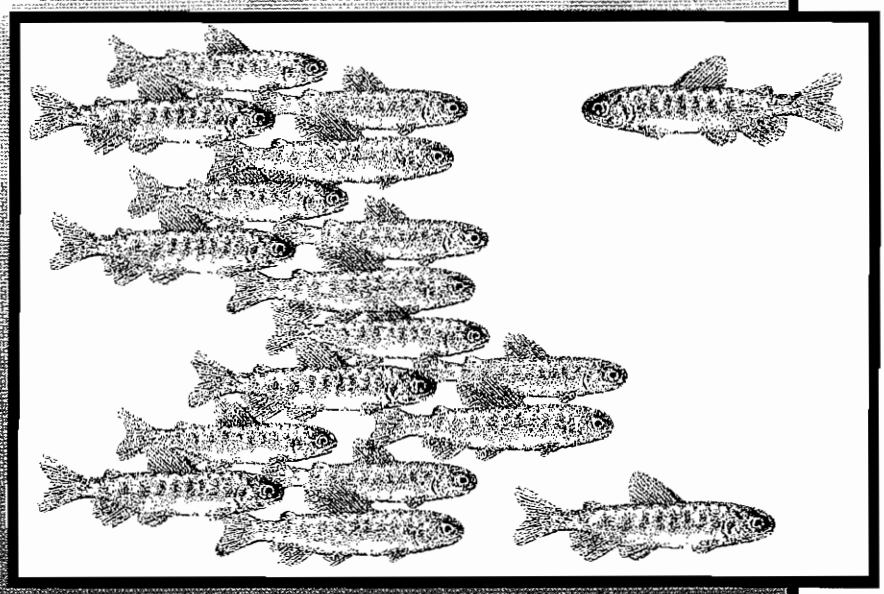
1999 Skagit River Wild 0+ Chinook Production Evaluation Annual Report



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Annual Report

1999 Skagit River Wild 0+ Chinook Production Evaluation

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Acknowledgments

Evaluation of the wild 0+ chinook production from the Skagit River in 1999 was made possible with funding from Seattle City Light. This third year of such support, combined with funds from the Dingle-Johnson/Wallop-Breaux program and matched with Washington Department of Fish & Wildlife funds, enabled the *Wild Salmon Production & Survival Evaluation* unit to trap downstream migrants in the lower Skagit River from mid-January through early-September.

A number of individuals from natural resource agencies, as well as private citizens, helped to make this project a success: field staff from the National Park Service-Sedro Wooley and WDFW SSHEAR technicians installed, operated and maintained traps to capture, enumerate, and mark wild coho in the upper Skagit Basin. We also appreciate the contributions of a number of individuals who provided logistical support: Pat and Sherman Courier, property owners adjacent to the mainstem traps, provided drinking water, utility access, and over-winter trap storage; Burlington Northern continued to allow us to anchor the traps to their railroad bridge; Dexter and Joan Self, property owners along Mannser Creek, provided access for our crew to install and operate a downstream migrant trap from which we captured and marked wild coho smolts.

The success of this project relies on the hard work of a number of dedicated permanent and temporary WDFW personnel. Scientific Technicians Dave Collins, Jim Repoz, Scott McGrath, Paul Lorenz, Calvin Martin, and Mat Gillum worked long hours operating and maintaining the traps, and enumerating and sampling catches. Unit biologists Mike Ackley and Pete Topping provided valuable logistical support during trap installation and removal. WDFW biologist Mark Hino developed the computer database and analyzed much of the trap data contained in this report. WDFW biologist Laurie Peterson reviewed and edited this report.

University of Washington graduate student, Ashley Steel, designed the visibility monitoring study which we began in 1998 and continued in 1999.

1999 Skagit River Wild 0+ Chinook Production Evaluation

Introduction

Skagit River chinook returns (spring and summer/fall combined) have steadily declined over the last fifty years (*PSSSRG* 1992)(*PSSSRG* 1997). In 1994, the Joint Chinook Technical Committee of the Pacific Salmon Commission designated the status of these stocks as "Not Rebuilding." To address this poor stock status, in 1995, resource managers formed the Skagit River Chinook work group. Composed of state, tribal, and federal fish biologists, this group recommends and coordinates restoration and monitoring programs. A major goal of this work group is to determine the limiting factors for chinook. Necessary data for this purpose include an indicator-stock tagging program, habitat inventory, annual adult escapement estimation, and wild juvenile chinook assessment. The juvenile production evaluation is a vital link in this process because it provides a direct measure of freshwater survival.

Seattle City Light (operators of several dams on the Skagit River), through a 1991 fisheries settlement agreement with WDFW, Federal agencies (NMFS, USFWS, USFS, and NPS), and the Skagit Tribes created the Skagit Non-Flow Plan Coordinating Committee (NCC). The NCC is responsible for funding several non-flow fisheries programs including the "Chinook Research Program." Beginning in 1997, this program provided funding to conduct chinook studies. This report documents our 1999 downstream migrant trapping project in the Skagit River which, with funding from the NCC, we expanded to improve our estimates of wild 0+ chinook production.

Understanding the major sources of interannual variation in run size is critical to improving harvest and habitat management. Quantifying anadromous salmonid populations as seaward migrants near saltwater entry is the most direct assessment of stock performance in freshwater because the variation resulting from marine survival and harvest are excluded. Relating smolt production to adult spawners over a number of broods empirically determines the watershed's natural production potential (provided escapement and environmental conditions are sufficient), its stock/recruit function if escapements are less than that required to achieve maximum production, and enables identification of the major density-independent source(s) of interannual variation in freshwater survival. To accomplish these and other fish management objectives, the WDFW implemented a long-term research program directed at measuring wild salmon production in terms of smolts and adults in selected watersheds, beginning in 1976 (*Seiler et al.*1981). In 1981, this program, which was directed primarily at coho salmon, was expanded to include additional large watersheds (*Seiler et al.*1984).

In 1990, we initiated downstream migrant trapping in the Skagit River system to quantify wild coho smolt production to, among other objectives, resolve a discrepancy in escapement estimates (*Conrad et al* 1997). This program, which in 1999 was in its tenth year, involves trapping and marking wild coho smolts emigrating from a number of tributaries, and sampling a portion of the

entire population via floating traps in the lower mainstem (R.M. 17, Burlington Northern railroad bridge). In addition, we coded-wire tag wild coho smolts captured at the gulper in Baker Lake because the upstream migrant trap below the dam provides a reliable accounting of all salmon returning to this system. Applying the marine survival estimated from the tag-based estimates of harvest and escapement to respective estimates of total system wild coho smolt production yields estimates of adult recruits, escapement, and harvest for the entire Skagit River system (*Seiler et al.*1995).

Although our trapping in the mainstem has been directed at coho smolts, we identify and enumerate all fish captured. For the first seven years (1990-1996), season total 0+ chinook catches in the one scoop trap have varied six-fold, from 1,700 to 10,500 chinook. (As of 1993, we have simultaneously operated both a scoop and a screw trap.) In addition to abundance, these catch totals are influenced by fishing effort (the time fished on each date and for the season), migration timing relative to the interval we trapped, and instantaneous trap efficiency. Many such variables as discharge, water velocity, turbidity, debris, channel configuration, trap placement, and fish size combine to affect instantaneous trap efficiency.

Preliminary expansion of these 0+ chinook catches, based on the season average recapture rates of wild coho and several other assumptions held consistent between years, has yielded chinook production estimates that range from 0.5 to 3.0 million. The accuracy and precision of these estimates is presently incalculable because the assumptions remain unverified. We believe, however, that these estimates reflect the abundance of wild 0+ chinook production from these broods, at least in a relative sense. We base this contention upon the significant negative correlation between the freshwater survival estimates and the severity of flow during the period that the eggs were incubating in the gravel. The survival rates in this relationship are the ratio of total 0+ chinook emigrants estimated past the traps to the potential egg deposition. System total egg deposition is simply the product of the estimated total adult chinook escapement, an assumed even sex ratio and a fecundity of 4,500 eggs/female. This relationship indicates that overall egg-to-migrant survival for Skagit River chinook may have varied twenty-fold or more within just these seven broods, almost entirely as a function of flow during egg incubation.

In 1997, we began trapping in mid-February and continued into September. This first season of extended trapping produced our first insight into the migration timing. For the season, we estimated 2.4 million wild 0+ chinook.

Measuring the biological attributes of outmigration timing and size contributes to our understanding of juvenile chinook freshwater life history. This information is useful for flow management (dams and other flow controls), habitat protection, and designing hatchery programs to minimize hatchery/wild interactions.

We estimate coho smolt production from the Skagit River with the mark and recapture strategy that we developed and have used successfully in a number of large watersheds throughout the state over many years. This method involves the following components:

1. Trapping all the wild coho smolts emigrating from a number of tributaries located throughout the basin;
2. Identifying each of these smolts with an external mark; and
3. Capturing a portion of the smolt population migrating through the lower mainstem and examining each fish for the mark.

This design produces relatively precise (CV<6%) and (we believe) unbiased production estimates, because a significant and representative portion of the coho smolt population is marked at the tributary traps. Therefore, trapping in the mainstem does not have to be continuous or even representative with respect to timing (*Seber* 1982). We explicitly developed this design to avoid the requirement of estimating gear efficiency.

Because of the early life history characteristics of chinook in freshwater, estimating their smolt production with the same statistical precision we achieve for coho smolts is not possible. Chinook originate in discrete portions of the mainstem, and subsequently rear for variable intervals in various reaches. Therefore, the methodology we use with coho, capturing and identifying a representative portion of the entire population, is not feasible for chinook. Each component likely has different survival patterns that result from the complex interactions of a number of factors: their parent's spawning timing and distribution; genetically-programed juvenile rearing strategies; and the flow and habitat conditions each brood and sub-population within it encounters. The susceptibility of migrants to capture also varies as a function of flow and environmental conditions in effect upstream of the trap and at the trap.

Operating downstream migrant traps over an extended period in the dynamic environment of the lower mainstem of a large river is challenging when conditions are optimal. During the spring runoff, however, as flows and debris levels exceed some threshold, it becomes impossible. Above a certain discharge, capture efficiency is generally some negative function of flow. When the traps are inoperable, however, it is zero. For these periods, migration has to be estimated by interpolation. Such estimates are biased if smolt migration rates are affected by flow changes, which we believe they are.

Calibrating the traps in the lower Skagit River with wild chinook caught in the traps is not feasible; catches within a sufficiently narrow time strata are simply too low. While hatchery chinook offer the potential of sufficient release group sizes on some broods, the requisite assumptions that they survive, distribute vertically and laterally, behave, and consequently, are caught at the same rate as wild chinook, are unverifiable and therefore, problematic as well.

Sources of Variation Affecting Wild 0+ chinook Estimates

Given the foregoing problems, estimating wild juvenile 0+ chinook production from the trapping data we have collected in the lower Skagit River involves a number of assumptions. Accuracy of the resultant estimates are a direct function of the veracity of these assumptions. Each assumption

deals with the uncertainty resulting from the following five major sources of variation we have identified.

1. **Trap efficiency**. Expanding catches to estimate wild 0+ chinook production requires estimates of instantaneous gear efficiency, ideally as a function of some measurable variable such as discharge.

2. **Day vs. night trap efficiency**. Trap efficiency may be influenced by light. For example, it may be lower during the daylight than at night.

   We have operated the traps primarily at night because catch rates, especially for coho and to a lesser extent chinook, are higher at night than during the daylight. Estimating instantaneous trap efficiency during the daylight hours, however, is probably not possible because it would require that a sufficient and known number of marked wild chinook pass the traps within a single daylight period. The traps fish only the top 4 ft of the water column, and the depth at our site is 20-30 ft, depending on discharge. If, as a function of increasing light intensity, juvenile chinook migrate at greater depth and/or their ability to avoid the trap increases, then trap efficiency during daylight hours would be lower. The behavior of juvenile chinook and the biases imposed by releasing marked fish immediately upstream of the traps precludes estimating instantaneous efficiency within such a limited time interval as a single daylight period. Catches during daylight hours appear to be positively affected by turbidity. If true, this results either from increased migration rate and/or from an increase in trap efficiency because avoidance is reduced.

3. **Day vs. night migration**. Efficiency-based estimates rely on trapping either continuously or randomly throughout the time strata that migration is estimated. We developed our experimental design for estimating coho production to avoid the requirement of continuous trapping in the mainstem. Therefore, trapping in previous years was conducted almost entirely at night.

4. **Migration interval**. Skagit River 0+ chinook emigrate over a wider season than coho smolts. Chinook begin their downstream migration in January or earlier, and continue through the summer or even into the fall. In most years, we operated the traps over the coho smolt migration period, early-April through mid-June. Beginning in 1994, and continuing through 1996, we extended trapping longer, as late as mid-July. In 1997, we began trapping in mid-February and continued into September. To better define the early portion of the migration period, in 1998 and 1999, we began trapping in mid-January and extended trapping into September. In 1999 we attempted to assess the late migration by operating the traps intermittently during October, November and December.

5. **Incidence of hatchery-produced fish**. Prior to 1994, releases of hatchery-produced 0+ chinook in the Skagit River were unmarked. Consequently, our estimates of wild chinook production for the first four years rely on an assumption for the number of hatchery-produced fingerlings we caught. Estimating both components of the migration relies on assumptions of how many hatchery fish survived to pass the trap during the interval trapped. Beginning with the 1993 brood, (released in 1994) all hatchery-produced zero age chinook released into the Skagit River have been marked with an adipose fin-clip (ad-mark) and coded-wire tagged.

Study Plan for 1999

The study plan for the 1999 trapping season was directed at continuing to improve the estimates of Skagit River chinook production through achieving a better understanding of the sources of variation. In addition to continuing our analysis of the chinook and coho trapping data collected over the previous nine years, the 1999 work plan included the following six operational elements.

1. **Trapping Season**
   A critical uncertainty in estimating Skagit River wild 0+ chinook production is their emigration timing. In 1999, we began trapping in mid-January and continued into early-September. Migration was in progress when trapping began and essentially over in mid-August. We planned to operate the traps intermittently in October, November, and December to assess migration. We operated the traps over three days in October but extreme high flows and large debris in November damaged the traps. We removed the traps from the river on November twelfth for repairs and replacement of the pontoons and work decks of the scoop trap.

2. **Nightly Trap Operation**
   Nightly trapping with both the scoop trap and screw trap was continued throughout the season.

3. **Daytime Trap Operation**
   Daytime trapping occurred every third day. We made concerted efforts to enumerate catches shortly after dawn and around dusk to enable separating day and night catches.

4. **Right and Left Ventral Marking**
   To assess differences in recapture rates of coho marked in the upper river versus coho marked lower in the watershed, we used two different marks. Coho smolts marked and released by the NPS and SSHEAR, high in the watershed, were marked with a partial left ventral fin clip as used in past years. Smolts captured and released from the Mannser Creek trap were marked with a partial right ventral fin clip.

5. **Trap Efficiency**
In addition to the marked wild coho released from the tributary traps, and the groups of hatchery fingerlings released from the two production facilities, we marked and released above the trap, four groups of hatchery chinook and two groups of dye-marked chum fry.

6. **Measuring Visibility**
To better understand the influence of water clarity on migration behavior, we measured visibility each day over most of the season. Visibility data will be correlated with flow and fish catch data.

7. **Hydro-acoustic Assessment**
We field tested a hydro-acoustic unit in an attempt to measure the depth distribution of chinook fry at the trap site.

Methods

Trapping Gear and Operation

We installed two floating downstream migrant traps in the lower Skagit River (R.M. 17) on January 16. With the permission of Burlington Northern, we attached the four anchor lines to the bridge support structures. The traps were positioned side by side in the zone of highest water velocity, which is just south of the southernmost pier, approximately 70 ft from the south bank. Velocity at this site varies as a function of discharge. At low flows it averages around 5 fps, and increases to around 7 fps at high flows.

Two types of traps were used: a floating inclined-plane screen trap (scoop trap), (*Seiler et al.* 1981) and a screw trap (*Busack et al.* 1991). Both traps are contained in steel pontoon barges, outfitted with two five-ton bow-mounted anchor winches loaded with up to 600 ft of ⅜ inch aircraft cable. Overall, the scoop trap barge measures 13 ft x 38 ft, while the screw trap barge is 15 ft x 30 ft. The inclined-screen of the scoop trap is 6 ft wide, and we fish it only 3.5 ft deep to maintain an oblique angle to the flow. We have found that the angle formed by the 16 ft-long screen, set 3.5 ft deep at the entrance, precludes impinging even such small migrants as pink and chum fry, as there is sufficient sweep across the surface relative to the flow through it. At this depth, the scoop trap screens a rectangular cross-sectional area of 21 ft^2. The 8 ft-diameter screw trap screens a cross-sectional area of 25 ft^2, in the shape of a semi-circle.

The traps were fished every night and every third day unless flows and associated debris loads were excessive. All captured fish were enumerated by species and age and examined for

appropriate external marks. Samples of wild chinook were measured (fork length, in centimeters) over the season.

Environmental Parameters

In addition to fish counts for intervals trapped, we also measured water temperature and turbidity daily using two devices; a standard secchi disk and a black disc viewed horizontally through a periscope *(Davies-Colley* 1988) (*Steel* in press). Mean daily flow data was provided by the USGS gauge at Mount Vernon.

Estimating Migration

Estimating migration for any period, whether a short time interval or an entire season, requires a catch and an estimate of capture rate or trap efficiency. Catch is the product of abundance and capture rate (Equation #1). As our objective is to estimate abundance, and catch is simply a count within a time period, estimating capture rate is the primary challenge. We directed our analysis of the catch data at correlating day and night catch rates with flow and visibility data. These correlations were employed to project catches of wild 0+ chinook and selected groups of marked fish to the standard of continuous trapping. Relating the projected numbers of marked fish recovered to the numbers released provides estimates of capture rates.

Equation #1: Basic formulas

$$C=Me \qquad M=\frac{C}{e}$$

where: M = migration
C = catch
e = trap efficiency

To assess catch rates of wild coho smolts and wild and hatchery 0+ chinook for light and dark periods, we selected sunrise and sunset as the strata breaks. For each trap, we sorted through the trapping interval database to select daytime fishing periods that were preceded and followed by night fishing intervals. Catch rates from the nights before and after the day fished were averaged to account for changing migration rates. Catch data were standardized by time fished in each interval and expressed as fish/hour rates. The ratio of day catch rate-to-night catch rate (d:n) was used to indicate relative catch rates as a function of daylight (Equation #2). We also computed season average day:night (d:n) catch ratios (Equation #3).

Equation #2: Comparing day catch rates to night catch rates:

$$R_i = C_{h_{di}} \div \frac{C_{ni-1} + C_{ni}}{h_{ni-1} + h_{ni}}$$

where: i = 24-hour period (from sunrise to sunrise)
R_i = ratio of day to night catch rates for period i
$C_{h(di)}$ = catch/hour during daylight for period i
C_{ni-1} = catch during night before period i
C_{ni} = catch during night for period i
h_{ni-1} = hours fished the night before period i
h_{ni} = hours fished during the night for period i

Equation #3: Season average ratio of day:night catch rates

$$\bar{\chi} R_i = \frac{\Sigma R_i}{n}$$

where: n = total number of comparisons over the season

Catch data was expanded to the standard of continuous trapping. For minor intervals of fishing time missed at night, we used straight-line interpolation of catch rates before and after the interval missed. To estimate catches for the several contiguous nights that the screw trap did not fish during the spring, we expanded catches in the scoop trap with the ratio of scoop to screw trap catches before and after the outage. Catches during the daylight intervals that we did not fish were estimated from night catches and the d:n ratio correlations with flow.

An estimate of instantaneous capture rate for both day and night intervals as a function of flow would be optimal. As discussed above, however, this may not be feasible with chinook. We have several indicators of trap efficiency in 1999: recaptures of the wild coho marked at the tributary traps over the season, recaptures of the four groups of fin-marked hatchery chinook that we released, recoveries of the hatchery chinook fingerlings released from Skagit Hatchery and the Countyline Ponds, and recoveries of the wild chum fry dye mark groups. While the hatchery chinook are the same species and age, because they may behave significantly different than wild fish, their capture rate may not represent that of wild chinook. In addition, because the mortality and residualism of hatchery chinook between release and passing the trap is unknown, but probably significant, the resultant unadjusted estimates of capture rate are biased low. While wild coho are a different species, age, and somewhat larger size, because they are actively migrating smolts released over an extended period, their recaptures may actually represent season average trap efficiency for wild chinook better than the hatchery chinook groups.

We released the four groups of fin-marked chinook and two groups of dye-marked chum fry approximately one mile upstream of the traps. Each of these groups were released in the same manner -- distributed evenly across the channel from a skiff, via buckets.

To project recapture rates for both hatchery chinook and the marked wild coho to the standard of continuous trapping, we expanded mark recoveries with the process described above. Recaptures of ad-marked chinook were complicated by the release of two different groups/stocks with the same external mark –one group was released from Countyline Ponds and the other group from Skagit Hatchery. Following release of the chinook acclimated at the Countyline Ponds, which began on May 29, we sacrificed a sample of ad-marked 0+ chinook over a number of days through early August, to recover tags and thereby estimate catches of each group.

Hydro-acoustic Assessment

In conjunction with the WDFW Hydro-acoustic Assessment Group (La Conner), we conducted a test on the scoop trap in early-February to acoustically measure the vertical distribution of fish targets. Analysis of data from these tests were inconclusive due to problems with the equipment, small fish size and rapid current at the trap site. Assessment of acoustic methods will require more time and the purchase of new equipment.

Results

Trap Operation and Flow

Trapping began on the night of January 16, and ended on the morning of October 30. We fished the scoop trap each night through August 21. Over this same interval, the screw trap also fished each night with the exception of 5 nights (February 27, 28 and May 24-26) due to mechanical problems and high debris loads, respectively. Over this interval we also operated both traps throughout the daylight every third day. On August 21, we ceased continuous nightly trap operation and fished the traps on a schedule of four nights on followed by three off through the night of September 6. We resumed trapping on October 28 through 31, and planned to operate the traps a few nights each month through December. On November 12, however, large debris transported by high flows (77,000 cfs) damaged the traps and required that we remove them from the river.

Flow is the dominant factor affecting downstream migrant trapping operations in any system. This is particularly true in the lower Skagit River due to the quantity of large woody debris this system transports during rising and high flows. From mid-January through mid-May, flows were relatively moderate averaging less than 20,000 cfs. Beginning in mid-May, flows increased, ranging from around 20,000 to a peak of 42,000 cfs in June before declining in early August (Figure 1).

Over the 234-day season (through the night of September 6), the scoop trap fished 3,327 hours out of the 5,595-hour season (59.5%). The screw trap fished on nearly the same schedule, although for fewer hours. In total, the screw trap fished 2,353 hours, 42.1% of the total season (Table 1).

Catch

Chinook fry were moving downstream when we began trapping in mid-January. On the first night of trapping, we caught 533 chinook fry. Over the first three days trapped, the combined catch rates averaged 15 chinook fry per hour. Catches varied throughout the month and by the last three days of January, the traps were averaging just over 12 chinook fry/hour. The highest catch rates of wild chinook fry, 168 and 146 fish/hour in the scoop and screw traps, respectively, occurred on the night of February 23. This peak occurred one month earlier than the peak in 1998 and coincided with a moderate flow increase (Figures 1 and 2). Over the remaining season, wild 0+ chinook catch rates fluctuated but generally declined beginning in late-March. For the last month of the trapping season, August 6 through September 6, wild chinook catch rates averaged <1 fish/hour.

Day-to-day variation in wild chinook catch rates was nearly identical between traps. The scoop trap, however, consistently out-fished the screw trap during both daylight and dark hours (Figure 2). For the season through July 31, the scoop and screw traps captured wild 0+ chinook at average rates of 22.1 and 17.1 fry/night hour fished, and 9.9 and 7.2 fry/day hour fished, respectively. These rates are simply the ratio of total catches to the total hours fished for each trap during daylight and nighttime fishing.

Season total catches of all salmonids caught over the ten years we have operated the floating traps in the lower Skagit River are listed in Table 2. For the season, we captured 96,746 wild and 5,662 hatchery zero age chinook. This is the highest catch of wild 0+ chinook in the ten years trapped.

In total, we caught only 8,457 wild coho smolts. Over the ten years trapped, wild coho smolt catches were lower only in 1993 (7,326 smolts). Our catch of 1,308 hatchery coho smolts was low but still higher than that of four other years.

Catches of yearling chinook were also low, especially hatchery fish. We caught only 285 wild and 242 hatchery yearling chinook. This is our third and second lowest catch of wild and hatchery yearling chinook. Relating the catch of hatchery yearlings to the 142,380 ad-marked/coded-wire tagged smolts released from Skagit Hatchery on April 14 estimates a recovery rate of less than 0.2%. The low catch of hatchery chinook probably results from their unnatural distribution across the channel. In previous years we have observed hatchery yearlings exhibiting rearing behavior, jumping in the slow water near the banks.

In contrast to these low catches, we caught 281,504 chum, over twice the previous record catch in 1995 of 112,000. Chum fry were by far the most abundant migrant in 1999.

Day:Night Catch Ratios

Wild 0+ chinook catch rates during daylight hours were compared to respective nighttime catch rates for the scoop trap on 53 trapping days, and for the screw trap on 58 trapping days (Tables 3a and 3b). Day:night catch rate ratios varied from zero to 159% in the scoop trap, and from zero to 213% in the screw trap. For the season, the ratio of summed day catch rates to summed night catch rates averaged 44% and 40% for the scoop and screw traps, respectively. Mean d:n catch rate ratios were higher -- 58% for the scoop trap and 55% for the screw trap. These rates are not directly comparable between traps because they were computed from different trapping days. Over the 47 days that both traps operated throughout the daylight hours, d:n ratios were nearly identical, averaging 56% for the scoop trap and 57% for the screw trap.

Flows on the dates we computed d:n ratios ranged just over three-fold: 11,233 cfs to 34,633 cfs, and 10,467 cfs to 34,700 cfs, for the scoop and screw traps, respectively. Regression analysis determined that flow explained 25% and 15% of the variation in d:n ratios in the scoop and screw traps, respectively (Figure 3).

Over the 1999 season, we caught wild 0+ chinook during the daytime at rates that averaged around 50% of the rates for the preceding and following nights. These ratios are intermediate compared to those estimated in 1998 (30%), when flows were more moderate, but lower than the 70-80% values observed in 1997, when flows were high (Figure 1).

Analysis of d:n catch ratios for hatchery chinook (21 for the scoop and 19 for the screw trap) were limited by release timing and low abundance (Tables 4a and 4b). In both traps, hatchery age 0+ chinook were consistently caught at lower rates, compared to wild chinook, during the daylight relative to respective nights. Overall, d:n ratios for hatchery chinook averaged 22% and 16% in the scoop and screw traps, respectively. These ratios were about half of the seasonal rates for wild chinook, which averaged 44% in the scoop trap and 40% in the screw trap. As with wild chinook, relating d:n ratios for hatchery chinook to flows indicated similar low positive correlations, 20% and 33%, for scoop and screw traps, respectively (Figure 4). Hatchery 0+ chinook d:n ratios tracked wild ratios, indicating that these fish responded to the same stimuli as wild migrants (Figure 5).

Day:night catch ratios for wild coho smolts averaged 6% and 5% in the scoop and screw traps, far less than the rates estimated for wild 0+ chinook (Tables 5a and 5b). Flows, which varied just over three-fold, from 10,000 to 33,700 cfs, explained some of the variation in d:n ratios for wild coho (Figure 6). Although flows during 1997 were considerably higher, the relationship between flow and d:n ratios in that season indicated that relatively few coho would be caught during the daytime at flows <20,000 cfs. Results in 1999 are consistent with these findings.

Visibility

We measured visibility from January 16 through September 6. Over the season, we recorded values as high and low as 297 cm and 33 cm. Day-to-day variation rarely exceeded a factor of two. Monthly averages ranged from a high of 203 cm in April to 77 cm in June (Table 6). Flow explained a significant portion of the daily variation (Figure 7). Flow accounted for 67% of the variation over the season. The correlation coefficient improved to 74% for the data through June. Snow melt throughout the summer increased turbidity independent of flow.

