8. Assessment of the Flathead Sole Stock in the Gulf of Alaska

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Executive Summary

The Gulf of Alaska (GOA) Flathead sole stock is typically assessed every four years with the last operational update assessment occurring in 2022 (Kapur and Monnahan (2022)). In the years between operational full or update assessments, a projection model is run to provide harvest level recommendations for the next two years. Due to the 2025 government shutdown, this year's assessment will be a harvest projection with an operational assessment planned for 2027. Please refer to the 2022 SAFE report for further information regarding the assessment model (available online at https://www.npfmc.org/library/safe-reports/).

Flathead sole is a Tier 3 assessment that uses an age-structured model. Thus, a single species projection model was run using parameter values from the accepted 2022 Flathead sole assessment model. The projection model predicts stock status and makes OFL and ABC recommendations for the next two year. Projections use numbers-at-age for Flathead sole from age 3-21+ and historical average recruitment of age 3 individuals to calculate OFLs and ABCs.

Description of Updated Catch

New data used in the harvest projection model included an updated 2025 catch estimate (932 t) and a new catch estimate for 2026. Following the method used in the 2022 full assessment, the full-year 2026 catch (891 t) was estimated by adding the average catch between August 01 and December 31 over the past 5 years (2020-2025) to the 2026 catch as of August 01, 2026. Estimates for the 2027 and 2028 catch are needed to run the projection model. These were estimated by averaging the catch over the previous 5 years (2020-2025).

Harvest Projection

Reference values for GOA Flathead sole are summarized in the following table, with the recommended ABC and OFL values for 2027 in bold.

	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity	2025	2026	**2027**	2028
M (natural mortality rate)	0.2	0.2	0.2	0.2
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	293,674	291,288	288,245	285,673
Female spawning biomass (t)	98,986	100,272	100,537	100,241
$B_{100\%}$	92,582	92,582	92,582	92,582
$B_{40\%}$	37,033	37,033	37,033	37,033
$B_{35\%}$	32,404	32,404	32,404	32,404
F_{OFL}	0.36	0.36	0.36	0.36
$maxF_{ABC}$	0.29	0.29	0.29	0.29
F_{ABC}	0.29	0.29	0.29	0.29
OFL (t)	50,587	51,176	**51,152**	50,740
maxABC (t)	41,476	41,980	41,975	41,639
ABC (t)	41,476	41,980	**41,975**	41,639
	As determined *last* year for:		As determined *this* year for:	
Status	2025	2026	2027	2028
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

Area Allocation of Harvest

Area apportionment for ABC is currently based on the proportion of survey biomass projected for each area using the survey averaging random effects model REMA (`v0.1.0`) developed by the survey averaging working group (see https://github.com/afsc-assessments/rema for more information). Apportionment to the Eastern Gulf is partitioned among the West Yakutat and East Yakutat-Southeast Outside region using the 2023 biomass ratio among those areas obtained from the bottom trawl survey.

The following table shows the recommended ABC apportionment for 2027 and 2028. The author notes that in previous projections of the Flathead Sole model (including those done in 2021), the time series of recruitment and spawning biomass used for projections began in 1984 (the start of the main period for recruitment deviations), not 1977, which is typically used. The Alaska Fisheries Science Center has recognized that an environmental "regime shift" affecting the long-term productive capacity of the groundfish stocks in the BSAI occurred during the period 1976-1977, thus most recruitment time series

generally start in 1977 except in special cases. Inputs to the projection model continue to use the time series of recruitment and spawning stock biomass (SSB) beginning in 1984, which corresponds to the onset of most survey data. Projections assume recruitment at age 3.

				Eastern		
Quantity	**Year**	**Western**	**Central**	**W. Yakutat**	**E. Yakutat/SEO**	**Total**
Area Apportionment %		31.47	51.03	11.45	6.05	100
ABC (t)	2027	13,208	21,421	4,807	2,539	41,975
ABC (t)	2028	13,103	21,250	4,768	2,518	41,639

Summary of Results

Fishery

The 2026 projected catch for Flathead Sole is 891 t, well below the 2026 ABC of 41,980 t. Since 2021, the catch has been low with the majority of the catch coming from the central Gulf. The 2026 exploitation ratio (catch/total biomass) is also low and significantly below the 1977-2026 long-term average of ~ 0.0076 (Figure 8-1).

