

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 every 4-years following the stock prioritization schedule. GOA northern rock and southern rock sole are classified as Tier 3 stocks and are assessed using assessment models that account for regional differences in growth configured in Stock Synthesis 3 (Methot and Wetzel 2013). The western GOA and central-eastern GOA are modeled separately with estimated area-specific growth patterns. The assessment models do not run during an off-cycle year. During off-cycle years, harvest projections are presented with recommendations of harvest levels for the next two years, using updated catch information in the projection model. The last full assessment in 2021 is available online <https://apps-afsc.fisheries.noaa.gov/refm/docs/2021/GOAnsrocksole.pdf>. A full stock assessment document was meant to happen in 2025, but was cancelled due to the government shutdown. The next full assessment is scheduled for 2027.

Description of Updated Catch

An assumption of the northern and southern rock sole assessment models is that total rock sole catch is split evenly between the species. New catch data were added to the projection model and the values reported here are representative of the 50% split between species.

New data added to the projection model included an updated for 2024 – 2026 (Table 1). We estimated the 2026 catch by increasing the official catch as of August 31, 2026 by an expansion factor. The expansion factors used were 1.43 for the central-eastern GOA and 1.17 for the western GOA. The expansion factor represents the average fraction of catch taken after August 31st in the last five complete years (2021-2025). This resulted in an estimated catch for 2026 of 560.31 t and 23.4 t for the central-eastern GOA and western GOA, respectively. The 2026 preliminary catch estimates were also used for the 2027 catch values in the projection model.

The 2024 official catch in the Central-eastern GOA increased by 200% compared to the estimate used in the 2024 projections. This increase was due to a single trip that occurred in September 2024. The official catch for 2025 and 2026 also increased from the values used in the 2024 projections. They were more modest increases of approximately 70% and 50%.

Summary of Results

The recommended ABCs for northern rock sole in the central-eastern GOA for 2027 and 2028 are 4,615 t and 4,640 t. The recommended OFLs are 5,401 t and 5,437 t for 2025 and 2026 in the central-eastern GOA. The recommended ABCs for northern rock sole in the western GOA for 2027 and 2028 are 9,305 t and 9,279 t. The recommended OFLs are 11,202 t and 11,169 t.

The recommended ABCs for southern rock sole in the central-eastern GOA for 2027 and 2028 are 15,540 t and 15,473 t. The recommended OFLs are 18,379 t and 18,296 t. The recommended ABCs for southern rock sole in the western GOA for 2027 and 2028 are 12,329 t and 12,109 t. The recommended OFLs are 14,584 t and 14,325 t.

Exploitation rates are higher in the Central-eastern GOA because the majority of the catch is from the central GOA (Figure 1). Exploitation rates have been declining. Southern rock sole biomass has an increasing trend between 2019 and 2026, whereas northern rock sole has been declining since 2007 (Figure 2).

Northern rock sole, Central-Eastern GOA Quantity	As estimated or <i>specified in 2024 for:</i>		As estimated or <i>recommended this year for:</i>	
	2025	2026	2027	2028
M (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)	39,925	40,808	39,988	40,290
Projected Female spawning biomass (t)	17,277	17,890	17,668	17,525
$B_{100\%}$	20,913	20,913	20,913	20,913
$B_{40\%}$	8,365	8,365	8,365	8,365
$B_{35\%}$	7, 320	7, 320	7, 320	7, 320
F_{OFL}	0.181	0.181	0.181	0.181
$maxF_{ABC}$	0.153	0.153	0.153	0.153
F_{ABC}	0.153	0.153	0.153	0.153
OFL (t)	5,383	5,504	5,401	5,437
maxABC (t)	4,600	4,703	4,615	4,646
ABC (t)	4,600	4,703	4,615	4,646
Status	As determined in 2024 for:		As determined <i>this</i> year for:	
	2023	2024	2025	2026
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

* Female natural mortality is fixed and male natural mortality is estimated in the assessment model.

