Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2010

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April 2014

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Transboundary Technical Committee Report No. 30

Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2010

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Prepared for:
Pacific Salmon Commission
Transboundary Technical Committee

April 2014

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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 2010. 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 3,160 sockeye salmon were captured in fish wheels located at Canyon Island, Alaska, of which 2,948 were tagged and 831 (28.1%) 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 11 was estimated to be 103,257 fish (95% confidence interval 77,187 to 95,157). An expansion factor based on fish wheel CPUE estimated 5,771 additional sockeye salmon migrated past Canyon Island prior to and after June 10 to September 11, for a total above border escapement of 109,028. Canadian commercial, test, and aboriginal fisheries harvested 20,211, 297, and 184 sockeye, respectively, resulting in a spawning escapement estimate of 88,336 sockeye salmon. Based on mean date and standard deviation of migration timing the sockeye salmon run was slightly late and less compressed than the 2000-2009 average. The Canyon Island catches of 8,868 pink salmon, 94 chum salmon and 176 steelhead salmon were 37.4% below average, 71.5% below average and 35.6% above average, respectively. The pink salmon run was four 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; Boyce and Andel 2012) 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 2010 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 2010 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 test fishery took place from September 15 through October 6. Drift and set gillnets were the gear types used; maximum allowable mesh sizes ranged from 14 cm (5 1/2 inches) to 20.4 cm (8 inches); most fishers used mesh sizes of 13-14 cm (5 1/4 - 5 ½ inches) 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.

[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 2010. 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 19 through August 31. Fish wheel I, located furthest upriver, was installed on May 19; fish wheel II was also 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 2010 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 2010 was 3,160. The total catch was 41.7% below the 2000 to 2009 average (Table 1; Appendix B.1). Fish wheel catches occurred from June 6 through August 30, and peaked during statistical week 32 (August 1 through August 7), when 642 sockeye salmon were captured. Prior to the first Canadian directed sockeye commercial fishery opening on June 13 (statistical week 25), 49 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 2010 pink salmon catch in the fish wheels at Canyon Island was 8,868 (Table 1; Appendix B.1), 37.4% below the 2000 to 2009 average. The peak daily catch of pink salmon in 2010 (671 fish) occurred on July 22. The 2010 fish wheel catch of chum salmon was 94. The total catch was 71.5% below the 2000 to 2009 average of 330. The peak daily catch of chum salmon (11 fish) occurred on August 20 (Appendix B.1). The total fish wheel catch of steelhead and Dolly Varden in 2010 were 176 and 452 fish respectively. The total catch of 176 steelhead was 35.6% above the 2000 to 2010 average of 112. The total catch of 452 Dolly Varden was 66.9% above the 2000 to 2010 average.

Tagging and Recovery Data

Of the 3,160 sockeye salmon caught in the Taku fish wheels, 2,948 were tagged (93.3**%**). 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 10 (0.012**%** of tags applied), leaving 3,430 available for recapture in Canadian fisheries. The Canadian commercial fishery recaptured 516 tagged sockeye and accounted for 98.4% of the total sockeye tags recovered or observed in upstream fisheries (Table 2). The Canadian test fishery recaptured 8 tags and aboriginal fishery did not recover any sockeye tags. Tags were also observed in

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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.

terminal areas, principally Little Trapper, Tatsamenie, Kuthai, and King Salmon Lakes lakes. These numbered 83, 148, 19, and 37 respectively. The escapements to these locations numbered 3,347, 3,513, 1,626 and 2,977 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 10 to September 11, 2010. 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 524 tags with corresponding recovery date information were returned from 20,508 sockeye salmon examined in the Canadian fisheries (Table 3). Recovery data from statistical weeks 26 and 27 (June 20 through July 3), 28 and 29 (July 4 through July 17), 31 and 32 (July 25 through August 7), and 35 through 37 (August 22 through September 11) were pooled due to statistically similar tagging ratios and low fishery/tagging effort. Tagging and recovery data were grouped into 9 and 7 strata, respectively (Table 4).

Using a maximum likelihood Darroch estimator, we estimated that 103,257 sockeye salmon passed Canyon Island between June 20 and September 11. The approximate 95% confidence interval associated with this estimate is 77,187 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 5,771 additional sockeye passed Canyon Island during statistical weeks 22 through 25 and 37 through 40. Downriver of the U.S./Canadian border, the U.S. inriver personal use fishery catch was estimated at 1,020 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 109,028. This estimate is 19.3% below the 2000 to 2009 average of 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 18.8%, compared to a 2000-2009 average of 18.6% (range 12.8% to 25.0%; Table 5). After removal of 20,211, 184, and 297 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 88,336 fish (Table 4). This is 19.5% below the 2000-2009 average of 109,757 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 2000 to 2009 averaged 3.4% (range 0.3% to 9.1%; Table 6). However, in 2010 the contribution of jacks was 4.7%.

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 24) of the sockeye salmon migration in 2010 was later (4 days) than the 2000-2010 average (Table 7). The standard deviation was slightly more (21.8 days in 2010 versus an average of 19.0 days); meaning the run was less compressed than average. Migratory timing statistics (mean date July 25; standard deviation 9.4 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 2010 was reflective of the run, the mean date of migration was September 5 (standard deviation 11.0 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 2010 was determined using recoveries of tagged fish from enumeration weirs (Table 8; Figure 6). These were weirs on the outlet streams of Little Trapper Lake (69 tags)**,** Tatsamenie Lake (138 tags), Kuthai Lake (19 tags) and King Samon Lake (37 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 24 to 29 (June 6 to July 17). The peak of the Kuthai Lake migration took place during statistical week 27 (June 27 to July 3).

Little Trapper Lake sockeye salmon peaked during stat week 30, July 18 through July 24. They were present at Canyon Island during statistical weeks 27 to 33 (June 27 to August 14).

King Salmon Lake sockeye salmon were present at Canyon Island during statistical weeks 26 to 31 (June 20 to July 31) and peaked during stat week 27 (June 27 through July 3).

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 4 to August 28). The peak week of migration for Tatsamenie Lake sockeye was statistical week 29 (July 11 through July 17).

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 39.4, 28.9, 28.8, and 32.0 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 28 averaged 32.18 days in transit while those tagged in statistical week 32 averaged 22.6 days. For the Tatsamenie stock, fish tagged in statistical week 29 averaged 40.2 days in transit while fish tagged in statistical week 34 averaged 32.3 days. King Salmon Lake fish tagged in statistical week 26 averaged 30.0 in transit while those tagged in statistical week 29 averaged 24.88 days. Kuthai Lake fish tagged in statistical week 24 (4 tags recovered) averaged 57.5 days in transit, while those tagged in statistical week 27 averaged 34.9 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 2010 are summarized in Appendices C.1 and C.2. Lengths at age are presented in Tables 10 and 12.

For sockeye salmon, age-1.2 fish were most prevalent (52.2%) with age-1.3 fish comprising 40.9%, age-2.2 6.3%, age-0.2 8.9%, age-2.3 0.5%, age-0.3 16.7%, 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 smaller than the 2000 to 2010 averages (Table 10). Females comprised 47.3% of the fish wheel catch of sockeye salmon (Appendix C.1).

Fish wheel catches of chum salmon were primarily comprised of age-0.4 (47.4%) fish, which is higher than the 2000-2010 average of 37.6% (Table 11). Age-0.3 fish constituted 36.8% of the fish wheel catch, lower than the 60.9% average. Female chum salmon were more prevalent (56.6%) than males (Appendix C.2). The average lengths at age for chum salmon passing Canyon Island were 505, 626, and 655 mm (MEF) for age 0.2, 0.3, and 0.4 fish respectively; these were all smaller than the 2000 to 2010 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 2010 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 26 through 36, over 4,153 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 slightly higher overall (3.4% versus 2.9%) (Appendix D). We therefore believe that significant 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 2010 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, 2010.

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
2009	5/12-9/27	3,388	9,225	214	249	19
2010	5/9-8/31	3,160	8,868	94	176	452
Average(00-09)		5,421	14,174	330	130	271

Table 2. Summary of Taku River sockeye tag recoveries by location and species, 2010.

