Kilbella/Chuckwalla Chinook Salmon
Stock Recovery Enhancement, 2015-2016



Prepared for:

Pacific Salmon Commission
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INTRODUCTION

Stock assessment and enhancement priorities for Rivers Inlet have been examined and discussed extensively over the past four years. This project was one of the top priorities for work on Chinook and other salmon species in Rivers Inlet identified by a Rivers Inlet Salmon Steering Committee (RISSC) comprised of representatives from the Wuikinuxv First Nation, local lodge owners, Fisheries and Oceans Canada (DFO), Rick Hansen Foundation (RHF), Pacific Salmon Foundation (PSF), and independent scientists. The RISSC was established in 2011 to guide the development of an immediate action plan for Wannock River Chinook salmon and long-term plans for other Rivers Inlet stocks and salmon species.

Historically, Chinook salmon from the Kilbella/Chuckwalla rivers (Figure 1) represented a significant portion of the Chinook salmon caught in the Rivers Inlet recreational fishery (Nelson et al. 2000). Annual escapement monitoring through 2010 indicated a 5-10 fold decline in spawners from the numbers observed in the 1998-2002 period when these stocks were being augmented through small-scale enhancement. In 2010, the escapement estimates for Chinook salmon were only 150 and 75 for the Kilbella and Chuckwalla rivers, respectively. Results from surveys conducted in September 2013 indicated that the number of Chinook salmon spawners in these rivers was similar to the very low numbers observed in 2010. Chinook salmon escapement estimates derived from the 2014 aerial surveys and broodstock-collection efforts were 200-300 and 100 for the Kilbella and Chuckwalla rivers, respectively.

PROJECT GOALS AND OBJECTIVES

The purpose of this project was to increase Chinook salmon returns to the Kilbella/Chuckwalla watersheds through a small-scale, targeted, enhancement program. Eggs and milt were collected from Kilbella/Chuckwalla Chinook salmon and reared at the Snootli Hatchery near Bella Coola. Fed fry were returned to net pens located near the Kilbella River estuary for further rearing prior to release. Information on the contribution of these fish to coastal fisheries will be obtained by applying coded-wire tags (CWT) to a large portion of the smolts released, and recovering marked fish from ongoing sampling programs in BC and Alaska.

The enhancement goal for 2014 and 2015 was to obtain 50,000 eggs and adequate milt from each stock in each year. This equates to 10 mature Chinook salmon of each sex from each river. The enhancement goal for 2016-2018 will be to collect 75,000 eggs and adequate milt annually from each stock. The ultimate goal is to increase number of annual spawners in the Kilbella and Chuckwalla rivers to an initial target of 1,000 adult Chinook salmon.

In the first year of this program (2014-15), Snootli Hatchery personnel and Wuikinuxv Fisheries technicians collected eggs from 4 female fish (3 Kilbella, 1 Chuckwalla), transported approximately 17,500 eggs to the Snootli Hatchery, transferred 16,486 fry to net pens in Rivers Inlet (12,207 from Kilbella; 4,279 from Chuckwalla), and released a total of 16,450 5.4-g smolts in the Spring of 2015 (English and MacLaurin 2015). Survival rates from egg take to release averaged 87.4% (95% for Kilbella, 71.4% for Chuckwalla; English and MacLaurin 2015).

The following sections document results from 2015-16, the second consecutive year of this program. Plans for 2016-17 activities are also discussed.

2015 PROJECT LOGISTICS

Personnel from Wuikinuxv Fisheries, DFO, Good Hope Cannery, and LGL Limited contributed to the 2015-16 project. In August and September, out-of-town crew members stayed at the Eagle's Nest Bed and Breakfast in Wuikinuxv Village. Helicopter support to conduct broodstock collection and aerial/swim surveys was provided by West Coast Helicopters (Port McNeill, BC). Eggs were transported from the Wuikinuxv Village airport to Bella Coola by West Coast Helicopters and Bella Coola Air (Hagensborg, BC). A 16-ft, flat-bottomed boat (Lowe 1648-MT) equipped with a 30-HP outboard jet was used to conduct reconnaissance trips and swim surveys in the lower Chuckwalla River.

