

Comparative Survival Rate Study (CSS) of Hatchery PIT-tagged Chinook

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Comparative Survival Rate Study of Hatchery PIT-tagged Chinook

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ABSTRACT

We PIT-tagged juvenile spring chinook salmon reared at Lookingglass Hatchery in October 2002 as part of the Comparative Survival Rate Study (CSS) for migratory year (MY) 2003. We tagged 20,950 Imnaha stock spring chinook salmon, and after mortality and tag loss, we allowed the remaining 20,904 fish to leave the acclimation pond at our Imnaha River satellite facility beginning 1 April 2003 to begin their seaward migration. The fish remaining in the pond were forced out on 15 April 2003. We tagged 20,820 Catherine Creek stock captive and conventional brood progeny spring chinook salmon, and after mortality and tag loss, we allowed the remaining 20,628 fish to leave the acclimation ponds at our Catherine Creek satellite facility beginning during two acclimation periods. The volitional release for the early acclimation group began 12 March 2003, and all remaining fish were forced out of the ponds on 23 March 2003. The volitional release for the late acclimation group began 31 March 2003, and all remaining fish were forced out of the ponds on 14 April 2003.

We estimated survival rates, from release to Lower Granite Dam in MY 2003, for three stocks of hatchery spring chinook salmon tagged at Lookingglass Hatchery to determine their relative migration performance. Survival rates for the Imnaha River, Lostine River, and Catherine Creek stocks were 0.714, 0.557, and 0.350, respectively.

We PIT-tagged 20,944 BY 2002 Imnaha River stock and 20,980 BY 2002 Catherine Creek stock captive and conventional brood progeny in October and November 2003 as part of the CSS for MY 2004. From tagging to January 28, 2004, the rates of mortality and tag loss for Imnaha River stock were 0.16% and 0.04%, respectively. Catherine Creek stock, during the same period, had rates of mortality and tag loss of 0.19% and 0.06%, respectively.

INTRODUCTION

The Comparative Survival Rate Study (CSS) is a multi-agency, multi-year project to determine smolt-to-adult survival rates of hatchery and wild chinook salmon that are transported and migrate in-river. ODFW has tagged hatchery-reared spring chinook salmon at Lookingglass Hatchery for the CSS each year since 1993.

This report summarizes PIT-tagging activities conducted at Lookingglass Hatchery for brood year (BY) 2001 and 2002 spring chinook salmon as part of the CSS for migratory years (MY) 2003 and 2004. The BY 2001 summary contains information on tagging and release, mortality, tag loss, and estimates of survival through the hydrosystem. The BY 2002 summary covers tagging activities, mortality and tag loss through January 28, 2004. Release information for BY 2002 spring chinook will be reported in the 2004 annual progress report.

SPRING CHINOOK SALMON TAGGED FOR MY 2003

Tagging Activities

This section summarizes PIT-tagging activities conducted at Lookingglass Hatchery on two stocks of BY 2001 spring chinook salmon as part of the 2003 CSS. Imnaha River stock spring chinook salmon were tagged 24–30 October 2002 (Table 1). A total of 20,904 PIT-tagged fish were volitionally released from the acclimation pond at the Imnaha River Satellite facility. The volitional release began 1 April 2003, and all remaining fish were forced out of the pond on 15 April 2003. Catherine Creek stock captive and conventional brood progeny were tagged 14–18 October 2002 (Table 1). A total of 20,628 PIT-tagged fish were volitionally released from acclimation ponds at the Catherine Creek Satellite facility. There were early and late acclimation groups released in Catherine Creek in 2003. The volitional release for the early acclimation group began 12 March 2003, and all remaining fish were forced out of the ponds on 23 March 2003. The volitional release for the late acclimation group began 31 March 2003, and all remaining fish were forced out of the ponds on 14 April 2003. Details of the fish tagged for the 2003 CSS are in **APPENDIX A**.

Table 1. Dates of tagging and release, numbers tagged and released, and mean lengths and weights at tagging of juvenile spring chinook salmon PIT-tagged at Lookingglass Hatchery in October 2002 for the 2003 CSS. Standard errors are in parentheses.

