Enumeration of Adult Chum Salmon, *Oncorhynchus keta*, in the Fishing Branch River, Yukon Territory, 1995

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ENUMERATION OF ADULT CHUM SALMON, *Oncorhynchus keta*, IN THE FISHING BRANCH RIVER, YUKON TERRITORY, 1995

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Boyce, I. 2001. Enumeration of adult chum salmon, *Oncorhynchus keta*, in the Fishing Branch River, Yukon Territory, 1995. Can. Manuscr. Rep. Fish. Aquat. Sci. 2563: 33 p.

A total of 51,971 migrating adult chum salmon (*Oncorhynchus keta*) was enumerated at a weir on the Fishing Branch River from August 27 to October 17, 1995. The run was estimated to be 50.9% female (n=51,971), and 0.6% age-3_1, 70.6% age-4_1, 27.7% age-5_1, and 1.2% age-6_1 (n=623). Fork length (mm) averaged 672 for males and 626 for females (n=795). A sample of post-spawn fish that drifted downstream onto the weir was 36.3% age-4_1, 57.0% age-5_1, 6.7% age-6_1 (n=135), and 49% female (n=150). Estimated expenditure of milt/eggs averaged 86.5% for males (n=77, st. dev.=40.5%) and 99.3% for females (n=73, st. dev.=37.2%). Seven chinook and 112 coho salmon were observed. Water temperature ranged from 6.5°C to 2.0°C; level fluctuated by 0.9 m. A helicopter survey was conducted upstream of the weir on October 4; the count was 15.7% of the weir count to that date.

RÉSUMÉ

Boyce, I. 2001. Enumeration of adult chum salmon, *Oncorhynchus keta*, in the Fishing Branch River, Yukon Territory, 1995. Can. Manuscr. Rep. Fish. Aquat. Sci. 2563: 33 p.

Entre le 27 août et le 17 octobre 1995, on a dénombré un total de 51 971 saumons kétas adultes migrateurs (*Oncorhynchus keta*) à une bordigue installée dans la rivière Fishing Branch. Selon des estimations, 50,9 % de la remonte se composait de femelles (n = 51 971), dont 0,6 % d'âge 3_1, 70,6 % d'âge 4_1, 27,7 % d'âge 5_1 et 1,2 % d'âge 6_1 (n = 623). À la fourche, les mâles et les femelles mesuraient en moyenne 672 mm et 626 mm de long, respectivement (n=795). Un échantillon de charognards, qui, après avoir dérivé vers l'aval, sont restés pris dans la bordigue, se composait de 36,3 % d'individus d'âge 4_1, de 57,0 % d'âge 5_1, de 6,7 % d'âge 6_1 (n = 135) et de 49 % de femelles (n = 150). Selon les estimations, 86,5 % des mâles (n = 77, ET = 40,5 %) et 99,3 % des femelles (n = 73, ET = 37,2 %) avaient frayé en moyenne. Sept quinnats et 112 cohos ont aussi été observés. La température de l'eau allait de 6,5 °C à 2,0 °C, tandis que le niveau de l'eau a varié de 0,9 m. Le nombre de saumons obtenu par relevé par hélicoptère effectué le 4 octobre en amont de la bordigue se chiffrait à 15,7 % du nombre obtenu à la bordigue jusqu'à cette date.

1.0 INTRODUCTION

Chum salmon (*Oncorhynchus keta*) native to the south fork of the Fishing Branch River have been enumerated annually since 1971. From 1972 to 1975, 1985 to 1989, and 1991 to 1995 a weir was used; in other years, escapement was estimated using aerial counts (JTC 1995b). Field operations and administration for the enumeration program have been conducted by Fisheries and Oceans Canada (DFO) in co-operation with the Vuntut Gwitchin First Nation (VGFN).

1.1 OBJECTIVES

The specific objectives of the 1995 Fishing Branch chum enumeration program were as follows:

1. to enumerate, by species and sex, all adult salmon passing the weir site;
2. to assess age and size composition by sex, and spawning success, of Fishing Branch River chum salmon;
3. to document hydrological conditions (temperature and level); and
4. to compare an aerial count of chum salmon with a known value (the weir count).

1.2 WATERSHED DESCRIPTION

Located in the northern Yukon Territory, the south fork of the Fishing Branch River is a headwater tributary of the Porcupine River, itself a major tributary to the Yukon River. The Fishing Branch River flows northeast out of the Ogilvie Mountains, draining an area of approximately 1700 square kilometres (NTS 116 J.K E 1/2, Department of Mines and Technical Surveys 1959). The south fork joins the north fork near Bear Cave Mountain and flows into the Miner River, a tributary of the upper Porcupine River (Figure 1). The spawning area on the Fishing Branch River is approximately 2,600 km from the Bering Sea (Bergstrom 1991).

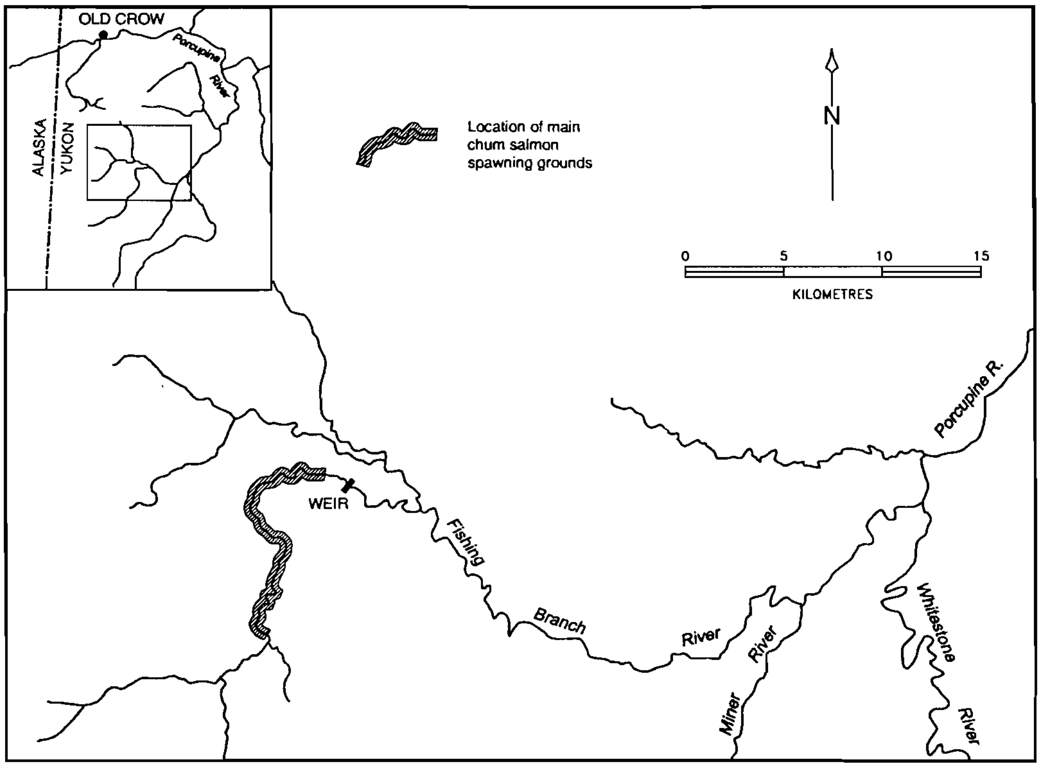

Figure 1. Map of the weir site on the Fishing Branch River.

The terrain in the Fishing Branch River watershed includes rolling hills with elevations generally below 450 m with some mountains up to 1000 m. Muskeg often extends to the riverbank. Trees include black and white spruce, willow and birch. There are ponds and thermokarst basins in the region, but no lakes (Oswald and Senyk 1977).

The closest climatological station to the Fishing Branch River is in Old Crow, approximately 120 km to the north of the weir site. Temperatures recorded at the station during the period 1968-1990 averaged -9.3 °C and ranged from -59°C to 32°C. The mean annual precipitation during this period was 239.5mm. (Environment Canada files).

The main channel of the Fishing Branch River is clear, swift, and meandering with riffles, large exposed gravel bars and pools up to 2.5 m deep. The streambed is made up of large cobble (50-250 mm) and medium cobble (2-50 mm) (Bryan 1973). Side channels are slow and have fine granular sediment over medium cobble (Bruce 1975).

Stream discharge fluctuates greatly due to regional precipitation and the spring snowmelt. Flood-like conditions in the summer and fall after rainfall are not uncommon. Available flow measurements at the weir site range from 11.3 cubic metres per second in March 1972 (Steigenberger 1972) to 56.6 cubic metres per second in September 1972 (Elson 1975). A 15 km stretch of groundwater discharge in the headwaters of the south fork of the Fishing Branch River maintains open water in winter many kilometres downstream. The weir site is in the open water area.

1.3 FISHERIES RESOURCE OVERVIEW

1.3.1 Species Present

The south fork of the Fishing Branch River is a major spawning ground for fall chum salmon[1]. Estimates of escapement have ranged from 15,150 to 353,282 chum salmon (JTC 1995b and Elson 1976). Spawning occurs from September to November. The groundwater flow provides a habitat suitable for spawning adults, incubating eggs and rearing juveniles when temperatures in the region are well below freezing (Steigenberger 1972).

Coho salmon (*O. kisutch*) spawn in the same area in October and November. Bryan (1973) reported that 150 coho juveniles were seined in a 300 square metre shallow riffle area of the Fishing Branch River in March 1972 and 12 were caught in a seine in May 1972. Low numbers of adult coho salmon have been enumerated at the weir. However, total escapements are unknown since the weir is removed before the coho migration is believed to be complete, because of weather conditions.

In July and August, chinook salmon (*O. tshawytscha*) also spawn in the groundwater area (Steigenberger et. al 1973). Low numbers of adult chinook have been observed at the weir and it has been suggested that the majority of the escapement each year occurs prior to weir installation. However, this was not supported by observations made in 1998 (Doehle 1999, Boyce and Wilson 2000).

Non-salmon species present in the area include: slimy sculpin (*Cottus cognatus*), round whitefish (*Prosopium cylindraceum*), Arctic grayling (*Thymallus arcticus*), and burbot (*Lota*). Northern pike (*Esox lucius*), humpback whitefish (*Coregonus clupeaformis*) and broad whitefish (*Coregonus nasus*) have also been noted at the weir site, and in the lower limits of the Fishing Branch River (Steigenberger et. al 1973).

1.3.2 Non-Human Utilisation

Grizzly bears, wolves and eagles, among other mammals and birds are known to be supported in part by the salmon stocks of the Fishing Branch River.

[1] Chum salmon in the Yukon River system can be separated into two major groups: fall (or autumn), and summer. Fall chum can be distinguished from summer chum as adults by: (1) later entrance into freshwater, (2) less developed reproductive systems at the time of entry into freshwater, (3) a later spawning period, (4) larger size, and (5) greater fecundity (Groot and Margolis 1991).

In a 6.5 km reach located in the vicinity of the weir site, the grayling population has been estimated to be 9,000 fish (Bruce 1973). In that study, stomach content analyses showed that the grayling diet included chum eggs and alevins. Other fish species native to the Fishing Branch River are believed to prey upon chum salmon eggs, alevins, and fry.

1.3.3 Human Utilisation

Fishing Branch River salmon are harvested in Canada by the VGFN on the Porcupine River near Old Crow, and in Alaskan subsistence and commercial fisheries along the length of the Yukon River in the United States. They may also be intercepted in the United States groundfish trawl fisheries in the Bering Sea-Aleutian Islands area and the Gulf of Alaska, in purse seine and salmon gillnet fisheries in the "False Pass" area near the south Alaska Peninsula, and in coastal gillnet fisheries in Norton Sound. Until 1992, Fishing Branch River salmon may have been harvested in other off-shore fisheries, namely:

1. the Japanese high-seas mothership and land-based salmon gillnet fisheries;
2. the high-seas squid gillnet fisheries in the North Pacific Ocean of Japan; the Republic of Korea, and the Republic of China (Taiwan);
3. the foreign groundfish fisheries of the Bering Sea and Gulf of Alaska;
4. the joint-venture groundfish fisheries of the Bering Sea and Gulf of Alaska; and
5. the groundfish trawl fishery by many nations in the "Doughnut Hole" international waters area of the Bering Sea.

