

# Calculated discards of Spanish Mackerel from the commercial fishing vessels in the Gulf of Mexico

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SEDAR81-WP-05

21 December 2022



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Please cite this document as:

Atkinson, Sarina and Kevin McCarthy. 2022. Calculated discards of Spanish Mackerel from the commercial fishing vessels in the Gulf of Mexico. SEDAR81-WP-05. SEDAR, North Charleston, SC. 17 pp.

**SEDAR 81-WP-05**

**Calculated discards of Spanish Mackerel from the commercial fishing vessels in the Gulf of Mexico**

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## **Introduction**

In August 2001, the Southeast Fisheries Science Center (SEFSC) initiated a program to collect commercial fishing vessel discard data from Gulf of Mexico and South Atlantic fisheries. A reporting form was developed that supplements the existing vessel coastal logbook forms that are currently mandatory for those fisheries (Poffenberger and McCarthy, 2004). Discard data from the SEFSC coastal fisheries discard logbook program were used to calculate the number of Gulf of Mexico Spanish Mackerel discards from commercial vertical line (handline and electric/hydraulic reel, aka bandit rig), trolling, and gill net vessels. While reef fish observer data is the preferred method for estimating discards in the Gulf of Mexico, there were insufficient data for Spanish Mackerel for analyses (Smith et al. 2018).

Data collection for the discard logbook program involves, each year, a 20% random sample of vessels with Gulf of Mexico reef fish, South Atlantic snapper-grouper, King Mackerel, Spanish Mackerel, Dolphin/Wahoo, and shark permits selected to report the number of animals discarded by species. To assure that the sample was representative of vessels with those Federal permits fishing in the Gulf of Mexico and South Atlantic, the universe of permitted vessels was stratified by region (Gulf of Mexico and South Atlantic) and gear fished. Fishing gear strata included handline, bandit rig, trolling, longline, fish trap, gillnet, and diving. A random sample was selected, without replacement, from each stratum. The selected fishers were instructed to complete a supplemental discard form for every fishing trip that they made. Trips with no discards were reported as such.

Reported data included the numbers of discards by species, estimated condition of the fish when released, reason for release (due to regulations or unmarketable/unwanted), and the fishing area where the animal was discarded. There are six options for the condition of released fish: all animals are dead, majority of the animals are dead, all animals are alive when released, majority of animals are alive, the fish are kept but not sold, and the condition of the animals is unknown. To calculate species specific discard rates, discard data were matched to the landings and effort data reported (for the appropriate trip) to the coastal logbook program.

## **Methods**

The approach used to calculate discards of Gulf of Mexico Spanish Mackerel followed the methods recommended in SEDAR 32. This method has become the standard approach for commercial fishery discard calculation in cases where observer reported data are insufficient for discard calculation. Discard rates are computed directly from the discard logbook data and applied to gear specific total effort from the coastal logbook program to calculate total discards of Spanish Mackerel. The available discard logbook data include all trips from vessels that reported in the Gulf of Mexico from 2002-2021 (Figure 1). The coastal logbook program began collecting data from all fishers in 1993. Therefore, discard estimates of Gulf of Mexico Spanish Mackerel are provided from 1993-2021.

### *Data Filtering*

Both discard logbook and coastal logbook data were filtered using the methods recommended during SEDARs 32 and 41 (McCarthy, 2013 and 2015). Data were filtered to remove possible erroneous data by eliminating trips that fished across multiple regions (i.e. the South Atlantic and Gulf of Mexico) and trips with reported fishing of more than 24 hours per day. Trips with reported effort greater than the 99.5 percentile of the distribution of the data (by gear) were filtered out of analyses. While data were filtered for the previous assessment (SEDAR 28), this analysis is using updated methods which may result in slight differences in total trips and effort from SEDAR 28.

Fishers remain in reporting compliance by returning discard logbooks with reports of “no discards”. For example, the percentage of discard reports from vertical line vessels returned with “no discards” has increased from 42 to 73 percent in southern Florida (McCarthy, 2011). During the SEDAR32 data workshop the issue of possible underreporting of commercial discards was discussed at length. The working group recommended that data be filtered to remove records from vessels that never reported discards of any species during a year. The SEDAR32 working group acknowledged that some commercial fishing trips may not have had discards of any species and discussed the likely maximum number of trips by a vessel without a report of discards. Following the SEDAR 32 and 41 commercial working groups’ recommendations, data were excluded from vessels that reported greater than 2 standard deviations from the mean number of trips it takes vessels to report a discard of any species.

