

## METHODS AND MATERIALS

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

The R/V *Lady Lisa*, a 75-ft (23-m) wooden-hulled, double-rigged, St. Augustine shrimp trawler owned and operated by the South Carolina Department of Natural Resources (SCDNR), is used to tow paired 75-ft (22.9-m) mongoose-type Falcon trawl nets (manufactured by Beaufort Marine Supply; Beaufort, S.C.) without TED's. The body of the trawl is constructed of #15 twine with 1.875-in (47.6-mm) stretch mesh. The cod end 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.

Trawls are towed for twenty minutes, excluding wire-out and haul-back time, exclusively during daylight hours (1 hour after sunrise to 1 hour before sunset). Each net 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.

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 randomly selected subsample are processed and 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.

In every collection, each of the priority species is weighed collectively and individuals are measured (Table 1). For large collections of the priority species, a random subsample consisting of thirty to fifty individuals is weighed and measured. Depending on the species, measurements of finfish are recorded as total length or fork length, measured to the nearest centimeter. 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.

Hydrographic data collected at each station include surface and bottom temperature and salinity measurements taken with a Seabird SBE-19 CTD profiler, sampling depth, and an estimate of wave height.

# HISTORY OF SEAMAP SHALLOW WATER TRAWL SAMPLING METHODS

SEDAR 13-DW-01

## Pilot Phase 1986

- Participating states sample their respective coastal waters
- Stratified random sampling design
- Daylight sampling in November-December
- 20-minute tows (bottom time)
- 35' high-rise nets
- Trawl samples sorted to species with each species weighed and the individuals counted and measured.

## 1987 - 88

- SCDNR took over all sampling in South Atlantic Bight
- Fixed-station sampling design
- 4 stations with 3 sites each : beach, near-beach, inlet
- Day/night sampling in monthly cruises of ~ 7 sea days
- 75' mongoose-type falcon trawls
- 20-minute tows (bottom time)
- Priority species sorted, weighed and measured. Non-priority species divided into taxonomic groups (decapod, stomatopod, finfish, elasmobranch, cephalopod, and miscellaneous invertebrates) and each group weighed and a species list was compiled.

## Full survey

### 1989

- SCDNR continues to do all sampling in South Atlantic Bight (Cape Canaveral, FL to Cape Hatteras, NC)
- Number of stations proportionally allocated to area of each stratum (2 to 8 per stratum).
- Initial random selection of stations, 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)
- 75' mongoose-type falcon trawls; 20-minute tows (bottom time)
- Contents of each trawl sorted to species, and total biomass and number of individuals recorded for all species of finfish, elasmobranchs, decapod and stomatopod crustaceans, and cephalopods
  - Each priority species weighed collectively and individuals measured to the nearest centimeter
  - Additional data - Penaeid shrimp: total length (mm), sex, female ovarian development, male spermatophore development, and occurrence of mated females. Blue crab: Carapace width (mm), individual weight, sex, maturity, and presence and developmental stage of eggs. Sharks: weighed, measured (total length and fork length), and sex noted (1994-present). Marine turtle measurements and tagging.
  - Only total biomass recorded for all other miscellaneous invertebrates and algae

### 1990 - 2000

- Daylight sampling
- 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
- Same gear, processing of trawl samples as 1989

### 1998 -2000

- Additional stations added to all strata to create pool of trawlable sites
- Stations chosen randomly from pool of stations in each stratum. Number of stations sampled within each stratum fixed.

### 2001-present

- Total number of stations sampled in inner strata increased from 78 to 102
- Outer strata no longer sampled
- Number of stations sampled within each stratum selected annually by optimal allocation. Random selection of stations within each stratum.
- Sharks, marine turtles, and horseshoe crabs added to list of priority species
- Age and growth sampling for selected sciaenid species

