

Prepared in cooperation with the St. Johns River Water Management District
and Volusia County

Seasonal and Spatial Distribution Patterns of Finfish and Selected Invertebrates in Coastal Lagoons of Northeastern Florida, 2002-2004



Scientific Investigations Report 2010-5131

Cover. Clockwise from top left: (1) finfish habitat in northeastern Florida, (2) a seawall set in downtown St. Augustine, (3) sorting a catch, (4) a marine stray, the Atlantic guitarfish (*Rhinobatos lentiginosus*) on a measuring board, and (5) collecting the bag after a set in a mangrove swamp in Volusia County. Photograph credits: Michael Turtora, USGS.

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By Michael Turtora and Elizabeth M. Schotman

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**U.S. Department of the Interior
U.S. Geological Survey**

U.S. Department of the Interior
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U.S. Geological Survey, Reston, Virginia: 2010

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Suggested citation:

Turtora, Michael, and Schotman, E.M., 2010, Seasonal and Spatial Distribution Patterns of Finfish and Selected Invertebrates in Coastal Lagoons of Northeastern Florida, 2002-2004: U.S. Geological Survey Scientific Investigations Report 2010-5131, 90 p.

Acknowledgments

The authors gratefully acknowledge the assistance of more than two hundred people from numerous institutions, agencies, and the general public who contributed to this project. The following individuals deserve specific mention and are listed in roughly chronological order by affiliation: Gary Mahon, Nick Funicelli, George Dennis, Ken Sulak, Wesley V. Winters, Jennifer Parks, Thomas T. Harding, Lacey Smith, Bill Loftus, Jane Eggleston, and Mike Deacon of the USGS; Paul Haydt, Ron Brockmeyer, and Jan Miller of the SJRWMD; Richard Paperno, Robert McMichael, Richard Matheson, Russell Brodie, Eric Sander, and Timothy McDonald of the Florida Fish and Wildlife Research Institute (FWRI); Thomas Frazer, Daniel Canfield, and Shazara Mulchan of the University of Florida (UF); Patrick O'Connor, Sharon Evans, and Jeff Martin of the Florida Department of Environmental Protection (FDEP) Northeast District; Kenneth Burk, Rick Gleeson, and Jon Brucker of the National Oceanographic and Atmospheric Administration/FDEP Guana-Tolomato-Matanzas National Estuarine Research Reserve; Deborah Shelly and Dave Murray of the Wekiva River and Tomoka Marsh Aquatic Preserve; Charlie DuToit of the Tomoka GeoPark; Bob Betts of the Anastasia Island Mosquito Control; Kelly Smith of the University of North Florida; Barbara Blonder of Flagler College; Richard Anderson of the UF Whitney Lab; the proprietors of Devil's Elbow Fish Camp; Robert Garrett and Terry Powers of the Gamble Rogers Middle School; Adrian Sahai, Megan Keserauskis, and Casey Lyon of the University of Central Florida; and finally, the Bobkovs, Michael McCue, Stacey Perfetto, Michael Mertens, Julie Scherr, Lee Ann Simcic, Jennifer Roupp, Carmen Deere, and Pamela Donnelly from the general public.

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Conversion Factors, Abbreviations and Acronyms

Multiply	By	To obtain
Length		
centimeter (cm)	0.3937	inch (in.)
millimeter (mm)	0.03937	inch (in.)
meter (m)	3.281	foot (ft)
meter (m)	1.094	yard (yd)
kilometer (km)	0.6214	mile (mi)
kilometer (km)	0.5400	mile, nautical (nmi)
Flow rate		
meter per second (m/s)	3.281	foot per second (ft/sec)

CA	Correspondence Analysis
CPUE	Catch per unit effort
FIM	Fisheries Independent Monitoring Program
NCB	Northern Coastal Basins
PCA	Principal Components Analysis
SAS	Statistical Analysis System
SJRWMD	St. Johns River Water Management District
USGS	U.S. Geological Survey

Seasonal and Spatial Distribution Patterns of Finfish and Selected Invertebrates in Coastal Lagoons of Northeastern Florida, 2002-2004

Michael Turtora and Elizabeth M. Schotman

Abstract

The U.S. Geological Survey conducted a survey of juvenile fisheries resources, in cooperation with the St. Johns River Water Management District and Volusia County, to establish baseline data on spatial and temporal distribution patterns of estuarine fish. The survey was conducted from November 2001 to March 2005 and the baseline data established for the survey in the Northern Coastal Basins were collected from January 2002 to December 2004. The study area included the bar-built estuaries ranging from just north of St. Augustine, Florida, south to Ponce de Leon Inlet. Sampling protocols developed by the Florida Fish and Wildlife Research Institute for their statewide Fisheries Independent Monitoring (FIM) program were replicated to allow for comparability with FIM program results. Samples were collected monthly from randomly selected stations based on a geographically stratified design. Finfish and selected invertebrates were collected using a 21.3-meter center-bag seine with a 3-millimeter mesh, and a 6.1-meter otter trawl with a 3-millimeter mesh liner. Total estimated fish and selected invertebrate densities were similar to estimates from FIM projects in adjacent areas and were characterized by similar dominant species. Preliminary analysis indicates that observed species distribution patterns were mainly a function of proximity to the three inlets within the study area. The two regions encompassing the northern Tolomato River and the Tomoka River and Basin are farthest from inlets and appear to function as oligohaline nursery areas. Those two areas had the greatest estimated densities of shellfish and juvenile sciaenid (drum) species associated with oligohaline waters (for example, *Micropogonias undulatus*, *Sciaenops ocellatus*, and *Cynoscion nebulosus*). Samples near inlets, and between the two northern inlets, had greater estimated densities of species limited to euhaline waters, including juvenile clupeids collected at relatively high abundance and species of marine strays collected in low abundance. Based on correspondence analysis, seasonal variation dominated the ordination of seine samples and spatial variation dominated the ordination of trawl samples; this was due to differences in the number and timing of taxa found near inlets versus oligohaline regions. The absence of seagrass habitat in the Northern Coastal Basins is reflected by the absence of a seagrass-fish assemblage.

Introduction

Fish distributions have not been studied extensively in the estuaries along the northeastern Florida coast from Ponte Vedra to Ponce de Leon Inlet, although sampling of three discontinuous areas of Volusia County was conducted from 1993 to 1996 (Paperno and others, 2001). The study area for this report (fig. 1), termed the Northern Coastal Basins (NCB) by the St. Johns River Water Management District (SJRWMD), encompasses some of the last remaining sparsely urbanized land along the Atlantic Coast of Florida, and includes parts of St Johns, Flagler, and Volusia Counties. Establishing baseline fish-population information in advance of expected rapid increases in urbanization is crucial to the management of water resources in this area because of the need to prioritize conservation and restoration efforts.

Although the use of estuaries by many species of marine fish at some stage of their life cycle has been studied at least since Gunter (1945), the significance of that use remains a subject of considerable discussion (Able, 2005; Ray, 2005). Initially, it was concluded that because juveniles of many species were abundant in estuaries, populations of those species use the estuary as a nursery and must be dependent on estuaries for survival of the population (McHugh, 1967; Clark, 1967). More recently, the concept of estuarine dependence has been refined to include different categories of estuarine use (Lenanton and Potter, 1987; Able and Fahay, 1998), with the ultimate recognition that the degree to which various species are dependent on estuaries varies continuously (Able, 2005). Differences in the use of estuarine habitats by resident and nonresident species vary across spatial and temporal scales. Ray (2005) suggested that differential use by related individual species may result in trophic guilds that possess resilience to environmental fluctuations in terms of ecosystem function. For example, related species such as drums, that have differing environmental tolerances but similar trophic function, may allow maintenance of ecosystem function under changing environmental conditions despite species distribution changes.

These issues are relevant to the application of fisheries surveys to aquatic resource management because the concept

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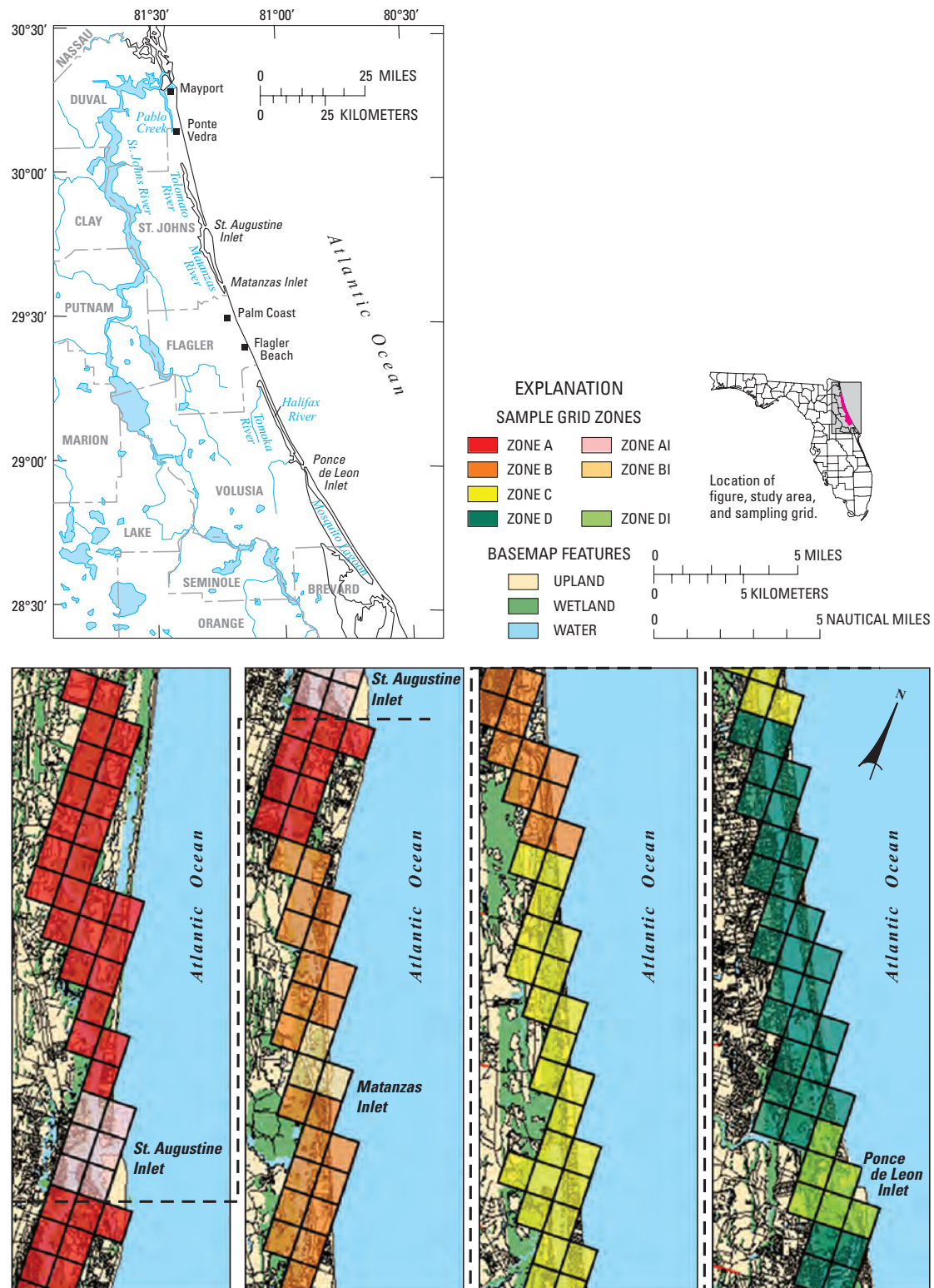


Figure 1. Study area location and sampling grid zones used in the study.

of estuarine dependence forms the theoretical basis for the legal definition of essential fish habitat, which has resource management implications (Benaka, 1999; Schmitt, 1999). Because salinity is one of the most important environmental determinants of fish nursery habitat, and alteration of freshwater discharge could alter the salinity regime of an estuary, there are also implications for the establishment of minimum flows and levels. To address these concerns, the U.S. Geological Survey (USGS), in cooperation with the SJRWMD and Volusia County, conducted a survey of juvenile fisheries resources from November 2001 to March 2005 to establish baseline data on estuarine fish spatial and temporal distribution patterns in the NCB.

The purposes of this report are to document the NCB survey and baseline data, and provide insight into the distribution of estuarine fish habitats in the NCB. The sampling design and methods employed are summarized, and baseline data are presented on the spatial and temporal distribution of fish and selected invertebrates collected in the NCB from January 2002 to December 2004. Survey results are compared with previous studies and analyzed in terms of the distribution of fish habitats within the study area.

Description of Study Area

Almost 160 km of coastline form the eastern boundary of the NCB. From north to south, the four inlets that connect these estuaries to the Atlantic Ocean are Mayport (St. Johns River mouth), St. Augustine Inlet, Matanzas Inlet, and Ponce de Leon Inlet. The two middle inlets are about 25 km apart, whereas the southern inlet is about 70 km south of Matanzas Inlet. The connection with the St. Johns River is through a canal that connects the headwaters of the Tolomato River in the NCB with Pablo Creek in the St. Johns River basin. The estuary south of Ponce de Leon Inlet is Mosquito Lagoon.

Significant anthropogenic disturbance of the estuarine ecosystems of the NCB has already occurred and is expected to continue. Some of these impacts have resulted in violations of State water quality standards (Florida Department of Environmental Protection, 1998) and shellfish-harvesting lease closures (Bonnie Holub and Associates, 1998). Rapid population growth in the basins and ongoing construction, particularly along the shoreline and other areas near the estuary, pose challenges to the maintenance of water quality and essential fish habitat (fig. 2). Between 1990 and 2000, all three counties within the NCB experienced population increases greater than the national average of 13.2 percent. Of these, Flagler County experienced the greatest percentage increase (73.9 percent) in Florida. The populations of St. Johns and Volusia Counties increased by 46.9 percent and 19.6 percent, respectively (Florida Legislature Office of Economic and Demographic Research, 2002).

Previous Studies

As noted earlier, Paperno and others (2001) conducted the only systematic fisheries survey in the NCB, which took place from 1993 to 1996 as part of a study of Volusia County estuaries. They sampled fixed stations monthly with seines and otter trawls near Ponce de Leon Inlet (n=8), and the Tomoka River and Basin (n=8), along with 11 stations south of the NCB in Mosquito Lagoon. They found that the Tomoka area was characterized by the presence of freshwater taxa and the seasonal recruitment of juvenile Penaeidae (commercial shrimp) and Sciaenidae (drums), whereas Ponce de Leon Inlet was characterized by species associated with euhaline waters such as *Opisthonema oglinum* (Atlantic thread herring) and *Harengula jaguana* (scaled sardine). Mosquito Lagoon stations were characterized by *Lucania parva* (rainwater killifish) and *Lagodon rhomboides* (pinfish), which are species associated with seagrass—an extremely rare habitat type in NCB estuaries. By sampling the two ends of the Ponce Inlet - Halifax River - Tomoka River estuarine system, Paperno and others (2001) demonstrated that the patterns of fish distribution and abundance in the southern basin of the NCB appear similar to patterns observed in other estuaries.

Methods of Data Collection and Analysis

The methods summarized here were developed by (and adopted from) the Florida Lake Watch Program (Florida LAKEWATCH, 2005) for nutrient and chlorophyll sampling, and by FWRI (2001) for other samples and data collections. Sampling stations were selected statistically using a geographically stratified, random, grid-based design. At each station, samples were collected with a seine or an otter trawl; additionally, environmental observations were made and water samples were collected for analysis of total nitrogen, phosphorus, and chlorophyll. Sampling was conducted for 5 or 6 days monthly from November 2001 to March 2005; however, this report includes data collected January 2002 through December 2004 only.

The R/V “Minute by Minute” is a 7-m mullet skiff donated to the USGS by the Florida Fish and Wildlife Conservation Commission Division of Law Enforcement for the purpose of conducting this study. Once obtained, the R/V was reconditioned and refit for use as a research platform (fig. 3).

Sample Frequency and Selection

Sampling-station selection followed methods developed as part of the Fisheries Independent Monitoring Program (FIM), and utilized a Statistical Analysis System (SAS) program developed by FIM to select sampling locations using a geographically-stratified random grid-based design (SAS/STAT software, Version 8 of the SAS System for Microsoft



Figure 2. Shoreline erosion, and seawall, marina, and dock construction: *A*, Shoreline erosion in Flagler County, *B*, new *Spartina alterniflora* growing in front of an eroded bank where a dock is under construction in St. Johns County, *C*, a new marina community under construction in Flagler County, *D*, closeup of unfinished seawall, *E*, backhoe at work on new seawall, *F*, completed seawall with rip rap. Photograph credits: Michael Turtora, USGS.



Figure 3. The R/V “Minute by Minute” outfitted as a research platform.
Photograph credit: Tom Harding, USGS.

Windows). The grid developed for the study used numbered cells, each with a size of one minute of latitude by one minute of longitude. Grid lines corresponded to geographical coordinates and grid cells were numbered from west to east and north to south (fig. 1).

The study area was geographically stratified by dividing it into four main zones (A to D) from north to south (fig. 1 and table 1). Because the three inlets in the study area are important biologically but small spatially, inlet sub-zones AI, BI, and DI were nested within main zones A, B, and D, respectively, to ensure the inlets were sampled frequently enough to be characterized. Inlet sub-zones were defined by grid cells within 1 nmi (nautical mile) of the landward mouth of an inlet.

For each month and for both gear types (seines and trawls), a fixed number of grid cells to be sampled were randomly selected without replacement from each zone independently of other months or the other gear type. Two sampling stations for each gear type were selected for each of the three inlet zones every month. Sampling stations for the four major zones were originally overselected because it was unclear how many samples could be obtained in 5 days over nearly 160 km

of coastline. Sampling efficiency was expected to improve once individuals became familiar with the methods and collected material. Excess sampling locations were randomly discarded each day of sampling. After several months of sampling, a sixth weekly sampling day was added to increase sample size and public participation. A goal of 48 samples per month was set in October of 2002.

Because the estuaries in the study area are narrow, every grid cell contained shoreline and open-water habitats and was initially part of the sampling universe for both gear types. With increasing experience on the water, the sampling universe for each gear type was progressively refined by removing grid cells that could not be sampled from the selection process for future monthly sampling.

Within each selected grid cell, a precise sampling location was identified using the following method designed to ensure that all suitable sampling locations (defined later) had an equal probability of being chosen. Each selected grid cell was divided by a grid with a cell size of a tenth of a minute. One of these 100 minor cells was randomly chosen as a starting point to conduct a field-based search for a sampling location within the

Table 1. Sampling strata, geographic areas and major water bodies.

Zone	Geographic area	Major water bodies
A	Ponte Vedra to St. Augustine	Tolomato River, Guana River, Matanzas River
AI	St. Augustine Inlet	
B	St. Augustine to Palm Coast	Matanzas River, ICW Canal, Palm Coast Canals
BI	Matanzas Inlet	
C	Flagler Beach to Ormond Beach	Smith Creek, Tomoka River and Basin, Halifax River
D	Ormond Beach to New Smyrna Beach	Halifax River, North Mosquito Lagoon
DI	Ponce de Leon Inlet	



Figure 4. Fish collection using seine hauls and seawall sets: *A*, a seine haul in front of a cut bank, *B*, a seawall set in Volusia County, *C*, a seawall set in downtown St. Augustine, and *D*, collecting the bag after a set in a mangrove swamp in Volusia County. Photograph credits: *A*, Tom Harding, USGS; *B*, *C*, and *D*, Michael Turtora, USGS.

major grid cell. The search was initially conducted with a map by envisioning leaving the starting point on a heading randomly chosen in advance and proceeding in a spiral either clockwise or counterclockwise (also chosen in advance) through all adjacent minor grid cells until a suitable habitat was reached.

The FIM program also stratifies seine samples by the existence of submerged aquatic vegetation as determined from aerial photographs. However, because no submerged aquatic vegetation is known to occur in the area sampled, the strata for this study were based solely on hydrography.

Fish Collection and Identification

Fishes were collected using two gear types (described in detail in FWRI, 2001) in order to sample complementary habitats. Shorelines were sampled with a 21.3×1.83 -m center bag seine, and deeper waters were sampled with a standard otter trawl with a 6.1-m mouth width. The seine was constructed of 3-mm, #35 knotless nylon stiff material Delta mesh, and the center bag measured $1.83 \times 1.83 \times 1.83$ m. The trawl was

constructed of twine with 3.8-cm stretch mesh, and the cod end had a liner made of the same material as the seine.

Seining

The seine was set from the stern of the R/V by maneuvering the stern as close to shore as possible and deploying a crew member with one end of the seine who proceeded immediately to shore. Depending on water depth, the operator motored or pushed the boat in a semicircle terminating back on shore while the seine was deployed over the stern. The seine was deployed either upcurrent or upwind depending on which was judged to be the controlling factor. Another crew member exited the boat with the second end of the seine and a third crew member followed with a bucket. The seine ends were taken the shortest distance to either the water's edge or the seaward edge of any emergent vegetation. The two ends of the seine were then fished towards each other along the shoreline so that they met in the middle. The seine was only deployed where the water depth at the center bag was less than 1.8 m and the depth at the seine ends was less than either 0.5 m or 1.0 m if at a seawall (fig. 4).



Figure 5. Rinsing down the trawl after a sample. Photograph credit, Michael Turtora, USGS.

A “center” person pulled in the leads from both wings at once while two others hauled in the floats from the wings. Care was taken to pull in both ends of the net at the same rate to keep it from folding and to assure that the fish inside the net would be collected in the seine bag and then transferred to the bucket. If emergent vegetation or a seawall was present along the shoreline, the wings were piled up around the lead puller to form a barrier. Water depths at the initial bag location and at the point at which the net was hauled were recorded.

Trawling

The trawl was deployed by hand from the stern and towed for 5 minutes at 0.772 m/s (speed over ground measured with a Garmin GPSmap76) for a “target” tow distance of 185 m. The trawl was towed in a straight line where water depths were between 1.8 and 7.6 m, and in the few instances where the water was shallower, the trawl was pulled in an arc to minimize any effect of prop wash on the catch. Water depths greater than 7.6 m or less than 1 m were not sampled. Trawl start and end depths were measured with a fathometer and recorded to an accuracy of the nearest 0.1 m. Start and end locations were determined with the GPS receiver and the heading was determined from the start and end points (fig. 5).

Processing

Finfish and selected shellfish were identified in the field to the lowest practical taxon when possible, and then enumerated, measured, and released (fig. 6). Standard lengths were measured to the nearest millimeter for up to 40 representative specimens for recreationally and commercially important finfishes, and as many as 10 specimens for other species. Following the FWRI (2001) guidelines, recreationally and commercially important finfishes are designated using the

proper noun “Selected Species,” and are identified in table 2. Representative specimens of unidentified species were returned to the laboratory for identification and a representative sample of identified fish was also retained for quality assurance. Voucher specimens of retained fish were deposited in the ichthyology collection of the Florida Museum of Natural History, University of Florida, Gainesville.

Although laboratory processing had not been completed for the 2004 samples prior to this report, the data presented herein provide a fairly complete representation of the abundance and distribution of collected specimens. Remaining sources of uncertainty are mostly limited to small mullet, drums, and silversides (reported as *Mugil spp.*, *Sciaenidae spp.*, and *Menidia spp.*, respectively). Silversides were identified in the lab as either *Menidia menidia* or *Menidia spp.* due to the likelihood of hybridization between the other forms (Tremain and Adams, 1995). Anchovies were identified as either *Anchoa hepsetus* or *A. mitchilli*, based on the relative positions of dorsal and anal fins. Although two other anchovy species may have been collected, results from samples collected in the northern Indian River Lagoon suggest that they are likely present in such small numbers (Snelson, 1983) that little information was lost by grouping them. *Eucinostomus* specimens less than 40 mm in length were not resolved to species because they are meristically and morphologically indistinguishable (Matheson and McEachran, 1984). Some infrequently collected taxa remain to be verified, such as blennies and butterfish.

If more than an estimated one thousand fish of any one species were captured in a sample, we subsampled by repeatedly dividing the sample in half until fewer than one thousand remained. The remaining fish were processed as described earlier. Splitting was accomplished using either a modified Motoda box splitter (FWRI, 2001) or, for exceptionally large catches, by spreading the fish out on a culling table and dividing them in half.

Environmental Data Collection

Water temperature, salinity, dissolved oxygen, and pH were recorded using a YSI 6900 data sonde at 1-m intervals, beginning at 0.5 m below the water surface, and also at 0.25 m above the bottom. A refractometer and thermometer were used to take surface measurements on the few occasions that the YSI malfunctioned. Tidal stage, wind, weather, and by-catch (unintended fisheries catch) were also recorded as was bottom substrate, where possible. For seine sample stations, characteristics of the shoreline were also recorded.

Unfiltered surface-water samples were collected for analysis of total nitrogen and phosphorus. A volume of water sufficient to visibly color a 0.45- μ m glass fiber filter was filtered and the filter was retained for analysis of total chlorophyll. Filters were placed in a desiccator and both filter and water samples were kept on ice during a research cruise and frozen at the end of each day of sampling. Samples were analyzed by the Florida Lake Watch Program (Florida LAKEWATCH, 2005).



Figure 6A-D. Sorting, measurement, and identification of fish specimens: *A*, Sorting a catch, *B*, sorting an abundant catch on the culling table, with a trawl door visible on the right, *C*, identifying a small specimen, and *D*, length series of juvenile spotted seatrout (*Cynoscion nebulosus*). Photograph credits: *A*, *B*, and *D*, Michael Turtora, USGS; *C*, Tom Harding, USGS.



Figure 6E-H. Sorting, measurement, and identification of fish specimens—Continued: *E*, A marine stray, the Atlantic guitarfish (*Rhinobatos lentiginosus*) on a measuring board, *F*, a striped mojarra (*Diapterus plumieri*) being measured for standard length, *G*, a tailless white mullet (*Mugil curema*) recorded and released alive, *H*, an abundant catch sorted to species. Photograph credits: *E*, *G*, and *H*, Michael Turtora, USGS; *F*, Tom Harding, USGS.

Table 2. Scientific names used in this report, including common names, abbreviations, and current synonyms.

[Selected Species in bold.]

Scientific name	Common name	Abbreviation	Synonym
<i>Abudefduf saxatilis</i>	Sergeant major	Abusax	
<i>Achirus lineatus</i>	Lined sole	Achlin	
<i>Albula vulpes</i>	Bonefish	Albvul	
<i>Aluterus heudeloti</i>	Dotterel filefish	Aluheu	
<i>Aluterus</i> spp.		Aluspp	
<i>Ameiurus natalis</i>	Yellow bullhead	Amenat	
<i>Anchoa hepsetus</i>	Striped anchovy	Anchep	
<i>Anchoa mitchilli</i>	Bay anchovy	Ancmit	
<i>Anchoa</i> spp.		Ancspp	
<i>Ancylopsetta quadrocellata</i>	Ocellated flounder	Ancqua	
<i>Archosargus probatocephalus</i>	Sheepshead	Arcpro	
<i>Arius felis</i>	Hardhead catfish	Arifel	Ariopsis
<i>Astroscopus y-graecum</i>	Southern stargazer	Asty-g	
<i>Bagre marinus</i>	Gafftopsail catfish	Bagmar	
<i>Bairdiella chrysoura</i>	Silver perch	Baichr	
<i>Bathygobius soporator</i>	Frillfin goby	Batsop	
<i>Blenniidae</i> spp.		Blespp	
<i>Bothidae</i> spp.		Botspp	
<i>Brevoortia</i> spp.		Brespp	
<i>Brevoortia tyrannus</i>	Atlantic menhaden	Bretyr	
<i>Callinectes ornatus</i>		Calorn	
<i>Callinectes sapidus</i>	Blue crab	Calsap	
<i>Callinectes similis</i>		Calsim	
<i>Callinectes</i> spp.		Calspp	
<i>Caranx bartholomaei</i>	Yellow jack	Carbar	
<i>Caranx hippos</i>	Crevalle jack	Carhip	
<i>Caranx latus</i>	Horse-eye jack	Carlat	
<i>Caranx</i> spp.		Carspp	
<i>Carcharhinus brevipinna</i>	Spinner shark	Carbre	
<i>Carcharhinus limbatus</i>	Blacktip shark	Carlim	
<i>Centropomus undecimalis</i>	Snook	Cenund	
<i>Centropristis philadelphica</i>	Rock sea bass	Cenphi	
<i>Centropristis striata</i>	Black sea bass	Censtr	
<i>Chaetodipterus faber</i>	Atlantic spadefish	Chafab	
<i>Charybdis hellerii</i>		Chahel	
<i>Chasmodes bosquianus</i>	Striped blenny	Chabos	
<i>Chasmodes saburrae</i>	Florida blenny	Chasab	
<i>Chilomycterus schoepfi</i>	Striped burrfish	Chisch	
<i>Chloroscombrus chrysurus</i>	Atlantic bumper	Chlchr	
<i>Citharichthys macrops</i>	Spotted whiff	Citmac	
<i>Citharichthys spilopterus</i>	Bay whiff	Citspi	
<i>Clupeidae</i> spp.		Cluspp	

Table 2. Scientific names used in this report, including common names, abbreviations, and current synonyms.—Continued

[Selected Species in bold.]

Scientific name	Common name	Abbreviation	Synonym
<i>Cynoscion nebulosus</i>	Spotted seatrout	Cynneb	
<i>Cynoscion regalis</i>	Atlantic weakfish	Cynreg	
<i>Cynoscion</i> spp.		Cynspp	
<i>Cyprinodon variegatus</i>	Sheepshead minnow	Cypvar	
<i>Dasyatis sabina</i>	Atlantic stingray	Dassab	
<i>Dasyatis say</i>	Bluntnose stingray	Dassay	
<i>Dasyatis</i> spp.		Dasspp	
<i>Diapterus auratus</i>	Irish pompano	Diaaur	
<i>Diapterus plumieri</i>	Striped mojarra	Diaplu	Eugerres
<i>Diodon holocanthus</i>	Balloonfish	Diohol	
<i>Diplectrum bivittatum</i>	Dwarf sand perch	Dipbiv	
<i>Diplectrum formosum</i>	Sand perch	Dipfor	
<i>Diplectrum</i> spp.		Dipspp	
<i>Diplodus argenteus</i>	Silver porgy	Diparg	
<i>Diplodus holbrooki</i>	Spottail pinfish	Diphol	
<i>Echeneis naucrates</i>	Sharksucker	Echnau	
<i>Elops saurus</i>	Ladyfish	Elosau	
<i>Epinephelus itajara</i>	Goliath Grouper	Epiita	
<i>Etropus crossotus</i>	Fringed flounder	Etrcro	
<i>Eucinostomus argenteus</i>	Spotfin mojarra	Eucarg	
<i>Eucinostomus gula</i>	Silver jenny	Eucgul	
<i>Eucinostomus harengulus</i>	Tidewater mojarra	Euchar	
<i>Eucinostomus jonesii</i>	Slender mojarra	Eucjon	
<i>Eucinostomus</i> spp.		Eucspp	
<i>Euleptorhamphus velox</i>	Flying halfbeak	Eulvel	
<i>Farfantepenaeus aztecus</i>	Brown shrimp	Farazt	
<i>Farfantepenaeus duorarum</i>	Pink shrimp	Farduo	
<i>Farfantepenaeus</i> spp.	Commercial shrimp	Farspp	
<i>Fundulus confluentus</i>	Marsh killifish	Funcon	
<i>Fundulus grandis</i>	Gulf killifish	Fungra	
<i>Fundulus heteroclitus</i>	Mummichog	Funhet	
<i>Fundulus majalis</i>	Striped killifish	Funmaj	
<i>Fundulus</i> spp.	Assorted killifish	Funspp	
<i>Gambusia holbrooki</i>	Eastern mosquitofish	Gamhol	
<i>Gobiesox strumosus</i>	Skilletfish	Gobstr	
<i>Gobiidae</i> spp.		Gobspp	
<i>Gobioides broussoneti</i>	Violet goby	Gobbro	
<i>Gobionellus boleosoma</i>	Darter goby	Gobbol	Ctenogobius
<i>Gobionellus oceanicus</i>	Highfin goby	Goboce	
<i>Gobionellus shufeldti</i>	Freshwater goby	Gobshu	Ctenogobius
<i>Gobionellus smaragdus</i>	Emerald goby	Gobsma	Ctenogobius
<i>Gobionellus</i> spp.		Gbnlus	Ctenogobius

Table 2. Scientific names used in this report, including common names, abbreviations, and current synonyms.—Continued

[Selected Species in bold.]

Scientific name	Common name	Abbreviation	Synonym
<i>Gobionellus stigmaticus</i>	Marked goby	Gobsti	Ctenogobius
<i>Gobiosoma bosc</i>	Naked goby	Gobbos	
<i>Gobiosoma longipala</i>	Twoscale goby	Goblon	
<i>Gobiosoma robustum</i>	Code goby	Gobrob	
<i>Gobiosoma</i> spp.		Gbsoma	
<i>Gymnura micrura</i>	Smooth butterfly ray	Gymmie	
<i>Haemulidae</i> spp.	Grunts	Haespp	
<i>Harengula jaguana</i>	Scaled sardine	Harjag	
<i>Hippocampus erectus</i>	Lined seahorse	Hipere	
<i>Hypleurochilus bermudensis</i>	Barred blenny	Hypber	
<i>Hyporhamphus meeki</i>	American halfbeak	Hypmee	
<i>Hypsoblennius henz</i>	Feather blenny	Hyphen	
<i>Hypsoblennius ionthas</i>	Freckled blenny	Hypion	
<i>Ictalurus punctatus</i>	Channel catfish	Ictpun	
<i>Labrisomus nuchipinnis</i>	Hairy blenny	Labnuc	
<i>Lactophrys</i> spp.		Lacspp	
<i>Lactophrys trigonus</i>	Trunkfish	Lactri	
<i>Lagodon rhomboides</i>	Pinfish	Lagrho	
<i>Larimus fasciatus</i>	Banded drum	Larfas	
<i>Leiostomus xanthurus</i>	Spot	Leixan	
<i>Lepisosteus osseus</i>	Longnose gar	Leposs	
<i>Leptocephalus</i> spp.		Lepspp	
<i>Limulus polyphemus</i>	Horseshoe crab	Limpol	
<i>Litopenaeus setiferus</i>	White shrimp	Litset	
<i>Lobotes surinamensis</i>	Tripletail	Lobsur	
<i>Lutjanus griseus</i>	Gray snapper	Lutgri	
<i>Lutjanus</i> spp.		Lutspp	
<i>Lutjanus synagris</i>	Lane snapper	Lutsyn	
<i>Membras martinica</i>	Rough silverside	Memmar	
<i>Menidia menidia</i>	Atlantic silverside	Menmen	
<i>Menidia</i> spp.		Silver	
<i>Menippe</i> spp.		Stone	
<i>Menticirrhus americanus</i>	Southern kingfish	Mename	
<i>Menticirrhus littoralis</i>	Gulf kingfish	Menlit	
<i>Menticirrhus saxatilis</i>	Northern kingfish	Mensax	
<i>Menticirrhus</i> spp.		Mncirh	
<i>Microgobius gulosus</i>	Clown goby	Micgul	
<i>Microgobius</i> spp.		Micspp	
<i>Microgobius thalassinus</i>	Green goby	Mictha	
<i>Micropis brachyurus</i>	Opposum pipefish	Micbra	
<i>Micropogonias undulatus</i>	Atlantic croaker	Micund	
<i>Monacanthus hispidus</i>	Planehead filefish	Monhis	

Table 2. Scientific names used in this report, including common names, abbreviations, and current synonyms.—Continued

[Selected Species in bold.]

