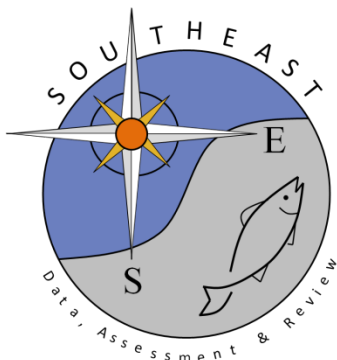


A Summary of Data on the Size Distribution and Release Condition of
Red Snapper Discards from Recreational Fishery Surveys in the Eastern
Gulf of Mexico

Dominique Lazarre, Beverly Sauls, and Rachel Germeroth

SEDAR52-WP-19

27 November 2017



This information is distributed solely for the purpose of pre-dissemination peer review. It does not represent and should not be construed to represent any agency determination or policy.

Please cite this document as:

Lazarre, Dominique, Beverly Sauls, and Rachel Germeroth. 2017. A Summary of Data on the Size Distribution and Release Condition of Red Snapper Discards from Recreational Fishery Surveys in the Eastern Gulf of Mexico. SEDAR52-WP-19. SEDAR, North Charleston, SC. 17 pp.

A Summary of Data on the Size Distribution and Release Condition of Red Snapper Discards from Recreational Fishery Surveys in the Eastern Gulf of Mexico

Prepared by:

Dominique Lazarre, Beverly Sauls, and Rachel Germeroth
Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute
Saint Petersburg, Florida

For: SEDAR 52 Gulf of Mexico Red Snapper Data Workshop, November, 2017.

Discarded fish are unavailable at the time of landing and 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, and such surveys have been conducted on for-hire headboat and charter vessels in the Gulf of Mexico since 2004. However, for-hire observer surveys have not been consistently funded and most available data are from the eastern Gulf. This report provides a summary of available information on the size, release condition, and disposition of red snapper collected by trained observers since 2005 during at-sea surveys on for-hire vessels in the Gulf of Mexico.

At-sea observer coverage is not practical from private recreational boats, and information on the size and condition of red snapper discards from this segment of the recreational fishery is more limited. The state of Florida has conducted a self-recruited volunteer angler catch card program since 2010. Information collected from this program from 2009-2012 has been described in a prior working paper. Recent information collected from 2015-2016 will be provided in this report and is compared to data from at-sea observer surveys.

At-Sea Observer Survey Coverage

In 2004, at-sea observer surveys were conducted on headboats in Alabama, and coverage was extended in 2005 to include headboats operating from the Gulf coast of Florida from the panhandle through the Florida Keys. The at-sea headboat survey was funded by the Gulf Fisheries Information Network (Gulf FIN) continuously through 2007, and was discontinued in both states in 2008. In June, 2009 the state of Florida secured alternative funds to continue at-sea observer coverage on both headboats and charter vessels in the northwestern panhandle and central peninsula, and that coverage has continued through 2016. From September 2010 through August 2011, the state of Texas participated in a cooperative study funded by the Marine Recreational Information Program to pilot test a for-hire logbook data collection method, which included charter vessels with federal reef fish permits operating from ports surrounding the Corpus Christi area. These data were analyzed in a prior working paper, and no additional analyses on Texas red snapper catch data will be included in the current analysis (Sauls 2012 – SEDAR31-DW11).

At-Sea Observer Survey Methods

Alabama and Florida, 2005 to 2007

Headboat vessels from Alabama and three subregions in Florida were randomly selected each week (Figure 1). Florida's western central region also had a separate sample quota for multi-day

trips that fish in areas farther offshore. Operators from selected vessels were contacted by state biologists and a trip was arranged on 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. Disposition 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.

Trip level information for each trip included the area fished, duration of fishing (to the nearest half hour), number of anglers, and minimum and maximum depths (feet) of the fishing sites. Area fished was coded differently for Alabama and Florida regions.

Area fished for Alabama were coded as:

- 1: 3 miles or less from shore; or
- 2: more than 3 miles from shore

Area fished for Keys, western peninsula, and northwest Florida were coded as:

- 3: 10 miles or less from shore; or
- 4: more than 10 miles from shore.

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.

Florida, 2009-2016

Similar to methods described above, charter and headboat vessels were randomly selected each week from a list of participating vessels in the northwestern region and central western regions of Florida. Selected vessels are contacted in advance to schedule a single trip during the selected week. Trips are scheduled based on vessel capacity. For example, when 6-pack vessels are selected, a trip is scheduled on a day where the reservation is for a party of 5 or less anglers. If there is no room available on a selected vessel for any reserved trips during the selected week, another vessel is randomly selected. Data from 2014 was omitted from the analysis because it was collected with a special permit, and not representative of the fishery as a whole.

Participating vessel operators permit up to two FWC biologists to board during a scheduled trips, and captains and mates actively assist biologists by permitting them to observe and collect data from fish as they are removed from anglers' gear and before fish are released or placed in the

fish box. Vessel operators also provide biologists with information on depth and area fished (commercial statistical area and/or degrees and minutes latitude and longitude) for each fishing station during each observed trip.

For each fish, biologists recorded the species, disposition, size (fork length in mm), and the condition of fish that were released in the same manner as 2005-2007.

A project coordinator conducted quality assurance and quality control checks on all field data as it was collected and submitted. Following data entry, electronic data were proofed against field data sheets.

At-Sea Observer Survey Data Analysis

Characterization of Trips:

Sampled trips were categorized into the following trip-types based on the duration of the sampled trip:

- Single-Day Trips (<24 hours)
 - Half-Day: < 6 hours
 - Three-Quarter-Day: 6 – 8 hours
 - Full-day: 9 – 24 hours
- Multi-Day Trips (>24 hours)

Headboat trips were not sampled proportional to fishing effort. For example, multi-day trips represent less than 3% of headboat fishing effort in Florida, but were sampled at a much higher rate in at-sea observer surveys. In the western central region of Florida, red snapper are more abundant and of larger size in the areas where multi-day trips fish compared to single day headboat trips. In the northwestern region of Florida, half-day trips were under-sampled with respect to headboat effort. We generated weighting factors for different trip-types using fishing effort data reported on headboat logbook trip reports for the years 2005 through 2016. Headboat effort data were provided by K. Fitzpatrick from NMFS Southeast Fisheries Science Center in Beaufort, NC.

