilis	23.6	12 - 34
Micropogonias undulatus	18.1	6 - 33
Mycteroperca microlepis		
Paralichthys albigutta	32.2	24 - 49
Paralichthys dentatus	25.2	11 - 52
Paralichthys lethostigma	30.1	19 - 43
Peprilus alepidotus	10.0	3 - 19
Peprilus triacanthus	8.6	2 - 19
Pogonias cromis	49.6	17 - 125
Pomatomus saltatrix	16.5	7 - 32
Sciaenops ocellatus		
Scomberomorus cavalla	17.2	4 - 38
Scomberomorus maculatus	23.3	11 - 51
DECAPOD CRUSTACEANS		
Callinectes sapidus	14.1	6 - 18
Farfantepenaeus aztecus	11.9	7 - 19
Farfantepenaeus duorarum	12.3	6 - 18
Litopenaeus setiferus	15.0	8 - 19

* No specimens of *Cynoscion nebulosus, 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 2003.

Cynoscion regalis

SPRING 2003						
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4
14	2	0	1.00	0	0	
15	10	0	1.00	0	0	
16	11	0	1.00	0	0	
17	17	0	1.00	0	0	
18	30	0	1.00	0	0	
19	32	0	1.00	0	0	
20	38	0	0.97	0.03	0	
21	30	0	1.00	0	0	
22	20	0	1.00	0	0	
23	18	0	1.00	0	0	
24	14	0	0.79	0.21	0	
25	11	0	0.45	0.55	0	
26	7	0	0.43	0.43	0.14	
27	8	0	0.13	0.88	0	
28	5	0	0.20	0.80	0	
29	3	0	0.33	0.67	0	
30	1	0	0	1.00	0	
31	1	0	0	1.00	0	

SUMMER 2003						
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4
9	2	1.00	0	0	0	0
10	3	1.00	0	0	0	0
11	6	1.00	0	0	0	0
12	9	1.00	0	0	0	0
13	9	1.00	0	0	0	0
14	8	0.88	0.13	0	0	0
15	8	1.00	0	0	0	0
16	9	0.89	0.11	0	0	0
17	8	1.00	0	0	0	0
18	10	1.00	0	0	0	0
19	7	0.57	0.43	0	0	0
20	14	0.21	0.79	0	0	0
21	9	0	1.00	0	0	0
22	15	0	1.00	0	0	0
23	12	0	1.00	0	0	0
24	21	0	0.95	0.05	0	0
25	19	0	1.00	0	0	0
26	12	0	0.83	0.17	0	0
27	8	0	1.00	0	0	0
28	5	0	0.60	0.40	0	0
29	3	0.33	0.33	0.33	0	0
30	2	0	0	0.50	0	0.50
32	1	0	0	1.00	0	0
35	1	0	0	0	1.00	0
36	1	0	0	0	0	1.00

FALL 2003						
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4
8	1	1.00	0	0		
10	1	1.00	0	0		
11	1	1.00	0	0		
12	3	1.00	0	0		
13	6	0.83	0.17	0		
14	4	0.75	0.25	0		
15	5	1.00	0	0		
16	13	0.92	0.08	0		
17	14	1.00	0	0		
18	22	1.00	0	0		
19	25	0.96	0.04	0		
20	20	0.95	0.05	0		
21	17	0.88	0.12	0		
22	16	0.94	0.06	0		
23	11	0.45	0.55	0		
24	14	0.21	0.79	0		
25	10	0.10	0.90	0		
26	11	0.09	0.91	0		
27	7	0	0.86	0.14		
28	3	0	1.00	0		
29	3	0	1.00	0		
30	4	0	0.50	0.50		
31	2	0	0.50	0.50		
33	2	0	1.00	0		
35	1	0	1.00	0		

