# SIZE, DISTRIBUTION AND ABUNDANCE OF JUVENILLE CHINOOK SALMON OF THE NECHAKO RIVER, 2003

*NECHAKO FISHERIES CONSERVATION PROGRAM*
*Technical Report No. M03-3*

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# EXECUTIVE SUMMARY

The distribution and abundance of juvenile chinook salmon *(Oncorhynchus tshawytscha)* were evaluated through sampling using electrofishing and rotary screw traps in 2003 in the upper 100 km of the Nechako River as part of the sixteenth year of the Nechako Fisheries Conservation Program (NFCP).

Mean daily water temperatures of the river at Bert Irvine's Lodge in 2003 fell within the minimum - maximum range observed between the years 1987 and 2002. Flows of the upper Nechako River at Cheslatta Falls in 2003 followed a pattern similar to previous years, although cumulative flows were slightly lower than average because of the small natural spring freshet.

Based on growth curves, emergence of chinook fry in 2003 had ceased by late May. Monthly electrofishing surveys along the length of the upper river in April, May, June, July and November captured 43,492 fish from 13 species or families. Juvenile chinook salmon were the most common species, accounting for 58% of all captures or 25,025 fish (24,435 0+ and 590 1+), of which 76% were captured at night. As in previous years, juvenile chinook were more active at night than during the day.

The catch-per-unit-effort (CPUE, number per 100 $m^2$ surveyed) of electrofished 0+ chinook peaked in May for both day and night catches. Spatial distribution of 0+ chinook along the length of the upper Nechako River, as indicated by electrofishing CPUE, was similar to that of previous years (*e.g.,* 2002): newly emerged chinook were most abundant first in the upper river (15 - 25 km from Kenny Dam), more evenly distributed throughout the river in May and June, and increased in abundance in Reach 1 in July.

The number of outmigrating 0+ chinook (9,174) captured by rotary screw traps at Diamond Island between April 02 and July 19, 2003, was once again essentially unimodal, with the peak of abundance centred around late April. The morphological characteristics (fork length, wet weight and condition index) of outmigrating 0+ chinook were comparable to those of fish caught in previous years.

The index of juvenile downstream migration was 129,004 0+ and 21,031 1+ chinook. The index of 0+ outmigrants for the years 1992 to 2003 was positively and significantly correlated (rho = 0.68, $P < 0.05$) with the number of parent spawners upstream of Diamond Island (1991 to 2002).

All comparisons with previous years indicated that the timing of chinook outmigration, water temperatures and flows in 2003 were comparable with those of previous years, although the latter two parameters were close to the lower end of the range thus far observed.

# 1.0 INTRODUCTION

This report describes juvenile chinook salmon *(Oncorhynchus tshawytscha),* distribution and abundance in the upper 100 km of the Nechako River in 2003.

The study was part of the sixteenth year of the Nechako Fisheries Conservation Program (NFCP). The primary objectives of the 2003 juvenile chinook outmigration study were to describe the relative abundance, growth and spatial distribution of juvenile chinook in the upper Nechako River, and to calculate an index of abundance of the number of juvenile chinook migrating downstream of Diamond Island from March to July. The secondary objective was to compare the biological parameters measured in 2003 with those measured over the previous 15 years.

# 2.0 METHODS

## 2.1 Study Sites

The study area included the upper 100 km of the Nechako River from Kenney Dam to Fort Fraser (**Figure 1**). It was divided into four reaches with the following boundaries, as originally defined by Envirocon Ltd. (1984):

| Reach | Distance (km) from Kenney Dam |
|---|---|
| 1 | 9.0-14.5 |
| 2 | 14.6-42.9 |
| 3 | 43.0-66.5 |
| 4 | 66.6-100.6 |

All longitudinal distances are in kilometres from the center line of Kenney Dam. The first nine kilometres of the river are within the Nechako River Canyon, which was dewatered by the closing of Kenney Dam in October 1952. The majority of the flows in the upper river occur downstream of Cheslatta Falls (km 9.0).

## 2.2 Temperature and Flow

Mean daily water temperatures were measured by a Tidbit© datalogger installed and monitored by Triton at Bert Irvine's Lodge in Reach 2 of the river, 19 km below Kenney Dam.

Spot water temperatures were recorded by handheld thermometers during electrofishing surveys. Both the mean daily water temperatures and the spot water temperatures are reported as data from Triton Environmental Consultants Ltd.

Daily water flows were recorded at Skins Lake Spillway (WSC station 08JA013) and at the Nechako River below Cheslatta Falls (WSC station 08JA017), and are reported as preliminary data from Water Survey of Canada (WSC).

## 2.3 Electrofishing Surveys

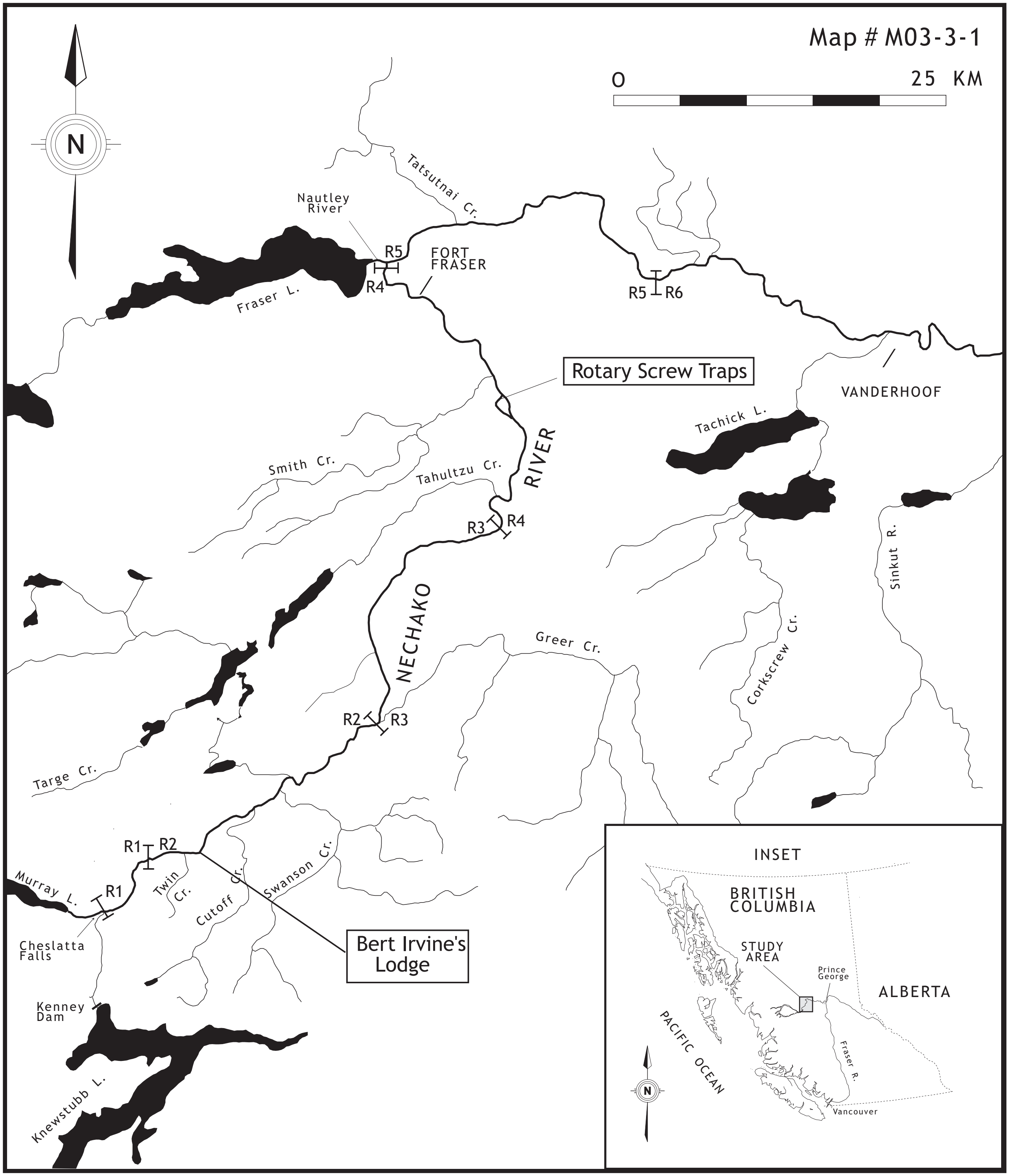
### *2.3.1 History*

Each year since 1990, the NFCP has conducted electrofishing surveys of the upper Nechako River to measure the relative abundance and spatial distribution of juvenile chinook. The surveys were initiated in 1990 when a downstream trapping fence could not be operated because of high river flows. In subsequent years the surveys have become an important component of the chinook monitoring program due to the capability of the surveys to show spatial variation in juvenile density during spring and summer—something no fixed gear can do.

### *2.3.2 Surveys*

The distribution of juvenile chinook salmon was assessed from single-pass electrofishing surveys of Reaches 1-4, as in previous years. Surveys began in April and continued in May, June, early July, and November. The surveys in April, May, June and July provide information on the abundance and distribution of juvenile chinook during the period of greatest habitat use by juvenile chinook within the upper Nechako River. The November sampling provides information on the juveniles that reside in the river in the fall and winter. Surveys were not completed

**FIGURE 1** **2003 Nechako River study area and traps location**



during late July and August because the release of summer cooling flows result in water levels that are too high to allow safe and effective electrofishing. During this period, large flows are released into the upper river to cool the river in order to mitigate potential increases in water temperatures during the summer and reduce the risk to sockeye salmon *(Oncorhynchus nerka)* migrating through the lower Nechako River to spawning grounds in the Stuart, Stellako and Nadina River systems.

Surveys of Reaches 1 through 4 were completed in each of the months sampled, except April and November when low river discharge prevented safe boat access to Reach 1. Electrofishing surveys were carried out at night and during the day, with night defined as the time period between sunset and sunrise.

A final electrofishing survey was initiated on November 1, but could not be completed due to ice formation on the river starting November 5. Reaches 1 - 3 were sampled prior to ice formation on the river. The following week weather conditions improved, and a second attempt to complete Reach 4 was made on November 15. The river was open, and Reach 4 was sampled during the day. However, night sampling could not be completed due to mechanical problems. The full survey schedule is shown in **Figure 2.**

The surveys were conducted on prime juvenile chinook salmon habitat, defined as depth greater than 0.5 m, velocity greater than 0.3 m/s and a substrate of gravel and cobble (Envirocon Ltd. 1984). That habitat is found mainly along the margins of the river, so the electrofishing surveys did not sample the portion of the population that may have occupied the mid-channel. Mid-channel residents are however a minor component of the population of juvenile chinook: Electrofishing surveys conducted by the Department of Fisheries and Oceans (DFO) have shown that mid-channel densities of chinook were 70 times lower than densities along river margins (Nechako River Project 1987). The same study also showed that 97% of observed juvenile chinook were found along river margins.

Fish were captured with a single pass of a Smith Root model 12B POW backpack electrofisher, identified to species (except for cottids), counted, and released live back into the river. This yielded a measure of catch-per-unit-effort (CPUE) of juvenile chinook, in this case the number of fish caught at a site divided by the area electrofished. Area was expressed in units of 100 m2 to avoid fractional CPUE. The CPUE units are thus fish numbers/100 $m^2$.

The age of juvenile chinook was recorded as 0+ or 1+, based on fork length. During spring and early summer juvenile chinook less than 90 mm long were classified as 0+. Those over 90 mm in length in the spring and early summer were classified as 1+. Juvenile chinook over 90 mm long in late summer were classified as 0+ because by that time all 1+ chinook had migrated out of the upper Nechako River. Rainbow trout were classified as juveniles if their fork length was <200 mm and adults if their length was >200 mm.

**FIGURE 2** **Schedule for 2003 outmigration sampling, Nechako River**

| Month | April | | | | | May | | | | June | | | | July | | | | | August | | | | September | | | | October | | | | | November | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Week | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| Electrofishing, day | X | X | | | | | X | X | | | | X | X | X | X | | | | | | | | | | | | | | | | | X | X | | |
| Electrofishing, night | X | X | | | | | X | X | | | | X | X | X | X | | | | | | | | | | | | | | | | | X | | | |
| Rotary Screw Traps, day | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | |
| Rotary Screw Traps, night | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | |

Fork length and wet weight were measured from an average of ten chinook at each site and each day or night sampling event. Fork length was measured to the nearest mm with a fry measuring board, and wet weight was measured to the nearest 0.01 g with an electronic balance.

Lengths and weights of subsamples of other salmonids such as rainbow trout were also measured but were not taken for non-salmonid fish other than burbot *(Lota lota)*, a rare species in the Nechako River.

Fulton's condition factor (Ricker 1975) was used as an index of physical condition:

(1) $CF = \text{weight (g)} \times 10^5/[\text{fork length (mm)}]^3$

Mean daily length and weight of 0+ and 1+ chinook were calculated separately for day and night catches because previous statistical analyses have shown that juvenile chinook lengths and weights are significantly different between night and day (fish caught at night being larger), and also because the behaviour of juvenile chinook varies with time of day — they tend to remain near instream cover during the day and to migrate between dusk and dawn.

It is important to note that areas sampled using electrofishing were not blocked off with nets, meaning that some fish could avoid capture by leaving a sampling area during a pass. Thus the electrofishing catch was an underestimate of the total number of fish in a survey area, which would require two-pass or three-pass sampling of blocked-off survey areas. However, the Nechako River electrofishing survey was not designed to estimate absolute numbers — it was designed to provide an index of relative abundance that could be compared between years.

This sampling strategy is called "semi-quantitative" (Crozier and Kennedy 1995). It has two advantages over the fully quantitative method. First, it is the only electrofishing technique that can be used when it is impractical to enclose a survey area in blocking nets because the area is too large to be enclosed or flows through the area are too strong to allow nets to be installed. For example, almost all electrofishing conducted in lakes and reservoirs (DeVries *et al.* 1995; Van Den Ayle *et al.* 1995; Miranda *et al.* 1996), and in large rivers (R.L.&L. Environmental Services Ltd. 1994), is semi-quantitative.

Second, it is often necessary to use semi-quantitative methods when the region to be surveyed contains many possible survey sites, but the time and resources available for sampling are limited (Crozier and Kennedy 1995). The upper Nechako River is too long (~ 100 km) for cost-effective quantitative sampling of its entire length several times a year.

There are two disadvantages of the semi-quantitative method. First, semi-quantitative electrofishing CPUE cannot be compared to fully quantitative CPUE unless the former are calibrated by the latter. That is, unless total numbers are estimated for a subset of the same areas that are semi-quantitatively surveyed, and a calibration relationship is developed from a comparison of the two types of CPUE (*e.g.,* Serns 1982; Hall 1986; Coble 1992; McInerny and Degan 1993; Edwards *et al.* 1987). At present, conversion of electrofishing CPUE to absolute CPUE is not an NFCP objective because the purpose of the electrofishing surveys is to search for among-year variations in relative abundance of juvenile chinook and not to compare it with absolute abundances of other chinook streams.

Second, semi-quantitative sampling assumes that the efficiency of capture, the fraction of total number of fish in a survey area that are caught in a single electrofishing pass, is constant for all sites and species of fish. However, electrofishing catch efficiency varies significantly with fish species, fish body size, type of habitat, time of day, water temperature, and the training and experience of personnel conducting the survey (Bohlin *et al.* 1989, 1990). The NFCP electrofishing project reduced error in estimation of CPUE by sampling only one type of habitat (prime juvenile chinook habitat), by focusing analysis on only one species (chinook), by analysing CPUE from night and day surveys separately, and by using the same experienced crew leaders each year. However, the study plan does not account for changes in catch efficiency that may result from seasonal changes in either fish size or water temperature. Since the sampling procedure used does not vary from year-to-year, it is assumed that any sampling biases that may be present as a result of these factors are equally likely to be present in any year, thereby allowing for comparison of the data collected from year-to-year.

## 2.4 Rotary Screw Traps

Rotary screw traps (RSTs) were used to estimate the number of juvenile chinook that migrated downstream past Diamond Island **(Figure 1)**.

An RST consists of a floating platform which supports a current-driven rotating cone. In front of the cone is an A-frame with a winch used to set the vertical position of the mouth of the cone, half of which is always submerged. In the back of the cone is a live box where captured fish are kept until the trap is emptied. The cone is 1.43 m long and made of 3 mm thick aluminium sheet metal with multiple perforations to allow water to drain. The diameter of the cone tapers from 1.55 m at the mouth to 0.3 m at the downstream end. Inside the cone is an auger or screw, the blades of which are painted black to reduce avoidance by fish. As the current of the river strikes the blades of the screw, it forces the cone to rotate. Any fish entering the cone is trapped in a temporary chamber formed by the screw blades. As the cone rotates, the chamber moves down the cone until its contents are deposited into the live box.

Three RSTs were suspended from a cable strung across the river channel off Diamond Island: RST 1 near the left bank (left margin), RST 2 in the middle of the river (mid channel), and RST 3 near the right bank (right margin). The 1.5 m space between the right bank of the river and RST 3 was blocked with a wing made of wire mesh fence panels. Although RST 1 was originally installed to be close to the left margin, the channel gradually changed course and widened during the multiple years of the study, and this RST is now sampling in mid channel. It was decided early on not to change its position from year to year. Thus, "left margin" is now a slight misnomer.

The RSTs were installed in early April once the river was free of ice, and removed in mid-July to avoid high cooling flows in July and August **(Figure 2)**. The traps were not re-installed in September because too few chinook salmon had been caught in the fall of previous years to justify re-installation of traps.

Each trap was emptied twice each day at 08:00 and 19:00. All fish were collected from the live box, counted and identified to species. A subsample of 10 chinook salmon was measured for length and weight with the same methods described for the electrofishing surveys, after which all fish, including the subsampled fish, were released live back into the river approximately 300 m downstream of the trapping site.

An index of the number of juvenile chinook passing Diamond Island was calculated by multiplying the total number of fish caught in an RST in a time period (day or night) by the ratio of the total flow of the river to the flow that passes through the RST:

$$(2)\ N_{ij} = nij(V_j/v_{ij})$$

where $N_{ij}$ = number of juvenile salmon passing Diamond Island on the *jth* date as estimated by the catches of the *ith* trap, $n_{ij}$ = number of chinook salmon caught in the *ith* trap on the *jth* date, $V_j$ = total water flow ($m^3/s$) of the Nechako River past Diamond Island on the *jth* date, and $v_{ij}$ = water flow ($m^3/s$) through the *ith* trap on the *jth* date. All analyses of rotary screw trap data were based on the numbers expanded by equation (2) rather than on catches.

$V_j$ was estimated from measurements on a staff gauge placed near the confluence with Smith Creek (cf. **Figure 1**), using a linear regression between flow and the height of the staff gauge (N = 14, R2 = 0.98, P<0.001):

$$(3)\ \text{Flow}(m^3/s) = -177.86 + 145.52\ (\text{staff height, m})$$

That regression was calculated for steady flow conditions from April to July, 2003.

Water flow though a trap ($v_{ij}$) was the product of one half the cross-sectional area (1.61 $m^2$) of the mouth of the trap (the trap mouth was always half-submerged) and average water velocity in front of the trap. Average water velocity (m/s) was measured with a Swoffer (model 2100) flow meter at three different places in the front of the mouth of the RST. The one exception to this rule was RST 3, where $v_{ij}$ was increased to include the water that flowed between it and the right bank of the river because the fish that would ordinarily have passed through this gap were diverted into RST 3 by the right wing.

Since there were three RSTs, there were three estimates of total chinook number each day. The best estimate of the total index number of chinook salmon was the mean of the three estimates weighted by the flow that passed through each trap.

# 3.0 RESULTS AND DISCUSSION

## 3.1 Temperature

Mean daily water temperature of the upper Nechako River at Bert Irvine's Lodge fluctuated from around to 0°C from January to mid-March to just over 18 °C on July 13, August 16 and August 17 (**Figure 3**). Overall, the temperatures recorded to the end of October, 2003 by Triton, were similar to the average of the 1987 - 2002 WSC data during the main period of chinook growth (April - September).

Spot temperatures measured during electrofishing surveys are plotted by month as a function of their distance from Kenney Dam in **Figure 4**. Only sites that were sampled during all months (April, May, June, July and November) are shown, and only night time temperatures are plotted to minimize variations

**FIGURE 3** **Comparisons of mean daily temperature of the upper Nechako River at Bert Irvine's lodge in 2003 with the mean, maximum and minimum for the years 1987 to 2002 (data available until Nov. 1, 2003)**

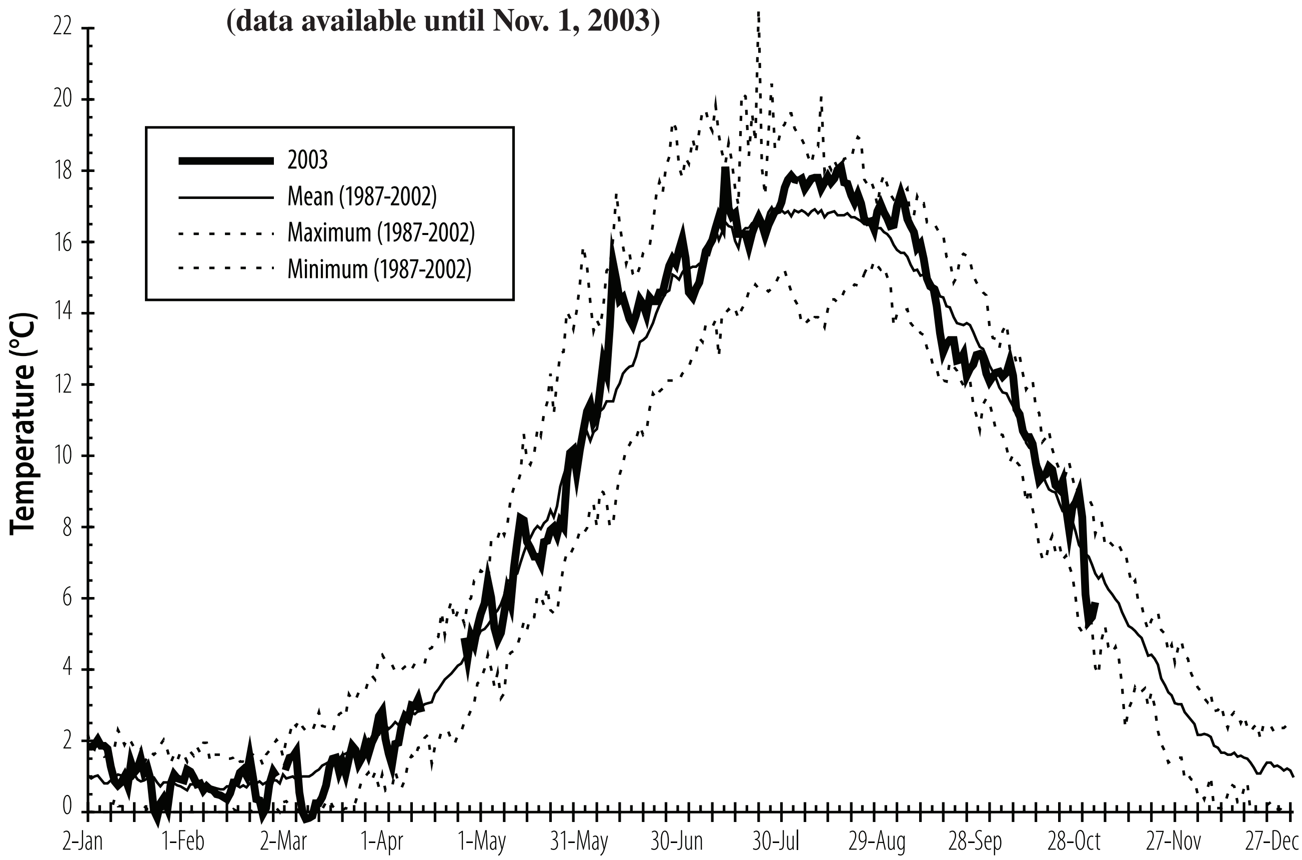
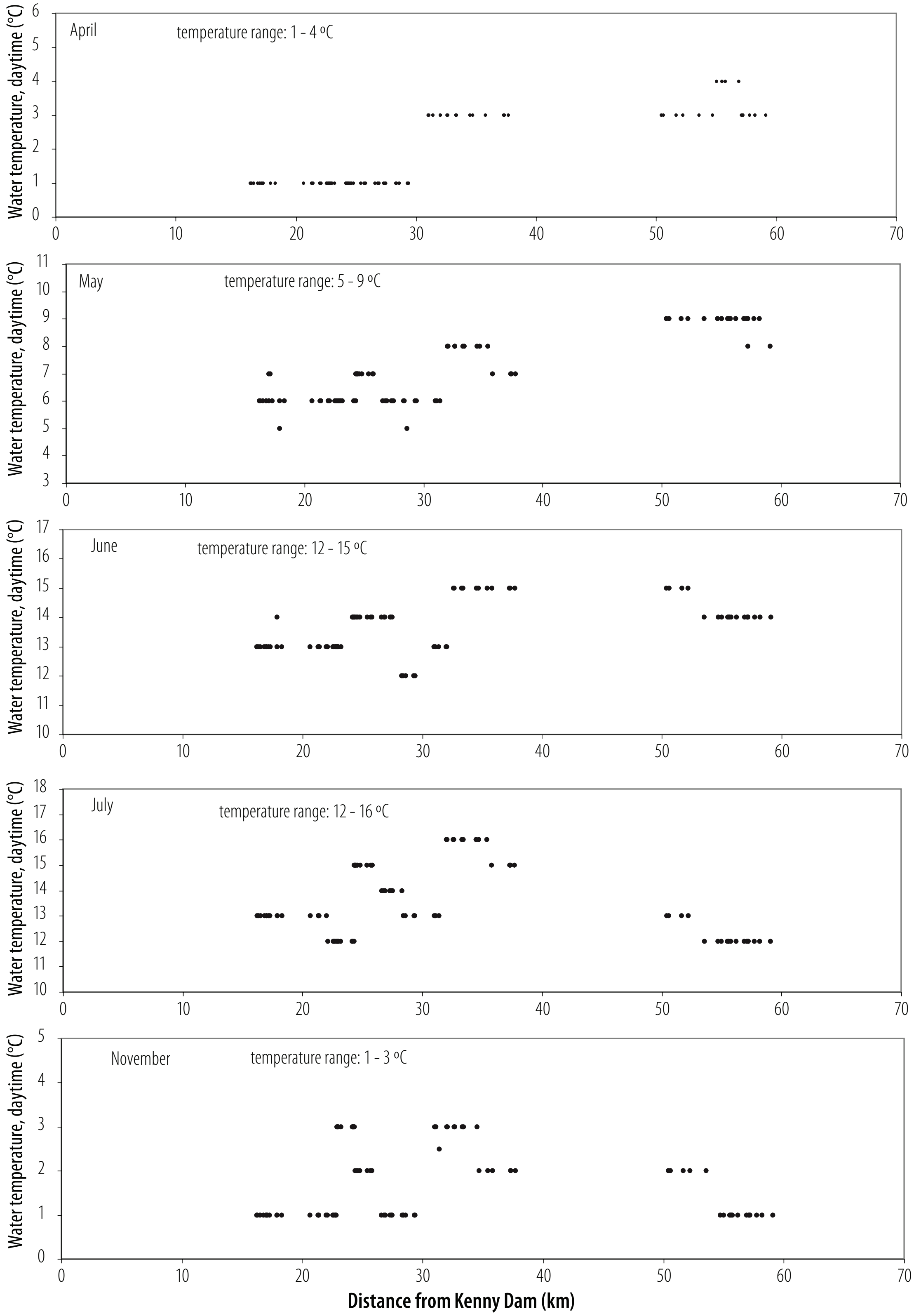


