Gitanyow Fisheries Authority

Kitwanga River Sockeye Salmon Enumeration, 2005

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Abstract

In 2005, the Kitwanga River Salmon Enumeration Facility operated for 100 continuous days and remained unbreached during the entire operation. The Gitanyow Fisheries Authority (GFA) operated the permanent fence from July 10th to October 17th, 2005 to enumerate all five species of salmon escaping to the Kitwanga River. A total of 937 sockeye, 2,408 chinook, 226 jack chinook, 229,226 pink, 1,862 chum, and 7,100 coho salmon were counted through the facility. The 2005 sockeye salmon escapement is the third lowest recorded by the GFA in the past six years. A record number of coho salmon returned to the Kitwanga River in 2005 and this total is more than double the next highest escapement recorded by the GFA in the past four years.

Acknowledgements

The Gitanyow Fisheries Authority (GFA) we would like to thank the Department of Fisheries and Oceans (Prince Rupert) and the Pacific Salmon Commission for partly funding the operation of the permanent fence in 2005. GFA would also like to acknowledge the hard work of the permanent fence staff whose dedication throughout the salmon enumeration season made the project a success.

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1.0 Introduction

Historically, the Gitanyow fished salmon in the Kitwanga River for food, social and ceremonial purposes. The main salmon species of attraction was the sockeye salmon. In the early 1900's sockeye stocks were thriving but by the 1920's the Gitanyow Elders talk of the noticeable declines in the Kitwanga sockeye stock (Cleveland, 2005). By the 1960's aboriginal fishing for sockeye on the Kitwanga River had ceased due to low run numbers and concerns for the unique stock (Cleveland, 2005). A definite answer as to why the sockeye declined has not been determined but several factors are suspected to have contributed to the decline of the stock. Such things as overexploitation in the commercial fishery and poor forest harvesting activities in the watershed are believed to have affected the Kitwanga sockeye stock (Cleveland, 2005).

In 1994, through the help of the DFO Aboriginal Fisheries Strategy (AFS) program the Gitanyow Fisheries Authority (GFA) was established to conserve and protect wild salmon stocks within their traditional territory. Some of the main goals of the GFA were to determine the yearly sockeye escapement and the limiting factors affecting the Kitwanga sockeye stock.

A part of any good assessment program deals with the accurate determination of adult salmon returning to the river on a yearly basis. In 2000, the GFA were successful in obtaining funds to establish a temporary fence in the upper parts of the Kitwanga Watershed located approximately 4 km below Kitwancool Lake. The temporary fence was successful in obtaining escapement results for sockeye salmon returning to Kitwancool Lake to spawn. The escapement results for Kitwanga Sockeye for the first three years of operation for the temporary fence were 260 in 2000, 227 in 2001 and 971 in 2002 (Cleveland, 2005). Although the temporary fence worked it was susceptible to fall floods because it was constructed of wood and rebar material. It also only sampled a small portion of the other salmon runs returning to the Kitwanga because most spawning for these salmon species occurred downstream of the temporary fence site. Therefore in 2003, the GFA were successful in obtaining funding to construct a permanent enumeration facility that was located near the mouth of the Kitwanga River to enumerate the entire salmon run for all five salmon species and steelhead. The permanent enumeration facility was very successful in its first two years of operation and the escapement results for sockeye salmon were 3,377 in 2003 and 1,264 in 2004 (Cleveland, 2005).

Since 2000, the GFA have been implementing studies throughout the Kitwanga Watershed to determine the limiting factors that are affecting the sockeye stock. Currently, the GFA are developing a Kitwanga Sockeye Rebuilding Plan. The plan highlights all of the sockeye works that have been completed in the Kitwanga Watershed and sets goals on how to bring the sockeye stock back to more sustainable levels. One very important part of the rebuilding plan is to determine the accurate escapement of adult sockeye salmon that are returning each year to the Kitwanga River. This goal is being achieved through the operation of the Kitwanga River Salmonid Enumeration facility. This report summarizes the escapement results and findings for the Kitwanga River Salmon Enumeration Facility in 2005.

2.0 Study Area

The Kitwanga River is a fifth order stream that drains into the Skeena River approximately 250 kilometres east (upstream) 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.

Kitwancool Lake is the only lake found within the Kitwanga Watershed. The lake is considered mesotrophic with a mean depth of approximately 5 meters and a maximum depth of 15m (Shorteed *et al*., 1998). It is relatively clear and the euphotic zone encompasses the entire water column in most areas of the lake. Kitwancool Lake is considered one of the most productive sockeye nursery lakes in all of B.C. mainly due to its extremely high macrozooplankton biomass, which is composed mostly of *Daphnia*, the main food source of juvenile sockeye (Shorteed *et al*., 1998). Through lake and stream reconnaissance surveys completed by the GFA it has been determined that Kitwanga sockeye utilize six key shoreline areas in Kitwancool lake for spawning (Cleveland et. al., 2003). Therefore, Kitwancool Lake plays a vital role in the life cycle of Kitwanga sockeye for spawning and juvenile rearing purposes.

The Kitwanga River Salmonid Enumeration Facility is located on the Kitwanga River approximately 4 km upstream from its confluence with the Skeena River. 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 also constructed on private property (owned by Marcus and Don Halvorson). Therefore, to ensure long-term access to the site the Gitanyow applied for a Statutory Right of Way to both the access road 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 Permanent fence also falls within the Gitwangak Eagle Clan Traditional Territory. Permission was granted to the GFA from the Eagle Clan Hereditary Chief (Calvin Hyzimsz) to conduct yearly enumeration operations on their territory.

Figure 1. illustrates the Kitwanga Watershed and makes specific reference to the location of the temporary enumeration fence, the Kitwanga River Salmonid Enumeration Facility and Kitwancool Lake.

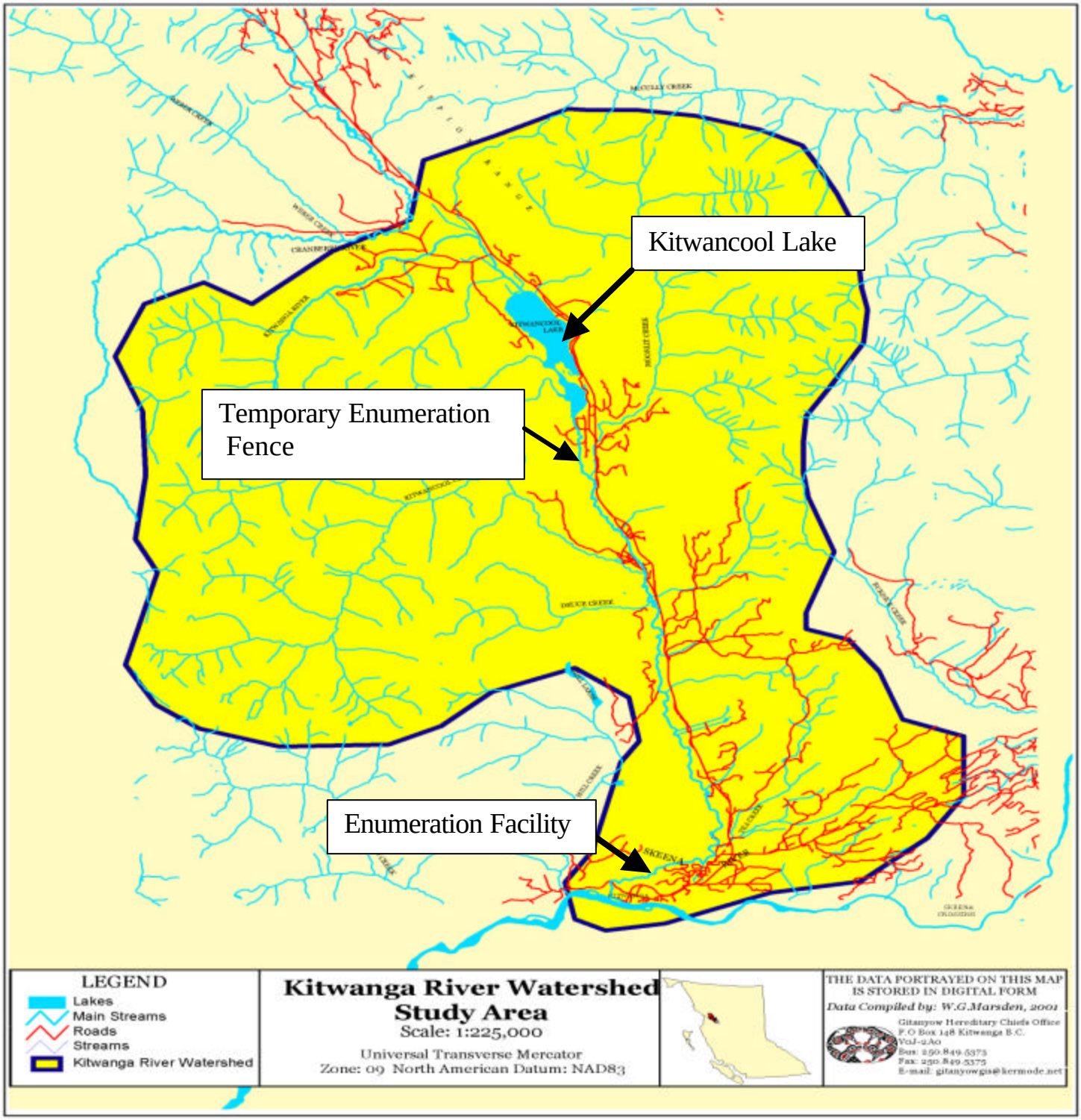


Figure 1. Illustration of the Kitwanga Watershed, making specific reference to the location of the temporary enumeration fence, the Kitwanga River Salmonid Enumeration Facility and Kitwancool Lake.

