

**2014 Alsek Chinook Salmon Run
Reconstruction Using Genetic Stock
Identification**
(A project funded through the Northern Fund of the
Pacific Salmon Commission)

Project NF-2014-I-32
DFO 5777

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Introduction

The Alsek River originates in the Yukon Territory, Canada, and flows in a southerly direction into the Gulf of Alaska, southeast of Yakutat, Alaska (Figure 1). Alsek River Chinook salmon (*Oncorhynchus tshawytscha*) are caught primarily in U.S. commercial and subsistence set gillnet fisheries in the lower Alsek River and in aboriginal and recreational fisheries in Canada. Small harvests of Alsek Chinook are probably taken in marine commercial gillnet fisheries near Yakutat. These populations are managed jointly by Canada and the U.S. through a sub-committee of the Pacific Salmon Commission (PSC) as part of the Canada/U.S. Pacific Salmon Treaty (PST) adopted in 1985 (TTC 1999). Historically, the status of Chinook salmon has been evaluated by monitoring escapement trends to the Klukshu River.

Prior to 1997, the Alsek River Chinook salmon return was unknown because stock assessment projects to determine system-wide escapements had not yet been developed. Escapements were known only for the Klukshu River. An escapement goal was developed for the Klukshu River in 1998 but very little else was known about the magnitude of run sizes and system wide production capacity. In 1997, a pilot project was initiated to determine the feasibility of assessing the drainage wide escapement for Chinook salmon using mark-recapture. After achieving the objectives of the 1997 study, the program was continued from 1998 through to 2004. Since then, the only other assessment of the total Chinook return to the Alsek was made in 2007, 2011, 2012 and 2014 using GSI. A revised escapement goal for Klukshu and a system wide goal for the Alsek was adopted in 2013.

Since 1976, weir counts by the Department of Fisheries and Oceans (DFO) in co-operation with the Champagne-Aishihik First Nation (CAFN) have been made on the Klukshu River, part of the Alsek River system. Recently, Chinook salmon weir counts at Klukshu, in conjunction with Chinook catch rate information from the test fishery at Dry Bay plus genetic stock identification (GSI) of tissue samples taken in the Dry Bay test fishery, were used to estimate the Alsek Chinook population in 2007 (Waugh and Stark 2008). The results were encouraging; a project recommendation was made by the Northern Fund Committee in 2008 to develop a sampling strategy (statistically valid) which would include methods of calculations and the precision expected based on various sample sizes and stock contribution levels for the apportionment of Alsek Chinook abundance into the requisite stocks (i.e. Klukshu and others) which, in conjunction with the Klukshu weir counts, would provide the foundation for reconstructing the Chinook return to the Alsek River. The project was completed by W. J. Gazey Research with funding from the Northern Fund ("*GSI Sample Size Requirements for In-river Run Reconstruction of Alsek Chinook and Sockeye Stocks, W. J. Gazey, April 2010*"). Gazey's analysis provided a model with which to determine the required sample sizes needed to reconstruct the Alsek Chinook returns to achieve a desired precision at a prescribed confidence level. The Gazey model formed the basis of the project for 2011, 2012 and 2014.

The 2009-2018 Transboundary chapter of the Pacific Salmon Treaty (PST) tasked the Parties and the Transboundary Technical Committee (TTC) to explore methods to determine in-river abundance for Alsek Chinook salmon. Further, the Transboundary Panel, as noted in the "*Pacific Salmon Commission Transboundary Panel Strategic Salmon Plan, March 2009*", has committed to develop and implement abundance-based management regimes for Alsek River Chinook which includes estimates of total abundance. The project proposed for 2014 was designed to meet the objectives set out in the PST and the Panel's strategic salmon plan. Subsequently, funding was secured through the Northern Fund of the Pacific Salmon Commission to analyze tissue samples

collected from the U.S. commercial fishery in Dry Bay for the purpose of reconstructing the 2014 Alsek Chinook salmon return.

