Gitanyow Fisheries Authority

The 2011 Kitwanga River Salmon Smolt Assessment

Submitted to: Gitanyow Hereditary Chiefs
Skeena Wild
Fisheries and Oceans Canada (Prince Rupert – Stock Assessment)

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Abstract

In 2011, the Gitanyow Fisheries Authority (GFA) operated the Kitwanga River Smolt Enumeration Facility (KsF) for the 4th consecutive year to enumerate sockeye salmon smolts, coho salmon smolts and other resident trout species. The KsF was operated from April 15th to June 28th, 2011. The 2011 sockeye smolt population estimate was 83, 854 and was comprised mostly of 1-Yr old smolts (97.5%). The timing of the 2011 sockeye smolt run was similar to the average run timing from 2001 to 2009 with over 83% of the run migrating past the KsF from May 3rd to May 17th. Freshwater production estimates for Gitanyow Lake were estimated at 52 sockeye smolts per female spawner. In 2011 the KsF was operated later into the season for the purposes of applying coded wire tags (CWT) to coho smolts. A total of 4,078 coho smolts were implanted with CWT's to estimate stock specific harvest rates on the cohort in Alaskan and Canadian fisheries.

Acknowledgements

The GFA would like to thank Fisheries and Oceans Canada (Prince Rupert – Stock Assessment division), Skeena Wild and the Gitanyow Hereditary Chiefs for jointly funding the operation of the KsF in 2011. GFA would also like to acknowledge the hard work of the GFA smolt fence staff whose dedication throughout the program made the operations a success. In 2011 GFA staff members included: Les McLean, Earl McLean, Jarvis Williams, Vern Russell, James Morgan, Phillip Johnson, Kevin Koch, Mark Cleveland, Gregory Rush and Derek Kingston.

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1.0 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 Gitanyow Lake turning red every fall as the sockeye congregated to spawn on their respective spawning grounds (Cleveland, 2005). However, by the 1920's the Elders talked of the noticeable declines in the returns of the Kitwanga sockeye stock (Cleveland, 2005). 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).

A definite answer as to why the Kitwanga stock declined has not been determined but several factors are suspected to have contributed to the decline of the sockeye stock. One of the largest contributors to the decline is believed to be linked to 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 that have likely contributed to the declines are linked to sockeye habitat destruction in the Kitwanga Watershed due to poor forest harvesting activities. Specific habitat impacts include the sedimentation of spawning beds the disruption of water flow patterns and changes in water quality of tributary feeder streams to Gitanyow Lake (Cleveland, 2006).

Historical DFO salmon escapement data system (SEDS) records for Kitwanga sockeye are incomplete and somewhat unreliable; therefore the determinations of accurate historical escapements are not possible.

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 health and abundance of Kitwanga sockeye salmon smolts emigrating from Gitanyow Lake (Cleveland et al., 2006).

From 2000 to 2007, GFA experimented with different weir and trap designs in an effort to accurately enumerate Kitwanga sockeye smolts on a yearly basis (Williams et al. 2002, McCarthy 2005, Kingston 2006 & Koch 2008). For the most part, these trap designs were deemed unusable on the Kitwanga River because they were often rendered inoperable during high water when many of the smolts migrated out of Gitanyow Lake.

In 2007 and 2008, the GFA were successful in acquiring funding to construct a permanent smolt fence on the Kitwanga River below Gitanyow Lake. The fence was named the Kitwanga River Smolt Enumeration Facility (KsF).

The KsF was rendered operational in the winter of 2008 and has been used for the last 4-years to count all sockeye emigrating from Gitanyow Lake. Since 2009, GFA has also monitored coho smolt abundance through the KsF and have initiated a coho CWT program. Other resident trout species are monitored at the site for general biological reasons.

In 2008 & 2009 the KsF was also used to monitor the production of Kitwanga hatchery sockeye fry out planting programs that took place in Gitanyow Lake in 2007 and 2008 (Cleveland, 2007 & Cleveland, 2009).

In the spring of 2011, the GFA operated the KsF to enumerate salmon smolts and other resident trout species as well as implant coho with CWT's. The 2011 smolt sampling season represents the fourth consecutive year that this project has been implemented at the KsF and the third year for the coho CWT program.

2.0 Introduction

The KsF plays a critical role in allowing GFA to monitor Kitwanga sockeye smolt production from Gitanyow Lake on a yearly basis. Assessing smolt production is important to the Gitanyow because it helps gauge the effectiveness of sockeye-rebuilding programs currently being carried out in the Kitwanga watershed

Since 2009, the GFA have been implanting coho smolts with CWT's (Kingston, 2010). Returning adult coho that have been implanted with a CWT are recovered in Alaskan and Canadian fisheries and at the Kitwanga River Salmon Enumeration Facility (KSEF). Tag recovery information helps fisheries managers determine coho survival rates and fisheries specific exploitation of yearly cohorts, which are assumed to be represent able for all Skeena coho stocks with similar life history traits.

Since the establishment of the KsF in 2008, the GFA have been able to successfully enumerate sockeye smolts, coho smolts and other resident trout species under high water events with no interruptions.

In 2011, the KsF was operated with funding contributions from Fisheries and Oceans Canada (Stock Assessment - Prince Rupert), Skeena Wild and the DFO's AFS program. This report summarizes the enumeration results and findings for the KsF program in 2011.

3.0 Methods

Installation of the KsF started on April 11th, 2011 and the smolt facility was rendered operational on April 15th, 2011 when the final components were connected to the concrete sill. The smolt-sampling period continued until June 28th, 2011 when all of the aluminum components were pulled from the river. The KsF is located on the Kitwanga River approximately 600m downstream from the outlet of Gitanyow Lake (UTM's 9U 557014E; 6131839N - Figure 1). The design of the KsF consisted of an aluminum weir that passively diverts emigrating smolts and other resident trout species into one of two trap boxes where they can be easily enumerated, sampled and released.

The aluminum weir and smolt trap boxes were attached to preformed concrete aprons that were placed in the riverbed during the construction of the smolt fence completion project (Kingston, 2008). The weir is constructed of prefabricated smolt panels, trap boxes and transoms that can be easily installed and removed by the GFA. The aluminum weir is designed to mimic the physical features of a beaver dam where water is backed-up forming a head of water upstream of the weir which spills over in a desired location. Traps boxes are installed at the spill locations and easily capture downstream moving fish that key in on the area. The weir is installed at a 45º angle to the rivers flow, which naturally moves fish to the left bank of the river where the trap boxes are installed.

The trap boxes were designed with dewatering screens that funnelled the smolts into a small holding box where they remained trapped (Photograph 1). Once the fish were committed to entering the de-watering screens, the fish were then transported down the V-shaped grooves where the water velocity was too great for them to swim back upstream. From the small holding boxes fish continue to move downstream through a 6" rigid plastic hose to a large covered 4' X 8' holding box where they are held until they are sampled each day (Photograph 2). In 2011 the KsF consisted of two smolt traps that were connected to two large 4' X 8' holding boxes. A temporary wooden walkway and aluminum railings were secured to the top of the transoms to allow GFA workers access to the smolt traps and clean the fence with ease (Photograph 3). Four to five rows of 6" stop-logs were placed at the back of each transom to create a damming effect upstream of the fence (Photograph 3). The stop-logs created a 6" to 12" head effect upstream of the fence at each of the smolt traps, which allowed them to work effectively to catch fish.