We correlated d:n ratios for wild chinook 0+ with the daily visibility data through June and found that daytime migration rates were negatively correlated with visibility, although the relationships were even weaker than with flow (Figure 8). Visibility data explained only 28% and 27% of the variation in d:n ratios for the scoop and screw traps, respectively.

Wild Coho Smolt Production Evaluation

Over the season, we captured 384 of the 53,002 wild RV and LV-marked coho smolts released from the eight tributary traps, a recovery rate of 0.72%. This combined rate is the lowest we have recorded over the ten years we have operated traps in the Skagit River. Recovery rates were significantly different between the two mark groups. Only 0.34% left-ventral marked coho were captured, compared to 1.24% for the RV group. While we expect some mortality occurs between marking at the tributary traps and passing the main stem traps, we have always believed that in-river survival of wild coho smolts is very high. This contention is supported by results of mark release/recapture trials in other streams and our long record of measuring marine survival via coded wire tagging wild smolts. This nearly four-fold difference in recapture rates indicates that a serious problem affected the upper river mark groups in 1999. Potential explanations follow:

1. **Stress induced by trapping, marking, and handling caused higher mortality in the up-river groups.**

2. **The actual number of LV smolts marked and released was lower than the reported number.**

3. **LV-marked fish were not identified at the mainstem traps.**

4. **Smolts originating in the upper watershed survive at a lower rate.**

Given the extremely low recovery rate of marked smolts from the upper basin, we elected to exclude this group from the estimate. Relating the season catch of 279 RV marked smolts from Mannser Creek to the total catch of 8,416 estimates their incidence at 3.3%. Applying this rate to

to the 22,546 smolts marked and released from the Mannser Creek trap estimates system production at 677,779 wild coho smolts (Table 7).

Capture Rate Indicators

Wild Coho

Projecting night catches of RV-marked wild coho smolts on the basis of d:n catch ratios of wild coho as a function of flow for the scoop trap (Figure 6) and using the season average rate for the screw trap estimates that, had we operated both traps continuously, we would have caught 4 and 9 additional marks in the scoop and screw traps, respectively. Relating the sum of actual and projected RV-marked catches (292 smolts) to the 22,546 wild coho smolts marked at the tributaries, estimates season average combined scoop and screw trap capture rates at 1.3%. This estimate assumes that all of the wild coho smolts marked at the Mannser Creek trap passed the scoop and screw traps during the season.

Fin-marked Hatchery 0+ Chinook

We released four groups of hatchery fin-marked chinook (Ad/UC and Ad/LC) at Gardner Bar, one mile upstream of the traps, on four different evenings (May 13, May 20, May 27 and June 30) (Table 8). Marked chinook smolts were recovered in the traps within two and three day periods following release. Recapture rates for these groups varied from 0.7% to 3.1% and averaged 1.7%, while flows ranged from 17,500 cfs to 29,000 cfs. Recapture rates and flow showed little correlation.

We operated the traps continuously, both day and night, over four days after each release. All the recoveries of these groups occurred at night, primarily on the first evening following the release (Table 8). While hatchery fish may not behave as wild fish, at least, based on the recovery patterns, it appears that most of these fish passed the traps fairly rapidly.

Hatchery 0+ Chinook Production Groups

Over the season, we caught 5,658 ad-marked hatchery 0+ chinook, 3,445 in the scoop trap and 2,211 in the screw trap (Table10). These totals do not include recoveries of the 10,087 chinook that were released in four groups upstream of the traps on four dates (May 13, 20, 27, and June 3; Table 8). The volitional release of 241,120 summer chinook from the Countyline Ponds began on May 13. Observations indicated that by May 30, all fish had emigrated from the pond. Skagit Hatchery began releases of 246,714 spring chinook fingerlings on June 1 (Table 11).

All hatchery chinook were ad-marked and coded-wire tagged. Consequently, estimating our catch of each group required recovering tags. On June 2, we began systematically sampling 5% of the hatchery chinook catch. Tags recovered from fish sampled prior to June 6 consisted of 94 spring chinook released from Skagit Hatchery, 1 summer chinook from Countyline Ponds, and 4 fish did not contain tags. We continued sampling through August 12. In total, we sacrificed 253 hatchery chinook fry, and recovered 244 tags. Of these, 225 tags (89%) were from Skagit Hatchery, and 19 tags (7%) were from Countyline Ponds (Table 9).

Applying tag recovery results (Table 9) to the daily sum of projected and actual catches of hatchery chinook estimated combined catches of 4,514 Skagit Hatchery 0+ spring chinook and 2,843 Countyline Ponds summer chinook. Relating these estimates to the numbers released yields capture rates of 1.8% and 1.2%, respectively. These rates underestimate trap efficiency for hatchery chinook if any mortality occurred between release and the traps.

Chum Fry

We released two groups of dye-marked wild chum as part of trap efficiency tests (Table 11). On April 22, we released the first group of 2,100 dye-marked chum fry at 1930 hrs. By the following morning, we had recovered 78 and 51 of these marked fry in the scoop and screw traps, respectively. Through the next day only 1 fry was recovered in the scoop trap and 2 in the screw trap. Thus, for both traps combined, a total of 132 chum fry were recovered following this release, with an overall capture rate of 6.3%.

The second release on April 29 totaled 1,650 wild chum. We operated the traps that night and through the next day, recovering a total of 119 fry (30 and 89 fry in the scoop and screw traps, respectively). The capture rate of these fry was 7.2% for both traps combined (Table 11).

Wild 0+ Chinook Estimates

Catch Projection

Expansion of catch rates estimates that had the traps fished continuously, we would have caught an additional 16,918 and 11,243 wild 0+ chinook in the scoop and screw traps, respectively (Tables 12a and 12b). Combined with the actual catches (55,254 and 41,492), these estimates project a total catch from January 16, through September 6 of 124,907 wild 0+ chinook. Actual catches comprise 77% of this total projection.

On January 16, the first night of operation, we caught over 500 wild 0+ chinook, indicating that the migration was under way before we began trapping. We assumed that the migration began on January 1 and, via extrapolating the average catches over the first five days, we estimated that we would have caught an additional 4,000 chinook fry.

By late August, catches had declined to zero. We did not catch any chinook over the three days that we trapped in late October either. Based on these indications, we assumed that an insignificant number of chinook emigrated after the trapping season.

Production

We selected a value of 2% to represent season average trap efficiency. This rate is the average of the six 0+ chinook mark groups expanded to account for an average mortality rate of 20% (1.6%÷80%). Expansion of the projected season catch in both traps by this rate yields a system production estimate of 6.4 million zero-age chinook.

Wild 0+ Chinook Migration Timing

Over the season, although catch data varied considerably from day-to-day (Figure 2), most of the migration occurred before April (Figures 10a and 10b). We estimated a median migration date in 1999 of March 8, almost two months earlier than the median dates estimated in 1997 and 1998, April 30 and May 2, respectively.

Hatchery 0+ Chinook Migration Timing

The ad-marked hatchery 0+ chinook from the Countyline acclimation ponds (summers) were released 22 days prior to the Skagit Hatchery chinook 0+ (springs). In past years we have observed different emigration rates for these groups. In all previous years, the fish released from Skagit Hatchery migrated faster than those released from Countyline ponds. In contrast, in 1999, most of the Countyline fish emigrated before the Skagit Hatchery fish were released (Figures 9 and 10b). Moreover, both groups exhibited similar emigration rates,with the majority passing the traps within ten days following release (Figure 10b).

Wild 0+ Chinook Size

Over the season, 0+ chinook captured in the traps increased in size from an average around 40 mm through the end of March, to around 90 mm by early-August (Table 13, Figure 11). The lower end of the weekly size range did not exceed 40 mm until late-May, indicating protracted emergence and/or slow growth for a component of the population. Little difference in size at time between traps was evident (Figure 12).

Egg-to-Migrant Survival

Relating our estimate of 6.4 million chinook to a potential deposition of 35.3 million eggs, results in an average survival-to-migration of 18% (Table 14). This estimate of potential egg deposition (P.E.D.) is the product of 7,848 females (derived from the total spawning escapement of chinook — springs, summers, and falls — a total of 15,695 for the 1998 brood) and a fecundity of 4,500 egg/female spawner. These data corroborate our previous findings for the Skagit River, that egg-to-migrant survival varies almost entirely as a function of the severity of flow during egg incubation. Figure 13 shows this significant negative correlation ($r^2 = 94\%$) over ten broods (1989-1998).

Assumptions

Every estimate relies on assumptions. Although we know that trap efficiency is not constant, because we presently have no flow based correlation model to indicate its variation, we selected a value, indicated by the recapture rates of several groups of marked chinook, to represent a season average rate. Therefore, the overall assumption is that, catch is a constant fraction of abundance. Component assumptions for estimating the numbers of wild 0+ chinook migrating from the Skagit River follow:

1. Catch Projection
   Because we fished both traps nearly every night and the scoop trap every night, expansion of catch up to the standard of continuous trap operation involved primarily estimating catch for the daytime periods that we did not fish. We assumed that the d:n catch ratio relationship with flow, applied to night catches, provides an unbiased estimate of the number of fish that we would have caught had the traps fished each day.

2. Trap Efficiency
   Estimating trap efficiency also involves the expansion for daytime catch for all marked fish categories used to indicate capture rates. Inherent in this approach is the assumption that trap efficiency during the daytime is identical to that during the night.
   a. Basic assumptions for every trap calibration group of marked fish include:
      1) The number passing the gear is known (survival from release to the trap is 100%);
      2) All marked fish captured are identified and enumerated.
   b. Marked hatchery chinook were captured at the same rate as wild 0+ chinook.
   c. Instantaneous trap efficiency is not a function of light.

Discussion of Assumptions

Although direct assessment of these assumptions is not possible, we have some intuition as to how important they are and in which direction some of them may be violated. These beliefs and their effects on our estimate of the 0+ chinook production from the Skagit River follows.

Assumption #1: Catch Projection

We have no reason to believe that the catch projections for the daylight periods not fished are biased. Although the relationship between flow and d:n ratios is weak, it should produce unbiased estimates. We believe that the catch projection for the season is a reasonable estimate of the numbers of wild 0+ chinook we would have caught in both traps had we fished continuously from mid-January to early-September.

Assumption #2a1: 100% Survival of Calibration Fish

It is doubtful that all of the fish released in each group survived to pass the trap. For this reason, we selected a trap efficiency rate that represented the average 0+ hatchery recovery rate, adjusted higher to account for a mortality factor of 20%. If, on average, mortality was higher, then we have underestimated trap efficiency which results in overestimating production. Capture rates of chum dye groups (6.1% and 7.2%) are probably not biased by mortality between release and passing the trap, given their rapid migration. Though different species, these capture rates, along with that for wild coho (1.3%), indicate that capture rates for wild 0+ chinook are probably not higher than 3%. It appears that survival of the Countyline Ponds summer chinook production was lower than that of the spring chinook released from Skagit Hatchery. This difference probably occurred in the ponds rather than in the river.

Assumption # 2a2: Complete Identification/Enumeration of All Marked Fish Captured

We are confident that virtually every marked fish captured was identified and recorded. The 1998 trap crew was comprised of experienced Scientific Technicians dedicated to collecting the highest quality data. Consequently, we don't consider this potential bias to be significant.

Assumption # 2b: Marked Hatchery Chinook Were Captured at the Same Rate as Wild Chinook

The degree to which the hatchery chinook represented wild 0+ chinook is unknown. The similarity of d:n ratios over the season (Figure 5) provides some evidence that hatchery fish are responding to the river conditions in a manner similar to that of the wild chinook. Presently, we do not have any indication that hatchery produced 0+ chinook are caught at higher or lower rates than wild chinook.

Assumption #2c: Trap Efficiency is Not Affected by Light

If this assumption is not correct, then it is likely that efficiency during the day is lower relative to the night rate; trap avoidance enhanced by daylight is the likely reason, if a difference exists. Another factor that would contribute to lower capture rates during the daylight could be any shifting in the migration path to deeper water as a function of light. In an attempt to measure trap efficiency during the day and night, in Spring 1998, we released paired groups of hatchery chinook. As we expected, however, these fish did not pass the gear within their release strata, so these tests provided no insight into this potential problem. If the hatchery calibration groups have the same diel migration behavior as wild fish, then different capture rates for day and night would not constitute a source of bias. Therefore, this assumption is really the same as #2B, for which we have little intuition.

Conclusion

We conclude that the critical assumption for producing unbiased estimates of wild 0+ chinook production is how well hatchery fish represent wild cohorts with respect to capture rate. With the assumption that hatchery produced 0+ chinook were captured at rates similar to those of wild chinook, we estimate that around 6 million wild juvenile chinook emigrated from the Skagit River in 1999.

Discussion

Moderate flows throughout 1999 allowed continuous trapping, unlike the 1997 season, in which high flows frequently interrupted trapping. Consequently, and as in 1998, this third year of extended trapping (January-September) provided another measure of the "shape" of the 0+ chinook migration from the Skagit River. Migration timing was considerably earlier in 1999 than in the previous two years. In addition, trapping over the three days in late October during which we captured no chinook provided an indication that migration did not resume in the fall.

The high spawning population in 1998, estimated at 15,700 chinook, followed by moderate winter flows, which peaked at only 51,000 cfs, resulted in an average brood survival rate which we estimated at 18%. This rate is near the highest we have measured thus far and agrees with the flow survival correlation developed over the previous nine broods. Although we estimated

substantially more chinook were produced in 1999 than in any of the previous years, the vast majority, around 75%, emigrated early, and as a result, were small, near 40 mm. This outcome raises several questions:

> What factors control migration timing? Does the interannual variation in timing observed thus far reflect density independent factors such as flow or was this shift caused by the higher population density? How is marine survival affected by fish size and timing of saltwater entry?

Continued monitoring of juvenile production and spawner abundance in combination with characterizing the brood specific attributes of smolt size and migration timing will contribute to our understanding of the density dependent and independent responses of this chinook population.

Trap efficiency is the link between catch and estimating production. The accuracy of all of our within-season estimates and interannual comparisons depend on the veracity of each season's estimate of this most critical parameter. In 1999, we again released four groups of fin-marked hatchery chinook to assess capture rate. Recovery rates were more variable in 1999, ranging from .7% to 3.1%, and averaging 1.7% compared to a mean of 2.9% in 1998. Higher flows in 1999 may explain this lower catch rate. In 1998, flows on the two release dates averaged around 14,000 cfs while flows on the four release dates in 1999 averaged 22,000 cfs. This outcome is consistent with our belief that capture rate is a negative function of flow. However, given the high variation in recapture among the four groups released in 1999, additional data is needed to better define this relationship.

Improving our estimates of 0+ chinook production from the Skagit River largely depends on calibrating the traps over a range of conditions. Instantaneous trap efficiency is not constant over the season; it varies as a function of flow, velocity, turbidity, light, and fish size. Flow is undoubtedly the most important variable because it integrates other physical parameters which affect fish behavior and trap operation. At the site we have placed the traps, velocity is a positive function of flow, as evidenced by the rotational speed of the screw trap. Even for a given discharge, however, velocity and flow vectors can be altered by large woody debris upstream of the railroad bridge, and locally at the trap site. Turbidity also appears to be an important parameter that may affect the rate that chinook migrate during the day, their vertical and lateral locations in the channel, and their ability to avoid the gear. Using hatchery fish to represent the responses of wild fish to the complex interactions of these variables with fish size, their physiological status, and the traps may present incalculable biases. Despite these uncertainties, because the numbers of wild fish captured at any one time are inadequate for trap calibration, releasing groups of marked hatchery 0+ chinook offer the closest surrogate to wild chinook. We will continue to experiment with marking chum and developing correlations with season average wild coho catch rates.

Recommendations

The following recommendations, which were taken from past reports, are listed here so that an accounting of the progress we made implementing them in the 1999 season can be assessed. As noted in last year's report, these measures include actions that we may reasonably and cost-effectively implement within the current scope and funding level of our trapping program in the lower Skagit River.

1. Continue the extended season trapping over a sufficient span of years and flow conditions to gain an understanding of the interannual variation in migration timing.

2. Count catches at or near sunrise and sunset to increase the data base for day:night catch comparisons.

3. For a sample of dates, over the season, count catches in two-hour increments over 24-hour periods to determine the variation in diel migration.

4. Investigate the potential of using hydro-acoustics to assess whether downstream migrants alter their vertical pathways as a function of light and/or turbidity. Although such gear cannot discriminate among species, this may be inferred by catches, depending on the extent that shifts occur.

5. Measure turbidity and assess the correlation with flow.

6. Release several paired groups (2,000/group) of marked hatchery 0+ chinook to assess the feasibility of using these fish to calibrate the traps.

7. Engage a biometrician to optimize sampling design and analytical methods, assess assumptions, and compute variance estimates.

Progress in 1999

1. **Accomplished.** We trapped each night from January 16 through mid-August. Trapping continued on a scheduled basis through September 6 and for three days in late October.

2. **Accomplished.** On most dates over the season, we counted catches near dusk and dawn.

3. **Not accomplished**. We did not conduct the two hour interval catch accounting because the high catches often precluded completing counting all the fish captured in both traps within such short intervals.
4. **Accomplished**. We field tested hydro-acoustic gear but determined that it did not reliably count targets at the trap site.

5. **Accomplished**. We measured turbidity throughout the season and correlated it with flow..

6. **Accomplished**. As documented in this report, we marked and released four groups of hatchery chinook, and two groups of dye-marked chum fry.

7. **Not accomplished**. Through 1999, the vacant WDFW biometrician position had not been filled due to agency budget constraints.

Recommendations for 2000

Our study plan for the 2000 season includes continuing the above recommendations, except for numbers 3 and 4. Due to the variable workloads imposed by debris and fish numbers, counting catches at regular small intervals within selected days throughout the season has not proved feasible. We are also discontinuing our recommendation to assess hydro-acoustic monitoring for diel differences in depth of targets. Beyond determining what doesn't work, we have made little progress on this front. In addition, to continuing this trapping operation as outlined above, we will differentially mark the wild coho smolts released from the Mannser Creek trap to evaluate in-river survival as a function of migration distance.

Table 1. Record of downstream migrant trap operations, Skagit River, all years.

Year	Gear Type	Date Start	Date End	Season Total Days	TRAPPING INTERVAL* Number of Days Fished Nighttime Full	Nighttime Partial	Daytime Full	Daytime Partial	Trap Out	HOURS Total	HOURS Trapped	Percent Fished
1990	Scr/Scp	04/13/1990	06/19/1990	66	50	1	5	10	11	1,602.5	590.5	36.8%
1991	Scoop	04/08/1991	06/20/1991	73	72	1	4	18	0	1,741.5	858.0	49.3%
1992	Scoop	04/10/1992	06/21/1992	72	65		3	5	7	1,717.0	667.0	38.8%
1993	Scoop	04/11/1993	06/07/1993	57	53	2	0	8	2	1,355.5	539.5	39.8%
	Screw	04/22/1993	06/07/1993	46	32	0	4	5	14	1,095.0	366.5	33.5%
1994	Scoop	04/09/1994	06/29/1994	81	78	3	5	4	0	1,931.0	828.0	42.9%
	Screw	04/09/1994	06/29/1994	81	78	1	10	6	2	1,931.0	917.0	47.5%
1995	Scoop	03/25/1995	07/15/1995	112	112	0	5	8	0	2,724.0	1,189.0	43.6%
	Screw	03/25/1995	07/17/1995	114	110	2	8	8	2	2,729.5	1,207.0	44.2%
1996	Scoop	04/12/1996	07/18/1996	97	95	0	6	28	2	2,321.5	1,110.5	47.8%
	Screw	04/12/1996	07/18/1996	97	91	3	7	25	3	2,321.5	1,112.0	47.9%
1997	Scoop	02/14/1997	09/10/1997	208	182	9	58	26	17	4,996.0	2,719.0	54.4%
	Screw	02/14/1997	09/10/1997	208	174	11	56	21	23	4,996.0	2,667.0	53.4%
1998	Scoop	01/18/1998	09/11/1998	236	231	0	85	3	5	5,640.0	3,599.0	63.8%
	Screw	01/18/1998	09/11/1998	236	188	0	69	1	48	5,640.0	2,992.0	53.0%
1999	Scoop	01/16/2000	09/06/2000	234	222	0	72	3	11	5,595.3	3,326.9	59.5%
	Screw	01/16/2000	09/06/2000	234	214	0	70	1	19	5,594.8	2,353.2	42.1%

Note: In 1990, we initially started trapping with a screw trap, but because of constant problems, replaced it with a scoop trap on May 7.

*Trapping intervals are defined as follows: "Full Nighttime" is from dusk to dawn; "Partial Nighttime" is a sub-interval of time between dusk and dawn; "Full Daytime" is from dawn to dusk; "Partial Daytime" is a sub-interval of time between dawn and dusk.

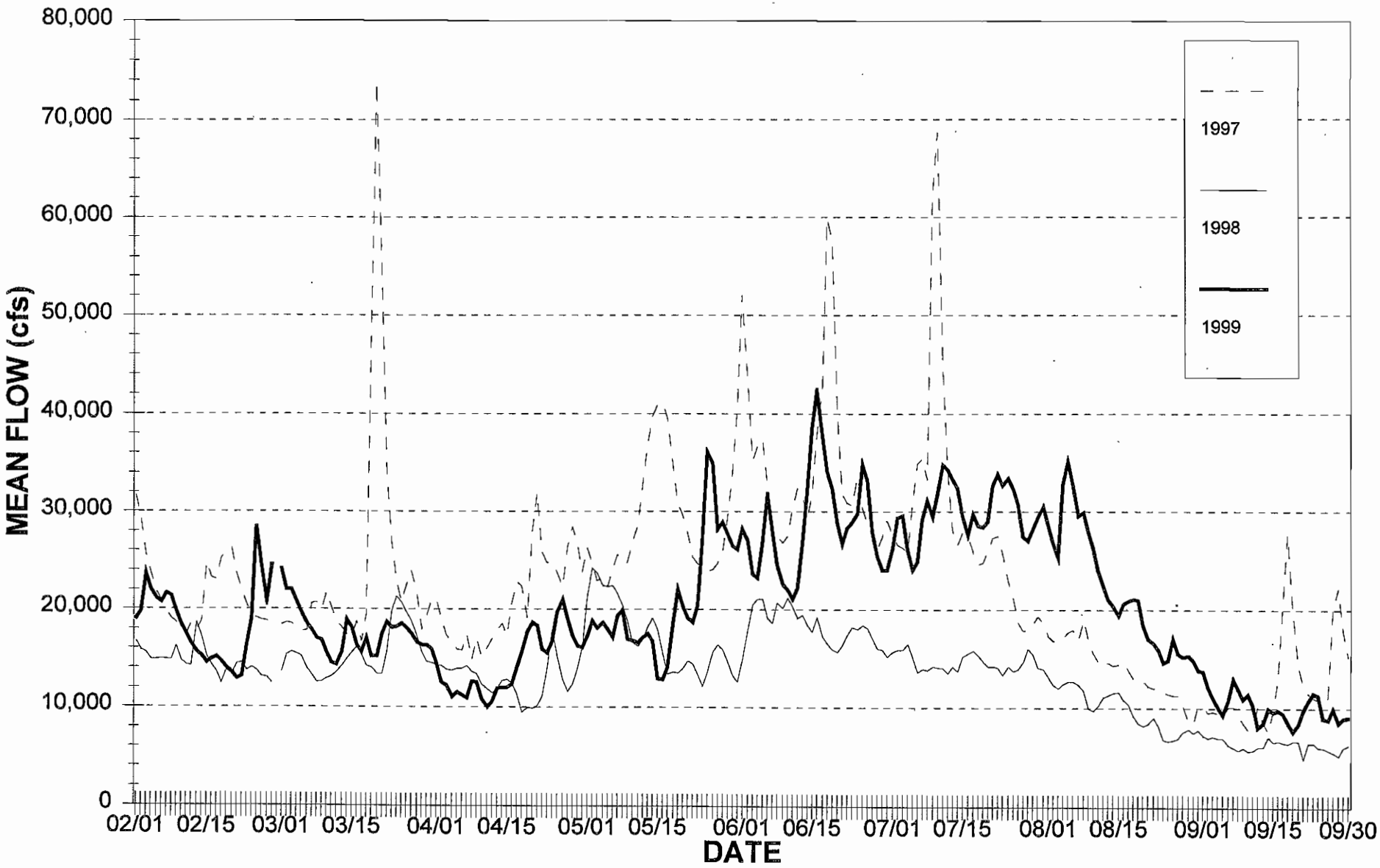


Figure 1. Comparison of 1997, 1998, & 1999 daily mean flows, Skagit River near Mt. Vernon, February through September.

D:\Datafile\SKAGIT\FLOW\flowcomp.wb3 (org. 11/18/93)

Figure 2. Wild and Hatchery chinook catches in the Skagit River mainstem traps, 1999.

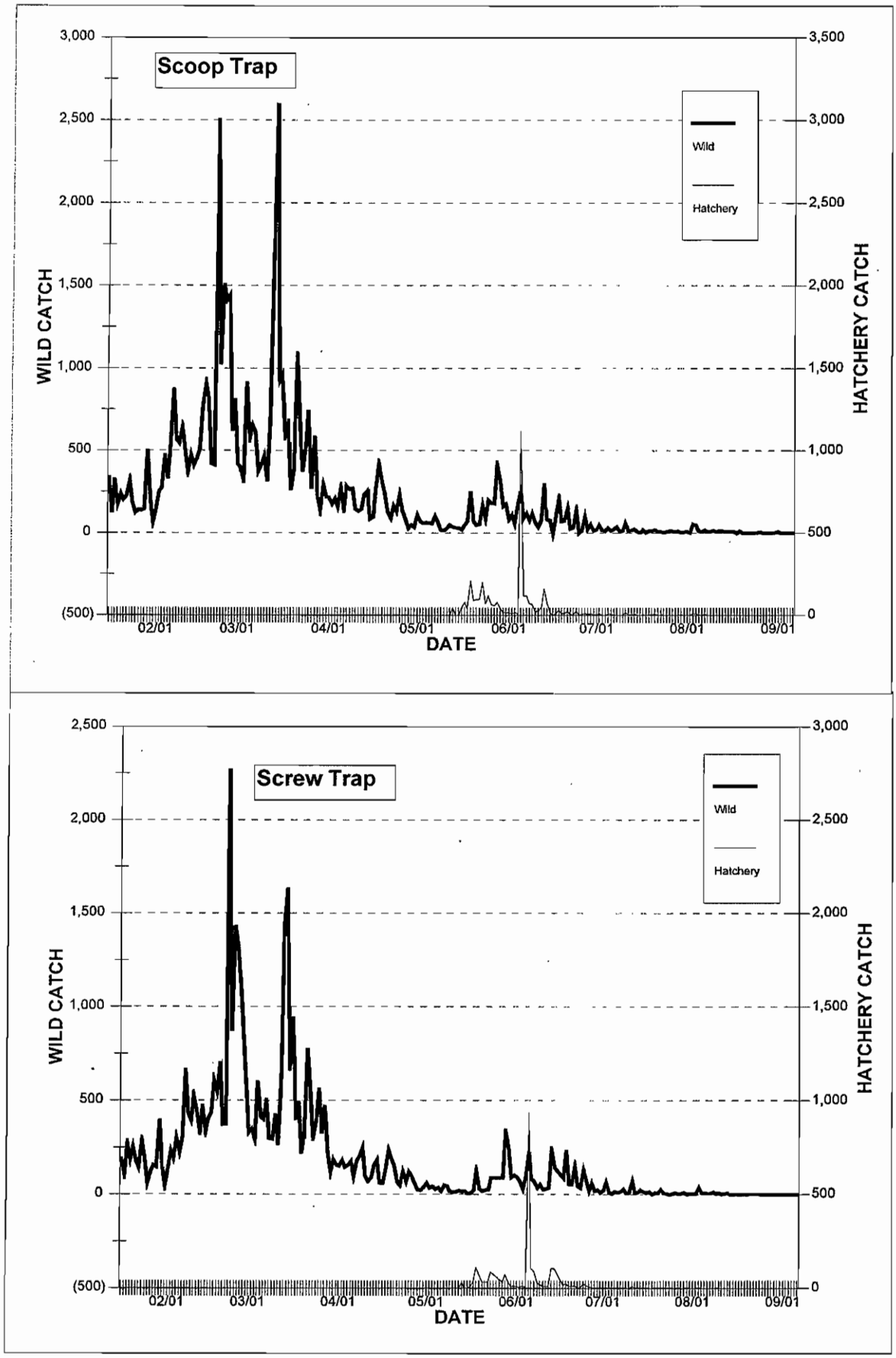


Table 2. Downstream migrant salmonids captured in the Skagit River mainstem scoop and screw traps, all years.

