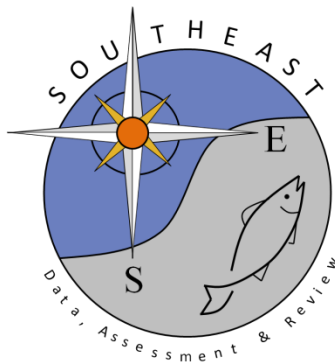# Discards of *Mustelus spp*. in the Gulf of Mexico reeffish bottom longline fishery

John Carlson, Elizabeth Scott-Denton, and Kevin McCarthy

SEDAR39-DW-26

14 May 2014
Addendum Added: 21 May 2014

Please cite this document as:

Discards of *Mustelus spp*. in the Gulf of Mexico reeffish bottom longline fishery

John Carlson
National Marine Fisheries Service, Southeast Fisheries Science Center,
3500 Delwood Beach Rd. Panama City, FL 32408
John.Carlson@noaa.gov

Elizabeth Scott-Denton
National Marine Fisheries Service, Southeast Fisheries Science Center,
4700 Avenue U
Galveston, Texas 77551

Kevin McCarthy
National Marine Fisheries Service, Southeast Fisheries Science Center Sustainable
Fisheries Division, 75 Virginia Beach Drive, Miami, FL, 33149

Introduction

The reeffish fishery in the Gulf of Mexico consists of approximately 890 federally
permitted vessels. Primary gears used in this fishery include bottom longline, vertical line
(bandit or handline) and more recently buoy gear. Although all reef fish species are
retained, the predominant target species are groupers, *Epinephelus* spp., and snappers,
Lutjanus spp. Details of the fishery and its operations can be found in Scott-Denton et al.
(2011). Of the approximately 890 permitted vessels about 130 report fishing with bottom
longline gear opposed to bandit or handline for the majority of their trips.

Data collected by at-sea observers of this fishery began in 2005 by the NMFS-
Panama City Laboratory. Fishery observers are trained in fishery and biological data
collection, biological sampling, and teleost and elasmobranch species identification.
Observers are required to record and measure all species captured, their disposition (e.g.
kept, discarded dead, used for bait, etc.) and effort (e.g. number of hooks, gear
characteristics, set and haul times). While the focus of the Panama City Laboratory
observer program was on shark directed bottom longline trips, observers also boarded
bottom longline fishing trips that targeted grouper, snapper, and tilefish because of the
overlap in vessels carrying dual permits (shark and reeffish). The NMFS-Galveston
Laboratory also began observer coverage of this fishery in 2006 as part of the observer
program to monitor the reeffish fishery in the Gulf of Mexico. Both programs have
continued observations of this fishery since 2006. During some hauls, *Mustelus spp*., are
caught as bycatch and retained and landed.

Bottom longline landings and fishing effort of commercial vessels operating in
the Gulf of Mexico are reported to the National Marine Fisheries Service (NMFS)
through the Coastal Fisheries Logbook Program (CFLP, conducted by the NMFS
Southeast Fisheries Science Center). The program collects landings and effort data by
fishing trip from vessels that are federally permitted to fish in a number of fisheries

managed by the National Marine Fisheries Service and Gulf of Mexico Fishery Management Councils. The coastal logbook program began in 1990 with the objective of a complete census of coastal fisheries permitted vessel activity, with the exception of Florida, where a 20% sample of vessels was selected to report. Beginning in 1993, reporting in Florida was increased to include all vessels permitted for Federally managed coastal fisheries.

Using these data, we estimated total discards of *Mustelus spp.* in the reefish bottom longline fishery from 2006-2012.

Methods

Observer reported *Mustelus spp.* discard rates from 2006-2012, along with self reported commercial fishing effort data, were used to calculate *Mustelus spp.* discards from the reefish bottom longline fishery in the Gulf of Mexico. Fishing effort data were available from the coastal logbook program for the years 1993-2012. Beginning in 1993 all commercial vessels with Federal fishing permits (other than those for swordfish, tunas, and shrimp) were required to report landings and effort to the coastal logbook program.

