Size Distribution, Release Condition, and Estimated Discard Mortality of Gray Triggerfish Observed in For-Hire Recreational Fisheries in the South Atlantic

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SEDAR41-DW34

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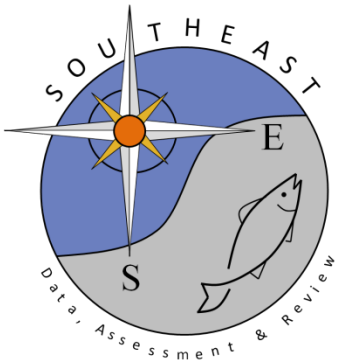
**Updated to include 2014 data



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Updated to include data for 2014

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Detailed information on the size and release condition of discarded fish is not collected in traditional dockside surveys of recreational fisheries. At-sea observer surveys provide valuable information on the size and condition of discarded fish. Such surveys have been conducted on headboat vessels in the south Atlantic since 2004. Coverage was expanded in 2013 to include charter vessels on the east coast of Florida. This report provides a summary of available information on the size, release condition, and disposition of gray triggerfish collected from headboats and charter boats from the Atlantic coast of Florida through North Carolina.

Coverage

Fishery observer coverage for headboats and charter vessels operating in the South Atlantic is summarized in Table 1.

Headboat Coverage

In 2004, at-sea observer surveys were conducted on headboats from North Carolina and South Carolina, and coverage was extended to east Florida in 2005. In the Florida Keys, the at-sea headboat survey was funded by the Gulf Fisheries Information Network (Gulf FIN) from 2005 until 2007. In 2010, the state of Florida secured alternative funds to continue limited at-sea observer coverage for headboats in the Keys through 2013. Headboats were not sampled in the Keys in 2014 due to loss of funding again in the Gulf.

Charter Vessel Coverage

In 2010, observer coverage in the Florida Keys was expanded to include charter vessels. In 2013 a MARFIN project that employs fishery observers on charter vessels was initiated on the east coast of Florida, including the Florida Keys. The MARFIN project is funded through 2015.

Table 1. Fishery observer coverage for headboats (H) and charter vessels (C).

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
NC	H	H	H	H	H	H	H	H	H	H	H
SC	H	H	H	H	H	H	H	H	H	H	H
GA	H	H	H	H	H	H	H	H	H	H	H
EFL		H	H	H	H	H	H	H	H	H, C	H, C
Keys		H	H	H			H, C	H, C	H, C	H, C	C

Cooperative vessels in each state were randomly selected year-round for observer coverage. The state of Florida was stratified into three regions: Northeast (Nassau through Brevard Counties, sub-region=5), Southeast (Indian River through Dade Counties, sub-region=4), and Keys (Monroe County, sub-region=3). Operators from selected vessels were contacted by state biologists and one or two observers were scheduled to sample a single trip in a selected week. For trips with 15 or less passengers in Florida, only one observer accompanied passengers during the scheduled trip.

