**Fishery Data Series No. 06-02**

# Production of Coho Salmon from the Taku River, 1999–2003

**by**

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**Alaska Department of Fish and Game** **Divisions of Sport Fish and Commercial Fisheries**

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**Weights and measures (metric)**

| | |
|---|---|
| centimeter | cm |
| deciliter | dL |
| gram | g |
| hectare | ha |
| kilogram | kg |
| kilometer | km |
| liter | L |
| meter | m |
| milliliter | mL |
| millimeter | mm |

**Weights and measures (English)**

| | |
|---|---|
| cubic feet per second | $ft^3/s$ |
| foot | ft |
| gallon | gal |
| inch | in |
| mile | mi |
| nautical mile | nmi |
| ounce | oz |
| pound | lb |
| quart | qt |
| yard | yd |

**Time and temperature**

| | |
|---|---|
| day | d |
| degrees Celsius | °C |
| degrees Fahrenheit | °F |
| degrees kelvin | K |
| hour | h |
| minute | min |
| second | s |

**Physics and chemistry**

| | |
|---|---|
| all atomic symbols | |
| alternating current | AC |
| ampere | A |
| calorie | cal |
| direct current | DC |
| hertz | Hz |
| horsepower | hp |
| hydrogen ion activity (negative log of) | pH |
| parts per million | ppm |
| parts per thousand | ppt, ‰ |
| volts | V |
| watts | W |

**General**

| | |
|---|---|
| Alaska Department of Fish and Game | ADF&G |
| Alaska Administrative Code | AAC |
| all commonly accepted abbreviations | e.g., Mr., Mrs., AM, PM, etc. |
| all commonly accepted professional titles | e.g., Dr., Ph.D., R.N., etc. |
| at | @ |
| compass directions: | |
| east | E |
| north | N |
| south | S |
| west | W |
| copyright | © |
| corporate suffixes: | |
| Company | Co. |
| Corporation | Corp. |
| Incorporated | Inc. |
| Limited | Ltd. |
| District of Columbia | D.C. |
| et alii (and others) | et al. |
| et cetera (and so forth) | etc. |
| exempli gratia (for example) | e.g. |
| Federal Information Code | FIC |
| id est (that is) | i.e. |
| latitude or longitude | lat. or long. |
| monetary symbols (U.S.) | $, ¢ |
| months (tables and figures): first three letters | Jan,...,Dec |
| registered trademark | ® |
| trademark | ™ |
| United States (adjective) | U.S. |
| United States of America (noun) | USA |
| U.S.C. | United States Code |
| U.S. state | use two-letter abbreviations (e.g., AK, WA) |

**Measures (fisheries)**

| | |
|---|---|
| fork length | FL |
| mideye-to-fork | MEF |
| mideye-to-tail-fork | METF |
| standard length | SL |
| total length | TL |

**Mathematics, statistics**

| | |
|---|---|
| *all standard mathematical signs, symbols and abbreviations* | |
| alternate hypothesis | $H_A$ |
| base of natural logarithm | *e* |
| catch per unit effort | CPUE |
| coefficient of variation | CV |
| common test statistics | (F, t, $\chi^2$, etc.) |
| confidence interval | CI |
| correlation coefficient (multiple) | R |
| correlation coefficient (simple) | r |
| covariance | cov |
| degree (angular ) | ° |
| degrees of freedom | df |
| expected value | *E* |
| greater than | > |
| greater than or equal to | ≥ |
| harvest per unit effort | HPUE |
| less than | < |
| less than or equal to | ≤ |
| logarithm (natural) | ln |
| logarithm (base 10) | log |
| logarithm (specify base) | $log_{2,}$ etc. |
| minute (angular) | ' |
| not significant | NS |
| null hypothesis | $H_O$ |
| percent | % |
| probability | P |
| probability of a type I error (rejection of the null hypothesis when true) | α |
| probability of a type II error (acceptance of the null hypothesis when false) | β |
| second (angular) | " |
| standard deviation | SD |
| standard error | SE |
| variance | |
| population | Var |
| sample | var |

# *FISHERY DATA SERIES NO. 06–02*

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by

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# ABSTRACT

Smolt abundance in 1999, 2000, 2001, and 2002 and adult production in 2000, 2001, 2002, and 2003 were estimated for coho salmon *Oncorhynchus kisutch* from the Taku River, near Juneau, Alaska using coded wire tags implanted in smolts, harvest sampling, and an inriver mark-recapture experiment on adults. A modified Petersen estimate was used to estimate that 1,728,240 (SE = 255,147), 1,846,629 (SE = 276,385), 2,718,816 (SE = 363,071), and 2,988,349 (SE = 1,008,886) smolt emigrated from the Taku River in 1999, 2000, 2001, and 2002; these smolt survived to adulthood at estimated rates of 6.3% (SE = 1.0%), 8.8% (SE = 1.4%), 11.2% (SE = 1.8%), and 8.9% (SE = 3.1%), accordingly. From the return of coded wire tags in 2000, 2001, 2002, and 2003, harvests of adults were estimated at 38,971 (SE = 3,326), 55,264 (SE = 4,828), 80,046 (SE = 6,389), and 78,277 (SE = 10,271), respectively in U. S. marine waters. Over these four years, the troll fishery took an estimated 54%; drift gillnet fisheries took 32%; recreational fisheries, 9%; and seine fisheries, 5% of marine harvests. An estimated 70,147 (SE = 5,667) in 2000, 107,493 (SE = 9,495) in 2001, 223,162 (SE = 28,648) in 2002, and 186,755 (SE = 17,727) in 2003 adults passed by Canyon Island (located about 30 km up the Taku River), estimated from tagging and recapture of adults in those years. Estimates of escapement past all fisheries in the Taku River were 64,700 (SE = 5,667) in 2000, 104,394 (SE = 9,495) in 2001, 219,360 (SE = 28,648) in 2002, and 183,038 (SE = 17,727) in 2003. Exploitation including all marine and inriver harvests was estimated at 41% in 2000, 36% in 2001, 28% in 2002, and 31% in 2003. The Taku River stock of coho salmon comprised an estimated 44%, 20%, 30%, and 37% of the coho salmon harvest in the Juneau recreational fishery in 2000, 2001, 2002, and 2003, respectively. The estimated run (escapement plus harvest) for coho salmon originating above Canyon Island was 109,149 (SE = 6,571) in 2000, 162,778 (SE = 10,652) in 2001, 303,276 (SE = 29,352) in 2002, and 265,089 (SE = 20,485) in 2003. Age composition of adult coho salmon was 80%, 81%, 85%, and 90% age-1.1 fish in 2000, 2001, 2002, and 2003.



Key words: adult production, coded wire tag, coho salmon, drift gillnet fishery, escapement, exploitation rate, harvest, inriver fishery, marine survival, mark-recapture experiment, migratory timing, *Oncorhynchus kisutch*, recreational fishery, seine fishery, smolt abundance, Taku River, troll fishery


# INTRODUCTION

The Taku River annually produces an estimated 100,000–450,000 adult coho salmon *Oncorhynchus kisutch*, many of which are caught in commercial and recreational fisheries in northern Southeast Alaska (Elliott and Bernard 1994; McPherson and Bernard 1995, 1996; McPherson et al. 1997, 1998; PSC 1996; Yanusz et al. 1999). Coho salmon returning to the Taku River pass through an offshore troll fishery before entering inside waters (Figure 1), then through a seine fishery in Icy and Chatham straits and a drift gillnet fishery in lower Lynn Canal. They next transit the recreational fishery near Juneau and the drift gillnet fishery in Taku Inlet/Stephens Passage before ascending the Taku River (Figure 2). After entering the river, the remaining coho salmon are exposed to a drift/set gillnet fishery just inside Canada (Figure 2). Because of the large production of coho salmon from the Taku River, and because of the many fisheries that utilize this production, the Alaska Department of Fish and Game (ADF&G), Fisheries and Oceans Canada (DFO), and the Taku River Tlingit First Nation (TRTFN) operate a cooperative program of stock assessment and management in regards to this stock (Appendix A1 contains references for past studies). Coho salmon spawning in the Taku River are managed as a single stock, and the stock assessment program has mirrored that emphasis since 1991 (McPherson and Bernard 1996; PSC 1996).

Objectives of this study were to estimate (1) abundance of coho salmon smolt leaving the Taku River in 1999–2002, (2) harvests of adults returning to the Taku River in 2000–2003, and (3) escapement and age composition of returning adults in 2000–2003. These objectives were accomplished by tagging and sampling smolt each spring from 1999 through 2002 in the lower Taku River and operating cooperative, inriver mark-recapture experiments to estimate abundance of adult coho salmon in 2000 through 2003.

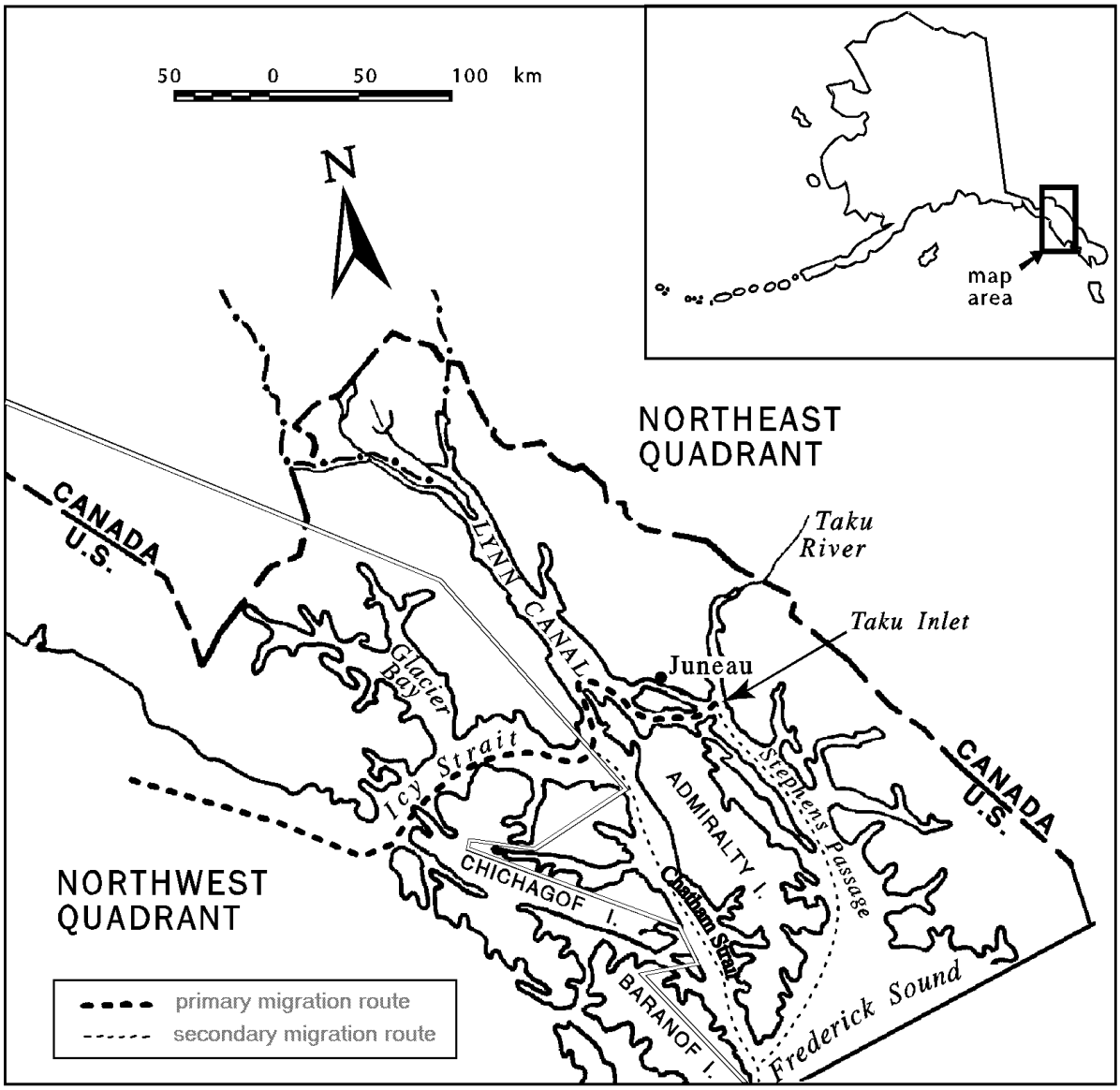


**Figure 1.–**Migration routes through northern Southeast Alaska of coho salmon bound for the Taku River.

# METHODS

## SMOLT CAPTURE, CODED WIRE TAGGING, AND SAMPLING

Minnow traps (style G-40) baited with salmon roe were fished daily for 24 h/d each spring, 1999-2002. Traps were distributed along mainstem banks and in some backwater areas along both sides of the Taku River stretching from about 6 km above to 6 km below Canyon Island (Figure 2). Traps were checked daily when the river stage was stable, and more frequently when the stage was rising or falling. Captured salmonid smolt and fry were transported to holding boxes at camp, and processed each afternoon. Coho and Chinook salmon *O. tshawytscha* smolt were separated by inspection from other species of salmon and Dolly Varden *Salvelinus malma*. Coho and Chinook salmon smolt were carefully examined to distinguish species. A clear 'window' in the pigmentation of the adipose fin (Meehan and Vania 1961; Pollard et al. 1997) and a more 'silver' sheen from a side view indicated a Chinook salmon smolt. Coho salmon smolt had more narrow parr marks, showed a greater number of small, darkly pigmented spots from a dorsal view,

