6. Assessment of the Rex Sole Stock in the Gulf of Alaska

Carey R. McGilliard
November 2022

Executive Summary

Introduction

The Gulf of Alaska rex sole stock is assessed every four years and was last assessed in 2021. In between the full assessment years, we present an executive summary to recommend harvest levels for the next two years. Please refer to the 2021 full stock assessment report for further information regarding the assessment model (McGilliard and Palsson, 2021, available online at https://apps-afsc.fisheries.noaa.gov/Plan_Team/2021/GOArex.pdf). A full stock assessment document with updated assessment and projection model results will be presented in 2025.

Rex sole is assessed using an age-structured model and Tier 3 determination within the context of a two-area model. The Western-Central GOA and Eastern GOA are modeled as separate areas with distinct growth patterns estimated by area. Thus, the single species projection model was run separately for the two areas using parameter values from the accepted 2021 rex sole assessment model (McGilliard and Palsson 2021), together with updated catch information for 2021-2022, to predict stock status for rex sole in 2023 and 2024 and to make ABC recommendations for those years. Projections are conducted using numbers-at-age for rex sole from age 3-20+ by area and historical recruitment of age 3 individuals by area to calculate OFL's and ABC's.

Summary of Results

Based on the updated projection model results, the recommended ABC's for 2023 and 2024 in the Western-Central GOA are 16,346 t and 16,739 t, and the OFL's are 19,865 t and 20,335 t. The new ABC recommendation and OFL for the Western-Central GOA in 2022 are similar to those developed in 2021 (16,276 t and 19,779 t). The recommended ABC's for 2023 and 2024 in the Eastern GOA are 4,318 t and 4,358 t, and the OFL's are 5,270 t and 5,317 t. The new ABC recommendation and OFL for the Eastern GOA in 2022 are almost exactly the same as those developed in 2021 because realized and projected catches as estimated last year and this year were approximately 2 t. The principal reference values are shown in the following three tables. The first table shows quantities for the entire GOA, the second table shows quantities for the Western-Central GOA, and the third table shows quantities for the Eastern GOA. The Western-Central and Eastern GOA are based on a Tier 3a approach, and the entire GOA table is simply the sum of the two areas.

Quantity	As estimated or *specified this* year for:		As estimated or *recommended this* year for:	
	2022	2023	2023	2024
M (natural mortality rate)	0.17	0.17	0.17	0.17
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	124,543	126,939	127,297	128,207
Female spawning biomass (t)	51,713	56,777	56,965	59,734
$B_{100\%}$	See area-specific tables below		See area-specific tables below	
$B_{40\%}$				
$B_{35\%}$				
F_{OFL}				
$maxF_{ABC}$				
F_{ABC}				
OFL (t)	23,302	25,049	25,135	25,652
maxABC (t)	19,141	20,594	20,664	21,097
ABC (t)	19,141	20,594	20,664	21,097
Status	As determined *last* year for:		As determined *this* year for:	
	2020	2021	2021	2022
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no

Quantity: (Western-Central GOA)	As estimated or *specified this* year for:		As estimated or *recommended this* year for:	
	2022	2023	2023*	2024*
M (natural mortality rate)	0.17	0.17	0.17	0.17
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	99,428	101,606	101,963	102,913
Female spawning biomass (t)	41,906	46,224	46,412	48,834
$B_{100\%}$	46,850	46,850	46,850	46,850
$B_{40\%}$	18,740	18,740	18,740	18,740
$B_{35\%}$	16,398	16,398	16,398	16,398
F_{OFL}	0.28	0.28	0.28	0.28
$maxF_{ABC}$	0.23	0.23	0.23	0.23
F_{ABC}	0.23	0.23	0.23	0.23
OFL (t)	18,314	19,779	19,865	20,335
maxABC (t)	15,057	16,276	16,346	16,739
ABC (t)	15,057	16,276	16,346	16,739
Status	As determined *last* year for:		As determined *this* year for:	
	2020	2021	2021	2022
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no

* Projections are based on the final catch of 2021 from the Western and Central GOA of 299 t that was used in place of maximum permissible ABC. The 2022-2024 projected catch was calculated as the average catch over the previous five years.

Quantity: (Eastern GOA)	As estimated or *specified this* year for:		As estimated or *recommended this* year for:	
	2022	2023	2023*	2024*
M (natural mortality rate)	0.17	0.17	0.17	0.17
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	25,115	25,333	25,334	25,294
Female spawning biomass (t)	9,807	10,553	10,553	10,900
$B_{100\%}$	8,998	8,998	8,998	8,998
$B_{40\%}$	3,599	3,599	3,599	3,599
$B_{35\%}$	3,149	3,149	3,149	3,149
F_{OFL}	0.31	0.31	0.31	0.31
$maxF_{ABC}$	0.25	0.25	0.25	0.25
F_{ABC}	0.25	0.25	0.25	0.25
OFL (t)	4,988	5,270	5,270	5,317
maxABC (t)	4,084	4,318	4,318	4,358
ABC (t)	4,084	4,318	4,318	4,358
Status	As determined *last* year for:		As determined *this* year for:	
	2020	2021	2021	2022
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no

* Projections are based on estimated catches of 1.67 t (the average over 2017-2021) used in place of maximum permissible ABC for 2022-2024, respectively. In many years catches from the Eastern GOA are small and confidential.

