

# **NORTH CAROLINA RED DRUM LONGLINE SURVEY**

## **DATA ACKNOWLEDGEMENT AND DATA CAVEATS**

March 2013

### **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 North Carolina's Division of Marine Fisheries (NCDMF) Red Drum Longline Survey (NC-LLS) 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 analyses, manipulations, or presentations. It is also the responsibility of the data user to cite and acknowledge SEAMAP and the NC-LLS (see [SEAMAP-SA Intellectual Property protocol](#))

### **II. BACKGROUND**

The NC-LLS is a National Marine Fisheries Service funded fishery-independent longline survey conducted by NCDMF since 2007. The primary objective of the NC-LLS is to develop a state specific sampling protocol that provides a fisheries independent index of abundance for adult red drum. Additional objectives of the NC-LLS include:

- To sample adult red drum and develop information on catch per unit effort (CPUE) and size, to collect migratory and stock identification data on adult red drum.
- To evaluate the age composition of adult red drum.
- To collect additional biological information and samples (otoliths, gonads, muscle, fin clips etc.) from a sub-sample of red drum that can be used to determine size at age, recruitment to adult spawning population, mercury contamination, and genetic composition of the stock.
- To disseminate accomplishments and results to the Atlantic States Marine Fisheries Commission (ASMFC) and National Marine Fisheries Service (NMFS) for inclusion in stock assessment efforts.

This survey will provide North Carolina with the resources necessary to develop a fishery independent index of abundance for adult red drum occurring in state waters that will be used in future stock assessment work. Tagging of red drum captured during the study will allow for additional information on migratory behavior and stock identification. Collection of age structures will provide insight on escapement rates from specific cohorts and provide a means to evaluate the age structure of the adult population.

### **III. METHODOLOGY**

## *Study Area*

This survey employs a stratified-random sampling design based on area and time. Areas chosen for sampling were based on prior North Carolina Division of Marine Fisheries (NCDMF) mark and recapture studies, which indicate the occurrence of adult red drum within Pamlico Sound during the months of July through October. The study area includes the Pamlico Sound in an area ranging from Gull Island to Hatteras and Ocracoke inlets and the adjacent coastal areas near the inlets to the mouth of the Neuse and Bay rivers. This area was overlaid with a one-minute by one-minute grid system (equivalent to one square nautical mile). Grids across the area were selected for inclusion in the sampling universe if they intercepted with the 1.8 m (6 ft) depth contour based on the use of bathymetric data from National Oceanic and Atmospheric Association (NOAA) navigational charts and field observations. Other factors, such as obstructions, accessibility, and logistics, were considered when grids were selected. Finally, the sample area was divided into twelve similarly sized regions (Figure 1).

In order to stratify samples through space and time, two samples were collected from each of the twelve regions during each of three periods from mid-July to mid-October. Sample periods for each year can be seen in Table 1. Sampling begins no sooner than an hour before sunset and continues into the night. An average of four sets is collected per night.

When time allows, additional non-random exploratory samples are made during the study period in Pamlico Sound and also in the nearshore waters of the Atlantic Ocean from Ocracoke to Cape Hatteras.

## *Gear*

Sampling is conducted using bottom longline gear. Lines are set and retrieved using hydraulic reels. Main lines consist of 500# test monofilament. All random samples are conducted with a 1,500-meter mainline with gangions placed at 15 meter intervals (100hooks/set). Stop sleeves are placed at 30 m intervals in order to prevent gangions from sliding down the ground line and becoming entangled when large species are encountered. Terminal gear is clip-on, monofilament gangions consisting of a 2.5 mm diameter stainless steel longline clip with a 4/0 swivel. Leaders on gangions consist of 200# monofilament with a 15/0 Mustad tuna circle hook. Gangions are placed on ground line at 15 m intervals allowing for a total of 100 hooks to be fished per set. Hooks are baited with readily with the standard being striped mullet and squid when striped mullet are unavailable. Sets are anchored and buoyed at each end. Soak times are kept short (~30 minutes) to minimize bait loss and to ensure that the red drum can be tagged in good condition.

Soak times, bait size, bait type, hook size, number of hooks, gangion length and distance between hooks are standardized as much as possible. One hundred hooks per set is the standard, although in rare instances, damage to lines or limited areas have resulted in shorter sets (i.e., less hooks). As a result, CPUE will be calculated as the number of red drum captured per hook (this assumes same soak times for all sets). Given the deterioration of bait and decreased fishing

power over time ) soak times are standardized to be as close to 30 minutes as possible from time the last hook is deployed to the time the first hook is retrieved (work-up time could vary depending on species captured).

## IV. RESULTS

### *Environmental and Habitat Data*

Environmental and habitat data are recorded during the haul back of each-main line and include: location, duration/soak time, gear parameters, sediment size, bottom composition, depth, surface and bottom temperature (°C), surface and bottom salinity (ppt), surface and bottom dissolved oxygen (mg/L), weather description, wind direction, wind speed (knots), and location (lat-longs in degrees, minutes seconds) of tagged and released fish. For more details on how parameters were measured and recorded see the [North Carolina Red Drum Longline Survey Parameters and Variables](#) document.

### *Catch Data*

All individuals captured were processed at the species level and were measured to the nearest millimeter for either fork or total length according to the morphology of the species. Hook location and species condition (alive or dead) were also recorded. Red drum and selected shark species were tagged and released. Each red drum was tagged with both an external Hallprint stainless steel dart tag (SSD) and an internal Passive Integrated Transponder (PIT) tag. PIT tags provide a means to monitor tag loss/non-reporting and also provide an internal means to means to monitor recaptures within the study (i.e., the public cannot detect and remove a PIT tag unlike SSD tags). The presence or absence of drumming sounds was noted for all red drum captured. Selected red drum species were retained and taken to the lab where age structures (otoliths) were removed and sex was determined. For sacrificed fish, stomach contents were removed and frozen. Stomachs were later worked up and each prey item in the stomach was identified to the most detailed taxonomic level possible, enumerated and weighed. Genetic material (fin clip) was removed for later processing from all red drum captured. All finclips were sent to SCDNR for further processing and analysis.

