

SEDAR 72 GOM Grouper State Reef Fish Survey (SRFS) Run
Updated Projections - Council Request

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This document provides updated projections for GOM Gag Grouper using the SEDAR 72 State of Florida's State Reef Fish Survey alternative model run ("SRFS Run"), following a Council Request to:

1. set the management year to 2024;
2. set the **sector allocation to 69% recreational: 31% commercial**, based on the average landings from 1986 – 2005 with private FL mode in SRFS units;
3. constrain 2023 interim landings to 661,000 pounds (lbs) gutted weight (gw), which is equivalent to the catch limit recommended in an interim rule being developed by the NOAA Fisheries Southeast Regional Office,

Projection Settings

All projection settings are detailed in **Table 1**.

Retained catch for the 2020-2022 interim years used landings statistics when available and the average of the last three years of retained catches when not. For 2020, finalized landings statistics were available for all fleets. For 2021, finalized landings statistics were available for the Recreational Headboat fleet, with near-final estimates available for all other fleets (Recreational Charter and Recreational Private + Shore are currently missing Texas catch estimates for the last wave of 2021; while commercial landings are complete but will undergo a minor adjustment next year). Given that only minor changes expected for 2021 landings, these preliminary estimates were used as the 2021 interim landings. For 2022, the average of the last three years of available landings, by fleet, were used as interim catch (i.e. 2019-2021). The FES-SRFS conversion factor of 0.420811 (Cross et al. 2020) was used to convert interim landings of the Private FL sector into SRFS currency.

The combined landings for 2023 were constrained to 661,000 lbs gw, using MRIP-FES for the private FL landings, which is equivalent to the catch limit recommended in an interim rule being developed by the NOAA Fisheries Southeast Regional Office. This interim rule is expected to be implemented on or about January 1, 2023, and to be in effect until at least January 1, 2024. To run projections, the combined had to be further apportioned between sectors and fleets. This was done by dividing catches between the commercial and recreational sector according to the 65:35 allocation ratio: 231,350 lbs gw to the commercial sector and 429,650 lbs gw to the recreational sector. Within the commercial sector, total commercial catches were further apportioned by fleet (VL vs. LL) based on the average proportion of observed landings in weight for 2017-2019 (65% VL: 150,377 lbs ~ 68 mt; 35% LL: 80,972 lbs ~ 37 mt). For the recreational landings, catches are

inputted as numbers in the Stock Synthesis assessment model. Total recreational catches were therefore apportioned between modes based on the average proportion of expected landings in weight for 2017-2019 (2% Headboat, 17% Charter, 81% Private/Shore), and converted to numbers of fish by dividing the catches in weight by the expected mean gutted weight of fish in the retained catches of each fleet (4.01 kg Headboat, 4.05 kg Charter, 3.73 kg Private/Shore).

Projection results

A summary of Magnuson-Stevens Reauthorization Act benchmarks and reference points are detailed in **Table 2**.

$F_{40\%SPR}$ was determined using a long-term 100-year projection assuming that equilibrium was obtained over the last 10 years (2109-2119). The minimum stock size threshold (MSST) was determined by multiplying the reference spawning stock biomass, $SSB_{40\%SPR}$, by 0.5 and was used to determine stock status. The maximum fishing mortality threshold (MFMT) was equivalent to the harvest rate ($F_{40\%SPR}$; total biomass killed / total biomass age 3+) that achieved $SSB_{40\%SPR}$, and was used to assess whether overfishing was occurring in a given year (**Figure 1**).

Stock status in 2019 indicated Gulf of Mexico Gag Grouper to be overfished with overfishing occurring (**Table 2**). F_0 projections were run to determine the year in which the stock would rebuild in the absence of fishing mortality ($SSB_y \geq SSB_{F_{40\%SPR}}$; using beginning of year (Jan 1) SSB estimates to determine if stock is rebuilt in year y).

OFL projection results for 2024-2028 are provided in **Table 3**. Since the stock is overfished (**Table 2**), rebuilding projection were conducted. The F_0 projections for the F_{SPR40} scenario show the stock rebuilding in 2035 (**Table 4**).

