

**FINAL REPORT FOR MORICE CHINOOK  
CWT GROUP PROJECT (2011/2012)**

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## **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 15<sup>th</sup> to July 15<sup>th</sup>) 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 were 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. There was a gap in the funding in 2009 due to the economic crash but we still managed to rear, tag and release the smolts from the 2008 egg take. Funding was reinstated in early 2010, and we continue to rear over 56,400 pre-smolts from the 2010 brood year and are now incubating over 79,000 eyed eggs and alevins from last year's (2011) successful egg take.

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 released over 80,000 CWT smolts in May of 2009. We also achieved our target of eggs from the 2008 brood, and over 56,000 CWT smolts were released in May of 2010. This final report for 2011/2012 summarizes the success of the project to this date in time.

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Table of Contents

	Page
1.0 INTRODUCTION .....	6
1.1 Background .....	6
1.2 Objectives .....	8
2.0 METHODS .....	9
3.0 RESULTS AND DISCUSSION .....	10
3.3 Summary for the 2010 Brood Year .....	10
3.4 Summary for the 2011 Brood Year .....	11
4.0 CONCLUSION / RECOMMENDATIONS .....	13

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.....	7
Figure 2. Growth of 2010 Brood Morice River Chinook Salmon in 2011/12 .....	10

List of Tables

	Page
Table I. Shocking and Picking Summary for the 2011 Brood Morice River Chinook Eggs Incubating at the Toboggan Creek Salmon Hatchery .....	12

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Contract # : NF-2011-I-15

Contract Period : April 1, 2011 - March 31, 2012

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### 1.0 Introduction

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#### 1.1 Background

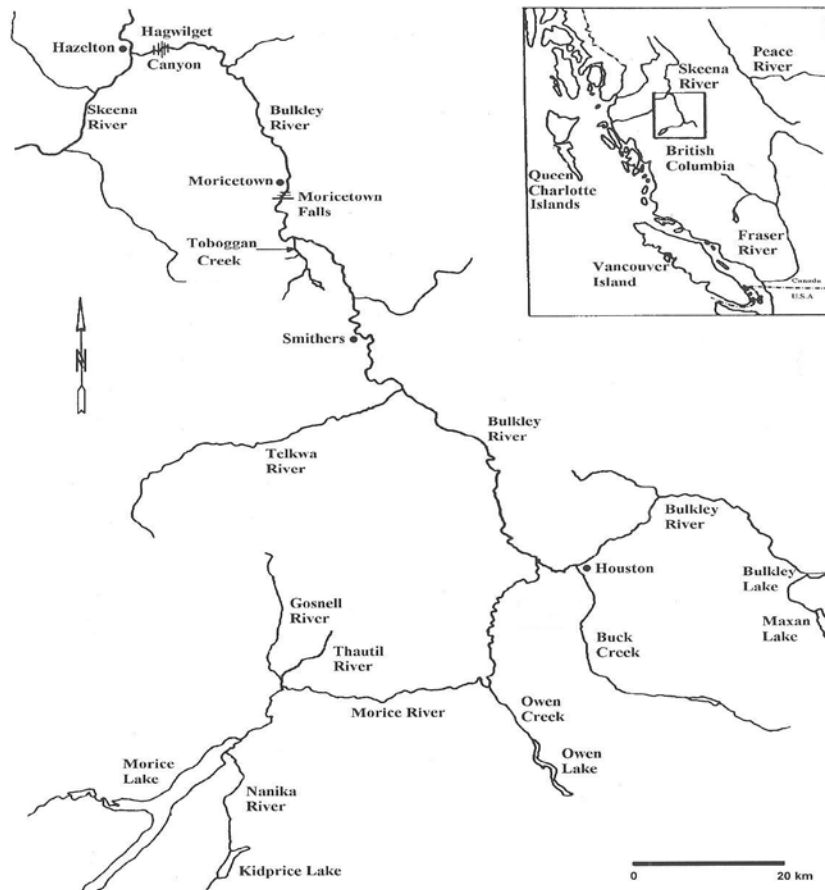
The Toboggan Creek Hatchery, under the direction of the Toboggan Creek Salmon and Steelhead Enhancement Society, has just completed its twenty-fifth year of successful operations. The Toboggan Creek Hatchery facility is located thirteen kilometers north-northwest of Smithers, British Columbia, on Highway 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 fresh water, 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 a few years ago but we have managed to re-initiate tagging of a small smolt tag-group since then.

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 15<sup>th</sup> to July 15<sup>th</sup>) 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 27 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.



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## 2.0 Methods

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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 for 25 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 likely occur in late April or early May.