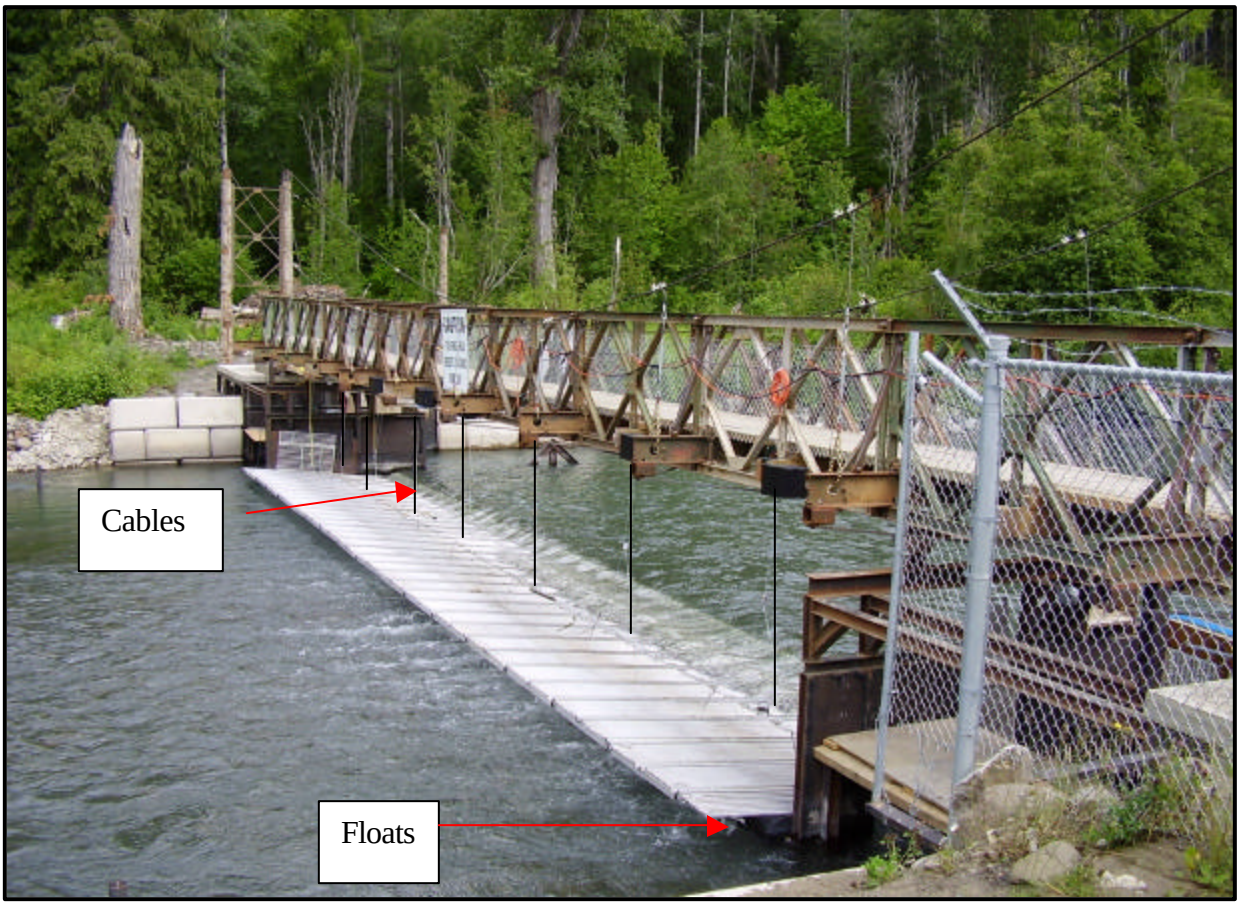
3.0 Methods

To effectively and accurately enumerate salmon returning to the Kitwanga River each year the GFA utilize a permanent enumeration facility that was constructed on the Kitwanga River in the spring of 2003. The enumeration facility is located near the mouth of the Kitwanga River and it has been determined that most salmon spawn above the site giving us an accurate measure of escapement for all species in any given year (Cleveland, 2004). During the summer and fall months the permanent facility utilizes aluminium panels that span the river to enumerate all five species of salmon (Photograph 1). In the winter and spring the panels are extracted and a resistivity counter is used to enumerate steelhead that are returning to the Kitwanga River.

Photograph 1. Salmonid enumeration facility located on the Kitwanga River.

The permanent enumeration facility is approximately 30 m in length and runs perpendicular to the rivers flow. The upstream end of the aluminum floating panels is 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 with fluctuating water levels. In total there are eighteen aluminums panels, which span the entire river. Large polyethylene floats are attached to the downstream end of the aluminium panels. These floats are used to assist in keeping the panels suspended above the water level. As a secondary method to ensure the fence remains above the water, the aluminium panels are secured with 3/8" aircraft cable to eight 1500 lb winches hung to the overhead walkway (Photograph 2). The winches and adjoining cables provide added flotation to the aluminium panels. It has

been GFA's experience that floats alone do not provide enough lift during high water events to keep the fence operational.



Photograph 2. Floating panels attached to overhead walkway bridge, note cables highlighted in black.

Each of the eighteen aluminium panels are heavy (175 lbs) and awkward to handle. Therefore, an overhead winch attached to a guideline helps the fence crew lower and raise the panels safely and position them into the river (Photograph 3).

Once the aluminium panels are secured in the river, trap boxes are installed on the left and right banks so that fish can be counted 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 that they can swim through (Photograph 4). The fisheries technician stationed at the trap box can then visually identify and tally the fish as they swim through. The trap box is separated into two sides to allow fish to swim up both sides. A white Teflon reflective background is used on the bottom of the trap box to make fish identification easier (creates more contrast). A floating viewing box with a plexiglass bottom is also used on top of the water column to cut the waters glare so positive fish identification can be made (Photograph 5). The entire trap box can be lowered or raised with a hand winch depending on the water level and clarity.

Photograph 3. Overhead winch used to lower aluminium panels into river

Photograph 4. Left bank trap box

Photograph 5. Plexiglass viewing box used to identify fish species as they swim through trap boxes.

A portion of the 2005 sockeye salmon run were randomly sampled for age, sex determination, fork length and condition. Scales were taken for aging purposes off of live fish as they migrated upstream, and otoliths collected from dead fish as they washed up on the fence post-spawning. To sample a desired fish that is swimming through the trap box, two overhead trap doors can be closed to contain the fish in the viewing area. The fish can then be dip netted out and sampled. Once sampled the fish is quickly returned to the trap box were it is allowed to revive itself and swim away freely at its leisure. The fisheries technicians working at the permanent enumeration fence are instructed on proper fish handling techniques so that fish are unharmed and stress levels are kept to a minimum.

Crews of two fisheries technicians visually enumerate and tally the salmon as they swim through each trap box. There are two separate trap boxes located on both river banks and each is equipped with two chutes (4 chutes in all). One crewmember works on the right bank, and the other on the left bank. Fish are counted and sampled during daylight hours by a morning and afternoon crews.

An Aquarod data logger is located directly below the permanent enumeration fence to monitor water stage, water temperature and air temperature throughout the salmon migration season. The data logger records these important parameters ever 30 minutes and has been in place since May 2, 2003.

Photograph 6. Sockeye salmon in sampling box

4.0 Results and Discussion

In March of 2005 there were several upgrades performed to the permanent enumeration facility prior to the upstream migration of salmon. Upgrades were conducted to prevent the fence from becoming submerged during high water events. In the previous two years of the fence operation the floating panels sank during high water and salmon were able to pass the fence without being enumerated. The funding to complete the upgrades to the permanent fence, which totalled over $40,000 was contributed by the DFO. Some of the upgrades included the addition of two large A-frame structures at the ends of the bridge abutments so two ¾" cables could be slung over the A-frame structures and attached to the walking bridge to form a suspension bridge. The reason the reinforcements were required was because the floating panels were now going to be attached to the bridge to hold it above the water during high water events. Another upgrade was to move the aluminums panel attachment point approximately 10 feet upstream and 2 feet higher in the water column. The initial attachment point was too low in the water column and gravel substrate would build up at the attachment point and would have to be dug out with an excavator on a yearly basis. Another upgrade performed in 2005 included cutting the panels down to a length of 10 feet. The last upgrade was to install an overhead guideline with a winch that helped to lift the 175 lb panels in and out of the river. All of these upgrades reduced the manual effort to put the fence in from three days down to only one day.

In 2003 and 2004 the permanent fence was temporarily submerged during floodwater events. These high water periods often coincided with the peak of the coho run and a portion of the chum run, therefore fish in both years swam through without being detected which compromised the results of the project. All of these upgrades were extremely helpful in 2005, because the fence remained unbreached for the entire season, even during the high water events. A complete report describing all of the upgrades that took place on the permanent fence can be seen in Appendix A.

The installation of the permanent fence panels was initiated on July 9th, 2005 and the fence was operational and enumerating salmon on July 10th, 2005. A crew of two fisheries technicians enumerated salmon from 6:00 am to 1:00 pm and split shift with another counting crew from 1:00 pm to 9:00 pm each day until the end of the sampling season on October 17, 2005. The fence continued operation for 100 continuous days.

The final escapement results for the various salmon species enumerated through the Kitwanga River Permanent Fence in 2005 are described in Table 1.

Table 1. Kitwanga Salmon run timing and total escapement, 2005

Species	Run Start	Mid Run	Run end	Peak Run	Total Escapement
Sockeye	July 21st	August 31st	October 12th	August 13th	**937**
Chinook	July 13th	August 20th	September 26th	July 29th	**2,408**
Pink	July 27th	August 31st	October 6th	August 13th	**229,226**
Chum	July 28th	September 2nd	October 7th	August 31st	**1,862**
Coho	August 7th	September 12th	October 16th	September 30th	**7,100**
Jack Chinook	-	--	--	--	**226**

4.1 Sockeye Salmon

A total of 937 sockeye salmon migrated past the permanent fence in 2005 (Table 1). This escapement is the third lowest escapement recorded in the past six years (Figure 2.) The sockeye escapement to the Kitwanga River for the previous 5 years was: 1,264 in 2004 (Cleveland, 2005), 3,377 in 2003 (Cleveland 2004), 971 in 2002 (Kingston and Cleveland 2003), 227 in 2001 (Cleveland 2002) and 260 in 2000 (Cleveland and Kingston 2001).
The sockeye escapement results from years 2000 to 2002 were recorded at a temporary fence installed approximately 4-km below Kitwancool Lake (Figure 1.). The escapement results from 2003 to 2004 were taken at the permanent enumeration facility located approximately 4- km upstream from the confluence with the Skeena River (Figure 1.). In 2005, the first sockeye was enumerated at the permanent fence on July 21st and the last sockeye migrated through the fence on October 12th. The peak run timing for 2005 Kitwanga sockeye occurred on August 13th, 2005. DFO fisheries managers estimate that Kitwanga sockeye take approximately two weeks to swim upstream from the Prince Rupert coast to the Kitwanga River. Therefore the bulk of the Kitwanga run would be in the commercial fishery in the last week of July (Fisheries and Oceans, 2005). This is

important for DFO managers to know what weeks Kitwanga Sockeye are most prevalent in the commercial fishery so that exploitation rates can be reduced during these weeks.
Three sockeye timing peaks were observed during this time period with the first being recorded on July 29th the second on August 12th and another last peak on August 26th (Figure 3). The sockeye run timing for 2003, 2004 and 2005 almost perfectly coincides with each other. The majority of sockeye escaping to the Kitwanga River for these three years starts around the first week in August and slows down substantially in the third week of September (Figure 3.).

