Red Grouper Projections

Prepared by NMFS Southeast Fisheries Science Center

Issued: November 2018

Introduction

In a memorandum dated June 23, 2017, from Gregg Waugh to Dr. Bonnie Ponwith, the SAFMC requested revised red grouper projections (Appendix 1). That request was fulfilled in a report from the NMFS SEFSC issued in August 2017. In a second memorandum dated October 30, 2018 from John Carmichael to Dr. Clay Porch, the SAFMC requested additional revised projections (Appendix 2). This report fulfills the second request. Specifically, the requested projection analyses included the following:

1. Yield and stock conditions to 2027 and 2029 based on fishing mortality rate of F=0, with recruitment based on long-term average recruitment.

2. Yield and stock conditions to 2027 and 2029 based on fishing mortality rate of F= $F_{REBUILD}$, with recruitment based on long-term average recruitment.

Methods

Except for modifications to accommodate the request, the projection methods were identical to those used in the SEDAR53 stock assessment of red grouper. In these revised analyses, fishing mortality rates take effect in 2020, and landings in 2016–2019 were fixed at levels requested in the memorandum (207,561 lb in 2016; 141,182 lb in 2017; 139,000 lb in 2018; and 150,000 lb in 2019; all in units of whole weight). For item 2 above, the $F_{REBUILD}$ scenario achieves stock recovery ($SSB>SSB_{MSY}$) with probability of at least 50% in the specified year.

- Scenario 1: F=0 with long-term average recruitment
- Scenario 2: $F=F_{REBUILD}$ with long-term average recruitment and stock recover (0.5 probability) in 2027
- Scenario 3: $F=F_{REBUILD}$ with long-term average recruitment and stock recovery (0.5 probability) in 2029

All projections were run through 2029. Note that the scenario based on F=0 to 2027 is contained within Scenario 1. Also, note that the value of $F_{REBUILD}$ differs between Scenarios 2 and 3.

Results

Results are tabulated in Tables 1–3, and presented graphically in Figures 1–5. In Scenario 2, $F_{REBUILD}=64\%F_{MSY}$, and in Scenario 3, $F_{REBUILD}=76\%F_{MSY}$.

Table 1. Scenario 1 projection results with F=0 starting in 2020 and long-term average recruitment. R = number of age-1 recruits (in 1000s), F = fishing mortality rate (per year), S = spawning stock (mt), L = landings expressed in numbers (n, in 1000s) or whole weight (w, in 1000 lb), D = dead discards expressed in numbers (n, in 1000s) or whole weight (w, in 1000 lb), and pr.reb = proportion of stochastic projection replicates with SSB $\geq$ SSB_{MSY}. The extension "b" indicates expected values (deterministic) from the base run; the extension "med" indicates median values from the stochastic projections.

Year	R.b	R.med	F.b	F.med	S.b(mt)	S.med(mt)	L.b(n)	L.med(n)	L.b(w)	L.med(w)	D.b(n)	D.med(n)	D.base(w)	D.med(w)	pr.reb
2016	323	265	0.11	0.12	885	844	19	19	208	208	32	28	52	50	0
2017	320	260	0.08	0.08	962	918	13	13	141	141	28	25	53	48	0
2018	327	267	0.06	0.07	1124	1072	15	14	139	139	27	24	56	51	0.002
2019	340	278	0.06	0.06	1358	1294	17	17	150	150	24	22	53	48	0.012
2020	354	288	0	0	1673	1585	0	0	0	0	0	0	0	0	0.05
2021	368	300	0	0	2096	1984	0	0	0	0	0	0	0	0	0.143
2022	381	317	0	0	2561	2420	0	0	0	0	0	0	0	0	0.283
2023	391	327	0	0	3054	2884	0	0	0	0	0	0	0	0	0.437
2024	398	334	0	0	3559	3360	0	0	0	0	0	0	0	0	0.58
2025	404	341	0	0	4065	3831	0	0	0	0	0	0	0	0	0.697
2026	408	348	0	0	4562	4304	0	0	0	0	0	0	0	0	0.788
2027	412	348	0	0	5044	4768	0	0	0	0	0	0	0	0	0.853
2028	414	354	0	0	5504	5213	0	0	0	0	0	0	0	0	0.901
2029	417	359	0	0	5941	5642	0	0	0	0	0	0	0	0	0.935

