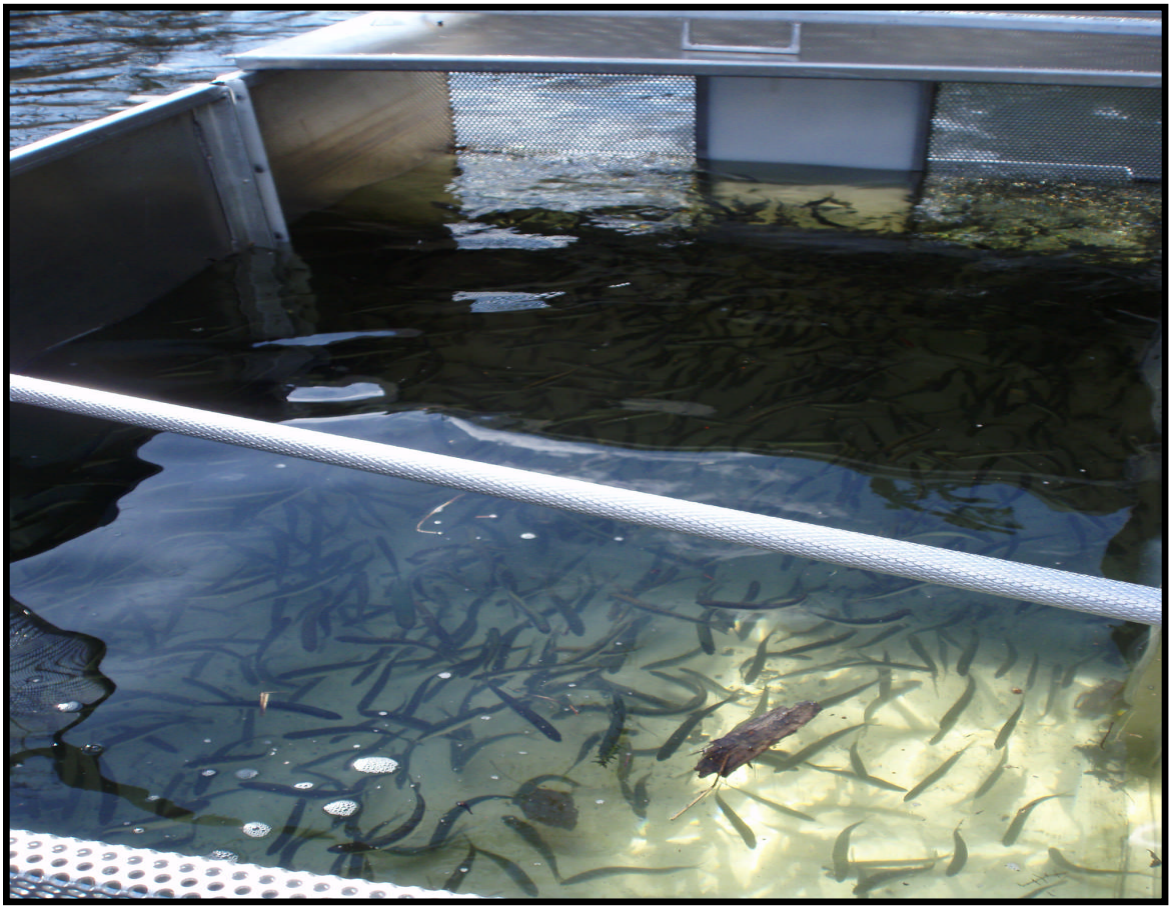
Gitanyow Fisheries Authority

The 2010 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 2010, the Gitanyow Fisheries Authority (GFA) operated the Kitwanga Smolt Enumeration Facility (KSF) for the 3rd consecutive year to enumerate sockeye salmon smolts, coho salmon smolts and other resident trout species. The KSF was operated from April 21st to June 11th, 2010. The 2010 sockeye smolt population estimate was 113,068 and was comprised mostly of 1-Yr old smolts (99.9%). The timing of the sockeye smolt run was quite compressed when compared to previous years and almost 50% of the run migrated past the weir on May 3rd, 2010. Freshwater production estimates from Gitanyow Lake determined that 165 wild sockeye smolts were produced per adult female spawner. In 2010 the KSF was operated much later into the season to sample coho smolts. A total of 10,918 coho smolts were sampled and successfully implanted with Coded Wire Tags (CWT) to estimate stock specific harvest rates on the cohort in Alaskan and Canadian coastal fisheries.

Acknowledgements

The GFA would like to thank Fisheries and Oceans Canada (Prince Rupert – Stock Assessment), Skeena Wild and the Gitanyow Hereditary Chiefs for jointly funding the operation of the KSF in 2010. 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 2010 GFA staff members included: Gary Morgan, Les McLean, Earl McLean, Jarvis Williams, Vern Russell, 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 well over 50% and reaching as high as 70% in some years (Cox-Rogers, DFO, Pers. comm., 2008). 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 and the disruption of flow and water quality in tributary feeder streams to Gitanyow Lake (Cleveland, 2005).

Historical DFO salmon escapement data system (SEDS) records for Kitwanga sockeye are incomplete and somewhat unreliable; therefore the determination of an exact historical escapement is not possible. In 1999, GFA initiated a Kitwanga sockeye rebuilding program to conserve, protect and recover the stock. One of the highest assessment 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).

Over the last seven years, GFA with support from DFO stock assessment biologists, have experimented with many 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 2006/2009 & 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 most of the smolts move out of the lake and migrate down the Kitwanga River. Therefore, GFA with the help of DFO engineers designed a permanent smolt fence that would be constructed from concrete and aluminum near the outlet of Gitanyow Lake.

In 2007, the GFA were successful in acquiring funding from the Ministry of Forests (MOF), Ministry of Environment (MoE), Gitanyow Hereditary Chiefs (GHC) and DFO to complete Phase I construction of Kitwanga Smolt Enumeration Facility (KSF). Phase I consisted of the establishment of a concrete sill in the Kitwanga River from which

aluminum transoms could be erected to support fence panels for smolt enumeration. The concrete sill was successfully constructed and installed in March and April of 2007, at a cost of $100,000.