Stock	Dates tagged	Number tagged	Dates released	Number released	Mean length (mm)	Mean weight (g)
Imnaha	24–30 Oct	20,950	1–15 Apr	20,904	125.5 (0.10)	24.21 (0.484)
Catherine	14–18 Oct	20,820	12 Mar – 14 Apr	20,628	129.5 (0.13)	28.68 (0.952)

Fish were collected for tagging at Lookingglass Hatchery by crowding them into one end of a raceway, and removing them with a dipnet. Fish were periodically netted and carried by bucket a short distance into a tagging trailer where they were held in two 90-gallon circulating troughs. After tagging, fish were returned to the raceway via a waterfilled pipe system.

Fish were netted from a circulating trough and anesthetized in 40 to 50 ppm tricaine methanesulfonate (MS-222) before tagging. PIT tags were implanted using methods similar to those described by Prentice et al. (1990a, 1990b) and the Columbia Basin Fish and Wildlife Authority PIT Tag Steering Committee (1999). We tagged fish manually using a modified syringe with a 12-gauge hypodermic needle. Tagging needles were disinfected before each use by soaking them for 10 min in 70% isopropyl alcohol, and subsequently dried for 10 min under a current of warm air. We recorded individual tag codes and fork lengths (nearest 1 mm) for each fish, and took a subsample of weights (nearest 0.1 g) from each raceway each day. Fish were allowed to recover in a recovery trough before they were released back into raceways. Tagging and release data were incorporated into tag files and submitted to the Columbia River Basin PIT Tag Information System (PTAGIS) database, administered by the Pacific States Marine Fisheries Commission (PSMFC).

Mortalities were collected from raceways at Lookingglass Hatchery and from acclimation ponds at the release sites. There were 34 and 126 mortalities of PIT-tagged spring chinook salmon, which was 0.16% and 0.61% of the total number of Imnaha River and Catherine Creek stocks tagged, respectively. Tag codes from recovered mortalities were removed from all tag files that were submitted to PTAGIS.

PIT tags that were shed by fish were recovered from individual raceways using an industrial strength magnet broom. A total of 12 and 64 PIT tags were recovered from Imnaha River and Catherine Creek raceways, which was 0.06% and 0.31% of the total Imnaha River and Catherine Creek fish that were tagged, respectively. Tag codes from recovered PIT tags were removed from all tag files that were submitted to PTAGIS.

Migration Performance

We examined estimates of survival from release to Lower Granite Dam for Catherine Creek stock captive and conventional brood progeny, Lostine River stock captive and conventional brood progeny (tagged by Nez Perce Tribe), and Imnaha River stock to determine their relative migration performance. These three stocks were tagged at Lookingglass Hatchery for the CSS for MY 2000 – 2003.

Survival rates to Lower Granite Dam were determined using CJS estimates (Cormack, Jolly and Seber), as calculated by the computer program SURPH.2 (Lady et al. 2001). The estimated survival rates to Lower Granite Dam for MY 2000 to 2003 of three stocks reared and tagged at Lookingglass Hatchery are shown in Table 2. Imnaha River stock survival rates were consistently higher than the survival rates of Catherine Creek stock and higher than or similar to Lostine River stock for the four years. Lostine River stock survived at a higher rate than Catherine Creek stock in migratory years 2000, 2002, and 2003, but was lower in MY 2001

when there was an equipment failure at the Lostine River acclimation facility and the fish were released earlier than scheduled. Survival rate estimates for all stocks tagged at Lookingglass Hatchery for the CSS from MY 1993 to 2003 are shown in **Appendix C**.

Table 2. CJS survival estimates for Catherine Creek stock captive and conventional brood progeny, Lostine River stock captive and conventional brood progeny, and Imnaha River stocks of juvenile spring chinook to Lower Granite Dam, for MY 2000 – 2003. Standard errors are in parentheses. Data for analysis were obtained from PTAGIS database on January 8, 2004.

