

# **Increased CWT application in Southern B.C. Coho indicator stocks**

Final Report to the Pacific Salmon Commission's Southern Endowment Fund Committee

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## **INTRODUCTION**

The 2005 Pacific Salmon Commission (PSC) Report of the Expert Panel on the Future of the Coded Wire Tag Recovery Program for Pacific Salmon (PSC Tech. Report No. 18) identified shortcomings of Coho indicator stocks due to low tag recoveries. With the prolonged low marine survival rates of Southern B.C. (SBC) Coho and subsequent reduction in fisheries, the Coho stocks in SBC fail to obtain sufficient recoveries of coded-wire tags (CWTs). In addition to the increased sampling already implemented as part of the CWT improvement program, increasing the number of CWT's applied to Coho will provide better information regarding marine survival, distribution and exploitation rates of SBC Coho.

## **PROJECT OBJECTIVES**

The primary objective of this project is to purchase and apply CWTs on adipose fin-clipped (AFC) juvenile Coho salmon, incremental to the current tagging levels already funded by the Canadian Department of Fisheries & Oceans (CDFO) for four SBC Coho indicator stocks to meet the CWT release group size standards as outlined in PSC Tech. Rep. 25.

## **METHODS**

Adult Coho salmon are captured by CDFO staff upon return to their spawning rivers in the summer or fall. Exact capture methods differ by location, but can include a variety of weir, beach seine, angling and tangle net. Adult Coho are held at a hatchery, either in concrete ponds or in circular fiberglass tubs until they are ready to be spawned. This determination is made by the fish culturists, who check the females to ensure that the eggs are loose, the belly is soft, and the ovipositor is distended. Eggs are gathered by incising the belly of the female and collecting them in a disinfected container. Milt is added from one or two males to fertilize the eggs. Water is then added to the fertilized eggs, after that they are disinfected in a solution of Ovadine and water for 10 minutes. It is at this stage that fish culturists must conduct bulk fecundity sampling to try to ensure that egg targets are met.

Fertilized eggs are placed into the incubation container, which may be a Heath Tray, Atkins cell, or bulk box. Fungal treatments are conducted on eggs, typically using Parasite-S. Coho eggs typically require approximately 400-500 accumulated thermal units (ATUs) prior to hatching (Billard & Jensen, 1996). Emerged fry are ponded into early rearing containers where they are reared until they are of suitable size for coded wire tagging. Fish health monitoring occurs continuously throughout the early rearing period, with prophylactic and antibiotic treatments used as required. The Salmonid Enhancement Program (SEP) veterinarian is available to diagnose any fish health issues that may arise and works closely with all hatcheries to ensure that fish are healthy prior to marking and release.

The procedures used to implant the CWTs into juvenile Coho are documented in detail by Nichols & Hillaby (1990). Juveniles must not be fed for 48 hours prior to marking and tagging, as this reduces the output of

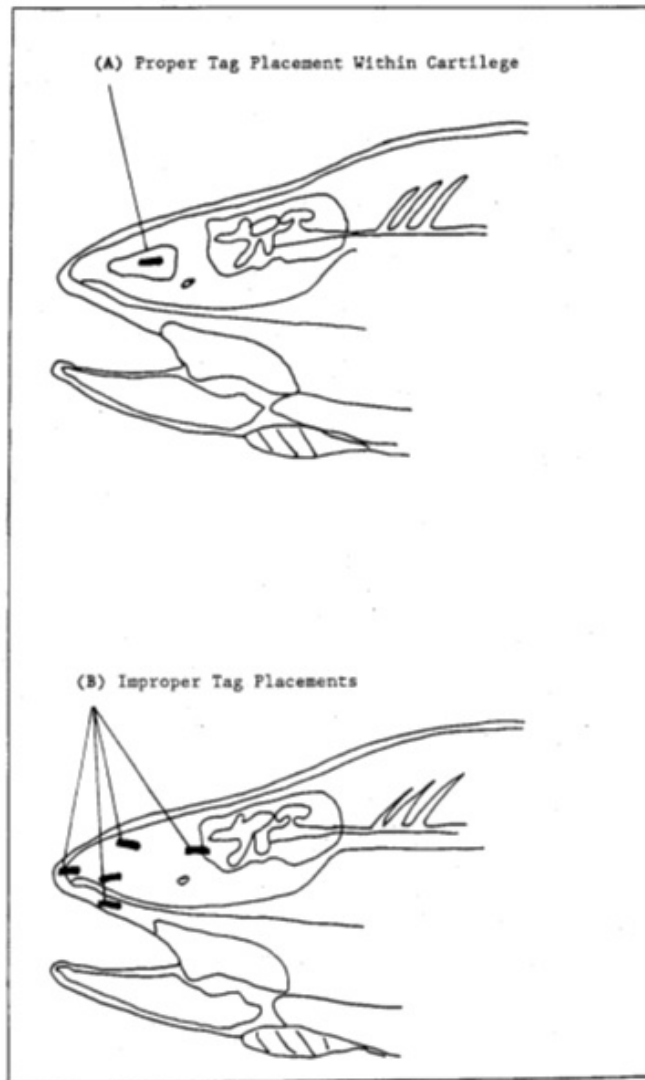
ammonia and excretory by-products associated with stressful fish handling. Juvenile Coho are transported to the tagging area in small batches and placed into a holding tank prior to being anaesthetized using Tricaine methanesulfonate (TMS). Following anaesthetization, the adipose fin of each juvenile salmon is excised using a set of surgical scissors, after which it is placed nose-first into a Mark IV CWT machine for tag insertion in the nasal tissue. Fish size-grading will occur at fin clipping to ensure that the appropriate sized head mold is used for fish size. Typically, there are 2 or 3 Mark IVs operating simultaneously, often with different sized head molds. Tagged fish are passed through a quality control device to ensure successful tag implantation.

