A Summary of Gray Triggerfish Size Distribution Data from Recreational Fishery Surveys in the Gulf of Mexico

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A Summary of Gray Triggerfish Size Distribution Data from Recreational Fishery Surveys in the Gulf of Mexico

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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 distribution 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, funding for observer surveys of the for-hire fleet has not been consistent and most available data are from the eastern Gulf of Mexico. This report provides a summary of available information on the size distribution of gray triggerfish collected by trained observers since 2005 during at-sea surveys on for-hire vessels in the Gulf of Mexico.

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 2017.

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 single trip was arranged during a selected week. Dependent upon the number of customers on board, one or two biologists accompanied passengers during a 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

Release Condition was coded as:
Good – Fish that were able to submerge and swim away immediately after release
Fair – Fish that re-submerged and swam away with minor difficulty
Bad – Fish released that demonstrated extreme difficulty re-submerging or swimming
Dead – Fish that were released dead, preyed upon by mammals or preyed upon by birds

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, 2009-2017
Similar to the 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 collection in 2009 does not represent a full year of data collection but are included below because they are representative of the fishery in the months data was collected. The records from 2014 were omitted from the analysis because they were 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 trip, 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 northwestern region of Florida, half-day trips were under-sampled with respect to headboat effort. Weighting factors were generated 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 under sampling.

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

Characterization of Discards:

Fish mid-line lengths assigned to two cm length bin categories (40 cm bin = fish 40 cm to 41.9 cm) and the number of lengths in each length bin category were summed by 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_t) for each trip-type and sample region. The weighted proportion of fish in a length bin (p_x) was calculated as follows:

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

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.

Results

The number of sampled trips by month and trip duration for headboat and charterboat trips are provided in Tables 1 & 2. Length frequency distributions from the headboat fishery are weighted to account for oversampling of some trip types, as compared to the frequency of these trips in the fishery (Table 3). The weighted length frequencies of discarded and harvested fish are described, by year, for the headboat fishery are found in Figure 2. The raw length frequency distribution for gray triggerfish harvest and discards are described in Figure 3. A more detailed summary of the lengths of discarded fish in the for-hire fleets are described in Table 4. The depth range corresponding with the discarding of gray triggerfish are described in Table 5. Lastly, the proportion of discarded fish observed in four aggregated release conditions are listed in Table 6.

Table 1. Florida sampled headboat at-sea observer trips by month, year, and trip duration for 2005-2017 (excluding 2008 and 2014).

YEAR	TRIP DURATION	MONTH												YEARLY TOTAL
		JAN	*FEB*	*MAR*	*APR*	*MAY*	*JUN*	*JUL*	*AUG*	*SEP*	*OCT*	*NOV*	*DEC*	
2005	*HALF DAY*	1	2	2	2	3	1	2	5	0	1	1	2	22
	THREE-QUARTER DAY	0	6	8	10	11	17	15	7	6	10	7	4	101
	FULL DAY	0	1	1	4	3	2	1	1	2	2	1	2	20
	MULTIDAY	0	1	0	2	3	2	2	2	2	2	1	2	19
	MONTHLY TOTAL	1	10	11	18	20	22	20	15	10	15	10	10	162
2006	*HALF DAY*	4	7	5	10	7	8	9	9	4	6	8	5	82
	THREE-QUARTER DAY	7	7	11	6	17	10	13	9	11	8	6	9	114
	FULL DAY	0	0	3	3	0	5	1	1	1	1	1	0	16
	MULTIDAY	2	3	3	3	1	2	3	3	2	2	2	2	28
	MONTHLY TOTAL	13	17	22	22	25	25	26	22	18	17	17	16	240
2007	*HALF DAY*	7	8	4	3	3	5	4	3	0	2	2	0	41
	THREE-QUARTER DAY	6	5	8	8	8	8	10	9	11	8	7	10	98
	FULL DAY	1	1	2	1	1	3	1	1	0	1	0	1	13
	MULTIDAY	2	2	2	1	1	2	1	2	1	4	5	2	25
	MONTHLY TOTAL	16	16	16	13	13	18	16	15	12	15	14	13	177
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	6	3	42
	FULL DAY	0	0	0	0	0	7	4	0	1	0	1	0	13
	MULTIDAY	0	0	0	0	0	0	1	3	1	2	1	1	9
	MONTHLY TOTAL	0	0	0	0	0	15	14	11	9	8	9	6	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
	MONTHLY TOTAL	6	7	6	9	6	13	14	8	10	7	4	4	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	7	6	5	5	5	7	66
	FULL DAY	0	0	0	1	0	6	1	0	1	0	0	0	9
	MULTIDAY	0	1	0	3	0	3	1	1	1	2	1	1	14
	MONTHLY TOTAL	4	8	8	11	8	18	11	9	8	11	7	16	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
	MONTHLY TOTAL	10	9	6	10	8	13	13	10	7	7	7	9	109

