FINAL REPORT FOR MORICE CHINOOK

CWT GROUP PROJECT (2010/2011)

Prepared for: **Pacific Salmon Commission**

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

April, 2011

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 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 managed to rear, tag and release the smolts from the 2008 egg take. Funding was reinstated in early 2010, and we continue to incubate over 62,000 alevins from last year's 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 report summarizes the success of the project to this date in time.

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Contract # : NF-2010-I-6

Contract Period : April 1, 2010 - March 31, 2011

1.0 Introduction

1.1 Background

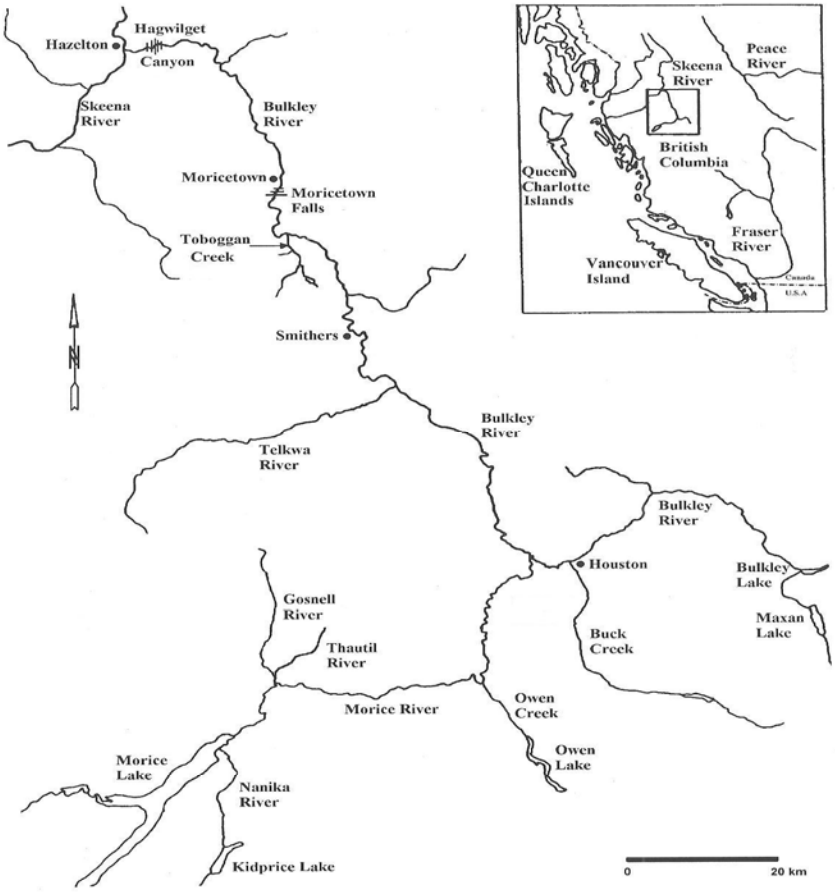
The Toboggan Creek Hatchery, under the direction of the Toboggan Creek Salmon and Steelhead Enhancement Society, has just completed its twenty-fourth year of successful operations. The Toboggan Creek Hatchery facility is located thirteen kilometers north-northwest of Smithers, British Columbia, on Highway 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 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 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 26 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

Rearing of the 2007 brood Morice Chinook pre-smolts continued after the 2008/09 contract expired. These salmon showed very good survivals through the late winter and early spring, prior to release.

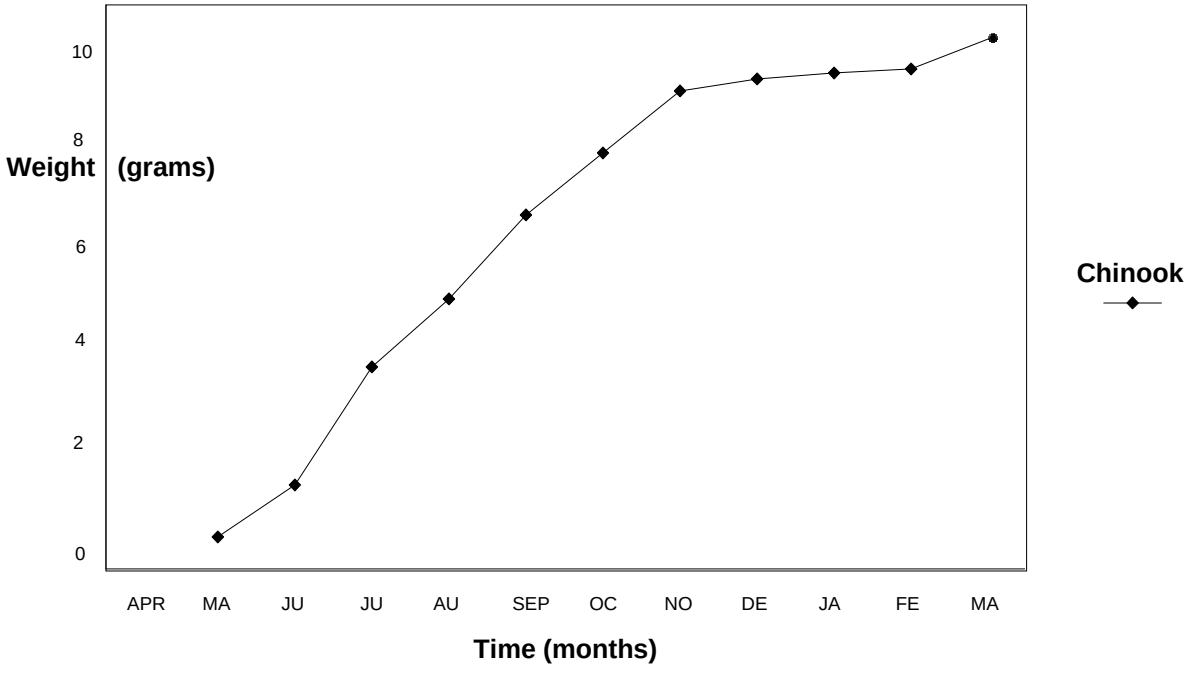
Beginning on May 12th, and concluding on May 15th, a total of 80,065 Morice River Chinook CWT's were transported and released into the Morice River. These smolts were taken to two different sites via the Morice Forest Service Road. Everything went well on the releases, with the average river temperature at just under 4.0 degrees Celsius. This CWT group appeared very healthy at release, averaging 8.5 grams in weight and having a condition coefficient of 1.09.