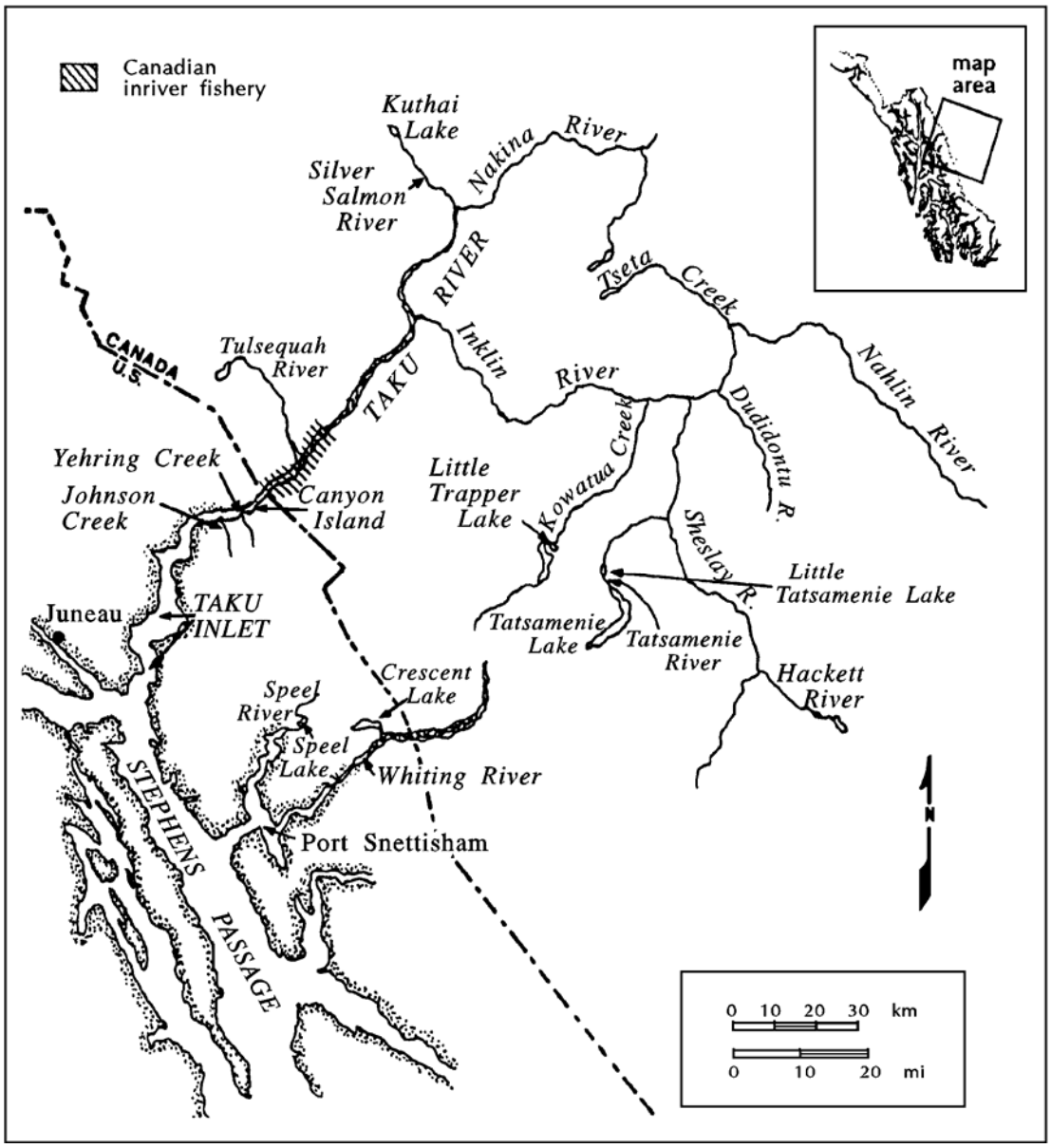


**Figure 2.–**Taku River drainage, northwestern British Columbia, and Southeast Alaska.

had pigmentation throughout the adipose fin, and had longer anterior rays on the anal fin.

All live coho salmon smolt ≥70 mm fork length (FL) in 1999 and 2000 and ≥75 mm FL in 2001 and 2002 were tranquilized in a solution of tricain-methane sulfonate (MS 222). The solution was buffered with sodium bicarbonate until the pH was neutral, as measured with a Hach kit. The MS 222 solution was maintained at river temperature by circulating it through a coil of aluminum tubing submerged in the river. All fish were tagged with a coded wire tag (CWT) and marked by excision of the adipose fin, following methods in Koerner (1977). Small coho salmon (70-85 mm FL in 1999 and 2000; 75-85 mm FL in 2001 and 2002) were tagged with a different set of codes than were larger smolt (>85 mm FL). All Chinook salmon smolt ≥50 mm FL were also tagged, but with different codes than those used for tagging coho salmon. All tagged fish were held for 24 hours and inspected for mortalities prior to release; 100 fish were checked daily to determine if their tag had been retained. When

fewer than 100 fish of a species were caught in a day, half the catch was checked. The number of fish tagged, number of tagging-related mortalities, and number of fish that had shed their tags were compiled and recorded on *ADF&G CWT Tagging Summary and Release Information Forms* which were submitted to the ADF&G Mark, Tag, and Age Lab in Juneau when field work ended.

One day per week, 1 out of 40 smolt was measured to the nearest 1 mm FL and weighed to the nearest 0.1 g. In addition, 1 out of 80 smolt had 12-15 scales removed from the preferred area for later determination of age (Scarnecchia 1979). Every coho salmon smolt that was recaptured in a minnow trap, i.e. already missing its adipose fin, was tested for the presence of a CWT, and its FL was recorded.

## SMOLT ABUNDANCE

Abundance of coho salmon smolt ($N_S$) in 1999, 2000, 2001, and 2002 was estimated using a modified Petersen's estimator for closed populations. A sample of smolts was marked and tagged in one of the above years, and a sample of adults was inspected for marks in the following year. During the year at sea the population was open to mortality, but because of their life history, was closed to recruitment. Because smaller smolts demonstrably had a lower probability of being caught in minnow traps and of surviving to adulthood, Chapman's modification of Petersen's estimator (Seber 1982) was altered to produce relatively unbiased estimates of smolt abundance. From Appendix A2, the corrected estimator is:

$$\hat{N}_S = \frac{(\hat{\lambda}M_1 + M_2 + 1)(C+1)}{\hat{\lambda}(R_1 + \hat{\pi}R_3) + R_2 + (1-\hat{\pi})R_3 + 1} - 1 \qquad (1)$$

where $M_1$ is the number of smaller smolts (70–85 or 75–85 mm FL) marked and released in a year, $M_2$ is the number of larger smolts (>85 mm FL) marked in the same year, $C$ the number of adults inspected for marks a year later, $R_1$ the subset of $C$ with marks representing adults tagged as smaller smolt, $R_2$ the subset of $C$ representing adults tagged as larger smolt, and $R_3$ the subset of $C$ comprised of marked fish that had lost their tag (size at tagging unknown). The adjustment $\lambda$ is the ratio of the catchability coefficients for larger to smaller smolt; $\pi$ is the fraction of adults that were tagged as smaller smolts. Note that if there is no difference in catchability by smolt group ($\lambda$ = 1), equation (1) becomes Chapman's modification regardless of size of marked smolt. Estimates of $\pi$ and $\lambda$ were obtained as (Appendices A2 and A3)

$$\hat{\pi} = \frac{\hat{T}_1}{\hat{T}_1 + \hat{T}_2} \qquad (2)$$

$$\hat{\lambda} = \frac{\hat{T}_2(\hat{\phi}_2 - \hat{p})}{\hat{T}_1(\hat{p} - \hat{\phi}_1)} \qquad (3)$$

where $\hat{T}_{1(2)}$ is the number of all tags representing smaller (or larger) smolt recovered or recaptured fromadult salmon regardless of how or where recovered or recaptured, $\phi_{1(2)}$ is the fraction of smaller (or larger) <u>smolts</u> that were age 1-freshwater (age-1.) when tagged, and $p$ is the fraction of all <u>adults</u> that are age-1. a year later.

Variance and relative statistical bias in the estimator (equation 1) were estimated with bootstrap procedures described in general by Buckland and Garthwaite (1991). Each bootstrap sample was drawn randomly with replacement from the capture histories of the $\hat{N}_S$ smolt in the "virtual" population (Figure 3). From the bootstrap sample a new estimate of smolt abundance $\hat{N}'_S$ was calculated. Then the process was repeated 200 times to create the frequency distribution $\hat{F}'(\hat{N}'_S)$. At the end of the iterations, the following statistics were calculated:

$$\overline{N}'_S = \frac{\sum_{b=1}^{200} \hat{N}'_{S(b)}}{200} \qquad (4a)$$

$$\mathrm{var}(\hat{N}_S) = \frac{\sum_{b=1}^{200} (\hat{N}'_{S(b)} - \overline{N}'_S)^2}{200-1} \qquad (4b)$$

$$\text{Estimated Relative Bias} = \frac{\overline{N}'_S - \hat{N}_S}{\hat{N}_S}(100) \qquad (4c)$$

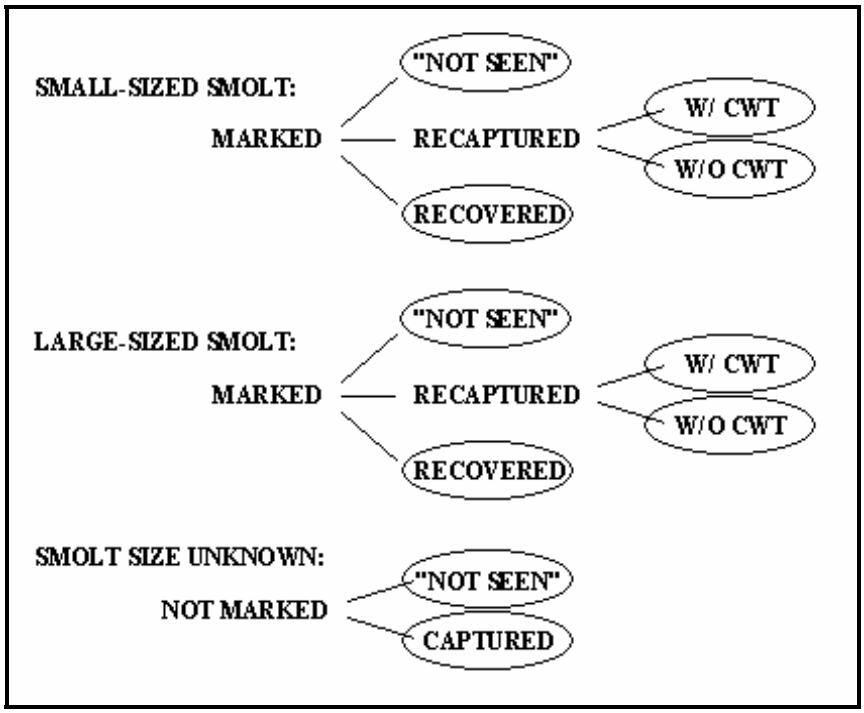


**Figure 3.**–Capture histories (in ovals) concerning smolts in the population emigrating from the Taku River.

The relationships between statistics and the 10 capture histories used in each year's simulation are provided in Tables 1 and 2. Bootstrap estimates $\hat{\phi}_1'$, $\hat{\phi}_2'$, and $\hat{p}'$ were obtained from binomial distributions based plug-in estima`tes $\hat{\phi}_1$, $\hat{\phi}_2$, and $\hat{p}$. A QuickBASIC program SMLTTAKU.BAS (Appendix A4) was used to conduct the simulations.

## HARVESTS

Methods described in Bernard and Clark (1996, Table 2) were used to estimate the marine harvests of salmon from the Taku River using information from stratified catch sampling of marine commercial and recreational fisheries. Commercial catch data for the analysis were summarized by ADF&G statistical week (SW) and district (for gillnet and seine fisheries), or by troll period and quadrant for troll fisheries. Data on recovery of tags from recreational fisheries was obtained from reports provided by the ADF&G Mark, Tag, and Age Lab located in Juneau and summarized by biweek and fishery (e.g., biweek 16 during the Sitka Marine Creel Survey). Harvest estimates were obtained from ADF&G reports (e.g., Hubartt et al. 2001) and ADF&G computer summaries. In most cases, CWTs were recovered in only a few strata in sport fisheries. Assuming that the harvests of fish with CWTs of interest were independent of sampling strata within fishery-biweeks, harvests and sampling information was totaled over the fishery-biweek to estimate contributions. This procedure allowed comparisons between published biweekly harvests and the CWT data, and minimized bias that could have resulted if estimates had been derived from data obtained in minor strata where sampling rates were unusual.

The harvest estimates are based on the:

1) Number of coho salmon harvested;
2) Fraction of the harvest inspected;
3) Number of coho salmon in the sample without adipose fins;
4) Number of fish whose heads reached the tag lab;
5) Number of these heads that contained a CWT;
6) Number of CWTs that were decoded; and
7) Number of decoded CWTs with the appropriate code (i.e., originally released in the Taku River).

**Table 1.–**Relationships among program variables, capture histories, and model variables in bootstrap simulations to estimate the variance of smolt abundance estimates.

| Program Variable | Capture History | Model Variables |
|---|---|---|
| (1) | Not marked, not seen | $\hat{N} - M_1 - M_2 - C + R_1 + R_2 + R_3$ |
| (2) | Marked, not seen – Smaller Smolt | $M_1 - \hat{T}_1$ |
| (3) | " " – Larger Smolt | $M_2 - \hat{T}_2$ |
| (4) | Marked, recaptured – Smaller Smolt w/ CWT | $R_1$ |
| (5) | " " – Larger Smolt w/ CWT | $R_2$ |
| (6) | " " – Smaller Smolt w/o CWT | $\hat{\pi} R_3$ |
| (7) | " " – Larger Smolt w/o CWT | $(1-\hat{\pi}) R_3$ |
| (8) | Marked, recovered – Smaller Smolt | $\hat{T}_1 - R_1 - \hat{\pi} R_3$ |
| (9) | " " – Larger Smolt | $\hat{T}_2 - R_2 - (1-\hat{\pi}) R_3$ |
| (10) | Not marked, captured | $C - R_1 - R_2 - R_3$ |

**Table 2.–**Model variables and their values for capture histories used to estimate abundance of coho salmon smolt emigrating from the Taku River in 1999, 2000, 2001, and 2002. Note the each row in this table corresponds to the same row in Table 1.

| Model Variables | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|
| $\hat{N} - M_1 - M_2 - C + R_1 + R_2 + R_3$ | = 1,691,411 | = 1,811,038 | = 2,718,816 | = 2,737,851 |
| $M_1 - \hat{T}_1$ | 18,712 – 98 = 18,614 | 24,074 – 175 = 23,899 | 23,285 – 163 = 23,122 | 9,710 – 74 = 9,636 |
| $M_2 - \hat{T}_2$ | 11,972 – 158 = 11,814 | 20,733 – 205 = 20,528 | 27,250 – 294 = 26,956 | 13,548 – 145 = 13,403 |
| $R_1$ | 19 | 20 | 16 | 8 |
| $R_2$ | 14 | 20 | 26 | 14 |
| $\hat{\pi} R_3$ | 0.383(2) = 0.77 | 0.461(21) = 9.68 | 0.357(40) = 14.3 | 0.338(8) = 2.704 |
| $(1-\hat{\pi}) R_3$ | (1 – 0.383) 2 = 1.23 | (1 – 0.461) 21 = 11.32 | (1 – 0.357) 40 = 25.7 | (1 – 0.338) 8 = 5.296 |
| $\hat{T}_1 - R_1 - \hat{\pi} R_3$ | 98 – 19 – 0.77 = 78.23 | 175 – 20- 9.68 = 145.32 | 163 – 16 – 14.3 = 132.7 | 74 – 8 – 2.704 = 63.296 |
| $\hat{T}_2 - R_2 - (1-\hat{\pi}) R_3$ | 158 – 14 – 1.23 = 142.77 | 205 – 20 – 11.32 = 172.68 | 294 – 26 – 25.7 = 242.3 | 145 – 14 – 5.296 = 125.704 |
| $C - R_1 - R_2 - R_3$ | 1,877 – 19 – 14 – 2 = 1,842 | 2,380 – 20 – 20 – 21 = 2,319 | 3,765 – 16 – 26 – 40 = 3,683 | 3,003 – 8 – 14 – 8 = 2,973 |

Harvest over all marine and freshwater fisheries ($H$) was estimated as the sum of harvests estimated for each fishery. Because harvest was estimated for each fishery independently, estimated variance for harvest over all fisheries is the sum of all variances estimated for each fishery.

