

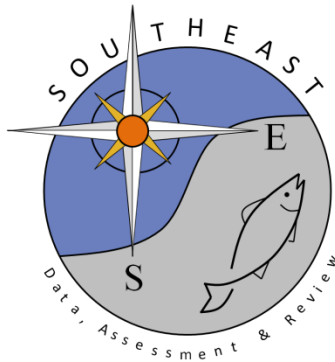
# Discards of *Mustelus canis* in the coastal gillnet fishery off the Southeast United States

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## **Discards of *Mustelus canis* in the coastal gillnet fishery off the Southeast United States**

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### **Introduction**

The Southeast Gillnet Observer Program has adapted to the changes of the Florida-Georgia shark gillnet fishery since the program began in 1993 (e.g. Carlson and Bethea 2007 and references therein, Mathers et al. 2013). There are currently about 500 total directed and incidental shark permits issued in the US Atlantic and Gulf of Mexico, while the number of gillnet fishers changes from year to year. Gillnet effort targeting large coastal (LCS) and small coastal (SCS) sharks, has declined in recent years as a result of Amendments 2 and 3 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan (NMFS 2007, 2010). Fishers have consequently increased effort targeting finfish, including Spanish mackerel *Scomberomorus maculatus*, king mackerel *Scomberomorus cavalla*, and bluefish *Pomatomus saltatrix*, with varying types of gillnet gear. However, a small amount of shark targeted gillnet effort continues to be observed especially for *Mustelus canis*. The Southeast Gillnet Observer Program, in its continuing efforts to adapt to the fishery, currently covers all anchored (sink and stab), strike, or drift gillnet fishing regardless of target by vessels that fish from Florida to North Carolina and the Gulf of Mexico year-round.

Herein, we report on the discards of *Mustelus canis* from onboard observations of the Southeast Gillnet Fishery.

### **Methods**

Observer reported *Mustelus canis* discard rates from 2007-2012, along with self reported commercial fishing effort data, were used to calculate discards from the gillnet fishery off the US southeast coast.

Total effort data reflects all 2007 through 2012 gillnet trip reports received by the Coastal Fisheries Logbook Program (hereafter Logbook Program). In 2007, the CFLP began

using an updated trip report form that provided gillnet fishermen a place to note the type of gillnet used (strike, drift, anchor, or other) as well as space to provide the number of sets. These fields were unavailable on logbook forms prior to 2007. There are some instances where fishermen have submitted a 2007 or later trip on a pre-2007 form.

Trip target determination was made by using the proportion of shark catch to the rest of trip landings. A shark landing percentage greater than or equal to 66.6% was considered a shark directed trip. A shark landing percentage of less than 33.3% were considered as “other” and shark landings 33.3-66.6% were considered as mixed. Dogfish were included with all other sharks for trip target determination.

Directed shark permit status was noted as yes or no. A permit history for all directed shark permits was created from the permit data housed in SEFSC’s Fishery Logbook System (FLS). These permit data were compared with the FLS trips by vessel and effective permit dates for permit status determination. There are a number of shark targeting trips without a directed shark permit. This is likely attributable to two primary reasons. First, the trip may have been targeting dogfish and possession of a directed shark permit was not required to fish for dogfish. Second, there are vessels that fish for sharks solely in state waters and therefore do not possess Federal shark permits. These fishers may have reported on the Coastal Fisheries Logbook because they possessed a logbook from another permit they held (e.g., Gulf of Mexico Reef Fish, King Mackerel, South Atlantic Snapper/Grouper, etc.). Thus gillnet effort was considered from all targets due to the mixed natures of sets.

We employed a simple ratio estimator to represent bycatch rates;

$$\text{Catch per unit effort (CPUE)} = \frac{\sum x}{\sum y}$$

Where x is the number of observed *Mustelus spp.* caught and y is the number of observed sets per year (Snedecor and Cochran, 1967). An estimate of uncertainty in these estimates was derived from bootstrap re-sampling of the calculated CPUE data set. A sample was drawn from the data (with replacement). The procedure was repeated 10,000 times to generate a mean distribution for the estimate. The sample values 2.5% and 97.5% of the bootstrap distribution were used as the lower and upper bounds of the 95% confidence interval for the parameter estimate. Total discards were calculated as the product of observer reported yearly mean discard rates from the bootstrapped data and the yearly total fishing effort (number of sets) reported to the coastal logbook program.