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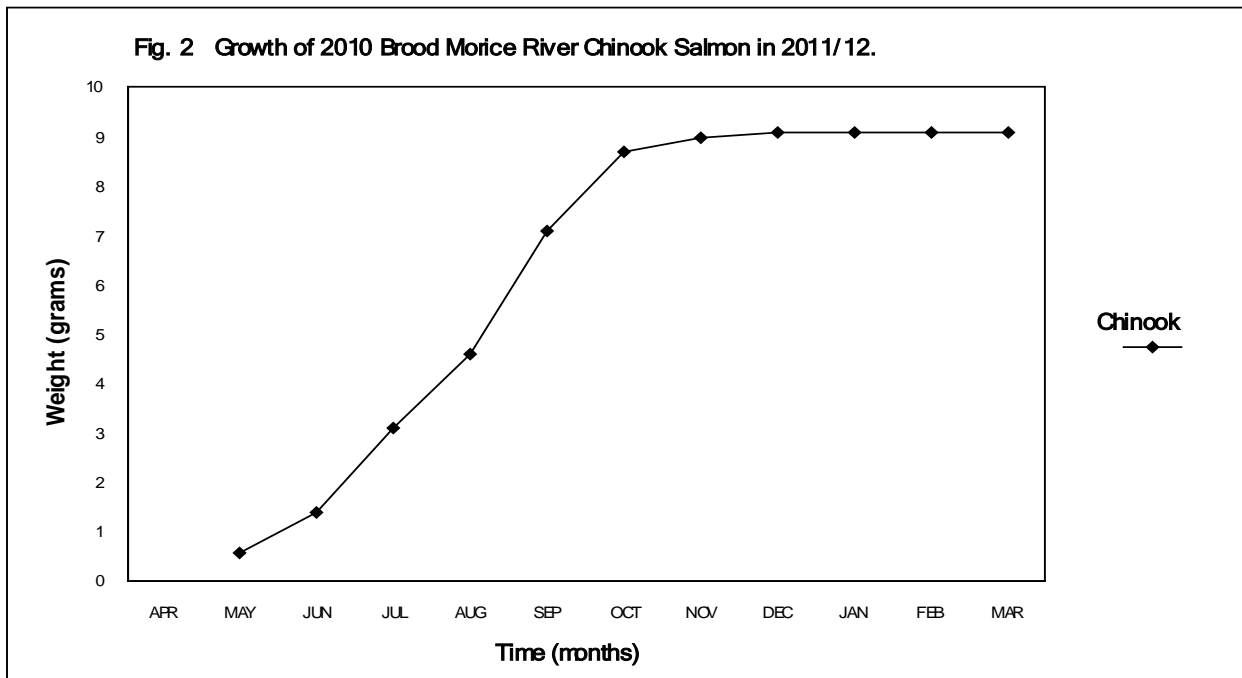
### 3.0 Results and Discussion

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#### 3.1 Summary for the 2010 Brood Year

Ponding of the 2010 brood Morice River Chinook fry commenced on May 17<sup>th</sup> and was completed by May 19<sup>th</sup>, 2011. These 0.40 gram fry were ponded in two Capilano troughs and feeding was initiated with #0 Skretting starter. The Chinook got on the starter feed quickly and were split into three troughs in late June, and into four troughs in late July. A total of 57,200 salmon fry were ponded and initial survivals were excellent. Green egg to ponding survivals were over 93.9%.

Growth of the 2010 brood Morice River Chinook fry increased rapidly, commencing in early June, 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 2011/12 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 last weight/length sampling on March 28<sup>th</sup>, 2012 these Morice River Chinook pre-smolts averaged 9.1 grams in weight, 93 millimeters in weight, and had a condition coefficient of 1.13.



Coded-wire tagging of the 2010 brood Morice Chinook CWT Group commenced on July 28<sup>th</sup> and was completed on August 11<sup>th</sup>, 2011. A total of 56,445 Chinook fry were coded-wire tagged and adipose clipped, and were transferred to the outdoor rearing channel in early September. The tag code for all of these Morice Chinook was 18-21-90. Another 600 to 700 unmarked fry surplus to the CWT Group were released in mid August of 2011.

Survivals of this stock from ponded fry to pre-smolt have been excellent. We hope to begin releasing these Chinook as 10 to 11 gram smolts in May, 2012.

### 3.4 Summary for the 2011 Brood Year

Preparations for Morice River broodstock collection in 2011 began in mid August, and reconnaissance of the spawning grounds began near the end of the month. As was the case during the initial egg takes in 2007, 2008 and 2010 very few fish were observed on redds at this time, with the great majority of Chinook adults holding in the deeper pools.

By the second 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 12<sup>th</sup>. We focused our egg collection efforts on this section of river.

