# Kilbella/Chuckwalla Chinook Salmon Stock Recovery Enhancement, 2018-2019 Final Report



*Prepared for:*

**Pacific Salmon Commission**
**1155 Robson St, Vancouver, BC V6E 1B5**

*Prepared by:*

**LGL Limited environmental research associates**
**9768 Second Street, Sidney, BC V8L 3Y8**

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LGL LIMITED
environmental research associates

***EA3562D***

# Kilbella/Chuckwalla Chinook Salmon Stock Recovery Enhancement, 2018-2019 Final Report

*Prepared by:*

Jason J. Smith[1], Karl K. English, Brydon Peace[2], Ian Douglas[3] and Sandie MacLaurin

*Prepared for:*

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1155 Robson St, Vancouver, BC V6E 1B5

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[1] LGL Limited environmental research associates, 9768 Second Street, Sidney, BC V8L 3Y8
[2] Percy Walkus Hatchery, Oweekeno Village, BC
[3] Fisheries and Oceans Canada, Box 340, Hagensborg, BC V0T 1H0

## INTRODUCTION

Stock assessment and enhancement priorities for Rivers Inlet have been examined and discussed extensively over the past five 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 2014 DFO aerial surveys were 200-300 and 100 for the Kilbella and Chuckwalla rivers, respectively. In 2014, 44 Chinook salmon (29 Kilbella, 15 Chuckwalla) were captured during broodstock collection by Snootli Hatchery personnel and Wuikinuxv Fisheries technicians (English and MacLaurin 2015). From 2015 to 2018, staff from Snootli Hatchery, Wuikinuxv Fisheries, and LGL Limited led the broodstock activities. During this period, the number of Chinook salmon encountered ranged from 27-67 on the Kilbella River and 29-35 on the Chuckwalla River (Smith et al. 2016, Smith et al. 2017, Smith et al. 2018).

## 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 (2014-2016 brood years) and Percy Walkus Hatchery in Wuikinuxv Village (2017-2018 brood year). 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 annually from each river. The enhancement goal for 2016-2018 was to collect 75,000 eggs and adequate milt annually from each stock (15 fish of each sex). 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), 4 female fish were spawned (3 Kilbella, 1 Chuckwalla), 18,857 eggs were transported to Snootli Hatchery, 16,521 fry were transferred to net pens in

Rivers Inlet (12,224 Kilbella; 4,258 Chuckwalla), and a total of 16,380 5.4-g smolts were released in the Spring of 2015 (Smith et al. 2016). Survival rates from egg take to release averaged 87% (94% for Kilbella, 71% for Chuckwalla). In the second year (2015-16), 8 females were spawned (6 Kilbella, 2 Chuckwalla), 32,853 eggs were transported to Snootli Hatchery, 30,333 fry were transferred to net pens, and 30,311 smolts were released in the Spring of 2016 (Smith et al. 2016). Survival rates from egg take to release averaged 92% (92% for Kilbella, 93% for Chuckwalla). In the third year (2016-17), 12 females were spawned (4 Kilbella, 8 Chuckwalla), 47,184 eggs were planted at the Snootli Hatchery, and 41,866 smolts were released in the Spring of 2017 (Smith et al. 2017). Egg-to-release survival averaged 88.7% (93.0% for Kilbella, 86.9% for Chuckwalla). In the fourth year (2017-18), 25 females were spawned (16 Kilbella, 9 Chuckwalla), 51,053 eggs were planted at the Percy Walkus Hatchery, and 45,038 smolts were released in the Spring of 2018 (Smith et al. 2018). Egg-to-release survival averaged 88.2% (92.3% for Kilbella, 85.8% for Chuckwalla). While there has been a steady increase in the number of females spawned each year, poor escapements have impacted the ability to meet annual enhancement goals.

The following sections document results from 2018-19, the fifth consecutive year of this program. Plans for 2019-20 activities are also discussed.

