

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

**TAKU RIVER COHO SALMON ESCAPEMENT AND
SMOLT TAGGING AUGMENTATION**

Final Report

Prepared by

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INTRODUCTION:

The stock assessment program on coho salmon originating from the Taku River ([Figure 1](#)) is a cooperative effort among the Alaska Department of Fish and Game (ADF&G), Fisheries and Oceans Canada (DFO), and the Taku River Tlingit First Nation (TRTFN). This project was initiated in 1987 and has been operated primarily off of U.S. federal aid funding and some DFO funding since that time; this funding has become insecure. However, in 1999 the Pacific Salmon Commission identified the need to have an approved biological escapement goal for this major stock of coho salmon, which produces an estimated 65,000 to 440,000 adult coho salmon annually, many of which are caught in commercial and recreational fisheries in Southeast Alaska and in Canadian inriver fisheries. Thus, additional funding was necessary to run the coho adult project through the majority of the adult run. Moreover, it was agreed that Chinook and coho smolt tagging numbers had to be increased to boost the coded wire tag (CWT) marked fractions 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 as well with the understanding that new directed Chinook fisheries would be developed. In response to these needs, the Northern Fund provided funding beginning in 2006 to allow the addition of a third juvenile trap line in order to boost coho and Chinook salmon tagging numbers and the associated CWT marked fractions and allow the operation of the coho salmon adult tagging project through the first week of October to encompass the majority of the adult run.

Each spring since 1991, coho salmon juveniles have been tagged with CWTs as they emigrate from the Taku River. 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. 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 late August and it is necessary to obtain tag ratio information by contract. Data gathered from these efforts has provided estimates of inriver abundance and escapement since 1987, estimates of harvest, exploitation, survival, juvenile 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.

