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Adult Mark-Recapture Studies of Taku River Salmon Stocks in 1989

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ABSTRACT

Mark-recapture studies of Taku River salmon (*Oncorhynchus*) stocks were conducted by the Alaska Department of Fish and Game and the Canadian Department of Fisheries and Oceans in 1989. The objectives of the program were to provide in-season estimates of the inriver abundance of sockeye (*O. nerka*) and coho salmon (*O. kisutch*) and postseason estimates of the inriver abundance of pink (*O. gorbuscha*) and chum salmon (*O. keta*), and to document the migratory timing and migration rates of specific Taku River sockeye salmon stocks. Marked to unmarked ratios of salmon harvested in Canadian inriver commercial and test gill net fisheries were used to develop the estimates of the inriver abundance of sockeye and coho salmon. A total of 5,650 sockeye salmon were captured in fish wheels located at Canyon Island, Alaska, of which 4,997 were tagged and 1,400 were subsequently recovered in fisheries or on the spawning grounds. An estimated 99,467 ± 9,536 (95% confidence interval) sockeye salmon migrated upriver past Canyon Island from 18 June to 25 September. Fish wheel catch per unit effort was used to estimate the portion of the return prior to 18 June. The total inriver return of sockeye salmon past Canyon Island was estimated to be 114,068 fish. Canadian commercial, test, and food fisheries harvested 18,805 sockeye salmon, thereby reducing the estimate of escapement to 95,263. The use of different capture methods that varied in size-selectivity for marking and recapture gear was shown to have little effect on the estimate of sockeye salmon run size. A total of 2,243 coho salmon were caught in the fish wheels, 2,125 were tagged, and 297 were subsequently recovered in fisheries or on the spawning grounds. Tagging terminated prior to the end of the run; however, we estimated that 60,841 ± 21,901 fish had passed Canyon Island by 1 October. The coho salmon escapement past the fisheries was 56,808. The fish wheel catch of pink salmon was 31,189 fish, of which 3,760 were tagged, and 268 later recovered. An estimated 340,000-500,000 pink salmon migrated above Canyon Island. Tagging and recovery efforts for chum salmon were too low to generate an estimate of the inriver run size for this species. The mean dates of migration of sockeye and pink salmon were slightly earlier than during 1984-1988. Migration rates of Little Trapper and Little Tatsamenie Lake sockeye salmon stocks increased through the season. The age compositions of sockeye, coho, and chum salmon fish wheel catches changed significantly through the season, but the age composition of chinook salmon catches did not.

KEY WORDS: Mark-recapture, escapement estimation, migratory timing, Taku River, transboundary river, salmon, fish wheel, age and sex composition, Pacific Salmon Treaty

INTRODUCTION

The Taku River originates in northern British Columbia and flows through Southeast Alaska, emptying into the Pacific Ocean near Juneau, Alaska (Figure 1). All five species of Pacific salmon (*Oncorhynchus*) return to spawn in the drainage and are primarily exploited by Canadian inriver and Alaskan District 111 commercial gill net fisheries and Alaskan commercial troll fisheries. Relatively small numbers of fish of Taku River origin are harvested by Canadian and Alaskan sport fisheries and inriver Canadian Indian food and Alaskan personal use fisheries.

Research on Taku River salmon has intensified in this decade as a result of treaty negotiations between the United States and Canada regarding salmon interceptions. Treaty negotiations revealed the lack of basic knowledge of the population dynamics of transboundary river stocks and of the contributions of these stocks to Alaskan and Canadian fisheries. The Pacific Salmon Treaty was drafted and ratified by the two countries in 1985; it mandated that specific proportions of any surplus return of sockeye salmon (*O. nerka*) not needed to satisfy escapement requirements for the Taku River be allocated to each country's fishermen. This agreement necessitated the development of stock assessment programs to monitor the Taku River sockeye salmon run size and harvest sharing proportions on an in-season basis.

Research programs designed to provide data necessary to manage fisheries in accordance with treaty directives were initiated on the Taku River in 1983. The Alaska Department of Fish and Game (ADF&G) initiated a scale pattern analysis program in 1983 to estimate the contribution of Taku River sockeye salmon stocks to the District 111 fishery (McGregor and Walls 1987). Mark-recapture studies on the Taku River, jointly operated by the ADF&G and the Canadian Department of Fisheries and Oceans (DFO), have been conducted annually since 1984 to produce estimates of the Taku River escapements of sockeye, pink (*O. gorbuscha*), coho (*O. kisutch*) and chum salmon (*O. keta*; Clark et al. 1986; McGregor and Clark 1987, 1988, 1989). The studies were expanded in 1988 to determine the feasibility of developing mark-recapture estimates of the Taku River chinook salmon escapement. In 1989 the National Marine Fisheries Service (NMFS), Auke Bay Laboratory, undertook a large-scale companion radio telemetry study of Taku River chinook salmon. This report presents results from Taku River mark-recapture studies conducted in 1989, with the exception of chinook salmon studies.

The specific objectives of the mark-recapture program were to:

1) provide in-season estimates of the abundance of adult Taku River sockeye and coho salmon migrating past Canyon Island, Alaska,

2) estimate the abundance of adult Taku River pink and chum salmon migrating past Canyon Island,

3) document the migratory timing and inriver migration rates of specific Taku River sockeye salmon stocks, and

4) estimate the age and sex compositions of the inriver returns of adult chinook, sockeye, coho, and chum salmon past Canyon Island.

METHODS

Study Area Description

The Taku River originates in the Stikine Plateau of northwestern British Columbia and drains an area of approximately 16,000 square kilometers (Figure 1). The Taku is formed by the merging of two principal tributaries, the Inklin and Nakina Rivers, approximately 50 km upstream from the international border. 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 a turbid river, much of its discharge originating in glacial fields on the eastern slopes of the Coast Range Mountains. This turbidity precludes complete enumeration of most salmon escapements by aerial or foot surveys. Water discharge in the summer generally increases in proportion to the amount of sunshine received in the interior (ADF&G 1955). Winter flows are minimal, ranging from approximately 30-130 m^3/s at the U.S. Geological Survey's water gauging station located on the lower Taku River near Canyon Island (U.S.G.S. unpublished data). Discharge increases in April and May and reaches a maximum average flow of 900-1,200 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. Since 1987 the maximum flow measured during the floods has been 2,150 m^3/s. During the floods, water levels fluctuate dramatically, and the river carries a tremendous load of debris.

Fish Wheel Operation

Migrating adult salmon were captured with two fish wheels at Canyon Island, located approximately 4 km downstream from the international border (Figure 1). Each fish wheel consisted of a pontoon framework supporting an axle, paddles, and basket assemblies. Two fish-catching baskets were rotated about the axle by the force of the water current against two paddles. The paddles were attached to paddle uprights set at right angles to the baskets. Crossbracing connected the baskets and paddle uprights. As the fish wheel baskets rotated, they scooped up salmon. V-shaped slides attached to the rib structure of each basket directed fish to liveboxes bolted to the outer sides of the pontoons.

Each fish wheel was constructed of milled lumber and was supported by two 7-8 m long pontoons. Six to ten 200-L (55 gallon) steel barrels, most of which were filled with polyurethane foam, were strapped beneath each pontoon for flotation. The baskets measured 3.1 m by 3.7 m, were covered with nylon seine mesh (5.1 x 5.1 cm openings), and fished to a depth of approximately 3.45 m.

The fish wheels were positioned in the vicinity of Canyon Island on opposite river banks, 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 fish wheels rotated at 0-4 r.p.m., depending on the water velocity and the number of attached paddles. When water levels subsided, we attached more paddles and moved the fish wheels farther out from shore into faster water currents to maintain a speed of basket rotation adequate to catch fish.

Fish wheels were operated on the Taku River from 5 May through 1 October. A set gill net was used from 1-4 May to capture chinook salmon for tagging prior to deploying the fish wheels. One fish wheel was installed on 5 May and fished until 8 May, when large debris destroyed the baskets. This wheel was repaired and resumed operation again on 11 May. The second wheel began fishing on 15 May. The wheels were not operated from 15-17 August during high water caused by the release of Tulsequah Lake; water levels increased 7 feet in a 48-h period and the river was full of debris, including uprooted trees up to 30 m in length. Water flows declined to levels below that required to spin the fish wheels from 17-21 September, but increased thereafter, allowing one wheel to be fished again through 1 October. A set gill net was used from 19-21 September to capture fish for tagging but was discontinued when a fish wheel became operational again.

Tagging Procedures

All uninjured sockeye, coho, and chum salmon caught in the fish wheels and gill nets were tagged with the exception of individuals less than 350 mm in length (mid-eye to fork of tail; MEF). Sockeye, coho, and chum salmon less than 350 mm in length were not tagged because fish in this size range are virtually unsusceptible to capture in the upriver gill net fishery from which tagged to untagged ratios are used to develop population estimates for these species. So many pink salmon were caught that catches were subsampled for tagging throughout the season. Approximately one out of five pink salmon caught through 14 July was tagged, while about one out of ten was tagged after this date because high catches made it impractical to tag at the previous rate. Chinook salmon less than 440 mm MEF were not tagged due to the difficulty in recovering individuals in this size range on the spawning grounds, and because virtually all these fish are one-ocean 'jack' males (Kissner 1982) that are rarely taken in U.S. marine or Canadian inriver fisheries.

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 fish 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. Fish were handled with bare hands to reduce scale abrasion. Biological sampling was also conducted during application of the spaghetti tags. Sex and MEF length measurements were recorded, and scale samples taken from all chinook, sockeye, coho, and chum salmon caught. Sex and length

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

data were collected daily from a subsample of 25 pink salmon, but scales were not taken from this species. The tagging and sampling procedures took from 20 to 40 s per fish to complete. The fish were then immediately and gently immersed back into the river.

A total of 429 chinook salmon captured in the fish wheels were tagged with radio transmitters by the National Marine Fisheries Service (J. Eiler, NMFS, Auke Bay, Alaska, personal communication). A spaghetti tag was also affixed to these fish. Radio tagged fish were transported in tubs of water from the fish wheel site to slack water slough areas adjacent to Canyon Island for release. Movements of these fish in the river were tracked by NMFS primarily to determine the distribution of chinook salmon in the drainage.

Fish wheel catches were sampled in the morning, afternoon, and evening. More frequent checks were made during the peak migration to minimize holding time and overcrowding of fish in the liveboxes.

The spaghetti tags we used were made of hollow PVC tubing (approximately 2.0 mm in diameter and 30 cm in length) and were consecutively numbered and labeled with project description information. Fluorescent orange tags were used to tag all species except chinook salmon. Chinook salmon were tagged with gray tags because, unlike sockeye and coho salmon for which abundance estimates were derived from tagged to untagged ratios in the Canadian fisheries occurring in the highly glacial lower Taku River, estimates of chinook salmon abundance were to be generated from examining fish for tags in clear-water spawning areas. Fluorescent orange tags are highly visible in clear water, and we believed that by using less visible gray tags the potential problem of selective predation on tagged fish on the spawning grounds by bears, raptors, and other predators would be minimized.

Tag Recovery

Tags were recovered from fish harvested in inriver commercial, test, and food fisheries. The fisheries occurred in Canadian portions of the Taku River within 20 km of the international border. The commercial fishery operated from 1-4 d per week from late June through late August. Drift and set gill nets were the principal gear types used, although one fishermen operated a fish wheel to capture fish. One fisherman was contracted by DFO to conduct the test fishery by making 5 to 10 standardized drifts each morning and evening that the commercial fishery was not open. The test fishery operated from 19 June until 5 October, approximately 6 weeks after the commercial fishery had been closed for the season. A cash reward of $2.00 was offered by DFO for each tag returned with information on the date and location of recapture. Tags were collected on a regular basis by the DFO Fisheries Guardian who also monitored and compiled daily catch statistics. Small numbers of tags were also recovered in the U.S. inriver personal use fishery and the District 111 gill net fishery. ADF&G offered a $2.00 reward for each tag returned, and conducted a lottery after the season to award a $100.00 bonus to one of the U.S. fishermen that returned tags.

Canadian commercial fishery catches of sockeye salmon were sampled by DFO and ADF&G personnel for sex, post-orbit to hypural (POH) length measurements, and scale data. Paired MEF and POH length measurements were taken from commercially caught salmon and were used to develop linear regressions for converting measurements from one type to another.

Tag recoveries were also made by DFO personnel at upstream migrant weirs at the outlets to Little Trapper and Little Tatsamenie Lakes. Tags were gathered at carcass-collecting weirs by DFO on the Nakina River and by ADF&G on the rivers draining Little Tatsamenie Lake (Tatsatua Creek) and Little Trapper Lake (Kowatua River). Additional tag recoveries were made at spawning locations in the upper Nahlin River, Kuthai Lake, and along the mainstem of the Taku River by ADF&G, DFO, and NMFS.

Tagging and tag recovery data were organized by ADF&G 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 Sunday in January. Inclusive dates for 1989 statistical weeks are shown in Appendix A.1.

Statistical Methods

We used a stratified population estimation technique (Chapman and Junge 1956; Darroch 1961) to develop abundance estimates and associated variances for sockeye and coho salmon. We used this stratified method because it allows the probabilities of capture in tagging and recovery strata to vary across these strata. The estimate of abundance per tagging stratum *i* is given by

$$N_i = D_n S^{-1} t \quad , \tag{1}$$

where:

$\mathbf{D_n}$ = a diagonal matrix of the number of fish examined in each recovery stratum j,

S = a matrix of m_{ij}, the number of tag recoveries in each recovery stratum j which were released in tagging stratum i, and

$\mathbf{t}$ = a vector of the number of tagged fish released per tagging stratum.

The total population is then the sum of these N_i. The variance-covariance matrix of the abundance estimate in each tagging stratum i was estimated using equations 11.20-11.23 on page 441 of Seber (1982). The estimated variance of the point estimate of the total abundance of fish passing the tagging site is the sum of the variance and covariance estimates of the individual strata. Darroch demonstrated that the bias of the estimated variance is negligible when compared to the abundance estimate if the number of tagged fish is adequate.

Assumptions which need to be satisfied to obtain a consistent estimator of the total number of fish in the population and the variance associated with this estimate are:

1. All fish in the jth recovery stratum, including tagged and untagged fish, have the same probability of being captured.

2. There is no tag loss and all recaptured tags are recognized and reported.

3. There is no tagging induced mortality.

4. The migratory behavior of the tagged and untagged individuals is the same (i.e., fish are not affected by the tagging process).

We used the adjusted Petersen estimate (Chapman 1951, Seber 1982) to calculate pink salmon abundance estimates instead of a stratified estimate because of suspected problems with tag loss or differential predation of tagged fish. The estimate of abundance is given by

$$\hat{N} = \frac{(M+1)*(C+1)}{R+1} - 1 \quad , \qquad (2)$$

where M is the number of tagged fish released, C is the sample examined for presence of tagged fish, and R is the number of tagged fish recaptured in the sample.

The variance of the abundance estimate is given by

$$V[\hat{N}] = \frac{(M+1)*(C+1)*(M-R)*(C-R)}{(R+1)^2*(R+2)} \quad . \tag{3}$$

Inriver sockeye and coho salmon return estimates were generated on an in-season basis in 1989. Mark-recapture data was forwarded to the Douglas ADF&G and Whitehorse DFO offices within 24 h after the weekly closure of the Canadian fishery. Data was quickly analyzed and inriver abundance estimates were developed. Historical migratory timing data was then used each week to project the total inriver run size for each species for the season. Due to the estimated 3-4 d travel time for fish between District 111 and Canyon Island (Clark et al. 1986), and since most tags applied at Canyon Island were not recovered until the following week in the Canadian fishery, our estimates of inriver abundance correspond with the movement of Taku River sockeye salmon through District 111 approximately 1-2 weeks earlier.

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

$$\bar{t} = \sum_{t=1}^{m} t * P_t \quad , \tag{4}$$

where t was the 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 in this report. The variance of the migrations was estimated by

$$\hat{s}_t^2 = \sum_{t=1}^{m} (t-\bar{t})^2 * P_t \quad . \tag{5}$$

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

$$\frac{\dfrac{C_k * T_{ks}}{T_k - T_{kc}}}{\displaystyle\sum_{j=22}^{40} \frac{C_j * T_{js}}{T_j - T_{jc}}} \quad , \tag{6}$$

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 return varied between fishing periods.

Age and sex compositions of fish wheel catches were computed for each species. Sockeye and coho salmon catches were stratified temporally for age composition analysis to correspond with abundance estimates for specific temporal strata. Temporal strata used for analysis of chinook and chum salmon differed because abundance estimates were not generated for these species. Chinook salmon catches were grouped into weekly strata for analysis. Chum salmon catches were assigned to only two strata because sample sizes were small. Changes in age composition among strata were tested for significance using a test to compare two proportions (Zar 1984).

Estimates of the sockeye and coho salmon abundance by age class were made by multiplying the age composition proportions for each period by the number of fish present during the corresponding period and summing the estimates within age classes across periods. Standard errors of the proportions in each period were calculated with standard binomial formulae using a correction factor to reflect finite population size (Cochran 1977). The standard error of the total abundance for each age class was calculated by weighting the standard error for each time strata by the abundance during the same strata; this standard error does not take into account variance in the weekly abundance estimates, however.

RESULTS

Fish Wheel Catches

Catches of chinook, sockeye, coho, pink, and chum salmon and Dolly Varden (*Salvelinus malma*) are listed in Appendix B. Graphs of the fish wheel CPUE for sockeye, chinook, and chum salmon are provided in Figure 2 and for pink and coho salmon in Figure 3.

The total catch of 1,824 chinook salmon in 1989 exceeded annual fish wheel catches of this species between 1984 and 1988 (Table 1). Catches were indicative of a good run, but were comparable historically only to 1988 totals because fish wheels were deployed 4-5 weeks earlier in 1988 and 1989 than during 1984 to 1987. The daily catch peaked on 26 and 27 May when 77 and 79 fish were captured, respectively.

Catches of sockeye salmon totaled 5,650 fish, higher than in all other years except 1986. Catches occurred from 27 May through 25 September, peaking during statistical week 28 (9-15 July), when 797 sockeye salmon were captured. Substantial fish wheel catches of sockeye salmon (765 fish; 13.5% of the season's total) were made at Canyon Island prior to the initial openings of either the U.S. or Canadian fisheries. Daily catches fluctuated dramatically, but in a predictable manner. The effect of the removal of large segments of the run by the District 111 gill net fishery was easily visible in the daily catches. This fishery opened at noon each Sunday during the sockeye salmon season and continued for 3 d each week from mid-June through mid-August. Upriver fish wheel catches typically declined to their lowest levels between Thursday and Saturday.

The catch of coho salmon totaled 2,243 fish, similar to catches in 1987 and 1988. Two peaks in fish wheel CPUE of coho salmon occurred, from 13-14 August and 23-24 September.

A total of 31,189 pink salmon were caught in the fish wheels. Catches of this species are typically of a similar magnitude during odd-numbered years, and substantially exceed catches from even-numbered years. The catch of pink salmon peaked on 16 July when 4,512 fish were caught; CPUE was almost 150 pink salmon per fish wheel hour on this date.

