Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2008

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August 2012

Pacific Salmon Commission
Technical Report No. 28

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Transboundary Technical Committee Report No. 28

Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2008

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Prepared for:
Pacific Salmon Commission
Transboundary Technical Committee

August 2012

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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 2008. 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 3,804 sockeye salmon were captured in fish wheels located at Canyon Island, Alaska, of which 3,463 were tagged and 1,143 (33.0%) 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 3 was estimated to be 84,073 fish (95% confidence interval 73,364 to 94,782). An expansion factor based on fish wheel CPUE estimated 3,495 additional sockeye salmon migrated past Canyon Island prior to and after June 8 to August 23, for a total above border escapement of 87,568. Canadian commercial and aboriginal fisheries harvested 19,294 and 215 sockeye, respectively, resulting in a spawning escapement estimate of 68,428 sockeye salmon. Based on mean date and standard deviation of migration timing the sockeye salmon run was slightly late and less compressed than the 1998-2007 average. The Canyon Island catches of 4,704 pink salmon, 350 chum salmon and 124 steelhead salmon were 66.9% below average, 13.5% above average and 10.6% above average, respectively. The pink salmon run was four days later and slightly more 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 2011) 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 2008 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 2008 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 and test fisheries, which occurred in Canadian portions of the Taku River within 20 km of the international border. Catches that were not available by statistical week were censored, for example the aboriginal ("food fish") catch. All sockeye salmon caught in the commercial and test 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 28 to to October 7. Chinook salmon were targeted until mid-June; sockeye salmon from then until mid-August; and finally coho salmon for the remainder of the season. A coho salmon catch-and-release test fishery took place from September 2 through October 8. 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 single side band radio or 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.

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

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

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:

$$\bar{t} = \sum_{t=1}^{m} t * P_t \quad , \qquad (1)$$

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:

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

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:

$$\frac{\dfrac{C_k * T_{ks}}{T_k - T_{kc}}}{\displaystyle\sum_{j=22}^{38} \frac{C_k * T_k}{T_K - T_{kc}}} \quad , \qquad (3)$$

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 16 through September 23. Fish wheel I, located furthest upriver, was installed on May 17; fish wheel II was installed on May 16. 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 2008 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 2008 was 3,804. The total catch was 32.0% below the 1998 to 2007 average (Table 1; Appendix B.1). Fish wheel catches occurred from June 2 through September 16, and peaked during statistical week 32 (August 6 through August 12), when 725 sockeye salmon were captured. Prior to the first Canadian directed sockeye commercial fishery opening on June 15 (statistical week 24), 174 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 2008 pink salmon catch in the fish wheels at Canyon Island was 4,704 (Table 1; Appendix B.1), 66.9% below the 1998 to 2007 average. The peak daily catch of pink salmon in 2008 (373 fish) occurred on July 28. The 2008 fish wheel catch of chum salmon was 350. The total catch was 13.5% above the 1998 to 2007 average of 308. The peak daily catch of chum salmon (39 fish) occurred on August 27 (Appendix B.1). The total fish wheel catch of steelhead and Dolly Varden in 2008 were 124 and 423 fish respectively. The total catch of 124 steelhead was 10.6% above the 1998 to 2007 average of 112. The total catch of 423 Dolly Varden was 44.1% above the 1998 to 2007 average.

Tagging and Recovery Data

Of the 3,804 sockeye salmon caught in the Taku fish wheels, 3,463 were tagged (91.0**%**). 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 33 (0.029**%** of tags applied), leaving 3,430 available for recapture in Canadian fisheries. The Canadian commercial fishery recaptured 649 tagged sockeye and accounted for 56.8% of the total sockeye tags recovered or observed in upstream fisheries (Table 2). The Canadian test fishery and aboriginal fishery did not recover any sockeye tags. Tags were also observed in terminal areas,

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[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.

principally Little Trapper, Tatsamenie, Kuthai, and King Salmon Lakes lakes. These numbered 92, 325, 11, and 17 respectively. The escapements to these locations numbered 3,831, 8,976, 1,547 and 888 sockeye respectively.

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 8 to August 23, 2008. Fishwheel CPUE for sockeye was used to expand the inriver run estimate for periods of low tag recovery and effort (SW 22-23 and 35-37).

A total of 649 tags with corresponding recovery date information were returned from 3,463 sockeye salmon examined in the Canadian fisheries (Table 3). Recovery data from statistical weeks 24 and 25 (June 8 through June 21), 26 and 27 (June 22 through July 5), 28 and 29 (July 6 through July 12), and 31 and 32 (July 27 through August 9) were pooled due to statistically similar tagging ratios and low fishery effort. Tagging and recovery data were grouped into 11 and 7 strata, respectively (Table 4).

Using a maximum likelihood Darroch estimator, we estimated that 84,442 sockeye salmon passed Canyon Island between June 8 and August 23. The approximate 95% confidence interval associated with this estimate is 73,726 to 95,157 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 3,495 additional sockeye passed Canyon Island during statistical weeks 22 through 23 and 35 through 37. Downriver of the U.S./Canadian border, the U.S. inriver personal use fishery catch was estimated at 1.010 sockeye using a tag return expansion method based on the current inriver commercial marked fraction (3.3%), and personal survey returns logged into the ADFG ALEX database. The total estimate of sockeye salmon run migrating past Canyon Island was 87,937. This estimate is 36.5% below that the 1998 to 2007 average (138,422) 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 22.3%, compared to a 1998-2007 average of 18.9% (range 12.8% to 25.5%; Table 5). After removal of 19,294, 215, and 0 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 68,428 fish (Table 4). This is 38.8% below the 1998-2007 average of 111,844 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 1998 to 2007 averaged 3.6% (range 0.3% to 9.1%; Table 6). However, in 2008 the contribution of jacks was only 2.4%.

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. Based on those results the 2008 mark-recapture data was not examined by fish size.

Migratory Timing

The mean date (July 22) of the sockeye salmon migration in 2008 was later (2 days) than the 1998-2007 average (Table 7). The standard deviation was slightly more (20.6 days in 2008 versus an average of 19.0 days); meaning the run was less compressed than average. Migratory timing statistics (mean date July 25; standard deviation 10.0 days) showed the pink salmon run timing was five 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 2008 was reflective of the run, the mean date of migration was August 28 (standard deviation 14.7 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 four individual stock groups of sockeye salmon past Canyon Island in 2008 was determined using recoveries of tagged fish from enumeration weirs (Table 8; Figure 6). These were weirs on the outlet streams Little Trapper (90 tags)**,** Tatsamenie (325 tags) lakes, Kuthai lake (11 tags) and King Samon lake (17 tags).

The Kuthai Lake stock migrated past Canyon Island the earliest of these four stocks examined. These fish were passing Canyon Island from statistical weeks 23 to 29 (June 1 to July 19). The peak of the Kuthai Lake migration took place during statistical week 26 (June 22 to June 28).

Little Trapper Lake sockeye salmon peaked during stat week 32, August 3 through August 9. They were present at Canyon Island during statistical weeks 27 to 34 (June 29 to August 23).

King Salmon Lake sockeye salmon were present at Canyon Island during statistical weeks 27 to 32 (June 29 to August 9) and peaked during stat week 28 (July 6 through July 12).

The Tatsamenie Lake stock exhibited both the latest and most protracted return timing; tagged fish bound for this system were present at Canyon Island between statistical weeks 28 to 35 (July 6 to August 30). The peak week of migration for Tatsamenie Lake sockeye was statistical week 31 (July 27 through August 2).

Inriver Sockeye Salmon Migration Rates

Inriver travel times of four 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 Kuthai Lake, King Salmon Lake, Little Trapper Lake and Tatsamenie Lake stocks are shown in Figure 7. Travel times averaged 46.0, 26.1, 24.0, 30.0 and 31.1 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 27 averaged 37.3 days in transit while those tagged in statistical week 32 averaged 21.5 days. For the Tatsamenie stock, fish tagged in statistical week 29 averaged 36.8 days in transit while fish tagged in statistical week 35 averaged 24.4 days. King Salmon Lake fish tagged in statistical week 26 averaged 34.7 in transit while those tagged in statistical week 28 averaged 23.3 days. Kuthai Lake fish tagged in statistical week 23 (one tag recovered) averaged 62.0 days in transit, while those tagged in statistical week 26 averaged 42.4 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 2008 are summarized in Appendices C.1 and C.2. Lengths at age are presented in Tables 10 and 12.

For sockeye salmon, age-1.3 fish were most prevalent (54.1%) with age-1.2 fish comprising 20.1%, age-2.2 2.6%, age-0.2 7.4%, age-2.3 2.1%, age-0.3 11.0%, and very small numbers of age-0.1, 1.1, 0.4, and 1.4 fish (Table 6). The lengths of age 1.2 and 1.3 sockeye salmon were equal to and larger than the 1998 to 2007 averages (Table 10). Females comprised 51.0% of the fish wheel catch of sockeye salmon (Appendix C.1).

Fish wheel catches of chum salmon were primarily comprised of age-0.3 (77.4%) fish, which is lower than the 1998-2007 average of 59.3% (Table 11). Age-0.4 fish constituted 20.5% of the fish wheel catch, lower than the 38.7% average. Female chum salmon were more prevalent (56.5%) than males (Appendix C.2). The average lengths at age for chum salmon passing Canyon Island were 545, 649, and 689 mm (MEF) for age 0.2, 0.3, and 0.4 fish respectively; these were similar to the 1998 to 2007 averages (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 at the Canadian commercial and test 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 twice 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 these 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 among 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, 2011). Based on those results the mark-recapture data for 2008 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 38, over 2,136 fish were examined for tagging needle marks in the Canadian commercial and test fisheries after tags had been removed by fishers. The number of tagging needle marks was compared with tag recovery rates, and found to be both lower overall (1.6% versus 3.4%) (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 2008 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, 2008.

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
2008	5/16-9/23	3,804	4,704	350	124	423
Average(98-07)		5,589	14,211	308	112	292

Table 2. Summary of Taku River sockeye tag recoveries by location and species, 2008.