**FIGURE 4** **Night time temperatures measured at electrofishing sites in the Nechako River, April to November, 2003**



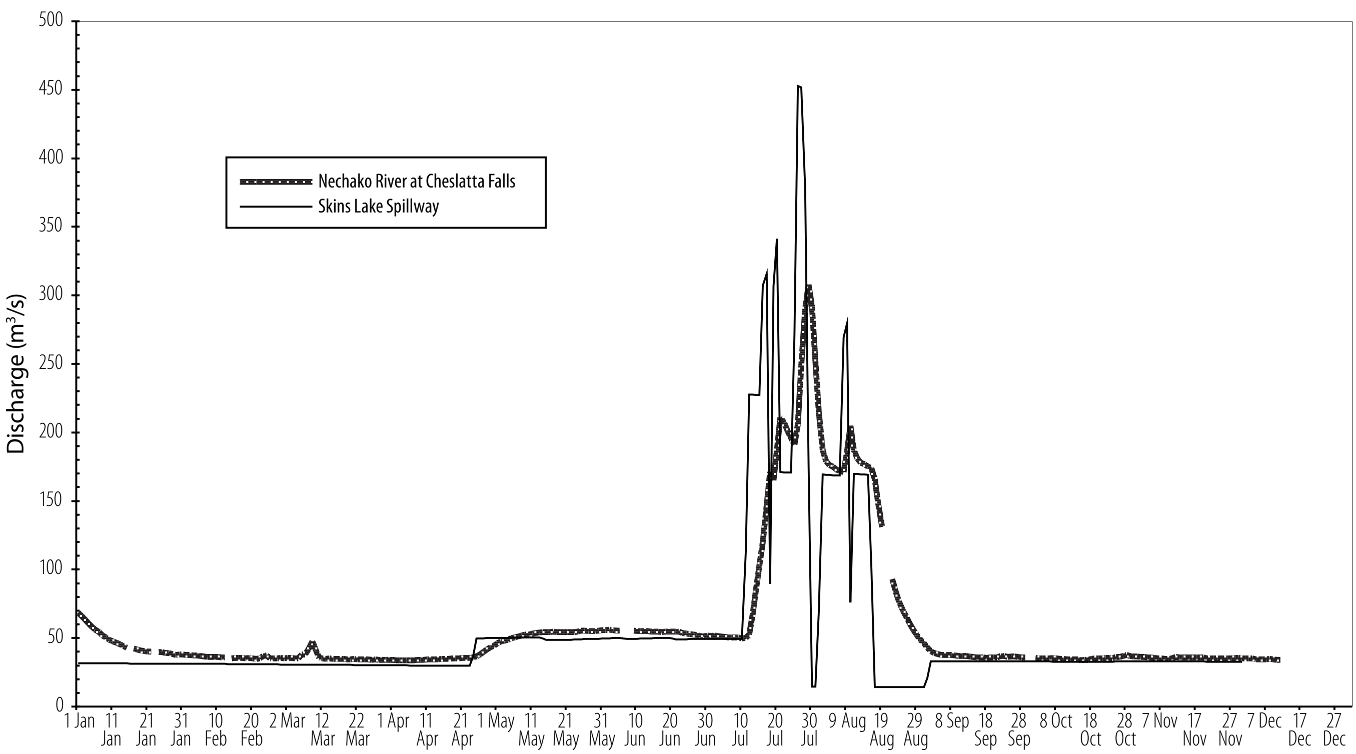
due to time of sampling (*e.g.,* sites sampled in early morning would be expected to have lower temperatures than sites sampled in the afternoon). In general, in 2003 water temperatures became progressively warmer downstream from the dam in April and May, increasing 2 degrees between the sites closest to the dam and those furthest downstream in each of the months. During the other months, temperatures were fairly stable throughout the river, with an overall change in temperature between the sites closest to the dam and those furthest downstream of either 1 degree (June and July) or less (November). The spot water temperatures recorded in April and November were the coldest of the past three years (average of 1.8 vs. 2.8 for April 2002 and 2001, and 1.7 vs. 5.2 and 4.4 for November 2002 and 2001).

In summary, temperature of the upper Nechako River varied with season and downstream distance. The temperatures experienced by juvenile chinook in the upper river may have been up to ±4°C different from the average daily temperatures downstream in April and May. These variations in temperature may tend to obscure relationships between temperature and growth of juvenile chinook salmon in the Nechako River.

## 3.2 Flow

From January 1 to April 23, 2003, releases from Skins Lake Spillway were relatively constant at approximately 30 $m^3/s$ (**Figure 5**). From April 23 to 25, releases rose from 30 to 50 $m^3/s$ and then remained stable until July 11, when they once again rose, this time from 50 to 316 $m^3/s$ on July 17 as part of the Summer Temperature Management Program (STMP). Intermediate peaks occurred on July 17 (316 $m^3/s$), July 20 (341 $m^3/s$) and August 9 (280 $m^3/s$) with a maximum peak of 452 $m^3/s$ on July 27 (higher than last year's peak of 377 $m^3/s$, but similar to the 2001 peak of 453 $m^3/s$). There were no fall or winter forced spills as of early December based on the data available at the time of this writing. Releases from September 2 to November 30 were approximately 32 $m^3/s$.

**FIGURE 5** **Daily flow of the Nechako River below Cheslatta Falls (WSC station 08JA017) and releases from Skins Lake Spillway, 2003 (data incomplete)**



Flows at Cheslatta Falls varied less rapidly than releases at Skins Lake Spillway due to the buffering effect of the Murray-Cheslatta Lake chain. Flows ranged between 31 $m^3/s$ and 66 $m^3/s$ between January 1 and July 12. It should be noted that the difference in average flows between Skins Lake Spillway and Cheslatta Falls was due to the addition of flows from tributaries to the Murray-Cheslatta system. Flows rose rapidly on July 12 in response to STMP releases, and reached a maximum of 308 $m^3/s$ on July 29, 2003. Flows then declined to an average of 36 $m^3/s$ from September 17 to early December.

In summary, the 2003 flows of the upper Nechako River at Cheslatta Falls were stable for most of the year and exhibited the typical changes in flows associated with the STMP in July and August.

## 3.3 Size and Growth of Chinook Salmon

### *3.3.1 Chinook 0+ Growth*

The growth in length and weight of chinook 0+ salmon electrofished along the river margins appeared to follow two separate growth stanzas: growth was slow during April and May and then increased in June (**Figures 6** and **7**). However, the apparent slow growth during the first stanza was more likely due to continuous emergence of fry over a period of several weeks—the numbers of emergent fry were large enough to force the mean size of all fish caught to stay close to the mean size of emergent fry. After emergence ceased, the second stanza began and the true growth rate of juvenile chinook became apparent. Based on the

**FIGURE 6** **Mean (±1 SE) fork lengths of chinook 0+salmon caught by electrofishing, Nechako River, 2003**

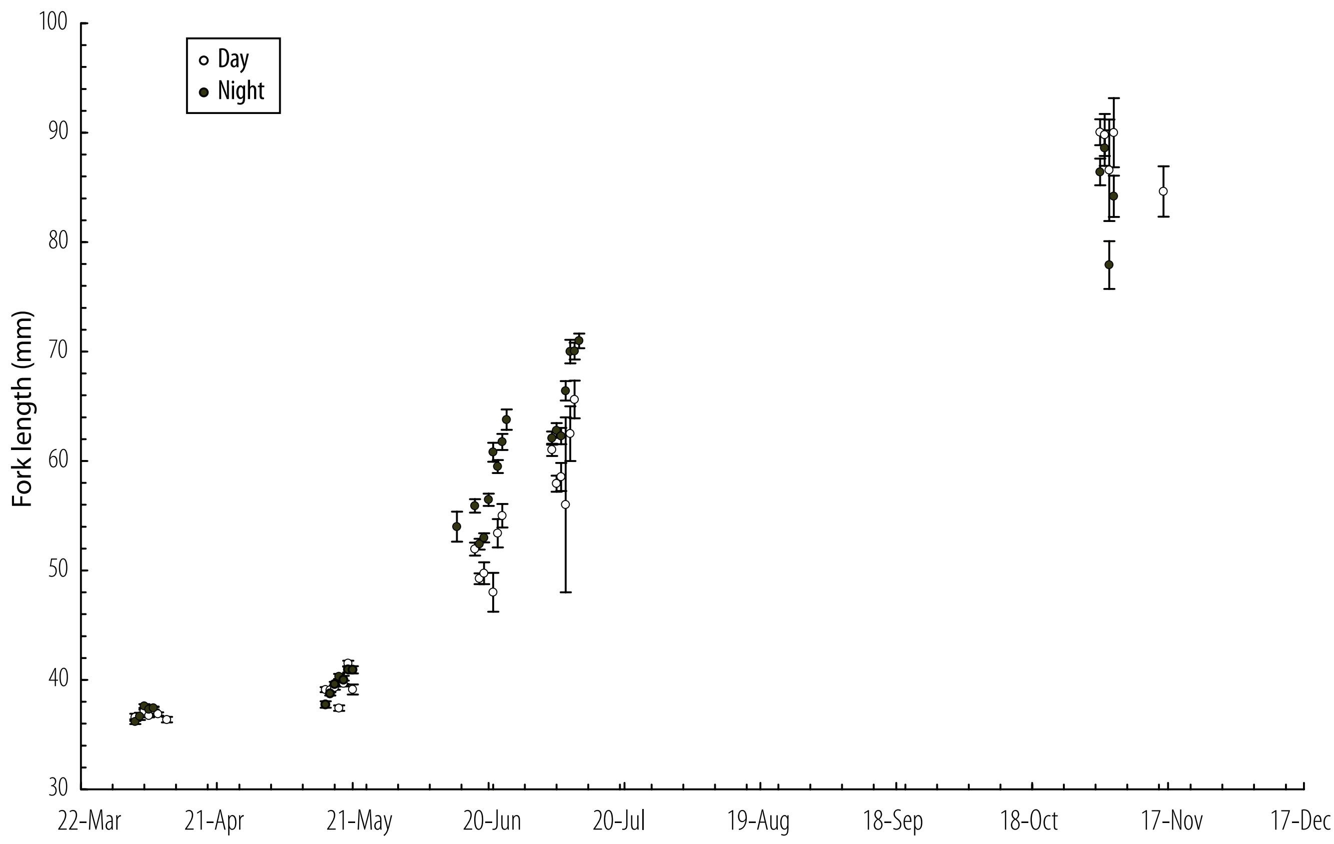
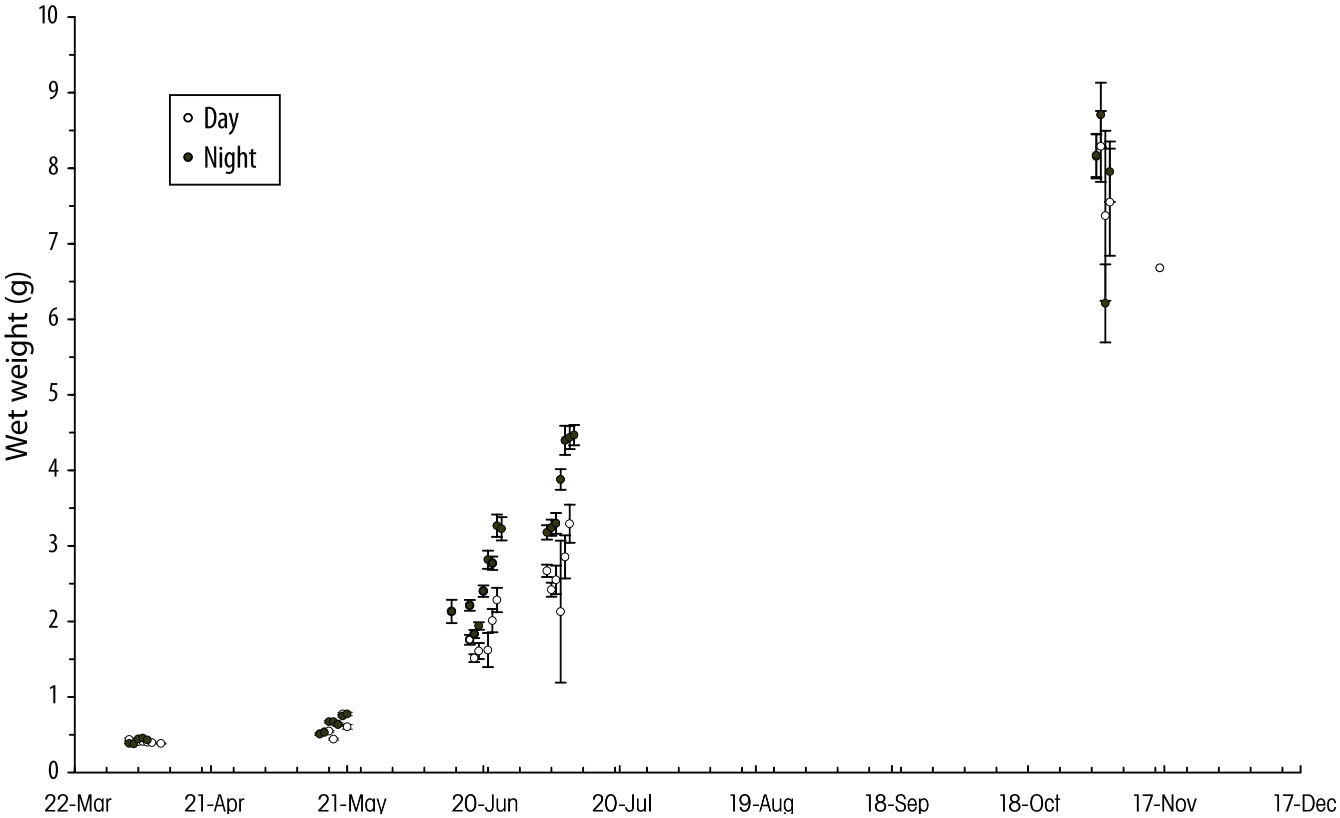


**FIGURE 7** **Mean (±1 SE)wet weights of chinook 0+salmon caught by electrofishing, Nechako River, 2003**




curvature of the relationship between mean length and weight vs. date, emergence appeared to have ceased by late May in 2003. There might have been a third growth stanza in late summer to fall when juvenile growth slowed (most likely because of decreasing temperatures). However the lack of sampling between July and November precludes any conclusion in this regard.

### *3.3.2 Chinook 1+ Growth*

Chinook 1+ also grew from April to May: the average fork length went from 84.0 mm in April to 90.3 mm in May ($t_{359, 0.05} = 5.12$, $P<0.05$, t-test on night-caught fish, ln-transformed values) and from 7.6 g to 10.2 g during the same time ($t_{355, 0.05} = 6.3$, $P<0.05$, t-test on night-caught fish, ln-transformed values).

### *3.3.3 Effect of time of day – electroshocking*

Factorial ANOVAs of fork length and wet weight (both ln-transformed to respect the assumptions of the test) with time of day (day or night) and time of year (April, May, June, July and November) showed that there was a significant interaction between time of day and time of year (**Table 1**). A significant interaction means that the effect of one independent variable (*e.g.,* 'time of day') on the dependent variable (Fork Length (FL) or Wet Weight (WW) in this case) depends on the level of the other independent variable ('time of year'). In the present case, the significant interaction between time of day and time of year forces one to test whether $FL_{night}$ is greater than $FL_{day}$ for each month sampled rather than lumping all $FL_{day}$ across months. There were also, as expected, significant effects of time of year and time of day on these variables.

**TABLE 1** **Results of factorial ANOVAs on Fork Length and Wet Weight of juvenile chinook captured by electrofishing in the Nechako River, 2003**

**Ln (length)**

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|---|---|---|---|---|---|
| Month | 4 | 246.37 | 61.59 | 6,282.24 | <.0001 |
| Day or Night | 1 | 0.86 | 0.86 | 88.14 | <.0001 |
| Month x D or N | 4 | 2.55 | 0.64 | 65.02 | <.0001 |
| Residual | 5,828 | 57.14 | 0.01 | | |

**Ln (weight)**

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|---|---|---|---|---|---|
| Month | 4 | 3,202.90 | 800.73 | 6,957.37 | <.0001 |
| Day or Night | 1 | 20.39 | 20.39 | 177.12 | <.0001 |
| Month x D or N | 4 | 16.80 | 4.20 | 36.50 | <.0001 |
| Residual | 5,784 | 665.68 | 0.12 | | |

There were significant day-night difference in fork length among juvenile chinook 0+ for all months (**Figure 8**; t-tests on ln-transformed data). Juvenile chinook caught at night were significantly longer than fish caught during the day in all months except November, although the size difference only exceeded 10% in June and July. Thus while the differences observed in April, May and November were statistically significant, they may not be biologically significant.

Chinook juveniles' wet weights showed a similar trend among months, as the fish tended to be heavier at night in all months during which they were sampled with the exception of November **(Figure 9)**. The night-day weight differences in June and July exceeded 45% whereas they were below 12% in the other months.

The most likely reasons for these apparently large day-night differences in summer months (June and July) could be related to territoriality and diurnal movements. During the day, the larger juvenile chinook hold feeding territories which they visually defend against smaller cohort members. These feeding territories are usually in sheltered areas with high drift making fish in these areas harder to sample. In addition, by defending the sheltered areas the larger fish force the smaller fish to the periphery of the habitat where they are more easily sampled. Alternatively, at night a wider size range of fish are active along the river margins than during the day because juvenile chinook tend to migrate more during night time when they are better able to avoid predators. As a result, the larger fish leave the sheltered areas making them more susceptible to sampling than during the day.

### Chinook Salmon 1+

There were more chinook 1+ caught by electrofishing than in previous years (590 vs. an average of 158 for the last three years, and 249 for the last ten). This reflects the high number of chinook 0+ emerging in 2002, which was the largest cohort on record. Most of the 1+ chinook (82%) were caught at night (**Table 2**). The only day-night statistical difference was between fork lengths of fish caught in April, which were larger during the day **(Figure 10)**. There was no statistical difference in wet weight of Chinook 1+ between night and day during any of the months during which sampling was undertaken **(Figure 11)**.

FIGURE 8 **Fork lengths (± SE) 2003 of chinook 0+ electrofished in the Nechako River**

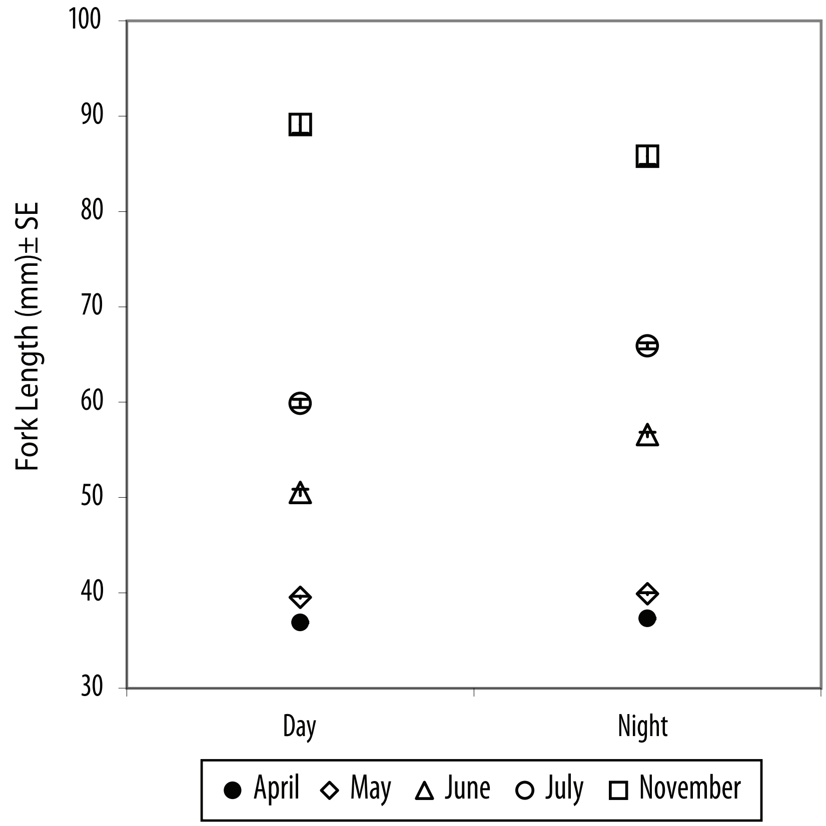
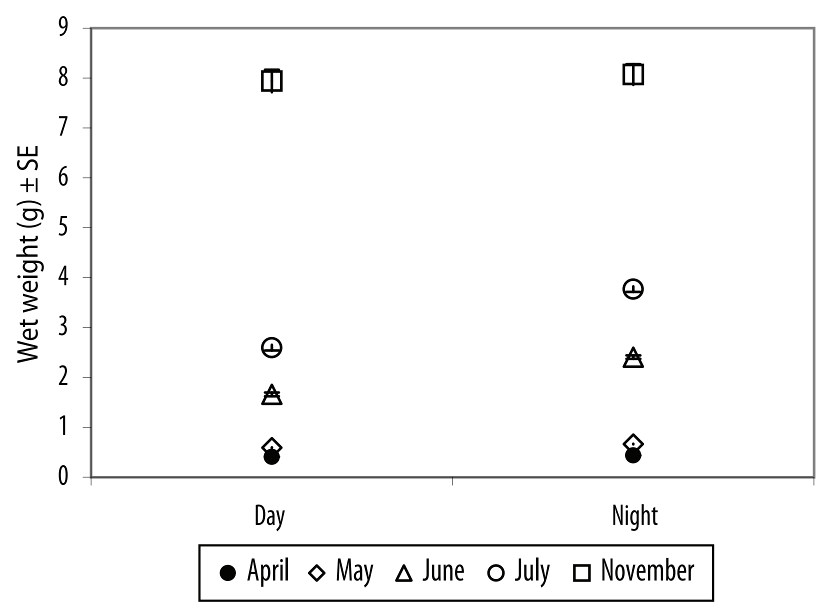



FIGURE 9 **Wet weights (± SE) of chinook 0+ electrofished in the Nechako River, 2003**



## TABLE 2 Fish captured by electrofishing in the upper Nechako River, 2003

| | | Adult (1+ for salmon) | | | | Juvenile (0+ for salmon) | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Common Name | Scientific Name | Day | Night | Total | Percent | Day | Night | Total | Percent | Day | Night | Total | Percent |
| Chinook salmon | *Oncorhynchus tshawytscha* | 108 | 482 | 590 | 1 | 5,909 | 18,526 | 24,435 | 56 | 6,017 | 19,008 | 25,025 | 57.5 |
| Longnose dace | *Rhinichthys cataractae* | 331 | 97 | 428 | 1 | 3,660 | 874 | 4,534 | 10 | 3,991 | 971 | 4,962 | 11.4 |
| Redside shiner | *Richardsonius balteatus* | 308 | 390 | 698 | 2 | 1,120 | 1,759 | 2,879 | 7 | 1,428 | 2,149 | 3,577 | 8.2 |
| Largescale sucker | *Catostomus macrocheilus* | 9 | 7 | 16 | 0 | 1,515 | 1,521 | 3,036 | 7 | 1,524 | 1,528 | 3,052 | 7.0 |
| Leopard dace | *Rhinichthys falcatus* | 225 | 204 | 429 | 1 | 1,213 | 953 | 2,166 | 5 | 1,438 | 1,157 | 2,595 | 6.0 |
| Northern pikeminnow | *Ptychocheilus oregonensis* | 2 | 11 | 13 | 0 | 755 | 1,304 | 2,059 | 5 | 757 | 1,315 | 2,072 | 4.8 |
| Sculpins (General) | *Cottidae* | 127 | 117 | 244 | 1 | 620 | 745 | 1,365 | 3 | 747 | 862 | 1,609 | 3.7 |
| Mountain whitefish | *Prosopium williamsoni* | 1 | 12 | 13 | 0 | 19 | 358 | 377 | 1 | 20 | 370 | 390 | 0.9 |
| Rainbow trout | *Oncorhynchus mykiss* | 3 | 2 | 5 | 0 | 24 | 83 | 107 | 0 | 27 | 85 | 112 | 0.3 |
| Sockeye salmon | *Oncorhynchus nerka* | 0 | 0 | 0 | 0.0 | 13 | 45 | 58 | 0.1 | 13 | 45 | 58 | 0.1 |
| Burbot | *Lota lota* | 0 | 1 | 1 | 0.0 | 6 | 26 | 32 | 0.1 | 6 | 27 | 33 | 0.1 |
| Coho salmon | *Oncorhynchus kisutch* | 0 | 3 | 3 | 0.0 | 1 | 0 | 1 | 0.0 | 1 | 3 | 4 | 0.0 |
| Peamouth chub | *Mylocheilus caurinus* | 0 | 0 | 0 | 0.0 | 3 | 0 | 3 | 0.0 | 3 | 0 | 3 | 0.0 |
| **Total** | | **1,114** | **1,326** | **2,440** | **5.6** | **14,858** | **26,194** | **41,052** | **94.4** | **15,972** | **27,520** | **43,492** | **100.0** |

**FIGURE 10** Fork lengths (± SE) 2003 of chinook 1+ electrofished in the Nechako River

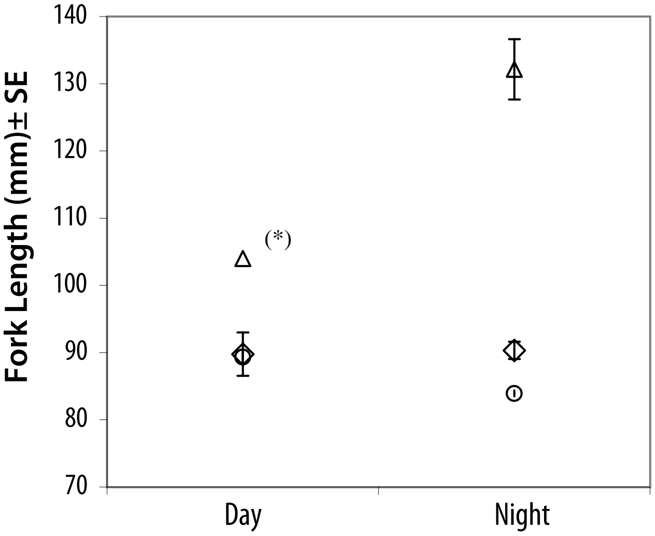
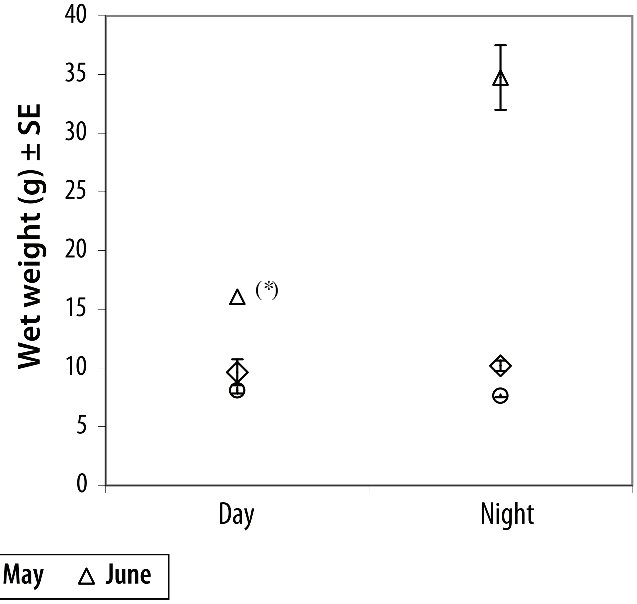



**FIGURE 11** Wet weights (± SE) 2003 of chinook 1+ electrofished in the Nechako River




* = sample size of 1 in June.