Scientific name	Common name	Abbreviation	Synonym
<i>Mugil cephalus</i>	Striped mullet	Mugcep	
<i>Mugil curema</i>	White mullet	Mugcur	
<i>Mugil</i> spp.		Mugspp	
<i>Myrophis punctatus</i>	Speckled worm eel	Myrpun	
<i>Ogcocephalus radiatus</i>	Polka-dot batfish	Ograd	
<i>Oligoplites saurus</i>	Leatherjacket	Olisau	
<i>Ophichthus gomesi</i>	Shrimp eel	Ophgom	
<i>Ophidion</i> spp.		Ophspp	
<i>Opisthonema oglinum</i>	Atlantic thread herring	Opiogl	
<i>Opsanus tau</i>	Oyster toadfish	Opstau	
<i>Orthopristis chrysoptera</i>	Pigfish	Ortchr	
<i>Paralichthys albigutta</i>	Gulf flounder	Paralb	
<i>Paralichthys dentatus</i>	Summer flounder	Parden	
<i>Paralichthys lethostigma</i>	Southern flounder	Parlet	
<i>Paralichthys</i> spp.	Flounder	Parspp	
<i>Paralichthys squamilentus</i>	Broad flounder	Parsqu	
<i>Penaeidae</i> spp.	Shrimps	Penspp	
<i>Peprilus alepidotus</i>	Harvestfish	Pepale	
<i>Peprilus burti</i>	Gulf butterfish	Pepbur	
<i>Peprilus triacanthus</i>	Butterfish	Peptri	
<i>Poecilia latipinna</i>	Sailfin molly	Poelat	
<i>Pogonias cromis</i>	Black drum	Pogcro	
<i>Pomatomus saltatrix</i>	Bluefish	Pomsal	
<i>Portunus gibbesi</i>	Iridescent swimming crab	Porgib	
<i>Portunus</i> spp.	Crabs	Porspp	
<i>Prionotus carolinus</i>	Northern searobin	Pricar	
<i>Prionotus evolans</i>	Striped searobin	Prievo	
<i>Prionotus rubio</i>	Blackfin searobin	Prirub	
<i>Prionotus scitulus</i>	Leopard searobin	Prisci	
<i>Prionotus</i> spp.	Searobins	Prispp	
<i>Prionotus tribulus</i>	Bighead searobin	Pritri	
<i>Pristigenys alta</i>	Short bigeye	Prialt	
<i>Rhinobatos lentiginosus</i>	Atlantic Guitarfish	Rhilen	
<i>Rhinoptera bonasus</i>	Cownose ray	Rhibon	
<i>Sardinella aurita</i>	Spanish sardine	Saur	
<i>Sciaenidae</i> spp.	Drums	Scispp	
<i>Sciaenops ocellatus</i>	Red drum	Scioce	
<i>Scomber</i> spp.	Mackerels	Scospp	
<i>Scorpaena brasiliensis</i>	Barbfish	Scobra	
<i>Scorpaena plumieri</i>	Spotted scorpionfish	Scoplu	
<i>Selar crumenophthalmus</i>	Bigeye scad	Selcru	
<i>Selene setapinnis</i>	Atlantic moonfish	Selset	

Table 2. Scientific names used in this report, including common names, abbreviations, and current synonyms.—Continued

[Selected Species in bold.]

Scientific name	Common name	Abbreviation	Synonym
<i>Selene vomer</i>	Lookdown	Selvom	
<i>Serranidae</i> spp.	Seabasses	Serspp	
<i>Sphoeroides maculatus</i>	Northern puffer	Sphmac	
<i>Sphoeroides nephelus</i>	Southern puffer	Sphnep	
<i>Sphoeroides</i> spp.	Pufferfish	Sphspp	
<i>Sphoeroides testudineus</i>	Checkered puffer	Sphtes	
<i>Sphyraena barracuda</i>	Great barracuda	Sphbar	
<i>Sphyraena guachancho</i>	Guaguanche	Sphgua	
<i>Sphyrna tiburo</i>	Bonnethead	Sphtib	
<i>Stellifer lanceolatus</i>	Star drum	Stelan	
<i>Stomolophus meleagris</i>	Cannonball jellyfish	Stomel	
<i>Strongylura marina</i>	Atlantic needlefish	Strmar	
<i>Strongylura notata</i>	Redfin needlefish	Strnot	
<i>Strongylura</i> spp.	Needlefish	Strspp	
<i>Symphurus plagiusa</i>	Blackcheek tonguefish	Sympla	
<i>Syngnathus floridae</i>	Dusky pipefish	Synflo	
<i>Syngnathus fuscus</i>	Northern pipefish	Synfus	
<i>Syngnathus louisianae</i>	Chain pipefish	Synlou	
<i>Syngnathus scovelli</i>	Gulf pipefish	Synsco	
<i>Syngnathus</i> spp.	Pipefish	Synspp	
<i>Synodus foetens</i>	Inshore lizardfish	Synfoe	
<i>Trachinotus carolinus</i>	Florida pompano	Tracar	
<i>Trachinotus falcatus</i>	Permit	Trafal	
<i>Trachurus lathami</i>	Rough scad	Tralat	
<i>Trichiurus lepturus</i>	Atlantic cutlassfish	Trilep	
<i>Trinectes maculatus</i>	Hogchoker	Trimac	
Unidentified species		Unispe	
<i>Urophycis floridana</i>	Southern hake	Uroflo	

Data Analysis

Data were entered into Microsoft Excel spreadsheets and compiled using the Statistical Analysis System (SAS). SAS programs, as well as Microsoft Excel and Word macros developed by FWRI (2001), were adapted to aid in data processing and to produce tables of descriptive statistics for (1) dominant and Selected Species, and (2) species abundance by month and sampling zone. Data were examined for seasonal and spatial patterns of species abundance and distribution using Correspondence Analysis (CA) with CANOCO (ter Braak and Similauer, 2002).

CA is an eigenanalysis technique that maximizes the correspondence between species scores and sample scores, rather than maximizing the variance explained, as in Principal

Components Analysis (PCA). Unlike PCA, which assumes a linear response to environmental gradients, CA assumes a uni-modal response, implying environmental optima. As a result, species scores are plotted as points in ordination space that are related to the peaks of the species-response curves rather than as vectors representing directions of ever-increasing abundance. The species-weighted correlation between species scores and sample scores is maximized on the first ordination axis and in subsequent orthogonal axes. Therefore, the location of species points in species-ordination space corresponds to the location in sample-ordination space of the samples in which the corresponding species were most abundant.

Initial analyses were performed on data for individual years to determine the optimum data transformation and scaling for subsequent analyses. By comparing species

scores and ordination plots of raw and transformed data, the $\log(x+1)$ transformation was determined to be least sensitive to extremely large catches compared with untransformed or square-root transformed data. Detrending by segments (Gauch, 1982) was found to impose an arch effect on the data where none existed, rather than removing an arch effect as intended; therefore, no detrending was performed in subsequent analyses. As a compromise, uncommon species were down-weighted in the analysis to minimize their effects without completely losing the information they contributed to the patterns of species abundance and distribution (ter Braak and Similauer, 2002). Generally, rare species distort the analysis only when few of the more common species occur in the same sample. Ter Braak and Similauer (2002) considered simply deleting these deviant samples to be a more elegant solution to the problem than deleting all rare species *a priori*.

Sample and species data were analyzed based on the zones they were located in, the month they were collected, and the type of gear with which they were collected (seine or trawl). Ordination methods are essentially a form of exploratory data analysis in that they suggest broad patterns in the data that can lead to further analysis for greater understanding and confirmation of those patterns. To this end, the ranges of months, peak months, and zones of minimum and maximum occurrence were tabulated; tabulations were made on taxa selected based on ordination results and their presence in sufficient numbers to show a distinct difference between inlets and areas farther up the estuary ("upestuary" areas). The intent was to better understand the contrasting spatiotemporal patterns between ordination results from seines and trawls. Each taxon was tabulated as being either predominantly collected in a particular gear type or in roughly equal numbers in both gear types. Resulting taxa that showed a clear gradient in abundance between inlet zones and the zone farthest from an inlet (Zone C) were then summarized by month and gear.

Fish and Selected Invertebrate Density and Distribution Patterns

Results of the current survey reveal several distinct fish and invertebrate density and distribution patterns within the study area. Overall, numbers were greater when collected in seines than in trawls; the greatest numbers were observed in seines near inlets and in trawls within Zone C. Seasonal variation had the greatest influence in the ordination of seine samples. Spatial variation had the greatest influence in the ordination of trawl samples—as a result of the number and timing of species occurring in greatest densities in inlets compared with upestuary areas. Although three inlets are present within the study area, only two estuarine areas appear to function as oligohaline nurseries. The absence of seagrass habitat in the study area was reflected by the absence of a seagrass fish assemblage.

Species Richness, Dominance, and Abundance

A total of 358,446 finfishes and selected invertebrates were collected in 1,563 samples during 2002–2004, representing 157 species and 58 families (table 2; appendix tables 1–1 and 1–2). Table 2 lists scientific names, taxonomic synonyms following more recent nomenclature, and common names and abbreviations for all taxa sorted alphabetically by scientific name. The 710 seine samples contained 272,270 individuals ($n=272,270$), and the 853 trawl samples contained 86,176 individuals. Compared with their corresponding major zones, more individuals per sample (catch per unit effort, CPUE) were collected in seine samples from inlet zones, and the reverse was true in trawl samples. Of the major zones, Zone C is farthest from an inlet, and had a consistently low CPUE among seine samples, but the highest among trawl samples every year (appendix tables 2–1, 3–1, and 4–1). By zone type, Zone D and its corresponding inlet (Zone DI) had the highest CPUE among seine samples each year, and Zone D had the second highest among trawls. Zone B and its corresponding inlet Zone BI had a relatively low CPUE for both gear types.

Overall, the most abundant taxon collected was *A. mitchilli* (bay anchovy, $n=114,106$), accounting for 32 percent of the total catch (appendix table 1–7). Including *A. mitchilli*, the top five taxa collected were *Leiostomus xanthurus* (spot, $n=58,036$), *M. undulatus* (Atlantic croaker, $n=19,460$), *Eucinostomus* spp. less than 40 mm (mojarra, $n=16,961$), and *A. hepsetus* (striped anchovy, $n=14,255$), in all accounting for 62 percent of the total catch (appendix table 1–7). *A. mitchilli*, *L. xanthurus*, and *M. undulatus* were the only taxa collected in both gear types among the 10 most abundant taxa (appendix tables 1–2 and 1–4).

Thirty Selected Species ($n=116,424$) were collected, accounting for 32 percent of the total catch (appendix tables 1–3 and 1–5). The 4 most abundant Selected Species were among the 10 most abundant taxa overall, accounting for 28 percent of the total catch: *L. xanthurus*, *M. undulatus*, *Litopenaeus setiferous* (white shrimp, $n=11,207$), and *Mugil cephalus* (striped mullet, $n=10,133$). Among Selected Species, only *Paralichthys squamulentus* (broad flounder, $n=10$) and *Albula vulpes* (bonefish, $n=3$) were collected in seines but not trawls, and only *Epinephelus itajara* (goliath grouper, $n=4$) were collected in trawls but not seines.

The 272,270 animals collected in seines accounted for 76 percent of the total catch. *Anchoa mitchilli* ($n=93,465$) and *L. xanthurus* ($n=53,204$) together accounted for 53.8 percent of the total catch in seines (appendix table 1–2). A total of 81,585 animals in 29 species classified as Selected Species were collected in seine hauls, accounting for 30 percent of the animals collected with this gear. The most abundant Selected Species collected in seines was *L. xanthurus*, followed by *M. cephalus* ($n=9,669$).

Anchoa mitchilli ($n=20,641$) and *M. undulatus* ($n=13,760$) together accounted for 40 percent of the individuals collected in 6.1-m otter trawls. A total of 34,839 animals in 28 species classified as Selected Species were collected in trawls, accounting for 40 percent of the animals collected with this gear. The most abundant Selected Species collected in trawls was *M. undulatus* ($n=13,760$), followed by *L. setiferous* ($n=6,196$).

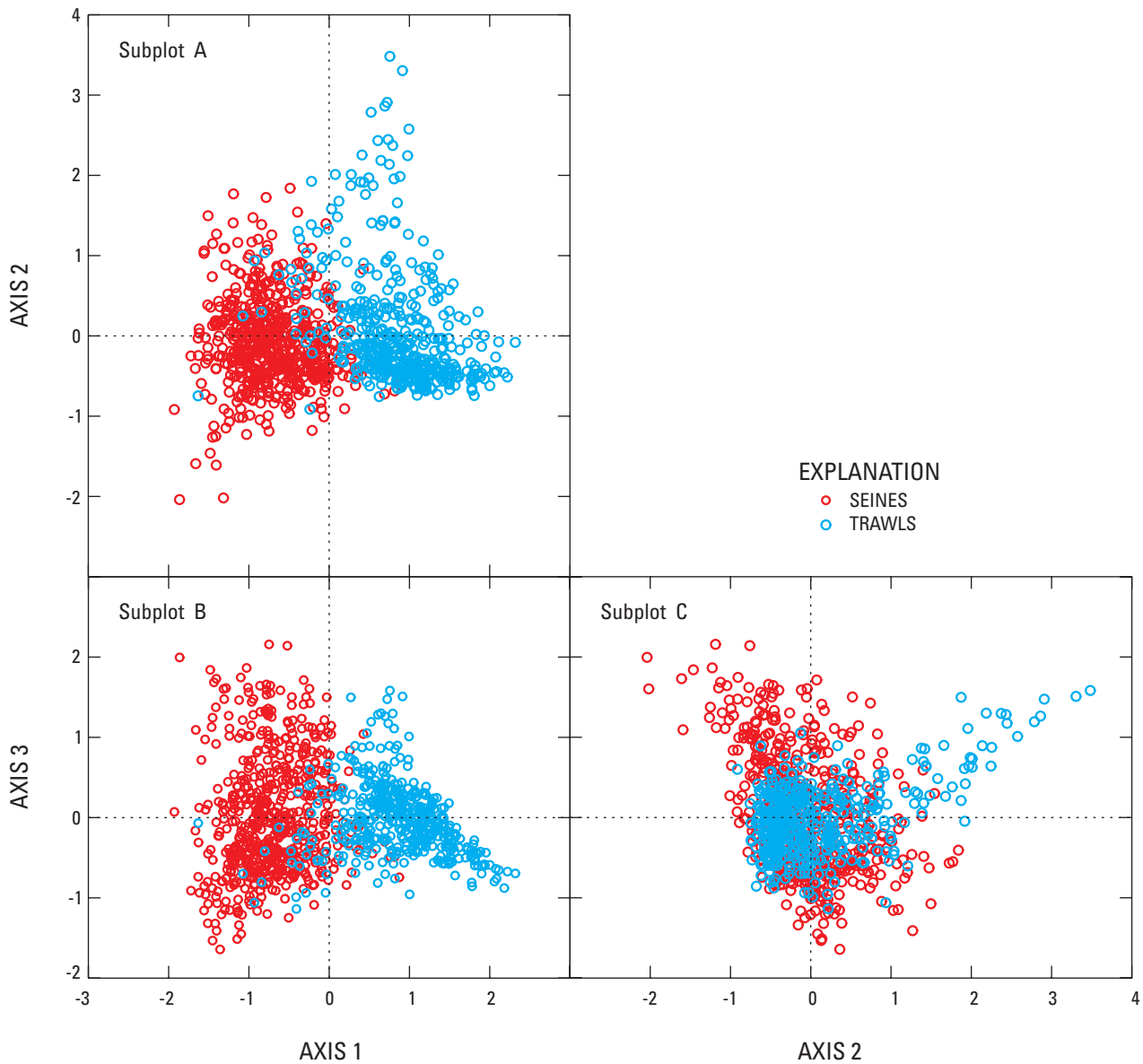


Figure 7. Ordination plots of samples color coded by the type of gear used in collecting samples.

Combined Gears

Two species, *Rhinobatos lentiginosus* (cownose ray) and *Peprilus burti* (gulf butterfish), were each collected in single samples with no other species present. This unduly influenced the ordination, even with down-weighting, and therefore, these species were removed from subsequent analysis. An ordination of samples based on the remaining species from both seines and trawls for the

years 2002-2004 discriminated samples from the two gear types along the first ordination axis with few errors (fig. 7). Comparison of this ordination plot with the corresponding ordination plot of species (fig. 8) provides a useful summary of gear preferences for the species included in the analysis, even though the unit of effort in terms of area sampled between trawl and seine samples is different. To simplify graphics, only samples with weights greater than 15 percent of the maximum sample weight, and species with

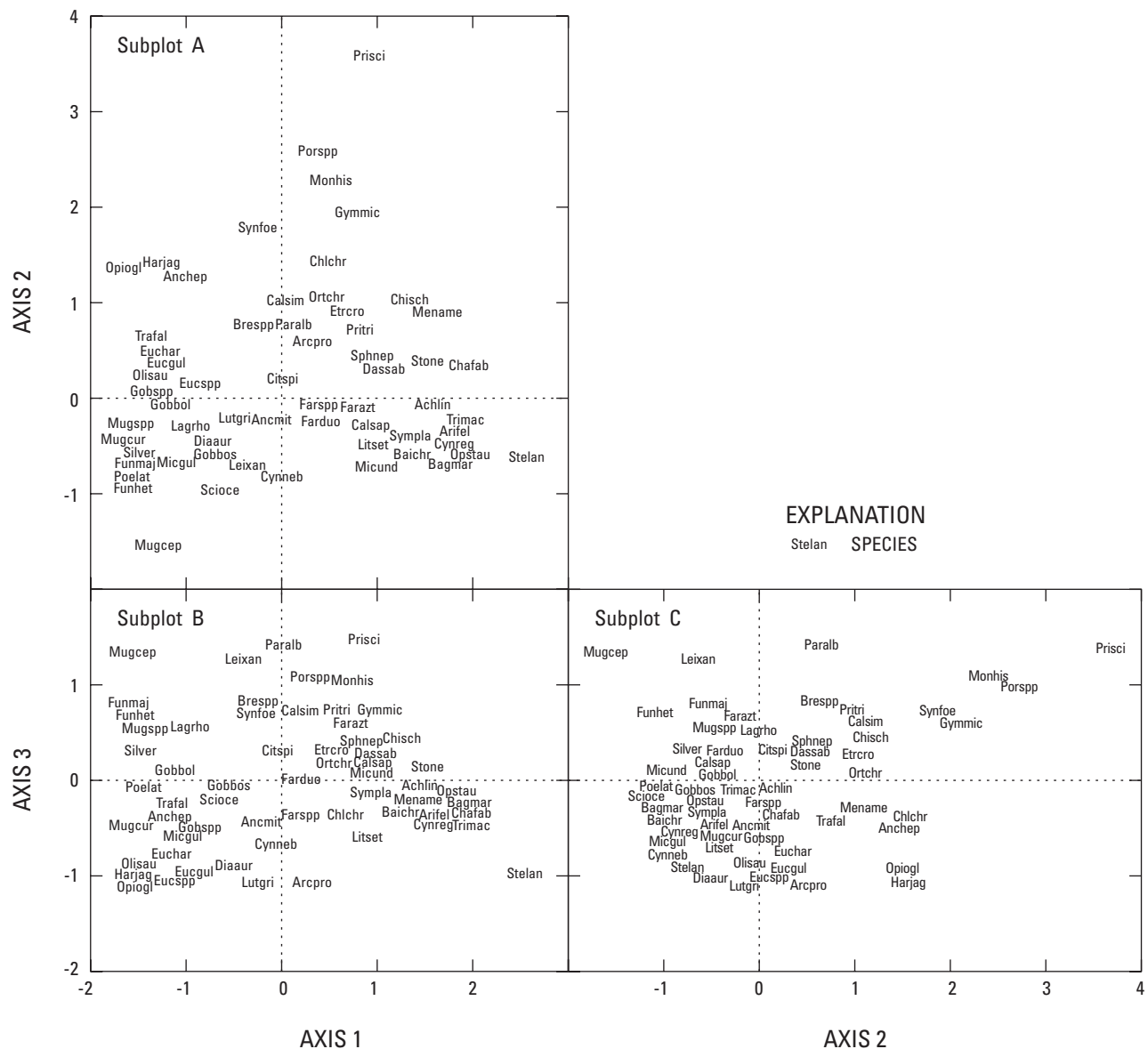


Figure 8. Ordination plots of species.

weights greater than 1 percent of the maximum species weight, were plotted on the figure, equaling about two thirds of samples and one third of species. Samples at the extremes of the second ordination axis have high scores on the third axis, whereas the majority of samples have similar scores on both axis 2 and 3, suggesting that subplot C in figure 7 is an ordination of samples independent of gear type.

Samples collected near inlets appear to be more variable than samples collected away from inlets, based on sample

ordination scores (fig. 9). The extremes of the second axis as well as a cluster of samples in the upper left quadrant of subplot A in figure 9 contain a disproportionately high number of samples from inlets that also have high scores on axis 3. As a result, subplot C in figure 9 roughly orders the samples by inlet distance, with the samples closest to the inlets located on the upper right triangle of the plot.

Samples with low axis 2 scores were collected with seines in winter (figs. 7 and 10), and contain high numbers of *M. cephalus*

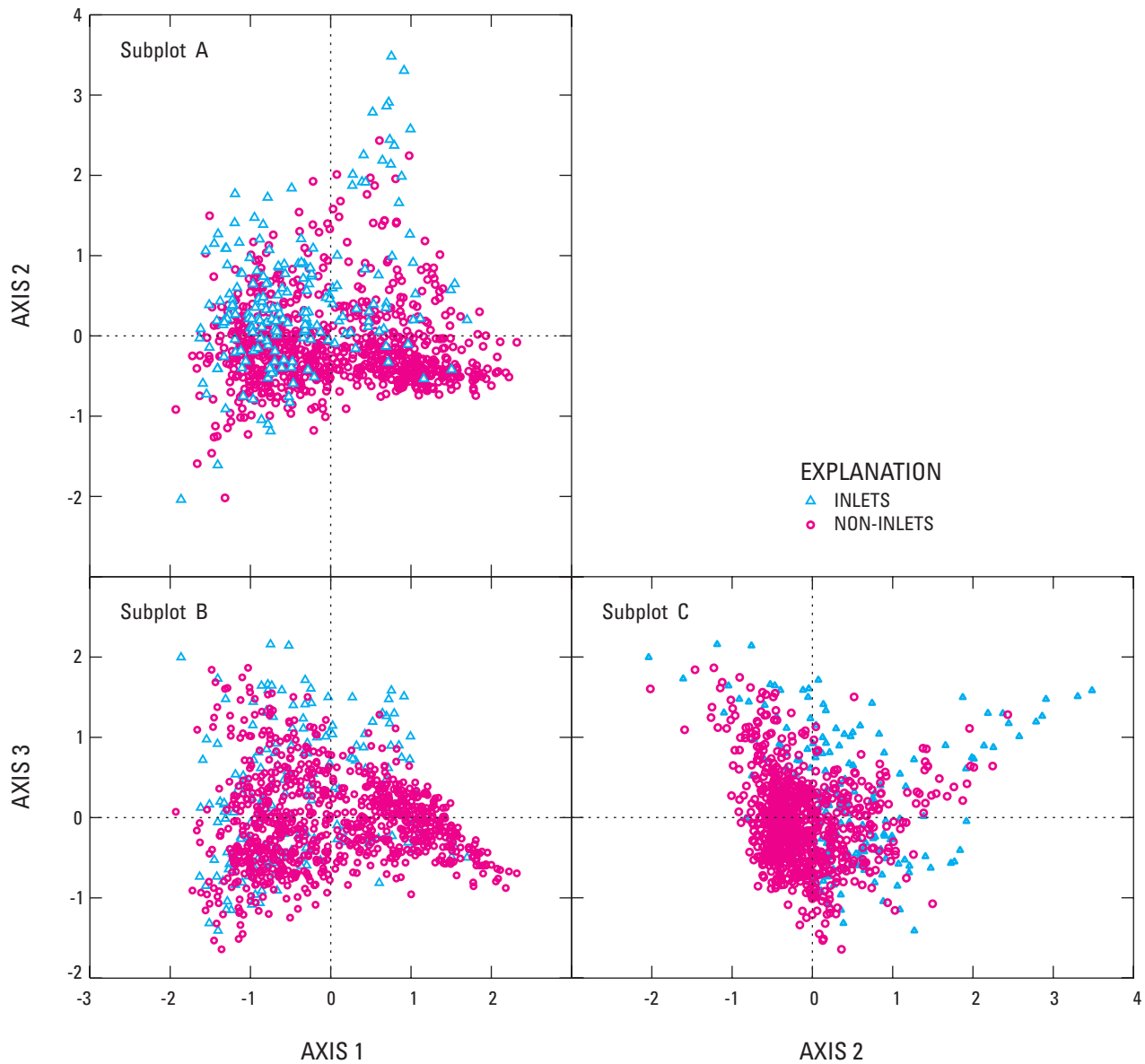


Figure 9. Ordination plots of samples color coded by zone.

(fig. 8), whereas samples with high axis 2 scores were collected near inlets in trawls during May and June (figs. 7-10), and contained relatively high numbers of marine species. In order of decreasing scores, these marine species include *Prionotus scitulus* (leopard searobin), *Portunus* sp. (probably *P. ornatus*), *Monacanthus hispidus* (planehead filefish), and *Gymnura micrura* (smooth butterfly ray). *Synodus foetens* (inshore lizardfish) were collected in equal numbers in seines and trawls near inlets in spring and summer. The cluster of samples in the upper left quadrant of

axis 2 vs. 1 (figs. 7-10) were collected near inlets with seines in summer and contained high numbers of *A. hepsetus* and clupeids (*H. jaguana*, *O. oglinum* and, although not plotted, *Sardinella aurita* [Spanish sardine]). Samples with high axis 1 scores were collected away from inlets in trawls in fall and contained species typically found over fine-grained sediments.

Subplot C in figure 10 displays a clockwise progression through the seasons, further suggesting that this projection, as well as the corresponding species ordination plot (fig. 8),

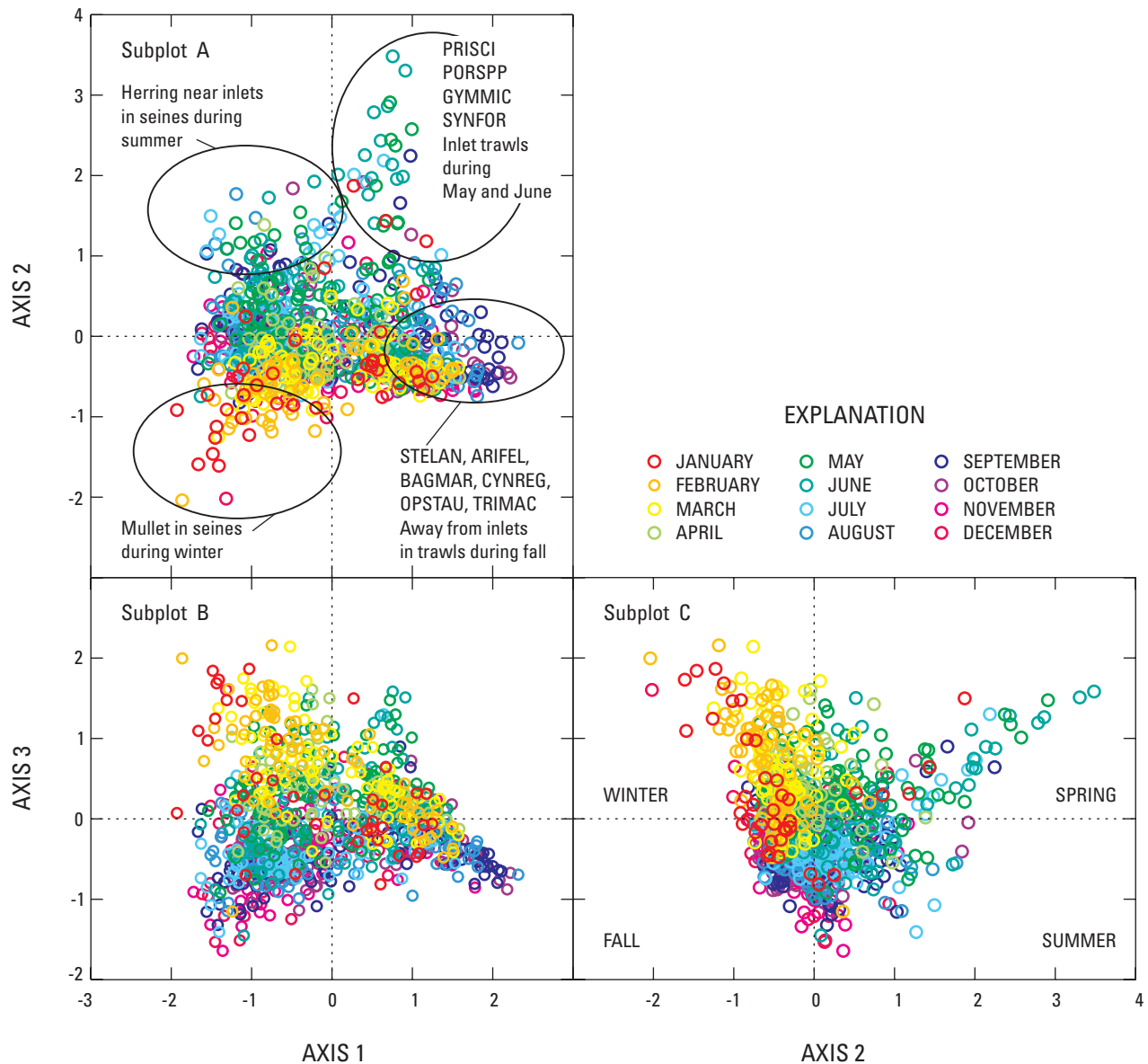


Figure 10. Ordination plots of samples color coded by month.

summarizes variation independent of gear type. Species near the center of subplot C in figure 8 were collected throughout most of the year, whereas species at the extremes show stronger seasonal variation. The seasonal variation in winter, spring, and summer appears to be mainly a function of species collected near inlets: mullet in winter, marine species in spring, and clupeids in summer. The fall component of seasonal variation is dominated by species occurring upestuary.

Seven drum species are distributed along the length of axis 1, but in a narrow range on axis 2 ($-1.0 < \text{axis 2} < -0.5$) (subplot A in fig. 8). *Stellifer lanceolatus* (star drum), collected all but exclusively in trawls, has high axis 1 scores and *Sciaenops ocellatus* (redfish), collected mostly in seines, has low axis 1 scores. Five of these seven drum species have negative axis 3 values putting them in the lower left quadrant of subplot C in figure 8, corresponding in sample space to samples collected in the fall, away from inlets (figs. 9 and 10).

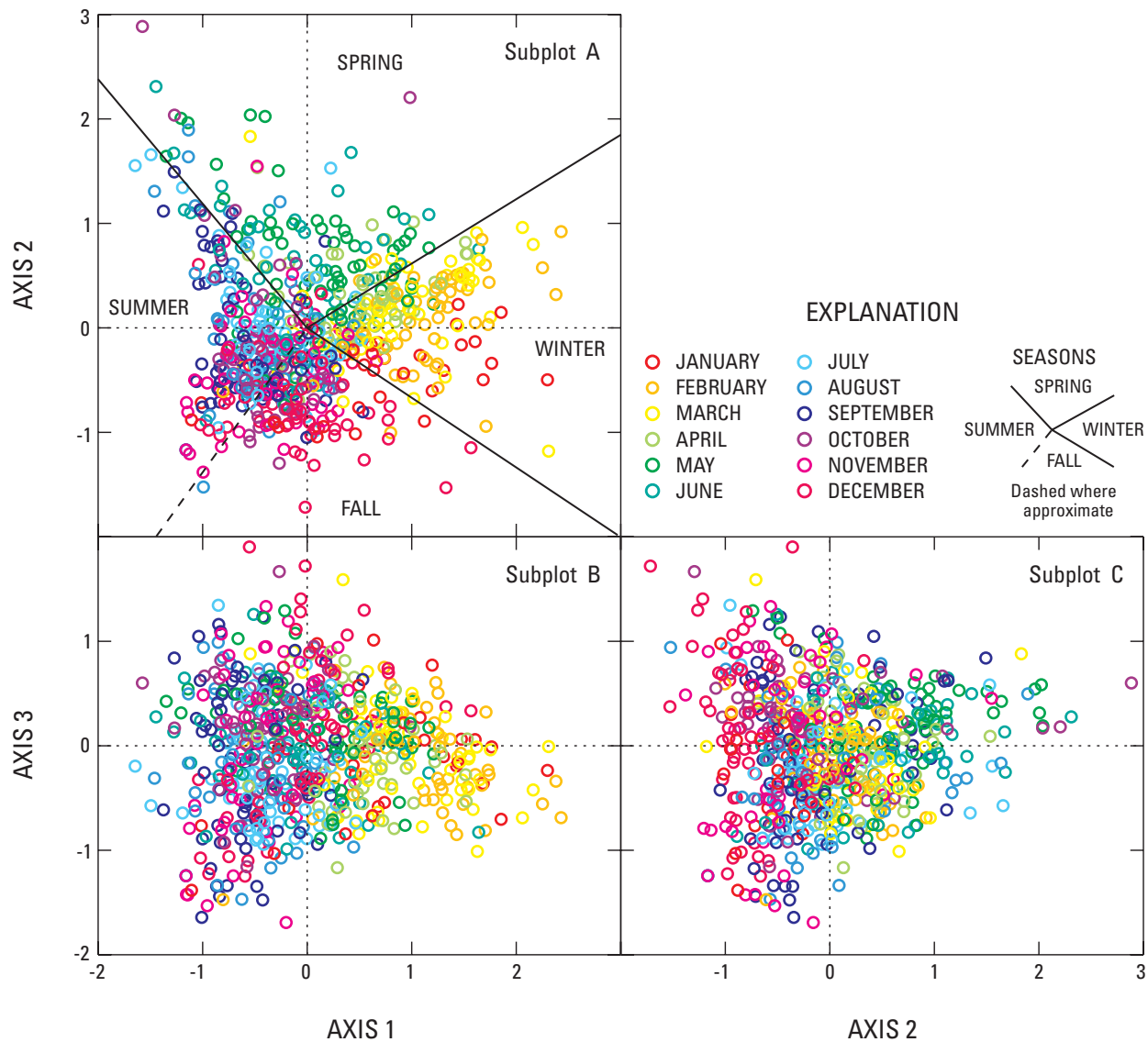


Figure 11. Ordination plots of seine samples color coded by month.

