

Abstract

The Bulkley/Morice river system, a tributary to the Skeena River in Northwestern British Columbia, is a very important producer of wild Chinook salmon (*Oncorhynchus tshawytscha*). The Upper Morice River, near Houston, B.C., is the main spawning area for this species in the Bulkley/Morice watershed.

Over the past five-year spawning cycle many stocks of Chinook salmon native to the upper Skeena River tributaries have been in decline. Despite very strong escapements of Chinook as recently as 2001, brood-year returns have declined sharply.

Historically, tag groups of hatchery-raised salmon have been instrumental in identifying and tracking factors that can influence salmon spawning escapement. There is presently no coded-wire tagged (CWT) Chinook mark group in the Upper Skeena watershed from the largest component of the Skeena run, that being the mid-timed (June 15th to July 15th) portion of the Chinook population. The Morice River stock has historically shown the highest escapements of Chinook entering the Skeena River during that time period.

As such, it was suggested to the Pacific Salmon Commission (PSC) in 2006 that a coded-wire tagged/adipose-clipped mark group of Chinook, representing the mid-timed upriver stocks, could provide for a better understanding of survivals, distribution and exploitation in future years. The Toboggan Creek Salmon and Steelhead Enhancement Society was awarded PSC funding in early 2007 to begin the task of producing a Morice River Chinook CWT group. In 2008 this funding was extended to include two brood years of coded-wire tagged production.

The initial proposal called for the production of a hatchery-raised group of at least 55,000 Morice River Chinook smolts. This successful project exceeded the original target in 2007 and we expect to release 80,000 CWT smolts in May of 2009. We also achieved our target of eggs from the 2008 brood, and presently we have close to 65,000 Chinook alevins incubating. This report summarizes the success of the project to this date in time.

**FINAL REPORT FOR MORICE CHINOOK
CWT GROUP PROJECT (2008/2009)**

Prepared for : **Pacific Salmon Commission**

Prepared by : Mike O'Neill, Manager
Toboggan Creek Hatchery
Smithers, B.C.

March, 2009

FINAL REPORT FOR MORICE CHINOOK CWT GROUP PROJECT (2008/2009)

Table of Contents

	Page
1.0 INTRODUCTION	1
1.1 Background	1
1.2 Objectives	3
2.0 METHODS	4
3.0 RESULTS AND DISCUSSION	5
3.1 Summary for the 2007 Brood Year	5
3.2 Summary for the 2008 Brood Year	6
4.0 CONCLUSION / RECOMMENDATIONS	9
5.0 ACKNOWLEDGEMENTS	9

List of Figures

	Page
Figure 1. Location of the Toboggan Creek Hatchery near Smithers, British Columbia; and the Morice River Chinook Salmon Spawning Grounds near Houston, British Columbia.....	2
Figure 2. Growth of 2007 Brood Morice River Chinook Salmon in 2008/09	6

List of Tables

	Page
Table I. Shocking and Picking Summary for the 2008 Brood Morice River Chinook Eggs Incubating at the Toboggan Creek Salmon Hatchery	8

FINAL REPORT FOR MORICE CHINOOK CWT GROUP PROJECT (2008/2009)

