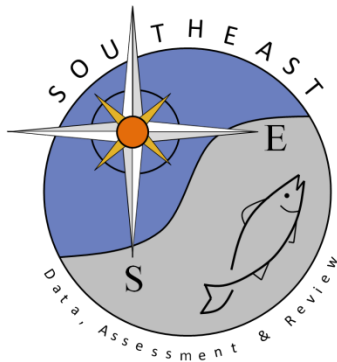


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SEDAR90-DW-11

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Introduction

During previous SEDAR Data Workshops, considerable time and effort was devoted to developing methods for back-calculating recreational landings for years prior to the implementation of modern data collection programs. The historical period is defined as pre-1981 because 1981 is the first year when the continuous time series for the Marine Recreational Information Program (MRIP) is available. Methods used in past stock assessments to estimate historical recreational landings include: 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) method (SEDAR-PW-07).

During the SEDAR best practices workshop, the FHWAR method was determined to be the best practice for estimating recreational landings for the historical time period (SEDAR-PW-07). Recent updates have been made to improve the FHWAR method to refine the effort estimates from the FHWAR survey to better align with the geographic parameters of the assessment and to update the method to adjust for recall bias (SEDAR 98-WP-08). This paper documents the methodological improvements and uses the recreational landings from SEDAR 41 South Atlantic (SA) Red Snapper (*Lutjanus campechanus*) to compare historical estimates using the original FHWAR method and the new updated method. Historical recreational landings estimates are also provided for SEDAR 90 in this paper. SEDAR 41 landings are used for comparison instead of SEDAR 73 landings because SEDAR 73 used the historical estimates provided in SEDAR 41 for the assessment. The SEDAR 41 estimates were calculated using MRIP landings that are in Coastal Household Telephone Survey (CHTS) units while the landings for S90 are in Fishing Effort Survey (FES) units.

National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR)

The FHWAR survey interviews U.S. residents about their fishing, hunting, and wildlife-associated (e.g. bird watching) activities. The U.S. Fish and Wildlife Service (USFWS) began conducting the FHWAR Survey in 1955 and it is one of the oldest and most comprehensive recreational surveys available. The survey is conducted every 5 years and gathers information on the number of anglers in the United States and the frequency and time spent fishing (FHWAR

1991). For the historical period from 1955-1985, historical estimates of U.S. population and estimates of fishing participation and effort are summarized in tables B-2 and B-3 in the 1991 FHWAR report (FHWAR 1991) and are provided as Tables 1 and 2 in this document. FHWAR provides estimates for the number of saltwater anglers, freshwater anglers, and saltwater fishing days for the entire U.S. (Tables 1 and 2). Angler estimates are also broken down into nine regions, however, only estimates for total anglers (i.e. saltwater and freshwater) are available for these smaller regions.

FHWAR Method

To estimate the number of saltwater anglers in the SA, the ratio of U.S. saltwater anglers to total U.S. anglers is applied to the total number of anglers in the SA. This ratio is then multiplied by the total number of U.S. saltwater days to estimate the number of saltwater days in the SA region. For the FHWAR survey, the SA includes Delaware (DE), Maryland (MD), Virginia (VA), North Carolina (NC), South Carolina (SC), Georgia (GA), and the entire state of Florida (FL; Figure 1). For SEDAR 90, the South Atlantic is defined as NC, SC, GA, and the east coast of Florida (FLE), so the saltwater days attributed to DE, MD, VA, and the west coast of FL (FLW) need to be excluded from the FHWAR estimates. In previous assessments, only effort for FLW was removed from the FHWAR estimates. The first improvement to the FHWAR method is that now FLW effort, and the effort from DE, MD, and VA are removed when calculating the number of saltwater angler days in the historical period. Effort data for all FHWAR SA states from MRIP and Southeast Region Headboat Survey (SRHS) were used to calculate the mean ratio of angler trips for FLW, DE, MD, and VA from 1984-86 to the total number of angler trips in the SA. This ratio was then used to exclude effort from the states outside of the SEDAR 90 assessment boundaries.

