Taku River Sockeye Salmon Genetic Stock Identification Analysis of 2020 Commercial Samples

Final Report
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Project DFO 57894

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Executive Summary

Northern Fund monies were used to conduct genetic stock identification (GSI) of sockeye salmon samples collected from the 2020 Taku River commercial fishery harvest. Sample targets were achieved and analysis is complete. The results provide run timing characteristics and proportionality of individual stocks comprising the Taku River sockeye salmon stock aggregate when they transited through the lower Taku River commercial fishing grounds. This information will allow managers to refine management regimes designed to protect any stocks of concern while informing exploitation of stocks in good health, and provide an alternate source of Taku River sockeye salmon stock assessment data.

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1 Introduction

Northern Endowment Fund (NEF) monies were provided for genetic analysis of scale samples collected from the commercial fishery sockeye harvest on the Taku River in 2020. This activity was first supported by the NEF in 2008 and makes use of the baseline samples collected with Fund assistance from 2007-2012.

Genetic analysis will identify the composition of the Taku River commercial sockeye salmon harvest by stock groupings. In addition, when coupled with escapement counts from headwater counting fences (weirs), it will permit estimation of drainage-wide abundance for comparison with the estimate derived from mark-recapture.

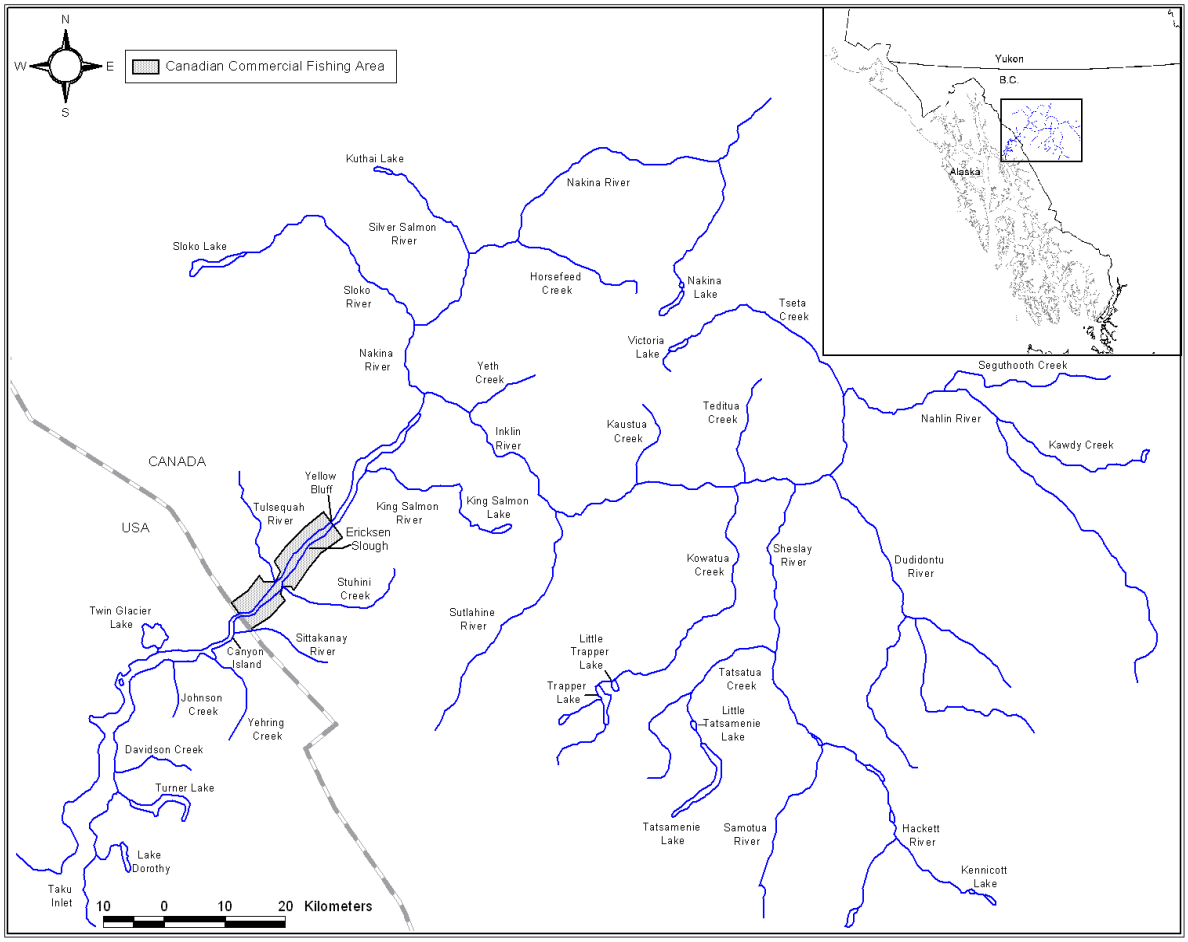

Figure 1. The Taku River drainage in British Columbia and Southeast Alaska.

