Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2004

James E. Andel
Ian M. Boyce

February 2007

**Pacific Salmon Commission
Technical Report No. 20**

The Pacific Salmon Commission is charged with the implementation of the Pacific Salmon Treaty, which was signed by Canada and the United States in 1985. The focus of the agreement are salmon stocks that originate in one country and are subject to interception by the other country. The objectives of the Treaty are to 1) conserve the five species of Pacific salmon in order to achieve optimum production, and 2) to divide the harvests so each country reaps the benefits of its investment in salmon management.

Technical Reports of the Pacific Salmon Commission present results of completed or ongoing investigations carried out by the Pacific Salmon Commission that are deemed of sufficient interest to be made available to the scientific community and the public.

Pacific Salmon Commission
600 - 1155 Robson Street
Vancouver, B.C.
V6E 1B5
(604) 684-8081

Pacific Salmon Commission
Technical Report No. 20

Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2004

Prepared by:
James E. Andel[1] and Ian M. Boyce[2]

Prepared for:
Pacific Salmon Commission
Transboundary Technical Committee

February 2007

[1] Alaska Department of Fish and Game, Division of Commercial Fisheries, P.O. Box 240020, Douglas, Alaska 99824.
[2] Fisheries and Oceans Canada, Yukon/Transboundary Rivers Area, 100-419 Range Road, Whitehorse, Yukon Territory, Y1A 3V1.

AUTHORS

James E. Andel is the Assistant Transboundary Research Biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries, P.O. Box 330, Douglas, Alaska 99827-0330. Voice: 907-766-2830, FAX: 907-766-2189, e-mail: jim_andel@fishgame.state.ak.us.

Ian M. Boyce is the Taku River Stock Assessment Biologist for Fisheries and Oceans Canada, Yukon/ Transboundary Rivers Area, 100-419 Range Road, Whitehorse, Yukon Territory, Y1A 3V1. Voice: 867-393-6739, FAX: 867-393-6738, e-mail: boycei@pac.dfo-mpo.gc.ca

ACKNOWLEDGMENTS

This project was conducted co-operatively by the Department of Fisheries and Oceans Canada (DFO), the Alaska Department of Fish and Game (ADF&G), and the Taku River Tlingit First Nation (TRTFN). The authors would like to express their appreciation to the field staff stationed at Canyon Island: Jerry Owens, Cheryl Dion, and Scott Duffy (ADF&G); Scott Herron**,** Matt Waugh, Julie Bartel, Mark McFarland, and Sean Stark (DFO); and Mike Smarch (TRTFN), for applying spaghetti tags and collecting fishery recoveries. We would like to thank Canadian commercial fishers, United States personal use and commercial gillnet fishers, and Brian Mercer, Harry Carlick, Mark Connor as well as other individuals working on spawning escapement enumeration projects, for recovering spaghetti tags. Thanks also to Rick Ferguson for supervising DFO field operations; Jason Williams for supervising TRTFN field operations; and Penny Saddler for managing Canyon Island data, providing inseason run status updates, as well as assisting with several tables and figures used in this report. We would also like to thank Mark Olsen (ADF&G) for his efforts in running the Canyon Island AWL forms through the OPSCAN machine, as well as Clyde Andrews (ADF&G) and Frances Naylen (DFO) for expediting.

Correct citation for this publication:

Andel, J.E. and I.M. Boyce. 2007. Mark-recapture studies of Taku River adult sockeye salmon stocks in 2004. Pacific Salmon Comm. Tech. Rep. No. 20: 55 p.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

Mark-recapture studies of adult Taku River salmon *Oncorhynchus* stocks were conducted by the Department of Fisheries and Oceans Canada, the Alaska Department of Fish and Game, and the Taku River Tlingit First Nation in 2004. 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 6,255 sockeye salmon were captured in fish wheels located at Canyon Island, Alaska, of which 5,661 were tagged and 905 (16.1%) were subsequently recovered in fisheries or on the spawning grounds. The inriver run of sockeye salmon past Canyon Island from June 4 to October 3 was estimated to be 125,727 fish (95% confidence interval 117,197 to 134,257). Canadian commercial, test, and aboriginal fisheries harvested 20,148, 78, and 120 sockeye, resulting in a spawning escapement estimate of 106,497 sockeye salmon. Based on mean date and standard deviation of migration timing the sockeye salmon run was approximately two days earlier and less compressed than the 1984-2003 average. The Kuthai Lake sockeye salmon stocks dominated the early portion of the run, the Little Trapper Lake the middle portion, and the Tatsamenie Lake stocks the late portion. The fish wheel catches of 8,464 pink salmon, 414 chum salmon, and 63 steelhead salmon were 47.2%, 19.8% below average and 3.3% above 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 2005; Boyce and Andel 2006) as a joint Canada/U.S. program involving the Alaska Department of Fish and Game (ADF&G) and Division of Fisheries and Oceans Canada (DFO) to provide weekly estimates of the Taku River salmon escapement past Canyon Island, Alaska (Figure 1). The Taku River Tlingit First Nation (TRTFN) began providing a technician to assist with operations in 1994. U.S. and Canadian fishery managers use CPUE and stock composition data from the U.S. District 111 and Canadian Taku River commercial gillnet fisheries and escapement estimates from this project to adjust fishing times, catches, and escapements.

The Taku River is a transboundary river which originates in northern British Columbia and flows southwest through the Coastal Mountain Range and Southeast Alaska to the Pacific Ocean (Figure 1). The Taku River supports numerous stocks of salmon that are harvested by the U.S. and Canada gillnet fisheries. The U.S. drift gillnet fishery primarily targets Taku River sockeye salmon stocks and 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 Canadian inriver fishery targets Taku River sockeye and coho salmon and incidentally harvests Chinook and pink salmon. The U.S./Canada 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 2004 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. 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.

OBJECTIVES

The primary goals of the Taku River sockeye salmon tagging program in 2004 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 at Canyon Island are outlined in project operational plans and reports completed by the ADF&G Division of Sport Fish in consultation with DFO.

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 kilometers (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 (Figure 2).

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 stopping the fish wheels during high water events a great deal of labor and material cost is saved by reducing damage to the fish wheels.

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 allowed 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. A portion of the chum salmon captured in the fish wheels were tagged with radio and spaghetti tags for distribution studies. This project is described in a separate report published by ADF&G (Andel, in prep). Pink 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)[1] 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, as well as in a catch-and-release gillnet fishery conducted by DFO. These fisheries 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 and the U.S. inriver personal use fishery 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. All sockeye caught in the catch-and-release fishery were examined for tags by DFO personnel.

---

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

The commercial fishery operated from two to five days per week from mid-June through early September. Until mid-August, it targeted sockeye salmon; after this, coho salmon. The test fishery took place from late April to mid-June and targeted Chinook salmon. The catch-and-release fishery was conducted from Early September through early October and targeted coho salmon. Drift and set gillnets were the gear types used; the mesh size was 13 cm (5 ¼ inches) to 15 cm (5 ⅞ inches) in the commercial and catch-and-release fisheries and 18.5 cm (7 ¼ inches) in the test fishery. The wooden fish wheel owned and operated by the TRTFN for commercial and food fish purposes was not deployed in 2004.

A cash reward of $5.00 (Canadian) was offered by DFO to commercial fishers for each sockeye tag returned with information on the date and location of recapture. Canadian catch statistics and tags were collected daily (when the fishery was open) by DFO personnel stationed at Erickson Slough, Canada. 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. A limited number of tags were also recovered from the U.S. inriver personal use fishery and the District 111 gillnet fishery. ADF&G offered a $2.00 (U.S.) reward for each tag returned from these fisheries.

Tag observations and recoveries were also made at enumeration weirs located at Little Trapper, Tatsamenie, Kuthai and King Salmon lakes. Additional recoveries were made in incidentally to Chinook work on the Nakina and Nahlin rivers as well as on directed sampling excursions to the mainstem Taku River spawning grounds.

Sex, length measurements, and scale data were obtained from the various fisheries, the enumeration weirs, and the Nahlin River and mainstem Taku spawning area.

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 2004 statistical weeks are shown in Appendix A.1.

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, whether it be 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 2004. Mark-recapture data was forwarded to the Douglas 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:

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

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

The variance of the migrations was estimated by:

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

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

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

where: k is the statistical week of interest; C_k is the weekly proportion of the total season's fish wheel CPUE, T_{ks} is the number of spawning ground recoveries of stock s that were tagged in week k, T_k is the number of fish tagged at Canyon Island in statistical week k, and T_{kc} is the number of fish tagged at Canyon Island in statistical week k and caught in the Canadian fishery.

An assumption implicit in this calculation is that the removal of fish by the Canadian inriver fishery does not alter the migratory timing distribution of individual stocks. This assumption may be violated because the Canadian fishery harvest rate of the inriver run varied between fishing periods.

RESULTS

Fish Wheel Operation

Fish wheels were operated on the Taku River from May 12 through October 4, except for June 25-27, and September 12-13 and 17-20, when both were shut down due to extreme high and low river levels. Fish wheel I, located furthest upriver, was installed on May 12; fish wheel II was installed on May 15. 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).[2]

Fish Wheel Catches

Daily catches of sockeye, pink, chum, and steelhead salmon in the Canyon Island fish wheels are listed in Appendices B.1. to B.4. Dates of operation and the total fish wheel catch by species for the 1984 to 2004 period are presented in Table 1. Graphs of the fish wheel CPUE for sockeye, pink, and chum salmon are included in Figure 3.

---

[2] 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.

The total catch of sockeye salmon in the Canyon Island fish wheels in 2004 was 6,255, 15.3% above the 1984 to 2003 average and similar to the catches from each of the previous three years. (Table 1; Appendix B.1). Catches occurred from June 4 through October 3, and peaked during statistical week 29 (July 11 to July 17), when 1,023 sockeye salmon were captured. Prior to the first Canadian and U.S. commercial fishery openings on June 20 (statistical week 26), 523 sockeye salmon (8.4% of the season total) had been captured in the fish wheels (Appendix B). 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 2004 pink salmon catch in the fish wheels at Canyon Island was 8,464 (Table 1; Appendix B), 47.2% below the 1984 to 2003 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 2004 (759 fish) occurred on July 25. The 2004 fish wheel catch of chum salmon was 414, 19.8% below the 1984 to 2003 average of 516. The peak daily catch of chum salmon (42 fish) occurred on September 5 (Appendix B.3). The fish wheel catch of steelhead was 63, 1.3% below the 1984 to 2003 average of 72.

Tagging and Recovery Data

Of the 6,255 sockeye salmon caught in the Taku fish wheels, 5,661 (90.5%) were tagged (Appendix B1). 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 B1. Recoveries downstream of Canyon Island totaled 35 (0.006% of tags applied), leaving 5,626 available for recapture in Canadian fisheries (Table 3). The Canadian commercial fishery recaptured 902 tagged sockeye and accounted for 58.7% of the total sockeye tags recovered or observed in upstream fisheries (Table 2). 1 tag was recovered in the Canadian test fishery; the catch-and-release fishery recovered 2 tags. Tags were also observed in terminal areas, principally Little Trapper, Tatsamenie and Kuthai lakes. These numbered 386, 108, and 38 respectively. The escapements to these locations numbered 9,613, 1,951, and 1,578 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 4 to October 3, 2004. A total of 905 tags with corresponding recovery date information were returned from 20,226 sockeye salmon examined in the Canadian fisheries (Table 3). Tagging data from statistical weeks 24-25 (June 6 through June19) and 35-36 (August 22 through September 4)) were pooled due to the limited number of tags out in this period, which marked the beginning and end of the run. Recovery data for other pooled weeks (SW28-SW29, SW30-SW31, and SW35-SW36) were pooled to combine weeks with statistically similar marked fractions. Recovery data from statistical weeks 27 (June 27 through July 3) and 32 (August 1through August 7) were treated separately due to changes in tag recovery rates. Tagging and recovery data were grouped into 11 and 7 strata, respectively (Table 4).

Using a maximum likelihood Darroch estimator, we estimated that 125,727 sockeye salmon passed Canyon Island between June 4 and October 3. The approximate 95% confidence interval associated with the estimate was 117,197 to 134,257 fish. This estimate was expanded by the cumulative proportion of fish wheel CPUE through June 4 and after Sept 5 to estimate the number of sockeye salmon that had passed before and after the period of the mark-recapture estimate. Using this method an estimate of 1,758 sockeye passed Canyon Island during statistical weeks 22 to 24 and 37 to 41. This estimate was also reduced by the U.S. inriver personal use fishery catch which was estimated at 660 sockeye using a tag return expansion method based on inriver commercial marked fraction (4.7%). The total estimate of sockeye salmon migrating past Canyon Island was 127,307. This estimate of is 2.9% lower than the 1984 to 2003 average (131,123 sockeye salmon; Table 5; Figure 4; TTC 2004).

