

# 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 and in accordance with the National Stock Assessment Prioritization effort (Methot 2015; Hollowed et al. 2016). For this off-cycle (even) year, we present a partial assessment consisting of an executive summary with recent fishery catch and survey trends as well as recommend harvest levels for the next two years. In on-cycle (odd) years, we will present a full stock assessment document with updated assessment and projection model results to recommend harvest levels for the next two years. Please refer to last year's full stock assessment and fishery evaluation (SAFE) report for further information regarding the stock assessment (Shotwell and Hanselman, 2019, available online at <https://archive.afsc.noaa.gov/refm/docs/2019/GOARougheye.pdf>).

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. 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. The data sets used in this assessment include total catch biomass, fishery age and size compositions, trawl and longline survey abundance estimates, trawl survey age compositions, and longline survey size compositions. For 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 2019.

## 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 2019 catch estimate (749 t) and new catch estimates for 2020-2022. The 2020 catch was estimated by increasing the official catch as of October 10, 2020, by an expansion factor of 1.045, which represents the average fraction of catch taken after October 10 in the last three complete years (2017-2019). This expansion factor resulted in an estimated catch for 2020 of 368 t. To estimate future catches, we updated the yield ratio to 0.48, which was the average of the ratio of catch to ABC for the last three complete catch years (2017-2019). This yield ratio was multiplied by the projected ABCs from the updated projection model to generate catches of 581 t in 2021 and 573 t in 2022.

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

## Summary of Results

For the 2021 fishery, we recommend the maximum allowable ABC of 1,212 t from the updated projection model. This ABC is very similar to last year's ABC of 1,209 t and nearly identical to last year's projected 2021 ABC of 1,211 t. Reference values for GOA RE/BS rockfish are summarized in the following table, with the recommended ABC and OFL values for 2021 in bold.

Quantity	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year for:*</i>	
	2020	2021	2021	2022
<i>M</i> (natural mortality rate)	0.036	0.036	0.036	0.036
Tier	3a	3a	3a	3a
Projected total (ages 3+) biomass (t)	40,336	40,393	40,432	40,454
Projected female spawning biomass (t)	12,518	12,530	12,540	12,563
$B_{100\%}$	20,658	20,658	20,658	20,658
$B_{40\%}$	8,263	8,263	8,263	8,263
$B_{35\%}$	7,230	7,230	7,230	7,230
$F_{OFL}$	0.048	0.048	0.048	0.048
$maxF_{ABC}$	0.040	0.040	0.040	0.040
$F_{ABC}$	0.040	0.040	0.040	0.040
OFL (t)	1,452	1,455	<b>1,456</b>	1,467
maxABC (t)	1,209	1,211	1,212	1,221
ABC (t)	1,209	1,211	<b>1,212</b>	1,221
Status	As determined <i>last</i> year for:		As determined <i>this</i> year for:	
	2018	2019	2019	2020
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 an updated catch of 749 t for 2019, an estimated catch of 368 t for 2020, and estimates of 581 t and 573 t used in place of maximum permissible ABC for 2021 and 2022. These calculations are in response to management requests to obtain more accurate projections.

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 (2019) is 749 t, which is less than the 2019 OFL of 1,715 t. The stock is not currently overfished nor approaching an overfished condition because the projected spawning biomass for 2020 and 2022 from the 2019 assessment model are 12,486 t and 12,563 t, respectively, well above the estimate of  $B_{35\%}$  at 7,230 t.

#### *Fishery Trends*

Updated catch data (t) for RE/BS rockfish in the Gulf of Alaska as of October 10, 2020 (NMFS Alaska Regional Office Catch Accounting System via the Alaska Fisheries Information Network (AKFIN) database, <http://www.akfin.org>) are summarized in the following table:

Year	Western	Central	Eastern	Gulfwide Total	Gulfwide ABC	Gulfwide TAC
2019	78	440	230	749	1,428	1,428
2020	4	175	173	352	1,209	1,209

Catch of RE/BS rockfish decreased in all areas in 2020 compared to 2019. 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. The majority of the RE/BS rockfish catch

remains in the rockfish and sablefish fisheries, with some increase in the flatfish fisheries. Using the projected 2020 catch of 368 t and the 2020 age-3 projected biomass of 40,336 t, the RE/BS rockfish catch/biomass ratio has ranged from 0.007-0.026 between 1991 and 2020 (Figure 13-1). The projected 2020 catch/biomass ratio is 0.009, the lowest since 2009 and below the long-term mean of 0.013.

