Red Porgy Length Frequency Distributions from At-Sea Headboat and Charter Observer Surveys in the South Atlantic, 2005 to 2017

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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 have been implemented to fill this data gap, providing valuable information on the size and condition of discarded fish. These surveys have been conducted on headboat vessels in the south Atlantic Ocean since 2004, with data for this report including data collected between 2005 and 2017. In this region, most headboat trips engage in bottom fishing for reef fish species, including red porgy, and other bottom dwelling fish. At-sea coverage was expanded to include charter vessels on the east coast of Florida from 2013-2015. This report provides a summary of available information on the size and disposition of red porgy collected on headboats and charter boats along the south Atlantic coast from North Carolina to Florida. Data collected from the Florida Keys prior to 2010 is excluded, as the Gulf of Mexico and South Atlantic Florida Keys could not be distinguished in catch data, but data from the Florida Keys (South Atlantic catch only) are included from 2009-2017.

Sample Methods

Cooperative vessels were randomly selected each month from six sample regions: The Florida Keys (Monroe County), southeast Florida (Dade to Indian River County), northeast Florida (Nassau to Brevard County), Georgia, South Carolina, and North Carolina. Operators from selected vessels were contacted by state biologists and were scheduled to sample a single trip in a selected week. Dependent upon the number of customers on board, one or two biologists accompanied passengers during the scheduled trip. The captain and mates cooperated by making sure fish caught by their anglers were observed by one of the biologists before they were stored in the fish hold or released overboard. Biologists would assist with dehooking fish for data collection, but were not permitted to influence the decision to keep or release a fish. For each fish, biologists recorded the species, disposition, size (fork length in mm), and the condition of

fish that were released. Release conditions were not recorded in North Carolina, South Carolina or Georgia.
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.

Data Elements
Trip level information for each trip included the area fished, duration of fishing (to the nearest half hour), number of anglers, and depths (meters) of the fishing sites. Site specific fishing depths have been recorded beginning in 2010 for the state of Florida.

Area fished for North Carolina, South Carolina, southeast and northeast Florida, and Florida Keys was coded as:
1: 3 miles or less from shore; or
2: more than 3 miles from shore

Characterization of Trips duration:
o Half-Day (H): < 6 hours
o Three-Quarter-Day (Q): 6 to 8.5 hours
o Full-day (F): 9 or more hours

Disposition codes are recorded for all fish and represent the final fate (e.g. kept or discarded) of each observed fish.

Dispostion was 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.

Historically, released condition is an observation of immediate mortality, and fish coded as "Good" swam down from the surface of the water immediately and fish coded as "Fair" swam down in a disoriented fashion. Other release conditions have been considered immediate mortality. Release conditions are only summarized for discarded fish observed in Florida.

Release Condition was coded as:
1: Good
2: Fair
3: Bad
4: Dead
5: Eaten
9: Unobserved

Barotrauma has been recorded since 2010 as a record of injury in captured fish as a result of rapid depressurization.
Barotrauma was coded as:
B: Bladder inflated
I: Intestines visible
P: Exopthalmia (pop-eyes)
S: Stomach everted
X: External bleeding
N: No visible signs

Length Frequencies

Sample Weighting:
Headboat vessels report fishing effort in logbook trip reports, and effort data were provided by the NMFS Southeast Fisheries Science Center in Beaufort, NC (Table 1). These data were weighted to account for the difference in sampling effort between states. Low sample numbers and need for confidentiality for regiosn with low headboat participation necessitate grouping disacrds into two regions: North Carolina/South Carolina (NC-SC) and Georgia/FL (GA-FL). To generate the sample weights (Wa) for each region, proportional fishing effort for the south Atlantic was divided by the proportional sampling effort in each region (Table 2).

$$W_a = \frac{N_a/N}{n_a/n}$$

Wa values <1 are down-weighted to account for oversampling, and those with values >1 are inflated to account for undersampling.

No weights were generated for the charter fishery data from Florida.

Characterization of Discards:
Fish mid-line lengths (in mm) for discarded fish were tranformed to total length using the total length to midline length relationship described in the SEDAR Update Assessment report from 2012.

$$TL = (1.135 * FL) + 6.264$$

Transformed lengths were placed in one cm length bin categories (100 cm bin = fish 99.51cm to 100.50 cm). The raw length frequencies for grouped regions (NC-SC and GA-FL) were multiplied by regional weights calculated based on the number of trips by region and year. Regional groupings: NC-SC (North Carolina and South Carolina) and GA-FL (Georgia and Florida) were grouped to accommodate low sample size and need The proportion of fish in each length bin (p_x) was calculated as follows:

$$p_x = \frac{\sum L_{NC-SC} * W_{NC-SC} + L_{GA-FL} * W_{GA-FL}}{\sum bin = i = 1..n[\sum L_{NC-SC} * W_{NC-SC} + L_{GA-FL} * L_{GA-FL}}$$

