

# **Population Estimate for Alsek River Chinook Salmon 2007**

*(Based on Genetic Stock Identification)*

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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 incidentally in 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 other fisheries located in the Gulf of Alaska region. 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 of what was assumed to be the principal chinook stock within the drainage: Klukshu River Chinook salmon.

As there is not a directed commercial harvest of Chinook salmon in the lower Alsek River, an in-season management regime is not yet in place. In 2005 through to 2007, a test fishery was implemented (as per the PST agreement on Transboundary Chinook) to develop some baseline information on Chinook abundance expressed as catch per unit effort (CPUE). The aboriginal and recreational fishery openings and closures are predicated on the in-season counts of Chinook salmon enumerated at the Klukshu River weir.

Results of the past mark-recapture program (1997-2004) provided reliable estimates of the Chinook salmon escapement within the Alsek River drainage but were cancelled before the returns of Chinook from these estimates could be assessed. This created a large data gap and therefore, managers are unable to develop a defensible drainage wide escapement goal which has been identified as a priority through the PST. Continuing the mark-recapture program into the future would be costly and funding sources have proven unreliable. Through current genetic stock identification (GSI) analysis, it is proposed that tissue samples from the test fishery in Dry Bay be utilized to determine stock specific contribution rates for stocks which have a developed baseline. The results from the GSI analysis will be used to generate an abundance estimate for the drainage, as well as, an estimate for stocks with a developed baseline. It is hoped that, pending the results of the program, a low cost means of developing drainage wide estimates for Chinook on the Alsek River can be achieved and will provide managers the results necessary to develop a reliable escapement goal for Chinook salmon. Interest has been identified in harvesting Chinook salmon commercially by both Canada and the U.S. To date, an in-season management tool has yet to be developed for Chinook, although, a correlation between the test fishery catch per unit effort and future drainage-wide escapement estimates may be possible.

