

Assessment of Chinook salmon freshwater production

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Abstract:

Kuskokwim River Chinook salmon management relies heavily on a manager's ability to anticipate a population's stability and growth rates. Many AYK adult Chinook salmon spawner-recruit relationships have shown evidence for strong density dependence and used to predict their respective populations' productivity. Because the long-term variation and recent declines in AYK Chinook Salmon stocks is thought to be at least partially caused by this strong density-dependent effect, partitioning density dependent effects between the freshwater and marine life history phases may highlight the relative importance of the two periods and may help anticipate the overall productivity of the population. We propose to use both an estimate of Chinook Salmon smolts and pre-smolts emigrating past the Kwethluk River Weir and adult escapement data to robustly quantify relationships between pre-smolt/smolt abundance, total returns and spawning escapements; thus, evaluating the hypothesis that the freshwater juvenile life history phase is not responsible for much of the density dependence seen in adult returns. It has been hypothesized that there is plasticity in the life history strategies of AYK Chinook Salmon allowing for populations to compensate for both environmental and spawning density variation. This hypothesis relies on the assumption that there is either "unseeded" suitable habitat available to migrants. Monitoring the relative level of inter-annual movement of pre-smolts to smolts and relating it to spawner abundance and future adult returns will identify the relative importance of plasticity in life history strategies. Smolt and pre-smolt abundance will be estimated using a rotary screw trap and mark-recapture techniques. A pilot study was completed in 2015 with smolt estimates from the 2013 brood year. Spawner abundance has increased 10 fold from 2013 -2015, providing a unique opportunity to monitor a wide range of potential subsequent changes in smolt and pre-smolt abundances which may inform the relative roll of density dependence in freshwater and marine environments. This work will provide insights into recent productivity declines and help place into context the extent of freshwater density dependency on adult returns.

Project Objectives:

Objective 1. Identify the relationships between smolt abundance and spawning escapements potentially partitioning density dependence between freshwater and marine life cycles.

Task 1. To estimate numbers of Chinook Salmon smolts emigrating from the Kwethluk River through time such that estimates are within 25% of the true value 90% of the time. To be met by September 30 2016, 2017, 2018.

Task 2. To compare variations in adult productivity with smolt production to determine if density dependent effects are present in freshwater environments. To be met by June 30, 2018.

Objective 2. Quantify variables that may be related to changes in environment and or habitat resulting in changes in mortality.

Task 1. To estimate the age and size composition of Chinook Salmon smolts in the Kwethluk River such that simultaneous 90% confidence intervals have a maximum width of 0.20; To be met by September 30 2016, 2017. 2018.

Task 2. To collect environmental measurements including annual daily water temperatures and stage heights to correlate with smolt outmigration and growth. Collection of environmental factors to be met by September 30, 2016, 2017, June 30 2018.

Task 3. Monitor the inter-annual movement of presmolt to spawner abundance identifying the relative importance of the presmolt movement to future adult returns. Annual presmolt movement to be met by Sept 30, 2016, 2017, June 30 2018.