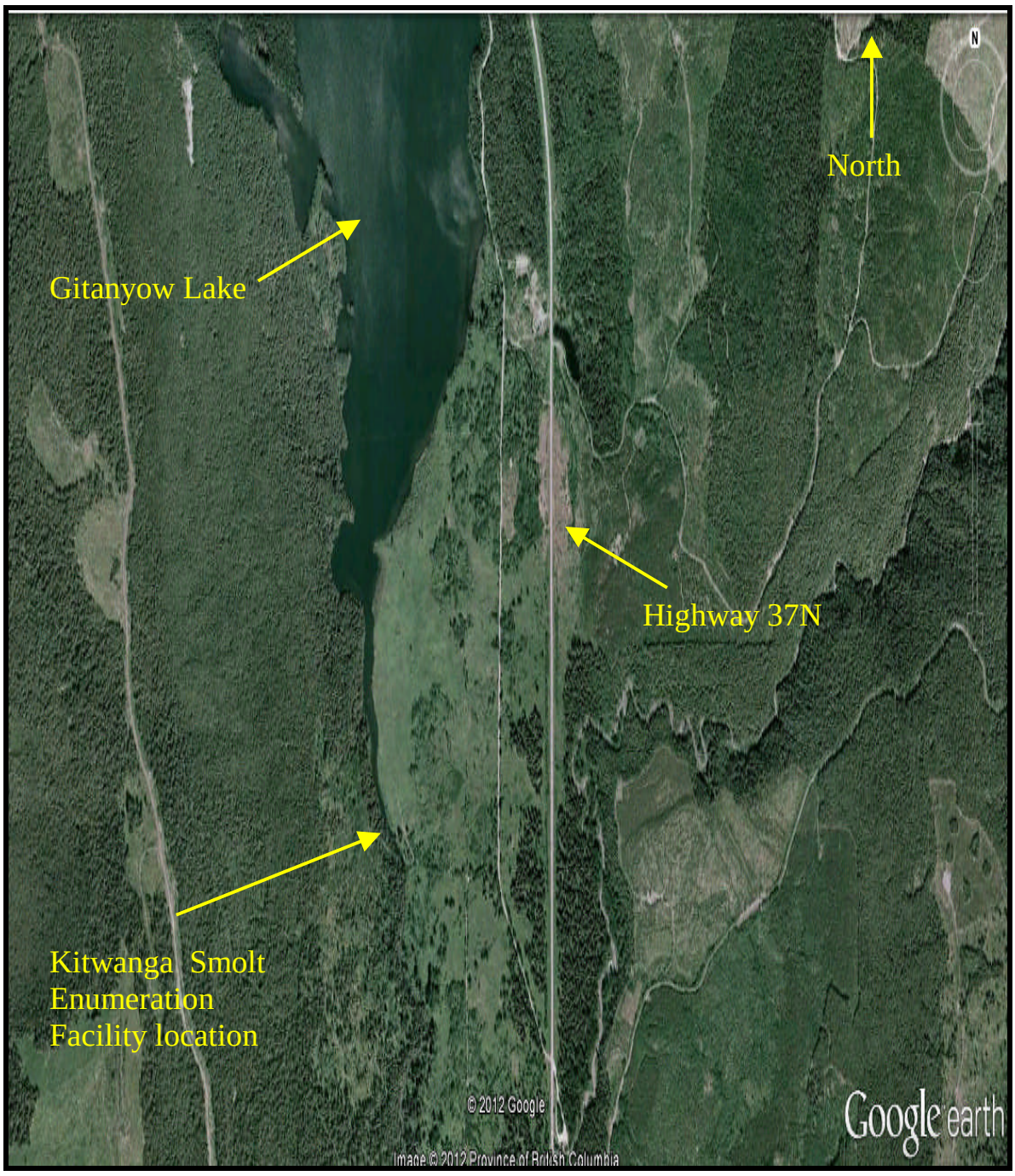
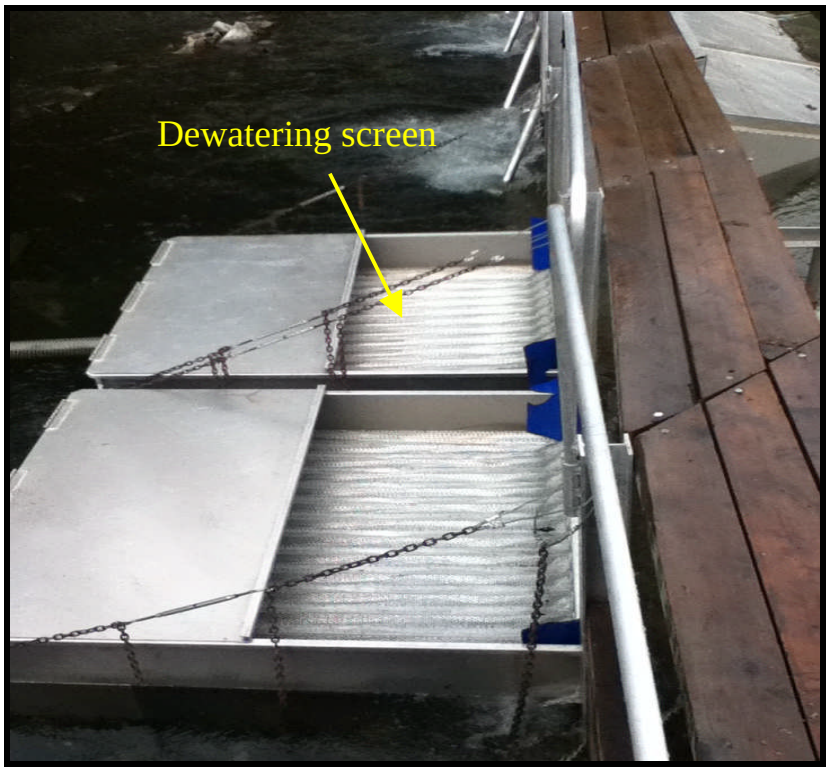
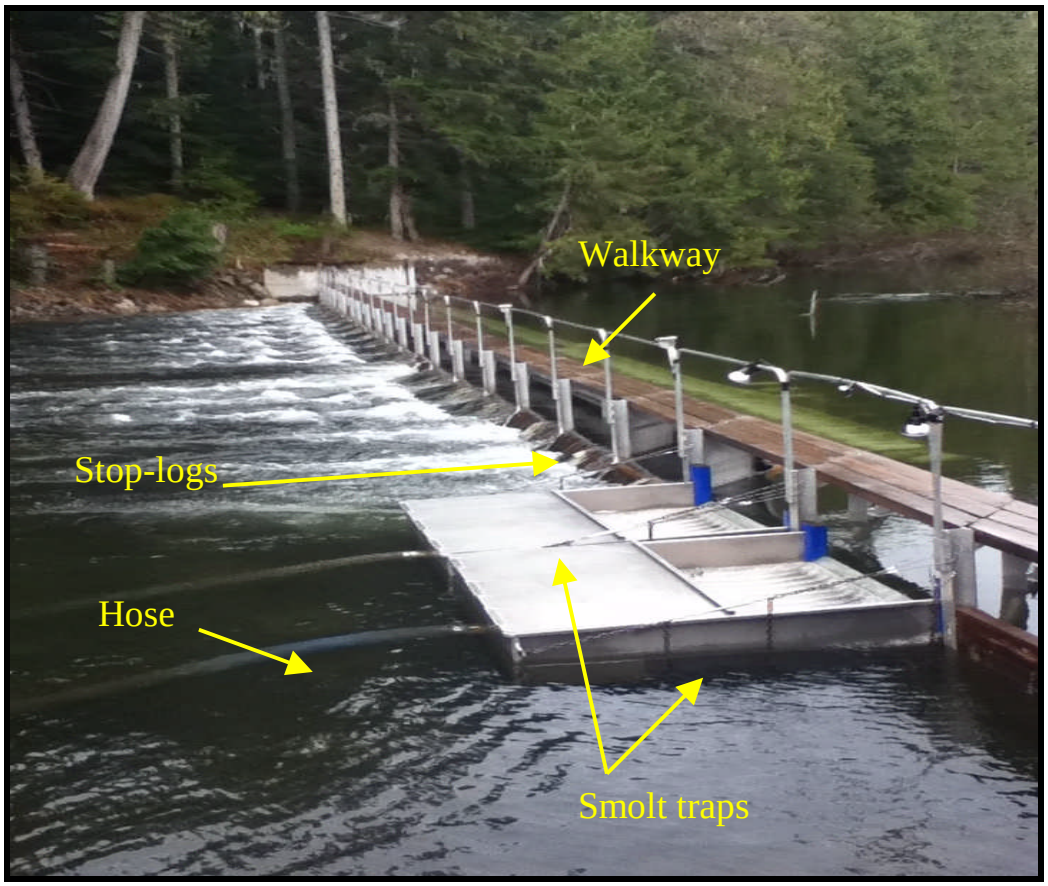


