Size Distribution and Release Condition of Gag Grouper Discards from Recreational Fishery Surveys in the Eastern Gulf of Mexico

Dominique Lazarre, Rachel Germeroth, Beverly Sauls

SEDAR72-WP-13

4 March 2021

Please cite this document as:

Lazarre, Dominique, Rachel Germeroth, Beverly Sauls. 2021. Size Distribution and Release Condition of Gag Grouper Discards from Recreational Fishery Surveys in the Eastern Gulf of Mexico. SEDAR72-DW-13. SEDAR, North Charleston, SC. 23 pp.

Size Distribution and Release Condition of Gag Grouper Discards from Recreational Fishery Surveys in the Eastern Gulf of Mexico

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

For: SEDAR 72 Gag Data Workshop, 2020.

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 vessels in Florida since 2005. This report provides a summary of available information on the size, release condition, and disposition of gag collected by trained observers from 2005-2019 during at-sea surveys on for-hire vessels in the eastern Gulf of Mexico.

At-Sea Observer Survey Coverage

For-hire observer surveys have been inconsistently funded, which has led to breaks in the time series (Table 1). From 2005-2007, at-sea observer survey coverage on headboats operating from Alabama and the Gulf coast of Florida, from the panhandle through the Keys, was funded by the Gulf Fisheries Information Network (Gulf FIN). There was a gap in funding from January 2008 through May 2009. In June 2009, coverage was expanded to include both headboats and charter vessels; however, the survey only extended from the panhandle south to Tampa Bay. Funding for charter coverage was drastically reduced in 2014, and coverage on headboats was limited to a small number of vessels participating in a pilot study for IFQ shares. Thus, data from this year are not considered representative of the fishery as a whole. Since 2015, there has been consistent coverage of both charter and headboats from the panhandle through the Florida Keys.

At-Sea Observer Survey Methods

Florida – 2005 to 2007

Headboat vessels from Florida were randomly selected each week. There were separate sample quotas for single-day trips (NW and SW regions) and multi-day trips (SW region). Operators from selected vessels were contacted by state biologists and a single trip was arranged 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.

Trip level information collected 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. For each fish observed, biologists recorded the species, disposition, size (fork length in mm), and the condition of fish that were released. Additionally, 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 – 2009-2019
Similar to methods described above, participating charter and headboat vessels were randomly selected each week in each region to carry one or more fishery observers. Selected vessels were contacted in advance to schedule a single trip during the selected week.

In addition to trip level data described above, vessel operators also provide biologists with station-level information, including depth and area fished (commercial statistical area and/or degrees and minutes latitude and longitude) for each fishing location during an observed trip.

On large capacity vessels, headboats, a subset of anglers is directly observed for the entire 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. For these anglers, hook type, hook size and hook location were recorded from the fish that they captured. Observers aim to collect data from all anglers on charterboats.

At-Sea Observer Survey Data Elements

Disposition was coded as:

Discards
1: thrown back alive, legal;
2: thrown back alive, not legal;
Harvest
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

Area fished was coded as:
3: 10 miles or less from shore; or
4: more than 10 miles from shore.

Characterization of Trip Duration:
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)

At-Sea Observer Survey Data Analysis

Data Filtering

The observer data were filtered by region and year to correspond with the data provided in SEDAR 33 and in accordance with the current terms of reference. The two regional groupings used are northwest Florida (NWFL – Escambia to Levy County) and southwest Florida (SWFL – Levy to Monroe County, north of US 1). In the early years of the study, 2005-2007, a small number of trips were observed in Mobile and Baldwin counties in Alabama, the data from these trips is aggregated into the NWFL region. In those same years, Gulf of Mexico trips in the Florida Keys were identified by the "area fished" variable associated with each trip. Starting in 2009, trips were specifically designated as being north or south of US1. No data is available for 2008 or 2014, due to funding limitations that prevented or limited sampling in each year. All records for gag grouper with an associated length measurement were included in data aggregations, with discarded and harvested distinguished from each other.

Sample Weighting

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 higher rate in at-sea observer surveys. In northwest 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 2019. 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 each 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 in each year. 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 fork lengths assigned to two cm length bin categories (40 cm bin = fish 40.0 cm to 41.9 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_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 fishes in length bin x for a given disposition in each 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. The number of discarded fishes was summed by trip type and multiplied by the weighting factor for each trip-type, by year, to construct the weighted discard length frequency distribution. For charter vessels, the discard length frequency was calculated by summing the raw number of discarded Gag in each length bin and dividing this number by the total number of discarded fishes, by year.

Summaries of release condition by fleet were created by summing the number of discarded fishes in each of four release conditions: Good, Fair, Bad, or Dead. The intersection of these release conditions and the hooking location for discarded fish were also calculated, by creating two modified conditions: No Trauma – discarded fish with Good release condition and Lip hook position and Trauma – discarded fish in the Fair, Bad, or Dead category or any fish hook position that was not the lip of the fish.

Comparison of Charter, Headboat and Private Boat Fishing Depths

No information is available on the size of discarded fish in the private boat segment of the recreational fishery in Florida, since observer coverage is limited to inspected for-hire vessels with professional crew. However, information on the depths where private boat anglers fish may be used to evaluate whether the fleet is catching and discarding Gag in areas that are similar to either the charter or headboat fleets. Since May 2015, the intercept survey for the Gulf Reef Fish Survey has collected information on the depths fished during private boat trips that target reef fish species. Sites where private boats frequently return from reef fish trips are randomly selected as a supplemental draw for the MRIP Access Point Angler Intercept Survey. During these assignments, angler parties that are intercepted at the dock are asked to report the types of reef fish species targeted and/or caught during their recently completed trip, the minimum and maximum depths fished, and the depth that was fished for the majority of time during the trip.

Private boat intercepts were included in the analysis if the party reported targeting and/or catching Gag. For the for-hire fleet, fishing depths from charter and headboat trips that targeted groupers (any species) and/or caught Gag were included in the analysis. For private boat trips, the depth fished the majority of time was used to group trips into 10m depth bins, and the number of trips in each bin was summed. Since the fishing depth at each location fished within a trip was known for charter and headboats, depths at each observed fishing location were summed

by 10m depth bin. Headboat sums were weighted using methods previously described above. The proportions of private boat trips that fished in each 10 depth interval was compared with what was observed in the for-hire fishery to evaluate whether private boats fished more similarly to charter or headboat fleets.

Results

At-Sea Observer Trips

The number of for-hire trips sampled by observers in the eastern Gulf of Mexico is provided in Tables 2 and 3. A smaller proportion of these trips were positive for gag grouper in each year. Sampling weights were used to adjust the number of headboat discards, as a function of under- or over-sampling of different trip durations in northwest and southwest Florida (Table 4). A total of 7,418 discarded fish and 1,196 harvested fish were measured during headboat At-sea observer trips between 2005 and 2019 in the coastal regions of west Florida. For charter trips, in western Florida, observers sampled 3,844 discarded fish and 784 harvested fish. Summary statistics for the length distribution of discarded and harvested fish observed during headboat and charter trips are provided in Tables 5 and 6. A summary of capture depths for discarded Gag, by fishing fleet (headboats and charterboats) is provided in Tables 7 and Table 8, showing that on average, Gag were caught in depths 30 meters or shallower in both fishing fleets. However, charter boats tend to fish in deeper depths compared to both headboats and private boats (Figure 1). Fishing occurred in shallow depths less than 20 meters during 78% of private boat trips that were intercepted, and 81% of fishing stations sampled from headboats also occurred in similar depths (Figure 1). Only 37% of fishing stations observed during charter boat trips occurred in depths less than 20m. Thus, it may be inferred that the size composition of Gag discards from private boats are more similar to those observed in the headboat fleet. Length frequency histograms for harvested and released (discarded) Gag by year are presented for western Florida headboats (Figure 2) and western Florida charterboats (Figure 3). A comparison of the size distributions of headboat and charter discards, for all years combined, showing the discards from the charter fishery skew larger than those from the headboat fishery (Figure 4).

