

**Summary of the 2007
Nighttime Roving Counts
and Pre-trip Flounder
Gig Surveys**

by
**Zachary Olsen
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**Management Data Series
No. 282
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COASTAL FISHERIES DIVISION
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Abstract.—Flounder (both *Paralichthys lethostigma* and *P. albigutta*) are highly sought by recreational and commercial anglers along the Texas coast. While routine Texas Parks and Wildlife Department (TPWD) harvest monitoring of sport-boat anglers is adequate to estimate daytime flounder landings, past studies have indicated that significant numbers of flounder are harvested at night by gig fishermen and are not intercepted during routine daytime surveys. This study investigates the nighttime flounder gig fishery with instantaneous roving counts and pre-trip ‘intent to gig’ angler interviews from October through December in 2007. The majority of nighttime activity occurred on the central Texas coast during October and November. Interestingly, the majority of interviews with anglers intending to gig occurred on weekday (Sunday through Thursday) as opposed to weekend (Friday and Saturday) nights. Approximately 95% of gig interviews occurred in the Aransas Bay/Corpus Christi Bay and Matagorda Bay/San Antonio Bay major areas. Eighty-nine percent of gig fishermen interviewed stated that they were fishing recreationally. While only a small number of commercial gig fishermen were intercepted during the study period, past studies have found that this sector is much more efficient and often harvests a significant portion of the total catch.

Introduction

Flounder, both southern (*Paralichthys lethostigma*) and Gulf (*P. albigutta*), are the basis for important recreational and commercial fisheries on the Texas coast. From 1998-2008, flounder were the third most sought after species by recreational bay/pass private-boat anglers, following red drum (*Sciaenops ocellatus*) and spotted seatrout (*Cynoscion nebulosus*; Green and Campbell 2010). Annual southern flounder harvest estimates (number of fish) for bay/pass private-boat recreational anglers decreased from 129,700 fish in 1983-84 to 42,700 in 2007-2008. Coastwide annual commercial harvest of flounder also decreased from 254,148 kg in 1986 to 27,034 kg in 2012 (Culbertson et al. 2004, TPWD unpublished data). These declines may be due to a variety of factors, including increasingly stricter regulations, decreasing fishing effort due to effort management (license buybacks) beginning September 2000, and unfavorable environmental conditions (Stokes 1977, Glass et al. 2008). In September 2009, commercial flounder daily bag limits dropped from 60 to 30 fish/day, and gigging was prohibited during the month of November. From 2000-2013, 241 of 549 original Commercial Finfish Fisherman’s licenses (44%) were retired, although these buybacks include commercial trotline fishermen as well as gig fishermen.

While commercial landings data includes all fishing activity (day/night, gig/trawl), routine monitoring of the recreational sector only occurs from 1000-1800 hours (Green and Campbell 2010), missing most nighttime gilled landings. Given the potential efficiency of this gear type (Cox 1987), excluding estimates of fishing pressure and landings from recreational and commercial nighttime gig fishermen could result in underestimating effort and landings or misunderstanding harvest patterns of flounder in Texas.

Few studies have targeted flounder harvest in Texas waters. A survey of nighttime flounder gigging pressure in Aransas Bay from January 1974 to September 1975 found that recreational anglers harvested more than twice that of the commercial sector in the same region annually, and more than three times that of the commercial sector during October and November (Stokes 1977). The gig fishery centered mostly in the vicinity of channels and Gulf pass areas during this time (Stokes 1977).

A study examining daytime flounder catches in Texas Gulf passes from October to December 1980 (Spiller 1982) found that while flounder landings may increase overall during the fall season, daytime shore-based surveys targeting flounder are not efficient in assessing coastwide harvest of this species. The results of his study were comparable to an earlier study broadly targeting shore-based fishing activity on the Texas coast (McEachron et al. 1981). This suggests that sampling effort may be better spent targeting nighttime fishermen.

From July-December of 1991, TPWD monitored the nighttime flounder gig fishery and found that recreational gig fishermen accounted for 83% of effort and 53% of landings (TPWD unpublished data). Preliminary estimates from the 1991 study describe a total effort of 60,479 man-hours and total landings of 101,106 flounder for the gig fishery along the Texas coast during this time period.

Recent declines in southern flounder populations along the Texas coast (Martinez-Andrade et al. 2005; Froeschke et al. 2011) necessitate a better understanding and more extensive monitoring of recreational and commercial nighttime gigging pressure for these populations. The objective of this report is to describe the nighttime flounder gig fishery based on the findings of nighttime flounder roving counts and 'intent to gig' interviews conducted in 2007 by TPWD.

Methods

From October through December 2007, nighttime roving counts were conducted in six major areas along the Texas coast (Sabine Lake, Galveston Bay, Matagorda Bay/San Antonio Bay, Aransas Bay/Corpus Christi Bay, upper Laguna Madre, and lower Laguna Madre; Figure 1) at both boat-access and shore-based fishing locations (Appendix A). Roves were conducted by counting attached empty trailers at all boat-access sites and lanterns at all shore-based sites, with the assumption that lanterns were associated with shore-based angling activity while trailers were associated with boat angling activity. Four roving counts were conducted each month (two at boat-access sites, two at shore-based sites), covering all sites in each major area, with two being conducted on weekday nights (Sunday-Thursday) and two on weekend nights (Friday-Saturday). Roves were distributed evenly between first and second halves of each month and no two roves of the same day type were conducted within five days of each other. Additionally, count order was alternated on successive rove days within each day type. Roves started one hour after sunset and were completed within two hours, and were not conducted on nights when sustained winds exceeded 13 knots at sunset as such condition were assumed to preclude flounder gigging. Because boat-access and shore-based counts have different effort units, results from these two strata are not comparable.

In addition, pre-trip 'intent to gig' surveys were conducted in the six major areas along the Texas coast at selected boat-access locations. Four surveys were conducted each month in each major area with two being conducted on weekday nights (Sunday-Thursday) and two on weekend nights (Friday-Saturday). In order to minimize demands on staff, selection of sites was geared toward those with high-pressure in conjunction with routine daytime boat-access surveys. Interviews were conducted from one hour before sunset to one hour after sunset and were not conducted on nights when sustained winds exceeded 13 knots at one hour prior to sunset. For the purpose of the survey, TPWD personnel intercepted anglers at the start of their trip to

determine if they intended to gig and if so, whether they were recreational or commercial fishermen.

Following completion of this study, field personnel from each of the major areas involved were asked to submit comments and suggestions as to the methodology and practicality of this study. These comments and suggestions are briefly summarized and discussed.

Results

Nighttime Flounder Roving Counts

From October through December 2007, 1,855 and 133 observations were made at boat-access sites (trailers) and shore-based locations (lanterns), respectively (Table 1). Nine-hundred sixty trailer observations (52%) were made in the Matagorda Bay/San Antonio Bay and Aransas Bay/Corpus Christi Bay areas, with 545 observations occurring in Matagorda Bay/San Antonio Bay. Sixty shore-based observations occurred in Galveston Bay (45%), followed by Aransas Bay/Corpus Christi Bay (n=29), Matagorda Bay/San Antonio Bay (n=21) and upper Laguna Madre (n=21). Sabine Lake contributed the smallest number of observations for both boat-access (n=29) and shore-based sites (n=1).

At boat-access sites coastwide, 814 (44%) and 657 (35%) observations were made in October and November, respectively, while at shore-based locations, 64 (48%) and 48 (36%) observations occurred in October and November, respectively. Weekend night observations were higher than weekday nights at both boat-access sites (n=1,228, 66%) and shore-based locations (n=82, 62%). Central coast areas [Matagorda Bay/San Antonio Bay (n=234) and Aransas Bay/Corpus Christi Bay (n=160)] had more observations in November than in October, while all other areas had more observations in October (Figure 2). Shore-based observations during October decreased geographically from Galveston Bay (n=41) to lower Laguna Madre (n=0), while November observations increased from Galveston Bay (n=11) south to upper Laguna Madre (n=16, Figure 3). Weekend observations were consistently higher at boat-access sites coastwide (Figure 4), while at shore-based sites only a single lantern was observed in both Sabine Lake and lower Laguna Madre (Figure 5). At both boat-access and shore-based sites, the number of weekday observations increased from October through December, while weekend observations decreased (Figures 6 and 7).

Pre-trip Interviews

A total of 137 pre-trip interviews were conducted at boat-access sites (Table 2). Coastwide, 57 parties (42% of all interviews) stated that they intended to gig, with 54 of these gig interviews (95%) coming from Aransas Bay/Corpus Christi Bay and Matagorda Bay/San Antonio Bay areas. No interviews with parties intending to gig were reported from Sabine Lake and Galveston Bay (Figure 8). Thirty-three interviews with parties intending to gig occurred in November, followed by 20 in October and four in December (Figure 9), and there was a higher number on weekdays (n=34) than weekends (n=23, Figure 10).

Of all gig interviews coastwide, 51 parties (89%) stated that they were recreational fishing, while only six (11%) stated that they were commercial fishing (Figure 11).

Commercial gig interviews only occurred in Aransas Bay/Corpus Christi Bay (n=4) and Matagorda Bay/San Antonio Bay (n=2). Similarly, 98% of recreational gig interviews (n=48) occurred in these same four areas. Interviews with parties intending to gig commercially occurred only in October (n=3) and November (n=3), and 30 recreational gig interviews (59%) occurred in November, followed by October (n=17) and December (n=4, Figure 12). Commercial gig interviews occurred evenly between weekday and weekends, while 31 recreational gig interviews (61%) occurred on weekdays (Figure 13).

Discussion

The lack of replication in this study (sampling only three months in a single year) precludes conclusions relating to annual seasonality of nighttime flounder gigging effort. The nighttime roving count and pre-trip interview results suggest that the nighttime flounder gig fishery is mainly located on the central Texas coast, with boat fishermen concentrated largely in the Matagorda Bay/San Antonio Bay and Aransas Bay/Corpus Christi Bay areas. The largest number of shore-based nighttime roving counts came from Galveston Bay; however, no pre-trip gigging interviews were reported from this bay system (though pre-trip interviews were only conducted at boat-access locations).