Appendix 2. cont'd

Menticirrhus americanus

Seasonal age-length keys

SPRING 2003									
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
11	3	0	1.0	0	0	0	0	0	
12	3	0	1.0	0	0	0	0	0	
13	7	0	1.0	0	0	0	0	0	
14	14	0	1.0	0	0	0	0	0	
15	12	0	1.0	0	0	0	0	0	
16	18	0	1.0	0	0	0	0	0	
17	26	0	1.0	0	0	0	0	0	
18	25	0	1.0	0	0	0	0	0	
19	34	0	1.0	0	0	0	0	0	
20	39	0	1.0	0	0	0	0	0	
21	49	0	0.9	0.02	0	0	0	0	
22	43	0	0.9	0.07	0	0	0	0	
23	48	0	0.6	0.29	0.02	0	0	0	
24	33	0	0.3	0.61	0.09	0	0	0	
25	36	0	0.1	0.78	0.11	0	0	0	
26	37	0	0.0	0.86	0.11	0	0	0	
27	30	0	0.1	0.73	0.10	0.0	0.0	0	
28	24	0	0	0.63	0.25	0.1	0	0	
29	18	0	0.0	0.50	0.33	0.0	0.0	0	
30	12	0	0	0.08	0.50	0.1	0.1	0.08	
31	6	0	0	0.17	0.67	0.1	0	0	
32	8	0	0	0	0.75	0.2	0	0	
33	7	0	0	0.29	0.14	0.5	0	0	
34	4	0	0	0	0.25	0.5	0.2	0	
35	2	0	0	0.50	0	0.5	0	0	

SUMMER 2003									
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
8	1	1.0	0	0	0	0			0
9	1	1.0	0	0	0	0			0
10	3	1.0	0	0	0	0			0
11	4	1.0	0	0	0	0			0
12	8	1.0	0	0	0	0			0
13	9	1.0	0	0	0	0			0
14	4	1.0	0	0	0	0			0
15	3	1.0	0	0	0	0			0
16	7	0.4	0.5	0	0	0			0
17	8	0.6	0.3	0	0	0			0
18	16	0.5	0.5	0	0	0			0
19	25	0.1	0.8	0	0	0			0
20	28	0.1	0.8	0	0	0			0
21	29	0.0	0.9	0.03	0	0			0
22	36	0.0	0.8	0.14	0	0			0
23	40	0	0.8	0.10	0.03	0			0
24	40	0	0.7	0.20	0.08	0			0
25	30	0.0	0.6	0.30	0	0.0			0
26	28	0	0.4	0.54	0.04	0			0
27	18	0.0	0.2	0.44	0.17	0.0			0
28	18	0	0.1	0.56	0.28	0			0
29	8	0	0.2	0.63	0.13	0			0
30	9	0	0	0.56	0.33	0			0.1
31	2	0	0	0.50	0	0.5			0
32	2	0	0.5	0	0.50	0			0
33	1	0	0	0	1.00	0			0
34	2	0	0	0	0	1.0			0

FALL 2003									
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
6	1	1.0	0	0	0	0			0
11	5	1.0	0	0	0	0			0
12	10	1.0	0	0	0	0			0
13	11	1.0	0	0	0	0			0
14	17	1.0	0	0	0	0			0
15	19	1.0	0	0	0	0			0
16	32	1.0	0	0	0	0			0
17	30	1.0	0	0	0	0			0
18	38	0.9	0.0	0	0	0			0
19	29	0.9	0.0	0	0	0			0
20	24	0.5	0.4	0	0	0			0
21	24	0.2	0.7	0	0	0			0
22	29	0.1	0.8	0	0	0			0
23	31	0.0	0.9	0.03	0	0			0
24	29	0.1	0.7	0.10	0	0			0
25	31	0.0	0.7	0.23	0	0			0
26	21	0	0.6	0.29	0.05	0			0
27	21	0	0.5	0.33	0.10	0			0
28	17	0	0.5	0.47	0	0			0
29	9	0	0.1	0.78	0.11	0			0
30	6	0	0.3	0.50	0.17	0			0
31	2	0	0	0	0.50	0			0.5
32	1	0	0	1.00	0	0			0
33	3	0	0.3	0.33	0.33	0			0
34	1	0	0	0	1.00	0			0
36	1	0	0	0	1.00	0			0
38	1	0	0	0	0	1.0			0