The majority of Gag released from both headboat and charterboat vessels were released with a “Good” release condition and “Lip” hooking location, 96.5% of fish (Table 9). Most fish were released with no apparent injury or disorientation preventing them from re-submerging.

Table 1. Sampling coverage for At-sea observer trips in west Florida (Escambia County through Monroe County N. of US 1) , by region and Year. The northwest region represents data collected in Escambia through Dixie County and the southwest region represents Levy through Monroe County (north of US 1 in the Florida Keys). The * indicates that 2009 represents only a half year of coverage. The italics indicates year with only partial coverage of a region.

Headboat Areas	**2005**	**2006**	**2007**	**2008**	**2009***	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Northwest	H	H	H		H,C	H,C	H,C	H,C	H,C		H,C	H,C	H,C	H,C	H,C
Southwest	H	H	H		*H,C*	*H,C*	*H,C*	*H,C*	*H,C*		H,C	H,C	H,C	H,C	H,C

Table 2. Numbers of headboat trips sampled by year, region, and trip duration for 2005-2019. Sampling in 2009 only represents half of the year – June to December.

YEAR	**Duration**								**Total**
	Half Day		*Three-Quarter Day*		*Full Day*		*Multi Day*		
	NWFL	*SWFL*	*NWFL*	*SWFL*	*NWFL*	*SWFL*	*NWFL*	*SWFL*	
2005	7	15	60	41	13	7	-	19	162
2006	10	24	60	51	8	7	-	28	188
2007	11	19	58	39	5	8	-	25	165
2009	4	4	24	18	-	13	-	9	72
2010	4	9	21	27	8	13	-	12	94
2011	11	19	41	25	2	7	-	14	119
2012	14	21	37	20	2	3	-	12	109
2013	15	24	22	1	7	24	-	11	104
2015	24	49	63	7	17	20	-	4	184
2016	22	67	63	18	18	35	-	7	230
2017	26	78	48	17	10	29	-	7	215
2018	17	64	53	15	4	57	-	10	220
2019	37	58	45	26	6	44	-	10	226

Table 3. Numbers of charterboat trips sampled by year, region, and trip duration for 2009-2019. Sampling in 2009 only represents half of the year – June to December.

Year	**Duration**							
	Half Day		*Three-Quarter Day*		*Full Day*		*Multi Day*	
	NWFL	*SWFL*	*NWFL*	*SWFL*	*NWFL*	*SWFL*	*NWFL*	*SWFL*
2009	1	1	21	8	13	10	-	-
2010	9	9	39	17	14	12	-	1
2011	10	22	62	16	7	12	-	-
2012	16	10	53	22	9	16	-	-
2013	25	20	35	20	17	10	-	-
2014	12	11	13	.	8	9	-	-
2015	40	36	49	16	28	33	-	-
2016	51	60	62	19	15	38	-	-
2017	34	46	37	23	22	44	-	2
2018	32	34	37	14	16	55	-	1
2019	27	27	62	21	19	63	-	-

Table 4. Weights generated to correct length frequencies to account for uneven sampling of trips with varying duration, by region, for headboats only.

Headboat Region	Year	Trip Duration			
		Half Day	*Three-Quarter Day*	*Full Day*	*Multi Day*
NWFL	2005	1.992	0.833	1.188	-
	2006	1.983	0.746	1.592	-
	2007	2.044	0.683	2.184	-
	2009	2.383	0.643	-	-
	2010	1.626	1.058	0.488	-
	2011	1.359	0.844	1.988	-
	2012	0.834	0.984	2.222	-
	2013	0.820	0.842	1.812	-
	2015	1.182	0.616	2.109	-
	2016	1.227	0.638	1.941	-
	2017	0.851	0.743	2.539	-
	2018	1.207	0.597	5.226	-
	2019	0.660	0.879	3.986	-
SWFL	2005	1.928	0.861	2.536	0.002
	2006	1.584	1.310	0.699	0.010
	2007	2.408	0.967	0.935	0.001
	2009	4.957	1.198	0.175	0.037
	2010	3.534	0.994	0.138	0.047
	2011	1.789	1.163	0.200	0.038
	2012	1.477	1.155	0.483	0.037
	2013	1.074	12.183	0.867	0.112
	2015	0.803	2.052	1.215	0.491
	2016	0.964	1.357	0.998	0.439
	2017	0.835	1.516	1.250	0.553
	2018	1.177	1.803	0.681	0.484
	2019	1.167	1.035	0.868	0.519

Table 5. Length summaries for discarded and harvested Gag observed on headboats trips in West Florida (Escambia County through Monroe County N. of US 1), by year and region (2009 represents a half year of data June through December).

YEAR	DISCARDS				HARVEST			
	N	*Min*	*Mean*	*Max*	*N*	*Min*	*Mean*	*Max*
NORTHWEST FLORIDA								
2005	351	241	443.9	946	39	469	623.9	838
2006	38	230	409.2	540	7	547	607.3	704
2007	6	237	431.0	686	2	562	576.0	590
2009*	7	321	407.9	497	1	675	675.0	675
2010	18	294	403.4	501	1	604	604.0	604
2011	25	400	555.3	830	2	525	550.5	576
2012	24	350	539.8	740	-	-	-	-
2013	5	421	570.6	730	-	-	-	-
2015	1	276	276.0	276	4	640	789.8	980
2016	8	324	567.3	788	1	822	822.0	822
2017	5	391	470.8	658	2	748	895.0	1042
2018	5	410	606.4	808	5	660	732.4	790
2019	51	341	478.4	619	6	590	676.2	902
SOUTHWEST FLORIDA								
2005	864	182	417.4	577	225	521	644.4	1172
2006	669	168	363.7	580	157	486	661.3	1100
2007	991	126	393.6	974	149	452	626.1	866
2009*	414	276	436.7	596	83	523	618.7	902
2010	660	230	441.6	800	173	518	634.6	882
2011	623	232	522.0	984	32	541	611.0	890
2012	332	272	530.2	940	24	348	627.8	782
2013	236	151	518.2	840	20	535	619.6	760
2015	124	235	399.7	860	30	380	631.0	750
2016	383	203	442.4	965	30	575	650.7	810
2017	284	191	439.1	1018	44	577	657.3	850
2018	724	209	432.1	900	65	586	672.4	920
2019	570	225	466.3	809	94	583	683.4	937

Table 6. Length summaries for discarded and harvested Gag observed on charterboat trips West Florida (Escambia County through Monroe County N. of US 1), by year and region (2009 represents a half year of data June through December).

YEAR	DISCARDS				HARVEST			
	N	*Min*	*Mean*	*Max*	*N*	*Min*	*Mean*	*Max*
NORTHWEST FLORIDA								
2009	28	275	433.7	530	3	544	701.7	831
2010	76	314	447.5	805	35	466	664.7	1190
2011	77	320	566.9	847	11	546	671.1	850
2012	93	290	561.6	830	50	538	654.8	897
2013	26	470	584.6	690	10	555	671.9	760
2014	11	434	611.5	775	1	539	539.0	539
2015	25	350	520.4	819	5	572	777.6	1028
2016	20	232	512.6	830	8	562	664.1	790
2017	20	271	526.9	1010	8	680	784.3	898
2018	17	371	522.6	985	12	614	726.2	904
2019	74	340	498.2	740	14	548	664.6	1050
SOUTHWEST FLORIDA								
2009	179	290	452.8	685	60	514	621.2	814
2010	442	261	465.7	736	124	534	622.6	1032
2011	510	285	511.6	895	16	540	594.4	632
2012	327	328	508.3	725	27	542	619.4	726
2013	287	260	525.8	850	17	421	601.1	680
2014	25	300	552.8	790	25	541	631.2	715
2015	109	280	503.5	872	21	535	663.1	871
2016	248	280	466.4	730	67	586	652.8	795
2017	317	195	437.4	772	85	582	674.0	955
2018	492	220	449.4	818	122	290	677.8	978
2019	444	270	466.7	873	63	342	648.5	820

Table 7. Summary of capture depths (in meters) for Gag discarded and harvested on headboats in West Florida, by year and region (2009 represents a half year of data June through December). The sample size, N, corresponds with the number of fishes caught at a given depth.

