Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2006

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June 2009

Pacific Salmon Commission
Technical Report No. 26

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Transboundary Technical Committee Report No. 26

Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2006

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Prepared for:
Pacific Salmon Commission
Transboundary Technical Committee

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TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF APPENDICES

ABSTRACT

Mark recapture studies of adult Taku River salmon *Oncorhynchus* stocks were conducted by the Department of Fisheries and Oceans Canada, the Alaska Department of Fish and Game, and the Taku River Tlingit First Nation in 2006. 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 5,282 sockeye salmon were captured in fish wheels located at Canyon Island, Alaska, of which 4,950 were tagged and 1,721 (35.0%) were subsequently recovered in fisheries or on the spawning grounds. The inriver run of sockeye salmon past Canyon Island from May 20 to October 3 was estimated to be 166,563 fish (95% confidence interval 136,116 to 197,009). Canadian commercial, aboriginal and test fisheries harvested 21,099, 120, and 262 sockeye, respectively, resulting in a spawning escapement estimate of 145,572 sockeye salmon. Based on mean date and standard deviation of migration timing the sockeye salmon run nearly two weeks late but slightly less compressed than the 1984-2005 average. The Kuthai Lake sockeye salmon stocks dominated the early portion of the run, the King Salmon and Little Trapper Lake the middle portion, and finally the Tatsamenie Lake and mainstem stocks the late portion. The Canyon Island catches of 21,726 pink salmon, 466 chum salmon and 47 steelhead salmon were 38.6% above average, 6.8% below average and 44.4% below average, respectively. The pink salmon run was six 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 2004) as a joint Canada/U.S. program involving the Department of Fisheries and Oceans Canada (DFO) and the Alaska Department of Fish and Game (ADF&G) 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 2006 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 Canada and the U.S. in February 2005.

OBJECTIVES

The primary goals of the Taku River sockeye salmon tagging program in 2006 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 30 to to October 4. Chinook salmon were targeted until mid-June; sockeye salmon from then until mid-August; and finally coho salmon for the remainder of the season. Test fisheries were conducted from May 3 through May 27 and then from September 3 through October 5 targeting chinook and coho salmon, respectively. Drift and set gillnets were the gear types used; mesh sizes ranged from 15 cm (5 1/2 inches) to 20.4 cm (8 inches) with the mesh size of 15 cm predominating during the sockeye season.

Daily tag return was a condition of the Canadian commercial licence. As an additional incentive, a cash reward of $5.00 (Canadian) was offered by DFO for each sockeye tag returned from any fishery (i.e. commercial, aboriginal, or test fishery). Canadian catch statistics and tags were collected daily during fishery openings by DFO personnel stationed at Ericksen Slough, just upstream of the Tulsequah River. Catch statistics were communicated to the DFO office in Whitehorse via 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

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

each tag returned from the District 111 and the inriver personal use fisheries. In addition, it conducted a post-season lottery to award a $100.00 bonus to one of the U.S. fishers that returned tags.
Tag observations and recoveries were also made at enumeration weirs located at Kuthai, King Salmon, Little Trapper, and Tatsamenie lakes. Additional recoveries were made on directed sampling excursions to the Nahlin River and mainstem Taku River spawning grounds.

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

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 2006. Mark-recapture data was forwarded to the Juneau ADF&G and Whitehorse DFO offices after each day of the commercial fishery. Data was analyzed and inriver abundance estimates were developed. Historical migratory timing data was then used each week to project the total inriver run size for the season. Due to the estimated three to four days travel time for fish between the Taku Inlet gillnet fishery and Canyon Island (Clark et al. 1986), as well as between Canyon Island and the Canadian fishery (based on current year tag recovery data), our estimates of inriver abundance corresponds with the movement of Taku River sockeye salmon through District 111 approximately one to two weeks earlier.

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

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

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

The variance of the migrations was estimated by:

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

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

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

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

RESULTS

Fish Wheel Operation

Fish wheels were operated on the Taku River from May 20 through October 3. Fish wheel I, located furthest upriver, was installed on May 20; fish wheel II was installed on May 27. Additional details regarding operations are presented in Appendix B.

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. and B.2. Dates of operation and the total fish wheel catch by species for the 1984 to 2006 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 2006 was 5,282. The total catch was 2.1% below the 1984 to 2005 average (Table 1; Appendix B.1). Fish wheel catches occurred from June 9 through October 3, and peaked during statistical week 31 (July 30 through August 5), when 977 sockeye salmon were captured. Prior to the first Canadian directed sockeye commercial fishery openings on June 18 (statistical week 25), 22 sockeye salmon (0.4% of the season total) 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 2006 pink salmon catch in the fish wheels at Canyon Island was 21,726 (Table 1; Appendix B.2), 38.6% above the 1984 to 2005 average. The peak daily catch of pink salmon in 2006 (3,535 fish) occurred on July 28. The 2006 fish wheel catch of chum salmon was 466. The total catch was 6.8% below the 1984 to 2005 average of 500. The peak daily catch of chum salmon (36 fish) occurred on September 6 and September 7 (Appendix B.2). The total fish wheel catch of steelhead and Dolly Varden in 2006 were 47 and 341 fish respectively. The total catch of 47 steelhead was 44.4% below the 1984 to 2005 average of 85. The total catch of 341 Dolly Varden was 44.8% of the 1984 to 2005 average.

[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.

Tagging and Recovery Data

Of the 5,282 sockeye salmon caught in the Taku fish wheels, 4,950 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 of Canyon Island totaled 18 (0.09**%** of tags applied), leaving 4,932 available for recapture in Canadian fisheries. The Canadian commercial fishery recaptured 694 tagged sockeye and accounted for 34% of the total sockeye tags recovered or observed in upstream fisheries (Table 2). The Canadian test fishery recovered 19 tags (0.9%). The U.S. Personal Use fishery recovered 18 tags. Tags were also observed in terminal areas, principally Little Trapper, Tatsamenie, Kuthai, and Kim Salmon Lakes lakes. These numbered 578, 665, 14, and 50 respectively. The escapements to these locations numbered 25,265, 22,475, 1,015 and 2,177 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 18 to September 16, 2006. Fishwheel CPUE for sockeye was used to expand the inriver run estimate for periods of low tag recovery and effort (SW 22-24, 38-41).

A total of 713 tags with corresponding recovery date information were returned from 21,361 sockeye salmon examined in the Canadian fisheries (Table 3). Tagging data from statistical weeks 24 through 25 (June 11 through June 24) were pooled due to low tag recovery numbers. Tagging data from statistical weeks 28 through 29 (July 9 through July 22) and weeks 30 through 31 (July 23 through August 5) were pooled due to statistically similar tagging ratios. Recovery data from statistical weeks 25 through 29 (June 18 through July 22), 31 through 32 (July 30 through August 12), as well as 36 through 37 (September 3 through September 16) were each pooled due to statistically similar marked fractions. Tagging and recovery data were grouped into 10 and 7 strata, respectively (Table 4).

Using a maximum likelihood Darroch estimator, we estimated that 166,563 sockeye salmon passed Canyon Island between June 18 and September 16. The approximate 95% confidence interval associated with this estimate is 136,116 to 197,009 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 the cumulative proportion of fish wheel CPUE. Using this method, it was estimated that 1,035 additional sockeye passed Canyon Island during statistical weeks 22 through 24 and 38 through 41. This estimate was also reduced by the U.S. inriver personal use fishery catch which was estimated at 545 sockeye using a tag return expansion method based on the current inriver commercial marked fraction (3.3%). The total estimate of sockeye salmon run migrating past Canyon Island was 167,053. This estimate is 27.3% higher that the 1984 to 2005 average (131,148 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 12.8%, compared to a 1984-2005 average of 19.4% (range 11.6 to 31.2%; Table 5). After removal of 21,099, 120, and 262 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 145,572 fish (Table 4). This is 38.2% above the 1984-2005 average of 105,344 fish.

The escapement estimate does not include two groups of sockeye salmon that spawn in the drainage: (1) fish that spawn in streams located downriver from Canyon Island, and (2) jack sockeye salmon. The number of sockeye salmon spawning downstream from Canyon Island is unknown but presumed to be small; spawning has been observed annually in lower tributaries of the lower Taku River (i.e. Fish Creek, Sockeye Creek, and Yehring Creek) during annual aerial and foot surveys (McGregor, personal communication; Figure 1). The contribution of jacks can represent a sizable portion of the Taku River run; the contribution of jack (one ocean) sockeye salmon to the Canyon Island fish wheel catches from 1983 to 2005 averaged 3.9% (range 0.0 to 9.1%; Table 6). However, in 2005 the contribution of jacks was only 1.7%.

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 2005 mark-recapture data was not examined by fish size.

Migratory Timing

The mean date (August 4) of the sockeye salmon migration in 2006 was significantly later (15 days) than the 1984-2005 average (Table 7). The standard deviation was slightly less (18.6 days in 2006 versus an average of 18.9 days); meaning the run was more compressed than average. Migratory timing statistics (mean date July 26; standard deviation 7.8 days) showed the pink salmon run timing was six days later than average and more compressed (averages for mean date and standard deviation were July 20 and 8.2 days respectively). 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 2006 was reflective of the run, the mean date of migration was September 4 (standard deviation 13.2 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 2006 was determined using recoveries of tagged fish from enumeration weirs (Table 9; Figure 6). These were weirs on the outlet streams of Kuthai (14 tags), King Salmon (48 tags), Little Trapper (413 tags), and Tatsamenie (512 tags) lakes (Table 2).

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 30 (June 11 to July 29). The peak of the Kuthai Lake migration took place during statistical week 25 (June 18 to June 24).

The next stock to migrate past Canyon Island was the King Salmon Lake stock. This occurred from statistical weeks 26 to 31 (June 25 to August 5), peaking during statistical week 27 (July 2 to July 8).

Little Trapper Lake sockeye salmon were slightly later than King Salmon Lake fish but peaked during the same week. They were present at Canyon Island during statistical weeks 26 to 33 (June 25 to August 19).

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 37 (July 9 to September 16). The peak week of migration for Tatsamenie Lake sockeye was statistical week 32 (August 6 to August 12).

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 43.5, 25.0, 24.0 and 26.9 days for each of these respective stocks.

Migration rates generally increased over the course of the run. Kuthai Lake fish tagged in statistical week 25 averaged 53.5 days in transit, while those tagged in statistical week 28 averaged 44.0 days. King Salmon Lake fish tagged in statistical week 26 averaged 25.2 in transit while those tagged in statistical week 30 averaged 18.0 days. Little Trapper Lake fish tagged in statistical week 26 averaged 38.8 days in transit while those tagged in statistical week 33 averaged 16.2 days. For the Tatsamenie stock, fish tagged in statistical week 29 averaged 30.3 days in transit while fish tagged in statistical week 37 averaged 18.3 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 2006 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 (47.3%) with age-1.2 fish comprising 27.2%, age-2.2 7.5%, age-0.2 8.2%, age-2.3 2.3%, age-0.3 5.5%, 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 similar to the 1983 to 2005 averages (Table 10). Females comprised 55.1% of the fish wheel catch of sockeye salmon (Appendix C.1).

