Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2005

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James E. Andel

November 2007

Pacific Salmon Commission
Technical Report No. 22

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Transboundary Technical Committee Report No. 22

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Prepared for:
Pacific Salmon Commission
Transboundary Technical Committee

November 2007

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ABSTRACT

Mark-recapture studies of adult Taku River salmon *Oncorhynchus* stocks were conducted by the Department of Fisheries and Oceans Canada, the Alaska Department of Fish and Game, and the Taku River Tlingit First Nation in 2005. The objectives of the studies were to provide inseason estimates of the inriver abundance of sockeye *O. nerka* and to document biological characteristics (migratory timing, migratory rates and age, sex, and size composition) of Taku River sockeye stocks. Tagged-to-untagged ratios of salmon harvested in the Canadian inriver gillnet fisheries were used to develop the estimates of the inriver abundance of sockeye. A total of 3,946 sockeye salmon were captured in fish wheels located at Canyon Island, Alaska, of which 3,619 were tagged and 1,087 (30.0%) were subsequently recovered in fisheries or on the spawning grounds. The inriver run of sockeye salmon past Canyon Island from May 29 to September 17 was estimated to be 134,509 fish (95% confidence interval 117,156 to 151,862). An additional 332 are estimated to have migrated past Canyon Island after this time. Canadian commercial, aboriginal and test fisheries harvested 21,697, 161 and 244 sockeye, respectively, resulting in a spawning escapement estimate of 112,739 sockeye salmon. Based on mean date and standard deviation of migration timing the sockeye salmon run was similar but slightly less compressed than the 1984-2004 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 15,839 pink salmon, 257 chum salmon, and 78 steelhead salmon were 1.1% above average, 49.7% below average and 8.2% below average, respectively. The pink salmon run was five days earlier 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 2005 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 2005 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 associated with tag recovery data 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 operated from two to six days per week from May 1 to September 6 and then again from October 2 to October 7. Chinook salmon were targeted until mid-June; sockeye salmon from then until mid-August; and finally coho salmon for the remainder of the season. The test fishery took place from early September through early October and targeted coho salmon. Drift and set gillnets were the gear types used; mesh sizes ranged from 13 cm (5 ¼ inches) to 20.4 cm (8 inches) with the mesh size of 13 cm predominating during the sockeye season.

A cash reward of $5.00 (Canadian) was offered by DFO to commercial fishers for each sockeye tag returned with information on the date of recapture. Canadian catch statistics and tags were collected daily during fishery openings by DFO personnel stationed at Ericksen Slough, just upstream of the Tulsequah River. Catch statistics were communicated to the DFO office in Whitehorse via single side band radio or satellite telephone and then relayed to the ADF&G office in Juneau. ADF&G offered a $2.00 (U.S.) reward for each tag returned from the District 111 and the inriver personal use fisheries. In addition, it conducted a post-season lottery to award a $100.00 bonus to one of the U.S. fishers that returned tags.

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

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 2005 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 2005. 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:

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

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 5 through October 2. Fish wheel I, located furthest upriver, was installed on May 7; fish wheel II was installed on May 5. 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 2005 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 2005 was 3,946; an additional seven sockeye were captured in gillnets in September and October while targeting coho salmon for tagging. The total catch was 27.6% below the 1984 to 2004 average (Table 1; Appendix B.1). Fish wheel catches occurred from June 3 through October 1, and peaked during statistical week 29 (July 10 through July 16), when 897 sockeye salmon were captured. Prior to the first Canadian directed sockeye commercial fishery openings on June 19 (statistical week 26), 232 sockeye salmon (5.9% 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 2005 pink salmon catch in the fish wheels at Canyon Island was 15,839 (Table 1; Appendix B.2), 1.1% above the 1984 to 2004 average. Catches during odd years have been slightly greater than those during even years since 1998. This may signify a return towards odd-year dominance. Fish wheel catches from 1992 through 1998 were even year dominant averaging 25% more than odd year catches for this period. The peak daily catch of pink salmon in 2005 (1,539 fish) occurred on July 14. The 2005 fish wheel catch of chum salmon was 251; an additional six chum salmon were captured in gillnets. The total catch of 257 was 49.7% below the 1984 to 2004 average of 511. The peak daily catch of chum salmon (25 fish) occurred on September 10 (Appendix B.2). The fish wheel and gillnet catches of steelhead were 44 and 34 fish respectively. The total catch of 78 steelhead was 8.2% below the 1984 to 2004 average of 85.

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

Tagging and Recovery Data

Of the 3,946 sockeye salmon caught in the Taku fish wheels, 3,619 were tagged (91.7%). One of the seven sockeye salmon captured in gillnets was also tagged. 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 38 (1.1% of tags applied), leaving 3,581 available for recapture in Canadian fisheries. The Canadian commercial fishery recaptured 605 tagged sockeye and accounted for 97.9% of the total sockeye tags recovered or observed in upstream fisheries (Table 2). The remaining 2.1% (thirteen tags) were recovered in the Canadian test fishery. A total of 26,734 fish were also inspected for tags in terminal areas, namely Kuthai, King Salmon, Little Trapper, and Tatsamenie lakes, the Nahlin River and the mainstem Taku River (Table 2.); tags were observed on 617 of these fish.

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 May 5 to October 4, 2005.

A total of 618 tags with corresponding recovery date information were returned from 21,941 sockeye salmon examined in the Canadian fisheries (Table 3). Tagging data from statistical weeks 23 through 25 (May 29 through June 18) were pooled due to the limited number of tags out in this period, which marked the beginning of the run. Recovery data from statistical weeks 24 through 27 (June 5 through July 2), 31 through 34 (July 24 through August 20), as well as 37 through 38 (September 4 through September 17) were treated separately due to changes in tag recovery rates. Tagging and recovery data were grouped into 14 and eight strata, respectively (Table 4). Using a maximum likelihood Darroch estimator, we estimated that 134,509 sockeye salmon passed Canyon Island between May 29 and September 17. The approximate 95% confidence interval associated with this estimate is 117,156 to 151,863 fish. In order to account for a small number of sockeye salmon that were caught in the Canyon Island fish wheels after this time, the Darroch estimate was expanded by approximately 0.25%, using fish wheel CPUE, to give a total estimate of 134,841. This estimate is within 3% of the 1984 to 2004 average (130,972 sockeye salmon; Table 5; Figure 4; TTC *in prep*).

The Taku River sockeye salmon run above Canyon Island was exploited by the Canadian fisheries at an estimated rate of 16.0%, compared to a 1984-2004 average of 19.5% (range 11.6 to 31.2%; Table 5). After removal of 21,697, 161, and 244 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 112,739 fish (Table 4). This is 7.4% above the 1984-2004 average of 104,992 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 2004 averaged 4.1% (range 0.0 to 9.1%; Table 6). However, in 2005 the contribution of jacks was only 0.1%.

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 (July 20) of the sockeye salmon migration in 2005 did not differ from 1984-2004 average (Table 7). The standard deviation was slightly greater (20.5 days in 2005 versus an average of 18.8 days); meaning the run was less compressed than average. Migratory timing statistics (mean date July 15; standard deviation 7.7 days) showed the pink salmon run timing was five days earlier 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 2005 was reflective of the run, the mean date of migration was September 5 (standard deviation 16.4 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 2005 was determined using recoveries of tagged fish from enumeration weirs (Table 9; Figure 6). These were weirs on the outlet streams of Kuthai (84 tags), King Salmon (27 tags), Little Trapper (260 tags), and Tatsamenie (95 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 25 to 32 (June 12 to August 6). The peak of the Kuthai Lake migration took place during statistical week 25 (June 12 to June 18).

The next stock to migrate past Canyon Island was the King Salmon Lake stock. This occurred from statistical weeks 26 to 30 (June 19 to July 23), peaking during statistical week 29 (July 10 to July 16).

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 27 to 33 (June 26 to August 13).

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 29 to 37 (July 10 to

September 10). The peak week of migration for Tatsamenie Lake sockeye was statistical week 33 (August 7 to August 13).

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 36.7, 28.8, 26.8 and 32.4 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 45.9 days in transit, while those tagged in statistical week 32 averaged 25.0 days. King Salmon Lake fish tagged in statistical week 28 averaged 32.0 in transit while those tagged in statistical week 30 averaged 21.5 days. Little Trapper Lake fish tagged in statistical week 27 averaged 33.6 days in transit while those tagged in statistical week 33 averaged 22.6 days. For the Tatsamenie stock, fish tagged in statistical week 29 averaged 40.9 days in transit while fish tagged in statistical week 38 averaged 21.0 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 2005 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 (50.2%) with age-1.2 fish comprising 24.7%, age-2.2 2.7%, age-0.2 4.9%, age-2.3 2.1%, age-0.3 15.0%, and very small numbers of age-0.1, 1.1, 0.4, and 1.4 fish (Table 6). The lengths of age 1.2 and 1.3 sockeye salmon were slightly below the 1983 to 2004 averages (Table 10). Males comprised 51.4% of the fish wheel catch of sockeye salmon (Appendix C.1).

Fish wheel catches of chum salmon were primarily comprised of age-0.3 (54.0%) fish, which is comparable to the 1983-2004 average of 52.6% (Table 11). Age-0.4 fish constituted 44.9% of the fish wheel catch. Female chum salmon were more prevalent (64.1%) than males (Appendix C.2). The average lengths at age for chum salmon passing Canyon Island were 605, 646, and 665 mm (MEF) for age 0.2, 0.3, and 0.4 fish respectively; these were slightly above the 1983 to 2004 averages (Table 12).

DISCUSSION

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

With respect to assumption (a), tagging efforts at the Taku River fish wheels and recovery efforts at the Canadian commercial and test fisheries were conducted on a frequent basis through the season. Both of the fish wheels were strictly maintained and adjusted throughout the entire sockeye salmon run. The wheels operated 24-hours per day except during equipment breakdowns; however it is known that river conditions affect the fishing efficiencies of both wheels. Recovery efforts were conducted a minimum of twice per week throughout the season, but water conditions can also affect the efficiency of commercial and test fishery set and drift nets. We are able to work around these variations in gear efficiency by using the Darroch stratified estimator for generating abundance estimates; this allows the probabilities of capture in tagging and recovery strata to vary across time but not within these strata.
It was likely that assumption (b) was violated in recent years of the Taku sockeye mark–recapture program because there were significant differences in the cumulative distribution function of length between fish sampled at the fish wheels and at the recovery location (Figure 5). Smaller fish were more prevalent in fish wheel samples than among the recovery samples. Stratification of mark–recapture data by size would remove possible bias in population estimates caused by differences in capture probabilities due to fish size (Bernard and Hansen 1992). In past studies, summed abundance estimates obtained for large and small sockeye salmon were not significantly different than the pooled estimates (Andel and Boyce, 2004). Based on those results the mark-recapture data for 2005 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 24 through 38, over 2,366 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 (1.1% versus 2.8%), and in all but one of the fifteen weekly periods sampled (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 2005 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 and chum salmon 1984 to 2005[a].

Year	Dates of Operation	Sockeye	Pink	Chum	Steelhead	Dolly Varden
1984	6/15-9/18	2,334	20,751	316	NA	NA
1985	6/16-9/21	3,601	27,670	1,376	NA	NA
1986	6/14-8/25	5,808	7,256	80	14	2,716
1987	6/15-9/20	4,307	42,786	1,533	38	868
1988	5/12-9/19	3,292	3,982	1,089	37	701
1989	5/5-10/1	5,650	31,189	645	34	1,308
1990	5/3-9/23	6,091	13,358	748	33	1,433
1991	6/8-10/15	5,102	23,553	1,063	135	326
1992	6/20-9/24	6,279	9,252	189	22	241
1993	6/12-9/29	8,975	1,625	345	30	375
1994	6/10-9/21	6,485	27,100	367	107	584
1995	5/4-9/27	6,228	1,712	218	65	509
1996	5/3-9/20	5,919	21,583	388	65	681
1997	5/3-10/1	5,708	4,962	485	102	454
1998	5/2-9/15	4,230	23,347	179	120	323
1999	5/14-9/28	4,639	23,503	164	76	330
2000	5/14-10/3	5,865	6,529	423	159	244
2001	5/27-9/27	6,201	9,134	250	125	196
2002	5/19-9/14	5,812	5,672	205	90	419
2003	5/20-10/4	5,970	15,491	262	49	285
2004	5/12-10/4	6,255	8,464	414	313	63
2005	5/5-10/4	3,953	15,839	257	78	293
Average (84-04)		5,464	15,663	511	85	635

[a]Starting in 1998, totals may include small numbers of fish captured in supplemental gillnetting targeting chinook and/or coho salmon. In 2005, seven sockeye, six chum, and 34 steelhead were captured by this method.