YEAR	DISCARDS				HARVEST			
	N	*Min*	*Mean*	*Max*	*N*	*Min*	*Mean*	*Max*
NORTHWEST FLORIDA								
2009*	7	24	29.3	39	1	31	31.0	31
2010	18	24	29.1	35	1	29	29.0	29
2011	25	23	32.5	66	2	38	45.5	53
2012	24	21	31.8	66	-	-	-	-
2013	5	31	35.8	39	-	-	-	-
2015	1	20	20.0	20	4	20	27.8	37
2016	8	26	31.5	40	1	61	61.0	61
2017	5	22	26.8	32	2	38	47.0	56
2018	5	30	37.8	61	5	31	35.4	44
2019	51	21	29.1	62	6	29	39.8	62
SOUTHWEST FLORIDA								
2009*	414	3	17.4	42	83	5	27.3	63
2010	660	12	20.9	55	173	12	34.6	50
2011	623	7	30.0	93	32	13	19.8	41
2012	329	8	23.6	70	24	13	28.8	65
2013	236	8	19.2	56	20	8	15.6	50
2015	124	6	15.2	60	30	7	16.9	35
2016	382	5	16.2	49	29	5	20.6	60
2017	284	7	19.2	65	44	11	25.5	53
2018	724	5	14.5	49	65	7	18.8	52
2019	570	6	18.7	62	94	8	23.9	56

Table 8. Summary of capture depths (in meters) for Gag discarded and harvested on charterboats in West Florida, by year and region (2009 represents a half year of data June through December). The sample size, N, corresponds with the number of fishes caught at a given depth.

YEAR	DISCARDS				HARVEST			
	N	*Min*	*Mean*	*Max*	*N*	*Min*	*Mean*	*Max*
NORTHWEST FLORIDA								
2009	28	19	28.3	49	3	34	39.0	42
2010	76	18	28.4	40	34	18	35.2	107
2011	77	18	31.0	53	11	27	34.7	52
2012	93	13	30.3	64	50	25	42.2	122
2013	26	20	31.0	52	10	24	36.4	66
2014	11	25	28.1	37	1	27	27.0	27
2015	25	13	20.1	32	5	19	42.0	85
2016	20	6	18.5	41	8	22	33.5	54
2017	20	9	36.4	88	8	29	45.8	57
2018	17	23	32.5	76	12	29	71.4	101
2019	74	17	29.1	42	14	24	32.7	72
SOUTHWEST FLORIDA								
2009	179	11	19.8	35	60	11	22.7	47
2010	442	10	20.9	56	124	10	25.3	63
2011	510	9	20.2	30	16	16	19.4	26
2012	327	7	18.7	36	27	10	20.9	27
2013	287	9	16.9	59	17	11	21.9	44
2014	25	12	30.4	51	25	16	17.4	25
2015	109	8	16.2	50	21	6	14.2	48
2016	248	6	14.3	32	67	5	13.5	41
2017	317	8	16.6	42	85	9	23.8	56
2018	492	6	18.2	55	122	6	25.4	64
2019	444	5	14.8	60	63	4	17.2	54

Table 9. Intersection of release condition and hook position for Gag released from the headboat and charter recreational fleets in West Florida (Escambia County through Monroe County N. of US 1). Fish that were released with a 'Good' condition (swam down immediately, without impairment) and were hooked in the 'Lip' were categorized as having 'No Trauma'. All other fish had some impairment post-release or were not hooked in the 'Lip'.

CONDITION	HEADBOAT		CHARTER		TOTAL	
	N	*%*	*N*	*%*	*N*	*%*
No Trauma	4261	94.8	3704	96.4	7965	95.5
Trauma	234	5.2	138	3.6	372	4.5
Total	4495	100.0	3842	100.0	8337	100.0