Mean discard rates were calculated for the years 2002-2021 by gear. The discard rate of vertical line and trolling vessels were calculated as discards per hook hours fished. The discard rate of gillnet vessels were calculated as discards per square yard hours fished. Annual total effort (hook hours for vertical line and trolling and square yard hours for gillnet) was multiplied by the mean discard rate from the appropriate gear to calculate total discards of Spanish Mackerel.

$$\text{Calculated discards} = \text{mean Spanish Mackerel discard rate per gear} * \text{annual total effort per gear}$$

For years prior to 2002 (the first year of discard data), the mean discard rate for the years 2002-2021 was used to calculate discards for the years 1993-2001 when only effort data were available.

## **Results and Discussion**

Reef fish observer data are available from 2007-2021 for the vertical line fishery. Within this time period, only 8 trips reported discards for Spanish Mackerel which amounts to a total of 39 observed discarded fish. With such limited data, discard estimates for Spanish Mackerel using commercial observer data could not be conducted.

Using discard logbook data, 46,926 discard forms were submitted for the Gulf of Mexico from 2002-2021. Of those trips, discards were reported on 26,298 trips and 19,998 trips reported no discards of any species. Table 1a and Table 1b highlights the sample size and number of fish discarded by year and gear. Following SEDAR 32 and 41 methods, discard logbook vertical line,

trolling, and gillnet vessels were excluded from analyses if a vessel reported more than 7, 24, and 9 trips, respectively until a discard of any species was reported. Discards of Spanish Mackerel were reported on only 102 trips of the submitted discard logbooks. Table 2 highlights the percentage of discards by disposition across all years (2002-2021) for each gear (gillnet, trolling, and vertical line). Additionally, Table 3 shows the reason for discarding Spanish Mackerel with management regulations being a majority of the responses.

There were 220,624 trips reported to the coastal logbook program by vessels that have been issued a Federal permit to fish in the Gulf of Mexico during 2002-2021 (Table 4a). Spanish Mackerel landings were reported for 11,334 trips or about 5% of all trips (Table 4b).

Calculated total discards (in number) of Gulf of Mexico Spanish Mackerel for each year and gear are provided in Tables 5 and 6. There were essentially no discards from the gillnet fishery because the discard rate was so low. The gear contributing to the most Spanish Mackerel discards was vertical line with as many as 12,000 fish discarded in 2003 (Figure 2). Since discard estimates are calculated using the mean discard rate of the entire time series (2002-2021), estimates will differ from SEDAR 28 (Figure 3). For vertical line vessels the average difference between SEDAR 28 discard estimates and SEDAR 81 is about 1,300 fish. The average difference for trolling vessels is 130 fish. SEDAR 28 reported no discards from the gillnet fishery and estimated discards for SEDAR 81 are negligible.

## **Literature Cited**

McCarthy, K. 2011. Calculated discards of yellowtail snapper from commercial vertical line fishing vessels in southern Florida. SEDAR27-DW-10. SFD-2011-016. 11 pp.

McCarthy, K. 2013. Calculated discards of Gray Triggerfish and blueline tilefish from US South Atlantic commercial fishing vessels. SEDAR32-DW11.

McCarthy, K. 2015. Calculated Discards of Gray Triggerfish from US South Atlantic Commercial Fishing Vessels. SEDAR41-DW37.

Poffenberger, J. and McCarthy, K. 2004. Estimates of red snapper discards by vessels with Federal permits in the Gulf of Mexico. SEDAR 7-DW-22.

Smith, S.G., A.C. Shideler, K.J. McCarthy. 2018. Proposed CPUE Expansion Estimation for Total Discards of Gulf of Mexico Red Grouper. SEDAR61-WP-15. SEDAR, North Charleston, SC. 11 pp.

## Tables

**Table 1a.** Number of trips reporting Spanish Mackerel (SM) and other discards by year and gear fished. “Conf” indicates confidential data (fewer than three vessels reporting within a cell).