## 2018 PROJECT LOGISTICS

Personnel from Wuikinuxv Fisheries, DFO, LGL Limited, Good Hope Cannery, and Duncanby Lodge contributed to the 2018-19 project. Out-of-town crew members stayed at the Percy Walkus Hatchery and Eagle's Nest Bed and Breakfast in Wuikinuxv Village. Helicopter support was provided by HeliJet International, Inc (Bell 206L Long Ranger; Photo 1).

## RESULTS OF AERIAL COUNTS IN 2018

*Kilbella River:* The broodstock crews spent a limited amount of helicopter time conducting aerial counts for Chinook salmon in 2018. No Chinook salmon were observed in the Kilbella River from the air during field activities from 25-29 August. In general, poor water clarity in the Kilbella River makes it difficult to conduct effective aerial counts.

*Chuckwalla River:* The broodstock crews counted no Chinook salmon on the Chuckwalla River during a 27 August survey, and one live and one dead Chinook salmon in the lower river on 1 September (Table 1).

## RESULTS OF 2018 BROODSTOCK COLLECTION EFFORTS

*Kilbella River:* In 4 days of fishing effort from 25 August to 28 August, 43 gillnet sets (80-100 ft long, 8.25 in. mesh) were made between rkm 22.3 and rkm 40.0 on the Kilbella River (Table 2; Photo 2). A total of 101 live Chinook salmon were captured, including 91 unmarked (or "new") fish (35 female, 56 male) and 10 recaptures (2 female, 8 male; Table 2; Photo 3). No Chinook salmon carcasses were encountered on the Kilbella River in 2018. Three key locations for capturing Chinook salmon on the Kilbella River in 2018 included:

1) "Shotgun Hole" [rkm 38.8] – a mainstem run where fish were spawning;
2) "Kardashian Run" area [rkm 37.8-38.3] – a long mainstem run; and
3) "Log Jam Run" [rkm 22.3] – a mainstem run where fish were spawning.

Nineteen females were spawned, of which ten were full of eggs and nine were only partially full of eggs (Table 3; Photo 4). Two females captured on 25 August were held in aluminum tubes; however, both were released on 27 August and neither was spawned. Milt was collected from 19 different males (Table 3). Females averaged 71 cm POH (range: 52-82 cm POH) and males averaged 66 cm POH (range: 45-87 cm POH; Figure 2). Successfully aged scale samples collected from Chinook salmon caught in the Kilbella River in 2018 consisted of fish of ages $3_1$ (7), $4_1$ (2), $5_1$ (6), $4_2$ (14), $5_2$ (34), $6_2$ (1), $5_3$ (1), and $6_3$ (1; Table 4).

Five adipose-clipped Chinook salmon (1 female, 4 male) were captured on the Kilbella River in 2018. These were likely fish raised and released under the Stock Recovery Enhancement Program. These fish were released alive (unspawned) after being sampled for length and scales.

*Chuckwalla River:* In 5 days of fishing effort from 27 August to 31 September, 62 gillnet sets were made between rkm 8.0 and rkm 21.4 on the Chuckwalla River (Table 2). A total of 44 live Chinook salmon were captured, including 42 unmarked fish (19 female, 23 male) and 2 male recaptures (Table 2). No Chinook salmon carcasses were encountered on the Chuckwalla River in 2018. Two key locations for capturing fish on the Chuckwalla River in 2018 included:

1) "Great Spot" (rkm 13.3) – a mainstem pool located <1 km below the canyon; and
2) "Grizzly Bank" (rkm 10.6) – a mainstem run.

Nine females were spawned, of which seven were full of eggs and two were only partially full of eggs (Table 3; Photo 5). Of these, two females were captured on 28 August, held for 4 days in aluminum tubes at the "Great Spot," and then spawned on 1 September. Milt from ten different males was collected (Table 3). Females averaged 74 cm POH (range: 66-87 cm POH) and males averaged 65 cm POH (range: 53-81 cm POH; Figure 2). Successfully aged scale samples collected from Chinook salmon caught in the Chuckwalla River in 2018 consisted of fish of ages $3_1$ (4), $4_1$ (2), $4_2$ (5), $5_2$ (20), and $6_2$ (1; Table 4).

