Stikine River Canadian Commercial Fishery Sampling and Stock Assessment 2019

Final Report
March 2020

PSC NF-2019-I-16
DFO CA2019-EF-046

Johnny Sembsmoen, Teresa Bachynski, and Jody Mackenzie-Grieve
Fisheries and Oceans Canada
Suite 100, 419 Range Road
Whitehorse, Yukon Territory
Y1A 3V1

Executive Summary

The Northern Endowment Fund (NEF) provided Fisheries and Oceans Canada (DFO) with financial support to assist with biological sampling of sockeye (*Oncorhynchus nerka*) and coho (*Oncorhynchus kisutch*) salmon from the Stikine River Canadian commercial fisheries between June 25 and September 6, 2019. A commercial fisheries closure was in effect from July 15 to August 24 due to mainstem sockeye salmon conservation concerns.

A total of six spaghetti tags were collected from Chinook salmon bycatch that were live released in the directed sockeye commercial fishery. A total of 375 Chinook Large and 272 Chinook non-large salmon were live released in the directed sockeye fishery.

A total of 10,772 sockeye were caught during the directed sockeye commercial fishery. A total of 1,590 (14.8%) were sampled; 1000 were sampled for age, sex, length, egg diameter, and otolith marks, and 590 were sampled for sex, length, and egg diameter.

A total of 5,228 coho were caught during the directed coho commercial fishery; 500 (9.6%) were sampled for age, sex, length and adipose clips. An additional 1,551 coho (30%) were inspected just for adipose clips. Twenty five heads were collected for CWT analysis.

All information gathered is integral to in-season fisheries management and stock assessment as well as postseason analyses, run reconstructions, and forecasting.

Table of Contents

List of Figures

List of Tables

Appendix

1.0 Introduction

The Stikine River drains a large watershed primarily located in northwestern British Columbia. The river system contains numerous significant tributaries which flow south west ultimately draining to the Pacific Ocean in Southeast Alaska near Wrangell (Figure 1).

Salmon returning to the Stikine River pass through a U.S. offshore troll fishery before entering inside Alaskan waters where they encounter commercial, subsistence and recreational fisheries. After entering the Stikine River salmon are harvested by U.S. subsistence fisheries, and once in Canada, by commercial, First Nation, and recreational fisheries.

The Canadian commercial fishery is located on the lower Stikine River from the Canada/ US border upstream to approximately the Porcupine River confluence, including approximately 10 km up the Iskut River (Figure 1). Sockeye (*Oncorhynchus nerka*) and coho (*Oncorhynchus kisutch*) salmon are targeted. The bilateral 2019 preseason forecast for large Chinook salmon (*Oncorhynchus tshawytscha*) was well below the 10 year average and the lower bound of the escapement goal, so for conservation reasons Chinook salmon commercial and test fisheries were not executed in either Canada or the United States. Canada also took the additional step of requiring the release of all Chinook bycatch in the directed sockeye commercial fishery.

This project involved Fisheries and Oceans Canada (DFO) Aquatic Science Technicians collaborating with lower Stikine River commercial fisheries in the collection of coded wire tags (CWT), otoliths, age, sex, length, and egg diameter samples as applicable from sockeye and coho salmon. Commercial fishers reported the number of Chinook released as bycatch and recorded the tag numbers of any tags observed. These data are vital elements of the Stikine River fishery management and stock assessment programs. CWT recovery is used in the estimation of smolt production of Chinook and coho salmon. Otoliths are used to estimate the contributions of enhanced Tahltan Lake sockeye. Age, sex, length and egg diameter comprise baseline stock assessment data used for stock recruitment analysis and monitoring stock health.

Technicians also collected daily commercial fishery performance data to inform in-season management of the fisheries.

The activities of this project are essential components of Stikine River Chinook, sockeye and coho management and enhancement plans as identified in Salmon Management and Enhancement Plans for the Stikine, Taku and Alsek Rivers, 2018 TCTR Report (19)-1.