Table 2. Summary of Canyon Island sockeye tag recoveries by location and species, 2005.

	Tags Recovered	Tags Observed Only	Total	Fish Inspected	Tag Ratio	Proportion Tags Observed
Commercial Fishery	605	0	605	21,697	0.028	0.475
Test Fishery	13	0	13	244	0.053	0.010
King Salmon Lake	27	0	27	1,002	0.027	0.021
Kuthai Lake	84	3	87	6,004	0.014	0.068
Little Trapper Lake	260	143	403	16,009	0.025	0.317
Tatsamenie Lake	95	2	97	3,372	0.029	0.076
Taku River mainstem	3	0	3	320	0.009	0.002
Nahlin River	0	0	0	27	0.000	0.000
Tatsatua Creek	0	0	0	-	-	0.000
U.S. downstream	38	0	38	-	-	0.030
Total	1,125	148	1,273			

Table 3. Tagging and recovery data from the 2005 Taku River sockeye salmon mark-recapture program. Data includes number of sockeye salmon tagged at Canyon Island and recovered above the border in the inriver Canadian commercial, test and gillnet catch & release fisheries by statistical week (downstream recoveries excluded).

Statistical Week of Tagging	Statistical Week of Recovery																	Total Tags Recovered	Total Tags Applied	Tag Ratio Recovered/ Applied
	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39			
23	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0.200
24	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	15	0.133
25	0	0	2	18	4	0	0	0	0	0	0	0	0	0	0	0	0	24	199	0.121
26	0	0	0	5	15	1	0	0	0	0	0	0	0	0	0	0	0	21	243	0.086
27	0	0	0	1	16	23	0	1	0	0	0	0	0	0	0	0	0	41	205	0.200
28	0	0	0	0	0	39	20	1	0	0	0	0	0	0	0	0	0	60	315	0.190
29	0	0	0	0	0	0	6	53	8	0	0	1	0	0	0	0	0	68	826	0.082
30	0	0	0	0	0	0	0	7	47	12	1	0	0	0	0	0	0	67	453	0.148
31	0	0	0	0	0	0	0	0	27	45	4	1	1	0	1	0	0	79	272	0.290
32	0	0	0	0	0	0	0	0	0	64	23	3	0	0	0	0	0	90	316	0.285
33	0	0	0	0	0	0	0	0	0	0	38	37	9	0	0	0	0	84	319	0.263
34	0	0	0	0	0	0	0	0	0	0	0	14	15	0	0	0	0	29	149	0.195
35	0	0	0	0	0	0	0	0	0	0	0	0	15	14	0	0	0	29	138	0.210
36	0	0	0	0	0	0	0	0	0	0	0	0	0	8	5	0	0	13	55	0.236
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3	0	7	37	0.189
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	30	0.100
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.000
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.000
Total	0	1	4	24	35	63	26	62	82	121	66	56	40	22	10	6	0	618	3,581	0.173
Sockeye Examined[a]:																		Total		
Test Fishery														69	103	64	8	244		
Can. Comm. Catch	1	37	222	1,012	1,886	1,019	1,641	1,809	3,193	4,355	2,668	2,100	1,279	457	18			21,697		
Aboriginal Fishery																				
Total	1	37	222	1,012	1,886	1,019	1,641	1,809	3,193	4,355	2,668	2,100	1,279	526	121	64	8	21,941		

[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, 2005.

Statistical Week of Tagging	Statistical Week of Recovery								Total Tags Recovered	Total Tags Applied	Tag Ratio
	24-27	28	29	30	31-34	35	36	37-38			
23-25	27								27	219	0.123
26	20	1							21	243	0.086
27	17	23		1					41	205	0.200
28		39	20	1					60	315	0.190
29			6	53	9				68	826	0.082
30				7	60				67	453	0.148
31					77	1		1	79	272	0.290
32					90				90	316	0.285
33					75	9			84	319	0.263
34					14	15			29	149	0.195
35						15	14		29	138	0.210
36							8	5	13	55	0.236
37								7	7	37	0.189
38								3	3	30	0.100
Total	64	63	26	62	325	40	22	16	618	3,577	0.173
Catch Examined for Tags	3,157	1,019	1,641	1,809	12,316	1,279	526	185	21,932		
Marked Fraction	0.021	0.066	0.016	0.035	0.027	0.032	0.044	0.095	0.029		
Above-Border Run	30,433	1,506	19,202	28,652	43,703	8,304	1,490	1,219	134,509		
Expansion based on Fish Wheel CPUE									332		
Expanded Above-Border Run									134,841		
Aboriginal Catch Not Examined for Tags									161		
95% Lower C.I.	22,144	-2,447	4,535	21,153	38,503	4,837	-213	576	117,156		
95% Upper C.I.	38,722	5,459	33,869	7,499	48,903	11,771	3,193	1,862	151,863		
Spawning Escapement	27,276	487	17,561	26,843	31,387	7,025	964	1,034	112,739		

Table 5. Historical sockeye salmon above border abundance, above border harvests, and escapement Taku River, 1984 to 2005.

Year	Border Escapement	Canadian Harvest	Harvest Rate	Spawning Escapement	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
Average (84-04)	130,972	25,743	0.20	104,992	228,507	98,482
Maximum (84-04)	200,918	47,988	0.31	167,691	399,277	207,008
Minimum (84-04)	91,548	12,967	0.12	70,715	118,452	25,811
SD (84-04)	29,887	9,222	0.05	24,109	69,904	46,729
CV (84-04)	22.8%	35.8%	24.9%	23.0%	30.6%	47.4%

Table 6. Historical age composition of sockeye salmon passing Canyon Island, Taku River, 1983 to 2005.

Year	Sample Size	Percent By Age Class 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
Average (83-04)	2,665	0.3	5.0	3.4	8.3	24.9	0.4	0.1	48.6	5.2	0.2	3.9	0.0	0.0	0.0
SD (83-04)		0.3	3.2	2.1	4.4	7.6	0.5	0.1	8.8	2.7	0.1	2.0	0.0	0.0	0.0
CV (83-04)		86.6	64.5	62.9	53.2	30.5	122.7	138.0	18.2	52.3	66.7	52.3	-	-	-

Table 7. Migratory timing statistics of sockeye, pink, and chum salmon past the Canyon Island fish wheels, 1984 to 2005. 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
Average (84-04)	7/20	18.8	7/20	8.2	9/1	13.3

Table 8. Weekly and cumulative proportions of four individual sockeye salmon stocks passing Canyon Island in 2005, 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	22-May	28-May								
23	29-May	4-Jun								
24	5-Jun	11-Jun								
25	12-Jun	18-Jun	0.232	0.232						
26	19-Jun	25-Jun	0.164	0.396	0.043	0.043	0.004	0.004		
27	26-Jun	2-Jul	0.139	0.534	0.138	0.180	0.056	0.059		
28	3-Jul	9-Jul	0.140	0.674	0.139	0.319	0.138	0.197		
29	10-Jul	16-Jul	0.173	0.847	0.591	0.909	0.446	0.643	0.071	0.071
30	17-Jul	23-Jul	0.075	0.921	0.091	1.000	0.170	0.813	0.137	0.208
31	24-Jul	30-Jul	0.045	0.967			0.081	0.895	0.099	0.307
32	31-Jul	6-Aug	0.033	1.000			0.078	0.973	0.147	0.454
33	7-Aug	13-Aug					0.027	1.000	0.205	0.659
34	14-Aug	20-Aug							0.128	0.787
35	21-Aug	27-Aug							0.120	0.907
36	28-Aug	3-Sep							0.068	0.975
37	4-Sep	10-Sep							0.025	1.000

Table 9. Inriver migration timing for four Taku River sockeye salmon stocks, 2005.

Stock	Week	Travel Time[a]	SD	SE	N	95% C.I.
Kuthai	25	45.9	8.6	1.9	21	3.66
	26	39.5	8.0	2.1	14	4.17
	27	34.1	9.0	2.7	11	5.32
	28	34.3	10.8	3.3	11	6.38
	29	32.1	8.3	2.1	16	4.05
	30	27.0	6.5	2.7	6	5.23
	31	25.0	7.8	4.5	3	8.84
	32	25.0			2	
	Average	36.7	10.6		84	
King Salmon	26	27.0			1	
	27	25.7	10.7	6.2	3	12.1
	28	32.0	2.6	1.2	5	2.3
	29	29.8	6.7	1.7	15	3.4
	30	21.5	4.9	3.5	2	6.86
	Average	28.8	6.8		24	
L. Trapper	26	48.0			1	
	27	33.6	3.7	1.0	14	1.94
	28	30.6	3.1	0.5	34	1.03
	29	26.5	3.7	0.3	131	0.63
	30	24.5	4.6	0.7	43	1.37
	31	24.6	7.5	1.9	16	3.65
	32	23.3	5.7	1.5	14	3.00
	33	22.6	2.4	0.9	7	1.76
	Average	26.8	5.1		260	
Tatsamenie	29	40.9	3.5	1.2	9	2.27
	30	36.1	4.0	1.0	15	2.04
	31	36.2	7.3	2.4	9	4.78
	32	32.7	4.3	1.2	12	2.44
	33	30.4	6.2	1.3	21	2.65
	34	30.1	7.1	2.4	9	4.64
	35	29.1	7.5	2.3	11	4.45
	36	27.0	5.2	2.3	5	4.60
	37	21.3	2.3	1.3	3	2.61
	38	21.0			1	
	Average	32.4	7.1		95	

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

Table 10. Historical length (MEF) at age composition of sockeye salmon passing Canyon Island, Taku River, 1983 to 2005.

	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			
Average (83-04)	2,645	317	448	326	574	480	334	597	576	503	595	579	610	515	555
SD (83-04)		13.7	11.6	8.5	9.1	13.9	14.4	20.4	9.9	14.3	17.8	10.9	49.2	35.4	
CV (83-04)		4.3%	2.6%	2.6%	1.6%	2.9%	4.3%	3.4%	1.7%	2.8%	3.0%	1.9%	8.1%		-

Table 11. Historical age composition of chum salmon passing Canyon Island, Taku River, 1983 to 2005.

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
Average (83-04)	353	1.2	52.6	45.3	2.3	0.0
SD (83-04)		1.8	21.1	21.2	2.8	0.1

Table 12. Historical length (MEF) at age composition of chum salmon passing Canyon Island, Taku River, 1983 to 2005.