	Tags Recovered	Tags Observed Only	Total	Fish Inspected	Tag Ratio	Percent Tags Observed
Commercial Fishery	649	0	649	19,509	0.033	0.568
Test Fishery	0	0	0	0	-	0.000
King Salmon Lake	15	2	17	897	0.019	0.015
Kuthai Lake	11	0	11	1,547	0.007	0.010
Little Trapper Lake	67	23	90	3,829	0.024	0.079
Tatsamenie Lake	275	50	325	8,976	0.036	0.284
Taku River mainstem	12	0	12	342	0.035	0.010
Nahlin River	1	0	1	200	0.005	0.001
Tatsatua Creek	0	0	0	not app	-	0.000
Tulsequah River	3	0	3	60	0.050	0.003
Fish Creek (U.S.)	2	0	2	50	0.040	0.002
Yehring Creek (U.S.)	0	0	0	48	0.000	
U.S. downstream	33	0	33	not app	-	0.029
Total	1,068	75	1,143	35,458		1.000

Table 3. Tagging and recovery data from the 2008 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 24	25	26	27	28	29	30	31	32	33	34	Total Tags Recovered	Total Tags Applied	Tag Ratio Recovered/ Applied
23												0	72	0.000
24		21										21	101	0.208
25		6	41	1	1	2						51	236	0.216
26			58	10	1	4						73	373	0.196
27				28	5	3						36	197	0.183
28					1	8		1				10	93	0.108
29						11	16					27	131	0.206
30							50	7				57	264	0.216
31								109	38	3	2	152	743	0.205
32									72	67	5	144	636	0.226
33										46	18	64	367	0.174
34											14	14	126	0.111
35												0	96	0.000
36												0	14	0.000
37												0	9	0.000
38												0	5	0.000
Total	0	27	99	39	8	28	66	117	110	116	39	649	3,463	0.187
Sockeye Examined[a]:												Total		
Test Fishery												0		
Can. Comm. Catch	10	1,438	3,164	1,051	426	813	2,418	4,694	2,829	1,645	806	19,294		
Aboriginal Fishery								215				215		
Total	10	1,438	3,164	1,051	426	813	2,418	4,909	2,829	1,645	806	19,509		

[a] Equals the number examined for Canyon Island tags.

Table 4. Pooled-strata tagging and recovery data used to calculate mark-recapture estimates of the inriver sockeye salmon run past Canyon Island, 2008.

Statistical Week of Tagging	Statistical Week of Recovery: 24-25	26-27	28-29	30	31-32	33	34	Total Tags Recovered	Total Tags Applied	Tag Ratio
24	21							21	101	0.208
25	6	42	3					51	236	0.216
26		68	5					73	373	0.196
27		28	8					36	197	0.183
28			9		1			10	93	0.108
29			11	16				27	131	0.206
30				50	7			57	264	0.216
31					147	3	2	152	743	0.205
32					72	67	5	144	636	0.226
33						46	18	64	367	0.174
34							14	14	126	0.111
Total	27	138	36	66	227	116	39	649	3,267	0.199
Catch Examined For Tags[a]	1,448	4,215	1,239	2,418	7,523	1,645	806	19,294		
Marked Fraction	0.019	0.034	0.030	0.028	0.031	0.076	0.051	0.035		
Above Border Run Estimate	2,478	5,537	29,933	19,564	13,269	8,700	4,961	84,442		
Fish Wheel CPUE Expansion[b]								3,495		
Aboriginal Fishery[c]					215			215		
Total Above Border Run								87,937		
U.S. Personal Use Catch[d]								1,010		
95% Lower C.I.	1,796	-414	17,918	14,637	11,491	6,936	3,044	73,726		
95% Upper C.I.	3,160	11,488	41,948	4,927	15,047	10,464	6,878	95,157		
Spawning Escapment	1,030	1,322	28,694	17,146	5,531	7,055	4,155	68,428		

[a] Includes Canadian commercial and test fishery catches

[b] Expansion based on fish wheel CPUE

[c] Represents sockeye taken in the aboriginal fishery.

[d] 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 2008[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	87,763	217,253	112,241
2008	87,937	19,509	0.222	68,428	169,178	81,241
Average(98-07)	138,422	26,013	0.189	111,844	238,853	102,419
Maximum(98-07)	200,918	47,988	0.250	167,691	399,277	207,008
Minimum(98-07)	91,548	17,090	0.128	70,715	141,041	44,940
S.D.(98-07)	36,816	9,363	0.041	30,985	77,644	52,438
C.V.(98-07)	26.6%	36.0%	21.5%	27.7%	32.5%	51.2%

[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 2008.

	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
2008	1,578	0.5	7.4	1.8	11.0	20.1	0.1	0.1	54.1	2.6	0.3	2.1	0.0	0.0	0.0
Average(98-07)	2,116.7	0.3	6.0	3.0	7.7	29.9	0.2	0.0	45.8	4.6	0.2	2.2	0.0	0.0	0.0
SD(98-07)		0.3	2.3	2.8	5.1	7.4	0.3	0.1	9.2	3.4	0.1	1.0	0.0	0.0	0.0
CV(98-07)		90.5%	39.1%	91.2%	66.7%	24.8%	149.1%	174.8%	20.0%	73.9%	55.7%	43.9%	-	-	-

Table 7. Migratory timing statistics of sockeye, pink , and chum salmon past the Canyon Island fish wheels, 1984 to 2008. 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
2008	7/22	20.6	7/25	10.0	8/28	14.7
Average(98-07)	7/20	19.0	7/21	8.1	9/3	13.7

Table 8. Weekly and cumulative proportions of three individual sockeye salmon stocks passing Canyon Island in 2008, based on spawning ground tag recoveries expanded by fish wheel indices (fish wheel CPUE).

			Little Trapper Lake		Tatsamenie Lake		Kuthai Lake		King Salmon Lake	
Statistical Week	Week Starting	Week Ending	Weekly Proportion	Cumul. Proportion	Weekly Proportion	Cumul. Proportion	Weekly Proportion	Cumul. Proportion	Weekly Proportion	Cumul. Proportion
22	22-May	28-May								
23	29-May	4-Jun					0.072	0.072		
24	5-Jun	11-Jun					0.089	0.162		
25	12-Jun	18-Jun					0.284	0.445		
26	19-Jun	25-Jun				0.000	0.458	0.903		
27	26-Jun	2-Jul	0.011	0.011		0.000	0.000	0.903	0.178	0.178
28	3-Jul	9-Jul	0.081	0.092	0.003	0.003	0.000	0.903	0.450	0.628
29	10-Jul	16-Jul	0.166	0.258	0.019	0.022	0.097	1.000	0.183	0.811
30	17-Jul	23-Jul	0.048	0.306	0.087	0.109			0.062	0.873
31	24-Jul	30-Jul	0.080	0.386	0.271	0.380			0.064	0.937
32	31-Jul	6-Aug	0.256	0.642	0.259	0.639			0.063	1.000
33	7-Aug	13-Aug	0.254	0.896	0.250	0.889				
34	14-Aug	20-Aug	0.104	1.000	0.055	0.944				
35	21-Aug	27-Aug			0.056	1.000				
36	28-Aug	3-Sep								
37	4-Sep	10-Sep								

Table 9. Inriver migration timing for four Taku River sockeye salmon stocks, 2008.

Stock	Week	Travel Time	SD	SE	N	95% C.I.
L. Trapper	26	46.00	1.41	1.00	2	1.95
	27	37.30	2.76	0.69	16	1.35
	28	35.10	8.31	2.30	13	4.52
	29	25.80	3.91	1.24	10	2.42
	30	25.80	6.90	2.44	8	4.78
	31	24.80	7.02	2.12	11	4.15
	32	21.50	2.16	0.88	6	1.73
	33	23.00	0.00	0.00	1	-
	Average	29.91				
Tatsamenie	28	40.00	0.00	0.00	1	-
	29	36.80	6.30	2.82	5	5.52
	30	31.96	2.95	0.58	26	1.13
	31	30.42	5.37	0.61	78	1.19
	32	31.53	6.37	0.77	68	1.51
	33	29.96	4.86	0.58	70	1.14
	34	23.79	4.76	1.27	14	2.49
	35	24.38	4.29	1.19	13	2.33
	Average	31.11				
King Salmon	26	34.67	11.55	6.67	3	13.07
	27	30.50	2.74	1.12	6	2.19
	28	23.33	10.97	6.33	3	12.41
	29	10.00	0.00	0.00	1	-
	30	32.00	0.00	0.00	1	-
	31	26.00	0.00	0.00	1	-
	Average	26.08				
Kuthai	23	62.00	0.00	0.00	1	-
	24	54.00	0.00	0.00	1	-
	25	42.33	9.71	5.61	3	10.99
	26	42.40	6.27	2.80	5	5.50
	27	-	-	-	0	-
	28	-	-	-	0	-
	29	29.00	0.00	0.00	1	-
	Average	45.95				

[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 site (Canyon Island) and the recovery location (weir site).

Table 10. Historical length (MEF) at age composition of sockeye salmon passing Canyon Island, Taku River, 2008.

Year	Sample Size	Length At Age Class 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			
2008	1,574	309	445	326	586	487	345		583	506	600	592			
Average(98-07)	2,130	323	453	330	575	487	336	587	576	510	591	579		540	555
SD(98-07)		14.9	9.0	7.0	8.6	11.9	11.7	21.8	9.1	11.5	15.5	12.1			
CV(98-07)		4.6%	2.0%	2.1%	1.5%	2.5%	3.5%	3.7%	1.6%	2.3%	2.6%	2.1%			-

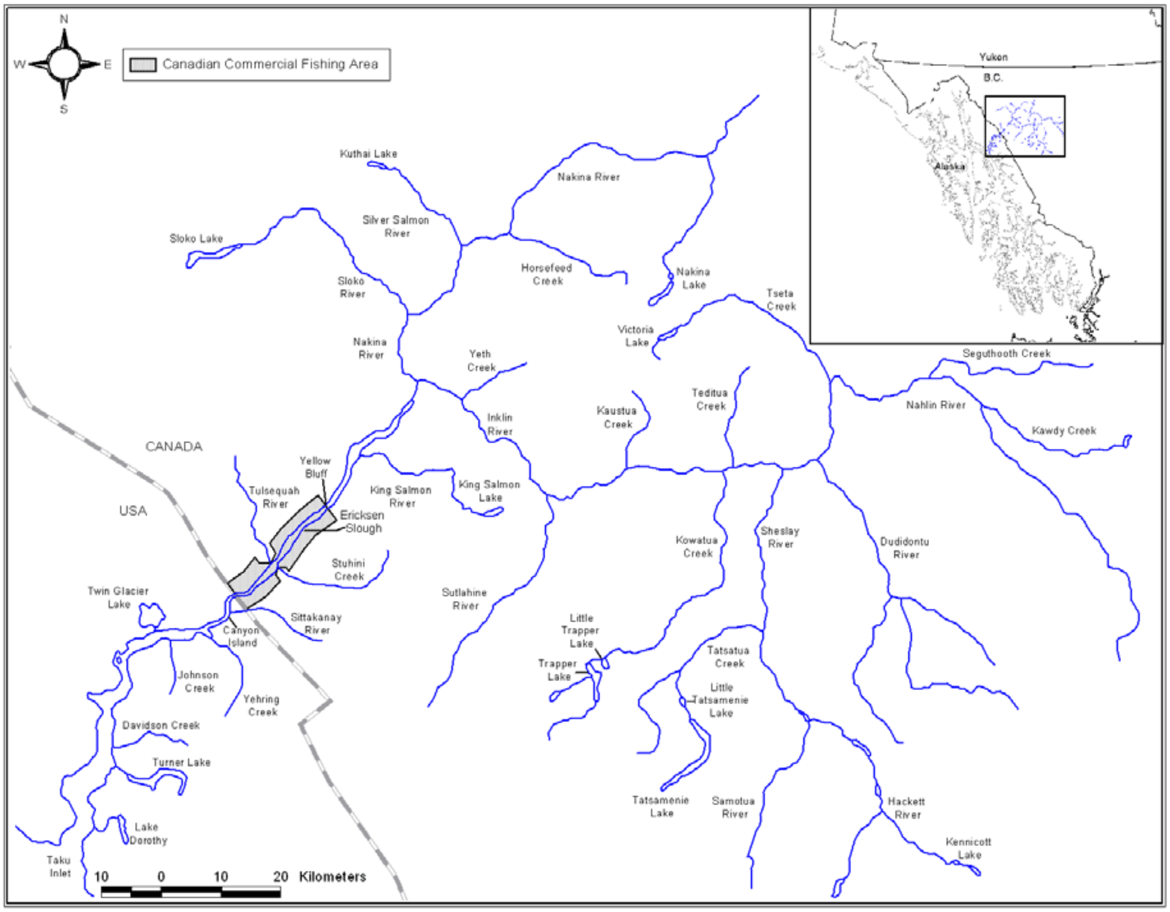
Table 11. Historical age composition of chum salmon passing Canyon Island fish wheels, Taku River, 2008.

