13. Assessment of the Rougheye and Blackspotted rockfish stock complex in the Gulf of Alaska

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Executive Summary

All Gulf of Alaska (GOA) rockfish stocks are assessed on a biennial stock assessment schedule to coincide with the availability of new survey data. We use a statistical age-structured model as the primary assessment tool for the Gulf of Alaska rougheye and blackspotted (RE/BS) rockfish complex which qualifies as a Tier 3 stock (Sullivan et al. 2021). This assessment consists of a population model, which uses survey and fishery data to generate a historical time series of biomass trajectories, and a projection model, which uses results from the population model to predict future population estimates and recommended harvest levels. For 2022, which is an off-cycle year, we do not re-run the assessment model but do update the projection model with new catch information. This incorporates the most current catch information without re-estimating model parameters and biological reference points. As with last year, we use the full assessment base model from 2021.

Summary of Changes in Assessment Inputs

Changes in the input data: There were no changes made to the assessment model inputs since this was an off-cycle year. New data added to the projection model included an updated 2021 catch estimate and new catch estimates for 2022-2024. The updated 2021 catch was 407 t, which was slightly higher than the 2021 catch estimated in the 2021 assessment (384 t, Sullivan et al. 2021). The 2022 catch was estimated by increasing the official catch as of October 15, 2022 (accessed on October 24, 2022), by an expansion factor of 1.042, which represents the average fraction of catch taken after October 15 in the last three complete years (2019-2021). This expansion factor resulted in an estimated catch for 2022 of 494 t. To estimate future catches, we updated the yield ratio to 0.50, which was the average of the ratio of catch to ABC for the last three complete catch years (2019-2021). This yield ratio was multiplied by the projected ABCs from the updated projection model to generate catches of 387 t in 2023 and 379 t in 2024.

Changes in the assessment methodology: There were no changes in assessment methodology since this was an off-cycle year.

Summary of Results

For the 2023 fishery, we recommend the maximum allowable ABC of 775 t from the updated projection model. This ABC is slightly less than the 2022 ABC of 788 t and nearly identical to last year's projected 2023 ABC of 781 t. Reference values for GOA RE/BS rockfish are summarized in the following table, with the recommended ABC and OFL values for 2023 in bold.

Quantity	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
	2022	2023	2023	2024
M (natural mortality rate)	0.034	0.034	0.034	0.034

Tier	3a	3a	3a	3a
Projected total (ages 3+) biomass (t)	26,060	25,997	25,837	25,755
Projected female spawning biomass (t)	8,648	8,627	8,554	8,514
$B_{100\%}$	14,776	14,776	14,776	14,776
$B_{40\%}$	5,911	5,911	5,911	5,911
$B_{35\%}$	5,172	5,172	5,172	5,172
F_{OFL}	0.046	0.046	0.046	0.046
$maxF_{ABC}$	0.038	0.038	0.038	0.038
F_{ABC}	0.038	0.038	0.038	0.038
OFL (t)	**947**	937	**930**	**927**
maxABC (t)	**788**	781	775	772
ABC (t)	**788**	781	**775**	**772**
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

The stock is not being subject to overfishing, is not currently overfished, nor is it approaching a condition of being overfished. The stock is not being subjected to overfishing because the official catch estimate for the most recent complete year (2021) is 407 t, which is less than the 2021 OFL of 1,456 t. The stock is not currently overfished nor approaching an overfished condition because the projected spawning biomass for 2023 and 2024 from the 2021 assessment model are 8,554 t and 8,514 t, respectively, well above the estimate of $B_{35\%}$ at 5,172 t.

Fishery Trends

Updated catch data (t) for RE/BS rockfish in the Gulf of Alaska as of October 15, 2022 (NMFS Alaska Regional Office Catch Accounting System via the Alaska Fisheries Information Network [AKFIN] database, http://www.akfin.org, accessed October 24, 2022) are summarized in the following table:

Year	Western	Central	Eastern	Gulfwide Total	Gulfwide ABC	Gulfwide TAC
2021	22	182	203	407	1,212	1,212
2022	95	226	153	474	788	788

Catch of RE/BS rockfish in 2022 increased in the Western and Central GOA and decreased in the Eastern GOA compared to 2021. The majority of the RE/BS rockfish catch remains in the rockfish and sablefish fisheries, with some increase in the flatfish fisheries. The composition of catch by gear type has remained relatively constant over time, with hook-and-line and trawl fisheries accounting for approximately 40% and 60% of the catch, respectively. However, in 2022 the proportion of catch by trawl gear increased to approximately 75%, while hook-and-line decreased to approximately 17%. The reduction in hook-and-line catch is attributed to increased use of slinky pot gear in the GOA sablefish fisheries. Using the projected 2022 catch of 494 t and the 2022 age-3 projected biomass of 26,037 t, the RE/BS rockfish catch/biomass ratio has ranged from 0.003-0.063 between 1977 and 2022, with a large spike in 1990 (Figure 13.1). The projected 2022 catch/biomass ratio is 0.019, just below the long-term mean of 0.020.