These fisheries harvested large numbers of salmon some of which were likely of Yukon River origin, and therefore potentially of Fishing Branch River origin. However, several of the offshore fisheries have been phased out by international agreements (JTC 1993c).

2.0 METHODS

2.1 WEIR LOCATION AND CONSTRUCTION

The weir was installed on the south fork of the Fishing Branch River approximately 31 km west of the Miner River confluence (Figure 1). The location has not varied since a weir was first installed on the Fishing Branch River in 1972. Approximate co-ordinates are 66°32 north and 139°15′ west (NTS map reference 116JK 1:50,000).

Materials and methods used to construct the weir were similar to those used since 1985. Photographs of the structure are presented in Appendix 11. Components included approximately 15 iron tripods, plywood/angle-iron stringers, electrical conduit, Vexar™[2] (plastic screening) and sandbags. A sampling chamber, constructed from rebar, angle-iron stringers, and conduit was placed where flow was the greatest (close to the middle of the river). This formed the apex of the weir. Tripods were placed out at a slight angle downstream from the sampling chamber to each bank of the river. The distance between tripods was 3 m (10 ft.). Tripods were interconnected by pairs of horizontal stringers that were bolted approximately one quarter and three quarters of the way up from the bottom of the upstream leg of each tripod. Conduit inserted at 5 cm (2") centres through the stringers provided the actual barrier to fish migration. Conduit was also inserted into the sampling chamber frame at the upstream end and sides. There was no gate at the downstream end of the chamber. Fish passage through the weir was made possible by removal of two or three pieces of conduit from the upstream end of the chamber. (This opening is hereafter referred to as the "gate".) A platform, supported by the weir itself and rebar driven into the river bottom, was placed by the side of the sampling chamber to permit enumeration and sampling.

Vexar™mesh was laid out along the lower portions of the conduit to further stabilise and seal the weir. Approximately 120 burlap bags filled with gravel were used to hold the Vexar™ in place and help anchor the structure.

Lighting consisted of approximately fourteen floodlights (100 and 150 watt) strung across the weir and within the camp, to facilitate night counting and to provide safe conditions for personnel. A gasoline-fuelled generator was used as the power source.

Weir construction was completed on August 27 at 1800 hrs.

2.3 ENUMERATION

2.3.1 Weir

Enumeration commenced three hours after weir installation was complete.

Migrants were counted according to gender as they passed through the sampling chamber gate. Gender identification was facilitated by marked dimorphism and clear water.

During enumeration periods, the gate was open for more than 50% of each hour. Generally enumeration was conducted 24 hours per day. Short-term gate closures occurred when there were lighting system problems on September 17 and 18, and when staff were sampling carcasses (a total of six hours between September 26 and October 14). A long-term gate closure

[2] Mention of trade names does not constitute endorsement by DFO.

occurred because of flooding from 2200 hrs on August 31 to 1600 hrs on September 9 (Appendix 1). During this period, enumeration was halted because fish countability was compromised by a decrease in water clarity, and because of personnel safety considerations. Some leakage of fish could have occurred at this time since the potential existed for chum salmon to pass over the weir or through spaces created by shifting tripods.

Enumeration ceased upon removal of the weir; this commenced at 1400 hrs on October 17.

2.3.2 Aerial survey

An aerial survey was conducted on October 4 from 1200 to 1300 hrs. Two observers enumerated from a Bell 206B Jet Ranger helicopter. Polarised sunglasses were worn and counts recorded using hand-held counters. One observer counted live fish, and the other counted dead fish. Reaches both upstream and roughly one river-kilometre downstream of the weir were surveyed from an altitude of approximately 30 m and an airspeed of about 30 kph. The survey took somewhat longer than usual since the high water conditions meant that some sloughs that typically lacked water in the fall contained spawning fish. The high water also reduced fish countability.

2.4 BIOLOGICAL SAMPLING

The chum salmon escapement was sampled in order to obtain age and length data by sex for the run. Fish were retrieved from the sampling chamber with a dip-net and placed in an aluminium tub containing river water. Using forceps, three scales were removed from the preferred area (located above the lateral line on an imaginary line extending from the posterior end of the dorsal fin to the anterior end of the anal fin). Fork length was measured to the nearest 5 mm using a flexible plastic tape measure. Sex was recorded. After sampling, fish were placed in an in-river recovery pen from which they could exit freely.

The target number of live fish samples was 750. This target was based on the number of data points required to characterise a population of approximately 100,000 fish having three age classes, with 95% confidence and +/- 5% precision (DFO files; from Cochran 1977). It was assumed that approximately 30% of the scales would be uninterpretable due to resorption. Attempts were made to sample in proportion to run timing; however this was somewhat difficult given interannual variation in timing, and the challenge of predicting the total escapement.

Data and samples were also collected from carcasses of chum salmon that had drifted onto the weir from an upstream location, either deceased or in a moribund state. Sex, post-orbital hypural (POH) length, and fork length were recorded. Ten scales were removed from each fish. The number of scales removed from carcasses was greater than the number removed from live samples since handling time was not a concern, and it was expected that scale resorption would be a greater problem. Pectoral fins, otoliths and vertebrae were also collected. The gonads in each carcass were examined visually in order to assess spawning success. The amount of reproductive material observed was expressed as a percentage of what was estimated to have been present prior to spawning. Pre-spawn fish were not examined for comparison purposes.

The primary reason for sampling carcasses was to augment data collected on live fish. Bony structures assisted in the interpretation of scale patterns by providing insight on resorption rates. On sexually mature fish that have migrated large distances without feeding, bony structures provide more reliable age data than scales, since they do not appear to be subject to the same degree of resorption. The two length measurements were taken in order to allow inference of POH length on live fish. POH length is more difficult to measure than fork length on living fish; however it is often a more useful estimator of size since it is not influenced by the changes in morphology that chum salmon exhibit as they approach sexual maturity (primarily kype development). The target of 150 carcass samples was judged to be sufficient for bony structure/ scale comparisons and length regression analyses.

2.5 HYDROLOGICAL DATA

Water temperature and level was recorded every four hours, with some interruptions. Temperature (°C) was taken from the platform adjacent to the sampling chamber using a hand-held alcohol thermometer. The temperature within the top six inches of the water column was measured.

A staff gauge was positioned close to the south bank of the river approximately five metres downstream from the weir. Placement may have varied slightly from other years of the study. The purpose of the gauge, which was not zeroed or placed in the deepest section of the river, was to track water level fluctuation throughout the 1995 enumeration period.

2.6 AGE ANALYSIS AND DATA STORAGE

Scales, pectoral fins, otoliths, and vertebrae were sent to the Fish Ageing Lab at the DFO Pacific Biological Station in Nanaimo, B.C. for age analysis.

Raw data were transcribed into Microsoft® Excel and stored at the DFO office in Whitehorse, Y.T.

3.0 RESULTS

3.1 ENUMERATION

3.1.1 Weir Count

A total of 51,971 adult chum salmon was observed passing the weir site in 1995 (Appendix 2). Fish passage was observed immediately after installation of the weir. However, the fact that only 86 fish were observed in first 48 hours of enumeration suggests that few fish were missed. It is also likely that few fish were missed at the end of the run, since only 136 were counted in the final 48 hours of weir operation. It is not known how many fish passed through or over the weir during the high water period (August 31 to September 9).

Two major daily count peaks were observed over the course of the project (Figure 2). These were separated by several days. The highest daily count, 2,653 chum salmon, was recorded on September 13. The mid-point of the observed run fell on September 23.

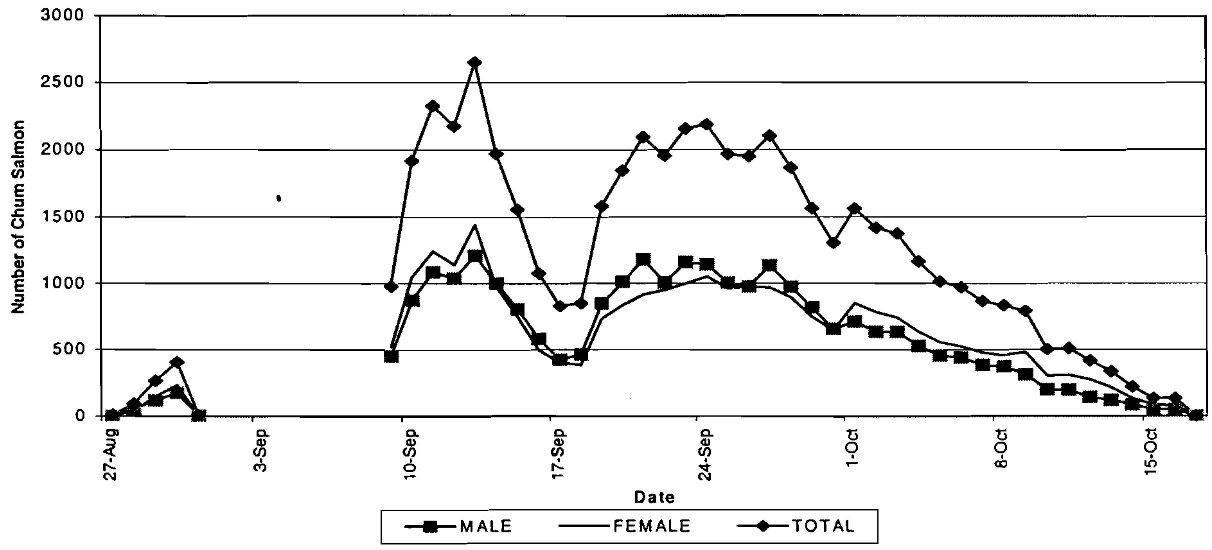

Figure 2. Daily counts of chum salmon through the Fishing Branch River weir, 1995.

Hourly counts are presented in Appendix 3.0 and Appendix 3.1. Note that the count recorded for a given hour represents the number of migrants through the weir between the beginning and end of that hour. Figure 3 depicts diel run timing averaged over the course of the observed run. (The numbers of fish that passed through the weir at a specific time each day were summed and divided by the number of days.) Certain days were censored, specifically those on which fish passage was completely halted for more than one hour[3] or there was a count of fewer than 500 fish. (Variability in diel run timing appeared to increase substantially on days with very low counts.) The average hourly counts suggest that evening (1700 hrs through 2000 hrs) and late morning (0900 hrs through 1000 hrs) were the favoured times for fish passage. However, variability was high (Appendix 3.2).

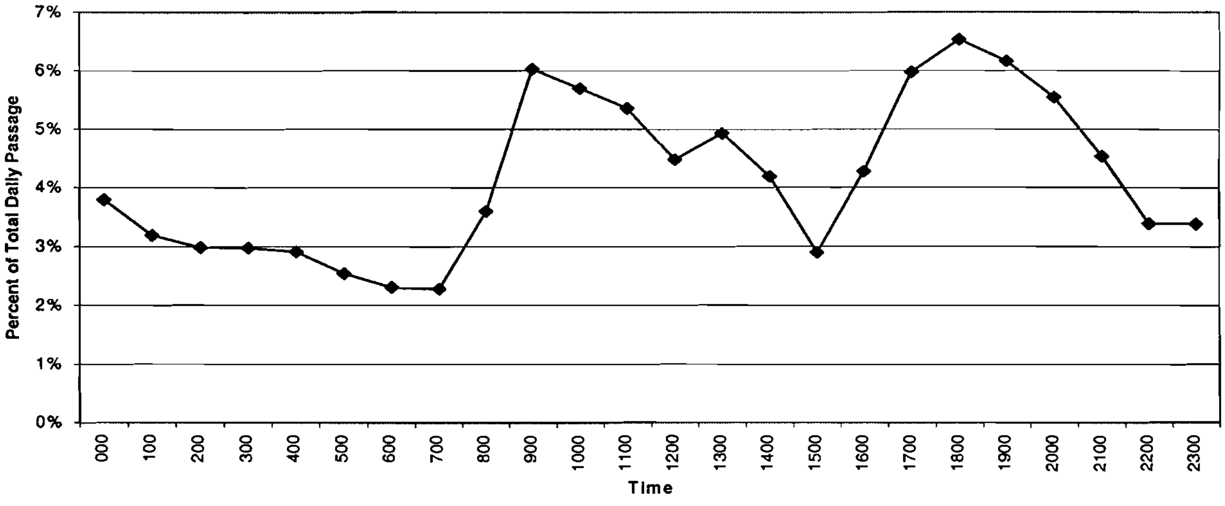

Figure 3. Average diel run timing of chum salmon through the Fishing Branch River weir, 1995.

