Estimates of Historic Recreational Landings of Red Snapper in the South Atlantic Using the FHWAR Census Method
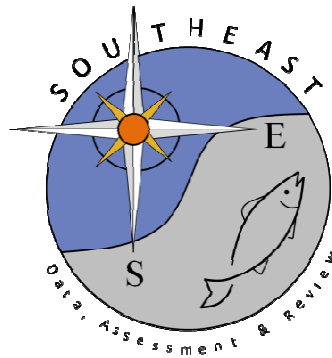
SEDAR 41-DW17

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Introduction

During previous SEDAR data workshops considerable time and effort has been devoted to developing methods for back-calculating recreational landings for years before modern data collection programs and landings estimates were implemented.   Methods used in past stock assessments included: ratios of commercial landings to recreational landings, estimates from the U.S. Fish and Wildlife Saltwater Angling Survey (SWAS),U.S. Census data as a proxy for recreational fishing effort to produce regression estimates of catch, and most recently the FHWAR (National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Survey) Method.

For the SEDAR 41 Data Workshop (DW) for South Atlantic red snapper, the Recreational Working Group (RWG) will evaluate historic recreational catch information used in SEDAR 24, along with other potential sources to compile historical landings prior to themodern recreational landings time period. This is defined as pre-1981 for the charter and private boat sectors, or pre - Marine Recreational Fisheries Statistics Survey (MRFSS).   One method that will be considered is the FHWAR Method (Brennan and Fitzpatrick, 2012) used in SEDAR 28 which will be presented in this document.

National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Survey (FHWAR), U.S Fish and Wildlife Service (USFWS).

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Survey has been conducted every 5 years since 1955 and is one of the oldest and most comprehensive recreational surveys. Among other things, its purpose is to gather information on the number of anglers in the United States, including frequency and time spent fishing (FHWAR 1991).

The FHWAR Surveys published in 1991, 1996, 2001, 2006 and 2011 provide summary tables of U.S. population estimates, along with estimates of fishing participation and effort from surveys conducted by the USFWS every five years from 1955 to 1985 (Tables 1 and 2). This information was used to develop an alternative method for estimating coast-wide recreational landings prior to 1981.

FHWAR Method

The two key components from the FHWAR surveys used in this census method are the estimates of U.S. saltwater anglers and the estimates of U.S. saltwater fishing days. The first objective was to determine the total saltwater anglers and saltwater days from the South Atlantic (SA) by using the summary information of U.S. anglers and U.S. saltwater anglers from the FHWAR surveys. The ratio of U.S saltwater anglers to the total U.S anglers was applied to the total number of

anglers for the SA to yield the total saltwater anglers for SA. The same method was used to calculate the total saltwater days for the SA from the FHWAR surveys from 1955-1985. The FHWAR surveys for the South Atlantic included the entire state of Florida, east and west coasts. In order to address the management boundaries for red snapper, the saltwater angler days for Florida's west coast (FLW) were separated from the SA saltwater angler days using the ratio of the MRFSS total angler trips for FLW to the MRFSS total angler trips for NC to FLW. The mean ratio from 1984-1986 was applied to the total saltwater days for the SA from 1955-1985 to remove FLW effort.

Similar to the SWAS, there was a 12-month recall period for respondents participating in the FHWAR surveys from 1955 – 1985. As part of the 1991 FWHAR, a study was conducted to compare the 12- month recall period to a four-month period. This study revealed that the level of recall bias varies for different types of fishing participation and expenditure (FHWAR, 1991).

Consequently, it was necessary to account for possible reporting bias and adjust the angling effort (saltwater days) in the FHWAR Surveys 1955-1985. In the case of red snapper in the South Atlantic, the total saltwater days for the SA 1955-1985 were adjusted for recall bias in the FHWAR surveys using the MRFSS and Southeast Region Headboat Survey (SRHS) total angler trips and days, respectively for the US East Coast (NC-FLE) in 1985 divided by the total saltwater days from the 1985 FHWAR Survey. This multiplier was then applied to the total SA saltwater days from 1955-1985 to adjust for recall bias. Using the adjusted saltwater days for SA from 1955 – 1985, the next step in this process was estimating landings of red snapper. This was accomplished by calculating the mean CPUE for red snapper in the South Atlantic from the MRFSS and SRHS landings estimates for 1981 to 1985. This mean CPUE was then applied to the adjusted saltwater days for the SA from 1955-1985 to estimate the historical landings of red snapper for those years (Table 3). Linear interpolation was used to estimate landings for years that the FHWAR surveys were not conducted during 1955-1980. Since historical recreational landings for red snapper were only lacking prior to 1981, the 1985 estimated landings using the FHWAR census method were excluded (Table 4).