### *Survey Trends*

The 2020 longline survey abundance estimate (relative population number or RPN) decreased 43% from the 2019 estimate and is well below the long-term mean (Figure 13-2). This steep decrease in RE/BS RPN could potentially be attributed to hook competition with sablefish, which has increased 97% overall since 2018, and 73% in the Gulf of Alaska. This information was not used for updating the 2020 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 2019 full assessment. The following table shows the recommended apportionment for 2021 and 2022 (in bold) using the two survey random effects model, which was approved in 2019. This method equally weights the longline and trawl survey indices. We provide the three survey weighted average, which was used historically, for reference. 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	2021	Area ABC (t)	13.88%	37.61%	48.51%	100%
		OFL (t)	<b>168</b>	<b>456</b>	<b>588</b>	<b>1,212</b>
	2022	Area ABC (t)	<b>170</b>	<b>459</b>	<b>592</b>	<b>1,221</b>
		OFL (t)				<b>1,467</b>
Three Survey Weighted Average	2021	Area ABC (t)	6.63%	55.70%	37.67%	100%
		OFL (t)	80	675	457	1,212
	2022	Area ABC (t)	81	680	460	1,221
		OFL (t)				1,467

## Summaries for Plan Team

Species	Year	Biomass <sup>1</sup>		OFL	ABC	TAC	Catch <sup>2</sup>		
RE/BS complex	2019	45,363		1,715	1,428	1,428	749		
	2020	40,336		1,452	1,209	1,209	352		
	2021	40,432		1,456	1,212				
	2022	40,454		1,467	1,221				
Stock/ Assemblage	Area	2020				2021		2022	
		OFL	ABC	TAC	Catch <sup>2</sup>	OFL	ABC	OFL	ABC
RE/BS complex	W		168	168	4		168		170
	C		455	455	175		456		459
	E		586	586	173		588		592
	Total	1,452	1,209	1,209	352	1,456	1,212	1,467	1,221

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

<sup>2</sup>Current as of October 10, 2020. Source: NMFS Alaska Regional Office Catch Accounting System via the AKFIN database (<http://www.akfin.org>).

## 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 2019. Since this is a partial assessment, we only respond to priority comments in the executive summary. We will respond to remaining and future comments in the next full assessment.

*“For Tiers 1-3 on a 2-year cycle when only the projection model is run with updated catch and the new survey estimate is not included in model output, the Team recommended using apportionment percentages determined in the last full assessment. The rationale for this is to update apportionment values when survey data is used in biomass and ABC/OFL calculations (Tiers 4-5) but not when projection models are run that don’t use new biomass estimates to inform reference points (Tiers 1-3).”* (GOA GPT November 2019)

In accordance with this guidance, the apportionment percentages for 2021 were carried over from the last full assessment.

### Recommendations and comments related to Risk Tables:

*“The SSC recommends the authors complete the risk table and note important concerns or issues associated with completing the table.”* (SSC October 2019)

*“The SSC recommends dropping the overall risk scores in the tables as these provided no additional information relative to ABC-setting and seemed to cause confusion. They simply report the maximum value of risk for the four factors, which is redundant information.”* (SSC December 2019)

*“The Teams recommended that authors continue to fill out the risk tables for full assessments.”* (Joint GPT November 2019)

*“The Teams recommend that each author have discretion to use the proposed systematization presented here as a tool to assist them in filling out the risk table.”* (Joint GPT September 2019)

*“The Teams recommended that adjustment of ABC in response to levels of concern should be left to the discretion of the author, the Team(s), and/or the SSC, but should not be mandated by the inclusion of a >1 level in any particular category.”* (Joint GPT November 2019)

We appreciate the guidance of the SSC and Joint GPTs on this topic and will complete the risk table for the next full assessment. We note that the SSC December 2019 minutes were particularly helpful and have been saved for future reference.

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

In this section, we list new or outstanding comments specific to RE/BS rockfish from the last full assessment in 2019. Since this is an off-cycle year we only respond to priority comments in the executive summary. We will respond to remaining and future comments in the next full assessment.

*“The Team recommended that the authors incorporate additional information about species identification obtained through otolith morphology in future assessments.”* (GOA GPT November 2019)

We will respond to this request and incorporate additional information about species identification using otolith morphology in the next full assessment.

*“The Team recommended that the author investigate how selectivity is modeled. In particular, there were some abrupt changes between ages in the average fishery selectivity.”* (GOA GPT November 2019)

We will respond to this request and investigate fishery selectivity in the next full assessment.

*“The Team accepted the new RE apportionment methodology, and recommended that this also be used in the future.”* (GOA GPT November 2019)

The new two survey random effects apportionment methodology was used for the 2020 assessment and will be used in future assessments.