The catch of chum salmon totaled 645 fish in 1989. The peak daily catch of 48 fish occurred on 25 September.

Tagging and Recovery Data

A total of 12,737 salmon were tagged at Canyon Island in 1989 (Table 2). Approximately 39% (4,997) of the tags were applied to sockeye salmon, followed by 30% (3,760) to pink, 17% (2,125) to coho, 10% (1,232) to chinook, and 5% (623) to chum salmon. The numbers of fish tagged each day by species are listed in Appendices B.1-B.5. Tags recovered downstream from Canyon Island in the District 111, inriver personal use, and U.S. sport fisheries were subtracted from the original tagging totals for sockeye, coho, and pink salmon for presentation in this appendix; these revised tagging totals were used for estimating abundances.

A total of 2,198 tagged fish were recovered (Table 2). Approximately 53% (1,170) were recovered in the Canadian commercial fishery and 40% (885) on the spawning grounds. Low numbers of recoveries were made in the Canadian sport, test, and food fisheries, U.S. personal use fishery, and downstream in Taku Inlet in the U.S. commercial gill net catches. Sockeye salmon represented 64% (1,400) of all tagged fish that were recovered, followed by coho (14%), pink (12%), chinook (10%), and chum salmon (1%).

Escapement Estimates

We derived escapement estimates for sockeye, coho, and pink salmon runs. Analysis of chinook salmon mark-recapture data will be reported elsewhere by Pahlke and Mecum 1990. A chum salmon escapement estimate was not generated because tag recoveries were too low to provide a reliable estimate.

Sockeye Salmon

Ratios of tagged to untagged sockeye salmon in the Canadian commercial and test fisheries were used to estimate the magnitude of the inriver return of sockeye salmon that passed Canyon Island from 18 June to 25 September. Fish wheel CPUE was used to estimate the number of fish that passed prior to 18 June (beginning of statistical week 25). It was necessary to use CPUE data to estimate the early portion of the return because neither the test nor commercial fisheries were operational at this time to recover tags.

A total of 793 tags with corresponding recovery date information were returned from 18,545 sockeye salmon taken in the Canadian commercial fishery and 207 sockeye salmon harvested in the test fishery (Table 3). Because estimation procedures were based on large sample theory, tagging and recovery periods were combined at the end of the season to increase the frequency of tag recoveries in tag-recapture strata. Tagging strata combined for this reason were statistical weeks 32 to 39, while grouped recovery strata were statistical weeks 33 to 40. The original stratification was thus reduced to eight tagging and recovery strata.

Additional stratification was necessary because analysis of this data matrix revealed that several of the weekly abundance estimates were, once the catch was subtracted, less than zero. Darroch (1961) discussed the possibility of strata-specific exploitation rates being larger than 1.0 or less than 0. This is principally a result of the large degree of uncertainty associated with the estimates of weekly abundance and exploitation rates. Darroch notes that even though weekly estimates may be imprecise, large negative covariances between strata may still result in a relatively accurate total abundance estimate. He suggested pooling adjacent strata to deal with this problem. Therefore we pooled additional strata and concluded with six tagging and six recapture strata.

Using these six strata, we estimated that 99,467 sockeye salmon passed Canyon Island between 18 June and 25 September (Table 4). The approximate 95% confidence interval associated with the estimate was ± 9,536, and the coefficient of variation was 4.9%. Approximately 0.128 of the total fish wheel sockeye salmon CPUE occurred prior to the start of the tag recapture efforts; therefore, the total inriver run past Canyon Island was estimated to be 114,068 fish.

The Taku River sockeye salmon run was exploited by the Canadian commercial fishery at an estimated rate of 0.163, compared to a 1984-1988 average of 0.152. After removal of 18,805 sockeye salmon by Canadian commercial, test, and food fisheries, the escapement past Canyon Island totaled 95,263 fish. The Transboundary Technical Committee set an interim escapement goal of 71,000-80,000 sockeye salmon for Canadian portions of the Taku River drainage (Transboundary Technical Committee 1989).

The escapement estimate does not include several 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 (fish smaller than approximately 350 mm MEF that have spent only 1 year at sea). The number of sockeye salmon spawning downstream from Canyon Island is unknown but presumed small. A total of 757 sockeye salmon was passed through the Yehring Creek weir (Elliott and Sterritt 1990); however, this was only a partial count because the weir was installed after some fish had already entered the creek. Small numbers of sockeye salmon were also observed on the U.S. side of the border in Fish Creek (Figure 1). The contribution of jacks can represent a sizeable portion of the Taku River run; 6.8% of the 1988 fish wheel catch of sockeye salmon was composed of jacks. In 1989 jacks comprised 3.4% of the fish wheel catch.

A necessary assumption of the population estimation technique we used is that all fish in a particular recovery stratum, whether tagged or untagged, have the same probability of being captured. We examined one possible factor that could have caused this assumption to be violated: that tagging and recapture gear differed in their size selectivity. The length frequency distributions of all sockeye salmon tagged at Canyon Island and of all tagged fish recovered in the Canadian commercial fishery are shown in figure 4. Analysis of the basic tagging data revealed that small (≤500 mm MEF length) tagged fish had a lower probability of being recaptured (10.4%) than did large (>500 mm MEF) tagged fish (16.7%; χ^2 = 18.7, P<0.001, df = 1). Therefore, we conclude that the probability of recapturing a tagged fish was not independent of fish length, probably due to the reduced susceptibility of small fish to capture in the gill nets.

To assess the possible effects of this size selectivity on the sockeye salmon population estimate, we stratified tagging and recovery data by size class. The inriver run of large fish past Canyon Island between 18 June and 25 September (Table 5) was estimated at 84,675 fish, ± 8,669 (95% confidence interval), while the inriver run of small fish (Table 6) was 17,062 ± 4,697 (95% confidence interval), for a total escapement estimate of 101,737 fish. This is within 2% of the inriver run estimate of 99,467 fish that was generated using data from fish of all sizes. The close agreement of the two estimates suggests that the population estimate is relatively insensitive to possible differences in the availability of different sized fish to tagging and recapture gear.

Coho Salmon

Recoveries of tagged coho salmon in the Canadian commercial and test fisheries were used to estimate the inriver return of coho salmon. Tagged coho salmon recovered from the fisheries totaled 242 fish (Table 7).

Early and late season coho salmon tagging and recovery data were pooled into appropriate strata. Both the tagging and recovery strata were pooled into seven strata (Table 8). The number of coho salmon passing Canyon Island by October 1, the last day of tagging, was 60,841 fish. The approximate 95% confidence interval of the estimate was ± 21,901 fish, and the coefficient of variation was 18.4%. A total of 4,033 coho salmon were harvested in the Canadian commercial, test, and food fisheries, thereby reducing the escapement estimate to 56,808 fish. The Transboundary Technical Committee set an interim escapement goal of 27,500-35,000 coho salmon for Canadian portions of the Taku River drainage (Transboundary Technical Committee 1989).

Our estimate of escapement based on tag and recapture data does not cover the entire coho salmon run. We terminated operation of the fish wheels on 1 October, by which time the catches had declined to a low level. Recapture efforts were suspended on 5 October when the inriver test fishery terminated. Some unknown proportion of the run migrated upriver after this time, although we believe the run was almost over due to the low fish wheel and inriver test gill net catches experienced in late September and early October.

The escapement of coho salmon to streams located downriver from Canyon Island is unknown and was not included in our estimate. A total of 1,444 coho salmon were counted through a weir operated by ADF&G, Sport Fish Division, on Yehring Creek. High water in the fall destroyed the weir prior to the end of the run; a minimum estimate for the total escapement into this stream was 1,570 coho salmon (Elliott and Sterritt 1990). Aerial surveys of other known spawning areas in lower river portions of the Taku River were conducted, but actual escapements to these areas are unknown. As for sockeye salmon, the coho salmon escapement estimate does not include fish smaller than 350 mm MEF. However coho salmon in this size range were extremely rare, as evidenced by the fish wheel catch of only three coho salmon of this size.

Pink Salmon

Tagged to untagged ratios of pink salmon observed in the Nakina River, the principal pink salmon spawning tributary in the Taku River drainage, were used to estimate the inriver return of pink salmon past Canyon Island. Due to suspected problems with tag loss or differential predation on tagged fish, an adjusted Petersen estimate was calculated instead of a stratified estimate. The potential problem of tag loss was detected in pink salmon migrating upstream past the Nakina River weir. A total of 17 tags were counted on 3,613 live pink salmon which migrated upstream through the weir. However, only six tags were recovered from 4,496 pink salmon carcasses examined at or above the weir. Loss of tags would result in a positive bias to the estimate.

We used the adjusted Petersen estimate as a preliminary estimate of the total inriver run size. Two estimates were calculated: an estimate using only lower Nakina River recovery data and an estimate using data from both the lower river and the live fish recovery data from the Nakina weir. Results are presented in Table 9. Preliminary estimates of total run size range from approximately 340,000 pink salmon (395,404 less the lower confidence interval of the estimate using only lower Nakina River recoveries of 55,569) to 500,000 pink salmon (441,747 plus the upper 90% confidence interval of the estimate using lower Nakina River and weir recovery data of 58,300).

Migratory Timing

The migratory timing of the sockeye salmon run in 1989, as measured by fish wheel CPUE data, was earlier (mean date = 14 July) than during the years 1984-1988 (Table 10). The standard deviation (20.1 d) was greater than in other years as a result of the strength of early-run stocks. The timing of the pink salmon migration was about average for odd-year runs, with a mean date of 18 July. The consistency of migratory timing of other species 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 these species. The mean date of the 1989 fish wheel catch of chinook salmon (6 June) was similar to 1988, the only other year when fish wheels have been operated prior to mid-June. The mean dates of the coho and chum salmon returns were 26 August and 13 September. Fish wheels were operated later in the fall in 1989 than in previous years, covering a larger segment of the migration; the later timing of these species in 1989 could simply be a result of this extended operation.

Sockeye Salmon Stock Timing

We determined the timing of individual stock groups of sockeye salmon past Canyon Island in 1989 by using recoveries of tagged fish from spawning grounds and weirs (Table 11; Figure 5). The primary recovery locations were weirs on the outlet streams of Little Trapper Lake (313 tags) and Little Tatsamenie Lake (114 tags). A total of 27 tags were recovered from Kuthai Lake, and 50 tags were recovered from slough and stream spawning sites along the mainstem of the Taku River between Yehring Creek and the confluence of the Inklin and Nakina Rivers. Fewer tags were recovered at Kuthai Lake and mainstem spawning areas because weirs were not operated at these locations. Our stock timing information is therefore not as complete or accurate for these stock groups as for the systems where weirs were operated.

The Kuthai Lake stock migrated past Canyon Island the earliest of any of the stocks examined. Tags recovered at Kuthai Lake were applied to sockeye salmon at Canyon Island between statistical weeks 23 and 28 (9 June-12 July). The peak weeks of passage were statistical weeks 24 and 25 (11-24 June).

Tagged sockeye salmon bound for Little Trapper Lake were present at Canyon Island between statistical weeks 24 and 33 (15 June-14 August). The peak of the migration of this stock occurred during 9-15 July (statistical week 28).

The migration of the sockeye salmon return to the Little Tatsamenie Lake system was the most protracted of the four groups we examined. Tagged fish bound for this system were present at Canyon Island between 29 June and 8 September. An estimated 11-21% of the escapement of this stock group passed Canyon Island each week between 9 July and 12 August.

The conglomerate of mainstem Taku River stocks we sampled exhibited a similar migratory timing as the Little Tatsamenie Lake system return. The migration of this composite stock group extended from 2 July through 31 August. The migration was protracted, with between 17% and 19% passing each week between 16 July and 12 August.

Inriver Sockeye Salmon Migration Rates

Inriver rates of migration of several headwater stocks, determined from the recovery of tagged fish at weirs, increased through the season (Figure 6). The time it took tagged fish to travel from Canyon Island to the Little Trapper Lake weir decreased consistently throughout the season; fish tagged in statistical week 24 averaged 47 d in transit, while fish tagged in statistical week 31 averaged 26 d to travel this distance. Travel time of tagged fish from Canyon Island to the Little Tatsamenie Lake weir decreased from 49 d for fish tagged in statistical week 27 to 26 d for fish tagged in week 35. This trend of increased migration speed through the season has been apparent for tagged fish every year that weirs have been operated at Little Trapper and Little Tatsamenie Lakes.

Age and Sex Composition

The age and sex compositions of the Canyon Island fish wheel and gill net catches of chinook, sockeye, coho, and chum salmon are summarized in Appendices C.1-C.4. Results of tests for significant changes in age composition among period strata for each species are summarized in Tables 12-15.

The age composition of chinook salmon catches did not change through the season (Table 12). Chinook salmon <440 mm MEF were not consistently sampled for scales throughout the season, and scales taken from fish in this size range were excluded from our analysis. Age-1.3 fish were most common in the catches (51.5%), followed by age 1.2 (27.9%), and age 1.4 (11.3%), with other minor age classes comprising the remainder of the samples. Males comprised the majority of the catch (55.5%), although females were more common among age-1.3, -1.4 and -1.5 fish.

The age composition of sockeye catches changed significantly during the season (Table 13). Age-1.3 fish were most prevalent (61.2%), followed by age 1.2

(19.8%), age 0.3 (5.1%), age 2.3 (4.6%), age 1.1 (3.0%), age 2.2 (2.9%), and age 0.2 (2.6%). Sockeye salmon that did not spend a winter in fresh water after emergence (age 0.) represented 7.8% of the catches, as did fish that spent two winters following emergence in fresh water (age 2.). The principal seasonal trends in age composition during the season were the decrease of age-1.3 sockeye and the increase of the age-1.2, age-0.3, and age-1.1 components. Males comprised 56.6% of the fish wheel catches of sockeye salmon.

Catches of coho salmon were almost exclusively age-1.1 (50.2%) and age-2.1 (48.0%) fish. All coho salmon but one had spent 1 year at sea. The age composition of coho catches changed significantly between numerous time strata (Table 14); age-2.1 fish tended to be more prevalent early in the season. Age-1.1 fish were more common later in the season. As for chinook and sockeye salmon, males were more prevalent (56.4%).

Fish wheel catches of chum salmon were comprised mostly of age-0.3 (77.2%) and age-0.4 (19.3%) fish. The age compositions of early season catches (15 June-2 September) differed from late season catches (Table 15) primarily because of the presence of higher percentages of older age fish early in the season. Female chum salmon were more prevalent (57.8%) than males.

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. The simplest estimation technique available, the adjusted Petersen, is valid only if all individuals have an equal probability of being tagged or of being recovered. Fluctuating river conditions affect the fishing efficiencies of both fish wheels (ADF&G 1956; Greenough 1971) and inriver gill net fisheries (Cousens et al. 1982); these are the gear types we used for capturing Taku River salmon for tagging purposes and for recovering sockeye and coho salmon for use in developing mark-recapture abundance estimates for these species. We were able to ignore this variation in gear efficiency for these species by using Darroch's stratified estimator, which allows the probabilities of capture in tagging and recovery strata to vary across these strata.

Differences in the location, timing, and methods used to recover tags may have resulted in different degrees of compliance with the assumption of no tag loss.

Tag loss can be caused by tagging-induced mortality, physical breakage or shedding of tags, selective predation on tagged fish, underreporting of tags by fishermen, and behavioral changes in tagged fish. Any loss of tags will cause population size to be overestimated.

Mortality resulting from the capture and tagging process is especially difficult to assess because of the practical difficulties in designing holding studies that simulate natural conditions (Robson and Regier 1964). Another way to assess mortality is to assign condition values (i.e., healthy, slightly injured, seriously injured) to tagged fish and then compare recovery rates among fish of the different classes. We did not do this, however, because we deliberately did not tag injured fish. We believed that any bias we introduced by not tagging injured fish would tend to offset bias due to tagging-induced mortality. Fish that were not tagged because of noticeable injuries totaled 59 chinook, 281 sockeye, 67 coho, and 3 chum salmon. Compared to the numbers tagged of each species, these represent 4.8%, 5.6%, 3.2%, and 0.5%, respectively. While we do not have an estimate of tagging-induced mortality in our program, the radio tagging project conducted simultaneously in 1989 by NMFS provides some indication of its possible magnitude. Of the 429 chinook salmon caught in the fish wheels and affixed with radio transmitters possessing motion sensors, 381 (89%) were tracked upriver from Canyon Island (J. Eiler, NMFS, Auke Bay, Alaska, personal communication). An estimated 9.8% of the fish either regurgitated the transmitter or died as a result of the tagging process or subsequent predation in the lower river. Some tag regurgitation was noted, but unfortunately the highly glacial nature of the river prevented recovery of the majority of the transmitters and the determination of the rate of tag regurgitation compared to tag-induced mortality. Because the tagging procedures used for radio and spaghetti tagging fish differed, the stress and subsequent mortality these animals experienced may not be directly comparable. However, we believe this maximum level of mortality was higher than for fish tagged solely with spaghetti tags, especially for species other than chinook salmon. Chinook salmon tagged either with spaghetti tags (McGregor and Clark 1989) or radio tags (J. Eiler, NMFS, Auke Bay, Alaska, personal communication) experienced substantially longer downriver drop-back periods than other salmon species, indicating that chinook salmon do not respond to the tagging process as well as other species.

We were able to assess the short-term loss of tags caused by physical breakage or shedding. Fish that lose spaghetti tags are readily identifiable by the presence of entrance and exit holes just below the dorsal fin created during tag application; these 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 fish were found throughout the season that had the secondary mark and no spaghetti tag, despite the recovery of 318 pink, 258 sockeye, 76 coho, 54 chinook, and 15 chum that had been previously tagged. We therefore believe that breakage or shedding of tags among fish subjected to the inriver fishery is minimal or nonexistent because the close proximity of the fishery to the tagging site (4 km) results in a very short travel time between the two locations.

Another possible source of tag loss is from the incomplete return of tags by fishermen. The 14 fishermen who fish the river have been informed about the tagging project by Canadian government biologists and fishery officers. A Fisheries Guardian is present on the river throughout the summer. The guardian interviews fishermen daily, often on several occasions, tabulates catch figures, and distributes tag reward money. If underreporting of tags from the fishery was a serious problem, tagged to untagged ratios of fish passing through upriver weirs should be higher than in the fishery. Since this tagging program began in 1984, however, tagged to untagged ratios at the weirs have been very similar, but generally slightly lower, than in the fishery. In 1989 the commercial fishery tagged to untagged ratio was 0.042, while at Little Trapper and Little Tatsamenie Lakes it was 0.036 and 0.040, respectively.

