

UW-FRI Preliminary Preseason Forecast for Bristol Bay in 2024

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Background and Purpose

Members of the Bristol Bay fisheries community expressed interest in a preliminary preseason forecast for Bristol Bay salmon abundance in the coming year (2024), based upon data available at the time of the last daily inseason release (late-July 2023) from the Alaska Department of Fish and Game. Based on this interest we developed a preliminary preseason forecast for Bristol Bay run size in 2024. As this preliminary preseason forecast is made prior to both finalized inseason data for the 2023 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.

We highlight that this is not a replacement for our standard **UW-FRI Preseason Forecast** that will be released on the standard schedule in November 2023, and will include 2024 abundance estimates by age class for all nine rivers in Bristol Bay, and the anticipated 2024 harvest in numbers and pounds.

Methods

To generate this preliminary preseason forecast, the final Alaska Department of Fish and Game (ADF&G) “daily” in season 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 30, 2023) was scaled up to the expected total 2023 Bristol Bay total (reconstructed) run size based on the observation that on average 94.1% of the total run size has been observed at the time of the last “daily” (2005-2022). The aggregate Bristol Bay age composition through July 18, 2023 was used to apportion this total 2023 run size estimate among reported age groups.

We used Dynamic linear models (DLMs) to generate the 2024 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 as a function of 1.2's). DLMs showed the best performance in retrospective (1-year ahead) testing for years 2006-2022. DLMs with log-transformed predictors and response variables were used to generate the 2024 preliminary preseason forecast.

Projected harvest in numbers by ocean age was calculated by subtracting the expected escapement based on the historical relationship between realized escapement and run size (1963-2022) and the assumed a South

Peninsula harvest of 1 million Bristol Bay sockeye salmon. Projected 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 for each age group.

Forecast Summary

The UW-FRI Preliminary (August) Preseason Forecast for 2024 Bristol Bay sockeye salmon run size is 38.9 million sockeye salmon. This preliminary forecast suggests that 63.0% of the 2024 total Bristol Bay run will be 2-ocean sockeye and 37% 3-ocean sockeye. The 2024 Preliminary Preseason Forecast of 38.9 million is 32% below the 2013-2022 (10-year) average of 57.2 million sockeye, and 19% below the 2003-2022 (20-year) average of 48.1 million. **The projected 2024 harvest is 26.4 million sockeye salmon or 145.1 million pounds.**

Table 1. Projected harvest based on the 2024 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 11.5 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 2024 is 5.5 pounds.

Ocean Age	Forecast (millions of sockeye)	Projected Harvest (millions of sockeye)	Projected Weight at Age (pounds)	Projected Harvest (millions of pounds)
2	24.5	16.6	4.9	80.8
3	14.4	9.8	6.6	64.3
Total	38.9	26.4	Average: 5.5	145.1

Table 2. Preliminary Preseason Forecast for Bristol Bay sockeye salmon run size in 2024 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	20.1	35.7%
1.3	12.7	19.4%
2.2	4.4	138.1%
2.3	1.8	73.9%
Bristol Bay Total	38.9	18.2%
2013-2022 Average	57.2	

2003-2022 Average

48.1

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 18.2% for years 2006-2022, when compared to the official (November) UW-FRI Preseason Forecast MAPE of 15.4% over this same time period.

UW-FRI Preseason Forecast Comparison

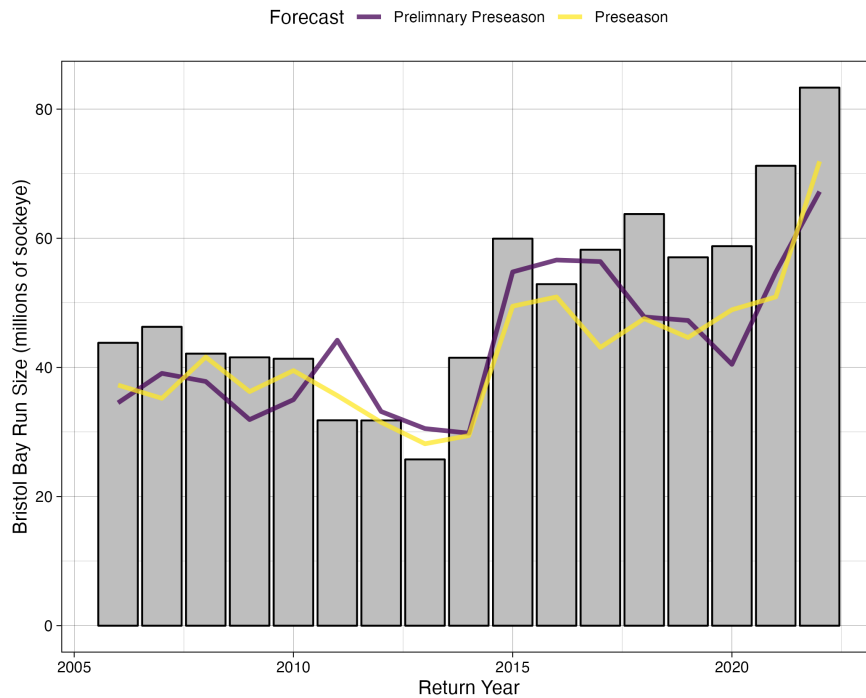


Figure 1. Retrospective (1-year) ahead predictions for Bristol Bay run size from the standard UW-FRI Preseason forecast (yellow line) and the preliminary preseason forecast methods (purple line), compared with observed total run size in millions of sockeye (bars).