Where L_a equals the number of fish in the length bin for a disarded fish in regional groups; W_a is the weighting factor for each regional group. The low sample size, and need for confidentiality for regions with low headboat participation necessitated grouping discards into two regions: North Carolina and South Carolina (NC-SC) and Georgia and Florida (GA-FL). The discard length frequency for headboat and charter vessels were calculated by summing the raw number of discarded fish in each 1 cm length bin, and multiplying each raw sum by a regional weighting factor that accounts for sampling differences within each regional group.

dividing this number by the total number of fish in each year. A length frequency distribution for each region was generated for each state, in addition to a single unweighted distribution with all states combined.

Results

Length frequency distributions for red porgy released (discarded) at sea were weighted by aggregated state groupings, with individual histograms provided for each year (Figure 1). The aggregated state trip totals are included in Table 1, with associated weights used to correct the raw length frequency distributions provided in Table 2. Additionally, unweighted length frequency distributions from 3 years of charter boat at sea sampling along the South Atlantic coast of Florida, are included (Figure 2). Summary statistics for harvested and discarded fish observed during headboat trips, aggregated into two regional groups, are provided by year (Table 3). Summarized station level depths recorded for individual recreational headboat and charter trips that caught red porgy on the east coast of Florida are summarized in Table 4.

Additionally, observed barotrauma condition are shown in Figure 3. A total of 644 red porgy were captured during observed trips on the east coast of Florida from 2005 to 2017. Barotrauma injury was recorded for 95.3% of the 424 fish that were checked for injury; but it should be noted that only 65 fish showed outward appearance of injury (Table 4). Of the 283 discarded fish, 2.85% were dead based on surface observations (conditions “Bad” or “Dead”).

Table 1. Headboat At-Sea observer trips sampled by region and year.

Year	NC-SC	GA-FL	Total
2005	155	144	299
2006	133	116	249
2007	143	128	271
2008	117	131	248
2009	103	137	240
2010	109	145	254
2011	101	139	240
2012	114	159	273
2013	96	158	254
2014	111	150	261
2015	84	144	228
2016	104	169	273
2017	102	184	286
Total	1472	1904	3376

Table 2. Sample weights applied to South Atlantic red porgy discards by region.

Year	NC-SC	GA-FL
2005	0.728	1.293
2006	0.748	1.288
2007	0.777	1.250
2008	0.597	1.360
2009	0.611	1.293
2010	0.646	1.266
2011	0.711	1.210
2012	0.667	1.239
2013	0.594	1.247
2014	0.456	1.402
2015	0.501	1.291
2016	0.603	1.244
2017	0.734	1.148

Table 3. Summary statistics for estimated red porgy total lengths (in millimeters), by state.