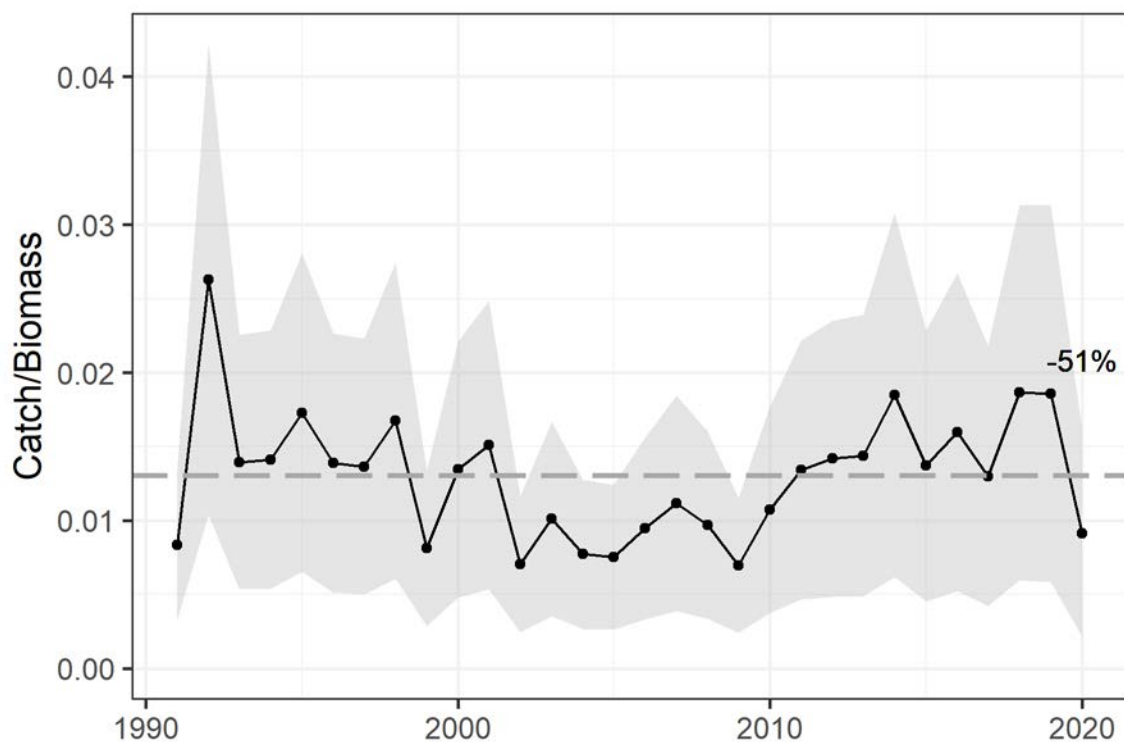


Figure 13-1. Catch divided by biomass (age 3+) from the age-structured model for GOA RE/BS rockfish with 95% sampling error confidence intervals (shaded area) from 1991-2020. The grey dashed line is the long-term average for the time series. Text percentage is the decrease of the 2020 catch/biomass ratio since 2019.

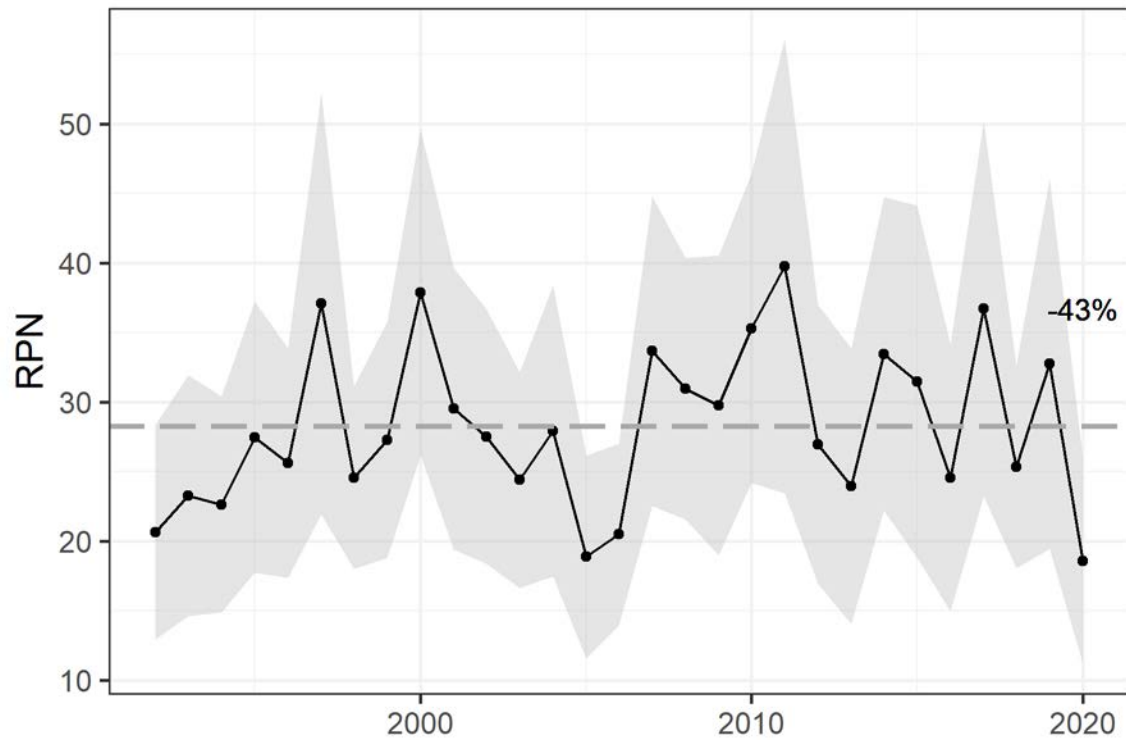


Figure 13-2. AFSC longline survey relative population numbers (RPN in thousands, point estimates in black) with 95% sampling error confidence intervals for GOA RE/BS rockfish (shaded area) from 1992-2020. Grey dashed line is long-term average for the time series. Text percentage is the decrease of the 2020 RPN since 2019.