Texas Parks and Wildlife Department's Marine Sport-Harvest Monitoring Program Metadata

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TPWD Marine Sport-Harvest Monitoring Program

I. Description

The Texas Parks and Wildlife Department (TPWD) Marine Sport-Harvest Monitoring Program samples fishing trips made by sport-boat anglers fishing in Texas marine waters. The TPWD survey provides estimates of daytime recreational fishing effort, landings, catch rate, and the species and length composition (of catch) for two six-month periods (seasons) per year. The primary focus of this survey is to monitor fishing activities of private-boat anglers fishing in Texas inshore waters (i.e., bays and passes) during daylight hours and returning from trips lasting less than 12 hours. Private-boat anglers fishing in offshore (Gulf of Mexico) waters and party-boat anglers (i.e., charterboats) fishing in both inshore and offshore waters are also sampled by the TPWD survey.

II. Methodology

Like many sport fishing surveys, the recreational activities of the Texas sport-boat angling population are monitored by two complementary surveys: a roving count survey to quantify relative fishing pressure and dockside interviews to enumerate catch (i.e., observed harvest in numbers of fish) and effort (in man-hours) (National Research Council 2006). Sport-boat anglers consist of fishermen that use privately-owned, rental boats (i.e., private-boats), or employ a professional guide for groups of less than ten people (i.e., party-boats or charterboats). The sample is stratified by bay, season, and day type. The TPWD survey divides inshore Texas waters into eight bay systems and offshore marine waters into five gulf areas (Figure 1). Temporally, the sampling year is split into four strata with effort divided between high-use (May 15th – Nov 20th) and low-use seasons (Nov 21st – May 14th) and between weekdays (Mon-Fri) and weekends (Sat-

Sun, holidays). This stratification scheme allows for bay-specific estimates of catch and effort important to state management of the Texas sport-boat fishery. Estimates from this survey are calculated by species, year, fishing activity (private vs. charterboat), season (high-use vs. low-use), bay system (Figure 1), and area fished (inshore bays and passes; Texas Territorial Sea, TTS; Exclusive Economic Zone, EEZ) (Phares 2005).

Catch data are collected from dockside interviews of any sport-boat anglers returning to inventoried coastal boat-access sites between 1000 and 1800 hours. Interviewers record the number of landed fish (i.e., observed harvest), equivalent to Type A Catch in the Marine Recreational Information Program (MRIP) survey conducted in other Gulf states (Matter and Nuttall 2020). Maximum total length is recorded for up to six randomly selected specimens of each species landed. Trip-specific information that includes angler county of residence, trip satisfaction, number of anglers, trip duration, and the spatial area and target species of fishing activities is also recorded. Self-reported catch is not monitored by the TPWD survey and so unobserved harvest (B1) and live discards (B2) are not estimable. Fish weights have not been measured by TPWD since May 1983. However, mean weights are provided based on length-weight conversion factors, many of which were derived from specimens collected by TPWD in the 1980s (Table 1).

Effort data are collected from both dockside interviews and roving count surveys, the former providing trip-level observations of absolute effort (in units of man-hours) from the product of number of anglers and trip length (not fishing time) (TPWD 1994, 2010, Phares 2005). Coast-wide observations of relative effort (i.e., fishing pressure) are collected from roving count

surveys wherein samplers drive to all boat-access sites within an assigned bay system and count 1) empty boat trailers at identified boat ramps and 2) empty wet slips and mooring spaces at marinas and boathouses. These counts are adjusted to account for non-angling activity based on dockside interviews reporting no fishing and the number of unrented slips and spaces from marina and boathouse operators. Roves only occur on "good weather" days and between the hours of 0800 and 1230. This approach maximizes counts per unit sampling effort and the comparability of counts among sites (TPWD 2010, 2017). During the high-use season, "bad weather" days are those where small craft advisories are in effect. Similarly, roves (and dockside interviews) are cancelled during the low-use season when weather conditions at 0800 suggest the data collected throughout that sampling day will not be worth the required resources to sample (e.g., two or fewer angler parties interviewed), as informed by nomographs using air temperature, wind speed, and precipitation as predictors (Spiller et al. 1988, TPWD 1994, 2017). Dockside interview surveys are also terminated early if no interviews are conducted by a predetermined time: 1300 hours for high-use weekends, 1400 for high-use weekdays and low-use weekends, and 1600 for low-use weekdays.