On both rivers, all fish held in aluminum tubes to ripen were kept at or near their respective capture sites. No fish died while being held in 2018 or showed any visible signs of stress (e.g., fungal growth).

Fishing effort in 2018 was substantially less than in 2016 and 2017 due to the fact egg targets were met for the first time. Undoubtedly more "new" fish would have been encountered in both rivers in 2018 had fishing effort been continued into early September. Chinook salmon catches in both rivers were higher in 2018 than in previous years (Figure 3); however, overall abundance remained low.

## RESULTS OF 2018 BROOD YEAR EGG INCUBATION AND FRY RELEASE

In total, 123,577 eggs (68,580 Kilbella; 54,997 Chuckwalla) were planted at the Percy Walkus Hatchery for incubation in August 2018 (Table 5; Photo 6). This was a 142% increase in the number of eggs planted compared to 2017.

Fed fry (~3 g) were transported to net pens in Kilbella Bay on 10 April and 11 April 2019. Some krill were fed to the fry during seapen rearing. On 3 May and 6 May, respectively, 61,788 Kilbella (5.2 g) and 48,543 Chuckwalla (5.1 g) smolts were released from the net pens. Egg-to-release survival was 90.1% for the Kilbella and 88.3% for the Chuckwalla (Table 5).

## PLANS FOR 2019 BROODSTOCK COLLECTION EFFORTS

Plans for 2019-20 have been developed based on the experience gained since the first project year (2014-15). The five project components for 2019-20 will include:

1) additional survey effort to improve the reliability of annual escapement estimates and determine the best locations and approach for obtaining broodstock;
2) broodstock collection in late August and early September;
3) reporting and recovery/sampling of adipose-clipped adult fish;
4) egg incubation, fry ponding/rearing, and CWT application at Percy Walkus Hatchery; and
5) transport of fry to net pens in Kilbella Bay for further rearing from April 2019 until release in May.

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 Percy Walkus Hatchery and in the net pens. Wuikinuxv Fisheries personnel will play an integral role as members of the Percy Walkus Hatchery crew, and will conduct escapement monitoring, broodstock collection, incubation, rearing, marking, and final rearing of Chinook salmon fry in the net pens prior to release.

The proposed 2019 escapement monitoring and broodstock collection program will include a full-time field program supervisor (Brydon Peace, Percy Walkus Hatchery) who will be on-site for the entire broodstock collection period. Unlike the 2015-16 through 2018-19 project years, a fisheries biologist from LGL Limited will not be involved in the 2019-20 fieldwork. Like 2017 and 2018, two, 4-person field crews will be used at the start of the 2019 broodstock program. Escapement numbers and broodstock collection locations will be determined using a combination of aerial and ground-based survey techniques. Broodstock collection will be conducted using gill nets (100 ft long, 8.25 in. mesh), like the methods used from 2014 to 2018. Fishing effort in 2019 will be focused in the few key locations where fish were captured in recent years (e.g., “Great Spot” on the Chuckwalla; “Log Jam Run” on the Kilbella).

## PLANS FOR 2019 BROOD YEAR EGG INCUBATION AND FRY RELEASE

Eggs and sperm from the 2019 brood year will be collected on the rivers and the gametes taken to the Percy Walkus 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. Fish will be ponded in Capilano-type troughs or 8-ft circular tubs, depending on inventories at the time. 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 COSTS FOR 2018-19

The PSC funding available for activities associated with the fifth year (2018-19) of Kilbella-Chuckwalla Chinook recovery enhancement efforts was $98,805. The current contract is slated to end on 30 September 2019. The final project and financial report to be submitted within 45 days of the end of the project to ensure that costs associated with the preparation of the project reports, preparations for the 2019 field program and complete project accounting and deliverables are covered by the 2018-19 project.