Appendix 2. cont'd

Micropogonias undulatus

Seasonal age-length keys

SPRING 2003							
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5
9	1	1.00	0	0	0	0	0
10	1	1.00	0	0	0	0	0
11	4	1.00	0	0	0	0	0
12	5	1.00	0	0	0	0	0
13	2	1.00	0	0	0	0	0
14	6	0.67	0.33	0	0	0	0
15	3	0.33	0.67	0	0	0	0
16	8	0	1.00	0	0	0	0
17	19	0	1.00	0	0	0	0
18	23	0	1.00	0	0	0	0
19	24	0	1.00	0	0	0	0
20	16	0	0.94	0.06	0	0	0
21	29	0	0.90	0.10	0	0	0
22	13	0	1.00	0	0	0	0
23	8	0	0.50	0.25	0	0.25	0
24	1	0	1.00	0	0	0	0
25	2	0	0	0.50	0	0	0.50

SUMMER 2003							
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5
10	2	1.00	0	0	0	0	0
11	5	1.00	0	0	0	0	0
12	12	0.92	0	0.08	0	0	0
13	7	1.00	0	0	0	0	0
14	23	0.96	0.04	0	0	0	0
15	27	0.89	0.07	0.04	0	0	0
16	25	1.00	0	0	0	0	0
17	22	0.95	0.05	0	0	0	0
18	34	0.35	0.65	0	0	0	0
19	35	0.20	0.77	0.03	0	0	0
20	35	0	0.94	0.03	0.03	0	0
21	31	0	0.90	0.10	0	0	0
22	16	0	0.75	0.13	0.13	0	0
23	9	0	0.56	0.11	0.22	0	0.11
24	3	0	0.33	0.33	0.33	0	0
25	1	0	0	0	0	0	1.00

FALL 2003							
TL	N	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5
12	1	1.00	0	0	0	0	0
13	5	0.80	0.20	0	0	0	0
14	9	0.89	0.11	0	0	0	0
15	23	0.96	0.04	0	0	0	0
16	25	1.00	0	0	0	0	0
17	33	0.91	0.09	0	0	0	0
18	29	0.97	0.03	0	0	0	0
19	35	0.83	0.14	0.03	0	0	0
20	33	0.55	0.45	0	0	0	0
21	22	0.05	0.77	0.18	0	0	0
22	16	0.19	0.56	0.13	0.13	0	0
23	8	0	0.75	0.25	0	0	0
24	1	0	0	1.00	0	0	0
25	1	0	0	0	1.00	0	0

Appendix 3. Number of individuals and biomass (kg) for all species collected in 2003.

Rank	Species Name	Total Number	Total Weight
1	*Leiostomus xanthurus*	105575	4788.426
2	*Micropogonias undulatus*	67491	4543.713
3	*Cynoscion nothus*	25370	2770.020
4	*Larimus fasciatus*	22504	1854.675
5	*Peprilus triacanthus*	21712	408.010
6	*Lagodon rhomboides*	20427	891.847
7	*Selene setapinnis*	17336	168.685
8	*Chloroscombrus chrysurus*	16820	427.470
9	*Stenotomus sp.*	15251	625.446
10	*Menticirrhus americanus*	14471	1406.446
11	*Anchoa hepsetus*	14428	149.612
12	*Farfantepenaeus aztecus*	10944	161.659
13	*Lolliguncula brevis*	10035	112.071
14	*Cynoscion regalis*	8700	639.915
15	*Stellifer lanceolatus*	8375	180.817
16	*Litopenaeus setiferus*	8369	227.858
17	*Prionotus carolinus*	5897	73.326
18	*Loligo sp.*	4747	78.325
19	*Opisthonema oglinum*	3505	94.014
20	*Synodus foetens*	3054	236.127
21	*Orthopristis chrysoptera*	2997	239.203
22	*Peprilus alepidotus*	2961	168.167
23	*Urophycis regius*	2883	78.962
24	*Anchoa mitchilli*	2491	5.315
25	*Libinia dubia*	2083	10.380
26	*Bairdiella chrysoura*	2028	92.735

