Northern Boundary and Transboundary Rivers Restoration & Enhancement Fund

TAKU RIVER COHO ADULT AUGMENTATION 2019

Final Report

Prepared by:

JEFF WILLIAMS
Alaska Department of Fish and Game
Division of Sport Fish
802 3rd Street
Douglas, Alaska 99824

(907) 465-8251
jeffrey.williams@alaska.gov

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 from 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 most of the adult run. Also, it was agreed that smolt tagging numbers needed to be increased in order to boost the coded wire tag (CWT) marked fractions in order to satisfy the sample sizes required for 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. Starting in 2017, DFO and Taku River Tlingit First Nations (TRTFN) have conducted a live-release assessment fishery when the commercial effort ceases. 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 escapement of adult coho salmon past Canyon Island between June and early October, such that the relative precision of the calculated 95% CI is ≤ 20%.

2. Boost the recapture components of the smolt mark–recapture study used to estimate the number of smolt which emigrated from the Taku River in 2018.

3. To boost the Event II portion of the joint Canada/U.S. adult mark–recapture study used to estimate the number of adults returning to the Taku River in 2019.

4. Determine through a radio telemetry study the approximate proportions of marked coho salmon that migrate above border, spawn below the border, and leave the river or die prior to spawning.

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

METHODS:

Detailed methods for the objectives listed below can be found in Williams et al. (2016).

Personnel from DFO, ADF&G, and TRTFN captured and tagged adult coho salmon using two fish wheels at Canyon Island as the first of two sampling events in a mark–recapture experiment to estimate escapement. When fish wheels were inoperative for more than two consecutive days, gillnets were used to capture coho salmon at Canyon Island during the hiatus. Coho salmon were carefully removed from the fish wheels or gillnets and placed into a trough filled with water. Every coho salmon at Canyon Island was 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 had their length and sex recorded and was tagged with an individually numbered "spaghetti" tag sewn through the dorsal musculature just below the posterior portion of the dorsal fin. All fish were released at the site of capture. Past studies on coho salmon have shown that the loss of spaghetti tags between the marking site at Canyon Island and the recapture area located just upriver above the border is rare, so no secondary mark was added to tagged fish. Additionally, the loss of the primary spaghetti tag has been viewed

as inconsequential as fish are normally recovered within one week of tagging and tagging scars are still visible and serve as a secondary mark.

For Event II of the adult coho salmon mark–recapture project to estimate escapement, fish were captured in the Canadian commercial fishery or assessment fishery and inspected for missing adipose fins and spaghetti tags (July through early October).

A portion of the fish captured in the lower river were tagged with radio transmitters to assess and estimate dropout rates of fish handled in the mark–recapture study. Methods were similar to radiotelemetry studies implemented by ADF&G on the Susitna River drainage for sockeye salmon (Yanusz et al. 2007 and 2011) and the Taku and Stikine rivers for Chinook salmon (Richards et al. 2016a, 2016b). Internal pulse-coded radio tags manufactured by Advanced Telemetry Systems were placed in coho salmon handled and marked in conjunction with the mark–recapture project. The tags are 52 mm long, 19-mm in diameter, 26-g in mass, have a 30 cm external whip antenna, a terminal battery life of 96 d, and operate on several frequencies within the 150.000–152.999 MHz range. Each radio tag was equipped with a mortality indicator mode that activates when the radio tag is motionless for approximately 24 h. Radio tags were inserted through the esophagus and into the upper stomach of the fish using a 1.0 cm (outside diameter), 30 cm long plastic tube. A total of 296 fish were radiotagged in 2019. Tags were deployed in proportion to the 2009–2018 average weekly catch of coho salmon near Canyon Island. Only healthy coho salmon ≥350 mm MEF length, irrespective of sex or size, were radiotagged.
Movements of radiotagged fish were monitored from time of release by a combination of fixed tracking stations and aerial and boat telemetry surveys. Tracking towers were used on the Taku River; two in the U.S. and three in Canada. On the U.S. side of the border, one tracking tower was placed below the marking site at Canyon Island and one was placed a short distance above Canyon Island. In Canada, the lowest tracking tower was located just above the main Canadian test/commercial fishery. Two tracking towers were placed near the Inklin/Nakina confluence (start of the Taku River mainstem). The radiotelemetry tower downstream of the tagging site and aerial flights were used to estimate the emigration or "dropout" rate of radiotagged coho salmon from the study area. Upstream radiotelemetry towers were used to estimate immigration rates into Canada. Aerial surveys provided coverage of most radiotagged fish near the border. These areas would most likely be Flannigan's Slough, Tulsequah River, Johnson, Sockeye, Fish, and Moose creeks and Twin Glacier Lakes.

