A Summary of Observer Data from the Size Distribution of Red Snapper Discards from Recreational Fishery Surveys in the Eastern Gulf of Mexico

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A Summary of Observer Data from the Size Distribution of Red Snapper Discards from Recreational Fishery Surveys in the Eastern Gulf of Mexico

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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, and such surveys have been conducted on for-hire vessels in Florida since 2005. For-hire observer surveys have not been consistently funded on both coasts of Florida, which has led to short breaks in the time series in some regions. The majority of these observer trips were conducted on headboat vessels, with charter vessels being surveyed intermittently starting in 2009 (Table 1). 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 eastern Gulf of Mexico.

At-Sea Observer Survey Coverage

In 2005, at-sea observer surveys coverage started on 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 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 continued until the COVID-19 pandemic resulted in a sampling stoppage from March 2020 through April 2021.

At-Sea Observer Survey Methods

Florida – 2005 to 2007

Headboat vessels from Florida were randomly selected each week. 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 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, biologists recorded the species, disposition, size (fork length in mm), and the condition of fish that were released.

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 – Present
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 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. Additionally, a subset of anglers was tracked by the biologist(s) for the entirety of the trip. For these anglers, hook type, hook size and hook location were recorded for the fish that they captured.

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.

Data Elements

Disposition was coded as:

<u>Discards</u>
1: thrown back alive, legal;
2: thrown back alive, not legal;
<u>Harvest</u>
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 fishes was coded as:

<u>For southeast and northeast Florida:</u>
1: 3 miles or less from shore; or
2: more than 3 miles from shore

<u>For Keys, western peninsula, and northwest Florida:</u>
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

Proportional Fishing Effort for Headboats
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. We generated weighting factors for different trip-types using fishing effort data reported on headboat logbook trip reports for the years 2005 through 2020. 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. The total number of sampled trips positive for Red Snapper and positive for Red Snapper discards is presented in Table 2.

No multi-day charter trips were sampled, and weights were not generated for charter samples (Table 3).

Characterization of Discards:
Fish fork lengths assigned to one cm length bin categories (40 cm bin = fish 39.5 cm to 40.4 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 Red Snapper in each length bin and dividing this number by the total number of discarded fishes, by year.

Results
At-Sea Observer Trips
The number of sampled trips that intercepted or discarded Red Snapper was provided by year for at-sea observer trips in Tables 2 & 3. Sampling weights were used to adjust the number of headboat discards, as a function of under- or over-sampling of different trip durations in each northwest and southwest Florida (Table 4). A total of 20,028 discarded fish and 4,618 harvested were measured during headboat At-sea observer trips between 2005 and 2020 in the coastal regions of west Florida. For charter trips, in western Florida, observers sampled 9,882 discarded fish and 3,398 harvested fish. The majority of intercepted fish were caught in the Northwest region of Florida, which accounted for 83.6% and 86.0% of the fish sampled, the headboat and charter fleets, respectively. Summary statistics for the length distribution of discarded and harvested fish observed during headboat and charter trips are provided in Tables 5 and 6. Length frequency histograms for harvested and released (discarded) Red Snapper by year are presented for western Florida headboats (Figure 1) and western Florida charterboats (Figure 2). A smoothed density plot, with length data from all years combined, comparing the headboat and charter fleets is show in Figure 3.

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 * indicates that 2009 represents only a half year of coverage.

Headboat Areas	**2005**	**2006**	**2007**	**2008**	**2009***	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020***
Northwest Florida	H	H	H		H,C	H,C	H,C	H,C	H,C		H,C	H,C	H,C	H,C	H,C	H,C
Southwest Florida	H	H	H		H,C	H,C	H,C	H,C	H,C		H,C	H,C	H,C	H,C	H,C	H,C
Florida Keys	H	H	H			H,C	H,C	H,C	H,C	C	C	H,C	H,C	H,C	H,C	H,C

Table 2. West Florida sampled HEADBOAT at-sea observer trips positive for Red Snapper and for Red Snapper discards by year and region. Sampling in 2009 only represents half of the year – June to December and sampling in 2020 represents January to March.

YEAR	NORTHWEST		SOUTHWEST	
	Positive Trips	*Discard Trips*	*Positive Trips*	*Discard Trips*
2005	75	72	18	14
2006	72	72	24	17
2007	73	73	19	13
2009	28	27	20	17
2010	32	31	18	15
2011	52	50	19	19
2012	49	48	14	10
2013	42	42	16	11
2015	86	79	4	3
2016	94	94	26	26
2017	76	76	22	22
2018	65	61	24	20
2019	78	77	25	26
2020	10	10	.	.

Table 3. West Florida sampled CHARTER BOAT at-sea observer trips positive for Red Snapper and for Red Snapper discards by year and region. Sampling in 2009 only represents half of the year – June to December and sampling in 2020 represents January to March.

YEAR	NORTHWEST		SOUTHWEST	
	Positive Trips	*Discard Trips*	*Positive Trips*	*Discard Trips*
2009	33	33	8	8
2010	61	59	7	6
2011	75	73	2	2
2012	71	69	3	3
2013	72	70	3	3
2015	79	75	13	11
2016	80	79	23	23
2017	66	66	25	24
2018	72	71	31	28
2019	89	88	34	32
2020	9	8	6	6

