

# 13. Assessment of the Northern Rockfish Stock in the Bering Sea and Aleutian Islands

by

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## Executive Summary

In 2005, Bering Sea/Aleutian Islands (BSAI) rockfish were moved to a biennial assessment schedule with full assessments in even years to coincide with the frequency of trawl surveys in the Aleutian Islands (AI) and the eastern Bering Sea (EBS) slope. In 2017, the scheduled frequency for some stock assessments was changed in response to the National Stock Assessment Prioritization effort. Bering Sea/Aleutian Islands (BSAI) northern rockfish will maintain a biennial schedule but with full assessments in odd years, with the next full assessment scheduled for 2023. The 2021 full assessment can be found at <https://apps-afsc.fisheries.noaa.gov/refm/docs/2021/BSAInork.pdf>. In years without a full assessment, a “partial assessment” is produced by revising the recent catch data and re-running the projection model using the results from the previous full assessment as a starting point. Therefore, this update does not incorporate any changes to the 2021 assessment methodology, but does update the catches for 2021-2022 and provides estimated catches for 2023-2024. The partial assessment also includes estimates of catch/biomass (i.e., exploitation rates) using estimated total biomass.

### **Summary of Changes in Assessment Inputs**

*Changes in input data:* The updated information for this partial assessment is replacing the estimated 2021 catch with the final catch value, revising the 2022 and 2023 catch estimates, and adding 2024 catch. The 2021 catch was 6,212 t, 29% smaller than the estimate of 8,782 t that was used in the 2021 projection. This difference resulted from the fishery catching an unusually low proportion of the remaining TAC in the fall of 2021 relative to other recent years. The 2022 catch is projected to be 8,434 t, 3% larger than the estimate of 8,213 in the 2021 projection. The estimated 2023 and 2024 catches are assumed to result from fishing at the estimated 2022  $F$  (from the 2022 projection model, and updated estimate of the 2022 catch), resulting in 8,129 t and 7,888 t, respectively.

*Changes in assessment methodology:* There were no changes in assessment methodology since this was a partial assessment year.

### **Summary of Results**

For the 2023 fishery, we recommend the maximum ABC of 18,687 t and an OFL of 22,776 t based on the updated projection model. The recommended 2023 ABC is 2.8% smaller than the 2022 ABC of 19,217 and 0.8% larger than the projected 2023 ABC of 18,538 from the 2021 projection model. A summary of the updated projection model results is shown below.

Quantity	As estimated or specified last year for:		As estimated or recommended this year for:	
	2022	2023	2023*	2024*
<i>M</i> (natural mortality rate)	0.054	0.054	0.054	0.054
Tier	3a	3a	3a	3a
Projected total (age 3+) biomass (t)	279,584	275,210	277,133	273,414
Female spawning biomass (t)				
Projected	121,126	117,333	118,251	115,209
<i>B</i> <sub>100%</sub>	171,768	171,768	171,768	171,768
<i>B</i> <sub>40%</sub>	68,707	68,707	68,707	68,707
<i>B</i> <sub>35%</sub>	60,119	60,119	60,119	60,119
<i>F</i> <sub>OFL</sub>	0.085	0.085	0.085	0.085
<i>maxF</i> <sub>ABC</sub>	0.069	0.069	0.069	0.069
<i>F</i> <sub>ABC</sub>	0.069	0.069	0.069	0.069
OFL (t)	23,420	22,594	22,776	22,105
maxABC (t)	19,217	18,538	18,687	18,135
ABC (t)	19,217	18,538	18,687	18,135
<b>Status</b>	As determined last year for:		As determined this year for:	
	2022	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 8,129 t and 7,888 t used in place of maximum permissible ABC for 2023 and 2024.

BSAI northern rockfish was not subjected to overfishing in 2021, and is not overfished or approaching an overfished condition.

BSAI northern rockfish exploitation rates have averaged 0.015 from 2004-2022 (Figure 13.1), which is below the exploitation rate associated from fishing at  $F_{40\%}$  (defined as  $U_{F40\%}$ ). Exploitation rates are computed as the ratio of catch within a year to the beginning year biomass (ages 3+). The estimates of biomass for 2022 were updated by re-running the projection model with updated catch data, where biomass estimate for other years were obtained from the 2021 stock assessment. Exploitation rates for BSAI subareas were obtained by using smoothed estimates of survey biomass from the random effects models to spatially partition the estimated total biomass. The exploitation rates from the BSAI subareas are below  $U_{F40\%}$ . The exploitation rate in the eastern Aleutian Islands peaked in 2015 and 2019, but has declined since 2019. The exploitation rates in the central and western Aleutian Islands have been increasing since 2014. The biomass estimates in the southern Bering Sea area are not viewed as reliable due to relatively large standard deviations and high variability between years, which accounts for the unusually high exploitation rates from 2009 - 2017.

## Summary table for the Plan Team

Year	Biomass <sup>1</sup>	OFL	ABC	TAC	Catch <sup>2</sup>
2021	244,600	18,917	15,557	13,000	6,212
2022	279,584	23,420	19,217	17,000	7,409
2023	277,133	22,776	18,687		
2024	273,414	22,105	18,135		

<sup>1</sup> Total biomass (ages 3+) from age-structured projection model.

<sup>2</sup> Source: AKFIN database, catch as of September 25, 2022.

SSC and Plan Team comments are listed below. In general, responses to comments relating to analyses of the age-structured assessment model are deferred until the next full assessment, currently scheduled for 2023.