Northern rock sole, Western GOA Quantity	As estimated or <i>specified in 2024 year for:</i>		As estimated or <i>recommended this year for:</i>	
	2025	2026	2027	2028
M (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)	67,322	67,374	66,515	66,207
Projected Female spawning biomass (t)	30,344	30,491	30,424	29,148
$B_{100\%}$	28,702	28,702	28,702	28,702
$B_{40\%}$	11,481	11,481	11,481	11,481
$B_{35\%}$	10,045	10,045	10,045	10,045
F_{OFL}	0.385	0.385	0.385	0.385
$maxF_{ABC}$	0.313	0.313	0.313	0.313
F_{ABC}	0.313	0.313	0.313	0.313
OFL (t)	11,046	11,119	11,202	11,169
maxABC (t)	9,168	9,290	9,305	9,279
ABC (t)	9,168	9,290	9,305	9,279
Status	As determined in 2024 year for:		As determined <i>this</i> year for:	
	2023	2024	2025	2026
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

* Female natural mortality is fixed and male natural mortality is estimated in the assessment model.
Northern rock sole, western GOA.

Southern rock sole, Central-Eastern GOA	As specified in 2024 for:		As estimated or <i>recommended this year</i> for:	
	2025	2026	2027	2028
Quantity				
M (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)	135,442	135,558	133,027	132,225
Projected Female spawning biomass (t)	54,486	56,993	57,045	55,143
$B_{100\%}$	53,439	53,439	53,439	53,439
$B_{40\%}$	21,376	21,376	21,376	21,376
$B_{35\%}$	18,703	18,703	18,703	18,703
F_{OFL}	0.268	0.268	0.268	0.268
$maxF_{ABC}$	0.224	0.224	0.224	0.224
F_{ABC}	0.224	0.224	0.224	0.224
OFL (t)	18,283	18,522	18,379	18,296
maxABC (t)	15,450	15,657	15,540	15,473
ABC (t)	15,450	15,657	15,540	15,473
	As determined <i>last</i> year for:		As determined <i>this</i> year for:	
Status	2023	2024	2025	2026
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

* Female natural mortality is fixed and male natural mortality is estimated in the assessment model.
Southern rock sole.

Southern rock sole, Western GOA	As <i>specified in 2024 for:</i>		As estimated or <i>recommended this year for:</i>	
	2024	2025	2027	2028
<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)	113,955	113,202	111,154	109,961
Projected Female spawning biomass (t)	49,053	50,699	50,703	48,502
$B_{100\%}$	43,788	43,788	43,788	43,788
$B_{40\%}$	17,515	17,515	17,515	17,515
$B_{35\%}$	15,326	15,326	15,326	15,326
F_{OFL}	0.222	0.222	0.222	0.222
$maxF_{ABC}$	0.185	0.185	0.185	0.185
F_{ABC}	0.185	0.185	0.185	0.185
OFL (t)	14,925	14,825	14,584	14,325
maxABC (t)	12,612	12,531	12,329	12,109
ABC (t)	12,612	12,531	12,329	12,109
As determined <i>last</i> year for:		As determined <i>this</i> year for:		
Status	2022	2023	2025	2026
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

Female natural mortality is fixed and male natural mortality is estimated in the assessment model.
Southern rock sole, western GOA.

5-year Projections

For the 5-year projections the catch inputs were as follows:

1. Catch for years 2024 – 2027 were specified as above.
2. The author specified the 5-year average F from 2021-2025, where the fishing mortality values from the projection model. This average fishing mortality was applied to 2028 – 2031.

The OFL, ABC, mean SSB, and mean relative SSB were obtained from alternative 3. This was done separately for the 2-species and 2-areas (a total of 4 tables). The results are presented in the table below:

Stock	Year	Expected Catch	OFL	maxABC	mean SSB	mean relative SSB
NRS CEGOA	2027	560	5401	4615	17668	0.84
	2028	743	5437	4646	17895	0.86
	2029	744	5439	4648	17935	0.86
	2030	744	5440	4648	17937	0.86
	2031	743	5437	4646	17944	0.86
NRS WGOA	2027	23.4	11,202	9,305	30,424	1.06
	2028	21	11,169	9,279	30,316	1.06
	2029	21	11,111	9,231	30,114	1.05
	2030	21	11,049	9,180	29,911	1.04
	2031	21	10,992	9,133	29,756	1.04
SRS CEGOA	2027	560	18,379	15,540	57,045	1.07
	2028	743	18,296	15,473	56,624	1.06
	2029	737	18,136	15,338	55,841	1.04
	2030	730	17,966	15,195	55,075	1.03
	2031	724	17,806	15,060	54,423	1.02
SRS WGOA	2027	23.4	14,584	12,329	50,703	1.16
	2028	20	14,325	12,109	49,935	1.14
	2029	20	14,086	11,907	49,000	1.12
	2030	19	13,883	11,735	48,146	1.10
	2031	19	13,721	11,597	47,440	1.08