Table 2. Scenario 2 projection results with F= $F_{REBUILD}$ starting in 2020, long-term average recruitment, and stock recovery (0.5 probability) occurring in 2027. R = number of age-1 recruits (in 1000s), F = fishing mortality rate (per year), S = spawning stock (mt), L = landings expressed in numbers (n, in 1000s) or whole weight (w, in 1000 lb), D = dead discards expressed in numbers (n, in 1000s) or whole weight (w, in 1000 lb), and pr.reb = proportion of stochastic projection replicates with SSB $\geq$ SSB_{MSY}. The extension "b" indicates expected values (deterministic) from the base run; the extension "med" indicates median values from the stochastic projections.

Year	R.b	R.med	F.b	F.med	S.b(mt)	S.med(mt)	L.b(n)	L.med(n)	L.b(w)	L.med(w)	D.b(n)	D.med(n)	D.base(w)	D.med(w)	pr.reb
2016	323	265	0.11	0.12	885	844	19	19	208	208	32	28	52	50	0
2017	320	260	0.08	0.08	962	918	13	13	141	141	28	25	53	48	0
2018	327	267	0.06	0.07	1124	1072	15	14	139	139	27	24	56	51	0.002
2019	340	278	0.06	0.06	1358	1294	17	17	150	150	24	22	53	48	0.012
2020	354	288	0.08	0.08	1634	1547	29	28	257	251	35	30	77	66	0.041
2021	367	299	0.08	0.08	1906	1793	33	32	303	295	36	31	79	68	0.078
2022	376	313	0.08	0.08	2176	2039	37	36	348	339	37	32	81	71	0.134
2023	383	320	0.08	0.08	2435	2274	40	39	391	381	38	33	84	73	0.202
2024	388	324	0.08	0.08	2680	2497	43	42	431	419	39	34	85	76	0.275
2025	393	330	0.08	0.08	2906	2701	46	45	468	455	39	35	87	77	0.352
2026	396	335	0.08	0.08	3114	2893	48	47	502	488	40	35	88	78	0.427
2027	399	335	0.08	0.08	3302	3071	51	49	533	518	40	36	89	79	0.503
2028	401	341	0.08	0.08	3472	3236	52	51	560	545	40	36	89	80	0.573
2029	403	344	0.08	0.08	3623	3387	54	52	585	569	41	36	90	81	0.634

Table 3. Scenario 3 projection results with F= $F_{REBUILD}$ starting in 2020, long-term average recruitment, and stock recovery (0.5 probability) occurring in 2029. R = number of age-1 recruits (in 1000s), F = fishing mortality rate (per year), S = spawning stock (mt), L = landings expressed in numbers (n, in 1000s) or whole weight (w, in 1000 lb), D = dead discards expressed in numbers (n, in 1000s) or whole weight (w, in 1000 lb), and pr.reb = proportion of stochastic projection replicates with SSB $\geq$ SSB_{MSY}. The extension "b" indicates expected values (deterministic) from the base run; the extension "med" indicates median values from the stochastic projections.

Year	R.b	R.med	F.b	F.med	S.b(mt)	S.med(mt)	L.b(n)	L.med(n)	L.b(w)	L.med(w)	D.b(n)	D.med(n)	D.base(w)	D.med(w)	pr.reb
2016	323	265	0.11	0.12	885	844	19	19	208	208	32	28	52	50	0
2017	320	260	0.08	0.08	962	918	13	13	141	141	28	25	53	48	0
2018	327	267	0.06	0.07	1124	1072	15	14	139	139	27	24	56	51	0.002
2019	340	278	0.06	0.06	1358	1294	17	17	150	150	24	22	53	48	0.012
2020	354	288	0.09	0.1	1627	1539	34	33	303	296	42	36	91	78	0.04
2021	366	298	0.09	0.1	1872	1759	39	37	353	344	43	37	93	80	0.07
2022	375	312	0.09	0.1	2110	1974	43	41	400	389	44	38	95	83	0.112
2023	381	318	0.09	0.1	2335	2175	46	44	443	431	45	39	97	85	0.161
2024	386	322	0.09	0.1	2542	2362	49	47	483	469	45	40	99	88	0.215
2025	390	328	0.09	0.1	2731	2532	52	50	520	504	46	40	100	89	0.273
2026	394	333	0.09	0.1	2903	2690	54	52	553	536	46	41	102	91	0.333
2027	396	332	0.09	0.1	3056	2836	56	54	583	565	47	42	103	92	0.388
2028	398	338	0.09	0.1	3193	2970	58	56	609	591	47	42	103	93	0.448
2029	400	342	0.09	0.1	3313	3094	59	57	633	614	47	42	104	94	0.501