RESULTS OF AERIAL AND SWIM COUNTS IN 2015

Kilbella River: In the Kilbella River, aerial counts of live and dead Chinook salmon were conducted via helicopter on 25 August and 4 September, 2015 (Table 1). Counts were stratified into 3 river sections: Mallon Creek (rkm 40.0) to Cascades (rkm 29.5), Cascades to 9-Mile Bridge (rkm 17.3), and 9-Mile Bridge to the mouth (rkm 0.0). A total of 4 live Chinook salmon were counted on 25 August, and 1 live Chinook salmon was counted on 4 September. Water clarity was very poor on 25 August despite extremely low water levels, likely due to run-off of glacial silt. Water clarity was better on 4 September; however the river still contained glacial silt making it difficult to count fish in deep water.

Chuckwalla River: In the Chuckwalla River, two helicopter counts (25 August and 3 September) and one swim count (6 September) were conducted in 2015 (Table 1). Counts were stratified into 4 river sections: Johns Creek (rkm 23.0) to Cascades (rkm 20.0), Cascades to the Canyon (rkm 14.0), the Canyon to the Bridge Pool (rkm 6.0), and the Bridge Pool to the mouth (rkm 0.0). On 25 August, a total of 21 live and 1 dead Chinook salmon were counted; and on 3 September, 6 live Chinook salmon were counted. Only 1 dead Chinook salmon was observed during the swim count on 6 September from the Bridge Pool to the mouth. Similar to the Kilbella River, water clarity on the 25 August survey was poor despite low extremely low water levels. Water clarity was significantly better for the 3 September aerial count and 6 September swim count.

In 2015, 67% (4 of 6 fish on 3 September) and 100% (21 of 21 fish on 25 August) of all Chinook salmon counted during helicopter surveys of the Chuckwalla River were observed upstream of the Canyon Pool (Table 1). In comparison, only 7-8% of Chinook salmon counted in 1999 (4 surveys from 1-17 September) were observed upstream of the Canyon Pool (see Table 7 in Nelson et al. 1999).

RESULTS OF BROODSTOCK COLLECTION EFFORTS IN 2015

Kilbella River: In 3 days of effort (27 August, 4-5 September), 38 gillnet sets (100 ft long, 8.25" mesh) were made between rkm 40.0 to rkm 30.5 in the upper Kilbella River (Table 2; Figure 2). A total of 33 live Chinook salmon were captured (Figure 3), including 32 unmarked fish (10 female, 22 male) and 1 recapture (male). In addition, 3 carcasses (female) were encountered on 5 September. Six females were spawned, including three that were full of eggs and three that were partially full of eggs (Table 3). Milt was taken from 9 males. Females averaged 74.2 cm POH (range: 68.0-88.0 cm POH) and males averaged 65.0 cm POH (range: 53.0-76.0 cm POH; Figure 4). Scales were collected from 10 females and 18 males; however, age results were not available at the time this report was prepared.

Chuckwalla River: In 3 days of effort (26 August, 3 September, 11 September), 43 gillnet sets were made between rkm 23.3 and rkm 17.0 in the upper Chuckwalla River (Table 2; Figure 5). A total of 28 live Chinook salmon were captured (Figure 6), including 25 unmarked fish (14 female, 11 male) and 3 recaptures (1 female, 2 male). Two carcasses (female) were encountered on the Chuckwalla River, one of which was found below the Bridge Pool (rkm 6.0) during the swim count on 6 September. Two females were spawned, including one that was full of eggs and one that was partially full of eggs (Table 3). Milt was taken from 8 males. Females averaged 74.3 cm POH (range: 69.0-85.0 cm POH) and males averaged 69.2 cm POH (range: 59.0-83.0 cm POH; Figure 4). Scales were collected from 16 females and 11 males; however, age results were not available at the time this report was prepared.