Sampling Design

The sampling frame for this survey consists of all Texas boat-access sites accessible to the general public and is updated biannually (i.e., seasonally) to reflect the opening and closing of sites. Prior to each survey season (i.e., high-use and low-use), sampling schedules are generated for each bay system (Figure 1) and day type (i.e., weekends and weekdays) from a two-step process: site selection and survey scheduling. First, active boat-access sites within each bay are randomly sampled with replacement, with selection probabilities proportional to the relative

fishing pressure at each site to ensure sites with high fishing activity are sampled more frequently than those with low fishing activity (TPWD 1988, 2010, 2017). Relative fishing pressure is calculated as the adjusted average effort of each boat-access site from the roving count survey divided by the sum of the adjusted average efforts from all sites in that bay system; this calculation is described in the next section in Equation 2. For each inshore bay (and pass) system, roves from the previous three years are used to construct pressure files with the most recent year weighted by 50% and the other two years by 25%. In step two, the high-use and low-use sampling seasons for each bay system are divided into 30-day intervals, within which a set number of weekends and weekdays are sampled without replacement to evenly distribute surveys across seasons and day type. Other scheduling procedures are then applied to evenly distribute surveys amongst days within each day type, minimize the number of surveys conducted each week, and maximize sampling at "crossover" sites (TPWD 2010, 2017). Crossover sites are located in one bay system, but comprise at least 1% of an adjacent bay's fishing activity. Such surveys satisfy sampling requirements in two bay systems (i.e., "double" surveys) and reduce the number of surveys and manpower requirements of the TPWD survey.

Gulf-only surveys supplement the data collected from routine (bay and pass) surveys. Gulf-only sites are added to the TPWD sampling schedule so the distribution of sampling intensity for the combined routine and gulf-only surveys better reflects the relative fishing pressure of those sites supporting gulf fishing (TPWD 2010). Gulf-only surveys are not scheduled during the low-use season given the relatively small amount of gulf fishing pressure that time of year. Only gulf fishing parties are interviewed in full during the gulf-only surveys (Phares 2005, TPWD 2010). Because there are much fewer gulf interviews than bay and pass interviews (<10%; TPWD

2010), counts from the previous four years are used to construct pressure files for each Gulf area, except Galveston Bay where six years of data are used. Site selection for gulf-only surveys does not distinguish between anglers fishing in TTS and EEZ waters and eliminates boat-access sites with limited to no offshore fishing activity.

Thirty-two sampling schedules are generated for the inshore bay systems of Texas (i.e., 2 seasons x 2 day types x 8 bay systems) but only ten for offshore gulf anglers (i.e., 1 season x 2 day types x 5 gulf areas). Since May 1983, TPWD has scheduled 1,014 dockside intercept surveys annually for bay and pass areas (Figure 1) (TPWD 2010). During every high-use season, 97 total surveys are scheduled for six of the eight inshore (bay and pass) systems, divided amongst 31 weekends (WE) and 66 weekdays (WD); sampling of Sabine Lake and San Antonio Bay is over 26 WE and 46 WD (72 total surveys). In low-use seasons, 36 total surveys are scheduled for each inshore bay system, divided amongst 12 WE and 24 WD. In addition to the routine inshore surveys, a total of 33-38 "gulf-only" surveys are conducted across all Gulf areas each year during the high-use season; their distribution variable between WE and WD surveys. Beginning in 2015, the number of "gulf-only" surveys was tripled (103-109 total surveys) to improve the precision of Red Snapper landings estimates.

A total of 128 roving count surveys have also been conducted annually since May 1983, 10 in each bay system during the high-use season (80 total) and 6 during the low-use season (48 total). Roves are scheduled so that one weekend and one weekday survey is conducted in five designated time blocks for the high-use season (i.e., May 15th through June, July, August, September, and October through November 20th) and three time blocks for the low-use season

(i.e., November 21st through January, February through March, and April through May 14th) (TPWD 2010). At least one weekend rove is conducted on Saturday and one on Sunday during low-use seasons and at least two on each of these days during high-use seasons.

Estimation of Landings and Effort

The total harvest (in numbers) from each b bay system and t time period (season/day type) ($\hat{A}_{bt}$) is estimated as the product of the (1) total number of "fishable" days within the strata (d_{bt}) and (2) expected (mean) number of fish landed each day across all i boat-access sites in bay b and time period t ($\hat{\bar{A}}_{bt}$) (TPWD 1994, 2010, Phares 2005):

Equation (1)

$$\hat{A}_{bt} = d_{bt}\hat{\bar{A}}_{bt} = \frac{d_{bt}}{n_{bt}}\left(\sum_{h=1}^{n}\sum_{i=1}^{s}\sum_{j=1}^{m} A_{bthij}\frac{l_t z_{bth}}{p_{bti}}\right)$$