Fish wheel catches of chum salmon were primarily comprised of age-0.3 (66.7%) fish, which is higher than the 1983-2005 average of 52.6% (Table 11). Age-0.4 fish constituted 31.2% of the fish wheel catch, lower than the 45.3% average. Female chum salmon were more prevalent (56.3%) than males (Appendix C.2). The average lengths at age for chum salmon passing Canyon Island were 615, 647, and 681 mm (MEF) for age 0.2, 0.3, and 0.4 fish respectively; these were slightly above the 1983 to 2005 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 (Boyce and Andel, 2005). Based on those results the mark-recapture data for 2006 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 effectively serve as a secondary mark. A substantial number of fish were recaptured in the fish wheels shortly after tagging. 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 or nonexistent. 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 2006 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, 2006

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	3,946	15,839	257	78	293
2006	5/20-10/3	5,282	21,726	466	47	341
Average(84-05)		5,395	15,671	500	85	617

Table 2. Summary of Taku River sockeye tag recoveries by location and species, 2006

	Tags Recovered	Tags Observed Only	Total	Fish Inspected	Tag Ratio	Percent Tags Observed
Commercial Fishery	694	0	694	21,099	0.033	0.339
Test Fishery	19	0	19	262	0.073	0.009
King Salmon Lake	48	2	50	2,177	0.023	0.024
Kuthai Lake	14	0	14	1,015	0.014	0.007
Little Trapper Lake	413	165	578	25,265	0.023	0.283
Tatsamenie Lake	512	153	665	22,475	0.030	0.325
Taku River mainstem	6	0	6	481	0.012	0.003
Nahlin River	1	0	1	180	0.006	0.000
Tatsatua Creek	0	0	0	-	-	0.000
U.S. downstream	18		18	-	-	0.009
Total	1,725	320	2,045	72,954		1.000

Table 3. Tagging and recovery data from the 2006 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			
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0.000
24	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	14	0.143
25	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	42	0.048
26	0	0	20	15	0	1	0	0	0	0	0	0	0	0	0	36	175	0.206
27	0	0	0	14	16	2	0	0	0	0	0	0	0	0	0	32	194	0.165
28	0	0	0	0	20	22	0	0	0	0	0	0	0	0	0	42	362	0.116
29	0	0	0	0	0	35	9	1	0	0	0	0	0	0	0	45	294	0.153
30	0	0	0	0	0	0	10	60	0	0	1	1	0	0	0	72	790	0.091
31	0	0	0	0	0	0	0	128	30	12	3	0	1	0	0	174	927	0.188
32	0	0	0	0	0	0	0	0	37	58	3	1	0	0	0	99	655	0.151
33	0	0	0	0	0	0	0	0	0	71	30	0	1	1	0	103	505	0.204
34	0	0	0	0	0	0	0	0	0	0	68	13	0	0	0	81	428	0.189
35	0	0	0	0	0	0	0	0	0	0	0	9	1	0	0	10	227	0.044
36	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	6	171	0.035
37	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	9	136	0.066
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0.000
Total	0	2	22	29	36	60	19	189	67	141	105	24	5	14	0	713	4,932	0.145
Sockeye Examined[a]:																Total		
Test Fishery													122	120	20	262		
Can. Comm. Catch	25	127	811	930	1,109	1,757	1,919	6,058	2,223	2,825	2,569	746				21,099		
Aboriginal Fishery																		
Total	25	127	811	930	1,109	1,757	1,919	6,058	2,223	2,825	2,569	746	122	120	20	21,361		

[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, 2006.

Statistical Week of Tagging	Statistical Week of Recovery							Total Tags Recovered	Total Tags Applied	Tag Ratio
	25-29	30	31-32	33	34	35	36-37			
24-25	4							4	56	0.071
26	36							36	175	0.206
27	32							32	194	0.165
28-29	77	9	1					87	656	0.133
30-31		10	220	12	4			246	1717	0.143
32			37	58	3	1		99	655	0.151
33				71	30		2	103	505	0.204
34					68	13		81	428	0.189
35						9	1	10	227	0.044
36-37							15	15	307	0.049
Total	149	19	258	141	105	23	18	713	4,920	0.145
Catch Eaxmined For Tags	4,734	1,919	8281	2,825	2,569	746	242	21,316		
Marked Fraction	0.031	0.010	0.031	0.050	0.041	0.031	0.074	0.033		
Total Above-Border Run	28,100	39,674	54,309	17,573	3,154	18,876	4,877	166,563		
Fish Wheel CPUE Expansion[a]								1,035		
U.S. Personal Use Fishery[b]								545		
Adjusted Total Above-Border Run								167,053		
Aboriginal Fishery[c]								120		
Inriver Test Fishery[d]								45		
95% Lower C.I.	24,086	2,312	43,477	12,851	-6,022	7,562	2,503	136,116		
95% Upper C.I.	32,113	77,037	65,141	22,294	12,330	30,190	7,252	197,009		
Spawning Escapement	23,366	37,755	46,028	14,748	585	18,130	4,635	145,572		

[a] Expansion based on fish wheel CPUE

[b] Tags from personal use catch expanded by inriver commerical marked fraction (3.3%) to obtain total catch

[c] Represents sockeye taken in the aboriginal fishery that were not checked for tags.

[d] 45 sockeye caught by the Canadian test fishery in SW 24 and SW 38 are not included within the above matrix.

Table 5. Historical sockeye salmon above border abundance, above border harvests, and escapement for the Taku River, 1984 to 2006[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
Average(84-05)	131,148	25,559	0.194	105,344	226,505	94,660
Maximum(84-05)	200,918	47,988	0.312	167,691	399,277	207,008
Minimum(84-05)	91,548	12,967	0.116	70,715	118,452	25,811
S.D.(84-05)	29,178	9,041	0.048	23,586	67,427	46,409
C.V.(84-05)	22.2%	35.4%	24.8%	22.4%	29.8%	49.0%

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

[b] Spawning escapement includes removals for Canadian Aboriginal and U.S. Personal Use Fisheries.

Table 6. Historical age composition of sockeye salmon passing Canyon Island, Taku River, 1983 to 2006.

	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
Average(83-05)	2,593	0.3	5.0	3.2	8.6	24.9	0.4	0.1	48.7	5.1	0.2	3.8	0.0	0.0	0.0
SD(83-05)		0.3	3.1	2.2	4.5	7.4	0.5	0.1	8.6	2.7	0.1	2.0	0.0	0.0	0.0
CV(83-05)		88.4%	63.1%	67.2%	52.9%	29.8%	127.2%	133.2%	17.8%	53.2%	67.6%	53.0%	-	-	-

Table 7. Migratory timing statistics of sockeye, pink , and chum salmon past the Canyon Island fish wheels, 1984 to 2006. 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
Average(84-05)	7/20	18.9	7/20	8.2	9/1	13.4

Table 8. Weekly and cumulative proportions of three individual sockeye salmon stocks passing Canyon Island in 2006, based on spawning ground tag recoveries expanded by fish wheel indices (fish wheel CPUE).

			Kuthai Lake		King Salmon Lake		Little Trapper Lake		Tatsamenie Lake	
Statistical Week	Week Starting	Week Ending	Weekly Proportion	Cumul. Proportion	Weekly Proportion	Cumul. Proportion	Weekly Proportion	Cumul. Proportion	Weekly Proportion	Cumul. Proportion
22	28-May	3-Jun								
23	4-Jun	10-Jun								
24	11-Jun	17-Jun	0.04	0.04						
25	18-Jun	24-Jun	0.41	0.45			0.00	0.00		
26	25-Jun	1-Jul	0.22	0.67	0.09	0.09	0.02	0.02		
27	2-Jul	8-Jul	0.27	0.94	0.38	0.47	0.08	0.11		
28	9-Jul	15-Jul	0.04	0.97	0.28	0.74	0.21	0.32	0.01	0.01
29	16-Jul	22-Jul	0.00	0.97	0.13	0.88	0.16	0.48	0.15	0.16
30	23-Jul	29-Jul	0.03	1.00	0.08	0.96	0.32	0.80	0.12	0.29
31	30-Jul	5-Aug			0.04	1.00	0.14	0.94	0.11	0.39
32	6-Aug	12-Aug					0.05	0.98	0.16	0.55
33	13-Aug	19-Aug					0.02	1.00	0.15	0.70
34	20-Aug	26-Aug							0.09	0.78
35	27-Aug	2-Sep							0.15	0.93
36	3-Sep	9-Sep							0.06	0.98
37	10-Sep	16-Sep							0.02	1.00

Table 9. Inriver migration timing for four Taku River sockeye salmon stocks, 2006.

Stock	Week	Travel Time	SD	SE	N	95% C.I.
Kuthai	24	68.0			1.0	
	25	53.5	3.5	2.5	2.0	4.90
	26	44.0	8.4	4.2	4.0	8.20
	27	38.0	8.7	3.9	5.0	7.64
	28	44.0			1.0	
	29					
	30	24.0			1.0	
	Average	43.5	12.0		14.0	
King Salmon	26	25.2	2.6		5.0	2.3
	27	24.0	6.6	1.6	17.0	3.1
	28	26.4	3.3	0.9	14.0	1.7
	29	28.8	5.0	2.0	6.0	4.0
	30	18.0	2.8	1.4	4.0	2.77
	Average	25.0	5.4		46	
L. Trapper	25	41.0			2.0	
	26	38.8	3.7	1.2	9.0	2.42
	27	31.4	2.9	0.5	33.0	0.97
	28	27.7	3.5	0.4	90.0	0.73
	29	24.9	4.4	0.6	62.0	1.10
	30	20.4	4.2	0.4	137.0	0.70
	31	20.7	4.0	0.5	57.0	1.03
	32	18.9	3.5	0.9	16.0	1.71
	33	16.2	1.2	0.5	6.0	0.94
	Average	24.0	6.0		412	
Tatsamenie	28	32.3	1.3	0.6	4.0	1.23
	29	30.3	3.8	1.0	15.0	1.94
	30	26.0	5.0	0.6	66.0	1.20
	31	28.8	6.3	0.6	114.0	1.16
	32	29.2	7.4	0.8	79.0	1.62
	33	28.8	5.6	0.7	61.0	1.42
	34	27.7	3.3	0.5	52.0	0.90
	35	25.8	3.9	0.5	51.0	1.06
	36	19.3	3.1	0.4	51.0	0.84
	37	18.3	2.8	0.7	16.0	1.37
	Average	26.9	6.3		509	

Table 10. Historical length (MEF) at age composition of sockeye salmon passing Canyon Island, Taku River, 2006

	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			
Average(83-05)	2,610	318	449	326	573	479	334	598	575	502	594	578	610	515	555
SD(83-05)		14.7	11.5	8.3	9.1	13.6	14.4	19.6	10.0	14.2	17.5	11.1	49.2	35.4	
CV(83-05)		4.6%	2.6%	2.6%	1.6%	2.8%	4.3%	3.3%	1.7%	2.8%	3.0%	1.9%	8.1%		-

Table 11. Historical age composition of chum salmon passing Canyon Island, Taku River, 2006.

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
Average (83-05)	346	1.2	52.6	45.3	2.2	0.0
SD (83-05)		1.8	20.6	20.7	2.8	0.1
CV (83-05)		0.7	2.6	2.2	0.8	0.3

Table 12. Historical length (MEF) at age composition of chum salmon passing Canyon Island, Taku River, 1983 to 2006.

	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	
Average (83-05)	362	597	634	664	674	640
SD (83-05)		40.6	15.3	11.7	24.8	56.6
CV (83-05)		6.8%	2.4%	1.8%	3.7%	8.8%

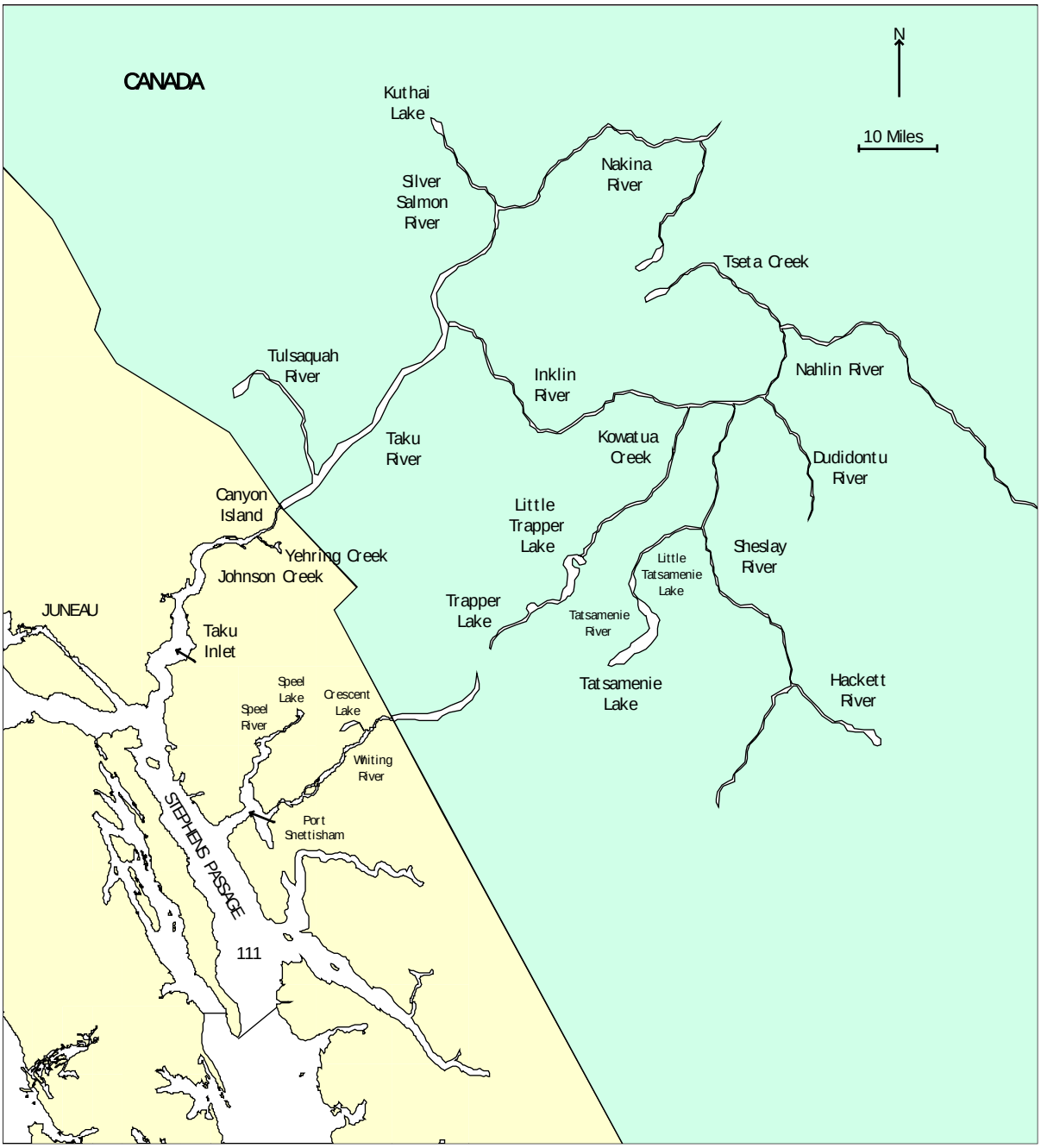


Figure 1. Taku River drainage, with location of tagging sites.