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
2008	283	0.4	77.4	20.5	1.8	0.0
Average(98-07)	241.2	1.1	59.3	38.7	0.8	0.0
SD(98-07)		0.8	17.1	16.7	1.3	0.0
CV(98-07)		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 2008.

	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	
2008	283	545	649	689	665	
Average(98-07)	279	595	636	666	674	
SD(98-07)		32.1	13.2	10.7	22.7	
CV(98-07)		5.4%	2.1%	1.6%	3.4%	

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



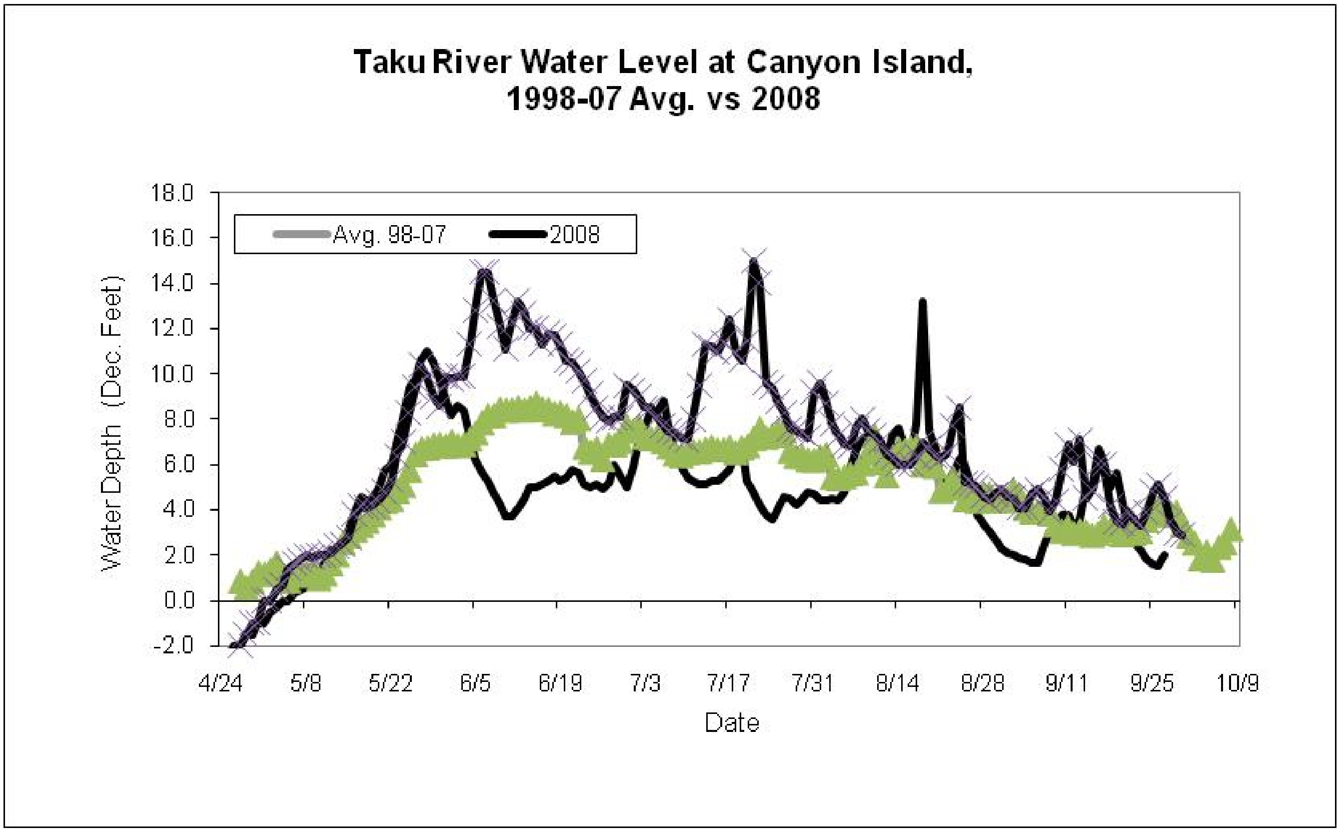
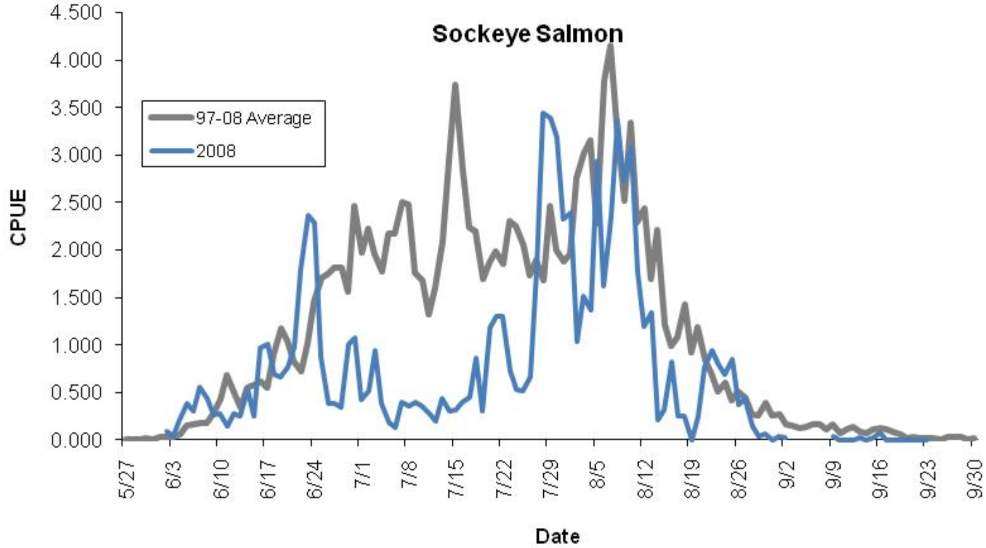


Figure 2. Water levels at Canyon Island, Taku River, 2008 vs. 1997-2007 average.



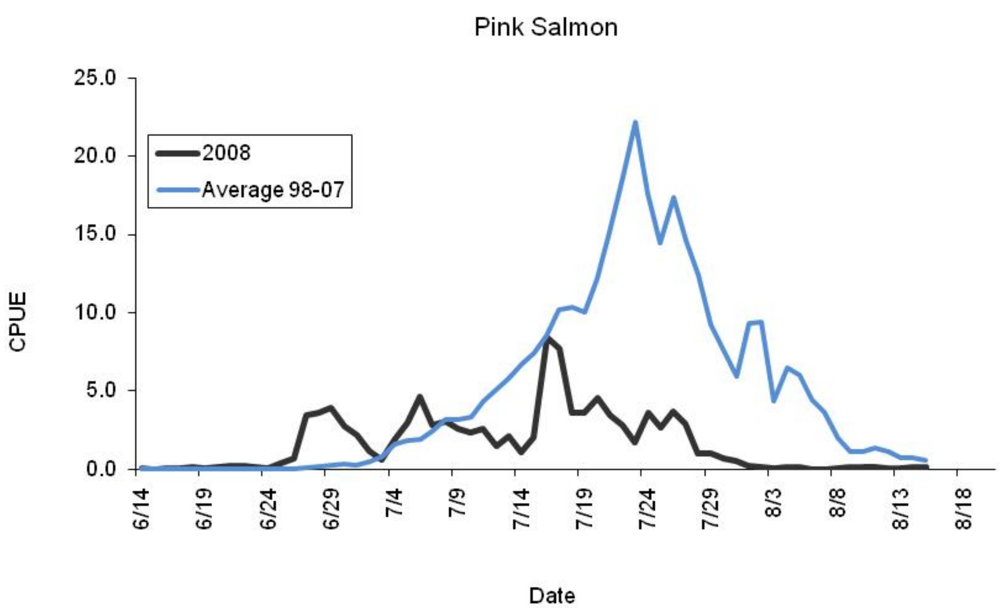
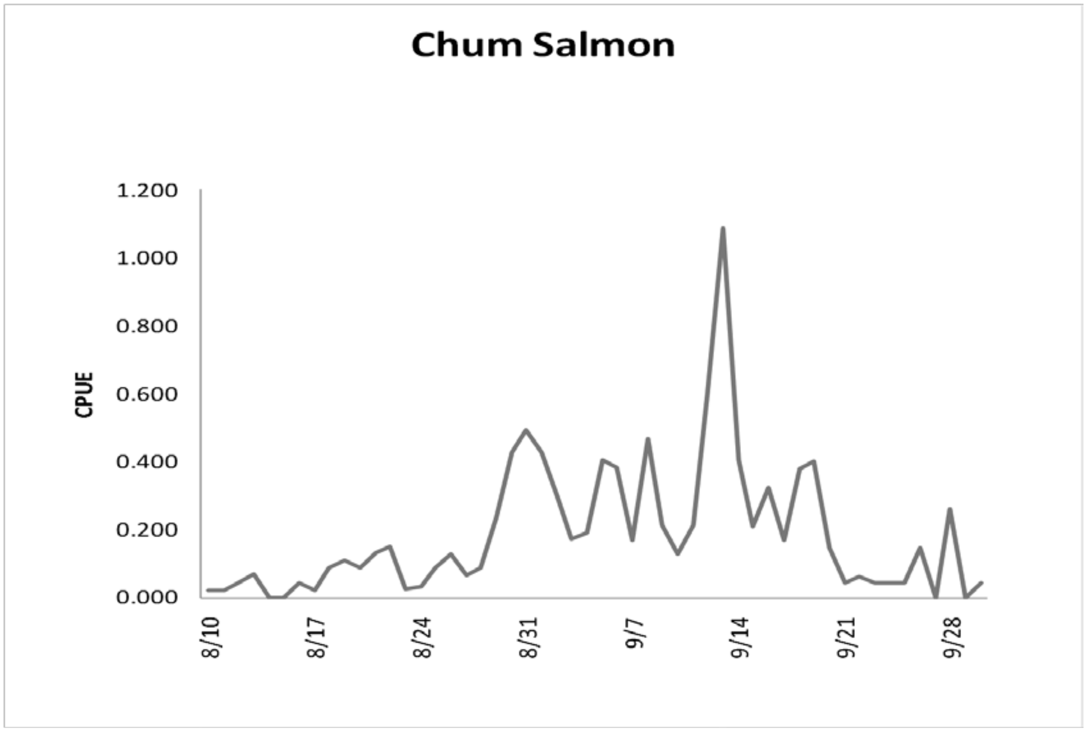


Figure 3. Fish wheel CPUE for sockeye, pink, and chum salmon at Canyon Island, 2007.

