

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

Carey R. McGilliard  
November 2023

### 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](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 2021-2023, to predict stock status for rex sole in 2024 and 2025 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.

#### Description of Updated Catch

New data added to the projection model included updated final catch data from 2021-2022 from the Western and Central GOA of 299 t and 695 t, and realized catch as of September 27, 2023 of 375 t. Catches from the Eastern GOA area often confidential with a long-term average of less than 2 t. New estimated catches for 2024-2025 was calculated as the average catch over the previous five years. The average catch was 1,118 t for Western and Central GOA and 2 t for Eastern GOA.

#### Summary of Results

Based on the updated projection model results, the recommended ABC's for 2024 and 2025 in the Western-Central GOA are 17,006 t and 16,987 t, and the OFL's are 20,660 t and 20,635 t. The new ABC recommendation and OFL for the Western-Central GOA in 2024 are similar to those projected for 2024 developed in 2022 (16,739 t and 20,335 t). The recommended ABC's for 2024 and 2025 in the Eastern GOA are 4,358 t and 4,316 t, and the OFL's are 5,318 t and 5,265 t. The new ABC recommendation and OFL for the Eastern GOA in 2023 are almost exactly the same as those developed in 2022 because realized and projected catches as estimated last year and this year were approximately within 1 t of each other. 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.

<b>Quantity</b>	As estimated or <i>specified this year for:</i>		As estimated or <i>recommended this year for:</i>					
	2023	2024	2024	2025				
<i>M</i> (natural mortality rate)	0.17	0.17	0.17	0.17				
Tier	3a	3a	3a	3a				
Projected total (3+) biomass (t)	127,297	128,207	129,611	129,296				
Female spawning biomass (t)	56,965	59,734	60,486	61,413				
<i>B</i> <sub>100%</sub>	See area-specific tables below		See area-specific tables below					
<i>B</i> <sub>40%</sub>								
<i>B</i> <sub>35%</sub>								
<i>F</i> <sub>OFL</sub>								
<i>maxF</i> <sub>ABC</sub>	See area-specific tables below		See area-specific tables below					
<i>F</i> <sub>ABC</sub>								
OFL (t)					25,135	25,652	25,978	25,900
maxABC (t)					20,664	21,097	21,364	21,303
ABC (t)	20,664	21,097	21,364	21,303				
<b>Status</b>	As determined <i>last</i> year for:		As determined <i>this</i> year for:					
	2021	2022	2022	2023				
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:	
	2023	2024	2024	2025
<i>M</i> (natural mortality rate)	0.17	0.17	0.17	0.17
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	101,963	102,913	104,316	104,219
Female spawning biomass (t)	46,412	48,834	49,586	50,458
<i>B</i> <sub>100%</sub>	46,850	46,850	46,850	46,850
<i>B</i> <sub>40%</sub>	18,740	18,740	18,740	18,740
<i>B</i> <sub>35%</sub>	16,398	16,398	16,398	16,398
<i>F</i> <sub>OFL</sub>	0.28	0.28	0.28	0.28
<i>maxF</i> <sub>ABC</sub>	0.23	0.23	0.23	0.23
<i>F</i> <sub>ABC</sub>	0.23	0.23	0.23	0.23
OFL (t)	19,865	20,335	20,660	20,635
maxABC (t)	16,346	16,739	17,006	16,987
ABC (t)	16,346	16,739	17,006	16,987
Status	As determined last year for:		As determined this year for:	
	2021	2022	2022	2023
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 and 2022 from the Western and Central GOA of 299 t and 695 t and realized catch as of September 27, 2023 of 375 t. The 2024-2025 projected catch was calculated as the average catch over the previous five years of 1,118 t.

Quantity: (Eastern GOA)	As estimated or <i>specified this year for:</i>		As estimated or <i>recommended this year for:</i>	
	2023	2024	2024	2025
<i>M</i> (natural mortality rate)	0.17	0.17	0.17	0.17
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	25,334	25,294	25,295	25,077
Female spawning biomass (t)	10,553	10,900	10,900	10,955
<i>B</i> <sub>100%</sub>	8,998	8,998	8,998	8,998
<i>B</i> <sub>40%</sub>	3,599	3,599	3,599	3,599
<i>B</i> <sub>35%</sub>	3,149	3,149	3,149	3,149
<i>F</i> <sub>OFL</sub>	0.31	0.31	0.31	0.31
<i>maxF</i> <sub>ABC</sub>	0.25	0.25	0.25	0.25
<i>F</i> <sub>ABC</sub>	0.25	0.25	0.25	0.25
OFL (t)	5,270	5,317	5,318	5,265
maxABC (t)	4,318	4,358	4,358	4,316
ABC (t)	4,318	4,358	4,358	4,316
Status	As determined <i>last</i> year for:		As determined <i>this</i> year for:	
	2021	2022	2022	2023
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 2 t (the average over 2018-2022) used in place of maximum permissible ABC for 2024-2025. Realized catches were used for 2021 and 2022 and realized catch as of September 27, 2023 was used for 2023. In many years catches from the Eastern GOA are small and confidential.

