



**Coded Wire Tagging of Chinook Salmon at the Whitehorse Rapids  
Hatchery in 2013**

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## Abstract

Chinook salmon fry reared at the Whitehorse Rapids Hatchery were adipose fin- clipped and injected with decimal tags in the early summer of 2012. Tricaine methane sulphonate (MS222) was used to anaesthetize the fry prior to clipping and tagging. The 2013 release of a total of 142,392 fry in three areas upstream of the Whitehorse Rapids dam along with the main stem Yukon were:

- 13,850 into Wolf Creek on May 27,
- 16,282 into the main stem Yukon River on June 4;
- 80,595 into Michie Creek on June 4, and
- 31,665 into the McIntock River on June 4.

The Yukon Fish and Game Association (YF&GA) staff at the Whitehorse Rapids Fishway hosted 20,991 visitors. This is 2,376 more than last year. Fishway staff provided tours of the facility and information to these visitors in English, French and German.

Fishway staff monitored the run composition and provided daily updates to DFO. In 2013, 1,139 returning adult Chinook salmon were counted at the Fishway, including 764 of hatchery origin. The hatchery component included 186 males and 578 females and represented 67% of the Whitehorse Rapids Fishway count. I am not aware of a year where we have had such a high percentage of females. We would hope this same dynamic was present in the wild stocks. Local students employed at the Whitehorse Rapids Fishway also assisted hatchery staff in the collection of the 70 Chinook used for broodstock and while taking biological data. They also assisted with the recovery of coded wire tags from the hatchery fish which were used for broodstock.

Walks were conducted on Wolf Creek for adult spawners with limited success. With the change in release numbers spawning adults are also decreasing.

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## Introduction

The Yukon Fish and Game Coded Wire Tagging project in 2013 was comprised of two main components: the tagging and releasing of groups of Whitehorse Rapids Chinook salmon fry, and support of the Whitehorse Rapids Fishway salmon enumeration and natural interpretation project and other associated stewardship activities.

Groups of Upper Yukon River Chinook salmon have been tagged with coded wire tags annually in the

Yukon Territory since 1985<sup>1</sup>, when hatchery fry were first released from the new Whitehorse Rapids Fish Hatchery (WRFH). The hatchery was constructed in 1984 in concert with the construction of a fourth turbine at the Whitehorse hydroelectric facility, and the hatchery fish were produced to offset possible impacts of the hydro generating facility. In excess of 80% of all the fish tagged have originated from the hatchery have been coded wire tagged, either by Fisheries and Oceans Canada, or by Yukon Fish and Game Association (YFGA). The coded wire tagging of Whitehorse Rapids Hatchery Chinook allows biologists to distinguish hatchery Chinook from wild Chinook over the course of their life cycle, for as long as seven years for the hatchery Chinook. The benefit of being able to select wild fish to contribute to hatchery broodstock and thus ensure genetic diversity benefits the Chinook run in perpetuity. Survival estimates made possible by the assessment of clipped fish returns allows ongoing assessment of hatchery effectiveness for as long as the marking continues.

Coded-wire tags (CWT's) are small (1mm long) pieces of metal wire that are injected into the nose cartilage of juvenile salmon. Tags are microscopically encoded with information that enables biologists to identify the tag group of the salmon when the tag is recovered through sampling or fishing efforts. The adipose fin is also removed from tagged fish so that they may be visually identified (Johnson 1990). The amount of information linked to the tag code varies depending on the type of tag applied (agency only, or decimal tag) and the management of the tag groups (differentiation of release groups). In addition to distinguishing hatchery fish from wild fish, the ability to identify the release groups of the tagged fish enables scientists to use sampling data to compare the survival of groups of fish, to assess their contribution to a specific fishery or fisheries, to assess survival rates, and to learn about migrations and distributions of stocks.

The Whitehorse Rapids Fishway is used to enumerate Chinook salmon migrating to spawning grounds upstream of Whitehorse, including almost all Chinook returning from releases from the Whitehorse Rapids fish hatchery. The viewing chamber at the Fishway allows staff to distinguish and record the origin (wild or hatchery) and the sex of the migrating Chinook salmon. The YFGA interpretive program at the Fishway provides an unparalleled opportunity for locals and visitors to observe and learn about Yukon River Chinook salmon. The program seeks to foster a salmon stewardship ethic in all those who visit, and most particularly among the staff who work at the Fishway. In recent years very capable staff have returned the facility to its ranking as the most visited site in the Whitehorse area.

