Taku River Watershed –
Nahlin River Chinook Salmon Sonar Enumeration 2017

Final Report
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DFO 57907

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Executive Summary

The Northern Endowment Fund provided monies to carry out the 2017 Nahlin River Chinook salmon (*Oncorhynchus tshawytscha)* sonar enumeration project within the Taku River drainage. This permitted the operation of an ARIS sonar unit from 1 June to 26 July 2017 with extrapolation to end of run estimated as 4 August 2017. An estimate of 2,375 large (>659 mid-eye fork length) Chinook salmon returned during this period.

A total of 321 Chinook salmon tissue samples were obtained from the lower Taku River through a separate live capture drift gillnet project and analyzed for genetic stock identification. The results show that 28.4% of lower Taku River Chinook samples are from the Nahlin stock group (combined Nahlin, Dudidontu, and Tseta stocks).

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1.0 Introduction

The purpose of this project was to enumerate and accurately estimate the escapement of large Chinook salmon, *Oncorhynchus tshawytscha,* to the Nahlin River using sonar technology. Genetic analysis of tissue samples gathered in the lower Taku River allowed us to estimate the contribution of Nahlin River Chinook to the entire Taku River drainage.

The Nahlin River is located in northwestern British Columbia about 160km south of Atlin, British Columbia, and comprises the headwaters of the Taku River. The Taku River drains to the Pacific Ocean in Southeast Alaska near Juneau (Figure 1; McPherson et al. 1998). The Taku River historically produces the largest run of Chinook salmon in Southeast Alaska, as well as the largest run in British Columbia north of the Skeena River. Based on genetic stock identification (GSI) to date and past aerial survey data, the Nahlin River is the second most important Chinook tributary in the Taku River drainage after the Nakina River, supporting approximately one third of the total annual returns to the Taku River.

Fisheries and Ocean Canada (DFO) retained Metla Environmental Inc (MEI) as a contractor to deliver this project in 2017, following their successful delivery of the project in 2016.

In 2017, as a benefit of this project, the count of large Chinook through the Nahlin River sonar site was used in combination with a concurrent Alaska Department of Fish and Game (ADF&G) Chinook radio telemetry project to provide a mark-recapture estimate of drainage wide Taku River Chinook abundance (PSC 2017).

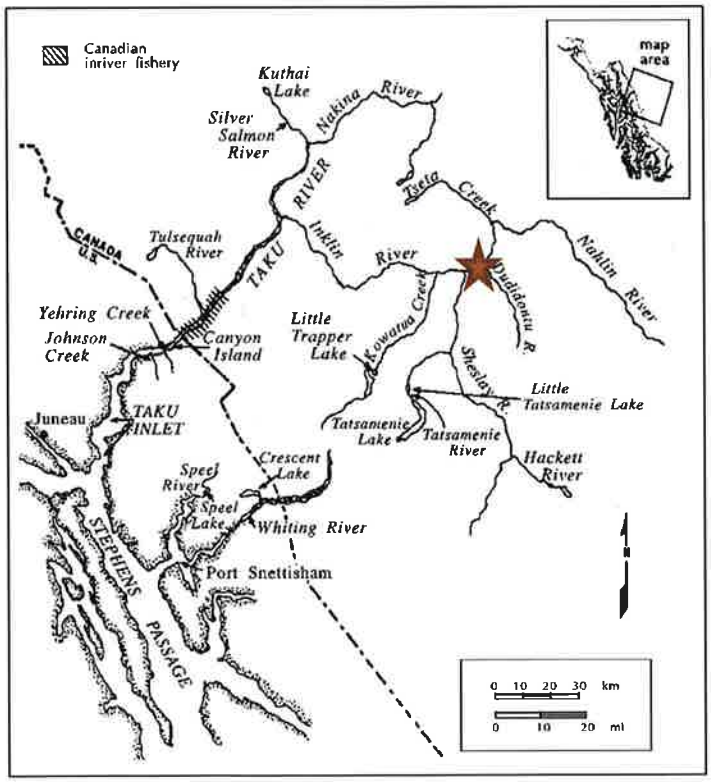

Figure 1. The Taku River drainage with the sonar location identified by the red star.

2.0 Objectives

The objectives of this project were to accurately estimate of the escapement of large (> 659 mm mid-eye to tail fork length) Chinook salmon to the Nahlin River and accurately estimate of the contribution of Nahlin River Chinook stock to the Taku River drainage wide return in 2017.

