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Stamp Falls Fishway Counts, Adipose Clip/CWT Recovery and Biological Sampling of Chinook Salmon Escapements in Stamp River and Robertson Creek Hatchery, 1992

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September 1993

STAMP FALLS FISHWAY COUNTS, ADIPOSE CLIP/CWT RECOVERY AND BIOLOGICAL SAMPLING OF CHINOOK SALMON ESCAPEMENTS IN STAMP RIVER AND ROBERTSON CREEK HATCHERY, 1992

Department of Fisheries & Oceans
NOV 8 1993
Ministère des Pêches et des Océans
OTTAWA

by

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ABSTRACT

Nelson, T. C. 1993. Stamp Falls Fishway counts, adipose clip/CWT recovery and biological sampling of chinook salmon escapements in Stamp River and Robertson Creek Hatchery, 1992. Can. Manuscr. Rep. Fish. Aquat. Sci. 2213: ix + 86 p.

Estimates of salmon escapement were derived for the Stamp River for 1992 using visual counts at the Stamp Falls Fishway. After adjusting for observer error, the total escapement of adult chinook salmon (*Oncorhynchus tshawytscha*) to the Stamp River was estimated at 141060 ± 8867; the total escapement of jack chinook was estimated at 4053 (confidence limits are not presented due to the low number of observations of jack chinook during verification tests). Escapement estimates for adult and jack coho salmon are also presented, as well as partial estimates for sockeye. This study is part of the Chinook Key Stream Program.

The age, size, sex, and hatchery contributions for chinook salmon in the upper Stamp River are also described using data from carcass recovery operations and live returns to Robertson Creek Hatchery. Age-3 males and age-4 females comprised the largest proportion of chinook escapement for both the Stamp River and Robertson Creek Hatchery. The mean lengths of all age groups of female chinook were larger than the corresponding mean lengths for males.

Escapement of adipose-clipped chinook to the entire Stamp River system (hatchery plus upper river returns) was 5177 and represented 3.5% of the entire population. This estimate was further stratified by age, sex, and tag code. The total hatchery contribution (marked and unmarked) to the escapement was estimated by expanding the number of observed adipose clips by the adipose-clip mark rate at release. In 1992, Robertson Creek Hatchery contributed 82.9% of the total chinook escapement to Stamp River. This hatchery contribution estimate was compared with a contribution estimate calculated using the Mark Recovery Program (MRP) method of coded wire tag expansions (Kuhn et al. 1988). Using the MRP method, the total hatchery contribution to escapement was 78.6%. Reasons for the differences between hatchery contribution estimates using the two methods are discussed.

Key words: Stamp River, chinook, key stream, escapement, fishway, coded wire tags, hatchery contribution

RÉSUMÉ

Nelson, T. C. 1993. Stamp Falls Fishway counts, adipose clip/CWT recovery and biological sampling of chinook salmon escapements in Stamp River and Robertson Creek Hatchery, 1992. Can. Manuscr. Rep. Fish. Aquat. Sci. 2213: ix + 86 p.

Les échappées de saumon ont été calculées dans la Stamp en 1992 à partir de dénombrements visuels réalisés à l'échelle à poisson de Stamp Falls. Après ajustement pour l'erreur due à l'observateur, on obtient 141 061 ± 8867 de saumons quinnats (*Oncorhynchus tshawytscha*) adultes échappés; on a calculé que 4053 quinnats madeleineaux s'étaient échappés (l'intervalle de confiance est omis à cause du faible effectif observé lors des contrôles). On présente également des estimations pour les saumons cohos adultes et madeleineaux, ainsi que des chiffres partiels pour le saumon rouge. Cette étude fait partie du Programme des cours d'eau clés pour le saumon quinnat.

On a également établi l'âge, la taille et le sexe des quinnats, de même que la contribution de piscicultures, dans le cours supérieur de la Stamp, à partir des opérations de récupération de poissons morts et des montaisons à la pisciculture du ruisseau Robertson. Les mâles de 3 ans et les femelles de 4 ans constituaient la plus grande part des échappées de quinnat de la Stamp et de la pisciculture du ruisseau Robertson. La longueur moyenne de femelles de tous les groupes d'âge était supérieure à celle des mâles.

L'échappée des quinnats marqués à la nageoire adipeuse dans tout le bassin de la Stamp (pisciculture et montaison dans le cours supérieur) a été de 5177 poissons et représente 3,5 % de l'effectif total. Ce chiffre a été ventilé par âge, sexe et code d'étiquette. On a établi la contribution totale de la pisciculture à l'échappée (poissons marqués et non marqués) en extrapolant à partir du nombre de poissons marqués observés et du taux de poissons marqués lors de la remise à l'eau. En 1992, la pisciculture du ruisseau Robertson à contribué à 82,9 % de l'échappée des quinnats dans la Stamp. On a comparé ce résultat à celui obtenu par la méthode de marquage et recapture (Kuhn et coll., 1988) faisant appel au marquage par fils codés, soit 78,6 %. On traite des causes de l'écart entre les deux résultats.

Mots clés: Stamp, saumon quinnat, cours d'eau, clé, échappée, échelle à poissons, fil codé, contribution de piscicultures

INTRODUCTION

In 1984, the Somass River system was selected under the Chinook Key Stream Program as one of the systems used to assess the response of chinook salmon stocks to a new harvest management regime. The goal of the new management regime is to rebuild chinook stocks to historical levels. The Chinook Key Stream Program was initiated in response to objectives set out in the Canada - U.S. Salmon Treaty.

The major objectives of the Chinook Key Stream Program are:

1. to accurately estimate chinook escapement on key streams;

2. to estimate harvest rates and contributions to fisheries and escapement based on coded wire tagged/adipose-clip returns, including estimates of the total escapement of coded wire tags to the key stream system; and

3. to estimate the contribution of hatchery and natural production to the escapement.

This report deals with the determination of spawning escapement of chinook salmon to the Stamp River in 1992 and related biological information. The objectives of the study were:

1. to estimate the total chinook salmon escapement to the Stamp River;

2. to determine the age and sex composition of both the in-river population and hatchery returns of chinook salmon to the system; and

3. to estimate the total escapement of coded wire tagged chinook salmon to the system, thereby assessing the hatchery contribution to the total escapement.

Part I of this report addresses the first objective and Part II of the report addresses objectives 2 and 3. Escapement estimates for the Stamp River for 1992 were derived using visual counts at the Stamp Falls Fishway and brailer counts at Robertson Creek Hatchery. Estimates of coded wire tag (CWT) returns, adipose-clip returns, and hatchery contributions were produced using dead recoveries of chinook salmon throughout the Stamp River and live returns of chinook salmon to Robertson Creek Hatchery.

PART I: STAMP FALLS FISHWAY COUNTS

INTRODUCTION

The chinook salmon of the Somass River system (including Robertson Creek Hatchery production) are the most abundant stock of this species on Vancouver Island and make important contributions to troll, net, and sport fisheries in U.S. and Canadian waters. Coded wire tag returns for chinook released from Robertson Creek Hatchery have been used to estimate the contribution of hatchery production to coastal fisheries (Sibert and Schnute 1982; English and Griffiths 1984); however, these analyses were incomplete due to the lack of reliable data on escapement, Indian fishery catches, and terminal sport fishery harvests. In 1984, the Department of Fisheries and Oceans initiated several investigations for Somass River chinook, including:

1. escapement estimation using a combination of mark-recapture techniques, counts of fish passing through the Stamp Falls Fishway, deadpitch surveys and hatchery returns (Lightly et al. 1988);

2. catch estimates for the Indian food fishery from field surveys; and

3. catch estimates for the Alberni Inlet and Somass River sport fisheries derived from creel surveys.

In 1985, the responsibility for providing reliable escapement and estimates for Somass River chinook was allocated to the Key Stream Program as part of a coast-wide attempt to monitor the effect of new management action on chinook stock status. After a number of years of attempting various methods, the salmon run to the Stamp River was successfully monitored in 1989 using visual counts. The 1992 program was executed using the same methods as in 1990 and 1991. Our specific objectives in the 1992 study were to:

1. count all chinook, coho, sockeye, steelhead, and other salmonids passing through the Stamp Falls Fishway between 3 September and 10 November, 1992;

2. quantify the random error associated with species identification and incorrect counting of fish migrating through the fishway; and

3. to estimate the number of fish migrating through the fishway during periods when reliable counting could not be conducted.

STUDY AREA

The Somass River system is one of the largest on Vancouver Island and includes the Stamp and Sproat rivers near Port Alberni (Figure 1). The Stamp River drains Great Central Lake and flows northeast and southeast into the Somass River. The Sproat River drains Sproat Lake and flows eastward into the Stamp River.

The Somass River system supports sockeye, chinook, coho, chum, and pink salmon, as well as steelhead and cutthroat trout. The system supports the largest stock of chinook salmon on the west coast of Vancouver Island. The Somass River chinook stocks are comprised of wild populations that spawn in the Sproat and Stamp rivers and production from Robertson Creek Hatchery (Figure 1). Somass River chinook generally have a fall run timing with the majority of the population returning in September and October. The majority of the chinook return at age 4, although ages range from 2 to 7 years. Coho salmon appear to have a similar run timing (Wright 1990).

Sockeye returning to the Somass River system are from Sproat and Great Central lakes and their tributaries. Only a fraction of the sockeye that return to Great Central Lake are enumerated at Stamp Falls Fishway, as the majority of the run (> 85%) has usually passed prior to 1 September. Sockeye have not been rigorously counted at Stamp Falls Fishway as the counting systems used have allowed many of the small adults and jacks (< 45 cm) to pass through the counting bars undetected. Coho, pink, chum, and steelhead salmon have also been enumerated at Stamp Falls Fishway with varying levels of rigor and success in recent years.

METHODS

Biophysical Observations

Maximum and minimum water temperatures were recorded daily at the fishway, usually between the hours of 0800 and 1000 am. Water levels were also recorded (to the nearest 1.0 cm) on a daily basis using a staff gauge positioned on the upstream corner of the fishway in the exit pool. Weather conditions were also monitored in terms of percent sun, cloud, and precipitation.

Fishway Counts

Visual counts of salmonids passing through the Stamp Falls Fishway were made between 2 September and 10 November, 1992. A counting station was installed at the upstream end of the fishway (Figure 2). Aluminum panels (2.4 m x 1 m frames of 7.6 cm channel aluminum) with

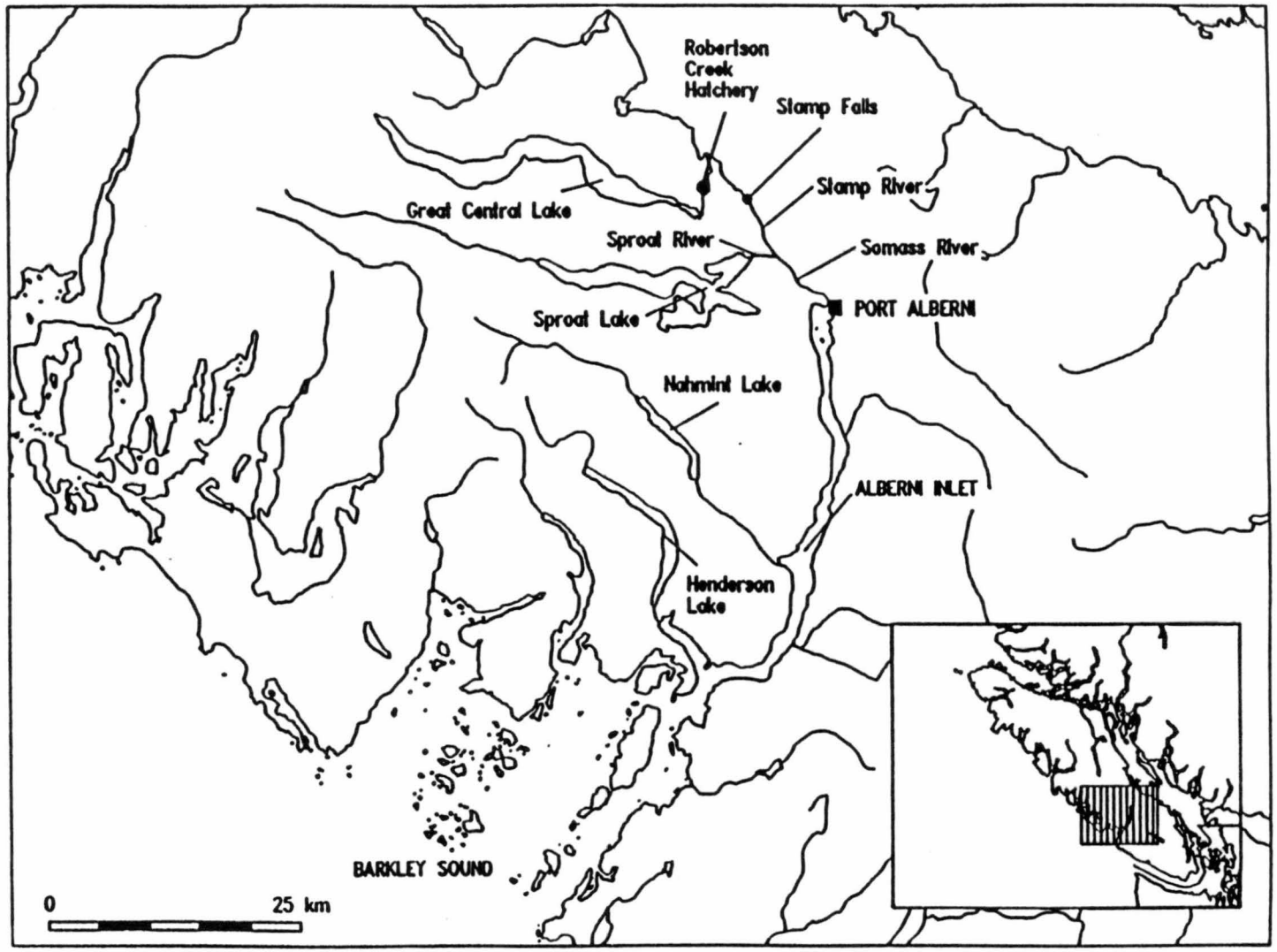


Figure 1. Map of Somass River system and Stamp Falls.

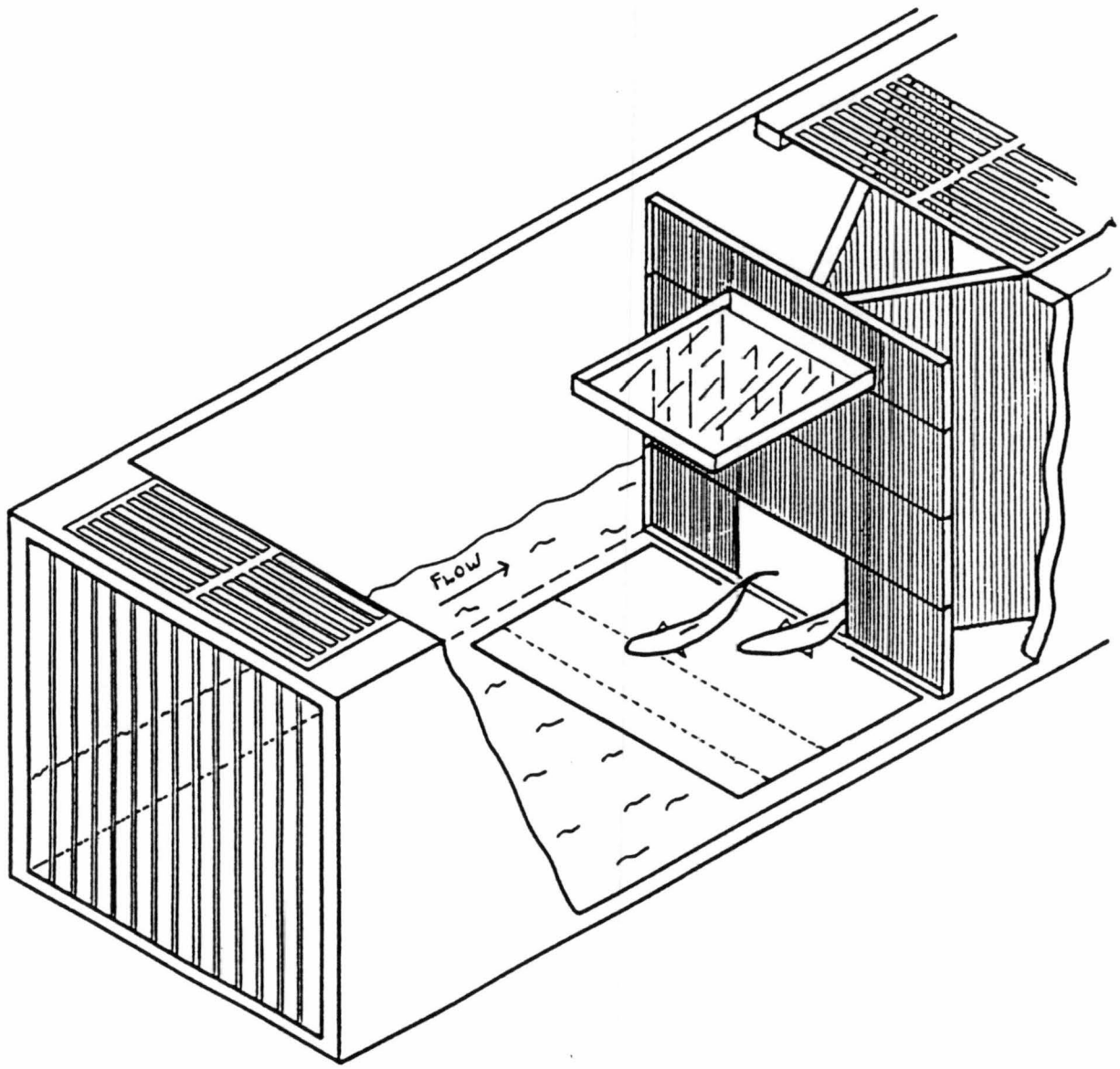


Figure 2. Diagram of the fish counting facility installed at the upstream end of Stamp Falls Fishway, 2 September through 10 November 1992.

vertical bars (2.5 cm OD aluminum conduit, spaced 5.1 cm between bars) were set into channel aluminum tracks which were attached to the inside of the fishway. The panels were stacked one on top of the other, perpendicular to the flow, as needed for the top of the panels to be at least 30 cm above the water line. A white vexar fence (2.5 cm mesh), strung on an aluminum frame was placed on the upstream side of the panel to effectively close the gap between the bars and prevent small salmonids (i.e. sockeye and coho < 45 cm) from escaping between the panel bars. A semi-permanent set of large aluminum panels, situated immediately downstream of the stacked panels, were positioned in a VEE formation to funnel fish through an opening in the centre of the bottom panel. The opening was 30 cm high and 1.3 m wide, and was designed to prevent multi-layered schools of fish from entering. A gate across the opening could be closed to prevent fish passage during verification tests and when the counting station was unmanned.

Once through the opening, fish passed over a 1 m x 2.4 m aluminum grid and a 1 m x 2.4 m sheet of plywood. To improve visibility a 1 m x 1 m viewing window was floated on the surface over the flashboard. Observations were made from the top of the fishway and counts were made as fish passed under the viewing window. A thin film of water was placed on top of the viewing window to enhance the image of the fish below. To prevent glare, tarps were placed over the fishway at the counting site.

Counts were made daily between dawn and dusk (usually from 0800 to 1700) and the panel gate was closed during the night. Two observers manned the station during counting hours and alternated counting every hour. The counting system described above worked well under most flow conditions.

Total counts of adult and jack chinook, adult and jack coho, sockeye, pink, chum, and steelhead were recorded hourly. Both the aluminum grid and plywood were marked at 34 cm and 59 cm to allow size range estimates of coho and chinook jacks, respectively. These total length size categories are based on age-length data from Robertson Creek Hatchery. Daily summaries that provided totals for each of the salmonid species (chinook adults, chinook jacks, coho adults, coho jacks, sockeye, and steelhead) counted at Stamp Falls Fishway were faxed to Robertson Creek Hatchery twice weekly and used for in-season management at the hatchery.

Precision of Counts

Estimates of counting and species identification errors were derived from a program of sub-sampling. For approximately one hour each day, the exit from the fishway was blocked using aluminum panels covered with vexar mesh (2 cm) so that fish could be counted, trapped and examined for species verification. Fish were counted through the gate and over the aluminum grid as normal but were contained in a 2 m x 2.4 m area. Between 10 and 30 fish of varying species composition were usually counted for each test. The captured fish were then dipnetted from the containment area and carefully checked for species. The tests were conducted at various times of the day and under varying light and water conditions. Tests were conducted daily from September 3 to October 19. No tests were conducted after this date due to flood and high water conditions in the fishway.

Hourly visual counts and species identification were adjusted in proportion to the difference between the observed visual counts and the verified counts. These differences were calculated in terms of the weighted mean proportional error (PE) for each sampling interval (generally one week):

$$PE_k = \frac{(\sum_{j=1}^{n} VerC_j) + 1}{(\sum_{j=1}^{n} VC_j) + 1} \quad (1)$$

where PE_k is the weighted mean proportional error of the visual counts for sample period k, $VerC_j$ is the verified number of fish determined from each test (j), VC_j is the number of fish observed during the test, and n is the number of tests conducted in each sampling interval.

The hourly counts of each species could then be adjusted using the following equation:

$$VC'_{k,j,i} = VC_{k,j,i} \cdot PE_k \quad (2)$$

where $VC_{k,j,i}$ is the actual count of fish in hour i, on day j, and in sample period k, and $VC'_{k,j,i}$ is the corresponding adjusted count.

The variance can be calculated for the total number of fish estimated in each week using the following equation:

$$Var(VC_k) = \sum_{i=1}^{n} \sum_{j=1}^{n} (VC'_{k,j,i})^2 \cdot Var(PE_k) \quad (3)$$

where $Var(VC_k)$ is the variance for the total estimated weekly count, $VC'_{k,j,i}$ is the adjusted weekly count, and $Var(PE_k)$ is the variance for the weighted mean proportional error of the visual counts for sample period k:

$$Var(PE_k) = \frac{\sum_{j=1}^{n} PE_{k,j}^2 \cdot W_{k,j} - \frac{(\sum_{j=1}^{n} PE_{k,j} \cdot W_{k,j})^2}{n}}{n - 1} \quad (4)$$

where $PE_{k,j}$ is the proportional error for sample period k for each test j:

$$PE_{k,j} = \frac{VerC_{k,j} + 1}{VC_{k,j} + 1}$$

and $W_{k,j}$ is the weight associated with each test:

$$W_{k,j} = \frac{n \cdot \sum_{s=1}^{m} VerC_{k,j,s}}{\sum_{j=1}^{n} \sum_{s=1}^{m} VerC_{k,j,s}}$$

and n is the number of tests conducted in period k, s is the species of salmon observed, and m is the number of each species observed.

The adjusted hourly counts for each species were summed to give daily and weekly estimates of the number of fish moving through the fishway. Daily estimates were summed to provide a total population estimate. The square root of the sum of weekly variances produced the total standard error. The verification tests were used to compare the counting accuracy of each of the observers.

Interpolation of Missing Counts

During extended periods of high or turbid water, when accurate visual counts could not be made, the panel gate was open and fish were allowed to pass upstream. Estimates of the number of chinook and coho salmon passing through the fishway were calculated by using the relationship between 1992 fishway counts and 1992 hatchery counts during a time period when fishway counts were available. The number of sockeye that passed through the fishway during flood periods was estimated using linear interpolation. An unknown number of fish migrating prior to 2 September could not be estimated in any rigorous manner.

RESULTS

Accuracy and Precision of Counts

Two factors were considered in assessing the accuracy and precision of the fishway counts. The first involved observer error in enumerating the fish and in species identification. The second

involved a comparison of "between observer" error. To assess these sources of error, verification tests were conducted for approximately one hour each day. Tests were conducted at various times of the day to account for varying light conditions and diel migration patterns of the fish. Figure 3 shows the hourly distribution of tests conducted for each of three timing periods.

Species Identification and Enumeration Error

Species identification error was determined by comparing the observed counts made during the verification tests with the verified number and species composition of fish captured during the tests (Table 1). Scattergrams of the daily observed and verified counts were plotted for each of chinook adults, chinook jacks, coho adults, coho jacks, and sockeye (Figure 4). Insufficient test data precluded an evaluation of counting error for chum salmon, pink salmon, and steelhead. Table 1 presents the results of the verification tests for chinook, coho, and sockeye along with the weighted mean proportional error and weighted standard deviation for each sampling interval.

The error in the observed counts, depending on the species, was between -67% and +20% during the first week of tests. The amount of error fluctuated between -40% and +37% for the next two weeks and by the third week of October the error was between -8% and +33%, depending on the species enumerated. Counts of chinook adults and sockeye were the most accurate, followed by counts of adult coho, jack chinook, and jack coho, respectively. The precision of the visual counts was poor during the first three weeks of counting ($0.13 < SD < 0.72$) but precision improved substantially thereafter. The differences in the precision of the counts for each species are illustrated in Figure 4.

Between-observer Error

The average observer error was calculated for each of the five observers using the data from the verification tests (Table 2).

Incomplete Counts

During the counting program, there were two "flood" event periods when the panel gate was open to allow fish passage. During these periods fish could pass through the fishway unobserved. The first of these periods was between 19 October and 27 October inclusive, when flood conditions caused water levels in the fishway to rise over 3 m. The high water and turbidity reduced visibility to near zero. Flood conditions again caused the stoppage of counting from 31 October to 1 November inclusive.

Counts of chinook and coho passing through the fishway during the two flood periods were estimated using an adjustment factor derived by comparing fishway counts and returns to Robertson Creek Hatchery during the pre-flood period of 25 September to 19 October, inclusive. The cumulative observed counts of chinook adults at the fishway were compared to the cumulative observed counts of chinook adults returning to the hatchery (Figure 5a). Next, the cumulative count

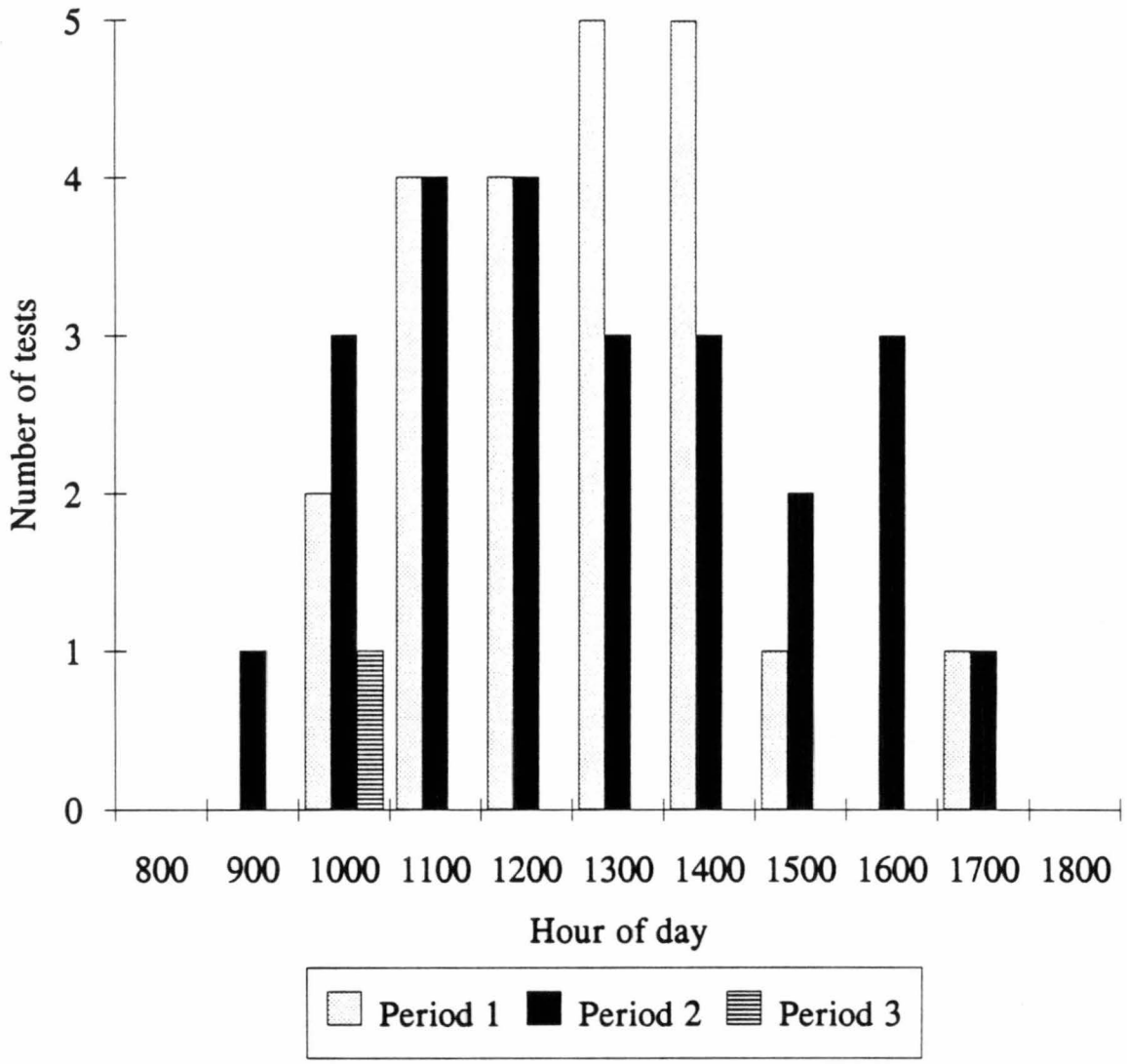


Figure 3. Frequency distribution of verification tests conducted at Stamp Falls Fishway, 1992. Period 1 = Sept. 8-21; Period 2 = Sept. 22-Oct. 5; and Period 3 = Oct. 6-26.

