

## Heat stress in Yukon River Chinook salmon

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### **Abstract:**

We will examine evidence of heat stress in Yukon River Chinook salmon (*Oncorhynchus tshawytscha*) using heat shock proteins and gene expression. Yukon River Chinook salmon have been in decline since the 1990s for unknown causes and the pace of decline has recently accelerated. Heat stress during spawning migration has the potential to cause significant prespawm mortality of adult fish. Two biomarkers will be used to assess the presence of heat stress in Yukon River Chinook salmon, the concentration of a specific heat shock protein (HSP70) associated with stress and the expression (i.e., transcription) of genes involved with thermal stress and physiological pathways affected by thermal stress. Fish will be collected during the spawning migration at established monitoring sites throughout the Yukon River watershed including test fisheries at Emmonak and Eagle, weirs on tributaries (East Fork Andreafsky River and Gisasa River), and a subsistence fish wheel near Tanana. A short (<48 h) manipulative temperature experiment will distinguish baseline protein and gene expression levels in fish held at a cooler control temperature from fish held at temperatures associated with low (18 °C) and high (21 °C) heat stress. The potential influence of migration timing, age, and size on the presence of stress indicators will also be evaluated. The results of this study will be used to assess the likelihood of increases in freshwater adult mortality and reduced reproductive success from heat stress. If heat stress indicators are present, managers may adjust escapement goals to compensate for the likelihood of higher prespawm mortality rates.

### **Project Objectives:**

Objective 1: Determine the presence of heat stress in migrating Yukon River Chinook salmon using gene and protein expression.