In 2008, the GFA acquired funding from the Pacific Salmon Commission (PSC), MOF, GHC and DFO to initiate Phase II of the KSF, which included the fabrication and construction of the aluminum fence components to make the permanent smolt fence operational. Phase II of the project was successfully implemented in March of 2008 at a cost of an additional $100,000 and marked the first year of the KSF operations.

In 2009, the GFA in conjunction with the yearly smolt enumeration program incorporated a Coded Wire Tag (CWT) program specific to emigrating coho smolts (Kingston, 2010).

In the spring of 2010, the GFA operated the KSF to enumerate salmon smolts and other resident trout species as well as implant coho with CWT's. The 2010 smolt sampling season represents the third consecutive year that this project has been implemented at the KSF.

2.0 Introduction

The KSF plays a critical role in assessing freshwater production of wild sockeye smolts in Gitanyow Lake. It also helps GFA fisheries biologists measure the effectiveness of Kitwanga sockeye fry outplanting programs that took place in 2007 and 2008 in Gitanyow Lake (Cleveland, 2007 & 2009).

Since 2009, the GFA have been implanting coho smolts with CWT's (Kingston, 2010). Marked coho are recovered in Alaskan and Canadian fisheries and at the Kitwanga River Salmon Enumeration Facility (KSEF). Tag recovery information will help to determine ocean survival rates of coho salmon and help managers determine where they are being harvested on a yearly basis.

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 2010, 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 2010.

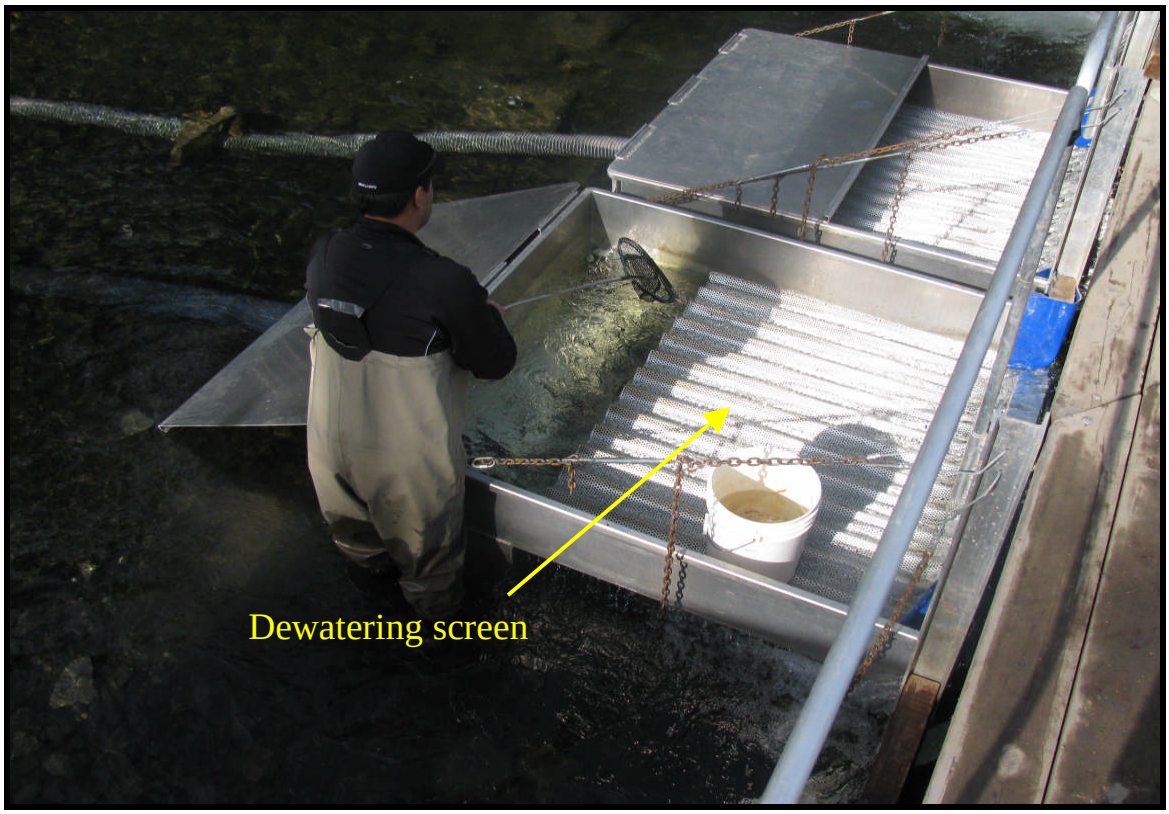
3.0 Methods

Installation of the KSF started on April 12th, 2010 and the smolt facility was rendered operational on April 16th, 2010 when the final components were connected to the concrete sill. The smolt-sampling period continued until June 25th, 2010 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 three 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 Phase I of the smolt fence completion project in 2007 (Kingston, 2008). The weir was constructed of prefabricated smolt panels, trap boxes and transoms that could be easily installed and removed by the GFA staff to monitor the yearly sockeye and coho smolt emigration. 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 river that naturally moves fish to the left bank of the river where the traps are installed.