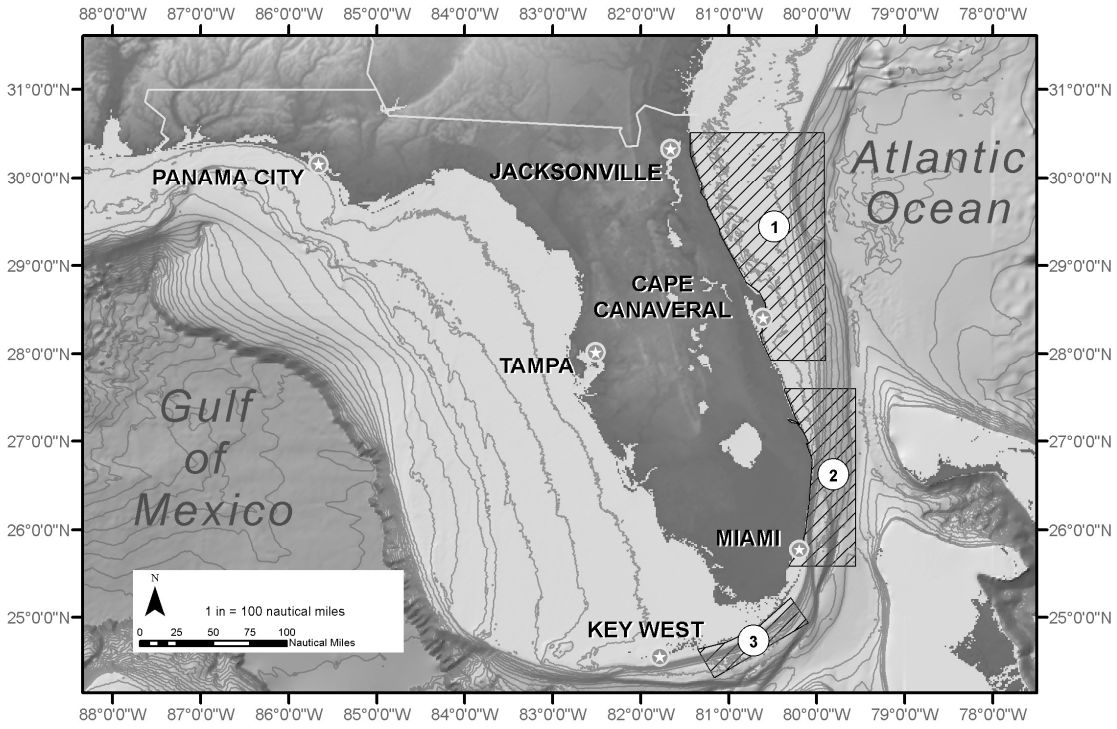

Figure 1. Areas in Florida with at-sea observer coverage. Area 1 is the northeast region, area 2 is the southeast region, and area 3 is the Key West Region.

Data Elements:

All sampled trips
Trip level data are available for all regions and years of observer coverage (Table 1). Trip level information for each sampled trip includes:

- Year, month and day of trip
- area where the majority of fishing took place,
    - coded as 3 miles or less from shore or more than 3 miles from shore
- duration of fishing (to the nearest half hour)
- total number of anglers on board
- number of anglers observed
- minimum and maximum depths fished (collected in Florida only)

A brief interview with each angler observed during a trip was also conducted to collect information on primary and secondary target species, angler avidity, and state and county of residence (discontinued in Florida when new methods were implemented, discussed in next section).

For each angler observed during a sampled trip, the following information was collected:

- total number of fish retained by species
- total number of fish discarded alive by species
- total number of fish discarded dead by species

For each fish caught by an observed angler during a sampled trip, biologists recorded:

- species
- size (fork length in mm)
- disposition, coded as:
    - 1: thrown back alive, legal
    - 2: thrown back alive, not legal
    - 3: plan to eat
    - 4: used for bait or plan to use for bait
    - 5: sold or plan to sell
    - 6: thrown back dead or plan to throw away
- Release condition, collected in Florida only, coded as:
    - 1 = Good, fish swam toward bottom immediately upon entry into the water
    - 2 = Fair, fish was disoriented upon release and slowly swam towards the bottom
    - 3 = Poor, fish was very disoriented upon release and remained at the surface
    - 4 = Dead, fish was either dead or unresponsive upon entering the water
    - 5 = Eaten, fish was eaten by a bird, another fish, or a marine mammal
    - 9 = Unobserved, unable to observe or not applicable (fish retained)

Florida only
Data collection methods were modified in Florida to collect more detailed station-level information beginning in 2010 in the Keys and 2011 on the east coast of Florida (Table 2).

For each location fished during a sampled trip, the following station-level information was recorded:

- latitude and longitude (degrees and minutes)
- fishing zone and subzone (same as commercial zones)
- depth (meters)
- up to three target species and percentage of time targeting each

For each angler observed at a given station, the following information was collected:

- total number of fish retained by species
- total number of fish discarded alive by species
- total number of fish discarded dead by species

For each rod fished by an observed angler at a given station, the following information was recorded:

- leader type and strength
- hook type (circle hook, J hook, kahle hook, treble hook, other)
- hook offset (yes or no)
- hook size (using a standard hook sizing chart)
- bait type (Iive, whole dead fish, cut fish, squid, cocktail, artificial)

For each fish observed from a given rod at a given station, the following information was recorded:

- species
- mid-line length (mm)
- disposition (same as above)
- release condition (same as above)
- anatomical location of embedded hooks (lip, mouth, throat, gill, gut, eye, external)
- method of hook removal (easy or difficult; by hand, dehooking tool, pliers, or left in place)
- presence of barotrauma symptoms (inflated bladder, everted stomach, extruded intestines, exopthalmia)
- venting method (released without venting, bladder vented, stomach vented)
- presence of gill injury (visible bleeding from gills)

Table 2. Availability of detailed station level data for headboats (H) and charter trips (C).