## ESCAPEMENTS

Estimates of the number $N_E$ of adult coho salmon passing by Canyon Island in 2000, 2001, 2002, and 2003 were based on two-event, closed-population, mark-recapture experiments conducted by ADF&G Divisions of Sport Fish

and Commercial Fisheries , TRTFN, and DFO. In the first sampling event, coho salmon were captured using fish wheels operated at Canyon Island, tagged with a uniquely numbered solid-core spaghetti tag sewn through the back of the fish just posterior and below the dorsal fin, measured to the nearest 5 mm from mid-eye to tail fork (MEF), sampled for scales, and released. A set gillnet (127 mm stretch mesh) was also used at Canyon Island to capture coho salmon when low water impaired operation of the fish wheels.

Scale samples consisted of four scales from the "preferred area" from each sampled fish - i.e. the left side of the fish two scales above the lateral line and on an imaginary line from the posterior dorsal fin to the anterior anal fin (Scarnecchia 1979). The scales were applied to a gum card in the field and later pressed into acetate cards. Ages were determined by examining the impressions under 70× magnification. Criteria used to assign ages were similar to those of Moser (1968) and were supplemented with results from recent studies on validating age as determined from scales (C. Farrington, CFD, Douglas, AK, unpublished data). Ages are reported in European notation (Koo 1962).

Coho salmon caught in two fisheries, the Canadian commercial gillnet and in test fisheries 3–20 km upstream of Canyon Island were sampled as part of the second event of the mark-recapture experiment. See Kelley and Milligan (1999) for a detailed description of the field methods. Mark-recapture data were grouped into statistical weeks (SW) for analysis to avoid the variability associated with day-to-day statistics and to reflect the weekly periods used to manage U.S. and Canadian fisheries. Because the commercial fishery ended before all adults had reached Canyon Island, a test fishery was used each year to extend sampling during the second event.

Adult abundance $N_E$ past Canyon Island during the mark-recapture experiment was estimated each year according to stratified models first developed by Darroch (Seber 1982) for circumstances where temporal or spatial distributions of fish affect their probabilities of capture. One condition for getting a consistent abundance estimate for passing salmon from an unstratified estimator is that there is no temporal changes in the probabilities of capture. Experience has shown that probabilities of capture of coho salmon during the first event often change as their annual migration progresses. Fluctuation in water levels at Canyon Island has affected the efficiency of fish wheels and gillnets (Yanusz et al. 1999). Also, the change from the commercial fishery to a test fishery halfway through the migration has affected probabilities of capture upstream during the second sampling event. In each annual experiment statistics were pooled across statistical weeks into strata based upon estimated fish catchability and fishing methods. To allow for travel time from Canyon Island upstream to the fisheries, recovery strata were lagged one SW from the release strata. A matrix of fish released and recovered in each stratum was input into the computer program SPAS (Arnason et al. 1996) to perform the abundance and variance calculations and diagnostic tests. Other conditions for obtaining a consistent estimate from a two-event mark-recapture experiment are:

1. All adults have an equal probability of being marked regardless of their size; or
2. All adults have an equal probability of being inspected for marks regardless of their size; and
3. There is no recruitment to the population between Canyon Island and the fisheries upstream; and
4. There is no trap-induced behavior; and
5. Fish do not lose their marks and all marks are recognizable.

Size distributions and recapture rates by size groups were compared to detect heterogeneity in probabilities of capture. Considering the short distance between Canyon Island and the inriver fisheries just upstream, and considering the life history of the species, no recruitment could have occurred between sampling events. Different sampling gears in different sampling events prevented trap-induced behavior. The short duration between sampling events should have left a scar as a secondary mark for any fish that had lost its tag in transit. Evidence from a radio telemetry study (Eiler et al. 1993) is that coho salmon caught as in this study can be expected to survive handling to move upstream to fishing

grounds in Canada. Escapement (spawning abundance) was estimated as $\hat{E} = \hat{N}_E - H_{FW}$ where the latter statistic is the inriver harvest in Canada (note that $\text{var}(\hat{E}) = \text{var}(\hat{N}_E)$ ).

### RUN SIZE, EXPLOITATION, AND MARINE SURVIVAL

Estimates of run size ($N_A$) of coho salmon returning to the Taku River above Canyon Island in 2000, 2001, 2002, and 2003 and the associated exploitation rates ($U$) in commercial and sport fisheries are based on the sum of estimates of harvest ($H$) and escapement ($E$):

$$\hat{N}_A = \hat{H} + \hat{E} \tag{5a}$$

$$\text{var}(\hat{N}_A) = \text{var}(\hat{H}) + \text{var}(\hat{E}) \tag{5b}$$

$$\hat{U} = \frac{\hat{H}}{\hat{H} + \hat{E}} \tag{6a}$$

Variance for equation (6a) was approximated with the delta method (Seber 1982) to be:

$$\text{var}(\hat{U}) \cong \frac{\text{var}(\hat{H})\hat{E}^2}{\hat{N}_A^4} + \frac{\text{var}(\hat{E})\hat{H}^2}{\hat{N}_A^4} \tag{6b}$$

Survival rate of smolts to adults ($S$) was estimated as:

$$\hat{S} = \frac{\hat{N}_A}{\hat{N}_S} \tag{7a}$$

Variance for equation (7a) was approximated with the delta method to be:

$$\text{var}(\hat{S}) \cong \hat{S}^2 \left[ \frac{\text{var}(\hat{N}_A)}{\hat{N}_A^2} + \frac{\text{var}(\hat{N}_S)}{\hat{N}_S^2} \right] \tag{7b}$$

## RESULTS

### PRODUCTION OF COHO SALMON 1999-2000

From 15 April through 6 June, 1999, 30,684 coho salmon smolt were captured, tagged, and released with the following codes:

| Tag code | Size[a] | Number tagged | Overnight mortality | Tag retention | Final release |
|---|---|---|---|---|---|
| 040126 | small | 11,099 | 7 | 0.999 | 11,079 |
| 040131 | small | 7,680 | 18 | 0.996 | 7,633 |
| 040127 | large | 10,083 | 4 | 0.998 | 10,057 |
| 040132 | large | 1,926 | 0 | 0.994 | 1,915 |
| Sub total | small | 18,779 | 25 | 0.996 | 18,712 |
| Sub total | large | 12,009 | 4 | 0.997 | 11,972 |
| Grand total | | 30,788 | 29 | 0.997 | 30,684 |

[a] Small coho salmon smolt were fish measured between 70-85 mm FL; large fish > 85 mm FL.

Ninety percent (90%) of coho salmon smolt were captured between 15 April and 25 May. Peak catches occurred on 21 April and 7 May, and 50% of the catch occurred by 5 May (Figure 4; Appendix B1). The average FL of coho salmon smolt was 82 mm (SD = 11.13; Figure 5) and average weight was 5.4 g (SD = 2.54) in 1999. Length frequencies of coho salmon smolt captured the first time and those recaptured were not comparable ($P < 0.001$; Figure 6) as recaptured fish were significantly larger than captured fish. An additional 19,622 Chinook salmon smolt were captured and tagged with code 04-01-41; 65 died within 24 h of tagging and tag retention was nearly 100% leaving a release of 19,531 marked smolts. Analyses of data on tagged Chinook salmon will be published after returns from that brood (1997) are completed in calendar year 2004.

Based on the recovery of tags (CWTs) and sampling a year later in 2000, an estimated 1,728,240 coho salmon smolt (SE = 255,147) had emigrated to sea in 1999 (capture histories and associated statistics are in Table 2 for this year and for 2000, 2001, and 2002). Coded wire tags were recovered from approximately 0.52% (98 of 18,712) smaller smolt and 1.32% (158 of 11,972) from larger smolt. These rates indicate significantly better odds (2.52) for recovery and implied survival of larger smolt ($\chi^2 = 55.91$, df = 1, $P < 0.0001$). From sampling smolts in 1999, estimated fractions of smaller and larger smolt comprised of age-1.0 fish ($\hat{\phi}_1$ and $\hat{\phi}_2$) were 0.97 (SE = 0.013) and 0.48 (SE = 0.064), respectively.

From sampling adults at Canyon Island in 2000, estimated fraction $\hat{p}$ of age-1.1 adults was 0.80 (SE = 0.016). From simulation the estimated ratio of catchability $\hat{\lambda}$ was 3.06 (SE = 0.82), confirming evidence presented in Figure 6 that larger smolt were more likely to be captured in minnow traps. Simulated estimates had a low of 1.483, indicating that $\hat{\lambda}$ was significantly greater than one. Estimated relative bias in $\hat{\lambda}$ was low at 5.2% and even lower in the abundance estimate (2.1%). In contrast to results from equation (1), abundance as estimated with Chapman's modification of Petersen's estimator was 1,600,733, about 5% less.

In 2000, during random sampling of marine catches, 229 adult coho salmon were found possessing CWTs germane to the Taku River (Appendix B2). The greatest number of CWTs (126) was recovered from the commercial troll fishery, nearly all of which were from the Northwest Quadrant (94%) on the outside coast, followed by the marine gillnet fisheries (61), most (74%) of them from District 111 (Taku Inlet/Stephens Passage). Twenty-nine (29) CWTs were recovered in the marine recreational fishery near Juneau from July through early September. Thirteen (13) CWTs were recovered in the seine fishery in Chatham Strait and Frederick Sound.

An estimated 38,971 (SE = 3,326) coho salmon originating upriver from Canyon Island were harvested in various marine and inriver fisheries in 2000 (Table 3; Appendix B2). Harvests in marine fisheries were estimated based on 1.76% of returning adults carrying a CWT. Thirty-five of 1,877 adults sampled at Canyon Island were missing their adipose fin, 33 of which had tags. Marked fractions of these sampled adults varied through the season (Table 4), but not significantly

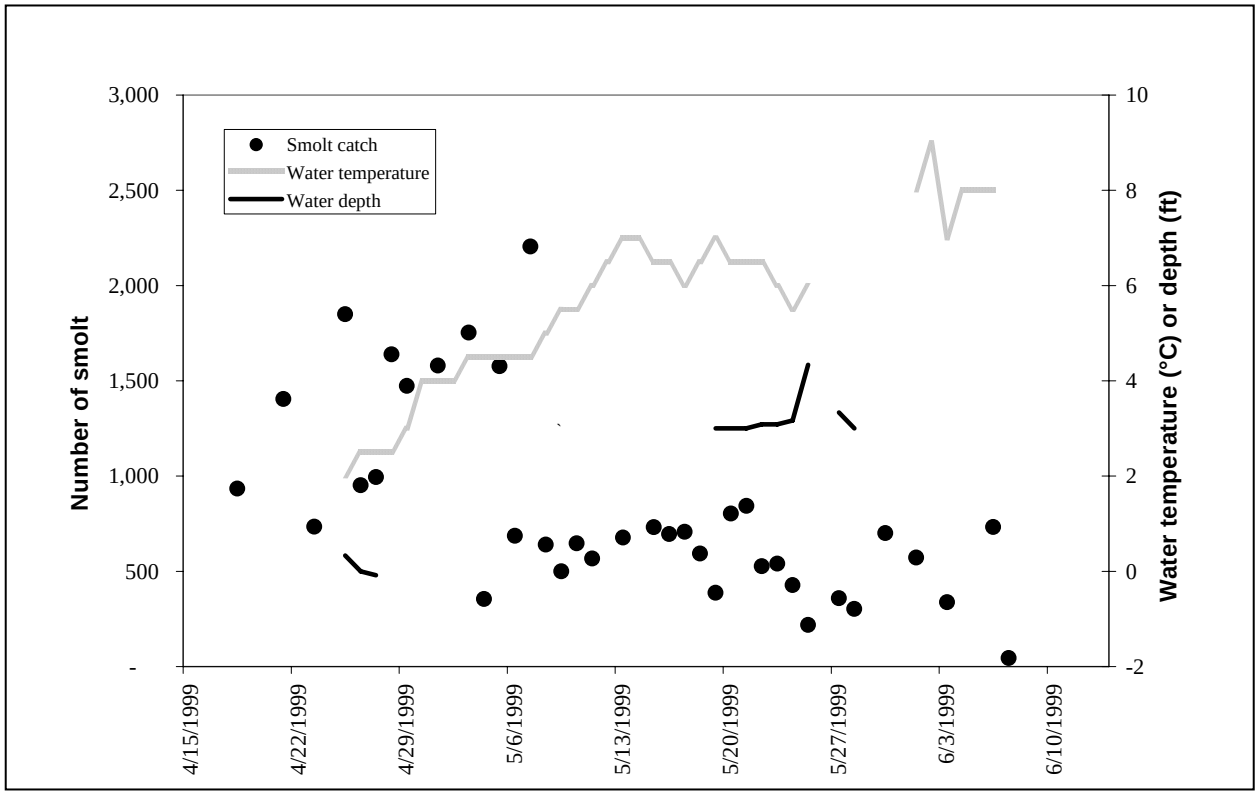


**Figure 4.–**Daily catch of coho salmon smolt ≥70 mm FL and daily water temperature and depth near Canyon Island, Taku River, during 1999.

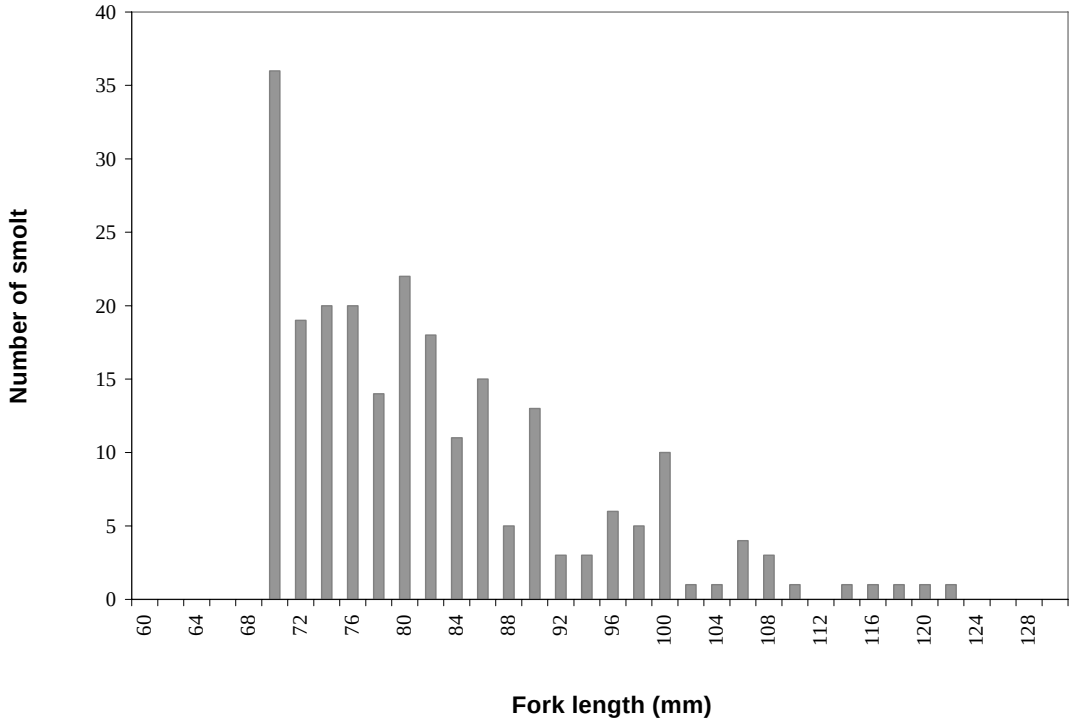


**Figure 5.**–Length frequency of 251 coho salmon smolt ≥70 mm FL captured and measured at Canyon Island, Taku River, during 1999.