Periodic fork length measurements and visual sex determination were taken from sockeye throughout their entire 2005 run. A total of 401 sockeye salmon were sampled. Female sockeye comprised 53.4% of the population. Conversely, males made up 46.6% of the population (Figure 4). In previous years the female sex ratios were also dominant. Female dominance was observed in 2002 and 2003 with females comprising 63% and 59% of the population respectively (Cleveland, 2005). In 2002, male sockeye were more dominant than female comprising 53% of the population (Cleveland, 2002). Fork length measurements were taken from 401 sockeye salmon in 2005 and male sockeye exhibited a mean fork length of 57.5 cm (n= 187). Male sockeye fork length ranged from 32cm to 68 cm (Table 2.). Female sockeye in 2005 exhibited a mean fork length measurement of 57.2 cm (n=214). Female fork lengths ranged from 37cm to 71cm (Table 2.). Mean fork length measurements for male sockeye salmon on average are larger than female sockeye. In all years from 2001 to 2005 the fork length difference between the two species ranged from 0.3 cm to 4.5 cm (Table 3.)

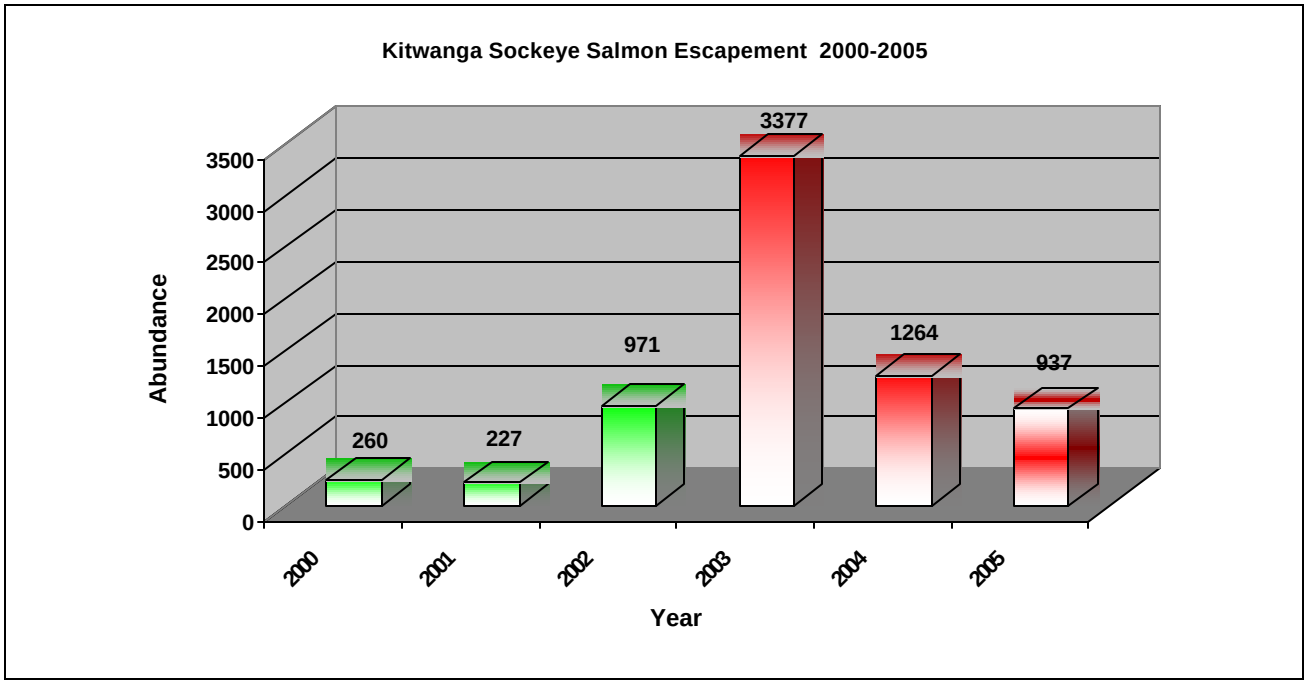


Figure 2. Kitwanga River sockeye salmon escapement results from 2000 to 2005

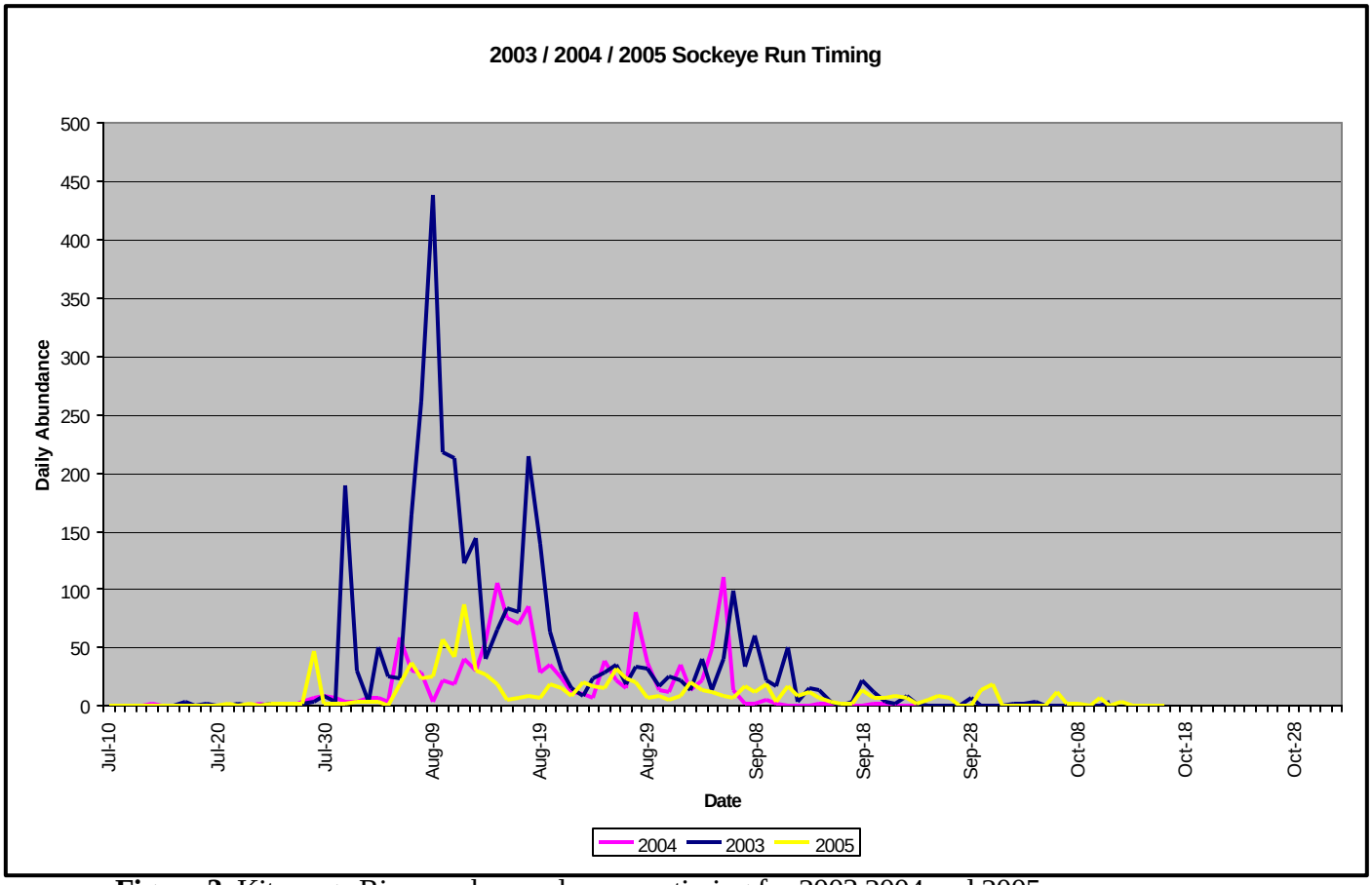


Figure 3. Kitwanga River sockeye salmon run timing for 2003,2004 and 2005.

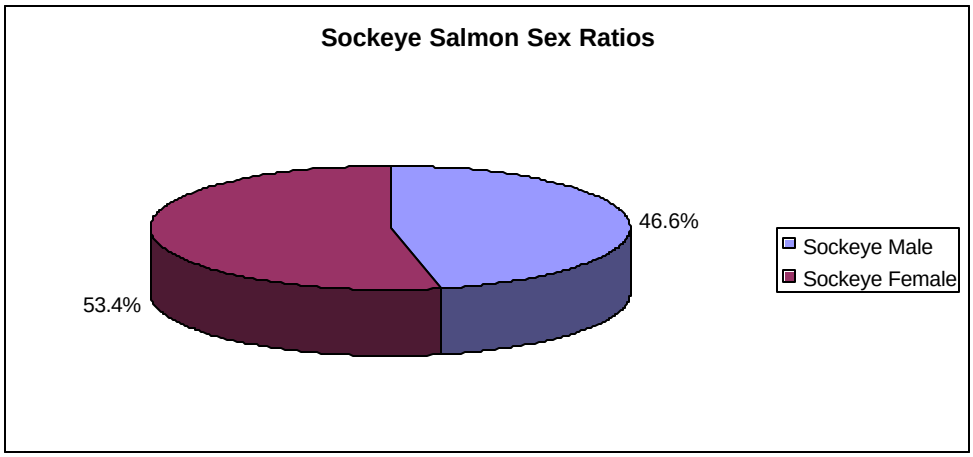


Figure 4. Sockeye salmon sex ratios.

Table 2. Sockeye salmon fork length statistics, 2005

Sex	Mean (cm)	Range (cm)	Standard Error	Sample Size
Male	57.5	32 - 68	0.39	187
Female	57.2	37 - 71	0.31	214

Table 3. Sockeye salmon male and female mean fork length measurements.