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

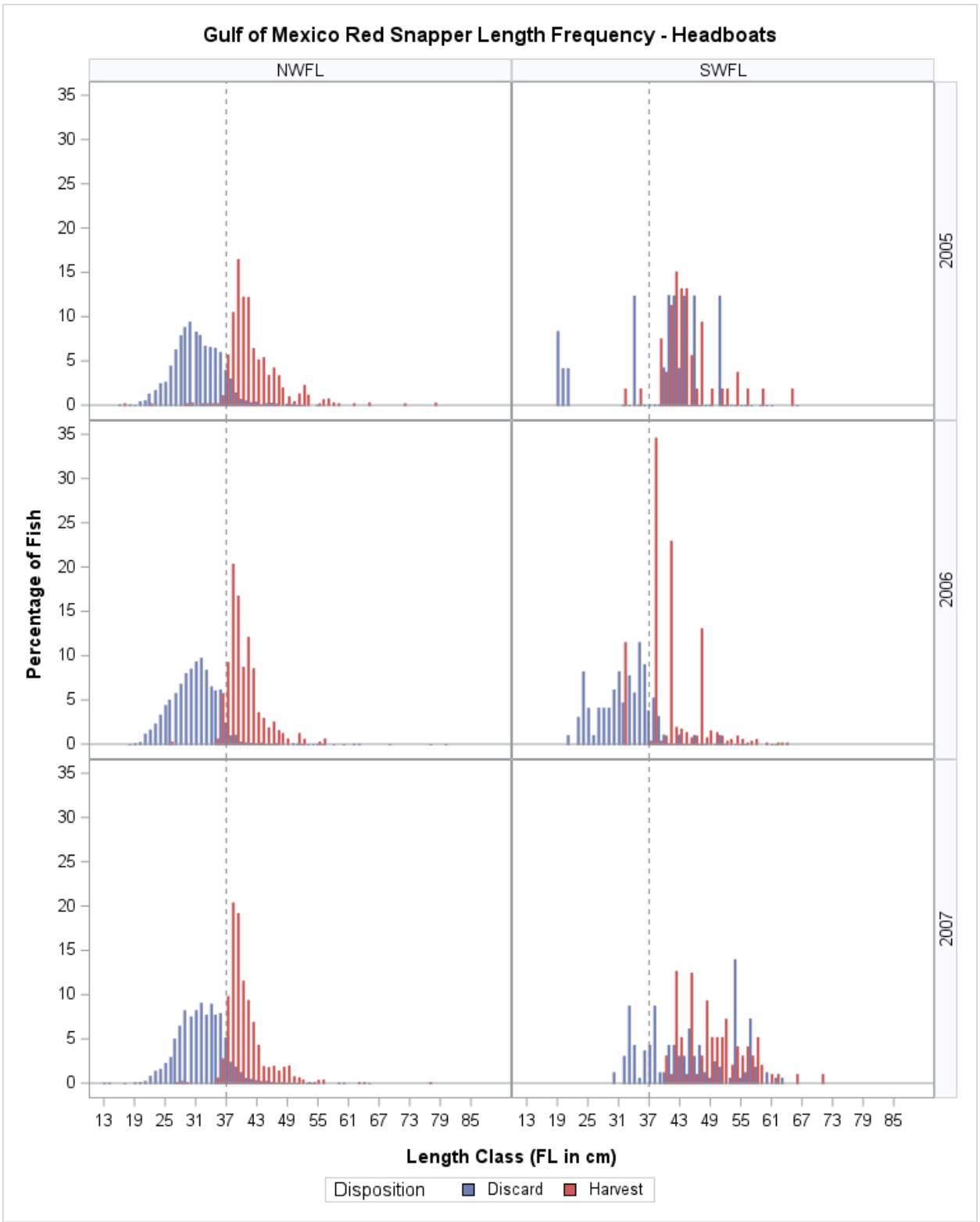
YEAR	NORTHWEST FLORIDA				SOUTHWEST FLORIDA			
	Half Day	*Three-Quarter Day*	*Full Day*	*Multi Day*	*Half Day*	*Three-Quarter Day*	*Full Day*	*Multi Day*
2005	1.596	0.668	0.952	-	1.524	0.680	2.004	0.001
2006	1.318	0.496	1.058	-	1.208	0.999	0.533	0.009
2007	1.273	0.425	1.360	-	1.887	0.758	0.733	0.068
2009	2.372	0.640	-	-	4.933	1.192	0.174	0.037
2010	1.484	0.965	0.446	-	3.385	0.952	0.133	0.045
2011	1.358	0.843	1.987	-	1.761	1.145	0.197	0.037
2012	0.807	0.951	2.149	-	1.471	1.151	0.481	0.037
2013	0.820	0.842	1.812	-	1.074	12.183	0.867	0.112
2015	1.180	0.615	2.105	-	0.803	2.052	1.215	0.490
2016	1.227	0.638	1.941	-	0.964	1.357	0.998	0.439
2017	0.851	0.743	2.538	-	0.832	1.510	1.246	0.551
2018	1.207	0.597	5.226	-	1.175	1.800	0.679	0.484
2019	0.658	0.876	3.973	-	1.166	1.033	0.867	0.518
2020	0.540	0.845	-	-	1.04	0.981	0.837	-

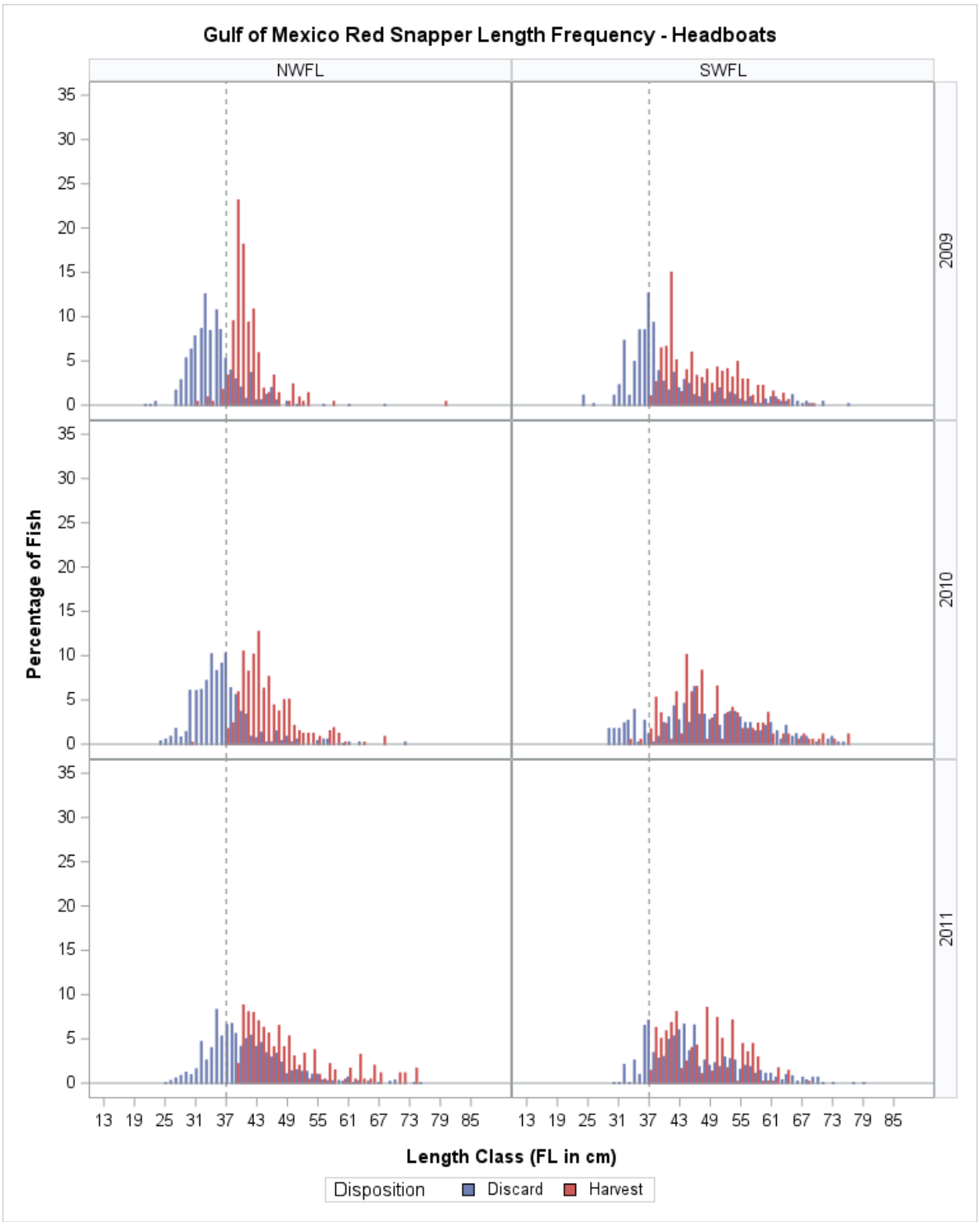
Table 5. Length summaries for discarded and harvested Red Snapper observed on HEADBOAT trips in West Florida, by year and region. Sampling in 2009 represents data collected from June through December and sampling in 2020 represents data collected from January through March.