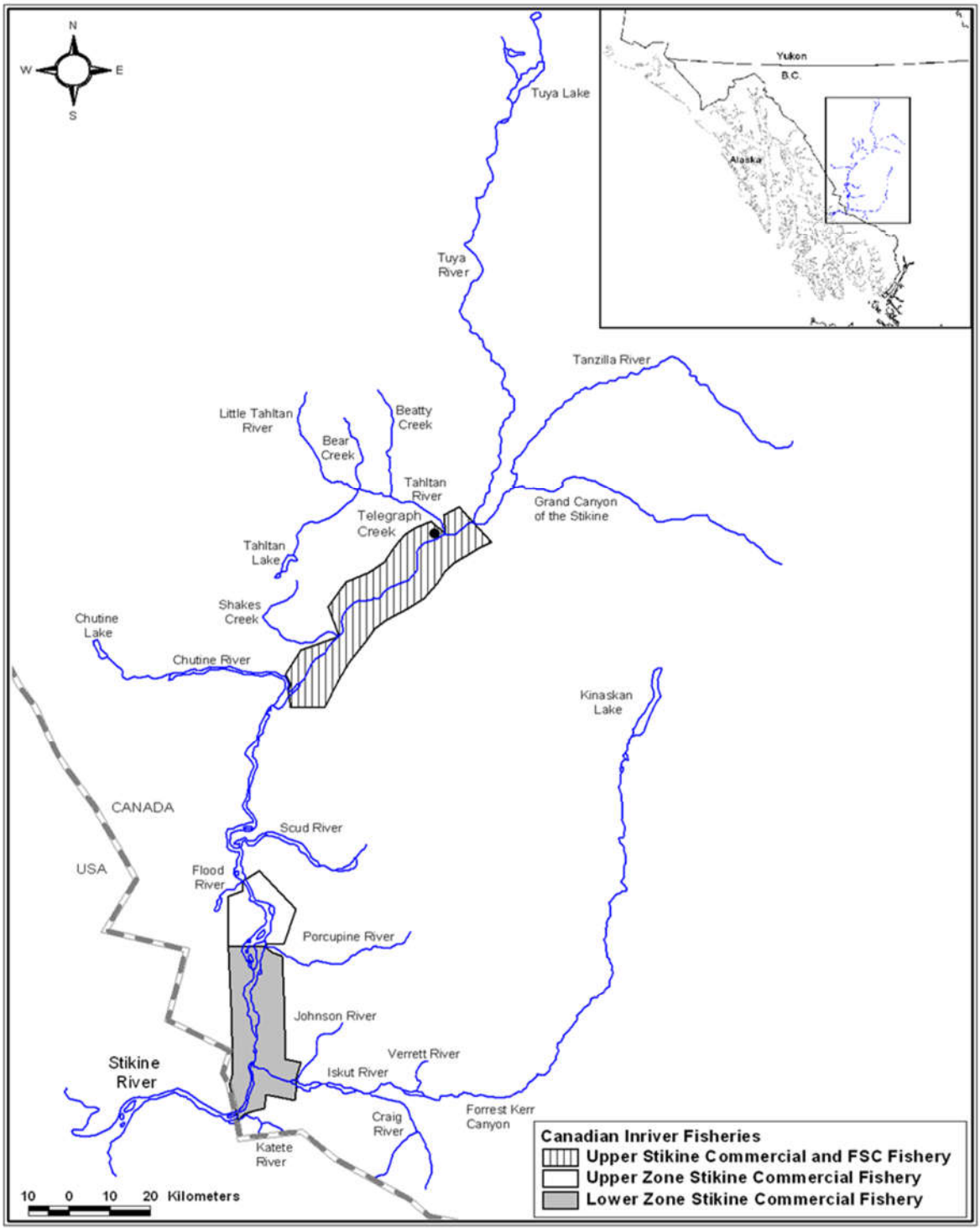

Figure 1. The Stikine River drainage and major tributaries showing Canadian commercial fishing areas.

