

Aerial Survey Counts from Select Stikine River Chinook Spawning Sites, 2015

(A project supported by the Northern Fund through the Pacific Salmon Commission)

DFO 57677

PSC NF-2015-I-15

Final Report

December 2015

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Executive Summary

Aerial surveys were conducted to enumerate spawning Stikine River Chinook salmon, *Oncorhynchus tshawytscha*, at select Stikine River Chinook spawning sites on August 8 and 11, 2015. The objectives were to provide a relative measure of onsite validation of lower reach Chinook salmon spawners against a mark-recapture programme, as well the provision of aerial survey precision of spawners located above the Little Tahltan weir.

A combined total of 559 Chinook salmon was observed from five survey index sites. The majority of fish were located in the Little Tahltan River. The lower reaches of Christina Creek and the Verrett River saw only nine and three fish respectively. The glacial runoff during the August 11 survey of index sites had a negative effect on the observation of Chinook. Approximately 40 per cent of the total run above the Little Tahltan weir was observed.

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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 (PST 2009). 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, Sixmile, 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 2004). 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 – 2008, 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 2015).

Over the past several years, core agency (DFO and ADF&G) funding has been reduced and as a result aerial surveys of the Little Tahltan River were terminated in 2004, and in 2014 the Little Tahltan weir

project was reduced in scope. Moreover, the weir program on the Little Tahltan River has recently been questioned as to its long term feasibility given its high 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, 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 (DFO 1995) It is important, therefore, to better monitor these sites thus providing, over the long term, a 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 programme, provide surveyors with the opportunity to assess the areas for landscape changes; the surveys also provide the opportunity to investigate other non-target spawning sites while in en-route to select sites (increased costs to do short, additional surveys are marginal).

The following paper reports on the findings of a Stikine River Chinook salmon aerial survey project conducted on August 8th and 11th, 2015. The data is compared and contrasted with past surveys conducted at select sites from 1979 to 2004. The efficacy of the project and recommendations are also presented.