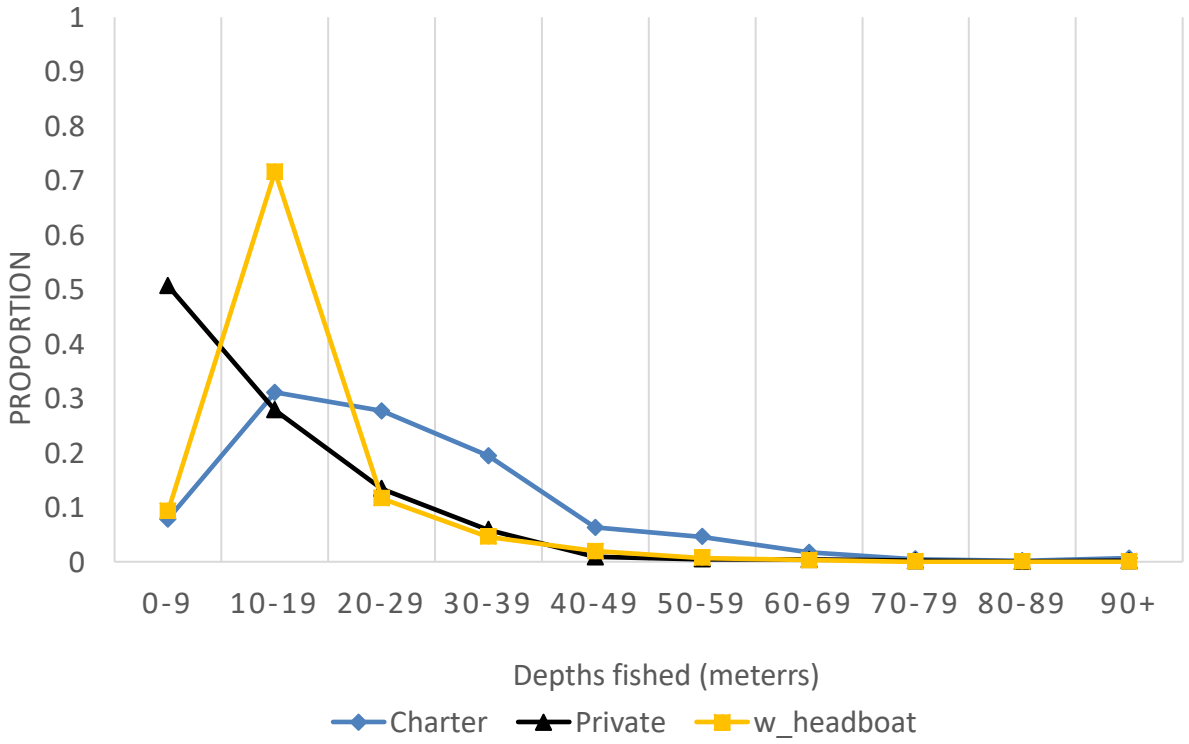
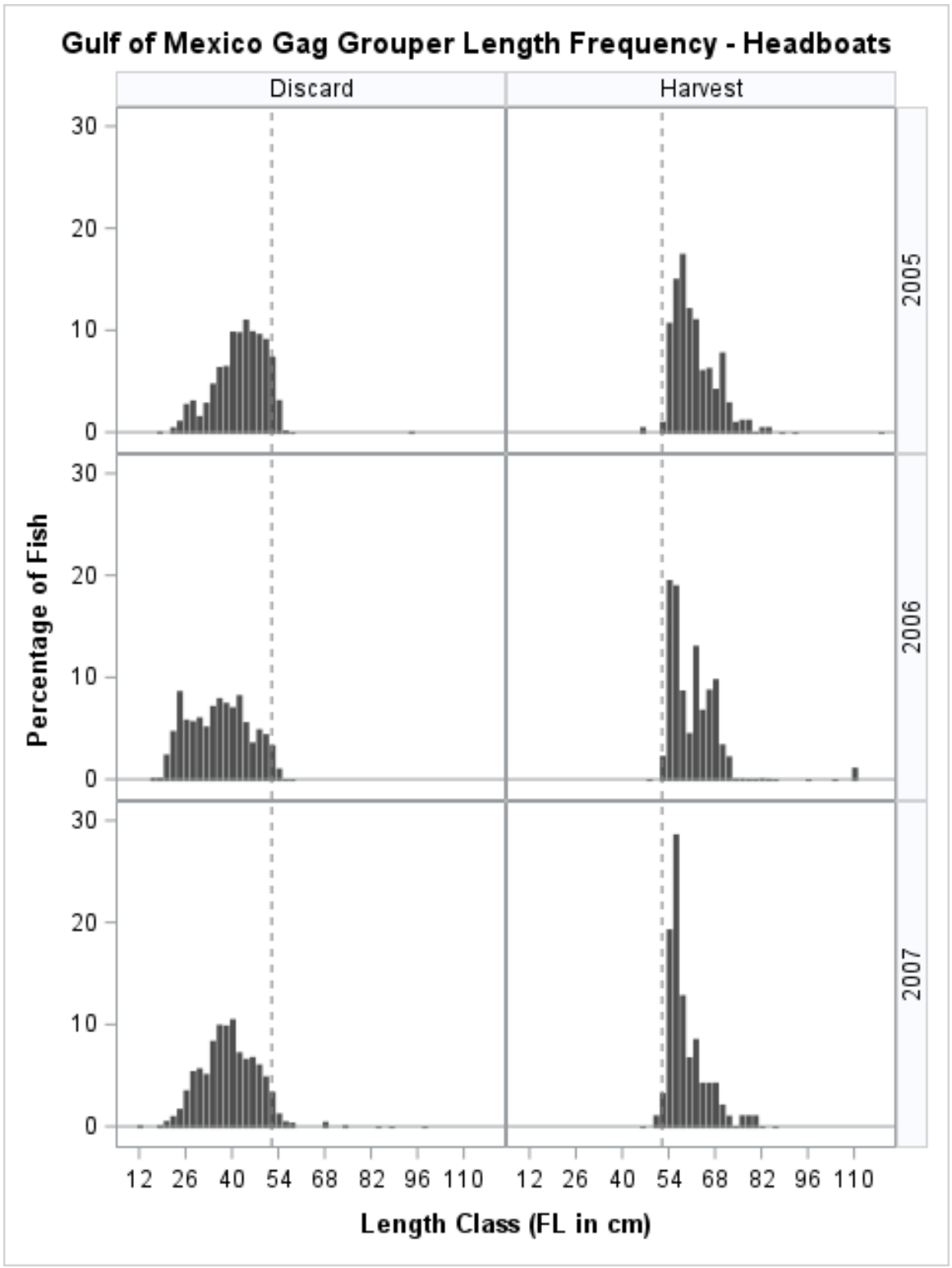
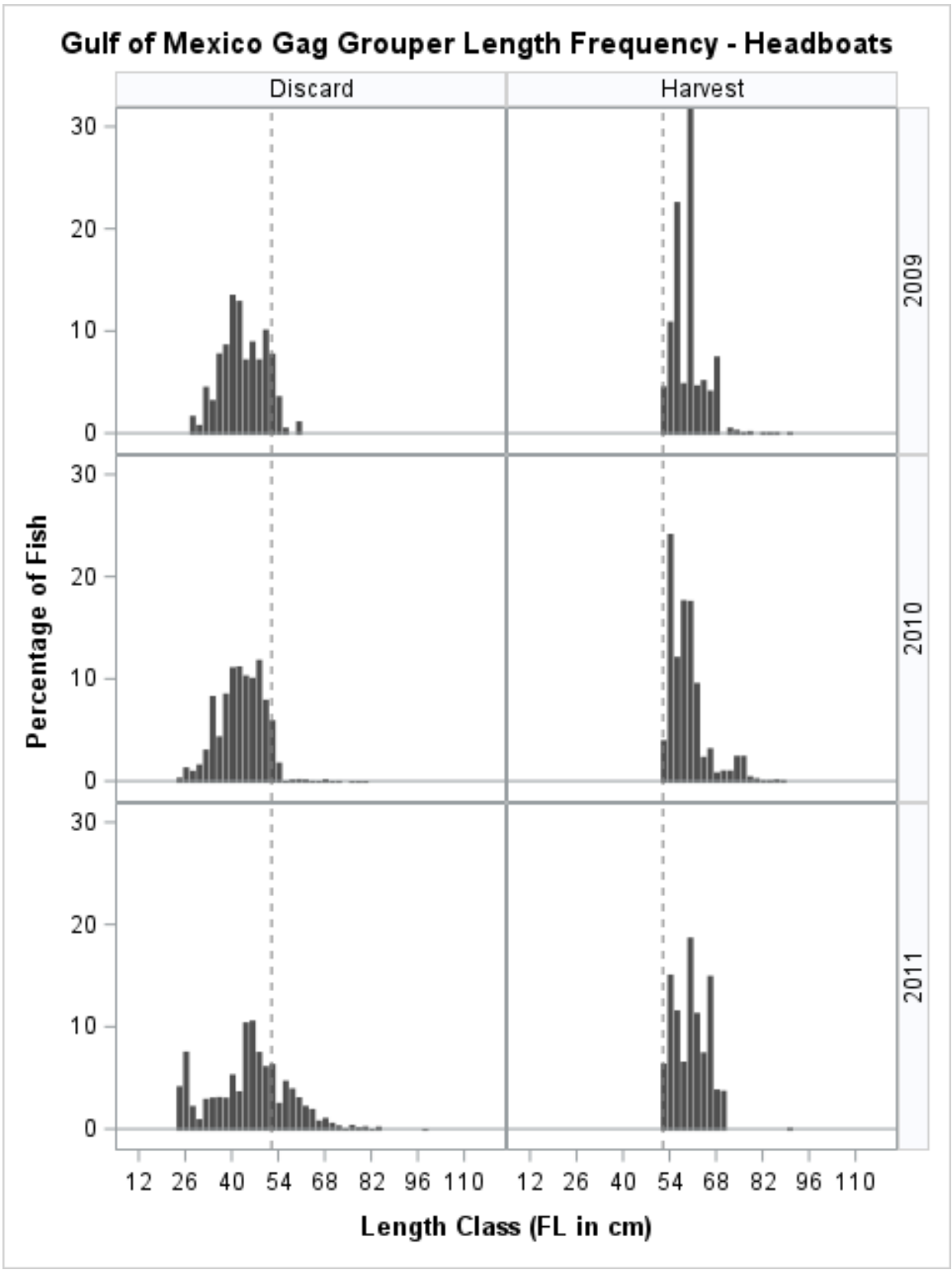
