

Stock Composition of Stikine and Taku Chinook and Sockeye Inriver Fisheries

(A study supported by the Northern Fund under the auspices of the Pacific Salmon Commission)

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Executive Summary

This report documents the results of the Stock Composition of Stikine and Taku Chinook and Sockeye Inriver Fisheries project supported by the Northern Fund of the Pacific Salmon Commission.

A total of \$39,900 Cdn has been received to date from the Northern Fund to carry out the collection of DNA samples from Stikine and Taku River chinook and sockeye. An additional \$4,400 is anticipated, subject to review of this report and results identified herein.

A total of 1,827 tissue samples were collected from chinook salmon harvested in the Stikine River commercial fishery between the dates of May 5 and July 28, 2008. A total of 1,520 tissue samples were also collected from sockeye salmon in this fishery between the dates of June 17 and August 14, 2008. Targets (120 chinook and 125 sockeye samples) were achieved for each week of the fisheries associated with a catch of more than 200 chinook and 500 sockeye. The total number of samples obtained exceeded the minimum anticipated by a substantial margin.

A total of 1,980 tissue samples were collected from chinook salmon harvested in the Taku River commercial fishery between the dates of April 29 and July 22, 2008. A total of 1,305 tissue samples were also collected from sockeye salmon in this fishery between the dates of June 15 and August 17, 2008. Targets (120 chinook and 125 sockeye samples) were achieved for each week of the fisheries associated with a catch of more than 200 fish, except for the penultimate week of the sockeye fishery. This minor shortfall was made up the subsequent week. As in the Stikine fisheries, the total number of samples obtained exceeded the minimum anticipated by a substantial margin.

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1.0 Introduction

Objective: Collection of genetic stock identification samples from lower Stikine and Taku inriver commercial fisheries in 2008 for the following purpose and goals.

Purpose: Eventual determination of reliable post-season estimates of the weekly stock compositions for chinook and sockeye in the lower Stikine and Taku inriver commercial fisheries.

Goal: Eventual processing of genetic stock identification samples from chinook by examining Pacific Salmon Commission standardized microsatellite loci; eventual processing of DNA samples collected from sockeye for microsatellite/major histocompatibility complex loci and possibly single nucleotide polymorphism (SNP) loci.

Improved inseason stock specific management of Transboundary River salmonids is required to meet stock specific spawning goals and harvest shares. Inseason catch estimates based on historical stock compositions (from scale pattern analysis i.e. SPA) are often unreliable and tend to differ significantly from post season estimates. There is also a need to verify the present stock identification techniques used in the inseason management some Transboundary sockeye salmon. The techniques presently used include SPA, egg diameter measurement, and brain parasite prevalence, each of which has significant drawbacks; the techniques available for chinook are even more limited. Transboundary chinook arrangements established in 2005 require the development of the capability by 2008. While this project focused on collection of samples for post-season estimates of weekly stock compositions, the long term goal is to have inseason capability. Improved stock composition estimates will permit the compilation of stock recruitment data which will be used to establish biologically based escapement goals for particular stocks of interest (e.g. Tatsamenie sockeye).

This project addresses one of the top priorities of the Transboundary Panel for 2008 Northern Fund Proposals; namely “*projects that improve the in-season stock identification for Alsek, Stikine and Taku Chinook and sockeye salmon*”. Although we are not yet at the point of conducting inseason stock identification, post season analysis of samples collected over time will provide insight into what stocks would be expected to be migrating through the fisheries at different times.

This project directly addresses the following strategic objective of the Northern Fund:

- “*improve the Parties ability to better manage the stocks and fisheries in the region (e.g. by developing methods to more accurately estimate inseason run sizes; to improve stock assessment capability; and to acquire the necessary information in a more timely fashion).*”;

It also addresses aspects of the Transboundary chinook arrangements reached in February 2005 which includes the following provisions:

- *Management of Stikine and Taku Chinook salmon will take into account the conservation of specific stocks or conservation units when planning and prosecuting their respective fisheries. To avoid over-harvesting of specific components of the run, weekly guideline harvests will be developed by apportioning their allowable harvest over the total Chinook season based on historical weekly run timing. The project will provide information to assess the run timing of various stocks or stock groupings through the inriver fishery.*

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- *By 2008, the Parties agree to develop and implement through the Committee an agreed Chinook stock identification program to assist in the management of Stikine and Taku Chinook salmon.*

The following stocks are of interest:

Stikine sockeye

1. Tahltan Lake
2. Chutine River / Lake
3. Mainstem Stikine River (Butterfly Creek to Tahltan River)
4. Scud River (Butterfly Creek to Flood River)
5. Porcupine River / mainstem Stikine (Flood River to international border)
6. Iskut River / Verret River
7. Craig River

Stikine chinook

1. Tahltan River
2. Shakes / upper Stikine River
3. Chutine River
4. Christina Creek / mainstem Stikine
5. Craig River / mainstem Iskut River
6. Verret River / upper Iskut River

Taku sockeye

1. Mainstem Taku and Nakina rivers
2. Kuthai Lake
3. Little Trapper Lake
4. Tatsamenie Lake
5. Hackett River
6. Dudidontu River / Nahlin River
7. King Salmon Lake

Taku chinook

1. Nakina River
2. Nahlin River / Tseta Creek
3. Dudidontu River
4. Upper Sheslay River / Hackett River
5. Tatsatua River
6. Kowatua River

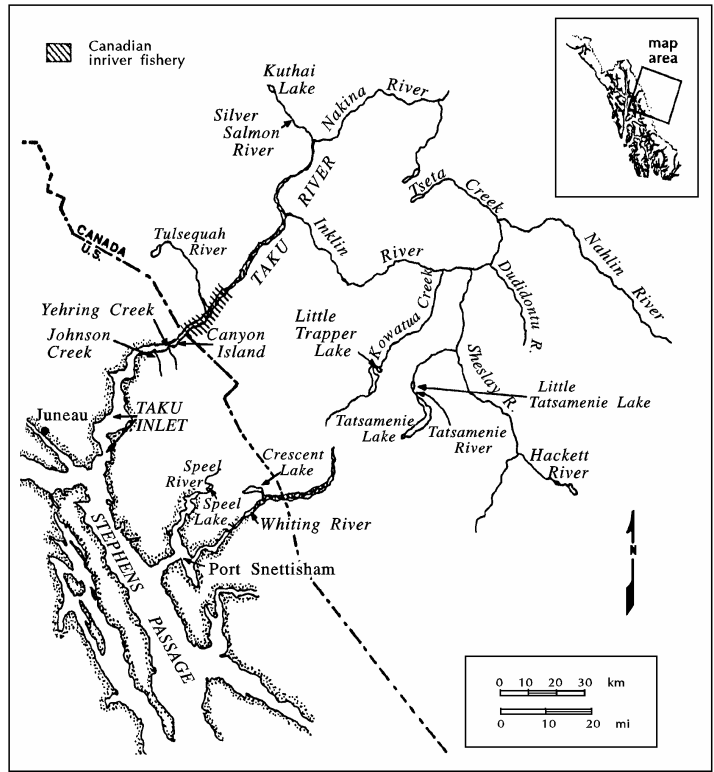


Figure 1. The Taku River drainage in British Columbia and Southeast Alaska.

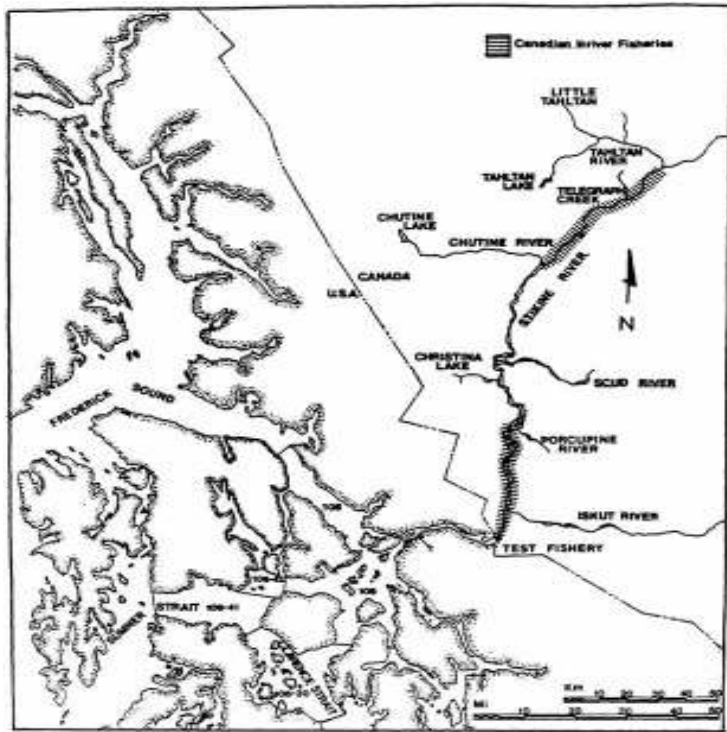


Figure 2. The Stikine River drainage in British Columbia and Southeast Alaska.