Species/age	1990 Scoop	1991 Scoop	1992 Scoop	1993		1994		1995		1996		1997		1998		1999	
				Scoop	Screw	Scoop	Screw	Scoop	Screw	Scoop	Screw	Scoop	Screw	Scoop	Screw	Scoop	Screw
Coho 1+ Wild	10,204	6,904	8,620	3,636	3,690	10,767	10,211	8,861	8,824	11,520	9,134	6,437	5,975	13,879	9,076	5,143	3,314
Hatchery	234	382	596	[a]714	[a]723	1,880	1,873	4,800	5,274	973	1,208	334	362	623	1,028	673	635
Coho 0+	48	22	64	79	4	57	5	204	57	246	50	364	220	1,216	409	744	311
Chinook 1+ Wild	[b]45	[b]1,132	[b]299	[b]3,567	[b]262	308	212	184	112	80	32	46	52	876	350	198	87
Hatchery								1,754	570	415	117	376	249	24	12	201	41
Chinook 0+ Wild	[c]8,528	[d]1,706	[e]8,812	[f]7,463	[f]3,415	9,721	4,743	10,536	5,767	2,834	1,731	26,798	20,780	33,698	20,001	55,254	41,492
Hatchery						2,320	1,098	6,083	2,022	4,165	2,888	1,163	684	5,837	2,127	[g]3,449	[g]2,213
Sockeye 1+	2	21	2	32	16	106	45	31	17	36	56	59	48	111	84	72	23
Chum 0+	617	48,505	3,081	66,790	13,939	5,113	7,689	66,139	55,824	10,578	5,384	38,243	39,174	37,162	18,498	172,774	108,730
Pink 0+	697	0	18,682	0	0	48,532	22,952	0	0	27,482	9,778	9	17	338,520	102,338	476	265
Steelhead 1+ Wild	198	301	332	304	663	601	1,297	532	1,184	364	778	319	531	389	1,100	99	334
Hatchery	223	66	124	658	2,381	670	3,107	1,282	4,579	751	1,751	982	2,401	446	2,325	122	511
Steelhead adult	0	0	0	0	0	0	0	4	1	1	0	3	4	1	3	11	1
Cutthroat 1+	117	60	153	45	91	198	437	107	263	165	332	58	89	98	401	30	150
Cutthroat adult	0	0	0	0	0	0	0	1	0	0	2	2	13	2	5	4	0
Dolly Varden	130	112	132	76	74	197	255	189	179	142	102	65	77	153	206	101	98
Trout parr	N/A	N/A	N/A	12	7	47	69	56	47	110	68	40	61	90	83	42	57

[a] Estimated by proportion of total catch.
[b] Includes both hatchery and wild.
[c] 1989 brood released from Clark Creek = 1,728,100: Fall = 1,170,800 Samish stock + 236,600 Clark Creek stock, released on June 8, 1990; and Summer = 73,800 + 246,900 Clark Creek stock released on June 28, 1990.
[d] Clark Creek stock released on June 18, 1991: 1,144,500 Fall and 111,120 Summer.
[e] Clark Creek stock: 786,100 Fall, released February 25, 1992; 483,280 Summer, released April 20, 1992; and 120,000 released May 21, 1992.
[f] Clark Creek stock: 1,588,800 Fall released in February 1993, and 250,000 Fall released on March 16, 1993; and 160,000 Summer released on May 16, 1993.
[g] Does not include hatchery chinook smolts released to estimate trap efficiency

Table 3a. Catch/hour rates of WILD 0+ CHINOOK during day and night periods, Skagit River SCOOP trap, 1999.

Date	DAYTIME					NIGHTTIME							DAY:NIGHT		
	Start	End	Time Fished	Catch	Catch/ Hour	Start Date	Start Time	End Date	End Time	Time Fished	Catch	Catch/ Hour	Diff (D-N)	Ratio (D/N)	Flow (cfs)
						01/17	17.00	01/18	7.50	14.50	206	14.21			
01/18	7.67	17.25	9.58	91	9.50	01/18	17.42	01/19	7.75	14.33	247	17.23			
	Total Wild		9.58	91	9.50					28.83	453	15.71	-6.22	60.4%	27,700
						01/20	17.58	01/21	7.58	14.00	172	12.29			
01/21	7.75	17.17	9.42	33	3.50	01/21	17.33	01/22	7.50	14.17	170	12.00			
	Total Wild		9.42	33	3.50					28.17	342	12.14	-8.64	28.9%	23,700
						01/22	17.67	01/23	8.33	14.67	228	15.55			
01/23	8.50	17.42	8.92	74	8.30	01/23	17.58	01/24	8.00	14.42	245	16.99			
	Total Wild		8.92	74	8.30					29.08	473	16.26	-7.96	51.0%	20,200
						01/25	17.00	01/26	7.17	14.17	124	8.75			
01/26	7.33	17.17	9.83	41	4.17	01/26	17.33	01/27	7.50	14.17	100	7.06			
	Total Wild		9.83	41	4.17					28.33	224	7.91	-3.74	52.7%	16,833
						01/28	17.83	01/29	7.58	13.75	145	10.55			
01/29	7.75	17.50	9.75	234	24.00	01/29	17.67	01/30	7.58	13.92	272	19.54			
	Total Wild		9.75	234	24.00					27.67	417	15.07	8.93	159.2%	20,267
						01/31	17.58	02/01	7.83	14.25	68	4.77			
02/01	8.00	17.75	9.75	74	7.59	02/01	17.92	02/02	8.33	14.42	78	5.41			
	Total Wild		9.75	74	7.59					28.67	146	5.09	2.50	149.0%	19,967
						02/03	17.50	02/04	7.83	14.33	273	19.05			
02/04	8.00	17.83	9.83	109	11.08	02/04	18.00	02/05	7.50	13.50	362	26.81			
	Total Wild		9.83	109	11.08					27.83	635	22.81	-11.73	48.6%	22,233
						02/06	18.08	02/07	8.17	14.08	537	38.13			
02/07	8.42	17.92	9.50	236	24.84	02/07	18.17	02/08	8.00	13.83	644	46.55			
	Total Wild		9.50	236	24.84					27.92	1,181	42.30	-17.46	58.7%	21,200
						02/09	17.58	02/10	7.50	13.92	548	39.38			
02/10	7.67	17.75	10.08	163	16.17	02/10	17.92	02/11	7.67	13.75	483	35.13			
	Total Wild		10.08	163	16.17					27.67	1,031	37.27	-21.10	43.4%	18,567
						02/12	17.83	02/13	8.25	14.42	373	25.87			
02/13	8.42	17.75	9.33	106	11.36	02/13	17.92	02/14	7.67	13.75	371	26.98			
	Total Wild		9.33	106	11.36					28.17	744	26.41	-15.06	43.0%	15,767
						02/15	17.83	02/16	7.50	13.67	458	33.51			
02/16	7.58	17.50	9.92	61	6.15	02/16	17.67	02/17	8.00	14.33	452	31.53			
	Total Wild		9.92	61	6.15					28.00	910	32.50	-26.35	18.9%	14,833
						02/18	17.50	02/19	7.58	14.08	909	64.54			
02/19	7.75	17.83	10.08	300	29.75	02/19	18.00	02/20	8.00	14.00	513	36.64			
	Total Wild		10.08	300	29.75					28.08	1,422	50.64	-20.88	58.8%	14,033
						02/21	18.25	02/22	7.92	13.67	415	30.37			
02/22	8.08	18.33	10.25	301	29.37	02/22	18.50	02/23	7.67	13.17	2,210	167.85			
	Total Wild		10.25	301	29.37					26.83	2,625	97.83	-68.46	30.0%	14,100
						02/27	18.75	02/28	8.00	13.25	619	46.72			
02/28	8.17	18.25	10.08	349	34.61	02/28	18.42	03/01	7.25	12.83	469	36.55			
	Total Wild		10.08	349	34.61					26.08	1,088	41.71	-7.10	83.0%	23,133
						03/03	18.50	03/04	7.00	12.50	318	25.44			
03/04	7.17	18.50	11.33	393	34.68	03/04	18.67	03/05	7.33	12.67	527	41.61			
	Total Wild		11.33	393	34.68					25.17	845	33.58	1.10	103.3%	20,833

Table 3a. Catch/hour rates of WILD 0+ CHINOOK during day and night periods, Skagit River SCOOP trap, 1999.

Date	DAYTIME					NIGHTTIME						DAY:NIGHT		
	Start	End	Time Fished	Catch	Catch/ Hour	Start Date	Start Time	End Date	End Time	Time Fished	Catch	Catch/ Hour	Diff (D-N)	Ratio (D/N)	Flow (cfs)
						03/09	18.08	03/10	7.33	13.25	418	31.55			
03/10	7.50	18.67	11.17	136	12.18	03/10	18.83	03/11	7.33	12.50	333	26.64			
	Total Wild		11.17	136	12.18					25.75	751	29.17	-16.99	41.8%	14,767
						03/13	18.50	03/14	6.00	11.50	1,745	151.74			
03/14	6.17	18.50	12.33	1,414	114.65	03/14	18.67	03/15	6.50	11.83	1,189	100.48			
	Total Wild		12.33	1,414	114.65					23.33	2,934	125.74	-11.09	91.2%	17,533
						03/15	18.50	03/16	7.17	12.67	925	73.03			
03/16	7.33	18.50	11.17	262	23.46	03/16	18.67	03/17	7.00	12.33	699	56.68			
	Total Wild		11.17	262	23.46					25.00	1,624	64.96	-41.50	36.1%	16,667
						03/17	18.25	03/18	7.25	13.00	591	45.46			
03/18	7.42	18.17	10.75	68	6.33	03/18	18.33	03/19	6.83	12.50	601	48.08			
	Total Wild		10.75	68	6.33					25.50	1,192	46.75	-40.42	13.5%	15,933
						03/20	18.83	03/21	7.17	12.33	384	31.14			
03/21	7.33	18.50	11.17	83	7.43	03/21	18.67	03/22	6.50	11.83	1,016	85.86			
	Total Wild		11.17	83	7.43					24.17	1,400	57.93	-50.50	12.8%	17,133
						03/24	19.00	03/25	7.00	12.00	529	44.08			
03/25	7.17	18.67	11.50	313	27.22	03/25	18.83	03/26	6.83	12.00	432	36.00			
	Total Wild		11.50	313	27.22					24.00	961	40.04	-12.82	68.0%	18,267
						03/26	18.75	03/27	6.83	12.08	268	22.18			
03/27	7.00	18.83	11.83	196	16.56	03/27	19.00	03/28	6.33	11.33	394	34.76			
	Total Wild		11.83	196	16.56					23.42	662	28.27	-11.71	58.6%	17,400
						03/29	18.92	03/30	6.92	12.00	139	11.58			
03/30	7.08	18.83	11.75	52	4.43	03/30	19.25	03/31	6.42	11.17	240	21.49			
	Total Wild		11.75	52	4.43					23.17	379	16.36	-11.93	27.1%	16,167
						04/02	18.67	04/03	6.58	11.92	178	14.94			
04/03	6.75	18.58	11.83	46	3.89	04/03	18.75	04/04	7.00	12.25	164	13.39			
	Total Wild		11.83	46	3.89					24.17	342	14.15	-10.26	27.5%	11,900
						04/04	19.75	04/05	7.00	11.25	162	14.40			
04/05	7.17	19.50	12.33	101	8.19	04/05	19.67	04/06	7.00	11.33	175	15.44			
	Total Wild		12.33	101	8.19					22.58	337	14.92	-6.73	54.9%	11,233
						04/08	17.83	04/09	7.83	14.00	265	18.93			
04/09	8.08	19.50	11.42	69	6.04	04/09	19.67	04/10	6.75	11.08	200	18.05			
	Total Wild		11.42	69	6.04					25.08	465	18.54	-12.49	32.6%	11,967
						04/13	20.00	04/14	6.75	10.75	229	21.30			
04/14	6.92	19.92	13.00	53	4.08	04/14	20.08	04/15	7.00	10.92	200	18.32			
	Total Wild		13.00	53	4.08					21.67	429	19.80	-15.72	20.6%	11,967
						04/22	20.25	04/23	7.00	10.75	91	8.47			
04/23	7.17	20.33	13.17	65	4.94	04/23	20.67	04/24	6.50	9.83	100	10.17			
	Total Wild		13.17	65	4.94					20.58	191	9.28	-4.34	53.2%	16,033
						05/07	20.67	05/08	6.83	10.17	104	10.23			
05/08	7.00	20.50	13.50	26	1.93	05/08	20.67	05/09	7.00	10.33	38	3.68			
	Total Wild		13.50	26	1.93					20.50	142	6.93	-5.00	27.8%	18,700
						05/14	19.92	05/15	6.25	10.33	24	2.32			
05/15	10.42	20.75	10.33	2	0.19	05/15	20.92	05/16	6.50	9.58	29	3.03			
	Total Wild		10.33	2	0.19					19.92	53	2.66	-2.47	7.3%	14,133

Table 3a. Catch/hour rates of WILD 0+ CHINOOK during day and night periods, Skagit River SCOOP trap, 1999.

Date	DAYTIME					NIGHTTIME						DAY:NIGHT		
	Start	End	Time Fished	Catch	Catch/ Hour	Start Date	Start Time	End Date	End Time	Time Fished	Catch	Catch/ Hour	Diff (D-N)	Ratio (D/N)	Flow (cfs)
						05/24	21.00	05/25	5.25	8.25	227	27.52			
05/25	14.50	18.00	3.50	33	9.43	05/25	21.58	05/26	5.17	7.58	104	13.71			
	Total Wild		3.50	33	9.43					15.83	331	20.91	-11.48	45.1%	32,667
						05/27	20.08	05/28	6.25	10.17	185	18.20			
05/28	6.42	21.08	14.67	173	11.80	05/28	21.25	05/29	6.67	9.42	218	23.15			
	Total Wild		14.67	173	11.80					19.58	403	20.58	-8.78	57.3%	28,267
						06/03	20.17	06/04	6.50	10.33	59	5.71			
06/04	6.67	20.50	13.83	69	4.99	06/04	20.67	06/05	6.67	10.00	104	10.40			
	Total Wild		13.83	69	4.99					20.33	163	8.02	-3.03	62.2%	24,533
						06/04	20.67	06/05	6.67	10.00	104	10.40			
06/05	6.83	20.50	13.67	92	6.73	06/05	20.67	06/06	6.00	9.33	166	17.79			
	Total Wild		13.67	92	6.73					19.33	270	13.97	-7.23	48.2%	27,267
						06/08	21.25	06/09	5.83	8.58	78	9.09			
06/09	6.08	21.17	15.08	40	2.65	06/09	21.33	06/10	5.50	8.17	80	9.80			
	Total Wild		15.08	40	2.65					16.75	158	9.43	-6.78	28.1%	23,033
						06/17	21.50	06/18	6.00	8.50	84	9.88			
06/18	6.17	21.00	14.83	158	10.65	06/18	21.17	06/19	5.50	8.33	56	6.72			
	Total Wild		14.83	158	10.65					16.83	140	8.32	2.33	128.1%	34,633
						06/20	21.75	06/21	5.50	7.75	73	9.42			
06/21	5.67	21.67	16.00	89	5.56	06/21	21.83	06/22	5.92	8.08	60	7.42			
	Total Wild		16.00	89	5.56					15.83	133	8.40	-2.84	66.2%	27,933
						06/28	21.50	06/29	5.75	8.25	24	2.91			
06/29	5.92	21.75	15.83	30	1.89	06/29	21.92	06/30	5.75	7.83	21	2.68			
	Total Wild		15.83	30	1.89					16.08	45	2.80	-0.90	67.7%	24,467
						07/04	21.50	07/05	5.75	8.25	14	1.70			
07/05	5.92	21.00	15.08	17	1.13	07/05	21.17	07/06	5.75	8.58	15	1.75			
	Total Wild		15.08	17	1.13					16.83	29	1.72	-0.60	65.4%	25,000
						07/07	21.75	07/08	5.75	8.00	24	3.00			
07/08	5.92	21.25	15.33	20	1.30	07/08	21.42	07/09	5.50	8.08	18	2.23			
	Total Wild		15.33	20	1.30					16.08	42	2.61	-1.31	49.9%	29,933
						07/10	21.42	07/11	5.75	8.33	13	1.56			
07/11	6.00	21.08	15.08	39	2.59	07/11	21.25	07/12	5.75	8.50	22	2.59			
	Total Wild		15.08	39	2.59					16.83	35	2.08	0.51	124.4%	33,700
						07/13	21.00	07/14	6.50	9.50	15	1.58			
07/14	6.67	20.58	13.92	19	1.37	07/14	20.75	07/15	6.50	9.75	6	0.62			
	Total Wild		13.92	19	1.37					19.25	21	1.09	0.27	125.1%	31,767
						07/16	21.50	07/17	6.50	9.00	1	0.11			
07/17	6.67	21.25	14.58	11	0.75	07/17	21.42	07/18	6.50	9.08	9	0.99			
	Total Wild		14.58	11	0.75					18.08	10	0.55	0.20	136.4%	28,600
						07/20	21.00	07/21	6.50	9.50	12	1.26			
07/21	6.83	21.00	14.17	15	1.06	07/21	21.17	07/22	5.75	8.58	5	0.58			
	Total Wild		14.17	15	1.06					18.08	17	0.94	0.12	112.6%	31,833
						07/25	21.50	07/26	6.50	9.00	7	0.78			
07/26	6.67	21.42	14.75	8	0.54	07/26	21.58	07/27	6.50	8.92	5	0.56			
	Total Wild		14.75	8	0.54					17.92	12	0.67	-0.13	81.0%	30,133

Table 3a. Catch/hour rates of WILD 0+ CHINOOK during day and night periods, Skagit River SCOOP trap, 1999.

Date	DAYTIME					NIGHTTIME							DAY:NIGHT		
	Start	End	Time Fished	Catch	Catch/ Hour	Start Date	Start Time	End Date	End Time	Time Fished	Catch	Catch/ Hour	Diff (D-N)	Ratio (D/N)	Flow (cfs)
						07/31	21.00	08/01	7.00	10.00	5	0.50			
08/01	7.17	21.42	14.25	3	0.21	08/01	21.58	08/02	6.50	8.92	5	0.56			
	Total Wild		14.25	3	0.21					18.92	10	0.53	-0.32	39.8%	28,600
						08/03	21.00	08/04	6.50	9.50	54	5.68			
08/04	6.75	20.75	14.00	25	1.79	08/04	20.92	08/05	6.75	9.83	23	2.34			
	Total Wild		14.00	25	1.79					19.33	77	3.98	-2.20	44.8%	31,067
						08/06	21.00	08/07	6.00	9.00	8	0.89			
08/07	6.17	20.50	14.33	10	0.70	08/07	20.50	08/08	6.50	10.00	8	0.80			
	Total Wild		14.33	10	0.70					19.00	16	0.84	-0.14	82.8%	30,767
						08/09	21.00	08/10	6.50	9.50	10	1.05			
08/10	6.67	20.17	13.50	6	0.44	08/10	20.42	08/11	6.50	10.08	10	0.99			
	Total Wild		13.50	6	0.44					19.58	20	1.02	-0.58	43.5%	26,000
						08/12	20.50	08/13	6.50	10.00	14	1.40			
08/13	6.67	20.67	14.00	3	0.21	08/13	20.83	08/14	6.75	9.92	8	0.81			
	Total Wild		14.00	3	0.21					19.92	22	1.10	-0.89	19.4%	21,333
						08/15	20.92	08/16	6.75	9.83	6	0.61			
08/16	6.92	20.67	13.75	3	0.22	08/16	20.83	08/17	7.00	10.17	4	0.39			
	Total Wild		13.75	3	0.22					20.00	10	0.50	-0.28	43.6%	20,300
						08/18	20.67	08/19	7.00	10.33	0	0.00			
08/19	7.00	20.50	13.50	2	0.15	08/19	20.67	08/20	7.00	10.33	10	0.97			
	Total Wild		13.50	2	0.15					20.67	10	0.48	-0.34	30.6%	20,167
						08/31	19.92	09/01	6.25	10.33	2	0.19			
09/01	6.50	19.83	13.33	1	0.08	09/01	20.33	09/02	6.83	10.50	7	0.67			
	Total Wild		13.33	1	0.08					20.83	9	0.43	-0.36	17.4%	13,200
Total			645.92	6,317	9.78					1,187.25	26,381	22.22	-12.44	44.0%	

53 # days in sample

Min	7.3%	11,233
Max	159.2%	34,633
Avg	58.1%	21,667

Figure 3. Day:night catch ratios for wild 0+ chinook, and daily mean flow, Skagit River mainstem traps, 1999.

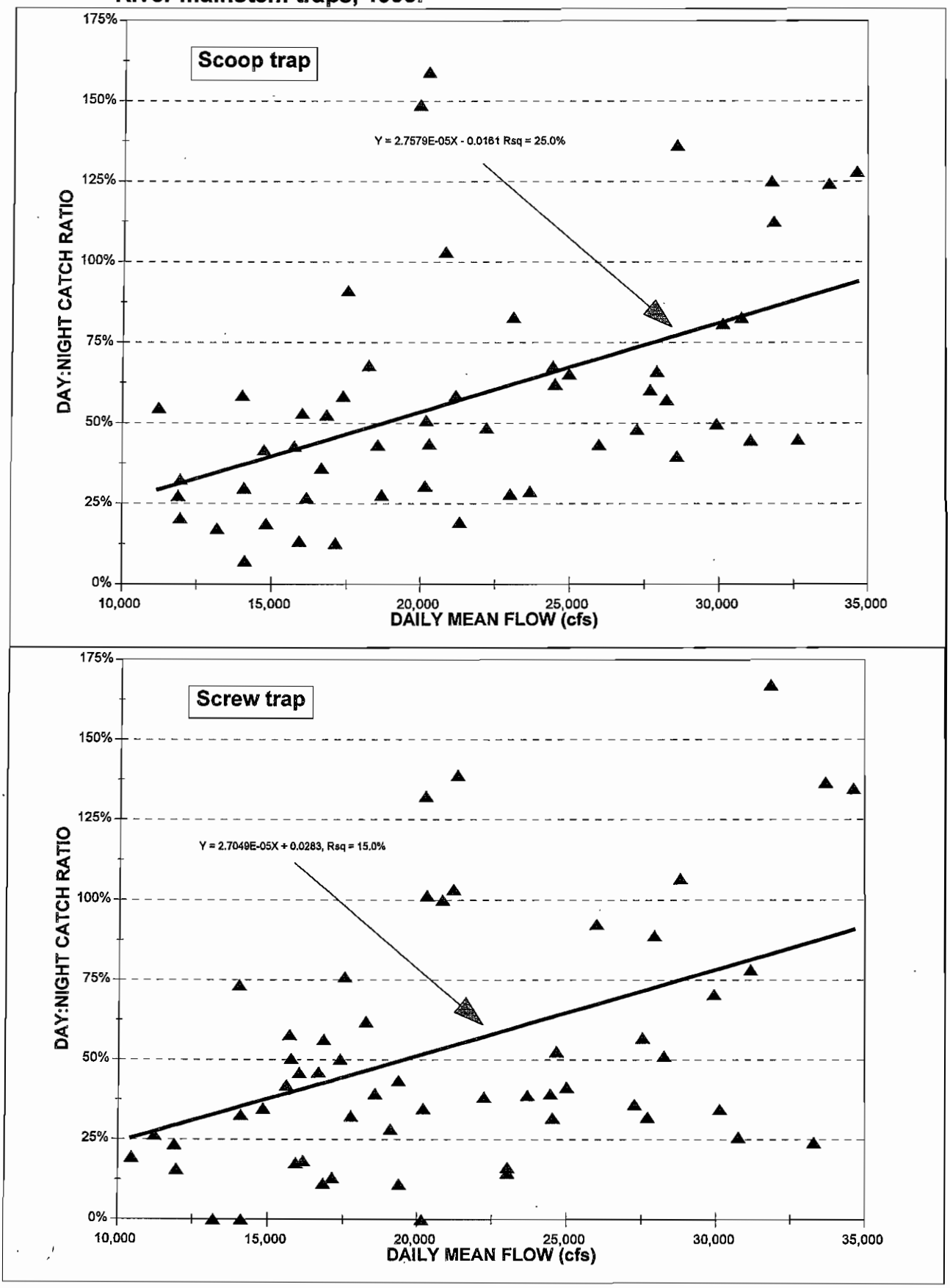


Table 4a. Catch/hour rates of HATCHERY 0+ CHINOOK during day and night periods, Skagit River SCOOP trap, 1999.

Date	DAYTIME					NIGHTTIME						DAY:NIGHT		
	Start	End	Time Fished	Catch	Catch/ Hour	Start Date	Start Time	End Date	End Time	Time Fished	Catch	Catch/ Hour	Diff (D-N)	Ratio (D/N)	Flow (cfs)
						05/14	19.92	05/15	6.25	10.33	0	0.00			
05/15	10.42	20.75	10.33	0	0.00	05/15	20.92	05/16	6.50	9.58	0	0.00			
	Total Wild		10.33	0	0.00					19.92	0	0.00	0.00	0.0%	14,133
						05/24	21.00	05/25	5.25	8.25	155	18.79			
05/25	14.50	18.00	3.50	8	2.29	05/25	21.58	05/26	5.17	7.58	57	7.52			
	Total Wild		3.50	8	2.29					15.83	212	13.39	-11.10	17.1%	32,667
						05/27	20.08	05/28	6.25	10.17	29	2.85			
05/28	6.42	21.08	14.67	42	2.86	05/28	21.25	05/29	6.67	9.42	27	2.87			
	Total Wild		14.67	42	2.86					19.58	56	2.86	0.00	100.1%	28,267
						06/03	20.17	06/04	6.50	10.33	1	0.10			
06/04	6.67	20.50	13.83	4	0.29	06/04	20.67	06/05	6.67	10.00	3	0.30			
	Total Wild		13.83	4	0.29					20.33	4	0.20	0.09	147.0%	24,533
						06/04	20.67	06/05	6.67	10.00	3	0.30			
06/05	6.83	20.50	13.67	92	6.73	06/05	20.67	06/06	6.00	9.33	1,026	109.93			
	Total Wild		13.67	92	6.73					19.33	1,029	53.22	-46.49	12.6%	27,267
						06/08	21.25	06/09	5.83	8.58	69	8.04			
06/09	6.08	21.17	15.08	25	1.66	06/09	21.33	06/10	5.50	8.17	43	5.27			
	Total Wild		15.08	25	1.66					16.75	112	6.69	-5.03	24.8%	23,033
						06/17	21.50	06/18	6.00	8.50	11	1.29			
06/18	6.17	21.00	14.83	31	2.09	06/18	21.17	06/19	5.50	8.33	2	0.24			
	Total Wild		14.83	31	2.09					16.83	13	0.77	1.32	270.6%	34,633
						06/20	21.75	06/21	5.50	7.75	12	1.55			
06/21	5.67	21.67	16.00	12	0.75	06/21	21.83	06/22	5.92	8.08	11	1.36			
	Total Wild		16.00	12	0.75					15.83	23	1.45	-0.70	51.6%	27,933
						06/28	21.50	06/29	5.75	8.25	4	0.48			
06/29	5.92	21.75	15.83	1	0.06	06/29	21.92	06/30	5.75	7.83	7	0.89			
	Total Wild		15.83	1	0.06					16.08	11	0.68	-0.62	9.2%	24,467
						07/04	21.50	07/05	5.75	8.25	1	0.12			
07/05	5.92	21.00	15.08	5	0.33	07/05	21.17	07/06	5.75	8.58	3	0.35			
	Total Wild		15.08	5	0.33					16.83	4	0.24	0.09	139.5%	25,000
						07/07	21.75	07/08	5.75	8.00	2	0.25			
07/08	5.92	21.25	15.33	1	0.07	07/08	21.42	07/09	5.50	8.08	0	0.00			
	Total Wild		15.33	1	0.07					16.08	2	0.12	-0.06	52.4%	29,933
						07/10	21.42	07/11	5.75	8.33	3	0.36			
07/11	6.00	21.08	15.08	8	0.53	07/11	21.25	07/12	5.75	8.50	8	0.94			
	Total Wild		15.08	8	0.53					16.83	11	0.65	-0.12	81.2%	33,700
						07/13	21.00	07/14	6.50	9.50	2	0.21			
07/14	6.67	20.58	13.92	5	0.36	07/14	20.75	07/15	6.50	9.75	3	0.31			
	Total Wild		13.92	5	0.36					19.25	5	0.26	0.10	138.3%	31,767
						07/16	21.50	07/17	6.50	9.00	1	0.11			
07/17	6.67	21.25	14.58	2	0.14	07/17	21.42	07/18	6.50	9.08	0	0.00			
	Total Wild		14.58	2	0.14					18.08	1	0.06	0.08	248.0%	28,600
						07/20	21.00	07/21	6.50	9.50	3	0.32			
07/21	6.83	21.00	14.17	6	0.42	07/21	21.17	07/22	5.75	8.58	3	0.35			
	Total Wild		14.17	6	0.42					18.08	6	0.33	0.09	127.6%	31,833

Table 4a. Catch/hour rates of HATCHERY 0+ CHINOOK during day and night periods, Skagit River SCOOP trap, 1999.

