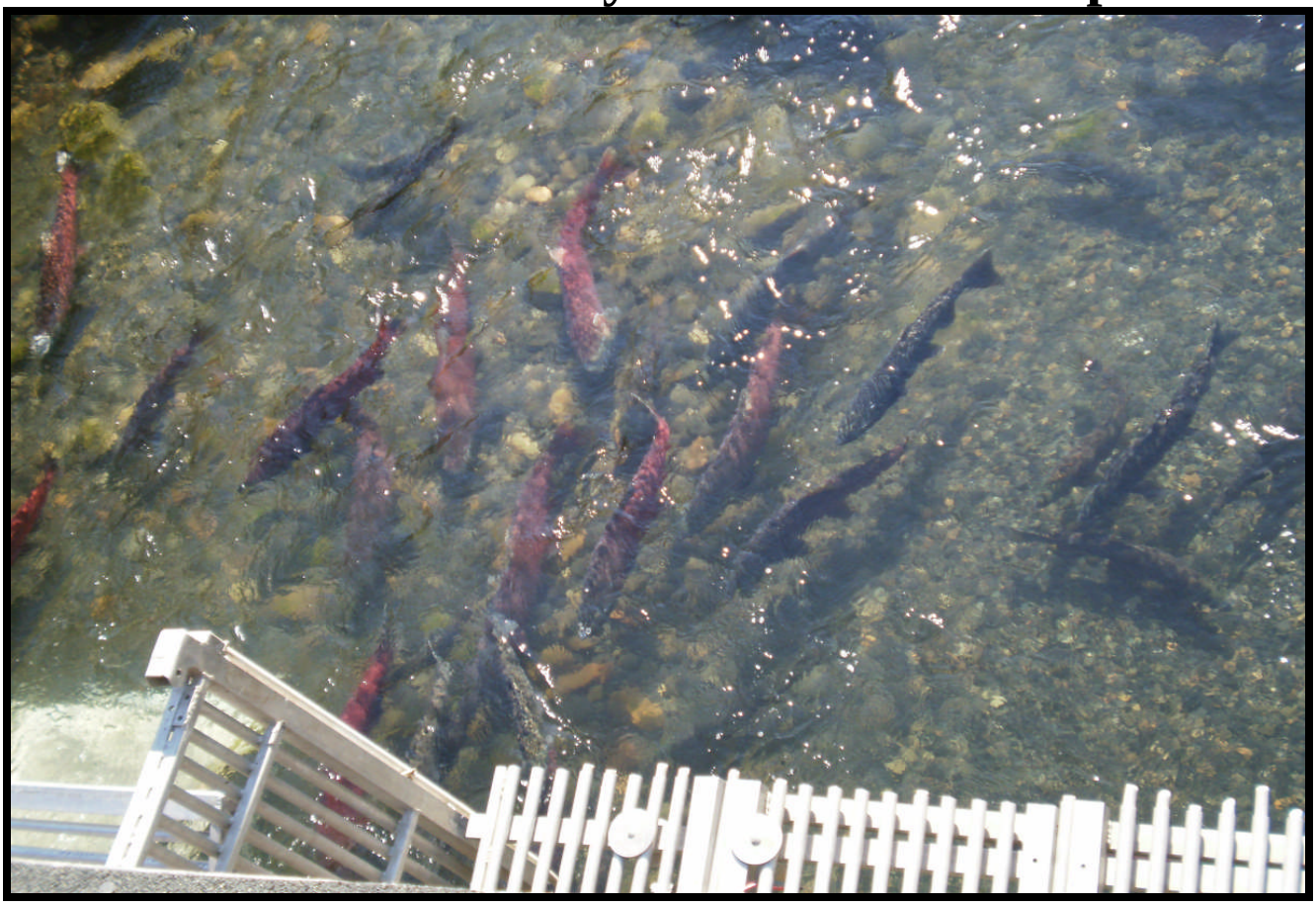
Gitanyow Fisheries Authority

Kitwanga River Salmon Enumeration Facility – 2010 Annual Report



Prepared for: Gitanyow Hereditary Chiefs
Skeena Watershed Initiative
Fisheries and Oceans, Canada
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Abstract

In 2010, the Gitanyow Fisheries Authority (GFA) operated the Kitwanga River Salmon Enumeration Facility (KSEF) for the 8th consecutive year to enumerate all five salmon species returning to the Kitwanga River. From July 6th to October 9th, 2010 a total of 20,804 sockeye (including 338-hatchery sockeye), 852 chinook, 63jack chinook, 15,650 pink, 348 chum, and 1,381 coho salmon (including 165 Coded Wire Tag (CWT)) were enumerated through the facility. The 2010 Kitwanga sockeye escapement is the highest ever recorded by the GFA since they started enumerating sockeye in 2000. Hatchery sockeye represented 1.6% of the 2010 return. Aging results from wild and hatchery sockeye concluded that 99% of the adult sockeye returns in 2010 were 4-year old returning fish. The 2010 pink salmon return was very good considering it is 3.6 times greater than the brood year escapement. Compared to previous returns, chinook and chum escapements were low and the GFA have been observing a decline in escapements from both species. The 2010 coho escapement was low when compared to previous years but it is likely underestimated due to breaching of the fence during the peak of the coho run. Although the fence was breached before the end of the sampling period due to extremely high waters seen at the site, GFA believes that only escapement counts for coho salmon were compromised because all other salmon species are predicted to have already migrated past the KSEF.

Acknowledgements

The Gitanyow Fisheries Authority (GFA) we would like to thank the Skeena Watershed Initiative, Fisheries and Oceans Canada (Prince Rupert – Stock Assessment) and the Gitanyow Hereditary Chiefs for jointly funding the operation of the permanent fence in 2010. GFA would also like to acknowledge the hard work of the 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, Sandy Hnatiak, Brenton Williams, Scott Williams, Frank Vipond, 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 logging and road building 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, with help from the DFO's Aboriginal Fisheries Strategy (AFS) program the Gitanyow Fisheries Authority (GFA) initiated a Kitwanga sockeye rebuilding program to conserve, protect and recover the stock. A key component of the rebuilding program included the determination of yearly sockeye escapement and the investigation of some of the potential limiting factors affecting Kitwanga sockeye production.

In 2000, 2001 and 2002 the GFA were successful in obtaining funds to establish and operate a temporary fence in the upper parts of the Kitwanga River to enumerate yearly sockeye escapements to the system. The fence was located approximately 4-km downstream of Gitanyow Lake, below all know Kitwanga sockeye spawning grounds. The temporary fence was successful in obtaining escapement results for sockeye salmon in all years. The escapement results were 260 in 2000, 227 in 2001 and 971 in 2002. Because historical escapements of Kitwanga sockeye were thought to be in the ten's of thousands these initial escapement results confirmed Gitanyow's fear that the sockeye stock was extremely depressed (Cleveland et. al, 2006).

Although the temporary fence worked it was susceptible to fall flooding because of the nature of the temporary structure. Furthermore, the operation proved costly and time consuming yielding only useful information for sockeye management. Therefore, in an effort to expand the programs usefulness the GFA recommended relocating the fence

closer to the mouth of the river to allow for the accurate determination of all six salmon species (including steelhead) returning to the Kitwanga River on a yearly basis.

GFA and DFO collaborated to initiate plans to construct a permanent enumeration facility near the confluence of the Kitwanga River (Cleveland, 2003). It took three years of intensive planning, field investigations and negotiations to develop conceptual plans and to secure capital funding to construct the facility (Cleveland, 2003). Finally during the winter and spring of 2003, the Kitwanga River Salmon Enumeration Facility (KSEF) was constructed at a cost of $750,000.00 and became operational in July 2003 (Cleveland, 2003).

Since 2000, the GFA with help from DFO have implemented various studies in an attempt to better understand the potential limiting factors to Kitwanga sockeye production. From these studies GFA in partnership with DFO and the Skeena Fisheries Commission (SFC) were able to develop a Kitwanga Sockeye Rebuilding Plan (KSRP) to help guide recovery of the stock (Cleveland *et. al*., 2006). Outcomes of the plan included recommendations to initiate stock enhancement / habitat restoration activities and an overall reduction in exploitation on a yearly basis. A key component of the plan also included accurate monitoring of Kitwanga adult sockeye escapement on a yearly basis to allow biologists working on the recovery of the stock to assess the effectiveness of their rebuilding efforts.

In the summer and fall of 2010, the KSEF was operated by the GFA to enumerate and sample sockeye, chinook, pink, chum and coho salmon, which represented the eighth consecutive year that this project has been implemented. Steelhead enumeration activities also took place in 2010 at the KSEF using DIDSON technology. The steelhead enumeration results will be presented in a separate report to be authored by the BC Ministry of Natural Resource Operation (Peard, Pers. comm., 2010).

2.0 Introduction

Since the establishment of the KSEF in 2003 it has proven to be a useful tool for fisheries managers to provide in-season and post season information to support management decision making in the Skeena River. Not only is the KSEF used as a middle Skeena salmon indicator but also it is the only fence in the northcoast that provides an accurate fence count for both pink and chum salmon. The KSEF is a key assessment tool used by the GFA to assess the Kitwanga Sockeye Rebuilding Program, which has been in effect since 2006. With the recent upgrades administered to the counting stations in 2010 the GFA now have the ability to stop every migrating salmon and check for adipose fin clips. Being able to identify if a sockeye salmon has a clipped adipose is essential to estimating the production from Kitwanga sockeye outplanting programs that took place in 2007 and 2008 (Cleveland, 2007& 2009). Recently, the GFA have been implanting coho smolts with Coded Wire Tags (CWT) (Kingston, 2010). Recovering the CWT coho at the KSEF will help to determine ocean survival rates of coho salmon and where they are being harvested in the various commercial, sport and aboriginal fisheries in Alaska and Canada on a yearly basis.

In 2010, the KSEF was operated with funding contributions from the Skeena Watershed Initiative, Fisheries and Oceans Canada (Prince Rupert) and the DFO's AFS program. This report summarizes the sampling results and findings for the KSEF program in 2010.

3.0 Study Area

The Kitwanga River is a fifth order stream that drains into the Skeena River approximately 250 kilometres northeast of Prince Rupert, B.C. It supports 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 is also known to support populations of resident rainbow trout (O. mykiss), cutthroat trout (*O. clarki*), Dolly Varden (*Salvelinus malma),* bull trout *(S. confluentus*), mountain whitefish (*Prosopium williamsoni*) and various other species of coarse fish (Cleveland, 2000). It is coded 40-2200 by the B.C. Watershed Classification System. The UTM coordinates at its confluence are 090055840 N, 6106300 E. The drainage encompasses an area of approximately 83,000 hectares and has a total mainstem length of 59 kilometres (Cleveland, 2000). The river can be divided into two sections, the Upper and the Lower Kitwanga River. The Upper Kitwanga is located directly north of Kitwancool Lake and has a main stem length of approximately 23 km. The Lower Kitwanga River flows south for approximately 36 km between Kitwancool Lake and the Skeena River. The Lower Kitwanga River has four major tributaries Tea Creek (40-2200-010), Deuce Creek (40-2200-020), Kitwancool Creek (40-2200-030) and Moonlit Creek (40-2200-040). 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 approximately 4 km upstream from its confluence with the Skeena River (Figure 1.) Access to the site is provided through a private road owned by Cher-Noble Enterprises Ltd. (owners Marcus and Don Halvorson). The actual enumeration facility is constructed on private property owned by Marcus and Don Halvorson. Therefore, to ensure long-term access to the site the Gitanyow Hereditary Chiefs applied for a Statutory Right of Way to both the road to access the site and the site where the enumeration facility was constructed. The Right of Way was granted on March 26, 2003 for both parcels of land and is legally in effect until 2028 (Cleveland, 2003).

The majority of the Kitwanga Watershed is located within Gitanyow Traditional Territory. However, the bottom portion of the river including the location of the KSEF is located on Gitwangak Eagle Clan Traditional Territory. Out of respect for the Eagle Clan (Hereditary Chief - Calvin Hyzims), the Gitanyow Hereditary Chiefs have consulted with their neighbours each year since 2003 for permission to conduct yearly salmon enumeration on their traditional territory. Each year as a sign of good faith two Gitwangak fishery labourers are hired to help operate the facility (Cleveland, 2005).

