APPENDIX A.1

Trawl Survey Program 195

Documentation obtained from the North Carolina Department of Environment and Natural Resources Division of Marine Fisheries

The North Carolina Pamlico Sound Survey

METHODS AND MATERIALS

Fifty-two randomly selected stations (grids) are sampled over a two week period, usually the second and third week of the month. The stations sampled are randomly selected from strata based upon depth and geographic location. The seven designated strata since 1990 are: Neuse River; Pamlico River; Pungo River; Pamlico Sound east of Bluff Shoal, shallow and deep; and Pamlico Sound west of Bluff Shoal, shallow and deep (Figure 1). Shallow water is considered water depth between 6-12 feet and deep water is considered water greater than 12 feet depth. A similar net design to the SEAMAP Shallow Water Trawl Survey is used.

Tow duration is 20 minutes at 2.5 knots using the R/V Carolina Coast pulling double rigged 30 ft (9.14-m) mongoose-type Falcon trawls (manufactured by Beaufort Marine Supply; Beaufort, SC) without TEDs. The R/V Carolina Coast is a 44- ft fiberglass hulled double rigged trawler owned and operated by the North Carolina Division of Marine Fisheries (NCDMF). The body of the trawl is constructed of #9 twine with 1.875-in (47.6-mm) stretch mesh. The codend of the net is constructed of #30 twine with 1.5-in (38.1-mm) stretch mesh. The tailbag is 80 meshes around and 80 meshes long (approximately 10-ft). A 120-ft (36.58-m) three-lead bridle is attached to each of a pair of wooden, chain doors that measure 4 ft by 2 ft (1.22-m X .061-m) and to a tongue centered on the headrope. A 60-cm "polyball" is attached between the end of the tongue and the tongue bridle cable. A 0.1875-in (4.76-mm) tickler chain that is 3.0-ft (0.9.-m) shorter than the 34-ft (10.36-m) footrope, is connected to the door next to the footrope.

Initially stations were originally allocated in proportion to the size of the strata (1987-1988). Beginning in March 1989, the randomly drawn stations are optimally allocated among the strata based upon all the previous sampling in order to provide the most accurate abundance estimates (PSE <20) for selected species. A minimum of three stations (replicates) is maintained in each strata. A minimum of 104 stations is trawled per year.

All species are sorted and a total number and weight is recorded for each species. For target species, 30-60 individuals are measured and total weights are measured. Environmental data taken during haul back include: temperature (^{o}C), salinity (ppt), wind speed (knots), and direction. Temperature and salinity are measured using a YSI 85 meter. The two catches from each tow are combined to form a single sample in an effort to reduce variability.

Finfish samples are sorted as follows: Incidental and/or exotic species (present in low numbers) as well as shellfish are separated from the total catch. The remaining sample contains species present in large numbers. These are sorted to species and the total biomass of each species is taken. For these species a random subsample (one kilogram) is counted, and an additional 30-60 individuals are measured for length and a total subsample weight taken. A list of all species measured is indicated in Table 1. The incidental and/or exotic species are enumerated and their biomass recorded.

For shellfish the total biomass for all Penaeid shrimp and the total biomass for blue crabs is taken. Length measurements for a subsample of 30-60 individuals per species of each shrimp species are taken and the total weight for that subsample is recorded. Blue crabs are worked up by individual with carapace length, sex and maturity recorded. A subsampling protocol for blue crabs is used when the amount of crabs in the catch consist of about 1/4 of a 50 lb. orange basket or more (started in 2002). One quarter of the catch comprises the subsample. The carapace width, sex and maturity of each of the blue crabs and the subsample biomass is taken. The individuals in the remaining three quarters of the basket are counted and the mature females are separated out. The carapace width of each of the mature females and their aggregate biomass is taken. Biomass for other invertebrates is taken and the number of individuals enumerated.

History of the Pamlico Sound Survey Sampling

1987-1989

- Area coverage included: Pamlico Sound and its bays, Croatan Sound, Roanoke Sound, Albemarle Sound east of a line from the mouth of Alligator River to the mouth of North River, the Pamlico River up to Bath Creek and the Neuse River up to Minnesott Beach (Figure 1).
- Sampling occurred in March, June, September, and December.

1988

- The December leg was partially extended into January due to scheduling conflicts and adverse weather conditions.

1990

- Sampling occurred in March, June and September only.
- The Albemarle Sound strata were eliminated.
- The Pungo River Stratum was added.
- Stations were expanded upstream along the Neuse and Pamlico River strata.
- Begin using grid design for stations and placing station ID in grid field of datasheet.

1991-Present

- Sampling in June and September only.

1999

- Both June and September cruises were delayed a month due to equipment malfunction and hurricane events (Dennis, Floyd, and Irene).

2002

- Began subsampling protocol for blue crabs in September.

2003

- September cruise extended into two days of October due to hurricane Isabel.