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
NC											
SC											
GA											
EFL								H	H	H, C	H, C
Keys							H, C	H, C	H, C	H, C	C

Sample Weights:

Headboat vessels report fishing effort in logbook trip reports, and effort data were provided by the NMFS Southeast Fisheries Science Center in Beaufort, NC. To generate weighting factors for sampled headboat trips throughout the survey area, fishing effort for the years 2005 through 2013 was used to calculate proportional fishing effort by state or region (for Florida). Sample weights were calculated as:

$$W_{ay} = (N_{ay}/N_y) / (n_{ay}/n_y) \qquad \text{Equation 1}$$

Where N_{ay} /N is the total number of headboat trips reported from area a (state or region) during year y divided by total number of trips reported in the South Atlantic, and n_{ay}/n is the number of trips sampled in area a during year y, divided by the total number of sampled trips in the South Atlantic. Areas with $W_{ay} < 1$ are down weighted to account for higher sampling effort and areas with $W_t > 1$ are upweighted to account for undersampling.

Numbers of headboat trips sampled in each state/region are provided in Table 3, and calculated sample weights are provided in Table 4.

Table 3. Headboat at-sea observer trips sampled by state/region and year.

Year	NC (n_i)	SC (n_i)	GA-NEFL (n_i)	SEFL (n_i)	Keys (n_i)	Sum (n)
2005	97	57	49	93	36	332
2006	88	45	45	71	52	301
2007	91	52	57	69	46	315
2008	78	39	55	74	0	246
2009	69	34	61	76	0	240
2010	83	26	51	72	0	232
2011	79	22	51	68	0	220
2012	78	36	62	64	0	240
2013	55	41	61	79	19	255
2014	70	41	68	79	0	258

Table 4. Sample weights (W_{ay}).

Year	NC	SC	GA-NEFL	SE-KY
2005	0.257	0.659	0.794	1.788
2006	0.177	0.934	0.681	1.730
2007	0.210	1.199	0.825	1.621
2008	0.164	1.320	0.859	1.817
2009	0.210	1.493	0.889	1.586
2010	0.184	2.030	0.823	1.693
2011	0.162	2.485	0.718	1.704
2012	0.178	1.444	0.587	2.153
2013	0.230	1.048	0.608	1.656
2014	0.160	0.960	0.414	2.269

Length Frequency

Fork length (in mm) was used in all length-based analyses in this report. Individual fish were assigned to one cm length bin categories (40 cm bin = fish 39.5 cm to 40.4 cm) and fish in each length bin category were summed by area (state or region), year and disposition (harvested, released), and multiplied by appropriate sample weights. Weighted values for each area within a length bin were then summed and weighted proportions of fish in each length bin calculated (Figure 2). Raw sample sizes for numbers of fish measured are provided in Table 5.

Table 5. Raw (unweighted) sample sizes for gray triggerfish lengths.

Year	Disposition	NC	SC	GA-NEFL	SEFL	Total
2005	Discard	0	0	21	87	108
	Harvest	99	21	98	180	398
2006	Discard	0	0	11	66	77
	Harvest	27	12	80	75	194
2007	Discard	5	1	14	66	86
	Harvest	81	21	158	37	297
2008	Discard	20	1	8	63	92
	Harvest	107	11	104	88	310
2009	Discard	7	0	19	103	129
	Harvest	95	0	177	86	358
2010	Discard	1	0	16	73	90
	Harvest	160	0	236	115	511
2011	Discard	1	8	2	32	43
	Harvest	105	91	80	70	346
2012	Discard	1	1	4	43	49
	Harvest	138	38	91	38	305
2013	Discard	0	0	8	127	135
	Harvest	160	0	240	72	472
2014	Discard	0	0	8	204	212
	Harvest	73	1	173	77	324

