

A Summary of Juvenile Salmonid Trapping in the Lillooet Lake Catchment, Including Lillooet and Birkenhead Rivers, 2010.

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Executive Summary

While the presence and spawning habits of chinook salmon (*Oncorhynchus tshawytscha*) in the Birkenhead River have been thoroughly documented, little is known about chinook abundance and distribution in neighbouring rivers in the Lillooet Lake watershed. Minnow trapping was conducted in various streams throughout the Lillooet Lake watershed in Spring 2010. Juvenile chinook salmon were captured in the Lillooet River and several of its major tributaries (Ryan River, Railroad Creek, Miller Creek, Green River, and Gravell Creek) as well as in the Birkenhead River and Joffre Creek. Juvenile chinook were captured in many areas and as late as was March 22 while subsequent trapping (as late as May 26) did not capture any juvenile chinook.

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Introduction

While the migration and spawning habits of Birkenhead River chinook salmon (*Oncorhynchus tshawytscha*) are fairly well documented (eg Greenbank 2007, 2008, 2009, Schubert et al. 2007, Townsend et al. 2010), the distribution of juveniles is less well understood (Schubert et al. 2007). Additionally, high turbidity, poor access and limited stock assessment funding has hindered efforts to document the distribution of chinook salmon in neighbouring rivers which share the Lillooet Lake watershed with the Birkenhead River.

In an effort to better understand the distribution of chinook salmon in the Lillooet Lake watershed, a minnow trapping program was undertaken in the Spring of 2010 with the intention of documenting the presence or absence of juvenile chinook salmon in rivers draining into the upper Lillooet River and Lillooet Lake. This report will describe the results of this study which was funded by Fisheries and Oceans Canada and the Fraser Salmon and Watersheds Program.

Methods

Study Area

Several rivers drain into Lillooet Lake (Figure 1). Of these, the largest is the upper Lillooet River, which has several major tributaries. The following systems were sampled during this program:

- Joffre Creek
- Ure Creek
- Birkenhead River
- Lillooet River (mainstem) and the following Lillooet River tributaries:
 - Salal Creek
 - Meager Creek
 - Silva Creek
 - South Creek
 - Railroad Creek
 - Ryan River
 - Meager Creek
 - Green River
 - Gravel Creek

The trapping locations are diagrammed in Figure 1, and UTM coordinates are provided in Appendix A.

Minnow Trapping

Wire funnel traps were baited with salmon roe and left overnight at sampling locations. Between 10 and 35 traps were set at each trapping location (Appendix A), and traps were set for at least 24 hours but no longer than 36. Trapping commenced in February 2010 and continued into May 2010, and several locations were re-trapped over a period of several months (Appendix A). A subset of captured salmonids were measured for fork length and had tissue samples taken for DNA analysis. The DNA analysis has yet to be completed.

Results

Juvenile chinook were found in 8 of the 13 stream systems sampled (Figure 1, Appendix A). Coho salmon (*Oncorhynchus kisutch*), rainbow trout (*O. mykiss*), cutthroat trout (*O. clarkii*), bull trout (*Salvelinus confluentus*), mountain whitefish (*Prosopium williamsoni*), and northern pikeminnow (*Ptychocheilus oregonensis*) were also captured (Appendix A). While trapping was conducted from the beginning of February to the end of May, no chinook were captured after March 22 (Appendix A).