### *3.3.4 0+ and 1+ Chinook Salmon Weight-Length Relationship*

The relationship between wet weight and fork length of 0+ and 1+ chinook salmon is shown in **Figure 12**. Although a power function explained 97% of the overall variation (Weight = $1.3^{-01}$, Fork Length $^{3.449}$, $R^2 = 0.97$ for all chinook), it was apparent that there was more variation among 1+ than among 0+ juveniles. Most juvenile 1+ were below the predicted weight for given fork lengths which indicates that the power function is a more accurate predictor of weight for shorter fork lengths (*e.g.,* 0+ chinook).

Overall, 1+ juveniles showed more variation in weight than 0+ juveniles **(Figure 13)**. The most likely explanation for this relates to the length of time taken to achieve or maintain a given length. For example, 90 mm 0+ chinook are usually captured in November and have then approximately spent six months rearing in the river. Conversely, most 90 mm 1+ chinook are captured in May or June, having spent more than one year rearing in the river. Differences in feeding success and rearing habitat quality (which affect weight) among fish of similar lengths would be more apparent with time.

#### 0+ and 1+ Chinook Salmon Condition

Average condition of 0+ chinook increased from 0.83 g/mm$^3$ in April (similar value as previous two years – 0.85 g/mm$^3$) to 1.25 g/mm$^3$ in June and July and 1.20 g/mm$^3$ in November **(Figure 14)**. Average condition of 1+ chinook salmon increased slightly from 1.24 g/mm$^3$ in April (n = 370) to 1.50 in June (n = 8; **Figure 15**). These results are as expected since condition, which is a reflection of weight per unit length, would tend to increase most during the early growth stanza *(i.e.,* April through July) when both length and weight are increasing steadily. However, between July and November when growth has slowed, condition tends to stabilize with only slight variations being observed primarily as a result of weight fluctuations in the fish that are associated with the availability of food.

**FIGURE 12** **Wet weight vs. fork length for juvenile chinook salmon, Nechako River, 2003: electrofishing**

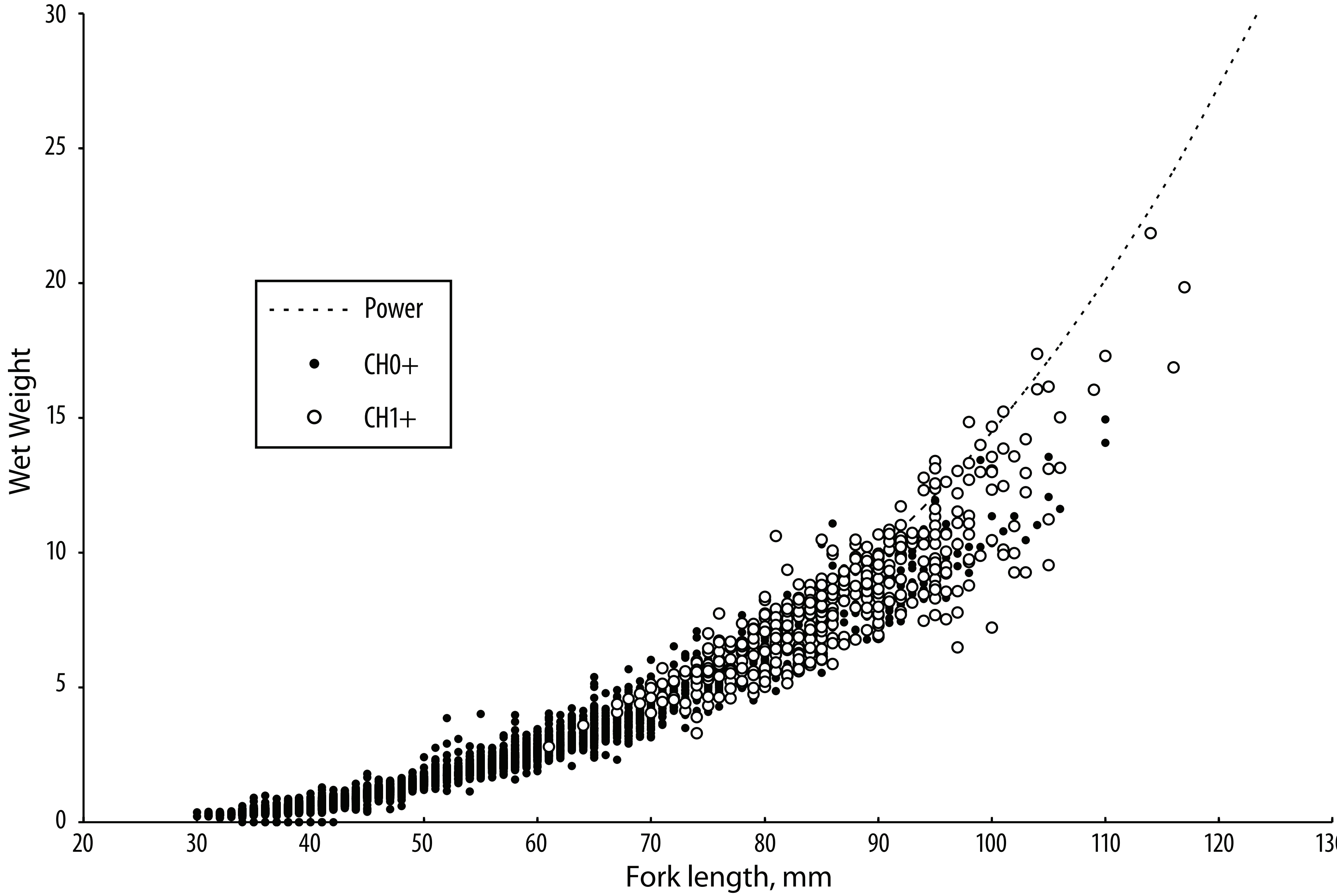


**FIGURE 13** **Variance in juvenile chinook wet weight per fork length. Fork lengths sorted per day. Fish caught electrofishing, Nechako River, 2003**

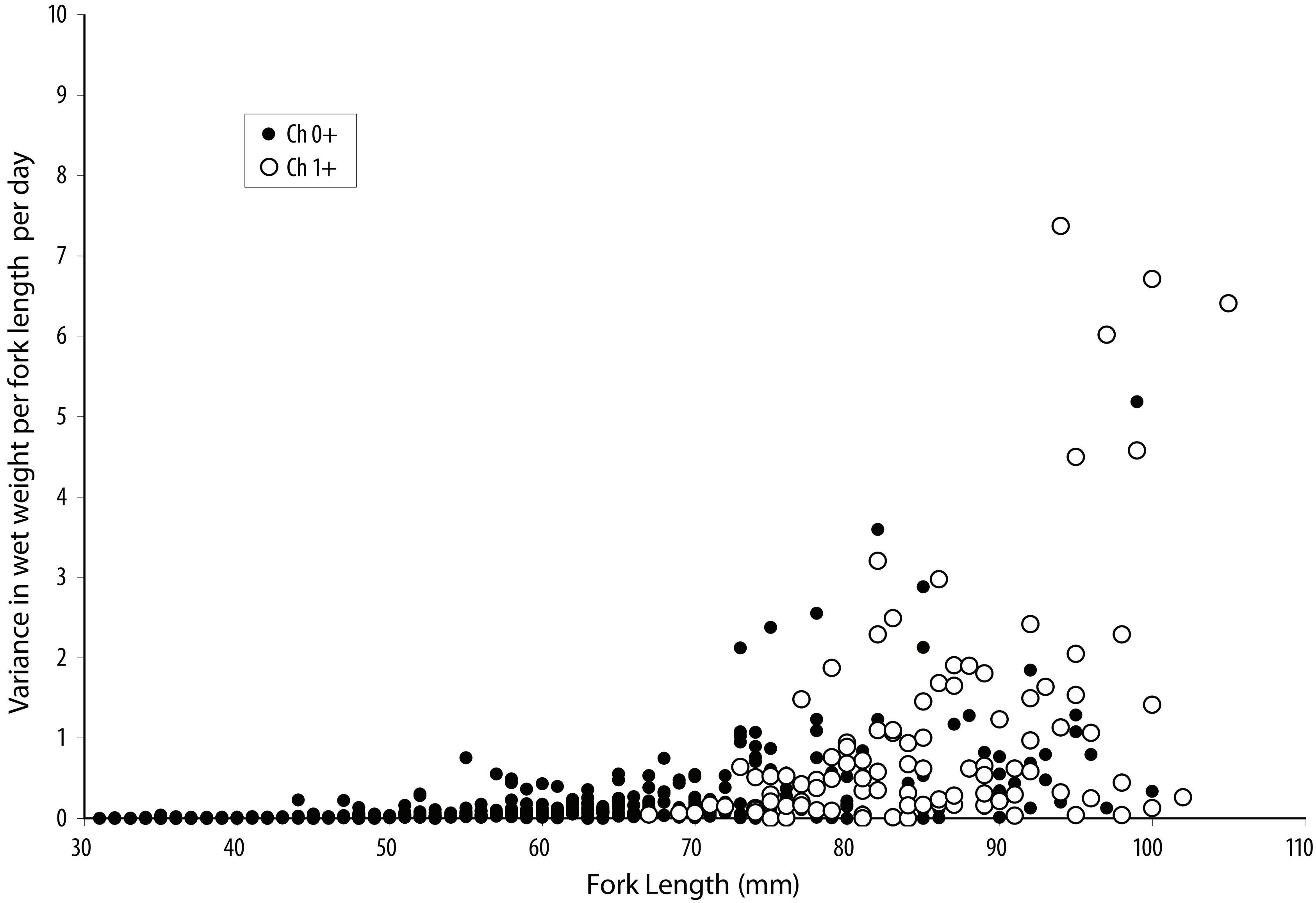


**FIGURE 14** **Condition indices of juvenile chinook 0+ caught by electrofishing in the Nechako River, 2003. N = 5,838**

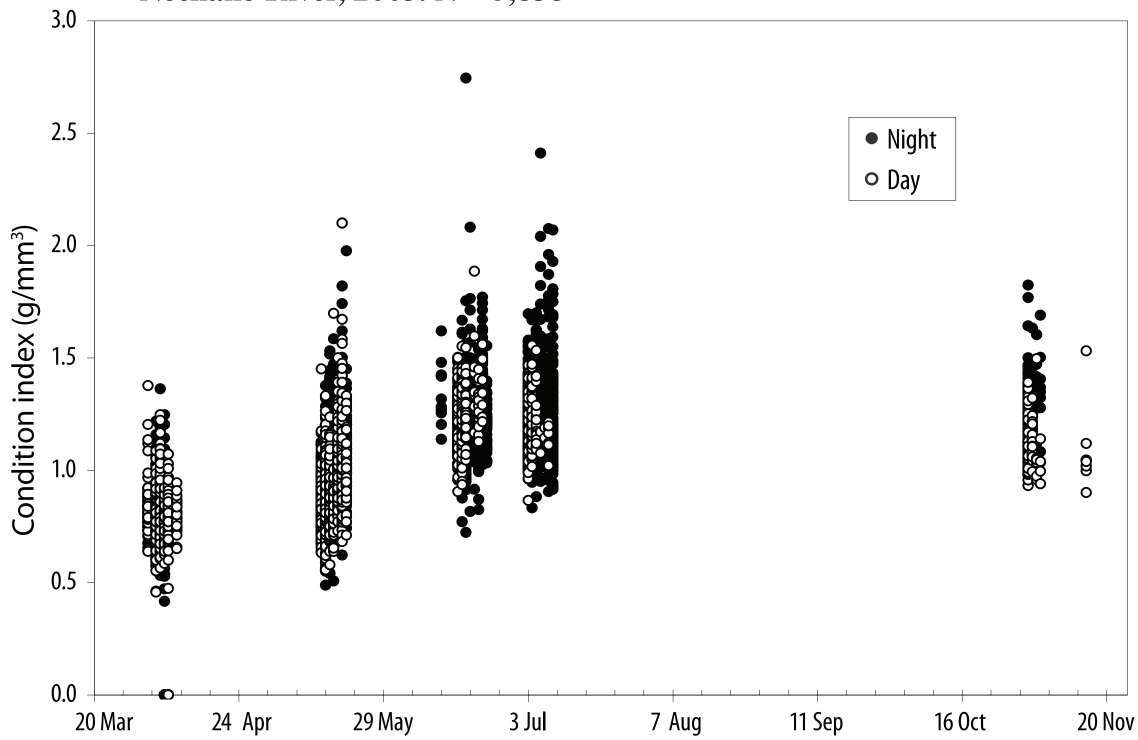
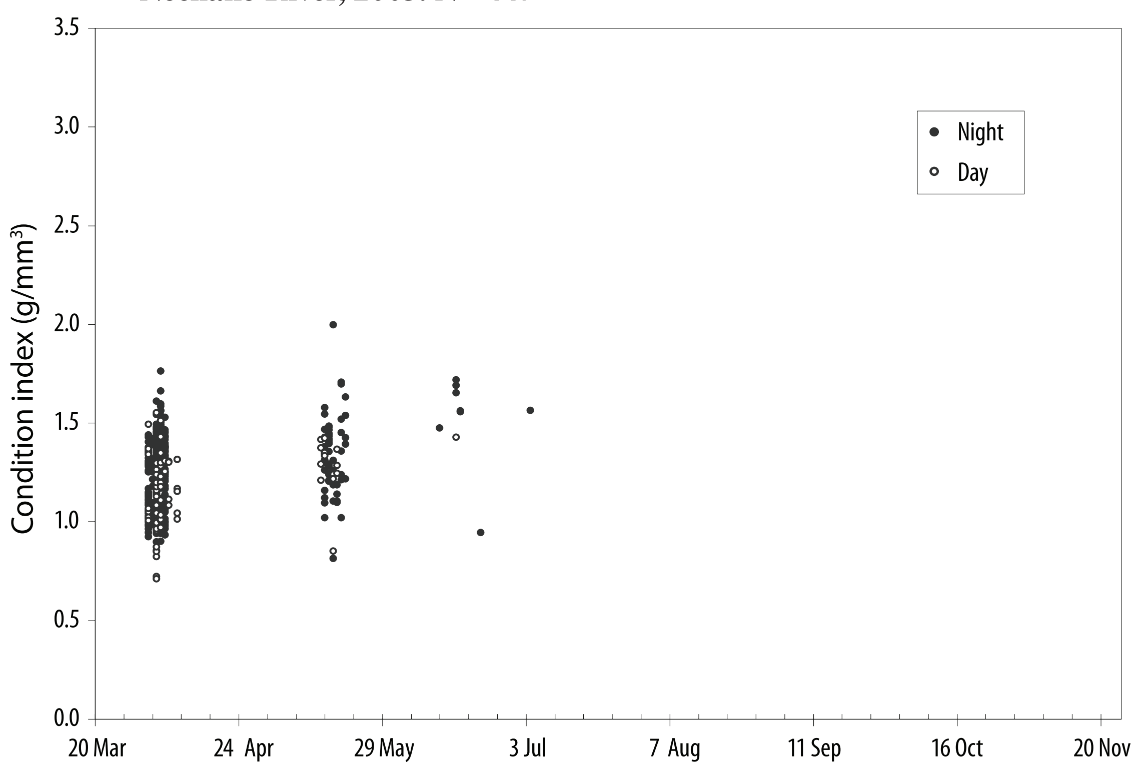



**FIGURE 15** **Condition indices of juvenile chinook 1+ caught by electrofishing in the Nechako River, 2003. N= 447**



### *3.3.5 Diamond Island Rotary Screw Traps*

Overall, 10,648 juvenile chinook salmon were caught by the rotary screw traps at Diamond Island in 2003 (**Table 3** and **Appendix 1**): 9,174 0+ and 1,474 1+. Approximately 90% of all 0+ fish and 98% of all 1+ fish were caught at night. This may reflect slightly different movement patterns or better avoidance of the traps during the day.

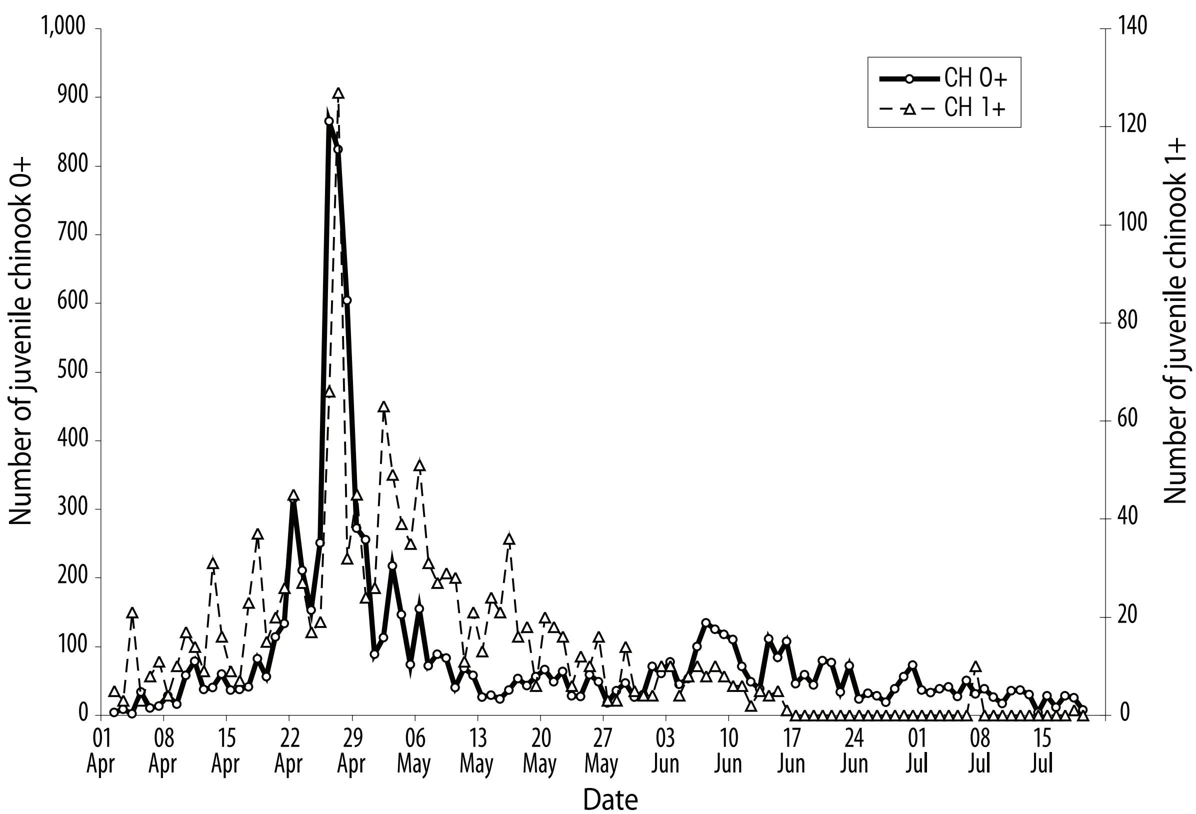
#### Chinook 0+

The distribution of juvenile 0+ chinook catches over time was essentially unimodal, with the peak of abundance centered around April 29, 2003 (**Figure 16**).

**TABLE 3** **Summary of rotary screw trap (RST) catches of chinook 0+ and 1+ at Diamond Is, Nechako River, April 2 to July 20, 2003**

| Trap number | Trap location | 0+ chinook | | | 1+ chinook | | |
|---|---|---|---|---|---|---|---|
| | | day | night | total | day | night | total |
| 1 | Left margin | 295 | 3,117 | 3,412 | 20 | 810 | 830 |
| 2 | Mid Channel | 251 | 3,178 | 3,429 | 28 | 423 | 451 |
| 3 | Right margin | 401 | 1,932 | 2,333 | 13 | 180 | 193 |
| | **Total** | **947** | **8,227** | **9,174** | **61** | **1,413** | **1,474** |

**FIGURE 16** **Juvenile chinook salmon 0+ and 1+ caught in rotary screw traps, Nechako River, 2003 (Note different scales for CH 0+ and 1+)**



The numbers of 0+ chinook estimated to have passed Diamond Island between April 1 and July 20 ranged from 109,017 for trap 3 to 141,545 for trap 2 **(Appendix 1)**. The total index number of 0+ chinook that passed Diamond Island, weighted by the average percent of river flow filtered by each trap, was 129,004.

All analyses of juvenile chinook catch distributions among traps were done on volume-expanded numbers, as they take into account the different water volumes sampled by different traps, and thus standardize the catches among traps. Analyses of morphological parameters were done on sub-sampled fish (not all fish caught were measured, Section 2.4).

There was a significant interaction between time of capture (day or night) and trap position for juvenile chinook 0+ **(Table 4)**. Therefore, the trap data were analysed separately by night and by day. As in previous years, the right margin trap caught significantly fewer chinook 0+ (absolute numbers) during the night than the two other traps, but there were no significant differences among traps during the day **(Table 3, Figure 17)**. Overall, all traps caught more chinook 0+ at night **(Figure 17)**. When water volume filtered by traps was taken into account (*i.e.,* standardized catches), no trap caught more fish than the others, although all traps caught significantly more chinook 0+ at night.

The chinook 0+ morphological parameters (fork length, wet weight) also differed among traps (**Figures 18a** and **b**): the left margin trap, which sampled more fish, tended to catch significantly larger juvenile chinook at night than either of the two other traps (tests done on ln-transformed data; differences of 6% in fork length from left to right margin trap fish and 59% in wet weight, both during the day). In past years, the traps which have caught more fish (the two margin traps alternate in that regard) have also caught larger fish.

### Chinook 1+

The numbers of 1+ chinook estimated to have passed Diamond Island between April 2 and July 20 ranged from 7,975 for trap 3 to 32,999 for trap 1 **(Appendix 1)**. The total index number of 1+ chinook that passed Diamond Island, weighted by the average percent of river flow filtered by each trap, was 21,031.

There was a significant interaction between time of capture (day or night) and trap position for juvenile chinook 1+ **(Table 5)**: there were more fish caught at night, and the left trap caught significantly more fish in terms of absolute numbers and average per session (**Table 3, Figure 19**). Both juvenile 0+ and 1+ chinook thus tended use the middle of the river (where the left trap is located) more than the margins in 2003. This is the same trend observed in 2002, but opposed to 2001 when 0+ fish were caught in greater numbers along the margin (in the right margin trap).

Chinook 1+ morphological parameters (fork length, wet weight) were slightly smaller in the right margin trap (**Figure 20**; tests done on ln-transformed data). Only night catches were tested as there were only 61 fish caught during the day **(Table 3)**. There were differences of 3% and 14% among traps for fork length and wet weight, respectively.

### 0+ Chinook Salmon Growth

Lengths and weights of 0+ chinook captured at Diamond Island followed trajectories similar to those of electrofished 0+ chinook (**Figures 21** and **22**; compare with **Figures 6** and **7**). The first growth stanza ran from early April to early to around May 17 - 21, at which time the rate of fry emergence had dropped to a level that allowed the true population growth curve to become apparent. From May 13 to July 20, chinook 0+ grew at an average of 0.58 mm per day, based on night catches. This growth rate is similar to 2002 (0.59 mm per day), and greater than 2000 and 2001 when they grew at an average of 0.52 and 0.49 mm per day, respectively, from mid May until July 20.

**TABLE 4** Factorial ANOVA on numbers of juvenile chinook 0+ captured by rotary screw traps standardized by volume sampled, Nechako, 2003. Ln - transformed values

| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|---|---|---|---|---|---|
| Day/Night | 1 | 431.21 | 431.21 | 412.50 | <.0001 |
| Trap location | 2 | 16.55 | 8.28 | 7.92 | 0.000 |
| Day/Night x trap location | 2 | 33.71 | 16.86 | 16.12 | <.0001 |
| Residual | 651 | 680.53 | 1.05 | | |

**FIGURE 17** Mean numbers (± SE) of juvenile chinook 0+ caught in rotary screw traps, Nechako River, April 02- July 20, 2003. Night and dayu catches are significantly different for all traps, PLSD test on Ln - transformed values.

