AYK-SSI PROPOSAL 2019

Project Title: Reducing uncertainty in sub-stock composition to better understand harvest-population diversity trade-offs in Canadian origin Yukon Chinook

Investigator(s): Dr. Matthew Siegle, Principal Investigator/Project Manager, ESSA Technologies Ltd., 600-2695 Granville Street, Vancouver, BC, V6H 3H4

Dr. Brendan Connors, Co-Principal Investigator, Quantitative Assessment Methods Section, Fisheries and Oceans Canada, 9860 West Saanich Road, P.O. Box 6000, Sidney, BC, V8L 4B2

Dr. Joel M.S. Harding, Co-Principal Investigator, Yukon River Salmon Stock Assessment Program, Fisheries and Oceans Canada, 100 - 419 Range Road, Whitehorse, YT, Y1A 3V1

Project Period: May 1, 2019 - June 30, 2020

Study Location: Yukon River watershed, including Canada

Abstract:
Declines in Canadian (CDN) origin Yukon Chinook have severely limited harvest opportunities for the communities in Alaska and Canada that depend upon these salmon for subsistence and cultural needs. These Chinook spawn in over 100 streams, which differ in productivity and carrying capacity due to local adaptation and finite habitat. This biocomplexity is critical to maintaining resilience to environmental change and dampening variability in harvest for fisheries. However, it can also lead to tradeoffs with harvest because not all populations can sustain the same harvest rates. CDN-origin Chinook are currently not managed for this biocomplexity, but instead as a single aggregate stock, which can increase the risk of overexploiting weak stocks. As part of an ongoing AYK-SSI project (#1701), we are investigating these harvest-diversity trade-offs in CDN-origin Chinook in order to evaluate how they affect the ability of alternative management actions to meet a range of management objectives (e.g., meet subsistence needs, protect population diversity). These analyses are predicated upon historical reconstructions of individual sub-stock abundances and dynamics, which in turn are based on genetic stock ID analyses of archived scale samples from the US-Yukon border over the last 35 years. We have identified that low sample sizes and run timing bias in the scale sampling result in imprecise and potentially biased sub-stock composition estimates. We propose to strategically increase the annual number of scales analyzed from 1982-2005. Over 8,000 scales have been analyzed to date to determine annual sub-stock composition of the run. Since 2006 an average of 500 scales have been analyzed annually, however, our current understanding of sub-stock composition from 1982 to 2005 is based on only ~ 150 scales from each year. Increasing the annual number of scales to 250 is predicted to eliminate biases and reduce uncertainty in sub-stock composition estimates by up to 15%. More precise, and less biased, sub-stock composition estimates will translate into reductions in uncertainty that will benefit the sub-stock run-reconstructions and stock-recruitment analyses that are the basis of the management simulation modeling that is currently underway. In addition, they will allow us a unique opportunity to conduct a formal Value of Information analysis on the consequences of improved understanding of population diversity on the performance of alternative mixed-stock harvest strategies for salmon in large river basins.