Application of Coded-Wire Tags to Chinook Salmon Fry Released at the Whitehorse Rapids Fish Hatchery in 2002

Prepared for:
Yukon Fish and Game Association:
Prepared by:
Patrick Milligan
Fisheries and Oceans Canada
Suite 100, 419 Range Road
Whitehorse, Yukon
Y1A 3V1

November 2002

Project CRE-63-02

Application of Coded-Wire Tags to Chinook Salmon Fry Released at the Whitehorse Rapids Fish Hatchery in 2002

This is a report on Project CRE-63-02: "Application of Coded-Wire Tags to Chinook Salmon Fry Released at the Whitehorse Rapids Fish Hatchery in 2002". Prepared by Patrick Milligan (Fisheries and Oceans Canada) for the Yukon Fish and Game Association.

Acknowledgements

This project was funded by the Canada/U.S. Yukon River Panel, through the Restoration and Enhancement Fund, and Fisheries and Oceans Canada.

I would like to thank Lawrence Vano and Sandra Beitz from the Whitehorse Rapids Fish Hatchery for overseeing and assisting with the tagging activities. Thanks also to Phyllis Nelson for co-ordinating the tagging. The clipping crew included Matt Larsen, Kathleen Dyke, Karen Milligan, and Darryl Sheepway.

Abstract

A total of 245,393 fry were adipose fin clipped and injected with full size binary coded-wire tags at the chinook salmon hatchery located in Whitehorse, Yukon Territory in the spring of YR 2002. Clove oil was used to anaesthetise the fry prior to clipping and tagging. Feeding was suspended for a minimum of 24 hours prior to tagging. Ten

different tag codes were used, each corresponding to a separate fry release group. Tag retention was tested and averaged 99%. Based on this information 244,045 tagged and clipped fry were released and 1,491 fry were released with an adipose clip only. Feeding was suspended 24-48 hours prior to fry release. Fish were released into only four areas. Releases occurred on May 23,June2 (Wolf Creek campground and above the cadet camp) and on June 08,10 2002 (Michie Creek at outlet of Michie Lake, M'Clintock River below falls, and Byng Creek.

Introduction

Coded-wire tags (CWTs) are small, metal, coded tags that are injected into the nose cartilage of juvenile salmon. The first tags were developed in the 1960's and carried longitudinal coloured stripes. Binary-coded tags were introduced in 1971 and quickly replaced colour-coded tags because of improved readability and an increase in the number of available codes. The size of a standard CWT is approximately 0.25mm by 1.0 mm. When tagged, the juvenile fish are given a secondary, external mark, specifically removal of the adipose fin, to allow visual identification (Johnson 1990; Maddigan 1998).

CWTs are widely used in North America. Studies involving them generally fall into one of the three following categories: experimental, stock assessment and stock contribution. Experimental studies are designed to compare the survival of two or more groups of fish, or their contribution to a specific fishery or fisheries. Stock assessment studies are designed to measure contributions to fisheries, survival rates, and distribution of a given stock. Contribution studies focus on exploitation of the stock in a fishery or fisheries and require more tagged fish to generate meaningful results (Johnson 1990).

Groups of upper Yukon River chinook salmon have been tagged with coded wire tags annually in the Yukon Territory since 1985[1], principally by Fisheries and Oceans Canada. Approximately 80% of all the fish tagged originated from the 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 in order to offset the impact of the turbines on juvenile chinook salmon migrating downstream. Over the 1985 to 2001 period, the WRFH released a total of 4,256,132 chinook salmon fry. Of these, 2,808,191 were labelled with CWTs and externally marked using adipose fin clips. An additional 273,328[2] were released with an adipose clip but not tagged and 1,174,613 were released without a tag or adipose clip. Annually 34% to 100% of the hatchery release has been tagged. The tags are applied to young of the year fry (also known as age "sub 1's" or "0 check" fry) in late May or early June, after a period of hatchery rearing[3]. Almost all of the fry have been released into the Yukon River system in a number of locations upstream of the hydroelectric facility.

---

[1] 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.

[2] This total includes 240,040 fry released in 1999.

[3] In 1998, the fry were ponded (i.e. transferred from incubation trays to rearing troughs) between February 1 and February 16 (WRFH 1998).

The goals of the WRFH chinook salmon CWT program are to:

(1) obtain information on survival rates, exploitation rates, run timing, and distribution;
(2) obtain information on differential survival rates resulting from different release strategies; and
(3) permit identification of returning hatchery fish in order to adhere to WRFH broodstock collection guidelines.

The first goal can be termed stock assessment while the second falls into the experimental category. The third goal is outside these categories – it does not involve CWTs directly. Rather, it involves only the external mark (the adipose fin clip) that was made when CWTs were applied. These goals are discussed in detail the results section.

Methods

Phyllis Nelson was contracted to conduct the tagging and fin clipping. Two taggers and four adipose fin clippers were employed. Operations commenced on May 23 and were completed on June 10, 2002.

