

Preliminary Preseason Forecast for Bristol Bay sockeye salmon in 2025 (UW-FRI)

Curry Cunningham^{1,2}, Chris Boatright¹, Ray Hilborn¹, Daniel Schindler¹

1. University of Washington, 2. University of Alaska Fairbanks

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Background and Summary

The Bristol Bay fisheries community expressed interest in a preliminary preseason forecast for Bristol Bay sockeye salmon abundance in the coming year (2025), based upon data available at the time of the last daily inseason release (late-July 2024) from the Alaska Department of Fish and Game (ADF&G). Based on this interest we developed a preliminary preseason forecast for Bristol Bay run size in 2025. As this preliminary preseason forecast is made prior to both finalized inseason data for the 2024 run and the formal run reconstruction process, this should be considered an advisory rather than a formal forecast given its lower accuracy and aggregated summary across stocks.

The standard **UW-FRI Preseason Forecast** that will be released in November 2024, will include 2025 abundance estimates by age class for all nine rivers in Bristol Bay, and the anticipated 2025 harvest in numbers and pounds. Our preliminary forecast for 2025 is for 49.6 million sockeye salmon to return to Bristol Bay, with a projected harvest of 32.4 million fish (185 million pounds).

Forecast Summary

The UW-FRI Preliminary (August) Preseason Forecast for 2025 Bristol Bay sockeye salmon run size is 49.6 million sockeye salmon. This preliminary forecast suggests that 39% of the 2025 total Bristol Bay run will be 2-ocean sockeye and 61% 3-ocean sockeye. The 2025 Preliminary Preseason Forecast of 49.6 million is 18% below the 2013-2023 (10-year) average of 60.1 million sockeye, and nearly equal to the 2003-2023 (20-year) average. **The projected 2025 inshore harvest is 32.4 million sockeye salmon or 185.3 million pounds.**

Table 1. Projected harvest based on the 2025 Preliminary Preseason Forecast for Bristol Bay sockeye salmon. The projected harvest assumes a harvest of 1 million Bristol Bay sockeye salmon in the South Peninsula commercial fishery and a projected escapement of 16.2 million sockeye salmon. Projected weight-at-age for 2 and 3-ocean sockeye salmon is based on the average relationship between run size and weight at age. The projected harvest in millions of pounds is the projected harvest by ocean age, multiplied by the projected weight at age. The projected average weight of sockeye salmon in 2025 is 5.7 pounds.

Ocean Age	Forecast (millions of sockeye)	Projected Harvest (millions of sockeye)	Projected Weight at Age (pounds)	Projected Harvest (millions of pounds)
2	19.5	12.8	4.7	60.3
3	30.1	19.6	6.4	125.0
Total	49.6	32.4	Average: 5.7	185.3

Table 2. Preliminary Preseason Forecast for Bristol Bay sockeye salmon run size in 2025 in millions of sockeye salmon. For comparison the recent 10-year and 20-year average total run sizes are presented, as well as the mean absolute percent error (MAPE) for age-specific forecast models.

Age	Forecast (millions of sockeye)	Model Performance (MAPE)
1.2	15.0	34.4%
1.3	27.4	20.1%
2.2	4.5	131.1%
2.3	2.6	73.6%
Bristol Bay Total	49.6	19.3%
2014-2023 Average	61.1	
2004-2023 Average	49.6	

Retrospective analysis of forecast performance, based on 1-year ahead predictions, indicates that for Bristol Bay this preliminary preseason forecast method has a higher overall mean absolute percent error (MAPE) of 19.3% for years 2006-2023, when compared to the official (November) UW-FRI Preseason Forecast MAPE of 15.1% over this same time period.

