Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2007

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Pacific Salmon Commission
Technical Report No. 27

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Technical Committee Report No. 27

Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2007

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Prepared for:
Pacific Salmon Commission
Transboundary Technical Committee

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TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

Mark recapture studies of adult Taku River salmon *Oncorhynchus* stocks were conducted by the Department of Fisheries and Oceans Canada, the Alaska Department of Fish and Game, and the Taku River Tlingit First Nation in 2007. The objectives of the studies were to provide inseason estimates of the inriver abundance of sockeye *O. nerka* and to document biological characteristics (migratory timing, migratory rates and age, sex, and size composition) of Taku River sockeye stocks. Tagged-to-untagged ratios of salmon harvested in the Canadian inriver gillnet fisheries were used to develop the estimates of the inriver abundance of sockeye. A total of 7,664 sockeye salmon were captured in fish wheels located at Canyon Island, Alaska, of which 7,055 were tagged and 2,183 (32.0%) were subsequently recovered or observed in fisheries or on the spawning grounds. The inriver run of sockeye salmon past Canyon Island from June 10 to September 22 was estimated to be 104,815 fish (95% confidence interval 97,171 to 112,444). An expansion factor based on fish wheel CPUE estimated 197 additional sockeye salmon migrated past Canyon Island prior to and after June 10 to September 22, for a total above border escapement of 105,012. Canadian commercial, test, and aboriginal fisheries harvested 16,714, 376 and 159 sockeye respectively, resulting in a spawning escapement estimate of 87,604 sockeye salmon. Based on mean date and standard deviation of migration timing the sockeye salmon run was over one week late and more compressed than the 1984-2006 average. Based on tag recoveries, the majority of the Little Trapper Lake stock passed Canyon Island earlier than the Tatsamenie Lake stock; a lack of recoveries, due to high water levels at Kuthai Lake and King Salmon weirs, did not allow for stock timing comparisons for these stocks. The Canyon Island catches of 12,405 pink salmon, 462 chum salmon and 63 steelhead salmon were 7.8% below average, 48.7% above average and 45.6% below average, respectively. The pink salmon run was six days later and slightly less compressed than average.

KEY WORDS: mark-recapture, stratified population estimations, escapement estimation, migratory timing, Taku River, transboundary river, salmon, fish wheel, age, length and sex composition, Pacific Salmon Treaty

INTRODUCTION

Inseason estimates of the spawning escapement of Taku River sockeye *Oncorhynchus nerka* are needed to fulfill the escapement goal and international harvest sharing requirements for stocks specified by the U.S./Canada Pacific Salmon Treaty. The Taku River mark-recapture project has been conducted annually since 1984 (Clark et al. 1986; McGregor and Clark 1987, 1988, 1989; McGregor et al. 1991; Kelley and Milligan 1999; Andel and Boyce 2006) as a joint U.S./Canada program involving the Alaska Department of Fish and Game (ADF&G) and the Department of Fisheries and Oceans Canada (DFO) to provide weekly estimates of the Taku River salmon escapement past Canyon Island, Alaska (Figure 1). The Taku River Tlingit First Nation (TRTFN) began providing a technician to assist with operations in 1994. U.S. and Canadian fishery managers use CPUE and stock composition data from the U.S. District 111 and Canadian Taku River commercial gillnet fisheries and escapement estimates from this project to adjust fishing times, catches, and escapements.

The Taku River is a transboundary river which originates in northern British Columbia and flows southwest through the Coastal Mountain Range and Southeast Alaska to the Pacific Ocean (Figure 1). The Taku River supports numerous stocks of salmon that are harvested by Canadian and U.S. gillnet fisheries. The Canadian fishery, which occurs inriver, targets Taku River chinook[1], sockeye and coho salmon and incidentally harvests chinook and pink salmon. The U.S. drift gillnet fishery which occurs in Taku Inlet and approach waters, primarily targets Taku River chinook and sockeye salmon stocks as well as summer chum salmon from local Alaskan enhancement programs during the summer months and mixed stocks of coho in fall. The U.S. fishery also incidentally harvests chinook and pink salmon. The Canada/U.S. Pacific Salmon Treaty (PST) of 1985, and subsequent additions to the original treaty, established conservation (71,000 to 80,000 escapement goal) and harvest sharing (percentage sharing of the allowable catch) objectives for the Taku River sockeye salmon run. The PST mandates cooperative international management of transboundary river stocks. The most intensive cooperative management is directed at sockeye, coho, and chinook salmon.

Mark-recapture methods were used in 2007 to estimate sockeye, chinook and coho salmon escapements. Chinook and coho studies are described in separate reports published by the ADF&G Division of Sport Fish and the Pacific Salmon Commission (in prep.) Fish wheels located at Canyon Island were used to capture sockeye, chinook, and coho for tagging. Tagging data coupled with ratios of tagged to untagged fish in the Canadian fisheries upstream were used to develop escapement estimates inseason.

The fish wheels also catch pink, chum and steelhead salmon. Although abundance is not estimated, the catches do provide an index of interannual variation. This is especially valuable if the entire migration period is bracketed by the period of fish wheel operation (for example, as with pink salmon).

Age, length, and sex data were collected from sockeye, pink, and chum salmon caught in the fish wheels.

[1] New directed chinook fisheries have been implemented as a result of an agreement reached between the U.S. and Canada in February 2005.

OBJECTIVES

The primary goals of the Taku River sockeye salmon tagging program in 2007 were to obtain information on the above-border run size, distribution, migratory timing, and age-sex-size composition of sockeye salmon stocks in the Taku River drainage.

Specific objectives of this study were:

1. Estimate the total spawning abundance of sockeye salmon returning to Canadian portions of the Taku River with an estimated coefficient of variation no greater than 10% of the estimate. Estimate weekly inriver abundance with a coefficient of variation no greater than 20% of the estimate;

2. Estimate the age, length, and sex composition of sockeye salmon migrating past the fish wheel site on a weekly basis;

3. Forecast total abundance of sockeye salmon on a weekly basis based on tag-recovery data and historical migration-timing data;

4. Quantitatively describe the migratory timing (mean and variance) of the sockeye, pink, and chum salmon migrations past Canyon Island; and

5. Estimate the annual age and sex composition of pink and chum salmon migrating past the fish wheel site.

Objectives for the Taku River coho and chinook salmon mark-recapture studies are outlined in reports published by the Pacific Salmon Commission and/or the ADF&G Division of Sport Fish.

METHODS

Study Area Description

The Taku River originates in the Stikine plateau of northwestern British Columbia, and drains an area of approximately 17,000 square kilometres (Figure 1). The merging of two principal tributaries, the Inklin and Nakina Rivers, approximately 50 km upstream from the international border forms the Taku River. The river flows southwest from this point though the Coast Mountain Range and empties into Taku Inlet about 30 km east of Juneau, Alaska. Approximately 95% of the Taku River watershed lies within Canada.

The Taku River is turbid, with much of its discharge originating in glacial fields on the eastern slopes of the Coast Range Mountains. This turbidity precludes complete enumeration of salmon escapements in many areas by aerial or foot surveys. Water discharge in the summer generally increases in proportion to the amount of sunshine received in the interior on coastal mountain ranges (ADF&G 1955). Winter (February) flows range from approximately 40-104 m^3/s at the U.S. Geological Survey water gauging station located on the lower Taku River near Canyon Island (Schellekens et al. 1996). Discharge increases in April and May and reaches a maximum average flow of 700-1,400 m^3/s during June. Flow usually remains high in July and drops in late August. The efficiency of fish wheels used to capture fish for tagging and the effectiveness of the Canadian commercial fishery are affected by the magnitude of river

discharge. Sudden increases in discharge in the lower river result from the release of the glacially impounded waters of Tulsequah Lake (Kerr 1948; Marcus 1960). These floods usually occur once or twice a year between May and August. During water years 1988 to 1995 the instantaneous peak flow due to a Tulsequah event was 2,889 m^3/s (August 17, 1989; Shellekens et al. 1996). During the floods, water levels fluctuate dramatically and the river carries a tremendous load of debris.

Fish Wheel Operation

Migrating adult salmon were captured with two fish wheels at Canyon Island, located approximately 4 km downstream from the international border (Figure 1). Each fish wheel consisted of two aluminum pontoons in a framework, measuring approximately 12 m in length and 6 m in width and filled with closed-cell styrofoam for flotation, supporting an axle, paddle, and basket assembly. Two fish-catching baskets were rotated about the axle by the force of the water current against the baskets and/or paddles. As the fish wheel baskets rotated, they scooped up salmon. V-shaped slides attached to the rib structure of each basket directed fish to aluminum liveboxes bolted to the outer sides of the pontoons.

The fish wheels were positioned in the vicinity of Canyon Island on opposite riverbanks, approximately 200 m apart, and have been operated in identical locations since 1984. They were secured in position by anchoring to large trees with 0.95 cm steel cable and were held out from, and parallel to, the shoreline by log booms. The Taku River channel at this location is ideal for fish wheel operation. The river is fully channelized through a relatively narrow canyon that has very steep walls.

The fish wheels rotated at 0-4 r.p.m., depending on the water velocity and the number of attached paddles. When water levels subsided, more paddles were attached and the fish wheels were moved farther out from shore into faster water currents to maintain a speed of basket rotation adequate to catch fish.

Over time it has become clear that Tulsequah River floods are preceded by a sudden decline in river temperature and a corresponding rapid increase in river level. It is standard operating procedure to stop the fish wheels when river levels near 290 cm (114 inches, standardized gauge measure). By doing so, damage to the fish wheels is minimized and significant labour and material costs avoided.

Baskets and liveboxes are removed from the pontoons and stored on high ground during the off season. The pontoons are towed upstream to a backwater slough and securely moored during the off season.

Tagging and Sampling Procedures

All sockeye captured in the fish wheels were sampled for sex and mid-eye to fork of tail length (MEF). In addition, a sub-sample of 260 sockeye salmon per week were sampled for scales. Cliethral arch to fork of tail (CAF) length measurements were taken from 200 sockeye salmon throughout the season, and paired with MEF measurements. Canadian fish buyers prefer a headless, gutted product; because of this, the only length measurement available from the commercial fishery was CAF. The paired MEF and CAF measurements from the fish wheels allow conversion of CAF measurements to MEF.

All chum salmon were sampled for sex, scales, and MEF length. The daily sampling goal for pink salmon was 25 fish; these fish were sampled for sex and MEF length.

All uninjured sockeye greater than 350 mm (MEF length) were tagged with numbered spaghetti tags. Sockeye less than 350 mm (MEF) were not tagged because fish in this size range are virtually unsusceptible to capture in the upriver gillnet fishery from which tagged to untagged ratios are used to

develop population estimates for these species. Sockeye salmon with serious wounds (most often thought to be seal inflicted) were not tagged. Pink, chum and steelhead salmon were not tagged.
Salmon were dipnetted from the fish wheel liveboxes into a tagging trough partially filled with river water. Spaghetti tags (Floy Tag and Manufacturing Inc., Seattle, WA)[2] were applied to sockeye salmon as follows: one person held the fish in the tagging trough while a second person inserted a 15 cm applicator needle and attached spaghetti tag through the dorsal musculature immediately below the dorsal fin. The ends of the spaghetti tag were then knotted together with a single overhand hitch. Biological sampling was also conducted during application of the spaghetti tags. Sex and length measurements were recorded, and scale samples taken from all chum salmon, and sub-samples of the sockeye salmon caught. Sex and length data were also collected daily from a sub-sample of 25 pink salmon, but scales were not taken from this species. The tagging and sampling procedures took from 40 to 60 seconds per fish to complete. The fish were then immediately and gently released back into the river.

The spaghetti tags used for sockeye salmon were made of hollow fluorescent orange PVC tubing (approximately 2.0 mm in diameter and 30 cm in length) and were consecutively numbered and labeled with project description information.

In general, fish wheel catches were sampled in the morning, afternoon, and evening. Less frequent checks, morning and evening, were made during lulls in the migration to minimize crew overtime. During peak migration times catches were sampled more frequently, early in the morning and late at night.

Tag Recovery

Sockeye were inspected for tags in Canadian commercial, test, and aboriginal ("food fish") fisheries, which occurred in Canadian portions of the Taku River within 20 km of the international border. All sockeye salmon caught in the commercial, test and lower river aboriginal fisheries were considered to have been examined for tags and all of the captured tags were considered to have been recovered.

The commercial fishery was open from one to seven days per week from April 30 to October 5. Chinook salmon were targeted until mid-June; sockeye salmon from then until mid-August; and finally coho salmon for the remainder of the season. Test fisheries were conducted from May 3 to June 17 and then from September 2 to October 5 targeting chinook and coho salmon, respectively. Drift and set gillnets were the gear types used; mesh sizes ranged from 15 cm (5 1/2 inches) to 20.4 cm (8 inches) with the mesh size of 15 cm predominating during the sockeye season.

Daily tag return was a condition of the Canadian commercial licence. As an additional incentive, a cash reward of $5.00 (Canadian) was offered by DFO for each sockeye tag returned from any fishery (i.e. commercial, aboriginal, or test fishery). Canadian catch statistics and tags were collected daily during fishery openings by DFO personnel stationed at Ericksen Slough, just upstream of the Tulsequah River. Catch statistics were communicated to the DFO office in Whitehorse via satellite telephone and then relayed to the ADF&G office in Juneau. ADF&G offered a $2.00 (U.S.) reward for each tag returned from the District 111 and the inriver personal use fisheries. Tag observations and recoveries were also made at enumeration weirs located at Kuthai, King Salmon, Little Trapper, and Tatsamenie lakes. Additional recoveries were made on directed sampling excursions to the Nahlin River and mainstem Taku River spawning grounds.

Sex, length, and scale data were obtained from these locations as well as the commercial and test fisheries.

[2] Mention of trade names does not constitute endorsement by DFO or ADF&G.

Tagging and tag recovery data were organized by statistical week for analysis. Statistical weeks begin at 00:01 AM Sunday and end the following Saturday at midnight, with weeks being numbered sequentially beginning with the week encompassing the first Saturday in January. Inclusive dates for 2006 statistical weeks are shown in Appendix A.

Statistical Methods

Sockeye salmon tagging data, tag recovery data and catch data were entered into an abundance estimation program which is referred to as the Stratified Population Analysis System (SPAS) (Arnason et al. 1996). This model provides stratified population estimates using maximum likelihood techniques (Plante 1990) and associated variances when *s* (the number of tagging stratum) and *t* (number of recovery stratum) are not equal. For cases in which *s*=*t*, the model provides stratified population estimates based on Chapman and Junge (1956) and Darroch (1961). This stratified method was used because it allows the probabilities of capture in tagging and recovery strata to vary across the strata.

Assumptions necessary to form consistent (i.e., approaching unbiased as sample size increases) stratified mark-recapture estimates in this study include (Arnason, et al. 1996):

1. All fish that pass Canyon Island during the period of interest have a non-zero probability of recovery in the commercial fishery and all fish caught by the fishery have a non-zero probability of being tagged (i.e., the population is closed);

2. There is no tag loss, tag induced mortality, tag mis-identification or non-reporting. Should any of these occur, they are to be estimated and adjusted for;

3. All fish, tagged or not, are independently caught with the same probability in any given recovery stratum;

4. All fish, tagged or not, move from a given release stratum to the recovery strata independently with the same probability distribution; and

5. There are no release strata or recovery strata where no tags are released or found respectively, and there are no rows or columns of the release-recovery matrix which are linear combinations of other rows or columns respectively.

The first assumption is addressed by the fact that two fish wheels are used in a consistent manner throughout the season and that the inriver fishery is conducted weekly. For the second assumption, tag-induced mortality was shown to be insignificant in a holding study conducted by McGregor and Milligan (1991, unpublished data). The extent of tag loss by shedding, misidentification, or non-reporting, was also found to be negligible in that study and several subsequent ones (e.g. Kelley et al., 1997). The third and fourth assumptions have not been assessed, while the fifth assumption is met by pooling of various recovery or release strata.

Inriver sockeye salmon run estimates were generated on an inseason basis in 2007. Mark-recapture data was forwarded to the Juneau ADF&G and Whitehorse DFO offices after each day of the commercial fishery. Data was analyzed and inriver abundance estimates were developed. Historical migratory timing data was then used each week to project the total inriver run size for the season. Due to the estimated three to four days travel time for fish between the Taku Inlet gillnet fishery and Canyon Island (Clark et al. 1986), as well as between Canyon Island and the Canadian fishery (based on current year tag recovery

data), our estimates of inriver abundance corresponds with the movement of Taku River sockeye salmon through District 111 approximately one to two weeks earlier.