Year	Vertical Line		Trolling		Gillnet		Other	
	SM	Other	SM	Other	SM	Other	SM	Other
2002	9	1060	6	99	-	-	-	175
2003	8	1661	-	17	-	-	-	230
2004	5	1392	Conf	21	-	-	-	298
2005	4	1121	Conf	29	-	-	-	167
2006	Conf	868	4	27	-	-	-	130
2007	Conf	956	Conf	30	-	-	-	141
2008	6	2015	-	80	-	3	-	115
2009	4	1172	Conf	22	-	-	-	87
2010	-	1079	Conf	67	-	-	-	165
2011	5	1140	-	67	-	22	-	215
2012	3	1303	-	90	-	41	-	177
2013	-	1171	-	79	-	12	-	174
2014	Conf	1066	-	122	Conf	79	-	230
2015	-	1094	-	71	3	59	-	224
2016	Conf	1074	Conf	125	-	11	-	128
2017	Conf	1158	-	92	-	9	-	139
2018	Conf	762	-	62	-	Conf	-	140
2019	21	1198	-	64	-	-	-	216
2020	5	863	-	21	-	3	-	97
2021	-	763	Conf	16	-	13	-	116



**Table 1b.** Number of discards (number of fish) reported for Spanish Mackerel (SM) and other species by year and gear fished. “Conf” indicates confidential data (fewer than three vessels reporting within a cell).

Year	Vertical Line		Trolling		Gillnet		Other	
	SM	Other	SM	Other	SM	Other	SM	Other
2002	104	127,868	61	1,556	-	-	-	43,728
2003	150	212,321	-	276	-	-	-	109,272
2004	20	188,778	Conf	268	-	-	-	65,701
2005	39	116,489	Conf	155	-	-	-	35,047
2006	Conf	67,800	9	153	-	-	-	35,273
2007	Conf	116,681	Conf	374	-	-	-	41,114
2008	42	184,620	-	1,465	-	69	-	16,991
2009	225	119,999	Conf	124	-	-	-	19,454
2010	-	93,344	Conf	364	-	-	-	34,638
2011	19	155,486	-	737	-	1,152	-	101,638
2012	33	150,703	-	736	-	9,221	-	67,223
2013	-	89,765	-	670	-	613	-	66,418
2014	Conf	52,852	-	2,927	Conf	3,215	-	47,763
2015	-	49,476	-	598	35	3,575	-	57,847
2016	Conf	67,374	Conf	1,402	-	287	-	43,191
2017	Conf	91,994	-	812	-	143	-	48,037
2018	Conf	46,322	-	432	-	Conf	-	80,905
2019	163	64,211	-	4,545	-	-	-	90,630
2020	63	45,057	-	101	-	18	-	36,962
2021	-	28,071	Conf	121	-	446	-	44,008

**Table 2.** Percentage of Gulf of Mexico Spanish Mackerel discards (from 2002-2021) by disposition for each of the three gears.

Disposition	Gillnet	Vertical Line	Trolling
Dead	39 %	11 %	1 %
Kept	61 %	30 %	50 %
Alive	-	53 %	49 %
Unknown	-	6 %	-

**Table 3.** Percentage of Gulf of Mexico Spanish Mackerel discards (from 2002-2021) by discard reason for each of the three gears.

Discard Reason	Gillnet	Vertical Line	Trolling
Market Conditions	37 %	7 %	15 %
Regulations	63 %	86 %	37 %
Unreported	-	6 %	48 %

**Table 4a.** Gulf of Mexico coastal logbook trips reported for Spanish Mackerel (SM) and other species by year and gear. Total trips may not match those reported in the text due to double counting trips (Spanish Mackerel and other species may have been reported on the same trip and that trip would have been included in both “Other” and “SM” totals).

Year	Gillnet		Vertical Line		Other		Trolling	
	Other	SM	Other	SM	Other	SM	Other	SM
2002	51	46	13,041	326	3,460	27	1,128	252
2003	33	52	12,862	278	3,221	16	1,080	248
2004	34	31	12,400	224	3,207	13	784	160
2005	24	45	10,274	240	2,784	5	608	74
2006	72	23	9,843	224	2,840	9	713	113
2007	45	44	7,178	176	1,753	3	834	110
2008	59	39	7,244	221	1,820	4	936	173
2009	104	91	7,975	266	1,257	20	1,041	208
2010	39	24	5,670	247	1,094	21	935	303
2011	111	85	6,383	259	1,353	7	1,057	199
2012	104	73	6,715	289	1,562	9	1,187	195
2013	193	180	6,306	298	1,549	19	1,141	300
2014	194	204	6,992	282	1,860	14	1,260	220
2015	195	188	6,705	304	1,850	8	1,126	272
2016	135	150	6,858	413	1,671	16	1,214	292
2017	86	59	6,834	386	1,593	6	1,467	338
2018	75	40	6,077	300	1,480	11	1,223	222
2019	77	54	5,909	390	1,371	11	1,100	247
2020	132	70	5,240	337	1,486	15	976	216
2021	103	62	4,577	208	1,267	4	917	155

**Table 4b.** Gulf of Mexico landings (pounds) reported to the coastal logbook program for Spanish Mackerel (SM) and other species by year and gear.

