



December 3/4, 2020

## Kitwanga River Salmon Studies Post-Season Update – 2020



As in other years the Gitanyow Fisheries Authority (GFA) operated the Kitwanga River Salmon Smolt Enumeration Facility (KsF) and the Kitwanga River Adult Salmon Enumeration Facility (KSEF) in 2020. This document summarizes the results collected through both programs in 2020.

## KsF Operations

GFA operated the KsF for the 13<sup>th</sup> consecutive year in 2020 (2008-2020), with funding from DFO’s Stock Assessment program and the Gitanyow Aboriginal Fisheries Strategy program. The purpose of the project annually is to fully enumerate Kitwanga sockeye smolts leaving Gitanyow Lake and to biologically sample a portion of the run in any given year. GFA also enumerate and sample Kitwanga coho salmon smolts leaving the upper part of the Kitwanga Watershed through the facility. A portion of the coho smolts caught were also adipose fin clipped and coded-wire tagged (CWT) for fisheries management tracking purposes. The KsF is a key assessment tool for the *Kitwanga Sockeye Rebuilding Program* and an important management tool for middle Skeena coho.

The KsF smolt weir was operational by April 14<sup>th</sup>, 2020. Smolt enumeration, sampling and CWT tagging (coho only) occurred uninterrupted from April 14<sup>th</sup> to July 7<sup>th</sup>, 2020.

## Sockeye Smolts

The total number of sockeye smolts counted through the facility in 2020 was **23,753** of which 3% (n=650) were randomly sampled for length, weight and age (scale smears). The majority of the sockeye smolts migrated through the weir between April 30<sup>th</sup> – May 13<sup>th</sup>, 2020 with a peak count of 8,471 on the night of May 6<sup>th</sup>. Sockeye smolt run timing was in line with previous years run timing. The overall production of Kitwanga sockeye for the year was estimated at **83 smolts per female**, assuming that most smolts were one-year old’s (to be determined by scale aging at a later date). Usually, most Kitwanga sockeye smolts are one-year old’s (~99%) and if true, this year they would have originated from the 2018 brood year. This estimate was generated by dividing the total number of 1-yr old smolts produced in 2020 by the number of adult females that escaped to the river and presumed to have successfully spawned in 2018. It should be noted that in 2018 GFA tracked adult sockeye using radio telemetry between the KSEF and the KsF and it was determined that in-river mortality was very high estimated at 68% for tagged fish and only 268 female adult sockeye reached Gitanyow Lake. Prior to 2017 and 2018, we had not conducted radio telemetry studies to determine on route mortality, and therefore the total adult escapement through the KSEF was assumed to have reached the lake to spawn. In river tracking was conducted in 2017 and 2018 because in these years river levels were extremely low and we found that adults struggled to make it to Gitanyow lake because of high predation and beaver dam blocking issues. If mortality is taken into account for the 2018 brood year, the estimated average smolts per female production would have been much lower and **estimated to be only 31**.

The long-term average for smolts per female is 73 (2008-2020) and the short-term average is 36 (2014-2020 – Table 1).

**Table 1: Sockeye smolt production in 2020 compared to results from the KsF from 2008 to 2019**

Female Spawner Brood Year	Female Spawner	Smolt Year	Smolt Estimate	Smolts per Female
2006	2,643	2008	226,273	86
2007	125	2009	34,970	280
2008	684	2010	113,044	165
2009	1,615	2011	83,717	52
2010	9,778	2012	400,907	41
2011	1,230	2013	84,294	69
2012	2,574	2014	46,955	18

Female Spawner Brood Year	Female Spawner	Smolt Year	Smolt Estimate	Smolts per Female
2013	277	2015	12,165	44
2014	7,123	2016	33,423	5
2015	2,272	2017	11,914	5
2016	451	2018	22,083	48
2017	134	2019	6,920	52
2018	286	<b>2020</b>	23,753	83*
<b>Average</b>	<b>2,246</b>		<b>84,648</b>	<b>73</b>

\*With assumption that most smolts came from 2018 brood year.