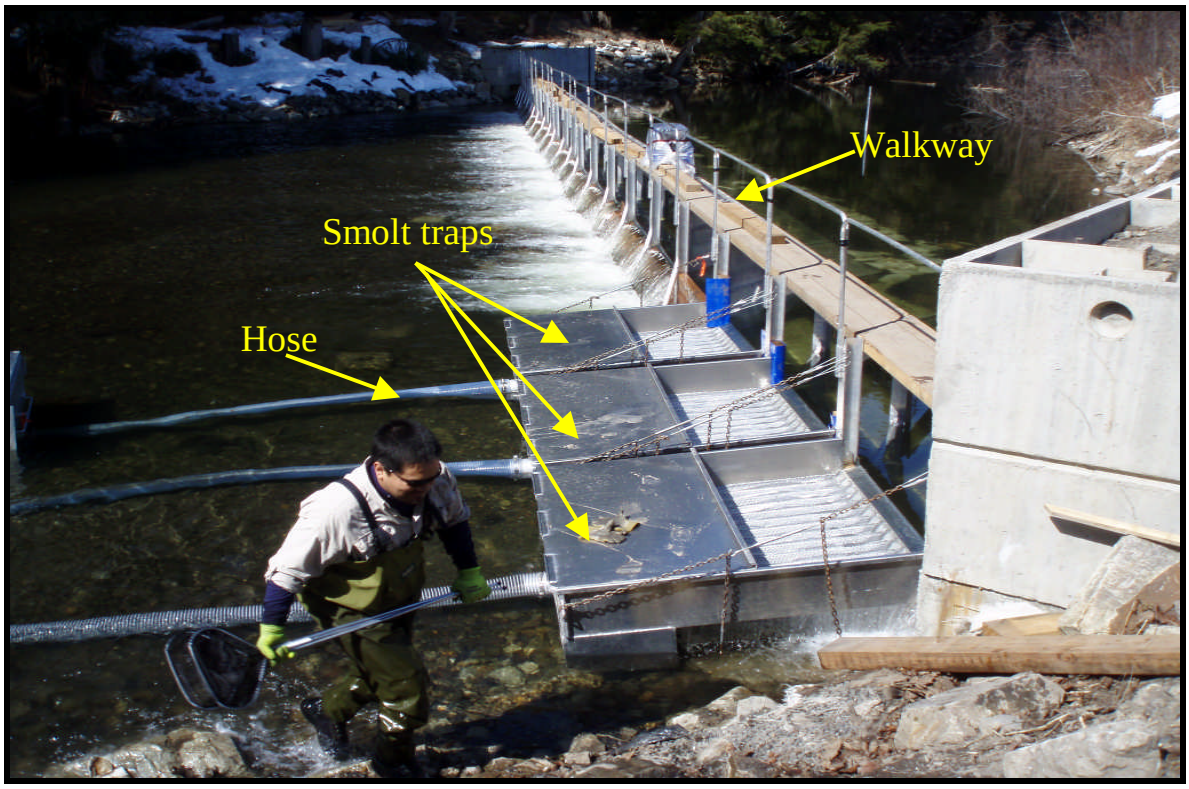
The trap boxes were designed with dewatering screens that funnelled the smolts into a small holding box where they remained trapped (Photograph 1). Once the fish were committed to entering the de-watering screens, the fish were then transported down the V-shaped grooves where the water velocity was too great for them to swim back upstream. A 6" rigid plastic hose connected the smolt trap to a large covered 4' X 8' holding box where smolts were held until they were sampled and enumerated (Photograph 2). In 2010 the smolt trapping apparatus consisted of three individual smolt traps that were connected to three 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. 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 2008- 2010 Kitwanga River Smolt Enumeration Facility showing reference to Gitanyow Lake outlet and Highway 37N (Image supplied from www.googleearth.com).



Photograph 1. Smolt trap box showing dewatering screen.

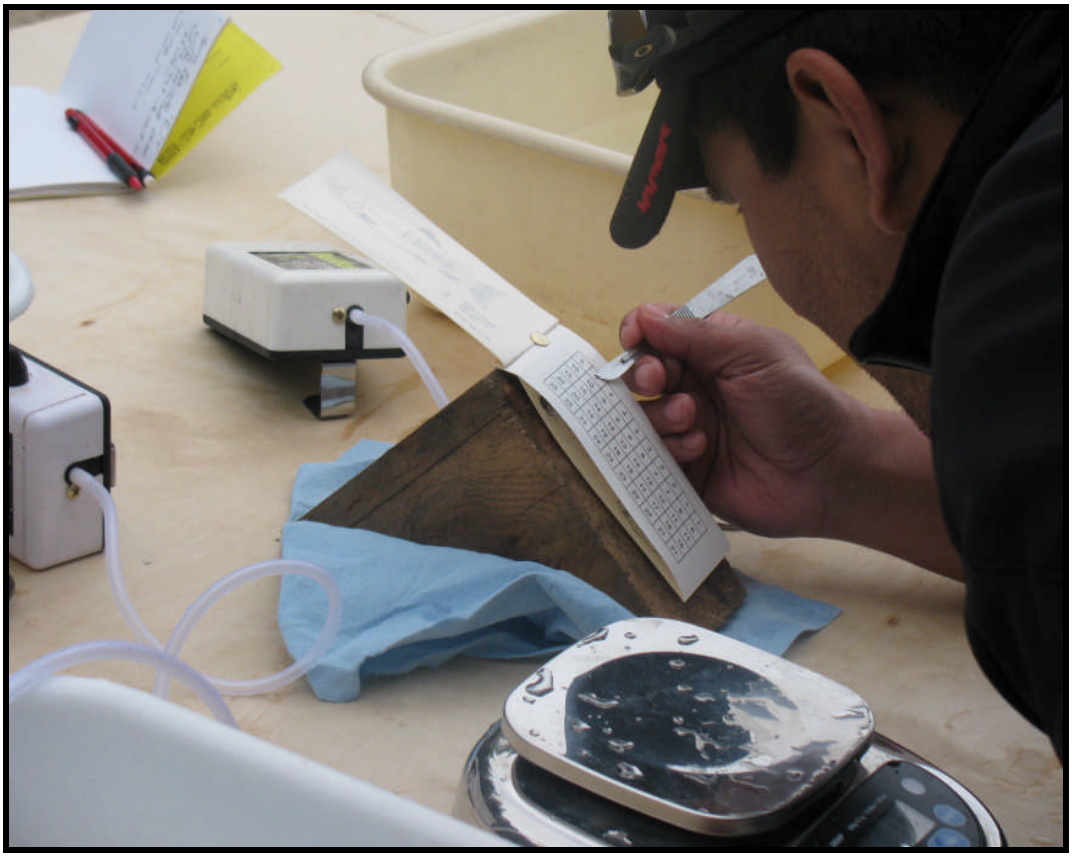
Photograph 2. Large holding boxes with 6” hose.