Proportional fishing effort was calculated as the total numbers of trips reported on logbook trip reports for a given trip-type in a given region, divided by the total number of headboat trips reported in the same region. To obtain the sample weight (W_t):

$$W_t = \frac{N_t/N}{n_t/n}$$

Where N_t/N is the number of trips of type t divided by total trips reported on logbook trip reports, and n_t/n is the number of trips of type t in the sample population divided by the total number of sampled trips. Trip-types with $W_t < 1$ are down weighted to account for oversampling and trip-types with $W_t > 1$ are inflated to account for undersampling.

No multi-day charter trips were sampled, and weights were not generated for charter samples.

Characterization of Discards:

Fish mid-line lengths assigned to one cm length bin categories (40 cm bin = fish 39.6 cm to 40.5 cm) and the number of lengths in each length bin category were summed by region, trip-type, and disposition (harvested and discarded).

For fish observed from headboats, counts of fish in each length bin were multiplied times the sample weight (W_i) for each trip-type and sample region. The weighted proportion of fish in a length bin (p_x) was calculated as follows:

$$p_x = \frac{\sum L_H * W_H + \sum L_F * W_F + W_Q * W_Q + W_M * W_M}{\sum (bin = i = 1 \dots n [\sum L_H * W_H + \sum L_F * W_F + W_Q * W_Q + W_M * W_M])}$$

Where L_H equals the number of fish in length bin x for a given disposition in a given region observed during half-day trips (H); and W_H is the weighting factor for half-day trips in the same region. Q = ¾-day trips, F = full-day trips, and M = multi-day trips. The denominator is the sum of all numerators for length bin 1 to length bin n .

Fish discarded by release condition were summed by trip type and multiplied by the weighting factor for each trip-type. The weighted sum of discarded fish in each release condition category was divided by the weighted sum for all fish discarded in all release condition categories to get proportions of discards in each release condition category.

Volunteer Red Snapper Catch Card Program

In May 2015, on the Florida Fish & Wildlife Conservation Commission's website, the red snapper catch card was made available as a web-based submission form. A printable PDF option was also provided. The system is not widely publicized at this point. It is likely that most of the users were familiar with the downloadable PDF catch card and decided to try out the online reporting tool.

For the current printable and web-based catch cards, the size categories (in inches) are: less than 12"; 12" to less than 16"; 16" up to 20"; and more than 20". Other data fields on the online catch card include the region and type of launch area departed from, number of anglers on the boat, number of red snapper harvested, distance fished from shore, depth fished (including minimum, maximum, and majority of fishing time), gear types, and how many red snapper released were: eaten by dolphins; eaten by other fish/sharks; eaten by birds; or dead or floating at the surface.

Results

At-Sea Observer Trips

The number of sampled trips by month and trip duration for at-sea observer trips are provided in tables 1 & 2. Summary statistics for length frequencies of discarded fish are provided in Table 3. Length frequency histograms for harvested and released (discarded) red snapper by year are presented for Florida headboats (Figure 2) and Florida charterboats (Figure 3).

Volunteer Red Snapper Catch Card

A summary of the number of records, fishing depths, and fishing distances from shore reported by private anglers are reported in Table 4. The proportion of discarded fish in the four length

categories specified on the catch card, for both opened and closed fishing seasons, are presented in Figure 4.

Aggregated Data Analysis

Table 5 describes the proportion of trips conducted in state versus federal waters for the headboat, charterboat and private fishing sectors for all years where data is available. The proportion of red snapper discards for each fishing sector: headboat, charterboat and private anglers was calculated by pooling data from all years for each fishing sector for length categories matching those designated on the volunteer angler catch logs (Figure 5).

References:

Sauls, B. 2012. A Summary of Data on the Size Distribution and Release Condition of Red Snapper Discards from Recreational Fishery Surveys in the Gulf of Mexico. SEDAR31-DW11. SEDAR, North Charleston, SC. 29 pp.

Table 1. Florida sampled headboat at-sea observer trips by month, year, and trip duration for 2005-2016.

YEAR	FLORIDA- HEADBOAT	MONTH												YEARLY TOTAL
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
2005	HALF DAY	1	3	4	5	5	5	5	9	3	4	3	4	51
	THREE-QUARTER DAY	0	6	7	10	11	17	15	7	7	13	8	5	106
	FULL DAY	0	1	2	5	3	2	1	1	2	2	1	1	21
	MULTIDAY	0	1	0	2	3	2	2	2	2	2	2	3	21
	<i>MONTHLY TOTAL</i>	<i>1</i>	<i>11</i>	<i>13</i>	<i>22</i>	<i>22</i>	<i>26</i>	<i>23</i>	<i>19</i>	<i>14</i>	<i>21</i>	<i>14</i>	<i>13</i>	199
2006	HALF DAY	4	7	6	10	7	8	9	9	4	6	8	5	83
	THREE-QUARTER DAY	6	6	11	6	15	9	13	9	11	7	5	9	107
	FULL DAY	1	1	3	3	2	6	1	1	1	2	2	0	23
	MULTIDAY	2	3	3	3	1	2	3	3	2	2	2	2	28
	<i>MONTHLY TOTAL</i>	<i>13</i>	<i>17</i>	<i>23</i>	<i>22</i>	<i>25</i>	<i>25</i>	<i>26</i>	<i>22</i>	<i>18</i>	<i>17</i>	<i>17</i>	<i>16</i>	241
2007	HALF DAY	7	8	6	7	6	7	6	4	2	3	5	1	62
	THREE-QUARTER DAY	5	5	8	9	9	9	11	8	13	9	8	12	106
	FULL DAY	2	1	2	2	1	3	1	2	0	2	0	0	16
	MULTIDAY	2	2	2	2	1	2	2	2	1	4	7	4	31
	<i>MONTHLY TOTAL</i>	<i>16</i>	<i>16</i>	<i>18</i>	<i>20</i>	<i>17</i>	<i>21</i>	<i>20</i>	<i>16</i>	<i>16</i>	<i>18</i>	<i>20</i>	<i>17</i>	215
2009	HALF DAY	0	0	0	0	0	0	3	1	1	0	1	2	8
	THREE-QUARTER DAY	0	0	0	0	0	8	6	7	6	6	5	3	41
	FULL DAY	0	0	0	0	0	7	4	0	1	0	2	0	14
	MULTIDAY	0	0	0	0	0	0	1	3	1	2	1	1	9
	<i>MONTHLY TOTAL</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>15</i>	<i>14</i>	<i>11</i>	<i>9</i>	<i>8</i>	<i>9</i>	<i>6</i>	72
2010	HALF DAY	0	1	0	0	3	1	5	2	1	0	0	0	13
	THREE-QUARTER DAY	4	3	3	6	3	5	3	5	7	6	1	2	48
	FULL DAY	1	2	2	1	0	4	5	1	1	1	3	0	21
	MULTIDAY	1	1	1	2	0	3	1	0	1	0	0	2	12
	<i>MONTHLY TOTAL</i>	<i>6</i>	<i>7</i>	<i>6</i>	<i>9</i>	<i>6</i>	<i>13</i>	<i>14</i>	<i>8</i>	<i>10</i>	<i>7</i>	<i>4</i>	<i>4</i>	94
2011	HALF DAY	0	0	2	1	5	4	2	2	1	4	1	8	30
	THREE-QUARTER DAY	4	7	6	6	3	5	6	6	5	5	5	7	65
	FULL DAY	0	0	0	1	0	5	1	0	1	0	0	0	8
	MULTIDAY	0	1	0	3	0	4	2	1	1	2	1	1	16
	<i>MONTHLY TOTAL</i>	<i>4</i>	<i>8</i>	<i>8</i>	<i>11</i>	<i>8</i>	<i>18</i>	<i>11</i>	<i>9</i>	<i>8</i>	<i>11</i>	<i>7</i>	<i>16</i>	119