Survey

The 2025 GOA survey biomass estimate for Flathead sole increased by ~ 44.7% from 2023. However, it is only slightly below the long term mean (2.6% lower) (Figure 8-2). As for the region specific survey biomass estimates, all three regions have shown an increase from 2023 (Western GOA 43.4% increase, Central GOA 13.3% increase, Eastern GOA 158% increase: Figure 8-3). Because the last operational update occurred in 2022, the 2023 and 2025 survey biomass indices were not included when determining apportionment for 2027 and 2028. These survey biomass indices will be included in the next operational assessment model.

5 Year Projections

The 2027 and 2028 catches are the average catch over the past 5 years (2020-2025). The 2029-2031 catches are determined by applying the average fishing mortality rate from 2017-2021.

Year	Expected Catch	OFL	ABC	Mean SSB	Mean Relative Spawning Biomass*
2027	739	51,152	41,975	10,054	1.086
2028	739	50,740	41,639	10,024	1.083
2029	1,883	50,165	41,166	9,952	1.075
2030	1,852	39,805	32,642	9,801	1.059
2031	1,821	32,669	26,767	9,646	1.042

*Ratio of female spawning biomass to equilibrium unfished female spawning biomass ($B_{100\%}$).

References

Kapur, M.S. and Monnahan, C. (2022) Assessment of the flathead sole stock in the gulf of alaska. In: *Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska*. North Pacific Fishery Management Council, Anchorage, AK.