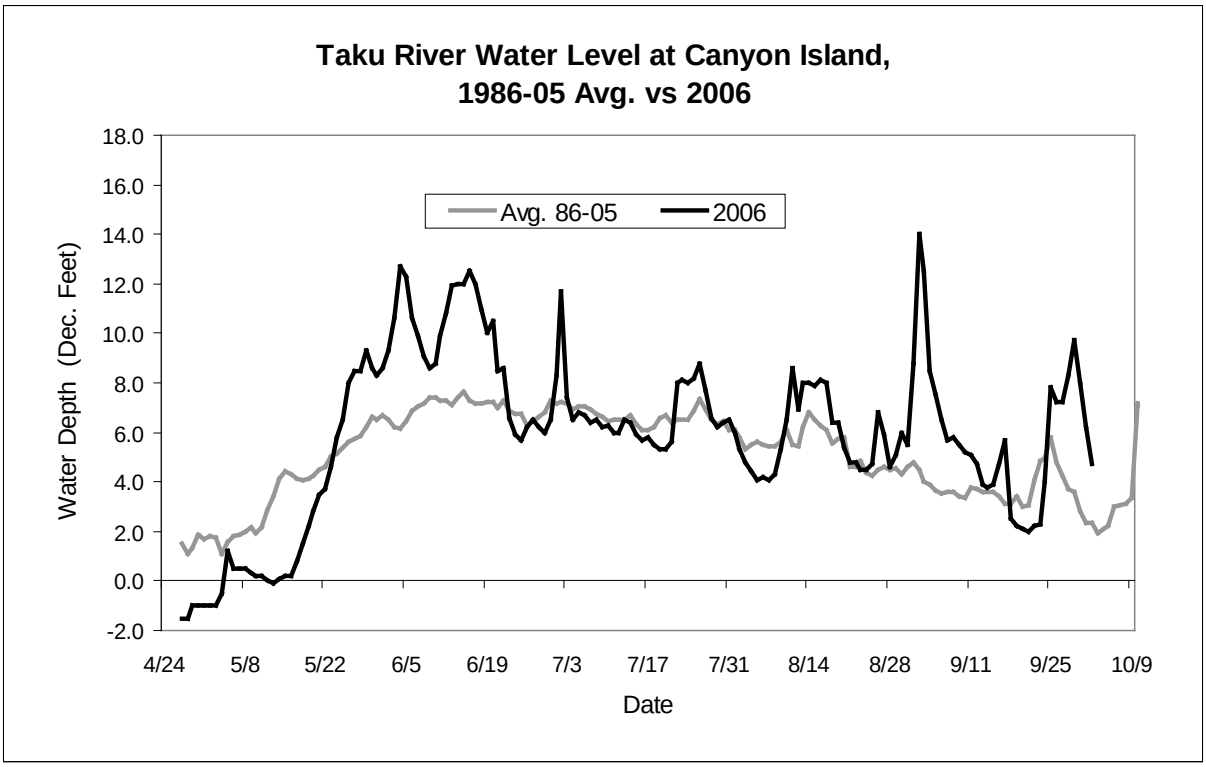


Figure 2. Water levels at Canyon Island, Taku River, 2006 vs. 1986-2005 average.

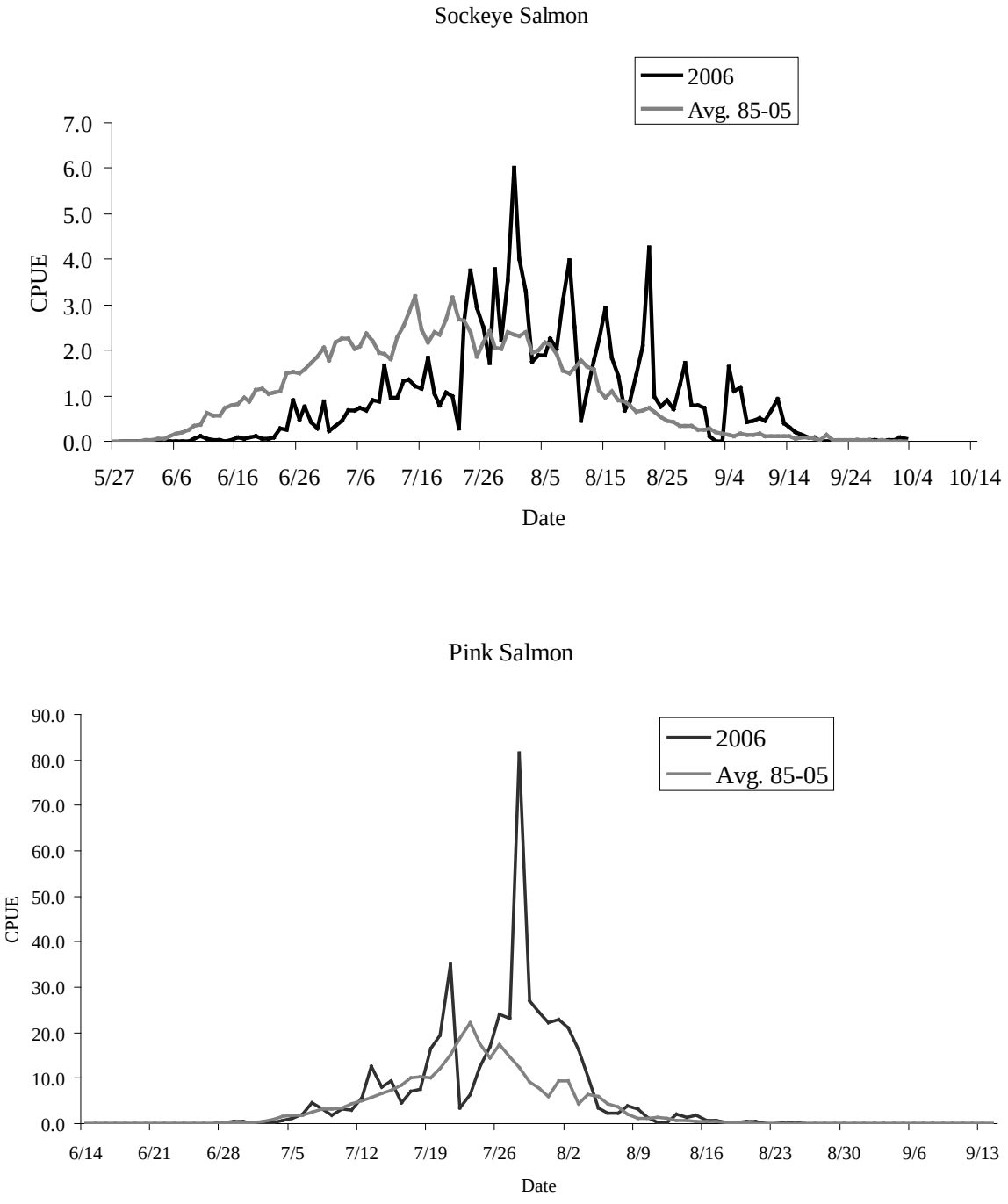
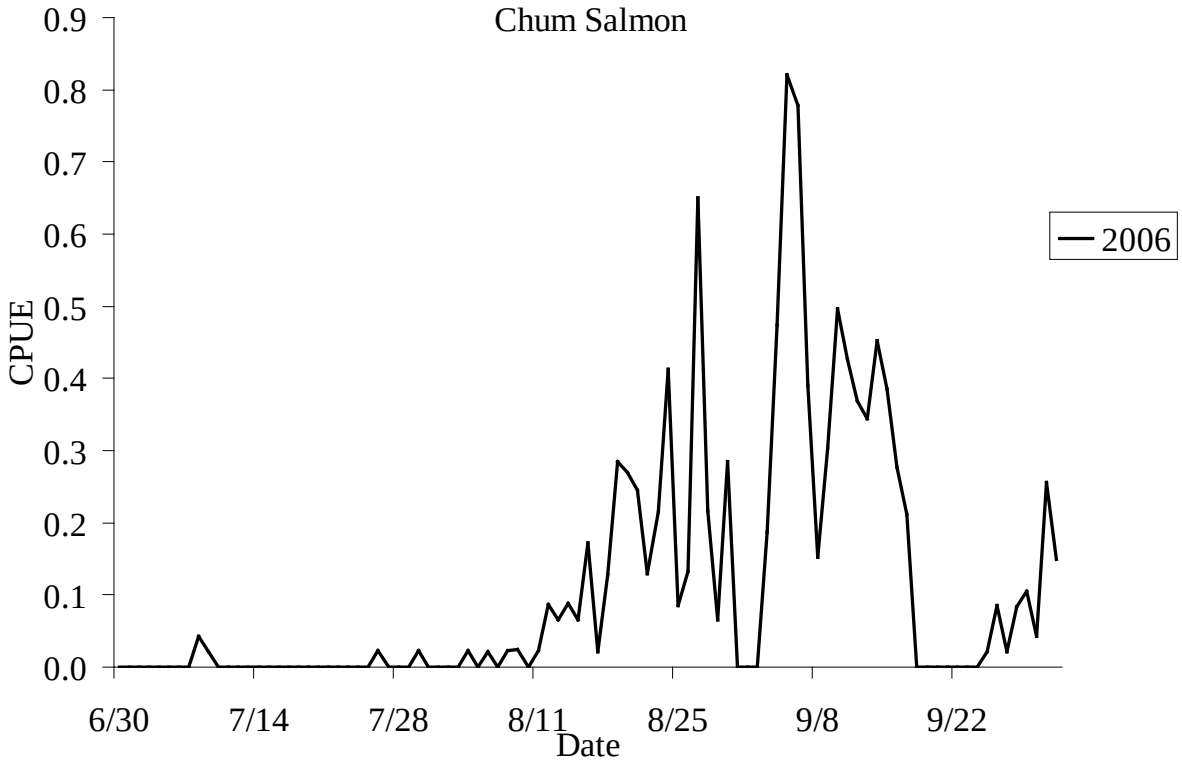


Figure 3. Fish wheel CPUE for sockeye, pink, and chum salmon at Canyon Island, 2006.

Figure 3. continued



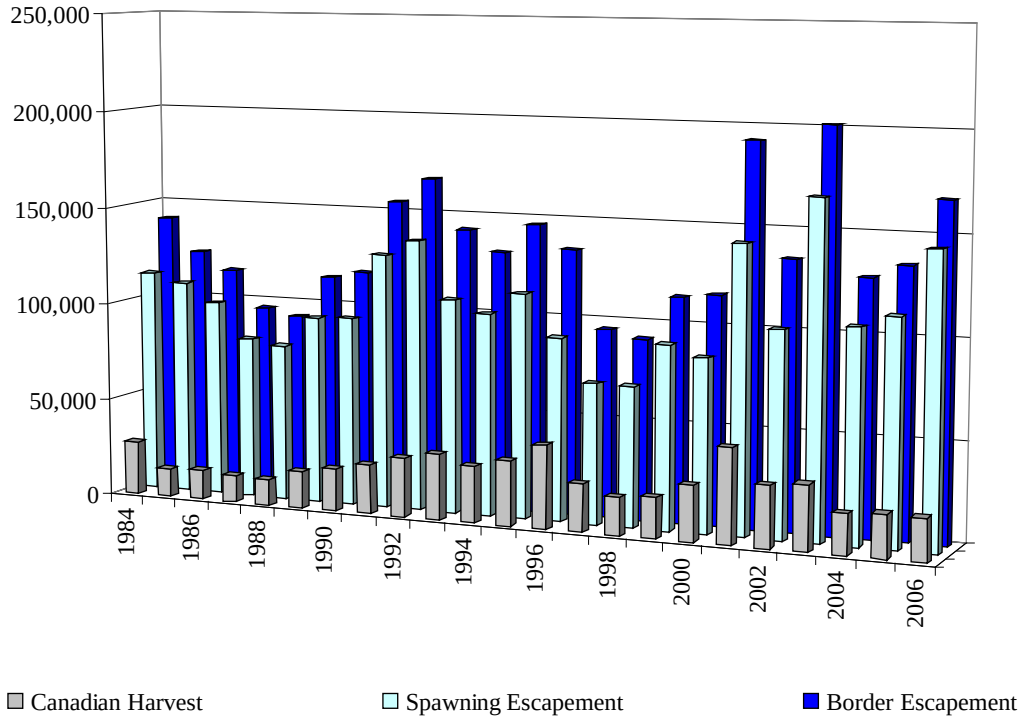


Figure 4. Historical sockeye mark-recapture abundance estimates above the U.S./Canada border including Canadian inriver harvests and escapements for Taku River sockeye, 1984-2006.