Fishable days (d_{bt}) are those not experiencing a severe weather anomaly (e.g., hurricanes, tropical storms, ice storms). Days subject to lesser weather events that may discourage boating activities (e.g., frontal passages) are considered fishable (TPWD 2017). Average daily landings ($\hat{\bar{A}}_{bt}$) are calculated as that observed each day across all m interviews within each site i over n surveys in a given strata (from dockside interviews), expanded for any missed interviews during a survey (z_{bth}), daylight hours not surveyed (l_t), and site-specific estimates of relative fishing pressure (p_{bti}):

Equation (2)

$$p_{bti} = \frac{\bar{q}_{bti}u_{bti}v_{bti}}{\sum_{i=1}^{s}\bar{q}_{bti}u_{bti}v_{bti}}$$

which is the proportion of total fishing pressure in bay b (across all s sites) occurring at site i; TPWD relative fishing pressure is calculated as the average number of empty boat trailers and

rented wet slips observed at site i ($\bar{q}_{bti}$) (from roving counts) adjusted for interviewed parties not fishing at site i (u_{bti}) or that park their trailer or rent a wet slip at a different site (v_{bti}). Stratified estimates of fishing effort ($\hat{f}_{bt}$) are calculated and adjusted using the same approach as that described for landings, but with observed landings (A_{bthij}) replaced by effort (f_{bthij}) in Equation (1). Effort observations (f_{bthij}) are in units of man-hours and calculated as the product of number of anglers and trip length from dockside interviews (TPWD 1994, 2010, Phares 2005). Catch rates are estimated using the quotient of TPWD estimates for total harvest ($\hat{A}_{bt}$) and fishing effort ($\hat{f}_{bt}$).

Fishing activity that falls outside the scope of the survey

The objective of the TPWD survey is to provide estimates of catch, size composition, and catch rate for private and charterboat anglers fishing in Texas waters to assist state managers tasked with regulating the popular Texas sport-boat fishery (TPWD 2010, 2017). Following this objective, TPWD catch estimates are only provided for "target species" with historical, current, or anticipated importance to the fishery (Table 2). These target species are also different between inshore (bays and passes) and offshore waters (TTS+EEZ). Although counted separately during dockside interviews, all non-target species are grouped into an "other" category for which the TPWD survey provides a single catch estimate.

As described above, site selection in the TWPD survey is made in proportion to the total fishing pressure each site supports and is stratified by bay system and time period (season, day type), but not fishing mode or area fished. Therefore, the TWPD survey mostly intercepts those anglers that

dominate the Texas sport-boat fishery: inshore private-boat fishermen (79% of total annual fishing effort; TPWD 2010). Gulf-only surveys were added to the TPWD survey in May 1992 to increase sampling of offshore private-boat anglers during the high-use season. Otherwise, charterboat and offshore private-boats are sampled opportunistically. Inshore charterboats (13%) and offshore private-boats (7%) (TPWD 2010) tend to launch from the same docks as inshore private-boat fishermen and are intercepted regularly by TPWD. Conversely, offshore charterboat fishermen are infrequently intercepted by the TPWD survey (1% of total effort) as these fishermen tend to launch from different docks than those used by private-boat anglers (Lee Green, pers. comm., 2006). There are also relatively few offshore charterboat operators in Texas, with only about 200 holding federal reef fish permits (Mark Fisher, pers. comm., 2020).

Additionally, estimates of sport-boat angler catch and effort by the TPWD survey should be considered minimum estimates (TPWD 1989). Dockside interviews and roving counts are only conducted throughout the day (1000 to 1800 hours) and do not cover any sport-boat fishing activities returning to the dock during the night or early daytime hours. On average, nighttime (1800-1000 hours) fishing effort constitutes 20% of the total fishing activity occurring at Texas docks over each 24-hour period, pressure that is likely to differ seasonally, between bay systems, and by target species (TPWD 2014). Sport-boat anglers launching from private docks are also not captured by the TPWD survey design. Historically, Ferguson and Green (1987) estimated that 17.8% (±7.7%) of all saltwater sport-boat anglers fishing in Texas waters originated from private residences or commercial boathouses. While boathouses were added to the inventory of coastal boat-access sites in May 1983, TPWD samplers do not have access to private docks. It is unclear what percentage of Texas sport-boat anglers currently launch from private docks.

Lastly, it is worth highlighting that the target population of the TPWD survey are Texas sport-boat anglers. This survey does not cover all other recreational fishing modes, some of which have sizable contributions to the total recreational fishing activities currently operating in Texas marine waters. Budgetary constraints and difficulties in sampling certain saltwater angler populations necessitated a focus of TPWD sampling on daytime, sport-boat anglers (TPWD 2018). Initially included in the survey (1974-76), headboat anglers and shore-based fishermen (i.e., wade and bank areas, lighted commercial piers) were ultimately removed from the TPWD survey design (Phares 2005, TPWD 2010, 2018). The routine monitoring of Texas headboats that began in May 1983 was terminated in May 1991 (TPWD 1989, 1994). Headboats have been covered by the Southeast Region Headboat Survey since 1986 (Brennan 2010, Fitzpatrick et al. 2017) and, on average, comprised only 5.2% and 2.8% of the total catch and effort (respectively) of inshore Texas sport-boat anglers between 1983 and 1991 (TPWD 1989, 1994).