Figure 3. continued



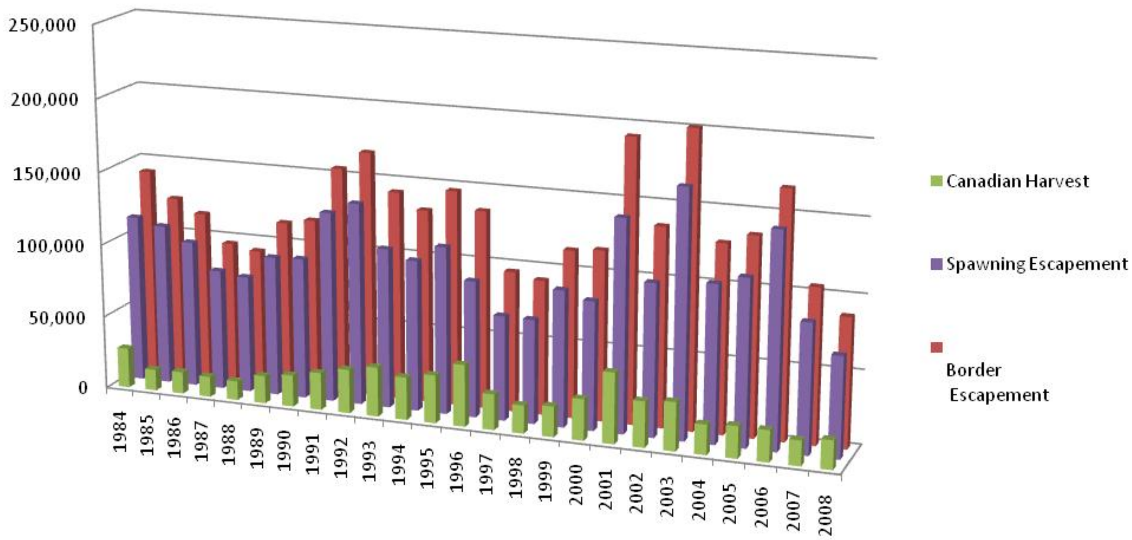


Figure 4. Historical sockeye mark-recapture abundance estimates above the U.S./Canada border including Canadian inriver harvests and escapements for Taku River sockeye, 1984-2008.

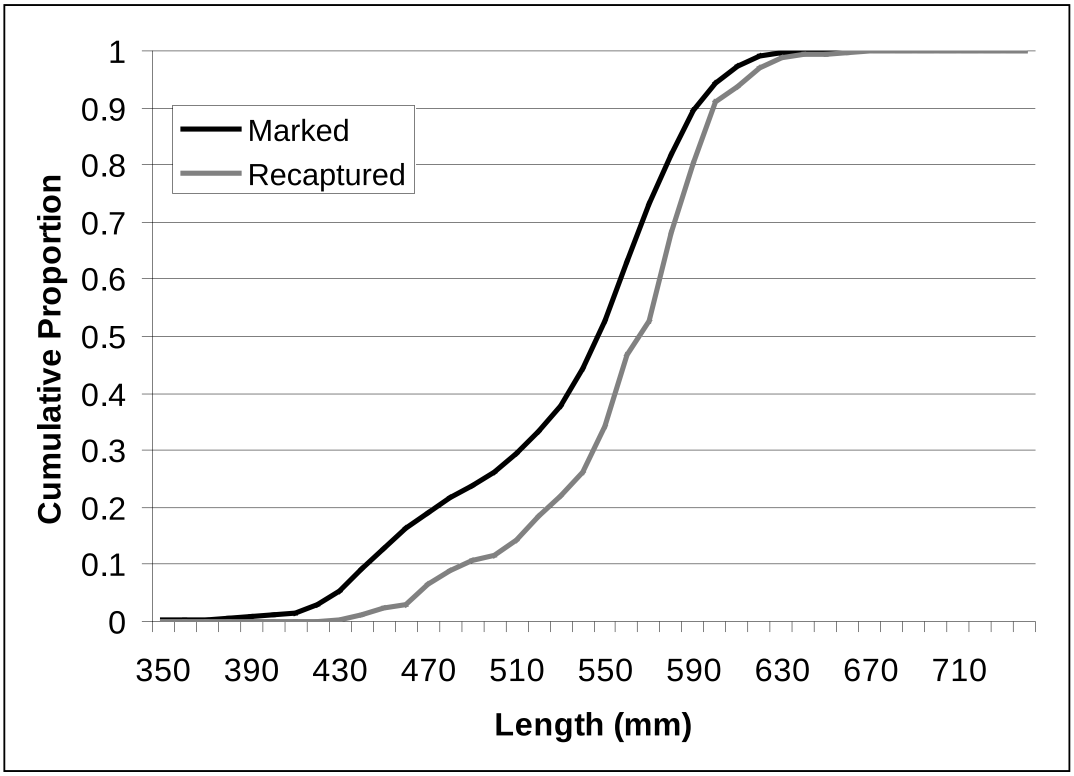


Figure 5. Cumulative Distribution Functions (CDF) of MEF lengths of sockeye salmon tagged at Canyon Island and of tagged sockeye salmon recovered in the Canadian commercial fishery, 2008.

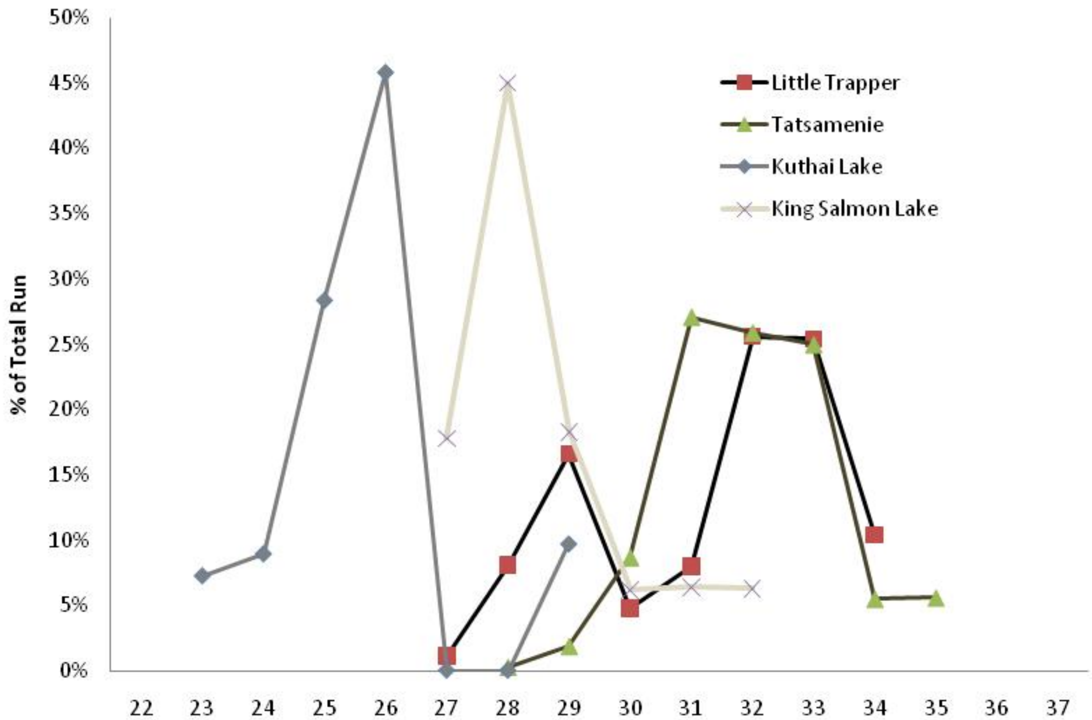


Figure 6. Run timing of four sockeye salmon stock groups passing Canyon Island, 2008.

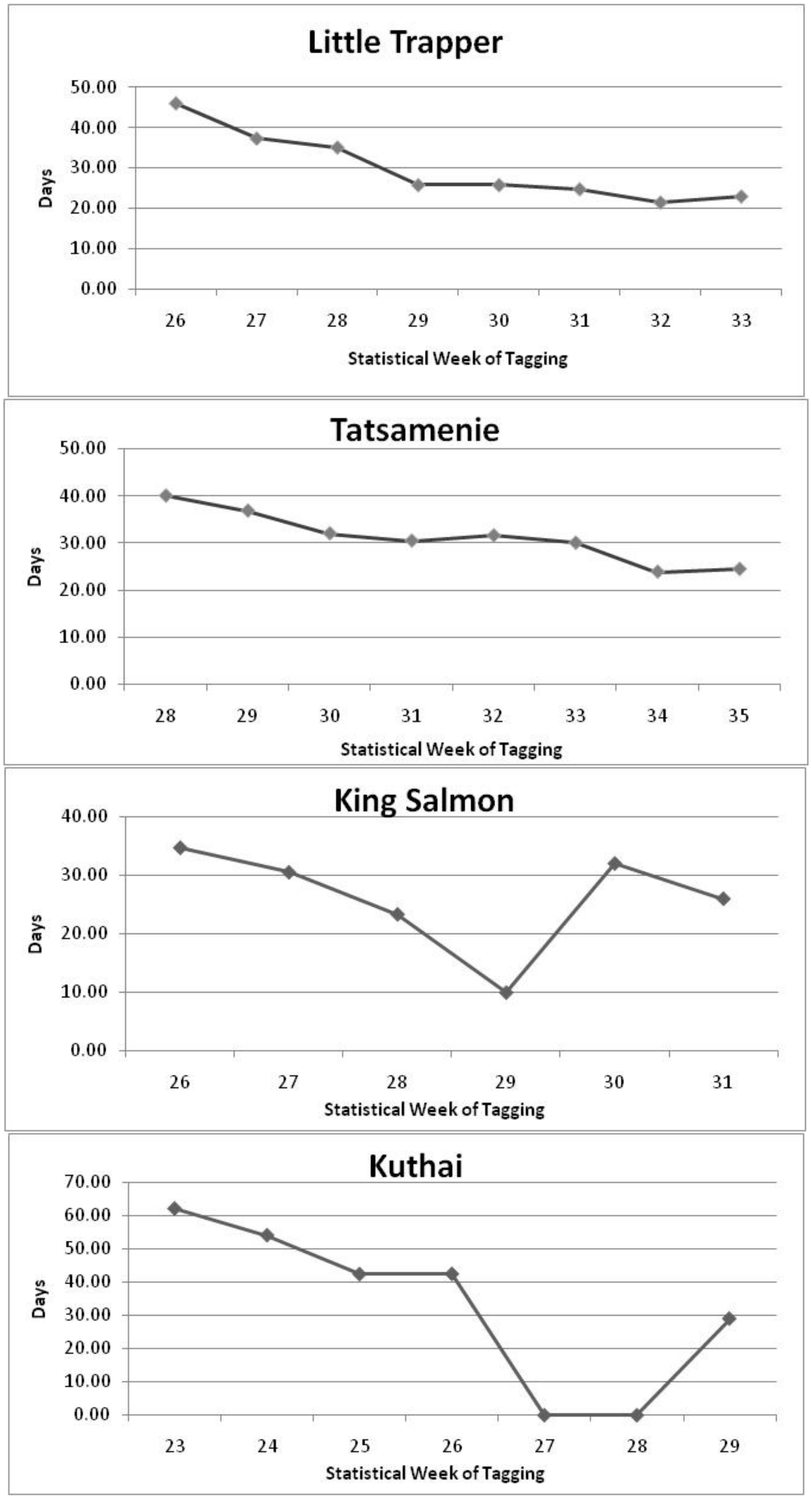


Figure 7. Mean travel times for tagged sockeye salmon between Canyon Island and two upriver locations, 2008.