Tag loss can occur throughout the inriver migration and spawning process. Cousens et al. (1982) reviewed numerous studies in which the magnitude of tag loss increased with the distance traveled between the tagging and recovery sites. Documented tag loss among chinook salmon sampled at carcass collecting weirs in the Taku River drainage in 1989 was 40% (Pahlke and Mecum 1990). In contrast, little tag loss has been noticed at Taku River counting weirs through which upstream migrating fish pass to reach the spawning grounds (DFO and ADF&G unpublished data). Substantial tag loss is likely to occur during courtship and spawning. Tag loss among male chinook salmon collected at carcass weirs in 1989 was much higher than among females, possibly due to the aggressive behavior and fighting rituals among males. Thus tag loss is much more likely to be a significant problem in mark-recapture studies that rely on distant spawning ground recoveries (i.e., our pink and chinook salmon programs) than studies in which recovery efforts are concentrated geographically and temporally near to the tagging location (i.e., our sockeye and coho salmon programs).

Quantitative information on tag loss in pink salmon on the spawning grounds is lacking. No tag loss was detected among pink salmon examined on the Nakina River spawning grounds in 1989, although it is possible that tag wounds were missed on carcasses in advanced stages of decomposition. However, because tagged to untagged ratios found among carcasses collected at and above the Nakina River weir were dramatically lower than among upstream-migrating adults at this location, it is possible that substantial tag loss may have occurred. In future years a more distinctive secondary mark such as a fin clip should be used to permit better determination of the tag loss in pink salmon. Selective removal of tagged pink salmon by predators may have also occurred. The bright orange tags we used on pink salmon were highly visible in clear water spawning areas. Future studies that rely on spawning ground tag recoveries should utilize tag colors that are less noticeable (i.e., the gray colored spaghetti tags we used for chinook salmon).

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Table 1. Total fish wheel catches of salmon, by species, 1984-1989.

Species	Year					
	1984[a]	1985	1986	1987	1988	1989
Chinook	138	184	571	285	1,436	1,824
Sockeye	2,334	3,601	5,808	4,307	3,292	5,650
Coho	889	1,207	758	2,240	2,168	2,243
Pink	20,845	27,670	7,256	42,786	3,982	31,189
Chum	316	1,376	80	1,533	1,089	645

[a] In 1984 a total of 4 fish wheels were operated, while in other years only 2 were used. The additional 2 wheels used in 1984 were much smaller in size and caught primarily pink salmon.

Table 2. Summary by species of the tags applied at Canyon Island and tag recoveries, 1989.

Species	Number of Fish Tagged	Canadian Commercial Catch	Canadian Testfish Catch	Canadian Foodfish Catch	District 111 Catch	Personal Use Fishery	Sport Fisheries	Escapement	Total
Chinook	1,232	61	4	2	12	0	2	130	211
Sockeye	4,997	777	16	0	9	28	0	570	1,400
Coho	2,125	217	25	0	13	6	3	33	297
Pink	3,760	103	0	0	0	12	3	150	268
Chum	623	12	6	0	2	0	0	2	22
Total	12,737	1,170	51	2	36	46	8	885	2,198

Table 3. Tagging and recovery data from the 1989 Taku River sockeye salmon mark-recapture program. Data include the numbers of sockeye salmon tagged at Canyon Island and recovered in Canadian commercial and test fisheries by statistical week.

Statistical Week of Tagging	Statistical Week of Recovery 25	26	27	28	29	30	31	32	33	34	35-40	Total Tags Recovered	Tags Applied	Tag Ratio (Recovered)/(Applied)
22												0	9	0.000
23												0	146	0.000
24	1	3	1					1				6	560	0.011
25		26	2									28	324	0.086
26		7	54			1						62	499	0.124
27			83	45	7	2						137	511	0.268
28				25	86	10						121	721	0.168
29					26	83	1		1			111	527	0.211
30						100	26	2	2			130	443	0.293
31							34	59	1	7		101	484	0.209
32								54	9	12		75	402	0.187
33									2	14		16	173	0.093
34										4	1	5	83	0.060
35											1	1	48	0.021
36												0	17	0.000
37												0	11	0.000
38												0	0	0.000
39												0	1	0.000
Total	1	36	140	70	119	196	61	116	15	37	2	793	4,959	0.160
Commercial Catch		1,562	3,687	2,088	2,275	3,271	2,281	2,750	265	366		18,545		
Testfish Catch	34	28	24	11	10	15	11	32	10	12	20	207		
Total Catch	34	1,590	3,711	2,099	2,285	3,286	2,292	2,782	275	378	20	18,752		

Table 4. Pooled-strata tagging and recovery data used to calculate mark-recapture estimates of the inriver sockeye salmon return past Canyon Island, 1989.

Statistical Week of Tagging	Statistical Week of Recovery							Tags Applied	Total Inriver Run	95% C.I.		Escapement
	26	27	28-29	30	31-32	33-40	Total			Lower	Upper	
25	26	2					28	324	18,884	11,814	25,953	17,294
26	7	54		1			62	499	28,228	19,810	36,645	24,517
27-28		83	163	12			258	1,232	14,505	7,909	21,100	10,121
29			26	83	1	1	111	527	16,805	12,871	20,738	13,519
30-31				100	121	10	231	927	11,448	3,025	19,871	6,374
32-39					54	43	97	735	9,597	6,302	12,891	8,924
Total	33	139	189	196	176	54	787	4,244	99,467	89,931	109,003	80,696 [a]
Catch	1,590	3,711	4,384	3,286	5,074	673	18,718					

[a] Mark-recapture escapement estimate was reduced by 53 fish which were taken in the Canadian inriver food fishery. The inriver run prior to statistical week 25 was estimated at 14,601 fish and the inriver test fishery catch in week 25 was 34 fish, thereby increasing the total estimates of inriver run and escapement to 114,068 and 95,263 fish, respectively.

Table 5. Tagging and recovery data used to estimate the inriver return of "large" (>500 mm MEF) sockeye salmon past Canyon Island, 1989. Data from the commercial fishery only was used to generate these estimates.

Statistical Week of Tagging	Statistical Week of Recovery						Total	Tags Applied	Total Inriver Run	95% C.I.	
	26	27	28-29	30-31	32-33	34				Lower	Upper
25	22						22	296	19,509	11,725	27,293
26	7	44		1			52	395	22,963	14,357	31,568
27-28		79	141	6			226	967	11,701	4,991	18,412
29-30			24	163	5		192	656	16,498	13,928	19,068
31-32				29	99	16	144	646	10,579	6,596	14,562
33-34					2	16	18	182	3,425	1,822	5,028
Total	29	123	165	199	106	32	654	3,142	84,675	76,006	93,344
Catch	1,450	3,398	4,002	4,742	2,826	314	16,732				

Table 6. Tagging and recovery data used to estimate the inriver return of "small" (350-500 mm MEF) sockeye salmon past Canyon Island, 1989. Data from the commercial fishery only was used to generate these estimates.

Statistical Week of Tagging	Statistical Week of Recovery							Total	Tags Applied	Total Inriver Run	95% C.I.	
	26-27	28	29	30	31	32	33-34				Lower	Upper
25-26	11							11	132	4,812	2,127	7,497
27	4	8						12	100	858	-159	1,875
28		1	10	3				14	161	3,043	1,130	4,956
29			1	23				24	179	3,523	2,084	4,963
30				14	6			20	124	1,238	-2,320	4,795
31					5	11	1	17	134	1,262	-502	3,025
32-34						7	4	11	176	2,327	-737	5,392
Total	15	9	11	40	11	18	5	109	1,006	17,062	12,366	21,759
Catch	401	132	229	489	321	165	76	1,813				

Table 7. Tagging and recovery data from the 1989 Taku River coho salmon mark-recapture program. Data include the numbers of coho salmon tagged at Canyon Island and recovered in Canadian commercial and test fisheries by statistical week.

Statistical Week of Tagging	Statistical Week of Recovery 27	28	29	30	31	32	33	34	35	36	37	38	39	40	Total Tags Recovered	Tags Applied	Tag Ratio (Recovered)/(Applied)
26															0	1	0.000
27		1													1	4	0.250
28			2	1		1									4	15	0.267
29			3	4	1										8	35	0.229
30				12	27	3									42	111	0.378
31					5	54	3								62	175	0.354
32						26	10	15							51	235	0.217
33								35							35	340	0.103
34								17	8	1					26	438	0.059
35									2						2	171	0.012
36										2	3	2			7	122	0.057
37											1				1	118	0.008
38															0	169	0.000
39													2	1	3	163	0.018
40															0	5	0.000
Total	0	1	5	17	33	84	13	67	10	3	4	2	2	1	242	2,102	0.115
Commercial Catch	2	10	42	255	496	874	258	939	0	0	0	0	0	0	2,876		
Testfish Catch	0	0	0	3	7	18	20	49	320	222	161	53	127	31	1,011		
Total Catch	2	10	42	258	503	892	278	988	320	222	161	53	127	31	3,887 [a]		

[a] An additional 146 coho salmon were harvested in the Canadian inriver food fishery, but this data is not included because catches were not available by statistical week.

Table 8. Pooled-strata tagging and recovery data used to calculate mark-recapture estimates of the inriver coho salmon return past Canyon Island, 1989.

Statistical Week of Tagging	Statistical Week of Recovery								Tags Applied	Total Inriver Run	95% C.I.		Escapement
	26-30	31	32	33	34	35	36-40	Total			Lower	Upper	
26-29	11	1	1					13	55	1,425	648	2,201	1,371
30	12	27	3					42	111	878	47	1,710	620
31		5	54	3				62	175	2,693	1,826	3,560	2,190
32			26	10	15			51	235	300	-2,592	3,191	-592
33					35			35	340	9,598	6,640	12,556	9,320
34					17	8	1	26	438	8,385	-255	17,025	7,397
35-40						2	11	13	748	37,562	14,702	60,423	36,648
Total	23	33	84	13	67	10	12	242	2,102	60,841	38,940	82,742	56,808 [a]
Catch	312	503	892	278	988	320	594	3,887					

[a] Mark-recapture escapement estimate was reduced by 146 fish which were harvested in the Canadian inriver food fishery.

Table 9. Tagging and recovery data used to calculate preliminary mark-recapture estimates of the inriver pink salmon return past Canyon Island, 1989.

Week of Tagging	Number of Tag Recoveries	Total Number Tagged	Number Examined
25-26	4	233	
27	20	711	
28	19	377	
29	63	1,477	
30	23	812	
31	0	117	
32	0	18	
Unknown	17		
Total in Lower River	129	3,745	13,721
Total at Weir and Lower River	146	3,745	17,334

	Estimated Abundance	90% Confidence Interval
Total in Lower River	395,404	± 55,569
Total at Weir and Lower River	441,747	± 58,300

Table 10. Migratory timing statistics of the various salmon species past the Canyon Island fish wheels, 1984-1989. Timing statistics for 1984 were based on fish wheel catch, while all other years were based on fish wheel CPUE.

		Year					
Species	Statistic	1984	1985	1986	1987	1988	1989
Chinook	Mean Date	6/28	6/26	6/28	6/27	6/8	6/6
	Standard Error [a]	8.0	8.6	9.2	7.7	14.9	15.6
Sockeye	Mean Date	7/23	7/24	7/16	7/24	7/19	7/14
	Standard Error	17.6	18.1	14.2	15.8	19.5	20.1
Coho	Mean Date	8/11	8/18	8/3	8/23	8/24	8/26
	Standard Error	12.3	16.3	10.3	18.4	15.6	20.2
Pink	Mean Date	7/19	7/19	7/27	7/19	7/21	7/18
	Standard Error	9.3	8.5	5.5	9.3	9.6	7.8
Chum	Mean Date	8/14	9/8	8/7	9/8	8/31	9/13
	Standard Error	12.8	11.8	11.3	10.5	12.5	15.9

[a] Units are days.

Table 11. Weekly and cumulative proportions of individual sockeye salmon stocks passing Canyon Island in 1989, based on spawning ground recoveries of tagged fish weighted by abundance indices (fish wheel CPUE).

		L. Trapper		L. Tatsamenie		Kuthai		Mainstem	
Statistical Week	Dates	Weekly Prop.	Cumul. Prop.	Weekly Prop.	Cumul. Prop.	Weekly Prop.	Cumul. Prop.	Weekly Prop.	Cumul. Prop.
23	(6/4-6/10)					0.128	0.128		
24	(6/11-6/17)	0.005	0.005			0.429	0.557		
25	(6/18-6/24)	0.048	0.053			0.343	0.900		
26	(6/25-7/1)	0.162	0.215	0.008	0.008	0.043	0.943		
27	(7/2-7/8)	0.243	0.458	0.026	0.034	0.000	0.943	0.020	0.020
28	(7/9-7/15)	0.371	0.829	0.111	0.145	0.057	1.000	0.023	0.043
29	(7/16-7/22)	0.099	0.928	0.202	0.347			0.191	0.234
30	(7/23-7/29)	0.052	0.980	0.154	0.501			0.189	0.423
31	(7/30-8/5)	0.015	0.995	0.205	0.706			0.170	0.593
32	(8/6-8/12)	0.003	0.998	0.156	0.862			0.190	0.783
33	(8/13-8/19)	0.002	1.000	0.077	0.939			0.107	0.890
34	(8/20-8/26)			0.025	0.964			0.096	0.986
35	(8/27-9/2)			0.020	0.984			0.014	1.000
36	(9/3-9/9)			0.016	1.000				

Table 12. Tests for significant changes among periods in the age composition of the Canyon Island fish wheel and gill net catch of chinook salmon by age class, 1989.

	Brood Year and Age Class							
	1986	1985	1984		1983		1982	
	1.1	1.2	1.3	2.2	1.4	2.3	1.5	2.4
Periods Compared[a]								
1 , 2								
1 , 3								
1 , 4								
1 , 5								
1 , 6								
2 , 3			S					
2 , 4								
2 , 5								
2 , 6								
3 , 4								
3 , 5								
3 , 6								
4 , 5								
4 , 6								
5 , 6								

S = $0.05 < p < 0.10$
S* = $0.01 < p < 0.05$
S** = $p < 0.01$

[a] The periods represent the following statistical weeks:
Period 1 Statistical Weeks 17-20
Period 2 Statistical Week 21
Period 3 Statistical Week 22
Period 4 Statistical Week 23
Period 5 Statistical Week 24
Period 6 Statistical Weeks 25-32

Table 13. Tests for significant changes among periods in the age composition of the Canyon Island fish wheel catch of sockeye salmon by age class, 1989.

	Brood Year and Age Class									
	1987	1986		1985			1984		1983	
	0.1	0.2	1.1	0.3	1.2	2.1	1.3	2.2	1.4	2.3
Periods Compared[a]										
1 , 2		S			S**		S**	S**		S*
1 , 3		S**	S*		S**		S**	S**		
1 , 4		S**	S**	S**	S**		S**	S**		
1 , 5		S**	S**	S**	S**		S**	S**		
1 , 6	S*	S**	S**	S**	S**	S	S**	S**		
1 , 7		S**	S**	S**	S**	S**	S**	S**		S*
2 , 3					S**		S**			
2 , 4			S**	S**			S**			
2 , 5		S**	S**	S**	S**		S**			
2 , 6		S**	S**	S**	S**		S**			S**
2 , 7		S	S**	S**	S**		S**			S**
3 , 4			S**	S**	S**					
3 , 5		S**	S**	S**			S**	S		
3 , 6		S**	S**	S**			S**			S*
3 , 7		S	S**	S**			S**	S**		S**
4 , 5		S**	S		S**		S**			
4 , 6	S**	S**		S**	S	S*	S**			S**
4 , 7	S*	S**	S**	S**	S**	S**	S**	S*		S**
5 , 6	S			S						
5 , 7		S**				S*				S**
6 , 7		S	S**							

S = $0.05 < p < 0.10$
S* = $0.01 < p < 0.05$
S** = $p < 0.01$

[a] The periods represent the following statistical weeks:
Period 1 Statistical Weeks 22-24
Period 2 Statistical Week 25
Period 3 Statistical Week 26
Period 4 Statistical Weeks 27-28
Period 5 Statistical Week 29
Period 6 Statistical Weeks 30-31
Period 7 Statistical Weeks 32-39

Table 14. Tests for significant changes among periods in the age composition of coho salmon in the Canyon Island fish wheel and gill net catch by age class, 1989.

	Brood Year and Age Class				
	1986	1986	1985	1984	1983
Periods Compared[a]	1.1	2.0	2.1	3.1	4.1
1 , 2					
1 , 3			S		
1 , 4	S		S*		
1 , 5	S*		S*		
1 , 6	S**		S**		
1 , 7	S**		S**		S
2 , 3					
2 , 4	S		S		
2 , 5	S**		S**		
2 , 6	S**		S**		
2 , 7	S**		S**		
3 , 4					
3 , 5					
3 , 6	S**		S**		
3 , 7				S	
4 , 5					
4 , 6	S		S		
4 , 7				S	
5 , 6			S		
5 , 7					
6 , 7	S		S**	S	

S = $0.05 < p < 0.10$
S* = $0.01 < p < 0.05$
S** = $p < 0.01$

[a] The periods represent the following statistical weeks:
Period 1 Statistical Weeks 26-29
Period 2 Statistical Week 30
Period 3 Statistical Week 31
Period 4 Statistical Week 32
Period 5 Statistical Week 33
Period 6 Statisticak Week 34
Period 7 Statistical Weeks 35-40

Table 15. Tests for significant changes among periods in the age composition of chum salmon in the Canyon Island fish wheel and gill net catch by age class, 1989.

