

"These materials do not constitute a formal publication and are for information only. They are in a pre-review, pre-decisional state and should not be formally cited. They are to be considered provisional and do not represent any final determination or policy of NOAA or the Department of Commerce."

Update to the 2019 Washington Cabezon catch-only model

The 2019 application of the Simple Stock Synthesis (SSS; catch history with a mix of pre-specified and Monte Carlo drawn life history parameters) approach for estimating OFL and ABC (based on a category 3 buffer of 0.778 ($P^*=0.45$, $\sigma = 2$)) provided catch recommendations for 2021-2022. Catch only models require a prior on stock status (in this case, depletion in the year 2018). While past catch-only applications of groundfishes typically assumed the stock status was at target in the most current year, thus assuming constant catches into the future, the stock status for Washington Cabezon was treated differently. Length compositions were combined across the 5 most recently available years, and LBSPR was used to estimate stock status in 2018. This value (0.65) was treated as a center of 4 other potential stock status mean values (0.4, 0.55, 0.75, and 0.9). Each of these priors (all assuming a CV of 0.1 in a beta distribution) was used to develop uncertainty in the catch estimates. However, the central tendency was above the target, so the ABC values for 2021 and 2022 were not constant, decreasing as the biomass decreases towards the target biomass. For the 2023-2024 ABCs, the values for 2021 and 2022 respectively were used again, though this would not reflect what a projection from the catch only model would suggest. It was therefore recognized that more information is needed set the 2025-2026 (and beyond) OFLs and ABCs.

This analysis applies the same analysis as was done in 2019 (applying a buffer on the OFL in each year of 0.778 based on a $P^*=0.45$ and category 3 $\sigma = 2$), but uses the actualized catches for years 2019-2023 (Table 1). Updated catches for 2018-2024, which includes Marine Area 4B, were provided by the Washington Department of Fish and Wildlife using RecFIN extractions. For 2024, an average of the 2022 and 2023 catches was used (which were very close to each other). Catch projections are provided in Table 2 through 2036. The value in 2025 is not inconsistent with the 2019 model projection (~11mt OFL for 2025 based on the median in 2018 of 0.65) and also consistent with fishing down towards the target biomass of 40%. Using that same assumption, namely that the stock was at a depletion of 65% in 2018, as the stock status input in the 2019 model, the estimated maximum sustainable yield at the biomass target of 40% is between 8 and 9 mt.

While the stepwise approach used in 2019 (LBSPR to get the depletion, then use it as a prior for the SSS model) to a catch only application was an advance over assuming a stock status prior, we currently have more advanced ways of taking advantage of all the length compositions data integrated with the catch model. There are multiple advantages of the integrated model approach (effectively, the SSC reviewed category 2 approach):

- Uses all of the length data instead of only the last 5 years.
- Fits all length data as a time series within the likelihood rather than as a composite.

- Allows for selectivity to be estimated across all data (also allows for fleet-specific selectivity, but not relevant here given only one fleet)
- Allows for recruitment estimation, thus freeing up the deterministic assumption
- Departs from the equilibrium assumptions of LBSPR and provides a direct estimate of stock status across years as informed by the length data
- Allows for other Stock Synthesis flexibilities on model specification as needed.
- Much quicker model runs.

This latter modelling approach was investigated and fit to all years of length data using the updated catch information, but not fully reported here. The data are fit well in the model, and estimated recruitment is consistent with years known to have prominent recruitment. For the next iteration of this assessment, it is recommended this approach (essentially a category 2 stock assessment) be considered, as it could move the stock beyond just catch recommendation and into stock status determination, as well as lower the applied uncertainty-based buffer.

Table 1. Catches used in the update vs 2019 model.

Year	Landings+ Dead Discards (mt)	
	2024 update	2019
2018	7.84	5.3
2019	11.53	4.6
2020	4.93	4.5
2021	8.13	
2022	10.11	
2023	11.10	
2024	10.61	

Table 2. Projected OFL and ABC (using a category 3 buffer of 0.778) for Washington Cabezon

Year	Recent catches	Projected OFL	Projected ABC	Depletion
2019	11.53	-	-	64%
2020	4.93	-	-	60%
2021	8.13	-	-	62%
2022	10.11	-	-	61%
2023	11.10	-	-	59%
2024	10.61	-	-	57%
2025	-	11.72	9.12	55%
2026	-	11.59	9.02	54%
2027	-	11.50	8.95	54%
2028	-	11.43	8.89	53%
2029	-	11.35	8.83	53%
2030	-	11.29	8.78	53%
2031	-	11.22	8.73	53%
2032	-	11.17	8.69	53%
2033	-	11.13	8.66	52%
2034	-	11.09	8.63	52%
2035	-	11.08	8.62	52%
2036	-	11.05	8.60	52%