Area Apportionment

The table below shows apportionment of the 2023 and 2024 ABCs among areas. The ABCs calculated for the Western-Central area (based on model estimates) are apportioned based on random effects model predictions of the proportion of Western-Central survey biomass in the Western and Central areas, respectively, in 2023-2024. Likewise, the ABC calculated for the Eastern area (based on model estimates) are apportioned based on random effects model predictions of the proportion Eastern survey biomass in the West Yakutat and Southeast areas, respectively.

Quantity	Western	Central	Total Western-Central	West Yakutat	Southeast	Total Eastern
Area Apportionment	19.80%	80.20%	100.00%	33.34%	66.66%	100.00%
2023 ABC (t)	3,236	13,110	16,346	1,439	2,879	4,318
2024 ABC (t)	3,314	13,425	16,739	1,453	2,905	4,358

Figures

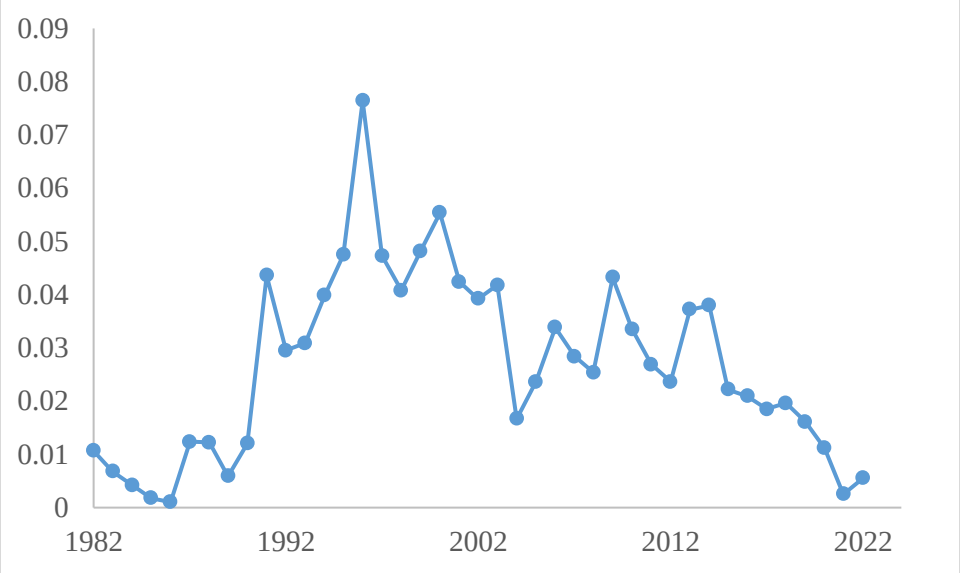

Figure 6.1. GOA rex sole catch-to-biomass ratio using age 3+ biomass for the entire GOA.

Tables

Table 6.1. Fishery catches for GOA rex sole by management area. Catch for 2022 is through October 10, 2022.

Year	Total Catch	Western Gulf	Central Gulf	Eastern Gulf
1982	959			
1983	595			
1984	365			
1985	154			
1986	93			
1987	1151			
1988	1192			
1989	599			
1990	1269			
1991	4636			
1992	3000			
1993	3000			
1994	3642	49	3508	85
1995	4021	220	3628	174
1996	5945	552	5202	191
1997	3296	681	2438	177
1998	2671	440	2195	36
1999	3059	603	2393	63
2000	3592	883	2702	Confidential
2001	2943	435	2507	Confidential
2002	3017	398	2619	Confidential
2003	3499	772	2726	2
2004	1467	527	940	0
2005	2180	576	1603	Confidential
2006	3295	350	2944	0
2007	2851	411	2438	1
2008	2707	185	2522	Confidential
2009	4753	342	4410	1
2010	3669	134	3534	2
2011	2878	131	2746	1
2012	2443	215	2228	Confidential
2013	3700	104	3596	0
2014	3577	126	3450	1
2015	1957	76	1882	Confidential
2016	1749	172	1575	3
2017	1484	48	1434	2
2018	1750	83	1665	2
2019	1612	74	1536	2

2020	1238	36	1201	1
2021	301	14	285	2
2022	686	40	645	0

Literature Cited

McGilliard, C.R. and Palsson, W. 2021. 6. Assessment of the rex sole stock in the Gulf of Alaska. In Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council, P.O. Box 103136, Anchorage AK 99510.