Figure 1. Scenario 1 projection results with F=0 starting in 2020 and long-term average recruitment. Expected values (base run) represented by dotted solid lines, medians by dashed lines with open circles, and uncertainty by thin lines corresponding to 5th and 95th percentiles of replicate projections. Solid horizontal lines mark MSY-related quantities; dashed horizontal lines represent corresponding medians.

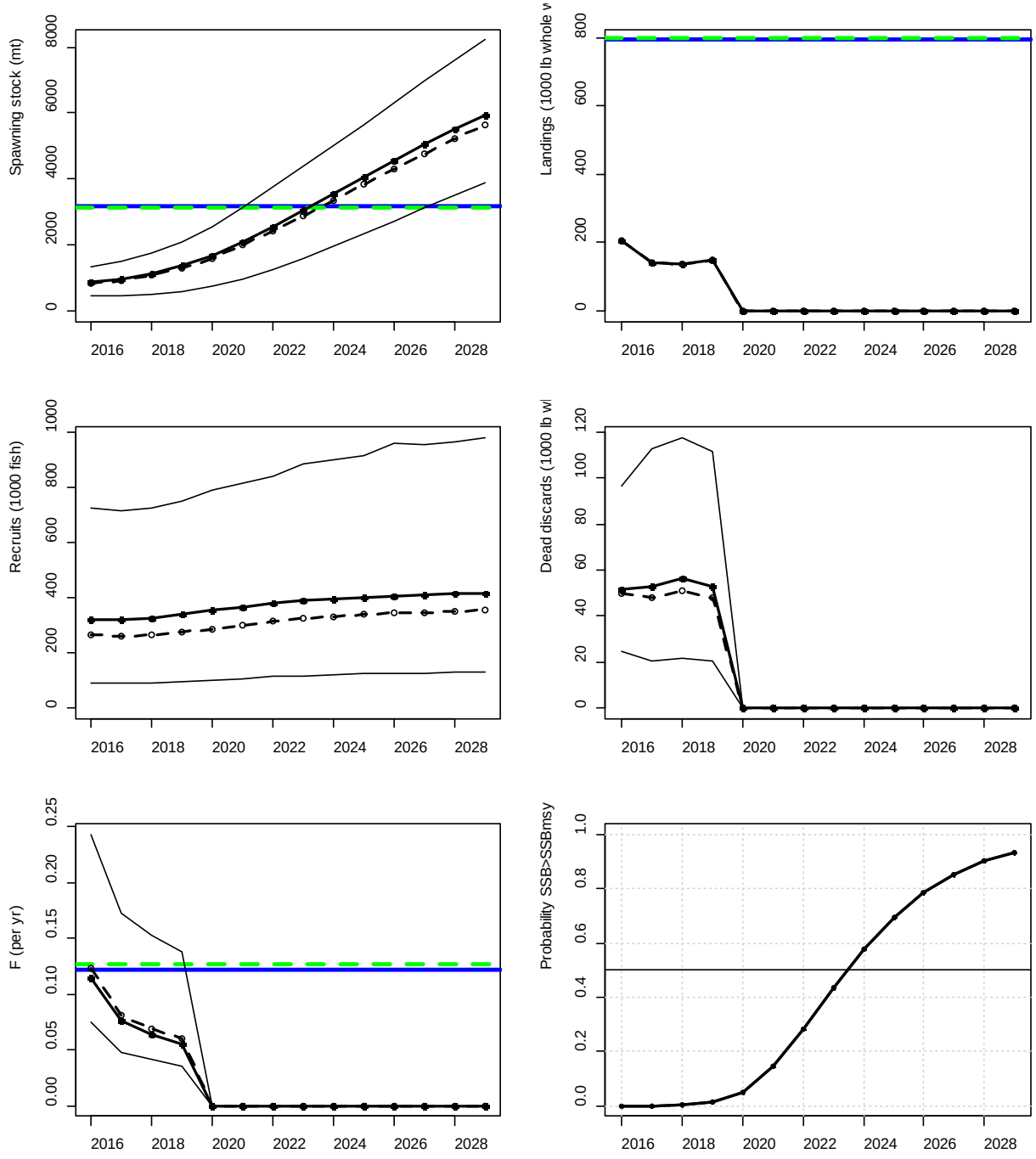


Figure 2. Scenario 2 projection results with F= $F_{REBUILD}$ starting in 2020, long-term average recruitment, and stock recovery (0.5 probability) occurring in 2027. Expected values (base run) represented by dotted solid lines, medians by dashed lines with open circles, and uncertainty by thin lines corresponding to 5th and 95th percentiles of replicate projections. Solid horizontal lines mark MSY-related quantities; dashed horizontal lines represent corresponding medians.

