

**CRE-05-14N Project Report:
Collection of genetic material
from adult Chinook Salmon in the
North Big Salmon Watershed
2014**



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Abstract

Genetic material was collected from 21 adult Chinook Salmon captured at four Stations in the North Big Salmon River on August 3, 2014. The Stations were geo-referenced. Images were taken of each Station. They have been submitted to DFO and offered to the Little Salmon/Carmacks First Nation. Tissue samples were submitted to DFO Whitehorse on August 4, 2014. Spawning Chinook were observed upstream of the past documented limit of distribution. The location was geo-referenced and reported. Eggs were collected from 2 female Chinook Salmon for the Alaska Department of Fish and Game's thiamin investigations.

Introduction

The 2014 Yukon River Panel (YRP) Near Term Priorities Conservation/Stocks/Run Assessment 1 identified that obtaining tissue samples from rivers identified by the JTC was Priority Ranking 1. The North Big Salmon (NBS) River was one of the identified watersheds. I submitted a Conceptual Proposal to collect tissue from adult Chinook Salmon in the NBS to the YRP in October 2013. I was invited to submit a Detailed Proposal (DP) and did so in late January, 2014. The application specified that tissue would be only be collected if stock levels permitted and environmental conditions were favorable. Sampling would not occur if low stock levels precluded the efficient collection of samples and the additive stress of tissue acquisition to individual fish. Similarly, river levels would have to be low enough that sampling would not be hazardous. Established methods would be used to collect the tissue and Quality Assurance/Quality Control would be rigorous. All collection sites would be geo-located and photo-referenced with digital images.

Project objectives, and the deliverables in address of each are listed below:

Objective 1 - Primary objective - to collect tissue samples from adult Chinook Salmon in the North Big Salmon Watershed.

Deliverables

- Tissue samples, to be submitted to DFO for onward transmission to Canadian and American laboratories
- A report of numbers of samples acquired, to be submitted to the Yukon River Panel in the Project Report

Objective 2 - Secondary objective - to geo-locate concentrations of Chinook salmon spawning in the North Big Salmon for the benefit of future managers or interested parties.

Deliverables.

- A list of the co-ordinates of all spawning concentrations, to be sent to DFO and included in the Project Report.

Objective 3 - Secondary objective – to acquire digital images of river channels at each Chinook Salmon spawning concentration and label them by date and location

Deliverables.

- A folder of all images, to be submitted to DFO as a photo baseline and offered to Little Salmon/Carmacks First Nation.

The YRP approved the project subject to the Chinook run size at Eagle, Alaska exceeding 30,000 Chinook Salmon by mid-August, 2014. This threshold was exceeded on July 18 and the project proceeded.

Methods

An application for a Scientific Collection License was prepared and submitted to DFO on July 11, and a license was issued on July 23, 2014. This was the sole authorization required to conduct the project.

On July 21 I emailed Trix Tanner, Aquatic Sciences Biologist at DFO Whitehorse regarding sample bottles and preservative. Bottles and preservative sufficient for 120 samples were

subsequently provided. A request followed from DFO asking that eggs and otoliths be collected for an Alaska Department of Fish and Game (ADF&G) thiamin study. Collection of the eggs could be accomplished at little added effort or impact to the fish and was agreed to. Otoliths would have required sacrifice of the female Chinook and was not authorized by the DFO Scientific Collection License.

The sampling platform was a Bell Long Ranger chartered from HeliDynamics in Whitehorse. This aircraft provided adequate seating for samplers and internal storage for equipment. The helicopter had satellite communications and was on site throughout the day. This allowed medevac capacity, should it be required.

The following variables were monitored in the period preceding the project implementation:

- Regional weather. July of 2014 was generally dry at the meteorological stations surrounding the NBS. This mitigated the concern that high levels of precipitation could result in increased river flow and levels of turbidity in the river. However, a weather system moved through the region between July 29 and 30, with up to 16.6 mm of rain in a 24 hour period recorded at Faro.
- Hydrometric data. The snow pack in the region of the NBS was between 111-130% of normal in May. Both the Teslin River at Johnsons Crossing and the Yukon River at Carmacks remained higher than normal throughout the period preceding the project. The Pelly appeared slightly higher than usual. The NBS was considered more likely to reflect the Pelly River than the upper Teslin. There was, however, some uncertainty.
- Forest fire activity in the North Big Salmon watershed. There were no forest fires in the NBS in 2014.
- Timing and strength of the 2014 upstream Chinook migration. The excellent ADF&G Daily Updates were monitored and were a prime determinant in choosing the date of sampling. Data from the Big Salmon Sonar is not publicly available. The numbers provided by DFO indicated that the Big Salmon return would also be early and strong. In the DP sampling had been scheduled for one day between August 10 – 16. However, the 2014 Chinook Salmon return was both unexpectedly early and strong. Data from the Big Salmon Sonar is not publicly available. The numbers provided by DFO indicated that the return to the Big Salmon would also be early and strong. The scheduled date was first set as August 10. As additional information became available, it was rescheduled to August 3. The rationale for this was that spawning in the NBS could have commenced as early as July 17. Under favorable conditions of flow and temperature Chinook in the Upper Yukon River Basin have been observed to commence spawning soon after arriving in their spawning locations. Spawning then may be swiftly completed. Redds may be vacated as adults die or become moribund. The peak of spawning may pass very rapidly, and it is advisable to err on the side of caution than risk being too late. All indications in 2014 were that flows and temperatures would be favorable throughout the upstream migration route from the ocean, and that the Chinook would be in excellent physical condition. Swift passage to spawning grounds was anticipated.

The sampling team comprised of four persons. Kieran O’Grady, Randy Wilson and Mike Janson were retained to capture fish. All were experienced salmon fishers and physically capable of landing adult salmon in fast water conditions.

We left Whitehorse early in the morning of August 3. We flew to the confluence of the North Big Salmon and Big Salmon River. Starting the reconnaissance phase of the project, we

followed the NBS upstream. We flew low enough and slow enough to see most adult Chinook, but high enough and fast enough to maintain an acceptable safety envelope.

Concentrations of spawning Chinook were noted as they were passed. The upstream limit of observed spawning was beyond any known past references and was accordingly geo-located. We then proceeded to the location on the North Big Salmon where the greatest number of salmon could be efficiently captured. When all available fish in that area had been fished out we proceeded to the second site and so on.

Digital images were acquired. Typically, one image was taken on the ground from the Station looking downstream and another looking downstream. One image was taken from the air of the Station from upstream and another from downstream.

We generally had four rods fishing. Snagging hooks, roe bag baited hooks and large spinners and spoons were used. Hooked salmon were brought to shore where the tissue samples were harvested. The 2007 DFO Yukon/Transboundary DNA Sampling Protocol as modified in MacDonald (2011) was followed. The Protocol requires that

- Tissue samples are collected from live fish and possibly freshly deceased carcasses (if gills remain red, eyes clear);
- A portion of the right and left axillary appendages is removed from each fish sampled;
- One axillary clips is placed in each of a labeled pair of sample vials containing 95% ethyl alcohol;
- The proportion of ethyl alcohol to tissue ratio must be at least 3:1 to ensure the preservation of the tissue;
- Tissue samples vials are labeled with the location of collection, name of sampler and the date of collection;
- The adipose fin of each sampled fish is removed so that recaptures may be quickly identified and released;
- The latitude and longitude of each location are acquired by GPS and noted; and
- Photographs are taken from the ground and air.

DFO also requested that the samples be submitted as quickly as possible so the preservative could be refreshed (replaced with new preservative).

Only tissue samples were acquired (including eggs for thiamin analysis). All samples were from living salmon. Sampled fish were returned to the water as quickly as possible. Age/Sex/Length measurements and sampling was not conducted.

Filled- and empty tissue storage bottles and preservative were returned to DFO on August 4 with the thiamin samples that had been collected.

The digital images were downloaded, labelled and submitted to DFO. They have been offered to the Little Salmon/Carmacks First Nation.

The mandatory Sampling Report was submitted to DFO to close out the Scientific Collection License.

Results:

The waters of the North Big Salmon were clear throughout the sampling. Flows in the NBS appeared to have recently risen, crested and were falling on August 3. The sky was clear of clouds in the morning and the air was still. There were valley winds and a high overcast in the afternoon.

Visibility was excellent during the reconnaissance. We saw few Salmon in the section of the NBS below the mouth of D'Abbadie Creek at app river km 15. Salmon became more numerous above this point. Most were single fish or in small groups (3-5). Four larger groups (10 – 20 each) were observed between app river km 44 and 55 and were later returned to and sampled. Eagles were seen at each of the four sites but at no other locations. A small group of four salmon was observed immediately below the mouth of Thomas Creek at 61.8766/133.77131, or app river km 66. No Salmon were observed further upstream.