These results were comparable to 1991 estimates of nighttime gig effort which found that an estimated 78% of gigging effort occurred in the Matagorda Bay/San Antonio Bay and Aransas Bay/Corpus Christi Bay areas (TPWD unpublished data). It can be postulated that heavier riverine inflow on the north Texas coast and high winds on the southern Texas coast result in more turbid waters which precludes gigging activity. Future studies to document the nighttime flounder gig fishery, at both boat-access and shore-based locations, should concentrate on the central Texas areas (Matagorda Bay south to Corpus Christi Bay) where the majority of gigging effort occurs.

The roving counts and pre-trip interviews suggest that nighttime effort during the fall flounder run is focused in October and November with limited nighttime activity occurring in December. This is similar to results reported by Stokes (1977), who found the majority of flounder gig effort and landings from Aransas Bay during fall 1974 occurred in October and November, followed by September and December. However, these findings may be directly related to the timing of the flounder run in 2007 (i.e. seasonality of nighttime effort directly tracks seasonality of the flounder movement for a given year), and so may be of limited use in terms of patterning nighttime gigging effort. Additionally, the results from the pre-trip interviews suggest that not all nighttime roving counts at boat launch facilities may be linked to flounder gig fishermen, as only 42% of parties stated that they intended to gig. The inverse patterns of nighttime activity by month and area shown in Figure 3 suggest that future studies should include region-specific evaluation.

Similar to the 1991 study conducted by TPWD, a majority of gig interviews were found to consist of recreational as opposed to commercial fishermen. The present study found that only 11% of gig interviews were commercial, similar to the 1991 study (TPWD unpublished data) which estimated that 16% of effort was commercial. It should be noted that effort estimates from the 1991 study are not directly comparable to estimates from roving counts in this study as

1991 estimates were determined from nighttime creel surveys and extrapolated based on roving counts (estimates given in man-hours). Nonetheless, the 1991 study found that CPUE among commercial fishermen was four times higher than that of recreational gig fishermen, resulting in 47% of the total estimated landings. Stokes (1977) found that commercial landings of flounder from January 1974 through September 1975 comprised only 29% of nighttime gig landings (though commercial data were drawn from a TPWD census and not the same survey used to estimate recreational gig landings). Since no post-trip interviews were conducted in conjunction with the present study, we are unable to draw conclusions regarding the current efficiency of the commercial sector, though it most likely remains higher than that of the recreational sector.

Following the conclusion of this study, TPWD staff members were asked to comment on its methodology and practicality. The accuracy of shore-based roving counts was questioned as lanterns may not have been indicative of gigging activity only (shoreline camping, etc.). Pre-trip interviews at shore-based locations may have allowed for a better understanding of activity in this stratum. Additionally, the study design did not intercept flounder fishermen on piers, and may have double counted anglers wading from boats with lanterns. Staff recommended limiting survey and rove effort to areas of known gigging activity, perhaps pre-determined by mail survey or additional questions to flounder fishermen encountered during routine harvest surveys. The study also put extra burden on staff man-hours and budget, especially in Galveston Bay where gigging effort is spread out over the largest geographical area.

Periodic roving surveys of both boat ramp and shore-based locations, and pre-trip interviews of the nighttime flounder fishery are helpful in characterizing changes in activity and behavior of this fishery and in preparing for more in-depth surveys of the fishery such as that conducted by TPWD in 1991. In order to effectively estimate total landings and effort for the nighttime flounder gig fishery, managers must understand where (appropriate survey locations) and when (appropriate seasonality and time) it is occurring. Studies such as this one will aid in such efforts and allow for periodic monitoring and improved study design for future surveys of the nighttime flounder gig fishery.

Acknowledgements

We thank all TPWD Coastal Fisheries Division field staff that participated in the collection of the data presented here. In addition, we recognize members of the 2007 'Flounder Team' Leslie Koza (Williams) and Charlene Hons in addition to Mark Fisher and Lee Green for the planning and implementation of the study design and for helpful guidance and feedback during the analysis and writing process.

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Tables and Figures

TABLE 1.—Nighttime roving counts for both boat-access sites (trailers) and shore-based sites (lanterns) among major area, month, and day type.

Major Area	Boat-access Sites			Shore-based Sites			Total
	Weekday	Weekend	Total	Weekday	Weekend	Total	
<u>Sabine Lake</u>							
Oct	4	13	17	1	0	1	18
Nov	5	5	10	0	0	0	10
Dec	2	0	2	0	0	0	2
Total	11	18	29	1	0	1	30
<u>Galveston Bay</u>							
Oct	61	102	163	15	26	41	204
Nov	19	57	76	6	5	11	87
Dec	25	35	60	4	4	8	68
Total	105	194	299	25	35	60	359
<u>Matagorda Bay/San Antonio Bay</u>							
Oct	67	145	212	2	9	11	223
Nov	100	134	234	7	2	9	243
Dec	34	65	99	0	1	1	100
Total	201	344	545	9	12	21	566
<u>Aransas Bay/Corpus Christi Bay</u>							
Oct	24	122	146	0	8	8	154
Nov	73	87	160	4	8	12	172
Dec	60	49	109	4	5	9	118
Total	157	258	415	8	21	29	444
<u>Upper Laguna Madre</u>							
Oct	29	88	117	1	2	3	120
Nov	27	63	90	5	11	16	106
Dec	24	47	71	1	1	2	73
Total	80	198	278	7	14	21	299
<u>Lower Laguna Madre</u>							
Oct	43	116	159	0	0	0	159
Nov	15	72	87	0	0	0	87
Dec	15	28	43	1	0	1	44
Total	73	216	289	1	0	1	290
Grand Total	627	1,228	1,855	51	82	133	1,988

TABLE 2.—Number of pre-trip interviews among major area, month, and day type (boat-access sites only).

Major Area	Weekday	Weekend	Total
<u>Sabine Lake</u>			
Oct	0	2	2
Nov	3	0	3
Dec	0	0	0
Total	3	2	5
<u>Galveston Bay</u>			
Oct	1	3	4
Nov	1	3	4
Dec	0	0	0
Total	2	6	8
<u>Matagorda Bay/San Antonio Bay</u>			
Oct	8	6	14
Nov	8	7	15
Dec	0	8	8
Total	16	21	37
<u>Aransas Bay/Corpus Christi Bay</u>			
Oct	7	14	21
Nov	16	15	31
Dec	3	1	4
Total	26	30	56
<u>Upper Laguna Madre</u>			
Oct	2	6	8
Nov	2	3	5
Dec	3	4	7
Total	7	13	20
<u>Lower Laguna Madre</u>			
Oct	3	5	8
Nov	0	1	1
Dec	1	1	2
Total	4	7	11
Grand Total	58	79	137

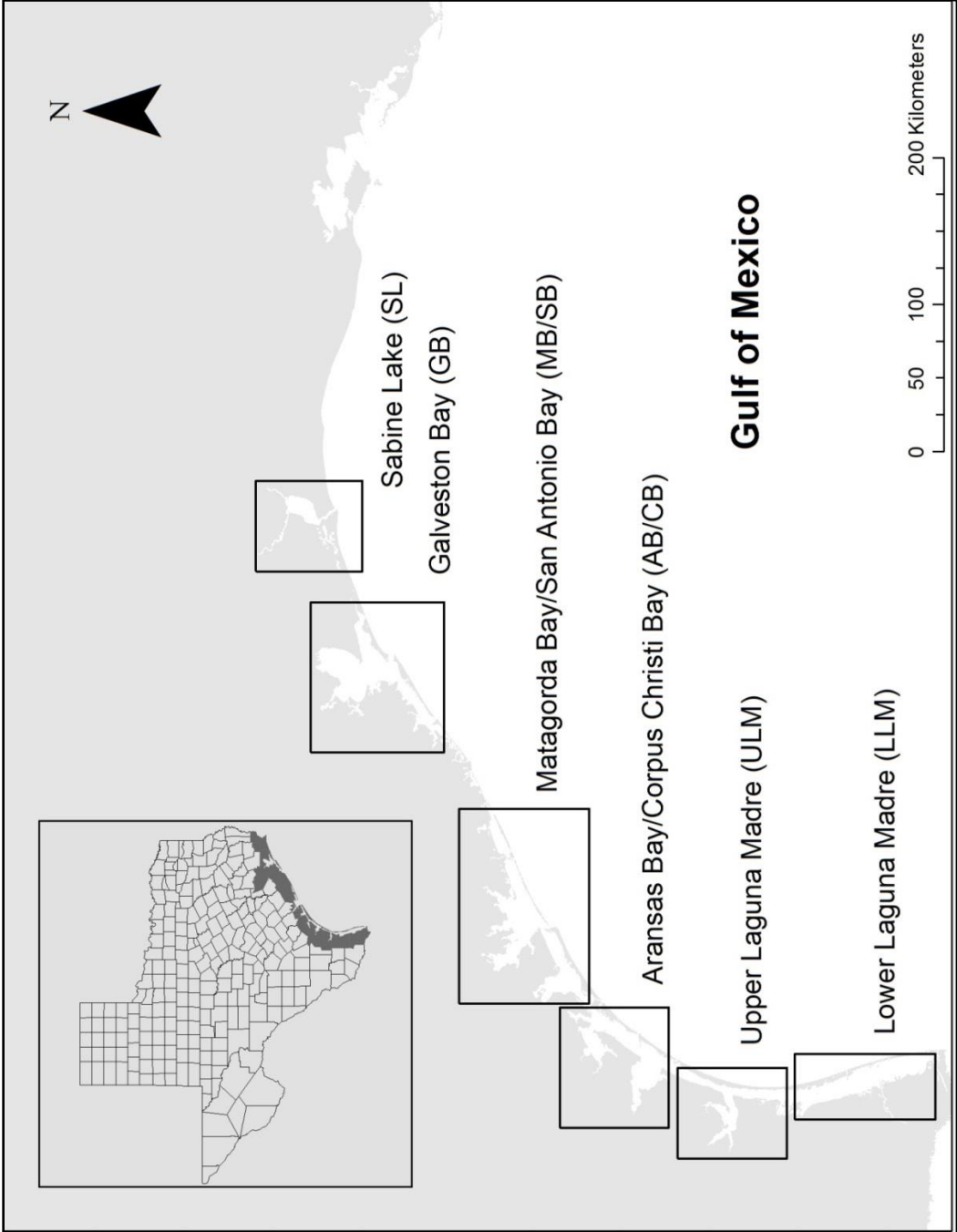


FIGURE 1.—A map of the Texas coast showing major areas surveyed in this study. Abbreviations for each major area used throughout this report are given in parentheses.