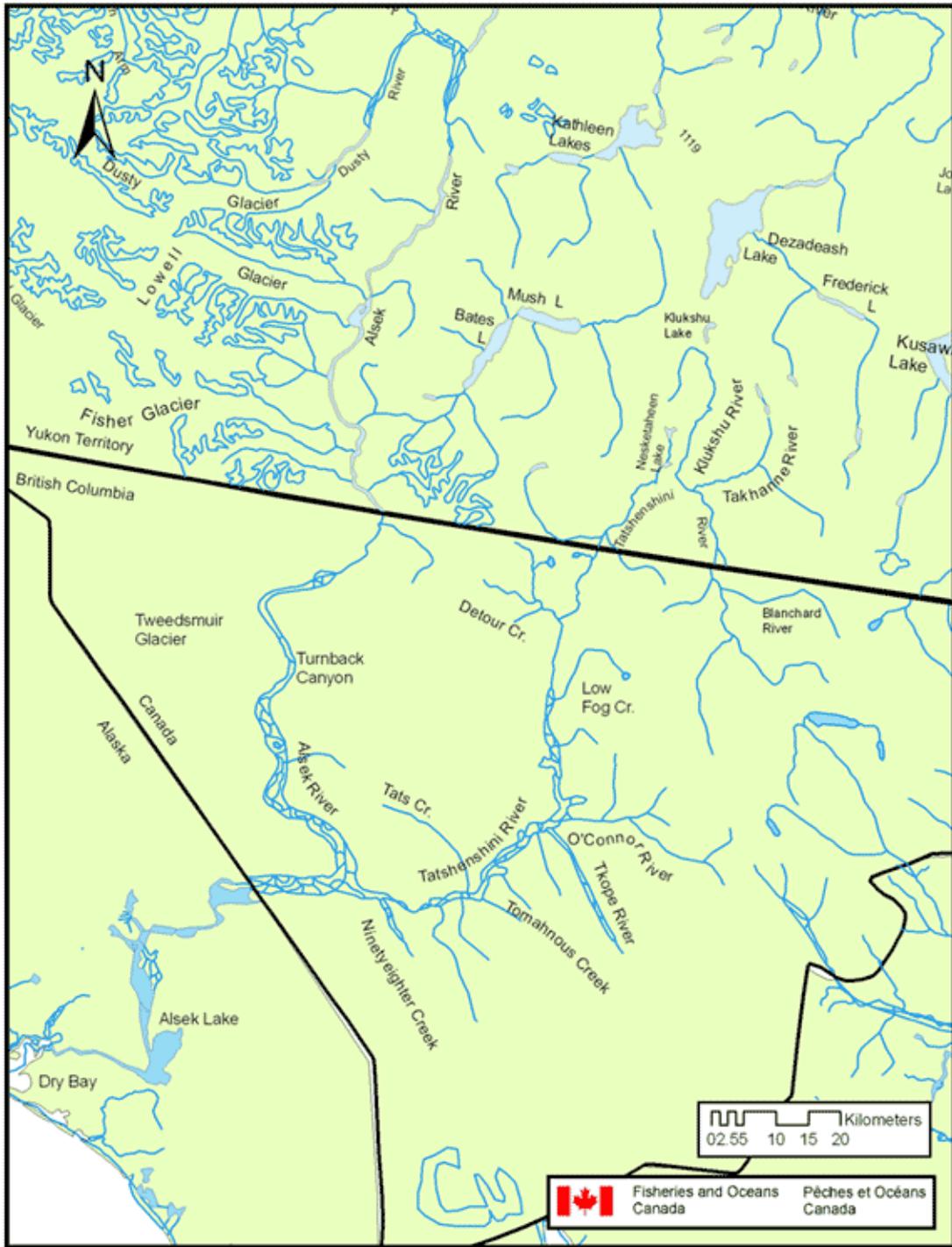


Figure 1. Alsek drainage map.

## **Objectives**

The following objectives are expected to be achieved through the estimation of the Alsek Chinook population through GSI analysis of chinook tissue samples taken in the U.S. Dry Bay commercial fishery for 2007:

- assess the Klukshu River Chinook contribution and drainage wide escapement of Chinook salmon within the Alsek River ;
- continue to provide the information necessary to assist managers in developing a future in-season abundance based management regime through the correlation of the U.S. test fishery CPUE and future abundance estimates;
- continue to provide the information necessary to develop a drainage wide (Alsek) escapement goal for Chinook salmon;
- allow Canadian managers to ensure the Basic Needs level is met set out by the Umbrella Final Agreement for the Champagne and Aishihik First Nation through the development of biologically based management regimes and escapement goals.

## **Methodology**

### ***DNA Collection and Analysis***

Approximately 500 Alsek River chinook salmon tissue samples (axillary appendage) were to be collected from the 2007 U.S. test fishery catch located at Dry Bay, Alaska from the middle of May to the end of June. The tissue samples were to be sent to Terry Beacham (DFO - Fisheries and Oceans Canada) for GSI analysis and to develop weekly contributions for Chinook stocks with developed baselines. The GSI analysis was to be conducted as per Withler et al (2000). These samples were to be compared to four populations with developed GSI baselines which were the Blanchard, Tatshenshini, Klukshu and Takhanne Rivers.

### ***Abundance Estimate***

Once analysis of the tissue samples was completed, the Klukshu chinook weir count was used to estimate the weekly Klukshu contribution in the test fishery at Dry Bay and then expanded to generate a total estimate by statistical week, which combined, will estimate the overall chinook escapement. Potentially, abundance estimates for other Alsek chinook stocks with GSI capability may be generated. Run timing for the Klukshu component will be calculated using the catch per unit effort of the Klukshu stock in the Dry Bay test fishery.

## **Results**

### ***DNA Collection and Analysis***

A total of 346 sockeye tissue samples from the Chinook test fishery were received from the Alaska Department of Fish and Game by Terry Beacham (DFO) for analysis in the fall of 2007. A total of 346 samples were analyzed and results were received from the DFO genetics lab in December of 2007. Of the 346 samples analyzed, 345 were assigned to one of the four Alek chinook stocks with developed baselines (near 100% readability). Sample analysis was roughly apportioned based on the run timing observed during the 2005 U.S. commercial sockeye fishery. Samples were collected beginning in statistical week 21 (starting May 20<sup>th</sup>) and completed in week 26 (starting June 24<sup>th</sup>).

### ***Abundance Estimate***

The total Alek chinook run for 2007 was estimated to be 2,497 with a 95% confidence interval (CI) range of 1,708 to 4,869 (Appendix 1). The above Dry Bay escapement was 1,754 (total run minus the Dry Bay test catch of 327 and commercial catch of 400). This resulted in an estimated 29% harvest rate in the combined fisheries located in Dry Bay. The Klukshu stock contributed a total of 969 chinook (approximately 39%) to the total Alek chinook run. Weekly estimates and the methodology used to generate them are outlined in the following paragraphs:

#### **Statistical Week 21-22**

The total weekly test fishery catch was 76 chinook of which 39 (52%) of these were of Klukshu origin. The total Klukshu run through Dry Bay in weeks 21-22 was 132. Using the weekly Klukshu run and the Klukshu proportion through Dry Bay an estimated 255 chinook, with a 95% CI range of 189 to 392, migrated through or were caught in Dry Bay during week 21-22. The estimated harvest rate was 30%.