2013	*HALF DAY*	4	2	5	2	2	4	6	4	3	2	0	5	39
	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
	MONTHLY TOTAL	9	8	10	7	6	17	10	10	7	9	4	7	104
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	6	8	70
	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
	MONTHLY TOTAL	10	10	15	16	19	12	17	19	15	16	12	23	184
2016	*HALF DAY*	6	8	7	6	7	6	8	6	8	5	11	12	90
	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
	MONTHLY TOTAL	22	22	22	18	14	16	20	19	19	20	18	21	231
2017	*HALF DAY*	10	10	10	5	11	7	7	13	6	12	10	4	105
	THREE-QUARTER DAY	6	6	6	5	5	7	4	7	7	3	4	5	65
	FULL DAY	5	3	2	1	7	2	3	3	2	4	4	3	39
	MULTIDAY	0	1	1	0	0	1	3	0	0	0	1	0	7
	MONTHLY TOTAL	21	20	19	11	23	17	17	23	15	19	19	12	216

Table 2. Florida sampled charterboat at-sea observer trips by month, year, and trip duration between 2009-2017 (excluding 2014).

YEAR	TRIP DURATION	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	5	8	4	3	1	29
	FULL DAY	0	0	0	0	0	1	8	1	5	3	4	1	23
	MULTIDAY	0	0	0	0	0	0	0	0	0	0	0	0	0
	MONTHLY TOTAL	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	3	5	6	4	4	5	10	7	2	56
	FULL DAY	0	1	1	0	5	5	1	0	0	8	5	0	26
	MULTIDAY	0	1	0	0	0	1	0	0	0	0	0	0	2
	MONTHLY TOTAL	4	5	6	4	11	16	7	6	6	19	16	3	103
2011	*HALF DAY*	0	3	6	1	4	4	1	.	5	4	2	3	33
	THREE-QUARTER DAY	3	5	4	7	8	8	7	10	8	5	6	8	79
	FULL DAY	2	0	0	2	0	5	2	1	1	4	1	1	19
	MULTIDAY	0	0	0	0	0	0	0	0	0	0	0	0	0
	MONTHLY TOTAL	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	8	10	4	76
	FULL DAY	0	1	2	3	3	1	4	1	4	2	3	1	25
	MULTIDAY	0	0	0	0	0	0	0	0	0	0	0	0	0
	MONTHLY TOTAL	6	9	9	8	10	10	15	12	9	17	15	9	129
2013	*HALF DAY*	2	2	9	5	3	2	6	6	5	3	5	4	52
	THREE-QUARTER DAY	2	5	7	4	4	12	9	4	2	2	3	2	56
	FULL DAY	4	1	0	4	2	4	2	0	2	6	3	0	28
	MULTIDAY	0	0	0	0	0	0	0	0	0	0	0	0	0
	MONTHLY TOTAL	8	8	16	13	9	18	17	10	9	11	11	6	136
2015	*HALF DAY*	4	2	6	3	9	7	6	8	9	7	6	10	77
	THREE-QUARTER DAY	3	0	7	5	5	6	5	9	7	6	8	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
	MONTHLY TOTAL	8	2	15	11	17	31	20	23	23	19	14	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	6	83
	FULL DAY	1	4	0	0	4	4	7	4	4	5	12	9	54
	MULTIDAY	0	0	0	0	0	0	0	1	0	0	0	0	1
	MONTHLY TOTAL	12	16	25	16	19	21	28	20	23	21	28	24	253

2017	*HALF DAY*	5	8	13	14	6	6	8	4	5	4	7	2	82
	THREE-QUARTER DAY	3	5	8	2	8	6	6	7	5	4	3	4	61
	FULL DAY	1	3	6	1	6	14	10	4	4	7	4	6	66
	MULTIDAY	0	1	0	0	0	1	0	0	0	0	0	0	2
	MONTHLY TOTAL	9	17	27	17	20	27	24	15	14	15	14	12	211

Table 3. Weights associated with each year and trip type; applied as a correction for oversampling some trip types.