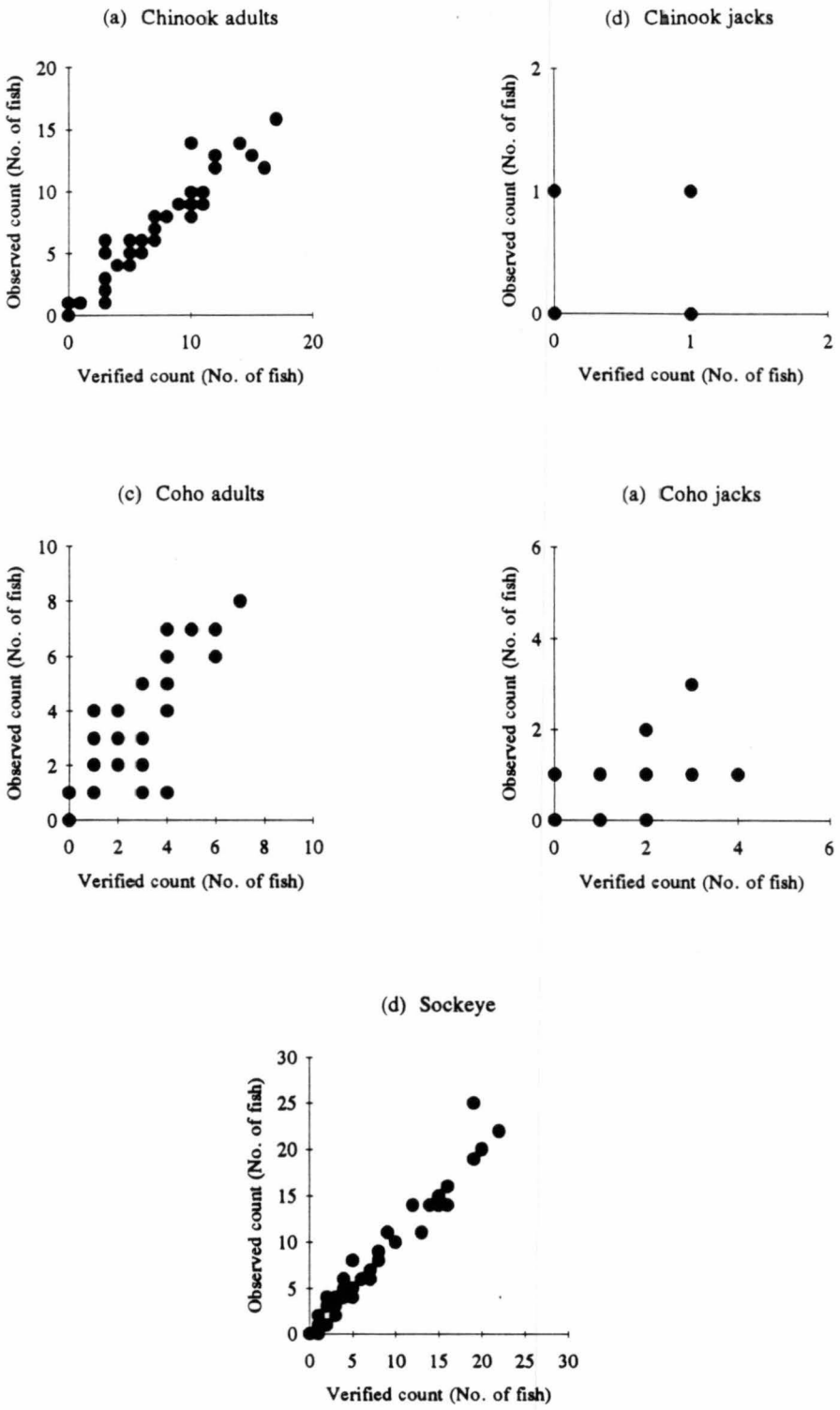


Figure 4. Scattergrams of observed counts versus verified counts from all verification tests conducted at Stamp Falls Fishway, 1992.

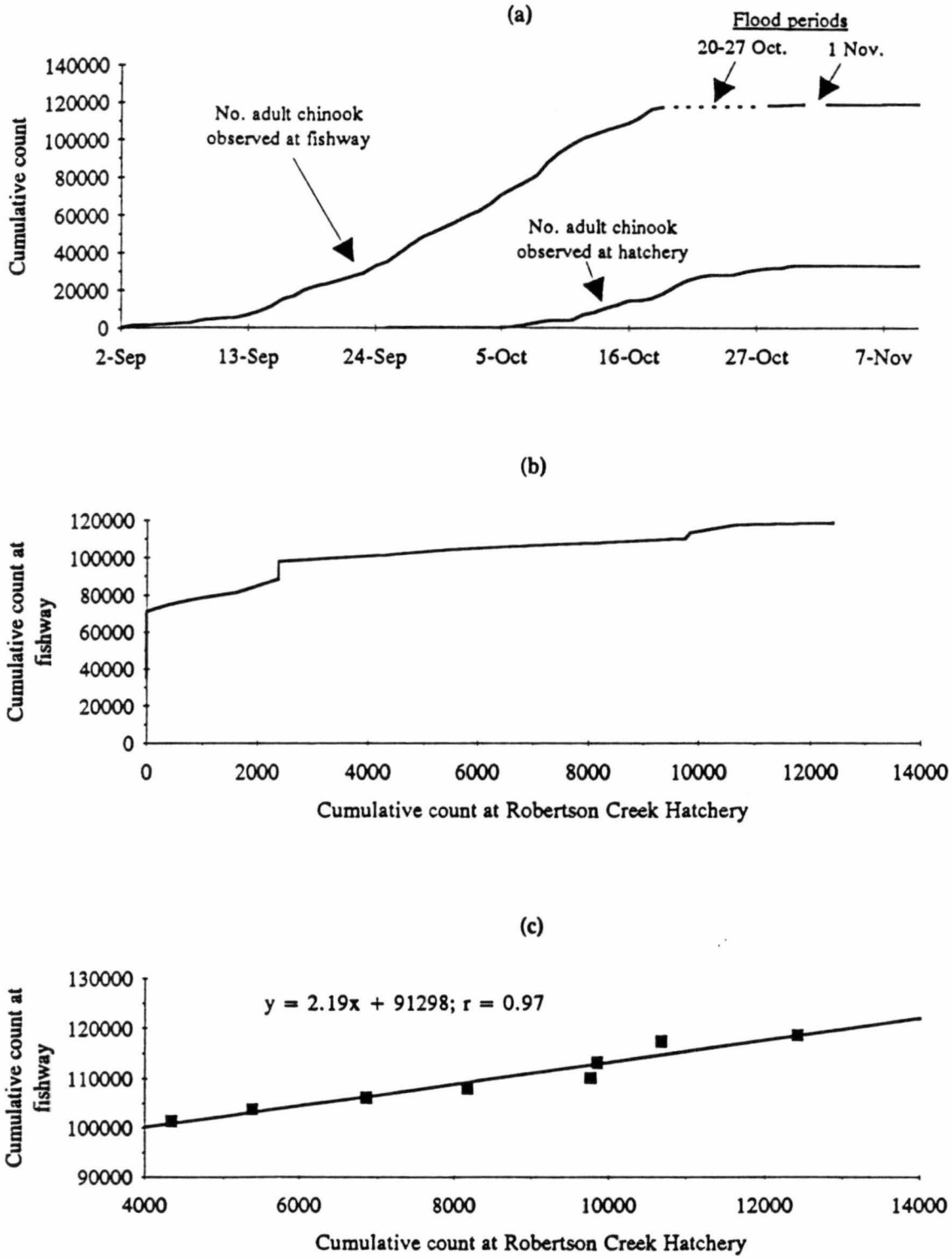


Figure 5. Figure (a) illustrates the relationship between observed counts of adult chinook at Robertson Creek Hatchery and Stamp Falls Fishway, by date, 1992. Figure (b) illustrates the relationship between the cumulative counts of adult chinook at the hatchery and the fishway during the pre-flood period from 25 Sept. - 19 Oct., inclusive (n = 25). Figure (c) presents the same relationship plus the linear regression for the period 12 - 19 Oct., inclusive (n = 8).

at Stamp Falls was plotted against the cumulative count at the hatchery (Figure 5b). It was evident from this figure that the relationship of the cumulative fishway and hatchery counts for chinook adults over the entire migration period was not a simple linear relation. However, there were distinct periods during the migration period when the movement of chinook adults through the fishway appeared to parallel the movement of chinook adults into the hatchery. The divisions between these periods are characterized by the steps in Figure 5b. Therefore, for the purposes of estimating the numbers of chinook adults moving through the fishway during the flood, it was assumed that the pattern of movement of chinook adults between 12 October and 19 October, inclusive, continued during the flood. Accordingly, the linear regression equation of the cumulative fishway counts versus the cumulative hatchery returns for this period was used to estimate the fishway counts during the same period (Figure 5c).

This procedure for estimating the movement of chinook adults through the fishway during the two flood periods was repeated for chinook jacks, coho adults, and coho jacks (Figures 6, 7, and 8, respectively). In all cases, significant relationships were found between the cumulative fishway counts and the cumulative hatchery returns between 12 October and 19 October.

Since no secondary counts were available for sockeye during the flood period, the numbers of sockeye salmon moving up the fishway during the flood periods were estimated using linear interpolation. No adjustments were made for chum salmon, pink salmon, or steelhead movement during the floods.

Variance estimates for the interpolated counts of each species were produced using the variance estimates derived from verification tests conducted during the sampling period that preceded the first flood period (week 7, Table 1).

Adjusted Counts and Population Estimates

Table 3 presents the adjusted daily fishway counts for each species. The unadjusted hourly counts are provided in Appendix 1-1 to 1-5. The estimated number of adult chinook that passed through the fishway between 2 September and 10 November was 141060 $\pm$ 8867. The estimate of jack chinook was 4053; confidence limits were not calculated due to the low number of observations of jack chinook during tests. The estimate for adult coho was 50145 $\pm$ 6180, and the estimate for jack coho was 7576 (confidence limits not calculated due to low observations during tests). The estimated number of sockeye that passed through the fishway during the period was 91276 $\pm$ 3970.

Migration Timing

Seasonal Migration

Figure 9 shows the adjusted daily counts of chinook adults and jacks at the Stamp Falls Fishway along with daily maximum and minimum water temperatures and water levels. The adjusted

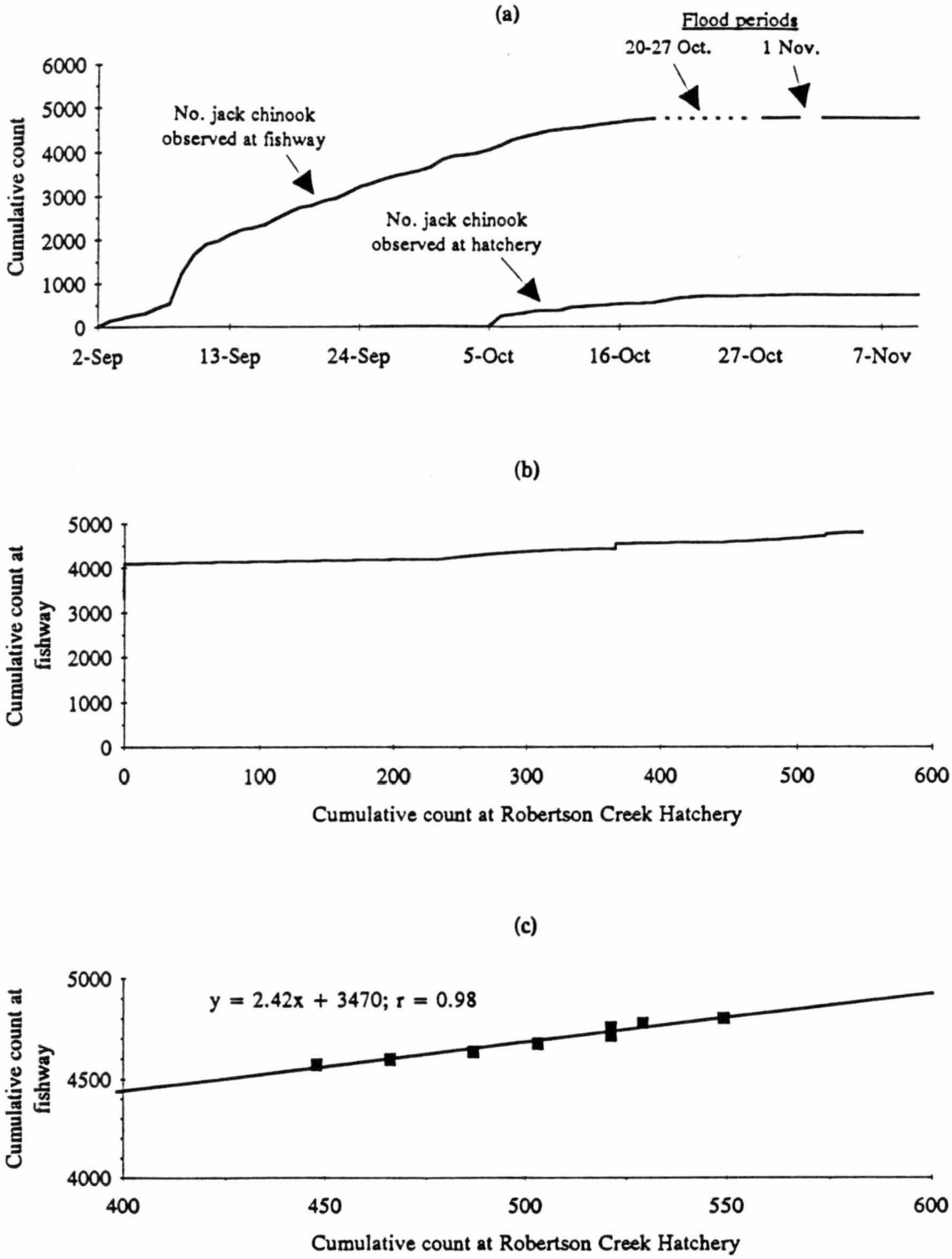


Figure 6. Figure (a) illustrates the relationship between observed counts of jack chinook at Robertson Creek Hatchery and Stamp Falls Fishway, by date, 1992. Figure (b) illustrates the relationship between the cumulative counts of jack chinook at the hatchery and the fishway during the pre-flood period from 25 Sept. - 19 Oct., inclusive (n = 25). Figure (c) presents the same relationship plus the linear regression for the period 12 - 19 Oct., inclusive (n = 8).

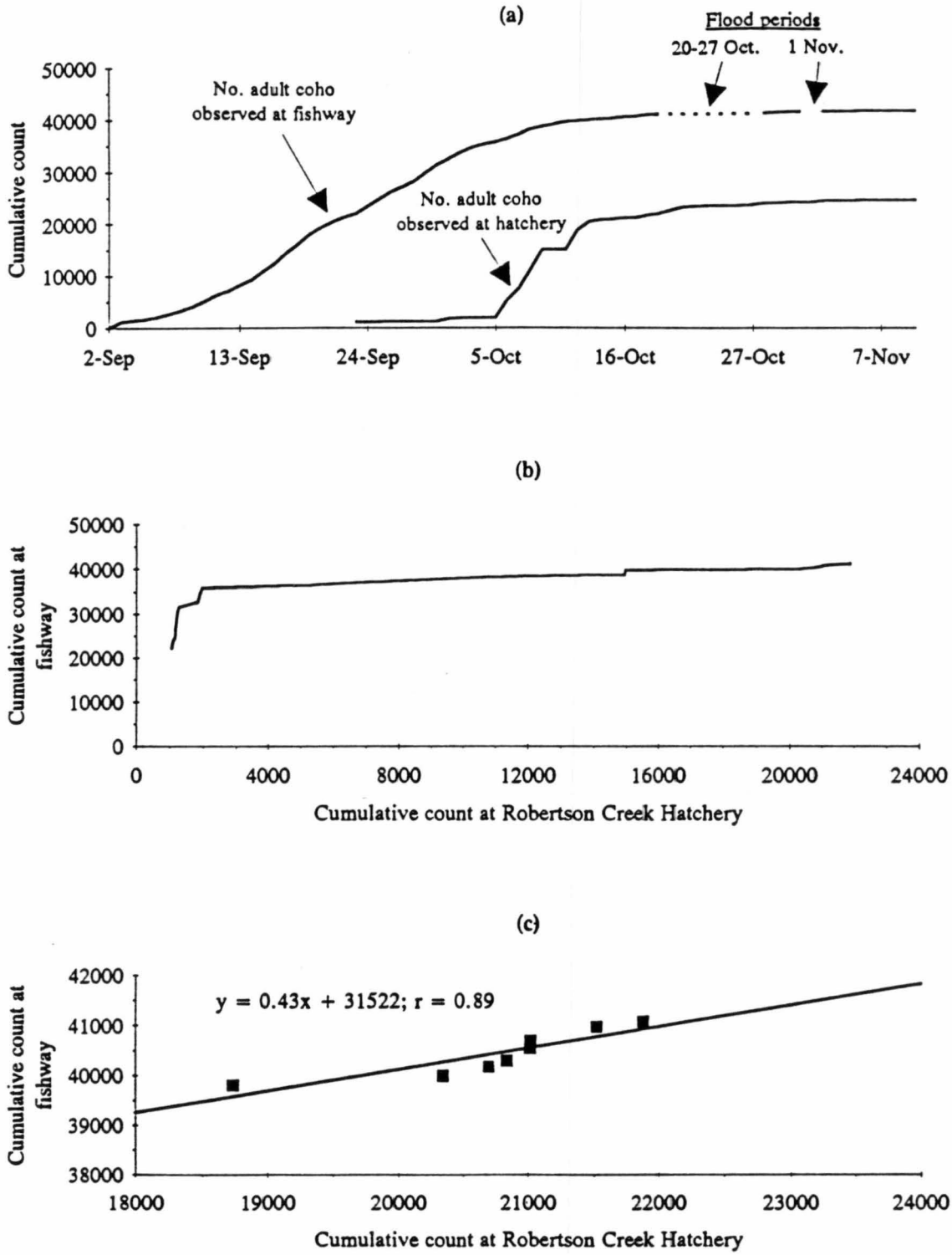


Figure 7. Figure (a) illustrates the relationship between observed counts of adult coho at Robertson Creek Hatchery and Stamp Falls Fishway, by date, 1992. Figure (b) illustrates the relationship between the cumulative counts of adult coho at the hatchery and the fishway during the pre-flood period from 23 Sept. - 19 Oct., inclusive (n = 27). Figure (c) presents the same relationship plus the linear regression for the period 12 - 19 Oct., inclusive (n = 8).

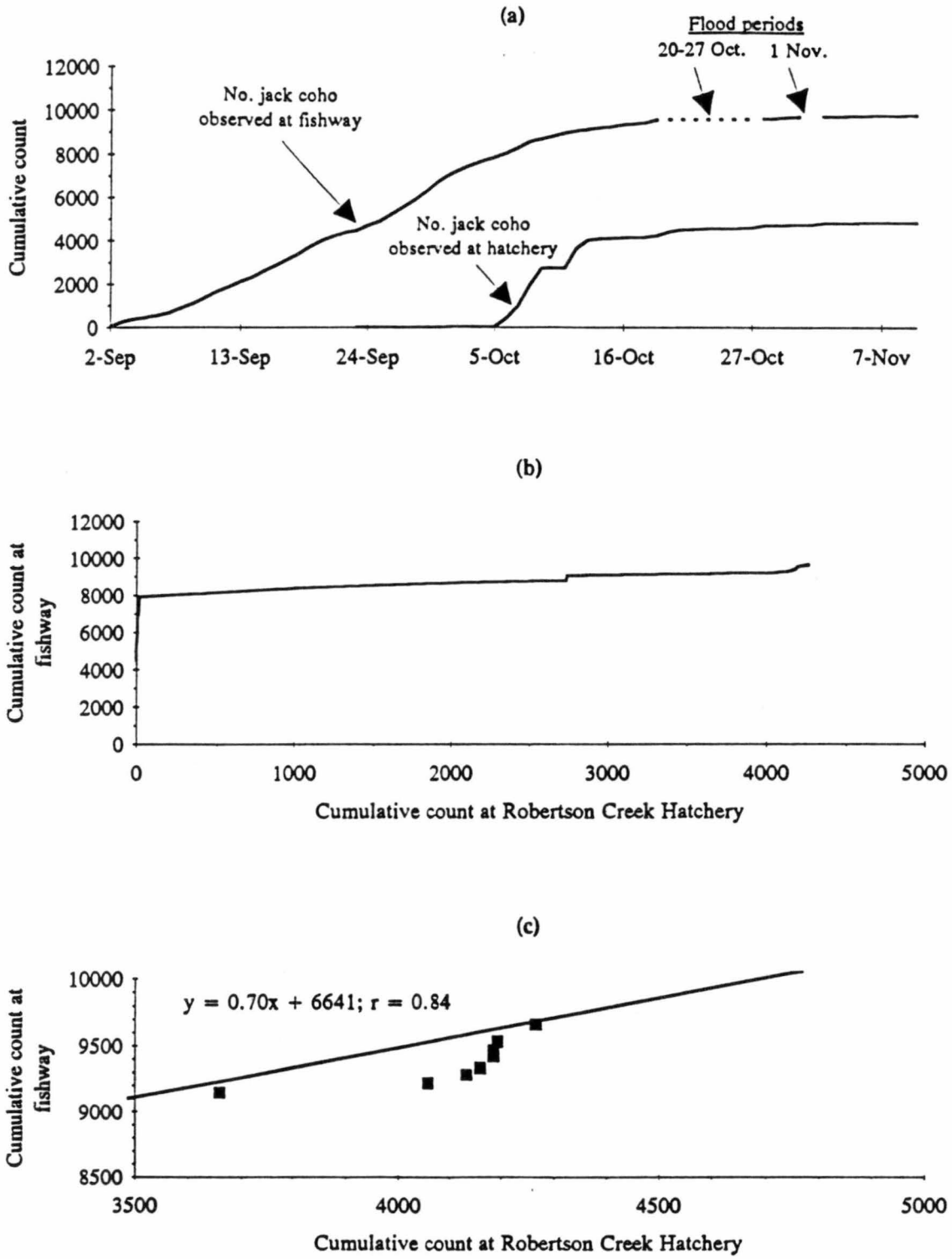


Figure 8. Figure (a) illustrates the relationship between observed counts of jack coho at Robertson Creek Hatchery and Stamp Falls Fishway, by date, 1992. Figure (b) illustrates the relationship between the cumulative counts of jack coho at the hatchery and the fishway during the pre-flood period from 24 Sept. - 19 Oct., inclusive (n = 26). Figure (c) presents the same relationship plus the linear regression for the period 12 - 19 Oct., inclusive (n = 8).

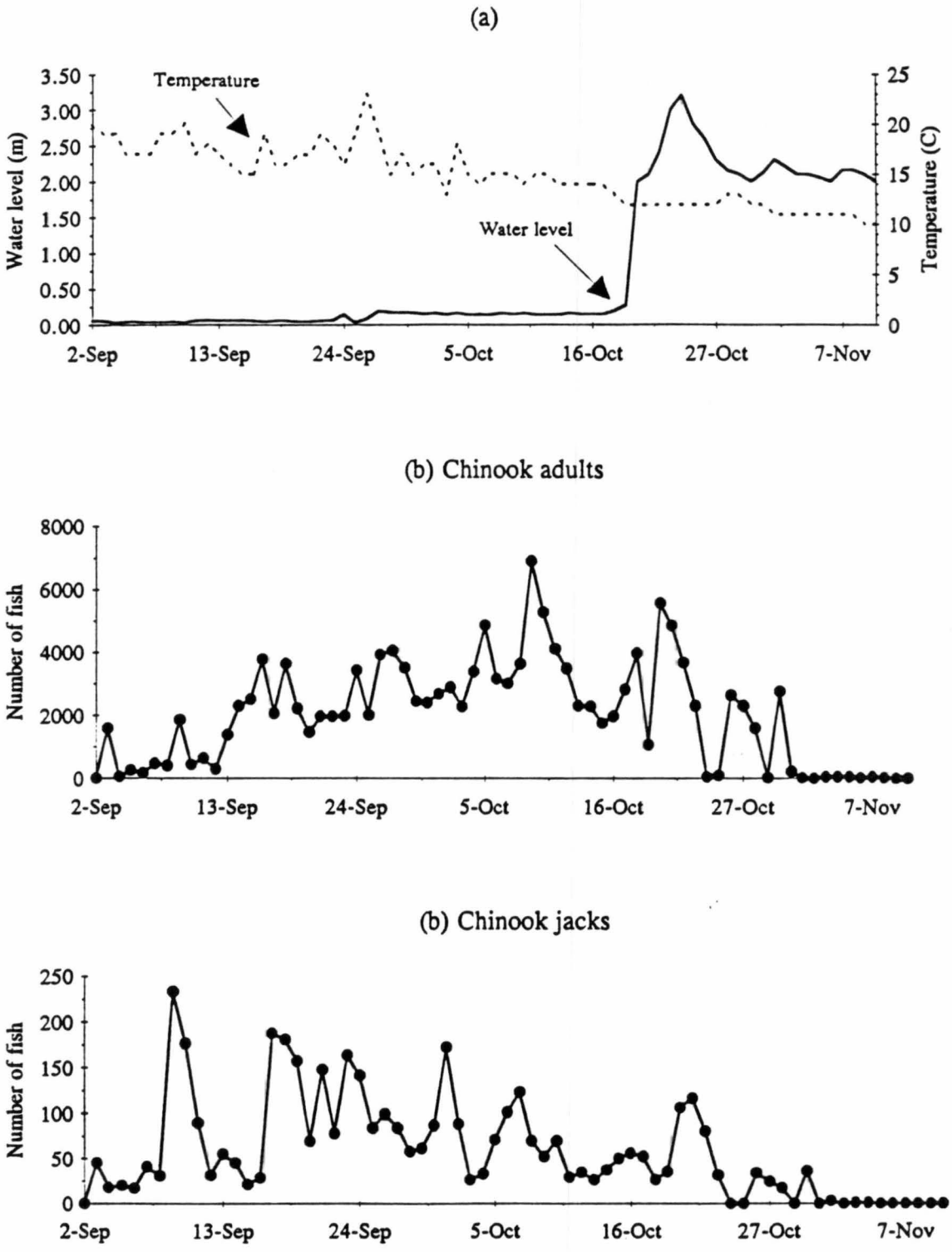


Figure 9. Figure (a) illustrates daily water levels and maximum water temperatures at Stamp Falls Fishway, 1992. Figures (b) and (c) illustrate adjusted daily counts of adult and jack chinook, respectively, (from Table 3) at Stamp Falls Fishway, 1992.

counts of chinook adults peaked at 6893 fish on 9 October. The adjusted counts of chinook jacks peaked several times with the daily maximum of 233 occurring on 9 September. Migration timing of chinook seemed to occur irrespective of water levels until the first flood period, when numbers increased sharply. Figure 9 also indicates that the counting period from 2 September to 10 November covered most of the migration of chinook, with very low numbers of fish missed at the tail end of the migration. During the first day of counting (2 September), crews were able to increase the discharge through the fishway by placing wooden planks across the secondary spillway adjacent to the fishway. The result was an increase in water depth over the observation area from 10 cm to 45 cm. As a direct result of this action the adjusted count of chinook adults jumped from zero on 2 September to 1594 on 3 September. This high count was followed by five days of lower counts (Table 3), which would indicate that the 3 September fish had staged at the bottom of the fishway for some number of days. Thus, it is likely that most of the beginning of the 1992 chinook run was counted. By 1 November, counts of chinook adults were less than 50 per day, and the last two days of observations (9 and 10 November) produced counts of 11 and seven, respectively (Table 3).

Figure 10 shows the adjusted counts of coho adults and jacks along with water temperature and levels. The adjusted counts of coho adults peaked at 2799 on 17 September. Coho jacks peaked at 357 on 30 September. The counting period of 2 September to 10 November appeared to have covered most of the adult coho run through the fishway but a small number of the early run (prior to 2 September) may have been missed. As with adult chinook, the counts of coho adults also jumped sharply on 3 September following the increase in fishway water levels on 2 September (Table 3). Coho migration appeared to be independent of water levels.