Seines

Similar to the combined gear results, one sample containing only a single *Menticirrhus saxatilis* (Northern kingfish) was deleted from the ordination analysis of seine data because of its disproportionate influence. With gear type no longer a factor, the resulting sample ordination discriminates among seasons (subplot A in fig. 11), which exhibits a counterclockwise annual cycle. Samples with high Axis 1

scores correspond to months with low temperatures and short days whereas samples with low Axis 1 scores correspond to months with high temperatures and long days. The corresponding ordination of species data provides a summary of the seasonal occurrence of various species collected in seines (fig. 12). Although all samples are plotted on figures 11 and 13, only those species with weights greater than 1 percent of maximum (about one third of the total number of species analyzed) are included in figure 12.

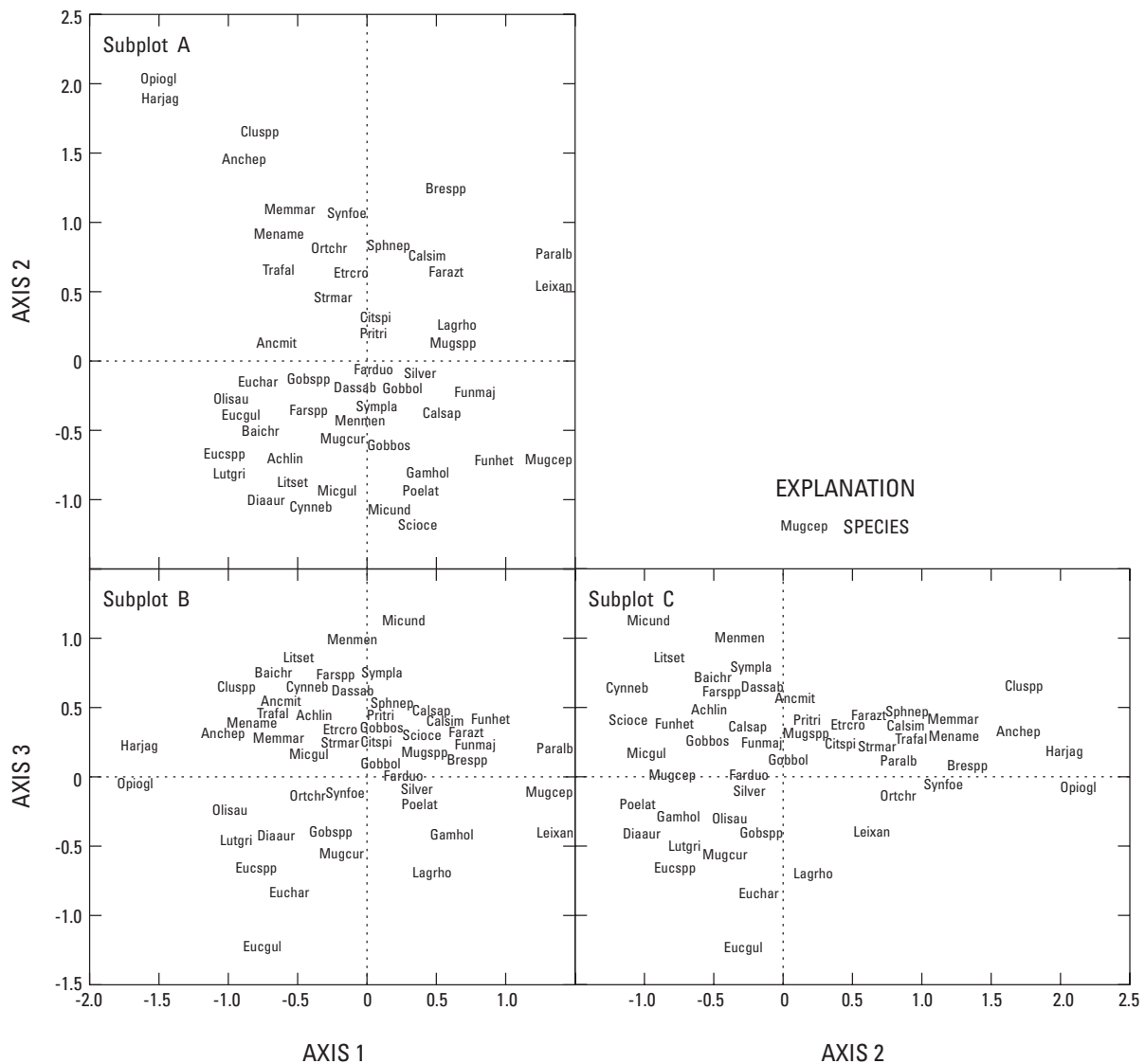


Figure 12. Ordination plots of species collected in seines.

As was seen with the combined data, samples collected with seines near inlets appear more variable (fig. 13), with distinctive samples collected from winter through summer that are distinguished by a high abundance of *M. cephalus*; then *L. xanthurus* and *Paralichthys albigutta* (gulf flounder); and finally clupeids (fig. 12). Although spatial effects are evident on subplot A in figure 13, they are more apparent in subplot C. This suggests that seasonal variation is more important than spatial variation among seine samples. Zone C samples dominate the base of the arrow in subplot C of figure 13 and samples from inlets dominate the tip.

Four of the six drum species common in seines are again in a narrow band on the second ordination axis, though in this case they lie in the upper left quadrant of subplot C in figure 12, corresponding to samples mostly collected in Zone C in the fall. Gerreids, which are widespread, have the lowest axis 3 scores and clupeids have moderate scores. This defines a triangle, with species from inlets at one vertex, species from upestuary areas at a second vertex, and samples containing widespread species at the third vertex.

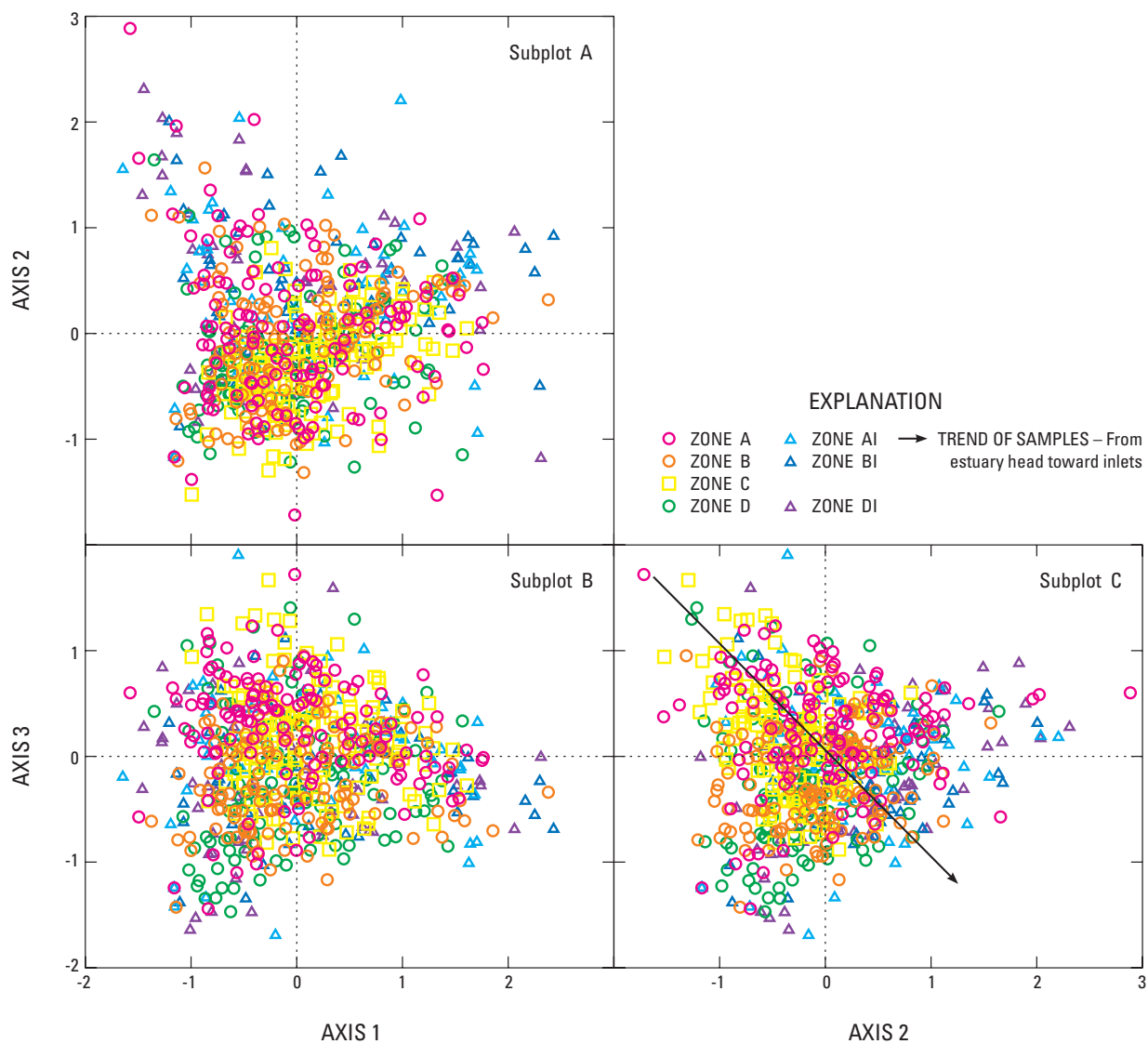


Figure 13. Ordination plots of seine samples color coded by zone.

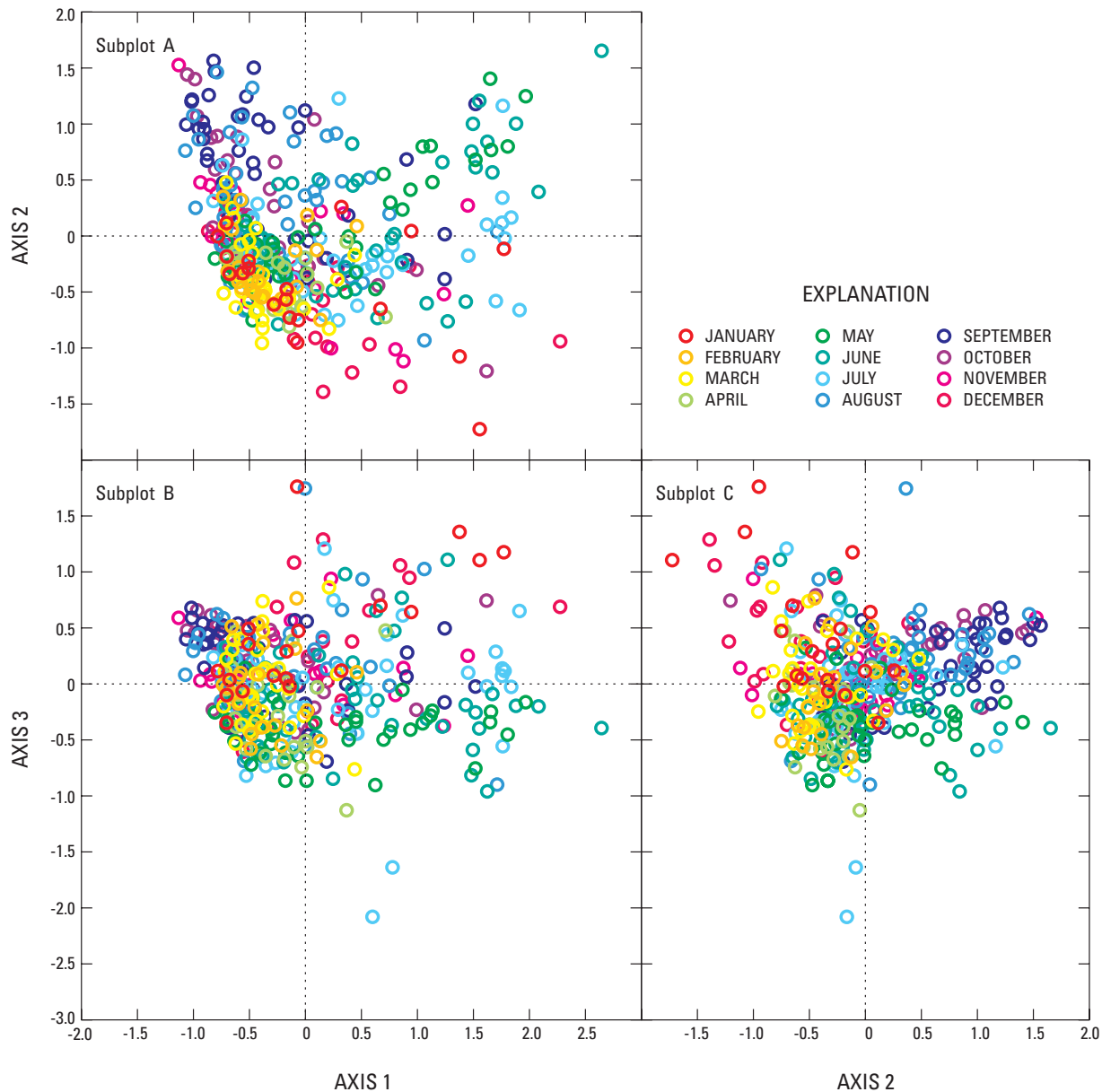


Figure 14. Ordination plots of trawl samples color coded by month.

Trawls

The cownose ray and butterfish were collected in trawls and were removed from analysis due to their disproportionate influence, as with the combined analysis. Samples with weights greater than 20 percent and species with weights greater than 1 percent are included in the plots in figures 14-16. Seasonal effects are evident on subplot A in figure 14, but there is no monotonic annual cycle as was evident with seines; however, such a cycle is present on subplot C in figure 14. Unlike the ordination of seine data which showed a strong seasonal pattern,

spatial variation seems to dominate the ordination of trawl data (fig. 16). All Zone C samples are less than 1 on axis 1, and samples from inlets have mostly positive axis 1 scores. Zone C samples mostly lie below the line on subplot A in figure 16, and inlet samples lie above it, as do most samples from Zone B. The upper end of this line corresponds to samples from Zone C and the upper reaches of Zone A containing *S. lanceolatus*, and the lower end to gerreids collected in several zones (fig. 15). Perpendiculars to this line extend to marine species from inlet samples in the upper right quadrant, and to drum and other upestuary species in the lower left quadrant.

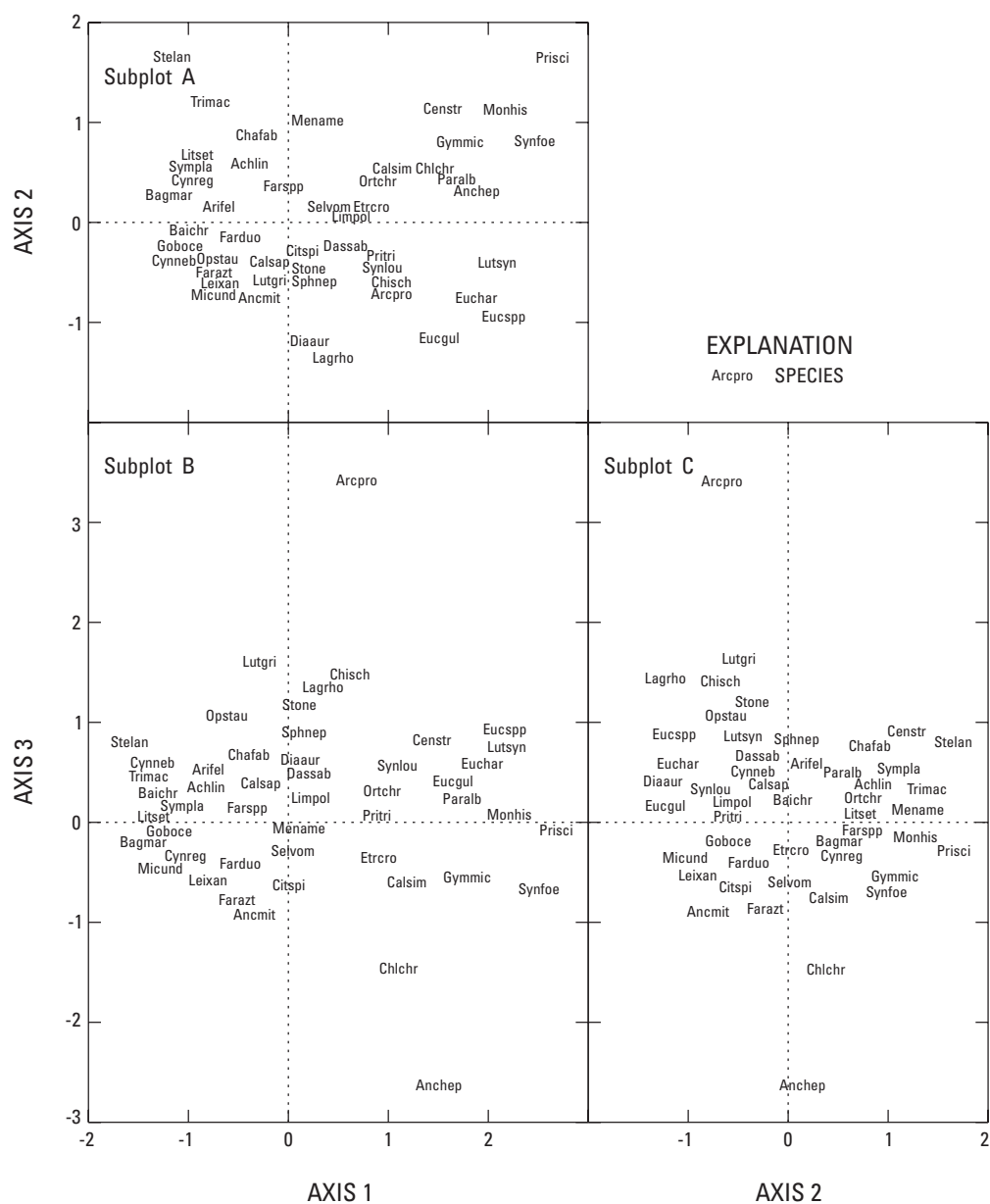


Figure 15. Ordination plots of species collected in trawls.

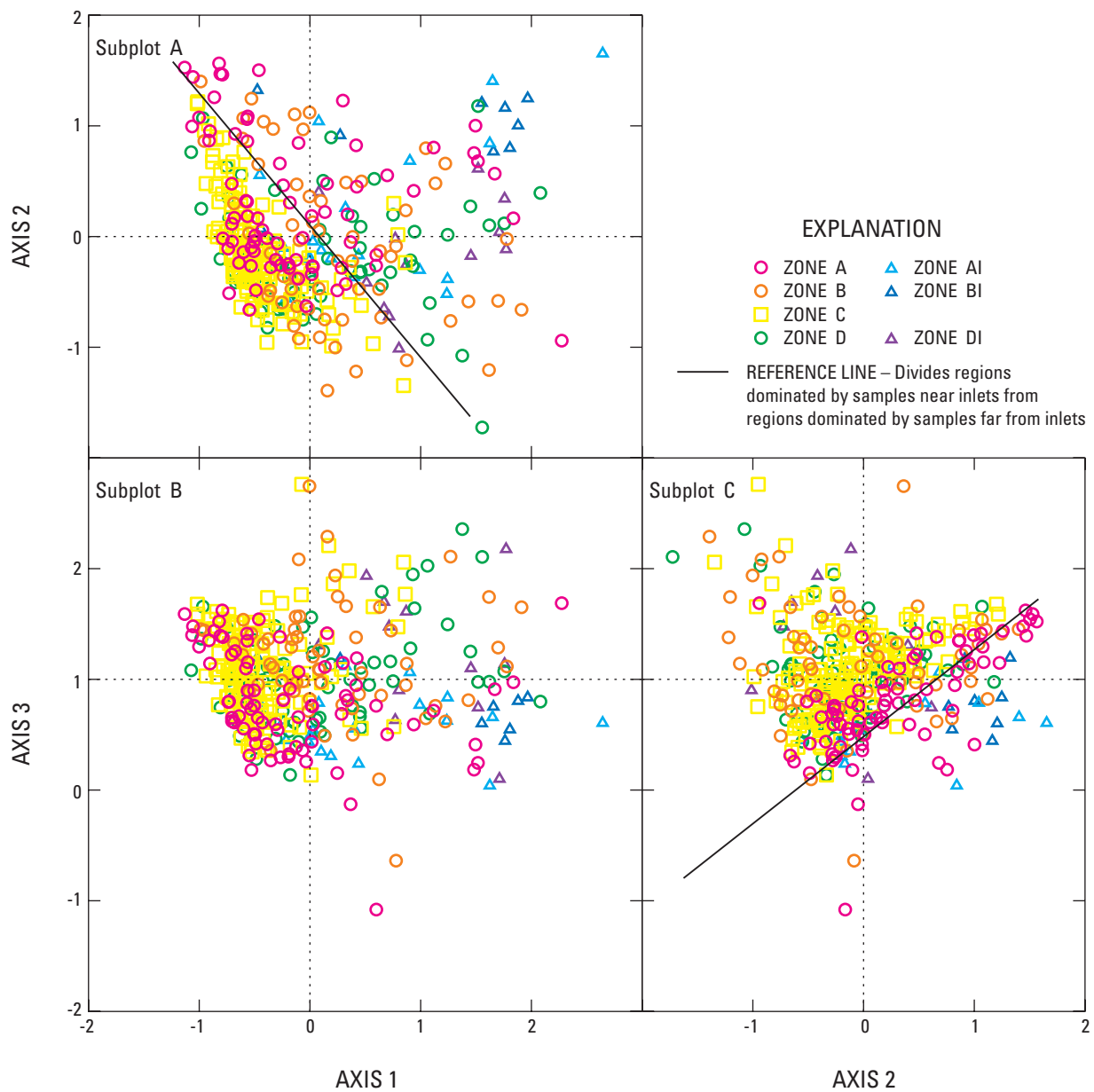


Figure 16. Ordination plots of trawl samples color coded by zone.

Underlying Patterns of Spatiotemporal Variation

The range of months, peak months, and zones of minimum and maximum occurrence for taxa selected based on ordination influence and general interest are presented in table 3, along with an indication of whether a particular taxon was predominantly present in a particular gear type or was present in roughly equal numbers in both gear types. A summary of taxa included in table 3 that showed a clear gradient in abundance between inlets and Zone C is presented in table 4.

The number of taxa collected predominantly in seine samples ("seine species") that showed an abundance gradient toward Zone C was similar to the number that showed an abundance gradient toward inlets; however, the number of "trawl species" disproportionately collected in Zone C was 3-4 times greater than those disproportionately collected near inlets (table 4). The evenness of "seine species" between Zone C and inlets results in ordinations with dominant temporal variation for seine samples. The concentration of "trawl species" collected in Zone C, results in ordinations with dominant spatial variation for trawl samples. These patterns suggest that shoreline habitats sampled by seines are more important for species that vary seasonally than are channel habitats sampled by trawls.

Comparison of Results with Previous Studies

The importance of residents and seasonal migrants in the characterization of upestry areas, and of marine strays in the characterization of inlets, are the findings of this study of the NCB that generally are similar to results found elsewhere (Bozeman and Dean, 1980; Cowan and Birdsong, 1985; Minello, 1999; Szedlmayer and Able, 1996; Tremain and Adams, 1995). Within the NCB, results of the current study are similar to results of Paperno and others (2001), in Volusia County, in the southern part of the NCB and extend these results to the rest of the NCB. Similarities and differences between the results of the "Volusia study" and the current study are discussed in this section. Similarities between the two studies are a result of sampling near Ponce de Leon Inlet and Tomoka River Basin in both studies, and are indicative of similar habitats sampled. Major differences primarily result from the absence of seagrass in the NCB and the presence of seagrass in Mosquito Lagoon (ML), to the south.

The Volusia study sampled three discontinuous regions, including areas further up the Tomoka River than were logistically feasible for the present study. Thus, the Volusia study's Tomoka River (TR) sampling stations were in fresher water than the current study, and they collected a greater number of freshwater species. Zone C in the current study most closely corresponds to the Volusia study TR stations, but includes an area that is 10 times as large. Similarly, because some of the Volusia study's Ponce Inlet (PI) stations were more than 1 nmi

from the landward mouth of the inlet, some of these stations correspond to Zone DI in the current study and some correspond to Zone D. Despite these differences in location and scale, there are many similarities as well as some instructive differences in results between the two studies.

For simplicity and clarity in the discussion that follows, the three areas sampled by the Volusia study are referred to by the two-letter abbreviations, TR, PI, and ML, used in Paperno and others (2001); regions sampled in the current study are referenced by zone.

Seines

Seine samples near inlets are at both extremes of ordination axes 1 and 2 in both studies, and there are many similarities among species that distinguish upestry areas from inlet areas. *Harengula jaguana* and *L. xanthurus* are at opposite extremes of axis 1, although the signs are reversed, and *M. undulatus* and penaeids are both in the center of axis 1. *Harengula jaguana* and *L. xanthurus* are inlet species with peak abundances in October and February, respectively, and *M. undulatus* is an upestry species with peak abundance in December. Ignoring Mosquito Lagoon (ML) samples, the Volusia study seine ordination places TR samples at the vertex of a triangle, with PI samples distributed along the opposite side; this is very similar to current study results shown on subplot C in figure 13, suggesting the influence of spatial variation.

The influence of seagrass is notably absent in the current study. ML samples occupy a vertex in the Volusia study seine ordination, corresponding to *L. parva*, a species common to seagrass habitats. *Lucania parva* was not identified in the current study and was rarely collected in TR and PI samples, despite one additional year of sampling. Seagrass in Mosquito Lagoon may have provided enough habitat variation for spatial factors to dominate seasonal variation in the Volusia study.

Among other species that characterized ML samples in the Volusia study, the NCB had higher densities of *Menidia spp.* (silversides) in Zone C and slightly lower densities in Zone A, compared with other NCB zones, with many more *Menidia menidia* in Zone AI than any other zone (appendix table 1-7). *Menidia menidia* is known to be a coastal species, whereas the other two likely species are more common in freshwater or brackish water (Robbins and Ray, 1986). In the NCB, fewer *L. rhomboides* were collected near inlets than in the surrounding major zones; the most were collected in Zone D, and the second most in Zone C. Consistent with these patterns, the fewest *L. rhomboides* and *Menidia spp.* were collected in PI, and although these species were important in the characterization of ML seine samples, they were unimportant in the NCB ordinations.

Of the species that characterize inlets, *H. jaguana* defines a vertex in the Volusia study ordination corresponding to PI samples. A similar pattern was found in the NCB study, but in this case, *H. jaguana* was joined by *O. oglinum* (Atlantic thread herring) and *A. hepsetus* (subplot C in figure 12). These

Table 3. Monthly occurrence, peak months, and zones of maximum and minimum occurrence for taxa collected in sufficient abundance for a zonal gradient to be apparent along with an indication of gear predominance.

[Class indicates zone of maximum abundance used in the construction of table 4; lower case letter used where multimodal]

Gear	Species	Months present	Modal months	Month number	Zone max	Zone min	Class
Seines	<i>Mugil curema</i>	All	Jan, Jul	1	D	BI,DI	
Seines	<i>Mugil cephalus</i>	All	Feb	2	AI	BI	
Seines	<i>Poecilia latipinna</i>	All but Apr	Feb	2	B/C/D	BI, DI	
Seines	<i>Gambusia holbrooki</i>	All but Jul	Feb	2	C,D	Inlets	c
Seines	<i>Leiostomus xanthurus</i>	>1000 Jan-Jun	Feb	2	Inlets	C,A	I
Seines	<i>Paralichthys albigutta</i>	Feb-Aug	Feb-Mar	2	Inlets	C	I
Seines	<i>Abudefduf saxatilis</i>	May, Nov	May	5	Inlets		I
Seines	<i>Lagodon rhomboides</i>	All	Feb-May	2	C,D	Inlets	c
Seines	<i>Anchoa hepsetus</i>	Apr-Sep	May	5	Inlets	C	I
Seines	<i>Opisthonema oglinum</i>	May- Oct	Jun-Aug	6	Inlets, A	C	I
Seines	<i>Sardinella aurita</i>	May-Sep	Jun, Aug	6	Inlets, A	C	i
Seines	<i>Trachinotus spp.</i>	May-Nov	Jun, Sep-Nov	6	Inlets	C	I
Seines	<i>Fundulus spp.</i>	All	Jul	7	North	South	
Seines	<i>Membras martinica</i>	Apr-Oct	Jul	7	C		C
Seines	<i>Cynoscion nebulosus</i>	Jun- Oct	Jul	7	C	Inlets	C
Seines	<i>Eucinostomus spp.</i>	>1000 Jun-Dec	Oct	10	Widespread		
Seines	<i>Diapterus auratus</i>	>100 Sep-Nov	Sep-Oct	9	C	Inlets	C
Seines	<i>Harengula jaguana</i>	May- Oct	Oct	10	Inlets	C	I
Seines	<i>Sciaenops ocellatus</i>	Oct-Dec	Oct	10	C	Inlets	C
Seines	<i>Lutjanus griseus</i>	>10 Jun-Dec	Oct	10		Inlets	
Seines	<i>Microgobius gulosus</i>	All	Sep-Oct	9	C	Inlets	C
Seines	<i>Anchoa mitchilli</i>	All	Oct	10	D	Inlets	c
Both	<i>Paralichthys lethostigma</i>	All but Nov	Mar	3	Widespread		
Both	<i>Farfantepenaeus spp.</i>	>500 Mar-Nov	May	5	C	Inlets	C
Both	<i>Bairdiella chrysoura</i>	All	May	5	A,C	Inlets	C
Both	<i>Orthopristis chrysoptera</i>	Apr-Aug	May-Jun	5	A, C, D	~Inlets	C
Both	<i>Citharichthys spilopterus</i>	All	Jun	6	A,C, D	Inlets	c
Both	<i>Synodus foetens</i>	Apr-Dec	Jun	6	Inlets	C	I
Both	<i>Litopenaeus setiferus</i>	>1000 Jun-Oct	Sep	9		Inlets	
Both	<i>Lutjanus synagris</i>	Jun- Dec	Oct	10	Inlets	BI/C	I
Trawls	<i>Chilomycterus schoepfi</i>	All	Jan	1	B,C,D	Inlets	c
Trawls	<i>Dasyatis sabina</i>	All	Jan	1	A,C,D	Inlets	c
Trawls	<i>Limulus polyphemus</i>	All but Jun, Aug	Feb	2		Inlets, C	
Trawls	<i>Callinectes sapidus</i>	All	Mar	3	C	Inlets	C
Trawls	<i>Centropomus striata</i>	Mar-Dec	Mar	3	North	South	
Trawls	<i>Prionotus tribulus</i>	All	Apr	4	Widespread		
Trawls	<i>Monacanthus hispidus</i>	All but Feb	May	5	Inlets	C, D	I
Trawls	<i>Opsanus tau</i>	All	May	5	C	Inlets	C
Trawls	<i>Ogcocephalus radiatus</i>	Most	May-Jun	5	A, AI, B	BI, C, D, DI	
Trawls	<i>Achirus lineatus</i>	All	May, Aug-Sep	5	C	Inlets	C
Trawls	<i>Gymnura micrura</i>	All but Jan	Jun	6	Inlets	C	I

Table 3. Monthly occurrence, peak months, and zones of maximum and minimum occurrence for taxa collected in sufficient abundance for a zonal gradient to be apparent along with an indication of gear predominance. —Continued

[Class indicates zone of maximum abundance used in the construction of table 4; lower case letter used where multimodal]

Gear	Species	Months present	Modal months	Month number	Zone max	Zone min	Class
Trawls	<i>Prionotus scitulus</i>	All	Jun	6	Inlets	C	I
Trawls	<i>Archosargus probatocephalus</i>	All	Aug	8	B,D	Inlets	
Trawls	<i>Bagre marinus</i>	Jun- Oct	Aug	8	C	Inlets (absent)	C
Trawls	<i>Gobionellus oceanicus</i>	All but Jul	Aug	8	C,D	Inlets	c
Trawls	<i>Menticirrhus americanus</i>	All	Aug	8		C	
Trawls	<i>Stellifer lanceolatus</i>	All	Aug-Sept	8	A/C	Inlets	c
Trawls	<i>Symphurus plagiatus</i>	All	Sep	9	C	Inlets	C
Trawls	<i>Trinectes maculatus</i>	All but Jan	Jul, Sep	7	A, C	Inlets	c
Trawls	<i>Arius felis</i>	All	Sep	9	C	Inlets	C
Trawls	<i>Chaetodipterus faber</i>	All but Jan	Sep	9	B	Inlets	
Trawls	<i>Chloroscombrus chrysurus</i>	May-Dec	Sep	9	A,B,D	Inlets, C	
Trawls	<i>Cynoscion regalis</i>	All	Sep	9	A,C	Inlets	c
Trawls	<i>Etropus crossotus</i>	All	Oct	10	A, AI, D	BI, C	
Trawls	<i>Micropogonias undulatus</i>	>1000 Oct-May	Dec	12	C, D	Inlets	C

Table 4. Summary of taxa having a clear abundance gradient between inlets and Zone C tabulated based on predominance in seines, trawls, or both gear types.

Month	Zone C			Inlets		
	Trawls	Both	Seines	Trawls	Both	Seines
1	2					
2			2	2		2
3	1					
4						
5	2	3				2
6		1			1	3
7	1		2	2		
8	3					
9	3		2	2		
10			2	2	1	1
11						
12	1					
Totals	13	4	8	8	2	8
Seines			12			10
Trawls	17			12		

fishes are at a minimum on axis 1 and a maximum on axis 2 in the NCB ordination of seines (fig. 12), and are associated with euhaline habitats (Richards and others, 1974; Hoes and Moore, 1977). *Sardinella aurita* occupies a similar position in the ordination but was not plotted due to its low weight. Unlike the Volusia study, in this study *Gobionellus boleosoma* (darter goby) does not seem to contribute to the discrimination of zones, perhaps because of inconsistent results. As with the Volusia study, relatively few *G. boleosoma* were collected in Zone C compared to Ponce Inlet (DI) and St. Augustine Inlet (AI). However, the fewest were collected at the Matanzas Inlet (MI).