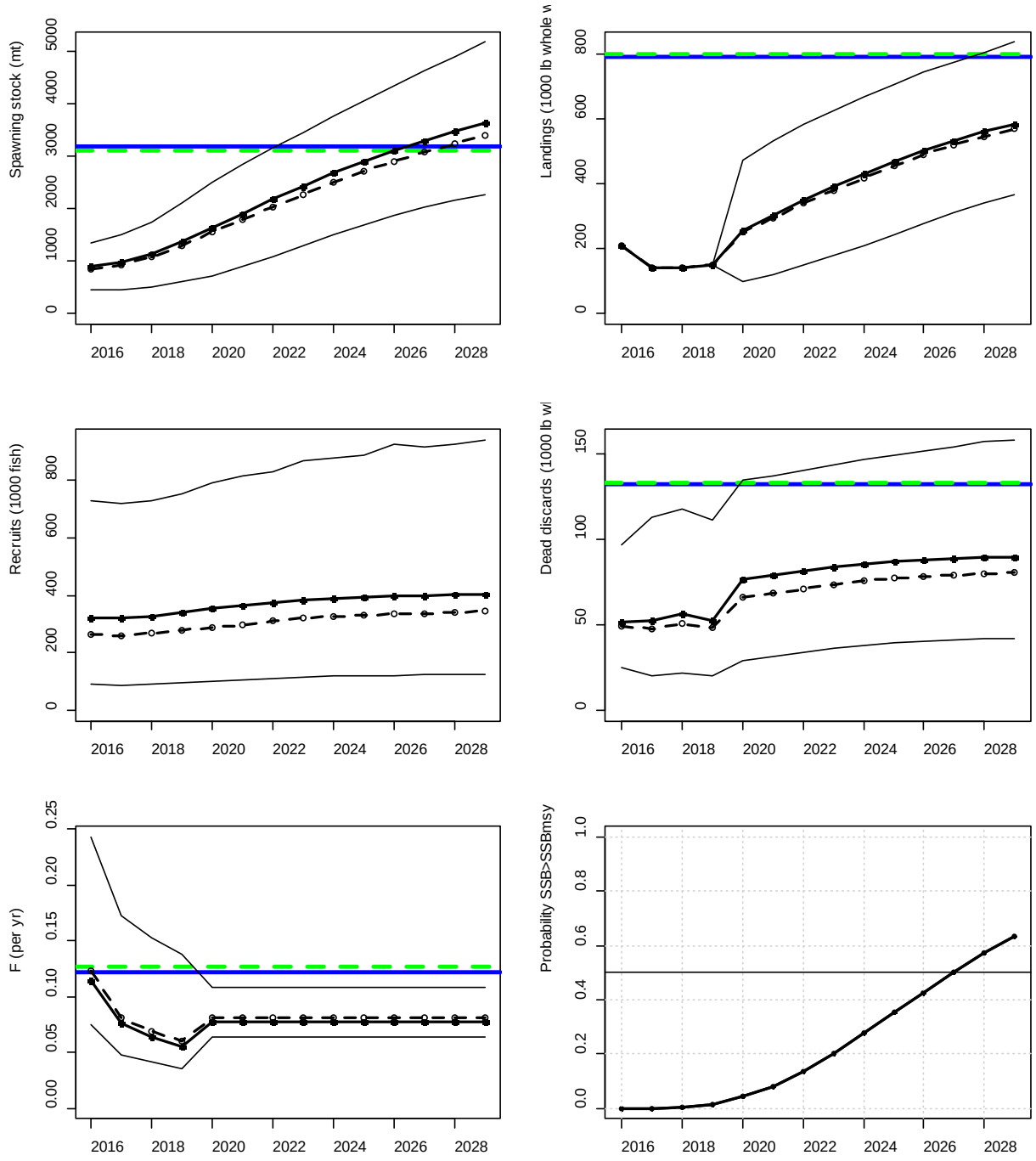


Figure 3. Scenario 2 probability density and cumulative probability of stock recovery ($SSB>SSB_{MSY}$).