Counts of sockeye salmon at Stamp Falls peaked on 28-30 September with adjusted daily counts of 8214, 7653, and 8345, respectively (Figure 11; Table 3). By 5 October the daily counts of sockeye had dropped dramatically.

It should be noted that the count of sockeye at Stamp Falls Fishway does not represent the total escapement of sockeye to Great Central Lake as the majority of sockeye migrate prior to the commencement of counting. However, counts at the fishway can be used as a check against sockeye counts at the outlet to Great Central Lake from 2 September to 10 November.

Diel Migration

To ensure complete counts of salmonids passing through the fishway, the gate to the counting facility was closed and fish migration was blocked from 1800 to 0800 hours. Hourly counts of each species were made during daylight hours. The mean hourly count of each species for four different counting periods were calculated and plotted in Figures 12, 13 and 14. Hourly counts during times when verification tests were conducted were excluded from the analysis.

There was no obvious pattern of diel migration for chinook (Figure 12). It would appear, however, that the movement of chinook through the fishway tended to start out slowly for the first hour after the gate was opened in the morning and decrease again during the last hour of counting. There also appeared to be a slight decrease during the 1200 hour, a time when the greatest amount of direct sunlight entered the fishway. Diel migrations of coho tended to mimic those of chinook (Figure 13). Sockeye, on the other hand, tended to start out slowly during the first hour, then peak during the second hour and gradually decrease throughout the day (Figure 14).

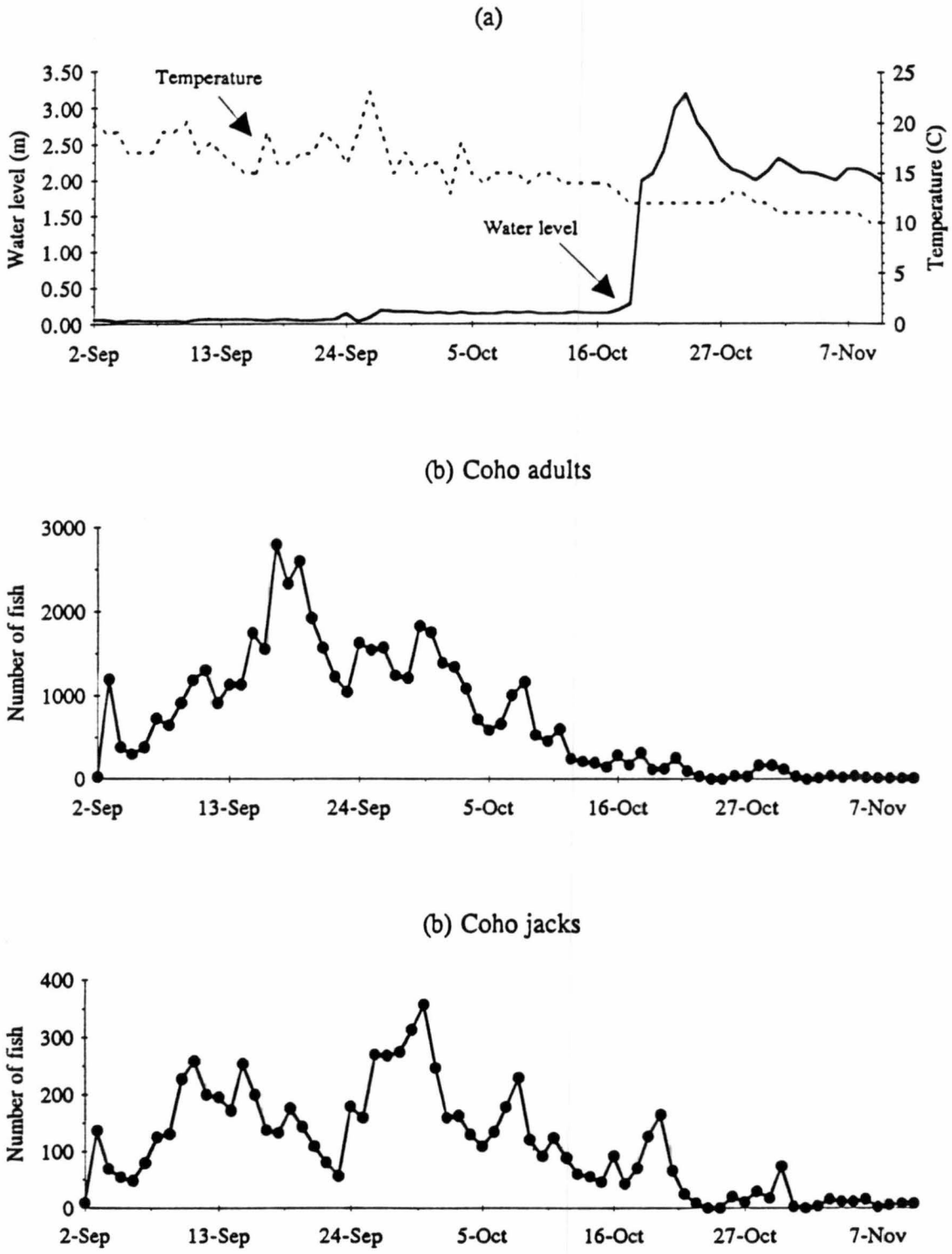
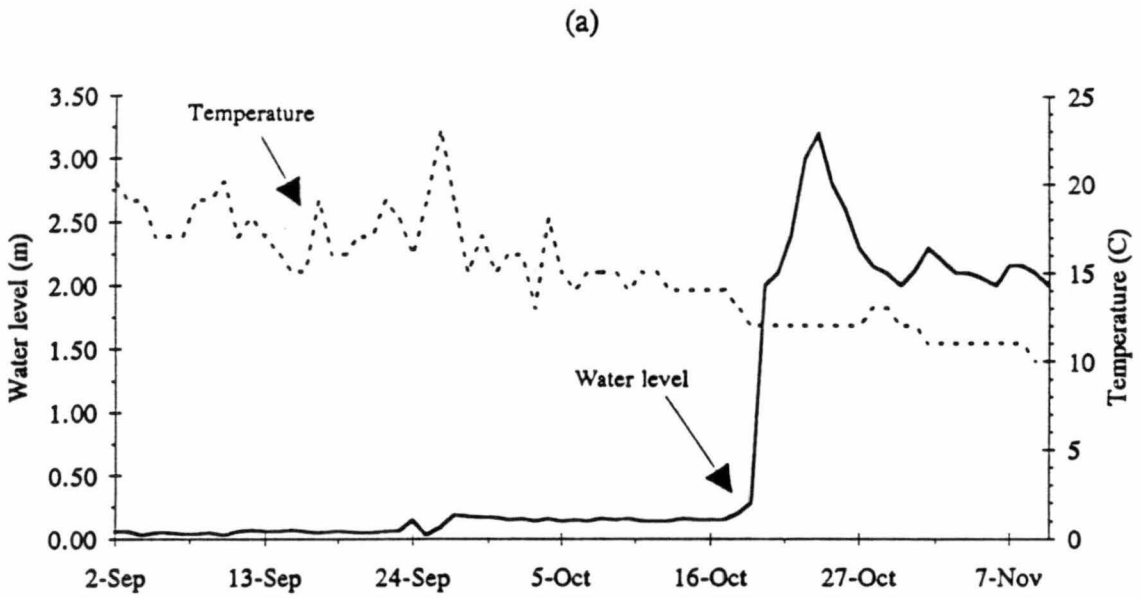


Figure 10. Figure (a) illustrates daily water levels and maximum water temperatures at Stamp Falls Fishway, 1992. Figures (b) and (c) illustrate adjusted daily counts of adult and jack coho, respectively, (from Table 3) at Stamp Falls Fishway, 1992.



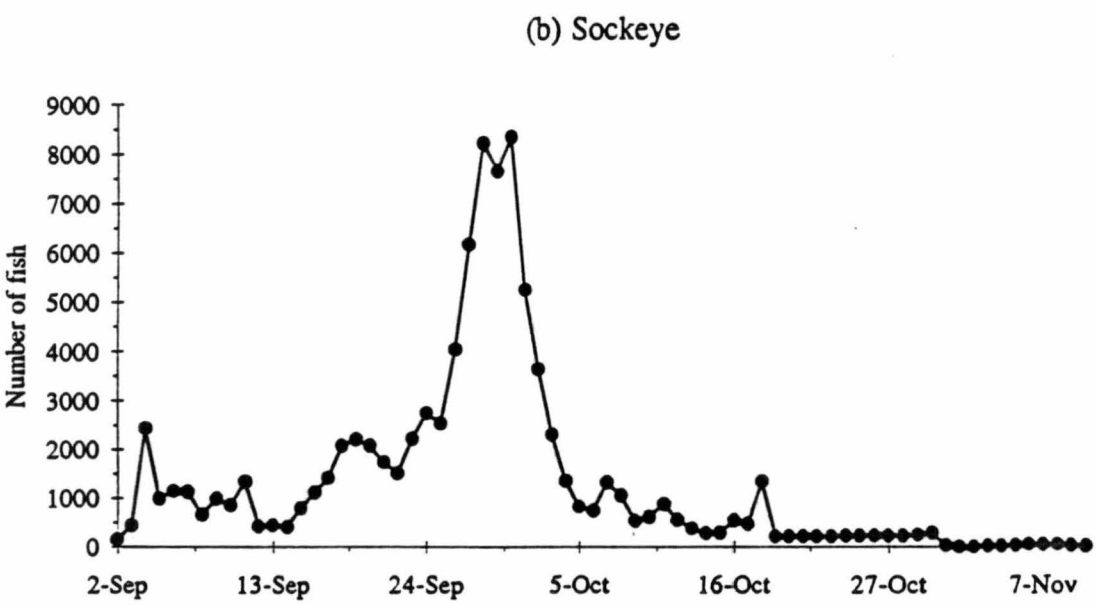


Figure 11. Figure (a) illustrates daily water levels and maximum water temperatures at Stamp Falls Fishway, 1992. Figure (b) illustrates the adjusted daily counts of sockeye (from Table 3) at Stamp Falls Fishway, 1992.

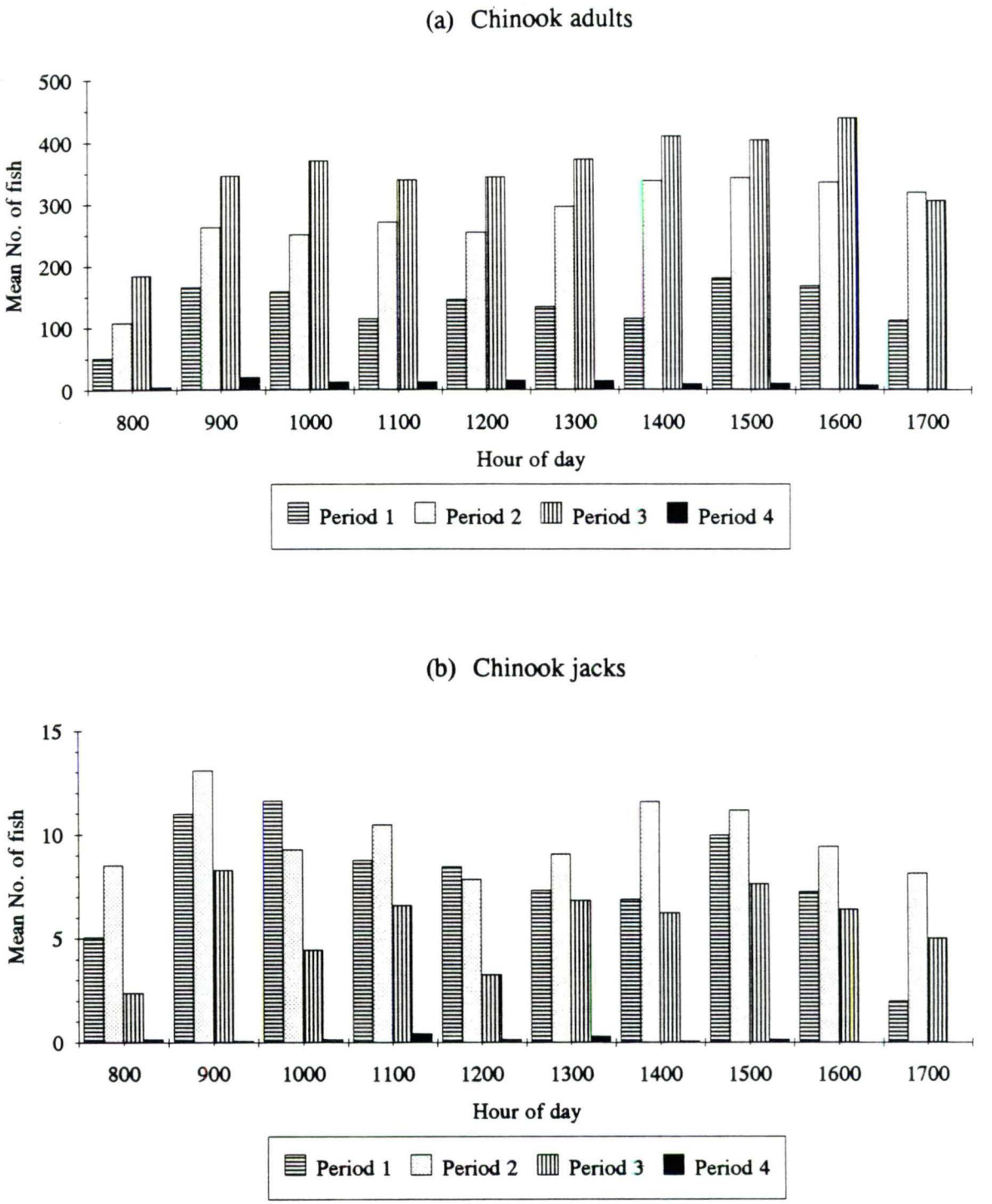
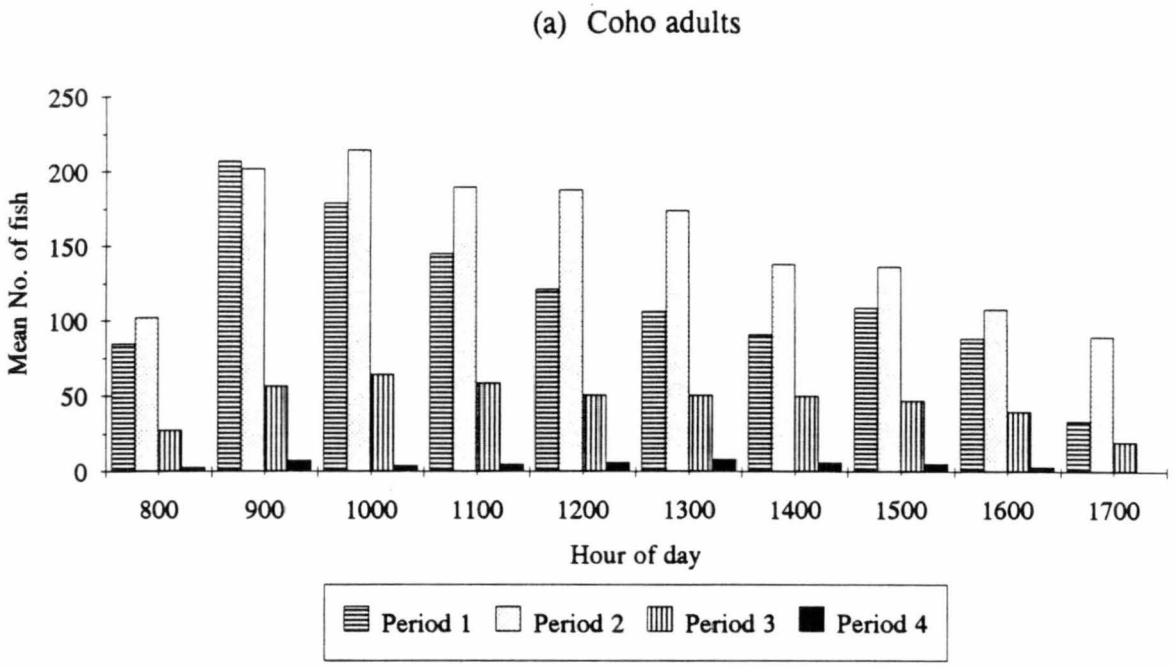


Figure 12. Hourly migration pattern of adult and jack chinook salmon (mean adjusted numbers) passing through Stamp Falls Fishway, by period, 1992. Period 1 = 2-18 Sep.; Period 2 = Sep. 19-Oct. 4; Period 3 = Oct. 5-19; Period 4 = Oct. 28-Nov. 10.



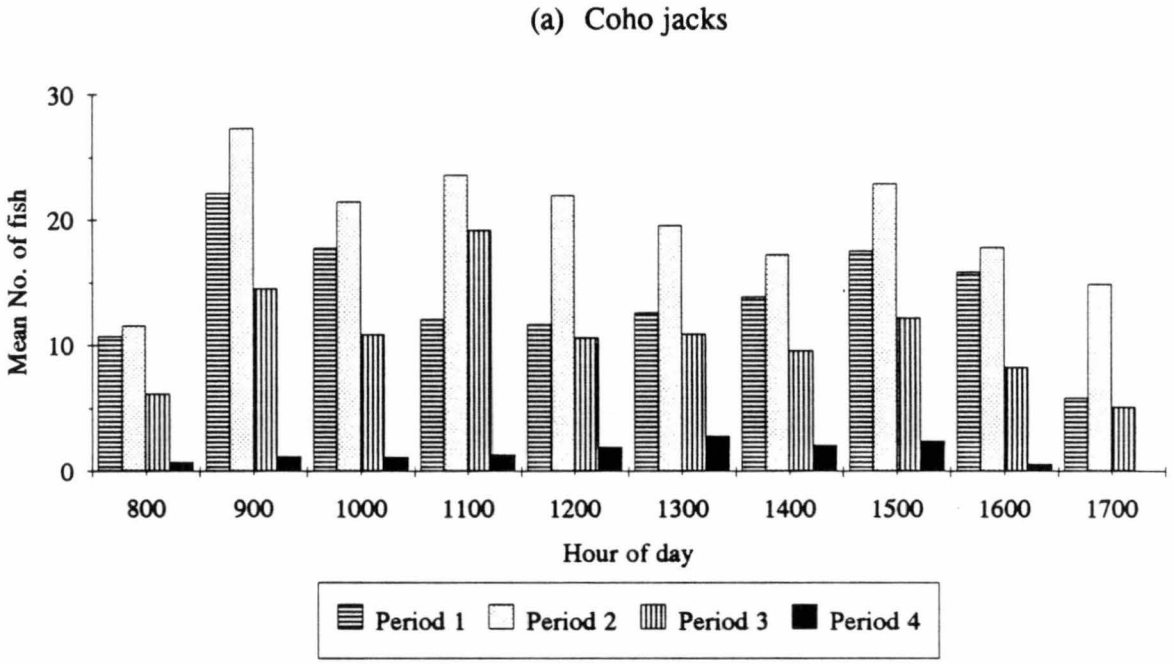


Figure 13. Hourly migration pattern of adult and jack coho salmon (mean adjusted numbers) passing through Stamp Falls Fishway, by period, 1992. Period 1 = 2-18 Sep.; Period 2 = Sep. 19-Oct. 4; Period 3 = Oct. 5-19; Period 4 = Oct. 28-Nov. 10.

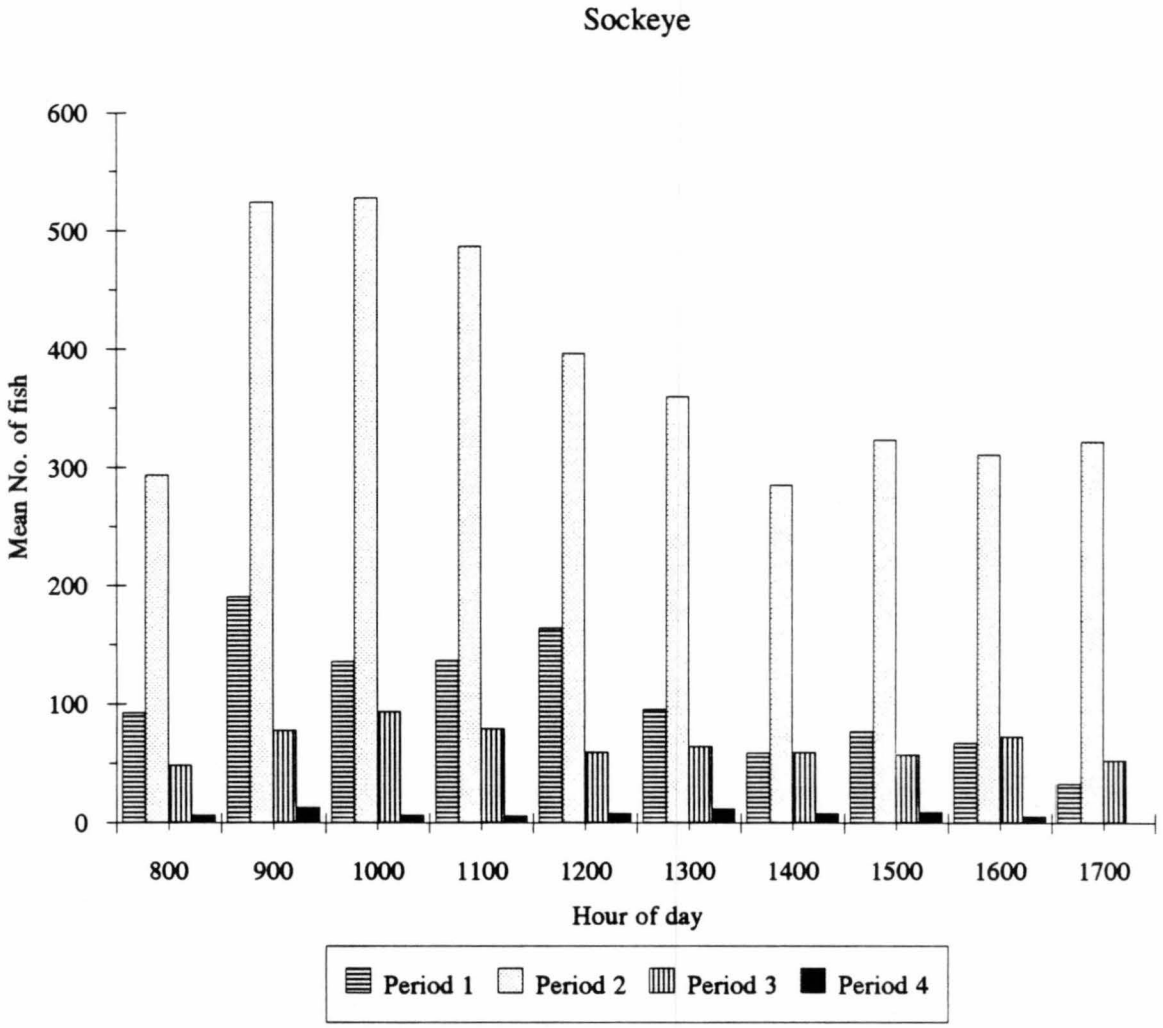


Figure 14. Hourly migration pattern of sockeye salmon (mean adjusted numbers) passing through Stamp Falls Fishway, by period, 1992. Period 1 = 2-18 Sep.; Period 2 = Sep. 19-Oct. 4; Period 3 = Oct. 5-19; Period 4 = Oct. 28-Nov. 10.

DISCUSSION

Salmonids migrating through the Stamp Falls Fishway were visually enumerated at the upstream end of the fishway. The objectives of the program were to: 1) obtain highly accurate counts of all species of fish passing through the fishway with an emphasis on the number of chinook adults and jacks; and 2) quantify the errors associated with counting, speciation, and the ability of observers to discriminate between jacks and adults. Observer error was successfully quantified using daily verification tests.

Observer Error

There are a number of possible sources of error in the counts of salmonids passing through the Stamp Falls Fishway. The counting apparatus and counting techniques were designed to mitigate as many of these sources of error as possible. The primary sources of error include observer error (species identification and miscounts) and multiple passage of fish (layering of fish and fall-back within the fishway).

Multiple passage of fish was mitigated in the design of the counting apparatus. The opening in the panels was purposely kept small to prevent too many fish from passing over the observation area at one time. Fall-back was minimized by setting the main fishway gates in a Vee formation to funnel the fish through the opening. This system worked well to minimize fall-back and once fish nosed through the panel opening, they moved quickly over the observation area and out of the fishway.

Errors in species identification and enumeration (observer error), as determined from the verification tests at Stamp Falls, ranged between 33% and 137% of the verified number depending on the sample period and fish species. Counts of chinook adults were the most precise and errors ranged from 87% to 120% over the migration period. After adjusting for counting error, the total counts for each species had 95% confidence intervals of between $\pm 4.3\%$ for sockeye and $\pm 12.3\%$ coho adults. The confidence interval for the population estimate for chinook adults was $\pm 6.3\%$. Confidence intervals for the population estimates for chinook jacks and coho jacks were not calculated due to low numbers of these jacks observed and verified in the verification tests (Table 1). These confidence intervals reflect the observers' ability to count each species of salmon. Sockeye were easily distinguished from the other species because of their distinct spawning colours and the presence of scarring on the body or fins. Coho jacks were more difficult to enumerate because small jacks (less than 30 cm in length) were able to escape from the containment area during the verification tests, and during normal counting operations, even with vexar screening (5 cm) covering the aluminum panels. Chinook adults were easy to identify because of their large size and body shape. However, some of the adult coho returning to the Stamp River are also very large and were sometimes confused with small adult or jack chinook. Observers relied on differences between body colour (coho tend to be darker) and spotting on the posterior end of the fish (larger and wider spaced spots on chinook). Difficulties in distinguishing between large coho and small adult or jack chinook were particularly pronounced when fish swam quickly through the viewing area. Steelhead were easily identified from

the other salmonids based on colour, the shape of the caudal peduncle, and fin ray coloration. There is no estimate, however, on the accuracy and precision of our counts for steelhead, pink salmon, and chum salmon.

Incomplete Counts

During this study there were four possible causes of incomplete counts at the fishway. The first cause was flooding, which prevented counting in the fishway but still allowed fish to move through the fishway. Flooding resulted in two periods of missed counting opportunities. The first was from 1130 hours on 19 October through 27 October and the second was from 1400 hours on 31 October through 1 November. Two separate techniques were used to estimate counts of salmonids moving through the fishway during the first flood period. Linear interpolation was used to estimate sockeye counts due to the unavailability of independent counts from elsewhere in the river system. It is difficult to say how well linear interpolation resulted in accurate estimates of the number of sockeye passing during the flood, but it likely underestimated the true number to some extent. The relationship between cumulative observed fishway counts and cumulative observed hatchery counts was used to estimate the number of chinook and coho moving through the fishway during the flood. Although there is still uncertainty with this technique, it probably more accurately reflects the movement of fish during the flood than linear interpolation. Lagging the fishway counts to account for the time of migration from the fishway to the hatchery did not improve the relationship. The likely reason for this is because fish returning to the hatchery gather in the lagoon just outside the hatchery for varying periods of time and movement of fish into the hatchery is driven primarily by the density of fish in the lagoon. This can best be described as a "treadmill" effect, whereby fish move into the hatchery in approximately the same proportion to fish moving into the lagoon from downstream areas.

The second cause of incomplete counts was the unknown number of salmon of all species that passed through the fishway prior to 2 September and after 10 November. A third potential source for incomplete counts was the undetected passage of small fish through the panel bars. Although this undetected passage of small fish was minimized by using vexar screening (mesh size 5 cm), fish less than 30 cm in length could still pass through the vexar. This included coho jacks, and very small adult coho or sockeye. No attempt was made to correct for these missed fish. The fourth potential source of incomplete counts was fish that bypassed the fishway and successfully negotiated Stamp Falls. Throughout the counting period, fish of all species were observed attempting to jump the falls. Crews were unable to confirm if any fish did or did not successfully negotiate the falls.

Migration Timing

The timing of migration of chinook salmon in 1992 was approximately the same as in 1991 (Bocking and Nass 1992). This timing is approximately one week earlier than in 1989 (Wright 1990) and both 1972 and 1973 (DFO, unpublished data, cited in Lightly et al. 1988) and a week later than

in 1990 (Bocking 1991a) and 1984 (Lightly et al. 1988). This degree of variability in run timing is not unusual.

The analysis of diel migration at Stamp Falls Fishway illustrates that there is very little variability in the diel migration of chinook. Coho tended to follow the same movement patterns as chinook, and sockeye tended to move in greater numbers during the morning hours.

PART II: AGE, LENGTH, AND SEX ANALYSIS AND CODED WIRE TAG RECOVERIES

INTRODUCTION

This section of the report deals with the population characteristics (age, length, and sex) of Stamp River chinook and the hatchery contributions to the total escapement. The Stamp River chinook escapement was stratified into two main groups: 1) those chinook spawning in the upper Stamp River between Stamp Falls and Robertson Creek Hatchery (the "in-river" population); and 2) those chinook returning to Robertson Creek Hatchery. The reason for this level of stratification was to compare differences in age, length, and sex attributes of these two components of the total escapement as well as different hatchery contributions. It was hypothesized that there would be significant differences in age structure, length and sex between the in-river population and the hatchery population. As well, it was hypothesized that the percentage of hatchery-origin fish would be significantly higher in the hatchery than in the river.

