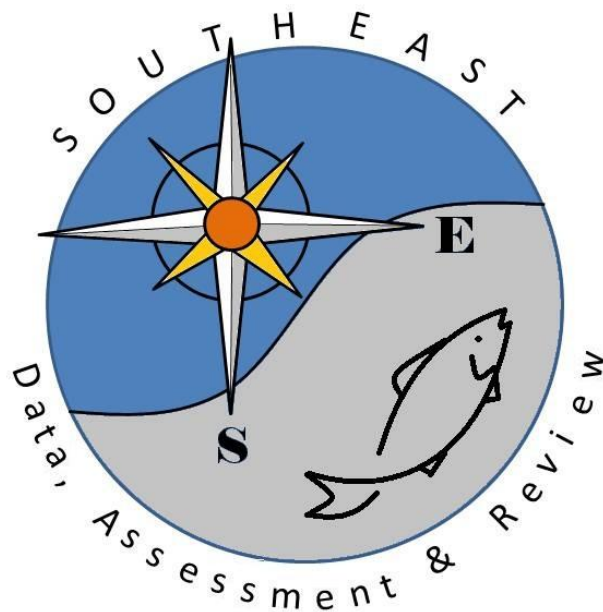


Estimating historical recreational angler effort in the Gulf of Mexico for the private, charter, and headboat fishing modes

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Estimating historical recreational angler effort in the Gulf of Mexico for the private, charter, and headboat fishing modes

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Introduction

The historic time period for red snapper fishing effort and landings in the Gulf of Mexico is defined as pre-1981, and prior to the start of the Marine Recreational Fisheries Statistics Survey. At the data workshop for red snapper held August 20-24, 2012 in Pensacola, Florida, the recreational workgroup was tasked with evaluating potential sources and methods to compile landings of red snapper prior to 1981. After evaluating two methods, (1) the coastal census method, and (2) the National Survey of Fishing, Hunting and Wildlife Associated Recreation (FHWAR) method, participants at the data workshop agreed that the FHWAR Method was preferable to the Coastal Census Method (SEDAR, 2012). However, the workgroup members expressed concern that the FHWAR method did not accurately capture effort trends for the offshore headboat fishery in the Gulf of Mexico, and that the method did not account for changes in catch rates over time due to factors, such as technological advances and changes in fleet behavior. An adapted FHWAR method is presented here as a means for providing estimates of historical recreational angler effort for the SEDAR 31 assessment of red snapper in the Gulf of Mexico. Aforementioned concerns with the FHWAR method were addressed by separately estimating historical effort by fishing mode, and by providing a time-series of historical recreational angler trips instead of landings.

Data Sources

Marine Recreational Fisheries Statistics Survey and Marine Recreational Information Program, National Marine Fisheries Service

Marine recreational catch and effort data in the Gulf of Mexico have been collected and reported by the National Marine Fisheries Service (NMFS) since 1981. The NMFS has estimated catch and effort in each Gulf state except Texas using the Marine Recreational Fisheries Statistics Survey (MRFSS), between 1981 and 2003, and the Marine Recreational Information Program (MRIP), since 2004. MRFSS and MRIP provides estimates in two-month periods ("waves") by fishing mode (shore fishing, private/rental boat, charter boat, or headboat/charter boat combined) and area of fishing (inshore, state Territorial Seas, U.S. Exclusive Economic Zone). For more information on MRIP and MRFSS visit <http://www.st.nmfs.noaa.gov/st1/recreational/>.

Together, MRFSS and MRIP provide a time-series of estimated catch per unit effort, total effort, landings, and discards between 1981 and 2011. Table 1 includes MRFSS and MRIP estimates of

total angler trips by year from all modes except the shore fishing mode. The exclusion of the shore mode due to unlikely encounters, and adjustments made to MRFSS data due to missing information and necessary calibrations are detailed in the SEDAR 31-DW Report (SEDAR, 2012). Note that estimates of headboat angler trips from MRFSS and MRIP are not available after 1985. Starting 1986, the NMFS began using the Southeast Region Headboat Survey (SERHS) to collect data on headboats in the Gulf of Mexico (Brennan, 2012).