Tag placement and retention is monitored in three ways. A small group of tagged fish will be retained at the end of each tagging day for a 24 hour retention check the following day. In many instances, small checks will be conducted on a more immediate basis to ensure quality control. In addition to the 24 hour retention check, a larger group of at least 500 fish is kept for up to 30 days to conduct a longer term retention check (Table 2). Finally, to ensure proper tag placement, one tagged smolt is euthanized and dissected every hour, with the tag placement observed (Figure 1).

Detailed operational procedures may vary slightly by facility, but generally follow the practices as described by Nichols & Hillaby (1990).

Following tag application, sub-yearling juvenile Coho are released from the hatchery back into their river of origin after a short period of holding (approximately 2 week). Yearling juvenile Coho remain on-site at the hatchery for further rearing. Hatcheries that have swim-in infrastructure will release directly from the hatchery to the river, while other facilities will transport the tagged fish to the river and force release them. Juvenile releases typically occur when Coho are smolting, although some juveniles may remain in the river for a short period of time prior to migrating to saltwater.

**Figure 1** - Proper coded wire tag placement (Nichols & Hillaby, 1990)



## RESULTS

Tagging project operations for Quinsam, Big Qualicum, Inch and Spius were completed at or before the expected date. Big Qualicum\* initially tagged 100,453 Coho, however experienced a disease outbreak soon after tagging was complete, resulting in a mortality loss of 19.66%, and a current holding number of 80,695 tagged Coho.

**Table 1** - Tagging schedule by hatchery.

Hatchery	Stock	Tagging Period
Qualicum	Big Qualicum River	June
Quinsam	Quinsam River	December
Inch	Inch Creek	September
Spius	Coldwater River	October

**Table 2** - Estimated tag loss rate (30 day tag retention check) by hatchery and stock in 2019 (2018 brood).

Hatchery	Stock	Tag Loss
Big Qualicum*	Big Qualicum River	0.00%
Quinsam	Quinsam River	2.19%
Inch	Inch Creek	1.05%
Spius	Coldwater River	1.24%

**Table 3** – Tag application targets and actuals (base level and incremental) for the 2019 tag application (2018 brood).

Stock	Core CWT Target	Additional CWT Target	Total CWT Target	Applied in 2019
Big Qualicum River	40,000	60,000	100,000	80,695
Quinsam River	40,000	60,000	100,000	104,016
Inch Creek	90,000	60,000	150,000	147,659
Coldwater River	40,000	25,000	65,000	62,165
<b>Total</b>	<b>210,000</b>	<b>205,000</b>	<b>415,000</b>	<b>394,535</b>

## DISCUSSION

Tag application numbers exceeded targets on 1 of 4 stocks, with 3 of the 4 stocks coming in under target. It is common to exceed CWT targets as the spools of wire that the tags are printed on often have 5-10% more tags than is stated. Increases in tagging numbers aid in increasing the number of observed and estimated CWTs, which will result in increased precision in estimated survival and exploitation rates. The total tag application number was 394,535; 20,465 short of the overall goal of 415,000 CWTs applied.

Actual tag application numbers are subject to variability for several reasons, including, but not limited to: insufficient broodstock available for egg target, lower than expected in-hatchery survival, or unresolvable tagging equipment malfunctions. Hatcheries with large production targets to support fisheries will likely achieve their tag target. Conversely, stocks that are enhanced for a stock assessment objective (Coldwater) have less flexibility in their targets. In addition, Spius hatchery has capacity limitations; therefore the Coldwater stock being reared at that facility cannot exceed the target.

Although the direct results of the tagging application completed in 2019 will not be apparent until the majority of those fish begin to recruit to the fishery and escapement, it can be assumed with certainty that the number of observed tags in catch and escapement will have increased as a function of the increase in tagging over the base level. This project represents the first step in a complex process that requires fishery and escapement sampling to recover CWTs in future years. Although the 2019 recovery year marks the end of the brood cycle for this project, which began with the 2015 brood year, the 2019 recovery data is still considered preliminary. Once data analysis of all cohort data between 2015-2019 is complete, we will be able to determine whether project objectives are being met; namely, the provision of improved information regarding marine survival, distribution and exploitation rates of Southern BC Coho through increased CWT application.

## APPENDIX

### Financial Expenditure Summary

Details of expenditures registered in the DFO financial system at fiscal year-end.

<b>Funding Total</b>	<b>\$ 70,201</b>
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DFO Casual Hire Salary for CWT application of: - Big Qualicum - Quinsam River - Inch Creek	\$ 20,574
Spilus Hatchery (Coldwater stock) Contracting Costs	\$ 2,170
Equipment and Supplies (CWTs and CWT equipment)	\$ 47,457
<b>Total Costs</b>	<b>\$ 70,201</b>

<b>Balance</b> ( <i>refunded to PSC</i> )	<b>\$ 0</b>
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## REFERENCES

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