Multivariate Analysis of Factors Affecting AYK Chinook Salmon

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Abstract:

This project will evaluate the impacts of climate and physical conditions in freshwater and the ocean on AYK Chinook salmon survival using a combination of time-series analyses and multivariate statistical techniques. Dynamic Factor Analysis (DFA), a new multivariate time-series technique, will be used to identify patterns of coherence both among Chinook salmon stocks of the AYK region, and among Chinook salmon stocks across Alaska. This method simultaneously enables the testing of specific hypotheses about the effects of known environmental conditions (e.g., ice break-up dates, strength of the Pacific Decadal Oscillation) while also identifying temporal patterns of variation that are shared by groups of Chinook salmon stocks. We will also use Principal Components Analysis (PCA) to synthesize and quantify the immense spatial and temporal complexity of marine environmental conditions (e.g., SST, wind) during critical Chinook salmon life stages; the goal of these analyses are to identify environmental drivers of AYK Chinook salmon productivity that are not detectable using univariate approaches. Having identified climate patterns that correlate with AYK Chinook salmon returns and productivity (i.e., Recruits-per-Spawner), we will test the ability of these climate variables to forecast AYK Chinook inshore returns given observations of the environmental conditions juvenile and sub-adult salmon experienced earlier in their lives. Finally, we will use the models developed with historical data to evaluate the future of AYK Chinook salmon under different future climate scenarios.

Project Objectives:

Objective 1: Identify physical climate conditions and biological indicators that correlate with Chinook returns. To be completed by May 2014.

Objective 2: Test the ability of the climate and biological indicators to forecast Chinook salmon returns. To be completed by December 2014.

Objective 3: Evaluate future returns of Chinook salmon under different climate forecast. To be completed by February 2015.