Fishery management decisions that affect the magnitude and distribution of harvests and escapements are based in principle on the measured or perceived abundance of fish through time. Mundy (1982) described a set of statistics, termed migratory timing statistics, useful for characterizing the annual timing of fish migrations and for comparing the timing of migrations between years. Abundance per unit of time is divided by the total abundance throughout the migration to generate a time series of proportions, or time density. The shape of the time density characterizes the timing and temporal distribution of the migration. Two simple features of the time density are the mean date and variance or dispersion of the migration through time. We used fish wheel CPUE as an index of the abundance of fish migrating past Canyon Island, and calculated migratory timing statistics following the procedures of Mundy (1982). The mean date of passage in a migration of *m* days was estimated by:

$$\bar{t} = \sum_{t=1}^{m} t * P_t \quad , \tag{1}$$

where $\bar{t}$ was the mean day of the migration (t=1 was the first day of the migration and m was the last day), and P_t is the proportion of the total cumulative fish wheel CPUE that occurred on day t. The calculated mean date is reported as the corresponding calendar date.

The variance of the migrations was estimated by:

$$s_t^2 = \sum_{t=1}^{m} (t - \bar{t})^2 * P_t \quad , \tag{2}$$

The timing of individual sockeye salmon stocks past Canyon Island was derived from recoveries of tagged fish on the spawning grounds and was weighted by fish wheel CPUE to permit the escapement of a particular stock to be apportioned to week of passage past Canyon Island. The formula we used for determining the proportion of the run occurring each week for each stock was:

$$\frac{\frac{C_k * T_{ks}}{T_k - T_{kc}}}{\sum_{j=22}^{38} \frac{C_k * T_k}{T_K - T_{kc}}} \quad , \tag{3}$$

where: *k* is the statistical week of interest; C_k is the weekly proportion of the total season's fish wheel CPUE, T_{ks} is the number of spawning ground recoveries of stock s that were tagged in week *k*, T_k is the number of fish tagged at Canyon Island in statistical week *k*, and T_{kc} is the number of fish tagged at Canyon Island in statistical week *k* and caught in the Canadian fishery.
An assumption implicit in this calculation is that the removal of fish by the Canadian inriver fishery does not alter the migratory timing distribution of individual stocks. This assumption may be violated because the Canadian fishery harvest rate of the inriver run varied between fishing periods.

RESULTS

Fish Wheel Operation

Fish wheels were operated on the Taku River from May 18 through September 30. Fish wheel I, located furthest upriver, was installed on May 18; fish wheel II was installed on May 19. Additional details regarding operations are presented in Appendix B.1

The aluminum two-basket configuration first used in 1996 has proven to be effective at very low river levels (as measured on a permanent staff gauge).[3]

Fish Wheel Catches

Daily catches of sockeye, pink, and chum salmon in the Canyon Island fish wheels are listed in Appendices B.1. Dates of operation and the total fish wheel catch by species for the 1984 to 2007 period are presented in Table 1. Graphs of the fish wheel CPUE for sockeye, pink, and chum salmon are included in Figure 3.

The catch of sockeye salmon in the Canyon Island fish wheels in 2007 was 7,664. The total catch was 42.1% above the 1997 to 2006 average (Table 1; Appendix B.1). Fish wheel catches occurred from June 10 through September 28, and peaked during statistical week 31 (July 29 through August 4), when 2,529 sockeye salmon were captured. Prior to the first Canadian directed sockeye commercial fishery opening on June 17 (statistical week 25), only 4 sockeye salmon had been captured in the fish wheels (Appendix B.1). As in past years, the daily catches fluctuated dramatically. The effects of the U.S. commercial fishery in Taku Inlet were observable as fish wheel catches declined to their lowest levels between Thursday and Saturday weekly; this suggested that the average travel time between Taku Inlet and Canyon Island was three to four days.

The total 2007 pink salmon catch in the fish wheels at Canyon Island was 12,405 (Table 1; Appendix B.1), 8.9% below the 1997 to 2006 average. The peak daily catch of pink salmon in 2007 (1,685 fish) occurred on July 26. The 2007 fish wheel catch of chum salmon was 462. The total catch was 48.7% below the 1997 to 2006 average of 311. The peak daily catch of chum salmon (50 fish) occurred on September 13 (Appendix B.1). The total fish wheel catch of steelhead and Dolly Varden in 2007 were 63 and 425 fish respectively. The steelhead catch was 54.3% below the 1997 to 2006 average of 116. The total catch of 425 Dolly Varden was 44.1% above the 1997 to 2006 average.

Tagging and Recovery Data

Of the 7,664 sockeye salmon caught in the Taku fish wheels, 7,055 were tagged (92.1**%**). Only jack sockeye salmon (fish smaller than approximately 350 mm MEF that have spent only one year at sea) or sockeye with noticeable injuries were not tagged. Daily numbers of sockeye caught and tagged are listed in Appendix B.1. Recoveries downstream (U.S. personal use and D-111 fishery) of Canyon Island totaled 19 (0.008**%** of tags applied), leaving 7,036 available for recapture in Canadian fisheries. The Canadian commercial fishery recaptured 1,320 tagged sockeye and accounted for 54.0% of the total sockeye tags recovered or observed in upstream fisheries (Table 2). The Canadian test fishery

[3] The aluminum baskets were experimentally used in 1996. Previous programs were constrained by low water conditions, particularly in the fall, which would not effectively turn the fish wheels.

recovered 11 tags (.005%) and the aboriginal fishery recovered 6 tags (0.002%). Tags were also observed in terminal areas, principally Little Trapper and Tatsamenie lakes; these numbered 331 and 754 respectively. Only one tag was observed at King Salmon Lake, and none was observed at Kuthai Lake. Sockeye salmon weir counts at these locations were 7,153, 11,187, 5 and 204 sockeye respectively. It is believed that the King Salmon and Kuthai counts are not representative of stock strength, as high water conditions may have delayed or prevented fish from reaching their destinations; at King Salmon Lake, several hundred sockeye salmon were observed in September, after the weir had been removed.

Escapement Estimates

Ratios of tagged to untagged sockeye salmon in the Canadian commercial, test and catch-and-release gillnet fisheries were used to estimate the magnitude of the inriver run of sockeye salmon that passed Canyon Island during the period of June 10 to September 22, 2007. Fishwheel CPUE for sockeye was used to expand the inriver run estimate for periods of low tag recovery and effort (SW 24 and 39).

A total of 1,337 tags with corresponding recovery date information were returned from 16,714 sockeye salmon examined in the Canadian fisheries (Table 3). Tagging data from statistical weeks 24 through 25 (June 10 through June 23) and 36 through 37 (September 2 through September 15) were pooled due to low tag recovery numbers. Recovery data from statistical weeks 25 through 26 (June 17 through June 30), weeks 29 through 31 (July 15 through August 4), and weeks 35 through 38 (August 26 through September 22) were pooled due to statistically similar tagging ratios and low fishery effort. Tagging and recovery data were grouped into 12 and 8 strata, respectively (Table 4).

Using a maximum likelihood Darroch estimator, we estimated that 104,815 sockeye salmon passed Canyon Island between June 10 and September 22. The approximate 95% confidence interval associated with this estimate is 97,171 to 112,444 fish. To estimate the total run of sockeye salmon that passed before and after the period of the mark-recapture estimate, the estimate was expanded by using fish wheel CPUE. Using this method, it was estimated that 197 additional sockeye passed Canyon Island during statistical weeks 24 and 39. Downriver of the U.S./Canadian border, the U.S. inriver personal use fishery catch was estimated at 566 sockeye using a tag return expansion method based on the current inriver commercial marked fraction (3.3%). The total estimate of sockeye salmon run migrating past Canyon Island was 105,012. This estimate is 24.6% below that the 1997 to 2006 average (137,465) sockeye salmon; Table 5; Figure 4).

The Taku River sockeye salmon run above Canyon Island was exploited by the Canadian fisheries at an estimated rate of 16.3%, compared to a 1997-2006 average of 19.8% (range 12.8% to 25.5%; Table 5). After removal of 16,714, 159, and 376 sockeye salmon by the Canadian commercial, aboriginal and test fisheries respectively from the estimated escapement to the Canada/U.S. border, the spawning escapement totaled an estimated 87,604 fish (Table 4). This is 20.5% below the 1997-2006 average of 110,177 sockeye salmon.

The escapement estimate does not include two groups of sockeye salmon that spawn in the drainage: (1) fish that spawn in streams located downriver from Canyon Island, and (2) jack sockeye salmon. The number of sockeye salmon spawning downstream from Canyon Island is unknown but presumed to be small; spawning has been observed annually in lower tributaries of the lower Taku River (i.e. Fish Creek, Sockeye Creek, and Yehring Creek) during annual aerial and foot surveys (McGregor, personal communication; Figure 1). The contribution of jacks can represent a sizable portion of the Taku River run; the contribution of jack (one ocean) sockeye salmon to the Canyon Island fish wheel catches from 1983 to 2006 averaged 3.9% (range 0.0 to 9.1%; Table 6). However, in 2007 the contribution of jacks was only 0.9%.

A necessary assumption of the population estimation technique used is that all fish in a particular recovery stratum, whether tagged or untagged, have the same capture probability. A factor that could violate this assumption is that tagging and recapture gear are selective for different sized fish. Based on length frequency distributions of sockeye salmon tagged at the fish wheels and of tagged sockeye recovered in the commercial fishery it is clear that the fish wheels tend to capture a higher proportion of smaller fish or the fishery captures a higher percentage of large fish (Figure 5).

In past years (Kelley et al. 1996, McGregor et al. 1991) the possible effects of size selectivity on the sockeye salmon population estimate were assessed by stratifying tagging and recovery data by size class. Results for those years demonstrate that the mark-recapture estimates are robust in respect to fish length differences between the tagging and recapture events. The summed abundance estimates obtained for large and small sockeye salmon separately were not significantly different than the pooled estimates. As a result of those findings, the 2007 mark-recapture data was not examined by fish size.

Migratory Timing

The mean date (July 29) of the sockeye salmon migration in 2007 was significantly later (9 days) than the 1997-2006 average (Table 7). The standard deviation was less than average (16.6 days in 2007 versus an average of 18.8 days); meaning the run was more compressed than typical. Migratory timing statistics (mean date July 26; standard deviation 8.4 days) showed the pink salmon run timing was six days later than average and slightly less compressed. The migratory timing relative to average for chum salmon is more difficult to assess because the duration of fish wheel operations has varied between years and has failed to cover the complete migration of this species. Assuming fish wheel CPUE in 2007 was reflective of the run, the mean date of migration was September 7 (standard deviation 10.7 days). However, it is likely that this assumption was not completely valid as there were still a small number of chum being caught at the time of fish wheel demobilization.

Sockeye Salmon Stock Timing

The timing of two individual stock groups of sockeye salmon past Canyon Island in 2007 was determined using recoveries of tagged fish from enumeration weirs (Table 8; Figure 6). These were weirs on the outlet streams of Little Trapper (232 tags) and Tatsamenie (586 tags) lakes. It was not possible to determine the timing of Kuthai Lake and King Salmon Lake stocks in 2007 due to a lack of tag recoveries.

Little Trapper Lake sockeye salmon peaked during stat week 31, July 29 through August 4. They were present at Canyon Island during statistical weeks 25 to 33 (June 17 to August 18).

Tagged fish bound for Tatsamenie Lake were present at Canyon Island between statistical weeks 27 to 37 (July 1 to September 15), however the majority of the run passed by relatively quickly. The peak week of migration for Tatsamenie Lake sockeye matched that of Little Trapper sockeye (statistical week 31).

Inriver Sockeye Salmon Migration Rates

Inriver travel times of two lake stocks could be determined from the recovery of tagged fish at enumeration weirs as described in the previous section (Table 9). Inriver travel times from Canyon Island for the Little Trapper Lake and Tatsamenie Lake stocks are shown in Figure 7. Travel times

averaged 31.7 and 31.6 days for each of these respective stocks.

Migration rates generally increased over the course of the run. Little Trapper Lake fish tagged in statistical week 26 averaged 49.3 days in transit while those tagged in statistical week 33 averaged 24.0 days. For the Tatsamenie stock, fish tagged in statistical week 29 averaged 39.0 days in transit while fish tagged in statistical week 37 averaged 22.1 days.

Age, Length, and Sex Composition

The age and sex compositions, by sex and time period, of the Canyon Island fish wheel catches of sockeye and chum salmon in 2007 are presented in Appendices C.1 and C.2. Age summaries are presented in Tables 6 and 11 while length at age summaries are presented in Tables 10 and 12.

For sockeye salmon, age 1.2 fish were most prevalent (39.2%) with age 1.3 fish comprising 36.6%, age 2.2 3.2%, age 0.2 7.7%, age 2.3 3.9%, age 0.3 8.3%, and very small numbers of age-0.1, 0.4 ,1.1, 2.1, and 1.4 fish (Table 6). As identified in Table 10, the lengths of age 1.2 and 1.3 sockeye salmon (49.9 and 58.5 respectively were slightly greater than the 1997 to 2006 averages (48.8 and 57.6 respectively). Females comprised 55.0% of the fish wheel catch of sockeye salmon (Appendix C.1).

Fish wheel catches of chum salmon were primarily comprised of age-0.3 (54.1%) fish, which is lower than the 1997-2006 average of 59.6% (Table 11). Age-0.4 fish constituted 42.4% of the fish wheel catch, lower than the 38.7% average. Female chum salmon were more prevalent (57.0%) than males (Appendix C.2). The average lengths at age for chum salmon passing Canyon Island were 581, 633, and 669 mm (MEF) for age 0.2, 0.3, and 0.4 fish respectively; in comparison, the 1997 to 2006 averages were 602, 637, and 666 respectively (Table 12).

DISCUSSION

The accuracy of mark-recapture studies in providing estimates of abundance is dependent on the degree to which the underlying assumptions of the analytical methods used are satisfied. We have chosen to use a stratified Darroch type estimator for our Taku River sockeye abundance estimates because we have different capture probabilities in the tagging and recovery strata due, primarily, to fluctuations in river level. In estimating the abundance of adult sockeye salmon in the Taku River we assumed: (a) tagging of adult sockeye salmon was in proportion to their numbers immigrating over time; (b) no sockeye salmon entered or left the system between the tagging and recovery events or sockeye salmon that made up the population of the capture strata have a non-zero probability of recapture during the recovery event; (c) no tag-induced mortality occurred; (d) the probability of recovering sockeye salmon is independent of its tagged/untagged status. Assumptions underlying this model, outlined above, have been examined at various times during the course of this project (Kelley et al. 1997, McGregor et al. 1991).

With respect to assumption (a), tagging efforts at the Taku River fish wheels and recovery efforts in the Canadian fisheries were conducted on a frequent basis through the season. Both of the fish wheels were strictly maintained and adjusted throughout the entire sockeye salmon run. The wheels operated 24-hours per day except during equipment breakdowns; however it is known that river conditions affect the fishing efficiencies of both wheels. Recovery efforts were conducted a minimum of two days per week throughout the season, but water conditions can also affect the efficiency of commercial and test fishery set and drift nets. We are able to work around these variations in gear efficiency by using the Darroch stratified estimator for generating abundance estimates; this allows the probabilities of capture in tagging and recovery strata to vary across time but not within strata.

It was likely that assumption (b) was violated in recent years of the Taku sockeye mark–recapture program because there were significant differences in the cumulative distribution function of length between fish sampled at the fish wheels and at the recovery location (Figure 5). Smaller fish were more prevalent in fish wheel samples than in the recovery samples. Stratification of mark–recapture data by size would remove possible bias in population estimates caused by differences in capture probabilities due to fish size (Bernard and Hansen 1992). In past studies, summed abundance estimates obtained for large and small sockeye salmon were not significantly different than the pooled estimates (Andel and Boyce, 2009). Based on those results the mark-recapture data for 2007 was not examined by fish size. We were able to make some correction for this possible bias by completely removing smaller "jack" salmon (less than or equal to 360 mm MEF length) from tag and recovery data.