Smolt per female production increased this year over last year, which seems to support previous findings that freshwater production varies quite significantly from year to year and although GFA, Skeena Fisheries Commission (SFC) and DFO (Cultus Lake Research Group) have been studying Gitanyow Lake for the last few years, no conclusive limiting factors to juvenile production have been found. To date monitoring has focused on dissolved oxygen / temperature profiling and chemical composition of Gitanyow Lake, parameters that highly influence juvenile sockeye survival and egg-to-fry survival in known spawning areas in Gitanyow Lake.

Planned projects to be undertaken in 2021 and beyond include, continuing with lake studies (e.g. thermal / dissolved oxygen strings at four long-term monitoring stations) and tracking studies (e.g. radio telemetry, PIT tagging) on adult sockeye in the Kitwanga River to identify the extent and severity of on route mortality issues.

Kitwanga sockeye smolts in 2020 were comparable in size to the long-term averages observed since detailed sampling programs were initiated over 15 years. In 2020, the average fork length was 107.4mm (long-term average 106.8mm), and the average weight was 12.4g (long-term average 11.9g).

## Coho Smolts

Coho smolts were also counted and randomly sampled through the KsF facility in 2020. The first coho smolt was enumerated on April 27<sup>th</sup>, with the peak of the run occurring on June 11<sup>th</sup>. A total of **8,194** coho smolts were counted through the KsF by the time it was shut down for the season on July 7, 2020. A total of 296 coho smolts were sampled for length, weight and age (4%) and **7,808** (>95% of the run from above Gitanyow Lake) were implanted with a CWT.

## KSEF Operations

In 2020, GFA operated the KSEF for the 18<sup>th</sup> consecutive year. Funding for the program was provided by the Pacific Salmon Commission Northern Fund, DFO's Stock Assessment and Aboriginal Fisheries Strategy programs and from the Gitanyow Huwilp Sustainability Fund.

Annual operations of the KSEF provides important stock assessment information of Kitwanga sockeye, chinook, pink, chum and coho salmon. The information collected is also used as a middle Skeena index to support management decision makers.

The KSEF was operated from July 15<sup>th</sup> to September 13<sup>th</sup>, 2020.

Overall water levels at the KSEF were much higher than the long term averages recorded between 2004 to 2019 (excluding 2018 low flow year) from the start of the program through to the removal of the fence in mid-September. This made the operations particularly challenging this year (Figure 1), so challenging that between August 16–17 and again between August 21–28 after heavy rainfall and flooding on the Kitwanga River, some or all the panels had to be left opened to relieve pressure on the fence to prevent permanent damage to the facility. It is not known how many fish passed through the KSEF uncounted during this time and unfortunately the

timing corresponded to when much of the Chinook, pink and chum would have escaped through the site. Large logs and other debris were carried down the river and were lodged on the facility log boom and the weir itself during this period. Fortunately, no serious damage to the site was observed but GFA crews spent considerable time dislodging debris and cleaning the site, including many 24-hour shifts to maintain the integrity of the facility. The fence was rendered fish tight once again on August 28<sup>th</sup> and remained fish tight until it was removed on September 14, 2020. The KSEF was left in from August 28<sup>th</sup> to September 14<sup>th</sup> in order to add to the overall counts for Chinook, pink, chum and coho and to allow for more biological sampling for each species. GFA with support from DFO also had planned to conduct aerial and foot surveys above the facility after the high water August events in hopes of estimating the number of fish passed uncounted, but the waters remained high and dirty right through to when the facility was dismantled in mid September preventing any visual counts from taking place.



*Photo on left shows large log that was removed from fence and photo on right shows logs that were removed from the fence over a one-week period.*



*View towards right bank of water overtop of sampling area on left bank during high water event.*



*Photo on left shows upstream view from right bank and photo on right is upstream view of KSEF after panels had been opened.*

After high water flooding compromised the KSEF operations on August 16<sup>th</sup> (first breach), GFA set-up the Kitwanga smolt fence (KsF) below Gitanyow Lake (30km upstream) and made it fish tight so it could be used as a secondary adult salmon counting facility, mainly to count sockeye and coho. Many salmon spawn between the KSEF and KsF but all the sockeye and about half of the coho spawn above the KsF site. The installation and operation of the KsF as a back-up is very important to the Kitwanga sockeye rebuilding program.