The Taku River sockeye salmon run above Canyon Island was exploited by the Canadian fisheries at an estimated rate of 15.9%, compared to a 1984-2003 average of 19.7% (range 11.6 to 31.2%; Table 5). After removal of 20,160, and 66 sockeye salmon by the Canadian commercial and test fisheries respectively, from the estimated escapement to the Canada/U.S. border, the spawning escapement totaled an estimated 106,701 fish (Table 4).

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 small. Small numbers of sockeye salmon have 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 2003 averaged 4.2% (range 0.0 to 9.1%; Table 6). In 2004, the contribution of jacks was 1.0%

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 2004 mark-recapture data was not examined by fish size.

Migratory Timing

The mean date (July 18) and standard deviation (19.5 days) of the sockeye salmon run in 2004 differed only slightly from 1984-2003 averages (July 20 and 18.8 days; Table 7). The 2004 run was two days earlier than average and slightly less compressed. Migratory timing statistics (mean date July 24; standard deviation 8.3 days) showed the pink salmon run timing was four days later than average and, like the sockeye salmon run, less 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 2004 was reflective of the run, the mean date of migration was September 4 (standard deviation 19.2 days). However, it is likely that this assumption was not completely valid as there was an interruption in fish wheel effort during the run (from September 12-13 and 17-20) and there were still a small number of chum being caught at the time of fish wheel demobilization.

Sockeye Salmon Stock Timing

The timing of three individual stock groups of sockeye salmon past Canyon Island in 2004 was determined using recoveries of tagged fish from enumeration weirs (Table 8; Figure 6). These were weirs on the outlet streams of Little Trapper (232 tags), Tatsamenie (104 tags), and Kuthai (30 tags) lakes (Table 2, Appendix C.1.).

The Kuthai Lake stock migrated past Canyon Island the earliest of these three stocks examined. These fish were passing Canyon Island from statistical weeks 25 to 31 (June 13 to July 31). The peak of the Kuthai Lake migration took place during statistical week 27 (June 27 to July 3).

Little Trapper Lake sockeye salmon were present at Canyon Island during statistical weeks 27 to 33 (June 27 to August 14). The peak of the Little Trapper Lake migration occurred during statistical week 29 (July 11 to July 17).

The Tatsamenie Lake stock exhibited the longest duration in return timing; tagged fish bound for this system were present at Canyon Island between statistical weeks 26 to 35 (June 20 to August 28). The peak week of migration for Tatsamenie Lake sockeye was statistical week 33 (August 8 to August 14).

Inriver Sockeye Salmon Migration Rates

Inriver travel times of three headwater 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, Little Trapper Lake and Tatsamenie Lake stocks are shown in Figure 7. Travel times averaged 34.0, 27.4 and 32.2 days for each of these respective stocks.

Migration rates generally increased over the course of the run. Kuthai Lake fish tagged in statistical week 26 averaged 43.9 days in transit, while those tagged in statistical week 29 averaged 29.4 days. For the Tatsamenie stock, fish tagged in statistical week 30 averaged 37.9 days in transit while fish tagged in statistical week 34 averaged 27.6 days. Little Trapper Lake fish tagged in statistical week 27 averaged 33.6 days in transit while those tagged in statistical week 32 averaged 24.9 days.

Age, Length, and Sex Composition

The age and sex compositions, by sex and time period, of the Canyon Island fish wheel catches of sockeye and chum salmon in 2004 are summarized in Appendices C and D. The results of regressions of paired measurements of mid-eye to fork of tail (MEF) and cliethral arch to fork of tail (CAF) lengths of sockeye and are summarized in Appendix F.

For sockeye salmon, age-1.3 fish were most prevalent (39.1%) with age-1.2 fish comprising 30.8%, age-2.2 3.4%, age-1.1 0.7%, age-0.2 7.5%, age-2.3 1.8%, age-0.3 16.2%, and very small numbers of age-0.1, 2.1, 0.4, 1.4, and 3.2, fish (Table 6). Age 0.1, 0.2, 0.3, 1.1, 1.2, 2.2, , and 2.3 sockeye salmon were slightly larger than the 1983 to 2003 average (Table 10). Female sockeye salmon were more prevalent (50.9%) than males (Appendix C).

Fish wheel catches of chum salmon were primarily comprised of age-0.3 (67.8%) fish, well above the 1983 to 2003 average of 51.8% (Table 11). Age-0.4 fish constituted 31.9% of the fish wheel catch. Male chum salmon were more prevalent (50.1%) than males (Appendix D). The average length at age for chum salmon passing Canyon Island was 633, 623 , and 657 mm (MEF) for age 0.2, 0.3, and 0.4 fish respectively (Table 12).

DISCUSSION

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

With respect to assumption (a), tagging efforts at the Taku River fish wheels and recovery efforts 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). 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 mark-recapture data for 2003 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 26 through 36, 1,886 fish were examined for tagging needle marks in the Canadian commercial fishery, after fishers had removed tags. The numbers of tagging needle holes was compared with tag recovery rates, and found to be consistently lower (Appendix E). (An additional 26 fish were examined in the spring test fishery; no tagging needle holes were observed and no tags had been recovered). This does not support the hypothesis that there is tag loss between the fish wheels and the fishery. 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.

Other data that can be used to infer the degree of short term tag loss are the tagged to untagged ratios of fish in the inriver fishery and at upstream recovery locations. In the commercial, test, and catch-and-release fisheries the pooled tagged to untagged ratio for sockeye salmon was 4.5 %, while it was 4.0% in the pooled recovery sample from the three principal recovery areas, Kuthai, Little Trapper and Tatsamenie lakes. While this data is not conclusive evidence that significant tag loss is not occurring, it does generally support the findings of more rigorous experiments; short-term tag loss appears to be negligible for the sockeye mark-recapture program. If tag loss is occurring it would be most pronounced at the upstream locations due to increased travel time (Table 9).

Fish wheels were not modified in 2004 and functioned effectively. As in recent years, a 2-basket configuration was used for the entire season.

LITERATURE CITED

(ADF&G) Alaska Department of Fish and Game. 1955. Annual Report for 1955. Report No. 7, Juneau.

Andel, J.E. and I.M. Boyce. Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks from 1998 to 2002. PSC Tech. Rep. No. 14, December 2004

Arnason, A. N., C. W. Kirby, C. J. Schwarz, and J. R. Irvine. 1996. Computer analysis of data from stratified mark-recovery experiments for estimation of salmon escapements and other populations. Canadian Technical Report of Fisheries and Aquatic Sciences. 2106: 37p.

Boyce, I.M. and J.E. Andel. Mark-Recapture Studies of Taku River Adult Sockeye Salmon Stocks in 2003. PSC Tech. Rep. No. 17, December 2005

Chapman, D. G., and C. O. Junge. 1956. The estimation of the size of a stratified animal population. Annals of Mathematical Statistics. 27:375-389.

Clark, J. E., A. J. McGregor, and F. E. Bergander. 1986. Migratory timing and escapement of Taku River salmon stocks, 1984-1985. In ADF&G (Alaska Department of Fish and Game) Section Report in 1985 Salmon Research conducted in Southeast Alaska by the Alaska Department of Fish and Game in conjunction with the National Marine Fisheries Service Auke Bay Labouratory for Joint U.S.-Canada Interception Studies. Division of Commercial Fisheries, Final Report, Contract Report WASC-85-ABC-00142 Juneau, Alaska.

Darroch, J. N. 1961. The two-sample capture-recapture census when tagging and sampling are stratified. Biometrika. 48:241-260.

Kelley, M. S., P. A. Milligan, and A. J. McGregor. 1997. Adult mark-recapture studies of Taku River adult salmon stocks in 1995. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 1J97-01. Juneau.

Kelley, M. S. and P. A. Milligan. 1997. Adult mark-recapture studies of Taku River adult salmon stocks in 1996. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 1J97-22. Juneau.

Kerr, F. A. 1948. Taku River map area, British Columbia. Canadian Department of Mines and Resources, Geological Survey Memoir 248, Ottawa.

Marcus, M. G. 1960. Periodic drainage of glacier-dammed Tulsequah Lake, British Columbia. The Geographical Review V. L., 1: 89-106.

McGregor, A. J., and J. E. Clark. 1987. Migratory timing and escapement of Taku River salmon stocks in 1986. Final Report - 1986 Salmon Research Conducted in Southeast Alaska by the Alaska Department of Fish and Game in Conjunction with the National Marine Fisheries Service Auke Bay Labouratory for Joint U.S.-Canada Interception Studies. Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau.

McGregor, A. J., and J. E. Clark. 1988. Migratory timing and escapement of Taku River salmon stocks in 1987. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 1J88-26, Juneau.

McGregor, A. J., and J. E. Clark. 1989. Migratory timing and escapement of Taku River salmon stocks in 1988. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 1J89-40, Juneau.

LITERATURE CITED (Continued)

McGregor, A. J., P. A. Milligan, and J. E. Clark. 1991. Adult mark-recapture studies of Taku River salmon stocks in 1989. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 91-05, Juneau.

Mundy, P. R. 1982. Computation of migratory timing statistics for adult Chinook salmon in the Yukon River, Alaska, and their relevance to fisheries management. North American Journal of Fisheries Management 2:359-370.

Plante, N. 1990. Estimation de la taille d'une population animale à l'aide d'une modèle de capture-recapture avec stratification. M. Sc. thesis, Université Laval, Quebec.

Schellekens, M. F., K. R. Linn, B. B. Bigelow, S. K. Shaw, and M. M. Hiner. 1996. Water resources data Alaska water year 1995. U.S. Geological Survey water Data report. AK-95-1.

TTC (Transboundary Technical Committee). 2003. Pacific Salmon Commission Joint Transboundary Technical Committee. Estimates of transboundary river salmon production, harvest, and escapement and a review of joint enhancement activities in 2002. Pacific Salmon Commission, TCTR (02)-2, Vancouver, British Columbia.

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

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	63	313
Average(84-03)		5,425	16,023	516	72	666

Table 2. Summary of Taku River sockeye tag recoveries by location and species, 2004

	Tags Recovered	Tags Observed Only	Total	Fish Inspected	Tag Ratio	Percent Tags Observed
Canadian Fishery	906	0	906	20,239	4.5%	60.8%
Test Fishery	2	0	2	50	4.0%	0.1%
Catch&Release Fishery	1	0	1	16	6.3%	0.1%
Kuthai Lake	33	5	38	1,578	2.4%	2.5%
Little Trapper Lake	234	152	386	9,613	4.0%	25.9%
Tatsamenie Lake	104	4	108	1,951	5.5%	7.2%
Nahlin River	0	0	0	50	0.0%	0.0%
U.S. Downstream	50	-	50	na	na	3.4%
Total	1,280	161	1,491	33,497		100.0%

Table 3. Tagging and recovery data from the 2004 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 25	26	27	28	29	30	31	32	33	34	35	36	Total Tags Recovered	Total Tags Applied	Tag Ratio Recovered/ Applied
24	0	0	1	0	0	0	0	0	0	0	0	0	1	44	0.023
25	1	61	11	1	0	0	0	0	0	0	0	0	74	447	0.166
26	0	40	55	11	0	0	0	0	0	0	0	0	106	441	0.240
27	0	0	10	26	1	0	0	0	0	0	0	0	37	284	0.130
28	0	0	0	23	31	3	1	0	0	0	0	0	58	496	0.117
29	0	0	0	0	69	102	8	2	0	0	0	0	181	930	0.195
30	0	0	0	0	0	70	81	7	4	0	0	0	162	795	0.204
31	0	0	0	0	0	0	18	102	10	2	1	0	133	801	0.166
32	0	0	0	0	0	0	0	27	30	1	1	1	60	450	0.133
33	0	0	0	0	0	0	0	0	23	24	6	3	56	495	0.113
34	0	0	0	0	0	0	0	0	0	4	19	1	24	322	0.075
35	0	0	0	0	0	0	0	0	0	0	6	2	8	77	0.104
36	0	0	0	0	0	0	0	0	0	0	0	5	5	44	0.114
Total	1	101	76	61	101	175	108	138	67	31	33	12	905	5,626	0.161
Sockeye Examined[a]:													Total		
Test Fishery	16											62	78		
Can. Comm. Catch[b]	0	2,020	1,845	1,605	3,169	3,763	2,881	1,739	1,676	780	589	81	20,148		
Total	16	2,020	1,845	1,605	3,169	3,763	2,881	1,739	1,676	780	589	143	20,226		

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

[b] 10 sockeye caught by the Canadian test fishery in SW 37 are not included within the above matrix.

Table 4. Pooled-strata tagging and recovery data used to calculate mark-recapture estimates of the inriver sockeye salmon run past Canyon Island, 2004.