T_{min} , calculated as the amount of time the stock or stock complex is expected to take to rebuild to its MSY proxy biomass level in the absence of any fishing mortality ($F=0$), was estimated at 11 years, leaving 3 options for determining the rebuilding time frame:

- T_{min} + the length of time associated with one generation time (8 years)
- $T_{min} * 2$
- Amount of time stock expected to take to rebuild to $SSB_{MSYproxy}$ if fished at $75\%MFMT$

The rebuilding timeframes outlined above are presented in **Tables 5-7**. Details regarding the impact to retained yield and discards is shown in **Tables 8-10**.

References

Cross, Tiffanie A., Colin P. Shea, and Beverly Sauls. 2020. A ratio-based method for calibrating GRFS and MRIP-FCAL estimates of total landings (numbers and pounds of fish), and releases (numbers of fish). SEDAR72-WP-04. SEDAR, North Charleston, SC. 10 pp.

Table 1. Settings used for Gulf of Mexico Gag Grouper SRFS Run updated projections.

Parameter	Value	Comment
Relative F	Not used	Average relative fishing mortality (apical F) over terminal three years of model (Red Tide F excluded)
Selectivity	2019	Fleet specific selectivity estimated in the terminal year of the model
Retention	2019	Fleet specific retention estimated in the terminal year of the model
Recruitment	Beverton-Holt stock-recruitment relationship	Derived from the model estimated Beverton-Holt stock-recruitment relationship
Interim Landings (2020-2023)	77/91/109/68 mt (Comm. Vertical Line) 139/164/128/37 mt (Comm. Longline) 2.98/3.64/3.09/0.97 thousands of fish (Headboat) 38/80/49/8 thousands of fish (Charter) 131/90/106/42 thousands of fish (Private)	Landings provided for 2020-2021; For 2022, used 3-year average of landings (2019-2021); For 2023, total landings constrained to 661,000 lbs gw (interim rule)
Allocation Ratio	31:69	Commercial:Recreational
Red Tide in Interim Years	0.18	Red Tide F for 2021 obtained from the Ecosim model (medium red tide scenario)

Table 2. Summary of Magnuson-Stevens Reauthorization Act benchmarks and reference points for the Gulf of Mexico Gag Grouper assessment. Spawning Stock Biomass (SSB) is in metric tons, whereas F is a harvest rate (total biomass killed / total biomass age 3+).

Criteria	Definition	F40%SPR Med 2021 Red Tide
Base M	Target M for fully selected ages in the Lorenzen (2005) scaling	0.159
Steepness	Steepness of the Beverton-Holt stock-recruit relationship (fixed)	0.855
R0	Virgin Recruitment (1000s)	8903.17
Generation Time	Fecundity-weighted mean age	7.88
SSB0	Virgin spawning stock biomass (mt)	67052.2
Mortality Rate Criteria		
Proxy	Fmsy proxy used	F40%SPR
Fmsy proxy	Fmsy proxy	0.095
MFMT	Fmsy proxy	0.095
%SPR equivalent of Fmsy proxy	%SPR equivalent	40
Fcurrent	Geometric mean of the last 3 years of the assessment (F2017-2019), excluding red tide mortality	0.352
Fcurrent/MFMT	Current stock status based on MFMT	3.684
Biomass Criteria		
SSBmsy proxy	Equilibrium SSB at Fmsy proxy	25039.1
MSST	$0.5 * SSB_{Fmsy_proxy}$	12519.55
SSBcurrent	SSB2019	1706.37
SSBcurrent/SSBFmsy_proxy	Current stock status based on SSBFmsy	0.068
SSBcurrent/MSST	Current stock status based on MSST	0.136
First year mgmt		2024
Yr rebuilt at F=0		2035
SSBcurrent/SSB0	SSB ratio in 2019	0.025
SSByrrebuilt/SSB0	SSB ratio in first year rebuilt	0.226

Table 3. Results of the OFL projections (fishing set at F_{SPR40}) for the Gulf of Mexico Gag Grouper SRFS Run. Recruitment (R) is in 1000s of age-0 fish, SSB is in metric tons, F is a harvest rate (total biomass killed / total biomass age 3+), and OFL is the overfishing limit in millions of pounds gutted weight.