Date	DAYTIME					NIGHTTIME						DAY:NIGHT		
	Start	End	Time Fished	Catch	Catch/ Hour	Start Date	Start Time	End Date	End Time	Time Fished	Catch	Catch/ Hour	Diff (D-N)	Ratio (D/N)	Flow (cfs)
						07/25	21.50	07/26	6.50	9.00	0	0.00			
07/26	6.67	21.42	14.75	1	0.07	07/26	21.58	07/27	6.50	8.92	2	0.22			
	Total Wild		14.75	1	0.07					17.92	2	0.11	-0.04	60.7%	30,133
						07/31	21.00	08/01	7.00	10.00	0	0.00			
08/01	7.17	21.42	14.25	0	0.00	08/01	21.58	08/02	6.50	8.92	1	0.11			
	Total Wild		14.25	0	0.00					18.92	1	0.05	-0.05	0.0%	28,600
						08/03	21.00	08/04	6.50	9.50	10	1.05			
08/04	6.75	20.75	14.00	5	0.36	08/04	20.92	08/05	6.75	9.83	5	0.51			
	Total Wild		14.00	5	0.36					19.33	15	0.78	-0.42	46.0%	31,067
						08/06	21.00	08/07	6.00	9.00	0	0.00			
08/07	6.17	20.50	14.33	3	0.21	08/07	20.50	08/08	6.50	10.00	3	0.30			
	Total Wild		14.33	3	0.21					19.00	3	0.16	0.05	132.6%	30,767
						08/09	21.00	08/10	6.50	9.50	0	0.00			
08/10	6.67	20.17	13.50	0	0.00	08/10	20.42	08/11	6.50	10.08	0	0.00			
	Total Wild		13.50	0	0.00					19.58	0	0.00	0.00	0.0%	26,000
						08/12	20.50	08/13	6.50	10.00	1	0.10			
08/13	6.67	20.67	14.00	0	0.00	08/13	20.83	08/14	6.75	9.92	0	0.00			
	Total Wild		14.00	0	0.00					19.92	1	0.05	-0.05	0.0%	21,333
Total			290.75	251	0.86					380.33	1,511	3.97	-3.11	21.7%	

21 # days in sample

Min	0.0%	14,133
Max	270.6%	34,633
Avg	79.0%	27,889

Table 4b. Catch/hour rates of HATCHERY 0+ CHINOOK during day and night periods, Skagit River SCREW trap, 1999.

Date	DAYTIME Start	End	Time Fished	Catch	Catch/ Hour	NIGHTTIME Start Date	Start Time	End Date	End Time	Time Fished	Catch	Catch/ Hour	DAY:NIGHT Diff (D-N)	Ratio (D/N)	Flow (cfs)
						05/20	20.08	05/21	7.50	11.42	23	2.01			
05/21	7.50	20.75	13.25	0	0.00	05/21	20.75	05/22	6.50	9.75	30	3.08			
	Total Wild		13.25	0	0.00					21.17	53	2.50	-2.50	0.0%	19,367
						05/21	20.75	05/22	6.50	9.75	30	3.08			
05/22	6.50	20.50	14.00	1	0.07	05/22	20.50	05/23	6.00	9.50	35	3.68			
	Total Wild		14.00	1	0.07					19.25	65	3.38	-3.31	2.1%	19,400
						05/27	20.00	05/28	7.00	11.00	37	3.36			
05/28	7.00	20.50	13.50	32	2.37	05/28	20.50	05/29	6.00	9.50	27	2.84			
	Total Wild		13.50	32	2.37					20.50	64	3.12	-0.75	75.9%	28,267
						05/28	20.50	05/29	6.00	9.50	27	2.84			
05/29	6.00	19.75	13.75	1	0.07	05/29	20.50	05/30	6.00	9.50	31	3.26			
	Total Wild		13.75	1	0.07					19.00	58	3.05	-2.98	2.4%	27,700
						06/03	20.25	06/04	6.00	9.75	2	0.21			
06/04	6.00	20.00	14.00	1	0.07	06/04	20.00	06/05	6.00	10.00	3	0.30			
	Total Wild		14.00	1	0.07					19.75	5	0.25	-0.18	28.2%	24,533
						06/04	20.00	06/05	6.00	10.00	3	0.30			
06/05	6.00	20.00	14.00	67	4.79	06/05	20.67	06/06	6.17	9.50	867	91.26			
	Total Wild		14.00	67	4.79					19.50	870	44.62	-39.83	10.7%	27,267
						06/08	21.25	06/09	5.50	8.25	30	3.64			
06/09	5.50	21.00	15.50	6	0.39	06/09	21.00	06/10	5.50	8.50	15	1.76			
	Total Wild		15.50	6	0.39					16.75	45	2.69	-2.30	14.4%	23,033
						06/17	21.50	06/18	6.50	9.00	18	2.00			
06/18	6.50	21.50	15.00	22	1.47	06/18	21.50	06/19	5.50	8.00	5	0.63			
	Total Wild		15.00	22	1.47					17.00	23	1.35	0.11	108.4%	34,633
						06/20	21.75	06/21	5.83	8.08	9	1.11			
06/21	5.83	21.42	15.58	9	0.58	06/21	21.42	06/22	6.00	8.58	5	0.58			
	Total Wild		15.58	9	0.58					16.67	14	0.84	-0.26	68.8%	27,933
						06/23	21.00	06/24	5.50	8.50	3	0.35			
06/24	5.50	21.00	15.50	7	0.45	06/24	21.00	06/25	6.17	9.17	16	1.75			
	Total Wild		15.50	7	0.45					17.67	19	1.08	-0.62	42.0%	31,167
						06/26	21.58	06/27	6.08	8.50	7	0.82			
06/27	6.08	21.25	15.17	2	0.13	06/27	21.25	06/28	5.75	8.50	4	0.47			
	Total Wild		15.17	2	0.13					17.00	11	0.65	-0.52	20.4%	28,800
						06/28	21.50	06/29	5.75	8.25	1	0.12			
06/29	5.75	21.50	15.75	1	0.06	06/29	21.50	06/30	5.75	8.25	1	0.12			
	Total Wild		15.75	1	0.06					16.50	2	0.12	-0.06	52.4%	24,467
						07/04	21.50	07/05	5.92	8.42	0	0.00			
07/05	5.92	21.25	15.33	1	0.07	07/05	21.25	07/06	5.75	8.50	2	0.24			
	Total Wild		15.33	1	0.07					16.92	2	0.12	-0.05	55.2%	25,000
						07/07	21.67	07/08	5.67	8.00	4	0.50			
07/08	5.67	21.00	15.33	1	0.07	07/08	21.00	07/09	5.50	8.50	2	0.24			
	Total Wild		15.33	1	0.07					16.50	6	0.36	-0.30	17.9%	29,933
						07/10	21.50	07/11	6.00	8.50	0	0.00			
07/11	6.25	21.00	14.75	8	0.54	07/11	21.08	07/12	6.00	8.92	3	0.34			
	Total Wild		14.75	8	0.54					17.42	3	0.17	0.37	314.9%	33,700

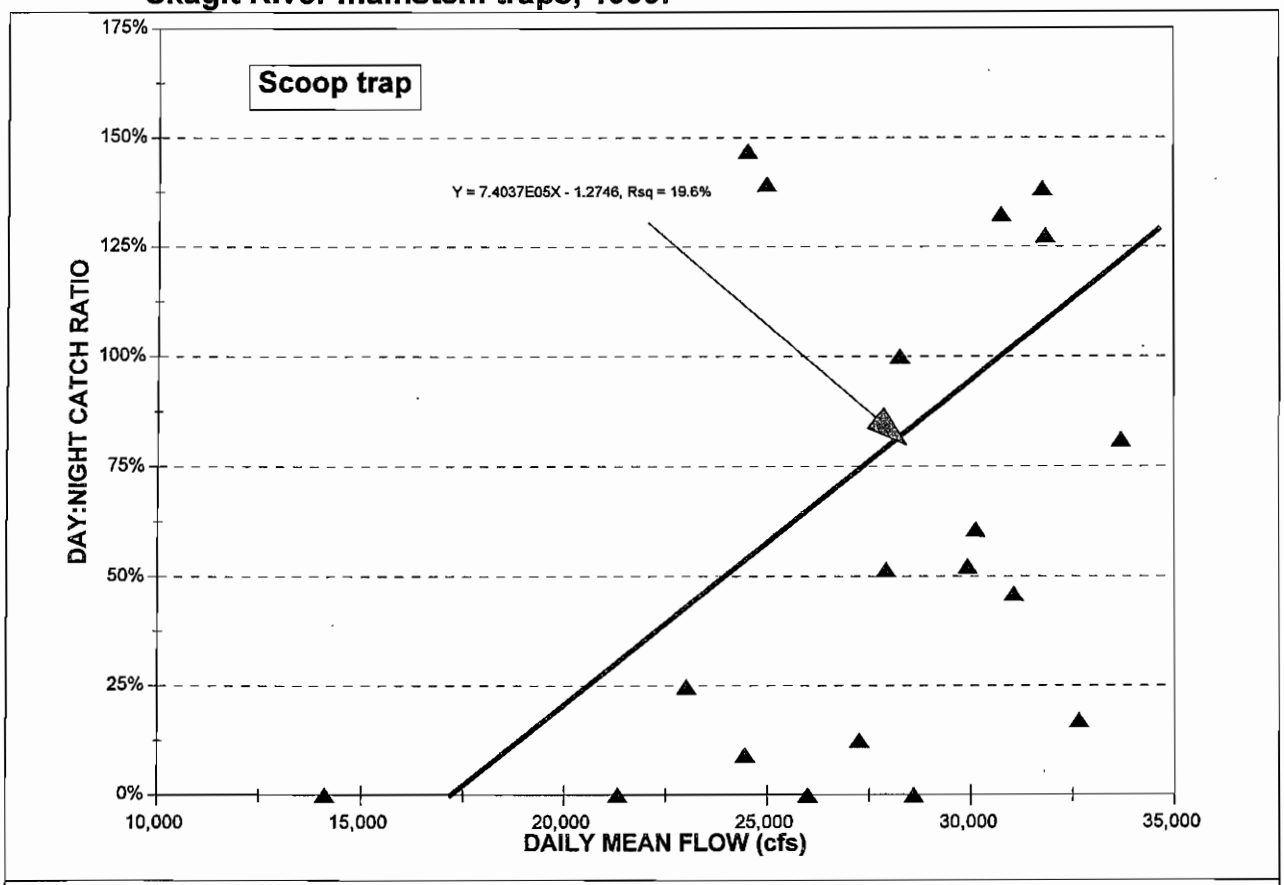
Table 4b. Catch/hour rates of HATCHERY 0+ CHINOOK during day and night periods, Skagit River SCREW trap, 1999.

Date	DAYTIME Start	End	Time Fished	Catch	Catch/ Hour	NIGHTTIME Start Date	Start Time	End Date	End Time	Time Fished	Catch	Catch/ Hour	DAY:NIGHT Diff (D-N)	Ratio (D/N)	Flow (cfs)
						07/20	21.00	07/21	6.83	9.83	2	0.20			
07/21	7.08	21.50	14.42	4	0.28	07/21	21.50	07/22	5.75	8.25	2	0.24			
	Total Wild		14.42	4	0.28					18.08	4	0.22	0.06	125.4%	31,833
						07/22	21.00	07/23	6.50	9.50	1	0.11			
07/23	6.50	21.67	15.17	1	0.07	07/23	21.67	07/24	6.50	8.83	1	0.11			
	Total Wild		15.17	1	0.07					18.33	2	0.11	-0.04	60.4%	33,300
						07/25	21.50	07/26	6.67	9.17	0	0.00			
07/26	6.67	21.25	14.58	0	0.00	07/26	21.25	07/27	6.50	9.25	0	0.00			
	Total Wild		14.58	0	0.00					18.42	0	0.00	0.00	0.0%	30,133
						07/31	21.00	08/01	6.83	9.83	0	0.00			
08/01	6.83	21.33	14.50	0	0.00	08/01	21.33	08/02	6.50	9.17	0	0.00			
	Total Wild		14.50	0	0.00					19.00	0	0.00	0.00	0.0%	23,033
Total			279.08	164	0.59					345.42	1,246	3.61	-3.02	16.3%	

19 # days in sample

Min	0.0%	19,367
Max	314.9%	34,633
Avg	52.6%	27,553

Figure 4. Day:night catch ratios for hatchery 0+ chinook, and daily mean flow, Skagit River mainstem traps, 1999.



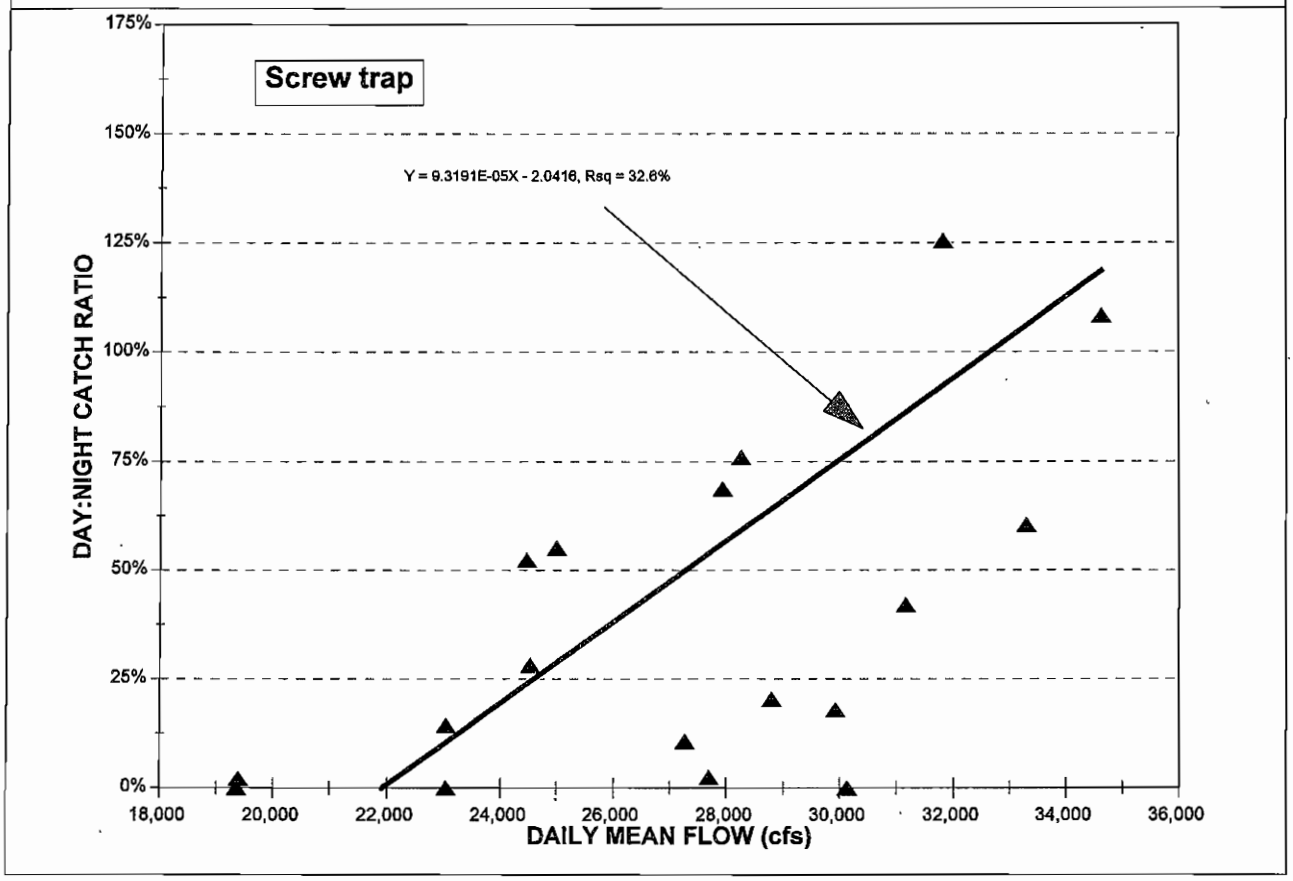
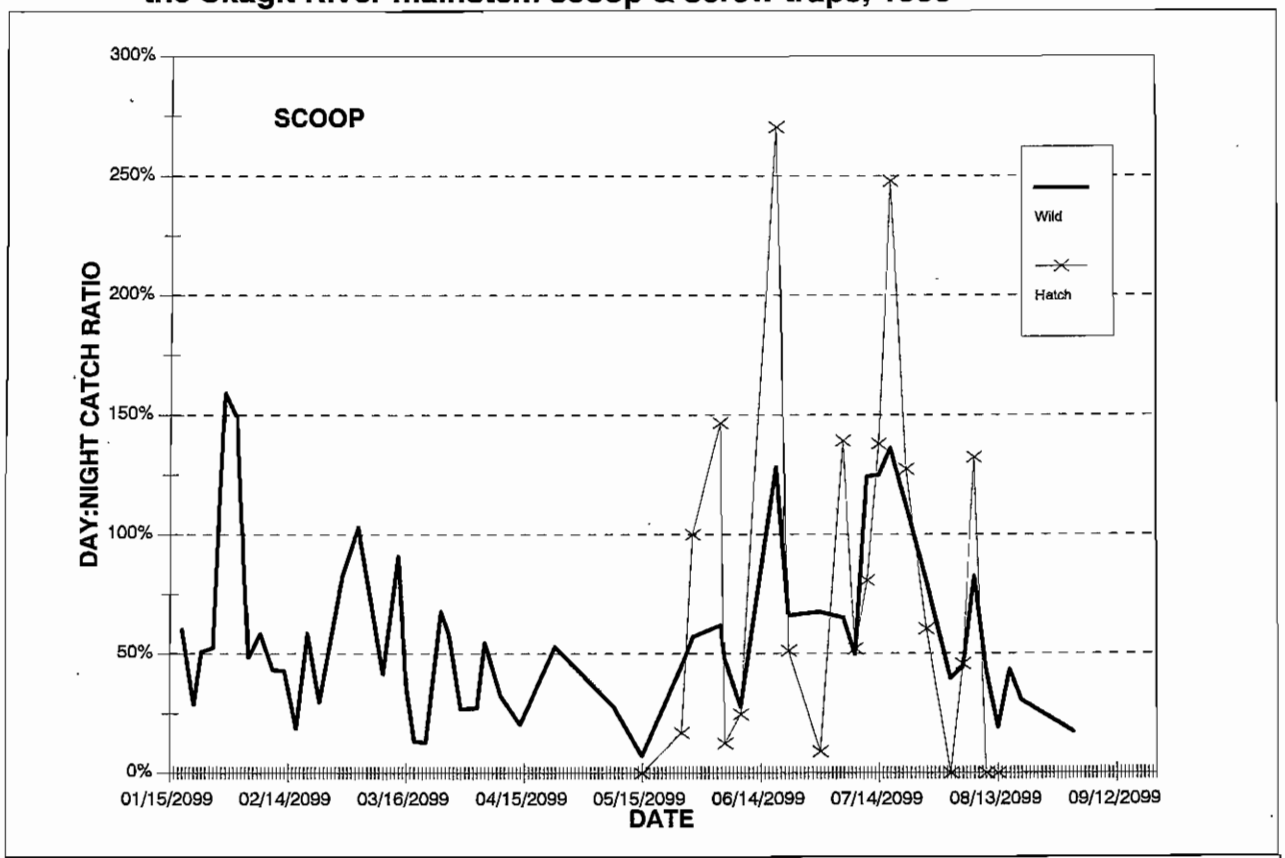


Figure 5. Comparison of day:night catch ratios for 0+ wild & hatchery chinook in the Skagit River mainstem scoop & screw traps, 1999



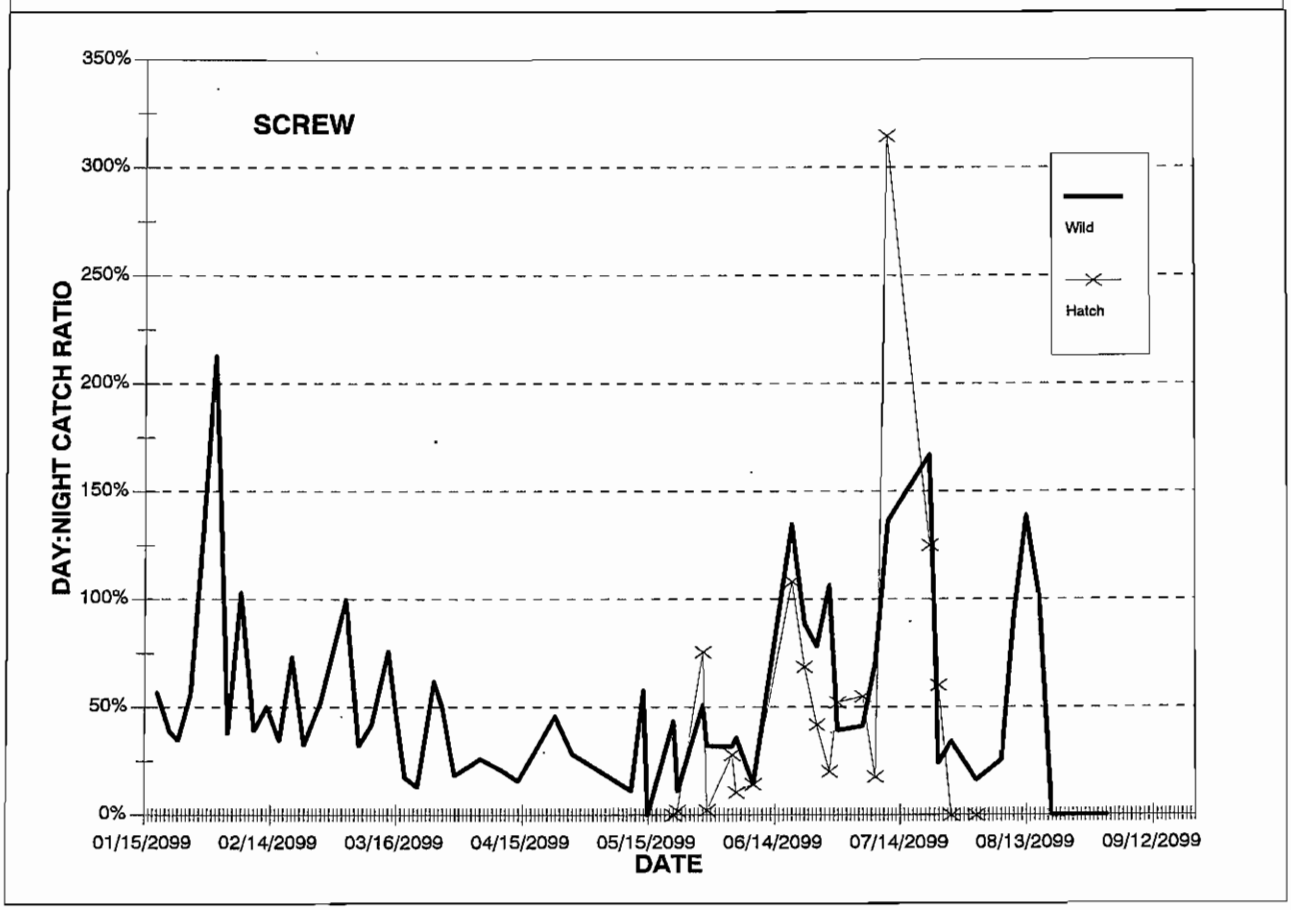


Table 5a. Catch/hour rates of WILD COHO SMOLTS during day and night periods, Skagit River SCOOP trap, 1999.

Date	DAYTIME Start	End	Time Fished	Catch	Catch/ Hour	NIGHTTIME Start Date	Start Time	End Date	End Time	Time Fished	Catch	Catch/ Hour	DAY:NIGHT Diff (D-N)	Ratio (D/N)	Flow (cfs)
						04/13	20.00	04/14	6.75	10.75	0	0.00			
04/14	6.92	19.92	13.00	0	0.00	04/14	20.08	04/15	7.00	10.92	2	0.18			
	Total Wild		13.00	0	0.00					21.67	2	0.09	-0.09	0.0%	11,967
						04/22	20.25	04/23	7.00	10.75	17	1.58			
04/23	7.17	20.33	13.17	0	0.00	04/23	20.67	04/24	6.50	9.83	28	2.85			
	Total Wild		13.17	0	0.00					20.58	45	2.19	-2.19	0.0%	16,033
						05/07	20.67	05/08	6.83	10.17	122	12.00			
05/08	7.00	20.50	13.50	0	0.00	05/08	20.67	05/09	7.00	10.33	101	9.77			
	Total Wild		13.50	0	0.00					20.50	223	10.88	-10.88	0.0%	18,700
						05/14	19.92	05/15	6.25	10.33	110	10.65			
05/15	10.42	20.75	10.33	0	0.00	05/15	20.92	05/16	6.50	9.58	82	8.56			
	Total Wild		10.33	0	0.00					19.92	192	9.64	-9.64	0.0%	14,133
						05/24	21.00	05/25	5.25	8.25	154	18.67			
05/25	14.50	18.00	3.50	14	4.00	05/25	21.58	05/26	5.17	7.58	108	14.24			
	Total Wild		3.50	14	4.00					15.83	262	16.55	-12.55	24.2%	32,667
						05/27	20.08	05/28	6.25	10.17	111	10.92			
05/28	6.42	21.08	14.67	18	1.23	05/28	21.25	05/29	6.67	9.42	101	10.73			
	Total Wild		14.67	18	1.23					19.58	212	10.83	-9.60	11.3%	28,267
						06/03	20.17	06/04	6.50	10.33	56	5.42			
06/04	6.67	20.50	13.83	2	0.14	06/04	20.67	06/05	6.67	10.00	53	5.30			
	Total Wild		13.83	2	0.14					20.33	109	5.36	-5.22	2.7%	24,533
						06/04	20.67	06/05	6.67	10.00	53	5.30			
06/05	6.83	20.50	13.67	17	1.24	06/05	20.67	06/06	6.00	9.33	43	4.61			
	Total Wild		13.67	17	1.24					19.33	96	4.97	-3.72	25.1%	27,267
						06/08	21.25	06/09	5.83	8.58	27	3.15			
06/09	6.08	21.17	15.08	1	0.07	06/09	21.33	06/10	5.50	8.17	28	3.43			
	Total Wild		15.08	1	0.07					16.75	55	3.28	-3.22	2.0%	23,033
						06/17	21.50	06/18	6.00	8.50	2	0.24			
06/18	6.17	21.00	14.83	2	0.13	06/18	21.17	06/19	5.50	8.33	8	0.96			
	Total Wild		14.83	2	0.13					16.83	10	0.59	-0.46	22.7%	34,633
						06/20	21.75	06/21	5.50	7.75	3	0.39			
06/21	5.67	21.67	16.00	1	0.06	06/21	21.83	06/22	5.92	8.08	4	0.49			
	Total Wild		16.00	1	0.06					15.83	7	0.44	-0.38	14.1%	27,933
						06/28	21.50	06/29	5.75	8.25	2	0.24			
06/29	5.92	21.75	15.83	0	0.00	06/29	21.92	06/30	5.75	7.83	2	0.26			
	Total Wild		15.83	0	0.00					16.08	4	0.25	-0.25	0.0%	24,467
						07/04	21.50	07/05	5.75	8.25	2	0.24			
07/05	5.92	21.00	15.08	0	0.00	07/05	21.17	07/06	5.75	8.58	0	0.00			
	Total Wild		15.08	0	0.00					16.83	2	0.12	-0.12	0.0%	25,000
						07/07	21.75	07/08	5.75	8.00	0	0.00			
07/08	5.92	21.25	15.33	0	0.00	07/08	21.42	07/09	5.50	8.08	1	0.12			
	Total Wild		15.33	0	0.00					16.08	1	0.06	-0.06	0.0%	29,933
Total			187.83	55	0.29					256.17	1,220	4.76	-4.47	6.1%	

14 # days in sample

Min	0.0%	11,967
Max	25.1%	34,633
Avg	7.3%	24,183

Table 5b. Catch/hour rates of WILD COHO SMOLTS during day and night periods, Skagit River SCREW trap, 1999.