The number of fish identified at the weir as female chum salmon was 26,437. This comprised 50.9% of thè total count. As illustrated in Table 1, the contribution of females to the count was greatest at the end of the run and least during the middle of the run. The weekly female contribution ranged from 46.2% (n=11,322) in statistical week (SW) 38 (ending September 23), to a maximum of 61.3% (n=271) in SW 42 (ending October 21).

[3] i.e. when the gate was closed and no fish were manually transferred over the gate.

Table 1. Weekly counts by sex of chum salmon at the Fishing Branch River weir, 1995.

Stat Week	Week Ending	Male	Female	Total	% Female
35	2-Sep	356	434	790	54.9%
36	9-Sep	454	524	978	53.6%
37	16-Sep	6,597	7,084	13,681	51.8%
38	23-Sep	6,094	5,228	11,322	46.2%
39	30-Sep	6,704	6,242	12,946	48.2%
40	7-Oct	3,793	4,578	8,371	54.7%
41	14-Oct	1,431	2,181	3,612	60.4%
42	21-Oct	105	166	271	61.3%
TOTAL		**25,534**	**26,437**	**51,971**	**50.9%**

Seven chinook and 112 coho salmon were observed migrating through the weir in 1995. The chinook were observed between August 29 and September 28, inclusive. Coho were observed each day from October 2 to October 16, inclusive (Appendix 4). Whitefish and arctic grayling were also observed at the weir site.

3.1.2 Aerial Survey

At the time of the helicopter survey the weir count was 86% complete. High water and overcast conditions were encountered, and had a negative impact on visibility. The countability was rated as "fair" out of the possible ratings "nil, poor, fair, good" and "excellent". A count of 7,020 chum salmon was obtained; this was 15.7% of the cumulative weir count at the time of survey completion. Approximately 2,245 (32%) of the fish seen upstream of the weir were carcasses. Downstream of the weir, 10 live and 110 dead chum salmon were observed. No chinook or coho salmon were documented.

3.2 BIOLOGICAL SAMPLING

3.2.1 Live Fish

The initiation of sampling of live fish for age, length and sex data was delayed until SW 37 (ending September 16) because of high water. Between September 14 and October 17, a total of 795 chum salmon were sampled. Sampling effort in relation to run timing is presented in Table 2.

Table 2. Sample effort in relation to run timing at the Fishing Branch River weir, 1995.

Stat Week	Week Ending	Count	% Count	Sample	% Sample
35	2-Sep	790	1.5%	0	0.0%
36	9-Sep	978	1.9%	0	0.0%
37	16-Sep	13,681	26.3%	150	18.9%
38	23-Sep	11,322	21.8%	250	31.4%
39	30-Sep	12,946	24.9%	190	23.9%
40	7-Oct	8,371	16.1%	126	15.8%
41	14-Oct	3,612	7.0%	70	8.8%
42	21-Oct	271	0.5%	9	1.1%
TOTAL		**51,971**	**100.0%**	**795**	**100.0%**

Fork length measurements taken from live female and male chum salmon are presented in Table 3. Also presented are POH lengths, inferred from fork lengths using the formula developed by regression analysis of lengths obtained from carcasses. The fork lengths taken from females averaged 626 mm, (std. dev.=29 mm; n=369). The fork lengths obtained from males averaged 672 mm (std. dev.=34 mm; n=426). The POH lengths calculated for females averaged 501 mm (std. dev.=16 mm). For males, POH length averaged 523 mm (std. dev.= 24 mm). Length-frequency histograms are presented in Appendix 5.

Table 3. Length composition by sex and age of Fishing Branch River chum salmon, 1995.

Age	**3_1**		**4_1**		**5_1**		**6_1**		**All Samples***	
Sex	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**
N	1	3	204	234	80	93	2	6	369	426
Fork Length										
Ave	585	633	621	670	635	686	668	693	626	672
Min	585	620	525	570	555	610	645	655	525	570
Max	585	655	695	770	690	765	690	725	715	770
Var		358	759	1,064	695	1,278	1,013	738	813	1,154
Std		19	28	33	26	36	32	27	29	34
Post-Orbital Hypural (POH) Length (based on linear regression)										
Ave	478	496	498	521	506	533	524	537	501	523
Min	478	486	445	451	462	479	511	511	445	451
Max	478	511	539	592	536	588	536	560	550	592
Var		177	232	527	212	633	309	365	248	571
Std		13	15	23	15	25	18	19	16	24

* includes unaged fish.

Of the 795 chum salmon scale samples taken from live fish and sent to the morphology lab for analysis, 623 (78.4%) yielded age data. Of the remaining samples, 109 (13.7% of total) were resorbed, 34 (4.3%) were regenerated and 29 (3.6%) had been rendered unreadable at the time of sampling by excess water. Age results for each week were expanded by the weir count, with each sex treated separately (Table 4). Males and females showed almost identical age compositions. The estimated age composition for the run was as follows: 0.6% age-3_1, 70.6% age-4_1, 27.7% age-5_1, and 1.2% age-6_1. Data by statistical week are presented in Appendix 6.

Table 4. Age composition of Fishing Branch chum salmon, 1995.

		Age Class				
	N	3_1	4_1	5_1	6_1	Total
Male	336	0.8%	70.8%	26.9%	1.5%	100%
Female	287	0.3%	70.6%	28.5%	0.6%	100%
Combined	623	0.6%	70.6%	27.7%	1.2%	100%

3.2.2 Carcasses

Age and size data collected from the carcasses of fish that drifted downstream on to the weir is presented in Appendix 7. Estimates of the expenditure of eggs or milt in individual carcass samples were quite variable, averaging 99.3% (std. dev.=37.2%; n=73) for females and 86.5% (std. dev.=40.5%; n=77) for males. All carcasses sampled showed evidence of at least some release of eggs or milt.

Linear regression was used to determine the relationship between fork length and POH length. Females and males were treated separately. The relationship for both females and males was significant at $p_{critical}=0.05$. The equation developed for females was: $a = 0.55b + 155$, where a = *fork length* and b = *POH length* (df=71; r-square=0.47). Likewise, the equation developed for males was $a = 0.69b + 58$ (df=75; r-square=0.76).

3.3 HYDROLOGICAL DATA

Water temperature readings are presented in Appendix 8. The range observed over the course of the season was 4.5°C. The maximum temperature recorded was 6.5°C (August 29, 30, September 9, 13 and 23), while the minimum was 2.0°C (October 11,12,14 and 16). Readings taken at 2000 hrs each day are presented in Figure 4.

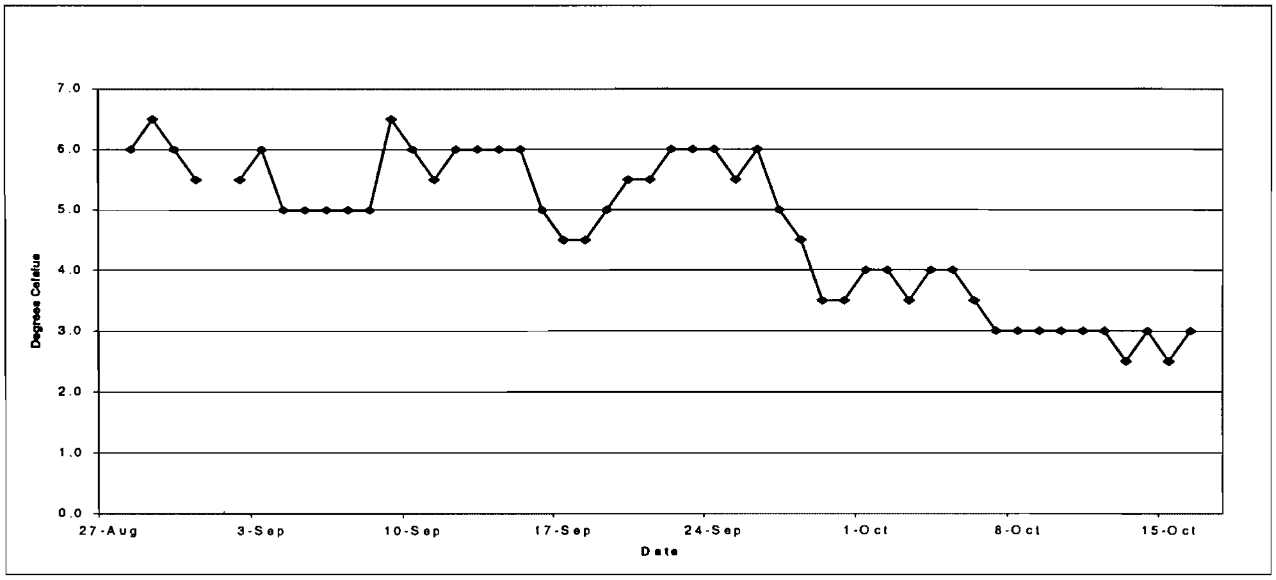

Figure 4. Daily water temperatures recorded at Fishing Branch River weir, 1995.

The highest water level reading, 1.2 m, was taken on September 1 at 2000 hrs (Appendix 9). (Note that levels do not reflect the absolute depth of the river as the gauge was not zeroed or placed in the deepest section of the river.) Precipitation preceded the high water event. Levels declined rapidly for four days after the peak and more slowly for the remainder of the season. The water fluctuated by 0.9 m over the measurement period. Figure 5 illustrates the water level readings taken at 2000 hrs each day.

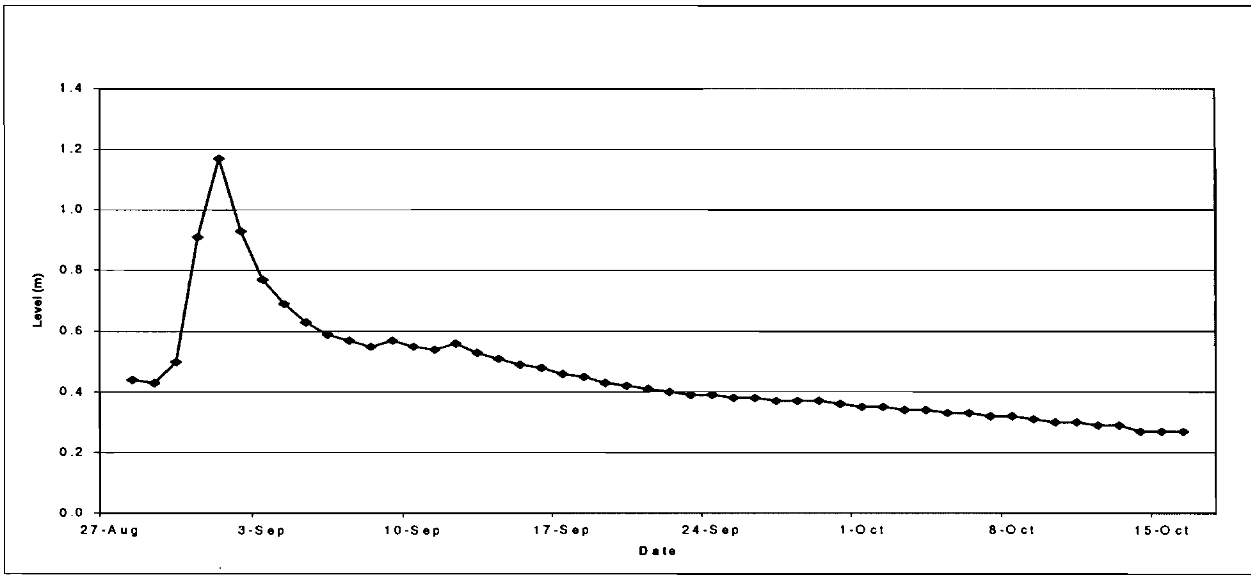

Figure 5. Daily water level readings taken at the Fishing Branch River weir, 1995.

