Stikine River Chinook Salmon

Aerial Survey Counts from Select Spawning Sites, 2018.

Final Report

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DFO CA# 57677

PSC NF-2018-VHPC-06

Johnny Sembsmoen and Aaron Foos
Fisheries and Oceans Canada
100-419 Range Road
Whitehorse, Yukon Territory
Y1A 3V1

Executive Summary

Aerial surveys were conducted to enumerate spawning Stikine River Chinook salmon, *Oncorhynchus tshawytscha*, at select Stikine River Chinook spawning sites on July 30 and August 2, 2018. The objectives were to provide aerial survey counts of Chinook salmon spawners for indexing against a mark-recapture program, as well aerial survey counts of spawners located above the Little Tahltan weir to maintain an expansion dataset.

Aerial survey conditions were challenging in 2018, complicated by one of the lowest Chinook run sizes on record. On July 30 the Tahltan River survey was aborted due to turbid/ muddy water, and turbid/ muddy water also negatively impacted the count at Christina Creek. On August 02 the Tahltan River and Beatty Creek surveys were aborted due to heavy smoke from the nearby forest fire and turbid/ muddy water also negatively impacted the counts at Christina Creek and Verrett River. A combined total of 126 Chinook salmon were observed from five survey index sites; 94 Chinook observed on July 30 and 32 Chinook on August 2. The majority of fish were located at Little Tahltan, Verrett River, and Beatty Creek (combined flight totals of 31, 41 and 32 Chinook respectively). Overall, approximately 4% of the total run of large Chinook above the Little Tahltan weir was observed, well below historical averages.

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1 Introduction

Stikine River Chinook salmon are harvested in both Canadian and U.S. waters. In the US, troll, recreational, commercial and subsistence gillnets fleets intercept Stikine River bound Chinook salmon. In Canada, commercial gillnet, food social and ceremonial (FSC), and recreational fisheries target this population. Stikine River Chinook salmon are subject to the principles and annexes of international Pacific Salmon Treaty (PST). Fisheries management regimes are, therefore, driven by catch share provision as prescribed by the PST (PSC 2014). The Transboundary Technical Committee (TTC), under the auspices of the PST, generates spawning goal escapements and annual total allowable catch metrics.

Chinook salmon in the Stikine River comprise one of over 50 indicator stocks included in annual assessments by the Chinook Technical Committee (CTC) of the Pacific Salmon Commission (PSC) to determine stock status, effects of management regimes, and other requirements of the Pacific Salmon Treaty (PST) (Der Hovanisian and Etherton 2006). The Stikine River is one of the largest producers of Chinook salmon in Northern B.C. and Southeast Alaska (Der Hovanisian and Etherton 2006). Spawning occurs in the lower mainstem and tributaries such as Tahltan, Little Tahltan, Chutine, Katete, Craig, Barrington and Tuya rivers; and Beatty, Christina, Verrett, Shakes, Six-mile, Andrew, and Tashoots creeks (DFO 1991; Pahlke and Etherton 1999; Bernard et al. 2000). The total Stikine River target escapement range is 14,000 to 28,000 large Chinook salmon with a point target of 17,368 large fish (PSC 2014). Reflective of the total Stikine River escapement goal, the target escapement range for Little Tahltan River is 2,700 to 5,300 large fish with a point target of 3,300 large fish (Bernard et al 2000).

The TTC uses a Chinook salmon model, referred to as the Stikine Chinook Salmon Management Model (SCMM), for in-season fisheries management. The SCMM is based on a linear regression between weekly cumulative CPUE of large Chinook salmon observed at a tagging site in the lower Stikine River and total run size based on mark-recapture studies conducted since 1996. For escapement enumeration, aerial helicopter surveys of the Little Tahltan River were conducted annually from 1975 – 2004, and a fish-enumeration weir has been operated at the mouth of the Little Tahltan River since 1985 (Benard et al. 2000). Since 1996, annual mark-recapture studies have been used to estimate spawning escapements (Pahlke and Etherton 1998, 1999, 2000; Pahlke et al. 2000; Der Hovanisian et al. 2002, 2003, 2004; Der Hovanisian and Etherton 2005; Der Hovanisian and Etherton 2006). In 1997 and 2005, radio-telemetry studies were conducted in conjunction with mark-recapture experiments to estimate the distribution and run timing of Chinook salmon spawners (Pahlke and Etherton 1999). Genetic stock identification (GSI) has provided insight germane to stock specific run timing and relative abundance in 2008, 2010, and 2012-13 to complement radio telemetry studies cited above (PSC 2018).

