Gitanyow Fisheries Authority

Kitwanga River Salmon Enumeration Facility – 2013 Annual Report

Submitted to: Gitanyow Hereditary Chiefs,
Pacific Salmon Foundation
Fisheries and Oceans, Canada,
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Skeena Wild Conservation Trust.

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Abstract

In 2013, the Gitanyow Fisheries Authority (GFA) operated the Kitwanga River Salmon Enumeration Facility (KSEF) for the 11th consecutive year to count and biologically sample Pacific salmon returning to the Kitwanga River. The fence stayed operational and leak-free from July 10th to October 28th, 2013. A total of 828 sockeye, 758 chinook, 120,172 pink, 567 chum, and 7,961 coho salmon were enumerated through the facility. The 2013 sockeye return of 828 fish was well below the highest recorded of 20,804 in 2010, above the lowest return of 240 fish in 2007, but much less than the running average of 4,385 fish per year (2003-2012). The 2013 chinook return of 758 fish was the lowest recorded at the KSEF since 2003, and 45 percent below the running average (2003 – 2012). The 2013 chinook return marked the sixth consecutive year of declines since the highest return of 3,225 chinook was seen in 2007. The 2013 pink run of 120,172 fish compares to a maximum odd year return of 559,865 in 2009 and a minimum return of 68,410 in 2011. The 2013 pink returns were much less than the odd-year running average of about 278,000 (years 2003, 2005, 2007, 2009, 2011), however the 2013 return almost doubled replacement of its 2011 broodstock of 68,410 fish. The 2013 chum salmon return of 567 fish was 70% of the average escapement recorded from 2003-2012 (806 fish), and marked the 8th consecutive year of low escapements. The 2013 coho escapement of 7,961 fish was well above the 2003-2012 average of 3,588 fish. GFA is confident that essentially the entire runs of sockeye, chinook, pink and chum salmon were captured during fence operation and only the run of coho may be underestimated due to the possibility that the run may have continued after fence closure.

Acknowledgements

Gitanyow Fisheries Authority (GFA) would like to thank the Gitanyow Hereditary Chiefs for their continued leadership and support for the GFA program, the 2013 project donors: Fisheries and Oceans Canada, the Pacific Salmon Foundation and Skeena Wild Conservation Trust. GFA would also like to acknowledge our field staff for all their hard work and dedication throughout the program, which made the operations a success. In 2013 GFA technicians included: Les McLean, Earl McLean, Vernon Russell, Phillip Johnson, Francis Williams and Brenton Williams and GFA lead staff: Derek Kingston, Mark Cleveland, Gregory Rush, Kevin Koch, Ian Riemenschneider.

Table of Contents

1. Introduction and Background 1
2. Description of the Study Area 3
3. KSEF Design and Operating Methods 5
4. Results 8
   4.1 Sockeye 9
   4.2 Chinook Salmon 14
   4.3 Pink Salmon 18
   4.4 Chum Salmon 19
   4.5 Coho Salmon 1
5. Discussion and Recommendations 1
6. References 1

List of Tables

Table 1: Run timing and total counts for all species counted through the KSEF in 2013..... 8
Table 2: Kitwanga sockeye salmon escapements from 2000 – 2013 with estimated Exploitation Rates from the Alaskan Marine and In-River fisheries. Total exploitation rates were provided by the Prince Rupert – DFO. 11
Table 3. Sockeye salmon fork length statistics at the KSEF in 2013. 12
Table 4: Average length (cm) for sockeye male, female and combined sexes from 2003 to 2013. 13
Table 5. Sockeye salmon age, sex and fork length statistics at the KSEF in 2013 (CL = mean variance at 95% confidence). 14
Table 6: Average, minimum, and maximum fork lengths (cm) for chinook salmon sampled in .. 16
2013 at the KSEF (n=103)..... 16
Table 7: Average length (cm) for chinook male, female and combined sexes from 2008 to 2013. 17
Table 8: Age Distribution of chinook salmon sampled at KSEF in 2012. 17
Table 9: Age Distribution of chinook salmon sampled at KSEF in 2013. 18
Table 10: Mean, minimum and maximum fork lengths (cm) for chum salmon sampled in 2013 at the KSEF. 21
Table 11: Average length (cm) for chum male, female and combined sexes from 2008 to 2013. 22
Table 12: Age distribution for chum salmon sampled in 2012 at the KSEF. 1

Table 13: Mean, minimum, and maximum fork lengths (cm) for coho salmon sampled in 2013 at the KSEF. 3
Table 14: Mean length (cm) for coho male, female and combined sexes from 2010 to 2013. 3
Table 15: Age distribution for coho salmon sampled in 2012 at the KSEF. 4
Table 16: Age distribution for coho salmon sampled in 2013 at the KSEF. 4

List of Figures and Photos

Figure 1: Map of the Kitwanga Watershed including the KSEF (operating from 2003-2013) and the temporary fence sites (operating from 2000-2002). 4
Figure 2: Photo series of the general KSEF structure including fence panels, right and left bank counting stations, overhead walkway, and winch cables suspended from the walkway that raise and lower fence panels according to flow rate and debris build-up. 5
Figure 3: Photo series of counting and sampling stations used at the KSEF. 7
Figure 4: Water Stage at the KSEF, 2004-2012 average and 2013 recordings. 9
Figure 5: Annual Sockeye escapement into the Kitwanga River from the year 2003 to 2013..... 10
Figure 6: Kitwanga River sockeye salmon average run timing (daily run percent) for 2003-2012 vs. run timing for 2013 at the KSEF..... 11
Figure 7: Fork length distribution for sockeye salmon in 2013 (n=121); X axis labels are 5 cm length class upper boundaries..... 12
Figure 8: Annual escapement for chinook salmon from 2003 to 2013. 15
Figure 9: Kitwanga Chinook % Run past KSEF by day for 2003-12 vs. 2013. 15
Figure 10: Fork length distribution for chinook salmon in 2013 (n=103); X axis is 5 cm length class upper boundaries..... 16
Figure 11: Annual escapement for odd year pink runs at the KSEF. 18
Figure 12: Run timing for pink salmon (daily run %) in 2013 vs. average odd year run between 19
2003 and 2011. 19
Figure 13: Annual escapement for chum salmon at the KSEF..... 20
Figure 14: Kitwanga River chum salmon average run timing (daily run %) for 2003-2012 vs. run timing for 2013 at the KSEF. 20
Figure 15: Fork length distribution for chum salmon in 2013 (n=105); X-axis labels are 5 cm length class upper boundaries..... 21
Figure 16: Annual escapement for coho salmon from 2003 to 2013 at the KSEF. 1

Figure 17: Kitwanga River coho salmon average run timing (daily run %) for 2003-2012 vs. run timing for 2013 at the KSEF. 2
Figure 16: Fork length distribution for coho salmon in 2013 (n=306); X-axis labels are 5 cm length class upper boundaries). 3

1. INTRODUCTION AND BACKGROUND

Historically, the Gitanyow fished salmon in the Kitwanga River for food, social and ceremonial purposes with sockeye being the main salmon species of choice. In the early 1900's sockeye stocks were thriving and Gitanyow Elders spoke of the lakeshores of Kitwancool Lake turning red every fall as the sockeye congregated to spawn on their respective spawning grounds. However, by the 1920's the Elders talked of the noticeable declines in the returns of the Kitwanga sockeye stock. By the 1960's most fishing sites along the Kitwanga River were abandoned and aboriginal fishing for sockeye had ceased due to low run numbers and concerns for the unique stock (Cleveland 2005, Kingston 2013).

One of the largest contributors to sockeye decline is suspected to be over-exploitation of the stock in commercial ocean fisheries. Past fishery re-constructions for the last 40 years show the average exploitation on Kitwanga sockeye has been over 50% and reaching as high as 70% in some years (Cox-Rogers, DFO, Pers. comm., 2010). Other factors likely contributed to the declines such as sockeye habitat destruction in the Kitwanga Watershed due to poor forest harvesting practices, which include the sedimentation of spawning beds, the disruption of water flow patterns, and changes in water quality of Gitanyow Lake tributary streams (Cleveland 2006, Kingston 2013).

Accurate Kitwanga adult salmon escapement data has been ongoing since the construction and continual operation of the Kitwanga River Salmon Enumeration Facility (KSEF) in 2003 near the mouth of the Skeena River. In 1999, GFA initiated a Kitwanga sockeye-rebuilding program to conserve, protect and recover the stock. One of the highest rebuilding priorities for the Kitwanga Sockeye Salmon Recovery Plan (KSRP), which was initiated in 2006, was to continue monitoring the yearly abundance of Kitwanga sockeye salmon smolts emigrating from Gitanyow Lake (Kingston 2013) to arrive at estimates of adult to smolt survival rates.

Historically, the DFO Salmon Escapement Data System (SEDS) records for Kitwanga Sockeye are very limited. In most years, stream escapement counts were not completed and even in those years where they were performed, the results are suspect because Kitwanga sockeye are exclusively lakeshore spawners and lakeshore counts have proven to be very difficult and usually under estimated true annual escapements.

In 1999, GFA initiated a Kitwanga sockeye-rebuilding program to conserve, protect and recover the stock. A key component of the rebuilding program included the accurate determination of annual sockeye returns to Gitanyow Lake and investigations of the potential limiting factors to sockeye production. Subsequently, in 2000, 2001, and 2002 the GFA established and operated a temporary counting fence located about 4-km downstream of Gitanyow Lake, below all know Kitwanga sockeye spawning grounds. Sockeye escapement for 2000, 2001, and 2002 were 260, 227, and 971 respectively, well below historic escapement levels which are believed to be in the tens of thousands (Cleveland et. al, 2006). Unfortunately, the temporary fence was periodically susceptible to flooding and breaching. It was also very costly and time consuming to maintain.

Therefore, GFA recommended and eventually acquired funding from various groups to build a permanent counting structure near the mouth to the Skeena River. During the winter and spring of 2003, the Kitwanga River Salmon Enumeration Facility (KSEF) was constructed about 4 Km upstream of the Skeena River confluence at a cost of $750,000. The KSEF was operational in July 2003 when salmon were counted through the facility for the first time (Cleveland, 2004). This initiative benefited Skeena salmon management by providing accurate annual counts of sockeye, chinook, pink, chum and coho salmon returning to the Kitwanga River, a middle Skeena indicator stream.

