

SNOQUALMIE RIVER JUVENILE SALMON OUT-MIGRATION STUDY PROGRESS REPORT

February – June 2014

1. Summary of activities completed during the sampling season.

On January 30th installation of the rotary screwtrap began and full trapping operations commenced on February 25th. The season ended on June 13th. The trap was fished for approximately 796.8 hours over 70 days within a 16 week period. 482 of those hours were fished at night representing 60.5% of total trapping effort. There were 8 scheduled fishing events (all night shifts) that were unfishable during this five month period due to unfavorable sampling conditions (i.e. high debris and discharge levels). During the sampling season 26,257 salmon and trout were captured, counted and released. Of that number, 23,508 were pinks accounting for 89.5% of the total catch. A total of 2,749 “other” salmonids were sampled. Captured unmarked Chinook included 196 sub-yearlings and 114 yearlings. The number of Chinook sub-yearlings caught at the Snoqualmie River trap has varied widely from year to year, with this years’ total falling 49% lower than the 10 year documented average (2004-2014 average; 402). Captured unmarked Coho included 1,084 yearlings and 1,148 sub-yearlings. The number of unmarked Coho yearlings caught was lower than last year, and is 37% lower than the 10 year documented average (2004-2014 average: 4,165) (Table 2).

During the trapping and handling process a total of 19 salmonid mortalities were reported of which 4 were Chinook sub-yearlings. Mortality rates were calculated for all salmonid species captured (Table 1). Mortality as a percentage of the total salmonid catch was approximately 0.003%, significantly lower than 2013 mortality rates, and substantially below the project average.

After a preliminary review of the data it appears that catch per unit effort (CPUE) for wild Chinook sub-yearlings was highest during Statistical Weeks (SW) 15 and 16 when 0.70 and 0.55 fish per hour were caught respectively. The timing of this peak has varied from year to year, and does not exhibit the observed consistency documented with Coho outmigration in the Snoqualmie. The Coho yearling outmigration took place over approximately 12 weeks from SW13 through 24. The highest CPUE for Coho yearlings was recorded during SW19 when 5.24 fish per hour were caught. The timing of this peak is consistent with the timing observed in all other years of the trapping project which generally occurs during weeks 18-20. Table 1 shows a monthly breakdown of catch numbers for all species and Table 3 shows statistical weeks and the corresponding dates. Figure 2 illustrates the outmigration timing for sub-yearling Chinook and yearling Coho and exhibits the aforementioned patterns observed in 2014.

A total of 12 trap efficiency tests (5 with Chinook sub-yearlings and 7 with Coho yearlings) were conducted on 12 different days throughout the 2014 sampling season. During these tests, groups of hatchery origin juvenile salmon were collected from Wallace River Hatchery, marked with biological dye, and released over a mile upstream of the trap site. These releases were conducted weekly throughout the duration of the sampling season unless the river was deemed unfishable. Following each release, the trap was operated continuously (except during debris removal) for a minimum of 36 hours. Efficiency calculations were then expressed as a percentage of the number of captured dyed fish in correlation to the total number of fish marked and released. The results of these tests are still being evaluated, but preliminary calculations suggest that the trap was operating at an efficiency rate of 0.70% for Chinook sub-yearlings and 0.58% for Coho yearlings during the 2014 sampling season. The 2014 Chinook efficiency is much lower than the documented seasonal averages (2001-2013 average: 1.51%), whereas Coho efficiency rates are closer to documented averages, but are still lower than expected norms observed at this site (2001-2013 average: 0.90%). Generally, Chinook efficiency rates are higher than Coho percentages at this site, but the averages in 2014 closely mirrored one another. Lower than normal efficiency rates began occurring in 2013, and the cause is still of yet unknown. During the 2013 and 2014 seasons, trapping equipment was inspected and monitored frequently and the trap was found to be in fully operational condition with no escape paths detected and no major equipment malfunctions. In general, the seasonal flows experienced on the Snoqualmie were very low (except during extreme hydrological weather events). Due to this, the 2014 trap operating revolutions were consistently low. It is possible that the lower flows resulting in low cone revolutions played a factor in overall lower catch rates both for the efficiency trials, as well as in general.

