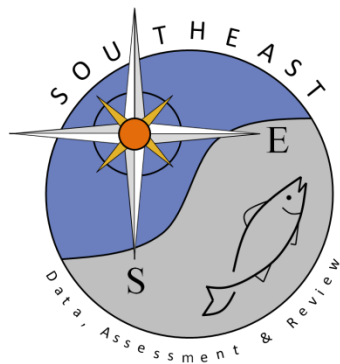


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April 29 2019



Please cite this document as: ,  
Ken Brennan. 2019. Estimates of Historic Recreational Landings of Cobia in the Atlantic Using the FHWAR Census Method. SEDAR58-DW10. SEDAR, North Charleston, SC. 8 pp.

**Estimates of Historic Recreational Landings of Cobia in the Atlantic Using the  
FHWAR Census Method**

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## **Introduction**

During previous SEDAR data workshops considerable time and effort was devoted to developing methods of back-calculating recreational landings for years prior to the start of modern data collection programs and landings estimates. 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); and U.S. Census data as a proxy for recreational fishing effort to produce regression estimates of catch. These approaches resulted in estimates that, in some cases, have generated a great deal of controversy.

The Recreational Working Group (RWG) for SEDAR 58 Data Workshop (DW) for Atlantic c o b i a was tasked to “evaluate historic recreational catch information and modify, as necessary, pre-MRIP estimates provided in SEDAR 28.”

## **Historical Angling**

The historic recreational landings of Atlantic cobia are defined as pre-1981 for the charter boat, headboat, private boat, and shore fishing modes; pre-1981 represents the start of the Marine Recreational Fisheries Statistics Survey (MRIP) and the beginning of landings estimates for cobia in the South Atlantic from the Southeast Region Headboat Survey (SRHS).

SEDAR 28 included historical recreational landings estimates for 1955 – 1980, based on the FHWAR method.

## **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 and 2006 provide summary tables (Comparison of Major Findings of the National Surveys: 1955 to 1985) 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 were the estimates of U.S. saltwater anglers and the estimates of U.S. saltwater days. The first objective was to determine the total saltwater anglers and saltwater days from New England to the South Atlantic (NE-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 NE-SA to yield the total saltwater anglers for NE-SA. The same method was used to calculate the total saltwater days for the NE-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 cobia NE - GA, the saltwater angler days for Florida were removed from the NE-SA saltwater angler days by using the ratio of the MRFSS total angler trips for FL to the MRFSS total angler trips for Maine to FL. The mean ratio from 1984-1986 was applied to the total saltwater days for the NE-SA from 1955-1985 to remove FL effort.

Similar to the Saltwater Angling Survey (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 cobia in the Atlantic, the total saltwater days for the NE-GA 1955-1985 were adjusted for recall bias in the FHWAR surveys by using the mean MRFSS total angler trips for the US East Coast (ME-FLE) 1984 to 1986, divided by the total saltwater days from the 1985 FHWAR Survey. This multiplier was then applied to the total NE-SA saltwater days from 1955-1985 to adjust for recall bias.

Using the adjusted saltwater days for NE-SA from 1955 – 1985, the next step in this process was estimating landings of cobia. This was accomplished by calculating the mean CPUE for cobia for ME-GA from the MRIP landings estimates for 1981 to 1985. This mean CPUE was then applied to the adjusted saltwater days for the NE-SA from 1955-1985 to estimate the historical landings of cobia 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 cobia 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 MRIP 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 the FHWAR Survey for historical recreational landings. By using data from FHWAR and the MRIP to calibrate this adjustment, the effect of the 12-month angler recall period is reduced. The historical landings of cobia

that were calculated using this method show a gradual increase from 1955 to 1980 (Figure 1). The FHWAR method could be used for other species by adjusting the geographic range of the FHWAR surveys to match management boundaries and the associated MRIP catch and effort data for a particular species.

**Literature Cited:**

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.

**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
<b>Total, United States</b>								
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
<b>New England</b>								
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
<b>Middle Atlantic</b>								
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
<b>East North Central</b>								
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
<b>West North Central</b>								
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
<b>South Atlantic</b>								
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
<b>East South Central</b>								
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
<b>Total sportsmen</b> .....	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
<b>Expenditures<sup>1</sup></b> .....	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
<b>Days</b> .....	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.**

**FHWAR estimation method for historical cobia landings (1955 - 1985)**

Year	US saltwater angler days	Proportion anglers NE-GA	Saltwater angler days NE-GA	Mean CPUE (MRFSS1981-1985)	Recall bias adjustment avg <sup>84</sup> 86 : 85 salt days	Adjusted saltwater angler days (NE - GA)	Adjusted cobia landings
1955	58,621,000	0.32	6,046,942	0.0002	3.32	15,951,624	2,609
1960	80,602,000	0.29	7,712,294	0.0002	3.32	23,293,761	3,810
1965	95,837,000	0.33	10,201,818	0.0002	3.32	33,840,793	5,535
1970	113,694,000	0.33	12,305,878	0.0002	3.32	34,831,840	5,697
1975	167,499,000	0.33	17,679,316	0.0002	3.32	52,044,539	8,513
1980	164,040,000	0.32	16,783,303	0.0002	3.32	54,980,835	8,993
1985	171,055,000	0.33	18,099,435	0.0002	3.32	60,189,443	9,845



**Table 4.** Estimated cobia landings (number) using FHWAR census method (1955-1980) MRIP (1981-2017), and SRHS (1981-2017) estimation methods.

Year	Est. landings (n)	Year	Est. landings (n)
1955	2,609	1987	24,893
1956	2,849	1988	11,923
1957	3,090	1989	21,732
1958	3,330	1990	18,057
1959	3,570	1991	21,504
1960	3,810	1992	23,164
1961	4,155	1993	15,766
1962	4,500	1994	12,256
1963	4,845	1995	27,713
1964	5,190	1996	94,123
1965	5,535	1997	18,938
1966	5,568	1998	11,241
1967	5,600	1999	23,794
1968	5,633	2000	13,665
1969	5,665	2001	11,672
1970	5,697	2002	16,864
1971	6,261	2003	51,969
1972	6,824	2004	31,635
1973	7,387	2005	57,370
1974	7,950	2006	50,908
1975	8,513	2007	36,360
1976	8,609	2008	28,859
1977	8,705	2009	52,657
1978	8,801	2010	50,607
1979	8,897	2011	31,487
1980	8,993	2012	46,387
1981	2,716	2013	66,204
1982	11,246	2014	52,472
1983	1,673	2015	110,419
1984	17,509	2016	75,779
1985	15,595	2017	39,661
1986	33,152		

**Figure 1.** Estimated cobia landings (number) using FHWAR census method (1955-1980), and combined recreational landings (1981-2017).