	Tags Recovered	Tags Observed Only	Total	Fish Inspected	Tag Ratio	Percent Tags Observed
Commercial Fishery	516		516	20,211	0.026	0.620
Test Fishery	8		8	297	0.027	0.010
King Salmon Lake	37		37	2,977	0.012	0.044
Kuthai Lake	19		19	1,626	0.012	0.023
Little Trapper Lake	69	14	83	3,347	0.025	0.100
Tatsamenie Lake	138	10	148	3,513	0.042	0.178
Taku River mainstem	13		13	561	0.023	0.016
Nahlin River	2		2	210	0.010	0.002
Tulsequah River	6		6	152	0.039	0.007
Fish Creek (U.S.)						0.000
Yehring Creek (U.S.)						0.000
U.S. downstream						0.000
Total	808	24	832	32,894		

Table 3. Tagging and recovery data from the 2010 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
	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39			
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0.000
25	0	0	18	1	0	0	0	0	0	0	0	0	0	0	0	0	19	125	0.152
26	0	1	39	17	1	0	0	0	0	0	0	0	0	0	0	0	58	222	0.261
27	0	0	0	30	16	1	0	0	0	0	0	0	0	0	0	0	47	252	0.187
28	0	0	0	0	22	11	5	2	0	0	0	0	0	0	0	0	40	271	0.148
29	0	0	0	0	0	47	3	0	1	0	0	0	0	0	0	0	51	308	0.166
30	0	0	0	0	0	0	94	24	0	1	0	0	0	0	0	0	119	429	0.277
31	0	0	0	0	0	0	0	26	25	1	0	0	0	0	0	0	52	276	0.188
32	0	0	0	0	0	0	0	0	15	58	4	0	0	0	0	0	77	577	0.133
33	0	0	0	0	0	0	0	0	0	20	5	4	0	0	0	0	29	265	0.109
34	0	0	0	0	0	0	0	0	0	0	10	5	2	0	0	0	17	110	0.155
35	0	0	0	0	0	0	0	0	0	0	0	11	1	0	0	0	12	52	0.231
36	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	3	15	0.200
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Total	0	1	57	48	39	59	102	52	41	80	19	20	4	2	0	0	524	2,938	0.178
Sockeye Examined[a]:																	Total		
Test Fishery											186	87	24				297		
Can. Comm. Catch	15	73	2054	1453	1475	2622	5786	2197	1724	1513	642	443	171	39	4	0	20,211		
Aboriginal Fishery																			
Total	15	73	2,054	1,453	1,475	2,622	5,786	2,197	1,724	1,513	828	530	195	39	4	0	20,508		

[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, 2010.

Statistical Week of Tagging	Statistical Week of Recovery 26-27	28-29	30	31-32	33	34	35-37	Total Tags Recovered	Total Tags Applied	Tag Ratio
25	19							19	125	0.152
26	56	1						57	222	0.257
27	30	17						47	252	0.187
28-29		80	8	3				91	579	0.157
30			94	24	1			119	429	0.277
31				51	1			52	276	0.188
32-33				15	78	9	4	106	842	0.126
34						10	7	17	110	0.155
35-36							15	15	67	0.224
Total	105	98	102	93	80	19	26	523	2,902	0.180
Catch Examined For Tags[a]	3,507	4,097	5,786	3,921	1,513	828	764	20,508		
Marked Fraction	0.031	0.025	0.018	0.024	0.056	0.023	0.035	0.026		
Above Border Run Estimate	16,002	27,511	18,132	20,555	13,086	5,055	2,917	103,257		
Fish Wheel CPUE Expansion[b]								5,771		
Aboriginal Fishery[c]								184		
Total Above Border Run								109,028		
U.S. Personal Use Catch[d]								1,020		
95% Lower C.I.	12,984	22,111	13,472	15,312	9,967	1,725	1,616	77,187		
95% Upper C.I.	19,021	32,910	22,792	5,243	16,205	8,384	4,217	95,157		
Spawning Escapment	12,495	23,414	12,346	16,634	11,573	4,227	2,153	88,336		

[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 2010[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	87,568	19,509	0.223	68,059	168,809	81,241
2009	85,599	11,154	0.130	74,339	121,138	35,539
2010	109,028	20,508	0.188	88,428	158,223	50,272
Average(00-09)	135,213	25,107	0.186	109,757	236,041	102,815
Maximum(00-09)	200,918	47,988	0.250	167,691	399,277	207,008
Minimum(00-09)	85,599	11,154	0.128	68,059	121,138	35,539
S.D.(00-09)	40,365	10,364	0.046	33,095	81,344	53,060
C.V.(00-09)	29.9%	41.3%	24.8%	30.2%	34.5%	51.6%

[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 2010.

	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
2009	1,333	0.4	8.4	9.5	10.8	20.6	0.4	0.2	44.0	1.4	0.0	4.4	0.0	0.0	0.0
2010	1,356	0.8	8.9	3.8	16.7	22.2	0.1	0.1	40.9	6.3	0.1	0.5	0.0	0.0	0.0
Average(00-09)	1,938.8	0.3	6.8	3.0	9.5	28.1	0.1	0.1	46.6	3.1	0.2	2.3	0.0	0.0	0.0
SD(00-09)		0.2	2.0	3.3	4.1	7.0	0.1	0.1	6.4	1.9	0.1	1.0	0.0	0.0	0.0
CV(00-09)		62.0%	29.1%	108.7%	42.7%	24.9%	102.2%	117.6%	13.8%	61.0%	64.3%	45.5%	-	-	-

Table 7. Migratory timing statistics of sockeye, pink , and chum salmon past the Canyon Island fish wheels, 1984 to 2010. 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
2009	7/20	15.9	7/24	9.9	9/6	17.5
2010	7/24	21.8	7/25	9.4	9/5	11.0
Average(00-09)	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 2010, 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	23-May	29-May								
23	30-May	5-Jun								
24	6-Jun	12-Jun					0.231	0.231		
25	13-Jun	19-Jun					0.072	0.303		
26	20-Jun	26-Jun					0.000	0.303	0.161	0.161
27	27-Jun	3-Jul	0.024	0.024			0.478	0.781	0.388	0.549
28	4-Jul	10-Jul	0.096	0.120	0.003	0.003	0.150	0.931	0.122	0.671
29	11-Jul	17-Jul	0.317	0.437	0.061	0.064	0.069	1.000	0.256	0.927
30	18-Jul	24-Jul	0.369	0.806	0.201	0.266			0.039	0.966
31	25-Jul	31-Jul	0.106	0.912	0.125	0.390			0.034	1.000
32	1-Aug	7-Aug	0.075	0.987	0.316	0.706				
33	8-Aug	14-Aug	0.013	1.000	0.206	0.912				
34	15-Aug	21-Aug			0.080	0.992				
35	22-Aug	28-Aug			0.008	1.000				
36	29-Aug	4-Sep								
37	5-Sep	11-Sep								

Table 9. Inriver migration timing for four Taku River sockeye salmon stocks, 2010.

Stock	Week	Travel Time	SD	SE	N	95% C.I.
L. Trapper	27	45.50	0.71	0.50	2	0.98
	28	32.18	10.29	3.10	11	6.08
	29	26.05	7.67	1.67	21	3.28
	30	29.32	7.86	1.68	22	3.29
	31	28.43	5.80	2.19	7	4.30
	32	22.60	5.59	2.50	5	4.90
	33	22.00			1	
	Average	28.57	8.5		69	
Tatsamenie	28	43.00			1	
	29	40.22	3.53	1.18	9	2.30
	30	37.17	5.32	1.09	24	2.13
	31	34.00	5.89	1.43	17	2.80
	32	29.49	6.12	0.91	45	1.79
	33	27.80	5.76	1.05	30	2.06
	34	32.30	6.62	2.09	10	4.10
	35	20.00			1	
	Average	31.96	7.0		137	
King Salmon	26	30.00	18.79	7.67	6	15.04
	27	30.36	18.63	4.98	14	9.76
	28	31.71	11.18	4.22	7	8.28
	29	24.88	5.67	2.00	8	3.93
	30	18.00			1	
	31	26.00			1	
	Average	28.92	14.5		37	
Kuthai	24	57.50	22.66	11.33	4	22.21
	25	39.00	7.07	5.00	2	9.80
	26					
	27	34.88	7.34	2.59	8	5.08
	28	34.75	4.27	2.14	4	4.19
	29	23.00			1	
	Average	39.42	14.6		19	

[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, 2010.

	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			
2008	1,574	309	445	326	586	487	345		583	506	600	592			
2009	3,610	326	448	336	592	467	345	662	577	517	595	582		525	
2010	1,356	319	437	335	565	477	340	560	563	494	580	556			
Average(00-09)	2,181	322	453	332	579	486	339	605	578	510	592	582		525	
SD(00-09)		15.1	8.8	5.6	9.6	13.5	11.0	31.6	8.4	11.7	13.6	12.5			
CV(00-09)		4.7%	2.0%	1.7%	1.7%	2.8%	3.3%	5.2%	1.4%	2.3%	2.3%	2.1%			