Statistical Week of Tagging	Statistical Week of Recovery 25-26	27	28-29	30-31	32	33-34	35-36	Total Tags Recovered	Total Tags Applied	Tag Ratio
24-25	62	12	1					75	491	0.153
26	40	55	11					106	441	0.240
27		10	27					37	284	0.130
28			54	4				58	496	0.117
29			69	110	2			181	930	0.195
30				151	7	4		162	795	0.204
31				18	102	12	1	133	801	0.166
32					27	31	2	60	450	0.133
33						47	9	56	495	0.113
34						4	20	24	322	0.075
35-36							13	13	121	0.107
Total	102	77	162	283	138	98	45	905	5,626	0.161
Catch Eaxmined For Tags	2,036	1,845	4,774	6,644	1,739	2,456	732	20,226		
Marked Fraction	0.053	0.044	0.035	0.044	0.086	0.042	0.066	0.047		
Total Above-Border Run	14,997	2,389	38,716	29,512	10,420	20,774	8,918	125,727		
Fish Wheel CPUE Expansion[a]								1,758		
U.S. Personal Use Fishery[b]								660		
Adjusted Total Above-Border Run								126,825		
Aboriginal Fishery[c]							120	120		
95% Lower C.I.	10,984	-2,118	32,037	25,345	8,168	14,920	5,883	117,197		
95% Upper C.I.	19,011	6,896	45,395	33,679	12,673	26,628	11,953	134,257		
Spawning Escapement	12,961	544	33,942	22,868	8,681	18,318	8,066	106,479		

[a] Expansion based on fish wheel CPUE

[b] Tags from personal use catch expanded by inriver commerical marked fraction (4.7%) to obtain total catch

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

Table 5. Historical sockeye salmon above border abundance, above border harvests, and escapement for the Taku River, 1984 to 2004.

Year	Border Escapement	Canadian Harvest	Canadian 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	127,047	20,226	0.159	106,701	198,625	71,578
Average(84-03)	131,123	26,013	0.197	104,907	229,640	99,510
Maximum(84-03)	200,918	47,988	0.312	167,691	399,277	207,008
Minimum(84-03)	91,548	12,967	0.116	70,715	118,452	25,811
S.D.(84-03)	30,655	9,376	0.049	24,732	71,522	47,698
C.V.(84-03)	23.4%	36.0%	25.0%	23.6%	31.1%	47.9%

Table 6. Historical age composition of sockeye salmon passing Canyon Island, Taku River, 1983 to 2004.

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
Average(83-03)	2,686	0.3	4.9	3.5	7.9	24.7	0.4	0.1	49.0	5.3	0.2	4.0	0.0	0.0	0.0
SD(83-03)		0.3	3.3	2.1	4.1	7.7	0.5	0.1	8.8	2.8	0.1	2.0	0.0	0.0	0.0
CV(83-03)		88.4%	66.7%	59.5%	52.3%	31.1%	118.0%	133.2%	17.9%	52.2%	68.1%	50.9%	-	-	-

Table 7. Migratory timing statistics of sockeye, pink , and chum salmon past the Canyon Island fish wheels, 1984 to 2004. 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
Average(84-03)	7/20	18.8	7/20	8.2	8/31	13.0

Table 8. Weekly and cumulative proportions of three individual sockeye salmon stocks passing Canyon Island in 2004, based on spawning ground tag recoveries expanded by fish wheel indices (fish wheel CPUE).

			Kuthai Lake		Little Trapper Lake		Tatsamenie Lake	
Statistical Week	Week Starting	Week Ending	Weekly Proportion	Cumulative Proportion	Weekly Proportion	Cumulative Proportion	Weekly Proportion	Cumulative Proportion
22	23-May	29-May						
23	30-May	5-Jun						
24	6-Jun	12-Jun						
25	13-Jun	19-Jun	0.05	0.05				
26	20-Jun	26-Jun	0.25	0.30			0.02	0.02
27	27-Jun	3-Jul	0.30	0.60	0.07	0.07	0.02	0.04
28	4-Jul	10-Jul	0.15	0.75	0.18	0.25	0.00	0.04
29	11-Jul	17-Jul	0.14	0.89	0.37	0.62	0.01	0.05
30	18-Jul	24-Jul	0.06	0.95	0.20	0.83	0.13	0.18
31	25-Jul	31-Jul	0.05	1.00	0.10	0.93	0.18	0.36
32	1-Aug	7-Aug			0.04	0.97	0.23	0.59
33	8-Aug	14-Aug			0.03	1.00	0.28	0.87
34	15-Aug	21-Aug					0.10	0.97
35	22-Aug	28-Aug					0.03	1.00
36	29-Aug	4-Sep						
37	5-Sep	11-Sep						

Table 9. Inriver migration timing for three Taku River sockeye salmon stocks, 2004.

Stock	Week	Travel Time	SD	SE	N	95% C.I.
Tatsamenie	26	58.5	4.90	3.5	2	6.79
	27	50.0			1	
	28				0	
	29	46.0			1	
	30	37.9	4.5	1.2	14	2.36
	31	32.9	6.4	1.4	20	2.80
	32	31.2	5.7	1.1	26	2.19
	33	29.3	5.7	1.1	26	2.19
	34	27.6	3.4	1.0	11	2.01
	35	24.3	3.5	2.0	3	3.96
	Average	32.2	7.5		104	
	Week	Travel Time	SD	SE	N	95% C.I.
L. Trapper	26	37.0			1	
	27	33.6	4.2	1.5	8	2.94
	28	31.5	3.3	0.5	47	0.96
	29	27.3	4.8	0.5	90	0.98
	30	25.1	4.2	0.6	49	1.18
	31	24.1	4.9	1.1	21	2.10
	32	24.9	4.2	1.3	10	2.59
	33	22.0	2.8	1.1	6	2.21
	Average	27.4	5.1		232	
	Week	Travel Time	SD	SE	N	95% C.I.
Kuthai	25	44.0	9.9	7.0	2	13.7
	26	43.9	10.2	3.6	8	7.1
	27	28.6	3.4	1.5	5	3.0
	28	30.3	6.6	2.7	6	5.3
	29	29.4	2.5	1.1	5	2.2
	30	21.5	0.7	0.5	2	1.0
	31	33.0	1.4	1.0	2	2.0
	Average	34.0	9.7		30	

Table 10. Historical length (MEF) at age composition of sockeye salmon passing Canyon Island, Taku River, 2004

	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			
Average(83-03)	2,665	316	447	326	573	479	334	598	576	503	595	579	610	515	555
SD(83-03)		13.2	11.4	8.6	9.2	13.4	14.4	20.9	10.0	14.6	18.2	10.8	49.2		-
CV(83-03)		4.2%	2.5%	2.6%	1.6%	2.8%	4.3%	3.5%	1.7%	2.9%	3.1%	1.9%	8.1%		-

Table 11. Historical age composition of chum salmon passing Canyon Island, Taku River, 2004

	Sample	Percent by Age Class				
Year	Size	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
Average (83-03)	356	1.3	51.8	46.0	2.4	0.0
SD (83-03)		1.8	23.6	23.3	2.8	0.2

Table 12. Historical length (MEF) at age composition of chum salmon passing Canyon Island, Taku River, 1983 to 2002.

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	
Average (83-03)	354	595	633	664	675	640
SD (83-03)		42.1	15.7	12.2	25.4	56.6
CV (83-03)		7.1%	2.5%	1.8%	3.8%	8.8%

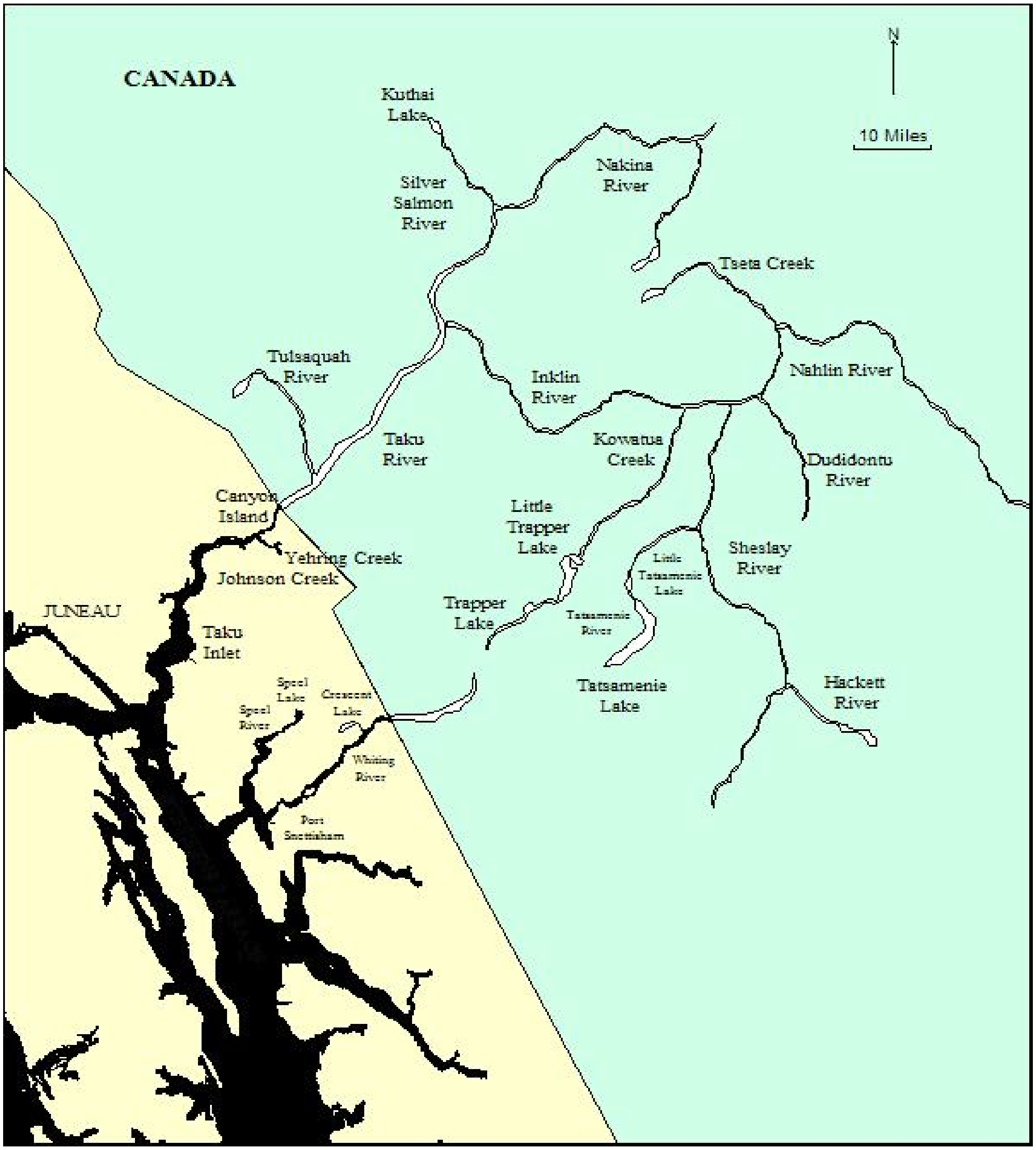


Figure 1. Taku River drainage, with location of tagging sites.

