Coastal Survey

DATA ACKNOWLEDGEMENT AND DATA CAVEATS

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I. ACKNOWLEDGEMENT

The following survey design, protocols, and data caveats are included to assist the data user in acquiring a thorough understanding of the survey before querying the SEAMAP-SA database for South Carolina Department of Natural Resources – Marine Resources Division (SCDNR-MRD) Coastal Survey (CS) data. The data user is responsible for reading all of the following text and fully comprehending every aspect of the requested data. Each requestor is solely accountable for any further analyzes manipulations, or presentations. It is also the responsibility of the data user to cite and acknowledge SEAMAP and the CS (see SEAMAP-SA Intellectual Property protocol)

II. BACKGROUND

The primary objective of the Coastal Survey (CS) is to provide long-term, fishery-independent data on the distribution and relative abundance of resident and transient fishes, elasmobranchs, decapod and stomatopod crustaceans, sea turtles, horseshoe crabs, and cephalopods that are accessible by high-rise trawls.

The CS began in 1986 with funding from the National Marine Fisheries Service (NMFS). The pilot phase of the CS was initiated in 1986 and participating states sampled their respective coastal waters. From 1987 to the present, SCDNR-MRD took over all sampling in the coastal zone of the South Atlantic Bight (SAB) between Cape Hatteras, North Carolina, and Cape Canaveral, Florida (Figure 1). The full scale CS began in 1989 (Table 1)

Sampling regimes have changed several times from the pilot phase to the present day CS. The first year of the pilot study, in 1986, daylight sampling was conducted from November to December. From 1987 to 1988, day and night sampling occurred during ~7 day monthly cruises. The first year of the full scale survey, in 1989, night sampling was conducted in the spring and daylight sampling was conducted in the summer and fall. From 1990 to present day, only daylight sampling is conducted during seasonal cruises in spring, summer, and fall (Table 1).

III. METHOGOLOGY

Study Area

Initially, during the first year of the pilot phase in 1986, a stratified random sampling design was used. The last two years of the pilot phase, 1987 to 1988, a fixed-station sampling design was implemented. By the time the full scale survey began in 1989, the number of stations was proportionally allocated to the area of each stratum (2 to 8 per statum) and stations were initially randomly selected with stations sampled during all cruises. From 1990 to 1997, all cruises

samples 24 inner strata (10 outer strata in the southern half of the SAB sampled in the spring, and 7 outer strata off North Carolina were sampled in the fall). From 1998 to 2000 additional stations were added to all strata to create a pool of trawlable sites and stations were chosen randomly from the pool of stations with a fixed number of stations sampled within each stratum. From 2001 to 2008 the total number of stations sampled in the inner strata each season increased from 78 to 102 (306 stations/year) and the outer strata sampling was eliminated in order to intensify sampling in the more shallow depth-zone. The number of stations sampled within each stratum was selected annually by optimal allocation and the random selection of stations within each stratum. In 2009 the total number of stations sampled in the inner strata each season increased to 112 (336 stations/year; Table 1).

From 1990 to present, the strata are delineated by the 4 m depth contour inshore and the 10 m depth contour offshore. In previous years (1990 to 2000), stations were sampled in deeper strata with station depths ranging from 10 to 19 m in order to gather data on the reproductive condition of commercial penaeid shrimp (Table 1).