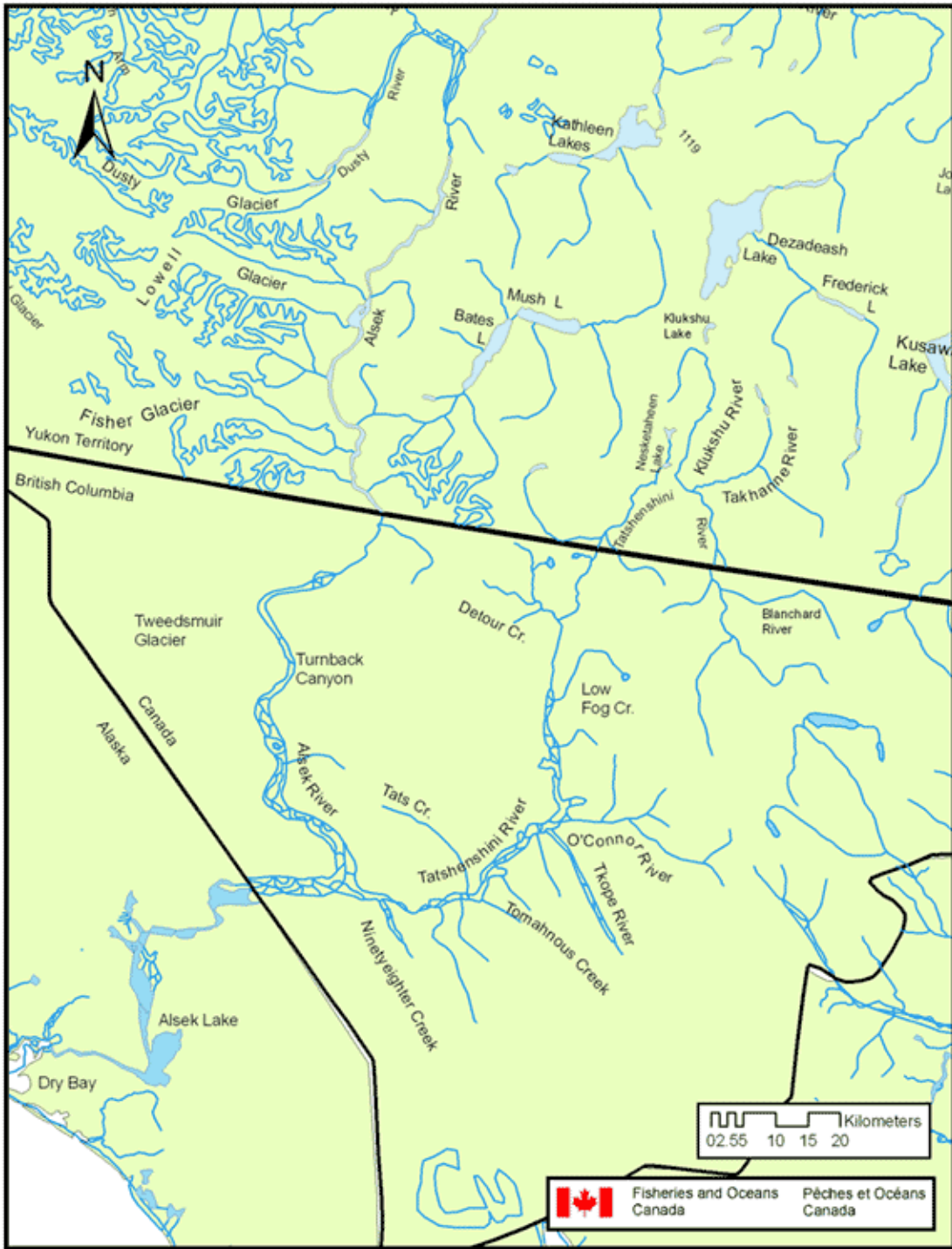


Figure 1. Alsek River drainage map.