4.0 DISCUSSION

The weir count of 51,971 chum salmon should be regarded as a minimum estimate of escapement, since some fish may have passed over or through the weir undetected during the flood event. The count was 35% higher than the 1991–1994 average of 38,551 chum salmon (JTC 1995b and Appendix 10). It was close to the lower end of the interim escapement objective range of 50,000 to 120,000 chum salmon to the Fishing Branch River. This objective was established through the Canada/U.S Yukon Salmon Negotiations.

Run timing appeared normal, although the observed peak occurred somewhat early relative to the 1991-1994[4] average (September 13 versus September 17). The mid-point of the observed run, September 22, occurred one day later than average. It is possible that the high water delayed fish passage through the weir and resulted in the high counts immediately after weir operations resumed (Figures 5 and 6). Note that counts for August 31 and September 9 are for only two and eight hours respectively (Appendix 3).

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[4] This period was chosen because it represents the most recent age-class cycle; the predominant age of spawning Fishing Branch River chum is four years.

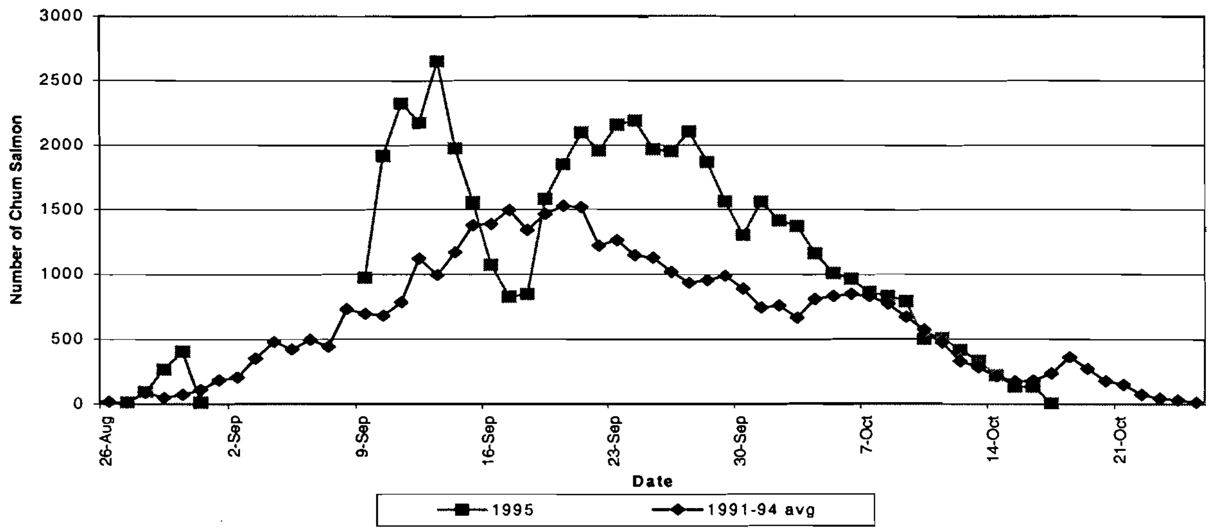

Figure 6. Daily counts of chum salmon through the Fishing Branch River weir, 1995 versus 1991 – 1994 average.

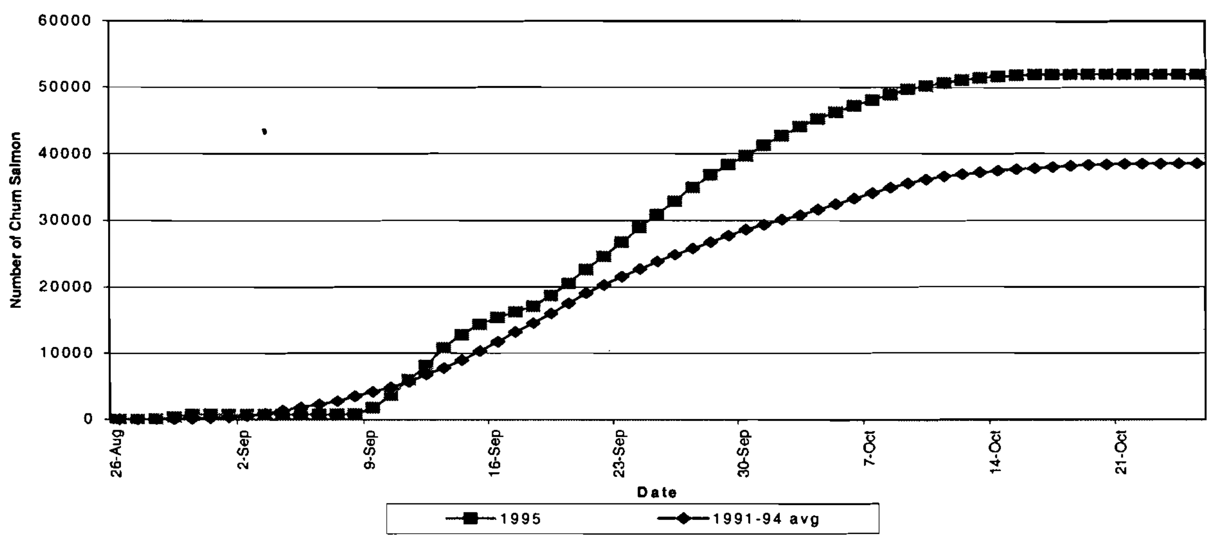

Figure 7. Cumulative counts of chum salmon through the Fishing Branch River weir, 1995 versus 1991 – 1994 average.

The contribution of females to the escapement (51%) was slightly below the recent cycle average (approximately 56%). The slight predominance of females observed at the weir most years may be a factor of gear selectivity in downstream fisheries. Males may be more susceptible to entanglement in gillnets because of their more pronounced snouts and teeth, particularly as they approach maturity (Milligan et al, 1986). Since fish were not handled to determine gender, there was potential for error from observer bias, and poor visibility of individual fish due to high densities, low water clarity and light conditions. Comparisons were made with the sex composition in the sample for age and length data, in which fish were closely inspected. The pooled sample (n=795) was 45% female, within 6% of the estimated run sex composition. Possible sources of error for the sample are those resulting from sample rate, timing (for example, the first two weeks of the run were not sampled) and method (for example, gender bias in sample selection).

The fact that the carcasses sampled contained few eggs or little milt suggests that most of the population spawned successfully.

The aerial survey accounted for less than one-fifth of the fish that were present. Over the years, the relationship between aerial survey counts and weir counts has been quite variable. This indicates that aerial enumeration is a poor substitute for a weir count. Prior to 1990, for years when there was no weir installed, aerial survey results were expanded by a factor of 2.71 to estimate escapement. In 1990, an expansion factor of 3.57 was used (JTC 1993c). Variability in aerial survey results can be due to differences in observer efficiency, water depth, clarity, and spawner density, run timing, and environmental factors. The density of spawners, their colouration, and the low light levels often experienced in September/October in the area make aerial surveys of the Fishing Branch River particularly challenging.

It was expected pre-season that an above-average number of Fishing Branch River-origin chum salmon would enter the mouth of the Yukon River in 1995. The expectation was based on an assumed productivity of 2.5 returns per spawner (r/s), escapement estimates in the principle brood years (1990 and 1991), and an expected return age composition of 73% age-four and 24% age-five. The 1995 forecast was for a return (i.e. run size) of 93,000 fish. In comparison, the run size was estimated to have averaged approximately 56,000 chum salmon from 1991-1994[5] (JTC 1995a). Coincidentally the pre-season forecast was the same as the one developed for the 1994 return.

The harvest of 5,489 chum salmon by the VGFN in the vicinity of Old Crow was considerably greater than the recent cycle average of approximately 2,000 fish. The U.S. harvest of Fishing Branch River-origin chum salmon, estimated using the footnoted assumptions, was 28,019 fish (DFO files). The number of Fishing Branch River-origin chum (U.S. harvest plus Canadian harvest plus escapement) that entered the mouth of the Yukon River in 1995 is

[5] The stock size is used here to mean the number of adult fish returning to the Yukon River from marine areas. Run size calculations are based on the following assumptions: (a) 30% of the U.S. catch is composed of Canadian-origin fish; (b) the U.S. harvests Canadian stocks in the same ratio as: upper Yukon River border escapement-to-Porcupine River border escapement; and (c) the Porcupine River border escapement consists of the Old Crow catch plus the Fishing Branch River escapement. A key assumption is that the Fishing Branch River upstream of the weir site is the only chum spawning area in the Canadian portion of the Porcupine River drainage.

therefore estimated to have been at least 85,478 fish. This was slightly below the pre-season projection. The harvest rate is estimated at 39%.

5.0 RECOMMENDATIONS

The weir should continue to be operated annually as it serves as the only index of chum salmon escapement in the Canadian portion of the Porcupine sub-basin of the Yukon River in Canada. The Fishing Branch River chum salmon stock is of substantial socio-economic value to the Vuntut Gwitchin First Nation. The international importance of the Fishing Branch River chum stock has also been recognised, and stock rebuilding options have been discussed (JTC 1993b).

6.0 ACKNOWLEDGEMENTS

Thanks to weir staff Harvey Kassi, Derek Able-Chitze and Isaac Thomas for their hard work and commitment to the project. For assistance in project administration, thanks to Carl Charlie of the VGFN. Thanks also to Mary Ellen Jarvis for data processing, Sue Moodie for assistance with report compilation, and to Sandy Johnston and Pat Milligan of DFO for providing editorial comments. For age-structure processing and interpretation, thanks to the staff at the DFO Fish Ageing lab in Nanaimo.

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8.0 APPENDICES

Appendix 1. Fishing Branch River weir operations, 1995.

Date	Gate Closure	Total Hours	Reason
28-Aug	-	-	-
29-Aug	-	-	-
30-Aug	2200 - 2359	2	high water
Aug 31 - Sept 8	000 - 2359	24	high water
9-Sep	000 - 1559	16	high water
10-Sep	-	-	-
11-Sep	-	-	-
12-Sep	-	-	-
13-Sep	-	-	-
14-Sep	-	-	-
15-Sep	-	-	-
16-Sep	-	-	-
17-Sep	2100 - 2359	3	lighting system malfunction
18-Sep	000 - 859	9	lighting system malfunction
19-Sep	-	-	-
20-Sep	-	-	-
21-Sep	-	-	-
22-Sep	-	-	-
23-Sep	-	-	-
24-Sep	-	-	-
25-Sep	-	-	-
26-Sep	1600 - 1759	2	other duties - carcass sampling
27-Sep	-	-	
28-Sep	-	-	
29-Sep	1600 - 1659	1	other duties - carcass sampling
30-Sep	-	-	
1-Oct	1600 - 1659	1	other duties - carcass sampling
2-Oct	1600 - 1659	1	other duties - carcass sampling
3-Oct	-	-	
4-Oct	1500 - 1559	1	other duties - carcass sampling
5-Oct	-	-	
6-Oct	-	-	
7-Oct	-	-	
8-Oct	-	-	
9-Oct	-	-	
10-Oct	-	-	
11-Oct	-	-	
12-Oct	-	-	
13-Oct	-	-	
14-Oct	1600 - 1659	1	other duties - carcass sampling
15-Oct	-	-	
16-Oct	-	-	
17-Oct	000-1259	13	weir pulled at 1400 hrs

Note: The weir was open for more than 50% of every hour unless otherwise noted.

Appendix 2. Daily counts of chum salmon through the Fishing Branch River weir, 1995.

