

**Application of Coded-Wire Tags to Chinook Salmon Fry  
Released at the Whitehorse Rapids Fish Hatchery in YR 2000**

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**Project RE-12-00**

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**This is a report on Project RE-12-00: "Application of Coded-Wire Tags to Chinook  
Salmon Fry Released at the Whitehorse Rapids Fish Hatchery in YR 2000"  
Prepared by Patrick Milligan (Fisheries and Oceans Canada).**

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## **Abstract**

A total of 162,829 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 2000. Tricaine methanesulfonate (MS-222) was used to anaesthetise the fry prior to clipping and tagging. Feeding was suspended for a minimum of 24 hours prior to tagging. Seven different tag codes were used, each corresponding to a separate release group. Tag retention was tested and averaged 99%. Based on this information 161,198 tagged and clipped fry were released and 1,631 fry were released with an adipose clip only. Feeding was suspended 24-48 hours prior to fry release. Due to the lower than average number of fish available for tagging, fish were released into only three areas. Releases occurred on June 4 (Wolf Creek) and on June 08, 2000 (Michie Creek and the McClintock River

## **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<sup>1</sup>, 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 2000 period, the WRFH released a total of 4,000,569 chinook salmon fry. Of these, 2,555,184 were labelled with CWTs and externally marked using adipose fin clips. An additional 270,772 were released with an adipose clip but not tag and 1,174,613 were released without a tag or adipose clip. Annually 34% to 100% of the hatchery release has

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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.

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<sup>2</sup>. Almost all of the fry have been released into the Yukon River system in a number of locations upstream of the hydroelectric facility.

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 was outside these categories – it did not involve CWTs directly. Rather, it involved only the external mark (the adipose fin clip) that was made when CWTs were applied. The broodstock collection guidelines for the WRFH prior to YR 2000 indicated that the use of hatchery fish as broodstock should be minimised. This approach was reviewed prior to the YR 2000 broodstock program and broodstock collection was relaxed. This new approach made the recovery of CTWs easier since they could simply be taken from the fish retained for broodstock.

The objective of the Upper Lakes Chinook Coded-Wire Tags to Program in Chinook YR 2000 was to tag and mark all of the juvenile salmon reared at the WRFH that year. Another objective was to update the CWT database, particularly the recovery information.

## **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 22 and were completed on June 08, 2000.

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 seven 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 2000 programs involved six groups of 25,000 and one group of 10,000 tags.

Fry weights ranged from 2.4 to 3 grams (Appendix 1).

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<sup>2</sup> In 1998, the fry were ponded (i.e. transferred from incubation trays to rearing troughs) between February 1 and February 16 (WRFH 1998).

Fry were sorted according to size and condition prior to CWT application. Small or deformed fry were not tagged<sup>3</sup>. Feeding was suspended at least 24 hours before tagging but was resumed afterwards. It was again suspended 24-48 hours prior to release.

Batches of <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 methanesulfonate, commonly referred to as MS-222 or TMS. Anaesthetic baths were changed frequently to prevent thermal shock. As 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, at which time they were re-anaesthetised and run through the tagging procedure again.

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

Tag Code	Release Location	Release Date
18-31-28	May 23	June 08
18-31-29	May 20	June 08
18-43-03	May 26	June 08
18-13-54	May 27	June 08
18-13-55	May 30	June 08
18-23-53	May 31	June 04
18-23-54	June 2	June 404

**Table 1.** Tagging and release dates for WRFH fry, YR 2000.

## Results

A sample of (n=<500) fry was collected from each tag group five days after tagging in order to check for CWT retention. Retention was estimated to be 99% (Appendix 1, WRFH 1998).

The total number of fry tagged was 162,829. Of these fry, 1,631 (1%) were estimated to have lost their tags. The total release of adipose fin clipped fry was therefore 161,198 fish. This constituted the total WRFH production of chinook salmon, less a small number of undersized or deformed fry (n=6,027) that were deemed unsuitable for CWTs. These untagged fry were released into Long Lake by the Department of Renewable Resources, Government of Yukon.

<sup>3</sup> A total of 6,027 small or deformed fish were released into Long Lake.

Fry releases occurred on June 4 and June 08. All release sites were upstream of the Whitehorse hydroelectric facility. The streams into which the fry were planted were Michie Creek, McClintock River, and Wolf Creek.

### **Recommendations**

WRFH chinook salmon fry should continue to be marked so that visual identification is possible.

Policies in place in YR 2000 required that all fish marked with an adipose clip also have a CWT. This differed from 1999 when the international mark committee granted approval for an adipose fin removal only; the removal of the adipose fin without the application of a CWT. This is a much cheaper proposition due to the high cost of the tags, however approval was not given for the YR 2000 and its unlikely that it will be given in the future.