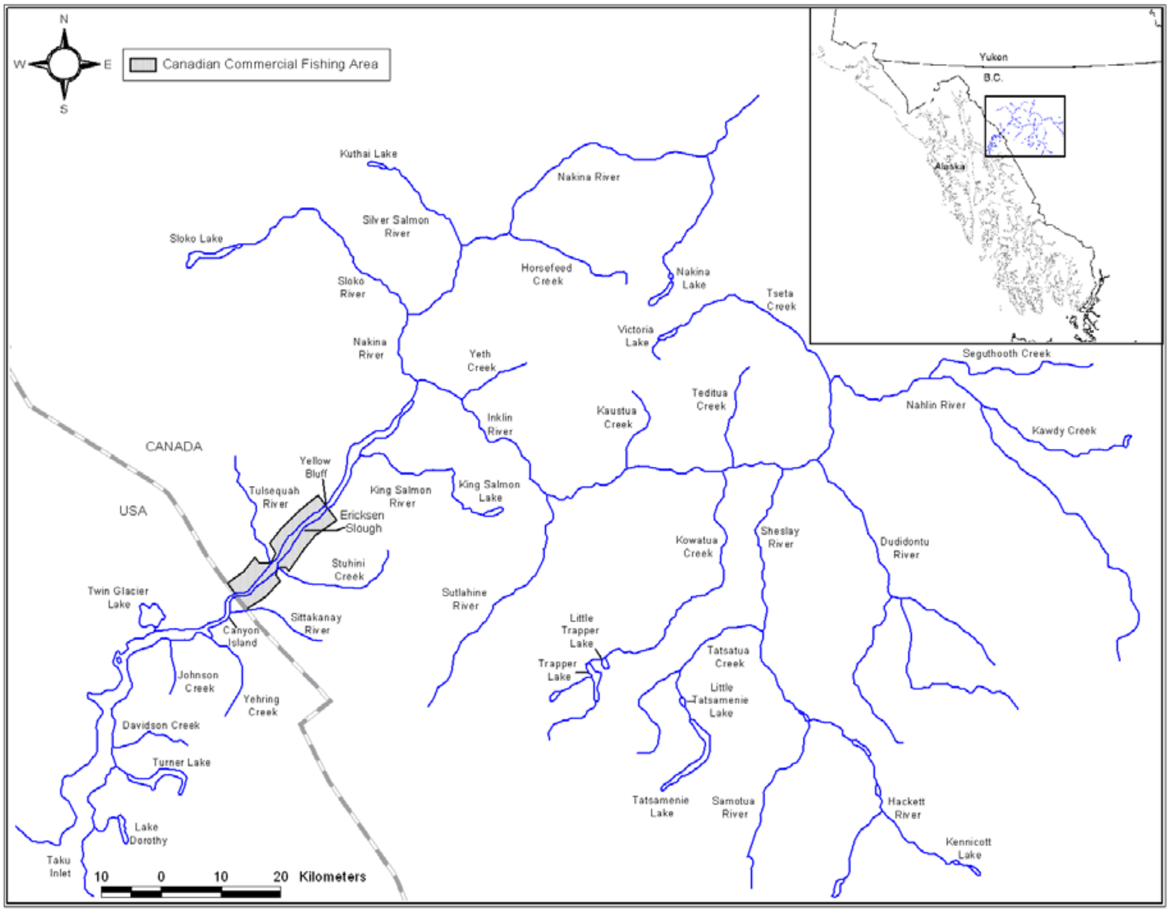
Table 11. Historical age composition of chum salmon passing Canyon Island fish wheels, Taku River, 2010.

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
2009	188	0.5	49.5	49.5	0.5	0.0
2010	95	3.2	36.8	47.4	0.0	0.0
Average(00-09)	258.0	0.9	60.9	37.6	0.7	0.0
SD(00-09)		0.8	12.6	12.9	0.8	0.0
CV(00-09)		1.2	4.8	2.9	0.9	

Table 12. Historical length (MEF) at age composition of chum salmon passing Canyon Island, Taku River, 1983 to 2010.

	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	
2009	188	545	621	662	695	
2010	95	505	626	655		
Average(00-09)	296	581	635	668	671	
SD(00-09)		37.0	14.5	12.9	18.3	
CV(00-09)		6.4%	2.3%	1.9%	2.7%	

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



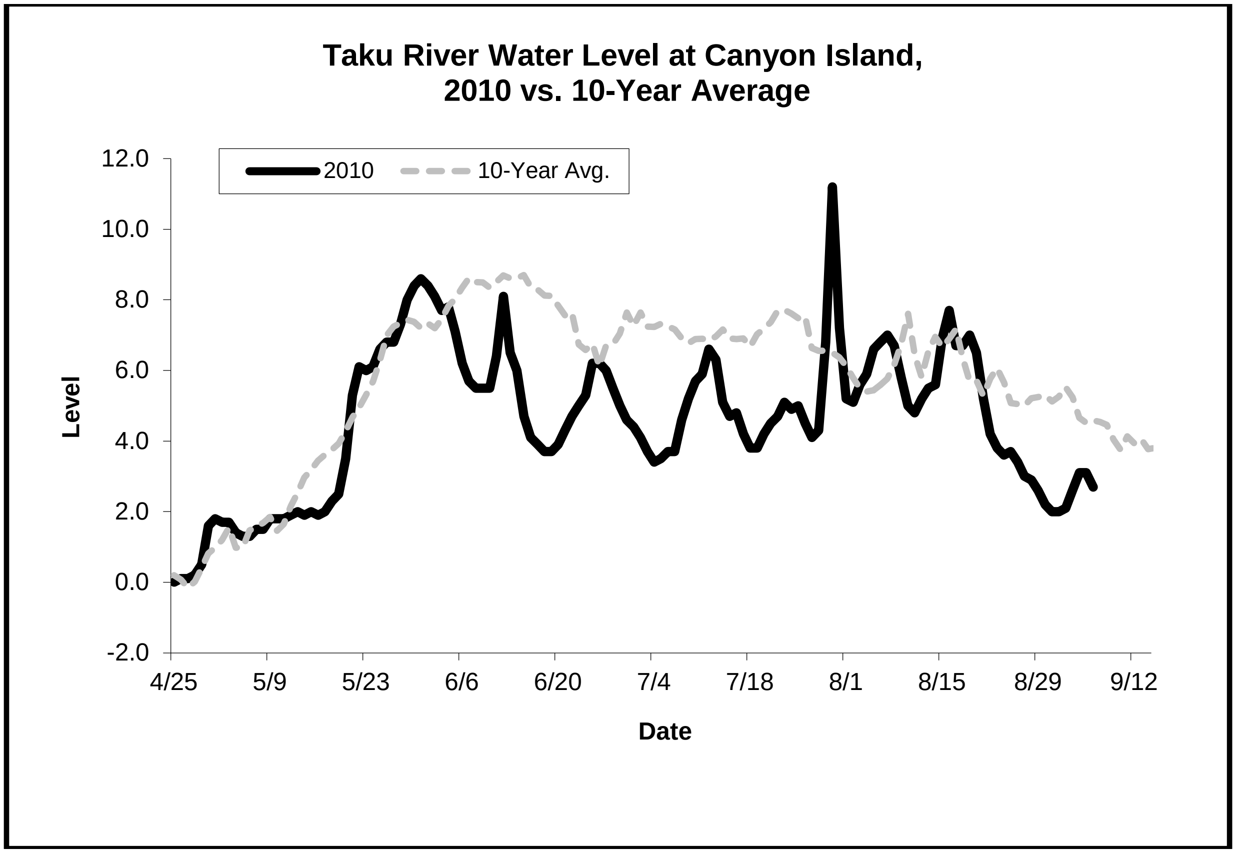


Figure 2. Water levels at Canyon Island, Taku River, 2010 vs. 2000-2009 average.

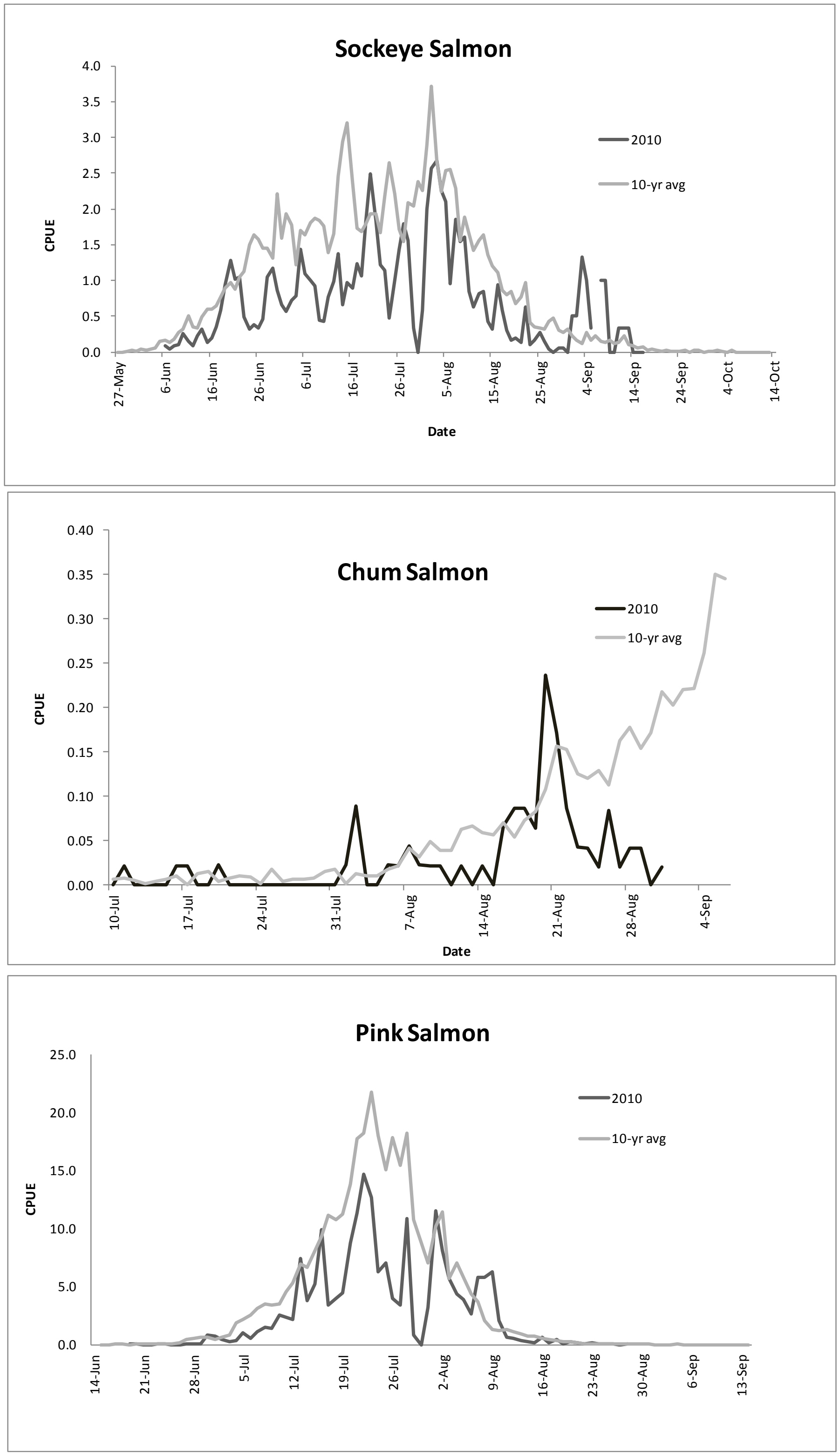


Figure 3. Fish wheel CPUE for sockeye, pink, and chum salmon at Canyon Island, 2010.