Date	Daily Male	Daily Female	Daily Total	Cumulative Total	Run Timing
27-Aug	3	9	12	12	0.0%
28-Aug	55	39	94	106	0.2%
29-Aug	117	151	268	374	0.7%
30-Aug	175	232	407	781	1.5%
31-Aug	6	3	9	790	1.5%
1-Sep				790	1.5%
2-Sep				790	1.5%
3-Sep	NO ENUMERATION DUE TO			790	1.5%
4-Sep				790	1.5%
5-Sep	HIGH WATER			790	1.5%
6-Sep				790	1.5%
7-Sep				790	1.5%
8-Sep				790	1.5%
9-Sep	454	524	978	1,768	3.4%
10-Sep	872	1,047	1,919	3,687	7.1%
11-Sep	1,086	1,242	2,328	6,015	11.6%
12-Sep	1,038	1,138	2,176	8,191	15.8%
13-Sep	1,211	1,442	2,653	10,844	20.9%
14-Sep	1,000	974	1,974	12,818	24.7%
15-Sep	808	747	1,555	14,373	27.7%
16-Sep	582	494	1,076	15,449	29.7%
17-Sep	427	403	830	16,279	31.3%
18-Sep	465	385	850	17,129	33.0%
19-Sep	846	736	1,582	18,711	36.0%
20-Sep	1,011	839	1,850	20,561	39.6%
21-Sep	1,181	915	2,096	22,657	43.6%
22-Sep	1,007	950	1,957	24,614	47.4%
23-Sep	1,157	1,000	2,157	26,771	51.5%
24-Sep	1,141	1,049	2,190	28,961	55.7%
25-Sep	1,005	963	1,968	30,929	59.5%
26-Sep	976	976	1,952	32,881	63.3%
27-Sep	1,134	969	2,103	34,984	67.3%
28-Sep	974	893	1,867	36,851	70.9%
29-Sep	817	746	1,563	38,414	73.9%
30-Sep	657	646	1,303	39,717	76.4%
1-Oct	710	852	1,562	41,279	79.4%
2-Oct	634	783	1,417	42,696	82.2%
3-Oct	633	742	1,375	44,071	84.8%
4-Oct	529	637	1,166	45,237	87.0%
5-Oct	457	557	1,014	46,251	89.0%
6-Oct	442	528	970	47,221	90.9%
7-Oct	388	479	867	48,088	92.5%
8-Oct	373	460	833	48,921	94.1%
9-Oct	313	480	793	49,714	95.7%
10-Oct	200	302	502	50,216	96.6%
11-Oct	197	312	509	50,725	97.6%
12-Oct	141	276	417	51,142	98.4%
13-Oct	120	216	336	51,478	99.1%
14-Oct	87	135	222	51,700	99.5%
15-Oct	51	84	135	51,835	99.7%
16-Oct	52	81	133	51,968	100.0%
17-Oct	2	1	3	51,971	100.0%
TOTALS	25,534	26,437	51,971		

Appendix 3.0. Hourly counts of male chum salmon through the Fishing Branch River weir, 1995

Date/Time	000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	Cum Total
27-Aug																						1	2	0	3	3
28-Aug									0	0	1	1	1	0	1	0	0	1	1	4	9	8	3	25	55	58
29-Aug	19	3	5	7	12	8	3	1	2	0	0	0	0	1	0	1	2	2	5	11	6	6	10	13	117	175
30-Aug	8	5	10	17	12	5	5	10	8	22	3	4	2	3	2	0	1	4	2	16	12	24			175	350
31-Aug		4	2																						6	356
1-Sep																									0	356
2-Sep																									0	356
3-Sep																									0	356
4-Sep																									0	356
5-Sep			High Water Conditions																						0	356
6-Sep																									0	356
7-Sep																									0	356
8-Sep																									0	356
9-Sep																	48	43	65	67	72	48	65	46	454	810
10-Sep	21	17	37	45	22	14	30	29	27	45	47	36	24	36	29	28	49	42	47	51	56	47	41	52	872	1,682
11-Sep	35	38	35	22	22	14	14	34	30	60	70	60	43	54	50	41	73	83	84	59	53	41	24	47	1,086	2,768
12-Sep	16	16	31	28	23	29	25	30	57	55	60	59	34	42	37	33	71	75	60	65	63	54	30	45	1,038	3,806
13-Sep	45	37	33	35	44	35	27	33	82	83	60	53	38	49	36	67	55	52	40	48	94	65	52	48	1,211	5,017
14-Sep	39	35	27	20	17	19	24	27	62	77	58	55	28	37	46	39	43	36	58	61	62	61	51	18	1,000	6,017
15-Sep	101	42	24	43	28	31	22	17	45	30	46	62	24	29	28	34	14	13	49	18	31	20	31	26	808	6,825
16-Sep	17	32	25	17	17	17	12	18	31	31	35	22	32	13	24	17	16	28	24	36	40	39	12	27	582	7,407
17-Sep	38	12	18	11	14	8	6	9	23	27	27	30	12	13	8	13	13	29	40	38	38	a	a	a	427	7,834
18-Sep	a	a	a	a	a	a	a	a	a	41	54	35	23	20	11	26	14	24	28	35	58	37	38	21	465	8,299
19-Sep	47	23	17	20	38	25	29	26	34	51	55	43	26	30	27	18	17	60	60	48	54	39	35	24	846	9,145
20-Sep	38	51	33	45	47	40	34	35	44	56	42	38	31	34	30	42	43	40	34	53	58	52	63	28	1,011	10,156
21-Sep	68	58	58	42	45	23	34	34	39	54	59	38	32	49	46	23	58	61	51	48	65	58	71	67	1,181	11,337
22-Sep	37	28	38	22	61	31	37	37	44	57	44	36	49	42	18	17	57	51	39	48	60	56	57	41	1,007	12,344
23-Sep	38	33	34	34	56	40	21	50	41	74	48	62	41	57	59	25	24	83	80	81	67	49	35	25	1,157	13,501
24-Sep	29	47	55	37	48	53	44	44	54	75	54	56	35	42	54	50	61	15	73	55	43	58	31	28	1,141	14,642
25-Sep	26	28	47	34	72	46	37	34	39	52	42	46	39	45	34	22	38	18	71	64	45	44	28	54	1,005	15,647
26-Sep	40	24	39	27	45	21	34	28	50	82	51	45	44	50	46	12			116	63	43	43	37	36	976	16,623
27-Sep	34	38	32	40	44	46	28	25	61	61	77	64	46	36	41	17	58	58	84	64	53	53	37	37	1,134	17,757
28-Sep	40	18	38	43	29	29	35	37	56	51	56	29	19	69	40	52	29	51	51	48	52	43	25	34	974	18,731
29-Sep	28	27	28	23	28	19	16	16	30	79	55	52	44	45	37	11		65	50	48	46	37	13	20	817	19,548
30-Sep	17	25	21	5	12	13	12	7	25	55	31	43	32	38	33	8	56	36	35	38	43	31	10	31	657	20,205
1-Oct	20	21	11	13	10	14	9	8	33	91	64	40	26	16	35	9		61	52	33	53	28	44	19	710	20,915
2-Oct	21	22	9	21	11	13	14	13	31	54	36	34	25	28	19	11		56	40	41	42	37	24	32	634	21,549
3-Oct	20	17	23	32	21	22	19	11	11	23	28	51	36	25	20	12	26	57	52	39	26	22	23	17	633	22,182
4-Oct	19	25	19	13	23	7	9	9	12	33	43	44	36	39	8		37	21	32	23	19	24	14	20	529	22,711
5-Oct	13	12	5	13	11	12	18	5	14	31	31	21	24	24	17	10	22	40	35	25	18	12	15	29	457	23,168
6-Oct	23	7	10	11	10	12	9	7	15	31	33	17	22	35	26	25	4	36	38	24	10	19	5	13	442	23,610
7-Oct	13	4	4	9	5	5	5	5	3	16	24	27	39	36	22	6	35	29	26	21	25	10	11	8	388	23,998
8-Oct	12	3	3	4	5	7	8	5	9	17	27	26	38	19	31	30	3	28	24	19	24	15	8	8	373	24,371
9-Oct	10	7	4	4	2	4	7	3	4	15	30	27	17	29	15	19	16	5	22	32	12	15	6	8	313	24,684
10-Oct	8	2	3	0	3	0	1	2	3	6	12	16	18	13	16	3	14	15	15	21	9	8	7	5	200	24,884
11-Oct	7	4	0	6	4	5	2	3	0	5	11	12	12	20	12	2	12	20	18	18	12	5	5	2	197	25,081
12-Oct	1	6	4	0	0	2	2	2	0	5	18	18	3	9	8	13	6	8	7	3	10	8	3	5	141	25,222
13-Oct	2	2	3	5	0	1	5	1	1	6	13	10	7	10	4	5	0	10	4	7	11	8	3	2	120	25,342
14-Oct	2	1	1	3	1	1	3	2	1	3	3	5	7	11	8	5		7	4	5	2	4	2	6	87	25,429
15-Oct	0	0	2	1	3	1	0	1	1	2	3	4	11	2	1	3	1	1	1	4	4	2	2	1	51	25,480
16-Oct	2	4	0	0	0	2	2	0	0	5	4	4	4	2	3	4	3	1	3	1	1	5	2	0	52	25,532
17-Oct														2	Weir Removal Commenced										2	25,534

a Lighting system malfunction; counting suspended

Appendix 3.1. Hourly counts of female chum salmon through the Fishing Branch River weir, 1995.

Date/Time	000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	Cum Total
27-Aug																						3	4	2	9	9
28-Aug									1	0	0	0	0	0	0	1	0	1	2	5	5	4	1	19	39	48
29-Aug	30	11	12	8	8	11	2	3	5	0	1	0	1	1	1	1	3	3	3	9	5	6	18	9	151	199
30-Aug	14	8	7	24	11	8	8	15	10	17	3	3	4	4	3	1	0	5	5	24	17	41			232	431
31-Aug	1	2																							3	434
1-Sep																									0	434
2-Sep																									0	434
3-Sep																									0	434
4-Sep																									0	434
5-Sep				High Water Conditions																					0	434
6-Sep																									0	434
7-Sep																									0	434
8-Sep																									0	434
9-Sep																	39	62	75	88	78	51	70	61	524	958
10-Sep	33	25	66	58	30	18	28	30	32	45	48	40	29	50	47	40	55	41	56	55	61	55	47	58	1,047	2,005
11-Sep	41	62	51	38	24	17	11	33	38	76	74	64	57	82	94	60	67	49	56	50	68	49	29	52	1,242	3,247
12-Sep	32	22	40	40	18	23	15	18	68	60	64	63	70	52	70	55	51	61	52	43	65	67	42	47	1,138	4,385
13-Sep	70	74	55	56	35	30	21	19	88	88	71	59	48	51	41	70	96	119	84	90	59	52	36	30	1,442	5,827
14-Sep	53	38	32	21	30	34	31	43	43	52	39	38	30	13	39	43	61	42	69	65	49	52	40	17	974	6,801
15-Sep	99	43	33	36	36	29	20	21	28	16	39	29	30	28	43	35	13	10	50	31	27	15	21	15	747	7,548
16-Sep	23	38	27	19	20	16	9	17	16	17	16	17	31	13	27	9	8	35	21	38	29	23	10	15	494	8,042
17-Sep	28	23	19	14	15	6	6	13	15	13	23	19	13	11	13	12	12	29	48	37	34	a	a	a	403	8,445
18-Sep	a	a	a	a	a	a	a	a	a	22	30	19	26	20	18	25	14	29	38	34	32	32	29	17	385	8,830
19-Sep	54	29	24	25	29	17	15	16	25	37	38	24	23	33	28	13	12	63	62	49	41	37	22	20	736	9,566
20-Sep	30	53	28	42	34	30	23	15	19	42	29	25	21	20	16	30	36	38	37	66	49	61	58	37	839	10,405
21-Sep	34	29	43	15	48	20	26	25	33	65	43	46	17	37	19	17	41	46	40	51	72	56	49	43	915	11,320
22-Sep	35	30	32	22	52	40	26	43	42	61	33	31	24	36	18	17	54	38	49	52	75	60	44	36	950	12,270
23-Sep	38	30	23	20	42	48	15	41	39	60	53	45	33	39	57	11	10	54	80	79	66	52	42	23	1,000	13,270
24-Sep	29	44	42	30	36	47	44	33	45	78	69	47	27	25	28	37	48	15	89	54	43	62	47	30	1,049	14,319
25-Sep	25	28	38	30	42	41	35	25	49	55	42	58	29	35	34	31	37	12	69	66	54	48	25	55	963	15,282
26-Sep	30	32	38	19	28	20	41	25	58	86	74	47	37	30	41	18			116	66	54	60	23	33	976	16,258
27-Sep	28	48	40	45	31	33	30	18	56	75	62	39	44	30	24	13	40	56	43	42	48	46	37	41	969	17,227
28-Sep	35	14	27	55	29	34	20	34	53	42	48	28	11	49	35	44	33	43	35	63	58	33	29	41	893	18,120
29-Sep	33	23	20	38	18	8	18	14	29	68	57	52	38	37	39	9		57	48	41	38	33	11	17	746	18,866
30-Sep	14	21	14	5	10	10	14	3	27	47	26	42	27	36	21	12	55	61	44	39	51	26	16	25	646	19,512
1-Oct	14	19	24	18	12	4	16	13	59	128	72	44	28	25	39	11		65	61	46	51	31	32	40	852	20,364
2-Oct	25	36	20	30	16	30	16	23	32	62	29	32	19	33	21	9		72	58	50	61	38	40	31	783	21,147
3-Oct	32	22	32	20	29	31	25	13	8	29	23	39	34	29	39	8	38	73	67	57	42	17	13	22	742	21,889
4-Oct	19	31	26	17	13	17	10	7	14	43	33	32	40	63	12		51	25	54	30	24	33	26	17	637	22,526
5-Oct	15	15	7	17	14	7	10	10	19	45	38	31	27	22	17	10	19	45	55	36	30	25	19	24	557	23,083
6-Oct	21	5	15	17	12	11	5	7	8	50	42	27	34	33	21	14	9	41	39	40	21	19	15	22	528	23,611
7-Oct	13	9	4	10	6	5	3	0	5	20	27	43	44	49	23	7	32	31	33	37	35	24	12	7	479	24,090
8-Oct	10	5	2	7	7	6	10	8	6	21	28	28	30	28	32	29	11	39	39	39	33	18	16	8	460	24,550
9-Oct	14	11	8	6	3	6	15	9	7	17	33	36	25	42	19	23	32	9	32	56	20	27	16	14	480	25,030
10-Oct	11	6	4	8	5	4	2	1	2	22	22	28	20	15	11	8	19	30	33	20	12	10	6	3	302	25,332
11-Oct	10	4	4	3	1	2	6	3	2	6	21	23	17	20	20	11	34	32	24	30	18	9	7	5	312	25,644
12-Oct	5	2	2	2	3	2	3	4	2	13	31	30	21	14	26	11	6	24	31	13	14	10	1	6	276	25,920
13-Oct	7	4	3	2	1	6	2	4	1	15	21	30	13	15	14	9	6	9	7	12	18	4	5	8	216	26,136
14-Oct	1	2	1	0	0	0	2	2	2	3	13	10	14	10	13	8		7	11	15	3	10	3	5	135	26,271
15-Oct	2	2	0	1	1	0	0	1	1	2	11	9	6	8	1	3	2	4	8	9	4	5	2	2	84	26,355
16-Oct	2	2	2	0	1	0	0	1	2	3	7	7	8	6	6	3	4	3	5	4	3	8	3	1	81	26,436
17-Oct														1	Weir Removal Commenced										1	26,437

