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

by
Paul D. Spencer and James N. Ianelli
November 2019

Executive Summary

In 2005, BSAI rockfish were moved to a biennial assessment schedule with full assessments in even years to coincide with the occurence 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 http://www.afsc.noaa.gov/REFM/docs/2018/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 2018 catch with the final catch value and revising the 2019 and 2020 catch estimates. The 2018 catch was 34,749 t, 2% lower than the estimate of 35,467 t that was used in the 2018 projection. The estimated 2019 catch of 41,401 t was obtained by summing the reported 2019 catch through September (34,454 t) and the product of the remaining amount of catch under the TAC (9,615 t) and an estimate of the proportion of the remaining Oct-Dec TAC which has been caught in recent years (72%, based on 2017 and 2018 data). The estimated 2019 catch is 17% larger than the value of 35,467 estimated in the 2018 projection model. The estimated 2020 and 2021 catches are assumed to result from fishing at the estimated 2019 *F,* resulting in 39,938 t and 38,334 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 2020 fishery, we recommend the maximum ABC of 48,846 t and an OFL of 58,956 t based on the updated projection model. The recommended 2020 ABC is 3.4% less than the 2019 ABC of 50,594 and 0.7% less than the projected 2020 ABC of 49,211 from the 2018 projection model. A summary of the updated projection model results is shown below.

Quantity	As estimated or specified last year for:		As estimated or recommended this year for:	
	2019	2020	2020*	2021*
M (natural mortality rate)	0.056	0.056	0.056	0.056
Tier	3a	3a	3a	3a
Projected total (age 3+) biomass	934,293	914,577	908,529	885,439
Female spawning biomass (t)				
Projected	399,024	386,835	383,178	367,062
$B_{100\%}$	645,738	645,738	645,738	645,738
$B_{40\%}$	258,295	258,295	258,295	258,295
$B_{35\%}$	226,008	226,008	226,008	226,008
F_{OFL}	0.095	0.095	0.095	0.095
$maxF_{ABC}$	0.079	0.079	0.079	0.079
F_{ABC}	0.079	0.079	0.079	0.079
OFL (t)	61,067	59,396	58,956	56,589
maxABC (t)	50,594	49,211	48,846	46,885
ABC (t)	50,594	49,211	48,846	46,885
Status	As determined last year		As determined this year	
	2017	2018	2018	2019
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 39,938 t and 38,334 t used in place of maximum permissible ABC for 2020 and 2021.

BSAI POP was not subjected to overfishing in 2018, and is not overfished or approaching an overfished condition.

BSAI POP exploitation rates have averaged 0.024 from 2004-2019 (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 2019 was updated from re-running the projection model with updated catch data, where biomass estimates for other years were obtained from the 2018 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 similar to the overall BSAI exploitation rates, with the exception of low exploitation rates in the EBS area in the early 2000s and an increase in the exploitation rate in the central AI since 2016. 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.

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 subarea 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 2020 and 2021, and the recent OFLs, ABCs, TACs, and catches.

Area	Year	Age 3 Bio (t)	OFL	ABC	TAC	Catch[1]
BSAI	2018	749,925	51,675	42,509	37,361	34,749
	2019	934,293	61,067	50,594	44,069	34,454
	2020	908,529	58,956	48,846		
	2021	885,439	56,589	46,885		
Eastern Bering Sea	2018			11,861	11,861	9,635
	2019			14,675	14,675	7,186
	2020			14,168	n/a	n/a
	2021			13,600	n/a	n/a
Eastern Aleutian Islands	2018			10,021	9000	9946
	2019			11,459	11009	9116
	2020			11,063	n/a	n/a
	2021			10,619	n/a	n/a
Central Aleutian Islands	2018			7,787	7500	7312
	2019			8,435	8385	8263
	2020			8,144	n/a	n/a
	2021			7,817	n/a	n/a
Western Aleutian Islands	2018			12,840	9000	8856
	2019			16,025	10000	9888
	2020			15,471	n/a	n/a
	2021			14,849	n/a	n/a

[1]Catch through September 28, 2019

Responses to SSC and Plan Team Comments on Assessments in General

(SSC, October 2019) The SSC recommends the authors complete the risk table and note important concerns or issues associated with completing the table.

We will complete the risk table in the 2020 full assessment.

Responses to SSC and Plan Team Comments Specific to this Assessment

(BSAI Plan Team, November 2018) The Team recommends producing a squid plot (see sablefish SAFE chapter for example) for the next full assessment, to examine the retrospective pattern with respect to recruitment trends.

The Team also recommends updating the prior on M using alternative methods for the next full assessment (e.g., Hamel method, Jason Cope online application, http://barefootecologist.com.au/shiny_m.html*).*

(SSC, December 2018) *Additionally, allowing survey selectivity to be a little more flexible in shape may be worth exploration.*

(SSC, December 2018) *The SSC encourages the author to look at sequentially removing data sources to see what data source may be causing the poor fit and residual pattern for the AI survey.*

This plots and analyses will be presented in the 2020 full assessment.

(SSC, December 2018) *Also, the SSC suggests ensuring that the non-estimated recruitments at the end of the model are using the mean recruitment, and not just the exponentiated log mean recruitment parameter.*

The non-estimated recruitments at the end of the model are the mean (not median) recruitment from the modeled lognormal distribution.
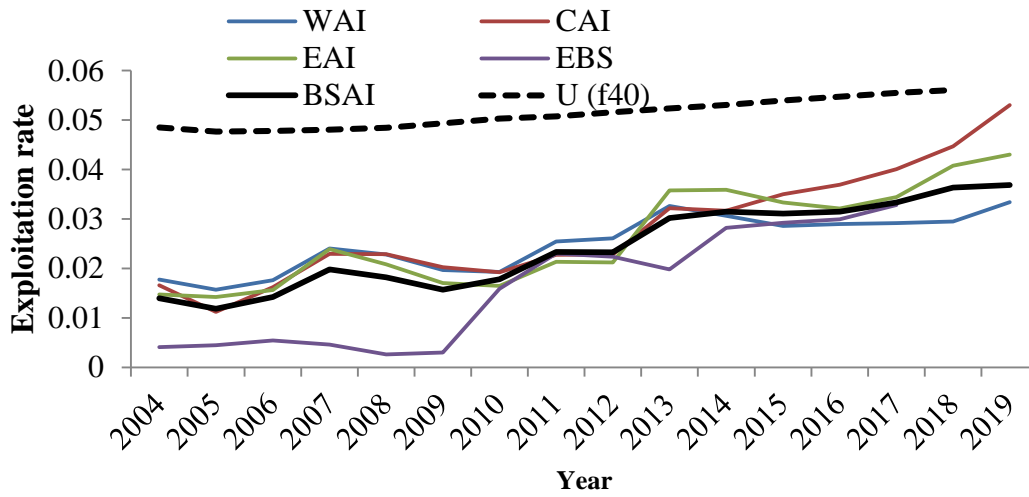
Figure 1. Exploitation rates for BSAI Pacific ocean perch. The $U_{F40\%}$ is the exploitation rate for each year that would occur from fishing at $F_{40\%}$, and is a function of the beginning year numbers at age, size at age, and fishing selectivity. Exploitation rates for 2019 are preliminary and based on catch through September 28, 2019.