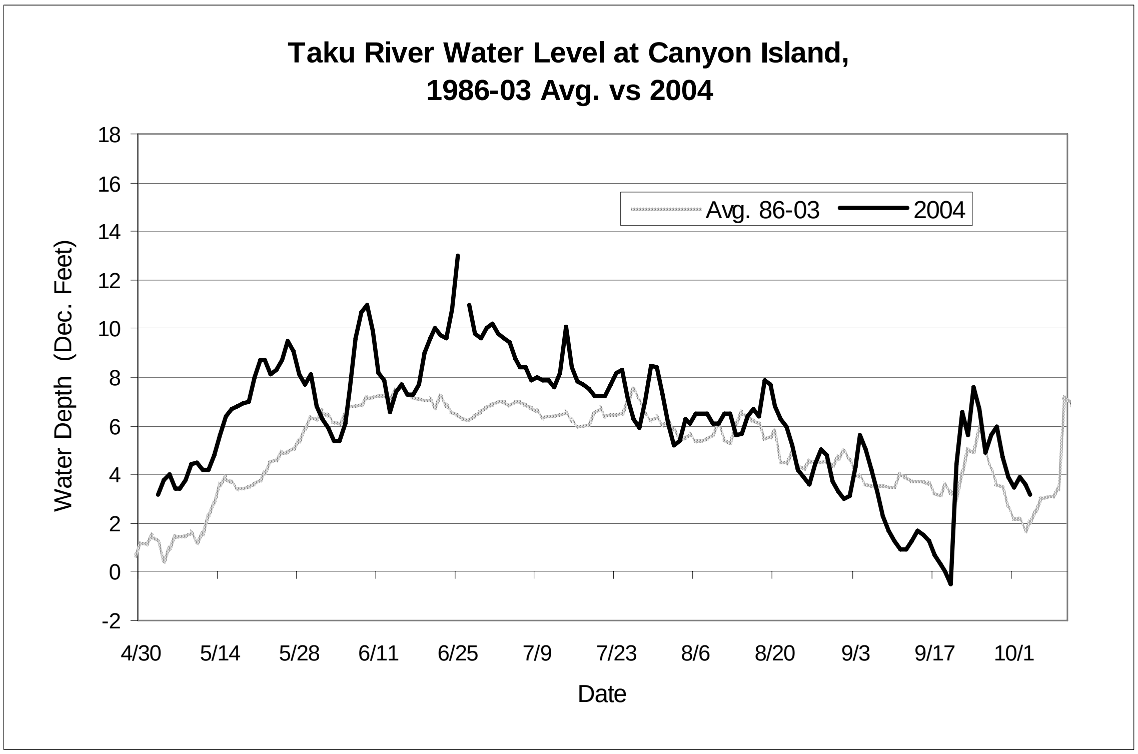
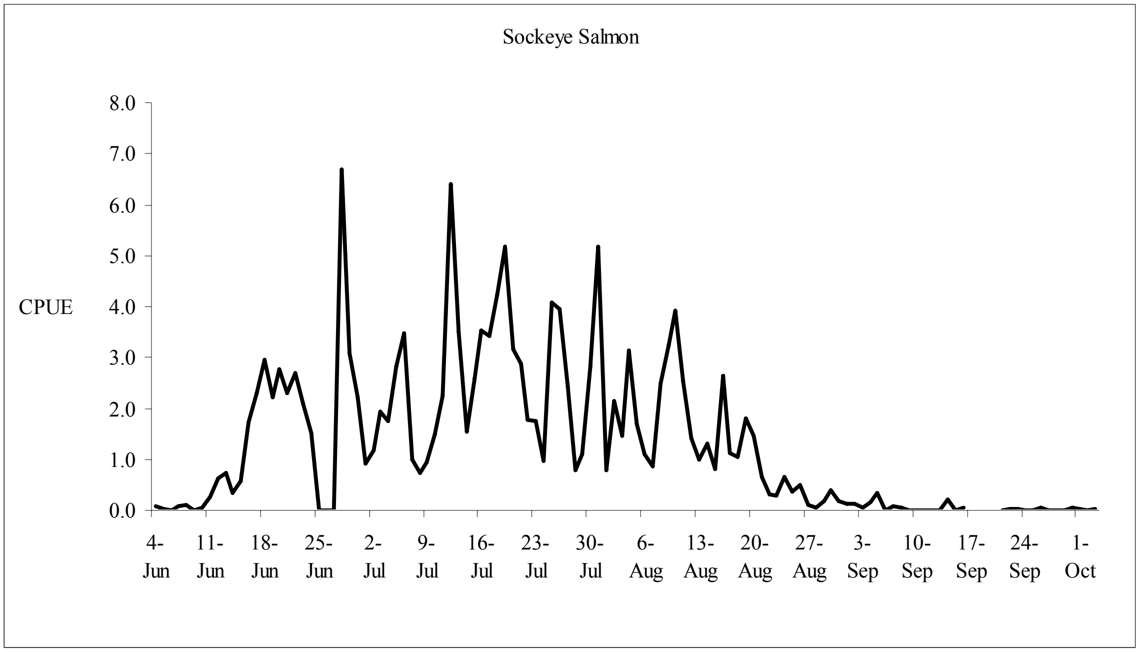


Figure 2. Canyon Island fish wheel dates of operation and catches of sockeye, pink, chum, steelhead, and Dolly Varden



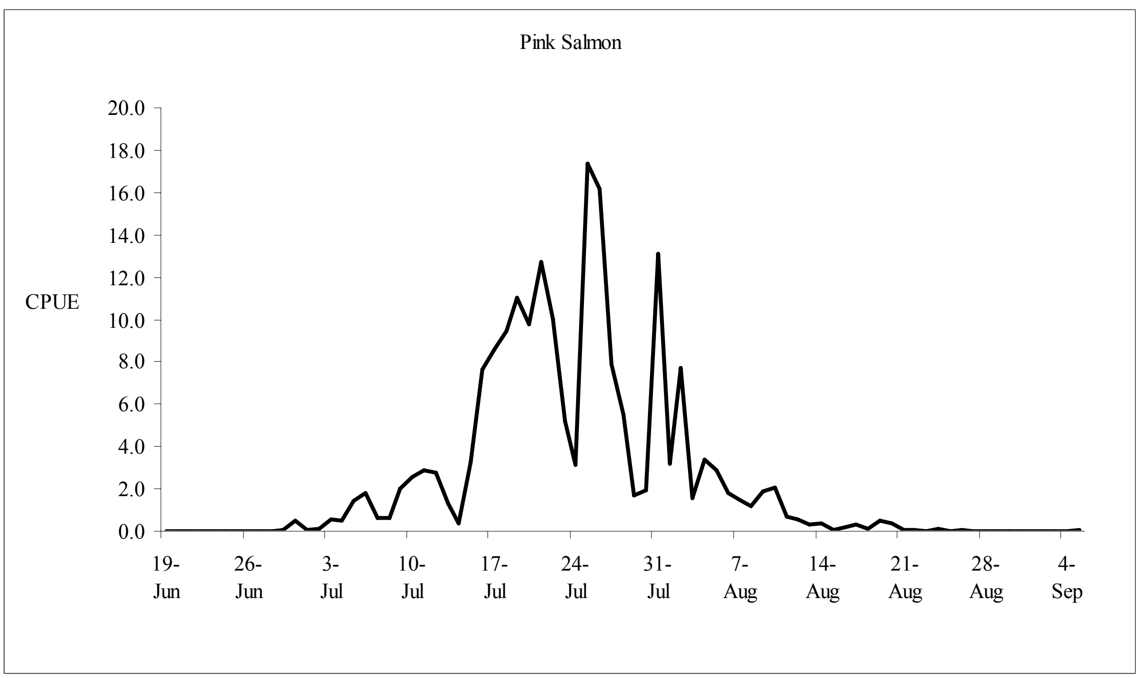
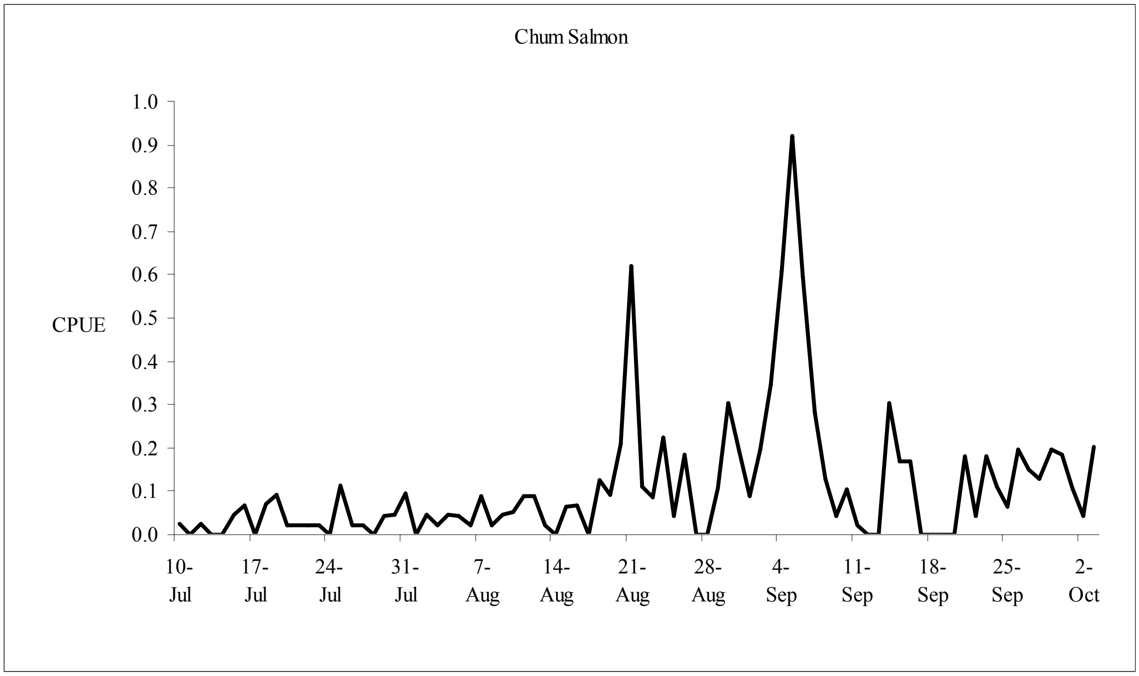


Figure 3. Fish wheel CPUE for sockeye, pink, and chum salmon at Canyon Island, 2004.

- continued -

Figure 3. continued



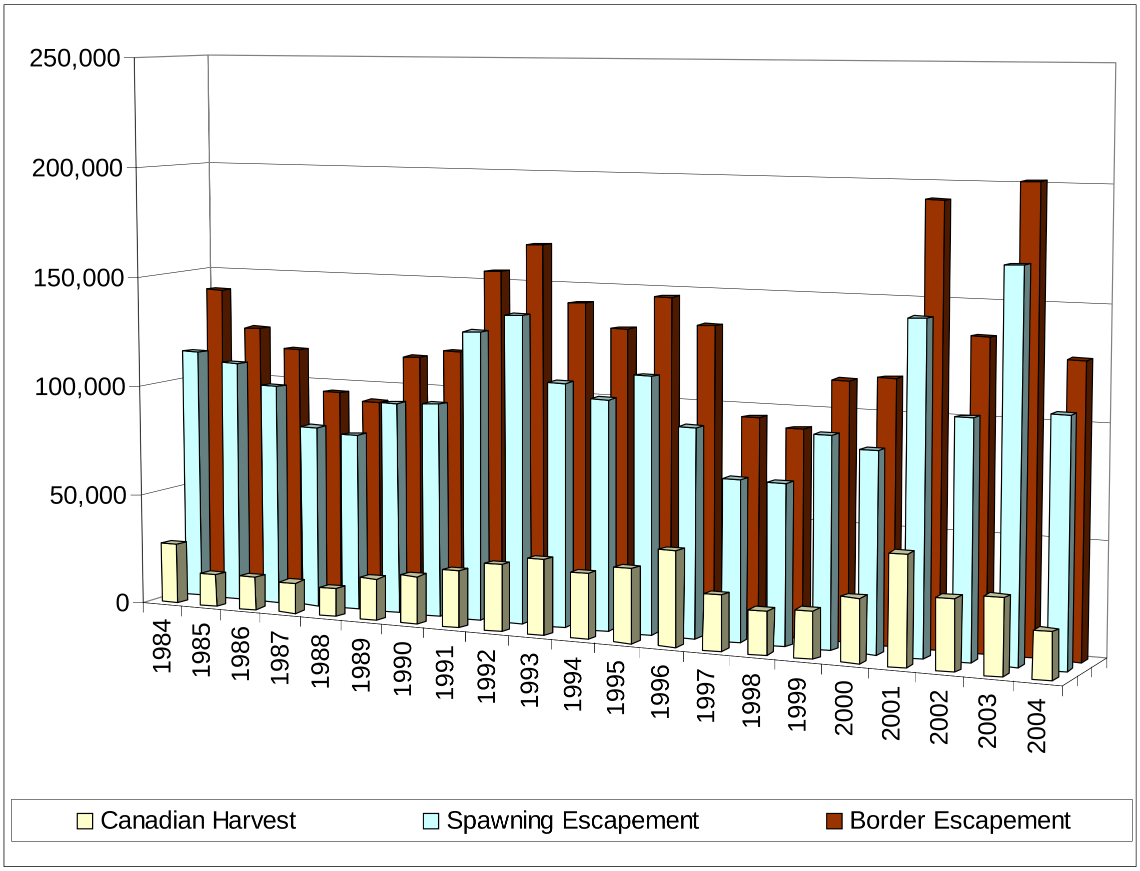


Figure 4. Historical sockeye mark-recapture abundance estimates above the U.S./Canada border including Canadian inriver harvests and escapements for Taku River sockeye, 1984-2004.