Contract # : NF-2007-I-1

Contract Period : April 1, 2008 - March 31, 2009

1.0 Introduction

1.1 Background

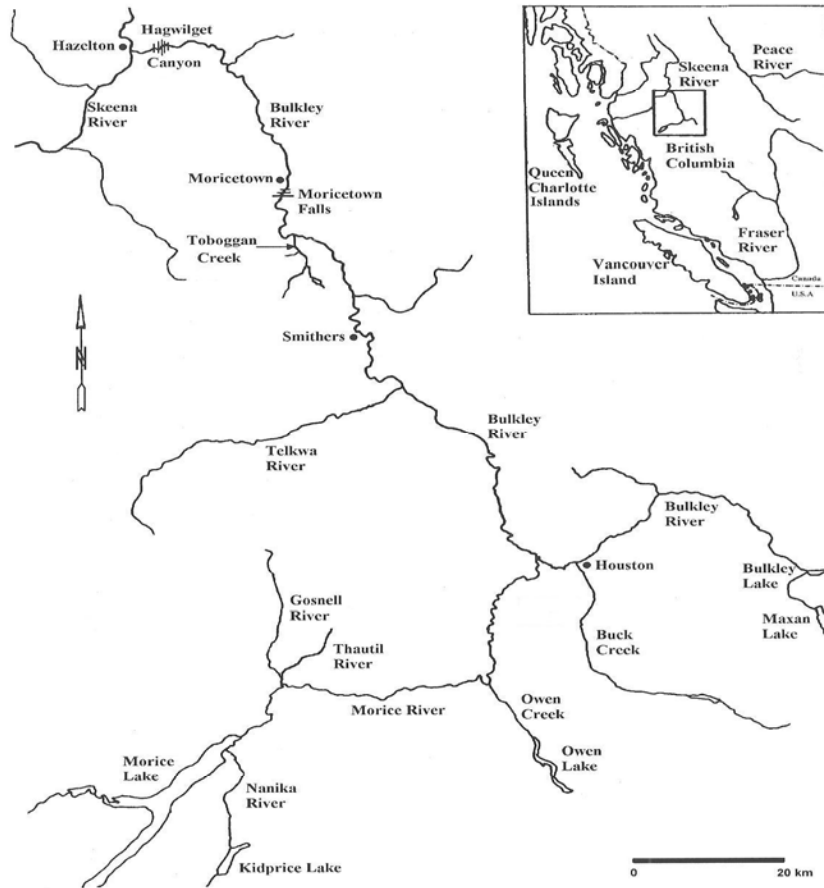
The Toboggan Creek Hatchery, under the direction of the Toboggan Creek Salmon and Steelhead Enhancement Society, has just completed its twenty-fourth year of successful operations. The Toboggan Creek Hatchery facility is located thirteen kilometers north-northwest of Smithers, British Columbia, on Highway 16 West (Fig. 1). Base funding for the hatchery contract is provided yearly by the Department of Fisheries and Oceans under the Community Involvement Division, and the Habitat and Enhancement Branch, of the Salmonid Enhancement Program.

Over the past spawning cycle, stocks of Chinook salmon native to the upper Skeena River tributaries have been in decline. Despite very strong escapements of Chinook as recently as 2001 we have seen brood-year returns decline sharply. The reasons for this are not clearly obvious.

The Upper Bulkley Chinook stock, which we have worked with since 1985, had an escapement of 5,600 spawners in 2001. In 2006, when the majority of spawner recruits would have been expected to return, we found less than 800 Chinook adults (four to six year-old salmon) in the system. The Upper Bulkley River system tends to be very low and clear during the August/September spawning period and spawner estimates are thought to be consistently accurate. This stock is early timed (April/May) in its entry to freshwater, and is genetically separate from the dominant stocks of Chinook in the Upper Skeena. Coded-wire tag (CWT) assessment of the hatchery returns did not indicate a problem with marine exploitation. Very few tags were reported in either the Alaskan or Canadian commercial fisheries. As such, Fisheries and Oceans Canada discontinued tagging of our Chinook smolt release group three years ago.

There is presently no CWT Chinook mark group in the Upper Skeena watershed from the largest component of the Skeena run, that being the mid-timed (June 15th to July 15th) portion of the Chinook population. Stocks represented in this time frame would be Morice, Kispiox, Sustut. The Morice River stock has historically shown the highest escapements of any of these stocks.

Figure 1. Location of the Toboggan Creek Hatchery near Smithers, British Columbia; and the Morice River Chinook Spawning Grounds near Houston, British Columbia



As such, it was suggested to the Pacific Salmon Commission (PSC) in 2006 that a coded-wire tagged/adipose clipped mark group of Chinook, representing the mid-timed upriver stocks, could provide for a better understanding of survivals, distribution and exploitation in future years. As well, there would then be a potential for developing an in-season abundance estimate that could provide for better-informed management decisions. The initial phase of this proposal was approved by the PSC in early 2007, and the project commenced in August of that year.

It is well accepted that an increase in science-based knowledge of salmon stocks on the west coast of North America will benefit those stocks in future years. The existence of a CWT group of Chinook from the Morice River will benefit that stock, and other mid-timed Skeena River stocks. CWT sampling in the Alaskan and Canadian ocean fisheries, and in the freshwater areas of the Skeena watershed, has previously provided valuable insights into the life history and survival rates of salmon stocks. This has proven to be a successful management tool for North Coast fisheries managers with the Toboggan Creek Coho Indicator CWT Group, raised at the Toboggan Creek Hatchery for the past 24 years.

1.2 Objectives

The initial proposal called for the production of a hatchery-raised group of Morice River Chinook smolts. A targeted CWT release group of 55,000 smolts required the collection of at least 75,000 green eggs and sperm from an adequate number of females and males on the spawning grounds of wild adult Chinook native to the watershed (Fig.1).