Year	Half Day	3/4 Day	Full Day	Multi Day
2005	2.0722	0.7985	1.6602	0.1349
2006	0.8832	1.2360	1.4576	0.1200
2007	1.8110	0.8311	1.4687	0.0882
2009	3.6232	0.8758	0.3979	0.1176
2010	3.0146	0.9994	0.2559	0.1220
2011	1.6410	0.9500	0.5780	0.1334
2012	1.2804	0.9972	1.0792	0.1624
2013	0.9995	1.2788	1.0917	0.1604
2015	1.0594	0.6386	1.5773	0.9013
2016	1.0978	0.7332	1.2907	0.6281
2017	0.8573	0.9138	1.5813	0.7024

Table 4. Summary length statistics for discarded gray triggerfish observed on headboats and charterboats in Florida (2008 and 2014 excluded).

Year	CHARTERBOAT				CHARTERBOAT			
	N	*Min*	*Mean*	*Max*	*N*	*Min*	*Mean*	*Max*
2005	202	192	250	447	-	-	-	-
2006	208	205	260	363	-	-	-	-
2007	166	200	269	540	-	-	-	-
2009	52	240	315	426	158	222	303	404
2010	115	220	307	392	201	234	313	439
2011	249	228	314	370	540	166	313	574
2012	292	204	323	492	434	230	321	517
2013	212	218	319	501	431	215	316	515
2015	738	196	326	608	982	136	316	580
2016	1314	210	323	560	1222	209	318	592
2017	914	174	350	534	984	157	340	518

Table 5. Summary statistics of the station level fishing depths (in meters) when gray triggerfish were captured during At-Sea observer trips from 2009-2017 (2008 and 2014 excluded). Sample size (N) corresponds to the number of gray triggerfish discarded at each depth.

Year	HEADBOAT				CHARTERBOAT			
	N	*Min*	*Mean*	*Max*	*N*	*Min*	*Mean*	*Max*
2009	66	16	32	58	196	18	34	67
2010	147	10	36	55	353	15	35	61
2011	316	10	34	67	717	11	33	60
2012	326	10	34	70	497	10	33	60
2013	233	15	33	55	493	9	31	45
2015	745	6	33	71	984	12	29	44
2016	1621	8	32	60	1339	11	29	51
2017	914	6	33	65	982	9	30	59

Table 6. Summary statistics for gray triggerfish release conditions in the headboat and charter recreational fishing fleets. The category 'Dead' includes fish that were released dead, preyed on by mammals and preyed on by birds.

Release Condition	HEADBOAT				CHARTERBOAT			
	Good	*Fair*	*Bad*	*Dead*	*Good*	*Fair*	*Bad*	*Dead*
N	3709	39	115	5	4844	45	49	3
%	95.89	1.01	2.97	0.13	98.04	0.91	0.99	0.06
Mean Depth	33	32	33	26	30	33	32	33
Max Depth	71	54	55	29	61	52	51	34