Year	Mean Male Fork length (cm)	Mean Female Fork length (cm)
2005	57.5	57.2
2004	58.3	56.4
2003	58.8	55.3
2002	59.1	54.6
2001	60.8	58.4

The 2005 sockeye escapement was the third lowest escapement recorded in the past six years. The 6-year average for Kitwanga sockeye escapement is 1,173. The 937 sockeye that returned in 2005 almost meets the 6-year average. It should be noted that in 2005 there were no commercial fisheries implemented in Area 4 targeting Skeena sockeye and subsequently Kitwanga sockeye due to poor returns to the Skeena River. If a commercial fishery had taken place we could have expected between a 26% to 45% exploitation rate on Kitwanga sockeye depending on the size of the total Skeena sockeye aggregate. Kitwanga sockeye have the same run timing as Babine sockeye and therefore are harvest at similar rates to the Skeena aggregate. The projected harvest rates for Skeena sockeye from the 2005/2006 Northern BC Salmon Integrated Fisheries Management Plan are as follows: 1-2 million Skeena return (26% harvest rate), 2-3 million Skeena return (31% harvest rate), 3-5 million Skeena return (41% harvest rate) and over 5 million Skeena return (45% harvest rate)

4.2 Chinook Salmon

A total of 2,408 adult chinook salmon migrated past the permanent fence in 2005 (Table 1.). The chinook salmon estimate is the highest escapement ever recorded by the GFA since they started enumerating chinook in 2000 (Figure 5.). A total of 226 jack chinook salmon were also recorded during the 2005 season (Table 1.). Jack chinook escapements were not combined to the total return of chinook salmon. The Kitwanga River chinook salmon escapement for the previous five years was: 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) and 1,121 in 2000 (Hamelin et. al., 2001). 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 2005 were collected at the Kitwanga River Salmon Enumeration Facility.

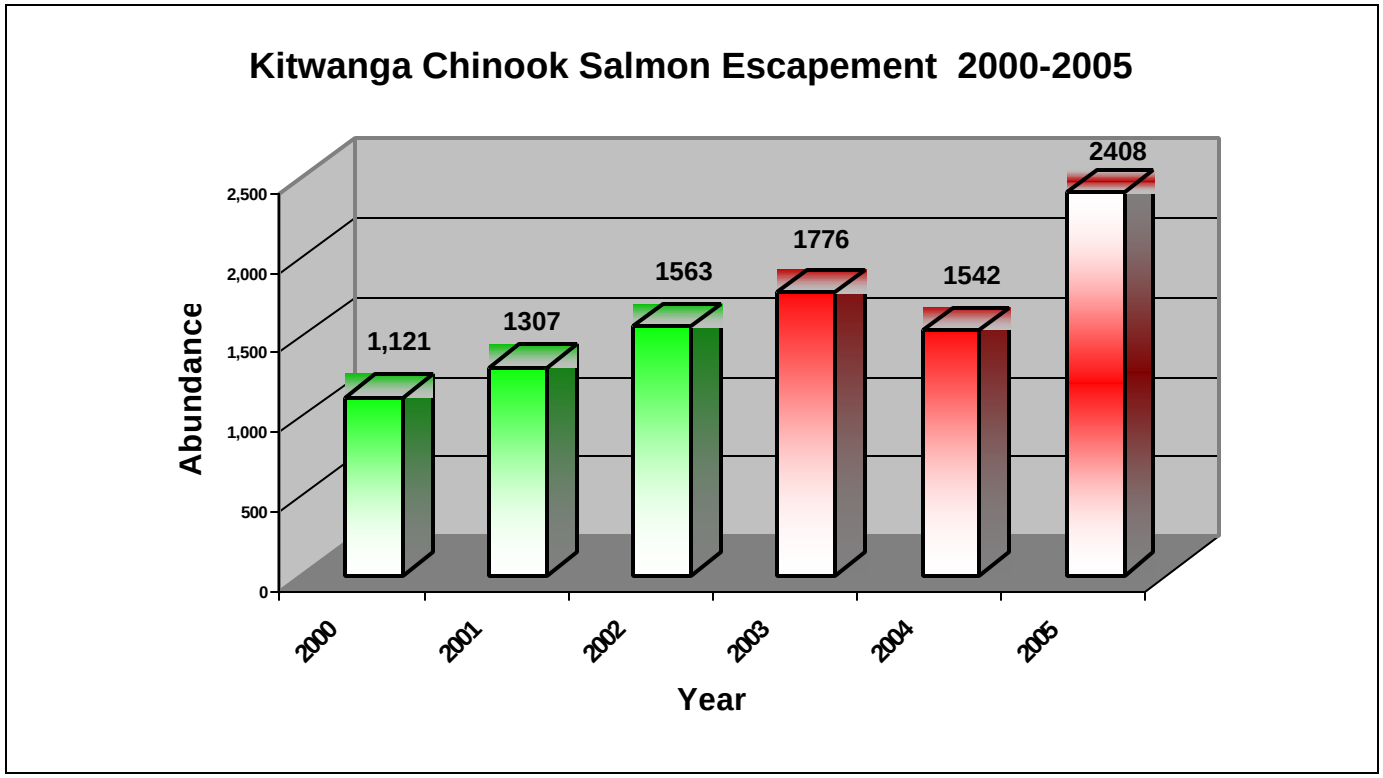


Figure 5. Kitwanga River chinook salmon escapement results from 2000 - 2005

In 2005, the first chinook salmon was enumerated at the permanent fence on July 13th and the last chinook migrated through the fence on September 26th. The peak run timing for Kitwanga chinook in 2005 occurred July 29th (Figure 6). The Kitwanga chinook run timing for 2003, 2004 and 2005 almost perfectly coincides with each other (Figure 6). The majority of chinook escaping to the Kitwanga River for these three years starts in the last week of July and ends in the third week of August.

Chinook salmon returns to the Kitwanga for the last 50 years on average are estimated at 545 fish per year (Morrell, 2000). The chinook salmon population based on enumeration efforts in the Kitwanga River for the past 6-years appear to be very healthy and significantly higher than the 50-year average. A portion of the increase in chinook abundance could likely be attributed to the construction of the permanent fence in 2003 allowing for a more reliable escapement estimate. Whereas before 2003 most counts were acquired by helicopter flights and a large portion of the chinook could have been missed depending on weather conditions, observer efficiency and water clarity.

In 2004 and 2005 the DFO stock assessment team (Prince Rupert) have been using the Kitwanga River Permanent Enumeration Facility to calibrate the observer efficiency of the observers performing the chinook helicopter flights. By knowing the exact amount of chinook that are in the river above the enumeration fence at the time of flight the observers can determine how many fish they missed during the flights. This calibrated efficiency is also being applied to historical chinook helicopter counts to get a more accurate escapement.

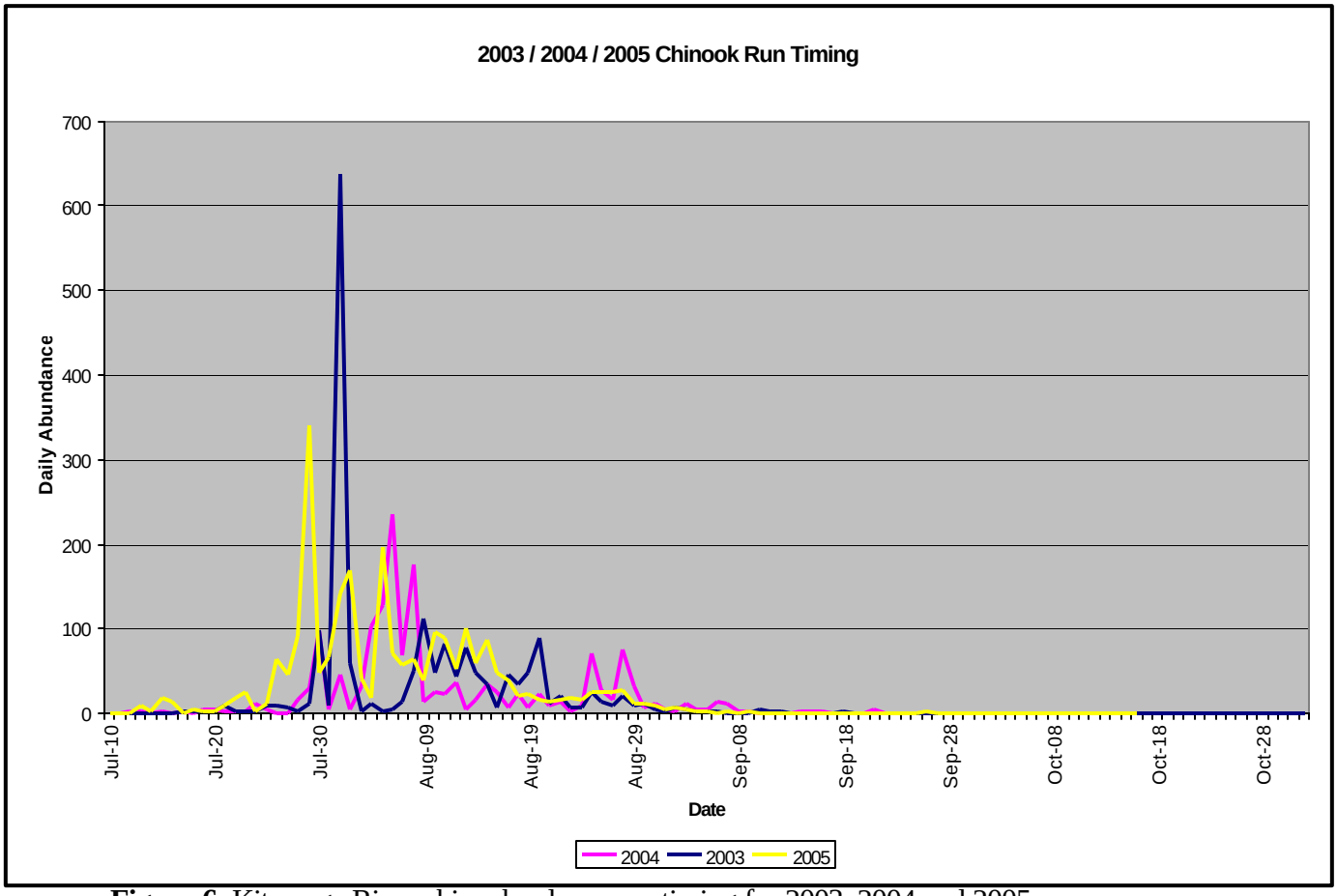


Figure 6. Kitwanga River chinook salmon run timing for 2003, 2004 and 2005

4.3 Pink Salmon

A total of 229,226 adult pink salmon migrated past the permanent fence in 2005 (Table 1.). This pink salmon estimate is the second highest escapement ever recorded by the GFA since they started enumerating pink salmon at the permanent fence in 2003 (Figure 5.). The Kitwanga River pink salmon escapement for the previous two years was: 71,070 in 2004 (Cleveland, 2005) and 336,375 in 2003 (Cleveland, 2004).