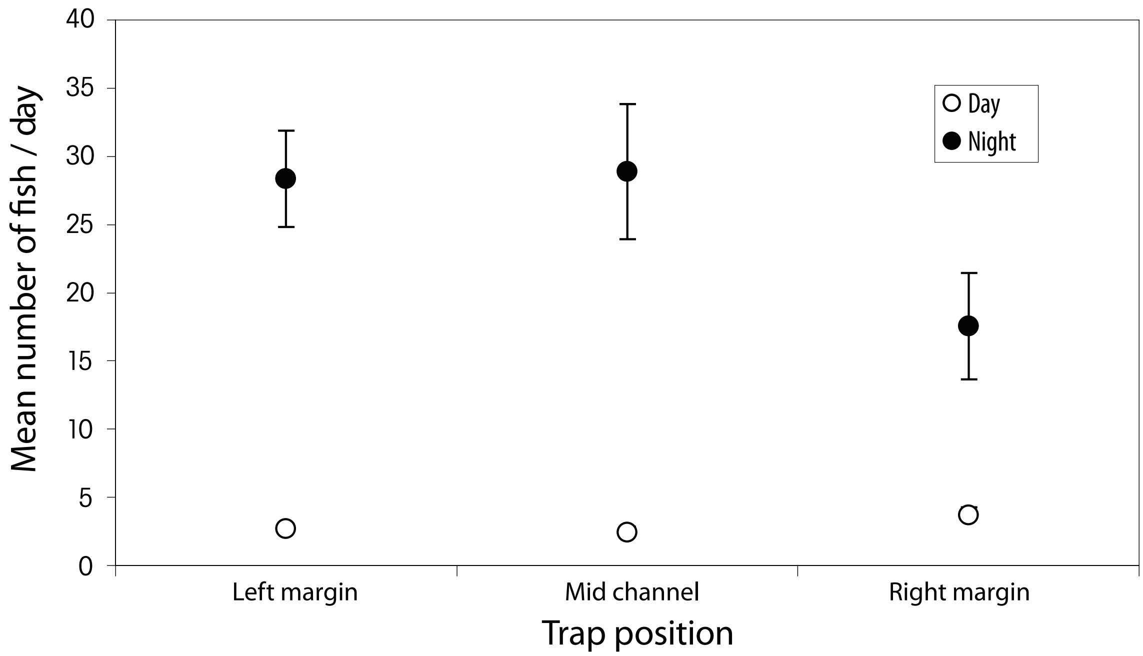


**FIGURE 18** **Mean fork length and wet weight of juvenile chinook salmon caught in rotary screw traps, Diamond Island, Nechako River, April – July**

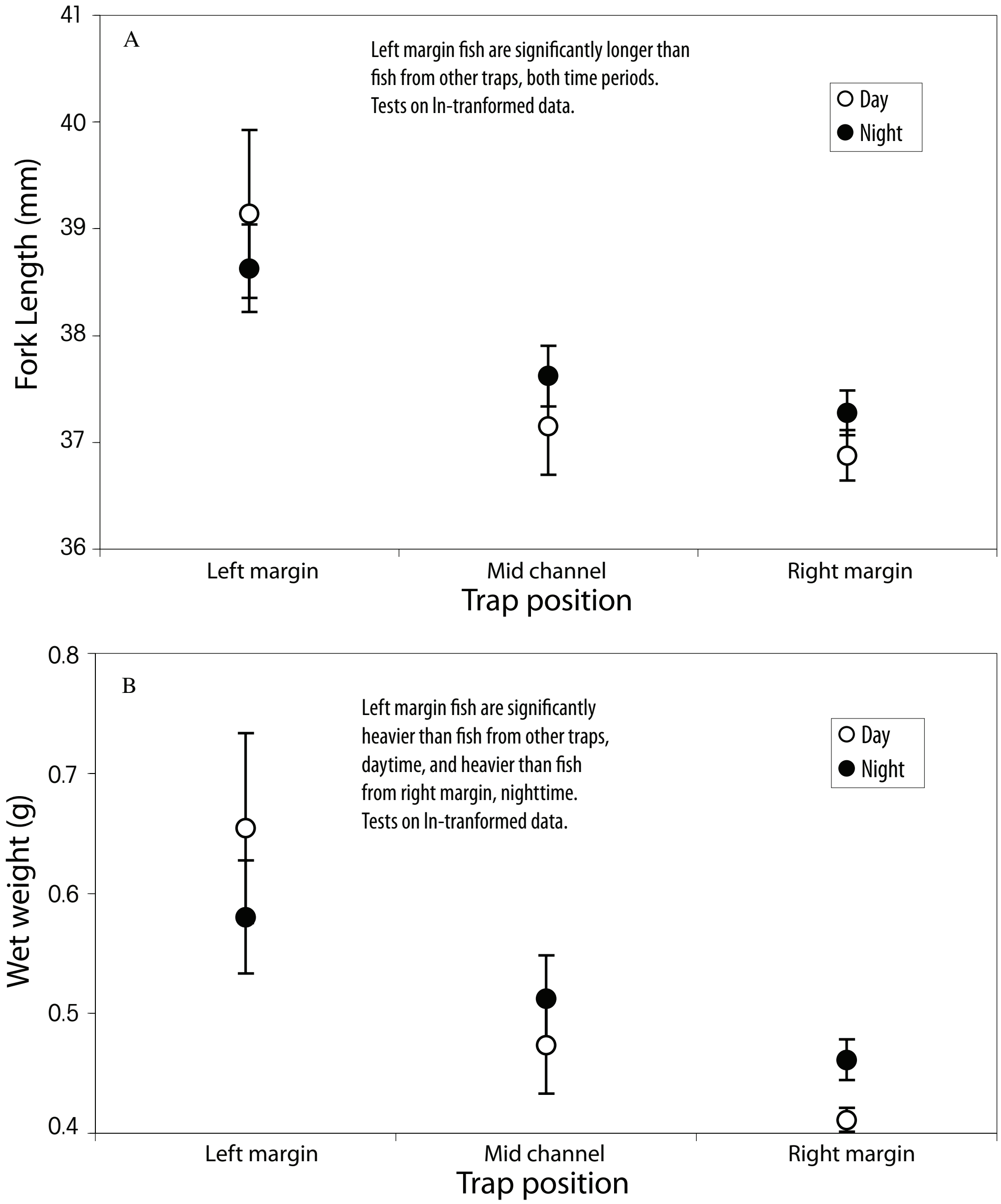
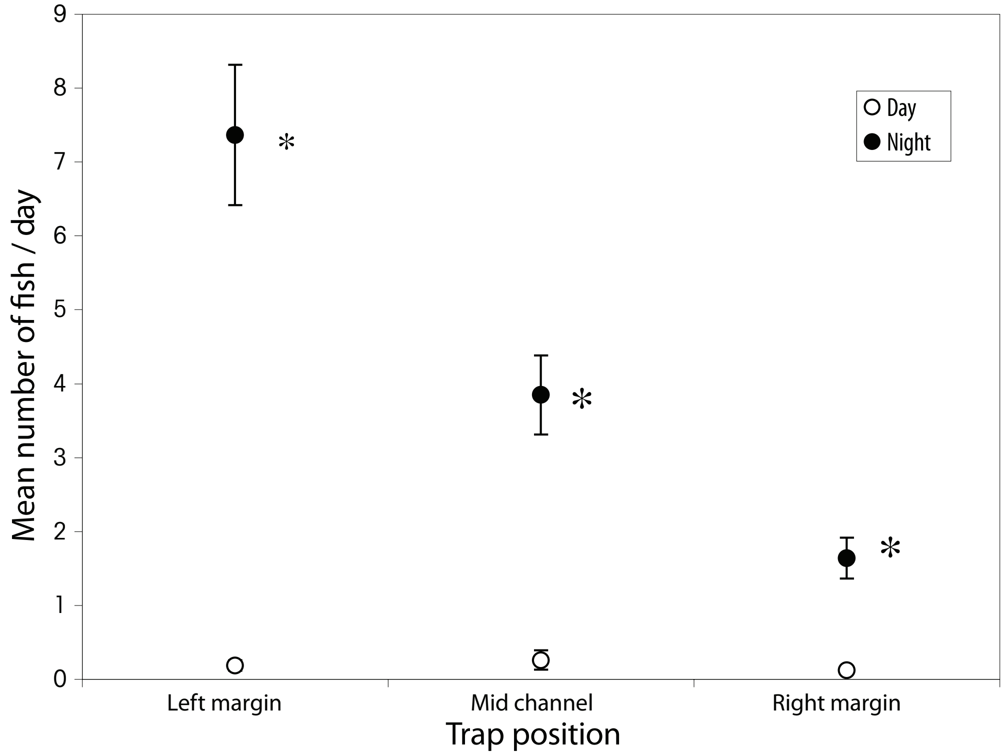



**TABLE 5** **Factorial ANOVA on numbers of juvenile chinook 1+ captured by rotary screw traps standardized by volume sampled, Nechako, 2003. Ln - transformed values**

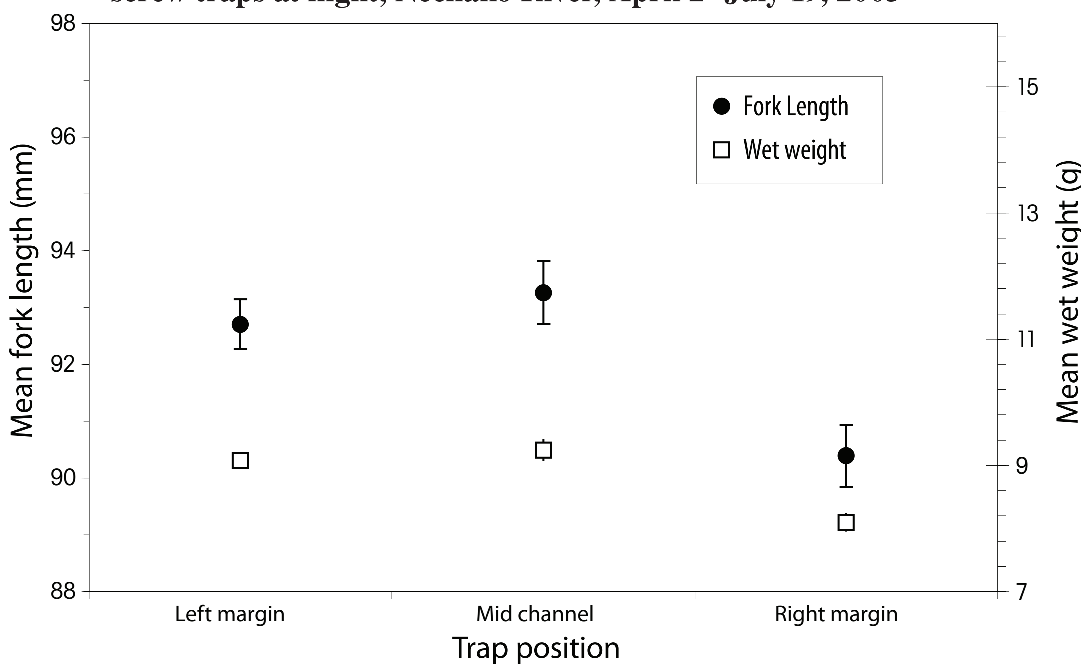
| | DF | Sum of Squares | Mean Square | F-Value | P-Value |
|---|---|---|---|---|---|
| Day/Night | 1 | 1121.19 | 1121.19 | 266.5 | <.0001 |
| Trap location | 2 | 103.54 | 51.77 | 12.3 | <.0001 |
| Day/Night x trap location | 2 | 83.56 | 41.78 | 9.931 | <.0001 |
| Residual | 651 | 2738.59 | 4.21 | | |

**FIGURE 19** **Mean numbers (± SE) of juvenile chinook 1+ caught in rotary screw traps, Nechako River, April 2- July 19, 2003**



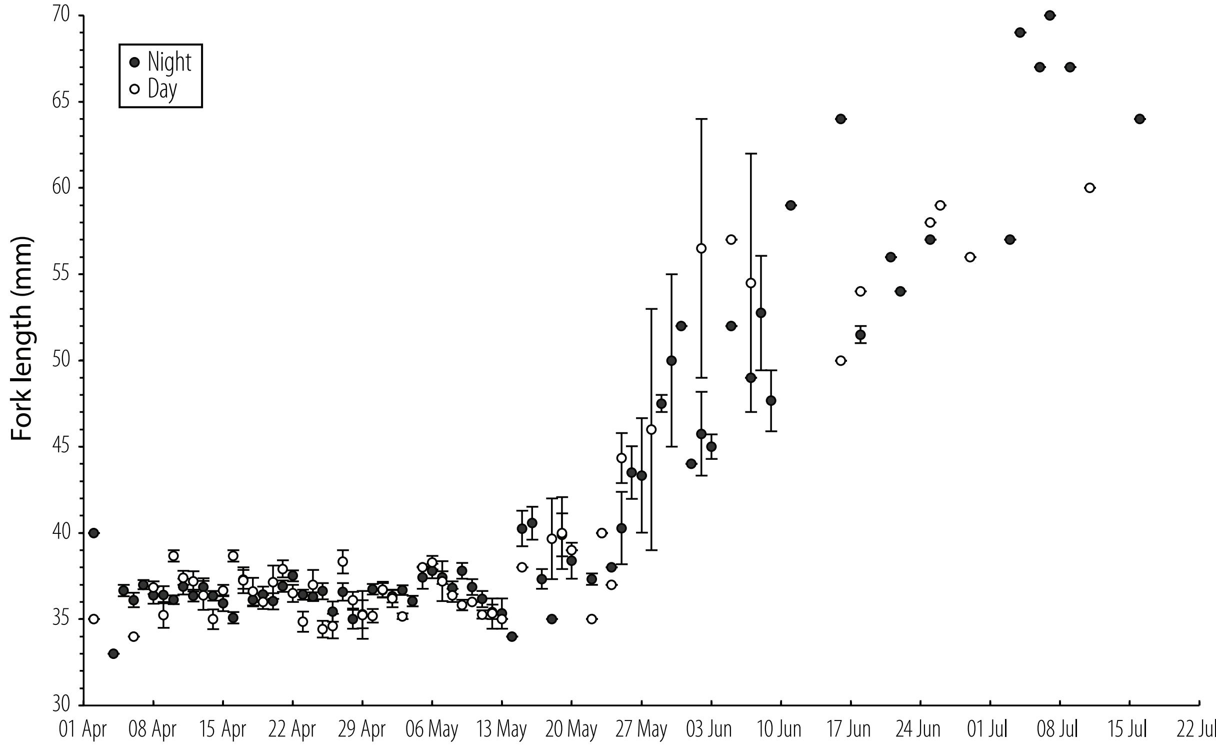

* significantly different from other traps during the same time period, PLSD test on L- transformed values

**FIGURE 20** **Mean fork length and wet weight (± SE) of juvenile chinook 1+ caught in rotary screw traps at night, Nechako River, April 2- July 19, 2003**

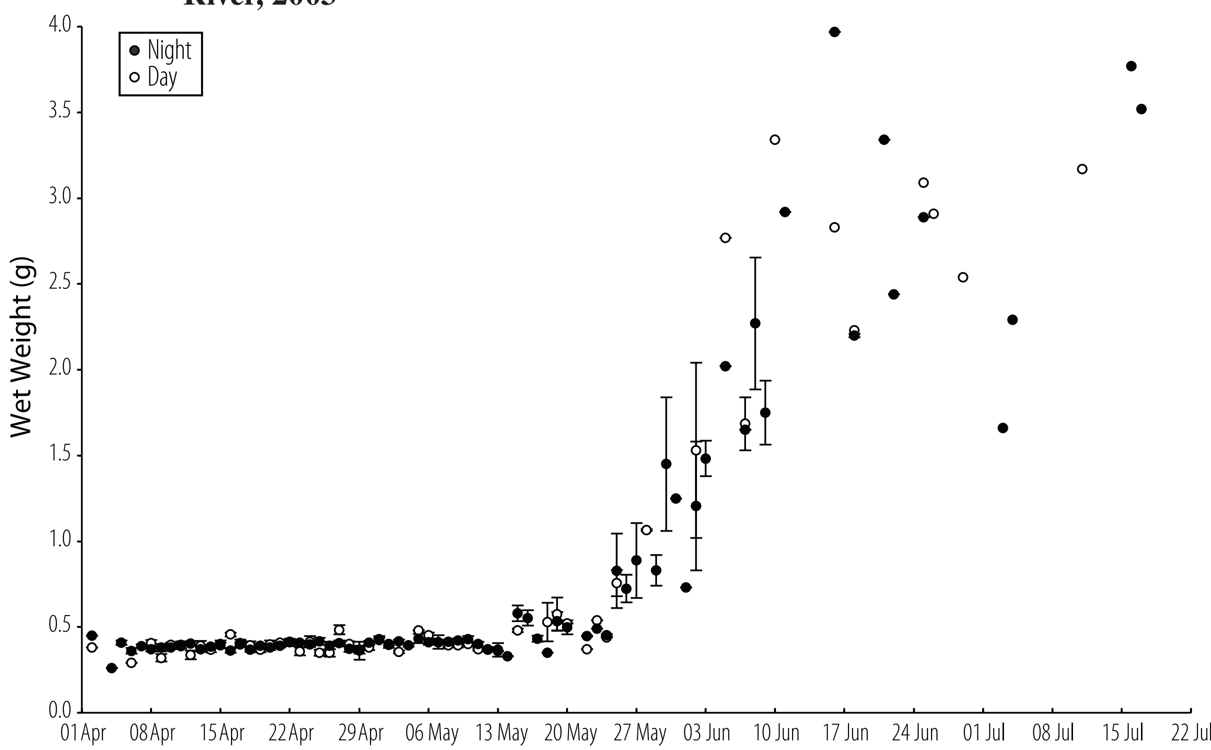



* significantly different from other traps, PLSD test on L- transformed values

## FIGURE 21 Mean length (±SE) of 0+ chinook salmon caught in rotary screw traps, Nechako River, 2003




## FIGURE 22 Mean weight (±SE) of 0+ chinook salmon caught in rotary screw traps , Nechako River, 2003



### 1+ Chinook Salmon Growth

The fork lengths and weights of 1+ chinook did not vary much with time of the year, suggesting the trigger for outmigration may be size dependent (**Figures 23** and **24**).

### 0+ and 1+ Chinook Salmon: Weight-Length Relationship

The regression of weight on length for trap-caught juvenile chinook salmon at Diamond Island (N = 2,065, Wt = $1.2^{-01}$ * $FL^{3.191}$) was similar to the regression for juvenile chinook salmon caught by electrofishing (N = 6,283, Wt = $1.3^{-01}$, Fork $Length^{3.449}$).

### 0+ and 1+ Chinook Salmon Condition

The trajectory of the average condition of 0+ chinook salmon was similar to that shown for electrofished fish — it hovered around 0.80 - 0.84 g/mm$^3$ over April and May (emerging fish) and climbed to an asymptote of 1.4 g/mm$^3$ in June and July. The average condition index of chinook 0+ was overall slightly higher in 2003 (0.83 - 1.4) than in 2002 (0.80 - 1.1). Condition of 1+ chinook also increased slightly with date from 1.08 g/mm$^3$ in late April to 1.23 g/mm$^3$ in July.

In summary, electrofishing surveys and rotary screw trap catches measured similar trends in length, weight and condition of juvenile chinook salmon in the upper Nechako River in 2003. The curvature of the growth curves of 0+ chinook indicated that emergence had ceased by late May (earlier than in 2002) and that growth was rapid over June and July.

**FIGURE 23** **Mean (±1 SE) length of 1+ chinook salmon, Nechako River, 2003, from rotary screw traps**

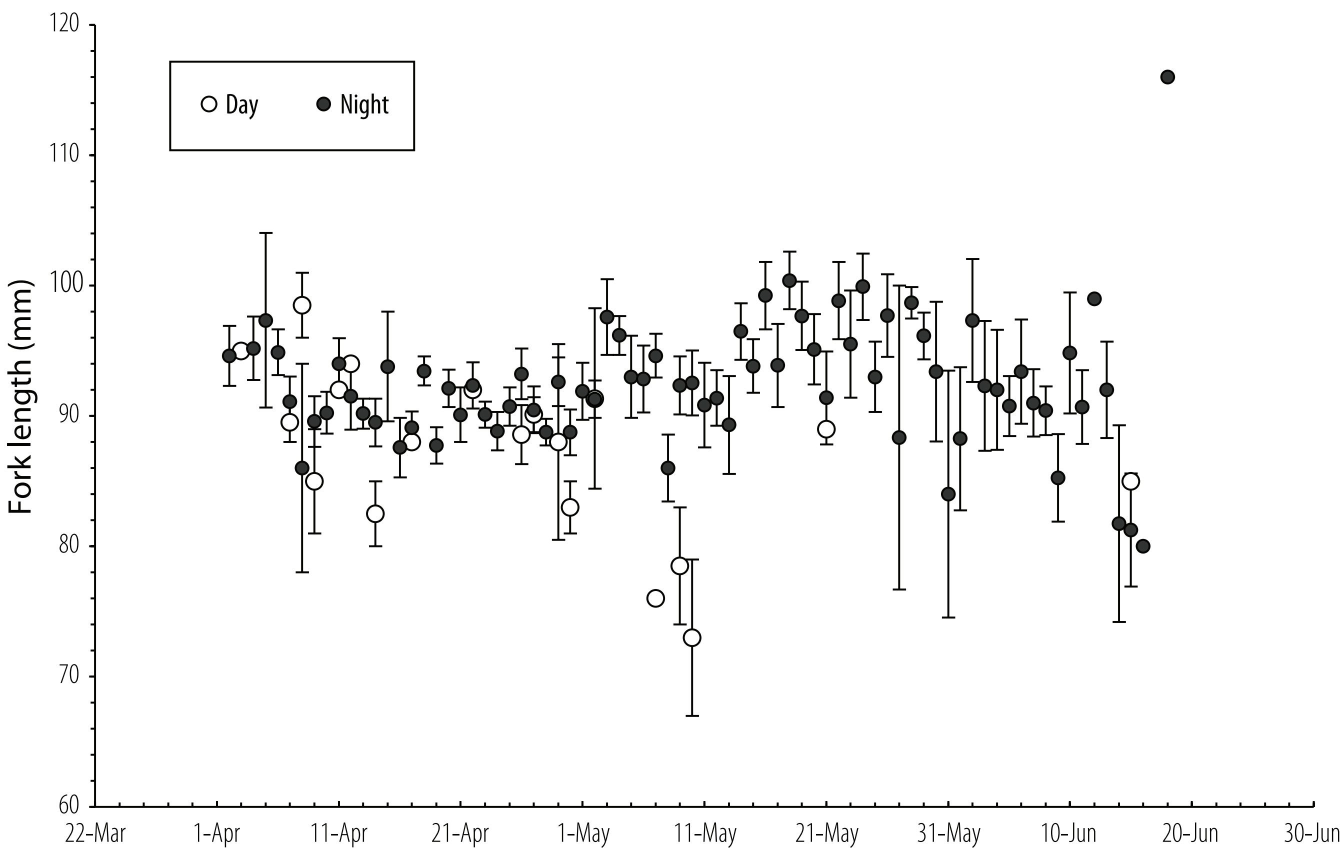
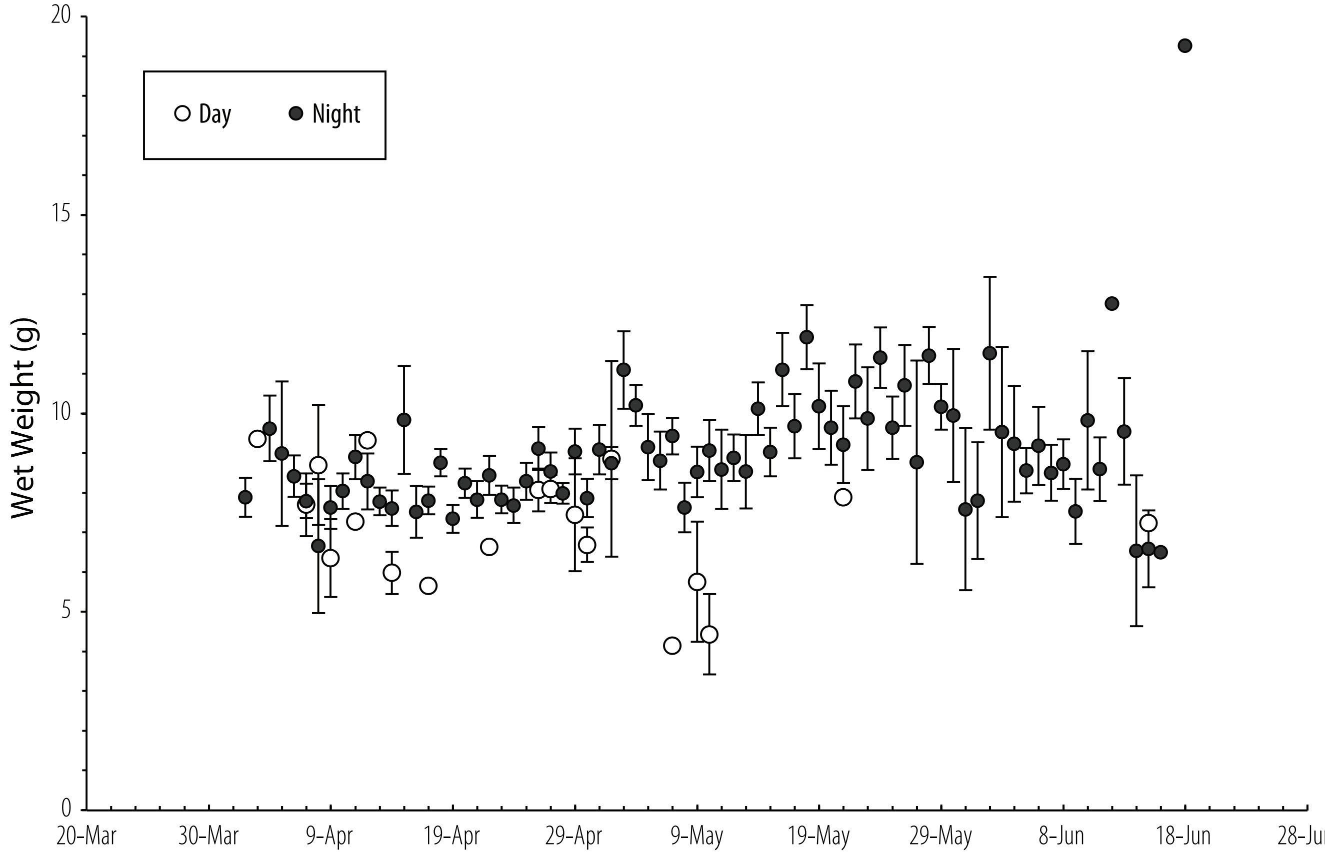


**FIGURE 24** **Mean (±1 SE) weight of 1+ chinook salmon, Nechako River, 2003, from rotary screw traps**




## 3.4 Catches

### *3.4.1 Electrofishing/All Species*

In total, 1,218 electrofishing sweeps were made along the margins of the upper Nechako River from April 2 to November 15, 2003: 616 during daylight and 602 at night. The average area covered by a sweep was 133 m$^2$ (median 120 m$^2$, range = 60 to 1,600 m$^2$). Most of the sweeps were less than 200 m$^2$ in area. The greatest amount of effort directed to a single site was applied, as in previous years, to RM17.9, a 1600 m$^2$ side channel that was found to contain many fish. Effort at individual sites ranged from 66 seconds (at a site mostly covered with shore ice) to 1708 seconds (at the 1,600 m$^2$ side channel site). The average effort per site was 251 seconds.

Overall, 43,492 fish from 13 species or families were captured and then released **(Table 6)**. This is a decrease from last year, when 54,646 fish were caught. Chinook salmon were, as usual, the most common species (N = 25,025) accounting for 58% of the total catch (compared to 49% in 2001 and 65% in 2002), followed by longnose dace (N = 4,962 or 11%) and redside shiner (N = 3,577 or 8%). Coho salmon and peamouth chub were the least common species (N = 4 and 3, respectively).

### *3.4.2 Electrofishing/0+ Chinook*

Overall, 24,435 0+ chinook were captured by electrofishing **(Table 6)**, of which 5,909 or 24% were taken during daylight. CPUE of electrofishing catches of 0+ chinook ranged from 0 to 379 fish/100 m$^2$.

#### Temporal Distribution of CPUE

CPUEs of 0+ chinook salmon peaked in May for day and night catches, and then decreased through to November **(Table 7)**.