2012	HALF DAY	1	4	2	2	4	5	5	5	2	2	0	3	35
	THREE-QUARTER DAY	8	3	3	7	4	3	5	4	4	5	6	5	57
	FULL DAY	1	1	0	0	0	3	0	0	0	0	0	0	5
	MULTIDAY	0	1	1	1	0	2	3	1	1	0	1	1	12
	<i>MONTHLY TOTAL</i>	<i>10</i>	<i>9</i>	<i>6</i>	<i>10</i>	<i>8</i>	<i>13</i>	<i>13</i>	<i>10</i>	<i>7</i>	<i>7</i>	<i>7</i>	<i>9</i>	109
2013	HALF DAY	4	2	5	2	2	4	5	4	3	2	0	5	38
	THREE-QUARTER DAY	1	4	4	1	2	4	1	1	1	4	0	0	23
	FULL DAY	3	1	0	3	2	5	2	4	2	3	4	2	31
	MULTIDAY	1	1	1	1	0	4	1	1	1	0	0	0	11
	<i>MONTHLY TOTAL</i>	<i>9</i>	<i>8</i>	<i>10</i>	<i>7</i>	<i>6</i>	<i>17</i>	<i>9</i>	<i>10</i>	<i>7</i>	<i>9</i>	<i>4</i>	<i>7</i>	103
2015	HALF DAY	1	4	7	5	8	3	6	11	7	8	3	10	73
	THREE-QUARTER DAY	4	5	6	6	7	4	8	4	6	6	5	8	69
	FULL DAY	5	1	2	5	4	3	2	4	2	2	2	5	37
	MULTIDAY	0	0	0	0	0	2	1	0	0	0	1	0	4
	<i>MONTHLY TOTAL</i>	<i>10</i>	<i>10</i>	<i>15</i>	<i>16</i>	<i>19</i>	<i>12</i>	<i>17</i>	<i>19</i>	<i>15</i>	<i>16</i>	<i>11</i>	<i>23</i>	183
2016	HALF DAY	6	8	7	6	8	6	8	6	8	5	11	12	91
	THREE-QUARTER DAY	9	5	11	8	4	4	7	8	8	11	3	3	81
	FULL DAY	7	8	3	4	2	4	5	3	3	4	4	6	53
	MULTIDAY	0	1	1	0	1	2	0	2	0	0	0	0	7
	<i>MONTHLY TOTAL</i>	<i>22</i>	<i>22</i>	<i>22</i>	<i>18</i>	<i>15</i>	<i>16</i>	<i>20</i>	<i>19</i>	<i>19</i>	<i>20</i>	<i>18</i>	<i>21</i>	232

Table 2. Florida sampled charterboat at-sea observer trips by month, year, and trip duration for June 2009 (2014 includes data collected with special permit).

YEAR	FLORIDA- CHARTERBOAT	MONTH												YEARLY TOTAL
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
2009	HALF DAY	0	0	0	0	0	0	0	0	0	0	1	1	2
	THREE-QUARTER DAY	0	0	0	0	0	5	3	3	7	4	3	1	26
	FULL DAY	0	0	0	0	0	1	8	3	6	3	4	1	26
	MULTIDAY	0	0	0	0	0	0	0	0	0	0	0	0	0
	<i>MONTHLY TOTAL</i>	0	0	0	0	0	6	11	6	13	7	8	3	54
2010	HALF DAY	1	0	1	1	1	4	2	2	1	1	4	1	19
	THREE-QUARTER DAY	3	3	4	2	4	5	4	4	5	10	6	2	52
	FULL DAY	0	1	1	1	6	6	1	0	0	8	6	0	30
	MULTIDAY	0	1	0	0	0	1	0	0	0	0	0	0	2
	<i>MONTHLY TOTAL</i>	4	5	6	4	11	16	7	6	6	19	16	3	103
2011	HALF DAY	0	3	6	1	4	4	1	0	5	4	2	3	33
	THREE-QUARTER DAY	3	5	4	7	8	8	7	10	8	5	6	7	78
	FULL DAY	2	0	0	2	0	5	2	1	1	4	1	2	20
	MULTIDAY	0	0	0	0	0	0	0	0	0	0	0	0	0
	<i>MONTHLY TOTAL</i>	5	8	10	10	12	17	10	11	14	13	9	12	131
2012	HALF DAY	3	0	3	0	0	4	3	1	1	7	2	4	28
	THREE-QUARTER DAY	3	8	4	5	7	5	8	10	4	7	9	4	74
	FULL DAY	0	1	2	3	3	1	4	1	4	3	4	1	27
	MULTIDAY	0	0	0	0	0	0	0	0	0	0	0	0	0
	<i>MONTHLY TOTAL</i>	6	9	9	8	10	10	15	12	9	17	15	9	129
2013	HALF DAY	2	2	10	5	3	2	7	6	5	3	5	4	54
	THREE-QUARTER DAY	2	5	7	4	4	12	9	4	1	2	3	2	55
	FULL DAY	4	1	0	4	3	4	2	0	3	6	3	0	30
	MULTIDAY	0	0	0	0	0	0	0	0	0	0	0	0	0
	<i>MONTHLY TOTAL</i>	8	8	17	13	10	18	18	10	9	11	11	6	139
2015	HALF DAY	4	2	6	3	9	7	6	8	9	7	6	10	77
	THREE-QUARTER DAY	3	0	7	5	4	6	5	9	7	6	9	4	65
	FULL DAY	1	0	2	3	3	18	9	6	7	6	0	6	61
	MULTIDAY	0	0	0	0	0	0	0	0	0	0	0	0	0
	<i>MONTHLY TOTAL</i>	8	2	15	11	16	31	20	23	23	19	15	20	203