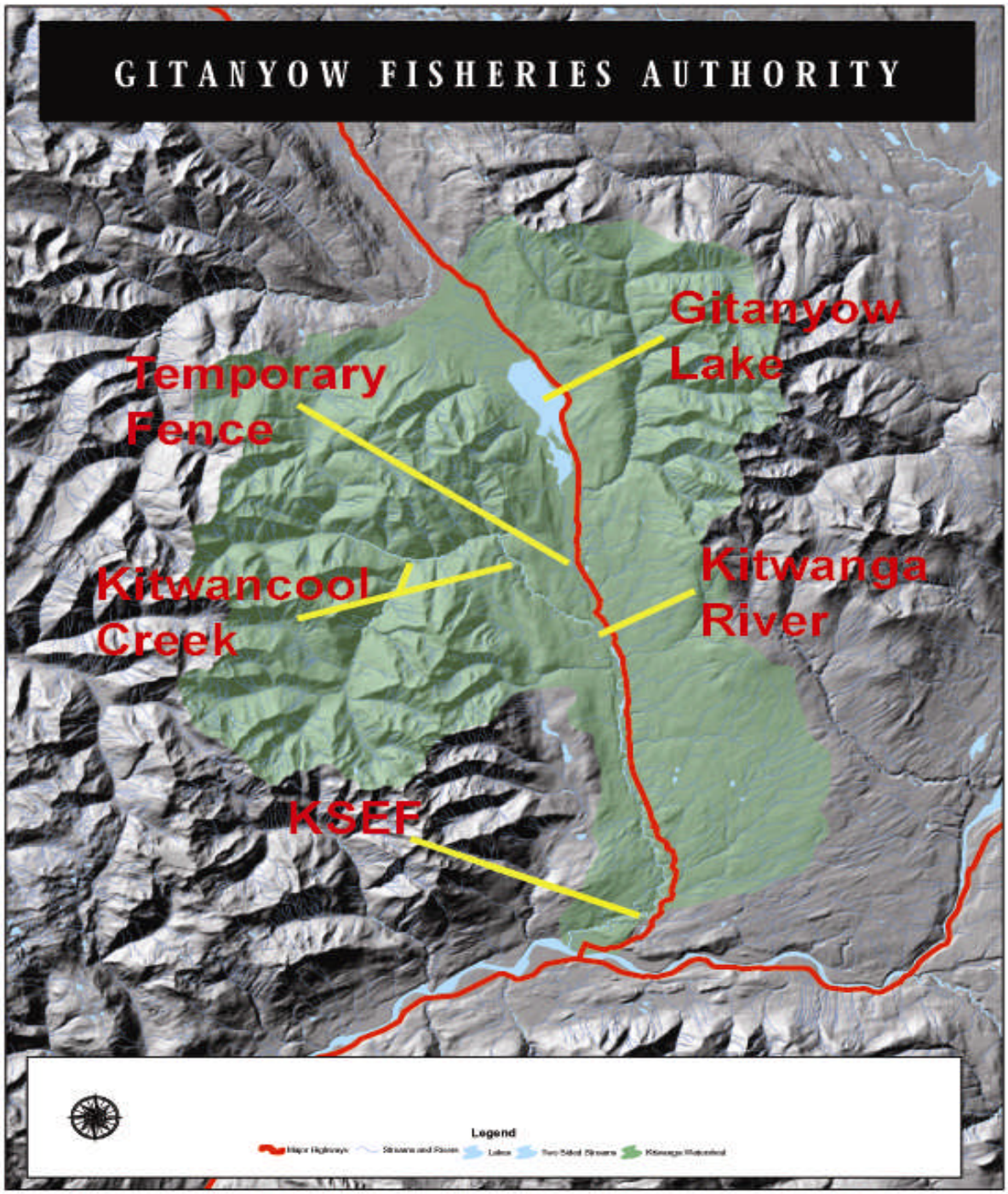
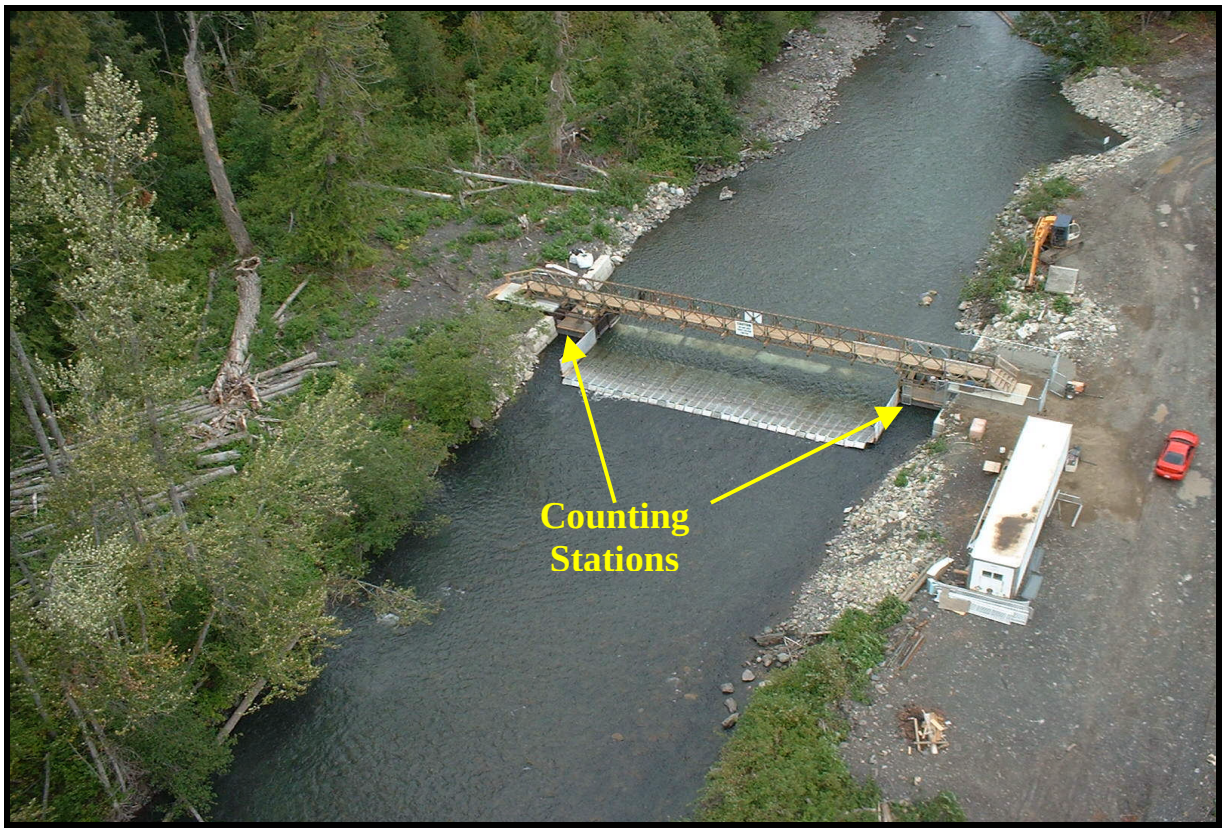


Figure 1: Map of the Kitwanga Watershed making specific reference to the KSEF and the temporary fence location.

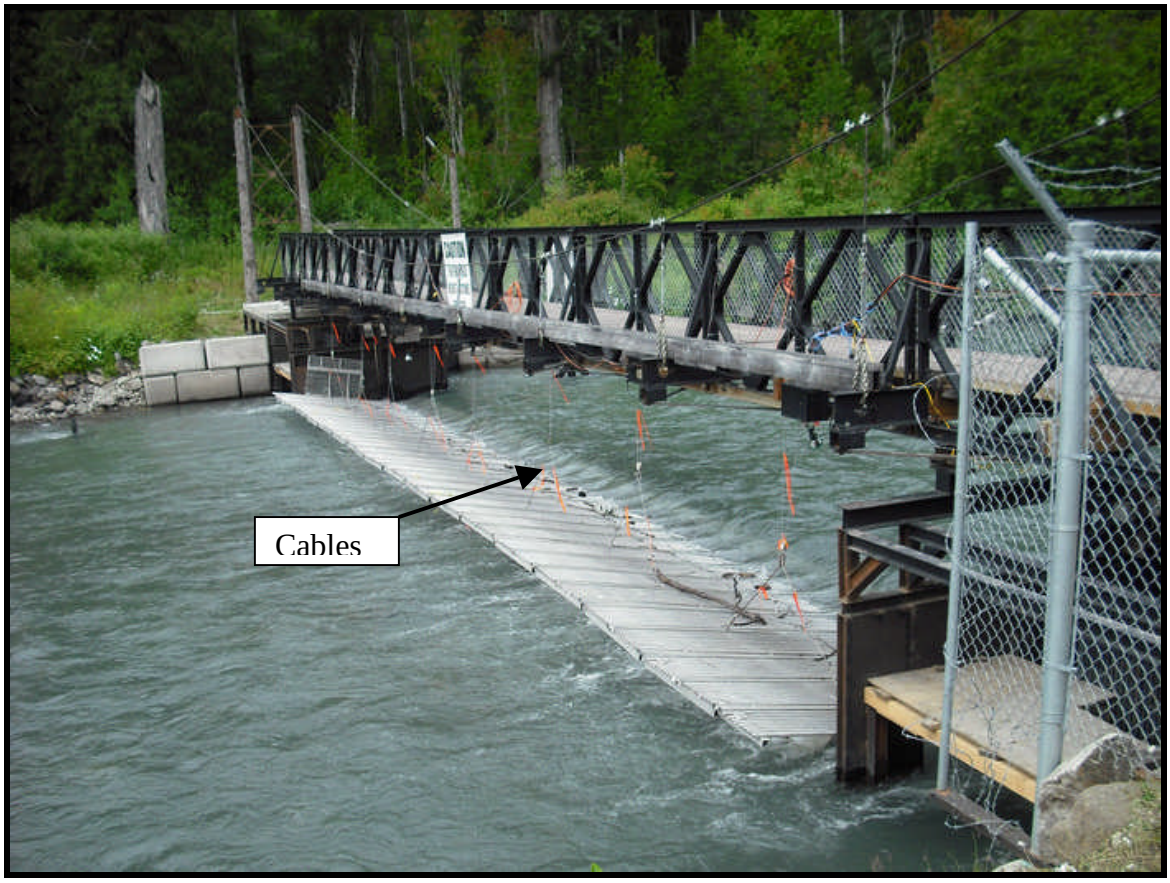
4.0 Methods

To effectively and accurately enumerate all salmon species returning to the Kitwanga River on an annual basis the GFA utilize a permanent fish fence that was constructed on the Kitwanga River in the winter of 2003. The fish fence is formally known as the Kitwanga River Salmon Enumeration Facility (KSEF). The enumeration facility is located near the mouth of the Kitwanga River below most salmon spawning areas (Cleveland, 2004). The KSEF operates during the summer and fall months and utilizes aluminum panels that span the entire river. The aluminum panels direct the upstream migrating salmon through one of two counting stations located on the left and right banks of the river (Photograph 1). From late fall to early summer all of the fence materials are removed from the river and it remains in more of a natural state allowing other species of fish unimpeded movement past the site.



Photograph 1. Aerial view of the KSEF showing the two counting stations.

The KSEF is approximately 30m long and runs perpendicular to the rivers flow. The upstream ends of the aluminum panels are secured in the river by attaching them to metal hooks. The metal hooks are permanently secured with hilti bolts to a cement sill that spans the entire width of the river. The hooks allow the floating panels to hinge up and down as water levels fluctuate. In total there are eighteen aluminum panels, which span the entire width of the river. The downstream ends of the panels are secured with 1/4" aircraft cable to eight - 1500 lb winches suspended from an overhead walkway bridge (Photograph 2). The winches and adjoining cables allow the fence to be easily raised or lowered depending on the water level at the KSEF.

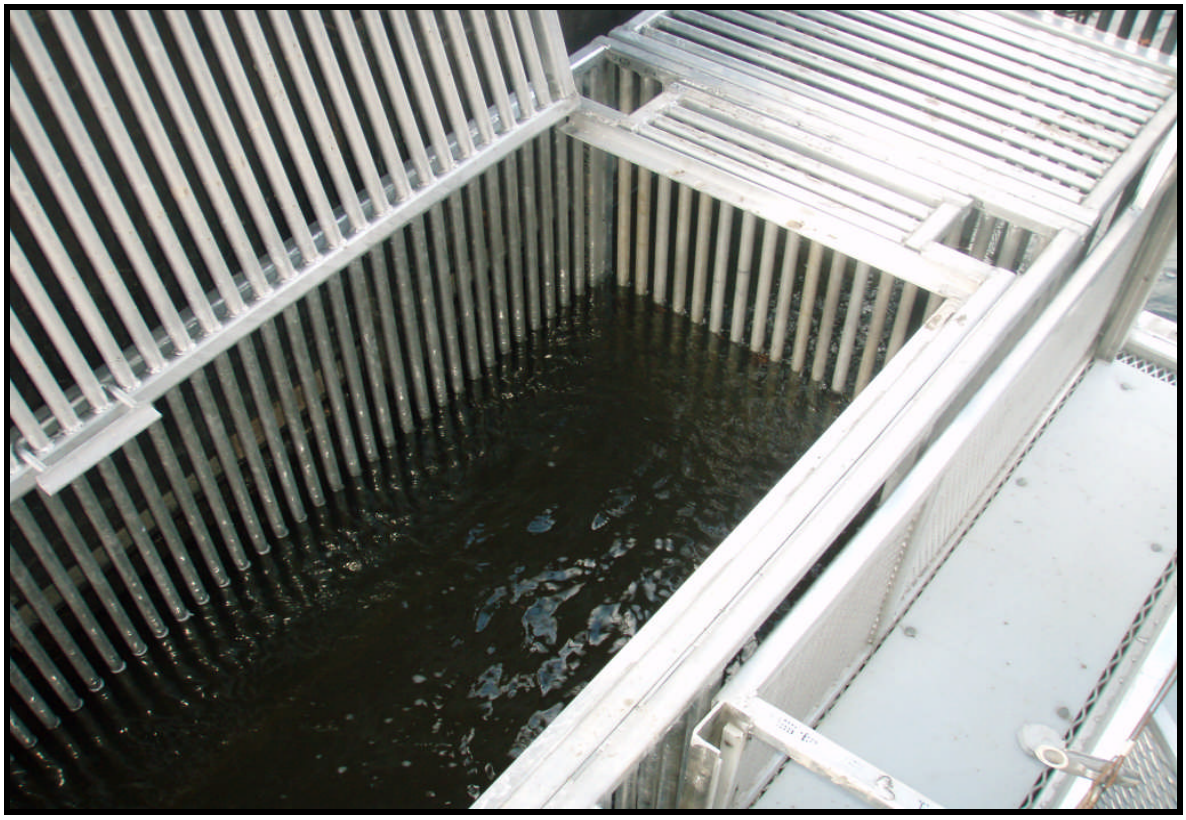


Photograph 2. Aluminum panels attached to overhead walkway bridge with cables.