2 Methods

Sockeye salmon scale samples are routinely taken from a portion of the Taku River Canadian commercial fishery harvest each week throughout the fishing season for age analysis. Fisheries and Oceans Canada's (DFO) Molecular Genetics Lab (MGL) at the Pacific Biological Station in Naniamo, B.C. is able to access these scale samples after they have been pressed for aging and use a portion of each sample for genetic analysis. Weekly sample sizes for genetic analysis were determined based in discussion with the MGL staff and subsampling was conducted at random from available samples.

The genetic stock identification methods used by Canada are bilaterally reviewed by the Transboundary Technical Committee (TTC) of Pacific Salmon Commission and detailed in the annual management plan for the Transboundary Rivers (PSC 2020). The management plan also details the baseline populations for Taku River sockeye salmon. More detailed descriptions of methods used in mixed-stock analysis by the MGL can be found in Beacham et. al. (2005 and 2006), Neaves et. al. (2004-2008), and Pella and Matsuda (2001).

The CBAYES computer program for mixed-stock analysis uses Bayesian statistical methods to establish a genetic profiles for all samples and estimates weekly and seasonal stock composition and associated error in the Taku River commercial sockeye salmon fishery. Results are reported here based on three stock groupings that have been bilaterally agreed to as the transboundary fisheries management reporting groups identified from the TTC Genetics workshop in April 2013, specifically:

1. Tatsamenie Lake
2. Taku Lakes Other
3. Taku River-Type – Further broken down in U.S. River types and CDN River types

3 Results and Discussion

The 2020 Taku River commercial fishery opened in statistical week (SW) 27 (ending 04 July); the directed sockeye salmon fishery ended in SW 33 (ending 15 August) but there were additional sockeye salmon harvested into SW 39 (ending 26 September) in the directed coho salmon fishery (Table 3). Through SW 35, 200 scale samples were collected per week. The limited number of sockeye harvested after this time were almost entirely sampled for scales. Apportionment of 2020 genetic samples was made in order improve genetic representation of the samples based on consultations with MGL staff in Nanaimo.

Table 1. Sockeye salmon scale samples collected for analysis in the 2020 Taku River commercial fishery by statistical week.

Statistical Week	Week Ending	Commercial Catch	Sockeye Samples Available	Sockeye Samples Analyzed
27	04 July	569	200	130
28	11 July	1,487	200	199
29	18 July	1,705	200	199
30	25 July	1,208	200	199
31	01 August	1,986	200	199
32	08 August	2,524	200	199
33	15 August	1,130	200	199
34	22 August	549	200	138
35	29 August	233	200	78
36	05 September	104	103	60
37	12 September	46	45	30
38	19 September	14	14	10
39	26 September	1	1	0
Total		**11,556**	**1,973**	**1,640**

Genetic results are presented in summary form by statistical week in Table 2. The season summary is included in the final columns of the table, and shows that overall the Taku River Canadian commercial fishery harvest was comprised of 49.9% river type sockeye salmon and 51.1% lake type sockeye salmon. Of the lake type fish, 14.5% were genotyped to the Tatsamenie Lake stock.

These data will be used in a variety of ways to inform Taku River fishery management and stock assessment. Those reviews and analysis will be presented elsewhere.

Table 2. Genetic results for Taku River commercial fishery sockeye salmon samples, 2020.