UW-FRI Preseason Forecast Comparison

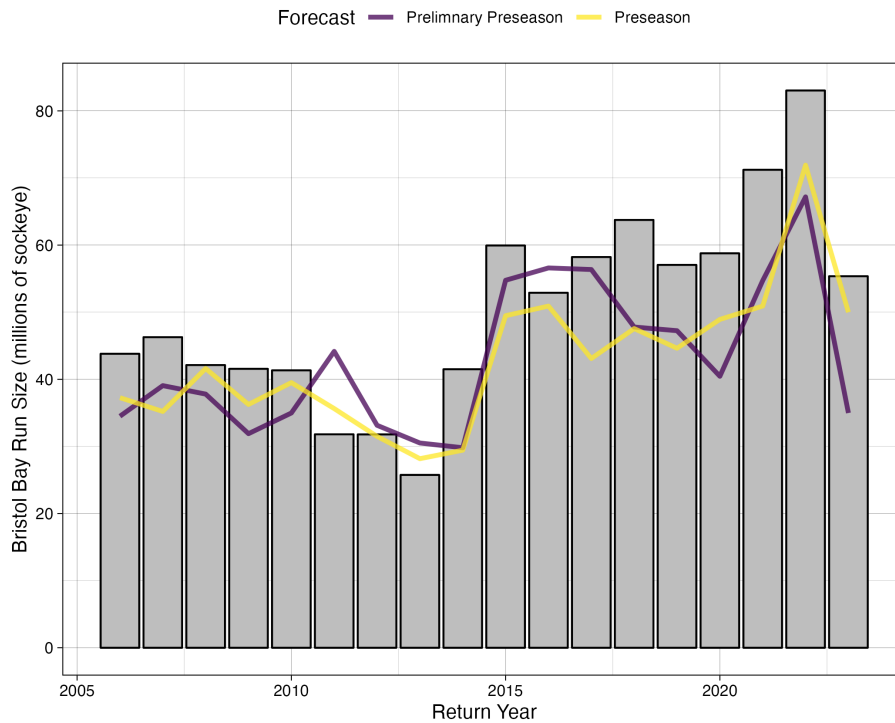


Figure 1. Retrospective (1-year) ahead predictions for Bristol Bay run size from the standard UW-FRI Preseason forecast (yellow line) and the preliminary preseason forecast methods (purple line), compared with observed total run size in millions of sockeye salmon (bars).

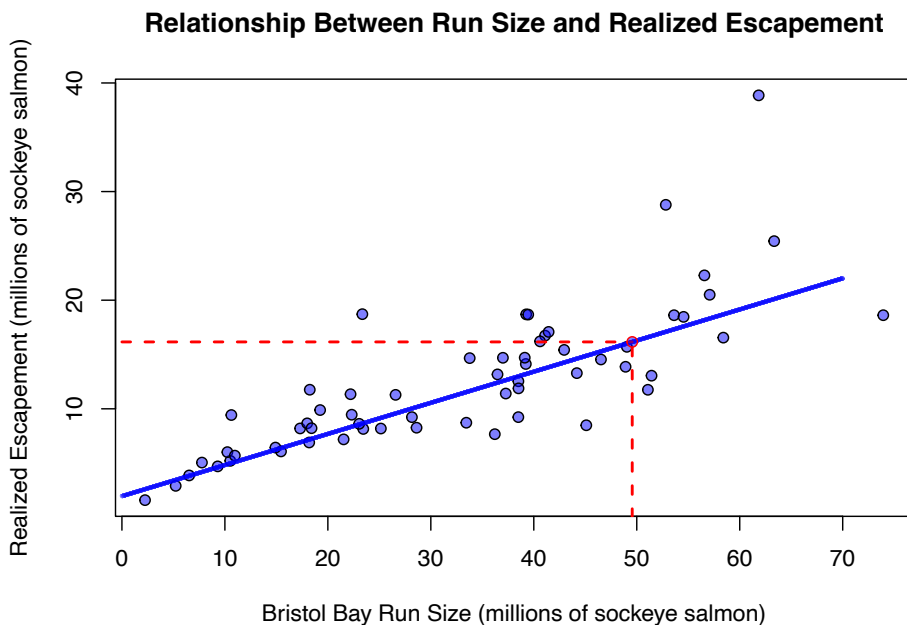


Figure 2. Linear relationship (blue line) between Bristol Bay run size and realized escapement. Points are individual years 1963-2023. The red dashed line highlights the prediction for 2025 expected escapement of 16.2 million sockeye salmon.