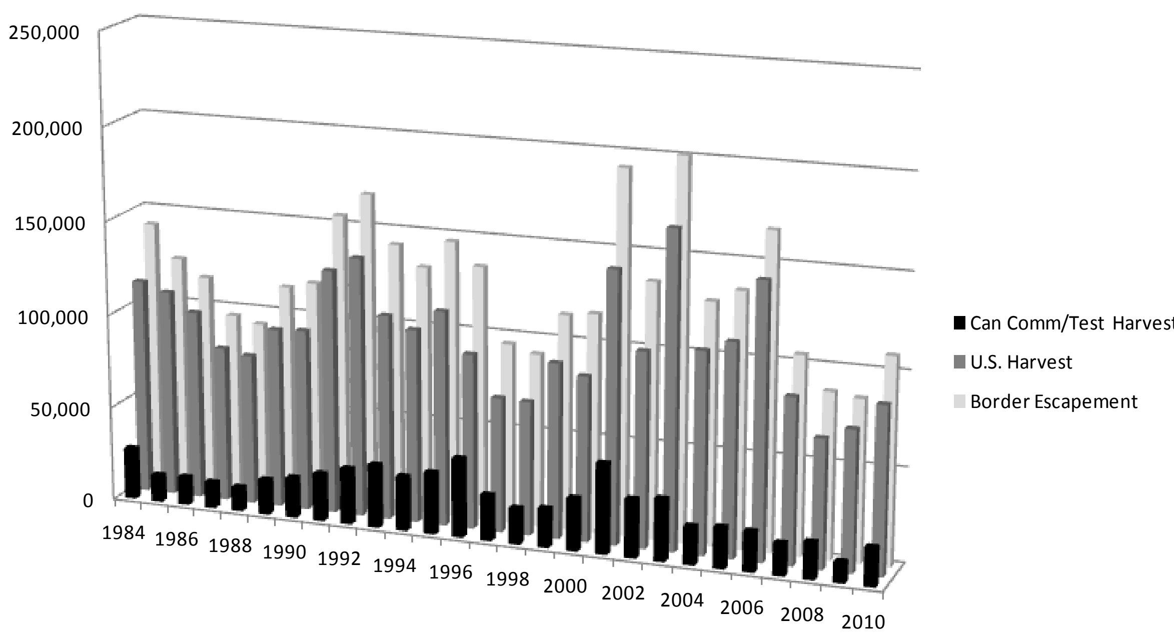


Figure 4. Historical sockeye mark-recapture abundance estimates above the U.S./Canada border including Canadian inriver harvests and escapements for Taku River sockeye, 1984-2010.

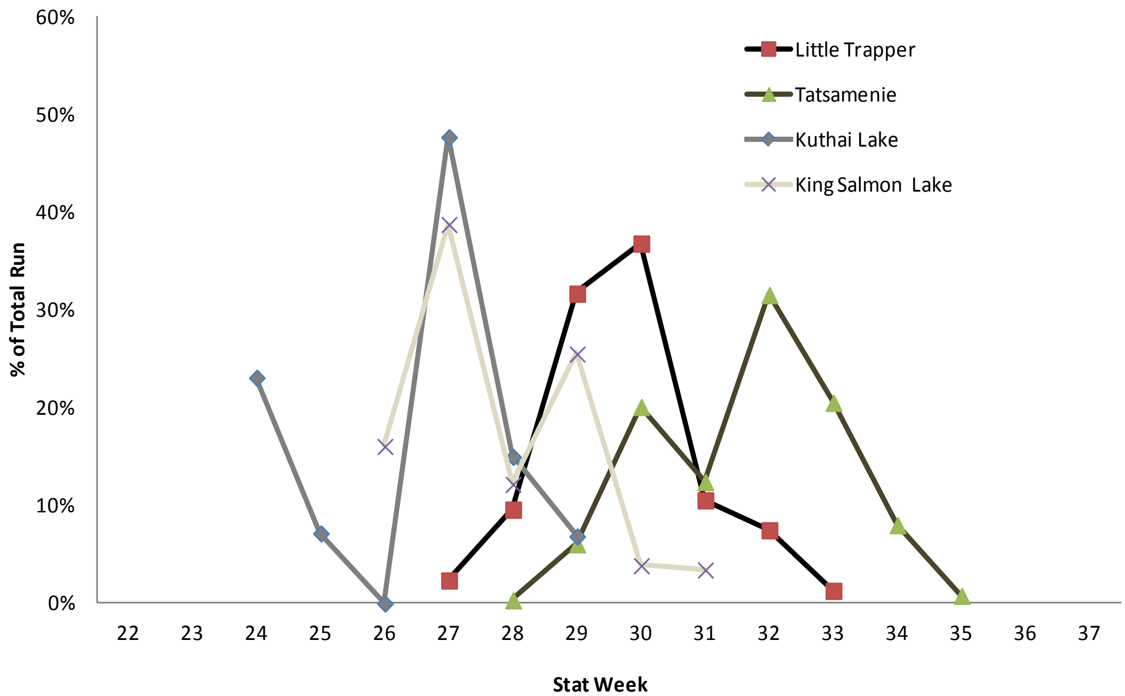


Figure 6. Run timing of four sockeye salmon stock groups passing Canyon Island, 2010.

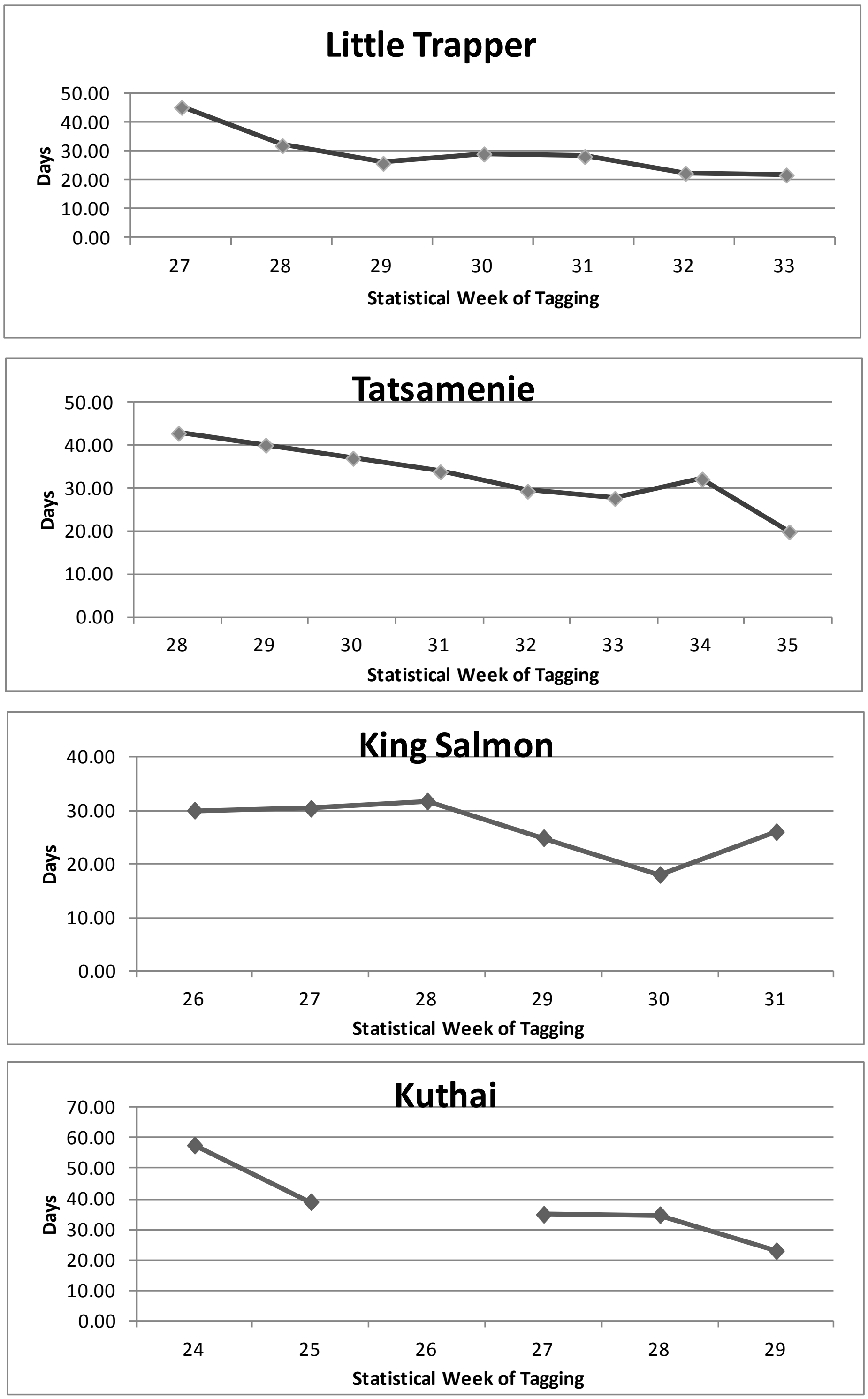


Figure 7. Mean travel times for tagged sockeye salmon between Canyon Island and two upriver locations, 2010.