	SW27		SW28		SW29		SW30		SW31		SW32		SW33		SW34		SW35		SW36		SW37		SW38		SW27-38	
SAMPLE SIZE (N/A)	122(8)		197(2)		199(0)		198(1)		197(2)		196(3)		198(1)		136(2)		78(0)		60(0)		29(1)		10(0)		1620(20)	
	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD
TAKU RIVER TYPES	12.6	(3.2)	19.9	(2.9)	35.2	(3.5)	42.8	(4.1)	69.7	(3.4)	68.5	(3.7)	60.7	(4.1)	64.4	(4.6)	68.2	(5.3)	52.2	(6.7)	64.3	(9.2)	48.7	(14.8)	49.5	(1.3)
TAKU LAKES OTHER	87.4	(3.2)	80.0	(2.9)	62.0	(3.6)	50.9	(3.7)	15.2	(2.7)	11.1	(2.4)	9.1	(2.2)	9.9	(2.7)	1.4	(1.4)	1.8	(1.8)	1.4	(3.6)	0.0	(3.4)	35.6	(1.2)
TATSAMENIE LAKE	0.0	(0.2)	0.0	(0.2)	2.6	(1.3)	4.6	(1.6)	14.9	(2.6)	19.3	(2.8)	28.8	(3.3)	23.8	(3.7)	29.6	(5.1)	45.4	(6.5)	34.2	(8.8)	50.0	(14.5)	14.5	(0.9)
US_RIVER TYPES	0.0	(0.3)	0.0	(0.2)	0.1	(0.4)	1.7	(2.0)	0.2	(0.6)	1.1	(1.5)	1.4	(2.2)	1.9	(2.1)	0.8	(1.9)	0.7	(1.7)	0.1	(1.1)	1.3	(6.0)	0.4	(0.5)

4 Budget and Project Operations

The Northern Endowment Fund allocation to DFO of $33,000.00 was fully expended. The 10% holdback of $3,300.00 is requested from the PSC once the final project report is accepted. A budget summary of expenditures can be referenced in Appendix 1.

5 Conclusion

Project objectives were achieved. Sockeye salmon scale samples were collected from the Taku River commercial fishery in 2020 and analyzed at the MGL. Stock composition of sockeye salmon harvest by week was identified. Fishery managers in both Canada and the U.S. will benefit by being able to identify the timing and exploitation rates of Taku River sockeye salmon stocks as they migrate through the lower reaches of the Taku River, information that will benefit stakeholders in both Canada and the U.S.. Though results from this project are retrospective, they are very informative and continue to lay the groundwork for the use of genetic stock identification as both an inseason management tool and a potential stock assessment tool.

6 Acknowledgements

Sean Stark managed logistics, coordinated sample collection, and sampled the commercial fishery. Teresa Bachynski, Tyler Sims, Philippe Beaulieu, Danielle Hosick, Ross Wilcox, and Melanie Collette also sampled the commercial fishery. Taku River commercial fishers collaborated by allowing DFO to sample their harvest. Emily Braithwaite and Brenda Ridgway of the Pacific Biological Station Sclerochronology Laboratory coordinated scale processing. Ben Sutherland of the Molecular Genetic Laboratory led the genetic analyses. Colleen Claggett and Yvonne Muirhead-Vert assisted with the financial administration and accounting for this project.

7 Literature cited

Beacham, T.D., J.R. Candy, B. McIntosh, C. MacConnachie, A.Tabata, K. Kaukinen, L. Deng, K. M. Miller, R. E. Withler, and N. V. Varnavskaya. 2005. Estimation of stock composition and individual identification of sockeye salmon on a Pacific Rim basis using microsatellite and major histocompatibility complex variation. Transactions of the American Fisheries Society 134: 1124-1146.

Beacham, T. D., J. R. Candy, K. L. Jonsen, J. Supernault, M. Wetklo, L. Deng, K. M. Miller, and R. E. Withler. 2006. Estimation of stock composition and individual identification of Chinook salmon across the Pacific Rim using microsatellite variation. Transactions of the American Fisheries Society 135: 861-888.

Neaves, P. I., Wallace, C. G., Candy, J. R., and Beacham, T. D. 2004-2008. CBayes: Computer program for mixed stock analysis of allelic data. Version v5.01.

Pacific Salmon Commission. 2020. Salmon Management and Enhancement Plans for the Stikine, Taku and Alsek Rivers, 2020. Transboundary Technical Committee Report TCTR(20)-01. Pacific Salmon Commission, Vancouver, B.C.

Pella, J., and Masuda, M. 2001. Bayesian method for analysis of stock mixtures from genetic characters. Fishery Bulletin 99:151-167.