Date	DAYTIME Start	End	Time Fished	Catch	Catch/ Hour	NIGHTTIME Start Date	Start Time	End Date	End Time	Time Fished	Catch	Catch/ Hour	DAY:NIGHT Diff (D-N)	Ratio (D/N)	Flow (cfs)
						04/10	19.92	04/11	6.83	10.92	0	0.00			
04/11	6.83	19.83	13.00	0	0.00	04/11	19.83	04/12	6.58	10.75	1	0.09			
	Total Wild		13.00	0	0.00					21.67	1	0.05	-0.05	0.0%	10,467
						04/22	20.17	04/23	6.50	10.33	19	1.84			
04/23	6.50	19.75	13.25	0	0.00	04/23	19.75	04/24	6.50	10.75	20	1.86			
	Total Wild		13.25	0	0.00					21.08	39	1.85	-1.85	0.0%	16,033
						04/26	20.00	04/27	6.67	10.67	27	2.53			
04/27	6.67	20.00	13.33	0	0.00	04/27	20.00	04/28	6.58	10.58	50	4.72			
	Total Wild		13.33	0	0.00					21.25	77	3.62	-3.62	0.0%	19,100
						05/10	20.50	05/11	6.33	9.83	62	6.31			
05/11	6.33	20.00	13.67	0	0.00	05/11	20.00	05/12	6.33	10.33	59	5.71			
	Total Wild		13.67	0	0.00					20.17	121	6.00	-6.00	0.0%	16,833
						05/13	19.50	05/14	6.17	10.67	98	9.19			
05/14	6.17	19.50	13.33	0	0.00	05/14	19.50	05/15	6.25	10.75	58	5.40			
	Total Wild		13.33	0	0.00					21.42	156	7.28	-7.28	0.0%	15,700
						05/14	19.50	05/15	6.25	10.75	58	5.40			
05/15	10.33	20.67	10.33	0	0.00	05/15	20.67	05/16	6.50	9.83	22	2.24			
	Total Wild		10.33	0	0.00					20.58	80	3.89	-3.89	0.0%	14,133
						05/20	20.08	05/21	7.50	11.42	91	7.97			
05/21	7.50	20.75	13.25	2	0.15	05/21	20.75	05/22	6.50	9.75	74	7.59			
	Total Wild		13.25	2	0.15					21.17	165	7.80	-7.64	1.9%	19,367
						05/21	20.75	05/22	6.50	9.75	74	7.59			
05/22	6.50	20.50	14.00	0	0.00	05/22	20.50	05/23	6.00	9.50	84	8.84			
	Total Wild		14.00	0	0.00					19.25	158	8.21	-8.21	0.0%	19,400
						05/27	20.00	05/28	7.00	11.00	117	10.64			
05/28	7.00	20.50	13.50	12	0.89	05/28	20.50	05/29	6.00	9.50	148	15.58			
	Total Wild		13.50	12	0.89					20.50	265	12.93	-12.04	6.9%	28,267
						05/28	20.50	05/29	6.00	9.50	148	15.58			
05/29	6.00	19.75	13.75	8	0.58	05/29	20.50	05/30	6.00	9.50	124	13.05			
	Total Wild		13.75	8	0.58					19.00	272	14.32	-13.73	4.1%	27,700
						06/03	20.25	06/04	6.00	9.75	49	5.03			
06/04	6.00	20.00	14.00	11	0.79	06/04	20.00	06/05	6.00	10.00	61	6.10			
	Total Wild		14.00	11	0.79					19.75	110	5.57	-4.78	14.1%	24,533
						06/04	20.00	06/05	6.00	10.00	61	6.10			
06/05	6.00	20.00	14.00	12	0.86	06/05	20.67	06/06	6.17	9.50	65	6.84			
	Total Wild		14.00	12	0.86					19.50	126	6.46	-5.60	13.3%	27,267
						06/08	21.25	06/09	5.50	8.25	16	1.94			
06/09	5.50	21.00	15.50	0	0.00	06/09	21.00	06/10	5.50	8.50	13	1.53			
	Total Wild		15.50	0	0.00					16.75	29	1.73	-1.73	0.0%	23,033
						06/17	21.50	06/18	6.50	9.00	7	0.78			
06/18	6.50	21.50	15.00	6	0.40	06/18	21.50	06/19	5.50	8.00	5	0.63			
	Total Wild		15.00	6	0.40					17.00	12	0.71	-0.31	56.7%	34,633
						06/20	21.75	06/21	5.83	8.08	2	0.25			
06/21	5.83	21.42	15.58	0	0.00	06/21	21.42	06/22	6.00	8.58	4	0.47			
	Total Wild		15.58	0	0.00					16.67	6	0.36	-0.36	0.0%	27,933
						06/23	21.00	06/24	5.50	8.50	1	0.12			
06/24	5.50	21.00	15.50	2	0.13	06/24	21.00	06/25	6.17	9.17	1	0.11			
	Total Wild		15.50	2	0.13					17.67	2	0.11	0.02	114.0%	31,167

Table 5b. Catch/hour rates of WILD COHO SMOLTS during day and night periods, Skagit River SCREW trap, 1999.

Date	DAYTIME Start	End	Time Fished	Catch	Catch/ Hour	NIGHTTIME Start Date	Start Time	End Date	End Time	Time Fished	Catch	Catch/ Hour	DAY:NIGHT Diff (D-N)	Ratio (D/N)	Flow (cfs)
						06/26	21.58	06/27	6.08	8.50	1	0.12			
06/27	6.08	21.25	15.17	0	0.00	06/27	21.25	06/28	5.75	8.50	2	0.24			
	Total Wild		15.17	0	0.00					17.00	3	0.18	-0.18	0.0%	28,800
						06/28	21.50	06/29	5.75	8.25	3	0.36			
06/29	5.75	21.50	15.75	1	0.06	06/29	21.50	06/30	5.75	8.25	1	0.12			
	Total Wild		15.75	1	0.06					16.50	4	0.24	-0.18	26.2%	24,467
						07/04	21.50	07/05	5.92	8.42	1	0.12			
07/05	5.92	21.25	15.33	0	0.00	07/05	21.25	07/06	5.75	8.50	3	0.35			
	Total Wild		15.33	0	0.00					16.92	4	0.24	-0.24	0.0%	25,000
Total			267.25	54	0.20					363.83	1,630	4.48	-4.28	4.5%	

19 # days in sample

Min	0.0%	10,467
Max	114.0%	34,633
Avg	12.5%	22,833

Figure 6. Day:night catch ratios for wild coho smolts and daily mean flow, Skagit River mainstem traps, 1999.

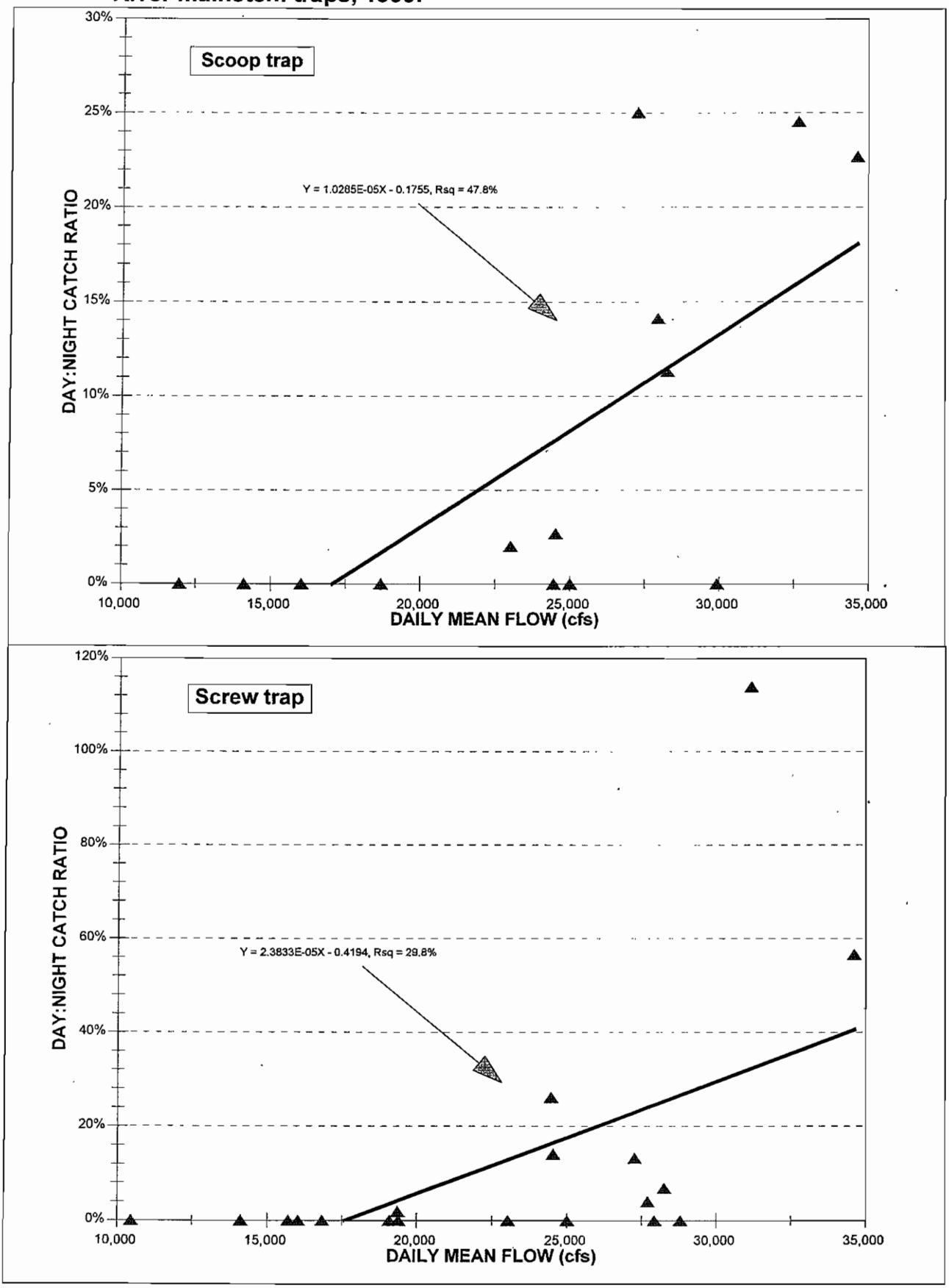
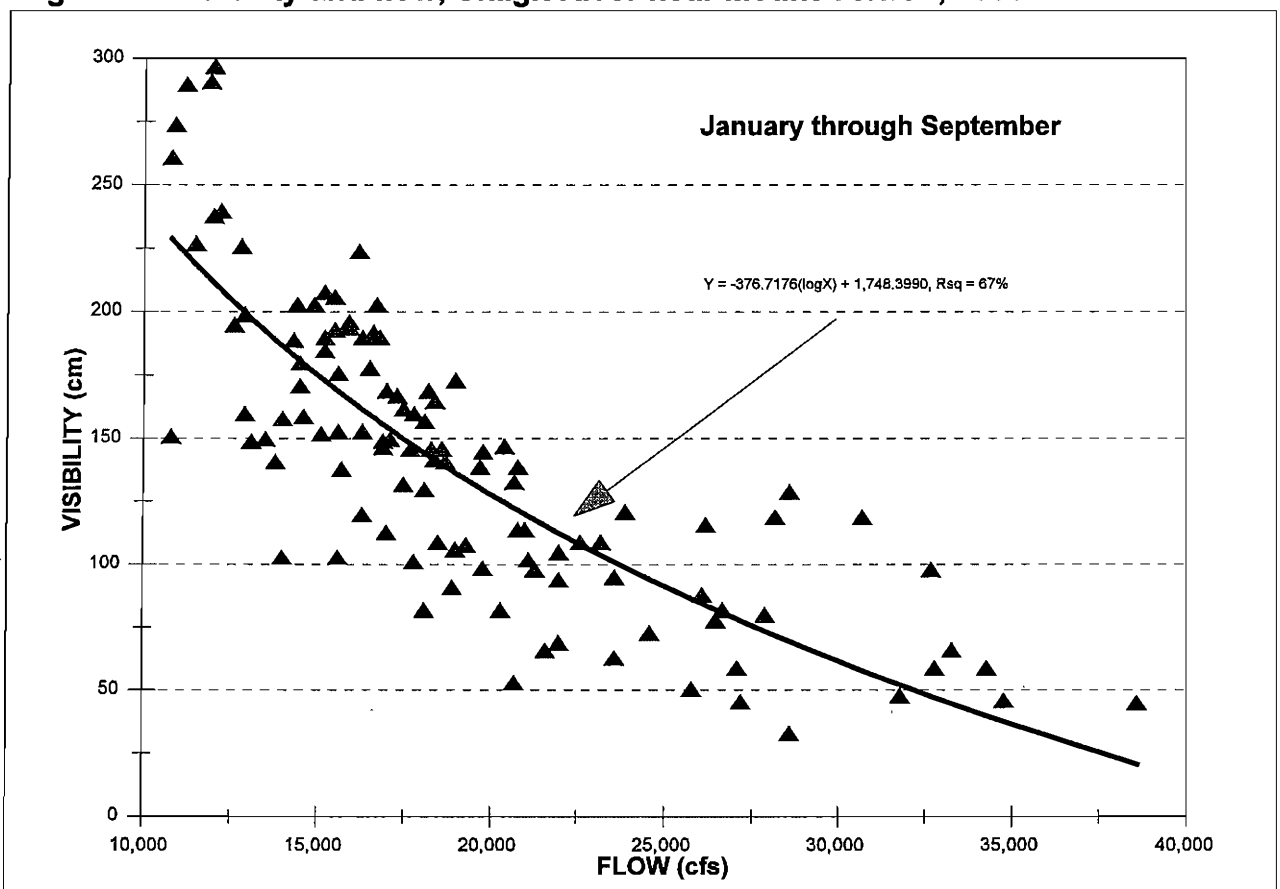


Table 6. Summary of visibility and flow data, Skagit River mainstem traps at Mt. Vernon, 1999.

Interval	FLOW			VISIBILITY (cm)			Rsq
	Min	Max	Avg	Min	Max	Avg	
January	16,900	27,200	20,883	46	149	91	75.2%
February	12,900	28,600	18,296	33	208	130	62.7%
March	14,300	22,000	17,170	82	196	152	41.1%
April	10,800	21,000	15,004	114	297	203	72.6%
May	12,800	27,100	20,070	59	226	125	81.4%
June	22,600	38,600	28,650	45	109	77	90.3%
January-June	10,800	38,600	18,445	33	297	145	66.9%
July	28,200	34,300	31,840	59	119	92	77.2%
August	13,800	32,800	22,638	59	147	121	49.0%
July-September	10,800	34,300	25,079	59	151	113	62.6%
All	10,800	21,000	19,282	33	109	141	60.1%

Figure 7. Visibility and flow, Skagit River near Mount Vernon, 1999



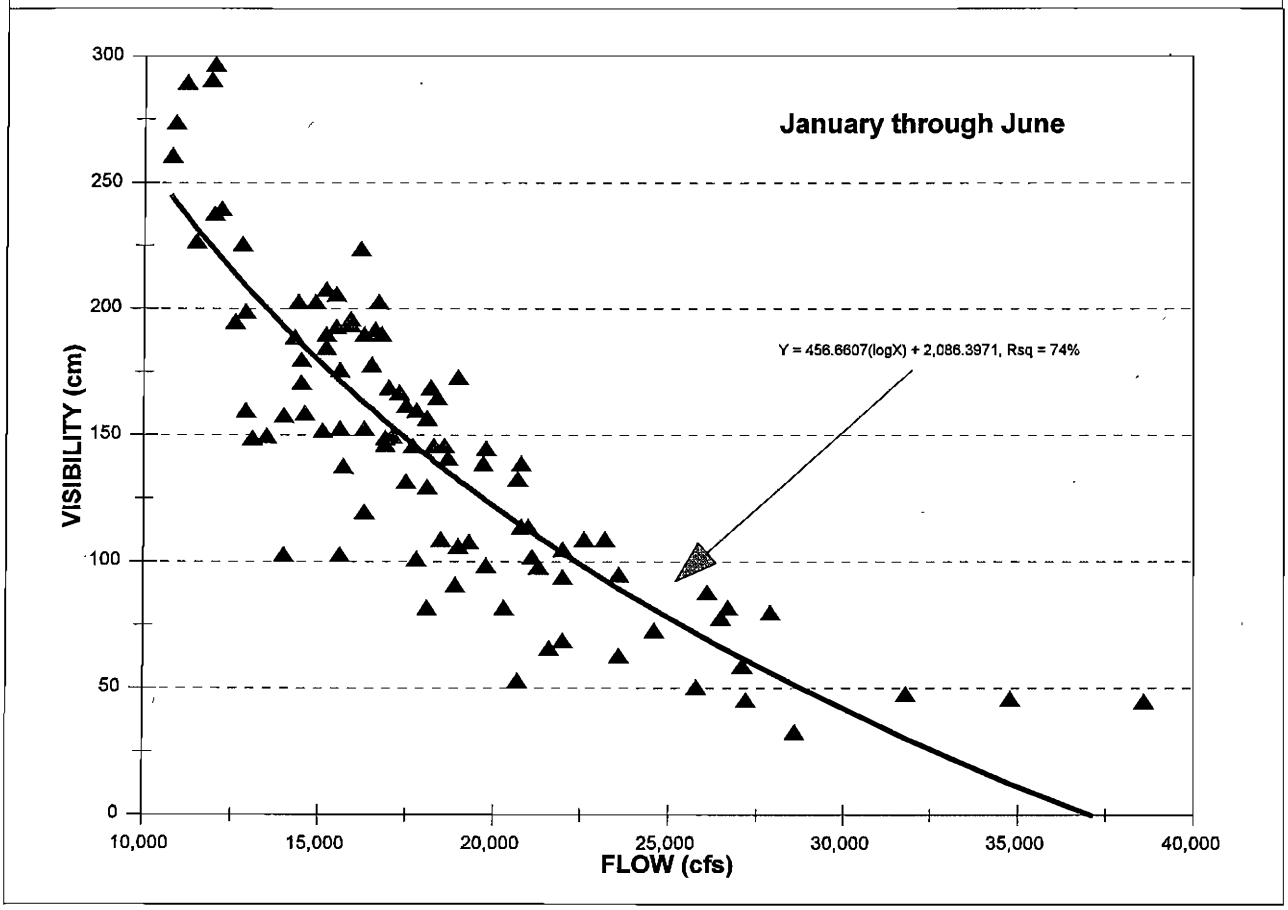
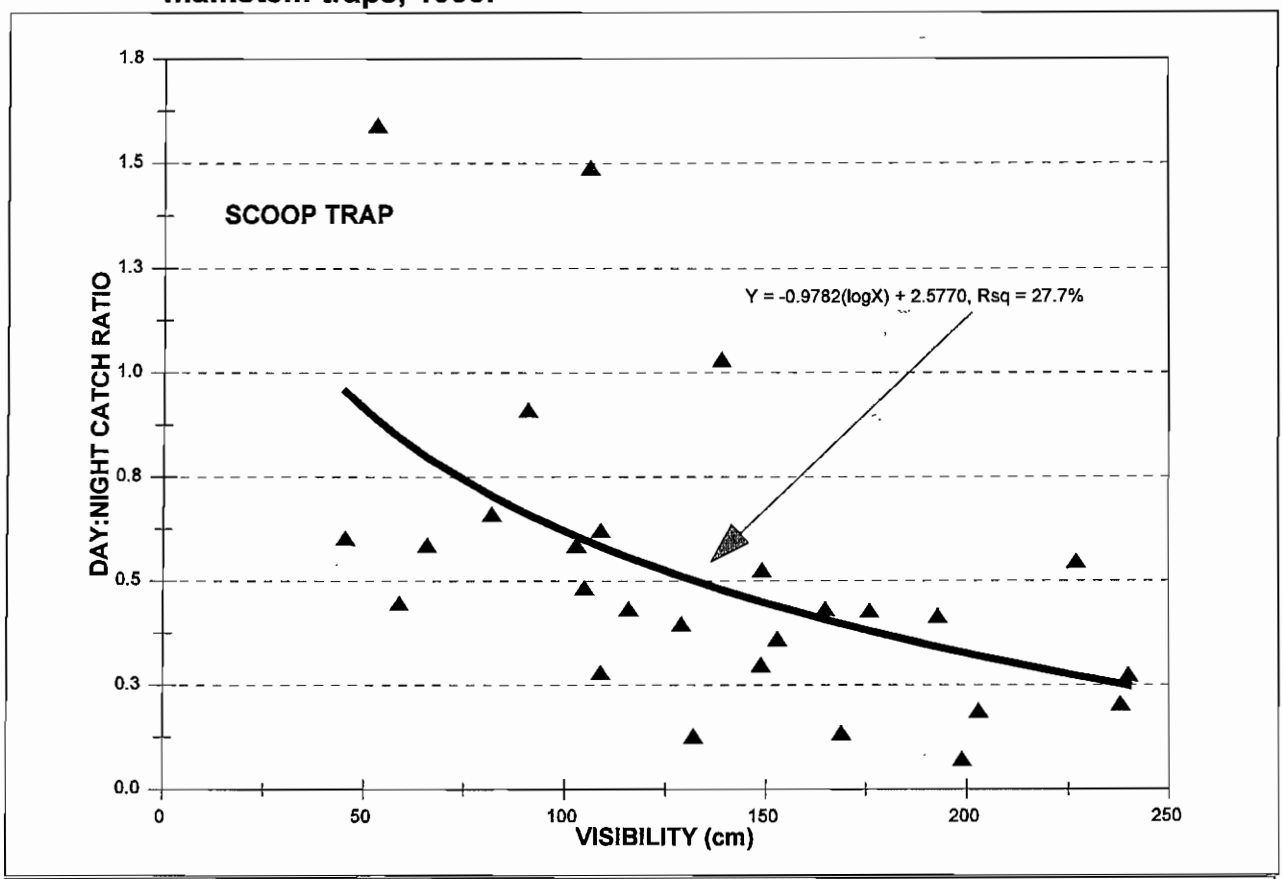


Figure 8. Day:Night wild chinook 0+ catch ratios and visibility, Skagit River mainstem traps, 1999.



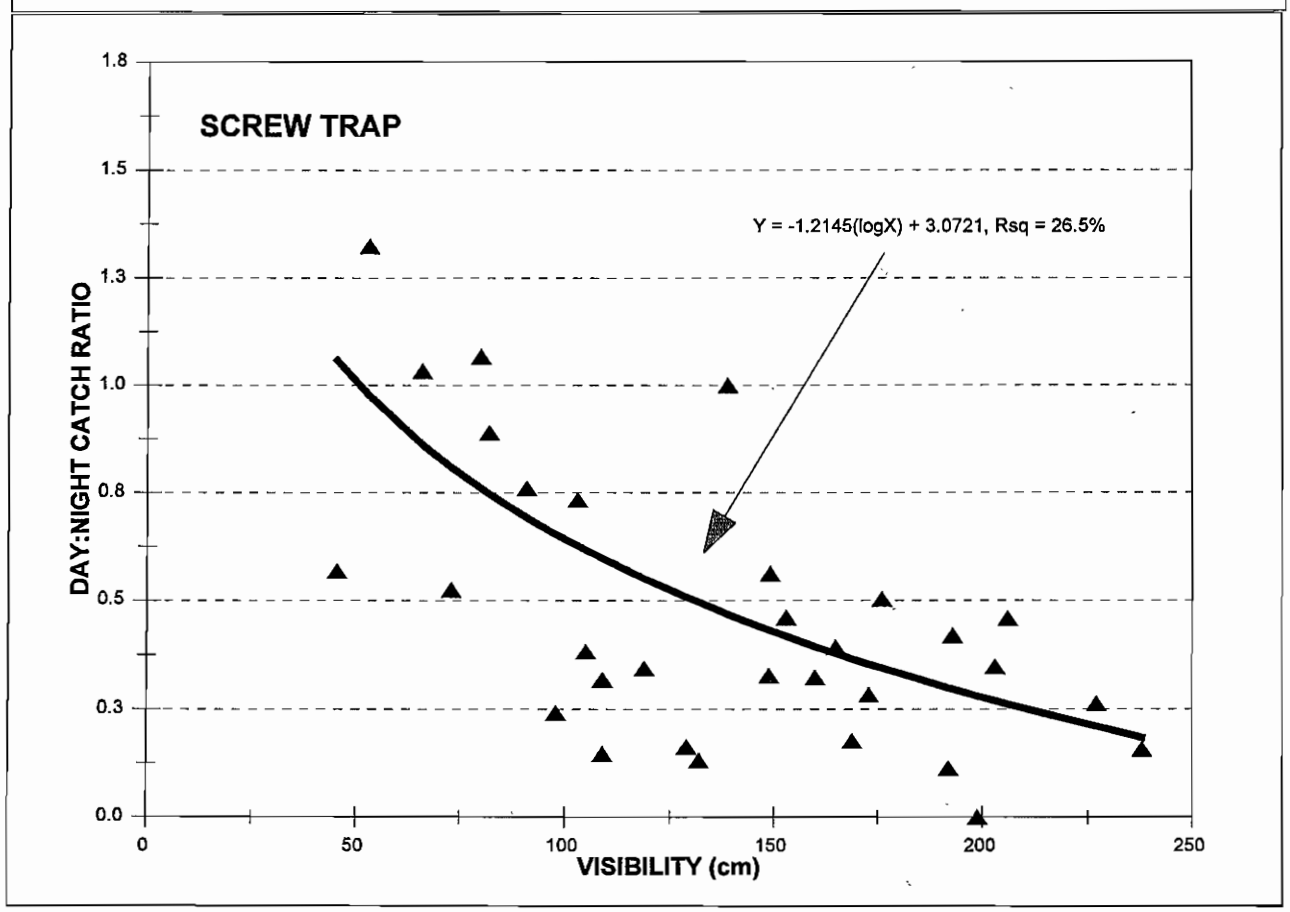


Table 7. Estimation of wild coho smolt production, Skagit River, 1999.

	Number	Formula
Total mainstem trap catches	9,861	
Baker River	[a]-125	
Skagit Hatchery/Lake Shannon	[b]-1,320	
Subtotal	-1,445	
Wild coho captured (c)	**8,416**	
RVs recaptured (r)	279	$N = \frac{(m+1)(c+1)}{(r+1)}$
RVs released (m)	22,546	
Total production (N)	**677,779**	
Variance (Var)	1.57e+09	$Var = \frac{(m+1)(c+1)(m-r)(c-r)}{(r+1)^2(r+1)}$
Standard deviation (sd)	39,578	
Coefficient of Var (CV)	5.84%	CV = sd ÷ N
Confidence interval (CI)	±77,544	CI = ± 1.96(sd)
Estimated coho production Skagit River	677,779	
Baker River	25,159	
Total Production	702,938	
Upper CI (95%)	755,323	
Lower CI (95%)	600,235	

[a] Estimated Baker recoveries: visually identified and detected for tags (85) times the tag expansion factor (1.4682 = 25,159/17,136) total tagged and unmarked Baker River smolts in the catch (Baker numbers from Arnie A. 10/12/99).

