Backgrounder: Chinook Salmon Stock Assessment Program and the Potential to Develop a CWT Indicator Program at Chilko River

Since 2010, the Department of Fisheries and Oceans (DFO) and the Tsilhqot'in National Government's (TNG) Fisheries Program have cooperatively implemented a mark-recapture study to estimate annual Chinook escapements in the Chilko River. Funded through the Sentinel Stocks Program (SSP) of the Pacific Salmon Commission (PSC), this study has produced high quality escapement estimates each year since then. Although 2013 was expected to be the final year of funding, the PSC's SSP has recently confirmed funding for one additional year of study at Chilko in fall 2014. The Chilko SSP project was initiated to address two major objectives:

- provide calibration of the aerial count methods employed throughout the upper Fraser; and,
- to investigate the feasibility of developing a Chinook salmon CWT program at Chilko.

CWT indicator projects provide the capacity to understand the distribution of fisheries impacts in marine and freshwaters, as well as annual estimates of marine survival for each indicator. For a stock to be used as a CWT indicator population, several conditions must be met. These include:

- That the population behaves in a manner representative of the other populations within the management unit that it is intended to represent;
- That highly precise and accurate estimates of spawning escapement of the proposed indicator stock can be attained annually;
- That sufficient CWT'd juveniles can be released annually to co-migrate with the naturally produced juveniles from that population, to recruit and be vulnerable to being caught in ocean fisheries or returning to the river as escapement
- And that carcass sampling rates in the escapement estimation program are adequate to recover sufficient numbers of coded wire tags from each age group represented in the escapement.

To date, CWT indicators have been established for three Fraser Chinook salmon management units; the Spring 4_2's (Nicola), Fall 4_1's (Harrison) and Summer 4_1's (Lower Shuswap), where high precision estimation is reliably achievable on an annual basis. The Chilko Chinook population is a component of the Fraser Summer Run 5_2 management unit (and part of the Fraser Spring-Summer 5_2's), neither of which are currently represented by an indicator stock. The lack of indicators for both the Summer 5_2 and Spring 5_2 Fraser Chinook units has been identified as a serious knowledge gap by the Southern BC Chinook Expert Panel Report, and the Upper Fraser Fisheries Conservation Alliance (UFFCA). Development of suitable indicators for the Spring 5_2 and Summer 5_2 management units would support PSC and domestic Chinook management objectives.

The Chilko SSP project has achieved the following since its inception in 2010:

- Annual high precision estimates of the Chinook escapement to the Chilko River, by age and sex, with high carcass sampling rates. These estimates have markedly improved our understanding of the efficacy of aerial escapement surveys in the Chilko and other middle Fraser tributaries.
- Established that high precision escapement estimation is feasible in an ongoing manner for the Chilko Chinook population. This latter finding is an essential attribute of any population being considered as a candidate for a CWT indicator project.If the annual escapements to a population cannot be reliably estimated using high precision methods then that population is not suitable for indicator stock program.

The next step in assessing the potential to use Chilko as an indicator stock is to determine whether Coded Wire Tagging (CWT'ing) is feasible for that population. CWT'ing is required to produce an adequate number of uniquely marked fish for subsequent recovery in coast-wide fisheries, and in the escapement for those that return to spawn. For the Fraser River 5_2 management units, about 300K CWT'd yearling smolts released annually would be required to provide sufficient recoveries for use as an indicator stock at current marine survival rates. The required release group size would be re-evaluated once survival rates had been measured.

Due to the widespread dispersal of naturally rearing juveniles and the snow dominated hydrograph with large spring freshets, it is unlikely that sufficient tags could be applied to naturally produced smolts, therefore CWT's must be applied to hatchery-reared juvenile Chinook, which are then released as smolts to co-migrate with naturally produced smolts from the same stock. There have been no hatchery releases at Chilko since the early 1990's, and no hatchery releases into the Chilko River have ever employed an appropriately timed and sized yearling smolt strategy that mirrors the timing and size of naturally-produced smolts. The required fish culture program, to develop a full scale CWT indicator at Chilko, must address investigation of optimal adult capture techniques, viability of long distance egg and juvenile transportation, disease prevalence, biological traits of the populations (e.g. fecundity), and other aspects of how these fish respond to culture.

In 2014, we have the opportunity to investigate the feasibility of producing an indicator stock group for release at Chilko, by examining brood capture options, rearing strategies, disease prevalence, and existing hatchery capacity that may be able to support future assessment releases for Chilko. The target for 2014 is to collect 150,000 eggs and to release 100,000 coded wire tagged yearling smolts. It is estimated that 25-30 pairs of Chinook will be required and captured using tanglenets in the Lingfield area of Chilko River. Two or three egg take events will be required with gametes from both sexes being collected in the field. Immediately after collection, eggs/milt will be cooled and transported by air or ground to Spius Creek hatchery, near Merritt, where fertilization will take place. All adult females used for brood will be sampled to assess Bacterial Kidney Disease (BKD) prevalence.

Incubation is planned for Spius Creek hatchery, using combinations of surface, ground and chilled ground water, to provide the necessary temperatures to rear/produce yearling Chinook smolts of the appropriate size. Eggs will be segregated by female to facilitate removal of BKD-positive eggs that exceed thresholds as determined by the SEP Veterinarian. Following emergence and ponding in spring 2015, the juveniles will be transported to Chehalis River hatchery near Agassiz, due to the lack of suitable available capacity at any of the hatcheries in the Interior. They will be reared to a size of ~18 grams by spring 2016, CWT's implanted, then transported back to the Chilko River for release. An imprinting strategy for that release will be developed.

It should be stressed that the proposed collection of brood in the fall of 2014, and subsequent release of CWT smolts in the spring of 2016 will not create an indicator population for the Chilko River, although those fish will recruit to fisheries and the escapement over several years post-release. The proposed experimental release will provide the opportunity to evaluate the feasibility of undertaking portions of the hatchery work associated with indicator release production. Creation of an indicator stock program will require the ongoing availability of suitable enhancement resources to produce annual releases of ~300K yearling CWT smolts, ongoing fishery sampling and undertaking intensive annual escapement estimation and CWT recovery programs to yield high precision estimates of the number of tagged and untagged returns.

For more information, ……..