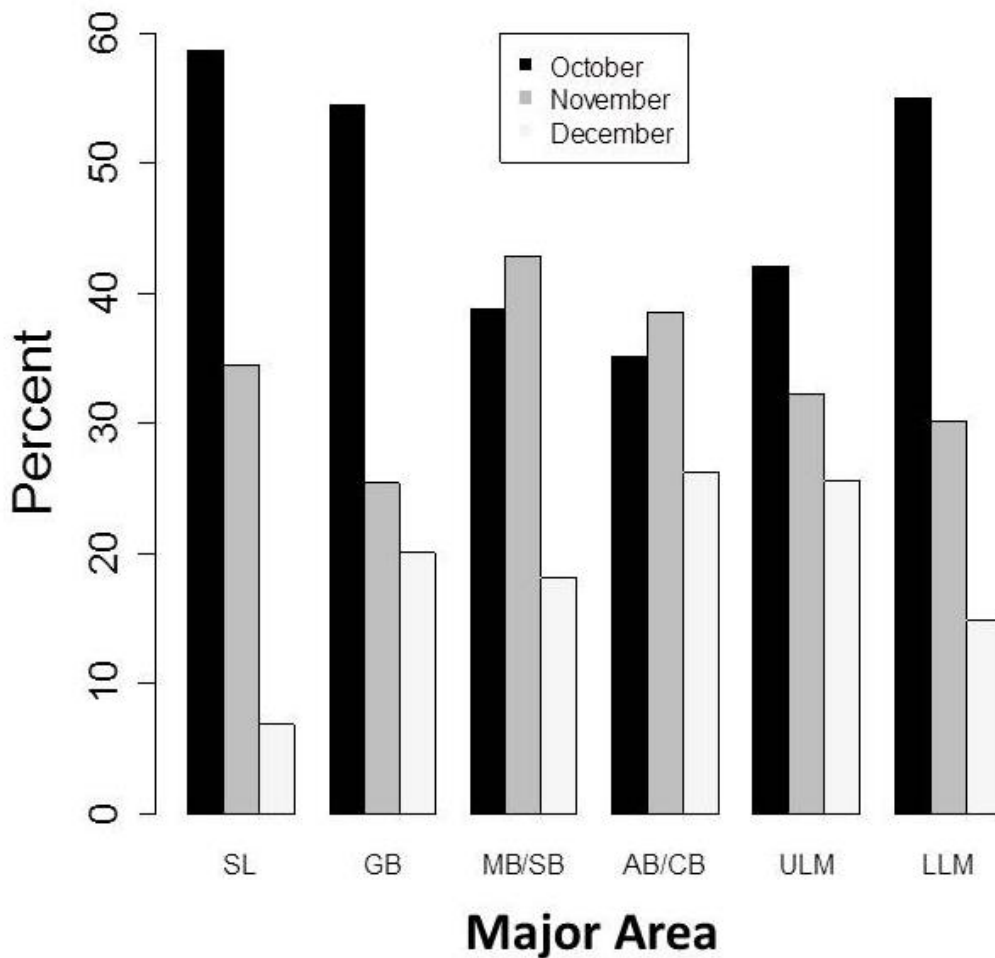


FIGURE 2.—Percent roving counts for boat-access sites by month within major area [Sabine Lake (SL), Galveston Bay (GB), Matagorda Bay/San Antonio Bay (MB/SB), Aransas Bay/Corpus Christi Bay (AB/CB), upper Laguna Madre (ULM), and lower Laguna Madre (LLM); n=1,855].

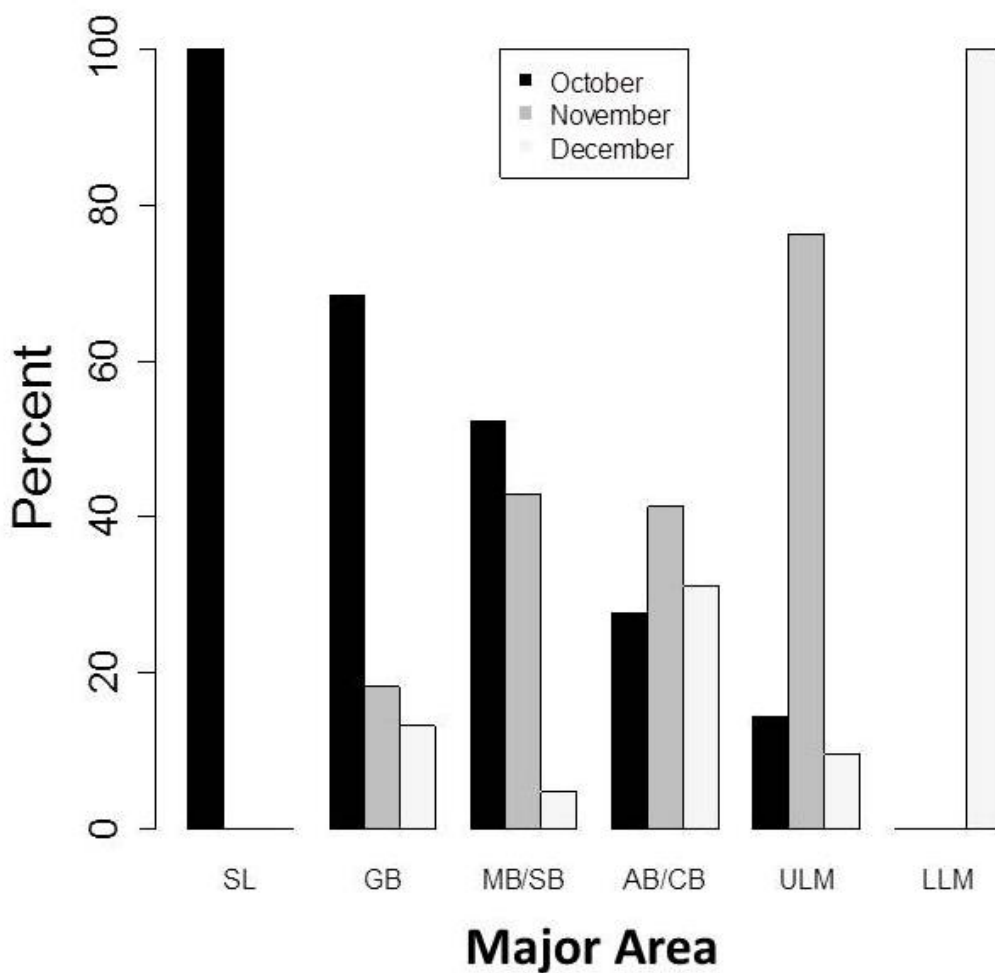


FIGURE 3.—Percent roving counts for shore-based sites by month within major area [Sabine Lake (SL), Galveston Bay (GB), Matagorda Bay/San Antonio Bay (MB/SB), Aransas Bay/Corpus Christi Bay (AB/CB), upper Laguna Madre (ULM), and lower Laguna Madre (LLM); n=133].

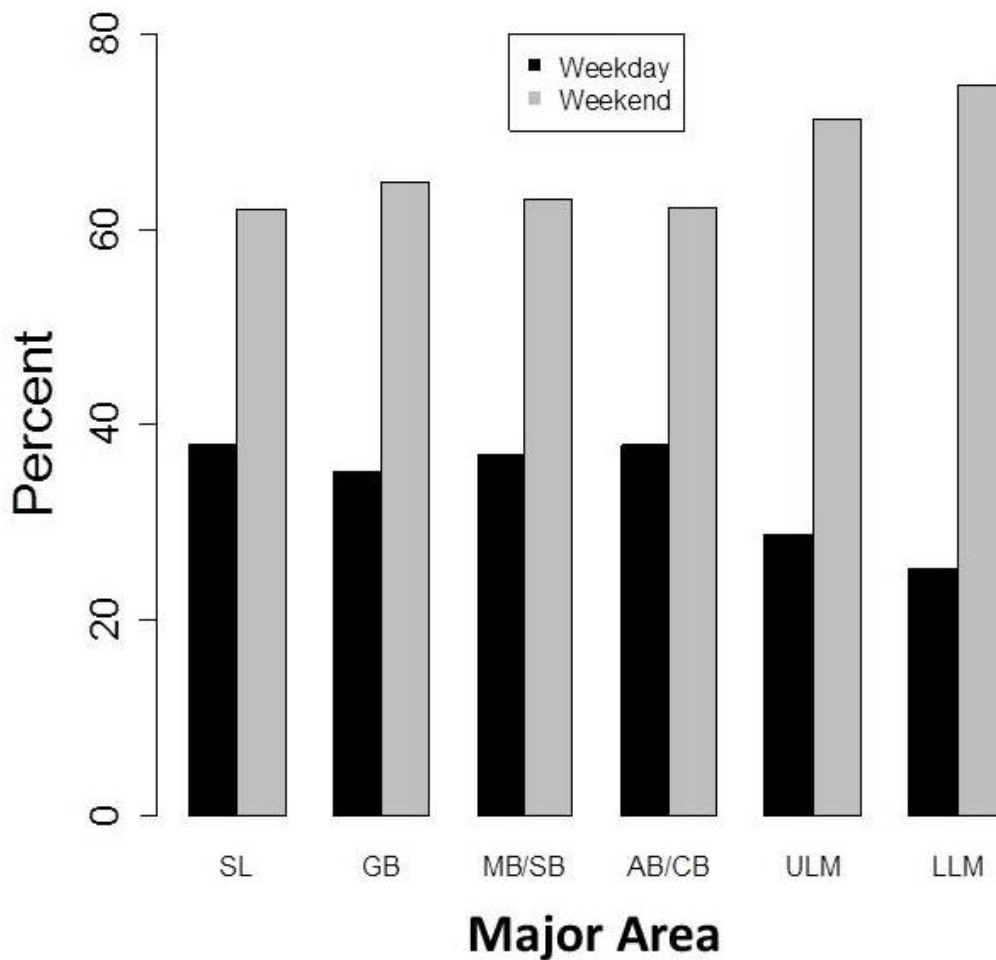


FIGURE 4.—Percent roving counts for boat-access sites by day type within major area [Sabine Lake (SL), Galveston Bay (GB), Matagorda Bay/San Antonio Bay (MB/SB), Aransas Bay/Corpus Christi Bay (AB/CB), upper Laguna Madre (ULM), and lower Laguna Madre (LLM); n=1,855].