Photograph 3. Smolt fence showing traps, 6" hose 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 works. 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. A sub sample of the sockeye smolts was sampled each day to determine their lengths and weights. Fork lengths were taken to the nearest 1 mm and weights to the nearest 0.1 grams. Scale samples were also taken and sent to Birkenhead Scale Analysis for aging purposes (Photograph 4). Water levels and water temperatures were recorded daily.

Because most sockeye smolts migrate out of Gitanyow Lake and move downstream at dusk and the early part of the night all captured sockeye smolts are held until dusk the following day before they are released downstream of the weir and allowed to continue their journey to the ocean. A portion of the cutthroat trout and bull trout were sampled for lengths, weights and scale samples. All the other fish species caught in the weir were documented as well.



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

3.1 Coho Coded Wire Tag (CWT) Program

In 2010, GFA continued their second year of the CWT program for coho smolts. Nearly all of the coho smolts that were captured at the weir were implanted with a CWT and released downstream. During the daily sampling procedures the coho smolts were enumerated along with the other fish species and set aside so they could be implanted with a CWT. Approximately 50-100 coho smolts at a time were placed in buckets with an aerator and carried to the coho sampling station. Five to ten coho smolts at a time were then placed in an anaesthetic solution of clove oil. Once anaesthetized a sub sample of the coho were measured for length and weight each day. Fork lengths were taken to the nearest 1 mm and weights to the nearest 0.1 grams. The CWT were applied from a Mark IV automated tag injector (Photograph 5). Once the tag was implanted the coho were then released down the Quality Control Device (QCD) to detect whether the tag was properly implanted into the fish (Photograph 6). Approximately 10% of the coho smolts that were tagged each day were held in a separate bin for a 24-hr period to determine tag loss and mortality. All other coho smolts were placed back into the large holding boxes in the Kitwanga River and released at nightfall with the sockeye smolts. The adipose fin was removed from each coho that was implanted with a CWT so that they can be recognizable throughout the different fisheries when they return as adults.

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 setup.

4.0 Results and Discussion

4.1 Smolt Migration Timing

The 2010 Kitwanga River smolt trap was successful in capturing sockeye smolts, coho smolts, adult bull trout, adult and juvenile cutthroat trout, juvenile steelhead/rainbow trout, Rocky mountain whitefish and sculpins.

In 2010, only wild sockeye smolts were found to be emigrating from Gitanyow Lake. This was to be expected given that fry enhancement in the lake was discontinued in 2009. It could have been possible that some hatchery sockeye smolts would have emigrated in the 2010 cohort as 2.0 or 3.0 aged smolts, but none were observed during the sampling period. Hatchery sockeye released in 2008 and 2009 in Gitanyow Lake were marked with an adipose fin clip making them recognizable from wild smolts.

The first sockeye smolt was enumerated on April 21st, 2010 and the last sockeye smolt was enumerated on June 11th, 2010 (Table 1). The midpoint of the run occurred on May 17th, 2010 (Table 1). The peak of the emigration occurred on May 3rd, 2010 where 48% of the entire run migrated past the smolt fence in one day (Figure 2). Approximately 92% of the sockeye smolts migrated through the weir in a two-week period from April 28th to May 11th, 2010. The peak of the 2010 migration was approximately 4 days earlier than the 2001-2009 average of May 7th (Table 1). The midpoint of the 2010 run was approximately 2 days later than the 2001-2009 midpoint average of May 15th (Table 1). When comparing the timing of the Kitwanga sockeye smolt run with water stage it appears that sockeye migrate when water levels are starting to increase from runoff (Figure 3).

Table 1. Kitwanga sockeye smolt run timing table showing start, end, peak, and midpoint from 2001 – 2010.

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
Average 2001 - 2009	**April 25th**	**May 28th**	**May 7th**	**May 15th**

