

# 10. Harvest Projection of the Alaska Plaice Stock in the Bering Sea and Aleutian Islands

Lee Cronin-Fine

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## Executive Summary

Alaska plaice (*Pleuronectes quadrituberculatus*) are assessed on a four year cycle in which a full assessment is conducted every four years and a harvest projection is done on the off years. A harvest projection involves projecting the model, established in the last full assessment, forward to predict future population estimates and recommended harvest levels for the next two years. The primary assessment tool for the Bering Sea/Aleutian Islands (BSAI) Alaska plaice assessment, a Tier 3 stock, is a statistical age-structured model that uses survey and fishery data to generate a historical time series of population estimates. The data sets used in this assessment include total catch biomass, fishery age compositions, eastern Bering Sea (EBS) shelf bottom trawl survey abundance estimates, and EBS shelf bottom trawl survey age compositions. For the 2023 Alaska plaice stock assessment, a harvest projection was conducted.

In a harvest projection year, the full assessment model is not rerun but instead a Tier 3 projection model with updated catch estimates is run to estimate the stock level in future years. This incorporates the most current harvest information without re-estimating model parameters and biological reference points. The Tier 3 projection operates outside the full assessment model by projecting estimates of future female spawning biomass, age 3+ total biomass, ABC and OFL from the full model estimates of 2021 numbers-at-age, weight-at-age, maturity, and selectivity. Please refer to the last full stock assessment report for further information regarding the stock assessment model [Ormseth (2021); available online at <https://www.fisheries.noaa.gov/alaska/population-assessments/north-pacific-groundfish-stock-assessments-and-fishery-evaluation>].

## Summary of Changes in Assessment Inputs

*Changes in the input data:* New data added to the Tier 3 projection model included an updated 2022 catch estimate (11,253 t) and a new catch estimate for 2023 through September 16, 2023 (sourced October 16, 2023 from the NMFS Alaska Regional Office using the Alaska Fisheries Information Network [AKFIN] database). Following the method used in the 2021 full assessment, the full-year 2023 catch (18,054 t) was estimated by averaging the three weeks of catch prior to September 16 and using this value as the assumed weekly catch for the remaining 15 weeks in 2023.

*Changes in the assessment methodology:* There were no changes in assessment methodology since this was an harvest projection.

## Summary of Results

For 2024, the recommended maximum allowable ABC from the Tier 3 projection model is 35,494 t. Reference values for BSAI Alaska plaice are summarized in the following table, with the recommended ABC and OFL values for 2024 in bold.

Quantity	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this</i> <i>year for:</i>	
	2023	2024	<b>2024</b>	2025
$M$ (natural mortality rate)	0.13	0.13	0.13	0.13
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	461,992	477,701	473,125	481,959
Female spawning biomass (t)	149,987	158,149	158,087	166,827
$B_{100\%}$	286,587	286,587	286,587	286,587
$B_{40\%}$	114,635	114,635	114,635	114,635
$B_{35\%}$	100,306	100,306	100,306	100,306
$F_{OFL}$	0.17	0.17	0.17	0.17
$maxF_{ABC}$	0.14	0.14	0.17	0.17
$F_{ABC}$	0.14	0.14	0.14	0.14
OFL (t)	40,823	43,328	<b>42,695</b>	45,182
maxABC (t)	33,946	36,021	35,494	37,560
ABC (t)	33,946	36,021	<b>35,494</b>	37,560
Status	As determined <i>last</i> <i>year for:</i>		As determined <i>this</i> <i>year for:</i>	
	2021	2022	2022	2023
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

The stock is not being subject to overfishing, is not currently overfished, nor is it approaching a condition of being overfished. The tests for evaluating these three statements on status determination require examining the official total catch from the most recent complete year (2022) and the current model projections of spawning biomass relative to  $B_{MSY}$  for 2024 and 2025. The estimated total catch for 2022 is 11,253 t, far below the 2022 OFL of 39,305 t; therefore, the stock is not being subjected to overfishing. The estimates of female spawning biomass for 2024 and 2025 from the 2023 stock assessment projections are 158,087 t and 166,827 t, respectively. Both estimates are well above the estimate of  $B_{35\%}$  of 100,306 t and therefore the stock is not currently overfished nor approaching an overfished condition.

## Summaries for Plan Team

Species	Year	Biomass	OFL	ABC	TAC	Catch
Alaska plaice	2022	443,769	39,305	32,697	29,221	11,253
	2023	462,892	40,823	33,946	17,500	9,707*
	2024	473,125	42,695	35,494		
	2025	481,959	45,182	37,560		

\*2023 catch as of September 16, 2023, sourced October 16, 2023 from the NMFS Alaska Regional Office using the AKFIN database (<http://www.akfin.org>).