Year	Sample Size	Length at Age Class 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		
Average (83-04)	367	597	633	663	674	640
SD (83-04)		41.8	15.4	12.0	24.8	56.6
CV (83-04)		7.0%	2.4%	1.8%	3.7%	8.8%

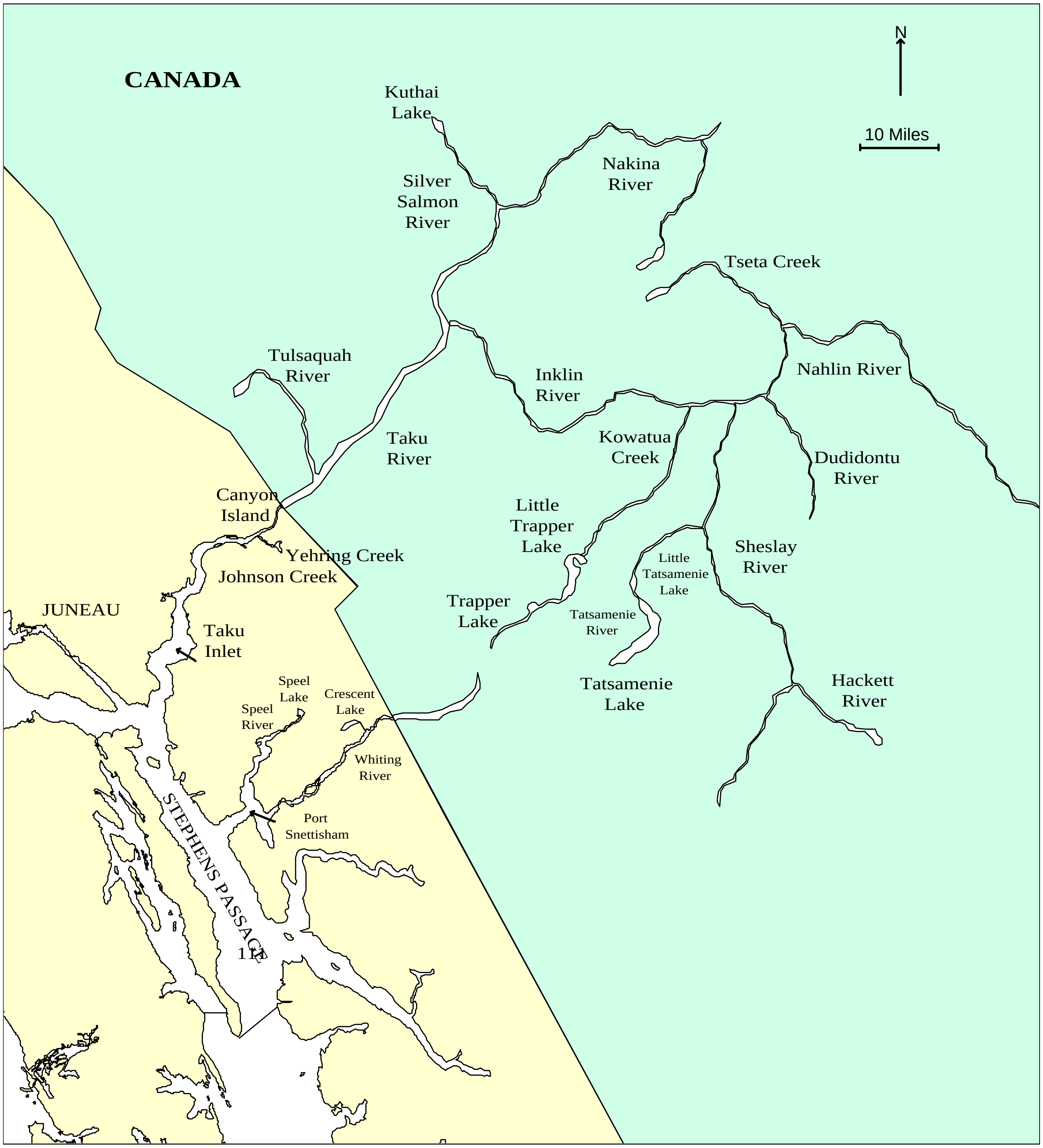


Figure 1. Taku River drainage, with location of tagging and recovery sites.

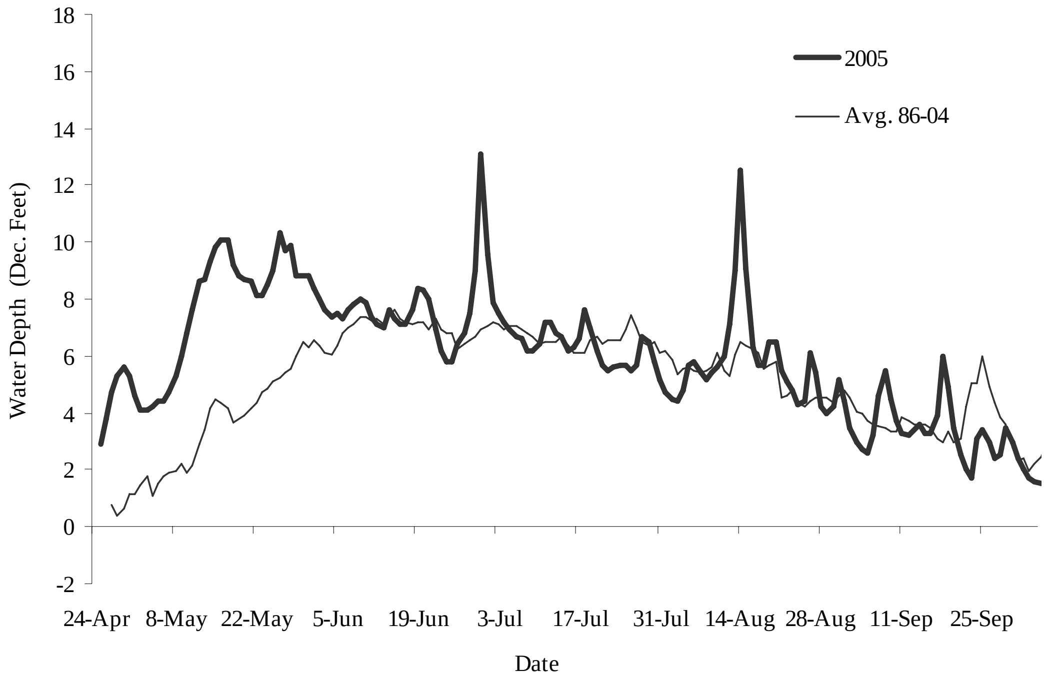
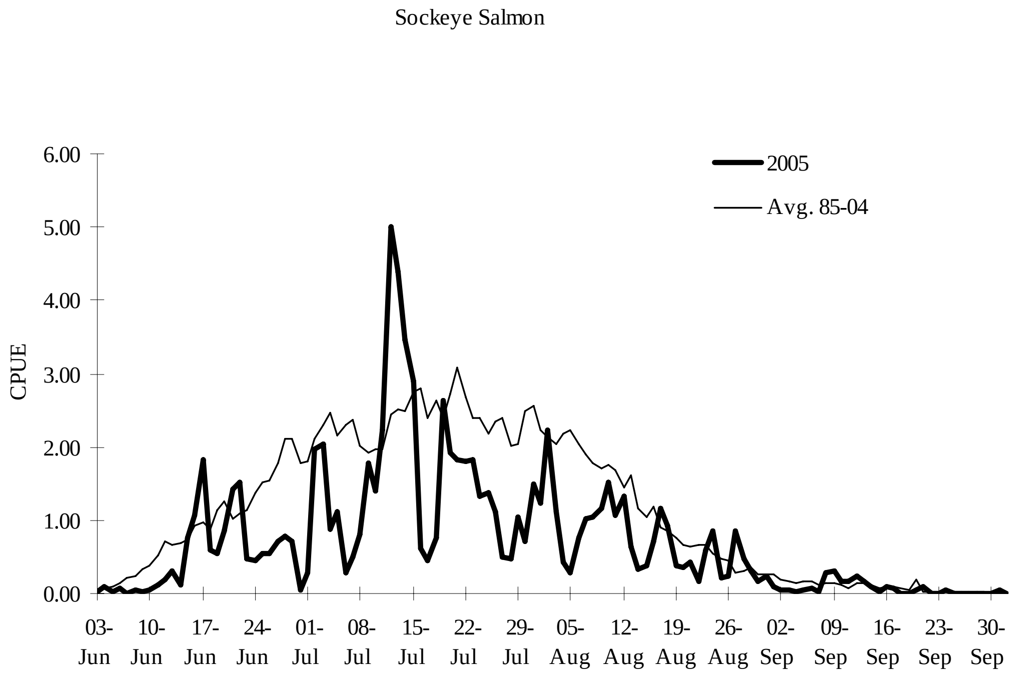


Figure 2. Water levels at Canyon Island, Taku River, 2005 vs. 1986-2004 average.



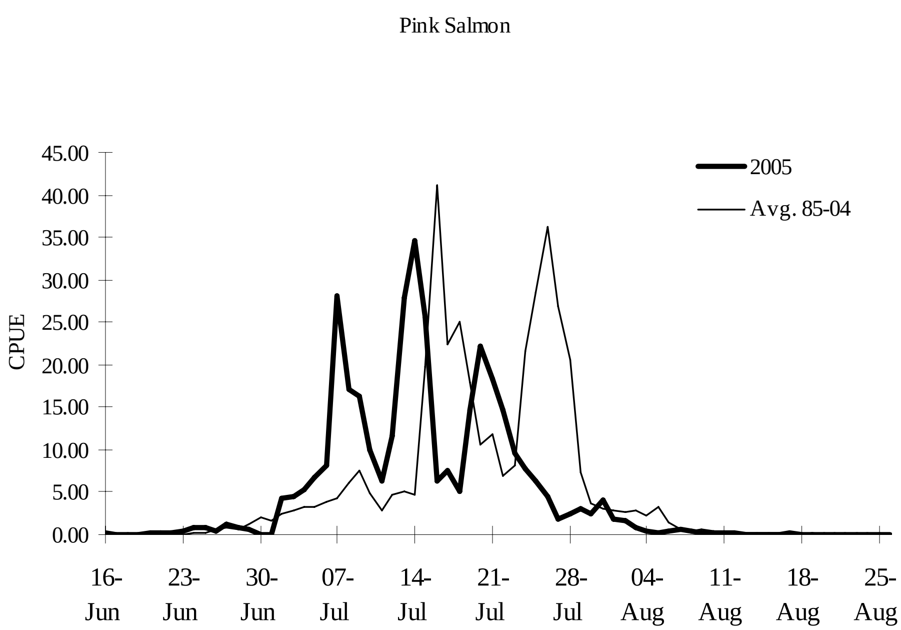


Figure 3. Fish wheel CPUE for sockeye, pink and chum salmon at Canyon Island, Taku River, 2005.

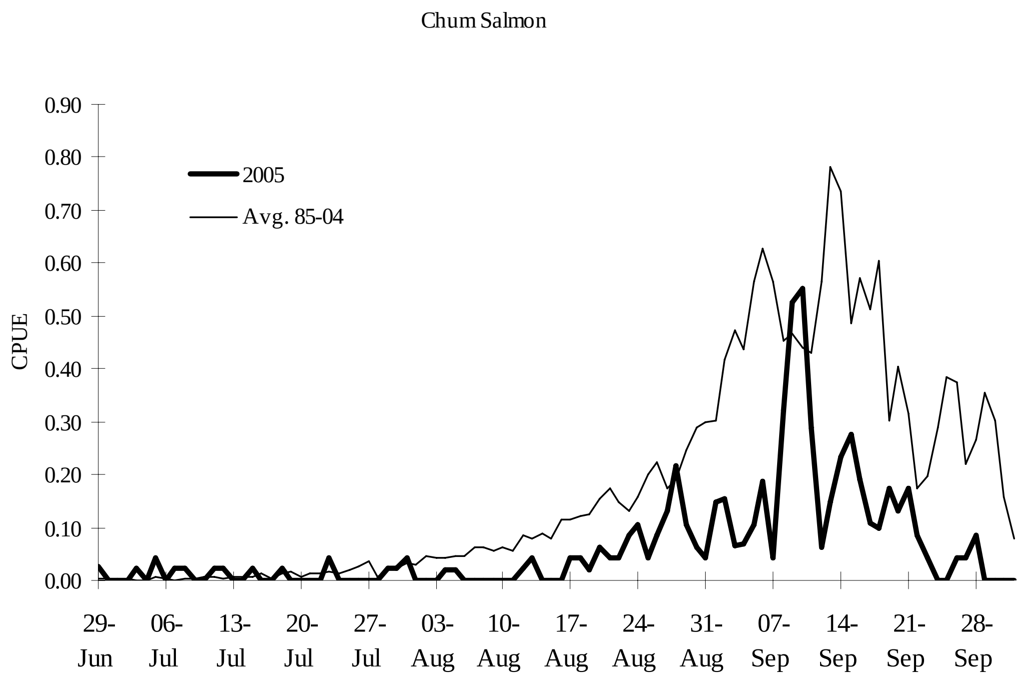


Figure 3 (cont'd). **Fish wheel CPUE for sockeye, pink and chum salmon at Canyon Island, Taku River, 2005.**