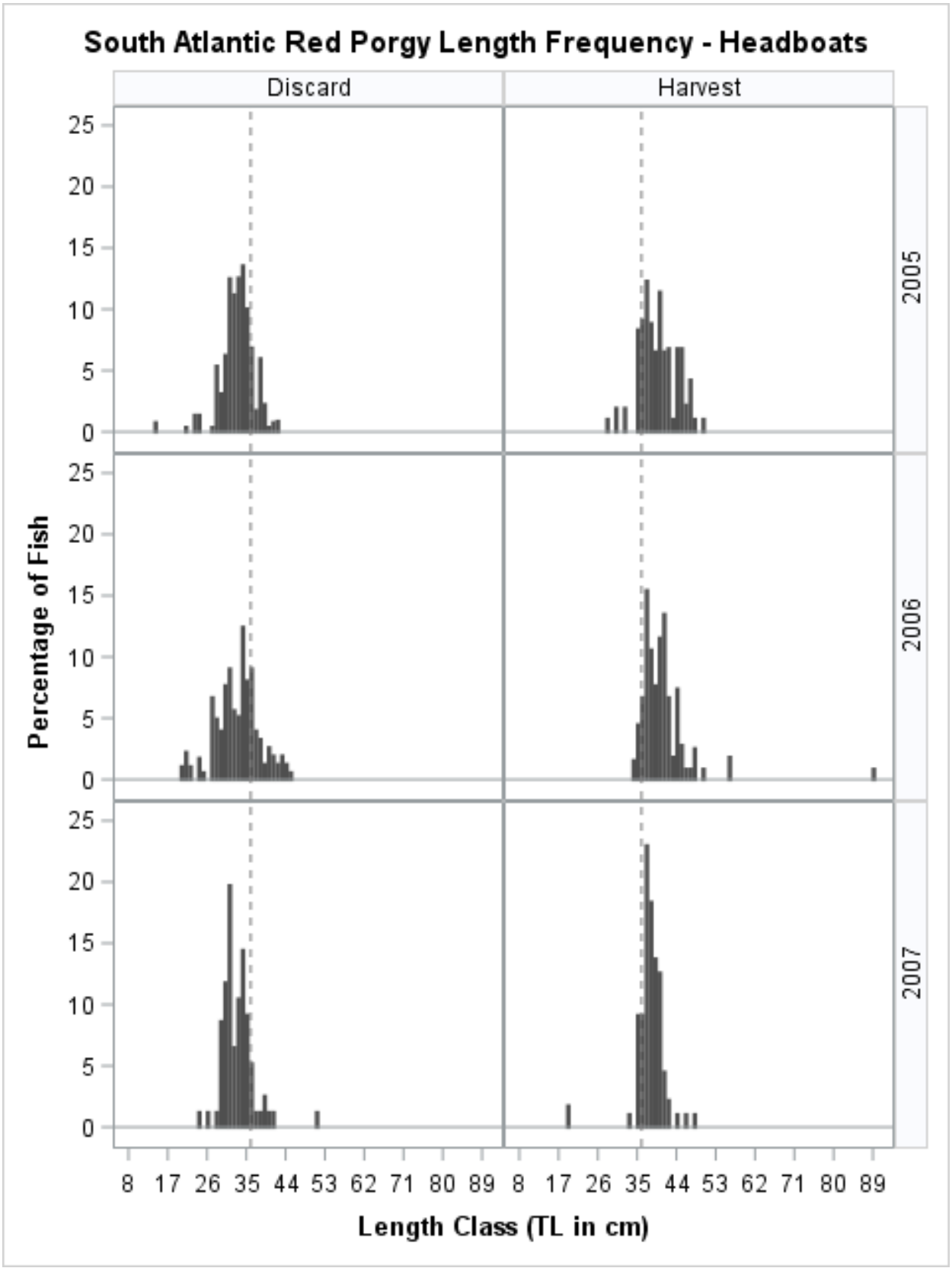
States	Year	Discards				Harvest			
		N	*Min*	*Mean*	*Max*	*N*	*Min*	*Mean*	*Max*
NC / SC	*2005*	110	213	331	423	69	283	403	498
	2006	116	239	338	449	96	349	407	893
	2007	74	242	329	514	85	326	382	483
	2008	93	180	327	427	85	327	385	466
	2009	23	216	326	358	23	326	386	449
	2010	41	198	320	444	43	306	384	455
	2011	102	209	324	435	67	357	398	501
	2012	154	222	327	419	92	335	399	616
	2013	80	77	323	414	47	153	385	463
	2014	38	276	329	376	18	279	381	467
	2015	9	236	323	371	10	374	397	444
	2016	45	280	327	367	76	344	389	475
	2017	21	270	328	382	38	270	389	450
GA / FL	*2005*	52	136	324	415	10	304	370	472
	2006	18	200	291	365	4	343	401	480
	2007	1	285	285	285	1	188	188	188
	2008	11	189	298	340	3	335	349	364
	2009	21	222	309	338	11	289	352	402
	2010	6	240	295	348	6	338	381	421
	2011	12	245	286	340	5	285	365	415
	2012	10	273	314	343	20	334	379	428
	2013	4	306	327	339	30	306	387	461
	2014	10	256	295	330	16	314	398	465
	2015	6	273	296	315	2	281	318	355
	2016	17	250	319	357	6	335	369	428
	2017	0	-	-	-	4	356	366	393

