

**Southeast Fisheries Science Center
Sustainable Fisheries Division**

**Addressing the request made by John Froeschke, Gulf of Mexico Fisheries Management Council
March 16, 2021**

Disclaimer: The results presented in this work are intended for within model comparisons only and not the purposes of management advice of any kind.

The SEFSC was requested to communicate to the GMFMC a comparison of the Gulf of Mexico King Mackerel stock assessment models towards helping to understand the effects of various changes. Changes were made to the recreational catch/discard data (CHTS vs. FES) and shrimp bycatch (2013 estimate vs. 2020 estimate). These changes represented the “best available data” at the time of the SEDAR 38U assessment. The requests made are given **Appendix 1** and **Appendix 2**.

Four models were configured to address this request. Each model isolates a particular model and/or data set in order to evaluate the effect of each change (**Table 1**).

Model_1. Baseline model. The SEDAR 38 model used for management advice:

- Use the original SEDAR 38 projection and the resulting OFL and ABC through FY2027.

Model_2. To evaluate any changes due only to the switch from CHTS to FES data:

- Use the SEDAR 38U model, truncated to 2012
- Replace the SEDAR 38 headboat landings/discards series with that used in SEDAR 38U
- Replace the SEDAR 38 CHTS series with the SEDAR 38U FES series
- Retain the SEDAR 38 shrimp bycatch estimate
- Project exactly as was done for the original SEDAR 38 model.

Model_3. To evaluate the effect of the new data inputs (FES and shrimp bycatch, combined) while retaining the old terminal year:

- Use the SEDAR 38U model, truncated to 2012
- Use the FES series and the updated SEDAR 38U shrimp estimate.
- Project exactly as you did for the original SEDAR38 model.

Model_4. To evaluate the effect of the new data series and population change since 2012.

- Use the accepted projections from SEDAR 38U

The same P^* value (0.43) used in both SEDAR 38 and 38U was applied to the OFL to calculate ABC. The resulting retained yield (mt) with 10% and 90% confidence intervals, Over Fishing Limit (OFL) and Allowable Biological Catch (ABC) resulting from the four model configurations shown in **Table 2**.

Model_2 projections for 2015-2027 resulted in an average ABC of 12.08 mp vs. 7.96 mp for the baseline model, an average annual difference of 52% (**Table 3**). This comparison reflects changes in the ABC due to changing from CHTS to FES landings/discards time series. Trends in the projections are shown in Figure 1. Similar to Model_1, Model_2 projections show a near term increase in ABC with a gradual decrease over the years. The shape of the projection trends are very similar however they differ by a scaling factor that changes over time.

Model_3 projections for 2015-2027 resulted in an average ABC of 11.57 mp vs 7.96 for the baseline model, an average difference across years of 46% (**Table 3**). This comparison reflects changes due to both the migration from CHTS to FES time series, as well as the changes in the shrimp fishery bycatch. The changes in the projection due to using the new shrimp fishery bycatch resulted in the stock assessment model estimating a larger starting population size to account for the increase mortality of juveniles.

Model_4 (the model that was used to provide SEDAR 38U management advice) resulted in an average ABC of 10.81 mp vs. 7.96 for the baseline model, a difference of 40% (**Table 3**). This difference reflects all changes in the data (i.e. FES and shrimp fishery bycatch) as well as the updates in the length compositions and CPUE time series that changed the model terminal year from 2012 to 2017. These updated data, specifically the headboat CPUE, resulted in reduced estimates of the most recent recruitment (**Figures 1 and 2**).

Table 1. Data and model combinations used to configuration the four King Mackerel models used for comparisons.

DATA / Model Used	Model 1	Model 2	Model 3	Model 4
Terminal Year	2012	2012	2012	2017
SEDAR 38	X			
SEDAR 38U		X	X	X
CHTS	X			
FES		X	X	X
Shimp 2012	X	X		
Shrimp 2020			X	X

Table 2. Retained yield (mt) with 10% and 90% confidence intervals, Over Fishing Limit (OFL) and Allowable Biological Catch (ABC) resulting from the four model configurations shown in Table 1