In the past, core agency (DFO and ADF&G) funding was reduced and as a result aerial surveys of the Little Tahltan River were terminated from 2005-13, and in 2014 the Little Tahltan weir project was reduced in scope. At times of budgetary constraints, the weir program on the Little Tahltan River has been questioned as to its long term feasibility given its cost and the potential of lower cost aerial survey counts serving as a surrogate to collect spawning escapement estimates. Analysis has shown that the

aerial survey counts are significantly correlated with the Little Tahltan weir counts. Aerial survey counts were collected from the Little Tahltan River and other upper Stikine reach spawning sites including the Tahltan River and Beatty Creek from 1979 to 2004, no surveys from 2005-2013, surveys starting again in 2014, with the exception of 2017 Appendix A.1. Except for a Stikine River Chinook spawning site located on the US reach of the Stikine River, there is a paucity of aerial survey counts from sites located within the lower reach of the Canadian section of the Stikine River. Two sites in particular support a sizeable spawning escapement of Chinook salmon; namely, the Verrett River and Christina Creek (Smith et al. 2007). These two sites coincide with one of the two Stikine River Chinook conservation units identified through Canada's Wild Salmon Policy. It is important to better monitor these sites to provide a long term measure of the relative spawning numbers (indicator stocks) returning to these sites on an inter-annual basis. Furthermore, aerial surveys of these lower reach sites serves to validate system wide escapement estimates generated from the annual mark-recapture program, and provide surveyors the opportunity to assess these areas for landscape changes. Surveys also provide the opportunity to investigate other non-target spawning sites while in en-route to select sites (increased costs to conduct short, additional investigations are marginal).

The specific objectives of the 2018 project were:

1. Aerial (helicopter) visual Chinook counts for the Tahltan River, Little Tahltan River, Beatty Creek, Verrett River, and Christina Creek;
2. Expansion of the Little Tahltan River aerial survey results and subsequent comparison with the weir count;
3. Maintenance/expansion of the data set for aerial Chinook counts on the Stikine River index sites

This report presents the findings of Stikine River Chinook salmon aerial surveys conducted on July 30 and August 2 of 2018. The data is compared and contrasted with past surveys conducted at select sites from 1979 to 2016.