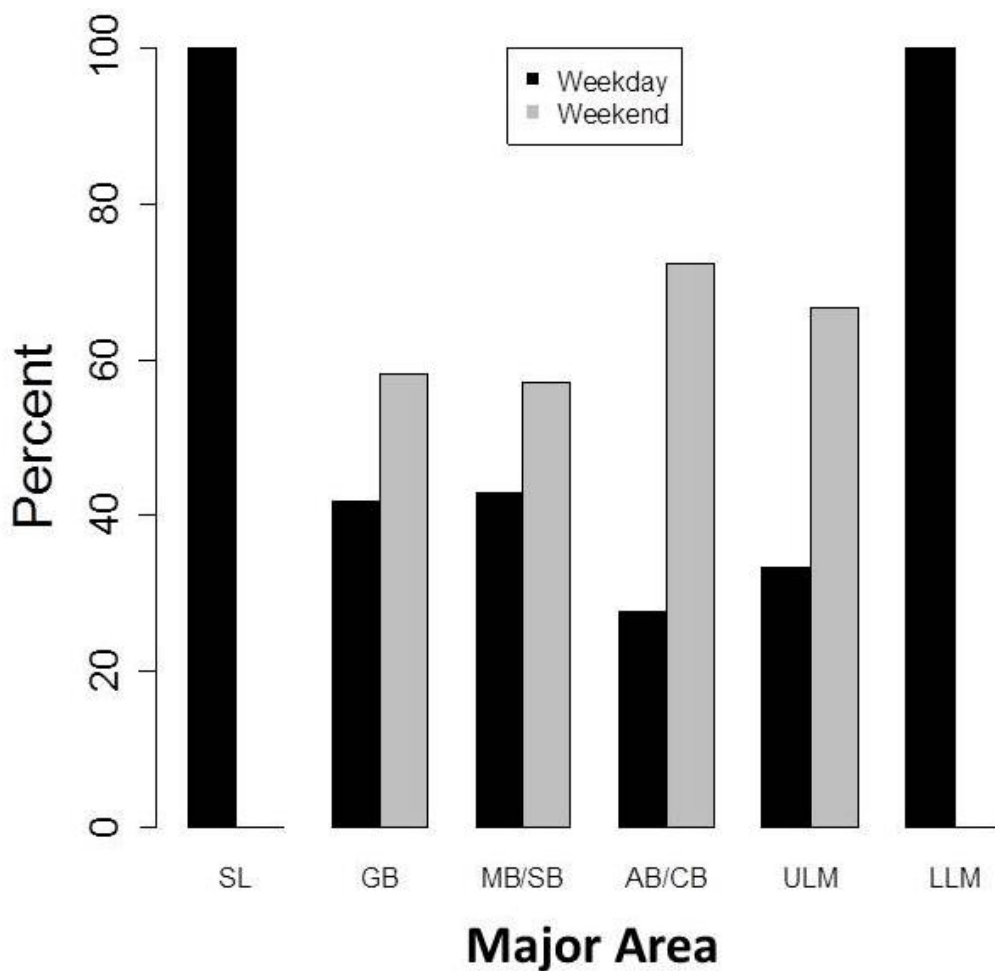


FIGURE 5.—Percent roving counts for shore-based sites by day type within major area [Sabine Lake (SL), Galveston Bay (GB), Matagorda Bay/San Antonio Bay (MB/SB), Aransas Bay/Corpus Christi Bay (AB/CB), upper Laguna Madre (ULM), and lower Laguna Madre (LLM); n=133].

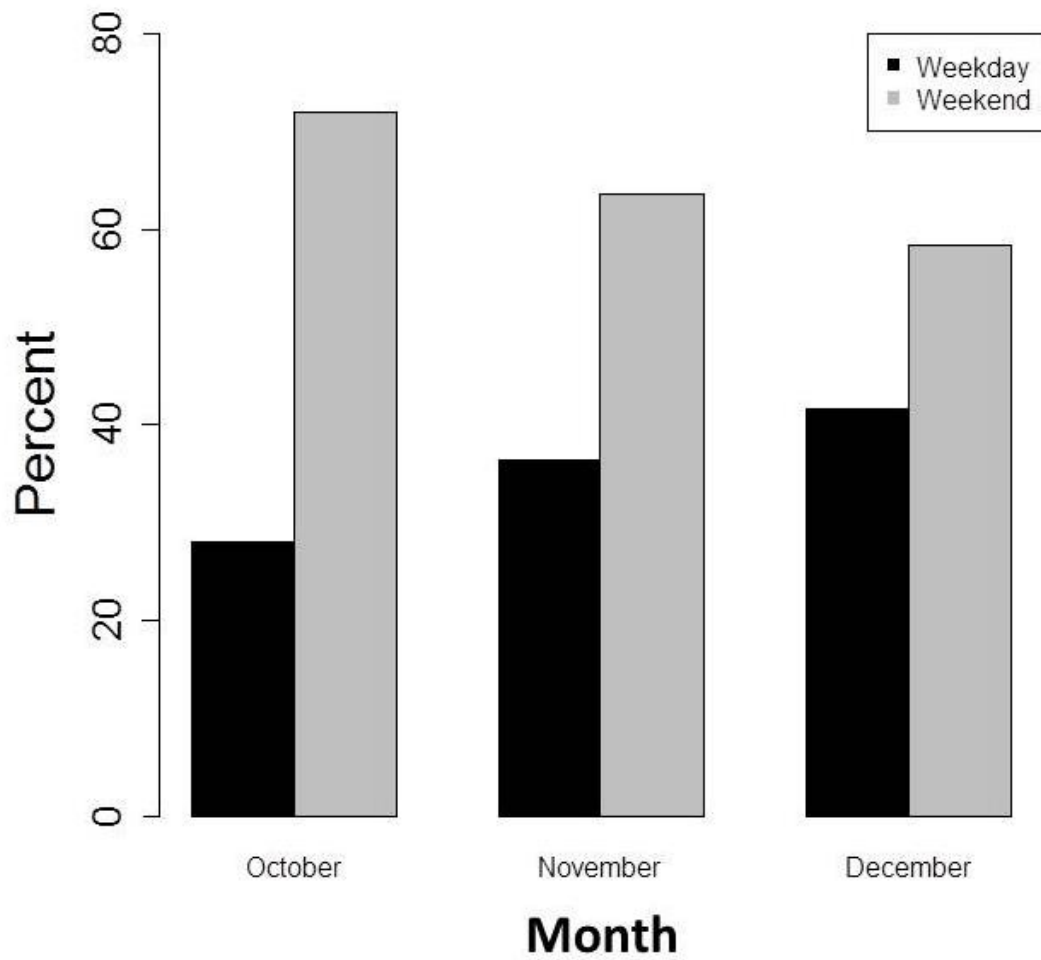


FIGURE 6.—Percent roving counts coastwide at all boat-access sites by day type within month (n=1,855).