Figure 1. Location of the Kitwanga River Smolt Enumeration Facility (KsF) showing reference to Gitanyow Lake outlet and Highway 37N (Image supplied from www.googleearth.com).



Photograph 1. Smolt trap box showing dewatering screen.

Photograph 2. Large holding boxes attached to smolt trap boxes with 6" hose.



Photograph 3. Smolt fence installed showing smolt traps, 6" hose, stop-logs and walkway.

Crews of two or three GFA fisheries technicians would check the trap first thing in the morning and conduct fish sampling and smolt enumeration work. The fence site was visited again just before dark to clean debris off the fence and ensure the traps were fishing at the proper water level. Trap adjustments could be made so the optimum amount of water was flowing through each trap area. This ensured the fish were captured in a passive, unharmful manner. Sub samples of all sockeye smolts caught daily were measured to determine their lengths and weights. Fork lengths were taken to the nearest 1 mm and weights to the nearest 0.1 grams. Scales samples were taken for aging purposes (Photograph 4). Scales were sent to Birkenhead Scale Analysis in the post-season to be aged. Environmental conditions such as water levels, water temperatures, weather conditions and air temperature were recorded at the KsF on a daily basis.

Most sockeye smolts that migrate out of Gitanyow Lake have been documented to move downstream at dusk and the early part of the night. Therefore, all sockeye smolts that were caught and sampled in 2011 were held until dusk before being released downstream of the weir and allowed to continue on their journey to the ocean. Smolts were held in large 4' X 8' covered aluminum boxes, so that predators couldn't access them prior to being released at nightfall. A portion of the cutthroat trout and bull trout caught at the KsF were also sampled for lengths, weights and scales. All the other fish species caught in the weir were also documented.

Photograph 4. GFA technician placing sockeye smolt scales onto a scale book.

3.1 Coho Coded Wire Tag (CWT) Program

For the third consecutive year GFA implemented a Kitwanga coho smolt CWT program in conjunction with the operation of the KsF. As in other years nearly all coho captured in 2011 were implanted with CWT's. In addition to tagging, approximately 10% of the run was sampled for age by collecting scale samples. Fork lengths were taken to the nearest 1 mm and weights to the nearest 0.1 grams.

To conduct tagging and sampling operations fish were anaesthetized using a bath of river water and clove oil. All tagged coho were given an adipose fin clip to make them recognizable. Once anaesthetized, the CWT's were implanted into the nose of the coho with a Mark III automated tag injector (Photograph 5). Tagged coho were then released down a Quality Control Device (QCD) to detect whether the tags had been properly implanted into the fish (Photograph 6). All coho found to have not retained their tag were re-tagged. As an added quality control measure approximately 10% of each days tagged group were held for 24-hrs and passed through the QCD for a second time to determine tag loss and mortality. Following all sampling and tagging operations, coho smolts were placed back into large holding boxes in the Kitwanga River and released at nightfall.

Photograph 5. GFA technician implanting a coho smolt with a CWT.

Photograph 6. Coded Wire Tag (CWT) machine, Quality Control Device (QCD) and sampling station set-up.

4.0 Results and Discussion

4.1 Smolt Migration Timing

In 2011 the GFA successfully implemented the Kitwanga River smolt enumeration program for the 4th consecutive year. The first sockeye smolt was enumerated on April 25th, 2011 and the last on June 23rd, 2011 (Table 1). The midpoint of the run occurred on May 25th, 2011 and the peak of the emigration occurred on May 14th, 2011 where 19.6% of the entire run migrated past the KsF in one day (Figure 2). Approximately 83% of the sockeye smolts migrated through the weir in a two-week period from May 3rd to May 17th, 2011. The peak of the 2011 migration was approximately 3 days later than the 2001-2010 average of May 11th (Table 1). The midpoint of the 2011 run was approximately 5 days later than the 2001-2010 midpoint average of May 20th (Table 1). When comparing the timing of the 2011 Kitwanga sockeye smolt run with water stage it appears that sockeye migrated when water levels started to increase from spring runoff (Figure 3).

In 2011, only wild sockeye smolts were found to be emigrating from Gitanyow Lake. This was to be expected given all hatchery fry from 2006 and 2007 enhancement programs should have left the lake by the spring of 2010

Table 1. Kitwanga sockeye smolt run timing table showing start, end, peak, and midpoint from 2001 – 2011.