The KsF was operational and fish tight by August 21<sup>st</sup> within five days of the first breach at the KSEF. For 2020, the KsF included the operation of an autonomous solar powered remote telemetry underwater DVR camera system equipped with satellite communication technology. The camera system was similar to the system utilized at the KSEF. This new camera system for the site was set up temporarily for this year and was made possible due to a GFA / SFC partnership and funding from the BC Science Restoration and Innovation Fund (BCSRIF). The system performed remarkably well and counted fish through the facility uninterrupted using mostly solar power through to when the KsF was removed on November 2<sup>nd</sup>, 2020. GFA also conducted stream walk counts of all known Kitwanga coho spawning areas through the fall as water conditions permitted, to estimate the total coho return to the upper part of the watershed for 2020.



*View of two sockeye through the camera box at KsF on August 26, 2020 (left) and view of camera box at KsF on October 11, 2020 (right).*

Water temperatures in the Kitwanga River were lower than normal for most of the period that the KSEF was operational. Temperatures fluctuating between 10-13°C (Figure 2).

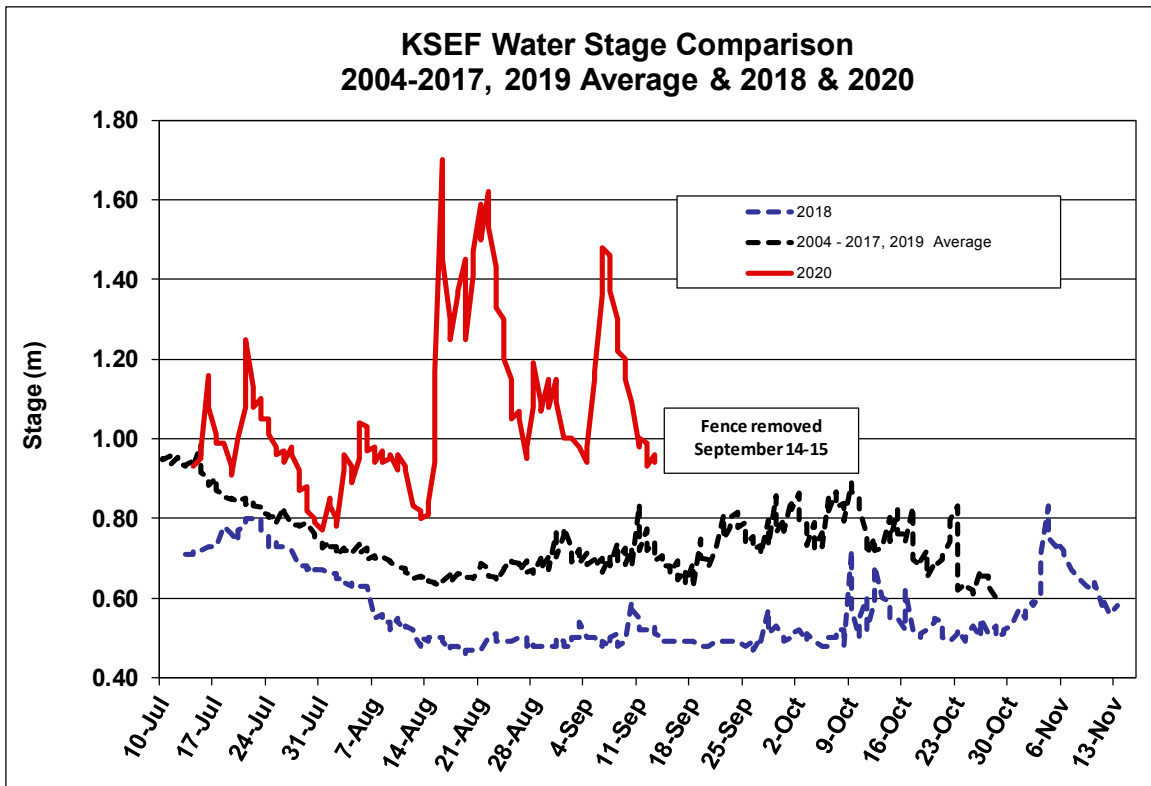


Figure 1: Average stage recordings at the KSEF (2004-2017, 2019 average, 2018) vs. 2020 results.