YEAR	DISCARDS				HARVEST			
	N	Min	Mean	Max	N	Min	Mean	Max
NORTHWEST FLORIDA								
2005	2869	157	312.1	552	387	170	419.5	777
2006	3449	182	307.0	800	206	260	402.4	563
2007	3953	127	322.7	655	547	275	403.6	772
2009	423	214	349.0	684	124	312	420.6	800
2010	406	236	357.7	725	175	297	448.5	683
2011	578	255	410.6	750	161	390	485.4	740
2012	796	196	389.1	751	104	378	506.6	768
2013	555	240	376.1	704	195	291	454.8	742
2015	516	171	376.5	690	363	362	476.5	784
2016	867	190	353.1	747	103	378	449.5	735
2017	797	208	355.2	787	218	370	429.0	737
2018	636	200	360.2	870	200	367	433.4	555
2019	801	209	366.9	660	140	298	439.9	698
2020	107	248	388.2	580	3	386	558.3	901
SOUTHWEST FLORIDA								
2005	133	190	418.5	657	53	316	443.8	651
2006	260	207	364.3	622	112	324	470.0	642
2007	112	300	433.8	635	86	398	504.2	711
2009	208	241	461.1	760	194	373	505.3	690
2010	283	287	501.0	752	108	330	518.1	762
2011	526	304	481.1	790	135	368	474.3	680
2012	96	325	495.3	708	69	272	511.5	700
2013	84	270	457.1	720	107	330	507.3	770
2015	21	290	394.9	560	61	369	619.8	820
2016	358	180	358.6	675	75	365	482.3	760
2017	244	250	396.8	686	243	348	440.1	705
2018	416	215	409.4	742	247	300	503.9	775
2019	516	164	430.5	727	202	280	528.0	769

Table 6. Length summaries for discarded and harvested Red Snapper observed on CHARTER BOAT trips in West Florida, by year and region. Sampling in 2009 represents data collected from June through December and sampling in 2020 represents data collected from January through March.

YEAR	DISCARDS				HARVEST			
	N	Min	Mean	Max	N	Min	Mean	Max
NORTHWEST FLORIDA								
2009	519	245	379.2	780	167	350	491.9	752
2010	1174	236	417.2	813	557	261	523.7	803
2011	1289	143	426.0	940	289	396	528.1	770
2012	885	221	431.3	954	191	375	531.6	870
2013	944	213	379.8	825	281	371	497.4	788
2015	436	205	382.9	770	200	369	493.9	880
2016	841	189	365.3	852	221	342	512.0	840
2017	804	159	365.9	818	252	342	487.4	860
2018	760	167	354.8	724	211	286	472.0	693
2019	781	204	372.7	819	201	365	487.8	781
2020	65	266	364.9	620	77	380	495.2	626
SOUTHWEST FLORIDA								
2009	18	345	429.2	580	19	410	476.5	589
2010	28	349	489.6	662	43	384	512.8	722
2011	3	515	570.0	640	-	-	-	-
2012	16	300	388.8	474	20	395	569.1	725
2013	9	320	426.6	602	15	480	569.2	680
2015	123	290	457.7	630	138	425	560.2	720
2016	191	250	347.5	450	25	373	437.5	670
2017	239	290	404.6	724	117	360	464.7	680
2018	420	259	445.7	766	159	385	489.0	709
2019	276	230	439.7	719	195	330	522.2	857
2020	61	225	372.5	566	20	380	492.4	663