#### **Statistical Week 23**

The total Dry Bay catch was 90 of which 40 (44%) of these were of Klukshu origin. The Klukshu run through Dry Bay for week 23 was 290. Using the weekly Klukshu run and the Klukshu proportion through Dry Bay, an estimated 659 (95% CI range 458 to 1,175) chinook migrated through or were caught in Dry Bay during week 23. The estimated harvest rate was 20%.

#### **Statistical Week 24**

The total Dry Bay catch was 90 of which 24 (26%) of these were estimated to be of Klukshu origin. The Klukshu run through Dry Bay for week 24 was 248. Using the weekly Klukshu run and the Klukshu proportion through Dry Bay, an estimated 938 (95% CI range 590 to 2,278) chinook migrated through or were caught in Dry Bay during week 24. The estimated harvest rate was 25%.

**Statistical Week 25-26**

The total Dry Bay catch was 71 of which 33 (46%) of these were of Klukshu origin. The Klukshu run through Dry Bay for week 25-26 was 299. Using the weekly Klukshu run and the Klukshu proportion through Dry Bay, an estimated 645 (95% CI range 471 to 1,024) chinook migrated through or were caught in Dry Bay during weeks 25-26. The estimated harvest rate was 45%.

## **Discussion and Recommendations**

In order to improve future abundance estimates for Alsek River Chinook using GSI, weekly and statistically sound sampling targets need to be set based on historical run timing (commercial/test fisheries and MRP data) so that all components of the run are represented appropriately. In order to achieve this, it may be necessary to analyze samples from the commercial catch to achieve the statistical goals, especially if, the Chinook test fishery catch (~500) does not provide a sufficient level of samples. Further research will be required to determine the appropriate sampling goals.

## Literature Cited

Withler, R.E, Le, K.D., Nelson, R.J., Miller, K.M., and Beacham, T.D. 2000. Intact genetic structure and high levels of genetic diversity in bottlenecked sockeye salmon, *Oncorhynchus nerka*, populations of the Fraser River, British Columbia, Canada. *Can.J. Fish. Aquat. Sci.* 57: 1985–1998.

## **Appendices**

## Appendix 1. Population estimate for the 2007 Alsek chinook salmon using GSI analysis of the Dry Bay test fishery and expansion of the Klukshu weir count.

Table. Population estimate for the 2007 Alsek chinook salmon using GSI analysis of the Dry Bay test fishery and expansion of the Klukshu weir count.

Statistical Week	Week Ending	Weekly Test Catch	Weekly Comm. Catch	Hours Fished	Test CPUE	Prop. Test CPUE	Klukshu Test Prop.	Klukshu Test Catch	Klukshu Comm. Catch	Klukshu Test CPUE	Klukshu Test Prop. CPUE	Weekly Klukshu Esc.	Weekly Klukshu Run	Total Weekly Run	Weekly Harvest Rate	Sample Size (n)	Standard error	Confidence interval	Lower CI Prop.	Upper CI Prop.	Lower CI	Upper CI
21-22	2-Jun-07	76	0	260	0.29	0.101	<b>0.518</b>	39	0	0.15	0.137	93	132	<b>255</b>	0.30	85	0.093	0.181	0.337	0.699	<b>189</b>	<b>392</b>
23	9-Jun-07	90	40	104	0.87	0.299	<b>0.440</b>	40	18	0.38	0.344	233	290	<b>659</b>	0.20	78	0.098	0.193	0.247	0.633	<b>458</b>	<b>1175</b>
24	16-Jun-07	90	142	78	1.15	0.399	<b>0.264</b>	24	38	0.30	0.275	186	248	<b>938</b>	0.25	91	0.079	0.155	0.109	0.420	<b>590</b>	<b>2278</b>
25-26	30-Jun-07	71	218	122	0.58	0.201	<b>0.464</b>	33	101	0.27	0.244	165	299	<b>645</b>	0.45	92	0.088	0.172	0.292	0.636	<b>471</b>	<b>1024</b>
		327	400	564	2.89			<b>136</b>	<b>156</b>	1.11	1.000	677	969	<b>2497</b>	<b>0.29</b>	346					<b>1708</b>	<b>4869</b>

Total Klukshu Run: 969

Klukshu Contribution: 0.39

Confidence Level (1-alpha) = 0.95

## **Financial Summary**