### Results and Discussion

Calculated discards (in numbers of fish) from the commercial gillnet fishery are provided in Table 1 and Table 2. The average sizes of *Mustelus spp.* captured in the gillnet fishery is in Table 3.

**Table 1.** Yearly calculated live discards of *Mustelus canis* from the southeast commercial gillnet fishery. Discards are reported as number of fish.

Year	Total logbook sets	Total Observer Sets	Mean per set discard alive	Discards	LCL	UCL
2007	3781	89	2.5955	9,814	0	41,275
2008	3607	135	0.0148	53	0	497
2009	4108	190	0.0158	65	0	-
2010	2714	281	2.9075	7,891	0	42,801
2011	3466	398	0.1307	453	0	2,003
2012	3613	298	0.0570	206	0	2,598

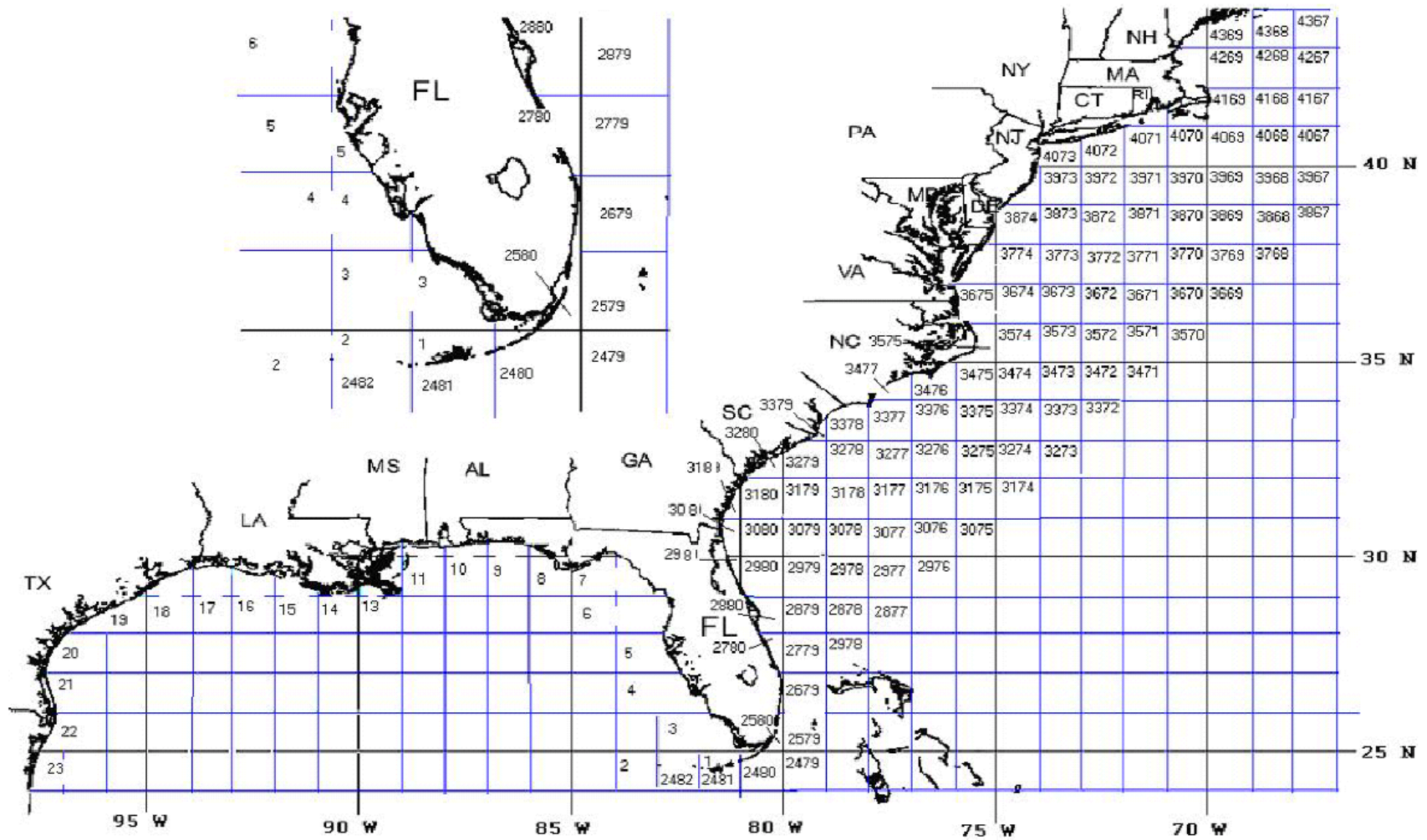
**Table 2.** Yearly calculated dead discards of *Mustelus canis* from the southeast commercial gillnet fishery. Discards are reported as number of fish.