The various *Eucinostomus* taxa have low axis 3 scores, plot near each other in the different NCB ordination plots (fig. 12), and could probably be combined without loss of information; as was done in the Volusia study. In both the current study and the Volusia study, densities were greater, particularly for small juveniles, at Ponce Inlet (Zone DI) than in Zones D and C. The pattern is reversed in other zones, however, with generally lower densities at inlets AI and BI than in Zones A and B. These patterns are reflected on subplot C in both figures 12 and 13.

In the Volusia study, *L. xanthurus* and *Brevoortia* spp. distinguished the PI and TR samples from ML samples. In the current study, the fewest *Brevoortia* spp. were collected in Zone C (the opposite was true in the Volusia study), and in an inconsistent pattern in other zones. The Volusia study collected equal numbers of *Anchoa* spp. in TL and PI samples and, in general, anchovies were responsible for the overlap of samples from different regions. In the current study, the most *A. hepsetus* were collected in Zone DI (Ponce Inlet) and the fewest in Zone C, with roughly equal numbers of *A. mitchilli* collected in the inlet (Zone CI) and Zone C samples. In general, however, there were fewer of both at the inlets; the most *A. mitchilli* were collected in Zone D. *Anchoa* spp. are therefore ubiquitous, but *A. hepsetus* may inhabit more saline waters than *A. mitchilli*, and these differences seem to be reflected in ordinations for the current study. Concerning life history strategy, *A. hepsetus* is listed as a marine species and *A. mitchilli* is listed as a nursery species by Ayvazian and others (1992). In terms of the degree of estuarine dependence, Able (2005) lists *A. hepsetus* as a facultative dependent with suspected geographic variability and *A. mitchilli* as a facultative dependent with suspected annual variability. Both of those views are consistent with results from the current study.

Trawls

Ordination of the Volusia study trawl data distinguished the TR samples from samples in the other two areas, but did not distinguish between PI and ML samples. TR samples were distinguished by high abundance of *S. lanceolatus*, *M. undulatus*, *C. sapidus*, *Penaeidae*, *Arius felis*, and *Gobiosoma bosc*. *Stellifer lanceolatus* and *G. bosc* had extremely high influence on the ordination results. The only difference between these

results and those from the current study is that *G. bosc* had no influence in the trawl ordination, although it is associated with Zone C among the seine samples.

Of the taxa that distinguished PI and ML samples from TR samples, *Orthopristis chrysoptera* (pigfish) and *Lagodon rhomboides* were collected in greater numbers in Zone C than near inlets in the current study and in greater numbers in ML and TR samples than PI samples in the Volusia study. *Etropus crossotus* (fringed flounder) and *Callinectes similis* (lesser blue crab) were collected in greater numbers in PI than TR, and in inlet samples than in Zone C samples. However, *Eucinostomus* spp. were collected in greater numbers in PI than in TR samples and in greater numbers in Zone DI than in Zone C samples, although the fewest were collected at the other inlets. *Menticirrhus americanus* was much more abundant in PI than TR samples, and was collected in the lowest density in Zone C and roughly equal densities elsewhere. The only major difference between the two studies among fish distinguishing PI and ML samples from TR samples is that *L. xanthurus* was collected in roughly equal numbers in the PI and TR samples, but in the current study this species had greater density at every inlet compared with other zones, and had the lowest density in Zones A and C.

Lutjanus griseus (gray snapper), a marine stray near the northern extent of its range in the Middle Atlantic Bight (Able, 2005), was generally collected in lower density near inlets and higher density up estuary in the NCB, a pattern more typical of an oligohaline nursery species. Conversely, *Lutjanus synagris* (lane snapper), which ranges only as far north as North Carolina (Robins and Ray, 1986), was found in highest density near inlets, a pattern typical of marine strays. These patterns represent variations in estuarine dependence across geographic ranges.

Allen and Baltz (1997) reported differential distribution of flatfish species along a salinity gradient in Barataria Bay. Among the most abundant flatfish, they found *Symphurus plagiusa* (blackcheeked tonguefish) concentrated in low salinity areas, *E. crossotus* (fringed flounder) in high salinity areas, and *Citharichthys spilopterus* (bay whiff) in between. Abundance patterns found in the NCB are consistent with these results.

Drum

Spot are among the drum species generally recognized to use oligohaline waters as nursery habitat. However, although spot were collected in abundance in all areas, higher densities were found near inlets than the surrounding areas, and lower densities were found away from inlets (Zone C) than in any area except Zone A, which includes the headwaters of the Tolomato River. Roughly equal numbers of spot were collected at the Volusia TR and PI stations. An increasing gradient in spot density from upper to lower sampling stations was observed in seine hauls at the mouths of tidal creeks longitudinally distributed along the Ogeechee River, Georgia,

and was explained as the influence of freshwater flushing and the movement of spot into deeper water as they mature (Rogers and others, 1984). Chao and Musick (1977) described the distribution of spot as ubiquitous and found evidence that they move into channel areas as they grow.

Although spot were collected in seines in this survey, eleven times as many were collected in trawls. Freshwater flushing in the Tomoka River and other areas of Zone C is unlikely to have affected results in the current study. Because younger fish are collected in greater numbers than older fish due to mortality and net avoidance, the observed distribution indicates either that spot were collected in the current study while they were traveling up estuary or that they remain widely distributed throughout the estuary.

Chao and Musick (1977) also found that during some months, spot were concentrated in the lower York River estuary of Virginia, whereas Atlantic croaker were concentrated in the upper estuary. Previous studies have suggested that the estuarine nursery "fills up backwards" (Rogers and others, 1984; Weinstein and Brooks, 1983; Chao and Musick, 1977), with respect to individual species because oligohaline areas are populated first. Atlantic croaker abundance peaks several months prior to spot; croaker are concentrated in the upper estuary when spot arrive, and therefore, the estuary may also fill up backwards with respect to different species. The contrasting distribution patterns between Atlantic croaker and spot are consistent with the concepts of both competitive exclusion and trophic guilds. Because spot reach maximum abundance in February, some consider them to be the first to arrive in the estuary; however, the reverse may be more accurate—they may arrive last.

M. americanus appears to have a similar distribution to spot, compared with drums found in greatest density in Zone C. The other two *Menticirrhus* spp. (*M. littoralis* and *M. saxatilis*) were collected in greater density in inlets. *Menticirrhus* spp. may represent variations in estuarine dependence within a genus.

Marine Strays

Inlets are characterized by a high number of species in low abundance that are considered marine strays (Lenanton and Potter, 1987; Able, 2005; Able and Fahay, 1998). Although their occurrence in the estuary may lack significance for their populations, these strays do seem to have significance in terms of fish habitat in that they characterize the inlet fish assemblage. The point that the use of a habitat may not be significant to the population of a species using it, but may still be significant to the habitat being used has been made by others. A single rare species may contain little information, but if rare species are nonrandomly distributed, then there is useful information contained in the aggregate. Wantiez and others (1996) found spatial factors explained major variations in trawl data and kept rare species citing them as useful indicators of brief environmental perturbations. Downweighting rare species

and only deleting outliers seems a reasonable compromise in the circumstance where rare species may be a distinguishing feature of a habitat.

Concluding Discussion

The NCB species distribution patterns observed in the current study are similar to those in nearby estuaries in terms of species composition and similar to estuaries elsewhere in terms of seasonal and spatial variation in habitat usage by various species (Bozeman and Dean, 1980; Cowan and Birdsong, 1985; Minello, 1999; Szedlmayer and Able, 1996; Tremain and Adams, 1995). Paperno and others (2001) were able to discriminate differences between discontinuous regions corresponding roughly to Zones C and DI in the current study. Our results show similar patterns as well as some indication of the continuous nature of these patterns, because this study included intervening areas as well as similar areas to the north. The three inlets in the study area serve as replicates to some degree, because comparisons can be made between them and surrounding areas.

Examination of individual samples within various zones suggests that northern (up estuary) Zone A samples are similar to Zone C samples in terms of species occurrence and abundance. Southern Zone A and most Zone B samples are similar to the inlet samples. The proximity of the two northern inlets may result in the Matanzas River, between these inlets, being distinguished by more marine species. The Palm Coast canals south of Matanzas Inlet are included in Zone B, but are close to the boundary with Zone C and the samples are more similar to those in Zone C. The samples in the northern portion of Zone D are similar to those in Zone C, and those in the southern portion are similar to Ponce Inlet samples.

Even though the study area has three inlets, the Matanzas River between the two northern inlets does not appear to function as an oligohaline nursery area. Consequently, the NCB appears to have only two mainstem oligohaline nursery areas: (1) the headwaters of the Tolomato River; and (2) the region surrounding the Tomoka River and Basin northward to Flagler Beach and the Palm Coast. Although some of the larger tidal creeks were sampled during this study, sampling was mostly limited to the mainstem Intracoastal Waterway. Miles of tidal creeks and flats were not sampled and may have even more combined importance as nursery habitat than the areas sampled. This is particularly true for creeks with fresh headwaters, such as those between the northern inlets; these creeks probably contain fish nursery areas.

Although the selection of sampling strata for this study ensured geographic coverage within a random sampling design, by necessity the strata boundaries were somewhat arbitrary with respect to the location of various habitats. In a study with geographically adjacent strata, there will be sampling units near the borders between strata that will be more similar to neighbors in adjacent strata than to members of the same

strata some distance away. However, the analysis of zones provides a convenient preliminary indication of information on the distribution of fish assemblages contained within the data collected by this study.

Because samples were collected across a continuous geographic continuum, analysis methods that take fuller advantage of the spatial distribution of samples would probably yield additional useful information. For example, although the current analysis suggests the existence of oligohaline nursery areas and an inlet fish assemblage, the spatial extent of those habitats has not been determined. The continuous spatial distribution of sampling stations may yield such determinations with a useful level of resolution. It would also be useful to know whether the fish assemblage exhibits continuous longitudinal variation or has relatively discrete zones that reflect habitat discontinuities (Rahel and Hubert, 1991). An assessment of the similarity of gradients related to the three inlets would also be informative.

Each of these questions could be addressed on a species-by-species basis, or for the fish assemblage as a whole. The correspondence analysis results summarize the fish assemblages and could be mapped as a method to determine the general spatial structure of fish habitats in the NCB. For example, a spatial gradient from oligohaline to euhaline habitats appears to exist along the line on subplot C in figure 14. Sample points could be projected onto that line, from which a chloropleth map could be constructed.

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Appendixes 1-4

Appendix 1. 2002-2004 Survey Data

Table 1–1. Summary of catch and effort data for Northern Coastal stratified-random sampling, 2002-2004.

[CPUE, catch per unit effort]

Zone	21.3-m river seine			6.1-m otter trawl			Totals		
	Animals	Hauls	CPUE	Animals	Hauls	CPUE	Animals	Hauls	CPUE
A	43,351	128	339	16,835	161	105	60,186	289	208
AI	31,306	64	489	4,471	66	68	35,777	130	275
B	27,731	133	209	13,044	168	78	40,775	301	135
BI	18,510	60	309	2,709	63	43	21,219	123	173
C	28,968	140	207	28,114	168	167	57,082	308	185
D	75,265	124	607	18,663	160	117	93,928	284	331
DI	47,139	61	773	2,340	67	35	49,479	128	387
Totals	272,270	710	383	86,176	853	101	358,446	1,563	229

Table 1–2. Catch statistics for 10 dominant species collected in 710 21.3-m river seine samples during Northern Coastal stratified-random sampling, 2002-2004.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean. Species are ranked in order of decreasing mean density]

Species	Number		% Occur	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Anchoa mitchilli</i>	93,465	34.3	49.2	193.59	51.36	706.95	32,258.82	33	0.03	15	71
<i>Leiostomus xanthurus</i>	53,204	19.5	44.4	110.20	24.28	587.15	13,700.00	23	0.06	7	152
<i>Eucinostomus</i> spp.	15,512	5.7	47.5	32.13	4.41	365.44	1,529.41	25	0.07	4	88
<i>Anchoa hepsetus</i>	13,113	4.8	24.9	27.16	5.33	523.36	2,110.29	37	0.08	18	93
<i>Menidia</i> spp.	12,763	4.7	55.5	26.44	3.33	335.26	1,463.24	46	0.14	10	102
<i>Mugil cephalus</i>	9,669	3.6	20.8	20.03	12.46	1,658.27	8,558.82	37	0.35	14	332
<i>Lagodon rhomboides</i>	8,222	3.0	49.4	17.03	2.78	434.87	1,280.88	37	0.23	9	178
<i>Micropogonias undulatus</i>	5,700	2.1	23.2	11.81	4.03	908.80	2,491.18	23	0.17	7	181
<i>Harengula jaguana</i>	5,317	2.0	8.3	11.01	5.06	1,224.91	2,955.88	61	0.22	19	124
<i>Eucinostomus harengulus</i>	5,233	1.9	48.2	10.84	1.18	291.06	429.41	55	0.16	26	115
Subtotal	222,198	81.6								4	332
Totals	272,270	100.0		566.33	59.88	281.12	32,344.12			1	530

Table 1–3. Catch statistics for Selected Species from 710 samples collected with a 21.3 x 1.83-m river seine during Northern Coastal stratified-random sampling, 2002-2004.

[%, percentage of the total catch represented by that taxon; % Occur, percentage of samples in which that species was collected; Stderr, Standard error; CV, coefficient of variation of the mean. Species are ranked in order of decreasing mean density]

Species	Number		% Occur	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Leiostomus xanthurus</i>	53,204	19.5	44.4	110.20	24.28	587.15	13,700.00	23	0.06	7	152
<i>Mugil cephalus</i>	9,669	3.6	20.8	20.03	12.46	1,658.27	8,558.82	37	0.35	14	332
<i>Micropogonias undulatus</i>	5,700	2.1	23.2	11.81	4.03	908.80	2,491.18	23	0.17	7	181
<i>Litopenaeus setiferus</i>	5,011	1.8	27.7	10.38	2.43	624.50	1,002.94	11	0.08	2	36
<i>Mugil curema</i>	2,680	1.0	25.9	5.55	1.97	945.01	1,298.53	86	0.71	15	244
<i>Farfantepenaeus duorarum</i>	1,411	0.5	23.4	2.92	0.53	480.84	197.06	9	0.09	3	21
<i>Farfantepenaeus aztecus</i>	706	0.3	10.6	1.46	0.30	539.20	107.35	13	0.13	3	32
<i>Callinectes sapidus</i>	664	0.2	29.2	1.38	0.17	322.14	72.06	29	1.17	4	161
<i>Trachinotus falcatus</i>	607	0.2	14.5	1.26	0.26	559.84	111.76	24	0.50	7	90
<i>Sciaenops ocellatus</i>	456	0.2	14.8	0.94	0.14	391.53	33.82	53	2.63	9	473
<i>Cynoscion regalis</i>	327	0.1	2.4	0.68	0.59	2,327.60	419.12	19	0.74	7	88
<i>Cynoscion nebulosus</i>	237	0.1	8.2	0.49	0.10	539.80	30.88	41	1.56	8	138
<i>Paralichthys albigutta</i>	231	0.1	11.5	0.48	0.10	548.49	48.53	48	2.36	9	203
<i>Trachinotus carolinus</i>	187	0.1	3.9	0.39	0.22	1,534.28	154.41	24	0.90	8	85
<i>Lutjanus griseus</i>	129	0.0	9.0	0.27	0.05	461.07	17.65	63	5.03	11	255
<i>Menticirrhus americanus</i>	70	0.0	5.1	0.14	0.03	542.86	8.82	49	2.57	18	120
<i>Lutjanus synagris</i>	63	0.0	2.3	0.13	0.07	1,329.97	42.65	47	3.17	19	110
<i>Archosargus probatocephalus</i>	55	0.0	4.1	0.11	0.03	622.26	10.29	165	13.80	16	355
<i>Pomatomus saltatrix</i>	33	0.0	2.1	0.07	0.03	1,158.22	19.12	42	2.25	21	88
<i>Paralichthys lethostigma</i>	33	0.0	3.7	0.07	0.01	568.30	4.41	177	23.75	22	403
<i>Centropomus undecimalis</i>	31	0.0	2.1	0.06	0.02	956.45	10.29	113	23.39	17	530
<i>Menticirrhus littoralis</i>	27	0.0	0.4	0.06	0.04	2,043.05	29.41	52	6.90	12	135
<i>Pogonias cromis</i>	20	0.0	1.3	0.04	0.02	1,232.33	11.76	106	14.48	54	350
<i>Elops saurus</i>	13	0.0	1.1	0.03	0.01	1,020.67	4.41	145	23.22	24	280
<i>Paralichthys squamilentus</i>	10	0.0	0.3	0.02	0.02	2,412.51	13.24	52	3.03	30	61
<i>Albula vulpes</i>	3	0.0	0.4	0.01	0.00	1,536.23	1.47	38	13.64	20	65
<i>Menticirrhus saxatilis</i>	3	0.0	0.4	0.01	0.00	1,536.23	1.47	58	4.63	50	66
<i>Paralichthys dentatus</i>	3	0.0	0.3	0.01	0.00	1,984.94	2.94	64	12.00	52	88
<i>Menippe</i> spp.	2	0.0	0.3	0.00	0.00	1,882.82	1.47	26	18.00	8	44
Totals	81,585	30.0	91.5	168.98	27.74	437.38	13,819.12			2	530

Table 1–4. Catch statistics for 10 dominant species collected in 853 bay 6.1-m otter trawl samples during Northern Coastal stratified-random sampling, 2002-2004.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean. Species are ranked in order of decreasing mean density]

Species	Number		% Occur	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Anchoa mitchilli</i>	20,641	24.0	38.2	3.26	0.48	432.06	189.96	42	0.07	13	148
<i>Micropogonias undulatus</i>	13,760	16.0	38.2	2.16	0.36	481.10	187.40	42	0.27	6	192
<i>Litopenaeus setiferus</i>	6,196	7.2	33.3	0.98	0.22	671.06	109.42	12	0.10	2	109
<i>Arius felis</i>	5,775	6.7	43.3	0.91	0.13	404.61	65.43	128	0.97	18	505
<i>Leiostomus xanthurus</i>	4,832	5.6	26.8	0.75	0.13	518.15	69.35	72	0.48	8	1,000
<i>Stellifer lanceolatus</i>	3,717	4.3	12.4	0.59	0.15	730.43	63.28	33	0.31	4	147
<i>Callinectes sapidus</i>	2,695	3.1	44.2	0.43	0.04	269.48	13.36	100	0.76	5	193
<i>Farfantepenaeus aztecus</i>	2,276	2.6	14.4	0.36	0.12	959.95	65.03	17	0.14	4	34
<i>Cynoscion regalis</i>	2,045	2.4	25.2	0.32	0.06	535.04	33.59	59	0.87	7	271
<i>Callinectes similis</i>	2,059	2.4	32.8	0.32	0.04	322.48	11.74	63	0.50	12	172
Subtotal	63,996	74.3								2	1,000
Totals	86,176	100.0		13.93	0.91	187.94	273.07			2	1,000

Table 1–5. Catch statistics for Selected Species collected in 707 bay 6.1-m otter trawl samples during Northern Coastal stratified-random sampling, 2002–2004.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean; --, not applicable. Species are ranked in order of decreasing mean density]

Species	Number		% Occur	DensityEstimate(animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Micropogonias undulatus</i>	13,760	38.2	38.2	2.16	0.36	481.10	187.40	42	0.27	6	192
<i>Litopenaeus setiferus</i>	6,196	33.3	33.3	0.98	0.22	671.06	109.42	12	0.10	2	109
<i>Leiostomus xanthurus</i>	4,832	26.8	26.8	0.75	0.13	518.15	69.35	72	0.44	8	211
<i>Callinectes sapidus</i>	2,695	44.2	44.2	0.43	0.04	269.48	13.36	100	0.76	5	193
<i>Farfantepenaeus aztecus</i>	2,276	14.4	14.4	0.36	0.12	959.95	65.03	17	0.14	4	34
<i>Cynoscion regalis</i>	2,045	25.2	25.2	0.32	0.06	535.04	33.59	59	0.87	7	271
<i>Farfantepenaeus duorarum</i>	837	18.5	18.5	0.13	0.02	409.98	7.42	13	0.17	4	31
<i>Menticirrhus americanus</i>	819	23.6	23.6	0.13	0.02	356.62	5.67	45	1.33	4	304
<i>Mugil cephalus</i>	464	1.4	1.4	0.07	0.07	2,665.09	57.07	38	2.16	20	272
<i>Menippe</i> spp.	163	9.6	9.6	0.03	0.00	442.75	1.62	44	2.51	5	166
<i>Mugil curema</i>	141	0.9	0.9	0.02	0.02	2,368.15	15.25	100	2.06	29	139
<i>Paralichthys albigutta</i>	140	11.3	11.3	0.02	0.00	346.69	1.08	174	4.40	25	340
<i>Archosargus probatocephalus</i>	109	5.6	5.6	0.02	0.00	693.49	2.43	226	7.94	70	429
<i>Lutjanus synagris</i>	82	3.6	3.6	0.01	0.01	1,290.82	4.45	72	3.72	19	234
<i>Sciaenops ocellatus</i>	76	2.5	2.5	0.01	0.00	1,063.68	2.56	39	2.66	10	118
<i>Lutjanus griseus</i>	74	4.0	4.0	0.01	0.00	712.57	1.75	128	7.22	12	254
<i>Cynoscion nebulosus</i>	63	0.1	4.5	0.01	0.00	568.77	0.67	109	7.19	10	235
<i>Paralichthys lethostigma</i>	30	0.0	2.8	0.00	0.00	638.36	0.40	198	16.50	26	338
<i>Trachinotus falcatus</i>	11	0.0	0.5	0.00	0.00	2,371.94	1.08	13	4.23	6	50
<i>Menticirrhus saxatilis</i>	10	0.0	0.7	0.00	0.00	1,428.14	0.54	78	11.07	23	117
<i>Epinephelus itajara</i>	4	0.0	0.5	0.00	0.00	1,457.73	0.13	327	72.81	125	455
<i>Elops saurus</i>	3	0.0	0.2	0.00	0.00	2,175.88	0.27	102	78.50	22	259
<i>Pogonias cromis</i>	3	0.0	0.2	0.00	0.00	2,175.88	0.27	118	10.93	105	140
<i>Trachinotus carolinus</i>	2	0.0	0.2	0.00	0.00	2,063.98	0.13	215	15.50	199	230
<i>Centropomus undecimalis</i>	1	0.0	0.1	0.00	0.00	2,920.62	0.13	128	--	128	128
<i>Pomatomus saltatrix</i>	1	0.0	0.1	0.00	0.00	2,920.62	0.13	53	--	53	53
<i>Menticirrhus littoralis</i>	1	0.0	0.1	0.00	0.00	2,920.62	0.13	138	--	138	138
<i>Paralichthys dentatus</i>	1	0.0	0.1	0.00	0.00	2,920.62	0.13	188	--	188	188
Totals	34,839	40.4	80.1	5.47	0.55	295.73	199.27			2	455

Table 1-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2002-2004.

[E, effort or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals E=1,563
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=78	E=127	E=132	E=126	E=143	E=137	E=137	E=130	E=142	E=137	E=139	E=135	
<i>Abudefduf saxatilis</i>	--	--	--	--	65	1	--	--	--	--	10	--	76
<i>Achirus lineatus</i>	7	11	79	37	192	45	58	152	224	54	19	12	890
<i>Albula vulpes</i>	--	1	--	--	2	--	--	--	--	--	--	--	3
<i>Aluterus heudeloti</i>	--	--	--	--	--	--	--	--	1	--	--	--	1
<i>Aluterus</i> spp.	--	--	--	--	--	1	--	--	--	--	--	--	1
<i>Ameiurus natalis</i>	--	--	1	--	--	--	--	--	--	--	--	--	1
<i>Anchoa hepsetus</i>	1	24	10	1,227	4,650	2,091	2,777	2,584	757	95	36	3	14,255
<i>Anchoa mitchilli</i>	1,326	1,275	2,518	7,979	5,137	8,014	10,467	10,580	16,138	38,452	11,597	623	114,106
<i>Anchoa</i> spp.	--	1	--	30	--	3	--	--	--	--	--	--	34
<i>Ancylopussetta quadrocellata</i>	--	--	2	2	8	2	4	--	--	--	--	--	18
<i>Archosargus probatocephalus</i>	11	2	3	6	15	15	16	39	26	17	10	4	164
<i>Arius felis</i>	701	173	106	376	242	419	728	677	903	664	591	234	5,814
<i>Astroscoptes y-graecum</i>	--	4	1	6	--	1	--	--	--	--	2	1	15
<i>Bagre marinus</i>	--	--	--	--	6	62	85	126	9	95	9	--	392
<i>Bairdiella chrysoura</i>	157	51	63	94	775	137	300	379	106	177	89	162	2,490
<i>Bathygobius soporator</i>	--	--	--	1	3	5	7	3	--	2	13	4	38
<i>Blenniidae</i> spp.	--	--	--	--	2	6	1	--	1	1	1	--	12
<i>Bothidae</i> spp.	--	1	1	--	--	--	--	2	--	--	--	--	4
<i>Brevoortia</i> spp.	22	88	88	340	287	1,499	35	20	22	54	53	3	2,511
<i>Brevoortia tyrannus</i>	--	--	--	--	--	--	--	--	--	--	1	--	1
<i>Callinectes ornatus</i>	--	--	--	--	--	--	--	--	--	--	1	5	6
<i>Callinectes sapidus</i>	126	286	484	345	254	243	375	357	260	245	252	132	3,359
<i>Callinectes similis</i>	5	54	233	448	937	755	582	192	204	192	60	52	3,714
<i>Callinectes</i> spp.	--	--	22	5	1	5	18	13	13	51	3	13	144
<i>Carangidae</i> spp.	--	--	--	1	4	5	2	1	--	--	--	--	13
<i>Caranx bartholomaei</i>	--	--	--	1	2	--	1	--	1	6	--	--	11
<i>Caranx hippos</i>	3	--	--	1	--	1	1	1	1	1	--	--	9
<i>Caranx latus</i>	--	--	--	--	--	1	--	--	1	--	--	--	2
<i>Caranx</i> spp.	--	--	1	--	--	1	--	--	--	--	--	--	2
<i>Carcharhinus brevipinna</i>	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Carcharhinus limbatus</i>	--	--	--	--	--	1	--	--	--	--	--	--	1
<i>Carcharhinus</i> spp.	--	--	--	--	1	--	--	--	--	--	--	--	1
<i>Centropomus undecimalis</i>	--	--	--	--	1	1	--	2	6	14	8	--	32
<i>Centropristis philadelphica</i>	--	--	1	1	1	1	1	2	4	3	1	--	15
<i>Centropristis striata</i>	--	--	15	3	7	6	5	4	7	4	5	2	58
<i>Chaetodipterus faber</i>	--	1	3	3	19	44	66	78	92	25	11	10	352
<i>Charybdis hellerii</i>	1	--	7	11	6	8	5	3	24	12	2	1	80

Table 1-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2002-2004.—Continued

[E, effort or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=78	E=127	E=132	E=126	E=143	E=137	E=137	E=130	E=142	E=137	E=139	E=135	
<i>Chasmodes bosquianus</i>	--	--	--	--	--	--	--	--	--	--	--	1	1
<i>Chasmodes saburrae</i>	--	--	--	--	--	--	--	--	--	--	--	1	1
<i>Chilomycterus schoepfi</i>	44	16	24	7	10	38	19	10	8	6	7	24	213
<i>Chloroscombrus chrysurus</i>	--	--	--	--	7	48	13	17	75	6	33	3	202
<i>Citharichthys macrops</i>	--	--	4	--	--	--	--	2	--	--	--	1	7
<i>Citharichthys spilopterus</i>	8	19	184	240	337	392	194	68	78	167	26	30	1,743
<i>Clupeidae</i> spp.	--	--	--	4	3,744	125	--	2	136	--	--	55	4,066
<i>Cynoscion nebulosus</i>	21	--	2	7	7	24	123	32	23	40	13	8	300
<i>Cynoscion regalis</i>	45	334	13	25	85	432	83	448	581	175	80	71	2,372
<i>Cynoscion</i> spp.	72	--	1	--	2	--	--	--	--	--	--	--	75
<i>Cyprinodon variegatus</i>	13	6	--	7	1	3	3	--	3	1	10	18	65
<i>Dasyatis sabina</i>	87	24	20	15	24	14	9	13	18	22	14	21	281
<i>Dasyatis say</i>	7	--	2	2	6	5	4	6	3	1	2	--	38
<i>Dasyatis</i> spp.	--	--	--	1	--	--	--	--	--	--	--	--	1
<i>Diapterus auratus</i>	3	2	1	4	18	5	39	24	148	155	117	92	608
<i>Diapterus plumieri</i>	--	--	--	--	--	--	--	1	--	--	--	--	1
<i>Diodon holocanthus</i>	--	--	--	--	1	--	--	--	--	--	--	--	1
<i>Diplectrum bivittatum</i>	--	--	--	--	--	1	--	--	--	--	--	--	1
<i>Diplectrum formosum</i>	--	--	--	--	--	--	--	--	--	1	--	--	1
<i>Diplectrum</i> spp.	--	--	--	--	--	--	--	--	--	2	--	--	2
<i>Diplodus argenteus</i>	--	--	--	--	--	--	--	--	--	9	--	--	9
<i>Diplodus holbrooki</i>	--	--	--	10	--	--	--	--	--	--	--	--	10
<i>Echeneis naucrates</i>	--	--	--	1	--	--	--	1	--	--	--	--	2
<i>Elops saurus</i>	--	1	--	1	4	--	2	2	3	3	--	--	16
<i>Epinephelus itajara</i>	--	--	--	--	--	1	--	--	1	--	1	1	4
<i>Etropus crossotus</i>	18	27	34	11	22	53	81	44	69	108	62	51	580
<i>Eucinostomus argenteus</i>	--	50	--	4	2	59	13	1	--	17	7	1	154
<i>Eucinostomus gula</i>	127	31	25	112	57	160	602	314	348	233	215	221	2,445
<i>Eucinostomus harengulus</i>	99	79	183	252	123	389	1,913	802	962	339	571	668	6,380
<i>Eucinostomus jonesi</i>	--	3	13	--	--	--	--	--	--	2	9	5	32
<i>Eucinostomus</i> spp.	125	329	249	93	394	2,135	1,520	1,286	1,690	4,802	2,733	1,605	16,961
<i>Euleptorhamphus velox</i>	--	--	--	--	--	--	--	--	--	1	--	--	1
<i>Farfantepenaeus aztecus</i>	1	21	83	869	1,513	258	30	20	9	11	145	22	2,982
<i>Farfantepenaeus duorarum</i>	4	29	124	429	215	139	109	270	86	419	375	49	2,248
<i>Farfantepenaeus</i> spp.	38	86	414	679	641	561	148	598	496	319	220	41	4,241
<i>Fundulus confluentus</i>	--	--	3	2	1	4	25	25	6	--	--	--	66
<i>Fundulus grandis</i>	--	13	--	204	--	--	133	8	182	--	7	1	548
<i>Fundulus heteroclitus</i>	117	79	41	23	42	120	1,649	6	305	21	21	119	2,543

Table 1-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2002-2004.—Continued

[E, effort or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=78	E=127	E=132	E=126	E=143	E=137	E=137	E=130	E=142	E=137	E=139	E=135	
<i>Fundulus majalis</i>	319	119	214	81	305	299	722	362	274	194	205	128	3,222
<i>Fundulus</i> spp.	--	--	--	1	7	--	697	178	231	--	--	--	1,114
<i>Gambusia holbrooki</i>	1	136	6	1	9	34	--	30	3	27	1	2	250
<i>Gobiesox strumosus</i>	--	--	--	1	3	2	2	--	--	--	--	--	8
<i>Gobiidae</i> spp.	--	18	42	10	36	208	407	28	18	260	29	15	1,071
<i>Gobioides broussoneti</i>	--	--	1	--	--	--	--	--	--	--	--	1	2
<i>Gobionellus boleosoma</i>	8	104	30	13	99	25	10	108	16	140	63	104	720
<i>Gobionellus oceanicus</i>	5	1	16	4	5	24	--	51	19	11	2	3	141
<i>Gobionellus shufeldti</i>	--	--	--	--	--	--	--	--	--	1	--	--	1
<i>Gobionellus smaragdus</i>	--	1	3	9	2	1	1	1	--	20	3	--	41
<i>Gobionellus</i> spp.	--	--	1	--	--	1	--	--	--	--	--	--	2
<i>Gobionellus stigmaticus</i>	1	--	--	--	2	--	--	--	--	--	--	--	3
<i>Gobiosoma bosc</i>	14	59	15	5	53	15	4	3	68	77	2	3	318
<i>Gobiosoma longipala</i>	--	--	--	--	--	2	--	1	--	--	--	--	3
<i>Gobiosoma robustum</i>	--	3	--	--	--	1	5	1	1	3	--	--	14
<i>Gobiosoma</i> spp.	--	--	2	--	--	--	--	--	--	--	--	--	2
<i>Gymnura micrura</i>	--	1	2	6	19	28	18	7	10	7	3	2	103
<i>Haemulidae</i> spp.	--	--	--	1	1	--	--	--	--	--	--	--	2
<i>Harengula jaguana</i>	2	--	--	22	303	97	196	490	1,288	2,911	11	1	5,321
<i>Hippocampus erectus</i>	5	1	3	1	2	1	1	--	--	1	1	4	20
<i>Hypleurochilus bermudensis</i>	1	--	1	--	--	--	--	--	--	--	--	--	2
<i>Hyporhamphus meeki</i>	--	--	2	--	--	--	--	--	--	--	--	--	2
<i>Hypsoblennius hentzi</i>	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Hypsoblennius ionthas</i>	1	--	--	--	--	--	--	--	--	--	--	--	1
<i>Ictalurus punctatus</i>	--	--	--	--	--	--	5	--	--	--	--	--	5
<i>Labrisomus nuchipinnis</i>	--	--	--	--	--	--	--	--	--	3	--	--	3
<i>Lactophrys</i> spp.	--	--	--	--	--	--	--	1	1	--	1	--	3
<i>Lactophrys trigonus</i>	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Lagodon rhomboides</i>	936	1,853	1,793	1,319	1,335	749	492	220	203	156	97	398	9,551
<i>Larimus fasciatus</i>	--	--	--	--	--	--	--	--	1	59	--	--	60
<i>Leiostomus xanthurus</i>	1,045	23,064	20,455	8,040	2,338	1,672	722	241	142	121	96	100	58,036
<i>Lepisosteus osseus</i>	--	--	--	1	--	--	--	--	--	--	--	--	1
<i>Leptocephalus</i> spp.	3	1	70	15	1	--	--	--	--	6	6	1	103
<i>Limulus polyphemus</i>	1	15	5	3	2	--	1	--	6	9	2	7	51
<i>Litopenaeus setiferus</i>	241	135	147	47	250	1,189	1,977	1,535	2,992	1,447	769	478	11,207
<i>Lobotes surinamensis</i>	--	--	--	--	--	1	--	--	--	--	--	--	1
<i>Lutjanidae</i> spp.	--	--	--	--	--	--	--	2	--	--	--	1	3
<i>Lutjanus griseus</i>	7	4	1	5	5	11	9	39	24	43	34	21	203
<i>Lutjanus</i> spp.	--	--	--	--	--	--	1	--	4	--	--	--	5