In conjunction with counting fences, GFA initiated various studies to research potential limiting factors to Kitwanga sockeye production. Efforts to rebuild the stocks have been ongoing. These include spawning habitat assessments and restoration projects (Kingston 2008, 2009) and Kitwanga sockeye enhancement (Cleveland 2007, 2009 and McCarthy and Cleveland 2012). In addition, a reduction in exploitation on Kitwanga sockeye was promoted by GFA for both the ocean and inland fisheries during peak migration periods for Kitwanga sockeye. DFO has implemented reduced fishing regimes to protect and rebuild Kitwanga sockeye. Annual average total exploitation rates in the last 5 years are estimated to be about 20%. These compare positively to the more historical exploitation rates, which averaged over 45%.

In addition, the KSEF is a key assessment tool used to assess the relative successes of the coho reproduction, which is a key component of the KSEF program that includes the recovery of Coded Wire Tags (CWT) initiated by GFA in 2009. Recovering CWT's help fishery biologists / managers understand migration and harvest patterns of coho salmon in Canada and Alaska. CWT

recoveries also provides important information related to salmon ocean production, information used throughout northern BC to better understand overall salmon survivals.

Since 2003 the KSEF has proved useful for fisheries managers to provide in-season and post season information and support management decisions for Skeena River salmon stocks. Not only is the KSEF used as a middle Skeena salmon indicator, but it is also the only fence in the Skeena River watershed that provides an accurate salmon count for both pink and chum salmon.
The 2013 season marks the eleventh year of obtaining accurate results at the KSEF. The escapement data from 2000 to 2002 obtained from the temporary weir, stream walks and aerial flights prior to the construction of the KSEF and presented in previous reports are no longer included.

In 2013, the KSEF was operated with funding contributions from Fisheries and Oceans Canada, Pacific Salmon Foundation, Skeena Wild Conservation Trust and the Gitanyow Fisheries Authority. This report summarizes the sampling results and findings for the KSEF program in 2013.

2. DESCRIPTION OF THE STUDY AREA

The Kitwanga River (BC Watershed Code 400-364900) is a fifth order stream that drains into the Skeena River about 250 km northeast of Prince Rupert, B.C. It supports all six species of Pacific salmon including pink salmon (Oncorhynchus gorbuscha), chum salmon (O. keta), chinook salmon (O. tshawytscha), coho salmon (O. kisutch), sockeye salmon (O. nerka), and steelhead trout (O. mykiss). The Kitwanga River supports populations of resident rainbow trout (O. mykiss), cutthroat trout (O. clarki), Dolly Varden char (Salvelinus malma), bull trout char (S. confluentus), mountain whitefish (Prosopium williamsoni) and various other species of coarse fish (BC Fisheries Information Summary System, or FISS).

The drainage encompasses an area of about 83,000 hectares and has a total mainstem length of about 59 kilometers (Cleveland 2000). Gitanyow Lake separates the Upper and the Lower Kitwanga River. The Upper Kitwanga is located directly north of Kitwancool Lake and has a main stem length of about 23 km. The Lower Kitwanga River flows south for about 36 km between Gitanyow Lake and the Skeena River. The Lower Kitwanga River has four major gazetted tributaries: Tea Creek, Deuce Creek, Kitwancool Creek and Moonlit Creek. The Upper

Kitwanga River has no major tributaries and exhibits a multi-channel meandering configuration, with numerous beaver dams along its lower reaches.

The KSEF is located on the Kitwanga River about 4 km upstream from its confluence with the Skeena River (Figure 1). It is situated on private property and a Statutory Right of Way permit has been granted for the site to the Gitanyow Fisheries for salmon research until 2036. Because there are Gitxsan (Gitwangak) First Nation interests near the KSEF site, fishery personnel from the Gitwangak community are trained and employed annually by GFA to help operate the facility.

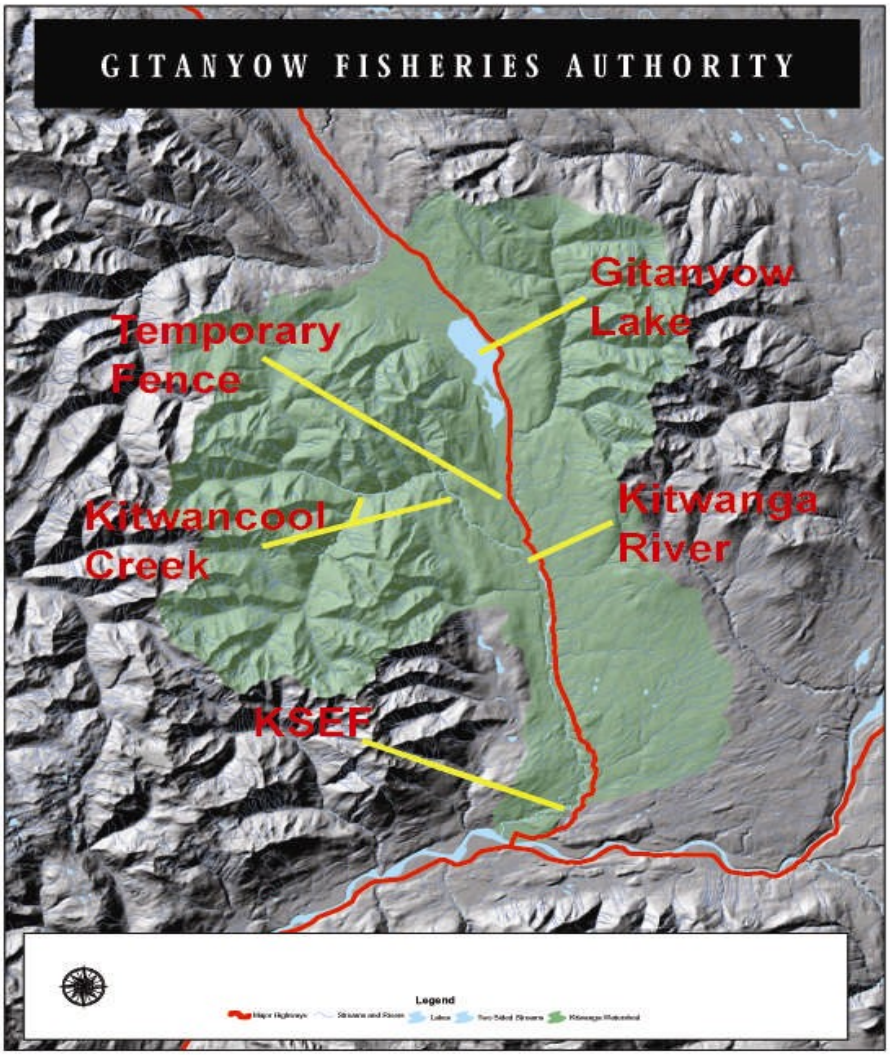

Figure 1: Map of the Kitwanga Watershed including the KSEF (operating from 2003-2013) and the temporary fence sites (operating from 2000-2002).

3. KSEF DESIGN AND OPERATING METHODS

The counting fence is located about 4 Km upstream of the mouth to the Skeena River and below most salmon spawning areas (Cleveland, 2004). The KSEF operates during the summer and fall months and uses aluminum panels that funnel fish into one of two counting stations located on the left and right banks of the river (Figure 2; photo series of KSEF design). From late fall through to the following summer, fence panels and counting boxes are removed allowing fish unimpeded movement past the site. The KSEF is about 30m wide and spans perpendicular to the rivers flow. The upstream ends of eighteen aluminum panels are secured to a cement base by metal hooks. The hooks allow the floating panels to hinge up and down as water levels fluctuate. The downstream ends of the panels are secured with 1/4" aircraft cable to eight - 1500 lb winches suspended from an overhead walkway bridge (see red flagging tape attached to cables in Figure 2). The winches and adjoining cables allow the fence to be easily raised or lowered depending on the water level and debris build-up at the KSEF.

Figure 2: Photo series of the general KSEF structure including fence panels, right and left bank counting stations, overhead walkway, and winch cables suspended from the walkway that raise and lower fence panels according to flow rate and debris build-up.

Once the aluminum panels are secured, the left and right bank counting stations are installed so that all fish can be recorded as they migrate past the fence. Fisheries technicians stationed at each trap box visually identify and tally fish by species. Each trap box has two counting chutes to direct fish into one of two large holding pens where they can be examined more closely, as necessary. A white teflon reflective background is used on the bottom of the trap boxes to make fish visual identification easier. A plexiglass-bottomed viewing box floats on the water to reduce glare and improve the fish visibility. Trap boxes are equipped with hand winches, which are raised or lowered to allow adequate water levels in the chutes.

In 2012 and 2013 GFA tested three experimental rotating panels designed to ease cleaning of leaves, woody debris, and dead pitch salmon during the fall rainy period. High water levels and debris accumulation often overwhelms the fence and result in early closure before all the salmon have escaped into the river. The new panel design was used during regular fence operations and proved much easier and quicker to clean. The new design allowed staff to safely rotate and clean the panels from the overhanging bridge without having to enter the river.

In 2013, random portions of the migrating salmon were systematically sampled to acquire a full range of fish sizes and scales for length/age analysis. When retrieved sampled fish were placed in a “V” trough equipped with a hose and electric pump which provided a constant supply of fresh river water during sampling (Figure 3; Photo series showing sampling stations and sockeye and chinook specimens). Samples were taken from all species except from pink salmon. Fish were also visually inspected to identify the presence of marks (e.g. adipose fin clip), measured for length and inspected for sex, ripeness and overall condition. Scale samples were collected for aging and are present in this report using the European method. This method presents ages using a two-number sequence with the first number representing the fresh water occupation period and the second number representing the salt-water occupation period.