Between September 12<sup>th</sup> and September 18<sup>th</sup> the salmon began actively spawning and we were able to capture a total of 200 Chinook over this period (130 males and 70 females). We experienced the most success utilizing a 100 foot long by 20 foot deep gillnet (5.5 inch mesh). This net was fairly easy to set and control during each drift, due to light 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 spawned out or fully ripe, while most of the males were ready to spawn. We collected eggs from a total of 17 ripe females and sperm from 68 ripe males. We took a similar number of females in 2011 as we did in 2010, at 17 and 15 respectively. Transport, fertilization and initial incubation of these Chinook eggs went very well.

Incubation temperatures averaged approximately 7.0 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 late October and shocking and picking occurred shortly afterwards. Survivals to this stage were very good at 97.1% (Table I) and over 80,000 eyed eggs survived from a total of slightly over 82,700 green eggs taken. The eggs were transferred to Heath trays, at a density of 5,000 eggs per tray, on November 1<sup>st</sup>. Hatching began at 480.0 accumulated thermal units (ATU's), with peak hatch occurring at 510.0 ATU's.

We continue to monitor the eggs daily and survivals to March 31<sup>st</sup> remain over 96%, with approximately 79,800 alevins still on hand. Ponding and feeding will commence in May, 2012.

Table I. Shocking and Picking Summary for the 2011 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>
M3-3	2	14	254	124(2.48)	4,500	10,905(97.6)
M3-4	2	4	368	124(2.48)	4,220	10,098(96.4)
M3-5	1	51	875	88(1.76)	3,670	5,584(85.8)
M3-6	2	2	81	122(2.44)	4,200	10,167(99.2)
M4-1	1	24	131	92(1.84)	3,070	5,517(97.3)
M4-2	1	2	24	123(2.46)	2,500	6,126(99.6)
M4-3	1	160	29	135(2.70)	2,020	5,425(96.6)
M4-4	2	21	224	125(2.50)	4,590	11,252(98.9)
M4-5	1	9	86	151(3.02)	1,710	5,078(98.2)
M4-6	2	2	105	125(2.50)	4,090	10,120(99.0)
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<u>Totals</u>	15	<u>289(0.3%)</u>	<u>2,177(2.6%)</u>	<u>119(2.38)</u>	<u>34,570</u>	<u>80,272(97.1)</u>
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#### 4.0 Conclusions/Recommendations

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Overall, the first four phases of the Morice Chinook CWT Group Project have gone extremely well until now. The project is on schedule and all of the objectives have been met and surpassed. In fact, over the first two brood-year releases (2007 and 2008) we released a total of 136,747 coded-wire tagged smolts even though we were only obligated to release 110,000. Considering that PSC funding was interrupted in the spring of 2009, this is a great accomplishment.

Instead of releasing the 2008 brood as untagged fry in May of 2009 we made a decision to try and rear the Morice River Chinook stock through to a tagged smolt release. Fisheries and Oceans Canada (FOC) paid the costs associated with coded-wire tagging and adipose clipping of over 56,800 Morice River Chinook from the 2008 brood. The Toboggan Creek Salmon and Steelhead Enhancement Society absorbed the costs of rearing and feeding these smolts, and the PSC funded the releases in May of 2010. Despite the unforeseen challenges created by the crash of the economy in 2008/09, and the subsequent effect on the endowment funding, the completion of the Morice Chinook program was accomplished in a very cooperative manner.

Tangible benefits that have resulted from the project are that we are very close to having an adult (5 to 6 year old) tag group of mid-timed Chinook from the Upper Skeena watershed present in the North Pacific. A good number of three-year old Chinook jacks from our 2007 brood smolt release returned in 2010, and we saw some three and four-year olds present in the river in 2011. In 2012 we will see both four-year old and five-year old Morice River CWT's in the catch and the escapement. 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.

With over 56,400 coded-wire tagged Morice Chinook from the 2010 brood still rearing we will once again exceed our obligation of a 55,000 smolt release group in May of 2012. We also expect to pond close to 79,000 Chinook fry from the 2011 brood year in May, which will easily allow for a release group of at least 65,000 to 70,000 coded-wire tagged smolts in May of 2013.

Surprisingly, the funding for successfully completing this beneficial program for a full life cycle was declined in early 2012. This leaves our hatchery, run by a non-profit Society, with the sole responsibility of rearing and releasing all of these Chinook from the 2010 and 2011 brood years.

Also, as a result of this, the 2012 egg take will very likely be cancelled as was the 2009 egg take. This seriously compromises the success of the initial proposal to rear and release at least five brood years of Morice River Chinook coded-wire tags over a period of seven fiscal years, when considering egg takes and smolt releases span a total of 21 months for each brood year.

Considering the lack of consistent Chinook data on upper Skeena stocks this is very unfortunate, and some serious afterthought should be given to completing the 2010 and 2011 brood programs.