3.0 Methods

The project was based out of a field camp provided by the contractor approximately three kilometers upstream from the confluence of the Sheslay and Nahlin Rivers (Figure 1). Project supplies and materials were transported by aircraft from Atlin, BC, to a remote airstrip located along the Nahlin River near the confluence of the Nahlin and the Sheslay Rivers. A riverboat was used to transport staff and materials to the project location. The camp consisted of plywood floor wall tents adjacent to the weir site.

DFO supplied MEI with an ARIS multi beam sonar unit for the project. The sonar unit was installed in combination with a partial weir on river right and a small deflection weir on river left to direct migrating fish into the ensonified portion of the channel (Appendix C). MEI operated and maintained the project from 1 June through 26 July (Appendix 1), the majority of the Chinook salmon migration. Sonar counts were expanded to cover the tail end of the run through 4 August.

Sonar files for the entire project duration were read by the contractor on site (no sub-sampling). Species apportionment sampling was not conducted as part of this project. All targets larger than 659 mm mid-eye to fork length were assumed to be large Chinook salmon, with no ability to distinguish between smaller Chinook and co-migrating sockeye salmon. The contractor invested a great deal of time and effort into developing relationships between sonar length, true total length, and mid-eye to fork length for this project, as well as developing rationale for size based apportionment (internal DFO files).

Water level and water temperature data were collected daily.

Tissue samples for GSI were collected through the ADF&G Wright River drift gillnet project on the lower Taku River. This project was live capturing Chinook salmon for application of radio transmitters as part of a drainage wide telemetry project. Samples were pooled by statistical week for analysis from 28 April (statistical week 17) to 30 June (statistical week 26). Samples were processed at the DFO Molecular Genetics Lab in Nanaimo, BC.

4.0 Results and Discussion

2017 was the second year that this fulsome project has taken place. The project was operated successfully in 2016, and a sonar feasibility study was conducted in 2015.

The 2017 final total estimate of large Chinook salmon past the Nahlin sonar site is 2,375. The first Chinook passed the sonar on 3 June, consistent with historic run timing. The run peaked on 25 June and tapered to sonar removal on 26 July. The remainder of the run was extrapolated based on the run trend to that date, and was estimated to be complete by 4 August with an estimated 40 large Chinook passing after sonar removal (Figure 2).

The water level was high at the beginning of the project and a rain event flooded the river from 14 July to 17 July, (Figure 3). The weir was damaged during the flood, and the sonar unit was not able to function during this time. Counts were extrapolated for this period.