[b] Hatchery ad-marked and unmarked smolt total from counts obtained by visual identification at trapping (1,308 Skagit hatchery + 12 brands from Baker Lake = 1,320).

Table 8. Release and recapture data for fin-marked 0+ age hatchery chinook, released at Gardner Bar, Skagit River, 1999

Night of Release	Number Released	Mark Type*	Time of Release	Night of Recapture	Flow (cfs)	Number Recaptured			Capture Rate (Comb.)
						Scoop	Screw	Combined (Scoop+Screw)	
5/13/99	2,496	UC	2030 hrs	5/13	17,500	18	14	32	1.28%
				5/14	16,700	28	18	46	1.84%
Subtotal						**46**	**32**	**78**	**3.13%**
5/20/99	2,520	LC	1830 hrs	5/20	20,300	3	3	6	0.24%
				5/21	19,100	4	7	11	0.44%
				5/22	18,700	0	1	1	0.04%
Subtotal						**7**	**11**	**18**	**0.71%**
5/27/99	2,537	UC	2030 hrs	5/27	28,200	22	11	33	1.30%
				5/28	28,900	7	6	13	0.51%
				5/29	27,700	1	0	1	0.04%
Subtotal						**30**	**17**	**47**	**1.85%**
6/03/99	2,534	LC	2030 hrs	6/03	23,600	6	4	10	0.39%
				6/04	23,200	9	6	15	0.59%
				6/05	26,800	1	0	1	0.04%
Subtotal						**16**	**10**	**26**	**1.03%**
GRAND TOTAL:	**10,087**					**99**	**70**	**169**	**1.68%**

*UC = Upper caudal fin mark; LC = Lower caudal fin mark.

Table 9. Breakdown of CWT recoveries from ad-marked chinook sacrificed at the Skagit River mainstem scoop and screw traps, 1999.

Date	Trap	NUMBER SAMPLED			63-06/09		63-07/57		21-01/51	
		Heads	No Tags	Tags	#	%	#	%	#	%
06/02	Scoop	1		1	1	100%		0%		0%
06/05	Scoop	4		4	4	100%		0%		0%
06/05	Screw	3		3	3	100%		0%		0%
06/06	Scoop	48	4	44	44	92%		0%		0%
06/06	Screw	43		43	42	98%		0%	1	2%
06/07	Scoop	6	1	5	5	83%		0%		0%
06/07	Screw	6		6	6	100%		0%		0%
06/08	Scoop	6		6	6	100%		0%		0%
06/08	Screw	4		4	3	75%		0%	1	25%
06/09	Scoop	6		6	5	83%		0%	1	17%
06/09	Screw	2		2	1	50%		0%	1	50%
06/10	Scoop	4	1	3	3	75%		0%		0%
06/10	Screw	2		2	2	100%		0%		0%
06/11	Scoop	2		2	2	100%		0%		0%
06/11	Screw	1		1	1	100%		0%		0%
06/12	Scoop	3		3	3	100%		0%		0%
06/13	Scoop	13	1	12	9	69%		0%	3	23%
06/13	Screw	7		7	6	86%		0%	1	14%
06/14	Scoop	8		8	8	100%		0%		0%
06/14	Screw	6		6	4	67%		0%	2	33%
06/15	Scoop	8		8	8	100%		0%		0%
06/15	Screw	10	1	9	8	80%		0%	1	10%
06/16	Scoop	2		2	2	100%		0%		0%
06/18	Scoop	11		11	11	100%		0%		0%
06/18	Screw	9		9	4	44%		0%	5	56%
06/20	Screw	1		1	1	100%		0%		0%
06/21	Scoop	2		2	2	100%		0%		0%
06/21	Screw	1		1	1	100%		0%		0%
06/22	Scoop	1		1	1	100%		0%		0%
06/22	Screw	1	1	0						
06/23	Scoop	1		1		0%	1	100%		0%
06/24	Scoop	2		2	1	50%		0%	1	50%
06/24	Screw	1		1	1	100%		0%		0%
06/25	Screw	2		2	2	100%		0%		0%

Table 9. Breakdown of CWT recoveries from ad-marked chinook sacrificed at the Skagit River mainstem scoop and screw traps, 1999.

Date	Trap	NUMBER SAMPLED			63-06/09		63-07/57		21-01/51	
		Heads	No Tags	Tags	#	%	#	%	#	%
06/27	Scoop	2		2	1	50%		0%	1	50%
06/27	Screw	1		1	1	100%		0%		0%
06/30	Scoop	1		1	1	100%		0%		0%
06/30	Screw	1		1	1	100%		0%		0%
07/01	Scoop	1		1	1	100%		0%		0%
07/03	Scoop	1		1	1	100%		0%		0%
07/05	Screw	1		1	1	100%		0%		0%
07/06	Scoop	1		1	1	100%		0%		0%
07/08	Scoop	1		1	1	100%		0%		0%
07/11	Scoop	1		1	1	100%		0%		0%
07/11	Screw	1		1	1	100%		0%		0%
07/12	Scoop	1		1	1	100%		0%		0%
07/13	Scoop	1		1	1	100%		0%		0%
07/13	Screw	1		1	1	100%		0%		0%
07/14	Screw	1		1	1	100%		0%		0%
07/15	Scoop	1		1	1	100%		0%		0%
07/21	Scoop	1		1	1	100%		0%		0%
07/21	Screw	1		1	1	100%		0%		0%
07/22	Scoop	1		1	1	100%		0%		0%
07/22	Screw	1		1	1	100%		0%		0%
07/23	Screw	1		1	1	100%		0%		0%
07/31	Scoop	1		1	1	100%		0%		0%
08/04	Scoop	1		1	1	100%		0%		0%
08/05	Scoop	1		1	1	100%		0%		0%
08/12	Scoop	1		1	1	100%		0%		0%
	Total	253	9	244	225	88.9%	1	0.4%	18	7.1%
	Scoop	145	7	138	131		1		6	
	Screw	108	2	106	94		0		12	

NOTE: **Skagit Hatchery (springs)** = Code 63-06/09 = 246,714 released
Countyline (summers) = Code 63-07/57 = 25,969 released
Countyline (summers) = Code 21-01/51 = 215,151 released
No tags = 3.6%

Table 10. Composition of actual and estimated catches of adipose-marked hatchery 0+ chinook captured in the Skagit River mainstem traps, 1999.

Date	SCOOP										SCREW									
	Actual Catch				Additional 24-hr Catch			Tag Breakdown			Actual Catch				Additional 24-hr Catch			Tag Breakdown		
Down	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline
01/16	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/17	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/18	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/19	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/20	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/21	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/22	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/23	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/24	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/25	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/26	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/27	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/28	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/29	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/30	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
01/31	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/01	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/02	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/03	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/04	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/05	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/06	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/07	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/08	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/09	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/10	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/11	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/12	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/13	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/14	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/15	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/16	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/17	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/18	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/19	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/20	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/21	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/22	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/23	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/24	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/25	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/26	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/27	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
02/28	0	0	0	0%	0	0	0	0			0		0	0%	0	0	0	0		

Table 10. Composition of actual and estimated catches of adipose-marked hatchery 0+ chinook captured in the Skagit River mainstem traps, 1999.

Date	SCOOP										SCREW									
	Actual Catch				Additional 24-hr Catch			Tag Breakdown			Actual Catch				Additional 24-hr Catch			Tag Breakdown		
Down	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline
03/01	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/02	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/03	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/04	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/05	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/06	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/07	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/08	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/09	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/10	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/11	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/12	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/13	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/14	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/15	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/16	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/17	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/18	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/19	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/20	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/21	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/22	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/23	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/24	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/25	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/26	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/27	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/28	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/29	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/30	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
03/31	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/01	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/02	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/03	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/04	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/05	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/06	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/07	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/08	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/09	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/10	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/11	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/12	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/13	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/14	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		

Table 10. Composition of actual and estimated catches of adipose-marked hatchery 0+ chinook captured in the Skagit River mainstem traps, 1999.

	SCOOP										SCREW									
Date	Actual Catch				Additional 24-hr Catch			Tag Breakdown			Actual Catch				Additional 24-hr Catch			Tag Breakdown		
Down	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline
04/15	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/16	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/17	3	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/18	1	0	0	0%	0	0	0	0			1	0	0	0%	0	0	0	0		0
04/19	0	0	0	0%	0	0	0	0			1	0	0	0%	0	0	0	0		0
04/20	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/21	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/22	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/23	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/24	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/25	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/26	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/27	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/28	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/29	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
04/30	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/01	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/02	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/03	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/04	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/05	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/06	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/07	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/08	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/09	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/10	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/11	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/12	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/13	45	45	0	100%	6	6	0	0			14	14	0	100%	3	3	0	0		
05/14	1	1	0	100%	0	0	0	0			18	18	0	100%	0	0	0	0		
05/15	0	0	0	0%	0	0	0	0			0	0	0	0%	0	0	0	0		
05/16	48	0	48	0%	9	0	9	57		57	8	0	8	0%	1	0	1	9		9
05/17	78	0	78	0%	23	0	23	101		101	37	0	37	0%	6	0	6	43		43
05/18	43	0	43	0%	40	0	40	83		83	113	0	113	0%	26	0	26	139		139
05/19	208	0	208	0%	50	0	50	258		258	72	0	72	0%	25	0	25	97		97
05/20	90	3	87	3%	32	1	31	118		118	33	3	30	9%	13	1	12	42		42
05/21	94	4	90	4%	0	0	0	90		90	31	7	24	23%	0	0	0	24		24
05/22	96	0	96	0%	0	0	0	96		96	36	1	35	3%	0	0	0	35		35
05/23	198	0	198	0%	50	0	50	248		248	89	0	89	0%	16	0	16	105		105
05/24	68	0	68	0%	68	0	68	136		136	0	0	0	0%	47	0	47	47		47
05/25	118	0	118	0%	31	0	31	149		149	0		0	0%	61	0	61	61		61
05/26	65	0	65	0%	50	0	50	115		115	0		0	0%	62	0	62	62		62
05/27	59	22	37	37%	23	9	14	51		51	34	11	23	32%	51	17	34	57		57
05/28	79	7	72	9%	2	0	2	74		74	76	6	70	8%	0	0	0	70		70
05/29	44	1	43	2%	2	0	2	45		45	35	0	35	0%	0	0	0	35		35

Table 10. Composition of actual and estimated catches of adipose-marked hatchery 0+ chinook captured in the Skagit River mainstem traps, 1999.

	SCOOP										SCREW									
Date	Actual Catch				Additional 24-hr Catch			Tag Breakdown			Actual Catch				Additional 24-hr Catch			Tag Breakdown		
Down	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline
05/30	16	0	16	0%	7	0	7	23		23	11	0	11	0%	5	0	5	16		16
05/31	15	0	15	0%	5	0	5	20		20	13	0	13	0%	3	0	3	16		16
06/01	15	0	15	0%	5	0	5	20	20		11	0	11	0%	3	0	3	14	14	
06/02	8	0	8	0%	5	0	5	13	13		6	0	6	0%	3	0	3	9	9	
06/03	16	7	9	44%	4	2	2	11	11		10	4	6	40%	2	1	1	7	7	
06/04	8	8	0	100%	2	2	0	0	0		6	6	0	100%	0	0	0	0	0	
06/05	1,118	1	1,117	0%	2	0	2	1,119	1,119		934	0	934	0%	3	0	3	937	937	
06/06	117	0	117	0%	201	0	201	318	292	26	108	0	108	0%	125	0	125	233	228	5
06/07	118	0	118	0%	41	0	41	159	133	26	91	0	91	0%	26	0	26	117	117	0
06/08	69	0	69	0%	36	0	36	105	105	0	30	0	30	0%	18	0	18	48	36	12
06/09	68	0	68	0%	2	0	2	70	58	12	21	0	21	0%	0	0	0	21	11	10
06/10	21	0	21	0%	13	0	13	34	26	8	11	0	11	0%	4	0	4	15	15	0
06/11	27	0	27	0%	10	0	10	37	37	0	7	0	7	0%	3	0	3	10	10	0
06/12	49	0	49	0%	13	0	13	62	62	0	14	0	14	0%	3	0	3	17	16	1
06/13	163	0	163	0%	4	0	4	167	116	51	108	0	108	0%	0	0	0	108	93	15
06/14	77	0	77	0%	29	0	29	106	106	0	107	0	107	0%	22	0	22	129	86	43
06/15	18	0	18	0%	20	0	20	38	38	0	0	0	0	0%	56	0	56	56	45	11
06/16	0	0	0	0%	65	0	65	65	65	0	0		0	0%	75	0	75	75	47	28
06/17	12	0	12	0%	49	0	49	61	61	0	18	0	18	0%	68	0	68	86	54	32
06/18	33	0	33	0%	0	0	0	33	33	0	27	0	27	0%	0	0	0	27	12	15
06/19	8	0	8	0%	2	0	2	10	10	0	11	0	11	0%	3	0	3	14	10	4
06/20	12	0	12	0%	4	0	4	16	16	0	9	0	9	0%	3	0	3	12	12	0
06/21	23	0	23	0%	0	0	0	23	23	0	14	0	14	0%	0	0	0	14	14	0
06/22	7	0	7	0%	4	0	4	11	11	0	4	0	4	0%	1	0	1	5	5	0
06/23	3	0	3	0%	2	0	2	5	5	0	3	0	3	0%	1	0	1	4	4	0
06/24	25	0	25	0%	0	0	0	25	13	12	23	0	23	0%	0	0	0	23	23	0
06/25	0	0	0	0%	15	0	15	15	15	0	0	0	0	0%	12	0	12	12	12	0
06/26	4	0	4	0%	18	0	18	22	17	5	7	0	7	0%	14	0	14	21	21	0
06/27	11	0	11	0%	0	0	0	11	6	5	6	0	6	0%	0	0	0	6	6	0
06/28	4	0	4	0%	1	0	1	5	5	0	1	0	1	0%	1	0	1	2	2	0
06/29	8	0	8	0%	0	0	0	8	8	0	2	0	2	0%	0	0	0	2	2	0
06/30	4	0	4	0%	2	0	2	6	6	0	0	0	0	0%	0	0	0	0	0	0
07/01	1		1	0%	1	0	1	2	2	0	4	0	4	0%	1	0	1	5	5	0
07/02	12		12	0%	0	0	0	12	12	0	4	0	4	0%	0	0	0	4	4	0
07/03	1		1	0%	1	0	1	2	2	0	1	0	1	0%	1	0	1	2	2	0
07/04	1		1	0%	0	0	0	1	1	0	0	0	0	0%	0	0	0	0	0	0
07/05	8		8	0%	0	0	0	8	8	0	3	0	3	0%	0	0	0	3	3	0
07/06	7		7	0%	2	0	2	9	9	0	0	0	0	0%	0	0	0	0	0	0
07/07	2		2	0%	2	0	2	4	4	0	4	0	4	0%	1	0	1	5	5	0
07/08	1		1	0%	0	0	0	1	1	0	3	0	3	0%	0	0	0	3	3	0
07/09	1		1	0%	0	0	0	1	1	0	2	0	2	0%	1	0	1	3	3	0
07/10	3		3	0%	1	0	1	4	4	0	0	0	0	0%	0	0	0	0	0	0
07/11	16		16	0%	0	0	0	16	16	0	11	0	11	0%	0	0	0	11	11	0
07/12	5		5	0%	3	0	3	8	8	0	4	0	4	0%	1	0	1	5	5	0
07/13	2		2	0%	1	0	1	3	3	0	5	0	5	0%	1	0	1	6	6	0

Table 10. Composition of actual and estimated catches of adipose-marked hatchery 0+ chinook captured in the Skagit River mainstem traps, 1999.

Date	SCOOP										SCREW									
	Actual Catch				Additional 24-hr Catch			Tag Breakdown			Actual Catch				Additional 24-hr Catch			Tag Breakdown		
Down	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline
07/14	8		8	0%	0	0	0	8	8	0	5	0	5	0%	0	0	0	5	5	0
07/15	2		2	0%	1	0	1	3	3	0	1	0	1	0%	0	0	0	1	1	0
07/16	1		1	0%	1	0	1	2	2	0	4	0	4	0%	1	0	1	5	5	0
07/17	2		2	0%	0	0	0	2	2	0	0	0	0	0%	0	0	0	0	0	0
07/18	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
07/19	4		4	0%	1	0	1	5	5	0	3	0	3	0%	0	0	0	3	3	0
07/20	3		3	0%	1	0	1	4	4	0	2	0	2	0%	1	0	1	3	3	0
07/21	9		9	0%	0	0	0	9	9	0	6	0	6	0%	0	0	0	6	6	0
07/22	0		0	0%	1	0	1	1	1	0	1	0	1	0%	0	0	0	1	1	0
07/23	3		3	0%	0	0	0	3	3	0	2	0	2	0%	0	0	0	2	2	0
07/24	1		1	0%	1	0	1	2	2	0	1	0	1	0%	0	0	0	1	1	0
07/25	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
07/26	3		3	0%	0	0	0	3	3	0	0	0	0	0%	0	0	0	0	0	0
07/27	0		0	0%	0	0	0	0	0	0	1	0	1	0%	0	0	0	1	1	0
07/28	1		1	0%	0	0	0	1	1	0	0	0	0	0%	0	0	0	0	0	0
07/29	1		1	0%	0	0	0	1	1	0	0	0	0	0%	0	0	0	0	0	0
07/30	2		2	0%	0	0	0	2	2	0	1	0	1	0%	0	0	0	1	1	0
07/31	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/01	1		1	0%	0	0	0	1	1	0	0	0	0	0%	0	0	0	0	0	0
08/02	1		1	0%	0	0	0	1	1	0	0	0	0	0%	0	0	0	0	0	0
08/03	10		10	0%	2	0	2	12	12	0	4	0	4	0%	0	0	0	4	4	0
08/04	10		10	0%	0	0	0	10	10	0	0	0	0	0%	0	0	0	0	0	0
08/05	3		3	0%	1	0	1	4	4	0	0		0	0%	2	0	2	2	2	0
08/06	0		0	0%	0	0	0	0	0	0	0	0	0	0%	1	0	1	1	1	0
08/07	6		6	0%	0	0	0	6	6	0	0	0	0	0%	0	0	0	0	0	0
08/08	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/09	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/10	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/11	1		1	0%	0	0	0	1	1	0	0	0	0	0%	0	0	0	0	0	0
08/12	1		1	0%	0	0	0	1	1	0	0	0	0	0%	0	0	0	0	0	0
08/13	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/14	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/15	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/16	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/17	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/18	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/19	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/20	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/21	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/22	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
08/23	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
08/24	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/25	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/26	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0
08/27	0		0	0%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0

Table 10. Composition of actual and estimated catches of adipose-marked hatchery 0+ chinook captured in the Skagit River mainstem traps, 1999.

Date	SCOOP										SCREW									
	Actual Catch				Additional 24-hr Catch			Tag Breakdown			Actual Catch				Additional 24-hr Catch			Tag Breakdown		
Down	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline	Total-H	UC/LC	Admks	%Rcp	Catch	Recap	Admks	Tot Ads	SkHat	Ctyline
08/28	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
08/29	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
08/30	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
08/31	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
09/01	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
09/02	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
09/03	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
09/04	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
09/05	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
09/06	0		0	0%	0	0	0	0	0	0	0		0	0%	0	0	0	0	0	0
Total	3,548	99	3,445		967	20	947	4,392	2,583	1,809	2,283	70	2,211		776	22	754	2,965	1,931	1,034

Note: Catches of hatchery chinook on April 17-18 were listed as Hatchery Unmarks in the database, and were not included in this breakdown.

SUMMARY:	Total Released	Estimated Recaptured	Recovery Rate
Skagit Hatchery spring chinook releases =	246,714	4,514	1.83%
Countyline Ponds summer chinook releases =	241,120	2,843	1.18%
TOTAL:	487,834	7,357	1.51%

Table 11. Capture rates of various groups of marked salmon smolts, Skagit River mainstem traps, 1999

Stock	Species	Age	Mark	RELEASE		RECOVERY			CAPTURE RATE		
				Date	Number	Scoop	Screw	Total	Scoop	Screw	Total
Wild	Coho	1+	RV	March-June	22,546	180	99	279	0.8%	0.4%	1.2%
Wild	Chum	0+	dye	April 22, 1930 hrs	2,100	79	53	132	3.8%	2.5%	6.3%
Wild	Chum	0+	dye	April 29, 2000 hrs	1,650	30	89	119	1.8%	5.4%	7.2%
Hatchery/Spring	Chinook	0+	AD/UC	May 13, 2030 hrs	2,496	46	32	78	1.8%	1.3%	3.1%
Hatchery/Spring	Chinook	0+	AD/LC	May 20, 1830 hrs	2,520	7	11	18	0.3%	0.4%	0.7%
Hatchery/Spring	Chinook	0+	AD/UC	May 27, 2030 hrs	2,537	30	17	47	1.2%	0.7%	1.9%
Hatchery/Spring	Chinook	0+	AD/LC	June 03, 2030 hrs	2,534	16	10	26	0.6%	0.4%	1.0%
Hatchery/Summer[a]	Chinook	0+	AD/CWT	May 13, 0800 hrs	241,120	1,809[c]	1,034[c]	2,843[c]	0.8%	0.4%	1.2%
Hatchery/Spring[b]	Chinook	0+	AD/CWT	June 01, 0900 hrs	246,714	2,583[c]	1,931[c]	4,514[c]	1.0%	0.8%	1.8%

[a] Released from Countyline Ponds

[b] Released from Skagit Hatchery

[c][d]Recoveries of adipose-marked hatchery chinook groups released at Countyline Ponds and Skagit Hatchery were estimated based on actual plus projected catches. Coded wire tag recovery results (Table 9) were used to apportion the projected catches of ad-marked chinook (Table 10), enabling estimates of Countyline Ponds recoveries and Skagit Hatchery recoveries as shown here. Actual catches of hatchery chinook adipose marks were as follows: 3,445 total adipose marks caught in the scoop trap and 2,211 total ad-marks caught in the screw trap (Table 10). Estimated adipose marks that we would have recovered had we fished continuously were: 947 in the scoop trap and 754 in the screw trap.

Table 12a. Actual and estimated chinook and coho outmigrants, captured in the Skagit River SCOOP trap, 1999.

Date	TIME		H-CHIN 0+			W-CHIN 0+			WILD COHO 1+		
Down	In	Out	Act	Est	Tot	Act	Est	Tot	Act	Est	Tot
01/16	14.42	0.00	0	0	0	333	0	333	0	0	0
01/17	7.25	9.58	0	0	0	122	139	261	0	0	0
01/18	23.57	0.51	0	0	0	331	5	336	0	0	0
01/19	14.33	9.67	0	0	0	176	93	269	0	0	0
01/20	21.25	10.00	0	0	0	237	76	313	0	0	0
01/21	23.59	0.33	0	0	0	203	2	205	0	0	0
01/22	14.66	10.17	0	0	0	228	82	310	0	0	0
01/23	23.34	0.33	0	0	0	319	2	321	0	0	0
01/24	14.84	9.33	0	0	0	194	67	261	0	0	0
01/25	14.17	8.83	0	0	0	124	43	167	0	0	0
01/26	24.01	0.32	0	0	0	141	4	145	0	0	0
01/27	14.33	9.75	0	0	0	137	36	173	1	0	1
01/28	13.75	10.25	0	0	0	145	46	191	0	0	0
01/29	23.66	0.34	0	0	0	506	4	510	0	0	0
01/30	14.08	10.09	0	0	0	207	109	316	0	0	0
01/31	14.25	9.83	0	0	0	68	54	122	0	0	0
02/01	24.16	0.34	0	0	0	152	4	156	0	0	0
02/02	14.08	9.17	0	0	0	251	56	307	0	0	0
02/03	14.33	9.92	0	0	0	273	116	389	0	0	0
02/04	23.33	0.34	0	0	0	471	4	475	0	0	0
02/05	14.08	10.25	0	0	0	330	146	476	0	0	0
02/06	14.09	10.25	0	0	0	537	175	712	0	0	0
02/07	23.33	0.50	0	0	0	880	8	888	0	0	0
02/08	14.33	9.67	0	0	0	570	239	809	1	0	1
02/09	13.92	9.58	0	0	0	548	201	749	0	0	0
02/10	23.83	0.34	0	0	0	646	4	650	0	0	0
02/11	14.42	9.91	0	0	0	503	162	665	0	0	0
02/12	14.42	9.83	0	0	0	373	131	504	1	0	1
02/13	23.08	0.34	0	0	0	477	4	481	0	0	0
02/14	14.00	10.08	0	0	0	414	115	529	0	0	0
02/15	13.67	10.08	0	0	0	458	122	580	0	0	0
02/16	24.25	0.25	0	0	0	513	4	517	0	0	0
02/17	13.92	10.08	0	0	0	779	177	956	0	0	0
02/18	14.08	9.50	0	0	0	909	221	1,130	1	0	1
02/19	24.08	0.34	0	0	0	813	6	819	0	0	0
02/20	13.50	10.00	0	0	0	422	121	543	0	0	0
02/21	13.67	10.75	0	0	0	415	112	527	1	0	1
02/22	23.42	0.33	0	0	0	2,511	13	2,524	0	0	0
02/23	13.00	10.83	0	0	0	1,023	579	1,602	0	0	0
02/24	12.83	10.67	0	0	0	1,502	530	2,032	0	0	0
02/25	12.58	11.67	0	0	0	1,415	1,152	2,567	1	0	1
02/26	24.42	0.33	0	0	0	1,445	13	1,458	1	0	1
02/27	13.25	10.75	0	0	0	619	341	960	0	0	0
02/28	22.91	0.34	0	0	0	818	14	832	0	0	0
03/01	12.75	11.25	0	0	0	418	253	671	0	0	0
03/02	12.92	11.50	0	0	0	396	215	611	1	0	1
03/03	12.50	10.83	0	0	0	318	179	497	0	0	0
03/04	23.99	0.34	0	0	0	920	8	928	0	0	0
03/05	12.83	11.34	0	0	0	576	259	835	0	0	0
03/06	13.25	11.25	0	0	0	657	263	920	0	0	0
03/07	22.67	0.33	0	0	0	618	8	626	0	0	0
03/08	13.75	11.25	0	0	0	379	169	548	0	0	0
03/09	13.25	10.08	0	0	0	418	133	551	0	0	0
03/10	23.67	0.33	0	0	0	469	22	491	0	0	0
03/11	12.50	11.17	0	0	0	314	111	425	1	0	1

Table 12a. Actual and estimated chinook and coho outmigrants, captured in the Skagit River SCOOP trap, 1999.