From 1955-1985, the FHWAR survey was based on a 12-month recall period for respondents. As part of the 1991 FHWAR survey, a study was conducted comparing estimates using the 12-month recall period versus a 4-month recall period. The recall study found the estimates for annual saltwater fishing days were on average 46% higher than estimates produced from the 4-month recall period (FHWAR 1991). In previous assessments, recall bias was adjusted by calculating the ratio of MRIP and SRHS 1985 effort to FHWAR 1985 saltwater days and multiplying this ratio by the FHWAR saltwater angler days for each survey year (e.g. 1955, 1960) to produce adjusted effort. This adjustment seemed more like a calibration between modern survey units (e.g. MRIP and SRHS) to FHWAR units. In the updated FHWAR method, recall bias is now adjusted by reducing saltwater angler days by the average estimate for recall bias between the 12-month and 4-month surveys (46%). After effort is adjusted for recall bias, then the ratio of MRIP and SRHS 1985 effort to adjusted FHWAR 1985 saltwater days is applied to adjusted saltwater days to calibrate FHWAR units to modern survey units (SEDAR98-DW-08).

The mean CPUE for MRIP and SRHS landings from 1981-1983 was then applied to the calibrated FHWAR saltwater days to estimate historical landings. (Table 3). This mean CPUE year range was also used in SEDAR 41. A minimum size limit of 12 inches was implemented in September 1983 and we did not want to include later years in the CPUE estimate because of the potential of the management regulations altering angler behavior.

Historical Landings Estimates

The updated FHWAR method was used to estimate separate historical recreational landings time series using data from SEDAR 41 and SEDAR 90 (Fig. 2). The improvements to the FHWAR method did not produce dramatically different estimates using SEDAR 41 data, and estimates using the updated method were < 2% lower than the original method. However, the historical recreational landings for SEDAR 90 are substantially larger than the historical landings from SEDAR 73 (Table 4, Fig. 2). This increase is driven by the switch from CHTS to FES which lead to increased effort estimates that are used in the calibration of FHWAR angler days to modern survey effort units.

Works Cited

Binion-Rock, S.M. SEDAR98-WP-08. 2024. An Update to the FHWAR Method Used to Estimate Historical Recreational Landings. SEDAR, North Charleston, SC. 15 pp.

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Tables

Table 1: Numbers (in thousands) of sportsman, anglers, and hunters in the United States and by FHWR Survey region from 1955-1985. Table copied from FHWR 1991.

(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	17,084	9.9
1980	184,891	100	48,966	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	3,802	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	2,484	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

Continued

Table 1 continued

(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
West South Central								
1955	10,250	100	2,560	25.0	2,237	21.8	1,165	11.4
1960	11,837	100	3,666	31.0	3,133	26.5	1,750	14.8
1965	12,724	100	3,713	29.2	3,278	25.8	1,571	12.3
1970	14,624	100	4,380	30.0	4,006	27.4	1,918	13.1
1975	16,628	100	5,781	34.8	5,267	31.7	2,563	15.4
1980	19,136	100	5,862	30.6	5,136	26.8	2,456	12.8
1985	21,184	100	6,418	30.3	5,704	26.9	2,572	12.1
Mountain								
1955	4,529	100	1,369	30.2	1,112	24.6	798	17.6
1960	5,222	100	1,846	31.5	1,372	26.3	1,120	21.4
1965	5,029	100	1,565	31.1	1,261	25.1	968	19.6
1970	5,656	100	2,044	36.1	1,769	31.3	960	17.3
1975	7,576	100	2,570	33.9	2,252	29.7	1,159	15.3
1980	9,160	100	2,903	31.7	2,500	27.3	1,268	13.8
1985	10,215	100	3,128	30.6	2,765	27.1	1,241	12.1
Pacific								
1955	13,570	100	2,637	19.4	2,252	16.6	1,116	8.2
1960	15,268	100	3,422	22.4	2,971	19.5	1,279	8.4
1965	17,523	100	4,246	24.2	3,744	21.4	1,433	8.2
1970	20,199	100	4,332	21.4	4,030	20.0	1,466	7.3
1975	23,012	100	5,811	25.2	5,386	23.4	1,607	7.0
1980	26,299	100	6,168	23.5	5,747	21.9	1,531	5.0
1985	38,725	100	6,154	21.4	5,829	20.3	1,310	4.6

Table 2: Comparison of major finding from the 1955-1985 FHWAR surveys. Numbers are in thousands. Table copied from FHWAR 1991.