Shore-based anglers, conversely, are not covered by another survey and exert much stronger pressure on Texas stocks. Boat anglers expended more effort (50% vs. 33%) and landed more fish (73% vs. 17%) than shore fishermen in the late 1970s, but a recent study (2013-2014) found comparable effort (4.90 vs. 4.79 million man-hours) and landings (1.23 vs. 1.52 million fish) between daytime inshore private-boat and shore-based anglers in Texas (TPWD 2018). According to TPWD estimates from 1998 to 2008, inshore private-boats account for 79% and 72% of all daytime sport-boat fishing effort and catch, respectively (TPWD 2010). Assuming these proportions (shore anglers to inshore private anglers and inshore private anglers to all sport-boat anglers) are consistent over time, shore-based fishing may represent almost half of all

fishing monitored by the TPWD survey. In addition, as seen in Table 3, landings of targeted species differ greatly between Texas sport-boat and shore-based anglers.

III. Temporal coverage

The TPWD survey design and its sport-boat angling estimates are stratified into high-use (May 15th – Nov 20th) and low-use seasons (Nov 21st – May 14th) and between weekdays (Mon-Fri) and weekends (Sat-Sun, holidays). Although sampling has been conducted year-round since the inception of the survey in May 1974, historical estimates are not comparable to those after May 1983 due to changes in sampling procedure (TPWD 2010). Total sampling effort was originally partitioned amongst quarters and fishing modes which, respectively, were:

- Winter (Dec-Feb), Spring (Mar-May), Summer (Jun-Aug), Fall (Sept-Nov)
- Shore (wade and bank), Boats Ramps (public), Lighted Piers (nighttime)

In May 1980, sample size issues and corresponding concerns with precision warranted changes to the stratification of sampling year, divided into the high-use and low-use seasons still in use today (TPWD 2017). Shore-based and nighttime angling sites were also removed from the TPWD sampling frame, focusing the survey on private-boat anglers. Additionally, historical catch estimates were calculated by scaling catch rates with total effort (TPWD 1989), analogous to that done by MRIP (Matter and Nuttall 2020), and required roves to produce accurate estimates of total absolute effort across the entire bay system. In May 1980, following budgetary constraints and logistical challenges to sampling (e.g., gas shortages, irregular operating hours), the objective of roves switched to estimation of the relative fishing pressure of individual sites in a given bay system (p_{bti} in Equation 2). This approach reduced sampling costs by 16-33% (TPWD 1989) but fundamentally changed the way the TPWD survey estimates catch and effort

(i.e., trip level observations scaled with “fishable” days; Equation 1). Bay fishermen were the only anglers interviewed before September 1977, after which all parties intercepted at a site were interviewed (i.e., bay, pass, gulf). However, it was not until May 1982 that the TPWD survey distinguished between anglers fishing in the TTS and EEZ (TPWD 1994).

Many of the modifications implemented in May 1983 finalized the foundation for the TPWD survey that exists today (Osburn and Osborn 1991, TPWD 2017). Marinas and boathouses were included in the TPWD boat-access site inventory to allow for routine monitoring of party-boats (i.e., charterboats). Samplers were instructed to measure fish length instead of weight, with few exceptions. The number of sampling days allocated to weekends (WE) and weekdays (WD) within each bay system was standardized: 12 WE and 24 WD each low-use season and 31 WE and 66 WD each high-use season, except San Antonio Bay and Sabine Lake wherein high-use sampling effort is spread over 26 WE and 46 WD surveys. Similarly, starting in May 1983, the time period over which roving count surveys are conducted has been consistent (0800 to 1230); dockside interviews have been conducted between 1000 and 1800 hours since September 1975.