Date	TIME		H-CHIN 0+			W-CHIN 0+			WILD COHO 1+		
Down	In	Out	Act	Est	Tot	Act	Est	Tot	Act	Est	Tot
03/12	12.00	11.50	0	0	0	711	184	895	0	0	0
03/13	11.50	12.00	0	0	0	1,745	524	2,269	1	0	1
03/14	24.16	0.34	0	0	0	2,603	22	2,625	0	0	0
03/15	12.67	12.00	0	0	0	925	503	1,428	0	0	0
03/16	23.50	0.33	0	0	0	961	4	965	2	0	2
03/17	13.00	11.25	0	0	0	591	238	829	1	0	1
03/18	23.25	0.33	0	0	0	669	4	673	0	0	0
03/19	12.16	11.84	0	0	0	259	166	425	0	0	0
03/20	12.34	12.00	0	0	0	384	127	511	1	0	1
03/21	23.00	0.33	0	0	0	1,099	4	1,103	2	0	2
03/22	12.00	12.00	0	0	0	686	429	1,115	0	0	0
03/23	12.00	12.08	0	0	0	371	257	628	0	0	0
03/24	12.00	12.42	0	0	0	529	226	755	0	0	0
03/25	23.50	0.33	0	0	0	745	7	752	1	0	1
03/26	12.08	11.92	0	0	0	268	168	436	0	0	0
03/27	23.16	0.34	0	0	0	590	8	598	2	0	2
03/28	11.75	12.25	0	0	0	223	145	368	1	0	1
03/29	12.00	12.59	0	0	0	139	83	222	2	0	2
03/30	22.92	0.58	0	0	0	292	3	295	3	0	3
03/31	12.00	12.08	0	0	0	219	101	320	0	0	0
04/01	11.66	12.17	0	0	0	215	85	300	2	0	2
04/02	11.91	12.34	0	0	0	178	68	246	0	0	0
04/03	24.08	0.34	0	0	0	210	2	212	0	0	0
04/04	11.25	12.75	0	0	0	162	51	213	0	0	0
04/05	23.66	0.34	0	0	0	276	2	278	1	0	1
04/06	11.08	12.75	0	0	0	140	52	192	2	0	2
04/07	13.17	11.00	0	0	0	285	54	339	0	0	0
04/08	14.00	10.83	0	0	0	265	73	338	1	0	1
04/09	22.50	0.42	0	0	0	269	3	272	4	0	4
04/10	11.92	13.25	0	0	0	147	57	204	0	0	0
04/11	22.25	0.33	0	0	0	133	2	135	0	0	0
04/12	10.08	13.42	0	0	0	145	41	186	3	0	3
04/13	10.75	14.00	0	0	0	229	78	307	0	0	0
04/14	23.92	0.33	0	0	0	253	2	255	2	0	2
04/15	10.67	13.00	0	0	0	86	54	140	7	0	7
04/16	11.75	13.33	0	0	0	98	35	133	6	0	6
04/17	22.41	0.34	3	0	3	277	2	279	9	0	9
04/18	10.58	13.42	1	0	1	416	166	582	13	0	13
04/19	11.33	13.67	0	0	0	313	216	529	7	0	7
04/20	10.00	13.00	0	0	0	242	167	409	11	0	11
04/21	10.17	13.75	0	0	0	132	125	257	15	0	15
04/22	10.75	13.83	0	0	0	91	63	154	17	0	17
04/23	22.99	0.51	0	0	0	165	3	168	28	0	28
04/24	9.67	14.08	0	0	0	132	75	207	60	0	60
04/25	10.92	14.08	0	0	0	234	130	364	28	2	30
04/26	11.50	12.75	0	0	0	138	120	258	34	1	35
04/27	22.91	0.34	0	0	0	89	0	89	49	0	49
04/28	10.42	13.83	0	0	0	29	31	60	55	0	55
04/29	11.50	13.25	0	0	0	50	20	70	56	0	56
04/30	23.49	0.34	0	0	0	36	0	36	27	0	27
05/01	10.67	13.00	0	0	0	110	37	147	55	0	55
05/02	10.17	13.08	0	0	0	74	58	132	53	1	54
05/03	10.17	14.33	0	0	0	60	46	106	97	1	98
05/04	11.00	13.75	0	0	0	64	40	104	64	2	66
05/05	17.58	0.34	0	0	0	61	2	63	45	0	45
05/06	14.50	14.33	0	0	0	58	29	87	107	1	108

Table 12a. Actual and estimated chinook and coho outmigrants, captured in the Skagit River SCOOP trap, 1999.

Date	TIME		H-CHIN 0+			W-CHIN 0+			WILD COHO 1+		
Down	In	Out	Act	Est	Tot	Act	Est	Tot	Act	Est	Tot
05/07	10.16	14.17	0	0	0	104	50	154	122	3	125
05/08	23.83	0.34	0	0	0	64	2	66	101	0	101
05/09	10.08	13.67	0	0	0	19	17	36	94	0	94
05/10	10.50	13.75	0	0	0	15	10	25	81	0	81
05/11	22.99	0.34	0	0	0	30	0	30	111	0	111
05/12	10.00	13.84	0	0	0	49	25	74	166	0	166
05/13	11.50	13.33	45	6	51	37	25	62	173	1	174
05/14	22.91	0.34	1	0	1	31	0	31	111	0	111
05/15	19.91	4.34	0	0	0	31	1	32	84	0	84
05/16	8.67	14.58	48	9	57	21	13	34	131	0	131
05/17	9.42	15.08	78	23	101	49	21	70	314	0	314
05/18	2.83	15.00	43	40	83	70	112	182	109	14	123
05/19	14.50	15.42	208	50	258	252	179	431	473	27	500
05/20	10.08	14.17	90	32	122	74	57	131	211	11	222
05/21	24.75	0.33	94	0	94	50	0	50	159	0	159
05/22	22.17	0.50	96	0	96	53	0	53	138	0	138
05/23	9.25	14.50	198	50	248	167	92	259	245	10	255
05/24	3.50	15.25	68	68	136	90	244	334	72	37	109
05/25	10.75	13.08	118	31	149	200	137	337	128	62	190
05/26	11.67	13.58	65	50	115	181	180	361	194	25	219
05/27	8.25	15.17	59	23	82	179	255	434	103	24	127
05/28	25.74	0.51	79	2	81	419	7	426	150	3	153
05/29	26.25	0.50	44	2	46	317	7	324	136	3	139
05/30	9.00	15.00	16	7	23	164	192	356	75	14	89
05/31	10.17	14.58	15	5	20	176	182	358	97	12	109
06/01	8.50	14.25	15	5	20	84	148	232	54	13	67
06/02	8.75	15.75	8	5	13	110	129	239	29	8	37
06/03	10.33	14.17	16	4	20	59	82	141	56	4	60
06/04	23.83	0.34	8	2	10	173	2	175	56	0	56
06/05	23.00	0.33	1,118	2	1,120	258	2	260	63	0	63
06/06	9.41	15.17	117	201	318	90	179	269	13	7	20
06/07	8.75	14.42	118	41	159	120	127	247	22	3	25
06/08	8.58	15.50	69	36	105	78	117	195	33	4	37
06/09	23.26	0.41	68	2	70	120	3	123	33	0	33
06/10	8.33	15.67	21	13	34	64	81	145	16	2	18
06/11	8.25	15.75	27	10	37	38	55	93	21	1	22
06/12	10.50	15.50	49	13	62	83	58	141	27	2	29
06/13	21.50	1.00	163	4	167	302	6	308	37	0	37
06/14	8.83	15.00	77	29	106	82	183	265	6	4	10
06/15	7.25	16.17	18	20	38	78	170	248	15	5	20
06/16	0.00	18.75	0	65	65	0	197	197	0	13	13
06/17	9.75	20.25	12	49	61	96	206	302	2	8	10
06/18	23.16	0.34	33	0	33	214	4	218	10	0	10
06/19	8.00	16.00	8	2	10	71	109	180	2	2	4
06/20	7.75	16.25	12	4	16	73	116	189	3	1	4
06/21	24.09	0.33	23	0	23	149	2	151	5	0	5
06/22	7.50	15.66	7	4	11	25	64	89	1	1	2
06/23	8.67	15.92	3	2	5	34	45	79	0	0	0
06/24	24.26	0.32	25	0	25	139	2	141	6	0	6
06/25	0.00	17.75	0	15	15	0	74	74	0	3	3
06/26	8.83	21.67	4	18	22	14	91	105	0	3	3
06/27	22.91	0.34	11	0	11	102	2	104	2	0	2
06/28	8.25	15.75	4	1	5	24	32	56	2	0	2
06/29	23.66	0.34	8	0	8	51	0	51	2	0	2
06/30	8.67	15.33	4	2	6	14	21	35	1	0	1
07/01	9.50	15.58	1	1	2	21	21	42	0	0	0

Table 12a. Actual and estimated chinook and coho outmigrants, captured in the Skagit River SCOOP trap, 1999.

Date	TIME		H-CHIN 0+			W-CHIN 0+			WILD COHO 1+		
Down	In	Out	Act	Est	Tot	Act	Est	Tot	Act	Est	Tot
07/02	23.75	0.42	12	0	12	47	1	48	4	0	4
07/03	8.25	14.50	1	1	2	16	23	39	0	0	0
07/04	8.25	15.75	1	0	1	14	20	34	2	0	2
07/05	23.66	0.34	8	0	8	32	0	32	0	0	0
07/06	8.25	16.00	7	2	9	14	18	32	1	0	1
07/07	8.00	15.75	2	2	4	24	29	53	0	0	0
07/08	23.41	0.34	1	0	1	38	0	38	1	0	1
07/09	7.50	15.75	1	0	1	9	22	31	0	0	0
07/10	8.33	16.67	3	1	4	13	20	33	0	0	0
07/11	23.58	0.42	16	0	16	61	0	61	0	0	0
07/12	9.00	15.75	5	3	8	14	30	44	1	0	1
07/13	9.50	14.50	2	1	3	15	21	36	0	0	0
07/14	23.66	0.34	8	0	8	25	0	25	0	0	0
07/15	9.50	14.50	2	1	3	7	8	15	0	0	0
07/16	9.00	15.00	1	1	2	1	5	6	0	0	0
07/17	23.66	0.34	2	0	2	20	0	20	1	0	1
07/18	9.50	15.00	0	0	0	4	8	12	0	0	0
07/19	9.00	14.00	4	1	5	13	10	23	0	0	0
07/20	9.50	15.00	3	1	4	12	16	28	0	0	0
07/21	22.75	0.50	9	0	9	20	0	20	0	0	0
07/22	9.67	15.25	0	1	1	9	11	20	0	0	0
07/23	23.50	0.33	3	0	3	10	0	10	0	0	0
07/24	9.00	15.00	1	1	2	3	4	7	0	0	0
07/25	9.00	15.00	0	0	0	7	7	14	0	0	0
07/26	23.67	0.33	3	0	3	13	0	13	0	0	0
07/27	10.08	14.50	0	0	0	11	9	20	0	0	0
07/28	9.50	14.42	1	0	1	5	8	13	0	0	0
07/29	24.08	0.17	1	0	1	11	0	11	0	0	0
07/30	9.25	14.25	2	0	2	3	5	8	0	0	0
07/31	10.00	14.25	0	0	0	5	5	10	0	0	0
08/01	23.17	0.33	1	0	1	8	0	8	0	0	0
08/02	9.50	14.50	1	0	1	3	5	8	0	0	0
08/03	9.50	14.50	10	2	12	54	30	84	0	0	0
08/04	23.83	0.42	10	0	10	48	0	48	0	0	0
08/05	9.67	14.25	3	1	4	11	24	35	0	0	0
08/06	9.00	14.33	0	0	0	8	13	21	0	0	0
08/07	24.33	0.17	6	0	6	18	0	18	0	0	0
08/08	9.50	14.50	0	0	0	8	10	18	0	0	0
08/09	9.50	14.50	0	0	0	10	10	20	0	0	0
08/10	23.58	0.42	0	0	0	16	0	16	0	0	0
08/11	9.75	14.25	1	0	1	8	8	16	0	0	0
08/12	10.00	14.00	1	0	1	14	9	23	0	0	0
08/13	23.92	0.33	0	0	0	11	0	11	2	0	2
08/14	9.75	14.25	0	0	0	7	6	13	0	0	0
08/15	9.83	14.17	0	0	0	6	5	11	0	0	0
08/16	23.92	0.33	0	0	0	7	0	7	0	0	0
08/17	10.33	13.67	0	0	0	8	4	12	0	0	0
08/18	10.33	13.67	0	0	0	0	3	3	0	0	0
08/19	23.83	0.17	0	0	0	12	0	12	0	0	0
08/20	10.33	13.50	0	0	0	0	3	3	0	0	0
08/21	0.00	17.17	0	0	0	0	3	3	0	0	0
08/22	0.00	24.00	0	0	0	0	4	4	0	0	0
08/23	0.00	24.00	0	0	0	0	4	4	0	0	0
08/24	10.17	20.00	0	0	0	2	3	5	0	0	0
08/25	10.00	14.00	0	0	0	2	1	3	0	0	0
08/26	10.00	13.83	0	0	0	5	2	7	0	0	0

Table 12a. Actual and estimated chinook and coho outmigrants, captured in the Skagit River SCOOP trap, 1999.

Date	TIME		H-CHIN 0+			W-CHIN 0+			WILD COHO 1+		
Down	In	Out	Act	Est	Tot	Act	Est	Tot	Act	Est	Tot
08/27	13.58	4.42	0	0	0	0	1	1	0	0	0
08/28	0.00	24.00	0	0	0	0	3	3	0	0	0
08/29	0.00	24.00	0	0	0	0	3	3	0	0	0
08/30	10.00	20.00	0	0	0	2	3	5	0	0	0
08/31	10.33	13.92	0	0	0	2	1	3	0	0	0
09/01	23.83	0.75	0	0	0	8	0	8	0	0	0
09/02	0.00	17.17	0	0	0	0	0	0	0	0	0
09/03	0.00	24.00	0	0	0	0	0	0	0	0	0
09/04	0.00	24.00	0	0	0	0	0	0	0	0	0
09/05	10.25	19.75	0	0	0	0	0	0	0	0	0
09/06	13.50	0.75	0	0	0	0	0	0	0	0	0
Total	3,326.91	2,268.34	3,548	967	4,515	55,254	16,918	72,172	5,190	338	5,528

Table 12b. Actual and estimated chinook and coho outmigrants, captured in the Skagit River SCREW trap, 1999.

Date	TIME		H-CHIN 0+			W-CHIN 0+			WILD COHO 1+		
Down	In	Out	Act	Est	Tot	Act	Est	Tot	Act	Est	Tot
01/16	14.33	0.00	0	0	0	188	0	188	0	0	0
01/17	7.50	9.50	0	0	0	109	52	161	0	0	0
01/18	24.42	0.00	0	0	0	274	0	274	0	0	0
01/19	13.91	9.34	0	0	0	187	50	237	0	0	0
01/20	21.66	9.67	0	0	0	255	46	301	0	0	0
01/21	24.08	0.00	0	0	0	178	0	178	0	0	0
01/22	14.42	10.00	0	0	0	145	39	184	0	0	0
01/23	24.25	0.00	0	0	0	291	0	291	0	0	0
01/24	14.75	9.00	0	0	0	175	51	226	0	0	0
01/25	14.42	9.00	0	0	0	63	29	92	0	0	0
01/26	24.25	0.00	0	0	0	124	0	124	1	0	1
01/27	14.17	9.66	0	0	0	155	34	189	0	0	0
01/28	13.75	10.25	0	0	0	148	44	192	0	0	0
01/29	24.00	0.00	0	0	0	399	0	399	0	0	0
01/30	14.25	10.08	0	0	0	162	55	217	0	0	0
01/31	14.25	9.67	0	0	0	48	28	76	0	0	0
02/01	24.50	0.00	0	0	0	133	0	133	0	0	0
02/02	14.00	9.25	0	0	0	234	38	272	0	0	0
02/03	14.00	10.00	0	0	0	194	61	255	0	0	0
02/04	24.00	0.00	0	0	0	304	0	304	0	0	0
02/05	14.08	10.17	0	0	0	229	68	297	0	0	0
02/06	14.00	10.25	0	0	0	305	78	383	0	0	0
02/07	24.08	0.00	0	0	0	671	0	671	0	0	0
02/08	14.50	9.50	0	0	0	437	112	549	0	0	0
02/09	14.33	9.42	0	0	0	397	108	505	0	0	0
02/10	23.92	0.00	0	0	0	529	0	529	0	0	0
02/11	14.58	9.75	0	0	0	443	116	559	0	0	0
02/12	14.25	9.67	0	0	0	332	103	435	0	0	0
02/13	23.83	0.00	0	0	0	469	0	469	1	0	1
02/14	13.75	9.92	0	0	0	339	97	436	0	0	0
02/15	14.00	10.25	0	0	0	410	110	520	0	0	0
02/16	24.33	0.00	0	0	0	440	0	440	1	0	1
02/17	14.08	9.92	0	0	0	611	133	744	0	0	0
02/18	14.25	9.50	0	0	0	547	155	702	0	0	0
02/19	24.25	0.00	0	0	0	706	0	706	0	0	0
02/20	13.50	9.92	0	0	0	374	117	491	0	0	0
02/21	13.25	10.75	0	0	0	375	120	495	0	0	0
02/22	24.00	0.00	0	0	0	2,272	0	2,272	1	0	1
02/23	13.00	11.00	0	0	0	869	466	1,335	0	0	0
02/24	12.83	10.75	0	0	0	1,437	383	1,820	0	0	0
02/25	13.17	11.50	0	0	0	1,336	475	1,811	0	0	0
02/26	24.33	0.00	0	0	0	1,128	0	1,128	0	0	0
02/27	0.00	15.92	0	0	0	0	310	310	0	0	0
02/28	0.00	24.00	0	0	0	0	468	468	0	0	0
03/01	12.92	18.33	0	0	0	330	357	687	0	0	0
03/02	13.00	11.50	0	0	0	350	120	470	0	0	0
03/03	13.17	10.58	0	0	0	294	104	398	0	0	0
03/04	23.66	0.17	0	0	0	603	3	606	0	0	0
03/05	13.00	11.25	0	0	0	413	130	543	0	0	0
03/06	12.66	11.09	0	0	0	401	140	541	0	0	0
03/07	23.75	0.00	0	0	0	505	0	505	0	0	0
03/08	13.91	11.09	0	0	0	299	115	414	0	0	0
03/09	13.00	9.92	0	0	0	296	87	383	0	0	0
03/10	24.42	0.00	0	0	0	429	0	429	1	0	1
03/11	12.50	11.08	0	0	0	263	100	363	0	0	0

Table 12b. Actual and estimated chinook and coho outmigrants, captured in the Skagit River SCREW trap, 1999.

Date	TIME		H-CHIN 0+			W-CHIN 0+			WILD COHO 1+		
Down	In	Out	Act	Est	Tot	Act	Est	Tot	Act	Est	Tot
03/12	12.00	11.50	0	0	0	658	174	832	0	0	0
03/13	13.25	12.00	0	0	0	1,430	389	1,819	1	0	1
03/14	22.83	0.00	0	0	0	1,637	0	1,637	1	0	1
03/15	12.33	11.84	0	0	0	659	299	958	0	0	0
03/16	24.33	0.00	0	0	0	945	0	945	2	0	2
03/17	12.50	11.17	0	0	0	397	185	582	0	0	0
03/18	24.17	0.00	0	0	0	497	0	497	1	0	1
03/19	12.34	11.66	0	0	0	217	118	335	0	0	0
03/20	11.75	11.83	0	0	0	330	108	438	2	0	2
03/21	24.00	0.00	0	0	0	777	0	777	1	0	1
03/22	12.00	12.00	0	0	0	529	241	770	1	0	1
03/23	12.00	12.00	0	0	0	301	165	466	2	0	2
03/24	11.58	12.42	0	0	0	394	146	540	0	0	0
03/25	24.42	0.00	0	0	0	569	0	569	0	0	0
03/26	11.58	11.75	0	0	0	322	129	451	0	0	0
03/27	24.17	0.00	0	0	0	474	0	474	0	0	0
03/28	11.92	12.08	0	0	0	220	106	326	3	0	3
03/29	11.75	12.33	0	0	0	120	70	190	0	0	0
03/30	23.83	0.00	0	0	0	186	0	186	2	0	2
03/31	12.00	12.17	0	0	0	156	65	221	1	0	1
04/01	11.67	12.08	0	0	0	153	63	216	1	0	1
04/02	11.42	12.33	0	0	0	181	71	252	1	0	1
04/03	23.66	1.42	0	0	0	145	4	149	0	0	0
04/04	12.00	12.59	0	0	0	155	55	210	0	0	0
04/05	22.24	1.17	0	0	0	175	4	179	0	0	0
04/06	11.25	12.59	0	0	0	96	52	148	1	0	1
04/07	13.08	11.00	0	0	0	180	49	229	0	0	0
04/08	13.25	10.92	0	0	0	202	63	265	2	0	2
04/09	23.58	0.00	0	0	0	249	0	249	0	0	0
04/10	10.91	13.17	0	0	0	99	66	165	0	0	0
04/11	23.75	0.00	0	0	0	72	0	72	1	0	1
04/12	10.25	13.25	0	0	0	91	37	128	0	0	0
04/13	10.50	13.92	0	0	0	157	66	223	1	0	1
04/14	24.58	0.00	0	0	0	184	0	184	1	0	1
04/15	10.83	12.84	0	0	0	63	49	112	1	0	1
04/16	10.75	13.25	0	0	0	60	30	90	0	0	0
04/17	19.25	4.50	0	0	0	142	20	162	4	0	4
04/18	10.67	13.33	1	0	1	235	85	320	9	0	9
04/19	11.25	13.58	1	0	1	187	104	291	7	0	7
04/20	10.33	13.09	0	0	0	154	82	236	10	0	10
04/21	10.33	13.42	0	0	0	68	57	125	19	0	19
04/22	10.33	13.67	0	0	0	51	31	82	19	0	19
04/23	24.00	0.00	0	0	0	123	0	123	20	0	20
04/24	9.83	14.00	0	0	0	72	42	114	52	0	52
04/25	11.08	13.92	0	0	0	120	50	170	32	3	35
04/26	10.67	12.67	0	0	0	97	50	147	27	3	30
04/27	23.91	0.00	0	0	0	62	0	62	50	0	50
04/28	10.58	13.92	0	0	0	28	17	45	28	0	28
04/29	10.66	13.09	0	0	0	24	13	37	39	0	39
04/30	24.67	0.00	0	0	0	39	0	39	10	0	10
05/01	10.83	13.00	0	0	0	63	20	83	58	0	58
05/02	10.42	12.92	0	0	0	37	24	61	26	1	27
05/03	10.33	14.08	0	0	0	44	22	66	33	0	33
05/04	9.67	13.75	0	0	0	29	20	49	41	1	42
05/05	8.67	10.00	0	0	0	38	175	213	33	5	38
05/06	15.42	14.08	0	0	0	20	7	27	56	0	56

Table 12b. Actual and estimated chinook and coho outmigrants, captured in the Skagit River SCREW trap, 1999.

Date	TIME		H-CHIN 0+			W-CHIN 0+			WILD COHO 1+		
Down	In	Out	Act	Est	Tot	Act	Est	Tot	Act	Est	Tot
05/07	10.09	13.91	0	0	0	50	17	67	92	3	95
05/08	24.41	0.00	0	0	0	45	0	45	62	0	62
05/09	10.25	13.50	0	0	0	17	10	27	54	0	54
05/10	9.83	13.67	0	0	0	13	8	21	62	0	62
05/11	24.00	0.00	0	0	0	15	0	15	59	0	59
05/12	10.17	13.67	0	0	0	22	9	31	75	0	75
05/13	10.67	13.33	32	3	35	15	9	24	98	0	98
05/14	24.08	0.00	0	0	0	19	0	19	58	0	58
05/15	20.17	4.08	0	0	0	6	0	6	22	0	22
05/16	8.92	14.50	8	1	9	8	4	12	64	0	64
05/17	9.67	14.83	37	6	43	23	10	33	133	0	133
05/18	8.83	14.75	113	26	139	129	74	203	324	12	336
05/19	8.67	15.33	72	25	97	32	49	81	128	39	167
05/20	11.42	14.08	33	13	46	19	15	34	91	10	101
05/21	23.00	0.00	31	0	31	23	0	23	78	0	78
05/22	23.50	0.00	36	0	36	26	0	26	86	0	86
05/23	9.25	14.50	89	16	105	89	35	124	121	11	132
05/24	0.00	18.25	0	47	47	0	114	114	0	76	76
05/25	0.00	24.00	0	61	61	0	150	150	0	100	100
05/26	0.00	24.00	0	62	62	0	151	151	0	101	101
05/27	5.83	20.00	34	51	85	89	125	214	76	84	160
05/28	24.42	0.00	76	0	76	339	0	339	159	0	159
05/29	27.00	0.75	35	0	35	244	4	248	180	0	180
05/30	9.00	15.00	11	5	16	93	68	161	61	32	93
05/31	10.50	14.50	13	3	16	103	58	161	80	21	101
06/01	8.42	14.08	11	3	14	94	59	153	70	28	98
06/02	8.75	15.75	6	3	9	70	60	130	59	27	86
06/03	9.75	14.25	12	2	14	33	32	65	49	12	61
06/04	24.00	0.00	4	0	4	92	0	92	73	0	73
06/05	23.50	0.67	934	3	937	228	3	231	79	1	80
06/06	9.42	14.91	108	125	233	85	79	164	24	24	48
06/07	8.83	14.50	91	26	117	70	49	119	32	11	43
06/08	8.25	15.42	30	18	48	38	38	76	20	8	28
06/09	24.00	0.00	21	0	21	54	0	54	14	0	14
06/10	8.50	15.50	11	4	15	27	25	52	20	3	23
06/11	8.25	15.75	7	3	10	31	22	53	15	3	18
06/12	11.00	15.50	14	3	17	36	22	58	23	3	26
06/13	21.83	0.00	108	0	108	241	0	241	41	0	41
06/14	9.00	15.17	107	22	129	143	93	236	13	11	24
06/15	0.00	18.00	0	56	56	0	158	158	0	19	19
06/16	0.00	24.00	0	75	75	0	211	211	0	26	26
06/17	9.00	21.50	18	68	86	89	189	278	7	23	30
06/18	23.00	0.00	27	0	27	235	0	235	11	0	11
06/19	8.00	16.00	11	3	14	55	45	100	3	3	6
06/20	8.08	16.25	9	3	12	54	44	98	2	1	3
06/21	24.17	0.00	14	0	14	153	0	153	4	0	4
06/22	7.50	15.50	4	1	5	45	40	85	1	1	2
06/23	8.50	16.00	3	1	4	36	33	69	1	1	2
06/24	24.67	0.00	23	0	23	131	0	131	3	0	3
06/25	0.00	17.83	0	12	12	0	69	69	0	24	24
06/26	8.50	21.58	7	14	21	22	83	105	1	29	30
06/27	23.67	0.00	6	0	6	60	0	60	2	0	2
06/28	8.25	15.75	1	1	2	18	14	32	3	1	4
06/29	24.00	0.00	2	0	2	26	0	26	2	0	2
06/30	8.75	15.25	0	0	0	10	9	19	0	0	0
07/01	9.50	15.75	4	1	5	22	11	33	0	0	0

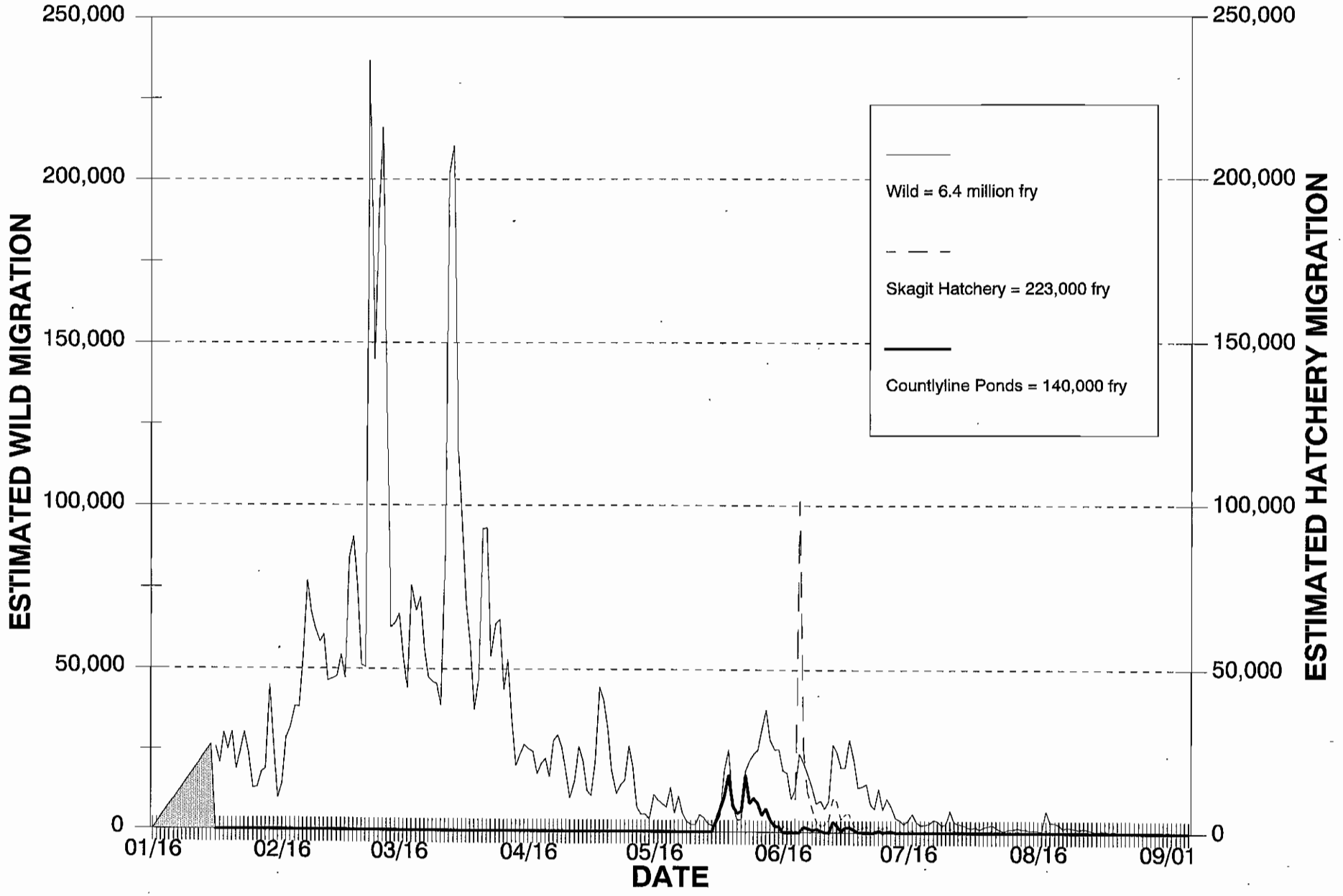
Table 12b. Actual and estimated chinook and coho outmigrants, captured in the Skagit River SCREW trap, 1999.