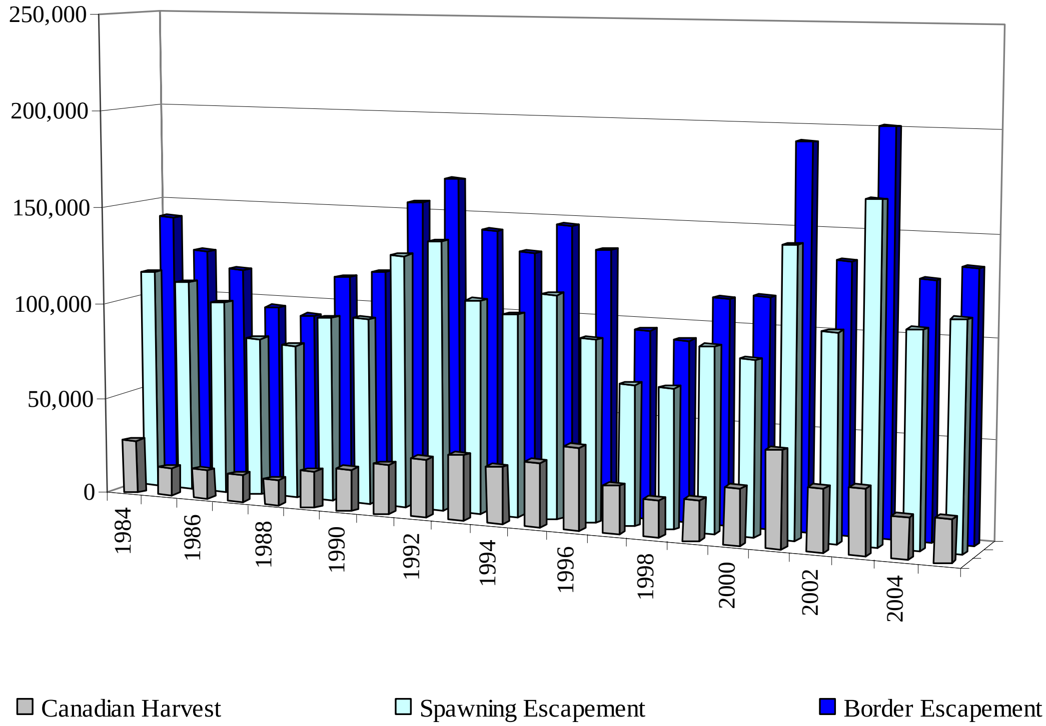


Figure 4. Historical sockeye mark-recapture abundance estimates above the U.S./Canada border including Canadian inriver harvests and escapements for Taku River sockeye, 1984-2005.

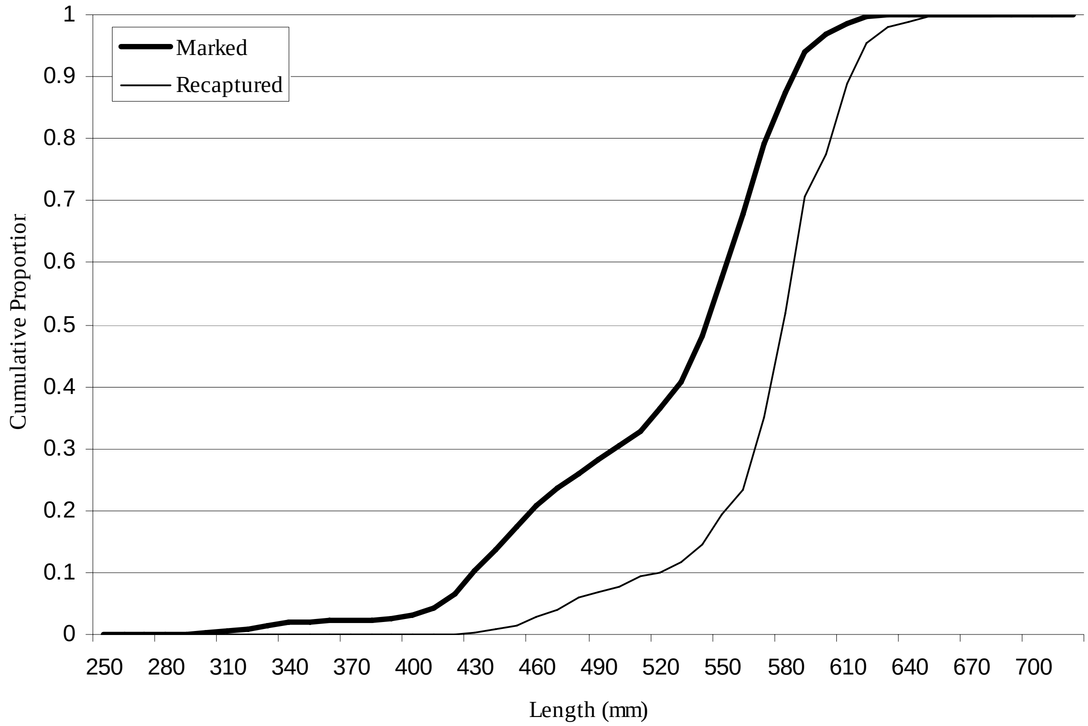


Figure 5. Cumulative Distribution Functions (CDF) of MEF lengths of sockeye salmon tagged at Canyon Island and of tagged sockeye salmon recovered in the Canadian commercial fishery, 2005.

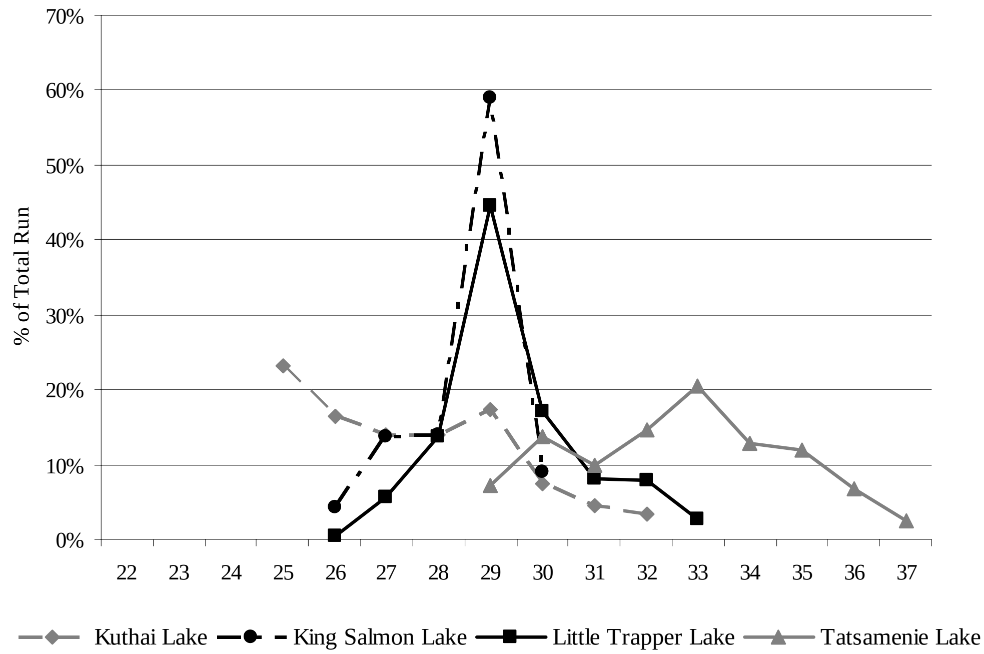
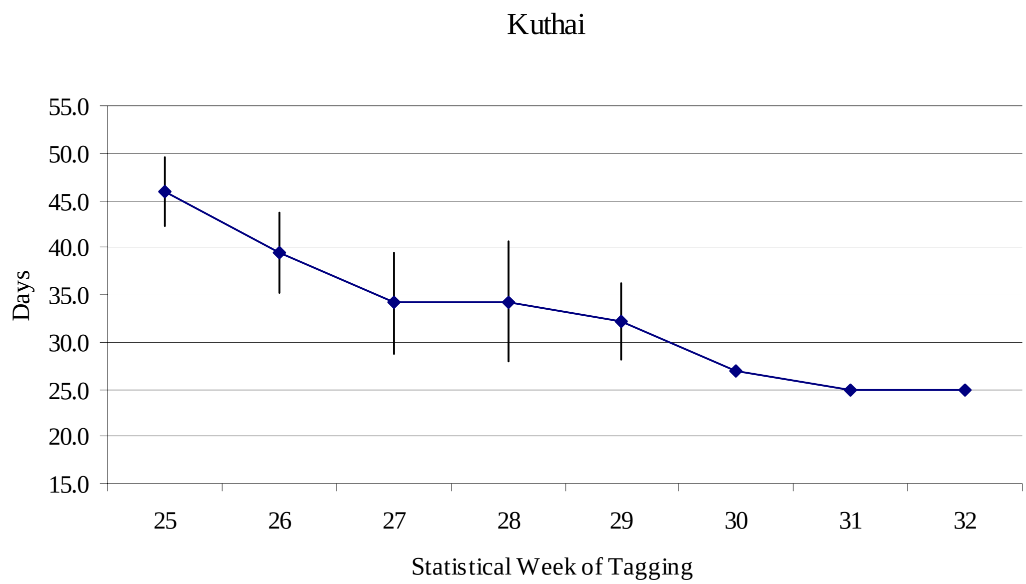


Figure 6. Run timing of four sockeye salmon stock groups passing Canyon Island, 2005.



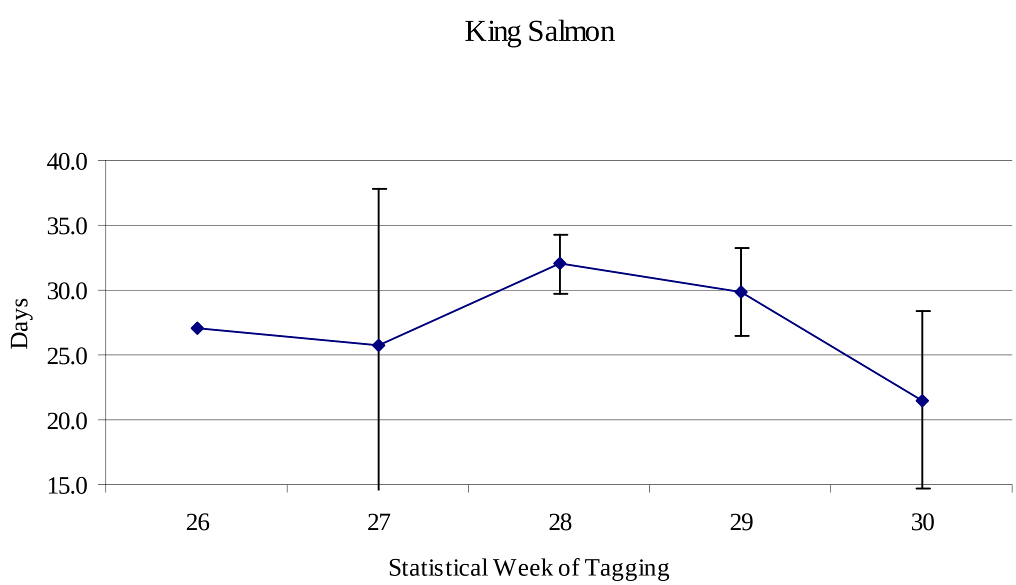
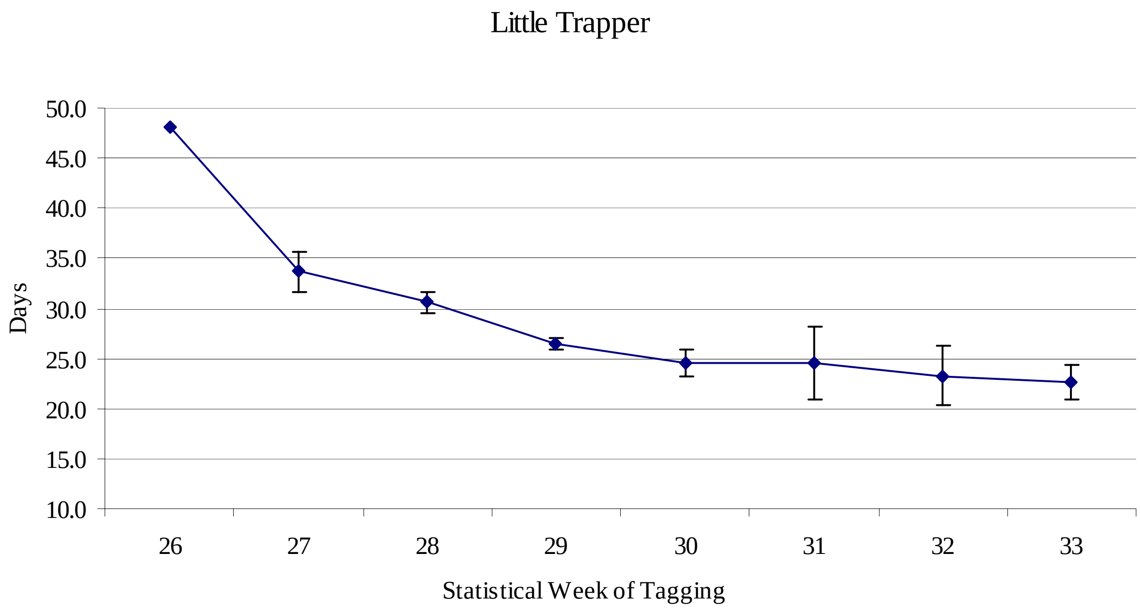