Objectives

The following objectives are expected to be achieved from the collection and analysis of Chinook salmon tissue samples taken in the U.S. Dry Bay commercial fishery for 2014:

- Collection of fishery performance data and tissue samples (up to 500) from the Alsek Chinook test and commercial fisheries (Dry Bay, Alaska);
- GSI analysis of tissue samples collected in the Dry Bay commercial fishery;
- Run reconstruction of the 2014 Alsek Chinook return at the desired precision (25%) within a 95% confidence level;
- Assessment of the Klukshu River Chinook salmon contribution to the drainage wide escapement within the Alsek River.

Methodology

DNA Collection and Analysis

Approximately 500 Alsek River Chinook salmon tissue samples (severed axillary appendages) were to be collected from the 2014 U.S. commercial fishery catch located in Dry Bay, Alaska from the middle of May to the end of June. The samples were to be sent to Terry Beacham (DFO Salmon Genetics Laboratory) for GSI analysis to develop weekly contributions of Klukshu River and other Chinook stocks to the commercial Chinook bycatch. In the laboratory, 15 microsatellites were surveyed with an ABI 3730 capillary DNA sequencer, and genotypes were scored by GeneMapper software 3.0 (Applied Biosystems, Foster City, CA) using an internal lane sizing standard as outlined by Beacham et al. (2006).

Run Reconstruction

Run reconstruction methodology was to be followed using the model detailed in “*GSI Sample Size Requirements for In-river Run Reconstruction of Alsek Chinook and Sockeye Stocks*, W.J. Gazez, April 2010”. Chinook salmon weir counts at Klukshu, in conjunction with Chinook catch rate information from the commercial fishery at Dry Bay and GSI of tissue samples taken in the Dry Bay commercial fishery, were to be used to estimate the 2014 Alsek River Chinook salmon population.

Results

DNA Collection and Analysis

A total of 620 Chinook tissue samples (axillary appendages) from the Dry Bay commercial fishery were received from the Alaska Department of Fish and Game and shipped to Terry Beacham (DFO – Genetics Lab) for analysis in the winter of 2014. A total of 610 samples were analyzed and results were received from the DFO genetics lab in February of 2015. Sample analysis was roughly apportioned based on the run timing observed during the 2014 U.S. commercial Chinook test fishery data (2005-08, 2011). Samples were collected beginning in statistical week 23 (starting June 1st) and completed in week 27 (ending July 5th).

Run Reconstruction

The total Alesek Chinook run for 2014 was estimated to be 2,658 (above Dry Bay escapement plus the Dry Bay catches; Appendix 1). The above Dry Bay escapement was estimated to be 1,572 (95% CI = 1,347 – 1,796, SD = 115). This resulted in an estimated 41% harvest rate in the combined fisheries located in Dry Bay (catch = 1,074). The Klukshu stock contributed a total of 862 Chinook (approximately 55%) to the total Alesek Chinook escapement.

Discussion and Recommendations

As detailed in Gazey 2010, the major assumptions for the estimation of aggregate escapement, associated variance and subsequent sample size requirements at specified levels of precision and confidence were:

1. Equal vulnerability of capture. Migration behaviour and size differences of returning stocks may cause unequal vulnerability of stocks to the test or commercial fisheries. Estimates are likely sensitive to violation.
2. Minimum in-river mortality. Computationally, straight-forward to adjust the weir counts for any suspected mortality. Impacts the aggregate escapement estimate and fraction to be sampled.
3. Functional relationship (linear assumed here) between sample size adjustment to obtain effective sample size and the Klukshu stock proportion. New baseline GSI data may alter or change the functional relationship (e.g., non-linear or non-stationary).

Literature Cited

Gazey, W. J. 2010. GSI Sample Size Requirements for In-river Run Reconstruction of Alesek Chinook and Sockeye Stocks. Pacific Salmon Commission, Vancouver, British Columbia.

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.