2. Project status and difficulties.

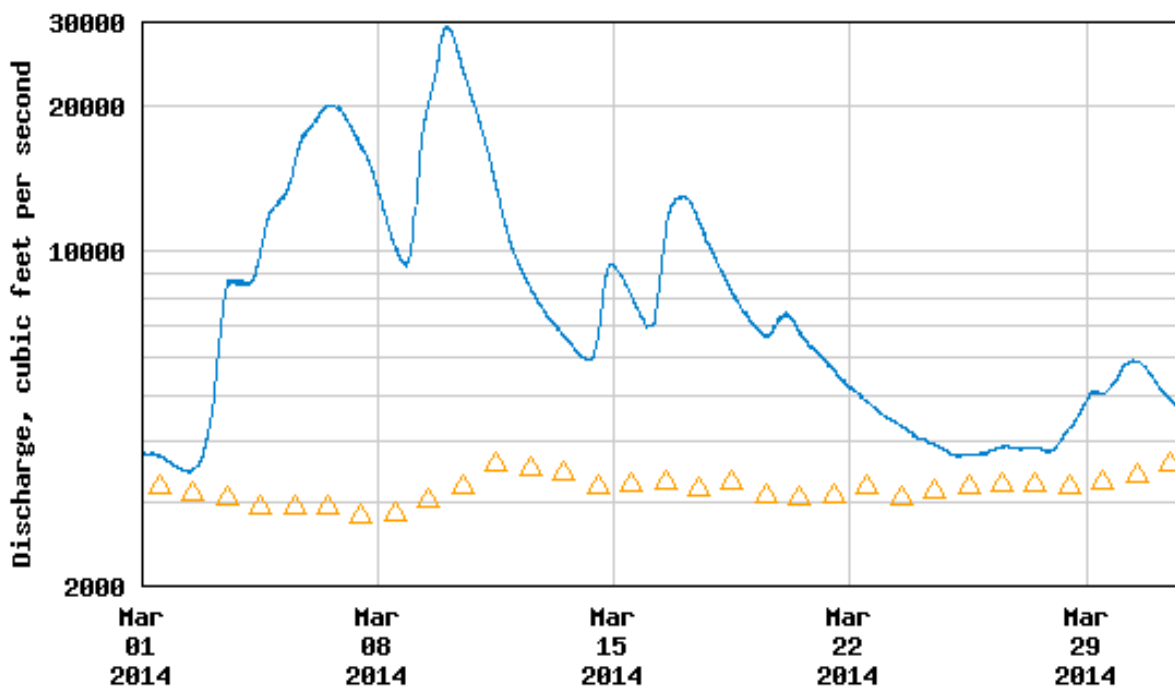
In terms of sampling success and trap operation the 2014 trapping season went fairly well. Total trapping effort (roughly 800 hours) and sample scheduling was impacted to a moderate degree by uncontrollable natural variables (weather) and difficulties with the employment process. In general, the project goal is to begin normal trap operations the first week of February each year. In 2014 we were delayed until the end of February due to logistical difficulties completing the employment process for our workers. In total, 8 night shifts were ultimately cancelled due to natural conditions and 1 night shift was re-scheduled due to employee call-in over the course of the 5 month sampling season in 2014. Immediately following the start of trapping operations on February, 22nd we were faced with notably unpredictable and arduous hydrologic conditions during the month of March, 2014 (Figure 1). Generally, flooding events beyond 12,000 cfs have proven to result in potentially hazardous working conditions, and are considered too high to safely sample. Further, the elevation of the Snoqualmie job site and its access road are low enough that frequent flooding is experienced on site. The roadway was frequently submerged during the month of March restricting vehicle access to the job site. Further, the safety threshold for sampling was also repeatedly met or exceeded over the course of the month of March, 2014. From March 3-11th, 2014 4 scheduled night shifts were cancelled due to rapidly rising and fluctuating river conditions and job site flooding. During this time period, the river rose gradually and steadily to over 20,000 cfs only to fall slightly and rise once again to peak at 29,300 cfs far surpassing the threshold for work safety and flooding. We attempted to reinstall the lines and resume trapping on March 13th, but our