### **Conservation Project Objectives**

The specific objectives of the YFGA 2013 Chinook tagging project were to:

- To purchase decimal coded wire tags (SWTs) for WRFH Chinook salmon fry reared at the Whitehorse Rapids Hatchery in YR 2012-2013.
- To employ an experienced contractor and a crew to mark the WRFH Chinook fry, including clipping adipose fins and applying CWTs to all Chinook fry of sufficient size and condition to tag.
- To contract a helicopter operator to work with WRFH personnel to load and transport marked fish out to designated release sites.
- To provide a summary report of the activities of the fry tagging and fry release, including tag retention, tagging mortality and biological sampling data for each tag group.

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<sup>1</sup> An exception occurred in 1999 when all fry released from the Whitehorse Rapids Hatchery were marked with the removal of their adipose fin, but coded wire tags were not applied.

## Tagging Project Materials and Methods

### Coded Wire Tag Purchase

YFGA consulted with DFO Whitehorse and DFO Pacific Regional staff in Vancouver BC to determine the appropriate tag purchases for 2013.

YFGA purchased 150,000 decimal coded wire tags from Northwest Marine Technologies. To take advantage of cost savings available only on early orders, YFGA made use of the regional DFO inventory of tags for the project, and then replaced them with tags that arrived after the tagging was completed. Tags were purchased with five separate tag codes to ensure that different tag codes could be applied to fish released at different release sites. The code groups utilized in 2013 were:

- Code 18-60-25: 13,850 tags
- Code 18-25-79: 47,577 tags
- Code 18-17-82: 33,018 tags
- Code 18-36-08: 9,285 tags
- Code 18-36-09: 6,997 tags
- Code 18-24-64: 31,665 tags

### Coded Wire Tag Application

Tagging was conducted in accordance with Whitehorse Rapids Hatchery standard procedures. Phyllis Nelson of 'Eh- Fish', a professional contractor from Vancouver who works throughout the Pacific Region and who has conducted the tagging in Yukon for over 20 years, was contracted to conduct the tagging and fin clipping. Ms Nelson, one additional tagger and four adipose fin clippers were employed. Most were students, including some who went on to work at the fish ladder after tagging ended. Operations commenced on May 21, 2013 and were completed on June 3rd.

Fry were sorted according to size and condition prior to tag application. Small or deformed fry were not tagged but were externally marked with an adipose clip. Feeding was suspended for at least 24 hours prior to tagging and resumed afterwards. Feeding was suspended again for a period of 24 to 48 hours prior to release.

Batches of approximately 50 fry were held in a nine-litre capacity plastic tub containing anaesthetic, for a minimum of two minutes prior to fin clipping. The anaesthetic used was tricaine methane sulphonate (MS222). Anaesthetic baths were changed frequently to prevent thermal shock of the fry, and to refresh the anaesthetic. Anaesthetic was prepared by mixing 30 grams of MS222 into 500 ml's of water to prepare a stock solution, and then mixing 25 ml's of the stock solution into 20 liters of water to prepare anaesthetic baths. Water was at 6 degrees Celsius. Fish were left in the basins just until they become docile enough to handle, and were monitored throughout to avoid the risk of over-dosing. The number of fish anesthetized at one time varied, and depended on the size of the fish, and the speed and agility of the clippers and tagger.

Anaesthetized fry were dip netted onto the clipping section of the tagging table, where clippers used surgical scissors to remove the adipose fin. Once the fry were fin clipped, they were passed to the

“clipped” section of the table, where they were accessible to a tagger for “Decimal” tag application. After tagging, each fry was immediately passed through a quality control device (QCD) to check for successful tag implantation. The QCD automatically detected, separated, and enumerated tagged and untagged specimens. Fry exited the QCD into recovery buckets of water which were supplied with a trickle flow to replenish oxygen. Recovery time of fish after the tagging procedure averaged about 2 minutes.

- Untagged fry identified and separated by the QCD were checked a second time for tag implantation. All untagged fry were then retagged with a CWT. Once tagging was complete, the recovered fry were returned to the rearing tanks where they were held for five days, and sample lots were passed through a QCD to determine CWT retention. All these activities are under the professional guidance of Phyllis Nelson throughout the entirety of the project. Phyllis maintained records of fish tagged daily by tag code, of results of daily sampling for tag retention estimation, and of tagging mortalities.

