

# Projections of OFL and ABC for Gulf of Mexico Greater Amberjack using the SEDAR 33 Update Assessment model modified to use FES derived recreational catch statistics

*Southeast Fisheries Science Center, Sustainable Fisheries Division*

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## Introduction:

During the June 2021 meeting, the Gulf of Mexico (Gulf) Fishery Management Council (Council) reviewed a presentation to integrate the results of the SEDAR 70 greater amberjack stock assessment into management advice. As part of its deliberation, the Council requested additional information from an analysis that would re-estimate the overfishing limit (OFL) and Acceptable Biological Catch (ABC) for the years from 2016 through 2020 using the SEDAR 33 Update assessment. The requested analysis would use MRIP-FES recreational data to generate harvest advice for SEDAR 33 Update in the MRIP-FES currency. This analysis will facilitate integration of the most recent catch advice into management that is necessary to end overfishing and rebuild the greater amberjack (GAJ) stock by 2027 consistent with the rebuilding plan.

## Methods:

The base model from SEDAR 33 Update was used as the basis for projections. To accommodate the Council's request, the recreational (Private and Charter) and Headboat fleets landings (Table 1) and discards (Table 2) were updated from the CHTS values used in the original assessment to the FES values used in the most recent GAJ assessment, SEDAR 70. The model was refit with the updated data, checked for convergence, and then used to conduct OFL and ABC projections. Projection methodology followed what was done for SEDAR 33 Update. A three year average was used to derive fleet relative  $F$ 's, selectivity and biology were taken from the most recent time period, and recruits were calculated using the SR curve. As was done for SEDAR 33 Update, fixed removals for 2016 were input in the forecast module of SS. The 2016 landings for the recreational and headboat fleets were updated using the FES values from SEDAR 70 (Table 1, 2016). Annual OFL values were derived through a constant  $F$  projection of the fishing mortality rate that achieved an SPR of 30% in equilibrium. Annual ABC values were derived through a constant  $F$  projection of the fishing mortality rate that rebuilds the stock to an SPR of 30% in 2027.

## Results:

Estimates of OFL and ABC (Table 3) increased relative to the estimates obtained during SEDAR 33 Update (Table 4) using CHTS recreational data. ABC values estimated in this report were based on  $F_{REBUILD}$  projections and are therefore not directly comparable to the SEDAR 33 Update values in table 4, which are based on projections of 75%  $F_{SPR30}$  and  $F_{SPR40}$ .

Tables.

Table 1. Gulf of Mexico Greater Amberjack landings used to conduct projections in support of the Council request. Values are identical to those used in the SEDAR 33 Update assessment with the exception of the recreational and headboat landings which were replaced with the FES values. Commercial handline (Comm. HL) and commercial longline (Comm. LL) values are in metric tons and combined private charter (Rec.) and headboat (Hbt) values are in 1000's of fish.

Year	Comm HL	Comm LL	Rec.	Hbt
1950	0	0	102.89	0.45
1951	0	0	123.47	0.54
1952	0	0	144.04	0.63
1953	0	0	164.62	0.72
1954	0	0	185.20	0.81
1955	0	0	205.78	0.90
1956	0	0	218.83	1.20
1957	0	0	231.88	1.49
1958	0	0	244.94	1.79
1959	0	0	257.99	2.09
1960	0	0	271.04	2.39
1961	0	0	271.75	2.69
1962	0	0	272.46	2.99
1963	3.82	0	273.16	3.29
1964	2.86	0	273.87	3.59
1965	2.35	0	274.57	3.89
1966	3.32	0	281.18	4.25
1967	13.11	0	287.80	4.60
1968	5.17	0	294.41	4.96
1969	32.73	0	301.02	5.32
1970	6.13	0	307.63	5.68
1971	17.27	0	318.45	5.68
1972	18.70	0	329.27	5.98
1973	12.69	0	340.09	6.28
1974	18.74	0	350.91	6.28
1975	35.08	0	361.73	8.67
1976	38.82	0	382.30	8.37
1977	53.82	0	402.88	7.77
1978	67.65	0	423.46	7.47
1979	66.77	1.24	444.03	8.37
1980	77.91	2.19	464.61	8.37
1981	95.45	10.12	327.88	7.77
1982	82.89	17.66	896.10	7.77

1983	104.76	20.47	482.74	7.77
1984	209.82	27.70	155.05	7.77
1985	293.59	51.88	570.52	7.77
1986	417.24	95.09	489.71	86.02
1987	588.82	119.42	1306.60	52.89
1988	785.24	157.03	329.39	29.66
1989	748.28	144.74	473.97	52.52
1990	513.23	60.42	89.13	24.26
1991	805.44	3.29	333.38	9.85
1992	456.92	25.15	379.23	19.75
1993	695.60	41.01	196.45	14.05
1994	550.02	33.94	134.19	13.12
1995	525.76	38.17	55.30	8.67
1996	538.54	26.81	137.64	10.51
1997	459.23	25.87	70.13	7.54
1998	274.99	23.37	68.11	5.11
1999	302.97	28.25	123.25	5.29
2000	354.97	30.90	99.06	6.00
2001	299.64	20.97	113.74	6.01
2002	313.24	35.62	234.77	10.69
2003	382.41	53.29	315.71	11.98
2004	394.66	36.73	246.44	6.24
2005	292.82	32.60	217.25	3.99
2006	234.13	34.38	134.06	4.73
2007	239.81	26.85	68.68	4.46
2008	171.58	41.10	142.14	4.82
2009	247.44	22.40	112.17	5.24
2010	241.54	10.31	149.77	2.57
2011	230.63	5.04	112.56	2.99
2012	138.54	4.49	149.10	3.84
2013	206.00	7.45	131.74	3.13
2014	224.44	9.59	138.36	1.99
2015	211.80	13.24	121.19	2.87
2016	174.55	13.84	109.61	1.10