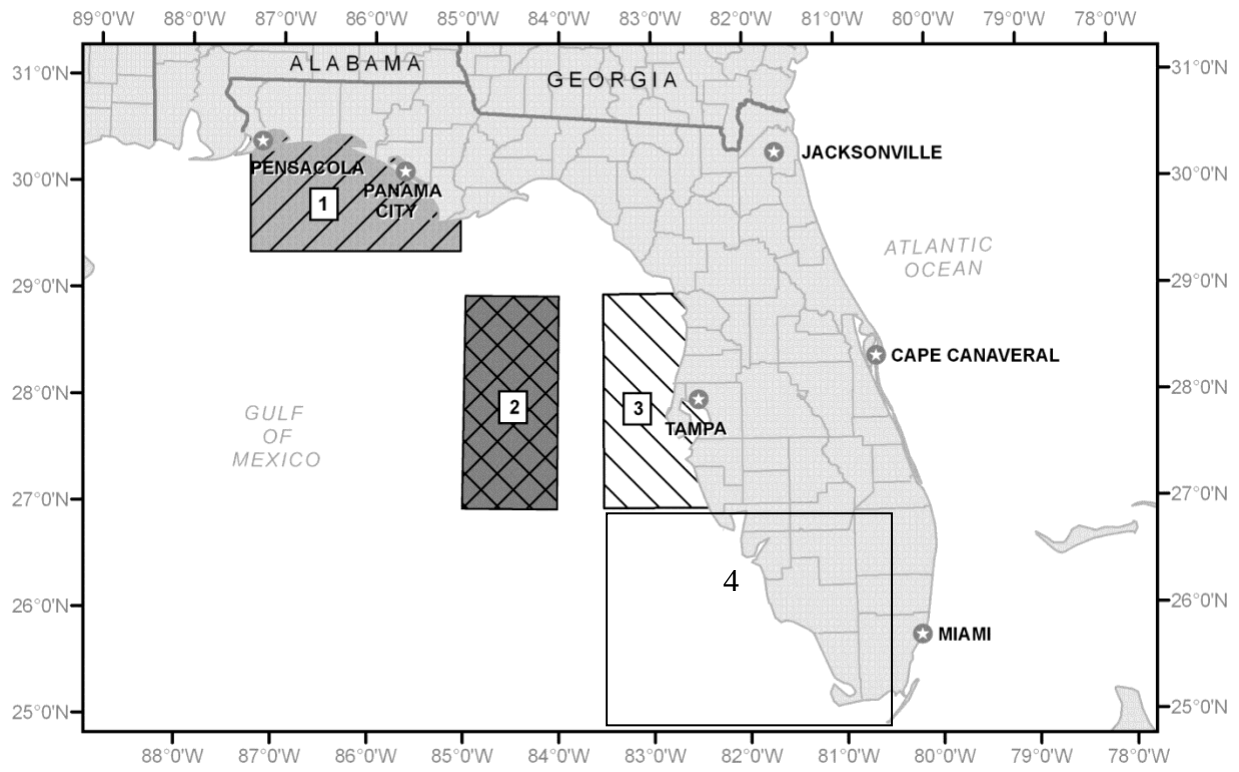
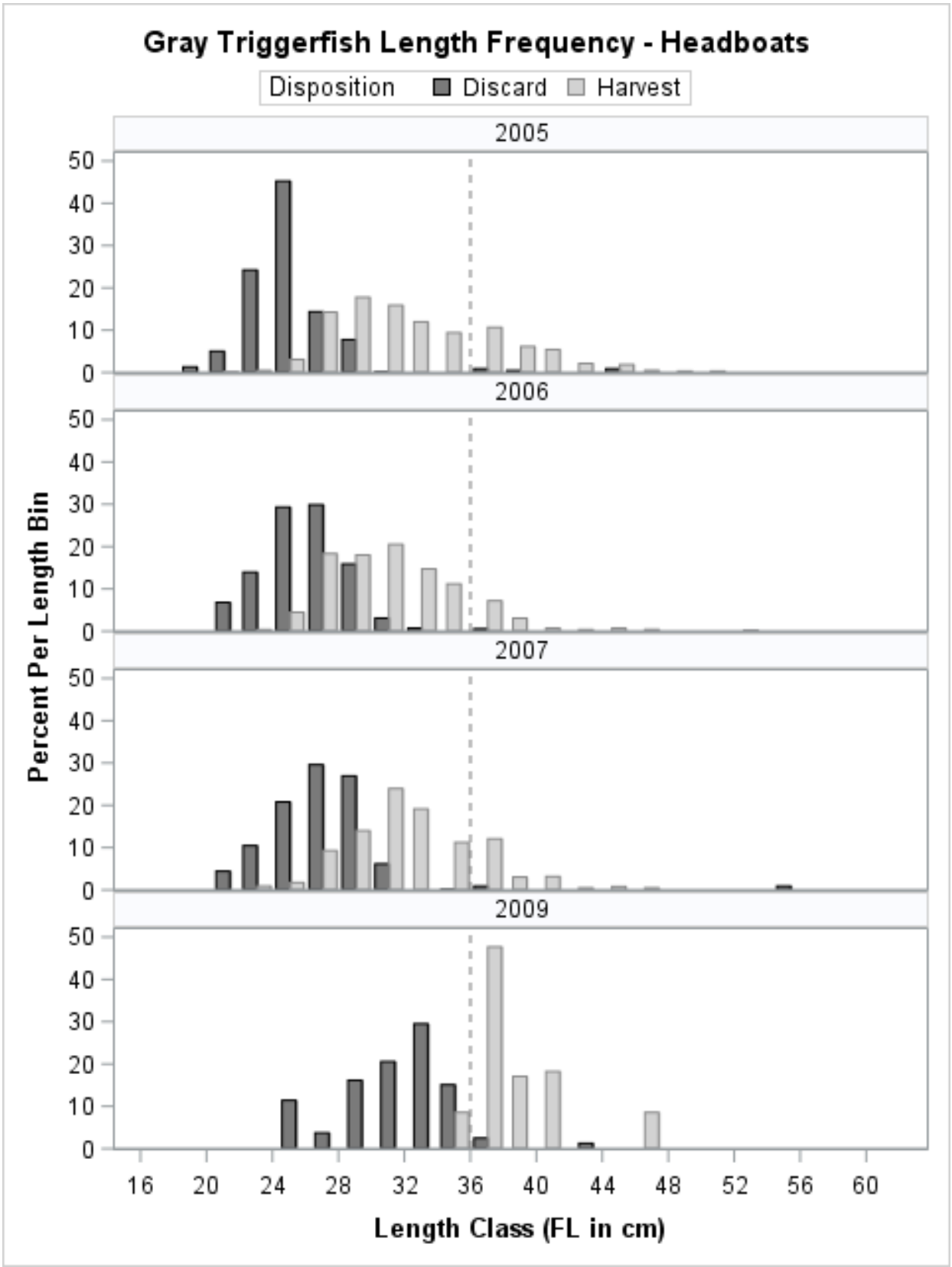