Groups of tagged fry were moved to round tanks allocated for fish of their specific tag code, under the direction of the hatchery manager. The hatchery manager resumed the feeding and cleaning schedule until the day before the fry release, at which time fry were again taken off feed.

### **Fry Releases**

YFGA consulted with DFO and Yukon Energy Corporation regarding release group sizes and release sites and verified that a transplant license was in place prior to releases. YFGA contracted Capital Helicopters to work with WRFH personnel to load and transport marked fish out to designated release sites.

Hatchery personnel recorded sampled data and tag code data and coordinated the releases. This included setting up tanks and oxygen systems, filling tanks, driving to the Wolf Creek site, scheduling helicopter pickups, calculating loading densities based on sample data, and loading fry. YFGA paid for helicopter transport to the release sites.

The Wolf Creek public fry release was carried out on May 26, 2013. Hatchery personnel transported fry to the release site by pick-up truck in an insulated fish tote. The public were invited to release fish, and hatchery personnel and YFGA volunteers loaded and distributed bags of fry and water for the public to carry to the stream at the Wolf Creek campground.

Helicopter fry releases were all carried out on June 4, 2013. Seven flights were required for releases at the various sites; two flights were required for the McClintock River releases along with four flights for Michie Creek and one for the Yukon River main stem releases for a total of 5.5 hours of flying and 627 litres of fuel. Great weather conditions made for excellent results.

## **Tagging Project Results and Discussion**

### **Coded Wire Tagging**

The 2013 release of a total of 142,392 fry in three areas upstream of the Whitehorse Rapids dam along with the main stem Yukon were:

- 13,850 into Wolf Creek on May 26,
- 16,282 into the main stem Yukon River on June 4;

- 80,595 into Michie Creek on June 4, and
- 31,665 into the McClintock River on June 4.

Fry weight at time of release ranged from 2.78 grams to 2.87 grams with an average weight of 2.83 grams which is up slightly from last year. Appendix 1 provides the summary of release data by tag group.

The total number of fry tagged and released in 2013 was 142,392. This is 4% lower than the 2012 release, and 4% higher than the recent five year average release of 136,451. Appendix 1 provides the Whitehorse Rapids Hatchery 2013 Chinook CWT release report. Historic release numbers are available in the annual Joint Technical Committee Report (JTC, 2013).

Appendix 2 provides the Whitehorse Rapids Hatchery 2011-2012 Chinook Data Summary which summarizes the collection of eggs and survival of eggs through to release in 2013.

It is interesting to note that tag recoveries through marine studies have provided information about the behaviour and location of tagged Yukon River Chinook in the Bering Sea. A recent interesting aspect of these tag recoveries is that they identify a northward migrating component in Yukon salmon within the Bering Strait (Celewycz et al. 2010). Three fry released with “Agency-only” coded wire tags in 2007 were recovered in mid-September in the Bering Strait during a surface trawl operation aboard a National Oceanic and Atmospheric Administration research vessel. These recoveries represent the most northerly recoveries of coded wire tagged Chinook salmon released in Whitehorse, Yukon.

## Recommendations

- 1) A greater focus on recovery of coded wire tags in the salmon fisheries would likely make this project more valuable.
- 2) The Whitehorse Rapids Fishway provides an ideal venue for communicating the value of Yukon River salmon to a broad spectrum of people from the Yukon River watershed and beyond; its value in fostering stewardship of the salmon resource could be further enhanced with in-season run updates, and information brochures from the Panel.

## Literature Cited

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JTC (Joint Technical Committee of the Yukon River US/Canada Panel). 2012. *Yukon River salmon 2011 season summary and 2012 season outlook*. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A12-01, Anchorage. Retrieved from <http://yukonriverpanel.com/salmon/wp-content/uploads/2009/03/jtc-report-summary-2011-preseason-2012.pdf>