Figures

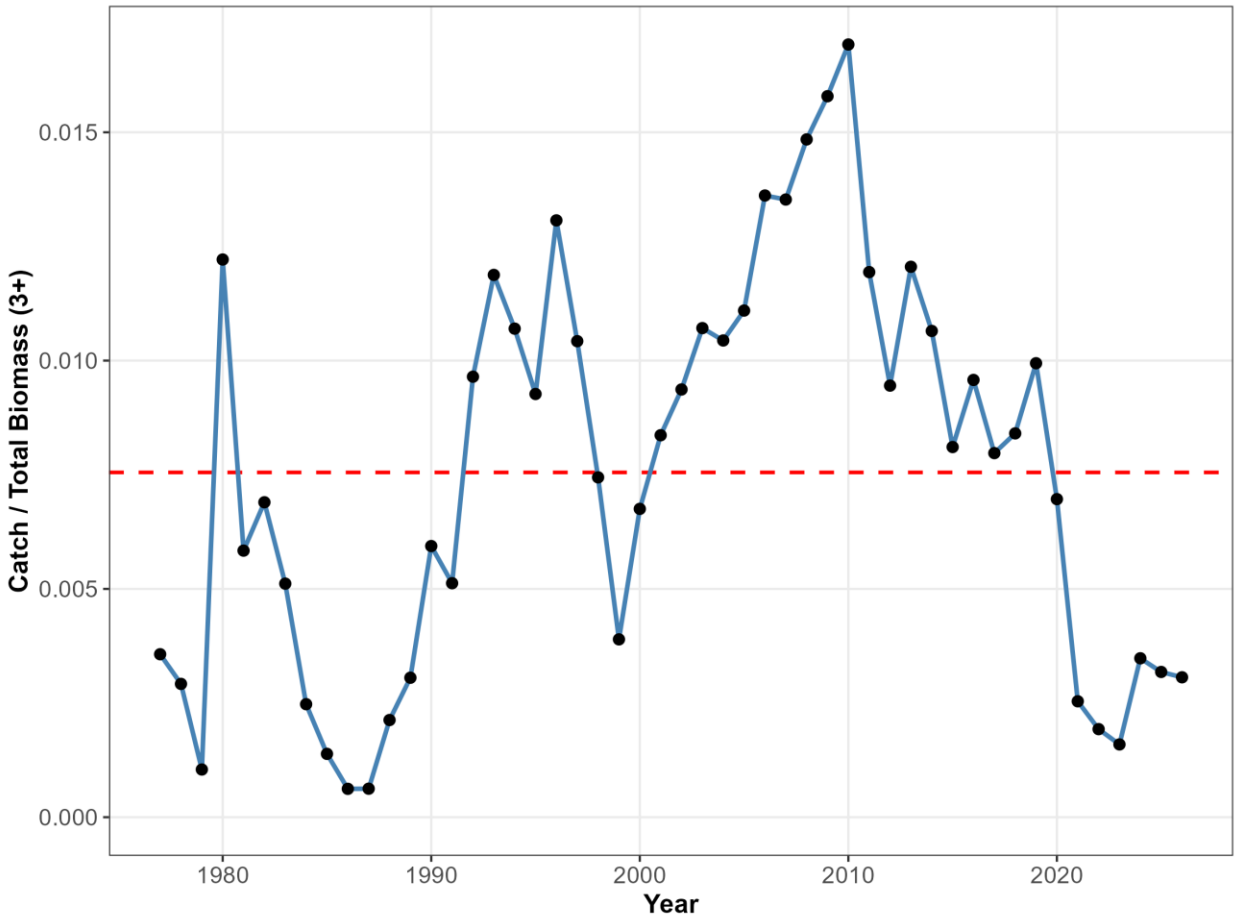

Figure 8-1. Catch to total biomass ratio using total biomass for age 3+ individuals for GOA Flathead sole. The 1977-2026, long-term average (0.0076) is shown by the red horizontal dashed line.

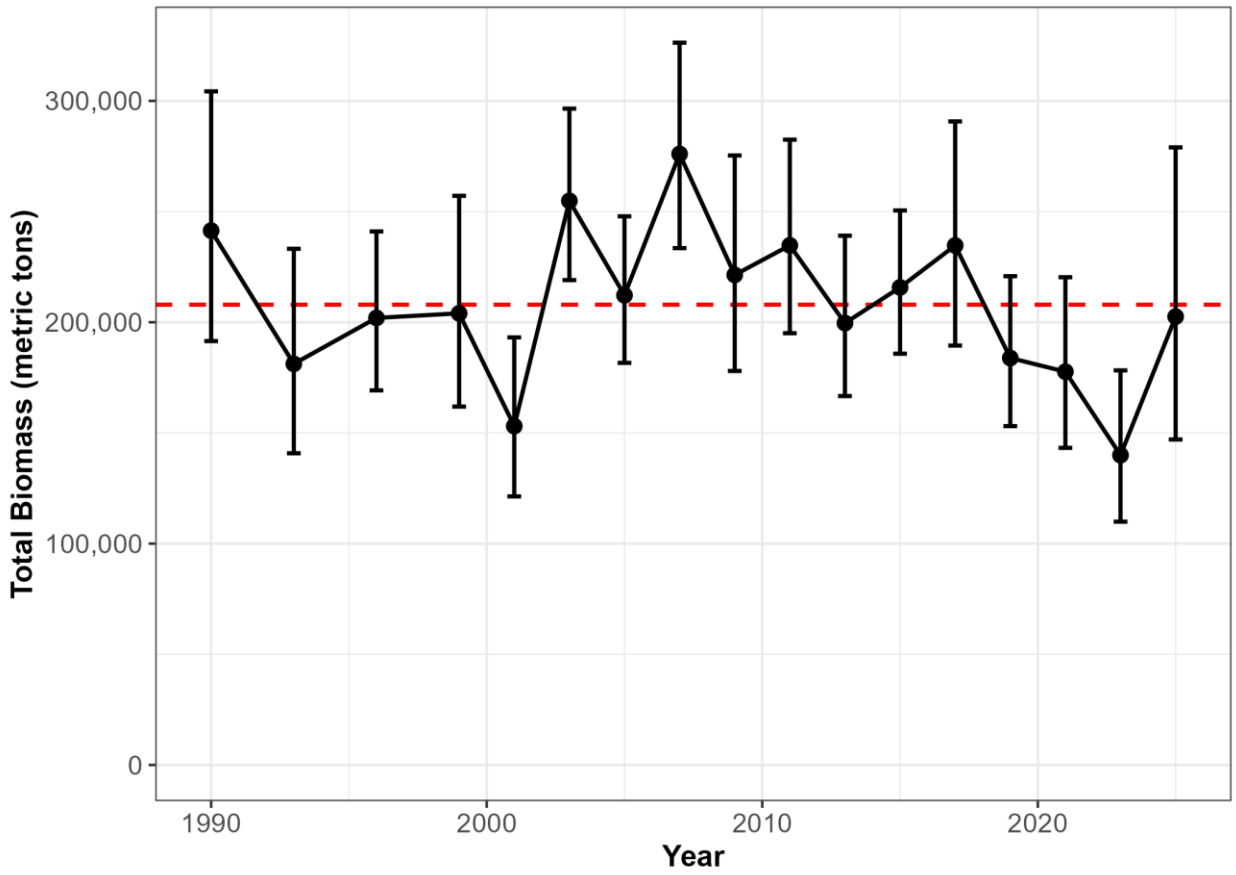

Figure 8-2. Total survey biomass index with 95% sampling error confidence intervals from the groundfish bottom trawl survey. The 1990-2025 long-term average biomass (207,932 t) is shown by the red horizontal dashed line.