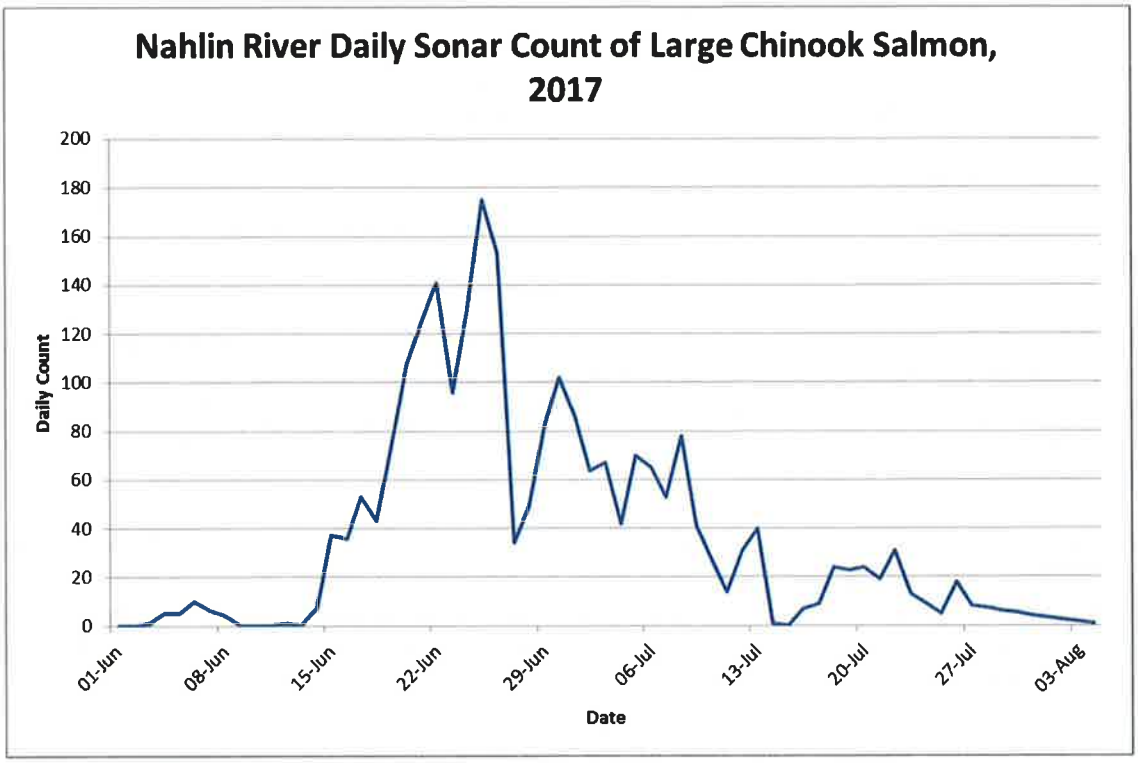

Figure 2. Nahlin River daily sonar count of large Chinook salmon, 2017.

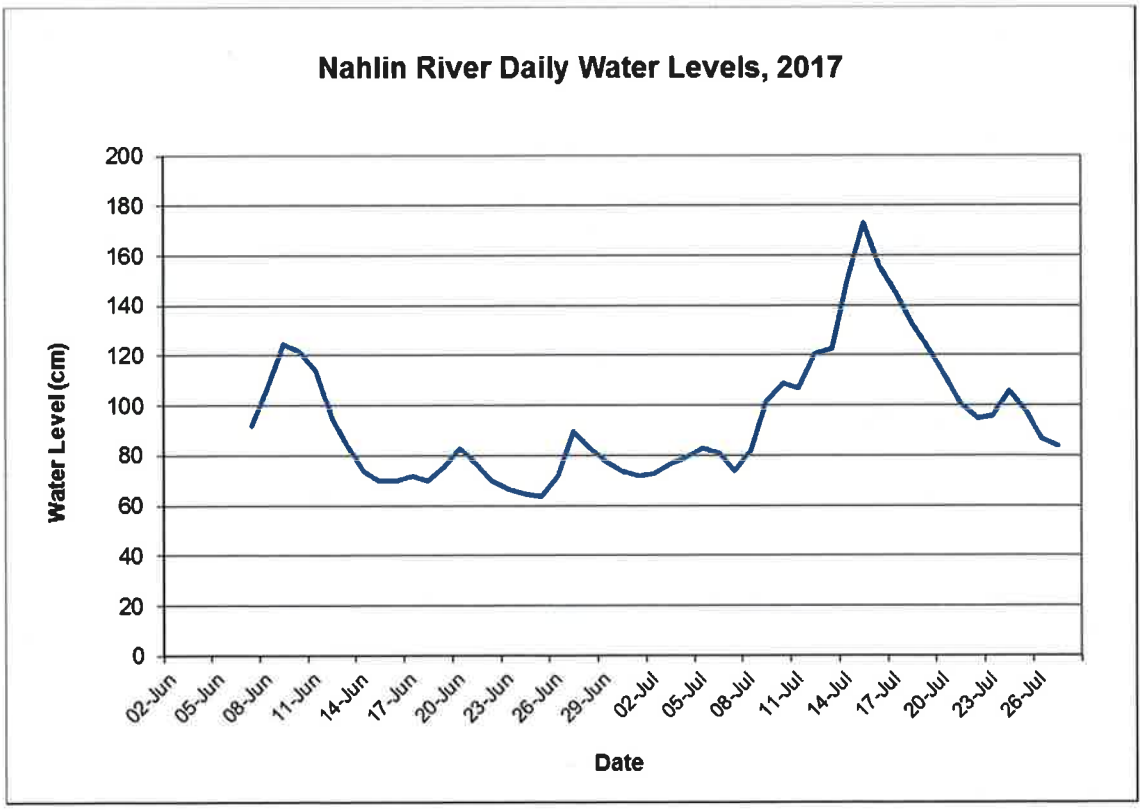

Figure 3. Nahlin River daily water levels, 2017.

The number of Chinook salmon tissue samples obtained for GSI in 2017 from the Wright River drift gillnet project, pooled by statistical week , are found in Table 1.