2016	HALF DAY	5	10	18	11	8	7	6	5	12	11	13	9	115
	THREE-QUARTER DAY	6	2	7	5	7	10	15	10	7	5	3	5	82
	FULL DAY	1	4	0	0	4	4	7	4	4	5	12	10	55
	MULTIDAY	0	0	0	0	0	0	0	1	0	0	0	0	1
	<i>MONTHLY TOTAL</i>	<i>12</i>	<i>16</i>	<i>25</i>	<i>16</i>	<i>19</i>	<i>21</i>	<i>28</i>	<i>20</i>	<i>23</i>	<i>21</i>	<i>28</i>	<i>24</i>	253

Table 3. Length summaries for discarded red snapper observed on headboats and charterboats in Florida.

Year	HEADBOAT				CHARTERBOAT			
	<i>N</i>	<i>Min</i>	<i>Mean</i>	<i>Max</i>	<i>N</i>	<i>Min</i>	<i>Mean</i>	<i>Max</i>
2005	3002	16	31.7	66	-	-	-	-
2006	3706	18	31.2	80	-	-	-	-
2007	4065	13	32.7	66	-	-	-	-
2009	629	21	38.7	76	538	25	38.2	78
2010	691	24	41.7	75	1201	24	42.0	81
2011	1100	26	44.5	79	1278	14	42.7	94
2012	893	20	40.2	75	897	22	43.1	95
2013	641	24	38.9	72	956	21	38.0	83
2015	536	17	37.8	69	555	21	40.0	77
2016	1225	18	35.5	75	1031	19	36.3	85

Table 4. Mean and mean minimum and maximum depth (in feet) fished by volunteer angler participants during red snapper open and closed seasons.

SEASON	YEAR	N	Depth (ft)		Distance From Shore (mi)	
			<i>Mean</i>	<i>Range</i>	<i>Mean</i>	<i>Range</i>
Closed	2015	2	16.2	11-21	7.0	6-8
	2016	17	18.9	0-32	20.1	6-47
	2017	7	21.6	9-37	14.6	2-52
Open	2015	48	27.4	6-55	19.1	0-100
	2016	28	32.6	18-61	21.3	3-52
	2017	23	25.3	14-46	15.6	1-61

Table 5. Proportion of trips in federal (EEZ) vs state waters (STTS) for headboat, charterboat and private anglers (based on volunteer log books).

YEAR	HEADBOAT				CHARTERBOAT				PRIVATE			
	EEZ		STTS		EEZ		STTS		EEZ		STTS	
	N	%	N	%	N	%	N	%	N	%	N	%
2005	83	96.5	3	3.5	-	-	-	-	-	-	-	-
2006	85	95.5	4	4.5	-	-	-	-	-	-	-	-
2007	81	94.2	5	5.8	-	-	-	-	-	-	-	-
2009	27	61.4	17	38.6	34	82.9	7	17.1	-	-	-	-
2010	37	78.7	10	21.3	47	73.4	17	26.6	-	-	-	-
2011	65	94.2	4	5.8	58	77.3	17	22.7	-	-	-	-
2012	51	89.5	6	10.5	53	77.9	15	22.1	-	-	-	-
2013	41	78.8	11	21.2	48	69.6	21	30.4	-	-	-	-
2015	60	74.1	21	25.9	53	63.1	31	36.9	19	38.8	30	61.2
2016	93	77.5	27	22.5	75	73.5	27	26.5	32	71.1	13	28.9