Year	R	F	F/ MFMT	SSB	SSB/ SSBF _{msy}	SSB/ MSST	Yield	SSB/ SSB ₀
2017	2,899	0.340	3.56	1,695	0.07	0.14	-	0.03
2018	1,517	0.446	4.68	1,727	0.07	0.14	-	0.03
2019	2,158	0.374	3.92	1,706	0.07	0.14	-	0.03
2020	3,553	0.331	3.47	1,836	0.07	0.15	1.88	0.03
2021	3,758	0.389	4.07	2,014	0.08	0.16	2.07	0.03
2022	3,139	0.482	5.05	1,513	0.06	0.12	1.91	0.02
2023	2,833	0.155	1.63	1,301	0.05	0.10	0.66	0.02
2024	3,625	0.095	1.00	1,897	0.08	0.15	0.58	0.03
2025	4,533	0.095	1.00	2,824	0.11	0.23	0.79	0.04
2026	5,213	0.095	1.00	3,789	0.15	0.30	0.97	0.06
2027	5,695	0.095	1.00	4,694	0.19	0.37	1.18	0.07
2028	6,092	0.095	1.00	5,641	0.23	0.45	1.43	0.08

Table 4. Results of projections at $F = 0$ for the Gulf of Mexico Gag Grouper SRFS Run. Recruitment (R) is in 1000s of age-0 fish, SSB is in metric tons, F is a harvest rate (total biomass killed / total biomass age 3+), and retained yield in millions of pounds gutted weight.

Year	R	F	F/ MFMT	SSB	SSB/ SSBF _{msy}	SSB/ MSST	Yield	SSB/ SSB ₀
2017	2,899	0.340	3.56	1,695	0.07	0.14	-	0.03
2018	1,517	0.446	4.68	1,727	0.07	0.14	-	0.03
2019	2,158	0.374	3.92	1,706	0.07	0.14	-	0.03
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2021	3,758	0.389	4.07	2,014	0.08	0.16	2.07	0.03
2022	3,139	0.482	5.05	1,513	0.06	0.12	1.91	0.02
2023	2,833	0.155	1.63	1,301	0.05	0.10	0.66	0.02
2024	3,625	0.000	0.00	1,897	0.08	0.15	0	0.03
2025	4,727	0.000	0.00	3,070	0.12	0.25	0	0.05
2026	5,558	0.000	0.00	4,413	0.18	0.35	0	0.07
2027	6,151	0.000	0.00	5,803	0.23	0.46	0	0.09
2028	6,622	0.000	0.00	7,348	0.29	0.59	0	0.11
2029	7,038	0.000	0.00	9,248	0.37	0.74	0	0.14
2030	7,393	0.000	0.00	11,527	0.46	0.92	0	0.17
2031	7,680	0.000	0.00	14,094	0.56	1.13	0	0.21
2032	7,905	0.000	0.00	16,859	0.67	1.35	0	0.25
2033	8,083	0.000	0.00	19,756	0.79	1.58	0	0.29
2034	8,223	0.000	0.00	22,729	0.91	1.82	0	0.34
2035	8,336	0.000	0.00	25,728	1.03	2.06	0	0.38

Table 5. Results for rebuilding projections using $T_{min} + 1$ generation time for Gulf of Mexico Gag Grouper SRFS Run F_{SPR40} scenario. Recruitment (R) is in 1000s of age-0 fish, SSB is in metric tons, F is a harvest rate (total biomass killed / total biomass age 3+), and retained yield in millions of pounds gutted weight. The $F_{rebuild}$ is shown starting in 2024.