Table 1. Chinook salmon tissue samples collected and analyzed from the Wright River drift gillnet project on the lowerTaku River in 2017 by statistical week.

Stat Week	Chinook Samples Obtained	Chinook Samples Analyzed
17	7	21
18	14	
19	31	31
20	23	23
21	37	37
22	37	37
23	58	58
24	64	64
25	36	36
26	14	14
27		
Total	**321**	**321**

Based on GSI results from 2017 samples, the Nahlin Chinook genetic group (combined stocks from Nahlin River, Dudidontu River, and Tseta Creek) comprised an average weekly contribution of 28.4%, while all other Taku stocks comprised the remaining 71.6%.

Table 2. Weekly Chinook stock composition of Nahlin Group in the lower Taku River based on GSI, 2017.

Statistical Week	Stock	
	Nahlin Group	Other
	Nahlin, Dudidontu, Tseta	
17-18	17.2%	82.8%
19	69.3%	30.7%
20	43.1%	56.9%
21	29.7%	70.3%
22	18.9%	81.1%
23	39.5%	60.5%
24	17.9%	82.1%
25	15.2%	84.8%
26	4.7%	95.3%
Average	**28.4%**	**71.6%**

5.0 Budget and Project Operations

As presented in Appendix B, the expenditures of Northern Funds amounted to $118,500, the amount budgeted. The 10% holdback of $11,850 is anticipated once this final project report is accepted by the Pacific Salmon Commission.

The service contract included both administration and some site/project costs. The total cost of the project amounted to $144,000 but the amount over and above the PSC support was covered by DFO internally as an in-kind contribution.

6.0 Conclusion

The planned and actual deliverables of the project were as follows:

1. Chinook salmon were enumerated using sonar from 1 June to 26 July on the Nahlin River in the upper Taku River drainage.
2. Lower Taku River Chinook samples were collected and analyzed for genetic stock identification.

The activities supported by this project contribute to accurate estimates of the escapement of large Chinook salmon to the Nahlin River and the stock composition of returns to the entire Taku River drainage. They also assist in the estimation of drainage wide Chinook runs in the Taku River in combination with radio telemetry projects and mark-recapture methodology.

7.0 Acknowledgements

Metla Environmental Inc., Brian Mercer, David McDonald, and Christine Bylenga conducted the sonar project supported by this funding under contract with DFO. Colleen Claggett and Julie Bradford of DFO assisted with financial administration and accounting for this project.

8.0 Literature Cited

McPherson, S. A., D. R. Bernard, S. K. Kelley, P. A. Milligan, and P. Timpany. 1998. Abundance of Chinook salmon in the Taku River in 1997. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series Report 98-41, Anchorage.

PSC (Pacific Salmon Commission). 2017. Preliminary estimates of transboundary river salmon production, harvest, and escapement and a review of joint enhancement activities in 2017. Transboundary Technical Committee Report.

9.0 Appendices

Appendix A: Daily Sonar Count of Large Chinook Salmon.

Date	Daily	Cumulative	
01-Jun	0	0	sonar begins counting
02-Jun	0	0	
03-Jun	1	1	
04-Jun	5	6	
05-Jun	5	11	
06-Jun	10	21	
07-Jun	6	27	
08-Jun	4	31	
09-Jun	0	31	
10-Jun	0	31	
11-Jun	0	31	
12-Jun	1	32	
13-Jun	0	32	
14-Jun	7	39	
15-Jun	37	76	
16-Jun	36	112	
17-Jun	53	165	
18-Jun	43	208	
19-Jun	74	282	
20-Jun	107	389	
21-Jun	124	513	
22-Jun	141	654	
23-Jun	96	750	
24-Jun	129	879	
25-Jun	175	1054	
26-Jun	153	1207	
27-Jun	34	1241	
28-Jun	49	1290	
29-Jun	82	1372	
30-Jun	102	1474	
01-Jul	86	1560	
02-Jul	64	1624	
03-Jul	67	1691	
04-Jul	42	1733	
05-Jul	70	1803	
06-Jul	65	1868	
07-Jul	53	1921	
08-Jul	78	1999	
09-Jul	41	2040	
10-Jul	27	2067	
11-Jul	14	2081	
12-Jul	31	2112	
13-Jul	40	2152	
14-Jul	1	2153	river in flood
15-Jul	0	2153	river in flood
16-Jul	7	2160	river in flood
17-Jul	9	2169	river in flood
18-Jul	24	2193	
19-Jul	23	2216	