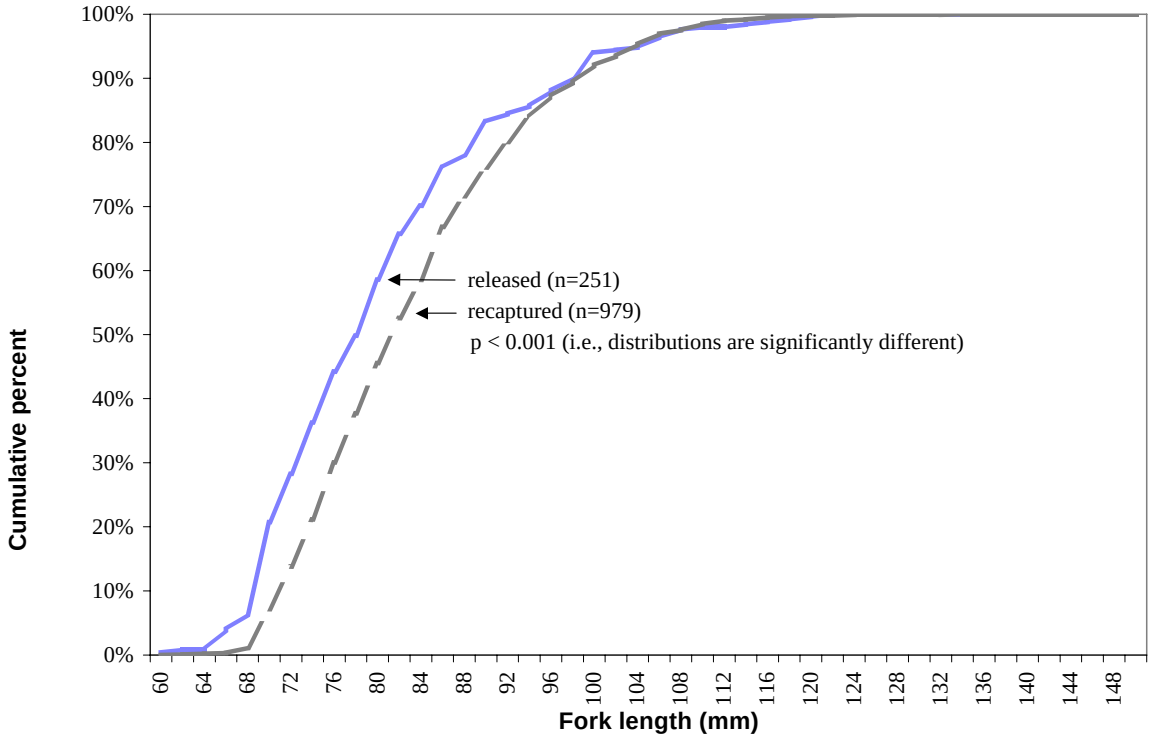


**Figure 6.**–Length frequency distributions of coho salmon smolt at the time of first capture and again during recapture at Canyon Island on the Taku River during 1999. Probability corresponds to a two-sample Kolmogorov-Smirnov test.

**Table 3.–**Estimates of smolt abundance in 1999, of adult harvest in 2000, escapement and run size in 2000 for the Taku River stock of coho salmon.

| | Estimate | SE | Exploitation rate | SE | Removal rate | SE |
|---|---|---|---|---|---|---|
| Smolt abundance (1999) | 1,728,240 | 255,147 | | | | |
| Marine survival | 0.063 | 0.010 | | | | |
| Adult run (2000) | 109,149 | 6,571 | | | | |
| Total harvest (2000) | 44,449 | 3,326 | 39.7% | 2.8% | | |
| Total marine harvest (2000) | 38,971 | 3,326 | 35.7% | 2.6% | 35.7% | 2.6% |
| Troll fishery subtotal | 21,236 | 2,480 | 19.5% | 1.7% | 19.5% | 1.7% |
| NW Quadrant | 20,292 | 2,454 | 18.6% | 1.6% | | |
| SW Quadrant | 80 | 79 | 0.1% | 0.0% | | |
| NE Quadrant | 864 | 349 | 0.8% | 0.2% | | |
| Seine fishery subtotal | 2,132 | 630 | 2.0% | 0.4% | 2.4% | 0.4% |
| District 112 | 1,869 | 602 | 1.7% | 0.3% | | |
| District 113 | 263 | 87 | 0.2% | 0.1% | | |
| Recreational fishery subtotal | 4,137 | 1,148 | 3.8% | 0.7% | 4.8% | 0.7% |
| Juneau | 4,137 | 1,148 | 3.8% | 0.7% | | |
| Drift gillnet subtotal | 11,466 | 1,789 | 10.5% | 1.1% | 14.0% | 1.1% |
| District 111 | 7,352 | 1,355 | 6.7% | 0.8% | | |
| District 115 | 4,114 | 1,168 | 3.8% | 0.7% | | |
| U.S. personal use harvest (2000)[a] | 31 | | | | | |
| Total Canadian harvest (2000)[b] | 5,447 | | 5.0% | 0.3% | 7.8% | 0.6% |
| Passage past Canyon Island (2000)[c] | 70,146 | 5,667 | | | | |
| Escapement past all fisheries (2000)[d] | 64,700 | 5,667 | | | | |

[a] U.S. personal use harvest mostly occurs downriver of the mark and recapture locations.

[b] Total Canadian harvest includes the inriver commercial, test, and aboriginal fisheries.

[c] Inriver run is the estimated number of coho salmon above Canyon Island.

[d] Escapement past all fisheries is the inriver run minus the total Canadian harvest.

**Table 4.–**Numbers of adult coho salmon sampled for coded wire tags at Canyon Island and in the Canadian test fishery along with the numbers of fish with clipped adipose fins and valid coded wire tags recovered in each by time strata in 2000.

| | Canyon Island | | | | Test Fishery | | | |
|---|---|---|---|---|---|---|---|---|
| | Number | | | | Number | | | |
| Date | Examined | Ad clips | Valid | Marked % Ad Clips | Examined | Ad clips | Valid | Marked % Ad Clips |
| July 9–Aug 12 | 199 | 1 | 1 | 0.50% | | | | |
| Aug 13–Aug 26 | 345 | 4 | 3 | 1.16% | | | | |
| Aug 27–Sept 9 | 532 | 8 | 7 | 1.50% | | | | |
| Sept 10–Sept 23 | 519 | 17 | 17 | 3.28% | 394 | 15 | 8 | 3.81% |
| Sept 24–Oct 7 | 282 | 5 | 5 | 1.77% | 209 | 4 | 2 | 1.91% |
| Total | 1,877 | 35 | 33 | 1.86% | 603 | 19 | 10 | 3.15% |

so ($\chi^2$ = 8.62, df = 4, P = 0.07). Details on the numbers examined by day at Canyon Island and in the test fishery along with the numbers of fish missing adipose fins, valid CWTs, and their respective codes are detailed in Appendix B3. Table 3 contains estimated fractions of harvest by fishery and estimated exploitation rates, and Figure 7 the weekly harvests by fishery. Estimated mean date of harvest, using techniques detailed in Mundy (1984), was 9 August for the troll fishery compared to 31 August for the gillnet fishery (Appendix B4). Mean date of estimated harvest in all marine fisheries occurred on 17 August, about average compared with previous years (McPherson and Bernard 1995, 1996; McPherson et al. 1997, 1998; Yanusz et al. 1999). Estimated harvest of coho salmon bound for the Taku River above Canyon Island in the Juneau marine recreational fishery was 4,137 fish or 9.3% of all estimated marine and inriver harvests (44,418). Expanding for the estimated 22% of the Taku River coho salmon run that spawns below Canyon Island, the recreational harvest was 5,304 (4,137/0.78) representing 44% of the estimated 11,960 coho salmon caught in the Juneau area marine fishery (Hubartt et al. 2001). The inriver harvest of coho salmon in the Taku River was 4,395 in 2000.

An estimated 70,146 (SE = 5,667) adults passed upstream of Canyon Island in 2000. Between 9 July and 3 October, 1,877 coho salmon were captured at Canyon Island of which 1,763 were marked and released. From 9 July through 9 September 4,395 coho salmon, 108 with spaghetti tags, were examined in the upstream commercial fishery. From 10 September through 7 October, 1,052 fish were caught (710 were harvested) in the inriver test fishery of which 28 carried tags; another 342 fish were harvested in the aboriginal fishery. The mark-recapture data were stratified

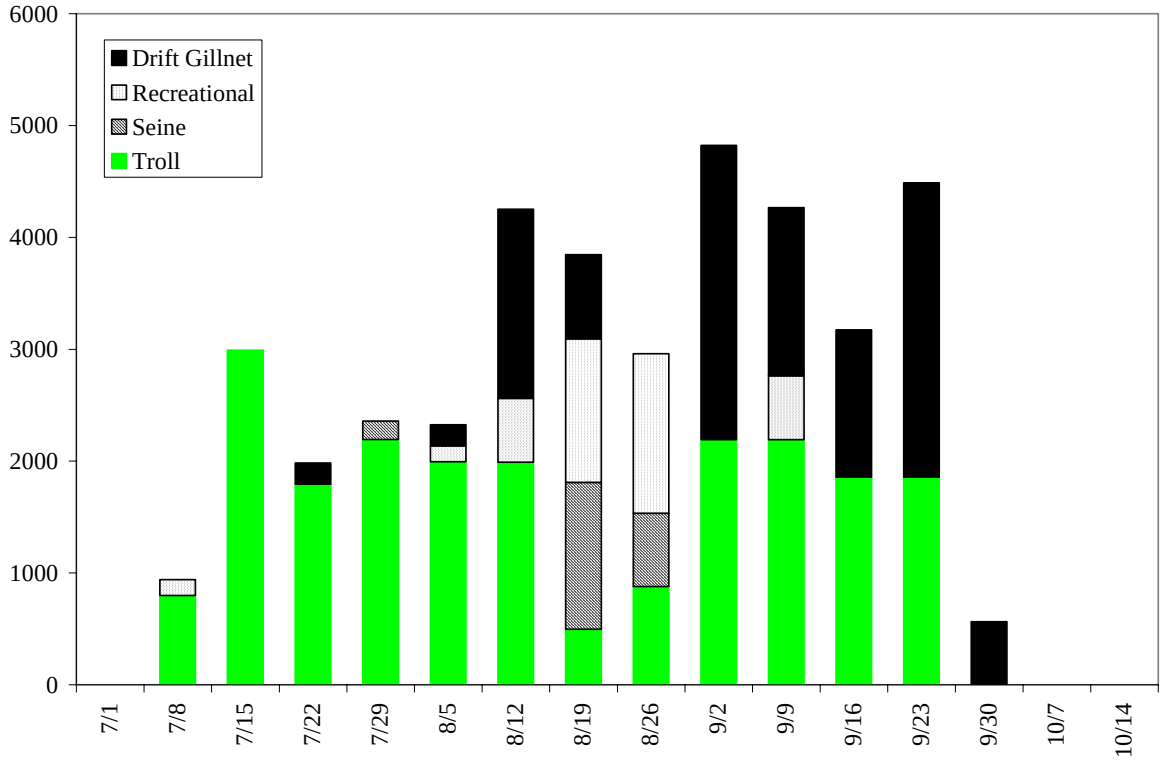


**Figure 7.–**Estimated harvests of coho salmon bound for Taku River in 2000, assigned to marine commercial and recreational fishery by statistical week (weekly estimates of harvest in the troll fishery approximated).

by week (Appendix B5) and tests for consistency in SPAS (Arnason et al. 1996) indicated near equal proportions of tags were recovered in the commercial and test fisheries ($\chi^2$ = 16.63, df = 12, P = 0.16). Comparisons of marked fractions in both fisheries were also similar ($\chi^2$ = 0.15, df = 1, P = 0.70). Since commercial and test fisheries were consecutive, results of these tests are evidence for having only a single stratum in the mark-recapture experiment, that is Chapman's modification of Petersen's estimator (Seber 1982) could be (and was) used to estimate abundance. Similar length distributions of all fish released with spaghetti tags and of fish recaptured upstream (Figure 8) indicated that no stratification was needed based on size. Given that 5,447 coho salmon were harvested above Canyon Island, estimated spawning escapement of coho salmon past all fisheries in 2000 was 64,700 (SE = 5,667) (Table 3).

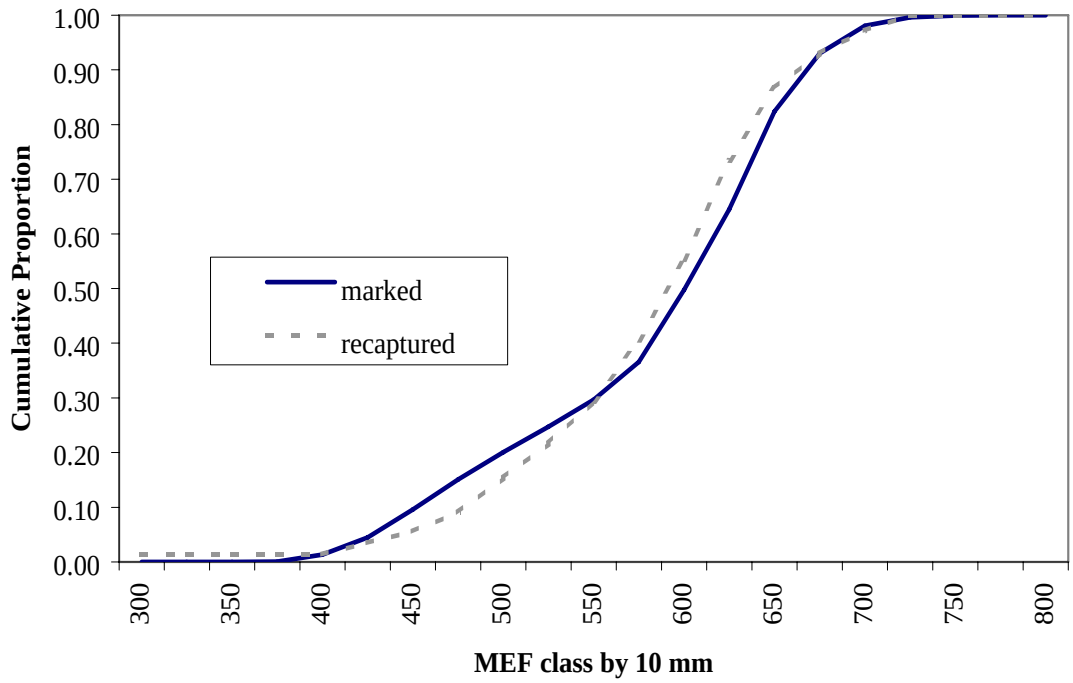


**Figure 8.**–Length distributions of adult coho salmon marked at Canyon Island compared with those of recaptures from the inriver fisheries as part of the mark-recapture experiment in 2000. Length distributions were not significantly different (P = 0.16).

