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# SEAMAP-SA Coastal Trawl Survey Data and Sample Collection Methods

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The Southeast Area Monitoring and Assessment Program - South Atlantic (SEAMAP-SA) Coastal Trawl Survey (CTS), funded by the National Marine Fisheries Service (NMFS) and conducted by the South Carolina Department of Natural Resources - Marine Resources Division (SCDNR-MRD), began in 1986. Standardized activities have been in place since 1990. This survey provides long-term, fishery-independent data on seasonal abundance and biomass of all finfish, elasmobranchs, decapod and stomatopod crustaceans, sea turtles, horseshoe crabs, and cephalopods that are accessible by high-rise trawls in coastal nearshore waters. Additional data recorded for priority species include: measurements of length or width for priority species, sex and individual weights for blue crabs, sharks, sea turtles, and horseshoe crabs, and reproductive information on penaeid shrimp, selected fish species, and blue crabs.

The overall survey design is a stratified, random sampling design with multiple seasons sampled in a year and latitudinally-based strata. Samples are taken by trawl from the coastal zone of the South Atlantic Bight (SAB) between Cape Hatteras, North Carolina, and Cape Canaveral, Florida (Figure 1). Multi-legged cruises are conducted in spring (early April - mid-May), summer (mid-July - early August), and fall (October - mid-November).

Stations are randomly selected from a pool of stations within each stratum. To reduce the variability of the data, the method of allocating the number of stations within each stratum was changed in 2001 from proportional allocation to optimal allocation (Thompson, 1992), with the number of stations sampled within each stratum determined annually. From 2001 to 2008, a total of 102 stations were allocated each season (306 stations/year) within twenty-four shallow water strata, representing an increase from 78 stations previously sampled in those strata by the trawl survey (1990-2000). From 2009 to 2012, 2015, and 2016, the number of stations allocated each season increased to 112 (336 total), and in 2013, 2014, and from 2017 to present the number of stations was reduced to 102. Strata are delineated by the 4 m depth contour inshore and the 9 m depth contour offshore. In previous years (1990-2000), stations were sampled in deeper strata with station depths ranging from 9 to 19 m to gather data on the reproductive condition of commercial penaeid shrimp. Outer strata were abandoned in 2001 to intensify sampling in the nearshore depth-zone.

Sampling occurs on board the R/V *Lady Lisa*, a 75 ft (22.9 m) wooden-hulled, double-rigged, St. Augustine shrimp trawler owned and operated by SCDNR-MRD, using a pair of 75 ft (22.9 m) mongoose-type Falcon trawl nets (manufactured by Beaufort Marine Supply, Beaufort, SC) without Turtle Excluder Devices (TEDs). Sampling is conducted during daylight hours

(between 1 hour after sunrise and 1 hour before sunset). Trawls are towed for 20 minutes with a target speed of 2.5 kts.

The catch from 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). Contents of each net are sorted to species (limited exceptions to genus or family only), 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. For other miscellaneous invertebrates and algae, which were treated as two separate taxonomic groups, only total biomass is recorded. When trawls contain high volume catches, all endangered species and species that pose a risk to staff during handling (e.g., elasmobranchs, catfish, scorpionfish) are removed and given priority for processing, then the remaining net contents are sub-sampled into shrimp baskets, weighed, and a randomly selected basket(s) is sorted and processed as described above. Abundance and biomass for each species is then expanded to estimate the total abundance and biomass of each species in the full catch using the ratio of the sub-sampled basket weight to the total catch weight.

When large numbers of an individual species occur in the processed catch, all individuals of that species are weighed, but only a haphazardly selected subsample is processed for abundance and length frequency. The species subsample consists of approximately 30 to 60 individuals. The total number of individuals in the catch is then estimated based on the ratio of the processed subsample weight to the total weight for that species.

In every collection, priority finfish and penaeid shrimp species undergo a “length frequency” work-up in which specimens are weighed collectively and individuals measured to the nearest millimeter (mm). For several priority finfish species, specimens are selected for a “life history” work-up based on season, stratum, and 1 cm size bin. Otolith samples are removed from Weakfish, *Cynoscion regalis*, Spot, *Leiostomus xanthurus*, Southern Kingfish, *Menticirrhus americanus*, Atlantic Croaker, *Micropogonias undulatus*, Bluefish, *Pomatomus saltatrix*, King Mackerel, *Scomberomorus cavalla*, and Spanish Mackerel, *Scomberomorus maculatus*. Gonad tissue samples are removed from Bluefish and Spanish Mackerel. These representative specimens are measured to the nearest mm (total length, fork length, centerline length, and/or standard length), weighed to the nearest gram, and the sex of each individual is determined based on gross gonad morphology. Sagittal otoliths and a representative sample of gonadal tissue are preserved and transported to the laboratory at SCDNR-MRD where samples are processed following accepted standard procedures (Harris *et al*., 2004).