Year	Gillnet		Vertical Line		Other		Trolling	
	Other	SM	Other	SM	Other	SM	Other	SM
2002	204,822	76,870	14,507,041	21,856	11,033,060	886	1,074,311	17,860
2003	246,176	543,139	13,725,482	21,684	11,562,539	7,874	941,767	20,012
2004	238,698	232,204	13,603,436	47,150	11,571,471	522	838,290	18,069
2005	386,390	587,085	11,836,533	24,992	10,005,699	33	767,026	4,530
2006	556,685	143,573	11,510,999	47,600	10,050,751	589	955,952	19,489
2007	403,702	319,769	10,445,274	14,576	6,043,452	45	919,848	15,629
2008	590,183	213,990	10,964,406	18,109	6,426,646	332	853,377	11,359
2009	864,104	897,597	12,736,305	32,334	4,036,189	5,572	919,579	16,994
2010	537,006	229,802	9,541,005	34,893	3,436,042	1,271	910,196	23,087
2011	748,580	277,492	11,568,553	33,722	5,630,637	408	1,123,065	16,328
2012	610,241	219,993	12,422,907	28,962	5,909,671	448	1,085,768	21,509
2013	609,169	150,597	11,195,689	22,813	6,409,012	7,044	988,179	8,996
2014	599,748	255,731	12,494,348	16,393	7,674,301	440	1,262,079	9,489
2015	487,970	297,742	12,826,412	27,407	6,845,850	483	1,175,128	17,694
2016	533,779	300,255	12,236,923	34,084	6,920,881	2,966	1,248,254	14,065
2017	598,124	53,604	12,087,213	25,096	5,700,617	701	1,393,058	18,738
2018	601,712	28,956	11,024,890	23,641	5,033,611	562	1,341,453	24,632
2019	689,619	33,022	11,190,820	24,841	4,882,172	406	1,199,307	16,544
2020	587,776	80,509	10,400,920	19,338	4,843,824	1,113	871,737	12,372
2021	573,449	56,844	9,805,967	9,242	5,107,551	95	734,015	6,125

**Table 5.** Calculated annual total discards (in number) of Gulf of Mexico Spanish Mackerel from vertical line, trolling, and gillnet vessels using SEDAR 32 methods.

Year	Vertical Line	Trolling	Gillnet
1993	7,626	2	
1994	9,061	3	
1995	8,955	14	
1996	9,671	41	
1997	10,791	28	
1998	9,986	45	5
1999	10,987	71	10
2000	10,559	52	18
2001	10,636	56	14
2002	11,162	49	8
2003	11,948	48	3
2004	10,644	36	1
2005	9,693	25	3
2006	9,968	37	7
2007	9,665	39	3
2008	8,553	32	5
2009	10,467	32	10
2010	7,997	22	4
2011	9,799	34	9
2012	11,267	38	8
2013	8,868	41	5
2014	9,194	42	4
2015	8,103	41	5
2016	8,223	42	3
2017	7,619	41	2
2018	6,037	33	2
2019	6,032	30	3
2020	5,002	27	3
2021	4,040	23	2

**Table 6.** Calculated annual total discards (in number) of Gulf of Mexico Spanish Mackerel from vertical line (a), trolling (b) and gillnet (c) vessels. Total effort, the mean discard rate and discard rate CVs are also provided.