Fry were injected with full-size binary-coded tags using two Northwest Marine Technology Inc. Mark IV tagging machines provided by Fisheries and Oceans Canada. A total of ten different tag codes were used. Multiple codes were used for all release sites. This was attributable to the size of the tag lot groups. The tags used in the YR 2002 program involved nine groups of 25,000 and two groups of 10,000 tags.

Fry were sorted according to size and condition prior to CWT application. Small or deformed fry were not tagged. Feeding was suspended at least 24 hours before tagging and resumed afterwards. Feeding was suspended again 24-48 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 a clove oil mixture. Anaesthetic baths were changed frequently to prevent thermal shock in the fry, and to re-fresh the anaesthetic. Once fry were fin clipped they were made accessible to a tagger for CWT application. After tagging each fry was immediately passed through a quality control device (QCD) to check for CWT implantation. The QCD automatically detected, separated, and enumerated tagged and untagged specimens. Untagged fry were held until the end of the day or tag code, at this time the fry were re-anaesthetised and run through the QCD again and checked a second time for CWT implantation. All untagged fry were then issued a CWT.

Results and Discussion

Tagging and release data for each tag group is presented in Table 1.

Table 1. Tagging and release dates for Whitehorse Rapids Fish Hatchery fry, 2002

Tag Code	Release Location	Release Date	Number Released
18-51-01	Wolf Creek	May 23	25,460
18-51-02	Wolf Creek	June 02	25,256
18-51-03	M'Clintock Falls	June 10	25,274
18-51-04	Byng Creek	June 10	24,907
18-51-05	Byng Creek	June 10	25,050
18-51-06	Michie Creek	June 10	27,305
18-51-07	Michie Creek	June 10	26,854
18-50-61	Michie Creek	June 10	28,131
18-50-62	Michie Creek	June 10	27,241
18-50-63	Michie Creek	June 10	8,567
		TOTAL	**244,045**

This total includes 1,491 released that are not expected to retain their tags.

The total number of fry tagged at the Whitehorse Rapids Fish Hatchery and released into the Yukon River in 2002 was 244,045 A sample of (n=<500) fry was collected from each tag group after tagging to determine CWT retention. Tag retention was estimated to be 99% (Appendix 1) thus 1% (1,491) of the tagged fry released were estimated have lost their tags. The total release of both tagged and adipose fin clipped fry was estimated to be 242,554 fish.

A total of 1,348 moralities were observed within this group from May 23 to June 10.

Fry weight at time of release ranged from 3.0 to 3.6 grams (Appendix 1).

An additional 3,062 fry were identified as unsuitable for clipping due to small size or deformities. These fry were released into the Yukon River at Rotary Peace Park in Whitehorse. This park is located downstream from the Yukon Electric hydro dam on the Yukon River.

Over the course of the coded wire-tagging program at the Whitehorse Rapids Fish Hatchery, ten marine recoveries have been recorded in Bering Sea trawl fishery (Figure 1).

Goals of CWT Program and Viability of CWT Samples

Based on the life history of the hatchery released fry (ie the short freshwater residency) it is unlikely that the CWT program will provide valuable differential survival information. Extensive juvenile trapping on the M'Clintock River and Michie Creek has demonstrated that there are virtually no hatchery fry in the watershed after early July. This implies that the emigration of presmolts/smolts occurs within a five week period after release. This time period is ephemeral thus it's unlikely that density dependent relationships would develop. There would have to be remarkable productivity differences between the release locations or between the number/density of fry released and available rearing habitat before discernible differences in survival would to be detectable within the release groups. If the hatchery released fish[4] were to more closely mimic the life history of wild fry (ie spend a summer in freshwater and overwinter before emigration) then density dependent relationships would be more readily apparent for the different release groups. An additional complication with respect to evaluating differential survival is the troublesome requirement to obtain an adequate CWT sample size from the returning adults for statistical purposes. This requires sampling at least 20% of the return for coded wire tags. It has been difficult to obtain samples from spawning locations due to access problems and a lack of available carcasses; a recently constructed ATV trail may have improved access trail to Michie Creek spawning areas. There is a very difficult public relations issue with respect to destroying 20% of the adult run at the Whitehorse Rapids Fishway for CWT information, particularly during years of low returns.

Based on a recent literature review, brood stock selection has been relaxed to include a higher contribution of hatchery fish[5]. The brood stock collection guidelines for the WRFH prior to YR 2000 required that the use of hatchery fish as broodstock be minimized. This approach was reviewed prior to the YR 2000 brood stock program and the requirement to minimise hatchery fish collected for brood stock was then relaxed. This new approach has made the recovery of coded wire tags easier since they can be taken from fish retained for brood stock, however, the sample size is for YR 2000 and 2001 is relatively low.

Recommendations

All of the WRFH chinook salmon fry released should be marked so that visual identification is possible.

The use of an "agency only tag" should be considered. This type of coded wire tag is much cheaper, however, the shortcoming is all of the fry released would be identified as one group thus different release locations would not have discrete tag codes.