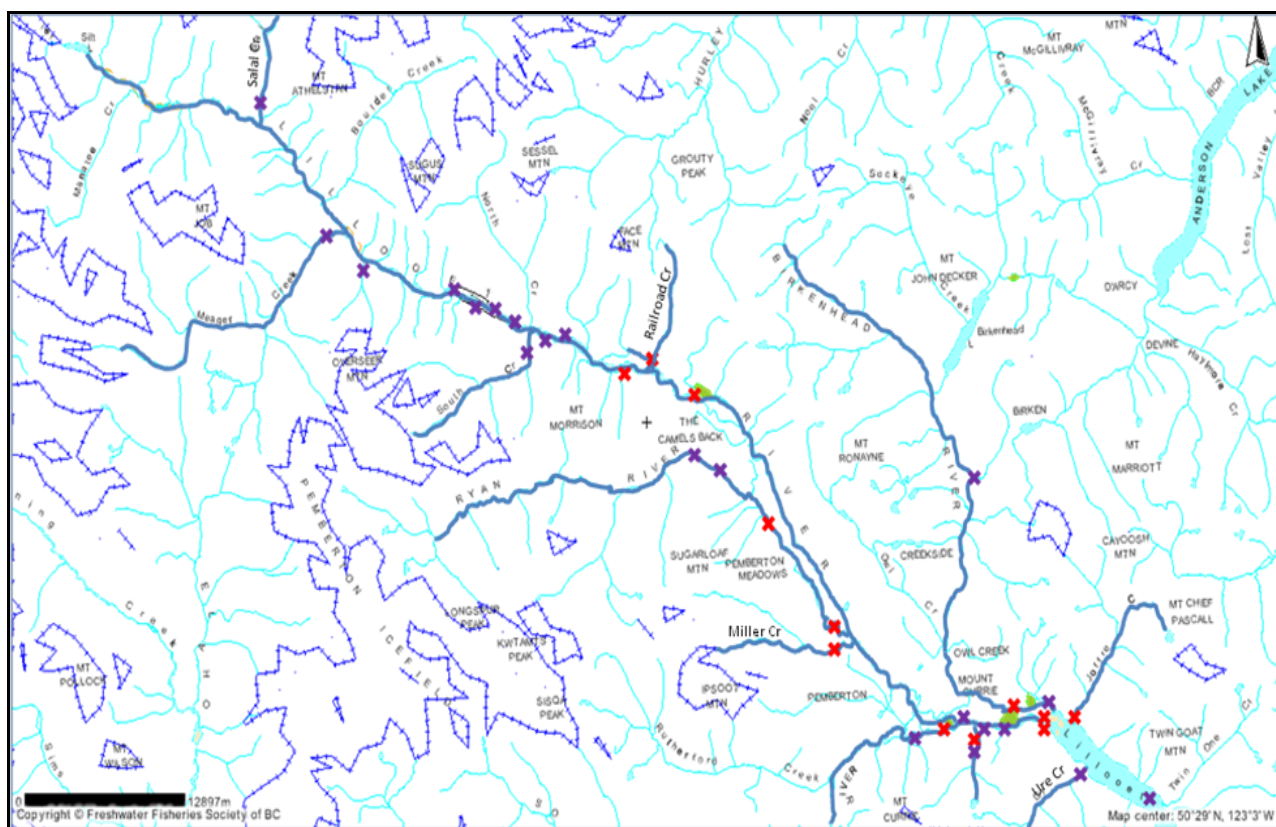


Figure 1: Trapping locations for 2010 in the Lillooet Lake catchment are shown with red and purple marks. Red marks indicate locations where juvenile chinook were captured while none were captured at the other locations.

A total of 231 chinook were captured in all areas (Table 1) while most Chinook (123, 53%) were captured in the Lillooet River mainstem. Catch per unit effort (CPUE) was calculated for all systems where chinook were encountered. For this calculation, one unit effort is defined as one minnow trap set for an overnight soak (24 to 36 hours). Since no Chinook were captured after March 22, 2010 only those traps set prior to that date were included in the CPUE calculation. CPUE was highest in Joffre Creek at 1.03 chinook per trap. CPUE was also quite high in the Lillooet River mainstem and Railroad Creek (Table 1).

Table 1: Total Chinook captures and CPUE for all systems.

System	Chinook Captured	CPUE	Chinook Measured
Ure	0	0	0
Joffre	30	1.03	10
Birkenhead	29	.40	6
Lillooet (Mainstem)	123	.60	27
Lillooet R. Tributaries			
Salal	0	N/A	0
Meager	0	N/A	0
Silva	0	N/A	0
South	0	N/A	0
Railroad	8	.61	2
Ryan	25	.38	8
Miller	3	.10	3
Green	12	.22	6
Gravell	1	.07	1
Totals	231		63

Fork length measurements for juvenile chinook were taken on 63 individuals from captures from all systems. Fork length ranged from 47 mm to 103 mm, with an overall mean fork length of 79.2 mm (Appendix B). Mean fork lengths for individual systems are shown in Table 1.

Table 2: Mean fork lengths for juvenile chinook captured in the Lillooet Lake catchment.

River	Lillooet	Ryan	Miller	Railroad	Green	Gravell	Birkenhead	Joffre
N	27	8	3	2	6	1	6	10
Mean Length	82.0	71.6	68.7	79.5	70.2	72.0	81.3	85.9
Std Deviation	15.09	9.29	18.93	2.12	6.91	NA	10.42	8.06

The Lillooet River and Joffre Creek had the highest proportion of chinook in the 81 to 90 mm and 91 to 100 mm size classes, while the Ryan, Green, and Birkenhead rivers had higher proportions of chinook below 80 mm (Figure 2). While size range varied over different systems it appears that all fish captured represented one age class, likely 1+. While only a portion of the Chinook was measured for fork length, our field information suggests that all Chinook were within the length range we have reported here and there were likely no emergent fry captured.