Year	Run Start	Run End	Run Peak	Run Midpoint
2001	April 29th	May 27th	May 6th	May 13th
2002	April 27th	June 1st	May 12th	May 11th
2003	April 23rd	June 2nd	May 2nd	May 13th
2004	April 19th	May 20th	April 30th	May 5th
2005	April 17th	May 19th	May 2nd	May 3rd
2006	April 22nd	May 25th	May 4th	May 9th
2007	May 1st	May 30th	May 10th	May 15th
2008	April 30th	May 28th	May 11th	May 14th
2009	May 1st	June 7th	May 18th	May 19th
2010	April 21st	June 11th	May 3rd	May 17th
2011	April 25th	June 23rd	May 14th	May 25th
Average 2001 - 2010	**April 25th**	**June 10th**	**May 11th**	**May 20th**

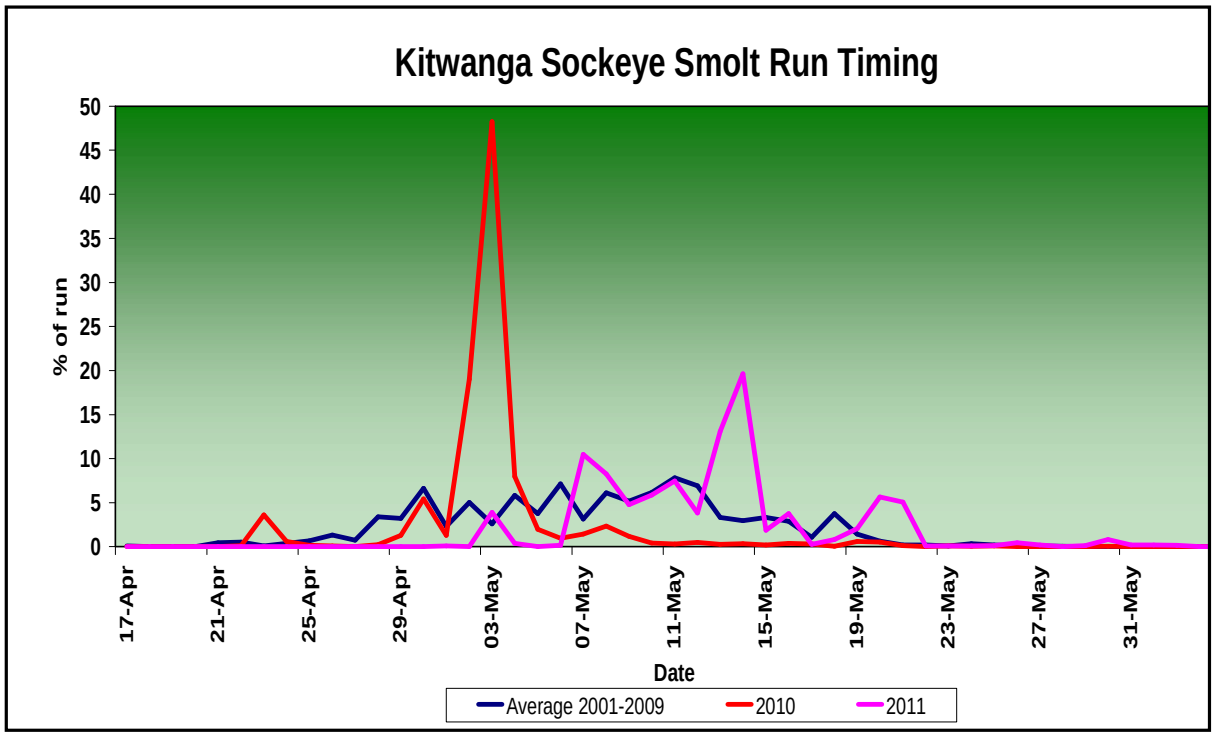


Figure 2. Kitwanga sockeye smolt run timing average (2001-2009) compared to 2010 and 2011.

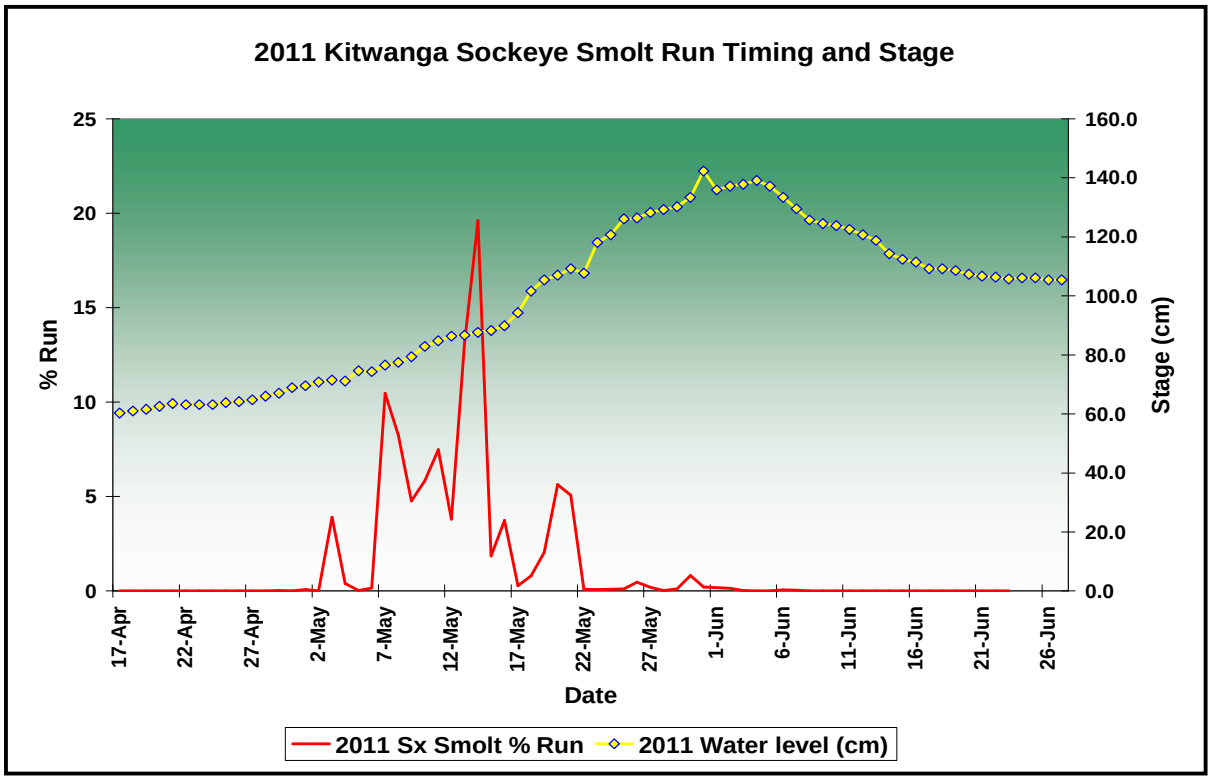


Figure 3. 2011 Kitwanga sockeye smolt run timing at the KsF and associated water stage.

The first coho smolt was enumerated on April 26th, 2011 and the last on June 28th, 2011. The peak of the coho run occurred on June 2nd, 2011 where 6.7% of the run migrated past the KsF (Figure 4). The midpoint of the 2011 coho run occurred approximately 1-day later then the 2009-2010 midpoint average (Table 2). When comparing the timing of the 2011 Kitwanga coho smolt run with water stage it appears that most of the coho migrated when water levels were at peak flows (Figure 5). When comparing the coho run timing from 2009 & 2010 to 2011 it is evident that the start and end dates from one year to the next are very similar (Figure 5).

Table 2. Kitwanga coho smolt run timing table showing start, end, peak, and midpoint from 2009 to 2011.