Appendix A. Inclusive dates for statistical weeks, 2010.

2010 Statistical Week Calendar						
Stat Week	**From**	**Through**		**Stat Week**	**From**	**Through**
1	1-Jan	3-Jan		28	4-Jul	10-Jul
2	4-Jan	10-Jan		29	11-Jul	17-Jul
3	11-Jan	17-Jan		30	18-Jul	24-Jul
4	18-Jan	24-Jan		31	25-Jul	31-Jul
5	25-Jan	31-Jan		32	1-Aug	7-Aug
6	1-Feb	7-Feb		33	8-Aug	14-Aug
7	8-Feb	14-Feb		34	15-Aug	21-Aug
8	15-Feb	21-Feb		35	22-Aug	28-Aug
9	22-Feb	28-Feb		36	29-Aug	4-Sep
10	29-Feb	6-Mar		37	5-Sep	11-Sep
11	7-Mar	13-Mar		38	12-Sep	18-Sep
12	14-Mar	20-Mar		39	19-Sep	25-Sep
13	21-Mar	27-Mar		40	26-Sep	2-Oct
14	28-Mar	3-Apr		41	3-Oct	9-Oct
15	4-Apr	10-Apr		42	10-Oct	16-Oct
16	11-Apr	17-Apr		43	17-Oct	23-Oct
17	18-Apr	24-Apr		44	24-Oct	30-Oct
18	25-Apr	1-May		45	31-Oct	6-Nov
19	2-May	8-May		46	7-Nov	13-Nov
20	9-May	15-May		47	14-Nov	20-Nov
21	16-May	22-May		48	21-Nov	27-Nov
22	23-May	29-May		49	28-Nov	4-Dec
23	30-May	5-Jun		50	5-Dec	11-Dec
24	6-Jun	12-Jun		51	12-Dec	18-Dec
25	13-Jun	19-Jun		52	19-Dec	25-Dec
26	20-Jun	26-Jun		53	26-Dec	1-Jan
27	27-Jun	3-Jul				

Appendix B.1. Catches and number tagged of salmon in the fish wheels at Canyon Island, 2010.

		FISHING EFFORT					SOCKEYE					PINK			CHUM			DV		Steelhead	
Stat		FWI	FWI	FWII	FWII	GN	FW Catches		FW Tagged		CPUE	Total Catches		CPUE	Total Catches		CPUE	Total Catches		Total Catches	
Week	Date	Effort	RPM	Effort	RPM	Hours	Daily	Cum.	Daily	Cum.	Daily	Daily	Cum.	Daily	Daily	Cum.	Daily	Daily	Cum.	Daily	Cum.
22	23-Apr																				
22	24-Apr																				
22	25-Apr																				
22	26-Apr																			1	
22	27-Apr																				0
22	28-Apr																				0
22	29-Apr																	1	1		0
23	30-Apr																		1		0
23	1-May																		1		0
23	2-May																	1	2	1	1
23	3-May																		2		1
23	4-May																		2		1
23	5-May																		2	3	4
23	6-May																		2	1	5
24	7-May																		2		5
24	8-May																		2		5
24	9-May			7.00	1.0	3.0													2		5
24	10-May			23.92	1.0	6.0													2		5
24	11-May					3.0													2		5
24	12-May					6.0												4	6		5
24	13-May					6.0												2	8		5
25	14-May					6.0													8		5
25	15-May					6.0												3	11		5
25	16-May					4.0												1	12		5
25	17-May					6.0												1	13		5
25	18-May					6.0													13		5
25	19-May	23.75	2.1	23.83	2.5	1.5												1	14		5
25	20-May	23.75	2.4	23.75	2.4	0.0													14		5
26	21-May	23.83	2.6	23.83	2.4	0.0													14		5
26	22-May	23.67	2.7	23.92	2.6	0.0													14		5
26	23-May	23.75	2.6	23.92	2.6	0.0													14		5
26	24-May	23.75	2.8	23.50	2.8	0.0												1	15	1	6
26	25-May	23.75	2.4	23.75	2.7	0.0													15		6
26	26-May	23.58	2.2	23.75	2.6	0.0												1	16	1	7
26	27-May	23.83	2.2	23.75	2.6	0.0													16		7
27	28-May	23.67	3.0	23.75	3.0	0.0													16		7
27	29-May	23.92	2.7	23.92	2.5	0.0													16		7
27	30-May	23.75	2.4	23.75	2.6	0.0													16	1	8
27	31-May	23.83	2.4	23.67	2.4	0.0													16	1	9
27	1-Jun	23.75	2.3	23.67	2.6	0.0													16		9
27	2-Jun	23.75	2.2	23.75	2.7	0.0													16		9
27	3-Jun	23.92	2.3	23.92	2.7	0.0													16		9
28	4-Jun	23.0	2.4	23.83	2.6	0.0													16	1	10
28	5-Jun	23.67	2.2	23.92	2.5	0.0													16		10
28	6-Jun	23.00	2.0	23.17	2.3	0.0	4	4	4	4	0.087							1	17	1	11
28	7-Jun	23.25	2.1	23.83	2.4	3.5	2	6	2	6	0.042							7	24	2	13
28	8-Jun	23.67	2.1	23.75	2.3	0.0	4	10	3	9	0.084							2	26		13
28	9-Jun	23.50	2.0	23.83	2.1	4.0	5	15	5	14	0.106							4	30	1	14
28	10-Jun	23.58	2.2	23.66	2.2	0.0	12	27	12	26	0.254							5	35	4	18
29	11-Jun	23.67	2.2	23.83	2.1	0.0	7	34	6	32	0.147								35		18
29	12-Jun	23.50	2.5	23.58	2.1	0.0	4	38	4	36	0.085								35		18
29	13-Jun	23.67	2.0	23.42	2.3	0.0	11	49	11	47	0.234							1	36		18
29	14-Jun	23.17	2.3	23.75	2.0	4.0	15	64	15	62	0.320							1	37	1	19
29	15-Jun	23.67	2.1	23.33	2.1	3.0	6	70	6	68	0.128							10	47	2	21
29	16-Jun	23.25	2.2	23.58	2.2	4.0	9	79	9	77	0.192							11	58	1	22
29	17-Jun	23.75	2.2	23.67	2.3	4.0	17	96	17	94	0.358							16	74		22
30	18-Jun	23.58	1.8	23.75	2.2	4.0	28	124	27	121	0.592							13	87	1	23
30	19-Jun	23.67	2.4	23.25	2.2	4.0	44	168	42	163	0.938	3	3	0.064				9	96		23
30	20-Jun	23.42	2.5	23.17	2.7	4.0	60	228	59	222	1.288	1	4	0.021				11	107		23
30	21-Jun	23.50	2.6	23.42	2.6	4.0	48	276	48	270	1.023		4	0.000				13	120	1	24
30	22-Jun	22.00	2.5	23.42	2.4	4.0	48	324	46	316	1.057		4	0.000				16	136		24
30	23-Jun	23.50	2.3	23.83	2.1	0.0	23	347	22	338	0.486	2	6	0.042				5	141		24
30	24-Jun	23.42	2.8	23.92	2.7	0.0	15	362	15	353	0.317	3	9	0.063				2	143		24
31	25-Jun	23.42	2.8	23.92	2.7	0.0	18	380	16	369	0.380	0	9	0.000				1	144		24
31	26-Jun	23.50	2.4	23.67	2.2	0.0	16	396	16	385	0.339	0	9	0.000				0	144		24
31	27-Jun	23.58	2.1	23.58	2.3	4.0	22	418	22	407	0.466	1	10	0.021				0	144		24
31	28-Jun	23.42	2.1	23.50	2.5	3.0	49	467	48	455	1.044	1	11	0.021				8	152		24
31	29-Jun	23.17	2.1	23.50	2.6	0.0	55	522	54	509	1.178	3	14	0.064				5	157		24
31	30-Jun	23.25	2.4	23.50	2.7	0.0	40	562	38	547	0.856	38	52	0.813				14	171		24
31	1-Jul	23.42	2.3	23.58	2.5	0.0	31	593	31	578	0.660	33	85	0.702				13	184		24
32	2-Jul	23.50	2.2	23.50	2.2	0.0	27	620	26	604	0.574	22	107	0.468				8	192		24
32	3-Jul	23.58	1.7	23.12	2.1	2.0	34	654	34	638	0.728	10	117	0.214				8	200		24
32	4-Jul	23.58	1.9	23.33	2.4	2.0	37	691	37	675	0.789	15	132	0.320				9	209		24
32	5-Jul	23.67	2.0	22.17	2.5	3.0	66	757	64	739	1.440	45	177	0.982				15	224		24
32	6-Jul	23.75	2.0	22.50	2.1	3.0	51	808	50	789	1.103	25	202	0.541				6	230		24
32	7-Jul	23.50	2.6	23.08	2.4	3.0	47	855	47	836	1.009	50	252	1.073				6	236	0	24
32	8-Jul	22.58	2.5	23.08	2.5	0.0	42	897	37	873	0.920	67	319	1.467				7	243	0	24
33	9-Jul	23.50	2.5	23.83	2.3	0.0	21	918	19	892	0.444	66	385	1.394				1	244	0	24
33	10-Jul	23.25	2.7	23.00	2.1	0.0	20	938	18	910	0.432	119	504	2.573				2	246	0	24
29	11-Jul	23.12	2.8	23.75	2.5	0.0	36	974	33	943	0.768	110	614	2.347	1	1	0.021	3	249	0	24

Appendix B.1. Catches and number tagged of salmon in the fish wheels at Canyon Island, 2010.