3.2 Summary for the 2008 Brood Year

Ponding of the 2008 brood Morice River Chinook fry commenced on May 25th and was completed by May 30th, 2009. 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 62,709 salmon fry were ponded and initial survivals were excellent. Green egg to ponding survivals were over 97.5%.

Growth of the 2008 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 2009/10 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. By August 1st, 2009 these Morice River Chinook fry averaged 3.3 grams in weight, and had a condition coefficient of 1.32.

Fig. 2 Growth of 2008 Brood Morice River Chinook Salmon in 2009/10.



Coded-wire tagging of the 2008 brood Morice Chinook CWT Group commenced on August 5th and was completed on August 13th, 2009. A total of 56,835 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 18-02-84. Funding to complete the tagging and clipping was supplied by DFO's Stock Assessment Division. Another 5,740 unmarked fry surplus to the CWT Group were released on April 29th, 2010.

Survivals of this stock from ponded fry to smolt were excellent. As well, green egg to release survivals exceeded 97%. We began releasing the 2008 brood Morice River Chinook CWT's on May 5th, 2010 and transported the last batch on May 14th. These smolts looked to be very healthy at release, averaging 10.4 grams in weight and with a condition coefficient of 1.14. A total of 56,682 CWT smolts from the 2008 brood were successfully released.

3.3 Summary for the 2009 Brood Year

Due to the lack of PSC funding in 2009/10, and with uncertainty that funds would be available in 2010/11, it became necessary to cancel plans to take Morice River Chinook eggs in September of 2009. Other funding sources were investigated but nothing became available. Fortunately, things improved over the winter of 2009/10 and the PSC was once again in a position to fund the Morice project.

3.4 Summary for the 2010 Brood Year

Preparations for Morice River broodstock collection in 2010 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 and 2008 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 12th. We focused our egg collection efforts on this section of river.

Between September 14th and September 17th the salmon began actively spawning and we were able to capture a total of 195 Chinook over this period (150 males and 45 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 ripe or partially-spawned out, while most of the males were ready to spawn. We collected eggs from a total of 15 ripe females and sperm from 60 ripe males. We took a similar number of females in 2010 as we did in 2008, at 15 and 14 respectively. Transport, fertilization and initial incubation of these Chinook eggs went very well.

Incubation temperatures averaged approximately 6.8 degrees Celsius through until Late 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 good at 94.4% (Table I) and over 62,500 eyed eggs survived from a total of slightly over 66,200 green eggs taken. The eggs were transferred to Heath trays, at a density of 5,000 eggs per tray, on November 2nd. Hatching began at 470.0 accumulated thermal units (ATU's), with peak hatch occurring at 500.0 ATU's.

We continue to monitor the eggs daily and survivals to March 31st remain just over 94%, with approximately 62,000 alevins still on hand. Ponding and feeding will commence in May, 2011.

Table I. Shocking and Picking Summary for the 2010 Brood Morice River Chinook Eggs Incubating at the Toboggan Creek Salmon Hatchery.

Tray #	Females	Pre-Shock	Post-Shock	50 ml Sample	Volume(mls)	Survival(%)
M3-2	3	53	354	116(3.32)	4,030	13,949(98.2)
M3-3	1	9	112	97(1.94)	3,230	5,397(92.7)
M3-4	2	95	859	137(2.74)	3,840	10,565(99.5)
M3-5	1	1	27	101(2.02)	2,210	10,148(98.9)
M3-6	1	25	142	93(1.86)	3,110	8,480(99.3)
M4-3	1	3	117	97(1.94)	2,450	5,694(97.3)
M4-4	2	126	558	103(2.06)	3,770	5,078(99.2)
M4-5	1	108	229	101(2.02)	2,640	4,163(98.3)
M4-6	2	270	590	104(2.08)	3,500	5,230(96.3)
Totals	13	690(1.1%)	2,988(4.5%)	117(2.34)	28,780	62,561(94.4)

4.0 Conclusions/Recommendations

Overall, the first three 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 close to 62,000 Chinook fry from the 2010 brood year in May, which will easily allow for a release group of 55,000 tagged and clipped yearling smolts in May of 2012.

Fisheries and Oceans Canada (FOC) paid the costs associated with coded-wire tagging and adipose clipping 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. 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 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 should see four-year olds present in the fishery in the coming months. 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.

For the 2011 egg take we will target the same number of females as in 2010, 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 2011/12. At this point it has been confirmed that the base funding has been approved for next year.

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.