References

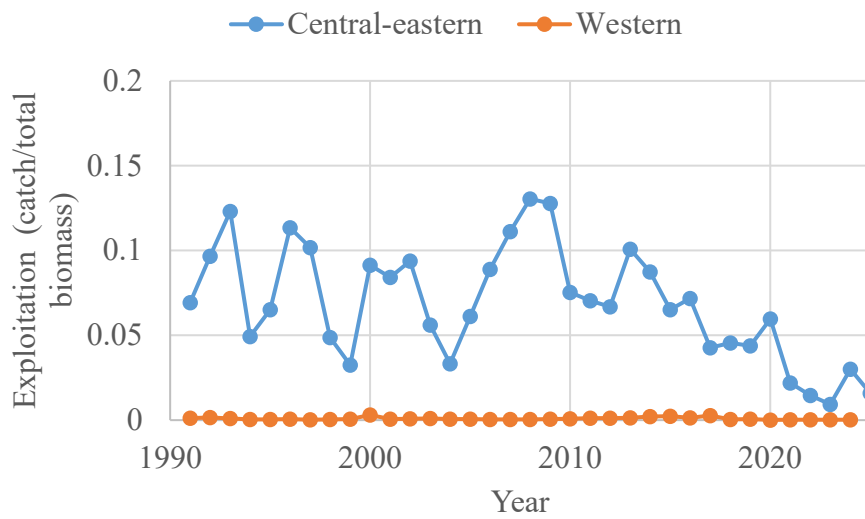
Methot, R. D., Wetzell, C. R. 2013. Stock synthesis: A biological and statistical framework for fish stock assessment and fishery management. Fisheries Research 142: 86-99.

Tables

Table 1. Catch (t) included as projection model inputs.

Stock	Area	Year	2024 projection	2026 projection
NRS	CEGOA	2021	632.7	632.7
		2022	508.84	508.84
		2023	343.45	343.45
		2024	371.63	1165.9
		2025	371.63	620.31
		2026	371.63	560.31
		2027	-	560.31
NRS	WGOA	2021	9.953	9.95
		2022	12.48	12.49
		2023	10.63	10.63
		2024	15.36	16.61
		2025	15.36	47.86
		2026	15.36	23.4
		2027	-	23.4
SRS	CEGOA	2021	632.7	632.7
		2022	508.84	508.84
		2023	343.45	343.45
		2024	371.63	1165.9
		2025	371.63	620.31
		2026	371.63	560.31
		2027	-	560.31
SRS	WGOA	2021	9.953	9.95
		2022	12.48	12.49
		2023	10.63	10.63
		2024	15.36	16.61
		2025	15.36	47.86
		2026	15.36	23.4
		2027	-	23.4

a)



b)

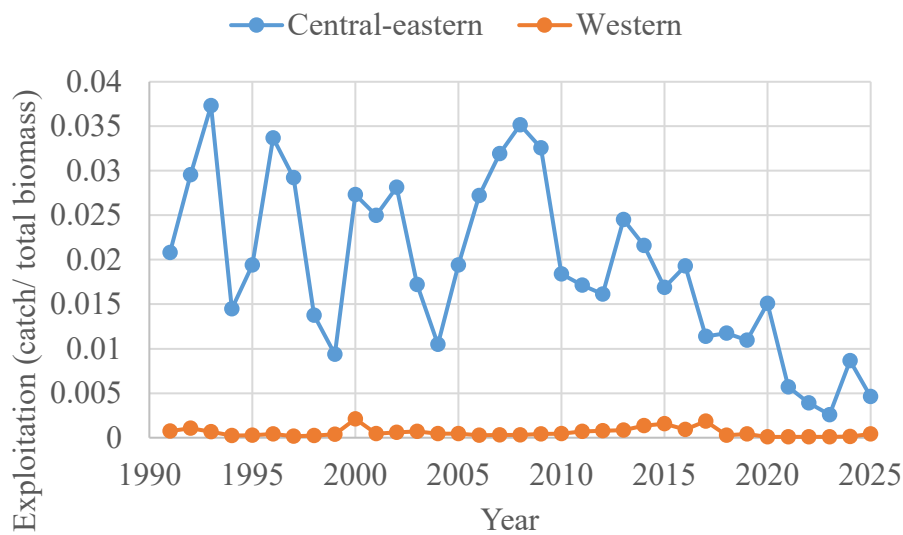


Figure 1. Exploitation rates by area for a) northern rock sole and b) southern rock sole.