2.0 Methods

Following the sampling protocol developed by the Transboundary Technical Committee (see Pacific Salmon Commission report TCTR (07)-02), axillary appendages were excised from Chinook and sockeye harvested in lower Stikine and Taku inriver commercial fisheries and preserved in alcohol. The following parameters were used in selection of sample size:

Probability of a Type 1 error (a): 0.05

Absolute Precision (p): +/- 0.125

Weekly sample targets were as follows:

	Number of stocks	Potential maximum weekly catch (N) ¹	Minimum sample ²	Target sample (n)
Stikine sockeye	7	30,000	116	125
Stikine Chinook	6	1,500	111	120
Taku sockeye	7	5,000	116	125
Taku Chinook	6	1,500	111	120

¹ Based on professional judgment and historic catches – note that requisite sample size (n) does not vary with population size (N) except in cases where there is a finite population correction i.e. n/N in greater than 0.1.

² Based on Tortora, R.D. 1978. A note on sample size estimation for multinomial populations. Amer. Statistician 32: 100-102.

Two rotating field crews three technicians were involved in the sample collection on the Taku and Stikine rivers beginning in late April and early May respectively. The chinook fisheries operated from the beginning of May until the middle of June; chinook catches continued into directed sockeye fishing periods. Sockeye sampling took place from the middle of June until the middle of August. There were bi-weekly re-supply / crew change events for the duration of the project. On the Taku River, samples were obtained from two landing stations, Cranberry and Mosquito Point. On the Stikine River, samples were obtained from the Great Glacier Salmon landing station and processing plant. Additional samples were collected from the Stikine River chinook tagging study and the lower Stikine River sockeye test fishery. Samples were stored in ethyl alcohol, in 125 or 150 ml bottles with the required shipping and handling information. In October, samples were shipped to the Molecular Genetics Lab at the Pacific Biological Station for storage and eventual analysis, pending funding.

3.0 Results and Discussion

3.1 Taku River

The Canada / U.S. Transboundary Technical Committee preseason forecast for the terminal run of large (greater than 660 mm mid-eye to fork length, mostly 3-ocean or older) Chinook salmon bound for the Taku River in 2008 was 39,400 fish. This fell short of what was required to allow a directed commercial fishery in Canada, specifically 42,400 fish. This trigger is based on the 2008 escapement goal of 36,000 fish, plus base level catches of 5,000 fish (1,500 for Canada and 3,500 for the US), plus the test fishery catch allowance of 1,400 fish.

Normally, a test fishery operating under a scientific collection licence would have been implemented to provide run abundance information. However, due to recent legal considerations, a scientific collection licence for the Taku River Chinook salmon test fishery was not issued. Instead, an assessment level commercial fishery was permitted. This was open to all Taku River commercial salmon licence holders and was limited to a total of 1,400 large Chinook salmon, spread over the period April 27 – June 14 (statistical weeks 18-24) according to the following weekly guidelines.

Table 1. Weekly catch targets in the Taku River commercial assessment fishery, 2008

<i>Week</i>	<i>Week Starting (Sunday)</i>	<i>Maximum Catch of Large Chinook</i>
18	April 27	100
19	May 4	200
20	May 11	300
21	May 18	275
22	May 25	225
23	June 1	200
24	June 8	100

Catch of “small” chinook was also permitted in this fishery. The numbers of large and small chinook caught were 1,399 and 140 respectively. Unlike the directed sockeye fishery in which the catch was sampled according to the weekly targets identified, tissue samples were obtained from 99% of the chinook caught. Results are presented in Table 2.

The directed sockeye fishery commenced on June 15; a total of total of 1,243 chinook were landed as bycatch between this date and July 22 (statistical week 30). The weekly sampling goal of 120 chinook was met for the two weeks in which the catch exceeded 200 fish (Table 2). The total number of chinook tissue samples obtained from the directed sockeye fishery was 450, accounting for 36% of all chinook caught. The total number of samples obtained exceeded the minimum anticipated (840, based on seven weeks of fishing) by a substantial margin.