The stock is not being subject to overfishing, is not currently overfished, nor is it approaching a condition of being overfished.

#### *Fishery Trends*

Updated catch data (NMFS Alaska Regional Office Catch Accounting System via the Alaska Fisheries Information Network (AKFIN) database, <http://www.akfin.org>) are summarized in **Error! Reference source not found.** and indicate lower catches in 2023 than in 2022, with lower than average catches for 2021-2023.

#### *Survey Trends*

The survey biomass is lower than in 2021 (Figure 2). The ratio of total catch to age 3+ modeled total biomass has been stable over the past three years, around a value of 0.01 (Figure 1).

## Area Apportionment

The table below shows apportionment of the 2024 and 2025 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 2024-2025. 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%	33.64%	66.66%	100.00%
2024 ABC (t)	3,367	13,639	17,006	1,466	2,905	4,358
2025 ABC (t)	3,363	13,624	16,987	1,452	2,877	4,316

## Figures

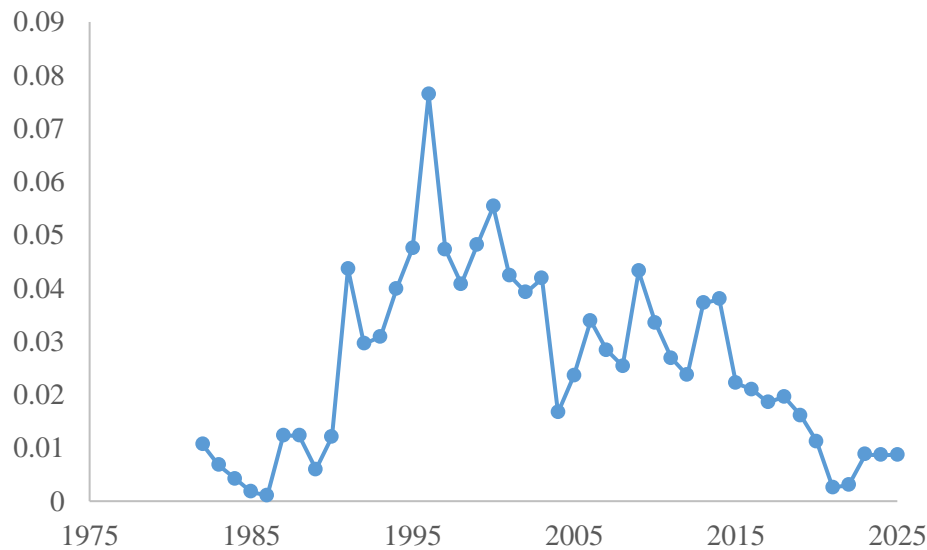


Figure 6.1. GOA rex sole catch-to-biomass ratio using age 3+ biomass for the entire GOA.

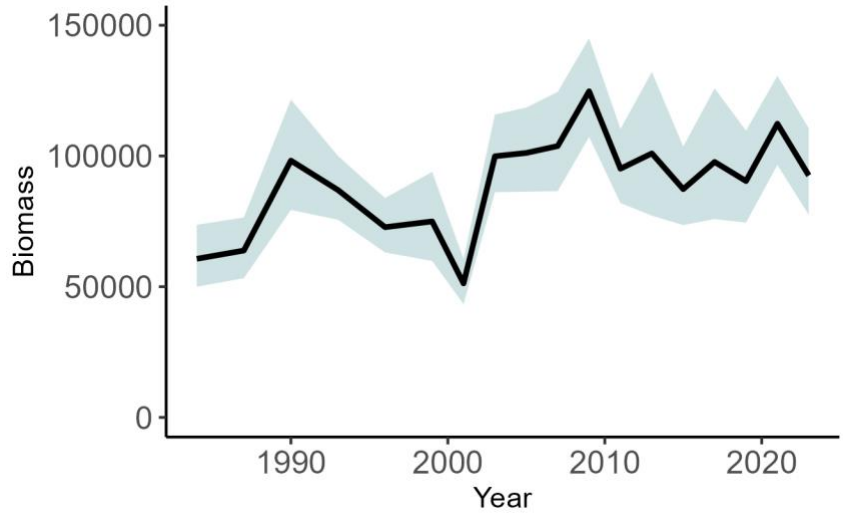


Figure 6.2. GOA rex sole survey biomass estimates over time (black line; tons) with 95% uncertainty intervals (blue).

## Tables

Table 6.1. Fishery catches for GOA rex sole by management area. Catch for 2023 is through September 27, 2023.

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	696	40	655	0
2023	376	21	354	1

---

### **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.