Year	Total sets	Total Observer Sets	Mean per set discard dead	Discards	LCL	UCL
2007	3781	89	0.0000	0	0	0
2008	3607	135	0.0000	0	0	0
2009	4108	190	0.0000	0	0	0
2010	2714	281	0.0605	164	0	214
2011	3466	398	0.0101	35	0	-
2012	3613	298	0.0067	24	0	-

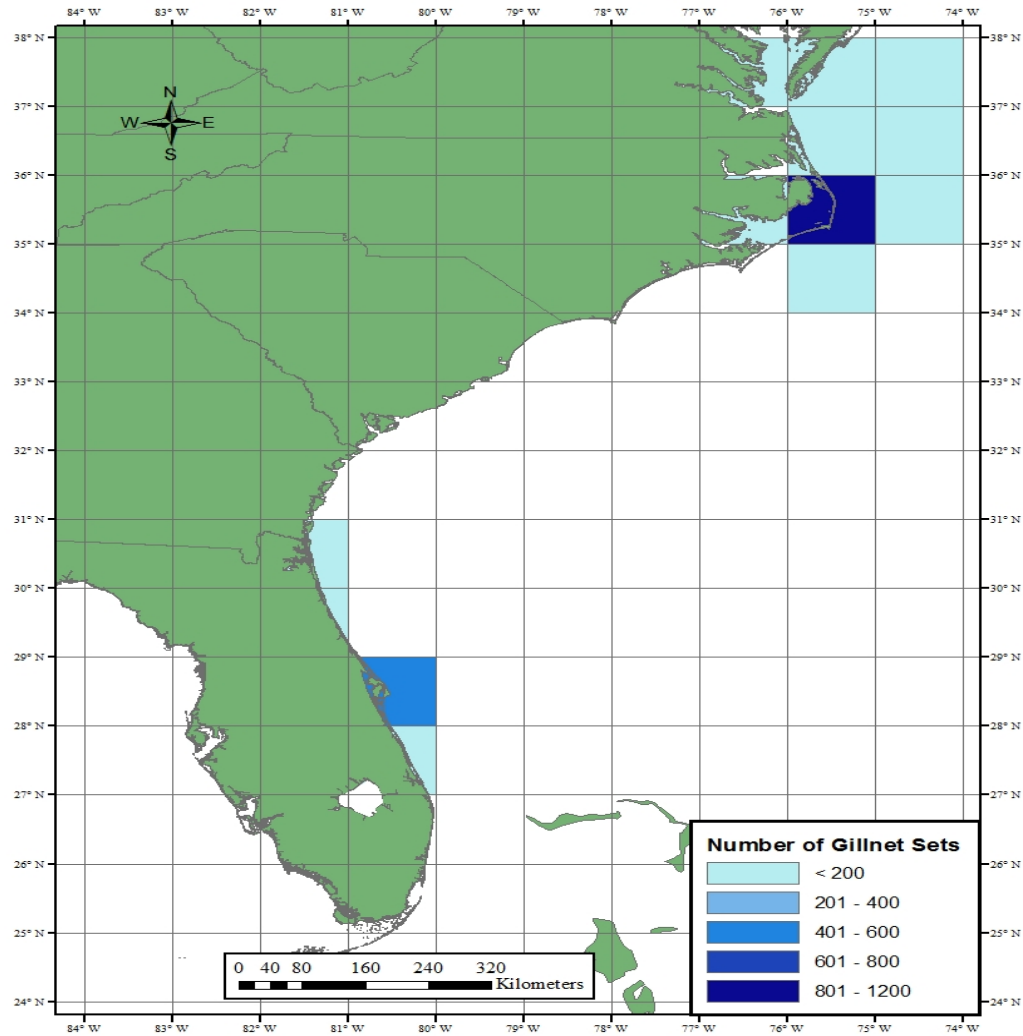
**Table 3.** Average size estimates of all *Mustelus canis* caught by year from the southeast commercial gillnet fishery.