### **Responses to SSC and Plan Team Comments Specific to this Assessment**

SSC (December, 2021) *The SSC requests that the uncertainty for the survey biomass estimates be included in all of the figures with these data.*

SSC (December, 2021) *The SSC suggests the technical description of the model (e.g., equations etc.) be moved to an appendix in this assessment, and the main document should contain a detailed text description of the model structure.*

These requests will be addressed in the full assessment scheduled for 2023.

SSC (December, 2021) *SSC recommends the author review any potential sources of data in the AI, including ADF&G surveys. It would also be helpful to confirm the absence of northern rockfish in the EBS survey data, noting the increase in the portion of the AI survey that enters the southern Bering Sea in 2018, following the marine heatwave.*

A review of alternative survey data sources for the Aleutian Islands was conducted in the 2022 BSAI blackspotted/rougeye rockfish assessment, including the AFSC longline survey, the IPHC longline survey, and the ADFG trawl survey. The assessment authors and the BSAI Plan Team each recommend not including these data sources in the assessment primarily because the current spatial extent of these surveys are much smaller than the Aleutian Islands stock area (and in the case of the IPHC survey, the spatial extent of the survey changed recently). This rationale also applies to any stock, and was also used in not including these surveys in the 2022 BSAI other rockfish assessment. Additionally, northern rockfish are typically not caught on longline gear, as their diet is dominated by euphausiids.

For the 2023 assessment, we will re-examine the EBS survey data with respect to northern rockfish sampling and biomass estimates.

SSC (December, 2021) *A final concern that the SSC wishes to elevate is the potential for a mismatch in the spatial structure of this stock, as noted by the assessment author. A stock structure evaluation was completed as an appendix to the 2012 assessment. This included information on an area-specific evaluation of growth using AI survey data that indicated differences in growth among AI subareas, EBS and the GOA. Genetic data also supported stock structure at a smaller spatial scale than currently used for management. Given the concerns described by the assessment author and the recent interest in directed targeting of northern rockfish, the SSC suggests updating the information presented in the stock structure appendix for the next full assessment in 2023, given that it will be more than 10 years old at that time and there may be new survey information available.*

We will update the stock structure template for the 2023 stock assessment.

SSC (December, 2021) Finally, as the SSC reiterates its request that the aging error matrix be updated with data from the BSAI, as the assessment author did not have time to complete the request this cycle.

We will update the ageing error matrix for the 2023 stock assessment.

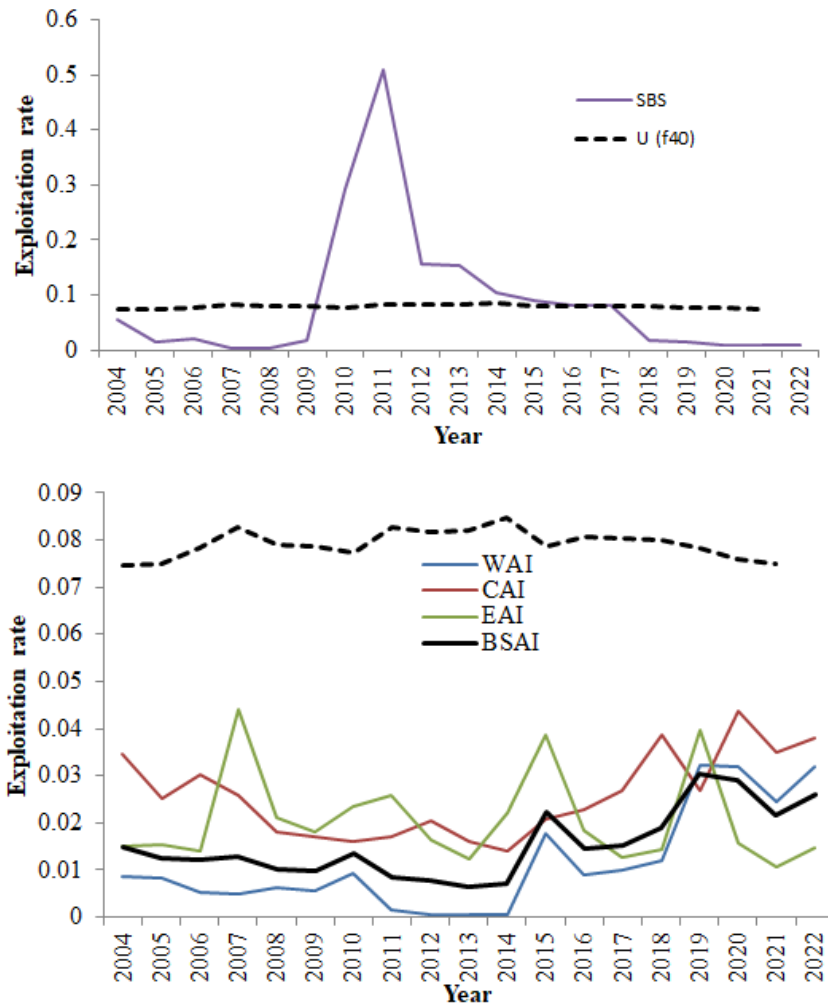


Figure 13.1. Exploitation rates for northern rockfish. The  $U_{F40\%}$  is the exploitation rate for each year that would occur from fishing at  $F_{40\%}$ , and is a function of the beginning year numbers at age, size at age, and fishing selectivity. The high exploitation rates in the southern Bering Sea (SBS) area result from highly variable survey biomass estimates for this area. Exploitation rates for 2022 are preliminary and based on catch through September 25, 2022.