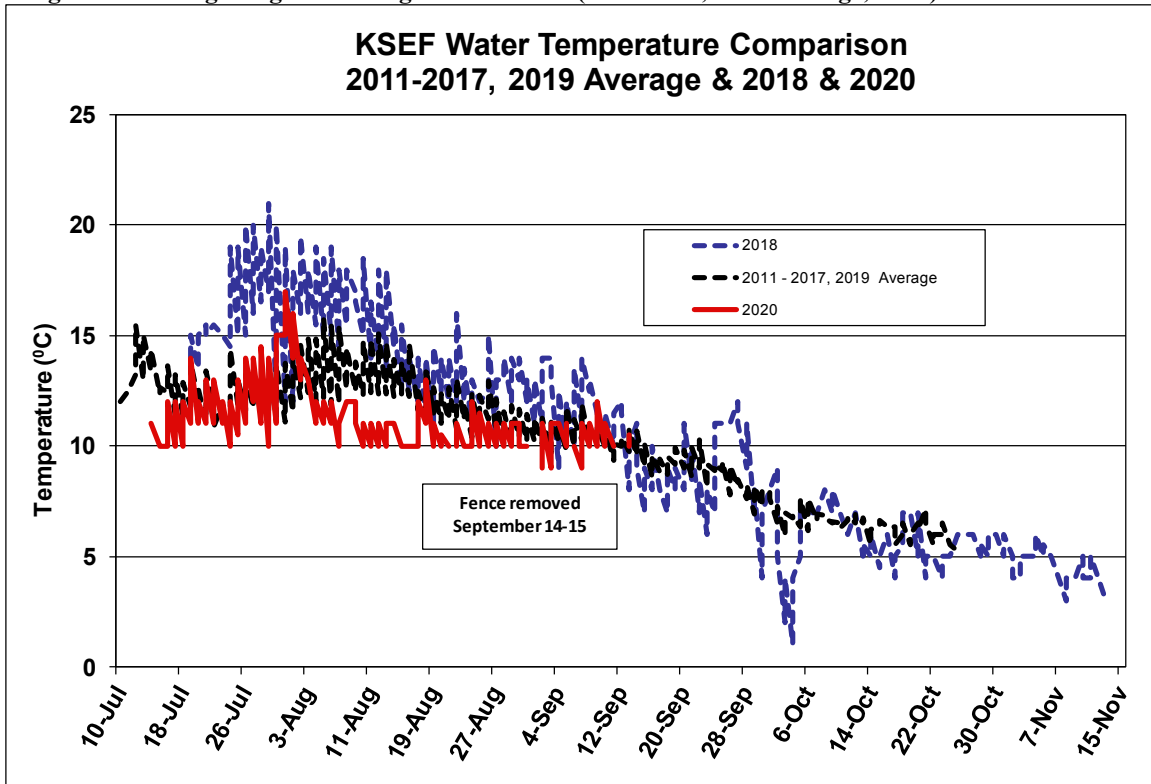


Figure 2: Average water temperature at the KSEF (2004-2017, 2019 average, 2018) vs. 2020 results.

In 2020, GFA once again operated a digital video camera recorder (DVR) at the KSEF. The DVR camera box was in place and operational on July 20<sup>th</sup>, 2020 and passed all species successfully. As was the case in 2018 and 2019, fish seemed more comfortable moving through the camera box than through our regular sample box areas which resulted in shorter holding times below the KSEF.

Salmon counts for Chinook, pink, chum and coho through the KSEF as of September 13<sup>th</sup>, 2020 are presented in Table 2 below. **Please note that these numbers are the minimum estimates for 2020** as we do not know how many passed through the KSEF uncounted during the high water events between August 16 – 17 and between August 21-28. In addition, for pink, chum and coho, when the fence was pulled on September 14, an estimated 2%, 23.9% and 73.6% of the respective runs were still to come (based on average % run timing from 2003-2019).