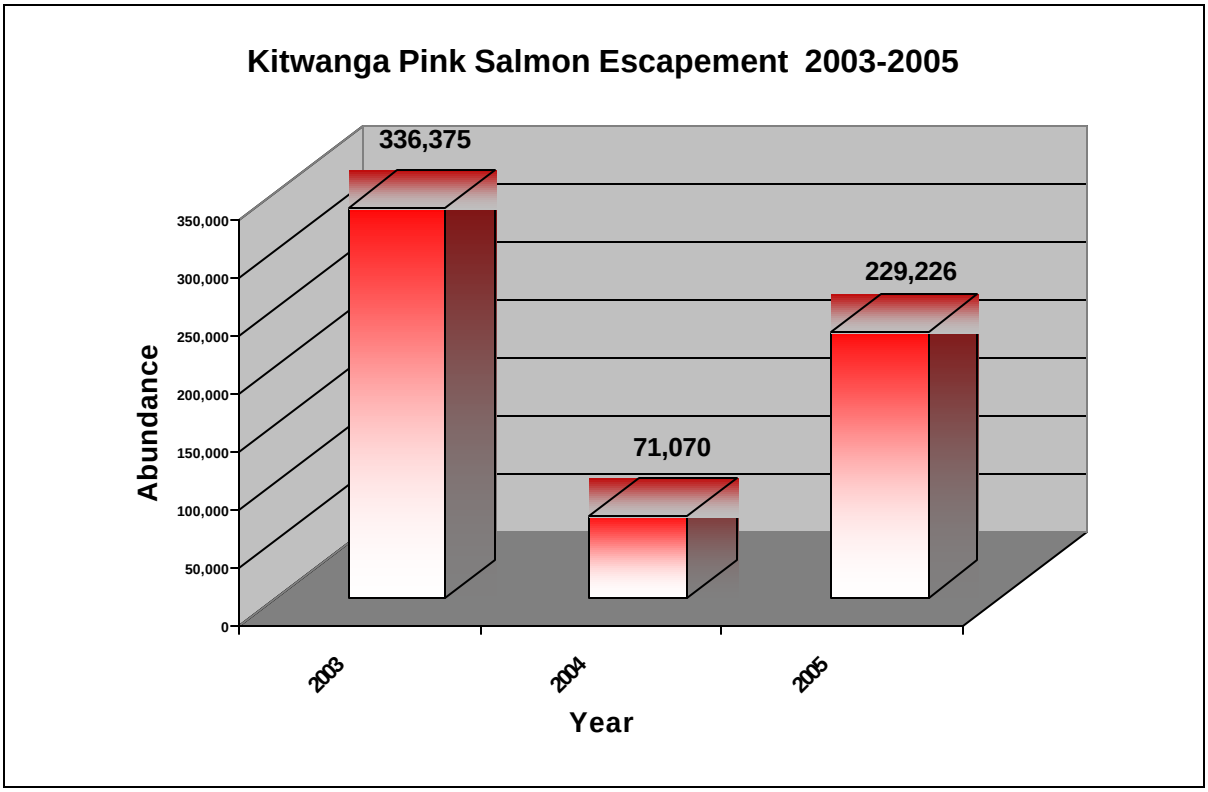


Figure 7. Kitwanga River pink salmon escapement results for 2003, 2004 and 2005

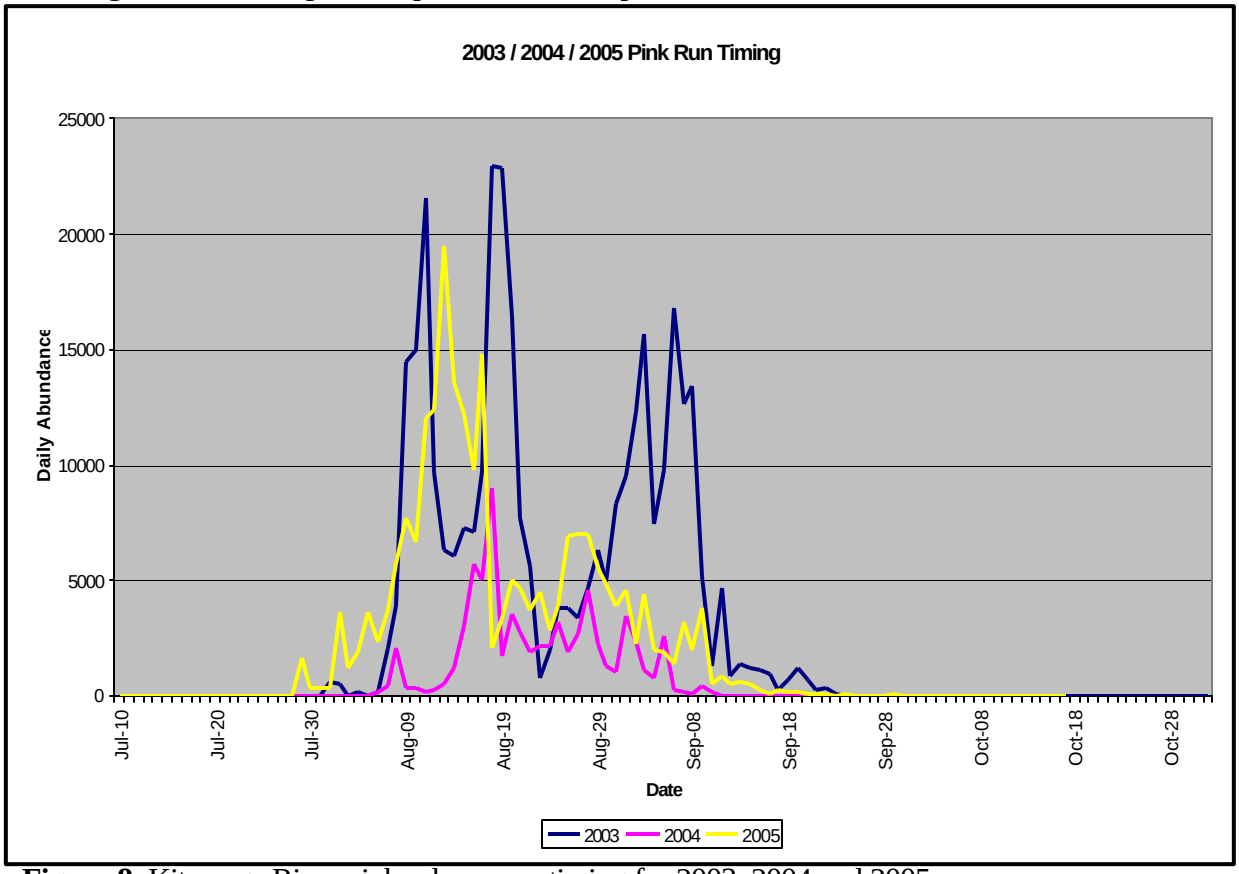


Figure 8. Kitwanga River pink salmon run timing for 2003, 2004 and 2005

In 2005, the first pink salmon was enumerated at the permanent fence on July 27th and the last pink salmon migrated through the fence on October 6th. The peak run timing for Kitwanga pink salmon in 2005 occurred on August 13th (Figure 8.) The majority of pink salmon escaping to the Kitwanga River for the past three years peaks on: August 13th (2005), August 19th (2004), and August 19th (2003).

There is a clear dominance for larger pink salmon runs returning to the Kitwanga River in odd years. This is expected due to the two-year life cycle that is exhibited by pink salmon. It was predicted that returns of pink salmon to the Kitwanga in 2005 would be similar to 2003. But, the returns were over 100,000 less pinks then the broodyear.

4.4 Chum Salmon

A total of 1,862 adult chum salmon migrated past the permanent fence in 2005 (Table 1.). This chum salmon estimate is the second highest escapement ever recorded by the GFA since they started enumerating chum salmon at the permanent fence in 2003. The Kitwanga River chum salmon escapement for the previous two years was: 1,169 in 2004 (Cleveland, 2005) and 1,950 in 2003 (Cleveland, 2004) (Figure 9.).

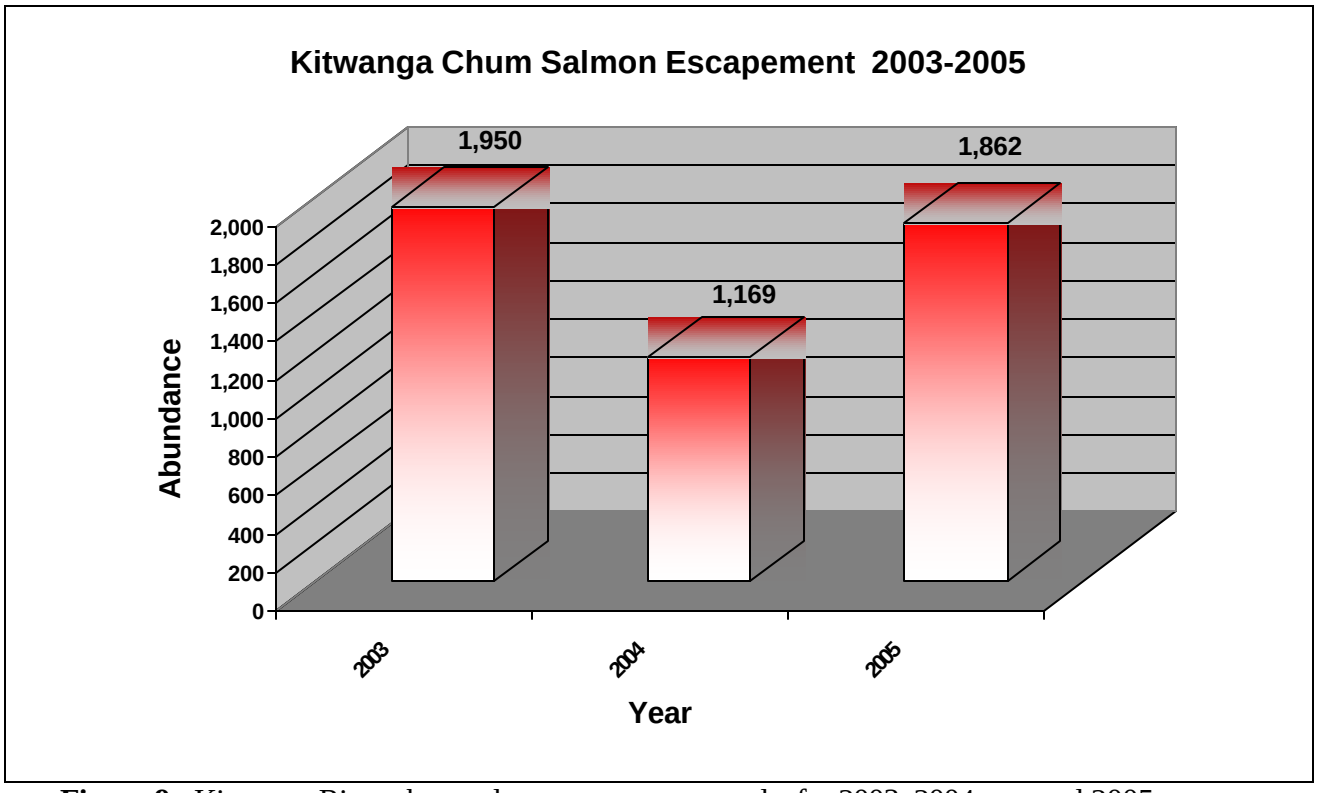


Figure 9. Kitwanga River chum salmon escapement results for 2003, 2004 and 2005

In 2005, the first chum salmon was enumerated at the permanent fence on July 28th and the last chum migrated through the fence on October 7th. The peak run timing for