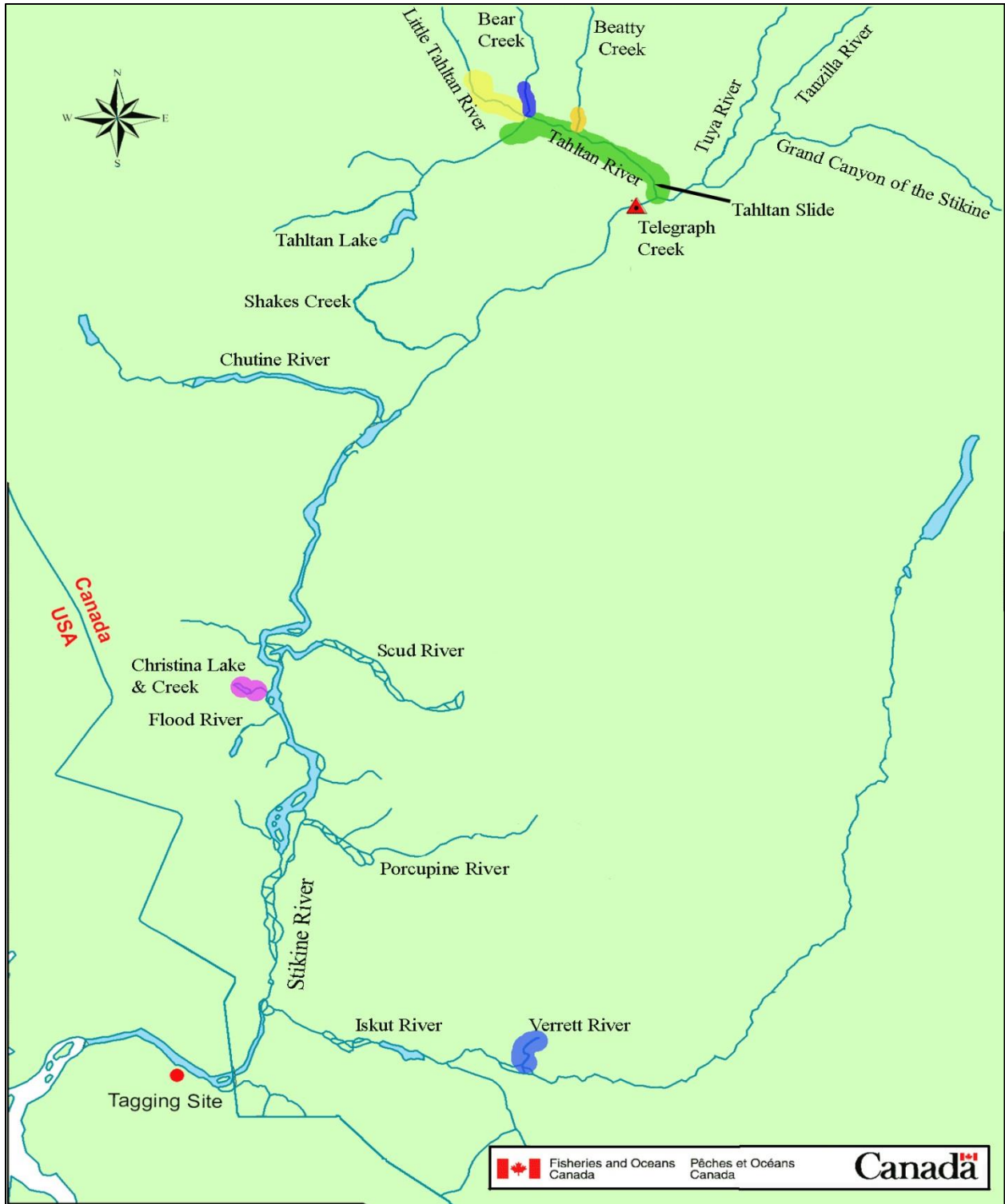


Figure 1. The lower to mid reach of the Stikine River drainage in British Columbia and Southeast Alaska, showing Chinook salmon aerial survey sites observed in 2015.

2 Methods

Lakelse Air's Bell 206 Jet Ranger helicopter was chartered through DFO's contractual policy for a total of 6 hrs on August 08, and 5 hrs on August 11, 2015. The helicopter departed Dease Lake, B.C. at 0900 hrs and returned at approximately 1600 hrs each day. (Dease Lake is approximately 80 km north of the survey site.) Two surveyors sat in tandem on the starboard side of the helicopter thus approximating viewing conditions. Survey speed 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 2015 (jack – 52%, large – 48%).

In preparation for the survey Lakelse Air Ltd. was notified a fortnight in advance of the flight time and the appropriate booking was made. Jet (A) helicopter fuel was staged at a strategic site within the flight path of the survey well in advance of the survey date. Table 1 lists the locations and defines the boundaries of the survey zone for each of the spawning sites.

The August 8th flight surveyed Beatty Creek and Little Tahltan River while the August 11th flight surveyed Christina Creek, Verrett River and the Tahltan River.

3 Results and Discussion

The survey conditions were mixed in that the August 8th survey was done under weather conditions that were compatible with aerial surveying (no fog or rain, light turbulence) coupled with low, and relatively clear flow regimes; however, on the August 11th survey the water clarity was compromised by turbidity (glacial occlusion), high flows regimes, and glare at select sites, Table 1.

Table 1. Summary of Chinook salmon counts taken from an aerial survey at select Stikine River chinook spawning sites, August 8 and 11, 2015.

AREA	: STR : FIN	CNT live	CNT carcass	2015 DATE	OBSERVERS	DESCRIPTON OF SURVEY AREA	COMMENTS
Tahltan River	: 1439 : 1555	110	1	11-Aug	Frocklage Dennis	: Tahltan River from Decheeka Falls : downstream to mouth : start:58°06.822//131°19.720 : end:58°00.655//130°58.692	: Viewing conditions were moderate; some : glacial runoff impairing observation. : Observed 80 eagles, four grizzly bears
Little Tahltan River	: 1137 : 1308	374	0	08-Aug	Frocklage Sembsmoen	: Little Tahltan River from top : downstream approximate 13km. : end:58°10.700//131°28.375 : start:58°07.282//131°19.124	: Viewing conditions were excellent. Clear : water throughout survey with small sections of glare : Heavy wind; pilot requested fly from top to mouth. : Observed 27 eagles.
Beatty Creek	: 1013 : 1026	63	0	08-Aug	Frocklage Sembsmoen	: Beatty Creek from its mouth : upstream approximate 5 km. : start:58°06.130//131°11.271 : end:58°07.106//131°10.655	: Viewing conditions were good; : water clear and low. : Observed eleven eagles.
Christina Creek	: 1326 : 1340	9	2	11-Aug	Frocklage Dennis	: Christina Creek from its mouth : upstream approximate 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	: Viewing conditions were : poor to fair due to higher water : and glacial runoff. : Observed three eagles.
Verrett River	: 1030 : 1041	3	1	11-Aug	Frocklage Dennis	: 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	: Viewing conditions were poor due to : high, glacial water. : Observed three eagles.
TOTAL	:	559					
estimates large*	:	268					
estimated jack	:	291					