Few “white tails” were observed and no carcasses. The river bottom in the spawning areas was composed of light colored materials and algae was generally absent. Redds were therefore very hard to determine when compared to other Yukon River salmon spawning streams (ie Tatchun and Klondike Rivers).

Tissue collection was conducted at the four sites where the larger groupings had been observed during the reconnaissance. Once collection started the site became a Station and was given a unique alpha-numerical identifier: NBS = North Big Salmon; 2014 = year of sampling; and (x) = number of station. Station locations and numbers of salmon captured at each are presented in Table 1. Locations are also shown on Figure 1.

Table 1 - North Big Salmon 2014 Chinook Salmon tissue acquisition			
Station #	Co-ordinates	Males	Females
NBS-2014-1	61.7908/134.2502	4	0
NBS-2014-2	61.8632/134.1165	5	0
NBS-2014-3	61.8630/134.0652	4	1
NBS-2014-4	61.8568/134.1365	3	3

Seven of the 16 males were spawned out, and the remaining 9 were in spawning condition. Two of the females were in spawning condition and provided sufficient eggs for the thiamin samples. The remaining two females were not yet ready to spawn. No eggs were harvested from these fish.

All fish were in remarkably good condition, regardless of spawning condition. No net marks were noted. There were no injuries and little fin- or tail erosion and associated fungal growth. One carcass was found at NBS-2014-4. It was covered with sand and was barely visible from the ground. The sand could have resulted from the preceding higher water, or from the adjacent spawning activities.



Figure 1. Locations of sampling Stations on the North Big Salmon River in 2014.

Discussion & Conclusions

The numbers of Chinook Salmon captured fell far short of that expected. A total of 21 Chinook tissue samples were collected, for a price of \$514 per sample. A successful sampling expedition was considered to be 75 samples collected, for a price of \$157 per sample.

There were two reasons for the low numbers captured. First, the Chinook were not in the spawning concentrations observed in during the tissue collection on August 11, 2004. This may be related to the timing of the sampling in 2014. Better results may have been achieved if the sampling had not been rescheduled from August 10 to August 3. A contributing factor could also have been the effects of landscape level wildfire that had occurred in the watershed in the last decade. Much of the river bottom was composed entirely of sand. Some areas with cobble/gravel river bottom showed signs of significant volumes of sand transiting through. It is possible that many of the NBS Chinook are now spawning in “pocket” habitats rather than the large concentrations observed in 2004.

The second reason was the difficulty in capturing the Chinook that were present. Snagging was negatively affected by the river stage. This did not allow the fishers to approach closely enough to the spawning Chinook to be entirely effective. The Salmon showed little interest in either the roe bags or the artificial lures.

All four concentrations of spawning Chinook were within a section of river approximately 15 km in length. Assuming that the 2014 spawning distribution reflects future distributions sampling should be concentrated in that area. The NBS was navigable for a smaller inflatable between the upstream- and downstream Stations. If future sampling takes place, a small crew could be

transported by helicopter to the upper end of the section and retrieved 2 or 3 days later from the lower end of the section. The river downstream of NBS-2014-1 has a higher gradient and a number of reaches with a boulder bottom. Travel through these areas by watercraft is not advised..

As noted, the condition of the Chinook Salmon captured and observed was remarkable. Spawned out male salmon were in better condition than pre-spawning individuals on spawning grounds generally are. This could be attributable to combinations of three factors: the salmon entering the river being more healthy than usual; the upstream migration habitat (flows and temperature) being more favorable; and lack of injury (including to the mucus layer of the skin) from gillnets that they were either released- or escaped from.

Acknowledgements:

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References:

Environment Yukon. May 8, 2014. Yukon Snow Survey Bulletin and Water Supply Forecast. Yukon Government Water Resources Branch. 28 p.

MacDonald, E. 2011. Collection and Analysis of Yukon River DNA Baseline Samples in Alaska and Canada – Canadian Collections. CRE-78-11. Fisheries and Oceans Canada. 20 p.

MacDonald, E. 2012. Collection and Analysis of Yukon River DNA Baseline Samples in Alaska and Canada – Canadian Collections. CRE-78-12. Fisheries and Oceans Canada. 20 p. and appendices.