2.0 Objectives

This project was for the collection of CWT, spaghetti tag, otolith, age, sex, length, and egg diameter samples as a applicable from Chinook, sockeye and coho salmon in the lower Stikine River commercial fisheries. There was no fishery in 2019 as a result of conservation concerns. These data are essential for stock assessment and fisheries management and are shared among several other integral joint Canada/ U.S. stock assessment projects that analyze and report respective results. More specifically, the objectives of this project were to:

1. Inspect for and recover CWT's from Chinook and coho salmon
2. Inspect for and recover spaghetti tags from Chinook salmon
3. Collect stock identification samples from sockeye salmon which specifically includes: otoliths (wild/ enhanced contribution) and egg-diameters (Tahltan Lake or Mainstem origin).
4. Collect age, sex and length samples from sockeye and coho salmon

3.0 Methods

The field crew consisted of one DFO aquatic science technician and one Tahltan First Nation (TFN) fisheries technician based out of a permanent DFO field camp located approximately one kilometer upstream of the Canada/ U.S. border within the lower zone of the Canadian commercial fishery on the lower Stikine River (Figure 1). The crew gathered fishery performance data from all commercial fishers and sampled commercial catch at the Great Glacier Salmon landing station which is less than one kilometer upstream from the DFO field camp. Extensive biological sampling is possible as fish were landed round.

The field crew gathered and collated all mandatory fishery reporting data on a daily basis and reported it to the DFO office in Whitehorse, Y.T. to inform in-season management and stock assessment programs.

Chinook Fishery Sampling

As a result of conservation concerns, there was no directed Chinook commercial fishery in 2019. All Chinook caught (dead or alive) in the directed sockeye commercial fishery were required to be released. Commercial fishers were instructed to observe and record daily number of releases, estimated size (large/ jack), and spaghetti tag numbers. Recovered spaghetti tags are used to develop run size estimates (Chinook mark-recapture program). Adipose-clipped Chinook salmon were released in 2019 and not retained for the CWT.

Sockeye Fishery Sampling

Sockeye salmon commercial fishery catches were sampled for biological data as per weekly targets identified below (Table 1). Biological sampling included fork length measurement (mm), scale collection (5 down), sex identification, egg diameter measurements, and otolith collection. Scales aged to estimate broodyear survival and are used in stock assessment forecasts, and are used for genetic stock identification (post-season), and egg diameters (10 eggs lined up in a row and measured to the nearest mm) are used for in-season stock identification (Tahltan or Mainstem). Otoliths are used for stock identification (wild versus enhanced) and brood year determination.

Otoliths were delivered to Alaska Department of Fish & Game (ADF&G) staff (Juneau, A.K.) once weekly for in-season analysis of the enhanced proportion by brood year.

Coho Fishery Sampling

Coho salmon commercial catches were sampled for length (fork length, mid-eye fork length, post-orbital hypural length; mm), scales (5 down), sex, and were checked for adipose clips (indicative of a coded wire tag) (Table 1). If adipose clipped fish were observed, heads were retained and shipped to the DFO office during crew changes for subsequent transport to the contracted DFO lab (J.O. Thomas) in Vancouver, B.C. for CWT extraction. Recovery data will be stored in internal databases until the dataset is verified, after which it will be uploaded into the Regional Mark Processing Centre website database (www.rmpc.org).

Table 1: Lower Stikine sampling directive, 2019.

Sampling Directive - Lower Stikine River - 2019

Commercial Fishery

	# scales		random sample goal	# otolith	# egg dia	random scales	length			ad-clip obs.
							fork	mid-eye	hypural	
sockeye	5 none	1st 2nd	200/ wk. 200/ wk.	required n/a	required required	required n/a	x x			
Chinook	n/a		**~ Retention not permitted for 2019 ~**							x
coho	5		200 in week #1 200 in week #2 100 in week #3	n/a n/a n/a	n/a n/a n/a	required required required	x x x	x x x	x x x	x x x

1) Observe all coho and incidental chinook for adipose clips. Keep all heads of adipose clipped fish/ label and put in freezer.
(if CWT tagged chinook are encountered, retain & label head, record: head code, location, fishery, date, species, sex)
2) For coho (comm.): record fork length, mid-eye fork length and post-orbital hypural length for all fish.
~ measurements to the nearest 5 millimetres (i.e., 555, 560, 565, 570, 575)
3) For sockeye (commercial): record only the fork length for all fish.
~ measurements to the nearest 5 millimetres (i.e., 555, 560, 565, 570, 575)
~ start a new otolith tray & scale book at the beginning of each statistical week
4) DNA collection is from the scales in 2019; do not collect axillary processes.
5) Scale book date is when the book is completed.
6) Sample Location for scale books is "Lower Stikine River". No short-hand abbreviations.
7) Use pencil when recording information in scale books.