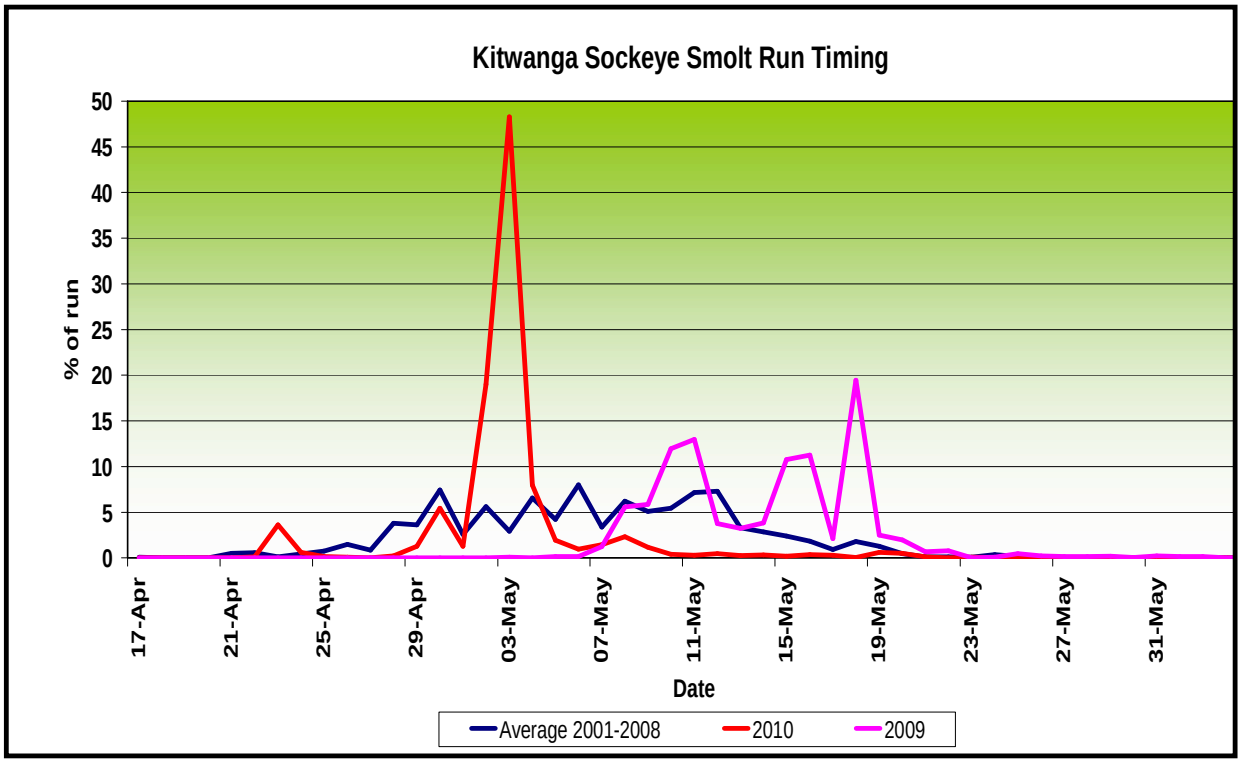


Figure 2: Kitwanga sockeye smolt run timing average (2001-2008) compared to 2009 and 2010.

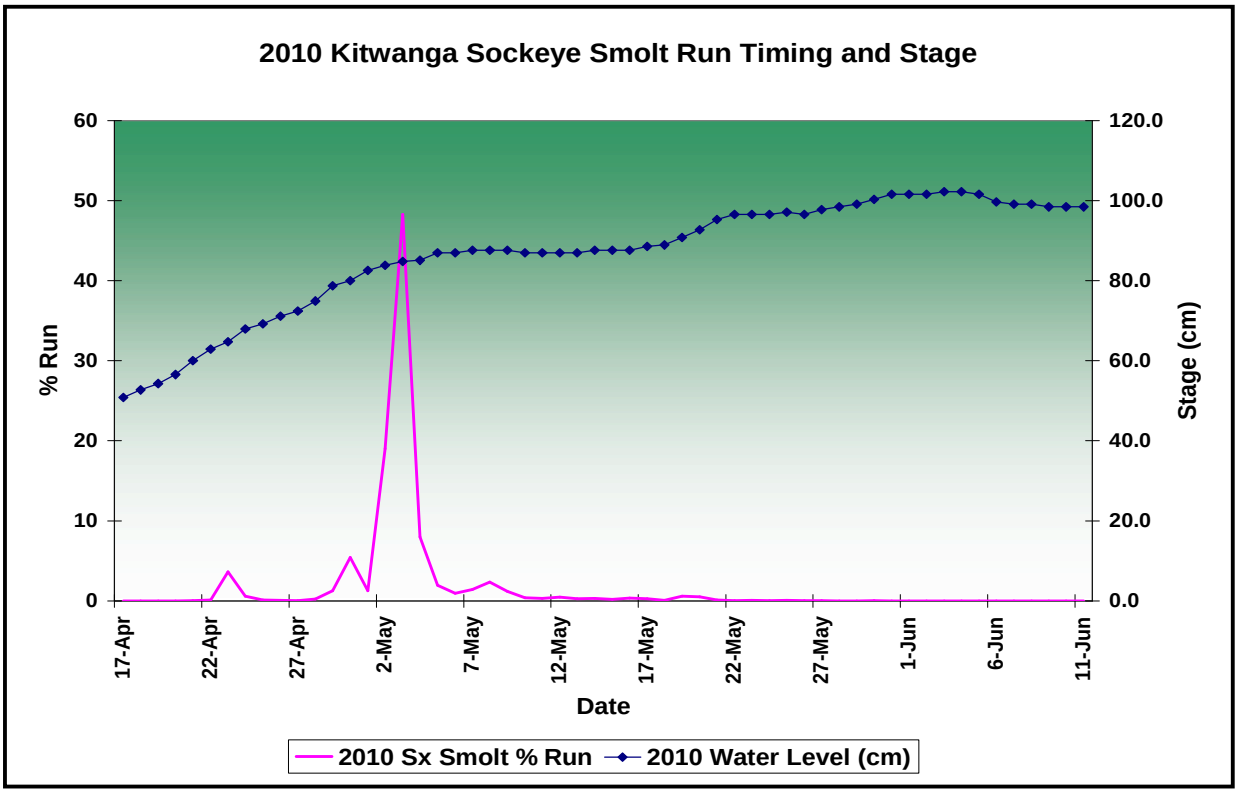


Figure 3: 2010 Kitwanga sockeye smolt run timing at the KSF and associated water stage.

The first coho smolt was enumerated on April 17th, 2010 and the last on June 25th, 2010. The peak of the coho smolt emigration occurred on May 31st, 2010 where 5.3% of the run migrated past the fence (Figure 4). The midpoints of the 2010 coho run occurred approximately 10 days earlier then what was observed in 2009 (Table 2). When comparing the timing of the Kitwanga coho smolt run with water stage it appears that most of the coho migrate when water levels are at the peak (Figure 5).

Table 2. Kitwanga coho smolt run timing table showing start, end, peak, and midpoint from 2009 and 2010.