GFA fisheries staff is instructed on proper fish handling techniques to reduce the stress on the fish. Crews of two fisheries technicians visually enumerated and tallied salmon as they swim through each trap box. One GFA technician would work on the right bank counting station and the other on the left bank counting station during each shift. The hours of operation were during daylight hours. The KSEF is closed nightly preventing upstream migration between dusk and dawn.

A manual stage gauge was used to measure river levels. Fisheries personnel recorded river levels four times daily. The manual stage gauge was established at the KSEF in 2004 and is used to compare water levels and flood events from year to year. Daily water temperatures, rain gauge measurements and air temperature are also recorded throughout the salmon migration period in 2013.

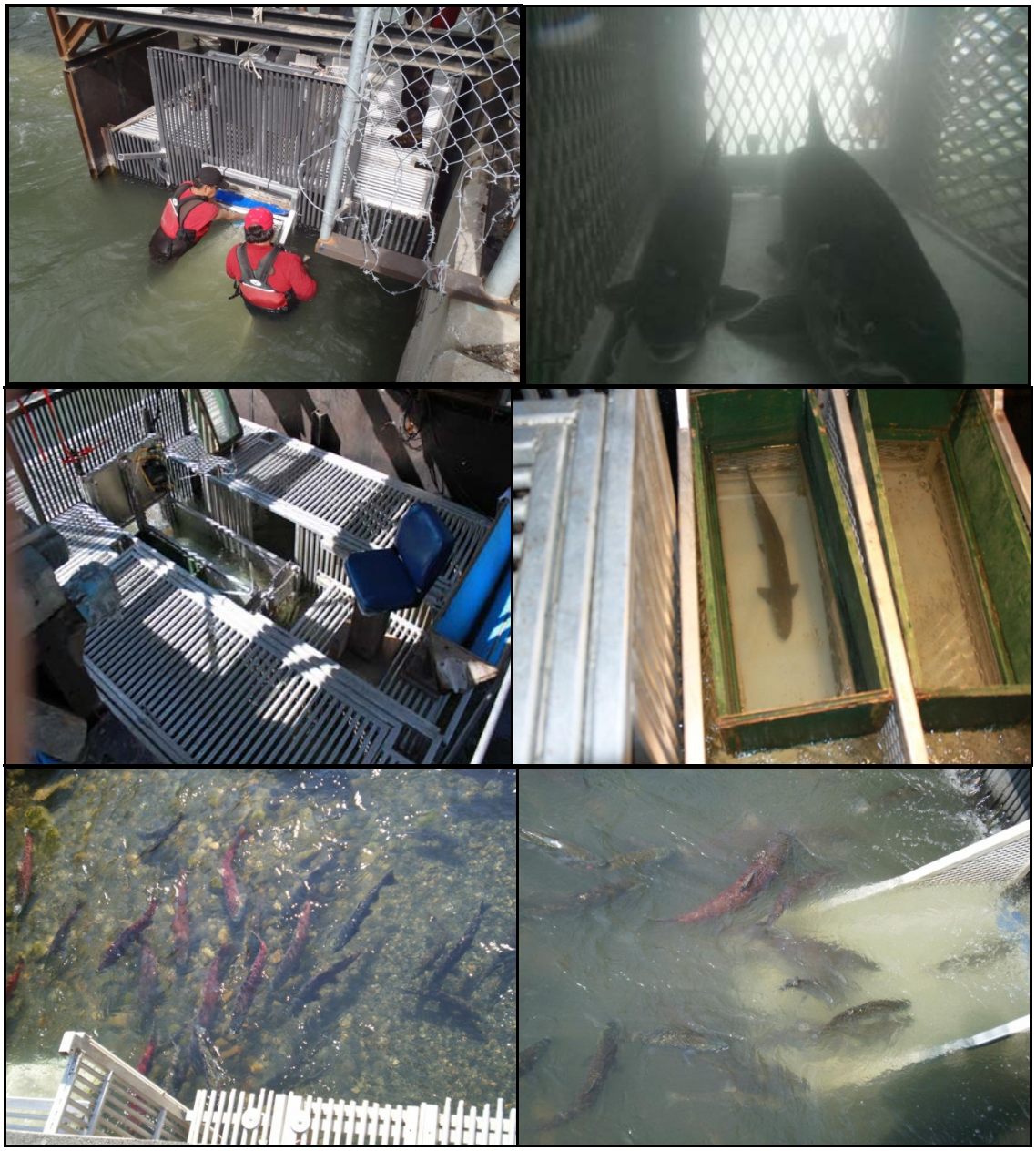

Figure 3: Photo series of counting and sampling stations used at the KSEF.

In July of 2013 during the KSEF set-up period, repairs were made to the KSEF after unseasonably high water flows and a woody debris torrent accumulated on the fence causing damage to the overhanging bridge and some of the support structures (contact GFA for details on fence damage and repairs). Funding to repair the damage was acquired from DFO and the repairs were made in fairly short order. KSEF operations proceeded as originally planned and fish counting was not delayed or compromised by the event.

4. RESULTS

The operation of the KSEF in 2013 marked the 11th consecutive year. The project was operated for a total of 111 days in 2013, from July 10th to October 28th. Based on average run timing through the KSEF (2003-2012), GFA assumes that all of the chinook, pink, chum, and sockeye, and coho runs would have moved through KSEF by the end of the project. A total of 130,286 salmon were counted through the fence during this period (Table 1).

Table 1: Run timing and total counts for all species counted through the KSEF in 2013.

Species	Run Start	Mid Run	Run End	Peak Run Range	Total Escapement
Sockeye	July 30th	September 15th	October 28th	August 10th – September 8th and October 5th - 9th	828
Chinook	July 17th	August 14th	September 15th	August 23rd – September 1st	758
Pink	August 1st	August 30th	October 11th	August 11th – September 16th	120,172
Chum	August 13th	September 11th	October 15th	August 26th – September 22nd	567
Coho	August 5th	September 18th	October 23rd	August 25th – September 23rd and October 5th - 9th	7,961

The average water level during July and the first half of August in 2013 were lower than the overall seen previously, but by the middle of August to the end of the project levels were normal (2004-2012). The highest water level occurred on October 7th peaking at 1.15m (Figure 4). Water temperatures were normal in 2013 and considered favorable for salmon during the fence operations ranging between 6.5 and 12.0 °C.

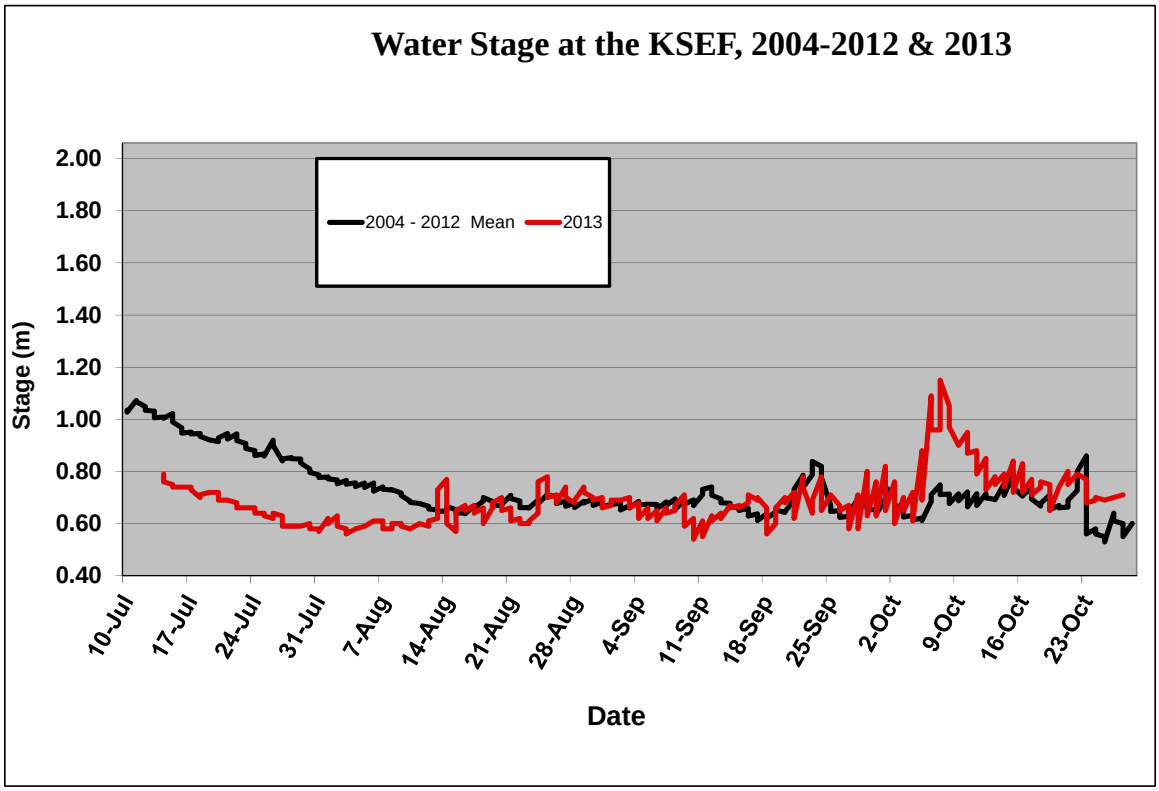

Figure 4: Water Stage at the KSEF, 2004-2012 average and 2013 recordings.

Species-specific breakdowns, including total counts, run timing, historical run numbers, size, age and sex structure are as follows:

4.1 Sockeye

A total of 828 sockeye were counted at the KSEF in 2013. Sockeye escapement in 2013 were well below the recorded high of 20,804 in 2010, above the lowest count of 240 counted in 2007, and less than 20% of the running average of 4,385 between 2003-2012 (Figures 5). The 2003 to 2013 running average has decreased and now stands at 4,062 sockeye per year.