Rank	Species Name	Total Number	Total Weight
27	*Pomatomus saltatrix*	2001	136.127
28	*Sardinella aurita*	1888	15.721
29	*Selene vomer*	1781	44.816
30	*Rhizoprionodon terraenovae*	1670	963.436
31	*Decapterus punctatus*	1548	60.273
32	*Portunus gibbesii*	1545	20.367
33	*Ovalipes stephensoni*	1533	13.384
34	*Prionotus evolans*	1374	36.661
35	*Callinectes similis*	1373	72.368
36	*Mustelus canis*	1333	2047.693
37	*Ancylopsetta quadrocellata*	1124	47.665
38	*Chaetodipterus faber*	1045	76.872
39	*Sphyraena guachancho*	980	121.490
40	*Scomberomorus maculatus*	941	129.781
41	*Trichiurus lepturus*	890	42.292
42	*Caranx crysos*	884	47.717
43	*Brevoortia tyrannus*	850	40.571
44	*Anchoa lyolepis*	833	1.229
45	*Scophthalmus aquosus*	732	18.003
46	*Ovalipes ocellatus*	729	10.179
47	*Rhinoptera bonasus*	722	3161.820
48	*Sphyrna tiburo*	696	703.956
49	*Scomberomorus cavalla*	684	40.988
50	*Citharichthys macrops*	677	13.443
51	*Etropus crossotus*	648	14.961
52	*Trinectes maculatus*	592	17.716
53	*Arenaeus cribrarius*	591	9.994
54	*Eucinostomus sp.*	584	30.568

Rank	Species Name	Total Number	Total Weight
55	*Menticirrhus littoralis*	574	67.776
56	*Dasyatis sayi*	557	1623.995
57	*Farfantepenaeus duorarum*	474	9.044
58	*Squilla empusa*	471	8.217
59	*Prionotus scitulus*	448	10.352
60	*Raja eglanteria*	392	302.751
61	*Selar crumenophthalmus*	367	4.118
62	*Paralichthys dentatus*	343	62.496
63	*Chilomycterus schoepfi*	339	82.243
64	*Trachinotus carolinus*	335	65.466
65	*Portunus spinimanus*	318	4.717
66	*Symphurus plagiusa*	305	9.747
67	*Squilla neglecta*	294	3.363
68	*Gymnura micrura*	274	132.088
69	*Squalus acanthias*	193	535.170
70	*Sphoeroides maculatus*	175	33.554
71	*Diplectrum formosum*	153	8.306
72	*Etropus cyclosquamus*	153	1.585
73	*Callinectes ornatus*	150	1.340
74	*Hepatus epheliticus*	140	2.905
75	*Pagurus pollicaris*	137	4.032
76	*Prionotus tribulus*	135	3.172
77	*Libinia emarginata*	120	2.393
78	*Syacium papillosum*	116	6.859
79	*Limulus polyphemus*	112	245.193
80	*Myliobatis freminvillei*	110	182.523
81	*Prionotus salmonicolor*	104	2.694
82	*Callinectes sapidus*	98	15.352

Rank	Species Name	Total Number	Total Weight
83	*Persephona mediterranea*	98	1.140
84	*Centropristis striata*	95	4.869
85	*Urophycis floridanus*	90	3.892
86	*Arius felis*	87	12.707
87	*Menticirrhus saxatilis*	83	12.787
88	*Stephanolepis hispidus*	81	0.730
89	*Haemulon aurolineatum*	77	4.389
90	*Bagre marinus*	74	9.608
91	*Alectis ciliarius*	74	0.795
92	*Dasyatis sabina*	61	19.068
93	*Paralichthys lethostigma*	56	21.392
94	*Trachurus lathami*	54	0.698
95	*Centropristis philadelphica*	51	2.126
96	*Harengula jaguana*	48	1.804
97	*Citharichthys spilopterus*	47	0.693
98	*Mobula hypostoma*	41	828.530
99	*Portunus sayi*	38	0.181
100	*Echeneis naucrates*	35	4.701
101	*Caretta caretta*	33	1473.080
102	*Menippe mercenaria*	32	6.877
103	*Rimapenaeus constrictus*	29	0.162
104	*Carcharhinus acronotus*	28	316.990
105	*Acanthostracion quadricornis*	27	6.207
106	*Diplodus holbrooki*	26	3.532
107	*Balistes capriscus*	21	7.065
108	*Upeneus parvus*	21	0.422
109	*Cancer irroratus*	21	0.164
110	*Brevoortia smithi*	19	5.033