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Year	R	F	F/ MFMT	SSB	SSB/ SSBF _{msy}	SSB/ MSST	Yield	SSB/ SSB ₀
2017	2,899	0.340	3.56	1,695	0.07	0.14	-	0.03
2018	1,517	0.446	4.68	1,727	0.07	0.14	-	0.03
2019	2,158	0.374	3.92	1,706	0.07	0.14	-	0.03
2020	3,553	0.331	3.47	1,836	0.07	0.15	1.88	0.03
2021	3,758	0.389	4.07	2,014	0.08	0.16	2.07	0.03
2022	3,139	0.482	5.05	1,513	0.06	0.12	1.91	0.02
2023	2,833	0.155	1.63	1,301	0.05	0.10	0.66	0.02
2024	3,625	0.079	0.83	1,897	0.08	0.15	0.48	0.03
2025	4,567	0.079	0.83	2,866	0.11	0.23	0.66	0.04
2026	5,274	0.079	0.83	3,892	0.16	0.31	0.83	0.06
2027	5,777	0.079	0.83	4,871	0.19	0.39	1.01	0.07
2028	6,187	0.079	0.83	5,906	0.24	0.47	1.23	0.09
2029	6,571	0.079	0.83	7,156	0.29	0.57	1.49	0.11
2030	6,914	0.079	0.83	8,611	0.34	0.69	1.78	0.13
2031	7,199	0.079	0.83	10,184	0.41	0.81	2.07	0.15
2032	7,429	0.079	0.83	11,800	0.47	0.94	2.37	0.18
2033	7,613	0.079	0.83	13,417	0.54	1.07	2.66	0.20
2034	7,762	0.079	0.83	15,005	0.60	1.20	2.94	0.22
2035	7,882	0.079	0.83	16,538	0.66	1.32	3.21	0.25
2036	7,980	0.079	0.83	17,989	0.72	1.44	3.47	0.27
2037	8,060	0.079	0.83	19,340	0.77	1.54	3.7	0.29

Table 5 Continued. Results for rebuilding projections using $T_{min} + 1$ generation time for Gulf of Mexico Gag Grouper SRFS Run F_{SPR40} scenario. Recruitment (R) is in 1000s of age-0 fish, SSB is in metric tons, F is a harvest rate (total biomass killed / total biomass age 3+), and retained yield in millions of pounds gutted weight. The $F_{rebuild}$ is shown starting in 2024.

Year	R	F	F/ MFMT	SSB	SSB/ SSBF _{msy}	SSB/ MSST	Yield	SSB/ SSB ₀
2038	8,125	0.079	0.83	20,579	0.82	1.64	3.91	0.31
2039	8,178	0.079	0.83	21,699	0.87	1.73	4.1	0.32
2040	8,222	0.079	0.83	22,701	0.91	1.81	4.27	0.34
2041	8,258	0.079	0.83	23,588	0.94	1.88	4.42	0.35
2042	8,288	0.079	0.83	24,364	0.97	1.95	4.55	0.36
2043	8,312	0.079	0.83	25,040	1.00	2.00	4.67	0.37

Table 6. Results for rebuilding projections using $T_{min} * 2$ for Gulf of Mexico Gag Grouper SRFS Run F_{SPR40} scenario. Recruitment (R) is in 1000s of age-0 fish, SSB is in metric tons, F is a harvest rate (total biomass killed / total biomass age 3+), and retained yield in millions of pounds gutted weight. The $F_{rebuild}$ is shown starting in 2024.