## TABLE 6 Fish captured in electroshocking passes in the upper Nechako River, 2003

| | | Adult | | | | Juvenile | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Common Name | Scientific Name | Day | Night | Total | Percent | Day | Night | Total | Percent | Day | Night | Total | Percent |
| Chinook salmon | *Oncorhynchus tshawytscha*[1] | 108 | 482 | 590 | 1.4 | 5,909 | 18,526 | 24,435 | 56.2 | 6,017 | 19,008 | 25,025 | 57.5 |
| Longnose dace | *Rhinichthys cataractae* | 331 | 97 | 428 | 1.0 | 3,660 | 874 | 4,534 | 10.4 | 3,991 | 971 | 4,962 | 11.4 |
| Redside shiner | *Richardsonius balteatus* | 308 | 390 | 698 | 1.6 | 1,120 | 1,759 | 2,879 | 6.6 | 1,428 | 2,149 | 3,577 | 8.2 |
| Largescale sucker | *Catostomus macrocheilus* | 9 | 7 | 16 | 0.0 | 1,515 | 1,521 | 3,036 | 7.0 | 1,524 | 1,528 | 3,052 | 7.0 |
| Leopard dace | *Rhinichthys falcatus* | 225 | 204 | 429 | 1.0 | 1,213 | 953 | 2,166 | 5.0 | 1,438 | 1,157 | 2,595 | 6.0 |
| Northern pikeminnow | *Ptychocheilus oregonensis* | 2 | 11 | 13 | 0.0 | 755 | 1,304 | 2,059 | 4.7 | 757 | 1,315 | 2,072 | 4.8 |
| Sculpins (General) | *Cottidae* | 127 | 117 | 244 | 0.6 | 620 | 745 | 1,365 | 3.1 | 747 | 862 | 1,609 | 3.7 |
| Mountain whitefish | *Prosopium williamsoni* | 1 | 12 | 13 | 0.0 | 19 | 358 | 377 | 0.9 | 20 | 370 | 390 | 0.9 |
| Rainbow trout | *Oncorhynchus mykiss* | 3 | 2 | 5 | 0.0 | 24 | 83 | 107 | 0.2 | 27 | 85 | 112 | 0.3 |
| Sockeye salmon | *Oncorhynchus nerka1* | 0 | 0 | 0 | 0.0 | 13 | 45 | 58 | 0.1 | 13 | 45 | 58 | 0.1 |
| Burbot | *Lota lota* | 0 | 1 | 1 | 0.0 | 6 | 26 | 32 | 0.1 | 6 | 27 | 33 | 0.1 |
| Coho salmon | *Oncorhynchus kisutch* | 0 | 3 | 3 | 0.0 | 1 | 0 | 1 | 0.0 | 1 | 3 | 4 | 0.0 |
| Peamouth chub | *Mylocheilus caurinus* | 0 | 0 | 0 | 0.0 | 3 | 0 | 3 | 0.0 | 3 | 0 | 3 | 0.0 |
| **Totals** | | **1,114** | **1,326** | **2,440** | **5.6** | **14,858** | **26,194** | **41,052** | **94.4** | **15,972** | **27,520** | **43,492** | **100.0** |

[1] "adult" = 1+ fish in this case

## TABLE 7 Mean electrofishing catch-per-unit-effort (CPUE, number/100 m2) of juvenile chinook salmon, Nechako River, 2003. N = number of date/site combinations electrofished (same for both ages)

| | Number of fish | | | 0+ CPUE | | 1+ CPUE | |
|---|---|---|---|---|---|---|---|
| Date | 0+ | 1+ | N | mean | SD | mean | SD |
| **Day** | | | | | | | |
| Apr | 750 | 94 | 106 | 5.9 | 7.1 | 0.8 | 2.2 |
| May | 3,830 | 13 | 137 | 22.6 | 26.7 | 0.1 | 0.3 |
| Jun | 777 | 1 | 137 | 3.5 | 12.7 | 0.0 | 0.1 |
| Jul | 472 | 0 | 137 | 1.9 | 7.7 | 0.0 | 0.0 |
| Nov | 80 | 0 | 99 | 0.7 | 1.4 | 0.0 | 0.0 |
| sum | 5,909 | 108 | | | | | |
| **Night** | | | | | | | |
| Apr | 2,505 | 416 | 101 | 20.4 | 26.6 | 3.6 | 5.9 |
| May | 10,088 | 57 | 137 | 59.3 | 66.9 | 0.4 | 0.8 |
| Jun | 4,032 | 7 | 137 | 22.2 | 31.5 | 0.0 | 0.2 |
| Jul | 1,794 | 2 | 137 | 9.9 | 16.0 | 0.0 | 0.1 |
| Nov | 107 | 0 | 80 | 1.1 | 2.1 | 0.0 | 0.0 |
| sum | 18,526 | 482 | | | | | |
| **Total** | **24,435** | **590** | | | | | |

#### Spatial Distribution of CPUE

Based on the relative distributions of CPUE per month, newly emergent chinook salmon (April) were spread in the middle river (**Figure 25** and **Appendix 2**), which is different from previous years when they usually concentrate in the upper portion at that time of year. Over the next two months (May to June), the fish spread themselves throughout the river, although relative abundances were higher at the two ends (10 - 30 km and 5080 km downstream of Kenny Dam). This may indicate both active upstream migration of juveniles, presumably in search of rearing habitat, as well as downstream movement of outmigrating juveniles. As in previous years, relative increases in CPUE in Reach 1 in July indicate active immigration to this river section while CPUE values in all other river sections decreased at the same time. Although river conditions in Reaches 1 and 4 precluded thorough sampling during November, CPUE values were at their lowest since April for the rest of the river. Nevertheless the distribution pattern appears similar to that of the previous year.

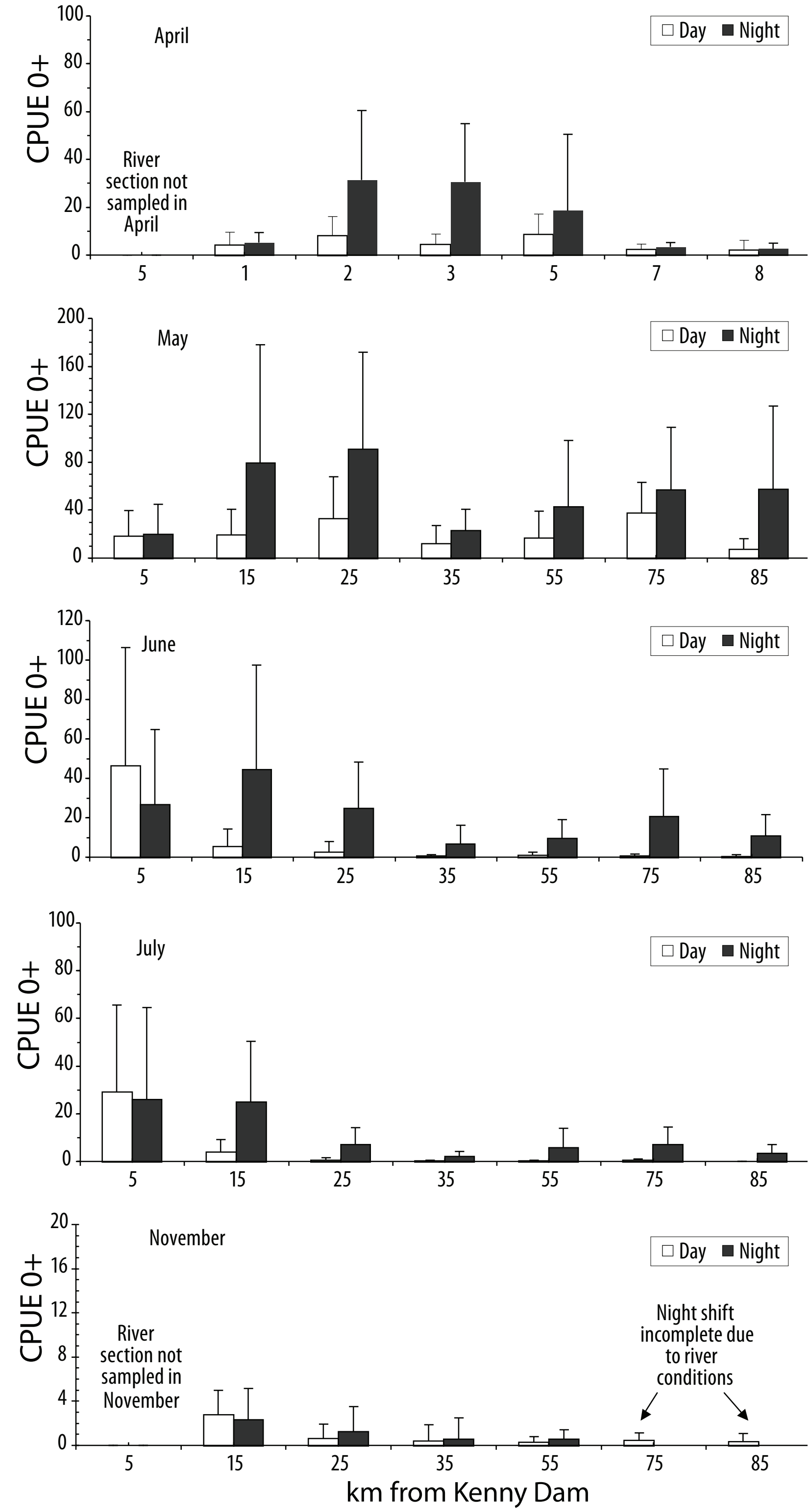
### *3.4.3 Electrofishing/1+ Chinook*

Overall, of the 590 1+ chinook that were captured by electrofishing **(Table 6)**, most (82%) were caught at night. CPUE of 1+ chinook ranged from 0.0 to 30 fish/100 m$^2$, and decreased rapidly with date **(Appendix 2)**.

### *3.4.4 Diamond Island Rotary Screw Traps/ Incidental Species*

Overall, 15,310 fish from 12 species or families were captured by the rotary screw traps in 2003 **(Table 8)**. Chinook salmon were the most common species, making up 70% of all fishes. The five most common non-salmonid fishes were largescale sucker, leopard dace, redside shiner, northern pikeminnow and mountain whitefish. The ranking of the species was different from that reported for the electrofishing surveys, but as in

**FIGURE 25** **Mean (+ 1 SD) monthly catch-per-unit-effort (CPUE, in fish caught per 100 m2) of 0+ chinook salmon, Nechako River, 2003: electrofishing. No sampling in the 40 - 49.9 km area.**



## TABLE 8 Fish captured in the rotary screw traps in the upper Nechako River, 2003

| Common Name | Scientific Name | Adult | | | | Juvenile | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Day | Night | Total | Percent | Day | Night | Total | Percent | Day | Night | Total | Percent |
| Chinook salmon | *Oncorhynchus tshawytscha*[1] | 61 | 1,413 | 1,474 | 9.6 | 947 | 8,227 | 9,174 | 59.9 | 1,008 | 9,640 | 10,648 | 69.5 |
| Largescale sucker | *Catostomus macrocheilus* | 3 | 14 | 17 | 0.1 | 57 | 965 | 1,022 | 6.7 | 60 | 979 | 1,039 | 6.8 |
| Leopard dace | *Rhinichthys falcatus* | 16 | 373 | 389 | 2.5 | 29 | 446 | 475 | 3.1 | 45 | 819 | 864 | 5.6 |
| Redside shiner | *Richardsonius balteatus* | 3 | 94 | 97 | 0.6 | 72 | 522 | 594 | 3.9 | 75 | 616 | 691 | 4.5 |
| Northern pikeminnow[2] | *Ptychocheilus oregonensis* | 0 | 12 | 12 | 0.1 | 83 | 499 | 582 | 3.8 | 83 | 511 | 594 | 3.9 |
| Rocky mountain whitefish | *Prosopium williamsoni* | 0 | 7 | 7 | 0.1 | 42 | 543 | 585 | 3.8 | 42 | 550 | 592 | 3.9 |
| Sockeye salmon | *Oncorhynchus nerka1* | 0 | 1 | 1 | 0.0 | 24 | 366 | 390 | 2.5 | 24 | 367 | 391 | 2.6 |
| Rainbow trout | *Oncorhynchus mykiss* | 1 | 4 | 5 | 0.0 | 2 | 179 | 181 | 1.2 | 3 | 183 | 186 | 1.2 |
| Longnose dace | *Rhinichthys cataractae* | 4 | 51 | 55 | 0.4 | 11 | 107 | 118 | 0.8 | 15 | 158 | 173 | 1.1 |
| Peamouth chub | *Mylocheilus caurinus* | 0 | 0 | 0 | 0.0 | 9 | 87 | 96 | 0.6 | 9 | 87 | 96 | 0.6 |
| Sculpins (General) | *Cottidae* | 2 | 3 | 5 | 0.0 | 7 | 22 | 29 | 0.2 | 9 | 25 | 34 | 0.2 |
| Burbot | *Lota lota* | 0 | 1 | 1 | 0.0 | 0 | 1 | 1 | 0.0 | 0 | 2 | 2 | 0.0 |
| **Total** | | **90** | **1,973** | **2,063** | **13.5** | **1,283** | **11,964** | **13,247** | **86.5** | **1,373** | **13,937** | **15,310** | **100.0** |

[1] "adult" = 1+ fish in this case

[2] previously known as "northern squawfish" (Nelson et al. 1998).

the latter, juveniles were the most abundant life history stage. Electrofishing surveys sampled a greater and probably more representative proportion of the species inhabiting the Nechako River: they covered a greater area and more diverse habitats. This was backed by the greater species evenness[1] of the latter: 0.17 for rotary screw traps sampling and 0.23 for electrofishing (Simpson's measure of evenness; Krebs 1999). Both measures were greater than the previous year (0.11 for 2002 for rotary screw traps and 0.19 for electrofishing); however, 2002 had lower than average values likely due to the dominance and abundance of chinook in that year (2002 had the greatest index of outmigration on record).

## 3.5 Comparisons with Previous Years

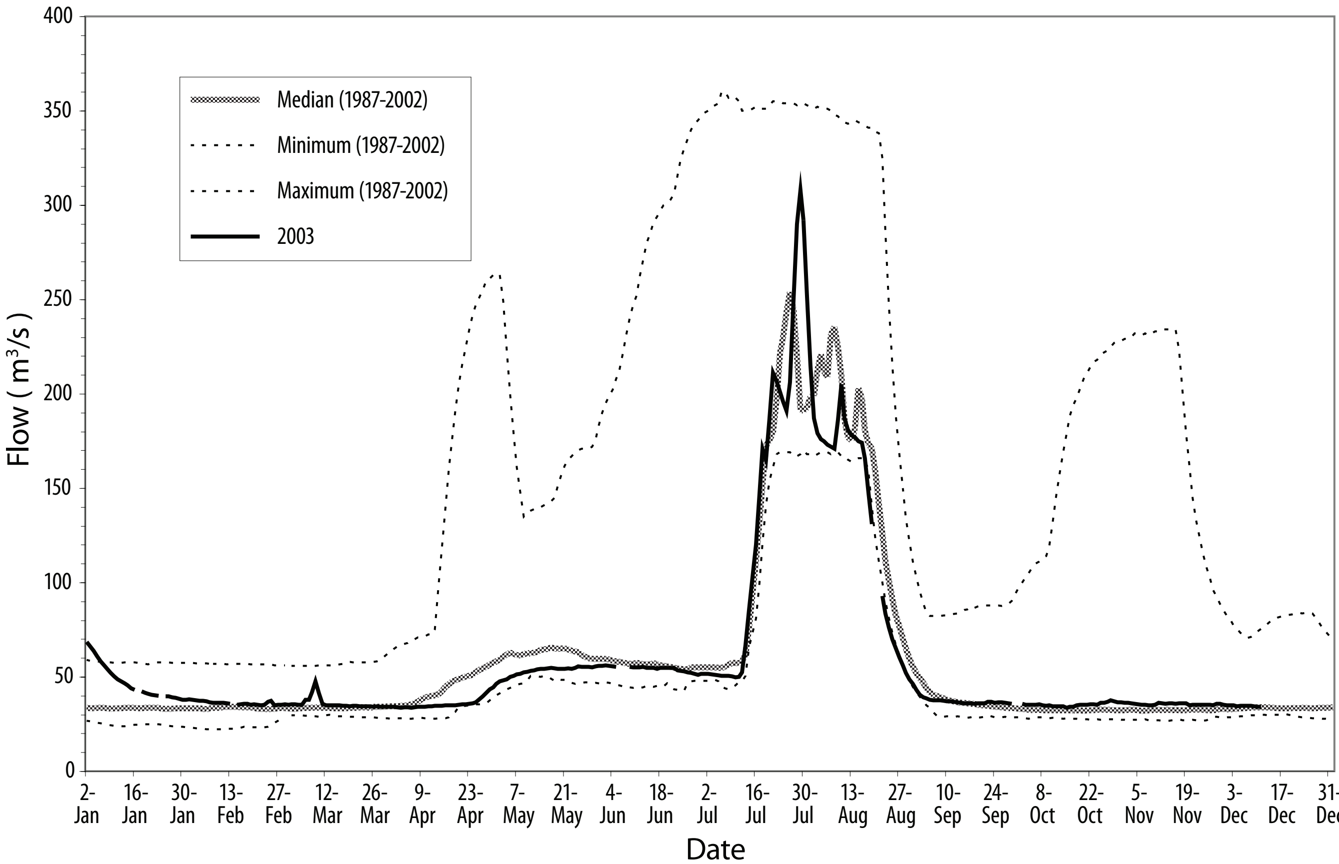
### *3.5.1 Temperature*

Mean daily water temperatures at Bert Irvine's Lodge in 2003 were for the most part very close to the average observed in the previous 13 years **(Figure 3)**. Temperatures in the upper Nechako River in 2003 exceeded 18°C on three separate days (July 13, August 16, and August 17).

### *3.5.2 Flows*

Daily flows of the upper Nechako River at Cheslatta Falls in 2003 were close to the 16-year median (1987 - 2002) for most of the year, except for late April - early May and late August when they were closer to the 15-year minimum **(Figure 26)**.

**FIGURE 26** **Comparison of mean, maximum and minimum daily flow of the Nechako River at Cheslatta Falls in 2003 with flows for the years 1987 to 2002. Data for 2003 still preliminary and incomplete.**




[1] Species evenness is the proportional representation of species within the sampled community, evenness being greatest when all species have equal representation (Krebs 1999).

Cumulative daily flows for 2003 were some of the lowest on record **(Figure 27)**, most likely due to the small natural spring freshet and the absence of any forced spills in fall and winter.

### *3.5.3 Growth of 0+ Chinook Salmon*

Mean fork length of 0+ chinook salmon electrofished in 2003 ranged from 37 mm in April to 87 mm in November, while mean wet weight ranged from 0.42 g in April to 8.01 g in November. Both mean fork length and mean wet weight were almost identical to the 14-year average (1989 - 2002) in April, May, June and July, but slightly below the 14-year average in November. The condition index for 0+ chinook salmon ranged from 0.83 in May to 1.25 in both June and July. Condition index values were consistently above the 14-year average for all months **(Figure 28)**.

Mean fork length of 0+ chinook salmon caught in rotary screw trap catches in 2003 ranged from 36 mm in April to 69 mm in July, while mean wet weight ranged from 0.4 g in April and May to 4.0 g in July. Both mean fork length and mean wet weight were almost identical to the average for the last 12 years (1991- 2002). The condition index for chinook caught in rotary screw catches at Diamond Island ranged from 0.9 in April to 1.2 in July, values that are also almost identical to the previous 12-year average **(Figure 29)**.

### *3.5.4 Outmigration index*

Daily indices (the sum of day and night catches for each day) of chinook outmigration measured at Diamond Island in 2003 were within the range observed in most of the previous twelve years **(Figure 30)**, with the exception of 2002 which represented the largest cohort of outmigrating juvenile chinook on record.

**FIGURE 27** **Cumulative flows of the Nechako River at Cheslatta Falls, 1987 to 2003. Data for 2003 preliminary and missing from Dec. 12 until the end of the year.**

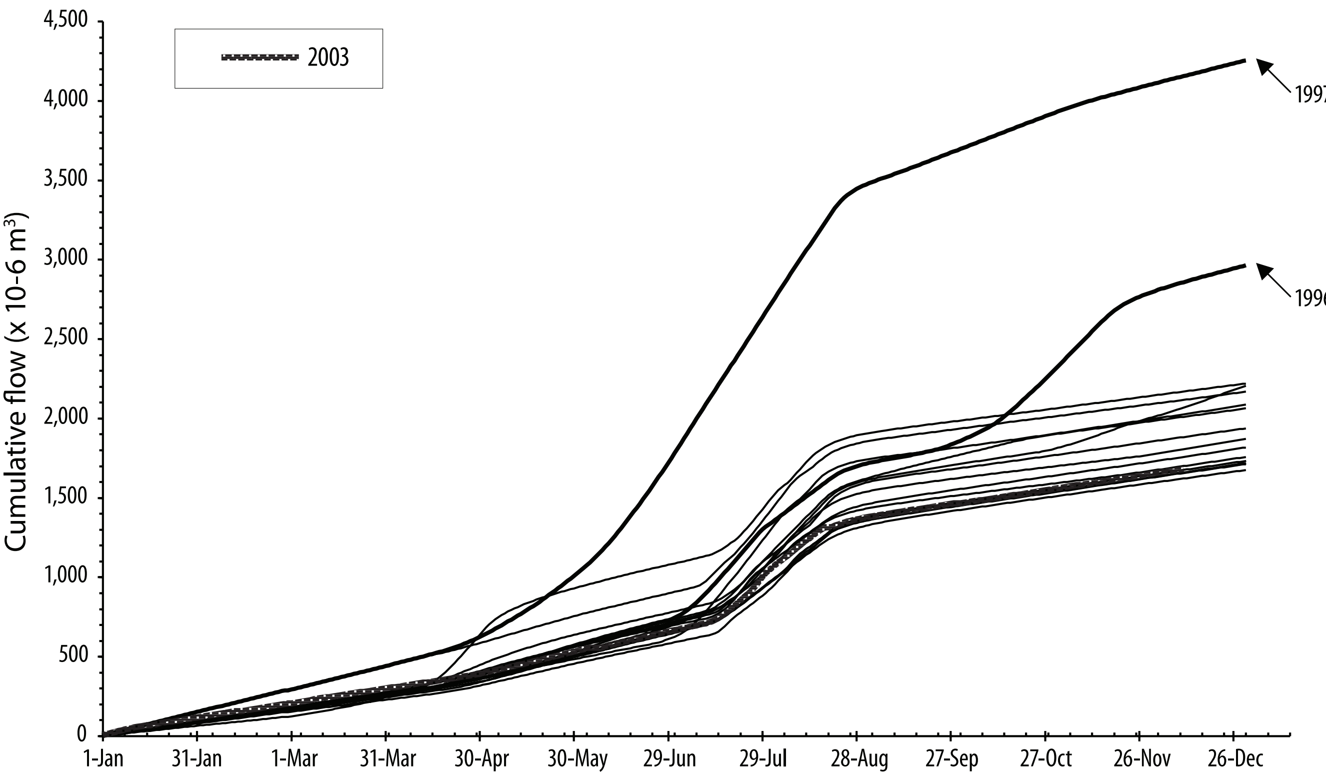


**FIGURE 28** **Comparison of mean size of 0+ chinook in the upper Nechako River in 2003 with mean, minimum and maximum size for 1989 to 2002 (electrofishing)**

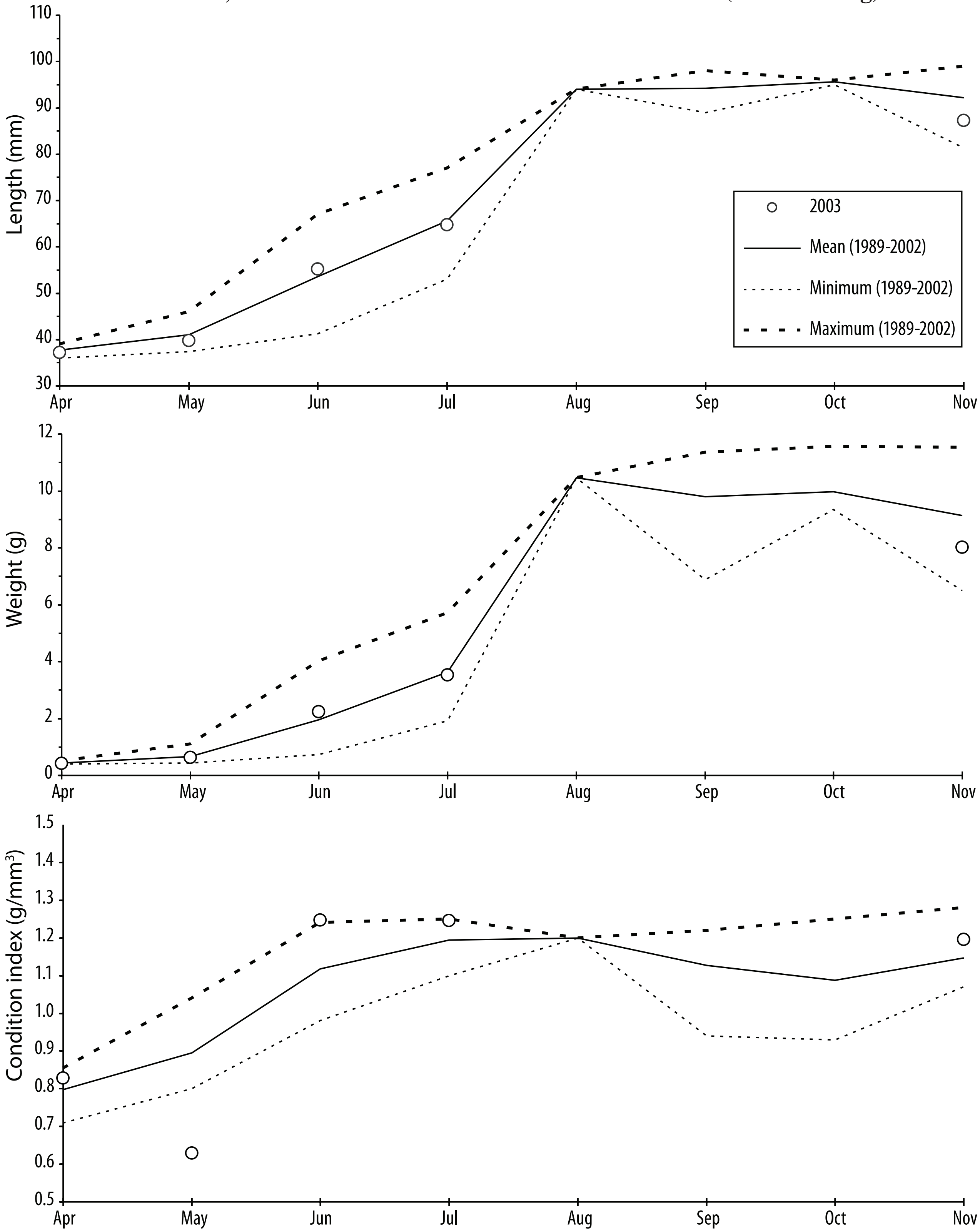


**FIGURE 29** **Comparison of mean size of 0+ chinook in the upper Nechako River in 2003 with mean, minimum and maximum size for 1991 to 2002 (Rotary Screw Traps)**