As in 2014, all unripe females were marked and released with the hope that they would be captured later in the season. Unripe fish captured on 26-27 August were not retained/held in fish tubes because of concerns over helicopter availability and expected high water levels in the following days. On 11 September, the crew was prepared to transport all unripe fish encountered to a holding area in the lower Chuckwalla River, however, no green fish were captured.

Unfortunately, despite seeing an increase in catches in 2015 compared to 2014, Chinook salmon abundance in both rivers continued to be very low, and the crew was not able to collect eggs from 10 ripe female Chinook salmon in each river.

RESULTS OF 2015-16 EGG INCUBATION AND FRY RELEASE

In total, 23,535 eggs (17,038 Kilbella, 6,497 Chuckwalla) were planted at the Snootli Hatchery for incubation in August/September 2015 (Table 4). This was a 43.4% increase in the number of eggs planted compared to 2014.

Add fry release numbers and egg-fry survival in the Spring

PLANS FOR 2016 BROODSTOCK COLLECTION EFFORTS

The experience gained from 2014 and 2015 has been used to develop plans for 2016 that will address the challenges encountered to date related to helicopter access, fish holding, and broodstock transport. The four project components for 2016 will include:

1) additional survey effort to improve the reliability of annual escapement estimates and determine the best locations for obtaining broodstock;
2) broodstock collection in late August and early September;
3) egg incubation, fry ponding/rearing, and CWT application at Snootli Hatchery; and
4) transport of fry to net pens in Rivers Inlet for further rearing from April until release in May of 2017.

These activities will be coordinated with the enhancement efforts for Wannock River Chinook salmon to ensure there is capacity to accommodate both groups of fish at the Snootli Hatchery and in the net pens. Wuikinuxv Fisheries personnel will assist with escapement monitoring and broodstock collections, and will be responsible for all tasks associated with rearing Chinook salmon fry in the net pens prior to release.

As in 2015, escapement numbers and broodstock collection locations will be determined using a combination of aerial, snorkel, and ground-based survey techniques in 2016. A full-time field program supervisor (LGL biologist) will be on-site for the entire broodstock collection period. Broodstock collection will be conducted using gill nets, similar to the methods used in 2014 and 2015, which have also been used successfully for Wannock River Chinook salmon.

Improvements to the broodstock collection program in 2016 will include:

1) starting broodstock collection by 19 August, which would be similar to 2014, but approximately one week earlier than in 2015 (26 August);
2) considering the use of two crews to increase the amount of sampling effort and the number of ripe fish captured; and
3) transporting unripe fish captured in the upper Kilbella and Chuckwalla rivers via helicopter to a central holding area in the lower Chuckwalla River and holding them until ripe. The holding site must be accessible by jet boat (e.g., Bridge Pool), and fish must only be held in tubes when forecasts predict minimal rain fall in the days ahead.

PLANS FOR 2016-17 EGG INCUBATION AND 2017 FRY RELEASE

Eggs and sperm will be collected on the rivers and the gametes flown to Snootli Hatchery. Eggs will be fertilized, rinsed, and placed in Heath-type, vertical incubators with a 100 ppm iodine solution. The antiseptic bath will be timed for 10 minutes, and then the trays will be placed into flowing water. At the eyed stage of development, eggs will be shocked, picked, enumerated, and placed back in Heath trays. Ponding will be done to two Capilano Type troughs arranged in lines of two. Fish will be split equally between the two troughs with 50,000

fry held in the upper section of each trough. Once densities reach 32 kg/m^3, half of the fish will be transferred to the lower section of each trough. When fry are over 1.5 g, all fish will be CWT marked, which will also verify fish numbers. Rearing will continue until fry reach ~3 g, at which point they will be transported to net pens in Rivers Inlet for final rearing and release. One float with two nets (15' long x 15' wide x 15' deep per net) will be used. This will ensure density at maximum size will not exceed the recommended 5 kg/m^3. Fish will be feed a daily ration until they reach an average weight of 5 g (target date to reach this size is 15 May). Records of mortality will be kept throughout rearing so an accurate number of fish released can be reported.

