

Project Title: Assessment of Adult Red Drum in South Carolina Coastal Waters

Project Objectives: To utilize fishery-independent methods to collect abundance and biological data on adult red drum for assessment of their population status in the coastal ocean and estuarine waters of South Carolina.

- To conduct fishery independent longline sampling on adult red drum to develop information on catch per unit effort (CPUE).
- To collect biological information (size, sex etc.) and samples (otoliths, gonads, muscle, fin clips etc.) from red drum in order to determine size at age, recruitment to the spawning population, mercury contamination, and genetic composition of the stock.
- To tag adult red drum for the collection of migratory and stock identification data.
- To tag and measure small coastal and large coastal sharks caught incidentally to red drum sampling, for inclusion in the COASTSPAN (Cooperative Atlantic States Shark Pupping and Nursery Survey) database.
- To disseminate accomplishments and results to the ASMFC and NMFS for inclusion in stock assessment efforts.

Expected Benefits: This survey will allow for a better understanding of adult population size along the South Carolina coast. Specimens that will be aged will be extremely valuable in determining escapement of sub-adults into the adult population. These elements are critical in the management of the stock.

Approach:

The SCDNR has conducted bottom longline surveys in nearshore and coastal waters in an attempt to generate an index of abundance of adult fish since 1994. Sampling was conducted with bottom longline gear from the R/V Anita (1994-2005?) and currently with the R/V Silver Crescent, a 50-foot shallow draft vessel equipped with two, 1-mile longline reels. Groundlines are constructed of 600 # test monofilament and are approximately 600 m long. Stop sleeves are placed on the groundline at 30 m intervals. Terminal gear is clip-on, monofilament gangions spaced at 15 m intervals (40 hooks per line). Gangions consist of a 2.5mm diameter stainless steel longline clip with 4/0 swivel, 0.5 m of 200# test monofilament and a 15/0, Mustad tuna circle hook. Ten to fourteen, 40 hook sets are made per day. Hooks are baited with spot, Atlantic mackerel, or other readily obtainable baitfish. The sets are anchored and buoyed at each end. Since the primary emphasis is on obtaining red drum in good condition for tagging, gear soak times are short (30 minutes). In live-bottom coastal waters, the rate of bait loss due to crabs and small fish is quite high and longer soak times would be unlikely to increase catch rates. Sampling is conducted during daylight hours.

Captured red drum are brought onboard to be measured (FL and TL mm) and tagged with a nylon dart tag beneath the second dorsal fin and a PIT tag between the first and second dorsal fins. All fish are scanned to detect the presence of a PIT tag in case the external tags have been lost. If a red drum is recaptured, the tag number is recorded. A fin clip sample is collected from each fish in order to identify stocked fish, and also to refine genetic tags to identify individuals. The presence of “drumming” is noted to identify male fish in our samples. This observation is noted with the understanding that female fish do not have the capacity to “drum”, and also that not all male fish do drum when captured.

The fixed station longline survey for adult red drum conducted by the SCDNR along coastal South Carolina since 1994, concentrated in the Charleston Harbor, with occasional trips to other areas of the coast. Index stations were sampled with 1-mile long gear, primarily in late summer