Scales samples were sent to DFO's Sclerochronology Laboratory at the Pacific Biological Station (Nanaimo, B.C.). Results are stored in internal DFO databases.

Otoliths samples were delivered to ADF&G on a weekly basis in-season and analyzed at the Mark Recovery Laboratory in Juneau, Alaska. Data are stored in an online database (mtalab.adfg.alaska.gov).

4.0 Results

There was no directed Chinook commercial or test fishery conducted on the Lower Stikine River in 2019. Mandatory release was also implemented for all Chinook caught as bycatch within the directed sockeye commercial fishery. A directed sockeye commercial fishery that targeted the Tahltan Lake stock occurred from June 25 to July 15. A directed sockeye commercial fishery that would have targeted the Mainstem stock (stat. wk. 31-34; July 28 to August 24) did not occur due to conservation concerns. A directed coho commercial fishery occurred from August 25 to September 7.

Chinook Salmon Tag Recovery

There was no directed Chinook salmon fishery in 2019. All Chinook salmon bycatch in the directed sockeye commercial fishery were required to be released. The commercial fishers were instructed to record the tag numbers of all spaghetti tagged fish observed prior to release. There were six tags observed in the directed sockeye commercial fishery.

Commercial Fishery – sockeye salmon

A total of 1,590 sockeye salmon were sampled from the commercial fisheries catch of 10,772 of which 1,000 were from the otolith sample group and 590 were from the no-otolith sample group. A total of 1,000 sockeye salmon GSI (scale analysis) samples were collected during statistical weeks 26 to 29, and 35 and 36. GSI results have not yet been received.

Typically, sockeye salmon of Tahltan origin return to the Stikine prior to Mainstem sockeye, and stock of origin of the commercial harvest can be expanded to the entire run across statistical weeks (Table 1). In 2019 there was no sockeye fishery targeting the Mainstem run, and sockeye caught in statistical weeks 35 and 36 were incidental to the coho fishery. Scale analyses showed that 5.2 (Gilbert-Rich age) aged sockeye accounted for approximately 80 % of the enhanced Tahltan sockeye, with 4.1 aged fish comprising approximately 20 % of the commercial samples analysed (Table 1). Tahltan wild sockeye comprised approximately 88 % 5.2 aged fish. The next most common age class was 4.1 (approximately 1% of the harvest) (Table 2). More than half (approximately 55%) of the Mainstem sockeye were 5.2 aged fish, and approximately 39 % were 4.1 aged fish (Table 3). These proportions are derived through otolith analyses and egg diameters to identify stock of origin and scale analyses for ageing.

Table 2: Summary of weekly sockeye salmon stock proportions and harvest by stock in the Canadian commercial fishery, 2019.

Statistical Week	Week Ending	Weekly Catch		Mainstem	Tuya Enhanced	Tahltan Enhanced	Tahltan Wild	All Tahltan	Total
26	29-Jun	1,806	N	17	0	81	48	129	146
			Proportion	0.116	0.000	0.555	0.329	0.884	1.000
			Expanded #	**210**	**0**	**1,002**	**594**	**1,596**	**1,806**
27	6-Jul	2,265	N	8	0	106	47	153	161
			Proportion	0.050	0.000	0.658	0.292	0.950	1.000
			Expanded #	**113**	**0**	**1,491**	**661**	**2,152**	**2,265**
28	13-Jul	3,459	N	16	0	92	47	139	155
			Proportion	0.103	0.000	0.594	0.303	0.897	1.000
			Expanded #	**357**	**0**	**2,053**	**1,049**	**3,102**	**3,459**
29	20-Jul	2,413	N	29	0	83	37	120	149
			Proportion	0.195	0.000	0.557	0.248	0.805	1.000
			Expanded #	**470**	**0**	**1,344**	**599**	**1,943**	**2,413**
30	27-Jul	0	N						
			Proportion						
			Expanded #						
31	3-Aug	0	N						
			Proportion						
			Expanded #						
32	10-Aug	0	N						
			Proportion						
			Expanded #						
33	17-Aug	0	N						
			Proportion						
			Expanded #						
34	24-Aug	0	N						
			Proportion						
			Expanded #						
35	31-Aug	535	N	58	0	7	4	11	69
			Proportion	0.841	0.000	0.101	0.058	0.159	1.000
			Expanded #	**450**	**0**	**54**	**31**	**85**	**535**
36	7-Sep	294	N	68	0	1	2	3	71
			Proportion	0.958	0.000	0.014	0.028	0.042	1.000
			Expanded #	**282**	**0**	**4**	**8**	**12**	**294**
37	14-Sep	0	N						
			Proportion						
			Expanded #						
	Total	10,772							
			Expanded #	**1,881**	**0**	**5,949**	**2,942**	**8,891**	**10,772**
			Proportion	0.175	0.000	0.552	0.273	0.825	