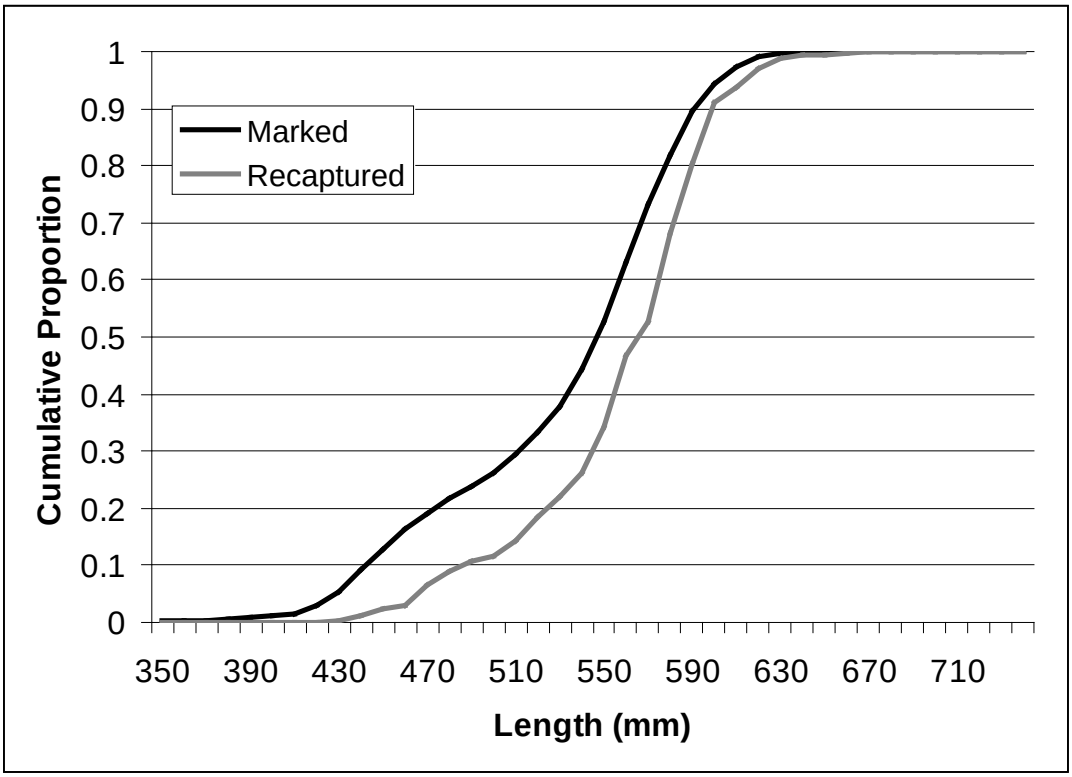


Figure 5. Cumulative Distribution Functions (CDF) of MEF lengths of sockeye salmon tagged at Canyon Island and of tagged sockeye salmon recovered in the Canadian commercial fishery, 2006.

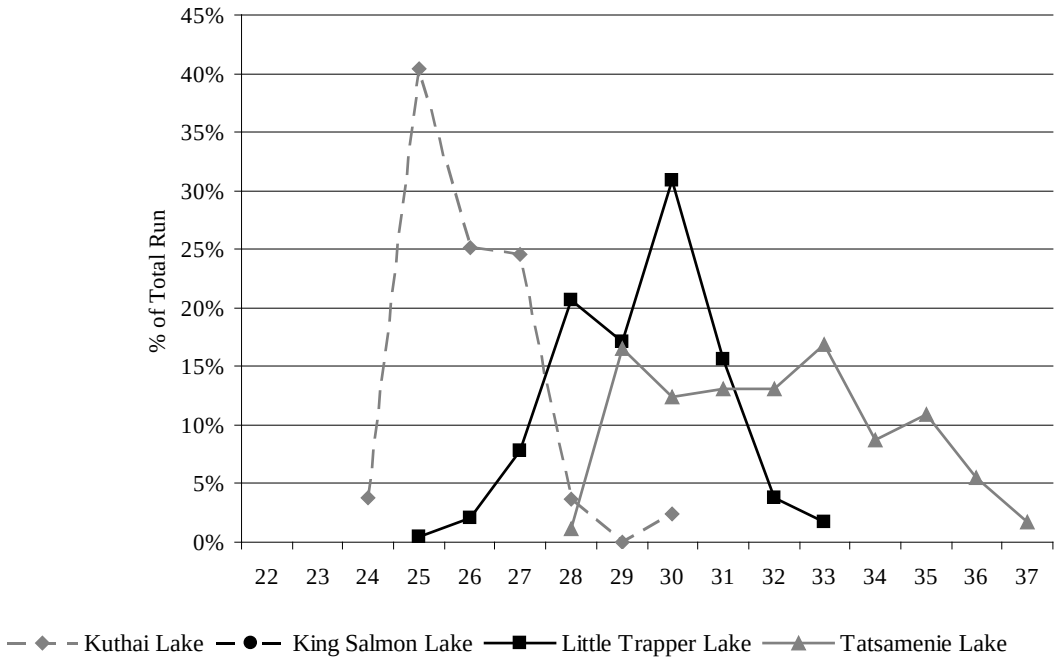
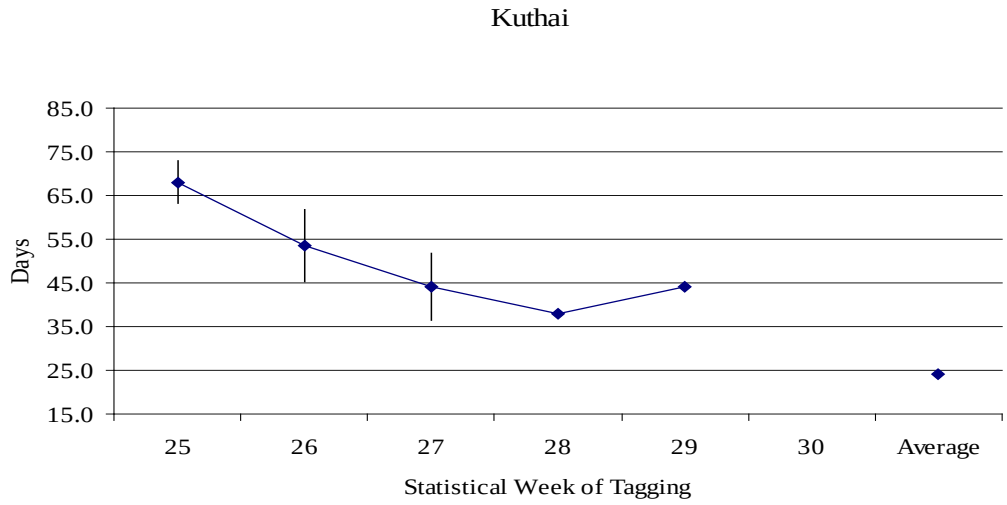


Figure 6. Run timing of four sockeye salmon stock groups passing Canyon Island, 2006.



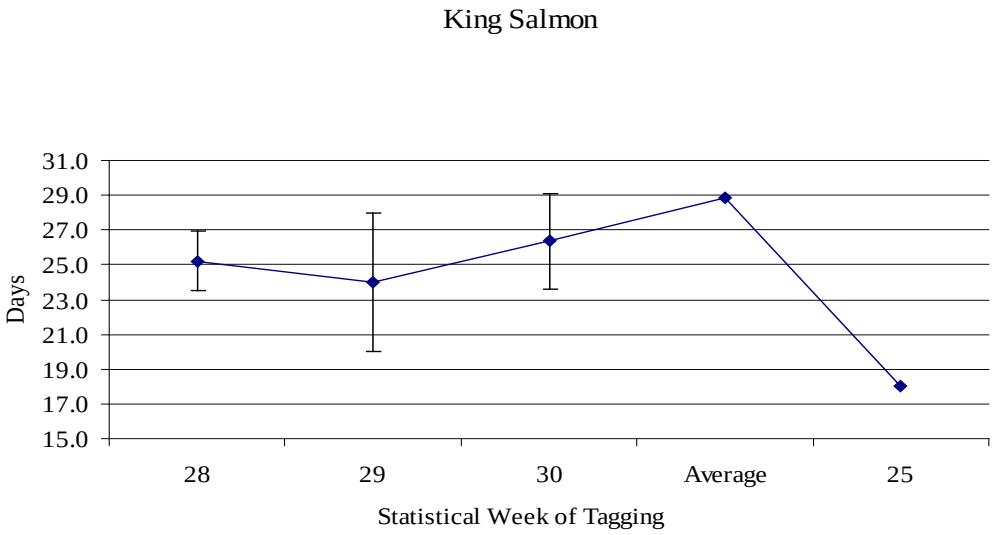


Figure 7. Mean travel times (and 95% confidence intervals) for tagged sockeye salmon between Canyon Island and four upriver locations, 2006.

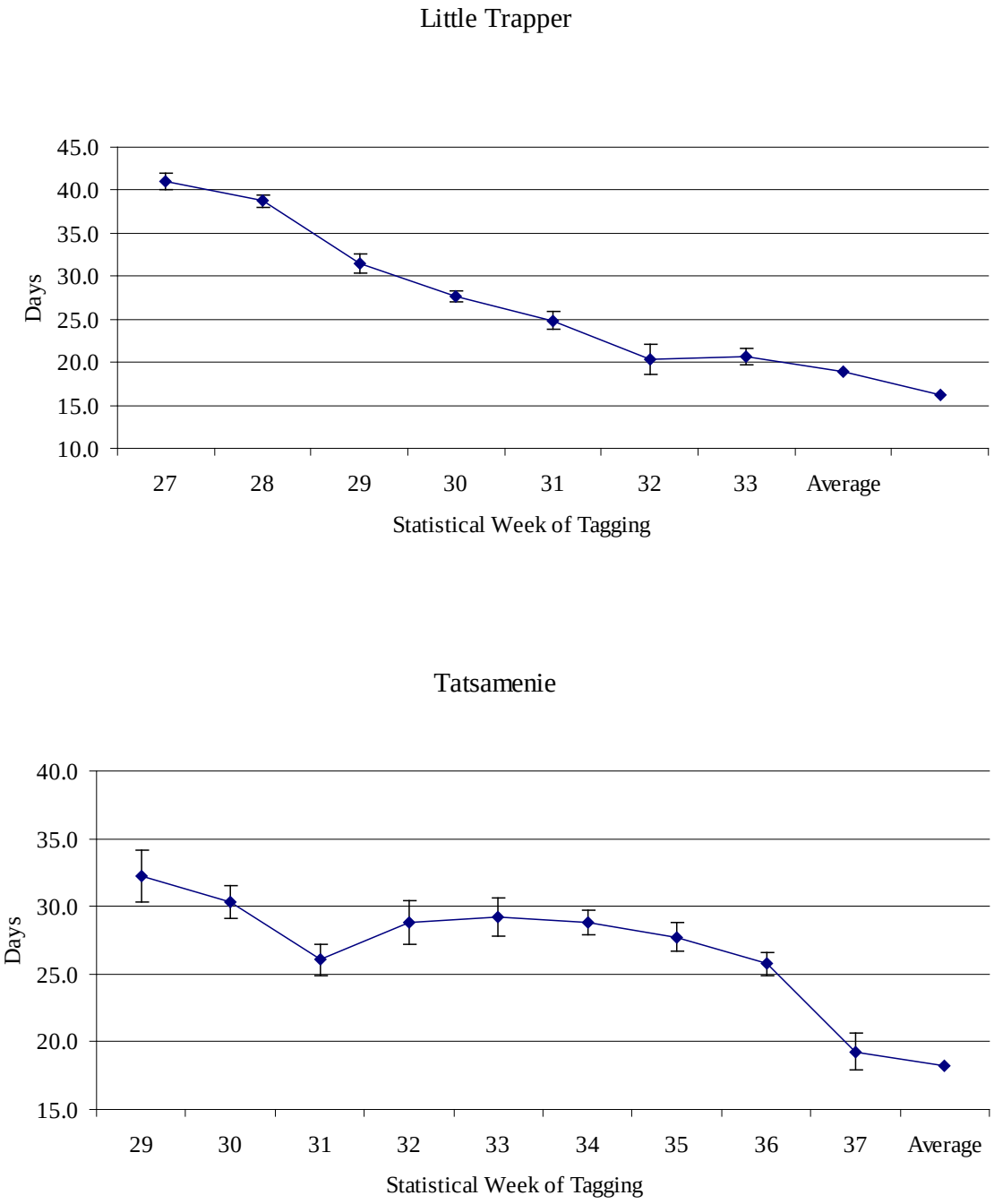


Figure 7 (cont'd). Mean travel times (and 95% confidence intervals) for tagged sockeye salmon between Canyon Island and four upriver locations, 2006.