An overhead guideline with electric winch helps the GFA staff to easily install and remove the 175 lb aluminum panels from the Kitwanga River (Photograph 3).
Once the aluminium panels are secured to the sill the left and right bank counting stations are assembled so that all fish species can be enumerated as they migrate past the fence. As the salmon migrate upstream they encounter the aluminium fence panels and swim to the left or right banks of the river. Once they are positioned near the riverbanks they encounter a trap box and passively swim through the box (Photograph 4). The fisheries technician stationed at the trap box can then visually identify and tally the fish as it swims through the trap box. The trap box is separated into two sides, which allows fish to swim up both sides. Each side of the trap box contains a revolving door that allows the technician the ability to direct a fish into one of two large holding pens where they can be effectively dipnetted and sampled if desired (Photograph 5). A white teflon reflective background is used on the bottom of the trap boxes to make fish identification easier. A floating viewing box with a plexiglass bottom is also used on top of the water column to cut the waters glare thereby improving the visibility of fish (Photograph 6). Trap boxes are equipped with hand winches, which allow sampling crews to lower or raise traps to improve fish visibility, which is dependent on the water level and clarity of the river.

Photograph 3. Overhead winch used to raise and lower aluminium panels.

Photograph 4. Left bank trap box.



Photograph 5. Left bank holding bin.

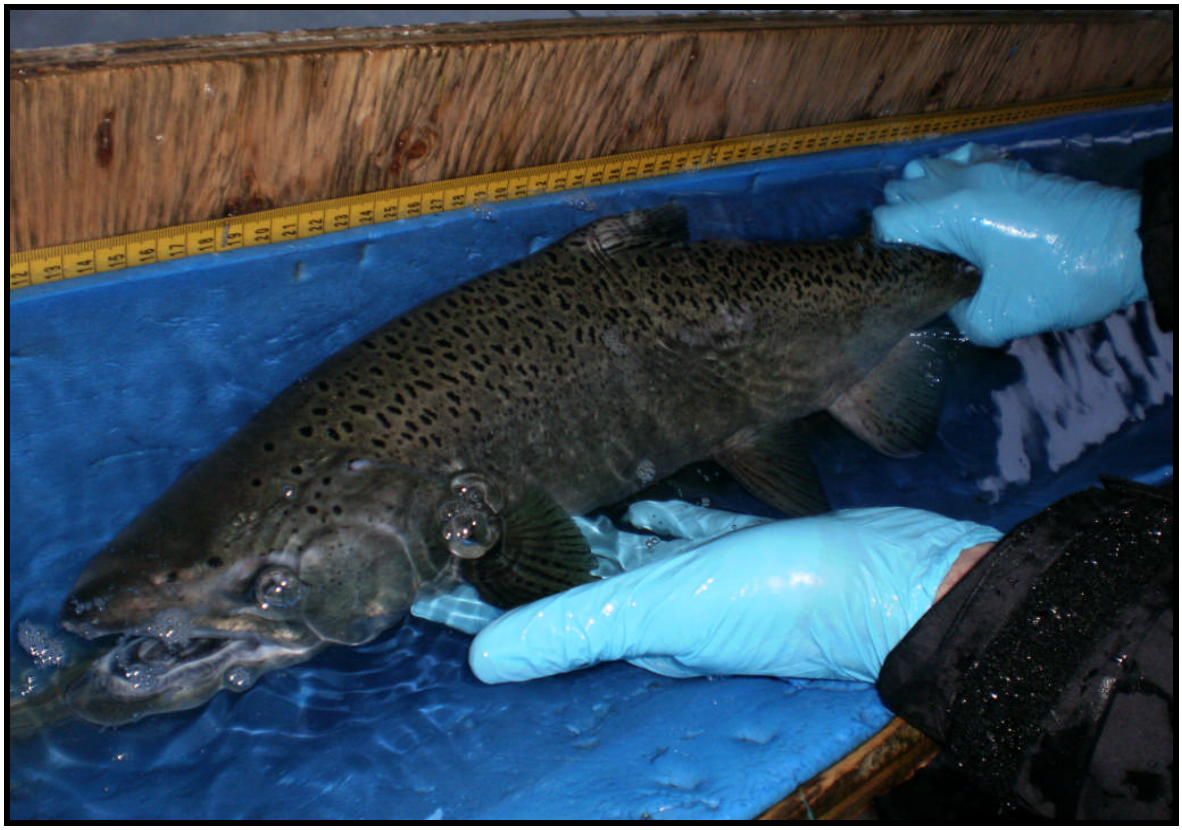
Photograph 6. Plexiglass viewing box used to identify fish species as it swims through the trap box.

In 2010, small portions of the migrating salmon were randomly sampled and scales were taken for aging purposes along with fork length measurements. To sample a desired fish that is swimming through the trap box, a revolving door was opened which diverted them into a large holding box. The fish could then be dip netted out and sampled. Once dipnetted the fish is placed in a "V" trough equipped with a hose and electric pump that provides a constant supply of fresh river water to the fishes gills (Photograph 7). The fresh water helps to calm the fish and reduce stress while sampling is taking place. Fish were visually inspected to identify the presence of marks (eg. adipose fin clip), determine sex, ripeness and overall condition. Once sampled the fish is immediately returned to the trap box were it is allowed to swim freely upstream. In 2010, all sockeye were stopped and examined for an adipose fin clip to determine whether the fish was a hatchery sockeye or a wild sockeye (Photograph 8). Hatchery sockeye were identified by the absence of an adipose fin and originated from earlier enhancement efforts initiated by GFA in 2006/07 (Cleveland, 2007).

In 2010, all coho were also stopped and examined to determine the presence of an adipose fin clip. If a coho was missing an adipose fin then it was documented as being from GFA's Coho Coded Wire Tag (CWT) program, which was initiated during the 2009 Salmon Smolt Assessment (Kingston, 2010).

GFA fisheries staff members working at the permanent enumeration fence are instructed on proper fish handling techniques to reduce the stress on the fish. Crews of two fisheries technicians visually enumerated and tallied the salmon as they swam 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. One two person fisheries crew would work a morning shift then a second crew would take over in the afternoon to ensure fish were not held up excessively.

A manual stage gauge was used to measure river levels four times daily at the KSEF site. 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. GFA staff also recorded water temperature, rain gauge measurements and air temperature daily throughout the salmon migration season.



Photograph 7. Chinook salmon with running water in a "V" trough.

Photograph 8. Sockeye salmon in "V" trough showing a missing (clipped) adipose fin.

5.0 Results and Discussion

In March 2010, there were several upgrades administered to the counting stations of the KSEF prior to the salmon enumeration season. The fence upgrades allowed the GFA to fabricate new counting stations out of aluminum and the ability to check migrating salmon for the presence of adipose fin clips. New trap boxes were constructed with revolving doors that allowed GFA technicians the ability to stop every fish and check for an adipose fin clip. If a single fish needed to be sampled it could be sampled immediately from the trap box or several fish could be diverted into a large holding pen allowing several fish to be sampled at one time. The funding to complete the upgrades to the KSEF were provided by DFO – AFS program (Prince Rupert).

The installation of the fence panels started on July 6th, 2010 and the fence was rendered operational on July 7th, 2010. On October 6th at 12:30am the fence was breached due to high water levels and large amounts of leaves and large woody debris clogging the panels that could not be removed quickly enough. The fence was submerged for approximately 30 hours and then raised again on October 8th, 2010. The fence remained up until October 9th at 1:30 pm where high waters and debris once again breached the fence. The fence was not raised after the second breaching period and the event marked the end of the 2010 operations.

GFA staff members enumerated fish at the KSEF for a total of 92 days in 2010 and a grand total of 77,065 salmon were enumerated (Table 1). The final escapement results for the various salmon species counted through the Kitwanga River Permanent Fence in 2010 are presented in Table 1.

Table 1. 2010 Kitwanga salmon run timing and escapement at the KSEF.

Species	Run Start	Mid Run	Run end	Peak Run Range	Total Escapement
Sockeye	July 13th	August 26th	October 9th	August 2nd – September 7th	**20,804 (including 338 hatchery)**
Chinook	July 22nd	August 11th	September 10th	August 23rd – September 4th	**852**
Pink	August 1st	August 29th	September 26th	August 24th - September 14th	**15,650**
Chum	August 15th	September 10th	October 6th	August 24th – September 28th	**348**
Coho	August 3rd	September 5th	October 9th	September 25th – October 1st	**1,381 (including 165 CWT)***
Jack Chinook	-	--	--	--	**63**

*** The escapement value of 1,381 for coho is likely underestimated due to breaching of the fence during the predicted peak of the coho run.**

Water levels at the KSEF in 2010 averaged 0.68m (min. = 0.49m / max. = 1.55m), which is slightly lower than the 2004-2009 average of 0.76m (min. = 0.53m / max. = 1.10m).

Water levels were below normal from early July to late August 2010 (Figure 2). In the first two weeks of September 2010 the water levels were similar to the 2004-2009 average and then decreased below the average until late September 2010. On October 4th the water levels increased rapidly due to heavy rains and on October 6th at 12:30am the fence was submerged. The fence remained operational till water levels reached 1.4m (Figure 2).

5.1 Sockeye Salmon

A total of 20,804 sockeye including 338-hatchery sockeye were enumerated at the KSEF in 2010 (Table 1). Hatchery sockeye represented 1.6% of the 2010 return. The 2010 sockeye escapement is the highest ever recorded since the GFA started enumerating sockeye on the Kitwanga River in 2000 (Figures 3). The 2010 sockeye escapement is thirteen times greater than the average escapement from 2000-2009, which was 1,582 fish. In 2010, Kitwanga sockeye experienced an estimated Exploitation Rate (ER) of 15% (Cox-Rogers, 2010) (Table 2). The ER is a combination of Alaskan, Canadian marine and In-River fisheries exploitation that occurs on Kitwanga sockeye before they are enumerated at the KSEF. If no ER occurred in 2010 we could have potentially seen 24,344 at the KSEF (Table 2). Previous escapements of Kitwanga sockeye recorded by the GFA were as follows:

- 3,047 in 2009 (Koch and McCarthy, 2010)
- 1,200 in 2008 (Koch and Cleveland, 2009)
- 240 in 2007 (Cleveland, 2008)
- 5,139 in 2006 (Cleveland, 2007)
- 937 in 2005 (Kingston, 2006)
- 1,264 in 2004 (Cleveland, 2005)
- 3,377 in 2003 (Cleveland, 2004)
- 971 in 2002 (Kingston and Cleveland, 2003)
- 227 in 2001 (Cleveland, 2002)
- 260 in 2000 (Cleveland and Kingston, 2001).

Sockeye escapement results from years 2000 to 2002 were recorded at a temporary fence located approximately 4-km below Gitanyow Lake (Figure 1). The escapement results from 2003 to 2010 were taken at the KSEF. In 2010, the first sockeye was enumerated at the KSEF on July 13th and the last sockeye migrated through the fence on October 9th. The 2010 peak run timing range for Kitwanga sockeye occurred between August 2nd to September 7th (Table 1). Seven sockeye run timing peaks were observed during 2010 and were recorded on August 3rd, August 6th, August 7th, August 26th (largest peak), September 3rd, and September 25th (Figure 4). In 2010, Kitwanga wild and hatchery sockeye run timing curves almost perfectly coincided with each other (Table 4). Overall the 2010 sockeye run started at the same time as the 2003-2009 average but ended earlier (Figure 4).