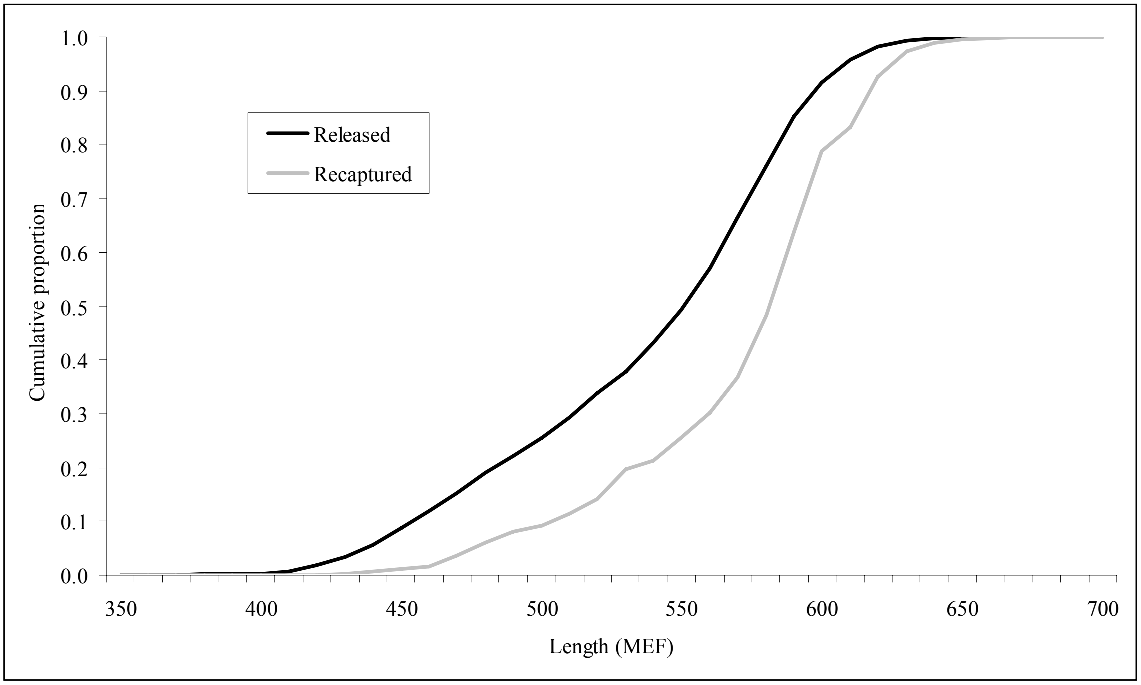


Figure 5. Cumulative distribution functions (CDF) of MEF lengths of sockeye salmon tagged at Canyon Island and of tagged sockeye salmon recovered in the Canadian commercial fishery, 2004

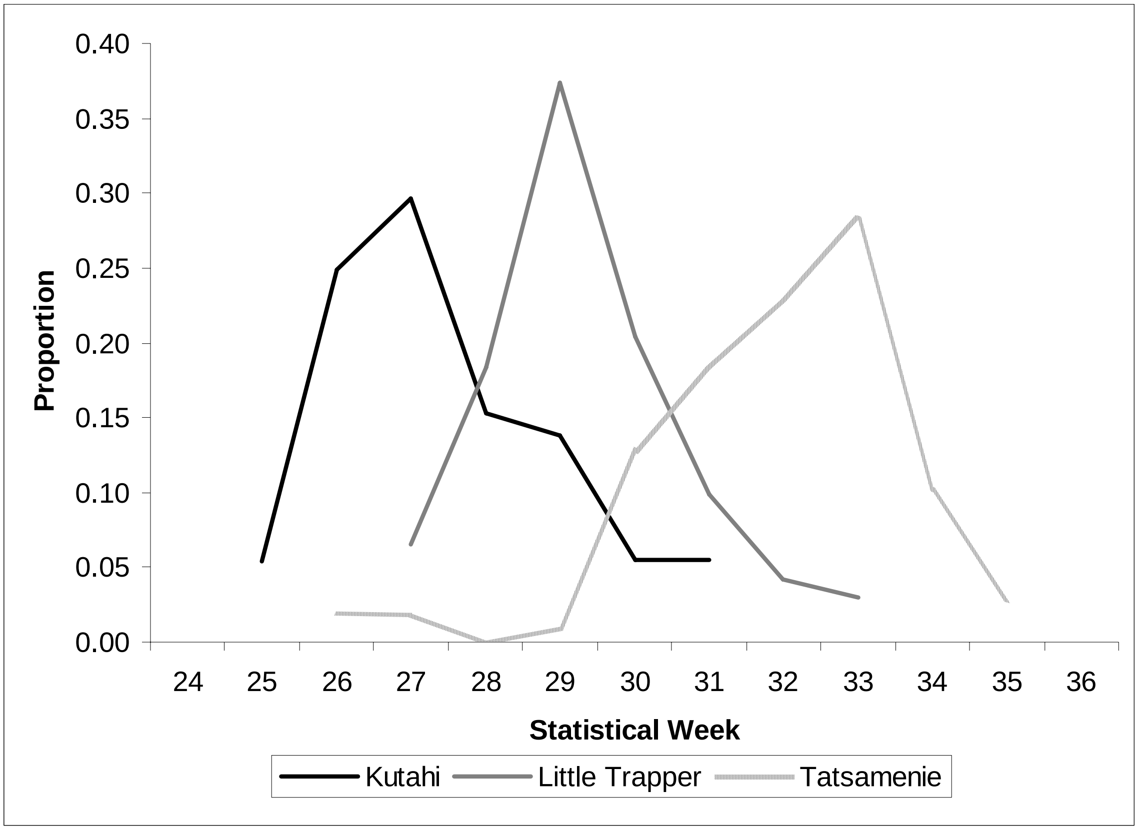


Figure 6. Run timing of three sockeye salmon stock groups passing Canyon Island, 2004.

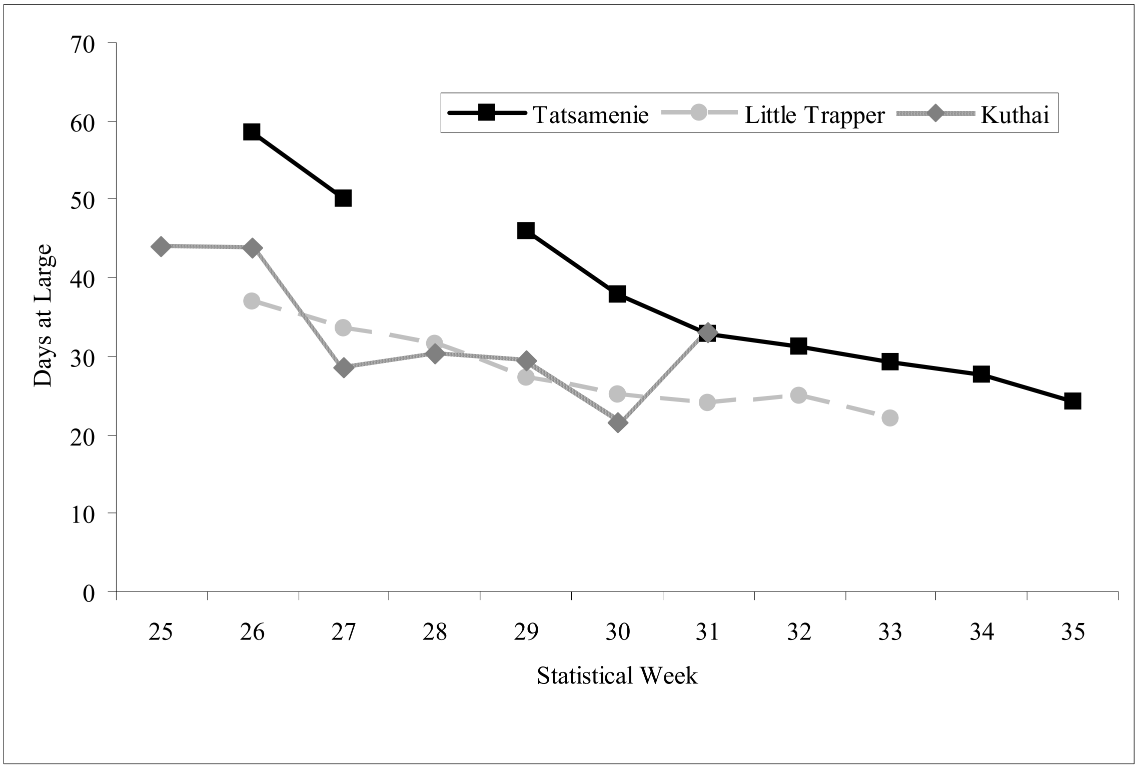


Figure 7. Mean travel times (and 95% confidence intervals) of spaghetti tagged sockeye salmon between Canyon Island and three upriver locations, 2004.

Appendix A. Inclusive dates for statistical weeks, 2004.

2004 Statistical Week Calendar

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

Appendix B (Page 1 of 4). Catches, number tagged, and CPUE of sockeye, pink, and chum salmon in the fish wheels at Canyon Island, 2004.

		FISHING EFFORT				WATER		SOCKEYE					PINK			CHUM		
Stat		FWI	FWI	FWII	FWII	Temp.	Level	FW Catches		FW Tagged		CPUE	FW Catches		CPUE	Total Catches		CPUE
Week	Date	Effort	RPM	Effort	RPM	(°C)	(dec.ft.)	Daily	Cum.	Daily	Cum.	Daily	Daily	Cum.	Daily	Daily	Cum.	Daily
18	29-Apr					4.3	0.8											
18	30-Apr					4.9	1.2	0	0	0	0		0	0		0	0	
18	1-May					5.1	1.9	0	0	0	0		0	0		0	0	
19	2-May					4.7	2.8	0	0	0	0		0	0		0	0	
19	3-May					4.9	3.2	0	0	0	0		0	0		0	0	
19	4-May					4.5	3.8	0	0	0	0		0	0		0	0	
19	5-May					4.3	4.0	0	0	0	0		0	0		0	0	
19	6-May					4.8	3.4	0	0	0	0		0	0		0	0	
19	7-May					7.2	3.4	0	0	0	0		0	0		0	0	
19	8-May					6.1	3.8	0	0	0	0		0	0		0	0	
20	9-May	**NO FISHING**				6.5	4.4		0		0			0			0	
20	10-May	**NO FISHING**				6.1	4.5		0		0			0			0	
20	11-May					7.7	4.2	0	0	0	0		0	0		0	0	
20	12-May	23.16	2.2			6.0	4.2	0	0	0	0		0	0		0	0	
20	13-May	23.25	2.2			6.0	4.8	0	0	0	0		0	0		0	0	
20	14-May	23.25	2.8			6.2	5.6	0	0	0	0		0	0		0	0	
20	15-May	23.17	2.8	10.67	2.1	6.3	6.4	0	0	0	0		0	0		0	0	
21	16-May	22.16	2.9	22.16	2.9	6.4	6.7	0	0	0	0		0	0		0	0	
21	17-May	21.42	2.9	22.08	2.8	6.9	6.8	0	0	0	0		0	0		0	0	
21	18-May	22.16	2.6	22.33	2.8	6.8	6.9	0	0	0	0		0	0		0	0	
21	19-May	20.08	2.8	22.67	2.8	6.9	7.0	0	0	0	0		0	0		0	0	
21	20-May	14.50	3.2	17.00	2.7	7.6	8.0	0	0	0	0		0	0		0	0	
21	21-May	18.75	3.1	23.50	2.1	6.9	8.7	0	0	0	0		0	0		0	0	
21	22-May	23.00	3.2	23.50	2.3	6.3	8.7	0	0	0	0		0	0		0	0	
22	23-May	22.25	3.0	22.75	2.4	6.4	8.1	0	0	0	0		0	0		0	0	
22	24-May	17.08	2.9	22.75	2.4	7.8	8.3	0	0	0	0		0	0		0	0	
22	25-May	22.92	3.3	22.42	2.9	7.2	8.7	0	0	0	0		0	0		0	0	
22	26-May	23.25	3.6	22.50	2.6	7.2	9.5	0	0	0	0		0	0		0	0	
22	27-May	22.83	3.2	21.92	2.5	7.0	9.1	0	0	0	0		0	0		0	0	
22	28-May	22.16	3.1	21.08	2.4	8.0	8.1	0	0	0	0		0	0		0	0	
22	29-May	21.58	3.1	18.83	2.4	7.9	7.7	0	0	0	0		0	0		0	0	
23	30-May	23.00	3.0	23.00	2.6	6.4	8.1	0	0	0	0		0	0		0	0	
23	31-May	23.25	2.8	22.58	1.9	7.3	6.8	0	0	0	0		0	0		0	0	
23	1-Jun	21.33	2.5	20.67	2.2	8.3	6.3	0	0	0	0		0	0		0	0	
23	2-Jun	22.85	2.3	23.33	2.1	7.9	5.9	0	0	0	0		0	0		0	0	
23	3-Jun	23.00	2.0	23.00	2.1	8.0	5.4	0	0	0	0		0	0		0	0	
23	4-Jun	22.75	2.3	23.25	2.1	10.4	5.4	4	4	3	3	0.087	0	0		0	0	
23	5-Jun	23.42	3.0	23.58	3.0	8.5	6.1	1	5	1	4	0.021	0	0		0	0	
24	6-Jun	23.25	3.5	23.00	2.9	7.8	7.5	0	5	0	4	0.000	0	0		0	0	
24	7-Jun	6.00	3.5	23.33	3.1	8.7	9.6	2	7	2	6	0.068	0	0		0	0	
24	8-Jun			18.16	3.1	9.2	10.7	2	9	2	8	0.110	0	0		0	0	

Appendix B (page 2 of 4)