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Year	R	F	F/ MFMT	SSB	SSB/ SSBF _{msy}	SSB/ MSST	Yield	SSB/ SSB ₀
2017	2,899	0.340	3.56	1,695	0.07	0.14	-	0.03
2018	1,517	0.446	4.68	1,727	0.07	0.14	-	0.03
2019	2,158	0.374	3.92	1,706	0.07	0.14	-	0.03
2020	3,553	0.331	3.47	1,836	0.07	0.15	1.88	0.03
2021	3,758	0.389	4.07	2,014	0.08	0.16	2.07	0.03
2022	3,139	0.482	5.05	1,513	0.06	0.12	1.91	0.02
2023	2,833	0.155	1.63	1,301	0.05	0.10	0.66	0.02
2024	3,625	0.087	0.91	1,897	0.08	0.15	0.53	0.03
2025	4,551	0.087	0.91	2,846	0.11	0.23	0.73	0.04
2026	5,245	0.087	0.91	3,843	0.15	0.31	0.9	0.06
2027	5,738	0.087	0.91	4,786	0.19	0.38	1.09	0.07
2028	6,142	0.087	0.91	5,778	0.23	0.46	1.33	0.09
2029	6,522	0.087	0.91	6,976	0.28	0.56	1.6	0.10
2030	6,862	0.087	0.91	8,367	0.33	0.67	1.9	0.12
2031	7,146	0.087	0.91	9,864	0.39	0.79	2.21	0.15
2032	7,376	0.087	0.91	11,395	0.46	0.91	2.52	0.17
2033	7,560	0.087	0.91	12,921	0.52	1.03	2.82	0.19
2034	7,710	0.087	0.91	14,414	0.58	1.15	3.12	0.21
2035	7,831	0.087	0.91	15,850	0.63	1.27	3.4	0.24
2036	7,929	0.087	0.91	17,205	0.69	1.37	3.66	0.26
2037	8,009	0.087	0.91	18,461	0.74	1.47	3.9	0.28

Table 6 Continued. Results for rebuilding projections using $T_{min} * 2$ for Gulf of Mexico Gag Grouper SRFS Run F_{SPR40} scenario. Recruitment (R) is in 1000s of age-0 fish, SSB is in metric tons, F is a harvest rate (total biomass killed / total biomass age 3+), and retained yield in millions of pounds gutted weight. The $F_{rebuild}$ is shown starting in 2024.

Year	R	F	F/ MFMT	SSB	SSB/ SSBF _{msy}	SSB/ MSST	Yield	SSB/ SSB ₀
2038	8,075	0.087	0.91	19,608	0.78	1.57	4.11	0.29
2039	8,128	0.087	0.91	20,642	0.82	1.65	4.31	0.31
2040	8,172	0.087	0.91	21,561	0.86	1.72	4.48	0.32
2041	8,208	0.087	0.91	22,372	0.89	1.79	4.63	0.33
2042	8,238	0.087	0.91	23,078	0.92	1.84	4.76	0.34
2043	8,262	0.087	0.91	23,690	0.95	1.89	4.87	0.35
2044	8,282	0.087	0.91	24,214	0.97	1.93	4.97	0.36
2045	8,298	0.087	0.91	24,662	0.98	1.97	5.05	0.37
2046	8,312	0.087	0.91	25,040	1.00	2.00	5.12	0.37

Table 7. Results for rebuilding projections using $75\%F_{SPR40}$ for Gulf of Mexico Gag Grouper SRFS Run. Recruitment (R) is in 1000s of age-0 fish, SSB is in metric tons, F is a harvest rate (total biomass killed / total biomass age 3+), and retained yield in millions of pounds gutted weight. The $F_{rebuild}$ is shown starting in 2024.

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Year	R	F	F/ MFMT	SSB	SSB/ SSBF _{msy}	SSB/ MSST	Yield	SSB/ SSB ₀
2017	2,899	0.340	3.56	1,695	0.07	0.14	-	0.03
2018	1,517	0.446	4.68	1,727	0.07	0.14	-	0.03
2019	2,158	0.374	3.92	1,706	0.07	0.14	-	0.03
2020	3,553	0.331	3.47	1,836	0.07	0.15	1.88	0.03
2021	3,758	0.389	4.07	2,014	0.08	0.16	2.07	0.03
2022	3,139	0.482	5.05	1,513	0.06	0.12	1.91	0.02
2023	2,833	0.155	1.63	1,301	0.05	0.10	0.66	0.02
2024	3,625	0.072	0.75	1,897	0.08	0.15	0.44	0.03
2025	4,583	0.072	0.75	2,885	0.12	0.23	0.6	0.04
2026	5,302	0.072	0.75	3,939	0.16	0.31	0.76	0.06
2027	5,813	0.072	0.75	4,954	0.20	0.40	0.93	0.07
2028	6,230	0.072	0.75	6,031	0.24	0.48	1.14	0.09
2029	6,618	0.072	0.75	7,333	0.29	0.59	1.38	0.11
2030	6,963	0.072	0.75	8,853	0.35	0.71	1.65	0.13
2031	7,248	0.072	0.75	10,502	0.42	0.84	1.93	0.16
2032	7,478	0.072	0.75	12,204	0.49	0.97	2.21	0.18
2033	7,662	0.072	0.75	13,914	0.56	1.11	2.49	0.21
2034	7,811	0.072	0.75	15,599	0.62	1.25	2.76	0.23
2035	7,931	0.072	0.75	17,232	0.69	1.38	3.02	0.26
2036	8,028	0.072	0.75	18,783	0.75	1.50	3.26	0.28
2037	8,108	0.072	0.75	20,233	0.81	1.62	3.49	0.30