Migratory year	Hatchery stock		
	Catherine Creek	Lostine River	Imnaha River
2000	0.4287 (0.0145)	0.6119 (0.0132)	0.6854 (0.0114)
2001	0.5392 (0.0041)	0.4786 (0.0059)	0.7548 (0.0034)
2002	0.4060 (0.0077)	0.6509 (0.0093)	0.6689 (0.0120)
2003	0.3503 (0.0082)	0.5567 (0.0096)	0.7142 (0.0120)

SPRING CHINOOK SALMON TAGGED FOR MY 2004

Tagging Activities

This section summarizes PIT-tagging activities conducted at Lookingglass Hatchery on two stocks of BY 2002 brood spring chinook salmon as part of the 2004 CSS. Imnaha River stock and Catherine Creek stock captive and conventional brood progeny spring chinook salmon were tagged 6 October to 6 November 2003 (Table 3). As of January 28, 2004, there were 20,901 Imnaha River stock, and 20,932 Catherine Creek stock with PIT tags in raceways at Lookingglass Hatchery. Details of the fish tagged for the 2004 CSS are in **APPENDIX B**.

Fish were collected and handled for tagging in the same manner as described for the BY 2001 spring chinook. Similarly, tagging protocol and data collection followed methods described for the BY 2001 spring chinook, except that only a subsample of fish were measured for length and weight from each raceway.

Lookingglass Hatchery personnel collected spring chinook mortalities from raceways. The mortality of PIT-tagged fish and untagged fish are shown in Table 4. The mortality of PIT-tagged fish was higher than the mortality of untagged fish for the Imnaha River stock (G-test of independence, $P < 0.05$, Sokal and Rohlf, 1995), but not for the Catherine Creek stock. Tag codes from recovered mortalities were removed from tag files that were submitted to PTAGIS.

PIT tags that were shed by fish were recovered from individual raceways using an industrial strength magnet broom. A total of 22 PIT tags were recovered from all raceways combined (Table 5). Tag codes from recovered PIT tags were removed from tag files that were submitted to PTAGIS.

Table 3. Dates of tagging, number tagged, and mean length and weight, with standard error in parentheses, of juvenile spring chinook salmon PIT-tagged at Lookingglass Hatchery 6 October to 6 November 2003.

Stock	Dates tagged	Number tagged	Mean length (mm)	Mean weight (g)
Imnaha River	15 – 17 October	20,944	101.4 (0.21)	12.94 (0.226)
Catherine Creek	6 October – 6 November	20,980	112.0 (0.26)	14.80 (0.477)

Table 4. Mortality of spring chinook salmon smolts at Lookingglass Hatchery by stock from tagging through January 28, 2004.

Stock	Total PIT tag mortalities	Mortality of PIT-tagged smolts (%)	Mortality of fish not tagged (%)
Imnaha River	34	0.16	0.09
Catherine Creek	39	0.19	0.14

Table 5. PIT tags recovered from Lookingglass Hatchery from tagging through January 28, 2004.

Stock	Number of recovered tags	Percent of total fish PIT-tagged
Imnaha River	9	0.04
Catherine Creek	13	0.06

These BY 2002 fish will be released in spring 2004, and their migration performance will be reported in next year's annual report.

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APPENDIX A

BY 2001 Spring Chinook Salmon Tagged at Lookingglass Hatchery and Released in the Imnaha River and Catherine Creek in Spring 2003

Appendix Table A-1. BY 2001 Imnaha River stock spring chinook salmon tagged at Lookingglass Hatchery in October 2002 and released in the Imnaha River in spring 2003 for the 2003 Comparative Survival Study.

Tag file name	Hatchery raceway	BKD segregation of female parents ^a	PIT-tagged fish released from the acclimation site
LRB02297.A14	14	Low	2,248
LRB02297.B14	14	Low	1,944
LRB02298.A15	15	Low	2,169
LRB02298.B15	15	Low	1,987
LRB02301.A16	16	Low	2,152
LRB02301.B16	16	Low	2,034
LRB02302.A17	17	Low	2,251
LRB02302.B17	17	Low	1,937
LRB02303.A18	18	Low	2,244
LRB02303.B18	18	Low	1,938
Total Imnaha River stock			20,904

^a BKD segregation based on Elisa ranges of Low < 0.2, Low-Mod. 0.2–0.399, Mod-Hi 0.4–0.799, and Clinical ≥ 0.8.

Appendix Table A-2. BY 2001 Catherine Creek stock spring chinook salmon tagged at Lookingglass Hatchery in October 2002 and released in Catherine Creek in spring 2003 for the 2003 Comparative Survival Study.