Two approaches to estimating the hatchery contribution to the Stamp River were examined. The first of these methods (Method A) has been used in other documents for chinook key streams (Andrew et al. 1988; Bocking et al. 1990; Carolsfeld et al. 1990; Bocking 1991a; Bocking 1991b; Bocking and Nass 1992; Nelson 1993a; Nelson 1993b) and uses the recovery rate of adipose-clipped chinook to expand recoveries of specific tag codes. The second method (Method B, Kuhn 1988) uses the recovery of CWTs in the escapement to estimate the hatchery contribution.

To avoid confusion in terminology relating to tagging and marking, the word "tagging" in this report refers to operculum tagging and punching of live adult and jack chinook in the river; "marking" refers to marking of chinook juveniles with coded wire tags (CWT) and adipose fin clips (AFC).

METHODS

Dead Recovery

Dead recovery in the Stamp River was conducted from 5 October through 27 November, 1992. Sampling was conducted in 10 stratified areas from Robertson Creek Hatchery to the lower Somass River (Figure 15). For the purpose of the analyses conducted in this report these areas were amalgamated into three strata: 1) upstream of the carcass weir; 2) the carcass weir; and 3) downstream of the carcass weir to Stamp Falls (Figure 15). There was also some sampling downstream of Stamp Falls (Area 7-9); data for recoveries in this area (downstream of the falls) are

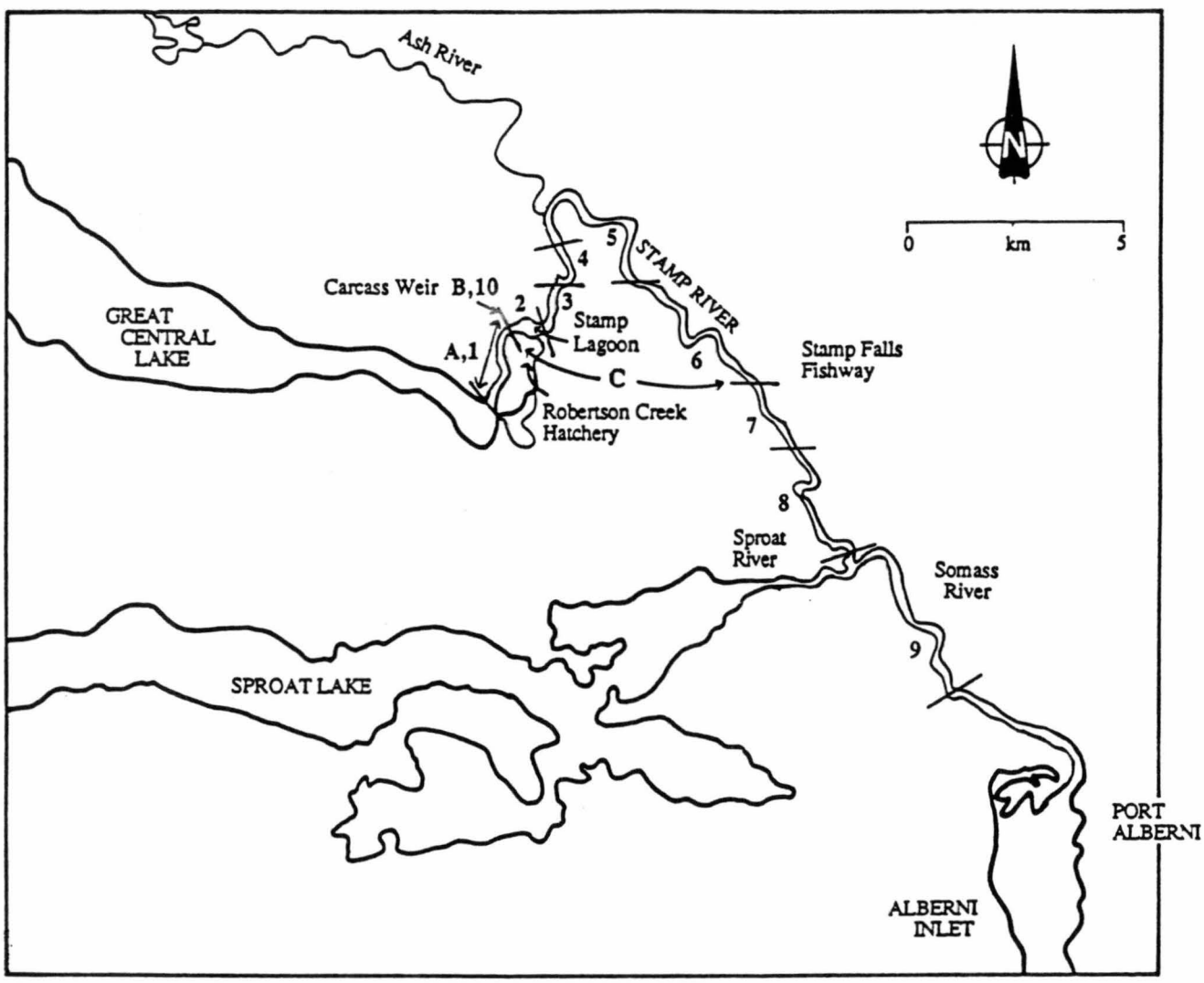


Figure 15. Map of Stamp River and Robertson Creek Hatchery showing carcass recovery areas. Numbers are hatchery designations, letters are the author's designation for this report.

presented in Appendix 2-1, but are not used in the analyses for this report as there is no estimate of the number of fish spawning downstream of the falls. The carcass weir was located at the upstream end of Stamp Lagoon, and consisted of a 45 x 2.5 m net strung across a 75 m-wide section of the river. The net, made of polyweb with 15.5 cm mesh, was suspended between two 3/8 inch cables running the full width of the river and anchored to trees on each shore. The bottom cable was held to the river bottom by rebar hooks driven into the gravel. The top cable was connected to a winch on each shore to facilitate a total release of the top end in the event of high water. Dead fish were recovered primarily by gaffing from a boat, and by walking the stream bank and shallow water between Stamp Lagoon and the Ash River confluence.

Carcasses recovered were measured (postorbital-hypural length) and examined for sex and missing adipose fins. A portion of the recovered carcasses was also sampled for scales, and all chinook with missing adipose fins had their heads removed for coded wire tag analysis. All carcasses sampled were cut in half to prevent double counting.

Hatchery Returns

The staff at Robertson Creek Hatchery enumerated all chinook returning to the hatchery between 25 September and 13 November, 1992 (Appendix 2-2). Daily records included the number of males, females, and jacks, missing adipose fins, scale sampling, and length (postorbital-hypural) measurements. Heads from all adipose-clipped chinook were removed and analyzed for coded wire tags.

Population Estimates

The total population of chinook returning to the Robertson Creek Hatchery was determined from brailer counts and stratified by males, females and jacks. The in-river population of chinook adults (above Stamp Falls) was determined by subtracting the total number of adult returns to the hatchery from the fishway count (see Part I). This estimate for chinook adults was then apportioned between males and females using the ratio of males to females as determined from the in-river dead recovery sample. The in-river population of jacks was determined by subtracting the number of jack returns to the hatchery from the fishway count of jack chinook.

Age, Length and Sex Analysis

Biological sampling of chinook during dead recovery and at the hatchery included scales for age determination, length, sex, and presence of an adipose clip. Males were considered to be jacks when their length was less than 59 cm. Some adipose-clipped fish (CWT) were also sampled for age

and length. Five scales were taken from the preferred area on each side of scale-sampled fish and placed in scale books.

Scales were read at the DFO scale laboratory in Vancouver. Ages were only read when a portion of the previous annulus was present and scales were not regenerated. Scales were classified as unreadable if the scales had regenerate centres, were resorbed, or if they were mounted upside down. Ages were recorded for fish for which there were at least two scales that could be read for both marine and freshwater ages. The aging system follows that described by Gilbert and Rich (1972).

The age composition determined with the available samples is valid only if age sampling was random and there was no bias in the readability of scales with age. Ages of older fish are usually more difficult to read than those of young fish because scales of older fish undergo more resorption and regeneration. The data were examined for this potential bias by comparing mean lengths of known and unknown (scales unreadable or not sampled) aged males and females.

The age-specific population estimates were then determined by allocating portions of the population estimate to age classes according to the age composition determined from scale samples. Sex ratios were determined for both the in-river population and the hatchery.

Hatchery Contributions

Heads from adipose-clipped chinook were removed and sent to the DFO tag recovery laboratory in Vancouver for dissection and tag decoding.

The estimation of the contribution of hatchery-reared chinook to the total escapement utilizes the adipose-clip or coded wire tag mark rate in the escapement. Two different approaches (Method A and Method B) were used to determine the contribution of hatchery-reared chinook, by tag code, to the escapement. In the first approach (Method A), dead recovery samples were used to estimate the total number of adipose-clipped fish in the escapement, stratified by river location (in-river versus hatchery) and sex. It should be noted that CWT expansions by the Mark Recovery Program for commercial and sport fisheries use Method B and, therefore, CWT expansions for escapements using Method A are not directly comparable.

Method A

Adipose-clipped fish were enumerated separately for males and females in the Stamp River and at the Robertson Creek Hatchery. The recovery of jack chinook was included with the adult male recoveries in this analysis. The first step in determining hatchery contributions was to estimate the number of adipose-clipped fish in each stratum (river versus hatchery) from the observed number of adipose clips:

$$EAD_{i,r} = \frac{OAD_{i,r} \cdot P_{i,r}}{C_{i,r}} \tag{7}$$

where *EAD* is the estimated number of adipose clips, *OAD* is the number of adipose clips observed, *C* is the number of fish examined, *P* is the population estimate, and *i* and *r* are subscripts denoting sex and river location (stratum), respectively. The sex-specific population estimates used here were from the age-structure analysis.

Given an estimate of the total number of adipose clips for each sex escaping to each portion of the system, the number of adipose clips for each tag code can be estimated by the allocation of adipose clips to tag code groups based on their relative frequency in the sample of decoded tags:

$$EAD_{i,r,tc} = \frac{EAD_{i,r} \cdot NDT_{i,r,tc}}{SumNDT_{i,r}} \tag{8}$$

where *tc* is a subscript denoting tag code and *NDT* is the number of successfully decoded tags for each sex, strata, and tag code (*tc*).

This approach of first estimating adipose-clipped fish and then allocating these among the successfully decoded CWTs assumes that any adipose-clipped fish not decoded (i.e. no pins) were once marked but lost their coded wire tag for some reason. If this assumption is incorrect, the calculation of the number of hatchery-origin fish using this method would be positively biased. It is possible, especially in the dead pitch, that some fish identified as hatchery releases by missing adipose fins may be fish that have naturally lost their adipose fins through some other means (e.g. carcass decomposition), or were misidentified. If decomposition of adipose fins is occurring, then the adipose clip rate among hatchery fish recovered in the dead pitch should be higher than that observed at release. Other potential sources of bias in the hatchery contribution estimate derived using Method A are discussed in Bocking (1991a).

The hatchery contribution to each year's escapement, stratified by river location and sex, was calculated by expanding the estimated number of adipose clips from each tag code group in proportion to the percentage of juvenile fish having an adipose clip at time of release:

$$EHC_{i,r,tc} = \frac{EAD_{i,r,tc} \cdot (RC_{tc} + RUC_{tc})}{RC_{tc}} \tag{9}$$

where *EHC* is the estimated hatchery contribution, *RC* is the number of chinook released with adipose clip for each tag code, and *RUC* is the number of chinook released without an adipose clip associated for each tag code.

These estimates of hatchery contribution, stratified by brood year (t), sex (i), river location (r), and tag code (tc) are summed to give the hatchery contribution of all tag codes to the entire escapement (EHC):

$$EHC_{i,r,t} = \sum_{i=1}^{n} EHC_{t,i,r,tc} \tag{10}$$

where n is the number of tag codes for a given brood year t.

Due to the potentially different ages at maturity of males and females, it is important that allocation of adipose-clipped fish to tag codes be carried out separately by sex whenever possible. In this study, the sex of all fish sampled for CWTs was recorded so that it was possible to estimate the total escapement of tag codes by sex (males included jacks). Final hatchery contribution estimates were made separately for fish of Robertson Creek origin and for hatchery stays from other rivers.

Method B

In the second approach used to estimate the hatchery contribution, the number of successfully decoded CWT chinook in the escapement, stratified by river and sex, were estimated using the methods described for the Mark Recovery Program (Kuhn et al. 1988). The primary difference between this method and Method A is that Method B uses the number of actual CWTs present in the escapement from which to derive the hatchery contribution, whereas Method A uses the number of adipose clips present in the escapement.

Estimating the total number of CWT returns from each of the brood years, and for each tag code, was done as follows.

First, the observed number of CWT recoveries was adjusted to account for "no pin" (no tag) recoveries:

$$ADJ_{i,r,tc} = OBS_{i,r,tc} \cdot \left[1 + \frac{LP}{K} + \frac{ND \cdot (K + LP)}{K \cdot (K + LP + NP)}\right] \tag{8}$$

where ADJ is the adjusted number of observed CWT fish, OBS is the observed number of CWT fish, K is the sum of all successfully decoded tags for all tag codes recovered, LP is the number of lost pin recoveries (CWT detected, but pin lost prior to reading), ND is the number of no data recoveries (adipose clip present, but head not taken; head taken and CWT present, but head lost or pin unreadable), NP is the number of no pin recoveries, and i, r, and tc are subscripts denoting sex, river section, and tag code, respectively.

This adjusted number of CWT recoveries is then used to estimate the total number of CWT returns for each tag code:

$$EST_{i,r,tc} = \frac{ADJ_{i,r,tc} \cdot P_{i,r}}{C_{i,r}} \quad (12)$$

where *EST* is the estimated number of CWT recoveries for a single tag code, *C* is the number of fish examined, *P* is the population estimate, and *i*, *r*, and *tc* are subscripts denoting sex, river, and tag code, respectively.

This approach of estimating the number of CWT chinook in the escapement assumes that any adipose-clipped chinook found without CWTs were never marked. This assumption is only valid if chinook tagged with a particular tag code did not lose the CWT after release from the hatchery (i.e. after accounting for tag loss during a retention test). Since it has been demonstrated for CWT fish that 90% of tag loss occurs within four weeks of tagging (Blankenship 1990), any fish that have been released within this four-week period are likely to continue to have some tag loss prior to being recovered in the fishery or escapement. Violation of the assumption of no tag loss will result in a negative bias in the hatchery contribution estimates. Other potential sources of bias in the hatchery contribute estimates derived using Method B are discussed in Bocking (1991a).

The hatchery contribution to each year's escapement, stratified by river location and sex, was calculated by expanding the estimated number of CWT fish from each tag code group in proportion to the percentage of juvenile fish having a CWT at time of release:

$$EHC_{i,r,tc} = \frac{EST_{i,r,tc} \cdot (RM_{tc} + RUM_{tc})}{RM_{tc}} \quad (10)$$

where *EHC* is the estimated hatchery contribution, *RM* is the number of chinook released with CWTs for each tag code, and *RUM* is the number of chinook released without CWTs for each tag code.

As for Method A, these estimates of hatchery contribution by tag code were then summed to give the hatchery contribution of all tag codes to the entire escapement, stratified by river, sex and brood year:

$$EHC_{i,r,t} = \sum_{i=1}^{n} EHC_{t,i,r,tc} \quad (14)$$

where *n* is the number of tag codes for a given brood year *t*.

Percent hatchery contributions by sex and age were then calculated using the population estimates derived from the age structure analysis.

RESULTS

Age, Length and Sex Composition

All of the fish sampled in the Stamp River and Robertson Creek were ocean reared, i.e. they left the river to rear in the ocean during their first year of life and are termed sub-ones in this report (Table 4). Total ages of Stamp River chinook ranged from 2 to 6 years. Six-year-old chinook represented less than one percent of the 1992 chinook escapements in both the Stamp River and Robertson Creek Hatchery (Table 4). The dominant male age groups for both the Stamp River (dead recovery) and Robertson Creek Hatchery were age 3 (44.8% and 57.3%, respectively) and age 4 (38.3% and 35.5%, respectively). The dominant female age groups both in-river and at the hatchery were age 4 (55.1% and 73.6%, respectively) and age 5 (37.1% and 22.2%, respectively).

Summaries of chinook mean lengths by age are presented in Table 4. In this table, the total mean length (all ages) is calculated from the raw data for all ages. Aged Stamp River males (mean postorbital-hypural length = 642 mm) were larger than Robertson Creek Hatchery male returns (mean postorbital-hypural length = 551 mm) and the difference was significant (t-test, $P < 0.001$). This is likely because 3-year-old chinook constituted a larger proportion of the male population in the hatchery (57.3%) than in the river (44.8%). The mean length of aged females was also dissimilar for in-river fish and hatchery returns (742 mm and 719 mm, respectively) and this difference was also significant (t-test, $P < 0.001$). In contrast, there were no significant differences between the mean lengths of unaged in-river males and unaged hatchery males (t-test, $P > 0.50$) or unaged in-river females and unaged hatchery females (t-test, $P > 0.50$). There was a significant difference between the mean lengths of aged and unaged in-river males (t-test, $P < 0.02$; the unaged fish were larger). For all other length comparisons of aged versus unaged chinook, the difference was not significant (t-tests: in-river females, $P > 0.20$; hatchery males, $P > 0.10$; hatchery females, $P > 0.50$).

The population estimates, stratified by river location, sex and age class, are shown in Table 5. The sex ratio in the hatchery, as determined from brailer counts, was 66.2% adult males, 30.8% females, and 2.9% jacks (Table 6). Hatchery age structure analysis produced almost identical population ratios: 66.0:30.8:3.2 (M:F:J). The sex ratio for the upper Stamp in-river population of chinook as determined from fishway counts minus the hatchery returns was 38.9:58.3:2.8 (M:F:J). Upper Stamp age structure analysis produced population ratios of 39.8:58.3:1.8 (M:F:J), which suggests that approximately 1100 adult males (0.76% of the total adjusted chinook escapement through Stamp Falls) were misidentified and recorded as jacks at the fishway counting operation. Table 6 lists the final, sex-specific population estimates using the observed counts and all age composition data.

Hatchery Contributions

The results of coded wire tag returns are presented below for the upper Stamp River and Robertson Creek Hatchery. Information includes the following:

1. the raw data and mark rates for the calculations;

2. estimates of the total escapement of adipose clips (Method A) and/or CWTs (Method B);

3. the observed and estimated escapement of adipose clips (Method A) or CWTs (Method B) by tag code, and the hatchery contribution to the escapement for each tag code; and

4. the estimated hatchery contribution to the escapement by age class.

In the upper Stamp River there were 441 adipose-clipped chinook recovered in the dead pitch for a mark rate of 3.6% (Table 7). At Robertson Creek Hatchery, there were 820 observed adipose clips for a mark rate of 3.4%. Table 7 presents the total estimated number of adipose clips in the in-river population and the hatchery returns. The mark rates represent the number of adipose-clipped chinook as a percentage of the total number of chinook in each population (wild + hatchery stock).

Hatchery Contributions - Method A

Results from the decoding of adipose-clipped fish from the upper Stamp River dead pitch and returns to Robertson Creek Hatchery are shown in Table 8. All CWT fish recovered that were released in another river system (strays) were included in the analysis. In 1992 there were three strays observed at the hatchery (one each from Gold, Conuma, and Nanaimo rivers). A single stray from Gold River was observed in the in-river deadpitch. A total of 411 CWT heads from adipose-clipped fish recovered in the in-river dead recovery were successfully decoded. A total of 778 CWT heads recovered at the hatchery were successfully decoded. Age-2 males (jacks) were included with all other (adult) males for this analysis. The allocations of the total escapement of adipose clips to tag codes recovered in-river and at the hatchery are shown in Tables 8 and 10. Table 9 lists the number of CWT fish and adipose-clipped fish released for each tag code (data from MRP database) . Using Method A, the estimated hatchery contributions to the 1992 escapements of chinook in the upper Stamp River and Robertson Creek Hatchery were 97795 and 22519, respectively (Table 10); these estimates do not include hatchery contributions from other systems (strays). The hatchery contribution to the total escapement of chinook by age class is presented in Table 11. The hatchery contribution to the in-river population of upper Stamp River chinook was estimated to be 71.5% for males and 87.7% for females. For hatchery returns, this contribution increased to 88.7% for males and 100.0% for females. Hatchery strays from Gold, Conuma, and Nanaimo rivers accounted for 0.1% of the population of hatchery males, and hatchery strays from Gold River accounted for less than 0.1% of the population of in-river males.

Hatchery Contributions - Method B

Results from the decoding of CWTs from the upper Stamp River dead pitch and returns to Robertson Creek Hatchery are shown in Table 12. This table shows the number of observed CWT fish in the escapement and the adjusted number of CWTs for each tag code. The allocations of the total escapement of CWT fish to tag codes recovered in-river and at the hatchery are shown in Tables 13 and 14. Using Method B, the estimated hatchery contributions to the 1992 escapements of chinook in the Stamp River and Robertson Creek Hatchery were 92387 and 21663, respectively (Table 14); these estimates do not include hatchery contributions from other systems (strays). The

hatchery contribution to the total escapement of chinook by age class is presented in Table 15. The hatchery contribution to the in-river population of chinook was estimated to be 68.8% for males and 82.0% for females. For hatchery returns, this contribution increased to 85.8% for males and 96.7% for females. Hatchery strays from Gold, Conuma, and Nanaimo rivers accounted for 0.1% of the population of hatchery males, and hatchery strays from Gold River accounted for 0.1% of the population of in-river males.

DISCUSSION

Age, Length and Sex Composition

The age-length composition obtained from sampling river carcasses was different from that obtained from hatchery returns. For all respective adult age classes (age 3 to age 6), the mean lengths of all aged chinook sampled in the Stamp River were larger than the mean lengths of aged chinook sampled at the hatchery. The mean length of aged jacks from the Stamp River was very similar to the mean length of aged jacks from the hatchery. The mean lengths of all aged males and all aged females from the Stamp River were significantly larger than the mean lengths of aged hatchery males and females. Although a comparison of unaged Stamp River chinook and unaged hatchery chinook found no significant length differences for either males or females, the sample sizes of unaged hatchery fish were very low in comparison to the sample sizes of unaged Stamp River fish.

The sex composition of the 1992 escapements to the upper Stamp River and Robertson Creek Hatchery (as calculated using the age composition of successfully aged fish) suggests that the percentage of returning jacks was higher in the hatchery (3.2%) than in the river (1.8%); this is consistent with results of the same comparison for 1991 and 1990 escapements (Bocking and Nass 1992; Bocking 1991b, respectively). The lower proportion of females observed in the hatchery returns (30.8%) compared to the in-river dead recovery (58.3%) has been observed in other hatchery populations (Bocking and Nass 1992; Bocking 1991a; Bocking et al. 1990; Lightly et al. 1988; Sibert and Schnute 1982).

Hatchery Contributions

Hatchery contribution estimates for 1992 were similar to those for 1991 and 1990 (Bocking and Nass 1992; Bocking 1991b, respectively). Hatchery Contributions to the in-river populations were 14-17% lower than for the hatchery. Method A produced higher contribution estimates than Method B. This is consistent with other studies (Bocking et al. 1990; Bocking 1991a; Bocking 1991b; Bocking and Nass 1992). The reasons for this difference are discussed in detail in Bocking 1991a.

SUMMARY

Fishway Counts

Counts of adult salmon returning to spawn in the Stamp River in 1992 were conducted at Stamp Falls Fishway using visual observations from 2 September to 10 November. Raw counts of salmon passing through the fishway were adjusted for observer error by comparing observed counts with verified counts of fish. The final estimate of chinook salmon was 145113 $\pm$ 8867 (confidence limits for adults only). The final estimate for coho was 57712 $\pm$ 6180 (confidence limits for adults only), and for sockeye the estimate was 91276 $\pm$ 3970.

Age, Length and Sex Composition

The age, length and sex composition of 1992 Stamp River chinook salmon were determined from carcass recovery and sampling of live returns to Robertson Creek Hatchery. The in-river population of spawners and the hatchery returns were analyzed separately. Age-3 males and age-4 females comprised the largest proportion of the chinook escapement in both the Stamp River and Robertson Creek Hatchery. The mean lengths of all age groups of female chinook were larger than the corresponding mean lengths of males. There was a larger proportion of females among river spawners (58.3%) than among hatchery returns (30.8%).

Hatchery Contribution Estimates

Adipose clip mark rates for the in-river carcass recovery samples and the hatchery returns were 3.6% and 3.4%, respectively. Two methods were described and used to estimate hatchery contributions to the escapement. Using Method A, which expands the number of observed adipose-clipped chinook, the hatchery contribution for the total Stamp River escapement was estimated at 82.9%. Using Method B, which expands the number of CWTs (excluding those with adipose clips only), the hatchery contribution was estimated at 78.6%. Contribution estimates varied between sexes and between in-river and hatchery spawners.

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TABLES

Table 1. Results of Stamp Falls verification tests, 1992. O = observed count, V=verified count.

Week	Date	Time	Observer	Gauge height (m)	Chinook adults			Chinook jacks			Coho adults			Coho jacks			Sockeye		
					O	V	V/O	O	V	V/O	O	V	V/O	O	V	V/O	O	V	V/O
1	3-Sep	1200	2	1.06	3.00	5.00	1.50	1.00	0.00	0.50	6.00	6.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00
1	4-Sep	1400	5	1.03	0.00	0.00	1.00	0.00	0.00	1.00	3.00	3.00	1.00	0.00	0.00	1.00	19.00	19.00	1.00
1	5-Sep	1100	3	1.05	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	2.00	8.00	9.00	1.11
1	6-Sep	1000	4	1.05	0.00	0.00	1.00	0.00	0.00	1.00	2.00	4.00	1.67	0.00	0.00	1.00	22.00	22.00	1.00
1	7-Sep	1400	3	1.04	0.00	0.00	1.00	0.00	0.00	1.00	4.00	4.00	1.00	0.00	0.00	1.00	15.00	14.00	0.94
1	8-Sep	1100	2	1.04	0.00	0.00	1.00	0.00	0.00	1.00	4.00	4.00	1.00	4.00	1.00	0.40	5.00	8.00	1.50
1	9-Sep	1300	3	1.05	5.00	5.00	1.00	1.00	0.00	0.50	2.00	3.00	1.33	0.00	0.00	1.00	2.00	1.00	0.67
				Weighted mean			1.20			0.33			1.14			0.60			1.03
				Weighted SD			0.17			0.21			0.30			0.40			0.21
2	10-Sep	1200	2	1.03	1.00	1.00	1.00	0.00	0.00	1.00	5.00	7.00	1.33	3.00	3.00	1.00	16.00	14.00	0.88
2	11-Sep	1300	4	1.06	0.00	1.00	2.00	1.00	0.00	0.50	1.00	1.00	1.00	1.00	0.00	0.50	4.00	4.00	1.00
2	12-Sep	1300	3	1.07	0.00	0.00	1.00	1.00	0.00	0.50	4.00	6.00	1.40	2.00	2.00	1.00	1.00	0.00	0.50
2	13-Sep	1200	2	1.06	3.00	5.00	1.50	1.00	0.00	0.50	6.00	6.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00
2	14-Sep	1400	4	1.06	11.00	9.00	0.83	1.00	1.00	1.00	3.00	3.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00
2	15-Sep	1000	3	1.07	14.00	14.00	1.00	0.00	0.00	1.00	2.00	2.00	1.00	0.00	0.00	1.00	1.00	2.00	1.50
2	16-Sep	1400	4	1.06	8.00	8.00	1.00	0.00	0.00	1.00	3.00	1.00	0.50	0.00	0.00	1.00	2.00	4.00	1.67
				Weighted mean			1.03			0.40			1.08			0.86			1.00
				Weighted SD			0.32			0.24			0.29			0.13			0.37
3	17-Sep	1400	3	1.05	7.00	7.00	1.00	1.00	1.00	1.00	2.00	3.00	1.33	0.00	0.00	1.00	3.00	3.00	1.00
3	18-Sep	1100	4	1.05	6.00	6.00	1.00	0.00	0.00	1.00	1.00	4.00	2.50	0.00	0.00	1.00	13.00	11.00	0.86
3	19-Sep	1500	3	1.06	5.00	4.00	0.83	1.00	1.00	1.00	4.00	5.00	1.20	0.00	0.00	1.00	4.00	6.00	1.40
3	20-Sep	1100	2	1.05	3.00	6.00	1.75	0.00	0.00	1.00	4.00	7.00	1.60	2.00	1.00	0.67	9.00	11.00	1.20
3	21-Sep	1200	4	1.05	6.00	5.00	0.86	0.00	1.00	2.00	2.00	2.00	1.00	0.00	0.00	1.00	7.00	7.00	1.00
3	22-Sep	1700	2	1.06	10.00	14.00	1.36	0.00	0.00	1.00	4.00	1.00	0.40	3.00	1.00	0.50	7.00	6.00	0.88
3	23-Sep	1300	4	1.05	5.00	4.00	0.83	0.00	0.00	1.00	1.00	3.00	2.00	0.00	0.00	1.00	5.00	5.00	1.00
				Weighted mean			1.09			1.33			1.37			0.50			1.02
				Weighted SD			0.37			0.35			0.72			0.22			0.20

Table 1. Results of Stamp Falls verification tests, 1992. O = observed count, V=verified count.