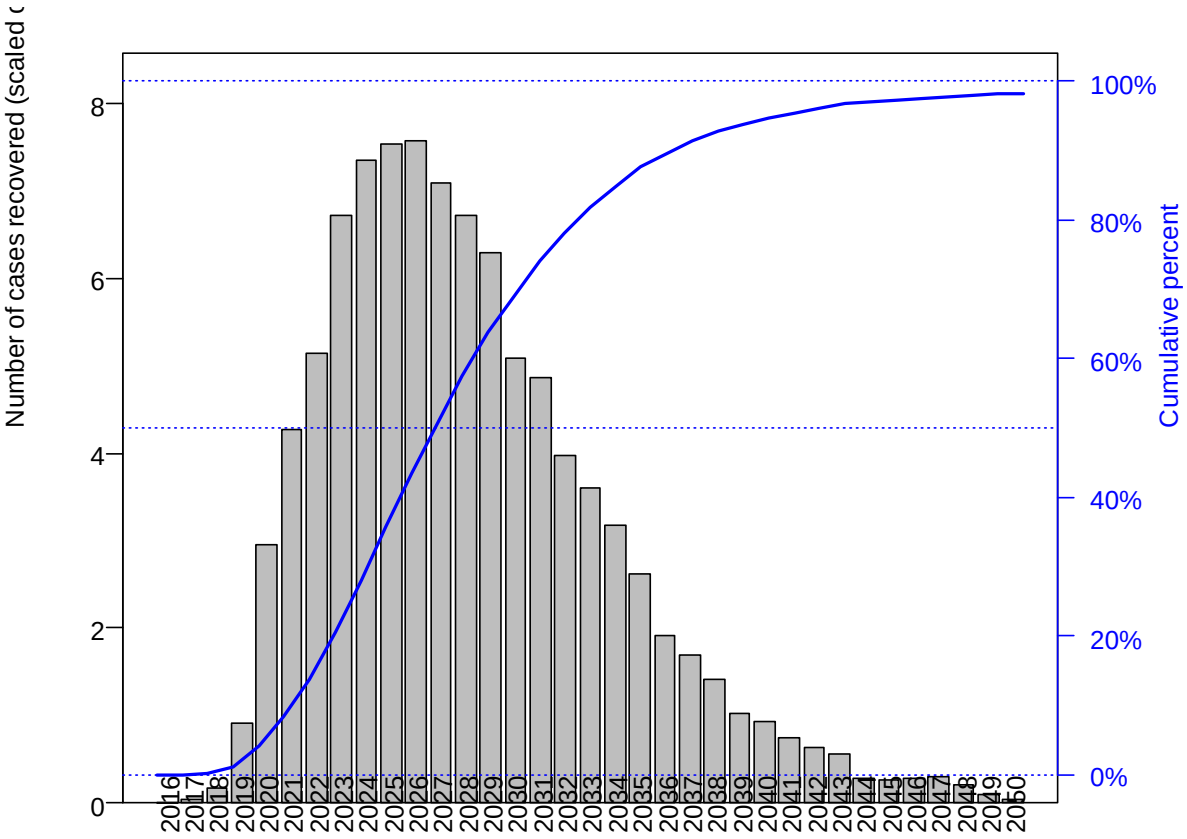


Figure 4. Scenario 3 projection results with F= $F_{REBUILD}$ starting in 2020, long-term average recruitment, and stock recovery (0.5 probability) occurring in 2029. Expected values (base run) represented by dotted solid lines, medians by dashed lines with open circles, and uncertainty by thin lines corresponding to 5th and 95th percentiles of replicate projections. Solid horizontal lines mark MSY-related quantities; dashed horizontal lines represent corresponding medians.