Rank	Species Name	Total Number	Total Weight
111	*Aluterus schoepfi*	19	2.626
112	*Paralichthys albigutta*	18	7.040
113	*Scomber scombrus*	17	0.163
114	*Carcharhinus brevipinna*	17	141.290
115	*Gymnura altavela*	16	185.060
116	*Caranx hippos*	15	1.626
117	*Rhinobatos lentiginosus*	14	16.160
118	*Pogonias cromis*	13	76.151
119	*Xiphopenaeus kroyeri*	13	0.093
120	*Alosa aestivalis*	12	0.291
121	*Lepidochelys kempi*	10	169.050
122	*Dasyatis centroura*	9	144.490
123	*Aetobatus narinari*	9	295.720
124	*Dasyatis americana*	8	24.680
125	*Rachycentron canadum*	8	5.010
126	*Hypsoblennius hentzi*	8	0.080
127	*Lutjanus synagris*	8	0.291
128	*Calappa flammea*	8	1.750
129	*Etrumeus teres*	7	0.011
130	*Urophycis earlli*	7	1.229
131	*Archosargus probatocephalus*	7	19.840
132	*Sphyrna lewini*	6	5.342
133	*Mugil cephalus*	6	1.297
134	*Hypleurochilus geminatus*	6	0.010
135	*Carcharhinus limbatus*	5	55.075
136	*Remora remora*	5	1.010
137	*Umbrina coroides*	5	0.219
138	*Porcellana sayana*	5	0.005

Rank	Species Name	Total Number	Total Weight
139	*Narcine brasiliensis*	4	4.185
140	*Oligoplites saurus*	4	0.409
141	*Hexapanopeus angustifrons*	4	0.009
142	*Odontaspis taurus*	3	14.570
143	*Carcharhinus plumbeus*	3	6.420
144	*Fistularia tabacaria*	3	0.026
145	*Hippocampus erectus*	3	0.030
146	*Syngnathus louisianae*	3	0.051
147	*Albunea paretii*	3	0.019
148	*Dromidia antillensis*	3	0.046
149	*Octopus vulgaris*	3	0.820
150	*Carcharhinus isodon*	2	26.750
151	*Elops saurus*	2	0.290
152	*Ophichthus gomesi*	2	0.370
153	*Paralichthys squamilentus*	2	0.117
154	*Pilumnus sayi*	2	0.021
155	*Ginglymostoma cirratum*	1	5.240
156	*Squatina dumeril*	1	23.100
157	*Leucoraja ocellata*	1	2.230
158	*Acipenser oxyrhynchus*	1	2.230
159	*Opsanus tau*	1	0.092
160	*Antennarius ocellatus*	1	0.020
161	*Histrio histrio*	1	0.006
162	*Syngnathus fuscus*	1	0.016
163	*Pristigenys altus*	1	0.008
164	*Seriola dumerili*	1	0.244
165	*Seriola rivoliana*	1	0.015
166	*Lutjanus campechanus*	1	0.023

Rank	Species Name	Total Number	Total Weight
167	*Calamus leucosteus*	1	0.545
168	*Kyphosus incisor*	1	0.015
169	*Hemipteronotus novacula*	1	0.026
170	*Mugil curema*	1	0.023
171	*Aluterus monoceros*	1	0.126
172	*Chilomycterus atinga*	1	0.810
173	*Psenes pellucidus*	1	0.013
174	*Alopias vulpinus*	1	14.330
175	*Hyporhampus meeki*	1	0.003
176	*Dermochelys coriacea*	1	290.000
177	*Petrochirus diogenes*	1	0.680
178	*Pagurus longicarpus*	1	0.012
179	*Hypoconcha arcuata*	1	0.002
180	*Panopeus herbstii*	1	0.002
181	*Podochela sidneyi*	1	0.002