PROJECT FUNDING AND COST FOR 2015-16

The PSC funding available for activities associated with the 2015-16 Kilbella-Chuckwalla Chinook recovery enhancement efforts was $95,000. In July 2015, we requested and received a contract amendment for the end date from 31 July 2015 to 30 September 2015 to allow for the preparation of the project reports, preparations for the 2015 field program and complete project accounting and deliverables. A detailed accounting of all personnel time, expenses, and in-kind contributions related to this project will be provided with a modified version of this report to be submitted to the PSC on or before 30 September 2016.

ACKNOWLEDGEMENTS

This project would not have been possible without the support from the Pacific Salmon Commission, Wuikinuxv First Nation, and DFO. We are grateful for their leadership and guidance throughout this project. This project is a key component of a 5-year business plan prepared for Rivers Inlet salmon by the Rivers Inlet Salmon Steering Committee. This committee includes: Rick Hansen (Chair), Sid Keay, Ted Walkus, George Cuthbert, John McCulloch, Fred Helmer, Dave Rolston, and Sandie MacLaurin. We thank each of these individuals for the continued support, guidance, and fundraising efforts for the Rivers Inlet Salmon Initiative. We thank Dave Rolston, Wuikinuxv Fisheries Manager, and Billie Johnson, Wuikinuxv Fisheries Technician, for their assistance with field logistics, broodstock collection and fry rearing in the net pens. We thank Marshall Hans (DFO), Dwayne Walkus, Tyler Mills, and Jessica Lyford (Good Hope Cannery) for their assistance with broodstock capture. Logistical support in Wuikinuxv Village was provided by Frank Johnson and Fred Smith. Air support was provided by West Coast Helicopters (Port McNeill) and Bella Coola Air (Hagensborg).

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Table 1. Aerial and swim counts of Chinook salmon in the Kilbella and Chuckwalla rivers, 2015.

	River km		Chinook Salmon		
River/Date/Section	**From:**	**To:**	**Live**	**Dead**	**Total**
KILBELLA RIVER					
25 August (Helicopter)					
Mallon Cr to Cascades	40.0	29.5	3	0	3
Cascades to 9-Mile Br	29.5	17.3	1	0	1
9-Mile Br to Mouth	17.3	0.0	0	0	0
Total			4	0	4
4 September (Helicopter)					
Mallon Cr to Cascades	40.0	29.5	1	0	1
Cascades to 9-Mile Br	29.5	17.3	0	0	0
9-Mile Br to Mouth	17.3	0.0	0	0	0
Total			1	0	1
CHUCKWALLA RIVER					
25 August (Helicopter)					
Johns Cr to Cascades	23.0	20.0	16	0	16
Cascades to Canyon	20.0	14.0	5	0	5
Canyon to Bridge Pool	14.0	6.0	0	0	0
Bridge Pool to Mouth	6.0	0.0	0	1	1
Total			21	1	22
3 September (Helicopter)					
Johns Cr to Cascades	23.0	20.0	3	0	3
Cascades to Canyon	20.0	14.0	1	0	1
Canyon to Bridge Pool	14.0	6.0	2	0	2
Bridge Pool to Mouth	6.0	0.0	0	0	0
Total			6	0	6
6 September (Swim Survey)					
Bridge Pool to Mouth	6.0	0.0	0	1	1

Table 2. Number of Chinook salmon encountered during broodstock collection and swim counts on the Kilbella and Chuckwalla rivers, 2015.

River/Date	Number of Sets	Live - Unmarked		Live - Recaps		Dead - Unmarked		Total (Live + Dead)		
		Female	Male	Female	Male	Female	Male	Female	Male	Total
Kilbella River[a]										
27-Aug	11	4	7	0	0	0	0	4	7	11
4-Sep	15	4	7	0	1	0	0	4	8	12
5-Sep	12	2	8	0	0	3	0	5	8	13
Total	38	10	22	0	1	3	0	13	23	36
Chuckwalla River[b]										
26-Aug	18	9	6	1	1	0	0	10	7	17
3-Sep	10	3	2	0	1	0	0	3	3	6
6-Sep[c]	-	0	0	0	0	1	0	1	0	1
11-Sep	15	2	3	0	0	1	0	3	3	6
Total	43	14	11	1	2	2	0	17	13	30
Grand Total	**81**	**24**	**33**	**1**	**3**	**5**	**0**	**30**	**36**	**66**

[a] All fish were encountered between Mallon Cr and the Cascades.