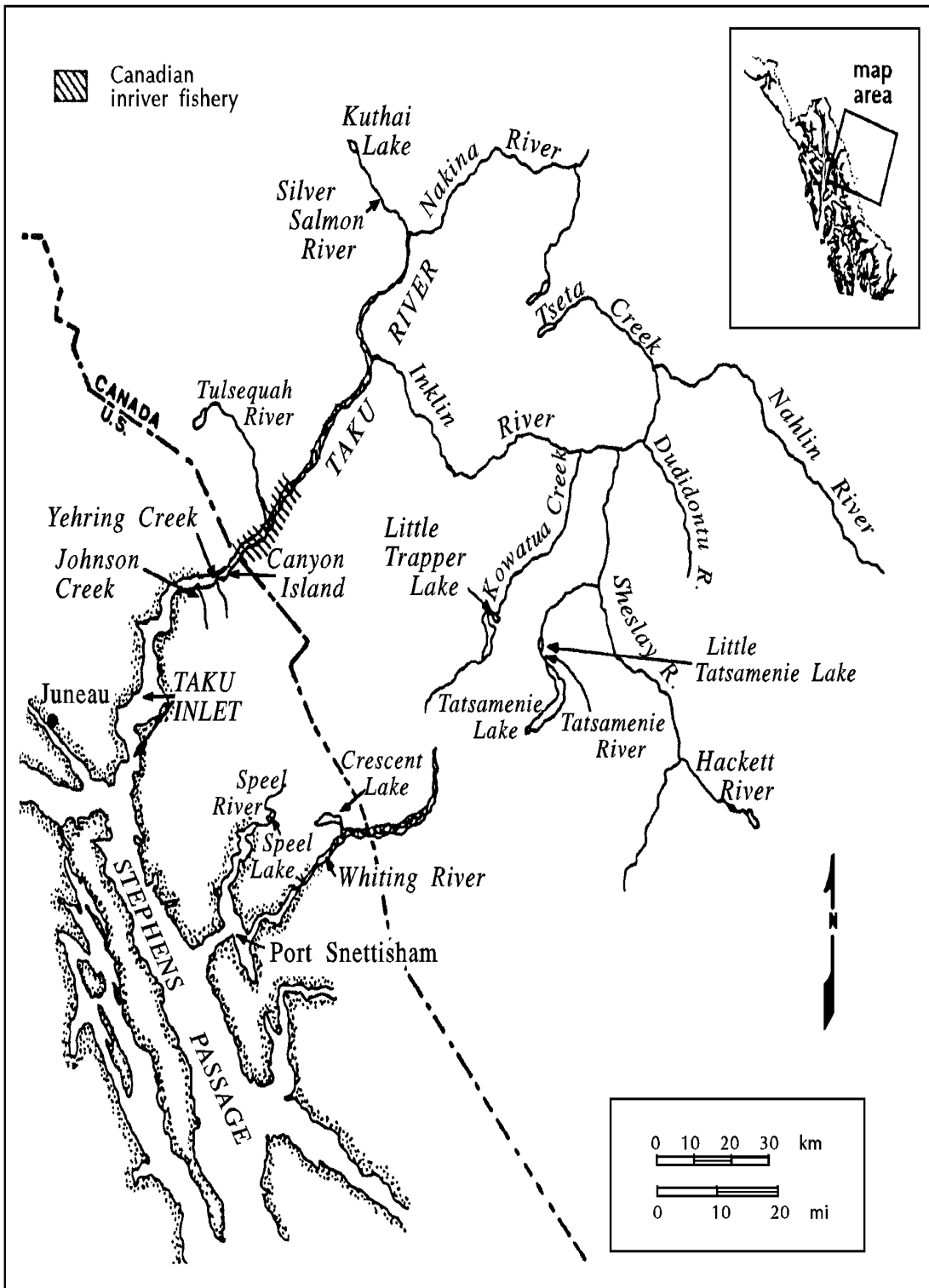


Figure 1.-Taku River drainage, northwestern British Columbia, and Southeast Alaska.

JUVENILE AND ADULT TAGGING:

Funds from this project allowed the addition of a third juvenile trap line in 2006, 2007 and 2008 resulting in a total of 34,117, 12,060 and 27,171 coho salmon juveniles being released with valid CWTs in each of these years, respectively. Additionally, 36,706, 9,848 and 23,950 Chinook salmon juveniles were tagged in these years (Table 1). The additional trap line roughly accounted for 1/3rd of the total juveniles tagged and released.

Table 1.-Numbers of juvenile coho and Chinook salmon tagged with coded-wire tags and released in the Taku River, 1991-2008.

Release Year	Coho	Chinook
1991	3,740	
1992	6,647	
1993	5,044	10,015
1994	11,448	9,858
1995	12,241	11,121
1996	14,888	21,582
1997	15,359	37,868
1998	19,833	32,723
1999	30,684	19,531
2000	44,807	17,298
2001	50,535	41,836
2002	23,258	37,776
2003	32,539	27,995
2004	16,116	23,078
2005	32,520	27,335
2006	34,117	36,706
2007	12,060	9,848
2008	27,171	23,950

The Northern Fund also extended the duration of the adult coho salmon tagging project from mid-September through the first week of October in 2006, 2007 and 2008 (Table 2). Prior to 2006 and since 1999, other funding sources were used to accomplish this task such that the majority of the coho salmon run was sampled and tagged in each of these years. These efforts resulted in 2,811, 2,117 and 2,213 adult coho salmon being tagged with spaghetti tags in 2006, 2007 and 2008, respectively, of which approximately 35% were released after September 15.

Table 2.-Numbers of adult coho salmon tagged with spaghetti tags at Canyon Island in the lower Taku River as part of event 2 of a two-event mark-recapture experiment along with the estimated inriver run and associated marked fraction, 1987-2008.

Year	Number tagged	Inriver run	Marked fraction
1987	2,240	61,976	.036
1988	2,168	43,093	.050
1989	2,243	60,841	.037
1990	1,860	75,881	.025
1991	4,922	132,923	.037
1992	2,103	90,394	.023
1993	2,552	114,091	.022
1994	4,792	111,036	.043
1995	2,531	69,448	.036
1996	1,895	49,687	.038
1997	1,663	35,035	.047
1998	1,777	66,472	.027
1999	1,848	66,343	.028
2000	1,877	70,147	.027
2001	2,380	107,493	.022
2002	3,766	223,162	.017
2003	3,003	186,755	.016
2004	3,163	142,626	.022
2005	1,476	99,811	.015
2006	2,811	134,053	.021
2007	2,117	58,159	.036
2008	2,213	99,199	.022

MEASURES OF SUCCESS:

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

1. estimate the number of coho salmon smolt leaving the Taku River and originating from above Canyon Island, such that the estimated number is within $\pm 25\%$ 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 estimated harvest is within $\pm 15\%$ of the true value 95% of the time;
3. estimate the escapement of adult coho salmon past Canyon Island such that the estimate is within $\pm 15\%$ of the true value 95% of the time;
4. estimate the age composition of adult coho salmon passing Canyon Island such that all estimated fractions are within ± 5 percentage points of their true values 95% of the time;
5. 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;

6. 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;
7. test the hypothesis that smaller coho salmon smolt (75–85 mm FL) survive at the same rate as larger smolt (85 mm <) with a Type I error of 5% and a power of 85% to detect a difference in rates of at least 20%.