Figure 7. Mean travel times (and 95% confidence intervals) for tagged sockeye salmon between Canyon Island and four upriver locations, 2005.



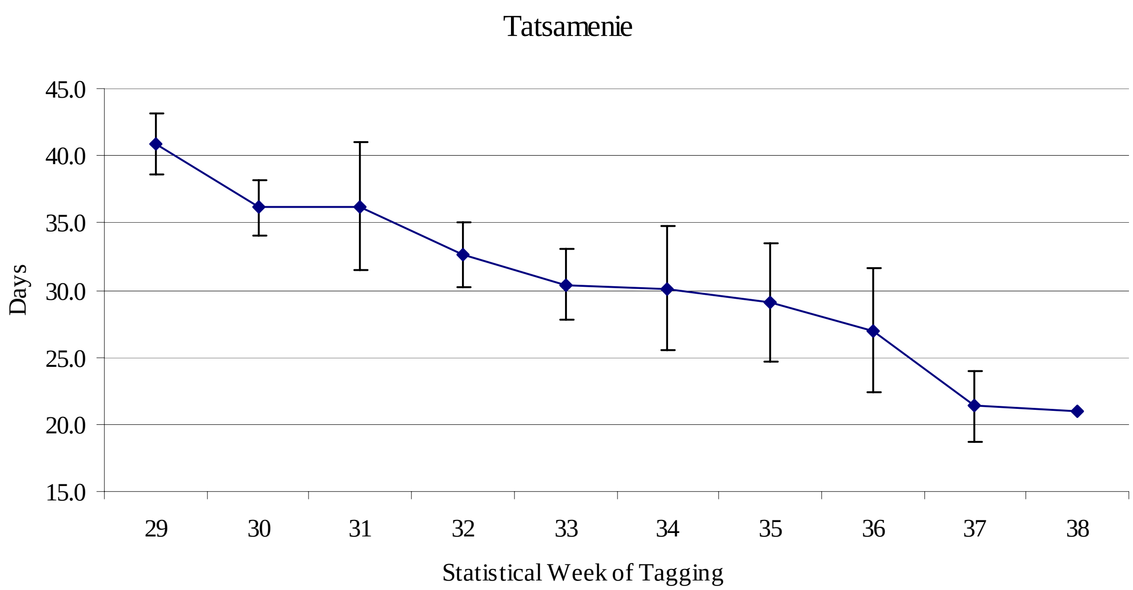


Figure 7 (cont'd). Mean travel times (and 95% confidence intervals) for tagged sockeye salmon between Canyon Island and four upriver locations, 2005.

Appendix A. Inclusive dates for statistical weeks, 2005.

Week	From	To
1		1-Jan
2	2-Jan	8-Jan
3	9-Jan	15-Jan
4	16-Jan	22-Jan
5	23-Jan	29-Jan
6	30-Jan	5-Feb
7	6-Feb	12-Feb
8	13-Feb	19-Feb
9	20-Feb	26-Feb
10	27-Feb	5-Mar
11	6-Mar	12-Mar
12	13-Mar	19-Mar
13	20-Mar	26-Mar
14	27-Mar	2-Apr
15	3-Apr	9-Apr
16	10-Apr	16-Apr
17	17-Apr	23-Apr
18	24-Apr	30-Apr
19	1-May	7-May
20	8-May	14-May
21	15-May	21-May
22	22-May	28-May
23	29-May	4-Jun
24	5-Jun	11-Jun
25	12-Jun	18-Jun
26	19-Jun	25-Jun
27	26-Jun	2-Jul

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

Appendix B.1. Catches, number tagged, and CPUE of sockeye salmon in the fish wheels at Canyon Island, 2005.

Stat Week	Date	Daily Sockeye Catch	Cumul. Sockeye Catch	Daily Sockeye Tagged	Cumul. Sockeye Tagged	Daily CPUE	Cumul. CPUE	Cumul. Proport. CPUE
21	20-May	0	0	0	0	0.0	0.0	0.00
21	21-May	0	0	0	0	0.0	0.0	0.00
22	22-May	0	0	0	0	0.0	0.0	0.00
22	23-May	0	0	0	0	0.0	0.0	0.00
22	24-May	0	0	0	0	0.0	0.0	0.00
22	25-May	0	0	0	0	0.0	0.0	0.00
22	26-May	0	0	0	0	0.0	0.0	0.00
22	27-May	0	0	0	0	0.0	0.0	0.00
22	28-May	0	0	0	0	0.0	0.0	0.00
23	29-May	0	0	0	0	0.0	0.0	0.00
23	30-May	0	0	0	0	0.0	0.0	0.00
23	31-May	0	0	0	0	0.0	0.0	0.00
23	1-Jun	0	0	0	0	0.0	0.0	0.00
23	2-Jun	0	0	0	0	0.0	0.0	0.00
23	3-Jun	1	1	1	1	0.0	0.0	0.00
23	4-Jun	4	5	4	5	0.1	0.1	0.00
24	5-Jun	1	6	1	6	0.0	0.1	0.00
24	6-Jun	3	9	3	9	0.1	0.2	0.00
24	7-Jun	0	9	0	9	0.0	0.2	0.00
24	8-Jun	2	11	2	11	0.0	0.2	0.00
24	9-Jun	1	12	1	12	0.0	0.3	0.00
24	10-Jun	2	14	2	14	0.0	0.3	0.00
24	11-Jun	6	20	6	20	0.1	0.4	0.00
25	12-Jun	9	29	8	28	0.2	0.6	0.01
25	13-Jun	14	43	13	41	0.3	0.9	0.01
25	14-Jun	6	49	6	47	0.1	1.0	0.01
25	15-Jun	35	84	34	81	0.8	1.8	0.02
25	16-Jun	50	134	47	128	1.1	2.9	0.03
25	17-Jun	70	204	65	193	1.8	4.7	0.05
25	18-Jun	28	232	26	219	0.6	5.3	0.06
26	19-Jun	25	257	22	241	0.5	5.8	0.07
26	20-Jun	40	297	37	278	0.9	6.7	0.08
26	21-Jun	65	362	61	339	1.4	8.1	0.09
26	22-Jun	61	423	58	397	1.5	9.6	0.11
26	23-Jun	22	445	22	419	0.5	10.1	0.12
26	24-Jun	21	466	20	439	0.4	10.6	0.12
26	25-Jun	26	492	23	462	0.6	11.1	0.13
27	26-Jun	26	518	24	486	0.6	11.7	0.13
27	27-Jun	33	551	33	519	0.7	12.4	0.14
27	28-Jun	36	587	35	554	0.8	13.1	0.15
27	29-Jun	28	615	26	580	0.7	13.8	0.16
27	30-Jun	1	616	1	581	0.0	13.9	0.16
27	1-Jul	10	626	9	590	0.3	14.2	0.16

Appendix B.1 (cont'd). Catches, number tagged, and CPUE of sockeye salmon in the fish wheels at Canyon Island, 2005.

Stat Week	Date	Daily Sockeye Catch	Cumul. Sockeye Catch	Daily Sockeye Tagged	Cumul. Sockeye Tagged	Daily CPUE	Cumul. CPUE	Cumul. Proport. CPUE
27	2-Jul	89	715	81	671	2.0	16.1	0.18
28	3-Jul	93	808	90	761	2.0	18.2	0.21
28	4-Jul	41	849	38	799	0.9	19.0	0.22
28	5-Jul	51	900	46	845	1.1	20.2	0.23
28	6-Jul	13	913	12	857	0.3	20.4	0.23
28	7-Jul	21	934	18	875	0.5	20.9	0.24
28	8-Jul	37	971	35	910	0.8	21.7	0.25
28	9-Jul	84	1,055	81	991	1.8	23.5	0.27
29	10-Jul	64	1,119	61	1,052	1.4	24.9	0.29
29	11-Jul	102	1,221	94	1,146	2.2	27.1	0.31
29	12-Jul	229	1,450	222	1,368	5.0	32.1	0.37
29	13-Jul	192	1,642	182	1,550	4.4	36.5	0.42
29	14-Jul	153	1,795	137	1,687	3.5	40.0	0.46
29	15-Jul	128	1,923	116	1,803	2.9	42.9	0.49
29	16-Jul	29	1,952	27	1,830	0.6	43.5	0.50
30	17-Jul	21	1,973	20	1,850	0.5	43.9	0.50
30	18-Jul	36	2,009	33	1,883	0.8	44.7	0.51
30	19-Jul	114	2,123	102	1,985	2.6	47.3	0.54
30	20-Jul	87	2,210	79	2,064	1.9	49.2	0.56
30	21-Jul	83	2,293	77	2,141	1.8	51.1	0.59
30	22-Jul	82	2,375	75	2,216	1.8	52.9	0.61
30	23-Jul	84	2,459	75	2,291	1.8	54.7	0.63
31	24-Jul	61	2,520	55	2,346	1.3	56.0	0.64
31	25-Jul	64	2,584	61	2,407	1.4	57.4	0.66
31	26-Jul	50	2,634	46	2,453	1.1	58.5	0.67
31	27-Jul	23	2,657	21	2,474	0.5	59.0	0.68
31	28-Jul	18	2,675	18	2,492	0.5	59.5	0.68
31	29-Jul	48	2,723	43	2,535	1.0	60.5	0.69
31	30-Jul	33	2,756	30	2,565	0.7	61.2	0.70
32	31-Jul	70	2,826	62	2,627	1.5	62.7	0.72
32	1-Aug	57	2,883	52	2,679	1.2	64.0	0.73
32	2-Aug	104	2,987	97	2,776	2.2	66.2	0.76
32	3-Aug	50	3,037	46	2,822	1.1	67.3	0.77
32	4-Aug	20	3,057	18	2,840	0.4	67.7	0.78
32	5-Aug	13	3,070	13	2,853	0.3	68.0	0.78
32	6-Aug	35	3,105	31	2,884	0.7	68.7	0.79
33	7-Aug	47	3,152	40	2,924	1.0	69.7	0.80
33	8-Aug	48	3,200	46	2,970	1.0	70.8	0.81

Appendix B.1 (cont'd). Catches, number tagged, and CPUE of sockeye salmon in the fish wheels at Canyon Island, 2005.