[b] 2 live fish (1F, 1M) and 1 carcass (F) were encountered between Cascades and Canyon, 1 carcass (F) was encountered below the Bridge Pool, and all other fish were encountered between Johns Cr and Cascades.

[c] No broodstock collection occurred on 6 September, the carcass was found during a swim count.

Table 3. Number of live Chinook salmon encountered during broodstock collection in 2015 that were spawned, green, or spent.

	Female				Male				
River/Date	Eggs Taken (full)	Eggs Taken (partial)	Green	Spent	Milt Taken	No Milt Taken	Green	Spent	Total
Kilbella									
27-Aug	2	1	1	0	3	3	0	1	11
4-Sep	0	2	1	1	3	3	0	2	12
5-Sep	1	0	1	0	3	4	0	1	10
Total	3	3	3	1	9	10	0	4	33
Chuckwalla									
26-Aug	1	0	7	2	4	1	2	0	17
3-Sep	0	1	1	1	3	0	0	0	6
11-Sep	0	0	0	2	1	0	0	2	5
Total	1	1	8	5	8	1	2	2	28
Grand Total	**4**	**4**	**11**	**6**	**17**	**11**	**2**	**6**	**61**

Table 4. Number of female Chinook salmon spawned, eggs planted at the Snootli Hatchery, and fry reared in net pens and released in Rivers Inlet, 2014-2015. Awaiting clarification from Sandie…the number of eggs and fry reported in the 2014 status report and the 'Kil_Chuck Inc 2014' tab of the 'KIL_CHUCK DATA 2014.xlsx' file she provided don't match-up.

River/Year	Females Spawned	Eggs Planted at Snootli (Est.)	Number of Fry Transferred to Sea Pens	Number of Fry Released in Rivers Inlet	Egg-to-Fry Survival
Kilbella River					
2014-15	3	12,350	12,207		95.0%
2015-16	6	17,038	-	-	-
Total	9	29,388	12,207		
Chuckwalla River					
2014-15	1	4,056	4,279		71.4%
2015-16	2	6,497	-	-	-
Total	3	10,553	4,279		
Both Rivers					
2014-15	4	16,406	16,486	16,450	
2015-16	8	23,535	-	-	-
Total	12	39,941			

Notes:

2014-15: 1 female from the Kilbella was partially spent.

2015-16: 3 females from the Kilbella and 1 from the Chuckwalla were partially spent.