## ACKNOWLEDGEMENTS

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**Table 1. Aerial counts of Chinook salmon in the Chuckwalla River conducted by the PSC broodstock crews in 2018.**

| | | | Chinook Salmon | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Crew** | **River section** | **Live** | **Dead** | **Coho** | **Precip** | **Clarity** | **Level** | **Vis.** | **Comments** |
| 27-Aug-18 | bp, mh | Mouth to Canyon Pool (rkm 0-14) | 0 | 0 | 0 | 0 | good | v-low | good | <10K PK, 100-200 CM, some CM carcasses not counted. |
| | | Upstream Canyon Pool (rkm 14-23) | 0 | 0 | 0 | | | | | No fish observed. |
| Survey Total | | | 0 | 0 | 0 | | | | | |
| 01-Sep-18 | bp ,jw | Mouth to Canyon Pool (rkm 0-14) | 1 | 1 | 0 | 0 | good | low | fair | 1 redd, ~15K PK, ~1K CM - while spending time above lower Bridge noted PK/CM moving in. |
| | | Upstream Canyon Pool (rkm 14-23) | 0 | 0 | 0 | | | | | No other species observed. |
| Survey Total | | | 1 | 1 | 0 | | | | | |

Notes:

Aerial counts were conducted by helicopter; and generally few fish were seen from the air during broodstock work.

No aerial surveys of the Kibella were conducted due to poor water clarity. During transit, very few fish seen from the air.

**Table 2. Number of live Chinook salmon encountered during broodstock collection in 2018.**

| River & Date | No. Sets | New Fish | | Recaps | | New Fish + Recaps | | | CPUE (fish/set) |
|---|---|---|---|---|---|---|---|---|---|
| | | Female | Male | Female | Male | Female | Male | Total | |
| **Kilbella** | | | | | | | | | |
| 25-Aug | 13 | 7 | 9 | 0 | 0 | 7 | 9 | 16 | 1.23 |
| 26-Aug | 17 | 18 | 28 | 0 | 1 | 18 | 29 | 47 | 2.76 |
| 27-Aug | 7 | 7 | 16 | 0 | 3 | 7 | 19 | 26 | 3.71 |
| 28-Aug | 6 | 3 | 3 | 2 | 4 | 5 | 7 | 12 | 2.00 |
| Subtotal | 43 | 35 | 56 | 2 | 8 | 37 | 64 | 101 | 2.35 |
| **Chuckwalla** | | | | | | | | | |
| 27-Aug | 11 | 1 | 2 | 0 | 0 | 1 | 2 | 3 | 0.27 |
| 28-Aug | 8 | 7 | 4 | 0 | 0 | 7 | 4 | 11 | 1.38 |
| 29-Aug | 14 | 3 | 3 | 0 | 0 | 3 | 3 | 6 | 0.43 |
| 30-Aug | 18 | 3 | 5 | 0 | 0 | 3 | 5 | 8 | 0.44 |
| 31-Aug | 11 | 5 | 9 | 0 | 2 | 5 | 11 | 16 | 1.45 |
| Subtotal | 62 | 19 | 23 | 0 | 2 | 19 | 25 | 44 | 0.71 |
| **Total** | **105** | **54** | **79** | **2** | **10** | **56** | **89** | **145** | **1.38** |

Notes:

Includes adipose-clipped hatchery fish captured: 5 on the Kilbella, 6 on the Chuckwalla.

No dead Chinook salmon were founding during broodstock activities on either river in 2018.