Additional, but lesser, modifications to the TPWD survey design occurred after 1983, some of which are described below (TPWD 2017). In May 1984, WE surveys in the low-use season could be terminated at 1400 hours if no angling interviews had been conducted prior to that time. This early termination criteria was extended to high-use WE surveys in May 1985, during which time nomographs started being used to cancel surveys based on “bad” weather days. Starting in November 1986, WD surveys in both seasons could be terminated at 1600 hours and, in May 1991, early termination times for the high-use season were changed to 1300 and 1400 hours for

WE and WD surveys respectively. Coverage of Texas headboats was terminated in May 1991 and, in May 1992, supplemental "gulf-only" surveys were added to the TPWD survey design to increase the precision of recreational fishing estimates for offshore anglers. These gulf-only surveys were conducted in Port Aransas and Port O'Connor to mitigate the reduced sampling of gulf anglers at "crossover" sites in Aransas/Corpus Christi and Matagorda/San Antonio respectively, caused by modifications to the list of TPWD "crossover" sites in May 1992. Gulf-only surveys were not conducted at sites in Sabine Lake, Galveston, lower Laguna Madre, or Matagorda Bay until May 1995. Ephemeral phenomenon have complicated TPWD sampling in some years (e.g., hurricanes), resulting in reduced survey effort in particular bay systems. Temporary difficulties have also required adjustments to the TPWD survey design; for example, pressure files between May 1999 and Nov 2005 were generated by modifying those from previous years given data entry delays during the transition to a new database. In hopes of improving sampling efficiency and/or accuracy of derived estimates, numerous guidelines and clarifications have also been passed on to TPWD surveyors over time. Many of these changes are beyond the scope of this metadata paper but are described in the *History of Procedures* section of TPWD 2017.

IV. Spatial coverage

The TPWD survey covers all marine waters along the Texas coast, spatially stratified into two primary classifications: (1) inshore bay-and-pass areas and (2) offshore gulf areas.

- Bay-and-pass areas consist of marine waters shoreward of barrier islands (bays) and openings or channels that connect bay waters with the Gulf of Mexico (passes). Pass areas extend 1.9 km from an opening or channel into Gulf waters.

- Gulf areas consist of the Texas Territorial Sea (TTS) and United States Exclusive Economic Zone (EEZ). The TTS extends from the surf line to 16.7 km offshore and excludes pass areas. The EEZ represents federal waters and includes all Gulf of Mexico waters beyond 16.7 km offshore.

Both inshore and offshore parties have been interviewed by the TPWD survey since September 1977 but it was not until May 1992 that sampling effort was explicitly allocated to "gulf-only" surveys.

These inshore and offshore designations are further stratified by the TPWD survey. Eight bay systems (shown in Figure 1) comprise the bay-and-pass areas of Texas:

1) Sabine Lake
2) Galveston Bay
3) Matagorda Bay (including East Matagorda Bay)
4) San Antonio Bay
5) Aransas Bay
6) Corpus Christi Bay
7) Upper Laguna Madre
8) Lower Laguna Madre

Excluding Sabine Lake, each of these bay systems has been sampled by the TPWD survey since September 1976. Sabine Lake was formally included in the TPWD survey design in May 1987. Gulf areas were divided into five geographic areas based on proximity of access:

1) Sabine Lake
2) Galveston Bay
3) Matagorda and San Antonio Bays
4) Aransas and Corpus Christi Bays, Upper Laguna Madre
5) Lower Laguna Madre

V. Data Source Contact

Texas Parks and Wildlife Department

Coastal Fisheries

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VI. Field Descriptions

TABLE_NAME	Variable name	DATA_TYPE	Variable Description
TX_ANGLER_CATCH	ACTIVITY_CODE	NUMBER (22)	Mode of fishing. Type of activity party was primarily engaged in.
	COMPLETION_DTTM	VARCHAR2 (30)	Ending date and time of survey (month (1 -12), day (1-31), year (four digits) and time (24hr))
	DATA_LOAD_DATE	DATE (7)	Date data loaded into GulfFIN
	EVENT_ID	VARCHAR2 (4)	ID assigned at GulfFIN
	INTERVIEW_ID_TXT	VARCHAR2 (10)	Boat ID (or could be interview time if boat ID is not available)
	INTERVIEW_TIME_NUM	NUMBER (22)	Beginning time of interview using 24-hour system
	LENGTH_NUM	NUMBER (22)	Individual length of each species landed. Up to six lengths for each species in each party.
	MAJOR_AREA_CODE	NUMBER (22)	Bay system of fishing (within the bay system for bay and pass fishing or the waters off this bay system for gulf fishing).
	MINOR_BAY_OF_CATCH_CODE	NUMBER (22)	Minor Bay system (sub-region of a major bay system) where most of the retained fish were caught or where most of the fishing activity took place if no fish were retained.
	SPECIES_CODE	NUMBER (22)	Numerical code of species landed (TPWD species code).
	STATION_CODE	NUMBER (22)	Numerical code of survey site
	TOTAL_CAUGHT_NUM	NUMBER (22)	Total number of each species landed, or retained, from the trip. This value is not additive across records (values are the same for each trip and species combination).
TX_ANGLER_INTERVIEWS	ACTIVITY_CODE	NUMBER (22)	Mode of fishing. Type of activity party was primarily engaged in.
	BAIT_1_CODE	NUMBER (22)	Numerical code of primary bait used by party. (Use only one bait code if a single bait is used to harvest greater than 85% of the landings or is used greater than 85% of the trip if no landings.)