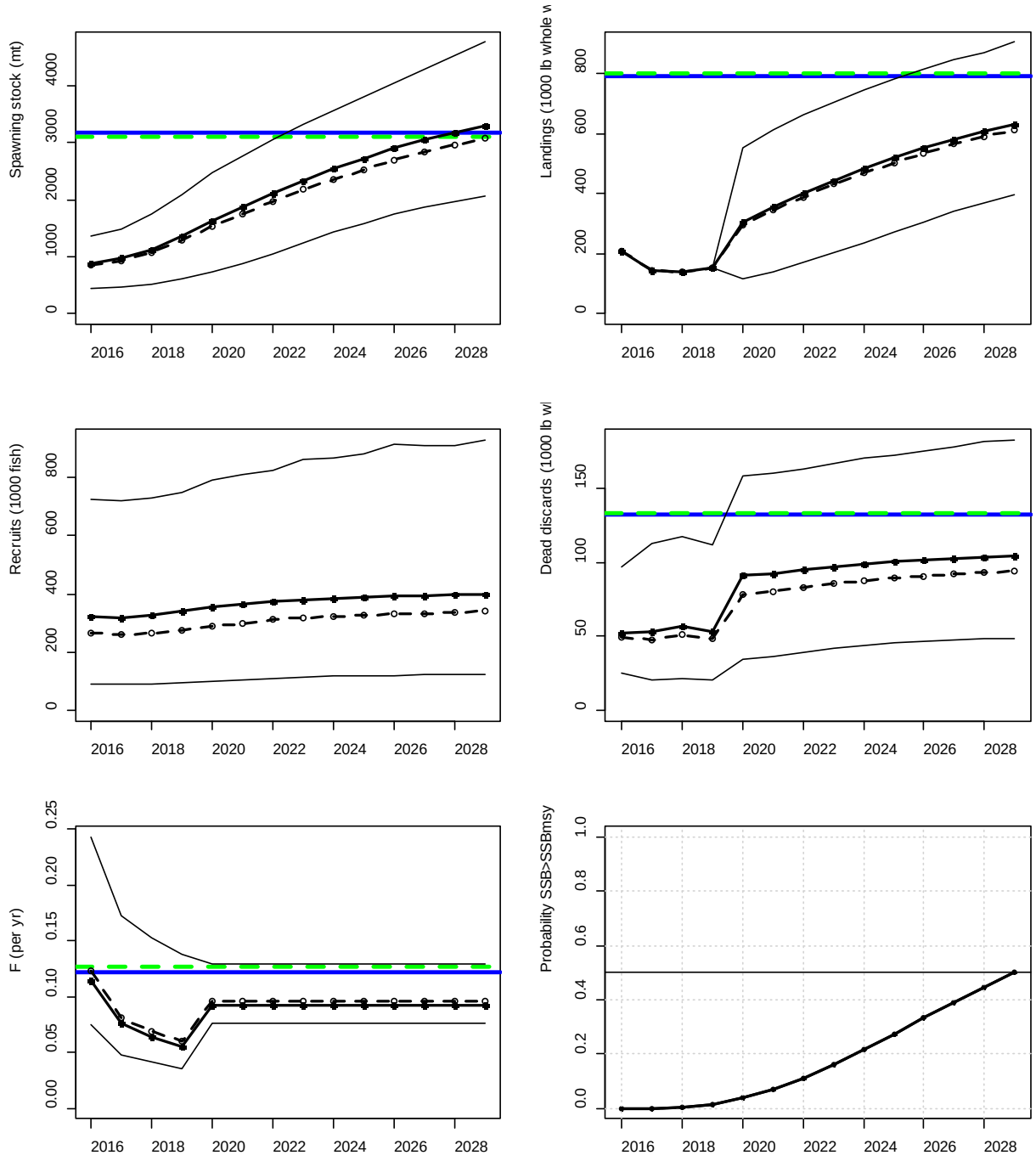
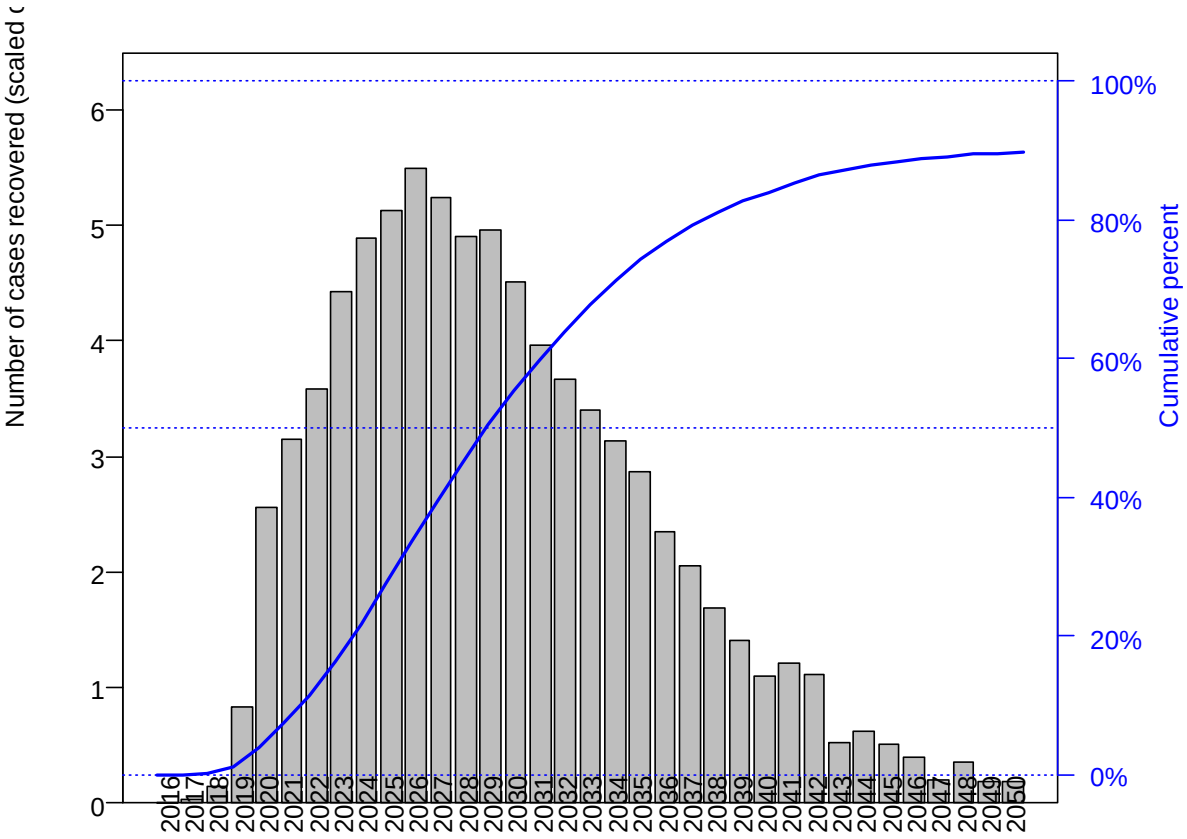


Figure 5. Scenario 3 probability density and cumulative probability of stock recovery ($SSB>SSB_{MSY}$).



Appendix 1. First memorandum requesting revised red grouper projections.

