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

Maia S. Kapur

November 2024

This report may be cited as: Kapur, M., 2024 Assessment of the Flathead Sole Stock in the Gulf of Alaska. North Pacific Fishery Management Council, Anchorage, AK. Available from https://www.npfmc.org/library/safe-reports/

Executive Summary

The Gulf of Alaska flathead sole stock is typically assessed every four years and was last assessed in 2022 (Kapur & Monnahan, 2022). In years without a full assessment, we present an executive summary of harvest projections to recommend harvest levels for the next two years. Please refer to the 2022 full stock assessment report for further information regarding the assessment model (available online at https://apps-afsc.fisheries.noaa.gov/Plan_Team/2022/GOAflathead.pdf).

Flathead sole is assessed using an age-structured model and Tier 3 determination. Thus, the single species projection model was run using parameter values from the accepted 2022 flathead sole assessment model, together with updated catch information for 2022, 2023, and estimated catches for 2024-2026 to predict stock status for flathead sole and to make ABC recommendations for those years. Projections are conducted using numbers-at-age for flathead sole from age 3-21+ and historical recruitment of age 3 individuals is used to calculate OFLs and ABCs.

Summary of Changes in Assessment Inputs

Changes in input data: The updated information for this harvest projection includes replacing the estimated 2023 catch with the final catch value from the Alaska Regional Office (https://www.fisheries.noaa.gov/sites/default/files/akro/car110_goa2023.html) (470 t), and estimating the 2024-2026 catches. The 2024 projected catch was calculated as the current catch as of 2024-07-24 added to the average 24 July – December 31 catches over the previous 5 years. The 2025 and 2026 projected catches were calculated as the average catch over the previous 5 years (1,108 t). These estimated catches for the present and two future years are input in place of *maxABC* for projections, which is appropriate given that recent catches are much less than the maximum ABC for this stock.

Summary of Results

The ABC for flathead sole is 41,476 t in 2025 and 41,980 t in 2026 and the OFL is 50,587 t in 2025 and 51,176 t in 2026.

	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity/Status	2024	2025	2025*	2026*
M (natural mortality)	0.2	0.2	0.2	0.2
Tier	3a	3a	3a	3a
Projected total (age 2+) biomass (t)	294,616	292,639	293,674	291,288
Projected female spawning biomass (t)	96,604	98,468	98,986	100,272
$B_{100\%}$	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)	49,414	50,322	**50,587**	51,176
*max*ABC (t)	40,503	41,258	41,476	41,980
ABC (t)	40,503	41,258	**41,476**	41,980
	As determined *last* year for:		As determined *this* year for:	
Status	2023	2024	2024	2025
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 estimated catch of 626 t for 2024 and estimates of 1,108 t and 1,108 t used in place of maximum permissible ABC for 2025 and 2026.

Area Allocation of Harvest

Area apportionment for ABC of Flathead sole 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 most recent biomass ratio among those areas obtained from the bottom trawl survey.

The following table shows the recommended ABC apportionment for 2025 and 2026. 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 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 %		32.77	52.60	9.57	5.06	100
ABC (t)	2025	13,592	21,817	3,970	2,097	41,476
ABC (t)	2026	13,757	22,083	4,018	2,122	41,980

Tables

Table 8-1. Total catch (t) of GOA flathead sole by area since 2000. Catch for 2024 is current up to 2024-06-06. Columns left blank indicate confidential catch information by area. Bolded years are not used in, or differ from, the base model. Note that the value for 2024 is the observed catch and the extrapolated catches used for this year in the projection model are higher. Values have been rounded to the nearest whole number.

Year	Total Catch (t)	Western Gulf	Central Gulf	Eastern Gulf
2000	1,548	259	1,274	15
2001	1,912	600	1,311	<1
2002	2,146	420	1,725	<1
2003	2,459	525	1,934	<1
2004	2,398	828	1,571	<1
2005	2,552	611	1,941	<1
2006	3,142	462	2,679	1
2007	3,130	666	2,462	2
2008	3,446	297	3,149	<1
2009	3,663	303	3,359	1
2010	3,903	462	3,441	<1
2011	2,732	393	2,338	<1
2012	2,167	277	1,890	<1
2013	2,819	588	2,230	<1
2014	2,557	219	2,337	1
2015	2,001	199	1,802	1
2016	2,422	228	2,191	2
2017	2,050	73	1,978	<1
2018	2,202	150	2,051	<1
2019	2,668	210	2,457	<1
2020	1,911	100	1,811	<1
2021	708	111	596	1
2022	564	42	521	<1
2023	470	34	436	<1

Year	Total Catch (t)	Western Gulf	Central Gulf	Eastern Gulf
2024	328	74	254	<1

Table 8-2. Biomass of flathead sole in the GOA groundfish bottom trawl survey (Bio, t) and coefficient of variation (CV) by year and regulatory area. Bolded years are not included in base model. Small discrepancies (<1 t) in Total column may occur due to rounding.