Model 1

P* = 0.43 YEAR	LCI	Retained Yield (mt)	UCI	ABC in MT	OFL (million lbs)	ABC (million lbs)
2015	3520	4261	5001	4159	9.39	9.17
2016	3229	4087	4945	3969	9.01	8.75
2017	3038	3956	4873	3830	8.72	8.44
2018	2908	3851	4794	3721	8.49	8.20
2019	2814	3767	4721	3636	8.31	8.02
2020	2744	3702	4660	3570	8.16	7.87
2021	2690	3651	4611	3519	8.05	7.76
2022	2650	3612	4573	3479	7.96	7.67
2023	2620	3581	4543	3449	7.90	7.60
2024	2597	3558	4520	3426	7.84	7.55
2025	2579	3541	4502	3408	7.81	7.51
2026	2566	3527	4488	3395	7.78	7.48
2027	2555	3517	4478	3384	7.75	7.46

Model 2

P* = 0.43 YEAR	LCI	Retained Yield (mt)	UCI	ABC in MT	OFL (million lbs)	ABC (million lbs)
2015	5550	6774	7998	6605	14.93	14.56
2016	5040	6396	7752	6209	14.10	13.69
2017	4690	6106	7522	5911	13.46	13.03
2018	4446	5884	7321	5686	12.97	12.53
2019	4269	5713	7158	5514	12.60	12.16
2020	4137	5583	7030	5384	12.31	11.87
2021	4038	5485	6931	5286	12.09	11.65
2022	3965	5410	6856	5211	11.93	11.49
2023	3909	5354	6798	5155	11.80	11.36
2024	3867	5311	6754	5112	11.71	11.27
2025	3835	5278	6721	5079	11.64	11.20
2026	3811	5253	6695	5055	11.58	11.14
2027	3793	5234	6676	5036	11.54	11.10

Model 3

P* = 0.43 YEAR	LCI	Retained Yield (mt)	UCI	ABC in MT	OFL (million lbs)	ABC (million lbs)
2015	4445	5512	6579	5365	12.15	11.83
2016	4234	5458	6682	5290	12.03	11.66
2017	4120	5432	6743	5251	11.97	11.58
2018	4060	5421	6782	5234	11.95	11.54
2019	4030	5425	6820	5233	11.96	11.54
2020	4013	5431	6849	5236	11.97	11.54
2021	4002	5433	6865	5236	11.98	11.54
2022	3994	5432	6870	5234	11.98	11.54
2023	3988	5429	6871	5231	11.97	11.53
2024	3983	5427	6870	5228	11.96	11.53
2025	3980	5424	6869	5226	11.96	11.52
2026	3977	5422	6868	5224	11.95	11.52
2027	3976	5421	6866	5222	11.95	11.51

Model 4

P* = 0.43 YEAR	LCI	Retained Yield (mt)	UCI	ABC in MT	OFL (million lbs)	ABC (million lbs)
2018		5196				
2019		5096				
2020		5104				
2021	3559	4941	6323	4751	10.89	10.47
2022	3523	5014	6504	4809	11.05	10.60
2023	3524	5070	6617	4857	11.18	10.71
2024	3535	5111	6687	4894	11.27	10.79
2025	3548	5141	6733	4921	11.33	10.85
2026	3560	5162	6765	4942	11.38	10.89
2027	3569	5178	6786	4956	11.41	10.93
2028	3577	5189	6801	4967	11.44	10.95
2029	3584	5198	6812	4976	11.46	10.97
2030	3589	5204	6820	4982	11.47	10.98

Table 3. Allowable Biological Catch (ABC) and percent difference from the SEDAR 38 resulting from the four model configurations shown in Table 1 above.

YEAR	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
	ABC (million lbs)	ABC (million lbs)	ABC (million lbs)	ABC (million lbs)	% Diff from SEDAR 38	% Diff from SEDAR 38	% Diff from SEDAR 38	% Diff from SEDAR 38
2015	9.17	14.56	11.83		0%	59%	29%	
2016	8.75	13.69	11.66		0%	56%	33%	
2017	8.44	13.03	11.58		0%	54%	37%	
2018	8.20	12.53	11.54	10.47	0%	53%	41%	28%
2019	8.02	12.16	11.54	10.60	0%	52%	44%	32%
2020	7.87	11.87	11.54	10.71	0%	51%	47%	36%
2021	7.76	11.65	11.54	10.79	0%	50%	49%	39%
2022	7.67	11.49	11.54	10.85	0%	50%	50%	41%
2023	7.60	11.36	11.53	10.89	0%	49%	52%	43%
2024	7.55	11.27	11.53	10.93	0%	49%	53%	45%
2025	7.51	11.20	11.52	10.95	0%	49%	53%	46%
2026	7.48	11.14	11.52	10.97	0%	49%	54%	47%
2027	7.46	11.10	11.51	10.98	0%	49%	54%	47%
Average	7.96	12.08	11.57	10.81	0%	52%	46%	40%

