

Increased CWT application in Southern B.C. coho indicator stocks

Final Report to the Southern Endowment Fund Committee

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INTRODUCTION

The 2005 PSC Report of the Expert Panel on the Future of the Coded Wire Tag Recovery Program for Pacific Salmon 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 directed towards coho increasing the number of CWT's applied to coho will provide better information regarding marine survival, distribution and exploitation rates of SBC coho. This project proposes to increase CWT application at four hatchery stocks to provide this information to analysts and fishery managers.

PROJECT OBJECTIVES

The primary and sole objective of this project was to purchase and apply CWTs on Adipose Fin Clipped (AFC) juvenile coho salmon incremental to the current tagging levels already funded by 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 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 the hatchery, either in concrete ponds or in circular fiberglass tubs (3 m in diameter) 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 then added from one or two males to fertilize the eggs. Water is then added to the fertilized eggs, after which 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). Swim up 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.

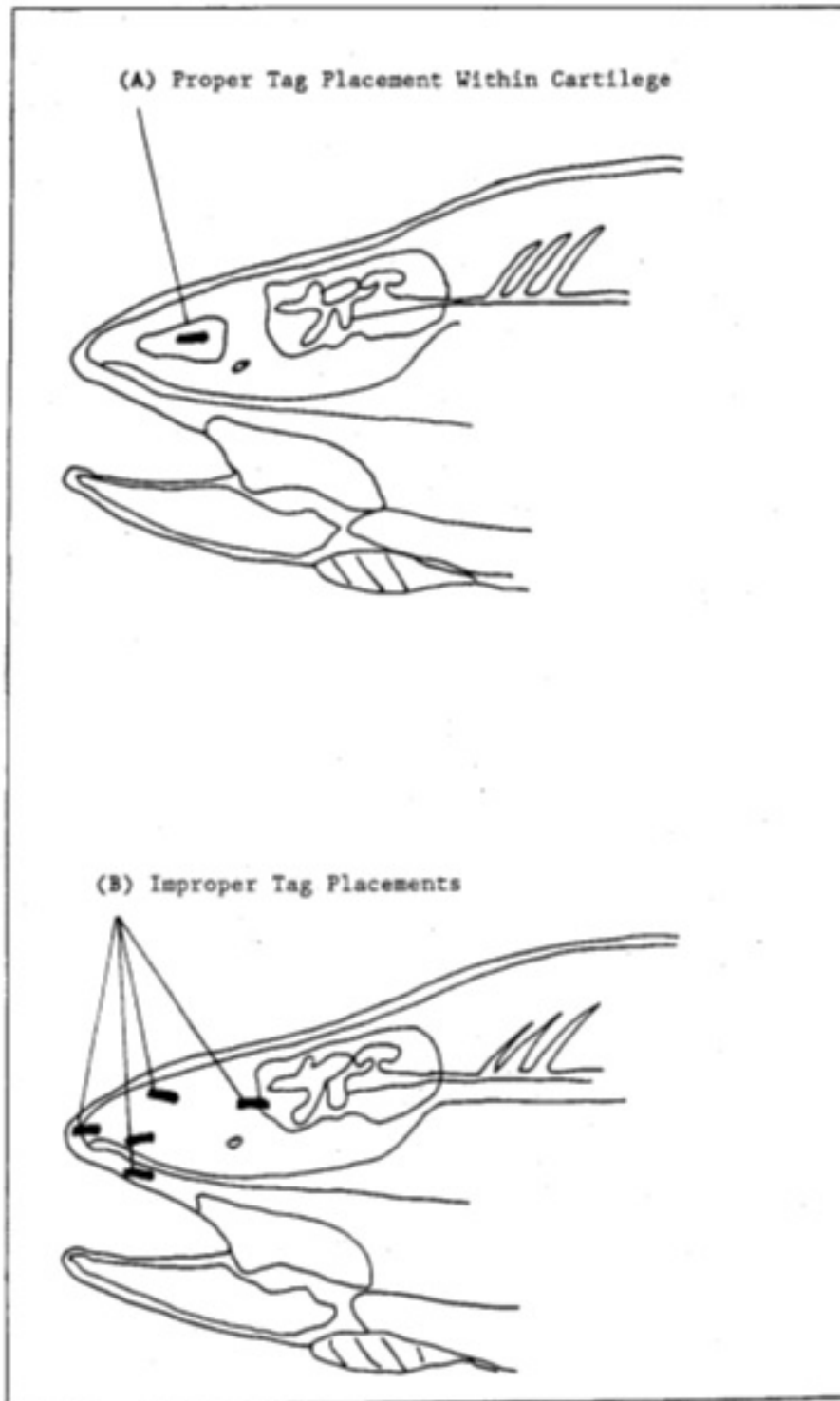
The procedures used to implant the CWTs into juvenile coho are documented in detail by Nichols & Hillaby (1990). Fry must be starved for 48 hours prior to marking and tagging, as this reduces the output of ammonia and excretory by-products associated with stressful fish handling. Juvenile coho are transported to the tagging area in small batches 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 (QCD) to ensure successful tag implantation.