Trawl Specifications

Tow duration is 20 minutes at 2.5 knots using the R/V *Lady Lisa* pulling a tow paried 75-ft (22.9-m) mongoose-type Falcon trawl nets (manufactured by Beaufort Marine Supply; Beaufort, S.C.) without TEDs. The R/V *Lady Lisa* is a 75-ft (23-m) wooden-hulled, double-rigged, St. Augustine shrimp trawler owned and operated by the South Carolina Department of Natural Resources (SCDNR). The body of the trawl is constructed of #15 twine with 1.875-in (47.6-mm) stretch mesh. The codend of the net is constructed of #30 twine with 1.625-in (41.3-mm) stretch mesh and is protected by chafing gear of #84 twine with 4-in (10-cm) stretch "scallop" mesh. A 300 ft (91.4-m) three-lead bridle is attached to each of a pair of wooden chain doors which measured 10 ft x 40 in (3.0-m x 1.0-m), and to a tongue centered on the head-rope. The 86-ft (26.3-m) head-rope, excluding the tongue, had one large (60-cm) Norwegian "polyball" float attached top center of the net between the end of the tongue and the tongue bridle cable and two 9-in (22.3-cm) PVC foam floats located one-quarter of the distance from each end of the net webbing. A 1-ft chain drop-back is used to attach the 89-ft foot-rope to the trawl door. A 0.25-in (0.6-cm) tickler chain, which is 3.0-ft (0.9-m) shorter than the combined length of the foot-rope and drop-back, is connected to the door alongside the foot-rope.

Each net is processed separately and assigned a unique collection number (port=odd, starboard=even); however, data from the paired trawls are pooled for analysis to form a standard unit of effort (tow), with the port (odd) collection number assigned to the tow.

IV. RESULTS

Environmental and Habitat Data

Environmental and habitat data were recorded during the haul back of each trawl and include: light phase, air, surface and bottom temperature (°C), surface and bottom salinity (ppt), start time, start and end depth (m), pressure (XXX), wind speed (knots), wind direction, wave height, precipitation, start and end latitude, and start and end longitude. For more details on how

parameters were measured and recorded (see the Coastal Survey Parameters and Variables document).

Catch Data

Twenty-three finfish, four decapod species, all marine turtles, all coastal shark species, and horseshoe crabs were selected as priority species (Table 2) by the SEAMAP-SA Committee. Additional data recorded for priority species include measurements of length or width for all, sex and individual weights for blue crab, sharks, sea turtles, and horseshoe crabs, and reproductive information on commercially important penaeid shrimp and blue crabs.

Contents of each net are sorted separately to species, and total biomass and number of individuals are recorded for all species of finfish, elasmobranchs, decapod and stomatopod crustaceans, cephalopods, sea turtles, xiphosurans, and cannonball jellies. Only total biomass is recorded for all other miscellaneous invertebrates (excluding cannonball jellies) and algae, which are treated as two separate taxonomic groups. Marine turtles are released in good condition according to NMFS permitting guidelines.

Where large numbers of individuals of a species occur in a collection, the entire catch is sorted and all individuals of that species are weighed, but only a random subsample consisting of 30 to 50 individuals is weighed and measured for length and a total number is calculated. For large trawl catches, the contents of each net are weighed prior to sorting and a randomly chosen subsample of the total catch is then sorted and processed. Total number is calculated by multiplying the number measured by the total weight/subsample weight ratio (Total number=number measured*(total weight/subsample weight). The data from the two nets are combined to represent a tow.

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

Gonad and otolith specimens from three sciaenid species *(Cynoscion regalis, Menticirrhus americanus, Micropogonias undulatus*) are also collected during seasonal cruises. A representative sample of specimens from each centimeter size range within each stratum are measured to the nearest mm (TL and SL), weighed to the nearest gram, and assigned a sex and maturity code. Sagittal otoliths and a representative series of gonadal tissue are removed, preserved, and transported to the laboratory at MRRI, where samples are processed. Age and growth sampling was suspended in 2007, due to funding shortfalls, but was resumed in 2008 (Table 1; see the Coastal Survey Parameters and Variables document).