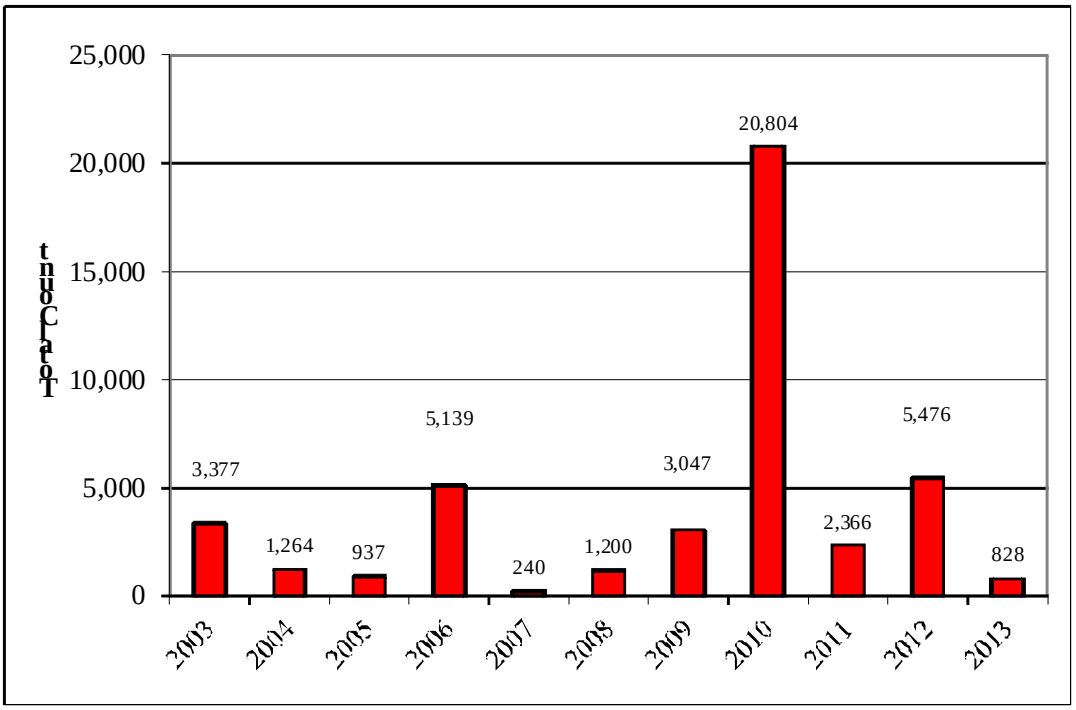

Figure 5: Annual Sockeye escapement into the Kitwanga River from the year 2003 to 2013.

In 2013, the first sockeye passed through the KSEF on July 30th about 3 weeks later than previous years. The last sockeye migrated through the fence on October 23rd (Figure 6), which is similar to other years. On the final day of fence operation, 28 sockeye counted on a stream walk downstream of the KSEF to the Skeena River and was added to the total fence count. Most of the sockeye run occurred roughly over a 4-week period from August 10th to September 9th, representing 66 percent of the total run. An outlier five-day burst of 141 sockeye (17 percent of the total run) occurred from October 5th to 9th.

Preliminary exploitation rates for 2013 from the Alaskan Marine and In-River fisheries were estimated at 13 percent (8% Alaskan Marine and 5% In-river) (pers. comm. Peter Hall, 2013). Without exploitation (estimated 108 sockeye removed), the estimated total return for would have been about 936 sockeye (Table 2).

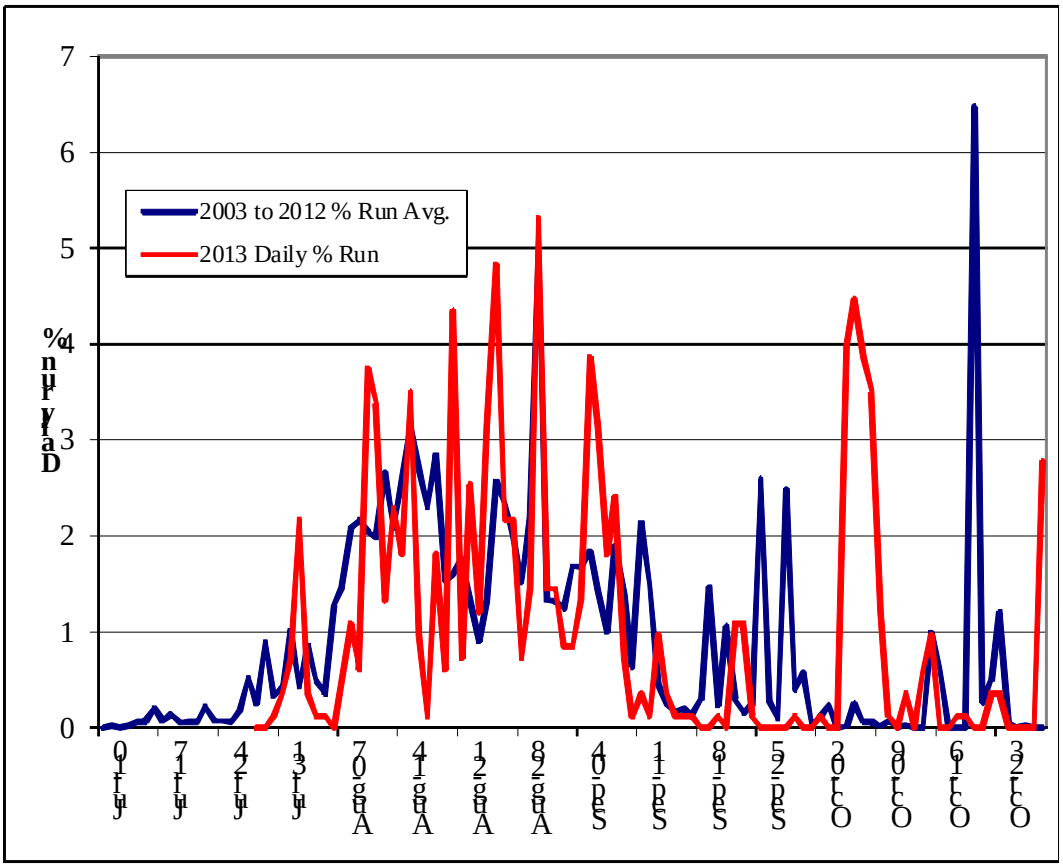

Figure 6: Kitwanga River sockeye salmon average run timing (daily run percent) for 2003-2012 vs. run timing for 2013 at the KSEF.

Table 2: Kitwanga sockeye salmon escapements from 2003 – 2013 with estimated Exploitation Rates from the Alaskan Marine and In-River fisheries. Total exploitation rates were provided by the Prince Rupert – DFO.

Year	Escapement	Total Exploitation (Alaskan + Canadian Marine + In-River)	Estimated Total Return
2003	3,377	38.0%	5,447
2004	1,264	38.3%	2,047
2005	937	27.9%	1,300
2006	5,139	54.2%	11,208
2007	240	61.3%	619
2008	1,200	50.0%	2,400
2009	3,047	15.0%	3,585
2010	20,804	14.5%	24,332
2011	2,366	31.0%	3,429
2012	5,476	32.0%	8,053
2013	828	13.0%	936

Fork length measurements, age and sex data were collected from 121 sockeye (14.6 percent of the run). Of these samples, male composition was nearly twofold greater than females at 79 males (65.3%) and 40 females (33%); the sex was unknown for two samples (1.7%). Average fork lengths were slightly greater for males and females showed a wider range in size than males (Table 3). Size class (5 cm) histogram showed a uni-modal distribution, dominated by fish in the 55 to 59 cm size class (39%) followed by fish in the 50 to 54 cm size class (31%; Figure 7). When male and female average length was compared to previous years, the 2013 results fell within the historical range (Table 4). Average length recorded since 2003 were similar and within a narrow 5-cm size range for males (55 to 60 cm), and females (52 to 57 cm)

Table 3. Sockeye salmon fork length statistics at the KSEF in 2013.

	Female	Male	Combined
Mean	54	58	57
Min	33	50.5	33
Max	65	67	67
Count	40	79	119

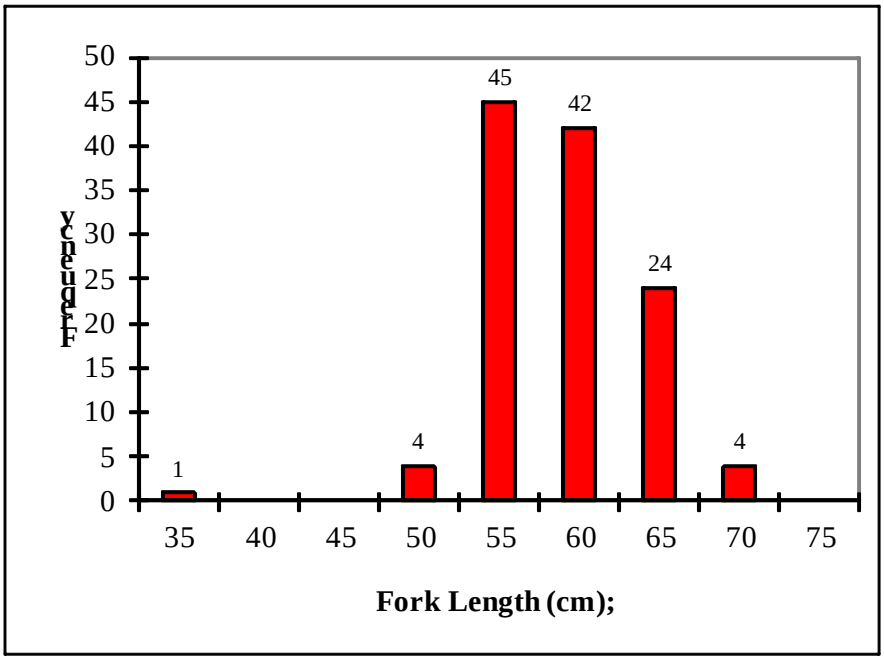

Figure 7: Fork length distribution for sockeye salmon in 2013 (n=121); X axis labels are 5 cm length class upper boundaries.

Table 4: Average length (cm) for sockeye male, female and combined sexes from 2003 to 2013.