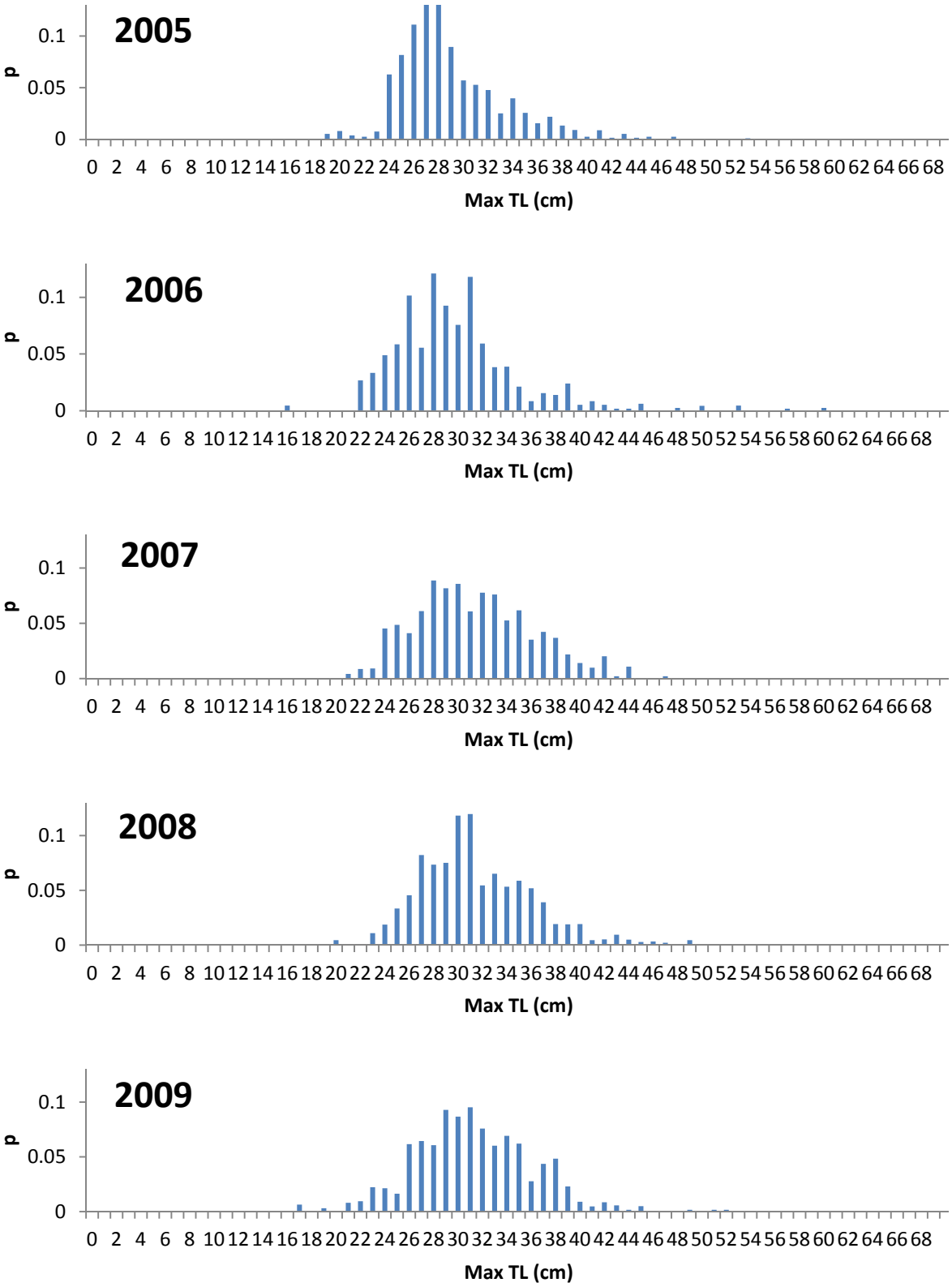

Figure 2. Weighted length frequency of gray triggerfish harvest and discards. Figure continued on next page.

