PAMLICO SOUND SURVEY

DATA ACKNOWLEDGEMENT AND DATA CAVEATS

February 2013

I. ACKNOWLEGEMENT

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 North Carolina's Division of Marine Fisheries (NCDMF) Pamlico Sound Survey (PSS) 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 PSS (see SEAMAP-SA Intellectual Property protocol)

II. BACKGROUND

The primary objective of the Pamlico Sound Survey (PSS) is to produce fishery-independent indices of abundance for important recreational and commercial fisheries in Pamlico Sound.

The PSS began in March 1987 with funding from the North Carolina's Division of Marine Fisheries with additional funds provided by the SM-18 SEAMAP federal program. From 1990-2011, the funding has been provided from a federal Sport Fish Restoration F-42 grant to survey population parameters of marine recreational fishes in North Carolina.

The survey was initially included the 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. In 1990 all Albemarle Sound strata were eliminated and the Pungo River was added. Now sampling occurs only in Pamlico Sound and associated rivers and bays (Figure 1).

All PSS sampling events have been conducted over a two week period. From 1987-1989 sampling was conducted quarterly during the months of March, June, September, and December. In 1990, December sampling was eliminated. From 1991 to the present, the PSS has been conducted during the months of June and September.

There were four years in which the survey did not occur over the same time series; 1988, 1999, 2003, and 2009. In 1988, the December leg of the cruise was partially extended into January 1989 because of scheduling conflicts and adverse weather conditions. In 1999, samples were collected during the month of July and the end of September and into October because vessel repairs and hurricanes prevented following the normal schedule. In September 2003, Hurricane Isabel caused a delay and sampling was completed two days in October. In September 2009, vessel repairs caused sampling to extend into the first week of October. This information as well as changes to environmental sampling, which will be discussed shortly, can be found in Table 1.

North Carolina Division of Marine Fisheries utilizes the PSS to calculate Juvenile Abundance Indices (JAI) for commercial and recreationally important species. The JAI is a critical component to any stock assessment because it provides an index of abundance that is independent of the commercial or recreational fisheries. The juvenile index is the annual geometric mean (weighted by strata) of the number of individuals per tow for young of the year (YOY), length cutoffs vary by month and species. Strata weights are as follows:

Post 1990 Weights for Strata

- Pamlico Sound Shallow East = 206.0;
- Pamlico Sound Shallow West = 135.0;
- Pamlico Sound Deep East = 554.0;
- Neuse River = 93.0;
- Pamlico River = 64.0;
- Pamlico Sound Deep West = 312.0;
- Albemarle Sound Deep = 61.0;
- Albemarle Sound Shallow = 59.0;
- Pungo River = 18.0;

Pre 1990 Weights for Strata

- Pamlico Sound Shallow East = 173.5;
- Pamlico Sound Shallow West = 105.5;
- Pamlico Sound Deep East = 521.5;
- Neuse River = 69.0;
- Pamlico River = 53.0;
- Pamlico Sound Deep West = 282.5;
- Albemarle Sound Deep = 56.0;
- Albemarle Sound Shallow = 54.0;

III. METHODOLOGY

Study Area

Fifty-two randomly selected stations (grids) are sampled during daylight, usually the second and third week of the cruise 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.

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.

Trawl Specifications

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.

IV. RESULTS

Environmental and Habitat Data

Environmental and habitat data were recorded during the haul back of each trawl and include: bottom composition, weather description, light phase, surface and bottom temperature (°C), surface and bottom salinity (ppt), surface and bottom dissolved oxygen (mg/L), start time, start and end depth (m), wind speed (knots), wind direction, precipitation, start and end latitude, and start and end longitude. Adjustments to environmental data collection have occurred over the year of the survey. Recording water quality, taken with a secchi disk, did not begin until 2008 and shoreline data and bottom sediment data, collected by ponar grab sample, did not begin until 2009 (Table 1). For more details on how parameters were measured and recorded see the Pamlico Sound Survey Parameters and Variables document.

Catch Data

Incidental and/or exotic species (present in low numbers), finfish, and shellfish are separated out. A list of all target species measured is indicated in Table 2. The incidental and/or exotic species are enumerated and their biomass recorded.

For finfish, target species are randomly subsample (1 kg) and emumerated. An additional 30-60 individuals are measured for length and a total biomass is recorded. If not on the target species list, the species is enumerated and a total biomass taken.

For invertebrates, the total biomass of all Penaeid shrimp (brown, white, and pink) and blue crabs is recorded by species. Penaeid shrimp are worked up in the same manner as target finfish species. Blue crabs are worked up individually. Carapace length, sex and maturity are recorded. A subsampling protocol for blue crabs is used when the amount of crabs in the catch consists of about 1/4 of a 50 lb. orange basket or more (started in 2002, modified in 2005). One quarter of the catch comprises the subsample. The carapace width, sex, and maturity of each of the blue crabs as well as the total biomass of the subsample are recorded. 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 recorded. For other invertebrates, they are counted and a total biomass is recorded.

Table 1. Pamlico Sound Survey (PSS) historical data.