Alaska plaice are caught throughout the year primarily as bycatch in the yellowfin sole (*Limanda aspera*) fishery. Across all fisheries, retention rates of Alaska plaice are high. It is estimated to be greater than 90% since 2018. The 2023 projected catch for Alaska plaice is 18,054 t, well below the 2023 ABC of 35,494 t (Figure 10-1). The 2023 exploitation ratio (catch/total biomass) is also projected to decrease and is estimated to be slightly below the 1975-2023 long-term average of ~ 0.03 (Figure 10-2). If the 2023 projected catch is realized, it will be the lowest catch to biomass ratio for Alaska plaice since 2009.

The 2023 EBS shelf trawl survey biomass estimate for Alaska plaice decreased by 5% from the 2022 estimate however the 95% confidence intervals for the two biomass estimates closely overlap. This year's survey biomass estimate is also 30% lower than the long-term mean (Figure 10-3). Because this is a harvest projection, the 2023 survey biomass estimate was not included when determining the recommended harvest levels for 2023 but will be added in the next full assessment model. Interested readers may note the increasing trend in the projected population biomass, despite decreasing survey biomass estimates between 2017 and 2023 (see Summary of Results table). This result is attributed to strong recruitment events since 2017, which began to emerge in the 2019 assessment (Ormseth 2021).

## Responses to SSC and Plan Team Comments on Assessments in General

Responses will be provided in the next full assessment.

### From the November 2021 BSAI Groundfish Plan Team minutes:

*The Team recommends that the AFSC prioritize research on best practices for specifying the selectivity schedules used in projections for Tier 1-3 stocks in general.*

### From the December 2021 SSC minutes:

*The SSC recommends that groundfish, crab and scallop assessment authors do not change recommendations in documents between the Plan Team and the SSC meetings, because it makes it more difficult to understand the context of the Plan Team's rationale and seems counter to the public process without seeing a revision history of the document.*

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

Responses will be provided in the next full assessment.

From the December 2021 SSC minutes:

*The author continued to investigate biomass in the NBS, noting that over 50% of the survey biomass currently resides in the NBS. While trawling is prohibited in the Northern Bering Sea Research Area, the spatial distribution of Alaska plaice does not suggest any stock separation. **The SSC appreciates the authors' investigation of this issue and recommends examining new models that include the use of the NBS data in a similar manner to many other BSAI stocks, perhaps through a combined EBS+NBS VAST index.** The author should also consider the potential for differences in age-at-maturity and size-at-age between the EBS and the NBS as they move forward. Additionally, the SSC suggests that the author examine the utility of estimating catchability ( $q$ ) within the model rather than relying on a fixed value (1.2).*

From the November 2021 BSAI Groundfish Plan Team minutes:

*The Team recommends that authors explore the relationship of the southern part of the stock in the EBS to the northern part of the stock in the NBS and consider developing models that include the NBS data.*

From the December 2019 SSC minutes:

*The SSC ... recommends continuing to track survey biomass trends in the NBS. The assessment indicates that sampling in the NBS in 2017 by a NPRB project showed differential age-at-maturity and size-at-age compared to the EBS. For the next full assessment, the SSC requests that the authors investigate differences in length composition and sex ratios between the NBS and EBS surveys. In addition, the SSC recommends analysis of genetic information to inform whether there is evidence of stock structure between the survey regions.*

## **Acknowledgements**

I would like to acknowledge the work of the previous author Jane Sullivan who was incredibly helpful in getting me up to speed on this assessment.

## **References**

Ormseth, O.A. (2021) Assessment of the Alaska plaice stock in the Bering Sea and Aleutian Islands. In: *Stock assessment and fishery evaluation report for the groundfish resources of the Bering Sea and Aleutian Islands regions*. North Pacific Fishery Management Council, Anchorage, AK.