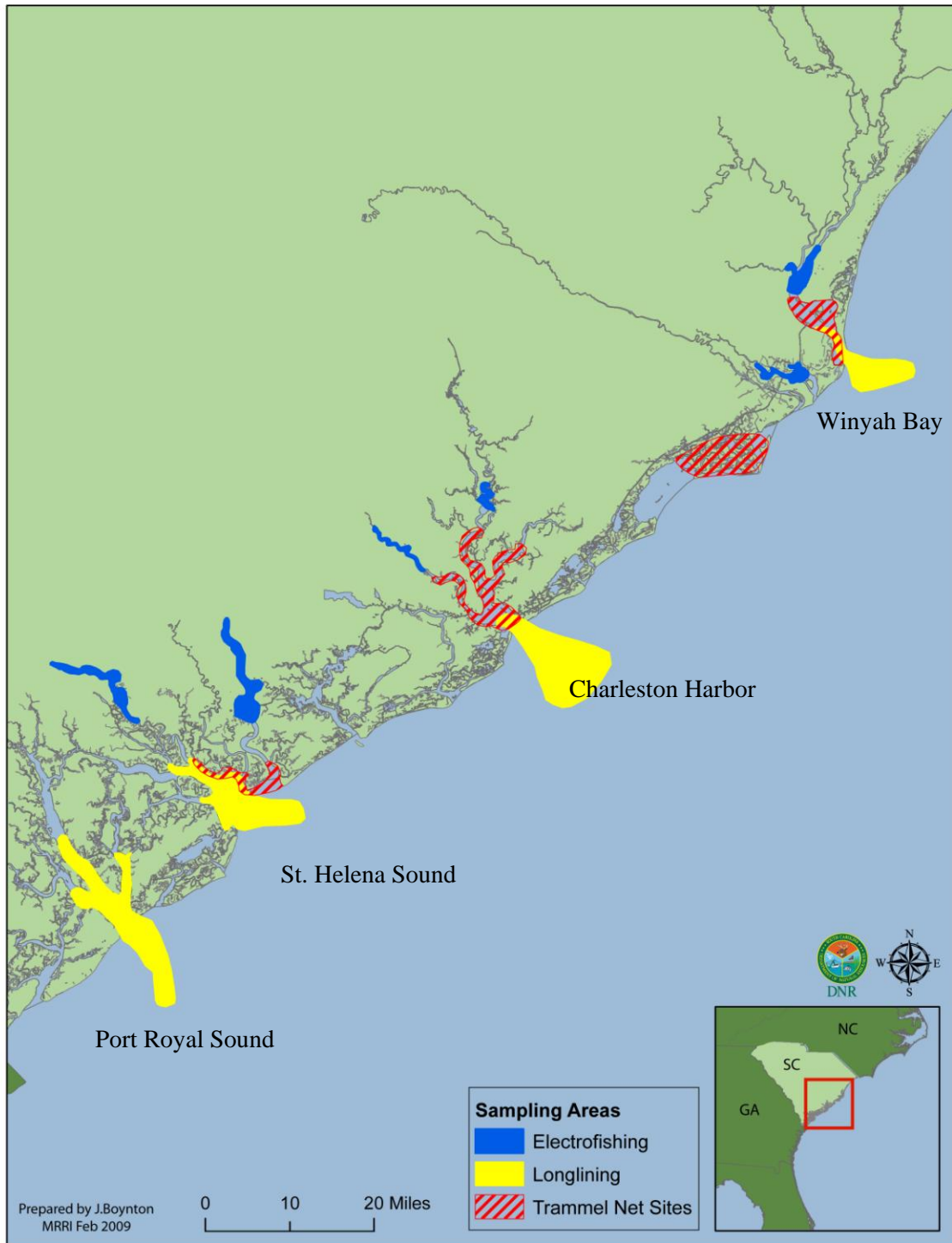
through fall when red drum are most densely aggregated. In an effort to respond to the needs of stock assessment biologists, the survey was redesigned in 2007. The new sampling design aims to increase coverage along the coast, to increase sample size, and to choose sampling sites randomly.

In 2007, sampling protocol was changed to increase sample size, geographical coverage and seasonal coverage. Sets are 1/3 miles long, and are set with 40 baited hooks. Thirty sites are randomly selected from a predetermined list of sites (40-100 sites/strata) during each sampling period (2- month periods: March/April, May/June, July/August, September/October, November/December). Each of four strata (Winyah Bay, Charleston Harbor, St. Helena Sound and Port Royal Sound) are sampled once during each time period.

A random sample of red drum are sacrificed and various samples have been taken for multiple investigations (per request of the ASMFC Red Drum Technical Committee). Selected fish are kept whole on ice and returned to the laboratory. Otoliths (sagittae) are extracted and processed for age and growth analysis. These data will allow us to determine escapement of red drum into the adult population by year class. Gonadal tissue will be excised and prepared for histological examination to verify gross maturity assessments, and to determine if the fish have reached maturity and if they have spawned during the current year. A sample of muscle tissue is excised and provided to SC DHEC for mercury analysis. Stomach contents will be identified and quantified. A piece of heart or fin is taken for genetic investigation. Some whole fish are sampled for a survey of parasites.

Location: We will sample four strata along the South Carolina coast with equal effort. These areas include Winyah Bay, Charleston Harbor, St. Helena Sound and Port Royal Sound. These areas give us a wide geographic coverage of the coast. Specific sampling locations within each strata have been identified and chosen due to bottom type, depth, and in some cases from previous sampling or suggestions from local charter captains.