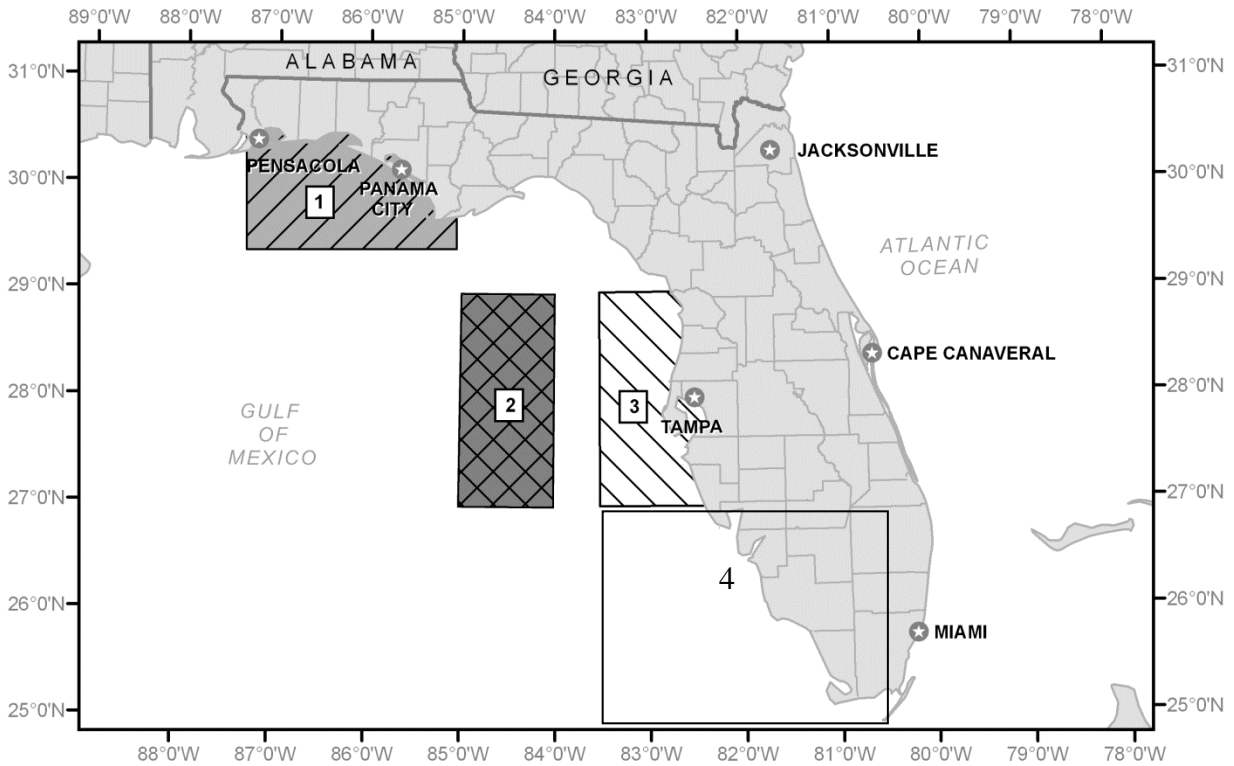
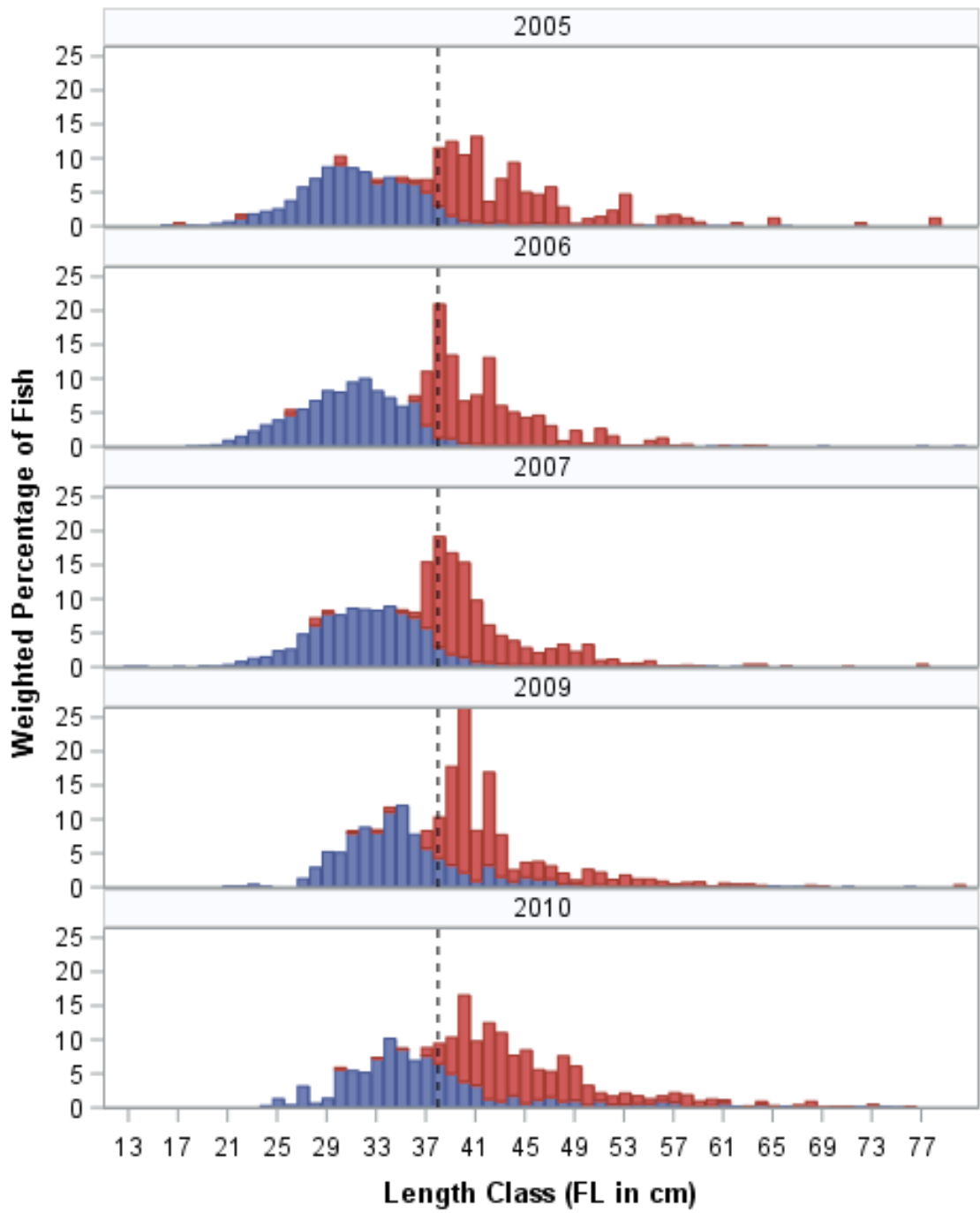


Figure 1. Areas in Florida with at-sea observer coverage. Area 1 is the northwestern panhandle region, area 2 is where multi-day trips from the western central region took place, and area 3 is where single-day trips from the western central region took place. From 2005-2007, headboats only were sampled from areas 1, 2, 3 and 4. From June 2009 through 2012, headboats and charter boats were surveyed from areas 1, 2 and 3.