**Table 3. Number of Chinook salmon spawned in 2018, by river and capture date.**

| River & Date Caught | Female | | Males Spawned |
|---|---|---|---|
| | Full | Partial | |
| **Kilbella** | | | |
| 25-Aug | 2 | 0 | 5 |
| 26-Aug | 5 | 2 | 8 |
| 27-Aug | 1 | 3 | 3 |
| 28-Aug | 2 | 1 | 3 |
| Subtotal | 10 | 6 | 19 |
| **Chuckwalla** | | | |
| 28-Aug | 2 | 1 | 1 |
| 29-Aug | 1 | 1 | 2 |
| 30-Aug | 1 | 0 | 2 |
| 31-Aug | 3 | 0 | 5 |
| Subtotal | 7 | 2 | 10 |
| **Total** | **17** | **8** | **29** |

Notes:

2 females caught on 8/28 were held and spawned on 9/1.

**Table 4. Age composition of Chinook salmon sampled in the Kilbella/Chuckwalla rivers in 2018.**

| River | European / Gilbert-Rich | 0.2 / $3_1$ | 0.3 / $4_1$ | 0.4 / $5_1$ | 1.2 / $4_2$ | 1.3 / $5_2$ | 1.4 / $6_2$ | 2.2 / $5_3$ | 2.3 / $6_3$ | M2 / 2M | M3 / 3M | M4 / 4M | 1F / S2 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kilbella | Male | 5 | 1 | 4 | 6 | 25 | 0 | 1 | 0 | 1 | 5 | 1 | 2 | 51 |
| | Female | 2 | 1 | 2 | 8 | 9 | 1 | 0 | 1 | 3 | 4 | 1 | 0 | 32 |
| | Total | 7 | 2 | 6 | 14 | 34 | 1 | 1 | 1 | 4 | 9 | 2 | 2 | 83 |
| Chuckwalla | Male | 3 | 5 | 0 | 4 | 9 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 22 |
| | Female | 1 | 1 | 0 | 1 | 11 | 1 | 0 | 0 | 1 | 2 | 0 | 0 | 18 |
| | Total | 4 | 6 | 0 | 5 | 20 | 1 | 0 | 0 | 1 | 3 | 0 | 0 | 40 |

Notes:

M1 (1M) = 1 marine annuli; M2 (2M) = 2 marine annuli; etc.

S2 (1F) = 1 freshwater annulus (Sub-2)

**Table 5. Number of Chinook salmon reared and released, by river and brood year.**

| River & Brood Year | Females Spawned | Eggs Planted[a] | Fry Transferred to Sea Pens | Fry Released in Ocean[b] | Egg-to-Release Survival |
|---|---|---|---|---|---|
| **Kilbella** | | | | | |
| 2014 | 3 | 12,859 | 12,224 | 12,122 | 94.3% |
| 2015 | 6 | 21,252 | 19,523 | 19,518 | 91.8% |
| 2016 | 4 | 14,082 | - | 13,096 | 93.0% |
| 2017 | 6 | 19,081 | 17,635 | 17,606 | 92.3% |
| 2018 | 16 | 68,580 | 63,869 | 61,788 | 90.1% |
| Subtotal | 35 | 135,854 | - | 124,130 | 91.4% |
| **Chuckwalla** | | | | | |
| 2014 | 1 | 5,998 | 4,297 | 4,258 | 71.0% |
| 2015 | 2 | 11,601 | 10,810 | 10,793 | 93.0% |
| 2016 | 8 | 33,102 | - | 28,770 | 86.9% |
| 2017 | 5 | 31,962 | 27,559 | 27,432 | 85.8% |
| 2018 | 9 | 54,997 | 49,744 | 48,543 | 88.3% |
| Subtotal | 25 | 137,660 | - | 119,796 | 87.0% |
| **Combined Total** | | | | | |
| 2014 | 4 | 18,857 | 16,521 | 16,380 | 86.9% |
| 2015 | 8 | 32,853 | 30,333 | 30,311 | 92.3% |
| 2016 | 12 | 47,184 | - | 41,866 | 88.7% |
| 2017 | 11 | 51,043 | 45,194 | 45,038 | 88.2% |
| 2018 | 25 | 123,577 | - | 110,331 | 89.3% |
| **Total** | **60** | **273,514** | **-** | **243,926** | |

[a] Eggs were planted at the Snootli Hatchery for the 2014-16 brood years and the Percy Walkus Hatchery for the 2017-18 brood years.