Table 1. Coastal Survey (CS) Historical data

Piolt Phase	1986	• Participating states sample their respective coastal waters • Stratified random sampling design • Daylight sampling in November-December with 35' high-rise nets • Trawl samples sorted to species with each species weighed and the individuals counted and measured.
	1987 to 1988	• SCDNR took over all sampling in South Atlantic Bight (Cape Canaveral, FL to Cape Hatteras, NC) • Fixed-station sampling design • Day/night sampling in monthly cruises of ~ 7 sea days with 75' mongoose-type falcon trawls • Priority species sorted, weighed and measured. Non-priority species divided into taxonomic groups and each group weighed.
Full Survery	1989	• Number of stations proportionally allocated to area of each stratum (2 to 8 per stratum). Stations initially randomly selected, with stations sampled during all cruises • Night sampling (Spring); Daylight sampling (Summer and fall) • 24 inner (15-30 ft), 24 outer strata (30-60 ft) • Contents of each trawl sorted to species. Total biomass and number of individuals recorded for all finfish species, elasmobranchs, decapod and stomatopod crustaceans, and cephalopods. Priority species weighed collectively and individual lengths recorded. Additionally Penaeid shrimp: total length, sex, ovarian development, spermatophore development, and occurrence of mated females; Blue crab: Carapace width, weight, sex, maturity, and presence and developmental stage of eggs; Sharks: weighed, total length and fork length, and sex noted (1994-present); Marine turtle measurements and tagging. Total biomass recorded for all other miscellaneous invertebrates and algae.
	1990 to 2000	• Daylight sampling during seasonal cruises (Spring, Summer, Fall) • 24 inner strata sampled all cruises. 10 outer strata in southern half of the SAB sampled in spring, and 7 outer strata off North Carolina sampled in fall • Stations were sampled in deeper strata with station depths ranging from 10 to 19 m.
	1998 to 2000	• Additional stations added to all strata to create pool of trawlable sites. Stations chosen randomly from pool in each stratum. Number of stations sampled within each stratum fixed.
	2001 to 2008	• Outer strata sampling eliminated. Number of stations sampled within each stratum selected annually by optimal allocation. Random selection of stations within each stratum. Total number of stations sampled in inner strata each season increased from 78 to 102 (306 stations/year). • Sharks, marine turtles, and horseshoe crabs added to priority species list. Age and growth sampling for selected sciaenid species (suspended in 2007, resumed in 2008).
	2009	• Total number of stations sampled in inner strata each season increased from 102 to 112 (336 stations/year). Strata are delineated by the 4 m depth contour inshore and the 10 m depth contour offshore.

Table 2. List of priority species for the Coastal Survey

COMMON NAME	SCIENTIFIC NAMES
Finfish (1986-Present)	
American harvestfish	*Peprilus paru*
Atlantic croaker	*Micropogonias undulatus*
Atlantic menhaden	*Brevoortia tyrannus*
Atlantic spadefish	*Chaetodipterus faber*
black drum	*Pogonias cromis*
black sea bass	*Centropristis striata*
bluefish	*Pomatomus saltatrix*
butterfish	*P. triacanthus*
gag	*Mycteroperca microlepis*
gulf flounder	*Paralichthys albigutta*
Gulf menhaden	*Brevoortia smithi*
king mackerel	*Scomberomorus cavalla*
kingcroaker	*M. littoralis*
northern kingfish	*M. saxatilis*
red drum	*Sciaenops ocellata*
sheepshead	*Archosargus probatocephalus*
southern flounder	*P. lethostigma*
southern kingfish	*Menticirrhus americanus*
Spanish mackerel	*S. maculatus*
spotted hake	*Leiostomus xanthurus*
spotted seatrout	*Cynoscion nebulosus*
summer flounder	*P. dentatus*
weakfish	*Cynoscion regalis*
Marine Turtles (1989-Present)	
green sea turtle	*Chelonia mydas*
Kemp's ridley sea turtle	*Lepidochelys kempi*
leatherback sea turtle	*Dermochelys coriacea*
loggerhead Sea Turtle	*Caretta caretta*
Decapods (1989-Present)	
blue crab	*Callinectes sapidus*
brown shrimp	*Farfantepenaeus aztecus*
pink shrimp	*F. duorarum*
white shrimp	*Litopenaeus setiferus*
Sharks (1994-Present)	
All species	Elasmobranchs
Xiphosurans (1995-Present)	
Atlantic horseshoe crab	*Limulus polyphemus*