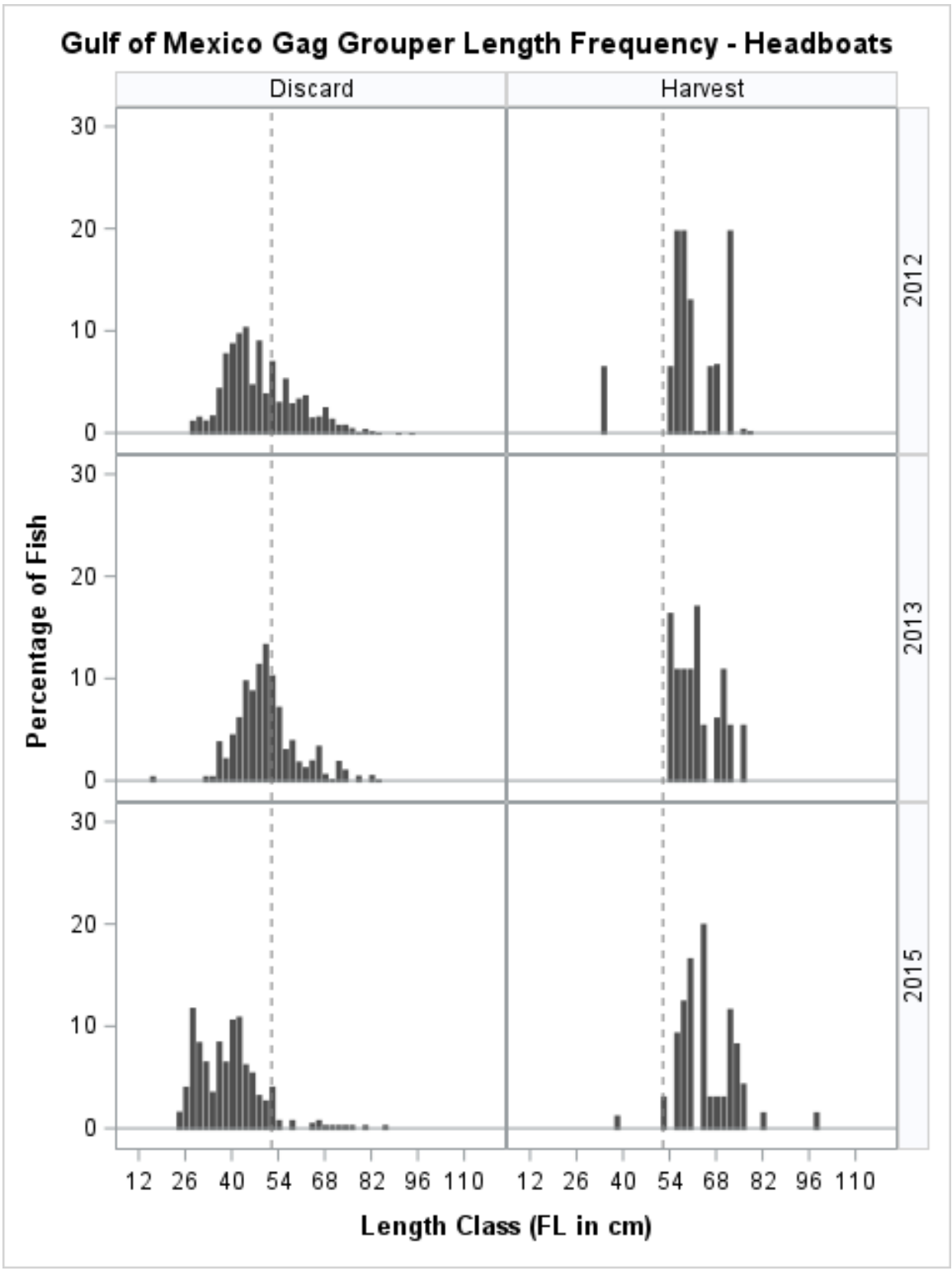
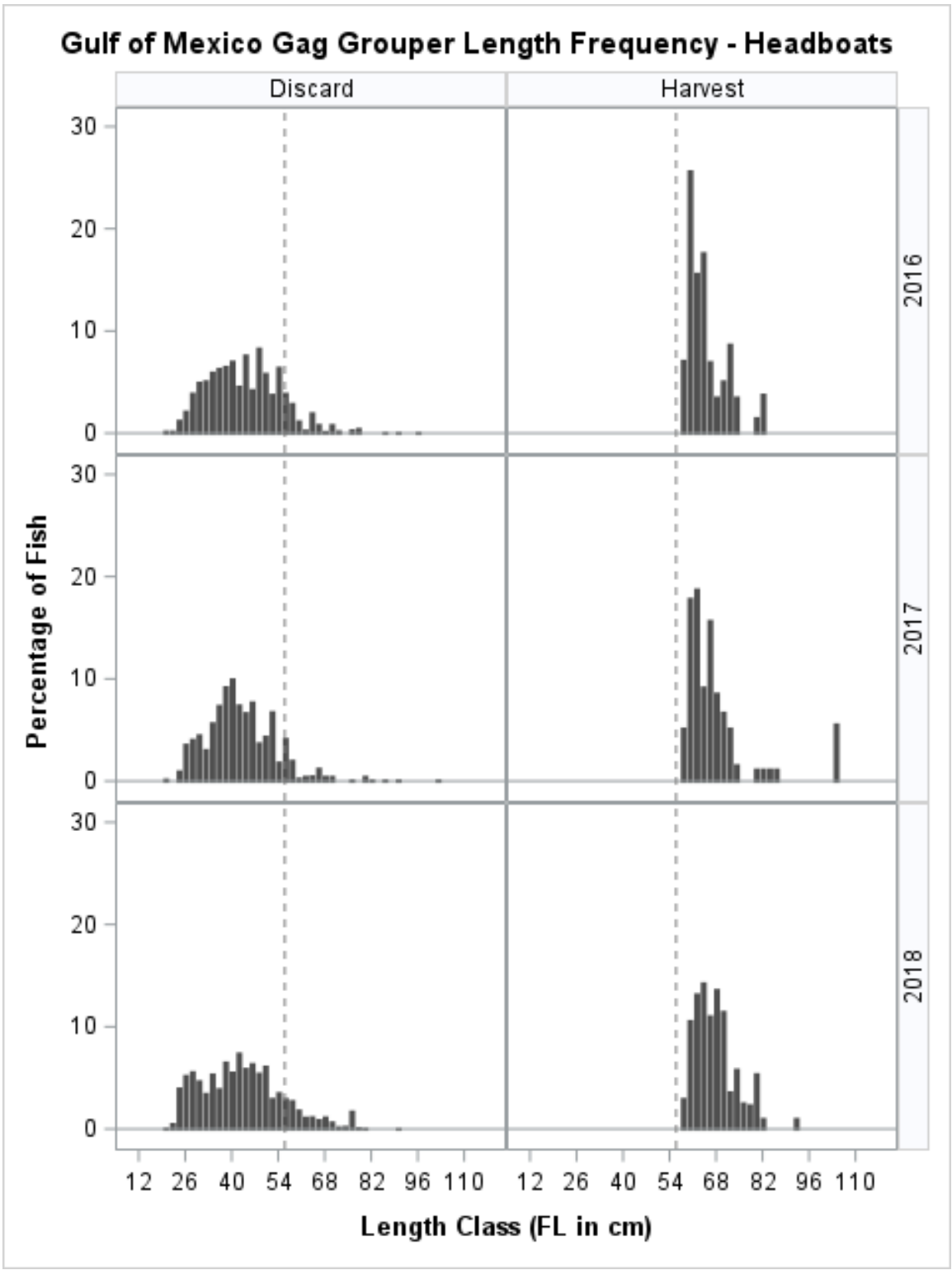