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Table 1-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2002-2004.—Continued

[E, effort or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=78	E=127	E=132	E=126	E=143	E=137	E=137	E=130	E=142	E=137	E=139	E=135	
<i>Lutjanus synagris</i>	--	1	--	--	--	12	36	14	13	53	8	8	145
<i>Membras martinica</i>	--	--	7	65	79	36	830	37	7	124	1	1	1,187
<i>Menidia menidia</i>	91	39	138	1	19	34	1,191	45	37	17	6	20	1,638
<i>Menidia</i> spp.	722	1,041	583	623	1,983	2,224	1,311	517	1,297	1,033	673	785	12,792
<i>Menippe</i> spp.	13	23	27	9	11	17	8	26	7	7	5	12	165
<i>Menticirrhus americanus</i>	7	27	4	10	43	69	80	286	207	92	44	20	889
<i>Menticirrhus littoralis</i>	--	--	1	--	--	2	--	--	--	5	--	20	28
<i>Menticirrhus saxatilis</i>	7	--	--	1	4	1	--	--	--	--	--	--	13
<i>Menticirrhus</i> spp.	--	--	--	--	--	--	--	4	--	--	--	--	4
<i>Microgobius gulosus</i>	6	16	3	1	--	18	35	25	56	62	1	--	223
<i>Microgobius</i> spp.	--	--	7	--	--	--	1	2	2	--	--	--	12
<i>Microgobius thalassinus</i>	--	1	--	--	2	2	3	4	13	--	--	--	25
<i>Microphis brachyurus</i>	--	--	--	1	--	--	--	--	--	--	--	--	1
<i>Micropogonias undulatus</i>	1,332	1,016	2,872	2,773	1,114	484	368	144	68	1,306	2,103	5,880	19,460
<i>Monacanthus hispidus</i>	1	--	3	10	102	37	7	8	4	6	4	5	187
<i>Mugil cephalus</i>	1,449	6,478	608	44	26	32	46	8	37	40	17	1,348	10,133
<i>Mugil curema</i>	1,108	33	16	17	290	268	497	160	87	68	24	253	2,821
<i>Mugil</i> spp.	161	702	121	15	309	25	33	6	31	48	41	356	1,848
<i>Myrophis punctatus</i>	--	1	--	--	--	--	--	--	--	--	--	--	1
<i>Ogcocephalus radiatus</i>	1	1	1	--	5	5	2	1	--	1	--	3	20
<i>Oligoplites saurus</i>	--	--	--	3	7	35	45	20	39	26	1	--	176
<i>Ophichthus gomesi</i>	--	1	--	--	--	--	--	--	--	--	--	--	1
<i>Ophidion</i> spp.	--	--	1	--	--	--	--	--	--	--	--	--	1
<i>Opisthonema oglinum</i>	--	--	--	--	93	1,323	492	1,459	79	33	--	1	3,480
<i>Opsanus tau</i>	13	18	32	11	86	22	20	25	25	7	11	15	285
<i>Orthopristis chrysoptera</i>	2	19	5	46	165	160	103	73	16	15	3	14	621
<i>Paralichthys albigutta</i>	11	71	74	47	63	22	25	25	9	10	10	4	371
<i>Paralichthys dentatus</i>	--	--	1	3	--	--	--	--	--	--	--	--	4
<i>Paralichthys lethostigma</i>	1	4	13	8	4	9	6	6	5	4	--	3	63
<i>Paralichthys</i> spp.	--	1	1	--	--	--	1	--	--	--	--	--	3
<i>Paralichthys squamilentus</i>	--	--	10	--	--	--	--	--	--	--	--	--	10
<i>Penaeidae</i> spp.	--	1	1	--	145	81	84	--	--	10	--	6	328
<i>Peprilus alepidotus</i>	--	--	26	3	15	13	--	1	--	--	--	--	58
<i>Peprilus burti</i>	--	1	1	--	--	--	--	--	--	--	--	--	2
<i>Peprilus triacanthus</i>	2	--	1	2	--	--	--	--	--	--	--	--	5
<i>Poecilia latipinna</i>	2	109	6	--	11	14	25	26	5	12	19	39	268
<i>Pogonias cromis</i>	--	--	--	--	--	7	12	--	--	--	1	3	23
<i>Pomatomus saltatrix</i>	--	--	--	2	11	3	--	--	--	17	1	--	34
<i>Portunus gibbesi</i>	--	--	1	--	--	4	9	2	--	3	1	2	22

Table 1-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2002-2004.—Continued

[E, effort or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=78	E=127	E=132	E=126	E=143	E=137	E=137	E=130	E=142	E=137	E=139	E=135	
<i>Portunus</i> spp.	--	3	--	2	139	194	36	54	2	3	3	2	438
<i>Prionotus carolinus</i>	--	1	--	--	--	--	--	--	--	--	--	--	1
<i>Prionotus evolans</i>	--	1	--	--	--	--	--	--	--	1	--	--	2
<i>Prionotus rubio</i>	1	1	1	--	--	1	--	--	--	--	--	--	4
<i>Prionotus scitulus</i>	15	8	13	6	44	149	57	38	35	17	8	11	401
<i>Prionotus</i> spp.	--	1	9	3	12	--	--	--	--	1	--	--	26
<i>Prionotus tribulus</i>	4	9	33	46	20	15	14	11	4	19	12	23	210
<i>Pristigenys alta</i>	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Rhinobatos lentiginosus</i>	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Rhinoptera bonasus</i>	--	--	3	--	--	--	--	--	--	--	--	--	3
<i>Sardinella aurita</i>	--	--	--	--	57	356	--	416	56	9	--	--	894
<i>Sciaenidae</i> spp.	10	14	1	6	4	1	1	539	902	124	9	2	1,613
<i>Sciaenops ocellatus</i>	32	39	27	26	7	9	3	--	29	154	138	68	532
<i>Scomber</i> spp.	--	--	--	--	--	--	--	1	--	--	--	--	1
<i>Scombridae</i> spp.	--	--	--	--	1	--	--	--	2	1	--	--	4
<i>Scorpaena brasiliensis</i>	--	--	1	1	1	1	--	1	--	1	1	1	8
<i>Scorpaena plumieri</i>	--	--	--	--	--	--	--	1	--	--	--	--	1
<i>Scorpaenidae</i> spp.	--	--	--	--	--	--	--	1	--	--	--	--	1
<i>Selar crumenophthalmus</i>	--	--	--	--	--	--	--	1	--	--	--	--	1
<i>Selene setapinnis</i>	--	--	--	--	--	--	--	2	--	--	8	--	10
<i>Selene vomer</i>	--	--	--	2	3	23	6	6	8	7	4	10	69
<i>Serranidae</i> spp.	--	--	--	2	--	--	--	--	1	--	--	--	3
<i>Sphoeroides maculatus</i>	--	1	--	1	4	6	2	6	--	--	5	1	26
<i>Sphoeroides nephelus</i>	24	16	24	15	16	37	6	13	8	17	16	18	210
<i>Sphoeroides</i> spp.	--	--	--	1	1	2	3	4	--	--	--	--	11
<i>Sphoeroides testudineus</i>	--	--	1	--	2	--	--	--	--	--	1	2	6
<i>Sphyraena barracuda</i>	--	--	--	2	3	5	3	1	2	20	2	--	38
<i>Sphyraena guachancho</i>	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Sphyrna tiburo</i>	--	--	--	2	1	--	--	--	--	--	--	--	3
<i>Stellifer lanceolatus</i>	9	10	17	9	16	25	5	1,637	1,327	485	109	74	3,723
<i>Stomolophus meleagris</i>	--	2	28	28	19	--	--	--	118	2	--	--	197
<i>Strongylura marina</i>	--	--	--	14	21	8	3	--	2	1	1	1	51
<i>Strongylura notata</i>	--	--	--	1	--	--	--	3	2	1	7	--	14
<i>Strongylura</i> spp.	--	1	--	3	1	1	1	5	2	1	--	--	15
<i>Symphurus plagiusa</i>	4	14	79	22	27	66	135	172	287	130	32	16	984
<i>Syngnathus floridae</i>	--	--	--	--	1	--	--	--	--	--	--	--	1
<i>Syngnathus fuscus</i>	1	1	1	--	1	--	--	--	1	--	1	--	6
<i>Syngnathus louisianae</i>	--	4	6	2	7	1	4	6	3	18	10	1	62
<i>Syngnathus scovelli</i>	--	1	1	1	1	2	2	--	--	--	--	--	8
<i>Syngnathus</i> spp.	--	5	1	7	5	6	9	8	1	3	3	2	50

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Table 1-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2002-2004.—Continued

[E, effort or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=78	E=127	E=132	E=126	E=143	E=137	E=137	E=130	E=142	E=137	E=139	E=135	
<i>Synodus foetens</i>	10	15	15	39	108	195	78	45	60	67	14	36	682
<i>Trachinotus carolinus</i>	--	--	--	10	25	129	3	6	3	6	5	2	189
<i>Trachinotus falcatus</i>	--	--	--	9	78	103	18	39	133	102	126	10	618
<i>Trachurus lathami</i>	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Trichiurus lepturus</i>	--	--	--	6	2	3	1	--	--	2	--	3	17
<i>Trinectes maculatus</i>	--	10	28	15	21	34	78	41	82	53	9	50	421
Unidentified species	2	1	7	33	2	3	3	2	2	5	9	1	70
<i>Urophycis floridana</i>	9	22	15	1	--	--	--	--	--	--	--	--	47
Totals	10,829	38,420	32,742	27,514	29,887	29,033	33,264	28,496	34,447	56,769	22,274	14,771	358,446

Table 1-7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2002-2004.

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
			E=289	E=130	E=301	E=123	E=308	E=284	E=128	
	E=710	E=853								E=1,563
<i>Abudefduf saxatilis</i>	76	--	--	--	--	66	--	--	10	76
<i>Achirus lineatus</i>	74	816	206	21	105	28	405	108	17	890
<i>Albula vulpes</i>	3	--	--	--	--	--	1	1	1	3
<i>Aluterus heudeloti</i>	1	--	--	--	--	--	--	1	--	1
<i>Aluterus</i> spp.	--	1	--	--	--	1	--	--	--	1
<i>Ameiurus natalis</i>	--	1	1	--	--	--	--	--	--	1
<i>Anchoa hepsetus</i>	13,113	1,142	2,834	1,887	1,754	1,442	195	1,597	4,546	14,255
<i>Anchoa mitchilli</i>	93,465	20,641	21,814	6,210	9,160	1,460	14,642	47,656	13,164	114,106
<i>Anchoa</i> spp.	30	4	29	2	--	1	2	--	--	34
<i>Ancylopsetta quadrocellata</i>	--	18	4	5	2	5	--	--	2	18
<i>Archosargus probatocephalus</i>	55	109	13	6	54	2	29	46	14	164
<i>Arius felis</i>	39	5,775	152	25	480	45	3,684	1,305	123	5,814
<i>Astroscopus y-graecum</i>	12	3	5	3	2	3	--	--	2	15
<i>Bagre marinus</i>	--	392	43	--	86	--	134	129	--	392
<i>Bairdiella chrysoura</i>	982	1,508	939	63	115	47	924	395	7	2,490
<i>Bathygobius soporator</i>	38	--	5	2	4	5	--	7	15	38
<i>Blenniidae</i> spp.	6	6	2	--	1	4	--	3	2	12
<i>Bothidae</i> spp.	3	1	2	--	--	--	2	--	--	4
<i>Brevoortia</i> spp.	1,863	648	102	507	313	167	57	894	471	2,511
<i>Brevoortia tyrannus</i>	--	1	--	--	--	--	1	--	--	1
<i>Callinectes ornatus</i>	1	5	--	--	--	4	--	1	1	6
<i>Callinectes sapidus</i>	664	2,695	249	32	335	54	1,619	827	243	3,359
<i>Callinectes similis</i>	1,655	2,059	740	584	626	618	345	521	280	3,714
<i>Callinectes</i> spp.	129	15	36	23	4	36	26	8	11	144
<i>Carangidae</i> spp.	12	1	3	1	6	--	--	3	--	13
<i>Caranx bartholomaei</i>	11	--	1	7	1	2	--	--	--	11
<i>Caranx hippos</i>	5	4	1	1	2	--	1	4	--	9
<i>Caranx latus</i>	2	--	1	--	--	--	1	--	--	2
<i>Caranx</i> spp.	2	--	--	--	1	--	--	--	1	2
<i>Carcharhinus brevipinna</i>	--	1	--	--	--	--	1	--	--	1
<i>Carcharhinus limbatus</i>	--	1	1	--	--	--	--	--	--	1
<i>Carcharhinus</i> spp.	--	1	1	--	--	--	--	--	--	1
<i>Centropomus undecimalis</i>	31	1	--	--	8	--	17	5	2	32
<i>Centropristis philadelphica</i>	--	15	4	4	4	--	1	1	1	15
<i>Centropristis striata</i>	1	57	16	8	11	15	1	2	5	58
<i>Chaetodipterus faber</i>	5	347	99	1	142	6	74	24	6	352
<i>Charybdis hellerii</i>	2	78	13	8	34	12	7	3	3	80
<i>Chasmodes bosquianus</i>	1	--	1	--	--	--	--	--	--	1
<i>Chasmodes saburrae</i>	--	1	--	--	--	--	1	--	--	1

Table 1–7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2002–2004.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
E=710	E=853	E=289	E=130	E=301	E=123	E=308	E=284	E=128	E=1,563	
<i>Chilomycterus schoepfi</i>	30	183	11	10	42	6	49	83	12	213
<i>Chloroscombrus chrysurus</i>	41	161	61	16	47	5	9	47	17	202
<i>Citharichthys macrops</i>	1	6	--	4	--	3	--	--	--	7
<i>Citharichthys spilopterus</i>	897	846	352	214	180	34	303	608	52	1,743
<i>Clupeidae</i> spp.	4,065	1	3,728	19	66	61	67	16	109	4,066
<i>Cynoscion nebulosus</i>	237	63	74	25	12	5	159	25	--	300
<i>Cynoscion regalis</i>	327	2,045	1,231	138	237	81	452	144	89	2,372
<i>Cynoscion</i> spp.	73	2	--	1	72	--	--	2	--	75
<i>Cyprinodon variegatus</i>	65	--	13	3	6	2	30	9	2	65
<i>Dasyatis sabina</i>	48	233	49	11	54	6	48	90	23	281
<i>Dasyatis say</i>	4	34	10	6	6	6	--	9	1	38
<i>Dasyatis</i> spp.	--	1	--	--	1	--	--	--	--	1
<i>Diapterus auratus</i>	448	160	96	11	79	1	247	168	6	608
<i>Diapterus plumieri</i>	1	--	--	--	--	--	--	1	--	1
<i>Diodon holocanthus</i>	--	1	--	--	--	--	1	--	--	1
<i>Diplectrum bivittatum</i>	--	1	--	--	--	--	--	1	--	1
<i>Diplectrum formosum</i>	--	1	--	1	--	--	--	--	--	1
<i>Diplectrum</i> spp.	2	--	--	2	--	--	--	--	--	2
<i>Diplodus argenteus</i>	9	--	--	--	--	--	--	9	--	9
<i>Diplodus holbrooki</i>	10	--	--	5	--	--	--	--	5	10
<i>Echeneis naucrates</i>	--	2	--	--	--	--	--	1	1	2
<i>Elops saurus</i>	13	3	2	--	3	--	4	7	--	16
<i>Epinephelus itajara</i>	--	4	--	--	1	--	2	1	--	4
<i>Etropus crossotus</i>	90	490	159	151	47	20	37	106	60	580
<i>Eucinostomus argenteus</i>	91	63	3	8	13	1	2	11	116	154
<i>Eucinostomus gula</i>	1,836	609	156	101	521	38	170	986	473	2,445
<i>Eucinostomus harengulus</i>	5,233	1,147	476	162	1,863	451	1,158	978	1,292	6,380
<i>Eucinostomus jonesi</i>	18	14	10	--	--	1	4	1	16	32
<i>Eucinostomus</i> spp.	15,512	1,449	1,454	1,288	4,391	511	1,808	3,508	4,001	16,961
<i>Euleptorhamphus velox</i>	1	--	--	--	--	1	--	--	--	1
<i>Farfantepenaeus aztecus</i>	706	2,276	503	16	112	35	1,438	864	14	2,982
<i>Farfantepenaeus duorarum</i>	1,411	837	441	57	284	22	1,035	363	46	2,248
<i>Farfantepenaeus</i> spp.	2,491	1,750	588	213	936	53	1,208	1,060	183	4,241
<i>Fundulus confluentus</i>	66	--	6	11	3	42	4	--	--	66
<i>Fundulus grandis</i>	548	--	199	120	10	--	--	217	2	548
<i>Fundulus heteroclitus</i>	2,540	3	548	1,555	248	40	90	49	13	2,543
<i>Fundulus majalis</i>	3,218	4	931	770	649	190	430	110	142	3,222
<i>Fundulus</i> spp.	947	167	405	697	7	4	1	--	--	1,114
<i>Gambusia holbrooki</i>	248	2	8	--	28	--	44	169	1	250

Table 1-7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2002-2004.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=710	E=853	E=289	E=130	E=301	E=123	E=308	E=284	E=128	E=1,563
<i>Gobiesox strumosus</i>	2	6	2	--	2	2	2	--	--	8
<i>Gobiidae</i> spp.	1,050	21	19	59	489	20	47	362	75	1,071
<i>Gobioides broussoneti</i>	--	2	--	--	--	--	1	1	--	2
<i>Gobionellus boleosoma</i>	695	25	47	135	108	7	14	272	137	720
<i>Gobionellus oceanicus</i>	35	106	4	--	6	--	48	83	--	141
<i>Gobionellus shufeldti</i>	1	--	--	--	--	--	1	--	--	1
<i>Gobionellus smaragdus</i>	40	1	17	1	2	2	1	6	12	41
<i>Gobionellus</i> spp.	2	--	--	--	--	--	2	--	--	2
<i>Gobionellus stigmaticus</i>	--	3	--	--	--	--	--	3	--	3
<i>Gobiosoma bosc</i>	289	29	90	1	66	1	76	82	2	318
<i>Gobiosoma longipala</i>	--	3	--	--	--	--	2	--	1	3
<i>Gobiosoma robustum</i>	8	6	5	--	--	2	1	5	1	14
<i>Gobiosoma</i> spp.	2	--	--	--	1	--	1	--	--	2
<i>Gymnura micrura</i>	9	94	29	27	9	10	5	11	12	103
<i>Haemulidae</i> spp.	--	2	--	--	--	1	--	--	1	2
<i>Harengula jaguana</i>	5,317	4	212	572	1,353	2,580	1	120	483	5,321
<i>Hippocampus erectus</i>	1	19	6	6	2	1	--	2	3	20
<i>Hypleurochilus bermudensis</i>	1	1	--	--	1	--	--	1	--	2
<i>Hyporhamphus meeki</i>	2	--	--	--	--	--	--	--	2	2
<i>Hypsoblennius hentzi</i>	--	1	--	--	1	--	--	--	--	1
<i>Hypsoblennius ionthas</i>	--	1	--	--	1	--	--	--	--	1
<i>Ictalurus punctatus</i>	--	5	--	--	--	--	5	--	--	5
<i>Labrisomus nuchipinnis</i>	3	--	--	--	--	--	--	--	3	3
<i>Lactophrys</i> spp.	1	2	--	--	--	1	--	1	1	3
<i>Lactophrys trigonus</i>	--	1	--	--	1	--	--	--	--	1
<i>Lagodon rhomboides</i>	8,222	1,329	172	126	1,452	241	2,003	4,796	761	9,551
<i>Larimus fasciatus</i>	--	60	--	59	1	--	--	--	--	60
<i>Leiostomus xanthurus</i>	53,204	4,832	4,057	7,028	5,142	9,065	4,881	9,664	18,199	58,036
<i>Lepisosteus osseus</i>	--	1	--	--	--	--	1	--	--	1
<i>Leptocephalus</i> spp.	24	79	26	7	28	14	15	10	3	103
<i>Limulus polyphemus</i>	6	45	19	2	13	1	4	10	2	51
<i>Litopenaeus setiferus</i>	5,011	6,196	2,893	518	3,118	432	3,059	1,123	64	11,207
<i>Lobotes surinamensis</i>	--	1	1	--	--	--	--	--	--	1
<i>Lutjanidae</i> spp.	2	1	--	--	2	1	--	--	--	3
<i>Lutjanus griseus</i>	129	74	23	8	60	5	54	35	18	203
<i>Lutjanus</i> spp.	5	--	--	--	--	--	4	1	--	5
<i>Lutjanus synagris</i>	63	82	12	17	24	2	5	16	69	145
<i>Membras martinica</i>	1,170	17	113	193	19	2	834	19	7	1,187
<i>Menidia menidia</i>	1,638	--	144	1,378	53	22	37	4	--	1,638

Table 1–7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2002–2004.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=710	E=853	E=289	E=130	E=301	E=123	E=308	E=284	E=128	
<i>Menidia</i> spp.	12,763	29	3,538	1,940	1,080	214	4,343	1,558	119	12,792
<i>Menippe</i> spp.	2	163	9	4	45	1	76	21	9	165
<i>Menticirrhus americanus</i>	70	819	208	83	168	86	89	166	89	889
<i>Menticirrhus littoralis</i>	27	1	1	20	--	5	--	--	2	28
<i>Menticirrhus saxatilis</i>	3	10	6	1	2	2	--	--	2	13
<i>Menticirrhus</i> spp.	--	4	1	--	--	--	--	3	--	4
<i>Microgobius gulosus</i>	203	20	32	--	21	--	139	28	3	223
<i>Microgobius</i> spp.	8	4	--	4	1	--	7	--	--	12
<i>Microgobius thalassinus</i>	6	19	--	13	4	--	8	--	--	25
<i>Microphis brachyurus</i>	1	--	--	--	--	--	--	1	--	1
<i>Micropogonias undulatus</i>	5,700	13,760	2,710	313	2,123	529	6,577	6,811	397	19,460
<i>Monacanthus hispidus</i>	55	132	42	28	20	70	12	8	7	187
<i>Mugil cephalus</i>	9,669	464	890	6,381	108	36	202	2,311	205	10,133
<i>Mugil curema</i>	2,680	141	306	369	327	43	377	1,332	67	2,821
<i>Mugil</i> spp.	1,829	19	263	217	238	200	425	77	428	1,848
<i>Myrophis punctatus</i>	1	--	--	--	--	--	--	1	--	1
<i>Ogcocephalus radiatus</i>	--	20	7	4	9	--	--	--	--	20
<i>Oligoplites saurus</i>	153	23	19	10	18	10	37	74	8	176
<i>Ophichthus gomesi</i>	--	1	1	--	--	--	--	--	--	1
<i>Ophidion</i> spp.	--	1	--	1	--	--	--	--	--	1
<i>Opisthonema oglinum</i>	3,441	39	1,471	315	344	687	29	45	589	3,480
<i>Opsanus tau</i>	5	280	19	2	21	2	219	20	2	285
<i>Orthopristis chrysoptera</i>	252	369	156	24	57	33	156	178	17	621
<i>Paralichthys albigutta</i>	231	140	53	110	41	30	35	67	35	371
<i>Paralichthys dentatus</i>	3	1	--	--	--	3	1	--	--	4
<i>Paralichthys lethostigma</i>	33	30	14	9	9	5	12	12	2	63
<i>Paralichthys</i> spp.	3	--	--	2	1	--	--	--	--	3
<i>Paralichthys squamilentus</i>	10	--	--	--	--	1	--	--	9	10
<i>Penaeidae</i> spp.	152	176	153	11	25	--	135	3	1	328
<i>Peprilus alepidotus</i>	--	58	--	26	5	13	2	--	12	58
<i>Peprilus burti</i>	--	2	--	--	1	--	--	1	--	2
<i>Peprilus triacanthus</i>	2	3	--	--	--	1	--	2	2	5
<i>Poecilia latipinna</i>	260	8	5	5	44	2	67	144	1	268
<i>Pogonias cromis</i>	20	3	10	2	1	--	8	2	--	23
<i>Pomatomus saltatrix</i>	33	1	18	4	4	1	2	5	--	34
<i>Portunus gibbesi</i>	1	21	2	14	4	1	--	--	1	22
<i>Portunus</i> spp.	103	335	34	14	40	259	15	27	49	438
<i>Prionotus carolinus</i>	--	1	--	1	--	--	--	--	--	1
<i>Prionotus evolans</i>	--	2	1	--	--	--	--	1	--	2

Table 1-7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2002-2004.—Continued

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Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=710	E=853	E=289	E=130	E=301	E=123	E=308	E=284	E=128	E=1,563
<i>Prionotus rubio</i>	1	3	--	3	1	--	--	--	--	4
<i>Prionotus scitulus</i>	20	381	54	108	38	74	1	71	55	401
<i>Prionotus</i> spp.	2	24	4	11	2	--	1	1	7	26
<i>Prionotus tribulus</i>	52	158	43	30	25	19	28	50	15	210
<i>Pristigenys alta</i>	--	1	--	1	--	--	--	--	--	1
<i>Rhinobatos lentiginosus</i>	--	1	--	--	1	--	--	--	--	1
<i>Rhinoptera bonasus</i>	--	3	--	--	--	--	--	--	3	3
<i>Sardinella aurita</i>	894	--	233	32	3	24	--	41	561	894
<i>Sciaenidae</i> spp.	914	699	657	11	19	1	20	2	903	1,613
<i>Sciaenops ocellatus</i>	456	76	28	38	67	2	265	126	6	532
<i>Scomber</i> spp.	--	1	1	--	--	--	--	--	--	1
<i>Scombridae</i> spp.	4	--	--	1	--	--	--	1	2	4
<i>Scorpaena brasiliensis</i>	1	7	1	--	1	3	1	1	1	8
<i>Scorpaena plumieri</i>	--	1	--	--	1	--	--	--	--	1
<i>Selar crumenophthalmus</i>	1	--	--	--	--	--	--	--	1	1
<i>Selene setapinnis</i>	--	10	--	1	1	--	7	--	1	10
<i>Selene vomer</i>	7	62	34	9	6	1	10	5	4	69
<i>Serranidae</i> spp.	2	1	--	--	1	--	2	--	--	3
<i>Sphoeroides maculatus</i>	7	19	7	1	5	--	9	3	1	26
<i>Sphoeroides nephelus</i>	60	150	14	9	41	16	82	34	14	210
<i>Sphoeroides</i> spp.	6	5	2	--	2	--	1	1	5	11
<i>Sphoeroides testudineus</i>	4	2	--	--	--	--	--	6	--	6
<i>Sphyraena barracuda</i>	37	1	5	1	2	--	--	14	16	38
<i>Sphyraena guachancho</i>	--	1	--	--	--	--	--	1	--	1
<i>Sphyrna tiburo</i>	--	3	2	--	--	--	1	--	--	3
<i>Stellifer lanceolatus</i>	6	3,717	1,690	4	352	343	938	391	5	3,723
<i>Stomolophus meleagris</i>	7	190	4	85	15	83	--	7	3	197
<i>Strongylura marina</i>	51	--	9	--	4	--	15	12	11	51
<i>Strongylura notata</i>	14	--	--	--	--	1	1	9	3	14
<i>Strongylura</i> spp.	15	--	--	2	4	--	5	1	3	15
<i>Symphurus plagiusa</i>	214	770	287	44	66	10	442	125	10	984
<i>Syngnathus floridae</i>	--	1	1	--	--	--	--	--	--	1
<i>Syngnathus fuscus</i>	2	4	1	1	1	1	--	2	--	6
<i>Syngnathus louisianae</i>	31	31	20	4	13	2	9	9	5	62
<i>Syngnathus scovelli</i>	5	3	--	1	--	--	3	4	--	8
<i>Syngnathus</i> spp.	26	24	3	3	14	3	9	15	3	50
<i>Synodus foetens</i>	370	312	118	134	95	117	20	102	96	682
<i>Trachinotus carolinus</i>	187	2	4	22	1	46	1	6	109	189
<i>Trachinotus falcatus</i>	607	11	76	90	64	175	49	108	56	618

Table 1–7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2002-2004.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=710	E=853	E=289	E=130	E=301	E=123	E=308	E=284	E=128	E=1,563
<i>Trachurus lathami</i>	--	1	--	--	--	1	--	--	--	1
<i>Trichiurus lepturus</i>	--	17	8	--	--	--	2	2	5	17
<i>Trinectes maculatus</i>	88	333	159	30	20	4	105	50	53	421
Unidentified species	17	53	16	8	16	5	6	12	7	70
<i>Urophycis floridana</i>	3	44	14	14	10	--	2	7	--	47
Totals	272,270	86,176	60,186	35,777	40,775	21,219	57,082	93,928	49,479	358,446

Appendix 2. 2002 Survey Data (NC02)

Table 2–1. Summary of catch and effort data for Northern Coastal stratified-random sampling, 2002.