Stat Week	Date	Daily Sockeye Catch	Cumul. Sockeye Catch	Daily Sockeye Tagged	Cumul. Sockeye Tagged	Daily CPUE	Cumul. CPUE	Cumul. Proport. CPUE
33	9-Aug	55	3,255	45	3,015	1.2	71.9	0.83
33	10-Aug	71	3,326	62	3,077	1.5	73.5	0.84
33	11-Aug	50	3,376	43	3,120	1.1	74.5	0.85
33	12-Aug	62	3,438	55	3,175	1.3	75.9	0.87
33	13-Aug	29	3,467	29	3,204	0.6	76.5	0.88
34	14-Aug	8	3,475	0	3,204	0.3	76.8	0.88
34	15-Aug	9	3,484	9	3,213	0.4	77.2	0.89
34	16-Aug	24	3,508	24	3,237	0.7	77.9	0.89
34	17-Aug	54	3,562	48	3,285	1.2	79.1	0.91
34	18-Aug	43	3,605	40	3,325	0.9	80.0	0.92
34	19-Aug	18	3,623	14	3,339	0.4	80.4	0.92
34	20-Aug	17	3,640	15	3,354	0.4	80.7	0.93
35	21-Aug	20	3,660	17	3,371	0.4	81.2	0.93
35	22-Aug	8	3,668	7	3,378	0.2	81.3	0.93
35	23-Aug	28	3,696	27	3,405	0.6	81.9	0.94
35	24-Aug	40	3,736	35	3,440	0.9	82.8	0.95
35	25-Aug	10	3,746	10	3,450	0.2	83.0	0.95
35	26-Aug	11	3,757	10	3,460	0.2	83.2	0.95
35	27-Aug	39	3,796	33	3,493	0.8	84.1	0.96
36	28-Aug	22	3,818	19	3,512	0.5	84.6	0.97
36	29-Aug	15	3,833	13	3,525	0.3	84.9	0.97
36	30-Aug	8	3,841	7	3,532	0.2	85.0	0.98
36	31-Aug	11	3,852	10	3,542	0.2	85.3	0.98
36	1-Sep	5	3,857	5	3,547	0.1	85.4	0.98
36	2-Sep	2	3,859	0	3,547	0.0	85.4	0.98
36	3-Sep	2	3,861	2	3,549	0.0	85.5	0.98
37	4-Sep	1	3,862	1	3,550	0.0	85.5	0.98
37	5-Sep	2	3,864	2	3,552	0.0	85.5	0.98
37	6-Sep	3	3,867	2	3,554	0.1	85.6	0.98
37	7-Sep	1	3,868	0	3,554	0.0	85.6	0.98
37	8-Sep	13	3,881	13	3,567	0.3	85.9	0.99
37	9-Sep	14	3,895	13	3,580	0.3	86.2	0.99
37	10-Sep	7	3,902	5	3,585	0.2	86.4	0.99
38	11-Sep	7	3,909	5	3,590	0.2	86.5	0.99
38	12-Sep	11	3,920	6	3,596	0.2	86.7	0.99
38	13-Sep	8	3,928	7	3,603	0.2	86.9	1.00
38	14-Sep	4	3,932	4	3,607	0.1	87.0	1.00
38	15-Sep	1	3,933	1	3,608	0.0	87.0	1.00
38	16-Sep	5	3,938	5	3,613	0.1	87.1	1.00
38	17-Sep	3	3,941	2	3,615	0.1	87.2	1.00
39	18-Sep	0	3,941	0	3,615	0.0	87.2	1.00
39	19-Sep	0	3,941	0	3,615	0.0	87.2	1.00
39	20-Sep	1	3,942	1	3,616	0.0	87.2	1.00

Appendix B.1 (cont'd). Catches, number tagged, and CPUE of sockeye salmon in the fish wheels at Canyon Island, 2005.

Stat Week	Date	Daily Sockeye Catch	Cumul. Sockeye Catch	Daily Sockeye Tagged	Cumul. Sockeye Tagged	Daily CPUE	Cumul. CPUE	Cumul. Proport. CPUE
39	21-Sep	2	3,944	2	3,618	0.1	87.3	1.00
39	22-Sep	0	3,944	0	3,618	0.0	87.3	1.00
39	23-Sep	0	3,944	0	3,618	0.0	87.3	1.00
39	24-Sep	1	3,945	0	3,618	0.0	87.4	1.00
40	25-Sep	0	3,945	0	3,618	0.0	87.4	1.00
40	26-Sep	0	3,945	0	3,618	0.0	87.4	1.00
40	27-Sep	0	3,945	0	3,618	0.0	87.4	1.00
40	28-Sep	0	3,945	0	3,618	0.0	87.4	1.00
40	29-Sep	0	3,945	0	3,618	0.0	87.4	1.00
40	30-Sep	0	3,945	0	3,618	0.0	87.4	1.00
40	1-Oct	1	3,946	1	3,619	0.0	87.4	1.00
41	2-Oct	0	3,946	0	3,619	0.0	87.4	1.00

Appendix B.2. Catches and CPUE of pink and chum salmon in the fish wheels at Canyon Island, 2005.

Date	Daily Pink Catch	Cumul. Pink Catch	Daily CPUE	Cumul. Proport. CPUE	Daily Chum Catch	Cumul. Chum Catch	Daily CPUE	Cumul. Proport. CPUE
20-May	0	0	0.00	0.00	0	0	0.00	0.00
21-May	0	0	0.00	0.00	0	0	0.00	0.00
22-May	0	0	0.00	0.00	0	0	0.00	0.00
23-May	0	0	0.00	0.00	0	0	0.00	0.00
24-May	0	0	0.00	0.00	0	0	0.00	0.00
25-May	0	0	0.00	0.00	0	0	0.00	0.00
26-May	0	0	0.00	0.00	0	0	0.00	0.00
27-May	0	0	0.00	0.00	0	0	0.00	0.00
28-May	0	0	0.00	0.00	0	0	0.00	0.00
29-May	0	0	0.00	0.00	0	0	0.00	0.00
30-May	0	0	0.00	0.00	0	0	0.00	0.00
31-May	0	0	0.00	0.00	0	0	0.00	0.00
1-Jun	0	0	0.00	0.00	0	0	0.00	0.00
2-Jun	0	0	0.00	0.00	0	0	0.00	0.00
3-Jun	0	0	0.00	0.00	0	0	0.00	0.00
4-Jun	0	0	0.00	0.00	0	0	0.00	0.00
5-Jun	0	0	0.00	0.00	0	0	0.00	0.00
6-Jun	0	0	0.00	0.00	0	0	0.00	0.00
7-Jun	0	0	0.00	0.00	0	0	0.00	0.00
8-Jun	0	0	0.00	0.00	0	0	0.00	0.00
9-Jun	0	0	0.00	0.00	0	0	0.00	0.00
10-Jun	0	0	0.00	0.00	0	0	0.00	0.00
11-Jun	0	0	0.00	0.00	0	0	0.00	0.00
12-Jun	0	0	0.00	0.00	0	0	0.00	0.00
13-Jun	0	0	0.00	0.00	0	0	0.00	0.00
14-Jun	0	0	0.00	0.00	0	0	0.00	0.00
15-Jun	0	0	0.00	0.00	0	0	0.00	0.00
16-Jun	9	9	0.19	0.00	0	0	0.00	0.00
17-Jun	0	9	0.00	0.00	0	0	0.00	0.00
18-Jun	1	10	0.02	0.00	0	0	0.00	0.00
19-Jun	3	13	0.06	0.00	0	0	0.00	0.00
20-Jun	5	18	0.11	0.00	0	0	0.00	0.00
21-Jun	9	27	0.20	0.00	0	0	0.00	0.00
22-Jun	12	39	0.30	0.00	0	0	0.00	0.00
23-Jun	20	59	0.43	0.00	0	0	0.00	0.00
24-Jun	34	93	0.73	0.01	0	0	0.00	0.00
25-Jun	36	129	0.76	0.01	0	0	0.00	0.00
26-Jun	16	145	0.34	0.01	0	0	0.00	0.00
27-Jun	55	200	1.17	0.01	0	0	0.00	0.00
28-Jun	34	234	0.73	0.01	0	0	0.00	0.00
29-Jun	28	262	0.70	0.02	1	1	0.03	0.00
30-Jun	0	262	0.00	0.02	0	1	0.00	0.00
1-Jul	2	264	0.05	0.02	0	1	0.00	0.00
2-Jul	191	455	4.24	0.03	1	2	0.02	0.01

Appendix B.2 (Cont'd). Catches and CPUE of pink and chum salmon in the fish wheels at Canyon Island, 2005.

Date	Daily Pink Catch	Cumul. Pink Catch	Daily CPUE	Cumul. Proport. CPUE	Daily Chum Catch	Cumul. Chum Catch	Daily CPUE	Cumul. Proport. CPUE
3-Jul	207	662	4.52	0.04	0	2	0.00	0.01
4-Jul	249	911	5.32	0.06	0	2	0.00	0.01
5-Jul	307	1,218	6.75	0.08	2	4	0.04	0.02
6-Jul	380	1,598	8.20	0.10	0	4	0.00	0.02
7-Jul	1,194	2,792	28.09	0.18	1	5	0.02	0.02
8-Jul	783	3,575	17.06	0.23	1	6	0.02	0.02
9-Jul	766	4,341	16.21	0.27	0	6	0.00	0.02
10-Jul	462	4,803	10.03	0.30	0	6	0.00	0.02
11-Jul	287	5,090	6.26	0.32	1	7	0.02	0.03
12-Jul	533	5,623	11.63	0.35	1	8	0.02	0.03
13-Jul	1,216	6,839	27.79	0.43	0	8	0.00	0.03
14-Jul	1,539	8,378	34.71	0.53	0	8	0.00	0.03
15-Jul	1,141	9,519	25.69	0.60	1	9	0.02	0.03
16-Jul	301	9,820	6.40	0.62	0	9	0.00	0.03
17-Jul	354	10,174	7.60	0.64	0	9	0.00	0.03
18-Jul	238	10,412	5.08	0.66	1	10	0.02	0.04
19-Jul	634	11,046	14.60	0.70	0	10	0.00	0.04
20-Jul	1,009	12,055	22.26	0.76	0	10	0.00	0.04
21-Jul	840	12,895	18.39	0.82	0	10	0.00	0.04
22-Jul	670	13,565	14.73	0.86	0	10	0.00	0.04
23-Jul	443	14,008	9.60	0.89	2	12	0.04	0.05
24-Jul	359	14,367	7.80	0.91	0	12	0.00	0.05
25-Jul	291	14,658	6.29	0.93	0	12	0.00	0.05
26-Jul	200	14,858	4.46	0.94	0	12	0.00	0.05
27-Jul	87	14,945	1.85	0.94	0	12	0.00	0.05
28-Jul	89	15,034	2.35	0.95	0	12	0.00	0.05
29-Jul	141	15,175	3.08	0.96	1	13	0.02	0.05
30-Jul	111	15,286	2.37	0.97	1	14	0.02	0.05
31-Jul	186	15,472	4.00	0.98	2	16	0.04	0.06
1-Aug	86	15,558	1.86	0.98	0	16	0.00	0.06
2-Aug	79	15,637	1.70	0.99	0	16	0.00	0.06
3-Aug	42	15,679	0.92	0.99	0	16	0.00	0.06
4-Aug	17	15,696	0.36	0.99	1	17	0.02	0.06
5-Aug	8	15,704	0.17	0.99	1	18	0.02	0.07
6-Aug	21	15,725	0.45	0.99	0	18	0.00	0.07
7-Aug	32	15,757	0.69	0.99	0	18	0.00	0.07
8-Aug	16	15,773	0.34	1.00	0	18	0.00	0.07
9-Aug	12	15,785	0.25	1.00	0	18	0.00	0.07
10-Aug	13	15,798	0.28	1.00	0	18	0.00	0.07
11-Aug	13	15,811	0.28	1.00	0	18	0.00	0.07
12-Aug	10	15,821	0.22	1.00	1	19	0.02	0.07
13-Aug	2	15,823	0.04	1.00	2	21	0.04	0.08
14-Aug	0	15,823	0.00	1.00	0	21	0.00	0.08
15-Aug	0	15,823	0.00	1.00	0	21	0.00	0.08
16-Aug	2	15,825	0.06	1.00	0	21	0.00	0.08
17-Aug	6	15,831	0.13	1.00	2	23	0.04	0.09

Appendix B.2 (Cont'd). Catches and CPUE of pink and chum salmon in the fish wheels at Canyon Island, 2005.

