12. Assessment of Pacific ocean perch in the Bering Sea and Aleutian Islands

by
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Executive Summary

In 2005, BSAI rockfish were moved to a biennial assessment schedule with full assessments in even years to coincide with the occurrence of trawl surveys in the Aleutian Islands (AI) and the eastern Bering Sea (EBS) slope. In 2017, the scheduled frequency for some stock assessments was changed in response to the National Stock Assessment Prioritization effort, with Bering Sea/Aleutian Islands (BSAI) Pacific ocean perch maintaining its existing schedule. In 2018, a full assessment was conducted which can be found at https://apps-afsc.fisheries.noaa.gov/refm/docs/2020/BSAIpop.pdf. A partial assessment is conducted this year by revising the recent catch data and re-running the projection model using the results from the previous full assessment as a starting point. Therefore, this update does not incorporate any changes to the 2018 assessment methodology, but does update the catch estimates for 2018-2020 and provides an estimated catch for 2021. The partial assessment also includes estimates of catch/biomass (i.e., exploitation rates), using estimated total biomass from the 2018 assessment and updated projection model.

Summary of Changes in Assessment Inputs

Changes in input data: The updated information for this partial assessment includes replacing the estimated 2020 catch with the final catch value and revising the 2021 and 2022 catch estimates. The 2020 catch was 40,417 t, 0.8% lower than the estimate of 40,746 t that was used in the 2020 projection. The estimated 2021 catch of 34,190 t was obtained by summing the reported 2021 catch through September (24,850 t) and the product of the remaining amount of catch under the TAC (11,049 t) and an estimate of the proportion of the remaining Oct-Dec TAC which has been caught in recent years (72%, based on 2019 and 2020 data). The estimated 2021 catch is 8% smaller than the value of 37,173 estimated in the 2020 projection model. The estimated 2022 and 2023 catches are assumed to result from fishing at the estimated 2021 F, resulting in 32,807 t and 31,550 t, respectively.

Changes in assessment methodology: There were no changes in assessment methodology since this was a partial assessment year.

Summary of Results

For the 2022 fishery, we recommend the maximum ABC of 35,688 t and an OFL of 42,605 t based on the updated projection model. The recommended 2022 ABC is 4% less than the 2021 ABC of 37,173 and 0.5% larger than the projected 2022 ABC of 35,503 from the 2020 projection model. A summary of the updated projection model results is shown below.

Quantity	As estimated or specified last year for: 2021	2022	As estimated or recommended this year for: 2022*	2023*
M (natural mortality rate)	0.056	0.056	0.056	0.056
Tier	3a	3a	3a	3a
Projected total (age 3+) biomass	756,011	735,367	738,710	724,085
Female spawning biomass (t)				
Projected	310,036	297,091	299,232	288,437
$B_{100\%}$	584,747	584,747	584,747	584,747
$B_{40\%}$	233,899	233,899	233,899	233,899
$B_{35\%}$	204,661	204,661	204,661	204,661
F_{OFL}	0.089	0.089	0.089	0.089
$maxF_{ABC}$	0.073	0.073	0.073	0.073
F_{ABC}	0.073	0.073	0.073	0.073
OFL (t)	44,376	42,384	42,605	40,977
maxABC (t)	37,173	35,503	35,688	34,322
ABC (t)	37,173	35,503	35,688	34,322
Status	As determined last year 2019	2020	As determined this year 2020	2021
Overfishing	No	n/a	No	n/a
Overfished	n/a		n/a	No
Approaching overfished	n/a		n/a	No

*Projections are based on estimated catches of 32,807 t and 31,550 t used in place of maximum permissible ABC for 2022 and 2023.

BSAI POP was not subjected to overfishing in 2020, and is not overfished or approaching an overfished condition.

BSAI POP exploitation rates have averaged 0.030 from 2004-2021 (Figure 1), which is below the exploitation rate associated from fishing at $F_{40\%}$ (defined as $U_{F40\%}$). Exploitation rates are computed as the ratio of catch within a year to the beginning year biomass (ages 3+). The estimate of biomass for 2021 was updated from re-running the projection model with updated catch data, where biomass estimates for other years were obtained from the 2020 stock assessment. Exploitation rates for BSAI subareas were obtained by using smoothed estimates of survey biomass from the random effects models to spatially partition the estimated total biomass. Exploitation rates from the BSAI subareas are generally similar to the overall BSAI exploitation rates, with the exception of low exploitation rates in the EBS area in the early 2000s and in the western Aleutians from 2017 -2020), and higher exploitation rates in the central Aleutians from 2016-2018. The similarity in exploitation rates between areas is expected because BSAI POP are managed with subarea ABCs based on the spatial distribution of survey biomass. Reduced catch in 2021 has reduced exploitation rates in all areas, although the 2021 catch is through Sept. 25 and thus preliminary.