[CPUE, catch per unit effort]

Zone	21.3-m river seine			6.1-m otter trawl			Totals		
	Animals	Hauls	CPUE	Animals	Hauls	CPUE	Animals	Hauls	CPUE
A	10,290	37	278	4,945	47	105	15,235	84	181
AI	12,902	19	679	2,578	21	123	15,480	40	387
B	6,509	43	151	5,387	52	104	11,896	95	125
BI	2,522	14	180	1,275	17	75	3,797	31	122
C	11,412	47	243	9,671	55	176	21,083	102	207
D	16,656	34	490	5,934	46	129	22,590	80	282
DI	13,773	15	918	499	20	25	14,272	35	408
Totals	74,064	209	354	30,289	258	117	104,353	467	223

Table 2-2. Catch statistics for 10 dominant species collected in 209 21.3-m river seine samples during Northern Coastal stratified-random sampling, 2002.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean. Species are ranked in order of decreasing mean density]

Species	Number		% Occur	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Anchoa mitchilli</i>	18,533	25.0	48.3	130.40	39.16	434.15	6,194.12	34	0.06	15	71
<i>Leiostomus xanthurus</i>	15,135	20.4	34.9	106.49	67.36	914.45	13,700.00	19	0.11	7	152
<i>Mugil cephalus</i>	6,567	8.9	22.5	46.21	40.97	1,281.67	8,558.82	24	0.19	14	270
<i>Eucinostomus</i> spp.	5,609	7.6	52.2	39.47	8.59	314.49	1,410.29	24	0.13	4	88
<i>Anchoa hepsetus</i>	4,814	6.5	30.1	33.87	10.13	432.38	1,061.76	33	0.10	18	79
<i>Litopenaeus setiferus</i>	3,499	4.7	38.8	24.62	7.60	446.11	1,002.94	12	0.10	2	36
<i>Menidia</i> spp.	3,168	4.3	52.2	22.29	3.77	244.37	401.47	43	0.24	15	86
<i>Brevoortia</i> spp.	1,679	2.3	8.6	11.81	6.76	827.37	1,164.71	21	0.25	14	74
<i>Menidia menidia</i>	1,638	2.2	16.7	11.53	7.03	881.55	1,429.41	41	0.32	20	82
<i>Farfantepenaeus</i> spp.	1,575	2.1	49.8	11.08	2.55	332.45	345.59	11	0.12	1	28
Subtotal	62,217	84.0								1	270
Totals	74,064	100.0		521.14	90.03	249.74	13,832.35			1	473

Table 2-3. Catch statistics for Selected Species collected in 209 21.3-m river seine samples during Northern Coastal stratified-random sampling, 2002.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean. Species are ranked in order of decreasing mean density]

Species	Number		%	Occur	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%			Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Leiostomus xanthurus</i>	15,135	20.4	34.9		106.49	67.36	914.45	13,700.00	19	0.11	7	152
<i>Mugil cephalus</i>	6,567	8.9	22.5		46.21	40.97	1,281.67	8,558.82	24	0.19	14	270
<i>Litopenaeus setiferus</i>	3,499	4.7	38.8		24.62	7.60	446.11	1,002.94	12	0.10	2	36
<i>Micropogonias undulatus</i>	1,002	1.4	25.8		7.05	1.39	285.03	108.82	35	0.57	7	181
<i>Mugil curema</i>	951	1.3	28.2		6.69	2.22	479.72	351.47	59	1.03	15	235
<i>Trachinotus falcatus</i>	219	0.3	15.8		1.54	0.56	524.20	80.88	25	0.89	9	68
<i>Sciaenops ocellatus</i>	176	0.2	13.4		1.24	0.31	360.58	26.47	36	3.94	9	473
<i>Cynoscion nebulosus</i>	139	0.2	13.9		0.98	0.26	378.29	30.88	38	1.93	8	138
<i>Callinectes sapidus</i>	128	0.2	23.0		0.90	0.19	306.23	25.00	34	2.35	6	125
<i>Lutjanus griseus</i>	47	0.1	10.5		0.33	0.10	447.27	17.65	59	7.05	11	173
<i>Paralichthys albigutta</i>	45	0.1	9.6		0.32	0.09	416.55	10.29	49	3.83	10	140
<i>Trachinotus carolinus</i>	31	0.0	3.8		0.22	0.13	892.37	26.47	28	3.63	11	75
<i>Menticirrhus littoralis</i>	20	0.0	0.5		0.14	0.14	1,445.68	29.41	36	2.80	12	55
<i>Archosargus probatocephalus</i>	19	0.0	5.7		0.13	0.06	597.03	10.29	132	20.45	18	334
<i>Menticirrhus americanus</i>	17	0.0	4.3		0.12	0.04	522.83	4.41	52	5.19	24	96
<i>Pogonias cromis</i>	15	0.0	2.9		0.11	0.06	841.80	11.76	90	5.44	76	151
<i>Centropomus undecimalis</i>	13	0.0	1.4		0.09	0.06	960.17	10.29	45	15.18	17	225
<i>Lutjanus synagris</i>	13	0.0	1.9		0.09	0.07	1,034.91	13.24	64	8.62	23	110
<i>Pomatomus saltatrix</i>	12	0.0	3.3		0.08	0.04	631.11	5.88	43	2.97	31	61
<i>Cynoscion regalis</i>	11	0.0	3.3		0.08	0.03	595.33	4.41	43	3.63	28	66
<i>Paralichthys lethostigma</i>	9	0.0	2.9		0.06	0.03	656.28	4.41	161	50.87	22	342
<i>Paralichthys squamilentus</i>	9	0.0	0.5		0.06	0.06	1,445.68	13.24	51	3.22	30	60
<i>Elops saurus</i>	5	0.0	1.4		0.04	0.02	863.70	2.94	85	17.08	38	121
<i>Albula vulpes</i>	3	0.0	1.4		0.02	0.01	830.64	1.47	38	13.64	20	65
<i>Menticirrhus saxatilis</i>	2	0.0	1.0		0.01	0.01	1,019.79	1.47	54	3.50	50	57
<i>Menippe</i> spp.	1	0.0	0.5		0.01	0.01	1,445.68	1.47	8		8	8
Totals	28,088	37.9	90.4		197.64	79.21	579.41	13,819.12			2	473

Table 2-4. Catch statistics for 10 dominant species collected in 258 bay 6.1-m otter trawl samples during Northern Coastal stratified-random sampling, 2002.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean. Species are ranked in order of decreasing mean density]

Species	Number		% Occur	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Anchoa mitchilli</i>	7,343	24.2	42.6	3.84	0.85	354.73	115.22	40	0.12	13	148
<i>Litopenaeus setiferus</i>	4,702	15.5	34.1	2.46	0.73	475.33	109.42	10	0.10	2	109
<i>Micropogonias undulatus</i>	3,154	10.4	36.4	1.65	0.46	449.64	97.27	42	0.43	6	156
<i>Stellifer lanceolatus</i>	2,007	6.6	14.7	1.05	0.39	596.77	63.28	35	0.40	4	100
<i>Arius felis</i>	1,923	6.3	43.8	1.01	0.24	377.35	34.54	125	1.64	43	505
<i>Farfantepenaeus</i> spp.	1,366	4.5	41.5	0.71	0.22	491.54	49.24	12	0.14	2	40
<i>Leiostomus xanthurus</i>	1,089	3.6	28.3	0.57	0.19	525.52	41.96	72	1.22	8	193
<i>Bairdiella chrysoura</i>	790	2.6	28.3	0.41	0.09	363.57	14.71	88	1.43	5	163
<i>Anchoa hepsetus</i>	713	2.4	8.1	0.37	0.22	965.86	54.91	43	0.45	18	96
<i>Callinectes sapidus</i>	606	2.0	47.3	0.32	0.05	245.40	7.15	104	1.54	11	176
Subtotal	23,693	78.1								2	505
Totals	30,289	100.0		15.84	1.84	186.33	273.07			2	890

Table 2-5. Catch statistics for Selected Species collected in 258 bay 6.1-m otter trawl samples during Northern Coastal stratified-random sampling, 2002.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that taxon was collected; Stderr, standard error; CV, coefficient of variation of the mean; -- not applicable. Species are ranked in order of decreasing mean density]

Species	Number		% Occur	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Litopenaeus setiferus</i>	4,702	15.5	34.1	2.46	0.73	475.33	109.42	10	0.10	2	109
<i>Micropogonias undulatus</i>	3,154	10.4	36.4	1.65	0.46	449.64	97.27	42	0.43	6	156
<i>Leiostomus xanthurus</i>	1,089	3.6	28.3	0.57	0.19	525.52	41.96	72	1.22	8	193
<i>Callinectes sapidus</i>	606	2.0	47.3	0.32	0.05	245.40	7.15	104	1.54	11	176
<i>Cynoscion regalis</i>	452	1.5	24.4	0.24	0.05	350.38	8.50	61	1.76	7	220
<i>Mugil cephalus</i>	430	1.4	0.8	0.22	0.22	1,580.20	57.07	27	0.61	20	205
<i>Menticirrhus americanus</i>	398	1.3	29.1	0.21	0.04	311.12	5.67	36	1.55	4	268
<i>Menippe</i> spp.	58	0.2	10.5	0.03	0.01	393.35	1.21	37	4.46	5	166
<i>Paralichthys albigutta</i>	52	0.2	15.5	0.03	0.00	254.31	0.40	186	7.62	76	340
<i>Archosargus probatocephalus</i>	41	0.1	7.8	0.02	0.01	530.25	1.48	215	15.66	70	429
<i>Lutjanus griseus</i>	32	0.1	5.8	0.02	0.01	492.84	0.67	94	7.90	12	212
<i>Sciaenops ocellatus</i>	31	0.1	4.3	0.02	0.01	663.36	1.48	32	1.85	14	70
<i>Cynoscion nebulosus</i>	21	0.1	5.4	0.01	0.00	492.45	0.54	110	11.08	18	178
<i>Lutjanus synagris</i>	13	0.0	3.9	0.01	0.00	530.23	0.27	72	8.63	23	118
<i>Trachinotus falcatus</i>	9	0.0	0.8	0.00	0.00	1,438.19	1.08	7	0.40	6	9
<i>Paralichthys lethostigma</i>	6	0.0	1.9	0.00	0.00	752.01	0.27	145	40.57	26	248
<i>Pogonias cromis</i>	3	0.0	0.8	0.00	0.00	1,195.35	0.27	118	10.93	105	140
<i>Elops saurus</i>	2	0.0	0.4	0.00	0.00	1,606.24	0.27	24	1.50	22	25
<i>Menticirrhus saxatilis</i>	2	0.0	0.8	0.00	0.00	1,133.57	0.13	59	27.00	32	86
<i>Centropomus undecimalis</i>	1	0.0	0.4	0.00	0.00	1,606.24	0.13	128	--	128	128
<i>Epinephelus itajara</i>	1	0.0	0.4	0.00	0.00	1,606.24	0.13	125	--	125	125
<i>Trachinotus carolinus</i>	1	0.0	0.4	0.00	0.00	1,606.24	0.13	199	--	199	199
<i>Menticirrhus littoralis</i>	1	0.0	0.4	0.00	0.00	1,606.24	0.13	138	--	138	138
<i>Paralichthys dentatus</i>	1	0.0	0.4	0.00	0.00	1,606.24	0.13	188	--	188	188
Totals	11,106	36.7	84.1	5.81	1.13	312.46	199.27			2	429

Table 2-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2002.

[E, effort, or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=33	E=32	E=36	E=33	E=48	E=42	E=41	E=34	E=46	E=40	E=44	E=38	
<i>Abudefduf saxatilis</i>	--	--	--	--	65	--	--	--	--	--	--	--	65
<i>Achirus lineatus</i>	5	3	24	4	7	13	35	34	47	16	11	2	201
<i>Albula vulpes</i>	--	1	--	--	2	--	--	--	--	--	--	--	3
<i>Aluterus heudeloti</i>	--	--	--	--	--	--	--	--	1	--	--	--	1
<i>Anchoa hepsetus</i>	--	5	--	1,134	2,568	850	887	33	34	15	--	1	5,527
<i>Anchoa mitchilli</i>	101	382	1,467	5,266	3,040	2,099	1,674	5,142	2,550	3,661	321	173	25,876
<i>Anchoa</i> spp.	--	1	--	28	--	--	--	--	--	--	--	--	29
<i>Ancylopsetta quadrocellata</i>	--	--	--	--	1	--	--	--	--	--	--	--	1
<i>Archosargus probatocephalus</i>	9	--	2	5	2	2	14	7	1	12	5	1	60
<i>Arius felis</i>	338	34	22	11	19	87	329	157	112	282	396	146	1,933
<i>Astroscopus y-graecum</i>	--	--	--	--	--	--	--	--	--	--	--	1	1
<i>Bagre marinus</i>	--	--	--	--	--	53	53	88	6	88	4	--	292
<i>Bairdiella chrysoura</i>	114	10	32	40	153	67	169	228	37	81	43	119	1,093
<i>Bathygobius soporator</i>	--	--	--	--	--	--	--	--	--	--	1	4	5
<i>Blenniidae</i> spp.	--	--	--	--	--	--	--	--	1	--	--	--	1
<i>Brevoortia</i> spp.	1	2	71	321	135	1,469	4	11	9	45	--	--	2,068
<i>Brevoortia tyrannus</i>	--	--	--	--	--	--	--	--	--	--	1	--	1
<i>Callinectes sapidus</i>	93	72	152	35	44	55	68	77	11	19	65	43	734
<i>Callinectes similis</i>	--	3	141	106	197	111	65	32	95	35	16	21	822
<i>Callinectes</i> spp.	--	--	22	5	1	--	18	--	13	51	3	2	115
<i>Carangidae</i> spp.	--	--	--	--	3	3	2	1	--	--	--	--	9
<i>Caranx hippos</i>	--	--	--	--	--	1	1	1	1	1	--	--	5
<i>Caranx latus</i>	--	--	--	--	--	--	--	--	1	--	--	--	1
<i>Caranx</i> spp.	--	--	1	--	--	--	--	--	--	--	--	--	1
<i>Carcharhinus</i> spp.	--	--	--	--	1	--	--	--	--	--	--	--	1
<i>Centropomus undecimalis</i>	--	--	--	--	--	--	--	--	5	8	1	--	14
<i>Centropristis philadelphica</i>	--	--	--	--	--	--	--	2	1	--	--	--	3
<i>Centropristis striata</i>	--	--	--	--	1	1	1	1	1	2	5	--	12
<i>Chaetodipterus faber</i>	--	--	1	--	1	28	63	15	32	9	6	1	156
<i>Charybdis hellerii</i>	--	--	--	--	--	--	1	--	24	5	2	1	33
<i>Chasmodes bosquianus</i>	--	--	--	--	--	--	--	--	--	--	--	1	1
<i>Chilomycterus schoepfi</i>	3	8	10	1	1	29	12	3	3	1	3	11	85
<i>Chloroscombrus chrysurus</i>	--	--	--	--	7	11	5	8	8	--	1	--	40
<i>Citharichthys macrops</i>	--	--	2	--	--	--	--	2	--	--	--	1	5
<i>Citharichthys spilopterus</i>	6	7	151	94	60	86	40	20	20	8	3	4	499
<i>Clupeidae</i> spp.	--	--	--	4	--	--	--	--	--	--	--	--	4
<i>Cynoscion nebulosus</i>	1	--	--	--	4	11	79	21	13	15	11	5	160
<i>Cynoscion regalis</i>	6	6	1	5	8	28	10	74	167	95	42	21	463
<i>Cyprinodon variegatus</i>	--	2	--	6	--	--	--	--	--	--	9	5	22
<i>Dasyatis sabina</i>	31	1	8	4	11	7	3	2	5	10	3	9	94

Table 2-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2002.—Continued

[E, effort, or total number of hauls; --, none identified. Species are arranged alphabetically]

[illegible]

Table 2-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2002.—Continued

[E, effort, or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=33	E=32	E=36	E=33	E=48	E=42	E=41	E=34	E=46	E=40	E=44	E=38	
<i>Limulus polyphemus</i>	--	1	1	2	1	--	--	--	--	3	--	3	11
<i>Litopenaeus setiferus</i>	59	14	12	--	199	803	1,868	984	2,787	739	545	191	8,201
<i>Lutjanus griseus</i>	--	--	--	3	1	5	5	13	12	8	17	15	79
<i>Lutjanus synagris</i>	--	1	--	--	--	--	2	1	3	12	2	5	26
<i>Membras martinica</i>	--	--	--	--	--	--	--	34	--	85	1	--	120
<i>Menidia menidia</i>	91	39	138	1	19	34	1,191	45	37	17	6	20	1,638
<i>Menidia</i> spp.	105	127	87	324	580	516	198	253	278	454	122	137	3,181
<i>Menippe</i> spp.	8	20	8	--	3	2	7	2	1	5	--	3	59
<i>Menticirrhus americanus</i>	4	4	--	7	6	18	40	137	114	43	33	9	415
<i>Menticirrhus littoralis</i>	--	--	1	--	--	--	--	--	--	--	--	20	21
<i>Menticirrhus saxatilis</i>	1	--	--	1	2	--	--	--	--	--	--	--	4
<i>Microgobius gulosus</i>	6	3	3	--	--	3	17	4	1	44	1	--	82
<i>Microgobius thalassinus</i>	--	--	--	--	2	2	3	1	13	--	--	--	21
<i>Microphis brachyurus</i>	--	--	--	1	--	--	--	--	--	--	--	--	1
<i>Micropogonias undulatus</i>	858	269	1,145	443	227	72	48	13	9	565	204	303	4,156
<i>Monacanthus hispidus</i>	1	--	1	--	52	11	1	8	4	2	1	2	83
<i>Mugil cephalus</i>	17	6,295	586	31	12	3	13	2	1	16	1	20	6,997
<i>Mugil curema</i>	7	9	3	11	287	51	359	61	20	22	10	111	951
<i>Mugil</i> spp.	--	--	1	--	46	3	--	--	1	3	--	--	54
<i>Ogcocephalus radiatus</i>	--	1	1	--	1	1	1	--	--	1	--	1	7
<i>Oligoplites saurus</i>	--	--	--	1	7	14	16	3	23	2	--	--	66
<i>Opisthonema oglinum</i>	--	--	--	--	50	10	32	501	--	--	--	--	593
<i>Opsanus tau</i>	1	12	16	1	1	2	15	7	8	1	4	5	73
<i>Orthopristis chrysoptera</i>	--	1	--	9	69	94	71	36	9	10	2	12	313
<i>Paralichthys albigutta</i>	3	14	23	11	15	7	6	4	2	2	8	2	97
<i>Paralichthys dentatus</i>	--	--	1	--	--	--	--	--	--	--	--	--	1
<i>Paralichthys lethostigma</i>	--	--	7	--	2	1	--	3	--	2	--	--	15
<i>Paralichthys squamilentus</i>	--	--	9	--	--	--	--	--	--	--	--	--	9
<i>Penaeidae</i> spp.	--	--	1	--	145	81	84	--	--	--	--	6	317
<i>Poecilia latipinna</i>	1	--	--	--	--	1	3	--	--	--	14	4	23
<i>Pogonias cromis</i>	--	--	--	--	--	5	12	--	--	--	--	1	18
<i>Pomatomus saltatrix</i>	--	--	--	2	8	--	--	--	--	2	--	--	12
<i>Portunus</i> spp.	--	--	--	--	7	39	1	5	--	1	1	1	55
<i>Prionotus evolans</i>	--	--	--	--	--	--	--	--	--	1	--	--	1
<i>Prionotus rubio</i>	1	1	1	--	--	1	--	--	--	--	--	--	4
<i>Prionotus scitulus</i>	4	1	7	--	4	8	6	8	29	7	5	4	83
<i>Prionotus</i> spp.	--	1	9	3	12	--	--	--	--	--	--	--	25
<i>Prionotus tribulus</i>	1	2	9	--	--	2	--	2	--	4	7	9	36
<i>Sardinella aurita</i>	--	--	--	--	46	--	--	--	--	--	--	--	46
<i>Sciaenidae</i> spp.	--	1	1	6	1	--	1	--	--	3	9	2	24

Table 2-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2002.—Continued

[E, effort, or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=33	E=32	E=36	E=33	E=48	E=42	E=41	E=34	E=46	E=40	E=44	E=38	
<i>Sciaenops ocellatus</i>	5	--	--	--	3	--	3	--	22	54	91	29	207
<i>Scomber</i> spp.	--	--	--	--	--	--	--	1	--	--	--	--	1
<i>Scorpaena brasiliensis</i>	--	--	--	--	--	--	--	1	--	1	--	--	2
<i>Selene setapinnis</i>	--	--	--	--	--	--	--	1	--	--	--	--	1
<i>Selene vomer</i>	--	--	--	1	2	8	2	1	3	--	1	--	18
<i>Serranidae</i> spp.	--	--	--	2	--	--	--	--	--	--	--	--	2
<i>Sphoeroides maculatus</i>	--	--	--	--	4	5	2	1	--	--	2	1	15
<i>Sphoeroides nephelus</i>	2	6	3	5	1	7	3	5	--	2	7	14	55
<i>Sphoeroides testudineus</i>	--	--	--	--	--	--	--	--	--	--	1	--	1
<i>Sphyræna barracuda</i>	--	--	--	--	2	--	1	--	1	4	--	--	8
<i>Stellifer lanceolatus</i>	--	--	--	1	--	5	3	702	1,001	162	104	34	2,012
<i>Strongylura marina</i>	--	--	--	10	6	6	2	--	2	--	--	1	27
<i>Symphurus plagiusa</i>	1	3	28	2	4	17	108	52	52	32	25	12	336
<i>Syngnathus floridae</i>	--	--	--	--	1	--	--	--	--	--	--	--	1
<i>Syngnathus fuscus</i>	--	--	1	--	--	--	--	--	1	--	1	--	3
<i>Syngnathus louisianae</i>	--	1	2	1	7	1	4	2	--	5	3	--	26
<i>Syngnathus scovelli</i>	--	--	--	1	1	2	2	--	--	--	--	--	6
<i>Syngnathus</i> spp.	--	2	--	--	--	--	--	--	1	--	--	--	3
<i>Synodus foetens</i>	1	--	7	2	18	36	12	10	12	5	6	14	123
<i>Trachinotus carolinus</i>	--	--	--	--	20	2	1	6	--	1	--	2	32
<i>Trachinotus falcatus</i>	--	--	--	6	39	58	1	30	63	30	1	--	228
<i>Trichiurus lepturus</i>	--	--	--	1	--	--	1	--	--	--	--	--	2
<i>Trinectes maculatus</i>	--	--	3	--	--	7	42	5	40	9	--	50	156
Unidentified species	--	--	6	25	--	1	1	--	--	--	--	--	33
Totals	2,215	20,137	7,493	9,747	9,732	8,835	9,766	9,462	9,323	10,192	4,062	3,389	104,353

Table 2-7. Summary, by gear and zone of species collected during Northern Coastal stratified-random sampling, 2002.

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=209	E=258	E=84	E=40	E=95	E=31	E=102	E=80	E=35	
<i>Abudefduf saxatilis</i>	65	--	--	--	--	65	--	--	--	65
<i>Achirus lineatus</i>	38	163	28	10	28	10	99	22	4	201
<i>Albula vulpes</i>	3	--	--	--	--	--	1	1	1	3
<i>Aluterus heudeloti</i>	1	--	--	--	--	--	--	1	--	1
<i>Anchoa hepsetus</i>	4,814	713	1,063	1,327	725	714	90	891	717	5,527
<i>Anchoa mitchilli</i>	18,533	7,343	6,740	2,387	1,253	40	6,266	9,054	136	25,876
<i>Anchoa</i> spp.	29	--	28	1	--	--	--	--	--	29
<i>Ancylopsetta quadrocellata</i>	--	1	1	--	--	--	--	--	--	1
<i>Archosargus probatocephalus</i>	19	41	5	3	14	--	17	18	3	60
<i>Arius felis</i>	10	1,923	34	6	124	12	1,455	295	7	1,933
<i>Astroscopus y-graecum</i>	1	--	--	--	--	--	--	--	1	1
<i>Bagre marinus</i>	--	292	1	--	82	--	114	95	--	292
<i>Bairdiella chrysoura</i>	303	790	296	17	71	45	510	149	5	1,093
<i>Bathygobius soporator</i>	5	--	2	1	--	--	--	2	--	5
<i>Blenniidae</i> spp.	--	1	--	--	1	--	--	--	--	1
<i>Brevoortia</i> spp.	1,679	389	73	499	167	67	3	807	452	2,068
<i>Brevoortia tyrannus</i>	--	1	--	--	--	--	1	--	--	1
<i>Callinectes sapidus</i>	128	606	62	12	94	22	329	193	22	734
<i>Callinectes similis</i>	290	532	120	159	137	75	133	167	31	822
<i>Callinectes</i> spp.	102	13	31	17	3	36	13	4	11	115
<i>Carangidae</i> spp.	9	--	2	--	5	--	--	2	--	9
<i>Caranx hippos</i>	5	--	1	1	2	--	--	1	--	5
<i>Caranx latus</i>	1	--	--	--	--	--	1	--	--	1
<i>Caranx</i> spp.	1	--	--	--	--	--	--	--	1	1
<i>Carcharhinus</i> spp.	--	1	1	--	--	--	--	--	--	1
<i>Centropomus undecimalis</i>	13	1	--	--	7	--	7	--	--	14
<i>Centropristis philadelphica</i>	--	3	2	--	--	--	--	1	--	3
<i>Centropristis striata</i>	--	12	5	1	4	1	--	--	1	12
<i>Chaetodipterus faber</i>	--	156	35	1	62	5	42	11	--	156
<i>Charybdis hellerii</i>	--	33	2	1	28	2	--	--	--	33
<i>Chasmodes bosquianus</i>	1	--	1	--	--	--	--	--	--	1
<i>Chilomycterus schoepfi</i>	29	56	7	4	20	1	24	28	1	85
<i>Chloroscombrus chrysurus</i>	--	40	2	1	9	4	1	13	10	40
<i>Citharichthys macrops</i>	1	4	--	2	--	3	--	--	--	5
<i>Citharichthys spilopterus</i>	268	231	74	97	61	5	84	169	9	499
<i>Clupeidae</i> spp.	4	--	4	--	--	--	--	--	--	4
<i>Cynoscion nebulosus</i>	139	21	51	25	3	--	68	13	--	160
<i>Cynoscion regalis</i>	11	452	126	35	120	63	107	12	--	463
<i>Cyprinodon variegatus</i>	22	--	6	--	1	--	7	8	--	22

Table 2-7. Summary, by gear and zone of species collected during Northern Coastal stratified-random sampling, 2002.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=209	E=258	E=84	E=40	E=95	E=31	E=102	E=80	E=35	
<i>Dasyatis sabina</i>	18	76	13	4	27	4	18	16	12	94
<i>Dasyatis say</i>	1	7	2	--	3	3	--	--	--	8
<i>Dasyatis</i> spp.	--	1	--	--	1	--	--	--	--	1
<i>Diapterus auratus</i>	44	30	6	10	16	--	23	19	--	74
<i>Diplodus holbrooki</i>	5	--	--	--	--	--	--	--	5	5
<i>Elops saurus</i>	5	2	--	--	1	--	4	2	--	7
<i>Epinephelus itajara</i>	--	1	--	--	1	--	--	--	--	1
<i>Etropus crossotus</i>	19	225	35	88	22	5	31	53	10	244
<i>Eucinostomus argenteus</i>	75	54	--	4	10	1	2	10	102	129
<i>Eucinostomus gula</i>	409	111	35	15	90	11	32	179	158	520
<i>Eucinostomus harengulus</i>	1,538	234	117	47	540	134	350	275	309	1,772
<i>Eucinostomus jonesi</i>	17	14	10	--	--	1	4	--	16	31
<i>Eucinostomus</i> spp.	5,609	384	559	146	2,145	396	855	1,203	689	5,993
<i>Farfantepenaeus</i> spp.	1,575	1,366	403	67	538	13	1,017	886	17	2,941
<i>Fundulus confluentus</i>	6	--	--	1	--	4	1	--	--	6
<i>Fundulus grandis</i>	231	--	15	6	1	--	--	207	2	231
<i>Fundulus heteroclitus</i>	712	--	118	471	87	--	27	3	6	712
<i>Fundulus majalis</i>	1,036	--	220	267	326	40	84	17	82	1,036
<i>Fundulus</i> spp.	4	--	--	--	3	--	1	--	--	4
<i>Gambusia holbrooki</i>	10	--	--	--	1	--	4	5	--	10
<i>Gobiesox strumosus</i>	--	3	2	--	1	--	--	--	--	3
<i>Gobiidae</i> spp.	74	3	1	1	70	--	--	5	--	77
<i>Gobionellus boleosoma</i>	168	16	10	64	18	--	4	44	44	184
<i>Gobionellus oceanicus</i>	7	10	--	--	3	--	10	4	--	17
<i>Gobionellus shufeldti</i>	1	--	--	--	--	--	1	--	--	1
<i>Gobionellus smaragdus</i>	22	--	16	1	--	2	1	--	2	22
<i>Gobionellus</i> spp.	1	--	--	--	--	--	1	--	--	1
<i>Gobiosoma bosc</i>	77	17	2	1	38	--	7	46	--	94
<i>Gobiosoma longipala</i>	--	3	--	--	--	--	2	--	1	3
<i>Gobiosoma robustum</i>	1	--	--	--	--	--	--	1	--	1
<i>Gobiosoma</i> spp.	1	--	--	--	1	--	--	--	--	1
<i>Gymnura micrura</i>	2	21	4	6	4	4	2	2	1	23
<i>Harengula jaguana</i>	817	1	2	530	4	212	--	68	2	818
<i>Hippocampus erectus</i>	1	7	2	5	1	--	--	--	--	8
<i>Hypleurochilus bermudensis</i>	1	--	--	--	1	--	--	--	--	1
<i>Hypsoblennius hentzi</i>	--	1	--	--	1	--	--	--	--	1
<i>Lactophrys</i> spp.	--	2	--	--	--	1	--	--	1	2
<i>Lactophrys trigonus</i>	--	1	--	--	1	--	--	--	--	1
<i>Lagodon rhomboides</i>	901	566	27	10	244	29	395	734	28	1,467

Table 2-7. Summary, by gear and zone of species collected during Northern Coastal stratified-random sampling, 2002.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=209	E=258	E=84	E=40	E=95	E=31	E=102	E=80	E=35	
<i>Leiostomus xanthurus</i>	15,135	1,089	74	413	625	194	1,180	2,908	10,830	16,224
<i>Leptocephalus</i> spp.	18	9	1	2	6	10	4	1	3	27
<i>Limulus polyphemus</i>	--	11	2	2	4	--	2	1	--	11
<i>Litopenaeus setiferus</i>	3,499	4,702	1,775	254	2,927	410	2,178	640	17	8,201
<i>Lutjanus griseus</i>	47	32	14	4	21	--	19	18	3	79
<i>Lutjanus synagris</i>	13	13	3	2	9	--	2	9	1	26
<i>Membras martinica</i>	120	--	34	86	--	--	--	--	--	120
<i>Menidia menidia</i>	1,638	--	144	1,378	53	22	37	4	--	1,638
<i>Menidia</i> spp.	3,168	13	561	309	230	37	1,637	380	27	3,181
<i>Menippe</i> spp.	1	58	1	--	13	--	31	10	4	59
<i>Menticirrhus americanus</i>	17	398	58	69	87	74	42	60	25	415
<i>Menticirrhus littoralis</i>	20	1	1	20	--	--	--	--	--	21
<i>Menticirrhus saxatilis</i>	2	2	--	--	1	2	--	--	1	4
<i>Microgobius gulosus</i>	70	12	17	--	2	--	53	10	--	82
<i>Microgobius thalassinus</i>	3	18	--	13	3	--	5	--	--	21
<i>Microphis brachyurus</i>	1	--	--	--	--	--	--	1	--	1
<i>Micropogonias undulatus</i>	1,002	3,154	646	176	156	12	1,990	1,093	83	4,156
<i>Monacanthus hispidus</i>	7	76	31	19	10	7	8	5	3	83
<i>Mugil cephalus</i>	6,567	430	20	5,889	48	1	113	728	198	6,997
<i>Mugil curema</i>	951	--	231	309	43	14	147	161	46	951
<i>Mugil</i> spp.	54	--	5	3	4	--	37	5	--	54
<i>Ogcocephalus radiatus</i>	--	7	2	--	5	--	--	--	--	7
<i>Oligoplites saurus</i>	65	1	8	5	7	6	18	21	1	66
<i>Opisthonema oglinum</i>	588	5	31	9	65	448	--	38	2	593
<i>Opsanus tau</i>	--	73	3	1	8	1	52	7	1	73
<i>Orthopristis chrysoptera</i>	99	214	61	6	26	6	87	126	1	313
<i>Paralichthys albigutta</i>	45	52	19	9	11	13	13	23	9	97
<i>Paralichthys dentatus</i>	--	1	--	--	--	--	1	--	--	1
<i>Paralichthys lethostigma</i>	9	6	3	5	2	1	1	3	--	15
<i>Paralichthys squamilentus</i>	9	--	--	--	--	--	--	--	9	9
<i>Penaeidae</i> spp.	150	167	149	6	25	--	134	2	1	317
<i>Poecilia latipinna</i>	23	--	3	2	--	--	4	14	--	23
<i>Pogonias cromis</i>	15	3	8	1	1	--	8	--	--	18
<i>Pomatomus saltatrix</i>	12	--	3	2	1	--	2	4	--	12
<i>Portunus</i> spp.	24	31	7	--	17	5	12	9	5	55
<i>Prionotus evolans</i>	--	1	--	--	--	--	--	1	--	1
<i>Prionotus rubio</i>	1	3	--	3	1	--	--	--	--	4
<i>Prionotus scitulus</i>	5	78	11	4	21	16	1	21	9	83
<i>Prionotus</i> spp.	2	23	4	10	2	--	1	1	7	25

Table 2-7. Summary, by gear and zone of species collected during Northern Coastal stratified-random sampling, 2002.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=209	E=258	E=84	E=40	E=95	E=31	E=102	E=80	E=35	
<i>Prionotus tribulus</i>	14	22	9	9	4	1	7	6	--	36
<i>Sardinella aurita</i>	46	--	--	--	--	5	--	41	--	46
<i>Sciaenidae</i> spp.	2	22	1	--	19	--	3	--	1	24
<i>Sciaenops ocellatus</i>	176	31	17	16	41	--	102	27	4	207
<i>Scomber</i> spp.	--	1	1	--	--	--	--	--	--	1
<i>Scorpaena brasiliensis</i>	--	2	--	--	--	2	--	--	--	2
<i>Selene setapinnis</i>	--	1	--	1	--	--	--	--	--	1
<i>Selene vomer</i>	3	15	8	2	1	--	1	4	2	18
<i>Serranidae</i> spp.	2	--	--	--	--	--	2	--	--	2
<i>Sphoeroides maculatus</i>	6	9	6	1	1	--	4	2	1	15
<i>Sphoeroides nephelus</i>	15	40	2	--	7	2	28	15	1	55
<i>Sphoeroides testudineus</i>	1	--	--	--	--	--	--	1	--	1
<i>Sphyraena barracuda</i>	7	1	3	--	--	--	--	4	1	8
<i>Stellifer lanceolatus</i>	5	2,007	589	3	68	343	669	340	--	2,012
<i>Strongylura marina</i>	27	--	4	--	3	--	11	7	2	27
<i>Symphurus plagiusa</i>	68	268	91	17	27	--	143	58	--	336
<i>Syngnathus floridae</i>	--	1	1	--	--	--	--	--	--	1
<i>Syngnathus fuscus</i>	1	2	--	1	1	--	--	1	--	3
<i>Syngnathus louisianae</i>	12	14	6	1	7	--	6	4	2	26
<i>Syngnathus scovelli</i>	3	3	--	1	--	--	2	3	--	6
<i>Syngnathus</i> spp.	--	3	--	--	2	--	--	1	--	3
<i>Synodus foetens</i>	63	60	21	20	29	9	4	20	20	123
<i>Trachinotus carolinus</i>	31	1	--	4	--	26	1	--	1	32
<i>Trachinotus falcatus</i>	219	9	62	37	7	98	12	11	1	228
<i>Trichiurus lepturus</i>	--	2	2	--	--	--	--	--	--	2
<i>Trinectes maculatus</i>	62	94	67	4	11	2	20	2	50	156
Unidentified species	9	24	13	1	14	--	1	3	1	33
Totals	74,064	30,289	15,235	15,480	11,896	3,797	21,083	22,590	14,272	104,353

Appendix 3. 2003 Survey Data (NC03)

Table 3–1. Summary of catch and effort data for Northern Coastal stratified-random sampling, 2003.