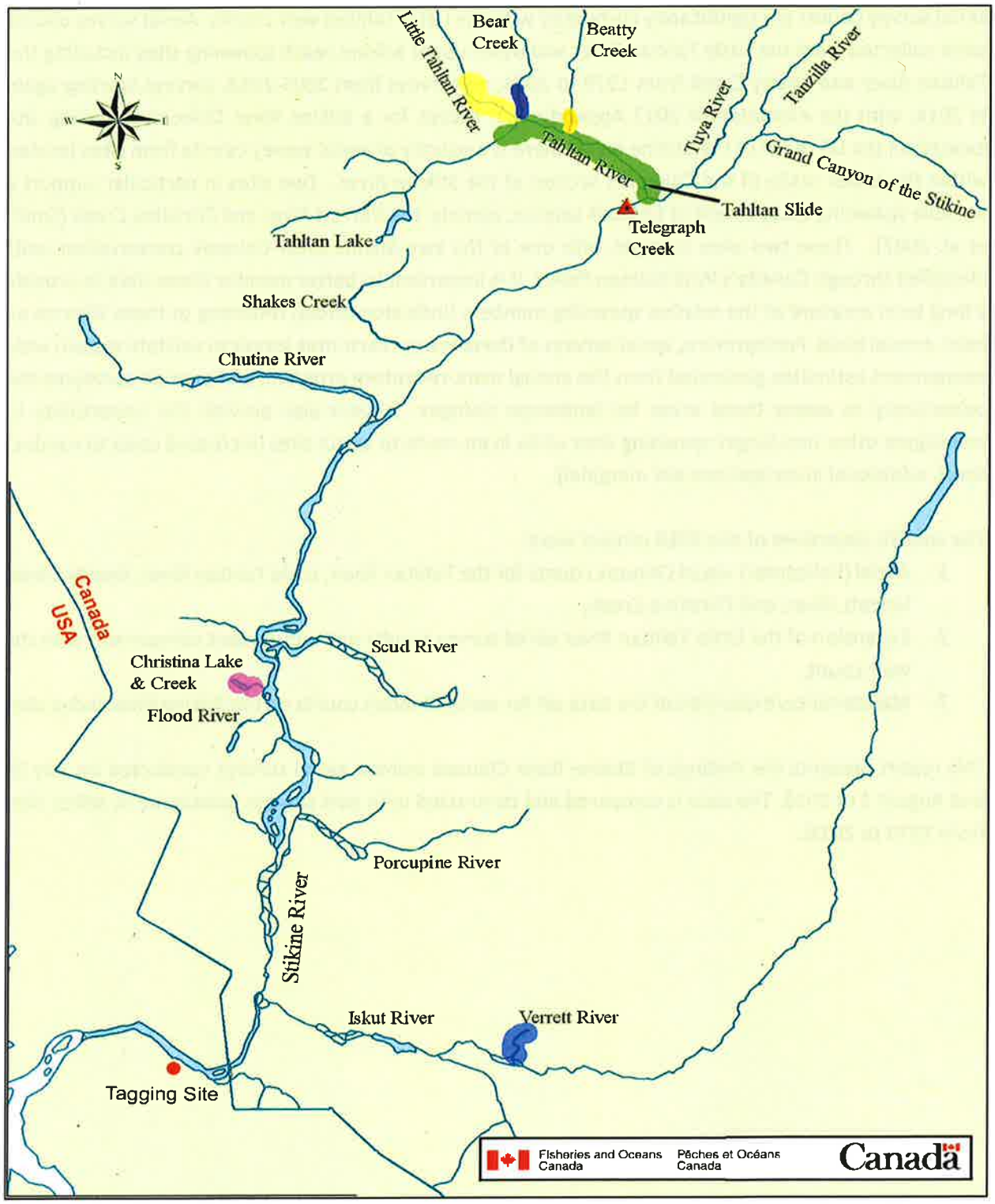

Figure 1. The lower to mid reaches of the Stikine River drainage in British Columbia and Southeast Alaska, showing Chinook salmon aerial survey sites observed in 2018.

2 Methods

Tundra Helicopters Bell 206 B Jet Ranger helicopter was charted through DFO's contractual policy for approximately six hours on each survey flight which occurred on July 30 and August 2, 2018. The helicopter departed Dease Lake, B.C. which is approximately 80 km east of the start of the first survey index site. Two observers sat in tandem on the starboard side of the helicopter thus approximating viewing conditions. Survey speeds varied from a stationary hovering position to approximately 20 km/hr. Altitude of surveys varied from 30 to 100 metres.

Survey conditions were subjectively assessed based on water clarity, water flow regime, overhanging foliage, glare, and, to a lesser degree, air turbulence. Surveyors counted individual live fish and noted their activity (spawning pairs, schooled). Carcasses were also enumerated. Ancillary information relating to bear, wolf, and eagle sightings were tabulated.

At the termination of the survey, the counts taken from the two surveyors were tallied and the average of the two counts was adopted as the number of utility. The total count included both large Chinook salmon (>735 mm fork length) and smaller jack Chinook salmon. An inferred contribution of the two size groups was calculated based on the ratio of jack to large Chinook salmon enumerated at the Little Tahltan weir in 2018 (jack – 47.7%, large – 52.3%).

In preparation for the survey Jet (A) helicopter fuel was staged at a strategic locations within the flight path of the survey well in advance of the survey date. Table 1 list's the survey's index sites and defines the boundaries of the survey zone for each of the spawning sites.