Week	Date	Time	Observer	Gauge height (m)	Chinook adults			Chinook jacks			Coho adults			Coho jacks			Sockeye		
					O	V	V/O	O	V	V/O	O	V	V/O	O	V	V/O	O	V	V/O
4	24-Sep	1300	3	1.15	5.00	5.00	1.00	0.00	0.00	1.00	3.00	3.00	1.00	2.00	2.00	1.00	0.00	0.00	1.00
4	25-Sep	1100	4	1.02	3.00	1.00	0.50	0.00	0.00	1.00	2.00	3.00	1.33	0.00	0.00	1.00	16.00	16.00	1.00
4	26-Sep	1200	3	1.09	8.00	8.00	1.00	0.00	0.00	1.00	4.00	4.00	1.00	0.00	0.00	1.00	5.00	5.00	1.00
4	27-Sep	1600	2	1.19	15.00	13.00	0.88	0.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	12.00	14.00	1.15
4	28-Sep	1000	3	1.18	3.00	3.00	1.00	0.00	0.00	1.00	2.00	2.00	1.00	0.00	0.00	1.00	20.00	20.00	1.00
4	29-Sep	1400	2	1.17	3.00	2.00	0.75	0.00	0.00	1.00	7.00	8.00	1.13	1.00	1.00	1.00	14.00	14.00	1.00
4	30-Sep	1200	4	1.17	1.00	1.00	1.00	0.00	0.00	1.00	2.00	3.00	1.33	1.00	0.00	0.50	51.00	52.00	1.02
				Weighted mean			0.87			1.00			1.14			0.80			1.03
				Weighted SD			0.18			0.00			0.17			0.25			0.06
5	1-Oct	1300	2	1.15	5.00	6.00	1.17	0.00	0.00	1.00	4.00	4.00	1.00	1.00	1.00	1.00	19.00	25.00	1.30
5	2-Oct	1100	3	1.16	4.00	4.00	1.00	0.00	0.00	1.00	0.00	1.00	2.00	1.00	1.00	1.00	15.00	15.00	1.00
5	3-Oct	1500	1	1.14	6.00	6.00	1.00	0.00	0.00	1.00	2.00	2.00	1.00	0.00	0.00	1.00	10.00	10.00	1.00
5	4-Oct	1600	1	1.16	16.00	12.00	0.76	0.00	0.00	1.00	2.00	3.00	1.33	0.00	0.00	1.00	7.00	7.00	1.00
5	5-Oct	1000	4	1.14	12.00	12.00	1.00	0.00	0.00	1.00	3.00	5.00	1.50	2.00	0.00	0.33	2.00	3.00	1.33
5	6-Oct	1400	2	1.15	10.00	9.00	0.91	0.00	0.00	1.00	6.00	7.00	1.14	1.00	1.00	1.00	1.00	1.00	1.00
5	7-Oct	1200	3	1.14	4.00	4.00	1.00	0.00	0.00	1.00	6.00	6.00	1.00	1.00	1.00	1.00	3.00	3.00	1.00
				Weighted mean			0.93			1.00			1.21			0.71			1.12
				Weighted SD			0.14			0.00			0.37			0.25			0.16
6	8-Oct	1700	2	1.16	6.00	6.00	1.00	1.00	1.00	1.00	3.00	3.00	1.00	1.00	1.00	1.00	6.00	6.00	1.00
6	9-Oct	1100	4	1.15	17.00	16.00	0.94	0.00	0.00	1.00	4.00	5.00	1.20	0.00	0.00	1.00	1.00	1.00	1.00
6	10-Oct	900	3	1.16	12.00	13.00	1.08	0.00	0.00	1.00	2.00	2.00	1.00	0.00	0.00	1.00	3.00	2.00	0.75
6	11-Oct	1000	2	1.14	10.00	10.00	1.00	0.00	0.00	1.00	2.00	3.00	1.33	2.00	1.00	0.67	6.00	6.00	1.00
6	12-Oct	1300	4	1.14	7.00	6.00	0.88	0.00	0.00	1.00	3.00	2.00	0.75	1.00	1.00	1.00	3.00	4.00	1.25
6	13-Oct	1500	3	1.14	11.00	10.00	0.92	0.00	0.00	1.00	0.00	1.00	2.00	1.00	1.00	1.00	3.00	3.00	1.00
6	14-Oct	1100	2	1.16	7.00	8.00	1.13	0.00	0.00	1.00	2.00	2.00	1.00	0.00	0.00	1.00	4.00	4.00	1.00
				Weighted mean			0.99			1.00			1.12			0.83			1.00
				Weighted SD			0.08			0.00			0.38			0.14			0.14

Table 1. Results of Stamp Falls verification tests, 1992. O = observed count, V=verified count.

Week	Date	Time	Observer	Gauge height (m)	Chinook adults			Chinook jacks			Coho adults			Coho jacks			Sockeye		
					O	V	V/O	O	V	V/O	O	V	V/O	O	V	V/O	O	V	V/O
7	15-Oct	1300	3	1.15	7.00	6.00	0.88	1.00	1.00	1.00	1.00	2.00	1.50	0.00	0.00	1.00	8.00	8.00	1.00
7	16-Oct	1600	2	1.15	10.00	8.00	0.82	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	4.00	5.00	1.20
7	17-Oct	1400	4	1.15	6.00	6.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5.00	5.00	1.00
7	18-Oct	1200	2	1.19	6.00	6.00	1.00	0.00	0.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00	10.00	10.00	1.00
7	19-Oct	1000	4	1.28	9.00	9.00	1.00	0.00	1.00	2.00	2.00	2.00	1.00	0.00	0.00	1.00	5.00	4.00	0.83
				Weighted mean			0.92			1.33			1.13			1.00			1.00
				Weighted SD			0.52			0.72			0.62			0.55			0.56

Table 2. Comparison of observer error from verification tests at Stamp Falls Fishway, 1992.

Observer	Number of tests	Chinook Adults		Chinook Jacks		Coho Adults		Coho Jacks		Sockeye	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	2	0.88	0.17	1.00	0.00	1.17	0.24	1.00	0.00	1.00	0.00
2	15	1.12	0.29	0.93	0.18	1.06	0.26	0.88	0.21	1.07	0.17
3	15	0.98	0.06	0.93	0.18	1.25	0.35	1.07	0.26	0.99	0.25
4	14	0.99	0.32	1.11	0.40	1.27	0.52	0.88	0.24	1.07	0.21
5	1	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00

Table 3. Total daily counts and 95% confidence limits for salmonids passing through Stamp Falls Fishway, September 2 to November 10, 1992. These counts are adjusted for species verification (Table 1). Numbers in italics are daily estimates for flood periods (20-27 Oct. and 1 Nov.), and were calculated for chinook and coho using the relationship between observed counts at Stamp Falls Fishway and Robertson Creek Hatchery (Figs. 5, 6, 7, and 8); daily estimates for sockeye, chum, and steelhead during the flood periods are from linear interpolation. SE is the standard error for the total count, derived from verification tests.

	Chinook		Coho				
Date	Adults	Jacks	Adults	Jacks	Sockeye	Chum	Steelhead
Sep-02	0	0	23	9	151	0	0
Sep-03	1594	45	1197	136	440	0	72
Sep-04	72	18	380	68	2428	0	28
Sep-05	260	20	299	53	993	0	12
Sep-06	163	17	376	49	1137	0	34
Sep-07	468	41	720	80	1125	0	46
Sep-08	397	31	642	124	657	0	25
Sep-09	1858	233	909	131	984	0	48
Sep-10	433	176	1185	227	840	0	26
Sep-11	621	90	1299	259	1326	0	59
Sep-12	289	32	905	200	414	0	49
Sep-13	1368	55	1134	195	427	0	72
Sep-14	2279	45	1123	172	407	0	26
Sep-15	2500	22	1740	254	775	0	35
Sep-16	3762	29	1553	200	1102	0	51
Sep-17	2061	188	2799	137	1404	0	74
Sep-18	3621	181	2332	133	2072	0	39
Sep-19	2219	157	2598	175	2192	0	44
Sep-20	1456	69	1921	144	2058	0	39
Sep-21	1960	148	1570	109	1730	0	37
Sep-22	1955	78	1223	81	1511	0	31
Sep-23	1987	164	1047	57	2213	0	14
Sep-24	3423	141	1620	179	2737	0	55
Sep-25	1998	84	1547	159	2530	0	24
Sep-26	3918	99	1570	270	4025	0	47
Sep-27	4041	84	1241	269	6149	0	26
Sep-28	3507	58	1208	274	8214	0	21
Sep-29	2430	62	1824	314	7653	0	28
Sep-30	2399	87	1751	357	8345	0	22
Oct-01	2664	172	1390	246	5242	0	33
Oct-02	2878	88	1341	160	3636	0	22
Oct-03	2279	26	1082	163	2295	0	16
Oct-04	3385	33	710	130	1340	0	12
Oct-05	4848	71	586	109	816	0	39
Oct-06	3147	101	661	134	746	0	23
Oct-07	2998	123	1008	178	1309	0	29
Oct-08	3625	70	1158	229	1032	0	32
Oct-09	6893	52	520	120	526	0	26
Oct-10	5266	70	451	91	611	0	19

Table 3. Total daily counts and 95% confidence limits for salmonids passing through Stamp Falls Fishway, September 2 to November 10, 1992. These counts are adjusted for species verification (Table 1). Numbers in italics are daily estimates for flood periods (20-27 Oct. and 1 Nov.), and were calculated for chinook and coho using the relationship between observed counts at Stamp Falls Fishway and Robertson Creek Hatchery (Figs. 5, 6, 7, and 8); daily estimates for sockeye, chum, and steelhead during the flood periods are from linear interpolation. SE is the standard error for the total count, derived from verification tests.

	Chinook		Coho				
Date	Adults	Jacks	Adults	Jacks	Sockeye	Chum	Steelhead
Oct-11	4107	29	592	124	867	0	18
Oct-12	3486	34	243	88	544	0	12
Oct-13	2305	26	211	59	367	0	7
Oct-14	2264	37	198	55	278	0	9
Oct-15	1750	51	145	46	296	0	6
Oct-16	1962	56	280	92	529	1	14
Oct-17	2819	52	170	42	459	0	10
Oct-18	3953	27	311	70	1324	7	13
Oct-19	1078	35	116	126	210	2	2
Oct-20	*5566*	*106*	*125*	*164*	*212*	*2*	*2*
Oct-21	*4852*	*116*	*252*	*65*	*215*	*2*	*2*
Oct-22	*3661*	*80*	*95*	*25*	*217*	*1*	*2*
Oct-23	*2299*	*32*	*32*	*8*	*220*	*1*	*2*
Oct-24	*50*	*0*	*0*	*0*	*222*	*1*	*1*
Oct-25	*96*	*0*	*0*	*0*	*225*	*1*	*1*
Oct-26	*2640*	*34*	*39*	*19*	*227*	*0*	*1*
Oct-27	*2305*	*24*	*28*	*10*	*230*	*0*	*1*
Oct-28	1589	*17*	167	29	232	0	1
Oct-29	28	*0*	163	17	235	0	4
Oct-30	2754	*36*	117	73	262	0	15
Oct-31	200	0	29	2	35	0	0
Nov-01	*31*	*2*	*0*	*0*	*4*	*0*	*0*
Nov-02	12	0	15	3	4	0	4
Nov-03	35	1	41	14	24	0	12
Nov-04	32	1	22	12	20	0	7
Nov-05	46	0	36	12	37	0	17
Nov-06	30	0	21	14	51	0	2
Nov-07	46	0	14	2	47	0	10
Nov-08	23	0	13	6	47	0	12
Nov-09	11	0	16	8	33	0	3
Nov-10	7	0	14	8	13	0	20
Total	141060	4053	50145	7567	91276	18	1545
SE	4411.49	179.59	3074.56	366.17	1975.20		
Upper 95% CL	149927	(a)	56325	(a)	95246		
Lower 95% CL	132193	(a)	43965	(a)	87306		

(a) Confidence limits for jack chinook and jack coho are not presented due to the low number of jacks observed and verified in the verification tests (Table 1)

Table 4. Age-length (postorbital-hypural) distribution of chinook salmon carcasses recovered in the Stamp River, and chinook salmon live returns to Robertson Creek Hatchery, 1992. Ages presented are total age; all specimens were freshwater age 1.

Location	Length class (mm)	Age (a) Male (b) 2	3	4	5	6	Total	Unk (c)	Female 2	3	4	5	6	Total	Unk (c)
Stamp River dead recovery															
	250-299	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	300-349	0	0	0	0	0	0	2	0	0	0	0	0	0	0
	350-399	1	0	0	0	0	1	2	0	0	0	0	0	0	0
	400-449	8	0	0	0	0	8	7	0	0	0	0	0	0	0
	450-499	1	5	0	0	0	6	19	0	0	0	0	0	0	0
	500-549	1	11	3	1	0	16	132	0	0	0	0	0	0	6
	550-599	0	35	3	2	0	40	475	0	2	0	1	0	3	30
	600-649	0	31	3	1	0	35	953	0	6	3	1	0	10	156
	650-699	0	16	22	4	0	42	853	0	3	14	0	0	17	518
	700-749	0	7	31	2	0	40	1120	0	7	89	13	0	109	1996
	750-799	0	2	25	11	0	38	646	0	2	66	41	2	111	2443
	800-849	0	1	7	7	0	15	201	0	3	23	58	2	86	1413
	850-899	0	3	1	1	0	5	38	0	0	1	15	1	17	310
	900-949	0	0	0	2	0	2	2	0	0	0	2	0	2	21
	950-999	0	0	0	0	0	0	0	0	0	0	1	0	1	1
	1000-1049	0	0	0	0	0	0	0	0	0	0	0	0	0	0
								0							
	Total	11	111	95	31	0	248	4450	0	23	196	132	5	356	6895
	Percent	4.4	44.8	38.3	12.5	0.0	100.0		0.0	6.5	55.1	37.1	1.4	100.0	
	Mean (d)	404	592	698	737	0	642 (e)	659	0	672	725	777	787	742 (e)	739
	SD (d)	43	78	66	94	0	107 (e)	76	0	70	41	50	33	56 (e)	54
Robertson Creek Hatchery															
	250-299	0	14	9	3	0	26	1	0	0	0	0	0	0	0
	300-349	1	2	2	0	0	5	0	0	0	0	0	0	0	0
	350-399	1	1	0	0	0	2	0	0	0	0	0	0	0	0
	400-449	7	0	0	0	0	7	0	0	0	0	1	0	1	0
	450-499	2	3	0	0	0	5	0	0	0	0	0	0	0	0
	500-549	0	22	0	0	0	22	1	0	1	0	0	0	1	0
	550-599	0	45	3	0	0	48	4	0	0	1	0	0	1	0
	600-649	1	47	7	0	0	55	1	0	4	3	0	0	7	1
	650-699	0	12	33	0	0	45	3	0	4	35	1	0	40	2
	700-749	0	2	24	2	0	28	2	0	3	101	10	0	114	5
	750-799	0	2	14	2	0	18	1	0	1	81	29	0	111	4
	800-849	0	0	1	0	0	1	1	0	0	8	22	0	30	2
	850-899	0	0	0	0	0	0	0	0	0	0	6	0	6	0
	900-949	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	950-999	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1000-1049	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	12	150	93	7	0	262	14	0	13	229	69	1 (f)	311	14
	Percent	4.6	57.3	35.5	2.7	0.0	100.0		0.0	4.2	73.6	22.2	0.3	100.0	
	Mean (d)	408	527	616	446	0	551 (e)	604	0	647	709	763	0	719 (e)	716
	SD (d)	74	142	168	348	0	166 (e)	135	0	65	39	60	0	53 (e)	56

(a) Data for calculations are from scale analysis and CWT age samples
(b) Includes jacks
(c) Unk = age unknown (scale unreadable)
(d) Values for postorbital-hypural length (mm)
(e) Calculated from raw data for all ages
(f) This single age-6 female with no length designation is included for escapement estimate analysis (Table 5)

Table 5. Escapement estimates, by age, of chinook salmon escapement to upper Stamp River (above Stamp Falls, excluding hatchery) and Robertson Creek Hatchery, 1992. Ages presented are total age; all specimens were freshwater age 1.

		Male (a)		Female	
Location	Age	Number	Percent (b)	Number	Percent (b)
Upper Stamp River					
	2	2232	4.4	0	0.0
	3	22527	44.8	4554	6.5
	4	19280	38.3	38807	55.1
	5	6291	12.5	26136	37.1
	6	0	0.0	990	1.4
	Total (c)	50331	100.0	70487	100.0
Robertson Creek Hatchery					
	2	769	4.6	0	0.0
	3	9618	57.3	313	4.2
	4	5963	35.5	5519	73.6
	5	449	2.7	1663	22.2
	6	0	0.0	24	0.3
	Total (d)	16800	100.0	7495	100.0 (e)

(a) Includes jacks

(b) From Table 4

(c) Adjusted adult fishway count (Table 3) minus adult hatchery returns (Appendix 2-2), apportioned by the male:female sex ratio (40:60) derived from dead recovery data from sampling locations upstream of the fishway (locations 1-6, 10; see Appendix 2-1); the total number of males is the sum of 40% of the in-river adult population plus 100% of the in-river jack population (see Table 6)

(d) Total hatchery returns

(e) Summation is a result of rounding

Table 6. Sex composition of escapement of chinook salmon into Robertson Creek Hatchery and of adjusted escapement through Stamp Falls Fishway using two different methods, 1992.

Location	Type of sampling	Male		Female		Jack		Total	
		Number (a)	%	Number (a)	%	Number (a)	%	Number	%
Hatchery	Braile (a)	16087	66.2	7495	30.8	713	2.9	24295	100.0
Hatchery	Age-comp (b)	16031	66.0	7495	30.8	769	3.2	24295	100.0
Upper Stamp	Fishway (c)	46991	38.9	70487	58.3	3340	2.8	120818	100.0
Upper Stamp	Age-comp (d)	48099	39.8	70487	58.3	2232	1.8	120818	100.0

(a) From actual counts of adult male, female, and jack chinook at the hatchery (Appendix 2-2)

(b) Male (adult and jack) numbers calculated using the adult male:jack ratio of successfully aged hatchery returns (Table 4); female numbers from actual count at hatchery

(c) From adjusted fishway counts for adults and jacks (Table 3) minus hatchery counts of adults and jacks (Appendix 2-2); the number of adult males and females is apportioned by the male:female sex ratio (40:60) observed in the dead recovery upstream of the fishway (locations 1-6, 10; see Appendix 2-1)

(d) Male numbers derived from the adult male:jack ratio of successfully aged fish carcasses recovered above the fishway (Table 5); female numbers calculated as in footnote (c)

Table 7. Estimates of the total escapement of adipose-clipped chinook salmon to the upper Stamp River (above falls) and Robertson Creek Hatchery, 1992. The escapement estimates to the upper Stamp River are calculated as the adjusted fishway counts minus the returns to the hatchery.

Location and sex	Sample size (a) A	Observed adipose clips (a) B	Mark rate (%) C=(B/A)x100	Escapement estimate (b) D	Percentage of population sampled E=(A/D)x100	Total estimated adipose clips F=(B/A)xD
Upper Stamp River						
Male (c)	4876	152	3.1	50331	9.7	1569
Female	7306	289	4.0	70487	10.4	2788
Total	12182	441	3.6	120818	10.1	4357
Robertson Creek Hatchery						
Male (c)	16800	554	3.3	16800	100.0	554
Female	7495	266	3.5	7495	100.0	266
Total	24295	820	3.4	24295	100.0	820

(a) From Appendix 2-1 for upper Stamp River and Appendix 2-2 for Robertson Creek Hatchery; sample sizes and observed adipose clips are from dead recovery data from sampling locations upstream of the fishway (locations 1-6, 10)

(b) Estimates are stratified between sexes according to hatchery and Upper Stamp River age compositions (Table 6)

(c) Includes jacks

Table 8. Estimates of total escapement of adipose-clipped chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. One decimal place is carried for the estimated adipose clips for calculating the expanded hatchery contribution in Table 10 (Method A).

		Upper Stamp River (a)				Robertson Creek Hatchery (a)			
		Decoded adipose clips		Estimated adipose clips		Decoded adipose clips		Estimated adipose clips	
Brood year	CWT code	M (b)	F	M (b)	F	M (b)	F	M (b)	F
1990	21208	0	0	0.0	0.0	2	0	2.1	0.0
	21550	0	0	0.0	0.0	2	0	2.1	0.0
	21551	1	0	10.9	0.0	4	0	4.2	0.0
	21552	0	0	0.0	0.0	1	0	1.0	0.0
	21553	0	0	0.0	0.0	1	0	1.0	0.0
	Subtotal	1	0	10.9	0.0	10	0	10.5	0.0
1989	20145	3	3	32.7	31.3	13	1	13.6	1.1
	20146	5	4	54.5	41.8	10	1	10.5	1.1
	20147	1	0	10.9	0.0	13	0	13.6	0.0
	20148	3	0	32.7	0.0	6	0	6.3	0.0
	20149	1	0	10.9	0.0	12	0	12.6	0.0
	20150	0	0	0.0	0.0	9	0	9.4	0.0
	20151	6	3	65.4	31.3	12	2	12.6	2.1
	20152	3	0	32.7	0.0	13	1	13.6	1.1
	20153	2	1	21.8	10.4	16	0	16.8	0.0
	20230	3	1	32.7	10.4	8	1	8.4	1.1
	20231	2	0	21.8	0.0	5	0	5.2	0.0
	20232	0	0	0.0	0.0	8	0	8.4	0.0
	20645	5	2	54.5	20.9	28	3	29.4	3.2
	20646	6	1	65.4	10.4	30	1	31.5	1.1
	20647	1	0	10.9	0.0	17	2	17.8	2.1
	20648	0	0	0.0	0.0	8	0	8.4	0.0
	20948	2	1	21.8	10.4	38	1	39.9	1.1
	20949	2	0	21.8	0.0	42	2	44.1	2.1
	20950	4	1	43.6	10.4	27	2	28.3	2.1
	20951	2	0	21.8	0.0	20	0	21.0	0.0
	Subtotal	51	17	555.7	177.5	335	17	351.5	18.1
1988	25014	5	10	54.5	104.4	8	15	8.4	16.0
	25630	1	3	10.9	31.3	2	2	2.1	2.1
	25640	3	2	32.7	20.9	3	2	3.1	2.1
	25643	2	1	21.8	10.4	5	1	5.2	1.1
	25645	0	2	0.0	20.9	2	1	2.1	1.1
	25646	3	2	32.7	20.9	3	6	3.1	6.4
	25648	2	0	21.8	0.0	5	2	5.2	2.1
	25651	1	7	10.9	73.1	0	2	0.0	2.1
	25653	0	4	0.0	41.8	0	2	0.0	2.1
	25654	0	6	0.0	62.7	1	2	1.0	2.1
	25657	1	4	10.9	41.8	2	2	2.1	2.1

Table 8. (cont.) Estimates of total escapement of adipose-clipped chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. One decimal place is carried for the estimated adipose clips for calculating the expanded hatchery contribution in Table 10 (Method A).

Brood year	CWT code	Upper Stamp River (a)				Robertson Creek Hatchery (a)			
		Decoded adipose clips		Estimated adipose clips		Decoded adipose clips		Estimated adipose clips	
		M (b)	F	M (b)	F	M (b)	F	M (b)	F
	25658	1	2	10.9	20.9	1	2	1.0	2.1
	25660	2	1	21.8	10.4	2	1	2.1	1.1
	25663	0	2	0.0	20.9	1	2	1.0	2.1
	25701	1	5	10.9	52.2	2	1	2.1	1.1
	25702	1	4	10.9	41.8	3	2	3.1	2.1
	25703	3	4	32.7	41.8	3	1	3.1	1.1
	25704	1	3	10.9	31.3	2	1	2.1	1.1
	25705	2	2	21.8	20.9	1	4	1.0	4.3
	25836	8	20	87.2	208.9	7	13	7.3	13.8
	25837	3	12	32.7	125.3	20	16	21.0	17.0
	25838	5	8	54.5	83.5	14	17	14.7	18.1
	25839	4	17	43.6	177.5	18	10	18.9	10.6
	26055	8	3	87.2	31.3	16	10	16.8	10.6
	26056	5	12	54.5	125.3	18	19	18.9	20.2
	26057	5	8	54.5	83.5	20	18	21.0	19.2
	Subtotal	67	144	730	1503.8	159	154	166.8	163.9
1987	24311	0	2	0.0	20.9	1	1	1.0	1.1
	24802	0	4	0.0	41.8	0	4	0.0	4.3
	24803	1	7	10.9	73.1	1	5	1.0	5.3
	24804	1	6	10.9	62.7	1	4	1.0	4.3
	24805	2	3	21.8	31.3	1	8	1.0	8.5
	24806	1	8	10.9	83.5	0	0	0.0	0.0
	24809	0	4	0.0	41.8	0	6	0.0	6.4
	24810	2	6	21.8	62.7	1	6	1.0	6.4
	24937	1	6	10.9	62.7	0	2	0.0	2.1
	24948	0	4	0.0	41.8	0	3	0.0	3.2
	24949	0	5	0.0	52.2	0	0	0.0	0.0
	24950	1	3	10.9	31.3	0	0	0.0	0.0
	24951	2	7	21.8	73.1	1	3	1.0	3.2
	24952	1	2	10.9	20.9	1	1	1.0	1.1
	24958	2	3	21.8	31.3	2	2	2.1	2.1
	24959	6	5	65.4	52.2	1	3	1.0	3.2
	24960	1	4	10.9	41.8	0	2	0.0	2.1
	24961	1	2	10.9	20.9	2	5	2.1	5.3
	25326	0	6	0.0	62.7	3	4	3.1	4.3
	25327	2	6	21.8	62.7	3	3	3.1	3.2
	25328	0	7	0.0	73.1	1	11	1.0	11.7
	25329	0	5	0.0	52.2	2	5	2.1	5.3
	Subtotal	24	105	261.5	1096.5	21	78	22.0	83.0

Table 8. (cont.) Estimates of total escapement of adipose-clipped chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. One decimal place is carried for the estimated adipose clips for calculating the expanded hatchery contribution in Table 10 (Method A).

		Upper Stamp River (a)				Robertson Creek Hatchery (a)			
		Decoded adipose clips		Estimated adipose clips		Decoded adipose clips		Estimated adipose clips	
Brood year	CWT code	M (b)	F	M (b)	F	M (b)	F	M (b)	F
1986	24257	0	1	0.0	10.4	0	1	0.0	1.1
	Subtotal	0	1	0.0	10.4	0	1	0.0	1.1
Total hatchery		143	267	1558.1	2788.2	525	250	550.9	266.0
Strays (c)									
1989	20656	0	0	0.0	0.0	1	0	1.0	0.0
	Subtotal	0	0	0.0	0.0	1	0	1.0	0.0
1988	26058	0	0	0.0	0.0	1	0	1.0	0.0
	26236	1	0	10.9	0.0	1	0	1.0	0.0
	Subtotal	1	0	10.9	0.0	2	0	2.1	0.0
Total strays		1	0	10.9	0.0	3	0	3.1	0.0
Total CWT		144	267	1569 (d)	2788 (d)	528	250	554 (d)	266 (d)
No head taken		0	0			0	0		
No data (5000)		1	3			6	3		
No pin (8000)		6	19			19	13		
Lost pin (9000)		1	0			1	0		
Observed adipose		152	289			554	266		

(a) Abbreviations are: M = male, F = female

(b) Includes jacks

(c) Strays are defined as returning adipose-clipped (and decoded) fish that were tagged in other systems; strays in this analysis were released in Gold River, Conuma River, and Nanaimo River, B.C.

(d) From Table 7

Table 9. CWT and adipose-clip release data for hatchery-reared chinook salmon returning to the Somass River system and Robertson Creek Hatchery, by tag code, 1992.