Texas Parks and Wildlife Department, Sport-boat Angling Survey

The Texas Parks and Wildlife Department (TPWD) implemented its Sport-boat Angling Survey in 1983 to obtain information on catch, effort, and length composition of the catch from sport-boat fishing trips in Texas marine waters (Green and Campbell, 2005). Sampling takes place at recreational boat access sites, and TPWD uses the data to generate recreational catch and effort estimates by fishing mode (private or charter) and by high-use (May 15-November 20) and low-use seasons (November 21-May 14). Disaggregating of the TPWD data from six-month season estimates into two-month wave estimates is detailed in the SEDAR 31 Data Workshop Report (SEDAR, 2012). Table 1 includes TPWD estimates of total angler trips by year. Since neither TPWD nor MRFSS provide estimates of Texas headboat angler trips, Texas headboat angler trips (1983-1985) were estimated using 1986-1990 SRHS Texas headboat angler trips (Table 2).

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, U.S. Fish and Wildlife Service and U.S. Census Bureau

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR) is one of the oldest continuous recreational surveys in the U.S. (U.S. Fish and Wildlife Service and U.S. Census Bureau, 1991). Among other things, the FHWAR survey gathers information about the number of anglers in the U.S., including the frequency of angler participation and time spent fishing. Estimates of annual anglers and angler participation from the FHWAR surveys conducted every five years between 1955 and 1985 are reproduced in Table 3.

FHWAR Method Summary

The FHWAR Survey Method was developed and used to estimate historical catch of Spanish mackerel and cobia in SEDAR 28 (Brennan and Fitzpatrick, 2012). In summary, the method uses FHWAR survey estimates of U.S. anglers, U.S. saltwater anglers, anglers by U.S. region, and U.S. saltwater days combined with MRFSS/MRIP effort data to estimate regional saltwater angler trips. To obtain landings, saltwater angler trips are multiplied by regionally-specific average catch rates that are calculated from early years (1981-1985) of the MRFSS/MRIP data.

Adapted FHWAR Method

To provide a time-series of historical recreational effort in the Gulf of Mexico for use in the red snapper assessment, historical angler trips were estimated by fishing mode (private, charter and headboat) and by Gulf of Mexico region (east and west). The DW panel suggested that encounters of red snapper from shore are unlikely, and therefore, historical effort from shore was not estimated. FHWAR saltwater angler trends (1955-1985) were used to estimate historical angler trips for the private fishing mode (details are provided in the following subsection). Meanwhile, the estimates of charter and headboat angler effort between 1950 and 1980 were assumed to be constant, and were set as their respective 1983-1985 averages. Although there is evidence, both anecdotal and from published literature, of a declining number headboats in west

Florida during 1950-1980, not enough information was available to develop proxies based on vessel numbers in each Gulf of Mexico region (Table 4).

Estimating historical private angler trips

Key components from the FHWAR surveys used in this method were the estimates of total U.S. anglers and U.S. saltwater anglers, estimates of U.S. saltwater days, and estimates of East South Central U.S. (East Gulf without west Florida) anglers and West South Central U.S. (West Gulf) anglers (Table 3). This information was used to estimate historical private recreational trips by gulf region using the following steps adapted from the FHWAR method (Brennan and Fitzpatrick, 2012). For years with FHWAR surveys (1955-1985), ratios of U.S saltwater anglers to total U.S anglers were applied to the number of anglers by Gulf region to obtain saltwater anglers by Gulf region. Also for years with FHWAR surveys, ratios of saltwater anglers by Gulf region to U.S. saltwater anglers were applied to total U.S. saltwater days to yield saltwater days by Gulf region. To expand saltwater days in the East South Central U.S. (ESC) to the entire east Gulf (including west Florida), the average of the 1983-1985 ratios of MRFSS estimated angler trips in west Florida to MRFSS estimated angler trips in Mississippi and Alabama was applied to the estimates of saltwater days in the ESC. For the east Gulf and west Gulf separately, the ratio of average private angler trips 1983-1985 (from MRFSS in the east Gulf and from MRFSS and TPWD in the west Gulf) to estimates of total saltwater days in 1985 were applied to saltwater angler days to obtain final estimates of private angler trips. Linear interpolation was used to estimate private recreational effort for years when FHWAR surveys were not conducted. Since historical effort were only lacking prior to 1981, the effort estimates from 1981 to 1985 using this method were excluded.

Results

Estimates of historical recreational angler trips by Gulf region and fishing mode between 1950 and 1980 are provided in Table 5 and plotted in Figure 1. These estimates suggest that recreational angler effort developed faster in the east than in the west Gulf of Mexico (Figure 1). In the east Gulf, the effort steadily increased between 1950 and 1980, with a period of slower growth between 1960 and 1970. In the west Gulf, the effort steadily increased between 1950 and 1980, with a period of slower growth between 1960 and 1970, and a period of negative growth between 1975 and 1980. The 1950-2011 time-series of combined private, charter, and headboat angler trips in the Gulf of Mexico show that more trips were consistently made in the east than in the west, and that the difference between the two regions has increased over time.