Table 7 Continued. Results for rebuilding projections using $75\%F_{SPR40}$ for Gulf of Mexico Gag Grouper SRFS Run. Recruitment (R) is in 1000s of age-0 fish, SSB is in metric tons, F is a harvest rate (total biomass killed / total biomass age 3+), and retained yield in millions of pounds gutted weight. The $F_{rebuild}$ is shown starting in 2024.

Year	R	F	F/ MFMT	SSB	SSB/ SSBF _{msy}	SSB/ MSST	Yield	SSB/ SSB ₀
2038	8,172	0.072	0.75	21,567	0.86	1.72	3.7	0.32
2039	8,225	0.072	0.75	22,779	0.91	1.82	3.88	0.34
2040	8,269	0.072	0.75	23,868	0.95	1.91	4.05	0.36
2041	8,305	0.072	0.75	24,836	0.99	1.98	4.2	0.37
2042	8,334	0.072	0.75	25,689	1.03	2.05	4.33	0.38

Table 8. Results for rebuilding projections using Tmin + 1 generation time for Gulf of Mexico Gag Grouper SRFS Run F_{SPR40} scenario. F is a harvest rate (total biomass killed / total biomass age 3+), while relative F is measured in terms of apical Fs. The F_{rebuild} is shown starting in 2024. Commercial (com) and recreational (rec) retained yield and discard (disc; live+dead) amounts are in millions of pounds gutted weight. Percent change in yield relative to the 2017-2019 average observed yield is shown in terms of biomass for the commercial sector and both biomass and numbers for the recreational sector. Percent contribution of discards (%Disc) to the total catch is shown in terms of biomass for the commercial sector and both biomass and numbers for the recreational sector.

Year	F	Allocation (com: rec)	Relative F (com: rec)	Com Yield	%Change Com Yield	Com Disc	Com %Disc	Rec Yield	%Change Rec Yield (bio)	%Change Rec Yield (num)	Rec Disc	Rec %Disc (bio)	Rec %Disc (num)
2017	0.340	-	34:66	-	-	-	-	-	-	-	-	-	-
2018	0.446	-	34:66	-	-	-	-	-	-	-	-	-	-
2019	0.374	-	37:63	-	-	-	-	-	-	-	-	-	-
2020	0.331	-	43:57	-	-	-	-	-	-	-	-	-	-
2021	0.389	-	43:57	-	-	-	-	-	-	-	-	-	-
2022	0.482	-	40:60	-	-	-	-	-	-	-	-	-	-
2023	0.155	-	48:52	-	-	-	-	-	-	-	-	-	-
2024	0.079	31:69	45:55	0.15	-71	0.04	20	0.33	-70	-70	0.55	62	90
2025	0.079	31:69	43:57	0.21	-59	0.04	18	0.46	-59	-60	0.59	56	89
2026	0.079	31:69	40:60	0.26	-49	0.05	16	0.57	-49	-53	0.67	54	89
2027	0.079	31:69	37:63	0.31	-38	0.06	16	0.7	-38	-44	0.85	55	89
2028	0.079	31:69	35:65	0.38	-24	0.07	16	0.85	-24	-31	1.06	55	89

Table 9. Results for rebuilding projections using $T_{min} * 2$ for Gulf of Mexico Gag Grouper SRFS Run F_{SPR40} scenario. F is a harvest rate (total biomass killed / total biomass age 3+), while relative F is measured in terms of apical Fs. The F_{rebuild} is shown starting in 2024. Commercial (com) and recreational (rec) retained yield and discard (disc; live+dead) amounts are in millions of pounds gutted weight. Percent change in yield relative to the 2017-2019 average observed yield is shown in terms of biomass for the commercial sector and both biomass and numbers for the recreational sector. Percent contribution of discards (%Disc) to the total catch is shown in terms of biomass for the commercial sector and both biomass and numbers for the recreational sector.