Year	Male	Female	Total
2003	58.8	55.3	56.6
2004	58.3	56.4	57.1
2005	57.5	57.2	57.4
2006	55.3	52.6	53.8
2007	52.2	53.5	53.3
2008	58.3	54.9	56.3
2009	57.4	54.3	55.8
2010	56.5	53.9	55.3
2011	59.0	56.0	57.5
2012	58.0	55.0	56.0
2013	58.0	54.0	57.0

In 2013, 121 scale samples were collected from adult sockeye and submitted to Carol Lidstone of Birkenhead Scales Analysis for age determination. Of these, 107 were confidently readable providing a 12.9 percent sample of the total run. Complete age specific sex and length data sets were available for 105 of these age samples (12.7 percent of the total run; Table 5). Age 4 fish, originating from the 2009 broodyear, were the dominating age class for both males (55%) and females (86%). Mean size for age 4 fish differed slightly for males and females at 61.8 and 59.3 cm respectively. The bulk of the remaining sockeye were 5-year old fish (Aged 1.3) originating from the 2008 broodyear. Two females were 5-year old fish but with a 2.2 age and averaged 56.5cm.

Table 5. Sockeye salmon age, sex and fork length statistics at the KSEF in 2013 (CL = mean variance at 95% confidence).

All Years					
Sex	**Count**	**Mean (cm)**	**CL (95%)**	**Min (cm)**	**Max (cm)**
Male	69	58.3	0.987	50.5	67
Female	36	53.7	1.691	33	65
Total	105	56.7	0.95	33	67
1.2 (4- Year Old Returning Sockeye)					
Sex	**Count**	**Mean (cm)**	**CL (95%)**	**Min (cm)**	**Max (cm)**
Male	38	55.3	0.823	50.5	62
Female	31	53	1.8	33	65
Total	69	54.3	0.95	33	65
1.3 (5- Year Old Returning Sockeye)					
Sex	**Count**	**Mean (cm)**	**CL (95%)**	**Min (cm)**	**Max (cm)**
Male	31	61.8	0.937	57	67
Female	3	59.3	5.737	58	62
Total	34	61.6	0.908	57	67
2.2 (5- Year Old Returning Sockeye)					
Sex	**Count**	**Mean (cm)**	**CL (95%)**	**Min (cm)**	**Max (cm)**
Male	n/a	n/a	n/a	n/a	n/a
Female	2	56.5	6.353	56	57
Total	2	56.5	6.353	56	57

4.2 Chinook Salmon

A total of 758 adult chinook salmon returned to the KSEF in 2013. The 2013 return is well below the highest observed return of 3,225 chinook in 2007 and is the lowest count recorded at the KSEF. The 2013 return is 45.2 percent below the running average from 2003 to 2012, which was 1,678 fish (Figure 8). Furthermore, the 2013 return marked the sixth consecutive decline in the running average since the KSEF highest return in 2007; the running average now stands at 1,595 fish/year.

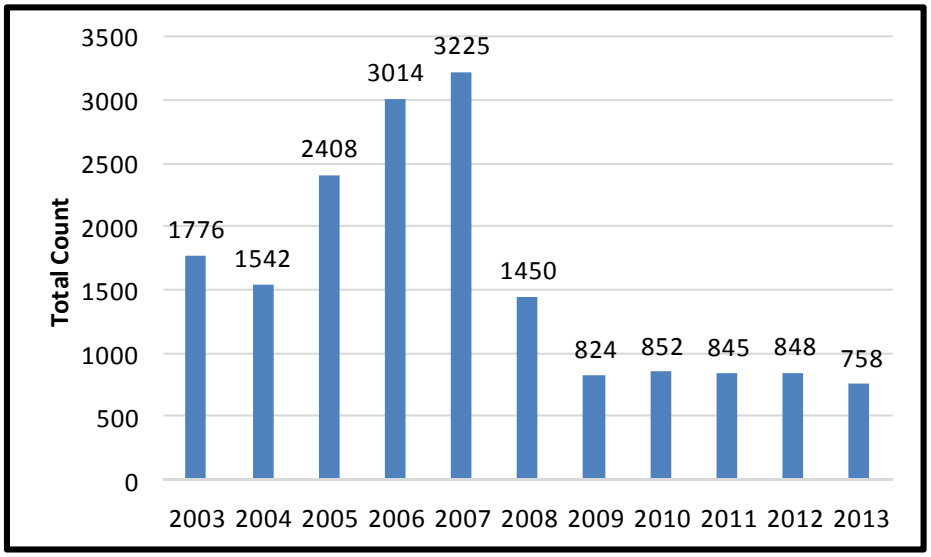

Figure 8: Annual escapement for chinook salmon from 2003 to 2013.

In 2013, the first chinook salmon was counted at the KSEF on July 17th and the last on September 15th. The 2013 main run timing range for Kitwanga chinook occurred from August 11th to September 1st (78% of the total run). The highest count was observed on August 25th (130 fish and 17 percent of the total) and was 17 days later than the average highest peak for years 2003 to 2012 (Figure 9).

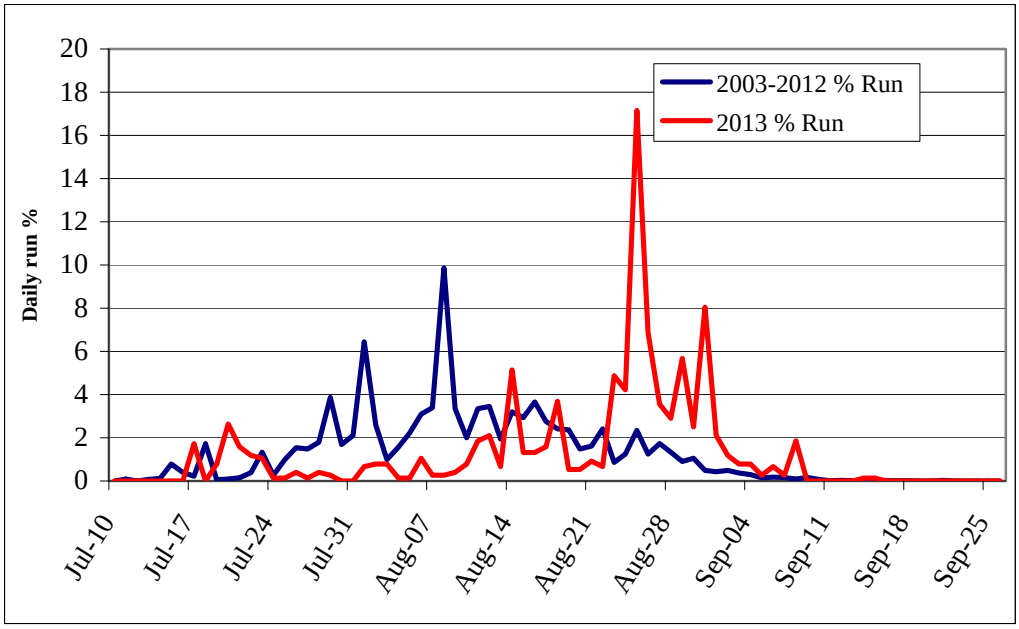

Figure 9: Kitwanga Chinook % Run past KSEF by day for 2003-12 vs. 2013.

Length, age, and sex data was collected from 103 chinook salmon (13.6 % of the total run) in 2013. Male and female sex ratios were 61 and 39 percent respectively. Size class (5 cm) histogram showed a varied distribution, but dominated by fish in 76-80cm class (27.2%) and followed by the 81-85cm class (22.3%; Figure 8). Average fork length of the total sample was 81.3 cm and males and females were 79.0 and 84.8 centimeters respectively (Table 6).

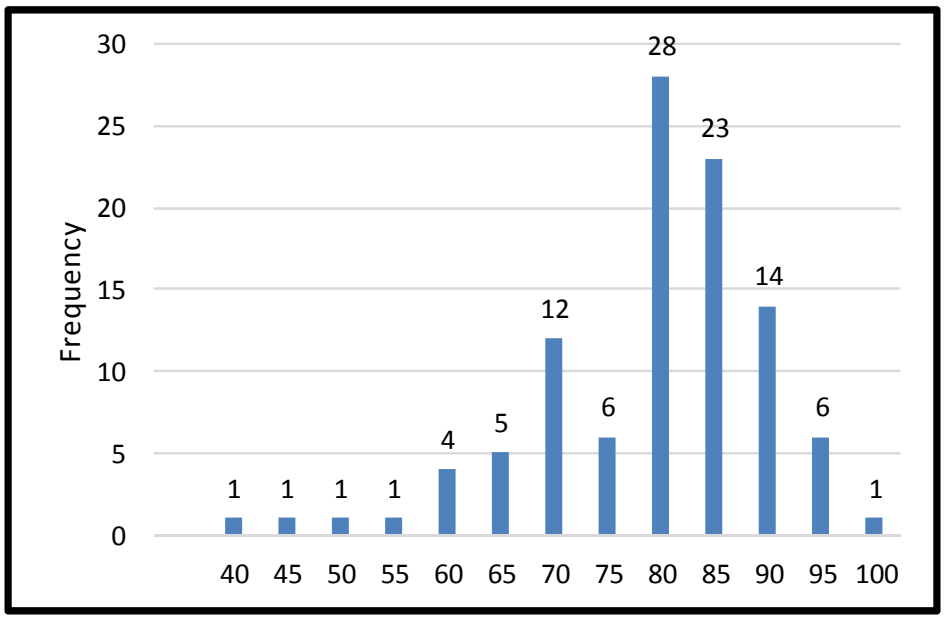

Figure 10: Fork length distribution for chinook salmon in 2013 (n=103); X axis is 5 cm length class upper boundaries.

Table 6: Average, minimum, and maximum fork lengths (cm) for chinook salmon sampled in 2013 at the KSEF (n=103).

	Male	Female	Combined
Mean	79.0	84.8	81.3
Minimum	40	68	40
Maximum	101	93	101
Count	63	40	103

Table 7: Average length (cm) for chinook male, female and combined sexes from 2008 to 2013.