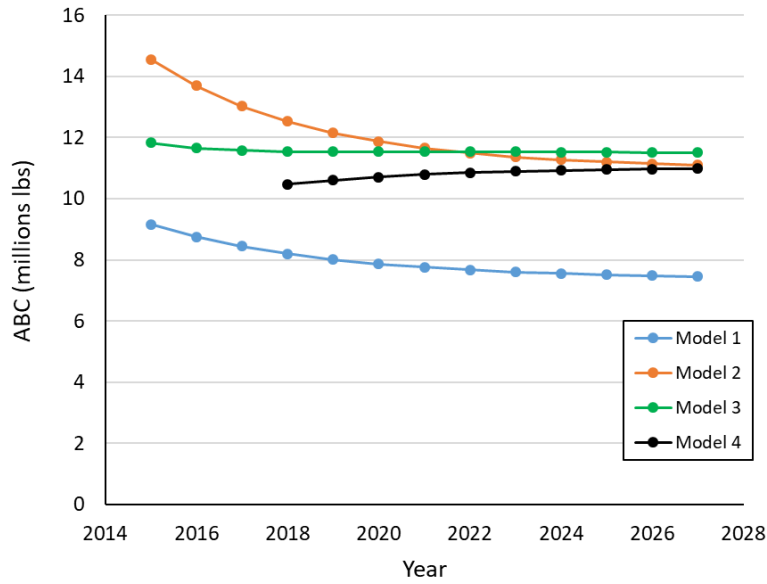


Figure 1. ABC projections for Gulf of Mexico King Mackerel from the four model configuration considered in this study.

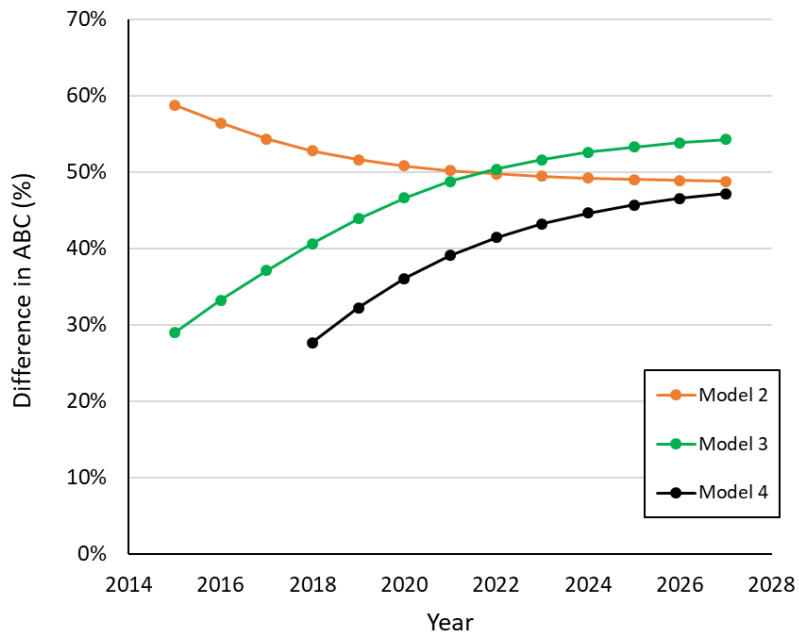


Figure 2. Percent differences between the baseline model (SEDAR 38) ABC projections and the ABCs for the three other model configurations considered in this study for Gulf of Mexico King Mackerel from.