Brood year	CWT release group	Release numbers: CWT A	Release numbers: Untagged B	CWT loss (%) C	Days held D	Adipose release status: Clipped E = A/(1-C/100)	Adipose release status: Unclipped F = A+B-E
1990	21208	26147	1753547	0.3	3	26226	1753468
	21550	33676	1919372	0.0	3	33676	1919372
	21551	33245	1569608	1.0	3	33581	1569272
	21552	32863	699972	1.0	3	33195	699640
	21553	33298	1070833	0.0	3	33298	1070833
1989	20145	19800	0	0.0	3	19800	0
	20146	21721	0	0.0	3	21721	0
	20147	21804	0	0.0	3	21804	0
	20148	17750	0	0.0	3	17750	0
	20149	17207	0	0.0	3	17207	0
	20150	14812	0	0.0	3	14812	0
	20151	20326	0	0.0	3	20326	0
	20152	21044	0	0.0	3	21044	0
	20153	20950	0	0.0	3	20950	0
	20230	17104	0	0.0	3	17104	0
	20231	17022	0	0.0	3	17022	0
	20232	17648	0	0.0	3	17648	0
	20645	25653	683278	0.0	3	25653	683278
	20646	26670	968593	0.0	3	26670	968593
	20647	25670	1431972	0.7	3	25851	1431791
	20648	26729	1107766	0.0	3	26729	1107766
	20948	25262	618148	1.0	3	25517	617893
	20949	26660	1018290	0.0	3	26660	1018290
	20950	26771	908745	0.0	3	26771	908745
	20951	27078	1217114	0.0	3	27078	1217114
1988	25014	25393	627708	0.1	3	25418	627683
	25630	10385	9	0.1	3	10394	0
	25640	9780	9	0.1	3	9789	0
	25643	9704	8	0.1	3	9712	0
	25645	9645	8	0.1	3	9653	0
	25646	9723	8	0.1	3	9731	0
	25648	9805	9	0.1	3	9814	0
	25651	9783	9	0.1	3	9792	0
	25653	9805	9	0.1	3	9814	0
	25654	10091	9	0.1	3	10100	0
	25657	9875	9	0.1	3	9884	0
	25658	9882	9	0.1	3	9891	0
	25660	10258	9	0.1	3	10267	0
	25663	9902	9	0.1	3	9911	0
	25701	9893	9	0.1	3	9902	0
	25702	9878	9	0.1	3	9887	0
	25703	9864	9	0.1	3	9873	0
	25704	9730	8	0.1	3	9738	0
	25705	9888	9	0.1	3	9897	0

Table 9. (cont.) CWT and adipose-clip release data for hatchery-reared chinook salmon returning to the Somass River system and Robertson Creek Hatchery, by tag code, 1992.

Brood year	CWT release group	Release numbers: CWT A	Release numbers: Untagged B	CWT loss (%) C	Days held D	Adipose release status: Clipped E = A/(1-C/100)	Adipose release status: Unclipped F = A+B-E
	25836	25389	1489437	0.1	3	25414	1489412
	25837	25026	1075504	0.1	3	25051	1075479
	25838	24734	1414607	0.1	3	24759	1414582
	25839	25298	936521	0.1	3	25323	936496
	26055	25330	676910	0.1	3	25355	676885
	26056	25079	1765174	0.1	3	25104	1765149
	26057	24939	901048	0.1	3	24964	901023
1987	24311	31137	322939	0.0	3	31137	322939
	24802	29450	305443	0.0	3	29450	305443
	24803	31791	0	0.0	3	31791	0
	24804	28912	0	0.0	3	28912	0
	24805	29111	0	0.0	3	29111	0
	24806	32201	0	0.0	3	32201	0
	24809	29554	306662	0.5	3	29703	306513
	24810	29060	301535	0.5	3	29206	301389
	24937	27033	413	1.5	3	27445	1
	24948	24137	369	1.5	3	24505	1
	24949	24691	0	0.0	3	24691	0
	24950	26264	0	0.0	3	26264	0
	24951	27071	530793	0.0	3	27071	530793
	24952	24270	475872	0.0	3	24270	475872
	24958	25913	898585	0.1	3	25939	898559
	24959	26354	904241	0.0	3	26354	904241
	24960	24425	838738	0.0	3	24425	838738
	24961	25921	890976	0.0	3	25921	890976
	25326	26695	497358	0.7	3	26883	497170
	25327	23657	412459	0.5	3	23776	412340
	25328	25640	484187	0.7	3	25821	484006
	25329	25951	496221	0.8	3	26160	496012
1986	24257	22396	112833	5.0	3	23575	111654
Total hatchery		1597623	31633929			1602139.7	31629412
Strays (a)							
1989	20656	26285	226423	0.4	36	26391	226317
1988	26058	26832	57418	0.0	1	26832	57418
	26236	20033	106647	1.2	1	20276	106404

(c) Strays are defined as returning adipose-clipped (and decoded) fish that were tagged in other systems; strays in this analysis were released in Gold River, Conuma River, and Nanaimo River, B.C.

Table 10. Estimates of total escapement of hatchery-reared chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. The expansion factor is used to expand the estimated number of adipose-clipped chinook in the escapement (from Table 8) to account for unclipped hatchery releases and hence to derive hatchery contributions to escapement (Method A). Expansion factor = (adipose-clipped releases + unclipped releases) / adipose-clipped releases.

Brood year	CWT release group	Release numbers (c)		Expansion factor	Expanded hatchery contribution (a)			
					Upper Stamp River		Robertson Cr. Hatchery	
		Clipped	Unclipped		M (b)	F	M (b)	F
1990	21208	26226	1753468	67.86	0	0	142	0
	21550	33676	1919372	58.00	0	0	122	0
	21551	33581	1569272	47.73	520	0	200	0
	21552	33195	699640	22.08	0	0	23	0
	21553	33298	1070833	33.16	0	0	35	0
	Subtotal				520	0	522	0
1989	20145	19800	0	1.00	33	31	14	1
	20146	21721	0	1.00	54	42	10	1
	20147	21804	0	1.00	11	0	14	0
	20148	17750	0	1.00	33	0	6	0
	20149	17207	0	1.00	11	0	13	0
	20150	14812	0	1.00	0	0	9	0
	20151	20326	0	1.00	65	31	13	2
	20152	21044	0	1.00	33	0	14	1
	20153	20950	0	1.00	22	10	17	0
	20230	17104	0	1.00	33	10	8	1
	20231	17022	0	1.00	22	0	5	0
	20232	17648	0	1.00	0	0	8	0
	20645	25653	683278	27.64	1506	577	812	88
	20646	26670	968593	37.32	2440	390	1175	40
	20647	25851	1431791	56.39	614	0	1006	120
	20648	26729	1107766	42.44	0	0	356	0
	20948	25517	617893	25.21	549	263	1005	27
	20949	26660	1018290	39.20	854	0	1727	83
	20950	26771	908745	34.95	1523	365	990	74
	20951	27078	1217114	45.95	1001	0	964	0
	Subtotal				8803	1720	8167	439
1988	25014	25418	627683	25.69	1400	2683	216	410
	25630	10394	0	1.00	11	31	2	2
	25640	9789	0	1.00	33	21	3	2
	25643	9712	0	1.00	22	10	5	1
	25645	9653	0	1.00	0	21	2	1
	25646	9731	0	1.00	33	21	3	6
	25648	9814	0	1.00	22	0	5	2
	25651	9792	0	1.00	11	73	0	2
	25653	9814	0	1.00	0	42	0	2
	25654	10100	0	1.00	0	63	1	2

Table 10. (cont.) Estimates of total escapement of hatchery-reared chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. The expansion factor is used to expand the estimated number of adipose-clipped chinook in the escapement (from Table 8) to account for unclipped hatchery releases and hence to derive hatchery contributions to escapement (Method A). Expansion factor = (adipose-clipped releases + unclipped releases) / adipose-clipped releases.

Brood year	CWT release group	Release numbers (c)		Expansion factor	Expanded hatchery contribution (a)			
					Upper Stamp River		Robertson Cr. Hatchery	
		Clipped	Unclipped		M (b)	F	M (b)	F
	25657	9884	0	1.00	11	42	2	2
	25658	9891	0	1.00	11	21	1	2
	25660	10267	0	1.00	22	10	2	1
	25663	9911	0	1.00	0	21	1	2
	25701	9902	0	1.00	11	52	2	1
	25702	9887	0	1.00	11	42	3	2
	25703	9873	0	1.00	33	42	3	1
	25704	9738	0	1.00	11	31	2	1
	25705	9897	0	1.00	22	21	1	4
	25836	25414	1489412	59.60	5195	12449	438	824
	25837	25051	1075479	43.93	1436	5505	922	748
	25838	24759	1414582	58.13	3167	4857	854	1052
	25839	25323	936496	37.98	1655	6743	717	404
	26055	25355	676885	27.70	2414	868	465	295
	26056	25104	1765149	71.31	3885	8936	1347	1442
	26057	24964	901023	37.09	2021	3099	778	710
	Subtotal				21435	45703	5777	5923
1987	24311	31137	322939	11.37	0	238	12	12
	24802	29450	305443	11.37	0	475	0	48
	24803	31791	0	1.00	11	73	1	5
	24804	28912	0	1.00	11	63	1	4
	24805	29111	0	1.00	22	31	1	9
	24806	32201	0	1.00	11	84	0	0
	24809	29703	306513	11.32	0	473	0	72
	24810	29206	301389	11.32	247	709	12	72
	24937	27445	1	1.00	11	63	0	2
	24948	24505	1	1.00	0	42	0	3
	24949	24691	0	1.00	0	52	0	0
	24950	26264	0	1.00	11	31	0	0
	24951	27071	530793	20.61	449	1506	22	66
	24952	24270	475872	20.61	225	430	22	22
	24958	25939	898559	35.64	777	1117	75	76
	24959	26354	904241	35.31	2308	1844	37	113
	24960	24425	838738	35.34	385	1476	0	75
	24961	25921	890976	35.37	385	739	74	188
	25326	26883	497170	19.49	0	1221	61	83
	25327	23776	412340	18.34	400	1149	58	59
	25328	25821	484006	19.74	0	1443	21	231

Table 10. (cont.) Estimates of total escapement of hatchery-reared chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. The expansion factor is used to expand the estimated number of adipose-clipped chinook in the escapement (from Table 8) to account for unclipped hatchery releases and hence to derive hatchery contributions to escapement (Method A). Expansion factor = (adipose-clipped releases + unclipped releases) / adipose-clipped releases.

Brood year	CWT release group	Release numbers (c) Clipped	Release numbers (c) Unclipped	Expansion factor	Expanded hatchery contribution (a) Upper Stamp River M (b)	Upper Stamp River F	Robertson Cr. Hatchery M (b)	Robertson Cr. Hatchery F
	25329	26160	496012	19.96	0	1042	42	106
	Subtotal				5252	14301	438	1247
1986	24257	23575	111654	5.74	0	60	0	6
	Subtotal				0	60	0	6
Total hatchery					36010	61785	14904	7615
Strays (d)								
1989	20656	26391	226317	9.58	0	0	10	0
	Subtotal				0	0	10	0
1988	26058	26832	57418	3.14	0	0	3	0
	26236	20276	106404	6.25	0	0	7	0
	Subtotal				0	0	10	0
Total strays					0	0	20	0

(a) Abbreviations are: M = male, F = female

(b) Includes jacks

(c) Adipose release status from Table 9

(d) Strays are defined as returning adipose-clipped (and decoded) fish that were tagged in other systems; strays in this analysis were released in Gold River, Conuma River, and Nanaimo River, B.C.

Table 11. Estimated hatchery contributions to chinook salmon escapements of upper Stamp River and Robertson Creek Hatchery, 1992. Contributions were calculated using expansion Method A for the estimated number of adipose clips (Table 10).

		Estimated escapement (a)		Hatchery contribution (b)				Stray contribution (b)			
				Male		Female		Male		Female	
Location	Age	Male (c)	Female	Number	%	Number	%	Number	%	Number	%
Upper Stamp River											
	2	2232	0	520	23.3	0	0.0	0	0.0	0	0.0
	3	22527	4554	8803	39.1	1720	37.8	0	0.0	0	0.0
	4	19280	38807	21435	100.0 (e)	45703	100.0 (e)	0	0.0	0	0.0
	5	6291	26136	5252	83.5	14301	54.7	0	0.0	0	0.0
	6	0	990	0	0.0	60	6.1	0	0.0	0	0.0
	Total	50331 (d)	70487	36010	71.5	61785 (d)	87.7	0	0.0	0	0.0
Robertson Creek Hatchery											
	2	769	0	522	67.9	0	0.0	0	0.0	0	0.0
	3	9618	313	8167	84.9	439	100.0 (e)	10	0.1	0	0.0
	4	5963	5519	5777	96.9	5923	100.0 (e)	10	0.2	0	0.0
	5	449	1663	438	97.6	1247	75.0	0	0.0	0	0.0
	6	0	24	0	0.0	6	25.3	0	0.0	0	0.0
	Total	16800 (d)	7495 (d)	14904	88.7	7615	100.0	20	0.1	0	0.0

(a) From Table 5

(b) From Table 10

(c) Includes jacks

(d) Summations are a result of rounding

(e) The hatchery contribution was calculated to be greater than the estimated escapement; therefore, the hatchery contribution was assumed to be 100% of the escapement

Table 12. Adjusted number of CWT chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. One decimal place is carried for the adjusted CWTs for estimating the total number of CWTs in Table 13 (Method B).

		Upper Stamp River (a)				Robertson Creek Hatchery (a)			
		Decoded		Adjusted		Decoded		Adjusted	
Brood	CWT	adipose clips (b)		adipose clips		adipose clips (b)		adipose clips	
year	code	M (c)	F	M (c)	F	M (c)	F	M (c)	F
1990	21208	0	0	0.0	0.0	2	0	2.0	0.0
	21550	0	0	0.0	0.0	2	0	2.0	0.0
	21551	1	0	1.0	0.0	4	0	4.1	0.0
	21552	0	0	0.0	0.0	1	0	1.0	0.0
	21553	0	0	0.0	0.0	1	0	1.0	0.0
	Subtotal	1	0	1.0	0.0	10	0	10.1	0.0
1989	20145	3	3	3.0	3.0	13	1	13.2	1.0
	20146	5	4	5.1	4.0	10	1	10.1	1.0
	20147	1	0	1.0	0.0	13	0	13.2	0.0
	20148	3	0	3.0	0.0	6	0	6.1	0.0
	20149	1	0	1.0	0.0	12	0	12.2	0.0
	20150	0	0	0.0	0.0	9	0	9.1	0.0
	20151	6	3	6.1	3.0	12	2	12.2	2.0
	20152	3	0	3.0	0.0	13	1	13.2	1.0
	20153	2	1	2.0	1.0	16	0	16.2	0.0
	20230	3	1	3.0	1.0	8	1	8.1	1.0
	20231	2	0	2.0	0.0	5	0	5.1	0.0
	20232	0	0	0.0	0.0	8	0	8.1	0.0
	20645	5	2	5.1	2.0	28	3	28.4	3.0
	20646	6	1	6.1	1.0	30	1	30.4	1.0
	20647	1	0	1.0	0.0	17	2	17.2	2.0
	20648	0	0	0.0	0.0	8	0	8.1	0.0
	20948	2	1	2.0	1.0	38	1	38.5	1.0
	20949	2	0	2.0	0.0	42	2	42.5	2.0
	20950	4	1	4.1	1.0	27	2	27.3	2.0
	20951	2	0	2.0	0.0	20	0	20.3	0.0
	Subtotal	51	17	51.7	17.2	335	17	339.3	17.2
1988	25014	5	10	5.1	10.1	8	15	8.1	15.2
	25630	1	3	1.0	3.0	2	2	2.0	2.0
	25640	3	2	3.0	2.0	3	2	3.0	2.0
	25643	2	1	2.0	1.0	5	1	5.1	1.0
	25645	0	2	0.0	2.0	2	1	2.0	1.0
	25646	3	2	3.0	2.0	3	6	3.0	6.1
	25648	2	0	2.0	0.0	5	2	5.1	2.0
	25651	1	7	1.0	7.1	0	2	0.0	2.0
	25653	0	4	0.0	4.0	0	2	0.0	2.0
	25654	0	6	0.0	6.1	1	2	1.0	2.0
	25657	1	4	1.0	4.0	2	2	2.0	2.0

Table 12. (cont.) Adjusted number of CWT chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. One decimal place is carried for the adjusted CWTs for estimating the total number of CWTs in Table 13 (Method B).

Brood year	CWT code	Upper Stamp River (a)				Robertson Creek Hatchery (a)			
		Decoded adipose clips (b)		Adjusted adipose clips		Decoded adipose clips (b)		Adjusted adipose clips	
		M (c)	F	M (c)	F	M (c)	F	M (c)	F
	25658	1	2	1.0	2.0	1	2	1.0	2.0
	25660	2	1	2.0	1.0	2	1	2.0	1.0
	25663	0	2	0.0	2.0	1	2	1.0	2.0
	25701	1	5	1.0	5.1	2	1	2.0	1.0
	25702	1	4	1.0	4.0	3	2	3.0	2.0
	25703	3	4	3.0	4.0	3	1	3.0	1.0
	25704	1	3	1.0	3.0	2	1	2.0	1.0
	25705	2	2	2.0	2.0	1	4	1.0	4.0
	25836	8	20	8.1	20.2	7	13	7.1	13.1
	25837	3	12	3.0	12.1	20	16	20.3	16.2
	25838	5	8	5.1	8.1	14	17	14.2	17.2
	25839	4	17	4.1	17.2	18	10	18.2	10.1
	26055	8	3	8.1	3.0	16	10	16.2	10.1
	26056	5	12	5.1	12.1	18	19	18.2	19.2
	26057	5	8	5.1	8.1	20	18	20.3	18.2
	Subtotal	67	144	67.9	145.5	159	154	161.0	155.8
1987	24311	0	2	0.0	2.0	1	1	1.0	1.0
	24802	0	4	0.0	4.0	0	4	0.0	4.0
	24803	1	7	1.0	7.1	1	5	1.0	5.1
	24804	1	6	1.0	6.1	1	4	1.0	4.0
	24805	2	3	2.0	3.0	1	8	1.0	8.1
	24806	1	8	1.0	8.1	0	0	0.0	0.0
	24809	0	4	0.0	4.0	0	6	0.0	6.1
	24810	2	6	2.0	6.1	1	6	1.0	6.1
	24937	1	6	1.0	6.1	0	2	0.0	2.0
	24948	0	4	0.0	4.0	0	3	0.0	3.0
	24949	0	5	0.0	5.1	0	0	0.0	0.0
	24950	1	3	1.0	3.0	0	0	0.0	0.0
	24951	2	7	2.0	7.1	1	3	1.0	3.0
	24952	1	2	1.0	2.0	1	1	1.0	1.0
	24958	2	3	2.0	3.0	2	2	2.0	2.0
	24959	6	5	6.1	5.1	1	3	1.0	3.0
	24960	1	4	1.0	4.0	0	2	0.0	2.0
	24961	1	2	1.0	2.0	2	5	2.0	5.1
	25326	0	6	0.0	6.1	3	4	3.0	4.0
	25327	2	6	2.0	6.1	3	3	3.0	3.0
	25328	0	7	0.0	7.1	1	11	1.0	11.1
	25329	0	5	0.0	5.1	2	5	2.0	5.1
	Subtotal	24	105	24.3	106.1	21	78	21.3	78.9

Table 12. (cont.) Adjusted number of CWT chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. One decimal place is carried for the adjusted CWTs for estimating the total number of CWTs in Table 13 (Method B).

Brood year	CWT code	Upper Stamp River (a)				Robertson Creek Hatchery (a)			
		Decoded adipose clips (b)		Adjusted adipose clips		Decoded adipose clips (b)		Adjusted adipose clips	
		M (c)	F	M (c)	F	M (c)	F	M (c)	F
1986	24257	0	1	0.0	1.0	0	1	0.0	1.0
	Subtotal	0	1	0.0	1.0	0	1	0.0	1.0
	Total hatchery	143	267	144.9	269.8	525	250	531.8	252.9
Strays (d)									
1989	20656	0	0	0.0	0.0	1	0	1.0	0.0
	Subtotal	0	0	0.0	0.0	1	0	1.0	0.0
1988	26058	0	0	0.0	0.0	1	0	1.0	0.0
	26236	1	0	1.0	0.0	1	0	1.0	0.0
	Subtotal	1	0	1.0	0.0	2	0	2.0	0.0
	Total strays	1	0	1.0	0.0	3	0	3.0	0.0
	Total CWT	144	267	145.9	269.8	528	250	534.8	252.9
No data (5000)		1	3			6	3		
No pin (8000)		6	19			19	13		
Lost pin (9000)		1	0			1	0		
Observed adipose		152	289			554	266		

(a) Abbreviations are: M = male, F = female

(b) From Table 8

(c) Includes jacks

(d) Strays are defined as returning adipose-clipped (and decoded) fish that were tagged in other systems; strays in this analysis were released in Gold River, Conuma River, and Nanaimo River, B.C.

Table 13. Estimates of total escapement of CWT chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. One decimal place is carried for the estimated CWTs for calculating the expanded hatchery contribution in Table 14 (Method B).

		Upper Stamp River (a)				Robertson Creek Hatchery (a)			
		Adjusted		Estimated		Adjusted		Estimated	
Brood	CWT	adipose clips (b)		adipose clips		adipose clips (b)		adipose clips	
year	code	M (c)	F	M (c)	F	M (c)	F	M (c)	F
1990	21208	0.0	0.0	0.0	0.0	2.0	0.0	2.0	0.0
	21550	0.0	0.0	0.0	0.0	2.0	0.0	2.0	0.0
	21551	1.0	0.0	10.5	0.0	4.1	0.0	4.1	0.0
	21552	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0
	21553	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0
	Subtotal	1.0	0.0	10.5	0.0	10.1	0.0	10.1	0.0
1989	20145	3.0	3.0	31.4	29.2	13.2	1.0	13.2	1.0
	20146	5.1	4.0	52.3	39.0	10.1	1.0	10.1	1.0
	20147	1.0	0.0	10.5	0.0	13.2	0.0	13.2	0.0
	20148	3.0	0.0	31.4	0.0	6.1	0.0	6.1	0.0
	20149	1.0	0.0	10.5	0.0	12.2	0.0	12.2	0.0
	20150	0.0	0.0	0.0	0.0	9.1	0.0	9.1	0.0
	20151	6.1	3.0	62.8	29.2	12.2	2.0	12.2	2.0
	20152	3.0	0.0	31.4	0.0	13.2	1.0	13.2	1.0
	20153	2.0	1.0	20.9	9.7	16.2	0.0	16.2	0.0
	20230	3.0	1.0	31.4	9.7	8.1	1.0	8.1	1.0
	20231	2.0	0.0	20.9	0.0	5.1	0.0	5.1	0.0
	20232	0.0	0.0	0.0	0.0	8.1	0.0	8.1	0.0
	20645	5.1	2.0	52.3	19.5	28.4	3.0	28.4	3.0
	20646	6.1	1.0	62.8	9.7	30.4	1.0	30.4	1.0
	20647	1.0	0.0	10.5	0.0	17.2	2.0	17.2	2.0
	20648	0.0	0.0	0.0	0.0	8.1	0.0	8.1	0.0
	20948	2.0	1.0	20.9	9.7	38.5	1.0	38.5	1.0
	20949	2.0	0.0	20.9	0.0	42.5	2.0	42.5	2.0
	20950	4.1	1.0	41.9	9.7	27.3	2.0	27.3	2.0
	20951	2.0	0.0	20.9	0.0	20.3	0.0	20.3	0.0
	Subtotal	51.7	17.2	533.6	165.7	339.3	17.2	339.3	17.2
1988	25014	5.1	10.1	52.3	97.5	8.1	15.2	8.1	15.2
	25630	1.0	3.0	10.5	29.2	2.0	2.0	2.0	2.0
	25640	3.0	2.0	31.4	19.5	3.0	2.0	3.0	2.0
	25643	2.0	1.0	20.9	9.7	5.1	1.0	5.1	1.0
	25645	0.0	2.0	0.0	19.5	2.0	1.0	2.0	1.0
	25646	3.0	2.0	31.4	19.5	3.0	6.1	3.0	6.1
	25648	2.0	0.0	20.9	0.0	5.1	2.0	5.1	2.0
	25651	1.0	7.1	10.5	68.2	0.0	2.0	0.0	2.0
	25653	0.0	4.0	0.0	39.0	0.0	2.0	0.0	2.0
	25654	0.0	6.1	0.0	58.5	1.0	2.0	1.0	2.0
	25657	1.0	4.0	10.5	39.0	2.0	2.0	2.0	2.0

Table 13. (cont.) Estimates of total escapement of CWT chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. One decimal place is carried for the estimated CWTs for calculating the expanded hatchery contribution in Table 14 (Method B).

Brood year	CWT code	Upper Stamp River (a)				Robertson Creek Hatchery (a)			
		Adjusted adipose clips (b)		Estimated adipose clips		Adjusted adipose clips (b)		Estimated adipose clips	
		M (c)	F	M (c)	F	M (c)	F	M (c)	F
	25658	1.0	2.0	10.5	19.5	1.0	2.0	1.0	2.0
	25660	2.0	1.0	20.9	9.7	2.0	1.0	2.0	1.0
	25663	0.0	2.0	0.0	19.5	1.0	2.0	1.0	2.0
	25701	1.0	5.1	10.5	48.7	2.0	1.0	2.0	1.0
	25702	1.0	4.0	10.5	39.0	3.0	2.0	3.0	2.0
	25703	3.0	4.0	31.4	39.0	3.0	1.0	3.0	1.0
	25704	1.0	3.0	10.5	29.2	2.0	1.0	2.0	1.0
	25705	2.0	2.0	20.9	19.5	1.0	4.0	1.0	4.0
	25836	8.1	20.2	83.7	195.0	7.1	13.1	7.1	13.1
	25837	3.0	12.1	31.4	117.0	20.3	16.2	20.3	16.2
	25838	5.1	8.1	52.3	78.0	14.2	17.2	14.2	17.2
	25839	4.1	17.2	41.9	165.7	18.2	10.1	18.2	10.1
	26055	8.1	3.0	83.7	29.2	16.2	10.1	16.2	10.1
	26056	5.1	12.1	52.3	117.0	18.2	19.2	18.2	19.2
	26057	5.1	8.1	52.3	78.0	20.3	18.2	20.3	18.2
	Subtotal	67.9	145.5	701.0	1403.9	161.0	155.8	161.0	155.8
1987	24311	0.0	2.0	0.0	19.5	1.0	1.0	1.0	1.0
	24802	0.0	4.0	0.0	39.0	0.0	4.0	0.0	4.0
	24803	1.0	7.1	10.5	68.2	1.0	5.1	1.0	5.1
	24804	1.0	6.1	10.5	58.5	1.0	4.0	1.0	4.0
	24805	2.0	3.0	20.9	29.2	1.0	8.1	1.0	8.1
	24806	1.0	8.1	10.5	78.0	0.0	0.0	0.0	0.0
	24809	0.0	4.0	0.0	39.0	0.0	6.1	0.0	6.1
	24810	2.0	6.1	20.9	58.5	1.0	6.1	1.0	6.1
	24937	1.0	6.1	10.5	58.5	0.0	2.0	0.0	2.0
	24948	0.0	4.0	0.0	39.0	0.0	3.0	0.0	3.0
	24949	0.0	5.1	0.0	48.7	0.0	0.0	0.0	0.0
	24950	1.0	3.0	10.5	29.2	0.0	0.0	0.0	0.0
	24951	2.0	7.1	20.9	68.2	1.0	3.0	1.0	3.0
	24952	1.0	2.0	10.5	19.5	1.0	1.0	1.0	1.0
	24958	2.0	3.0	20.9	29.2	2.0	2.0	2.0	2.0
	24959	6.1	5.1	62.8	48.7	1.0	3.0	1.0	3.0
	24960	1.0	4.0	10.5	39.0	0.0	2.0	0.0	2.0
	24961	1.0	2.0	10.5	19.5	2.0	5.1	2.0	5.1
	25326	0.0	6.1	0.0	58.5	3.0	4.0	3.0	4.0
	25327	2.0	6.1	20.9	58.5	3.0	3.0	3.0	3.0
	25328	0.0	7.1	0.0	68.2	1.0	11.1	1.0	11.1
	25329	0.0	5.1	0.0	48.7	2.0	5.1	2.0	5.1
	Subtotal	24.3	106.1	251.1	1023.6	21.3	78.9	21.3	78.9

Table 13. (cont.) Estimates of total escapement of CWT chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. One decimal place is carried for the estimated CWTs for calculating the expanded hatchery contribution in Table 14 (Method B).