Date	Daily Pink Catch	Cumul. Pink Catch	Daily CPUE	Cumul. Proport. CPUE	Daily Chum Catch	Cumul. Chum Catch	Daily CPUE	Cumul. Proport. CPUE
18-Aug	2	15,833	0.04	1.00	2	25	0.04	0.09
19-Aug	3	15,836	0.06	1.00	1	26	0.02	0.10
20-Aug	0	15,836	0.00	1.00	3	29	0.06	0.11
21-Aug	0	15,836	0.00	1.00	2	31	0.04	0.12
22-Aug	0	15,836	0.00	1.00	2	33	0.04	0.12
23-Aug	1	15,837	0.02	1.00	4	37	0.08	0.14
24-Aug	0	15,837	0.00	1.00	5	42	0.11	0.16
25-Aug	1	15,838	0.02	1.00	2	44	0.04	0.16
26-Aug	1	15,839	0.02	1.00	4	48	0.09	0.18
27-Aug	0	15,839	0.00	1.00	6	54	0.13	0.20
28-Aug	0	15,839	0.00	1.00	10	64	0.22	0.24
29-Aug	0	15,839	0.00	1.00	5	69	0.11	0.26
30-Aug	0	15,839	0.00	1.00	3	72	0.06	0.27
31-Aug	0	15,839	0.00	1.00	2	74	0.04	0.27
1-Sep	0	15,839	0.00	1.00	7	81	0.15	0.30
2-Sep	0	15,839	0.00	1.00	7	88	0.15	0.32
3-Sep	0	15,839	0.00	1.00	3	91	0.07	0.34
4-Sep	0	15,839	0.00	1.00	3	94	0.07	0.35
5-Sep	0	15,839	0.00	1.00	1	95	0.02	0.35
6-Sep	0	15,839	0.00	1.00	8	103	0.17	0.38
7-Sep	0	15,839	0.00	1.00	2	105	0.04	0.39
8-Sep	0	15,839	0.00	1.00	15	120	0.32	0.44
9-Sep	0	15,839	0.00	1.00	24	144	0.52	0.53
10-Sep	0	15,839	0.00	1.00	25	169	0.55	0.63
11-Sep	0	15,839	0.00	1.00	13	182	0.29	0.68
12-Sep	0	15,839	0.00	1.00	3	185	0.06	0.69
13-Sep	0	15,839	0.00	1.00	7	192	0.15	0.71
14-Sep	0	15,839	0.00	1.00	11	203	0.23	0.75
15-Sep	0	15,839	0.00	1.00	13	216	0.28	0.80
16-Sep	0	15,839	0.00	1.00	9	225	0.19	0.83
17-Sep	0	15,839	0.00	1.00	5	230	0.11	0.85
18-Sep	0	15,839		1.00	3	233	0.10	0.87
19-Sep	0	15,839		1.00	4	237	0.17	0.90
20-Sep	0	15,839		1.00	3	240	0.13	0.92
21-Sep	0	15,839		1.00	4	244	0.17	0.95
22-Sep	0	15,839		1.00	2	246	0.08	0.96
23-Sep	0	15,839		1.00	1	247	0.04	0.97
24-Sep	0	15,839		1.00	0	247	0.00	0.97
25-Sep	0	15,839		1.00	0	247	0.00	0.97
26-Sep	0	15,839	0.00	1.00	1	248	0.04	0.98
27-Sep	0	15,839	0.00	1.00	1	249	0.04	0.99
28-Sep	0	15,839		1.00	2	251	0.09	1.00
29-Sep	0	15,839	0.00	1.00	0	251	0.00	1.00
30-Sep	0	15,839	0.00	1.00	0	251	0.00	1.00
1-Oct	0	15,839	0.00	1.00	0	251	0.00	1.00
2-Oct	0	15,839	0.00	1.00	0	251	0.00	1.00
3-Oct	0	15,839		1.00	0	251		1.00
4-Oct	0	15,839		1.00	0	251		1.00

Appendix C.1. Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class										
	2003	2002	2002	2001	2001	2000	2000	2000	1999	1999	
	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 (May 29 - June 11)											
Male											
Sample Size		1					2				3
Percent		9.1					18.2				27.3
Std. Error		9.1					12.2				14.1
Female											
Sample Size					2		6				8
Percent					18.2		54.5				72.7
Std. Error					12.2		15.7				14.1
All Fish											
Sample Size		1			2		8				11
Percent		9.1			18.2		72.7				100.0
Std. Error		9.1			12.2		14.1				
Statistical Week 25 (June 12 - 18)											
Male											
Sample Size				1	7		60	1		2	71
Percent				0.7	4.8		41.1	0.7		1.4	48.6
Std. Error				0.7	1.8		4.1	0.7		1.0	4.2
Female											
Sample Size					9		61	3		2	75
Percent					6.2		41.8	2.1		1.4	51.4
Std. Error					2.0		4.1	1.2		1.0	4.2
All Fish											
Sample Size				1	16		121	4		4	146
Percent				0.7	11.0		82.9	2.7		2.7	100.0
Std. Error				0.7	2.6		3.1	1.4		1.4	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class										
	2003	2002	2002	2001	2001	2000	2000	2000	1999	1999	
	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 19 - 25)											
Male											
Sample Size		2		5	15		61	1		2	86
Percent		1.1		2.8	8.4		34.3	0.6		1.1	48.3
Std. Error		0.8		1.2	2.1		3.6	0.6		0.8	3.8
Female											
Sample Size				2.0	14.0		67.0	2.0		7.0	92
Percent				1.1	7.9		37.6	1.1		3.9	51.7
Std. Error				0.8	2.0		3.6	0.8		1.5	3.8
All Fish											
Sample Size		2		7	29		128	3		9	178
Percent		1.1		3.9	16.3		71.9	1.7		5.1	100.0
Std. Error		0.8		1.5	2.8		3.4	1.0		1.6	
Statistical Week 27 (June 26 - July 2)											
Male											
Sample Size		4		3	36		49	1		4	97
Percent		2.5		1.9	22.2		30.2	0.6		2.5	59.9
Std. Error		1.2		1.1	3.3		3.6	0.6		1.2	3.9
Female											
Sample Size		1		2	17		40	1		4	65
Percent		0.6		1.2	10.5		24.7	0.6		2.5	40.1
Std. Error		0.6		0.9	2.4		3.4	0.6		1.2	3.9
All Fish											
Sample Size		5		5	53		89	2		8	162
Percent		3.1		3.1	32.7		54.9	1.2		4.9	100.0
Std. Error		1.4		1.4	3.7		3.9	0.9		1.7	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class										
	2003	2002	2002	2001	2001	2000	2000	2000	1999	1999	
	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 3 - 9)											
Male											
Sample Size		5	4	6	60		41	3		1	120
Percent		2.5	2.0	3.0	30.3		20.7	1.5		0.5	60.6
Std. Error		1.1	1.0	1.2	3.3		2.9	0.9		0.5	3.5
Female											
Sample Size				7	18		51	1		1	78
Percent				3.5	9.1		25.8	0.5		0.5	39.4
Std. Error				1.3	2.0		3.1	0.5		0.5	3.5
All Fish											
Sample Size		5	4	13	78		92	4		2	198
Percent		2.5	2.0	6.6	39.4		46.5	2.0		1.0	100.0
Std. Error		1.1	1.0	1.8	3.5		3.6	1.0		0.7	
Statistical Week 29 (July 10 - 16)											
Male											
Sample Size	1	6	5	7	51		28	3		1	102
Percent	0.5	3.2	2.7	3.8	27.6		15.1	1.6		0.5	55.1
Std. Error	0.5	1.3	1.2	1.4	3.3		2.6	0.9		0.5	3.7
Female											
Sample Size		1		15	8		57			2	83
Percent		0.5		8.1	4.3		30.8			1.1	44.9
Std. Error		0.5		2.0	1.5		3.4			0.8	3.7
All Fish											
Sample Size	1	7	5	22	59		85	3		3	185
Percent	0.5	3.8	2.7	11.9	31.9		45.9	1.6		1.6	100.0
Std. Error	0.5	1.4	1.2	2.4	3.4		3.7	0.9		0.9	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class										
	2003 0.1	2002 0.2	2002 1.1	2001 0.3	2001 1.2	2000 0.4	2000 1.3	2000 2.2	1999 1.4	1999 2.3	Total
Statistical Week 30 (July 17 - 23)											
Male											
Sample Size	2	7	2	22	34		28	2		1	98
Percent	1.0	3.7	1.0	11.5	17.8		14.7	1.0		0.5	51.3
Std. Error	0.7	1.4	0.7	2.3	2.8		2.6	0.7		0.5	3.6
Female											
Sample Size		1		22	13		54	1		2	93
Percent		0.5		11.5	6.8		28.3	0.5		1.0	48.7
Std. Error		0.5		2.3	1.8		3.3	0.5		0.7	3.6
All Fish											
Sample Size	2	8	2	44	47		82	3		3	191
Percent	1.0	4.2	1.0	23.0	24.6		42.9	1.6		1.6	100.0
Std. Error	0.7	1.5	0.7	3.1	3.1		3.6	0.9		0.9	
Statistical Week 31 (July 24 - 30)											
Male											
Sample Size	2	5	4	10	31		24	3			79
Percent	1.3	3.3	2.6	6.6	20.4		15.8	2.0			52.0
Std. Error	0.9	1.5	1.3	2.0	3.3		3.0	1.1			4.1
Female											
Sample Size		1		28	7		33	2		2	73
Percent		0.7		18.4	4.6		21.7	1.3		1.3	48.0
Std. Error		0.7		3.2	1.7		3.4	0.9		0.9	4.1
All Fish											
Sample Size	2	6	4	38	38		57	5		2	152
Percent	1.3	3.9	2.6	25.0	25.0		37.5	3.3		1.3	100.0
Std. Error	0.9	1.6	1.3	3.5	3.5		3.9	1.5		0.9	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class										
	2003 0.1	2002 0.2	2002 1.1	2001 0.3	2001 1.2	2000 0.4	2000 1.3	2000 2.2	1999 1.4	1999 2.3	Total
Statistical Week 32 (July 31 - August 6)											
Male											
Sample Size	1	10	8	16	29		17	1		1	83
Percent	0.6	6.4	5.1	10.3	18.6		10.9	0.6		0.6	53.2
Std. Error	0.6	2.0	1.8	2.4	3.1		2.5	0.6		0.6	4.0
Female											
Sample Size		6		22	9	1	30	4		1	73
Percent		3.8		14.1	5.8	0.6	19.2	2.6		0.6	46.8
Std. Error		1.5		2.8	1.9	0.6	3.2	1.3		0.6	4.0
All Fish											
Sample Size	1	16	8	38	38	1	47	5		2	156
Percent	0.6	10.3	5.1	24.4	24.4	0.6	30.1	3.2		1.3	100.0
Std. Error	0.6	2.4	1.8	3.4	3.4	0.6	3.7	1.4		0.9	
Statistical Week 33 (August 7 - 13)											
Male											
Sample Size	3	18	4	9	24		23	2			83
Percent	1.7	10.1	2.2	5.1	13.5		12.9	1.1			46.6
Std. Error	1.0	2.3	1.1	1.6	2.6		2.5	0.8			3.7
Female											
Sample Size				36	13		44			2	95
Percent				20.2	7.3		24.7			1.1	53.4
Std. Error				3.0	2.0		3.2			0.8	3.7
All Fish											
Sample Size	3	18	4	45	37		67	2		2	178
Percent	1.7	10.1	2.2	25.3	20.8		37.6	1.1		1.1	100.0
Std. Error	1.0	2.3	1.1	3.3	3.1		3.6	0.8		0.8	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class										
	2003 0.1	2002 0.2	2002 1.1	2001 0.3	2001 1.2	2000 0.4	2000 1.3	2000 2.2	1999 1.4	1999 2.3	Total
Statistical Week 34 (August 14 - 20)											
Male											
Sample Size	1	14	3	9	14		11				52
Percent	1.0	13.6	2.9	8.7	13.6		10.7				50.5
Std. Error	1.0	3.4	1.7	2.8	3.4		3.1				5.0
Female											
Sample Size		2		9	5		31	3		1	51
Percent		1.9		8.7	4.9		30.1	2.9		1.0	49.5
Std. Error		1.4		2.8	2.1		4.5	1.7		1.0	5.0
All Fish											
Sample Size	1	16	3	18	19		42	3		1	103
Percent	1.0	15.5	2.9	17.5	18.4		40.8	2.9		1.0	100.0
Std. Error	1.0	3.6	1.7	3.8	3.8		4.9	1.7		1.0	
Statistical Week 35 (August 21 - 27)											
Male											
Sample Size		4	4	7	10		8	2		1	36
Percent		4.4	4.4	7.7	11.0		8.8	2.2		1.1	39.6
Std. Error		2.2	2.2	2.8	3.3		3.0	1.5		1.1	5.2
Female											
Sample Size				14	10		30	1			55
Percent				15.4	11.0		33.0	1.1			60.4
Std. Error				3.8	3.3		5.0	1.1			5.2
All Fish											
Sample Size		4	4	21	20		38	3		1	91
Percent		4.4	4.4	23.1	22.0		41.8	3.3		1.1	100.0
Std. Error		2.2	2.2	4.4	4.4		5.2	1.9		1.1	