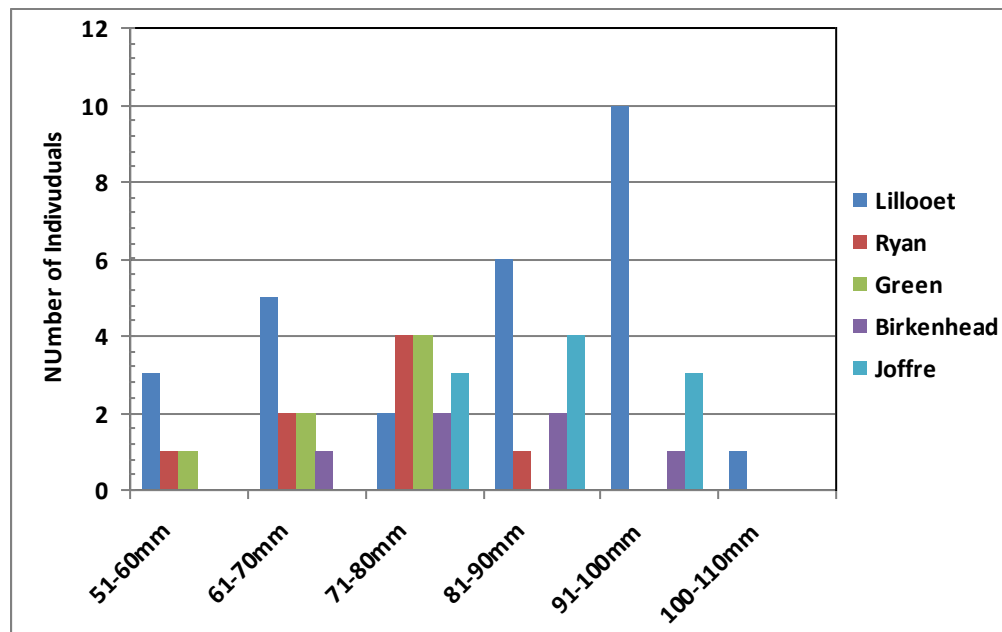


Figure 2: Length-frequency distribution for juvenile chinook captured from 6 streams in the Lillooet Lake catchment.

Discussion

Juvenile chinook salmon are present in several rivers within the Lillooet Lake watershed that have been historically neglected by adult escapement surveys; including Joffre Creek, Ure Creek, and the Lillooet River along with many of its tributaries. Additionally, juvenile chinook are likely more widespread in the Lillooet River system than this study shows, given that much of the trapping occurred in April and May (Appendix A) when age-1+ chinook had most likely already emigrated downstream. Berezay et al. (1988) documented juvenile chinook emigration from the lower Lillooet River ending in April. This suggests that traps set in late April and May might have been too late to capture rearing juvenile chinook, as fish large enough to be trapped would have already smolted and migrated downstream. This finding may also indicated that trapping efforts were focused on rearing type habitat while spawning may have occurred in upstream spawning areas and emergent fry had not yet migrated into these rearing areas.

Exploratory efforts have proven unsuccessful in enumerating adult chinook escapement to the Lillooet and Green Rivers due to the large size and high turbidity of these systems (J. Greenbank, *personal observation*). Given the unique evolutionary and conservation properties of the well-studied Birkenhead chinook population (Shubert et al. 2007), it is likely that increased attention and effort to the study of these neighbouring populations will provide useful information for scientists and resource managers.

Literature Cited

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Appendix A: Location and Species Information for traps set in the Lillooet Lake catchment, 2010