*based on the percentage of large chinook to jack Chinook salmon (47.9%) observed at the Little Tahltan weir in 2015

A total of 559 Chinook salmon (large and jacks) was observed in the prescribed index areas listed in Table 1. Both large Chinook salmon (fish measuring >735mm fork length) and “jack” Chinook salmon (fish measuring less than 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 highest concentration of large Chinook salmon was observed in the Little Tahltan River, n=374, Table 1. There were only 9 Chinook salmon observed at Christina Creek and only three Chinook salmon observed at the Verrett River index area; the former site had very poor viewing condition due to glacial runoff and higher water, while the latter site had conditions similar, but not as extreme. Approximately 40 per cent (179 large Chinook) of the total Little Tahltan weir count of 450 large Chinook salmon was observed during the aerial survey, very close to the 1985-2004 average of 41 per cent, Appendix A.1. This contrast of accuracy rates may be due to the low return of Chinook salmon transiting the weir resulting in the many small, clearly visible “pockets” of Chinook salmon spawners or migrants observed in the course of the survey (i.e. there were seldom schools of fish holding in a layered pattern, hence individual fish were exposed and easily enumerated).

The total count of 53 large Tahltan River Chinook salmon was approximately three percent of past surveys conducted at this reach of the river. Notwithstanding the slightly impaired viewing conditions at this site, the relatively poor count is possibly linked to the May 2014 Tahltan River rockslide that effectively blocked immigration of up to 70 percent of Tahltan River origin Chinook salmon. The Tahltan River rockslide may be size selective for salmon passage under different water flow regimes.

4 Budget and Project Operations

As presented in Appendix B, the expenditures were as expected and the allotted \$19.3k was expended. Approximately 95 per cent of the total expenditure was on a helicopter charter, the balance covered travel and miscellaneous costs. No funding went toward staging of helicopter fuel as some fuel had been staged at a strategic site by another project in 2014 and permission was given to use this fuel. A summary of expenditures in relation to forecasted amounts is as follows:

- a) Helicopter fuel haul and boat charter
 - Total cost: \$0 (amount budgeted \$3,000)
- b) Helicopter (Bell 206 Jet Ranger) charter and travel
 - Total cost: \$16,017 (amount budgeted \$13,800)
- c) Site Support: helicopter fuel
 - Miscellaneous: \$3,283 (amount budgeted \$2,500)

5 Conclusion

The project was fulfilled in that the five index sites were surveyed during two aerial flights. The ratio of (jack/ large) applied to the aerial survey counts from the Little Tahltan weir sample (jack/ large) ratio observed in 2015 should be used with a measure of scepticism given the possible salmon size selectivity for passage under different water flow regimes.

The aerial survey counts of the main stem Tahltan River were valuable in providing information on the spawning distribution of the species, i.e. found that spawners were located at many and varied sites from near the mouth of the river upstream to Decheeka Falls. The survey also provided timely insight into the migration success of Chinook salmon around the May 2014 rockslide. These data were used in post season analysis and stake holder and agency meetings.

6 Recommendations

Given that the importance of realizing the survey objectives which 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 which loosely corresponds to DFO's Wild Salmon Policy prescribed

conservation units (stocks), in concert with augmenting the current Little Tahltan weir (jack/ large ratio) to aerial survey count ratio's, and providing some measure of validation of the system wide mark-recapture based escapement estimates, it is highly recommended that these surveys continue. Moreover, the surveys of the Tahltan River gain special importance in light of the 2014 rockslide. Survey counts above the slide will provide insight as to salmon access conditions at the landslide site. 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), Mr. Dennis of the Iskut First Nation and Johnny Sembsmoen of DFO conducted the aerial surveys supported by this funding. Colleen Claggett and Carol Laframboise (DFO) assisted with the financial administration and accounting for this project