We were able to assess the short-term loss of tags caused by physical breakage or shedding. Fish that lose their spaghetti tags are readily identifiable by the presence of entrance and exit holes just below the dorsal fin created during tag application. Those holes serve as a secondary mark. In the fish wheels, no sockeye or coho salmon were found throughout the season that had the needle hole "secondary mark" and no spaghetti tag. These results are consistent with those observed in previous years. In addition, in statistical weeks 25 through 36, over 2,089 fish were examined for tagging needle marks in the Canadian commercial fishery after tags had been removed by fishers. The number of tagging needle marks was compared with tag recovery rates, and found to be lower overall (6.0% versus 7.9%) (Appendix D). We therefore believe that breakage or shedding of tags among sockeye subjected to the inriver fishery is minimal. The close proximity of the fishery to the tagging site (4 km) results in a very short travel time between the two locations.

Fish wheels were not modified in 2007 and functioned effectively. As in recent years, a 2-basket configuration was used for the entire season.

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Table 1. Canyon Island fish wheel dates of operation and catches of sockeye, pink, chum, steelhead, and Dolly Varden, 2007.

Year	Dates of Operation	Sockeye	Pink	Chum	Steelhead	Dolly Varden
1984	6/15-9/18	2,334	20,751	316	NA	NA
1985	6/16-9/21	3,601	27,670	1,376	NA	NA
1986	6/14-8/25	5,808	7,256	80	14	2,716
1987	6/15-9/20	4,307	42,786	1,533	38	868
1988	5/12-9/19	3,292	3,982	1,089	37	701
1989	5/5-10/1	5,650	31,189	645	34	1,308
1990	5/3-9/23	6,091	13,358	748	33	1,433
1991	6/8-10/15	5,102	23,553	1,063	135	326
1992	6/20-9/24	6,279	9,252	189	22	241
1993	6/12-9/29	8,975	1,625	345	30	375
1994	6/10-9/21	6,485	27,100	367	107	584
1995	5/4-9/27	6,228	1,712	218	65	509
1996	5/3-9/20	5,919	21,583	388	65	681
1997	5/3-10/1	5,708	4,962	485	102	454
1998	5/2-9/15	4,230	23,347	179	120	323
1999	5/14-9/28	4,639	23,503	164	76	330
2000	5/14-10/3	5,865	6,529	423	159	244
2001	5/27-9/27	6,201	9,134	250	125	196
2002	5/19-9/14	5,812	5,672	205	90	419
2003	5/20-10/4	5,970	15,491	262	49	285
2004	5/12-10/4	6,255	8,464	414	313	63
2005	5/5-10/4	3,953	15,839	258	79	293
2006	5/20-9/30	5,296	21,726	466	47	341
2007	5/18-9/30	7,664	12,405	462	63	425
Average(97-06)		5,393	13,467	311	116	295

Table 2. Summary of Taku River sockeye tag recoveries by location and species, 2007.

	Tags Recovered	Tags Observed Only	Total	Fish Inspected	Tag Ratio	Percent Tags Observed
Commercial Fishery	1,320	0	1,320	16,714	0.079	0.539
Test Fishery	11	0	11	376	0.029	0.004
King Salmon Lake	1	0	1	5	0.200	0.000
Kuthai Lake	0	0	0	204	0.000	0.000
Little Trapper Lake	232	99	331	7,153	0.046	0.135
Tatsamenie Lake	586	168	754	11,187	0.067	0.308
Taku River mainstem	6	0	6	165	0.036	0.002
Nahlin River	1	0	1	86	0.012	0.000
Tatsatua Creek	1	0	1	not app	-	0.000
U.S. downstream	19	0	19	0	-	0.008
Aboriginal Fishery	6	0	6	159	0.038	0.002
Total	2,183	267	2,450	36,049		1.000

Table 3. Tagging and recovery data from the 2007 Taku River sockeye salmon mark-recapture program. Data includes number of sockeye salmon tagged and recovered in the Canadian commercial fishery by statistical week (downstream recoveries excluded).

Statistical Week of Tagging	Statistical Week of Recovery																Total Tags Recovered	Total Tags Applied	Tag Ratio Recovered/ Applied
	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38			
24																	0	17	0.000
25				47	8												55	266	0.207
26				27	34	1	1										63	439	0.144
27					11	24	3	1					1				40	499	0.080
28						11	11	8									30	222	0.135
29							2	20		1							23	221	0.104
30								32	57	8							97	763	0.127
31									145	283	38	3	4	1			474	2354	0.201
32										128	167	15	8				318	1356	0.235
33											79	56	11	2	1	1	150	500	0.300
34												28	23	2			53	221	0.240
35													7	7			14	77	0.182
36														15	1		16	68	0.235
37															4		4	39	0.103
38																	0	9	0.000
39																	0	4	0.000
40																	0	0	
Total	0	0	0	74	53	36	17	61	202	420	284	102	54	27	6	1	1,337	7,055	0.190

Sockeye Examined[a]:																	Total
Test Fishery														269	97	10	376
Can. Comm. Catch			309	976	825	885	266	1,096	4,294	3,418	2,786	987	287	578	7		16,714
Aboriginal Fishery											91	45	23				159
Total	0	0	309	976	825	885	266	1,096	4,294	3,418	2,877	1,032	310	847	104	10	17,249

Table 4. Pooled-strata tagging and recovery data used to calculate mark-recapture estimates of the inriver sockeye salmon run past Canyon Island, 2007.

Statistical Week of Tagging	Statistical Week of Recovery								Total Tags Recovered	Total Tags Applied	Tag Ratio
	25-26	27	28	29-31	32	33	34	35-38			
24-25	47	8							55	283	0.194
26	27	34	1	1					63	440	0.143
27		11	24	4				1	40	499	0.080
28			11	19					30	224	0.134
29				22	1				23	223	0.103
30				89	8				97	769	0.126
31				145	283	38	3	5	474	2354	0.201
32					128	167	15	8	318	1356	0.235
33						79	56	15	150	500	0.300
34							28	25	53	222	0.239
35								14	14	77	0.182
36-37								20	20	108	0.185
Total	74	53	36	280	420	284	102	4	1,337	7,055	0.190
Catch Examined For Tags[a]	1,285	825	885	5,656	3,418	2,877	1,032	1,271	17,249		
Marked Fraction	0.061	0.069	0.042	0.052	0.140	0.110	0.110	0.003	0.084		
Above Border Run Estimate	5,637	7,594	11,297	45,246	12,472	13,438	1,310	7,820	104,815		
Fish Wheel CPUE Expansion[b]									197		
Aboriginal Fishery						91	45	23	159		
Total Above Border Run									105,012		
U.S. Personal Use Catch[c]									566		
95% Lower C.I.	3,240	4,207	6,801	37,661	8,779	10,106	-803	5,544	97,171		
95% Upper C.I.	8,034	10,981	15,793	7,585	16,165	16,770	3,423	10,096	112,444		
Spawning Escapment	4,352	6,769	10,412	39,590	9,054	10,470	233	6,526	87,604		

[a] Includes Canadian commercial and test fishery catches

[b] Expansion based on fish wheel CPUE

[c] Not subtracted from above border run estimate.

Table 5. Historical sockeye salmon above border abundance, above border harvests, and escapement for the Taku River, 1984 to 2007[a].

Year	Border Escapement	Canadian Commercial and Test Harvest	Canadian Commercial and Test Harvest Rate	Spawning Escapement[b]	Total Run	U.S. Harvest
1984	141,254	27,292	0.193	113,962	199,796	58,543
1985	123,974	14,411	0.116	109,563	197,783	73,809
1986	115,045	14,939	0.130	100,106	175,980	60,934
1987	96,023	13,887	0.145	82,136	150,147	54,124
1988	92,641	12,967	0.140	79,674	118,452	25,811
1989	114,068	18,805	0.165	95,263	176,873	62,805
1990	117,573	21,474	0.183	96,099	226,072	108,499
1991	154,873	25,380	0.164	129,493	258,285	103,412
1992	167,376	29,862	0.178	137,514	289,814	122,438
1993	142,148	33,523	0.236	108,625	283,456	141,308
1994	131,580	29,001	0.220	102,579	228,626	97,046
1995	146,450	32,711	0.223	113,739	237,458	91,008
1996	134,651	42,025	0.312	92,626	321,858	187,207
1997	95,438	24,352	0.255	71,086	173,726	78,288
1998	91,548	19,038	0.208	70,715	141,041	49,493
1999	113,705	20,681	0.182	92,562	177,032	63,327
2000	115,693	27,942	0.242	87,298	247,405	131,712
2001	192,269	47,988	0.250	144,071	399,277	207,008
2002	135,233	31,053	0.230	103,343	251,943	116,710
2003	200,918	32,933	0.171	167,691	337,768	156,727
2004	127,949	20,346	0.159	106,691	205,866	77,917
2005	134,841	21,697	0.161	112,739	179,781	44,940
2006	167,053	21,361	0.128	145,572	231,166	64,113
2007	105,012	17,090	0.163	87,604	217,253	112,241
Average(97-06)	137,465	26,739	0.198	110,177	234,500	99,024
Maximum(97-06)	200,918	47,988	0.255	167,691	399,277	207,008
Minimum(97-06)	91,548	19,038	0.128	70,715	141,041	44,940
S.D.(84-06)	29,474	8,876	0.049	24,523	67,427	46,409
C.V.(84-06)	21.4%	33.2%	24.6%	22.3%	28.8%	46.9%

[a] U.S. catch and run size are preliminary.

[b] Spawning escapement includes removals for Canadian Aboriginal.

Table 6. Historical age composition of sockeye salmon passing Canyon Island, Taku River, 1983 to 2007.

	Sample	Percent By Age Class													
Year	Size	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	3.2	2.4	3.3
1983	1,574	0.0	0.4	0.0	5.7	16.6	0.0	0.0	62.5	7.6	0.2	7.4	0.0	0.0	0.1
1984	1,583	0.3	2.1	1.8	11.5	15.4	0.2	0.2	57.0	9.2	0.3	2.8	0.0	0.0	0.0
1985	2,437	0.3	6.0	4.1	4.0	17.2	0.4	0.4	53.8	8.7	0.7	4.8	0.0	0.1	0.0
1986	3,468	0.0	2.9	0.4	6.3	29.7	0.1	0.0	50.2	2.4	0.3	8.0	0.0	0.0	0.0
1987	2,987	0.8	1.0	5.0	12.7	17.3	2.0	0.2	54.2	2.3	0.2	4.6	0.0	0.1	0.0
1988	2,450	0.3	6.5	6.2	8.0	29.8	0.3	0.0	38.7	5.6	0.2	4.6	0.1	0.0	0.0
1989	4,272	0.3	3.0	4.2	7.0	19.5	0.4	0.0	58.3	3.3	0.2	4.0	0.0	0.0	0.0
1990	4,489	0.4	4.9	3.6	4.7	26.3	0.2	0.1	48.5	6.4	0.3	4.8	0.0	0.0	0.0
1991	3,594	0.1	7.9	3.3	9.5	31.4	0.8	0.1	37.7	4.9	0.3	4.4	0.0	0.0	0.0
1992	1,678	0.3	7.1	3.0	12.3	26.7	0.7	0.1	41.2	3.8	0.0	5.4	0.0	0.0	0.0
1993	2,593	0.2	4.3	3.2	11.0	15.6	0.7	0.0	55.5	4.9	0.2	4.9	0.0	0.0	0.0
1994	2,789	1.0	5.1	5.2	9.4	17.3	0.1	0.0	55.2	4.0	0.1	3.0	0.0	0.0	0.0
1995	3,461	0.3	14.6	3.0	4.0	32.9	0.1	0.1	36.3	5.8	0.1	3.0	0.0	0.0	0.0
1996	2,659	0.1	3.8	1.3	18.3	17.1	0.1	0.0	51.1	5.9	0.2	2.1	0.0	0.0	0.0
1997	2,787	0.1	1.4	1.8	9.4	27.4	0.2	0.2	44.5	7.3	0.1	7.6	0.1	0.0	0.0
1998	2,429	0.1	2.4	5.2	0.8	19.7	0.3	0.0	60.4	6.9	0.2	4.0	0.0	0.0	0.1
1999	2,261	0.9	4.8	6.5	2.5	39.9	1.1	0.0	30.3	12.1	0.1	1.7	0.0	0.0	0.0
2000	2,305	0.0	6.3	1.2	8.6	34.5	0.2	0.0	42.3	4.6	0.1	2.0	0.0	0.0	0.0
2001	2,145	0.5	2.2	8.3	9.7	21.4	0.3	0.0	53.8	2.1	0.1	1.4	0.0	0.0	0.0
2002	2,460	0.3	8.9	2.8	2.6	37.1	0.0	0.2	43.9	2.0	0.4	1.7	0.0	0.0	0.0
2003	1,982	0.4	6.8	3.5	7.6	24.9	0.1	0.1	54.4	1.1	0.2	1.2	0.0	0.0	0.0
2004	2,232	0.3	7.5	0.7	16.2	30.8	0.0	0.0	39.1	3.4	0.2	1.8	0.0	0.0	0.0
2005	1,724	0.1	4.9	0.2	15.0	24.7	0.0	0.1	50.2	2.7	0.1	2.1	0.0	0.0	0.0
2006	1,862	0.2	8.2	1.4	5.5	27.2	0.1	0.0	47.3	7.5	0.4	2.3	0.0	0.0	0.0
2007	1,767	0.1	7.7	0.7	8.3	39.2	0.1	0.0	36.6	3.2	0.3	3.9	0.0	0.0	0.0
Average(83-06)	2,593	0.3	5.1	3.2	8.4	25.0	0.4	0.1	48.6	5.2	0.2	3.7	0.0	0.0	0.0
SD(83-06)		0.3	3.1	2.2	4.5	7.3	0.5	0.1	8.5	2.7	0.1	2.0	0.0	0.0	0.0
CV(83-06)		87.8%	61.4%	68.4%	53.0%	29.1%	129.0%	137.6%	17.4%	51.9%	65.9%	53.4%	-	-	-

Table 7. Migratory timing statistics of sockeye, pink , and chum salmon past the Canyon Island fish wheels, 1984 to 2007. Timing statistics in 1984 were based on catch, all other years were based on fish wheel CPUE.

	Species					
	Sockeye		Pink		Chum	
Year	Mean Date	S.D.	Mean Date	S.D.	Mean Date	S.D.
1984	7/23	17.6	7/19	9.3	8/14	12.8
1985	7/24	18.1	7/19	8.5	9/8	11.8
1986	7/16	14.2	7/27	5.5	8/7	11.3
1987	7/24	15.8	7/19	9.3	9/8	10.5
1988	7/19	19.5	7/21	9.6	8/31	12.5
1989	7/14	20.1	7/18	7.8	9/13	15.9
1990	7/20	18.8	7/23	8.9	8/30	15.1
1991	7/24	20.6	7/23	6.6	9/11	13.0
1992	7/25	14.4	7/24	7.2	8/28	13.5
1993	7/21	16.9	7/15	8.9	9/7	14.4
1994	7/23	20.2	7/24	10.1	9/2	15.6
1995	7/22	22.0	7/14	7.8	9/3	9.8
1996	7/21	18.9	7/23	6.5	8/27	14.0
1997	7/26	23.9	7/14	10.0	9/5	11.6
1998	7/18	21.1	7/24	7.9	9/4	8.7
1999	7/18	19.5	7/24	7.9	9/3	14.5
2000	7/17	20.8	7/25	8.7	8/30	16.9
2001	7/20	18.1	7/18	8.4	9/2	13.4
2002	7/9	18.6	7/20	7.6	8/31	12.3
2003	7/19	16.5	7/15	7.8	9/3	12.2
2004	7/18	19.5	7/24	8.3	9/4	19.2
2005	7/20	20.5	7/15	7.7	9/5	16.4
2006	8/4	18.6	7/26	7.8	9/4	13.2
2007	7/29	16.6	7/26	8.4	9/7	10.7
Average(97-06)	7/20	18.8	7/20	8.2	9/1	13.3

Table 8. Weekly and cumulative proportions of three individual sockeye salmon stocks passing Canyon Island in 2007, based on spawning ground tag recoveries expanded by fish wheel indices (fish wheel CPUE).