This project meets the objectives laid out in various local plans including the Morice Land and Resource Management Plan and the Morice River Strategic Planning Process. The Sport Fishing Advisory Board also supports this project at the local, regional and provincial levels. The concept also agrees with Fisheries and Oceans Canada's enhancement and stock assessment objectives. Data available as a result of the project will benefit the objectives of the PSC Northern Fund and the Pacific Salmon Treaty by providing science-based information to further our fisheries managers' knowledge regarding Chinook salmon survival rates, in-season abundance, distribution, catch and exploitation.

2.0 Methods

The techniques employed in this initial phase of the project were tailored after previous successes of the Toboggan Creek Hatchery over two decades of salmon enhancement and broodstock capture. This involved the collection of Morice River Chinook eggs and milt from wild spawners, transport, fertilization, and incubation to the alevin stage. Eggs were transported green to the hatchery and fertilized there. All of the eggs were initially placed in moist incubators (proven reliable over 20 years by the TCSSES) and transferred to Heath trays at eyed stage.

Capture of ripe female and male Chinook adults; utilizing gillnets, seines and angling was the original plan. The size of the river necessitates the use of jet boats to access the spawning grounds and to set and drift the nets over the ripe salmon as they moved onto the redds.

Setting the nets between two boats at the top of a drift and then pushing the spawners upstream by means of a single boat swinging downstream of the drifting net facilitated the capture of the Chinook broodstock. Once the drift was completed the net was pursed to shore and the tangled fish were sorted and placed in holding bags. Angling also contributed to the broodstock capture.

Sperm was expressed from ripe males and placed in small Ziploc freezer bags before storage in a cooler. Ripe females were killed, bled and hung for at least 20 minutes prior to being stripped of eggs, and the eggs were then placed in large Ziploc freezer bags and stored in the cooler. The eggs and sperm were kept at a targeted temperature of 4 to 6 degrees Celsius.

Once back at the hatchery the eggs were fertilized using a matrix methodology. Each female's eggs were split into 4 small stainless steel bowls, and sperm from at least 2 different males was used to fertilize each bowl of eggs. After adding water to activate the sperm the bowls were stirred lightly and allowed to stand for 20 to 30 seconds prior to mixing into a large bowl, at which time more sperm was added to ensure maximum fertilization. The eggs were then rinsed of excess sperm and placed in a floating tray to water harden for at least 30 minutes. Once water hardened the tray of eggs was then placed in a prescribed iodine solution of 100 parts per million for surface disinfection purposes.

Upon completion of this process the trays were then placed in the moist incubators and left to incubate until eyed stage (approximately 280 thermal units) when they were shocked and picked prior to being transferred to Heath trays. They will remain in these trays until ready to pond, which we anticipate will occur in late April.