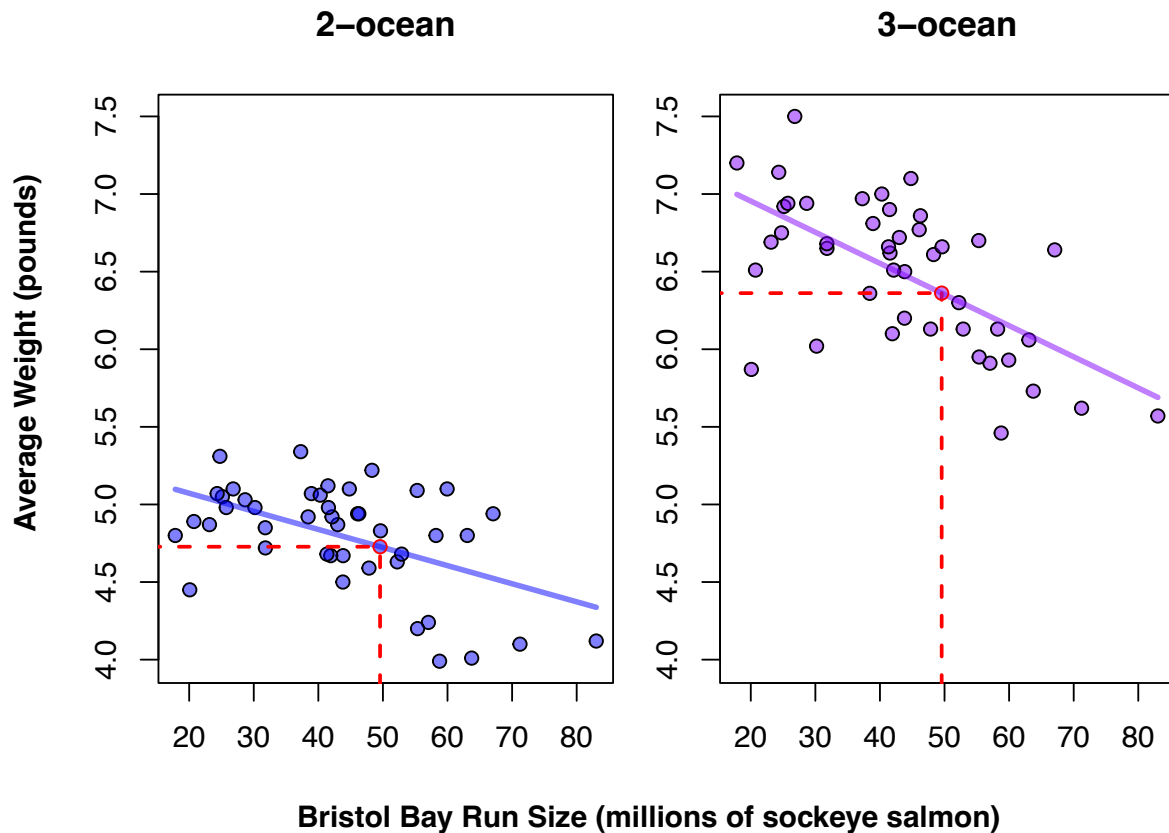


Figure 3. Relationship between annual Bristol Bay run size and the average weight of 2 and 3-ocean sockeye salmon for years 1980-2023. Solid lines describe the average relationship, while the red dashed lines highlight the prediction for sockeye salmon weight-at-age in 2025 of 4.7 pounds for 2-ocean sockeye salmon and 6.4 pounds for 3-ocean sockeye.

Methods

To generate this preliminary preseason forecast, the final ADF&G “daily” inseason release describing total Bristol Bay catch and escapement was used in conjunction with the aggregate age composition reported by ADF&G.

The total catch plus escapement reported on the last “daily” (July 31, 2024) was scaled up to the expected total 2024 Bristol Bay total (reconstructed) run size based on the observation that on average 94.2% of the total run size has been observed at the time of the last “daily” (2005-2023). The aggregate Bristol Bay age composition through August 12, 2024 was used to apportion the total 2024 run size estimate among reported age groups.

We used Dynamic linear models (DLMs) to generate the 2025 preliminary forecast. This class of models allows for changes over time in both average run size by age class and the relationship between forecasted

age classes and members of the same cohort that returned in previous years (e.g., 1.3's predicted from 1.2's). DLMs showed the best performance in retrospective (1-year ahead) testing for years 2006-2023. DLMs with log-transformed predictors and response variables were used to generate the 2025 preliminary preseason forecast.

Projected inshore harvest in numbers by ocean age were calculated by subtracting the expected escapement based on the historical relationship between realized escapement and run size (1963-2023) and the assumed South Peninsula harvest of 1 million Bristol Bay sockeye salmon. The projected inshore harvest in pounds was calculated by multiplying the expected weight per fish for 2 and 3-ocean sockeye salmon based on the relationship between weight-at-age and run size in past years by the projected harvest in numbers at age.

Contact Information

If you have any questions, please feel free to reach out to Curry Cunningham (907-360-4217, cjcunningham@alaska.edu) or Chris Boatright (907-843-2720, cboat@uw.edu).