

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

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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 2021-2023, 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.

| Quantity | 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> _{100%} | See area-specific tables below | | See area-specific tables below | | | | | |
| <i>B</i> _{40%} | | | | | | | | |
| <i>B</i> _{35%} | | | | | | | | |
| <i>F</i> _{OFL} | | | | | | | | |
| <i>maxF</i> _{ABC} | See area-specific tables below | | See area-specific tables below | | | | | |
| <i>F</i> _{ABC} | | | | | | | | |
| 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 | | | | |
| 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 | | | | |

| 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> _{100%} | 46,850 | 46,850 | 46,850 | 46,850 |
| <i>B</i> _{40%} | 18,740 | 18,740 | 18,740 | 18,740 |
| <i>B</i> _{35%} | 16,398 | 16,398 | 16,398 | 16,398 |
| <i>F</i> _{OFL} | 0.28 | 0.28 | 0.28 | 0.28 |
| <i>maxF</i> _{ABC} | 0.23 | 0.23 | 0.23 | 0.23 |
| <i>F</i> _{ABC} | 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> _{100%} | 8,998 | 8,998 | 8,998 | 8,998 |
| <i>B</i> _{40%} | 3,599 | 3,599 | 3,599 | 3,599 |
| <i>B</i> _{35%} | 3,149 | 3,149 | 3,149 | 3,149 |
| <i>F</i> _{OFL} | 0.31 | 0.31 | 0.31 | 0.31 |
| <i>maxF</i> _{ABC} | 0.25 | 0.25 | 0.25 | 0.25 |
| <i>F</i> _{ABC} | 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

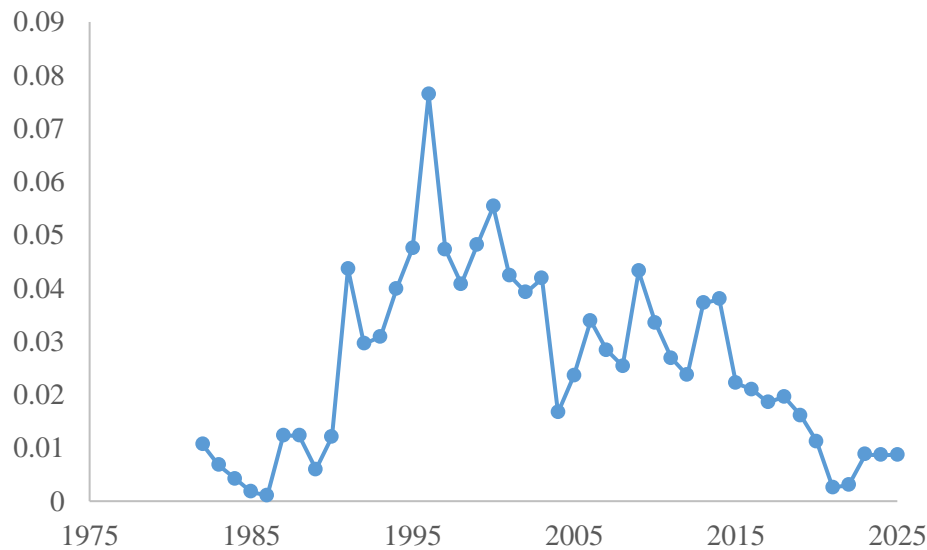


Figure 6.1. GOA rex sole catch-to-biomass ratio using age 3+ biomass for the entire GOA.

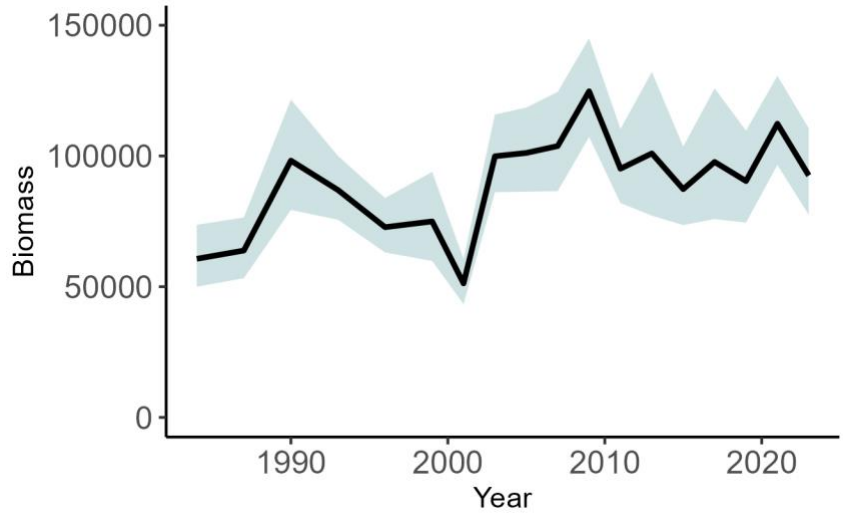


Figure 6.2. GOA rex sole survey biomass estimates over time (black line; tons) with 95% uncertainty intervals (blue).

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.