Kitwanga chum salmon in 2005 occurred on August 31st (Figure 10.) The Kitwanga chum salmon run timing for 2003, 2004 and 2005 almost perfectly coincides with each other. The majority of chum salmon escaping to the Kitwanga River for these three years starts in the last week of July and ends in the third week of August (Figure 10.).

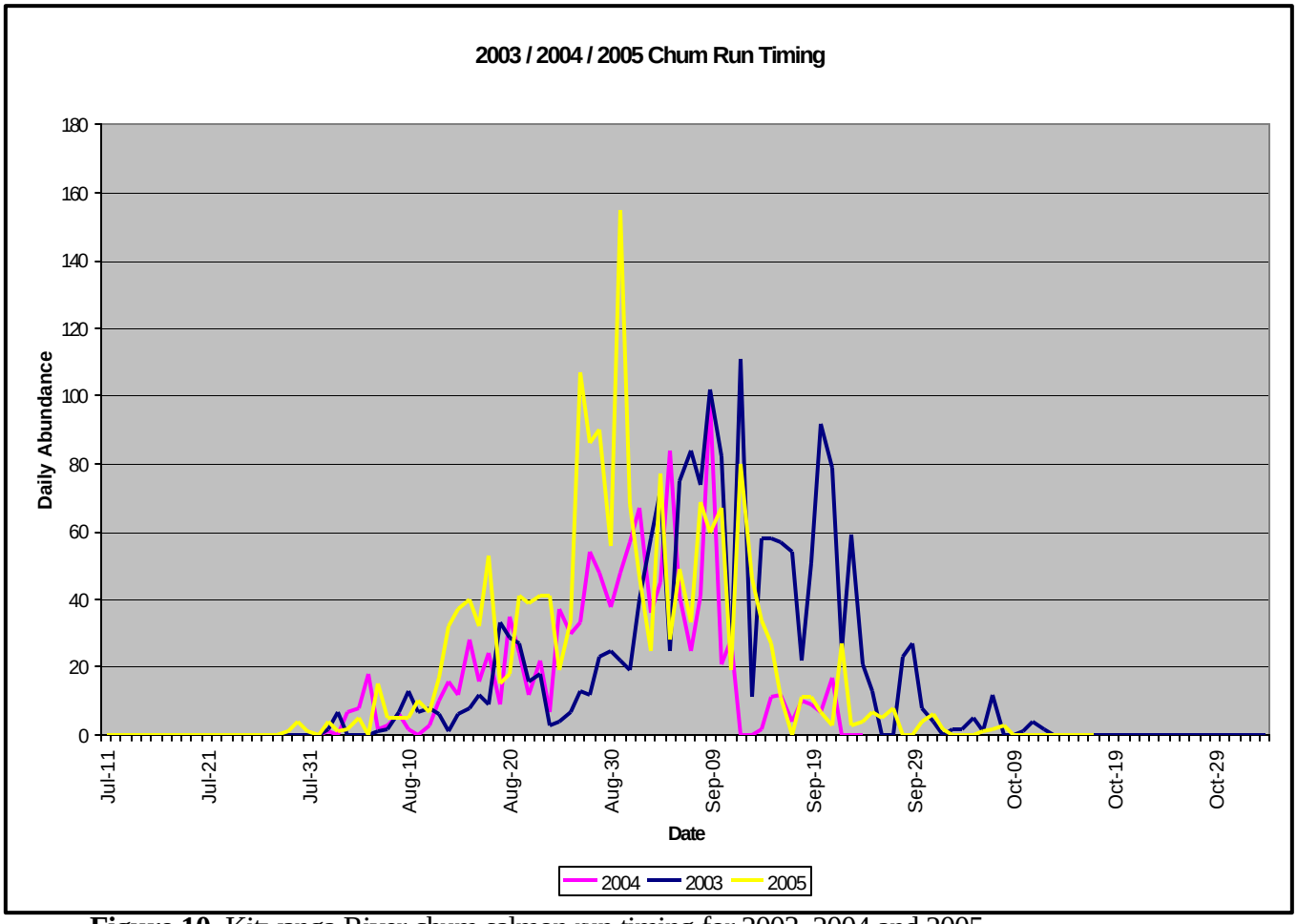


Figure 10. Kitwanga River chum salmon run timing for 2003, 2004 and 2005

When chum salmon migration timing is plotted against water stage there is a relationship between the increase in water level and an increase in chum salmon abundance. In early September 2005, the water stage increases due to fall rain events and the abundance of chum salmon migrating past the permanent fence increases before and during the peak rain events (Figure 11.).

The Kitwanga River permanent fence is the only reliable count of chum salmon in the Skeena watershed. Very little aging information has been collected on Kitwanga chum salmon so in an effort to better understand the age structure of Kitwanga chum the GFA have collected dead chum that have washed up on the fence. The otoliths are going to be extracted from these fish and their age will be determined to better understand their age composition. Gottesfeld *et.al.*, 2002 believed that Kitwanga River chum were thought to make up approximately 40% of the total reported Skeena chum stock in the 1950's. If

that is still the case then the numbers of chum salmon returning to the Skeena let alone the Kitwanga are very depressed.

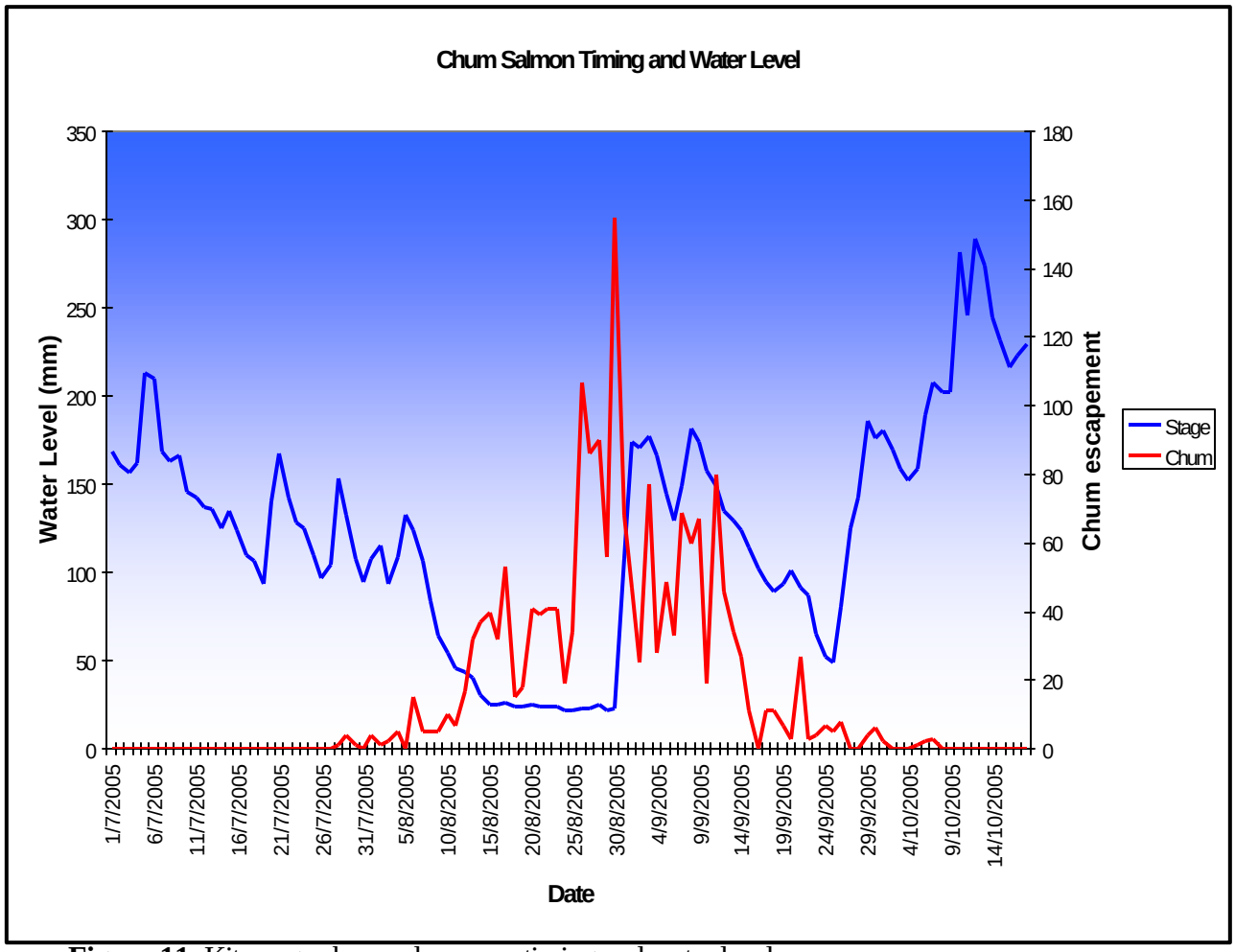


Figure 11. Kitwanga chum salmon run timing and water level.