	Brood Year and Age Class				
	1986	1985	1984	1983	1982
	0.2	0.3	0.4	0.5	0.6
Periods Compared[a]					
1 , 2		S**	S**	S*	

S = 0.05 < p < 0.10
S* = 0.01 < p < 0.05
S** = p < 0.01

[a] The periods represent the following statistical weeks:
Period 1 Statistical Weeks 24-35
Period 2 Statistical Weeks 36-40

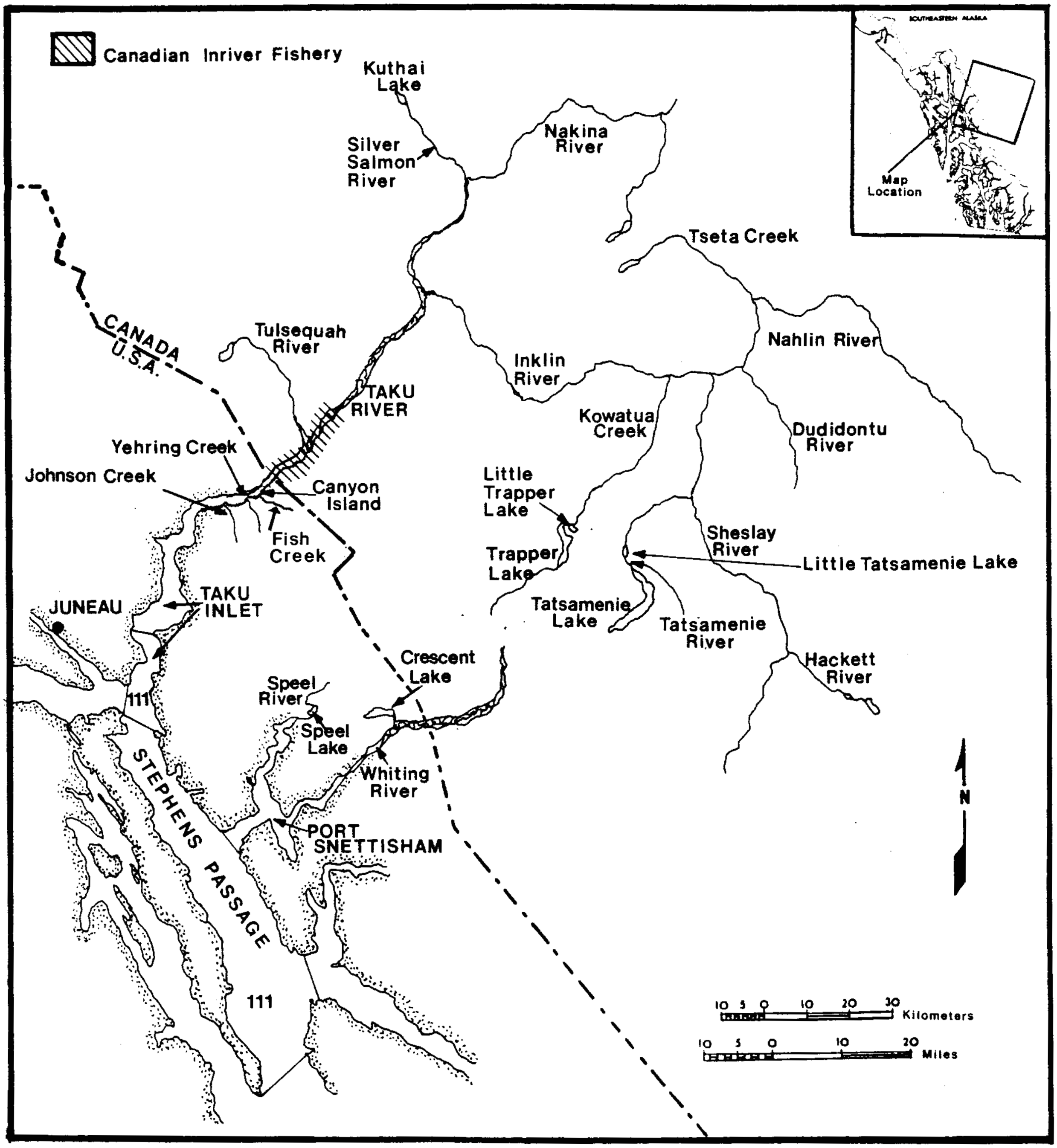


Figure 1. The Taku River drainage, with location of tagging and recovery sites.

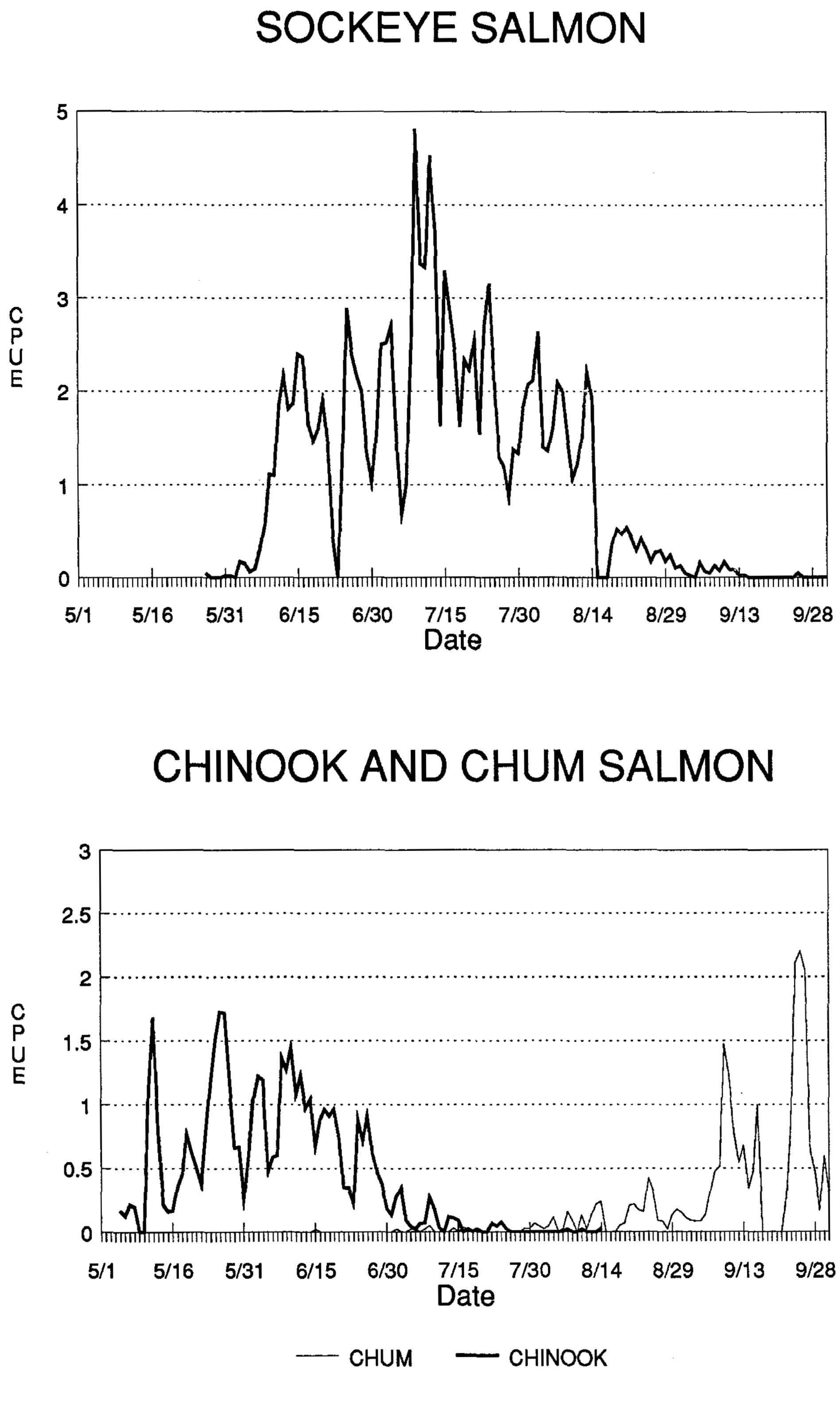
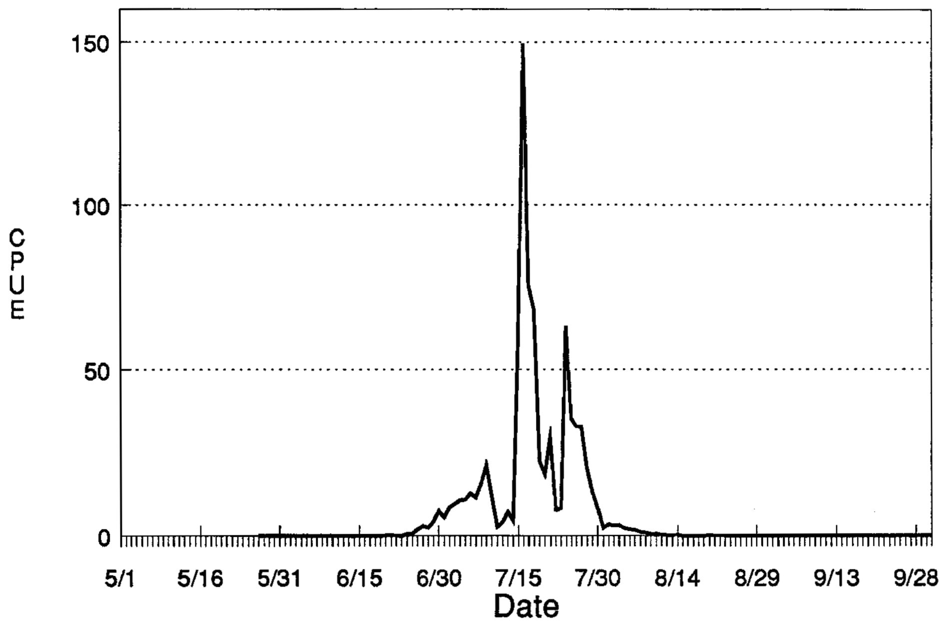


Figure 2. Fish wheel CPUE (catch per fish wheel hour) for sockeye, chinook, and chum salmon in 1989.

PINK SALMON



COHO SALMON

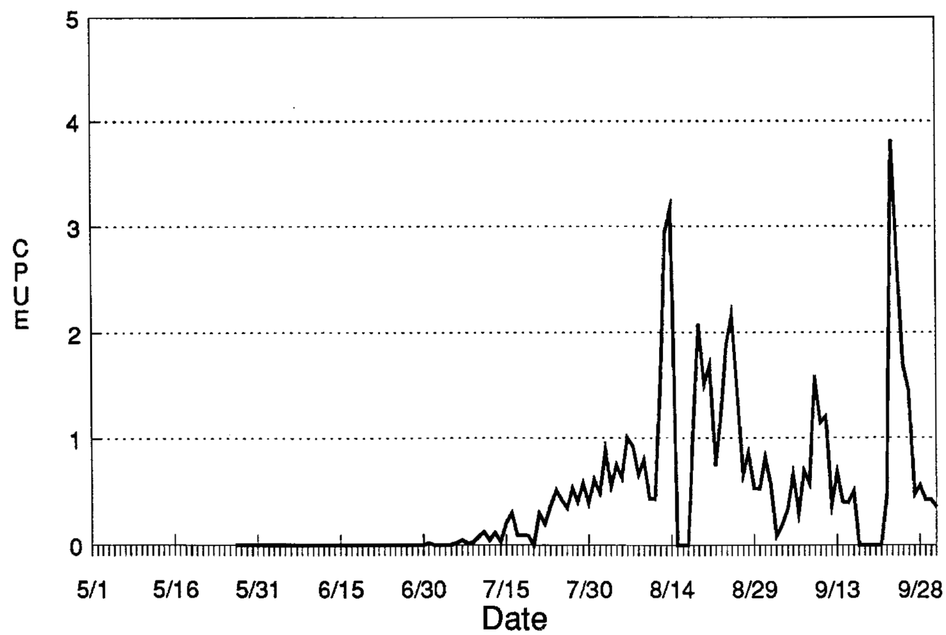


Figure 3. Fish wheel CPUE (catch per fish wheel hour) for pink and coho salmon in 1989.

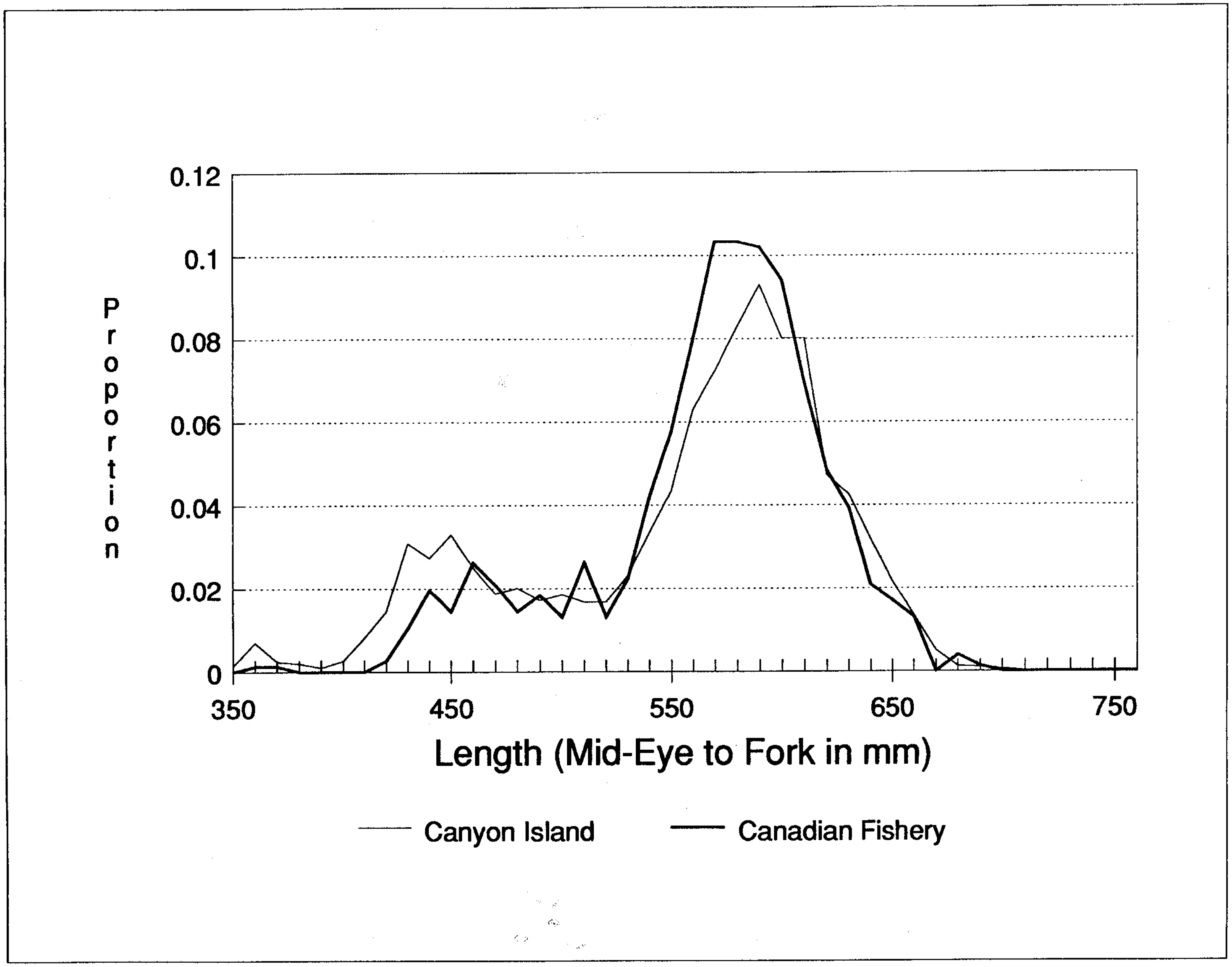


Figure 4. Length frequency distributions of sockeye salmon tagged at Canyon Island and of tagged sockeye salmon recovered in the Canadian commercial gill net fishery in 1989.

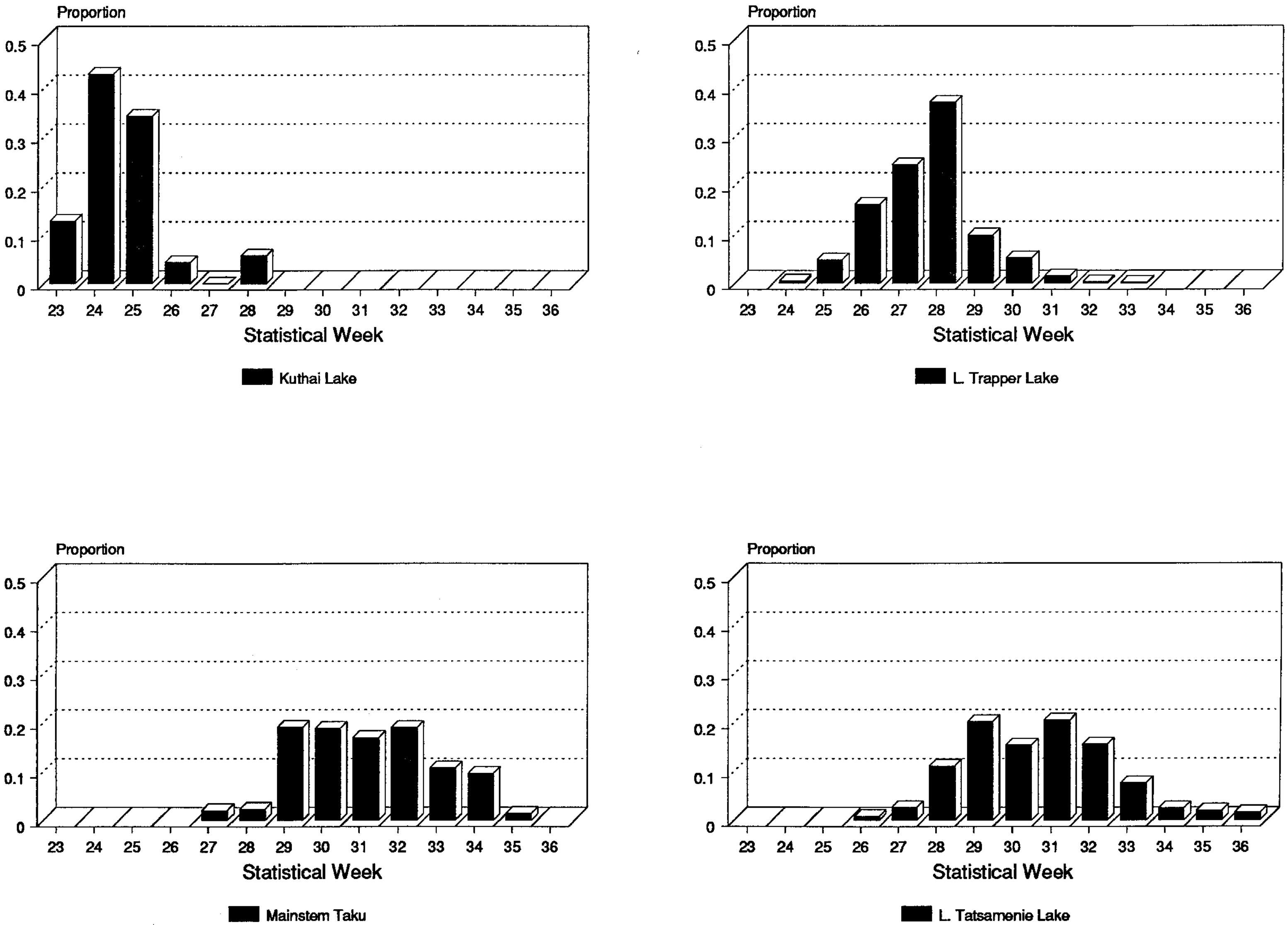


Figure 5. Run timing of sockeye salmon stock groups passing Canyon Island in 1989, based on spawning ground recoveries of tagged fish weighted by abundance indicies (fish wheel CPUE).