Gulf of Mexico Red Snapper Length Frequency - Headboats
NWFL
SWFL
2005
2006
2007
Percentage of Fish
0
5
10
15
20
25
30
35
13 19 25 31 37 43 49 55 61 67 73 79 85
Length Class (FL in cm)
Disposition
Discard
Harvest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SWFL
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2010
2011
Percentage of Fish
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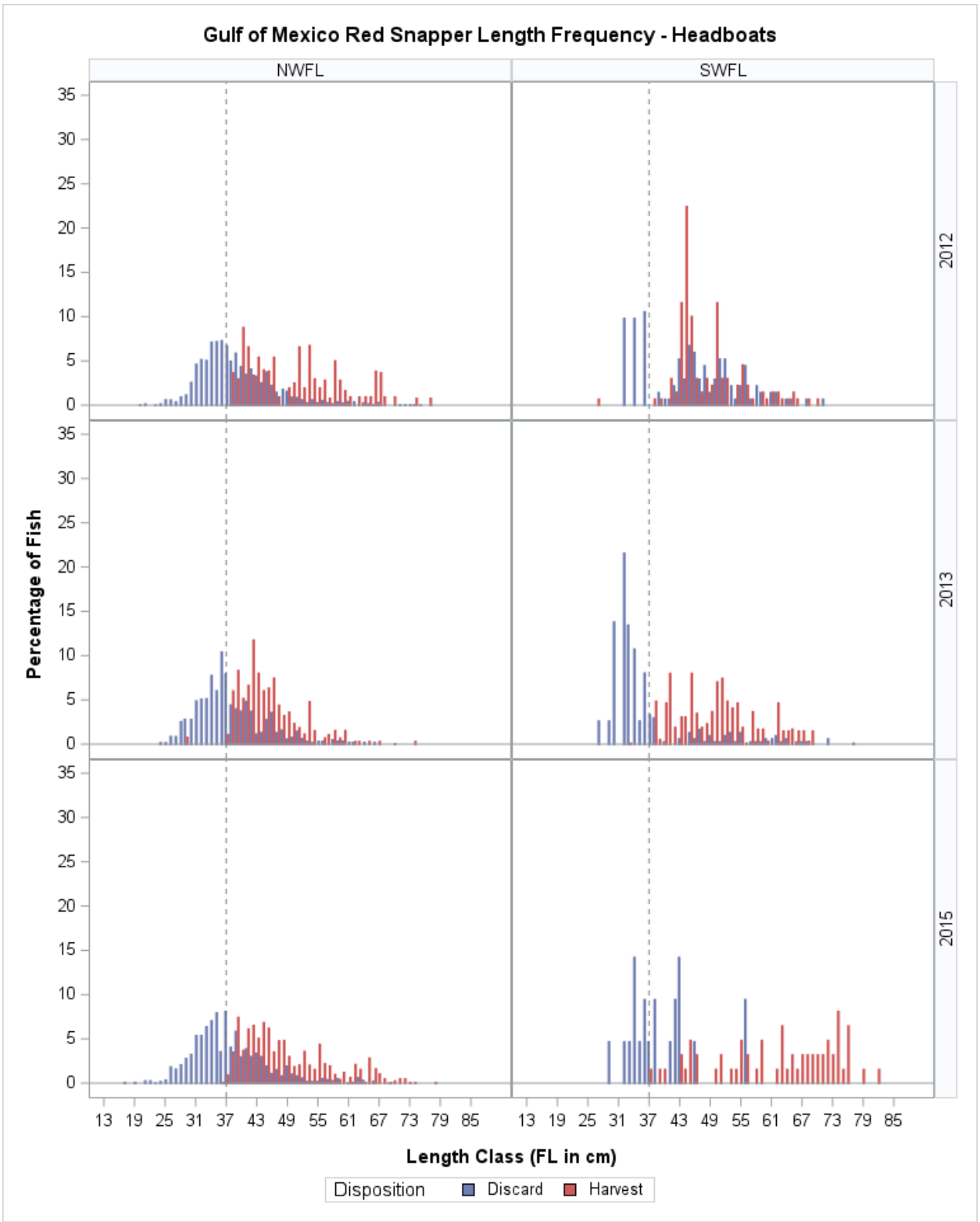
Length Class (FL in cm)
Disposition
Discard