			Little Trapper Lake		Tatsamenie Lake	
Statistical Week	Week Starting	Week Ending	Weekly Proportion	Cumul. Proportion	Weekly Proportion	Cumul. Proportion
22	22-May	28-May				
23	29-May	4-Jun				
24	5-Jun	11-Jun	0.000	0.000		
25	12-Jun	18-Jun	0.003	0.003		
26	19-Jun	25-Jun	0.019	0.022	0.000	0.000
27	26-Jun	2-Jul	0.114	0.136	0.004	0.004
28	3-Jul	9-Jul	0.102	0.238	0.003	0.007
29	10-Jul	16-Jul	0.098	0.336	0.009	0.016
30	17-Jul	23-Jul	0.133	0.469	0.060	0.076
31	24-Jul	30-Jul	0.338	0.807	0.486	0.562
32	31-Jul	6-Aug	0.131	0.938	0.321	0.883
33	7-Aug	13-Aug	0.062	1.000	0.071	0.954
34	14-Aug	20-Aug	0.000	1.000	0.027	0.981
35	21-Aug	27-Aug	0.000	1.000	0.005	0.986
36	28-Aug	3-Sep			0.010	0.996
37	4-Sep	10-Sep			0.004	1.000

Table 9. Inriver migration timing for four Taku River sockeye salmon stocks, 2007[a].

Stock	Week	Travel Time	SD	SE	N	95% C.I.
L. Trapper	25	54.50	0.00	0.00	1	
	26	49.30	3.83	1.71	5	3.36
	27	44.36	3.43	0.57	36	1.12
	28	39.86	3.01	0.60	25	1.18
	29	32.62	3.08	0.60	26	1.18
	30	28.79	3.85	0.57	45	1.13
	31	24.81	3.81	0.43	77	0.85
	32	23.63	2.90	0.75	15	1.47
	33	24.00	4.95	3.50	2	6.86
	Average	31.69				
Tatsamenie	27	52.50	1.00	0.58	3	1.13
	28	46.00	0.71	0.50	2	0.98
	29	39.00	3.02	1.23	6	2.41
	30	33.87	3.33	0.47	51	0.91
	31	30.93	6.00	0.34	304	0.67
	32	31.97	7.21	0.56	163	1.11
	33	31.24	6.82	1.23	31	2.40
	34	31.43	5.84	1.56	14	3.06
	35	29.50	3.61	2.08	3	4.08
	36	25.17	2.80	1.15	6	2.24
	37	22.17	1.53	0.88	3	1.73
	Average	31.64				

[a] The average travel time for each weekly period was derived from the number of days the tagged fish took to travel between the tagging sire (Canyon Island) and the recovery location (weir site).

Table 10. Historical length (MEF) at age composition of sockeye salmon passing Canyon Island, Taku River, 2007.

	Sample	Length At Age Class													
Year	Size	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	2.4	3.2	3.3
1983	1,573		447		577	469			578	522	618	582			
1984	1,572	297	445	315	575	476	320	610	576	511	580	589			
1985	2,422	309	457	337	572	486	372	609	579	510	597	590	625		
1986	3,362		449	305	584	493	310		582	491	598	581			
1987	2,923	316	460	319	587	463	329	610	592	494	565	592	650		
1988	2,422	313	443	319	576	482	324		578	480	600	578			
1989	4,254	315	442	340	578	468	334		591	488	619	589			
1990	4,432	316	427	326	570	470	322	612	574	485	578	576	555		
1991	3,581	313	442	322	561	463	321	610	569	482	602	572			
1992	1,667	351	431	328	564	467	345	585	568	482		569			
1993	2,582	316	440	327	555	470	333		558	507	573	556			
1994	2,784	329	431	327	559	455	325		557	497	585	561			
1995	3,435	324	455	329	563	481	357	625	562	509	630	569			
1996	2,649	300	472	323	581	489	338		583	524	607	587			
1997	2,770	310	461	332	579	503	339	581	580	514	585	574		490	
1998	2,427	313	445	327	578	483	346		569	510	579	575			555
1999	2,251	328	446	317	565	485	326	555	568	515	612	575		540	
2000	2,300	310	460	324	583	503	329		582	508	610	581			
2001	2,140	308	449	324	581	498	340	600	586	519	572	567			
2002	2,453	299	437	334	583	473	320	614	589	522	609	595			
2003	1,966	336	458	340	570	475	340	570	578	492	582	593			
2004	2,231	338	463	332	580	500		585	570	505	588	591			
2005	1,842	345	457	331	564	472		600	563	490	585	563			
2006	1,858	325	450	334	564	484			570	515	574	565			
2007	1,834	326	465	337	585	499	353		585	523	602	589			
Average(97-06)	2,224	321	453	330	575	488	334	586	576	509	590	578		515	555
SD(97-06)		15.3	8.5	6.6	8.0	12.4	9.4	20.1	8.7	10.7	15.1	11.7		35.4	
CV(97-06)		4.8%	1.9%	2.0%	1.4%	2.6%	2.8%	3.4%	1.5%	2.1%	2.6%	2.0%			-

Table 11. Historical age composition of chum salmon passing Canyon Island fish wheels, Taku River, 2007.

Year	Sample Size	Percent by Age Class 0.2	0.3	0.4	0.5	0.6
1983	24	8.3	45.8	54.2	8.3	0.0
1984	280	2.5	85.0	13.6	0.0	0.0
1985	728	0.4	68.1	31.9	0.0	0.0
1986	64	0.0	51.6	51.6	0.0	0.0
1987	1075	1.0	48.6	48.8	2.0	0.0
1988	853	0.0	30.4	68.5	1.5	0.0
1989	574	0.5	77.4	19.5	3.1	0.3
1990	636	0.3	23.0	76.7	0.5	0.3
1991	missing data					
1992	163	0.0	56.4	37.4	8.0	0.0
1993	278	0.7	22.3	75.9	2.5	0.0
1994	310	0.6	32.6	63.2	4.8	0.0
1995	192	2.1	19.8	75.5	4.7	0.0
1996	351	1.1	68.4	23.4	7.1	0.0
1997	425	0.9	56.2	42.4	0.5	0.0
1998	152	0.7	27.6	67.8	3.9	0.0
1999	151	2.0	84.1	13.9	0.0	0.0
2000	273	0.0	75.5	24.5	0.0	0.0
2001	207	1.0	44.9	54.1	0.0	0.0
2002	144	0.7	45.8	53.5	0.0	0.0
2003	230	2.7	72.9	23.1	1.3	0.0
2004	305	0.2	67.8	31.9	0.1	0.0
2005	198	1.0	54.0	44.9	0.0	0.0
2006	375	1.1	66.7	31.2	1.1	0.0
2007	377	1.6	54.1	42.4	1.9	0.0
Average (97-06)	246	1.0	59.6	38.7	0.7	0.0
SD (97-06)		0.8	17.1	16.7	1.2	0.0
CV (97-06)		1.3	3.5	2.3	0.6	

Table 12. Historical length (MEF) at age composition of chum salmon passing Canyon Island, Taku River, 1983 to 2007.

	Sample	Length at Age Class				
Year	Size	0.2	0.3	0.4	0.5	0.6
1983	24	599	651	658	714	
1984	279	615	630	683		
1985	727	592	658	680		
1986	63		640	666		
1987	1,061	579	642	668	668	
1988	845		642	675	690	
1989	571	587	628	669	678	680
1990	634	655	629	666	690	600
1991	missing data					
1992	163		614	656	667	
1993	277	510	598	638	616	
1994	310	660	610	645	660	
1995	192	556	632	652	663	
1996	350	595	642	662	684	
1997	424	651	640	673	693	
1998	151	600	634	662	703	
1999	149	615	644	664		
2000	273		650	680		
2001	207	528	623	665		
2002	144	610	649	669		
2003	227	564	612	644	650	
2004	634	633	623	657	660	
2005	250	605	646	665		
2006	374	615	647	681	692	
2007	377	581	633	669	663	
Average (97-06)	283	602	637	666	680	
SD (97-06)		36.6	13.2	10.9	23.1	
CV (97-06)		6.1%	2.1%	1.6%	3.4%	

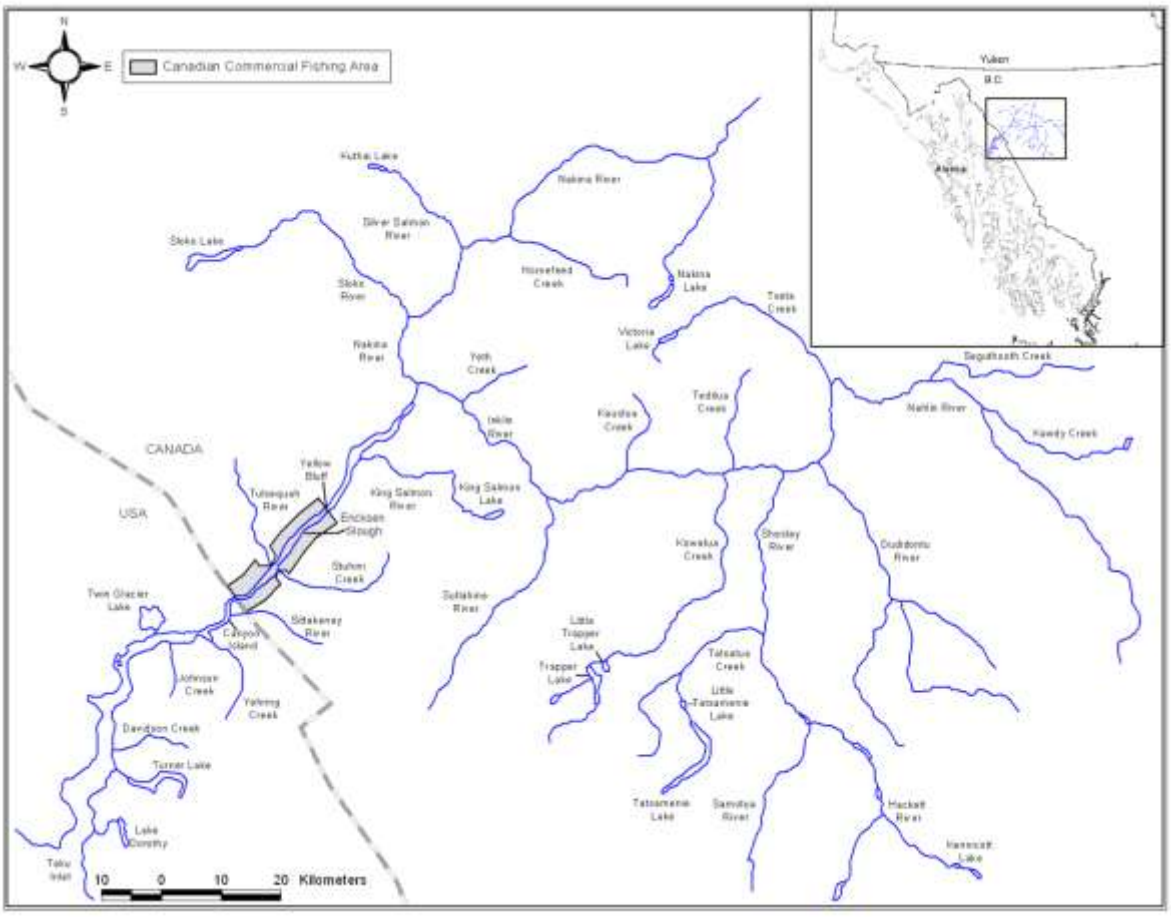


Figure 1. Taku River drainage, with location of tagging sites.

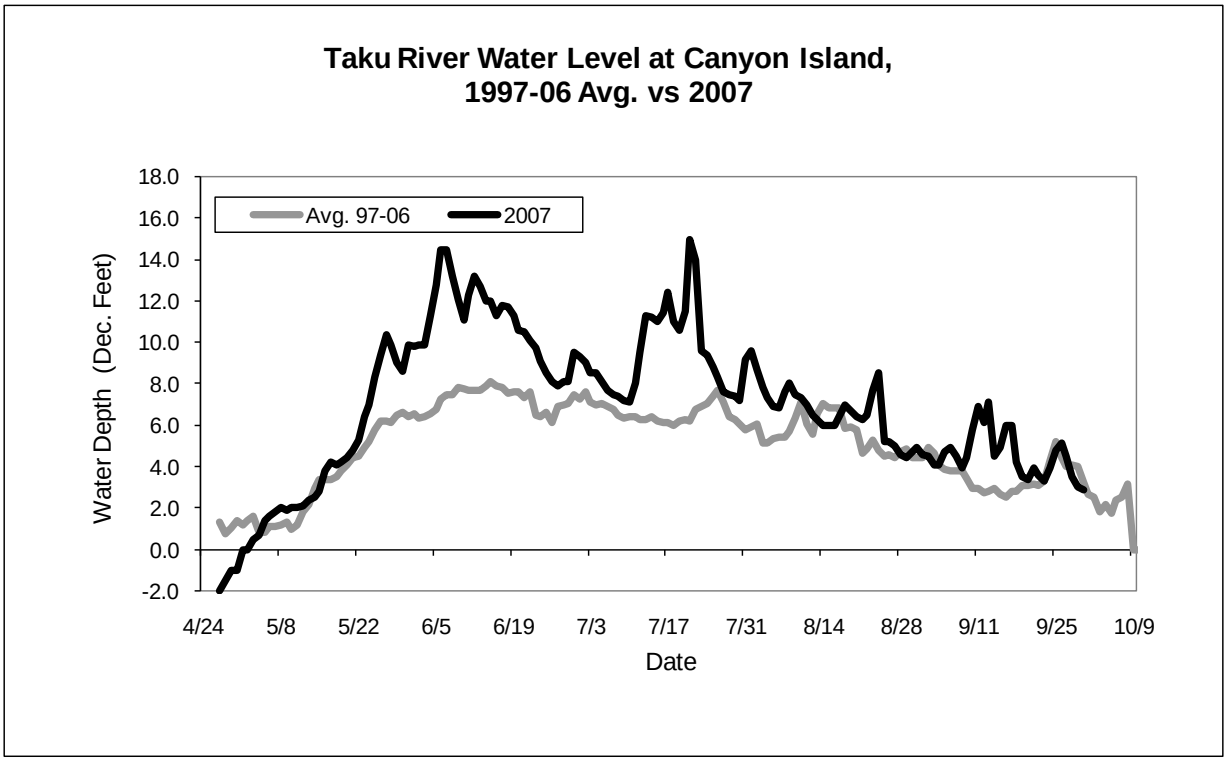
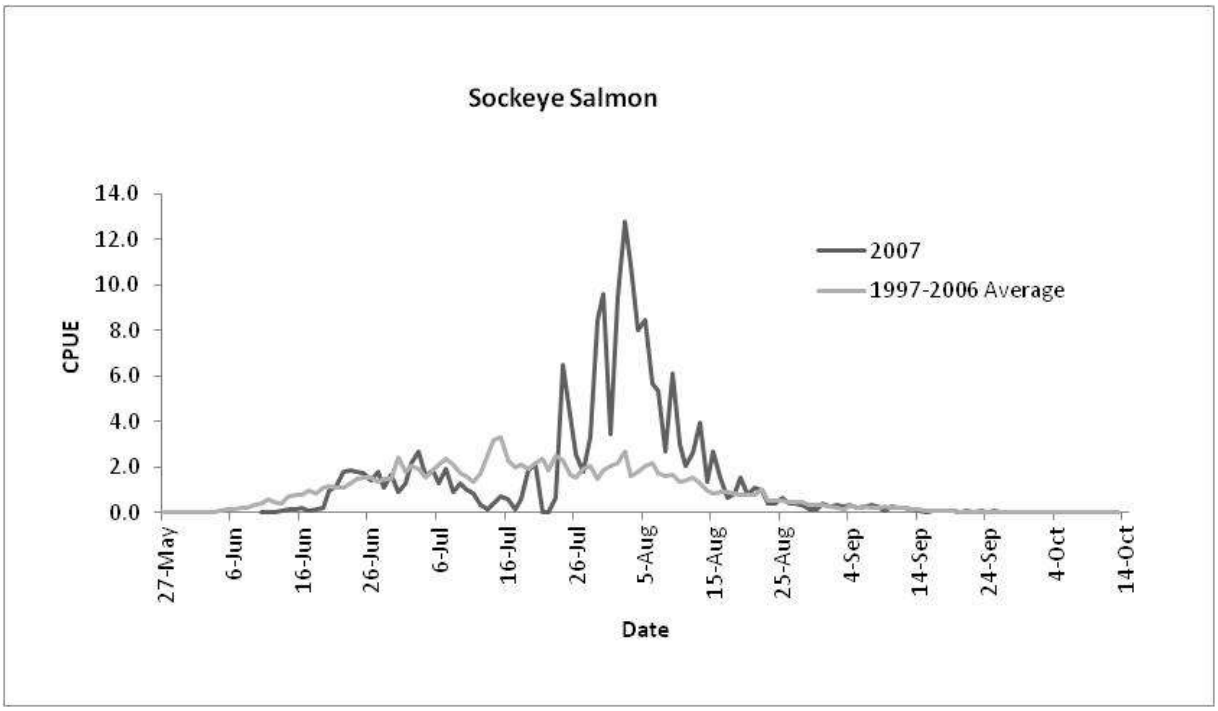


Figure 2. Water levels at Canyon Island, Taku River, 2007 vs. 1997-2006 average.