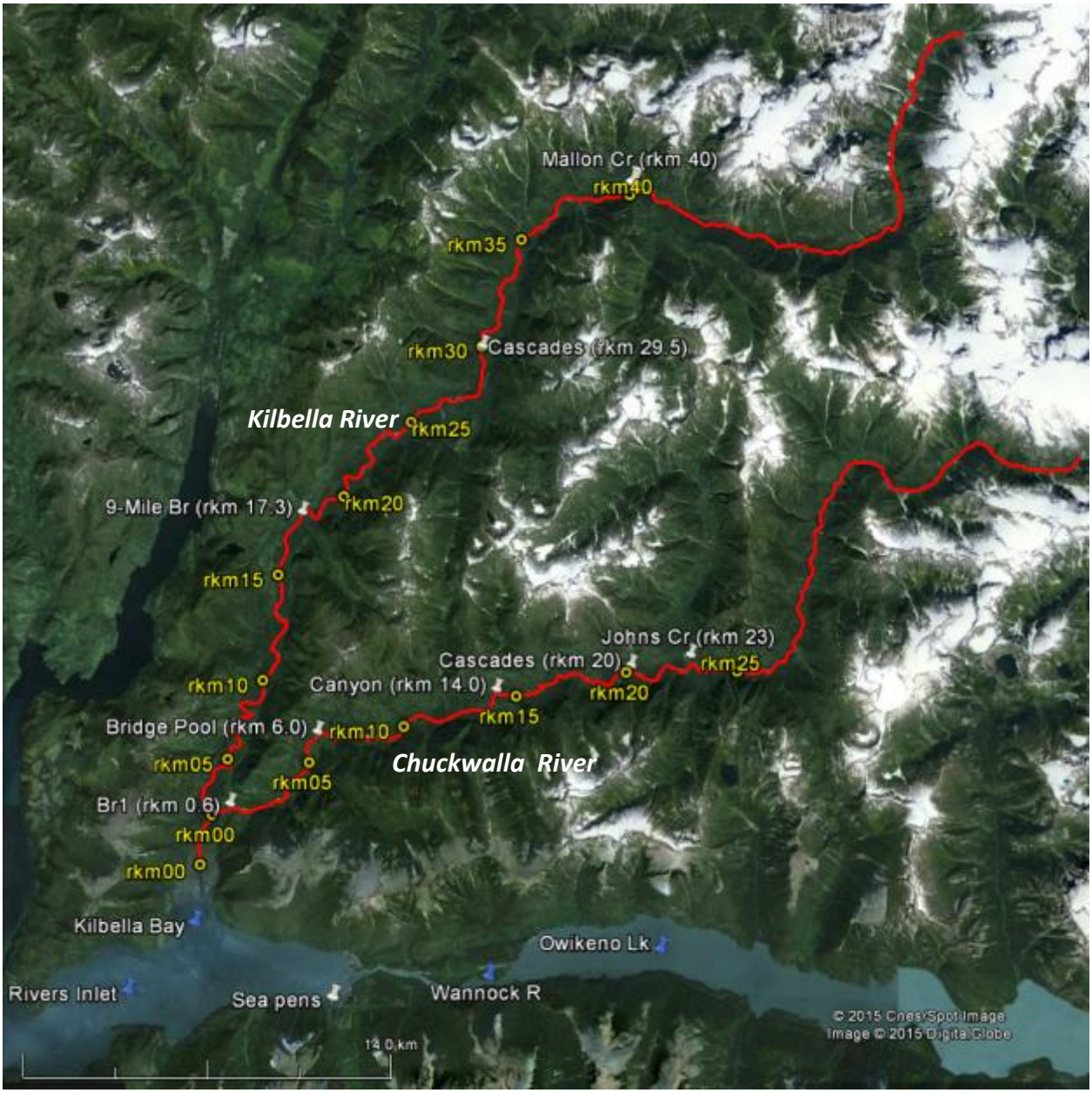

Figure 1. Map of the study area showing the Kilbella and Chuckwalla rivers and location of the net pens at the head of Rivers Inlet.

Figure 2. Location of gillnet sets made in the upper Kilbella River, 2015. Labels indicate the month/day and set number (e.g., "9/5-1" is the first set made on 5 September). Note that some set sites may not be shown if their location overlaps with other sets. The blue line indicates the GPS tracks made during broodstock collection on each day.