Harvest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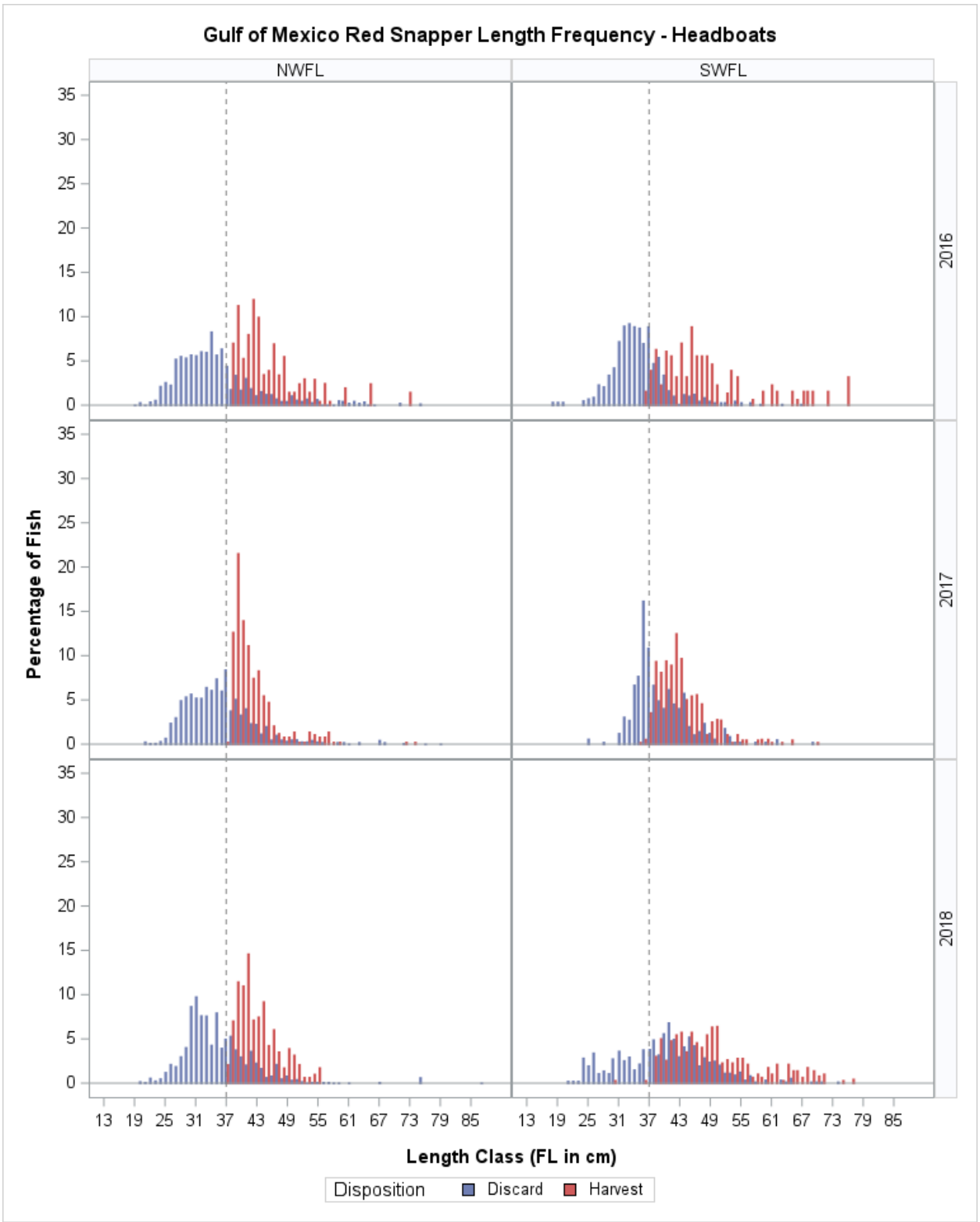
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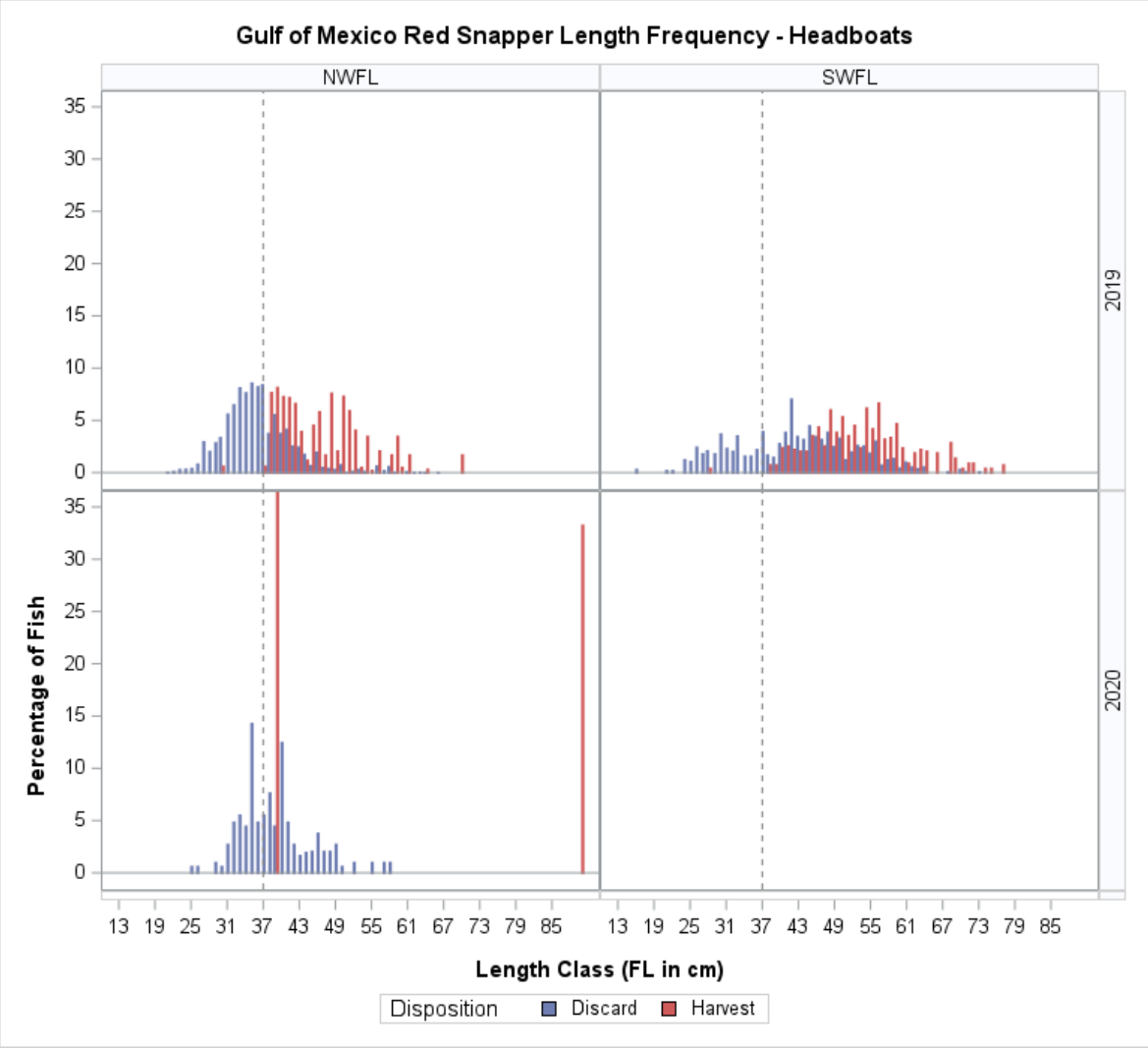
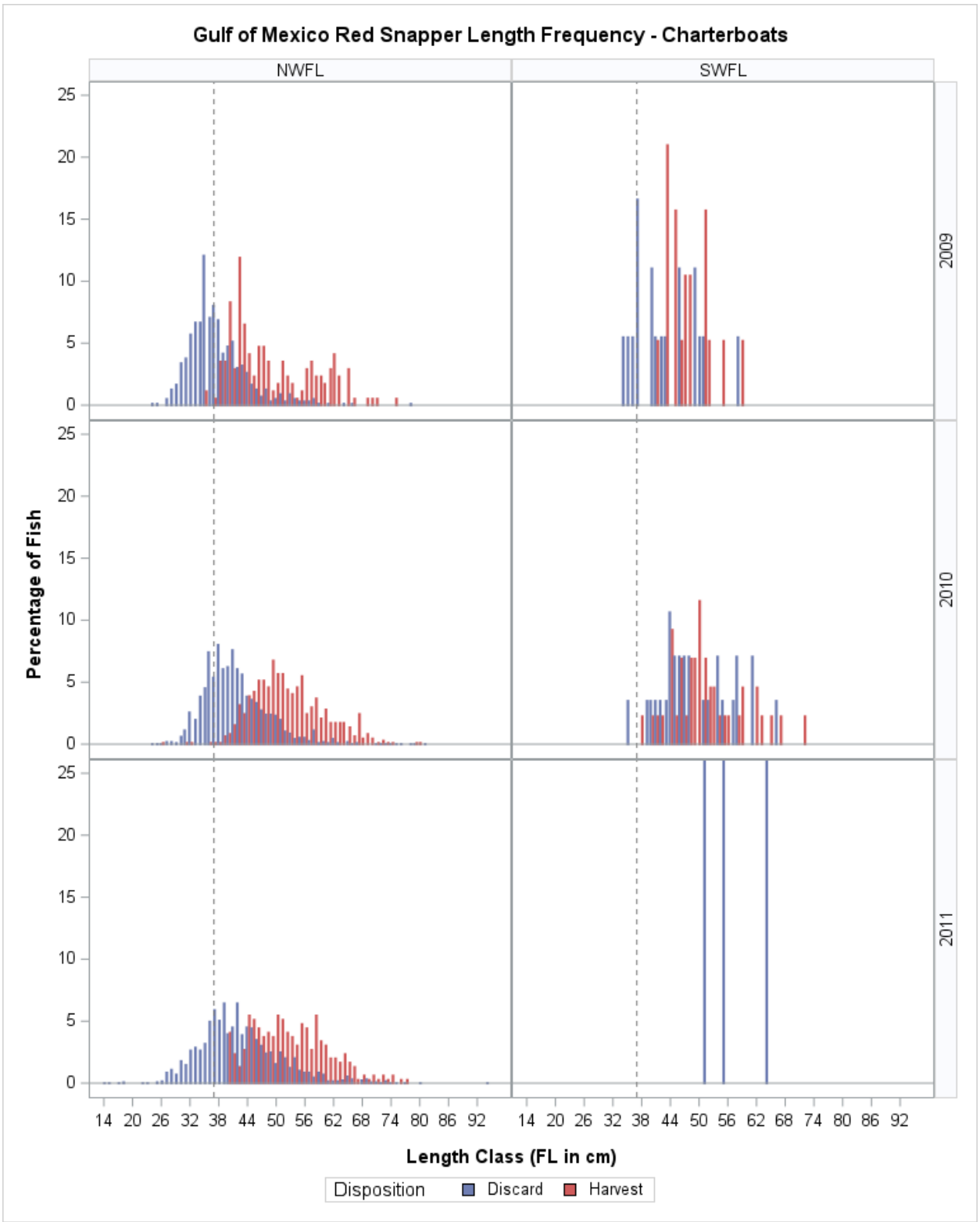
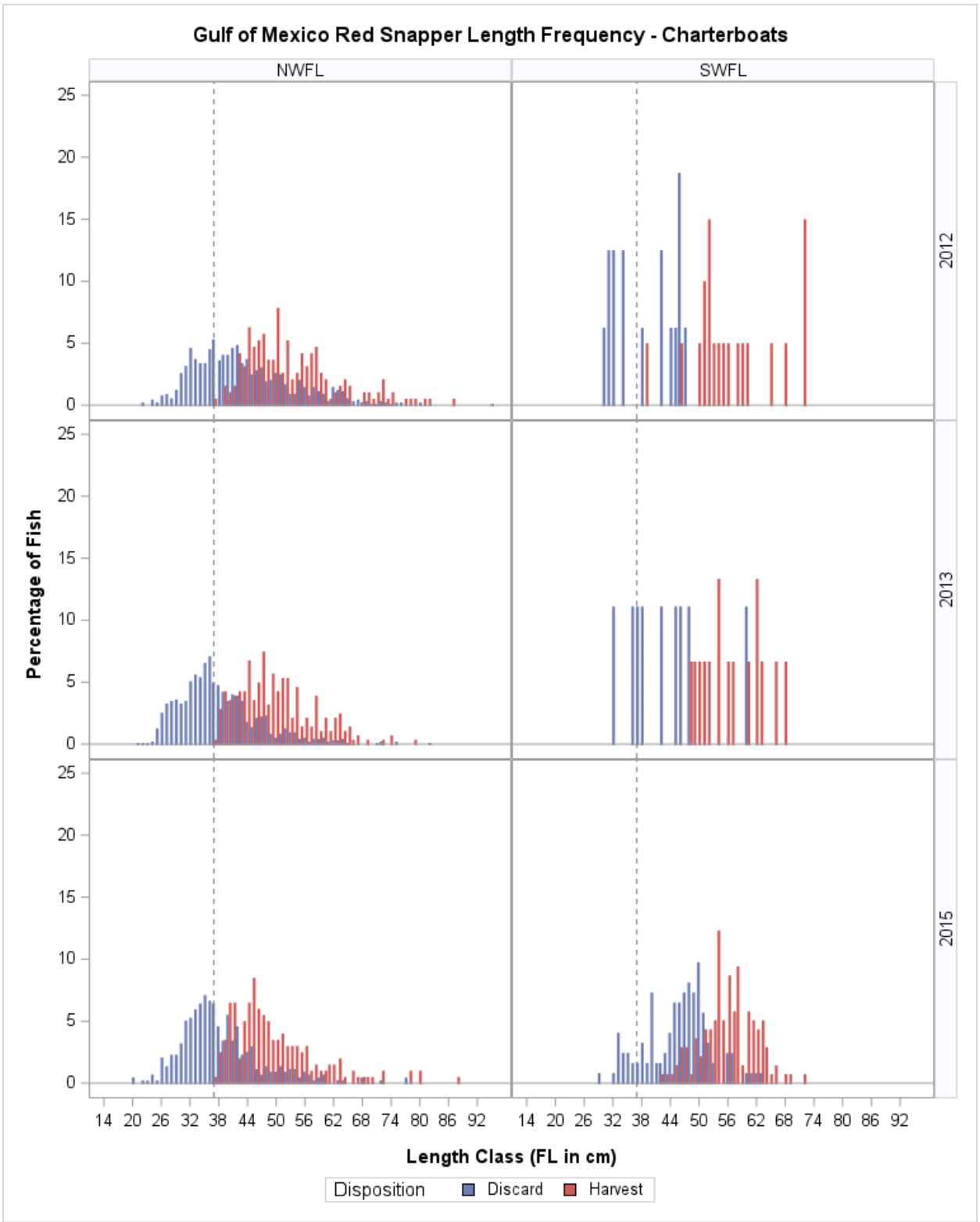