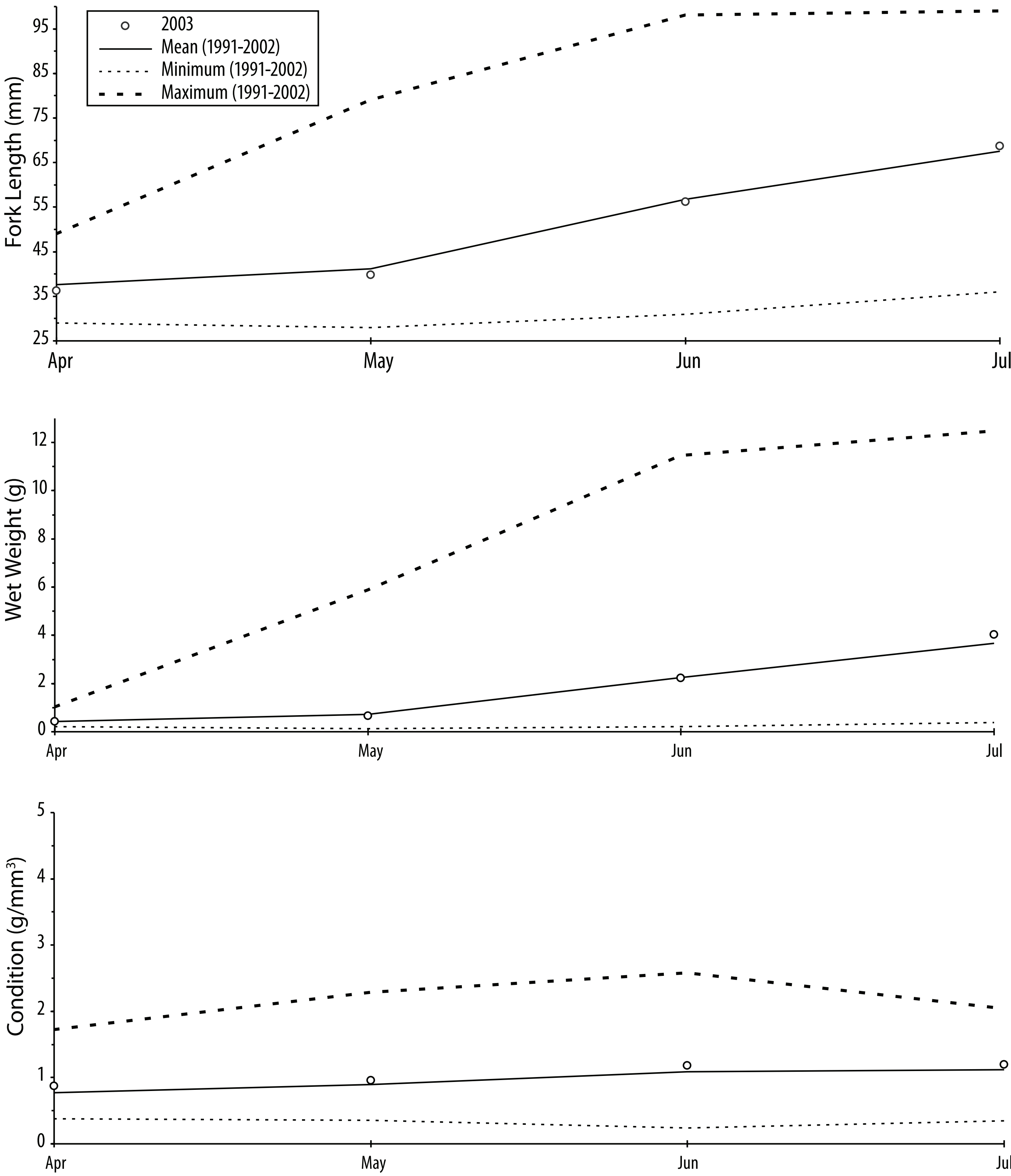
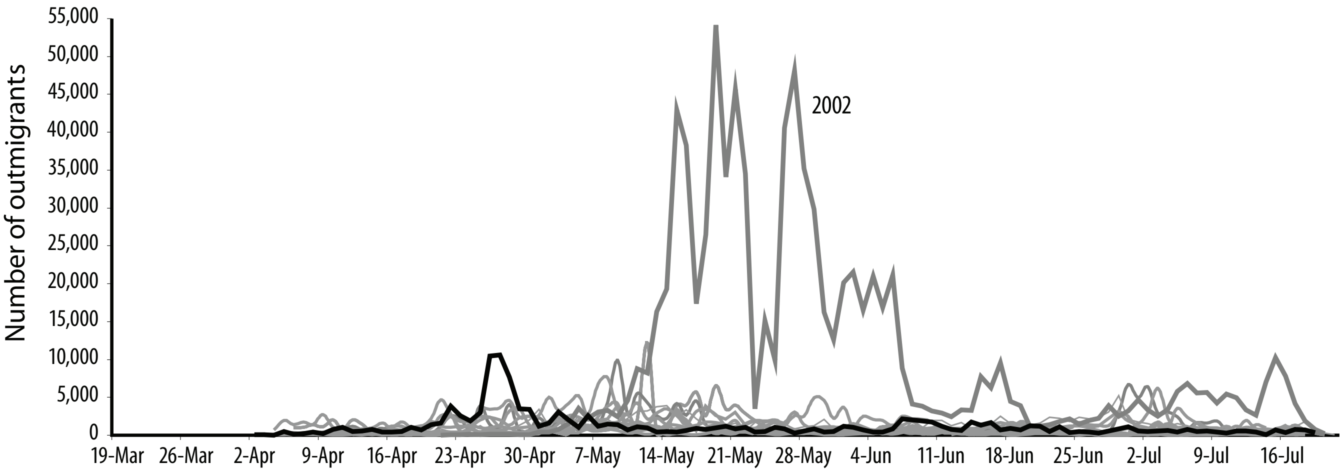
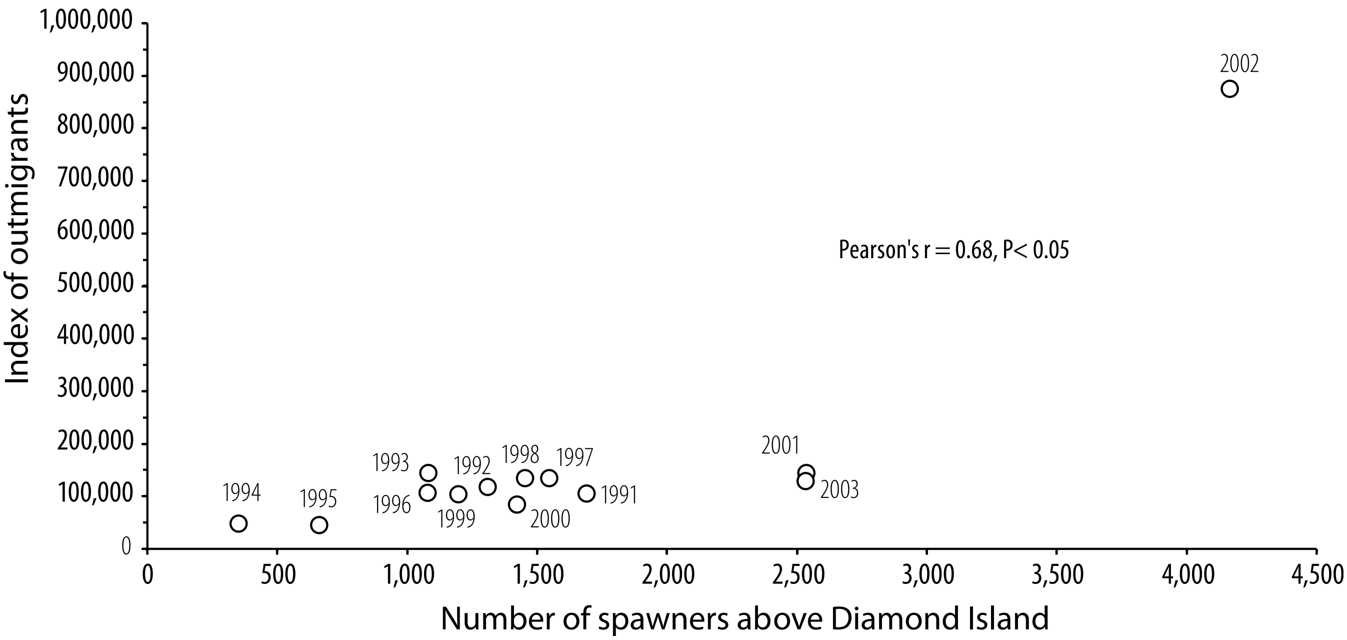


FIGURE 30 **Daily indices of chinook 0+ outmigrants, Diamond Island, Nechako River, 1991 to 2003. Dark line is 2003.**




The index of outmigration of 0+ chinook that passed Diamond Island between April and July of each year from 1992 to 2003 was significantly and positively correlated with the number of adults that spawned upstream of Diamond Island from 1991-2002 (**Figure 31**). The similar number of spawners in the fall of 2000 and 2002 (2001 and 2003 data points of **Figure 31**) resulted in similar index values, confirming that the index of outmigration reflects real biological processes.

FIGURE 31 **Index of chinook salmon 0+ outmigrants calculated from rotary screw traps vs. the number of spawners above Diamond Island the previous year, Nechako River 1991-2003**



### 3.5.5 *Conclusions*

The calculated index of juvenile outmigration for chinook in the upper Nechako River appeared to reflect the biological processes as evidenced by the continued strong relationship between spawners returning to the system and juveniles leaving the system. The strength of the spawner/fry relationship, as well as the consistent trends of morphological characteristics of rearing fry, indicate a stable rearing environment capable of supporting the population of juveniles resulting from a spawner returns that do not exceed the upper range defining the Conservation Goal. It should be noted that these results do not rule out density dependent effects for juveniles that may occur as a result of spawner returns that exceed the upper range of the Conservation Goal.

## 4.0 REFERENCES


*Bohlin, T., S. Haurin, T.G. Heggberget, G. Rasmussen, and S.J. Saltveit. 1989. Electrofishing — theory and practice with special emphasis on salmonids. Hydrobiologia 173: 9-43.*

*Bohlin, T., T.G. Heggberget, and C. Strange. 1990. Electric fishing for sampling and stock assessment, p. 112-139. In Fishing with electricity: applications in freshwater fisheries management. Edited by I.C. Cowx and P. Lamarque. Fishing News Books, Oxford, U.K.*

*Coble, D.W. 1992. Predicting population density of largemouth bass from electrofishing catch per effort. North American Journal of Fisheries Management 12: 650-652.*

*Crozier, W.W., and G.J.A. Kennedy. 1995. Application of a fry (0+) abundance index, based on semi-quantitative electrofishing, to predict Atlantic salmon smolt runs in the River Bush, Northern Ireland. Journal of Fish Biology 47: 107-114.*

*DeVries, M.R., M.J. Van Den Ayle, and E.R. Gilliland. 1995. Assessing shad abundance: Electrofishing with active and passive fish collection. North American Journal of Fisheries Management 15: 891-897.*

*Edwards, C.M., R.W. Drenner, K.L. Gallo, and K.E. Rieger. 1997. Estimation of population density of largemouth bass in ponds by using mark-recapture and electrofishing catch per effort. North American Journal of Fisheries Management 17: 719-725.*

*Envirocon Ltd. 1984. Environmental studies associated with the proposed Kemano Completion Hydroelectric Development. Volumes 1 to 22. Prepared for the Aluminum Company of Canada, Vancouver, B.C.*

*Hall, T.J. 1986. Electrofishing catch per hour as an indicator of largemouth bass density in Ohio impoundments. North American Journal of Fisheries Management 6: 397-400.*

*Krebs, C.J. 1999. Ecological Methodology. Second edition. Addison Wesley Longman, Inc. Menlo Park.*

*McInerny, M.C., and D.J. Degan. 1993. Electrofishing catch rates as an index of largemouth bass population density in two large reservoirs. North American Journal of Fisheries Management 13: 223-228.*

*Miranda, L.E. W.D. Hubbard, S. Sangare, and T. Holman. 1996. Optimizing electrofishing sample duration for estimating relative abundance of largemouth bass in reservoirs. North American Journal of Fisheries Management 16: 324331.*

*Nechako River Project. 1987. Studies of juvenile chinook salmon in the Nechako River, British Columbia - 1985 and 1986. Canadian Manuscript Report of Fisheries and Aquatic Sciences 1954.*

*Nelson, J.S., E.J. Crossman, H. Espinosa-Perez, C.R. Gilbert, R.N. Leo, and J.D. Williams. 1998. Recommended changes in common fish names: Pikeminnow to replace squawfish (*Ptychocheilus *spp.). Fisheries 23: 37.*

*Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research Board of Canada 191.*

*R.L.&L. Environmental Services Ltd. 1994. Fish stock and habitat assessments for the Columbia River below Revelstoke Canyon Dam. Report prepared for the Environmental Resources Division of B.C. Hydro, Vancouver, B.C.*

*Serns, S.L. 1982. Relationship of walleye fingerling density and electrofishing catch per effort in northern Wisconsin lakes. North American Journal of Fisheries Management 2: 38-44.*

*Sokal, R.R., and Rohlf, F.J. 1981. Biometry. 2nd edition. W.H. Freeman and Company, New York.*

*Van Den Ayle, M.J., J. Boxrucker, P. Michaeletz, B. Vondracek, and G.R. Ploskey. 1995. Comparison of catch rate, length distribution, and precision of six gears used to sample reservoir shad populations. North American Journal of Fisheries Management 15: 940-955.*

# APPENDIX 1

## Daily catch of juvenile chinook salmon by rotary screw traps, and index of outmigrants at Diamond Island, Nechako River, 2003

# APPENDIX 1

## Daily catch of juvenile chinook salmon by rotary screw traps, and index of outmigrants at Diamond Island, Nechako River, 2003

| | | | | | RST No. 1: | | | | | | RST No. 2: | | | | | | RST No. 3: | | | | | | Total Catch | | Weighted Average | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | RST staff (cm) | In RST staff cm | In River flow m³/s | River flow m³/s | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | 1+ | 0+ | 1+ | 0+ |
| Day | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.057 | 2.4 | 0 | 1 | 0 | 41 | 0.96 | 2.2 | 0 | 0 | 0 | 0 | 1.62 | 3.7 | 0 | 1 | 0 | 27 | 0 | 2 | 0 | 24 |
| 3-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.057 | 2.4 | 0 | 0 | 0 | 0 | 0.96 | 2.2 | 0 | 0 | 0 | 0 | 1.62 | 3.7 | 1 | 0 | 27 | 0 | 1 | 0 | 12 | 0 |
| 4-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.057 | 2.4 | 0 | 0 | 0 | 0 | 0.96 | 2.2 | 0 | 0 | 0 | 0 | 1.62 | 3.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.140 | 2.6 | 0 | 0 | 0 | 0 | 0.98 | 2.3 | 0 | 0 | 0 | 0 | 0.95 | 2.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.140 | 2.6 | 0 | 0 | 0 | 0 | 0.98 | 2.3 | 0 | 1 | 0 | 44 | 0.95 | 2.2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 14 |
| 7-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.040 | 2.4 | 1 | 0 | 42 | 0 | 0.97 | 2.2 | 0 | 0 | 0 | 0 | 0.95 | 2.2 | 1 | 0 | 46 | 0 | 2 | 0 | 29 | 0 |
| 8-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.040 | 2.4 | 1 | 4 | 42 | 167 | 0.97 | 2.2 | 1 | 2 | 45 | 90 | 0.95 | 2.2 | 0 | 6 | 0 | 274 | 2 | 12 | 29 | 176 |
| 9-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.066 | 2.5 | 0 | 0 | 0 | 0 | 1.03 | 2.4 | 2 | 1 | 85 | 42 | 1.05 | 2.4 | 1 | 3 | 41 | 124 | 3 | 4 | 42 | 55 |
| 10-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.066 | 2.5 | 0 | 1 | 0 | 41 | 1.03 | 2.4 | 0 | 1 | 0 | 42 | 1.05 | 2.4 | 0 | 1 | 0 | 41 | 0 | 3 | 0 | 42 |
| 11-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.149 | 2.6 | 0 | 0 | 0 | 0 | 1.07 | 2.5 | 0 | 0 | 0 | 0 | 1.06 | 2.4 | 1 | 5 | 41 | 204 | 1 | 5 | 13 | 66 |
| 12-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.149 | 2.6 | 0 | 0 | 0 | 0 | 1.07 | 2.5 | 1 | 1 | 41 | 41 | 1.06 | 2.4 | 0 | 7 | 0 | 286 | 1 | 8 | 13 | 106 |
| 13-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.149 | 2.6 | 0 | 0 | 0 | 0 | 1.07 | 2.5 | 0 | 0 | 0 | 0 | 1.06 | 2.4 | 0 | 12 | 0 | 490 | 0 | 12 | 0 | 159 |
| 14-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.163 | 2.7 | 1 | 1 | 37 | 37 | 1.16 | 2.7 | 0 | 1 | 0 | 38 | 1.17 | 2.7 | 1 | 16 | 37 | 592 | 2 | 18 | 25 | 224 |
| 15-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.479 | 3.4 | 0 | 2 | 0 | 59 | 1.22 | 2.8 | 0 | 1 | 0 | 36 | 1.26 | 2.9 | 0 | 4 | 0 | 138 | 0 | 7 | 0 | 77 |
| 16-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.479 | 3.4 | 0 | 0 | 0 | 0 | 1.22 | 2.8 | 0 | 1 | 0 | 36 | 1.26 | 2.9 | 0 | 2 | 0 | 69 | 0 | 3 | 0 | 33 |
| 17-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.166 | 2.7 | 0 | 0 | 0 | 0 | 1.18 | 2.7 | 1 | 1 | 37 | 37 | 1.12 | 2.6 | 0 | 3 | 0 | 117 | 1 | 4 | 13 | 50 |
| 18-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.166 | 2.7 | 0 | 0 | 0 | 0 | 1.18 | 2.7 | 0 | 2 | 0 | 73 | 1.12 | 2.6 | 0 | 3 | 0 | 117 | 0 | 5 | 0 | 63 |
| 19-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 0 | 1 | 0 | 35 | 1.14 | 2.6 | 0 | 3 | 0 | 114 | 1.20 | 2.8 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 49 |
| 20-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 0 | 3 | 0 | 106 | 1.14 | 2.6 | 0 | 3 | 0 | 114 | 1.20 | 2.8 | 0 | 2 | 0 | 72 | 0 | 8 | 0 | 97 |
| 21-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.249 | 2.9 | 0 | 0 | 0 | 0 | 1.19 | 2.7 | 0 | 6 | 0 | 219 | 1.16 | 2.7 | 0 | 6 | 0 | 225 | 0 | 12 | 0 | 145 |
| 22-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.249 | 2.9 | 1 | 0 | 35 | 0 | 1.19 | 2.7 | 0 | 2 | 0 | 73 | 1.16 | 2.7 | 0 | 6 | 0 | 225 | 1 | 8 | 12 | 97 |
| 23-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 0 | 7 | 0 | 247 | 1.14 | 2.6 | 0 | 4 | 0 | 152 | 1.20 | 2.8 | 0 | 15 | 0 | 542 | 0 | 26 | 0 | 316 |
| 24-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 0 | 4 | 0 | 141 | 1.14 | 2.6 | 0 | 2 | 0 | 76 | 1.20 | 2.8 | 0 | 4 | 0 | 145 | 0 | 10 | 0 | 121 |
| 25-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 0 | 10 | 0 | 352 | 1.14 | 2.6 | 0 | 9 | 0 | 342 | 1.23 | 2.8 | 0 | 9 | 0 | 318 | 0 | 28 | 0 | 338 |
| 26-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 1 | 19 | 35 | 669 | 1.14 | 2.6 | 5 | 33 | 190 | 1,255 | 1.23 | 2.8 | 1 | 41 | 35 | 1,449 | 7 | 93 | 84 | 1,121 |
| 27-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.184 | 2.7 | 7 | 2 | 257 | 73 | 1.07 | 2.5 | 13 | 10 | 529 | 407 | 1.14 | 2.6 | 4 | 33 | 153 | 1,263 | 24 | 45 | 308 | 577 |
| 28-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.152 | 2.6 | 0 | 16 | 0 | 604 | 1.08 | 2.5 | 0 | 12 | 0 | 481 | 1.18 | 2.7 | 0 | 26 | 0 | 956 | 0 | 54 | 0 | 687 |
| 29-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.152 | 2.6 | 1 | 2 | 38 | 76 | 1.08 | 2.5 | 1 | 6 | 40 | 241 | 1.18 | 2.7 | 1 | 15 | 37 | 552 | 3 | 23 | 38 | 293 |
| 30-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.184 | 2.7 | 1 | 9 | 37 | 331 | 1.07 | 2.5 | 0 | 10 | 0 | 407 | 1.01 | 2.3 | 1 | 10 | 43 | 429 | 2 | 29 | 27 | 386 |
| 1-May | 152.1 | 5.0 | 5.0 | 43.5 | 1.184 | 2.7 | 0 | 14 | 0 | 514 | 1.07 | 2.5 | 0 | 8 | 0 | 325 | 1.01 | 2.3 | 0 | 13 | 0 | 557 | 0 | 35 | 0 | 466 |
| 2-May | 152.1 | 5.0 | 5.0 | 43.5 | 1.157 | 2.7 | 1 | 9 | 38 | 338 | 1.10 | 2.5 | 2 | 9 | 79 | 355 | 0.78 | 1.8 | 0 | 4 | 0 | 222 | 3 | 22 | 43 | 314 |
| 3-May | 152.1 | 5.0 | 5.0 | 43.5 | 1.157 | 2.7 | 0 | 12 | 0 | 451 | 1.10 | 2.5 | 0 | 2 | 0 | 79 | 0.78 | 1.8 | 0 | 4 | 0 | 222 | 0 | 18 | 0 | 257 |
| 4-May | 152.1 | 5.0 | 5.0 | 43.5 | 1.184 | 2.7 | 0 | 2 | 0 | 73 | 1.15 | 2.6 | 0 | 2 | 0 | 76 | 0.84 | 1.9 | 0 | 1 | 0 | 52 | 0 | 5 | 0 | 69 |
| 5-May | 152.1 | 5.0 | 5.0 | 43.5 | 1.184 | 2.7 | 0 | 0 | 0 | 0 | 1.15 | 2.6 | 0 | 1 | 0 | 38 | 0.84 | 1.9 | 0 | 4 | 0 | 208 | 0 | 5 | 0 | 69 |
| 6-May | 158.6 | 5.1 | 5.1 | 52.9 | 1.199 | 2.3 | 0 | 8 | 0 | 353 | 1.15 | 2.2 | 0 | 6 | 0 | 275 | 0.81 | 1.5 | 0 | 5 | 0 | 328 | 0 | 19 | 0 | 318 |
| 7-May | 158.6 | 5.1 | 5.1 | 52.9 | 1.199 | 2.3 | 0 | 5 | 0 | 221 | 1.15 | 2.2 | 0 | 3 | 0 | 138 | 0.81 | 1.5 | 1 | 4 | 66 | 263 | 1 | 12 | 17 | 201 |

## APPENDIX 1 (cont.) Daily catch of juvenile chinook salmon by rotary screw traps, and index of outmigrants at Diamond Island, Nechako River, 2003