Conclusions

The FHWAR method utilizes a combination of information including U.S. angler population estimates and angling effort estimates from 1955 – 1985 FHWAR, along with estimates of recreational effort and landings from the MRFSS and SRHS 1981 – 1985. The FWHAR method also used both sources of information to adjust for recall bias, an issue that must be addressed when considering using either the SWAS or the FHWAR Surveys for historical recreational landings.   By using data from FHWAR and the MRFSS to calibrate this adjustment, the effect of the 12-month angler recall period is reduced. The historical landings of red snapper that were

calculated using this method show a gradual increase from 1955 to 1980, which reflects an evolving recreational fishery and technological advancements (Figure 1).

Literature Cited:

Brennan, K. and K. Fitzpatrick. 2012. SEDAR31-RD35 Estimates of Historic Recreational Landings of Spanish Mackerel in the South Atlantic Using the FHWAR Census Method. National Marine Fisheries Service Southeast Fisheries Science Center, Sustainable Fisheries, Beaufort, NC.

U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau. 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

Tables

Table 1. Anglers and Hunters, by Census Division: 1955 to 1985 (U.S. population 12 years old and older. Numbers in thousands).

Year	Population		Sportsmen (fished or hunted)		Anglers		Hunters	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total, United States								
1955.	118,366	100	24,917	21.1	20,813	17.6	11,784	10.0
1960.	131,226	100	30,435	23.2	25,323	19.3	14,637	11.2
1965.	141,928	100	32,881	23.2	28,348	20.0	13,585	9.6
1970.	155,230	100	36,277	23.4	33,158	21.4	14,336	9.2
1975.	171,860	100	45,773	26.6	41,299	24.0	17,094	9.9
1980.	184,691	100	46,966	25.4	41,873	22.7	16,758	9.1
1985.	195,659	100	49,827	25.5	45,345	23.2	16,340	8.4
New England								
1955.	7,919	100	1,224	15.4	1,002	12.7	589	7.4
1960.	8,349	100	1,368	16.4	1,205	14.4	517	6.2
1965.	9,256	100	1,650	17.8	1,488	16.0	583	6.3
1970.	8,652	100	1,579	18.3	1,430	16.5	582	6.7
1975.	9,910	100	2,004	20.2	1,861	18.8	566	5.7
1980.	10,205	100	1,974	19.3	1,788	17.5	572	5.6
1985.	10,554	100	2,058	19.5	1,914	18.1	552	5.2
Middle Atlantic								
1955.	24,869	100	3,539	14.2	2,811	11.3	1,608	6.5
1960.	26,493	100	3,432	13.0	2,569	9.7	1,723	6.5
1965.	27,346	100	3,602	13.2	2,760	10.1	1,631	6.0
1970.	28,244	100	4,539	16.1	4,504	14.4	1,731	6.1
1975.	30,449	100	5,919	19.4	5,097	16.7	2,096	6.9
1980.	30,256	100	5,181	17.1	4,332	14.3	2,001	6.6
1985.	31,099	100	5,565	17.9	4,820	15.5	1,972	6.3
East North Central								
1955.	25,733	100	5,489	21.3	4,583	17.8	2,538	9.9
1960.	26,833	100	6,316	32.5	5,317	19.8	2,985	11.1
1965.	28,124	100	6,214	22.1	5,336	19.0	2,563	9.1
1970.	31,550	100	7,284	23.1	6,699	21.2	2,812	8.9
1975.	32,796	100	9,049	27.6	8,181	24.9	3,392	10.3
1980.	33,526	100	8,725	26.0	7,891	23.5	2,955	8.8
1985.	33,747	100	8,973	26.6	8,270	24.5	2,814	8.3
West North Central								
1955.	9,201	100	2,913	31.7	2,346	25.5	1,534	16.7
1960.	10,149	100	3,383	33.3	2,855	28.1	1,709	16.8
1965.	11,681	100	3,678	31.5	3,226	27.6	1,620	13.9
1970.	12,904	100	4,000	31.0	3,579	27.7	1,783	13.8
1975.	13,564	100	4,524	33.3	4,089	30.1	1,863	13.7
1980.	13,826	100	4,770	34.5	4,220	30.5	1,965	14.2
1985.	14,137	100	5,140	36.4	4,681	33.1	1,971	13.9
South Atlantic								
1955.	14,336	100	3,223	22.5	2,805	19.6	1,449	10.1
1960.	17,798	100	4,423	24.9	3,695	20.8	2,045	11.5
1965.	20,593	100	5,626	27.3	5,054	24.5	1,900	9.2
1970.	23,539	100	5,461	23.2	5,129	21.8	1,904	8.1
1975.	27,127	100	7,110	26.2	6,479	23.9	2,494	9.2
1980.	30,512	100	7,769	25.5	7,086	23.2	2,444	8.0
1985.	33,636	100	8,721	25.9	8,056	24.0	2,467	7.3
East South Central								
1955.	7,959	100	1,963	24.7	1,665	20.9	989	12.4
1960.	9,277	100	2,778	29.9	2,207	23.8	1,510	16.3
1965.	9,652	100	2,587	26.8	2,201	22.8	1,294	13.4
1970.	9,862	100	2,660	27.0	2,464	25.0	1,162	11.8
1975.	10,798	100	3,007	27.8	2,689	24.9	1,355	12.5
1980.	11,771	100	3,614	30.7	3,173	27.0	1,567	13.3
1985.	12,364	100	3,671	29.7	3,308	26.8	1,441	11.7