3.0 Results and Discussion

3.1 Summary for the 2007 Brood Year

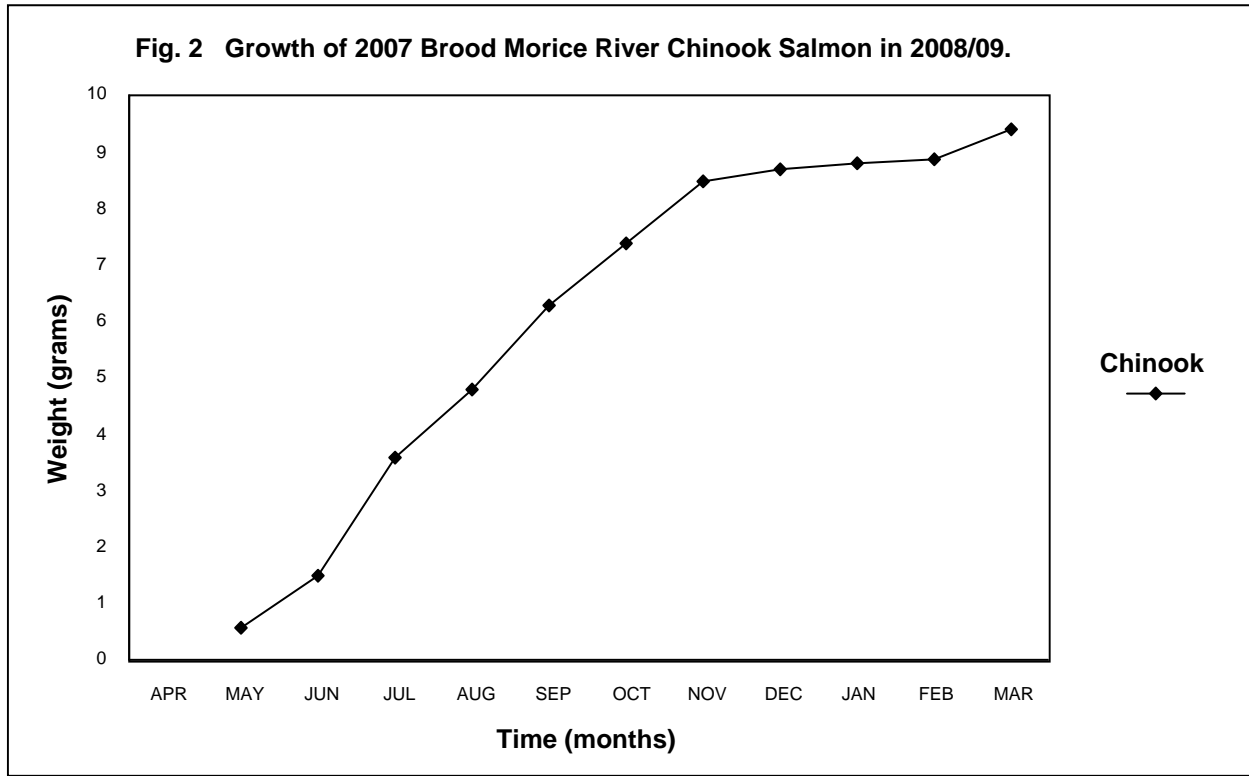
Ponding of the 2007 brood Morice River Chinook fry commenced on May 9th and was completed by May 13th, 2008. These 0.40 gram fry were ponded in one Capilano trough and feeding was initiated with #0 Skretting starter. The Chinook got on the starter feed quickly and were split into two troughs in late May. A total of 86,196 salmon fry were ponded and initial survivals were excellent. Green egg to ponding survivals were over 95%.

Growth of the 2007 brood Morice River Chinook fry increased rapidly, commencing in late May, in conjunction with warming water temperatures and these fish continued to grow at a healthy pace through the summer period (Fig. 2). The rate of growth in 2008/09 was similar to past years, with other stocks we have worked with, and dropped off dramatically during the winter period as a result of prolonged cold temperatures and ice cover on the outdoor channel. At the present time these Morice River Chinook smolts average 9.4 grams in weight, and we hope to have them at 12.0 grams or larger prior to release in late May of 2009.

These Chinook fry were split into 3 Capilano troughs in mid June and their densities were reduced again in July, when they were transferred to the two large indoor troughs. We did not experience any serious problems during the initial indoor rearing of the 2007 brood Chinook.

Coded-wire tagging of the Morice Chinook CWT Group commenced on August 11th and was completed on August 15th, 2008. A total of 80,280 Chinook fry were coded-wire tagged, with the 25,000 fry surplus to the 55,000 target marked with funds from DFO's Stock Assessment Division. Another 6,000 to 8,000 fry surplus to the CWT Group were released in late August.

Survivals since ponding have been excellent and presently are over 99%. Green egg to release survivals may exceed 94% and we presently have over 80,000 Morice River Chinook remaining.



3.2 Summary for the 2008 Brood Year

Preparations for Morice River broodstock collection in 2008 began in mid August, and reconnaissance of the spawning grounds began near the end of the month. As was the case in the initial egg take in 2007 very few fish were observed on redds at this time, with the great majority of Chinook adults holding in the deeper pools.

By the first week of September a substantial number of Chinook, mostly males, began to move onto the shallower sections of the Upper Morice River; just downstream of the lake outflow. The first active spawning was observed on September 8th. We focused our egg collection efforts on this section of river.

Between September 15th and September 21st the salmon began actively spawning and we were able to capture a total of 240 Chinook over this period (180 males and 60 females). We did not try using seine nets in 2008 as they had proven to be relatively unsuccessful the previous year due to the weight of the nets and the strength of the current. As in 2007, angling proved to be somewhat more successful especially for capturing male spawners as they are quite territorial in nature. We experienced the most success utilizing a 100 foot long by 20 foot deep gillnet (5.5 inch mesh). This net was much easier to set and control during each drift, due to lighter mesh. The great majority of fish captured were tangled in the net by their maxillary bone and mouth as opposed to being gilled, and we did not experience any incidental mortality of spawners during broodstock collection.