Gulf of Mexico Fishery Management Council

Managing Fishery Resources in the U.S. Federal Waters of the Gulf of Mexico

4107 W. Spruce Street, Suite 200, Tampa, Florida 33607 USA
Phone: 813.348.1630 • Toll free: 888.833.1844 • Fax: 813.348.1711
www.gulfcouncil.org

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MEMORANDUM

DATE: November 6, 2020

TO: Dr. Clay Porch, SEFSC Science and Research Director

FROM: Dr. John Froeschke, Deputy Director

RE: King Mackerel Acceptable Biological Catch (ABC) conversion from historical data

During the October 2020 meeting, the Council reviewed the results of the recently completed Gulf king mackerel SEDAR 38 update stock assessment. As part of their deliberation, the Council has requested additional information that may be necessary to modify catch levels and sector allocations based on the use of Marine Recreational Information Program (MRIP)-Fishing Effort Survey (FES) data in the most recent stock assessment. Specifically, the Council is requesting an analysis that would re-estimate the overfishing limit (OFL) and ABC for the fishing years from 2016/2017 through the 2019/2020. The OFL and ABC recommendations that resulted from SEDAR 38 were originally based on MRIP-Coastal Household Telephone Survey (CHTS) recreational data while the SEDAR 38U assessment uses MRIP-FES data. The requested analysis would use MRIP-FES recreational data in the SEDAR 38 assessment to generate the harvest advice in the MRIP-FES currency. No other modifications to the SEDAR 38 model are requested. I have discussed this requested previously with your staff and they have indicated this work could be completed within approximately two weeks (November 20, 2020). Please contact me directly if you have any concerns.

cc: John Walter, Ph.D.
Shannon Cass-Calay, Ph.D.
Craig Brown, Ph.D.
Michael Schirripa, Ph.D.
Natasha Mendez-Ferrer, Ph.D.
Carrie Simmons, Ph.D.
Peter Hood



**UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric
Administration**

National Marine Fisheries Service
Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, Florida 33149 U.S.A.
(305) 361-4200 Fax: (305) 361-4499

006891NOV2020

November 20, 2020

Dr. Carrie M. Simmons, Ph.D., Executive Director
Gulf of Mexico Fishery Management Council
4107 W. Spruce Street, Suite 200
Tampa, Florida 36607

Dear Dr. Simmons:

During the October 2020 meeting of the Gulf of Mexico Fisheries Management Council (the Council), the Council reviewed the report of the SSC meeting (Standing, Reef Fish, Mackerel, Ecosystem, and Socioeconomic SSC Webinar Meeting Summary, September 14, 2020) and the recently completed Gulf King Mackerel SEDAR 38U update stock assessment. On November 6, 2020, the Council requested additional information to facilitate comparisons between catch levels and sector allocations based on the use of MRIP-Coastal Household Telephone Survey (MRIP-CHTS) and MRIP-Fishing Effort Survey (MRIP-FES) data in the King Mackerel stock assessment. Specifically, the Council requested an analysis that would re-estimate the overfishing limit (OFL), acceptable biological catch (ABC) and annual catch limit (ACL) for the fishing years from 2016/2017 through 2019/2020. To accomplish this request the Center was directed to:

- 1) Replace the MRIP-CHTS landings and discard estimates in the SEDAR 38 (2014) base model with estimates derived from MRIP-FES in order to generate management advice in MRIP-FES currency.
- 2) Compare the original OFL, ABC and ACL in MRIP-CHTS currency to the revised estimates in MRIP-FES currency.
- 3) To facilitate comparison, the Council requested no further modifications to the SEDAR 38 base model.

The Center attempted the work outlined above but discovered that a simple replacement of the recreational time series resulted in a model that did not converge and produced unstable results. This is always a potential problem when making substantive changes to input data. Attempts to stabilize this particular model required changes that make invalidated the desired comparisons (i.e. between catch levels and sector allocations based on the use of MRIP-CHTS and MRIP-FES data). For this reason, the Center was not able to produce useful results using the methods outlined above. Although other approaches are possible, they require additional consideration as

to how to best proceed. The Center is willing to continue to work with Council staff to address this issue.

Sincerely,

A handwritten signature in black ink, appearing to read "John F. Walter, III". The signature is written in a cursive style with a large, sweeping initial "J".

John F. Walter, III
Deputy Director for Science and Council Services

cc: Clay Porch
Shannon Cass-Calay
Michael Schirripa
Peter Hood
John Froeschke
Craig Brown
Larry Massey