---

[4] The emigration of hatchery fish shortly after release is likely related to the size at the time of release (due to feeding) in combination with other factors such as photoperiod.

[5] Hatchery staff used to avoid selecting hatchery produced fish for brood stock.

Literature Cited

JTC (Joint United States/Canada Yukon River Technical Committee). 1997. Yukon River salmon season review for 1997 and Technical Committee Report. November 1997. Whitehorse, Yukon Territory.

Johnson, Kenneth J. 1990. Regional Overview of Coded Wire Tagging of Anadromous Salmon and Steelhead in Northwest America. American Fisheries Symposium 7:782-816.

Maddigan, K. A. 1998. Feasibility Study of a Chinook Salmon Program for Coded Wire Tags at Selected Buying and Processing Plants in Emmonak, Alaska, 1998. Canada/ U.S. Restoration and Enhancement Fund Project RE-10-98A.

Whitehorse Rapids Fish Hatchery Staff. 1998. Whitehorse Rapids Fish Hatchery Final Report. The Yukon Fish and Game Association, Whitehorse, Yukon.

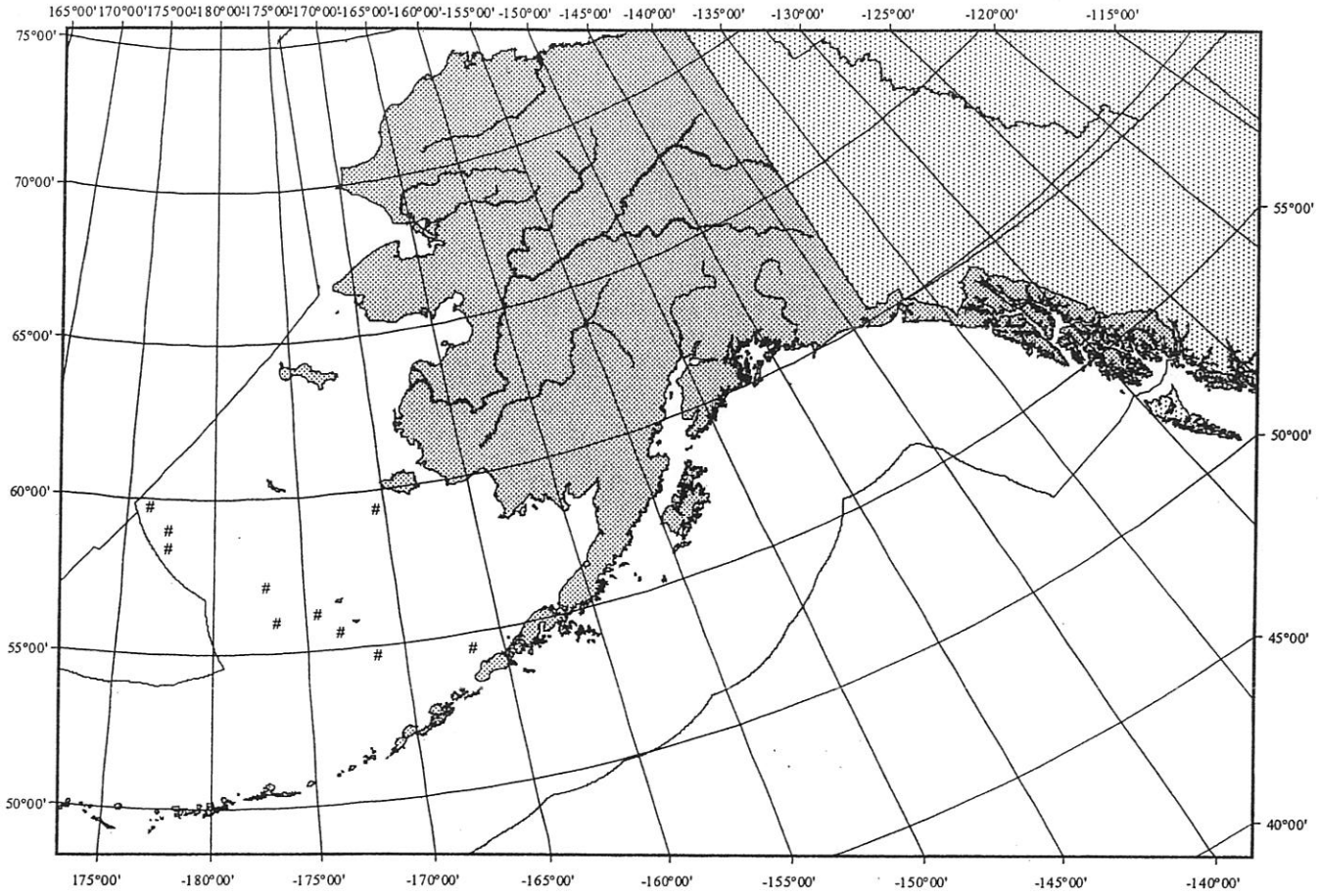

Figure 1 Location of the capture of Yukon River coded-wire tagged chinook salmon in the BSAI groundfish fishery.