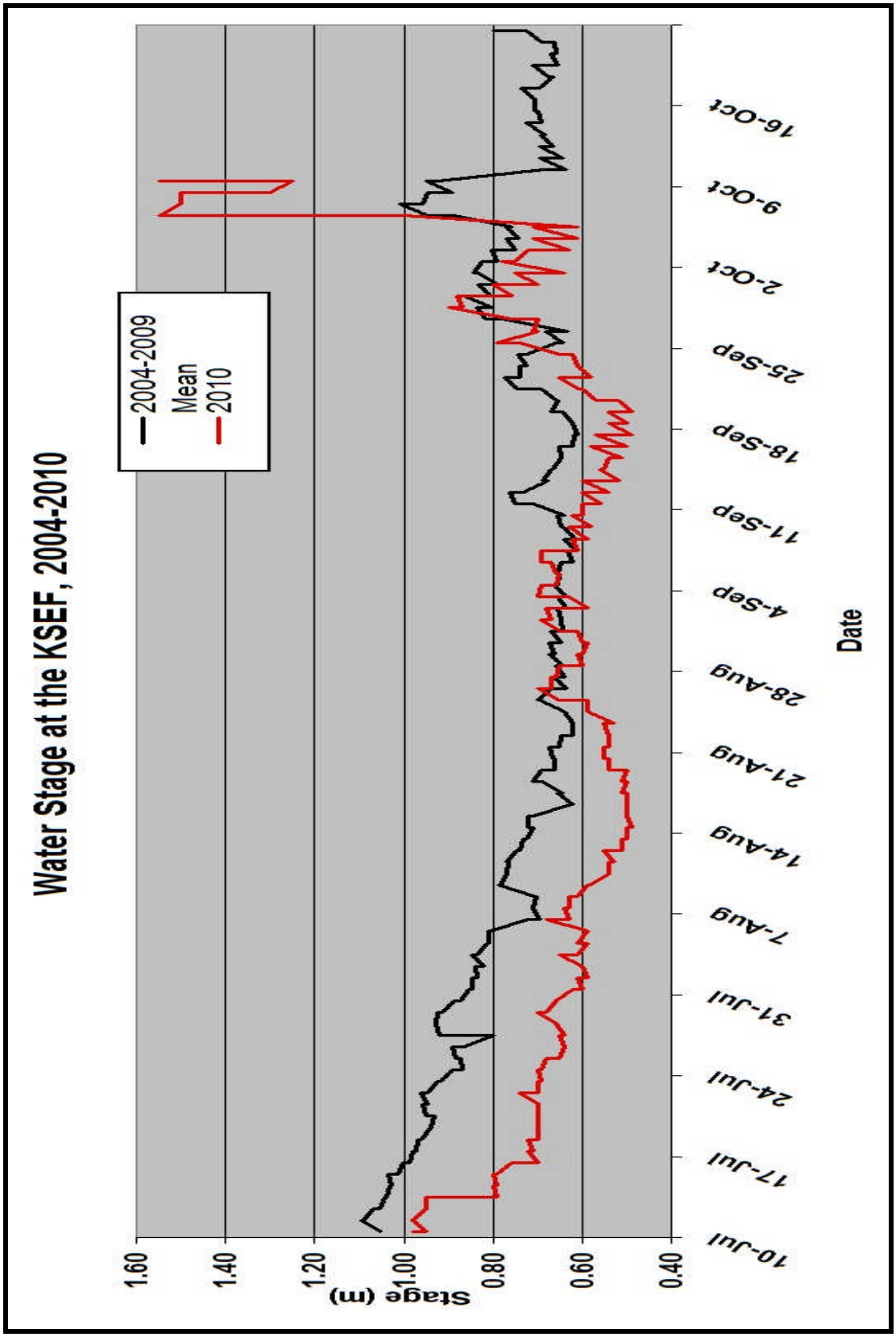


Figure 2: Water levels at the KSEF in 2010 compared to average water levels from 2004 - 2009.

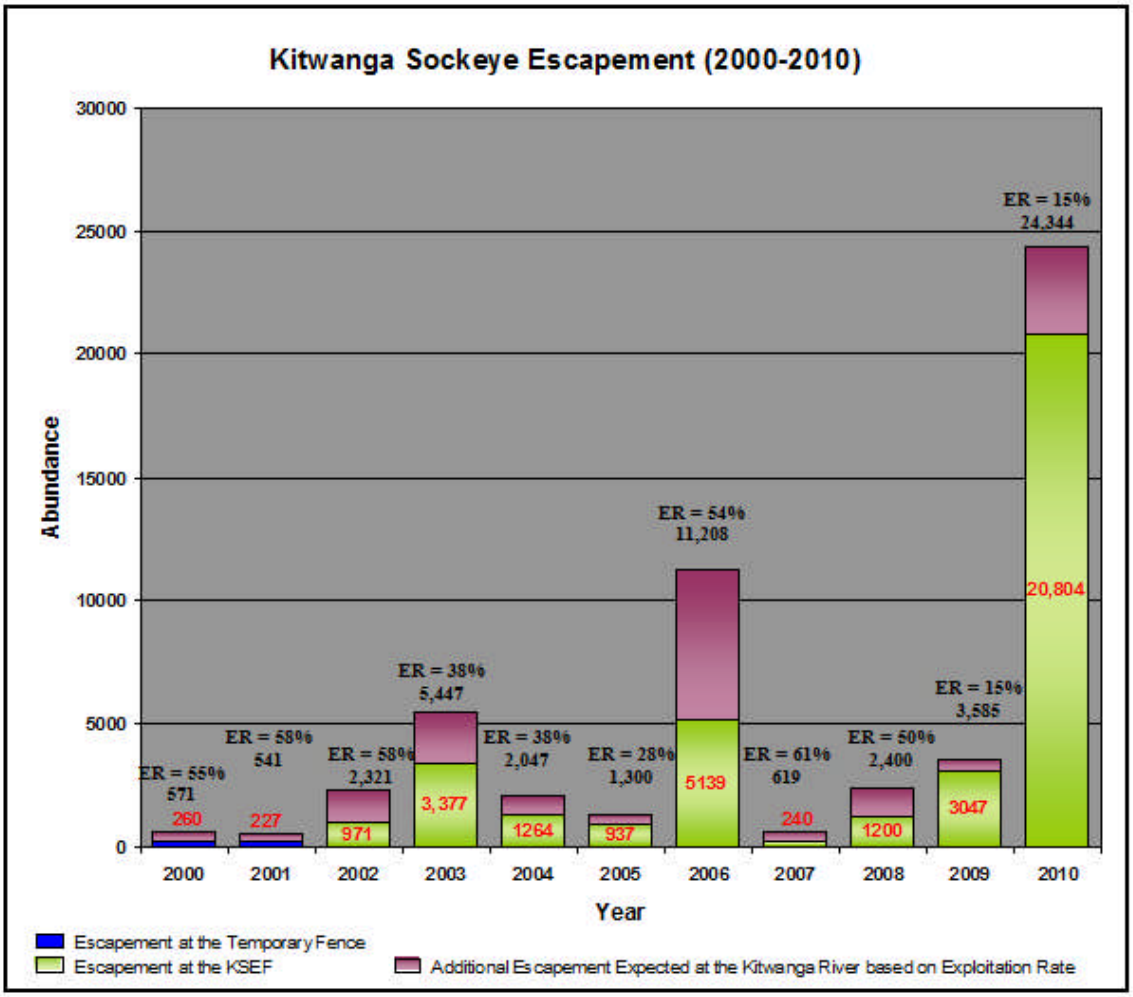


Figure 3: Sockeye escapements recorded in the Kitwanga River from 2000-2010 by the GFA. Also showing the estimated yearly Exploitation Rate (ER) from Alaskan, Canadian marine and In-River fisheries.

Table 2: Kitwanga sockeye salmon escapements from 2000 – 2010 with estimated Exploitation Rates from the Alaskan, Canadian Marine and In-River fisheries.

Return Year	Escapement	Total Exploitation (Alaskan + Can. Marine + In-River)	Total Return
2000	260	55%	571
2001	227	58%	541
2002	971	58%	2,321
2003	3,377	38%	5,447
2004	1,264	38%	2,047
2005	937	28%	1,300
2006	5,139	54%	11,208
2007	240	61%	619
2008	1,200	50%	2,400
2009	3,047	15%	3,585
2010	20,804	15%	24,344

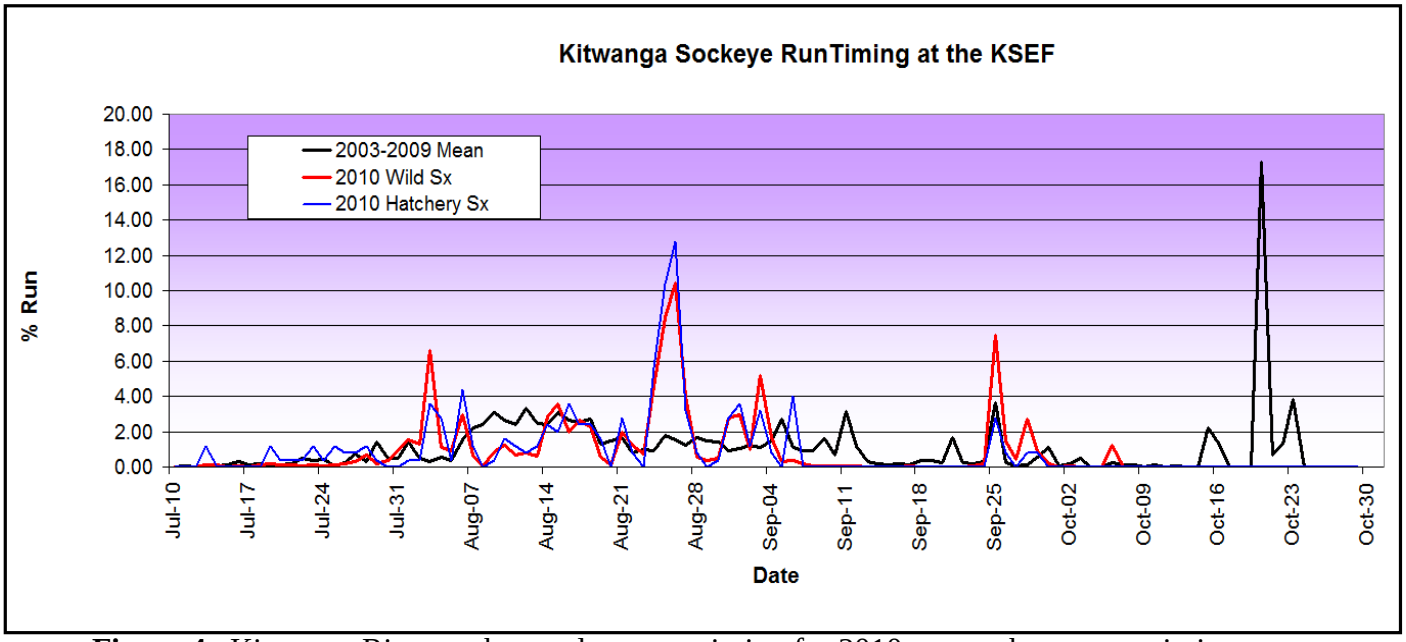


Figure 4. Kitwanga River sockeye salmon run timing for 2010 versus the average timing from 2003-2009 at the KSEF.

Periodic fork length measurements and visual sex determination were taken from wild and hatchery sockeye throughout the 2010 sampling period. A total of 323 wild sockeye salmon were sampled, where female's comprised 47.0% of the population (Figure 4). A total of 83 hatchery sockeye were also sampled, where female's comprised 53% of the population (Figure 4). From 2003-2009, wild female sockeye have been slightly more dominant than males with the female contribution ranging from 49.6% to 63% (Koch and Cleveland 2009, Koch and McCarthy 2010).

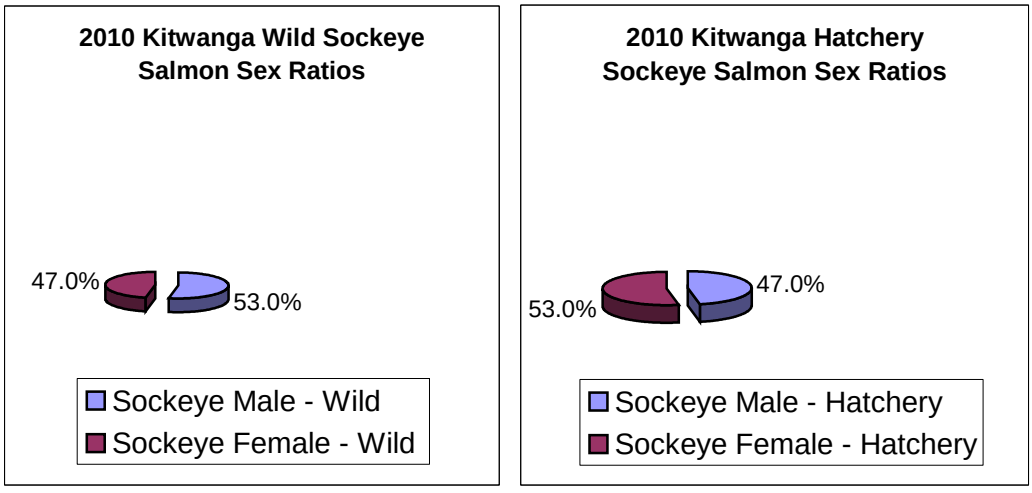


Figure 5. 2010 Kitwanga sockeye wild and hatchery salmon sex ratios.