**Table 2: Salmon returns through the KSEF in 2020**

Salmon Species	2020 Returns to Sept. 13 <sup>th</sup>	Avg. % Run through KSEF to Sept. 13 <sup>th</sup> (2003-2019)	Minimum Escapement (2003-2019)	Maximum Escapement (2003-2019)
<b>Chinook*</b>	<b>119</b>	100 %	586 (2017)	3,225 (2007)
<b>Pink (even year)</b>	<b>1,939</b>	98.0 %	2,736 (2018)	75,416 (2014)
<b>Chum</b>	<b>35</b>	76.1 %	150 (2008)	1,862 (2005)
<b>Coho</b>	<b>210**</b>	26.4%	551 (2018)	12,080 (2009)

\*Excluding jack chinook (n=202) counted this year.

\*\*See below for overall coho estimates once our KSEF, KsF and stream walk counts are integrated.

### **Sockeye Adults**

A total of 440 sockeye were counted through the KSEF and KsF in 2020. This escapement is well below the long-term (2003-2019) average of 3,885 (Figure 3).

Once the KSEF was installed and fish tight as of July 15, the first sockeye passed the site on August 2<sup>nd</sup>. A total of nine sockeye were counted through the KSEF during the July 15<sup>th</sup> to September 13<sup>th</sup> operations with the remaining 431 counted through the KsF.

The first sockeye counted through the KsF was on August 26<sup>th</sup>. Given the timing, the high water levels in the Kitwanga River for the period and the travel time required for sockeye to navigate between the KSEF and the KsF, GFA does not believe any sockeye would have passed the KsF uncounted between the time the KSEF went down for the first time and when the KsF was rendered fish tight. However, based on two years of telemetry tracking conducted on Kitwanga sockeye in 2017 and 2018 it is estimated that 5 of the 9 sockeye counted through the KSEF prior to August 16<sup>th</sup> likely would have passed the KsF site prior to its set-up and this is reflected in the total count.

Age results for 2020 adult sockeye were not available in time for this summary, but they will be included in the 2020 KSEF Annual Report, which will be finalized in early 2021. On average (2002-2019), four-year olds comprise 80% of the run, with five-year old's at 19% and three-year old's at approximately 1%.