		FISHING EFFORT				WATER		SOCKEYE					PINK			CHUM		
Stat		FWI	FWI	FWII	FWII	Temp.	Level	FW Catches		FW Tagged		CPUE	FW Catches		CPUE	Total Catches		CPUE
Week	Date	Effort	RPM	Effort	RPM	(°C)	(dec.ft.)	Daily	Cum.	Daily	Cum.	Daily	Daily	Cum.	Daily	Daily	Cum.	Daily
24	9-Jun			22.84	2.3	8.8	11.0	0	9	0	8	0.000	0	0		0	0	
24	10-Jun	9.08	3.3	22.67	2.4	7.7	9.9	2	11	1	9	0.063	0	0		0	0	
24	11-Jun	22.25	2.8	22.17	2.4	8.7	8.2	12	23	12	21	0.270	0	0		0	0	
24	12-Jun	21.84	2.4	22.84	2.2	8.2	7.9	28	51	27	48	0.627	0	0		0	0	
25	13-Jun	22.75	2.3	23.00	2.1	8.5	6.6	33	84	31	79	0.721	0	0		0	0	
25	14-Jun	22.83	2.7	23.33	2.6	8.7	7.4	16	100	15	94	0.347	0	0		0	0	
25	15-Jun	23.00	2.8	22.50	2.4	8.1	7.7	26	126	24	118	0.571	0	0		0	0	
25	16-Jun	21.42	2.7	21.83	2.2	8.6	7.3	75	201	71	189	1.734	0	0		0	0	
25	17-Jun	22.42	2.6	21.33	2.2	9.3	7.3	101	302	95	284	2.309	0	0		0	0	
25	18-Jun	21.67	2.8	19.67	2.4	9.8	7.7	122	424	117	401	2.951	0	0		0	0	
25	19-Jun	23.16	3.2	21.16	2.8	10.2	9.0	99	523	94	495	2.234	1	1	0.0234	0	0	
26	20-Jun	22.75	3.5	20.00	2.5	9.6	9.6	118	641	113	608	2.760	0	1	0.0000	0	0	
26	21-Jun	23.33	3.3	21.83	2.6	10.1	10.0	104	745	97	705	2.303	0	1	0.0000	0	0	
26	22-Jun	22.50	3.3	22.00	2.6	10.4	9.7	120	865	113	818	2.697	0	1	0.0000	0	0	
26	23-Jun	23.16	3.4	21.42	2.4	10.8	9.6	93	958	84	902	2.086	0	1	0.0000	0	0	
26	24-Jun	12.00	3.5	11.83	2.4	7.0	10.8	36	994	34	936	1.511	0	1	0.0000	0	0	
26	25-Jun	**NO FISHING - FLOOD**				6.4	13.0		994		936	0.000		1	0.0000		0	
26	26-Jun	**NO FISHING - FLOOD**				5.5			994		936	0.000		1	0.0000		0	
27	27-Jun	**NO FISHING - FLOOD**				10.0	11.0		994		936	0.000		1	0.0000		0	
27	28-Jun			9.25	2.5	11.8	9.8	62	1,056	59	995	6.703	0	1	0.0000	0	0	
27	29-Jun			21.75	1.9	10.1	9.6	67	1,123	62	1,057	3.080	1	2	0.0460	0	0	
27	30-Jun			21.58	2.2	11.2	10.0	48	1,171	42	1,099	2.224	11	13	0.5097	0	0	
27	1-Jul			23.16	2.6	9.9	10.2	21	1,192	18	1,117	0.907	2	15	0.0864	0	0	
27	2-Jul	3.83	3.0	22.75	2.7	10.0	9.8	31	1,223	28	1,145	1.166	3	18	0.1129	0	0	
27	3-Jul	23.08	2.7	20.75	2.3	9.7	9.6	85	1,308	75	1,220	1.939	24	42	0.5476	0	0	
28	4-Jul	22.75	3.0	22.67	2.2	9.5	9.4	80	1,388	75	1,295	1.761	23	65	0.5064	0	0	
28	5-Jul	23.25	2.9	22.33	2.6	10.0	8.8	129	1,517	116	1,411	2.830	66	131	1.4480	0	0	
28	6-Jul	22.67	2.5	20.67	2.4	9.5	8.4	151	1,668	139	1,550	3.484	80	211	1.8459	0	0	
28	7-Jul	23.42	2.7	23.25	2.5	9.3	8.4	46	1,714	40	1,590	0.986	28	239	0.6000	0	0	
28	8-Jul	23.00	2.6	22.67	2.2	7.7	7.9	33	1,747	29	1,619	0.723	29	268	0.6350	0	0	
28	9-Jul	23.50	3.0	23.08	2.4	9.2	8.0	44	1,791	43	1,662	0.945	94	362	2.0180	0	0	
28	10-Jul	23.25	3.0	16.92	2.2	8.9	7.9	60	1,851	55	1,717	1.494	103	465	2.5641	1	1	0.0249
29	11-Jul	22.16	2.8	22.08	2.1	8.3	7.9	100	1,951	95	1,812	2.260	128	593	2.8933	0	1	0.0000
29	12-Jul	23.00	2.7	20.08	2.2	7.7	7.6	276	2,227	262	2,074	6.407	120	713	2.7855	1	2	0.0232
29	13-Jul	22.83	2.9	21.16	2.6	8.8	8.2	154	2,381	142	2,216	3.501	59	772	1.3412	0	2	0.0000
29	14-Jul	23.67	3.0	22.58	3.2	6.6	10.1	71	2,452	66	2,282	1.535	17	789	0.3676	0	2	0.0000
29	15-Jul	23.08	2.7	21.50	2.6	7.9	8.4	115	2,567	97	2,379	2.580	144	933	3.2301	2	4	0.0449
29	16-Jul	22.50	2.6	21.67	2.2	10.0	7.8	156	2,723	143	2,522	3.532	337	1,270	7.6296	3	7	0.0679
29	17-Jul	22.42	2.9	21.67	2.5	10.1	7.7	151	2,874	138	2,660	3.425	380	1,650	8.6187	0	7	0.0000
30	18-Jul	21.92	2.8	20.50	2.4	9.6	7.5	180	3,054	168	2,828	4.243	401	2,051	9.4531	3	10	0.0707
30	19-Jul	22.00	2.6	21.16	2.3	9.4	7.2	223	3,277	202	3,030	5.167	477	2,528	11.0519	4	14	0.0927

Appendix B (Page 3 of 4).

		FISHING EFFORT				WATER		SOCKEYE					PINK			CHUM		
Stat		FWI	FWI	FWII	FWII	Temp.	Level	FW Catches		FW Tagged		CPUE	FW Catches		CPUE	Total Catches		CPUE
Week	Date	Effort	RPM	Effort	RPM	(°C)	(dec.ft.)	Daily	Cum.	Daily	Cum.	Daily	Daily	Cum.	Daily	Daily	Cum.	Daily
30	20-Jul	22.08	2.5	22.33	2.4	9.5	7.2	141	3,418	130	3,160	3.175	435	2,963	9.7951	1	15	0.0225
30	21-Jul	22.33	2.7	22.00	2.4	10.3	7.2	128	3,546	118	3,278	2.887	565	3,528	12.7453	1	16	0.0226
30	22-Jul	22.83	2.8	22.42	2.4	9.2	7.7	81	3,627	72	3,350	1.790	454	3,982	10.0331	1	17	0.0221
30	23-Jul	22.58	3.0	22.25	2.9	7.6	8.2	78	3,705	71	3,421	1.740	232	4,214	5.1751	1	18	0.0223
30	24-Jul	23.42	2.7	23.08	2.6	7.9	8.3	45	3,750	41	3,462	0.968	146	4,360	3.1398	0	18	0.0000
31	25-Jul	22.00		21.75		9.3	7.1	179	3,929	163	3,625	4.091	759	5,119	17.3486	5	23	0.1143
31	26-Jul	22.42	2.2	21.42	1.9	9.4	6.3	173	4,102	155	3,780	3.946	710	5,829	16.1953	1	24	0.0228
31	27-Jul	21.67	2.0	22.58	1.7	10.0	5.9	108	4,210	101	3,881	2.441	349	6,178	7.8870	1	25	0.0226
31	28-Jul	23.16	3.0	23.33	2.6	9.2	7.0	36	4,246	27	3,908	0.774	256	6,434	5.5066	0	25	0.0000
31	29-Jul	23.25	2.8	23.50	2.3	8.7	8.5	51	4,297	48	3,956	1.091	78	6,512	1.6684	2	27	0.0428
31	30-Jul	23.00	2.6	21.83	2.5	8.9	8.4	127	4,424	117	4,073	2.833	88	6,600	1.9630	2	29	0.0446
31	31-Jul	21.67	2.2	19.92	2.1	8.9	7.3	215	4,639	200	4,273	5.170	545	7,145	13.1041	4	33	0.0962
32	1-Aug	23.33	1.3	23.16	2.3	7.7	6.1	36	4,675	33	4,306	0.774	149	7,294	3.2050	0	33	0.0000
32	2-Aug	22.33	2.3	21.33	1.8	8.1	5.2	94	4,769	91	4,397	2.153	337	7,631	7.7187	2	35	0.0458
32	3-Aug	22.92	2.5	23.08	2.3	9.0	5.4	67	4,836	62	4,459	1.457	73	7,704	1.5870	1	36	0.0217
32	4-Aug	22.92	2.5	21.00	2.4	7.9	6.3	138	4,974	120	4,579	3.142	149	7,853	3.3925	2	38	0.0455
32	5-Aug	22.67	2.3	22.42	2.3	8.6	6.1	77	5,051	63	4,642	1.708	130	7,983	2.8831	2	40	0.0444
32	6-Aug	23.33	2.7	23.67	2.6	8.3	6.5	51	5,102	45	4,687	1.085	84	8,067	1.7872	1	41	0.0213
32	7-Aug	22.33	2.6	22.83	2.6	7.0	6.5	39	5,141	36	4,723	0.864	67	8,134	1.4836	4	45	0.0886
33	8-Aug	22.33	2.6	21.83	2.4	7.3	6.5	110	5,251	96	4,819	2.491	52	8,186	1.1775	1	46	0.0226
33	9-Aug	22.25	2.2	22.00	2.0	8.1	6.1	143	5,394	129	4,948	3.232	84	8,270	1.8983	2	48	0.0452
33	10-Aug	9.25	2.6	10.33	2.3	8.4	6.1	77	5,471	68	5,016	3.933	40	8,310	2.0429	1	49	0.0511
33	11-Aug	11.42	2.8	11.00	2.4	10.4	6.5	57	5,528	50	5,066	2.542	16	8,326	0.7136	2	51	0.0892
33	12-Aug	23.16	2.6	22.50	2.4	8.7	6.5	65	5,593	55	5,121	1.424	27	8,353	0.5913	4	55	0.0876
33	13-Aug	23.42	2.2	23.08	2.2	8.7	5.6	46	5,639	42	5,163	0.989	16	8,369	0.3441	1	56	0.0215
33	14-Aug	23.08	2.3	22.67	2.1	8.5	5.7	60	5,699	55	5,218	1.311	16	8,385	0.3497	0	56	0.0000
34	15-Aug	22.25	2.8	23.25	2.4	8.6	6.4	37	5,736	30	5,248	0.813	4	8,389	0.0879	3	59	0.0659
34	16-Aug	22.42	3.0	22.16	2.4	8.4	6.7	118	5,854	104	5,352	2.647	8	8,397	0.1795	3	62	0.0673
34	17-Aug	9.16	2.5	9.67	2.7	7.5	6.4	21	5,875	20	5,372	1.115	6	8,403	0.3186	0	62	0.0000
34	18-Aug	12.16	3.0	11.83	2.7	9.0	7.9	25	5,900	21	5,393	1.042	3	8,406	0.1251	3	65	0.1251
34	19-Aug	22.42	2.6	21.75	2.7	8.1	7.7	80	5,980	69	5,462	1.811	21	8,427	0.4754	4	69	0.0906
34	20-Aug	21.67	2.1	21.58	1.7	7.8	6.8	63	6,043	57	5,519	1.457	16	8,443	0.3699	9	78	0.2081
34	21-Aug	22.92	1.9	22.33	2.0	8.3	6.3	29	6,072	21	5,540	0.641	4	8,447	0.0884	28	106	0.6188
35	22-Aug	22.83	1.2	22.75	1.7	8.0	6.0	14	6,086	12	5,552	0.307	4	8,451	0.0878	5	111	0.1097
35	23-Aug	22.92	2.0	23.50	2.1	7.2	5.2	13	6,099	8	5,560	0.280	1	8,452	0.0215	4	115	0.0862
35	24-Aug	22.42	1.5	22.42	1.0	9.0	4.2	29	6,128	26	5,586	0.647	7	8,459	0.1561	10	125	0.2230
35	25-Aug	23.25	1.0	23.58	1.5	7.2	3.9	17	6,145	15	5,601	0.363	1	8,460	0.0214	2	127	0.0427
35	26-Aug	10.25	1.2	11.50	1.1	7.3	3.6	11	6,156	10	5,611	0.506	1	8,461	0.0460	4	131	0.1839
35	27-Aug	13.58	2.3	13.50	2.1	8.2	4.4	3	6,159	3	5,614	0.111	0	8,461	0.0000	0	131	0.0000
35	28-Aug	23.75	2.5	23.83	2.4	7.5	5.0	3	6,162	3	5,617	0.063	0	8,461	0.0000	0	131	0.0000
36	29-Aug	23.08	2.1	23.25	2.1	7.4	4.8	8	6,170	8	5,625	0.173	0	8,461	0.0000	5	136	0.1079

Appendix B (Page 4 of 4).