Brood year	CWT code	Upper Stamp River (a)				Robertson Creek Hatchery (a)			
		Adjusted adipose clips (b)		Estimated adipose clips		Adjusted adipose clips (b)		Estimated adipose clips	
		M (c)	F	M (c)	F	M (c)	F	M (c)	F
1986	24257	0.0	1.0	0.0	9.7	0.0	1.0	0.0	1.0
	Subtotal	0.0	1.0	0.0	9.7	0.0	1.0	0.0	1.0
Total hatchery		144.9	269.8	1496.2	2603.0	531.8	252.9	531.8	252.9
Strays (d)									
1989	20656	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0
	Subtotal	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0
1988	26058	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0
	26236	1.0	0.0	10.5	0.0	1.0	0.0	1.0	0.0
	Subtotal	1.0	0.0	10.5	0.0	2.0	0.0	2.0	0.0
Total strays		1.0	0.0	10.5	0.0	3.0	0.0	3.0	0.0
Total CWT		145.9	269.8	1506.6	2603.0	534.8	252.9	534.8	252.9
Escapement estimate (e)		50331	70487			16800	7495		
Sample size (e)		4876	7306			16800	7495		

(a) Abbreviations are: M = male, F = female
(b) From Table 12
(c) Includes jacks
(d) Strays are defined as returning adipose-clipped (and decoded) fish that were tagged in other systems; strays in this analysis were released in Gold River, Conuma River, and Nanaimo River, B.C.
(e) From Table 7

Table 14. Estimates of total escapement of hatchery-reared chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. The expansion factor is used to expand the estimated number of CWT chinook in the escapement (from Table 13) to account for untagged hatchery releases and hence to derive hatchery contributions to escapement (Method B).
Expansion factor = (CWT releases + untagged releases) / CWT releases.

Brood year	CWT release group	Release numbers (b)		Expansion factor	Expanded hatchery contribution (a)			
					Upper Stamp River		Robertson Cr. Hatchery	
		CWT	Untagged		M (c)	F	M (c)	F
1990	21208	26147	1753547	68.06	0	0	138	0
	21550	33676	1919372	58.00	0	0	117	0
	21551	33245	1569608	48.21	504	0	195	0
	21552	32863	699972	22.30	0	0	23	0
	21553	33298	1070833	33.16	0	0	34	0
	Subtotal				504	0	507	0
1989	20145	19800	0	1.00	31	29	13	1
	20146	21721	0	1.00	52	39	10	1
	20147	21804	0	1.00	10	0	13	0
	20148	17750	0	1.00	31	0	6	0
	20149	17207	0	1.00	10	0	12	0
	20150	14812	0	1.00	0	0	9	0
	20151	20326	0	1.00	63	29	12	2
	20152	21044	0	1.00	31	0	13	1
	20153	20950	0	1.00	21	10	16	0
	20230	17104	0	1.00	31	10	8	1
	20231	17022	0	1.00	21	0	5	0
	20232	17648	0	1.00	0	0	8	0
	20645	25653	683278	27.64	1446	539	784	84
	20646	26670	968593	37.32	2343	364	1134	38
	20647	25670	1431972	56.78	594	0	978	115
	20648	26729	1107766	42.44	0	0	344	0
	20948	25262	618148	25.47	533	248	980	26
	20949	26660	1018290	39.20	820	0	1667	79
	20950	26771	908745	34.95	1462	341	956	71
	20951	27078	1217114	45.95	961	0	931	0
	Subtotal				8463	1609	7900	418
1988	25014	25393	627708	25.72	1345	2507	208	390
	25630	10385	9	1.00	10	29	2	2
	25640	9780	9	1.00	31	20	3	2
	25643	9704	8	1.00	21	10	5	1
	25645	9645	8	1.00	0	20	2	1
	25646	9723	8	1.00	31	20	3	6
	25648	9805	9	1.00	21	0	5	2
	25651	9783	9	1.00	10	68	0	2
	25653	9805	9	1.00	0	39	0	2
	25654	10091	9	1.00	0	59	1	2

Table 14. (cont.) Estimates of total escapement of hatchery-reared chinook salmon to the upper Stamp River and Robertson Creek Hatchery, by tag code, 1992. The expansion factor is used to expand the estimated number of CWT chinook in the escapement (from Table 13) to account for untagged hatchery releases and hence to derive hatchery contributions to escapement (Method B).
Expansion factor = (CWT releases + untagged releases) / CWT releases.

Brood year	CWT release group	Release numbers (b)		Expansion factor	Expanded hatchery contribution (a)			
					Upper Stamp River		Robertson Cr. Hatchery	
		CWT	Untagged		M (c)	F	M (c)	F
	25657	9875	9	1.00	10	39	2	2
	25658	9882	9	1.00	10	20	1	2
	25660	10258	9	1.00	21	10	2	1
	25663	9902	9	1.00	0	20	1	2
	25701	9893	9	1.00	10	49	2	1
	25702	9878	9	1.00	10	39	3	2
	25703	9864	9	1.00	31	39	3	1
	25704	9730	8	1.00	10	29	2	1
	25705	9888	9	1.00	21	20	1	4
	25836	25389	1489437	59.66	4994	11633	423	784
	25837	25026	1075504	43.98	1380	5145	891	712
	25838	24734	1414607	58.19	3044	4539	825	1001
	25839	25298	936521	38.02	1591	6301	693	385
	26055	25330	676910	27.72	2321	811	449	280
	26056	25079	1765174	71.38	3734	8351	1301	1372
	26057	24939	901048	37.13	1942	2896	752	676
	Subtotal				20604	42710	5582	5636
1987	24311	31137	322939	11.37	0	222	12	12
	24802	29450	305443	11.37	0	443	0	46
	24803	31791	0	1.00	10	68	1	5
	24804	28912	0	1.00	10	58	1	4
	24805	29111	0	1.00	21	29	1	8
	24806	32201	0	1.00	10	78	0	0
	24809	29554	306662	11.38	0	444	0	69
	24810	29060	301535	11.38	238	665	12	69
	24937	27033	413	1.02	11	59	0	2
	24948	24137	369	1.02	0	40	0	3
	24949	24691	0	1.00	0	49	0	0
	24950	26264	0	1.00	10	29	0	0
	24951	27071	530793	20.61	431	1406	21	63
	24952	24270	475872	20.61	216	402	21	21
	24958	25913	898585	35.68	747	1043	72	72
	24959	26354	904241	35.31	2217	1721	36	107
	24960	24425	838738	35.34	370	1378	0	71
	24961	25921	890976	35.37	370	690	72	179
	25326	26695	497358	19.63	0	1148	60	79
	25327	23657	412459	18.43	386	1078	56	56
	25328	25640	484187	19.88	0	1357	20	221

Table 14. Estimates of total escapement of hatchery-reared chinook salmon to the upper Stamp River and (cont.) Robertson Creek Hatchery, by tag code, 1992. The expansion factor is used to expand the estimated number of CWT chinook in the escapement (from Table 13) to account for untagged hatchery releases and hence to derive hatchery contributions to escapement (Method B).
Expansion factor = (CWT releases + untagged releases) / CWT releases.

Brood year	CWT release group	Release numbers (b) CWT	Release numbers (b) Untagged	Expansion factor	Expanded hatchery contribution (a) Upper Stamp River M (c)	Upper Stamp River F	Robertson Cr. Hatchery M (c)	Robertson Cr. Hatchery F
	25329	25951	496221	20.12	0	981	41	102
	Subtotal				5047	13390	424	1189
1986	24257	22396	112833	6.04	0	59	0	6
	Subtotal				0	59	0	6
Total hatchery					34619	57768	14413	7250
Strays (d)								
1989	20656	26285	226423	9.61	0	0	10	0
	Subtotal				0	0	10	0
1988	26058	26832	57418	3.14	0	0	3	0
	26236	20033	106647	6.32	66	0	6	0
	Subtotal				66	0	9	0
Total strays					66	0	19	0

(a)Abbreviations are: M = male, F = female
(b) From Table 9
(c) Includes jacks
(d) Strays are defined as returning adipose-clipped (and decoded) fish that were tagged in other systems; strays in this analysis were released in Gold River, Conuma River, and Nanaimo River, B.C.

Table 15. Estimated hatchery contributions to chinook salmon escapements of upper Stamp River and Robertson Creek Hatchery, 1992. Contributions were calculated using expansion Method B for the estimated number of CWTs (Table 14).

				Hatchery contribution (b)				Stray contribution (b)			
		Estimated escapement (a)		Male		Female		Male		Female	
Location	Age	Male (c)	Female	Number	%	Number	%	Number	%	Number	%
Upper Stamp River											
	2	2232	0	504	22.6	0	0.0	0	0.0	0	0.0
	3	22527	4554	8463	37.6	1609	35.3	0	0.0	0	0.0
	4	19280	38807	20604	100.0 (e)	42710	100.0 (e)	66	0.3	0	0.0
	5	6291	26136	5047	80.2	13390	51.2	0	0.0	0	0.0
	6	0	990	0	0.0	59	5.9	0	0.0	0	0.0
	Total	50331 (d)	70487	34619 (d)	68.8	57768	82.0	66	0.1	0	0.0
Robertson Creek Hatchery											
	2	769	0	507	65.9	0	0.0	0	0.0	0	0.0
	3	9618	313	7900	82.1	418	100.0 (e)	10	0.1	0	0.0
	4	5963	5519	5582	93.6	5636	100.0 (e)	9	0.2	0	0.0
	5	449	1663	424	94.5	1189	71.5	0	0.0	0	0.0
	6	0	24	0	0.0	6	25	0	0.0	0	0.0
	Total	16800 (d)	7495 (d)	14413	85.8	7250 (d)	96.7	19	0.1	0	0.0

(a) From Table 5

(b) From Table 14

(c) Includes jacks

(d) Summations are a result of rounding

(e) The hatchery contribution was calculated to be greater than the estimated escapement; therefore, the hatchery contribution was assumed to be 100% of the escapement

APPENDICES

Appendix 1-1. Actual counts of adult chinook salmon at Stamp Falls Fishway, 1992. Bold numbers that are underlined indicate when verification tests were conducted.

Date	Hour of day										Total
	800	900	1000	1100	1200	1300	1400	1500	1600	1700	
Sep-02											0
Sep-03	35	52	115	76	**3**	118	179	283	240	227	1328
Sep-04				9	8	26	**0**	3	11	3	60
Sep-05	2	29	40	**1**	27	15	27	58	18		217
Sep-06	1	48	**0**	16	13	3	13	42			136
Sep-07	8	22	36	24	48	36	**0**	46	154	16	390
Sep-08	38	32	69	**0**	20	13	43	28	75	13	331
Sep-09	111	373	227	250	222	**8**	46	103	191	17	1548
Sep-10	26	103	64	20	**4**	53	13	77	60		420
Sep-11	78	62	155	**0**	35	109	61	54	49		603
Sep-12		44	31	22	16	**0**	8	30	130		281
Sep-13	35	52	115	76	**3**	118	179	283	240	227	1328
Sep-14	137	332	286	216	279	233	**11**	340	267	112	2213
Sep-15	139	326	128	**290**	240	215	253	277	205	354	2427
Sep-16	170	438	456	304	351	379	**208**	469	555	322	3652
Sep-17	35	302	278	242	257	176	**191**	227	112	71	1891
Sep-18		374	338	**170**	373	385	430	519	324	409	3322
Sep-19	88	168	123	151	138	232	228	**341**	282	285	2036
Sep-20	80	183	116	**31**	103	109	205	164	217	128	1336
Sep-21		84	177	186	**85**	255	180	258	233	340	1798
Sep-22	70	184	142	142	186	205	233	264	241	**127**	1794
Sep-23	4	92	126	88	115	**119**	286	320	354	319	1823
Sep-24	152	426	410	467	517	**216**	543	364	508	332	3935
Sep-25	106	198	129	**120**	196	283	303	342	335	284	2296
Sep-26	86	409	472	492	**295**	547	557	549	556	540	4503
Sep-27	227	548	553	449	546	431	704	562	**286**	339	4645
Sep-28	493	423	**211**	422	297	486	392	556	428	323	4031
Sep-29	96	271	283	204	190	201	**227**	375	504	442	2793
Sep-30	81	268	229	300	**91**	408	231	404	308	437	2757
Oct-01	111	340	226	312	235	**158**	371	408	354	350	2865
Oct-02	101	317	335	**115**	433	373	392	318	399	312	3095
Oct-03	131	259	263	188	157	200	336	**193**	300	423	2450
Oct-04	60	391	479	458	480	438	504	344	**188**	298	3640
Oct-05	220	555	**310**	717	646	640	629	610	482	404	5213
Oct-06	215	360	357	216	277	279	**240**	520	590	330	3384
Oct-07	158	312	287	323	**126**	380	366	487	424	361	3224
Oct-08	151	338	298	327	326	500	420	501	489	**312**	3662
Oct-09	335	767	922	**473**	925	640	832	609	743	717	6963
Oct-10	294	**255**	706	600	701	494	605	567	591	506	5319
Oct-11	155	420	**224**	333	404	495	578	498	540	501	4148
Oct-12	229	407	403	407	303	**215**	411	381	432	333	3521

Appendix 1-1. Actual counts of adult chinook salmon at Stamp Falls Fishway, 1992. Bold numbers that are underlined indicate when verification tests were conducted.

	Hour of day										
Date	800	900	1000	1100	1200	1300	1400	1500	1600	1700	Total
Oct-13	126	235	216	177	177	288	302	**206**	430	171	2328
Oct-14	124	130	157	**110**	236	325	321	380	320	184	2287
Oct-15	95	202	167	156	166	**125**	322	258	278	133	1902
Oct-16	141	173	246	267	205	196	228	238	**281**	158	2133
Oct-17		250	376	377	291	282	**291**	397	521	279	3064
Oct-18		390	500	531	**275**	551	554	499	598	399	4297
Oct-19	240	543	**152**	237							1172
Oct-20											0
Oct-21											0
Oct-22		Counts suspended at 11:30 a.m. on 19 Oct. due to high and									0
Oct-23		turbid water. Counts resumed at 8:00 a.m. on 28 Oct. High									0
Oct-24		water precluded verification tests after 19 Oct.									0
Oct-25											0
Oct-26											0
Oct-27											0
Oct-28	15	52	18	26	82	57	47	25	36		358
Oct-29		122	64	54	48	49	38	50	54		479
Oct-30		33	40	39	32	41	20	48	23		276
Oct-31	22	43	37	35	32	31		Counts suspended at			200
Nov-01		14:00 on 31 Oct. through 1 Nov. due to high and turbid water.									0
Nov-02				2	2	1	3	4			12
Nov-03	4	7		7	7	3	6	1			35
Nov-04	9	5	3	4	6		1	4			32
Nov-05	1	9	7	8	6	8	4	3			46
Nov-06	1	3	3	5	5	6	6	1			30
Nov-07	1	15	9	6	5	3	6	1			46
Nov-08	6	5	2	3		3		4			23
Nov-09	3	1	1	0	1	0	3	2			11
Nov-10	0	0	4	0	0	2	1	0			7
Total	5246	12782	12121	11281	11247	12162	13588	14895	14956	11838	120116

Appendix 1-2. Actual counts of jack chinook salmon at Stamp Falls Fishway, 1992. Bold numbers that are underlined indicate when verification tests were conducted.

	Hour of day										
Date	800	900	1000	1100	1200	1300	1400	1500	1600	1700	Total
Sep-02											0
Sep-03	11	6	20	4	**0**	9	28	19	32	7	136
Sep-04				13	12	22	**0**	2	5	1	55
Sep-05	1	8	7	**0**	13	0	9	15	7		60
Sep-06	6	9	**0**	4	11	0	3	8	10		51
Sep-07	0	27	9	9	15	15	**0**	17	29	4	125
Sep-08	10	32	18	**0**	3	5	4	1	12	9	94
Sep-09	62	106	176	100	92	**7**	33	56	71	4	707
Sep-10	84	108	70	57	**0**	61	17	21	23		441
Sep-11	31	33	33	**1**	24	23	28	26	25		224
Sep-12		22	12	8	3	**1**	6	4	23		79
Sep-13	11	6	20	4	**1**	9	28	19	32	7	137
Sep-14	5	33	6	13	5	8	**1**	23	7	12	113
Sep-15	8	3	4	**0**	10	4	11	4	7	3	54
Sep-16	2	7	7	14	4	5	**1**	14	6	12	72
Sep-17	0	20	11	18	9	13	**5**	55	6	4	141
Sep-18		10	26	**6**	30	24	16	10	9	5	136
Sep-19	37	9	19	15	9	6	6	**4**	6	7	118
Sep-20	4	3	4	**6**	4	5	9	2	11	4	52
Sep-21		31	6	14	**3**	26	6	8	3	14	111
Sep-22	4	7	7	2	10	9	3	6	6	**5**	59
Sep-23	2	5	22	3	11	**30**	33	4	9	4	123
Sep-24	9	14	4	25	1	**6**	11	32	12	27	141
Sep-25	13	5	14	**0**	11	8	11	8	8	6	84
Sep-26	4	32	8	7	**10**	4	9	7	15	3	99
Sep-27	13	5	3	5	5	5	23	16	**4**	5	84
Sep-28	6	7	**5**	5	7	5	13	6	4	0	58
Sep-29	6	4	3	10	7	6	**6**	8	6	6	62
Sep-30	5	8	5	9	**10**	16	1	15	9	9	87
Oct-01	11	36	14	22	13	**8**	13	23	17	15	172
Oct-02	3	21	8	**9**	6	9	5	8	11	8	88
Oct-03	4	1	2	3	2	2	6	**0**	4	2	26
Oct-04	0	3	1	5	5	2	6	7	**1**	3	33
Oct-05	0	19	**1**	13	3	11	12	4	4	4	71
Oct-06	6	15	4	3	5	16	**5**	20	21	6	101
Oct-07	7	22	9	16	**8**	27	3	20	2	9	123
Oct-08	0	13	2	5	3	12	3	16	5	**11**	70
Oct-09	6	3	7	**1**	5	2	7	5	7	9	52
Oct-10	4	**12**	1	12	1	5	5	12	13	5	70
Oct-11	0	2	**2**	6	1	1	2	3	6	6	29
Oct-12	2	2	8	2	3	**1**	6	1	7	2	34

Appendix 1-2. Actual counts of jack chinook salmon at Stamp Falls Fishway, 1992. Bold numbers that are underlined indicate when verification tests were conducted.

Date	Hour of day										Total
	800	900	1000	1100	1200	1300	1400	1500	1600	1700	
Oct-13	0	3	3	1		4	1	**4**	3	7	26
Oct-14	2	0	2	**1**	4	3	13	5	2	5	37
Oct-15	0	1	3	2	4	**4**	9	5	7	3	38
Oct-16	3	2	8	2	7	2	5	3	**8**	2	42
Oct-17		10		3	2	3	**1**	8	4	8	39
Oct-18		1	2	2	**2**	1	8	0	4	0	20
Oct-19		14	**0**	12							26
Oct-20											0
Oct-21											0
Oct-22		Counts suspended at 11:30 a.m. on 19 Oct. due to high and									0
Oct-23		turbid water. Counts resumed at 8:00 a.m. on 28 Oct. High									0
Oct-24		water precluded verification tests after 19 Oct.									0
Oct-25											0
Oct-26											0
Oct-27											0
Oct-28	0	0	0	0	1	2	1	1	0		5
Oct-29	2	1	1	5	0	0	0	0	0	0	9
Jan-00		0	0	0	1	2	0	1	0		4
Oct-31	0	0	0	0	0	0		Counts suspended at			0
Nov-01		14:00 on 31 Oct. through 1 Nov. due to high and turbid water.									0
Nov-02				0	0	0	0	0			0
Nov-03	0	0	1	0	0	0	0	0			1
Nov-04	0	0	0	1	0	0	0	0			1
Nov-05	0	0	0	0	0	0	0	0			0
Nov-06	0	0	0	0	0	0	0	0			0
Nov-07	0	0	0	0	0	0	0	0			0
Nov-08	0	0	0	0	0	0	0	0			0
Nov-09	0	0	0	0	0	0	0	0			0
Nov-10	0	0	0	0	0	0	0	0			0
Total	384	741	598	478	396	449	432	556	523	263	4820

Appendix 1-3. Actual counts of adult coho salmon at Stamp Falls Fishway, 1992. Bold numbers that are underlined indicate when verification tests were conducted.

Date	Hour of day										Total
	800	900	1000	1100	1200	1300	1400	1500	1600	1700	
Sep-02									20		20
Sep-03	89	142	199	143	**6**	97	106	91	139	38	1050
Sep-04				40	140	51	**3**	54	26	19	333
Sep-05	16	80	40	**0**	30	17	40	22	17		262
Sep-06	61	142	**2**	27	25	5	14	48	6		330
Sep-07	46	163	148	68	59	24	**4**	52	49	19	632
Sep-08	104	79	128	**4**	41	56	39	60	36	16	563
Sep-09	117	146	126	83	94	**5**	50	62	110	4	797
Sep-10	182	287	237	109	**8**	80	41	105	48		1097
Sep-11	172	283	175	**1**	149	118	103	119	83		1203
Sep-12		227	133	97	52	**4**	128	98	99		838
Sep-13	89	142	199	143	**6**	97	106	91	139	38	1050
Sep-14	73	163	197	204	110	73	**3**	101	80	36	1040
Sep-15	205	306	2	**270**	183	176	127	114	136	92	1611
Sep-16	103	197	246	210	117	99	**90**	148	136	92	1438
Sep-17	41	356	309	374	228	272	**59**	274	80	50	2043
Sep-18		323	319	**125**	210	180	190	148	118	89	1702
Sep-19	204	213	297	279	272	145	211	**63**	112	100	1896
Sep-20	92	216	188	**86**	170	173	133	131	124	89	1402
Sep-21		186	230	235	**48**	155	67	105	58	62	1146
Sep-22	69	173	129	105	81	123	56	83	44	**30**	893
Sep-23	29	77	108	72	79	**99**	73	83	84	60	764
Sep-24	95	186	183	187	193	**97**	127	112	133	108	1421
Sep-25	101	223	218	**115**	129	159	100	110	101	101	1357
Sep-26	45	218	122	226	**62**	223	77	218	69	117	1377
Sep-27	122	118	181	68	188	66	160	72	**82**	32	1089
Sep-28	54	165	**104**	161	109	119	110	119	71	48	1060
Sep-29	109	233	158	177	202	239	**126**	165	89	102	1600
Sep-30	105	168	273	170	**114**	185	164	134	125	98	1536
Oct-01	116	129	133	134	186	**68**	110	124	84	65	1149
Oct-02	78	135	197	**50**	167	111	163	93	77	37	1108
Oct-03	78	132	119	104	110	107	74	**54**	61	55	894
Oct-04	37	64	72	92	109	52	60	38	**29**	34	587
Oct-05	30	75	**51**	64	56	48	38	57	42	23	484
Oct-06	37	60	63	43	63	50	**46**	79	73	32	546
Oct-07	38	113	106	79	**49**	132	121	104	55	36	833
Oct-08	46	110	156	151	160	88	108	110	81	**24**	1034
Oct-09	21	50	75	**39**	56	47	55	45	46	30	464
Oct-10	31	**33**	66	48	45	32	66	34	30	18	403
Oct-11	30	63	**48**	68	86	50	59	29	61	35	529
Oct-12	19	23	42	35	15	**19**	15	28	11	10	217

Appendix 1-3. Actual counts of adult coho salmon at Stamp Falls Fishway, 1992. Bold numbers that are underlined indicate when verification tests were conducted.

Date	Hour of day										Total
	800	900	1000	1100	1200	1300	1400	1500	1600	1700	
Oct-13	15	31	27	28	15	20	14	**14**	14	10	188
Oct-14	7	8	19	**15**	21	28	21	23	26	9	177
Oct-15	6	23	10	18	11	**12**	16	14	12	6	128
Oct-16	17	40	47	37	33	24	18	17	**11**	4	248
Oct-17		19	27	39	18	14	**6**	13	6	8	150
Oct-18		28	40	29	**36**	33	37	19	31	22	275
Oct-19	13	40	**27**	23							103
Oct-20											0
Oct-21											0
Oct-22		Counts suspended at 11:30 a.m. on 19 Oct. due to high and									0
Oct-23		turbid water. Counts resumed at 8:00 a.m. on 28 Oct. High									0
Oct-24		water precluded verification tests after 19 Oct.									0
Oct-25											0
Oct-26											0
Oct-27											0
Oct-28	8	25	7	16	26	43	25	12	5		167
Oct-29		38	12	18	14	17	21	21	22		163
Oct-30		15	9	6	14	24	15	19	15		117
Oct-31	6	4	6	3	4	6		Counts suspended at			29
Nov-01		14:00 on 31 Oct. through 1 Nov. due to high and turbid water.									0
Nov-02				1	3	3	3	5			15
Nov-03	7	3	2	8	2	7	5	7			41
Nov-04	1	3	2	6	4	3	1	2			22
Nov-05	6	4	5	4	5	5	5	2			36
Nov-06	1	1	5	1	5	3	4	1			21
Nov-07	3	5	0	1	2	0	1	2			14
Nov-08	3	2	3	1	2	1	1	0			13
Nov-09	2	0	2	2	5	1	3	1			16
Nov-10	0	2	3	1	1	1	3	3			14
Total	2979	6490	6032	4943	4428	4186	3621	3952	3206	1898	41735

Appendix 1-4. Actual counts of jack coho salmon at Stamp Falls Fishway, 1992. Bold numbers that are underlined indicate when verification tests were conducted.

Date	Hour of day										Total
	800	900	1000	1100	1200	1300	1400	1500	1600	1700	
Sep-02									15		15
Sep-03	19	30	20	26	**0**	37	24	29	26	16	227
Sep-04				7	29	20	**0**	21	29	8	114
Sep-05	3	24	8	**0**	8	11	19	6	10		89
Sep-06	6	35	**0**	12	6	3	5	8	6		81
Sep-07	9	21	42	16	11	7	**0**	14	12	1	133
Sep-08	16	40	34	**4**	12	25	24	29	13	10	207
Sep-09	26	38	22	19	16	**6**	26	31	33	1	218
Sep-10	35	52	46	15	**7**	32	13	34	30		264
Sep-11	44	66	34	**1**	17	9	47	46	37		301
Sep-12		48	28	26	30	**2**	54	22	22		232
Sep-13	19	30	20	26	**0**	37	24	29	26	16	227
Sep-14	6	19	40	48	22	21	**0**	24	12	8	200
Sep-15	32	29	25	**31**	38	22	26	29	30	33	295
Sep-16	14	14	29	23	35	21	**14**	36	27	19	232
Sep-17	11	37	45	34	36	35	**16**	36	8	16	274
Sep-18		43	48	**13**	30	29	33	17	43	9	265
Sep-19	45	40	41	46	62	35	27	**10**	28	16	350
Sep-20	17	63	28	**45**	21	44	9	36	14	11	288
Sep-21		46	17	49	**9**	28	5	35	12	16	217
Sep-22	3	46	10	22	2	30	2	25	6	**15**	161
Sep-23	12	4	18	6	21	**9**	12	8	20	3	113
Sep-24	2	27	8	46	20	**27**	19	34	16	25	224
Sep-25	17	8	30	**12**	20	16	21	27	37	11	199
Sep-26	18	41	47	29	**20**	35	31	36	28	52	337
Sep-27	43	27	53	20	56	19	48	27	**32**	11	336
Sep-28	15	50	**14**	45	16	51	33	67	21	31	343
Sep-29	16	57	35	31	58	24	**47**	47	58	19	392
Sep-30	8	57	43	81	**23**	65	32	48	50	39	446
Oct-01	28	49	42	36	36	**31**	28	48	15	34	347
Oct-02	7	49	18	**12**	28	21	20	25	23	22	225
Oct-03	21	31	28	30	31	36	15	**9**	9	20	230
Oct-04	16	7	45	18	28	13	23	17	**10**	6	183
Oct-05	5	25	**2**	27	19	20	12	28	8	8	154
Oct-06	21	21	27	15	15	18	**14**	17	32	9	189
Oct-07	17	42	20	43	**6**	33	23	28	17	22	251
Oct-08	2	59	27	41	25	43	13	41	9	**16**	276
Oct-09	10	5	28	**1**	27	11	24	17	14	8	145
Oct-10	7	**6**	15	10	12	11	23	11	9	6	110
Oct-11	5	11	**14**	11	21	18	20	20	23	6	149
Oct-12	11	15	22	3	13	**11**	7	10	9	5	106

Appendix 1-4. Actual counts of jack coho salmon at Stamp Falls Fishway, 1992. Bold numbers that are underlined indicate when verification tests were conducted.

	Hour of day										
Date	800	900	1000	1100	1200	1300	1400	1500	1600	1700	Total
Oct-13	2	12	12	4	3	6	10	**5**	14	3	71
Oct-14	7	6	7	**8**	5	7	6	15	3	2	66
Oct-15	2	7	6	6	0	**2**	5	8	6	4	46
Oct-16	7	14	14	9	10	3	12	13	**6**	4	92
Oct-17		6	5	7	9	5	**3**	3	1	3	42
Oct-18		4	10	7	**15**	9	11	9	4	1	70
Oct-19	0	11	**0**	115							126
Oct-20											0
Oct-21											0
Oct-22		Counts suspended at 11:30 a.m. on 19 Oct. due to high and									0
Oct-23		turbid water. Counts resumed at 8:00 a.m. on 28 Oct. High									0
Oct-24		water precluded verification tests after 19 Oct.									0
Oct-25											0
Oct-26											0
Oct-27											0
Oct-28	2	1	5	3	6	6	1	2	3		29
Oct-29		4	1	2	2	3	2	2	1		17
Oct-30		11	2	7	6	16	7	20	4		73
Oct-31	1				1			Counts suspended at			2
Nov-01		14:00 on 31 Oct. through 1 Nov. due to high and turbid water.									0
Nov-02				0	0	3	0	0			3
Nov-03	1	0	0	2	2	1	6	2			14
Nov-04	0	0	0	3	1	3	2	3			12
Nov-05	0	0	1	1	2	4	3	1			12
Nov-06	2	0	1	0	3	2	5	1			14
Nov-07	0	0	0	0	1	0	0	1			2
Nov-08	0	1	2	1	0	1	1	0			6
Nov-09	2	0	2	0	2	0	2	0			8
Nov-10	2	0	2	0	1	1	0	2			8
Total	614	1389	1143	1155	955	1038	909	1169	921	565	9858

Appendix 1-5. Actual counts of sockeye salmon at Stamp Falls Fishway, 1992. Bold numbers that are underlined indicate when verification tests were conducted.