Conclusions

The time-series of historical effort estimated here can be used to inform the Gulf of Mexico red snapper assessment models. The adjusted FHWAR method could be used to estimate historical recreational effort for other species, and when appropriate, the method could be modified to include estimates for shore effort.

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Figures and Tables

Table 1. Estimates of angler trips (1981-2011) by data source (MRFSS or TPWD), Gulf of Mexico region (east or west), and fishing mode (private, charter, or headboat). Estimates of angler trips (private or charter) by TPWD began in 1983. Estimates of angler trips for the headboat fishing mode are not available after 1985.

Data Source	MRFSS Angler Trips						TPWD Angler Trips		
Region	East (West Florida, Alabama, and Mississippi)			West (Louisiana)			West (Texas)		
Mode	Priv	Cbt	Hbt	Priv	Cbt	Hbt	Priv	Cbt	Hbt
1981	5,868,785	157,747	59,026	933,118	55,055	4,812			
1982	3,966,594	490,086	219,923	1,472,372	123,144	10,763			
1983	4,933,240	384,628	175,576	1,674,790	103,097	9,011	637,416	31,710	65,549*
1984	6,277,928	297,282	138,988	1,228,868	102,061	8,920	712,741	22,580	46,676*
1985	5,710,443	379,425	190,311	1,217,120	111,626	9,756	842,642	30,430	62,903*
1986	6,225,140	449,668		1,911,101	63,674		900,634	29,908	
1987	6,719,770	485,071		1,798,018	61,693		1,101,027	36,502	
1988	8,525,619	451,723		2,172,913	107,790		1,041,148	28,452	
1989	7,051,072	431,288		1,661,235	92,868		912,547	45,098	
1990	5,893,190	375,533		1,323,317	50,601		836,475	34,617	
1991	7,401,112	386,684		1,685,626	63,224		851,765	49,337	
1992	7,445,759	412,291		1,927,495	57,371		983,387	46,987	
1993	7,002,535	707,752		2,038,772	80,303		994,885	55,530	
1994	7,549,732	766,482		1,835,069	93,888		1,094,067	91,731	
1995	7,302,714	887,899		2,268,181	132,488		1,079,590	73,680	
1996	7,232,473	837,274		2,118,544	153,183		1,098,874	78,566	
1997	7,974,528	949,175		2,220,555	142,696		1,000,579	100,031	
1998	7,076,776	700,588		1,862,129	60,079		972,527	113,400	
1999	7,118,582	614,225		1,979,222	69,542		1,203,709	116,857	
2000	9,006,073	717,435		2,722,392	94,198		1,160,245	163,253	
2001	9,725,587	623,897		2,645,551	118,489		987,771	162,901	
2002	9,383,764	670,576		2,251,331	93,646		964,901	141,888	
2003	10,815,267	587,181		3,294,740	104,182		1,008,535	123,118	
2004	11,822,923	687,707		3,821,170	143,362		1,005,883	120,675	
2005	10,801,603	568,099		2,783,541	122,637		952,890	108,589	
2006	10,818,830	649,309		2,801,489	186,740		993,831	162,899	
2007	11,824,374	708,048		3,155,773	143,709		904,040	153,730	
2008	11,686,834	639,857		3,508,115	179,188		906,498	150,906	
2009	10,266,646	639,470		3,176,235	182,796		913,642	121,851	
2010	9,629,807	501,304		3,054,931	78,886		864,161	123,162	
2011	9,569,769	621,870		3,341,584	112,736		962,961	162,440	

* Estimated by applying the average of the 1986-1990 ratios between SERHS Texas headboat trips and TPWD charter trips to the 1983-1985 TPWD charter trips (Table 2).

Table 2. Estimates of Texas charter and headboat angler trips from 1986 to 1990. The average of the 1986-1990 ratios, shown in the bottom right cell, was used to estimate 1983-1985 headboat angler trips (Table 1).

Data Source	TPWD	SRHS	Headboat to Charter boat Ratios
Region	West (Texas)	West (Texas)	
Mode	Charter Angler Hours	Headboat Angler Hours	
1986	29908	61386	2.05
1987	36502	70279	1.93
1988	28452	80754	2.84
1989	45098	69858	1.55
1990	34617	68215	1.97
Average			2.07

Table 3. Estimates of anglers and angler participation from FHWAR surveys between 1955 and 1985 (U.S. Fish and Wildlife Service and U.S. Census Bureau, 1991). FHWAR saltwater angler trends (1955-1985) were used to estimate historical private angler trips (1950-1980) in the Gulf of Mexico.