Year	F	Allocation (com: rec)	Relative F (com: rec)	Com Yield	%Change Com Yield	Com Disc	Com %Disc	Rec Yield	%Change Rec Yield (bio)	%Change Rec Yield (num)	Rec Disc	Rec %Disc (bio)	Rec %Disc (num)
2017	0.340	-	34:66	-	-	-	-	-	-	-	-	-	-
2018	0.446	-	34:66	-	-	-	-	-	-	-	-	-	-
2019	0.374	-	37:63	-	-	-	-	-	-	-	-	-	-
2020	0.331	-	43:57	-	-	-	-	-	-	-	-	-	-
2021	0.389	-	43:57	-	-	-	-	-	-	-	-	-	-
2022	0.482	-	40:60	-	-	-	-	-	-	-	-	-	-
2023	0.155	-	48:52	-	-	-	-	-	-	-	-	-	-
2024	0.087	31:69	45:55	0.16	-68	0.04	20	0.36	-68	-67	0.6	62	90
2025	0.087	31:69	43:57	0.22	-56	0.05	18	0.5	-55	-57	0.65	56	89
2026	0.087	31:69	40:60	0.28	-45	0.05	16	0.62	-45	-48	0.74	54	89
2027	0.087	31:69	37:63	0.34	-33	0.07	16	0.75	-33	-39	0.93	55	89
2028	0.087	31:69	35:65	0.41	-19	0.08	16	0.92	-18	-26	1.15	56	89

Table 10. Results for rebuilding projections using 75%F_{SPR40} for Gulf of Mexico Gag Grouper SRFS Run F_{SPR40} scenario. F is a harvest rate (total biomass killed / total biomass age 3+), while relative F is measured in terms of apical Fs. The F_{rebuild} is shown starting in 2024. Commercial (com) and recreational (rec) retained yield and discard (disc; live+dead) amounts are in millions of pounds gutted weight. Percent change in yield relative to the 2017-2019 average observed yield is shown in terms of biomass for the commercial sector and both biomass and numbers for the recreational sector. Percent contribution of discards (%Disc) to the total catch is shown in terms of biomass for the commercial sector and both biomass and numbers for the recreational sector.

Year	F	Allocation (com: rec)	Relative F (com: rec)	Com Yield	%Change Com Yield	Com Disc	Com %Disc	Rec Yield	%Change Rec Yield (bio)	%Change Rec Yield (num)	Rec Disc	Rec %Disc (bio)	Rec %Disc (num)
2017	0.340	-	34:66	-	-	-	-	-	-	-	-	-	-
2018	0.446	-	34:66	-	-	-	-	-	-	-	-	-	-
2019	0.374	-	37:63	-	-	-	-	-	-	-	-	-	-
2020	0.331	-	43:57	-	-	-	-	-	-	-	-	-	-
2021	0.389	-	43:57	-	-	-	-	-	-	-	-	-	-
2022	0.482	-	40:60	-	-	-	-	-	-	-	-	-	-
2023	0.155	-	48:52	-	-	-	-	-	-	-	-	-	-
2024	0.072	31:69	45:55	0.13	-73	0.03	20	0.3	-73	-73	0.49	62	90
2025	0.072	31:69	43:57	0.19	-63	0.04	18	0.42	-63	-64	0.53	56	89
2026	0.072	31:69	40:60	0.23	-54	0.05	16	0.52	-54	-57	0.61	54	89
2027	0.072	31:69	37:63	0.29	-43	0.05	16	0.64	-43	-48	0.78	55	89
2028	0.072	31:69	34:66	0.35	-30	0.07	16	0.78	-30	-37	0.96	55	89