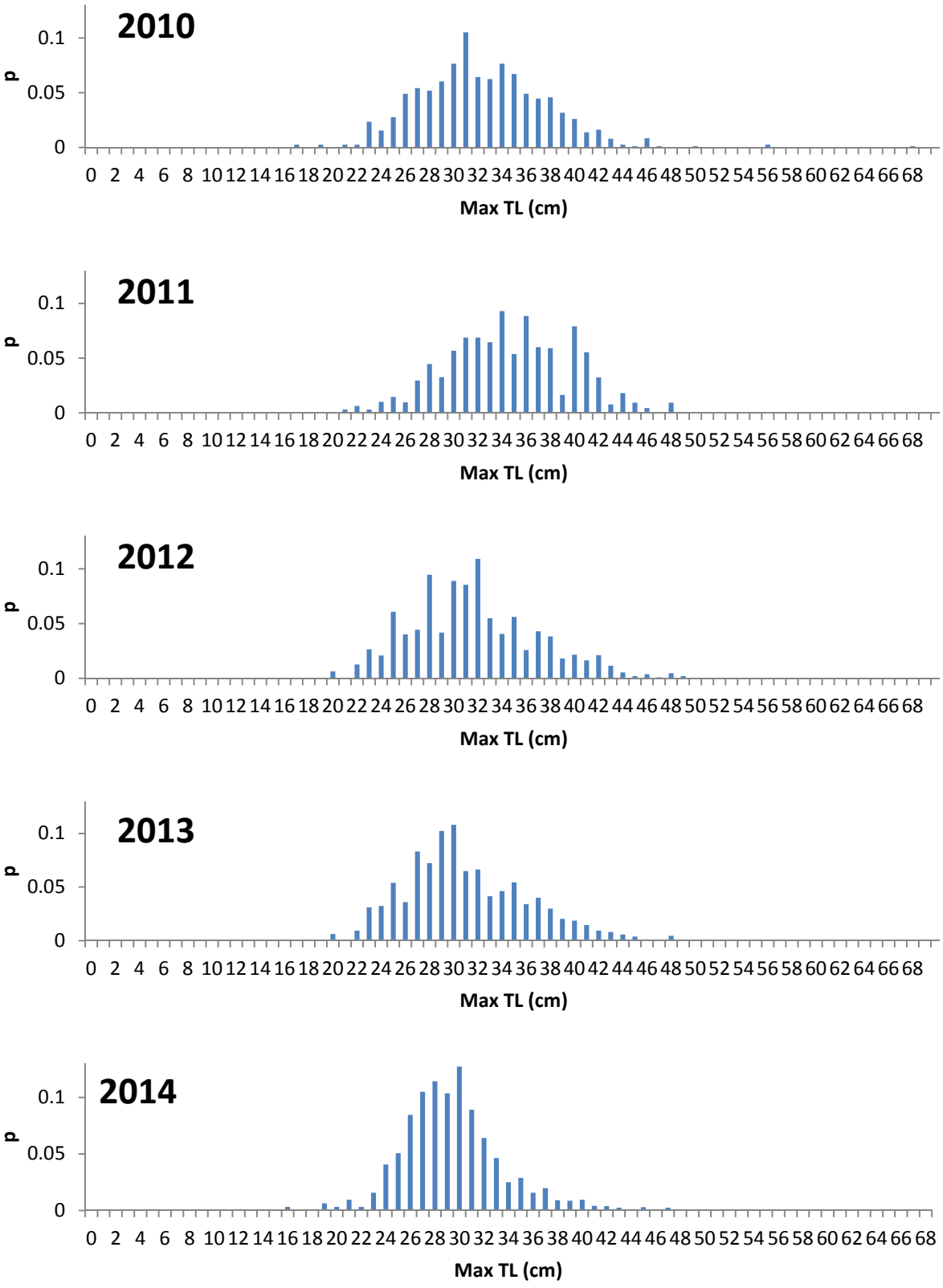

Figure 2, continued.

Hook Type Usage in the For-Hire Fishery

In the South Atlantic, circle hooks have been required since 3/3/2011 when fishing for species in the snapper-grouper management group north of 28 degrees north latitude (the boundary between Brevard and Indian River Counties in Florida). Among trips sampled off the Atlantic coast of Florida, the prevalence of circle hook use on headboats and charter vessels varied north and south of this demarcation (Figure 3). Circle hook use was higher in the NE region where circle hook use is required; however, offset J hook use was also prevalent in this region (Figure 3). The majority of circle hooks observed on headboats were offset circle hooks (Figure 3), whereas a higher portion of circle hooks observed on charter trips were non-offset (Figure 4).