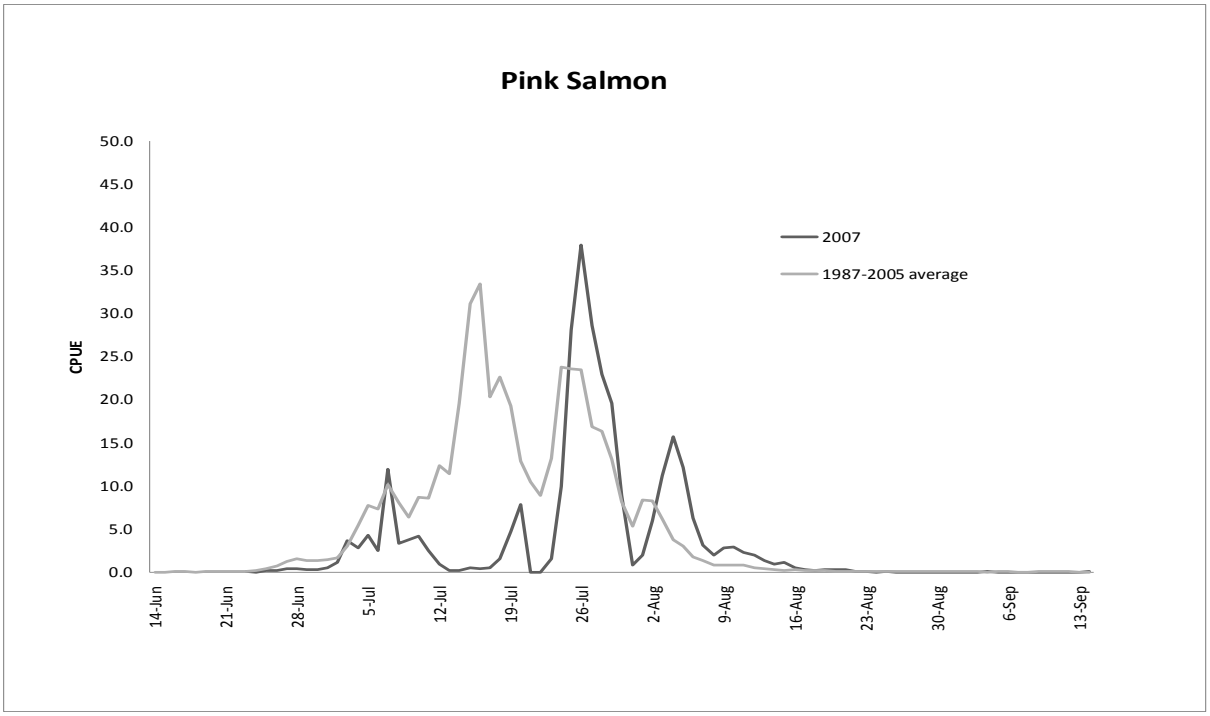
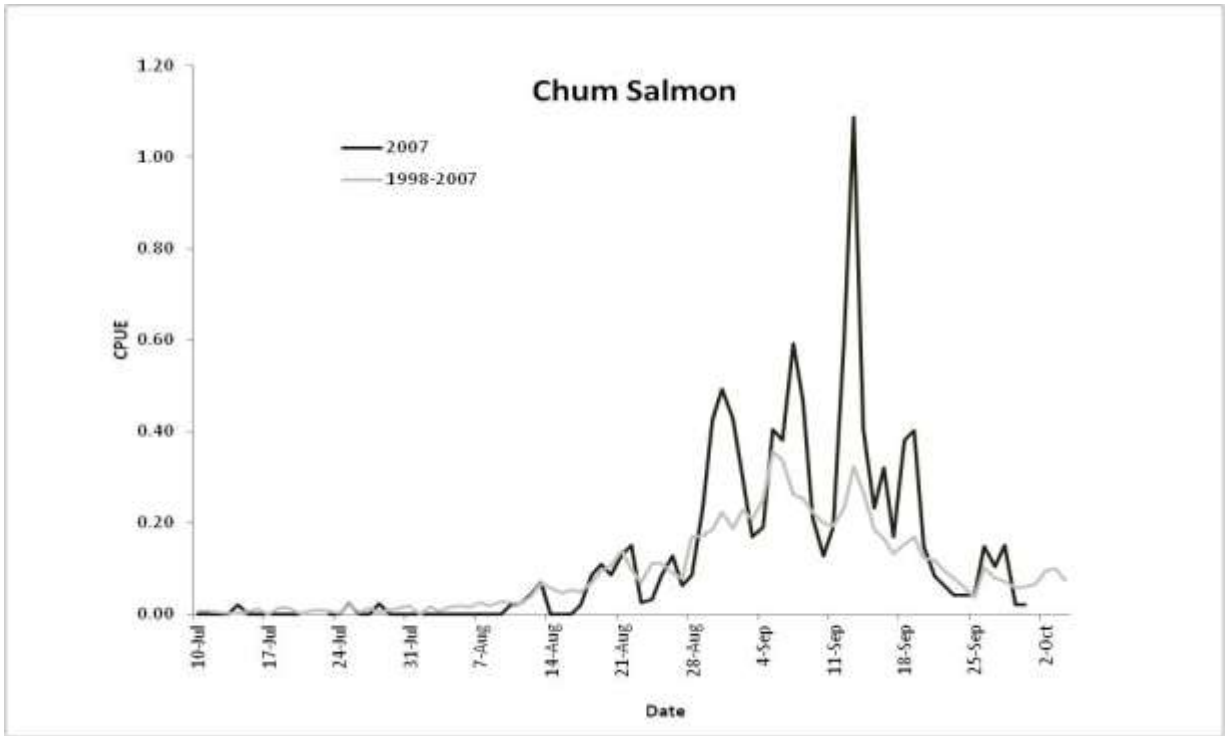


Figure 3. Fish wheel CPUE for sockeye, pink, and chum salmon at Canyon Island, 2007.

Figure 3. continued



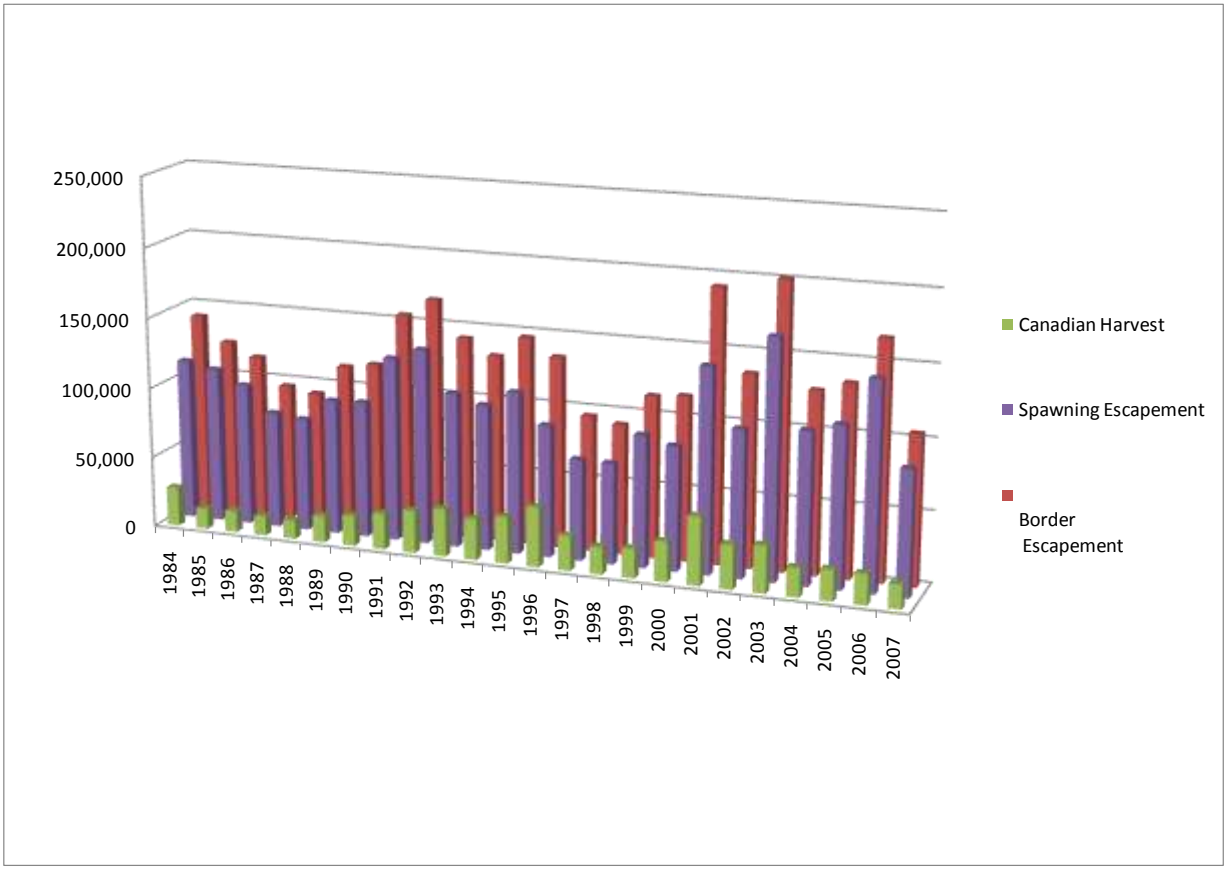


Figure 4. Historical sockeye mark-recapture abundance estimates above the U.S./Canada border including Canadian inriver harvests and escapements for Taku River sockeye, 1984-2007.

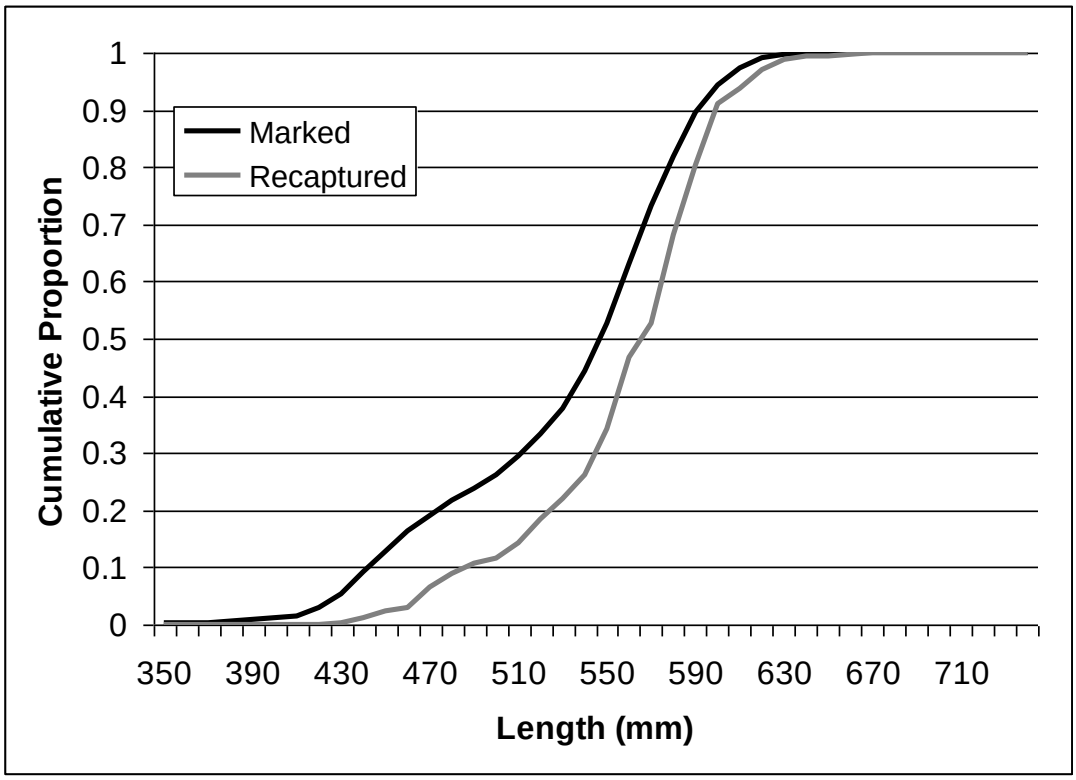


Figure 5. Cumulative Distribution Functions (CDF) of MEF lengths of sockeye salmon tagged at Canyon Island and of tagged sockeye salmon recovered in the Canadian commercial fishery, 2007.

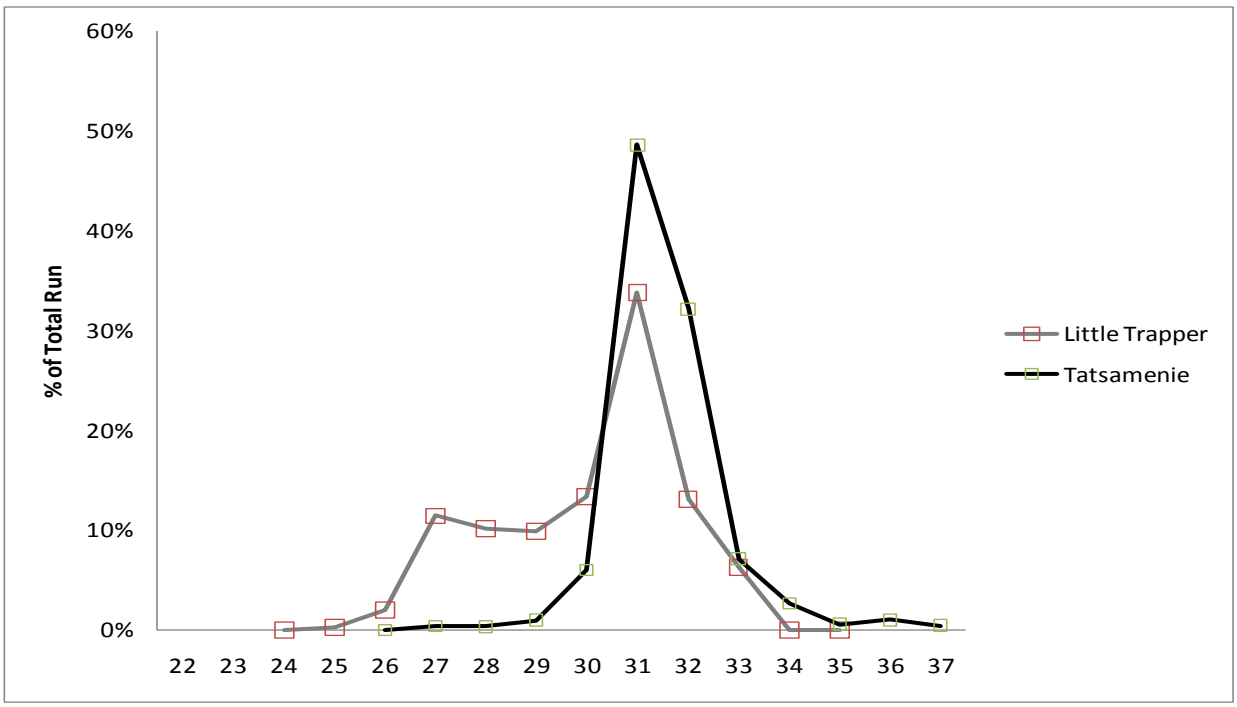


Figure 6. Run timing of two sockeye salmon stock groups passing Canyon Island, 2007.