Year	Activity
1988-1989	• 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. • Sampling occurred in March, June, September, and December. • December 1988 leg was partially extended into January due to scheduling conflicts and adverse weather conditions.
1989	• Random sub-sample method used during 6/1989 cruise • Beginning 9/1989 entire catch sorted to species and sub-sampled at the species level if necessary
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	• Drop March cruise, only have June and September legs.
1999	• Both June and September cruises were delayed a month due to equipment malfunction and hurricane events.
2003	• September cruise extended into two days of October due to hurricane Isabel.
2008	• Began recording Water Clarity with Secchi disk
2009	• Shoreline Data and Sediment taken using ponar grab • September cruise extended into October due to boat repairs
2011	• Hurricane Irene: Category 1, track went through Pamlico Sound on 8/27/2011

For more information regarding the North Carolina Pamlico Sound Survey please contact Jason Rock.

Table 2. List of species measured on the Pamlico Sound Survey.*

COMMON NAME	SCIENTIFIC NAME
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*

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*
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

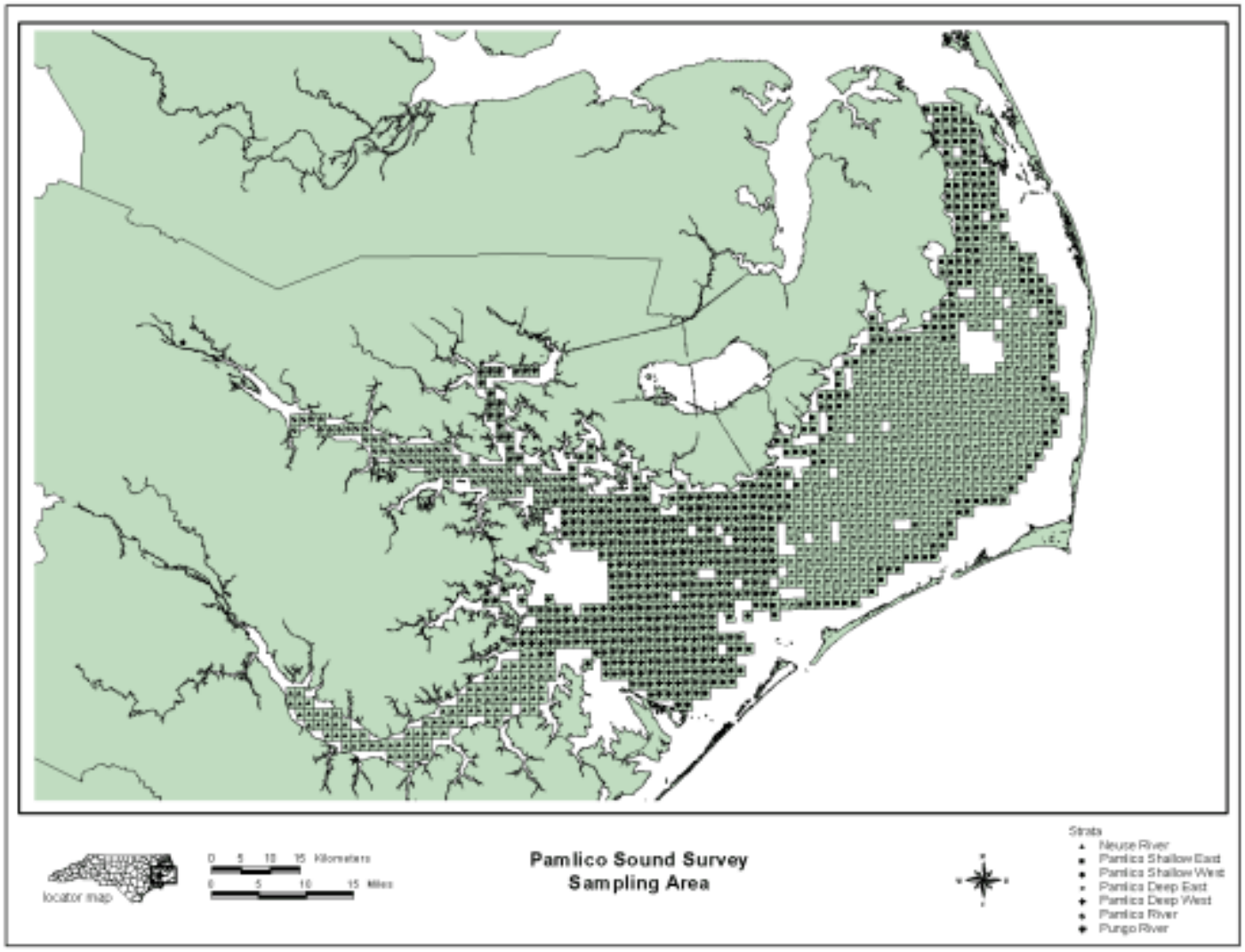

Figure 1. Location and grids of the Pamlico Sound Survey area of eastern North Carolina.

Things to do/check

- Check with Jason about the most updated maps.
- Items highlighted in blue sound be linked document
    - Intellectual Property Right
    - PSS Parameters and Variables – needs to be created from program doc