RESULTS AND DISCUSSION:

In 2019, 1,755 adult coho salmon (Table 1) were tagged with spaghetti tags in the fish wheels (1,692) and set gillnet (38) in the Event I efforts at Canyon Island. Upstream, a total of 12,085 fish were inspected (222 of which were recaptured from tagging efforts at Canyon Island) in the Canadian commercial fishery. Adult information was used to estimate an inriver run of 95,011 (SE=5,929) coho salmon, yielding an escapement estimate of 82,759 after subtracting all inriver harvest. All 1,782 adult coho salmon sampled at Canyon Island were inspected for Event II of the mark–recapture experiment to estimate smolt abundance. At total of 14 adult coho salmon were missing adipose fins.

Of the 1,755 adult coho salmon tagged at Canyon Island, 296 we also tagged with a radio transmitter. Stationary tracking towers along with multiple fixed-wing and helicopter surveys were used to track fish tagged with radio transmitters. Five of the 296 transmitters were never detected, and it was assumed this was due to tag failure. As a result, these five tags were omitted from the analysis. 238 of the remaining 291 fish fixed with radio transmitters were classified as having made upstream progress by crossed the U.S./Canada border and recruiting into the Canadian

commercial fishery or Event II of the mark–recapture project. 53 of the 291 fish fixed with radio transmitters were classified as not crossing the U.S./Canada border, producing a dropout rate of just over 18%. Of the 53 fish that did not cross the U.S./Border, 13 were thought to have spawned in tributaries below Canyon Island. Due to the short distances from spawning habitat in the below border tributaries to the mainstem Taku River, it is difficult to know with high enough resolution where exactly tagged fish final fate was located.

Table 1.-Numbers of adult coho salmon tagged with spaghetti tags at Canyon Island in the lower Taku River as part of event 1 of a two-event mark–recapture experiment along with the estimated inriver run, escapement, and associated marked fraction, 1987-2019.

Year	Number tagged	Inriver run	Escapement	Marked fraction
1987	2,240	61,976	55,457	0.036
1988	2,168	43,093	39,450	0.050
1989	2,243	60,841	56,808	0.037
1990	1,860	75,881	72,196	0.025
1991	4,922	132,923	127,484	0.037
1992	2,103	89,270	83,729	0.024
1993	2,552	123,964	119,330	0.021
1994	4,792	111,036	96,343	0.043
1995	2,531	69,448	55,710	0.036
1996	1,895	49,687	44,635	0.038
1997	1,663	35,035	32,345	0.047
1998	1,777	66,472	61,382	0.027
1999	1,848	66,343	60,768	0.028
2000	1,877	70,147	64,700	0.027
2001	2,380	107,493	104,394	0.022
2002	3,766	223,162	219,360	0.017
2003	3,003	186,755	183,112	0.016
2004	3,163	139,011	129,327	0.023
2005	1,476	143,817	135,558	0.010
2006	2,811	134,053	122,384	0.021
2007	2,117	82,319	74,246	0.026
2008	2,213	99,199	95,226	0.022
2009	2,769	113,716	103,950	0.024
2010	1,731	141,238	126,830	0.012
2011	1,762	83,349	70,871	0.021
2012	1,095	84,847	70,775	0.013
2013	1,383	78,492	68,117	0.018
2014	3,560	140,739	124,171	0.025
2015	1,931	70,299	60,178	0.027
2016	1,257	99,224	87,704	0.013
2017	1,568	65,670	57,868	0.024
2018	1,095	60,678	51,173	0.018
2019	1,755	95,011	82,759	0.018
Total mean	2,282	97,127	89,041	0.026

CONCLUSION:

In the fall of 2019, the Northern Endowment Fund was used to operate the adult coho salmon tagging project from September through the first week of October. Extending the tagging and recapture projects through the first week of October maintained consistency in project duration since these efforts began in 1999. The results were at or above expectation 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)). The radiotagging project for adult coho salmon will continue for at least two more years to inform the mark–recapture project and help reduce bias in estimating population parameters.

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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 Adult Augmentation, 2019.

Line Item	Allocations	Expenditures	Balance
Personnel	$61,581.55	$62,548.75	($967.20)
Travel	$0.00	$0.00	$0.00
Contractual	$17,500.00	$19,467.74	($1,967.74)
Commodities	$50,839.45	$45,645.93	$5,193.52
Equipment	$0.00	$0.00	$0.00
Administrative Overhead	$13,854.00	$13,854.00	$0.00
All Lines	$143,505.00	$141,516.42	$1,988.58

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