The combined efforts put forth in 2006, 2007 and 2008 provided answers to all of these objectives. The number of juvenile coho salmon emigrating from the Taku River in 2006, 2007 and 2008 was estimated at 2.2 million (SE=427,280), 2.1 million (SE=444,661) and 2.0 million (*SE pending*), accordingly. The 2006 and 2007 estimates exceed the precision requirements listed above yet the 2008 estimate is still pending final analysis. Marine harvest in 2006, 2007 and 2008 was 92,508 (SE=7,812), 82,356 (SE=8,853) and 73,113 (SE=15,131), in that order, resulting in marine exploitation rates of 40.8% (SE=2.4%), 58.8% (SE=2.6%) and 42.4% (SE=6.3%). In 2006, the estimated inriver run was 134,053 (SE=8,643) and inriver harvest was 12,275 resulting in an escapement past all fisheries of 121,778. In 2007, the estimated inriver run was 57,623 (SE=3,247) and inriver harvest was 7,993 resulting in an escapement past all fisheries of 49,632. In 2008, the estimated inriver run was 99,199 (SE=15,062) and inriver harvest was 3,839 resulting in an escapement past all fisheries of 95,360.

The estimated age and fork length (FL) composition of juvenile coho salmon sampled in the lower Taku River in 2006, 2007 and 2008 was 90.9 mm and 7.0 g, 87.5 mm and 6.5 g, and 92.7 mm and 7.3 g, respectively. The estimated age composition of adult coho salmon sampled at Canyon Island in the lower Taku River in 2006 and 2007 was 80% age-1.1 (SE=1.4%) and 20% age-2.1 fish (SE=1.4%) and 79% age-1.1 (SE=1.6%) and 21% age-2.1 fish (SE=1.6%), correspondingly. Results from 2008 are still pending age analysis.

Early results suggest marine survival increases with size and age. Interestingly, for the same size class of fish, the oldest juveniles had the highest marine survivals. For the same age class of fish, the largest juveniles had the highest marine survivals. In general, marine survival was lowest for small, age-1.1 fish; conversely it was highest for large, age-2.1 fish.

A manuscript covering the production of coho salmon from the Taku River, 2004–2007 has recently been submitted for peer review.

CONCLUSION:

The addition of the third trap line during juvenile trapping was successful and essentially provided 1/3rd of the overall season's catch. For adults, extending the tagging project through the first week of October accounted for roughly 35% of the total number of fish tagged and maintained consistency in project duration since these efforts began in 1999. Although these efforts cost about \$75,000 U.S., the results were at or above expectation and have further emphasized the importance to continue these efforts down the road.

ACKNOWLEDGMENT:

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DETAILED BUDGET SUMMARY:

In total, the Northern Fund provided \$225,000 U.S. funds for the Taku River Coho Salmon Escapement and Smolt Tagging Augmentation project. Of that, 10% or \$22,500 was held back by the Northern Fund pending the completion of a final report resulting in ADF&G receiving \$202,500. Two-hundred and seventy-seven line item expenditures were made by ADF&G totaling \$196,577 for work on this project; another \$26,538 was administrative overhead costs associated with this project.

Subcontractors and Consultants provided the bulk of the costs from this project totaling \$92,731 and mostly with Ward Air, Coastal Helicopters, and River Dirtbags air and barge services. These services were crucial in providing the transportation of personnel, equipment, and supplies to keep this project functioning. The original spending plan anticipated spending \$106,993; thus, just over \$14,000 was not spent in this category.

Labour Wages & Salaries associated with doing this work accounted for the next greatest amount of costs totaling \$60,530. The original spending plan anticipated spending \$65,657; thus, just over \$5,000 was not spent in this category.

Capital Costs & Assets and Training accounted for the remaining balance of the anticipated expenditures minus Overhead & Indirect Costs. However, a departure from the anticipated spending plan occurred in this category as only about \$1,000 was spent from an original allocation of nearly \$20,000 leaving about \$19,000 unspent in this category.

Site & Project Costs was originally allocated no funds; however, due to shortfalls in anticipated in-kind cash sources, we did not invest in capital and assets as originally planned and used these funds and any unspent funds from other categories to pay for food, fuel, hardware, and lumber totaling \$41,168 (Table 3).

Table 3.- Allocated and actual costs for seven major spending categories see in the Northern Fund project Taku Coho Salmon Escapement and Smolt Tagging Augmentation, 2006-2008.

Category	Allocated	Actual	Difference
Labour Wages & Salaries	\$ 65,657	\$ 60,530	\$ 5,127
Subcontractors & Consultants	\$ 106,993	\$ 92,731	\$ 14,262
Volunteer Labour			
Site / Project Costs		\$ 41,168	\$(41,168)
Training	\$ 1,200		\$ 1,200
Overhead / Indirect Costs	\$ 32,208	\$ 27,740	\$ 4,468
Capital Costs / Assets	\$ 18,672	\$ 946	\$ 17,726
Total	\$ 224,730	\$ 223,115	\$ 1,615