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
Average 2009 –2010	**April 18th**	**July 4th**	**June 13th**	**May 27th**

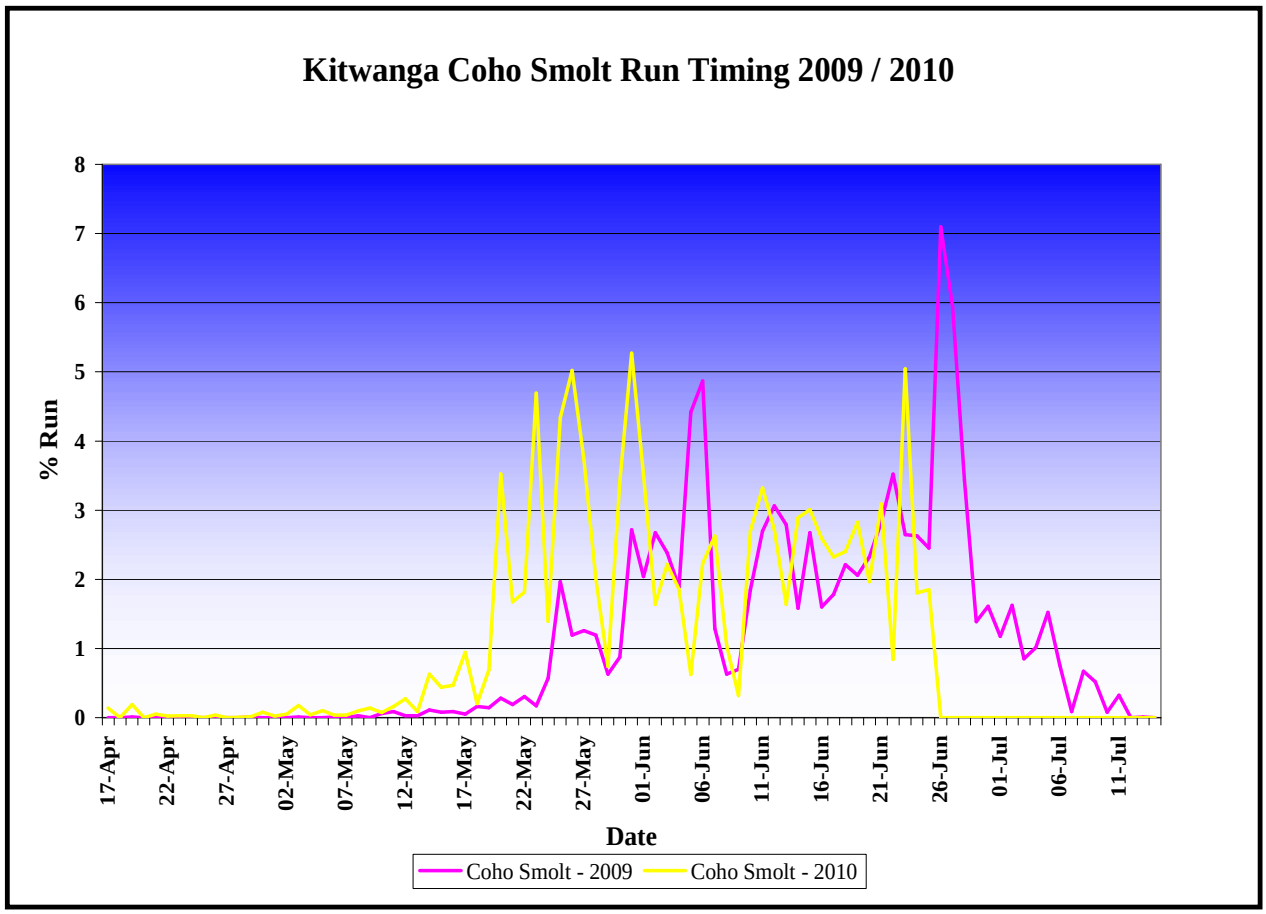


Figure 4: Kitwanga River coho smolt run timing at the KSF in 2009 and 2010.

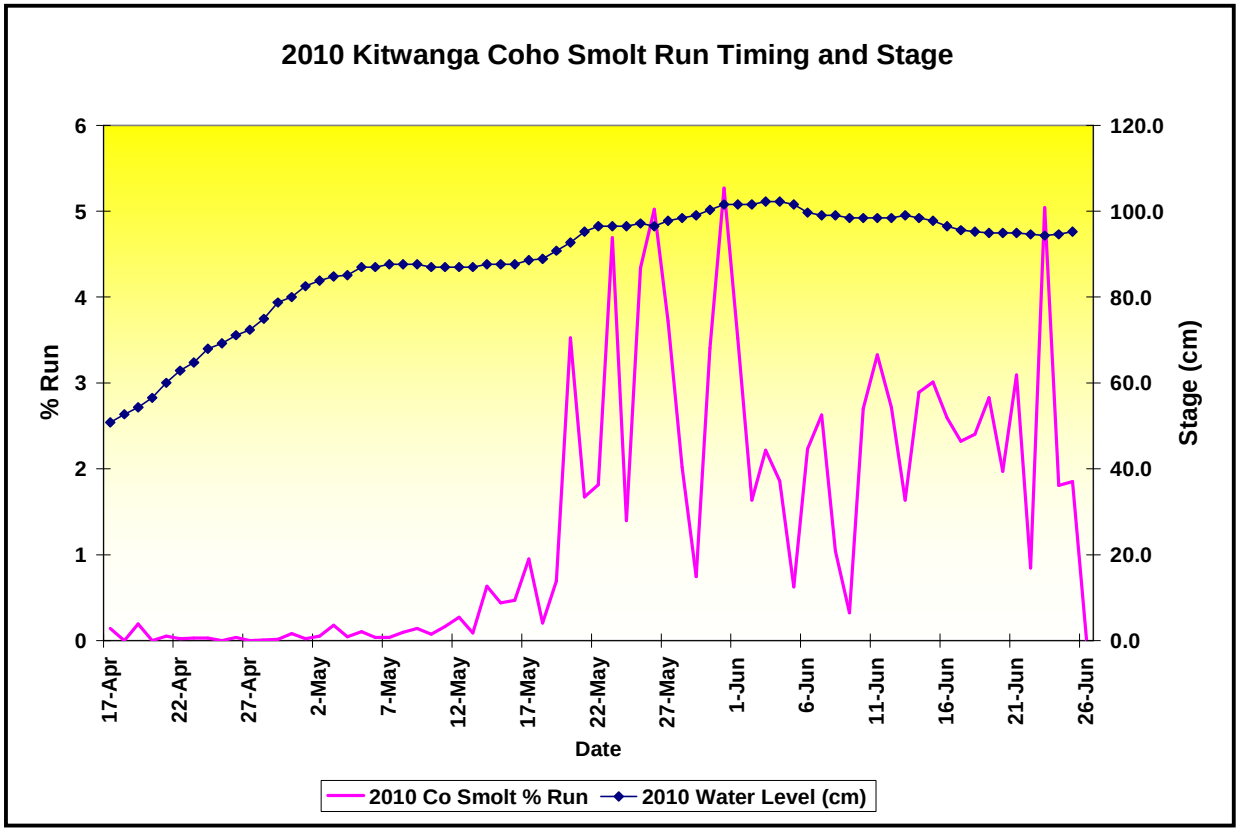


Figure 5: 2010 Kitwanga coho smolt run timing at the KSF and associated water stage.