	BAIT_2_CODE	NUMBER (22)	Numerical code of secondary bait used by party, if any
	COMPLETION_DTTM	VARCHAR2 (30)	Ending date and time of survey (month (1 -12), day (1-31), year (four digits) and time (24hr))
	COUNTY_CODE	NUMBER (22)	Numerical code of county (if Texas), or state (if USA) or country (if not USA) of permanent residence of party members.
	DATA_LOAD_DATE	DATE (7)	Date data loaded into GulfFIN
	EVENT_ID	VARCHAR2 (4)	ID assigned at GulfFIN
	GEAR_1_CODE	NUMBER (22)	Numerical code of primary gear used by party. (Use only one gear code if a single gear is used to harvest greater than 85% of the landings or is used greater than 85% of the trip if no landings.)
	GEAR_2_CODE	NUMBER (22)	Numerical code of secondary gear used by party, if any
	INTERVIEW_ID_TXT	VARCHAR2 (10)	Boat ID (or could be interview time if boat ID is not available)
	INTERVIEW_TIME_NUM	NUMBER (22)	Beginning time of interview using 24-hour system
	MAJOR_AREA_CODE	NUMBER (22)	Bay system of fishing (within the bay system for bay and pass fishing or the waters off this bay system for gulf fishing).
	MINOR_BAY_OF_CATCH_CODE	NUMBER (22)	Minor Bay system (sub-region of a major bay system) where most of the retained fish were caught or where most of the fishing activity took place if no fish were retained.
	NUMBER_OF_PEOPLE_NUM	NUMBER (22)	Number of people in party
	STATION_CODE	NUMBER (22)	Numerical code of survey site
	TRIP_LENGTH_NUM	NUMBER (22)	Length of trip to the nearest 0.5 hour. Trip length is the lapsed time from when a party leaves ramp or wet slip at start of trip until party returns to ramp or wet slip at end of trip.
TX_REC_ESTIMATES	ACTIVITY	VARCHAR2 (1)	Mode of fishing. Type of activity party was primarily engaged in.
	AREA	VARCHAR2 (5)	Area where most of the fish were caught ('BAY','EEZ','TTS')
	CALENDAR_YEAR	VARCHAR2 (5)	Year of estimate (seasonal year- for low season estimates this represents the year in which the majority of the season occurs)
	DATA_LOAD_DATE	DATE (7)	Date data loaded into GulfFIN

	LANDINGS	NUMBER (22)	Estimate of landed catch in number
	LANDINGS_SE	NUMBER (22)	Standard error of "Landings"
	MEAN_LENGTH	NUMBER (22)	Estimate of mean length, mm total
	SEASON	VARCHAR2 (1)	Season of fishing; 1=High (May 15th-Nov 20th); 2=Low (Nov 21st-May 14th)
	SPECIES	VARCHAR2 (30)	Scientific name of each species landed (genus (first letter) and species (first nine letters)
	SPECIES_CODE	VARCHAR2 (11)	Numerical code of species landed (TPWD species code).
TX_REC_ESTIMATES_EFFORT	ACTIVITY	VARCHAR2 (1)	Mode of fishing. Type of activity party was primarily engaged in.
	AREA	VARCHAR2 (5)	Area where most of the fish were caught ('BAY','EEZ','TTS')
	CALENDAR_YEAR	VARCHAR2 (4)	Year of estimate (seasonal year- for low season estimates this represents the year in which the majority of the season occurs)
	DATA_LOAD_DATE	DATE (7)	Date data loaded into GulfFIN
	ESTHRS	NUMBER (22)	Estimate of total angler hours (trip hours, not fishing hours)
	ESTHRS_SE	NUMBER (22)	Standard error of "Esthrs"
	PARSIZE	NUMBER (22)	Estimate of mean party size
	SEASON	VARCHAR2 (1)	Season of fishing; 1=High (May 15th-Nov 20th); 2=Low (Nov 21st-May 14th)
	TRIPLEN	NUMBER (22)	Estimate of mean trip length (hours)
	TTLANGLR	NUMBER (22)	Total anglers interviewed

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VIII. Tables

Table 1. Length to weight conversion factors for selected (target) fishes from the TPWD survey (Table A.5 in TPWD 2010). Defining WW as whole weight (grams) and TL as maximum total length (mm), equations are of the form: $\log_{10} WW = \log_{10} a + b(\log_{10} TL)$.