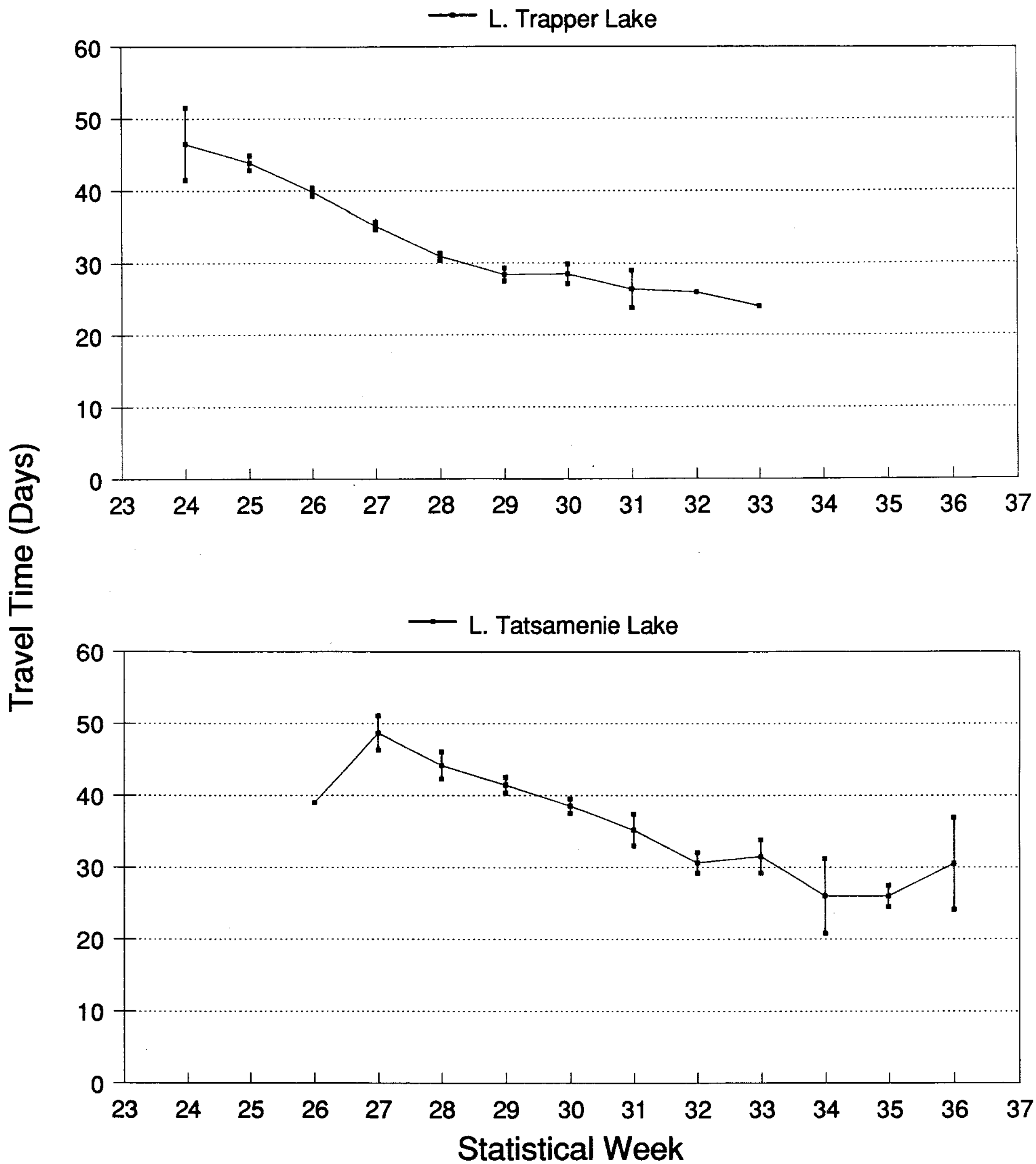


Figure 6. Mean travel times (and 95% confidence intervals) of spaghetti-tagged sockeye salmon between Canyon Island and two Taku River headwater weirs, 1989.

APPENDICES

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Appendix A.1. Inclusive dates for statistical weeks, 1989.

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

Appendix B.1. Catches, numbers tagged, and CPUE (catch/wheel hour) of chinook salmon in fish wheels at Canyon Island, 1989. Large-sized fish are greater than or equal to 661 mm MEF in length, medium-sized fish are from 440-660 mm MEF, and small fish are less than 440 mm MEF.

	Daily Chinook Catch	Cumul. Chinook Catch	Radio Tags: Medium Daily	Radio Tags: Medium Cum	Radio Tags: Large Daily	Radio Tags: Large Cum	Spaghetti Tags: Medium Daily	Spaghetti Tags: Medium Cum	Spaghetti Tags: Large Daily	Spaghetti Tags: Large Cum	Combined Cumul. Medium Tagged	Combined Cumul. Large Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
prior 5 May[a]	13	13	3	3	10	10	0	0	0	0	3	10			
05-May	2	15	0	3	2	12	0	0	0	0	3	12	0.162	0.004	0.004
06-May	3	18	0	3	3	15	0	0	0	0	3	15	0.125	0.003	0.007
07-May	5	23	0	3	3	18	0	0	0	0	3	18	0.208	0.005	0.011
08-May	4	27	1	4	2	20	0	0	0	0	4	20	0.190	0.004	0.016
09-May	0	27	0	4	0	20	0	0	0	0	4	20	0.000	0.000	0.016
10-May	1	28	0	4	1	21	0	0	0	0	4	21	0.000	0.000	0.016
11-May	8	36	3	7	5	26	0	0	0	0	7	26	1.143	0.026	0.042
12-May	35	71	4	11	25	51	0	0	0	0	11	51	1.680	0.038	0.080
13-May	19	90	2	13	9	60	0	0	0	0	13	60	0.792	0.018	0.098
14-May	5	95	0	13	1	61	1	1	0	0	14	61	0.208	0.005	0.102
15-May	5	100	1	14	1	62	0	1	0	0	15	62	0.159	0.004	0.106
16-May	8	108	3	17	3	65	0	1	0	0	18	65	0.167	0.004	0.110
17-May	17	125	2	19	10	75	0	1	0	0	20	75	0.354	0.008	0.118
18-May	21	146	3	22	10	85	2	3	0	0	25	85	0.452	0.010	0.128
19-May	37	183	3	25	22	107	7	10	0	0	35	107	0.771	0.017	0.146
20-May	30	213	2	27	11	118	13	23	0	0	50	118	0.625	0.014	0.160
21-May	23	236	4	31	12	130	1	24	0	0	55	130	0.504	0.011	0.171
22-May	17	253	3	34	7	137	2	26	0	0	60	137	0.370	0.008	0.180
23-May	33	286	5	39	15	152	1	27	0	0	66	152	0.783	0.018	0.197
24-May	50	336	0	39	3	155	17	44	6	6	83	161	1.181	0.027	0.224
25-May	69	405	0	39	3	158	10	54	31	37	93	195	1.500	0.034	0.258
26-May	77	482	0	39	0	158	12	66	31	68	105	226	1.723	0.039	0.297
27-May	79	561	0	39	0	158	25	91	38	106	130	264	1.717	0.039	0.336
28-May	54	615	0	39	4	162	18	109	20	126	148	288	1.168	0.027	0.363
29-May	31	646	0	39	4	166	13	122	7	133	161	299	0.662	0.015	0.378
30-May	29	675	0	39	7	173	6	128	9	142	167	315	0.665	0.015	0.393
31-May	12	687	0	39	7	180	5	133	0	142	172	322	0.254	0.006	0.399
01-Jun	27	714	3	42	9	189	5	138	7	149	180	338	0.592	0.013	0.412
02-Jun	48	762	0	42	9	198	8	146	21	170	188	368	1.036	0.024	0.436
03-Jun	56	818	0	42	0	198	14	160	28	198	202	396	1.222	0.028	0.463
04-Jun	55	873	1	43	7	205	12	172	25	223	215	428	1.192	0.027	0.490
05-Jun	22	895	0	43	3	208	3	175	9	232	218	440	0.475	0.011	0.501
06-Jun	26	921	0	43	11	219	2	177	4	236	220	455	0.590	0.013	0.515
07-Jun	28	949	0	43	7	226	7	184	3	239	227	465	0.603	0.014	0.528
08-Jun	62	1011	0	43	12	238	14	198	17	256	241	494	1.370	0.031	0.559
09-Jun	58	1069	0	43	9	247	17	215	20	276	258	523	1.270	0.029	0.588
10-Jun	64	1133	0	43	0	247	17	232	37	313	275	560	1.446	0.033	0.621

- continued -

Appendix B.1 (Page 2 of 3).

	Daily Chinook Catch	Cumul. Chinook Catch	Radio Tags Medium Daily	Radio Tags Medium Cum	Radio Tags Large Daily	Radio Tags Large Cum	Spaghetti Tags Medium Daily	Spaghetti Tags Medium Cum	Spaghetti Tags Large Daily	Spaghetti Tags Large Cum	Combined Cumul. Medium Tagged	Combined Cumul. Large Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
11-Jun	49	1182	0	43	9	256	11	243	15	328	286	584	1.081	0.025	0.645
12-Jun	55	1237	0	43	8	264	21	264	11	339	307	603	1.229	0.028	0.673
13-Jun	44	1281	1	44	12	276	9	273	9	348	317	624	0.971	0.022	0.695
14-Jun	47	1328	0	44	0	276	7	280	20	368	324	644	1.046	0.024	0.719
15-Jun	30	1358	0	44	9	285	8	288	5	373	332	658	0.672	0.015	0.734
16-Jun	26	1384	0	44	3	288	3	291	4	377	335	665	0.877	0.020	0.754
17-Jun	44	1428	0	44	9	297	9	300	4	381	344	678	0.963	0.022	0.776
18-Jun	41	1469	0	44	1	298	8	308	10	391	352	689	0.913	0.021	0.797
19-Jun	43	1512	0	44	8	306	10	318	5	396	362	702	0.965	0.022	0.819
20-Jun	34	1546	1	45	6	312	10	328	2	398	373	710	0.750	0.017	0.836
21-Jun	16	1562	1	46	1	313	2	330	2	400	376	713	0.346	0.008	0.844
22-Jun	16	1578	0	46	3	316	1	331	0	400	377	716	0.343	0.008	0.851
23-Jun	2	1580	0	46	1	317	0	331	0	400	377	717	0.224	0.005	0.857
24-Jun	29	1609	0	46	13	330	5	336	0	400	382	730	0.890	0.020	0.877
25-Jun	28	1637	0	46	8	338	7	343	3	403	389	741	0.715	0.016	0.893
26-Jun	24	1661	0	46	4	342	3	346	0	403	392	745	0.912	0.021	0.914
27-Jun	28	1689	0	46	6	348	4	350	0	403	396	751	0.619	0.014	0.928
28-Jun	21	1710	0	46	5	353	5	355	1	404	401	757	0.466	0.011	0.938
29-Jun	17	1727	0	46	5	358	4	359	1	405	405	763	0.374	0.008	0.947
30-Jun	8	1735	0	46	4	362	0	359	1	406	405	768	0.186	0.004	0.951
01-Jul	6	1741	0	46	2	364	0	359	2	408	405	772	0.134	0.003	0.954
02-Jul	12	1753	0	46	3	367	1	360	6	414	406	781	0.273	0.006	0.960
03-Jul	15	1768	0	46	0	367	4	364	3	417	410	784	0.343	0.008	0.968
04-Jul	4	1772	0	46	0	367	3	367	0	417	413	784	0.090	0.002	0.970
05-Jul	2	1774	0	46	0	367	1	368	0	417	414	784	0.044	0.001	0.971
06-Jul	1	1775	0	46	0	367	1	369	0	417	415	784	0.022	0.001	0.972
07-Jul	3	1778	0	46	3	370	0	369	0	417	415	787	0.067	0.002	0.973
08-Jul	3	1781	0	46	1	371	1	370	1	418	416	789	0.068	0.002	0.975
09-Jul	11	1792	0	46	4	375	2	372	1	419	418	794	0.267	0.006	0.981
10-Jul	7	1799	0	46	1	376	3	375	1	420	421	796	0.180	0.004	0.985
11-Jul	1	1800	0	46	1	377	0	375	0	420	421	797	0.030	0.001	0.985
12-Jul	0	1800	0	46	0	377	0	375	0	420	421	797	0.000	0.000	0.985
13-Jul	3	1803	0	46	1	378	1	376	0	420	422	798	0.116	0.003	0.988
14-Jul	4	1807	0	46	2	380	1	377	0	420	423	800	0.108	0.002	0.991
15-Jul	3	1810	0	46	2	382	0	377	0	420	423	802	0.089	0.002	0.993
16-Jul	0	1810	0	46	0	382	0	377	0	420	423	802	0.000	0.000	0.993
17-Jul	1	1811	0	46	1	383	0	377	0	420	423	803	0.023	0.001	0.993
18-Jul	0	1811	0	46	0	383	0	377	0	420	423	803	0.000	0.000	0.993
19-Jul	1	1812	0	46	0	383	0	377	0	420	423	803	0.022	0.001	0.994
20-Jul	0	1812	0	46	0	383	0	377	0	420	423	803	0.000	0.000	0.994
21-Jul	0	1812	0	46	0	383	0	377	0	420	423	803	0.000	0.000	0.994

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	Daily Chinook Catch	Cumul. Chinook Catch	Radio Tags				Spaghetti Tags				Combined Cumul. Medium Tagged	Combined Cumul. Large Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
			Medium		Large		Medium		Large						
			Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum					
22-Jul	3	1815	0	46	0	383	0	377	2	422	423	805	0.066	0.002	0.995
23-Jul	2	1817	0	46	0	383	1	378	1	423	424	806	0.045	0.001	0.996
24-Jul	3	1820	0	46	0	383	0	378	1	424	424	807	0.075	0.002	0.998
25-Jul	1	1821	0	46	0	383	0	378	0	424	424	807	0.025	0.001	0.998
26-Jul	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
27-Jul	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
28-Jul	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
29-Jul	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
30-Jul	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
31-Jul	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
01-Aug	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
02-Aug	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
03-Aug	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
04-Aug	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
05-Aug	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
06-Aug	0	1821	0	46	0	383	0	378	0	424	424	807	0.000	0.000	0.998
07-Aug	1	1822	0	46	0	383	0	378	1	425	424	808	0.022	0.001	0.999
08-Aug	0	1822	0	46	0	383	0	378	0	425	424	808	0.000	0.000	0.999
09-Aug	0	1822	0	46	0	383	0	378	0	425	424	808	0.000	0.000	0.999
10-Aug	1	1823	0	46	0	383	0	378	0	425	424	808	0.022	0.000	0.999
11-Aug	0	1823	0	46	0	383	0	378	0	425	424	808	0.000	0.000	0.999
12-Aug	0	1823	0	46	0	383	0	378	0	425	424	808	0.000	0.000	0.999
13-Aug	0	1823	0	46	0	383	0	378	0	425	424	808	0.000	0.000	0.999
14-Aug	1	1824	0	46	0	383	0	378	0	425	424	808	0.026	0.001	1.000
15-Aug	0	1824	0	46	0	383	0	378	0	425	424	808	0.000	0.000	1.000

[a] Fish caught and tagged prior to 5 May were caught in set gill nets.

Appendix B.2. Catches, numbers tagged, and CPUE (catch/wheel hour) of sockeye salmon in fish wheels at Canyon Island, 1989. Tagging totals were reduced to account for tagged fish recovered in downstream fisheries.

	Daily Sockeye Catch	Cumul. Sockeye Catch	Daily Sockeye Tagged	Cumul. Sockeye Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
27-May	2	2	0	0	0.043	0.000	0.000
28-May	0	2	0	0	0.000	0.000	0.000
29-May	0	2	0	0	0.000	0.000	0.000
30-May	0	2	0	0	0.000	0.000	0.000
31-May	1	3	1	1	0.021	0.000	0.000
01-Jun	1	4	1	2	0.022	0.000	0.001
02-Jun	0	4	0	2	0.000	0.000	0.001
03-Jun	8	12	7	9	0.175	0.001	0.002
04-Jun	7	19	7	16	0.152	0.001	0.003
05-Jun	3	22	3	19	0.065	0.000	0.003
06-Jun	4	26	4	23	0.091	0.001	0.004
07-Jun	14	40	12	35	0.302	0.002	0.006
08-Jun	26	66	25	60	0.575	0.004	0.010
09-Jun	51	117	49	109	1.117	0.008	0.018
10-Jun	49	166	46	155	1.107	0.008	0.026
11-Jun	84	250	80	235	1.853	0.013	0.040
12-Jun	97	347	90	325	2.168	0.016	0.055
13-Jun	82	429	79	404	1.809	0.013	0.068
14-Jun	84	513	79	483	1.870	0.013	0.082
15-Jun	107	620	97	580	2.395	0.017	0.099
16-Jun	70	690	67	647	2.360	0.017	0.116
17-Jun	75	765	68	715	1.642	0.012	0.128
18-Jun	66	831	59	774	1.469	0.011	0.138
19-Jun	71	902	69	843	1.593	0.011	0.150
20-Jun	86	988	79	922	1.897	0.014	0.164
21-Jun	67	1055	61	983	1.454	0.010	0.174
22-Jun	20	1075	20	1003	0.429	0.003	0.177
23-Jun	0	1075	0	1003	0.000	0.000	0.177
24-Jun	39	1114	36	1039	1.197	0.009	0.186
25-Jun	113	1227	109	1148	2.885	0.021	0.206
26-Jun	63	1290	60	1208	2.393	0.017	0.224
27-Jun	98	1388	93	1301	2.166	0.016	0.239
28-Jun	90	1478	85	1386	1.996	0.014	0.254
29-Jun	62	1540	53	1439	1.363	0.010	0.263
30-Jun	44	1584	38	1477	1.025	0.007	0.271
01-Jul	69	1653	61	1538	1.545	0.011	0.282
02-Jul	110	1763	98	1636	2.500	0.018	0.300
03-Jul	110	1873	93	1729	2.519	0.018	0.318
04-Jul	120	1993	106	1835	2.701	0.019	0.338
05-Jul	70	2063	56	1891	1.542	0.011	0.349
06-Jul	31	2094	27	1918	0.685	0.005	0.354
07-Jul	45	2139	37	1955	1.002	0.007	0.361
08-Jul	102	2241	94	2049	2.296	0.017	0.377
09-Jul	198	2439	181	2230	4.810	0.035	0.412
10-Jul	131	2570	121	2351	3.373	0.024	0.436
11-Jul	107	2677	98	2449	3.335	0.024	0.460
12-Jul	97	2774	89	2538	4.528	0.033	0.493
13-Jul	96	2870	87	2625	3.715	0.027	0.519
14-Jul	57	2927	50	2675	1.632	0.012	0.531