Figure 1. Weighted length frequencies of harvested and released Red Snapper measured by at-sea observers on headboats along West Florida from 2005-2020. Harvest includes fish that were released dead.


Gulf of Mexico Red Snapper Length Frequency - Charterboats
NWFL
SWFL
2009
2010
2011
Percentage of Fish
0
5
10
15
20
25
14 20 26 32 38 44 50 56 62 68 74 80 86 92
Length Class (FL in cm)
Disposition
Discard
Harvest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SWFL
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2013
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Percentage of Fish
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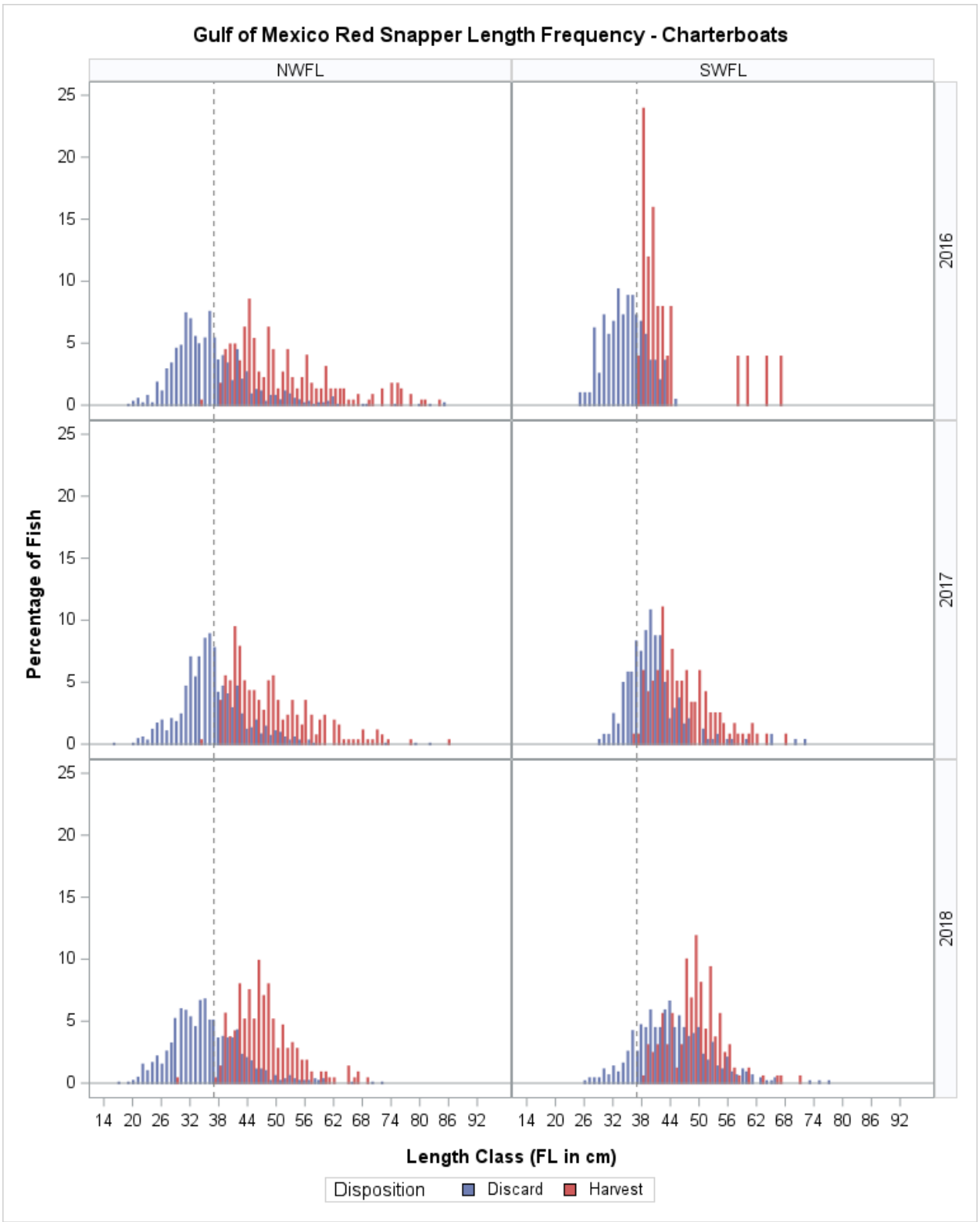
Disposition
Discard
Harvest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NWFL
SWFL
2016
2017
2018
Percentage of Fish
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14 20 26 32 38 44 50 56 62 68 74 80 86 92
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Disposition
Discard
Harvest