## Appendix 1: Whitehorse Rapids CWT and Associated non-CWT Groups Release Report

**HATCHERY/PROJECT** Whitehorse Rapids Fish Hatchery/Enhancement

**SPECIES** CN-124 (Yukon River Chinook)

**DATE**

16-Jun-13

**CONTACT** Lawrence Vano - Operations Manager

**ONE OF TWO PAGES**

CWT TAG CODE	REP	BROOD YEAR	RUN	STUDY	EXPIRED	STOCK TYPE	STOCK	RELEASE	REL PERIOD	REL STAGE	CODED WIRE TAGGED FISH				ASSOCIATED NON-CWT FISH					ABORIGINAL SUV			
											CWT FINCLIP	# CWT TAGGED	# SHED CWT	SAMPLE SIZE	TAGLOS S	FINCLIP	NUMBER	PARTIAL CLIPS	ENUM METHOD		TOTAL RELEASE	LENGTH	WEIGHT
															DAYS %							mm	gm
18-60-25		2012	2	H	P	W	Yukon River	Wolf Creek	27 - 05 - 2013	FF	Adipose	10,482	105	500	3 1.0	3,368	0		C	13,850		2.24	
COMMENTS	10,485 - 3 Mortalities = 10,482 X 99% Tag retention = 105 adipose clipped with no tag retained and 10,377 adiposed clipped with tag *** 3,368 TO SMALL TO CODED WIRE TAG ADIPOSE FIN CLIPPED ONLY**** retained. Total Released 10,482																						
18-25-79		2012	2	H	P	W	Yukon River	Michie Creek	04/06/2013	FF	Adipose	47,577	952	500	5 2.0		0		C	47,577		2.7	
COMMENTS	47,704 - 127 mortalities =47,577 X 98% Tag retention = 952 adipose clipped with no tag retained and 46,625 adipose clipped with tag retained. Total Released 47,577																						
18-17-82		2012	2	H	P	W	Yukon River	Michie Creek	6- 04-2 012	FF	Adipose	33,018	660	500	5 2.0		0		C	33,018		2.46	
COMMENTS	33,079 - 61 mortalities = 33,018 X 98 Tag retention = 660 adiposed clipped with no tag retained and 32,358 adiposed clipped with tag retained. Toatl Released 33,018																						
18-36-08		2012	2	H	P	W	Yukon River	Main Steam	6- 04-2 012	FF	Adipose	9,285	93	500	5 0.1		0		C	9,285		2.44	
	9,295 - 10 mortalities = 9,285 X 99% Tag retention = 93 adiposed clipped with no tag retained and 9,192 adiposed clipped with tag retained. Total Release 9,285																						



COMMENTS																				
18-36-09	2012	2	H	P	W	Yukon River	Main Steam	04/06/2013	FF	Adipose	6,997	140	500	5	2.0	0		C	6,977	2.44
COMMENTS	7,000 - 3 mortalities = 6,997 X 98 % Tag retention = 140 adiposed clipped with no tag retained and 6,857 adiposed clipped with tag retained. Total Release 6,997																			

## CWT AND ASSOCIATED NON-CWT GROUPS RELEASE REPORT

**HATCHERY/PROJECT** Whitehorse Rapids Fish Hatchery/Enhancement     
 **SPECIES** CN-124 (Yukon River Chinook)     
 **DATE** June 16 2013  
**CONTACT** Lawrence Vano - Operations Manager

CWT TAG CODE	REP	BROOD YEAR	RUN	STUDY	EXPI	STOCK TYPE	STOCK	RELEASE	REL PERIOD	REL STAGE	CODED WIRE TAGGED FISH				ASSOCIATED NON-CWT FISH				LEN GTH	WEIGHT	ABORIGINAL	
											CWT FINCLIP	# CWT TAGGED	# SHED CWT	SAMPLE SIZE	TAGLOS S	FINCLIP	NUMBER	PARTIAL CLIPS				ENUM METHOD
Ag D1 D2				R S			CODE NAME	CODE NAME	DDMMYY					DAYS %						mm	gm	
18-27-64		2012	2	H	P	W	Yukon River	McClintock River	04/06/2013	FF	Adipose	31,690	0	500	5	0%	0		C	31,665	2.35	
31,690 - 25 mortalities = 31,665 X 100 % Tag retention = 0 adiposed clipped with no tag retained and 31,665 adiposed clipped with tag retained. Total Release 31,665																						

## Appendix 2: Whitehorse Rapids 2012-2013 Chinook Data Summary

### *Chinook Salmon Releases 2013*

#### ***Wolf Creek***

Tag Code 18-60-25

10,485 – 3 mortalities = 10,482 X 99% Tag retention = 105 Adipose clipped with no tag retained and 10,337 Adipose clipped with tag retained. Released 3,368 fry deemed too small to coded wire tag, adipose fin clipped only.