Table 2. Comparison of Major Findings of the National Surveys: 1955 to 1985 (U.S. population 12 years old and older. Numbers in thousands).

Sportsmen, expenditures, and days	1955	1960	1965	1970	1975	1980	1985
Total sportsmen	24,917	30,435	32,881	36,277	45,773	46,966	49,827
Anglers	20,813	25,323	28,348	33,158	41,299	41,873	45,345
Freshwater	18,420	21,677	23,962	29,363	36,599	35,782	39,122
Saltwater	4,557	6,292	8,305	9,460	13,738	11,972	12,893
Hunters	11,784	14,637	13,583	14,336	17,094	16,758	16,340
Small game	9,822	12,105	10,576	11,671	14,182	12,496	11,130
Big game	4,414	6,277	6,566	7,774	11,037	11,047	12,576
Waterfowl	1,986	1,955	1,650	2,894	4,284	3,177	3,201
Expenditures[1]	13,904,225	17,010,944	18,282,320	23,925,058	40,730,094	42,094,416	51,101,515
Anglers	9,336,002	11,882,891	12,137,086	16,706,477	28,656,715	28,521,304	34,731,608
Freshwater	6,951,447	9,117,627	8,819,330	12,580,446	21,138,064	20,321,023	23,014,603
Saltwater	2,384,556	2,765,259	3,317,773	4,126,031	7,518,651	6,807,288	8,737,535
Hunters	4,568,222	5,128,045	4,651,589	7,218,581	12,073,379	13,185,436	12,461,852
Small game	2,409,399	3,206,537	2,552,606	3,185,841	5,519,441	4,068,112	2,846,575
Big game	1,579,704	1,526,585	1,737,452	3,209,185	5,168,708	6,876,092	6,494,911
Waterfowl	579,119	394,927	361,527	823,555	1,385,230	934,186	951,728
Days	566,870	658,308	708,578	909,876	1,459,551	1,300,983	1,415,379
Fishing	397,447	465,769	522,759	706,187	1,058,075	952,420	1,064,986
Freshwater	338,826	385,167	426,922	592,494	890,576	788,392	895,027
Saltwater	58,621	80,602	95,837	113,694	167,499	164,040	171,055
Hunting	169,423	192,539	185,819	203,689	401,476	348,543	350,393
Small game	118,630	138,192	128,448	124,041	269,653	225,793	214,544
Big game	30,834	39,190	43,845	54,536	100,600	117,406	135,447
Waterfowl	19,959	15,158	13,526	25,113	31,223	26,179	25,933

Table 3. FWHAR census method adjusted saltwater days and adjusted red snapper landings.