	Total		Western		Central		Eastern	
Year	Bio (t)	CV	Bio (t)	CV	Bio (t)	CV	Bio (t)	CV
1990	243,055	0.12	58,740	0.19	161,256	0.16	23,059	0.31
1993	188,579	0.13	57,760	0.21	113,976	0.19	16,843	0.19
1996	205,521	0.09	66,732	0.18	122,730	0.11	16,059	0.16
1999	207,590	0.12	49,636	0.21	139,356	0.15	18,598	0.45
2001	153,594	0.12	68,164	0.20	85,430	0.14		
2003	257,294	0.08	67,055	0.13	170,852	0.10	19,388	0.14
2005	213,213	0.08	59,458	0.17	142,043	0.09	11,712	0.30
2007	281,402	0.08	78,361	0.16	177,641	0.11	25,400	0.28
2009	225,377	0.11	80,115	0.21	128,910	0.14	16,351	0.34
2011	235,639	0.09	76,049	0.16	128,427	0.12	31,162	0.34
2013	201,233	0.09	62,131	0.19	121,063	0.11	18,039	0.27
2015	218,548	0.08	67,665	0.18	126,200	0.09	24,684	0.14
2017	236,588	0.11	99,009	0.19	123,087	0.14	14,493	0.30
2019	185,840	0.09	66,710	0.17	94,280	0.13	24,850	0.24
2021	180,000	0.11	46,234	0.21	103,880	0.15	29,886	0.26
2023	140,862	0.12	38,409	0.31	79,945	0.12	22,508	0.37

Figures

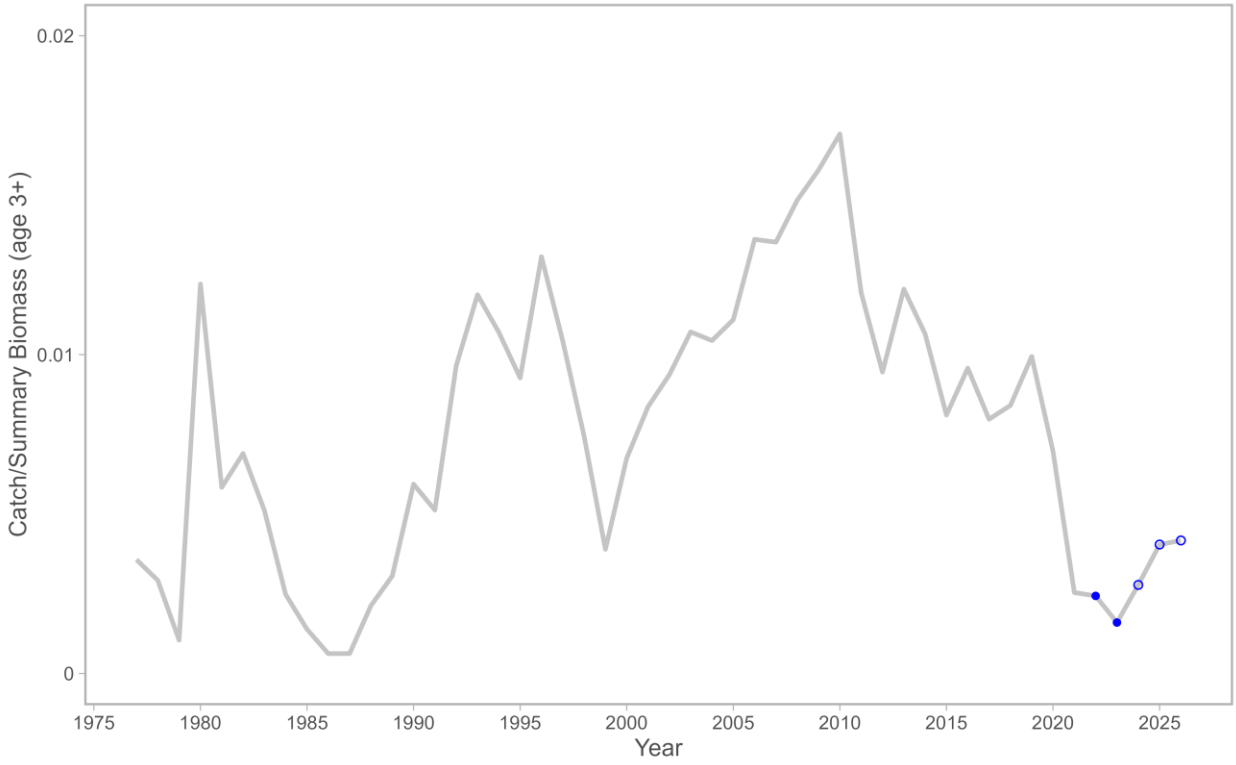

Figure 8-1. Catch to total biomass ratio using total biomass for age 3+ individuals for GOA flathead sole. Blue points are catches included in the projection model; open points are estimated or projected, whereas solid points are complete observed years.

References

Kapur, M. and Monnahan, C. 2022. Assessment of the Assessment of the Flathead Sole Stock in the Gulf of Alaska. North Pacific Fishery Management Council, Anchorage, AK. Available from https://apps-afsc.fisheries.noaa.gov/Plan_Team/2022/GOAflathead.pdf