3 Results and Discussion

The July 30 survey conditions were favourable for aerial surveying (no fog or rain, sunny, light turbulence). The Tahltan River index flight was aborted due to turbid/ dirty water which prevented observing Chinook, and the Christina Creek index site count was impaired due to turbid/ muddy water. There was good water clarity and favorable conditions for the Little Tahltan River, Beatty Creek, and Verrett River index sites (Table 1).

Table 1. Summary of Chinook salmon aerial counts at select Stikine River Chinook spawning sites; July 30, 2018.

Area	Start Finish	Count Live	Count Carcass	2018 Date	Observers	Description of Survey Area	Comments
Tahltan River	9:23 9:27	0	0	30-Jul	Frocklage Carlick	Tahltan River from Decheeka Falls downstream to mouth start:58^{0}06.822'//131^{0}19.720 end:58^{0}00.655'//130^{0}58.692	Flight aborted - Turbid/ dirty water Like chocolate milk 4 eagles observed 0 bears observed
Little Tahltan River	8:44 9:17	19	0	30-Jul	Frocklage Carlick	Little Tahltan River from its mouth upstream approximately 13km. start:58^{0}07.282'//131^{0}19.124 end:58^{0}10.700'//131^{0}28.375	18 eagles observed 0 bears observed
Beatty Creek	14:23 14:32	32	1	30-Jul	Frocklage Carlick	Beatty Creek from its mouth upstream approximately 5 km. start:58^{0}06.130'//131^{0}11.271 end:58^{0}07.106'//131^{0}10.655	10 eagles observed 0 bears observed
Christina Creek	10:18 10:33	2	2	30-Jul	Frocklage Carlick	Christina Creek from its mouth upstream approximately 6 km. including the lower 2 km of the inlet stream emptying into Christina Lk. start:57^{0}14.282'//131^{0}50.364 end:57^{0}14.709'//131^{0}55.102	Turbid/ muddy 4 eagles observed 0 bears observed
Verrett River	12:15 12:25	41	0	30-Jul	Frocklage Carlick	Verrett River from its mouth upstream to Verrett R. falls, including a secondary channel flowing east start:56^{0}41.488'//131^{0}01.009 end:56^{0}42.375'//130^{0}59.470	Glacial, slightly turbid decent conditions 6 eagles observed 0 bears observed

TOTALS	94
estimates large*	49
estimated jack	45

*based on the percentage of large Chinook to jack Chinook salmon (52.3%) observed at the Little Tahltan weir in 2018.

The August 02 survey conditions were favourable for aerial surveying (no fog or rain, sunny, light turbulence). The Tahltan River and Beatty Creek surveys were aborted due to too much smoke from nearby forest fires. The Christina Creek and Verrett River surveys were impaired due to very turbid/ muddy water. There was good water clarity conditions and favorable conditions for the Little Tahltan River survey (Table 2).

Table 2. Summary of Chinook salmon aerial counts at select Stikine River Chinook spawning sites; August 02, 2018.

Area	Start Finish	Count Live	Count Carcass	2018 Date	Observers	Description of Survey Area	Comments
Tahltan River		0	0	2-Aug	Sembsmoen Carlick	Tahltan River from Decheeka Falls downstream to mouth start:58°06.822'//131°19.720 end:58°00.655'//130°58.692	Survey aborted. Too much smoke from the forest fire.
Little Tahltan River	9:30 9:55	31	0	2-Aug	Sembsmoen Carlick	Little Tahltan River from its mouth upstream approximately 13km. start:58°07.282'//131°19.124 end:58°10.700'//131°28.375	Some glare off water A little windy 18 eagles observed 0 bears observed
Beatty Creek		0	0	2-Aug	Sembsmoen Carlick	Beatty Creek from its mouth upstream approximately 5 km. start:58°06.130'//131°11.271 end:58°07.106'//131°10.655	Survey aborted. Too much smoke from the forest fire.
Christina Creek	11:30 11:40	0	0	2-Aug	Sembsmoen Carlick	Christina Creek from its mouth upstream approximately 6 km. including the lower 2 km of the inlet stream emptying into Christina Lk. start:57°14.282'//131°50.364 end:57°14.709'//131°55.102	Very turbid and muddy water 2 eagles observed 1 bear observed
Verrett River	13:30 13:35	1	0	2-Aug	Sembsmoen Carlick	Verrett River from its mouth upstream to Verrett R. falls, including a secondary channel flowing east start:56°41.488'//131°01.009 end:56°42.375'//130°59.470	Very turbid and muddy water 6 eagles observed 0 bears observed
TOTALS		32					
estimates large*		17					
estimated jack		15					