## PRODUCTION OF COHO SALMON 2000-2001

From 9 April through 14 June 2000, 24,136 coho salmon smolt were captured, tagged, and released with the following codes:

| Tag code | Size[a] | Number tagged | Overnight mortality | Tag retention | Final release |
|---|---|---|---|---|---|
| 040253 | small | 10,720 | 15 | 0.999 | 10,705 |
| 040252 | small | 10,529 | 5 | 0.996 | 10,482 |
| 040360 | small | 2,887 | 0 | 1.000 | 2,887 |
| 040254 | large | 10,680 | 14 | 0.996 | 10,634 |
| 040255 | large | 10,014 | 19 | 0.998 | 9,995 |
| 040133 | large | 104 | 0 | 1.000 | 104 |
| Sub total | small | 24,136 | 20 | 0.997 | 24,074 |
| Sub total | large | 20,798 | 33 | 0.997 | 20,733 |
| Grand total | | 44,934 | 53 | 0.997 | 44,807 |

[a] Small coho salmon smolt were fish measured between 75-85 mm FL; large fish were > 85 mm FL.

Ninety percent (90%) of coho smolt were captured between 15 April and 25 May. Peak catches occurred from 19 April through 3 May, and 50% of the catch occurred by 3 May (Figure 9; Appendix C1). The average FL of coho salmon smolt was 88 mm (SD = 10.53; Figure 10) andaverage weight was 7.0 g (SD = 2.62) in 2000. Length frequencies of coho salmon smolt captured the first time and those recaptured were not significantly different (P = 0.39; Figure 11). An additional 17,396 Chinook salmon smolt were captured and tagged with code 04-03-53; 59 died within 24 h of tagging and tag retention was nearly 100% leaving a release of 17,298 marked smolts. Analyses of data on tagged Chinook salmon will be published after returns from that

brood (1998) are completed in calendar year 2005.

Based the recovery of CWTs and sampling a year later in 2001, an estimated 1,846,629 coho salmon smolt (SE = 276,385) had emigrated to sea in 2000 (values for capture histories are in Table 2). Coded wire tags were recovered from approximately 0.73% (175 of 24,074) smaller smolt and 0.99% (205 of 20,733) from larger smolt. These rates indicate slightly better odds (1.36) for recovery and implied survival of larger smolt ($\chi^2$ = 9.08, df = 1, P = 0.0025). From sampling smolts in 2000, estimated fractions of smaller and larger smolt comprised of age-1.0 fish($\hat{\phi}_1$ and $\hat{\phi}_2$) were 0.968 (SE = 0.012) and 0.475 (SE = 0.032), respectively. From sampling adults at Canyon Island in 2001, estimated fraction $\hat{p}$ of age-1.1 adults was 0.81 (SE = 0.014). From simulation the estimated ratio of catchability $\hat{\lambda}$ was 2.66 (SE = 0.571), indicating that larger smolt were more likely to be captured in minnow traps (in contrast to information in Figure 11). Simulated estimateshad a low of 1.675, indicating that $\hat{\lambda}$ was significantly greater than one. Estimated relative bias in $\hat{\lambda}$ was low at 3.4% as is estimated bias in the abundance estimate (1.9%). Consistent with the indication of a small difference in survival rates between large and small smolt reported above, abundance as estimated with Chapman's modification of Petersen's estimator (1,720,771) was about 5% less than the estimate from equation (1).

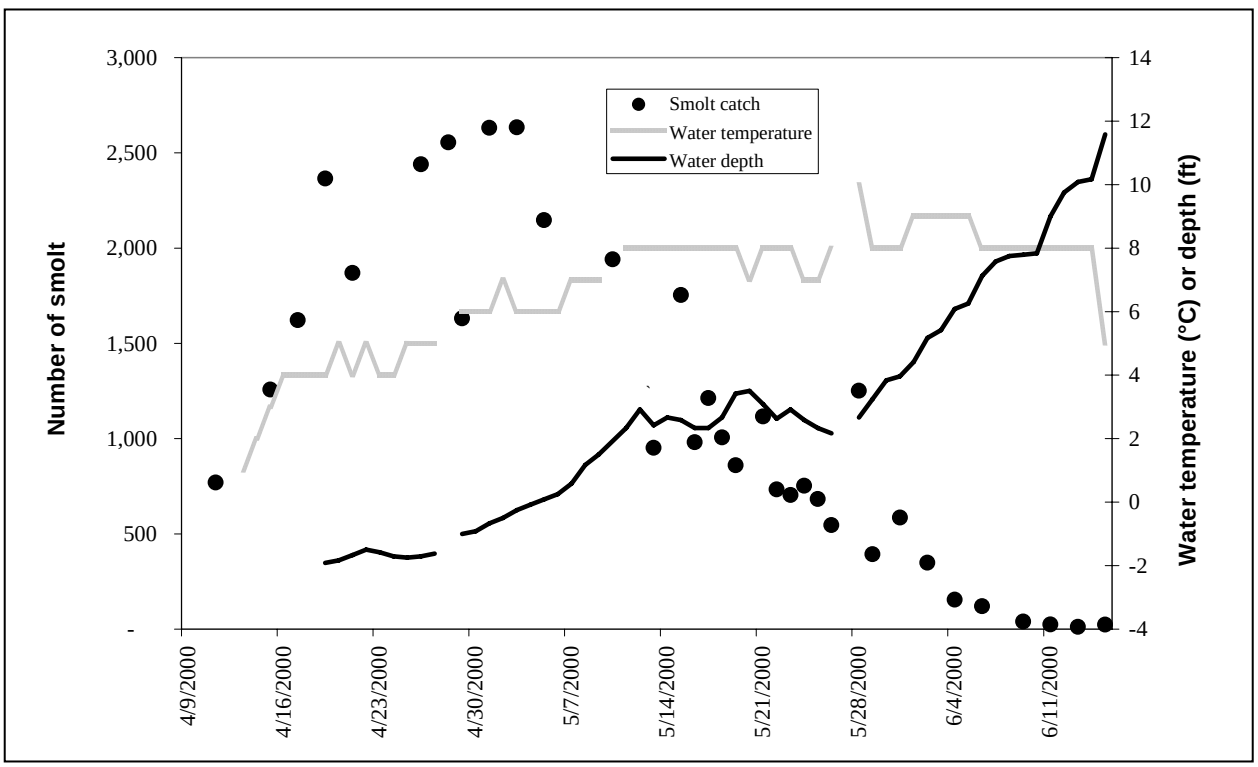


**Figure 9.**–Daily catch of coho salmon smolt ≥75 mm FL and daily water temperature and depth near Canyon Island, Taku River, during 2000.

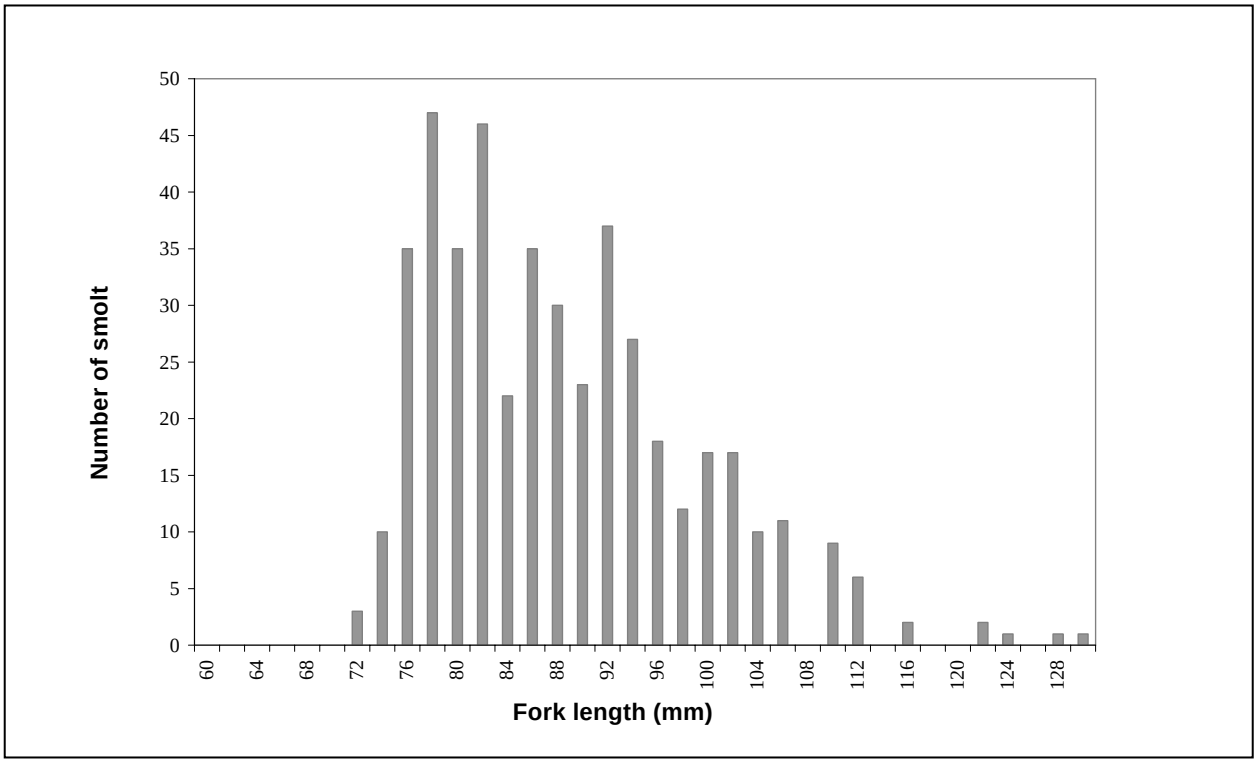


**Figure 10.–**Length frequency of 458 coho salmon smolt ≥75 mm FL captured and measured at Canyon Island, Taku River, during 2000.

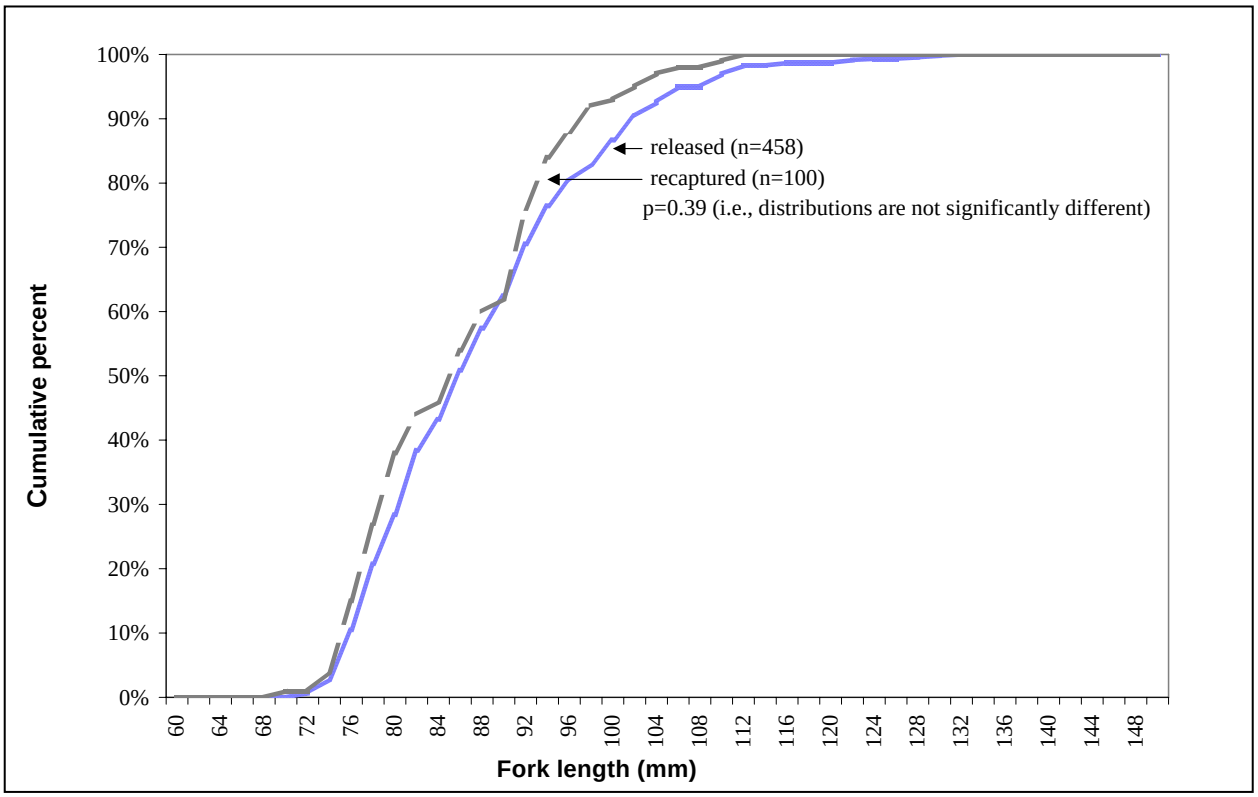


**Figure 11.–**Length frequency distributions of coho salmon smolt at the time of first capture and again during recapture at Canyon Island on the Taku River during 2000. Probability corresponds to a two-sample Kolmogorov-Smirnov test.

In 2001, during random sampling of marine catches, 351 adult coho salmon were found possessing CWTs germane to the Taku River (Appendix C2). The greatest number of CWTs (220) was recovered from the commercial troll fishery, most of which were split between the Northeast Quadrant (50%) and the Northwest Quadrant (49%). Other CWTs were recovered in marine gillnet fisheries (87), most (87%) of them from District 111 (Taku Inlet/Stephens Passage), and twenty-six (26) CWTs were recovered in the marine recreational fishery near Juneau from July through early September. Eighteen (18) CWTs were recovered in the seine fishery in Chatham Strait and Frederick Sound.

An estimated 58,385 (SE = 4,828) coho salmon originating upriver from Canyon Island were harvested in various marine and inriver fisheries in 2001 (Table 5; Appendix C2). Harvests in marine fisheries were estimated based on 2.39% of returning adults carrying a CWT. Sixty-one of 2,380 adults sampled at Canyon Island were missing their adipose fin, 57 of which had tags. Marked fractions of these sampled adults varied through the season (Table 6), but not significantly so ($\chi^2$ = 3.36, df = 5, P = 0.64). Details on the numbers examined by day at Canyon Island and in the test fishery along with the numbers of ad clips, valid CWTs, and their respective codes can be found in Appendix C3. Table 5 contains estimated fractions of harvest by fishery and estimated exploitation rates, and Figure 12 the weekly harvests by fishery. Estimated mean date of harvest, using techniques detailed in Mundy (1984), was 8 August for the troll fishery compared to 11 September for the gillnet fishery (Appendix C4). Mean date of estimated harvest in all marine fisheries occurred on 16 August, about average compared with previous years (McPherson and Bernard 1995, 1996; McPherson et al. 1997, 1998; Yanusz et al. 1999). Estimated harvest of coho salmon bound for the Taku River above Canyon Island in the Juneau marine recreational fishery was 2,505 fish or 4.5% of all estimated marine and inriver harvests (55,710). Expanded to 3,212 (2,505/0.78) for the entire Taku River drainage, this was 20% of the estimated 16,036 coho salmon caught in the Juneau area marine fishery (Hubartt et al. 2002). The inriver harvest of coho salmon in the Taku River was 3,099 in 2001.