Year	Total U.S. Anglers	Total U.S. Saltwater Anglers	Total U.S. Saltwater Days	Total Anglers MS-AL	Total Anglers TX-LA
1955	20,813,000	4,557,000	58,621,000	1,665,000	2,237,000
1960	25,323,000	6,292,000	80,602,000	2,207,000	3,133,000
1965	28,348,000	8,305,000	95,837,000	2,201,000	3,278,000
1970	33,158,000	9,460,000	113,694,000	2,464,000	4,006,000
1975	41,299,000	13,738,000	167,499,000	2,689,000	5,267,000
1980	41,873,000	11,972,000	164,040,000	3,173,000	5,136,000
1985	45,345,000	12,893,000	171,055,000	3,308,000	5,704,000

Table 4. Estimates of headboat and charter vessels by Gulf state and year, compiled from various sources.

Years	Number of Vessels by State and Mode										References
	WFL		AL		MS		LA		TX		
	Hbt	Cbt	Hbt	Cbt	Hbt	Cbt	Hbt	Cbt	Hbt	Cbt	
1951	100										Camber, 1955
1955	81	241									Ellis, 1958
1960	89	385									Moe, 1963
1975									88		Ditton et al., 1977
1977	68	395									Browder et al., 1981
1979									23	121	McEachron and Matlock, 1983
1980										121	Matheusik, 1980
1985	62	733	2	38	2	21	2	48	20	128	Holland et al., 1992; Ditton et al., 1992

Table 5: Historical angler trips (1950 -1980) by Gulf region and fishing mode that were estimated using the adapted FHWAR method. FHWAR saltwater angler trends (Table 3) and MRFSS private angler trips (Table 1) were used to estimate historical private angler trips. Estimates of charter and headboat angler effort between 1950 and 1980 were set as their 1983-1985 averages (from MRFSS in the east Gulf and from MRFSS and TPWD in the west Gulf; Table 2).

Data Source	Estimated Angler Trips							
Region	East Gulf of Mexico (West Florida, Alabama, And Mississippi)				West Gulf of Mexico (Louisiana and Texas)			
Mode	Priv	Cbt	Hbt	Total	Priv	Cbt	Hbt	Total
1950	1,064,191	353,778	168,292	1,064,191	257,141	133,835	67,605	458,581
1951	1,275,300	353,778	168,292	1,362,312	328,962	133,835	67,605	530,401
1952	1,486,408	353,778	168,292	1,660,432	400,782	133,835	67,605	602,222
1953	1,697,517	353,778	168,292	1,958,552	472,603	133,835	67,605	674,043
1954	1,908,626	353,778	168,292	2,256,672	544,424	133,835	67,605	745,863
1955	2,119,734	353,778	168,292	2,554,793	616,244	133,835	67,605	817,684
1956	2,330,843	353,778	168,292	2,852,913	688,065	133,835	67,605	889,505
1957	2,541,951	353,778	168,292	3,064,021	759,886	133,835	67,605	961,325
1958	2,753,060	353,778	168,292	3,275,130	831,706	133,835	67,605	1,033,146
1959	2,964,168	353,778	168,292	3,486,238	903,527	133,835	67,605	1,104,967
1960	3,175,277	353,778	168,292	3,697,347	975,348	133,835	67,605	1,176,787
1961	3,212,903	353,778	168,292	3,734,973	997,058	133,835	67,605	1,198,497
1962	3,250,529	353,778	168,292	3,772,599	1,018,767	133,835	67,605	1,220,207
1963	3,288,155	353,778	168,292	3,810,225	1,040,477	133,835	67,605	1,241,917
1964	3,325,781	353,778	168,292	3,847,851	1,062,187	133,835	67,605	1,263,627
1965	3,363,407	353,778	168,292	3,885,477	1,083,897	133,835	67,605	1,285,337
1966	3,454,506	353,778	168,292	3,976,576	1,135,812	133,835	67,605	1,337,252
1967	3,545,605	353,778	168,292	4,067,675	1,187,727	133,835	67,605	1,389,167
1968	3,636,704	353,778	168,292	4,158,774	1,239,642	133,835	67,605	1,441,082
1969	3,727,803	353,778	168,292	4,249,873	1,291,557	133,835	67,605	1,492,997
1970	3,818,902	353,778	168,292	4,340,972	1,343,472	133,835	67,605	1,544,911
1971	4,041,043	353,778	168,292	4,563,113	1,492,641	133,835	67,605	1,694,081
1972	4,263,183	353,778	168,292	4,785,253	1,641,810	133,835	67,605	1,843,250
1973	4,485,324	353,778	168,292	5,007,394	1,790,979	133,835	67,605	1,992,419
1974	4,707,464	353,778	168,292	5,229,534	1,940,148	133,835	67,605	2,141,588
1975	4,929,605	353,778	168,292	5,451,675	2,089,317	133,835	67,605	2,290,757
1976	5,067,420	353,778	168,292	5,589,490	2,065,039	133,835	67,605	2,266,479
1977	5,205,235	353,778	168,292	5,727,305	2,040,761	133,835	67,605	2,242,201
1978	5,343,050	353,778	168,292	5,865,120	2,016,483	133,835	67,605	2,217,923
1979	5,480,866	353,778	168,292	6,002,936	1,992,205	133,835	67,605	2,193,645
1980	5,618,681	353,778	168,292	6,140,751	1,967,927	133,835	67,605	2,169,367