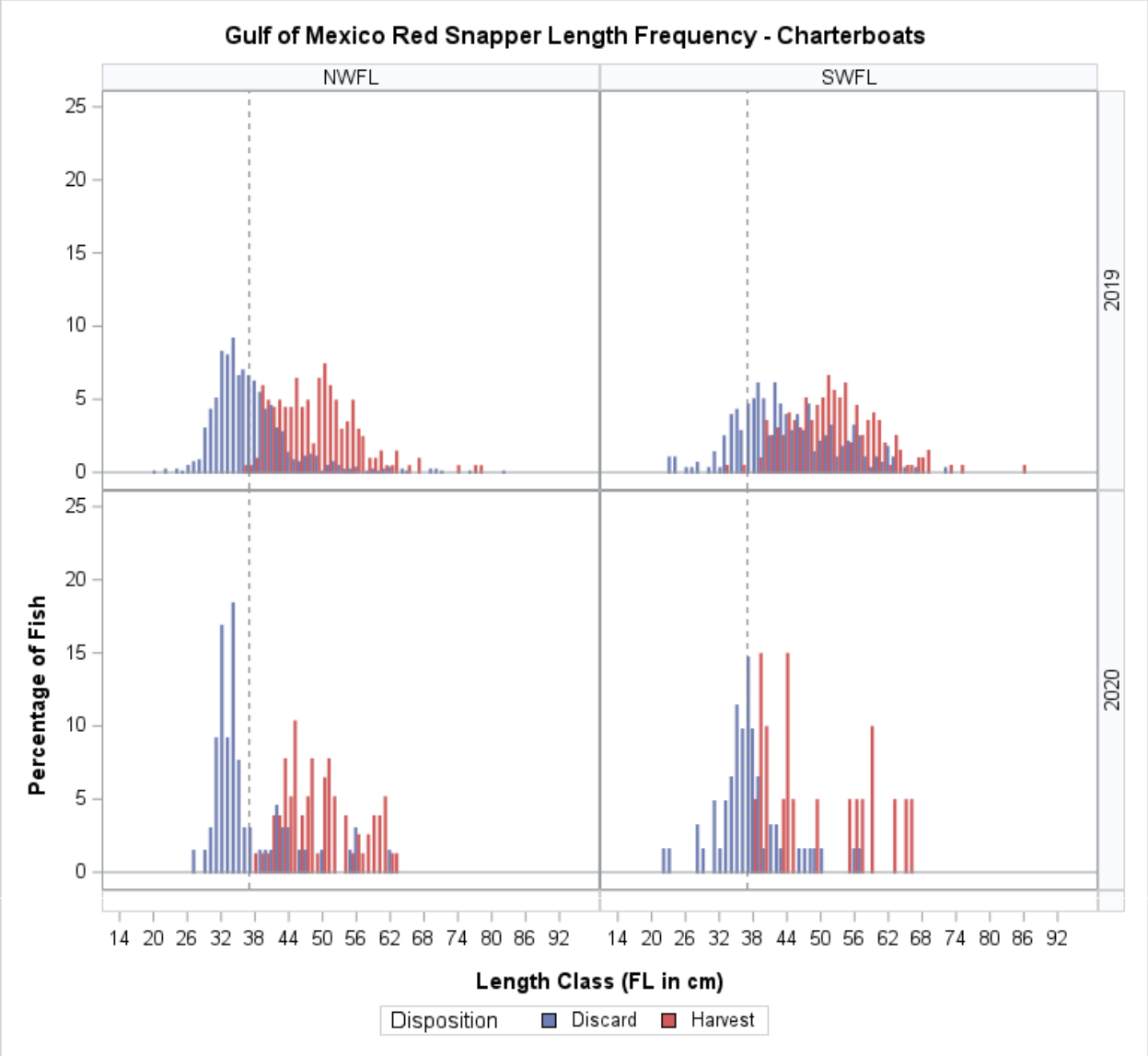

Figure 2. Length frequency of harvested and released Red Snapper measured by at-sea observers on charterboats in West Florida 2009-2020. Harvest includes fish that were released dead.

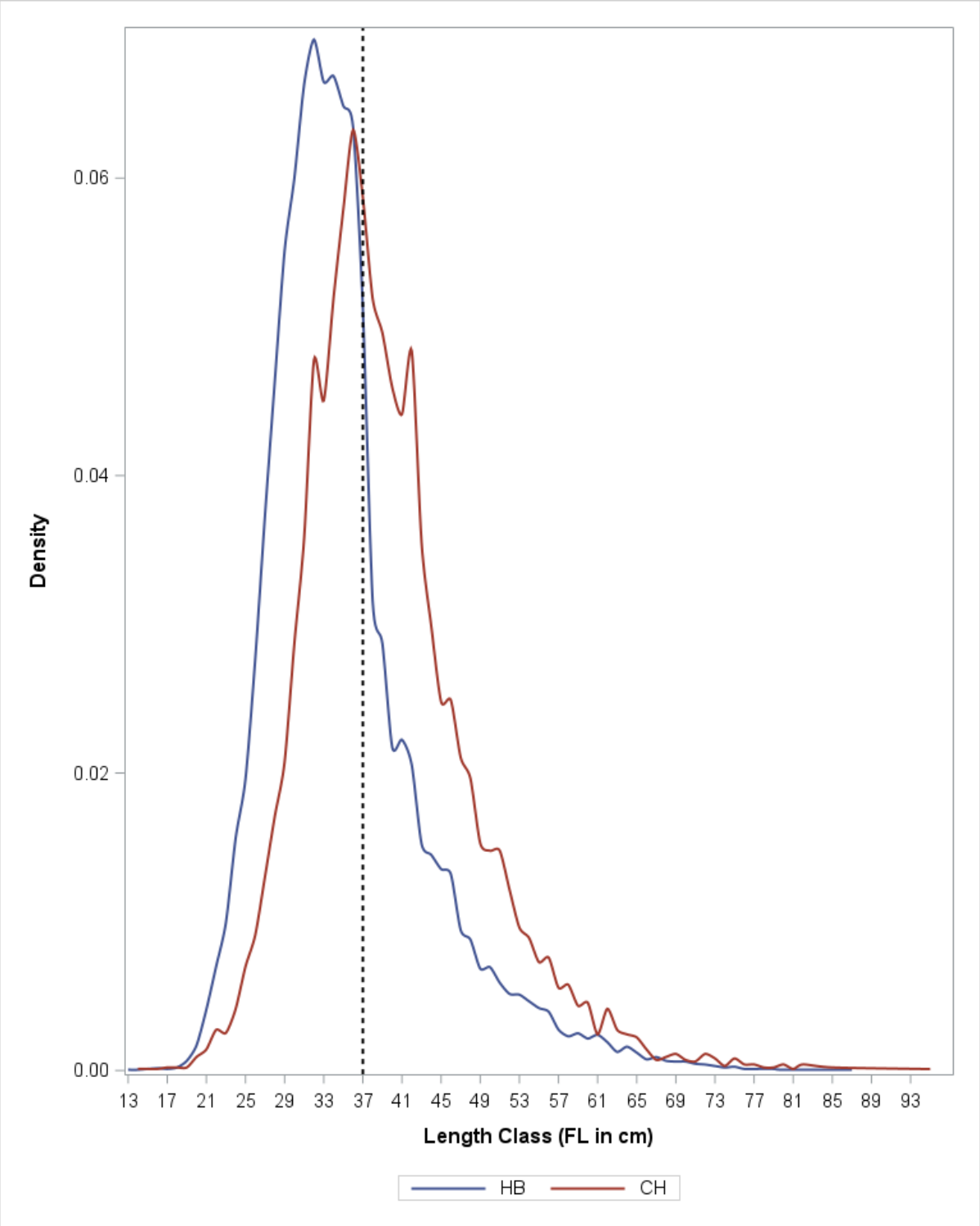

Figure 3. Density plot of discarded Red Snapper lengths from the Headboat and Charter fleets in the Gulf of Mexico, with all years combined.

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