Year	Total salt_days SA	Adjusted Effort	Avg CPUE MRFSS & SRHS 81-85	Historic Catch (number)	S.D.	CV
1955	4820112	4153270	0.0151	62825	36774	0.59
1960	7038690	6064917	0.0151	91741	53700	0.59
1965	10225693	8811011	0.0151	133280	78015	0.59
1970	10525159	9069047	0.0151	137184	80300	0.59
1975	15726330	13550658	0.0151	204975	119981	0.59
1980	16613593	14315171	0.0151	216539	126750	0.59
1985	18187481	15671319	0.0151	237053	138758	0.59

Table 4. Estimated combined recreational red snapper landings (number) using FHWAR census method (1955-1980) MRFSS (1981-2003), MRIP (2004-2013), and SRHS (1972-2013) estimation methods.

| Year	Number	Year	Number
1955	62,825	1985	412,418
1956	68,608	1986	139,686
1957	74,391	1987	85,565
1958	80,175	1988	141,161
1959	85,958	1989	151,431
1960	91,741	1990	36,017
1961	100,049	1991	57,766
1962	108,357	1992	69,194
1963	116,665	1993	21,621
1964	124,973	1994	30,785
1965	133,280	1995	24,278
1966	134,061	1996	17,722
1967	134,842	1997	44,644
1968	135,622	1998	20,442
1969	136,403	1999	54,469
1970	137,184	2000	68,112
1971	150,742	2001	53,235
1972	164,300	2002	57,263
1973	177,858	2003	37,162
1974	191,417	2004	44,700
1975	204,975	2005	38,163
1976	207,288	2006	34,427
1977	209,601	2007	30,861
1978	211,914	2008	117,157
1979	214,226	2009	117,929
1980	216,539	2010	539
1981	158,219	2011	1,359
1982	68,286	2012	15,001
1983	112,897	2013	6,673
1984	302,198		

Figures
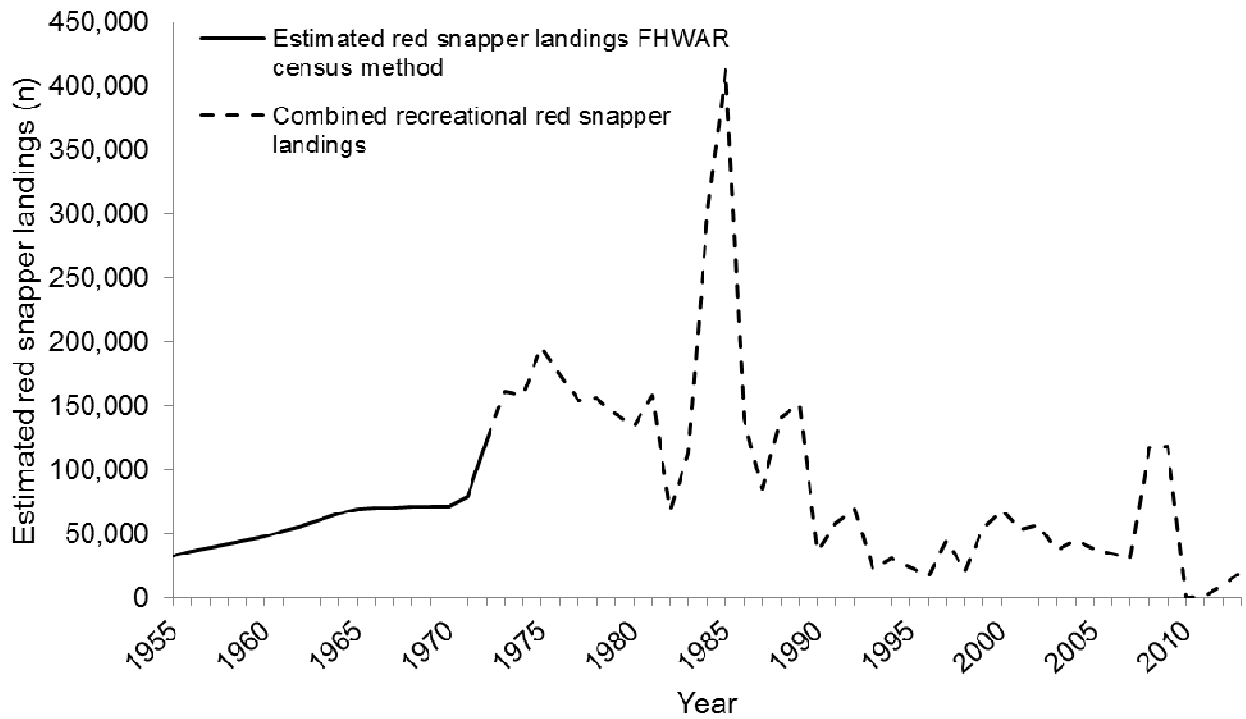
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