**(a) Vertical Line**

Year	Trips Reporting Effort	Total Effort	Discard Rate	Discard Rate CV	Estimated Discards
1993	10,816	6,399,319	0.0011917	44.406	7,626
1994	11,651	7,603,346	0.0011917	44.406	9,061
1995	11,790	7,514,114	0.0011917	44.406	8,955
1996	11,820	8,114,826	0.0011917	44.406	9,671
1997	12,087	9,054,996	0.0011917	44.406	10,791
1998	12,272	8,379,578	0.0011917	44.406	9,986
1999	13,054	9,219,076	0.0011917	44.406	10,987
2000	13,006	8,859,913	0.0011917	44.406	10,559
2001	12,752	8,924,970	0.0011917	44.406	10,636
2002	12,938	9,366,382	0.0011917	44.406	11,162
2003	12,775	10,025,997	0.0011917	44.406	11,948
2004	12,323	8,931,527	0.0011917	44.406	10,644
2005	10,247	8,133,060	0.0011917	44.406	9,693
2006	9,859	8,363,875	0.0011917	44.406	9,968
2007	7,186	8,110,047	0.0011917	44.406	9,665
2008	7,285	7,176,731	0.0011917	44.406	8,553
2009	7,988	8,783,071	0.0011917	44.406	10,467
2010	5,646	6,710,091	0.0011917	44.406	7,997
2011	6,466	8,222,177	0.0011917	44.406	9,799
2012	6,773	9,454,124	0.0011917	44.406	11,267
2013	6,347	7,440,799	0.0011917	44.406	8,868
2014	6,952	7,714,291	0.0011917	44.406	9,194
2015	6,728	6,799,442	0.0011917	44.406	8,103
2016	6,894	6,899,884	0.0011917	44.406	8,223
2017	6,847	6,393,110	0.0011917	44.406	7,619
2018	6,070	5,065,405	0.0011917	44.406	6,037
2019	5,956	5,061,758	0.0011917	44.406	6,032
2020	5,235	4,196,881	0.0011917	44.406	5,002
2021	4,578	3,389,807	0.0011917	44.406	4,040

**(b) Trolling**

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Year	Trips Reporting Effort	Total Effort	Discard Rate	Discard Rate CV	Estimated Discards
1993	90	4,119	0.0005964	40.8061	2
1994	173	4,747	0.0005964	40.8061	3
1995	333	23,508	0.0005964	40.8061	14
1996	671	68,318	0.0005964	40.8061	41
1997	522	47,022	0.0005964	40.8061	28
1998	1,063	75,126	0.0005964	40.8061	45
1999	1,414	119,854	0.0005964	40.8061	71
2000	1,466	87,593	0.0005964	40.8061	52
2001	1,508	93,106	0.0005964	40.8061	56
2002	1,189	81,576	0.0005964	40.8061	49
2003	1,165	79,770	0.0005964	40.8061	48
2004	829	60,347	0.0005964	40.8061	36
2005	637	41,297	0.0005964	40.8061	25
2006	773	62,306	0.0005964	40.8061	37
2007	904	65,055	0.0005964	40.8061	39
2008	999	53,319	0.0005964	40.8061	32
2009	1,121	53,385	0.0005964	40.8061	32
2010	1,014	37,587	0.0005964	40.8061	22
2011	1,132	57,368	0.0005964	40.8061	34
2012	1,284	63,139	0.0005964	40.8061	38
2013	1,237	68,824	0.0005964	40.8061	41
2014	1,341	69,660	0.0005964	40.8061	42
2015	1,252	69,360	0.0005964	40.8061	41
2016	1,290	70,316	0.0005964	40.8061	42
2017	1,562	68,878	0.0005964	40.8061	41
2018	1,277	55,400	0.0005964	40.8061	33
2019	1,140	51,053	0.0005964	40.8061	30
2020	1,036	45,161	0.0005964	40.8061	27
2021	959	39,140	0.0005964	40.8061	23