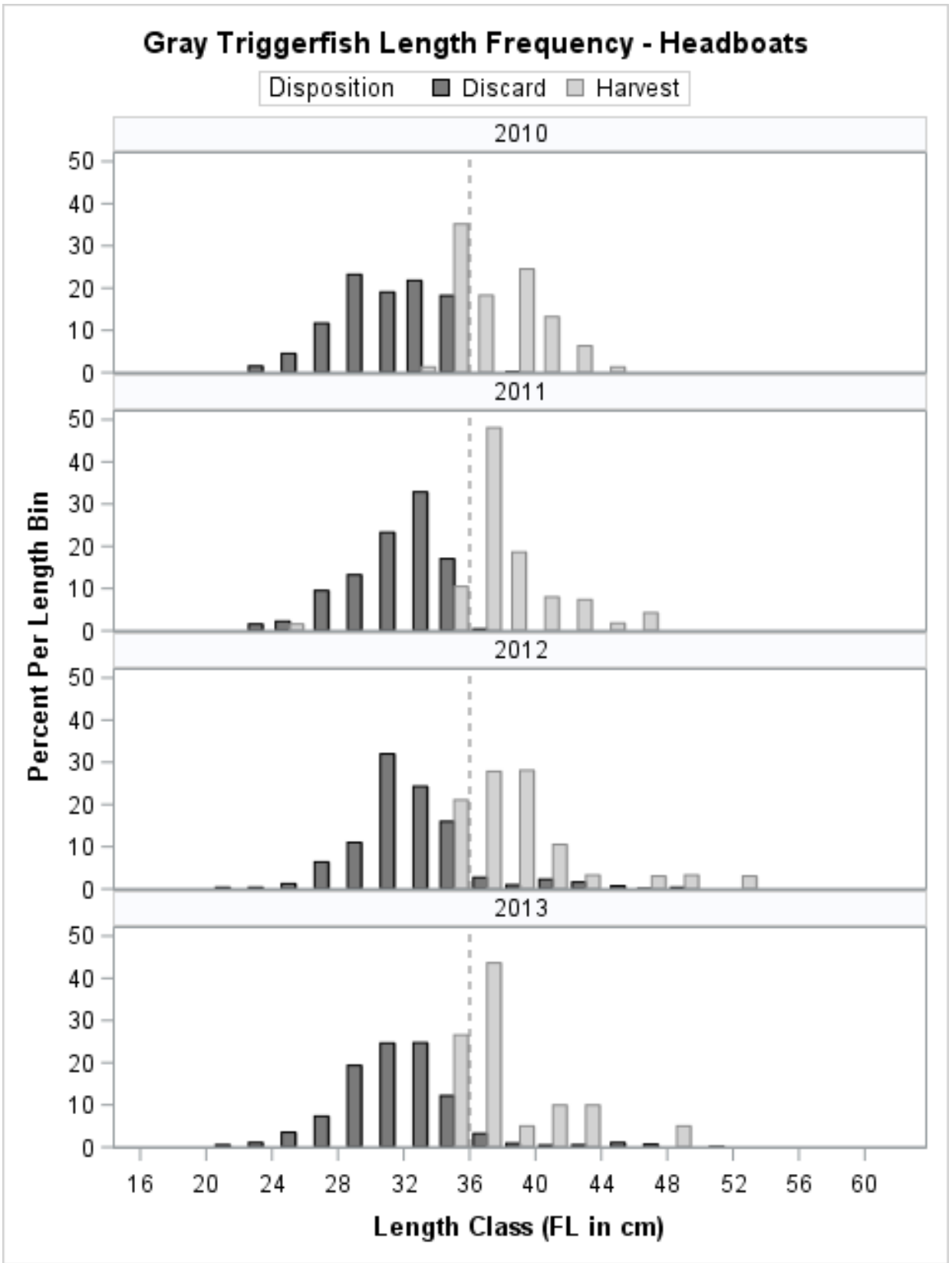