Species	*log a*	*b*	Source
Atlantic croaker	-5.360	3.200	Classen et al. (1988)
Atlantic sharpnose shark	-7.150	3.670	Classen et al. (1988)
Atlantic spadefish	-3.810	2.710	Morris and Martin (1990)
Black drum	-4.856	3.001	Harrington et al. (1979)
Blacktip shark	-5.970	3.270	Morris and Martin (1990)
Cobia	-5.148	3.009	Derived[a]
Dolphinfish	-4.925	2.888	Campbell (1984)
Gafftopsail catfish	-5.430	3.150	Classen et al. (1988)
Gray triggerfish	-3.856	2.595	Derived[b]
Greater amberjack	-5.848	3.281	Derived[a]
King mackerel	-5.495	3.070	Campbell et al. (1988)
Lane snapper	-3.991	2.652	Manooch and Mason (1984)
Little tunny	-5.216	3.095	Derived[c]
Red drum	-5.085	3.041	Harrington et al. (1979)
Red snapper	-5.242	3.145	Campbell (1984)
Sand seatrout	-5.190	3.080	Morris and Martin (1990)
Sheepshead	-4.424	2.869	Harrington et al. (1979)
Southern flounder	-5.260	3.125	Harrington et al. (1979)
Spanish mackerel	-4.878	2.866	Campbell (1984)
Spotted seatrout	-5.192	3.062	Harrington et al. (1979)
Vermilion snapper	-5.766	3.324	Campbell (1984)
"Other" species	-5.000	3.000	Unknown[d]

[a] Unpublished Texas Parks and Wildlife Department total length and whole weight pairs were regressed using SAS.

[b] Total length to fork length and fork length to whole weight conversions found in Johnson and Saloman (1984) were used to convert artificial total lengths to whole weights, then total length and whole weight pairs were regressed using SAS.

[c] Unpublished National Marine Fisheries Service (Beaufort) total length and whole weight pairs were regressed using SAS.

[d] Generic isometric growth.

Table 2. Target Species for which catch estimates from offshore and inshore sport-boat anglers are provided by the TPWD survey (constructed from TPWD 2010 text).

Common Name	Scientific Name	Inshore (Bays & Passes)	Offshore (Gulf of Mexico)
Atlantic Croaker	*Micropogonias undulatus*	x	x
Atlantic Sharpnose Shark	*Rhizoprionodon terraenovae*		x
Atlantic Spadefish	*Chaetodipterus faber*		x
Black Drum	*Pogonias cromis*	x	x
Blacktip Shark	*Carcharhinus limbatus*		x
Cobia	*Rachycentron canadum*		x
Dolphinfish	*Coryphaena hippurus*		x
Gafftopsail Catfish	*Bagre marinus*	x	
Gray Triggerfish	*Balistes capriscus*		x
Greater Amberjack	*Seriola dumerili*		x
King Mackerel	*Scomberomorus cavalla*		x
Lane Snapper	*Lutjanus synagris*		x
Little Tunny	*Euthynnus alletteratus*		x
Red Drum	*Sciaenops ocellatus*	x	x
Red Snapper	*Lutjanus campechanus*		x
Sand Seatrout	*Cynoscion arenarius*	x	x
Sheepshead	*Archosargus probatocephalus*	x	
Southern Flounder	*Paralichthys lethostigma*	x	
Spanish Mackerel	*Scomberomorus maculatus*		x
Spotted Seatrout	*Cynoscion nebulosus*	x	x
Vermilion Snapper	*Rhomboplites aurorubens*		x
OTHER Species		x	x
ALL Species (Combined)		x	x

Table 3. Estimated landings (in number and kilograms) in Texas bay-pass and gulf areas by angler type between May 15, 2013 and May 14, 2014 (copied from Table O.2 in TPWD 2018). Weight estimates calculated as the product of landings (number of fish) and mean weight (from conversion equations of individual fish lengths; see Table 1).