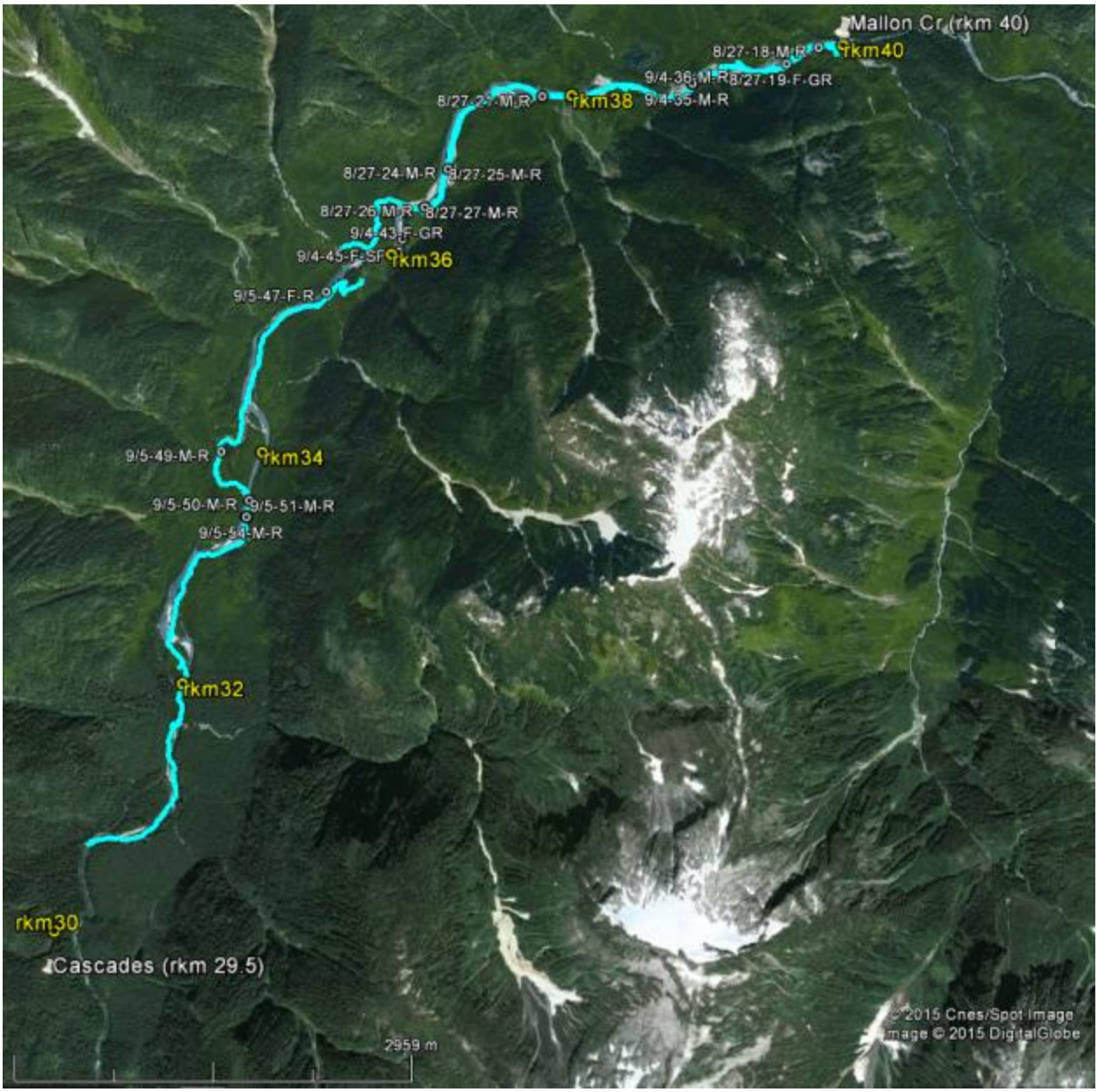

Figure 3. Location of Chinook salmon captured in the upper Kilbella River, 2015. Data labels indicate the month/day, fish ID, sex, and fish condition (e.g., "9/5-47-F-R" is fish #47, female, ripe, caught on 5 September). Note that some fish captured may not be shown if their capture location overlaps with other fish. The blue line indicates the GPS tracks made during broodstock collection on each day.