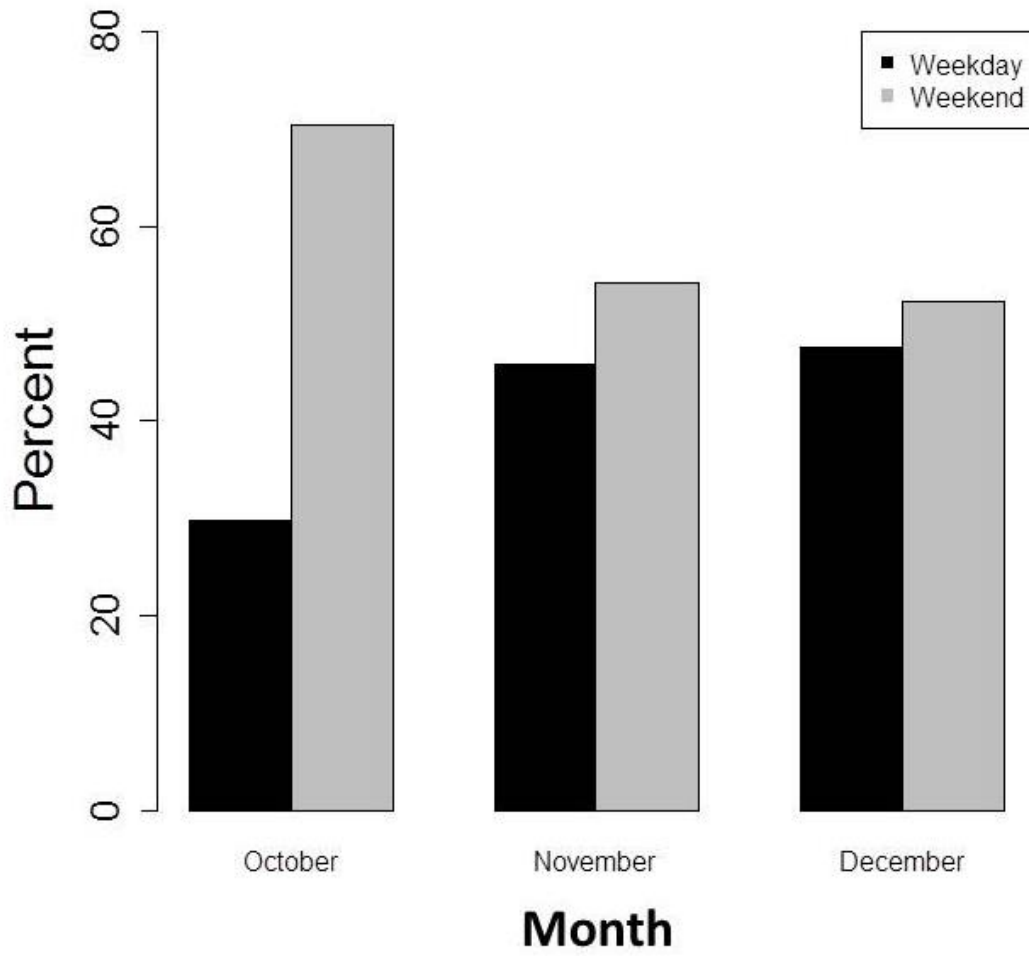


FIGURE 7.—Percent roving counts coastwide at all shore-based sites by day type within month (n=133).

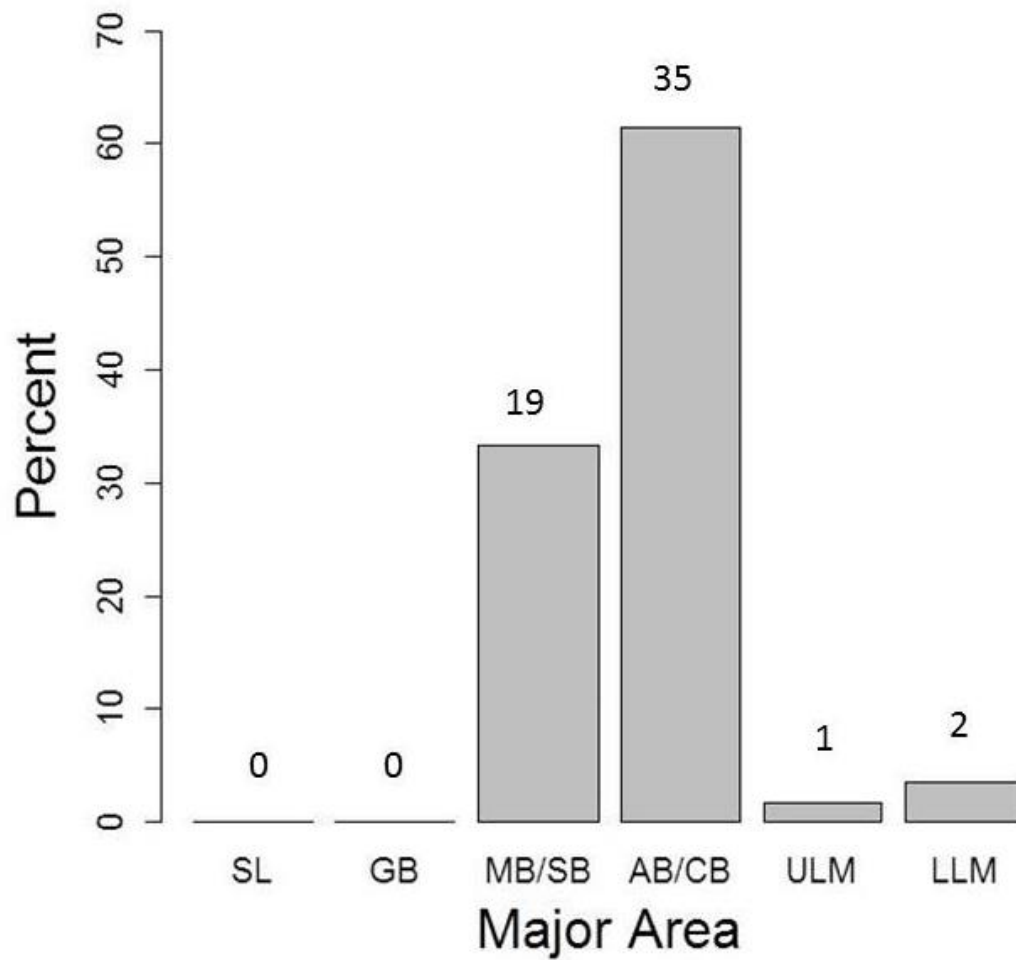


FIGURE 8.—Percent gig pre-trip interviews for boat-access sites by major area [Sabine Lake (SL), Galveston Bay (GB), Matagorda Bay/San Antonio Bay (MB/SB), Aransas Bay/Corpus Christi Bay (AB/CB), upper Laguna Madre (ULM), and lower Laguna Madre (LLM)]. Sample size for each major area is given ($n = 57$).

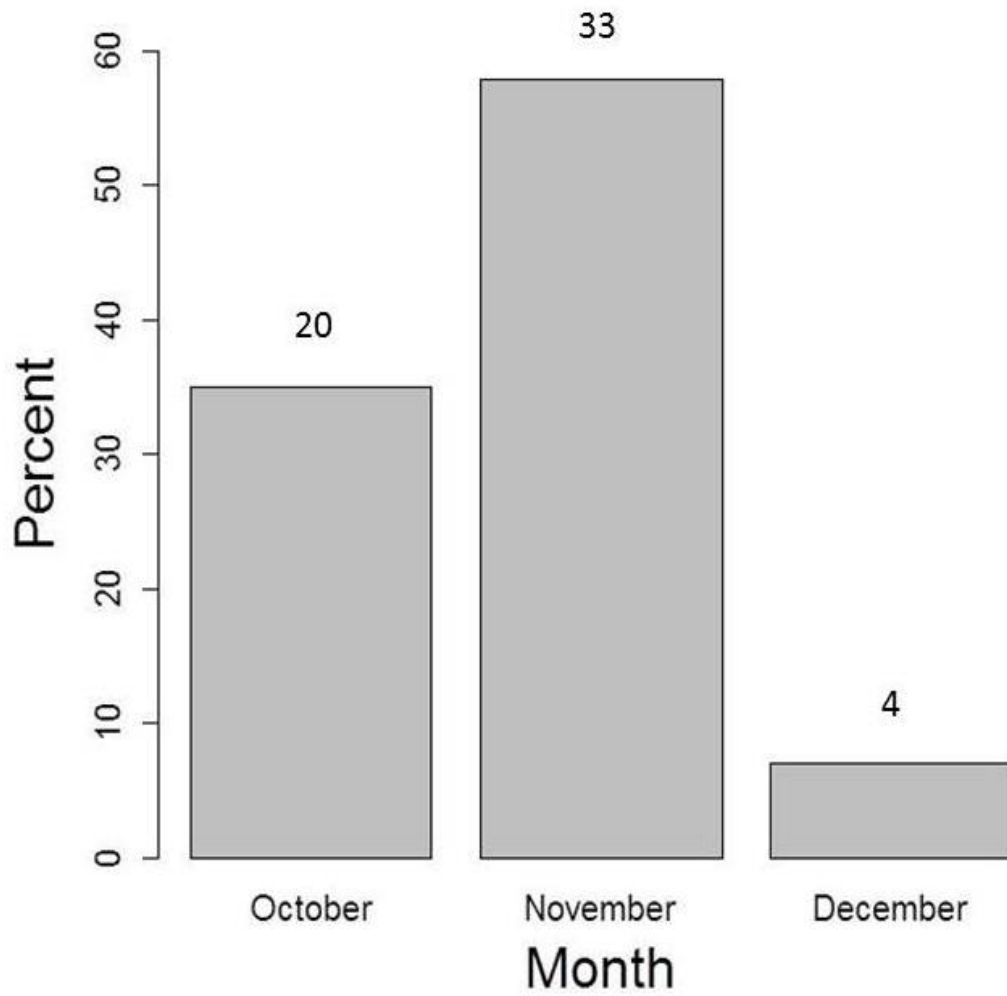


FIGURE 9.—Percent gig pre-trip interviews coastwide at all boat-access sites by month. Sample size for each month is given (n=57).

