

**Northern Boundary and Transboundary Rivers
Restoration & Enhancement Fund**

**TAKU RIVER COHO SMOLT TAGGING
AUGMENTATION 2015**

Final Report

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INTRODUCTION:

The Taku River (Figure 1) coho salmon stock assessment project is a cooperative effort between Canada and the United States, led by and the Department of Fisheries and Oceans Canada (DFO) and the Alaska Department of Fish and Game (ADF&G). This project was initiated in 1987 and has been operated primarily off of federal funding since that time. However, in 1999 the Pacific Salmon Commission identified the need to have an approved biological escapement goal for this major stock of coho salmon producing an estimated 65,000 to 440,000 adult coho salmon annually, many of which are caught in commercial, First Nation, and recreational fisheries in British Columbia and Southeast Alaska. Thus, additional funding was necessary to run the adult project through the majority of the adult run; moreover, it was agreed that smolt tagging numbers had to be increased in order to boost the coded wire tag (CWT) marked fractions in order to satisfy the sample sizes required for new stratified coho salmon smolt estimation analyses and to increase the accuracy and precision of not only the coho salmon harvest estimates but for Chinook salmon with the understanding that new directed Chinook fisheries were in the foreseeable future. The Northern Fund has provided assistance since 2006 that has augmented the program by permitting the use of three traplines during spring smolt tagging and ensured that the adult mark-recapture project would run through early October in each year.

Each spring since 1991, coho salmon smolt have been tagged with CWTs as they emigrate from the Taku River. In the following year, returning adults are sampled for these tags using fish wheels and set gillnets operated near Canyon Island in the lower Taku River in the U.S. At the same time, adults are tagged as part of a two-event mark-recapture study to estimate the inriver abundance and sampled for age, sex, and length composition data. A short distance upriver, in Canada, adults are inspected in the commercial gillnet fishery. Typically the commercial fishery ceases in early September and it is necessary to obtain tag ratio information by contract. Data gathered from these efforts have provided estimates of inriver abundance and escapement since 1987, estimates of harvest, exploitation, survival, smolt abundance, and total run since 1992, and run forecasts since 1996. These combined efforts inriver along with adult sampling programs in the various marine fisheries allow detailed stock assessment analyses.

OBJECTIVES:

The specific objectives expected to be achieved by this project are:

1. Estimate the number of coho salmon smolt (≥ 75 mm FL) leaving the Taku River and originating from above Canyon Island, such that the estimated number is within 25% of the true value 95% of the time.
2. Estimate the marine harvest of coho salmon from Taku River originating from above Canyon Island, in sampled salmon fisheries via recovery of CWTs applied in prior years such that the half-width of the calculated 95% confidence interval is $\leq 20\%$ of the estimate.
3. Estimate the age composition of coho salmon smolt captured near Canyon Island such that all age classes are estimated within ± 7 percentage points of their true values 95% of the time.
4. Estimate the mean length of coho salmon smolt captured near Canyon Island such that the estimated means are within ± 2 mm of the true mean 95% of the time.
5. Test the hypothesis that smaller coho salmon smolt (75–85 mm FL) survive at the same rate as larger smolt (>85 mm).



Figure 1.-Taku River drainage, northwestern British Columbia, and Southeast Alaska.

METHODS:

Smolt Abundance (objective 1)

Personnel from DFO and ADF&G captured coho salmon smolt using baited (salmon roe) minnow traps and beach seines. Captured coho salmon smolt were transported to a central camp each day for sorting and tagging. All healthy coho salmon smolt ≥ 75 mm (fork length) were anesthetized in a buffered solution of tricaine methanesulfonate (MS-222), injected with a CWT, and had their adipose fin clipped as part of the Event I of the mark-recapture experiment to estimate smolt abundance. Fish wheels and set gillnets will be used to capture coho salmon at Canyon Island as Event II of the mark-recapture experiment (June through early October each season). Coho salmon will be carefully removed from the fish wheels or gillnets and placed into a trough filled with water. Every coho salmon at Canyon Island will be inspected for a missing adipose fin as Event II of the mark-recapture experiment to estimate smolt abundance. All healthy coho salmon 350 mm mid-eye to fork of tail and larger caught in either fish wheels or gillnets will have their length and sex recorded and will be tagged with an individually numbered “spaghetti” tag sewn through the dorsal musculature just below the posterior portion of the dorsal fin as Event I of a separate mark-recapture project to estimate adult coho salmon escapement.