Appendix 3.2. Diel run timing of male and female chum salmon through the Fishing Branch River weir, 1995

Date/Time	000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Sum	# Fish
29-Aug	18%	5%	6%	6%	7%	7%	2%	1%	3%	0%	0%	0%	0%	1%	0%	1%	2%	2%	3%	7%	4%	4%	10%	8%	100%	268
10-Sep	3%	2%	5%	5%	3%	2%	3%	3%	3%	5%	5%	4%	3%	4%	4%	4%	5%	4%	5%	6%	6%	5%	5%	6%	100%	1,919
11-Sep	3%	4%	4%	3%	2%	1%	1%	3%	3%	6%	6%	5%	4%	6%	6%	4%	6%	6%	6%	5%	5%	4%	2%	4%	100%	2,328
12-Sep	2%	2%	3%	3%	2%	2%	2%	2%	6%	5%	6%	6%	5%	4%	5%	4%	6%	6%	5%	5%	6%	6%	3%	4%	100%	2,176
13-Sep	4%	4%	3%	3%	3%	2%	2%	2%	6%	6%	5%	4%	3%	4%	3%	5%	6%	6%	5%	5%	6%	4%	3%	3%	100%	2,653
14-Sep	5%	4%	3%	2%	2%	3%	3%	4%	5%	7%	5%	5%	3%	3%	4%	4%	5%	4%	6%	6%	6%	6%	5%	2%	100%	1,974
15-Sep	13%	5%	4%	5%	4%	4%	3%	2%	5%	3%	5%	6%	3%	4%	5%	4%	2%	1%	6%	3%	4%	2%	3%	3%	100%	1,555
16-Sep	4%	7%	5%	3%	3%	3%	2%	3%	4%	4%	5%	4%	6%	2%	5%	2%	2%	6%	4%	7%	6%	6%	2%	4%	100%	1,076
19-Sep	6%	3%	3%	3%	4%	3%	3%	3%	4%	6%	6%	4%	3%	4%	3%	2%	2%	8%	8%	6%	6%	5%	4%	3%	100%	1,582
20-Sep	4%	6%	3%	5%	4%	4%	3%	3%	3%	5%	4%	3%	3%	3%	2%	4%	4%	4%	4%	6%	6%	6%	7%	4%	100%	1,850
21-Sep	5%	4%	5%	3%	4%	2%	3%	3%	3%	6%	5%	4%	2%	4%	3%	2%	5%	5%	4%	5%	7%	5%	6%	5%	100%	2,096
22-Sep	4%	3%	4%	2%	6%	4%	3%	4%	4%	6%	4%	3%	4%	4%	2%	2%	6%	5%	4%	5%	7%	6%	5%	4%	100%	1,957
23-Sep	4%	3%	3%	3%	5%	4%	2%	4%	4%	6%	5%	5%	3%	4%	5%	2%	2%	6%	7%	7%	6%	5%	4%	2%	100%	2,157
24-Sep	3%	4%	4%	3%	4%	5%	4%	4%	5%	7%	6%	5%	3%	3%	4%	4%	5%	1%	7%	5%	4%	5%	4%	3%	100%	2,190
25-Sep	3%	3%	4%	3%	6%	4%	4%	3%	4%	5%	4%	5%	3%	4%	3%	3%	4%	2%	7%	7%	5%	5%	3%	6%	100%	1,968
27-Sep	3%	4%	3%	4%	4%	4%	3%	2%	6%	6%	7%	5%	4%	3%	3%	1%	5%	5%	6%	5%	5%	5%	4%	4%	100%	2,103
28-Sep	4%	2%	3%	5%	3%	3%	3%	4%	6%	5%	6%	3%	2%	6%	4%	5%	3%	5%	5%	6%	6%	4%	3%	4%	100%	1,867
29-Sep	4%	3%	3%	4%	3%	2%	2%	2%	4%	9%	7%	7%	5%	5%	5%	1%	0%	8%	6%	6%	5%	4%	2%	2%	100%	1,563
30-Sep	2%	4%	3%	1%	2%	2%	2%	1%	4%	8%	4%	7%	5%	6%	4%	2%	9%	7%	6%	6%	7%	4%	2%	4%	100%	1,303
1-Oct	2%	3%	2%	2%	1%	1%	2%	1%	6%	14%	9%	5%	3%	3%	5%	1%	0%	8%	7%	5%	7%	4%	5%	4%	100%	1,562
2-Oct	3%	4%	2%	4%	2%	3%	2%	3%	4%	8%	5%	5%	3%	4%	3%	1%	0%	9%	7%	6%	7%	5%	5%	4%	100%	1,417
3-Oct	4%	3%	4%	4%	4%	4%	3%	2%	1%	4%	4%	7%	5%	4%	4%	1%	5%	9%	9%	7%	5%	3%	3%	3%	100%	1,375
4-Oct	3%	5%	4%	3%	3%	2%	2%	1%	2%	7%	7%	7%	7%	9%	2%	0%	8%	4%	7%	5%	4%	5%	3%	3%	100%	1,166
5-Oct	3%	3%	1%	3%	2%	2%	3%	1%	3%	7%	7%	5%	5%	5%	3%	2%	4%	8%	9%	6%	5%	4%	3%	5%	100%	1,014
6-Oct	5%	1%	3%	3%	2%	2%	1%	1%	2%	8%	8%	5%	6%	7%	5%	4%	1%	8%	8%	7%	3%	4%	2%	4%	100%	970
7-Oct	3%	1%	1%	2%	1%	1%	1%	1%	1%	4%	6%	8%	10%	10%	5%	1%	8%	7%	7%	7%	7%	4%	3%	2%	100%	867
8-Oct	3%	1%	1%	1%	1%	2%	2%	2%	2%	5%	7%	6%	8%	6%	8%	7%	2%	8%	8%	7%	7%	4%	3%	2%	100%	833
9-Oct	3%	2%	2%	1%	1%	1%	3%	2%	1%	4%	8%	8%	5%	9%	4%	5%	6%	2%	7%	11%	4%	5%	3%	3%	100%	793
10-Oct	4%	2%	1%	2%	2%	1%	1%	1%	1%	6%	7%	9%	8%	6%	5%	2%	7%	9%	10%	8%	4%	4%	3%	2%	100%	502
11-Oct	3%	2%	1%	2%	1%	1%	2%	1%	0%	2%	6%	7%	6%	8%	6%	3%	9%	10%	8%	9%	6%	3%	2%	1%	100%	509
12-Oct	1%	2%	1%	0%	1%	1%	1%	1%	0%	4%	12%	12%	6%	6%	8%	6%	3%	8%	9%	4%	6%	4%	1%	3%	100%	417
13-Oct	3%	2%	2%	2%	0%	2%	2%	1%	1%	6%	10%	12%	6%	7%	5%	4%	2%	6%	3%	6%	9%	4%	2%	3%	100%	336
14-Oct	1%	1%	1%	1%	0%	0%	2%	2%	1%	3%	7%	7%	9%	9%	9%	6%	0%	6%	7%	9%	2%	6%	2%	5%	100%	222
15-Oct	1%	1%	1%	1%	3%	1%	0%	1%	1%	3%	10%	10%	13%	7%	1%	4%	2%	4%	7%	10%	6%	5%	3%	2%	100%	135
16-Oct	3%	5%	2%	0%	1%	2%	2%	1%	2%	6%	8%	8%	9%	6%	7%	5%	5%	3%	6%	4%	3%	10%	4%	1%	100%	133
Average (a)	4%	3%	3%	3%	3%	3%	2%	2%	4%	6%	6%	5%	4%	5%	4%	3%	4%	6%	7%	6%	6%	5%	3%	3%	100%	
st. dev. (a)	2%	1%	1%	1%	1%	1%	1%	1%	2%	2%	1%	1%	2%	2%	1%	2%	3%	2%	1%	2%	1%	1%	1%	1%		
st. dev. (b)	7%	2%	2%	2%	3%	2%	1%	0%	1%	2%	4%	4%	4%	3%	4%	2%	2%	2%	2%	3%	2%	2%	3%	3%		

Days on which passage of fish was completely halted for more than one hour are not included.

(a) only days on which more than 500 fish were counted are included.

(b) only days on which fewer than 500 fish were counted are included.

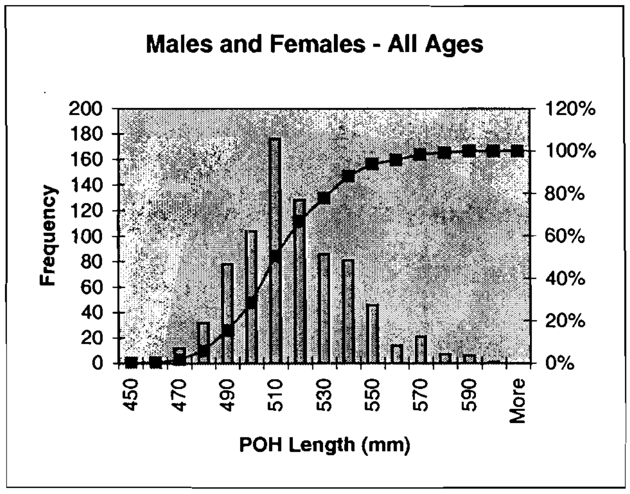
Appendix 4. Daily counts of chinook and coho salmon through the Fishing Branch River weir, 1995

Date	Daily Chinook	Cumulative Chinook	Daily Coho	Cumulative Coho
27-Aug	0	0	0	0
28-Aug	0	0	0	0
29-Aug	2	2	0	0
30-Aug	0	2	0	0
31-Aug				
1-Sep				
2-Sep				
3-Sep	NO ENUMERATION DUE TO			
4-Sep				
5-Sep		HIGH WATER		
6-Sep				
7-Sep				
8-Sep				
9-Sep	0	2	0	0
10-Sep	1	3	0	0
11-Sep	1	4	0	0
12-Sep	1	5	0	0
13-Sep	1	6	0	0
14-Sep	0	6	0	0
15-Sep	0	6	0	0
16-Sep	0	6	0	0
17-Sep	0	6	0	0
18-Sep	0	6	0	0
19-Sep	0	6	0	0
20-Sep	0	6	0	0
21-Sep	0	6	0	0
22-Sep	0	6	0	0
23-Sep	0	6	0	0
24-Sep	0	6	0	0
25-Sep	0	6	0	0
26-Sep	0	6	0	0
27-Sep	0	6	0	0
28-Sep	1	7	0	0
29-Sep	0	7	0	0
30-Sep	0	7	0	0
1-Oct	0	7	0	0
2-Oct	0	7	1	1
3-Oct	0	7	2	3
4-Oct	0	7	3	6
5-Oct	0	7	1	7
6-Oct	0	7	5	12
7-Oct	0	7	2	14
8-Oct	0	7	14	28
9-Oct	0	7	8	36
10-Oct	0	7	5	41
11-Oct	0	7	12	53
12-Oct	0	7	15	68
13-Oct	0	7	11	79
14-Oct	0	7	9	88
15-Oct	0	7	12	100
16-Oct	0	7	12	112
17-Oct	0	7	0	112
TOTALS	7		112	

Appendix 5. Length-frequency histograms of Fishing Branch River chum salmon, 1995.