Appendix A. Inclusive dates for statistical weeks, 2008.

2008 Statistical Week Calendar						
Stat Week	From	Through		Stat Week	From	Through
1	1-Jan	5-Jan		28	6-Jul	12-Jul
2	6-Jan	12-Jan		29	13-Jul	19-Jul
3	13-Jan	19-Jan		30	20-Jul	26-Jul
4	20-Jan	26-Jan		31	27-Jul	2-Aug
5	27-Jan	2-Feb		32	3-Aug	9-Aug
6	3-Feb	9-Feb		33	10-Aug	16-Aug
7	10-Feb	16-Feb		34	17-Aug	23-Aug
8	17-Feb	23-Feb		35	24-Aug	30-Aug
9	24-Feb	1-Mar		36	31-Aug	6-Sep
10	2-Mar	8-Mar		37	7-Sep	13-Sep
11	9-Mar	15-Mar		38	14-Sep	20-Sep
12	16-Mar	22-Mar		39	21-Sep	27-Sep
13	23-Mar	29-Mar		40	28-Sep	4-Oct
14	30-Mar	5-Apr		41	5-Oct	11-Oct
15	6-Apr	12-Apr		42	12-Oct	18-Oct
16	13-Apr	19-Apr		43	19-Oct	25-Oct
17	20-Apr	26-Apr		44	26-Oct	1-Nov
18	27-Apr	3-May		45	2-Nov	8-Nov
19	4-May	10-May		46	9-Nov	15-Nov
20	11-May	17-May		47	16-Nov	22-Nov
21	18-May	24-May		48	23-Nov	29-Nov
22	25-May	31-May		49	30-Nov	6-Dec
23	1-Jun	7-Jun		50	7-Dec	13-Dec
24	8-Jun	14-Jun		51	14-Dec	20-Dec
25	15-Jun	21-Jun		52	21-Dec	27-Dec
26	22-Jun	28-Jun		53	28-Dec	31-Dec
27	29-Jun	5-Jul				

Appendix B.1. Catches and number tagged of salmon in the fish wheels at Canyon Island, 2008.

			FISHING EFFORT				SOCKEYE							PINK					CHUM			DV		Steelhead	
Stat			FWI	FWI	FWII	FWII	FW Catches		FW Tagged		CPUE			Total Catches		CPUE			Total Catches		CPUE	Total Catches		Total Catches	
Week	Date	Day	Effort	RPM	Effort	RPM	Daily	Cum.	Daily	Cum.	Daily	Cum.	Cum. Prop	Daily	Cum.	Daily	Cum.	Cum. Prop	Daily	Cum.	Daily	Daily	Cum.	Daily	Cum.
17	23-Apr																					2	2		
17	24-Apr																					1	3		
17	25-Apr																					1	4		
17	26-Apr																						4	1	1
17	27-Apr						0	0	0	0													4		1
17	28-Apr						0	0	0	0													4		1
17	29-Apr						0	0	0	0													4		1
18	30-Apr						0	0	0	0													4		1
18	1-May						0	0	0	0												1	5	1	2
18	2-May						0	0	0	0												4	9		2
18	3-May						0	0	0	0													9		2
18	4-May						0	0	0	0													9	1	3
18	5-May						0	0	0	0												1	10		3
18	6-May						0	0	0	0												1	11		3
19	7-May						0	0	0	0													11		3
19	8-May						0	0	0	0													11		3
19	9-May						0	0	0	0												1	12		3
19	10-May						0	0	0	0													12	1	4
19	11-May						0	0	0	0													12		4
19	12-May						0	0	0	0													12		4
19	13-May						0	0	0	0													12		4
20	14-May		NO FISHING EFFORT					0		0													12		4
20	15-May						0	0	0	0													12		4
20	16-May		0.0	0.0	14.00	2.1	0	0	0	0													12		4
20	17-May		8.00	2.2	23.92	2.4	0	0	0	0												1	13		4
20	18-May		23.83	2.2	23.92	2.4	0	0	0	0												3	16		4
20	19-May		23.83	2.3	23.92	2.5	0	0	0	0												2	18		4
20	20-May		23.50	2.5	23.50	2.4	0	0	0	0													18	1	5
21	21-May		23.00	2.5	23.00	2.5	0	0	0	0												1	19		5
21	22-May		23.50	2.3	23.75	2.3	0	0	0	0												2	21		5
21	23-May		23.42	2.5	23.58	2.9	0	0	0	0													21		5
21	24-May		23.50	2.5	23.75	2.8	0	0	0	0													21		5
21	25-May		23.67	3.0	23.67	3.1	0	0	0	0													21		5
21	26-May		23.92	2.5	23.92	2.5	0	0	0	0													21		5
21	27-May		23.92	2.5	23.75	2.3	0	0	0	0													21		5
22	28-May		23.42	2.7	23.83	2.5	0	0	0	0													21		5
22	29-May		23.83	2.8	23.93	2.4	0	0	0	0													21		5
22	30-May		23.67	2.7	23.83	2.0	0	0	0	0												1	22		5
22	31-May		23.67	2.7	23.83	2.0	0	0	0	0													22		5
22	1-Jun		23.42	2.2	23.00	2.5	0	0	0	0													22		5
22	2-Jun	1	23.42	2.6	22.83	2.3	4	4	4	4	0.086	0.086	0.0010										22		5
22	3-Jun	2	23.67	3.0	22.83	2.6	2	6	2	6	0.043	0.129	0.0016										22		5
23	4-Jun	3	23.8	2.3	23.17	2.2	10	16	10	16	0.000	0.129	0.0016										22		5
23	5-Jun	4	22.50	2.3	21.42	2.0	17	33	17	33	0.387	0.517	0.0063										22		5
23	6-Jun	5	23.08	2.2	22.33	1.9	14	47	14	47	0.308	0.825	0.0100									1	23		5
23	7-Jun	6	22.17	2.0	22.58	2.0	25	72	25	72	0.559	1.384	0.0168										23		5
23	8-Jun	7	22.83	2.0	22.67	2.0	20	92	20	92	0.440	1.823	0.0221									1	24		5
23	9-Jun	8	22.92	2.0	23.33	2.0	12	104	11	103	0.259	2.083	0.0252								0.000		24		5
23	10-Jun	9	23.08	2.0	23.50	2.0	22	126	13	116	0.472	2.555	0.0309								0.000	1	25	1	6
24	11-Jun	10	23.58	2.0	23.67	2.0	19	145	7	123	0.402	2.957	0.0358								0.000	2	27		6
24	12-Jun	11	23.58	2.1	23.58	2.0	13	158	13	136	0.276	3.233	0.0392								0.000		27		6
24	13-Jun	12	23.58	2.2	23.83	2.0	19	177	12	148	0.401	3.633	0.0440								0.000		27		6
24	14-Jun	13	23.58	2.5	23.67	2.3	31	208	25	173	0.656	4.289	0.0520								0.000	1	28		6
24	15-Jun	14	23.08	2.4	23.58	2.3	20	228	12	185	0.429	4.718	0.0572								0.000		28		6
24	16-Jun	15	23.17	2.4	23.42	2.1	45	273	44	229	0.966	5.684	0.0689								0.000	3	31		6
24	17-Jun	16	22.00	2.2	23.42	2.2	46	319	41	270	1.013	6.697	0.0811								0.000	4	35	4	10
25	18-Jun	17	23.17	2.4	23.33	2.3	32	351	30	300	0.688	7.385	0.0895								0.000	0	35	3	13
25	19-Jun	18	23.08	2.5	23.42	2.3	31	382	31	331	0.667	8.052	0.0975								0.000	1	36		13
25	20-Jun	19	23.08	2.5	23.33	2.3	36	418	36	367	0.776	8.827	0.1069								0.000	3	39		13
25	21-Jun	20	23.17	2.5	23.50	2.3	46	464	42	409	0.986	9.813	0.1189								0.000	3	42		13
25	22-Jun	21	22.58	2.5	23.25	2.4	82	546	82	491	1.789	11.602	0.1405								0.000	4	46	2	15
25	23-Jun	22	22.42	2.3	22.92	2.3	107	653	104	595	2.360	13.962	0.1691								0.000		46		15
25	24-Jun	23	22.92	2.1	23.08	1.9	105	758	102	697	2.283	16.245	0.1968								0.000	1	47	1	16
26	25-Jun	24	23.33	2.3	23.15	2.0	41	799	41	738	0.882	17.127	0.2075								0.000	3	50		16
26	26-Jun	25	23.25	2.2	23.75	2.1	18	817	16	754	0.383	17.510	0.2121	1	1	0.021	0.0213	0.0002			0.000	0	50		16
26	27-Jun	26	23.58	2.0	23.75	1.8	18	835	15	769	0.380	17.890	0.2167	0	1	0.000	0.0213	0.0002			0.000	2	52	1	17
26	28-Jun	27	23.58	2.2	23.67	2.1	16	851	13	782	0.339	18.229	0.2208	2	3	0.042	0.0636	0.0006			0.000	2	54	0	17
26	29-Jun	28	22.92	2.3	22.92	2.2	46	897	44	826	1.003	19.232	0.2330	4	7	0.087	0.1509	0.0015			0.000	3	57	1	18
26	30-Jun	29	23.17	2.1	23.58	2.0	50	947	47	873	1.070	20.302	0.2459	8	15	0.171	0.3220	0.0031			0.000	1	58	0	18
26	1-Jul	30	23.50	2.2	23.67	2.1	20	967	18	891	0.424	20.726	0.2511	1	16	0.021	0.3432	0.0034			0.000	5	63	1	19
27	2-Jul	31	23.42	2.6	23.58	2.5	24	991	23	914	0.511	21.236	0.2573	7	23	0.149	0.4921	0.0048			0.000	1	64		19
27	3-Jul	32	23.25	2.6	23.50	2.6	44	1035	38	952	0.941	22.178	0.2687	9	32	0.193	0.6846	0.0067	1	1	0.021	2	66	1	20
27	4-Jul	33	23.42	2.4	23.67	2.3	18	1053	18	970	0.382	22.560	0.2733	9	41	0.191	0.8758	0.0086	0	1	0.000	2	68	0	20
27	5-Jul	34	23.58	2.6	23.83	2.4	9	1062	9	979	0.190	22.750	0.2756	5	46	0.105	0.9812	0.0096	0	1	0.000	3	71	0	20
27	6-Jul	35	22.25	2.3	22.42	2.3	6	1068	6	985	0.134	22.884	0.2772	3	49	0.067	1.0484	0.0102	0	1	0.000	1	72	0	20
27	7-Jul	36	23.58	2.3	23.67	2.3	19	1087	18	1003	0.402	23.286	0.2821	19	68	0.402	1.4505	0.0142	0	1	0.000	5	77	0	20
27	8-Jul	37	23.67	2.3	23.58	2.3	17	1104	16	1019	0.360	23.646	0.2864	32	100	0.677	2.1277	0.0208	0	1	0.000	12	89	0	20
28	9-Jul	38	22.92	2.5	22.83	2.1	18	1122	18	1037	0.393	24.039	0.2912	158	258	3.454	5.5813	0.0545	1	2	0.022	14	103	0	20
28	10-Jul	39	23.50	2.4	23.58	2.1	17	1139	14	1051	0.361	24.400	0.2956	168	426	3.568	9.1497	0.0893	0	2	0.000	8	111	0	20
28	11-Jul	40	23.08	2.0	23.75	2.1	13	1152	12	1063	0.278	24.678	0.2989	185	611	3.950	13.1002	0.1279	1	3	0.021	3	114	0	20
28	12-Jul	41	23.12	2.0	23.58	2.0	9	1161	9	1072	0.193	24.871	0.3013	127	738	2.719	15.8196	0.1545	0	3	0.000	3	117	0	20
28	13-Jul	42	23.75	1.9	23.58	2.2	21	1182	20	1092	0.444	25.314	0.3067	103	841	2.176	17.9958	0.1757	0	3	0.000	7	124	0	20
28	14-Jul	43	23.42	2.2	23.58	1.9	14	1196	14	1106	0.298	25.612	0.3103	53	894	1.128	19.1235	0.1867	0	3	0.000	3	127	0	20
28	15-Jul	44	23.58	2.3	23.67	2.1	15	1211	14	1120	0.317	25.930	0.3141	28	922	0.593	19.7161	0.1925	0	3	0.000	5	132	0	20