Table 1. List of species measured on the Pamlico Sound Survey .*

Common Name	**Scientific name**
Finfish species:	
alewife	Alosa pseudoharengus
American eel	Anguilla rostrata
American shad	Alosa sapidissima
Atlantic croaker	Micropogonias undulatus
Atlantic menhaden	Brevoortia tyrannus
Atlantic spadefish	Chaetodipterus faber
black crappie	Pomoxis nigromaculatus
black drum	Pogonias cromis
black grouper	Mycteroperca bonaci
blueback herring	Alosa aestivalis
bluefish	Pomatomous saltatrix
bluegill	Lepomis machrochirus
brown bullhead	Ictalurus nebulosus
butterfish	Peprilus triacanthus
channel catfish	Ictalurus punctatus
cobia	Rachycentron canadum
crevalle jack	Caranx hippos
gag	Mycteroperca microlepis
gray snapper	Lutjanus griseus
gulf flounder	Paralichthys albigutta
harvestfish	peprilus alepidotus
hickory shad	Alosa mediocris
king mackerel	Scomberomorus cavalla
lane snapper	Lutjanus synagris
largemouth bass	Micropterus salmoides
mutton snapper	Lutlanus falcatus
northern kingfish	Menticirrhus saxatilis
northern puffer	Sphoeroides maculatus
permit	Trachinotus falcatus
pigfish	Orthoprostis chrysoptera
pumpkinseed	Lepomis gibbosus
red drum	Sciaenops ocellatus
red grouper	Epinephalus morio
rock sea bass	Centropristis philadelphica
sheepshead	Archosargus probatocephalus
silver perch	Bairdiella chrysoura
southern flounder	Paralichthys lethostigma
southern hake	Urophycis floridanus
southern kingfish	Menticirrhus americanus
Spanish mackerel	Scomberomorous maculatus

Table 1. Continued.

Common name	Scientific name
spotted hake	Urophycis regius
spotted hake	Leistomus xanthurus
spotted seatrout	Cynscion nebulosus
striped bass	Morone saxatilis
striped mullet	Mugil cephalus
summer flounder	Paralichthys dentatus
tautog	Tautoga onitis
weakfish	Cynoscio regalis
white catfish	Ictalurus catus
white perch	Morone americana
yellow bullhead	Ictalurus natalis
yellow perch	Perca flavescens
Non-finfish species:	
white or greentail shrimp	Litopenaeus setiferus
brown or summer shrimp	Farfantepenaeus aztecus
pink shrimp	Farfantepenaeus duorarum
blue crab	Callinectes sapidus
turtles	

* all other species are counted and each species biomass taken

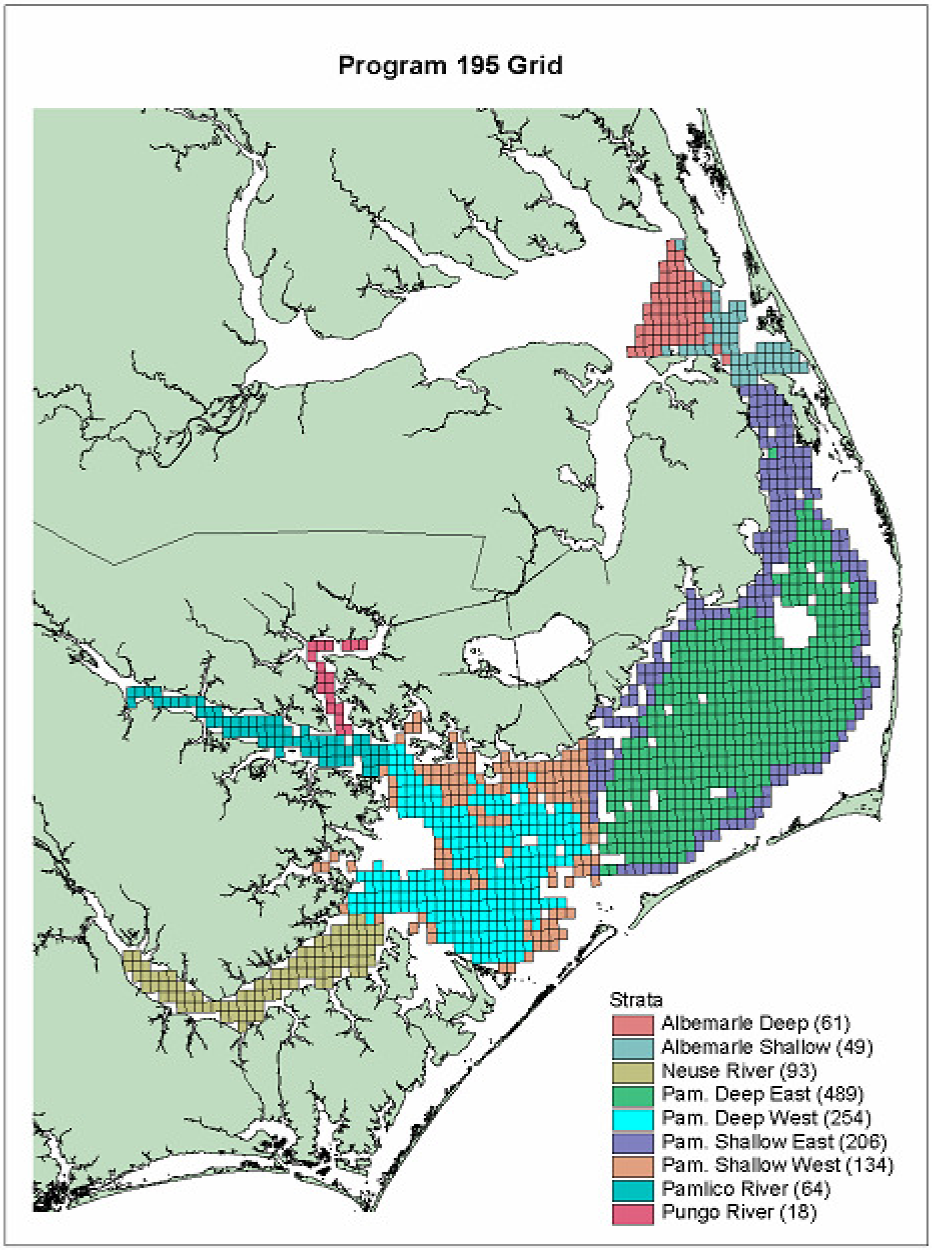

Figure 1: Grid system by strata for the Pamlico Sound Survey. Including the Albemarle Sound grids dropped in 1990.