Year	Avg FL (cm)	S.D.	n
2005	55.00	0.00	1
2006	78.00	0.00	1
2007	79.13	4.63	15
2008	85.29	7.54	160
2009	73.60	14.21	57
2010	66.22	19.90	77
2011	84.25	16.05	28
2012	84.09	13.21	156

**Figure 1.** Coastal logbook statistical areas.



**Figure 2.** Distribution of observed fishing effort in the coastal gillnet fishery off the US southeast coast 2007-2012.



## ADDENDUM TO SEDAR39-DW-23

### Discards of *Mustelus canis* in the coastal gillnet fishery off the Southeast United States

#### Introduction

Based on discussion at the SEDAR 29, bycatch rates in the coastal gillnet fishery in the US south Atlantic were back calculated using the following procedure:

1. The median bycatch rate was calculated from the observer data for the years 2007-2012.
2. Total discards were calculated using the median discard rate multiplied by the year specific data from the coastal logbook data.
3. An estimate of uncertainty in these estimates was derived from bootstrap re-sampling of the year-based observer CPUE data set. A sample was drawn from the data (with replacement). The procedure was repeated 10,000 times to generate a mean distribution for the estimate. The sample values 2.5% and 97.5% of the bootstrap distribution were used to extrapolate the lower and upper bounds of the 95% confidence interval for the year specific total discards.

Table 1. Yearly calculated live discards of *Mustelus canis* from the coastal gillnet fishery. Discards are reported as number of fish.

Year	Total logbook sets	Total Observer Sets	Per set discard alive	MEAN TOTAL DISCARDS	LCL	UCL
1998	3210		0.0939	301	68	8,053
1999	2597		0.0939	244	55	6,515
2000	2934		0.0939	275	62	7,361
2001	2835		0.0939	266	60	7,112
2002	3036		0.0939	285	64	7,617
2003	2757		0.0939	259	59	6,917
2004	2699		0.0939	253	57	6,771
2005	3010		0.0939	282	64	7,552
2006	3489		0.0939	327	74	8,753
2007	3781	89	2.5955	9,814	0	41,275
2008	3607	135	0.0148	53	0	497
2009	4108	190	0.0158	65	0	
2010	2714	281	2.9075	7,891	0	42,801
2011	3466	398	0.1307	453	0	2,003
2012	3613	298	0.0570	206	0	2,598



Table 2. Yearly calculated dead discards of *Mustelus canis* from the coastal gillnet fishery. Discards are reported as number of fish.

Year	Total sets	Total Observer Sets	Per set discard dead	MEAN TOTAL DISCARDS	LCL	UCL
1998	3210		0.0034	11	0	135
1999	2597		0.0034	9	0	109
2000	2934		0.0034	10	0	123
2001	2835		0.0034	10	0	119
2002	3036		0.0034	10	0	128
2003	2757		0.0034	9	0	116
2004	2699		0.0034	9	0	113
2005	3010		0.0034	10	0	126
2006	3489		0.0034	12	0	147
2007	3781	89	0.0000	0	0	0
2008	3607	135	0.0000	0	0	0
2009	4108	190	0.0000	0	0	0
2010	2714	281	0.0605	164	0	214
2011	3466	398	0.0101	35	0	
2012	3613	298	0.0067	24	0	