	Bay-pass shore-based			Bay-pass private-boat			Gulf shore-based		
Species	Landings (number)	Mean weight	Landings (weight)	Landings (number)	Mean weight	Landings (weight)	Landings (number)	Mean weight	Landings (weight)
Atlantic Croaker	275,801	0.20	55,160	133,396	0.24	32,015	7,983	0.14	1,118
Atlantic Spadefish	71,552	0.29	20,750	1,660	0.32	531	3,912	0.19	743
Black Drum	26,243	1.65	43,301	73,313	1.66	121,700	2,919	1.80	5,254
Gafftopsail Catfish	34,918	1.31	45,743	44,140	1.20	52,968	5,883	1.35	7,942
Gray Snapper	57,654	0.31	17,873	23,160	0.37	8,569	82	0.34	28
Red Drum	31,458	4.19	131,809	187,392	2.35	440,371	3,326	3.29	10,943
Sand Seatrout	257,386	0.25	64,347	83,377	0.31	25,847	9,190	0.26	2,389
Sheepshead	57,356	1.22	69,974	33,642	1.38	46,426	64	0.99	63
Southern Flounder	148,248	0.88	130,458	60,136	0.88	52,920	59	0.80	47
Southern Kingfish	78,024	0.25	19,506	42,279	0.26	10,993	19,103	0.26	4,967
Spanish Mackerel	49,113	0.60	29,468	8,155	0.86	7,013	3,464	0.72	2,494
Spotted Seatrout	64,468	0.97	62,534	469,270	0.91	427,036	2,735	0.96	2,626
Other finfish	365,960	0.57	208,597	70,930	1.68	119,162	23,339	0.72	16,804
Sum of landings [b]	1,518,200		899,500	1,230,800		1,345,600	82,100		55,400

[b] Total landings rounded to nearest 100 fish or 100 kg of fish.

IX. Figures

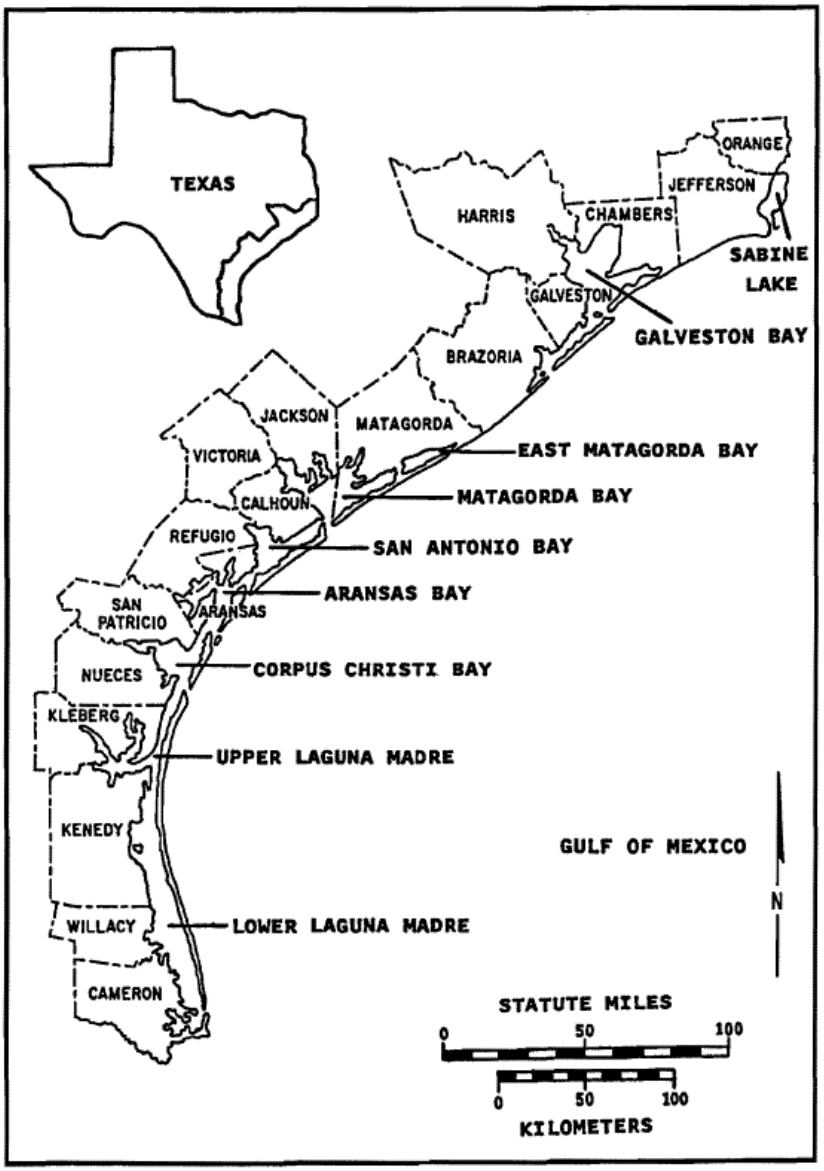

Figure 1. Bay systems and coastal counties of Texas (Figure 1 in TPWD 2010). Note that East Matagorda Bay is grouped with Matagorda Bay to create eight spatial strata for bay and pass areas. Offshore, gulf areas are divided into five strata comprised of (1) Sabine Lake, (2) Galveston Bay, (3) the two Matagorda bays and San Antonio Bay, (4) Aransas, Corpus Christi, and upper Laguna Madre, and (5) lower Laguna Madre.