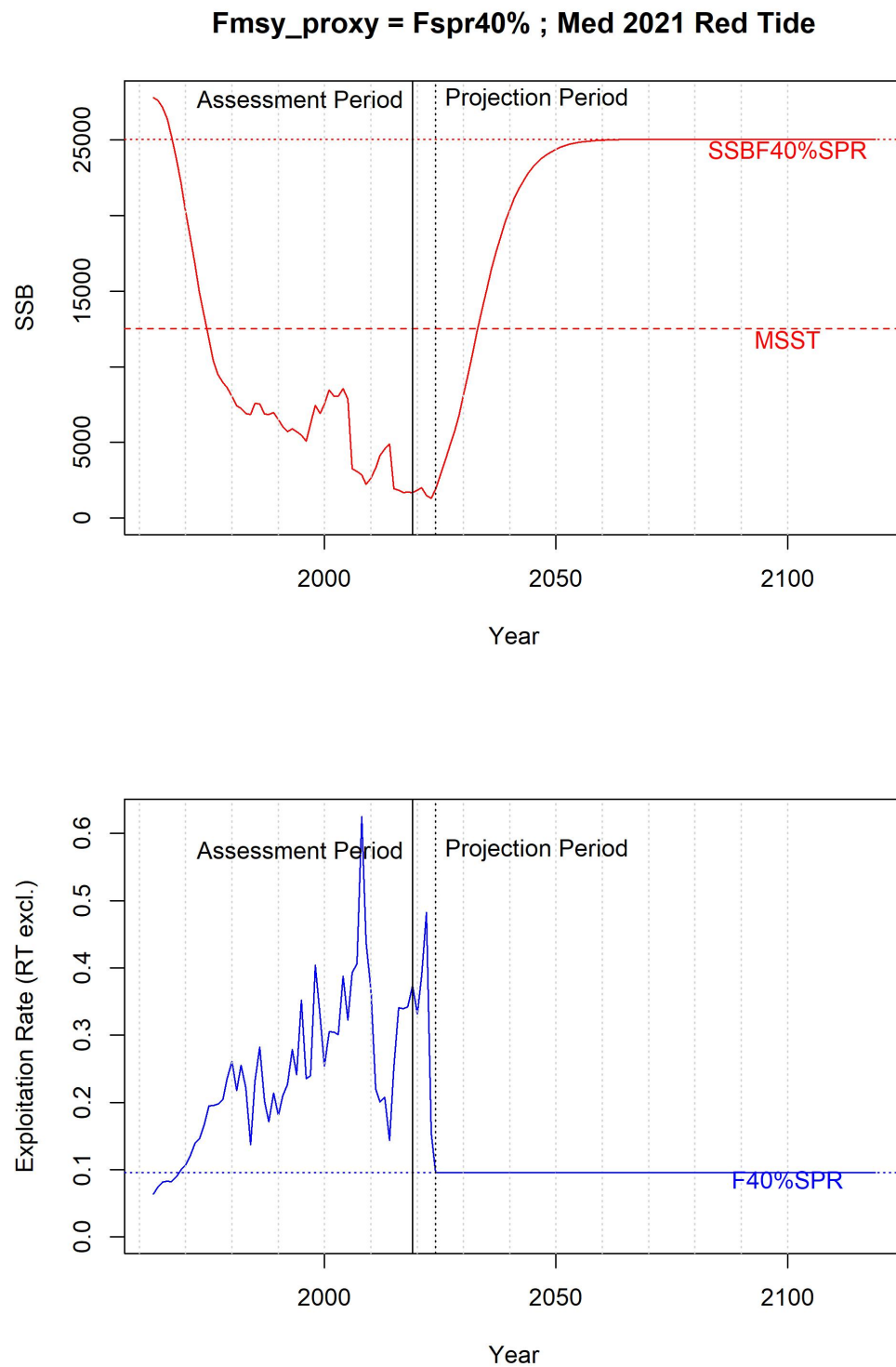


Figure 1. Time series of SSB and exploitation rate (total biomass killed / total biomass age 3+) for the SRFS Run with respect to status determination criteria for the Gulf of Mexico Gag Grouper assessment.