Total Released May 26, 2013 = 13,850 @ 2.24 grams

#### ***Michie Creek***

Tag Code 18-25-79

47,704 – 127 mortalities = 47,577 X 98% Tag retention = 952 Adipose clipped with no tag retained and 46,625 Adipose clipped with tag retained.

Total Released June 4, 2013 = 47,577 @ 2.70 grams

#### ***Michie Creek***

Tag Code 18-17-82

33,079 – 61 mortalities = 33,018 X 98% Tag retention = 660 Adipose clipped with no tag retained and 32,358 Adipose clipped with tag retained.

Total Released June 4, 2013 = 33,018 @ 2.46 grams

#### ***Main Steam Yukon River***

Tag Code 18-36-08

9,295 – 10 mortalities = 9,285 X 99% Tag retention = 93 Adipose clipped with no tag retained and 9,192 Adipose clipped with tag retained.

Total Released June 4, 2013 = 9,285 @ 2.44 grams

#### ***Main Steam Yukon River***

Tag Code 18-36-09

7,000 – 3 mortalities = 6,997 X 98% Tag retention = 140 Adipose clipped with no tag retained and 6,857 Adipose clipped with tag retained.

Total Released June 4, 2013 = 6,997 @ 2.44 grams

#### ***McClintock River***

Tag Code 18-24-64

31,690 – 25 mortalities = 31,665 X 100% Tag retention = 0 Adipose clipped with no tag retained and 31,655 Adipose clipped with tag retained.

Total Released June 4, 2013 = 31,665 @ 2.35 grams

## ***Total Chinook Salmon Released Upper Yukon River Basin*** ***142,392***

### **Chinook Salmon By 2013**

Egg Take Dates = August 28 to September 11, 2013  
 Number Of Females Successfully Spawned = 32  
 Number Of Females Partially Spawned = 6  
 Number Of Females Lost To Holding = 4  
 Number Of Males Utilized = 69  
 Estimated Number of Green Eggs Taken (second inventory) = 192,146  
 Percent Fertilization 24 Hours = 92%  
 Pre-Eyed Mortalities And Development Checks = September 19 to October 6, 2013 (150 Atu's)  
 Number Of Mortalities (including eggs removed for development checks) =11,342  
 Percent Development = 81%  
 Dates Of Shocking & Eyed Egg Inventory= Start October 15 End November 1, 2013  
 Number of Shocking Mortalities (second inventory) = 20,313  
 Number Estimated Eyed Eggs = 160,491  
 Survival Green To Eyed Egg Stage =83%  
 Number Mortalities Eyed Egg To Hatching Stage = 3,550  
 Number Of Eyed Eggs Pre Fox Creek /Classroom Donation = 156,941  
 Survival Eyed Egg To Hatch Stage =97%  
 Number Of Eyed Eggs Donated Fox Creek Project = 22,542  
 Number Of Eyed Eggs Donated Stream To Sea Classroom Project = 1,000  
 Total Eyed Eggs Donated = 23,542  
 Average Atu's During Eyed Egg Transfer = 380 Atu's  
 Date Of Transfer To McIntyre Creek Hatchery = November 7, 2013  
 Total Eyed Eggs Incubating In Whitehorse Rapids Fish Hatchery (post donation) = 133,399  
 Total Eyed Eggs Pre Hatch = 131,486  
 Total Mortalities Eyed To Hatch = 1,913  
 Survival Eyed To Hatch Stage - 98%  
 Hatching Dates = Start November 15, 2013 (492 Atu's) End December 8, 2013 (528 Atu's)  
 Average Atu's To Complete Hatch = 510 Atu's  
 Total Alevins Complete Hatch Stage = 129,573  
 Total Mortalities Hatch To Pondering = 6,015  
 Pondering Dates = February 8 To February 19, 2014 (Average 1000 Atu's)  
 Survival Complete Hatch To February 19 Complete Pondering =95%  
 Total number Of Estimated Fry Pondered = 123,558  
 Total Fry Rearing March 4, 2014 = 121,260 @ .50 grams (Average 6 indoor tanks)

### **Comments:**

As of March 4, 2014 the Whitehorse Rapids Fish Hatchery is rearing 121,260 fry in six indoor round tanks at an average weight of .50 grams.