(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	21,877	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	11,764	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	1,966	1,955	1,650	2,894	4,284	3,177	3,201
Expenditures	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	706,578	909,876	1,459,551	1,300,963	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	289,653	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. Summary of estimates produced using the updated FHWAR method for SEDAR 90. The mean CPUE was calculated using combined MRIP and SRHS landing and effort estimates from 1981-1983. Adjusted saltwater days are regional saltwater days after they have been adjusted for recall bias. Standardized saltwater days refers to calibrating FHWAR units to MRIP, and SRHS units.

Year	U.S. Saltwater Days	Adjusted SA Saltwater Days	Standardized SA Saltwater Days	Mean CPUE	Historical Catch (n)	CV
1955	58,621,000	3,802,518	3,551,631	0.021	74,398	0.830
1960	80,602,000	5,660,632	5,287,150	0.021	110,752	0.830
1965	95,837,000	8,223,674	7,681,084	0.021	160,899	0.830
1970	113,694,000	8,464,509	7,906,029	0.021	165,611	0.830
1975	167,499,000	12,647,378	11,812,917	0.021	247,451	0.830
1980	164,040,000	13,360,930	12,479,389	0.021	261,412	0.830

Table 4: Comparison of historical recreational landings (in numbers), using estimates from SEDAR 41 and estimates produced for SEDAR 90 SA Red Snapper.

Year	S41 (n)	S90 (n)
1955	36,536	74,398
1956	39,899	81,669
1957	43,263	88,940
1958	46,626	96,211
1959	49,989	103,482
1960	53,353	110,752
1961	58,184	120,782
1962	63,015	130,811
1963	67,847	140,841
1964	72,678	150,870
1965	77,510	160,899
1966	77,964	161,842
1967	78,418	162,784
1968	78,872	163,727
1969	79,326	164,669
1970	79,780	165,611
1971	87,665	181,979
1972	95,549	198,347
1973	103,434	214,715
1974	111,319	231,083
1975	119,204	247,451
1976	120,549	250,243
1977	121,894	253,035
1978	123,239	255,827
1979	124,584	258,620
1980	125,929	261,412

Figures

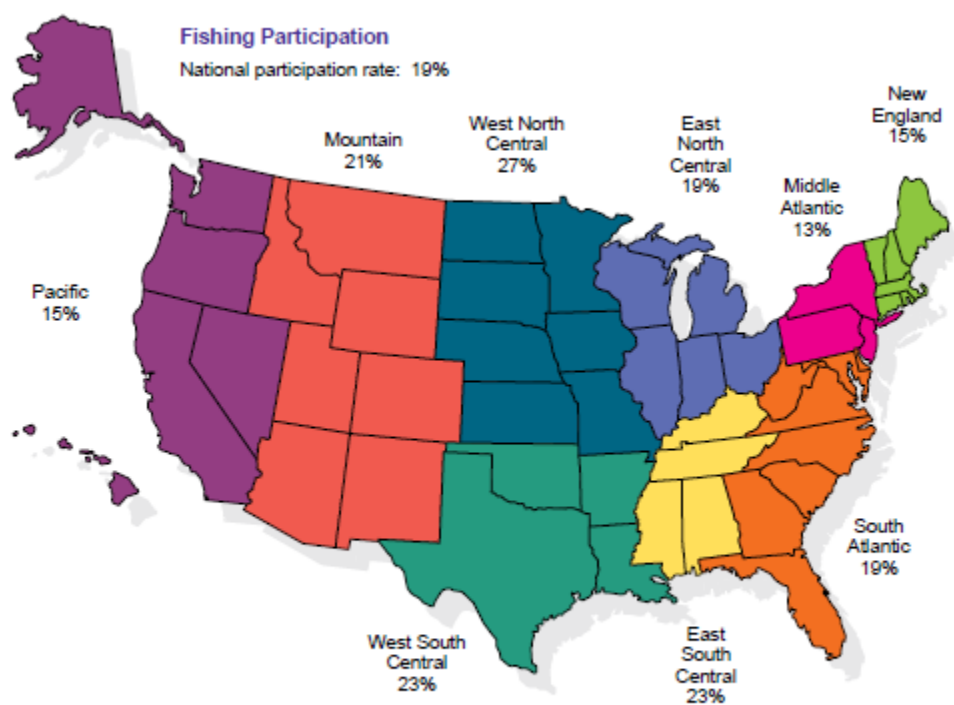


Figure 1. Map of regions defined in the FHWAR survey. Figure is from FHWAR 1991. The numbers show the percentage of anglers by region in the 1991 survey.