**Table 1.** North Carolina Red Drum Longline Survey (NC-LLS) historical sampling periods.

Sample Year	Sample Period
2007	<ul style="list-style-type: none"><li>• Period 1 - July 23 to August 8</li><li>• Period 2 - August 13 to September 7</li><li>• Period 3 - September 10 to October 5</li></ul>
2008	<ul style="list-style-type: none"><li>• Period 1 - July 14 to August 8</li><li>• Period 2 - August 9 to September 6</li><li>• Period 3 - September 7 to October 10</li></ul>
2009	<ul style="list-style-type: none"><li>• Period 1 - July 20 to August 10</li><li>• Period 2 - August 11 to September 10</li><li>• Period 3 - September 11 to October 1</li></ul>
2010	<ul style="list-style-type: none"><li>• Period 1 - July 21 to August 10</li><li>• Period 2 - August 11 to September 10</li><li>• Period 3 - September 11 to October 11</li></ul>
2011	<ul style="list-style-type: none"><li>• Period 1 - July 21 to August 10</li><li>• Period 2 - August 11 to September 9</li><li>• Period 3 - September 10 to October 4</li></ul>
2012	<ul style="list-style-type: none"><li>• Period 1 - July 25 to August 13</li><li>• Period 2 - August 21 to September 12</li><li>• Period 2 - September 13 to October 3</li></ul>

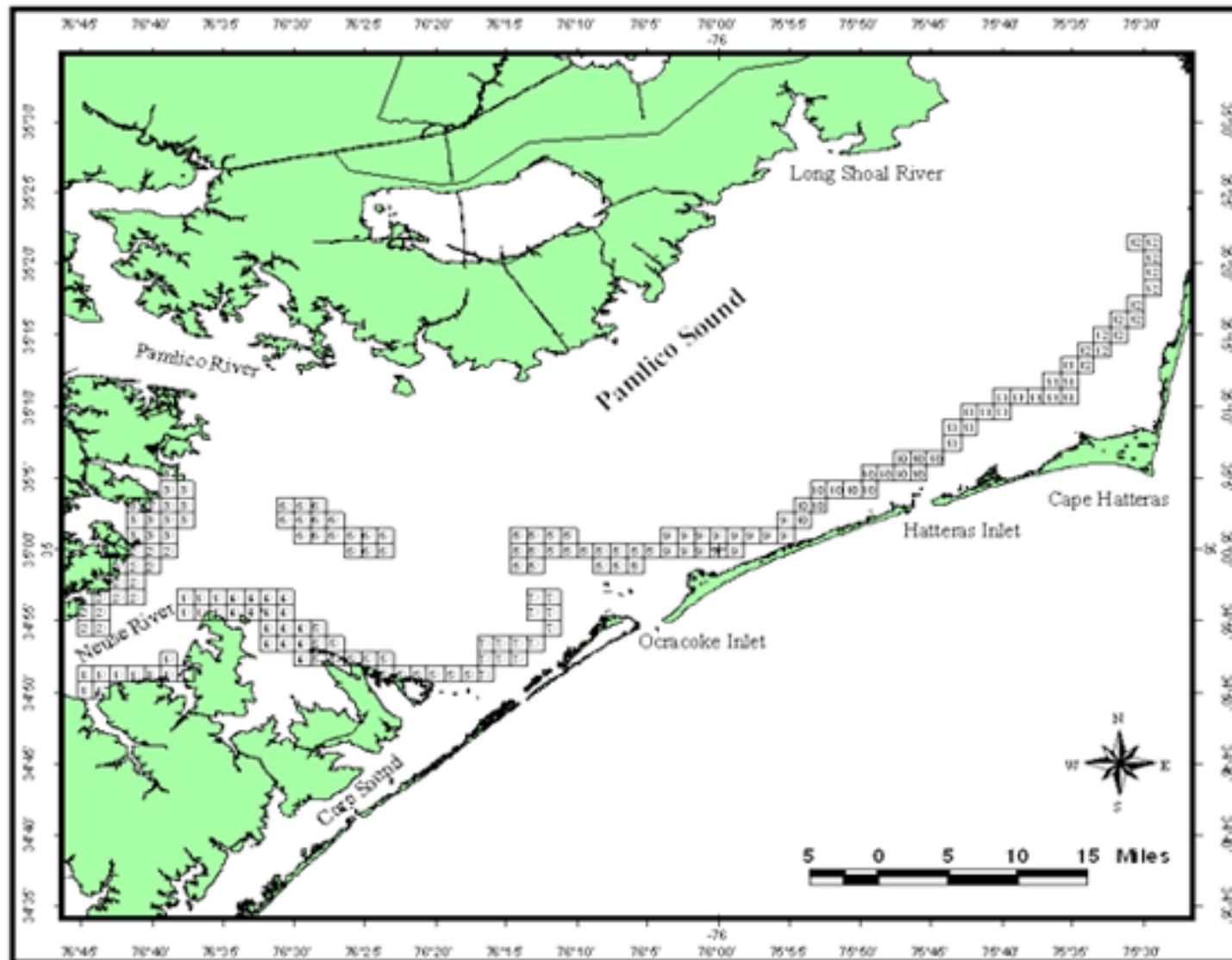


Figure 1. The random grid system and sample regions used in the North Carolina Red Drum Longline Survey.