Area Allocation of Harvests

The ABC for BSAI Pacific ocean perch is currently apportioned among four areas: the western, central, and eastern Aleutian Islands, and eastern Bering Sea, with the apportionments based on a random walk random effects model to smooth the survey time series. The estimated proportion of the stock in 4 subareas for the AI survey, and also the EBS slope survey, is shown below (the SBS and EBS slope areas contributed to the EBS subarea ABC).

ABC apportionments

	Area				
	WAI	CAI	EAI	SBS	EBS slope
2018 smoothed biomass estimate	388,948	204,741	278,146	110,304	245,905
percentage	31.7%	16.7%	22.6%	9.0%	20.0%

Summaries for the Plan Team

The following table gives the projected OFLs and apportioned ABCs for 2022 and 2023, and the recent OFLs, ABCs, TACs, and catches.

Area	Year	Age 3 Bio (t)	OFL	ABC	TAC	Catch[1]
BSAI	2020	908,529	58,956	48,846	42,875	40,417
	2021	756,011	44,376	37,173	35,899	24,850
	2022	738,710	42,605	35,688	n/a	n/a
	2023	724,085	40,977	34,322	n/a	n/a
Eastern Bering Sea	2020			14,168	14,168	11,944
	2021			10,782	10,782	3,369
	2022			10,352	n/a	n/a
	2023			9,956	n/a	n/a
Eastern Aleutian Islands	2020			11,063	10,613	10,621
	2021			8,419	8,419	5860
	2022			8,083	n/a	n/a
	2023			7,774	n/a	n/a
Central Aleutian Islands	2020			8,144	8,094	7,966
	2021			6,198	6,198	5,481
	2022			5,950	n/a	n/a
	2023			5,722	n/a	n/a
Western Aleutian Islands	2020			15,471	10,000	9,886
	2021			11,774	10,500	10,140
	2022			11,303	n/a	n/a
	2023			10,870	n/a	n/a

[1]Catch through September 25, 2021

Responses to SSC and Plan Team Comments on Assessments in General

(SSC, October 2021) The SSC developed guidance for the use of risk tables, with 14 comments/recommendations.

Authors' response: This guidance will be used when updating the risk table in the next full assessment.

Responses to SSC and Plan Team Comments Specific to this Assessment

(BSAI Plan Team, November 2020) *The Team recommended investigating Francis weighting and trying different time blocks of natural mortality to help improve the fit to the Aleutian Islands survey index.*

(SSC, December 2020*) The lack of fit in recent years is concerning and the SSC suggests that this should continue to be a focus of future work.*

The SSC supports continued work on evaluating M, including examining the impact of loosening the prior on M and considering time blocks in M, as suggested by the BSAI GPT, if an appropriate rationale can be developed. The SSC also supports the BSAI GPT recommendation to investigate Francis weighting.

The SSC further suggests the author considers evaluating combining the two surveys biomass and age compositions through geo-spatial models.

We will address these topics in the 2022 full assessment.

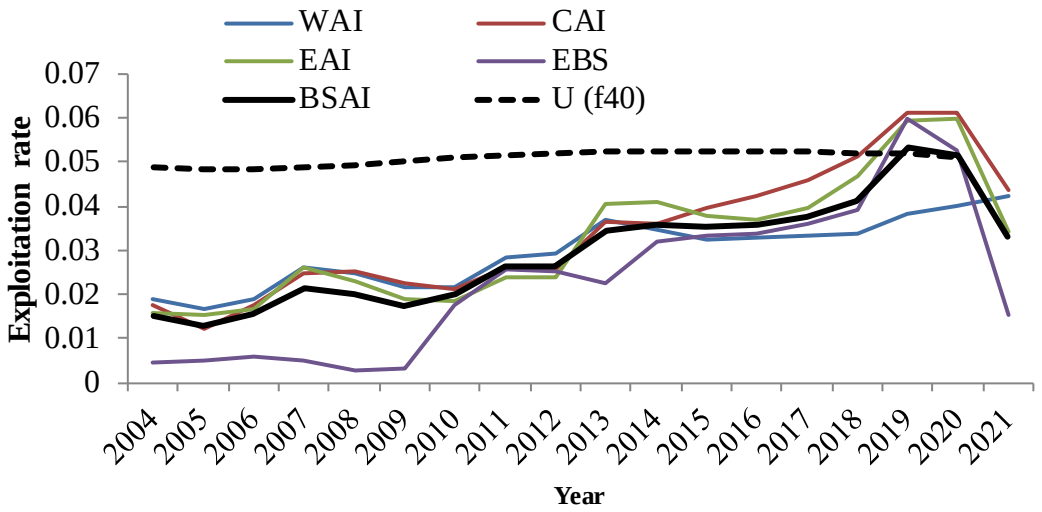

Figure 1. Exploitation rates for BSAI Pacific ocean perch. The $U_{F40\%}$ is the exploitation rate for each year that would occur from fishing at $F_{40\%}$, and is a function of the beginning year numbers at age, size at age, and fishing selectivity. Exploitation rates for 2021 are preliminary and based on catch through September 25, 2021.