Year	Run Start	Run End	Run Peak	Run Midpoint
2009	April 19th	July 13th	June 26th	June 1st
2010	April 17th	June 25th	May 31st	May 22nd
2011	April 26th	June 28th	June 2nd	May 28th
Average 2009 – 2010	**April 18th**	**July 4th**	**June 13th**	**May 27th**

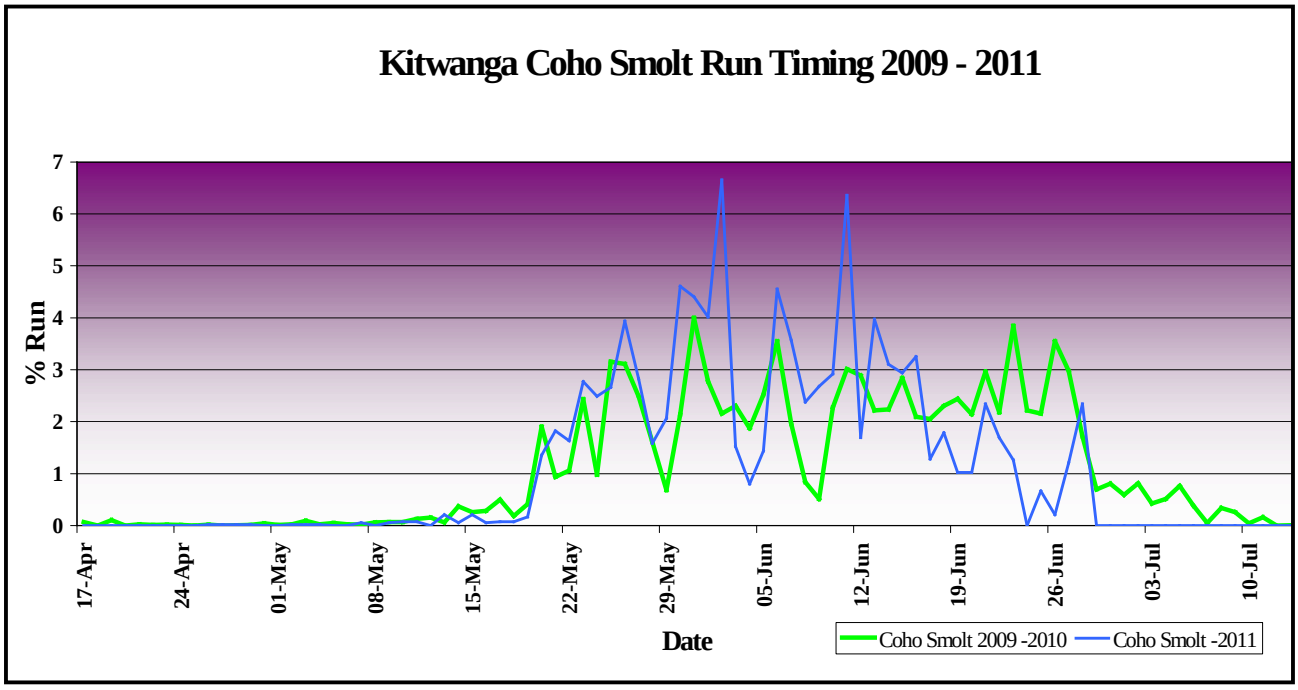


Figure 4. Kitwanga coho smolt run timing at the KsF from 2009 to 2011.

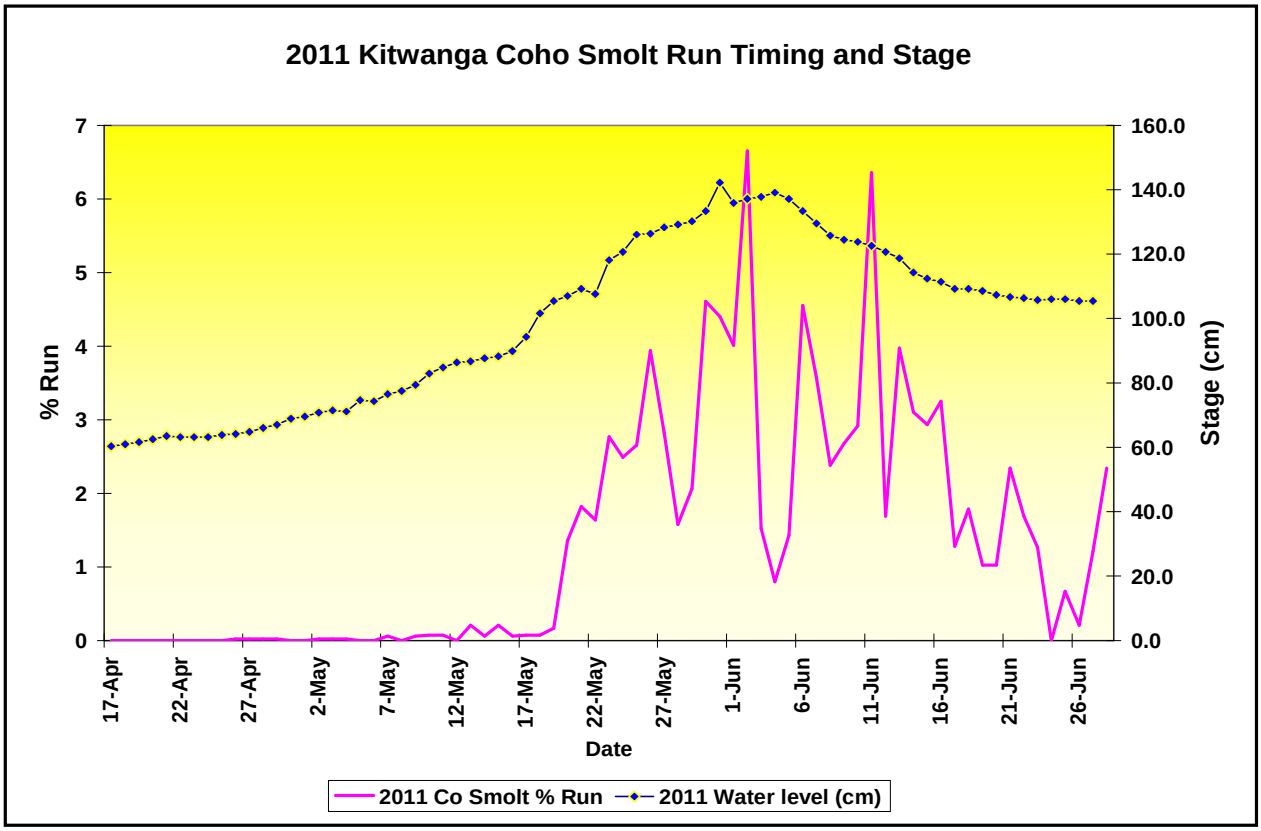


Figure 5: 2011 Kitwanga coho smolt run timing at the KsF and associated water stage.