Figure 1. Areas in Florida with at-sea observer coverage. Area 1 is the northwestern panhandle region, area 2 is where multi-day trips from the western central region took place, and area 3 is where single-day trips from the western central region took place. From 2005-2007, headboats only were sampled from areas 1, 2, 3 and 4. From June 2009 through 2012, headboats and charter boats were surveyed from areas 1, 2 and 3. From 2013-2014 consistent sampling in area 4 was added again.


Gray Triggerfish Length Frequency - Headboats
Disposition
Discard
Harvest
2005
2006
2007
2009
Percent Per Length Bin
0
10
20
30
40
50
16
20
24
28
32
36
40
44
48
52
56
60
Length Class (FL in cm)


Gray Triggerfish Length Frequency - Headboats
Disposition
Discard
Harvest
2010
2011
2012
2013
Percent Per Length Bin
0
10
20
30
40
50
16
20
24
28
32
36
40
44
48
52
56
60
Length Class (FL in cm)

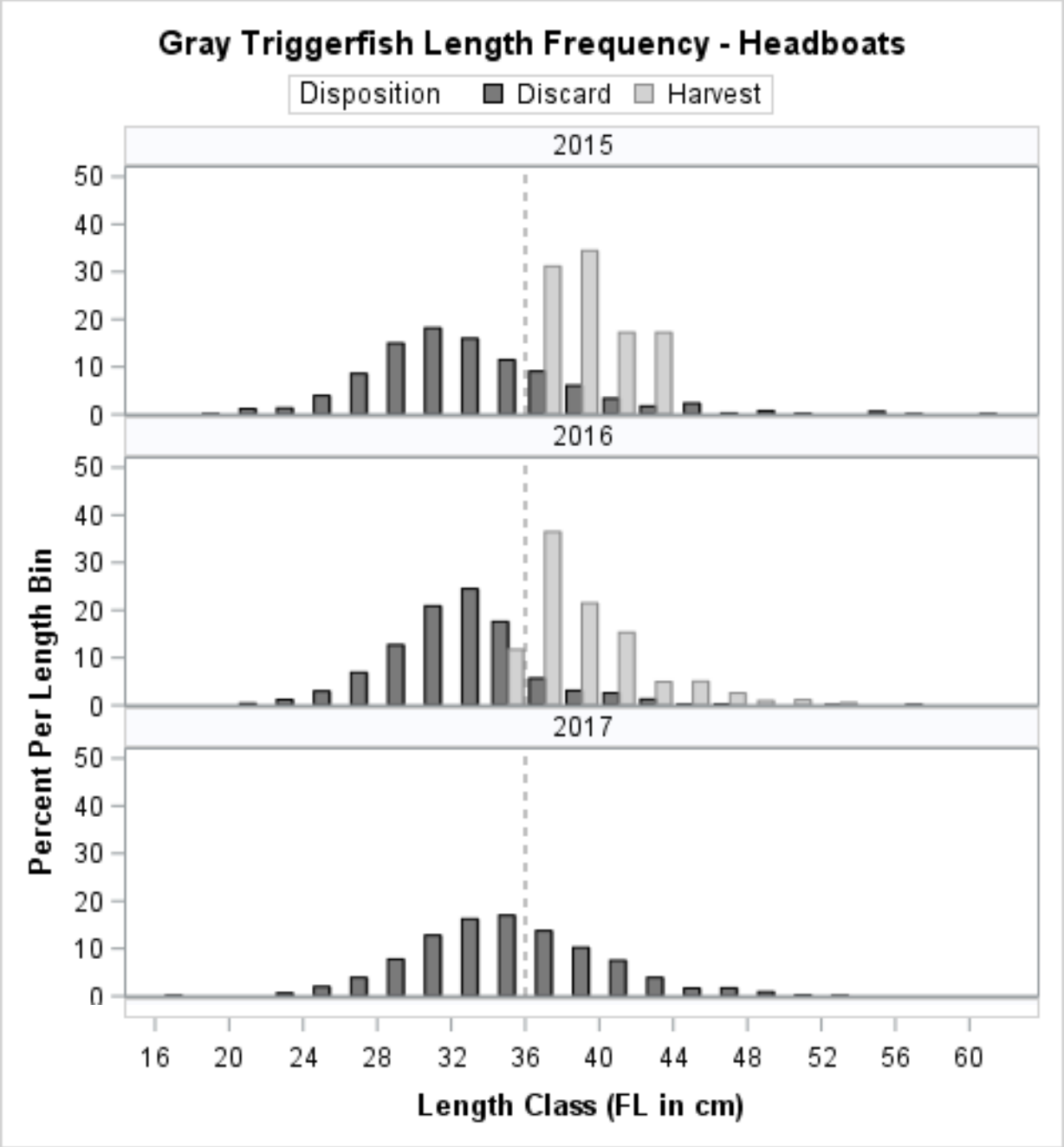
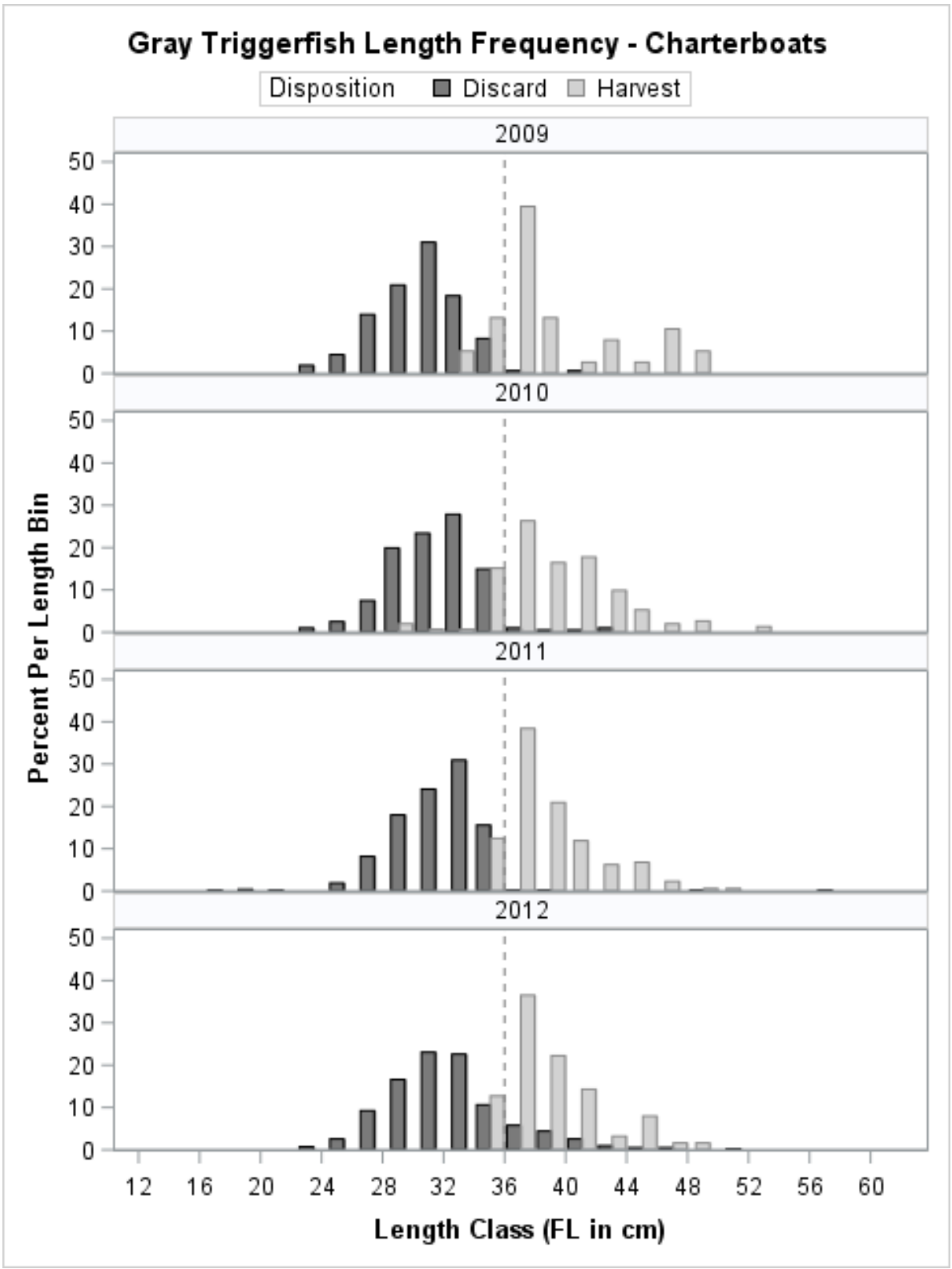


Figure 2. Length frequencies of harvested and released gray triggerfish measured by At-Sea observers on headboats in Florida 2005-2017, weighted by trip type (excluding 2008 and 2014). Harvest includes fish that were released dead. Dotted reference lines correspond with approximate minimum size limit for the species (14 inches, ~36 cm).