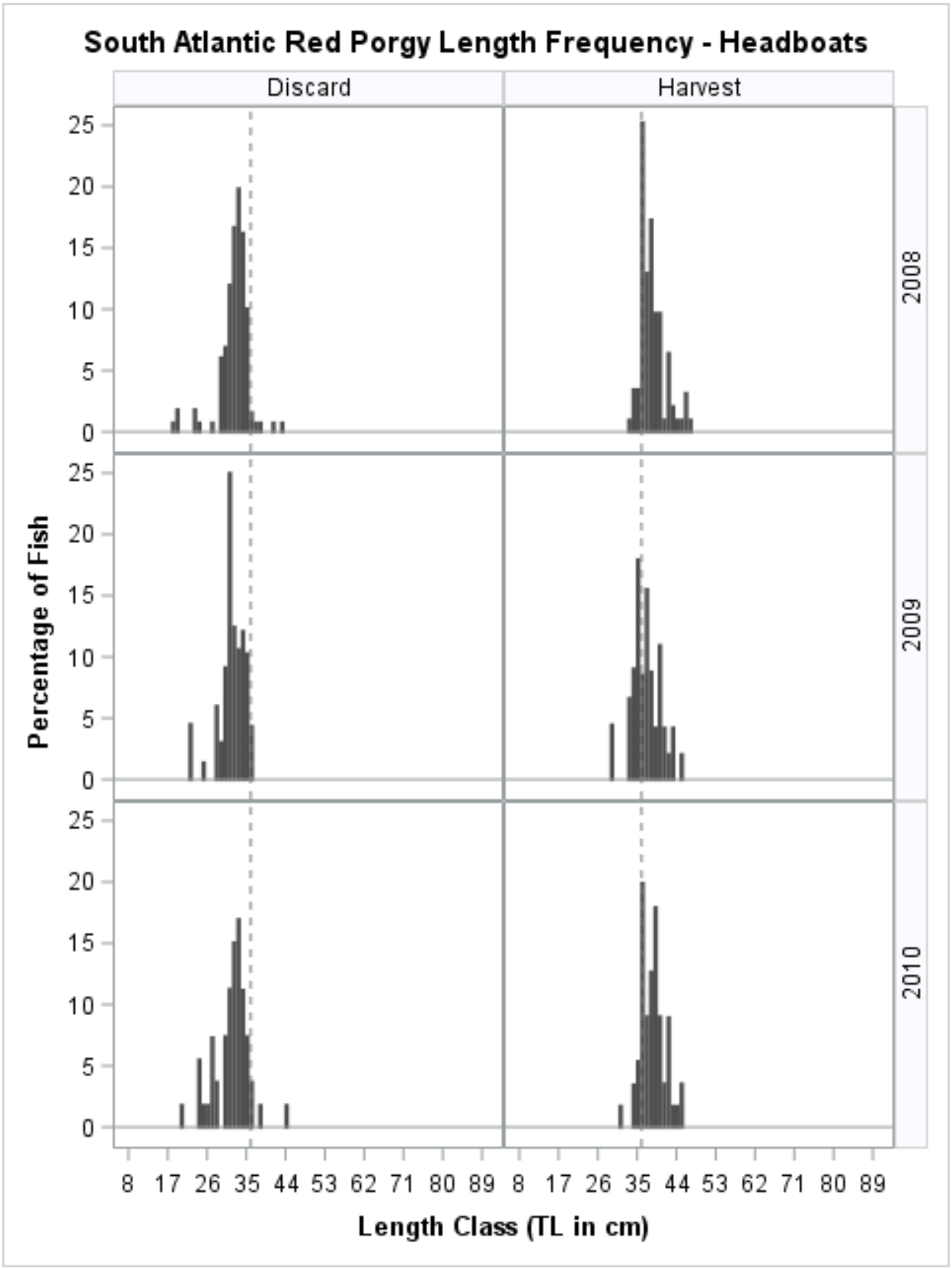
Table 4. Summary statistics of station level depths (in meters) for observed trips that caught red porgy on the east coast of Florida.

Year	Headboat					Charter		
	No. of Trips	*Min*	*Mean*	*Max*	*No. of Trips*	*Min*	*Min*	*Mean*
2011	5	28	36	44	-	-	-	-
2012	4	40	44	48	-	-	-	-
2013	6	30	46	55	7	36	36	46
2014	8	28	54	88	11	32	32	52
2015	6	24	42	64	10	30	30	50
2016	5	24	43	72	-	-	-	-
2017	1	34	34	34	1	160	160	161

Table 5. Proportions of observed post-release condition for discarded red porgy on the east coast of Florida.