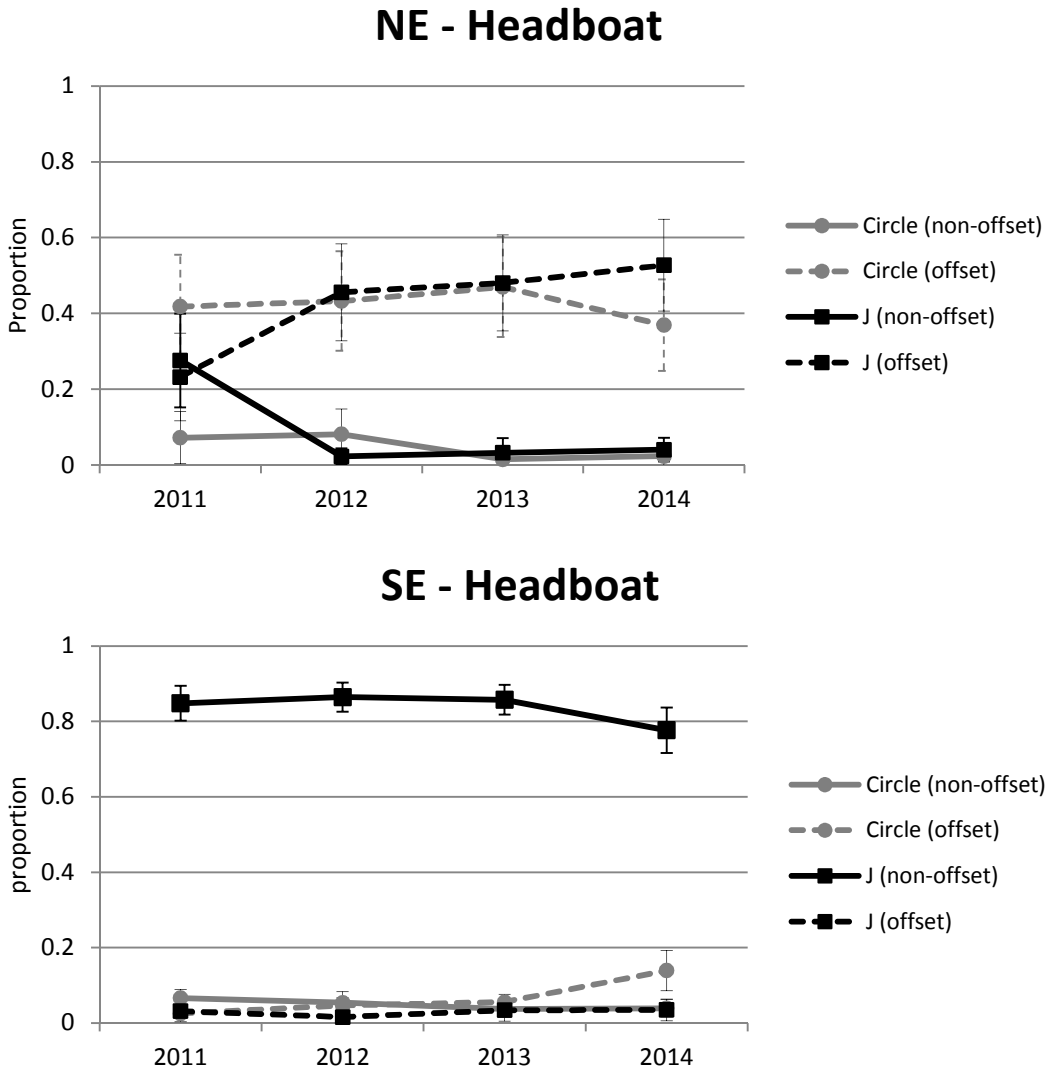

Figure 3. Mean proportion of hooks observed each year (2011 to 2013) during headboat trips sampled on the Atlantic coast of Florida north (NE) and south (SE) of 28 degrees north latitude. Circle hooks were required after 3/3/2011 when fishing for snapper and grouper north of 28 degrees north latitude.