4.5 Coho Salmon

A total of 7,100 coho salmon migrated past the permanent fence in 2005 (Table 1). This escapement is the highest escapement ever recorded by the GFA since they started enumerating coho salmon in 2001 (Figure 12.) The coho escapement from the Kitwanga River for the previous 4 years was: 2,760 in 2004 (Cleveland, 2005), 2,300 in 2003, 3,515 in 2002 and 3226 in 2001 (Cleveland 2004). The coho escapement results from years 2001 and 2002 were recorded during stream walks of the entire Kitwanga River during the spawning season. The escapement results from 2003 to 2005 were taken at the permanent enumeration facility located approximately 4-km upstream from the confluence with the Skeena River (Figure 1.).

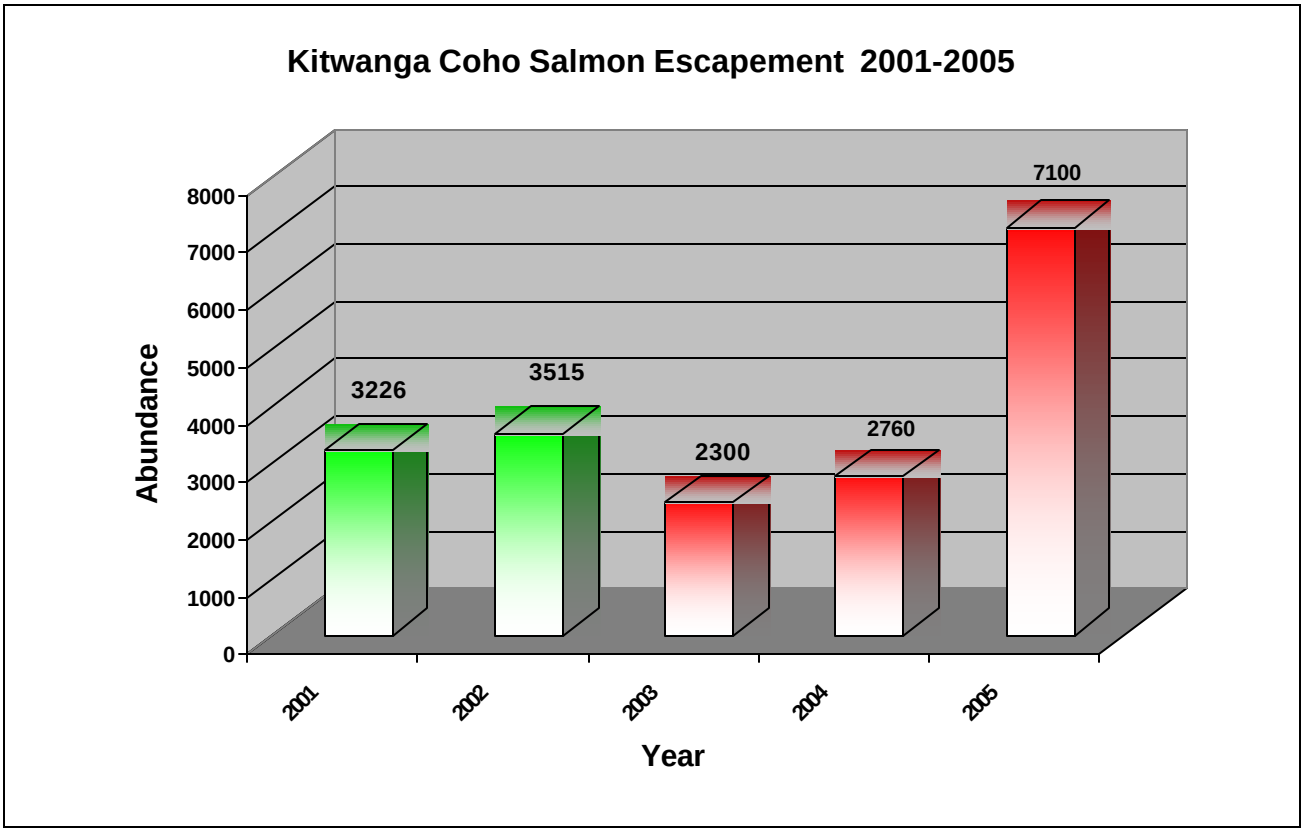


Figure 12. Kitwanga River coho salmon escapement results for 2001 to 2005

In 2005, the first coho was enumerated at the permanent fence on August 7th and the last coho migrated through the fence on October 16th (Figure 13.) The peak run timing for Kitwanga coho in 2005 was on September30th where 2350 coho migrated past the fence in one day. It is very hard to compare the coho run timing for the past three years due to breaching problems with the fence in 2003 and 2004. Coho salmon like to migrate to their respective spawning grounds during flood events in September and October. During 2003 and 2004 the fence became submerged for several days during the peak of the coho salmon migration while large numbers of coho were holding behind the fence. 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. In 2005 the permanent fence remained unbreached and a total of 7,100 coho were enumerated which is double the next highest escapement ever recorded by the GFA. In Figure 14. you can clearly see that at the end of September, 2005 there is a dramatic increase in water stage and at the same time the abundance of coho salmon migrating past the fence increased abundantly at the same time.