[CPUE, catch per unit effort]

Zone	21.3-m river seine			6.1-m otter trawl			Totals		
	Animals	Hauls	CPUE	Animals	Hauls	CPUE	Animals	Hauls	CPUE
A	14,722	47	313	5,867	61	96	20,589	108	191
AI	4,538	24	189	817	23	36	5,355	47	114
B	9,134	46	199	5,120	62	83	14,254	108	132
BI	6,073	24	253	540	24	23	6,613	48	138
C	10,218	49	209	10,086	58	174	20,304	107	190
D	16,999	46	370	6,748	59	114	23,747	105	226
DI	12,675	23	551	999	24	42	13,674	47	291
Totals	74,359	259	287	30,177	311	97	104,536	570	183

Table 3-2. Catch statistics for 10 dominant species collected in 259 21.3-m river seine samples during Northern Coastal stratified-random sampling, 2003.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean. Species are ranked in order of decreasing mean density]

Species	Number		%	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%	Occur	Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Anchoa mitchilli</i>	17,668	23.8	48.3	100.32	24.92	399.82	3,532.35	36	0.06	16	68
<i>Leiostomus xanthurus</i>	13,640	18.3	47.1	77.45	17.16	356.58	2,685.29	23	0.13	7	136
<i>Anchoa hepsetus</i>	6,047	8.1	19.3	34.33	11.78	552.00	2,110.29	40	0.12	20	93
<i>Eucinostomus</i> spp.	5,786	7.8	40.2	32.85	8.86	433.99	1,529.41	24	0.08	9	41
<i>Menidia</i> spp.	4,178	5.6	55.2	23.72	4.11	279.11	542.65	53	0.22	15	88
<i>Lagodon rhomboides</i>	4,007	5.4	54.8	22.75	5.20	367.99	813.24	34	0.32	12	166
<i>Mugil cephalus</i>	3,030	4.1	26.3	17.20	8.65	809.61	1,933.82	60	0.77	18	277
<i>Eucinostomus harengulus</i>	2,087	2.8	45.9	11.85	2.54	345.52	429.41	55	0.24	33	97
<i>Harengula jaguana</i>	1,776	2.4	5.0	10.08	7.14	1,139.47	1,773.53	60	0.16	21	88
<i>Opisthonema oglinum</i>	1,548	2.1	5.8	8.79	3.51	643.35	627.94	50	0.18	30	71
Subtotal	59,767	80.4								7	277
Totals	74,359	100.0		427.15	38.32	143.54	3,607.35			3	530

Table 3-3. Catch statistics for Selected Species collected in 259 21.3-m river seine samples during Northern Coastal stratified-random sampling, 2003.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean; --, not applicable. Species are ranked in order of decreasing mean density]

Species	Number		%	Occur	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%			Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Leiostomus xanthurus</i>	13,640	18.3	47.1		77.45	17.16	356.58	2,685.29	23	0.13	7	136
<i>Mugil cephalus</i>	3,030	4.1	26.3		17.20	8.65	809.61	1,933.82	60	0.77	18	277
<i>Mugil curema</i>	1,441	1.9	29.0		8.18	5.06	995.85	1,298.53	102	0.80	24	208
<i>Micropogonias undulatus</i>	1,167	1.6	20.8		6.63	2.31	560.53	441.18	23	0.38	8	118
<i>Farfantepenaeus duorarum</i>	940	1.3	37.8		5.34	1.24	374.72	197.06	9	0.11	3	20
<i>Litopenaeus setiferus</i>	646	0.9	18.1		3.67	1.76	773.83	310.29	10	0.15	4	29
<i>Cynoscion regalis</i>	310	0.4	2.3		1.76	1.62	1,482.43	419.12	17	0.69	7	88
<i>Farfantepenaeus aztecus</i>	261	0.4	13.5		1.48	0.44	476.71	75.00	13	0.24	4	20
<i>Callinectes sapidus</i>	247	0.3	26.3		1.40	0.34	385.63	72.06	30	2.01	6	161
<i>Sciaenops ocellatus</i>	216	0.3	18.5		1.23	0.27	359.71	33.82	55	3.42	12	368
<i>Trachinotus falcatus</i>	200	0.3	9.7		1.14	0.48	683.80	111.76	28	0.81	10	57
<i>Trachinotus carolinus</i>	134	0.2	3.9		0.76	0.60	1,269.42	154.41	24	0.55	11	50
<i>Paralichthys albigutta</i>	86	0.1	11.6		0.49	0.20	653.67	48.53	40	4.47	10	173
<i>Lutjanus synagris</i>	47	0.1	3.5		0.27	0.17	1,026.07	42.65	43	3.19	19	105
<i>Lutjanus griseus</i>	31	0.0	6.2		0.18	0.07	656.48	16.18	69	11.67	12	255
<i>Cynoscion nebulosus</i>	26	0.0	3.1		0.15	0.10	1,128.98	26.47	64	4.18	18	114
<i>Menticirrhus americanus</i>	25	0.0	5.0		0.14	0.04	502.04	5.88	53	4.10	19	120
<i>Archosargus probatocephalus</i>	15	0.0	3.5		0.09	0.03	570.16	4.41	247	18.83	85	355
<i>Paralichthys lethostigma</i>	8	0.0	2.3		0.05	0.02	690.99	2.94	89	39.96	24	278
<i>Elops saurus</i>	5	0.0	1.2		0.03	0.02	1,064.88	4.41	152	37.08	24	253
<i>Centropomus undecimalis</i>	4	0.0	1.5		0.02	0.01	799.98	1.47	327	87.27	105	530
<i>Pogonias cromis</i>	4	0.0	0.8		0.02	0.02	1,135.77	2.94	106	29.19	54	180
<i>Pomatomus saltatrix</i>	3	0.0	1.2		0.02	0.01	925.55	1.47	64	16.19	33	88
<i>Menticirrhus littoralis</i>	2	0.0	0.4		0.01	0.01	1,609.35	2.94	35	0.50	34	35
<i>Menippe</i> spp.	1	0.0	0.4		0.01	0.01	1,609.35	1.47	44	--	44	44
<i>Menticirrhus saxatilis</i>	1	0.0	0.4		0.01	0.01	1,609.35	1.47	66	--	66	66
<i>Paralichthys squamilentus</i>	1	0.0	0.4		0.01	0.01	1,609.35	1.47	61	--	61	61
Totals	22,491	30.3	91.9		127.70	20.36	256.61	2,689.71			3	530

Table 3-4. Catch statistics for 10 dominant species collected in 311 bay 6.1-m otter trawl samples during Northern Coastal stratified-random sampling, 2003.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean. Species are ranked in order of decreasing mean density]

Species	Number		%	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Anchoa mitchilli</i>	10,045	33.3	38.9	4.34	1.08	437.12	189.96	41	0.09	18	72
<i>Micropogonias undulatus</i>	6,149	20.4	38.6	2.61	0.72	487.47	187.40	42	0.42	8	175
<i>Leiostomus xanthurus</i>	1,813	6.0	25.4	0.76	0.26	612.48	69.35	73	0.72	9	211
<i>Arius felis</i>	1,560	5.2	40.2	0.67	0.12	329.56	18.89	146	1.92	18	388
<i>Cynoscion regalis</i>	835	2.8	21.2	0.36	0.14	688.86	33.59	67	1.36	14	269
<i>Callinectes sapidus</i>	790	2.6	37.3	0.34	0.05	262.12	9.85	97	1.39	12	193
<i>Farfantepenaeus aztecus</i>	740	2.5	20.9	0.32	0.15	859.47	46.41	13	0.19	4	30
<i>Litopenaeus setiferus</i>	717	2.4	34.1	0.30	0.06	340.68	12.01	17	0.23	3	36
<i>Eucinostomus</i> spp.	563	1.9	7.7	0.24	0.13	939.97	33.46	25	0.28	9	47
<i>Eucinostomus harengulus</i>	548	1.8	15.4	0.23	0.09	668.23	25.36	57	0.59	40	115
Subtotal	23,760	78.9								3	388
Totals	30,177	100.0		13.40	1.59	204.63	200.49			3	851

Table 3-5. Catch statistics for Selected Species collected in 311 bay 6.1-m otter trawl samples during Northern Coastal stratified-random sampling, 2003.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean; --, not applicable. Species are ranked in order of decreasing mean density]

Species	Number		% Occur	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Micropogonias undulatus</i>	6,149	20.4	38.6	2.61	0.72	487.47	187.40	42	0.42	8	175
<i>Leiostomus xanthurus</i>	1,813	6.0	25.4	0.76	0.26	612.48	69.35	73	0.72	9	211
<i>Cynoscion regalis</i>	835	2.8	21.2	0.36	0.14	688.86	33.59	67	1.36	14	269
<i>Callinectes sapidus</i>	790	2.6	37.3	0.34	0.05	262.12	9.85	97	1.39	12	193
<i>Farfantepenaeus aztecus</i>	740	2.5	20.9	0.32	0.15	859.47	46.41	13	0.19	4	30
<i>Litopenaeus setiferus</i>	717	2.4	34.1	0.30	0.06	340.68	12.01	17	0.23	3	36
<i>Farfantepenaeus duorarum</i>	494	1.6	32.5	0.21	0.04	310.24	7.42	13	0.23	4	31
<i>Mugil curema</i>	139	0.5	1.9	0.06	0.05	1,449.72	15.25	100	2.08	29	139
<i>Menticirrhus americanus</i>	148	0.5	19.0	0.06	0.01	297.32	1.75	56	4.06	10	304
<i>Lutjanus synagris</i>	65	0.2	5.8	0.03	0.01	981.80	4.45	75	4.10	28	234
<i>Menippe</i> spp.	58	0.2	9.6	0.03	0.01	429.81	1.21	54	3.85	6	110
<i>Sciaenops ocellatus</i>	37	0.1	1.6	0.02	0.01	1,154.27	2.56	43	3.62	15	78
<i>Paralichthys albigutta</i>	39	0.1	8.0	0.02	0.00	419.39	0.67	176	9.19	25	289
<i>Mugil cephalus</i>	33	0.1	2.9	0.01	0.01	974.55	2.29	180	11.89	49	272
<i>Cynoscion nebulosus</i>	31	0.1	5.5	0.01	0.00	502.94	0.67	119	9.33	13	235
<i>Archosargus probatocephalus</i>	24	0.1	4.5	0.01	0.00	541.58	0.54	201	15.24	83	359
<i>Lutjanus griseus</i>	21	0.1	3.9	0.01	0.00	592.27	0.54	125	9.01	48	195
<i>Paralichthys lethostigma</i>	8	0.0	1.9	0.00	0.00	820.05	0.40	189	41.57	31	338
<i>Menticirrhus saxatilis</i>	6	0.0	0.6	0.00	0.00	1,312.75	0.54	100	5.97	73	117
<i>Epinephelus itajara</i>	2	0.0	0.6	0.00	0.00	1,244.98	0.13	364	43.00	321	407
<i>Pomatomus saltatrix</i>	1	0.0	0.3	0.00	0.00	1,763.52	0.13	53	--	53	53
<i>Trachinotus carolinus</i>	1	0.0	0.3	0.00	0.00	1,763.52	0.13	230	--	230	230
<i>Trachinotus falcatus</i>	1	0.0	0.3	0.00	0.00	1,763.52	0.00	30	--	30	30
Totals	12,152	40.3	76.8	5.15	0.87	298.67	187.67			3	407

Table 3-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2003.

[E, effort or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	E=570
	E=45	E=47	E=48	E=46	E=48	E=47	E=48	E=48	E=48	E=49	E=48	E=48	
<i>Abudefduf saxatilis</i>	--	--	--	--	--	--	--	--	--	--	10	--	10
<i>Achirus lineatus</i>	2	5	54	18	157	9	5	48	6	10	5	--	319
<i>Ameiurus natalis</i>	--	--	1	--	--	--	--	--	--	--	--	--	1
<i>Anchoa hepsetus</i>	1	--	2	4	1,293	747	1,445	2,359	492	54	33	--	6,430
<i>Anchoa mitchilli</i>	1,225	202	614	685	1,372	4,126	7,356	3,058	2,870	1,493	4,625	87	27,713
<i>Ancylopsetta quadrocellata</i>	--	--	1	--	1	1	--	--	--	--	--	--	3
<i>Archosargus probatocephalus</i>	2	2	1	--	5	1	2	1	16	3	4	2	39
<i>Arius felis</i>	363	68	61	243	128	174	145	135	24	37	150	38	1,566
<i>Astroscopus y-graecum</i>	--	1	--	--	--	--	--	--	--	--	1	--	2
<i>Bagre marinus</i>	--	--	--	--	6	9	28	23	2	6	5	--	79
<i>Bairdiella chrysoura</i>	43	40	21	33	580	24	106	54	43	79	32	25	1,080
<i>Bathygobius soporator</i>	--	--	--	1	2	3	4	2	--	1	12	--	25
<i>Blenniidae</i> spp.	--	--	--	--	--	2	--	--	--	1	1	--	4
<i>Brevoortia</i> spp.	21	37	11	2	151	10	--	1	13	9	51	2	308
<i>Callinectes sapidus</i>	33	118	214	71	70	68	104	49	26	86	163	35	1,037
<i>Callinectes similis</i>	5	26	49	82	321	215	122	39	30	80	31	22	1,022
<i>Callinectes</i> spp.	--	--	--	--	--	--	--	--	--	--	--	11	11
<i>Carangidae</i> spp.	--	--	--	--	1	2	--	--	--	--	--	--	3
<i>Caranx hippos</i>	3	--	--	--	--	--	--	--	--	--	--	--	3
<i>Centropomus undecimalis</i>	--	--	--	--	1	--	--	1	--	1	1	--	4
<i>Centropristis philadelphica</i>	--	--	--	1	1	--	1	--	2	2	--	--	7
<i>Centropristis striata</i>	--	--	2	--	2	2	--	--	--	2	--	--	8
<i>Chaetodipterus faber</i>	--	--	--	2	5	6	--	8	2	6	3	6	38
<i>Charybdis hellerii</i>	1	--	--	1	--	7	2	--	--	7	--	--	18
<i>Chasmodes saburrae</i>	--	--	--	--	--	--	--	--	--	--	--	1	1
<i>Chilomycterus schoepfi</i>	41	5	10	5	8	2	1	1	2	2	2	11	90
<i>Chloroscombrus chrysurus</i>	--	--	--	--	--	9	8	4	50	5	32	1	109
<i>Citharichthys spilopterus</i>	2	4	7	50	146	57	81	30	26	55	10	3	471
<i>Clupeidae</i> spp.	--	--	--	--	109	20	--	1	--	--	--	--	130
<i>Cynoscion nebulosus</i>	20	--	2	2	3	--	1	3	1	22	2	1	57
<i>Cynoscion regalis</i>	39	325	10	1	63	289	34	20	303	30	12	19	1,145
<i>Cynoscion</i> spp.	72	--	1	--	--	--	--	--	--	--	--	--	73
<i>Cyprinodon variegatus</i>	13	1	--	--	1	--	--	--	--	--	--	1	16
<i>Dasyatis sabina</i>	56	17	12	9	7	4	4	4	9	3	6	5	136
<i>Dasyatis say</i>	7	--	1	1	3	2	3	2	2	--	2	--	23
<i>Diapterus auratus</i>	2	--	--	--	--	1	17	18	135	141	43	61	418
<i>Diodon holocanthus</i>	--	--	--	--	1	--	--	--	--	--	--	--	1
<i>Diplectrum bivittatum</i>	--	--	--	--	--	1	--	--	--	--	--	--	1
<i>Diplectrum formosum</i>	--	--	--	--	--	--	--	--	--	1	--	--	1
<i>Diplectrum</i> spp.	--	--	--	--	--	--	--	--	--	2	--	--	2

Table 3-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2003.—Continued

[E, effort or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=45	E=47	E=48	E=46	E=48	E=47	E=48	E=48	E=48	E=49	E=48	E=48	
<i>Elops saurus</i>	--	1	--	1	--	--	--	--	3	--	--	--	5
<i>Epinephelus itajara</i>	--	--	--	--	--	--	--	--	1	--	--	1	2
<i>Etropus crossotus</i>	7	12	17	7	9	12	56	9	11	34	26	5	205
<i>Eucinostomus argenteus</i>	--	--	--	--	--	--	--	--	--	17	7	1	25
<i>Eucinostomus gula</i>	122	1	1	11	21	60	267	200	271	113	69	57	1,193
<i>Eucinostomus harengulus</i>	54	--	--	18	5	176	743	379	708	103	279	170	2,635
<i>Eucinostomus jonesi</i>	--	--	--	--	--	--	--	--	--	1	--	--	1
<i>Eucinostomus</i> spp.	57	--	--	--	177	873	245	134	487	2,477	1,437	462	6,349
<i>Farfantepenaeus aztecus</i>	1	1	37	26	706	39	6	13	8	10	144	10	1,001
<i>Farfantepenaeus duorarum</i>	4	16	79	84	132	54	41	204	64	361	371	24	1,434
<i>Fundulus confluentus</i>	--	--	3	2	--	--	--	--	--	--	--	--	5
<i>Fundulus grandis</i>	--	11	--	--	--	--	--	--	--	--	--	--	11
<i>Fundulus heteroclitus</i>	109	73	--	5	33	37	68	4	--	5	3	50	387
<i>Fundulus majalis</i>	290	28	29	1	32	40	24	22	8	28	28	35	565
<i>Gambusia holbrooki</i>	--	132	4	--	9	33	--	12	--	26	--	--	216
<i>Gobiidae</i> spp.	--	--	--	--	35	207	407	15	16	188	29	15	912
<i>Gobioides broussoneti</i>	--	--	1	--	--	--	--	--	--	--	--	--	1
<i>Gobionellus boleosoma</i>	8	66	18	6	--	--	--	--	--	--	--	--	98
<i>Gobionellus oceanicus</i>	2	--	13	--	--	--	--	--	--	--	--	--	15
<i>Gobionellus smaragdus</i>	--	1	3	8	--	--	--	--	--	--	--	--	12
<i>Gobionellus stigmaticus</i>	1	--	--	--	--	--	--	--	--	--	--	--	1
<i>Gobiosoma bosc</i>	11	7	2	--	--	3	--	1	5	73	2	--	104
<i>Gobiosoma robustum</i>	--	3	--	--	--	--	--	--	--	--	--	--	3
<i>Gymnura micrura</i>	--	--	2	1	9	16	10	1	2	1	2	1	45
<i>Harengula jaguana</i>	2	--	--	21	--	20	28	489	1,216	--	3	--	1,779
<i>Hippocampus erectus</i>	--	1	--	--	--	--	1	--	--	--	1	2	5
<i>Hypleurochilus bermudensis</i>	1	--	--	--	--	--	--	--	--	--	--	--	1
<i>Hyporhamphus meeki</i>	--	--	2	--	--	--	--	--	--	--	--	--	2
<i>Hypsoblennius ionthas</i>	1	--	--	--	--	--	--	--	--	--	--	--	1
<i>Ictalurus punctatus</i>	--	--	--	--	--	--	5	--	--	--	--	--	5
<i>Labrisomus nuchipinnis</i>	--	--	--	--	--	--	--	--	--	3	--	--	3
<i>Lagodon rhomboides</i>	883	1,198	317	225	950	275	185	125	131	43	26	179	4,537
<i>Leiostomus xanthurus</i>	986	7,052	3,945	1,049	1,382	465	291	109	100	14	15	45	15,453
<i>Lepisosteus osseus</i>	--	--	--	1	--	--	--	--	--	--	--	--	1
<i>Leptocephalus</i> spp.	2	--	1	1	1	--	--	--	--	6	2	--	13
<i>Limulus polyphemus</i>	1	11	3	--	--	--	1	--	1	5	2	2	26
<i>Litopenaeus setiferus</i>	182	107	108	19	24	246	62	76	5	347	79	108	1,363
<i>Lutjanus griseus</i>	7	4	--	1	3	1	1	--	3	14	13	5	52
<i>Lutjanus</i> spp.	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Lutjanus synagris</i>	--	--	--	--	--	9	34	12	9	39	6	3	112

Table 3-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2003.—Continued

[E, effort or total number of hauls; --, none identified. Species are arranged alphabetically]

[illegible]

Table 3-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2003.—Continued

[E, effort or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=45	E=47	E=48	E=46	E=48	E=47	E=48	E=48	E=48	E=49	E=48	E=48	
<i>Selar crumenophthalmus</i>	--	--	--	--	--	--	--	1	--	--	--	--	1
<i>Selene setapinnis</i>	--	--	--	--	--	--	--	1	--	--	--	--	1
<i>Selene vomer</i>	--	--	--	--	--	13	3	1	2	1	1	6	27
<i>Sphoeroides maculatus</i>	--	1	--	--	--	1	--	--	--	--	3	--	5
<i>Sphoeroides nephelus</i>	22	9	13	7	2	6	2	--	2	12	6	4	85
<i>Sphoeroides testudineus</i>	--	--	--	--	--	--	--	--	--	--	--	1	1
<i>Sphyraena barracuda</i>	--	--	--	--	1	--	--	1	1	7	2	--	12
<i>Sphyraena guachancho</i>	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Sphyrna tiburo</i>	--	--	--	--	1	--	--	--	--	--	--	--	1
<i>Stellifer lanceolatus</i>	9	10	17	4	13	15	2	--	5	--	--	--	75
<i>Stomolophus meleagris</i>	--	--	28	28	19	--	--	--	118	2	--	--	195
<i>Strongylura marina</i>	--	--	--	4	11	2	1	--	--	--	1	--	19
<i>Strongylura</i> spp.	--	1	--	1	1	--	--	3	1	1	--	--	8
<i>Symphurus plagiusa</i>	3	8	45	8	18	9	16	9	2	60	4	3	185
<i>Syngnathus fuscus</i>	1	1	--	--	1	--	--	--	--	--	--	--	3
<i>Syngnathus louisianae</i>	--	2	1	1	--	--	--	--	3	13	6	1	27
<i>Syngnathus scovelli</i>	--	1	1	--	--	--	--	--	--	--	--	--	2
<i>Syngnathus</i> spp.	--	--	--	4	4	1	6	2	--	3	3	1	24
<i>Synodus foetens</i>	9	4	2	2	38	92	39	13	22	47	4	15	287
<i>Trachinotus carolinus</i>	--	--	--	10	5	116	1	--	2	--	1	--	135
<i>Trachinotus falcatus</i>	--	--	--	--	19	20	8	--	7	35	108	4	201
<i>Trichiurus lepturus</i>	--	--	--	--	--	3	--	--	--	--	--	2	5
<i>Trinectes maculatus</i>	--	9	23	7	15	3	34	3	2	11	6	--	113
Unidentified species	2	1	--	--	1	1	--	--	--	--	7	--	12
<i>Urophycis floridana</i>	9	21	3	1	--	--	--	--	--	--	--	--	34
Totals	8,614	10,631	6,782	3,490	9,341	10,036	13,886	9,383	9,011	7,437	10,135	5,790	104,536

Table 3-7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2003.

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=259	E=311	E=108	E=47	E=108	E=48	E=107	E=105	E=47	
<i>Abudefduf saxatilis</i>	10	--	--	--	--	--	--	--	10	10
<i>Achirus lineatus</i>	13	306	144	7	52	6	73	32	5	319
<i>Ameiurus natalis</i>	--	1	1	--	--	--	--	--	--	1
<i>Anchoa hepsetus</i>	6,047	383	737	389	468	603	12	609	3,612	6,430
<i>Anchoa mitchilli</i>	17,668	10,045	9,364	232	4,979	192	6,090	6,329	527	27,713
<i>Ancylopsetta quadrocellata</i>	--	3	--	1	--	1	--	--	1	3
<i>Archosargus probatocephalus</i>	15	24	6	3	11	1	8	9	1	39
<i>Arius felis</i>	6	1,560	54	17	152	7	1,006	232	98	1,566
<i>Astroscopus y-graecum</i>	1	1	--	1	--	--	--	--	1	2
<i>Bagre marinus</i>	--	79	37	--	--	--	15	27	--	79
<i>Bairdiella chrysoura</i>	637	443	616	11	12	--	274	167	--	1,080
<i>Bathygobius soporator</i>	25	--	2	--	2	4	--	3	14	25
<i>Blenniidae</i> spp.	3	1	2	--	--	--	--	2	--	4
<i>Brevoortia</i> spp.	60	248	18	1	102	33	51	86	17	308
<i>Callinectes sapidus</i>	247	790	84	7	123	22	605	182	14	1,037
<i>Callinectes similis</i>	506	516	304	107	127	112	49	142	181	1,022
<i>Callinectes</i> spp.	11	--	--	--	--	--	11	--	--	11
<i>Carangidae</i> spp.	3	--	--	1	1	--	--	1	--	3
<i>Caranx hippos</i>	--	3	--	--	--	--	--	3	--	3
<i>Centropomus undecimalis</i>	4	--	--	--	1	--	2	1	--	4
<i>Centropristis philadelphica</i>	--	7	1	3	2	--	--	--	1	7
<i>Centropristis striata</i>	--	8	1	6	--	--	1	--	--	8
<i>Chaetodipterus faber</i>	1	37	6	--	6	1	20	3	2	38
<i>Charybdis hellerii</i>	2	16	6	5	4	--	--	1	2	18
<i>Chasmodes saburrae</i>	--	1	--	--	--	--	1	--	--	1
<i>Chilomycterus schoepfi</i>	--	90	3	3	14	2	13	50	5	90
<i>Chloroscombrus chrysurus</i>	--	109	56	11	35	--	2	4	1	109
<i>Citharichthys spilopterus</i>	234	237	118	43	75	10	75	127	23	471
<i>Clupeidae</i> spp.	130	--	79	19	2	1	14	15	--	130
<i>Cynoscion nebulosus</i>	26	31	20	--	4	--	31	2	--	57
<i>Cynoscion regalis</i>	310	835	948	--	16	--	119	59	3	1,145
<i>Cynoscion</i> spp.	73	--	--	1	72	--	--	--	--	73
<i>Cyprinodon variegatus</i>	16	--	2	--	1	1	11	1	--	16
<i>Dasyatis sabina</i>	20	116	19	4	17	1	23	63	9	136
<i>Dasyatis say</i>	2	21	7	3	2	2	--	8	1	23
<i>Diapterus auratus</i>	309	109	36	1	54	1	216	107	3	418
<i>Diodon holocanthus</i>	--	1	--	--	--	--	1	--	--	1
<i>Diplectrum bivittatum</i>	--	1	--	--	--	--	--	1	--	1
<i>Diplectrum formosum</i>	--	1	--	1	--	--	--	--	--	1

Table 3-7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2003.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=259	E=311	E=108	E=47	E=108	E=48	E=107	E=105	E=47	
<i>Diplectrum</i> spp.	2	--	--	2	--	--	--	--	--	2
<i>Elops saurus</i>	5	--	--	--	1	--	--	4	--	5
<i>Epinephelus itajara</i>	--	2	--	--	--	--	2	--	--	2
<i>Etropus crossotus</i>	36	169	46	44	22	10	6	38	39	205
<i>Eucinostomus argenteus</i>	16	9	3	4	3	--	--	1	14	25
<i>Eucinostomus gula</i>	835	358	62	45	175	23	92	588	208	1,193
<i>Eucinostomus harengulus</i>	2,087	548	62	54	618	254	565	392	690	2,635
<i>Eucinostomus jonesi</i>	1	--	--	--	--	--	--	1	--	1
<i>Eucinostomus</i> spp.	5,786	563	594	285	1,026	77	421	1,284	2,662	6,349
<i>Farfantepenaeus aztecus</i>	261	740	425	3	55	9	362	136	11	1,001
<i>Farfantepenaeus duorarum</i>	940	494	357	44	202	13	646	142	30	1,434
<i>Fundulus confluentus</i>	5	--	--	--	2	--	3	--	--	5
<i>Fundulus grandis</i>	11	--	--	--	1	--	--	10	--	11
<i>Fundulus heteroclitus</i>	384	3	93	26	153	31	35	44	5	387
<i>Fundulus majalis</i>	561	4	274	37	107	59	47	35	6	565
<i>Gambusia holbrooki</i>	214	2	8	--	18	--	28	162	--	216
<i>Gobiidae</i> spp.	896	16	15	52	406	18	41	329	51	912
<i>Gobioides broussoneti</i>	--	1	--	--	--	--	--	1	--	1
<i>Gobionellus boleosoma</i>	98	--	2	17	18	1	--	35	25	98
<i>Gobionellus oceanicus</i>	--	15	--	--	--	--	1	14	--	15
<i>Gobionellus smaragdus</i>	12	--	--	--	--	--	--	4	8	12
<i>Gobionellus stigmaticus</i>	--	1	--	--	--	--	--	1	--	1
<i>Gobiosoma bosc</i>	99	5	75	--	2	--	6	20	1	104
<i>Gobiosoma robustum</i>	3	--	2	--	--	--	1	--	--	3
<i>Gymnura micrura</i>	4	41	14	12	3	2	2	5	7	45
<i>Harengula jaguana</i>	1,776	3	62	36	1,220	351	--	5	105	1,779
<i>Hippocampus erectus</i>	--	5	1	--	1	--	--	1	2	5
<i>Hyleurochilus bermudensis</i>	--	1	--	--	--	--	--	1	--	1
<i>Hyporhamphus meeki</i>	2	--	--	--	--	--	--	--	2	2
<i>Hypsoblennius ionthas</i>	--	1	--	--	1	--	--	--	--	1
<i>Ictalurus punctatus</i>	--	5	--	--	--	--	5	--	--	5
<i>Labrisomus nuchipinnis</i>	3	--	--	--	--	--	--	--	3	3
<i>Lagodon rhomboides</i>	4,007	530	88	76	646	146	1,019	1,915	647	4,537
<i>Leiostomus xanthurus</i>	13,640	1,813	1,918	1,355	776	3,894	2,174	3,535	1,801	15,453
<i>Lepisosteus osseus</i>	--	1	--	--	--	--	1	--	--	1
<i>Leptocephalus</i> spp.	2	11	3	1	7	1	--	1	--	13
<i>Limulus polyphemus</i>	4	22	16	--	5	--	2	2	1	26
<i>Litopenaeus setiferus</i>	646	717	409	30	63	18	491	341	11	1,363
<i>Lutjanus griseus</i>	31	21	6	2	8	--	18	7	11	52

Table 3-7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2003.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=259	E=311	E=108	E=47	E=108	E=48	E=107	E=105	E=47	E=570
<i>Lutjanus</i> spp.	1	--	--	--	--	--	--	1	--	1
<i>Lutjanus synagris</i>	47	65	8	13	15	--	3	7	66	112
<i>Membras martinica</i>	988	17	49	76	19	1	834	19	7	1,005
<i>Menidia</i> spp.	4,178	16	929	970	543	87	1,009	641	15	4,194
<i>Menippe</i> spp.	1	58	5	2	18	--	28	4	2	59
<i>Menticirrhus americanus</i>	25	148	50	--	24	8	23	45	23	173
<i>Menticirrhus littoralis</i>	2	--	--	--	--	--	--	--	2	2
<i>Menticirrhus saxatilis</i>	1	6	6	--	--	--	--	--	1	7
<i>Microgobius gulosus</i>	22	2	9	--	2	--	7	6	--	24
<i>Micropogonias undulatus</i>	1,167	6,149	657	33	1,121	66	2,610	2,567	262	7,316
<i>Monacanthus hispidus</i>	6	20	6	6	4	6	--	--	4	26
<i>Mugil cephalus</i>	3,030	33	854	487	44	34	83	1,559	2	3,063
<i>Mugil curema</i>	1,441	139	53	35	218	9	220	1,027	18	1,580
<i>Mugil</i> spp.	442	19	6	3	19	9	174	21	229	461
<i>Myrophis punctatus</i>	1	--	--	--	--	--	--	1	--	1
<i>Ogcocephalus radiatus</i>	--	3	1	--	2	--	--	--	--	3
<i>Oligoplites saurus</i>	38	22	3	3	3	--	9	41	1	60
<i>Ophichthus gomesi</i>	--	1	1	--	--	--	--	--	--	1
<i>Ophidion</i> spp.	--	1	--	1	--	--	--	--	--	1
<i>Opisthonema oglinum</i>	1,548	3	429	273	95	223	2	4	525	1,551
<i>Opsanus tau</i>	--	147	4	--	5	--	133	5	--	147
<i>Orthopristis chrysoptera</i>	53	42	24	13	10	1	32	12	3	95
<i>Paralichthys albigutta</i>	86	39	15	55	18	5	13	10	9	125
<i>Paralichthys lethostigma</i>	8	8	4	--	1	1	5	4	1	16
<i>Paralichthys</i> spp.	1	--	--	1	--	--	--	--	--	1
<i>Paralichthys squamilentus</i>	1	--	--	--	--	1	--	--	--	1
<i>Peprilus alepidotus</i>	--	44	--	26	5	13	--	--	--	44
<i>Peprilus triacanthus</i>	2	3	--	--	--	1	--	2	2	5
<i>Poecilia latipinna</i>	152	8	1	--	33	--	19	106	1	160
<i>Pogonias cromis</i>	4	--	2	--	--	--	--	2	--	4
<i>Pomatomus saltatrix</i>	3	1	1	1	--	1	--	1	--	4
<i>Portunus gibbesi</i>	1	19	2	13	3	1	--	--	1	20
<i>Prionotus carolinus</i>	--	1	--	1	--	--	--	--	--	1
<i>Prionotus evolans</i>	--	1	1	--	--	--	--	--	--	1
<i>Prionotus scitulus</i>	3	155	13	85	9	23	--	18	10	158
<i>Prionotus</i> spp.	--	1	--	1	--	--	--	--	--	1
<i>Prionotus tribulus</i>	16	61	19	11	10	13	11	9	4	77
<i>Pristigenys alta</i>	--	1	--	1	--	--	--	--	--	1
<i>Sardinella aurita</i>	538	--	--	32	3	--	--	--	503	538

Table 3-7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2003.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=259	E=311	E=108	E=47	E=108	E=48	E=107	E=105	E=47	
<i>Sciaenidae</i> spp.	911	2	--	--	--	1	10	--	902	913
<i>Sciaenops ocellatus</i>	216	37	4	22	18	--	135	73	1	253
<i>Scorpaena brasiliensis</i>	1	1	1	--	--	--	--	--	1	2
<i>Selar crumenophthalmus</i>	1	--	--	--	--	--	--	--	1	1
<i>Selene setapinnis</i>	--	1	--	--	1	--	--	--	--	1
<i>Selene vomer</i>	--	27	16	--	2	1	7	1	--	27
<i>Sphoeroides maculatus</i>	1	4	--	--	4	--	--	1	--	5
<i>Sphoeroides nephelus</i>	18	67	3	4	16	6	41	10	5	85
<i>Sphoeroides testudineus</i>	1	--	--	--	--	--	--	1	--	1
<i>Sphyraena barracuda</i>	12	--	--	--	2	--	--	4	6	12
<i>Sphyraena guachancho</i>	--	1	--	--	--	--	--	1	--	1
<i>Sphyrna tiburo</i>	--	1	--	--	--	--	1	--	--	1
<i>Stellifer lanceolatus</i>	--	75	12	--	1	--	50	12	--	75
<i>Stomolophus meleagris</i>	7	188	4	85	15	81	--	7	3	195
<i>Strongylura marina</i>	19	--	2	--	1	--	4	3	9	19
<i>Strongylura</i> spp.	8	--	--	2	1	--	4	--	1	8
<i>Symphurus plagiusa</i>	82	103	77	10	16	6	39	29	8	185
<i>Syngnathus fuscus</i>	1	2	1	--	--	1	--	1	--	3
<i>Syngnathus louisianae</i>	16	11	12	3	2	2	1	4	3	27
<i>Syngnathus scovelli</i>	2	--	--	--	--	--	1	1	--	2
<i>Syngnathus</i> spp.	15	9	3	--	2	2	4	11	2	24
<i>Synodus foetens</i>	135	152	34	58	38	68	12	45	32	287
<i>Trachinotus carolinus</i>	134	1	2	13	1	11	--	--	108	135
<i>Trachinotus falcatus</i>	200	1	5	4	25	22	28	90	27	201
<i>Trichiurus lepturus</i>	--	5	3	--	--	--	2	--	--	5
<i>Trinectes maculatus</i>	23	90	36	5	4	1	57	8	2	113
Unidentified species	1	11	2	2	--	1	--	6	1	12
<i>Urophycis floridana</i>	3	31	14	3	8	--	2	7	--	34
Totals	74,359	30,177	20,589	5,355	14,254	6,613	20,304	23,747	13,674	104,536

Appendix 4. 2004 Survey Data (NC04)

Table 4–1. Summary of catch and effort data for Northern Coastal stratified-random sampling, 2004.