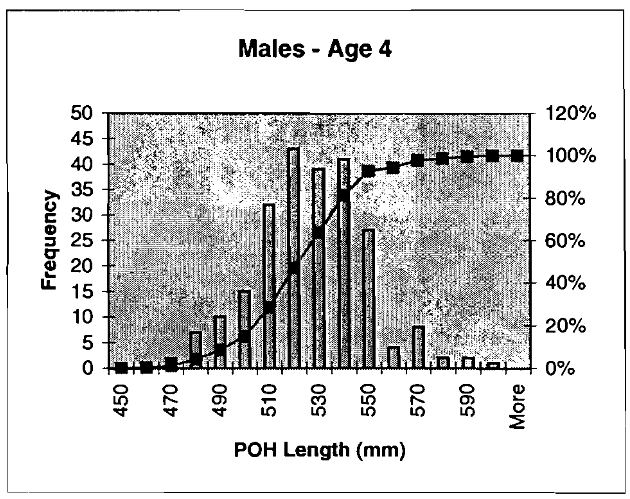
Male and Female — All Ages

Bin	*Frequency*	*Cumulative %*
450	1	0.1%
460	2	0.4%
470	12	1.9%
480	32	5.9%
490	78	15.7%
500	104	28.8%
510	176	50.9%
520	128	67.0%
530	86	77.9%
540	81	88.1%
550	46	93.8%
560	14	95.6%
570	21	98.2%
580	7	99.1%
590	6	99.9%
600	1	100.0%
More	0	100.0%



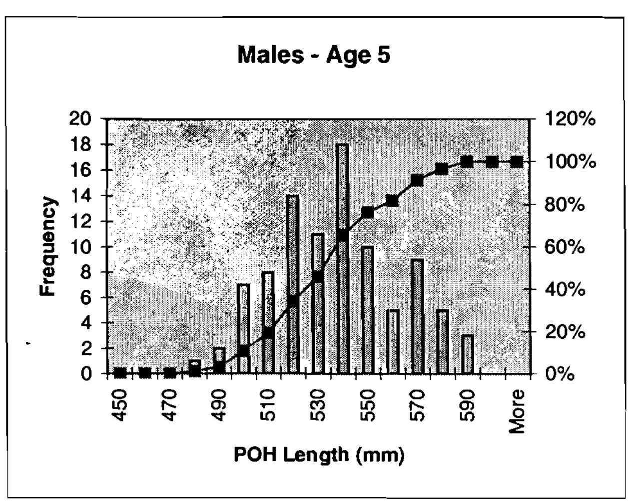
Males — Age 4

Bin	*Frequency*	*Cumulative %*
450	0	0.0%
460	1	0.4%
470	2	1.3%
480	7	4.3%
490	10	8.5%
500	15	15.0%
510	32	28.6%
520	43	47.0%
530	39	63.7%
540	41	81.2%
550	27	92.7%
560	4	94.4%
570	8	97.9%
580	2	98.7%
590	2	99.6%
600	1	100.0%
More	0	100.0%



Males — Age 5

Bin	*Frequency*	*Cumulative %*
450	0	0.0%
460	0	0.0%
470	0	0.0%
480	1	1.1%
490	2	3.2%
500	7	10.8%
510	8	19.4%
520	14	34.4%
530	11	46.2%
540	18	65.6%
550	10	76.3%
560	5	81.7%
570	9	91.4%
580	5	96.8%
590	3	100.0%
600	0	100.0%
More	0	100.0%

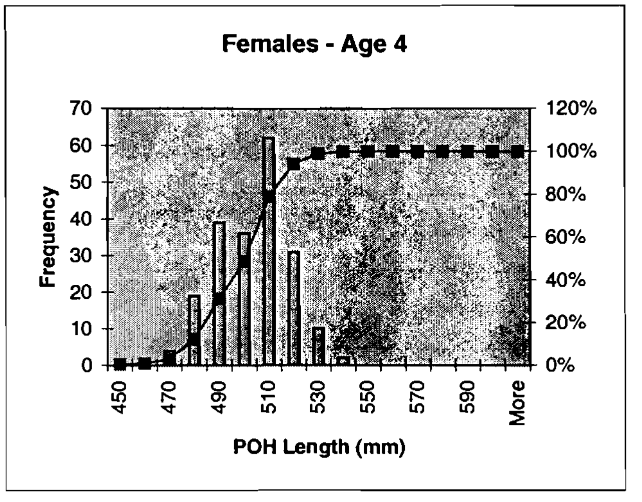


Note: Bin values represent upper end of ranges. For example, bin 450 contains fish ranging from 441 to 450 mm in length.

Appendix 5 (Cont'd). Length-frequency histograms of Fishing Branch River chum salmon, 1995.

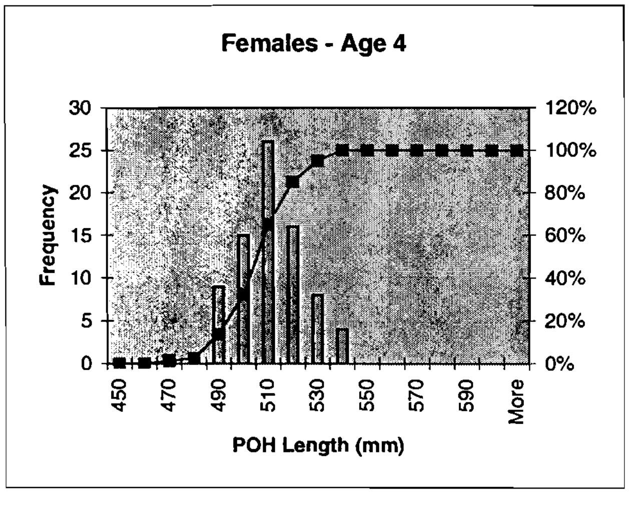
Females Age 4

Bin	*Frequency*	*Cumulative %*
450	1	0.5%
460	1	1.0%
470	4	2.9%
480	19	12.2%
490	39	31.2%
500	36	48.8%
510	62	79.0%
520	31	94.1%
530	10	99.0%
540	2	100.0%
550	0	100.0%
560	0	100.0%
570	0	100.0%
580	0	100.0%
590	0	100.0%
600	0	100.0%
More	0	100.0%



Females Age 5

Bin	*Frequency*	*Cumulative %*
450	0	0.0%
460	0	0.0%
470	1	1.3%
480	1	2.5%
490	9	13.8%
500	15	32.5%
510	26	65.0%
520	16	85.0%
530	8	95.0%
540	4	100.0%
550	0	100.0%
560	0	100.0%
570	0	100.0%
580	0	100.0%
590	0	100.0%
600	0	100.0%
More	0	100.0%



Note: Bin values represent upper end of ranges. For example, bin 450 contains fish ranging from 441 to 450 mm in length.

Appendix 6. Age composition of Fishing Branch River chum salmon by statistical week, 1995.

Stat Week	Week Ending		Age Class 31	41	51	61	Weekly Sample	Weekly Count
Males								
35-37	16-Sep	N	0	53	27	1	81	7,407
		Expanded #	0	4,847	2,469	91		
			0%	65%	33%	1%		
38	23-Sep	N	2	65	39	4	110	6,094
		Expanded #	111	3,601	2,161	222		
			2%	59%	35%	4%		
39	30-Sep	N	1	59	19	0	79	6,704
		Expanded #	85	5,007	1,612	0		
			1%	75%	24%	0%		
40	7-Oct	N	0	43	4	1	48	3,793
		Expanded #	0	3,398	316	79		
			0%	90%	8%	2%		
41	14-Oct	N	0	12	3	0	15	1,431
		Expanded #	0	1,145	286	0		
			0%	80%	20%	0%		
42	21-Oct	N	0	2	1	0	3	105
		Expanded #	0	70	35	0		
			0%	67%	33%	0%		
Total		Expanded #	**196**	**18,067**	**6,879**	**392**	**25,534**	
			1%	71%	27%	2%	100%	
Females								
35-37	16-Sep	N	0	30	14	0	44	8,042
		Expanded #	0	5,483	2,559	0		
			0%	68%	32%	0%		
38	23-Sep	N	0	44	29	1	74	5,228
		Expanded #	0	3,109	2,049	71		
			0%	59%	39%	1%		
39	30-Sep	N	0	54	15	1	70	6,242
		Expanded #	0	4,815	1,338	89		
			0%	77%	21%	1%		
40	7-Oct	N	1	41	14	0	56	4,578
		Expanded #	82	3,352	1,145	0		
			2%	73%	25%	0%		
41	14-Oct	N	0	33	7	0	40	2,181
		Expanded #	0	1,799	382	0		
			0%	83%	18%	0%		
42	21-Oct	N	0	2	1	0	3	166
		Expanded #	0	111	55	0		
			0%	67%	33%	0%		
Total		Expanded #	**82**	**18,669**	**7,527**	**160**	**26,437**	
			0%	71%	28%	1%	100%	
Sexes Combined								
35-37	16-Sep	N	0	83	41	1	125	15,449
		Expanded #	0	10,258	5,067	124		
			0%	66%	33%	1%		
38	23-Sep	N	2	109	68	5	184	11,322
		Expanded #	123	6,707	4,184	308		
			1%	59%	37%	3%		
39	30-Sep	N	1	113	34	1	149	12,946
		Expanded #	87	9,818	2,954	87		
			1%	76%	23%	1%		
40	7-Oct	N	1	84	18	1	104	8,371
		Expanded #	80	6,761	1,449	80		
			1%	81%	17%	1%		
41	14-Oct	N	0	45	10	0	55	3,612
		Expanded #	0	2,955	657	0		
			0%	82%	18%	0%		
42	21-Oct	N	0	4	2	0	6	271
		Expanded #	0	181	90	0		
			0%	67%	33%	0%		
Total		Expanded #	**290**	**36,680**	**14,401**	**599**	**51,971**	
			1%	71%	28%	1%	100%	

Appendix 7. Fishing Branch River weir carcass sample, 1995.

Table 1. Sex composition of the chum salmon carcass sample, Fishing Branch River weir, 1995.

Stat Week	Week Ending	Males	Females	Total	% Female
39	30-Sep	22	18	40	45.0%
40	7-Oct	40	35	75	46.7%
41	14-Oct	15	20	35	57.1%
Total		77	73	150	48.7%

Table 2. Length composition by sex and age of the chum salmon carcass sample, Fishing Branch River weir, 1995.

Age	41		51		61		All Samples	
Sex	Female	Male	Female	Male	Female	Male	Female	Male
N	25	24	33	44	5	4	73	77
Post-Orbital Hypural (POH) Length								
Ave	479	508	493	511	493	503	486	508
Min	440	460	455	465	480	460	425	450
Max	545	550	595	600	510	520	595	600
Var	502	641	600	1177	245	825	653	976
Std	22	25	24	34	16	29	26	31
Fork Length								
Ave	587	653	604	650	607	645	597	650
Min	520	590	565	585	600	585	520	565
Max	660	725	645	765	620	685	660	765
Var	844	1202	522	1819	95	1867	772	1595
Std	29	35	23	43	10	43	28	40

Table 3. Age composition of the chum salmon carcass sample, Fishing Branch River weir, 1995.