Appendices

Appendix 1. Population estimate for the 2014 Alsek Chinook salmon using GSI analysis and expansion of the Klukshu weir count. Model developed by W.J. Gazey Research, 2010.

GSI Run Reconstruction for the Alsek River - Chinook 2014									
Required input values are in red font									
Output of required GSI sample using the "EstSample" macro in blue font									
Week	Run Weight	Klukshu Prop.	Run Standard	Escapement Above Dry Bay	"Actual" Sample	Effective Sample	SD Prop	SD wp	SD Escape
1 (23)	0.409	0.477	0.409	643	349	118.5	0.046	0.019	47
2 (24)	0.313	0.598	0.313	492	180	61.0	0.063	0.020	36
3 (25)	0.196	0.600	0.196	308	36	12.2	0.140	0.027	22
4 (26-30)	0.082	0.593	0.082	129	45	15.3	0.126	0.010	9
5	0.000	0.000	0.000	0	0	0.0	0.000	0.000	0
6	0.000	0.000	0.000	0	0	0.0	0.000	0.000	0
7	0.000	0.000	0.000	0	0	0.0	0.000	0.000	0
8	0.000	0.000	0.000	0	0	0.0	0.000	0.000	0
Total	1.000		1.000	1,572	610			0.040	115
Klukshu Esc. Above Dry Bay		862						Confidence Interval	
Desired Confidence		95%			% Sample =	38.8%		Low	High
Desired Precision		25%			Precision =	14.3%			
Effect. Sample Coeff.		0.34	-0.005					1,347	1,796
Effective sample size coefficients based on 2005-2007 studies:									
	Sockeye	0.253	1.677						
	Chinook	0.342	-0.005						
							55% Klukshu comp.		
							Total Run: 2,658		

Financial Summary

Project Budget Form

Name of Project: 2014 Alesek Chinook Run Reconstruction Using GSI

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 (In-kind & cash + PSC Amount)	In-Kind & Cash	PSC Amount
Biologist (DFO Bi-2)	1	10	7.5	36	2,700	2,700	
Senior Technician (DFO EG-5)	1	1	7.5	35	262	262	
Financial Officer (DFO As-2)	1	1	7.5	30	225	225	
Fisheries Technician	1	1	7.5	32	240	240	
Person Days (# of crew x work days)		13		sub total	3,427	3,427	

Labour - Employer Costs (percent of wages subtotal amount)

	rate	20%		sub total	685	685	
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Subcontractors & Consultants	# of crew	# of work days	hrs per day	rate per hour			
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Insurance if applicable	rate	0%		sub total			
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Volunteer Labour	# of crew	# of work days	hrs per day				
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Skilled							
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Un-skilled							
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Insurance if applicable	rate	0%		sub total			
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Total Labour Costs 4,112 4,112

Provide details in the space below
(use an additional page if needed)

Site / Project Costs				
Travel (do not include to & from work)				
Small Tools & Equipment				
Site Supplies & Materials	lab suples (to cover 500 samples)		8,500	8,500
Equipment Rental				
Work & Safety Gear				
Repairs & Maintenance				
Permits				
Technical Monitoring				
Other site costs				
	Total Site / Project Costs		8,500	8,500

ELIGIBLE COSTS				BUDGET	OTHER FUNDING	CONTRIBUTION 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				
Total Training Costs						
Overhead / Indirect Costs						
Office space; including utilities, etc.				800	800	
Insurance						
Office supplies				100	100	
Telephone & long Distance				100	100	
Photocopies & printing						
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						
Total Overhead Costs				1,000	1,000	
Capital Costs / Assets						
Provide details in the space below (use an additional page if needed)						
Assets are things of value that have an initial cost of \$250 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.						
Total Capital Costs						
Project Total Costs				13,612	5,112	8,500
Budget Summary						
(PSC + in-kind + cash)						
Total Labour Costs				4,112		
Total Site / Project Costs				8,500		
Total Training Costs				-		
Total Overhead Costs				1,000		
Total Capital Costs				-		
Project Total				13,612		