River	Site	Date	Temp	# Traps	Chinook	Coho	RBT	CTT	BT	WF	Sculpin	NPM	Description
Lillooet	LLT	10/02/2010	NR	10	0	0	4	0	0	0	22	0	NR, "Lillooet Trib"
Lillooet	LL1	18/02/2010	NR	20	0	0	0	0	3	6	30	3	NR, "Lower Lillooet"
Lillooet	UL1	23/02/2010	3	30	16	0	1	5	16	0	12	0	10U,0494342,5596874
Lillooet	LK1	24/02/2010	5	20	1	2	2	0	0	0	0	0	10U,0528416,5571325
Lillooet	LK2	25/02/2010	5	31	8	5	0	2	0	1	2	0	10U,0527466,5572109
Lillooet	L7.5	01/03/2010	4.5	25	89	6	0	2	1	0	22	0	10U,0497454,5596270
Lillooet	L14.5	22/03/2010	5	29	9	80	0	2	10	0	2	0	NR
Lillooet	LK1	29/03/2010	4.5	40	0	13	0	0	1	0	16	0	10U,0528416,5571325
Lillooet	LK3	07/04/2010	6	29	0	0	0	0	1	0	16	0	10U,0534255,5553178
Lillooet	L18	12/04/2010	6.5	20	0	4	0	4	0	0	1	0	10U,0482587,5602344
Lillooet	L19	14/04/2010	7.5	33	0	20	0	2	2	0	1	0	10U,0481193,5602644
Lillooet	L16	19/04/2010	5	10	0	1	0	0	0	0	1	0	10U,0487692,5599399
Lillooet	L12	19/04/2010	6.5	10	0	3	0	2	1	0	0	0	10U,0492144,5597236
Lillooet	L22	27/04/2010	7.5	10	0	5	0	0	1	0	2	0	10U,0483246,5601967
Lillooet	L12	17/05/2010	10	10	0	18	0	7	0	0	0	0	10U,0474048,5620853
Lillooet	L20.5	18/05/2010	6	20	0	0	0	0	0	0	0	0	10U,0464454,5635237
Lillooet	L10.5	19/05/2010	6.5	20	0	46	0	0	2	0	7	0	NR (Lillooet River 10.5KM, south side)
Lillooet	L4.5	20/05/2010	6	6	0	0	0	0	0	0	0	0	10U,0489249,5626020
Ryan	RY1	16/02/2010	3.5	15	7	0	1	0	0	0	3	0	10U,0511456,5578714
Ryan	RY1	17/02/2010	3	20	18	4	0	1	1	0	13	0	10U,0511456,5578714
Ryan	RY1	23/03/2010	4.5	10	0	21	0	0	1	0	4	0	10U,0511456,5578714
Ryan	RY2	31/03/2010	4.5	21	0	0	0	0	6	0	0	0	10U,0503274,5588482
Miller	Mill1	09/02/2010	2	30	3	12	0	0	8	0	0	0	10U,0511294,5578096
Salal	Salal1	25/05/2010	13	20	0	0	0	0	0	0	0	0	N50*40.984, W123*29.010
Meager	Meag1	26/05/2010	NR	10	0	0	0	0	0	0	0	0	N50*37.262, W123*24.212
Silva	Silv1	26/04/2010	5.5	32	0	10	0	9	2	0	0	0	10U,0473839,5604901
South	South1	28/04/2010	7.5	10	0	0	0	0	0	0	0	0	at forestry road
Railroad	RR1	15/03/2010	4.5	13	8	99	0	18	0	0	0	0	Forestry Road 9km
Green	GRN1	10/02/2010	NR	17	0	0	1	0	0	0	39	0	10U,0512086,5570990; downstream of Nairn Park
Green	GRN2	22/02/2010	3	23	12	0	3	0	1	0	12	0	upstream of Green River bridge
Green	GRNWet1	17/03/2010	6	15	0	2	0	0	0	0	1	0	10U,0518946,5571785; wetland at 3km Forestry Rd
Green	GRNWet1	23/03/2010	6.5	7	0	15	0	6	0	0	0	0	10U,0518946,5571785; wetland at 3km Forestry Rd
Green	GRN2	24/03/2010	5	15	0	9	0	0	0	0	2	0	upstream of Green River bridge
Gravell	GRVL1	11/02/2010	3.5	15	1	0	0	1	0	0	0	0	
Birkenhead	BRK1	15/02/2010	4.5	29	29	35	3	0	1	0	4	0	10U,0520607,5574350; Reach 2 above logjam
Birkenhead	BRK2	17/03/2010	3.5	30	0	0	0	1	2	0	17	0	10U,0530090,5596270; upper river
Birkenhead	BRK3	18/03/2010	8.5	11	0	14	0	0	0	0	5	0	Birkenhead River Causeway (near mouth)
Joffre	J1	15/02/2010	3	29	30	17	13	2	0	0	1	0	10U,0529234,5572232
Ure	URE1	17/02/2010	3	10	0	0	0	0	2	0	0	0	10U,0530910,5569122; mouth
Ure	URE2	17/02/2010	3	10	0	0	0	0	5	0	0	0	10U,0529770,5568476; forestry bridge

