Submitted by the Alaska Department of Fish and Game at the request of Board Member Huntington.

March 6, 2018

Forecasted Yukon King Salmon Run Size Using Juvenile Data

Marine juvenile king salmon abundance, apportioned by genetic stock composition information, can be used to forecast adult runs of Yukon River king salmon. There is a very good relationship between the number of juvenile king salmon we see in late summer in the ocean (primarily two year old fish) and adult returns in future years. These data provide a leading indicator of productivity changes and new information to consider alongside traditional forecasting tools, which use adult spawner abundance data. Insight from this juvenile life stage provides run outlooks up to three years into the future, which can aid in longer term resource planning. In addition to significant new information for predicting population trends, these data are also integral to understanding the broader ecology and dynamics of these stocks, including research into potential mechanisms causing productivity changes.

The preliminary juvenile abundance observed in 2017 is below average, though not the lowest observed.

- Juvenile abundance in 2017 will contribute primarily to runs in 2020 and 2021.
- Since more than one juvenile year contributes to a given run year, we would also need to see low juvenile abundance in 2018 before there would be concern for a significant decline in run size after 2020.

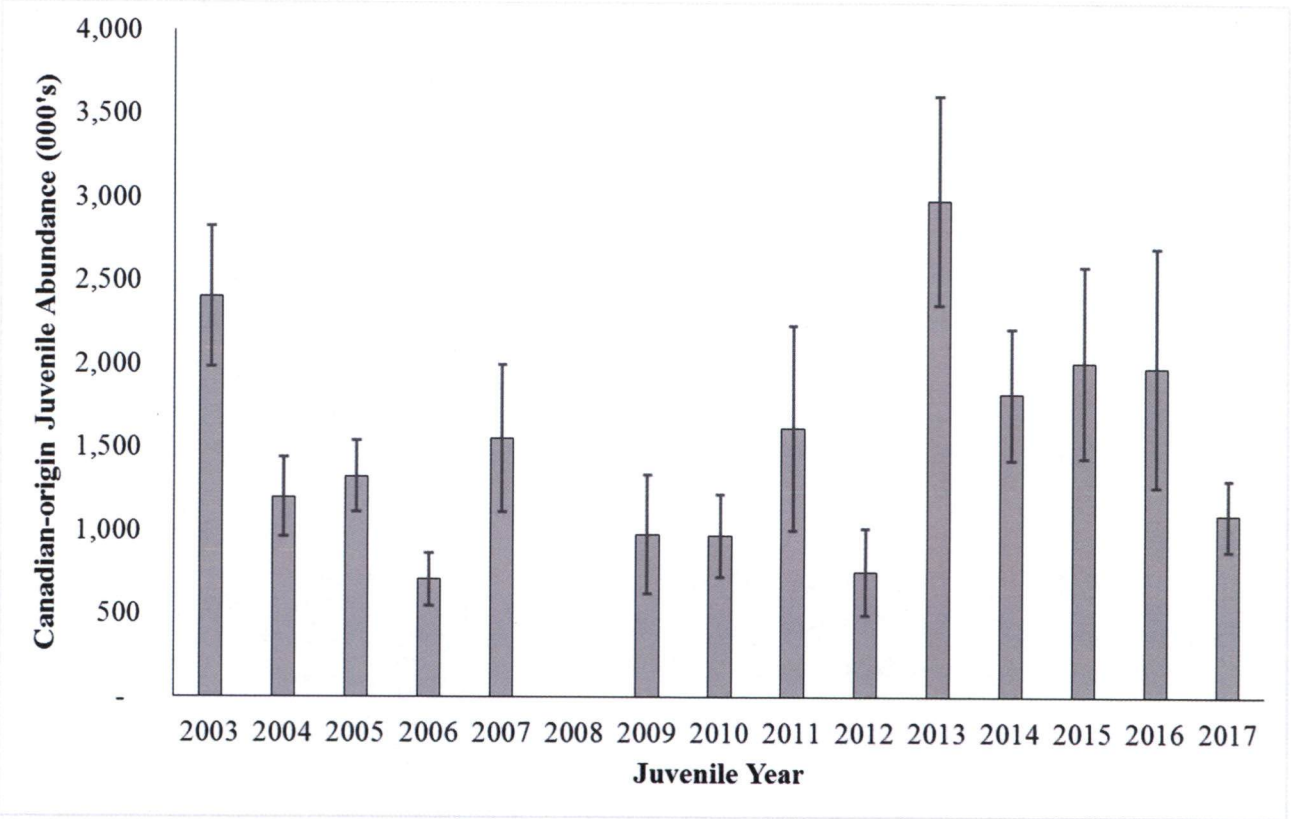

Figure 1 Juvenile Canadian-origin king salmon abundance in each northern Bering Sea survey year. The estimated abundance in 2017 is preliminary.