Figure 1. Depth distribution of trips sampled from private boats, charter boats, and headboats (weighted by trip type).


Gulf of Mexico Gag Grouper Length Frequency - Headboats
Discard
Harvest
2005
2006
2007
Percentage of Fish
0
10
20
30
12 26 40 54 68 82 96 110
Length Class (FL in cm)


Gulf of Mexico Gag Grouper Length Frequency - Headboats
Discard
Harvest
2009
2010
2011
Percentage of Fish
0
10
20
30
12 26 40 54 68 82 96 110
Length Class (FL in cm)


Gulf of Mexico Gag Grouper Length Frequency - Headboats
Discard
Harvest
2012
2013
2015
Percentage of Fish
0
10
20
30
12 26 40 54 68 82 96 110
Length Class (FL in cm)


Gulf of Mexico Gag Grouper Length Frequency - Headboats
Discard
Harvest
2016
2017
2018
Percentage of Fish
0
10
20
30
12 26 40 54 68 82 96 110
Length Class (FL in cm)

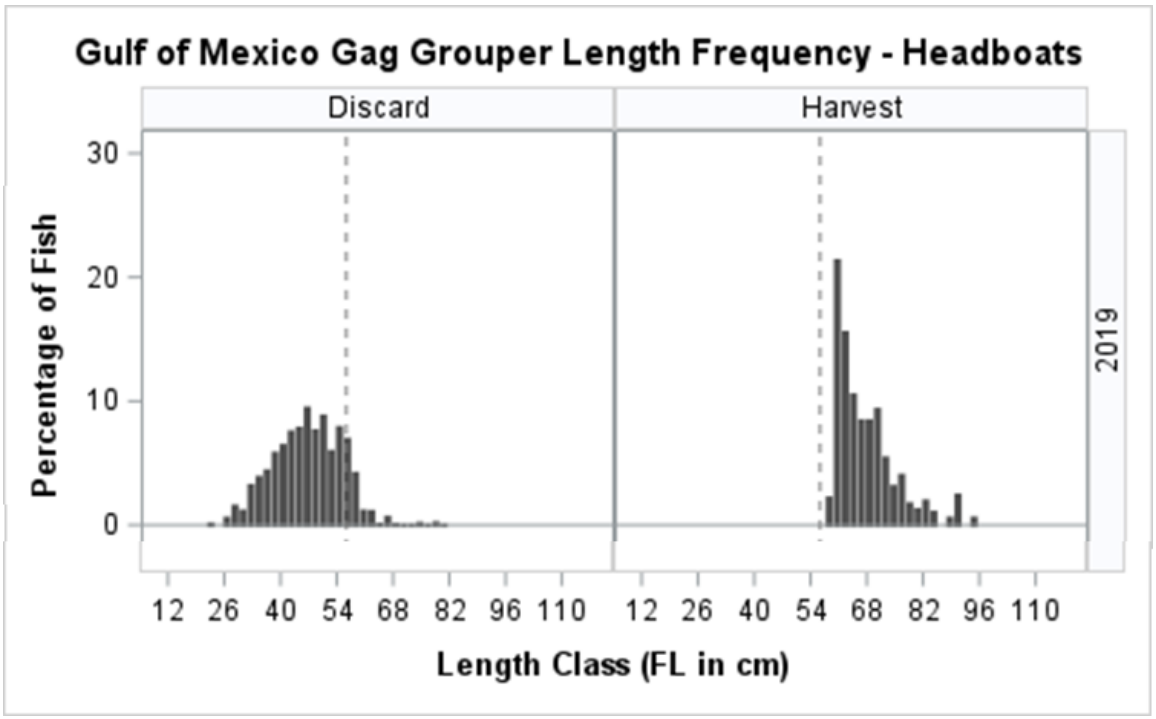
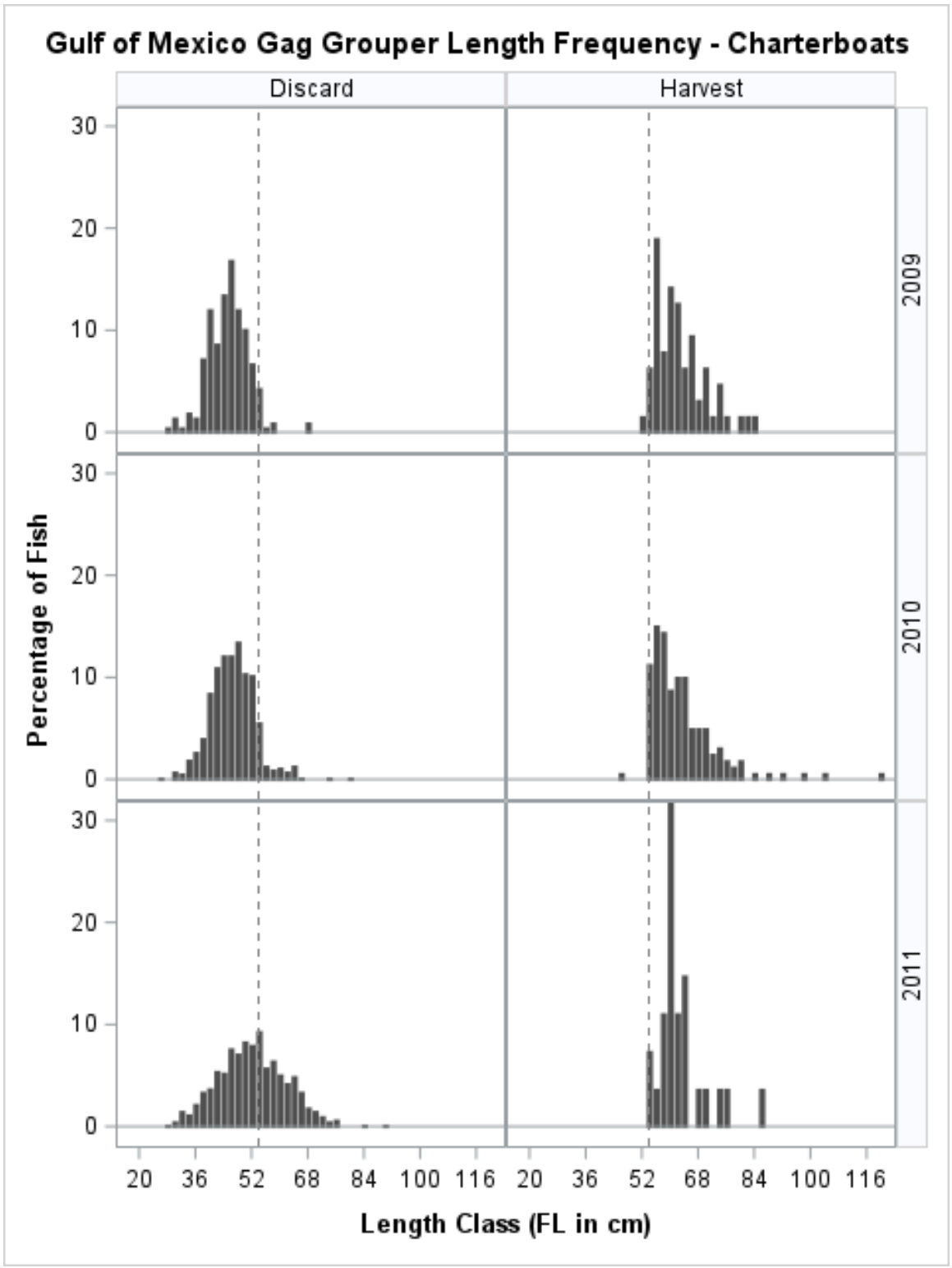
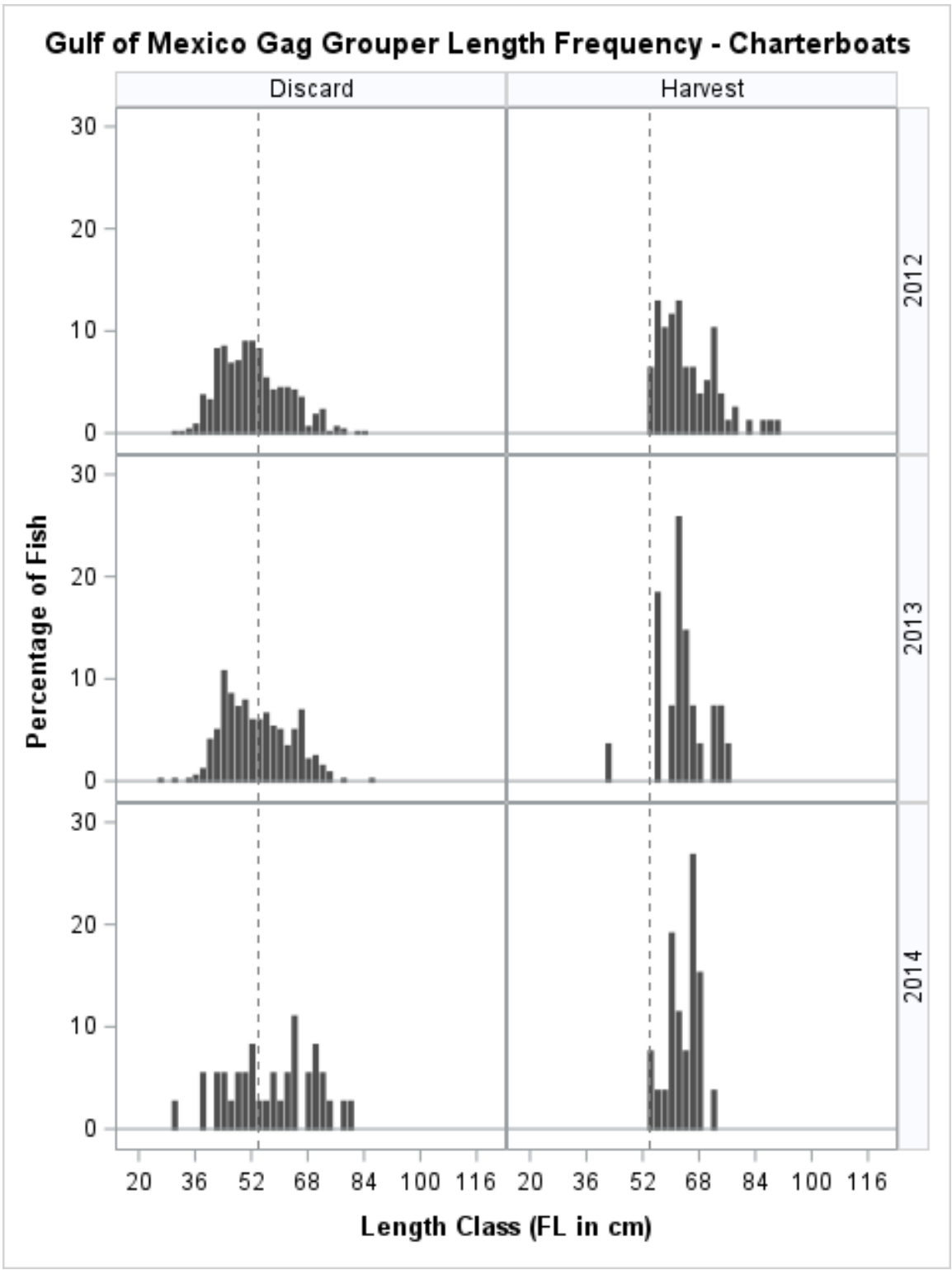
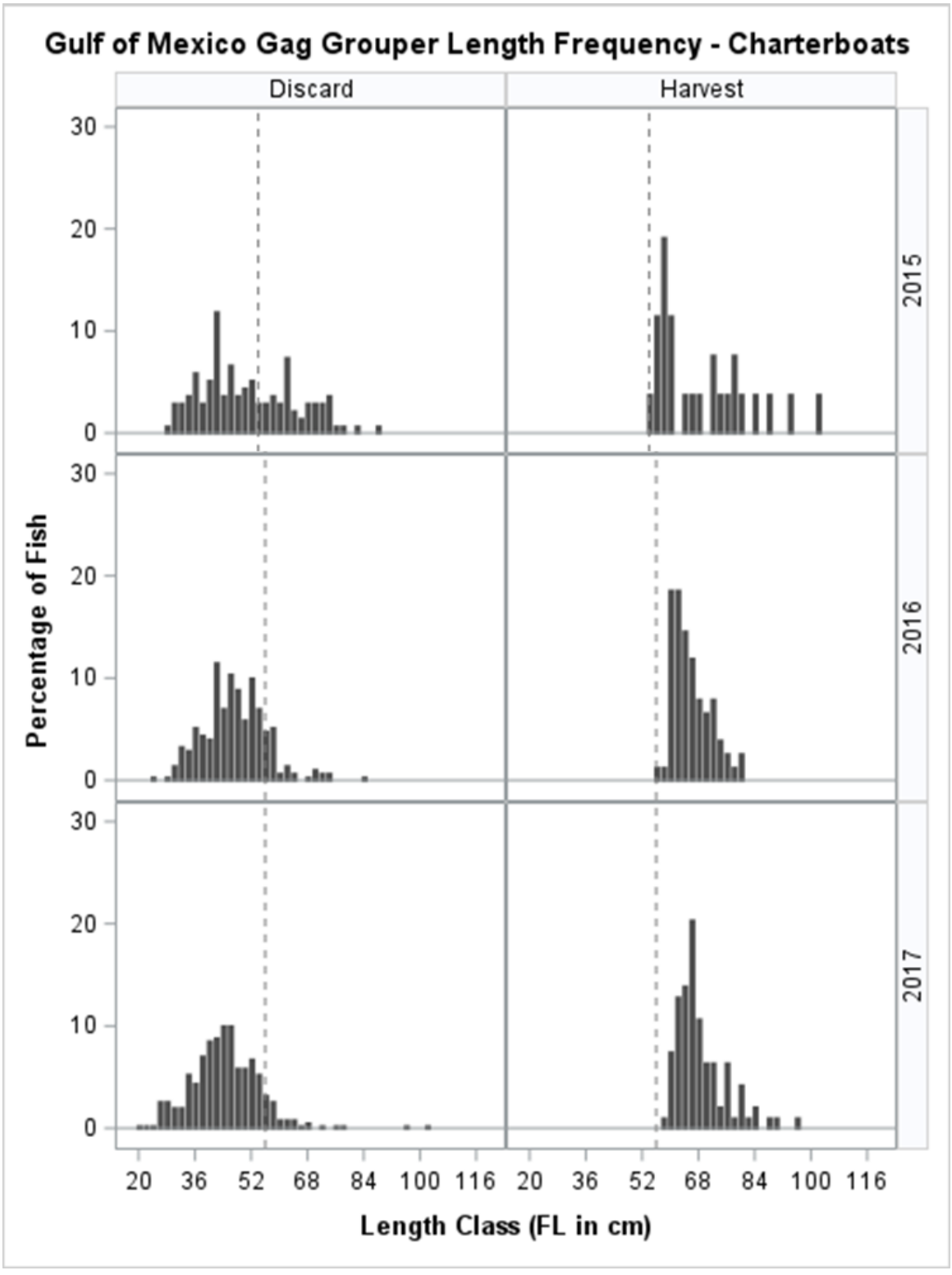