Year	Male	Female	Combined
2008	87.8	92.3	89.2
2009	83.6	88.6	85.6
2010	74.6	87.5	80.7
2011	76	86	80.1
2012	77	84	80
2013	79	84.8	81.3

Age results for chinook in 2012 were not available for reporting, therefore they will be presented below (Table: 8). Of the readable scales from the 2012 aging sample (90 samples out of a run total of 848 fish, or 10.6% of the 2012 run), the majority of fish (47.8%) were 5-year old returns originating from the 2007 broodyear, followed by 4 year old returns originating from the 2008 broodyear (32.2%, Table 8). The progeny from the 2007 broodyear differed in life history by the amount of time spent in fresh and salt waters with the majority spending 1 year in fresh water.

Table 8: Age Distribution of chinook salmon sampled at KSEF in 2012.

European	Gilbert-Rich	Brood Year	Frequency	Percent
14	62	2006	15	16.7%
04	51	2007	1	1.1%
13	52	2007	41	45.6%
22	53	2007	1	1.1%
12	42	2008	29	32.2%
11	32	2009	3	3.3%
Total			90	100.0%

Of the readable scales from the 2013 aging sample (70 samples out of a run total of 758 fish, or 9.2% of the 2013 run), the majority of fish (60%) were 5-year old returns originating from the 2008 brood stock, followed by 4 year old returns originating from the 2009 brood stock (30%, Table 9). The progeny from the 2007 and 2008 broodyear differed in life history by the amount of time spent in fresh and salt waters with the majority spending 1 year in fresh water.

Table 9: Age Distribution of chinook salmon sampled at KSEF in 2013.

European	Gilbert-Rich	Brood Year	Frequency	Percent
14	62	2007	5	7.1%
23	63	2007	1	1.4%
13	52	2008	41	58.6%
22	53	2008	1	1.4%
12	42	2009	21	30.0%
11	32	2010	1	1.4%
Total			70	100.0%

4.3 Pink Salmon

A total of 120,172 adult pink salmon migrated past the KSEF in 2013. This compares to a maximum odd year return of 559,865 in 2009 and a minimum return of 68,410 in 2011 (Figure 11). The 2013 pink returns were less than half of the odd-year running average of 278,129 (years 2003, 2005, 2007, 2009, 2011) and was the second lowest recorded in an odd year since accurate counts were initiated in 2003.

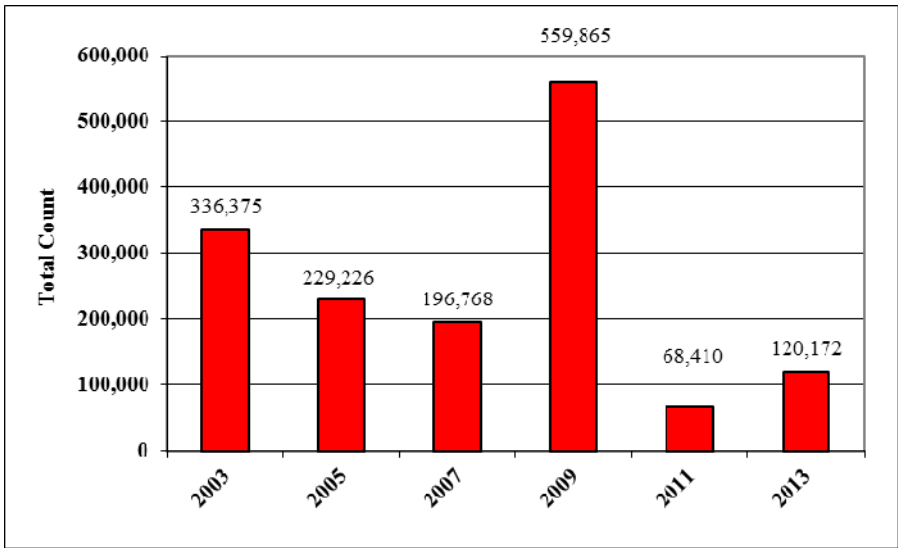

Figure 11: Annual escapement for odd year pink runs at the KSEF.

Since pink salmon are exclusively 2 year olds, all of the run would have originated from the

2011 broodyear, which had an escapement of 68,410 fish, meaning the 2013 return almost doubled replacement. The bulk of the pinks migrated through the KSEF occurred over a 4-week period between August 12th and September 13th (96% of the run; maximum count of 9,127 fish on August 31st, Figure 12). The peak run timing in 2013 was similar to that of other odd years.

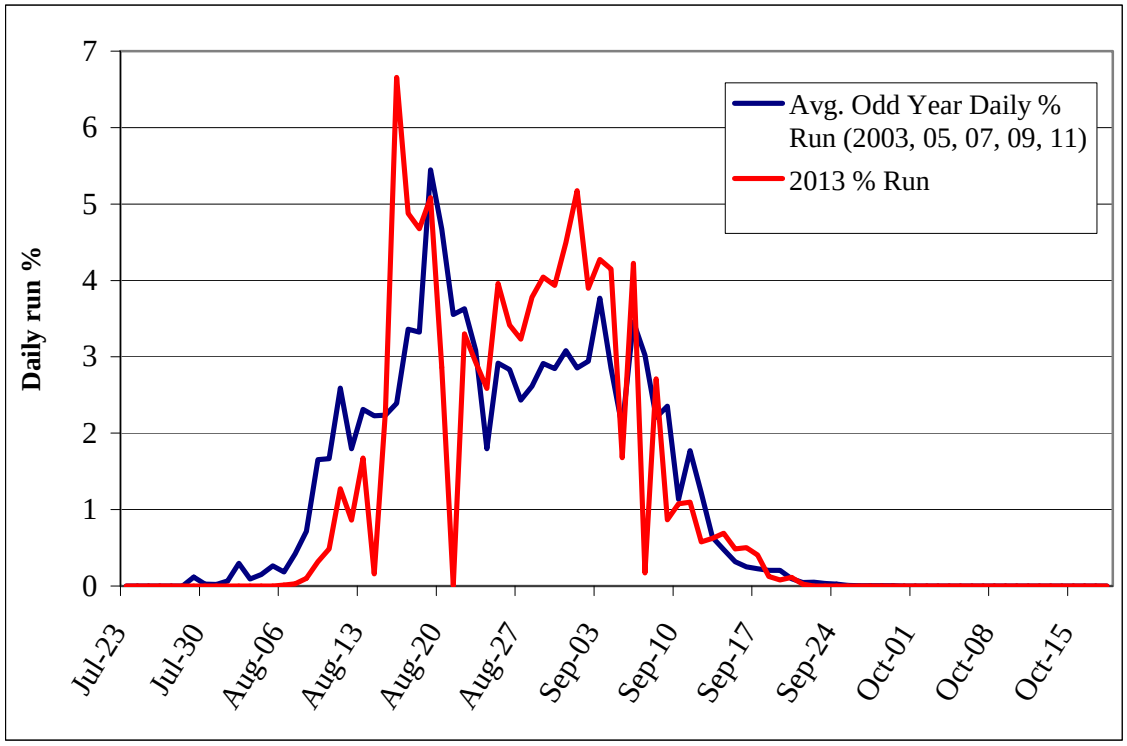

Figure 12: Run timing for pink salmon (daily run %) in 2013 vs. average odd year run between 2003 and 2011.

4.4 Chum Salmon

A total of 567 adult chum salmon migrated past the KSEF in 2013. The 2013 run compares to a maximum return of 1,862 fish in 2005 and a minimum return of 150 fish in 2008 (Figure 13). The 2013 chum escapement is 70% of the average escapement recorded from 2003-2012, which was 806 fish. The current average now stands at 784 fish/year.

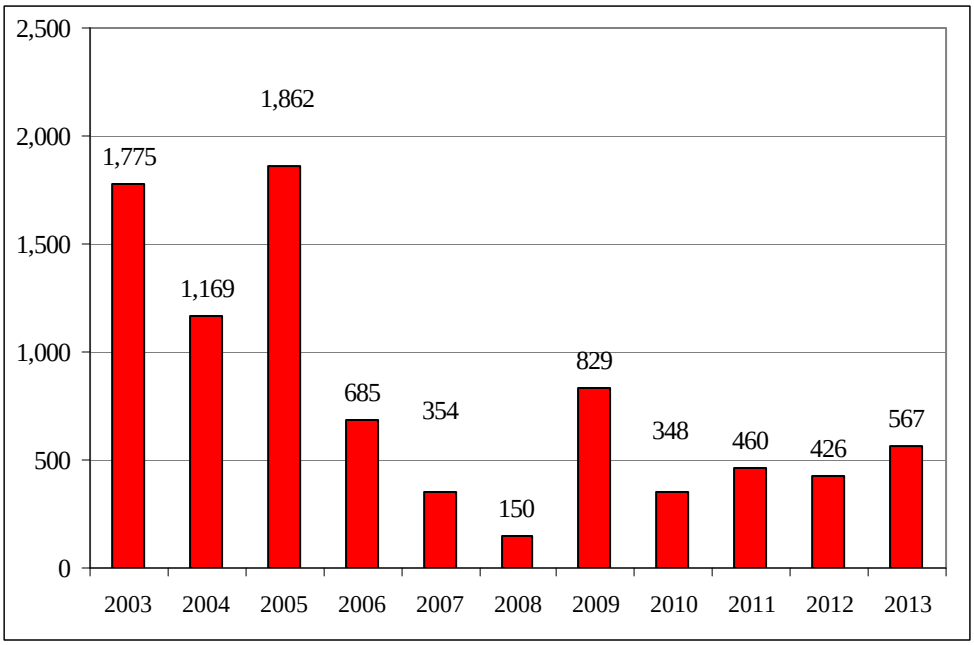

Figure 13: Annual escapement for chum salmon at the KSEF.

In 2013, the first chum salmon was counted at the KSEF on August 13th and the last on October 15th. The bulk of the run occurred over a 4-week period between August 26th and September 22nd (90% of the run; maximum count of 47 fish on August 31st; Figure 14).