Date	TIME		H-CHIN 0+			W-CHIN 0+			WILD COHO 1+		
Down	In	Out	Act	Est	Tot	Act	Est	Tot	Act	Est	Tot
07/02	23.42	0.58	4	0	4	66	1	67	1	0	1
07/03	8.25	14.50	1	1	2	12	16	28	1	0	1
07/04	8.42	15.75	0	0	0	5	6	11	1	0	1
07/05	23.83	0.00	3	0	3	17	0	17	3	0	3
07/06	8.33	15.92	0	0	0	12	9	21	0	0	0
07/07	8.00	15.67	4	1	5	17	11	28	0	0	0
07/08	23.83	0.00	3	0	3	31	0	31	0	0	0
07/09	7.66	15.92	2	1	3	7	7	14	0	0	0
07/10	8.50	16.42	0	0	0	10	7	17	1	0	1
07/11	23.67	0.33	11	0	11	72	0	72	0	0	0
07/12	9.00	15.50	4	1	5	8	12	20	0	0	0
07/13	9.25	14.50	5	1	6	12	6	18	0	0	0
07/14	24.25	0.00	5	0	5	23	0	23	0	0	0
07/15	9.50	14.50	1	0	1	15	8	23	0	0	0
07/16	9.00	15.00	4	1	5	10	8	18	0	0	0
07/17	24.00	0.00	0	0	0	15	0	15	0	0	0
07/18	9.50	15.00	0	0	0	3	3	6	0	0	0
07/19	9.25	14.00	3	0	3	9	4	13	2	0	2
07/20	9.83	14.75	2	1	3	7	5	12	0	0	0
07/21	22.67	0.25	6	0	6	28	0	28	0	0	0
07/22	9.50	15.25	1	0	1	6	5	11	0	0	0
07/23	24.00	0.00	2	0	2	6	0	6	0	0	0
07/24	9.00	15.00	1	0	1	1	2	3	1	0	1
07/25	9.17	15.00	0	0	0	5	2	7	0	0	0
07/26	23.83	0.00	0	0	0	9	0	9	0	0	0
07/27	9.92	14.58	1	0	1	5	3	8	1	0	1
07/28	9.75	14.50	0	0	0	6	3	9	0	0	0
07/29	23.41	0.34	0	0	0	11	0	11	0	0	0
07/30	9.25	14.50	1	0	1	3	2	5	0	0	0
07/31	9.83	14.25	0	0	0	4	2	6	0	0	0
08/01	23.67	0.00	0	0	0	5	0	5	0	0	0
08/02	9.50	14.50	0	0	0	4	2	6	0	0	0
08/03	9.83	14.50	4	0	4	37	12	49	1	0	1
08/04	9.67	7.50	0	0	0	10	7	17	0	0	0
08/05	0.00	24.00	0	2	2	0	24	24	0	1	1
08/06	9.00	21.08	0	1	1	6	21	27	0	0	0
08/07	24.59	0.00	0	0	0	6	0	6	0	0	0
08/08	9.50	14.08	0	0	0	13	5	18	0	0	0
08/09	10.00	14.50	0	0	0	5	5	10	0	0	0
08/10	23.50	0.50	0	0	0	8	0	8	0	0	0
08/11	9.25	14.25	0	0	0	2	1	3	0	0	0
08/12	10.00	14.25	0	0	0	4	2	6	0	0	0
08/13	24.25	0.00	0	0	0	8	0	8	1	0	1
08/14	9.75	14.25	0	0	0	0	1	1	0	0	0
08/15	10.17	14.00	0	0	0	0	0	0	0	0	0
08/16	24.08	0.00	0	0	0	5	0	5	0	0	0
08/17	10.50	13.50	0	0	0	0	1	1	0	0	0
08/18	10.50	13.50	0	0	0	2	1	3	0	0	0
08/19	23.50	0.25	0	0	0	2	0	2	0	0	0
08/20	10.33	13.75	0	0	0	0	1	1	0	0	0
08/21	0.00	17.17	0	0	0	0	2	2	0	0	0
08/22	0.00	24.00	0	0	0	0	2	2	0	0	0
08/23	0.00	24.00	0	0	0	0	3	3	0	0	0
08/24	9.83	20.17	0	0	0	1	2	3	0	0	0
08/25	10.00	14.00	0	0	0	2	1	3	0	0	0
08/26	10.25	14.00	0	0	0	2	1	3	0	0	0

Table 12b. Actual and estimated chinook and coho outmigrants, captured in the Skagit River SCREW trap, 1999.

Date	TIME		H-CHIN 0+			W-CHIN 0+			WILD COHO 1+		
Down	In	Out	Act	Est	Tot	Act	Est	Tot	Act	Est	Tot
08/27	13.50	4.25	0	0	0	0	0	0	0	0	0
08/28	0.00	24.00	0	0	0	0	1	1	0	0	0
08/29	0.00	24.00	0	0	0	0	2	2	0	0	0
08/30	10.42	19.83	0	0	0	0	1	1	0	0	0
08/31	9.83	13.92	0	0	0	0	0	0	0	0	0
09/01	24.25	0.33	0	0	0	0	0	0	0	0	0
09/02	0.00	17.42	0	0	0	0	0	0	0	0	0
09/03	0.00	24.00	0	0	0	0	0	0	0	0	0
09/04	0.00	24.00	0	0	0	0	0	0	0	0	0
09/05	11.25	20.00	0	0	0	0	0	0	0	0	0
09/06	11.50	1.25	0	0	0	0	0	0	0	0	0
Total	3,241.59	2,353.24	2,283	776	3,059	41,492	11,243	52,735	3,352	762	4,114

Figure 9. **Estimated wild & hatchery 0+ chinook migration past the Skagit River mainstem scoop & screw traps, 1999.**



C:\Skagit\Mark's est.wb3 (org. 04/04/00)

WDFW (rev. Friday, April 21, 2000)

Figure 10a. Timing of projected 0+ chinook catch in the Skagit River mainstem traps, by statistical week, 1999.

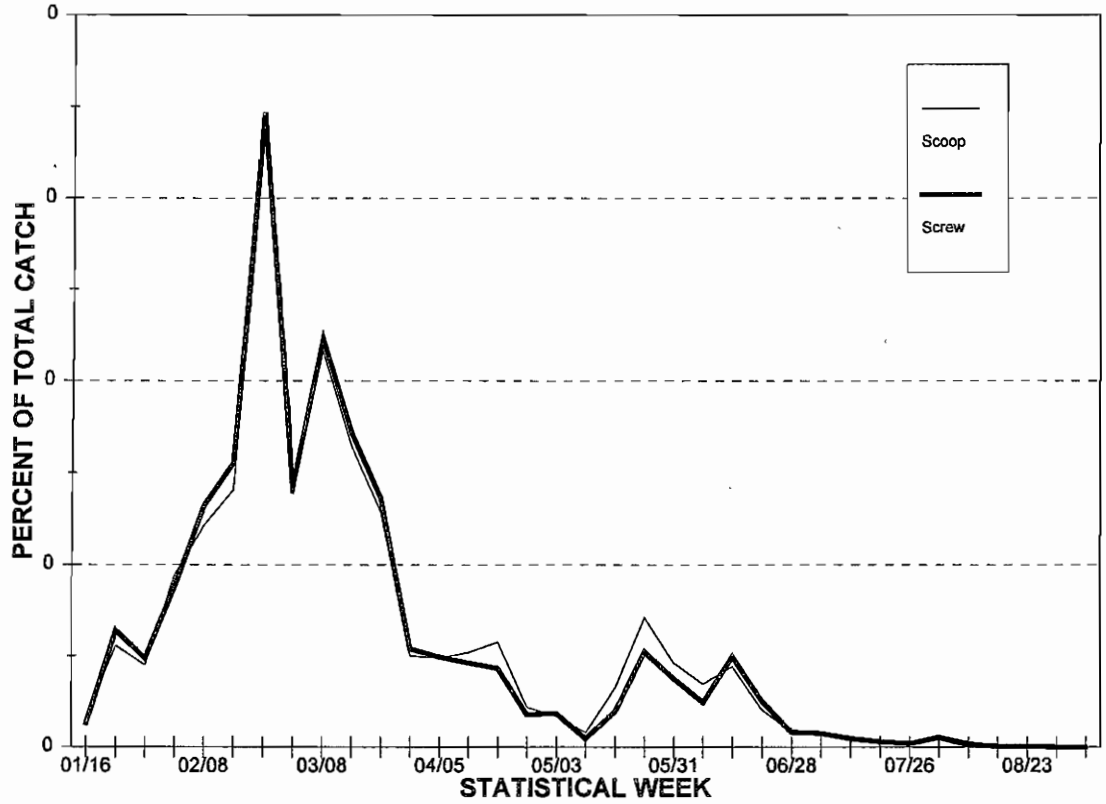


Figure 10b. Wild and hatchery 0+ chinook migration timing, Skagit River 1999.

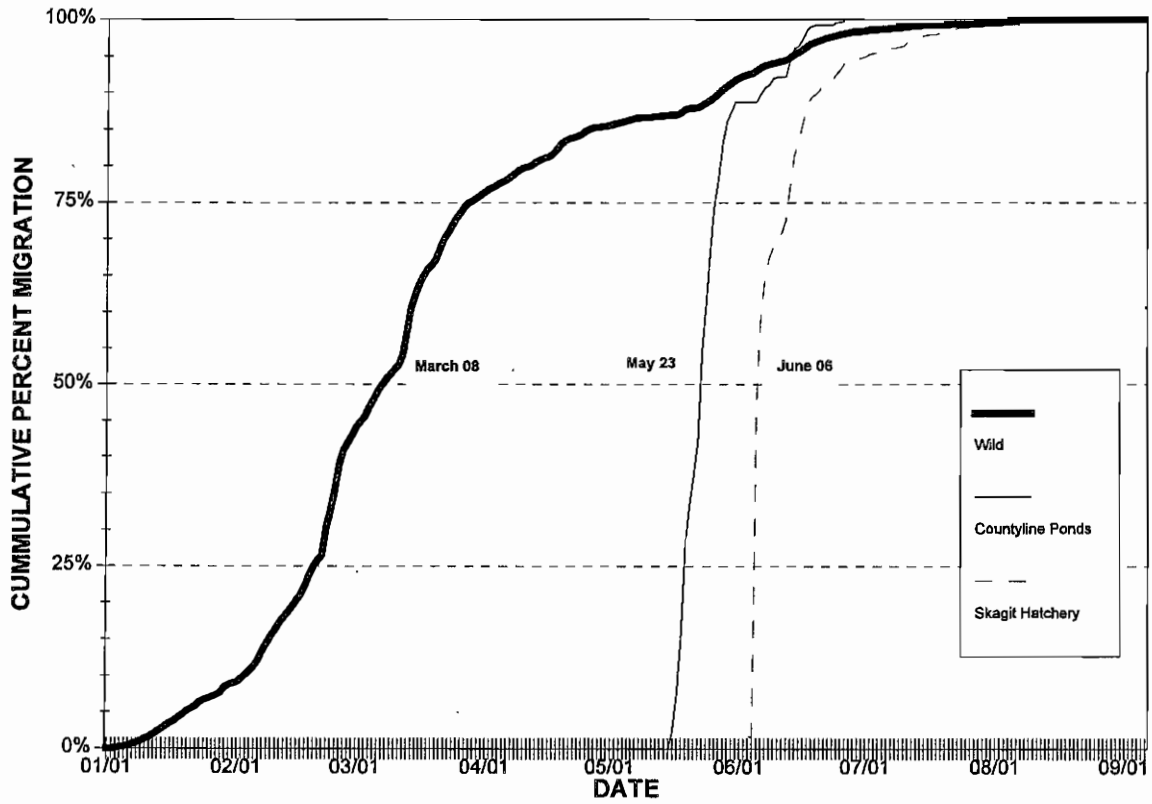


Table 13. Summary of wild 0+ chinook fork length data, Skagit River mainstem scoop and screw traps, 1999.

STATISTICAL WEEK			SCOOP TRAP						SCREW TRAP					
No.	Begin	End	Avg	s.d.	Range Min	Range Max	n	Catch	Avg	s.d.	Range Min	Range Max	n	Catch
3	01/16	01/17	39.7	2.50	36	48	20	455	39.0	1.69	36	42	20	297
4	01/18	01/24	39.5	1.58	35	43	81	1,688	39.2	1.72	35	44	75	1,505
5	01/25	01/31	39.2	1.68	36	42	74	1,328	39.5	1.70	34	43	80	1,099
6	02/01	02/07	39.4	1.57	36	44	90	2,894	39.2	1.79	35	43	86	2,070
7	02/08	02/14	39.3	1.71	35	43	114	3,531	39.5	1.79	35	43	97	2,946
8	02/15	02/21	39.8	1.84	35	50	100	4,309	40.0	1.71	37	51	119	3,463
9	02/22	02/28	39.8	1.43	36	44	173	9,333	39.9	1.32	36	43	141	7,042
10	03/01	03/07	39.8	1.16	37	42	127	3,903	40.1	1.43	37	45	100	2,896
11	03/08	03/14	39.9	1.59	36	46	116	6,639	40.4	2.17	35	50	100	5,012
12	03/15	03/21	40.6	1.90	36	48	85	4,888	40.5	1.86	35	47	88	3,822
13	03/22	03/28	41.0	1.75	37	50	83	3,412	40.8	1.77	37	47	86	2,809
14	03/29	04/04	42.4	3.10	37	54	75	1,415	42.4	3.33	35	54	66	1,096
15	04/05	04/11	40.8	2.92	35	53	72	1,515	41.7	3.52	37	59	70	1,073
16	04/12	04/18	43.9	8.26	35	82	74	1,504	41.7	4.17	37	61	77	932
17	04/19	04/25	45.8	8.29	36	81	93	1,309	46.6	8.33	39	82	86	775
18	04/26	05/02	48.4	9.11	36	74	66	526	46.5	7.55	33	67	44	350
19	05/03	05/09	52.7	11.85	37	86	51	430	47.8	8.65	38	69	52	243
20	05/10	05/16	55.9	11.45	36	87	49	214	53.9	10.72	37	75	38	98
21	05/17	05/23	59.9	9.09	39	77	91	715	58.7	7.28	39	71	55	341
22	05/24	05/30	57.4	6.95	39	74	177	1,550	57.8	5.99	42	73	100	765
23	05/31	06/06	58.5	6.78	43	69	35	950	59.3	4.46	53	69	22	705
24	06/07	06/13	59.4	6.28	44	77	51	805	59.6	5.96	49	76	24	497
25	06/14	06/20	64.3	6.95	55	90	30	614	60.8	5.91	51	70	30	576
26	06/21	06/27	65.2	5.12	59	76	19	463	67.6	10.20	52	92	30	447
27	06/28	07/04	67.8	9.55	47	85	16	187	69.8	2.92	64	75	12	159
28	07/05	07/11	71.0	14.48	46	94	20	191	72.5	11.71	44	90	27	166
29	07/12	07/18	79.3	13.69	55	106	48	86	77.9	11.90	60	103	38	86
30	07/19	07/25	88.9	10.07	74	102	12	74	84.1	11.77	61	107	20	62
31	07/26	08/01	85.2	10.39	70	117	24	56	85.8	10.41	67	113	16	43
32	08/02	08/08	90.3	11.68	73	115	33	150	90.8	13.18	71	119	16	76
33	08/09	08/15	92.1	7.74	81	108	9	72						27
34	08/16	08/22	93.4	6.80	85	105	10	27	89.0	13.93	70	103	3	9
35	08/23	08/29	91.5	2.29	88	94	4	9	91.0	4.00	87	95	2	5
36	08/30	09/05					0	12						0
37	09/06						0	0						0
SEASON TOTAL			48.53	4.82	35	117	2,122	55,254	46.93	4.16	33	119	1,820	41,492

Figure 11. Weekly range and mean size, Skagit River wild 0+ chinook, 1999.

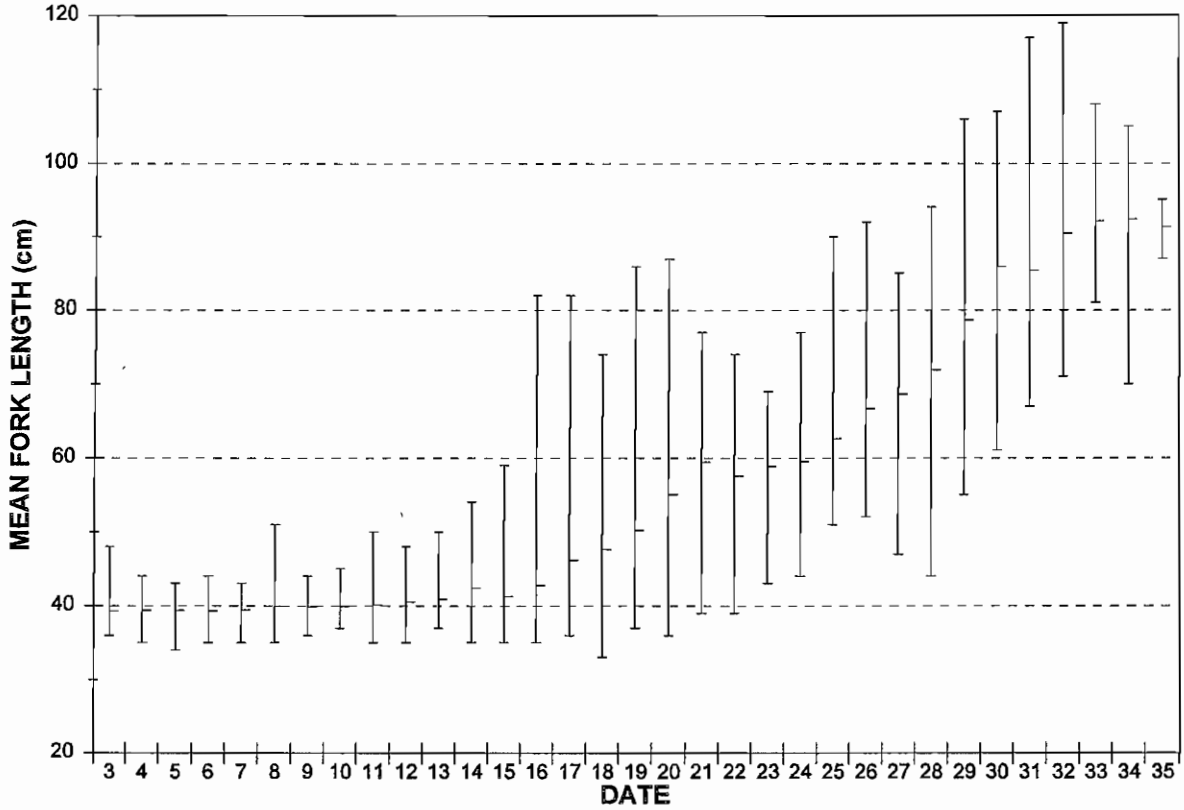


Figure 12. Comparison of weekly mean size, by trap, Skagit River wild 0+ chinook, 1999.

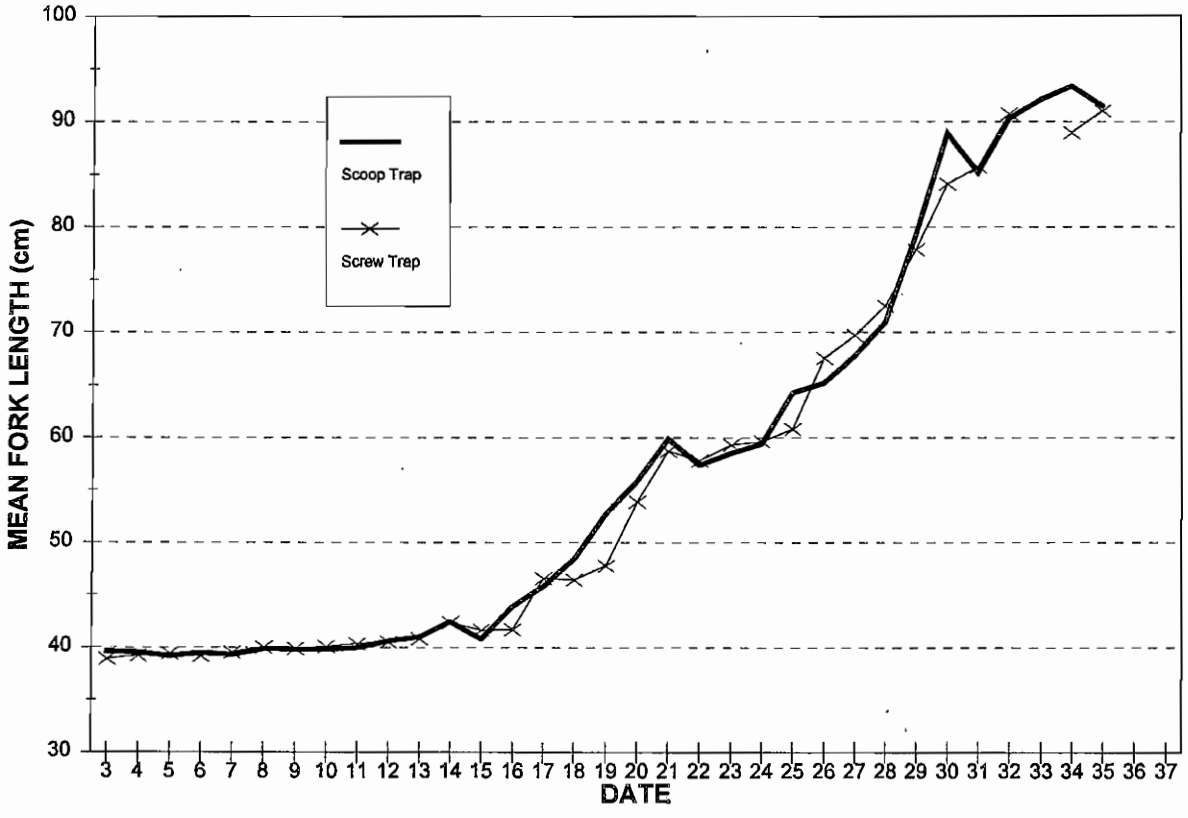


Table 14. Estimated freshwater survival (egg deposition to migration), Skagit River wild 0+ chinook, by brood year.

A	B	C	D	E	F	G
Brood Year (i)	**ESTIMATED ESC.** Total	Females 0.5*B	**PED** @ 4,500 (millions)	**Wild Smolts** (millions)	**Survival to Migr.** (E/D)	**Winter High Flow** (cfs)
1989	6,547	3,274	14.7	1.7	12%	88,200
1990	16,935	8,468	38.1	0.5	1%	142,000
1991	5,845	2,923	13.2	2.4	18%	40,100
1992	7,196	3,598	16.2	3.0	18%	27,700
1993	5,585	2,793	12.6	2.7	22%	26,800
1994	5,694	2,847	12.8	1.5	12%	55,700
1995	6,930	3,465	15.6	0.7	5%	126,000
1996	12,025	6,013	27.1	4.5	17%	40,000
1997	4,996	2,498	11.2	2.4	21%	52,500
1998	15,695	7,848	35.3	6.4	18%	51,900

Note: Estimated escapement does not include returns to the Baker trap or the spring chinook component. Prior to the 1996 brood, estimates were based on trapping during the coho migration period (April-June). Full-season trapping commenced in 1997.

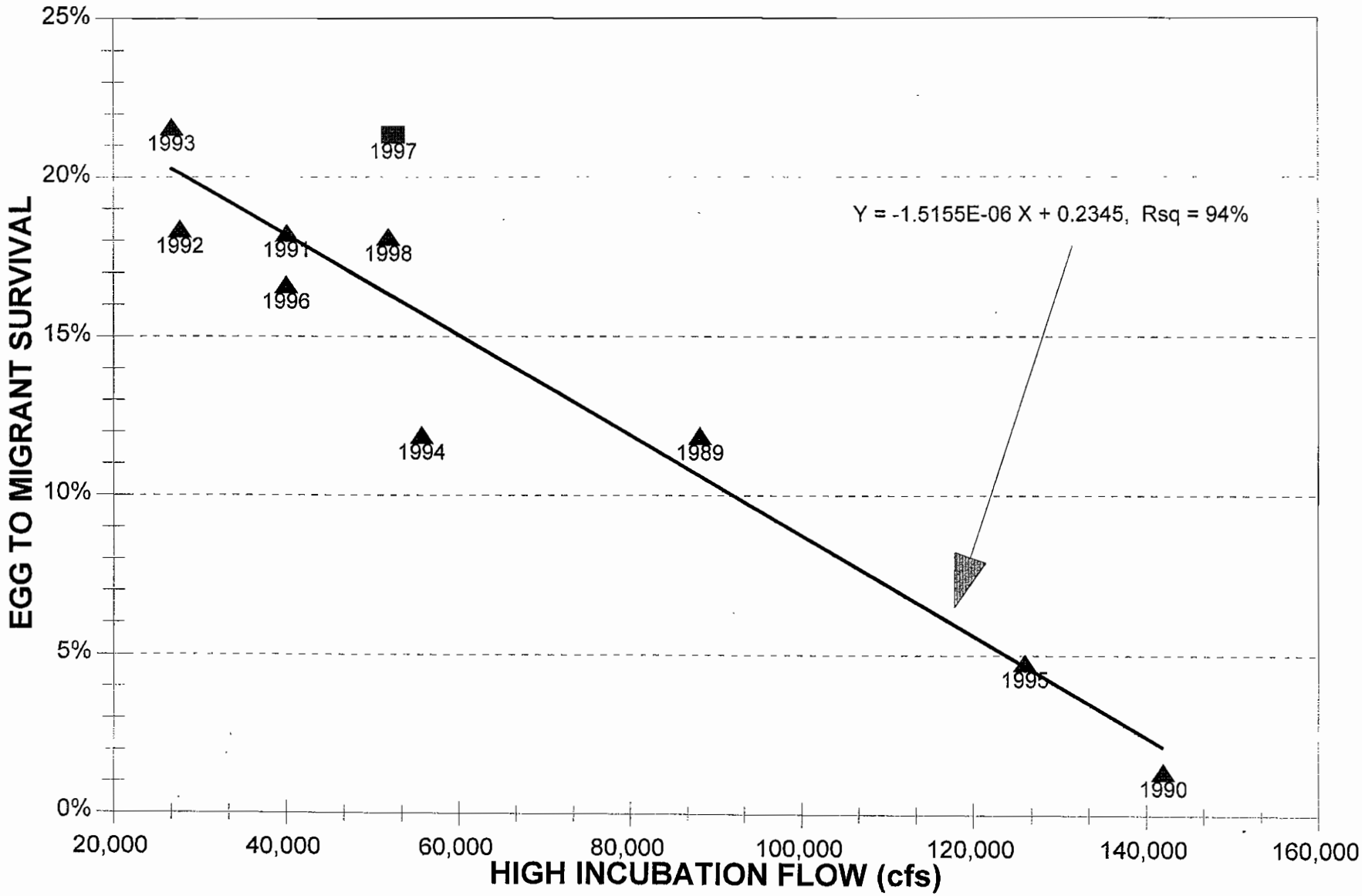


Figure 13. Egg-to-migrant survival estimates of wild 0+ chinook, by brood year, Skagit River

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