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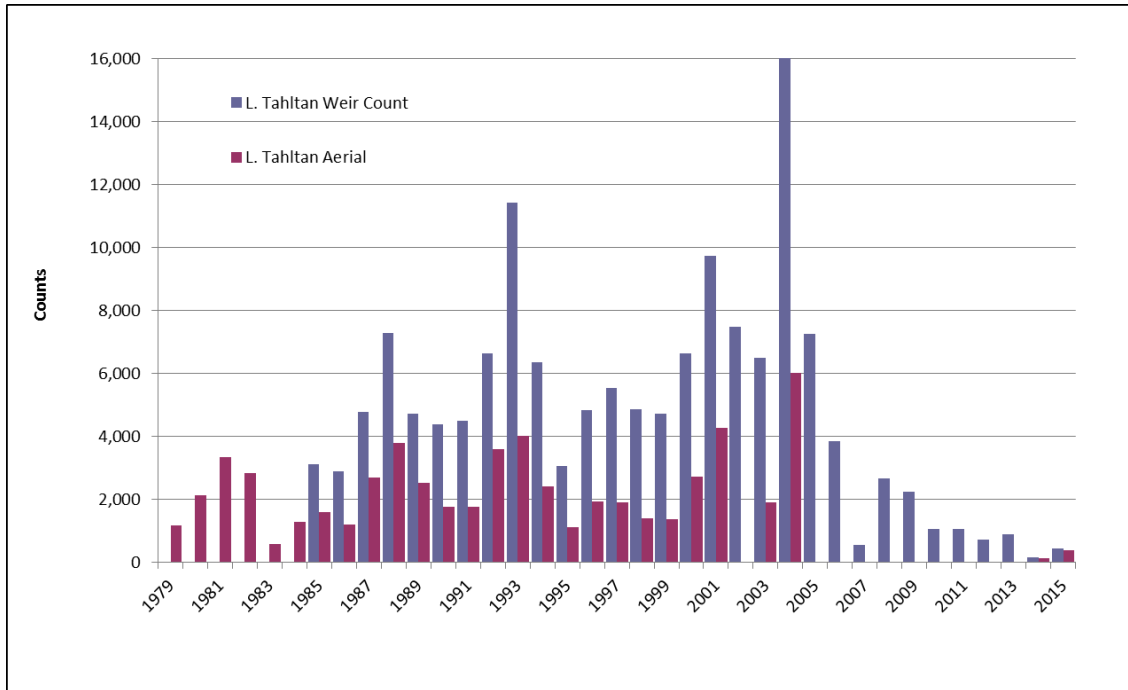
Appendix A: Table of total run size and escapement estimates, Stikine River Chinook salmon, 1979-2015.

Appendix A.1. Run size and escapement of Stikine River Chinook salmon based on mark-recapture, foot survey and aerial survey estimates, 1979-2015.

Year	Little Tahltan Weir	Little Tahltan Aerial	Tahltan Aerial	Beatty Aerial	Aerial count: L.Tahltan % of total weir
1979		1166	2118		
1980		2137	960	122	
1981		3334	1852	558	
1982		2830	1690	567	
1983		594	453	83	
1984		1294		126	
1985	3114	1598	1490	147	51.3%
1986	2891	1201	1400	183	41.5%
1987	4783	2706	1390	312	56.6%
1988	7292	3796	4384	593	52.1%
1989	4715	2527		362	53.6%
1990	4392	1755	2134	271	40.0%
1991	4506	1768	2445	193	39.2%
1992	6627	3607	1891	362	54.4%
1993	11425	4010	2249	757	35.1%
1994	6360	2422		184	38.1%
1995	3072	1117	696	152	36.4%
1996	4821	1920	772	218	39.8%
1997	5547	1907	260	218	34.4%
1998	4873	1385	587	125	28.4%
1999	4733	1379			29.1%
2000	6631	2720			41.0%
2001	9730	4258			43.8%
2002	7476				
2003	6492	1903			29.3%
2004	16381	6014			36.7%
2005	7253				
2006	3860				
2007	562				
2008	2663				
2009	2245				
2010	1057				
2011	1058				
2012	720				
2013	878				
2014*	169	121	514	15	71.6%
2015	450	374	110	63	83.1%
per cent avg		5.3%	31.3%	5.3%	166.9%
Averages					
1985-2013	5040	2374	n/a	n/a	n/a
1979-2004	n/a	2374	n/a	n/a	41.10%
1979-1998	n/a	2266	1642	291	42.92%
1985-2004	6293	2526	1642	291	41.34%

* used large to jack ratio observed at the weir as a proxy to discriminate large and jacks from the aerial survey results. The total combined count of large and jack Chinook salmon was 149 L. Tahltan, 633 Tahltan River and 19 Beatty Creek.