Tag file name	Hatchery raceway	Rearing treatment of parents ^a	BKD segregation of female parents ^b	PIT-tagged fish released from the acclimation site
LRB02287.A01	1	Fa, Fn	Low	2,431
LRB02287.B01	1	Fa, Fn	Low	2,641
LRB02288.A01	1	Fa, Fn	Low	1,027
LRB02288.B01	1	Fa, Fn	Low	834
LRB02288.A03	3	Natural	Low	1,563
LRB02288.B03	3	Natural	Low	1,241
LRB02289.A03	3	Natural	Low	2,060
LRB02289.B03	3	Natural	Low	2,057
LRB02289.A02	2	Sn	Low	1,331
LRB02289.B02	2	Sn	Low	963
LRB02290.A02	2	Sn	Low	2,193
LRB02290.B02	2	Sn	Low	2,287
Total Catherine Creek Stock				20,628

^a Fa = captive broodstock program, adult rearing in freshwater with accelerated growth profile; Fn = captive broodstock program, adult rearing in freshwater, with natural growth profile; Sn = captive broodstock program, adult rearing in saltwater, with natural growth profile; Natural = conventional broodstock program, adults were wild fish that were captured at Catherine Creek weir and spawned at Lookingglass Hatchery.

^b BKD segregation based on Elisa ranges of Low < 0.2, Low-Mod. 0.2–0.399, Mod-Hi 0.4–0.799, and Clinical ≥ 0.8.

APPENDIX B

BY 2002 Spring Chinook Salmon Tagged at Lookingglass Hatchery For Release in the Imnaha River and Catherine Creek in Spring 2004

Appendix Table B-1. BY 2002 Imnaha River stock spring chinook salmon tagged at Lookingglass Hatchery in October 2003 for release in the Imnaha River in spring 2004 for the 2004 Comparative Survival Study.

Tag file name	Hatchery raceway	BKD segregation of female parents ^a	PIT-tagged fish as of 01/28/04
LRB03288.A12	12	Low	1,749
LRB03288.B12	12	Low	1,748
LRB03288.A13	13	Low	1,692
LRB03288.B13	13	Low	1,796
LRB03289.A14	14	Low	1,795
LRB03289.B14	14	Low	1,701
LRB03289.A15	15	Low	1,795
LRB03289.B15	15	Low	1,700
LRB03289.A16	16	Low	1,680
LRB03289.B16	16	Low	1,796
LRB03290.A17	17	Low	2,180
LRB03290.B17	17	Low	1,269
Total Imnaha River Stock			20,901

^a BKD segregation based on Elisa ranges of Low < 0.2, Low-Mod. 0.2–0.399, Mod-Hi 0.4–0.799, and Clinical ≥ 0.8.

Appendix Table B-2. BY 2002 Catherine Creek stock spring chinook salmon tagged at Lookingglass Hatchery in October and November 2003 for release in Catherine Creek in spring 2004 for the 2004 Comparative Survival Study.

Tag file name	Hatchery raceway	Rearing treatment of parents ^a	BKD segregation of female parents ^b	PIT-tagged fish as of 01/28/04
LRB03279.A01	1	Natural	Low	2,430
LRB03279.B01	1	Natural	Low	2,801
LRB03280.A02	2	Fw	Low	2,564
LRB03280.B02	2	Fw	Low	2,661
LRB03310.A02	2	Fw	Low	1,322
LRB03310.B02	2	Fw	Low	1,324
LRB03280.A03	3	Sw	Low	2,794
LRB03280.B03	3	Sw	Low	2,445
LRB03310.A03	3	Sw	Low	1,391
LRB03310.B03	3	Sw	Low	1,200
Total Catherine Creek Stock				20,932

^a Natural = conventional broodstock program, adults were wild fish that were captured at Catherine Creek weir and spawned at Lookingglass Hatchery; Fw = captive broodstock program, adult rearing in freshwater; Sw = captive broodstock program, adult rearing in saltwater.

^b BKD segregation based on Elisa ranges of Low < 0.2, Low-Mod. 0.2–0.399, Mod-Hi 0.4–0.799, and Clinical ≥ 0.8.