Relationship Between Run Size and Realized Escapement

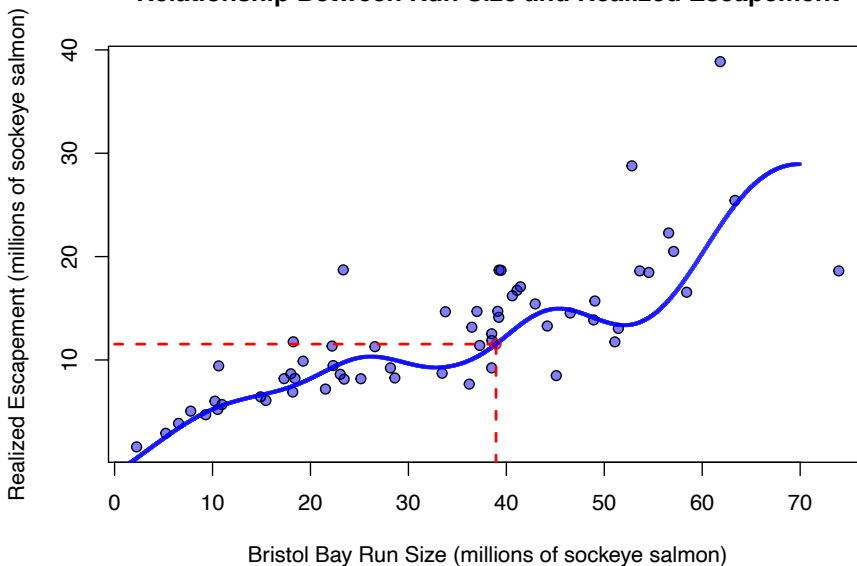
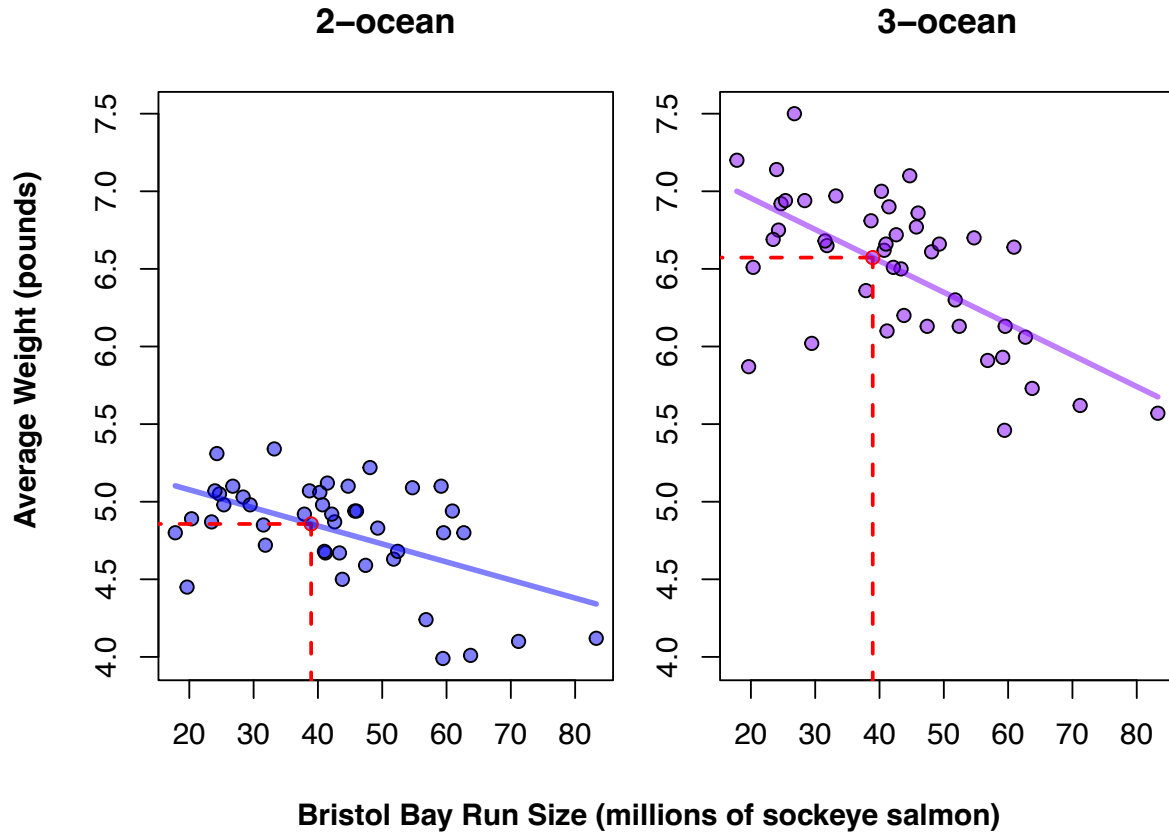


Figure 2. Smoothed relationship (blue line) between Bristol Bay run size and realized escapement. Points are individual years 1963-2022. The red dashed line highlights the prediction for 2024 realized escapement of 11.5 million sockeye salmon.

Figure 3. Relationship between annual Bristol Bay run size and the average weight of 2 and 3-ocean sockeye salmon for years 1980-2022. Solid lines describe the average relationship, while the red dashed lines highlights the prediction for sockeye salmon weight-at-age in 2024 of 4.9 pounds for 2-ocean sockeye salmon and 6.6 pounds for 3-ocean sockeye.



Contact Information

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