Species codes	Common Name	Scientific Name
Chinook	chinook salmon	<i>Oncorhynchus tshawytscha</i>
Coho	coho salmon	<i>O. kisutch</i>
RBT	rainbow trout	<i>O. mykiss</i>
CTT	cutthroat trout	<i>O. clarkii</i>
BT	bull trout	<i>Salvelinus confluentus</i>
MW	mountain whitefish	<i>Prosopium williamsoni</i>
NPM	northern pikeminnow	<i>Ptychocheilus oregonensis</i>
Sculpin	sculpin	<i>Cottus sp.</i>

Appendix B: Fork length measurements for fish trapped in the Lillooet lake catchment, 2010

River	Site	Date	Species	Fork Le
Lillooet	UL1	23/02/2010	Chinook	52
Lillooet	UL1	23/02/2010	Chinook	97
Lillooet	UL1	23/02/2010	Chinook	83.5
Lillooet	UL1	23/02/2010	Chinook	70
Lillooet	UL1	23/02/2010	Chinook	92
Lillooet	UL1	23/02/2010	Cutthroat	154
Lillooet	UL1	23/02/2010	Bull Trout	168
Lillooet	LK1	24/02/2010	Chinook	93
Lillooet	LK1	24/02/2010	Chinook	99
Lillooet	LK1	24/02/2010	Chinook	87
Lillooet	LK1	24/02/2010	Coho	80
Lillooet	LK1	24/02/2010	Bull Trout	175
Lillooet	LK2	25/02/2010	Chinook	82
Lillooet	LK2	25/02/2010	Chinook	87
Lillooet	LK2	25/02/2010	Cutthroat	160
Lillooet	L7.5	01/03/2010	Chinook	84
Lillooet	L7.5	01/03/2010	Chinook	57
Lillooet	L7.5	01/03/2010	Chinook	67
Lillooet	L7.5	01/03/2010	Chinook	93
Lillooet	L7.5	01/03/2010	Chinook	72
Lillooet	L7.5	01/03/2010	Chinook	103
Lillooet	L7.5	01/03/2010	Chinook	96
Lillooet	L7.5	01/03/2010	Chinook	97
Lillooet	L7.5	01/03/2010	Chinook	78
Lillooet	L7.5	01/03/2010	Chinook	97
Lillooet	L7.5	01/03/2010	Chinook	52
Lillooet	L7.5	01/03/2010	Chinook	68
Lillooet	L7.5	01/03/2010	Chinook	81
Lillooet	L7.5	01/03/2010	Chinook	66
Lillooet	L7.5	01/03/2010	Chinook	96
Lillooet	L7.5	01/03/2010	Chinook	96
Lillooet	L7.5	01/03/2010	Chinook	69
Ryan	RY1	16/02/2010	Chinook	74
Ryan	RY1	16/02/2010	Chinook	80
Ryan	RY1	16/02/2010	Chinook	79
Ryan	RY1	16/02/2010	Chinook	83
Ryan	RY1	16/02/2010	Chinook	65
Ryan	RY2	17/02/2010	Chinook	73
Ryan	RY2	17/02/2010	Chinook	58
Ryan	RY2	17/02/2010	Chinook	61
Ryan	RY2	17/02/2010	Coho	85
Ryan	RY2	17/02/2010	Coho	82
Ryan	RY2	17/02/2010	Cutthroat	125
Miller	Mill1	09/02/2010	Chinook	47
Miller	Mill1	09/02/2010	Chinook	77
Miller	Mill1	09/02/2010	Chinook	82
Miller	Mill1	09/02/2010	Bull Trout	170
Railroad	RR1	15/03/2010	Chinook	81
Railroad	RR1	15/03/2010	Chinook	78
Green	GRN2	22/02/2010	Chinook	70
Green	GRN2	22/02/2010	Chinook	72
Green	GRN2	22/02/2010	Chinook	71
Green	GRN2	22/02/2010	Chinook	77
Green	GRN2	22/02/2010	Chinook	57
Green	GRN2	22/02/2010	Chinook	74
Gravell	GRVL1	11/02/2010	Chinook	72
Gravell	GRVL1	11/02/2010	Cutthroat	142
Birkenhead	BRK1	15/02/2010	Chinook	98
Birkenhead	BRK1	15/02/2010	Chinook	84
Birkenhead	BRK1	15/02/2010	Chinook	78