[b] Net pens were located in Kilbella Bay, Rivers Inlet.


**Figure 1. Map of the Kilbella and Chuckwalla rivers and the location of the sea pens in Kilbella Bay.**

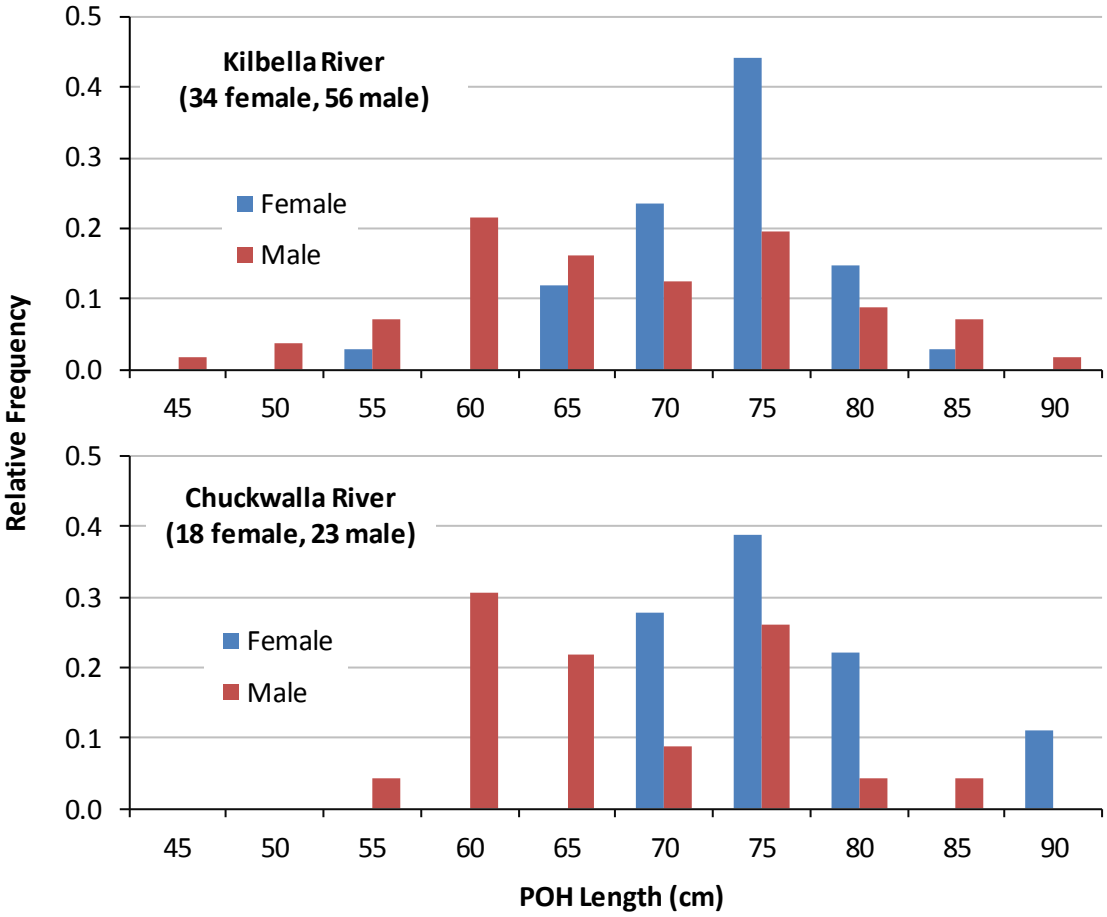


**Figure 2. Length-frequency distribution of unique ('new') Chinook salmon sampled in 2018, by river and sex. Post-orbital hypural (POH) length was used, and these data exclude recaptures.**