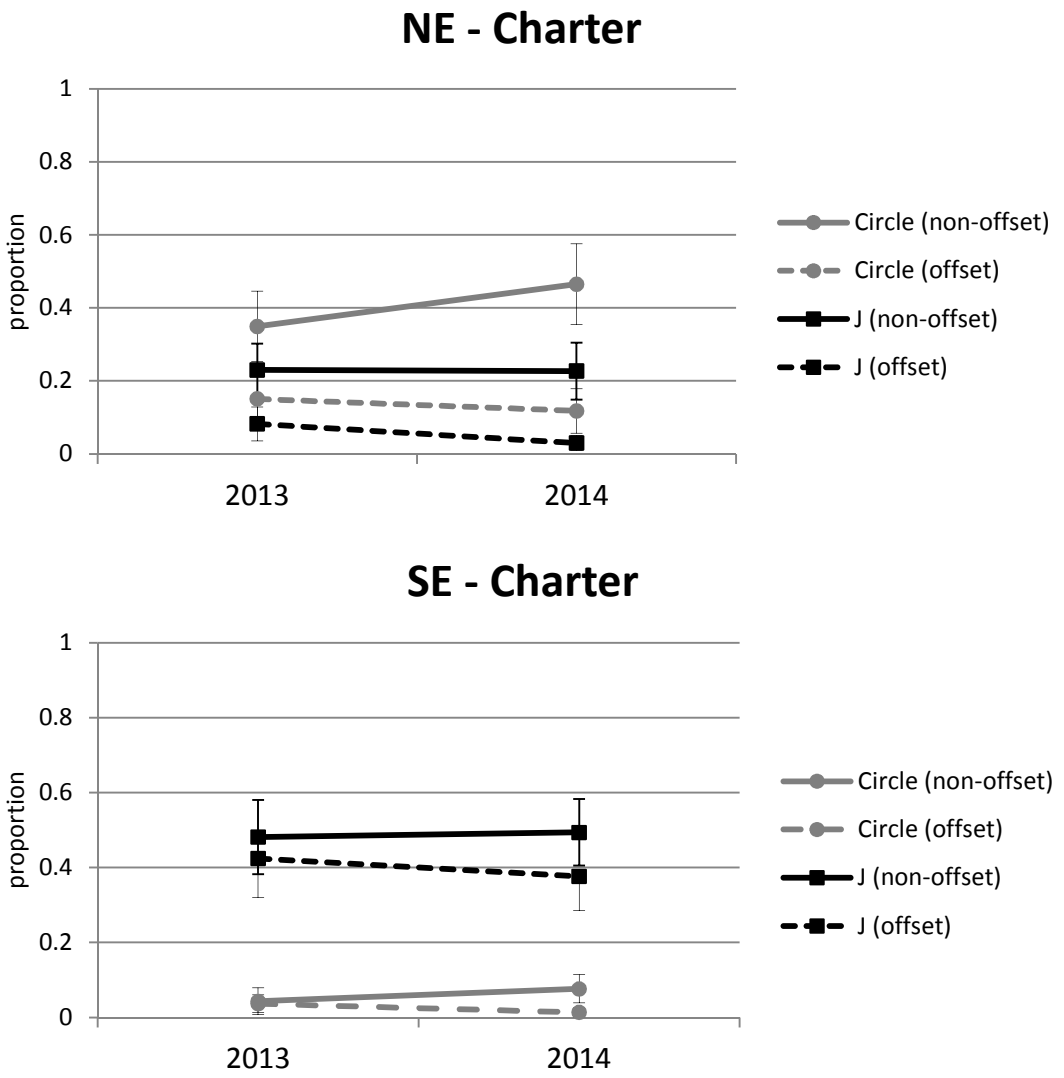

Figure 4. Mean proportion of fishing rigs by hook type observed during charter trips sampled on the Atlantic coast of Florida for regions north (top panel) and south (bottom panel) of 28 degrees north latitude. Circle hooks were required after 3/3/2011 when fishing for snapper and grouper north of 28 degrees north latitude.

Hook Injuries

Out of 2,088 gray triggerfish observed on the Atlantic coast of Florida, 34.8%, were caught with circle hooks, 64.8% were caught with J hooks, and <1% were caught with kahle or treble hooks. Among gray triggerfish caught with circle hooks, 50.3% were caught with offset hooks; and among those caught with J hooks, 30.4% were caught on offset hooks. There were no observations of fish hooked in potentially lethal locations with circle hooks, and approximately 2% of gray triggerfish caught with J hooks were hooked in potentially lethal locations. Based on these observations, it is unlikely that the requirement to use circle hooks when fishing for reef fishes in the South Atlantic has resulted in a significant reduction in discard mortality for this

particular species. This result is similar to what has been reported for gray triggerfish in the Gulf of Mexico (SEDAR31-RD50).

Table 6. Numbers of gray triggerfish observed by hook-type and location where the hook was embedded, and percent of gray triggerfish with potentially lethal hook injuries.

Hook-type	Lip or jaw	Potentially lethal	Percent potentially lethal
Non-offset circle hook	359	3	0.83
Offset circle hook	365	1	0.27
Non-offset J hook	921	21	2.23
Offset J hook	400	11	2.68
Other (kahle, treble)	7	0	0

Condition of Gray Triggerfish Discards in Florida

Out of roughly 2,000 gray triggerfish discards that were observed in Florida, all were released alive with no immediate mortalities. Only 2.9% of gray triggerfish live discards were vented prior to release. The majority of gray triggerfish discards were observed at shallow depths <50 meters; however, the proportion that were either disoriented or floating on the surface upon release increased with increasing capture depth, but did not exceed 25% (Figure 3; note, only three live discards were observed at >80 meters capture depth). Gray triggerfish exhibited distended swim bladders across a range of depths, and an increasing portion also exhibited extruded intestines with increased capture depth (Figure 3, bottom panel). Exopthalmia and extruded stomachs were less frequently observed (Figure 3).

References

SEDAR31-RD50 Sauls, B., Ayala O., 2012. Circle hook requirements in the Gulf of Mexico: application in recreational fisheries and effectiveness for conservation of reef fishes. Bull. Mar. Sci. 88: 667–979.