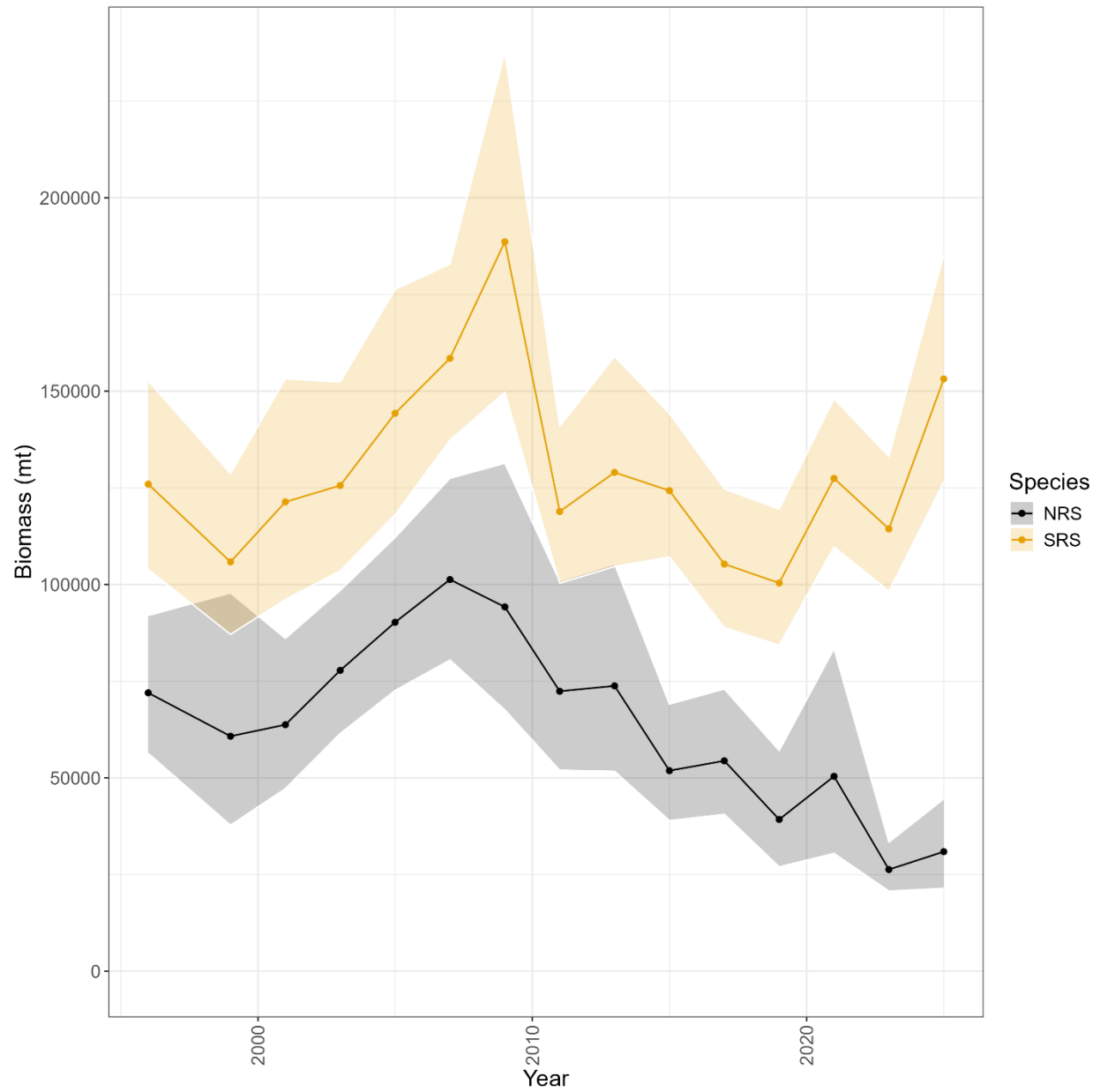


Figure 2. GOA bottom trawl survey biomass.