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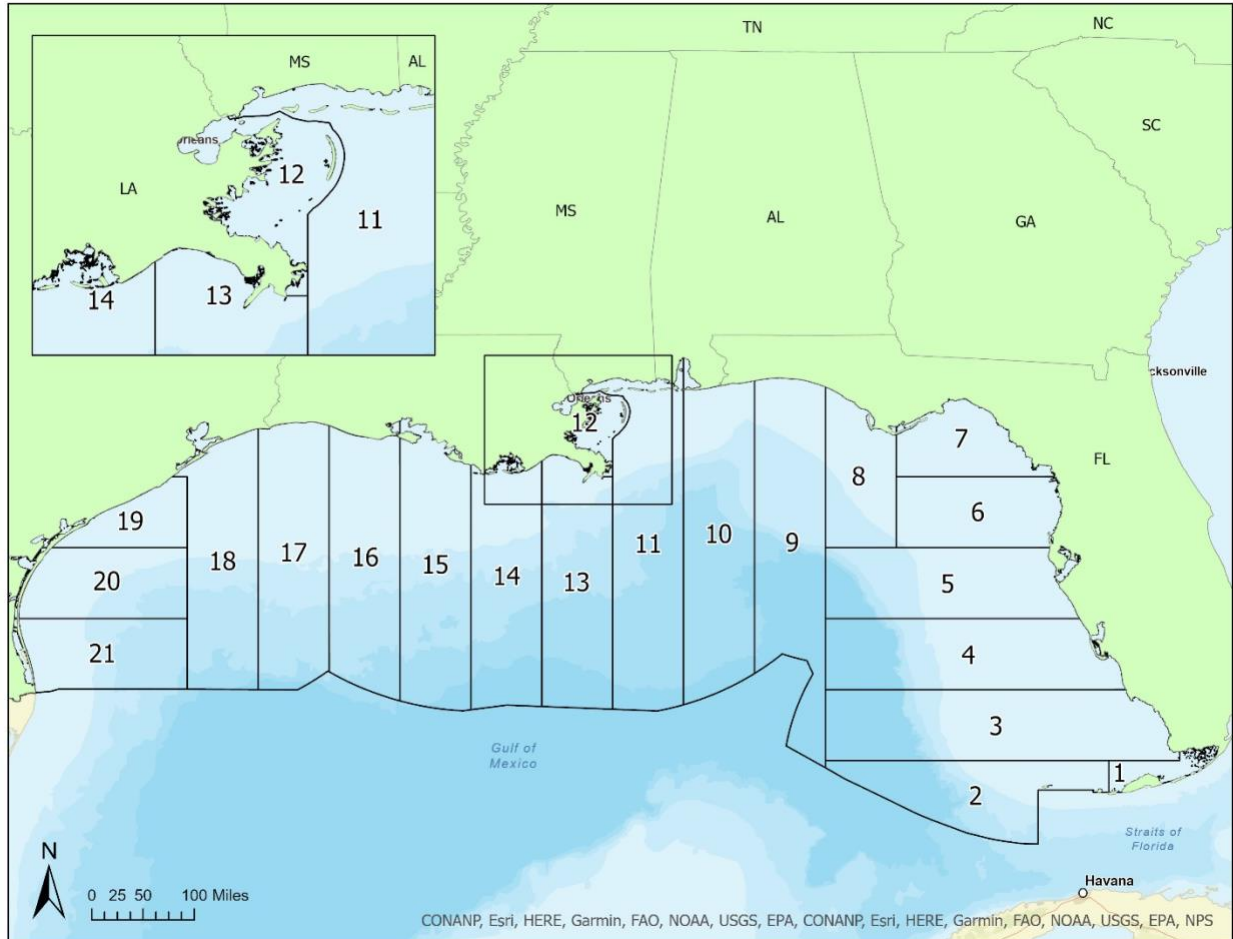
**(c) Gillnet**

Year	Trips Reporting Effort	Total Effort	Discard Rate	Discard Rate CV	Estimated Discards
1998	81	7,273,680	0.0000007	24.5561	5
1999	213	14,996,675	0.0000007	24.5561	10
2000	144	26,227,070	0.0000007	24.5561	18
2001	148	20,900,270	0.0000007	24.5561	14
2002	78	11,446,300	0.0000007	24.5561	8
2003	73	4,762,400	0.0000007	24.5561	3
2004	55	1,958,360	0.0000007	24.5561	1
2005	67	4,727,960	0.0000007	24.5561	3
2006	91	9,586,160	0.0000007	24.5561	7
2007	87	4,469,950	0.0000007	24.5561	3
2008	93	7,871,050	0.0000007	24.5561	5
2009	181	14,367,610	0.0000007	24.5561	10
2010	61	5,244,700	0.0000007	24.5561	4
2011	150	12,542,950	0.0000007	24.5561	9
2012	138	12,244,975	0.0000007	24.5561	8
2013	258	7,525,300	0.0000007	24.5561	5
2014	262	5,378,495	0.0000007	24.5561	4
2015	242	7,195,552	0.0000007	24.5561	5
2016	166	3,641,650	0.0000007	24.5561	3
2017	99	3,113,540	0.0000007	24.5561	2
2018	82	2,377,710	0.0000007	24.5561	2
2019	90	4,568,850	0.0000007	24.5561	3
2020	142	4,084,967	0.0000007	24.5561	3
2021	111	3,127,103	0.0000007	24.5561	2