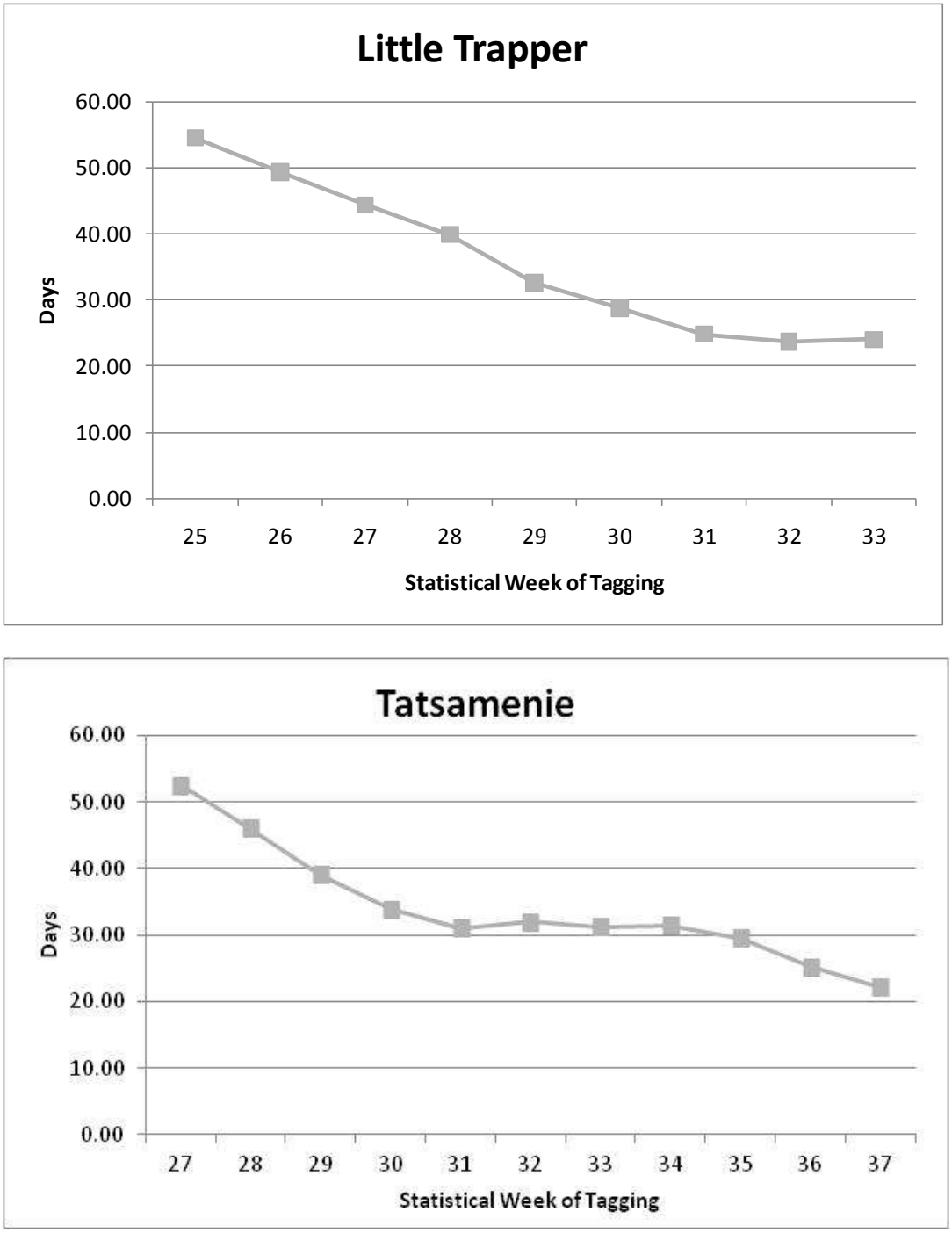


Figure 7. Mean travel times for tagged sockeye salmon between Canyon Island and two upriver locations, 2007.

Appendix A. Inclusive dates for statistical weeks, 2007.

2007 Statistical Week Calendar						
Stat Week	**From**	**Through**		**Stat Week**	**From**	**Through**
1	1-Jan	6-Jan		28	8-Jul	14-Jul
2	7-Jan	13-Jan		29	15-Jul	21-Jul
3	14-Jan	20-Jan		30	22-Jul	28-Jul
4	21-Jan	27-Jan		31	29-Jul	4-Aug
5	28-Jan	3-Feb		32	5-Aug	11-Aug
6	4-Feb	10-Feb		33	12-Aug	18-Aug
7	11-Feb	17-Feb		34	19-Aug	25-Aug
8	18-Feb	24-Feb		35	26-Aug	1-Sep
9	25-Feb	3-Mar		36	2-Sep	8-Sep
10	4-Mar	10-Mar		37	9-Sep	15-Sep
11	11-Mar	17-Mar		38	16-Sep	22-Sep
12	18-Mar	24-Mar		39	23-Sep	29-Sep
13	25-Mar	31-Mar		40	30-Sep	6-Oct
14	1-Apr	7-Apr		41	7-Oct	13-Oct
15	8-Apr	14-Apr		42	14-Oct	20-Oct
16	15-Apr	21-Apr		43	21-Oct	27-Oct
17	22-Apr	28-Apr		44	28-Oct	3-Nov
18	29-Apr	5-May		45	4-Nov	10-Nov
19	6-May	12-May		46	11-Nov	17-Nov
20	13-May	19-May		47	18-Nov	24-Nov
21	20-May	26-May		48	25-Nov	1-Dec
22	27-May	2-Jun		49	2-Dec	8-Dec
23	3-Jun	9-Jun		50	9-Dec	15-Dec
24	10-Jun	16-Jun		51	16-Dec	22-Dec
25	17-Jun	23-Jun		52	23-Dec	29-Dec
26	24-Jun	30-Jun		53	30-Dec	
27	1-Jul	7-Jul		54		

Appendix B.1. Catches and number tagged of salmon in the fish wheels at Canyon Island, 2007.

		Fish Wheel				Sockeye					Sockeye					Chum			DV		Steelhead	
Stat		FWI		FW2		Caught		Tagged			CPUE			Caught		Caught			Caught		Caught	
Week	Date	Hrs	RPM	Hrs	RPM	Daily	Cum.	Daily	Cum.	Daily	Cum	Cum. Prop	Daily	Cum.	CPUE	Daily	Cum.	CPUE	Daily	Cum.	Daily	Cum.
17	4/22/07																					
17	4/23/07						0		0					0			0			0		0
17	4/24/07						0		0					0			0			0		0
17	4/25/07						0		0					0			0			0		0
17	4/26/07						0		0					0			0			0		0
17	4/27/07						0		0	0	0	0		0			0			0		0
17	4/28/07						0		0	0	0	0		0			0			0		0
18	4/29/07						0		0	0	0	0		0			0			0		0
18	4/30/07						0		0	0	0	0		0			0			0		0
18	5/1/07						0		0	0	0	0		0			0			0		0
18	5/2/07						0		0	0	0	0		0			0			0		0
18	5/3/07						0		0	0	0	0		0			0			0		0
18	5/4/07						0		0	0	0	0		0			0			0		0
18	5/5/07						0		0	0	0	0		0			0			0		0
19	5/6/07						0		0	0	0	0		0			0			0		0
19	5/7/07						0		0	0	0	0		0			0			0		0
19	5/8/07						0		0	0	0	0		0			0			0		0
19	5/9/07						0		0	0	0	0		0			0			0		0
19	5/10/07						0		0	0	0	0		0			0			0		0
19	5/11/07						0		0	0	0	0		0			0			0		0
19	5/12/07						0		0	0	0	0		0			0			0		0
20	5/13/07						0		0	0	0	0		0			0			0		0
20	5/14/07						0		0	0	0	0		0			0			0		0
20	5/15/07						0		0	0	0	0		0			0			0		0
20	5/16/07						0		0	0	0	0		0			0			0		0
20	5/17/07						0		0	0	0	0		0			0			0		0
20	5/18/07	5.5	1.7			0	0	0	0	0	0	0	0	0		0	0		0	0	0	0
20	5/19/07	24	1.9	7.5	2.2	0	0	0	0	0	0	0	0	0		0	0		0	0	1	1
21	5/20/07	22.6	1.7	23.8	2.2	0	0	0	0	0	0	0	0	0		0	0		5	5	0	1
21	5/21/07	23.3	2.3	23.7	2.2	0	0	0	0	0	0	0	0	0		0	0		1	6	0	1
21	5/22/07	23.3	2.3	23.8	2.3	0	0	0	0	0	0	0	0	0		0	0		0	6	0	1
21	5/23/07	11.3	3.2	23.8	2.5	0	0	0	0	0	0	0	0	0		0	0		1	7	0	1
21	5/24/07	0	0	23.8	2.5	0	0	0	0	0	0	0	0	0		0	0		0	7	0	1
21	5/25/07	12	2.5	23.8	2.5	0	0	0	0	0	0	0	0	0		0	0		1	8	0	1
21	5/26/07	23.9	2.9	23.9	2.1	0	0	0	0	0	0	0	0	0		0	0		0	8	0	1
22	5/27/07	23.9	2.9	23.9	2.1	0	0	0	0	0	0	0	0	0		0	0		0	8	0	1
22	5/28/07	23.9	2.8	23.9	2.1	0	0	0	0	0	0	0	0	0		0	0		0	8	0	1
22	5/29/07	23.8	2.6	23.3	2	0	0	0	0	0	0	0	0	0		0	0		0	8	0	1
22	5/30/07	23.7	2.5	22.8	2.5	0	0	0	0	0	0	0	0	0		0	0		0	8	0	1
22	5/31/07	23.9	3.1	23.9	2.9	0	0	0	0	0	0	0	0	0		0	0		0	8	0	1
22	6/1/07	23.8	2.6	23.7	2.6	0	0	0	0	0	0	0	0	0		0	0		0	8	0	1
22	6/2/07	23.8	3	23.8	2.7	0	0	0	0	0	0	0	0	0		0	0		0	8	0	1
23	6/3/07	23.8	2.3	23.8	2.3	0	0	0	0	0	0	0	0	0		0	0		0	8	0	1
23	6/4/07	20.4	2.9	20.5	2.7	0	0	0	0	0	0	0	0	0		0	0		0	8	1	2
23	6/5/07	0	0	0	0		0		0	0	0	0		0			0			8		2
23	6/6/07	0	0	0	0		0		0	0	0	0		0			0			8		2
23	6/7/07	0	0	0	0		0		0	0	0	0		0			0			8		2
23	6/8/07	0	0	14.8	2.1		0		0	0	0	0		0			0			8		2
23	6/9/07	13.8	3	23.8	2.1	0	0	0	0	0	0	0	0	0		0	0		0	8	0	2
24	6/10/07	18.8	3	23.8	2.1	1	1	1	1	0.023	0.023	0.000	0	0		0	0		3	11	0	2
24	6/11/07	10.4	3.1	16.3	2.2	1	2	1	2	0.037	0.061	0.000	0	0		0	0		0	11	0	2
24	6/12/07	0	0	8.75	2.2	0	2	0	2	0.000	0.061	0.000	0	0		0	0		0	11	0	2

Appendix B.1. Catches and number tagged of salmon in the fish wheels at Canyon Island, 2007.

		Fish Wheel				Sockeye					Sockeye		Pink			Chum			DV		Steelhead	
Stat		FWI		FW2		Caught		Tagged			CPUE		Caught			Caught			Caught		Caught	
Week	Date	Hrs	RPM	Hrs	RPM	Daily	Cum.	Daily	Cum.	Daily	Cum	Cum. Prop	Daily	Cum.	CPUE	Daily	Cum.	CPUE	Daily	Cum.	Daily	Cum.
24	6/13/07	14.8	3.1	14.9	2.2	2	4	2	4	0.067	0.128	0.001	0	0		0	0		0	11	0	2
24	6/14/07	9.17	2.7	9.33	2.2	2	6	2	6	0.108	0.236	0.001	0	0		0	0		0	11	0	2
24	6/15/07	13.7	2.7	15.3	2.2	3	9	3	9	0.104	0.340	0.002	0	0		0	0		0	11	0	2
24	6/16/07	23.8	2.7	23.7	2.3	8	17	8	17	0.168	0.509	0.003	0	0		0	0		2	13	0	2
25	6/17/07	23.8	2.7	23.8	2.4	4	21	4	21	0.084	0.593	0.003	0	0		0	0		0	13	0	2
25	6/18/07	23.8	2.7	23.8	1.6	6	27	6	27	0.126	0.719	0.004	0	0		0	0		0	13	0	2
25	6/19/07	23.8	2.5	23.4	2	8	35	8	35	0.169	0.888	0.005	0	0		0	0		1	14	0	2
25	6/20/07	21.1	2.6	19.2	2.2	39	74	34	69	0.969	1.857	0.010	0	0		0	0		2	16	0	2
25	6/21/07	23.7	2.6	23.3	2.7	53	127	52	121	1.130	2.987	0.017	0	0		0	0		1	17	0	2
25	6/22/07	23.4	2.6	22.7	2.2	81	208	80	201	1.757	4.744	0.026	0	0		0	0		1	18	0	2
25	6/23/07	23.6	2.6	22.2	2	85	293	82	283	1.858	6.602	0.037	1	1	0.022	0	0		1	19	0	2
26	6/24/07	22.8	2.2	23.5	2.3	82	375	75	358	1.770	8.372	0.046	0	1	0.000	0	0		4	23	0	2
26	6/25/07	23.6	2.7	22.1	2.2	80	455	77	435	1.752	10.124	0.056	7	8	0.153	0	0		1	24	0	2
26	6/26/07	23.7	2.2	22.8	2.1	66	521	62	497	1.419	11.543	0.064	7	15	0.151	0	0		2	26	0	2
26	6/27/07	20.4	2	22.5	1.9	77	598	69	566	1.797	13.340	0.074	16	31	0.373	0	0		1	27	0	2
26	6/28/07	23.5	2.3	22.8	2.4	51	649	48	614	1.103	14.443	0.080	19	50	0.411	0	0		5	32	0	2
26	6/29/07	23.1	2.4	23.4	2.4	77	726	70	684	1.656	16.099	0.089	14	64	0.301	0	0		10	42	0	2
26	6/30/07	23.1	2.7	22.1	2.7	41	767	39	723	0.908	17.007	0.094	12	76	0.266	0	0		7	49	0	2
27	7/1/07	23.7	2.3	23	2.5	59	826	55	778	1.264	18.271	0.101	20	96	0.429	0	0		5	54	0	2
27	7/2/07	23.8	2.4	23.5	2.6	102	928	92	870	2.159	20.430	0.113	50	146	1.058	0	0		8	62	0	2
27	7/3/07	23.8	2.4	21.8	2.2	122	1050	107	977	2.677	23.106	0.128	165	311	3.620	0	0		5	67	0	2
27	7/4/07	23.4	2.4	22.8	2	75	1125	73	1050	1.624	24.731	0.137	130	441	2.816	0	0		15	82	0	2
27	7/5/07	8.5	2	22.7	2.2	58	1183	50	1100	1.861	26.592	0.148	131	572	4.203	0	0		11	93	0	2
27	7/6/07	13.5	2	23.1	2	47	1230	46	1146	1.285	27.876	0.155	89	661	2.433	0	0		5	98	0	2
27	7/7/07	23	1.9	21.9	2.3	87	1317	76	1222	1.937	29.813	0.165	536	1197	11.932	0	0		14	112	1	3
28	7/8/07	23.2	2.1	23.3	2.6	42	1359	42	1264	0.905	30.718	0.171	153	1350	3.296	0	0		6	118	0	3
28	7/9/07	22.8	1.9	23.1	2.4	59	1418	58	1322	1.285	32.003	0.178	169	1519	3.681	0	0		5	123	0	3
28	7/10/07	23.3	2.3	23	2.4	48	1466	48	1370	1.038	33.041	0.183	193	1712	4.173	0	0		4	127	0	3
28	7/11/07	23.4	2.6	23.5	2.5	39	1505	37	1407	0.831	33.872	0.188	114	1826	2.430	0	0		2	129	0	3
28	7/12/07	23.6	3	23.6	2.7	16	1521	15	1422	0.339	34.211	0.190	40	1866	0.848	0	0		1	130	0	3
28	7/13/07	23.3	2.8	23.8	3	7	1528	7	1429	0.149	34.360	0.191	7	1873	0.149	0	0		1	131	0	3
28	7/14/07	23.7	2.8	23.5	2.7	18	1546	17	1446	0.382	34.742	0.193	10	1883	0.212	1	1	0.021	9	140	0	3
29	7/15/07	23.4	2.7	23.3	2.4	33	1579	32	1478	0.707	35.449	0.197	22	1905	0.471	0	1	0.000	8	148	1	4
29	7/16/07	23.4	2.6	23.6	2.6	26	1605	25	1503	0.553	36.002	0.200	16	1921	0.340	0	1	0.000	4	152	0	4
29	7/17/07	14.1	2.6	23.7	2.5	4	1609	4	1507	0.106	36.108	0.200	16	1937	0.424	0	1	0.000	7	159	0	4
29	7/18/07	23.6	2.7	23.1	2.6	27	1636	26	1533	0.579	36.687	0.204	72	2009	1.543	0	1	0.000	18	177	0	4
29	7/19/07	23.4	2.5	22	2.6	83	1719	78	1611	1.827	38.514	0.214	214	2223	4.712	0	1	0.000	21	198	0	4
29	7/20/07	14.9	2.7	14	2.5	61	1780	58	1669	2.109	40.624	0.225	226	2449	7.815	0	1	0.000	7	205	0	4
29	7/21/07	0	0	0	0		1780		1669	0.000	40.624	0.225		2449	0.000		1	0.000		205		4
30	7/22/07	0	0	0	0		1780		1669	0.000	40.624	0.225		2449	0.000		1	0.000		205		4
30	7/23/07	15.8	2.3	15.3	2.3	19	1799	18	1687	0.613	41.236	0.229	46	2495	1.484	0	1	0.000	1	206	0	4
30	7/24/07	23.1	2.7	20	2.6	279	2078	274	1961	6.476	47.713	0.265	426	2921	9.889	0	1	0.000	4	210	0	4
30	7/25/07	22.9	2.5	20.8	2.5	187	2265	175	2136	4.282	51.995	0.289	1224	4145	28.028	1	2	0.023	9	219	0	4
30	7/26/07	22.7	2.3	21.8	2.5	114	2379	99	2235	2.566	54.561	0.303	1685	5830	37.933	0	2	0.000	3	222	0	4
30	7/27/07	22.8	2.2	21.8	2.2	79	2458	70	2305	1.775	56.337	0.313	1270	7100	28.539	0	2	0.000	11	233	0	4
30	7/28/07	22.6	2.3	22.1	2.1	147	2605	133	2438	3.292	59.628	0.331	1025	8125	22.951	1	3	0.022	10	243	0	4
31	7/29/07	20.8	2.4	19	2.1	336	2941	316	2754	8.436	68.064	0.378	778	8903	19.533	0	3	0.000	11	254	0	4
31	7/30/07	22.2	2.4	18.2	2	388	3329	349	3103	9.618	77.682	0.431	357	9260	8.850	0	3	0.000	3	257	2	6
31	7/31/07	23.4	2.7	21.5	2.6	154	3483	146	3249	3.428	81.111	0.450	35	9295	0.779	0	3	0.000	2	259	0	6
31	8/1/07	21.6	2.5	16.9	2.5	365	3848	345	3594	9.481	90.591	0.503	76	9371	1.974	0	3	0.000	3	262	0	6
31	8/2/07	22.6	2.4	16.8	2.6	502	4350	480	4074	12.764	103.355	0.574	234	9605	5.950	0	3	0.000	1	263	0	6
31	8/3/07	21.9	2.3	19.2	2.4	447	4797	410	4484	10.879	114.233	0.634	460	10065	11.195	0	3	0.000	3	266	0	6
31	8/4/07	22.3	2.3	19.9	2.4	337	5134	308	4792	7.990	122.223	0.678	660	10725	15.647	0	3	0.000	7	273	0	6
32	8/5/07	22.2	2.2	20.3	2.2	358	5492	344	5136	8.439	130.662	0.725	513	11238	12.093	0	3	0.000	10	283	0	6
32	8/6/07	22.5	2	21.5	2	250	5742	234	5370	5.682	136.344	0.757	276	11514	6.273	0	3	0.000	3	286	4	10
32	8/7/07	22.5	2.5	21.8	2.6	238	5980	222	5592	5.369	141.713	0.787	139	11653	3.136	0	3	0.000	1	287	0	10
32	8/8/07	23.2	2.6	22.8	2.4	122	6102	106	5698	2.652	144.365	0.801	88	11741	1.913	0	3	0.000	1	288	0	10
32	8/9/07	23.2	2.4	21.2	2	270	6372	257	5955	6.089	150.454	0.835	124	11865	2.797	0	3	0.000	4	292	0	10