An estimated 107,493 (SE = 9,495) adults passed upstream of Canyon Island in 2001. Between 3 July and 5 October, 2,380 coho salmon were captured at Canyon Island of which 2,230 were marked and released. From 8 July through 31 August, 2,320 coho salmon, 50 with spaghetti tags, were examined in the upstream commercial fishery. After 1 September through 10 October, 3,509 fish were caught (31 of these were harvested) in the test fishery and of the total 70 carried tags; another 500 fish were harvested in the aboriginal fishery. The mark-recapture data were stratified by week (Appendix C5) and tests for consistency in SPAS (Arnason et al. 1996) indicated near equal proportions of tags were recovered in the commercial and test fisheries ($\chi^2$ = 20.18, df = 13, P = 0.09). Comparisons of marked fractions in both fisheries were also similar ($\chi^2$ = 0.17, df = 1, P = 0.68). Since commercial and test fisheries were consecutive, results of these tests are evidence for having only a single stratum in the mark-recapture experiment, that is Chapman's modification of Petersen's estimator (Seber 1982) could be (and was) used to estimate abundance. Given that 3,099 coho salmon were harvested above Canyon Island, estimated spawning escapement of coho salmon past all fisheries in 2001 was 104,394 (SE = 9,495) (Table 5).

## PRODUCTION OF COHO SALMON 2001-2002

From 12 April through 9 June 2001, 50,535 coho salmon smolt were captured, tagged, and released with the following codes:

| Tag code | Size[a] | Number tagged | Overnight mortality | Tag retention | Final release |
|---|---|---|---|---|---|
| 040293 | small | 11,028 | 2 | 0.999 | 11,019 |
| 040294 | small | 11,028 | 6 | 0.999 | 11,022 |
| 040295 | small | 1,244 | 0 | 1.000 | 1,244 |
| 040454 | large | 11,139 | 5 | 0.999 | 11,126 |
| 040455 | large | 10,942 | 3 | 1.000 | 10,939 |
| 040456 | large | 5,187 | 2 | 1.000 | 5,185 |
| Sub total | small | 23,300 | 8 | 0.999 | 23,285 |
| Sub total | large | 27,268 | 10 | 0.999 | 27,250 |
| Grand total | | 50,568 | 18 | 0.999 | 50,535 |

[a] Small coho salmon smolt were fish measured between 75-85 mm FL; large fish > 85 mm FL.

**Table 5.–**Estimates of smolt abundance in 2000, of adult harvest, escapement and run size in 2001 for the Taku River stock of coho salmon.

| | Estimate | SE | Exploitation rate | SE | Removal rate | SE |
|---|---|---|---|---|---|---|
| Smolt abundance (2000) | 1,846,629 | 276,385 | | | | |
| Marine survival | 0.088 | 0.014 | | | | |
| Adult run (2001) | 162,778 | 10,652 | | | | |
| Total harvest (2001) | 58,385 | 4,828 | 35.9% | 2.8% | | |
| Total marine harvest (2001) | 55,264 | 4,828 | 34.0% | 2.7% | 34.0% | 2.7% |
| Troll fishery subtotal | 38,326 | 4,370 | 23.5% | 2.2% | 23.5% | 2.2% |
| NW Quadrant | 23,865 | 3,711 | 14.7% | 1.7% | | |
| SW Quadrant | 83 | 83 | 0.1% | 0.0% | | |
| NE Quadrant | 14,293 | 2,304 | 8.8% | 1.0% | | |
| SE Quadrant | 85 | 84 | 0.1% | 0.0% | | |
| Seine fishery subtotal | 2,066 | 604 | 1.3% | 0.2% | 1.7% | 0.2% |
| District 109 | 304 | 216 | 0.2% | 0.1% | | |
| District 112 | 1,366 | 403 | 0.8% | 0.2% | | |
| District 114 | 395 | 395 | 0.2% | 0.2% | | |
| Recreational fishery subtotal | 3,094 | 865 | 1.9% | 0.4% | 2.5% | 0.4% |
| Sitka | 589 | 294 | 0.4% | 0.1% | | |
| Juneau | 2,505 | 813 | 1.5% | 0.3% | | |
| Drift gillnet subtotal | 11,777 | 1,760 | 7.2% | 0.8% | 9.9% | 0.8% |
| District 106 | 500 | 288 | 0.3% | 0.1% | | |
| District 115 | 2,065 | 835 | 1.3% | 0.3% | | |
| District 111 | 9,212 | 1,523 | 5.7% | 0.7% | | |
| U.S. personal use harvest (2001)[a] | 22 | | | | | |
| Total Canadian harvest (2001)[b] | 3,099 | | 1.9% | 0.1% | 2.9% | 0.3% |
| Inriver run (2001)[c] | 107,493 | 9,495 | | | | |
| Escapement past all fisheries (2001)[d] | 104,394 | 9,495 | | | | |

[a] U.S. personal use harvest mostly occurs downriver of the mark and recapture locations.
[b] Total Canadian harvest includes the inriver commercial, test, and aboriginal fisheries.
[c] Inriver run is the estimated number of coho salmon above Canyon Island.
[d] Escapement past all fisheries is the inriver run minus the total Canadian harvest.

**Table 6.–**Numbers of adult coho salmon sampled and adipose fin-clips recovered at Canyon Island and in the Canadian test fishery in 2001. Also shown is the number of valid coded wire tags recovered at Canyon Island along with the spaghetti tag marked percent as seen in the Canadian commercial and test fisheries, the program used to estimate inriver abundance.

| | **Canyon Island** | | | | **Test Fishery** | | | |
|---|---|---|---|---|---|---|---|---|
| | Number | | | | Number | | | |
| Date | Examined | Ad clips | Valid | Marked % Ad clips | Examined | Ad clips | Marked % Ad clips | Marked % Spag tags |
| July 3–Aug 4 | 100 | 1 | 0 | 1.00% | | | | 2.33% |
| Aug 5–Aug 18 | 125 | 3 | 3 | 2.40% | | | | 1.40% |
| Aug 19–Sept 1 | 305 | 8 | 8 | 2.62% | 92 | 2 | 2.17% | 3.37% |
| Sept 2–Sept 15 | 595 | 15 | 13 | 2.52% | 1,142 | 21 | 1.84% | 1.74% |
| Sept 16–Sept 29 | 930 | 29 | 29 | 3.12% | 926 | 14 | 1.51% | 1.95% |
| Sept 30–Oct 13 | 325 | 5 | 4 | 1.54% | 832 | 14 | 1.68% | 2.40% |
| Total | 2,380 | 61 | 57 | 2.56% | 2,992 | 51 | 1.70% | 2.06% |

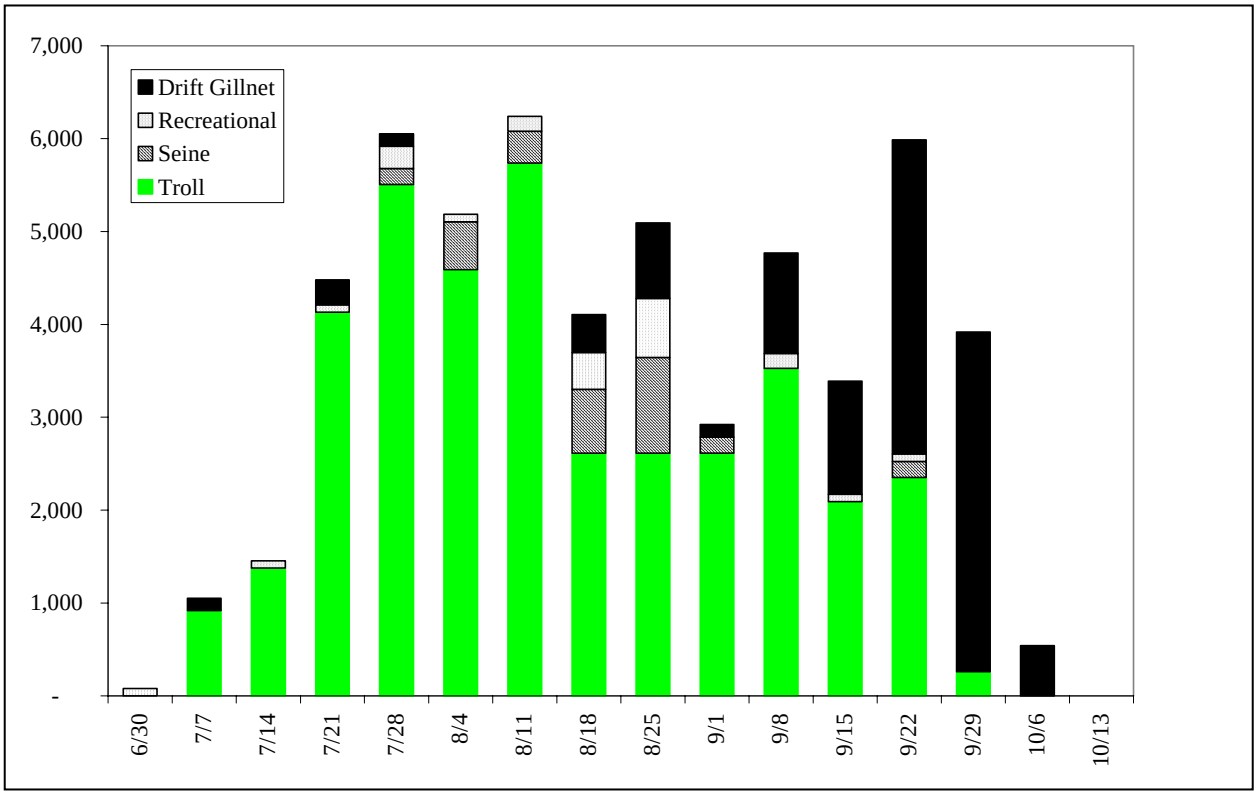


**Figure 11.–**Estimated harvests of coho salmon bound for Taku River in 2001, assigned to marine commercial and recreational fishery by statistical week (weekly estimates of harvest in the troll fishery approximated).

Ninety percent (90%) of coho smolt were captured between 16 April and 24 May. Peak catches occurred during this same period, and 50% of the catch occurred by 5 May (Figure 13; Appendix D1). The average FL of coho salmon smolt was 88 mm (SD = 9.8; Figure 14) and average weight was 6.9 g (SD = 2.37) in 2001. Length frequencies of coho salmon smolt captured the first time and those recaptured were marginally significant (P = 0.05; Figure 15) with

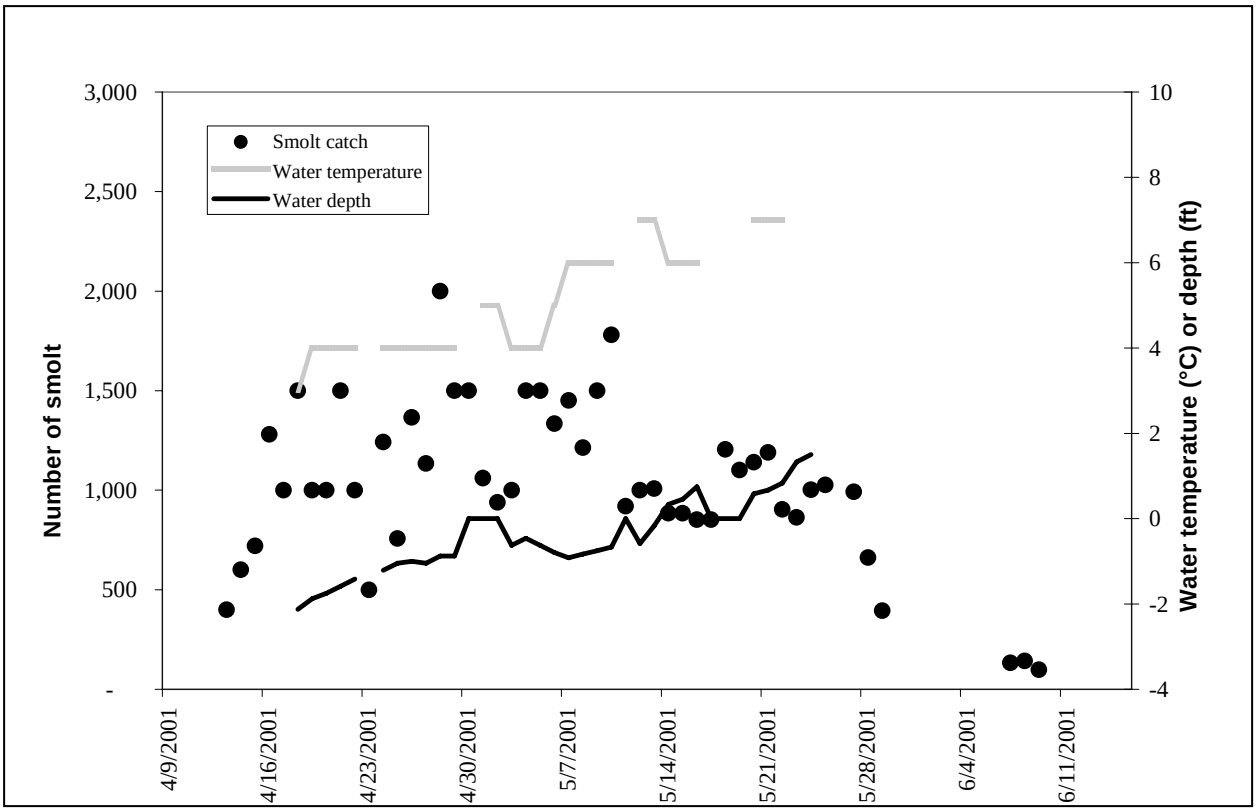


**Figure 12.–**Daily catch of coho salmon smolt ≥75mm FL and daily water temperature and depth near Canyon Island, Taku River, during 2001.