Table 3: Summary of age (GR), sex, and length characteristics of sockeye salmon (Tahltan enhanced) sampled in the lower Stikine River commercial fishery, 2019.

		42		52		Combined *	
		F	M	F	M	F	M
	N	20	52	177	121	197	173
	Proportion	0.054	0.141	0.478	0.327	0.532	0.468
Proportion by age		0.195		0.805			
Fork Length	Count	20	52	177	121	197	173
	Average	542	522	602	629	596	597
	Std. Dev.	16.50	29.61	27.23	28.13	32.04	56.92
	Maximum	590	595	675	689	675	689
	Minimum	522	480	439	540	439	480
Mid-Eye Fork Length	Count	20	52	177	121	197	173
	Average	504	478	557	571	551	543
	Std. Dev.	14.38	25.60	23.74	24.32	27.94	49.21
	Maximum	546	541	620	622	620	622
	Minimum	487	442	414	494	414	442
Post-Orbital Hypural Length	Count	20	52	177	121	197	173
	Average	443	420	487	502	483	477
	Std. Dev.	12.11	22.70	19.98	21.57	23.52	43.64
	Maximum	478	476	541	548	541	548
	Minimum	428	388	367	434	367	388

* : Includes unaged samples.

Table 4: Summary of age (GR), sex, and length characteristics of sockeye salmon (Tahltan wild) sampled in the lower Stikine River commercial fishery, 2019.

		41		42		52		53		63		Combined *	
		F	M	F	M	F	M	F	M	F	M	F	M
	N	1	0	17	0	159	0	1	0	2	0	185	0
	Proportion	0.006	0.000	0.094	0.000	0.883	0.000	0.006	0.000	0.011	0.000	1.000	0.000
Proportion by age		0.006		0.094		0.883		0.006		0.011			
Fork Length	Count	1		17		159		1		2		185	
	Average	586		550		603		556		584		598	
	Std. Dev.			24.41		26.48				4.24		30.16	
	Maximum	586		595		681		556		587		681	
	Minimum	586		508		515		556		581		508	
Mid-Eye Fork Length	Count	1		17		159		1		2		185	
	Average	543		512		558		516		541		553	
	Std. Dev.			21.28		23.09				3.70		26.30	
	Maximum	543		550		625		516		543		625	
	Minimum	543		474		481		516		538		474	
Post-Orbital Hypural Length	Count	1		17		159		1		2		185	
	Average	475		449		488		453		474		484	
	Std. Dev.			17.91		19.43				3.11		22.14	
	Maximum	475		482		545		453		476		545	
	Minimum	475		418		423		453		472		418	

* : Includes unaged samples.

Table 5: Summary of age (GR), sex, and length characteristics of sockeye salmon (mainstem) sampled in the lower Stikine River commercial fishery, 2019.