Available coastal logbook data were filtered to include only bottom longline data and to remove records missing effort information (number of sets, number of hooks per set). Data reported from individual trips with fishing effort in both the South Atlantic and Gulf of Mexico were excluded from the analyses because fishing effort cannot be reliably apportioned within single trips. Coastal logbook data were additionally filtered to remove likely erroneous records; for example, data from trips that reported fishing more 24 sets per 24 hours. Those data that exceeded the 99.5 percentile of the data for any variable used to calculate effort (number of sets, number of hooks) were also excluded. Such outliers in the data set usually resulted from data entry errors. After data filtering, effort data from only those trips that targeted reeffish (defined as trips with reported landings of 2/3 reefish by weight) were included in the analysis. Effort was defined as hooks fished because hook hours fished could not be reliably calculated from the coastal logbook data.

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 Gulf of Mexico *Mustelus spp*. discards (in numbers of fish) from the commercial bottom longline fishery are provided in Table 1 and Table 2. The location of logbook statistical grids is in Figure 1 and the distribution of fishing effort is in Figure 2. The lengths of all *Mustelus spp*., regardless of disposition, captured is in Figure 3.

Table 1. Yearly calculated live discards of *Mustelus spp.* from the bottom longline fishery. Discards are reported as number of fish.

Year	Total logbook sets	Total Observer Sets	Mean per set discard alive	Discards	LCL	UCL
2006	29738	228	0.1228	3,652	0	3,952
2007	25770	372	0.1237	3,187	0	23,670
2008	27047	274	2.7701	74,922	0	463,496
2009	16753	804	1.2898	21,608	0	111,878
2010	13337	2019	0.5503	7,339	0	21,841
2011	19408	2542	0.1987	3,856	0	17,667
2012	16647	1087	0.5501	9,158	0	44,737

Table 2. Yearly calculated dead discards of *Mustelus spp.* from the bottom longline fishery. Discards are reported as number of fish.

Year	Total logbook sets	Total Observer Sets	Mean per set discard dead	Discards	LCL	UCL
2006	29738	228	0.0044	130	0	
2007	25770	372	0.0000	0	0	0
2008	27047	274	0.1350	3,652	0	26,595
2009	16753	804	0.0249	417	0	4,466
2010	13337	2019	0.0583	778	0	
2011	19408	2542	0.0063	122	0	
2012	16647	1087	0.0434	722	0	

