

Effects of Ichthyophonus on Yukon River Chinook Salmon

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Project Period: July 1, 2013 – June 30, 2015

Abstract:

The fish parasite *Ichthyophonus* has been hypothesized as a driver of long-term declines in Yukon River Chinook salmon by reducing spawning effectiveness and contributing to pre-spawning mortality. However, most evidence supporting this hypothesis is circumstantial, based either on field survey data that show only correlations, or laboratory studies conducted with surrogate host species that may exhibit different host responses to *Ichthyophonus*. Cause-and-effect relationships can only be demonstrated by a combination of laboratory and field research specifically targeting the Yukon River Chinook salmon strain, placing particular emphasis on understanding the host, parasite, and environmental factors influencing *Ichthyophonus* disease progression and host mortality. This project will test the following hypotheses in Yukon River Chinook salmon: (1) water temperature influences progression and outcome of *Ichthyophonus* infections, (2) stress (corticosteroid) hormone influences initiation, kinetics and outcome of *Ichthyophonus* infections, and (3) the Yukon River Chinook salmon are more susceptible than other genetically distinct Chinook salmon stocks to *Ichthyophonus* infections. This project comprises controlled laboratory parasite exposures in both fresh water and seawater, and will complement field studies by isolating parameters of interest and directly evaluating their influence on the disease process. Better understanding of temperature effects on *Ichthyophonus* infections is useful for development of models to predict prevalence and outcome of infections under current temperature ranges, and temperatures predicted with climate change. Experiments on elevated levels of stress hormones, which are naturally elevated during upstream spawning migrations, are important for understanding potential effects of these immunosuppressive hormones on disease progression and survival. Investigations of *Ichthyophonus* susceptibility will clarify an apparent paradox, whereby *Ichthyophonus* disease is generally not a problem in Chinook salmon populations outside the AYK region, despite often high infection prevalence in prey fishes.

Project Objectives:

Objective 1: Determine whether temperature influences the kinetics and outcome of *Ichthyophonus* infections in Yukon River Chinook salmon. To be met by January 30, 2014.

Objective 2: Determine whether stress hormones (corticosteroids) influence the susceptibility to infection with *Ichthyophonus*, kinetics of the disease, and outcome of infection in Yukon River Chinook salmon. To be met by December 30, 2014.

Objective 3: Determine the relative susceptibilities of Yukon River and Puget Sound Chinook salmon to *Ichthyophonus* infections. To be met by June 30, 2015.