4.2 Age Structure

Sockeye Smolts

In 2011, a total of 394 sockeye smolt scale samples were analysed for age composition. Approximately 97.5% of the sockeye smolts were aged as 1.0 year-old smolts originating from the 2009 broodyear (Table 3). All one year-old scales examined in 2011 exhibited a freshwater stress; the location of the stress varied but was usually found within the 4th and 16th circuli. The total number of circuli in the first year of growth ranged from 15 to 25 (Appendix 1). Age 2.0 smolts accounted for 2.0% and Age 3.0 smolts accounted for 0.5% of the sample (Table 3).

Table 3. Summary of 2011 sockeye scale analysis conducted by Carole Lidstone of Birkenhead Scale Analyses.

Sample Date	Sockeye Smolt	European Age	Gilbert-Rich Age	Brood Year	Frequency	Percentage
April - June 2011	Wild	1.0	22	2009	384	97.5
	Wild	2.0	33	2008	8	2.0
	Wild	3.0	44	2007	2	0.5
				Total	**394**	**100%**

Coho Smolts

In 2011, a total of 525 coho smolt scales were collected and sent to the Pacific Biological Station (PBS) for aging. At the time of authoring of this report the coho scales had not yet been analyzed, therefore aging results will be presented later once the analysis become available.

4.3 Length and Weight Statistics

Sockeye Smolts Age 1.0

A total of 740 sockeye smolts were sampled for lengths and weights. The average fork length of age 1.0 sockeye smolts was 106.6 mm and ranged from 85 mm to 151 mm (Table 4). Average weight measurements were 11.8 grams and ranged from 6.1 grams to 32.7 grams (Table 4). In 2011, age 1.0 sockeye smolts on average were 2.9 mm shorter and 0.6 grams lighter than the average collected between 2001-2010 (Table 4).

Table 4: Mean fork lengths and weights for Age 1.0 Kitwanga sockeye smolts from 2001 to 2011 (Williams et al. 2002, McCarthy 2005, Kingston 2006, 2009, 2010, 2011 & Koch 2008).

Year	Sample Size (N)	Mean Fork Length (mm)	Max. / Min. Fork Length (mm)	Mean Weight (g)	Max. / Min. Weight (g)
2001	1,750	103.5		10.2	
2002	1,389	103.9		10.6	
2003	1,025	112.3	94 / 156	14.0	7.6 / 32.9
2004	465	114.1	94 / 159	14.4	8.2 / 31.1
2005	260	116.4	90 / 135	13.4	6.1 / 23.2
2006	750	115.0	94 / 135	14.3	7.0 / 26.0
2007	349	108.2	85 / 125	12.0	5.0 / 18.1
2008	1,224	102.8	76 / 122	9.9	4.9 / 28.5
2009	320	112.1	86 / 132	13.4	5.7 / 21.3
2010	2,490	106.4	77 / 128	11.5	4.1 / 21.5
2011	740	106.6	85 / 151	11.8	6.1 / 32.7
Average 2001 - 2010		**109.5**		**12.4**	

Sockeye Smolts Age 2.0

In 2011, seven age 2.0 sockeye smolts were sampled and they yielded an average fork length of 211.0 mm and average weight of 101.4 grams (Table 5).

Table 5: Wild sockeye smolts age 2.0 mean fork length and weight for 2011.

Age	Sample Size (N)	Mean Fork Length (mm)	Mean Weight (g)
2.0	7	211	101.4

Sockeye Smolts Age 3.0

Two age 3.0 sockeye smolts were sampled and the average fork length was 264.0 mm and weight was 179.1 grams (Table 6).

Table 6: Wild sockeye smolts age 3.0 mean fork length and weight for 2011

Age	Sample Size (N)	Mean Fork Length (mm)	Mean Weight (g)
3.0	2	264	179.1

In 2011, the most frequent length category for age 1.0 sockeye smolts was 107 to 109mm and 205 to 207mm for age 2.0/3.0 sockeye (Figure 6). In 2011, there was a distinct separation in lengths classes between age 1.0 and 2.0/3.0 year old sockeye smolts (Figure 6).

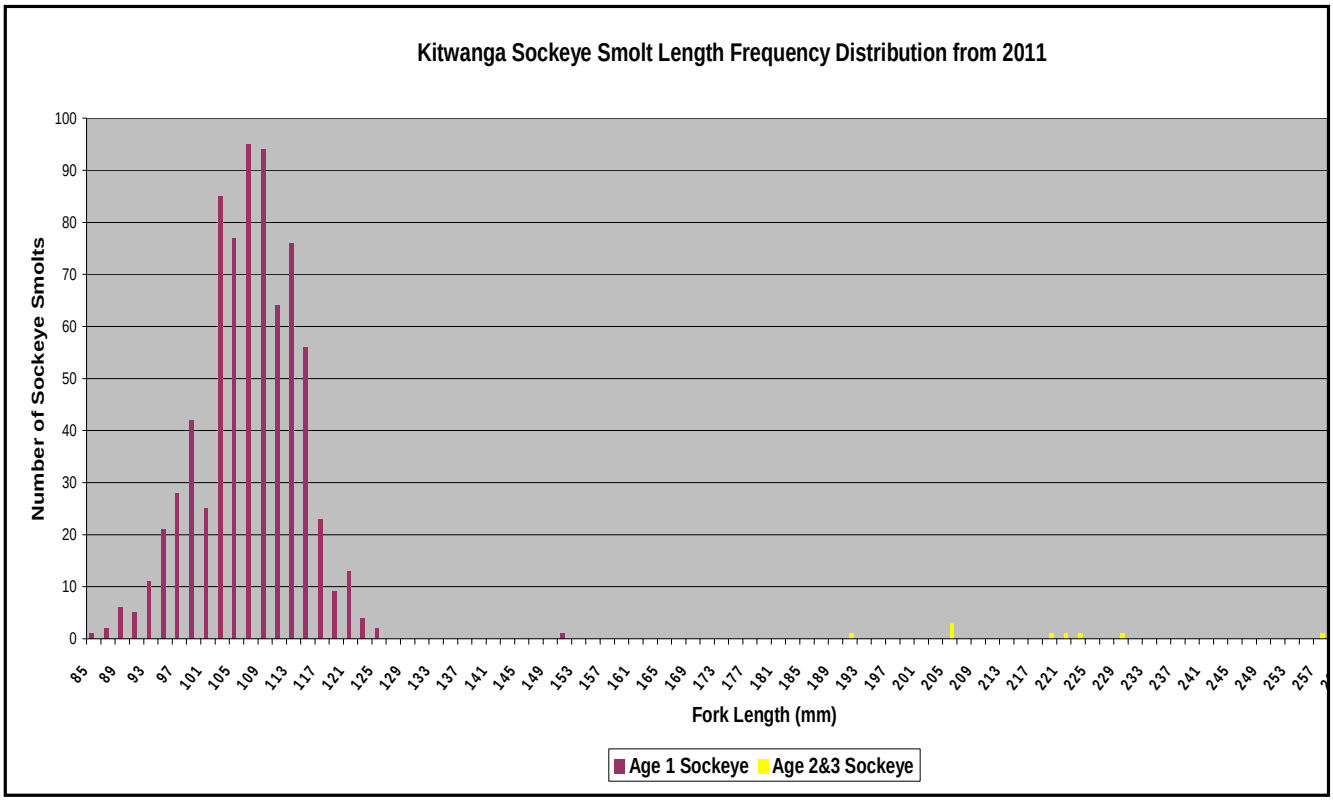


Figure 6: Kitwanga sockeye smolt length frequency distribution from 2011.

