

**Ocean harvest real-time forecasts of  
fall Chinook salmon (*Oncorhynchus tshawytscha*)  
returns to the Columbia River**

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## EXECUTIVE SUMMARY

Forecasts of fall Chinook salmon runs to the Columbia River are a critical management component for harvest decisions and monitoring abundance trends because Columbia River fall Chinook salmon form the largest contributing fish group to ocean Chinook fisheries north of Cape Falcon, Oregon, and also they include Snake River fish at extinction risk (Good et al. 2005). For the forecast importance, preseason forecasts of fall Chinook salmon runs have been made annually, using historical sibling runs. However their accuracy has not been consistent over years, and further uncertainty of preseason forecasts has not been measured.

The main motivation of this study is to improve the traditional forecast methods. We noted that catch and effort data from ocean troll fisheries during May – July have not been incorporated to the traditional preseason forecasts that are made before February or March. Such data could be available on a real-time basis, and thus incorporation of those data would enable us to make the real-time forecasts of fish runs.

Catch and effort data from Southeast (SE) Alaska ocean troll fisheries are available on a weekly basis. Stock- and age- specific proportions in the ocean abundance are estimated by the PSC CTC ocean model. Applying the proportion estimates to ocean catch data, we were able to extract data on stock- and age- specific ocean catches. With those data, we made in-season forecasts of fish runs on a weekly basis.

We blended the in-season forecast of fish run with the traditional preseason forecast to create an integrated forecast. To do so, we made the respective forecast as a probability density function (pdf). The pdf of the integrated forecast was built by the product of the in-season forecast and preseason forecast, assuming the independence between these two forecasts. We applied our methods to five stocks of Upriver Bright (URB), Mid Columbia River Bright (MCB), Lower River Wild (LRW), Lower River Hatchery (LRH), and Bonneville Pool Hatchery (BPH).

We evaluated performances of the in-season forecasts, the preseason forecasts, and the integrated forecasts respectively. We found the distributions of the traditional preseason forecasts were very narrow, and thus 90% prediction interval (PI) of the preseason

forecasts frequently missed actual runs. We inflated the preseason forecast's distribution by multiplying its standard deviation (SD) by five. The five times of its SD was chosen by our empirical exploration. The integrated forecast, which is from the inflated preseason forecast and the in-season forecast, performed best in terms of accuracy and 90% PI's coverage of actual run.