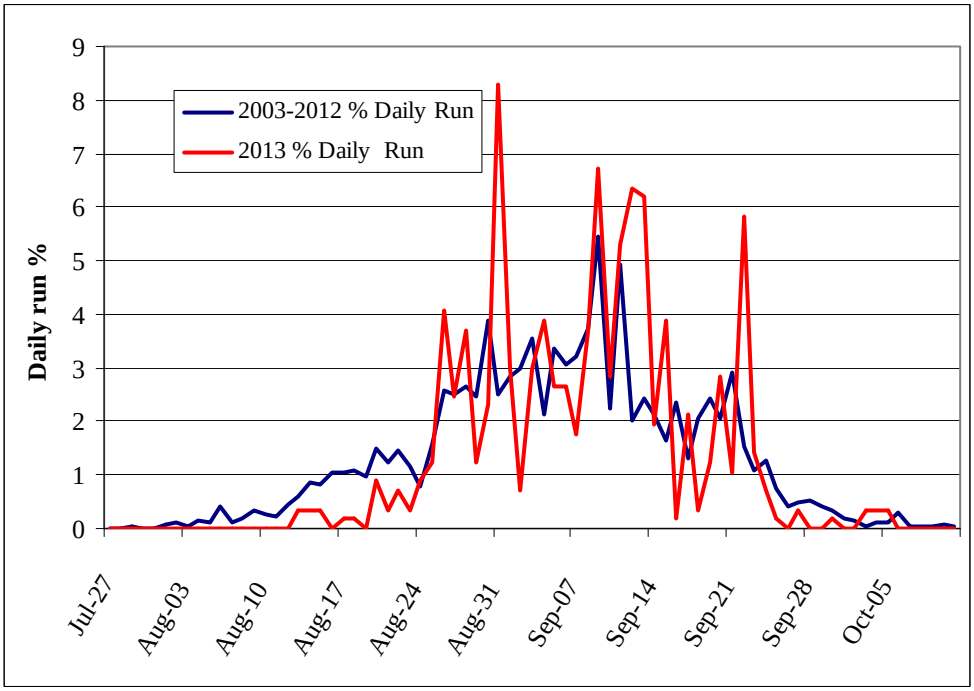

Figure 14: Kitwanga River chum salmon average run timing (daily run %) for 2003-2012 vs. run timing for 2013 at the KSEF.

Fork length, sex and age data was collected from 105 chum salmon in 2013 (18.5% of the run). Size class (5 cm) histogram showed a uni-modal distribution, dominated by fish in the 70 to 80 cm length class (about 65%; Figure 15). Male and female sex ratios were 45 and 55 percent respectively. On average, males were slightly larger than females (76.8 and 74.3cm respectively; Table 10). Compared to length data collected since 2008, the 2013 mean lengths were consistently within the 70 to 80 cm range (Table 11).

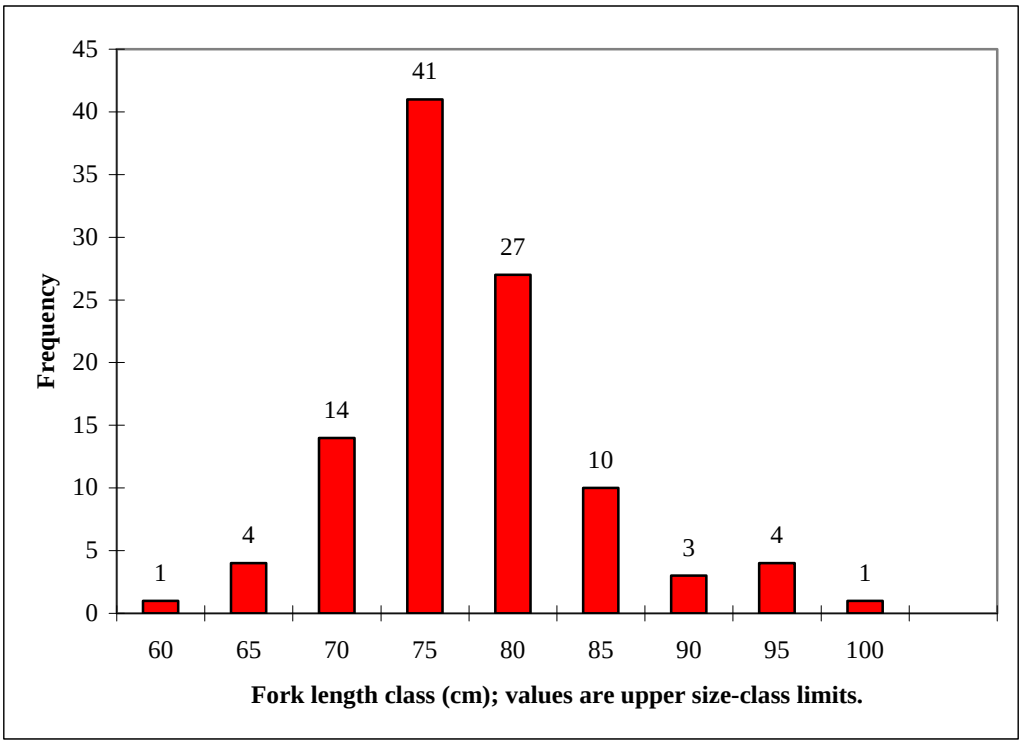

Figure 15: Fork length distribution for chum salmon in 2013 (n=105); X-axis labels are 5 cm length class upper boundaries.

Table 10: Mean, minimum and maximum fork lengths (cm) for chum salmon sampled in 2013 at the KSEF.

	Male	Female	Combined
Mean	76.8	74.3	75.4
Minimum	60	61	60
Maximum	100	93	100
Count	47	57	104

Table 11: Average length (cm) for chum male, female and combined sexes from 2008 to 2013.

Year	Male	Female	Combined
2008	77	70.3	75
2009	76.1	72	73.7
2010	76.5	73.9	75.1
2011	71	70	70.7
2012	80	77	78
2013	76.8	74.3	75.4

Age results for 2013 chum salmon returns were not available at the time of the report. However, 2012 age results not available for the 2012 report are presented below (Table 12). Of the readable scales from the 2012 aging sample (80 samples out of a run total of 426 fish, or 18.8% of the 2012 run), the majority of fish (72.5%) were 5-year olds originating from the 2007 broodyear, followed by 4-year old returns originating from the 2008 broodyear. Chum salmon almost immediately migrate to the ocean post-hatch therefore there are no freshwater annuli.

Table 12: Age distribution for chum salmon sampled in 2012 at the KSEF.

European	Gilbert-Rich	Brood Year	Frequency	Percent
05	61	2006	1	1.3%
04	51	2007	58	72.5%
03	41	2008	15	18.8%
02	31	2009	6	7.5%
Total:			80	100.0%

Age results for 2013 are presented below (Table 13). Of the readable scales from the 2013 aging sample (105 samples out of a run total of 567 fish, or 18.5% of the 2013 run), the majority of fish (91.4%) were 4 year olds originating from the 2009 broodyear.

Table 12: Age distribution for chum salmon sampled in 2012 at the KSEF.

European	Gilbert-Rich	Brood Year	Frequency	Percent
05	61	2007	1	1.0%
04	51	2008	4	3.8%
03	41	2009	96	91.4%
02	31	2010	4	3.8%
Total:			105	100.0%

4.5 Coho Salmon

The 2013 coho escapement of 7,961 fish was 4,373 fish above the 2003-2012 average (3,588 fish/year; Figure 16). However the running average is skewed by two abnormally high returns in 2005 and 2009 (7,100 and 12,080 fish respectively), while most of the other years runs ranged between about 1,000 and 3,000 fish (Figure 16). The current running average now stands at 3,986 fish/year. The 2013 run compares to a maximum return of 12,080 fish in 2009 and a minimum return of 690 fish in 2004, however in 2004 the KSEF closed relatively early on September 24th due to flooding and fence damage.

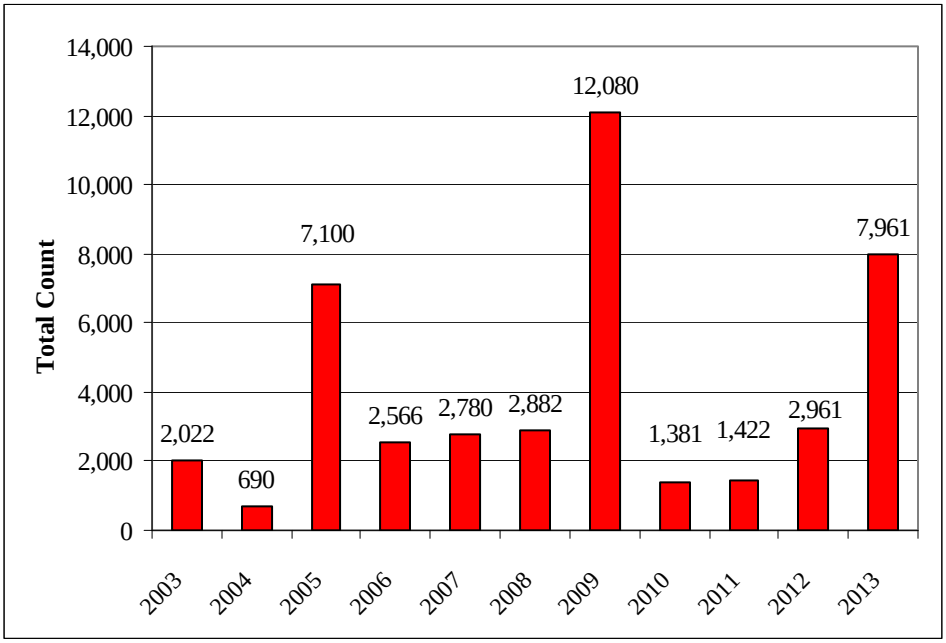

Figure 16: Annual escapement for coho salmon from 2003 to 2013 at the KSEF.

In 2013, the first coho salmon was counted at the KSEF on August 5th and the last on October 28th, the last day of counting before the fence closed. The bulk of the run occurred in two large spikes occurring between August 25th and September 23rd (37% of the run) and from October 5th to October 9th (55% of the run). The maximum and relatively high count of 1,934 fish (24% of the run) occurred on October 5th (Figure 17).