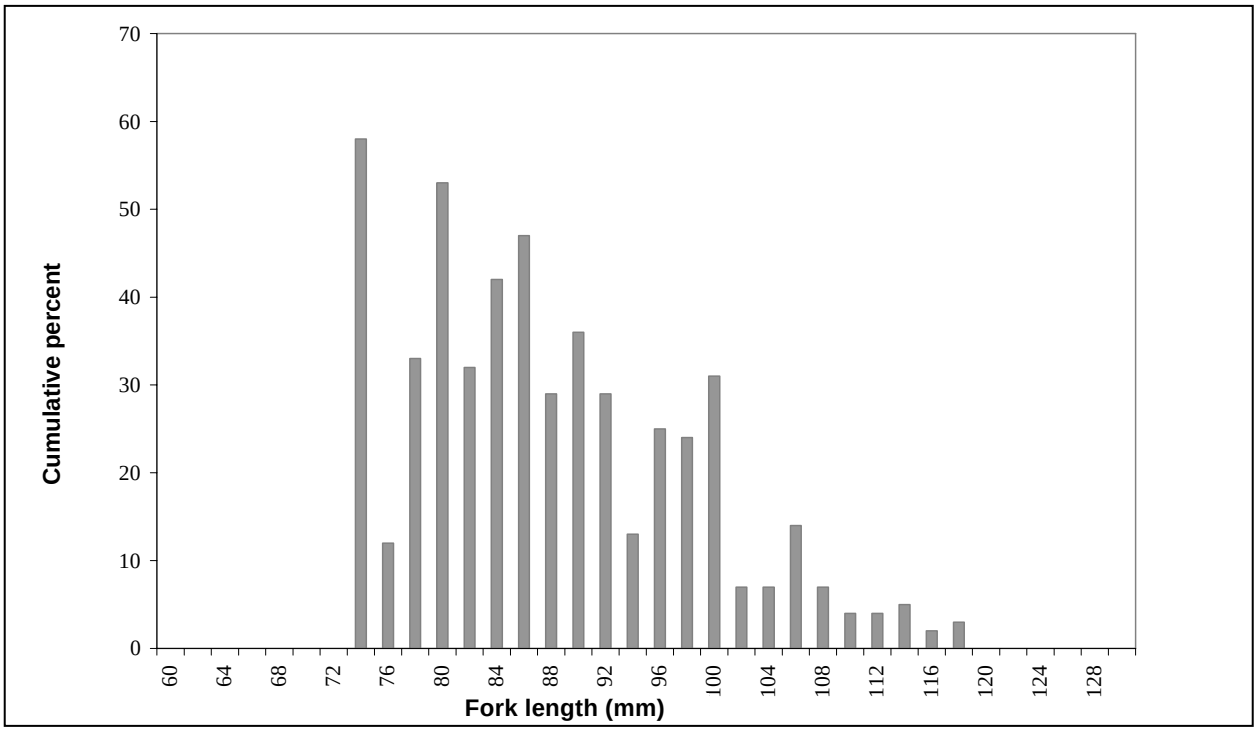


**Figure 13.–**Length frequency of 530 coho salmon smolt ≥75 mm FL captured and measured at Canyon Island, Taku River, during 2001.

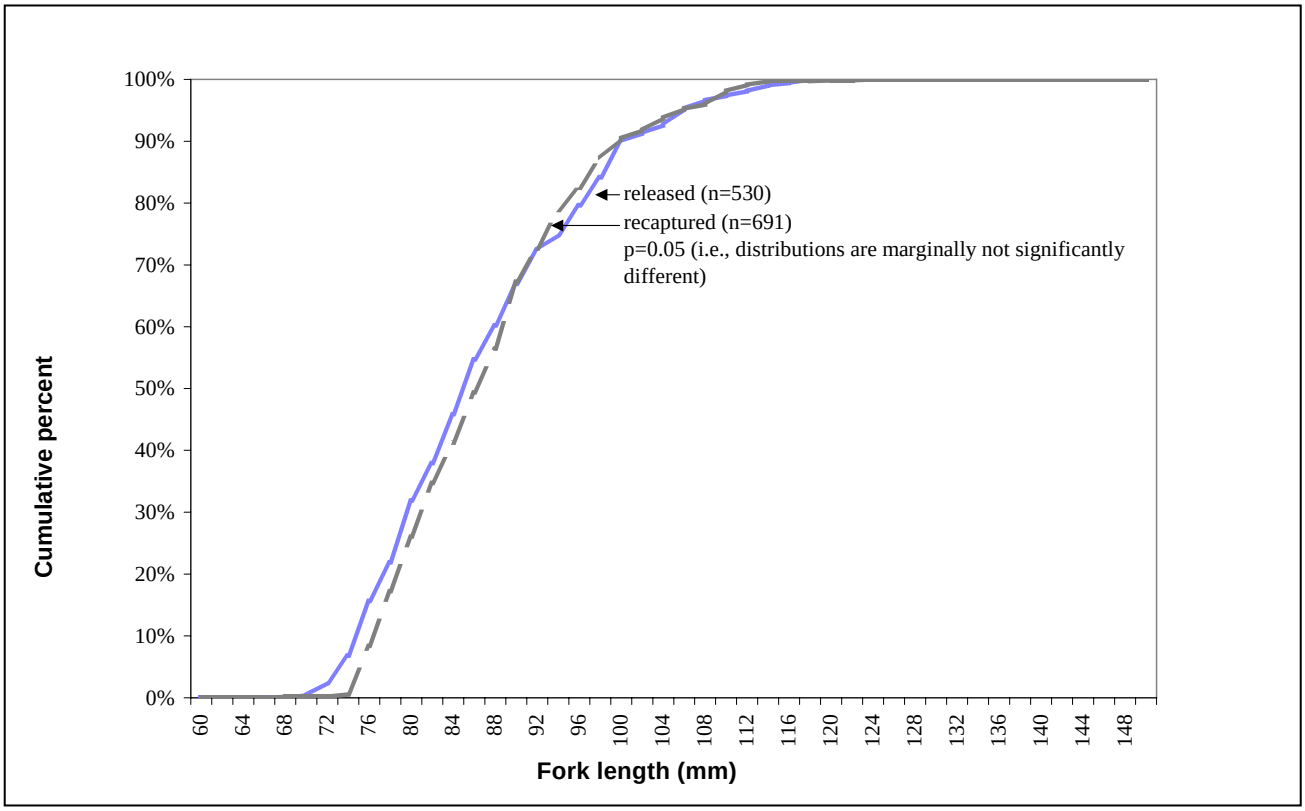


**Figure 14.**–Length frequency distributions of coho salmon smolt at the time of first capture and again during recapture at Canyon Island on the Taku River during 2001. Probability corresponds to a two-sample Kolmogorov-Smirnov test.

recaptured fish slightly larger than captured fish. An additional 41,945 Chinook salmon smolt were captured and tagged with codes 04-03-53 and 04-03-54; 89 died within 24 h of tagging and tag retention was nearly 100% leaving a release of 41,836 marked smolts. Analyses of data on tagged Chinook salmon will be published after returns from that brood (1999) are completed in calendar year 2006.

Based the recovery of CWTs and sampling a year later in 2002, an estimated 2,718,816 coho salmon smolt (SE = 363,071) had emigrated to sea in 2001 (values for capture histories are in Table 2). Coded wire tags were recovered from approximately 0.70% (163 of 23,285) smaller smolt and 1.08% (294 of 27,250) from larger smolt. These rates indicate better odds (1.54) for recovery and implied survival of larger smolt ($\chi^2$ = 20.11, df = 1, P < 0.0001). From sampling smolts in 2001, estimated fractions of smaller and larger smolt comprised of age-1.0 fish ($\hat{\phi}_1$ and $\hat{\phi}_2$) were 0.942 (SE = 0.015) and 0.454 (SE = 0.031), respectively. From sampling adults at Canyon Island in 2002, estimated fraction $\hat{p}$ of age-1.1 adults was 0.85 (SE = 0.011). From simulation the estimated ratio of catchability $\hat{\lambda}$ was 7.850 (SE = 2.219), confirming evidence that larger smolt were more likely to be captured in minnow traps. Simulated estimates of $\lambda$ had a low of 4.700, indicating that $\hat{\lambda}$ was significantly greater than one. Estimated relative bias in $\hat{\lambda}$ is low at 4.0% as is estimated bias for the abundance estimate (1.6%). Abundance as estimated with Chapman's modification of Petersen's estimator (2,292,994) was about 16% less than the estimate from equation (1).In 2002, during random sampling of marine catches, 398 adult coho salmon were found possessing CWTs germane to the Taku River (Appendix D2). The greatest number of CWTs (227) was recovered from the commercial troll fishery, nearly all which were from the Northwest Quadrant (95%) on the outer coast. Other CWTs

were recovered in the marine gillnet fisheries (95), most (76%) of them fromDistrict 111 (Taku Inlet/Stephens Passage), and twenty-nine (58) CWTs were recovered in the marine recreational fishery near Juneau from July through early September. Eighteen (18) CWTs were recovered in the seine fishery in Chatham Strait and Frederick Sound.

An estimated 83,916 (SE = 6,389) coho salmon originating upriver from Canyon Island were harvested in various marine and inriver fisheries in 2002 (Table 7; Appendix D2). Harvests in marine fisheries were estimated based on 2.02% of returning adults carrying a CWT. Eighty-two (82) of 3,765 adults sampled at Canyon Island were missing their adipose fin, 76 of which were considered valid tags (two of the valid tags were assumed as valid; one was lost during shipping and another was lost on the lab floor). Marked fractions of these sampled adults varied through the season (Table 8), but not significantly so ($\chi^2$ = 5.03, df = 5, P = 0.41). Details on the numbers examined by day at Canyon Island and in the test fishery along with the numbers of fish missing adipose fins, and numbers of valid CWTs and their respective codes are detailed in Appendix D3. Table 7 contains estimated fractions of harvest by fishery and estimated exploitation rates, and Figure 16 the weekly harvests by fishery. Estimated mean date of harvest, using techniques detailed in Mundy (1984), was 25 August for the troll fishery compared to 3 September for the gillnet fishery (Appendix D4). Mean date of estimated harvest in all marine fisheries occurred on 27 August, about two weeks later than the average seen in prior years (McPherson and Bernard 1995, 1996; McPherson et al. 1997, 1998; Yanusz et al. 1999).

Estimated harvest in the Juneau marine recreational fishery was 6,189 fish for coho salmon germane to areas of the Taku River near or above Canyon Island or 7.4% of all estimated marine and inriver harvests (83,916 fish). Expanded for the entire drainage to an estimate of 7,935 (6,189/0.78), this represents 30% of the estimated 26,273 coho salmon caught in the Juneau marine fishery, according to harvest and sampling data from Hubartt and Jaenicke (2004).

Between 2 July and 10 October, 3,765 coho salmon were captured at Canyon Island of which 3,518 were marked and released. From 7 July through 17 August, 3,082 fish were harvested in the upstream commercial fishery; 3,076 of these were sampled and 76 had spaghetti tags. After 18 August through 11 October, 4,069 fish were caught (32 of these were harvested) in the test fishery and of the total 69 carried tags; another 688 fish were harvested in the aboriginal fishery. The mark-recapture data were stratified by week (Appendix D5) and tests for consistency in SPAS (Arnason et al. 1996) indicated that equal proportions of tags were not recovered in the commercial and test fisheries ($\chi^2$ = 31.99, df = 13, P < 0.001). Comparisons of marked fractions in both fisheries were also not similar $\chi^2$ = 7.97, df = 1, P = 0.004). Results of these tests were evidence for stratifying the mark-recapture experiment by time and using Darroch's method (Seber 1982) to estimate the escapement of coho salmon in 2002. The mark-recapture data were stratified by two time and recovery periods as follows:

| Time | Number released w/ marks | Commercial fishery | Test fishery |
|---|---|---|---|
| Stratum 1 | 687 | 76 | 6 |
| Stratum 2 | 2,831 | 0 | 56 |
| Number inspected for marks | | 3,076 | 4,069 |

where Stratum 1 refer to fish released at Canyon Island between 2 July and 24 August, Stratum 2 referred to fish released between 25 August and 10 October. Using SPAS (Arnason et al. 1996), the estimated number of adult coho salmon past Canyon Island in 2002 was 223,162 (SE = 28,648). Given that 3,802 coho salmon were harvested above Canyon Island, the estimated spawning escapement of coho salmon past all fisheries in 2002 was 219,360 (SE = 28,648) (Table 7).

**Table 7.–**Estimates of smolt abundance in 2001, of adult harvest, escapement and run size in 2002 for the Taku River stock of coho salmon.

| | Estimate | SE | Exploitation rate | SE | Removal rate | SE |
|---|---|---|---|---|---|---|
| Smolt abundance (2001) | 2,718,816 | 363,071 | | | | |
| Marine survival | 0.112 | 0.018 | | | | |
| Adult run (2002) | 303,270 | 29,352 | | | | |
| Total harvest (2002) | 83,916 | 6,389 | 27.7% | 3.0% | | |
| Total marine harvest (2002) | 80,046 | 6,389 | 26.4% | 2.9% | 26.4% | 2.9% |
| Troll fishery subtotal | 39,054 | 4,345 | 12.9% | 1.6% | 12.9% | 1.6% |
| NW Quadrant | 37,461 | 4,316 | 12.4% | 1.6% | | |
| SW Quadrant | 71 | 71 | 0.0% | 0.0% | | |
| NE Quadrant | 1,388 | 482 | 0.5% | 0.1% | | |
| SE Quadrant | 133 | 133 | 0.0% | 0.0% | | |
| Seine fishery subtotal | 3,457 | 1,062 | 1.1% | 0.3% | 1.3% | 0.3% |
| District 110 | 154 | 154 | 0.1% | 0.0% | | |
| District 112 | 2,602 | 1,021 | 0.9% | 0.3% | | |
| District 114 | 700 | 251 | 0.2% | 0.1% | | |
| Recreational fishery subtotal | 6,641 | 1,366 | 2.2% | 0.4% | 2.5% | 0.4% |
| Sitka | 205 | 204 | 0.1% | 0.0% | | |
| Elfin Cove | 50 | 49 | 0.0% | 0.0% | | |
| Gustavus | 198 | 100 | 0.1% | 0.0% | | |
| Juneau | 6,189 | 1,346 | 2.0% | 0.4% | | |
| Drift gillnet subtotal | 30,894 | 4,352 | 10.2% | 1.4% | 12.2% | 1.4% |
| District 111 | 26,981 | 4,257 | 8.9% | 1.3% | | |
| District 115 | 3,913 | 906 | 1.3% | 0.2% | | |
| U.S. personal use harvest (2002)[a] | 68 | | | | | |
| Total Canadian harvest (2002)[b] | 3,802 | | 1.3% | 0.1% | 1.7% | 0.2% |
| Inriver run (2002)[c] | 223,162 | 28,648 | | | | |
| Escapement past all fisheries (2002)[d] | 219,360 | 28,648 | | | | |

[a] U.S. personal use harvest mostly occurs downriver of the mark and recapture locations.

[b] Total Canadian harvest includes the inriver commercial, test, and aboriginal fisheries.

[c] Inriver run is the estimated number of coho salmon above Canyon Island.

[d] Escapement past all fisheries is the inriver run minus the total Canadian harvest.