Condition	*N*	Proportion
Good	226	0.919
Fair	13	0.053
Bad	6	0.024
Dead	1	0.004


South Atlantic Red Porgy Length Frequency - Headboats
Discard
Harvest
2005
2006
2007
Percentage of Fish
0
5
10
15
20
25
8 17 26 35 44 53 62 71 80 89
Length Class (TL in cm)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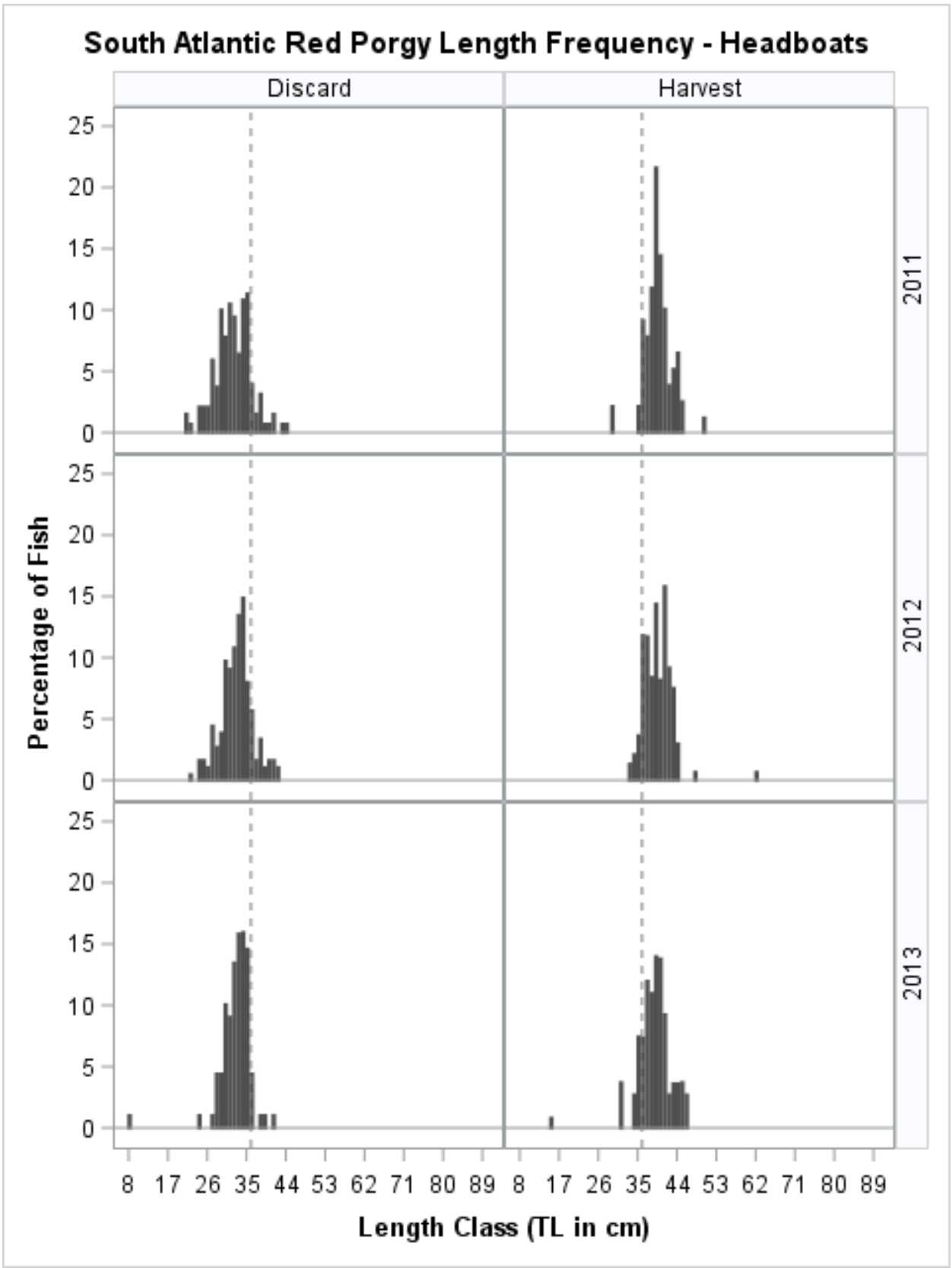
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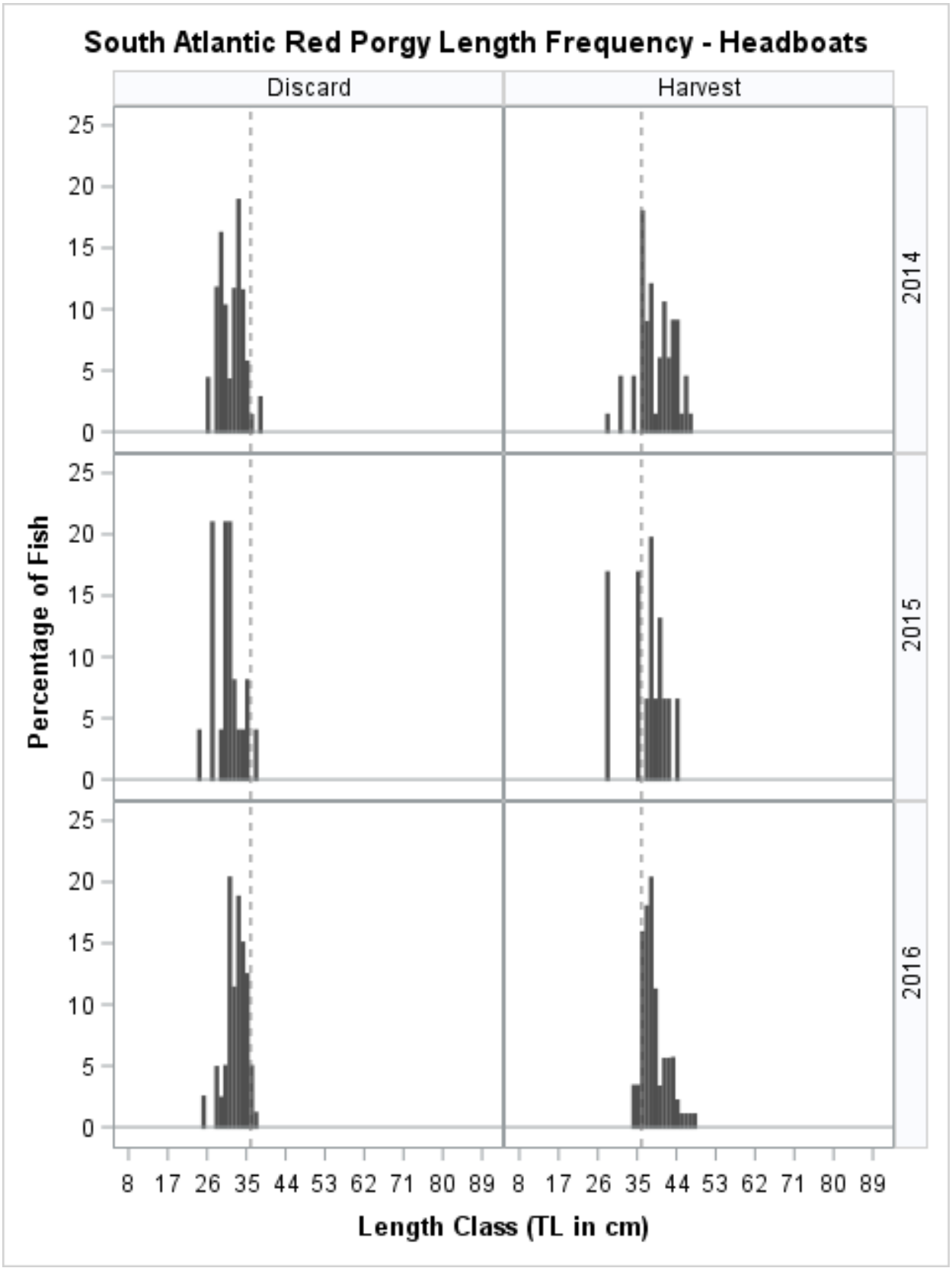
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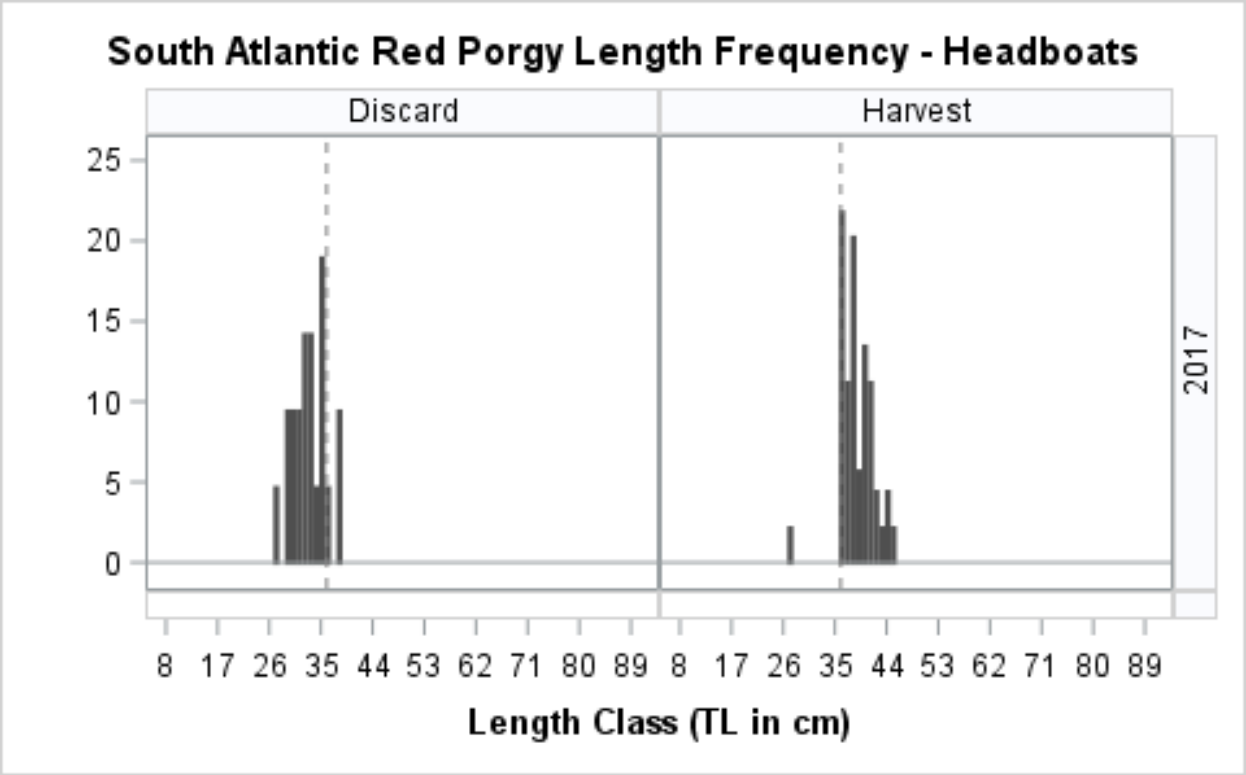