Appendix A. Inclusive dates for statistical weeks, 2006.

2006 Statistical Week Calendar

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

Appendix B.1. Catches, number tagged, and CPUE of sockeye salmon in the fish wheels at Canyon Island, 2006.

Stat		Temp.	Level	FW Catches		FW Tagged		CPUE		
Week	Date	(°C)	(dec.ft.)	Daily	Cum.	Daily	Cum.	Daily	Cum.	Cum. Prop
20	20-May	5.5	2.8	0	0	0	0	0.000	0.000	0.0000
21	21-May	5.5	3.5	0	0	0	0	0.000	0.000	0.0000
21	22-May	5.5	3.7	0	0	0	0	0.000	0.000	0.0000
21	23-May	5.8	4.6	0	0	0	0	0.000	0.000	0.0000
21	24-May	4.6	5.8	0	0	0	0	0.000	0.000	0.0000
21	25-May	5.0	6.5	0	0	0	0	0.000	0.000	0.0000
21	26-May	5.5	8.0	0	0	0	0	0.000	0.000	0.0000
21	27-May	6.0	8.5	0	0	0	0	0.000	0.000	0.0000
22	28-May	6.0	8.5	0	0	0	0	0.000	0.000	0.0000
22	29-May	5.8	9.3	0	0	0	0	0.000	0.000	0.0000
22	30-May	6.0	8.6	0	0	0	0	0.000	0.000	0.0000
22	31-May	6.0	8.3	0	0	0	0	0.000	0.000	0.0000
22	1-Jun	7.0	8.6	0	0	0	0	0.000	0.000	0.0000
22	2-Jun	7.0	9.3	0	0	0	0	0.000	0.000	0.0000
22	3-Jun	6.4	10.6	0	0	0	0	0.000	0.000	0.0000
23	4-Jun	6.0	12.7		0		0	0.000	0.000	0.0000
23	5-Jun	6.0	12.3	0	0	0	0	0.000	0.000	0.0000
23	6-Jun	7.2	10.6	0	0	0	0	0.000	0.000	0.0000
23	7-Jun	7.3	9.9	0	0	0	0	0.000	0.000	0.0000
23	8-Jun	7.3	9.1	0	0	0	0	0.000	0.000	0.0000
23	9-Jun	7.4	8.6	3	3	2	2	0.064	0.064	0.0005
23	10-Jun	8.5	8.8	5	8	4	6	0.107	0.171	0.0014
24	11-Jun	8.5	9.9	3	11	3	9	0.063	0.234	0.0020
24	12-Jun	8.8	10.8	2	13	2	11	0.042	0.276	0.0023
24	13-Jun	9.0	11.9	1	14	1	12	0.021	0.297	0.0025
24	14-Jun	9.0	12.0	0	14	0	12	0.000	0.297	0.0025
24	15-Jun	9.0	12.0	2	16	2	14	0.042	0.339	0.0028
24	16-Jun	7.9	12.5	3	19	3	17	0.089	0.428	0.0036
24	17-Jun	8.3	12.0	3	22	3	20	0.063	0.491	0.0041
25	18-Jun	8.1	11.0	4	26	4	24	0.084	0.575	0.0048
25	19-Jun	7.6	10.0	6	32	6	30	0.127	0.702	0.0059
25	20-Jun	5.7	10.5	2	34	2	32	0.044	0.745	0.0062
25	21-Jun	7.9	8.5	3	37	3	35	0.063	0.808	0.0067
25	22-Jun	7.3	8.6	4	41	4	39	0.085	0.893	0.0074
25	23-Jun	8.6	6.6	13	54	13	52	0.278	1.170	0.0098
25	24-Jun	7.2	5.9	11	65	10	62	0.255	1.425	0.0119
26	25-Jun	8.0	5.7	42	107	40	102	0.903	2.328	0.0194
26	26-Jun	8.4	6.2	23	130	21	123	0.488	2.816	0.0235
26	27-Jun	8.7	6.5	36	166	33	156	0.767	3.583	0.0299

Appendix B.1 (cont'd). Catches, number tagged, and CPUE of sockeye salmon in the fish wheels at Canyon Island, 2006.

Stat		Temp.	Level	FW Catches		FW Tagged		CPUE		
Week	Date	(°C)	(dec.ft.)	Daily	Cum.	Daily	Cum.	Daily	Cum.	Cum. Prop
26	28-Jun	7.8	6.2	20	186	18	174	0.422	4.006	0.0334
26	29-Jun	8.2	6.0	14	200	13	187	0.295	4.301	0.0359
26	30-Jun	7.7	6.5	41	241	40	227	0.869	5.170	0.0431
26	1-Jul	6.2	8.3	11	252	10	237	0.232	5.402	0.0450
27	2-Jul	4.5	11.7	12	264	12	249	0.336	5.738	0.0478
27	3-Jul	8.0	7.4	21	285	21	270	0.443	6.181	0.0515
27	4-Jul	8.4	6.5	32	317	31	301	0.682	6.863	0.0572
27	5-Jul	9.7	6.8	32	349	29	330	0.677	7.540	0.0629
27	6-Jul	9.6	6.7	34	383	31	361	0.725	8.265	0.0689
27	7-Jul	9.0	6.4	32	415	31	392	0.684	8.949	0.0746
27	8-Jul	9.2	6.5	42	457	39	431	0.895	9.844	0.0821
28	9-Jul	9.0	6.2	41	498	37	468	0.874	10.718	0.0894
28	10-Jul	8.4	6.3	77	575	74	542	1.665	12.383	0.1033
28	11-Jul	9.2	6.0	44	619	43	585	0.950	13.333	0.1112
28	12-Jul	10.0	6.0	44	663	42	627	0.955	14.287	0.1191
28	13-Jul	9.2	6.5	61	724	57	684	1.324	15.611	0.1302
28	14-Jul	8.1	6.4	63	787	59	743	1.357	16.968	0.1415
28	15-Jul	8.9	5.9	56	843	50	793	1.211	18.179	0.1516
29	16-Jul	9.0	5.7	54	897	47	840	1.159	19.338	0.1613
29	17-Jul	9.6	5.8	85	982	78	918	1.845	21.183	0.1766
29	18-Jul	9.3	5.5	48	1030	45	963	1.032	22.215	0.1853
29	19-Jul	9.3	5.3	37	1067	33	996	0.798	23.013	0.1919
29	20-Jul	9.4	5.3	49	1116	44	1040	1.065	24.079	0.2008
29	21-Jul	9.1	5.6	46	1162	34	1074	1.000	25.079	0.2091
29	22-Jul	8.1	8.0	13	1175	13	1087	0.276	25.354	0.2114
30	23-Jul	9.1	8.1	120	1295	116	1203	2.637	27.991	0.2334
30	24-Jul	9.0	8.0	170	1465	162	1365	3.750	31.742	0.2647
30	25-Jul	7.8	8.2	133	1598	130	1495	2.939	34.681	0.2892
30	26-Jul	7.9	8.8	113	1711	105	1600	2.502	37.183	0.3101
30	27-Jul	8.8	7.7	77	1788	69	1669	1.708	38.891	0.3243
30	28-Jul	9.0	6.6	164	1952	123	1792	3.784	42.675	0.3559
30	29-Jul	8.5	6.2	99	2051	85	1877	2.221	44.895	0.3744
31	30-Jul	8.8	6.4	154	2205	143	2020	3.540	48.436	0.4039
31	31-Jul	9.2	6.5	258	2463	249	2269	6.000	54.436	0.4540
31	1-Aug	8.5	6.0	173	2636	157	2426	4.016	58.451	0.4874
31	2-Aug	8.5	5.3	139	2775	131	2557	3.296	61.748	0.5149
31	3-Aug	8.9	4.8	79	2854	77	2634	1.752	63.500	0.5295
31	4-Aug	8.5	4.4	88	2942	85	2719	1.896	65.396	0.5454
31	5-Aug	8.0	4.1	86	3028	85	2804	1.904	67.300	0.5612
32	6-Aug	8.5	4.2	104	3132	103	2907	2.253	69.553	0.5800
32	7-Aug	9.0	4.1	94	3226	91	2998	2.040	71.593	0.5970
32	8-Aug	8.4	4.3	140	3366	131	3129	3.099	74.692	0.6229
32	9-Aug	8.0	5.3	177	3543	165	3294	3.971	78.663	0.6560
32	10-Aug	7.0	6.5	101	3644	98	3392	2.499	81.162	0.6768
32	11-Aug	4.0	8.6	21	3665	21	3413	0.446	81.608	0.6806
32	12-Aug	6.5	6.9	48	3713	46	3459	1.123	82.731	0.6899
33	13-Aug	5.6	8.0	81	3794	76	3535	1.769	84.500	0.7047
33	14-Aug	5.0	8.0	102	3896	96	3631	2.233	86.733	0.7233
33	15-Aug	4.5	7.9	134	4030	129	3760	2.945	89.678	0.7479
33	16-Aug	4.3	8.1	84	4114	77	3837	1.833	91.511	0.7631
33	17-Aug	4.6	8.0	67	4181	61	3898	1.446	92.957	0.7752

Appendix B.1 (cont'd). Catches, number tagged, and CPUE of sockeye salmon in the fish wheels at Canyon Island, 2006.