Figure 1. Coastal logbook statistical areas.
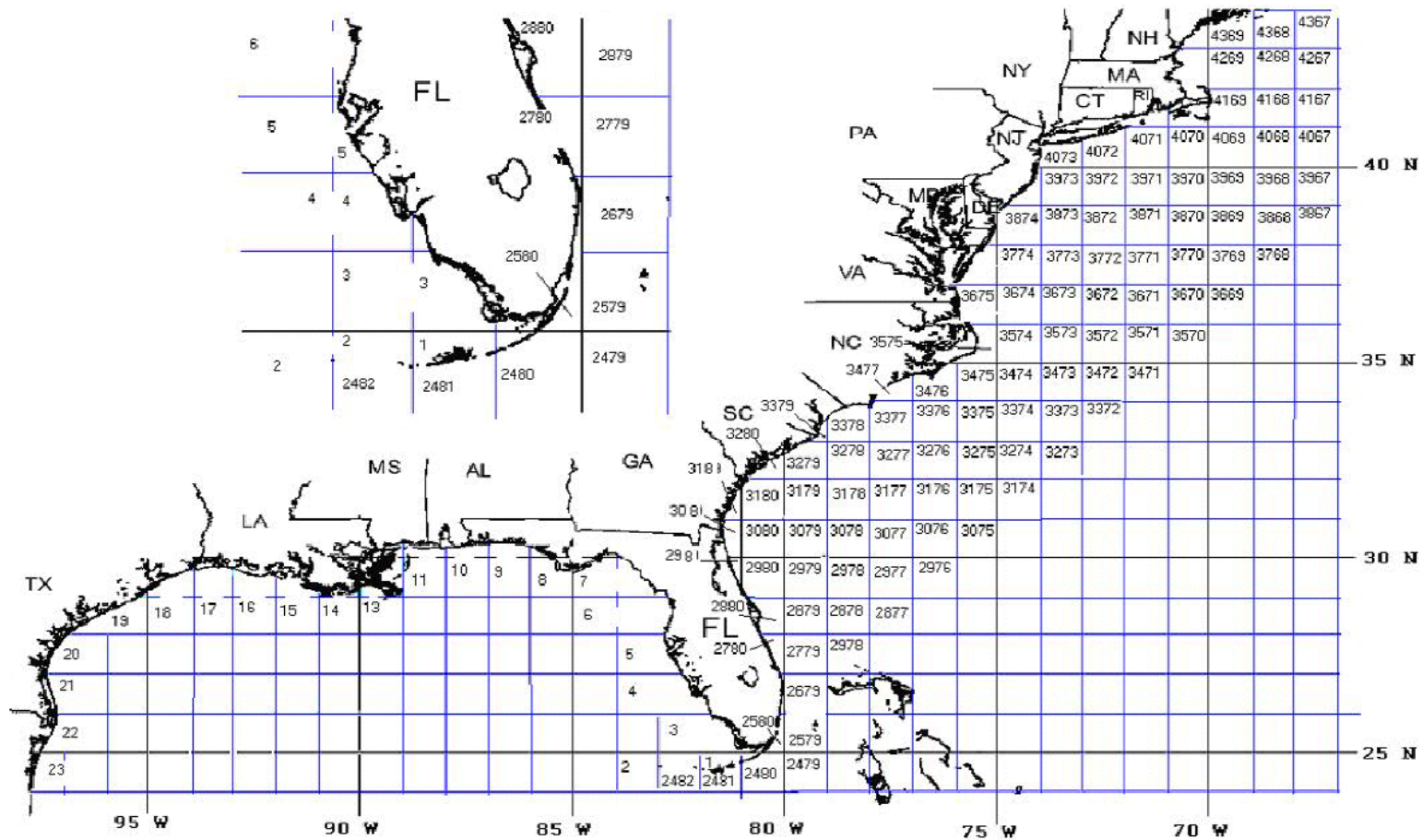
Figure 2. Distribution of observed fishing effort in the Gulf of Mexico for the directed reefish longline fishery 2006-2012.