Date	Hour of day										Total
	800	900	1000	1100	1200	1300	1400	1500	1600	1700	
Sep-02									147		147
Sep-03	33	47	68	40	**1**	64	44	59	42	29	427
Sep-04				637	950	371	**19**	179	111	90	2357
Sep-05	185	306	159	**8**	133	39	78	27	29		964
Sep-06	342	358	**22**	176	65	42	41	28	30		1104
Sep-07	107	251	149	82	140	63	**15**	166	93	26	1092
Sep-08	95	207	67	**5**	43	91	25	45	38	22	638
Sep-09	129	204	160	133	107	**17**	90	54	57	4	955
Sep-10	148	191	161	73	**33**	60	63	58	53		840
Sep-11	158	311	260	**4**	232	176	55	74	56		1326
Sep-12		135	62	51	38	**1**	45	44	38		414
Sep-13	33	47	68	40	**1**	64	44	59	42	29	427
Sep-14	55	86	83	41	41	29	**0**	35	24	13	407
Sep-15	77	138	74	**121**	53	68	34	65	65	80	775
Sep-16	92	170	208	135	74	66	**69**	116	101	71	1102
Sep-17	93	356	259	196	97	120	**47**	112	64	32	1376
Sep-18		372	358	**226**	279	160	175	172	136	153	2031
Sep-19	195	275	338	262	253	206	212	**127**	162	119	2149
Sep-20	240	302	269	**199**	258	170	129	173	193	85	2018
Sep-21		338	345	290	**129**	152	117	108	103	114	1696
Sep-22	176	262	313	101	142	119	100	84	108	**76**	1481
Sep-23	110	329	286	294	232	**60**	206	213	233	207	2170
Sep-24	177	264	348	362	363	**219**	236	225	284	179	2657
Sep-25	208	455	361	**109**	177	168	120	219	273	366	2456
Sep-26	169	487	418	569	**261**	458	312	454	399	381	3908
Sep-27	454	684	818	649	839	499	622	421	**481**	503	5970
Sep-28	572	974	**936**	1160	664	936	778	814	578	563	7975
Sep-29	537	885	932	895	1095	680	**550**	533	564	759	7430
Sep-30	685	935	897	1131	**809**	959	573	774	650	689	8102
Oct-01	396	778	681	675	440	**374**	313	378	304	341	4680
Oct-02	285	474	581	**312**	418	344	334	139	202	157	3246
Oct-03	190	320	345	206	226	188	181	**89**	117	187	2049
Oct-04	96	239	236	176	128	73	87	64	**59**	38	1196
Oct-05	63	116	**76**	78	64	42	67	62	96	65	729
Oct-06	46	96	82	58	43	23	**30**	81	100	107	666
Oct-07	100	175	194	165	**58**	144	66	93	94	80	1169
Oct-08	101	120	108	117	110	67	102	100	139	**68**	1032
Oct-09	19	71	57	**53**	49	48	49	42	59	79	526
Oct-10	37	**44**	82	77	88	49	63	59	69	43	611
Oct-11	52	124	**85**	135	67	68	70	92	79	95	867
Oct-12	35	100	104	87	41	**27**	45	39	36	30	544

Appendix 1-5. Actual counts of sockeye salmon at Stamp Falls Fishway, 1992. Bold numbers that are underlined indicate when verification tests were conducted.

	Hour of day										
Date	800	900	1000	1100	1200	1300	1400	1500	1600	1700	Total
Oct-13	29	22	45	21	23	27	44	**37**	80	39	367
Oct-14	18	20	36	**24**	23	27	46	33	27	24	278
Oct-15	8	23	28	24	16	**27**	46	51	49	24	296
Oct-16	48	48	70	79	83	67	41	39	**36**	18	529
Oct-17		38	59	88	45	42	**36**	53	62	36	459
Oct-18		65	202	257	**173**	229	174	87	90	47	1324
Oct-19	49	99	**62**								210
Oct-20											0
Oct-21											0
Oct-22		Counts suspended at 11:30 a.m. on 19 Oct. due to high and									0
Oct-23		turbid water. Counts resumed at 8:00 a.m. on 28 Oct. High									0
Oct-24		water precluded verification tests after 19 Oct.									0
Oct-25											0
Oct-26											0
Oct-27											0
Oct-28	22	23	18	9	39	58	31	11	21		232
Oct-29		60	10	16	25	29	28	35	32		235
Oct-30		51	23	24	15	52	27	48	22		262
Oct-31	16	3	7	5	3	1		Counts suspended at			35
Nov-01		14:00 on 31 Oct. through 1 Nov. due to high and turbid water.									0
Nov-02				0	1	0	1	2			4
Nov-03	5	5	3	4	0	3	2	2			24
Nov-04	3	2	3	4	1	2	3	2			20
Nov-05	3	2	4	1	6	4	9	8			37
Nov-06	3	7	8	4	7	9	7	6			51
Nov-07	22	12	2	3	2	3	1	2			47
Nov-08	11	5	8	4	8	3	2	6			47
Nov-09	5	6	5	3	6	3	3	2			33
Nov-10	3	1	1	1	1	0	0	6			13
Total	6735	12518	11644	10699	9718	8090	6707	7106	6927	6068	86212

Appendix 2-1. Dead recovery and adipose-clipped status of chinook salmon recovered in the Stamp River, by location, 1992. (a)

	Location 1						Location 2					
	Total recovered			Adipose clipped			Total recovered			Adipose clipped		
Date	M	F	J	M	F	J	M	F	J	M	F	J
05-Oct	20	50	0	0	3	0	6	22	0	1	1	0
06-Oct	13	17	0	0	0	0	8	13	0	0	2	0
07-Oct	2	9	0	0	0	0	17	31	0	3	1	0
08-Oct	18	27	2	0	0	0	0	0	0	0	0	0
09-Oct	11	28	5	0	6	0	8	32	5	1	3	0
10-Oct	0	0	0	0	0	0	0	0	0	0	0	0
11-Oct	0	0	0	0	0	0	0	0	0	0	0	0
12-Oct	95	128	25	0	3	1	27	63	4	1	2	1
13-Oct	61	83	9	4	4	4	30	38	10	0	1	0
14-Oct	84	130	19	4	7	1	13	0	1	0	0	0
15-Oct	90	129	24	4	11	0	17	43	2	2	3	0
16-Oct	121	127	41	6	5	0	21	52	7	2	4	0
17-Oct	0	0	0	0	0	0	0	0	0	0	0	0
18-Oct	166	241	46	7	8	2	0	0	0	0	0	0
19-Oct	82	130	17	1	5	0	27	54	8	1	6	1
20-Oct	66	118	15	3	7	0	37	67	15	1	4	1
21-Oct	90	172	17	5	7	1	0	0	0	0	0	0
22-Oct	44	115	11	0	6	1	55	63	15	1	2	1
23-Oct	0	0	0	0	0	0	0	0	0	0	0	0
24-Oct	0	0	0	0	0	0	0	0	0	0	0	0
25-Oct	0	0	0	0	0	0	0	0	0	0	0	0
26-Oct	76	264	9	4	10	0	0	0	0	0	0	0
27-Oct	228	472	35	7	10	1	58	87	15	3	3	1
28-Oct	136	267	37	4	13	1	36	44	19	1	2	1
29-Oct	57	93	1	1	2	0	41	56	2	0	3	0
02-Nov	372	653	65	8	13	2	0	0	0	0	0	0
03-Nov	190	331	56	3	11	1	88	100	45	1	1	1
04-Nov	68	163	27	2	6	1	40	94	16	1	2	0
05-Nov	38	103	7	0	3	0	0	0	0	0	0	0
06-Nov	1	0	0	0	0	0	0	0	0	0	0	0
07-Nov	1	0	0	0	0	0	0	0	0	0	0	0
08-Nov	1	0	0	0	0	0	0	0	0	0	0	0
09-Nov	1	0	0	0	0	0	0	0	0	0	0	0
10-Nov	1	0	0	0	0	0	0	0	0	0	0	0
11-Nov	1	0	0	0	0	0	0	0	0	0	0	0
12-Nov	1	0	0	0	0	0	0	0	0	0	0	0
13-Nov	1	0	0	0	0	0	0	0	0	0	0	0
14-Nov	1	0	0	0	0	0	0	0	0	0	0	0
15-Nov	0	0	1	0	0	0	0	0	0	0	0	0
16-Nov	1	0	0	0	0	0	0	0	0	0	0	0
17-Nov	1	0	0	0	0	0	0	0	0	0	0	0
18-Nov	1	0	0	0	0	0	0	0	0	0	0	0
19-Nov	1	0	0	0	0	0	0	0	0	0	0	0
20-Nov	1	0	0	0	0	0	0	0	0	0	0	0
21-Nov	1	0	0	0	0	0	0	0	0	0	0	0
22-Nov	0	0	1	0	0	0	0	0	0	0	0	0
23-Nov	0	0	1	0	0	0	0	0	0	0	0	0
24-Nov	0	0	1	0	0	0	0	0	0	0	0	0
25-Nov	1	0	0	0	0	0	0	0	0	0	0	0
26-Nov	1	0	0	0	0	0	0	0	0	0	0	0
27-Nov	1	0	0	0	0	0	0	0	0	0	0	0
Total	2146	3850	472	63	140	16	529	859	164	19	40	7

(a) Abbreviations are: M = male, F = female, J = jack

Appendix 2-1 (cont.). Dead recovery and adipose-clipped status of chinook salmon recovered in the Stamp River, by location, 1992. (a)

	Location 3						Location 4					
	Total recovered			Adipose clipped			Total recovered			Adipose clipped		
Date	M	F	J	M	F	J	M	F	J	M	F	J
05-Oct	0	0	0	0	0	0	0	0	0	0	0	0
06-Oct	0	0	0	0	0	0	26	60	0	2	2	0
07-Oct	17	26	1	1	1	0	19	28	2	1	1	0
08-Oct	0	0	0	0	0	0	0	0	0	0	0	0
09-Oct	5	22	2	1	1	0	11	36	3	1	2	0
10-Oct	0	0	0	0	0	0	0	0	0	0	0	0
11-Oct	0	0	0	0	0	0	0	0	0	0	0	0
12-Oct	15	52	6	1	1	0	42	84	12	1	3	0
13-Oct	5	17	5	0	0	0	40	98	10	0	3	0
14-Oct	0	0	0	0	0	0	31	44	5	1	4	0
15-Oct	17	43	2	0	1	0	26	43	1	2	2	0
16-Oct	0	0	0	0	0	0	64	132	16	1	2	0
17-Oct	0	0	0	0	0	0	0	0	0	0	0	0
18-Oct	13	60	5	0	3	0	39	91	7	3	7	0
19-Oct	0	0	0	0	0	0	84	175	17	3	12	1
20-Oct	0	0	0	0	0	0	36	92	5	3	6	1
21-Oct	0	0	0	0	0	0	24	68	5	1	5	0
22-Oct	0	0	0	0	0	0	44	129	25	1	2	1
23-Oct	0	0	0	0	0	0	0	0	0	0	0	0
24-Oct	0	0	0	0	0	0	0	0	0	0	0	0
25-Oct	0	0	0	0	0	0	0	0	0	0	0	0
26-Oct	0	0	0	0	0	0	24	91	0	1	1	0
27-Oct	0	0	0	0	0	0	54	82	7	2	4	0
28-Oct	0	0	0	0	0	0	79	166	26	1	7	0
29-Oct	0	0	0	0	0	0	57	83	5	3	2	0
02-Nov	0	0	0	0	0	0	95	247	34	0	9	0
03-Nov	0	0	0	0	0	0	73	113	13	1	3	1
04-Nov	0	0	0	0	0	0	47	104	14	0	4	1
05-Nov	0	0	0	0	0	0	0	0	0	0	0	0
06-Nov	0	0	0	0	0	0	0	0	0	0	0	0
07-Nov	0	0	0	0	0	0	0	0	0	0	0	0
08-Nov	0	0	0	0	0	0	0	0	0	0	0	0
09-Nov	0	0	0	0	0	0	0	0	0	0	0	0
10-Nov	0	0	0	0	0	0	0	0	0	0	0	0
11-Nov	0	0	0	0	0	0	0	0	0	0	0	0
12-Nov	0	0	0	0	0	0	0	0	0	0	0	0
13-Nov	0	0	0	0	0	0	0	0	0	0	0	0
14-Nov	0	0	0	0	0	0	0	0	0	0	0	0
15-Nov	0	0	0	0	0	0	0	0	0	0	0	0
16-Nov	0	0	0	0	0	0	0	0	0	0	0	0
17-Nov	0	0	0	0	0	0	0	0	0	0	0	0
18-Nov	0	0	0	0	0	0	0	0	0	0	0	0
19-Nov	0	0	0	0	0	0	0	0	0	0	0	0
20-Nov	0	0	0	0	0	0	0	0	0	0	0	0
21-Nov	0	0	0	0	0	0	0	0	0	0	0	0
22-Nov	0	0	0	0	0	0	0	0	0	0	0	0
23-Nov	0	0	0	0	0	0	0	0	0	0	0	0
24-Nov	0	0	0	0	0	0	0	0	0	0	0	0
25-Nov	0	0	0	0	0	0	0	0	0	0	0	0
26-Nov	0	0	0	0	0	0	0	0	0	0	0	0
27-Nov	0	0	0	0	0	0	0	0	0	0	0	0
Total	72	220	21	3	7	0	915	1966	207	28	81	5

(a) Abbreviations are: M = male, F = female, J = jack

Appendix 2-1 (cont.). Dead recovery and adipose-clipped status of chinook salmon recovered in the Stamp River, by location, 1992. (a)

	Location 5						Location 6					
	Total recovered			Adipose clipped			Total recovered			Adipose clipped		
Date	M	F	J	M	F	J	M	F	J	M	F	J
05-Oct	0	0	0	0	0	0	0	0	0	0	0	0
06-Oct	0	10	0	2	0	0	0	0	0	0	0	0
07-Oct	6	11	0	0	0	0	0	0	0	0	0	0
08-Oct	0	0	0	0	0	0	0	0	0	0	0	0
09-Oct	11	32	2	1	0	0	0	0	0	0	0	0
10-Oct	0	0	0	0	0	0	0	0	0	0	0	0
11-Oct	0	0	0	0	0	0	0	0	0	0	0	0
12-Oct	0	0	0	0	0	0	0	0	0	0	0	0
13-Oct	3	22	0	1	1	0	0	0	0	0	0	0
14-Oct	0	0	0	0	0	0	0	0	0	0	0	0
15-Oct	0	0	0	0	0	0	0	0	0	0	0	0
16-Oct	7	13	0	0	2	0	0	0	0	0	0	0
17-Oct	0	0	0	0	0	0	0	0	0	0	0	0
18-Oct	0	0	0	0	0	0	0	0	0	0	0	0
19-Oct	0	0	0	0	0	0	0	0	0	0	0	0
20-Oct	0	0	0	0	0	0	0	0	0	0	0	0
21-Oct	0	0	0	0	0	0	0	0	0	0	0	0
22-Oct	0	0	0	0	0	0	0	0	0	0	0	0
23-Oct	0	0	0	0	0	0	0	0	0	0	0	0
24-Oct	0	0	0	0	0	0	0	0	0	0	0	0
25-Oct	0	0	0	0	0	0	0	0	0	0	0	0
26-Oct	0	0	0	0	0	0	0	0	0	0	0	0
27-Oct	0	0	0	0	0	0	0	0	0	0	0	0
28-Oct	0	0	0	0	0	0	0	0	0	0	0	0
29-Oct	0	0	0	0	0	0	0	0	0	0	0	0
02-Nov	0	0	0	0	0	0	0	0	0	0	0	0
03-Nov	0	0	0	0	0	0	0	0	0	0	0	0
04-Nov	0	0	0	0	0	0	0	0	0	0	0	0
05-Nov	0	0	0	0	0	0	0	0	0	0	0	0
06-Nov	0	0	0	0	0	0	0	0	0	0	0	0
07-Nov	0	0	0	0	0	0	0	0	0	0	0	0
08-Nov	0	0	0	0	0	0	0	0	0	0	0	0
09-Nov	0	0	0	0	0	0	0	0	0	0	0	0
10-Nov	0	0	0	0	0	0	0	0	0	0	0	0
11-Nov	0	0	0	0	0	0	0	0	0	0	0	0
12-Nov	0	0	0	0	0	0	0	0	0	0	0	0
13-Nov	0	0	0	0	0	0	0	0	0	0	0	0
14-Nov	0	0	0	0	0	0	0	0	0	0	0	0
15-Nov	0	0	0	0	0	0	0	0	0	0	0	0
16-Nov	0	0	0	0	0	0	0	0	0	0	0	0
17-Nov	0	0	0	0	0	0	0	0	0	0	0	0
18-Nov	0	0	0	0	0	0	0	0	0	0	0	0
19-Nov	0	0	0	0	0	0	0	0	0	0	0	0
20-Nov	0	0	0	0	0	0	0	0	0	0	0	0
21-Nov	0	0	0	0	0	0	0	0	0	0	0	0
22-Nov	0	0	0	0	0	0	0	0	0	0	0	0
23-Nov	0	0	0	0	0	0	0	0	0	0	0	0
24-Nov	0	0	0	0	0	0	0	0	0	0	0	0
25-Nov	0	0	0	0	0	0	0	0	0	0	0	0
26-Nov	0	0	0	0	0	0	0	0	0	0	0	0
27-Nov	0	0	0	0	0	0	0	0	0	0	0	0
Total	27	88	2	4	3	0	0	0	0	0	0	0

(a) Abbreviations are: M = male, F = female, J = jack

Appendix 2-1 (cont.). Dead recovery and adipose-clipped status of chinook salmon recovered in the Stamp River, by location, 1992. (a)

	Location 7						Location 8					
	Total recovered			Adipose clipped			Total recovered			Adipose clipped		
Date	M	F	J	M	F	J	M	F	J	M	F	J
05-Oct	0	0	0	0	0	0	0	0	0	0	0	0
06-Oct	0	0	0	0	0	0	0	0	0	0	0	0
07-Oct	0	0	0	0	0	0	0	0	0	0	0	0
08-Oct	0	0	0	0	0	0	0	0	0	0	0	0
09-Oct	0	0	0	0	0	0	0	0	0	0	0	0
10-Oct	0	0	0	0	0	0	0	0	0	0	0	0
11-Oct	0	0	0	0	0	0	0	0	0	0	0	0
12-Oct	0	0	0	0	0	0	0	0	0	0	0	0
13-Oct	0	0	0	0	0	0	0	0	0	0	0	0
14-Oct	0	0	0	0	0	0	0	0	0	0	0	0
15-Oct	0	0	0	0	0	0	0	0	0	0	0	0
16-Oct	0	0	0	0	0	0	0	0	0	0	0	0
17-Oct	0	0	0	0	0	0	0	0	0	0	0	0
18-Oct	0	0	0	0	0	0	0	0	0	0	0	0
19-Oct	0	0	0	0	0	0	0	0	0	0	0	0
20-Oct	0	0	0	0	0	0	0	0	0	0	0	0
21-Oct	0	0	0	0	0	0	0	0	0	0	0	0
22-Oct	0	0	0	0	0	0	0	0	0	0	0	0
23-Oct	0	0	0	0	0	0	0	0	0	0	0	0
24-Oct	0	0	0	0	0	0	0	0	0	0	0	0
25-Oct	0	0	0	0	0	0	0	0	0	0	0	0
26-Oct	0	0	0	0	0	0	0	0	0	0	0	0
27-Oct	0	0	0	0	0	0	0	0	0	0	0	0
28-Oct	0	0	0	0	0	0	0	0	0	0	0	0
29-Oct	0	0	0	0	0	0	62	68	11	3	1	0
02-Nov	0	0	0	0	0	0	0	0	0	0	0	0
03-Nov	0	0	0	0	0	0	0	0	0	0	0	0
04-Nov	0	0	0	0	0	0	0	0	0	0	0	0
05-Nov	0	0	0	0	0	0	0	0	0	0	0	0
06-Nov	0	0	0	0	0	0	0	0	0	0	0	0
07-Nov	0	0	0	0	0	0	0	0	0	0	0	0
08-Nov	0	0	0	0	0	0	0	0	0	0	0	0
09-Nov	0	0	0	0	0	0	0	0	0	0	0	0
10-Nov	0	0	0	0	0	0	0	0	0	0	0	0
11-Nov	0	0	0	0	0	0	0	0	0	0	0	0
12-Nov	0	0	0	0	0	0	0	0	0	0	0	0
13-Nov	0	0	0	0	0	0	0	0	0	0	0	0
14-Nov	0	0	0	0	0	0	0	0	0	0	0	0
15-Nov	0	0	0	0	0	0	0	0	0	0	0	0
16-Nov	0	0	0	0	0	0	0	0	0	0	0	0
17-Nov	0	0	0	0	0	0	0	0	0	0	0	0
18-Nov	0	0	0	0	0	0	0	0	0	0	0	0
19-Nov	0	0	0	0	0	0	0	0	0	0	0	0
20-Nov	0	0	0	0	0	0	0	0	0	0	0	0
21-Nov	0	0	0	0	0	0	0	0	0	0	0	0
22-Nov	0	0	0	0	0	0	0	0	0	0	0	0
23-Nov	0	0	0	0	0	0	0	0	0	0	0	0
24-Nov	0	0	0	0	0	0	0	0	0	0	0	0
25-Nov	0	0	0	0	0	0	0	0	0	0	0	0
26-Nov	0	0	0	0	0	0	0	0	0	0	0	0
27-Nov	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	62	68	11	3	1	0

(a) Abbreviations are: M = male, F = female, J = jack

Appendix 2-1 (cont.). Dead recovery and adipose-clipped status of chinook salmon recovered in the Stamp River, by location, 1992. (a)

	Location 9						Location 10					
	Total recovered			Adipose clipped			Total recovered			Adipose clipped		
Date	M	F	J	M	F	J	M	F	J	M	F	J
05-Oct	0	0	0	0	0	0	6	12	0	0	0	0
06-Oct	0	0	0	0	0	0	3	3	1	0	0	0
07-Oct	0	0	0	0	0	0	10	5	0	0	0	0
08-Oct	33	107	8	1	7	0	5	6	0	0	0	0
09-Oct	0	0	0	0	0	0	6	5	2	0	0	0
10-Oct	0	0	0	0	0	0	0	0	0	0	0	0
11-Oct	0	0	0	0	0	0	0	0	0	0	0	0
12-Oct	0	0	0	0	0	0	20	32	2	0	6	0
13-Oct	0	0	0	0	0	0	15	18	2	0	1	0
14-Oct	43	93	8	2	1	1	23	25	5	0	2	0
15-Oct	0	0	0	0	0	0	14	31	8	0	0	1
16-Oct	0	0	0	0	0	0	31	33	14	0	2	1
17-Oct	0	0	0	0	0	0	0	0	0	0	0	0
18-Oct	0	0	0	0	0	0	51	83	28	0	3	0
19-Oct	0	0	0	0	0	0	54	70	21	4	4	1
20-Oct	0	0	0	0	0	0	0	0	0	0	0	0
21-Oct	0	0	0	0	0	0	0	0	0	0	0	0
22-Oct	0	0	0	0	0	0	0	0	0	0	0	0
23-Oct	0	0	0	0	0	0	0	0	0	0	0	0
24-Oct	0	0	0	0	0	0	0	0	0	0	0	0
25-Oct	0	0	0	0	0	0	0	0	0	0	0	0
26-Oct	0	0	0	0	0	0	0	0	0	0	0	0
27-Oct	0	0	0	0	0	0	0	0	0	0	0	0
28-Oct	0	0	0	0	0	0	0	0	0	0	0	0
29-Oct	6	24	5	0	1	0	0	0	0	0	0	0
02-Nov	0	0	0	0	0	0	0	0	0	0	0	0
03-Nov	0	0	0	0	0	0	0	0	0	0	0	0
04-Nov	0	0	0	0	0	0	0	0	0	0	0	0
05-Nov	0	0	0	0	0	0	0	0	0	0	0	0
06-Nov	0	0	0	0	0	0	0	0	0	0	0	0
07-Nov	0	0	0	0	0	0	0	0	0	0	0	0
08-Nov	0	0	0	0	0	0	0	0	0	0	0	0
09-Nov	0	0	0	0	0	0	0	0	0	0	0	0
10-Nov	0	0	0	0	0	0	0	0	0	0	0	0
11-Nov	0	0	0	0	0	0	0	0	0	0	0	0
12-Nov	0	0	0	0	0	0	0	0	0	0	0	0
13-Nov	0	0	0	0	0	0	0	0	0	0	0	0
14-Nov	0	0	0	0	0	0	0	0	0	0	0	0
15-Nov	0	0	0	0	0	0	0	0	0	0	0	0
16-Nov	0	0	0	0	0	0	0	0	0	0	0	0
17-Nov	0	0	0	0	0	0	0	0	0	0	0	0
18-Nov	0	0	0	0	0	0	0	0	0	0	0	0
19-Nov	0	0	0	0	0	0	0	0	0	0	0	0
20-Nov	0	0	0	0	0	0	0	0	0	0	0	0
21-Nov	0	0	0	0	0	0	0	0	0	0	0	0
22-Nov	0	0	0	0	0	0	0	0	0	0	0	0
23-Nov	0	0	0	0	0	0	0	0	0	0	0	0
24-Nov	0	0	0	0	0	0	0	0	0	0	0	0
25-Nov	0	0	0	0	0	0	0	0	0	0	0	0
26-Nov	0	0	0	0	0	0	0	0	0	0	0	0
27-Nov	0	0	0	0	0	0	0	0	0	0	0	0
Total	82	224	21	3	9	1	238	323	83	4	18	3

(a) Abbreviations are: M = male, F = female, J = jack

Appendix 2-2. Total numbers and adipose-clip status of chinook salmon returning to Robertson Creek Hatchery, by date, 1992. (a)

Date	Total returns			Adipose clips		
	M	F	J	M	F	J
25-Sep	1	1	0	0	0	0
26-Sep	0	0	0	0	0	0
27-Sep	0	0	0	0	0	0
28-Sep	0	0	0	0	0	0
29-Sep	0	0	0	0	0	0
30-Sep	0	0	0	0	0	0
01-Oct	2	0	0	0	0	0
02-Oct	0	0	0	0	0	0
03-Oct	0	0	0	0	0	0
04-Oct	0	0	0	0	0	0
05-Oct	0	0	0	0	0	0
06-Oct	255	77	229	19	0	7
07-Oct	424	90	38	15	3	1
08-Oct	574	128	35	26	2	2
09-Oct	549	201	54	10	5	0
10-Oct	0	0	0	0	0	0
11-Oct	0	0	0	0	0	0
12-Oct	1422	457	82	63	23	0
13-Oct	749	263	18	20	7	0
14-Oct	1054	389	21	18	10	0
15-Oct	858	410	16	33	14	0
16-Oct	1068	465	18	36	17	0
17-Oct	37	43	0	4	1	0
18-Oct	601	223	8	0	5	0
19-Oct	1203	479	20	39	16	0
20-Oct	1769	736	41	53	28	2
21-Oct	1461	683	45	40	32	3
22-Oct	1015	602	32	29	26	1
23-Oct	556	464	12	17	13	1
24-Oct	21	1	0	1	0	0
25-Oct	41	2	0	1	0	0
26-Oct	741	442	14	8	15	0
27-Oct	639	403	10	1	10	0
28-Oct	337	357	7	12	20	0
29-Oct	8	2	0	2	1	0
30-Oct	669	556	12	20	13	3
31-Oct	8	5	0	0	0	0
01-Nov	8	5	1	1	0	0
02-Nov	8	4	0	0	1	0
03-Nov	9	7	0	0	0	0
04-Nov	0	0	0	0	0	0
05-Nov	0	0	0	71	4	-5
06-Nov	0	0	0	0	0	0
07-Nov	0	0	0	0	0	0
08-Nov	0	0	0	0	0	0
09-Nov	0	0	0	0	0	0
10-Nov	0	0	0	0	0	0
11-Nov	0	0	0	0	0	0
12-Nov	0	0	0	0	0	0
13-Nov	0	0	0	0	0	0
Total	16087	7495	713	539	266	15

(a) Abbreviations are: M = male, F = female, J = jack