		31		41		42		52		53		63		Combined *	
		F	M	F	M	F	M	F	M	F	M	F	M	F	M
	N	3	0	68	0	1	0	96	0	1	0	5	0	229	0
	Proportion	0.017	0.000	0.391	0.000	0.006	0.000	0.552	0.000	0.006	0.000	0.029	0.000	1.000	0.000
Proportion by age		0.017		0.391		0.006		0.552		0.006		0.029			
Fork Length	Count	3		68		1		96		1		5		229	
	Average	587		605		550		602		530		595		602	
	Std. Dev.	42.52		26.04				26.25				21.79		27.04	
	Maximum	630		660		550		671		530		620		671	
	Minimum	545		545		550		540		530		570		530	
Mid-Eye Fork Length	Count	3		68		1		96		1		5		229	
	Average	543		559		511		556		494		550		557	
	Std. Dev.	37.08		22.71				22.89				19.00		23.58	
	Maximum	581		607		511		617		494		572		617	
	Minimum	507		507		511		502		494		529		494	
Post-Orbital Hypural Length	Count	3		68		1		96		1		5		229	
	Average	476		489		449		487		434		482		487	
	Std. Dev.	31.21		19.12				19.27				16.00		19.85	
	Maximum	508		530		449		538		434		500		538	
	Minimum	445		445		449		442		434		464		434	

* : Includes unaged samples.

Commercial Fishery – coho salmon

A total of 500 coho salmon were sampled from the commercial fisheries catch of 5,228 fish from 25 August 25 to 7 September 7. The coho scale analysis has a low priority at the DFO scale lab and results are not expected until late March – early April 2020.

5.0 Budget Summary

The Northern Endowment Fund 90% advance of $78,733.00 was fully expended. Total project expenditures were $78,773,77 which was $40.77 over-budget. The 10% holdback of allocated funds will not be required. A budget summary can be referenced in Appendix 1.

6.0 Conclusions

All objectives of the project were met. As there was no directed Chinook commercial fishery in 2019 as a result of conservation concerns, no Chinook samples were collected. With the cooperation of commercial fishers, 6 spaghetti tags were reported. The spaghetti tags assist in generating a mark-recapture estimate for the species (reported elsewhere).

A directed sockeye commercial fishery that targeted the Tahltan Lake stock occurred during statistical weeks 26 though 29 (the first opening was on June 25 and the last ended on July 15). A directed sockeye commercial fishery that would have targeted the Mainstem stock (statistical weeks 31 through 34; July 28 to August 24) did not occur due to conservation concerns. Although sample targets were met for sockeye salmon, the Mainstem stock was not sampled through directed fisheries. Weekly samples goals were met for coho salmon.

The public posting of fisheries notices for commercial openings and extensions were completed. The coordination of shipping otolith samples to Wrangell, Alaska on a weekly basis was carried out successfully. The communication of important daily/ weekly commercial/ test fishery catch information and results of fish sampling to fisheries managers was performed in a timely fashion.

Sampling of the commercial fishery provides critical information required for in-season fisheries management and for post season fishery analyses and stock assessment.

7.0 Acknowledgements

Jared Dennis completed field operations for the Tahltan and Iskut First Nation under the direction of Cheri Frocklage (Tahltan Fisheries Co-ordinator) and Kerry Carlick (Tahltan Fisheries Program Manager).

Mathieu Ducharme, Shawn McFarland, Adam Brennan, and Mark McFarland completed field operations and project expediting for DFO under the direction of Johnny Sembsmoen and Jody Mackenzie-Grieve.

B.C. Yukon Air Service Ltd. and Tundra Helicopters Ltd. provided air support for the project.

The project would not have been successful without the participation of Stikine River commercial fishers, Great Glacier Salmon Ltd. and Stikine Salmon.

Appendix 1 - Budget Summary

Fisheries and Oceans Canada - PSC Project Budget Financial Report

Name of Project and PSC#:

Stikine River Canadian Commercial Fishery Sampling and Stock Assessment (I-16)

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	$ -						
	Benefits	$ -				$ -		
Biologist	Salary	$ 4,050.00	$ 4,050.00					
	Benefits	$ 1,093.50	$ 1,093.50			$ -		
Technicians (EG-4 & EG-3	Salary	$ 27,075.00	$ 27,075.00					
	Benefits	$ 7,310.25	$ 7,310.25			$ -		
Total Expended		$ 39,528.76	$ 39,528.76	$ -		$ -	$ -	$ -