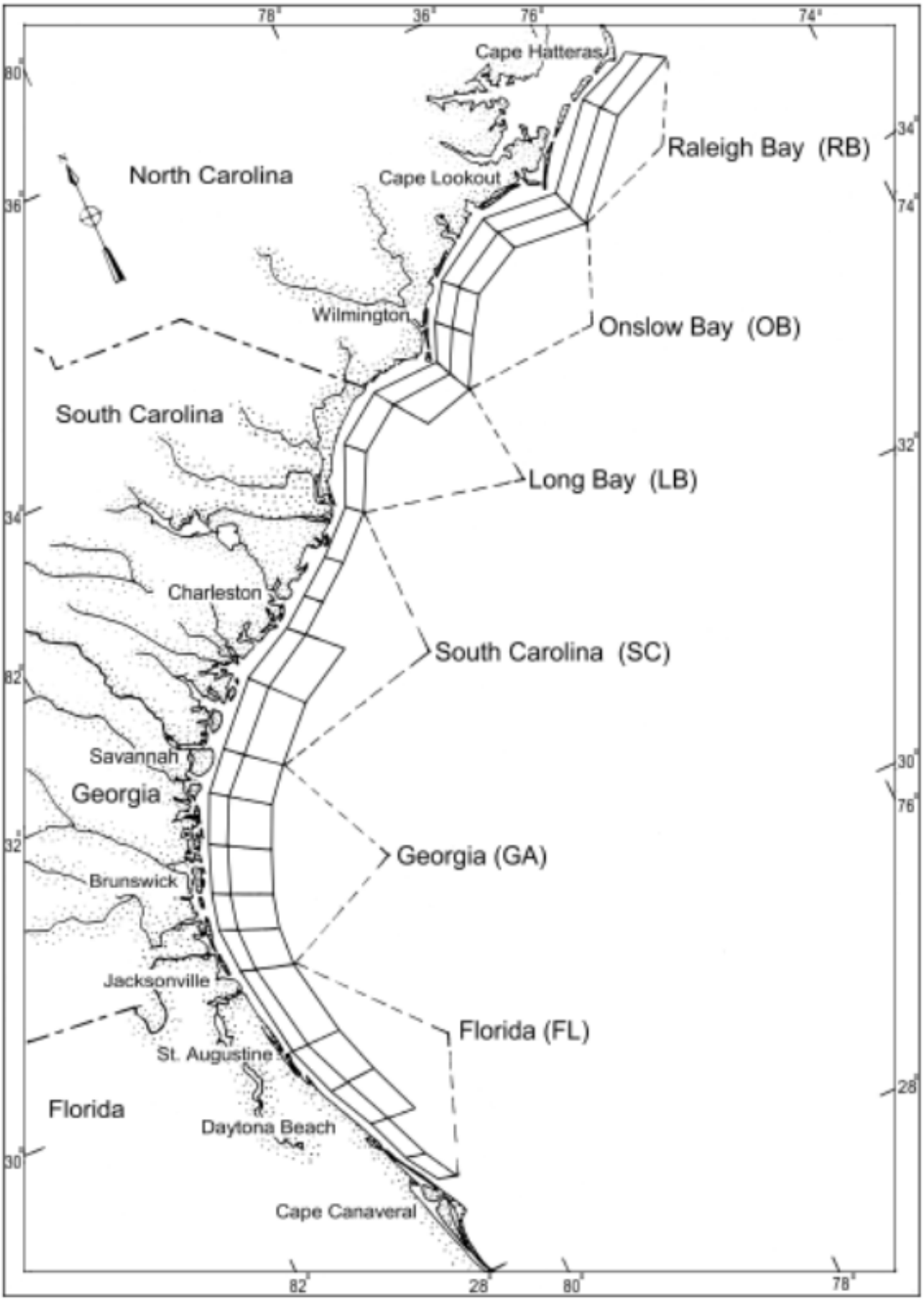

Figure 1. Strata sampled by the SEAMAP-SA Coastal Survey. Inner (shallow) strata sampled during all seasons throughout the survey. Outer (deep) strata were sampled (south in spring, north in fall) from 1990-2000. (Strata are not drawn to scale.)