Appendix B.1. Catches and number tagged of salmon in the fish wheels at Canyon Island, 2008.

			FISHING EFFORT				SOCKEYE							PINK					CHUM			DV		Steelhead	
Stat			FWI	FWI	FWII	FWII	FW Catches		FW Tagged		CPUE			Total Catches		CPUE			Total Catches		CPUE	Total Catches		Total Catches	
Week	Date	Day	Effort	RPM	Effort	RPM	Daily	Cum.	Daily	Cum.	Daily	Cum.	Cum. Prop	Daily	Cum.	Daily	Cum.	Cum. Prop	Daily	Cum.	Daily	Daily	Cum.	Daily	Cum.
29	16-Jul	45	23.42	2.3	23.67	2.0	19	1230	19	1139	0.403	26.333	0.3190	91	1013	1.932	21.6486	0.2114	0	3	0.000	4	136	0	20
29	17-Jul	46	23.33	2.4	23.58	2.1	21	1251	17	1156	0.448	26.781	0.3244	138	1151	2.942	24.5904	0.2401	0	3	0.000	5	141	0	20
29	18-Jul	47	23.08	2.5	23.00	2.2	40	1291	36	1192	0.868	27.649	0.3349	213	1364	4.622	29.2128	0.2853	0	3	0.000	4	145	0	20
29	19-Jul	48	23.12	2.4	23.67	2.6	14	1305	11	1203	0.299	27.948	0.3386	130	1494	2.778	31.9911	0.3124	1	4	0.021	2	147	0	20
29	20-Jul	49	23.25	2.1	23.12	2.4	55	1360	52	1255	1.186	29.134	0.3529	140	1634	3.019	35.0103	0.3419	0	4	0.000	3	150	0	20
29	21-Jul	50	23.12	2.0	23.08	2.0	60	1420	51	1306	1.299	30.433	0.3687	120	1754	2.597	37.6077	0.3672	0	4	0.000	4	154	0	20
29	22-Jul	51	23.42	2.0	23.25	2.0	61	1481	55	1361	1.307	31.740	0.3845	110	1864	2.357	39.9647	0.3902	0	4	0.000	6	160	0	20
30	23-Jul	52	22.83	2.0	23.42	2.0	34	1515	29	1390	0.735	32.475	0.3934	118	1982	2.551	42.5161	0.4152	1	5	0.022	9	169	0	20
30	24-Jul	53	23.50	2.1	23.33	2.0	25	1540	24	1414	0.534	33.009	0.3999	69	2051	1.473	43.9895	0.4295	0	5	0.000	5	174	1	21
30	25-Jul	54	22.83	2.3	23.58	2.3	24	1564	24	1438	0.517	33.526	0.4061	97	2148	2.090	46.0795	0.4500	0	5	0.000	6	180	0	21
30	26-Jul	55	21.42	2.5	23.50	2.4	30	1594	29	1467	0.668	34.194	0.4142	47	2195	1.046	47.1258	0.4602	0	5	0.000	10	190	0	21
30	27-Jul	56	22.25	2.2	23.33	2.6	82	1676	78	1545	1.799	35.993	0.4360	91	2286	1.996	49.1223	0.4797	0	5	0.000	5	195	0	21
30	28-Jul	57	22.50	2.1	21.92	2.4	153	1829	142	1687	3.444	39.437	0.4777	373	2659	8.397	57.5195	0.5617	1	6	0.023	15	210	0	21
30	29-Jul	58	22.83	2.6	22.92	2.4	155	1984	146	1833	3.388	42.825	0.5188	351	3010	7.672	65.1916	0.6366	1	7	0.022	12	222	0	21
31	30-Jul	59	22.75	2.2	23.00	2.4	146	2130	140	1973	3.191	46.017	0.5574	166	3176	3.628	68.8200	0.6720	1	8	0.022	15	237	1	22
31	31-Jul	60	23.00	2.0	23.08	2.4	107	2237	97	2070	2.322	48.339	0.5856	165	3341	3.581	72.4007	0.7070	0	8	0.000	9	246	0	22
31	1-Aug	61	22.92	1.8	22.75	2.3	109	2346	98	2168	2.387	50.725	0.6145	207	3548	4.533	76.9332	0.7512	1	9	0.022	10	256	0	22
31	2-Aug	62	23.12	2.4	23.12	2.2	48	2394	42	2210	1.038	51.763	0.6271	158	3706	3.417	80.3502	0.7846	1	10	0.022	10	266	0	22
31	3-Aug	63	22.83	2.2	23.42	2.2	70	2464	68	2278	1.514	53.277	0.6454	129	3835	2.789	83.1394	0.8118	1	11	0.022	13	279	0	22
31	4-Aug	64	23.42	2.1	23.42	2.3	64	2528	62	2340	1.366	54.643	0.6619	82	3917	1.751	84.8900	0.8289	0	11	0.000	7	286	0	22
31	5-Aug	65	22.58	2.5	22.42	2.2	132	2660	126	2466	2.933	57.577	0.6975	161	4078	3.578	88.4678	0.8639	1	12	0.022	9	295	0	22
32	6-Aug	66	22.83	2.8	22.92	2.5	74	2734	62	2528	1.617	59.194	0.7171	121	4199	2.645	91.1126	0.8897	3	15	0.066	16	311	0	22
32	7-Aug	67	21.92	2.4	22.67	2.6	105	2839	85	2613	2.355	61.549	0.7456	163	4362	3.656	94.7681	0.9254	7	22	0.157	8	319	1	23
32	8-Aug	68	22.00	2.2	22.33	2.5	149	2988	122	2735	3.361	64.910	0.7863	130	4492	2.933	97.7007	0.9540	6	28	0.135	5	324	0	23
32	9-Aug	69	22.50	2.5	22.67	2.6	123	3111	111	2846	2.723	67.633	0.8193	44	4536	0.974	98.6748	0.9635	10	38	0.221	4	328	0	23
32	10-Aug	70	22.83	2.0	22.00	2.1	138	3249	131	2977	3.078	70.711	0.8566	45	4581	1.004	99.6786	0.9733	4	42	0.089	3	331	0	23
32	11-Aug	71	23.50	2.4	22.50	2.4	81	3330	77	3054	1.761	72.472	0.8779	31	4612	0.674	100.3525	0.9799	7	49	0.152	4	335	0	23
32	12-Aug	72	22.83	2.3	23.00	2.3	55	3385	49	3103	1.200	73.672	0.8925	24	4636	0.524	100.8762	0.9850	9	58	0.196	9	344	0	23
33	13-Aug	73	23.08	2.4	23.12	2.5	62	3447	56	3159	1.342	75.014	0.9087	11	4647	0.238	101.1143	0.9874	2	60	0.043	2	346	0	23
33	14-Aug	74	23.50	2.8	23.75	2.6	10	3457	8	3167	0.212	75.226	0.9113	5	4652	0.106	101.2201	0.9884	1	61	0.021	4	350	0	23
33	15-Aug	75	23.33	2.5	23.58	2.5	15	3472	13	3180	0.320	75.546	0.9151	3	4655	0.064	101.2840	0.9890	1	62	0.021	0	350	0	23
33	16-Aug	76	23.00	2.3	23.42	2.4	38	3510	33	3213	0.819	76.364	0.9251	8	4663	0.172	101.4564	0.9907	9	71	0.194	2	352	0	23
33	17-Aug	77	23.33	2.4	23.83	2.5	12	3522	11	3224	0.254	76.619	0.9281	5	4668	0.106	101.5624	0.9917	5	76	0.106	1	353	0	23
33	18-Aug	78	23.75	3.0	23.83	2.9	12	3534	11	3235	0.252	76.871	0.9312	0	4668	0.000	101.5624	0.9917	3	79	0.063	0	353	0	23
33	19-Aug	79	7.00	3.5	7.00	3.5	0	3534	0	3235	0.000	76.871	0.9312	0	4668	0.000	101.5624	0.9917	0	79	0.000	0	353	0	23
34	20-Aug	80	13.08	2.8	14.17	2.0	7	3541	7	3242	0.257	77.128	0.9343	2	4670	0.073	101.6358	0.9925	0	79	0.000	1	354	0	23
34	21-Aug	81	23.12	2.1	14.50	2.0	29	3570	26	3268	0.771	77.899	0.9437	6	4676	0.159	101.7953	0.9940	8	87	0.213	1	355	0	23
34	22-Aug	82	21.92	2.1	23.50	2.0	43	3613	38	3306	0.947	78.845	0.9551	6	4682	0.132	101.9274	0.9953	27	114	0.594	17	372	0	23
34	23-Aug	83	22.58	2.5	23.58	2.2	37	3650	33	3339	0.802	79.647	0.9648	6	4688	0.130	102.0574	0.9966	29	143	0.628	3	375	0	23
34	24-Aug	84	22.83	2.6	23.67	2.5	32	3682	29	3368	0.688	80.335	0.9732	3	4691	0.065	102.1219	0.9972	14	157	0.301	4	379	0	23
34	25-Aug	85	22.92	2.5	22.83	2.4	39	3721	30	3398	0.852	81.188	0.9835	3	4694	0.066	102.1875	0.9978	11	168	0.240	8	387	1	24
34	26-Aug	86	23.33	2.4	23.33	2.0	17	3738	15	3413	0.364	81.552	0.9879	5	4699	0.107	102.2946	0.9989	10	178	0.214	3	390	0	24
35	27-Aug	87	22.42	2.2	21.33	2.0	19	3757	15	3428	0.434	81.986	0.9932	5	4704	0.114	102.4089	1.0000	39	217	0.891	5	395	1	25
35	28-Aug	88	23.42	1.8	17.50	1.8	6	3763	4	3432	0.147	82.133	0.9949						10	227	0.244	3	398	1	26
35	29-Aug	89	23.67	1.8	23.75	1.7	2	3765	1	3433	0.042	82.175	0.9955						6	233	0.127	6	404	0	26
35	30-Aug	90	23.83	1.6	23.75	1.8	3	3768	2	3435	0.063	82.238	0.9962						5	238	0.105	1	405	0	26
35	31-Aug	91	23.75	1.0	23.92	1.0	2	3770	0	3435	0.042	82.280	0.9967						7	245	0.147	2	407	0	26
35	1-Sep	92	23.75	0.5	23.92	0.5	4	3774	0	3435	0.084	82.364	0.9977						1	246	0.021	4	411	5	31
35	2-Sep	93	23.9	0.3	29.92	0.3	3	3777	2	3437	0.000	82.364	0.9977						2	248	0.037	2	413	0	31
36	3-Sep	94					2	3779	2	3439		82.364	0.9977						0	248		0	413	1	32
36	4-Sep	95					2	3781	2	3441		82.364	0.9977						0	248		0	413	4	36
36	5-Sep	96					1	3782	1	3442		82.364	0.9977						0	248		0	413	5	41
36	6-Sep	97					7	3789	7	3449		82.364	0.9977						5	253		0	413	9	50
36	7-Sep	98					6	3795	6	3455		82.364	0.9977						4	257		2	415	6	56
36	8-Sep	99					1	3796	1	3456		82.364	0.9977						2	259		2	417	10	66
36	9-Sep	100	23.50	2.2	23.50	1.7	2	3798	2	3458	0.043	82.407	0.9983						10	269	0.213	1	418	5	71
37	10-Sep	101	23.42	2.2	23.83	2.0	0	3798	0	3458	0.000	82.407	0.9983						20	289	0.423	0	418	0	71
37	11-Sep	102	23.58	2.0	23.83	2.1	0	3798	0	3458	0.000	82.407	0.9983						11	300	0.232	0	418	2	73
37	12-Sep	103	23.42	2.3	23.83	1.9	0	3798	0	3458	0.000	82.407	0.9983						6	306	0.127	1	419	2	75
37	13-Sep	104	23.67	2.2	23.83	1.5	1	3799	0	3458	0.021	82.428	0.9985						6	312	0.126	0	419	5	80
37	14-Sep	105	23.75	2.3	23.83	1.9	1	3800	1	3459	0.021	82.449	0.9988						3	315	0.063	0	419	1	81
37	15-Sep	106	23.58	2.7	23.83	2.5	1	3801	1	3460	0.021	82.470	0.9990						2	317	0.042	0	419	4	85
37	16-Sep	107	23.67	2.1	13.50	2.3	3	3804	3	3463	0.081	82.550	1.0000						3	320	0.081	0	419	0	85
38	17-Sep	108	23.50	2.6			0		0										4	324	0.170	0	419	2	87
38	18-Sep	109	21.67	2.7			0		0										4	328	0.185	2	421	1	88
38	19-Sep	110	22.83	2.2			0		0										3	331	0.131	1	422	1	89
38	20-Sep	111	23.50	2.4			0		0										4	335	0.170	0	422	4	93
38	21-Sep	112	23.58	2.0			0		0										4	339	0.170	0	422	5	98
38	22-Sep	113	23.58	1.7			0		0										6	345	0.254	0	422	7	105
38	23-Sep	114	23.75	1.2			0	0.91036	0										3	348	0.126	1	423	6	111