## **Literature Cited**

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Appendix 1. Summary of releases and recoveries of Coded-wire Tagged Chinook Salmon from Whitehorse Hatchery, 1985 - 2000

Release Location	Release Date*	Code	# Tagged & Clipped <sup>c</sup>	Adipose Clipped Only	%Tag-Loss <sup>k</sup>	Days <sup>a</sup>	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Michie	25-May-85	023248	26,670	518			27,188		0	
Michie	25-May-85	023226	28,269	518			28,787		0	
Michie	25-May-85	023247	43,325	518			43,843		0	
Wolf	1985	no-clip	0	0			0		10,520	10,520
SUM	1985		98,264	1,555			99,819		10,520	110,339
Michie	1986	023731	77,170				77,170		1,000	78,170
Wolf	1986						0		5,720	5,720
SUM	1986		77,170				77,170		6,720	83,890
Michie	05-Jun-87	024812	47,644	1,361	0.0280 <sup>b</sup>		49,005	2.50	9,598	58,603
Michie	05-Jun-87	024813	49,344	808	0.0160 <sup>b</sup>		50,152	2.50	9,141	59,293
Michie	05-Jun-87	024814	51,888	559	0.0110 <sup>b</sup>		52,447	2.50	9,422	61,869
Michie	05-Jun-87	024815	43,367	2,066	0.0450 <sup>b</sup>		45,433	2.50	7,868	53,301
Michie	05-Jun-87	024258	25,945	245	0.0090 <sup>b</sup>		26,190	2.50	4,171	30,361
Wolf	30-May-87	024259	26,752	123	0.0050 <sup>b</sup>		26,875	2.50	422	27,297
SUM	1987		244,940	5,162			250,102		40,622	290,724
Michie	10-Jun-88	025549	77,670	1,991		15	79,661	2.80	84,903	164,564
Michie	10-Jun-88	025550	78,013	1,592		11	79,605	2.70	85,288	164,893
Wolf	05-Jun-88	no-clip	0	0			0		25,986	25,986
SUM	1988		155,683	3,583			159,266		196,177	355,443
Wolf	1989	no-clip	0	0			0		22,388	22,388
Michie	06-Jun-89	026004	26,161	326	0.0150		26,487	2.30	0	26,487
Michie	06-Jun-89	026005	24,951	128	0.0040		25,079	2.30	0	25,079
Michie	06-Jun-89	026006	25,098	291	0.0180		25,389	2.40	0	25,389
Michie	06-Jun-89	026007	25,233	156	0.0008		25,389	2.20	95,724	121,113
Fishway	06-Jun-89	026008	25,194	357	0.0130		25,551	2.70	0	25,551
Fishway	06-Jun-89	026009	25,190	351	0.0125		25,541	2.70	0	25,541
SUM	1989		151,827	1,609			153,436		118,112	271,548
Wolf	06-Jun-90	no-clip	0	0			0		11,969	11,969
Michie	02-Jun-90	020238	24,555	501	0.0200		25,056	2.30	0	25,056
Michie	02-Jun-90	020239	24,345	753	0.0300		25,098	2.30	0	25,098
Fishway	02-Jun-90	020260	24,508	501	0.0200		25,009	2.20	0	25,009
Fishway	02-Jun-90	020263	25,113	254	0.0100		25,367	2.20	0	25,367
SUM	1990		98,521	2,009			100,530		11,969	112,499
Wolf	08-Jun-91	180322	49,477	793	0.0150		50,270	2.30	0	50,270
Fishway	06-Jun-91	180323	52,948	193	0.0025		53,141	2.30	0	53,141
Michie	06-Jun-91	180324	50,020	176	0.0025		50,196	2.30	87,348	137,544
SUM	1991		152,445	1,162			153,607		87,348	240,955
Wolf	04-Jun-92	180829	48,239	0	0.0000		48,239	2.40	0	48,239
Fishway	04-Jun-92	180828	49,356	99	0.0020		49,455	2.30	0	49,455
Michie	04-Jun-92	180830	52,946	643	0.0120		53,589	2.20	249,166	302,755
SUM	1992		150,541	742			151,283		249,166	400,449
Wolf	06-Jun-93	181215	50,248	0	0.0000		50,248	2.30	0	50,248
Fishway	06-Jun-93	181216	49,957	434	0.0090		50,391	2.30	0	50,391
Michie	06-Jun-93	181217	50,169	0	0.0000		50,169	2.30	290,647	340,816
SUM	1993		150,374	434			150,808		290,647	441,455
Wolf	02-Jun-94	181427	50,155	270	0.0053		50,425	2.30	0	50,425
Michie	02-Jun-94	181428	50,210	127	0.0002		50,337	2.30	158,780	209,117
Fishway	02-Jun-94	181429	50,415	125	0.0002		50,540	2.30	0	50,540
SUM	1994		150,780	522			151,302		158,780	310,082
Wolf	06-Jun-95	181246	10,067	164	0.0163	3	10,231	1.67	0	10,231
Wolf	06-Jun-95	181247	9,122	0	0.0000	3	9,122	1.53	0	9,122
Michie	06-Jun-95	181826	25,231	337	0.0134	3	25,568	2.47	4,552	30,120
Michie	06-Jun-95	181827	25,187	141	0.0056	3	25,328	2.33	0	25,328
SUM	1995		69,607	642			70,249		4,552	74,801
Wolf	26-May-96	18748	10,131	102	0.0010	5	10,233	2.30	0	10,233
Fox	4-Jun-96	182823	35,452	0	0.0000	5	35,452	2.43	0	35,452
Byng	4-Jun-96	181041	25,263	516	0.0020	5	25,779	2.37	0	25,779
Michie	5-Jun-96	183345	50,082	1,022	0.0020	5	51,104	2.51	0	51,104
Michie	5-Jun-96	183346	50,260	508	0.0010	5	50,768	2.43	0	50,768
Michie	5-Jun-96	183347	49,985	505	0.0010	5	50,490	2.32	0	50,490
Judas	4-Jun-96	183348	49,798	1,016	0.0020	5	50,814	2.43	0	50,814
McClintock	4-Jun-96	183349	49,991	302	0.0010	5	50,293	2.27	0	50,293
SUM	1996		320,962	3,971			324,933		0	324,933