| | | | | | RST No. 1: | | | | | | RST No. 2: | | | | | | RST No. 3: | | | | | | Total Catch | | Weighted Average | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | In | In River | River | Trap | Percent | Catch | | Population estimate | | Trap | Percent | Catch | | Population estimate | | Trap | Percent | Catch | | Population estimate | | | | | |
| Date | RST staff (cm) | RST staff cm | flow m³/s | flow m³/s | flow m³/s | flow sampled | 1+ | 0+ | 1+ | 0+ | flow m³/s | flow sampled | 1+ | 0+ | 1+ | 0+ | flow m³/s | flow sampled | 1+ | 0+ | 1+ | 0+ | 1+ | 0+ | 1+ | 0+ |
| 8-May | 158.6 | 5.1 | 5.1 | 52.9 | 1.199 | 2.3 | 0 | 7 | 0 | 309 | 1.09 | 2.1 | 0 | 7 | 0 | 341 | 0.88 | 1.7 | 0 | 2 | 0 | 121 | 0 | 16 | 0 | 268 |
| 9-May | 158.6 | 5.1 | 5.1 | 52.9 | 1.199 | 2.3 | 2 | 5 | 88 | 221 | 1.09 | 2.1 | 0 | 8 | 0 | 390 | 0.88 | 1.7 | 0 | 2 | 0 | 121 | 2 | 15 | 34 | 251 |
| 10-May | 158.6 | 5.1 | 5.1 | 52.9 | 1.178 | 2.2 | 0 | 5 | 0 | 225 | 1.15 | 2.2 | 2 | 4 | 92 | 185 | 0.86 | 1.6 | 0 | 2 | 0 | 123 | 2 | 11 | 33 | 183 |
| 11-May | 159.1 | 5.1 | 5.1 | 53.7 | 1.196 | 2.2 | 0 | 10 | 0 | 449 | 1.15 | 2.1 | 0 | 7 | 0 | 328 | 0.90 | 1.7 | 0 | 6 | 0 | 358 | 0 | 23 | 0 | 381 |
| 12-May | 159.1 | 5.1 | 5.1 | 53.7 | 1.196 | 2.2 | 0 | 4 | 0 | 180 | 1.15 | 2.1 | 0 | 2 | 0 | 94 | 0.90 | 1.7 | 0 | 2 | 0 | 119 | 0 | 8 | 0 | 132 |
| 13-May | 159.1 | 5.1 | 5.1 | 53.7 | 1.178 | 2.2 | 0 | 1 | 0 | 46 | 1.15 | 2.1 | 0 | 1 | 0 | 47 | 0.89 | 1.7 | 0 | 4 | 0 | 242 | 0 | 6 | 0 | 100 |
| 14-May | 159.1 | 5.1 | 5.1 | 53.7 | 1.178 | 2.2 | 0 | 0 | 0 | 0 | 1.15 | 2.1 | 0 | 0 | 0 | 0 | 0.89 | 1.7 | 0 | 2 | 0 | 121 | 0 | 2 | 0 | 33 |
| 15-May | 159.1 | 5.1 | 5.1 | 53.7 | 1.216 | 2.3 | 0 | 0 | 0 | 0 | 1.13 | 2.1 | 0 | 1 | 0 | 48 | 0.72 | 1.3 | 0 | 14 | 0 | 1,039 | 0 | 15 | 0 | 262 |
| 16-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.240 | 2.2 | 0 | 5 | 0 | 225 | 1.11 | 2.0 | 0 | 2 | 0 | 100 | 0.83 | 1.5 | 0 | 8 | 0 | 540 | 0 | 15 | 0 | 263 |
| 17-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.240 | 2.2 | 0 | 1 | 0 | 45 | 1.11 | 2.0 | 0 | 0 | 0 | 0 | 0.83 | 1.5 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 18 |
| 18-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.234 | 2.2 | 0 | 4 | 0 | 181 | 1.14 | 2.0 | 0 | 1 | 0 | 49 | 0.84 | 1.5 | 0 | 2 | 0 | 133 | 0 | 7 | 0 | 122 |
| 19-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.234 | 2.2 | 0 | 7 | 0 | 317 | 1.14 | 2.0 | 0 | 2 | 0 | 98 | 0.84 | 1.5 | 0 | 2 | 0 | 133 | 0 | 11 | 0 | 191 |
| 20-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.178 | 2.1 | 0 | 0 | 0 | 0 | 1.15 | 2.1 | 0 | 3 | 0 | 146 | 0.87 | 1.6 | 0 | 1 | 0 | 64 | 0 | 4 | 0 | 70 |
| 21-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.178 | 2.1 | 1 | 1 | 47 | 47 | 1.15 | 2.1 | 0 | 1 | 0 | 49 | 0.87 | 1.6 | 0 | 0 | 0 | 0 | 1 | 2 | 18 | 35 |
| 22-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.246 | 2.3 | 0 | 2 | 0 | 87 | 1.20 | 2.2 | 0 | 1 | 0 | 45 | 0.94 | 1.7 | 0 | 1 | 0 | 58 | 0 | 4 | 0 | 64 |
| 23-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.246 | 2.3 | 0 | 1 | 0 | 44 | 1.20 | 2.2 | 0 | 1 | 0 | 45 | 0.94 | 1.7 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 32 |
| 24-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.202 | 2.2 | 0 | 1 | 0 | 45 | 1.13 | 2.1 | 0 | 2 | 0 | 96 | 0.82 | 1.5 | 0 | 1 | 0 | 66 | 0 | 4 | 0 | 69 |
| 25-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.202 | 2.2 | 0 | 9 | 0 | 407 | 1.13 | 2.1 | 0 | 5 | 0 | 240 | 0.82 | 1.5 | 0 | 7 | 0 | 464 | 0 | 21 | 0 | 362 |
| 26-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.222 | 2.2 | 0 | 1 | 0 | 45 | 1.19 | 2.2 | 0 | 3 | 0 | 137 | 0.81 | 1.5 | 0 | 3 | 0 | 202 | 0 | 7 | 0 | 118 |
| 27-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.222 | 2.2 | 0 | 1 | 0 | 45 | 1.19 | 2.2 | 0 | 1 | 0 | 46 | 0.81 | 1.5 | 0 | 1 | 0 | 67 | 0 | 3 | 0 | 51 |
| 28-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.222 | 2.2 | 0 | 3 | 0 | 134 | 1.19 | 2.2 | 0 | 6 | 0 | 274 | 0.81 | 1.5 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 152 |
| 29-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.210 | 2.2 | 0 | 0 | 0 | 0 | 1.14 | 2.1 | 0 | 0 | 0 | 0 | 0.87 | 1.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.210 | 2.2 | 0 | 1 | 0 | 46 | 1.14 | 2.1 | 0 | 1 | 0 | 49 | 0.87 | 1.6 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 35 |
| 31-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.240 | 2.2 | 0 | 1 | 0 | 45 | 1.21 | 2.2 | 0 | 0 | 0 | 0 | 0.84 | 1.5 | 0 | 1 | 0 | 66 | 0 | 2 | 0 | 34 |
| 1-Jun | 160.6 | 5.1 | 5.1 | 55.8 | 1.240 | 2.2 | 0 | 2 | 0 | 90 | 1.21 | 2.2 | 0 | 1 | 0 | 46 | 0.84 | 1.5 | 0 | 3 | 0 | 199 | 0 | 6 | 0 | 102 |
| 2-Jun | 160.6 | 5.1 | 5.1 | 55.8 | 1.240 | 2.2 | 1 | 4 | 45 | 180 | 1.21 | 2.2 | 0 | 3 | 0 | 138 | 0.84 | 1.5 | 0 | 6 | 0 | 398 | 1 | 13 | 17 | 220 |
| 3-Jun | 160.6 | 5.1 | 5.1 | 55.8 | 2.162 | 3.9 | 0 | 5 | 0 | 129 | 2.13 | 3.8 | 0 | 0 | 0 | 0 | 1.63 | 2.9 | 0 | 4 | 0 | 137 | 0 | 9 | 0 | 85 |
| 4-Jun | 160.6 | 5.1 | 5.1 | 55.8 | 2.162 | 3.9 | 0 | 0 | 0 | 0 | 2.13 | 3.8 | 0 | 1 | 0 | 26 | 1.63 | 2.9 | 0 | 4 | 0 | 137 | 0 | 5 | 0 | 47 |
| 5-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 2.309 | 4.4 | 0 | 7 | 0 | 161 | 2.28 | 4.3 | 0 | 4 | 0 | 93 | 1.80 | 3.4 | 0 | 3 | 0 | 88 | 0 | 14 | 0 | 116 |
| 6-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 2.309 | 4.4 | 0 | 7 | 0 | 161 | 2.28 | 4.3 | 0 | 2 | 0 | 46 | 1.80 | 3.4 | 0 | 4 | 0 | 117 | 0 | 13 | 0 | 108 |
| 7-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 1.222 | 2.3 | 0 | 9 | 0 | 390 | 1.16 | 2.2 | 0 | 7 | 0 | 319 | 0.86 | 1.6 | 0 | 15 | 0 | 922 | 0 | 31 | 0 | 505 |
| 8-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 1.222 | 2.3 | 0 | 7 | 0 | 303 | 1.16 | 2.2 | 0 | 5 | 0 | 228 | 0.86 | 1.6 | 0 | 6 | 0 | 369 | 0 | 18 | 0 | 294 |
| 9-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 1.225 | 2.3 | 0 | 7 | 0 | 302 | 1.17 | 2.2 | 0 | 7 | 0 | 317 | 0.89 | 1.7 | 0 | 4 | 0 | 238 | 0 | 18 | 0 | 290 |
| 10-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 1.225 | 2.3 | 0 | 3 | 0 | 130 | 1.17 | 2.2 | 0 | 1 | 0 | 45 | 0.89 | 1.7 | 0 | 1 | 0 | 60 | 0 | 5 | 0 | 81 |
| 11-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 1.246 | 2.4 | 0 | 6 | 0 | 255 | 1.16 | 2.2 | 0 | 2 | 0 | 92 | 0.81 | 1.5 | 0 | 6 | 0 | 393 | 0 | 14 | 0 | 231 |
| 12-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.199 | 2.4 | 0 | 1 | 0 | 42 | 1.14 | 2.3 | 0 | 1 | 0 | 44 | 0.83 | 1.7 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 32 |
| 13-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.199 | 2.4 | 0 | 0 | 0 | 0 | 1.14 | 2.3 | 0 | 0 | 0 | 0 | 0.83 | 1.7 | 0 | 1 | 0 | 60 | 0 | 1 | 0 | 16 |
| 14-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.234 | 2.5 | 0 | 1 | 0 | 41 | 1.19 | 2.4 | 0 | 0 | 0 | 0 | 0.82 | 1.6 | 0 | 3 | 0 | 183 | 0 | 4 | 0 | 62 |
| 15-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.234 | 2.5 | 1 | 6 | 41 | 243 | 1.19 | 2.4 | 0 | 0 | 0 | 0 | 0.82 | 1.6 | 0 | 3 | 0 | 183 | 1 | 9 | 15 | 139 |

## APPENDIX 1 (cont.) Daily catch of juvenile chinook salmon by rotary screw traps, and index of outmigrants at Diamond Island, Nechako River, 2003

| | | | | | RST No. 1: | | | | | | RST No. 2: | | | | | | RST No. 3: | | | | | | Total Catch | | Weighted Average | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | RST staff (cm) | In RST staff cm | In River flow m³/s | River flow m³/s | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | 1+ | 0+ | 1+ | 0+ |
| 16-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.213 | 2.4 | 0 | 3 | 0 | 124 | 1.17 | 2.3 | 0 | 3 | 0 | 128 | 0.83 | 1.7 | 0 | 1 | 0 | 60 | 0 | 7 | 0 | 109 |
| 17-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.213 | 2.4 | 0 | 4 | 0 | 165 | 1.17 | 2.3 | 0 | 0 | 0 | 0 | 0.83 | 1.7 | 0 | 1 | 0 | 60 | 0 | 5 | 0 | 78 |
| 18-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.240 | 2.5 | 0 | 0 | 0 | 0 | 1.19 | 2.4 | 0 | 1 | 0 | 42 | 0.81 | 1.6 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 15 |
| 19-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.152 | 2.3 | 0 | 2 | 0 | 87 | 1.15 | 2.3 | 0 | 0 | 0 | 0 | 0.84 | 1.7 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 32 |
| 20-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.152 | 2.3 | 0 | 0 | 0 | 0 | 1.15 | 2.3 | 0 | 3 | 0 | 131 | 0.84 | 1.7 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 48 |
| 21-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.240 | 2.5 | 0 | 1 | 0 | 40 | 1.19 | 2.4 | 0 | 1 | 0 | 42 | 0.83 | 1.7 | 0 | 1 | 0 | 60 | 0 | 3 | 0 | 46 |
| 22-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.240 | 2.5 | 0 | 0 | 0 | 0 | 1.19 | 2.4 | 0 | 0 | 0 | 0 | 0.83 | 1.7 | 0 | 1 | 0 | 60 | 0 | 1 | 0 | 15 |
| 23-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.240 | 2.5 | 0 | 2 | 0 | 81 | 1.19 | 2.4 | 0 | 0 | 0 | 0 | 0.83 | 1.7 | 0 | 1 | 0 | 60 | 0 | 3 | 0 | 46 |
| 24-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.166 | 2.3 | 0 | 0 | 0 | 0 | 1.11 | 2.2 | 0 | 1 | 0 | 45 | 0.83 | 1.7 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 16 |
| 25-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.166 | 2.3 | 0 | 1 | 0 | 43 | 1.11 | 2.2 | 0 | 1 | 0 | 45 | 0.83 | 1.7 | 0 | 1 | 0 | 61 | 0 | 3 | 0 | 48 |
| 26-Jun | 155.1 | 5.0 | 5.0 | 47.8 | 1.181 | 2.5 | 0 | 2 | 0 | 81 | 1.11 | 2.3 | 0 | 0 | 0 | 0 | 0.90 | 1.9 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 30 |
| 27-Jun | 155.1 | 5.0 | 5.0 | 47.8 | 1.181 | 2.5 | 0 | 1 | 0 | 41 | 1.11 | 2.3 | 0 | 0 | 0 | 0 | 0.90 | 1.9 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 15 |
| 28-Jun | 155.1 | 5.0 | 5.0 | 47.8 | 1.155 | 2.4 | 0 | 3 | 0 | 124 | 1.10 | 2.3 | 0 | 0 | 0 | 0 | 0.88 | 1.8 | 0 | 1 | 0 | 54 | 0 | 4 | 0 | 61 |
| 29-Jun | 155.1 | 5.0 | 5.0 | 47.8 | 1.155 | 2.4 | 0 | 1 | 0 | 41 | 1.10 | 2.3 | 0 | 2 | 0 | 87 | 0.88 | 1.8 | 0 | 1 | 0 | 54 | 0 | 4 | 0 | 61 |
| 30-Jun | 155.1 | 5.0 | 5.0 | 47.8 | 1.193 | 2.5 | 0 | 0 | 0 | 0 | 1.15 | 2.4 | 0 | 0 | 0 | 0 | 0.89 | 1.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.163 | 2.4 | 0 | 1 | 0 | 41 | 1.13 | 2.4 | 0 | 0 | 0 | 0 | 0.86 | 1.8 | 0 | 1 | 0 | 56 | 0 | 2 | 0 | 30 |
| 2-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.163 | 2.4 | 0 | 1 | 0 | 41 | 1.13 | 2.4 | 0 | 0 | 0 | 0 | 0.86 | 1.8 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 15 |
| 3-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.163 | 2.4 | 0 | 0 | 0 | 0 | 1.13 | 2.4 | 0 | 0 | 0 | 0 | 0.86 | 1.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.228 | 2.6 | 0 | 0 | 0 | 0 | 1.10 | 2.3 | 0 | 1 | 0 | 43 | 0.91 | 1.9 | 0 | 1 | 0 | 52 | 0 | 2 | 0 | 30 |
| 5-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.228 | 2.6 | 0 | 0 | 0 | 0 | 1.10 | 2.3 | 0 | 0 | 0 | 0 | 0.91 | 1.9 | 0 | 1 | 0 | 52 | 0 | 1 | 0 | 15 |
| 6-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.190 | 2.5 | 0 | 0 | 0 | 0 | 1.12 | 2.3 | 0 | 0 | 0 | 0 | 0.86 | 1.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.190 | 2.5 | 0 | 0 | 0 | 0 | 1.12 | 2.3 | 0 | 0 | 0 | 0 | 0.86 | 1.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.160 | 2.4 | 0 | 0 | 0 | 0 | 1.14 | 2.4 | 0 | 0 | 0 | 0 | 0.82 | 1.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.160 | 2.4 | 0 | 0 | 0 | 0 | 1.14 | 2.4 | 0 | 0 | 0 | 0 | 0.82 | 1.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.128 | 2.4 | 0 | 1 | 0 | 42 | 1.15 | 2.4 | 0 | 0 | 0 | 0 | 0.90 | 1.9 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 15 |
| 11-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.128 | 2.4 | 0 | 1 | 0 | 42 | 1.15 | 2.4 | 0 | 0 | 0 | 0 | 0.90 | 1.9 | 0 | 1 | 0 | 53 | 0 | 2 | 0 | 30 |
| 12-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.216 | 2.5 | 0 | 0 | 0 | 0 | 1.14 | 2.4 | 0 | 0 | 0 | 0 | 0.85 | 1.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.216 | 2.5 | 0 | 0 | 0 | 0 | 1.14 | 2.4 | 0 | 0 | 0 | 0 | 0.85 | 1.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14-Jul | 175.6 | 5.2 | 5.3 | 77.7 | 1.269 | 1.6 | 0 | 0 | 0 | 0 | 1.22 | 1.6 | 0 | 0 | 0 | 0 | 0.97 | 1.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15-Jul | 185.6 | 5.2 | 5.3 | 92.2 | 1.361 | 1.5 | 0 | 2 | 0 | 136 | 1.27 | 1.4 | 0 | 1 | 0 | 73 | 1.13 | 1.2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 74 |
| 16-Jul | 196.1 | 5.3 | 5.4 | 107.5 | 1.361 | 1.3 | 0 | 1 | 0 | 79 | 1.27 | 1.2 | 0 | 0 | 0 | 0 | 1.13 | 1.1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 29 |
| 17-Jul | 196.1 | 5.3 | 5.4 | 107.5 | 1.287 | 1.2 | 0 | 0 | 0 | 0 | 1.27 | 1.2 | 0 | 0 | 0 | 0 | 1.49 | 1.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18-Jul | 196.1 | 5.3 | 5.4 | 107.5 | 1.287 | 1.2 | 0 | 0 | 0 | 0 | 1.27 | 1.2 | 0 | 1 | 0 | 85 | 1.49 | 1.4 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 27 |
| 19-Jul | 224.6 | 5.4 | 5.7 | 149.0 | 1.381 | 0.9 | 0 | 1 | 0 | 108 | 1.26 | 0.8 | 0 | 0 | 0 | 0 | 0.66 | 0.4 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 45 |

## APPENDIX 1 (cont.) Daily catch of juvenile chinook salmon by rotary screw traps, and index of outmigrants at Diamond Island, Nechako River, 2003

| | | | | | RST No. 1: | | | | | | RST No. 2: | | | | | | RST No. 3: | | | | | | Total Catch | | Weighted Average | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | RST staff (cm) | In RST staff cm | In River flow m³/s | River flow m³/s | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | 1+ | 0+ | 1+ | 0+ |
| **Night** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.057 | 2.4 | 3 | 0 | 123 | 0 | 0.96 | 2.2 | 0 | 2 | 0 | 90 | 1.62 | 3.7 | 2 | 0 | 54 | 0 | 5 | 2 | 60 | 24 |
| 3-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.057 | 2.4 | 0 | 4 | 0 | 165 | 0.96 | 2.2 | 0 | 3 | 0 | 135 | 1.62 | 3.7 | 2 | 1 | 54 | 27 | 2 | 8 | 24 | 95 |
| 4-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.057 | 2.4 | 5 | 0 | 206 | 0 | 0.96 | 2.2 | 6 | 0 | 271 | 0 | 1.62 | 3.7 | 10 | 2 | 268 | 54 | 21 | 2 | 251 | 24 |
| 5-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.140 | 2.6 | 1 | 0 | 38 | 0 | 0.98 | 2.3 | 0 | 31 | 0 | 1,374 | 0.95 | 2.2 | 2 | 3 | 91 | 137 | 3 | 34 | 42 | 481 |
| 6-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.140 | 2.6 | 3 | 0 | 114 | 0 | 0.98 | 2.3 | 3 | 9 | 133 | 399 | 0.95 | 2.2 | 2 | 0 | 91 | 0 | 8 | 9 | 113 | 127 |
| 7-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.040 | 2.4 | 5 | 1 | 209 | 42 | 0.97 | 2.2 | 0 | 12 | 0 | 537 | 0.95 | 2.2 | 4 | 0 | 182 | 0 | 9 | 13 | 132 | 191 |
| 8-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.040 | 2.4 | 0 | 2 | 0 | 84 | 0.97 | 2.2 | 2 | 7 | 90 | 313 | 0.95 | 2.2 | 0 | 7 | 0 | 319 | 2 | 16 | 29 | 235 |
| 9-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.066 | 2.5 | 2 | 3 | 82 | 122 | 1.03 | 2.4 | 0 | 5 | 0 | 212 | 1.05 | 2.4 | 5 | 4 | 207 | 165 | 7 | 12 | 97 | 166 |
| 10-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.066 | 2.5 | 8 | 12 | 326 | 489 | 1.03 | 2.4 | 2 | 10 | 85 | 423 | 1.05 | 2.4 | 7 | 33 | 289 | 1,364 | 17 | 55 | 235 | 760 |
| 11-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.149 | 2.6 | 4 | 33 | 151 | 1,249 | 1.07 | 2.5 | 4 | 21 | 162 | 852 | 1.06 | 2.4 | 5 | 19 | 204 | 776 | 13 | 73 | 172 | 966 |
| 12-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.149 | 2.6 | 7 | 4 | 265 | 151 | 1.07 | 2.5 | 0 | 7 | 0 | 284 | 1.06 | 2.4 | 1 | 18 | 41 | 735 | 8 | 29 | 106 | 384 |
| 13-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.149 | 2.6 | 12 | 1 | 454 | 38 | 1.07 | 2.5 | 9 | 19 | 365 | 771 | 1.06 | 2.4 | 10 | 8 | 409 | 327 | 31 | 28 | 410 | 371 |
| 14-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.163 | 2.7 | 7 | 16 | 262 | 598 | 1.16 | 2.7 | 2 | 19 | 75 | 714 | 1.17 | 2.7 | 5 | 7 | 185 | 259 | 14 | 42 | 174 | 522 |
| 15-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.479 | 3.4 | 7 | 7 | 206 | 206 | 1.22 | 2.8 | 1 | 8 | 36 | 285 | 1.26 | 2.9 | 1 | 14 | 34 | 482 | 9 | 29 | 99 | 318 |
| 16-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.479 | 3.4 | 3 | 9 | 88 | 265 | 1.22 | 2.8 | 2 | 20 | 71 | 711 | 1.26 | 2.9 | 2 | 5 | 69 | 172 | 7 | 34 | 77 | 373 |
| 17-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.166 | 2.7 | 7 | 11 | 261 | 410 | 1.18 | 2.7 | 4 | 22 | 147 | 808 | 1.12 | 2.6 | 11 | 4 | 428 | 156 | 22 | 37 | 276 | 464 |
| 18-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.166 | 2.7 | 14 | 20 | 522 | 746 | 1.18 | 2.7 | 9 | 42 | 331 | 1,542 | 1.12 | 2.6 | 14 | 15 | 544 | 583 | 37 | 77 | 464 | 965 |
| 19-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 7 | 20 | 247 | 705 | 1.14 | 2.6 | 3 | 24 | 114 | 913 | 1.20 | 2.8 | 5 | 8 | 181 | 289 | 15 | 52 | 182 | 632 |
| 20-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 11 | 25 | 388 | 881 | 1.14 | 2.6 | 6 | 49 | 228 | 1,864 | 1.20 | 2.8 | 3 | 32 | 109 | 1,157 | 20 | 106 | 243 | 1,288 |
| 21-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.249 | 2.9 | 14 | 28 | 487 | 975 | 1.19 | 2.7 | 6 | 83 | 219 | 3,025 | 1.16 | 2.7 | 6 | 10 | 225 | 375 | 26 | 121 | 314 | 1,461 |
| 22-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.249 | 2.9 | 26 | 165 | 905 | 5,744 | 1.19 | 2.7 | 14 | 89 | 510 | 3,244 | 1.16 | 2.7 | 4 | 53 | 150 | 1,987 | 44 | 307 | 531 | 3,706 |
| 23-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 18 | 96 | 634 | 3,382 | 1.14 | 2.6 | 3 | 79 | 114 | 3,005 | 1.20 | 2.8 | 6 | 10 | 217 | 361 | 27 | 185 | 328 | 2,246 |
| 24-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 9 | 21 | 317 | 740 | 1.14 | 2.6 | 2 | 114 | 76 | 4,337 | 1.20 | 2.8 | 6 | 8 | 217 | 289 | 17 | 143 | 206 | 1,736 |
| 25-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 11 | 122 | 388 | 4,298 | 1.14 | 2.6 | 6 | 68 | 228 | 2,587 | 1.23 | 2.8 | 2 | 33 | 71 | 1,167 | 19 | 223 | 229 | 2,688 |
| 26-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.234 | 2.8 | 36 | 281 | 1268 | 9,899 | 1.14 | 2.6 | 20 | 282 | 761 | 10,728 | 1.23 | 2.8 | 3 | 209 | 106 | 7,388 | 59 | 772 | 711 | 9,305 |
| 27-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.184 | 2.7 | 60 | 143 | 2203 | 5,251 | 1.07 | 2.5 | 31 | 305 | 1261 | 12,402 | 1.14 | 2.6 | 12 | 331 | 459 | 12,663 | 103 | 779 | 1321 | 9,992 |
| 28-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.152 | 2.6 | 11 | 102 | 415 | 3,851 | 1.08 | 2.5 | 12 | 347 | 481 | 13,918 | 1.18 | 2.7 | 9 | 101 | 331 | 3,713 | 32 | 550 | 407 | 6,996 |
| 29-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.152 | 2.6 | 9 | 49 | 340 | 1,850 | 1.08 | 2.5 | 26 | 94 | 1043 | 3,770 | 1.18 | 2.7 | 7 | 106 | 257 | 3,897 | 42 | 249 | 534 | 3,167 |
| 30-Apr | 152.1 | 5.0 | 5.0 | 43.5 | 1.184 | 2.7 | 11 | 45 | 404 | 1,652 | 1.07 | 2.5 | 10 | 81 | 407 | 3,294 | 1.01 | 2.3 | 1 | 100 | 43 | 4,287 | 22 | 226 | 293 | 3,007 |
| 1-May | 152.1 | 5.0 | 5.0 | 43.5 | 1.184 | 2.7 | 17 | 28 | 624 | 1,028 | 1.07 | 2.5 | 6 | 25 | 244 | 1,017 | 1.01 | 2.3 | 3 | 1 | 129 | 43 | 26 | 54 | 346 | 719 |
| 2-May | 152.1 | 5.0 | 5.0 | 43.5 | 1.157 | 2.7 | 40 | 27 | 1502 | 1,014 | 1.10 | 2.5 | 15 | 42 | 592 | 1,658 | 0.78 | 1.8 | 5 | 22 | 277 | 1,220 | 60 | 91 | 857 | 1,300 |
| 3-May | 152.1 | 5.0 | 5.0 | 43.5 | 1.157 | 2.7 | 29 | 93 | 1089 | 3,493 | 1.10 | 2.5 | 19 | 22 | 750 | 868 | 0.78 | 1.8 | 1 | 84 | 56 | 4,659 | 49 | 199 | 700 | 2,843 |
| 4-May | 152.1 | 5.0 | 5.0 | 43.5 | 1.184 | 2.7 | 16 | 47 | 588 | 1,726 | 1.15 | 2.6 | 20 | 37 | 759 | 1,404 | 0.84 | 1.9 | 3 | 57 | 156 | 2,963 | 39 | 141 | 536 | 1,936 |
| 5-May | 152.1 | 5.0 | 5.0 | 43.5 | 1.184 | 2.7 | 29 | 5 | 1065 | 184 | 1.15 | 2.6 | 4 | 21 | 152 | 797 | 0.84 | 1.9 | 2 | 43 | 104 | 2,235 | 35 | 69 | 481 | 948 |
| 6-May | 158.6 | 5.1 | 5.1 | 52.9 | 1.199 | 2.3 | 35 | 27 | 1546 | 1,192 | 1.15 | 2.2 | 14 | 53 | 642 | 2,430 | 0.81 | 1.5 | 2 | 56 | 131 | 3,675 | 51 | 136 | 854 | 2,278 |
| 7-May | 158.6 | 5.1 | 5.1 | 52.9 | 1.199 | 2.3 | 19 | 27 | 839 | 1,192 | 1.15 | 2.2 | 9 | 16 | 413 | 734 | 0.81 | 1.5 | 2 | 17 | 131 | 1,116 | 30 | 60 | 503 | 1,005 |
| 8-May | 158.6 | 5.1 | 5.1 | 52.9 | 1.199 | 2.3 | 22 | 23 | 972 | 1,016 | 1.09 | 2.1 | 5 | 39 | 244 | 1,900 | 0.88 | 1.7 | 0 | 11 | 0 | 663 | 27 | 73 | 452 | 1,221 |