Gray Triggerfish Length Frequency - Charterboats
Disposition
Discard
Harvest
2009
2010
2011
2012
Percent Per Length Bin
0
10
20
30
40
50
12
16
20
24
28
32
36
40
44
48
52
56
60
Length Class (FL in cm)

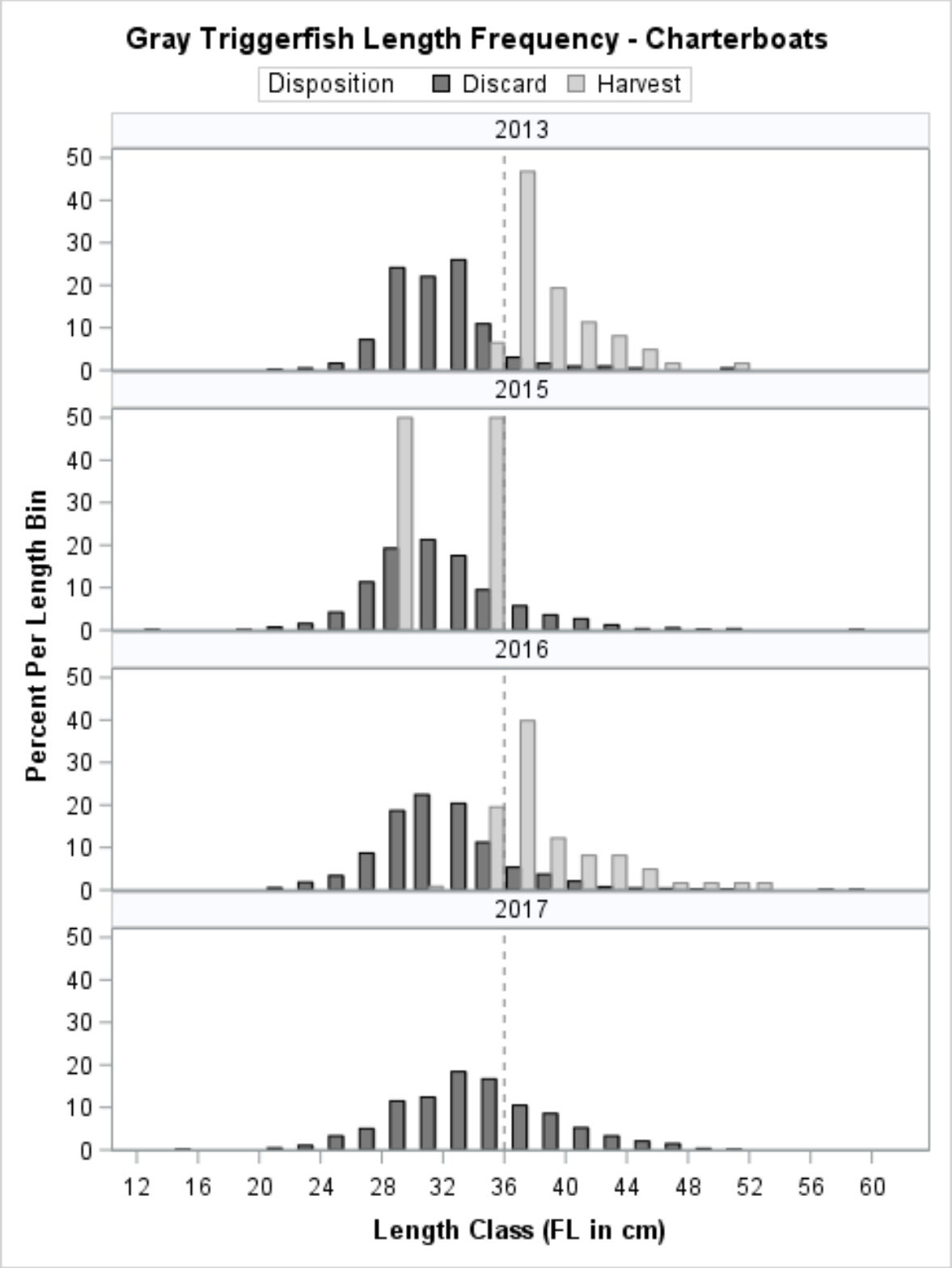


Figure 3. Length frequency of harvested and released gray triggerfish measured by at-sea observers on charterboats in Florida 2009-2017 (excluding 2008 and 2014). Harvest includes fish that were released dead. Dotted reference lines correspond with approximate minimum size limit for the species (14 inches, ~36 cm).