Figure 1. Weighted discard length frequency distributions from headboats observed from North Carolina to Florida, by year. Dotted lines reference the minimum sizes limit for the species, 14 inches in total length, in the South Atlantic.

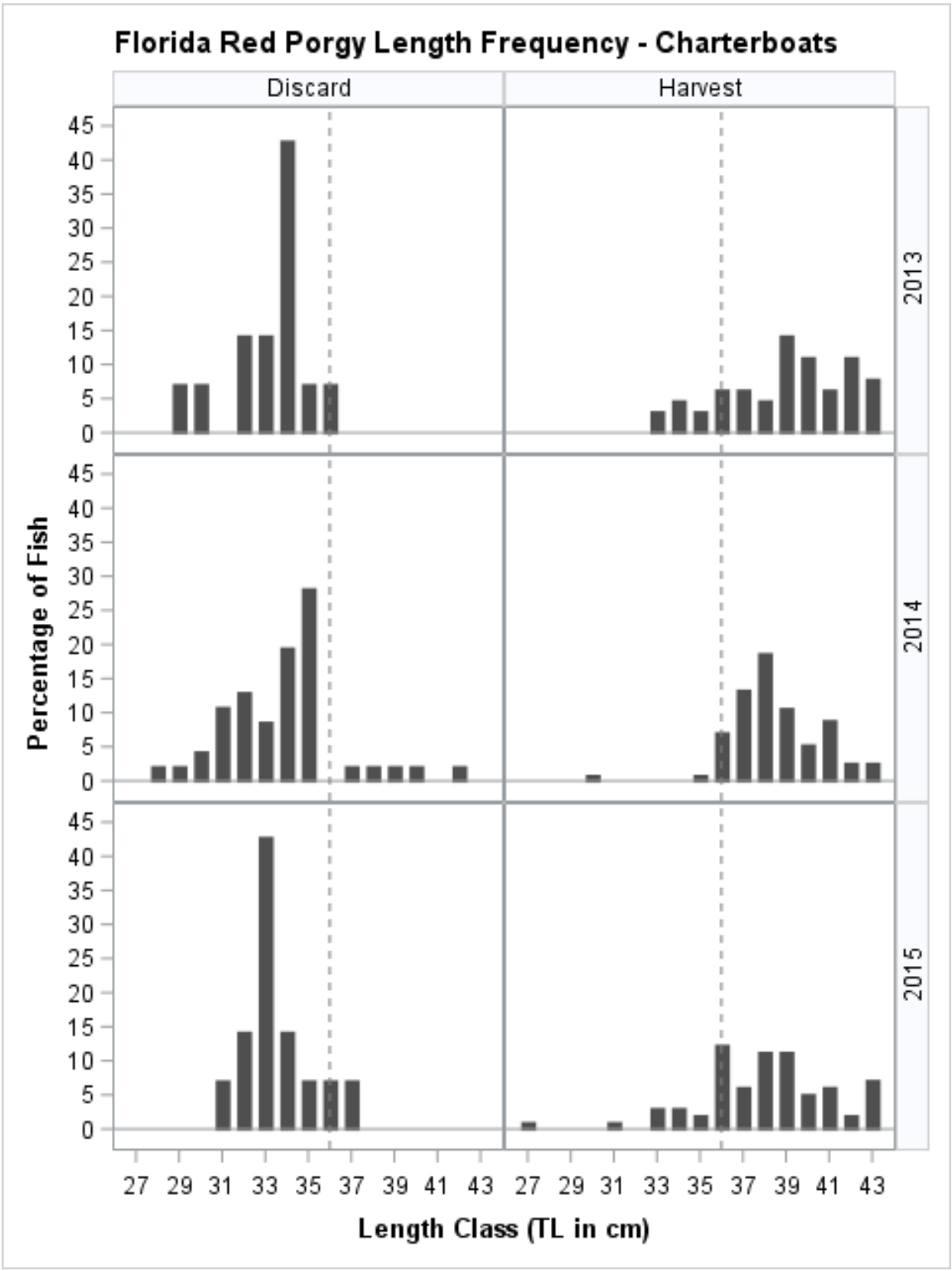

Figure 2. Raw length frequency distributions from charter boats observed in Florida, by year. Dotted lines reference the minimum sizes limit for the species, 14 inches in fork length, in the South Atlantic.