## Figures

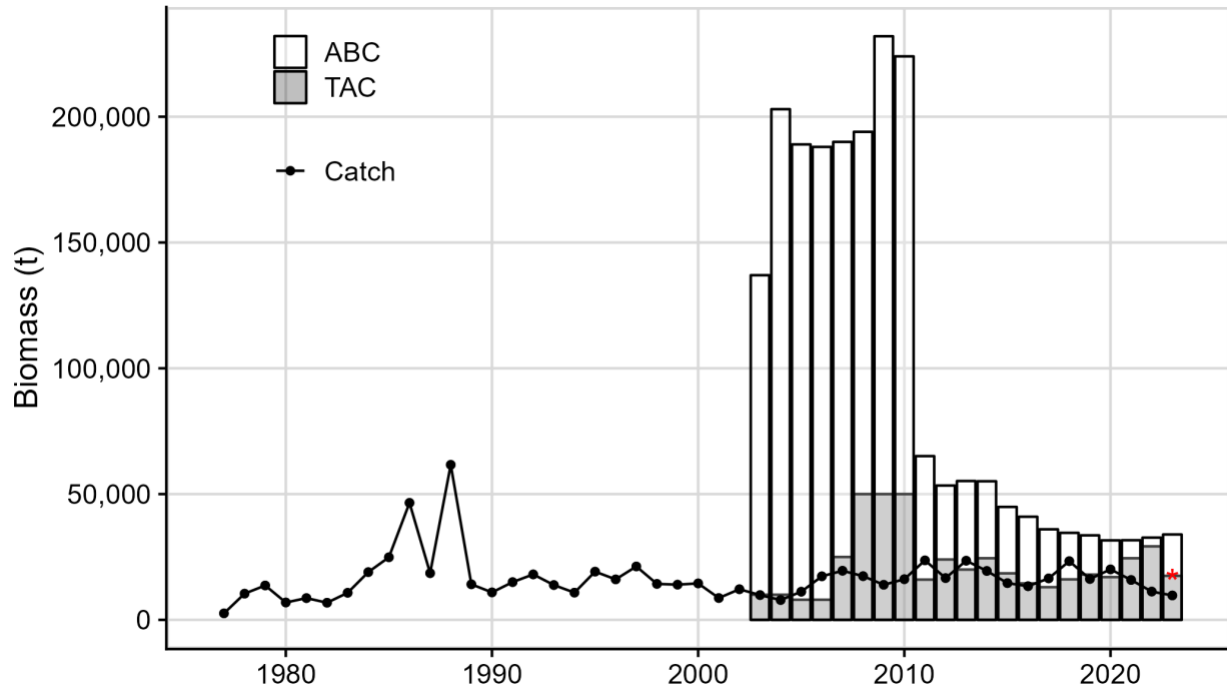


Figure 10-1. Alaska plaice catch, ABC and TAC from 1977-2023, with the projected 2023 catch estimate shown as a red asterisk. Data reflect catch posted through September 16, 2023 (sourced October 16, 2023 from the NMFS Alaska Regional Office using the AKFIN database (<http://www.akfin.org>)).