Coho Smolts

525 coho smolts were sampled for length and weight measurements in 2011. Average fork lengths of coho smolts were 130.2 mm and ranged from 104 mm to 230 mm. Average weights were 23.5 grams and ranged from 10.8 grams to 114.9 grams (Table 7).

Table 7: Coho smolts mean fork lengths and weights for 2009, 2010 and 2011.

Year	Sample Size (N)	Mean Fork Length (mm)	Max. / Min. Fork Length (mm)	Mean Weight (g)	Max. / Min. Weight (g)
2009	95	134.8	111 / 172	26.5	13.6 / 55.1
2010	550	141.2	103 / 272	31.1	11.8 / 195.4
2011	525	130.2	104 / 230	23.5	10.8 / 114.9

After receiving the aging results from the 2010 coho smolts we were able to compare the length at age of 1.0 and 2.0 year-old fish. An age at length histogram was plotted to separate the two age classes. In 2010 there was no clear separation in lengths between the two age classes and infact there was a large overlap between the two age groups (Figure 7). The most frequent length category for age 1.0 coho smolts was 135 to 140 mm and 140 to 145mm for age 2.0 coho (Figure 7.)

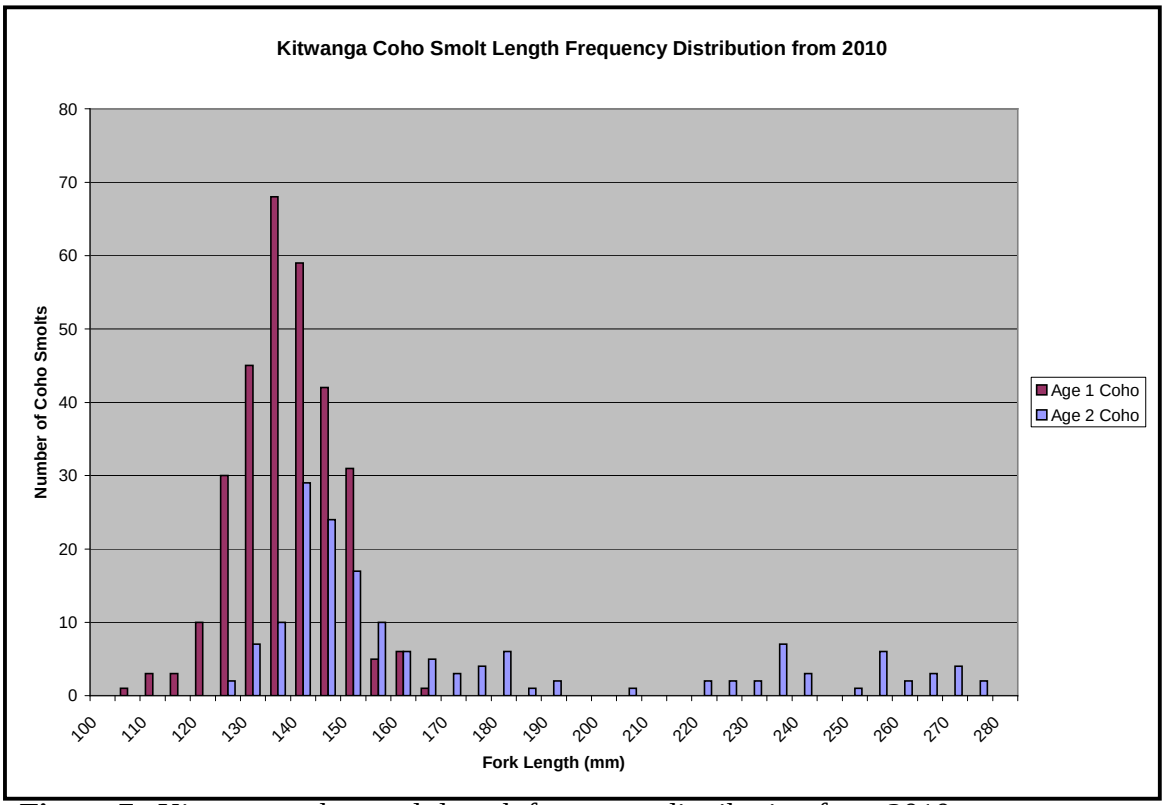


Figure 7. Kitwanga coho smolt length frequency distribution from 2010.

4.4 Population Estimate

Sockeye Smolts

In 2011, the sockeye smolt population was estimated by adding the total daily catch from each trap. A total of 83,854 wild sockeye smolts were captured during the 2011 study period, which included 137 two-year-old smolts (Table 8). The 2011 population estimate is the second lowest estimate ever recorded since the GFA started enumerating sockeye smolts at the KsF in 2008.

Table 8: Kitwanga River sockeye smolt population estimate and trap efficiency for 2001 - 2011.

Year	# Smolts Marked	# Smolts Recaptured	Trap Efficiency %	Total Smolts Captured	2-Yr. Old Smolts	**Hatchery Smolt Population Estimate**	**Wild Smolt Population Estimate**	95% C.I. Lower	95% C.I. Upper
2001	570	13	2	1,921		--	**78,389**	39,332	117,446
2002	1,827	294	16	6,842		--	**42,402**	38,074	46,730
2003	1,702	78	5	4,806		--	**103,623**	81,628	125,619
2004	1,177	36	3	3,773		--	**120,155**	82,732	157,578
2005	4,516	372	8	8,252		--	**99,942**	90,461	109,423
2006	2,166	171	8	8,591		--	**108,248**	92,925	123,571
2007	4,889	521	11	7,436		--	**69,667**	64,225	75,109
2008	N/A	N/A	N/A	229,026		2,753	**226,273**	213,486	239,060
2009	N/A	N/A	N/A	36,554	311	1,273	**35,281**	--	--
2010	N/A	N/A	N/A	113,068	24	--	**113,068**	---	--
2011	N/A	N/A	N/A	83,854	137	--	**83,854**	--	--

Other Species

The KsF also enumerated 5,383 coho smolts. Resident trout species were enumerated during the study and these totals accounted for 661 cutthroat trout, 129 adult bull trout (> 300 mm), 86 Juvenile Bull Trout (< 300 mm) and 88 rainbow trout (Table 8.). Other fish species captured, included 129 Rocky mountain whitefish, 1,679 sculpins and 4 redside shiners (Table 9).

Table 9. Summary of other fish species caught at the Kitwanga smolt fence in 2011.

Year	Coho Smolts	Cutthroat Trout	Bull Trout Adult (> 300 mm)	Bull Trout Juvenile (< 300 mm)	Rainbow Trout	Rocky Mountain Whitefish	Sculpin	Redside Shiner
2011	5,383	661	129	86	88	129	1,679	4

4.5 Sockeye Smolt Production

In 2011, it is estimated that an average of 52 smolts were produced per female spawner (Table 10). This estimate was generated by dividing the total number of 1-yr old smolts produced in 2011 by the number of adult females that escaped to the river and presumed to have successfully spawned in 2009 (Koch and McCarthy, 2010). The 2011 Kitwanga smolt production is the lowest production recorded since we started accurately enumerating smolts at the KsF in 2008.