4.2 Age Structure

Sockeye Smolts

In 2010, a total of 765 sockeye smolt scale samples were analysed for age composition. All of the sockeye that were aged were determined to be Age 1.0 smolts and would have originated from the 2008 broodyear (Table 3).

Table 3: Summary of 2010 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 2010	Wild	1.0	22	2008	765	100.00

All one year-old scales exhibited a freshwater stress; the location of the stress varied but was usually found within the 4th and 14th circuli. The total number of circuli in the first year of growth ranges from 11 to 25. In general, the total circuli count is directly related to smolt length and weight (Appendix 1). As has been noted previously the strength of

the stress ranges from weak to moderate to strong, with most smolts in 2010 exhibiting moderate to strong stresses.

Coho Smolts

In 2010, a total of 600 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 2,490 sockeye smolts were sampled for lengths and weights. The average fork length of age 1.0 sockeye smolts was 106.4 mm and ranged from 77 mm to 128 mm (Table 4). Average weight measurements were 11.5 grams and ranged from 4.1 grams to 21.5 grams (Table 4). In 2010, age 1.0 sockeye smolts on average were 3.1 mm shorter and 0.9 grams lighter than the averaged collected between 2001-2009 (Table 4).

Table 4: Kitwanga River sockeye wild smolts mean fork lengths and weights for 2001-2010 (Williams et al. 2002, McCarthy 2005, Kingston 2006, 2009, 2010 & Koch 2008).

Year	Sample Size (N)	Mean Fork Length (mm)	Mean Weight (g)
2001	1,750	103.5	10.2
2002	1,389	103.9	10.6
2003	1,025	112.3	14.0
2004	465	114.1	14.4
2005	260	116.4	13.4
2006	750	115.0	14.3
2007	349	108.2	12.0
2008	1,224	102.8	9.9
2009	320	112.1	13.4
2010	2,490	106.4	11.5
Average 2001 - 2009		**109.5**	**12.4**

Sockeye Smolts Age 2.0

In 2010, only one age 2.0 sockeye smolt was sampled and its fork length and weight was 151.0 mm and 33.6 grams respectively (Table 5).

Table 5: Wild sockeye smolts age 2.0 mean fork length and weight for 2010.

Age	Sample Size (N)	Mean Fork Length (mm)	Mean Weight (g)
2.0	1	151.0	33.6

Coho Smolts

550 coho smolts were sampled for length and weight measurements. Average fork lengths of coho smolts were 141.2 mm and ranged from 103 mm to 264 mm. Average weights were 31.1 grams and ranged from 11.8 grams to 192.7 grams (Table 6).

Table 6: Coho smolts mean fork lengths and weight for 2010.

Sample Size (N)	Mean Fork Length (mm)	Mean Weight (g)
550	141.2	31.1

4.4 Population Estimate

Sockeye Smolts

In 2010, the sockeye smolt population was estimated by adding the total daily catch from each trap. A total of 113,068 wild sockeye smolts were captured during the 2010 study period, which included 24 two-year-old smolts. The 2010 population estimate is the second highest ever recorded from Gitanyow Lake since population estimates were generated for the stock dating back to 2001 (Table 7).

Table 7: Kitwanga River sockeye smolt population estimate and trap efficiency for 2001-2010.

Year	# Smolts Marked	# Smolts Recaptured	Trap Efficiency %	Total Smolts Captured	**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	1,273	**35,281***	--	--
2010	N/A	N/A	N/A	113,068	--	**113,068***	---	--

***Note:** 2009 wild smolt population estimate includes 311 two-year-old smolts
2010 wild smolt population estimate includes 24 two-year–old smolts

Other Species

The KSF also captured 13,622 coho smolts. Resident trout species were also captured during the study and these totals accounted for 987 cutthroat trout, 614 bull trout and 216 rainbow trout (Table 8.). Other fish species captured, included 143 Rocky mountain whitefish, over 11,000 sculpins and 11 redside shiners (Table 8).

Table 8. Summary of other fish species caught at the Kitwanga smolt fence in 2010.

Year	Coho Smolts	Cutthroat Trout	Bull Trout	Rainbow Trout	Rocky Mountain Whitefish	Sculpin	Redside Shiner
2010	13,622	987	614	216	143	11,148	11

4.5 Sockeye Smolt Production

In 2010, it is estimated that an average of 165 smolts were produced per female spawner in 2008. This estimate was generated by dividing the total number of smolts produced in 2010 by the number of adult females that are thought to have successfully spawned in 2008 (Koch and Cleveland, 2008). The 2010 smolt production is almost double what was produced in 2008 but less than what was produced in 2009 (Table 9). In comparison, other British Columbia lakes such as Cultus and Chilko have produced an average of 108 and 115 sockeye smolts per female per year respectively (Hall, 2009). Historical sockeye smolt production estimates for these lakes date back over 30 years.

Table 9. Estimate of smolts per female spawner for wild sockeye in 2008, 2009 and 2010.

	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

4.6 Coho CWT Tagging Program

In 2010, it is estimated that 10,918 coho smolts were implanted with CWT'S at the KSF (Table 10). 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. Five separate tag groups were used during the 2010 study with tag loss rates ranging from 0.0% to 3.0% (Table 10). Mortality rates for the tag groups ranged from 0.0% to 9.8% (Table 10).

Table 10. Kitwanga Coho CWT groups release report summary 2010.