Subcontractors & Consultants

Contract	Contract Amount Expended	Inkind	PSC funding (expenses)		Approved Budget	Total PSC Funded Expenditure	Variance
Air charter	$ 20,133.83		$ 20,134		21,000		
Boat Charter	$ 12,705.00		$ 12,705		10,500		
TFN Technician	$ 22,628.27		$ 22,628		27,621		
Otolith Delivery	$ 1,430.91		$ 1,431		1,500		
	$ -						
Total Expended	$ 56,898.01	$ -	$ 56,898.01		$ 60,621.00	$ 56,898.01	$ 3,722.99
		$ 39,528.75		Total	$ 60,621.00	$ 56,898.01	$ 3,722.99

Site / Project Costs

Item	Amount Expended	Inkind	PSC funding (expenses)		Approved Budget	Total PSC Funded Expenditure	Variance
Travel	$ 3,127.10		$ 3,127		4,800		
Small Tools & Equipment	$ 467.00		$ 467		1,500		
Site Supplies & Materials	$ 4,470.80		$ 4,471		4,400		
Equipment Rental	$ -				-		
Work & Safety Gear	$ 660.32		$ 660		800		
Repairs & Maintenance	$ 3,099.68		$ 3,100		4,000		
Permits	$ 6,581.94		$ 6,582		7,000		
Other costs	$ 2,986.92		$ 2,987		3,000		
Total Expended	$ 21,493.76	$ -	$ 21,493.76		$ 25,500.00	$ 21,493.76	$ 4,006.24
		$ -			$ 25,500.00	$ 21,493.76	$ 4,006.24

Training Costs

Item	Amount Expended	Inkind	PSC funding (expenses)		Approved Budget	Total PSC Funded Expenditure	Variance
safety and health training	$ 1,200.00	$ 1,200.00					
	$ -						
Total Expended	$ 1,200.00	$ 1,200.00	$ -		$ -	$ -	$ -
		$ 1,200.00			$ -	$ -	$ -

Fisheries and Oceans Canada - PSC Project Budget Financial Report

Name of Project and PSC#:

Stikine River Canadian Commercial Fishery Sampling and Stock Assessment (I-16)

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	$ 300.00	300					
Telephone & long Distance	$ 382.00		382		1,360		
Photocopies & printing	$ -						
Indirect/overhead costs	$ 800.00	800					
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	$ 1,482.00	$ 1,100.00	$ 382.00		$ 1,360.00	$ 382.00	$ 978.00
		$ 1,100.00			$ 1,360.00	$ 382.00	$ 978.00

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	$ 39,528.75		$ 60,621.00	$ 56,898.01	$ 3,722.99
Site / Project Costs	$ -		$ 25,500.00	$ 21,493.76	$ 4,006.24
Training	$ 1,200.00		$ -	$ -	$ -
Overhead / Indirect Costs	$ 1,100.00		$ 1,360.00	$ 382.00	$ 978.00
Capital Costs / Assets	$ -		$ -	$ -	$ -
TOTAL			$ 87,481.00	$ 78,773.77	$ 8,707.23

PSC Project Funding Grant Advance Amount Received	$ (78,733.00)	(funds rec enter as negative)
PSC Project Funding Grant Amount Remaining to be Paid		(positive refundable to PSC)
Difference Between Grant Amount and Project Expenditures	$ (40.77)	

Fisheries and Oceans Canada - PSC Project Budget Financial Report

Name of Project and PSC#:

Stikine River Canadian Commercial Fishery Sampling and Stock Assessment (I-16)

Justification if Variance

90% of award to DFO was advanced; overspent by approx $41

Project Manager Name	Jody Mackenzie-Grieve
Project Manager Signature	MackenzieGrieve, Jody Digitally signed by MackenzieGrieve, Jody Date: 2020.03.31 08:54:42 -07'00'
Date	31-Mar-20
DFO Responsibility Center Manager Name	Bill Waugh
DFO Responsibility Center Manager Signature	Waugh, William Digitally signed by Waugh, William Date: 2020.03.31 16:33:19 -07'00'
Date	31-Mar-20