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	Daily Sockeye Catch	Cumul. Sockeye Catch	Daily Sockeye Tagged	Cumul. Sockeye Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
15-Jul	111	3038	95	2770	3.297	0.024	0.555
16-Jul	86	3124	66	2836	2.851	0.021	0.575
17-Jul	104	3228	92	2928	2.423	0.017	0.593
18-Jul	70	3298	57	2985	1.625	0.012	0.605
19-Jul	104	3402	89	3074	2.333	0.017	0.621
20-Jul	85	3487	74	3148	2.227	0.016	0.637
21-Jul	103	3590	93	3241	2.543	0.018	0.656
22-Jul	70	3660	56	3297	1.544	0.011	0.667
23-Jul	119	3779	97	3394	2.694	0.019	0.686
24-Jul	130	3909	117	3511	3.158	0.023	0.709
25-Jul	85	3994	72	3583	2.103	0.015	0.724
26-Jul	56	4050	46	3629	1.295	0.009	0.733
27-Jul	52	4102	42	3671	1.200	0.009	0.742
28-Jul	39	4141	29	3700	0.870	0.006	0.748
29-Jul	50	4191	40	3740	1.377	0.010	0.758
30-Jul	51	4242	48	3788	1.339	0.010	0.768
31-Jul	81	4323	67	3855	1.831	0.013	0.781
01-Aug	93	4416	82	3937	2.070	0.015	0.796
02-Aug	91	4507	75	4012	2.112	0.015	0.811
03-Aug	115	4622	99	4111	2.633	0.019	0.830
04-Aug	62	4684	57	4168	1.404	0.010	0.840
05-Aug	63	4747	56	4224	1.367	0.010	0.850
06-Aug	72	4819	61	4285	1.603	0.012	0.862
07-Aug	93	4912	84	4369	2.090	0.015	0.877
08-Aug	91	5003	69	4438	1.996	0.014	0.891
09-Aug	68	5071	55	4493	1.503	0.011	0.902
10-Aug	49	5120	34	4527	1.067	0.008	0.909
11-Aug	56	5176	43	4570	1.213	0.009	0.918
12-Aug	68	5244	56	4626	1.508	0.011	0.929
13-Aug	93	5337	82	4708	2.205	0.016	0.945
14-Aug	74	5411	68	4776	1.935	0.014	0.959
15-Aug	0	5411	0	4776	0.000	0.000	0.959
16-Aug	0	5411	0	4776	0.000	0.000	0.959
17-Aug	0	5411	0	4776	0.000	0.000	0.959
18-Aug	7	5418	6	4782	0.359	0.003	0.961
19-Aug	23	5441	17	4799	0.521	0.004	0.965
20-Aug	21	5462	17	4816	0.473	0.003	0.969
21-Aug	23	5485	14	4830	0.539	0.004	0.972
22-Aug	18	5503	13	4843	0.433	0.003	0.976
23-Aug	13	5516	13	4856	0.297	0.002	0.978
24-Aug	19	5535	10	4866	0.420	0.003	0.981
25-Aug	14	5549	10	4876	0.313	0.002	0.983
26-Aug	8	5557	6	4882	0.174	0.001	0.984
27-Aug	13	5570	11	4893	0.276	0.002	0.986
28-Aug	13	5583	12	4905	0.294	0.002	0.988
29-Aug	8	5591	7	4912	0.177	0.001	0.990
30-Aug	11	5602	8	4920	0.242	0.002	0.991
31-Aug	5	5607	5	4925	0.107	0.001	0.992

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	Daily Sockeye Catch	Cumul. Sockeye Catch	Daily Sockeye Tagged	Cumul. Sockeye Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
01-Sep	6	5613	4	4929	0.129	0.001	0.993
02-Sep	2	5615	1	4930	0.044	0.000	0.993
03-Sep	1	5616	1	4931	0.021	0.000	0.994
04-Sep	0	5616	0	4931	0.000	0.000	0.994
05-Sep	7	5623	6	4937	0.159	0.001	0.995
06-Sep	3	5626	2	4939	0.063	0.000	0.995
07-Sep	2	5628	2	4941	0.048	0.000	0.995
08-Sep	4	5632	4	4945	0.128	0.001	0.996
09-Sep	2	5634	2	4947	0.074	0.001	0.997
10-Sep	6	5640	6	4953	0.168	0.001	0.998
11-Sep	4	5644	3	4956	0.087	0.001	0.999
12-Sep	3	5647	2	4958	0.082	0.001	0.999
13-Sep	1	5648	0	4958	0.023	0.000	1.000
14-Sep	1	5649	0	4958	0.021	0.000	1.000
15-Sep	0	5649	0	4958	0.000	0.000	1.000
16-Sep	0	5649	0	4958	0.000	0.000	1.000
17-Sep	0	5649	0	4958	0.000	0.000	1.000
18-Sep	0	5649	0	4958	0.000	0.000	1.000
19-Sep	0	5649	0	4958	0.000	0.000	1.000
20-Sep	0	5649	0	4958	0.000	0.000	1.000
21-Sep	0	5649	0	4958	0.000	0.000	1.000
22-Sep	0	5649	0	4958	0.000	0.000	1.000
23-Sep	0	5649	0	4958	0.000	0.000	1.000
24-Sep	0	5649	0	4958	0.000	0.000	1.000
25-Sep	1	5650	1	4959	0.046	0.000	1.000
26-Sep	0	5650	0	4959	0.000	0.000	1.000
27-Sep	0	5650	0	4959	0.000	0.000	1.000
28-Sep	0	5650	0	4959	0.000	0.000	1.000
29-Sep	0	5650	0	4959	0.000	0.000	1.000
30-Sep	0	5650	0	4959	0.000	0.000	1.000
01-Oct	0	5650	0	4959	0.000	0.000	1.000

Appendix B.3. Catches, numbers tagged, and CPUE (catch/wheel hour) of coho salmon in fish wheels at Canyon Island, 1989. Tagging totals were reduced to account for tagged fish recovered in downstream fisheries.

	Daily Coho Catch	Cumul. Coho Catch	Daily Coho Tagged	Cumul. Coho Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
01-Jul	1	1	1	1	0.022	0.000	0.000
02-Jul	0	1	0	1	0.000	0.000	0.000
03-Jul	0	1	0	1	0.000	0.000	0.000
04-Jul	0	1	0	1	0.000	0.000	0.000
05-Jul	0	1	0	1	0.000	0.000	0.000
06-Jul	1	2	1	2	0.022	0.000	0.001
07-Jul	2	4	2	4	0.045	0.001	0.001
08-Jul	1	5	1	5	0.023	0.000	0.002
09-Jul	1	6	1	6	0.024	0.000	0.002
10-Jul	3	9	2	8	0.077	0.001	0.004
11-Jul	4	13	2	10	0.125	0.002	0.006
12-Jul	1	14	1	11	0.047	0.001	0.006
13-Jul	3	17	3	14	0.116	0.002	0.008
14-Jul	1	18	1	15	0.029	0.000	0.009
15-Jul	7	25	5	20	0.208	0.003	0.012
16-Jul	9	34	9	29	0.298	0.005	0.017
17-Jul	4	38	4	33	0.093	0.002	0.019
18-Jul	4	42	4	37	0.093	0.002	0.020
19-Jul	4	46	2	39	0.090	0.001	0.022
20-Jul	0	46	0	39	0.000	0.000	0.022
21-Jul	12	58	9	48	0.296	0.005	0.027
22-Jul	9	67	7	55	0.199	0.003	0.030
23-Jul	16	83	12	67	0.362	0.006	0.036
24-Jul	21	104	16	83	0.510	0.008	0.044
25-Jul	17	121	17	100	0.421	0.007	0.051
26-Jul	15	136	12	112	0.347	0.006	0.057
27-Jul	23	159	20	132	0.531	0.009	0.066
28-Jul	18	177	17	149	0.402	0.007	0.073
29-Jul	21	198	17	166	0.579	0.010	0.082
30-Jul	15	213	14	180	0.394	0.007	0.089
31-Jul	27	240	26	206	0.610	0.010	0.099
01-Aug	22	262	20	226	0.490	0.008	0.107
02-Aug	38	300	37	263	0.882	0.015	0.122
03-Aug	24	324	22	285	0.550	0.009	0.131
04-Aug	33	357	30	315	0.747	0.012	0.143
05-Aug	29	386	26	341	0.629	0.010	0.153
06-Aug	45	431	43	384	1.002	0.017	0.170
07-Aug	41	472	38	422	0.921	0.015	0.185
08-Aug	30	502	26	448	0.658	0.011	0.196
09-Aug	36	538	31	479	0.796	0.013	0.209
10-Aug	20	558	17	496	0.436	0.007	0.217
11-Aug	20	578	19	515	0.433	0.007	0.224
12-Aug	65	643	61	576	1.442	0.024	0.248
13-Aug	124	767	119	695	2.940	0.049	0.297
14-Aug	121	888	117	812	3.163	0.052	0.349
15-Aug	0	888	0	812	0.000	0.000	0.349
16-Aug	0	888	0	812	0.000	0.000	0.349
17-Aug	0	888	0	812	0.000	0.000	0.349
18-Aug	22	910	18	830	1.128	0.019	0.368

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	Daily Coho Catch	Cumul. Coho Catch	Daily Coho Tagged	Cumul. Coho Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
19-Aug	92	1002	86	916	2.083	0.035	0.402
20-Aug	67	1069	61	977	1.509	0.025	0.427
21-Aug	72	1141	65	1042	1.688	0.028	0.455
22-Aug	31	1172	29	1071	0.745	0.012	0.468
23-Aug	54	1226	48	1119	1.234	0.020	0.488
24-Aug	85	1311	82	1201	1.878	0.031	0.519
25-Aug	97	1408	89	1290	2.168	0.036	0.555
26-Aug	66	1474	64	1354	1.435	0.024	0.579
27-Aug	31	1505	26	1380	0.658	0.011	0.590
28-Aug	38	1543	33	1413	0.860	0.014	0.604
29-Aug	24	1567	23	1436	0.531	0.009	0.613
30-Aug	24	1591	22	1458	0.528	0.009	0.622
31-Aug	38	1629	38	1496	0.814	0.013	0.635
01-Sep	26	1655	25	1521	0.558	0.009	0.644
02-Sep	4	1659	4	1525	0.087	0.001	0.646
03-Sep	9	1668	7	1532	0.190	0.003	0.649
04-Sep	16	1684	15	1547	0.339	0.006	0.655
05-Sep	29	1713	26	1573	0.659	0.011	0.666
06-Sep	14	1727	8	1581	0.296	0.005	0.670
07-Sep	29	1756	24	1605	0.690	0.011	0.682
08-Sep	18	1774	12	1617	0.575	0.010	0.691
09-Sep	43	1817	30	1647	1.583	0.026	0.718
10-Sep	41	1858	28	1675	1.147	0.019	0.737
11-Sep	55	1913	43	1718	1.198	0.020	0.757
12-Sep	14	1927	11	1729	0.381	0.006	0.763
13-Sep	30	1957	20	1749	0.678	0.011	0.774
14-Sep	19	1976	11	1760	0.404	0.007	0.781
15-Sep	5	1981	5	1765	0.397	0.007	0.787
16-Sep	2	1983	0	1765	0.500	0.008	0.796
17-Sep	0	1983	0	1765	0.000	0.000	0.796
18-Sep	0	1983	0	1765	0.000	0.000	0.796
19-Sep [a]	0	1983	16	1781	0.000	0.000	0.796
20-Sep	0	1983	42	1823	0.000	0.000	0.796
21-Sep	0	1983	30	1853	0.000	0.000	0.796
22-Sep	9	1992	8	1861	0.463	0.008	0.803
23-Sep	77	2069	73	1934	3.818	0.063	0.867
24-Sep	57	2126	56	1990	2.672	0.044	0.911
25-Sep	37	2163	35	2025	1.695	0.028	0.939
26-Sep	31	2194	30	2055	1.442	0.024	0.963
27-Sep	11	2205	9	2064	0.473	0.008	0.971
28-Sep	13	2218	13	2077	0.557	0.009	0.980
29-Sep	10	2228	10	2087	0.422	0.007	0.987
30-Sep	10	2238	10	2097	0.424	0.007	0.994
01-Oct	5	2243	5	2102	0.357	0.006	1.000

[a] Fish were captured with set gill nets from 19-21 September because low water flows prevented fish wheel operation.

Appendix B.4. Catches, numbers tagged, and CPUE (catch/wheel hour) of pink salmon in fish wheels at Canyon Island, 1989. Tagging totals were reduced to account for tagged fish recovered in downstream fisheries.

	Daily Pink Catch	Cumul. Pink Catch	Daily Pink Tagged	Cumul. Pink Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
18-Jun	1	6	0	0	0.022	0.000	0.000
19-Jun	2	8	0	0	0.045	0.000	0.000
20-Jun	6	14	0	0	0.132	0.000	0.000
21-Jun	8	22	0	0	0.174	0.000	0.001
22-Jun	4	26	1	1	0.086	0.000	0.001
23-Jun	0	26	0	1	0.000	0.000	0.001
24-Jun	18	44	1	2	0.552	0.001	0.001
25-Jun	22	66	1	3	0.562	0.001	0.002
26-Jun	54	120	5	8	2.051	0.002	0.005
27-Jun	137	257	28	36	3.028	0.004	0.008
28-Jun	118	375	25	61	2.618	0.003	0.011
29-Jun	199	574	39	100	4.374	0.005	0.017
30-Jun	324	898	79	179	7.549	0.009	0.026
01-Jul	252	1150	54	233	5.641	0.007	0.032
02-Jul	382	1532	64	297	8.682	0.010	0.043
03-Jul	426	1958	76	373	9.755	0.012	0.055
04-Jul	476	2434	95	468	10.716	0.013	0.068
05-Jul	497	2931	100	568	10.945	0.013	0.081
06-Jul	576	3507	89	657	12.729	0.015	0.096
07-Jul	521	4028	156	813	11.601	0.014	0.110
08-Jul	698	4726	131	944	15.714	0.019	0.129
09-Jul	876	5602	140	1084	21.283	0.026	0.155
10-Jul	454	6056	51	1135	11.689	0.014	0.169
11-Jul	89	6145	25	1160	2.774	0.003	0.172
12-Jul	91	6236	25	1185	4.248	0.005	0.177
13-Jul	188	6424	24	1209	7.276	0.009	0.186
14-Jul	161	6585	37	1246	4.611	0.006	0.192
15-Jul	1975	8560	75	1321	58.658	0.071	0.262
16-Jul	4512	13072	266	1587	149.553	0.180	0.443
17-Jul	3235	16307	486	2073	75.373	0.091	0.534
18-Jul	2939	19246	0	2073	68.206	0.082	0.616
19-Jul	1006	20252	25	2098	22.566	0.027	0.643
20-Jul	710	20962	209	2307	18.606	0.022	0.665
21-Jul	1208	22170	346	2653	29.827	0.036	0.701
22-Jul	360	22530	145	2798	7.940	0.010	0.711
23-Jul	370	22900	25	2823	8.377	0.010	0.721
24-Jul	2593	25493	106	2929	62.983	0.076	0.797
25-Jul	1433	26926	289	3218	35.453	0.043	0.840
26-Jul	1433	28359	146	3364	33.133	0.040	0.880
27-Jul	925	29284	88	3452	33.064	0.040	0.920
28-Jul	483	29767	117	3569	20.634	0.025	0.944
29-Jul	314	30081	41	3610	13.306	0.016	0.960
30-Jul	112	30193	25	3635	8.244	0.010	0.970
31-Jul	159	30352	25	3660	2.531	0.003	0.973
01-Aug	139	30491	15	3675	3.540	0.004	0.978
02-Aug	144	30635	15	3690	3.227	0.004	0.982
03-Aug	106	30741	15	3705	3.297	0.004	0.986
04-Aug	96	30837	12	3717	2.400	0.003	0.989
05-Aug	85	30922	10	3727	2.083	0.003	0.991

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	Daily Pink Catch	Cumul. Pink Catch	Daily Pink Tagged	Cumul. Pink Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
06-Aug	55	30977	7	3734	1.892	0.002	0.993
07-Aug	48	31025	5	3739	1.236	0.001	0.995
08-Aug	29	31054	6	3745	1.053	0.001	0.996
09-Aug	27	31081	0	3745	0.641	0.001	0.997
10-Aug	21	31102	0	3745	0.588	0.001	0.998
11-Aug	12	31114	0	3745	0.455	0.001	0.998
12-Aug	11	31125	0	3745	0.266	0.000	0.998
13-Aug	14	31139	0	3745	0.261	0.000	0.999
14-Aug	15	31154	0	3745	0.366	0.000	0.999
15-Aug	0	31154	0	3745	0.000	0.000	0.999
16-Aug	0	31154	0	3745	0.000	0.000	0.999
17-Aug	0	31154	0	3745	0.000	0.000	0.999
18-Aug	2	31156	0	3745	0.000	0.000	0.999
19-Aug	10	31166	0	3745	0.045	0.000	0.999
20-Aug	5	31171	0	3745	0.225	0.000	0.999
21-Aug	4	31175	0	3745	0.094	0.000	1.000
22-Aug	4	31179	0	3745	0.096	0.000	1.000
23-Aug	5	31184	0	3745	0.114	0.000	1.000
24-Aug	1	31185	0	3745	0.022	0.000	1.000
25-Aug	2	31187	0	3745	0.045	0.000	1.000
26-Aug	1	31188	0	3745	0.022	0.000	1.000
27-Aug	0	31188	0	3745	0.000	0.000	1.000
28-Aug	0	31188	0	3745	0.000	0.000	1.000
29-Aug	0	31188	0	3745	0.000	0.000	1.000
30-Aug	0	31188	0	3745	0.000	0.000	1.000
31-Aug	0	31188	0	3745	0.000	0.000	1.000
01-Sep	0	31188	0	3745	0.000	0.000	1.000
02-Sep	0	31188	0	3745	0.000	0.000	1.000
03-Sep	0	31188	0	3745	0.000	0.000	1.000
04-Sep	0	31188	0	3745	0.000	0.000	1.000
05-Sep	1	31189	0	3745	0.023	0.000	1.000
06-Sep	0	31189	0	3745	0.000	0.000	1.000
07-Sep	0	31189	0	3745	0.000	0.000	1.000
08-Sep	0	31189	0	3745	0.000	0.000	1.000
09-Sep	0	31189	0	3745	0.000	0.000	1.000
10-Sep	0	31189	0	3745	0.000	0.000	1.000
11-Sep	0	31189	0	3745	0.000	0.000	1.000
12-Sep	0	31189	0	3745	0.000	0.000	1.000
13-Sep	0	31189	0	3745	0.000	0.000	1.000
14-Sep	0	31189	0	3745	0.000	0.000	1.000
15-Sep	0	31189	0	3745	0.000	0.000	1.000
16-Sep	0	31189	0	3745	0.000	0.000	1.000
17-Sep	0	31189	0	3745	0.000	0.000	1.000
18-Sep	0	31189	0	3745	0.000	0.000	1.000
19-Sep	0	31189	0	3745	0.000	0.000	1.000
20-Sep	0	31189	0	3745	0.000	0.000	1.000
21-Sep	0	31189	0	3745	0.000	0.000	1.000
22-Sep	0	31189	0	3745	0.000	0.000	1.000
23-Sep	0	31189	0	3745	0.000	0.000	1.000
24-Sep	0	31189	0	3745	0.000	0.000	1.000
25-Sep	0	31189	0	3745	0.000	0.000	1.000
26-Sep	0	31189	0	3745	0.000	0.000	1.000
27-Sep	0	31189	0	3745	0.000	0.000	1.000
28-Sep	0	31189	0	3745	0.000	0.000	1.000
29-Sep	0	31189	0	3745	0.000	0.000	1.000
30-Sep	0	31189	0	3745	0.000	0.000	1.000
01-Oct	0	31189	0	3745	0.000	0.000	1.000

Appendix B.5. Catches, numbers tagged, and CPUE (catch/wheel hour) of chum salmon in fish wheels at Canyon Island, 1989. Tagging totals were reduced to account for tagged fish recovered in downstream fisheries.