Florida Red Snapper Length Frequency on Headboats

Disposition ■ Discard ■ Harvest



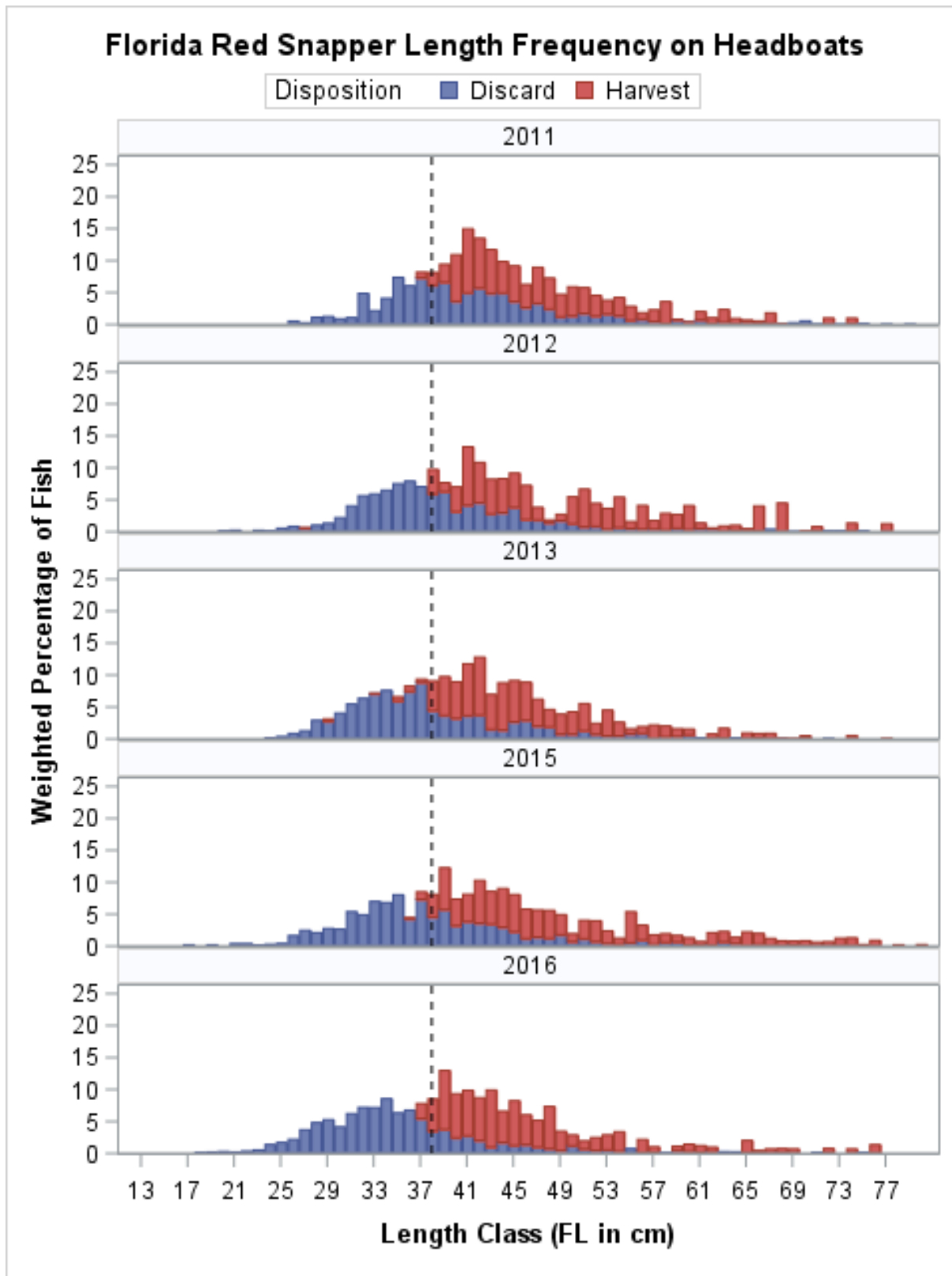
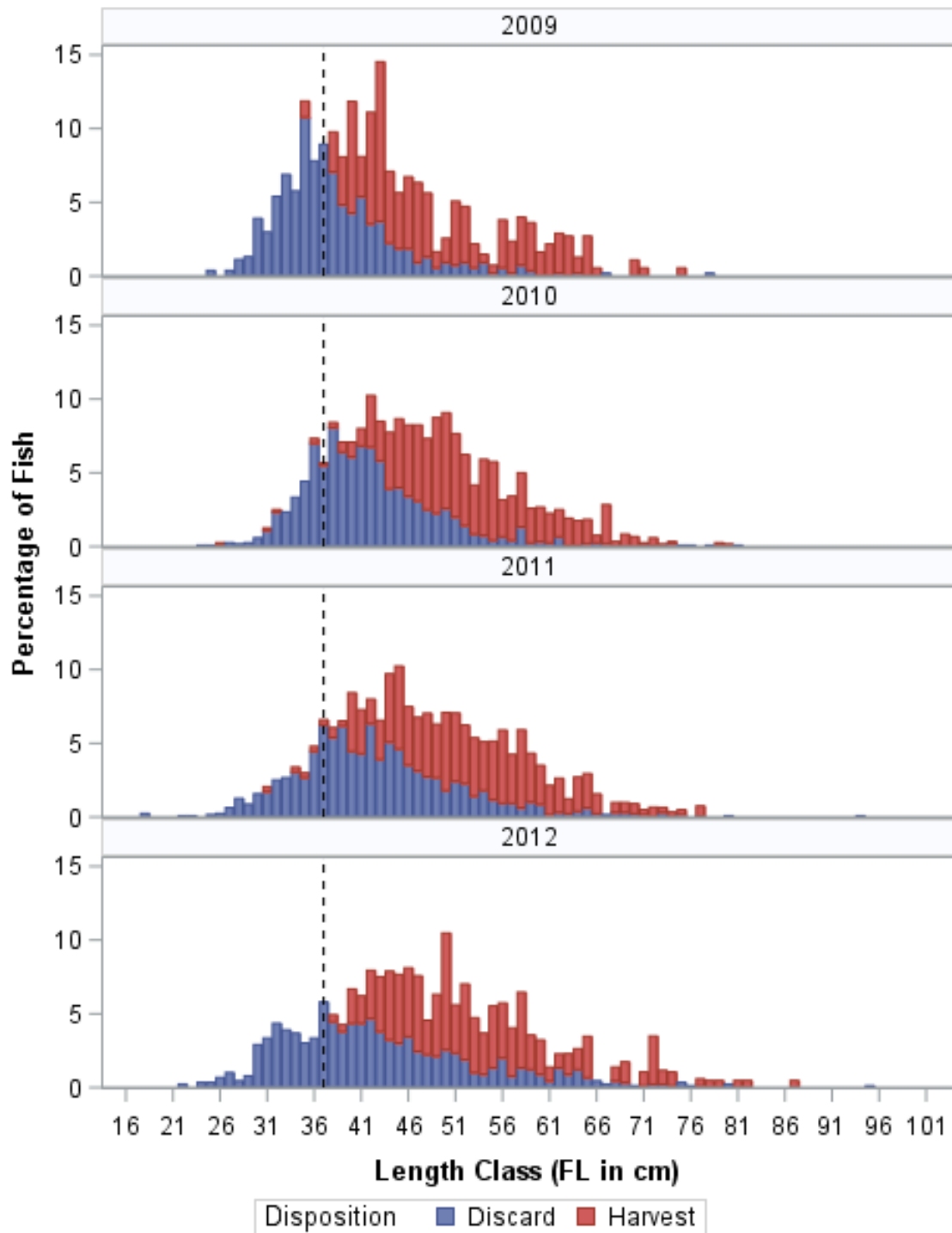


Figure 2. Length frequencies of harvested and released red snapper measured by at-sea observers on headboats in Florida 2005-2016, weighted by trip type. Harvest includes fish that were released dead. Reference line represents the fork length associated with a 16 inch fish.