Survey Trends

There was no new GOA bottom trawl survey biomass estimate in 2022. The 2021 biomass estimate was a 56% decrease from 2019 and 43% below the long-term mean (1990-2021). The 2022 longline survey abundance estimate (relative population number, RPN) increased 12% from the 2021 estimate but is 16% below the long-term mean (Figure 13.2). The new longline survey RPN was not used for updating the 2022 projection model for RE/BS rockfish as this was an off-cycle year.

Area Allocation of Harvests

The apportionment percentages are the same as in the 2021 full assessment. The following table shows the recommended apportionment for 2023 and 2024 (in bold) using the two survey random effects model. This method equally weights the longline and trawl survey indices. Please refer to the last full stock assessment for information regarding the apportionment rationale for RE/BS rockfish.

Method	Area Allocation		Western GOA	Central GOA	Eastern GOA	Total
Two Survey Random Effects			23.30%	29.90%	46.80%	100.00%
	2023	Area ABC (t)	**180**	**232**	**363**	**775**
		OFL (t)				**930**
	2024	Area ABC (t)	**180**	**231**	**361**	**772**
		OFL (t)				**927**

Summaries for Plan Team

Species	Year	Biomass[1]	OFL	ABC	TAC	Catch[2]
RE/BS complex	2021	40,432	1,456	1,212	1,212	407
	2022	26,062	947	788	788	474
	2023	25,837	930	775		
	2024	25,755	927	772		

Stock/ Assemblage	Area	2022 OFL	2022 ABC	2022 TAC	2022 Catch[2]	2023 OFL	2023 ABC	2024 OFL	2024 ABC
RE/BS complex	W		184	184	95		180		180
	C		235	235	226		232		231
	E		369	369	153		363		361
	Total	947	788	788	474	930	775	927	772

[1]Total biomass (ages 3+) from the age-structured model in the year the TAC was specified for current and past years, or the current model for projection years.

[2]Current as of October 15, 2022. Source: NMFS Alaska Regional Office Catch Accounting System via the AKFIN database (http://www.akfin.org), accessed October 24, 2022.

Responses to SSC and Plan Team Comments on Assessments in General

In this section, we list new or outstanding comments on assessments in general from the last full assessment in 2021. We will respond to these comments in the next full assessment.

(GOA Groundfish Plan Team, November 2021): *The Team recommends all GOA authors evaluate any bottom trawl survey information used in their assessment prior to 1990 including the 1984 and 1987*

surveys and conduct sensitivity analyses to evaluate their usefulness to the assessment. This may apply for Aleutian Islands surveys but this was only raised during GOA assessment considerations.

(SSC, December 2021): *The SSC recommends that groundfish, crab and scallop assessment authors do not change recommendations in documents between the Plan Team and the SSC meetings, because it makes it more difficult to understand the context of the Plan Team's rationale and seems counter to the public process without seeing a revision history of the document.*

Responses to SSC and Plan Team Comments Specific to this Assessment

(GOA Groundfish Plan Team, November 2021): *The Team agreed with the data and model issues raised by the author including data weighting, trawl survey length data, survey index refinements, and parameterizations for survey catchabilities and selectivities. The Team continued to place a high priority on developing robust species identification methods and in estimating composition data.*

(SSC, December 2021): *The GOA GPT noted that the large changes in survey catchability estimates resulted in a downward shift in the long-term biomass trajectory for this stock. However, because the surveys exhibit inconsistent trends and partition biomass differently among areas, it is unclear if these signals reflect a genuine conservation concern or are the byproduct of survey data conflicts. The SSC concurs with the author and the GOA GPT that it would be prudent to estimate survey indices using the same depth strata definitions and to examine weighting CPUE by a variable other than total geographic area that may be more relevant to this complex (e.g., Essential Fish Habitat within a stratum).*

Literature cited

Sullivan, J., S.K. Shotwell, D.H. Hanselman, P.J.F. Hulson, B.C. Williams, E.M. Yasumiishi, B.E. Ferriss. 2021. 13. Assessment of the Rougheye and Blackspotted rockfish stock complex in the Gulf of Alaska. *In*: Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska as projected for 2022. North Pacific Fishery Management Council, 605 W 4th Ave, Suite 306 Anchorage, AK 99501.