		FISHING EFFORT					SOCKEYE					PINK			CHUM			DV		Steelhead	
Stat		FWI	FWI	FWII	FWII	GN	FW Catches		FW Tagged		CPUE	Total Catches		CPUE	Total Catches		CPUE	Total Catches		Total Catches	
Week	Date	Effort	RPM	Effort	RPM	Hours	Daily	Cum.	Daily	Cum.	Daily	Daily	Cum.	Daily	Daily	Cum.	Daily	Daily	Cum.	Daily	Cum.
29	12-Jul	22.50	2.3	23.42	1.9	0.0	45	1019	44	987	0.980	97	711	2.112	0	1	0.000	2	251		24
29	13-Jul	23.33	2.2	23.08	2.2	0.0	64	1083	62	1049	1.379	343	1054	7.391	0	1	0.000	3	254	0	24
29	14-Jul	23.42	2.6	23.67	2.6	0.0	31	1114	31	1080	0.658	177	1231	3.759	0	1	0.000	5	259	0	24
29	15-Jul	23.12	2.6	22.83	2.5	0.0	45	1159	45	1125	0.979	239	1470	5.201	0	1	0.000	11	270	0	24
29	16-Jul	22.83	2.0	23.12	2.4	0.0	41	1200	39	1164	0.892	457	1927	9.946	1	2	0.022	12	282	0	24
29	17-Jul	23.33	2.0	22.75	2.1	0.0	57	1257	56	1220	1.237	158	2085	3.429	1	3	0.022	15	297	0	24
30	18-Jul	22.92	2.0	22.42	2.3	0.0	48	1305	46	1266	1.059	179	2264	3.948	0	3	0.000	14	311	1	25
30	19-Jul	22.42	2.2	22.67	2.1	0.0	83	1388	82	1348	1.841	200	2464	4.436	0	3	0.000	18	329	0	25
30	20-Jul	20.12	2.2	22.33	2.6	0.0	106	1494	102	1450	2.497	371	2835	8.740	1	4	0.024	4	333	0	25
30	21-Jul	22.33	2.4	22.67	2.5	0.0	83	1577	80	1530	1.844	511	3346	11.356	0	4	0.000	11	344	0	25
30	22-Jul	22.42	2.2	23.25	2.5	0.0	56	1633	52	1582	1.226	671	4017	14.692	0	4	0.000	4	348	0	25
30	23-Jul	22.42	1.9	23.33	2.3	0.0	52	1685	51	1633	1.137	580	4597	12.678	0	4	0.000	1	349	0	25
30	24-Jul	23.08	1.8	23.08	2.2	0.0	22	1707	18	1651	0.477	291	4888	6.304	0	4	0.000	3	352	0	25
31	25-Jul	22.58	2.2	23.33	2.2	0.0	46	1753	45	1696	1.002	324	5212	7.057	0	4	0.000	2	354	0	25
31	26-Jul	22.83	2.4	23.00	2.4	0.0	66	1819	55	1751	1.440	183	5395	3.993	0	4	0.000	9	363	0	25
31	27-Jul	22.83	2.5	22.92	2.5	0.0	82	1901	79	1830	1.792	156	5551	3.410	0	4	0.000	6	369	0	25
31	28-Jul	22.42	2.4	23.00	2.6	0.0	71	1972	68	1898	1.563	492	6043	10.832	0	4	0.000	10	379	1	26
31	29-Jul	3.00	2.9	3.00	2.9	0.0	2	1974	2	1900	0.333	5	6048	0.833	0	4	0.000	0	379	0	26
31	30-Jul	2.50	1.8	7.00	1.5	0.0	0	1974	0	1900	0.000	0	6048	0.000	0	4	0.000	0	379	0	26
31	31-Jul	22.75	2.1	23.00	1.8	0.0	27	2001	27	1927	0.590	147	6195	3.213	0	4	0.000	3	382	0	26
32	1-Aug	22.17	2.1	22.33	2.1	0.0	89	2090	85	2012	2.000	514	6709	11.551	1	5	0.022	6	388	0	26
32	2-Aug	22.75	2.3	21.75	2.5	0.0	114	2204	103	2115	2.562	361	7070	8.112	4	9	0.090	4	392	0	26
32	3-Aug	22.25	2.5	22.17	2.5	0.0	119	2323	105	2220	2.679	254	7324	5.718	0	9	0.000	9	401	0	26
32	4-Aug	22.25	2.7	22.17	2.3	0.0	100	2423	97	2317	2.251	194	7518	4.367	0	9	0.000	3	404	0	26
32	5-Aug	22.08	2.8	22.25	2.3	0.0	93	2516	77	2394	2.098	174	7692	3.925	1	10	0.023	2	406	0	26
32	6-Aug	23.08	2.4	22.67	2.3	0.0	44	2560	38	2432	0.962	122	7814	2.667	1	11	0.022	0	406	0	26
32	7-Aug	22.25	2.7	22.34	2.3	0.0	83	2643	74	2506	1.861	257	8071	5.764	2	13	0.045	0	406	0	26
33	8-Aug	22.25	2.3	20.64	2.5	0.0	66	2709	57	2563	1.539	249	8320	5.806	1	14	0.023	2	408	0	26
33	9-Aug	22.33	2.0	22.50	2.3	0.0	72	2781	66	2629	1.606	281	8601	6.268	1	15	0.022	3	411	2	28
33	10-Aug	22.67	1.8	23.42	2.5	0.0	39	2820	36	2665	0.846	93	8694	2.018	1	16	0.022	6	417	0	28
33	11-Aug	23.75	2.7	23.33	2.6	0.0	30	2850	26	2691	0.637	28	8722	0.595	0	16	0.000	1	418	0	28
33	12-Aug	23.08	2.4	23.25	2.7	0.0	38	2888	32	2723	0.820	26	8748	0.561	1	17	0.022	3	421	0	28
33	13-Aug	22.67	2.3	23.25	2.1	0.0	39	2927	31	2754	0.849	15	8763	0.327	0	17	0.000	1	422	0	28
33	14-Aug	22.92	2.8	23.12	2.6	0.0	20	2947	17	2771	0.434	11	8774	0.239	1	18	0.022	1	423	0	28
34	15-Aug	23.17	2.4	23.25	2.4	0.0	15	2962	14	2785	0.323	6	8780	0.129	0	18	0.000	0	423	0	28
34	16-Aug	21.67	2.6	23.17	2.7	0.0	42	3004	39	2824	0.937	28	8808	0.624	3	21	0.067	0	423	0	28
34	17-Aug	22.83	2.4	23.25	2.5	0.0	27	3031	24	2848	0.586	7	8815	0.152	4	25	0.087	0	423	0	28
34	18-Aug	22.33	2.8	23.50	2.8	0.0	14	3045	13	2861	0.305	18	8833	0.393	4	29	0.087	2	425	0	28
34	19-Aug	23.33	2.3	23.25	2.6	0.0	8	3053	7	2868	0.172	4	8837	0.086	3	32	0.064	0	425	0	28
34	20-Aug	23.17	2.1	23.33	2.0	0.0	9	3062	8	2876	0.194	10	8847	0.215	11	43	0.237	2	427	0	28
34	21-Aug	23.00	2.1	23.50	2.1	0.0	6	3068	5	2881	0.129	5	8852	0.108	8	51	0.172	2	429	1	29
35	22-Aug	23.00	1.8	23.42	2.1	0.0	29	3097	25	2906	0.625	4	8856	0.086	4	55	0.086	3	432	0	29
35	23-Aug	23.33	1.6	23.66	1.8	0.0	5	3102	4	2910	0.106	5	8861	0.106	2	57	0.043	1	433	1	30
35	24-Aug	23.66	2.1	23.66	1.9	0.0	8	3110	6	2916	0.169	2	8863	0.042	2	59	0.042	1	434	0	30
35	25-Aug	23.58	1.6	23.66	1.8	0.0	13	3123	10	2926	0.275	3	8866	0.064	1	60	0.021	3	437	0	30
35	26-Aug	23.58	1.4	23.50	1.5	0.0	7	3130	5	2931	0.149	1	8867	0.021	4	64	0.085	3	440	1	31
35	27-Aug	23.75	1.4	23.83	1.5	0.0	2	3132	2	2933	0.042	0	8867	0.000	1	65	0.021	2	442	0	31
35	28-Aug	23.83	1.0	23.75	1.0	3.0	0	3132	0	2933	0.000	1	8868	0.021	2	67	0.042	4	446	2	33
36	29-Aug	23.92	<1	23.92	<1	3.0	3	3135	3	2936	0.063	0	8868		2	69	0.042	1	447	2	35
36	30-Aug	24.00	<1	24.00	<1	4.0	3	3138	3	2939	0.063	0	8868		0	69	0.000	1	448	5	40
36	31-Aug	24.00	<1	24.00	<1	4.0	0	3138	0	2939	0.000	0	8868		1	70	0.021	0	448	4	44
36	1-Sep					4.0	2	3140	2	2941	0.500	0	8868		3	73	0.750	0	448	4	48
36	2-Sep					4.0	2	3142	0	2941	0.500	0	8868		4	77	1.000	2	450	3	51
36	3-Sep					3.0	4	3146	4	2945	1.333	0	8868		0	77	0.000	1	451	1	52
36	4-Sep					3.0	3	3149	3	2948	1.000	0	8868		1	78	0.333	0	451	2	54
37	5-Sep					3.0	1	3150	0	2948	0.333	0	8868		0	78	0.000	1	452	2	56
37	6-Sep					0.0		3150		2948			8868			78			452		56
37	7-Sep					3.0	3	3153	0	2948	1.000	0	8868		1	79	0.333	0	452	10	66
37	8-Sep					3.0	3	3156	0	2948	1.000	0	8868		1	80	0.333	0	452	6	72
37	9-Sep					3.0	0	3156	0	2948	0.000	0	8868		4	84	1.333	0	452	2	74
37	10-Sep					3.0	0	3156	0	2948	0.000	0	8868		2	86	0.667	0	452	2	76
37	11-Sep					3.0	1	3157	0	2948	0.333	0	8868		2	88	0.667	0	452	8	84
38	12-Sep					3.0	1	3158	0	2948	0.333	0	8868		0	88	0.000	0	452	6	90
38	13-Sep					3.0	1	3159	0	2948	0.333	0	8868		0	88	0.000	0	452	10	100
38	14-Sep					3.0	0	3159	0	2948	0.000	0	8868		0	88	0.000	0	452	5	105
38	15-Sep					3.0	0	3159	0	2948	0.000	0	8868		4	92	1.333	0	452	12	117
38	16-Sep					3.0	0	3159	0	2948	0.000	0	8868		1	93	0.333	0	452	6	123
38	17-Sep					3.0	0	3159	0	2948		0	8868		0	93	0.000	0	452	6	129
38	18-Sep					3.0	0	3159	0	2948		0	8868		1	94	0.333	0	452	4	133
39	19-Sep					3.0	1	3160	0	2948		0	8868		0	94	0.000	0	452	8	141
39	20-Sep					3.0	0	3160	0	2948		0	8868		0	94	0.000	0	452	6	147
39	21-Sep					3.0	0	3160	0	2948		0	8868		0	94	0.000	0	452	3	150
39	22-Sep					3.0	0	3160	0	2948		0	8868		0	94	0.000	0	452	5	155
39	23-Sep					3.0	0	3160	0	2948		0	8868		0	94	0.000	0	452	4	159
39	24-Sep							3160		2948			8868			94			452		159
39	25-Sep					3.0	0	3160	0	2948		0	8868		0	94		0	452	3	162
40	26-Sep					3.0	0	3160	0	2948		0	8868		0	94		0	452	11	173
40	27-Sep					3.0	0	3160	0	2948		0	8868		0	94		0	452	2	175