*based on the percentage of large Chinook to jack Chinook salmon (52.3%) observed at the Little Tahltan weir in 2018.

A combined survey total of 126 Chinook salmon were observed in the prescribed index areas listed in Tables 1 and 2. Both large Chinook salmon (fish measuring >735mm fork length) and "jack" Chinook salmon (fish measuring <736 mm fork length) were observed; however, the two size types were not distinguished in the field data. As a surrogate, the percentage of large salmon against the total run counted at the Little Tahltan River weir was applied to the total aerial survey count to provide an estimate of large and jack Chinook salmon observed. The July 30 flight provided good results for three of the five index sites compared to good results for just one of the five index sites on the August 02 flight. The highest count of 41 Chinook was observed on July 30 at Verrett River. The high count of 31 for the Little Tahltan River survey occurred on August 2. Approximately 3.5% (16 large Chinook) of the total Little Tahltan weir count of 453 large Chinook salmon was observed during the aerial survey which is well below the 1985-2016 average of 41.1%, Appendix 1. This contrast of accuracy rates may be due to hidden pockets of Chinook salmon that were not visible at the time of the survey, as viewing conditions were good.

In prior years where we have both aerial counts and weir counts for Little Tahltan River large Chinook, the relationship is strong (R2 = 0.89). This was strengthened to an R2 = 0.90 with the addition of 2018 data. This provides confidence that if in the future we are unable to deliver the weir program, we would be able to generate a reasonably confident estimate of escapement to Little Tahltan River by expanding an aerial count. If we had employed this method in 2018, this relationship would have estimated a Little Tahltan River large Chinook escapement estimate of 304 fish. This is within 33% of the actual escapement observed through the weir. Had the 2018 Little Tahltan River aerial counts been more in line with the average proportion of Chinook observed, this estimate would be more precise.

4 Budget Summary

The Northern Endowment Fund allocation of $23,200 was not fully expended as the project came in under budget at $20,880.00 due to efficiencies gained in cooperation with TFN. The project expenditures were equal to the 90% advance of project funds from the PSC of $20,880, so there will be no holdback funds required, and no refund from DFO. A budget summary of expenditures can be referenced in Appendix 3.

5 Conclusion

The project objectives were met in that survey attempts were made at all index sites during two aerial flights. Unfortunately, environmental conditions significantly impaired the results of these surveys at some sites. The Little Tahltan surveys were successful and added critical data to improve our understanding of the relationship between aerial counts and weir counts on this river.

6 Recommendations

Survey objectives are to provide Chinook counts from index sites in both the upper (Little Tahltan, Tahltan, and Beatty) and lower reaches (Christina and Verrett) of the Stikine River; these areas loosely correspond to DFO's Wild Salmon Policy prescribed conservation units (stocks). Survey results also augment the Little Tahltan video weir count to aerial survey count relationship, and provide some measure of validation of the system wide mark-recapture escapement estimates. For these reasons it is highly recommended that these surveys continue. It is further recommended that surveys be conducted as early as possible during the day and before peak glacial melt is manifest, thus capitalizing on opportune viewing conditions in glacier fed systems. (To note: this recommendation is not germane to the Little Tahltan index site given that this system has minor glacial runoff inputs). Finally, it is imperative that planning and scheduling for the surveys start in early June to ensure helicopter availability and provide time for helicopter fuel placement and surveyor scheduling.