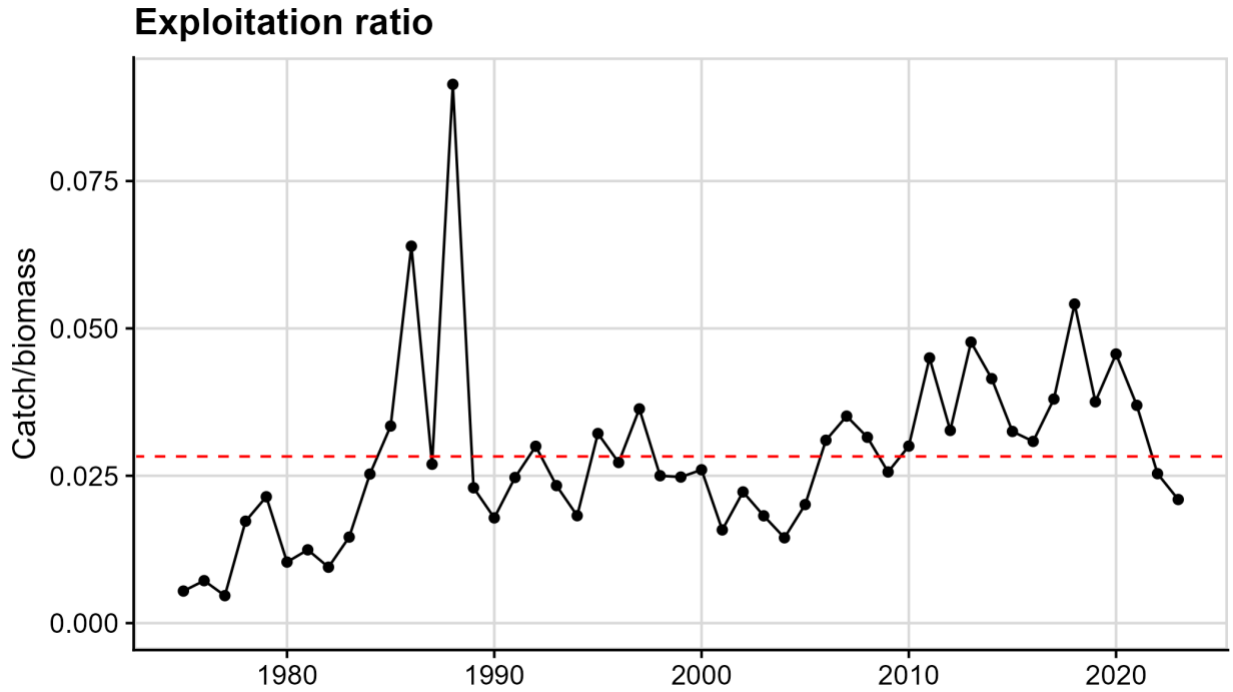


Figure 10-2. Exploitation ratio for Alaska plaice in the BSAI. Exploitation ratio is defined as the catch divided by the total predicted age-3+ biomass. The total predicted biomass time series was obtained from the 2021 assessment model (1975-2020), the 2021 projection model (2021) and the 2023 projection model (2022-2023). The 2023 exploitation ratio is based on the projected 2023 catch of 18,054 t. The 1977-2023, long-term average (0.03) is shown in the horizontal dashed red line.

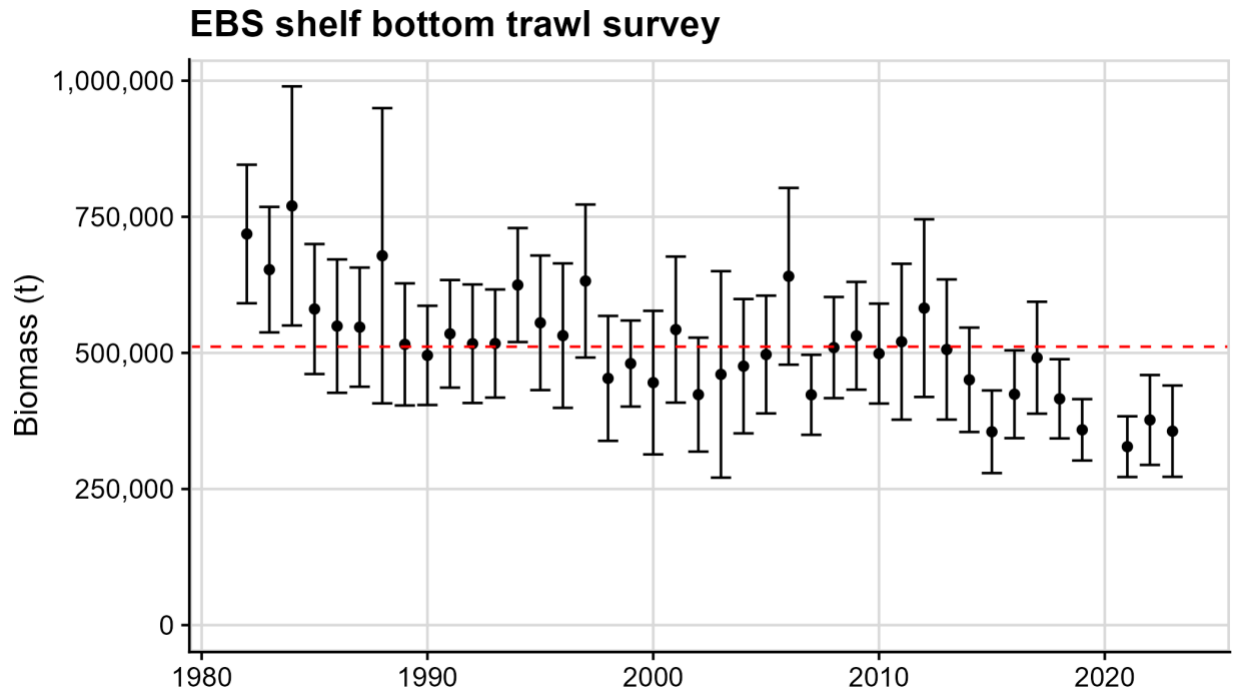


Figure 10-3. Alaska plaice biomass estimates from the EBS shelf trawl survey using the standard grid (no Northern EBS), 1982-2023. No survey was conducted in 2020 due to the COVID-19 pandemic. Data, sourced from the AKFIN database, may differ slightly from previous assessments due to minor modification in the strata definitions. The 1982-2023 long-term average biomass (511,428 t) is shown in the horizontal dashed red line.