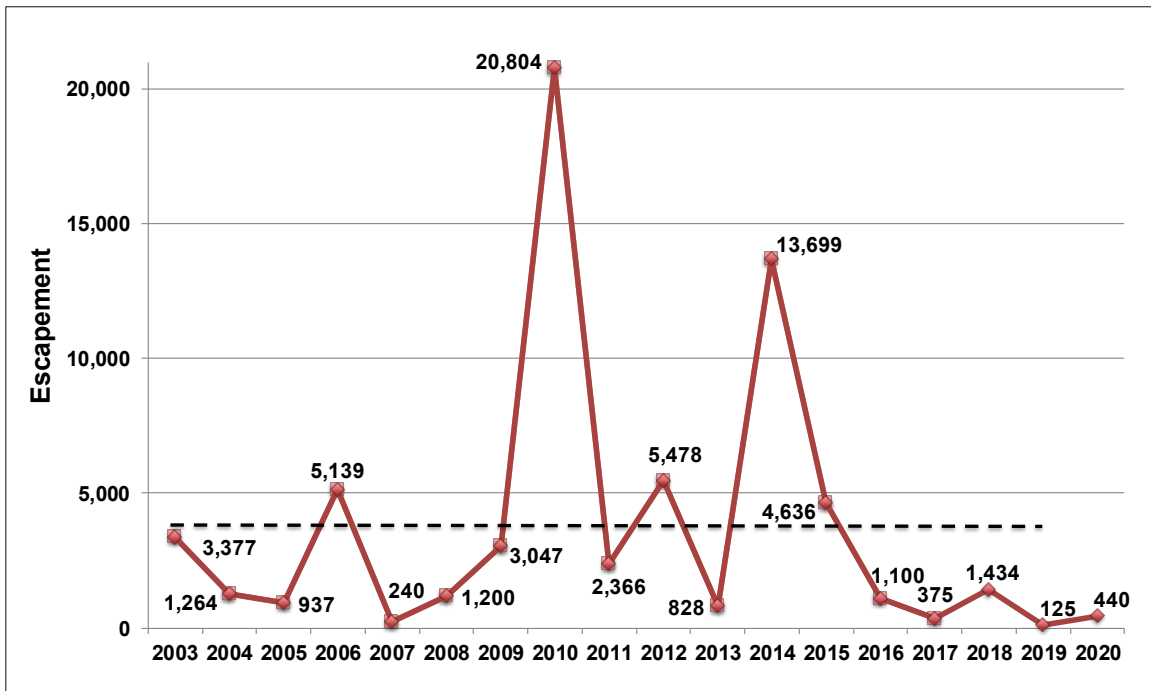


Figure 3: Kitwanga Sockeye Escapements 2003-2020 (dashed line represents average).

### Coho

An estimated minimum of 553 coho were counted at the KSEF, KsF and through multiple stream walks on known spawning areas in 2020. This is well below the long-term average of 3,578 from 2003 to 2019 (Figure 4).

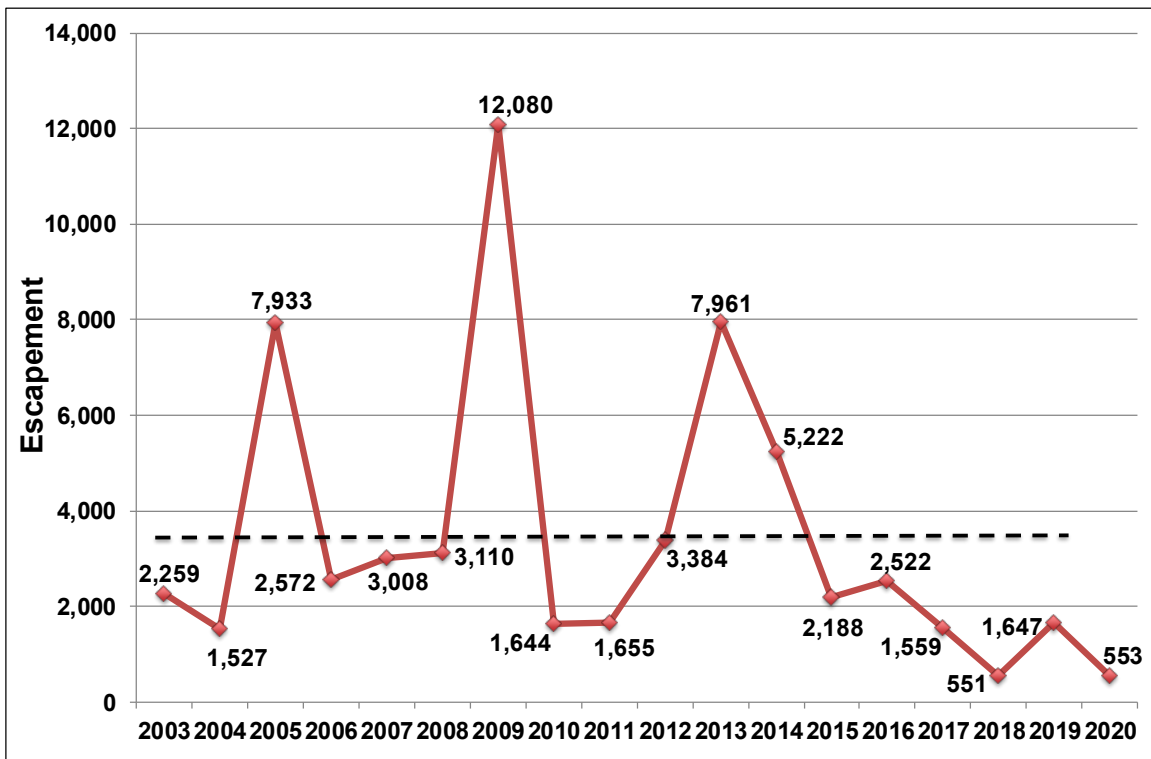


Figure 4: Kitwanga Coho Escapements 2003-2020 (dashed line represents average).