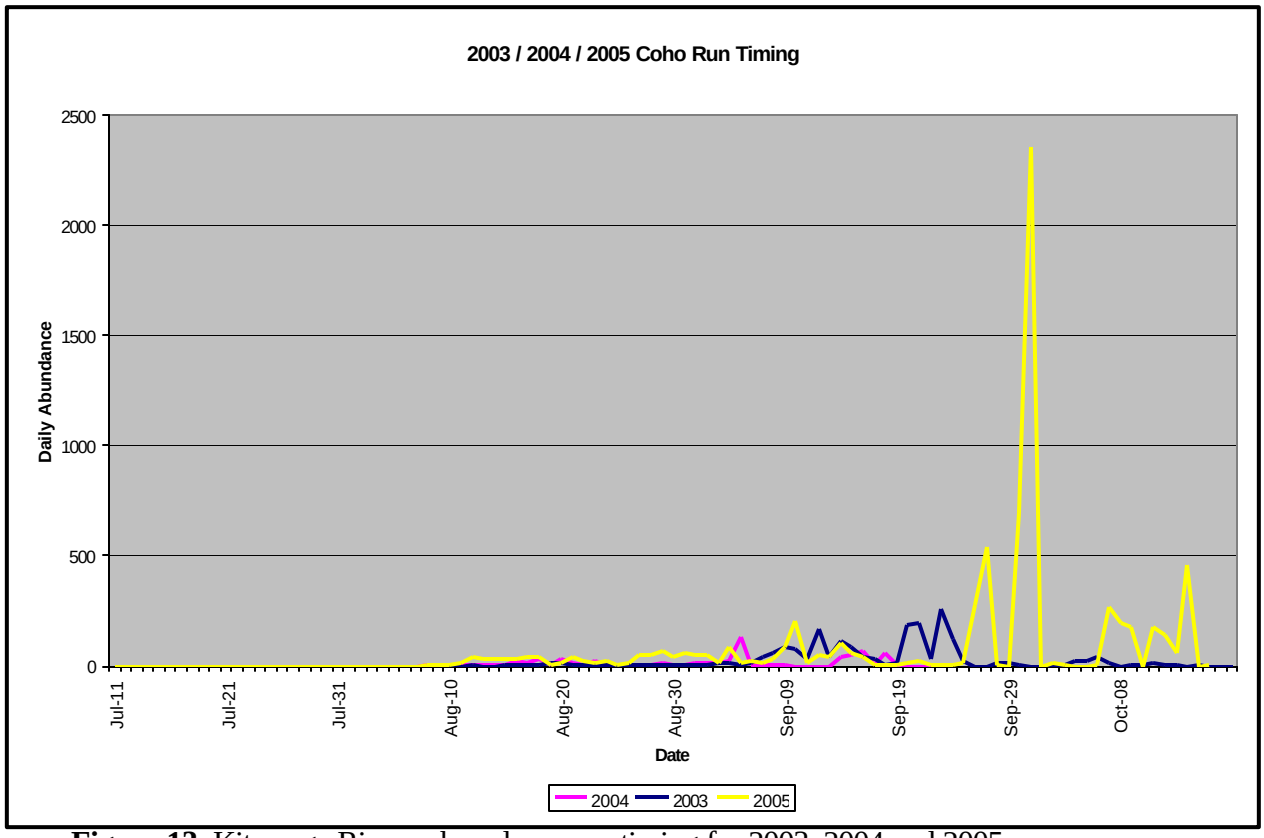


Figure 13. Kitwanga River coho salmon run timing for 2003, 2004 and 2005

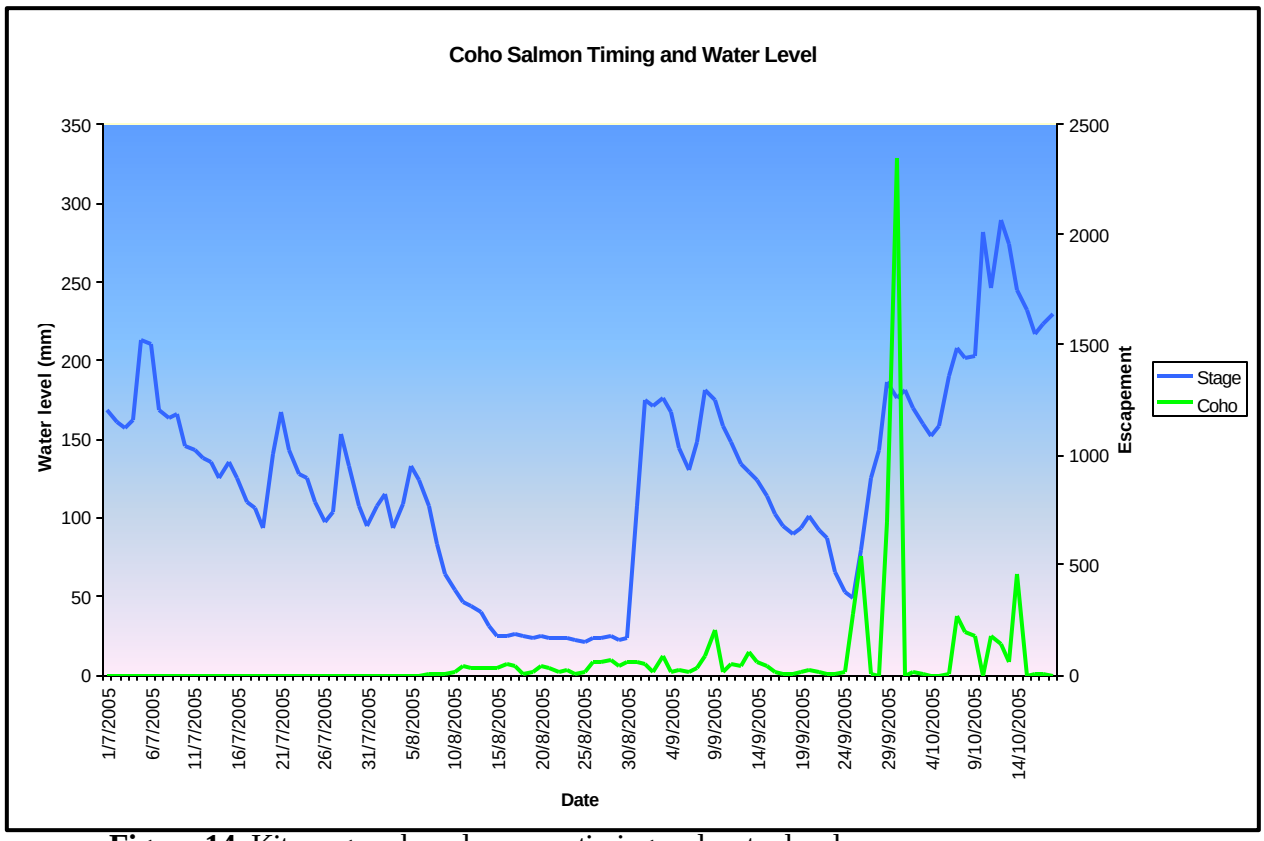


Figure 14. Kitwanga coho salmon run timing and water level.

5.0 Conclusions / Recommendations

The upgrades made to the Kitwanga River Salmon Enumeration Facility in March, 2005 prior to the salmon migration season proved to be very successful. The fence remained unbreached for the entire operation in 2005. Since the installation of the permanent fence in 2003 the floating panels of the fence would often become submerged during fall flood events and a large portion of fish would migrate past the fence without being enumerated. The submerging of the fence would often coincide with the peak of the coho run and it was estimated that 30% -50% of the entire coho run would not have been enumerated. This was more evident during the 2005 season when a record number of coho returned to the Kitwanga River that was more than double the next highest escapement recorded in the last 4-years.

The 2005 sockeye escapement was the third lowest escapement recorded in the past six years. The number seems low but this problem could have been compounded during the 2005 season if there would have been a commercial sockeye fishery in area 4. If a commercial fishery had taken place we could have expected between a 26% to 45% harvest rate on Kitwanga sockeye depending on the size of the total Skeena sockeye aggregate. The reason being that Kitwanga sockeye have the same run timing as Babine sockeye and therefore are harvested at similar rates to the Skeena sockeye aggregate.

Since the construction of the Kitwanga River Salmon Enumeration Facility the permanent fence has proved to be very helpful in determining the strength of middle Skeena salmon stocks. Other benefits of the permanent fence are the accurate determination of sockeye salmon timing when they migrate through the permanent fence. By knowing the sockeye timing in the Kitwanga River the timing can be backtracked to determine when they come through the coastal fisheries in Prince Rupert. This is important for DFO managers to know so that exploitation rates can be reduced during these weeks.

Another benefit of the permanent fence is that DFO stock assessment is using the Kitwanga River to calibrate the observer efficiency of the observers performing the chinook helicopter counts. By knowing the exact amount of chinook that are in the river at the time of flight the observers can determine how many fish are being missed. This calibrated efficiency is also being applied to historical chinook helicopter counts to get a more accurate escapement. Another big benefit of the fence operation is that the Kitwanga permanent fence is the only fence in the Northcoast that has an accurate count on chum salmon.

The most important aspect of the fence is the accurate determination of sockeye escaping to the Kitwanga River each year. Most of the projects completed on the Kitwanga River watershed are a reaction to the low numbers of sockeye presently returning as compared to historical sockeye estimates. The permanent fence will prove to be very important as the GFA along with DFO and other fisheries organizations start implementing portions of the Kitwanga Sockeye rebuilding plan. The fence will allow the GFA to actually measure the success of these rebuilding programs by seeing if the amount of sockeye salmon is indeed increasing over the next 2-3 sockeye life cycles.

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Appendix - A

Gitanyow Fisheries Authority

Final Reporting on the 2005 Upgrades to the Kitwanga River Salmonid Enumeration Facility

Submitted to: Department of Fisheries and Oceans Canada, Aboriginal Fisheries Strategy Program.

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Introduction

The Kitwanga Facility was constructed in 2003 through a joint working agreement between the Gitanyow Fisheries Authority (GFA), the Department of Fisheries and Oceans (DFO), the Province of BC and Chernoble Enterprises at a cost exceeding $600,000. The facility has been in operation for the past two years (2003 & 2004) yielding excellent results on chinook, sockeye, pink, chum and coho salmon escapement to the Kitwanga River. The salmon escapement results acquired for 2003 and 2004 have not only given an incite into the health of Kitwanga salmon stocks, but the information collected is also being used as an index of salmon production to other middle Skeena Rivers. Because of these reasons the Kitwanga River Salmonid Enumeration Facility has become an indispensable tool in the management of salmon stocks in the Skeena Watershed.

However, during the 2003 and 2004 salmon facility set-up and operation two chronic setbacks have been experienced. These two problems consists of:

1. An excessive deposition of gravels and cobbles over the aluminum fence panel hooking system, making it extremely hard to install the counting fence at the beginning of every sampling season.

2. The sinking of the floating fence panels during September high water events resulting in incomplete escapement counts for both chum and coho salmon (later run timing fish).

In response to the first problem, GFA was forced both in 2003 and 2004 to hire an excavator to remove the gravel and cobble deposition on the fence hooks from the fence sill. This was not only monetarily expensive but it also created an unfavorable instream condition where each and every year it required that a large excavator entered the river which potentially disrupted and or destroyed localized fish and fish habitat. In 2004 GFA attempted to address the second problem by upgrading the fence panel floating system, but this proved ineffective during fall floods.

Therefore, during the winter of 2005 DFO provided funds in the amount of $40,000 to address the problems. Funding was awarded to the GFA through DFO's Aboriginal Fisheries Strategy program and upgrades to the facility were performed in March of 2005. Upgrades consisted of the installation of an improved fence panel hooking system in a more favorable location (top of the crump weirs rather than at the bottom) and abandonment of the floating fence system for a more stationary tie back system. This report will summarize in detail the upgrades that took place and there associated timelines to hopefully rectify the problems experienced in the two consecutive salmon sampling seasons.

Methods

The project upgrades were coordinated and lead by GFA Head Fisheries Biologist Mark Cleveland and GFA Fisheries Biologist Derek Kingston. All engineering specifications and improvement designs were developed and supervised in the field by DFO Engineer Don Hjorth (P. Rupert). Several contractors were hired to complete some of the specialized tasks involved in the upgrades, they are listed below as project Support workers.

Project Support Workers

1. Fence panel mounting bracket fabrication and underwater steel cutting - Johnny's Welding Ltd., Terrace, B.C.
2. Tree falling and cedar pole preparation– Shawn Fressen (Professional Faller), Terrace, B.C.
3. Specialized on site welding – Neil Murray, Kitwanga, B.C.
4. Excavation, installation of bridge reinforcements and bridge brace cable set-up - Nechacko Northcoast Construction, Terrace, B.C.
5. Specialized off-site steel fabrication – RH Senden Welding, Hazelton, B.C.
6. General Laborers – Gitanyow Fisheries Authority, Kitwanga, B.C.

Project Equipment

1. One 200 John Deere excavator, equipped with Canola Oil hydraulics
2. Hilti Drill / Hilti Bolts.
3. Miscellaneous power tools and hand tools

Photograph Documentation of Works

The following photographs are presented in chronological order to depict the improvements that took place at the Kitwanga River Salmonid Enumeration Facility in 2005. Upgrades commenced on March 3, 2005 and continued until March 29, 2005. The first task consisted of the installation of new and improved fence mounting brackets at the highest point on the crumps (Sketch #1). These works were performed during low water conditions, where a specialized extended drill bit was used to drill pilot holes in the cement crumps where Hilti studs could be pounded in to secure the hooking brackets (Photograph #1 and #2).

Sketch #1: Photograph of a cement crump similar to the crumps in the river showing old and new location of fence hooking system.

Photograph #1: Hilti Drill, specialized drill bit and Hilti stud used to secure fence hooking bracket to cement crump.

Photograph #2: Fence hooking bracket installation.

The second task performed was the re-enforcement of the existing Bailey bridge so that the fence could be tied back to the bridge that will enable the use of electric winches to

raise and lower the fence during the salmon counting operations. The fence will be raised and lowered in response to fluctuating water levels. Re-enforcement of the bridge was achieved by erecting two Cedar Pole "A" frame structures at each end of the bridge structure. The "A" frames were in turn tied back to cement block anchors, which were buried into the ground. To secure the bridge to between the anchors and the "A" frames ¾" 6X26 wire rope (construction grade) was setup. The entire suspension bridge type setup was tied into using turnbuckles so that the structure could be adjusted as needed (Photographs #4-8).

Photograph #3: Cedar pole "A" frame preparation.

Photograph #4: "A" frame construction.

Photograph #5: "A" frame installation.

Photograph #6: Installed "A" frame.

Photograph #7: Installation of "A" frame anchors.

Photograph #8: Completed "A" frames and re-enforcement cables.

To ensure the fence panels would fit on the new fence hooking brackets three existing steel cutwaters needed to be cut back. A contractor with expertise in under water steel cutting was hired to cut the cutwaters.

Photograph #9: Cutwaters being cutout to allow for proper fence panel installation.

Conclusions and Future Monitoring

The project proceeded as planned, within the allowed budget and all works were completed prior to any high water events. The final installation of cable turnbuckles and cable tightening will be completed in late June 2005 prior to fence panel installation. These works will be completed by GFA through an in-kind contribution to the project.

The true test of the effectiveness of the fence e upgrades will be realized when the fence panels are installed in July of 2005. At this time we will be able to determine the fit of the new hook bracketing system. The other test of the improvements will be in September of 2005 when we determine if the upgrades to the fence can withstand the all flooding events as seen in other years.

If everything proceeds as planned it is anticipated that the fence will be installed without the need for the digging out of fence panel hooks, and that the fence will remain operational throughout the entire salmon escapement period. This should result in a 100% accurate count for all five species of salmon immigrating to the Kitwanga River in 2005.