efforts were quickly thwarted due to an employee call-in which resulted in the cancellation of 1 night shift. Following this cancellation, the river rose again, and the lines were again taken down on 03/14 with an impending flood forecast. From March 13th-17th 2 additional night shifts were cancelled. During this second event, the river peaked at 13,000 cfs resulting in flooding of the roadway and conditions beyond our threshold sampling safety limits. The lines were re-installed, and trapping resumed full operation beginning March 18th. This series of extreme weather events in conjunction with a one month employment delay in February directly impacted the total effort for the 2014 season and is likely a key component of the comparatively low sampling effort for the season. On April 17-18th, 2 night shifts were cancelled again due to rapidly rising river levels. During this time period, the river rose to 11,000 cfs and bordered the safety threshold. Unfortunately, the debris levels experienced during this event were substantial, and trapping became overly laborious and arduous. Following this event in April, no other scheduled sampling events were cancelled at the Snoqualmie site until the season ended in June.

From 2012-2014, in an attempt to further evaluate stock-specific production estimates and abundance, DNA samples were collected for genetic parentage-assignment analyses of juvenile Chinook salmon. In cooperation with Washington State Department of Fish and Wildlife, all unmarked (adipose intact) Chinook (both 0+ and 1+ size classes) caught in the trap were clipped for DNA sampling. During the 2014 monitoring season approximately 305 upper-caudal DNA samples were taken from a mix of sub-yearling and yearling unmarked Chinook juveniles. This number is notably lower than the encounter rate for the pilot year in 2012, and is significantly lower than the number of samples taken in 2013. The total number of Chinook encounters is, in part, a function of the total trapping effort and CPUE. As mentioned above, low flow conditions for the majority of trap operation on the Snoqualmie likely played a role in these overall low CPUE and efficiency rates.

Figure 1: USGS March, 2014 Hydrograph Results.

USGS 12149000 SNOQUALMIE RIVER NEAR CARNATION, WA



---- Provisional Data Subject to Revision ----

△ Median daily statistic (84 years) — Discharge

Table 1: Snoqualmie River trap catch and mortalities 2014

(Data is preliminary)

February

	<i>Chinook</i>		<i>Coho</i>		<i>Chum</i>	<i>Pink</i>	<i>Steelhead</i>		<i>Resident Resident Resident</i>	<i>Cut./Rain. Trout Rainbow</i>	<i>Total Salmonid Fry/Parr</i>	<i>Catch</i>	<i>Lamp</i>	<i>Sculpin spp. Sunfish</i>	<i>Stickle-Stickle-spp.</i>	<i>back</i>
	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>0+</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>								
<i>Day</i>	(11.2 hours of effort)															
Catch	2	0	0	0	2	95	0	0	0	0	99	0	0	0	0	
Morts.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Night</i>	(17.6 hours of effort)															
Catch	2	0	1	2	0	134	0	0	0	0	139	2	0	0	0	
Morts.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Monthly Totals	(28.8 hours of effort)															
Catch	4	0	1	2	2	229	0	0	0	0	238	2	0	0	0	
Morts.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

March

	<i>Chinook</i>		<i>Coho</i>		<i>Chum</i>	<i>Pink</i>	<i>Steelhead</i>		<i>Resident Resident Resident</i>	<i>Cut./Rain. Trout Rainbow</i>	<i>Total Salmonid Fry/Parr</i>	<i>Catch</i>	<i>Lamp</i>	<i>Sculpin spp. Sunfish</i>	<i>Stickle-Stickle-spp.</i>	<i>back</i>
	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>0+</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>								
<i>Day</i>	(26.9 hours of effort)															
Catch	5	0	2	2	1	537	0	0	0	0	547	0	0	0	0	
Morts.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Night</i>	(60.7 hours of effort)															
Catch	9	1	15	2	27	3008	5	0	0	0	3067	34	4	2	0	
Morts.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Monthly Totals	(87.6 hours of effort)															
Catch	14	1	17	4	28	3545	5	0	0	0	3614	34	4	2	0	
Morts.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Table 1: Snoqualmie River trap catch and mortalities 2014

(Data is preliminary)