## APPENDIX 1 (cont.) Daily catch of juvenile chinook salmon by rotary screw traps, and index of outmigrants at Diamond Island, Nechako River, 2003

| | | | | | RST No. 1: | | | | | | RST No. 2: | | | | | | RST No. 3: | | | | | | Total Catch | | Weighted Average | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | RST staff (cm) | In RST staff cm | In River flow $m^3/s$ | River flow $m^3/s$ | Trap flow $m^3/s$ | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | Trap flow $m^3/s$ | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | Trap flow $m^3/s$ | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | 1+ | 0+ | 1+ | 0+ |
| 9-May | 158.6 | 5.1 | 5.1 | 52.9 | 1.199 | 2.3 | 20 | 21 | 883 | 927 | 1.09 | 2.1 | 6 | 21 | 292 | 1,023 | 0.88 | 1.7 | 1 | 26 | 60 | 1,567 | 27 | 68 | 452 | 1,138 |
| 10-May | 158.6 | 5.1 | 5.1 | 52.9 | 1.178 | 2.2 | 17 | 1 | 764 | 45 | 1.15 | 2.2 | 8 | 4 | 370 | 185 | 0.86 | 1.6 | 1 | 24 | 61 | 1,470 | 26 | 29 | 432 | 482 |
| 11-May | 159.1 | 5.1 | 5.1 | 53.7 | 1.196 | 2.2 | 5 | 15 | 224 | 673 | 1.15 | 2.1 | 6 | 23 | 281 | 1,077 | 0.90 | 1.7 | 0 | 7 | 0 | 417 | 11 | 45 | 182 | 745 |
| 12-May | 159.1 | 5.1 | 5.1 | 53.7 | 1.196 | 2.2 | 15 | 12 | 673 | 539 | 1.15 | 2.1 | 6 | 28 | 281 | 1,311 | 0.90 | 1.7 | 0 | 10 | 0 | 596 | 21 | 50 | 348 | 828 |
| 13-May | 159.1 | 5.1 | 5.1 | 53.7 | 1.178 | 2.2 | 7 | 3 | 319 | 137 | 1.15 | 2.1 | 6 | 14 | 281 | 656 | 0.89 | 1.7 | 0 | 3 | 0 | 182 | 13 | 20 | 217 | 334 |
| 14-May | 159.1 | 5.1 | 5.1 | 53.7 | 1.178 | 2.2 | 13 | 7 | 592 | 319 | 1.15 | 2.1 | 10 | 13 | 468 | 609 | 0.89 | 1.7 | 1 | 7 | 61 | 424 | 24 | 27 | 401 | 451 |
| 15-May | 159.1 | 5.1 | 5.1 | 53.7 | 1.216 | 2.3 | 14 | 1 | 618 | 44 | 1.13 | 2.1 | 7 | 6 | 333 | 285 | 0.72 | 1.3 | 0 | 1 | 0 | 74 | 21 | 8 | 367 | 140 |
| 16-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.240 | 2.2 | 25 | 4 | 1126 | 180 | 1.11 | 2.0 | 9 | 5 | 451 | 251 | 0.83 | 1.5 | 2 | 12 | 135 | 810 | 36 | 21 | 632 | 369 |
| 17-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.240 | 2.2 | 7 | 34 | 315 | 1,531 | 1.11 | 2.0 | 9 | 11 | 451 | 552 | 0.83 | 1.5 | 0 | 7 | 0 | 473 | 16 | 52 | 281 | 913 |
| 18-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.234 | 2.2 | 10 | 10 | 453 | 453 | 1.14 | 2.0 | 5 | 19 | 246 | 933 | 0.84 | 1.5 | 3 | 7 | 199 | 464 | 18 | 36 | 313 | 626 |
| 19-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.234 | 2.2 | 6 | 11 | 272 | 498 | 1.14 | 2.0 | 0 | 24 | 0 | 1,179 | 0.84 | 1.5 | 0 | 10 | 0 | 662 | 6 | 45 | 104 | 782 |
| 20-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.178 | 2.1 | 12 | 23 | 569 | 1,090 | 1.15 | 2.1 | 6 | 27 | 292 | 1,316 | 0.87 | 1.6 | 2 | 12 | 128 | 770 | 20 | 62 | 350 | 1,084 |
| 21-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.178 | 2.1 | 15 | 12 | 711 | 569 | 1.15 | 2.1 | 2 | 23 | 98 | 1,121 | 0.87 | 1.6 | 0 | 11 | 0 | 706 | 17 | 46 | 297 | 804 |
| 22-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.246 | 2.3 | 13 | 22 | 568 | 960 | 1.20 | 2.2 | 3 | 18 | 136 | 817 | 0.94 | 1.7 | 0 | 19 | 0 | 1,098 | 16 | 59 | 257 | 948 |
| 23-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.246 | 2.3 | 4 | 9 | 175 | 393 | 1.20 | 2.2 | 2 | 10 | 91 | 454 | 0.94 | 1.7 | 0 | 7 | 0 | 405 | 6 | 26 | 96 | 418 |
| 24-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.202 | 2.2 | 8 | 7 | 362 | 317 | 1.13 | 2.1 | 4 | 12 | 192 | 576 | 0.82 | 1.5 | 0 | 4 | 0 | 265 | 12 | 23 | 207 | 396 |
| 25-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.202 | 2.2 | 7 | 9 | 317 | 407 | 1.13 | 2.1 | 3 | 21 | 144 | 1,007 | 0.82 | 1.5 | 0 | 8 | 0 | 530 | 10 | 38 | 172 | 655 |
| 26-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.222 | 2.2 | 12 | 17 | 534 | 756 | 1.19 | 2.2 | 4 | 21 | 182 | 958 | 0.81 | 1.5 | 0 | 3 | 0 | 202 | 16 | 41 | 270 | 692 |
| 27-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.222 | 2.2 | 2 | 6 | 89 | 267 | 1.19 | 2.2 | 1 | 7 | 46 | 319 | 0.81 | 1.5 | 0 | 2 | 0 | 135 | 3 | 15 | 51 | 253 |
| 28-May | 159.6 | 5.1 | 5.1 | 54.4 | 1.222 | 2.2 | 2 | 18 | 89 | 801 | 1.19 | 2.2 | 1 | 7 | 46 | 319 | 0.81 | 1.5 | 0 | 1 | 0 | 67 | 3 | 26 | 51 | 439 |
| 29-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.210 | 2.2 | 9 | 21 | 415 | 969 | 1.14 | 2.1 | 5 | 19 | 244 | 929 | 0.87 | 1.6 | 0 | 7 | 0 | 450 | 14 | 47 | 243 | 815 |
| 30-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.210 | 2.2 | 4 | 17 | 185 | 784 | 1.14 | 2.1 | 1 | 7 | 49 | 342 | 0.87 | 1.6 | 0 | 0 | 0 | 0 | 5 | 24 | 87 | 416 |
| 31-May | 160.6 | 5.1 | 5.1 | 55.8 | 1.240 | 2.2 | 3 | 13 | 135 | 586 | 1.21 | 2.2 | 0 | 8 | 0 | 368 | 0.84 | 1.5 | 1 | 7 | 66 | 464 | 4 | 28 | 68 | 475 |
| 1-Jun | 160.6 | 5.1 | 5.1 | 55.8 | 1.240 | 2.2 | 3 | 31 | 135 | 1,396 | 1.21 | 2.2 | 1 | 22 | 46 | 1,012 | 0.84 | 1.5 | 0 | 12 | 0 | 796 | 4 | 65 | 68 | 1,102 |
| 2-Jun | 160.6 | 5.1 | 5.1 | 55.8 | 1.240 | 2.2 | 6 | 15 | 270 | 676 | 1.21 | 2.2 | 3 | 8 | 138 | 368 | 0.84 | 1.5 | 0 | 25 | 0 | 1,659 | 9 | 48 | 153 | 814 |
| 3-Jun | 160.6 | 5.1 | 5.1 | 55.8 | 2.162 | 3.9 | 8 | 29 | 207 | 749 | 2.13 | 3.8 | 2 | 20 | 52 | 524 | 1.63 | 2.9 | 0 | 19 | 0 | 651 | 10 | 68 | 94 | 641 |
| 4-Jun | 160.6 | 5.1 | 5.1 | 55.8 | 2.162 | 3.9 | 3 | 21 | 78 | 543 | 2.13 | 3.8 | 1 | 13 | 26 | 340 | 1.63 | 2.9 | 0 | 6 | 0 | 206 | 4 | 40 | 38 | 377 |
| 5-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 2.309 | 4.4 | 4 | 19 | 92 | 436 | 2.28 | 4.3 | 4 | 18 | 93 | 418 | 1.80 | 3.4 | 0 | 2 | 0 | 59 | 8 | 39 | 66 | 323 |
| 6-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 2.309 | 4.4 | 7 | 52 | 161 | 1,192 | 2.28 | 4.3 | 3 | 35 | 70 | 813 | 1.80 | 3.4 | 0 | 0 | 0 | 0 | 10 | 87 | 83 | 721 |
| 7-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 1.222 | 2.3 | 5 | 67 | 217 | 2,902 | 1.16 | 2.2 | 2 | 30 | 91 | 1,365 | 0.86 | 1.6 | 1 | 6 | 62 | 369 | 8 | 103 | 130 | 1,679 |
| 8-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 1.222 | 2.3 | 8 | 41 | 346 | 1,776 | 1.16 | 2.2 | 2 | 35 | 91 | 1,592 | 0.86 | 1.6 | 0 | 31 | 0 | 1,906 | 10 | 107 | 163 | 1,745 |
| 9-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 1.225 | 2.3 | 1 | 55 | 43 | 2,376 | 1.17 | 2.2 | 5 | 22 | 226 | 996 | 0.89 | 1.7 | 2 | 22 | 119 | 1,309 | 8 | 99 | 129 | 1,596 |
| 10-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 1.225 | 2.3 | 5 | 52 | 216 | 2,247 | 1.17 | 2.2 | 1 | 23 | 45 | 1,041 | 0.89 | 1.7 | 0 | 30 | 0 | 1,785 | 6 | 105 | 97 | 1,692 |
| 11-Jun | 158.6 | 5.1 | 5.1 | 52.9 | 1.246 | 2.4 | 3 | 27 | 128 | 1,147 | 1.16 | 2.2 | 3 | 23 | 137 | 1,052 | 0.81 | 1.5 | 0 | 7 | 0 | 459 | 6 | 57 | 99 | 940 |
| 12-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.199 | 2.4 | 1 | 23 | 42 | 960 | 1.14 | 2.3 | 1 | 10 | 44 | 440 | 0.83 | 1.7 | 0 | 13 | 0 | 780 | 2 | 46 | 32 | 726 |
| 13-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.199 | 2.4 | 4 | 22 | 167 | 918 | 1.14 | 2.3 | 1 | 7 | 44 | 308 | 0.83 | 1.7 | 0 | 8 | 0 | 480 | 5 | 37 | 79 | 584 |
| 14-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.234 | 2.5 | 0 | 61 | 0 | 2,473 | 1.19 | 2.4 | 3 | 30 | 126 | 1,264 | 0.82 | 1.6 | 1 | 16 | 61 | 977 | 4 | 107 | 62 | 1,652 |
| 15-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.234 | 2.5 | 3 | 47 | 122 | 1,905 | 1.19 | 2.4 | 1 | 17 | 42 | 716 | 0.82 | 1.6 | 0 | 11 | 0 | 672 | 4 | 75 | 62 | 1,158 |
| 16-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.213 | 2.4 | 0 | 59 | 0 | 2,432 | 1.17 | 2.3 | 1 | 36 | 43 | 1,540 | 0.83 | 1.7 | 0 | 5 | 0 | 301 | 1 | 100 | 16 | 1,557 |

## APPENDIX 1 (cont.) Daily catch of juvenile chinook salmon by rotary screw traps, and index of outmigrants at Diamond Island, Nechako River, 2003

| | | | | | RST No. 1: | | | | | | RST No. 2: | | | | | | RST No. 3: | | | | | | Total Catch | | Weighted Average | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | RST staff (cm) | In RST staff cm | In River flow m³/s | River flow m³/s | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | Trap flow m³/s | Percent flow sampled | Catch 1+ | Catch 0+ | Population estimate 1+ | Population estimate 0+ | 1+ | 0+ | 1+ | 0+ |
| 17-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.213 | 2.4 | 0 | 22 | 0 | 907 | 1.17 | 2.3 | 0 | 13 | 0 | 556 | 0.83 | 1.7 | 0 | 6 | 0 | 361 | 0 | 41 | 0 | 638 |
| 18-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.240 | 2.5 | 0 | 25 | 0 | 1,009 | 1.19 | 2.4 | 0 | 22 | 0 | 925 | 0.81 | 1.6 | 0 | 11 | 0 | 677 | 0 | 58 | 0 | 895 |
| 19-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.152 | 2.3 | 0 | 22 | 0 | 956 | 1.15 | 2.3 | 0 | 15 | 0 | 653 | 0.84 | 1.7 | 0 | 5 | 0 | 299 | 0 | 42 | 0 | 670 |
| 20-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.152 | 2.3 | 0 | 47 | 0 | 2,042 | 1.15 | 2.3 | 0 | 26 | 0 | 1,132 | 0.84 | 1.7 | 0 | 3 | 0 | 179 | 0 | 76 | 0 | 1,212 |
| 21-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.240 | 2.5 | 0 | 47 | 0 | 1,896 | 1.19 | 2.4 | 0 | 18 | 0 | 757 | 0.83 | 1.7 | 0 | 8 | 0 | 482 | 0 | 73 | 0 | 1,120 |
| 22-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.240 | 2.5 | 0 | 17 | 0 | 686 | 1.19 | 2.4 | 0 | 14 | 0 | 589 | 0.83 | 1.7 | 0 | 2 | 0 | 120 | 0 | 33 | 0 | 506 |
| 23-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.240 | 2.5 | 0 | 43 | 0 | 1,735 | 1.19 | 2.4 | 0 | 25 | 0 | 1,051 | 0.83 | 1.7 | 0 | 1 | 0 | 60 | 0 | 69 | 0 | 1,059 |
| 24-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.166 | 2.3 | 0 | 9 | 0 | 386 | 1.11 | 2.2 | 0 | 6 | 0 | 271 | 0.83 | 1.7 | 0 | 7 | 0 | 424 | 0 | 22 | 0 | 355 |
| 25-Jun | 156.6 | 5.1 | 5.1 | 50.0 | 1.166 | 2.3 | 0 | 20 | 0 | 858 | 1.11 | 2.2 | 0 | 6 | 0 | 271 | 0.83 | 1.7 | 0 | 3 | 0 | 182 | 0 | 29 | 0 | 468 |
| 26-Jun | 155.1 | 5.0 | 5.0 | 47.8 | 1.181 | 2.5 | 0 | 15 | 0 | 608 | 1.11 | 2.3 | 0 | 7 | 0 | 301 | 0.90 | 1.9 | 0 | 4 | 0 | 214 | 0 | 26 | 0 | 390 |
| 27-Jun | 155.1 | 5.0 | 5.0 | 47.8 | 1.181 | 2.5 | 0 | 10 | 0 | 405 | 1.11 | 2.3 | 0 | 8 | 0 | 344 | 0.90 | 1.9 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 270 |
| 28-Jun | 155.1 | 5.0 | 5.0 | 47.8 | 1.155 | 2.4 | 0 | 21 | 0 | 870 | 1.10 | 2.3 | 0 | 7 | 0 | 303 | 0.88 | 1.8 | 0 | 6 | 0 | 325 | 0 | 34 | 0 | 517 |
| 29-Jun | 155.1 | 5.0 | 5.0 | 47.8 | 1.155 | 2.4 | 0 | 34 | 0 | 1,409 | 1.10 | 2.3 | 0 | 17 | 0 | 736 | 0.88 | 1.8 | 0 | 1 | 0 | 54 | 0 | 52 | 0 | 791 |
| 30-Jun | 155.1 | 5.0 | 5.0 | 47.8 | 1.193 | 2.5 | 0 | 42 | 0 | 1,684 | 1.15 | 2.4 | 0 | 25 | 0 | 1,044 | 0.89 | 1.9 | 0 | 6 | 0 | 321 | 0 | 73 | 0 | 1,081 |
| 1-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.163 | 2.4 | 0 | 25 | 0 | 1,028 | 1.13 | 2.4 | 0 | 8 | 0 | 338 | 0.86 | 1.8 | 0 | 1 | 0 | 56 | 0 | 34 | 0 | 516 |
| 2-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.163 | 2.4 | 0 | 24 | 0 | 987 | 1.13 | 2.4 | 0 | 6 | 0 | 254 | 0.86 | 1.8 | 0 | 2 | 0 | 111 | 0 | 32 | 0 | 485 |
| 3-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.163 | 2.4 | 0 | 28 | 0 | 1,151 | 1.13 | 2.4 | 0 | 9 | 0 | 381 | 0.86 | 1.8 | 0 | 1 | 0 | 56 | 0 | 38 | 0 | 576 |
| 4-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.228 | 2.6 | 0 | 20 | 0 | 779 | 1.10 | 2.3 | 0 | 17 | 0 | 738 | 0.91 | 1.9 | 0 | 2 | 0 | 105 | 0 | 39 | 0 | 575 |
| 5-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.228 | 2.6 | 0 | 18 | 0 | 701 | 1.10 | 2.3 | 0 | 5 | 0 | 217 | 0.91 | 1.9 | 0 | 3 | 0 | 157 | 0 | 26 | 0 | 384 |
| 6-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.190 | 2.5 | 0 | 29 | 0 | 1,166 | 1.12 | 2.3 | 0 | 20 | 0 | 853 | 0.86 | 1.8 | 0 | 1 | 0 | 56 | 0 | 50 | 0 | 754 |
| 7-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.190 | 2.5 | 0 | 29 | 0 | 1,166 | 1.12 | 2.3 | 10 | 0 | 426 | 0 | 0.86 | 1.8 | 0 | 2 | 0 | 111 | 10 | 31 | 151 | 467 |
| 8-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.160 | 2.4 | 0 | 26 | 0 | 1,072 | 1.14 | 2.4 | 0 | 11 | 0 | 461 | 0.82 | 1.7 | 0 | 1 | 0 | 59 | 0 | 38 | 0 | 583 |
| 9-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.160 | 2.4 | 0 | 14 | 0 | 577 | 1.14 | 2.4 | 0 | 11 | 0 | 461 | 0.82 | 1.7 | 0 | 1 | 0 | 59 | 0 | 26 | 0 | 399 |
| 10-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.128 | 2.4 | 0 | 14 | 0 | 594 | 1.15 | 2.4 | 0 | 2 | 0 | 84 | 0.90 | 1.9 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 242 |
| 11-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.128 | 2.4 | 0 | 16 | 0 | 679 | 1.15 | 2.4 | 0 | 17 | 0 | 710 | 0.90 | 1.9 | 0 | 0 | 0 | 0 | 0 | 33 | 0 | 498 |
| 12-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.216 | 2.5 | 0 | 22 | 0 | 865 | 1.14 | 2.4 | 0 | 12 | 0 | 504 | 0.85 | 1.8 | 0 | 2 | 0 | 112 | 0 | 36 | 0 | 537 |
| 13-Jul | 155.1 | 5.0 | 5.0 | 47.8 | 1.216 | 2.5 | 0 | 19 | 0 | 747 | 1.14 | 2.4 | 0 | 9 | 0 | 378 | 0.85 | 1.8 | 0 | 2 | 0 | 112 | 0 | 30 | 0 | 447 |
| 14-Jul | 175.6 | 5.2 | 5.3 | 77.7 | 1.269 | 1.6 | 0 | 1 | 0 | 61 | 1.22 | 1.6 | 0 | 3 | 0 | 192 | 0.97 | 1.2 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 90 |
| 15-Jul | 185.6 | 5.2 | 5.3 | 92.2 | 1.361 | 1.5 | 0 | 7 | 0 | 474 | 1.27 | 1.4 | 0 | 16 | 0 | 1,162 | 1.13 | 1.2 | 0 | 2 | 0 | 163 | 0 | 25 | 0 | 613 |
| 16-Jul | 196.1 | 5.3 | 5.4 | 107.5 | 1.361 | 1.3 | 0 | 9 | 0 | 711 | 1.27 | 1.2 | 0 | 1 | 0 | 85 | 1.13 | 1.1 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 286 |
| 17-Jul | 196.1 | 5.3 | 5.4 | 107.5 | 1.287 | 1.2 | 0 | 16 | 0 | 1,336 | 1.27 | 1.2 | 0 | 9 | 0 | 760 | 1.49 | 1.4 | 0 | 3 | 0 | 217 | 0 | 28 | 0 | 744 |
| 18-Jul | 196.1 | 5.3 | 5.4 | 107.5 | 1.287 | 1.2 | 1 | 12 | 84 | 1,002 | 1.27 | 1.2 | 0 | 9 | 0 | 760 | 1.49 | 1.4 | 0 | 3 | 0 | 217 | 1 | 24 | 27 | 637 |
| 19-Jul | 224.6 | 5.4 | 5.7 | 149.0 | 1.381 | 0.9 | 0 | 3 | 0 | 324 | 1.26 | 0.8 | 0 | 0 | 0 | 0 | 0.66 | 0.4 | 0 | 3 | 0 | 681 | 0 | 6 | 0 | 271 |
| 20-Jul | 224.6 | 5.4 | 5.7 | 149.0 | 1.381 | 0.9 | 0 | 0 | 0 | 0 | 1.26 | 0.8 | 0 | 0 | 0 | 0 | 0.66 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | | | | | | | **830** | **3,412** | **32,999** | **134,684** | | | **451** | **3,429** | **18,853** | **141,549** | | | **193** | **2,333** | **7,975** | **109,017** | **1,474** | **9,174** | **21,032** | **129,004** |

# APPENDIX 2

## Mean monthly catch-per-unit-effort (CPUE, fish caught per m$^2$) of juvenile chinook salmon by 10 km intervals of the upper Nechako River, 2003

APPENDIX 2

## Mean monthly catch-per-unit-effort (CPUE, fish caught per m$^2$) of juvenile chinook salmon by 10 km intervals of the upper Nechako River, 2003

| Date | Time of day | Distance from Kenney Dam | midpoint (km) | 0+ CPUE mean | 0+ CPUE SD | 1+ CPUE mean | 1+ CPUE SD |
|---|---|---|---|---|---|---|---|
| | | 10.0-19.9 | 15 | 4.25 | 5.45 | 1.08 | 1.25 |
| | | 20.0-29.9 | 25 | 8.02 | 8.13 | 1.24 | 3.45 |
| April | Day | 30.0-39.9 | 35 | 4.35 | 4.67 | 0.55 | 1.23 |
| | | 50.0-59.9 | 55 | 8.64 | 8.53 | 0.32 | 0.86 |
| | | 70.0-79.9 | 75 | 2.47 | 2.17 | 0.59 | 1.1 |
| | | 80.0-89.9 | 85 | 2.2 | 3.97 | 0.4 | 0.67 |
| | | 10.0-19.9 | 15 | 5.33 | 3.99 | 2.42 | 2.79 |
| | | 20.0-29.9 | 25 | 31.32 | 29.11 | 5.42 | 8.39 |
| April | Night | 30.0-39.9 | 35 | 30.68 | 24.21 | 0.98 | 2.06 |
| | | 50.0-59.9 | 55 | 18.47 | 32.15 | 3.84 | 4.59 |
| | | 70.0-79.9 | 75 | 3.4 | 1.86 | 1.28 | 0.98 |
| | | 80.0-89.9 | 85 | 2.57 | 2.43 | 3.34 | 2.81 |
| | | 0.0-9.9 | 5 | 18.1 | 21.7 | 0.1 | 0.3 |
| | | 10.0-19.9 | 15 | 19.1 | 21.7 | 0.2 | 0.5 |
| | | 20.0-29.9 | 25 | 33 | 35.1 | 0 | 0.1 |
| May | Day | 30.0-39.9 | 35 | 12.2 | 15.1 | 0.1 | 0.4 |
| | | 50.0-59.9 | 55 | 17 | 22.4 | 0.2 | 0.6 |
| | | 70.0-79.9 | 75 | 37.8 | 25.5 | 0 | 0 |
| | | 80.0-89.9 | 85 | 7.4 | 8.6 | 0 | 0 |
| | | 0.0-9.9 | 5 | 20 | 24.73 | 0 | 0 |
| | | 10.0-19.9 | 15 | 79.19 | 99.04 | 0.6 | 0.4 |
| | | 20.0-29.9 | 25 | 90.64 | 81.31 | 0.4 | 0.9 |
| May | Night | 30.0-39.9 | 35 | 22.99 | 17.65 | 0.3 | 0.5 |
| | | 50.0-59.9 | 55 | 42.72 | 55.36 | 0.5 | 0.9 |
| | | 70.0-79.9 | 75 | 56.89 | 52.43 | 0.2 | 0.5 |
| | | 80.0-89.9 | 85 | 57.32 | 69.48 | 0.2 | 0.7 |
| | | 0.0-9.9 | 5 | 46.5 | 59.9 | 0 | 0 |
| | | 10.0-19.9 | 15 | 5.3 | 8.9 | 0.03 | 0.16 |
| | | 20.0-29.9 | 25 | 2.7 | 5.4 | 0 | 0 |
| June | Day | 30.0-39.9 | 35 | 0.5 | 0.8 | 0 | 0 |
| | | 50.0-59.9 | 55 | 0.8 | 1.8 | 0 | 0 |
| | | 70.0-79.9 | 75 | 0.7 | 1 | 0 | 0 |
| | | 80.0-89.9 | 85 | 0.4 | 0.8 | 0 | 0 |

## APPENDIX 2 (cont.) Mean monthly catch-per-unit-effort (CPUE, fish caught per $m^2$) of juvenile chinook salmon by 10 km intervals of the upper Nechako River, 2003

| Date | Time of day | Distance from Kenney Dam | midpoint (km) | 0+ CPUE mean | 0+ CPUE SD | 1+ CPUE mean | 1+ CPUE SD |
|---|---|---|---|---|---|---|---|
| | | 0.0-9.9 | 5 | 26.67 | 37.94 | 0 | 0 |
| | | 10.0-19.9 | 15 | 44.29 | 53.03 | 0.18 | 0.48 |
| | | 20.0-29.9 | 25 | 24.71 | 23.5 | 0 | 0 |
| June | Night | 30.0-39.9 | 35 | 6.56 | 9.77 | 0 | 0 |
| | | 50.0-59.9 | 55 | 9.65 | 9.52 | 0 | 0 |
| | | 70.0-79.9 | 75 | 20.56 | 24.29 | 0 | 0 |
| | | 80.0-89.9 | 85 | 10.51 | 11.07 | 0.05 | 0.2 |
| | | 0.0-9.9 | 5 | 29.2 | 36.3 | 0 | 0 |
| | | 10.0-19.9 | 15 | 3.9 | 5.4 | 0 | 0 |
| | | 20.0-29.9 | 25 | 0.6 | 0.8 | 0 | 0 |
| July | Day | 30.0-39.9 | 35 | 0.2 | 0.4 | 0 | 0 |
| | | 50.0-59.9 | 55 | 0.1 | 0.3 | 0 | 0 |
| | | 70.0-79.9 | 75 | 0.4 | 0.7 | 0 | 0 |
| | | 80.0-89.9 | 85 | 0 | 0 | 0 | 0 |
| | | 0.0-9.9 | 5 | 25.92 | 38.58 | 0 | 0 |
| | | 10.0-19.9 | 15 | 24.86 | 25.55 | 0.06 | 0.22 |
| | | 20.0-29.9 | 25 | 6.96 | 7.1 | 0 | 0 |
| July | Night | 30.0-39.9 | 35 | 2.05 | 2.17 | 0 | 0 |
| | | 50.0-59.9 | 55 | 5.85 | 7.94 | 0 | 0 |
| | | 70.0-79.9 | 75 | 7.2 | 7.18 | 0 | 0 |
| | | 80.0-89.9 | 85 | 3.5 | 3.52 | 0 | 0 |
| | | 10.0-19.9 | 15 | 2.75 | 2.22 | 0 | 0 |
| | | 20.0-29.9 | 25 | 0.6 | 1.33 | 0 | 0 |
| November | Day | 30.0-39.9 | 35 | 0.39 | 1.51 | 0 | 0 |
| | | 50.0-59.9 | 55 | 0.26 | 0.51 | 0 | 0 |
| | | 70.0-79.9 | 75 | 0.48 | 0.66 | 0 | 0 |
| | | 80.0-89.9 | 85 | 0.32 | 0.74 | 0 | 0 |
| | | 10.0-19.9 | 15 | 2.33 | 2.83 | 0 | 0 |
| | | 20.0-29.9 | 25 | 1.24 | 2.25 | 0 | 0 |
| November | Night | 30.0-39.9 | 35 | 0.58 | 1.93 | 0 | 0 |
| | | 50.0-59.9 | 55 | 0.57 | 0.84 | 0 | 0 |
| | | 70.0-79.9 | 75 | Not sampled - river frozen | | | |
| | | 80.0-89.9 | 85 | Not sampled - river frozen | | | |