Appendix C.1. Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

	2005	2004	2004	2003	2003	2003	2002	2002	2002	2001	2001	
	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 6 - 12)												
Male												
Sample Size				1				8	1		1	11
Percent				3.7				29.6	3.7		3.7	40.7
Std. Error				3.7				9.0	3.7		3.7	9.6
Female												
Sample Size								16				16
Percent								59.3				59.3
Std. Error								9.6				9.6
All Fish												
Sample Size				1				24	1		1	27
Percent				3.7				88.9	3.7		3.7	100.0
Std. Error				3.7				6.2	3.7		3.7	
Statistical Week 25 (June 13 - 19)												
Male												
Sample Size					10			18	2			30
Percent					12.2			22.0	2.4			36.6
Std. Error					3.6			4.6	1.7			5.4
Female												
Sample Size				4	5			38	4		1	52
Percent				4.9	6.1			46.3	4.9		1.2	63.4
Std. Error				2.4	2.7			5.5	2.4		1.2	5.4
All Fish												
Sample Size				4	15			56	6		1	82
Percent				4.9	18.3			68.3	7.3		1.2	100.0
Std. Error				2.4	4.3			5.2	2.9		1.2	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

	Brood Year and Age Class											
	2005	2004	2004	2003	2003	2003	2002	2002	2002	2001	2001	
	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 20 - June 26)												
Male												
Sample Size		3		3	27			34	2			69
Percent		2.0		2.0	18.1			22.8	1.3			46.3
Std. Error		1.2		1.2	3.2			3.4	0.9			4.1
Female												
Sample Size				2	23			41	14			80
Percent				1.3	15.4			27.5	9.4			53.7
Std. Error				0.9	3.0			3.7	2.4			4.1
All Fish												
Sample Size		3		5	50			75	16			149
Percent		2.0		3.4	33.6			50.3	10.7			100.0
Std. Error		1.2		1.5	3.9			4.1	2.5			
Statistical Week 27 (June 27 - July 3)												
Male												
Sample Size		3	1	5	64			20	4			97
Percent		1.6	0.5	2.6	33.9			10.6	2.1			51.3
Std. Error		0.9	0.5	1.2	3.5			2.2	1.0			3.6
Female												
Sample Size					46			36	10			92
Percent					24.3			19.0	5.3			48.7
Std. Error					3.1			2.9	1.6			3.6
All Fish												
Sample Size		3	1	5	110			56	14			189
Percent		1.6	0.5	2.6	58.2			29.6	7.4			100.0
Std. Error		0.9	0.5	1.2	3.6			3.3	1.9			

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

	Brood Year and Age Class											
	2005	2004	2004	2003	2003	2003	2002	2002	2002	2001	2001	
	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 4 - 10)												
Male												
Sample Size		11		4	53			27	3			98
Percent		5.4		2.0	26.1			13.3	1.5			48.3
Std. Error		1.6		1.0	3.1			2.4	0.8			3.5
Female												
Sample Size		1	1	5	44			48	5		1	105
Percent		0.5	0.5	2.5	21.7			23.6	2.5		0.5	51.7
Std. Error		0.5	0.5	1.1	2.9			3.0	1.1		0.5	3.5
All Fish												
Sample Size		12	1	9	97			75	8		1	203
Percent		5.9	0.5	4.4	47.8			36.9	3.9		0.5	100.0
Std. Error		1.7	0.5	1.4	3.5			3.4	1.4		0.5	
Statistical Week 29 (July 11 - 17)												
Male												
Sample Size	2	18	1	5	76			14	4			120
Percent	0.9	8.3	0.5	2.3	34.9			6.4	1.8			55.0
Std. Error	0.6	1.9	0.5	1.0	3.2			1.7	0.9			3.4
Female												
Sample Size		2		24	36		1	31	4			98
Percent		0.9		11.0	16.5		0.5	14.2	1.8			45.0
Std. Error		0.6		2.1	2.5		0.5	2.4	0.9			3.4
All Fish												
Sample Size	2	20	1	29	112		1	45	8			218
Percent	0.9	9.2	0.5	13.3	51.4		0.5	20.6	3.7			100.0
Std. Error	0.6	2.0	0.5	2.3	3.4		0.5	2.7	1.3			

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

	Brood Year and Age Class										
	2005	2004	2004	2003	2003	2003	2002	2002	2002	2001	2001	
	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 18 - 24)												
Male												
Sample Size	2	22	2	23	61			13	3			126
Percent	0.9	9.5	0.9	10.0	26.4			5.6	1.3			54.5
Std. Error	0.6	1.9	0.6	2.0	2.9			1.5	0.7			3.3
Female												
Sample Size		2		39	31			32	1			105
Percent		0.9		16.9	13.4			13.9	0.4			45.5
Std. Error		0.6		2.5	2.2			2.3	0.4			3.3
All Fish												
Sample Size	2	24	2	62	92			45	4			231
Percent	0.9	10.4	0.9	26.8	39.8			19.5	1.7			100.0
Std. Error	0.6	2.0	0.6	2.9	3.2			2.6	0.9			
Statistical Week 31 (July 25 - July 31)												
Male												
Sample Size		19	4	3	32			17	1		1	77
Percent		13.7	2.9	2.2	23.0			12.2	0.7		0.7	55.4
Std. Error		2.9	1.4	1.2	3.6			2.8	0.7		0.7	4.2
Female												
Sample Size				16	12			30	3		1	62
Percent				11.5	8.6			21.6	2.2		0.7	44.6
Std. Error				2.7	2.4			3.5	1.2		0.7	4.2
All Fish												
Sample Size		19	4	19	44			47	4		2	139
Percent		13.7	2.9	13.7	31.7			33.8	2.9		1.4	100.0
Std. Error		2.9	1.4	2.9	4.0			4.0	1.4		1.0	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