7 Acknowledgements

Cheri Frocklage (Tahltan Fisheries Co-ordinator), Kerry Carlick (Tahltan Fisheries Program Manager) and Johnny Sembsmoen of DFO conducted the aerial surveys supported by this funding. Tundra Helicopters provided the air charter services. Bandstra Transportation and Myles Sampson provided fuel transport. Colleen Claggett, Katherine Lai, and Conie Rogan (DFO) assisted with the financial administration and accounting for this project.

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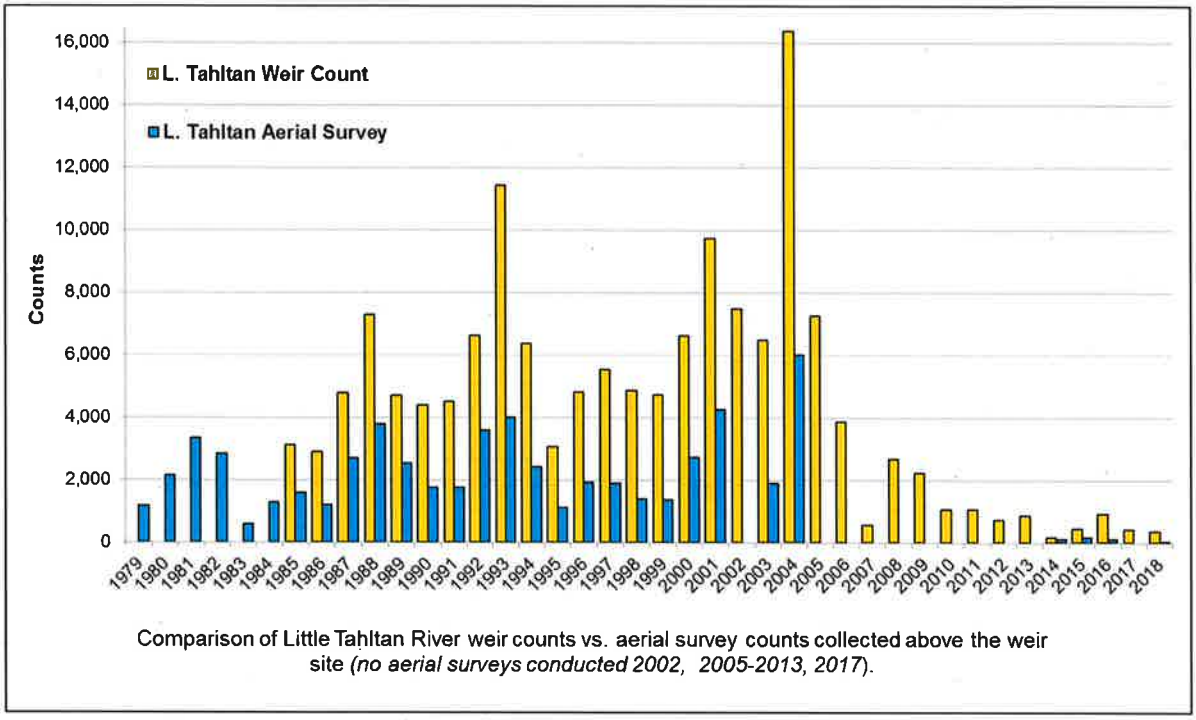
9 Appendices

Appendix 1 - Run size and escapement of Stikine River Chinook salmon based on weir counts and aerial survey estimates, 1979-2018.