Figure 1. Map of sampling areas along the coast of SC.



Results:

Table 1. Mean number of red drum per set by year for 1-mile-long gear.

Year	Number of sets	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
1995	44	3.34091	4.32378	0.65183	2.0264	4.6555
1996	97	1.5567	3.10231	0.31499	0.9314	2.182
1997	101	0.88119	1.85088	0.18417	0.5158	1.2466
1998	138	1.61594	3.39024	0.2886	1.0453	2.1866
1999	115	2.3913	2.87974	0.26854	1.8593	2.9233
2000	127	1.55906	3.3962	0.30136	0.9627	2.1554
2001	112	2.14286	3.13899	0.29661	1.5551	2.7306
2002	125	3.376	4.97358	0.44485	2.4955	4.2565
2003	170	2.67647	4.02889	0.309	2.0665	3.2865
2004	105	2.6	3.42951	0.33469	1.9363	3.2637
2005	49	5.46939	5.73404	0.81915	3.8224	7.1164
2006	104	3.48077	6.09947	0.5981	2.2946	4.667
2007	34	1.35294	2.58061	0.44257	0.4525	2.2534

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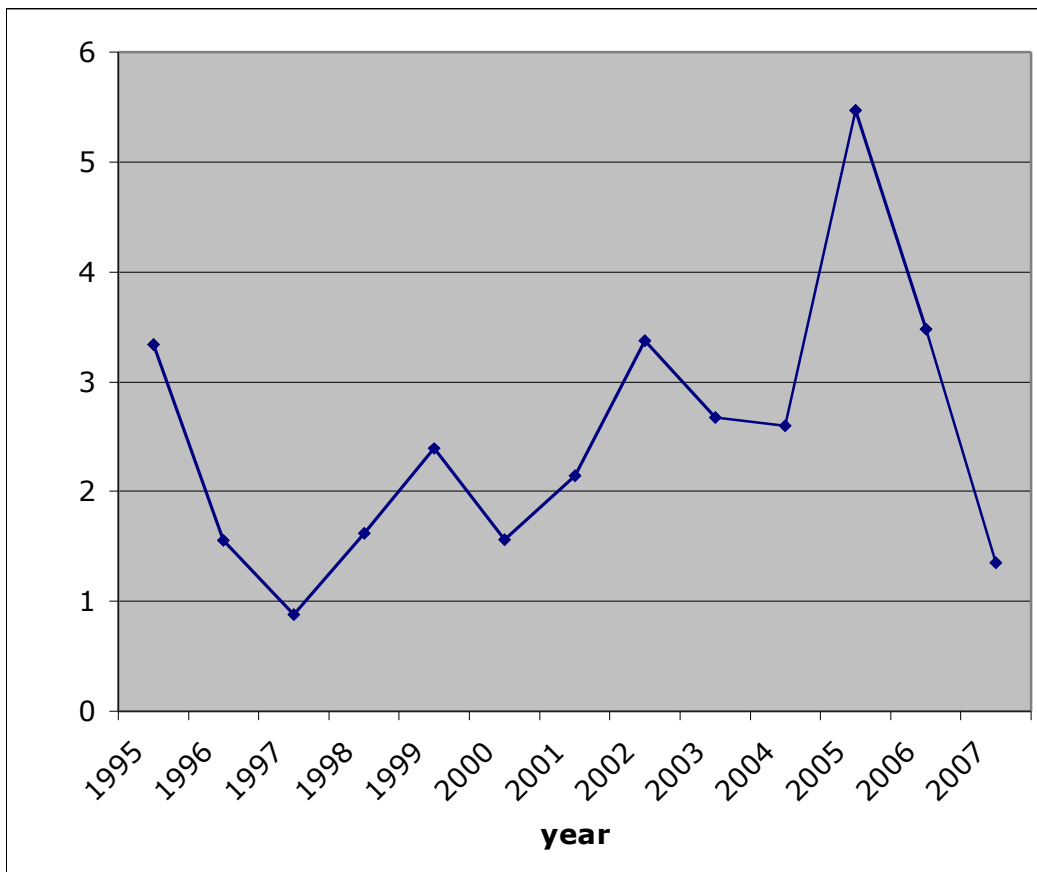


Table 2. Mean number of red drum by month.