April

	<i>Chinook</i>		<i>Coho</i>		<i>Chum</i>	<i>Pink</i>	<i>Steelhead</i>		<i>Resident Resident Resident</i>	<i>Cut./Rain. Trout Rainbow</i>	<i>Total Salmonid Fry/Parr</i>	<i>Catch</i>	<i>Lamp</i>	<i>Sculpin spp. Sunfish</i>	<i>Stickle-Stickle-spp.</i>	<i>back</i>
	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>0+</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>								
<i>Day</i>	(75.2 hours of effort)															
Catch	12	0	12	17	22	3298	0	0	0	0	3361	1	0	0	0	
Morts.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Night</i>	(169.5 hours of effort)															
Catch	98	11	447	252	59	14397	4	0	0	0	15272	57	7	5	1	
Morts.	0	0	2	0	0	1	0	0	0	0	3	0	0	0	0	
Monthly Totals	(244.8 hours of effort)															
Catch	110	11	459	269	81	17695	4	0	0	0	18633	58	7	5	1	
Morts.	0	0	2	0	0	1	0	0	0	0	3	0	0	0	0	

May

	<i>Chinook</i>		<i>Coho</i>		<i>Chum</i>	<i>Pink</i>	<i>Steelhead</i>		<i>Resident Resident Resident</i>	<i>Cut./Rain. Trout Rainbow</i>	<i>Total Salmonid Fry/Parr</i>	<i>Catch</i>	<i>Lamp</i>	<i>Sculpin spp. Sunfish</i>	<i>Stickle-Stickle-spp.</i>	<i>back</i>
	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>0+</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>								
<i>Day</i>	(141.2 hours of effort)															
Catch	7	14	22	38	21	1740	0	2	0	0	1845	8	5	4	22	
Morts.	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	
<i>Night</i>	(164.5 hours of effort)															
Catch	55	67	568	755	4	292	13	21	3	0	1792	55	5	15	66	
Morts.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Monthly Totals	(305.7 hours of effort)															
Catch	62	81	590	793	25	2032	13	23	3	0	3637	63	10	19	88	
Morts.	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	

Table 1: Snoqualmie River trap catch and mortalities 2014

(Data is preliminary)

June

	<i>Chinook</i>		<i>Coho</i>		<i>Chum</i>	<i>Pink</i>	<i>Steelhead</i>		<i>Resident Resident</i>	<i>Cut./Rain. Trout Rainbow</i>	<i>Total Salmonid Fry/Parr</i>	<i>Catch</i>	<i>Lamp</i>	<i>Sculpin spp. Sunfish</i>	<i>Stickle-Stickle-spp.</i>	<i>back</i>
	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>0+</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>								
<i>Day</i>	(60.3 hours of effort)															
Catch	1	5	3	0	0	2	0	0	0	0	11	2	1	0	13	
Morts.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Night</i>	(69.7 hours of effort)															
Catch	5	16	78	16	0	5	3	0	0	0	124	92	2	5	33	
Morts.	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
Monthly Totals	(130.0 hours of effort)															
Catch	6	21	81	16	0	7	3	0	0	0	135	94	3	5	46	
Morts.	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	

Totals

(796.8 total hours of effort)

	<i>Chinook</i>		<i>Coho</i>		<i>Chum</i>	<i>Pink</i>	<i>Steelhead</i>		<i>Resident Resident</i>	<i>Cut./Rain. Trout Rainbow</i>	<i>Total Salmonid Fry/Parr</i>	<i>Catch</i>	<i>Lamp</i>	<i>Sculpin spp. Sunfish</i>	<i>Stickle-Stickle-spp.</i>	<i>back</i>
	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>1+</i>	<i>0+</i>	<i>0+</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>								
Catch	196	114	1148	1084	136	23508	25	23	3	0	26257	251	24	31	135	
Morts.	1	0	2	0	0	2	0	0	0	0	5	0	0	0	0	
Mortality Rate	0.51%	0.00%	0.17%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%		0.02%					
% of Total Catch	0.7%	0.4%	4.3%	4.1%	0.5%	88.0%	0.1%	0.1%	0.0%	0.0%	98.3%	0.9%	0.1%	0.1%	0.5%	