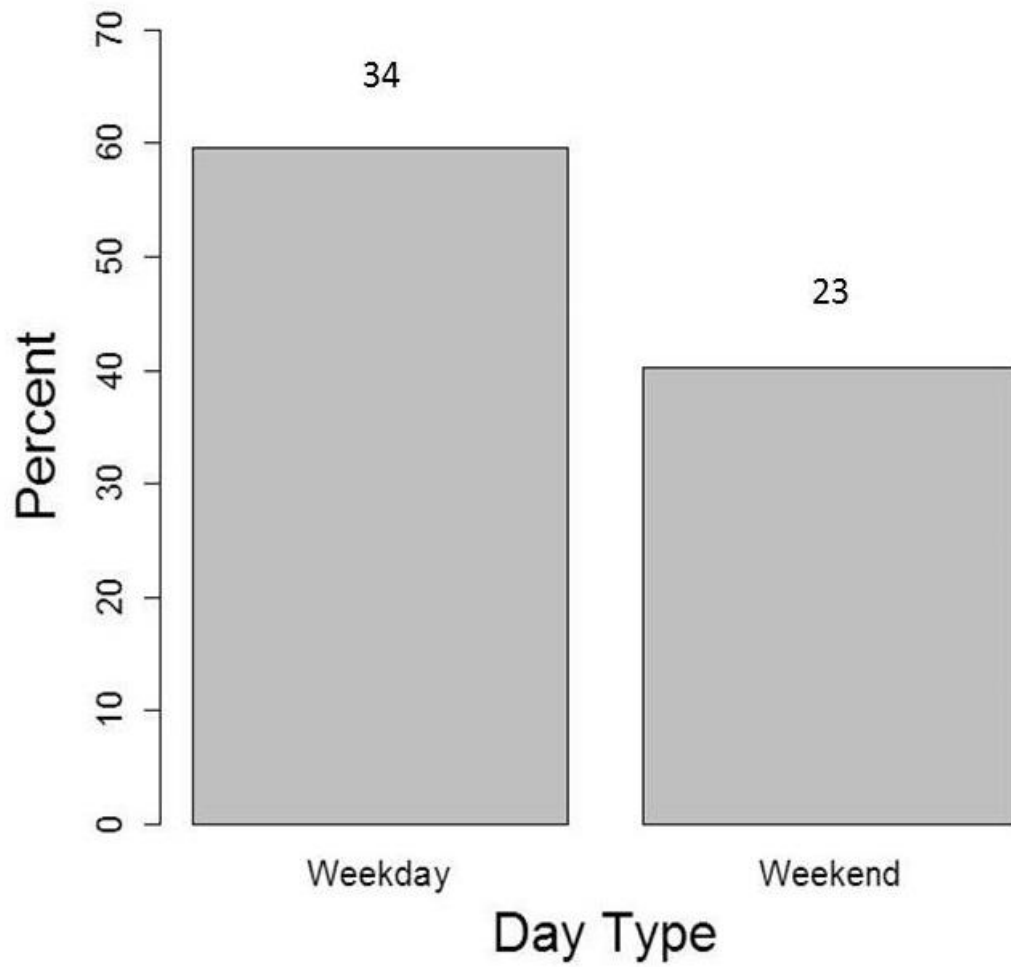


FIGURE 10.—Percent gig pre-trip interviews coastwide at all boat-access sites by day type. Sample size for each day type is given (n=57).

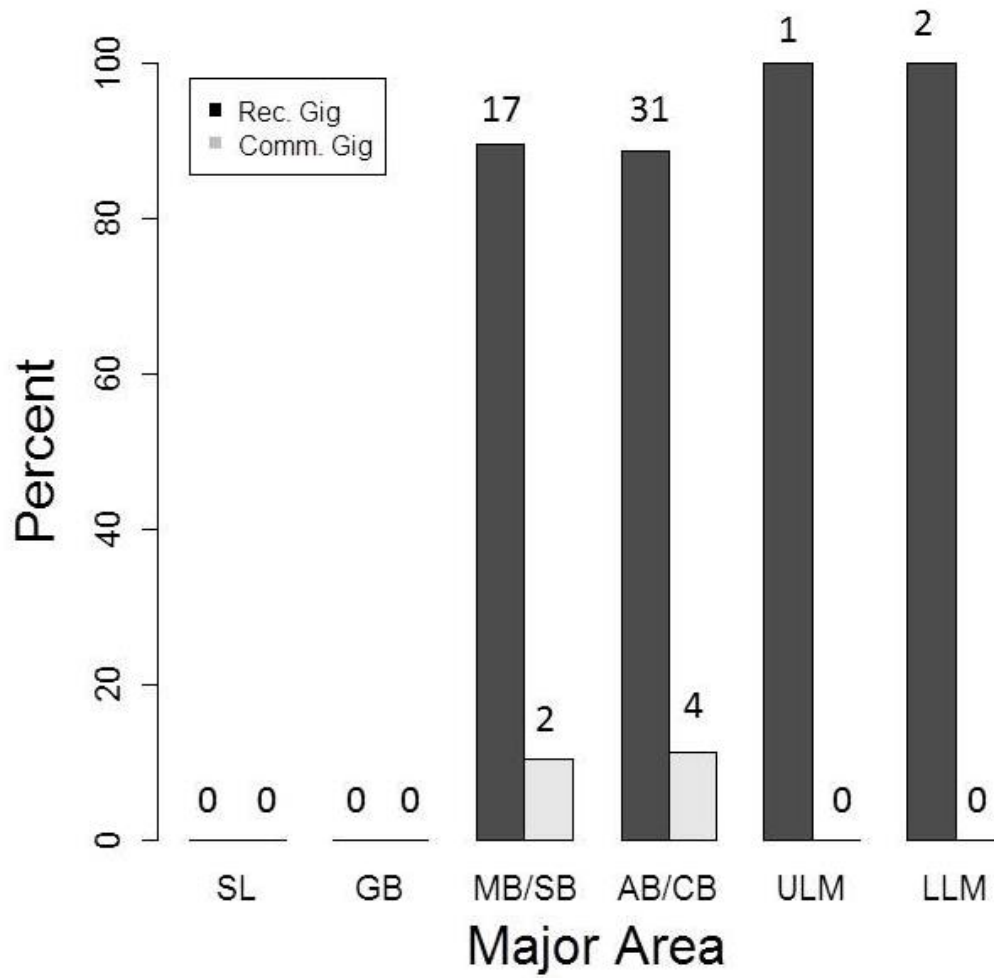


FIGURE 11.—Percent recreational (Rec. Gig) and commercial (Comm. Gig) gig pre-trip interviews within major area. Sample size for each strata is given (n=57).

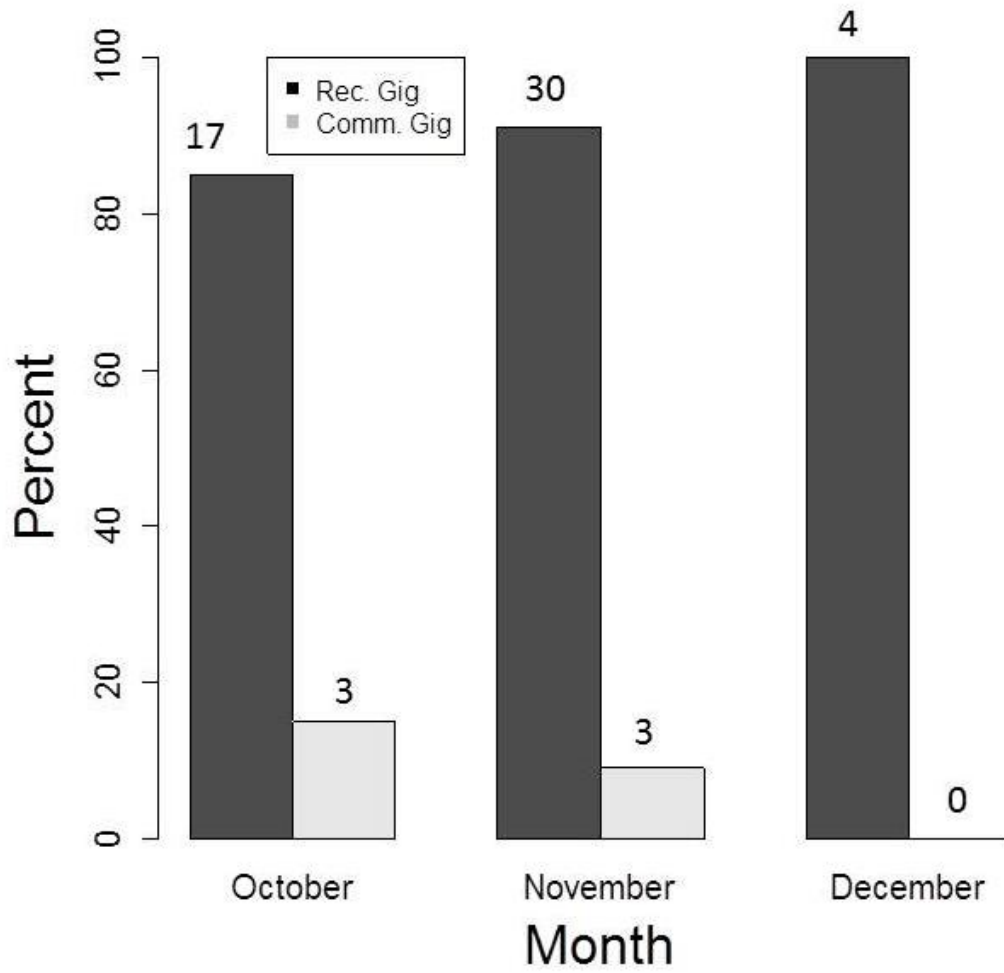


FIGURE 12.—Percent recreational (Rec. Gig) and commercial (Comm. Gig) gig pre-trip interviews coastwide at all sites within month. Sample size for each strata is given (n=57).