	Brood Year and Age Class											
	2005	2004	2004	2003	2003	2003	2002	2002	2002	2001	2001	
	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 1 - 7)												
Male												
Sample Size	3	23	14	15	64	1		17	5			142
Percent	1.4	11.1	6.7	7.2	30.8	0.5		8.2	2.4			68.3
Std. Error	0.8	2.2	1.7	1.8	3.2	0.5		1.9	1.1			3.2
Female												
Sample Size				21	23			20	2			66
Percent				10.1	11.1			9.6	1.0			31.7
Std. Error				2.1	2.2			2.0	0.7			3.2
All Fish												
Sample Size	3	23	14	36	87	1		37	7			208
Percent	1.4	11.1	6.7	17.3	41.8	0.5		17.8	3.4			100.0
Std. Error	0.8	2.2	1.7	2.6	3.4	0.5		2.7	1.3			
Statistical Week 33 (August 8 - 14)												
Male												
Sample Size	4	12	14	7	41			20	4	1		103
Percent	2.1	6.3	7.4	3.7	21.6			10.5	2.1	0.5		54.2
Std. Error	1.0	1.8	1.9	1.4	3.0			2.2	1.0	0.5		3.6
Female												
Sample Size				24	17			37	8		1	87
Percent				12.6	8.9			19.5	4.2		0.5	45.8
Std. Error				2.4	2.1			2.9	1.5		0.5	3.6
All Fish												
Sample Size	4	12	14	31	58			57	12	1	1	190
Percent	2.1	6.3	7.4	16.3	30.5			30.0	6.3	0.5	0.5	100.0
Std. Error	1.0	1.8	1.9	2.7	3.3			3.3	1.8	0.5	0.5	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

	Brood Year and Age Class											
	2005	2004	2004	2003	2003	2003	2002	2002	2002	2001	2001	
	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 15 - 21)												
Male												
Sample Size		3	8	1	13			7	1			33
Percent		3.4	9.1	1.1	14.8			8.0	1.1			37.5
Std. Error		1.9	3.1	1.1	3.8			2.9	1.1			5.2
Female												
Sample Size				16	17			18	3		1	55
Percent				18.2	19.3			20.5	3.4		1.1	62.5
Std. Error				4.1	4.2			4.3	1.9		1.1	5.2
All Fish												
Sample Size		3	8	17	30			25	4		1	88
Percent		3.4	9.1	19.3	34.1			28.4	4.5		1.1	100.0
Std. Error		1.9	3.1	4.2	5.1			4.8	2.2		1.1	
Statistical Week 35 (August 22 - 28)												
Male												
Sample Size		2	5	3	10			4				24
Percent		5.7	14.3	8.6	28.6			11.4				68.6
Std. Error		4.0	6.0	4.8	7.7			5.5				8.0
Female												
Sample Size			1	5	2			3				11
Percent			2.9	14.3	5.7			8.6				31.4
Std. Error			2.9	6.0	4.0			4.8				8.0
All Fish												
Sample Size		2	6	8	12			7				35
Percent		5.7	17.1	22.9	34.3			20.0				100.0
Std. Error		4.0	6.5	7.2	8.1			6.9				

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

	Brood Year and Age Class											
	2005	2004	2004	2003	2003	2003	2002	2002	2002	2001	2001	
	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 (August 29 - September 4)												
Male												
Sample Size								1				1
Percent								16.7				16.7
Std. Error								16.7				16.7
Female												
Sample Size					1			3	1			5
Percent					16.7			50.0	16.7			83.3
Std. Error					16.7			22.4	16.7			16.7
All Fish												
Sample Size					1			4	1			6
Percent					16.7			66.7	16.7			100.0
Std. Error					16.7			21.1	16.7			

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

				Brood Year and Age Class							
	2005	2004	2004	2003	2003	2003	2002	2002	2002	2001	2001	
	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	11	116	49	70	451	1	0	200	30	1	2	931
Percent	0.6	6.6	2.8	4.0	25.6	0.1	0.0	11.3	1.7	0.1	0.1	52.7
Std. Error	0.2	0.6	0.4	0.5	1.0	0.1	0.0	0.8	0.3	0.1	0.1	1.2
Female												
Sample Size		5	2	156	257		1	353	55		5	834
Percent		0.3	0.1	8.8	14.6		0.1	20.0	3.1		0.3	47.3
Std. Error		0.1	0.1	0.7	0.8		0.1	1.0	0.4		0.1	1.2
All Fish												
Sample Size	11	121	51	226	708	1	1	553	85	1	7	1765
Percent	0.6	6.9	2.9	12.8	40.1	0.1	0.1	31.3	4.8	0.1	0.4	100.0
Std. Error	0.2	0.6	0.4	0.8	1.2	0.1	0.1	1.1	0.5	0.1	0.1	

Appendix C.2. Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

	Brood Year and Age Class				
	2004	2003	2002	2006	
	0.2	0.3	0.4	0.5	Total
Statistical Weeks 29 (July 11 - July 17)					
Male					
Sample Size			1		1
Percent			33.3		33.3
Std. Error			-		
Female					
Sample Size		2			2
Percent		66.7			66.7
Std. Error		33.3			
All Fish					
Sample Size		2	1		3
Percent		66.7	33.3		100.0
Std. Error					
Statistical Week 30 (July 18 - 24)					
Male					
Sample Size		1			1
Percent		100.0			100.0
Std. Error		-			
Female					
Sample Size					
Percent					
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, 2010.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 32 (August 1 - 7)					
Male					
Sample Size	2		1		3
Percent	22.2		11.1		33.3
Std. Error	14.7		11.1		16.7
Female					
Sample Size		1	5		6
Percent		11.1	55.6		66.7
Std. Error		11.1	17.6		16.7
All Fish					
Sample Size	2	1	6		9
Percent	22.2	11.1	66.7		100.0
Std. Error	14.7	11.1	16.7		
Statistical Week 33 (August 10 - 16)					
Male					
Sample Size		2			2
Percent		40.0			40.0
Std. Error		24.5			24.5
Female					
Sample Size	1		2		3
Percent	20.0		40.0		60.0
Std. Error	20.0		24.5		24.5
All Fish					
Sample Size	1	2	2		5
Percent	20.0	40.0	40.0		100.0
Std. Error	20.0	24.5	24.5		

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 34 (August 17 - August 23)					
Male					
Sample Size		7	7		14
Percent		26.9	26.9		53.8
Std. Error		8.9	8.9		10.0
Female					
Sample Size		2	10		12
Percent		7.7	38.5		46.2
Std. Error		5.3	9.7		10.0
All Fish					
Sample Size		9	17		26
Percent		34.6	65.4		100.0
Std. Error		9.5	9.5		
Statistical Week 35 (August 22 - 28)					
Male					
Sample Size		5	4		9
Percent		31.3	25.0		56.3
Std. Error		12.0	11.2		12.8
Female					
Sample Size		2	5		7
Percent		12.5	31.3		43.8
Std. Error		8.5	12.0		12.8
All Fish					
Sample Size		7	9		16
Percent		43.8	56.3		100.0
Std. Error		12.8	12.8		

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 36 (August 29 - September 4)					
Male					
Sample Size			2		2
Percent			20.0		20.0
Std. Error			13.3		13.3
Female					
Sample Size		5	3		8
Percent		50.0	30.0		80.0
Std. Error		16.7	15.3		13.3
All Fish					
Sample Size		5	5		10
Percent		50.0	50.0		100.0
Std. Error		16.7	16.7		
Statistical Week 37 (September 5 - 11)					
Male					
Sample Size			2		2
Percent			28.6		28.6
Std. Error			18.4		18.4
Female					
Sample Size		3	2		5
Percent		42.9	28.6		71.4
Std. Error		20.2	18.4		18.4
All Fish					
Sample Size		3	4		7
Percent		42.9	57.1		100.0
Std. Error		20.2	20.2		

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2010.

	Brood Year and Age Class				
	2003	2002	2001	2005	
	0.2	0.3	0.4	0.5	Total
Statistical Week 38 (September 12 - 18)					
Male					
Sample Size		1	1		2
Percent		16.7	16.7		33.3
Std. Error		16.7	16.7		21.1
Female					
Sample Size		4			4
Percent		66.7			66.7
Std. Error		21.1			21.1
All Fish					
Sample Size		5	1		6
Percent		83.3	16.7		100.0
Std. Error		16.7	16.7		
Combined Periods (June 29 - October 4)					
Male					
Sample Size	2	16	18		36
Percent	2.4	19.3	21.7		43.4
Std. Error	1.7	4.4	4.6		5.5
Female					
Sample Size	1	19	27		47
Percent	1.2	22.9	32.5		56.6
Std. Error	1.2	4.6	5.2		5.5
All Fish					
Sample Size	3	35	45		83
Percent	3.6	42.2	54.2		100.0
Std. Error	2.1	5.5	5.5		

Appendix D. Results of secondary marking study to test for short term tag loss for sockeye captured at the Canyon Island fish wheels, 2010.

Stat. Week	Canadian Catch	Tags Recovered	Fishery Ratio	Fish Examined for 2nd Marks	Number of 2nd Marks	Sample Ratio	Fishery Ratio - Sampled Ratio
26	2054	57	0.028	799	23	0.029	-0.001
27	1453	48	0.033	351	12	0.034	-0.001
28	1475	39	0.026	200	4	0.020	0.006
29	2622	55	0.021	200	8	0.040	-0.019
30	5786	103	0.018	200	2	0.010	0.008
31	2197	48	0.022	200	1	0.005	0.017
32	1724	39	0.023	933	39	0.042	-0.019
33	1513	70	0.046	684	34	0.050	-0.003
34	642	17	0.026	368	7	0.019	0.007
35	443	18	0.041	200	12	0.060	-0.019
36	171	6	0.035	18	1	0.056	-0.020
Total	20,080	514	0.026	4,153	143	0.034	-0.009