Collection of tissue samples from sockeye salmon was conducted in accordance with weekly targets during the directed sockeye fishery. Sample collection commenced on June 15 and concluded on August 23, 2008, through ten weeks of fishing. A total of 1,305 tissue samples were obtained, amounting to 7% of the sockeye caught. The target of 125 samples was achieved for each week of the fishery associated with a catch of more than 200 fish, except for the penultimate week of the sockeye fishery, which had a sample of 100 fish. This shortfall was made up the subsequent week, during which 200 samples were obtained (Table 2.) As was the case with chinook, the total number of samples obtained exceeded the minimum anticipated (875, based on seven weeks of fishing) by a substantial margin.

Table 2. Catches of chinook and sockeye salmon and associated tissue samples in the Taku River commercial fishery, 2008 by statistical week.

Stat Week	Chinook Catch	Chinook DNA Obtained	Sockeye Catch	Sockeye DNA Obtained
18	108	108		
19	206	206		
20	323	323		
21	315	310		
22	243	240		
23	232	232		
24	112 (1539)	111 (1530)	10	
Sockeye Season				
25	447	125	1,443	130
26	447	125	3,165	125
27	180	100	1,036	125
28	85	80	426	125
29	60	20	788	125
30	18		2,418	125
31			4,694	125
32			2,829	125
33			1,645	100
34			800	200
Total	2,776	1,980	19,254	1,305

3.2 Stikine River

Collection of tissue samples from chinook commenced on May 5 (statistical week 19) with the opening of the chinook commercial fishery and concluded on July 28, 2008 (statistical week 28), during the directed sockeye fishery. Collection of sockeye samples commenced on June 17 (the first week of the directed sockeye fishery, statistical week 25) and concluded on August 14, 2008 (statistical week 33). Additional chinook and sockeye DNA samples were collected on a weekly basis from the Kakwan chinook tagging site (located approximately 20 km downstream from the commercial fishery grounds) and from the sockeye test fishery (conducted on the commercial fishing grounds).

A total of 1,827 chinook samples were obtained from the commercial fishery (Table 2).. The weekly sampling goal of 120 samples was met for all of the weekly commercial fishery openings that yielded catches greater than 200 fish. During most weeks, 200 samples were collected. The sample amounted to approximately 25% of the 7,241 chinook caught in the commercial fishery. An additional 434 samples were collected from the Kakwan tagging site.

A total of 1,520 sockeye samples were collected from the commercial fishery, comprising 25% of the catch of 28,611 sockeye. The weekly sampling goal of 125 fish was achieved for each week of the fisheries associated with a catch of more than 500 sockeye. As with chinook, during most weeks, 200 samples were collected. The total number of samples obtained exceeded the minimum anticipated (875, based on seven weeks of fishing) by a substantial margin. An additional 105 samples were collected in the sockeye test fishery.

Table 3. Catches of chinook and sockeye salmon and associated tissue samples in the Stikine River commercial and test fisheries and chinook tagging site, 2008 by statistical week.

Stat Week	Chinook Catch	Chinook DNA Obtained	Sockeye Catch	Sockeye DNA Obtained
19	98	~60(61 ^a)		
20	375	200(61 ^a)		
21	535	200(19 ^a)		
22	472	200(7 ^a)		
23	1,450	200(78 ^a)		
24	1,822	200(96 ^a)	10	~6
25	1,084	200(51 ^a)	479	
Sockeye Season				
26	678	200(42 ^a)	8,378	200
27	404	200(19 ^a)	9,791	200
28	183	~100	3,574	200
29	84	~40	2,912	200
30	43	~20	1,472	200
31	10	~5	1,581	200
32	3	~2	366	~100
33			44	~20 (57 ^b)
34				(20 ^b)
35				(28 ^b)
36			4	
Total	7,241	1,827(434^a)	28,611	1,520 (105^b)

^a: samples from tagged fish captured at Kakwan Point, located 20 km downstream from commercial fishing grounds

^b: samples from the test fishery located within the commercial fishing grounds

3.1 Budget and Project Operations

Scheduling went as planned, with targets being reached on a weekly basis throughout the fisheries. In-kind and Fund expenditures are presented in Appendix 2. As noted, the DFO in-kind contribution is estimated at \$24,500 plus use of capital equipment and on-river facilities. The in-kind contribution is as follows: \$4,700 personnel, \$2,900 labour – employer costs, \$10,500 site costs (travel, sampling supplies, provisions, on-road vehicle/boat maintenance, boat fuel), \$800 training and \$5,700 overhead.

The amount requested from the Fund was \$44,300; approximately \$19,000 for wages, \$18,000 for air charter, \$7,000 for site costs (sampling material, provisions, and boat fuel). Expenditures for the different categories were generally close to the amount budgeted; however there was an overage in site costs of approximately \$3,300 (primarily boat fuel). This was offset by underages in air charter and labour costs (\$2,600 and \$700 respectively). Total Fund expenditures amounted to \$44,288, within the amount anticipated from the Fund pending acceptance of this final report.