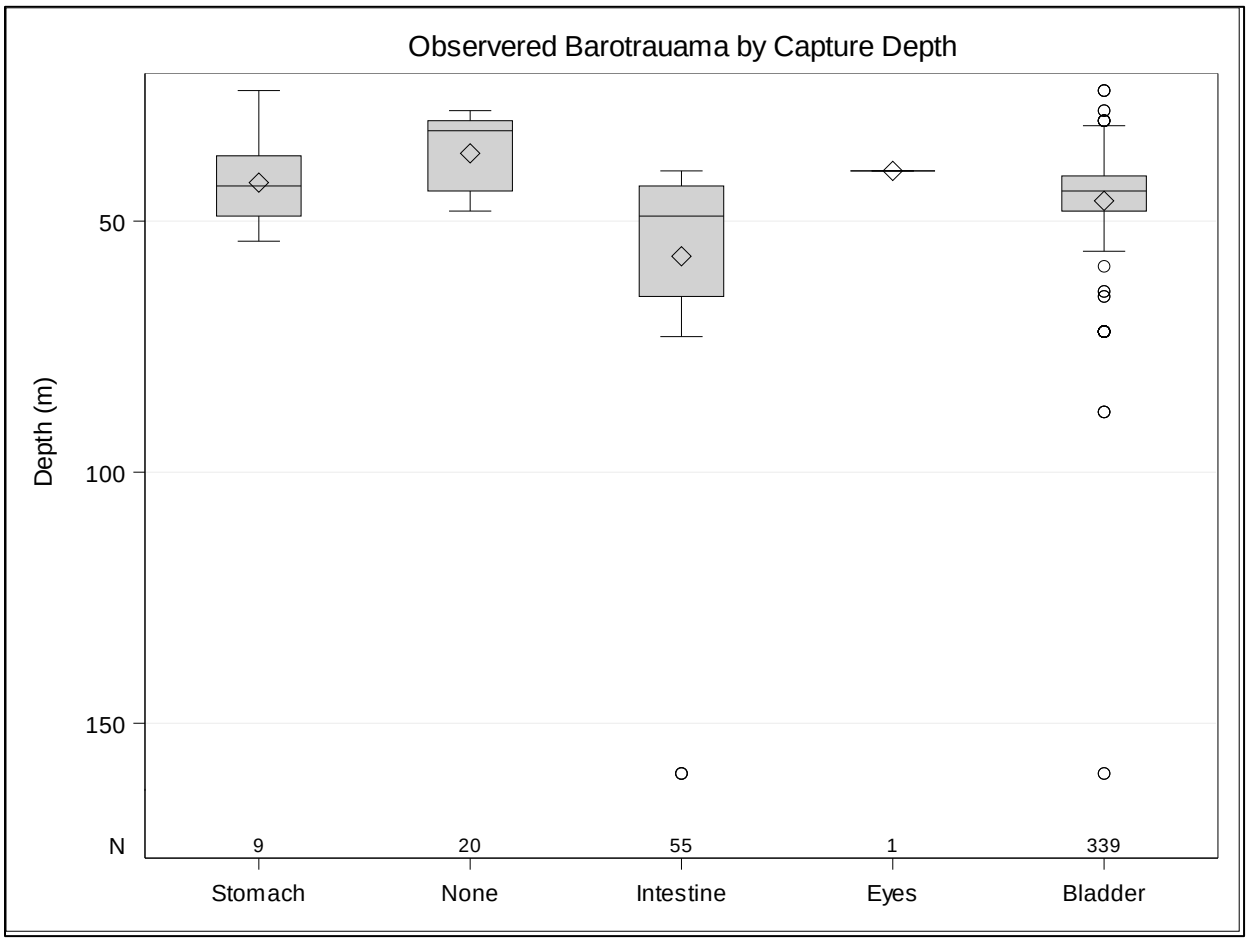

Figure 3. Boxplots of observed barotrauma for discarded red porgy, by depth (in meters). The number of observations for each condition is inset in the figure.