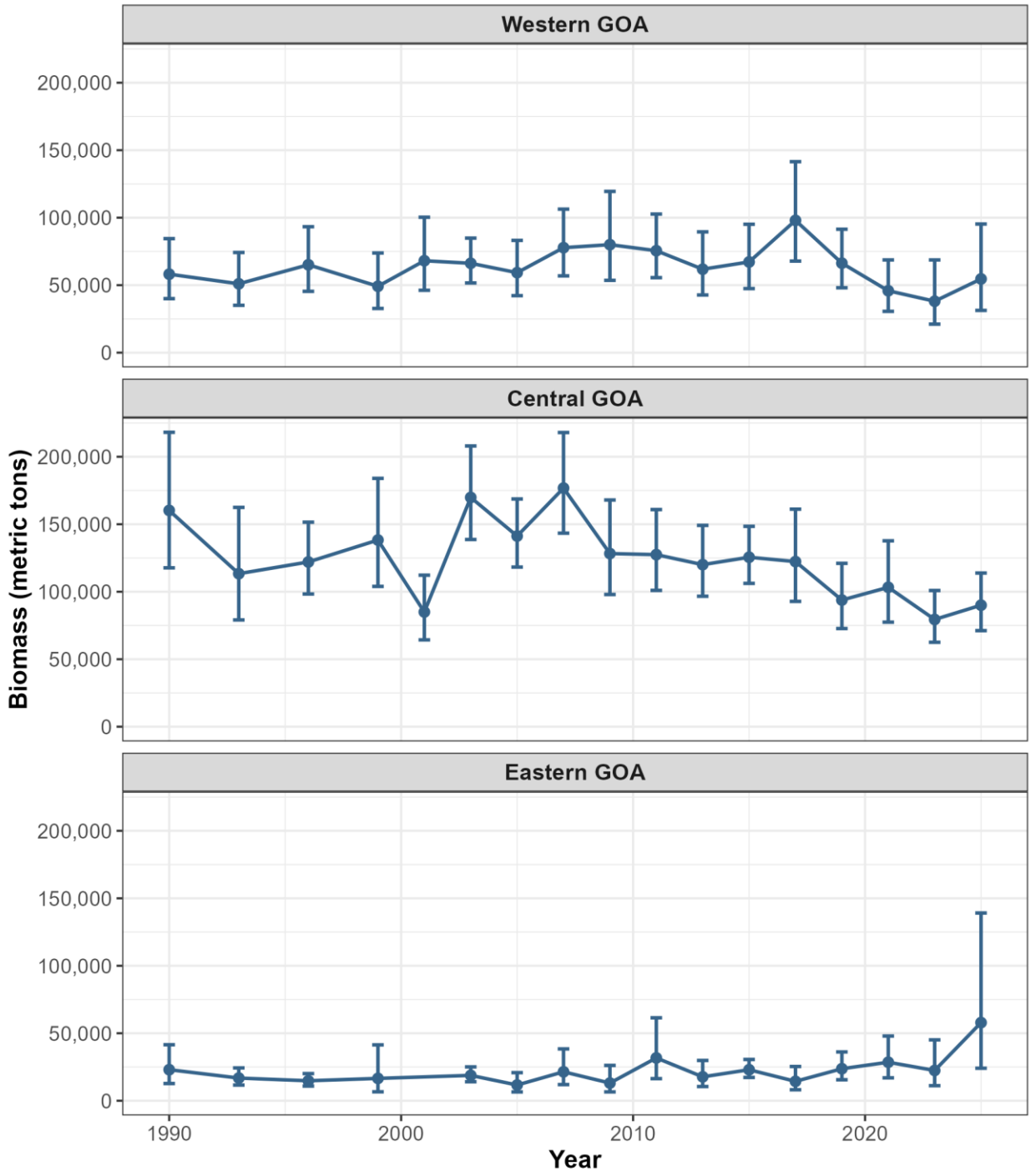

Figure 8-3. Survey biomass index by area with 95% sampling error confidence intervals from the groundfish bottom trawl survey.