4.0 Conclusion

This project was a success, with the number of tissue samples collected from chinook and sockeye salmon on the Stikine and Taku rivers in excess of the number anticipated.

Contingent upon funding for sample processing, fishery managers in both Canada and the U.S. will benefit by being able to identify the timing of the different sockeye and Chinook stocks through the lower reaches of the Stikine and Taku rivers. Improved management will benefit stakeholders in both Canada and the U.S.. Though results from this project will be retrospective, they will have the potential to lay the groundwork for the use of genetic stock identification as an in-season management tool.

Appendix 1: Photographs



Photograph 1. Early May 2008 on the Taku River just downstream of the Canada / U.S Border.



Photograph 2. Chinook salmon in fish trough on Taku



Photograph 3. Collecting axilliary appendage from chinook salmon on Taku River



Photograph 4. Taku River Cranberry Island landing station.



Photograph 5. Downstream boundary of the commercial fishing area on the Taku River.

Appendix 2: Financial Summary

Project Budget Form

ELIGIBLE COSTS	TOTAL BUDGET	OTHER FUNDING	PSC N. FUND GRANT AMOUNT	Actual Spending
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Labour
Wages & Salaries

Position	# of crew	# of work days	hrs per day	rate per hour	Total (In-kind & cash + PSC Amount)	In-Kind & Cash	PSC Amount	Actual
DFO Stock Assessment Biologist BI-3	1	16	7.5	39.00	4,680	4,680		
DFO Fishery Technician EG-4	2	24.8	7.5	26.78	9,961		9,961	9,794
DFO Fishery Technician EG-3	2	24.8	7.5	24.47	9,104		9,104	8,566
Person Days (# of crew x work days)					sub total	4,680	19,065	18,360

Labour - Employer Costs (percent of wages subtotal amount)

rate	12%	sub total	2,849
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Subcontractors & Consultants

	# of crew	# of work days	hrs per day	rate per hour				
Atlin Air (floatplane service)		9	1.8	560	9,072		9,072	8,782
Tsayta Air (floatplane service)		9	2	500	9,000		9,000	6,708
Insurance if applicable					rate	0%		
					sub total		18,072	15,489

Volunteer Labour

	# of crew	# of work days	hrs per day					
Skilled								
Un-skilled								
Insurance if applicable					rate	0%		
					sub total			
Total Labour Costs								

Site / Project Costs

Detail (use additional page for details if needed)

Travel (do not include to & from work)	vehicle fuel - Atlin, Telegraph Creek; meals & incid.	4,000	4,000		
Small Tools & Equipment					
Site Supplies & Materials	preservative, containers, provisions	7,130	2,070	5,060	3,532
Equipment Rental					
Work & Safety Gear					
Repairs & Maintenance	vehicle and boat maintenance	2,300	2,300		
Permits					
Technical Monitoring					
Other site costs	boat fuel (20 drums of fuel at \$210 ea)	4,200	2,100	2,100	6,906
Total Site / Project Costs		17,630	10,470	7,160	10,438

ELIGIBLE COSTS

BUDGET

**OTHER CONTRIBUTION
FUNDING FUNDING**

Training (e.g Swiftwater, bear aware, electrofishing, etc).					Total (PSC + In-kind + cash)	In-Kind & Cash	PSC Amount	
Name of course	# of crew	# of days						
bear aware	4	1	200		800	800		
Total Training Costs					800	800	-	

Overhead / Indirect Costs (not to exceed 20% of PSC Amount)

Office space; including utilities, etc.		2,600	2,600		
Insurance					
Office supplies		500	500		
Telephone & long Distance	satellite phone	2,600	2,600		
Photocopies & printing					
Other overhead costs					
Total Overhead Costs		5,700	5,700	-	

Capital Costs / Assets

Detail (use additional page for details if needed)

Total Capital Costs								
Project Total Costs					68,796	24,499	44,297	44,288

Budget Summary

	Total	InKind&Casl	PSC	Actual
Total Labour Costs	44,666	7,529	37,137	33,849
Total Site / Project Costs	17,630	10,470	7,160	10,438
Total Training Costs	800	800	-	
Total Overhead Costs	5,700	5,700	-	
Total Capital Costs	-	-	-	
Project Total	68,796	24,499	44,297	44,288