Appendix 1: Financial Summary

Taku River - Sockeye Salmon Genetic Stock Identification 2020 (PSC NF-2020-I-29)

EXPENDITURES

Labour

DFO Employee Salaries and Benefits

Position		Expenditures (DFO Inkind + PSC)	DFO-Inkind	PSC funding (expenses)		Approved Budget (PSC Funding)	Total PSC Funded Expenditure	Variance
Manager	Salary	$ 435.00	$ 435.00					
	Benefits	$ 117.45	$ 117.45			$ -		
Biologist	Salary	$ 2,025.00	$ 2,025.00					
	Benefits	$ 546.75	$ 546.75			$ -		
Technician	Salary	$ 1,110.00	$ 1,110.00					
	Benefits	$ 299.70	$ 299.70			$ -		
	Total Expended	**$ 4,533.90**	**$ 4,533.90**	**$ -**		**$ -**	**$ -**	**$ -**

Subcontractors & Consultants

Contract		Contract Amount Expended	Inkind	PSC funding (expenses)		Approved Budget	Total PSC Funded Expenditure	Variance
Contract A		$ -						
Contract B		$ -						
Contract C		$ -						
		$ -						
		$ -						
	Total Expended	**$ -**	**$ -**	**$ -**		**$ -**	**$ -**	**$ -**
			$ 4,533.90		**Total**	**$ -**	**$ -**	**$ -**

Site / Project Costs

Item		Amount Expended	Inkind	PSC funding (expenses)		Approved Budget	Total PSC Funded Expenditure	Variance
Travel		$ -						
Small Tools & Equipment		$ -						
Site Supplies & Materials - Lab Supp. for GSI		$ 33,000.00		$ 33,000.00		$ 33,000.00		
Equipment Rental		$ -						
Work & Safety Gear		$ -						
Repairs & Maintenance		$ -						
Permits		$ -						
Other costs		$ -						
	Total Expended	**$ 33,000.00**	**$ -**	**$ 33,000.00**		**$ 33,000.00**	**$ 33,000.00**	**$ -**
			$ -			**$ 33,000.00**	**$ 33,000.00**	**$ -**

Training Costs

Item		Amount Expended	Inkind	PSC funding (expenses)		Approved Budget	Total PSC Funded Expenditure	Variance
Name of course		$ -						
		$ -						
	Total Expended	**$ -**	**$ -**	**$ -**		**$ -**	**$ -**	**$ -**
			$ -			**$ -**	**$ -**	**$ -**

Overhead / Indirect Costs

Item	Amount Expended	Inkind	PSC funding (expenses)	Approved Budget	Total PSC Funded Expenditure	Variance
Office space; including utilities, etc.	$ -					
Insurance	$ -					
Office supplies	$ -					
Telephone & long Distance	$ -					
Photocopies & printing	$ -					
Indirect/overhead costs	$ -					
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	$ -	$ -	$ -	$ -	$ -	$ -
		$ -		$ -	$ -	$ -

Capital Costs / Assets (Value > $250.00)

Item	Amount Expended		PSC funding (expenses)	Approved Budget	Total PSC Funded Expenditure	Variance
	$ -					
	$ -					
	$ -					
	$ -					
Total Expended	$ -	$ -	$ -	$ -	$ -	$ -
		$ -		$ -	$ -	$ -

Financial Report

Categories	DFO InKind		Approved Budget (PSC Grant)	Project Expenditures (PSC$)	Variance
Labour	$ 4,533.90		$ -	$ -	$ -
Site / Project Costs	$ -		$ 33,000.00	$ 33,000.00	$ -
Training	$ -		$ -	$ -	$ -
Overhead / Indirect Costs	$ -		$ -	$ -	$ -
Capital Costs / Assets	$ -		$ -	$ -	$ -
TOTAL			**$ 33,000.00**	**$ 33,000.00**	**$ -**

PSC Project Funding Grant Advance Amount Received	**$ (29,700.00)**	(funds rec enter as negative)
PSC Project Funding Grant Amount Remaining to be Paid	**$ (3,300.00)**	(positive refundable to PSC)
Difference Between Grant Amount and Project Expenditures	**$ -**	

Justification if Variance

Project Manager Name	Aaron Foos
Project Manager Signature	Foos, Aaron Digitally signed by Foos, Aaron Date: 2021.01.22 15:03:46 -07'00'
Date	
DFO Responsibility Center Manager Name	William Waugh
DFO Responsibility Center Manager Signature	Waugh, William Digitally signed by Waugh, William Date: 2021.01.22 15:42:33 -07'00'
Date	