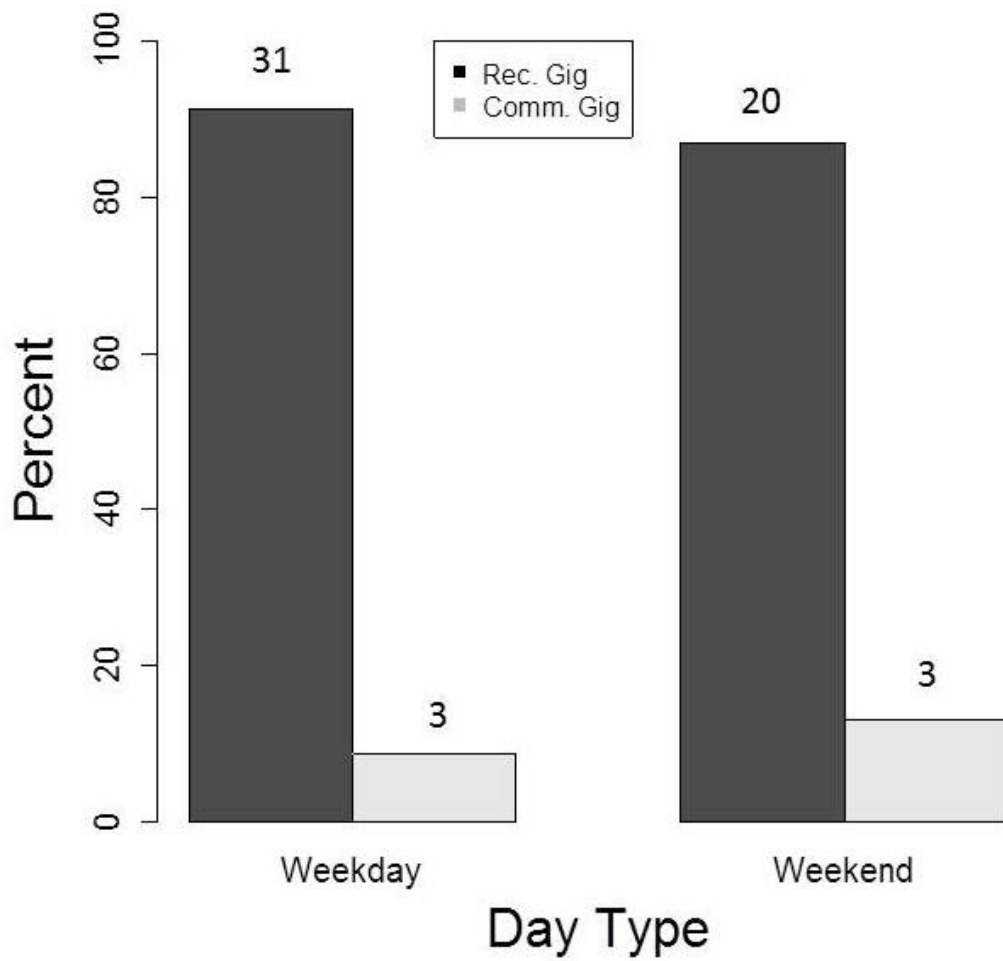


FIGURE 13.—Percent recreational (Rec. Gig) and commercial (Comm. Gig) gig pre-trip interviews coastwide at all sites within day type. Sample size for each strata is given (n=57).

Appendix A. Inventoried sites used in the 2007 nighttime roving study.

TABLE A.1.—Inventoried boat-access sites used in the 2007 nighttime roving study.

Bay system ^a	Minor bay	Site number	Latitude	Longitude	Site identification
SL	700	2	29° 46' 01"	93° 53' 35"	Lake Sabine Causeway Ramp (Louisiana side)
	700	6	29° 52' 02"	93° 55' 19"	Pleasure Island Public Ramp
	701	11	29° 45' 35"	93° 56' 09"	Keith Lake Ramp
	700	13	29° 59' 48"	93° 57' 07"	Port Neches Park Ramp
	714	14	29° 58' 12"	93° 52' 27"	Ancelet's Marina Ramp
	710	20	29° 44' 21"	93° 53' 22"	Broadway Public Ramp
	714	36	30° 00' 04"	93° 51' 59"	Entergy Canal Public Ramp (Northeast approach to bridge canal at State Hwy 87)
	710	37	29° 45' 51"	93° 53' 52"	Mesquite Point Public Ramp
	700	39	29° 51' 35"	93° 55' 49"	Logan Park Public Ramp
	GB	180	27	29° 22' 26"	94° 50' 11"
180		29	29° 21' 56"	94° 48' 55"	Sansom-Yarbrough State Ramp
201		30	29° 18' 24"	94° 54' 23"	Jones Lake State Ramp
201		34	29° 19' 53"	94° 56' 35"	Louis' Ramp
100		38	29° 12' 40"	95° 12' 29"	Chocolate Bay State Ramp
50		39	29° 05' 23"	95° 16' 36"	Marlin Marina Ramp
50		40	29° 05' 42"	95° 17' 00"	Bastrop Bayou County Road 227 Bridge State Ramp
50		41	29° 05' 08"	95° 17' 18"	Bastrop Marina Ramp & Lift
110		43	29° 02' 55"	95° 09' 55"	Christmas Bay Ramp
110		44	29° 04' 46"	95° 07' 52"	San Luis County Park Ramp
350		49	29° 08' 39"	95° 02' 51"	Sea Isle Ramp
350		57	29° 17' 07"	94° 50' 11"	61st Street County Park Ramp
350		62	29° 17' 22"	94° 52' 26"	Galveston Bait & Tackle Camp Ramp
150		66	29° 25' 50"	94° 42' 34"	Siever's Cut Bait Camp Ramp

TABLE A.1.—(Continued)

Bay system ^a	Minor bay	Site number	Latitude	Longitude	Site identification	
GB	150	70	29° 28' 53"	94° 36' 16"	Stingaree Marina Ramp	
	286	72	29° 30' 55"	94° 30' 43"	L.K. Lauderdale County Ramp	
	141	78	29° 27' 46"	94° 58' 23"	Dickinson Bayou State Hwy. 146 Bridge	
	180	83	29° 19' 05"	94° 46' 35"	Galveston Yacht Basin Ramp	
	241	84	29° 25' 07"	94° 55' 30"	Moses Lake Marina Ramp	
	150	95	29° 28' 45"	94° 36' 16"	The Oasis II Ramp	
	50	128	29° 05' 43"	95° 17' 00"	Under the Bridge Bar Bait Camp Ramp	
	91	162	29° 22' 05"	95° 45' 07"	Ermin Pilsner Public Ramp	
	180	170	29° 23' 21"	94° 45' 35"	Hornbeck's Bait Camp Ramp	
	MB/SB	170	1	28° 25' 58"	96° 25' 59"	Froggie's Public Ramp
		170	2	28° 26' 21"	96° 24' 51"	Fishing Center Ramp
		271	4	28° 30' 42"	96° 29' 18"	Indianola Marina Ramp
		220	9	28° 30' 42"	96° 33' 46"	Point Comfort Public Ramp
		210	10	28° 38' 24"	96° 27' 31"	Florence Bait Camp Ramp
		60	11	28° 44' 16"	96° 24' 07"	Crescent V Public Ramp
		60	12	28° 38' 08"	96° 21' 22"	At Last Marina Ramp
		340	13	28° 43' 15"	96° 16' 24"	Turtle Bridge Public Ramp
320		14	28° 41' 48"	96° 13' 47"	Turning Basin Ramp	
320		16	28° 42' 16"	96° 12' 33"	East Bay Public Ramp	
590		19	28° 40' 12"	95° 57' 52"	River Bend Public Ramp	
590		22	28° 37' 40"	96° 58' 13"	Rawlings Ramp	
160		24	28° 46' 20"	95° 38' 03"	Caney Creek Marina Ramp	
160		28	28° 45' 28"	95° 46' 26"	Chinquapin Ramp	
220		31	28° 41' 39"	96° 39' 50"	Six-Mile Public Ramp	
160		59	28° 41' 34"	97° 57' 29"	Matagorda Harbor Public Ramp	

TABLE A.1.—(Continued)

Bay system ^a	Minor bay	Site number	Latitude	Longitude	Site identification	
MB/SB	320	60	28° 41' 53"	96° 13' 05"	Railroad Park Public Ramp	
	170	62	28° 26' 25"	96° 24' 53"	Clark's Seafood Ramp	
	160	63	28° 46' 05"	96° 38' 25"	Crab Trap Ramp	
	160	69	28° 45' 48"	95° 37' 55"	Mitchell's Cut Public Ramp	
	170	104	28° 21' 55"	96° 34' 38"	Fulghum's Ramp	
	AB/CB	227	1	28° 01' 50"	97° 02' 17"	Little Bay Public Ramp
120		3	28° 06' 48"	97° 01' 28"	South Copano Causeway Public Ramp (State Hwy. 35)	
20		4	28° 08' 14"	97° 00' 24"	Sea Gun Marina Ramp	
310		5	28° 07' 41"	96° 59' 08"	Goose Island State Park Ramp	
310		6	28° 08' 24"	96° 58' 39"	St. Charles Marina Ramp	
280		13	27° 54' 00"	97° 08' 09"	South Conn Brown Harbor Public Ramp	
284		14	27° 53' 18"	97° 06' 42"	Fin & Feather Marina Ramp	
285		15	27° 52' 52"	97° 05' 57"	South Bay Marina Ramp	
280		17	27° 59' 30"	97° 04' 21"	Cove Harbor North Public Ramp	
280		20	27° 52' 09"	97° 05' 51"	Crab Man Ramp	
284		28	27° 53' 24"	97° 08' 55"	Aransas Pass Airport Public Ramp	
96		29	27° 50' 17"	97° 04' 00"	Port Aransas Public Ramp	
284		46	27° 53' 20"	97° 08' 49"	Ransom Channel Park Public Ramp	
280		48	27° 59' 23"	97° 04' 44"	Cove Harbor South Public Ramp	
130		103	27° 50' 16"	97° 13' 15"	Ingleside Cove Public Ramp	
130		109	27° 44' 14"	97° 08' 13"	Wilson's Cut Ramp	
ULM		370	11	27° 38' 05"	97° 14' 17"	Clem's Marina Public Ramp
		370	12	27° 38' 03"	97° 14' 11"	Billing's Public Ramp
		370	19	27° 28' 22"	97° 18' 31"	Bird Island Basin Ramp
	370	27	27° 37' 55"	97° 14' 22"	Marker 37 Ramp	

TABLE A.1.—(Continued)

Bay system ^a	Minor bay	Site number	Latitude	Longitude	Site identification
ULM	670	29	27° 37' 06"	97° 12' 45"	Packery Channel Public Ramp
LLM	230	2	26° 06' 06"	97° 10' 08"	Jim's Pier Ramp
	230	7	26° 04' 27"	97° 12' 52"	White Sands Ramp
	262	11	26° 20' 10"	97° 26' 10"	Ready's Bait Stand Ramp
	230	13	26° 33' 10"	97° 25' 41"	Willacy County Navigation District Ramp
	282	14	26° 33' 24"	97° 25' 44"	Port Mansfield State Ramp
	230	17	26° 33' 06"	97° 25' 42"	Port Mansfield Boat Basin Docks
	230	24	26° 03' 59"	97° 12' 37"	Sea Ranch Marina II Dry Storage Shed at Southpoint
	230	27	26° 04' 43"	97° 10' 09"	South Padre Island State Ramp
	262	30	26° 20' 59"	97° 23' 28"	Adolph Tomae County Park Ramp

^a SL=Sabine Lake, GB=Galveston Bay, MB/SB=Matagorda Bay/San Antonio Bay, AB/CB=Aransas Bay/Corpus Christi Bay, ULM=upper Laguna Madre, and LLM=lower Laguna Madre.