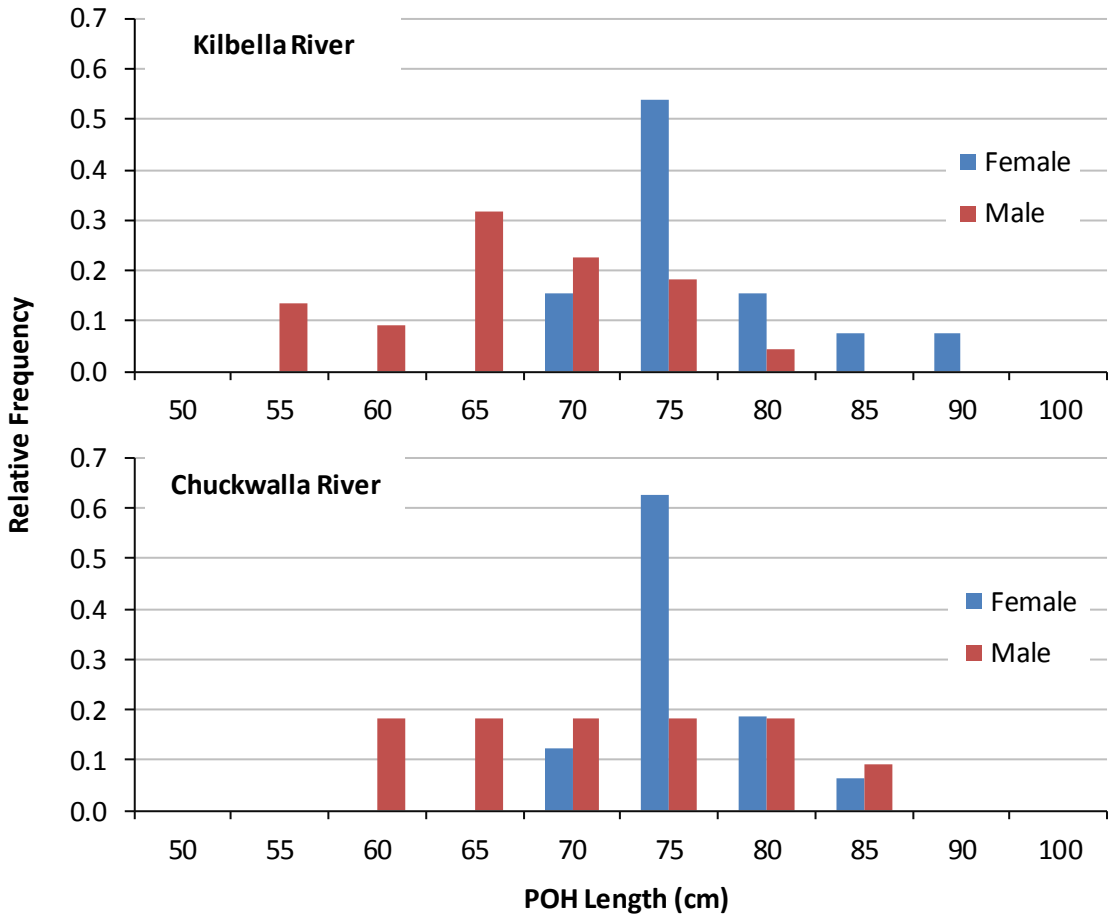

Figure 4. Length-frequency distribution of Chinook salmon sampled in 2015, by river and sex. Post-orbital hypural (POH) length was used, and both live and dead fish were included.

Figure 5. Location of gillnet sets made in the upper Chuckwalla River, 2015. Labels indicate the month/day and set number (e.g., "9/5-1" is the first set made on 5 September). Note that some set sites may not be shown if their location overlaps with other sets. The blue line indicates the GPS tracks made during broodstock collection on each day.

Figure 6. Location of Chinook salmon captured in the upper Chuckwalla River, 2015. Data labels indicate the month/day, fish ID, sex, and condition (e.g., "9/5-47-F-R" is fish #47, female, ripe, caught on 5 September). Note that some fish captured may not be shown if their capture location overlaps with other fish. The blue line indicates the GPS tracks made during broodstock collection on each day.

Photo 1. Gillnet deployed in the upper Chuckwalla River on 26 August, 2015.

Photo 2. Eggs being collected from a ripe female Chinook salmon on the upper Kilbella River, 27 August 2015.

Photo 3. Milt being collected from a ripe male Chinook salmon on the upper Kilbella River, 27 August 2015.

Photo 4. Aerial photograph showing the difference in water clarity between the Kilbella (top) and Chuckwalla (bottom) rivers on 25 August 2015. River flow is from right to left in the photograph.

Photo 5. Sockeye salmon captured in the upper Kilbella River, 5 September 2015. This was the only sockeye salmon observed in either river in 2015.