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class										
	2003	2002	2002	2001	2001	2000	2000	2000	1999	1999	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 36 (August 28 - September 3)											
Male											
Sample Size	1		1	3	3		4	2			14
Percent	2.6		2.6	7.7	7.7		10.3	5.1			35.9
Std. Error	2.6		2.6	4.3	4.3		4.9	3.6			7.8
Female											
Sample Size				7	2		14	2			25
Percent				17.9	5.1		35.9	5.1			64.1
Std. Error				6.2	3.6		7.8	3.6			7.8
All Fish											
Sample Size	1		1	10	5		18	4			39
Percent	2.6		2.6	25.6	12.8		46.2	10.3			100.0
Std. Error	2.6		2.6	7.1	5.4		8.1	4.9			
Statistical Week 37 (September 4 - 10)											
Male											
Sample Size			1	1	3		5	2			12
Percent			3.8	3.8	11.5		19.2	7.7			46.2
Std. Error			3.8	3.8	6.4		7.9	5.3			10.0
Female											
Sample Size				1	2		11				14
Percent				3.8	7.7		42.3				53.8
Std. Error				3.8	5.3		9.9				10.0
All Fish											
Sample Size			1	2	5		16	2			26
Percent			3.8	7.7	19.2		61.5	7.7			100.0
Std. Error			3.8	5.3	7.9		9.7	5.3			

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class										
	2003	2002	2002	2001	2001	2000	2000	2000	1999	1999	
	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 11 - 17)											
Male											
Sample Size	1		1		3		4	1			10
Percent	4.0		4.0		12.0		16.0	4.0			40.0
Std. Error	4.0		4.0		6.6		7.5	4.0			10.0
Female											
Sample Size				1	5		5	3	1		15
Percent				4.0	20.0		20.0	12.0	4.0		60.0
Std. Error				4.0	8.2		8.2	6.6	4.0		10.0
All Fish											
Sample Size	1		1	1	8		9	4	1		25
Percent	4.0		4.0	4.0	32.0		36.0	16.0	4.0		100.0
Std. Error	4.0		4.0	4.0	9.5		9.8	7.5	4.0		
Statistical Weeks 39-40 (September 18 - October 1)											
Male											
Sample Size							1	1			2
Percent							33.3	33.3			66.7
Std. Error							33.3	33.3			33.3
Female											
Sample Size							1				1
Percent							33.3				33.3
Std. Error							33.3				33.3
All Fish											
Sample Size							2	1			3
Percent							66.7	33.3			100.0
Std. Error							33.3	33.3			

Appendix C.1 (Cont'd). Age composition of sockeye salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class										
	2003	2002	2002	2001	2001	2000	2000	2000	1999	1999	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Combined Periods (May 29 - October 1)											
Male											
Sample Size	12.0	76.0	37.0	99.0	320.0		366.0	25.0		13.0	948
Percent	0.7	4.1	2.0	5.4	17.4		19.8	1.4		0.7	51.4
Std. Error	0.2	0.5	0.3	0.5	0.9		0.9	0.3		0.2	1.2
Female											
Sample Size		12.0		166.0	134.0	1.0	535.0	23.0	1.0	24.0	896
Percent		0.7		9.0	7.3	0.1	29.0	1.2	0.1	1.3	48.6
Std. Error		0.2		0.7	0.6	0.1	1.1	0.3	0.1	0.3	1.2
All Fish											
Sample Size	12	88	37	265	454	1	901	48	1	37	1844
Percent	0.7	4.8	2.0	14.4	24.6	0.1	48.9	2.6	0.1	2.0	100.0
Std. Error	0.2	0.5	0.3	0.8	1.0	0.1	1.2	0.4	0.1	0.3	

Appendix C.2. Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class			
	2002	2001	2000	
	0.2	0.3	0.4	Total
Statistical Weeks 28 -29 (July 3 - 16)				
Male				
Sample Size				
Percent				
Std. Error				
Female				
Sample Size			5	5
Percent			2.0	2.0
Std. Error			7.0	7.0
All Fish				
Sample Size			5	5
Percent			100.0	100.0
Std. Error			0.0	
Statistical Week 30 (July 17 - 23)				
Male				
Sample Size			2	2
Percent			100.0	100.0
Std. Error			0.0	0.0
Female				
Sample Size				
Percent				
Std. Error				
All Fish				
Sample Size			2	2
Percent			100.0	100.0
Std. Error			0.0	
Statistical Week 31 (July 24 - 30)				
Male				
Sample Size			1	1
Percent			100.0	100.0
Std. Error				
Female				
Sample Size				
Percent				
Std. Error				
All Fish				
Sample Size			1	1
Percent			100.0	100.0
Std. Error				

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class			
	2002	2001	2000	
	0.2	0.3	0.4	Total
Statistical Week 32 (July 31 - August 6)				
Male				
Sample Size				
Percent				
Std. Error				
Female				
Sample Size			3	3
Percent			100.0	100.0
Std. Error			0.0	0.0
All Fish				
Sample Size				3
Percent				0.0
Std. Error				
Statistical Week 33 (August 7 - 13)				
Male				
Sample Size			2	2
Percent			66.7	66.7
Std. Error			33.3	33.3
Female				
Sample Size			1	1
Percent			33.3	33.3
Std. Error			33.3	33.3
All Fish				
Sample Size			3	3
Percent			100.0	100.0
Std. Error			0.0	
Statistical Week 34 (August 14 - 20)				
Male				
Sample Size			3	3
Percent			42.9	42.9
Std. Error			20.2	20.2
Female				
Sample Size		2	2	4
Percent		28.6	28.6	57.1
Std. Error		18.4	18.4	20.2
All Fish				
Sample Size		2	5	7
Percent		28.6	71.4	100.0
Std. Error		18.4	18.4	

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

fishing period, 2005.

	Brood Year and Age Class			
	2002	2001	2000	
	0.2	0.3	0.4	Total
Statistical Week 35 (August 21 - 27)				
Male				
Sample Size		5	1	6
Percent		26.3	5.3	31.6
Std. Error		10.4	5.3	11.0
Female				
Sample Size		8	5	13
Percent		42.1	26.3	68.4
Std. Error		11.6	10.4	11.0
All Fish				
Sample Size		13	6	19
Percent		68.4	31.6	100.0
Std. Error		11.0	11.0	
Statistical Week 36 (August 28 - September 3)				
Male				
Sample Size		7	5	12
Percent		25.9	18.5	44.4
Std. Error		8.6	7.6	9.7
Female				
Sample Size		5	10	15
Percent		18.5	37.0	55.6
Std. Error		7.6	9.5	9.7
All Fish				
Sample Size		12	15	27
Percent		44.4	55.6	100.0
Std. Error		9.7	9.7	
Statistical Week 37 (September 4 - 10)				
Male				
Sample Size		18	10	28
Percent		28.1	15.6	43.8
Std. Error		5.7	4.6	6.3
Female				
Sample Size		22	14	36
Percent		34.4	21.9	56.3
Std. Error		6.0	5.2	6.3
All Fish				
Sample Size		40	24	64
Percent		62.5	37.5	100.0
Std. Error		6.1	6.1	

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class			
	2002	2001	2000	
	0.2	0.3	0.4	Total
Statistical Week 38 (September 11 - 17)				
Male				
Sample Size		7	7	14
Percent		14.3	14.3	28.6
Std. Error		5.1	5.1	6.5
Female				
Sample Size	1	23	11	35
Percent	2.0	46.9	22.4	71.4
Std. Error	2.0	7.2	6.0	6.5
All Fish				
Sample Size	1	30	18	49
Percent	2.0	61.2	36.7	100.0
Std. Error	2.0	7.0	7.0	
Statistical Week 39 (September 18 - 24)				
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 40 (September 25 - October 1)				
Male				
Sample Size				
Percent				
Std. Error				
Female				
Sample Size	1		2	3
Percent	33.3		66.7	100.0
Std. Error	33.3		33.3	0.0
All Fish				
Sample Size	1		2	3
Percent	33.3		66.7	100.0
Std. Error	33.3		33.3	

Appendix C.2 (Cont'd). Age composition of chum salmon in the Canyon Island fish wheels by sex and fishing period, 2005.

	Brood Year and Age Class			
	2002 0.2	2001 0.3	2000 0.4	Total
Combined Periods (July 3 - October 1)				
Male				
Sample Size		38	33	71
Percent		19.2	16.7	35.9
Std. Error		2.8	2.7	3.4
Female				
Sample Size	2	69	56	127
Percent	1.0	34.8	28.3	64.1
Std. Error	0.7	3.4	3.2	3.4
All Fish				
Sample Size	2	107	89	198
Percent	1.0	54.0	44.9	100.0
Std. Error	0.7	3.6	3.5	

Appendix D. Results of secondary marking study to test for short term tag loss for sockeye captured at the Canyon Island fish wheels, 2005.

Stat. Week	Canadian Catch	Tags Recovered	Fishery Ratio	Fish Examined for 2^{nd} Marks	Number of 2^{nd} Marks	Sample ratio	Fishery Ratio - Sampled Ratio
23-24	38	1	0.026	5		0.000	0.026
25	222	4	0.018	74		0.000	0.018
26	1,012	24	0.024	200		0.000	0.024
27	1,886	33	0.017	200		0.000	0.017
28	1,019	63	0.062	200	3	0.015	0.047
29	1,641	25	0.015	200	2	0.010	0.005
30	1,809	64	0.035	200	7	0.035	0.000
31	3,193	82	0.026	200	2	0.010	0.016
32	4,355	120	0.028	200		0.000	0.028
33	2,668	66	0.025	200	7	0.035	-0.010
34	2,100	57	0.027	199	1	0.005	0.022
35	1,279	40	0.031	200	2	0.010	0.021
36	526	23	0.044	200		0.000	0.044
37	121	10	0.083	41	2	0.049	0.034
38	64	6	0.094	47	1	0.021	0.072
Total	21,933	618	0.028	2,366	27	0.011	0.017