Females						Males							
41		51		61		41		51		61		Total	
n	%	n	%	n	%	n	%	n	%	n	%	n	%
25	18.5%	33	24.4%	5	3.7%	24	17.8%	44	32.6%	4	3.0%	135	100.0%

Appendix 8. Water temperature at Fishing Branch River weir, 1995

units = degrees Celcius

Date/Time	2400	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
27-Aug																							5.0	
28-Aug									4.5				5.0				5.5				6.0			
29-Aug	5.0				5.0				4.5				5.0				6.5				6.5			
30-Aug	6.5				6.0				5.0				6.0				6.0				6.0			
31-Aug	6.0				5.5				6.0				5.0								5.5			
1-Sep																								
2-Sep												5.0					5.5				5.5			
3-Sep									5.0				5.5				6.0				6.0			
4-Sep									5.0				4.5								5.0			
5-Sep									4.0				4.5				5.0				5.0			
6-Sep									4.5				5.0				5.0				5.0			
7-Sep									4.0								4.5				5.0			
8-Sep									4.5				5.0				5.5				5.0			
9-Sep									5.0				5.0				6.5				6.5			
10-Sep	5.5				5.0				4.5				5.5				6.0				6.0			
11-Sep	5.5				5.5				5.5				5.5				5.5				5.5			
12-Sep	5.5				5.5				5.5				5.5				6.0				6.0			
13-Sep	5.5				5.5				5.5				6.0				6.5				6.0			
14-Sep	5.0				5.0				5.0				5.0				5.5				6.0			
15-Sep	5.0				5.0				5.0				5.0				6.0				6.0			
16-Sep	5.0				4.5				4.0				4.5				5.0				5.0			
17-Sep	4.0				4.0				3.5				3.5				4.5				4.5			
18-Sep										3.5			3.5				4.5				4.5			
19-Sep	3.5				3.5				3.5				4.0				5.5				5.0			
20-Sep	4.0				4.0				4.0				4.5				5.0				5.5			
21-Sep	5.0				4.0				4.5				4.5				5.0				5.5			
22-Sep	5.0				5.0				5.0				5.5				5.5				6.0			
23-Sep	5.5				5.0				5.0				6.0				6.5				6.0			
24-Sep	6.0				5.0				5.0				5.5				5.5				6.0			
25-Sep	5.5				5.0				5.0				5.0				5.5				5.5			
26-Sep	5.0				5.0				5.0				5.0				6.0				6.0			
27-Sep	5.5				5.0				5.0				5.0				5.5				5.0			
28-Sep	5.0				5.0				4.5				4.5				5.0				4.5			
29-Sep	4.5				4.0				3.0				3.0				4.0				3.5			
30-Sep	3.0				3.5				3.0				3.0				3.5				3.5			
1-Oct	3.5				3.0				3.0				3.0				4.0				4.0			
2-Oct	3.5				3.5				3.5				3.5				4.0				4.0			
3-Oct	4.0				3.5				3.5				4.0				4.0				3.5			
4-Oct	4.0				3.5				3.5				3.5				4.0				4.0			
5-Oct	4.0				3.5				3.5				3.0				3.5				4.0			
6-Oct	3.5				3.5				3.0				3.0				3.5				3.5			
7-Oct	3.5				3.0				3.0				3.0				3.0				3.0			
8-Oct	3.0				3.0				3.0				3.0				3.0				3.0			
9-Oct	3.0				3.0				3.0				3.0				3.5				3.0			
10-Oct	3.0				3.0				3.0				3.0				3.0				3.0			
11-Oct	2.5				2.0				2.5				2.5				2.5				3.0			
12-Oct	2.5				2.5				2.0				2.5				2.5				3.0			
13-Oct	3.0				2.5				2.5				2.5				2.5				2.5			
14-Oct	2.5				2.5				2.0				2.5				3.0				3.0			
15-Oct	3.0				2.5				2.5				2.5				3.0				2.5			
16-Oct	2.5				2.0				2.5				3.0				3.0				3.0			
17-Oct														2.5										

Appendix 9. Water level at the Fishing Branch River weir, 1995.

units = metres

Date/Time	2400	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	###
27-Aug																							0.45	
28-Aug									0.44				0.44				0.44				0.44			
29-Aug	0.44				0.43				0.43				0.43				0.43				0.43			
30-Aug	0.45				0.44				0.45				0.46				0.47				0.50			
31-Aug	0.59				0.62				0.64				0.70				0.80				0.91	0.97		1.00
1-Sep	1.02	1.05																			1.17			
2-Sep												0.90					0.95				0.93			
3-Sep	0.90								0.85				0.82				0.79				0.77			
4-Sep									0.75				0.74								0.69			
5-Sep									0.63				0.65				0.64				0.63			
6-Sep									0.61				0.60				0.60				0.59			
7-Sep									0.59								0.58				0.57			
8-Sep									0.57				0.57				0.56				0.55			
9-Sep									0.55				0.55				0.55				0.57			
10-Sep	0.57				0.57				0.57				0.56				0.55				0.55			
11-Sep	0.55				0.54				0.54				0.54				0.54				0.54			
12-Sep	0.54				0.54				0.54				0.54				0.56				0.56			
13-Sep	0.56				0.55				0.55				0.54				0.54				0.53			
14-Sep	0.53				0.53				0.52				0.52				0.51				0.51			
15-Sep	0.50				0.50				0.49				0.49				0.49				0.49			
16-Sep	0.49				0.49				0.49				0.49				0.49				0.48			
17-Sep	0.48				0.48				0.47				0.47				0.47				0.46			
18-Sep										0.46			0.45				0.45				0.45			
19-Sep	0.45				0.45				0.44				0.44				0.44				0.43			
20-Sep	0.43				0.43				0.42				0.42				0.42				0.42			
21-Sep	0.42				0.42				0.42				0.41				0.41				0.41			
22-Sep	0.41				0.41				0.41				0.40				0.40				0.40			
23-Sep	0.40				0.40				0.40				0.39				0.39				0.39			
24-Sep	0.39				0.39				0.39				0.39				0.39				0.39			
25-Sep	0.39				0.38				0.38				0.38				0.38				0.38			
26-Sep	0.38				0.38				0.38				0.38				0.38				0.38			
27-Sep	0.37				0.37				0.37				0.37				0.37				0.37			
28-Sep	0.36				0.37				0.37				0.37				0.37				0.37			
29-Sep	0.37				0.37				0.37				0.37				0.37				0.37			
30-Sep	0.37				0.37				0.37				0.36				0.36				0.36			
1-Oct	0.36				0.36				0.36				0.36				0.35				0.35			
2-Oct	0.35				0.35				0.35				0.35				0.35				0.35			
3-Oct	0.35				0.35				0.35				0.35				0.34				0.34			
4-Oct	0.34				0.34				0.34				0.34				0.34				0.34			
5-Oct	0.34				0.34				0.33				0.33				0.33				0.33			
6-Oct	0.33				0.33				0.33				0.33				0.33				0.33			
7-Oct	0.33				0.33				0.32				0.32				0.32				0.32			
8-Oct	0.32				0.32				0.32				0.32				0.32				0.32			
9-Oct	0.32				0.32				0.31				0.31				0.31				0.31			
10-Oct	0.31				0.31				0.31				0.31				0.30				0.30			
11-Oct	0.30				0.30				0.30				0.30				0.30				0.30			
12-Oct	0.30				0.30				0.30				0.29				0.29				0.29			
13-Oct	0.29				0.29				0.29				0.29				0.28				0.29			
14-Oct	0.28				0.28				0.28				0.28				0.28				0.27			
15-Oct	0.27				0.27				0.27				0.27				0.27				0.27			
16-Oct	0.27				0.27				0.27				0.27				0.27				0.27			
17-Oct														0.26										

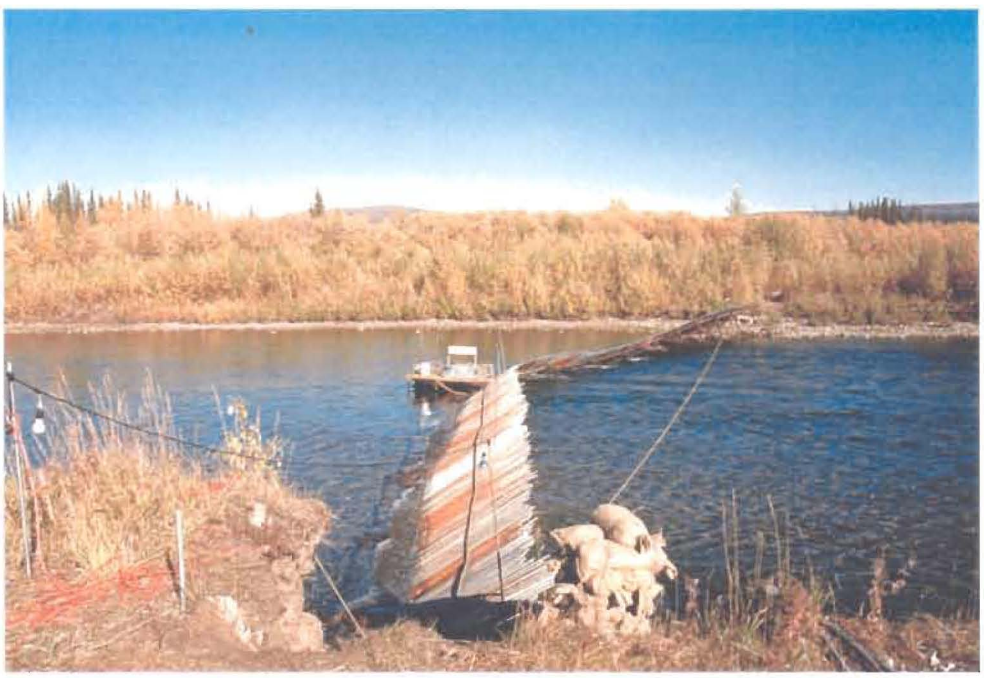
Appendix 10. Annual counts of Fishing Branch River salmon, 1971 – 1995.
(Chum counts taken from JTC 1995b; chinook and coho counts taken from DFO files)

Year	Chum [a,b]	Chinook [h]	Coho [h]
1971	312,800	0 [b]	6 [b]
1972	35,125 [c]	1	0
1973	15,989 [d]	3	6
1974	32,525 [d]	2	0
1975	353,282 [d]	3	0
1976	36,584		
1977	88,400		
1978	40,800		
1979	119,898		
1980	55,268		
1981	57,386 [e]		
1982	15,901		
1983	27,200		
1984	15,150		
1985	56,016 [d]	3	0
1986	31,723 [d]	4	0
1987	48,956 [d]	0	6
1988	23,597 [d]	3	0
1989	43,834 [d]	6	12
1990	35,000 [f]		
1991	37,733 [d]	6	23
1992	22,517 [d]	1	0
1993	28,707 [d]	2	0
1994	65,247 [d]	23	100
1995	51,971 [d,g]	7	112

[a] Total escapement estimated using weir to aerial survey expansion factor of 2.72, unless otherwise indicated.
[b] Aerial survey count unless otherwise indicated.
[c] Weir installed on September 22. Estimate consists of a weir count of 17,190 after September 22, and a tagging passage estimate of 17,935 prior to weir installation.
[d] Weir count.
[e] Initial aerial survey count was doubled before applying the weir/aerial expansion factor of 2.72 since only half of the spawning area was surveyed.
[f] Weir was not operated. Although only 7,541 chum salmon were counted on a single survey flown October 26, a population estimate of approximately 27,000 fish was made through date of survey, based upon historic average aerial-to-weir expansion of 28%. Actual population of spawners was reported by DFO as between 30,000-40,000 fish considering aerial survey timing.
[g] Incomplete count due to late installation and/or early removal of project or high water events.
[h] Weir counts unless otherwise indicated.

Appendix 11. Photographs

Photograph 1. Typical construction of the Fishing Branch River weir.



Photograph 2. The Fishing Branch River weir.