continued



Table 8. (page 2 of 2).

Release Location	Release Date*	Code	# Tagged & Clipped <sup>c</sup>	Adipose Clipped Only	%Tag-Loss <sup>k</sup>	Days <sup>n</sup>	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Wolf	1-Jun-97	182325	14,850	150		2	15,000	2.30	0	15,000
Wolf	1-Jun-97	182326	20,334	0		4	20,334		0	20,334
Wolf	8-Jun-97	182906	10,158	0		8	10,158		0	10,158
Fox	11-Jun-97	182554	25,242	0		3	25,242	2.43	0	25,242
Fox	11-Jun-97	182555	24,995	253		3	25,248		0	25,248
Byng	11-Jun-97	182907	10,029	0		1	10,029	2.37	0	10,029
Byng	11-Jun-97	182905	10,155	0		1	10,155		0	10,155
Michie	11-Jun-97	182859	49,657	502		3	50,159	2.51	0	50,159
Michie	11-Jun-97	182860	50,130	0		3	50,130	2.43	0	50,130
Judas	7-Jun-97	182327	19,951	202		3/7	20,153	2.43	0	20,153
Judas	11-Jun-97	182553	25,146	0		11	25,146	2.43	0	25,146
McClintock	11-Jun-97	182551	25,399	0		3	25,399	2.27	0	25,399
McClintock	11-Jun-97	182552	24,792	251		3	25,043		0	25,043
SUM	1997		310,838	1,358			312,196		0	312,196
Michie	12-Jun-98	184122	49,243	1,004	0.0200	5	50,247	2.84	0	50,247
Michie	12-Jun-98	184121	49,197	1,004	0.0200	5	50,201	2.81	0	50,201
Byng	12-Jun-98	183160	24,518	1,022	0.0400	5	25,540	3.00	0	25,540
McClintock	12-Jun-98	184043	49,810	503	0.0100	5	50,313	2.76	0	50,313
Judas	13-Jun-98	025417	19,018	1,432	0.0700	5	20,450	2.55	0	20,450
Judas	12-Jun-98	183159	25,331	256	0.0100	5	25,587	2.60	0	25,587
Wolf	6-Jun-98	021958	10,104	421	0.0400	5	10,525	1.95	0	10,525
Wolf	4-Jun-98	024606	34,813	710	0.0200	5	35,523	2.63	0	35,523
SUM	1998		262,034	6,352			268,386		0	268,386
Michie	6-Jun-99			80,393			0	3.13	0	80,393
Byng	6-Jun-99			64,430			0	2.92	0	64,430
McClintock	6-Jun-99			64,169			0	2.95	0	64,169
Wolf	6-Jun-99			31,048			0	3.07	0	31,048
SUM	1999			240,040			240,040		0	240,040
Michie	8-Jun-00	183128	25,114	254	0.0100	5	25,368	2.80	0	25,368
Michie	8-Jun-00	183129	25,037	253	0.0100	5	25,290	2.80	0	25,290
Michie	8-Jun-00	184303	10,907	110	0.0100	5	11,017	2.84	0	11,017
McClintock	8-Jun-00	181354	25,041	254	0.0100	5	25,295	2.70	0	25,295
McClintock	8-Jun-00	181355	25,016	253	0.0100	5	25,269	2.68	0	25,269
Wolf	4-Jun-00	182353	25,071	253	0.0100	5	25,324	2.67	0	25,324
Wolf	4-Jun-00	182354	25,012	254	0.0100	5	25,266	2.40	0	25,266
SUM	2000		161,198	1,631			162,829		0	162,829
TOTALS			2,555,184	270,772			2,825,956		1,174,613	4,000,569

a: Tag loss measured over 5 days unless indicated otherwise.

b: unknown period.

c: usually corresponds to "tagged" category on MRP release forms

Non-CWT groups not recorded, 1985-1986.

CWT Data recorded from CWT release sheets 1989-94.

CWT Data prior to 1987 not verified against SEP records.

\* release year = brood year + 1