Marine Harvest (objective 2)

Marine harvest for Taku River coho salmon (originating above Canyon Island) will be estimated in various marine fisheries using procedures from Bernard et al. (1998). A stratified catch sampling approach will be used in marine commercial and recreational fisheries across Southeast Alaska.

Age Composition (objective 3)

A systematically drawn sample of coho salmon smolt scales was taken at a rate of one in every 100 healthy fish ≥ 75 mm (fork length). Each fish sampled for age had 12-15 scales removed from the preferred area (Scarnecchia 1979) on the left side of each fish and pressed between two microscope slides.

Mean length (objective 4)

A systematically drawn sample of coho salmon smolt lengths was taken at a rate of one in every 100 healthy fish ≥ 75 mm (fork length). Each fish measured for length was measured from the tip of the snout to the fork of the tail. Length measurements were taken to the nearest millimeter.

Smolt survival (objective 5)

Two unique CWT codes were used for tagging coho salmon smolt of different sizes. Smolt 75-85mm (fork length) was tagged with one code and smolt >85 mm (fork length) was tagged with a separate code. Different CWT codes will be used to determine if survival rates are the same between the different size categories. All adult coho salmon are sampled for the presence/absence of an adipose fin at Canyon Island as part of event II of the smolt abundance mark-recapture experiment. A missing adipose fin signifies a fish implanted with a CWT. CWTs will be decoded for each fish missing an adipose fin, and the associated data will be used in testing the hypothesis that smaller coho salmon smolt survive at the same rate as large coho salmon smolt.

RESULTS AND DISCUSSION:

In 2016, 12,026 coho salmon smolt (Table 1) were tagged with CWTs and adipose fin clipped in the Event I efforts near Canyon Island. Coho smolt abundance and smolt survival for the 2016 release year will not be determined until the end of the 2017 adult coho salmon sampling season. 116 coho salmon smolt were sampled for age, length, and weight. The estimated age composition of coho salmon smolt sampled in 2016 is still pending age analysis. The mean length of coho salmon smolt in 2016 was 93 mm (SD = 13). The mean weight of coho salmon smolt in 2016 was 8.4 grams (SD = 4). The marine harvest of coho salmon will be estimated after the entire 2016 release year has returned in 2017.

Table 1.-Numbers of coho salmon smolt tagged with CWTs near Canyon Island in the lower Taku River as part of event 1 of a two-event mark-recapture experiment, 1991-2016.

Year	Coho smolt CWTd
1991	3,954
1992	6,647
1993	5,081
1994	11,462
1995	12,268
1996	14,896
1997	15,364
1998	19,852
1999	30,759
2000	44,871
2001	50,920
2002	23,262
2003	32,620
2004	16,164
2005	32,544
2006	34,139
2007	12,083
2008	28,498
2009	14,534
2010	23,494
2011	14,647
2012	13,596
2013	6,829
2014	4,964
2015	19,384
2016	12,026

CONCLUSION:

In the spring of 2016, the Northern Fund was used to operate a second smolt trapline and to fully staff the CWT tagging operations by ADF&G. All field work was conducted from early April through June, 2016. The additional funds provided by the Northern Fund doubled the effort and catches of ADF&G. The additional effort is essential in meeting project objectives, especially during years with low smolt abundance or catches, and have further emphasized the importance to continue these efforts to support abundance-based management of coho salmon on the Taku River as implemented by the Pacific Salmon Commission ((PSC 1999, p. 26, Chapter 1, Paragraph 3(b)(2)(i)).

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DETAILED BUDGET SUMMARY:

Table 2.- Allocated and expended costs for major spending categories see in the Northern Fund project Taku River Coho Smolt Tagging Augmentation, 2015.

Line Item	Allocations	Expenditures	Balance
Personnel	\$45,910.00	\$45,167.96	\$742.04
Travel	\$0.00	\$0.00	\$0.00
Contractual	\$4,800.00	\$4,772.11	\$27.89
Commodities	\$11,648.90	\$11,992.75	(\$343.85)
Equipment	\$0.00	\$0.00	\$0.00
Administrative Overhead	\$9,437.10	\$9,437.10	\$0.00
All Lines	\$71,796.00	\$71,369.92	\$426.08

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Bernard, D. R., R. P. Marshall, and J. E. Clark. 1998. Planning sampling programs to estimate salmon harvest with coded-wire tags. *Canadian Journal of Fisheries and Aquatic Sciences* 55:1983–1995.

Scarnecchia, D. L. 1979. Variation of scale characteristics of coho salmon with sampling location on the body. *Progressive Fish Culturist* 41(3):132–135.