Canadian-origin king salmon preseason forecasts have been provided to stakeholders and managers since 2013.

- Forecasted run sizes over the next three years are expected to produce Canadian-origin king salmon runs large enough to meet escapement needs and unlikely to require significant restrictions to subsistence harvest.
    - Run size of Canadian-origin king salmon in 2018 and 2019 are expected to be similar to what was observed in 2017.
    - Run size of Canadian-origin king salmon in 2020 is expected to be lower than the 2018 and 2019 runs, and more similar to the run size observed in 2016.

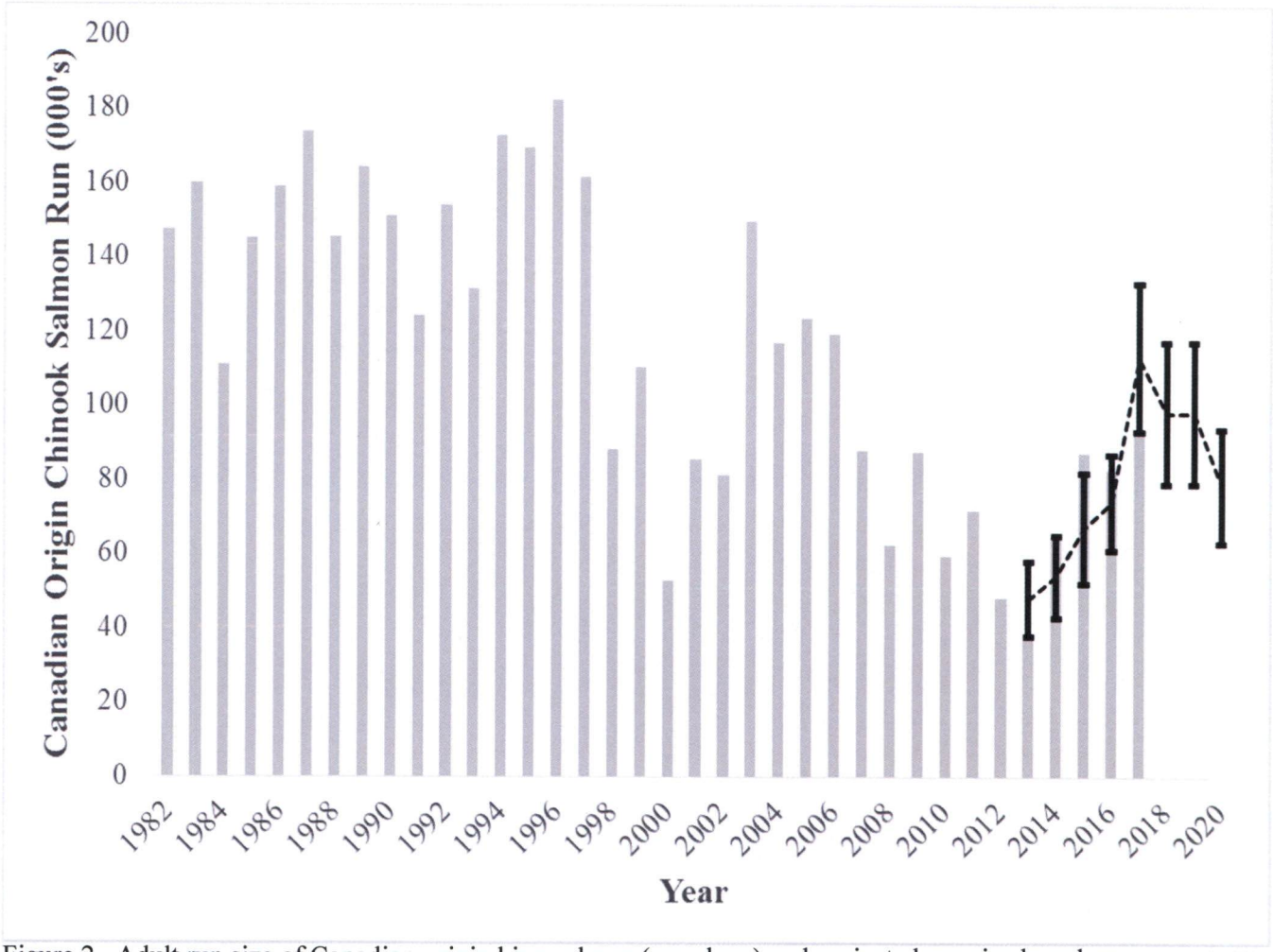

Figure 2. Adult run size of Canadian-origin king salmon (gray bars) and projected run size based on juvenile abundance forecast (black dashed line and error bars indicating forecast range).