Appendix A.2. Aerial survey counts versus Little Tahltan River weir counts of Chinook salmon, 1985-2015.



Appendix B: Financial Summary

Project Budget Form

Name of Project: Stikine River Chinook Salmon Aerial Surveys (2015)

ELIGIBLE COSTS					TOTAL PROJECT BUDGET	OTHER FUNDING	PSC N. FUND GRANT AMOUNT		
Labour									
Wages & Salaries									
Position	# of crew	# of work days	hrs per day	rate per hour	Total (PSC + In-kind + cash)	In-Kind & Cash	PSC Amount	Actual Expenses	Variance
Senior Technician (DFO EG-5)	1	12	7.5	35	3,150	3,150			
Senior Technician (DFO EG-5)	1	12	7.5	35	3,150	3,150			
Fisheries Technician (DFO EG-3)	1	5	7.5	32	1,200	1,200			
Financial Officer	1	1	7.5	30	225	225			
Person Days (# of crew x work days)					sub total	7,725	7,725		
Labour - Employer Costs (percent of wages subtotal amount)									
		rate	20%		sub total	1,545	1,545		
Subcontractors & Consultants									
	# of crew	# of work days	hrs per day	rate per hour					
Helicopter Fuel Haul (includes boat charter)					3,000		3,000		3,000
Insurance if applicable									
		rate	0%		sub total		3,000	-	3,000
Volunteer Labour									
	# of crew	# of work days	hrs per day						
Skilled									
Un-skilled									
Insurance if applicable									
		rate	0%		sub total				
Total Labour Costs					12,270	9,270	3,000	-	3,000
Site / Project Costs									
Provide details in the space below (use an additional page if needed)									
Travel (do not include to & from work)	Helicopter charters and per diems				13,800		13,800	16,017	(2,217)
Small Tools & Equipment									-
Site Supplies & Materials	Helicopter fuel				2,500		2,500	3,283	(783)
Equipment Rental									-
Work & Safety Gear									-
Repairs & Maintenance									-
Permits									-
Technical Monitoring									-
Other site costs									-
Total Site / Project Costs					16,300		16,300	19,300	(3,000)

Project Budget Form (continued)

ELIGIBLE COSTS				BUDGET	OTHER FUNDING	CONTRIBUTION FUNDING		
				Total (PSC + In-kind + cash)	In-Kind & Cash	PSC Amount	Actual	Variance
Training (e.g Swiftwater, bear aware, electrofishing, etc).								
Name of course	# of crew	# of days						
Total Training Costs								
Administrative Costs								
Office space; including utilities, etc.				800	800			
Office supplies				100	100			
Telephone & Long Distance				100	100			
Photocopies & printing								
Insurance								
Indirect/overhead costs								
(If the PSC contribution to Indirect costs exceeds 20% of the total PSC grant you will be required to submit back-up documentation justifying the expense).								
Other overhead costs (give details)								
Total Administrative Costs				1,000	1,000			
Provide details in the space below (use an additional page if needed)								
Capital Costs / Assets								
Assets are things of value that have an initial cost of \$250 CAN or more and which can be readily misappropriated for personal use or gain or which are not, or will not be, fully consumed during the term of the project.								
Asset	Provide details here							
Asset	Provide details here							
Asset	Provide details here							
Asset	Provide details here							
Total Capital Costs								
Project Total Costs				29,570	10,270	19,300	19,300	-
						Balance		\$ -
Budget Summary								
(PSC + in-kind + cash)						initial payment		\$ 17,370.00
						10% holdback		\$ 1,930.00
								\$ 19,300.00
Total Labour Costs			12,270					
Total Site / Project Costs			16,300					
Total Training Costs			-					
Total Overhead Costs			1,000					
Total Capital Costs			-					
Project Total			29,570					

Appendix C: Photographs

Appendix C.1. Verrett River near mouth.



Appendix C.2. Little Tahltan River weir.



Appendix C.3. Decheeka Falls, Tahltan River, starting point of the Tahltan River aerial survey.



Appendix C.4. Cheri Frocklage, aerial survey participant and Tahltan Fisheries Co-ordinator.