In 2010, fork length measurements were taken from 323 wild sockeye salmon. Male sockeye exhibited a mean fork length of 57.5 cm and ranged from 48cm to 65 cm, while wild female sockeye exhibited a mean fork length of 53.9 cm and ranged from 46 cm to 65 cm (Table 3). In 2010, fork length measurements were also taken from 83 hatchery sockeye. Male sockeye exhibited a mean fork length of 56.3 cm and ranged from 46.5 cm to 63 cm while hatchery female sockeye exhibited a mean fork length measurement of 53.9 cm and ranged from 47 cm to 60 cm (Table 3). When comparing mean fork length measurements between the sexes of 2010 hatchery sockeye versus wild sockeye the mean fork lengths were almost identical (Table 3). On average hatchery and wild male sockeye were larger than female sockeye (Table 3).

Table 3. Sockeye salmon fork length statistics, 2010

	Mean Fork Length (cm)	Fork Length Range (cm)	Sample Size
Wild Male	56.5	48 - 65	171
Hatchery Male	56.3	46.5 - 63	39
Wild Female	53.9	46 - 65	152
Hatchery Female	53.9	47 - 60	44

In 2010, 406 scales samples were taken from both wild and hatchery sockeye and sent to Carol Lidstone of Birkenhead Scales Analysis for age determination. It was determined that approximately 99% of the wild male and female sockeye were in the 4 year old age class (Table 4). Hatchery sockeye returns from both male and female populations showed that 98% were also 4 year old returning fish (Table 4). One of the hatchery male sockeye was aged as a 3 year old returning sockeye with no freshwater analysis indicating it had migrated out of Gitanyow Lake just after it had been transplanted as a fry. Age data shows that most Kitwanga sockeye return predominantly as 4 years old fish, therefore given that most of the run would have originated from 2006 where the escapement was 5,139, the number of recruits per spawner from 2006 to 2010 was approximately 4.7.

Table 4. Sockeye salmon male and female mean fork length measurements.

Age	Wild Male Sockeye (N=171)	Hatchery Male Sockeye (N=39)	Wild Female Sockeye (N=152)	Hatchery Female Sockeye (N=44)
European Age 0.2 (3 year old returning sockeye)	0%	2.60%	0%	0%
European Age 1.1 (3 year old returning sockeye)	0%	0.0%	0%	0%
European Age 1.2 (4 year old returning sockeye)	98.80%	97.40%	100%	100%
European Age 1.3 (5 year old returning sockeye)	1.20%	0.00%	0%	0%

5.2 Chinook Salmon

A total of 852 adult and 63 jack chinook salmon migrated past the KSEF in 2010 (Table 1). The chinook salmon estimate is the second lowest escapement ever recorded by the GFA since they started enumerating chinook salmon in 2000 (Figure 6). The 2010 chinook escapement is 38% of the average escapement from 2003-2009 that was 2,236. The chinook escapement results from years 2000 to 2002 were recorded by a combination of stream walks and helicopter flights performed during the peak-spawning season. The chinook escapement results from 2003 to 2010 were collected through the operation of the KSEF (Figure 1). Previous escapements of chinooks recorded by the GFA were as follows:

- 824 in 2009 (Koch and McCarthy, 2010)
- 1,450 in 2008 (Koch and Cleveland, 2009)
- 3,225 in 2007 (Cleveland, 2008)
- 3,014 in 2006 (Cleveland, 2007)
- 2,408 in 2005 (Kingston, 2006)
- 1,542 in 2004 (Cleveland, 2005)
- 1,776 in 2003 (Cleveland, 2004)
- 1,563 in 2002 (Kingston et. al., 2003)
- 1,307 in 2001 (McCarthy et. al., 2002)
- 1,121 in 2000 (Hamelin *et. al.*, 2001)

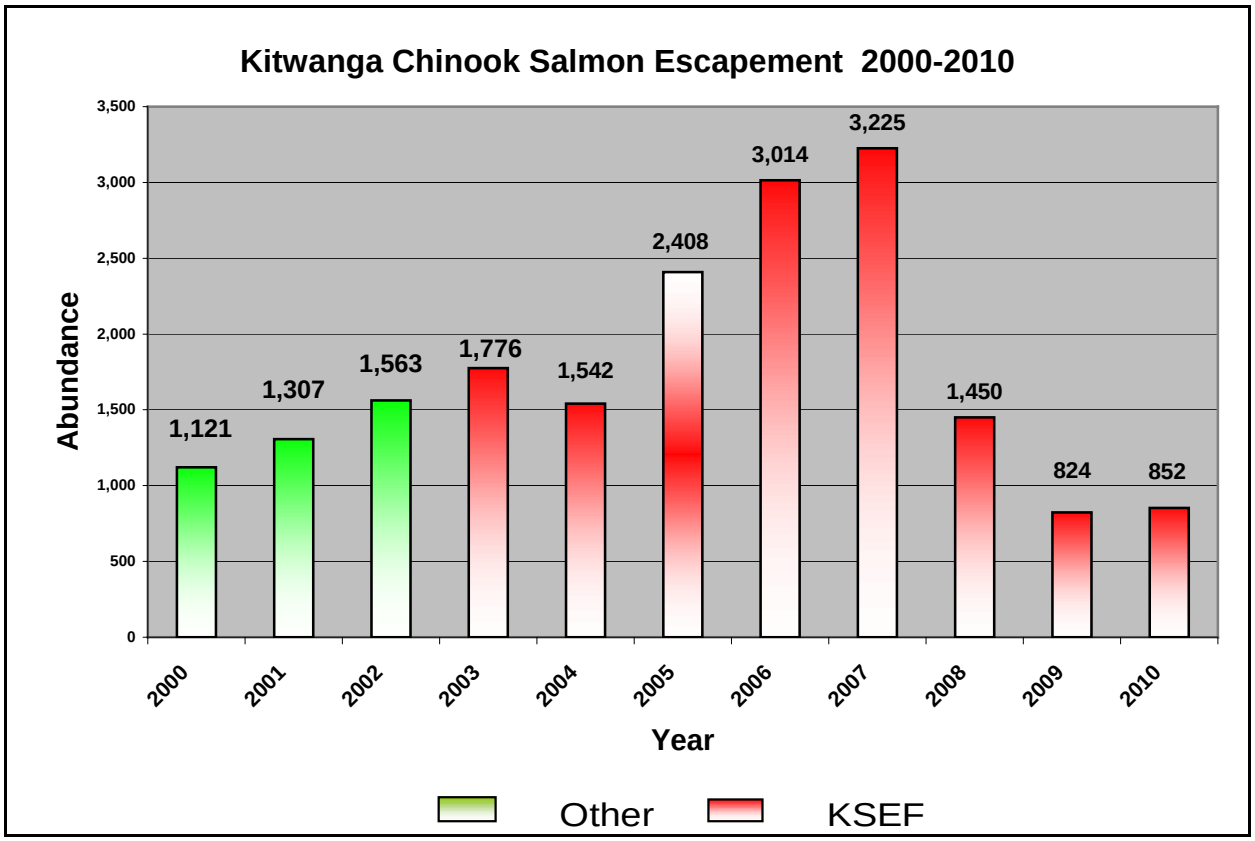


Figure 6. Kitwanga River chinook salmon escapement results from 2000 - 2010.

In 2010, the first chinook salmon was enumerated at the KSEF on July 22nd and the last chinook migrated through the fence on September 10th. The peak run timing range for Kitwanga chinook in 2010 occurred between August 23rd to September 10th (Figure 7). The 2010 Kitwanga chinook run timing is approximately three weeks later than the 2003-2009 average. The delay in the 2010 chinook run timing is likely attributed to the prolonged lower than normal water levels experienced at the KSEF in August 2010.

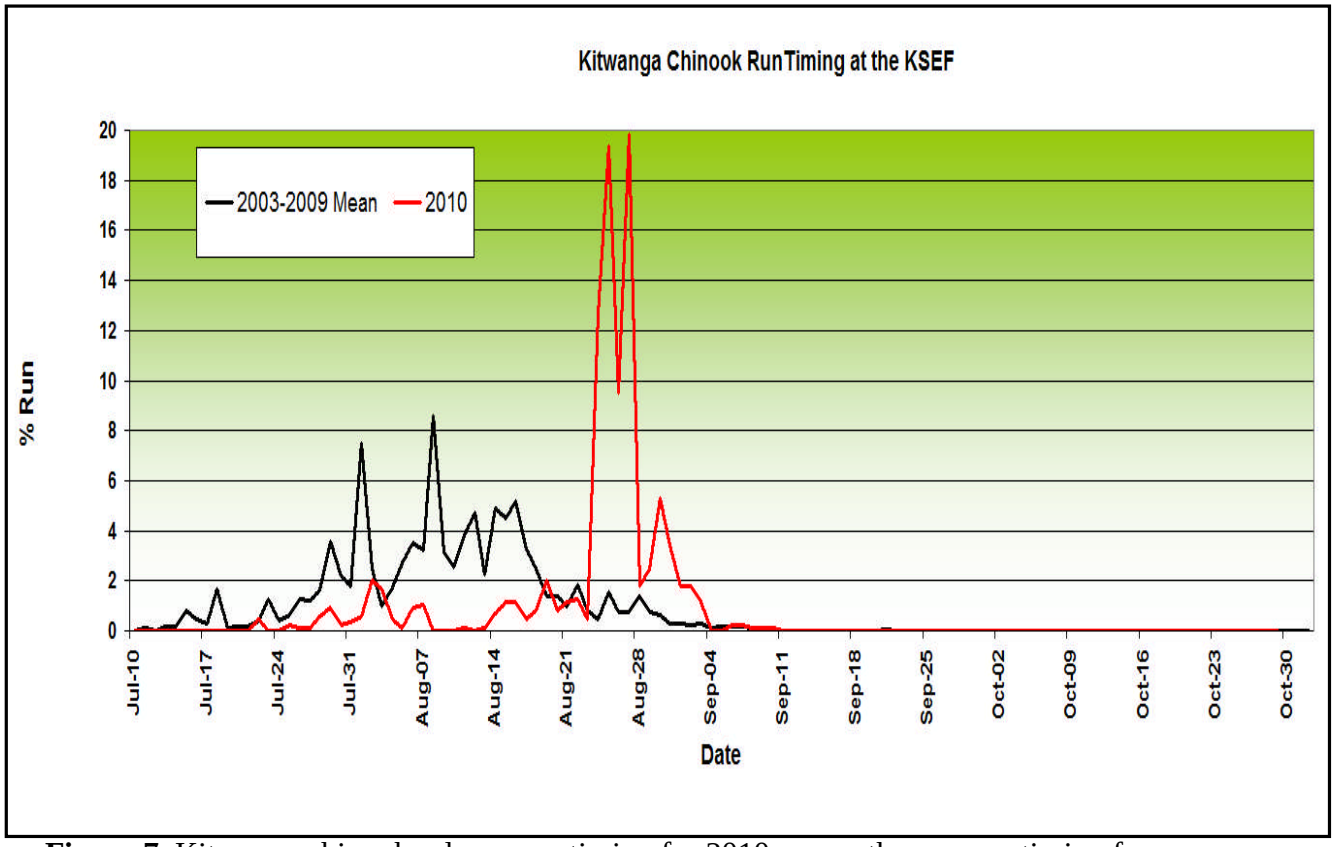


Figure 7. Kitwanga chinook salmon run timing for 2010 versus the average timing from 2003- 2009 at the KSEF.

Periodic fork length measurements and visual sex determination were taken from chinook throughout the 2010 migration. A total of 104 chinook salmon were sampled with female chinook comprising 47.0% of the population. Male chinook`s exhibited a mean fork length of 74.6 cm and ranged from 59cm to 104 cm. While female`s exhibited a mean fork length of 87.5 cm and ranged from 58 cm to 101 cm (Table 5). At the time of authoring of this report the chinook scales had not yet been analyzed by DFO's Pacific Biological Station, therefore aging results will be presented later once the analysis become available.

Table 5. 2010 Chinook salmon fork length measurements and sex ratios.

Chinook	Mean Fork Length (cm)	Fork Length Range (cm)	Sex Ratio	Sample Size
Male	74.6	59 - 104	53.0%	55
Female	87.5	58.0 - 101	47.0%	49

5.3 Pink Salmon

A total of 15,650 adult pink salmon migrated past the KSEF in 2010 (Table 1). The 2010 pink escapement is 54% of the average escapement from the odd year average return of 28,950 (2004, 2006, 2008) (Figure 8).

- 559,865 in 2009 (Koch and McCarthy, 2010)
- 4,245 in 2008 (Koch and Cleveland, 2009)
- 196,768 in 2007 (Cleveland, 2008)
- 11,534 in 2006 (Cleveland, 2007)
- 229,226 in 2005 (Kingston, 2006),
- 71,070 in 2004 (Cleveland, 2005)
- 336,375 in 2003 (Cleveland, 2004).

As in all years pinks in 2010 were 2 year old returning fish. Therefore, given that all of the run would have originated from 2008 where the escapement was 4,245, the number of recruits per spawner for pink salmon from 2008 to 2010 was approximately 3.7. Up until this year pink even year escapements to the Kitwanga have been in decline, however this was not the case in 2010.