All otolith sections were examined by two readers independently, a primary reader who examines all otolith sections and a secondary reader who examines one-third of otolith sections. Each reader assigns an increment count, determined by counting the number of alternating translucent and opaque bands, without knowledge of specimen data or capture

location information. Additionally, edge type is determined for some species and consists of no increments, increment on the edge, or narrow, medium, or wide growth after increment formation. Depending on the species, age is defined as increment count or as calendar age based on increment count, month/season of capture, and edge type. All gonad samples are examined by two readers independently, without knowledge of specimen data or capture location information. Maturity codes are assigned based on descriptions in Brown-Peterson *et al.* (2011).

Hydrographic data, including surface to bottom temperature and salinity measurements, are logged with a CTD profiler at each station. Additionally, sampling depth (start and end) and an estimate of wave height, as well as atmospheric data on air temperature, barometric pressure, precipitation, wind speed, and wind direction are recorded at each station.

## References


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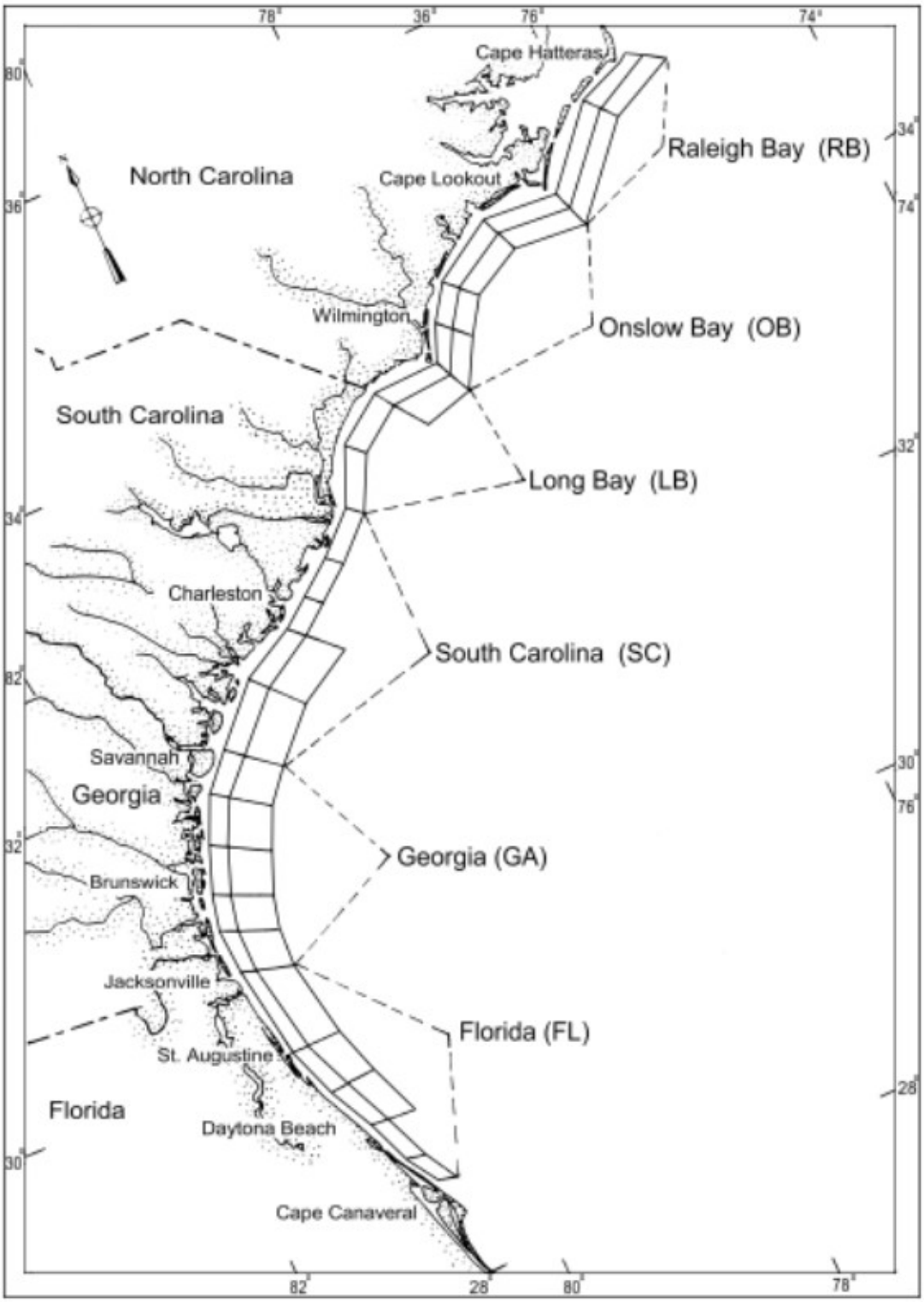


Figure 1. Strata sampled by the SEAMAP-SA Coastal Trawl Survey. Inner (shallow) strata were sampled during all seasons throughout the survey. Outer (deep) strata were sampled (south in spring, north in fall) from 1990-2000. (Strata are not drawn to scale.)