Month	# of sets	Mean # drum
1	6	0.16666667
3	14	0.42857143
4	42	0.16666667
5	51	0.64705882
6	76	0.55263158
7	59	0.96610169
8	75	0.81333333
9	180	1.87777778
10	405	3.94074074
11	323	2.52941176
12	90	2.12222222

Table 3. Mean number of red drum by stratum.

Strata	# of sets	Mean # drum
CH	1211	2.22460776
PRS	49	5.10204082
SHS	45	0.06666667
WB	16	12.625

Figure 3. Total length in mm of red drum by age. N=135

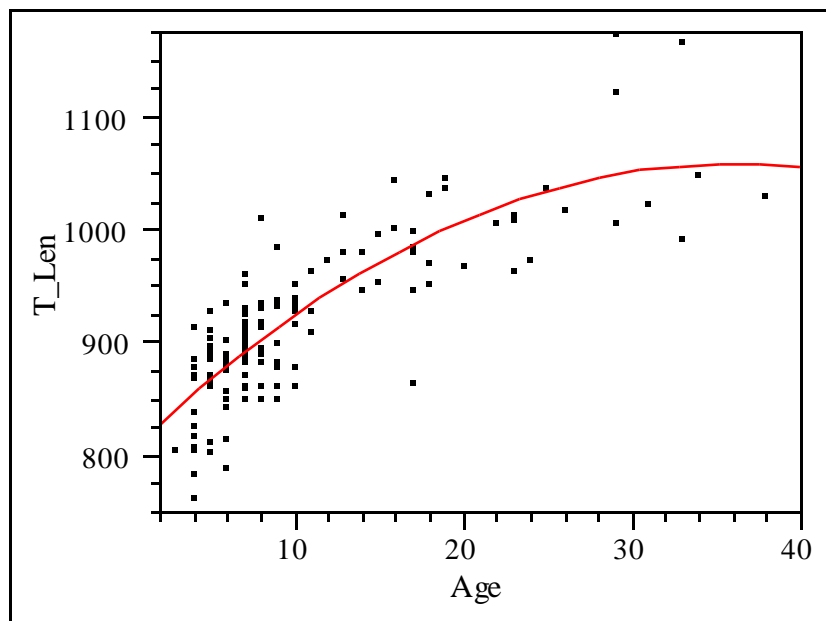
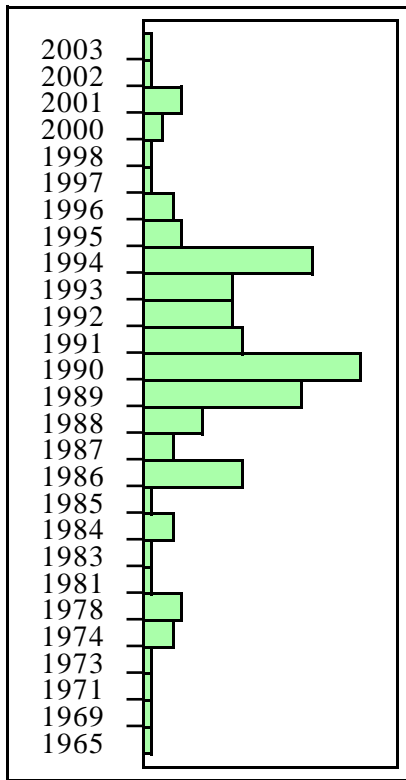


Figure 4. Year class distribution from adult population.



Level	Count	Prob
1965	1	0.00735
1969	1	0.00735
1971	1	0.00735
1973	1	0.00735
1974	3	0.02206
1978	4	0.02941
1981	1	0.00735
1983	1	0.00735
1984	3	0.02206
1985	1	0.00735
1986	10	0.07353
1987	3	0.02206
1988	6	0.04412
1989	16	0.11765
1990	22	0.16176
1991	10	0.07353
1992	9	0.06618
1993	9	0.06618
1994	17	0.125
1995	4	0.02941
1996	3	0.02206
1997	1	0.00735
1998	1	0.00735

	2000	2	0.01471
	2001	4	0.02941
	2002	1	0.00735
	2003	1	0.00735
Total		136	1