

Growth, age, & survival of AYK Chinook salmon

Investigator: Greg Ruggerone, Principal Investigator, Nature Resources Consultants, Inc.;
Phone: 206-285-3420; Email: gruggerone@nrccorp.com

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Abstract:

Abundances and harvests of Chinook salmon in western Alaska have been relatively low since the mid-1990s, leading to significant hardship for people of this region. Growth of salmon in marine and freshwater habitats is often a key factor affecting salmon survival and age-at-maturation, but direct growth estimates are rarely collected in these remote habitats for more than a few years. However, salmon scales provide an index of annual growth in freshwater and marine habitats and Chinook salmon scales have been collected for fisheries management for decades. We propose to extend the existing scale growth databases for Yukon, Kuskokwim, and Nushagak Chinook salmon by nine years, thereby creating indices of growth in freshwater and marine habitats from the 1960s or 1970s through 2013. With the scale growth datasets, hierarchical multi-population analyses will be combined with a model selection and multi-model inference to test for biological and physical factors affecting Chinook salmon growth in freshwater and the ocean over several decades. Furthermore, this statistical framework and new or revised data on productivity and total abundance of Yukon, Kuskokwim, and Nushagak Chinook salmon will be used to test for effects of growth in freshwater and the ocean on Chinook salmon productivity (survival) and age-at-maturation. Recent Chinook salmon escapement goal studies indicate the importance of density-dependence in freshwater; we propose to test for density dependence effects on growth in the juvenile (freshwater) stage because understanding density dependence is important when developing spawner-recruit relationships and escapement goals. Growth typically has a strong influence on age-at-maturation of Chinook salmon. Scale growth will be used to test for the life stage at which growth influences maturation of age-1.3 and age-1.4 male versus female Chinook salmon. The proposed investigation provides a cost-effective approach for addressing key questions about the decline of Chinook salmon in the AYK region.

Project Objectives:

Objective 1: Extend the existing Chinook scale growth datasets for Yukon, Kuskokwim, and Nushagak stocks through year 2013.

Objective 2: Test for biological and physical factors affecting annual Chinook salmon scale growth during freshwater versus ocean life stages.

Objective 3: Test whether Chinook scale growth during one or more life stages and biological/physical factors affect abundance, productivity and age-at-maturation of western Alaska Chinook salmon.

Objective 4: Test for the effect of growth and gender on age-at-maturation of Chinook salmon.