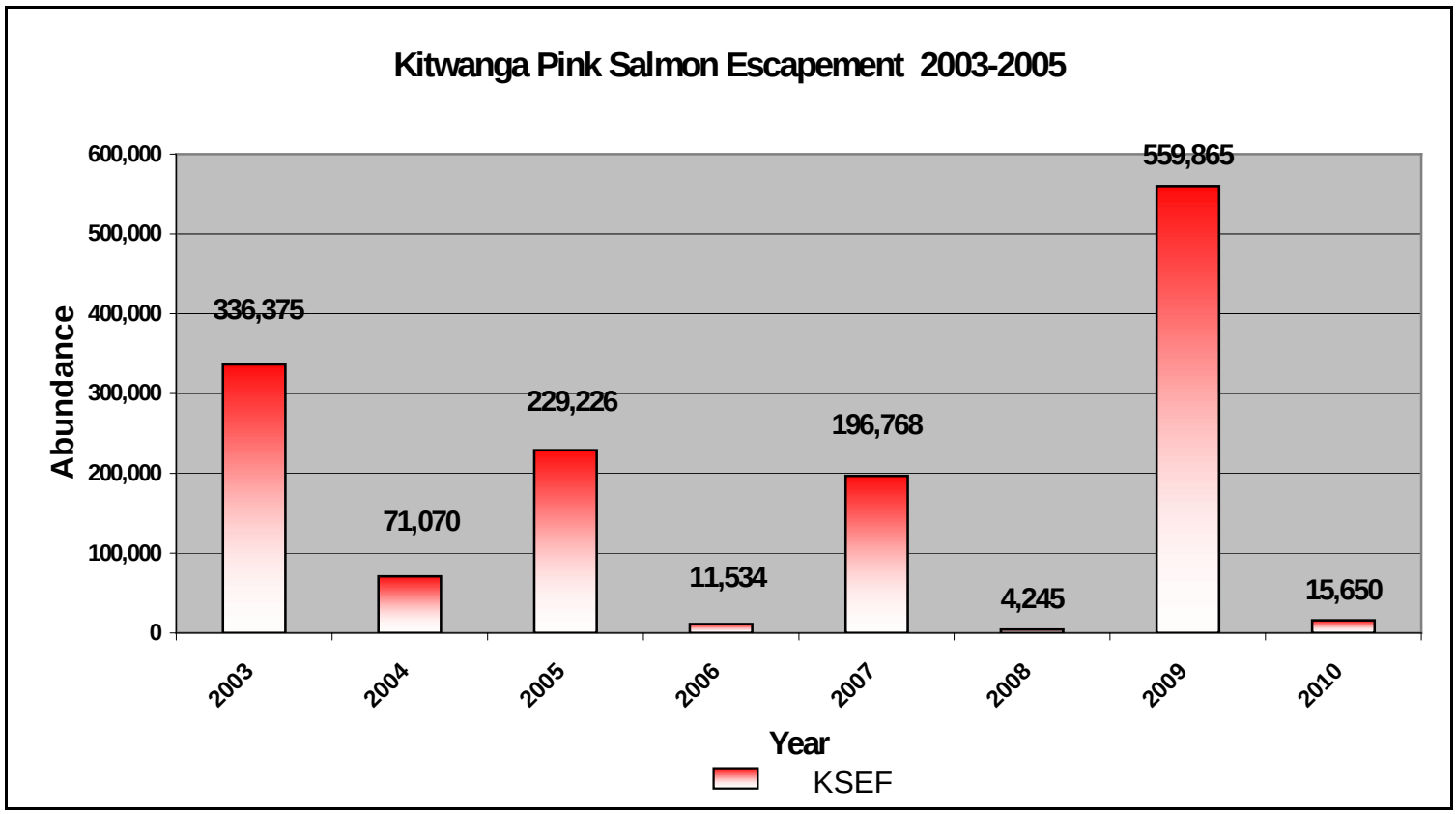


Figure 8. Kitwanga River pink salmon escapement results for 2003 to 2010.

In 2010, the first pink salmon was enumerated at the KSEF on August 1st and the last pink salmon migrated through the fence on September 26th (Table 1). The peak run timing range occurred from August 24th to September 14th (Figure 9). Overall the start of the 2010 pink run was delayed by one week but ended at the same time as the average timing of even-year pinks from 2004,2006 and 2008 (Figure 9).

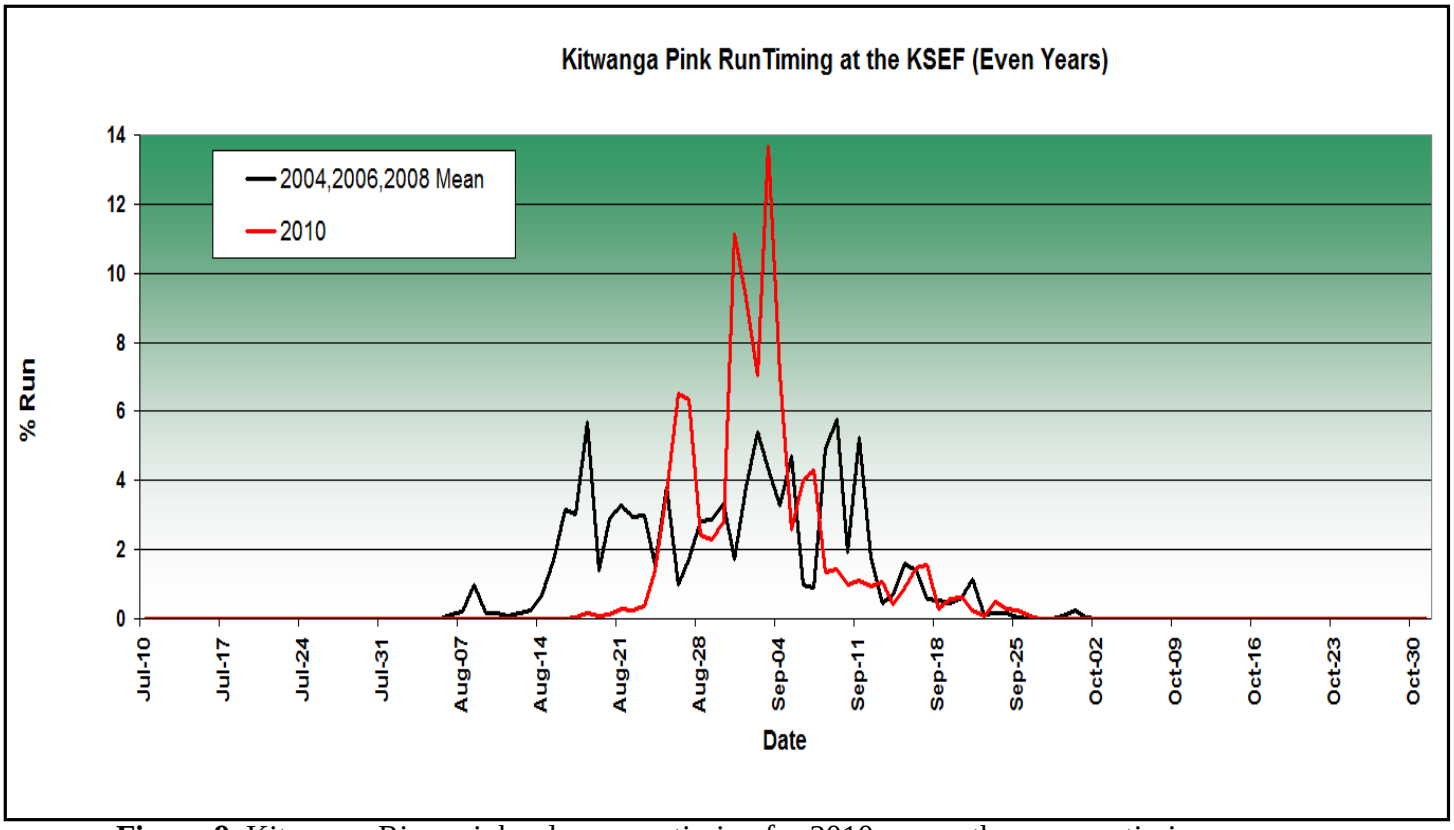


Figure 9. Kitwanga River pink salmon run timing for 2010 versus the average timing from 2004, 2006, 2008 at the KSEF.

5.4 Chum Salmon

A total of 348 adult chum salmon migrated past the KSEF in 2010 (Table 1). The 2010 chum estimate is the second lowest escapement to the Kitwanga River since 2003 (Figure 10). The 2010 chum escapement is 35% of the average escapement from 2003-2009 that was 1,000. Previous escapements of chums recorded by the GFA were as follows:

- 829 in 2009 (Koch and McCarthy, 2009)
- 150 in 2008 (Koch and Cleveland, 2009),
- 354 in 2007 (Cleveland, 2008),
- 685 in 2006 (Cleveland, 2007),
- 1,862 in 2005 (Kingston, 2006),
- 1,169 in 2004 (Cleveland, 2005),
- 1,950 in 2003 (Cleveland, 2004).

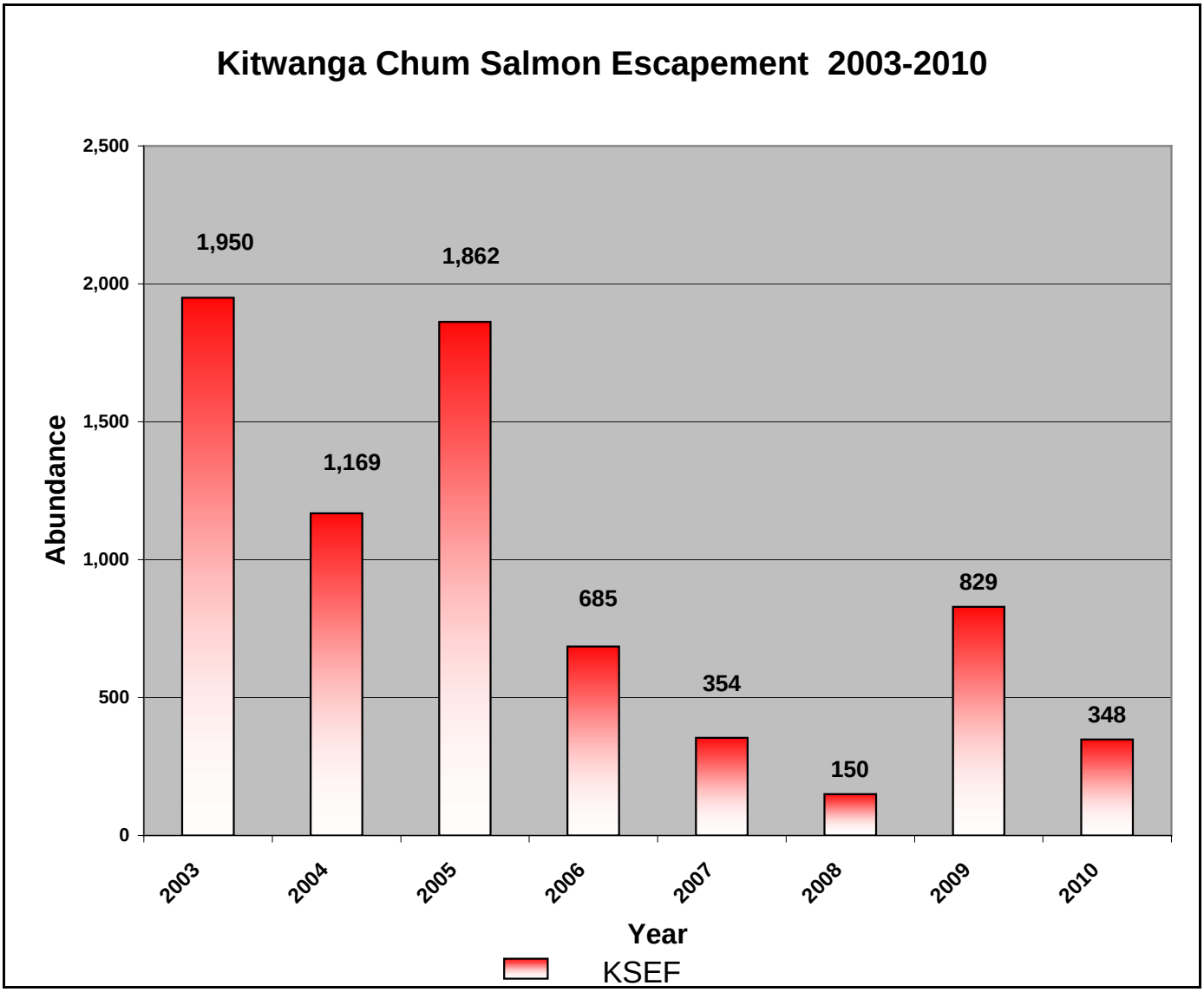


Figure 10. Kitwanga River chum salmon escapement results for 2003 to 2010.

In 2010, the first chum salmon was enumerated at the KSEF on August 5th and the last on October 6th (Figure 1). The peak run timing occurred from August 24th to September 28th (Figure 11). Overall the start of the run was delayed by approximately two weeks but it ended at the same time as has been seen previously (Figure 11). The delay in the 2010 chum run timing is likely attributed to the prolonged lower than normal water levels experienced at the KSEF in August 2010.