		FISHING EFFORT				WATER		SOCKEYE					PINK			CHUM		
Stat		FWI	FWI	FWII	FWII	Temp.	Level	FW Catches		FW Tagged		CPUE	FW Catches		CPUE	Total Catches		CPUE
Week	Date	Effort	RPM	Effort	RPM	(°C)	(dec.ft.)	Daily	Cum.	Daily	Cum.	Daily	Daily	Cum.	Daily	Daily	Cum.	Daily
36	30-Aug	22.92	1.2	23.16	1.6	7.8	3.7	18	6,188	18	5,643	0.391	0	8,461	0.0000	14	150	0.3038
36	31-Aug	23.33	1.7	23.50	1.6	7.9	3.3	9	6,197	5	5,648	0.192	0	8,461	0.0000	9	159	0.1922
36	1-Sep	22.25	1.3	22.83	1.5	7.6	3.0	6	6,203	6	5,654	0.133	0	8,461	0.0000	4	163	0.0887
36	2-Sep	22.33	1.9	23.50	1.9	7.8	3.1	6	6,209	5	5,659	0.131	0	8,461	0.0000	9	172	0.1964
36	3-Sep	23.08	2.1	23.25	2.2	7.5	4.3	2	6,211	2	5,661	0.043	0	8,461	0.0000	16	188	0.3453
36	4-Sep	21.67	2.6	22.75	2.2	8.1	5.6	7	6,218	0	5,661	0.158	1	8,462	0.0225	27	215	0.6078
37	5-Sep	23.00	1.5	22.58	1.5	6.5	5.0	16	6,234	0	5,661	0.351	2	8,464	0.0439	42	257	0.9215
37	6-Sep	22.42	1.9	23.00	1.6	6.0	4.2	0	6,234	0	5,661	0.000	0	8,464	0.0000	27	284	0.5945
37	7-Sep	22.67	1.5	23.16	1.5	6.5	3.3	3	6,237		5,661	0.065	0	8,464	0.0000	13	297	0.2837
37	8-Sep	23.25	1.0	23.42	1.0	6.0	2.3	2	6,239		5,661	0.043	0	8,464	0.0000	6	303	0.1286
37	9-Sep	23.33	1.0	23.75	1.0	6.0	1.7	0	6,239		5,661	0.000	0	8,464	0.0000	2	305	0.0425
37	10-Sep	23.50	1.0	23.75	1.0	6.0	1.3	0	6,239		5,661	0.000	0	8,464	0.0000	5	310	0.1058
37	11-Sep	23.75	0.5	23.83	0.5	7.0	0.9	0	6,239		5,661	0.000	0	8,464	0.0000	1	311	0.0210
38	12-Sep	**NO FISHING - low water**				7.0	0.9		6,239		5,661	0.000		8,464	0.0000		311	0.0000
38	13-Sep	**NO FISHING - low water**				7.0	1.3		6,239		5,661	0.000		8,464	0.0000		311	0.0000
38	14-Sep	23.08	1.2			7.0	1.7	5	6,244	0	5,661	0.217	0	8,464	0.0000	7	318	0.3033
38	15-Sep	23.83	0.1			7.0	1.5	0	6,244	0	5,661	0.000	0	8,464	0.0000	4	322	0.1679
38	16-Sep	23.92	0.1			6.0	1.3	1	6,245	0	5,661	0.042	0	8,464	0.0000	4	326	0.1672
38	17-Sep	**Wheels down - low water**				7.5	0.7	0	6,245	0	5,661		0	8,464	0.0000	3	329	0.0000
38	18-Sep	**Wheels down - low water**				7.0	0.3	2	6,247	0	5,661		0	8,464	0.0000	6	335	0.0000
39	19-Sep	**NO FISHING - low water**				7.0	0.0		6,247		5,661	0.000		8,464	0.0000		335	0.0000
39	20-Sep	**Wheels down - low water**				7.0	-0.5	0	6,247	0	5,661		0	8,464	0.0000	2	337	0.0000
39	21-Sep	21.92	1.5			7.0	4.4	0	6,247	0	5,661	0.000	0	8,464	0.0000	4	341	0.1825
39	22-Sep	22.75	3.1	23.33	2.5	6.5	6.6	1	6,248	0	5,661	0.022	0	8,464	0.0000	2	343	0.0434
39	23-Sep	21.00	2.4	23.08	2.0	6.0	5.6	1	6,249	0	5,661	0.023	0	8,464	0.0000	8	351	0.1815
39	24-Sep	21.92	2.6	22.83	1.7	6.0	7.6	0	6,249	0	5,661	0.000	0	8,464	0.0000	5	356	0.1117
39	25-Sep	22.50	2.0	23.50	1.5	5.5	6.7	0	6,249	0	5,661	0.000	0	8,464	0.0000	3	359	0.0652
40	26-Sep	22.58	1.5	23.58	1.5	5.5	4.9	2	6,251	0	5,661	0.043	0	8,464	0.0000	9	368	0.1950
40	27-Sep	23.08	2.4	23.50	2.3	6.0	5.6	0	6,251	0	5,661	0.000	0	8,464	0.0000	7	375	0.1503
40	28-Sep	23.00	2.0	23.25	1.8	6.0	6.0	0	6,251	0	5,661	0.000	0	8,464	0.0000	6	381	0.1297
40	29-Sep	22.83	1.3	23.16	1.4	6.0	4.7	0	6,251	0	5,661	0.000	0	8,464	0.0000	9	390	0.1957
40	30-Sep	22.16	1.8	21.58	1.8	6.8	3.9	2	6,253	0	5,661	0.046	0	8,464	0.0000	8	398	0.1829
40	1-Oct	23.33	2.0	23.08	1.5	7.0	3.5	1	6,254	0	5,661	0.022	0	8,464	0.0000	5	403	0.1077
40	2-Oct	23.42	2.1	23.67	2.1	7.1	3.9	0	6,254	0	5,661	0.000	0	8,464	0.0000	2	405	0.0425
41	3-Oct	22.75	2.0	22.00	2.0	7.0	3.6	1	6,255	0	5,661	0.022	0	8,464	0.0000	9	414	0.2011
41	4-Oct	9.83	1.9	10.67	1.6	7.0	3.2	0	6,255	0	5,661	0.000	0	8,464	0.0000	0	414	0.0000

Appendix C (Page 1 of 8). Age composition of sockeye salmon in the Canyon Island, Taku River fish wheels by sex and fishing period, 2004.

	Brood Year and Age Class										
	2002	2001	2001	2000	2000	1999	1999	1999	1998	1998	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 23 (May 30 - June 5)											
Male											
Sample Size							3				3
Percent							60.0				60.0
Std. Error							24.5				24.5
Female											
Sample Size							2				2
Percent							40.0				40.0
Std. Error							24.5				24.5
All Fish											
Sample Size							5				5
Percent							%100.0				100.0
Std. Error											
Statistical Week 24 (June 6 - 12)											
Male											
Sample Size					2		17				19
Percent					5.7		48.6				54.3
Std. Error					4.0		8.6				8.5
Female											
Sample Size					2		13	1			16
Percent					5.7		37.1	2.9			45.7
Std. Error					4.0		8.3	2.9			8.5
All Fish											
Sample Size					4		30	1			35
Percent					11.4		85.7	2.9			100.0
Std. Error					5.5		6.0	2.9			

Appendix C (Page 2 of 8).

	Brood Year and Age Class										
	2002	2001	2001	2000	2000	1999	1999	1999	1998	1998	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 25 (June 13 - 19)											
Male											
Sample Size				8	56		66	5			135
Percent				3.1	21.6		25.5	1.9			52.1
Std. Error				1.1	2.5		2.7	0.9			3.1
Female											
Sample Size				3	36		80	5			124
Percent				1.2	13.9		30.9	1.9			47.9
Std. Error				0.7	2.1		2.9	0.9			3.1
All Fish											
Sample Size				11	93		148	10			262
Percent				4.2	35.5		56.5	3.8			100.0
Std. Error				1.2	2.9		3.0	1.2			
Statistical Week 26 (June 20 - 26)											
Male											
Sample Size		1		2	41		43	5			92
Percent		0.7		1.4	28.1		29.5	3.4			63.0
Std. Error		0.7		1.0	3.7		3.8	1.5			4.0
Female											
Sample Size				2	13		36	3			54
Percent				1.4	8.9		24.7	2.1			37.0
Std. Error				1.0	2.4		3.6	1.2			4.0
All Fish											
Sample Size		1		4	54		79	8			146
Percent		0.7		2.7	37.0		54.1	5.5			100.0

Appendix C (Page 3 of 8).

	2002 0.1	2001 0.2	2001 1.1	2000 0.3	2000 1.2	1999 0.4	1999 1.3	1999 2.2	1998 1.4	1998 2.3	Total
	Brood Year and Age Class										
Statistical Week 27 (June 27 - July 3)											
Male											
Sample Size		6		5	51		34	5			101
Percent		3.1		2.6	26.4		17.6	2.6			52.3
Std. Error		1.2		1.1	3.2		2.7	1.1			3.6
Female											
Sample Size				3	40		44	2		3	92
Percent				1.6	20.7		22.8	1.0		1.6	47.7
Std. Error				0.9	2.9		3.0	0.7		0.9	3.6
All Fish											
Sample Size		6		8	91		78	7		3	193
Percent		3.1		4.1	47.2		40.4	3.6		1.6	100.0
Std. Error		1.2		1.4	3.6		3.5	1.3		0.9	
Statistical Week 28 (July 4 - 10)											
Male											
Sample Size		8		8	61		40	3		1	121
Percent		3.6		3.6	27.5		18.0	1.4		0.5	54.5
Std. Error		1.2		1.2	3.0		2.6	0.8		0.4	3.3
Female											
Sample Size		1		10	31		54	5			101
Percent		0.5		4.5	14.0		24.3	2.3			45.5
Std. Error		0.4		1.4	2.3		2.9	1.0			3.3
All Fish											
Sample Size		9		18	92		94	8		1	222
Percent		4.1		8.1	41.4		42.3	3.6		0.5	100.0

Appendix C (Page 4 of 8).

	Brood Year and Age Class										
	2002	2001	2001	2000	2000	1999	1999	1999	1998	1998	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 29 (July 11 - 17)											
Male											
Sample Size		21	1	7	43		32	4		3	111
Percent		9.3	0.4	3.1	18.9		14.1	1.8		1.3	48.9
Std. Error		1.9	0.4	1.1	2.6		2.3	0.9		0.8	3.3
Female											
Sample Size		1		20	28		57	7	1	2	116
Percent		0.4		8.8	12.3		25.1	3.1	0.4	0.9	51.1
Std. Error		0.4		1.9	2.2		2.9	1.1	0.4	0.6	3.3
All Fish											
Sample Size		22	1	27	71		89	11	1	5	227
Percent		9.7	0.4	11.9	31.3		39.2	4.8	0.4	2.2	100.0
Std. Error		2.0	0.4	2.1	3.1		3.2	1.4	0.4	1.0	
Statistical Week 30 (July 18 - 24)											
Male											
Sample Size		34	1	11	29		21	2		2	100
Percent		16.3	0.5	5.3	13.9		10.1	1.0		1.0	48.1
Std. Error		2.6	0.5	1.5	2.4		2.1	0.7		0.7	3.5
Female											
Sample Size		3		30	21		47		1	6	108
Percent		1.4		14.4	10.1		22.6		0.5	2.9	51.9
Std. Error		0.8		2.4	2.1		2.9		0.5	1.2	3.5
All Fish											
Sample Size		37	1	41	50		68	2	1	8	208
Percent		17.8	0.5	19.7	24.0		32.7	1.0	0.5	3.8	100.0

Appendix C (Page 5 of 8).

	Brood Year and Age Class										
	2002	2001	2001	2000	2000	1999	1999	1999	1998	1998	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 31 (July 25 - 31)											
Male											
Sample Size	3	26	2	22	30		16	1		1	101
Percent	1.4	12.5	1.0	10.6	14.4		7.7	0.5		0.5	48.6
Std. Error	0.8	2.3	0.7	2.1	2.4		1.8	0.5		0.5	3.5
Female											
Sample Size		1		41	22		40	1	1	1	107
Percent		0.5		19.7	10.6		19.2	0.5	0.5	0.5	51.4
Std. Error		0.5		2.8	2.1		2.7	0.5	0.5	0.5	3.5
All Fish											
Sample Size	3	27	2	63	52		56	2	1	2	208
Percent	1.4	13.0	1.0	30.3	25.0		26.9	1.0	0.5	1.0	100.0
Std. Error	0.8	2.3	0.7	3.2	3.0		3.1	0.7	0.5	0.7	
Statistical Week 32 (August 1 - 7)											
Male											
Sample Size		20	1	16	32		14	1		2	86
Percent		9.8	0.5	7.8	15.6		6.8	0.5		1.0	42.0
Std. Error		2.1	0.5	1.9	2.5		1.8	0.5		0.7	3.4
Female											
Sample Size		2		38	19		52	2		6	119
Percent		1.0		18.5	9.3		25.4	1.0		2.9	58.0
Std. Error		0.7		2.7	2.0		3.0	0.7		1.2	3.4
All Fish											
Sample Size		22	1	54	51		67	3		8	206
Percent		10.7	0.5	26.2	24.8		32.5	1.5		3.9	100.0

Appendix C (Page 6 of 8).