Appendix C.1. Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	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 23 (June 1 - 7)												
Male												
Sample Size								22			1	23
Percent								44.0			2.0	46.0
Std. Error								7.1			2.0	7.1
Female												
Sample Size								27				27
Percent								54.0				54.0
Std. Error								7.1				7.1
All Fish												
Sample Size								49			1	50
Percent								98.0			2.0	100.0
Std. Error								2.0			2.0	
Statistical Week 24 (June 8 - 14)												
Male												
Sample Size					6			26			1	33
Percent					7.5			32.5			1.3	41.3
Std. Error					3.0			5.3			1.3	5.5
Female												
Sample Size				1	1			45				47
Percent				1.3	1.3			56.3				58.8
Std. Error				1.3	1.3			5.6				5.5
All Fish												
Sample Size				1	7			71			1	80
Percent				1.3	8.8			88.8			1.3	100.0
Std. Error				1.3	3.2			3.6			1.3	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	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 25 (June 15 - June 21)												
Male												
Sample Size		4		6	12			52			2	76
Percent		2.4		3.6	7.3			31.5			1.2	46.1
Std. Error		1.2		1.5	2.0			3.6			0.9	3.9
Female												
Sample Size				5	12			72				89
Percent				3.0	7.3			43.6				53.9
Std. Error				1.3	2.0			3.9				3.9
All Fish												
Sample Size		4		11	24			124			2	165
Percent		2.4		6.7	14.5			75.2			1.2	100.0
Std. Error		1.2		1.9	2.8			3.4			0.9	
Statistical Week 26 (June 22 - 28)												
Male												
Sample Size		3		4	16			50	2	1		76
Percent		2.1		2.8	11.1			34.7	1.4	0.7		52.8
Std. Error		1.2		1.4	2.6			4.0	1.0	0.7		4.2
Female												
Sample Size				5	20			42	1			68
Percent				3.5	13.9			29.2	0.7			47.2
Std. Error				1.5	2.9			3.8	0.7			4.2
All Fish												
Sample Size		3		9	36			92	3	1		144
Percent		2.1		6.3	25.0			63.9	2.1	0.7		100.0
Std. Error		1.2		2.0	3.6			4.0	1.2	0.7		

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	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 25 (June 15 - June 21)												
Male												
Sample Size		4		6	12			52			2	76
Percent		2.4		3.6	7.3			31.5			1.2	46.1
Std. Error		1.2		1.5	2.0			3.6			0.9	3.9
Female												
Sample Size				5	12			72				89
Percent				3.0	7.3			43.6				53.9
Std. Error				1.3	2.0			3.9				3.9
All Fish												
Sample Size		4		11	24			124			2	165
Percent		2.4		6.7	14.5			75.2			1.2	100.0
Std. Error		1.2		1.9	2.8			3.4			0.9	
Statistical Week 26 (June 22 - 28)												
Male												
Sample Size		3		4	16			50	2	1		76
Percent		2.1		2.8	11.1			34.7	1.4	0.7		52.8
Std. Error		1.2		1.4	2.6			4.0	1.0	0.7		4.2
Female												
Sample Size				5	20			42	1			68
Percent				3.5	13.9			29.2	0.7			47.2
Std. Error				1.5	2.9			3.8	0.7			4.2
All Fish												
Sample Size		3		9	36			92	3	1		144
Percent		2.1		6.3	25.0			63.9	2.1	0.7		100.0
Std. Error		1.2		2.0	3.6			4.0	1.2	0.7		

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	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 27 (June 29 - July 5)												
Male												
Sample Size		6	1	1	23			26	2			59
Percent		4.6	0.8	0.8	17.7			20.0	1.5			45.4
Std. Error		1.8	0.8	0.8	3.4			3.5	1.1			4.4
Female												
Sample Size				7	22			38	3		1	71
Percent				5.4	16.9			29.2	2.3		0.8	54.6
Std. Error				2.0	3.3			4.0	1.3		0.8	4.4
All Fish												
Sample Size		6	1	8	45			64	5		1	130
Percent		4.6	0.8	6.2	34.6			49.2	3.8		0.8	100.0
Std. Error		1.8	0.8	2.1	4.2			4.4	1.7		0.8	
Statistical Week 28 (July 6 - 12)												
Male												
Sample Size		7	1		17			13	3			41
Percent		9.9	1.4		23.9			18.3	4.2			57.7
Std. Error		3.6	1.4		5.1			4.6	2.4			5.9
Female												
Sample Size		1		5	9			14	1			30
Percent		1.4		7.0	12.7			19.7	1.4			42.3
Std. Error		1.4		3.1	4.0			4.8	1.4			5.9
All Fish												
Sample Size		8	1	5	26			27	4			71
Percent		11.3	1.4	7.0	36.6			38.0	5.6			100.0
Std. Error		3.8	1.4	3.1	5.8			5.8	2.8			