Florida Red Snapper Length Frequency on Charterboats



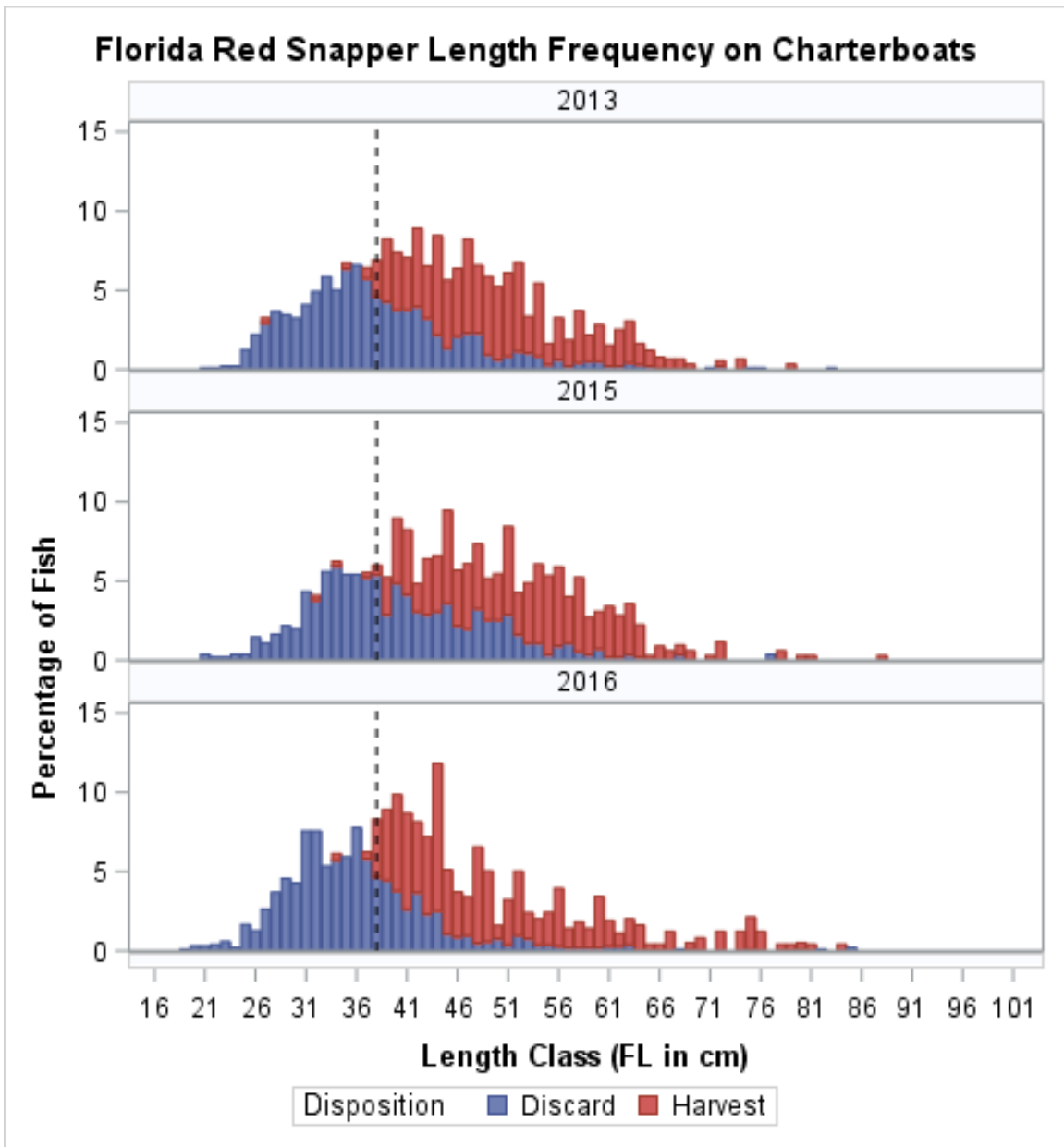


Figure 3. Length frequency of harvested and released red snapper measured by at-sea observers on charterboats in Florida 2009-2016. Harvest includes fish that were released dead. Reference line represents the fork length associated with a 16 inch fish.