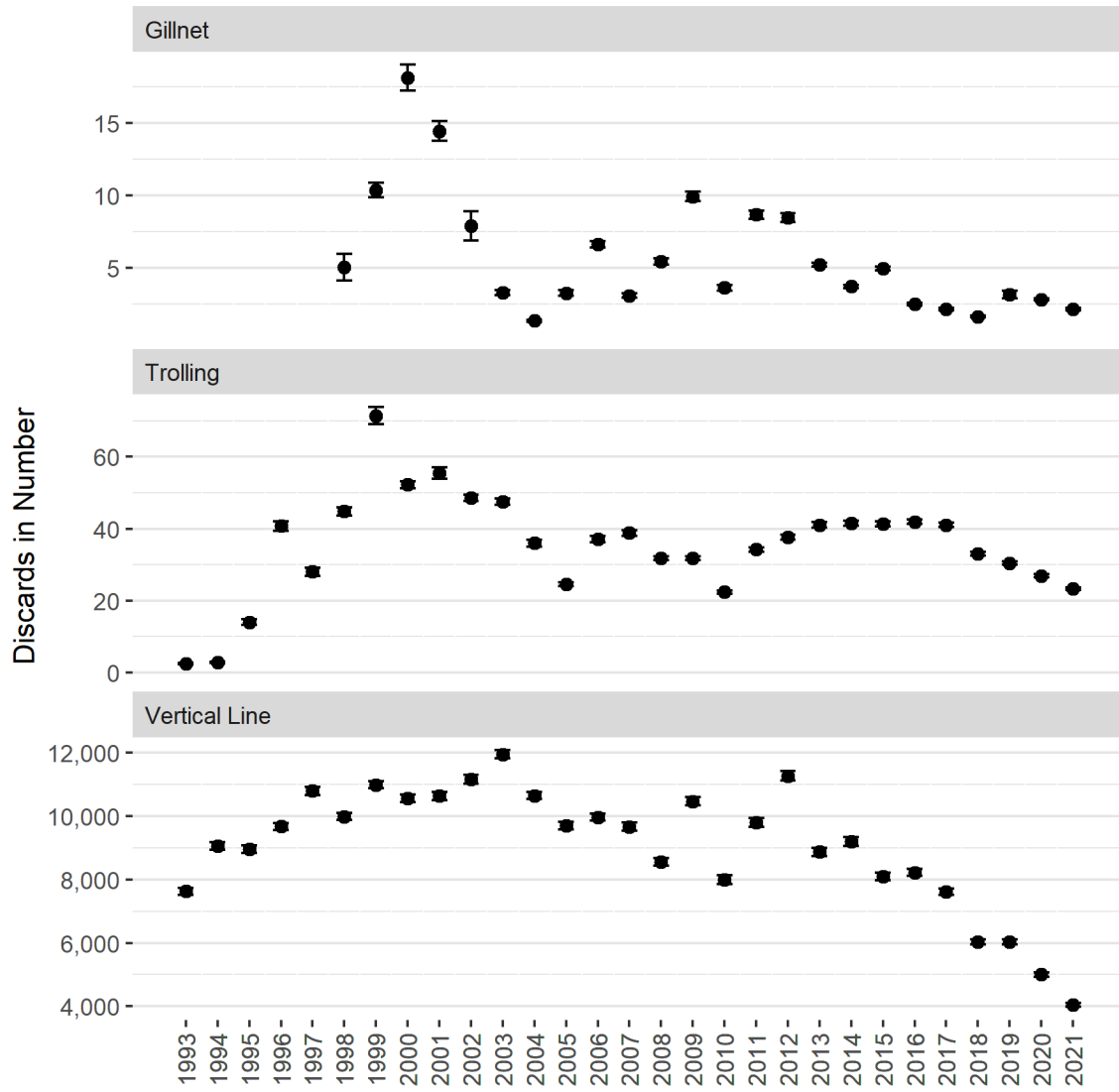


## Figures

**Figure 1.** Map of Gulf of Mexico fishing areas.



**Figure 2.** Discards in number for Gulf of Mexico Spanish Mackerel by gear.



**Figure 3.** Comparison between SEDAR 81 discard estimates and SEDAR 28 discard estimates for vertical line and trolling vessels. Gillnet vessels are not included here because SEDAR 28 reported no discards.