Most of the females captured were either not as yet ripe or spawned out, while most of the males were ready to spawn. We collected eggs from a total of 14 ripe females and sperm from 70 ripe males. We took four fewer females in 2008, as in 2007 we were well over our egg target of 70,000 eggs. Transport, fertilization and initial incubation of these Chinook eggs went very well.

Incubation temperatures averaged approximately 6.2 degrees Celsius through until mid November, when the incubation flows were switched from ground water to Toboggan Creek surface water. From this point to the end of March the temperatures have averaged 1.0 degrees.

These Morice River Chinook eggs reached eyed stage in early November and shocking and picking occurred shortly afterwards. Survivals to this stage were excellent at 98.1% (Table I) and over 65,200 eyed eggs survived from a total of slightly over 66,500 green eggs taken. The eggs were transferred to Heath trays, at a density of 5,000 eggs per tray, on November 11th. Hatching began at 450.0 accumulated thermal units (ATU's), with peak hatch occurring at 470.0 ATU's.

We continue to monitor the eggs daily, and survivals to March 31st remain well over 97% with approximately 65,000 alevins still on hand. Ponding and feeding will commence shortly.

Table I. Shocking and Picking Summary for the 2008 Brood Morice River Chinook Eggs Incubating at the Toboggan Creek Salmon Hatchery.

<u>Tray #</u>	<u>Females</u>	<u>Pre-Shock</u>	<u>Post-Shock</u>	<u>50 ml Sample</u>	<u>Volume(mls)</u>	<u>Survival(%)</u>
M3-1	1	14	73	155(3.10)	1,620	4,949(98.2)
M3-2	1	18	407	135(2.70)	2,150	5,397(92.7)
M3-3	2	12	44	126(2.52)	4,210	10,565(99.5)
M3-4	2	49	60	110(2.20)	4,640	10,148(98.9)
M3-5	2	19	37	102(2.04)	4,170	8,480(99.3)
M3-6	1	28	134	94(1.88)	3,100	5,694(97.3)
M4-3	1	12	32	101(2.02)	2,520	5,078(99.2)
M4-4	1	25	39	104(2.08)	2,020	4,163(98.3)
M4-5	1	27	175	117(2.34)	2,310	5,230(96.3)
M4-6	1	14	55	104(2.08)	2,710	5,582(98.8)
<hr/>						
<u>Totals</u>	13	<u>218(0.3%)</u>	<u>1,056(1.6%)</u>	<u>113(2.26)</u>	<u>29,450</u>	<u>65,286(98.1)</u>
<hr/>						

4.0 Conclusion / Recommendations

Overall, the first two phases of the Morice Chinook CWT Group Project have gone extremely well. The project is on schedule and all of the objectives have been met and surpassed. We expect to pond well over 64,000 Chinook fry from the 2008 brood year in May, which will easily allow for a release group of 55,000 tagged and clipped yearling smolts in May of 2010.

Fisheries and Oceans Canada (FOC) paid the extra costs associated with coded-wire tagging and adipose clipping 25,000 Morice River Chinook, from the 2007 brood, that were surplus to our target of 55,000. This will increase the likelihood of having more adult Morice CWT's present in both the saltwater and freshwater environments. Subsequently, this will increase chances of success in efforts to sample tagged Chinook in both the catch and the escapement.

Tangible benefits that have resulted from the project are that we are two years closer to having a adult tag group of mid-timed Chinook from the Upper Skeena watershed present in the North Pacific. Having these CWT's available to be landed and sampled in the various fisheries in the waters of Alaska and British Columbia will increase the present base of knowledge. The data generated by sampling of the salmon catch and escapement in future years will enhance the likelihood of sustainable management of a wider range of Skeena-bound Chinook stocks.

For the 2009 egg take we will target the same number of females as in 2008, unless it is recommended by the PSC and FOC biologists to increase the present CWT target above 55,000 smolts. This is, of course, contingent on continued funding from the PSC for 2009/10.

5.0 Acknowledgements

I would like to thank the Pacific Salmon Commission and the North Coast Stock Assessment Biologists from Fisheries and Oceans Canada for supporting our proposal. I would also like to thank my Hatchery Foreman, Randy Bryce, for his tireless efforts; as well as my volunteer Board of Directors for their strong ongoing support and interest.

Appendix. Financial Statement of Expenditures