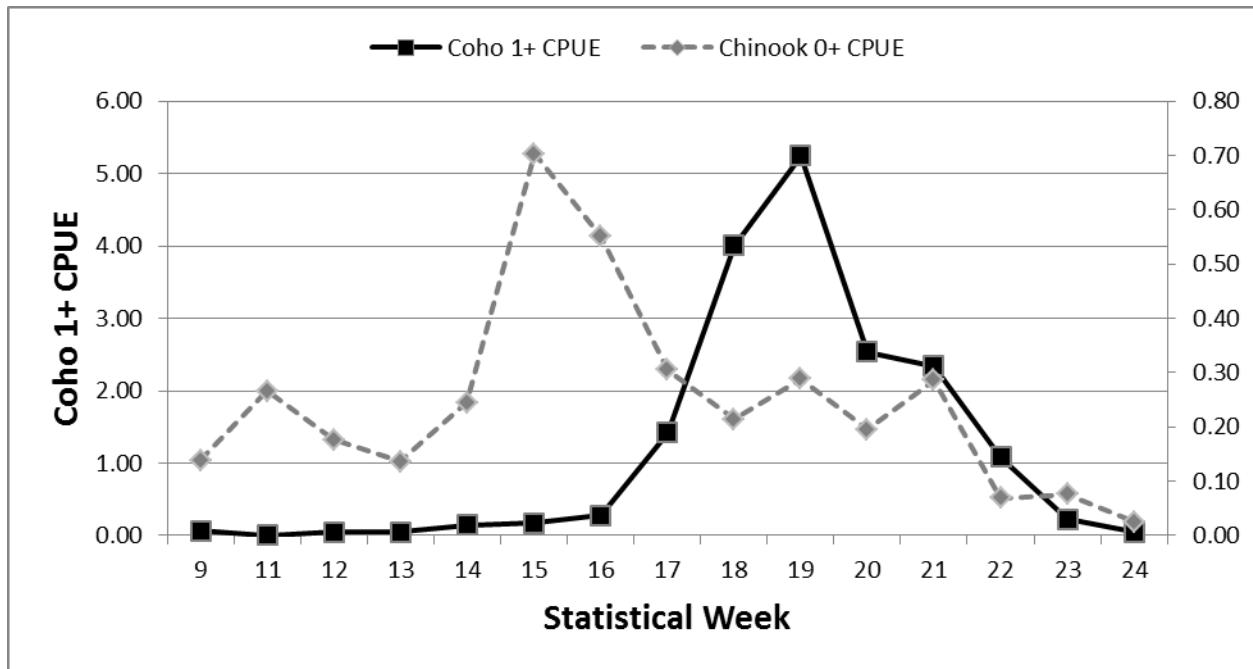
Table 2. Annual sampling effort and catch totals for sub-yearling Chinook and yearling coho at the Snoqualmie River Rotary screwtrap 2001-2014 (preliminary data).

Year	Effort (hrs)	Chinook	Coho
2001	509	619	553
2002	780.3	653	1894
2003	945.5	882	1305
2004	1056	611	1127
2005	1017.8	677	1187
2006	992	761	2023
2007	509.5	120	615
2008	317.9	163	587
2009	632.1	259	754
2010	1157.8	357	1149
2011	500.8	284	1662
2012	847.2	377	1384
2013	1217.93	615	1718
2014	796.8	196	1084
<i>10 Year Avg.</i>		<i>401.8182</i>	<i>1208.182</i>

Table 3. Statistical weeks and corresponding dates for 2014 sampling season.

Year	2014			
	StatWeek	BegWeek	MidWeek	EndWeek
2014	9	2/23	2/26	3/1
2014	10	3/2	3/5	3/8
2014	11	3/9	3/12	3/15
2014	12	3/16	3/19	3/22
2014	13	3/23	3/26	3/29
2014	14	3/30	4/2	4/5
2014	15	4/6	4/9	4/12
2014	16	4/13	4/16	4/19
2014	17	4/20	4/23	4/26
2014	18	4/27	4/30	5/3
2014	19	5/4	5/7	5/10
2014	20	5/11	5/14	5/17
2014	21	5/18	5/21	5/24
2014	22	5/25	5/28	5/31
2014	23	6/1	6/4	6/7
2014	24	6/8	6/11	6/14
2014	25	6/15	6/18	6/21
2014	26	6/22	6/25	6/28

Figure 2. Chinook sub-yearling (age 0+) and coho yearling (age 1+) migration patterns observed during 2013 at the Snoqualmie River trap, river mile 12.2 (preliminary data).



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