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 D03/53	9 (1.7%)	21 (4.0%)	5.7%	522	2677	2925	141.4	31.2
A08 D04/16	6 (2.9%)	20 (9.8%)	12.7%	205	1507	1638	140.5	29.4
A08 D29/62	12 (3.0%)	0 (0 %)	3.0%	401	3890	4002	143.0	33.1
A08 D03/63	4 (2.1%)	0 (0 %)	2.1%	194	1921	1975	137.8	28.1
A08 D03/44	0 (0 %)	0 (0 %)	0 %	96	923	948	130.1	25.0
Total					**10,918**	**11,488**		

4.7 Other Findings

Ice Off & Sockeye Smolt Run Peak

From studies conducted on Kitwanga sockeye smolt emigration it has been determined that they usually leave Gitanyow Lake shortly after the ice comes off the lake (Koch, 2008). In 2010, ice off occurred on April 21st and the peak of the smolt run occurred 10 days later. Over the past five years Kitwanga sockeye smolts also left the lake between 4 and 9 days after ice off (Table 11).

Table 11: Relationship between ice-off and the peak of the Kitwanga sockeye smolt run from 2006 – 2010.

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

5.0 Conclusion and Recommendations

The GFA have been successful enumerating both sockeye and coho smolts at the KSF for the past three years. Since 2008, the KSF has remained operable for the entire sockeye and coho smolt migration period and even during high water conditions.

The 2010 sockeye smolt population estimate was 113,068 and was comprised almost exclusively of 1-Yr old smolts (99.9%). The sockeye smolt run timing was quite compressed when compared to previous years with almost 50% of the run migrating past the weir in one single day.

In 2010, freshwater production estimates from Gitanyow Lake determined that 165 sockeye smolts were produced per adult female. When this production estimate is compared to other British Columbia Sockeye lakes the production is 47% above the average.

In 2009 and 2010, the GFA operated a CWT program for Kitwanga coho smolts and have successfully applied enough tags each year to access Alaskan coastal harvest rates on the stock. In 2010, the GFA applied almost 11,000 CWT's and it is expected that the tagged fish will return to the Kitwanga River in 2012 where a tag ratio will be acquired for the cohort.

The GFA, with help from MOF, DFO, MOE, and the GHC, has successfully implemented a sockeye smolt counting facility that will provide reliable estimates of smolt migration from Gitanyow Lake on a yearly basis. The smolt escapement estimates will help biologists determine the freshwater production in Gitanyow Lake as well as a yearly smolt to adult survival rate specific to the Kitwanga sockeye stock when coupled with escapement results from the Kitwanga River Salmon Enumeration Facility. As coho smolt and adult assessments continue on the Kitwanga system, coho CWT information collected by the GFA and tag recaptures in the commercial fishery will help to determine ocean survival rates and exploitation of the stock in the various Alaskan and Canadian fisheries in the ocean and in freshwater recreational and aboriginal fisheries.

References

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Appendix 1 – Letter from Carol Lidstone of Birkenhead Scale Analyses

Birkenhead Scale Analyses

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November 30, 2010

Derek Kingston,
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P.O. Box 148,
Kitwanga, B.C. V0J 2A0

Re: 2010 Kitwanga River Sockeye Smolt & Adult - Scale Analysis

Dear Derek,

Attached is the analysis for the sockeye smolt and adult scales collected from the Kitwanga River in 2010. The updated version of the Excel file includes the scale age, circuli counts and relevant comments.

Smolt Sample – April & May, 2010
All of the smolt scales were analyzed, however to stay within the budget approximately half of the sample has corresponding circuli counts. All of the readable scales are age 1 with a total circuli count ranging from 11-25. The total circuli count is generally directly related to smolt size. All of the smolt scales are exhibiting a stress in the first year of growth, between the 4^{th}-14^{th} circuli. Five samples demonstrate 2 stresses within the first year of growth. As with previous analysis, the strength of the stress ranges from weak to moderate to strong, with most being moderate to strong. The 8 samples with a weak stress are identified under "comments"; they are generally small in size with a low circuli count. None of the scales exhibit the typical hatchery pattern.

Adult Sample – July & August, 2010

The entire adult sample was analyzed, with circuli counts provided for all readable scales. The majority are age 1.2, but also two age 1.3, and one age 0.2, which is a hatchery fish that exhibits 2 stresses but no freshwater annulus.

Hatchery Pattern - Adults
Most of the scales with no adipose exhibit the typical Kitwanga hatchery pattern. However there are five fish with no adipose that exhibit the wild pattern (see comments). Two samples that do not exhibit the typical hatchery pattern have a wide focus, and I suspect they are lacking the first stress which is normally visible between the 3^{rd}-6^{th} circuli. In general, the hatchery scales are showing a stress between the 3^{rd}-6^{th} circuli, plus growth from 0-5, and a total circuli count ranging from 21-27. Nine of the hatchery pattern scales exhibit two stresses in the first year of growth.

Wild Pattern - Adults
Most of the scales with an adipose exhibit the typical wild pattern unique to Kitwanga, with a stress between the 6th-15th circuli, plus growth ranging from 0-4, and a total circuli count of 15-26. I believe the total circuli count is lower in average than previous analysis. Please see cover letter from the 2008 smolt analysis, which suggests the 2010 adult return may have a lower than average circuli count.

There are a few exceptions within the wild pattern scales:

- 4 samples with adipose exhibit the typical hatchery pattern; Book 67348 #24, is hatchery pattern, but may have been mixed with #25 which is a wild pattern, but no entry in computer.
- 3 samples demonstrate a weak stress; the majority of stresses are moderate to strong.
- 4 samples do not exhibit a stress

I hope you are satisfied with the results, and I look forward to hearing any comments or questions you may have. Please note I will be away from the office from December 1-6. I will return scales and hard copy of results after December 7th, in case you require any additional analysis. I will also return the 2009 samples, which I still have.

Thank you very much for the opportunity to complete this work for you.

Sincerely,

Carol Lidstone
Birkenhead Scale Analyses