Appendix B.1. Catches and number tagged of salmon in the fish wheels at Canyon Island, 2007.

		Fish Wheel				Sockeye					Sockeye		Pink			Chum			DV		Steelhead	
Stat		FWI		FW2		Caught		Tagged			CPUE		Caught			Caught			Caught		Caught	
Week	Date	Hrs	RPM	Hrs	RPM	Daily	Cum.	Daily	Cum.	Daily	Cum	Cum. Prop	Daily	Cum.	CPUE	Daily	Cum.	CPUE	Daily	Cum.	Daily	Cum.
32	8/10/07	23.1	2.2	22.9	2	137	6509	122	6077	2.978	153.432	0.852	134	11999	2.912	1	4	0.022	4	296	0	10
32	8/11/07	22.9	2	22.5	1.9	92	6601	71	6148	2.026	155.458	0.863	101	12100	2.224	1	5	0.022	4	300	0	10
33	8/12/07	22.7	2.1	22.3	1.9	117	6718	106	6254	2.605	158.062	0.877	88	12188	1.959	2	7	0.045	4	304	0	10
33	8/13/07	22.3	2	21.5	2	174	6892	166	6420	3.977	162.039	0.899	56	12244	1.280	3	10	0.069	3	307	0	10
33	8/14/07	18.7	2	17.9	2	49	6941	19	6439	1.339	163.379	0.907	31	12275	0.847	0	10	0.000	2	309	0	10
33	8/15/07	22.7	2	15.4	2	101	7042	85	6524	2.652	166.030	0.922	41	12316	1.076	0	10	0.000	9	318	0	10
33	8/16/07	22.4	2.1	22.4	2	69	7111	63	6587	1.539	167.569	0.930	23	12339	0.513	2	12	0.000	9	327	0	10
33	8/17/07	23.4	2.1	23.6	2.3	29	7140	24	6611	0.617	168.186	0.934	12	12351	0.255	1	13	0.021	8	335	0	10
33	8/18/07	23.3	2.6	23.3	2.6	40	7180	37	6648	0.857	169.043	0.938	7	12358	0.150	4	17	0.086	12	347	0	10
34	8/19/07	23.2	2.3	23.1	2.2	71	7251	60	6708	1.535	170.578	0.947	11	12369	0.238	5	22	0.108	3	350	0	10
34	8/20/07	23	2.1	23.3	2.3	37	7288	33	6741	0.800	171.378	0.951	13	12382	0.281	4	26	0.086	3	353	0	10
34	8/21/07	22.9	2.2	23.1	2.1	51	7339	45	6786	1.109	172.487	0.957	10	12392	0.217	6	32	0.130	4	357	0	10
34	8/22/07	23.3	2.5	22.9	2.6	44	7383	39	6825	0.951	173.438	0.963	5	12397	0.108	7	39	0.151	2	359	0	10
34	8/23/07	15.5	2.8	23.5	3	15	7398	10	6835	0.385	173.823	0.965	4	12401	0.103	1	40	0.026	1	360	0	10
34	8/24/07	8.5	2.5	23.4	2.5	13	7411	11	6846	0.407	174.230	0.967	0	12401	0.000	1	41	0.032	0	360	0	10
34	8/25/07	23.1	2	23.3	2	31	7442	24	6870	0.669	174.899	0.971	2	12403	0.043	4	45	0.086	6	366	1	11
35	8/26/07	23.3	2.5	23.6	1.9	17	7459	14	6884	0.362	175.262	0.973	0	12403	0.000	6	51	0.128	4	370	0	11
35	8/27/07	23.6	1.9	23.6	1.9	18	7477	13	6897	0.382	175.644	0.975	0	12403	0.000	3	54	0.064	3	373	1	12
35	8/28/07	23.2	1.5	23.4	1.5	14	7491	14	6911	0.300	175.944	0.977	0	12403	0.000	4	58	0.086	1	374	0	12
35	8/29/07	23.6	1.8	23.6	1.5	5	7496	5	6916	0.106	176.050	0.977	0	12403	0.000	11	69	0.233	3	377	0	12
35	8/30/07	23.5	1.7	23.5	1.5	6	7502	6	6922	0.128	176.178	0.978	0	12403	0.000	20	89	0.426	1	378	0	12
35	8/31/07	23.3	1.9	23.5	1.8	18	7520	16	6938	0.385	176.563	0.980	0	12403	0.000	23	112	0.492	3	381	0	12
35	9/1/07	23.3	2	23.6	1.9	12	7532	9	6947	0.256	176.819	0.981	0	12403	0.000	20	132	0.426	4	385	0	12
36	9/2/07	23.3	2.1	23.6	1.9	16	7548	12	6959	0.342	177.160	0.983	0	12403	0.000	14	146	0.299	3	388	0	12
36	9/3/07	23.4	2.1	23.6	1.9	11	7559	11	6970	0.234	177.394	0.985	0	12403	0.000	8	154	0.170	1	389	0	12
36	9/4/07	23.4	2.4	23.7	2	16	7575	15	6985	0.340	177.734	0.987	1	12404	0.021	9	163	0.191	2	391	1	13
36	9/5/07	23.5	1.9	23.5	2.3	8	7583	6	6991	0.170	177.904	0.988	0	12404	0.000	19	182	0.404	1	392	0	13
36	9/6/07	23.6	2.3	23.6	2.4	10	7593	10	7001	0.254	178.159	0.989	0	12404	0.000	16	198	0.382	1	393	0	13
36	9/7/07	23.6	2.3	23.8	2	8	7601	8	7009	0.338	178.497	0.991	0	12404	0.000	4	202	0.592	5	398	1	14
36	9/8/07	23.5	1.7	23.7	2	7	7608	7	7016	0.233	178.730	0.992	0	12404	0.000	18	220	0.466	0	398	0	14
37	9/9/07	23.5	2.3	23.8	2.3	3	7611	3	7019	0.063	178.793	0.992	0	12404	0.000	9	229	0.212	0	398	0	14
37	9/10/07	23.4	2.5	23.8	2.3	10	7621	9	7028	0.254	179.048	0.994	0	12404	0.000	6	235	0.127	1	399	0	14
37	9/11/07	23.5	2.8	23.8	2.5	8	7629	8	7036	0.190	179.238	0.995	0	12404	0.000	9	244	0.190	2	401	0	14
37	9/12/07	23.3	2.2	23.4	2.2	9	7638	9	7045	0.193	179.431	0.996	0	12404	0.000	28	272	0.600	1	402	2	16
37	9/13/07	22.8	1.9	23.2	2.1	7	7645	7	7052	0.152	179.583	0.997	0	12404	0.000	50	322	1.087	0	402	2	18
37	9/14/07	23.4	2	23.5	2	3	7648	3	7055	0.064	179.647	0.997	1	12405	0.021	19	341	0.405	1	403	0	18
37	9/15/07	23.8	2.7	23.8	2.5	0	7648	0	7055	0.000	179.647	0.997	0	12405		10	351	0.232	1	404	0	18
38	9/16/07	23.1	2.6	23.6	2.6	2	7650	2	7057	0.043	179.690	0.997	0	12405		15	366	0.321	0	404	0	18
38	9/17/07	23.6	2	23.7	2.3	3	7653	3	7060	0.063	179.754	0.998	0	12405		8	374	0.169	0	404	0	18
38	9/18/07	23.6	2	23.8	2	2	7655	2	7062	0.085	179.838	0.998	0	12405		17	391	0.380	1	405	1	19
38	9/19/07	23.6	1.9	23.8	1.9	1	7656	1	7063	0.063	179.902	0.999	0	12405		15	406	0.401	0	405	0	19
38	9/20/07	23.8	1.8	23.8	1.8	0	7656	0	7063	0.000	179.902	0.999	0	12405		4	410	0.147	0	405	1	20
38	9/21/07	23.8	1.9	23.9	1.9	3	7659	0	7063	0.084	179.985	0.999	0	12405		1	411	0.084	0	405	2	22
38	9/22/07	23.8	1.5	23.8	1.9	1	7660	1	7064	0.021	180.006	0.999	0	12405		3	414	0.063	1	406	2	24
39	9/23/07	23.8	1.7	23.8	1.7	2	7662	2	7066	0.063	180.069	1.000	0	12405		2	416	0.042	0	406	0	24
39	9/24/07	23.9	1.5	23.9	1.7	0	7662	0	7066	0.000	180.069	1.000	0	12405		2	418	0.042	0	406	0	24
39	9/25/07	23.8	2.5	23.8	2.3	2	7664	2	7068	0.063	180.132	1.000	0	12405		1	419	0.042	0	406	1	25
39	9/26/07	23.6	2.5	23.9	2.5	0	7664	0	7068	0.000	180.132	1.000	0	12405		6	425	0.147	3	409	1	26
39	9/27/07	24	1.5	24	1.5		7664		7068	0.000	180.132	1.000		12405			425	0.104		409		26
39	9/28/07	22.6	1.3	23.8	1	0	7664	0	7068	0.022	180.154	1.000	0	12405		12	437	0.151	0	409	0	26
39	9/29/07	24	1	24	1		7664		7068					12405			437	0.021		409		26
40	9/30/07	23.8	1	23.8	1	0	7664	0	7068				0	12405		2	439	0.021	1	410	0	26

Appendix C.1. Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class										
	2004	2003	2003	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Weeks 23-24 (June 4 - 17)											
Male											
Sample Size		1		1	3		10				15
Percent		5.9		5.9	17.6		58.8				88.2
Std. Error		5.9		5.9	9.5		12.3				8.1
Female											
Sample Size							2				2
Percent							11.8				11.8
Std. Error							8.1				8.1
All Fish											
Sample Size		1		1	3		12				17
Percent		5.9		5.9	17.6		70.6				100.0
Std. Error		5.9		5.9	9.5		11.4				
Statistical Week 25 (June 18 - 24)											
Male		2									
Sample Size		2			7		4				13
Percent		8.3			29.2		16.7				54.2
Std. Error		5.8			9.5		7.8				10.4
Female											
Sample Size					5		5			1	11
Percent					20.8		20.8			4.2	45.8
Std. Error					8.5		8.5			4.2	10.4
All Fish											
Sample Size		2			12		9			1	24
Percent		8.3			50.0		37.5			4.2	100.0
Std. Error		5.8			10.4		10.1			4.2	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class											
	2004	2003	2003	2002	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 24 (June 10 - 16)												
Male												
Sample Size					2				2			4
Percent					16.7				16.7			33.3
Std. Error					11.2				11.2			14.2
Female												
Sample Size				1				7				8
Percent				8.3				58.3				66.7
Std. Error				8.3				14.9				14.2
All Fish												
Sample Size				1	2			7	2			12
Percent				8.3	16.7			58.3	16.7			100.0
Std. Error				8.3	11.2			14.9	11.2			
Statistical Week 25 (June 17 - 23)												
Male												
Sample Size		1	1	2	30			38				72
Percent		0.6	0.6	1.2	18.2			23.0				43.6
Std. Error		0.6	0.6	0.9	3.0			3.3				3.9
Female												
Sample Size				4	31			57	1			93
Percent				2.4	18.8			34.5	0.6			56.4
Std. Error				1.2	3.1			3.7	0.6			3.9
All Fish												
Sample Size		1	1	6	61			95	1			165
Percent		0.6	0.6	3.6	37.0			57.6	0.6			100.0
Std. Error		0.6	0.6	1.5	3.8			3.9	0.6			

