

4. Assessment of the Northern and Southern Rock Sole Stock in the Gulf of Alaska

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Executive Summary

Gulf of Alaska northern and southern rock sole (*Lepidopsetta ployxystra* and *Lepidopsetta bilineatta*) are assessed on a 4-year stock assessment schedule and were last assessed in 2021 (Bryan and Palsson, 2021). This year represents an off-cycle year and during years when a full assessment is not completed a partial assessment is done. For a partial assessment, the projection model uses the most current catch information without re-estimating the model parameters. The projection model results are then combined with the other shallow-water flatfish recommended harvest levels. The combined recommendations are used for the next two years.

GOA northern rock and southern rock sole are classified as Tier 3 stocks and are assessed using age-structured stock assessment models that account for regional differences in growth. The western GOA and central-eastern GOA are modeled separately with estimated area-specific growth patterns. The species-specific projection model was run separately for each area using the results from the last accepted northern rock sole and southern rock sole assessment models and updated catch information for 2021-2022. The resulting ABC recommendations are for 2023 and 2024.

Summary of Changes in Assessment Inputs

Changes were not made to the assessment model inputs since this was an off-cycle year. New data added to the projection model included final 2021 catch and catch estimates for 2022-2024.

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Summary of Results

An assumption of the northern and southern rock sole assessment models is that total rock sole catch is split evenly between the species. This was true for the 2021 full assessments and the catch updates for this year's partial assessment use this 50% split. Therefore, the area-specific catch updates were the same in the northern rock sole and southern rock sole projection models. The final 2021 catch in the central region was updated and increased to 663 t from 634 t. The 2022 end of year catch was derived as the product of the catch on September 28, 2022 (456.9 t) and an expansion factor of 1.205. The 2022 catch input was changed from 634 t to 551 t and was used as the catch input for 2023 and 2024. The 2021 catch in the western region was updated and reduced to 9.95 t from 40.6 t and the 2022 end of year catch was derived as the product of the catch on September 28, 2022 (12.07 t) and an expansion factor of 1.083. The 2022 catch was changed from 40.6 t to 13.07 t and was used as the catch input for 2023 and 2024.

The recommended ABCs for northern rock sole in the central GOA for 2023 and 2024 are 4,214 t and 4,421 t. The recommended OFLs are 4,934 t and 5,175 t for 2023 and 2024 in the central GOA. The recommended ABCs for northern rock sole in the western GOA for 2023 and 2024 are 8,508t and 8,916 t.

The recommended OFLs are 10,259 t and 10,749 t. The 2023 advice from the updated projection models is similar to what was specified in 2021.

The recommended ABCs for southern rock sole in the central GOA for 2023 and 2024 are 14,246 t and 14,978 t. The recommended OFLs are 16,874 t and 17,733 t. The recommended ABCs for southern rock sole in the western GOA for 2023 and 2024 are 11,840 t and 12,430 t. The recommended OFLs are 14,029 t and 14,718 t. The 2023 advice from the updated projection models is similar to what was specified in 2021.

Catch biomass ratios will be presented in the shallow-water flatfish chapter.

Northern rock sole, Central GOA Quantity	As estimated or <i>recommended last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2022	2023	2023	2024
<i>M</i> (natural mortality rate; female, male)	0.2, 0.232*	0.2, 0.232*	0.2, 0.232*	0.2, 0.232*
Tier	3a	3a	3a	3a
Projected total (age 0+) biomass (t)	35,089	36,945	37,080	38,502
Projected Female spawning biomass (t)	11,266	13,359	13,431	15,845
<i>B</i> _{100%}	20,913	20,913	20,913	20,913
<i>B</i> _{40%}	8,365	8,365	8,365	8,365
<i>B</i> _{35%}	7, 320	7, 320	7, 320	7, 320
<i>F</i> _{OFL}	0.181	0.181	0.181	0.181
<i>maxF</i> _{ABC}	0.153	0.153	0.153	0.153
<i>F</i> _{ABC}	0.153	0.153	0.153	0.153
OFL (t)	4,541	4,913	4,934	5,175
maxABC (t)	3,877	4,197	4,214	4,421
ABC (t)	3,877	4,197	4,214	4,421
	As determined <i>last year for:</i>		As determined <i>this year for:</i>	
Status	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

*Northern rock sole, central GOA: projections are based on an estimated catch of 551 t for 2022 and estimates of 551 t and 551 t used in place of maximum permissible ABC for 2023 and 2024.