**Combined Estimates of Private, Charter, and Headboat Angler Trips
by region in the Gulf of Mexico (1950-2011)**

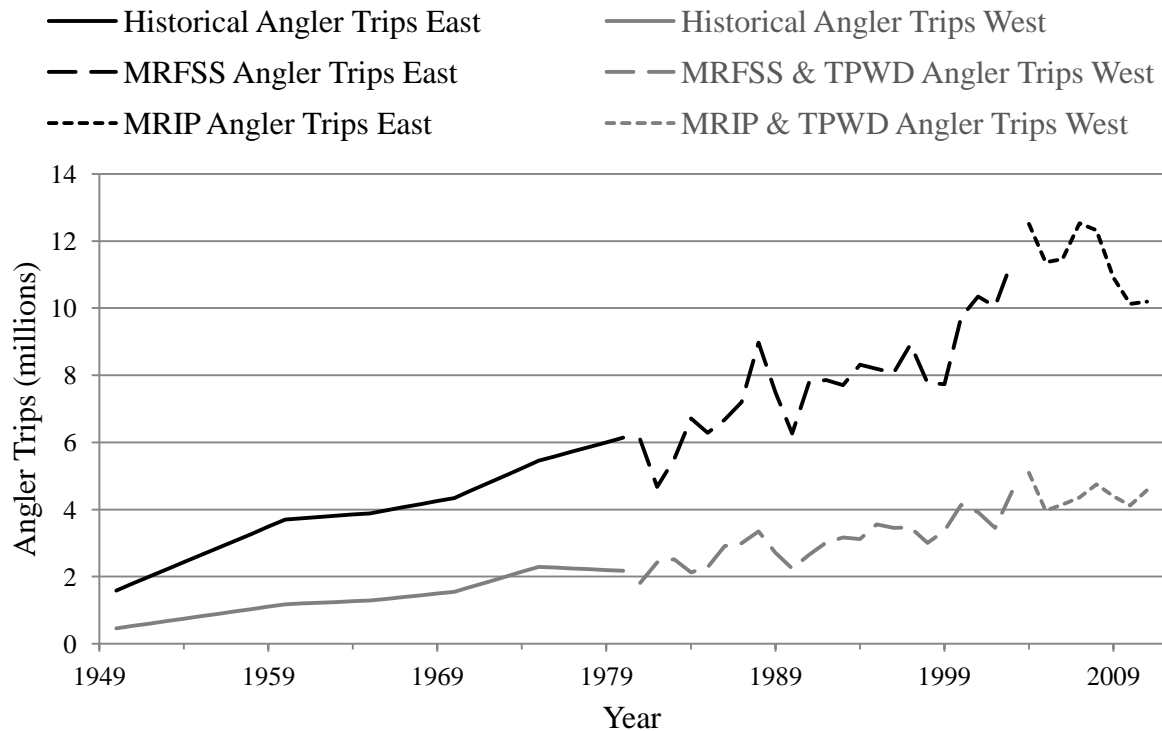


Figure 2: Estimated angler trips in the east (west Florida to Mississippi) and west (Louisiana and Texas) for private, charter, and headboat fishing modes combined. Angler trips for the headboat fishing mode are only included between 1950 and 1985. Historical angler trips (1950-1980) were estimated using the adjusted FHWAR method. Estimates of total angler trips by Gulf region and by fishing mode are available in Tables 2 and 3.