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Table 2. Gulf of Mexico Greater Amberjack discards used to conduct projections in support of the Council request. Values are identical to those used in the SEDAR 33 Update assessment with the exception of the recreational and headboat discards which were replaced with the FES values. Commercial handline (Comm. HL) and commercial longline (Comm. LL) values are in metric tons and combined private charter (Rec.) and headboat (Hbt) values are in 1000's of fish.

Year	Comm HL	Comm LL	Rec.	Hbt
1981			38.1298	0.0053
1982			87.9572	0.1545
1983			162.086	0.4214
1984			33.864	0
1985			43.5865	0.0007
1986			110.919	14.2124
1987			72.7784	0.3008
1988			119.888	0.0744
1989			172.696	1.85
1990			185.604	26.6118
1991			348.563	6.8387
1992			322.31	7.6376
1993			321.673	13.1728
1994			182.616	7.1368
1995			119.484	3.7439
1996			79.5629	4.2792
1997			130.064	3.0063
1998			196.222	7.2961
1999			223.08	5.9042
2000			340.347	3.72
2001			1492.92	8.9905
2002			748.64	8.2243
2003			664.76	6.91
2004			386.374	1.9799
2005			543.235	2.5524
2006			507.998	1.7899
2007	46.413	1.015	328.476	3.3685
2008	144.738	2.446	369.371	4.637
2009	67.249	1.892	267.774	5.619
2010	97.114	1.317	1063.26	2.981
2011	38.731	1.208	690.032	3.107
2012	269.78	1.159	370.876	3.834
2013	82.179	3.549	703.34	4.665
2014	136.76	2.008	422.74	5.75

2015	78	2.799	515.972	8.235
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Table 3. Estimates of OFL and ABC derived from an equilibrium projection of  $F_{SPR30}$  and a rebuild projection which aimed to rebuild to SPR 30% by 2027, respectively. All values are in millions of pounds whole weight and in FES units.

<b>Year</b>	<b>OFL</b>	<b>ABC</b>
2016	2.92	2.92
2017	2.00	1.70
2018	2.52	2.20
2019	3.03	2.70
2020	3.48	3.14

Table 4. Management advice table for from the SEDAR 33 update and the SEDAR 33 benchmark model assessment reports for greater amberjack.

Criteria	Definitions	SEDAR 33 Update	SEDAR 33
<b>M</b>		0.28	0.28
<b>Steepness</b>		0.85	0.85
<b>Virgin Recruitment</b>	1,000s	2,761	2,827
<b>SSB Unfished</b>		18,779	17,356
	<b>Mortality rate criteria</b>		
<b>Fmsy or proxy</b>	F_SPR30%	0.20	0.22
<b>MFMT</b>	F_SPR30%	0.20	0.22
<b>Fcurrent</b>	Geometric mean (F(nyr-3)-nyr)	0.33	0.26
<b>Fcurrent/MFMT</b>		1.69	1.15
	<b>Biomass criteria</b>		
<b>SSB_msy or proxy</b>	SSB_SPR30%	5,686	4,646
<b>MSST (Mtons)</b>	(1-M)*SSB_SPR30%	4,094	3,345
<b>SSBcurrent (Mtons)</b>	SSB2015	1,640	2,188
<b>SSBcurrent/SSB_SPR30%</b>	SSB2015	0.288	0.47
<b>SSBcurrent/MSST</b>	SSB2015	0.400	0.65
<b>OFL</b>	<b>Annual yield at MFMT (MP, ww) = FSPR30%</b>		
	OFL 2017	1.243	2.906
	OFL 2018	1.500	2.986
	OFL 2019	1.836	3.068
	OFL 2020	2.167	3.170
	OFL 2021	2.438	3.266
	OFL 2022	2.666	3.344
<b>ABC</b>	<b>Annual yield at FOY (MP, ww) = 75%FSPR30%</b>		
	ABC 2017	0.936	2.489
	ABC 2018	1.182	2.616
	ABC 2019	1.489	2.730
	ABC2020	1.794	2.852
	ABC 2021	2.057	2.964
	ABC 2022	2.287	3.058
<b>Alternative ABC</b>	<b>Annual yield (MP, ww) = FSPR40%</b>		
	2017	0.927	2.379
	2018	1.172	2.514
	2019	1.477	2.633
	2020	1.781	2.758
	2021	2.043	2.872
	2022	2.273	2.968