Table 10. Estimate of smolts per female spawner for Kitwanga wild sockeye from 2008 to 2011.

	Year	Smolt Estimate	Female Spawners	Smolts/Female
Wild Sockeye	2008	226,273	2643	86
Wild Sockeye	2009	34,970	125	280
Wild Sockeye	2010	113,044	684	165
Wild Sockeye	2011	83,717	1615	52

4.6 Coho CWT Tagging Program

In 2011, it is estimated that 4,078 coho smolts were implanted with CWT's at the KSF (Table 11). This CWT total was corrected for tag loss and handling mortality compiled from sub samples of tagged coho smolts that were held for 24-hour periods. In 2011 tag loss rates were low and only accounted for 0.3% of the sample (Table 11). Mortality rates for the tag group were also low and averaged only 0.5% (Table 11).

Table 11. Kitwanga Coho CWT group release report summary for 2011.

CWT Tag Group	Tag Loss # (%)	Mortality # (%)	Tag Loss + Mortality %	Sample Size	# Coho Tagged (Corrected for tag loss and mortality)	Total Release (#tagged + #untagged)	Fork Length (mm)	Weight (grams)
A08 D07/74	6 (0.3%)	8 (0.4%)	0.8%	1779	4,078	4,700	130.2	23.5

4.7 Other Findings

Ice Off & Sockeye Smolt Run Peak

From studies conducted on Kitwanga sockeye smolt emigration it has been determined that Kitwanga sockeye smolts usually leave Gitanyow Lake shortly after the ice comes off the lake (Koch, 2008). In 2011, ice off occurred on May 14th and the peak of the smolt run occurred 12 days later. Over the past six years Kitwanga sockeye smolts also left Gitanyow Lake between 4 and 12 days after ice off (Table 12).

Table 12: Relationship between ice-off and the peak of the Kitwanga sockeye smolt run from 2006 – 2011.

Year	Date of ice off Gitanyow Lake	Peak of smolt migration	Time from ice off Gitanyow Lake to peak of smolt emigration
2006	April 26th	May 4th	8 Days
2007	May 6th	May 10th	4 Days
2008	May 4th	May 11th	7 Days
2009	May 9th	May 18th	9 Days
2010	April 21st	May 3rd	10 Days
2011	May 2nd	May 14th	12 Days

5.0 Conclusion

The GFA have accurately enumerated both sockeye and coho smolts at the KsF for the past four years. Since 2008, the KsF has remained operational for the entire sockeye and coho smolt migration period even during yearly spring flood events.

The 2011 sockeye smolt population estimate was 83,854 and was comprised almost exclusively of 1-Yr old smolts (97.5%). The 2011 sockeye smolt run timing was quite similar to the average run timings observed from 2001 to 2009 with over 83% of the run migrating past the weir in a two week period from May 3rd to May 17th.

The 2011 Kitwanga sockeye freshwater production estimates from Gitanyow Lake determined that 52 sockeye smolts were produced per adult female in 2009.

Since 2009 the GFA have implemented CWT programs on the Kitwanga River to access survivals and harvest rates on coho. Each year GFA strives to apply a minimum of 10,000 tags to ensure the sample size is large enough to effectively assess yearly impacts from the various fisheries on the cohort. Unfortunately in 2011, only 4,078 coho were implanted with a CWT because not many coho emigrated downstream through the KsF. It is expected that the 2011 CWT fish will return to the Kitwanga River in 2012 as adults where they will be counted through the KSEF and a tag ratio will be acquired for the cohort.

GFA continues to successfully implement the enumeration of sockeye smolts on a yearly basis, which will help to provide reliable estimates of smolt migration from Gitanyow Lake. Kitwanga sockeye smolt production is high priority because the results help biologists shape the future of stock rebuilding efforts

Coho CWT generated information is useful because it helps fishery managers to determine ocean survival, exploitation of coho stocks in the various Alaskan and Canadian fisheries in the ocean and in freshwater recreational and aboriginal fisheries. The information produced is useful because it is used to help fisheries managers make better decisions related to salmon harvest on a yearly basis. Because of thee reasons the program should continue annually.

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Appendix 1 – Letter from Carol Lidstone of Birkenhead Scale Analyses

Birkenhead Scale Analyses

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December 12, 2011

Derek Kingston,
Fisheries Biologist
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P.O. Box 148,
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Re: 2011 Kitwanga River Smolt Sockeye Scale Analysis

Dear Derek,

Attached is the analysis for the sockeye smolt scales collected from the Kitwanga River in 2011. The updated version of the Excel file includes the scale age, circuli counts and relevant comments.

May 3-18, 2011:
The first half of the total 750 sample was analyzed, to include the age, circuli count, and the location of the freshwater stress. The results of the 375 samples analyzed are as follows:

4 Unreadable: 3 have typical age 1 weights, 1 has a large weight of 107.7 grams.

362 Age One: Weights range from 6.1-16.0 grams, with one large smolt at 32.7 grams. All scales exhibit a freshwater stress, typical of Kitwanga sockeye, between the 5^{th}-16^{th} circuli. The number of circuli from the stress to the first annulus ranges between 4-16. The total circuli count is between 15-25, with the exception of the large smolt scale, which has a total circuli count of 32.

7 Age Two: The weights of the age 2 smolts are between 64.2–140.2 grams. Five of the samples exhibit a stress in each year, with the total circuli count in the first year between 17-25, and between 22-26 in the second year, for a total circuli count from 42–47. One is a poor image, so the circuli count is not provided, but the scale does exhibit the typical Kitwanga stress in each year of growth.

One sample has a low first year circuli count (13) and does not exhibit a stress in the first year of growth. The second year of growth does exhibit a stress, with a circuli count of 23. The total circuli count of this age 2 smolt is smaller than the other age 2 smolts, at 36. This sample is also the smallest of the age 2 smolts, at a weight of 64.2 grams, the next smallest is 84.3 grams.

2 Age Three: The weights of the age 3 smolts are 167.9 and 190.2 grams. They do not exhibit a stress in the first year of growth, and have a low first year circuli count of 12 & 13. They both exhibit stresses in the 2nd and 3rd years of growth, with total circuli counts in each year between 21-24, and total circuli counts including all three years, of 58 & 59.

May 19-June 2, 2011

The only scales analyzed in the remaining sample were smolts with a weight greater than 16.0 grams. This included 24 samples with the largest weight being 19.7 grams. The results are as follows:

- 22 age 1 with the typical Kitwanga circuli count and freshwater stress.
- 1 unreadable
- 1 age 2 (17.1 g), with a low circuli count and no stress in the first year of growth, a stress in the second year of growth, with a circuli count in each year of 8+16, for a total of 24.

Please let me know if you have any questions or concerns regarding the results. I will return the scales and results to you via Xpress Post. Once again, thank you very much for the opportunity to complete this work for you.

Sincerely,

Carol Lidstone
Birkenhead Scale Analyses