Tag placement and retention is monitored in 3 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 (at lunch and at end of day) 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, juvenile coho are released from the hatchery back into their river of origin after a short period of holding (~2 week). 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 stay 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

Coded wire tagging began on schedule at all sites, as water temperatures during the incubation and rearing period were relatively normal. All tagging project operations were completed at or before the expected date, and there were no significant fish health issues during the tagging process.

Table 1 - Tagging schedule by hatchery.

Hatchery	Stock	Tagging Period
Qualicum	Qualicum	May
Quinsam	Quinsam	May
Inch	Inch	August
Spius	Coldwater	September

Table 2 - Estimated tag loss rate by hatchery / stock.

Hatchery	Stock	Tag Loss
Qualicum	Qualicum	0.003%
Quinsam	Quinsam	0.19%
Inch	Inch	0.20%
Spius	Coldwater	not yet available

Table 3 – Tag application targets and actuals (base level and incremental) for the 2015 tag application.

Location	Core CWT Target	Additional CWT Target	Total CWT Target	Applied in 2015	Notes
Big Qualicum River	40,000	60,000	100,000	145,897 ¹	Exceeded target by 45,897
Quinsam River	40,000	60,000	100,000	181,067 ²	Exceeded target by 81,067
Inch Creek	40,000	60,000	100,000	150,152	Exceeded target by 50,152
Coldwater River	40,000	25,000	65,000	58,181	Under target by 6,819
Total	160,000	205,000	365,000	535,297	Exceeded target by 170,297

¹ Big Qualicum CWT's applied in 2015 include 42.6K that are an additional experimental late release.

² Quinsam River CWT's applied in 2015 include 40.2K that are an additional experimental late release.

DISCUSSION

Actual tag application numbers exceeded targets on 3 of 4 stocks. The project overall goal of 365,000 CWTs applied was surpassed. It is common to apply up to 10% more tags than planned, as the spools of wire that the tags are printed on can be run out right to the end, which allows some extra tags to be applied. Juveniles are reared with the goal of having surplus to the target. This mitigates any disease or mortality issues. It can often lead to having more juveniles of a particular stock than planned. It is very rare for these extra fish to be not tagged if tags are available. Increases in tagging numbers help to increase the number of observed and estimated CWTs, which will result in increased precision in estimated of survival and exploitation rate.

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 that have large production targets to support fisheries will very rarely fail to reach their tag target. For example, a Big Qualicum hatchery has a production target of 400,000 smolts with 140,000 required for tagging (base level + incremental = experimental late release). Thus, even with a weak adult return and not meeting their egg target, the tagging target can still be met. Conversely, stocks that are enhanced purely for stock assessment purposes (Coldwater) have less flexibility in their targets. On top of that, the Coldwater stock has rearing limitations due to capacity at Spius hatchery being maxed out.

Although the direct results of the tagging application completed in 2015 will not be apparent until the majority of those fish begin to recruit to the fishery and escapement in 2017, 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.

It is too early to be able to assess the ultimate success of this project. This project represents the first step in a complex process that requires fishery and escapement sampling to recover CWTs in future years.

APPENDIX 1

Financial Expenditure Summary

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

PACIFIC SALMON COMMISSION (PSC)

Project Code 57025 2015-2016 Expenditures

Contractor Costs

Hatchery / Facility	Contractor	Cost
Spius	EH-Fish	\$ 2,150
		\$ 2,150

Salary Costs

Hatchery / Facility	Contractor	Cost
Inch Creek	salary	\$ 4,410
Quinsam	salary	\$ 9,109
		\$ 13,593

Equipment & Gear Costs

Vendor	Item(s)	Cost
NMT	CWTs	\$ 22,268
Skretting	Fish Food	\$ 4,127
		\$ 26,394

Total Expenditures \$ **42,063**

Total Received from PSC \$ **46,737**

Balance \$ **4,600**

Refunded to the PSC \$ **4,600**

Balance \$ **74**

REFERENCES

Nichols, T.L., and J.E. Hillaby. 1990. Manual for Coded-Wire Tagging and Fin Clipping of Juvenile Salmon at Enhancement Operations Facilities. Prepared under contract #90SB.FP501-7-0060/A to Supply and Services Canada by Streamline Consulting Services Limited

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