Stat		Temp.	Level	FW Catches		FW Tagged		CPUE		
Week	Date	(°C)	(dec.ft.)	Daily	Cum.	Daily	Cum.	Daily	Cum.	Cum. Prop
33	18-Aug	7.9	6.4	31	4212	31	3929	0.667	93.625	0.7808
33	19-Aug	7.5	6.4	41	4253	35	3964	0.876	94.500	0.7881
34	20-Aug	8.3	5.4	67	4320	61	4025	1.467	95.968	0.8003
34	21-Aug	7.2	4.8	93	4413	91	4116	2.094	98.062	0.8178
34	22-Aug	7.2	4.8	157	4570	150	4266	4.272	102.334	0.8534
34	23-Aug	8.5	4.5	23	4593	22	4288	0.993	103.327	0.8617
34	24-Aug	7.0	4.5	36	4629	33	4321	0.776	104.102	0.8681
34	25-Aug	8.5	4.7	41	4670	38	4359	0.891	104.994	0.8756
34	26-Aug	6.5	6.8	33	4703	33	4392	0.707	105.701	0.8815
35	27-Aug	6.2	5.9	56	4759	55	4447	1.233	106.934	0.8918
35	28-Aug	6.4	4.6	77	4836	73	4520	1.727	108.661	0.9062
35	29-Aug	6.5	5.1	37	4873	33	4553	0.800	109.461	0.9128
35	30-Aug	6.5	6.0	36	4909	36	4589	0.780	110.241	0.9193
35	31-Aug	6.0	5.5	31	4940	30	4619	0.734	110.975	0.9255
35	1-Sep	6.0	8.8	3	4943	0	4619	0.113	111.088	0.9264
35	2-Sep	5.0	14.0		4943		4619	0.000	111.088	0.9264
36	3-Sep	6.0	12.5	0	4943	0	4619	0.000	111.088	0.9264
36	4-Sep	7.1	8.5	35	4978	35	4654	1.634	112.722	0.9400
36	5-Sep	7.5	7.5	30	5008	29	4683	1.094	113.816	0.9491
36	6-Sep	7.0	6.5	52	5060	48	4731	1.186	115.002	0.9590
36	7-Sep	7.0	5.7	19	5079	19	4750	0.411	115.413	0.9625
36	8-Sep	6.0	5.8	20	5099	18	4768	0.459	115.873	0.9663
36	9-Sep	7.0	5.5	24	5123	22	4790	0.521	116.393	0.9706
37	10-Sep	6.0	5.2	21	5144	21	4811	0.455	116.848	0.9744
37	11-Sep	5.8	5.1	31	5175	30	4841	0.669	117.517	0.9800
37	12-Sep	6.5	4.7	42	5217	41	4882	0.944	118.461	0.9879
37	13-Sep	6.0	3.9	18	5235	17	4899	0.390	118.850	0.9911
37	14-Sep	5.0	3.8	14	5249	11	4910	0.302	119.152	0.9936
37	15-Sep	5.0	3.9	9	5258	9	4919	0.194	119.346	0.9953
37	16-Sep	2.0	4.7	7	5265	7	4926	0.150	119.496	0.9965
38	17-Sep	1.5	5.7	4	5269	4	4930	0.085	119.581	0.9972
38	18-Sep	3.5	2.5	2	5271	2	4932	0.085	119.665	0.9979
38	19-Sep	5.0	2.2		5271		4932	0.000	119.665	0.9979
38	20-Sep	5.0	2.1	0	5271	0	4932	0.000	119.665	0.9979
38	21-Sep	5.2	2.0	0	5271	0	4932	0.000	119.665	0.9979
38	22-Sep	5.0	2.2	0	5271	0	4932	0.000	119.665	0.9979
38	23-Sep	5.5	2.3	0	5271	0	4932	0.000	119.665	0.9979
39	24-Sep	4.5	4.0	0	5271	0	4932	0.000	119.665	0.9979
39	25-Sep	5.0	7.8	1	5272	0	4932	0.036	119.701	0.9982
39	26-Sep	4.5	7.2	0	5272	0	4932	0.000	119.701	0.9982
39	27-Sep	5.0	7.2	1	5273	0	4932	0.021	119.723	0.9984
39	28-Sep	4.7	8.3	1	5274	0	4932	0.021	119.744	0.9986
39	29-Sep	4.5	9.7	0	5274	0	4932	0.000	119.744	0.9986
39	30-Sep	4.5	8.0	1	5275	0	4932	0.021	119.765	0.9988
40	1-Oct		6.2	1	5276	0	4932	0.021	119.786	0.9989
40	2-Oct		4.7	4	5280	0	4932	0.085	119.871	0.9996
40	3-Oct		3.7	2	5282	0	4932	0.043	119.914	1.0000

Appendix B.2. Catches and CPUE of pink and chum salmon in the fish wheels at Canyon Island, 2006.

		PINK					CHUM				
Stat		Total Catches		CPUE			Total Catches		CPUE		
Week	Date	Daily	Cum.	Daily	Cum.	Cum. Prop	Daily	Cum.	Daily	Cum.	Cum. Prop
25	23-Jun	0	0	0.000	0.0000	0.0000	0	0	0.000	0.0000	0.0000
25	24-Jun	2	2	0.046	0.0463	0.0001	0	0	0.000	0.0000	0.0000
26	25-Jun	5	7	0.108	0.1539	0.0003	0	0	0.000	0.0000	0.0000
26	26-Jun	4	11	0.085	0.2387	0.0005	0	0	0.000	0.0000	0.0000
26	27-Jun	4	15	0.085	0.3239	0.0007	0	0	0.000	0.0000	0.0000
26	28-Jun	8	23	0.169	0.4929	0.0010	0	0	0.000	0.0000	0.0000
26	29-Jun	22	45	0.464	0.9569	0.0020	0	0	0.000	0.0000	0.0000
26	30-Jun	20	65	0.424	1.3809	0.0028	1	1	0.021	0.0212	0.0020
26	1-Jul	1	66	0.021	1.4019	0.0029	0	1	0.000	0.0212	0.0020
27	2-Jul	0	66	0.000	1.4019	0.0029	0	1	0.000	0.0212	0.0020
27	3-Jul	7	73	0.148	1.5496	0.0032	0	1	0.000	0.0212	0.0020
27	4-Jul	30	103	0.639	2.1889	0.0045	0	1	0.000	0.0212	0.0020
27	5-Jul	51	154	1.079	3.2683	0.0067	0	1	0.000	0.0212	0.0020
27	6-Jul	100	254	2.132	5.4001	0.0111	0	1	0.000	0.0212	0.0020
27	7-Jul	216	470	4.620	10.0204	0.0207	0	1	0.000	0.0212	0.0020
27	8-Jul	155	625	3.303	13.3239	0.0275	0	1	0.000	0.0212	0.0020
28	9-Jul	81	706	1.726	15.0502	0.0310	2	3	0.043	0.0638	0.0060
28	10-Jul	150	856	3.243	18.2935	0.0377	1	4	0.022	0.0854	0.0080
28	11-Jul	137	993	2.956	21.2499	0.0438	0	4	0.000	0.0854	0.0080
28	12-Jul	263	1256	5.706	26.9561	0.0556	0	4	0.000	0.0854	0.0080
28	13-Jul	577	1833	12.522	39.4778	0.0814	0	4	0.000	0.0854	0.0080
28	14-Jul	373	2206	8.035	47.5131	0.0979	0	4	0.000	0.0854	0.0080
28	15-Jul	434	2640	9.384	56.8969	0.1173	0	4	0.000	0.0854	0.0080
29	16-Jul	212	2852	4.550	61.4472	0.1267	0	4	0.000	0.0854	0.0080
29	17-Jul	330	3182	7.161	68.6087	0.1414	0	4	0.000	0.0854	0.0080
29	18-Jul	352	3534	7.570	76.1786	0.1570	0	4	0.000	0.0854	0.0080
29	19-Jul	760	4294	16.401	92.5791	0.1908	0	4	0.000	0.0854	0.0080
29	20-Jul	891	5185	19.370	111.9487	0.2307	0	4	0.000	0.0854	0.0080
29	21-Jul	1610	6795	35.000	146.9487	0.3029	0	4	0.000	0.0854	0.0080
29	22-Jul	165	6960	3.498	150.4467	0.3101	0	4	0.000	0.0854	0.0080
30	23-Jul	295	7255	6.484	156.9302	0.3235	0	4	0.000	0.0854	0.0080
30	24-Jul	560	7815	12.354	169.2840	0.3489	0	4	0.000	0.0854	0.0080
30	25-Jul	772	8587	17.061	186.3448	0.3841	0	4	0.000	0.0854	0.0080
30	26-Jul	1083	9670	23.976	210.3209	0.4335	0	4	0.000	0.0854	0.0080
30	27-Jul	1045	10715	23.181	233.5019	0.4813	1	5	0.022	0.1076	0.0101
30	28-Jul	3535	14250	81.564	315.0663	0.6494	0	5	0.000	0.1076	0.0101
30	29-Jul	1202	15452	26.963	342.0290	0.7050	0	5	0.000	0.1076	0.0101
31	30-Jul	1061	16513	24.391	366.4198	0.7552	0	5	0.000	0.1076	0.0101
31	31-Jul	953	17466	22.163	388.5826	0.8009	1	6	0.023	0.1309	0.0122
31	1-Aug	988	18454	22.934	411.5167	0.8482	0	6	0.000	0.1309	0.0122
31	2-Aug	892	19346	21.152	432.6692	0.8918	0	6	0.000	0.1309	0.0122
31	3-Aug	737	20083	16.349	449.0179	0.9255	0	6	0.000	0.1309	0.0122
31	4-Aug	477	20560	10.278	459.2959	0.9467	0	6	0.000	0.1309	0.0122
31	5-Aug	158	20718	3.498	462.7938	0.9539	1	7	0.022	0.1530	0.0143
32	6-Aug	107	20825	2.318	465.1113	0.9587	0	7	0.000	0.1530	0.0143
32	7-Aug	108	20933	2.344	467.4550	0.9635	1	8	0.022	0.1747	0.0163

Appendix B.2 (Cont'd). Catches and CPUE of pink and chum salmon in the fish wheels at Canyon Island, 2006.

		PINK					CHUM				
Stat		Total Catches		CPUE			Total Catches		CPUE		
Week	Date	Daily	Cum.	Daily	Cum.	Cum. Prop	Daily	Cum.	Daily	Cum.	Cum. Prop
32	8-Aug	175	21108	3.874	471.3293	0.9715	0	8	0.000	0.1747	0.0163
32	9-Aug	141	21249	3.164	474.4928	0.9780	1	9	0.022	0.1972	0.0184
32	10-Aug	59	21308	1.460	475.9525	0.9810	1	10	0.025	0.2219	0.0207
32	11-Aug	11	21319	0.234	476.1862	0.9815	0	10	0.000	0.2219	0.0207
32	12-Aug	10	21329	0.234	476.4201	0.9820	1	11	0.023	0.2453	0.0229
33	13-Aug	98	21427	2.140	478.5603	0.9864	4	15	0.087	0.3326	0.0311
33	14-Aug	59	21486	1.292	479.8522	0.9890	3	18	0.066	0.3983	0.0372
33	15-Aug	79	21565	1.736	481.5884	0.9926	4	22	0.088	0.4863	0.0455
33	16-Aug	33	21598	0.720	482.3085	0.9941	3	25	0.065	0.5517	0.0516
33	17-Aug	29	21627	0.626	482.9344	0.9954	8	33	0.173	0.7244	0.0677
33	18-Aug	13	21640	0.280	483.2143	0.9960	1	34	0.022	0.7459	0.0697
33	19-Aug	6	21646	0.128	483.3424	0.9962	6	40	0.128	0.8740	0.0817
34	20-Aug	22	21668	0.482	483.8242	0.9972	13	53	0.285	1.1587	0.1083
34	21-Aug	16	21684	0.360	484.1845	0.9980	12	65	0.270	1.4290	0.1336
34	22-Aug	4	21688	0.109	484.2934	0.9982	9	74	0.245	1.6739	0.1565
34	23-Aug	1	21689	0.043	484.3365	0.9983	3	77	0.130	1.8034	0.1686
34	24-Aug	8	21697	0.172	484.5089	0.9986	10	87	0.215	2.0188	0.1887
34	25-Aug	7	21704	0.152	484.6610	0.9990	19	106	0.413	2.4319	0.2273
34	26-Aug	4	21708	0.086	484.7468	0.9991	4	110	0.086	2.5176	0.2353
35	27-Aug	3	21711	0.066	484.8128	0.9993	6	116	0.132	2.6497	0.2477
35	28-Aug	1	21712	0.022	484.8353	0.9993	29	145	0.651	3.3002	0.3085
35	29-Aug	4	21716	0.086	484.9217	0.9995	10	155	0.216	3.5164	0.3287
35	30-Aug	5	21721	0.108	485.0300	0.9997	3	158	0.065	3.5814	0.3348
35	31-Aug	0	21721	0.000	485.0300	0.9997	12	170	0.284	3.8654	0.3613
35	1-Sep	0	21721	0.000	485.0300	0.9997	0	170	0.000	3.8654	0.3613
35	2-Sep		21721	0.000	485.0300	0.9997		170	0.000	3.8654	0.3613
36	3-Sep	0	21721	0.000	485.0300	0.9997	0	170	0.000	3.8654	0.3613
36	4-Sep	1	21722	0.047	485.0767	0.9998	4	174	0.187	4.0522	0.3788
36	5-Sep	0	21722	0.000	485.0767	0.9998	13	187	0.474	4.5263	0.4231
36	6-Sep	2	21724	0.046	485.1224	0.9999	36	223	0.821	5.3476	0.4999
36	7-Sep	0	21724	0.000	485.1224	0.9999	36	259	0.778	6.1260	0.5726
36	8-Sep	0	21724	0.000	485.1224	0.9999	17	276	0.390	6.5164	0.6091
36	9-Sep	0	21724	0.000	485.1224	0.9999	7	283	0.152	6.6684	0.6233
37	10-Sep	0	21724	0.000	485.1224	0.9999	14	297	0.303	6.9714	0.6517
37	11-Sep	0	21724	0.000	485.1224	0.9999	23	320	0.496	7.4678	0.6981
37	12-Sep	0	21724	0.000	485.1224	0.9999	19	339	0.427	7.8948	0.7380
37	13-Sep	0	21724	0.000	485.1224	0.9999	17	356	0.368	8.2628	0.7724
37	14-Sep	1	21725	0.022	485.1439	1.0000	16	372	0.345	8.6075	0.8046
37	15-Sep	0	21725	0.000	485.1439	1.0000	21	393	0.452	9.0599	0.8469
37	16-Sep	1	21726	0.021	485.1653	1.0000	18	411	0.385	9.4449	0.8829
38	17-Sep	0	21726	0.000	485.1653	1.0000	13	424	0.277	9.7215	0.9088
38	18-Sep	0	21726	0.000	485.1653	1.0000	5	429	0.211	9.9328	0.9285
38	19-Sep		21726	0.000	485.1653	1.0000		429	0.000	9.9328	0.9285
38	20-Sep	0	21726	0.000	485.1653	1.0000	0	429	0.000	9.9328	0.9285
38	21-Sep	0	21726	0.000	485.1653	1.0000	1	430	0.000	9.9328	0.9285
38	22-Sep	0	21726	0.000	485.1653	1.0000	0	430	0.000	9.9328	0.9285
38	23-Sep	0	21726	0.000	485.1653	1.0000	0	430	0.000	9.9328	0.9285
39	24-Sep	0	21726	0.000	485.1653	1.0000	0	430	0.000	9.9328	0.9285
39	25-Sep	0	21726	0.000	485.1653	1.0000	0	430	0.000	9.9328	0.9285
39	26-Sep	0	21726	0.000	485.1653	1.0000	1	431	0.021	9.9538	0.9305
39	27-Sep	0	21726	0.000	485.1653	1.0000	4	435	0.085	10.0391	0.9384
39	28-Sep	0	21726	0.000	485.1653	1.0000	1	436	0.021	10.0602	0.9404
39	29-Sep	0	21726	0.000	485.1653	1.0000	4	440	0.084	10.1447	0.9483
39	30-Sep	0	21726	0.000	485.1653	1.0000	5	445	0.106	10.2505	0.9582
40	1-Oct	0	21726	0.000	485.1653	1.0000	2	447	0.042	10.2927	0.9621
40	2-Oct	0	21726	0.000	485.1653	1.0000	12	459	0.256	10.5487	0.9861
40	3-Oct	0	21726	0.000	485.1653	1.0000	7	466	0.149	10.6977	1.0000

Appendix B.3 Catches of dolly varden and steelhead in the fish wheels at Canyon Island, 2006.