Figures

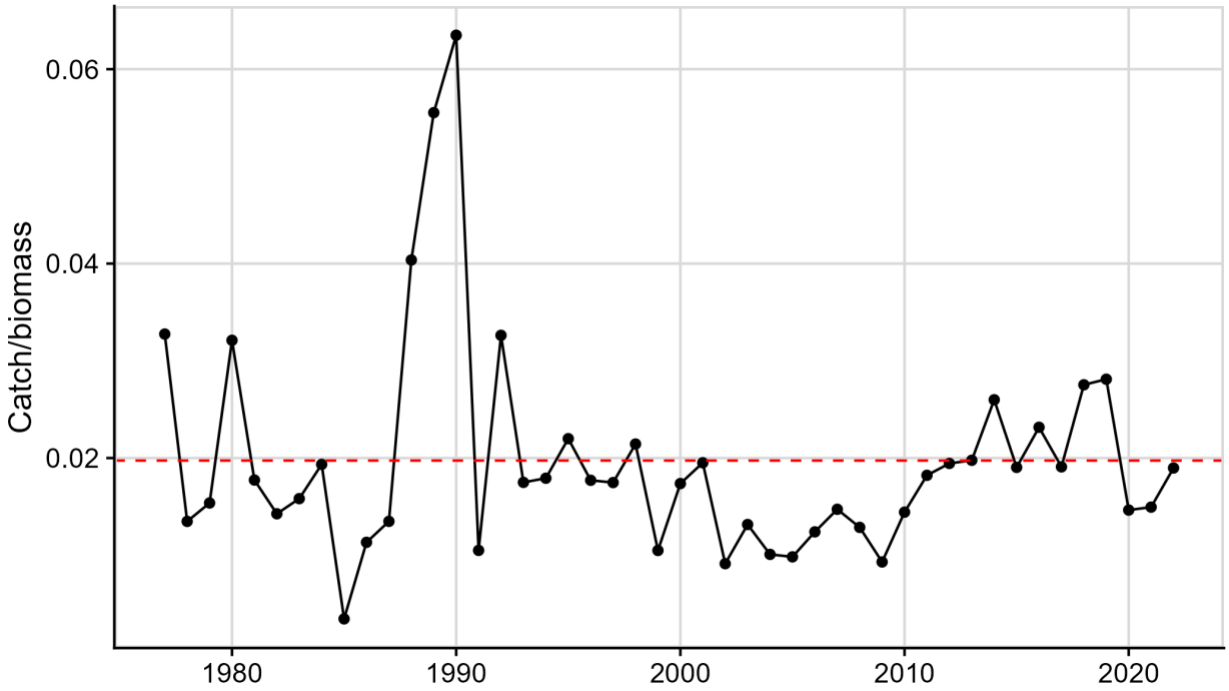

Figure 13.1. Catch divided by biomass (age 3+) for GOA RE/BS rockfish, 1977-2022. The red dashed line is the long-term average for the time series.

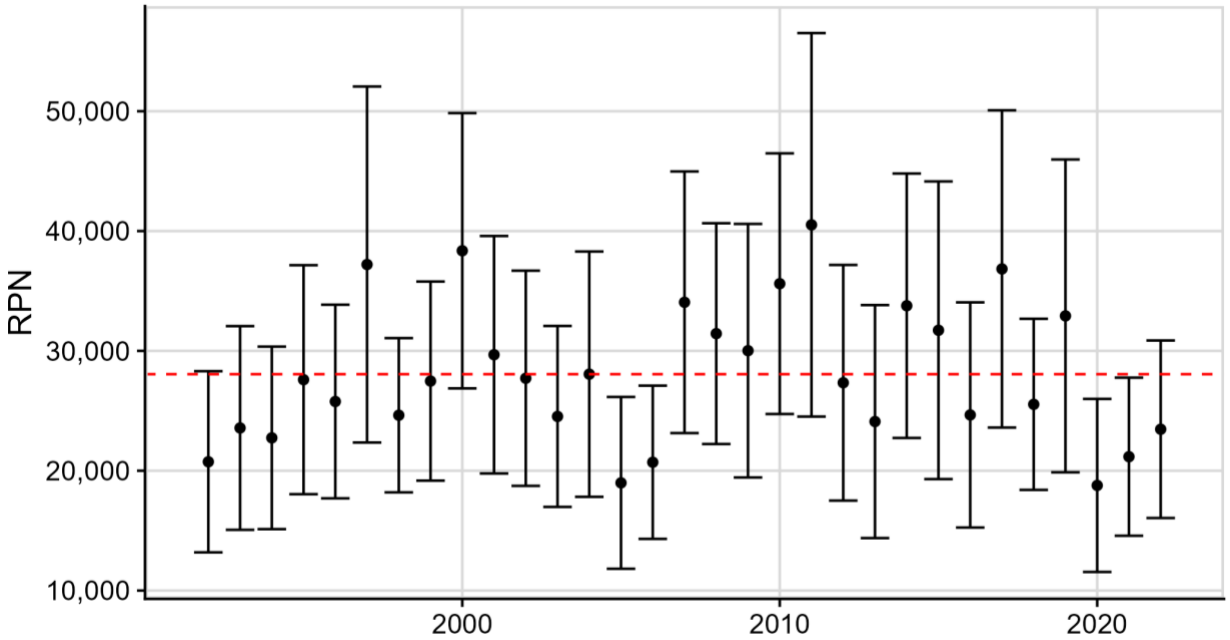

Figure 13.2. AFSC longline survey relative population numbers (RPN) with 95% sampling error confidence intervals for GOA RE/BS rockfish from 1992-2022. Red dashed line is long-term average for the time series.