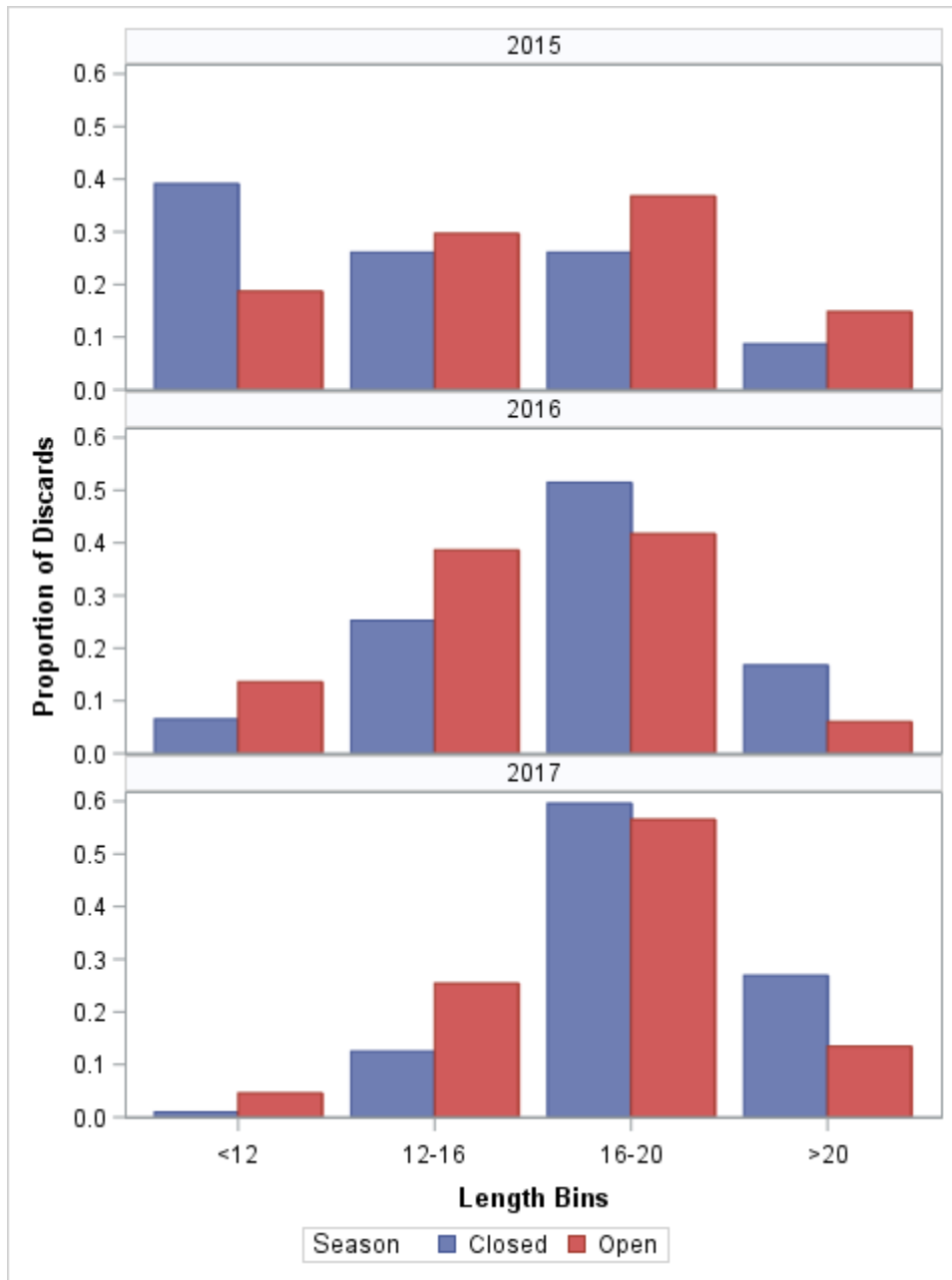


Figure 4. Proportion of red snapper releases by size class reported on volunteer angler catch logs during regular open harvest seasons and closed seasons. Conversions: up to 12" = \leq 30cm length bins; >12"-16" = 31-40cm bins; >16-20" = 41-50cm bins; >20" = >50cm bins.

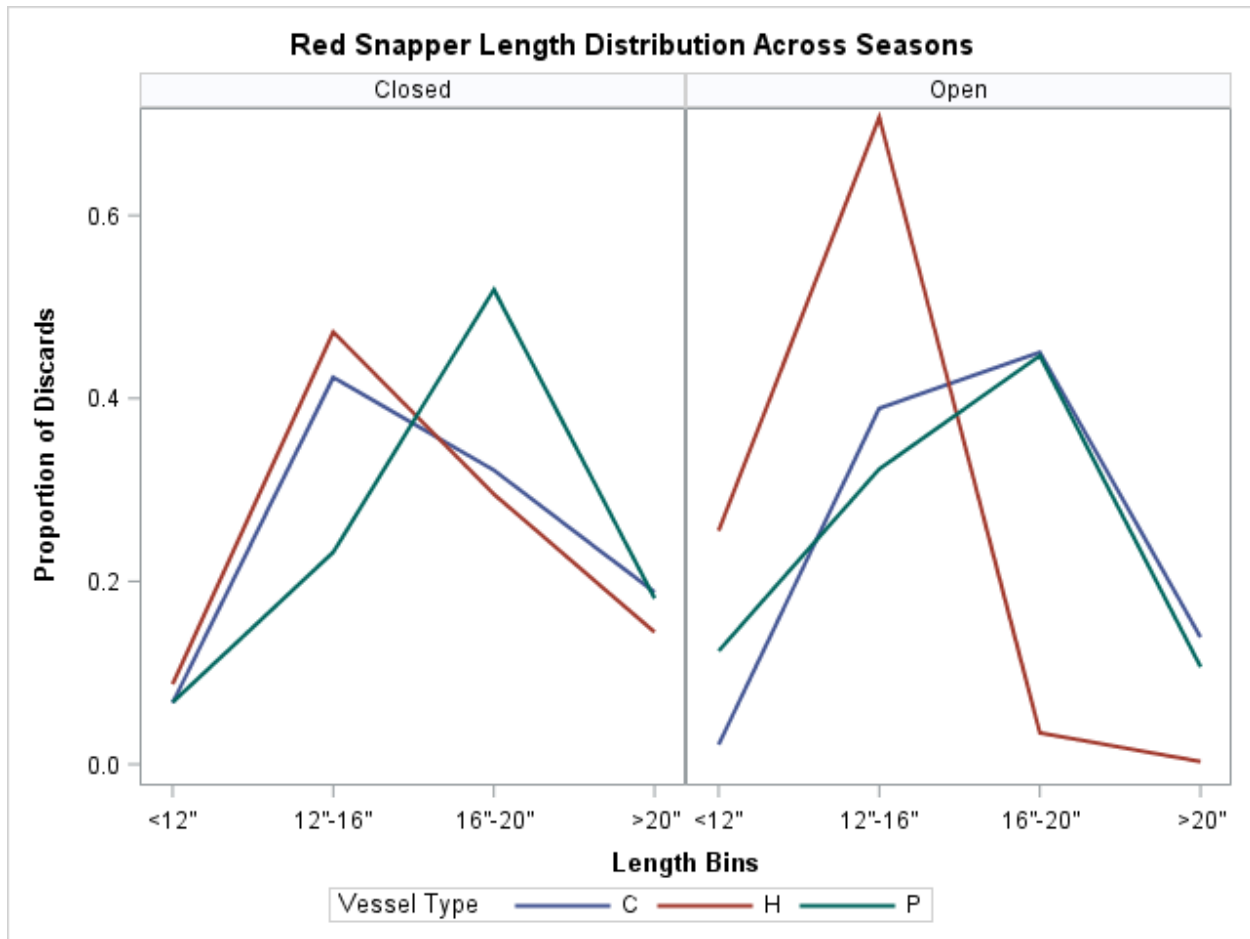


Figure 5. Proportion of red snapper discards by size category from charterboat (C) and headboat (H) at-sea surveys and from volunteer angler catch logs (P), pooled for all years. Conversions: up to 12" = ≤ 30 cm length bins; >12"-16" = 31-40cm bins; >16-20" = 41-50cm bins; >20" = >50cm bins.