TABLE A.2.—Inventoried shore-based sites used in the 2007 nighttime roving study.

Bay system ^a	Minor bay	Station	Latitude	Longitude	Site identification
SL	714	33	29° 42' 05"	93° 51' 13"	West shore of Sabine Pass Channel from old Coast Guard Station to south for 1.0 mile
GB	700	70	29° 55' 02"	93° 52' 15"	North levy northern-most drain pipes
	180	201	29° 26' 42"	94° 55' 02"	Moses floodgates to Bay Street
	180	202	29° 25' 19"	94° 53' 26"	Bay Street intersection to start of Texas City Dike
	180	203	29° 23' 25"	94° 53' 10"	Both sides of base of Texas City Dike
	180	204	29° 23' 20"	94° 52' 55"	Texas City Dike spoil island
	180	205	29° 18' 14"	94° 53' 54"	Virginia Point
	110	303	29° 02' 01"	96° 11' 40"	Vicinity of Cedar Cut Public Ramp (BR #149)
	110	304	29° 02' 52"	96° 09' 56"	Vicinity of Christmas Bay Public Ramp (BR #43)
	530	305	29° 04' 45"	95° 07' 30"	West side of San Luis Pass
	530	306	29° 05' 08"	95° 07' 06"	East side of San Luis Pass
	350	308	29° 08' 12"	95° 03' 49"	Terramar Beach area
	350	402	29° 15' 20"	94° 55' 05"	End of Sportsman Road
	350	403	29° 15' 54"	94° 53' 56"	Anderson Ways
	350	404	29° 16' 22"	94° 52' 50"	End of 103rd Street at Offatts Bayou
	91	503	29° 22' 08"	94° 45' 06"	Fort Travis to base of North Jetty
	192	506	29° 22' 20"	94° 46' 05"	Horseshoe Lake to Port Bolivar
	500	507	29° 30' 48"	94° 30' 30"	West side of Rollover Pass
	500	508	29° 30' 48"	94° 29' 42"	East side of Rollover Pass
	330	602	29° 45' 18"	94° 41' 30"	Fort Anahuac Park (BR 75)
	150	603	29° 34' 30"	94° 33' 21"	Anahuac National Wildlife Refuge
MB/SB	210	8	28° 38' 12"	96° 27' 20"	Olivia Park area
	340	12	28° 41' 15"	96° 16' 25"	Area at end of road 0.8 mile southwest of Jensen Point

TABLE A.2.—(Continued)

Bay system ^a	Minor bay	Station	Latitude	Longitude	Site identification
MB/SB	320	14	28° 41' 43"	96° 13' 50"	Southwest of Palacios Turning Basin from west jetty to southwest for 0.4 mile to drainage ditch
	320	18	28° 43' 57"	96° 12' 05"	Along East Bayshore Avenue for 0.7 mi from McGlothlin Street to Yellow Windmill Point
	360	20	28° 36' 50"	96° 12' 42"	Oyster Lake bridge area
	220	31	28° 39' 56"	96° 34' 50"	North side of Port Lavaca Causeway from east end of causeway to northeast for 0.75 mile to last access road
	220	42	28° 41' 38"	96° 39' 50"	Shoreline adjacent to Six-Mile boat ramp parking lot 0.5 mile south of Placedo Creek
	60	48	28° 43' 55"	96° 25' 58"	Both ends of Hwy. 35 bridge over Carancahua Bay
	60	49	28° 44' 17"	96° 24' 05"	Shoreline adjacent to Crescent V boat ramp parking lot
	360	51	28° 38' 32"	96° 19' 22"	Area at end of road 1.2 miles west of Well Point
	320	55	28° 43' 47"	96° 11' 10"	Collegeport boat ramp area
	320	74	28° 41' 26"	96° 14' 35"	Area at end of road 1.0 mile southwest of Palacios Turning Basin
	170	114	28° 21' 52"	96° 34' 53"	ICWW shoreline near Charlie's Bait ramp
	360	170	28° 26' 55"	96° 24' 10"	Entire length of Port O'Connor seawall, including jetty at southeast end
AB/CB	280	2	27° 53' 34"	97° 07' 26"	North side of Hwy. 361 from ICWW in Aransas Pass to Morris & Cummings Cut
	20	6	27° 59' 52"	97° 03' 37"	Shoreline along Shell Ridge Road
	95	17	27° 52' 40"	97° 05' 45"	North side of Hwy. 361 from Morris & Cummings Cut to southeast for 2.3 miles
	95	20	27° 51' 11"	97° 04' 16"	South shore of Aransas Channel from northwest tip of Harbor Island to south for 1.1 miles
	227	35	28° 01' 50"	97° 02' 43"	South end of Little Bay from park entrance on east shore to 0.7 mile northeast along west shore

TABLE A.2.—(Continued)

Bay system ^a	Minor bay	Station	Latitude	Longitude	Site identification
AB/CB	310	45	28° 08' 18"	96° 58' 39"	Hail Point including St. Charles Marina pier.
	310	47	28° 09' 04"	96° 58' 23"	Eighth Street to Big Tree Road
	120	48	28° 0' 8" 12"	97° 00' 30"	North Copano Causeway west side to northeast corner of Copano Bay
	120	67	28° 06' 39"	97° 01' 38"	South Copano Causeway west side to southeast corner
	130	118	27° 49' 17"	97° 11' 46"	Northwest of Beach Club west property line to just southeast of Beach Club east property line
	130	120	27° 49' 20"	97° 11' 47"	South end of Hwy. 1069 at Corpus Christi Ship Channel
	284	126	27° 53' 31"	97° 07' 27"	South side of Hwy. 361 from ICWW to west side of Stedman Island
	284	129	27° 52' 36"	97° 05' 53"	South side Hwy. 361 from 0.7 miles southeast of Morris & Cummings Cut to southeast for 0.75 miles
	284	130	27° 52' 06"	97° 05' 19"	South side Hwy. 361 from 1.45 miles southeast of Morris & Cummings Cut to southeast for 0.75 miles
	284	131	27° 51' 27"	97° 04' 56"	South side Hwy. 361 from northwest tip Harbor Island to south for 0.55 miles
	96	132	27° 50' 05"	97° 05' 26"	South shore Corpus Christi Ship Channel from just east of county pier to Piper Channel (Charlie's Pasture)
	96	134	27° 50' 20"	97° 04' 11"	South shore of Corpus Christi Ship Channel from west side of ferry landing to east end of bulkhead at mariculture lab
	130	154	27° 44' 15"	97° 08' 13"	East end of Wilson's Cut
ULM	370	7	27° 37' 15"	97° 12' 49"	South side of both ends of Park Road 53 bridge over Packery Channel
	370	8	27° 36' 55"	97° 12' 37"	North side of both ends of Park Road 53 bridge over Packery Channel

TABLE A.2.—(Continued)

Bay system ^a	Minor bay	Station	Latitude	Longitude	Site identification
ULM	370	9	27° 37' 52"	97° 13' 10"	South shore of Packery Channel from southeast boundary of Nueces County Park to northwest for 0.6 mile
	370	10	27° 37' 53"	97° 13' 28"	South shore of Packery Channel from north side of Park Road 22 to northeast for 0.3 mile
	370	11	27° 37' 50"	97° 13' 22"	North side of Park Road 22 from east end of Padre Isles bridge to 0.4 mile east of bridge
	370	25	27° 39' 02"	97° 15' 18"	South side of Kennedy Causeway from east end of Humble Channel bridge to southeast for 1.1 miles
	370	30	27° 28' 34"	97° 18' 32"	Bird Island Basin area from 0.5 mile northeast of end of paved road to northeast for 0.9 mile
	370	31	27° 28' 06"	97° 18' 48"	Bird Island Basin south
	230	39	26° 04' 55"	97° 10' 05"	South Padre Island from Queen Isabella Causeway to south for 0.4 mile to public boat ramp at old causeway
	230	40	26° 05' 28"	97° 10' 00"	South Padre Island from Queen Isabella Causeway to north for 0.8 mile to Fiesta Harbor
	230	41	26° 08' 14"	97° 10' 36"	South Padre Island from north water tower to south to Parrot Eyes restaurant
	230	59	26° 04' 16"	97° 11' 37"	Long Island Peninsula from swing bridge on north side to east for 0.6 mile then west for 0.4 mile to Outdoor Resorts on south side
LLM	230	74	26° 03' 33"	97° 10' 15"	South side of Brownsville Ship Channel from northeast for 1.2 miles then southeast 0.4 mile to beginning of road bulkhead
	230	87	26° 04' 35"	97° 10' 00"	South Padre Island from north side of Coast Guard Channel to public boat ramp at old causeway
	230	88	26° 04' 15"	97° 09' 50"	South Padre Island from south side of Coast Guard Channel to southeast along shoreline for 0.45 mile to beginning of rock bulkhead

TABLE A.2.—(Continued)

Bay system ^a	Minor bay	Station	Latitude	Longitude	Site identification
LLM	230	89	26° 08' 35"	97° 10' 20"	South Padre Island from north water tower to north along shoreline for 1.0 mile

^a SL=Sabine Lake, GB=Galveston Bay, MB/SB=Matagorda Bay/San Antonio Bay, AB/CB=Aransas Bay/Corpus Christi Bay, ULM=upper Laguna Madre, and LLM=lower Laguna Madre.

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