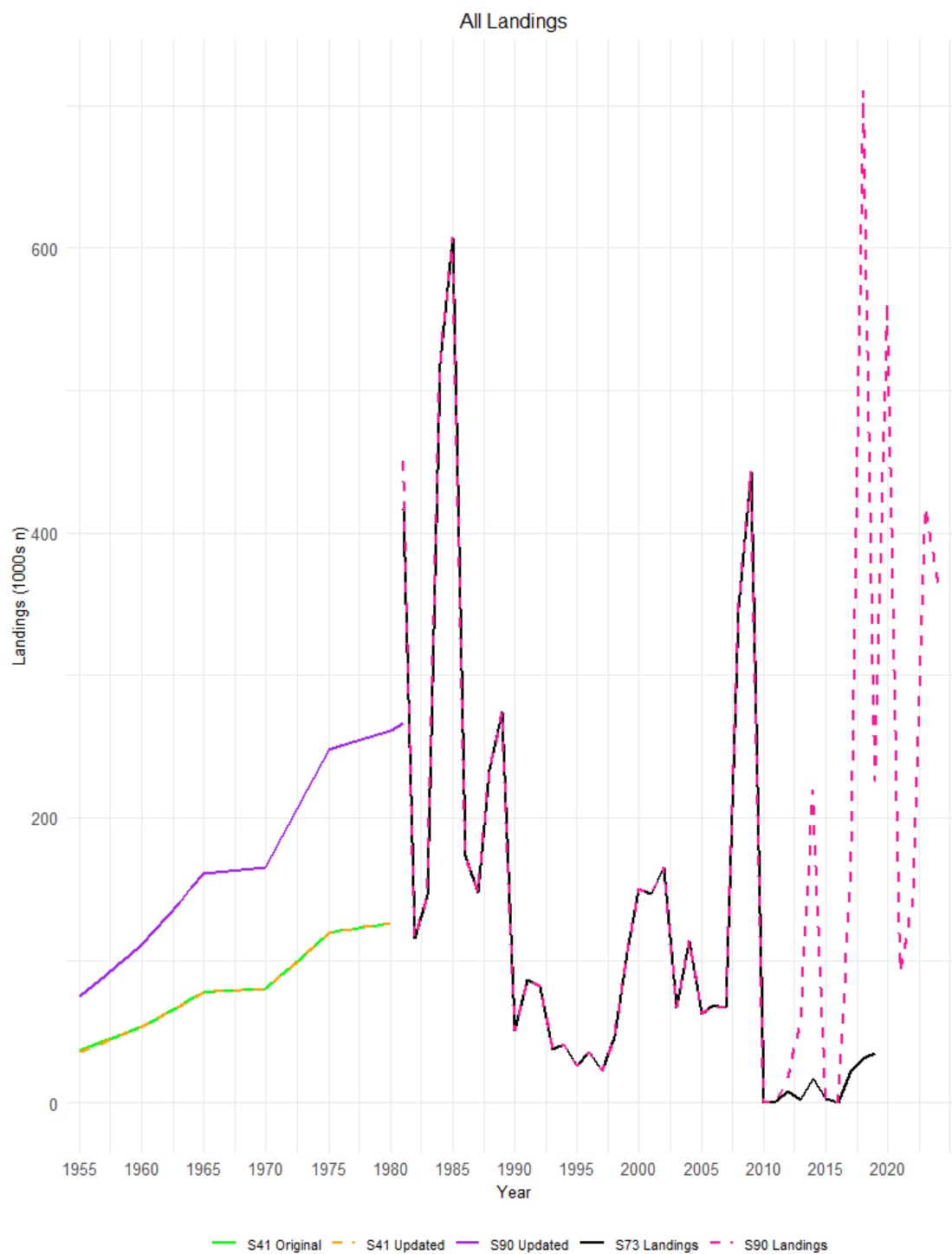


Figure 2. Historical red snapper landings (numbers in 1000s) from 1955-1980 for SEDAR 41 estimated using the original and updated FHWAR method, historical red snapper landings for SEDAR 90 using the updated FHWAR method, and modern MRIP and SRHS landings combined for SEDAR 73 and SEDAR 90. All landings estimates are in numbers in 1000s.