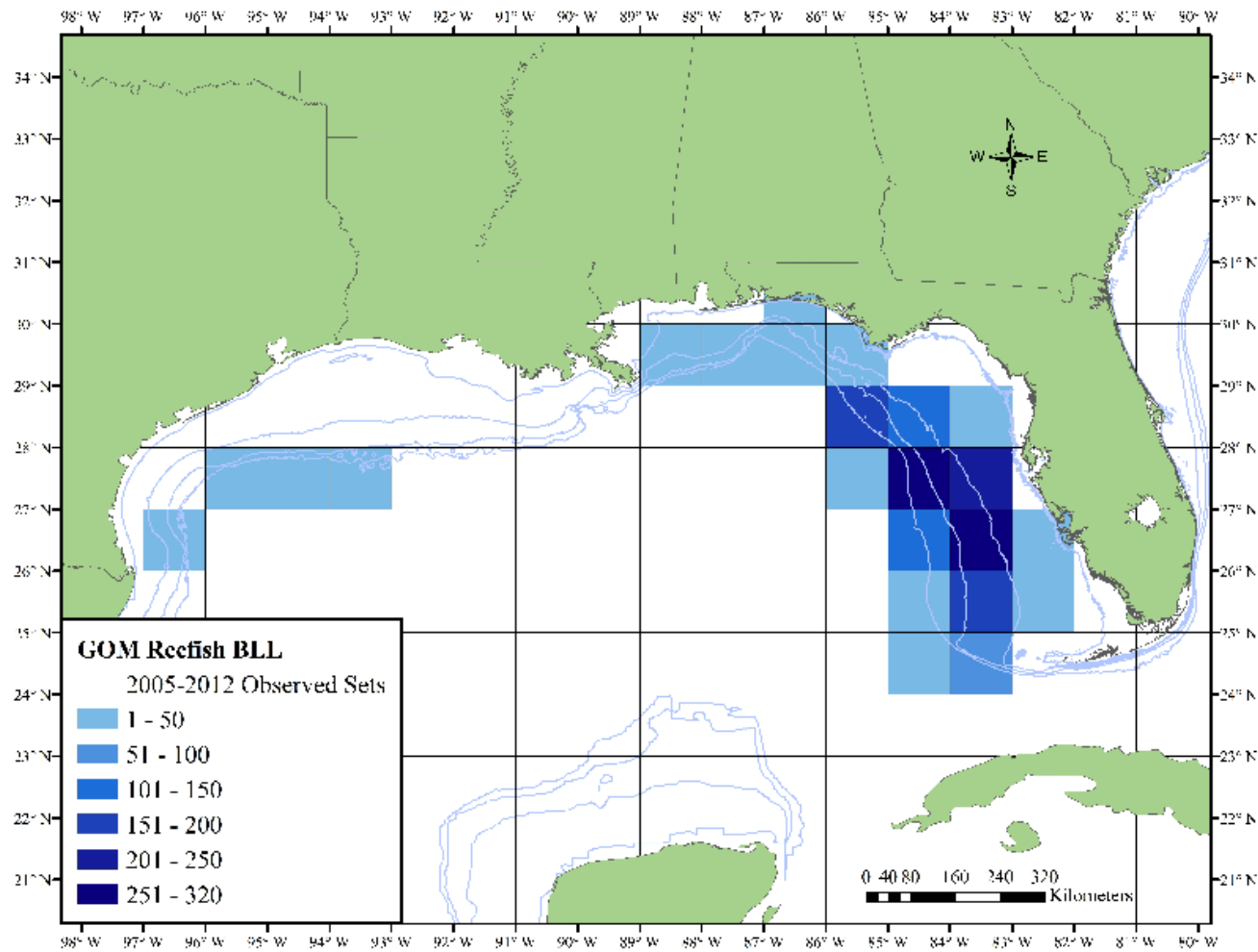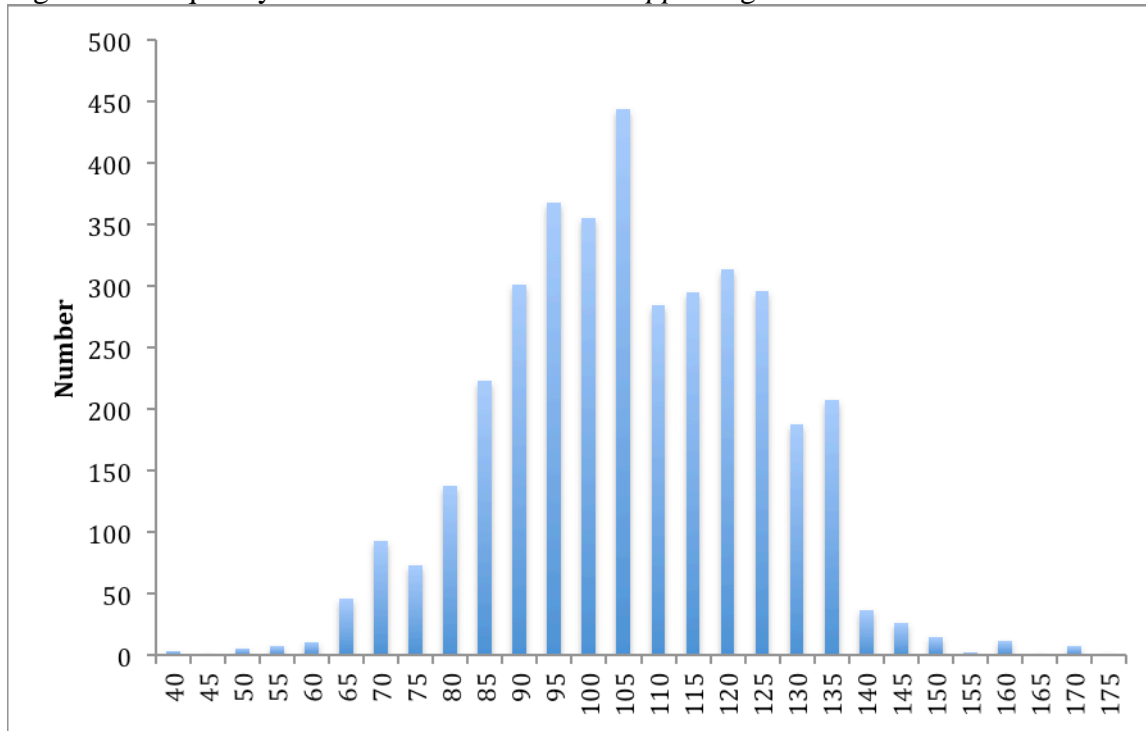
Figure 3. Frequency distribution of all *Mustelus spp.* caught from the Gulf of Mexico reefish longline fishery.