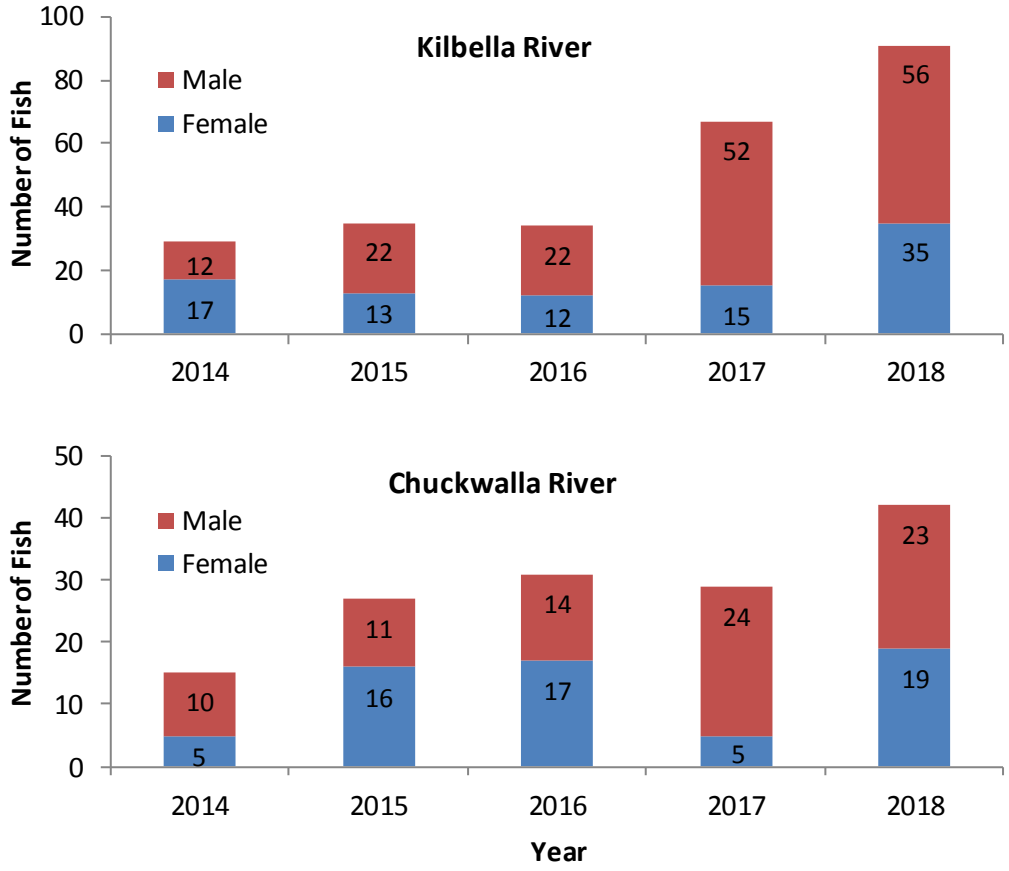


**Figure 3. Number of unique ('new') Chinook salmon encountered during broodstock collection activities, 2014 to 2018. These counts include both live and dead fish, but exclude recaptures.**

**Photo 1. Bell 206L Long Ranger helicopter used to transport crew and gear between the hatchery and rivers (August 2018).**

**Photo 2. Inflatable raft used for broodstock collection on Kilbella River (August 2018).**

**Photo 3. Chinook salmon with a uniquely numbered operculum tag and hole punch prior to release (August 2018).**

**Photo 4. John Willis (left) and K'odi Lewis-Willie (right) spawning a female Chinook salmon (A ugust 2018).**

**Photo 5. Sandie MacLaurin (left) and Kyle Morton (right) spawning a male Chinook salmon (August 2018).**

**Photo 6. Nadine Shaw (left) and Brydon Peace (right) fertilizing Chinook salmon eggs at the Percy Walkus Hatchery (August 2018).**