Periodic fork length measurements and visual sex determination were taken from chum throughout the 2010 migration. A total of 106 chum salmon were sampled with female chum comprising 56.0% of the population (Table 6). Male chum exhibited a slightly longer mean fork length of 76.5 cm and ranged from 57cm to 93 cm, while Female's exhibited a mean fork length of 73.9 cm and ranged from 57 cm to 88 cm (Table 6).

At the time of authoring of this report the chum scales had not yet been analyzed by DFO's Pacific Biological Station, therefore aging results will be presented later once the analysis become available.

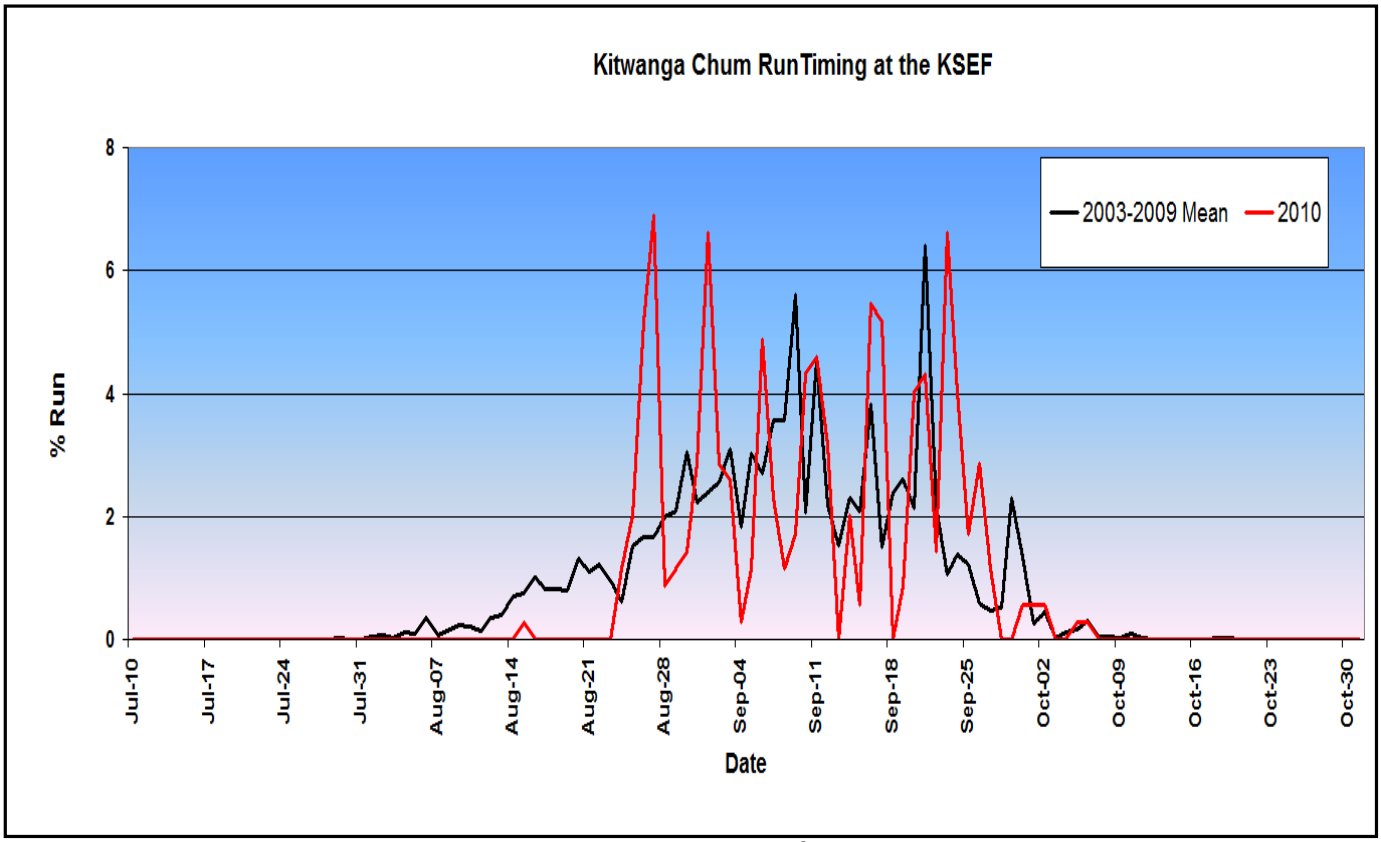


Figure 11. Kitwanga River chum salmon run timing from 2010 versus the average timing from 2003 to 2009 at the KSEF.

Table 6. 2010 Chum salmon fork length measurements and sex ratios.

Chum	Mean Fork Length (cm)	Fork Length Range (cm)	Sex Ratio	Sample Size
Male	76.5	57 - 93	44.0%	47
Female	73.9	57.0 - 88	56.0%	59

5.5 Coho Salmon

A total of 1,381 coho including 165 cwt coho were enumerated at the KSEF in 2010 (Table 1). The 2010 coho estimate is the lowest escapement ever recorded by the GFA since they started enumerating coho in 2001 (Figure 12). The 2010 coho escapement is 32% of the average escapement from 2001-2009 that was 4,357. The 2010 coho escapement value of 1,381 for coho is likely underestimated due to breaching of the fence during the peak of the coho run. It is likely that many coho salmon would have moved through the site undetected and therefore not been recorded in this report. The coho escapement results from years 2001 and 2002 were recorded during stream walks of the entire Kitwanga River during the spawning season. The coho escapement results

from 2003 to 2010 were taken at KSEF (Figure 1). Previous escapements of coho recorded by the GFA were as follows:

- 12,080 in 2009 (Koch and McCarthy, 2009)
- 2,882 in 2008 (Koch an Cleveland, 2008)
- 2,780 in 2007 (Cleveland, 2008)
- 2,566 in 2006 (Cleveland, 2007)
- 7,100 in 2005 (Kingston, 2006)
- 2,760 in 2004 (Cleveland, 2005)
- 2,300 in 2003 (Cleveland 2004)
- 3,515 in 2002 (Kingston, 2003)
- 3,226 in 2001 (Cleveland, 2002)

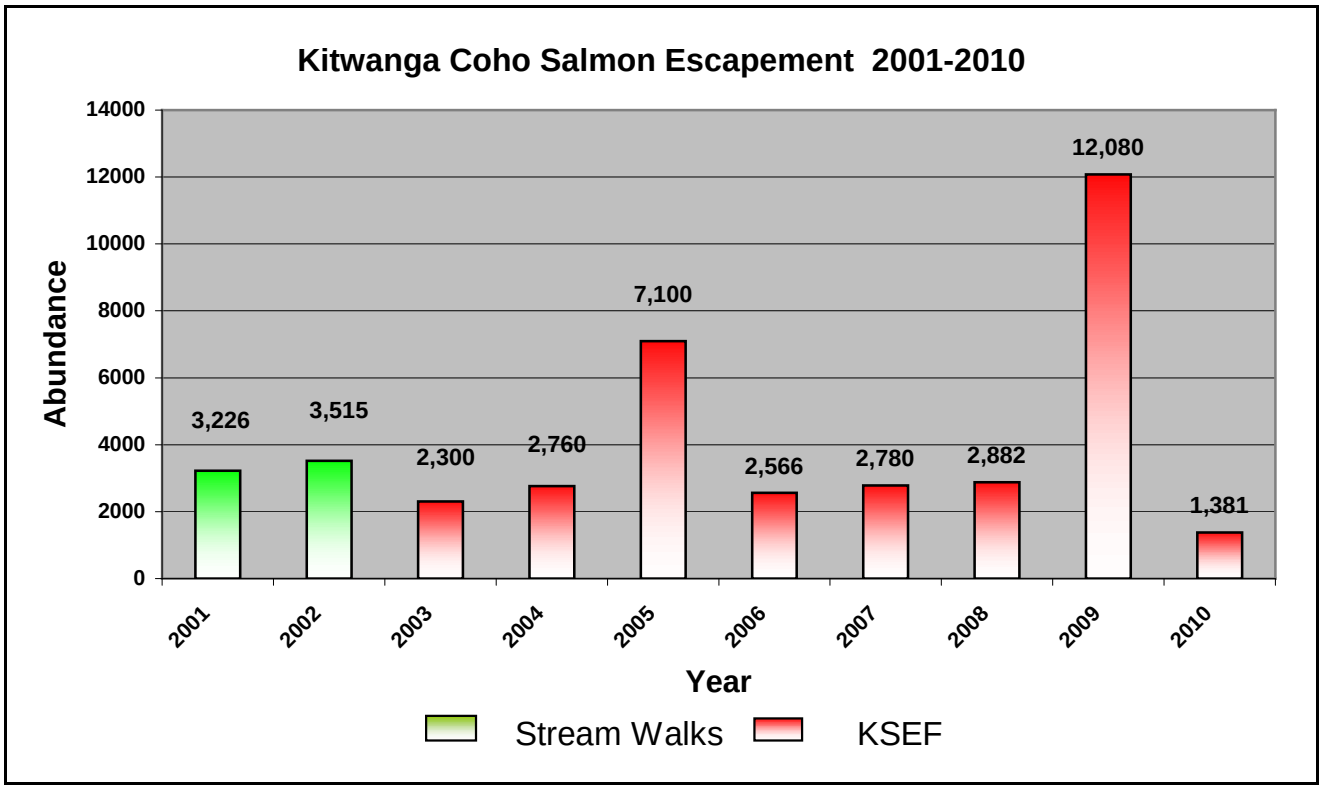


Figure 12. Kitwanga River coho salmon escapement results for 2001 to 2010.

In 2010, the first coho was enumerated at KSEF on August 3rd and the last on October 1st (Figure 13). The peak run occurred between September 25th and October 1st (Figure 13). The starting and peak of the 2010 coho run timing curve was very similar to the 2003 – 2009 average timing curve (Figure 13). However, the fence was breached and it is likely that many coho would have migrated past the site undetected. Previous observations at the KSEF have shown that coho salmon like to migrate to their respective spawning grounds during flood events in late September and October. In past years the KSEF has been breached at high water levels due to a build-up of large amounts of leaves, post spawned salmon carcasses and large woody debris clogging the panels. In these cases debris cannot be removed quickly enough to keep the fence above the waters surface.

Often large numbers of coho are holding behind the fence during these flood events. Even a 24-hour breach in the fence during the peak coho migration could account for over 50% of the coho population migrating past the fence without being counted.

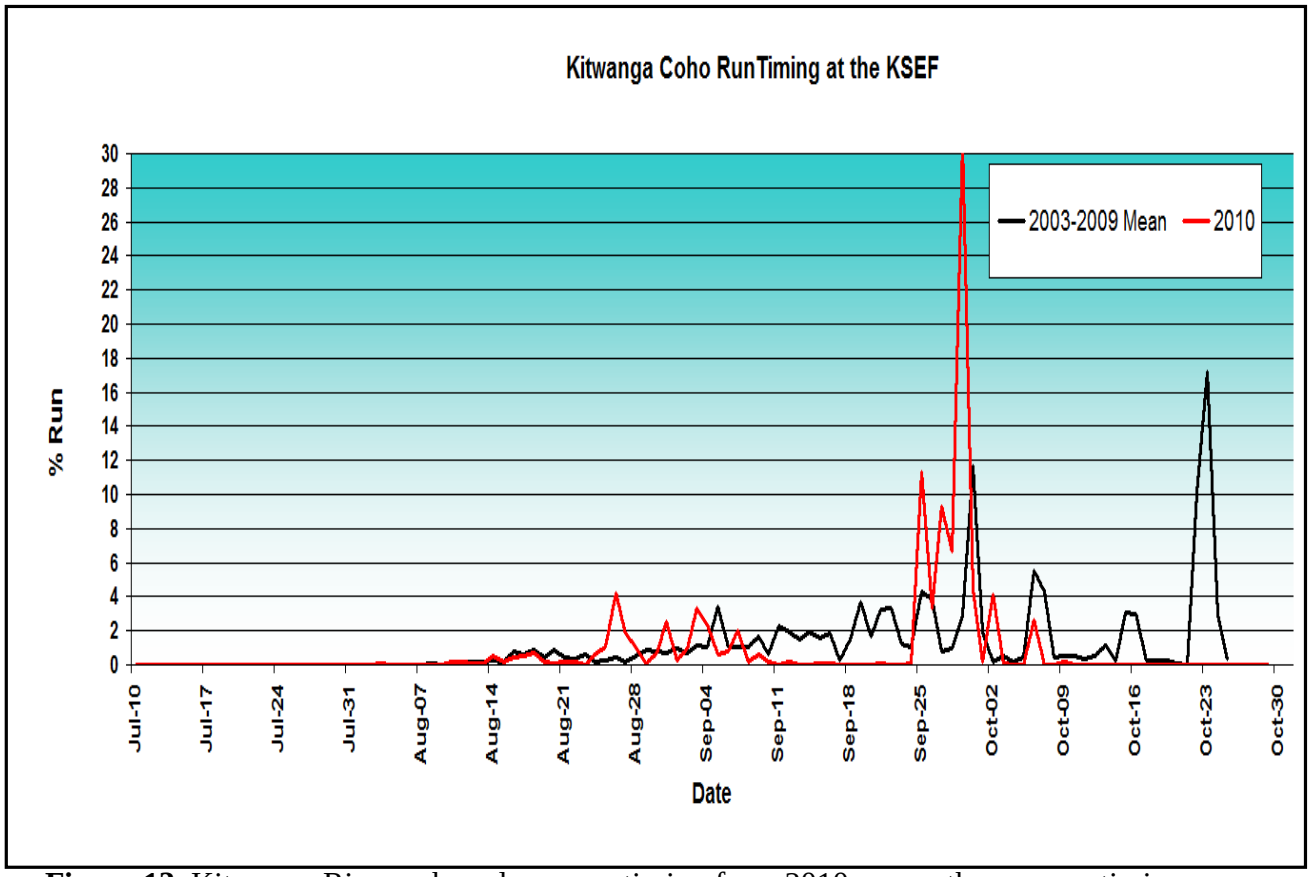


Figure 13. Kitwanga River coho salmon run timing from 2010 versus the average timing from 2003-2009 at the KSEF.