[CPUE, catch per unit effort]

Zone	21.3-m river seine			6.1-m otter trawl			Totals		
	Animals	Hauls	CPUE	Animals	Hauls	CPUE	Animals	Hauls	CPUE
A	18,339	44	417	6,023	53	114	24,362	97	251
AI	13,866	21	660	1,076	22	49	14,942	43	347
B	12,088	44	275	2,537	54	47	14,625	98	149
BI	9,915	22	451	894	22	41	10,809	44	246
C	7,338	44	167	8,357	55	152	15,695	99	159
D	41,610	44	946	5,981	55	109	47,591	99	481
DI	20,691	23	900	842	23	37	21,533	46	468
Totals	123,847	242	512	25,710	284	91	149,557	526	284

Table 4-2. Catch statistics for 10 dominant species collected in 242 21.3-m river seine samples during Northern Coastal stratified-random sampling, 2004.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean. Species are ranked in order of decreasing mean density]

Species	Number		%	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Anchoa mitchilli</i>	57,264	46.2	50.8	347.98	144.09	644.16	32,258.82	32	0.04	15	66
<i>Leiostomus xanthurus</i>	24,429	19.7	49.6	148.45	36.86	386.29	4,675.00	27	0.09	10	134
<i>Menidia</i> spp.	5,417	4.4	58.7	32.92	8.08	381.72	1,463.24	41	0.20	10	102
<i>Eucinostomus</i> spp.	4,117	3.3	51.2	25.02	4.72	293.72	735.29	28	0.12	8	79
<i>Clupeidae</i> spp.	3,931	3.2	9.1	23.89	21.05	1,370.67	5,091.18	25	0.05	18	37
<i>Micropogonias undulatus</i>	3,531	2.9	23.6	21.46	11.48	832.38	2,491.18	19	0.12	10	90
<i>Lagodon rhomboides</i>	3,314	2.7	51.2	20.14	5.77	445.57	1,280.88	38	0.31	9	177
<i>Harengula jaguana</i>	2,724	2.2	11.6	16.55	12.33	1,158.62	2,955.88	66	0.36	21	105
<i>Anchoa hepsetus</i>	2,252	1.8	26.4	13.68	3.01	342.53	375.00	35	0.19	18	83
<i>Fundulus majalis</i>	1,621	1.3	33.1	9.85	2.35	370.55	316.18	37	0.39	11	102
Subtotal	108,600	87.7								8	177
Totals	123,847	100.0		752.59	150.87	311.86	32,344.12			2	458

Table 4-3. Catch statistics for Selected Species collected in 242 21.3-m river seine samples during Northern Coastal stratified-random sampling, 2004.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean. Species are ranked in order of decreasing mean density]

Species	Number		% Occur	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Leiostomus xanthurus</i>	24,429	19.7	49.6	148.45	36.86	386.29	4,675.00	27	0.09	10	134
<i>Micropogonias undulatus</i>	3,531	2.9	23.6	21.46	11.48	832.38	2,491.18	19	0.12	10	90
<i>Litopenaeus setiferus</i>	866	0.7	28.5	5.26	1.86	549.15	392.65	10	0.16	3	36
<i>Farfantepenaeus duorarum</i>	471	0.4	28.1	2.86	0.76	412.06	107.35	9	0.14	3	21
<i>Farfantepenaeus aztecus</i>	445	0.4	16.5	2.70	0.72	415.21	107.35	13	0.16	3	32
<i>Callinectes sapidus</i>	289	0.2	37.6	1.76	0.28	251.61	35.29	26	1.79	4	153
<i>Mugil curema</i>	288	0.2	20.7	1.75	0.56	497.36	116.18	90	1.76	29	244
<i>Trachinotus falcatus</i>	188	0.2	18.6	1.14	0.32	435.77	50.00	19	0.78	7	90
<i>Paralichthys albigutta</i>	100	0.1	13.2	0.61	0.18	459.98	27.94	55	3.34	9	203
<i>Cynoscion nebulosus</i>	72	0.1	8.7	0.44	0.15	537.61	27.94	38	2.72	12	134
<i>Mugil cephalus</i>	72	0.1	13.6	0.44	0.10	362.66	13.24	167	8.13	52	332
<i>Sciaenops ocellatus</i>	64	0.1	12.0	0.39	0.08	336.69	8.82	91	8.09	17	316
<i>Lutjanus griseus</i>	51	0.0	10.7	0.31	0.07	343.44	7.35	63	8.45	11	251
<i>Menticirrhus americanus</i>	28	0.0	5.8	0.17	0.06	569.83	8.82	42	4.08	18	111
<i>Trachinotus carolinus</i>	22	0.0	4.1	0.13	0.05	539.63	5.88	22	4.39	8	85
<i>Archosargus probatocephalus</i>	21	0.0	3.3	0.13	0.05	643.62	8.82	138	22.40	16	260
<i>Pomatomus saltatrix</i>	18	0.0	2.1	0.11	0.08	1,144.54	19.12	37	1.59	21	48
<i>Paralichthys lethostigma</i>	16	0.0	5.8	0.10	0.03	445.86	4.41	231	29.52	32	403
<i>Centropomus undecimalis</i>	14	0.0	3.3	0.09	0.04	748.51	8.82	116	27.62	21	385
<i>Cynoscion regalis</i>	6	0.0	1.7	0.04	0.02	894.41	4.41	41	4.60	27	55
<i>Menticirrhus littoralis</i>	5	0.0	0.4	0.03	0.03	1,555.63	7.35	120	8.36	98	135
<i>Elops saurus</i>	3	0.0	0.8	0.02	0.01	1,157.58	2.94	232	40.40	152	280
<i>Lutjanus synagris</i>	3	0.0	1.2	0.02	0.01	894.41	1.47	29	5.17	23	39
<i>Paralichthys dentatus</i>	3	0.0	0.8	0.02	0.01	1,157.58	2.94	64	12.00	52	88
<i>Pogonias cromis</i>	1	0.0	0.4	0.01	0.01	1,555.63	1.47	350		350	350
Totals	31,006	25.0	92.1	188.42	38.43	317.32	4,741.18			3	403

Table 4-4. Catch statistics for 10 dominant species collected in 284 bay 6.1-m otter trawl samples during Northern Coastal stratified-random sampling, 2004.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean. Species are ranked in order of decreasing mean density]

Species	Number		% Occur	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Micropogonias undulatus</i>	4,457	17.3	39.4	2.12	0.58	462.77	119.67	43	0.50	7	192
<i>Anchoa mitchilli</i>	3,253	12.7	33.5	1.55	0.32	349.63	52.75	48	0.13	19	70
<i>Arius felis</i>	2,292	8.9	46.1	1.09	0.28	433.78	65.43	118	1.49	30	396
<i>Leiostomus xanthurus</i>	1,930	7.5	27.1	0.92	0.22	410.15	38.05	72	0.53	10	201
<i>Stellifer lanceolatus</i>	1,635	6.4	17.3	0.78	0.26	565.50	49.38	29	0.39	8	147
<i>Farfantepenaeus aztecus</i>	1,536	6.0	20.4	0.73	0.31	715.89	65.03	19	0.15	6	34
<i>Callinectes sapidus</i>	1,299	5.1	48.9	0.62	0.09	255.28	13.36	101	1.13	5	180
<i>Callinectes similis</i>	1,011	3.9	37.3	0.48	0.08	283.82	11.74	65	0.74	12	172
<i>Litopenaeus setiferus</i>	777	3.0	31.7	0.37	0.06	294.68	9.31	20	0.24	3	64
<i>Cynoscion regalis</i>	758	2.9	30.3	0.36	0.08	353.00	11.60	49	1.39	9	271
Subtotal	18,948	73.7								3	396
Totals	25,710	100.0		12.71	1.27	164.68	145.44			3	832

Table 4-5. Catch statistics for Selected Species collected in 284 bay 6.1-m otter trawl samples during Northern Coastal stratified-random sampling, 2004.

[%, percentage of the total catch represented by that species; % Occur, percentage of samples in which that species was collected; Stderr, standard error; CV, coefficient of variation of the mean; --, not applicable. Species are ranked in order of decreasing mean density]

Species	Number		%	Density Estimate (animals/100m ²)				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
<i>Micropogonias undulatus</i>	4,457	17.3	39.4	2.12	0.58	462.77	119.67	43	0.50	7	192
<i>Leiostomus xanthurus</i>	1,930	7.5	27.1	0.92	0.22	410.15	38.05	72	0.53	10	201
<i>Farfantepenaeus aztecus</i>	1,536	6.0	20.4	0.73	0.31	715.89	65.03	19	0.15	6	34
<i>Callinectes sapidus</i>	1,299	5.1	48.9	0.62	0.09	255.28	13.36	101	1.13	5	180
<i>Litopenaeus setiferus</i>	777	3.0	31.7	0.37	0.06	294.68	9.31	20	0.24	3	64
<i>Cynoscion regalis</i>	758	2.9	30.3	0.36	0.08	353.00	11.60	49	1.39	9	271
<i>Farfantepenaeus duorarum</i>	343	1.3	20.1	0.16	0.04	377.05	5.40	13	0.23	6	28
<i>Menticirrhus americanus</i>	273	1.1	23.6	0.13	0.03	342.33	3.91	52	2.26	10	207
<i>Paralichthys albigutta</i>	49	0.2	10.9	0.02	0.01	381.40	1.08	161	5.90	59	272
<i>Menippe</i> spp.	47	0.2	8.8	0.02	0.01	519.55	1.62	40	4.38	7	114
<i>Archosargus probatocephalus</i>	44	0.2	4.9	0.02	0.01	796.72	2.43	249	9.44	105	409
<i>Lutjanus griseus</i>	21	0.1	2.5	0.01	0.01	1,076.90	1.75	182	14.53	39	254
<i>Paralichthys lethostigma</i>	16	0.1	4.6	0.01	0.00	484.65	0.27	222	16.31	106	333
<i>Cynoscion nebulosus</i>	11	0.0	2.5	0.01	0.00	848.61	0.67	81	22.94	10	204
<i>Sciaenops ocellatus</i>	8	0.0	1.8	0.00	0.00	838.14	0.40	48	17.24	10	118
<i>Lutjanus synagris</i>	4	0.0	1.1	0.00	0.00	1,028.95	0.27	23	3.28	19	33
<i>Menticirrhus saxatilis</i>	2	0.0	0.7	0.00	0.00	1,189.53	0.13	29	6.00	23	35
<i>Mugil curema</i>	2	0.0	0.7	0.00	0.00	1,189.53	0.13	108	8.00	100	116
<i>Elops saurus</i>	1	0.0	0.4	0.00	0.00	1,685.23	0.13	259	--	259	259
<i>Epinephelus itajara</i>	1	0.0	0.4	0.00	0.00	1,685.23	0.13	455	--	455	455
<i>Trachinotus falcatus</i>	1	0.0	0.4	0.00	0.00	1,685.23	0.13	50	--	50	50
<i>Mugil cephalus</i>	1	0.0	0.4	0.00	0.00	1,685.23	0.13	220	--	220	220
Totals	11,581	45.0	79.9	5.50	0.90	274.61	130.46			3	455

Table 4-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2004.

[E, effort, or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=0	E=48	E=48	E=47	E=47	E=48	E=48	E=48	E=48	E=48	E=47	E=49	
<i>Abudefduf saxatilis</i>	--	--	--	--	--	1	--	--	--	--	--	--	1
<i>Achirus lineatus</i>	--	3	1	15	28	23	18	70	171	28	3	10	370
<i>Aluterus</i> spp.	--	--	--	--	--	1	--	--	--	--	--	--	1
<i>Anchoa hepsetus</i>	--	19	8	89	789	494	445	192	231	26	3	2	2,298
<i>Anchoa mitchilli</i>	--	691	437	2,028	725	1,789	1,437	2,380	10,718	33,298	6,651	363	60,517
<i>Anchoa</i> spp.	--	--	--	2	--	3	--	--	--	--	--	--	5
<i>Ancylorsetta quadrocellata</i>	--	--	1	2	6	1	4	--	--	--	--	--	14
<i>Archosargus probatocephalus</i>	--	--	--	1	8	12	--	31	9	2	1	1	65
<i>Arius felis</i>	--	71	23	122	95	158	254	385	767	345	45	50	2,315
<i>Astroscopus y-graecum</i>	--	3	1	6	--	1	--	--	--	--	1	--	12
<i>Bagre marinus</i>	--	--	--	--	--	--	4	15	1	1	--	--	21
<i>Bairdiella chrysoura</i>	--	1	10	21	42	46	25	97	26	17	14	18	317
<i>Bathygobius soporator</i>	--	--	--	--	1	2	3	1	--	1	--	--	8
<i>Blenniidae</i> spp.	--	--	--	--	2	4	1	--	--	--	--	--	7
<i>Bothidae</i> spp.	--	1	1	--	--	--	--	2	--	--	--	--	4
<i>Brevoortia</i> spp.	--	49	6	17	1	20	31	8	--	--	2	1	135
<i>Callinectes ornatus</i>	--	--	--	--	--	--	--	--	--	--	1	5	6
<i>Callinectes sapidus</i>	--	96	118	239	140	120	203	231	223	140	24	54	1,588
<i>Callinectes similis</i>	--	25	43	260	419	429	395	121	79	77	13	9	1,870
<i>Callinectes</i> spp.	--	--	--	--	--	5	--	13	--	--	--	--	18
<i>Carangidae</i> spp.	--	--	--	1	--	--	--	--	--	--	--	--	1
<i>Caranx bartholomaei</i>	--	--	--	1	2	--	1	--	1	6	--	--	11
<i>Caranx hippos</i>	--	--	--	1	--	--	--	--	--	--	--	--	1
<i>Caranx latus</i>	--	--	--	--	--	1	--	--	--	--	--	--	1
<i>Caranx</i> spp.	--	--	--	--	--	1	--	--	--	--	--	--	1
<i>Carcharhinus brevipinna</i>	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Carcharhinus limbatus</i>	--	--	--	--	--	1	--	--	--	--	--	--	1
<i>Centropomus undecimalis</i>	--	--	--	--	--	1	--	1	1	5	6	--	14
<i>Centropristis philadelphica</i>	--	--	1	--	--	1	--	--	1	1	1	--	5
<i>Centropristis striata</i>	--	--	13	3	4	3	4	3	6	--	--	2	38
<i>Chaetodipterus faber</i>	--	1	2	1	13	10	3	55	58	10	2	3	158
<i>Charybdis hellerii</i>	--	--	7	10	6	1	2	3	--	--	--	--	29
<i>Chilomycterus schoepfi</i>	--	3	4	1	1	7	6	6	3	3	2	2	38
<i>Chloroscombrus chrysurus</i>	--	--	--	--	--	28	--	5	17	1	--	2	53
<i>Citharichthys macrops</i>	--	--	2	--	--	--	--	--	--	--	--	--	2
<i>Citharichthys spilopterus</i>	--	8	26	96	131	249	73	18	32	104	13	23	773
<i>Clupeidae</i> spp.	--	--	--	--	3,635	105	--	1	136	--	--	55	3,932
<i>Cynoscion nebulosus</i>	--	--	--	5	--	13	43	8	9	3	--	2	83
<i>Cynoscion regalis</i>	--	3	2	19	14	115	39	354	111	50	26	31	764
<i>Cynoscion</i> spp.	--	--	--	--	2	--	--	--	--	--	--	--	2

Table 4–6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2004.—Continued

[E, effort, or total number of hauls; --, none identified. Species are arranged alphabetically]

[illegible]

Table 4-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2004.—Continued

[E, effort, or total number of hauls; --, none identified. Species are arranged alphabetically]

[illegible]

Table 4-6. Monthly summary of species collected during Northern Coastal stratified-random sampling, 2004.—Continued

[E, effort, or total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Month												Totals
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	E=0	E=48	E=48	E=47	E=47	E=48	E=48	E=48	E=48	E=48	E=47	E=49	
<i>Pomatomus saltatrix</i>	--	--	--	--	1	2	--	--	--	15	--	--	18
<i>Portunus gibbesi</i>	--	--	1	--	--	--	--	--	--	--	--	1	2
<i>Portunus</i> spp.	--	3	--	2	132	155	35	49	2	2	2	1	383
<i>Prionotus scitulus</i>	--	--	4	3	30	67	29	18	4	--	2	3	160
<i>Prionotus tribulus</i>	--	6	13	38	8	8	5	9	--	3	2	5	97
<i>Rhinobatos lentiginosus</i>	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Rhinoptera bonasus</i>	--	--	3	--	--	--	--	--	--	--	--	--	3
<i>Sardinella aurita</i>	--	--	--	--	11	290	--	--	--	9	--	--	310
<i>Sciaenidae</i> spp.	--	13	--	--	3	--	--	539	--	121	--	--	676
<i>Sciaenops ocellatus</i>	--	8	7	19	2	8	--	--	2	23	--	3	72
<i>Scombridae</i> spp.	--	--	--	--	1	--	--	--	2	1	--	--	4
<i>Scorpaena brasiliensis</i>	--	--	1	1	1	1	--	--	--	--	--	--	4
<i>Scorpaena plumieri</i>	--	--	--	--	--	--	--	1	--	--	--	--	1
<i>Scorpaenidae</i> spp.	--	--	--	--	--	--	--	1	--	--	--	--	1
<i>Selene setapinnis</i>	--	--	--	--	--	--	--	--	--	--	8	--	8
<i>Selene vomer</i>	--	--	--	1	1	2	1	4	3	6	2	4	24
<i>Serranidae</i> spp.	--	--	--	--	--	--	--	--	1	--	--	--	1
<i>Sphoeroides maculatus</i>	--	--	--	1	--	--	--	5	--	--	--	--	6
<i>Sphoeroides nephelus</i>	--	1	8	3	13	24	1	8	6	3	3	--	70
<i>Sphoeroides</i> spp.	--	--	--	1	1	2	3	4	--	--	--	--	11
<i>Sphoeroides testudineus</i>	--	--	1	--	2	--	--	--	--	--	--	1	4
<i>Sphyraena barracuda</i>	--	--	--	2	--	5	2	--	--	9	--	--	18
<i>Sphyrna tiburo</i>	--	--	--	2	--	--	--	--	--	--	--	--	2
<i>Stellifer lanceolatus</i>	--	--	--	4	3	5	--	935	321	323	5	40	1,636
<i>Stomolophus meleagris</i>	--	2	--	--	--	--	--	--	--	--	--	--	2
<i>Strongylura marina</i>	--	--	--	--	4	--	--	--	--	1	--	--	5
<i>Strongylura notata</i>	--	--	--	1	--	--	--	3	2	1	7	--	14
<i>Strongylura</i> spp.	--	--	--	2	--	1	1	2	1	--	--	--	7
<i>Symphurus plagiusa</i>	--	3	6	12	5	40	11	111	233	38	3	1	463
<i>Syngnathus louisianae</i>	--	1	3	--	--	--	--	4	--	--	1	--	9
<i>Syngnathus</i> spp.	--	3	1	3	1	5	3	6	--	--	--	1	23
<i>Synodus foetens</i>	--	11	6	35	52	67	27	22	26	15	4	7	272
<i>Trachinotus carolinus</i>	--	--	--	--	--	11	1	--	1	5	4	--	22
<i>Trachinotus falcatus</i>	--	--	--	3	20	25	9	9	63	37	17	6	189
<i>Trachurus lathami</i>	--	--	--	--	--	--	1	--	--	--	--	--	1
<i>Trichiurus lepturus</i>	--	--	--	5	2	--	--	--	--	2	--	1	10
<i>Trinectes maculatus</i>	--	1	2	8	6	24	2	33	40	33	3	--	152
Unidentified species	--	--	1	8	1	1	2	2	2	5	2	1	25
<i>Urophycis floridana</i>	--	1	12	--	--	--	--	--	--	--	--	--	13
Totals	--	7,652	18,467	14,277	10,814	10,162	9,612	9,651	16,113	39,140	8,077	5,592	149,557

Table 4-7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2004.

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=242	E=284	E=97	E=43	E=98	E=44	E=99	E=99	E=46	
<i>Abudefduf saxatilis</i>	1	--	--	--	--	1	--	--	--	1
<i>Achirus lineatus</i>	23	347	34	4	25	12	233	54	8	370
<i>Aluterus</i> spp.	--	1	--	--	--	1	--	--	--	1
<i>Anchoa hepsetus</i>	2,252	46	1,034	171	561	125	93	97	217	2,298
<i>Anchoa mitchilli</i>	57,264	3,253	5,710	3,591	2,928	1,228	2,286	32,273	12,501	60,517
<i>Anchoa</i> spp.	1	4	1	1	--	1	2	--	--	5
<i>Ancylosetta quadrocellata</i>	--	14	3	4	2	4	--	--	1	14
<i>Archosargus probatocephalus</i>	21	44	2	--	29	1	4	19	10	65
<i>Arius felis</i>	23	2,292	64	2	204	26	1,223	778	18	2,315
<i>Astroscopus y-graecum</i>	10	2	5	2	2	3	--	--	--	12
<i>Bagre marinus</i>	--	21	5	--	4	--	5	7	--	21
<i>Bairdiella chrysoura</i>	42	275	27	35	32	2	140	79	2	317
<i>Bathygobius soporator</i>	8	--	1	1	2	1	--	2	1	8
<i>Blenniidae</i> spp.	3	4	--	--	--	4	--	1	2	7
<i>Bothidae</i> spp.	3	1	2	--	--	--	2	--	--	4
<i>Brevoortia</i> spp.	124	11	11	7	44	67	3	1	2	135
<i>Callinectes ornatus</i>	1	5	--	--	--	4	--	1	1	6
<i>Callinectes sapidus</i>	289	1,299	103	13	118	10	685	452	207	1,588
<i>Callinectes similis</i>	859	1,011	316	318	362	431	163	212	68	1,870
<i>Callinectes</i> spp.	16	2	5	6	1	--	2	4	--	18
<i>Carangidae</i> spp.	--	1	1	--	--	--	--	--	--	1
<i>Caranx bartholomaei</i>	11	--	1	7	1	2	--	--	--	11
<i>Caranx hippos</i>	--	1	--	--	--	--	1	--	--	1
<i>Caranx latus</i>	1	--	1	--	--	--	--	--	--	1
<i>Caranx</i> spp.	1	--	--	--	1	--	--	--	--	1
<i>Carcharhinus brevipinna</i>	--	1	--	--	--	--	1	--	--	1
<i>Carcharhinus limbatus</i>	--	1	1	--	--	--	--	--	--	1
<i>Centropomus undecimalis</i>	14	--	--	--	--	--	8	4	2	14
<i>Centropristis philadelphica</i>	--	5	1	1	2	--	1	--	--	5
<i>Centropristis striata</i>	1	37	10	1	7	14	--	2	4	38
<i>Chaetodipterus faber</i>	4	154	58	--	74	--	12	10	4	158
<i>Charybdis hellerii</i>	--	29	5	2	2	10	7	2	1	29
<i>Chilomycterus schoepfi</i>	1	37	1	3	8	3	12	5	6	38
<i>Chloroscombrus chrysurus</i>	41	12	3	4	3	1	6	30	6	53
<i>Citharichthys macrops</i>	--	2	--	2	--	--	--	--	--	2
<i>Citharichthys spilopterus</i>	395	378	160	74	44	19	144	312	20	773
<i>Clupeidae</i> spp.	3,931	1	3,645	--	64	60	53	1	109	3,932
<i>Cynoscion nebulosus</i>	72	11	3	--	5	5	60	10	--	83
<i>Cynoscion regalis</i>	6	758	157	103	101	18	226	73	86	764

Table 4-7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2004.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=242	E=284	E=97	E=43	E=98	E=44	E=99	E=99	E=46	
<i>Cynoscion</i> spp.	--	2	--	--	--	--	--	2	--	2
<i>Cyprinodon variegatus</i>	27	--	5	3	4	1	12	--	2	27
<i>Dasyatis sabina</i>	10	41	17	3	10	1	7	11	2	51
<i>Dasyatis say</i>	1	6	1	3	1	1	--	1	--	7
<i>Diapterus auratus</i>	95	21	54	--	9	--	8	42	3	116
<i>Diapterus plumieri</i>	1	--	--	--	--	--	--	1	--	1
<i>Diplodus argenteus</i>	9	--	--	--	--	--	--	9	--	9
<i>Diplodus holbrooki</i>	5	--	--	5	--	--	--	--	--	5
<i>Echeneis naucrates</i>	--	2	--	--	--	--	--	1	1	2
<i>Elops saurus</i>	3	1	2	--	1	--	--	1	--	4
<i>Epinephelus itajara</i>	--	1	--	--	--	--	--	1	--	1
<i>Etropus crossotus</i>	35	96	78	19	3	5	--	15	11	131
<i>Eucinostomus gula</i>	592	140	59	41	256	4	46	219	107	732
<i>Eucinostomus harengulus</i>	1,608	365	297	61	705	63	243	311	293	1,973
<i>Eucinostomus</i> spp.	4,117	502	301	857	1,220	38	532	1,021	650	4,619
<i>Euleptorhamphus velox</i>	1	--	--	--	--	1	--	--	--	1
<i>Farfantepenaeus aztecus</i>	445	1,536	78	13	57	26	1,076	728	3	1,981
<i>Farfantepenaeus duorarum</i>	471	343	84	13	82	9	389	221	16	814
<i>Farfantepenaeus</i> spp.	916	384	185	146	398	40	191	174	166	1,300
<i>Fundulus confluentus</i>	55	--	6	10	1	38	--	--	--	55
<i>Fundulus grandis</i>	306	--	184	114	8	--	--	--	--	306
<i>Fundulus heteroclitus</i>	1,444	--	337	1,058	8	9	28	2	2	1,444
<i>Fundulus majalis</i>	1,621	--	437	466	216	91	299	58	54	1,621
<i>Fundulus</i> spp.	943	167	405	697	4	4	--	--	--	1,110
<i>Gambusia holbrooki</i>	24	--	--	--	9	--	12	2	1	24
<i>Gobiesox strumosus</i>	2	3	--	--	1	2	2	--	--	5
<i>Gobiidae</i> spp.	80	2	3	6	13	2	6	28	24	82
<i>Gobionides broussoneti</i>	--	1	--	--	--	--	1	--	--	1
<i>Gobionellus boleosoma</i>	429	9	35	54	72	6	10	193	68	438
<i>Gobionellus oceanicus</i>	28	81	4	--	3	--	37	65	--	109
<i>Gobionellus smaragdus</i>	6	1	1	--	2	--	--	2	2	7
<i>Gobionellus</i> spp.	1	--	--	--	--	--	1	--	--	1
<i>Gobionellus stigmaticus</i>	--	2	--	--	--	--	--	2	--	2
<i>Gobiosoma bosc</i>	113	7	13	--	26	1	63	16	1	120
<i>Gobiosoma robustum</i>	4	6	3	--	--	2	--	4	1	10
<i>Gobiosoma</i> spp.	1	--	--	--	--	--	1	--	--	1
<i>Gymnura micrura</i>	3	32	11	9	2	4	1	4	4	35
<i>Haemulidae</i> spp.	--	2	--	--	--	1	--	--	1	2

Table 4-7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2004.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=242	E=284	E=97	E=43	E=98	E=44	E=99	E=99	E=46	
<i>Harengula jaguana</i>	2,724	--	148	6	129	2,017	1	47	376	2,724
<i>Hippocampus erectus</i>	--	7	3	1	--	1	--	1	1	7
<i>Lactophrys</i> spp.	1	--	--	--	--	--	--	1	--	1
<i>Lagodon rhomboides</i>	3,314	233	57	40	562	66	589	2,147	86	3,547
<i>Larimus fasciatus</i>	--	60	--	59	1	--	--	--	--	60
<i>Leiostomus xanthurus</i>	24,429	1,930	2,065	5,260	3,741	4,977	1,527	3,221	5,568	26,359
<i>Leptocephalus</i> spp.	4	59	22	4	15	3	11	8	--	63
<i>Limulus polyphemus</i>	2	12	1	--	4	1	--	7	1	14
<i>Litopenaeus setiferus</i>	866	777	709	234	128	4	390	142	36	1,643
<i>Lobotes surinamensis</i>	--	1	1	--	--	--	--	--	--	1
<i>Lutjanidae</i> spp.	2	1	--	--	2	1	--	--	--	3
<i>Lutjanus griseus</i>	51	21	3	2	31	5	17	10	4	72
<i>Lutjanus</i> spp.	4	--	--	--	--	--	4	--	--	4
<i>Lutjanus synagris</i>	3	4	1	2	--	2	--	--	2	7
<i>Membras martinica</i>	62	--	30	31	--	1	--	--	--	62
<i>Menidia</i> spp.	5,417	--	2,048	661	307	90	1,697	537	77	5,417
<i>Menippe</i> spp.	--	47	3	2	14	1	17	7	3	47
<i>Menticirrhus americanus</i>	28	273	100	14	57	4	24	61	41	301
<i>Menticirrhus littoralis</i>	5	--	--	--	--	5	--	--	--	5
<i>Menticirrhus saxatilis</i>	--	2	--	1	1	--	--	--	--	2
<i>Menticirrhus</i> spp.	--	4	1	--	--	--	--	3	--	4
<i>Microgobius gulosus</i>	111	6	6	--	17	--	79	12	3	117
<i>Microgobius</i> spp.	8	4	--	4	1	--	7	--	--	12
<i>Microgobius thalassinus</i>	3	1	--	--	1	--	3	--	--	4
<i>Micropogonias undulatus</i>	3,531	4,457	1,407	104	846	451	1,977	3,151	52	7,988
<i>Monacanthus hispidus</i>	42	36	5	3	6	57	4	3	--	78
<i>Mugil cephalus</i>	72	1	16	5	16	1	6	24	5	73
<i>Mugil curema</i>	288	2	22	25	66	20	10	144	3	290
<i>Mugil</i> spp.	1,333	--	252	211	215	191	214	51	199	1,333
<i>Ogcocephalus radiatus</i>	--	10	4	4	2	--	--	--	--	10
<i>Oligoplites saurus</i>	50	--	8	2	8	4	10	12	6	50
<i>Opisthonema oglinum</i>	1,305	31	1,011	33	184	16	27	3	62	1,336
<i>Opsanus tau</i>	5	60	12	1	8	1	34	8	1	65
<i>Orthopristis chrysoptera</i>	100	113	71	5	21	26	37	40	13	213
<i>Paralichthys albigutta</i>	100	49	19	46	12	12	9	34	17	149
<i>Paralichthys dentatus</i>	3	--	--	--	--	3	--	--	--	3
<i>Paralichthys lethostigma</i>	16	16	7	4	6	3	6	5	1	32
<i>Paralichthys</i> spp.	2	--	--	1	1	--	--	--	--	2

Table 4-7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2004.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

Species	Gear and Strata		Zone							Totals
	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=242	E=284	E=97	E=43	E=98	E=44	E=99	E=99	E=46	
<i>Penaeidae</i> spp.	2	9	4	5	--	--	1	1	--	11
<i>Peprilus alepidotus</i>	--	14	--	--	--	--	2	--	12	14
<i>Peprilus burti</i>	--	2	--	--	1	--	--	1	--	2
<i>Poecilia latipinna</i>	85	--	1	3	11	2	44	24	--	85
<i>Pogonias cromis</i>	1	--	--	1	--	--	--	--	--	1
<i>Pomatomus saltatrix</i>	18	--	14	1	3	--	--	--	--	18
<i>Portunus gibbesi</i>	--	2	--	1	1	--	--	--	--	2
<i>Portunus</i> spp.	79	304	27	14	23	254	3	18	44	383
<i>Prionotus scitulus</i>	12	148	30	19	8	35	--	32	36	160
<i>Prionotus tribulus</i>	22	75	15	10	11	5	10	35	11	97
<i>Rhinobatos lentiginosus</i>	--	1	--	--	1	--	--	--	--	1
<i>Rhinoptera bonasus</i>	--	3	--	--	--	--	--	--	3	3
<i>Sardinella aurita</i>	310	--	233	--	--	19	--	--	58	310
<i>Sciaenidae</i> spp.	1	675	656	11	--	--	7	2	--	676
<i>Sciaenops ocellatus</i>	64	8	7	--	8	2	28	26	1	72
<i>Scombridae</i> spp.	4	--	--	1	--	--	--	1	2	4
<i>Scorpaena brasiliensis</i>	--	4	--	--	1	1	1	1	--	4
<i>Scorpaena plumieri</i>	--	1	--	--	1	--	--	--	--	1
<i>Scorpaenidae</i> spp.	--	1	--	--	1	--	--	--	--	1
<i>Selene setapinnis</i>	--	8	--	--	--	--	7	--	1	8
<i>Selene vomer</i>	4	20	10	7	3	--	2	--	2	24
<i>Serranidae</i> spp.	--	1	--	--	1	--	--	--	--	1
<i>Sphoeroides maculatus</i>	--	6	1	--	--	--	5	--	--	6
<i>Sphoeroides nephelus</i>	27	43	9	5	18	8	13	9	8	70
<i>Sphoeroides</i> spp.	6	5	2	--	2	--	1	1	5	11
<i>Sphoeroides testudineus</i>	2	2	--	--	--	--	--	4	--	4
<i>Sphyrna barracuda</i>	18	--	2	1	--	--	--	6	9	18
<i>Sphyrna tiburo</i>	--	2	2	--	--	--	--	--	--	2
<i>Stellifer lanceolatus</i>	1	1,635	1,089	1	283	--	219	39	5	1,636
<i>Stomolophus meleagris</i>	--	2	--	--	--	2	--	--	--	2
<i>Strongylura marina</i>	5	--	3	--	--	--	--	2	--	5
<i>Strongylura notata</i>	14	--	--	--	--	1	1	9	3	14
<i>Strongylura</i> spp.	7	--	--	--	3	--	1	1	2	7
<i>Symphurus plagiusa</i>	64	399	119	17	23	4	260	38	2	463
<i>Syngnathus louisianae</i>	3	6	2	--	4	--	2	1	--	9
<i>Syngnathus</i> spp.	11	12	--	3	10	1	5	3	1	23
<i>Synodus foetens</i>	172	100	63	56	28	40	4	37	44	272
<i>Trachinotus carolinus</i>	22	--	2	5	--	9	--	6	--	22

Table 4–7. Summary, by gear and zone, of species collected during Northern Coastal stratified-random sampling, 2004.—Continued

[E, effort, or the total number of hauls; --, none identified. Species are arranged alphabetically]

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	21.3-m river seine	6.1-m otter trawl	A	AI	B	BI	C	D	DI	
	E=242	E=284	E=97	E=43	E=98	E=44	E=99	E=99	E=46	E=526
<i>Trachinotus falcatus</i>	188	1	9	49	32	55	9	7	28	189
<i>Trachurus lathami</i>	--	1	--	--	--	1	--	--	--	1
<i>Trichiurus lepturus</i>	--	10	3	--	--	--	--	2	5	10
<i>Trinectes maculatus</i>	3	149	56	21	5	1	28	40	1	152
Unidentified species	7	18	1	5	2	4	5	3	5	25
<i>Urophycis floridana</i>	--	13	--	11	2	--	--	--	--	13
Totals	123,847	25,710	24,362	14,942	14,625	10,809	15,695	47,591	21,533	149,557

ISBN 978-1-4113-2921-8