ADDENDUM TO SEDAR39-DW-26

Discards of *Mustelus spp*. in the Gulf of Mexico reefish bottom longline fishery

Introduction

Based on discussion at the SEDAR 29, bycatch rates in the reefish bottom longline fishery in the Gulf of Mexico were back calculated using the following procedure:

1. The median bycatch rate was calculated from the observer data for the years 2006-2012.
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 spp.* from the bottom longline fishery. Discards are reported as number of fish.

Year	Total logbook sets	Total Observer Sets	Per set discard alive	MEAN TOTAL DISCARDS	LCL	UCL
1990	10963		0.5501	6,031	2,355	15,287
1991	19159		0.5501	10,540	4,115	26,715
1992	10826		0.5501	5,956	2,325	15,096
1993	34019		0.5501	18,715	7,307	47,435
1994	40785		0.5501	22,437	8,760	56,870
1995	36416		0.5501	20,034	7,822	50,778
1996	39941		0.5501	21,973	8,579	55,693
1997	46073		0.5501	25,347	9,896	64,243
1998	38713		0.5501	21,297	8,315	53,980
1999	40260		0.5501	22,149	8,647	56,138
2000	38945		0.5501	21,425	8,365	54,304
2001	38112		0.5501	20,967	8,186	53,142
2002	35414		0.5501	19,483	7,606	49,380
2003	38636		0.5501	21,255	8,298	53,873
2004	36276		0.5501	19,957	7,792	50,582
2005	27697		0.5501	15,237	5,949	38,620
2006	29738	228	0.1228	3,652	0	3,952
2007	25770	372	0.1237	3,187	0	23,670
2008	27047	274	2.7701	74,922	0	463,496
2009	16753	804	1.2898	21,608	0	111,878
2010	13337	2019	0.5503	7,339	0	21,841
2011	19408	2542	0.1987	3,856	0	17,667
2012	16647	1087	0.5501	9,158	0	44,737

Table 2. Yearly calculated dead discards of *Mustelus spp.* from the bottom longline fishery. Discards are reported as number of fish.

Year	Total sets	Total Observer Sets	Mean per set discard dead	MEAN TOTAL DISCARDS	LCL	UCL
1990	10963		0.0249	273	81	755
1991	19159		0.0249	477	141	1,319
1992	10826		0.0249	269	80	745
1993	34019		0.0249	846	250	2,342
1994	40785		0.0249	1,015	300	2,808
1995	36416		0.0249	906	268	2,507
1996	39941		0.0249	994	294	2,750
1997	46073		0.0249	1,146	339	3,172
1998	38713		0.0249	963	285	2,665
1999	40260		0.0249	1,001	296	2,772
2000	38945		0.0249	969	286	2,681
2001	38112		0.0249	948	280	2,624
2002	35414		0.0249	881	260	2,438
2003	38636		0.0249	961	284	2,660
2004	36276		0.0249	902	267	2,497
2005	27697		0.0249	689	204	1,907
2006	29738	228	0.0044	130	0	
2007	25770	372	0.0000	0	0	0
2008	27047	274	0.1350	3,652	0	26,595
2009	16753	804	0.0249	417	0	4,466
2010	13337	2019	0.0583	778	0	
2011	19408	2542	0.0063	122	0	
2012	16647	1087	0.0434	722	0	