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class											
	2004	2003	2003	2002	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 26 (June 24 - June 30)												
Male												
Sample Size		8		8	52			34	1			103
Percent		3.3		3.3	21.2			13.9	0.4			42.0
Std. Error		1.1		1.1	2.6			2.2	0.4			3.2
Female												
Sample Size				9	82			47	3		1	142
Percent				3.7	33.5			19.2	1.2		0.4	58.0
Std. Error				1.2	3.0			2.5	0.7		0.4	3.2
All Fish												
Sample Size		8		17	134			81	4		1	245
Percent		3.3		6.9	54.7			33.1	1.6		0.4	100.0
Std. Error		1.1		1.6	3.2			3.0	0.8		0.4	
Statistical Week 27 (July 1 - 7)												
Male												
Sample Size		10	1	7	43			12				73
Percent		5.7	0.6	4.0	24.4			6.8				41.5
Std. Error		1.7	0.6	1.5	3.2			1.9				3.7
Female												
Sample Size		1		7	53			38	1	1	2	103
Percent		0.6		4.0	30.1			21.6	0.6	0.6	1.1	58.5
Std. Error		0.6		1.5	3.5			3.1	0.6	0.6	0.8	3.7
All Fish												
Sample Size		11	1	14	96			50	1	1	2	176
Percent		6.3	0.6	8.0	54.5			28.4	0.6	0.6	1.1	100.0
Std. Error		1.8	0.6	2.0	3.8			3.4	0.6	0.6	0.8	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class											
	2004	2003	2003	2002	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 28 (July 8 - 14)												
Male												
Sample Size		12	2	5	14			31	2		1	67
Percent		9.3	1.6	3.9	10.9			24.0	1.6		0.8	51.9
Std. Error		2.6	1.1	1.7	2.7			3.8	1.1		0.8	4.4
Female												
Sample Size		2		1	16			41	1		1	62
Percent		1.6		0.8	12.4			31.8	0.8		0.8	48.1
Std. Error		1.1		0.8	2.9			4.1	0.8		0.8	4.4
All Fish												
Sample Size		14	2	6	30			72	3		2	129
Percent		10.9	1.6	4.7	23.3			55.8	2.3		1.6	100.0
Std. Error		2.7	1.1	1.9	3.7			4.4	1.3		1.1	
Statistical Week 29 (July 15 - 21)												
Male												
Sample Size		11		7	35			18	2		1	74
Percent		7.6		4.9	24.3			12.5	1.4		0.7	51.4
Std. Error		2.2		1.8	3.6			2.8	1.0		0.7	4.2
Female												
Sample Size				3	20			42	4		1	70
Percent				2.1	13.9			29.2	2.8		0.7	48.6
Std. Error				1.2	2.9			3.8	1.4		0.7	4.2
All Fish												
Sample Size		11		10	55			60	6		2	144
Percent		7.6		6.9	38.2			41.7	4.2		1.4	100.0
Std. Error		2.2		2.1	4.1			4.1	1.7		1.0	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class											
	2004	2003	2003	2002	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 30 (July 22 - 28)												
Male												
Sample Size	1	25	1	9	36			15				87
Percent	0.7	16.7	0.7	6.0	24.0			10.0				58.0
Std. Error	0.7	3.1	0.7	1.9	3.5			2.5				4.0
Female												
Sample Size		2		12	14			32	1		2	63
Percent		1.3		8.0	9.3			21.3	0.7		1.3	42.0
Std. Error		0.9		2.2	2.4			3.4	0.7		0.9	4.0
All Fish												
Sample Size	1	27	1	21	50			47	1		2	150
Percent	0.7	18.0	0.7	14.0	33.3			31.3	0.7		1.3	100.0
Std. Error	0.7	3.1	0.7	2.8	3.9			3.8	0.7		0.9	
Statistical Week 31 (July 29 - August 4)												
Male												
Sample Size	1	31	4	10	41			13	1		3	104
Percent	0.5	16.4	2.1	5.3	21.7			6.9	0.5		1.6	55.0
Std. Error	0.5	2.7	1.0	1.6	3.0			1.8	0.5		0.9	3.6
Female												
Sample Size		4		18	20			36	1		6	85
Percent		2.1		9.5	10.6			19.0	0.5		3.2	45.0
Std. Error		1.0		2.1	2.2			2.9	0.5		1.3	3.6
All Fish												
Sample Size	1	35	4	28	61			49	2		9	189
Percent	0.5	18.5	2.1	14.8	32.3			25.9	1.1		4.8	100.0
Std. Error	0.5	2.8	1.0	2.6	3.4			3.2	0.7		1.6	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class											
	2004	2003	2003	2002	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 32 (August 5 - August 11)												
Male												
Sample Size	1	14	7	2	33			9			4	70
Percent	0.5	7.6	3.8	1.1	17.9			4.9			2.2	38.0
Std. Error	0.5	2.0	1.4	0.8	2.8			1.6			1.1	3.6
Female												
Sample Size		4		14	43			39	9	2	3	114
Percent		2.2		7.6	23.4			21.2	4.9	1.1	1.6	62.0
Std. Error		1.1		2.0	3.1			3.0	1.6	0.8	0.9	3.6
All Fish												
Sample Size	1	18	7	16	76			48	9	2	7	184
Percent	0.5	9.8	3.8	8.7	41.3			26.1	4.9	1.1	3.8	100.0
Std. Error	0.5	2.2	1.4	2.1	3.6			3.2	1.6	0.8	1.4	
Statistical Week 33 (August 12 - 18)												
Male												
Sample Size	1	6	6	7	23			10	2	1	7	63
Percent	0.6	3.9	3.9	4.5	14.8			6.5	1.3	0.6	4.5	40.6
Std. Error	0.6	1.6	1.6	1.7	2.9			2.0	0.9	0.6	1.7	4.0
Female												
Sample Size		2		7	37			30	10		6	92
Percent		1.3		4.5	23.9			19.4	6.5		3.9	59.4
Std. Error		0.9		1.7	3.4			3.2	2.0		1.6	4.0
All Fish												
Sample Size	1	8	6	14	60			40	12	1	13	155
Percent	0.6	5.2	3.9	9.0	38.7			25.8	7.7	0.6	8.4	100.0
Std. Error	0.6	1.8	1.6	2.3	3.9			3.5	2.2	0.6	2.2	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class											
	2004	2003	2003	2002	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 34 (August 19 - 25)												
Male												
Sample Size	1	2	10	2	11	1		22	4		8	61
Percent	0.7	1.4	6.8	1.4	7.5			15.1	2.7		5.5	41.1
Std. Error	0.7	1.0	2.1	1.0	2.2			3.0	1.4		1.9	4.1
Female												
Sample Size		2		11	31			33	4	1	3	85
Percent		1.4		7.5	21.2			22.6	2.7	0.7	2.1	58.2
Std. Error		1.0		2.2	3.4			3.5	1.4	0.7	1.2	4.1
All Fish												
Sample Size	1	4	10	13	42			55	8	1	11	146
Percent	0.7	2.7	6.8	8.9	28.8			37.7	5.5	0.7	7.5	99.3
Std. Error	0.7	1.4	2.1	2.4	3.8			4.0	1.9	0.7	2.2	
Statistical Week 35 (August 26 - September 1)												
Male												
Sample Size			7		5	1		5			3	21
Percent			11.9		8.5	1.7		8.5			5.1	35.6
Std. Error			4.2		3.7	1.7		3.7			2.9	6.3
Female												
Sample Size				1	21			10	2		4	38
Percent				1.7	35.6			16.9	3.4		6.8	64.4
Std. Error				1.7	6.3			4.9	2.4		3.3	6.3
All Fish												
Sample Size			7	1	26	1		15	2		7	59
Percent			11.9	1.7	44.1	1.7		25.4	3.4		11.9	100.0
Std. Error			4.2	1.7	6.5	1.7		5.7	2.4		4.2	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class											
	2004	2003	2003	2002	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 36 (September 2 - 8)												
Male												
Sample Size		1	2		1			7	2		2	15
Percent		2.2	4.3		2.2			15.2	4.3		4.3	32.6
Std. Error		2.2	3.0		2.2			5.4	3.0		3.0	7.0
Female												
Sample Size				1	12			13	1		4	31
Percent				2.2	26.1			28.3	2.2		8.7	67.4
Std. Error				2.2	6.5			6.7	2.2		4.2	7.0
All Fish												
Sample Size		1	2	1	13			20	3		6	46
Percent		2.2	4.3	2.2	28.3			43.5	6.5		13.0	100.0
Std. Error		2.2	3.0	2.2	6.7			7.4	3.7		5.0	
Statistical Week 37 (September 9 - 15)												
Male												
Sample Size			1					5	1		1	8
Percent			4.0					20.0	4.0		4.0	32.0
Std. Error			4.0					8.2	4.0		4.0	9.5
Female												
Sample Size					2			10	1		4	17
Percent					8.0			40.0	4.0		16.0	68.0
Std. Error					5.5			10.0	4.0		7.5	9.5
All Fish												
Sample Size			1		2			15	2		5	25
Percent			4.0		8.0			60.0	8.0		20.0	100.0
Std. Error			4.0		5.5			10.0	5.5		8.2	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class											
	2004	2003	2003	2002	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 38-39 (September 16 - 29)												
Male												
Sample Size			1					3			1	5
Percent			8.3					25.0			8.3	41.7
Std. Error			8.3					13.1			8.3	14.9
Female												
Sample Size								2	3		2	7
Percent								16.7	25.0		16.7	58.3
Std. Error								11.2	13.1		11.2	14.9
All Fish												
Sample Size			1					5	3		3	12
Percent			8.3					41.7	25.0		25.0	100.0
Std. Error			8.3					14.9	13.1		13.1	

	Brood Year and Age Class											
	2004	2003	2003	2002	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	Total
Combined Periods (June 10 - September 29)												
Male												
Sample Size	5.0	121.0	43.0	59.0	326.0	2.0		223.0	18.0		31.0	828
Percent	0.3	6.6	2.3	3.2	17.7	0.1		12.1	1.0		1.7	45.0
Std. Error	0.1	0.6	0.4	0.4	0.9	0.1		0.8	0.2		0.3	1.2
Female												
Sample Size		17.0		89.0	382.0	0.0	0.0	438.0	42.0	4.0	39.0	1011
Percent		0.9		4.8	20.8	0.0	0.0	23.8	2.3	0.2	2.1	55.0
Std. Error		0.2		0.5	0.9	0.0	0.0	1.0	0.3	0.1	0.3	1.2
All Fish												
Sample Size	5	138	43	148	708	2		661	60	4	70	1839
Percent	0.3	7.5	2.3	8.0	38.5	0.1		35.9	3.3	0.2	3.8	100.0
Std. Error	0.1	0.6	0.4	0.6	1.1	0.1		1.1	0.4	0.1	0.4	

Appendix C.2. Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Weeks 28 (July 8 - 14)					
Male					
Sample Size					0
Percent					0
Std. Error					
Female					
Sample Size		1			1
Percent		100.0			100
Std. Error					0.0
All Fish					
Sample Size		1			1
Percent		100.0			100.0
Std. Error					0.0
Statistical Week 29 (July 15 - 21)					
Male					
Sample Size					0
Percent					0
Std. Error					
Female					
Sample Size					0
Percent					0
Std. Error					
All Fish					
Sample Size					0
Percent					0.0
Std. Error					

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 30 (July 22 - 28)					
Male					
Sample Size		1	1		2
Percent		50.0	50.0		100
Std. Error		50.0			0.0
Female					
Sample Size					0
Percent					0
Std. Error					
All Fish					
Sample Size		1	1		2
Percent		50.0	50.0		100.0
Std. Error		50.0			
Statistical Week 31 (July 29 - August 4)					
Male					
Sample Size					0
Percent					0
Std. Error					
Female					
Sample Size					0
Percent					0
Std. Error					
All Fish					
Sample Size					0
Percent					0.0
Std. Error					

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 32 (August 5 - August 11)					
Male					
Sample Size					0
Percent					0.0
Std. Error					
Female					
Sample Size					0
Percent					0.0
Std. Error					
All Fish					
Sample Size					0
Percent					0.0
Std. Error					
Statistical Week 33 (August 12 - 18)					
Male					
Sample Size		2	2		4
Percent		18.2	18.2		36.4
Std. Error		12.2	12.2		15.2
Female					
Sample Size		5	1	1	7
Percent		45.5	9.1	9.1	63.6
Std. Error		15.7	9.1	9.1	15.2
All Fish					
Sample Size		7	3	1	11
Percent		63.6	27.3	9.1	100.0
Std. Error		15.2	14.1	9.1	

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 34 (August 19 - 25)					
Male					
Sample Size		5	7		12
Percent		27.8	38.9		66.7
Std. Error		10.9	11.8		11.4
Female					
Sample Size		3	3		6
Percent		16.7	16.7		33.3
Std. Error		9.0	9.0		11.4
All Fish					
Sample Size		8	10		18
Percent		44.4	55.6		100.0
Std. Error		12.1	12.1		
Statistical Week 35 (August 26 - September 1)					
Male					
Sample Size		8	24		32
Percent		11.0	32.9		43.8
Std. Error		3.7	5.5		5.8
Female					
Sample Size	2	17	20	2	41
Percent	2.7	23.3	27.4		53.4
Std. Error	1.9	5.0	5.3		5.9
All Fish					
Sample Size	2	25	44	2	73
Percent	2.7	34.2	60.3	2.7	100.0
Std. Error	1.9	5.6	5.8	1.9	

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 36 (September 2 - 8)					
Male					
Sample Size		23	10	2	35
Percent		25.6	11.1	2.2	38.9
Std. Error		4.6	3.3	1.6	5.2
Female					
Sample Size		33	20	2	55
Percent		36.7	22.2	2.2	61.1
Std. Error		5.1	4.4	1.6	5.2
All Fish					
Sample Size		56	30	4	90
Percent		62.2	33.3	4.4	100.0
Std. Error		5.1	5.0	2.2	
Statistical Week 37 (September 9 - 15)					
Male					
Sample Size	1	26	25		52
Percent	0.9	24.5	23.6		49.1
Std. Error	0.9	4.2	4.1		4.9
Female					
Sample Size	2	25	27		54
Percent	1.9	23.6	25.5		50.9
Std. Error	1.3	4.1	4.3		4.9
All Fish					
Sample Size	3	51	52		106
Percent	2.8	48.1	49.1		100.0
Std. Error	1.6	4.9	4.9		

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2007.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 38 (September 16 - 22)					
Male					
Sample Size		16	5		21
Percent		28.6	8.9		37.5
Std. Error			3.8		6.5
Female					
Sample Size	1	23	11		35
Percent	1.8	41.1	19.6		62.5
Std. Error	1.8	6.6	5.4		6.5
All Fish					
Sample Size	1	39	16		56
Percent	1.8	69.6	28.6		100.0
Std. Error	1.8	6.2	6.1		
Statistical Week 39-40 (September 23 - October 6)					
Male					
Sample Size		4	2		6
Percent		18.2	9.1		27.3
Std. Error			6.3		9.7
Female					
Sample Size		12	4		16
Percent		54.5	18.2		72.7
Std. Error		10.9	8.4		9.7
All Fish					
Sample Size		16	6		22
Percent		72.7	27.3		100.0
Std. Error		9.7	9.7		

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Combined Periods (July 8 - October 6)					
Male					
Sample Size		85	76	2	163
Percent		22.4	20.1	0.5	43.0
Std. Error		2.1	2.1	0.4	2.5
Female					
Sample Size	6	119	86	5	216
Percent	1.6	31.4	22.7	1.3	57.0
Std. Error	0.6	2.4	2.2	0.6	2.5
All Fish					
Sample Size	6	204	162	7	379
Percent	1.6	53.8	42.7	1.8	98.2
Std. Error	0.6	2.6	2.5	0.7	

Appendix D. Results of secondary marking study to test for short term tag loss for sockeye captured at the Canyon Island fish wheels, 2007.

Stat. Week	Fishery Catch	Tags Recovered	Fishery Ratio	Fish Examined for 2nd Marks	2nd Marks Observed	Sample Ratio	Fishery Ratio - Sampled Ratio
25	309		0.000	200		0.000	0.000
26	976	74	0.076	200	6	0.030	0.046
27	825	53	0.064	200	12	0.060	0.004
28	885	36	0.041	200	11	0.055	-0.014
29	266	17	0.064	189	10	0.053	0.011
30	1,096	61	0.056	200	7	0.035	0.021
31	4,294	202	0.047	200	6	0.030	0.017
32	3,418	420	0.123	200	19	0.095	0.028
33	2,786	284	0.102	200	30	0.150	-0.048
34	987	99	0.100	150	9	0.060	0.040
35	287	51	0.178	100	14	0.140	0.038
36	578	23	0.040	50	2	0.040	0.000
37	7		0.000				
Totals	16,714	1,320	0.079	2,089	126	0.060	0.019