Stat		Total Catches		Total Catches		Stat		Total Catches		Total Catches		Stat		Total Catches		Total Catches	
Week	Date	Daily	Cum.	Daily	Cum.	Week	Date	Daily	Cum.	Daily	Cum.	Week	Date	Daily	Cum.	Daily	Cum.
17	23-Apr					25	22-Jun	2	48	1	3	34	21-Aug	1	259	0	11
17	24-Apr					25	23-Jun	1	49	1	4	34	22-Aug	10	269	1	12
17	25-Apr					25	24-Jun	2	51	1	5	34	23-Aug	3	272	0	12
17	26-Apr					26	25-Jun	2	53	1	6	34	24-Aug	3	275	0	12
17	27-Apr	0	0	0	0	26	26-Jun	3	56	1	7	34	25-Aug	2	277	0	12
17	28-Apr	0	0	0	0	26	27-Jun	2	58	0	7	34	26-Aug	0	277	0	12
17	29-Apr	1	1	0	0	26	28-Jun	1	59	1	8	35	27-Aug	0	277	0	12
18	30-Apr	1	2	0	0	26	29-Jun	0	59	1	9	35	28-Aug	3	280	1	13
18	1-May	2	4	0	0	26	30-Jun	2	61	0	9	35	29-Aug	3	283	2	15
18	2-May	1	5	0	0	26	1-Jul	2	63	0	9	35	30-Aug	4	287	0	15
18	3-May	0	5	0	0	27	2-Jul	1	64	0	9	35	31-Aug	1	288	1	16
18	4-May	0	5	0	0	27	3-Jul	4	68	0	9	35	1-Sep	0	288	0	16
18	5-May	2	7	0	0	27	4-Jul	2	70	0	9	35	2-Sep		288		16
18	6-May	1	8	1	1	27	5-Jul	1	71	0	9	36	3-Sep	0	288	0	16
19	7-May	0	8	0	1	27	6-Jul	4	75	0	9	36	4-Sep	4	292	2	18
19	8-May	3	11	0	1	27	7-Jul	2	77	0	9	36	5-Sep	2	294	0	18
19	9-May	1	12	0	1	27	8-Jul	2	79	0	9	36	6-Sep	5	299	1	19
19	10-May	7	19	0	1	28	9-Jul	3	82	0	9	36	7-Sep	3	302	0	19
19	11-May	0	19	0	1	28	10-Jul	2	84	0	9	36	8-Sep	3	305	0	19
19	12-May	7	26	0	1	28	11-Jul	10	94	1	10	36	9-Sep	3	308	0	19
19	13-May	5	31	0	1	28	12-Jul	7	101	0	10	37	10-Sep	3	311	0	19
20	14-May		31		1	28	13-Jul	6	107	0	10	37	11-Sep	6	317	1	20
20	15-May	5	36	0	1	28	14-Jul	0	107	0	10	37	12-Sep	4	321	0	20
20	16-May		36		1	28	15-Jul	4	111	0	10	37	13-Sep	6	327	1	21
20	17-May	1	37	0	1	29	16-Jul	6	117	0	10	37	14-Sep	3	330	1	22
20	18-May	1	38	0	1	29	17-Jul	13	130	0	10	37	15-Sep	3	333	1	23
20	19-May	0	38	0	1	29	18-Jul	11	141	0	10	37	16-Sep	3	336	0	23
20	20-May	0	38	0	1	29	19-Jul	11	152	0	10	38	17-Sep	0	336	0	23
21	21-May	1	39	0	1	29	20-Jul	15	167	0	10	38	18-Sep	0	336	1	24
21	22-May	3	42	0	1	29	21-Jul	7	174	0	10	38	19-Sep		336		24
21	23-May	0	42	0	1	29	22-Jul	0	174	0	10	38	20-Sep	0	336	4	28
21	24-May	0	42	0	1	30	23-Jul	1	175	0	10	38	21-Sep	0	336	1	29
21	25-May	0	42	0	1	30	24-Jul	2	177	0	10	38	22-Sep	0	336	1	30
21	26-May	1	43	0	1	30	25-Jul	0	177	0	10	38	23-Sep	0	336	7	37
21	27-May	0	43	0	1	30	26-Jul	0	177	0	10	39	24-Sep	0	336	1	38
22	28-May	0	43	0	1	30	27-Jul	1	178	0	10	39	25-Sep	1	337	0	38
22	29-May	0	43	0	1	30	28-Jul	2	180	0	10	39	26-Sep	0	337	0	38
22	30-May	0	43	0	1	30	29-Jul	9	189	0	10	39	27-Sep	0	337	1	39
22	31-May	0	43	0	1	31	30-Jul	2	191	0	10	39	28-Sep	1	338	0	39
22	1-Jun	0	43	0	1	31	31-Jul	4	195	0	10	39	29-Sep	0	338	0	39
22	2-Jun	0	43	0	1	31	1-Aug	4	199	0	10	39	30-Sep	0	338	0	39
22	3-Jun	1	44	0	1	31	2-Aug	2	201	0	10	40	1-Oct	0	338	0	39
23	4-Jun		44		1	31	3-Aug	2	203	0	10	40	2-Oct	3	341	1	40
23	5-Jun	0	44	0	1	31	4-Aug	3	206	0	10	40	3-Oct	0	341	7	47
23	6-Jun	0	44	0	1	31	5-Aug	3	209	0	10						
23	7-Jun	0	44	0	1	32	6-Aug	2	211	0	10						
23	8-Jun	0	44	0	1	32	7-Aug	6	217	0	10						
23	9-Jun	1	45	0	1	32	8-Aug	3	220	0	10						
23	10-Jun	1	46	0	1	32	9-Aug	6	226	0	10						
24	11-Jun	0	46	0	1	32	10-Aug	1	227	0	10						
24	12-Jun	0	46	0	1	32	11-Aug	0	227	0	10						
24	13-Jun	0	46	1	2	32	12-Aug	0	227	0	10						
24	14-Jun	0	46	0	2	33	13-Aug	0	227	0	10						
24	15-Jun	0	46	0	2	33	14-Aug	4	231	0	10						
24	16-Jun	0	46	0	2	33	15-Aug	9	240	0	10						
24	17-Jun	0	46	0	2	33	16-Aug	5	245	0	10						
25	18-Jun	0	46	0	2	33	17-Aug	6	251	0	10						
25	19-Jun	0	46	0	2	33	18-Aug	1	252	1	11						
25	20-Jun	0	46	0	2	33	19-Aug	2	254	0	11						
25	21-Jun	0	46	0	2	34	20-Aug	4	258	0	11						

Appendix C.1. Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

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

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class										
	2004	2003	2003	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 26 (June 25 - July 1)											
Male											
Sample Size		6	1	2	24		24				57
Percent		4.4	0.7	1.5	17.6		17.6				41.9
Std. Error		1.8	0.7	1.0	3.3		3.3				4.2
Female											
Sample Size		1		2	40		34			2	79
Percent		0.7		1.5	29.4		25.0			1.5	58.1
Std. Error		0.7		1.0	3.9		3.7			1.0	4.2
All Fish											
Sample Size		7	1	4	64		58			2	136
Percent		5.1	0.7	2.9	47.1		42.6			1.5	100.0
Std. Error		1.9	0.7	1.5	4.3		4.3			1.0	
Statistical Week 27 (July 2 - 8)											
Male											
Sample Size		14			45		15	2		0	76
Percent		10.7			34.4		11.5	1.5			58.0
Std. Error		2.7			4.2		2.8	1.1			4.3
Female											
Sample Size					21		32	2			55
Percent					16.0		24.4	1.5			42.0
Std. Error					3.2		3.8	1.1			4.3
All Fish											
Sample Size		14			66		47	4			131
Percent		10.7			50.4		35.9	3.1			100.0
Std. Error		2.7			4.4		4.2	1.5			