Year	Little Tahltan Weir	Little Tahltan Aerial	Tahltan Aerial	Beatty Aerial	Aerial count: L. Tahltan % of total weir
1979		1,166	2,118		
1980		2,137	960	122	
1981		3,334	1,852	558	
1982		2,830	1,690	567	
1983		594	453	83	
1984		1,294		126	
1985	3,114	1,598	1,490	147	51.32%
1986	2,891	1,201	1,400	183	41.54%
1987	4,783	2,706	1,390	312	56.58%
1988	7,292	3,796	4,384	593	52.06%
1989	4,715	2,527		362	53.59%
1990	4,392	1,755	2,134	271	39.96%
1991	4,506	1,768	2,445	193	39.24%
1992	6,627	3,607	1,891	362	54.43%
1993	11,425	4,010	2,249	757	35.10%
1994	6,360	2,422		184	38.08%
1995	3,072	1,117	696	152	36.36%
1996	4,821	1,920	772	218	39.83%
1997	5,547	1,907	260	218	34.38%
1998	4,873	1,385	587	125	28.42%
1999	4,733	1,379			29.14%
2000	6,631	2,720			41.02%
2001	9,730	4,258			43.76%
2002	7,476				
2003	6,492	1,903			29.31%
2004	16,381	6,014			36.71%
2005	7,253				
2006	3,860				
2007	562				
2008	2,663				
2009	2,245				
2010	1,057				
2011	1,058				
2012	720				
2013	878				
2014	169	121	514	15	71.63%
2015	450	179	53	30	39.78%
2016	921	107	95	25	11.62%
2017	492				
2018	453	16		17	3.53%
Averages 1985-2017	4,491	2,200	1,357	244	41.08%
2008-2017	1,065	136	221	23	41.01%
2018 % avg. of 2008-2017	42.52%	11.79%	n/a	72.40%	8.61%

2014: Little Tahltan Weir (L/J - ratio = 80.9%)
2015: Little Tahltan Weir (L/J - ratio = 47.9%)
2016: Little Tahltan Weir (L/J - ratio = 74.3%)
2017: No Aerial Surveys
2018: Little Tahltan Weir (L/J - ratio = 52.3%)

Appendix 2 - Aerial survey counts versus Little Tahltan River weir counts of Chinook salmon, 1985-2018.



Comparison of Little Tahltan River weir counts vs. aerial survey counts collected above the weir site *(no aerial surveys conducted 2002, 2005-2013, 2017)*.

Appendix 3 *Financial Summary*

Fisheries and Oceans Canada - PSC Project Budget Financial Report

Name of Project and PSC#:

STIKINE RIVER CHINOOK SALMON AERIAL SURVEYS (NEF-2018-VHPC-06)

EXPENDITURES

Labour

DFO Employee Salaries and Benefits

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

Subcontractors & Consultants

Contract	Contract Amount Expended		Approved Budget	Total Expenditure	Variance
Air Fuel Haul (includes boat charter)	$ 4,105.00		3,000		
Air Charter	$ 13,644.75		16,000		
Total Expended	$ 17,749.75	Total Budget	$ 19,000.00	$ 17,749.75	$ 1,250.25
		Total Labour Summary	$ 19,000.00	$ 17,749.75	$ 1,250.25

Site / Project Costs

Item	Amount Expended		Approved Budget	Total Expenditure	Variance
Travel	$ 497.16		$ 1,200.00		
Small Tools & Equipment					
Site Supplies & Materials	$ 2,633.09		$ 3,000.00		
Equipment Rental					
Work & Safety Gear					
Repairs & Maintenance					
Permits					
Other costs					
Total Expended	$ 3,130.25	Total Budget	$ 4,200.00	$ 3,130.25	$ 1,069.75
		Total Site / Project Summary	$ 4,200.00	$ 3,130.25	$ 1,069.75

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					
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	$ -	Total Budget	$ -	$ -	$ -
		Total Overhead / Indirect Summary	$ -	$ -	$ -

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	$ 19,000.00	$ 17,749.75	$ 1,250.25
Site / Project Costs	$ 4,200.00	$ 3,130.25	$ 1,069.75
Training	$ -	$ -	$ -
Overhead / Indirect Costs	$ -	$ -	$ -
Capital Costs / Assets	$ -	$ -	$ -
TOTAL	**$ 23,200.00**	**$ 20,880.00**	**$ 2,320.00**

PST Project Funding Grant Advance Amount Received	$ (20,880.00)
PST Project Funding Grant Amount Remaining to be Paid	$ -
Difference Between Grant Amount and Project Expenditures	$ -

Project Manager Name: Aaron Foos

Project Manager Signature:

Date: 25 March 2019

DFO Responsibility Center Manager Name: William Waugh

DFO Responsibility Center Manager Signature:

Date: Mar. 26/19