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL
4055 Faber Place Drive, Suite 201, North Charleston SC 29405
Call: (843) 571-4366 | Toll-Free: (866) SAFMC-10 | Fax: (843) 769-4520 | Connect: www.safmc.net

Dr. Michelle Duval, Chair | Charlie Phillips, Vice Chair
Gregg T. Waugh, Executive Director

June 23, 2017

MEMORANDUM

TO: Bonnie Ponwith
FROM: Gregg Waugh *GTW*
SUBJECT: Request for Revised Red Grouper Projections

The South Atlantic Council reviewed stock status and SSC recommendations for Red Grouper at its June 2017 meeting. Projections in the assessment consider management changes taking place in either 2017 or 2019. The Council is considering actions that could implement revised fishing levels in 2018. Therefore, the Council requests updated projections based on management actions taking place in 2018, addressing the following projection conditions:

1. Yield and stock conditions to 2030 based on fishing mortality rates of F_{MSY} (OFL) and 75% F_{MSY} ($F_{REBUILD}$), with recruitment based on the "low" recruitment scenarios presented in the assessment.
2. Yield and stock conditions projected to the year when the stock is rebuilt ($SSB>SSB_{MSY}$) based on fishing mortality rates of F_{MSY} (OFL) and 75% F_{MSY} ($F_{REBUILD}$), with recruitment based on the predicted values from the Stock-Recruitment relationship.
3. These fishing mortality rates will take effect in 2018.
4. For landings in 2016 and 2017, apply the same assumed values used in the original projections.
5. For each recruitment scenario, provide the full suite of projection outputs as provided in the SEDAR 53 stock assessment.

Please provide the requested projections to Council staff by noon on August 21, 2017 for inclusion in the Briefing Book for the September 2017 SAFMC meeting.

We appreciate your assistance in addressing this request. Please contact John Carmichael if you have any questions regarding these items.

cc: Council Members and Staff
Jack McGovern and Rick DeVictor
Monica Smit-Brunello
Theo Brainerd, Trika Gerard, and Erik Williams

Appendix 2. Second memorandum requesting revised red grouper projections.

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL
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Call: (843) 571-4366 | Toll-Free: (866) SAFMC-10 | Fax: (843) 769-4520 | Connect: www.safmc.net

Jessica McCawley, Chair | Mel Bell, Vice Chair
Gregg T. Waugh, Executive Director

October 30, 2018
LN#201866

MEMORANDUM

TO: Clay Porch

FROM: John Carmichael

SUBJECT: Request for Red Grouper Projections

The South Atlantic Council has developed Regulatory Amendment 30 to update the rebuilding schedule for Red Grouper based on the results of the SEDAR 53 Standard stock assessment. In order for the Council to meet its statutory deadline for getting the new rebuilding schedule in place, this amendment has to go before the Council for final approval at their March 2019 meeting. However, current projections do not match the assumptions necessary to properly frame the rebuilding alternatives. The Council is also considering changing the starting year of the 10-year rebuilding plan to a more recent year, requiring us to evaluate projections with two alternative terminal years. **Therefore, the Council requests updated projections based on the original SEDAR 53 Standard assessment for the following rebuilding projection conditions:**

- Projections of Red Grouper yield and stock conditions, based on long-term average recruitment, at F=0 and $F_{Rebuild}$ to 2027 and 2029.
    - Base $F_{Rebuild}$ on a 10-year rebuilding period starting in 2017 or 2019.
    - Changes in the ACL will take effect in 2020.
    - Use actual landings for 2016 (207,561 lbs. ww) and 2017 (141,182 lbs. ww).
    - Base landings for 2018 and 2019 on the ACL of 139,000 lbs. ww for 2018 and 150,000 lbs. ww for 2019.

Please provide the requested materials to Council staff by noon on Friday, November 9, 2018.

We appreciate your assistance in addressing this request. Please contact me if you have any questions regarding these items.

cc: Theo Brainerd & Erik Williams
Jessica McCawley & Mel Bell
John Hadley, Brian Chevront & Mike Errigo
Monica Smit-Brunello, Rick DeVictor & Jack McGovern