20-Jul	24	2240	
21-Jul	19	2259	
22-Jul	31	2290	
23-Jul	13	2303	
24-Jul	9	2312	
25-Jul	5	2317	
26-Jul	18	2335	sonar stops counting
27-Jul	8	2343	extrapolated count
28-Jul	7	2350	extrapolated count
29-Jul	6	2357	extrapolated count
30-Jul	5	2362	extrapolated count
31-Jul	4	2366	extrapolated count
01-Aug	3	2370	extrapolated count
02-Aug	3	2372	extrapolated count
03-Aug	2	2374	extrapolated count
04-Aug	1	2375	extrapolated count

Appendix B: Expenditures

Fisheries and Oceans Canada - PSC Project Budget Financial Report

Name of Project and PSC#:

Taku Nahlin Chinook Enumeration, 2017 (NF-2017-I-23)

EXPENDITURES

Labour

DFO Employee Salaries and Benefits

Position	Expenditures		Approved Budget	Total Expenditure	Variance
Salary					
Benefits			$ -		
Salary					
Benefits			$ -		
Salary					
Benefits			$ -		
Total Expended	$ -	Total Budget	$ -	$ -	$ -

Subcontractors & Consultants

Contract	Contract Amount Expended		Approved Budget	Total Expenditure	Variance
Contractor	$ 108,000.00		108,000		
Total Expended	$ 108,000.00	Total Budget	$ 108,000.00	$ 108,000.00	$ -
		Total Labour Summary	$ 108,000.00	$ 108,000.00	$ -

Site / Project Costs

Item	Amount Expended		Approved Budget	Total Expenditure	Variance
Travel					
Small Tools & Equipment					
Site Supplies & Materials					
Equipment Rental					
Work & Safety Gear					
Repairs & Maintenance					
Permits					
Other costs					
Total Expended	$ -	Total Budget	$ -	$ -	$ -
		Total Site / Project Summary	$ -	$ -	$ -

Training Costs

Item	Amount Expended		Approved Budget	Total Expenditure	Variance
Name of course					
Total Expended	$ -	Total Budget	$ -	$ -	$ -
		Total Training Summary	$ -	$ -	$ -

Fisheries and Oceans Canada - PSC Project Budget Financial Report

Overhead / Indirect Costs

Item	Amount Expended	Approved Budget	Total Expenditure	Variance
Office space; including utilities, etc.				
Insurance				
Office supplies				
Telephone & long Distance				
Photocopies & printing				
Indirect/overhead costs (GSI Analysis)	10500	10,500		
Administration and financial management				
(If the PSC contribution to Indirect costs exceeds 20% of the total PSC grant submission of back-up documentation justifying the expense is required).				
Total Expended	$ 10,500.00	Total Budget $ 10,500.00	$ 10,500.00	$ -
Total Overhead / Indirect Summary		$ 10,500.00	$ 10,500.00	$ -

Capital Costs / Assets (Value > $250.00)

Item	Amount Expended	Approved Budget	Total Expenditure	Variance
Total Expended	$ -	Total Budget $ -	$ -	$ -
Total Capital Cost / Asset Summary		$ -	$ -	$ -

Financial Report

Categories	Approved Budget (PSC Grant)	Project Expenditures	Variance
Labour	$ 108,000.00	$ 108,000.00	$ -
Site / Project Costs	$ -	$ -	$ -
Training	$ -	$ -	$ -
Overhead / Indirect Costs	$ 10,500.00	$ 10,500.00	$ -
Capital Costs / Assets	$ -	$ -	$ -
TOTAL	**$ 118,500.00**	**$ 118,500.00**	**$ -**

PST Project Funding Grant Advance Amount Received	**$ 106,650.00**
PST Project Funding Grant Amount Remaining to be Paid	**$ 11,850.00**
Difference Between Grant Amount and Project Expenditures	**$ -**

Project Manager Name Aaron Foos

Project Manager Signature

Date 21 Feb 2018

DFO Responsibility Center Manager Name Bill Wakeham

DFO Responsibility Center Manager Signature

Date Feb. 21/18

Appendix C: Photographs

Photograph 1. Sonar.

Photograph 2. Sonar work station.

Photograph 3. Nahlin River partial weir and sonar.