Figure 2. Weighted length frequencies of harvested and released Gag measured by at-sea observers on headboats along West Florida from 2005-2019. Harvest includes fish that were released dead. Reference line represents the fork length associated with the minimum size limit.


Gulf of Mexico Gag Grouper Length Frequency - Charterboats
Discard
Harvest
2009
2010
2011
Percentage of Fish
0
10
20
30
20
36
52
68
84
100
116
Length Class (FL in cm)


Gulf of Mexico Gag Grouper Length Frequency - Charterboats
Discard
Harvest
2012
2013
2014
Percentage of Fish
0
10
20
30
20
36
52
68
84
100
116
Length Class (FL in cm)


Gulf of Mexico Gag Grouper Length Frequency - Charterboats
Discard
Harvest
2015
2016
2017
Percentage of Fish
0
10
20
30
20
36
52
68
84
100
116
Length Class (FL in cm)

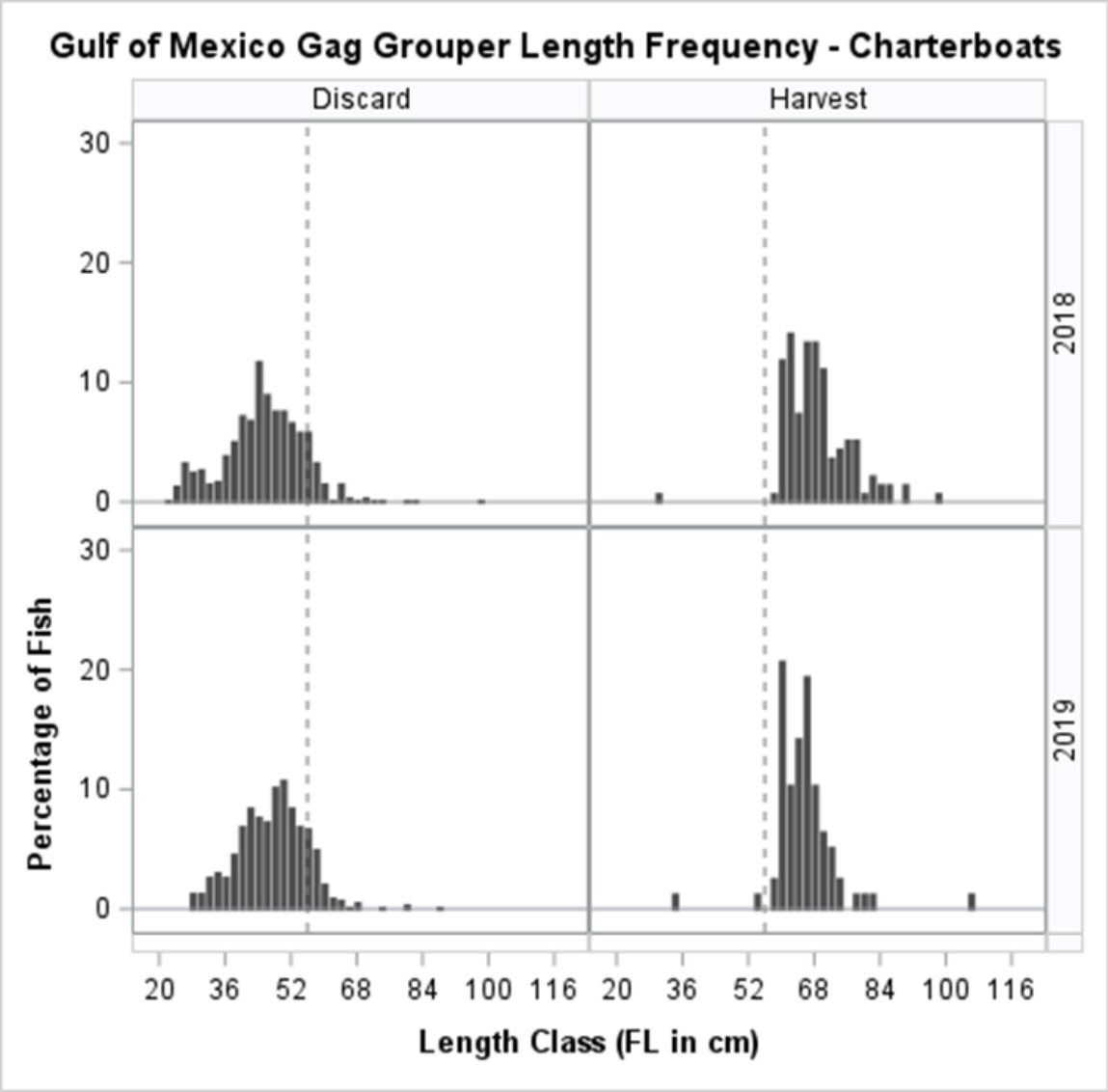


Figure 3. Length frequency of harvested and released Gag measured by at-sea observers on charterboats in West Florida 2009-2019. Harvest includes fish that were released dead. Reference line represents the fork length associated with the minimum size limit.

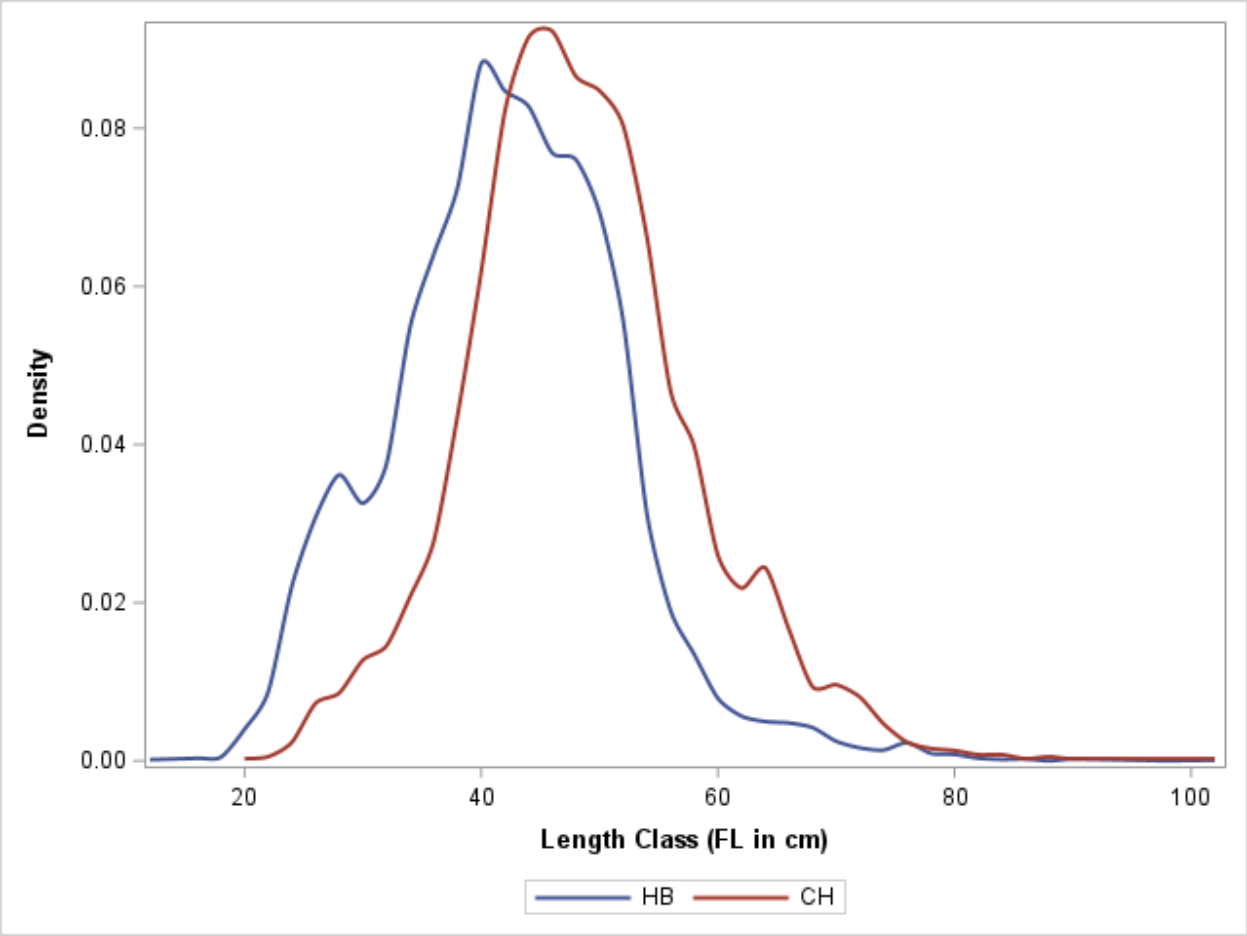


Figure 4. Comparison of headboat and charter discard length frequencies, all years of data combined.