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class										
	2004	2003	2003	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 28 (July 9 - 15)											
Male											
Sample Size		17	3		63		20	5		2	110
Percent		8.3	1.5		30.7		9.8	2.4		1.0	53.7
Std. Error		1.9	0.8		3.2		2.1	1.1		0.7	3.5
Female											
Sample Size		1		1	31		55	3	1	3	95
Percent		0.5		0.5	15.1		26.8	1.5	0.5	1.5	46.3
Std. Error		0.5		0.5	2.5		3.1	0.8	0.5	0.8	3.5
All Fish											
Sample Size		18	3	1	94		75	8	1	5	205
Percent		8.8	1.5	0.5	45.9		36.6	3.9	0.5	2.4	100.0
Std. Error		2.0	0.8	0.5	3.5		3.4	1.4	0.5	1.1	
Statistical Week 29 (July 16 - 22)											
Male											
Sample Size		14	2		42		24	2		1	85
Percent		8.4	1.2		25.1		14.4	1.2		0.6	50.9
Std. Error		2.2	0.8		3.4		2.7	0.8		0.6	3.9
Female											
Sample Size		1		3	17		55	3		3	82
Percent		0.6		1.8	10.2		32.9	1.8		1.8	49.1
Std. Error		0.6		1.0	2.3		3.6	1.0		1.0	3.9
All Fish											
Sample Size		15	2	3	59		79	5		4	167
Percent		9.0	1.2	1.8	35.3		47.3	3.0		2.4	100.0
Std. Error		2.2	0.8	1.0	3.7		3.9	1.3		1.2	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class										
	2004	2003	2003	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 30 (July 23 - 29)											
Male											
Sample Size		20	2	3	21		41	3		2	92
Percent		11.6	1.2	1.7	12.1		23.7	1.7		1.2	53.2
Std. Error		2.4	0.8	1.0	2.5		3.2	1.0		0.8	3.8
Female											
Sample Size		1		4	9		62	2		3	81
Percent		0.6		2.3	5.2		35.8	1.2		1.7	46.8
Std. Error		0.6		1.1	1.7		3.7	0.8		1.0	3.8
All Fish											
Sample Size		21	2	7	30		103	5		5	173
Percent		12.1	1.2	4.0	17.3		59.5	2.9		2.9	100.0
Std. Error		2.5	0.8	1.5	2.9		3.7	1.3		1.3	
Statistical Week 31 (July 30 - August 5)											
Male											
Sample Size	1	22	3	2	26		34	4		1	93
Percent	0.5	11.6	1.6	1.1	13.7		17.9	2.1		0.5	48.9
Std. Error	0.5	2.3	0.9	0.7	2.5		2.8	1.0		0.5	3.6
Female											
Sample Size		1		18	11		58	5	1	3	97
Percent		0.5		9.5	5.8		30.5	2.6	0.5	1.6	51.1
Std. Error		0.5		2.1	1.7		3.3	1.2	0.5	0.9	3.6
All Fish											
Sample Size	1	23	3	20	37		92	9	1	4	190
Percent	0.5	12.1	1.6	10.5	19.5		48.4	4.7	0.5	2.1	100.0
Std. Error	0.5	2.4	0.9	2.2	2.9		3.6	1.5	0.5	1.0	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class										
	2004	2003	2003	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 32 (August 6 - August 12)											
Male											
Sample Size	1	19	2	8	14		26	3			73
Percent	0.6	10.6	1.1	4.5	7.8		14.5	1.7			40.8
Std. Error	0.6	2.3	0.8	1.5	2.0		2.6	1.0			3.7
Female											
Sample Size		1		14	13		61	10		7	106
Percent		0.6		7.8	7.3		34.1	5.6		3.9	59.2
Std. Error		0.6		2.0	1.9		3.6	1.7		1.5	3.7
All Fish											
Sample Size	1	20	2	22	27		87	13		7	179
Percent	0.6	11.2	1.1	12.3	15.1		48.6	7.3		3.9	100.0
Std. Error	0.6	2.4	0.8	2.5	2.7		3.7	1.9		1.5	
Statistical Week 33 (August 13 - 19)											
Male											
Sample Size	2	20	7		15		20	8		2	74
Percent	1.1	11.1	3.9		8.3		11.1	4.4		1.1	41.1
Std. Error	0.8	2.3	1.4		2.1		2.3	1.5		0.8	3.7
Female											
Sample Size		3		12	23		50	15	1	2	106
Percent		1.7		6.7	12.8		27.8	8.3	0.6	1.1	58.9
Std. Error		1.0		1.9	2.5		3.3	2.1	0.6	0.8	3.7
All Fish											
Sample Size	2	23	7	12	38		70	23	1	4	180
Percent	1.1	12.8	3.9	6.7	21.1		38.9	12.8	0.6	2.2	100.0
Std. Error	0.8	2.5	1.4	1.9	3.1		3.6	2.5	0.6	1.1	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class										
	2004	2003	2003	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 34 (August 20 - 26)											
Male											
Sample Size		3	2	1	11		24	6	1	1	49
Percent		1.9	1.3	0.6	7.1		15.6	3.9	0.6	0.6	31.8
Std. Error		1.1	0.9	0.6	2.1		2.9	1.6	0.6	0.6	3.8
Female											
Sample Size				14	12		70	6		3	105
Percent				9.1	7.8		45.5	3.9		1.9	68.2
Std. Error				2.3	2.2		4.0	1.6		1.1	3.8
All Fish											
Sample Size		3	2	15	23		94	12	1	4	154
Percent		1.9	1.3	9.7	14.9		61.0	7.8	0.6	2.6	100.0
Std. Error		1.1	0.9	2.4	2.9		3.9	2.2	0.6	1.3	
Statistical Week 35 (August 27 - September 2)											
Male											
Sample Size		3	1	1	6		21	2		1	35
Percent		2.6	0.9	0.9	5.3		18.4	1.8		0.9	30.7
Std. Error		1.5	0.9	0.9	2.1		3.6	1.2		0.9	4.3
Female											
Sample Size		1		6	10		42	17	1	2	79
Percent		0.9		5.3	8.8		36.8	14.9	0.9	1.8	69.3
Std. Error		0.9		2.1	2.7		4.5	3.4	0.9	1.2	4.3
All Fish											
Sample Size		4	1	7	16		63	19	1	3	114
Percent		3.5	0.9	6.1	14.0		55.3	16.7	0.9	2.6	100.0
Std. Error		1.7	0.9	2.3	3.3		4.7	3.5	0.9	1.5	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class										
	2004	2003	2003	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 36 (September 3 - 9)											
Male											
Sample Size			1		7		14	11		1	34
Percent			1.0		6.9		13.7	10.8		1.0	33.3
Std. Error			1.0		2.5		3.4	3.1		1.0	4.7
Female											
Sample Size				5	17		35	11			68
Percent				4.9	16.7		34.3	10.8			66.7
Std. Error				2.1	3.7		4.7	3.1			4.7
All Fish											
Sample Size			1	5	24		49	22		1	102
Percent			1.0	4.9	23.5		48.0	21.6		1.0	100.0
Std. Error			1.0	2.1	4.2		5.0	4.1		1.0	
Statistical Week 37 (September 10 - 16)											
Male											
Sample Size			2	2	5		12	5	1	3	30
Percent			2.3	2.3	5.8		14.0	5.8	1.2	3.5	34.9
Std. Error			1.6	1.6	2.5		3.8	2.5	1.2	2.0	5.2
Female											
Sample Size				3	9		30	13	1		56
Percent				3.5	10.5		34.9	15.1	1.2		65.1
Std. Error				2.0	3.3		5.2	3.9	1.2		5.2
All Fish											
Sample Size			2	5	14		42	18	2	3	86
Percent			2.3	5.8	16.3		48.8	20.9	2.3	3.5	100.0
Std. Error			1.6	2.5	4.0		5.4	4.4	1.6	2.0	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class										
	2004	2003	2003	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 38 (September 17 - 23)											
Male											
Sample Size											0
Percent											0.0
Std. Error											
Female											
Sample Size							1	1			2
Percent							50.0	50.0			100.0
Std. Error							50.0	50.0			0.0
All Fish											
Sample Size							1	1			2
Percent							50.0	50.0			100.0
Std. Error							50.0	50.0			

	Brood Year and Age Class										
	2004	2003	2003	2002	2002	2001	2001	2001	2000	2000	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Combined Periods (June 4 - October 7)											
Male											
Sample Size	4.0	141.0	26.0	20.0	289.0		290.0	52.0		14.0	836
Percent	0.2	7.6	1.4	1.1	15.5		15.6	2.8		0.8	44.9
Std. Error	0.1	0.6	0.3	0.2	0.8		0.8	0.4		0.2	1.2
Female											
Sample Size		10.0		82.0	218.0	0.0	593.0	88.0	5.0	29.0	1025
Percent		0.5		4.4	11.7	0.0	31.9	4.7	0.3	1.6	55.1
Std. Error		0.2		0.5	0.7	0.0	1.1	0.5	0.1	0.3	1.2
All Fish											
Sample Size	4	151	26	102	507		883	140	5	43	1861
Percent	0.2	8.1	1.4	5.5	27.2		47.4	7.5	0.3	2.3	100.0
Std. Error	0.1	0.6	0.3	0.5	1.0		1.2	0.6	0.1	0.3	

Appendix C.2. Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class			
	2003	2002	2001	
	0.2	0.3	0.4	Total
Statistical Weeks 26 - 28 (June 25 - 15)				
Male				
Sample Size		1	2	3
Percent		25.0	50.0	75.0
Std. Error		25.0	28.9	25.0
Female				
Sample Size			1	1
Percent			2.0	2.0
Std. Error			8.1	8.1
All Fish				
Sample Size		1	3	4
Percent		25.0	75.0	100.0
Std. Error		25.0	25.0	
Statistical Week 29 (July 16 - 22)				
Male				
Sample Size				0
Percent				0.0
Std. Error				
Female				
Sample Size				0
Percent				0.0
Std. Error				
All Fish				
Sample Size				0
Percent				0.0
Std. Error				

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class			
	2003	2002	2001	
	0.2	0.3	0.4	Total
Statistical Week 30 (July 23 - 29)				
Male				
Sample Size				0
Percent				0.0
Std. Error				
Female				
Sample Size				0
Percent				0.0
Std. Error				
All Fish				
Sample Size				0
Percent				0.0
Std. Error				
Statistical Week 31 (July 30 - August 5)				
Male				
Sample Size				
Percent				
Std. Error				
Female				
Sample Size		1		1
Percent		100.0		100.0
Std. Error		0.0		0.0
All Fish				
Sample Size		1		1
Percent		100.0		100.0
Std. Error		0.0		

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class			
	2003	2002	2001	
	0.2	0.3	0.4	Total
Statistical Week 32 (August 6 - August 12)				
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	25.0		25.0	
All Fish				
Sample Size	3	1	4	
Percent	75.0	25.0	100.0	
Std. Error	25.0	25.0		
Statistical Week 33 (August 13 - 19)				
Male				
Sample Size	5	7	12	
Percent	21.7	30.4	52.2	
Std. Error	8.8	9.8	10.6	
Female				
Sample Size	8	3	11	
Percent	34.8	13.0	47.8	
Std. Error	10.2	7.2	10.6	
All Fish				
Sample Size	13	10	23	
Percent	56.5	43.5	100.0	
Std. Error	10.6	10.6		

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class			
	2003	2002	2001	
	0.2	0.3	0.4	Total
Statistical Week 34 (August 20 - 26)				
Male				
Sample Size		17	13	30
Percent		30.9	23.6	54.5
Std. Error		6.3	5.8	6.8
Female				
Sample Size		15	10	25
Percent		27.3	18.2	45.5
Std. Error		6.1	5.2	6.8
All Fish				
Sample Size		32	23	55
Percent		58.2	41.8	100.0
Std. Error		6.7	6.7	
Statistical Week 35 (August 27 - September 2)				
Male				
Sample Size		14	8	22
Percent		26.4	15.1	41.5
Std. Error		6.1	5.0	6.8
Female				
Sample Size		18	13	31
Percent		34.0	24.5	58.5
Std. Error		6.6	6.0	6.8
All Fish				
Sample Size		32	21	53
Percent		60.4	39.6	100.0
Std. Error		6.8	6.8	

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class			
	2003	2002	2001	
	0.2	0.3	0.4	Total
Statistical Week 36 (September 3 - 9)				
Male				
Sample Size		35	14	49
Percent		36.5	14.6	51.0
Std. Error		4.9	3.6	5.1
Female				
Sample Size		35	12	47
Percent		36.5	12.5	49.0
Std. Error		4.9	3.4	5.1
All Fish				
Sample Size		70	26	96
Percent		72.9	27.1	100.0
Std. Error		4.6	4.6	
Statistical Week 37 (September 10 - 16)				
Male				
Sample Size		28	11	39
Percent		24.6	9.6	34.2
Std. Error		4.0	2.8	4.5
Female				
Sample Size		55	20	75
Percent		48.2	17.5	65.8
Std. Error		4.7	3.6	4.5
All Fish				
Sample Size		83	31	114
Percent		72.8	27.2	100.0
Std. Error		4.2	4.2	

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2006.

	Brood Year and Age Class			
	2003	2002	2001	
	0.2	0.3	0.4	Total
Statistical Week 38 (September 17 - 23)				
Male				
Sample Size		1	2	3
Percent		6.7	13.3	20.0
Std. Error			9.1	10.7
Female				
Sample Size		9	3	12
Percent		60.0	20.0	80.0
Std. Error		13.1	10.7	10.7
All Fish				
Sample Size		10	5	15
Percent		66.7	33.3	100.0
Std. Error		12.6	12.6	
Statistical Week 39 (September 24 - 30)				
Male				
Sample Size		6		6
Percent		35.3		35.3
Std. Error				11.9
Female				
Sample Size	1	8	2	11
Percent	5.9	47.1	11.8	64.7
Std. Error	5.9	12.5	8.1	11.9
All Fish				
Sample Size	1	14	2	17
Percent	5.9	82.4	11.8	100.0
Std. Error	5.9	9.5	8.1	

	Brood Year and Age Class			
	2003	2002	2001	
	0.2	0.3	0.4	Total
Combined Periods (July 3 - October 1)				
Male				
Sample Size		109	58	167
Percent		28.5	15.2	43.7
Std. Error		2.3	1.8	2.5
Female				
Sample Size	1	150	64	215
Percent	0.3	39.3	16.8	56.3
Std. Error	0.3	2.5	1.9	2.5
All Fish				
Sample Size	1	259	122	382
Percent	0.3	67.8	31.9	100.0
Std. Error	0.3	2.4	2.4	

Appendix D. Results of secondary marking study to test for short term tag loss for sockeye captured at the Canyon Island fish wheels, 2006.

Stat. Week	Canadian Catch	Tags Recovered	Fishery Ratio	Examined for 2nd	Number of 2nd Marks	Sample ratio	Fishery Ratio - Sampled Ratio
24	25						
25	127	2	0.016				
26	811	2	0.002	189	1	0.005	-0.003
27	930	36	0.039	200	6	0.030	0.009
28	1,109	32	0.029	200	6	0.030	-0.001
29	1,757	42	0.024	200	3	0.015	0.009
30	1,919	45	0.023	200	1	0.005	0.018
31	6,058	72	0.012	200	3	0.015	-0.003
32	2,223	174	0.078	200		0.000	0.078
33	2,825	99	0.035	200	1	0.005	0.030
34	2,569	103	0.040	200	3	0.015	0.025
35	746	81	0.109	200	1	0.005	0.104
36	122	10	0.082				
37	120	7	0.058	100	9	0.090	-0.032
38	20	9	0.450	47		0.000	0.450
Totals	21,209	714	0.034	2,136	34	0.016	0.018