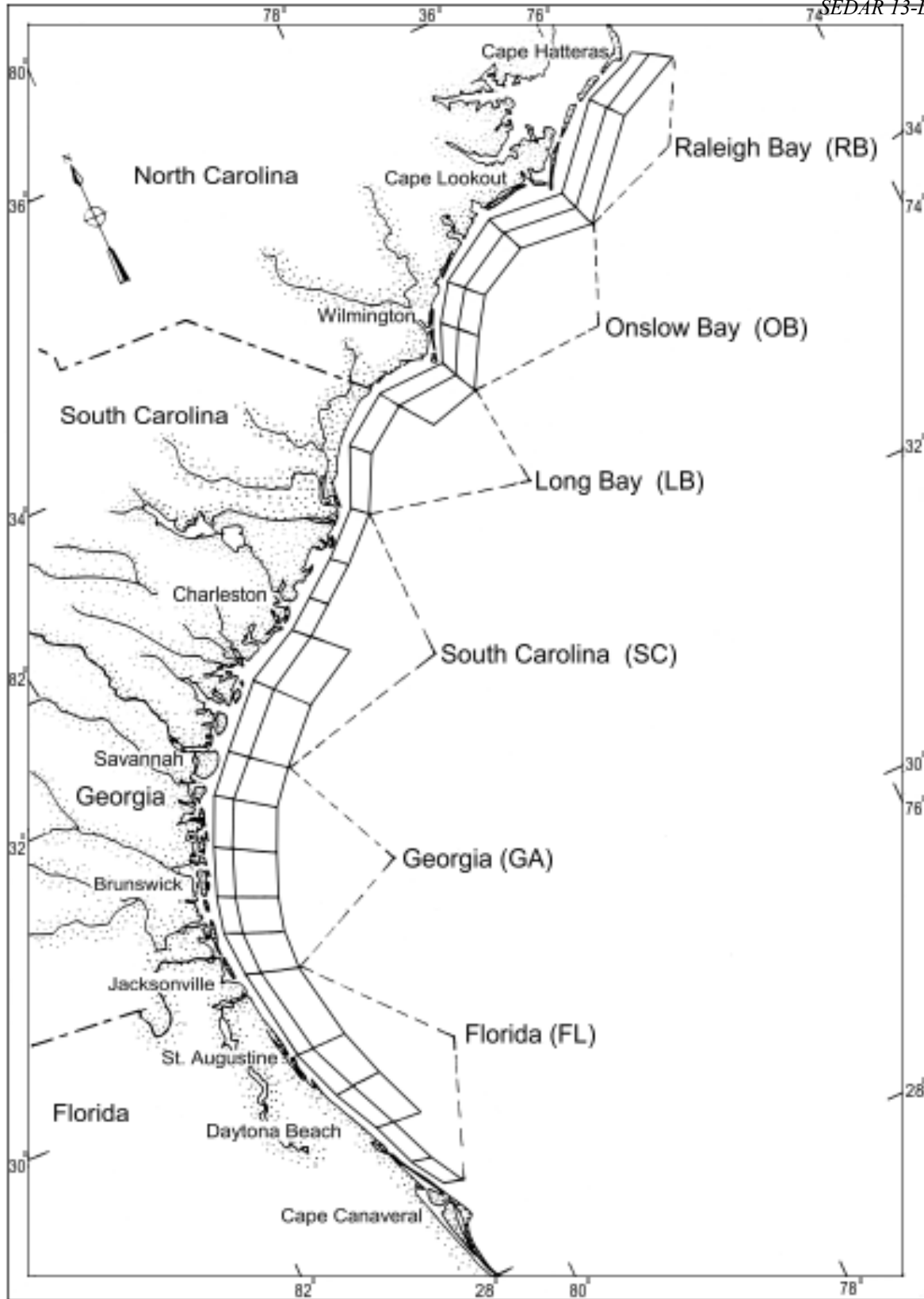


Figure 1. Strata sampled by the SEAMAP-SA Shallow Water Trawl Survey. Inner (shallow) strata sampled during all seasons throughout the survey. Outer (deep) strata were sampled (south in spring, north in fall) from 1990-2000. (Strata are not drawn to scale.)

Table 1. Priority species of the SEAMAP-SA Shallow Water Trawl Survey. (Although data were taken in previous years, sharks, marine turtles, and horseshoe crabs were added to the list of priority species in 2001).

**Finfish** (1989-present)

*Archosargus probatocephalus*  
*Brevoortia smithi*  
*Brevoortia tyrannus*  
*Centropristis striata*  
*Chaetodipterus faber*  
*Cynoscion nebulosus*  
*Cynoscion regalis*  
*Leiostomus xanthurus*  
*Menticirrhus americanus*  
*M. littoralis*  
*M. saxatilis*  
*Micropogonias undulatus*  
*Mycteroperca microlepis*  
*Paralichthys albigutta*  
*P. dentatus*  
*P. lethostigma*  
*Peprilus paru*  
*P. triacanthus*  
*Pogonias cromis*  
*Pomatomus saltatrix*  
*Sciaenops ocellata*  
*Scomberomorus cavalla*  
*S. maculatus*

**Elasmobranchs** (1994-present)

All shark species

**Marine Turtles** (1989-present)

*Caretta caretta*  
*Chelonia mydas*  
*Dermochelys coriacea*  
*Lepidochelys kempfi*

**Decapods** (1989-present)

*Callinectes sapidus*  
*Farfantepenaeus aztecus*  
*F. duorarum*  
*Litopenaeus setiferus*

**Xiphosurans** (1995-present)

*Limulus polyphemus*