A total run forecast for the Yukon River (Alaskan and Canadian stocks) has recently been developed, and is being provided to managers and stakeholders in 2018 for the first time. This total run forecast is scaled to adult run size measured by Pilot Station sonar and all harvest and escapement downstream of the sonar: this provides a run size expectation tailored to the inseason assessment tools available to Yukon River stakeholders and managers.

- Preliminary king salmon forecasts for the total Yukon River demonstrates a similar trend over the next three years to the one predicted for Canadian-origin stocks: 2018 being similar to the observed run size in 2017 (as measured by Pilot Station sonar), and run size declining in 2019 and 2020.

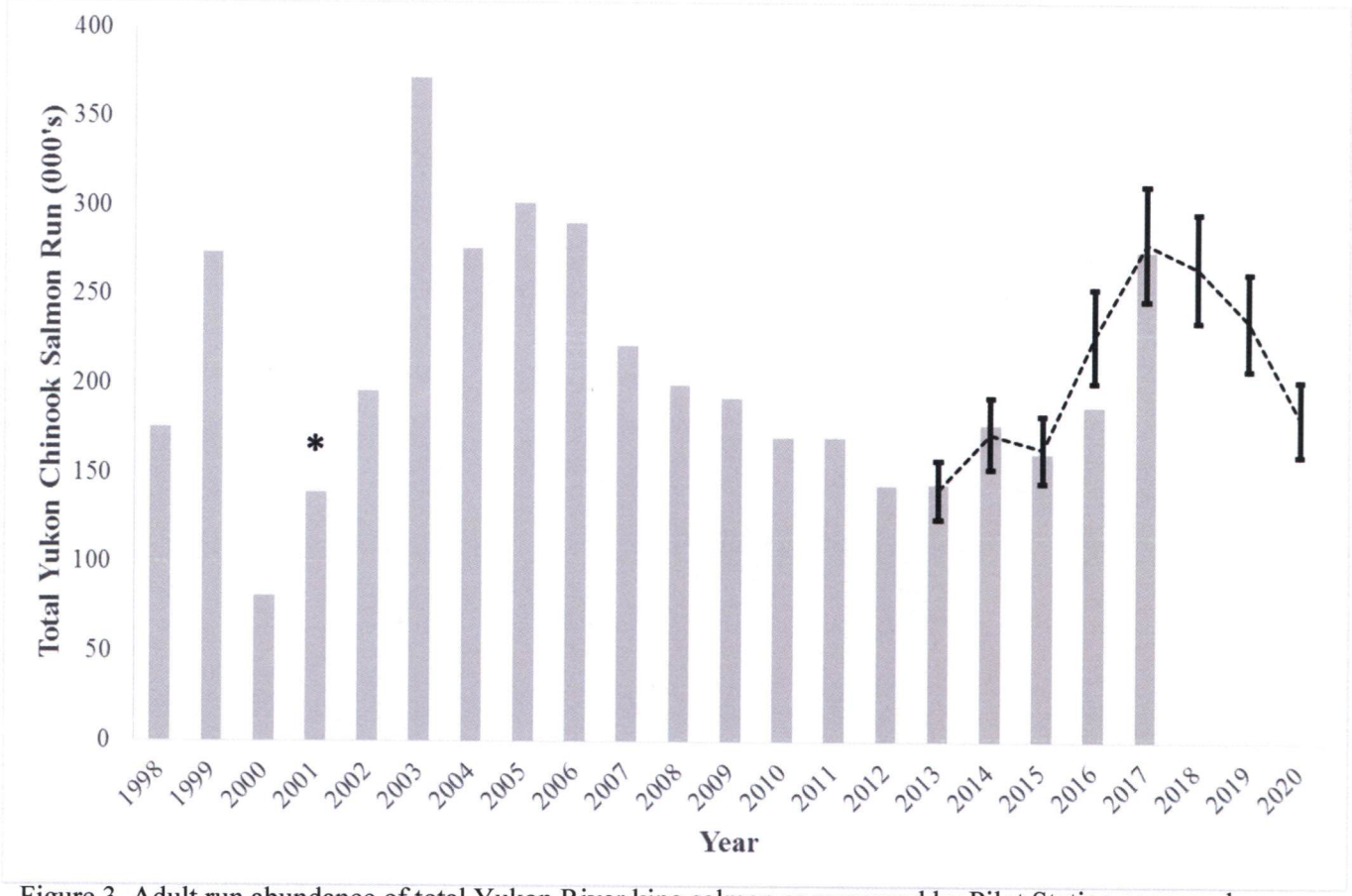

Figure 3. Adult run abundance of total Yukon River king salmon as measured by Pilot Station sonar and all harvest and escapement downstream of the sonar (gray bars) and projected run size based on juvenile forecast (black dashed line and error bars indicating forecast range). The 2001 total run estimate should be considered a minimum due to incomplete counts.