	Daily Chum Catch	Cumul. Chum Catch	Daily Chum Tagged	Cumul. Chum Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
15-Jun	1	1	0	0	0.022	0.001	0.001
16-Jun	0	1	0	0	0.000	0.000	0.001
17-Jun	0	1	0	0	0.000	0.000	0.001
18-Jun	0	1	0	0	0.000	0.000	0.001
19-Jun	0	1	0	0	0.000	0.000	0.001
20-Jun	0	1	0	0	0.000	0.000	0.001
21-Jun	0	1	0	0	0.000	0.000	0.001
22-Jun	0	1	0	0	0.000	0.000	0.001
23-Jun	0	1	0	0	0.000	0.000	0.001
24-Jun	0	1	0	0	0.000	0.000	0.001
25-Jun	0	1	0	0	0.000	0.000	0.001
26-Jun	0	1	0	0	0.000	0.000	0.001
27-Jun	0	1	0	0	0.000	0.000	0.001
28-Jun	0	1	0	0	0.000	0.000	0.001
29-Jun	0	1	0	0	0.000	0.000	0.001
30-Jun	0	1	0	0	0.000	0.000	0.001
01-Jul	0	1	0	0	0.000	0.000	0.001
02-Jul	1	2	1	1	0.023	0.001	0.002
03-Jul	0	2	0	1	0.000	0.000	0.002
04-Jul	0	2	0	1	0.000	0.000	0.002
05-Jul	1	3	1	2	0.022	0.001	0.003
06-Jul	1	4	1	3	0.022	0.001	0.004
07-Jul	0	4	0	3	0.000	0.000	0.004
08-Jul	1	5	1	4	0.023	0.001	0.005
09-Jul	2	7	2	6	0.049	0.002	0.007
10-Jul	0	7	0	6	0.000	0.000	0.007
11-Jul	0	7	0	6	0.000	0.000	0.007
12-Jul	0	7	0	6	0.000	0.000	0.007
13-Jul	0	7	0	6	0.000	0.000	0.007
14-Jul	1	8	1	7	0.029	0.001	0.009
15-Jul	0	8	0	7	0.000	0.000	0.009
16-Jul	1	9	1	8	0.033	0.002	0.010
17-Jul	1	10	1	9	0.023	0.001	0.011
18-Jul	0	10	0	9	0.000	0.000	0.011
19-Jul	1	11	1	10	0.022	0.001	0.012
20-Jul	0	11	0	10	0.000	0.000	0.012
21-Jul	0	11	0	10	0.000	0.000	0.012
22-Jul	0	11	0	10	0.000	0.000	0.012
23-Jul	0	11	0	10	0.000	0.000	0.012
24-Jul	0	11	0	10	0.000	0.000	0.012
25-Jul	0	11	0	10	0.000	0.000	0.012
26-Jul	0	11	0	10	0.000	0.000	0.012
27-Jul	0	11	0	10	0.000	0.000	0.012
28-Jul	0	11	0	10	0.000	0.000	0.012
29-Jul	1	12	1	11	0.028	0.001	0.014
30-Jul	1	13	1	12	0.026	0.001	0.015
31-Jul	3	16	3	15	0.068	0.003	0.018
01-Aug	2	18	2	17	0.045	0.002	0.020

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	Daily Chum Catch	Cumul. Chum Catch	Daily Chum Tagged	Cumul. Chum Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
02-Aug	1	19	1	18	0.023	0.001	0.021
03-Aug	2	21	2	20	0.046	0.002	0.023
04-Aug	5	26	5	25	0.113	0.005	0.028
05-Aug	0	26	0	25	0.000	0.000	0.028
06-Aug	1	27	1	26	0.022	0.001	0.029
07-Aug	7	34	7	33	0.157	0.007	0.036
08-Aug	4	38	3	36	0.088	0.004	0.040
09-Aug	0	38	0	36	0.000	0.000	0.040
10-Aug	6	44	5	41	0.131	0.006	0.046
11-Aug	1	45	1	42	0.022	0.001	0.047
12-Aug	6	51	6	48	0.133	0.006	0.054
13-Aug	9	60	9	57	0.213	0.010	0.063
14-Aug	9	69	8	65	0.235	0.011	0.074
15-Aug	0	69	0	65	0.000	0.000	0.074
16-Aug	0	69	0	65	0.000	0.000	0.074
17-Aug	0	69	0	65	0.000	0.000	0.074
18-Aug	1	70	1	66	0.051	0.002	0.076
19-Aug	3	73	3	69	0.068	0.003	0.080
20-Aug	9	82	9	78	0.203	0.009	0.089
21-Aug	9	91	9	87	0.211	0.010	0.099
22-Aug	7	98	7	94	0.168	0.008	0.106
23-Aug	7	105	6	100	0.160	0.007	0.114
24-Aug	19	124	16	116	0.420	0.019	0.133
25-Aug	14	138	12	128	0.313	0.014	0.147
26-Aug	4	142	3	131	0.087	0.004	0.151
27-Aug	4	146	4	135	0.085	0.004	0.155
28-Aug	1	147	1	136	0.023	0.001	0.156
29-Aug	6	153	6	142	0.133	0.006	0.162
30-Aug	8	161	8	150	0.176	0.008	0.170
31-Aug	7	168	6	156	0.150	0.007	0.177
01-Sep	5	173	5	161	0.107	0.005	0.182
02-Sep	4	177	4	165	0.087	0.004	0.186
03-Sep	4	181	4	169	0.085	0.004	0.190
04-Sep	4	185	3	172	0.085	0.004	0.194
05-Sep	6	191	6	178	0.136	0.006	0.200
06-Sep	15	206	14	192	0.317	0.015	0.215
07-Sep	20	226	19	211	0.476	0.022	0.236
08-Sep	16	242	15	226	0.511	0.023	0.260
09-Sep	40	282	37	263	1.472	0.067	0.327
10-Sep	44	326	42	305	1.231	0.056	0.384
11-Sep	36	362	34	339	0.784	0.036	0.420
12-Sep	20	382	19	358	0.544	0.025	0.445
13-Sep	30	412	29	387	0.678	0.031	0.476
14-Sep	16	428	15	402	0.340	0.016	0.491
15-Sep	6	434	5	407	0.477	0.022	0.513
16-Sep	4	438	0	407	1.000	0.046	0.559
17-Sep	0	438	0	407	0.000	0.000	0.559
18-Sep	0	438	0	407	0.000	0.000	0.559
19-Sep	0	438	2	409	0.000	0.000	0.559

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	Daily Chum Catch	Cumul. Chum Catch	Daily Chum Tagged	Cumul. Chum Tagged	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
20-Sep	0	438	7	416	0.000	0.000	0.559
21-Sep [a]	0	438	6	422	0.000	0.000	0.559
22-Sep	5	443	5	427	0.257	0.012	0.571
23-Sep	17	460	17	444	0.843	0.039	0.609
24-Sep	45	505	45	489	2.110	0.097	0.706
25-Sep	48	553	47	536	2.199	0.101	0.807
26-Sep	44	597	43	579	2.047	0.094	0.901
27-Sep	15	612	14	593	0.645	0.030	0.930
28-Sep	11	623	11	604	0.471	0.022	0.952
29-Sep	4	627	4	608	0.169	0.008	0.960
30-Sep	14	641	13	621	0.594	0.027	0.987
01-Oct	4	645	2	623	0.286	0.013	1.000

[a] Fish were captured with set gill nets on 19-21 September for tagging because low water flows prevented fish wheel operation.

Appendix B.6. Catches and CPUE (catch/wheel hour) of Dolly Varden in fish wheels at Canyon Island, 1989.

	Daily Catch	Cumul. Catch	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
05-May	0	0	0.000	0.000	0.000
06-May	0	0	0.000	0.000	0.000
07-May	1	1	0.042	0.001	0.001
08-May	0	1	0.000	0.000	0.001
09-May	0	1	0.000	0.000	0.001
10-May	0	1	0.000	0.000	0.001
11-May	0	1	0.000	0.000	0.001
12-May	2	3	0.096	0.003	0.004
13-May	0	3	0.000	0.000	0.004
14-May	0	3	0.000	0.000	0.004
15-May	0	3	0.000	0.000	0.004
16-May	0	3	0.000	0.000	0.004
17-May	0	3	0.000	0.000	0.004
18-May	0	3	0.000	0.000	0.004
19-May	0	3	0.000	0.000	0.004
20-May	0	3	0.000	0.000	0.004
21-May	0	3	0.000	0.000	0.004
22-May	0	3	0.000	0.000	0.004
23-May	1	4	0.024	0.001	0.005
24-May	3	7	0.071	0.002	0.007
25-May	0	7	0.000	0.000	0.007
26-May	0	7	0.000	0.000	0.007
27-May	2	9	0.043	0.001	0.009
28-May	2	11	0.043	0.001	0.010
29-May	1	12	0.021	0.001	0.011
30-May	2	14	0.046	0.001	0.012
31-May	5	19	0.106	0.003	0.016
01-Jun	0	19	0.000	0.000	0.016
02-Jun	8	27	0.173	0.005	0.021
03-Jun	9	36	0.196	0.006	0.027
04-Jun	9	45	0.195	0.006	0.033
05-Jun	6	51	0.130	0.004	0.037
06-Jun	8	59	0.181	0.006	0.043
07-Jun	9	68	0.194	0.006	0.049
08-Jun	23	91	0.508	0.016	0.065
09-Jun	14	105	0.307	0.010	0.075
10-Jun	5	110	0.113	0.004	0.079
11-Jun	1	111	0.022	0.001	0.079
12-Jun	2	113	0.045	0.001	0.081
13-Jun	0	113	0.000	0.000	0.081
14-Jun	3	116	0.067	0.002	0.083
15-Jun	10	126	0.224	0.007	0.090
16-Jun	4	130	0.135	0.004	0.094
17-Jun	9	139	0.197	0.006	0.101
18-Jun	6	145	0.134	0.004	0.105
19-Jun	15	160	0.336	0.011	0.115
20-Jun	9	169	0.199	0.006	0.122
21-Jun	8	177	0.174	0.005	0.127

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	Daily Catch	Cumul. Catch	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
22-Jun	14	191	0.300	0.010	0.137
23-Jun	0	191	0.000	0.000	0.137
24-Jun	14	205	0.430	0.014	0.150
25-Jun	5	210	0.128	0.004	0.154
26-Jun	9	219	0.342	0.011	0.165
27-Jun	14	233	0.309	0.010	0.175
28-Jun	13	246	0.288	0.009	0.184
29-Jun	16	262	0.352	0.011	0.195
30-Jun	14	276	0.326	0.010	0.205
01-Jul	20	296	0.448	0.014	0.220
02-Jul	14	310	0.318	0.010	0.230
03-Jul	14	324	0.321	0.010	0.240
04-Jul	10	334	0.225	0.007	0.247
05-Jul	9	343	0.198	0.006	0.253
06-Jul	13	356	0.287	0.009	0.262
07-Jul	11	367	0.245	0.008	0.270
08-Jul	22	389	0.495	0.016	0.286
09-Jul	119	508	2.891	0.091	0.377
10-Jul	52	560	1.339	0.042	0.420
11-Jul	28	588	0.873	0.028	0.447
12-Jul	2	590	0.093	0.003	0.450
13-Jul	4	594	0.155	0.005	0.455
14-Jul	21	615	0.601	0.019	0.474
15-Jul	20	635	0.594	0.019	0.493
16-Jul	31	666	1.028	0.033	0.525
17-Jul	40	706	0.932	0.029	0.555
18-Jul	53	759	1.230	0.039	0.594
19-Jul	12	771	0.269	0.009	0.602
20-Jul	13	784	0.341	0.011	0.613
21-Jul	18	802	0.444	0.014	0.627
22-Jul	8	810	0.176	0.006	0.633
23-Jul	15	825	0.340	0.011	0.643
24-Jul	21	846	0.510	0.016	0.659
25-Jul	19	865	0.470	0.015	0.674
26-Jul	43	908	0.994	0.031	0.706
27-Jul	37	945	0.854	0.027	0.733
28-Jul	0	945	0.000	0.000	0.733
29-Jul	18	963	0.496	0.016	0.748
30-Jul	7	970	0.184	0.006	0.754
31-Jul	11	981	0.249	0.008	0.762
01-Aug	10	991	0.223	0.007	0.769
02-Aug	9	1000	0.209	0.007	0.776
03-Aug	14	1014	0.321	0.010	0.786
04-Aug	3	1017	0.068	0.002	0.788
05-Aug	21	1038	0.456	0.014	0.802
06-Aug	35	1073	0.779	0.025	0.827
07-Aug	29	1102	0.652	0.021	0.848
08-Aug	12	1114	0.263	0.008	0.856
09-Aug	23	1137	0.508	0.016	0.872

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	Daily Catch	Cumul. Catch	Daily Cpue	Daily Proport. Cpue	Cumul. Proport. Cpue
10-Aug	14	1151	0.305	0.010	0.882
11-Aug	20	1171	0.433	0.014	0.896
12-Aug	9	1180	0.200	0.006	0.902
13-Aug	17	1197	0.403	0.013	0.915
14-Aug	19	1216	0.497	0.016	0.930
15-Aug	0	1216	0.000	0.000	0.930
16-Aug	0	1216	0.000	0.000	0.930
17-Aug	0	1216	0.000	0.000	0.930
18-Aug	2	1218	0.103	0.003	0.934
19-Aug	20	1238	0.453	0.014	0.948
20-Aug	12	1250	0.270	0.009	0.956
21-Aug	21	1271	0.492	0.016	0.972
22-Aug	5	1276	0.120	0.004	0.976
23-Aug	3	1279	0.069	0.002	0.978
24-Aug	4	1283	0.088	0.003	0.981
25-Aug	4	1287	0.089	0.003	0.984
26-Aug	2	1289	0.043	0.001	0.985
27-Aug	4	1293	0.085	0.003	0.988
28-Aug	1	1294	0.023	0.001	0.988
29-Aug	1	1295	0.022	0.001	0.989
30-Aug	1	1296	0.022	0.001	0.990
31-Aug	3	1299	0.064	0.002	0.992
01-Sep	0	1299	0.000	0.000	0.992
02-Sep	0	1299	0.000	0.000	0.992
03-Sep	0	1299	0.000	0.000	0.992
04-Sep	0	1299	0.000	0.000	0.992
05-Sep	3	1302	0.068	0.002	0.994
06-Sep	3	1305	0.063	0.002	0.996
07-Sep	2	1307	0.048	0.002	0.997
08-Sep	1	1308	0.032	0.001	0.998
09-Sep	0	1308	0.000	0.000	0.998
10-Sep	0	1308	0.000	0.000	0.998
11-Sep	1	1309	0.022	0.001	0.999
12-Sep	1	1310	0.027	0.001	1.000
13-Sep	0	1310	0.000	0.000	1.000
14-Sep	0	1310	0.000	0.000	1.000
15-Sep	0	1310	0.000	0.000	1.000
16-Sep	0	1310	0.000	0.000	1.000
17-Sep	0	1310	0.000	0.000	1.000
18-Sep	0	1310	0.000	0.000	1.000
19-Sep	0	1310	0.000	0.000	1.000
20-Sep	0	1310	0.000	0.000	1.000
21-Sep	0	1310	0.000	0.000	1.000
22-Sep	0	1310	0.000	0.000	1.000
23-Sep	0	1310	0.000	0.000	1.000
24-Sep	0	1310	0.000	0.000	1.000
25-Sep	0	1310	0.000	0.000	1.000
26-Sep	0	1310	0.000	0.000	1.000
27-Sep	0	1310	0.000	0.000	1.000
28-Sep	0	1310	0.000	0.000	1.000
29-Sep	0	1310	0.000	0.000	1.000
30-Sep	0	1310	0.000	0.000	1.000
01-Oct	0	1310	0.000	0.000	1.000

Appendix C.1. Age composition of the chinook salmon return past Canyon Island, Taku River, by sex, age class, and time period strata, 1989. Data does not include chinook salmon smaller than 440 mm MEF in length.

	Brood Year and Age Class								
	1986	1985	1984		1983		1982		
	1.1	1.2	1.3	2.2	1.4	2.3	1.5	2.4	Total
Statistical Weeks 17-20 (April 29-May 20)									
Male									
Sample Size		23	27	4	2	3	1		60
Percent		19.7	23.1	3.4	1.7	2.6	0.9		51.3
Std. Error		3.7	3.9	1.7	1.2	1.5	0.8		4.6
Female									
Sample Size		4	38	1	12	1	1		57
Percent		3.4	32.5	0.9	10.3	0.9	0.9		48.7
Std. Error		1.7	4.3	0.8	2.8	0.8	0.8		4.6
All Fish									
Sample Size		27	65	5	14	4	2		117
Percent		23.1	55.6	4.3	12.0	3.4	1.7		100.0
Std. Error		3.9	4.6	1.9	3.0	1.7	1.2		
Statistical Week 21 (May 21-27)									
Male									
Sample Size		36	36	6	2	2	1		83
Percent		21.1	21.1	3.5	1.2	1.2	0.6		48.5
Std. Error		3.1	3.1	1.4	0.8	0.8	0.6		3.8
Female									
Sample Size		9	59	1	13	5	1		88
Percent		5.3	34.5	0.6	7.6	2.9	0.6		51.5
Std. Error		1.7	3.6	0.6	2.0	1.3	0.6		3.8
All Fish									
Sample Size		45	95	7	15	7	2		171
Percent		26.3	55.6	4.1	8.8	4.1	1.2		100.0
Std. Error		3.3	3.8	1.5	2.2	1.5	0.8		
Statistical Week 22 (May 28-June 3)									
Male									
Sample Size	1	49	43	6	6			3	108
Percent	0.6	27.2	23.9	3.3	3.3			1.7	60.0
Std. Error	0.6	3.3	3.2	1.3	1.3			0.9	3.6
Female									
Sample Size		6	40		18	3	5		72
Percent		3.3	22.2		10.0	1.7	2.8		40.0
Std. Error		1.3	3.1		2.2	0.9	1.2		3.6
All Fish									
Sample Size	1	55	83	6	24	3	5	3	180
Percent	0.6	30.6	46.1	3.3	13.3	1.7	2.8	1.7	100.0
Std. Error	0.6	3.4	3.7	1.3	2.5	0.9	1.2	0.9	
Statistical Week 23 (June 4-June 10)									
Male									
Sample Size		35	34	2	3	1	2		77
Percent		24.5	23.8	1.4	2.1	0.7	1.4		53.8
Std. Error		3.6	3.5	1.0	1.2	0.7	1.0		4.2
Female									
Sample Size		4	39	1	12	3	4	3	66
Percent		2.8	27.3	0.7	8.4	2.1	2.8	2.1	46.2
Std. Error		1.4	3.7	0.7	2.3	1.2	1.4	1.2	4.2
All Fish									
Sample Size		39	73	3	15	4	6	3	143
Percent		27.3	51.0	2.1	10.5	2.8	4.2	2.1	100.0
Std. Error		3.7	4.2	1.2	2.6	1.4	1.7	1.2	

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	Brood Year and Age Class								
	1986	1985	1984		1983		1982		
	1.1	1.2	1.3	2.2	1.4	2.3	1.5	2.4	Total
Statistical Week 24 (June 11-17)									
Male									
Sample Size		40	31	5	4	3	1		84
Percent		28.2	21.8	3.5	2.8	2.1	0.7		59.2
Std. Error		3.8	3.5	1.5	1.4	1.2	0.7		4.1
Female									
Sample Size		3	35	2	15	1	2		58
Percent		2.1	24.6	1.4	10.6	0.7	1.4		40.8
Std. Error		1.2	3.6	1.0	2.6	0.7	1.0		4.1
All Fish									
Sample Size		43	66	7	19	4	3		142
Percent		30.3	46.5	4.9	13.4	2.8	2.1		100.0
Std. Error		3.8	4.2	1.8	2.8	1.4	1.2		
Statistical Weeks 25-32 (June 18-August 12)									
Male									
Sample Size	1	42	43	1	5	2	1		95
Percent	0.6	26.2	26.9	0.6	3.1	1.3	0.6		59.4
Std. Error	0.6	3.5	3.5	0.6	1.4	0.9	0.6		3.9
Female									
Sample Size		4	45	1	11	1	2	1	65
Percent		2.5	28.1	0.6	6.9	0.6	1.3	0.6	40.6
Std. Error		1.2	3.5	0.6	2.0	0.6	0.9	0.6	3.9
All Fish									
Sample Size	1	46	88	2	16	3	3	1	160
Percent	0.6	28.8	55.0	1.3	10.0	1.9	1.9	0.6	100.0
Std. Error	0.6	3.6	3.9	0.9	2.4	1.1	1.1	0.6	
Combined Periods (Percentages are not weighted by time period abundance)									
Male									
Sample Size	2	229	214	24	22	11	6	3	515
Percent	0.2	24.6	23.4	2.6	2.4	1.2	0.7	0.3	55.5
Std. Error	0.1	1.4	1.3	0.5	0.5	0.3	0.3	0.2	1.6
Female									
Sample Size		30	256	6	81	14	15	4	406
Percent		3.3	28.0	0.7	8.9	1.5	1.6	0.4	44.5
Std. Error		0.6	1.4	0.3	0.9	0.4	0.4	0.2	1.6
All Fish									
Sample Size	2	255	470	30	103	25	21	7	917
Percent	0.2	27.9	51.5	3.3	11.3	2.7	2.3	0.8	100.0
Std. Error	0.1	1.4	1.6	0.6	1.0	0.5	0.5	0.3	

Appendix C.2. Age composition of the sockeye salmon return past Canyon Island, Taku River, by sex, age class, and time period strata, 1989.