SEDAR41-RD16. Sauls, B., R. Cody, O. Ayala, B. Cermak. 2013. A directed study of the recreational red snapper fisheries in the Gulf of Mexico along the West Florida Shelf. Federal Grant NA09NMF4720265, Final report submitted to National Marine Fisheries Service, Southeast Regional Office.

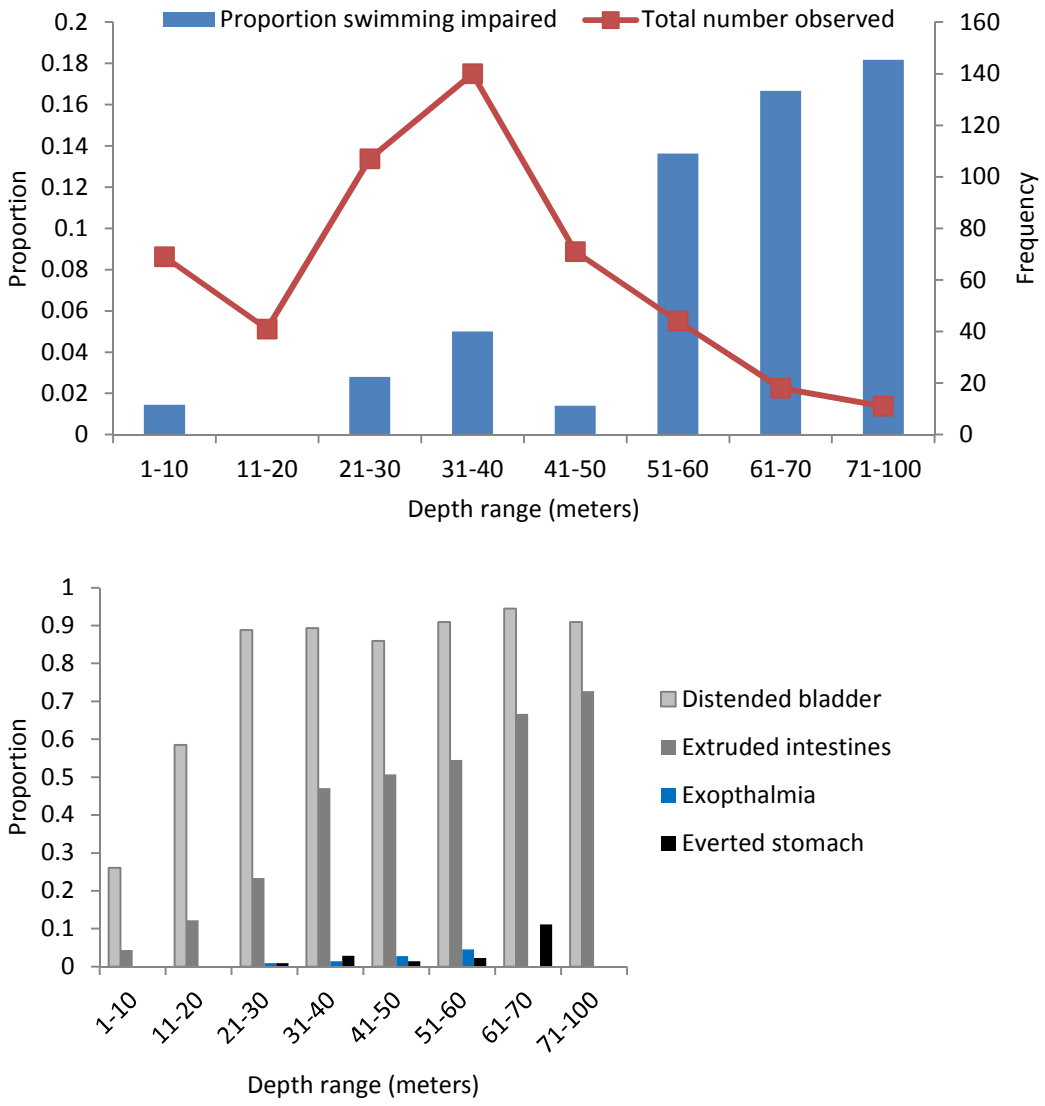

Figure 3. Proportion of gray triggerfish discards that exhibited swimming impairments (either disoriented or floating at the surface upon release), and total numbers of live discards observed by 10 meter depth interval (top panel); proportion exhibiting barotrauma symptoms (bottom panel).