	Brood Year and Age Class										
	2002	2001	2001	2000	2000	1999	1999	1999	1998	1998	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 33 (August 8 - 14)											
Male											
Sample Size		12	4	21	27		24	1		5	94
Percent		5.5	1.8	9.7	12.4		11.1	0.5		2.3	43.3
Std. Error		1.5	0.9	2.0	2.2		2.1	0.5		1.0	3.4
Female											
Sample Size		6		46	21		40	9		1	123
Percent		2.8		21.2	9.7		18.4	4.1		0.5	56.7
Std. Error		1.1		2.8	2.0		2.6	1.3		0.5	3.4
All Fish											
Sample Size		18	4	67	48		64	10		6	217
Percent		8.3	1.8	30.9	22.1		29.5	4.6		2.8	100.0
Std. Error		1.9	0.9	3.1	2.8		3.1	1.4		1.1	
Statistical Week 34 (August 15 - 21)											
Male											
Sample Size	2	15	6	19	32		18	5		1	98
Percent	0.9	7.0	2.8	8.9	15.0		8.5	2.3		0.5	46.0
Std. Error	0.7	1.7	1.1	1.9	2.4		1.9	1.0		0.5	3.4
Female											
Sample Size		2		30	26	1	48	6	1	1	115
Percent		0.9		14.1	12.2	0.5	22.5	2.8	0.5	0.5	54.0
Std. Error		0.7		2.4	2.2	0.5	2.9	1.1	0.5	0.5	3.4
All Fish											
Sample Size	2	17	6	49	58	1	66	11	1	2	213
Percent	0.9	8.0	2.8	23.0	27.2	0.5	31.0	5.2	0.5	0.9	100.0

Appendix C (Page 7 of 8).

	Brood Year and Age Class										
	2002	2001	2001	2000	2000	1999	1999	1999	1998	1998	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Statistical Week 35 (August 22 - 28)											
Male											
Sample Size		8	1	2	9		1	1		3	25
Percent		12.9	1.6	3.2	14.5		1.6	1.6		4.8	40.3
Std. Error		4.3	1.6	2.3	4.5		1.6	1.6		2.7	6.3
Female											
Sample Size		1		12	8		15	1			37
Percent		1.6		19.4	12.9		24.2	1.6			59.7
Std. Error		1.6		5.1	4.3		5.5	1.6			6.3
All Fish											
Sample Size		9	1	14	17		16	2		3	62
Percent		14.5	1.6	22.6	27.4		25.8	3.2		4.8	100.0
Std. Error		4.5	1.6	5.3	5.7		5.6	2.3		2.7	
Statistical Week 36 (August 29 - Sept. 4)											
Male											
Sample Size	1			1	6		2			1	11
Percent	3.1			3.1	18.8		6.3			3.1	34.4
Std. Error	3.1			3.1	7.0		4.3			3.1	8.5
Female											
Sample Size				5	2		13		1		21
Percent				15.6	6.3		40.6		3.1		65.6
Std. Error				6.5	4.3		8.8		3.1		8.5
All Fish											
Sample Size	1			6	8		15		1	1	32
Percent	3.1			18.8	25.0		46.9		3.1	3.1	100.0

Appendix C (Page 8 of 8).

	Brood Year and Age Class										
	2002	2001	2001	2000	2000	1999	1999	1999	1998	1998	
	0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Combined Periods											
Male											
Sample Size	6	151	16	122	419		331	33		19	1,097
Percent	0.4	5.8	0.6	4.5	16.6		18.9	1.2		1.1	49.1
Std. Error	0.2	0.5	0.2	0.4	0.9		2.0	0.2		0.3	2.1
Female											
Sample Size		17		240	269	1	541	42	5	20	1,135
Percent		0.7		10.0	10.5	<0.1	27.0	1.7	0.4	0.7	50.9
Std. Error		0.2		0.7	0.7	<0.1	2.1	0.3	0.2	0.2	2.1
All Fish											
Sample Size	6	168	16	362	689	1	875	75	5	39	2,236
Percent	0.4	6.4	0.6	14.5	27.1	<0.1	46.0	2.9	0.4	1.8	100.0
Std. Error	0.2	0.5	0.2	0.8	1.1	<0.1	1.1	0.4	0.2	0.4	

Appendix D (Page 1 of 7). Age composition of chum salmon in the Canyon Island, Taku River fish wheels by sex and fishing period, 2004.

	Brood Year and Age Class				
	2001	2000	1999	1998	
	0.2	0.3	0.4	0.5	Total
Statistical Week 29 (July 11 - 17)					
Male					
Sample Size		3	2		5
Percent		60.0	40.0		100.0
Std. Error		24.5	24.5		0.0
Female					
Sample Size					0
Percent					0.0
Std. Error					0.0
All Fish					
Sample Size		3	2		5
Percent		60.0	40.0		100.0
Std. Error		24.5	24.5		
Statistical Week 30 (July 18 - 24)					
Male					
Sample Size		3	3		6
Percent		37.5	37.5		75.0
Std. Error		18.3	18.3		16.4
Female					
Sample Size		2			2
Percent		25.0			25.0
Std. Error		16.4			16.4
All Fish					
Sample Size		5	3		8
Percent		62.5	37.5		100.0
Std. Error		18.3	18.3		

Appendix D (Page 2 of 7).

	2001 0.2	2000 0.3	1999 0.4	1998 0.5	Total
	Brood Year and Age Class				
Statistical Week 31 (July 25 - 31)					
Male					
Sample Size		5			5
Percent		50.0			50.0
Std. Error		16.7			16.7
Female					
Sample Size		3	2		5
Percent		30.0	20.0		50.0
Std. Error		15.3	13.3		16.7
All Fish					
Sample Size		8	2		10
Percent		80.0	20.0		100.0
Std. Error		13.3	13.3		
Statistical Week 32 (August 1 - 7)					
Male					
Sample Size		3	2		5
Percent		42.9	28.6		71.4
Std. Error		20.2	18.4		18.4
Female					
Sample Size		1	1		2
Percent		14.3	14.3		28.6
Std. Error		14.3	14.3		18.4
All Fish					
Sample Size		4	3		7
Percent		57.1	42.9		100.0
Std. Error		20.2	20.2		

Appendix D (Page 3 of 7).

	Brood Year and Age Class				
	2001	2000	1999	1998	
	0.2	0.3	0.4	0.5	Total
Statistical Week 33 (August 8 - 14)					
Male					
Sample Size		4			4
Percent		50.0			50.0
Std. Error		18.9			18.9
Female					
Sample Size		3	1		4
Percent		37.5	12.5		50.0
Std. Error		18.3	12.5		18.9
All Fish					
Sample Size		7	1		8
Percent		87.5	12.5		100.0
Std. Error		12.5	12.5		
Statistical Week 34 (August 15 - 21)					
Male					
Sample Size		18	10		28
Percent		39.1	21.7		60.9
Std. Error		7.3	6.1		7.3
Female					
Sample Size		14	4		18
Percent		30.4	8.7		39.1
Std. Error		6.9	4.2		7.3
All Fish					
Sample Size		32	14		46
Percent		69.6	30.4		100.0
Std. Error		6.9	6.9		

Appendix D (Page 4 of 7).

	Brood Year and Age Class				
	2001	2000	1999	1998	
	0.2	0.3	0.4	0.5	Total
Statistical Week 35 (August 22 - 28)					
Male					
Sample Size		6	2		8
Percent		26.1	8.7		34.8
Std. Error		9.4	6.0		10.1
Female					
Sample Size		10	5		15
Percent		43.5	21.7		65.2
Std. Error		10.6	8.8		10.1
All Fish					
Sample Size		16	7		23
Percent		69.6	30.4		100.0
Std. Error		9.8	9.8		
Statistical Week 36 (August 29 - Sept. 4)					
Male					
Sample Size		13	11		24
Percent		24.1	20.4		44.4
Std. Error		5.9	5.5		6.8
Female					
Sample Size		18	12		30
Percent		33.3	22.2		55.6
Std. Error		6.5	5.7		6.8
All Fish					
Sample Size		37	25		62
Percent		59.7	40.3		100.0
Std. Error		6.3	6.3		

Appendix D (Page 5 of 7).

	Brood Year and Age Class				
	2001	2000	1999	1998	
	0.2	0.3	0.4	0.5	Total
Statistical Week 37 (Sept. 5 - 11)					
Male					
Sample Size	2	29	11		42
Percent	2.5	36.3	13.8		52.5
Std. Error	1.8	5.4	3.9		5.6
Female					
Sample Size		28	9	1	38
Percent		35.0	11.3	1.3	47.5
Std. Error		5.4	3.5	1.2	5.6
All Fish					
Sample Size	2	57	20	1	80
Percent	2.5	71.3	25.0	1.3	100.0
Std. Error	1.8	5.1	4.9	1.2	
Statistical Week 38 (Sept. 12 - 18)					
Male					
Sample Size		1			1
Percent		33.3			33.3
Std. Error		33.3			33.3
Female					
Sample Size		2			2
Percent		66.7			66.7
Std. Error		33.3			33.3
All Fish					
Sample Size		3			3
Percent		100.0			100.0
Std. Error					

Appendix D (Page 6 of 7).

	Brood Year and Age Class				
	2001	2000	1999	1998	
	0.2	0.3	0.4	0.5	Total
Statistical Week 39 (Sept. 19 - 25)					
Male					
Sample Size		6	1		7
Percent		33.3	5.6		38.9
Std. Error		11.4	5.6		11.8
Female					
Sample Size		6	5		11
Percent		33.3	27.8		61.1
Std. Error		11.4	10.9		11.8
All Fish					
Sample Size		12	6		18
Percent		66.7	33.3		100.0
Std. Error		11.4	11.4		
Statistical Week 40 (Sept. 26 - October 2)					
Male					
Sample Size		3	1		4
Percent		11.1	3.7		14.8
Std. Error		6.2	3.7		7.0
Female					
Sample Size		10	13		23
Percent		37.0	48.1		85.2
Std. Error		9.5	9.8		7.0
All Fish					
Sample Size		13	14		27
Percent		48.1	51.9		100.0
Std. Error		9.8	9.8		

Appendix D (Page 7 of 7).

	Brood Year and Age Class				
	2001	2000	1999	1998	
	0.2	0.3	0.4	0.5	Total
Statistical Week 41 (October 3 - 9)					
Male					
Sample Size			2		2
Percent			25.0		25.0
Std. Error			16.4		16.4
Female					
Sample Size		4	2		6
Percent		50.0	25.0		75.0
Std. Error		18.9	16.4		16.4
All Fish					
Sample Size		4	4		8
Percent		50.0	50.0		100.0
Std. Error		18.9	18.9		
Combined Periods					
Male					
Sample Size	2	94	45		141
Percent	0.2	34.2	15.7		50.1
Std. Error	0.1	4.5	3.2		4.2
Female					
Sample Size		101	54	1	156
Percent		33.5	16.2	0.1	49.9
Std. Error		4.2	2.6	0.1	4.2
All Fish					
Sample Size	2	201	101	1	305
Percent	0.2	67.8	31.9	0.1	100.0
Std. Error	0.1	3.8	3.8	0.1	

Appendix E. Results of study to test for short term tag loss for sockeye salmon tagged at the Canyon Island fish wheels, 2004.

Stat. Week	Canadian Commercial Catch	Tags Recovered	Fishery Ratio	Fish Examined for 2nd Marks	Number of 2nd Marks	Sample ratio	Fishery Ratio - Sampled Ratio
26	2020	101	5.0%	200	10	5.0%	0.0%
27	1845	77	4.2%	200	7	3.5%	0.7%
28	1605	61	3.8%	200	4	2.0%	1.8%
29	3169	101	3.2%	199	7	3.5%	-0.3%
30	3763	175	4.7%	201	8	4.0%	0.7%
31	2881	108	3.7%	200	6	3.0%	0.7%
32	1739	138	7.9%	200	12	6.0%	1.9%
33	1676	67	4.0%	200	3	1.5%	2.5%
34	780	31	4.0%	200	7	3.5%	0.5%
35	589	33	5.6%	81	3	3.7%	1.9%
36	81	10	12.3%	5	0	0.0%	12.3%
Totals	20,148	902		1,886	67		