	Brood Year and Age Class										
	1987	1986		1985			1984		1983		
	0.1	0.2	1.1	0.3	1.2	2.1	1.3	2.2	1.4	2.3	Total
Statistical Weeks 22-24 (May 27-June 17)											
Male											
Sample Size				9	15		294			12	330
Percent				1.6	2.6		50.9			2.1	57.1
Std. Error				0.5	0.6		2.0			0.6	2.0
Number				227	379		7,427			303	8,336
Female											
Sample Size				2	6		230	1		9	248
Percent				0.3	1.0		39.8	0.2		1.6	42.9
Std. Error				0.2	0.4		2.0	0.2		0.5	2.0
Number				51	152		5,810	25		227	6,265
All Fish											
Sample Size				11	21		524	1		21	578
Percent				1.9	3.6		90.7	0.2		3.6	100.0
Std. Error				0.6	0.8		1.2	0.2		0.8	
Number				278	530		13,237	25		530	14,601
Statistical Week 25 (June 18-24)											
Male											
Sample Size		3		3	31		120	2		8	167
Percent		1.1		1.1	11.0		42.4	0.7		2.8	59.0
Std. Error		0.6		0.6	1.8		2.9	0.5		1.0	2.9
Number		200		200	2,069		8,007	133		534	11,144
Female											
Sample Size				3	11		83	7		12	116
Percent				1.1	3.9		29.3	2.5		4.2	41.0
Std. Error				0.6	1.1		2.7	0.9		1.2	2.9
Number				200	734		5,538	467		801	7,740
All Fish											
Sample Size		3		6	42		203	9		20	283
Percent		1.1		2.1	14.8		71.7	3.2		7.1	100.0
Std. Error		0.6		0.9	2.1		2.7	1.0		1.5	
Number		200		400	2,803		13,546	601		1,335	18,884

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	Brood Year and Age Class										
	1987	1986		1985			1984		1983		
	0.1	0.2	1.1	0.3	1.2	2.1	1.3	2.2	1.4	2.3	Total
Statistical Week 26 (June 25-July 1)											
Male											
Sample Size		6	5	3	73	1	135	3	1	6	233
Percent		1.5	1.2	0.7	17.8	0.2	32.9	0.7	0.2	1.5	56.8
Std. Error		0.6	0.5	0.4	1.9	0.2	2.3	0.4	0.2	0.6	2.4
Number		412	343	206	5,014	69	9,272	206	69	412	16,003
Female											
Sample Size				4	34		119	5	1	14	177
Percent				1.0	8.3		29.0	1.2	0.2	3.4	43.2
Std. Error				0.5	1.4		2.2	0.5	0.2	0.9	2.4
Number				275	2,335		8,173	343	69	962	12,157
All Fish											
Sample Size		6	5	7	108	1	254	8	2	20	411
Percent		1.5	1.2	1.7	26.3	0.2	61.8	1.9	0.5	4.9	100.0
Std. Error		0.6	0.5	0.6	2.2	0.2	2.4	0.7	0.3	1.1	
Number		412	343	481	7,418	69	17,445	549	137	1,374	28,228
Statistical Weeks 27-28 (July 2-5)											
Male											
Sample Size		15	39	31	150	1	301	25	2	25	589
Percent		1.4	3.7	2.9	14.2	0.1	28.5	2.4	0.2	2.4	55.8
Std. Error		0.4	0.6	0.5	1.0	0.1	1.3	0.5	0.1	0.5	1.5
Number		206	536	426	2,062	14	4,138	344	27	344	8,098
Female											
Sample Size		1	3	40	46		331	9	2	34	466
Percent		0.1	0.3	3.8	4.4		31.4	0.9	0.2	3.2	44.2
Std. Error		0.1	0.2	0.6	0.6		1.4	0.3	0.1	0.5	1.5
Number		14	41	550	632		4,551	124	27	467	6,407
All Fish											
Sample Size		16	42	71	196	1	632	34	4	59	1,055
Percent		1.5	4.0	6.7	18.6	0.1	59.9	3.2	0.4	5.6	100.0
Std. Error		0.4	0.6	0.7	1.2	0.1	1.5	0.5	0.2	0.7	
Number		220	577	976	2,695	14	8,689	467	55	811	14,505

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	Brood Year and Age Class										
	1987	1986		1985			1984		1983		
	0.1	0.2	1.1	0.3	1.2	2.1	1.3	2.2	1.4	2.3	Total
Statistical Week 29 (July 16-22)											
Male											
Sample Size		31	28	19	93		90	12		3	276
Percent		7.0	6.3	4.3	20.9		20.2	2.7		0.7	61.9
Std. Error		1.2	1.1	0.9	1.9		1.9	0.8		0.4	2.3
Number		1,165	1,053	714	3,496		3,384	451		113	10,376
Female											
Sample Size		1		19	18		107	8	1	16	170
Percent		0.2		4.3	4.0		24.0	1.8	0.2	3.6	38.1
Std. Error		0.2		0.9	0.9		2.0	0.6	0.2	0.9	2.3
Number		38		714	677		4,023	301	38	602	6,391
All Fish											
Sample Size		32	28	38	111		198	20	1	19	447
Percent		7.2	6.3	8.5	24.8		44.3	4.5	0.2	4.3	100.0
Std. Error		1.2	1.1	1.3	2.0		2.3	1.0	0.2	0.9	
Number		1,203	1,053	1,429	4,173		7,444	752	38	714	16,805
Statistical Weeks 30-31 (July 23-August 5)											
Male											
Sample Size	7	34	45	33	120	5	159	16		10	429
Percent	0.8	4.0	5.2	3.8	14.0	0.6	18.5	1.9		1.2	50.0
Std. Error	0.3	0.6	0.7	0.6	1.1	0.3	1.3	0.4		0.4	1.6
Number	93	453	600	440	1,599	67	2,119	213		133	5,717
Female											
Sample Size	1	14	2	66	71	2	245	17		11	429
Percent	0.1	1.6	0.2	7.7	8.3	0.2	28.6	2.0		1.3	50.0
Std. Error	0.1	0.4	0.2	0.9	0.9	0.2	1.5	0.5		0.4	1.6
Number	13	187	27	880	946	27	3,265	227		147	5,717
All Fish											
Sample Size	8	48	47	100	191	7	404	33		21	859
Percent	0.9	5.6	5.5	11.6	22.2	0.8	47.0	3.8		2.4	100.0
Std. Error	0.3	0.8	0.7	1.1	1.4	0.3	1.6	0.6		0.5	
Number	107	640	626	1,333	2,545	93	5,384	440		280	11,448

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	Brood Year and Age Class										
	1987	1986		1985			1984		1983		
	0.1	0.2	1.1	0.3	1.2	2.1	1.3	2.2	1.4	2.3	Total
Statistical Weeks 32-40 (August 6-Sept. 25)											
Male											
Sample Size	4	17	55	28	92	9	100	13	1	4	323
Percent	0.6	2.7	8.6	4.4	14.4	1.4	15.7	2.0	0.2	0.6	50.6
Std. Error	0.3	0.6	1.1	0.8	1.3	0.5	1.4	0.5	0.2	0.3	1.9
Number	60	255	826	421	1,382	135	1,502	195	15	60	4,851
Female											
Sample Size		6	3	35	69		173	22	1	6	315
Percent		0.9	0.5	5.5	10.8		27.1	3.4	0.2	0.9	49.4
Std. Error		0.4	0.3	0.9	1.2		1.7	0.7	0.2	0.4	1.9
Number		90	45	526	1,036		2,598	330	15	90	4,731
All Fish											
Sample Size	4	23	58	64	161	9	273	35	2	10	639
Percent	0.6	3.6	9.1	10.0	25.2	1.4	42.7	5.5	0.3	1.6	100.0
Std. Error	0.3	0.7	1.1	1.1	1.7	0.5	1.9	0.9	0.2	0.5	
Number	60	345	871	961	2,418	135	4,100	526	30	150	9,597
Combined Periods (Percentages are weighted by period escapements)											
Male											
Sample Size	11	106	172	126	574	16	1,199	71	4	68	2,347
Percent	0.1	2.4	2.9	2.3	14.0	0.2	31.5	1.4	0.1	1.7	56.6
Std. Error	<0.1	0.3	0.3	0.2	0.7	0.1	0.9	0.2	0.1	0.2	0.9
Number	153	2,692	3,358	2,634	16,001	284	35,849	1,543	111	1,899	64,525
Female											
Sample Size	1	22	8	169	255	2	1,288	69	5	102	1,921
Percent	<0.1	0.3	0.1	2.8	5.7	<0.1	29.8	1.6	0.1	2.9	43.4
Std. Error	<0.1	0.1	<0.1	0.3	0.4	<0.1	0.9	0.2	0.1	0.3	0.9
Number	13	328	113	3,195	6,512	27	33,959	1,817	149	3,295	49,408
All Fish											
Sample Size	12	128	180	297	830	18	2,488	140	9	170	4,272
Percent	0.1	2.6	3.0	5.1	19.8	0.3	61.2	2.9	0.2	4.6	100.0
Std. Error	<0.1	0.3	0.3	0.3	0.8	0.1	0.9	0.3	0.1	0.4	
Number	167	3,020	3,471	5,858	22,582	311	69,845	3,360	260	5,194	114,068

Appendix C.3. Age composition of the coho salmon return past Canyon Island, Taku River, by sex, age class, and time period strata, 1989.

	Brood Year and Age Class					
	1986		1985	1984	1983	
	1.1	2.0	2.1	3.1	4.1	Total
Statistical Weeks 26-29 (June 25-July 22)						
Male						
Sample Size	11		19	1		31
Percent	23.9		41.3	2.2		67.4
Std. Error	6.3		7.2	2.1		6.9
Number	341		589	31		960
Female						
Sample Size	3		12			15
Percent	6.5		26.1			32.6
Std. Error	3.6		6.4			6.9
Number	93		372			465
All Fish						
Sample Size	14		31	1		46
Percent	30.4		67.4	2.2		100.0
Std. Error	6.7		6.9	2.1		
Number	434		960	31		1,425
Statistical Week 30 (July 23-29)						
Male						
Sample Size	43		56	3		102
Percent	30.3		39.4	2.1		71.8
Std. Error	3.5		3.8	1.1		3.5
Number	266		346	19		631
Female						
Sample Size	9		30	1		40
Percent	6.3		21.1	0.7		28.2
Std. Error	1.9		3.1	0.6		3.5
Number	56		185	6		247
All Fish						
Sample Size	52		86	4		142
Percent	36.6		60.6	2.8		100.0
Std. Error	3.7		3.8	1.3		
Number	322		532	25		878
Statistical Week 31 (July 30-August 5)						
Male						
Sample Size	47		44	3	1	95
Percent	31.8		29.7	2.0	0.7	64.2
Std. Error	3.7		3.7	1.1	0.7	3.8
Number	855		801	55	18	1,729
Female						
Sample Size	18		33	2		53
Percent	12.2		22.3	1.4		35.8
Std. Error	2.6		3.3	0.9		3.8
Number	328		600	36		964
All Fish						
Sample Size	65		77	5	1	148
Percent	43.9		52.0	3.4	0.7	100.0
Std. Error	4.0		4.0	1.4	0.7	
Number	1,183		1,401	91	18	2,693

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	Brood Year and Age Class					
	1986		1985	1984	1983	
	1.1	2.0	2.1	3.1	4.1	Total
Statistical Week	32	(August 6-12)				
Male						
Sample Size	63		53	3		119
Percent	40.4		34.0	1.9		76.3
Std. Error	2.7		2.6	0.8		2.4
Number	121		102	6		229
Female						
Sample Size	11		24	2		37
Percent	7.1		15.4	1.3		23.7
Std. Error	1.4		2.0	0.6		2.4
Number	21		46	4		71
All Fish						
Sample Size	74		77	5		156
Percent	47.4		49.4	3.2		100.0
Std. Error	2.8		2.8	1.0		
Number	142		148	10		300
Statistical Week	33	(August 13-19)				
Male						
Sample Size	99		78	4		181
Percent	33.7		26.5	1.4		61.6
Std. Error	2.7		2.5	0.7		2.8
Number	3,232		2,546	131		5,909
Female						
Sample Size	47		63	3		113
Percent	16.0		21.4	1.0		38.4
Std. Error	2.1		2.4	0.6		2.8
Number	1,534		2,057	98		3,689
All Fish						
Sample Size	146		141	7		294
Percent	49.7		48.0	2.4		100.0
Std. Error	2.9		2.9	0.9		
Number	4,766		4,603	229		9,598
Statistical Week	34	(August 20-26)				
Male						
Sample Size	140	1	92	6		239
Percent	35.9	0.3	23.6	1.5		61.3
Std. Error	2.4	0.3	2.1	0.6		2.4
Number	3,002	21	1,973	129		5,125
Female						
Sample Size	80		65	4	2	151
Percent	20.5		16.7	1.0	0.5	38.7
Std. Error	2.0		1.8	0.5	0.4	2.4
Number	1,716		1,394	86	43	3,238
All Fish						
Sample Size	220	1	158	10	2	391
Percent	56.3	0.3	40.4	2.6	0.5	100.0
Std. Error	2.5	0.2	2.4	0.8	0.4	
Number	4,718	21	3,388	214	43	8,385

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Appendix C.3 (Page 3 of 3).

	Brood Year and Age Class					
	1986		1985	1984	1983	
	1.1	2.0	2.1	3.1	4.1	Total
Statistical Weeks 35-40 (August 27-Oct. 1)						
Male						
Sample Size	181		156	3		340
Percent	27.9		24.1	0.5		52.5
Std. Error	1.7		1.7	0.3		1.9
Number	10,476		9,029	174		19,678
Female						
Sample Size	146		158	3	1	308
Percent	22.5		24.4	0.5	0.2	47.5
Std. Error	1.6		1.7	0.3	0.2	1.9
Number	8,450		9,145	174	58	17,826
All Fish						
Sample Size	328		314	6	1	649
Percent	50.5		48.4	0.9	0.2	100.0
Std. Error	1.9		1.9	0.4	0.2	
Number	18,984		18,173	347	58	37,562
Combined Periods (Percentages are weighted by period escapements)						
Male						
Sample Size	584	1	498	23	1	1,107
Percent	30.1	<0.1	25.3	0.9	<0.1	56.4
Std. Error	1.2	<0.1	1.2	0.2	<0.1	1.3
Number	18,293	21	15,386	543	18	34,261
Female						
Sample Size	314		385	15	3	717
Percent	20.1		22.7	0.7	0.2	43.6
Std. Error	1.1		1.1	0.2	0.1	1.3
Number	12,197		13,799	404	101	26,501
All Fish						
Sample Size	899	1	884	38	4	1,826
Percent	50.2	<0.1	48.0	1.6	0.2	100.0
Std. Error	1.4	<0.1	1.3	0.3	0.1	
Number	30,548	21	29,206	947	119	60,841

Appendix C.4. Age composition of the chum salmon return past Canyon Island, Taku River, by sex, age class, and time period strata, 1989.

	Brood Year and Age Class					
	1986	1985	1984	1983	1982	
	0.2	0.3	0.4	0.5	0.6	Total
Statistical Weeks 24-35 (June 15-Sept. 2)						
Male						
Sample Size		55	21	4		80
Percent		34.6	13.2	2.5		50.3
Std. Error		3.8	2.7	1.2		3.9
Female						
Sample Size		45	28	5	1	79
Percent		28.3	17.6	3.1	0.6	49.7
Std. Error		3.6	3.0	1.4	0.6	3.9
All Fish						
Sample Size		100	49	9	1	159
Percent		62.9	30.8	5.7	0.6	100.0
Std. Error		3.8	3.6	1.8	0.6	
Statistical Weeks 36-40 (Sept. 3-Oct. 1)						
Male						
Sample Size		141	17	4		162
Percent		34.1	4.1	1.0		39.1
Std. Error		2.3	1.0	0.5		2.4
Female						
Sample Size	2	201	45	4		252
Percent	0.5	48.6	10.9	1.0		60.9
Std. Error	0.3	2.4	1.5	0.5		2.4
All Fish						
Sample Size	2	343	62	8		415
Percent	0.5	82.7	14.9	1.9		100.0
Std. Error	0.3	1.8	1.7	0.7		
Combined Periods (Percentages are not weighted by time strata abundance)						
Male						
Sample Size		196	38	8		242
Percent		34.2	6.6	1.4		42.2
Std. Error		1.9	1.0	0.5		2.0
Female						
Sample Size	2	246	73	9	1	331
Percent	0.3	42.9	12.7	1.6	0.2	57.8
Std. Error	0.2	2.0	1.4	0.5	0.2	2.0
All Fish						
Sample Size	2	443	111	17	1	574
Percent	0.3	77.2	19.3	3.0	0.2	100.0
Std. Error	0.2	1.7	1.6	0.7	0.2	