Periodic fork length measurements and visual sex determination were taken from coho throughout 2010. A total of 181 coho salmon were sampled with female coho comprising 44.0% of the population. Male coho exhibited a mean fork length of 65.3 cm and ranged from 46 cm to 80 cm. While female's had a mean fork length of 64.2 cm and ranged from 39 cm to 78 cm (Table 7). At the time of authoring of this report the coho scales had not yet been analyzed by DFO's Pacific Biological Station, therefore aging results will be presented later once the analysis become available.

Table 7. 2010 coho salmon fork length measurements and sex ratios.

Coho	Mean Fork Length (cm)	Fork Length Range (cm)	Sex Ratio	Sample Size
Male	65.3	46 - 80	56.0%	102
Female	64.2	39.0 - 78	44.0%	79

In May/June 2009, the GFA implanted 8,701 coho smolts with Coded Wire Tags (CWT) at the Kitwanga River Smolt Assessment Facility and released them into the Kitwanga

River and a total of 51 adult coho CWT were recovered in Alaskan commercial fisheries in 2010 (Table 8).

Table 8. Coho CWT capture and release information for the Kitwanga River and Toboggan Creek.

Location	Number of coho smolts tagged in 2009	Number of coho adult recoveries in Alaskan Fisheries - 2010
Kitwanga River	8,701	51
Toboggan Creek	34,349	120

The majority of adult Kitwanga coho that were recovered in the Alaskan commercial fisheries were recovered in the Ketchikan (45.1%), Sitka (39.2%) and Craig (9.8%) fisheries areas (Table 9). In comparison Tobaggan Creek adult CWT coho were captured in the following concentrations in the Ketchikan (35.8%), Sitka (30.0%) and Craig (20.0%) fisheries areas (Table 9). A map outlining the Alaskan fisheries areas can be found on the Alaska Department of Fish and Game at this link: www.cf.adfg.state.ak.us/geninfo/statmaps/charts/currentcharts/chart05_salm_shell_all.pdf

Table 9. Adult coho CWT recoveries for the Kitwanga River and Toboggan Creek in Alaskan commercial fisheries areas.

Alaskan Fisheries Area	Kitwanga River Coho Recoveries – 2010 (n=51)	Toboggan Creek Coho Recoveries – 2010 (n=120)
CRAIG	9.8%	20.0%
ELFIN COVE	0%	0.8%
EXCURSION INLET	2.0%	5.0%
HOONAH	0%	2.5%
KETCHIKAN	45.1%	35.8%
PELICAN	0%	1.7%
PETERSBURG	3.9%	2.5%
SITKA	39.2%	30.0%
WRANGELL	0%	0.8%
YAKUTAT	0%	0.8%

6.0 Conclusions / Recommendations

Since the construction of the KSEF in 2003 it has proven to be very helpful in determining the strength of middle Skeena salmon stocks. In 2010, the GFA successfully operated the KSEF to enumerate and collect biological information for sockeye, chinook, chum, pink and coho salmon returning to the Kitwanga River. Although the fence was breached in early October 2010 due to heavy rains, only escapement counts for coho salmon are thought to have been compromised. This conclusion was determined by looking at previous years run timing results for the other four species of salmon.

In March 2010 several upgrades were administered to the counting stations prior to the salmon migration season. These upgrades proved to be very successful for the operations of the fence in the summer/fall 2010. The upgrades allowed GFA technicians the ability to stop and inspect every coho and sockeye for an adipose fin clip. Being able to determine the absence of adipose fin clips on sockeye salmon helps the GFA to determine the production from fry outplanting programs conducted in 2007 and 2008. Similarly, being able to identify an adipose fin clip with a CWT on returning coho helps the GFA to determine ocean survival and harvest rates of coho throughout the various fisheries.

The 2010 sockeye escapement of 20,804 including 338-hatchery sockeye was the highest ever recorded since the GFA started enumerating sockeye on the Kitwanga River in 2000. Furthermore, this was the first year that hatchery sockeye returns were observed at the fence and they represented 1.6% of the 2010 return. The outstanding sockeye return in 2010 indicates that Kitwanga sockeye experienced very good ocean survival.

The 2010 chinook salmon estimate of 852 is the second lowest escapement ever recorded by the GFA since they started enumerating chinook salmon on the Kitwanga River in 2000. The GFA have been observing declining numbers of chinook escapement at the KSEF over the past three years. The GFA plan to monitor the chinook run again in 2011 and if current declines continue they will encourage a change to chinook management for the Kitwanga River.

A total of 15,650 adult pink salmon migrated past the KSEF in 2010. The 2010 pink salmon estimate was 3.6 times greater than the brood year escapement of 2008. Up until this year pink even year escapements to the Kitwanga have been in decline, however this was not the case in 2010.

A total of 348 adult chum salmon were enumerated at the KSEF in 2010. The 2010 chum estimate is the second lowest escapement ever recorded by the GFA since they started enumerating chum at the KSEF in 2003. Chum salmon returns to the Kitwanga River appear to be extremely low which is concerning. If escapements do not improve substantially in future years, recovery options may need to be explored.

A total of 1,381 coho including 165 cwt coho were enumerated at the KSEF in 2010. This escapement is biased low because it is predicted that many more coho would have migrated past the KSEF during the high waters experienced in October 2010 without

being enumerated. The majority of adult Kitwanga coho that were recovered in the Alaskan commercial fisheries were recovered in the Ketchikan (45.1%), Sitka (39.2%) and Craig (9.8%) fisheries areas.

7.0 References

Cleveland, M.C. 2000. Limnology of Kitwanga Lake: an attempt to identify limiting factors affecting sockeye salmon (*Oncorhynchus nerka*) production. Gitanyow Fisheries Authority, Kitwanga, B.C. 97 pp.

Cleveland, M.C. and D. Kingston. 2001. Kitwanga sockeye enhancement program. Gitanyow Fisheries Authority, Kitwanga, B.C. 13 pp.

Cleveland, M.C. 2002. Kitwanga Fisheries Treaty Related Measure #3: The 2001 Adult Steelhead/Sockeye Salmon Enumeration and Data Gathering Initiatives. Gitanyow Fisheries Authority. Kitwanga, B.C. 55 pp.

Cleveland, M.C. 2003. Final Reporting on the Implementation of the Permanent Kitwanga River Salmonid Enumeration Facility and Selective Fisheries Fence. Gitanyow Fisheries Authority, Kitwanga, B.C. 51 pp.

Cleveland, M.C. 2003a. Kitwanga Fisheries Treaty Related Measure #1: Adult Sockeye Enumeration, Adult Steelhead resistivity Counter Initiative and Water Quality and Quantity Studies 2002. Gitanyow Fisheries Authority, Kitwanga, B.C. 67 pp.

Cleveland, M.C. and M. McCarthy, 2003. Kitwanga Fisheries Treaty Related Measure #2: Kitwancool Lake Sockeye Spawning Habitat Assessment. Gitanyow Fisheries Authority, Kitwanga, B.C. 36 pp.

Cleveland, M.C. 2004. The Kitwanga River Adult Salmon Enumeration Initiative, 2003. Gitanyow Fisheries Authority, Kitwanga, B.C. 39 pp.

Cleveland, M.C. 2005. Kitwanga River Sockeye Salmon Enumeration, 2004. Gitanyow Fisheries Authority, Kitwanga, B.C. 32 pp.

Cleveland, M.C., S. Cox-Rogers and K. Rabnett. 2006. Kitwanga Sockeye Salmon Recovery Plan (KSRP). Gitanyow Fisheries Authority, Kitwanga, BC. Fisheries and Oceans Canada, Prince Rupert, BC. Skeena Fisheries Commission, Hazelton, BC. 52 pp.

Cleveland, M.C. 2007. Kitwanga Sockeye Enhancement Program 2006/2007. Gitanyow Fisheries Authority, Kitwanga, B.C. 56 pp.

Cleveland, M.C. 2007. Kitwanga River Sockeye Salmon Enumeration, 2006. Gitanyow Fisheries Authority, Kitwanga, B.C. 34 pp.

Cleveland, M.C. 2008. Kitwanga River Sockeye Salmon Enumeration, 2007. Gitanyow Fisheries Authority, Kitwanga, B.C. 29 pp.

Cleveland, M.C. 2009. Kitwanga Sockeye Enhancement Program 2007/2008 – Year 2. Gitanyow Fisheries Authority, Kitwanga, B.C. 37 pp.

Cox-Rogers, S. 2008. Personal communication and unpublished data provided on Jan.21/08. Skeena sockeye exploitations for various run-timing groups. Fisheries and Oceans Canada. P.Rupert, BC.

Cox-Rogers, S. 2009. Personal communication. Stock assessment biologist. Fisheries and Oceans Canada. Prince Rupert, B.C.

Cox-Rogers, S. 2010. Salmon Post Season Review – 2010 North Central Coast Sockeye Review Presentation Fisheries and Oceans Canada. Prince Rupert, B.C.

Fisheries and Oceans Canada. 2008*b*. NuSEDS. V2.0. Regional adult salmon escapement database 1950-2005. Fisheries and Oceans Canada, Pacific Biological Station, Nanaimo, B.C.

Fisheries and Oceans Canada. 2009. Post Season Report for 2008 Canadian Treaty Limit Fisheries, 2009. Report prepared for the Pacific Salmon Commission. 72 pp.

Gottesfeld, A.S., K.A. Rabnett, and P.E. Hall. 2002. Conserving Skeena Fish Populations and Their Habitat. Skeena Fisheries Commission, Hazelton, BC. 281 pp.

Hamelin, E., M.C. Cleveland. 2001. The 2000 Kitwanga River Chinook Salmon (*Oncorhynchus tshawytscha*) Enumeration Initiative. Gitanyow Fisheries Authority. Kitwanga, B.C. 12 pp.

Holt, C. 2008. Canada's Policy for Conservation of Wild Pacific Salmon – Presentation on Assessing Status of Conservation Units for the Wild Salmon Policy. Fisheries and Oceans Canada.

Kingston, D. 2003. The 2002 Kitwanga River Chinook Residency Timing Study. Gitanyow Fisheries Authority, Kitwanga, BC. 22 pp.

Kingston, D. and M.C. Cleveland. 2003. Kitwanga River Fisheries Treaty Related Measure #1: Adult Sockeye Enumeration, Adult Steelhead Resistivity Counter Initiative and Water Quality and Quantity Studies 2002. Gitanyow Fisheries Authority, Kitwanga, BC. 67 pp.

Kingston, D. 2006. Kitwanga River Sockeye Salmon Enumeration, 2005. Gitanyow Fisheries Authority, Kitwanga, B.C. 39 pp.

Kingston, D. 2010. The 2009 Kitwanga River Salmon Smolt Assessment. Gitanyow Fisheries Authority, Kitwanga, B.C. 22 pp.

Koch, K. and M.C. Cleveland. 2009. Kitwanga River Salmon Enumeration Facility – 2008 Annual Report. Gitanyow Fisheries Authority, Kitwanga, B.C. 41 pp.

Koch, K. and M. McCarthy. 2010. Kitwanga River Salmon Enumeration Facility – 2010 Annual Report. Gitanyow Fisheries Authority, Kitwanga, B.C. 32 pp.

Lidstone, C. 2010. Unpublished data from scale analysis. Birkenhead Scale Analyses, Lone Butte, BC.

McCarthy, M., M.C. Cleveland, D. Kingston. 2002. The 2001 Kitwanga River Chinook Salmon Enumeration Initiative. Gitanyow Fisheries Authority, Kitwanga, B.C. 18 pp.

Peard, D. 2010. Personal communication. Resource Information Biologist. Ministry of Natural Resource Operation. Smithers, B.C.

Rabnett, K., Gottesfeld, A and C. Holland. 2002. Dispersed Traditional Fisheries in the Kitwanga Watershed. Gitxsan Watershed Authority, Hazelton, BC. 26 pp.

Shortreed, K.S., J.M.B. Hume, K.F. Morton, and S.G. MacLellan. 1998. Trophic status and rearing capacity of smaller sockeye nursery lakes in the Skeena River system. Can. Tech. Rep. Fish. Aquat. Sci. 2240: 78 p.