Northern rock sole, Western GOA Quantity	As estimated or <i>recommended last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2022	2023	2023	2024
<i>M</i> (natural mortality rate; female, male)	0.2, 0.254*	0.2, 0.254*	0.2, 0.254*	0.2, 0.254*
Tier	3a	3a	3a	3a
Projected total (age 0+) biomass (t)	65,271	66,465	66,512	67,083
Projected Female spawning biomass (t)	24,150	26,488	26,525	29,301
<i>B</i> _{100%}	28,702	28,702	28,702	28,702
<i>B</i> _{40%}	11,481	11,481	11,481	11,481
<i>B</i> _{35%}	10,045	10,045	10,045	10,045
<i>F</i> _{OFL}	0.385	0.385	0.385	0.385
<i>maxF</i> _{ABC}	0.313	0.313	0.313	0.313
<i>F</i> _{ABC}	0.313	0.313	0.313	0.313
OFL (t)	9,628	10,248	10,259	10,749
maxABC (t)	7,986	8,498	8,508	8,916
ABC (t)	7,986	8,498	8,508	8,916
	As determined <i>last year for:</i>		As determined <i>this year for:</i>	
Status	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

*Northern rock sole, western GOA: Projections are based on an estimated catch of 13 t for 2022 and estimates of 13 t and 13 t used in place of maximum permissible ABC for 2023 and 2024.

Southern rock sole, Central GOA Quantity	As estimated or <i>recommended last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2022	2023	2023	2024
<i>M</i> (natural mortality rate; female, male)	0.2, 0.253*	0.2, 0.253*	0.2, 0.253*	0.2, 0.253*
Tier	3a	3a	3a	3a
Projected total (age 0+) biomass (t)	130,706	133,265	133,391	134,647
Projected Female spawning biomass (t)	37,555	43,470	43,539	49,696
<i>B</i> _{100%}	53,439	53,439	53,439	53,439
<i>B</i> _{40%}	21,376	21,376	21,376	21,376
<i>B</i> _{35%}	18,703	18,703	18,703	18,703
<i>F</i> _{OFL}	0.268	0.268	0.268	0.268
<i>maxF</i> _{ABC}	0.224	0.224	0.224	0.224
<i>F</i> _{ABC}	0.224	0.224	0.224	0.224
OFL (t)	15,622	16,853	16,874	17,733
maxABC (t)	13,185	14,229	14,246	14,978
ABC (t)	13,185	14,229	14,246	14,978
Status	As determined <i>last</i> year for:		As determined <i>this</i> 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

*Southern rock sole, central GOA: projections are based on an estimated catch of 551 t for 2022 and estimates of 551 t and 551 t used in place of maximum permissible ABC for 2023 and 2024.

Southern rock sole, Western GOA Quantity	As estimated or <i>recommended last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2022	2023	2023	2024
<i>M</i> (natural mortality rate; female, male)	0.2, 0.271	0.2, 0.271	0.2, 0.271	0.2, 0.271
Tier	3a	3a	3a	3a
Projected total (age 0+) biomass (t)	113,153	114,371	114,420	114,480
Projected Female spawning biomass (t)	35,556	40,425	40,457	45,479
<i>B</i> _{100%}	43,788	43,788	43,788	43,788
<i>B</i> _{40%}	17,515	17,515	17,515	17,515
<i>B</i> _{35%}	15,326	15,326	15,326	15,326
<i>F</i> _{OFL}	0.222	0.222	0.222	0.222
<i>maxF</i> _{ABC}	0.185	0.185	0.185	0.185
<i>F</i> _{ABC}	0.185	0.185	0.185	0.185
OFL (t)	12,842	14,021	14,029	14,718
maxABC (t)	10,833	11,834	11,840	12,430
ABC (t)	10,833	11,834	11,840	12,430
Status	As determined <i>last</i> year for:		As determined <i>this</i> 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

*Southern rock sole, western GOA: Projections are based on an estimated catch of 13 t for 2022 and estimates of 13 t and 13 t used in place of maximum permissible ABC for 2023 and 2024.