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	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 29 (July 13 - 19)												
Male												
Sample Size	1	13		5	16			21	1	1		58
Percent	1.1	14.4		5.6	17.8			23.3	1.1	1.1		64.4
Std. Error	1.1	3.7		2.4	4.1			4.5	1.1	1.1		5.1
Female												
Sample Size				5	5			20	2			32
Percent				5.6	5.6			22.2	2.2			35.6
Std. Error				2.4	2.4			4.4	1.6			5.1
All Fish												
Sample Size	1	13		10	21			41	3	1		90
Percent	1.1	14.4		11.1	23.3			45.6	3.3	1.1		100.0
Std. Error	1.1	3.7		3.3	4.5			5.3	1.9	1.1		
Statistical Week 30 (July 20 - July 26)												
Male												
Sample Size	1	18	2	9	35			24	2		1	92
Percent	0.6	11.1	1.2	5.6	21.6			14.8	1.2		0.6	56.8
Std. Error	0.6	2.5	0.9	1.8	3.2			2.8	0.9		0.6	3.9
Female												
Sample Size		1		19	6			44				70
Percent		0.6		11.7	3.7			27.2				43.2
Std. Error		0.6		2.5	1.5			3.5				3.9
All Fish												
Sample Size	1	19	2	28	41			68	2		1	162
Percent	0.6	11.7	1.2	17.3	25.3			42.0	1.2		0.6	100.0
Std. Error	0.6	2.5	0.9	3.0	3.4			3.9	0.9		0.6	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	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 31 (July 27 - August 2)												
Male												
Sample Size	2	16	4	11	18			29	2		1	83
Percent	1.0	8.0	2.0	5.5	9.0			14.6	1.0		0.5	41.7
Std. Error	0.7	1.9	1.0	1.6	2.0			2.5	0.7		0.5	3.5
Female												
Sample Size		1		36	14			62	1	1	1	116
Percent		0.5		18.1	7.0			31.2	0.5	0.5	0.5	58.3
Std. Error		0.5		2.7	1.8			3.3	0.5	0.5	0.5	3.5
All Fish												
Sample Size	2	17	4	47	32			91	3	1	2	199
Percent	1.0	8.5	2.0	23.6	16.1			45.7	1.5	0.5	1.0	100.0
Std. Error	0.7	2.0	1.0	3.0	2.6			3.5	0.9	0.5	0.7	
Statistical Week 32 (August 3 - 9)												
Male												
Sample Size		31	3	9	23	1		30	2		5	104
Percent		16.6	1.6	4.8	12.3			16.0	1.1		2.7	55.1
Std. Error		2.7	0.9	1.6	2.4			2.7	0.8		1.2	3.6
Female												
Sample Size		1		17	14			46	1	2	2	83
Percent		0.5		9.1	7.5			24.6	0.5	1.1	1.1	44.4
Std. Error		0.5		2.1	1.9			3.2	0.5	0.8	0.8	3.6
All Fish												
Sample Size		32	3	26	37			76	3	2	7	187
Percent		17.1	1.6	13.9	19.8			40.6	1.6	1.1	3.7	99.5
Std. Error		2.8	0.9	2.5	2.9			3.6	0.9	0.8	1.4	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	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 33 (August 10 - 16)												
Male												
Sample Size		7	6	4	13			30	1		8	69
Percent		5.0	4.3	2.9	9.4			21.6	0.7		5.8	49.6
Std. Error		1.9	1.7	1.4	2.5			3.5	0.7		2.0	4.3
Female												
Sample Size				11	9			43	3		4	70
Percent				7.9	6.5			30.9	2.2		2.9	50.4
Std. Error				2.3	2.1			3.9	1.2		1.4	4.3
All Fish												
Sample Size		7	6	15	22			73	4		12	139
Percent		5.0	4.3	10.8	15.8			52.5	2.9		8.6	100.0
Std. Error		1.9	1.7	2.6	3.1			4.3	1.4		2.4	
Statistical Week 34 (August 17 - 23)												
Male												
Sample Size	1	4	6	1	3			14				29
Percent	1.3	5.2	7.8	1.3	3.9			18.2				37.7
Std. Error	1.3	2.5	3.1	1.3	2.2			4.4				5.6
Female												
Sample Size				5	7		1	29	5		1	48
Percent				6.5	9.1		1.3	37.7	6.5		1.3	62.3
Std. Error				2.8	3.3		1.3	5.6	2.8		1.3	5.6
All Fish												
Sample Size	1	4	6	6	10		1	43	5		1	77
Percent	1.3	5.2	7.8	7.8	13.0		1.3	55.8	6.5		1.3	100.0
Std. Error	1.3	2.5	3.1	3.1	3.9		1.3	5.7	2.8		1.3	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	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 35 (August 24 - 30)												
Male												
Sample Size	3	3	4	1	4			9	2		1	27
Percent	4.0	4.0	5.3	1.3	5.3			12.0	2.7		1.3	36.0
Std. Error	2.3	2.3	2.6	1.3	2.6			3.8	1.9		1.3	5.6
Female												
Sample Size		1		6	10			24	4		3	48
Percent		1.3		8.0	13.3			32.0	5.3		4.0	64.0
Std. Error		1.3		3.2	4.0			5.4	2.6		2.3	5.6
All Fish												
Sample Size	3	4	4	7	14			33	6		4	75
Percent	4.0	5.3	5.3	9.3	18.7			44.0	8.0		5.3	100.0
Std. Error	2.3	2.6	2.6	3.4	4.5			5.8	3.2		2.6	
Statistical Week 36 (August 31 - September 6)												
Male												
Sample Size			1									1
Percent			25.0									25.0
Std. Error			25.0									25.0
Female												
Sample Size				1					2			3
Percent				25.0					50.0			75.0
Std. Error				25.0					28.9			25.0
All Fish												
Sample Size			1	1					2			4
Percent			25.0	25.0					50.0			100.0
Std. Error			25.0	25.0					28.9			

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	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 37 (September 7 - 13)												
Male												
Sample Size												0
Percent												0.0
Std. Error												
Female												
Sample Size								1				1
Percent								100.0				100.0
Std. Error								-				-
All Fish												
Sample Size								1				1
Percent								100.0				100.0
Std. Error								-				
Statistical Week 38 (September 14 - 20)												
Male												
Sample Size					2				1			3
Percent					50.0				25.0			75.0
Std. Error					28.9				25.0			25.0
Female												
Sample Size								1				1
Percent								25.0				25.0
Std. Error								-				-
All Fish												
Sample Size					2			1	1			4
Percent					50.0			25.0	25.0			100.0
Std. Error					28.9			-	25.0			

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

				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 1 - September 20)												
Male												
Sample Size	8.0	112.0	28.0	51.0	188.0	1.0	0.0	346.0	18.0	2.0	20.0	774
Percent	0.5	7.1	1.8	3.2	11.9	0.1	0.0	21.9	1.1	0.1	1.3	49.0
Std. Error	0.2	0.6	0.3	0.4	0.8	0.1	0.0	1.0	0.3	0.1	0.3	1.3
Female												
Sample Size	0.0	5.0	0.0	123.0	129.0	0.0	1.0	508.0	23.0	3.0	12.0	804
Percent	0.0	0.3	0.0	7.8	8.2	0.0	0.1	32.2	1.5	0.2	0.8	51.0
Std. Error	0.0	0.1	0.0	0.7	0.7	0.0	0.1	1.2	0.3	0.1	0.2	1.3
All Fish												
Sample Size	8	117	28	174	317	1	1	854	41	5	32	1578
Percent	0.5	7.4	1.8	11.0	20.1	0.1	0.1	54.1	2.6	0.3	2.0	100.0
Std. Error	0.2	0.7	0.3	0.8	1.0	0.1	0.1	1.3	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, 2008.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Weeks 27 (June 29 - July 5)					
Male					
Sample Size					
Percent					
Std. Error					
Female					
Sample Size			1		1
Percent			100.0		100.0
Std. Error			-		0.0
All Fish					
Sample Size			1		1
Percent			100.0		100.0
Std. Error					
Statistical Week 28 (July 6 - 12)					
Male					
Sample Size					
Percent					
Std. Error					
Female					
Sample Size			1		1
Percent			100.0		100.0
Std. Error			-		-
All Fish					
Sample Size			1		1
Percent			100.0		100.0
Std. Error					

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 29 (July 13 - 19)					
Male					
Sample Size					
Percent					
Std. Error					
Female					
Sample Size			1		1
Percent			100.0		0.0
Std. Error			-		
All Fish					
Sample Size			1		1
Percent			100.0		100.0
Std. Error					
Statistical Week 30 (July 20 - 26)					
Male					
Sample Size					
Percent					
Std. Error					
Female					
Sample Size		1			1
Percent		100.0			100.0
Std. Error		-			-
All Fish					
Sample Size		1			1
Percent		100.0			100.0
Std. Error					

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 31 (July 27 - August 2)					
Male					
Sample Size		3			3
Percent		60.0			60.0
Std. Error		24.5			24.5
Female					
Sample Size		2			2
Percent		40.0			40.0
Std. Error		24.5			24.5
All Fish					
Sample Size		5			5
Percent		100.0			100.0
Std. Error		0.0			
Statistical Week 33 (August 10 - 16)					
Male					
Sample Size	1	16	1		18
Percent	4.0	64.0	4.0		72.0
Std. Error	4.0	9.8	4.0		9.2
Female					
Sample Size		6	1		7
Percent		24.0	4.0		28.0
Std. Error		8.7	4.0		9.2
All Fish					
Sample Size	1	22	2		25
Percent	4.0	88.0	8.0		100.0
Std. Error	4.0	6.6	5.5		

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 33 (August 10 - 16)					
Male					
Sample Size		10	2	1	13
Percent		33.3	6.7	3.3	43.3
Std. Error		8.8	4.6	3.3	9.2
Female					
Sample Size		15	2		17
Percent		50.0	6.7		56.7
Std. Error		9.3	4.6		9.2
All Fish					
Sample Size		25	4	1	30
Percent		83.3	13.3	3.3	100.0
Std. Error		6.9	6.3	3.3	
Statistical Week 34 (August 17 - August 23)					
Male					
Sample Size		22	5		27
Percent		34.9	7.9		42.9
Std. Error		6.1	3.4		6.3
Female					
Sample Size		28	6	2	36
Percent		44.4	9.5	3.2	57.1
Std. Error		6.3	3.7	2.2	6.3
All Fish					
Sample Size		50	11	2	63
Percent		79.4	17.5	3.2	100.0
Std. Error		5.1	4.8	2.2	

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

		Brood Year and Age Class					
		2003	2002	2001	2005		
		0.2	0.3	0.4	0.5		Total
Statistical Week 35 (August 24 - August 30)							
Male							
Sample Size			33	8			41
Percent			37.5	9.1			46.6
Std. Error			5.2	3.1			5.3
Female							
Sample Size			30	17			47
Percent			34.1	19.3			53.4
Std. Error			5.1	4.2			5.3
All Fish							
Sample Size			63	25			88
Percent			71.6	28.4			100.0
Std. Error			4.8	4.8			
Statistical Week 36 (August 31 - September 6)							
Male							
Sample Size			4				4
Percent			44.4				44.4
Std. Error			17.6				17.6
Female							
Sample Size			4	1			5
Percent			44.4	11.1			55.6
Std. Error			17.6	11.1			17.6
All Fish							
Sample Size			8	1			9
Percent			88.9	11.1			100.0
Std. Error			11.1	11.1			

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2008.

	Brood Year and Age Class				Total
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 37 (September 14 - 20)					
Male					
Sample Size		5	2		7
Percent		17.9	7.1		25.0
Std. Error		7.4	5.0		8.3
Female					
Sample Size		17	2	2	21
Percent		60.7	7.1	7.1	75.0
Std. Error		9.4	5.0	5.0	8.3
All Fish					
Sample Size		22	4	2	28
Percent		78.6	14.3	7.1	92.9
Std. Error		7.9	6.7	5.0	
Statistical Week 38-39 (September 21 - October 4)					
Male					
Sample Size		9	1		10
Percent		29.0	3.2		32.3
Std. Error		8.3	3.2		8.5
Female					
Sample Size		14	7		21
Percent		45.2	22.6		67.7
Std. Error		9.1	7.6		8.5
All Fish					
Sample Size		23	8		31
Percent		74.2	25.8		100.0
Std. Error		8.0	8.0		

Appendix D. Results of secondary marking study to test for short term tag loss for sockeye captured at the Canyon Island fish wheels, 2008.

		Brood Year and Age Class					
		2003	2002	2001	2005		
		0.2	0.3	0.4	0.5		Total
Combined Periods (June 29 - October 4)							
Male							
Sample Size		1	102	19	1		123
Percent		0.4	36.0	6.7	0.4		43.5
Std. Error		0.4	2.9	1.5	0.4		3.0
Female							
Sample Size		0	117	39	4		160
Percent			41.3	13.8	1.4		56.5
Std. Error			2.9	2.1	0.7		3.0
All Fish							
Sample Size		1	219	58	5		283
Percent		0.4	77.4	20.5	1.8		98.2
Std. Error		0.4	2.5	2.4	0.8		