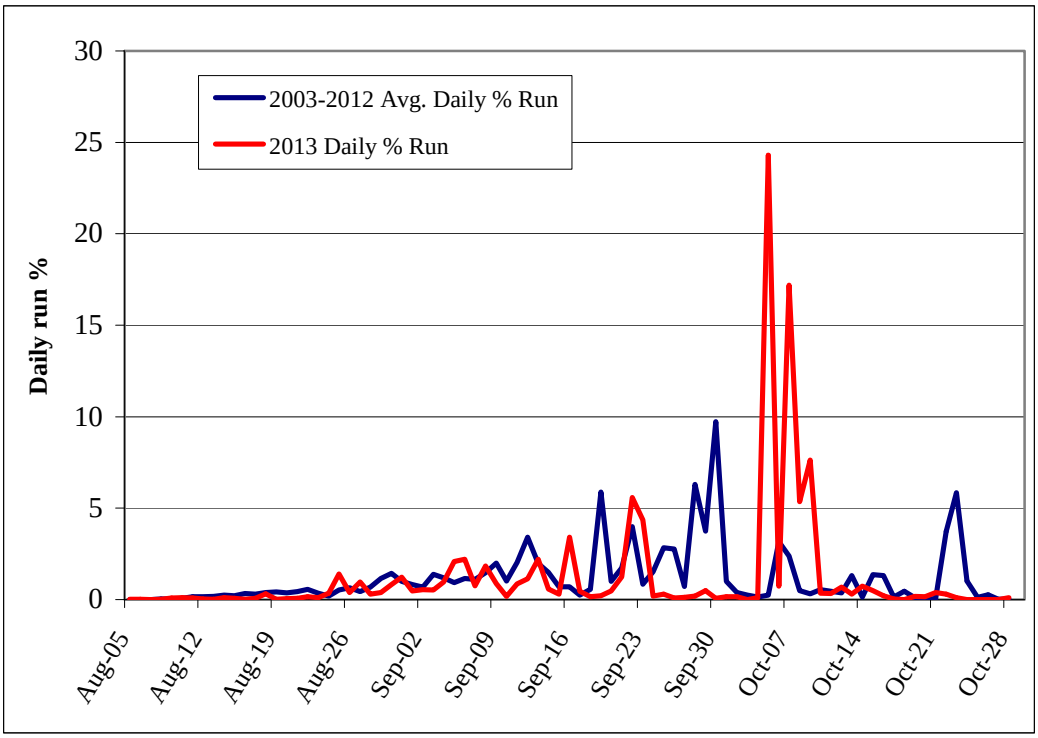

Figure 17: Kitwanga River coho salmon average run timing (daily run %) for 2003-2012 vs. run timing for 2013 at the KSEF.

Length, age, and sex data was collected from 306 coho salmon in 2013 (3.8% of the total run). Male and female sex ratios were 69% and 31% respectively. Average fork length for males and females were similar at 63.7 and 60.4 centimeters respectively (Table 13). Size class (5 cm) histogram showed a uni-modal distribution, dominated by fish in 61to 65 cm length interval (about 33%; Figure 18). Compared to length data collected since 2010, the 2013 mean lengths were consistently within the 60 to 65 cm range (Table 14).

Table 13: Mean, minimum, and maximum fork lengths (cm) for coho salmon sampled in 2013 at the KSEF.

	Male	Female	Combined
Mean	63.7	60.4	62.7
Minimum	42	41	41
Maximum	78	76	78
Count	207	95	302

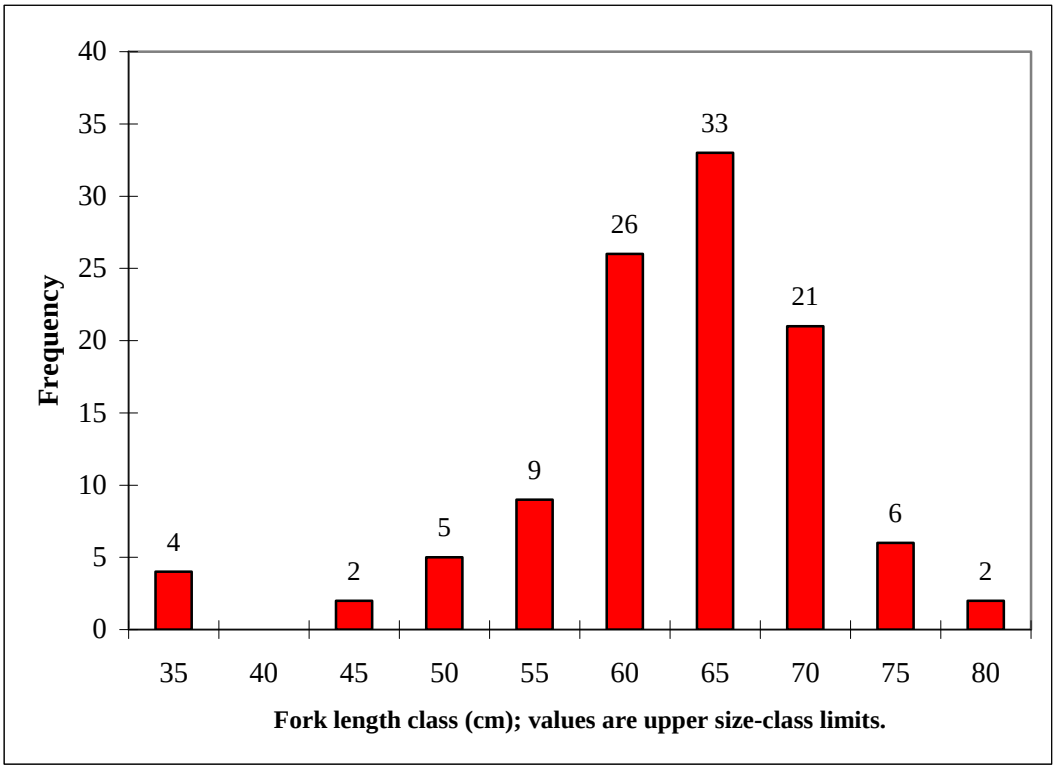

Figure 18: Fork length distribution for coho salmon in 2013 (n=306); X-axis labels are 5 cm length class upper boundaries).

Table 14: Mean length (cm) for coho male, female and combined sexes from 2010 to 2013.

Year	Male	Female	Combined
2010	65.3	64.2	64.8
2011	60.8	62.5	61.4
2012	62.3	60.7	61.2
2013	63.7	60.4	62.7

In this report both 2012 and 2013 aging data is presented below and each show very similar proportions of 3 and 4-year old returns. Of the 52 readable scales from the 2012 aging samples (1.8% of the 2012 run of 2,962 fish), the majority of fish were 3-year old returns from the 2009 broodyear (84.6%) followed by 4-year old returns from the 2008 broodyear (15.4%; Table 15). Each age class differed by the time coho spent in freshwater, but all spent one year in salt water.

Table 15: Age distribution for coho salmon sampled in 2012 at the KSEF.

European	Gilbert-Rich	Brood Year	Frequency	Percent
21	43	2008	8	15.4%
11	32	2009	44	84.6%
Total:			52	100.0%

Of the 230 readable scales from the 2013 aging samples (2.8% of the 2013 run of 7,961 fish), the majority of fish were 3-year old returns from the 2010 broodyear (81.7%) followed by 4-year old returns from the 2009 broodyear (18.3%; Table 16). Each age class differed by the time coho spent in freshwater, but all spent one year in salt water.

Table 16: Age distribution for coho salmon sampled in 2013 at the KSEF.

European	Gilbert-Rich	Brood Year	Frequency	Percent
21	43	2009	42	18.3%
11	32	2010	188	81.7%
Total:			230	100.0%

5. DISCUSSION AND RECOMMENDATIONS

Since the KSEF construction in 2003, GFA has collected accurate and invaluable data to determine the strength of Kitwanga River salmon stocks against other middle Skeena salmon stocks on an ongoing basis. In 2013, the GFA initiated the KSEF to enumerate and collect biological information for sockeye, chinook, chum, pink and coho salmon returning to the Kitwanga River. GFA is confident that essentially the entire runs of sockeye, chinook, pink and chum salmon were captured during fence operation and only the run of coho may be underestimated due to the possibility that the run may have continued after fence closure.

Most of the 2013 sockeye run of 828 fish were 4-year olds originating from the 2009 broodstock return of 3,047 fish, which shows a remarkable set-back in population rebuilding. Skeena sockeye as a whole experienced wide scale escapement declines in 2013 so the problem wasn't isolated to the Kitwanga stock. In fact, the Skeena sockeye return was so low that it was one of the worse on record. The most likely cause of the sockeye failure is due to poor ocean survival for sockeye that went to sea in 2010 and 2011. Up until this point, Kitwanga sockeye have experienced a sporadic but positive rebuilding trend since the crash in 2007 (240 fish). This illustrates the importance of continuing the KSEF program to firstly acquire accurate escapement numbers, and secondly to forward concrete results to DFO to influence management decision making.

The 2013 chinook salmon run of 758 is the lowest escapement ever recorded by the GFA since they started enumerating chinook salmon on the Kitwanga River through the KSEF in 2003. Chinook salmon numbers were 45.2% of the average and marks the sixth consecutive year of returns well below average, and should be cause for concern to fisheries managers. If escapements do not improve substantially in future years, recovery options may need to be explored.

A total of 120,172 adult pink salmon migrated past the KSEF in 2013. Odd year runs normally dominate over even year runs. The 2013 return is the second lowest odd brood year recorded since accurate counts were initiated in 2003. These fish would have originated from the 2011 brood year (the lowest odd year return).

A total of 567 adult chum salmon migrated past the KSEF in 2013, which is 70% of the average escapement recorded from 2003-2012, and marks the 8th year of numbers well below the running average since 2006. If escapements do not improve substantially in future years, recovery options may need to be explored.

A total of 7,961 coho were enumerated at the KSEF in 2013, which is 4,373 fish above the average escapement recorded from 2003-2012. This shows notable improvement from the previous three years. Based on most years, coho are 3-year old fish, which means this run likely originated largely from the second lowest ever recorded return of 1,381 fish in 2010. No CWT implanted coho were expected to return in 2013 and none were observed.

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