**Table 8.–**Numbers of adult coho salmon sampled and adipose fin-clips recovered at Canyon Island and in the Canadian test fishery in 2002. Also shown is the number of valid coded wire tags recovered at Canyon Island along with the spaghetti tag marked percent as seen in the Canadian commercial and test fisheries, the program used to estimate inriver abundance.

| | Canyon Island | | | | Test Fishery | | | |
|---|---|---|---|---|---|---|---|---|
| | Number | | | | Number | | | |
| Date | Examined | Ad clips | Valid | Marked % Ad clips | Examined[a] | Ad clips | Marked % Ad clips | Marked % Spag tags |
| July 7–Aug 3 | 277 | 4 | 4 | 1.44% | | | | 2.74% |
| Aug 4–Aug 17 | 229 | 5 | 3 | 2.18% | | | | 2.21% |
| Aug 18–Aug 31 | 1,037 | 17 | 15 | 1.64% | 417 | 1 | 0.24% | 2.22% |
| Sept 1–Sept 14 | 1,070 | 30 | 29 | 2.80% | 1,353 | 14 | 1.03% | 1.80% |
| Sept 15–Sept 28 | 816 | 16 | 15 | 1.96% | 1,009 | 13 | 1.29% | 1.05% |
| Sept 29–Oct 11 | 336 | 10 | 10 | 2.98% | 1,020 | 29 | 2.84% | 1.30% |
| Total | 3,765 | 82 | 76 | 2.18% | 3,799 | 57 | 1.50% | 1.93% |

[a] In the test fishery, of the total examined for spaghetti tags, 270 fish were not examined for adipose fin-clips.

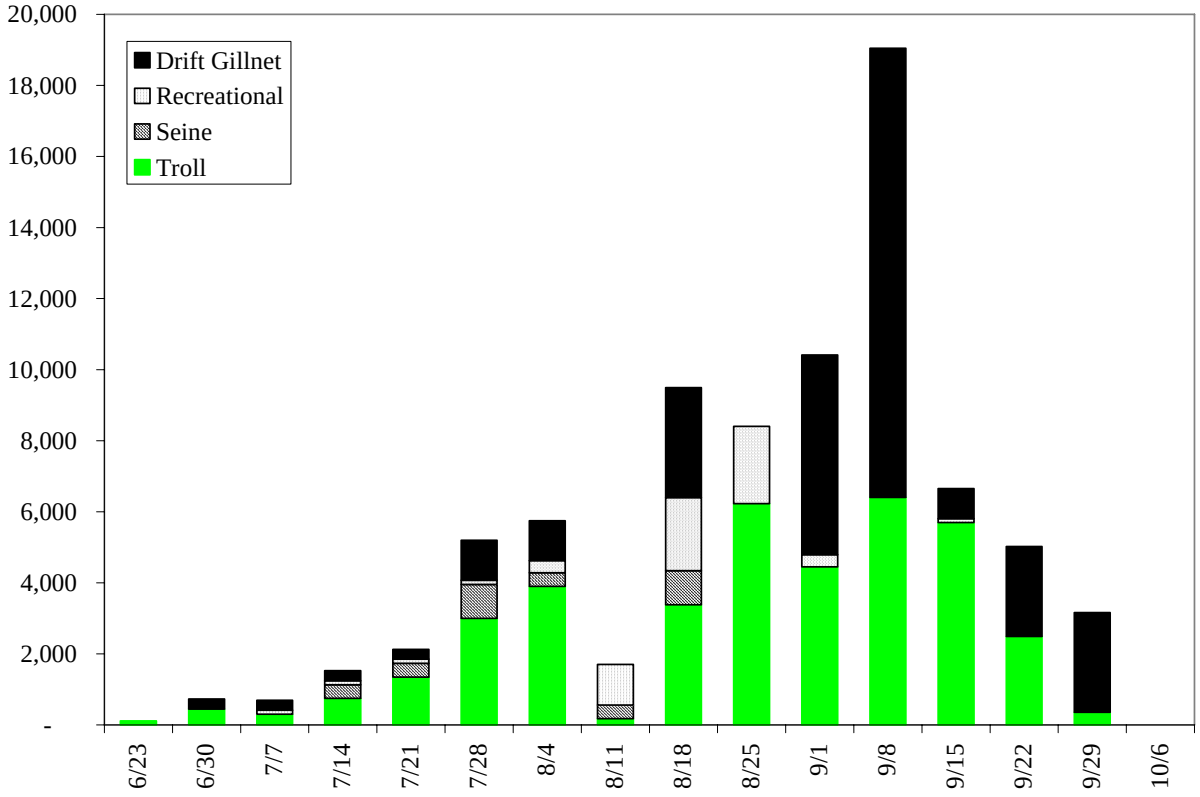


**Figure 15.–**Estimated harvests of coho salmon bound for Taku River in 2002, assigned to marine commercial and recreational fishery by statistical week (weekly estimates of harvest in the troll fishery approximated).

## PRODUCTION OF COHO SALMON 2002–2003

From 18 April through 8 June 2002, 23,258 coho salmon smolt were captured, tagged, and released with the following codes:

| Tag code | Size[a] | Number tagged | Overnight mortality | Tag retention | Final release |
|---|---|---|---|---|---|
| 040551 | small | 9,718 | 4 | 0.999 | 9,710 |
| 040544 | large | 10,806 | 10 | 1.000 | 10,796 |
| 040550 | large | 2,752 | 0 | 1.000 | 2,752 |
| Sub total | small | 9,718 | 4 | 0.999 | 9,710 |
| Sub total | large | 13,558 | 10 | 1.000 | 13,548 |
| Grand total | | 23,276 | 14 | 0.999 | 23,258 |

[a] Small coho salmon smolt were fish measured between 70-85 mm FL; large fish were > 85 mm FL.

Ninety percent (90%) of coho smolt were captured between 19 April and 21 May. Peak catches occurred from 28 April through 14 May, and 50% of the catch occurred by 7 May (Figure 17; Appendix E1). The average FL of coho salmon smolt was 88 mm (SD = 10.26; Figure 18) and average weight was 6.7 g (SD = 2.39) in 2002. Length frequencies of coho salmon smolt captured the first time and those recaptured were not significantly different (P = 0.65; Figure 19). An additional 37,834 Chinook salmon smolt were captured and tagged with codes 04-05-41, 04-05-42, 04-05-43, and 04-05-49; 39 died within 24 h of tagging and tag retention was nearly 100% leaving a release of 37,776 marked smolts. Analyses of data on tagged Chinook salmon will be published after returns from that brood (2000) are completed in calendar year 2007.

Based on the recovery of CWTs and sampling a year later in 2003, an estimated 2,988,349 coho salmon smolt (SE = 1,008,886) had emigrated to sea in 2002 (values for capture histories are in Table 2). Coded wire tags were recovered from approximately 0.76% (74 of 9,710) smaller smolt and 1.07% (145 of 13,548) from larger smolt. These rates indicate slightly better odds (1.40) for recovery and implied survival of larger smolt ($\chi^2$ = 5.75, df = 1, P = 0.0164). From sampling smolts in 2002, estimated fractions of smaller and larger smolt comprised of age-1.0 fish ($\hat{\phi}_1$ and $\hat{\phi}_2$) were 0.892 (SE = 0.030) and 0.352 (SE = 0.043), respectively. From sampling adults at Canyon Island in 2003, estimated fraction $\hat{p}$ of age-1.1 adults was 0.90 (SE = 0.010). From simulation the estimated ratio of catchability $\hat{\lambda}$ was 38.51 (SE = 686.21), indicating that larger smolt were more likely to be captured in minnow traps (in contrast to information in Figure 19). Simulated estimates had a low of 3116 and a high of 8248, indicating that $\hat{\lambda}$ was far ranging and the estimated relative bias was high at 386% as is estimated bias in the abundance estimate (8.38%). Consistent with the indication of a small difference in survival rates between large and small smolt reported above, abundance as estimated with Chapman's modification of Petersen's estimator (2,085,056) was about 18% less than the estimate from equation (1).

In 2003, during random sampling of marine catches, 197 adult coho salmon were found possessing CWTs germane to the Taku River (Appendix E2). The greatest number of CWTs (93) was recovered from the commercial troll fishery, nearly all which were from the Northwest Quadrant (95%) on the outer coast with the remaining from the Northeast Quadrant. Other CWTs were recovered in marine gillnet fisheries (65), with District 111 (Taku Inlet/Stephens Passage) providing 53% and the remainder being from District 115. Twenty-seven (27) CWTs were recovered in the marine recreational fishery near Juneau from late July through early September and 12 CWTs were recovered in the seine fisheries of Districts 112 and 114.

An estimated 82,051 (SE = 10,271) coho salmon originating upriver from Canyon Island were harvested in various marine and inriver fisheries in 2003 (Table 9; Appendix E2). Harvests in marine fisheries were estimated based on 0.97% of returning adults carrying a CWT. Thirty (30) of 2,778 adults sampled at Canyon Island were missing their adipose fin, 27 of which had tags. Marked fractions of these sampled adults varied through the season (Table 10), but not significantly ($\chi^2$ = 4.30, df = 4, P = 0.36). Details on the numbers examined by day at Canyon Island and in the test fishery along with the numbers of adipose fin clips, valid CWTs, and their respective codes can be found in Appendix E3. Table 9 contains estimated fractions of harvest by fishery and estimated exploitation rates, and Figure 20 the

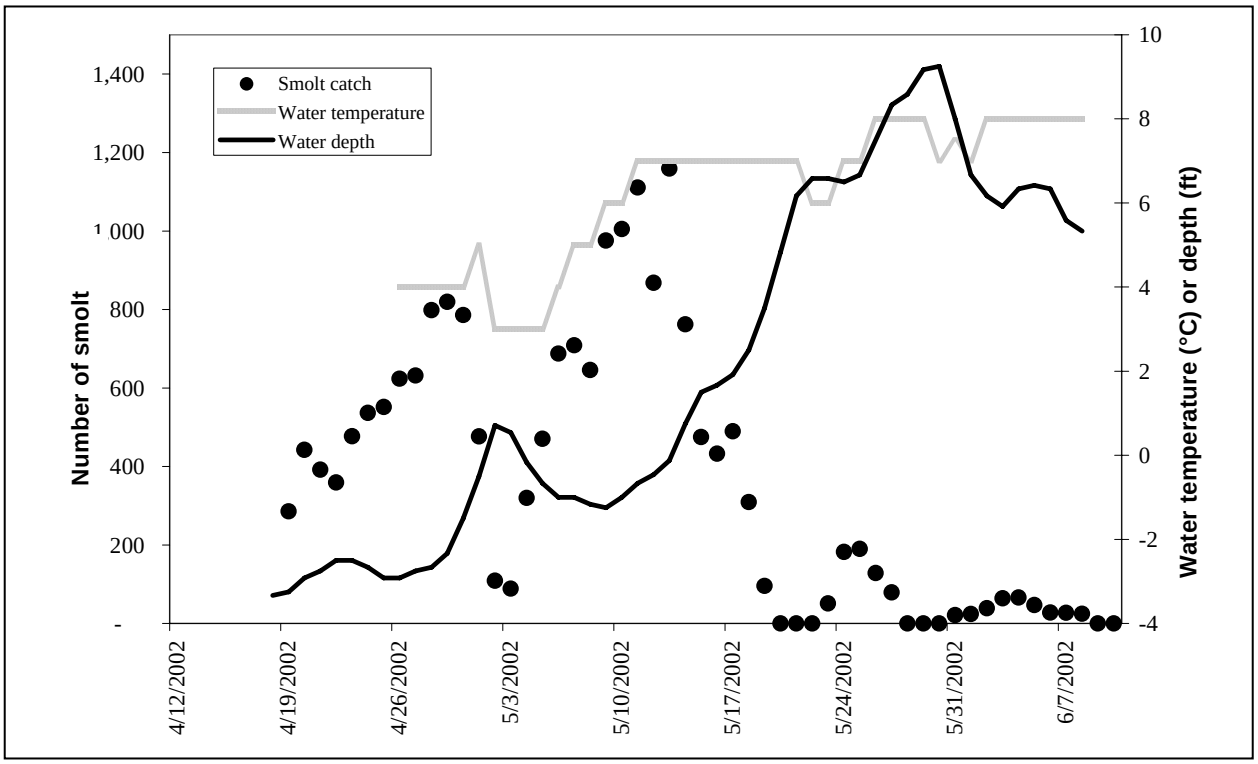


**Figure 16.–**Daily catch of coho salmon smolt ≥75mm FL and daily water temperature and depth near Canyon Island, Taku River, during 2002.

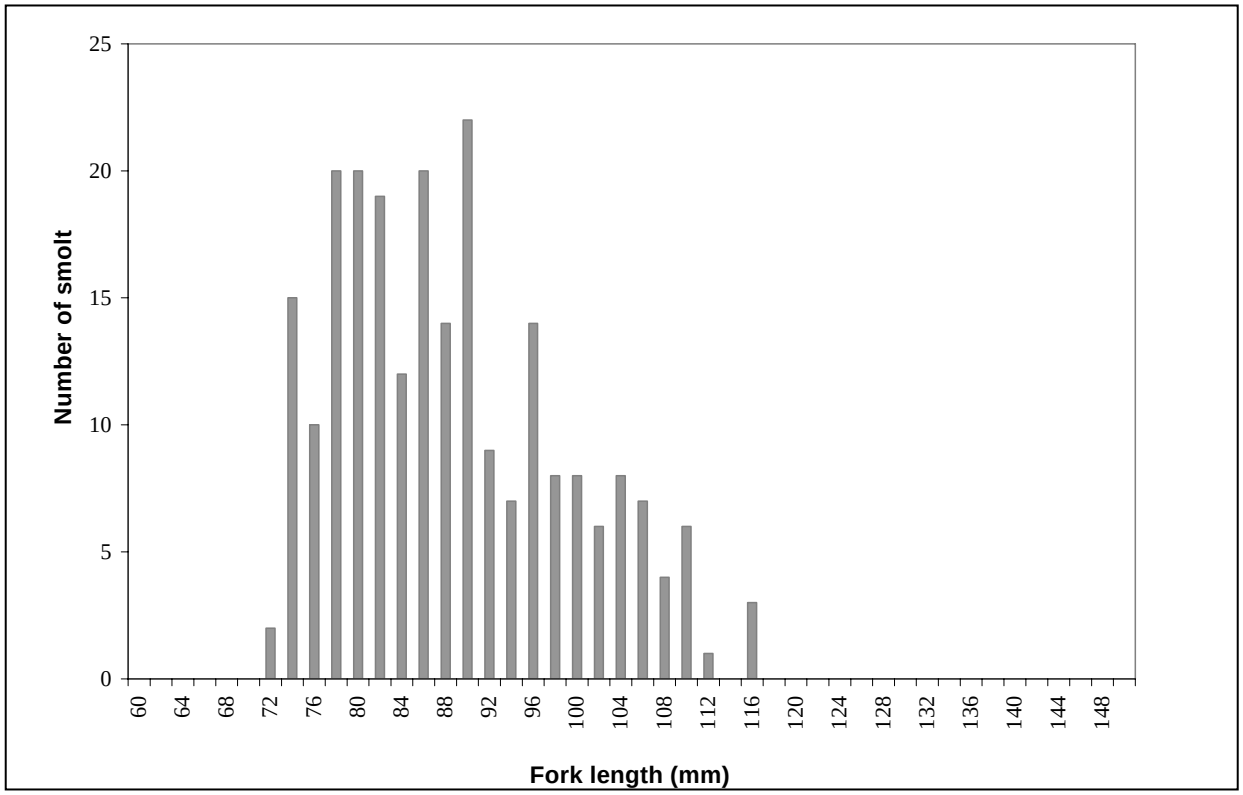


**Figure 17.–**Length frequency of 235 coho salmon smolt ≥75 mm FL captured and measured at Canyon Island, Taku River, during 2002.

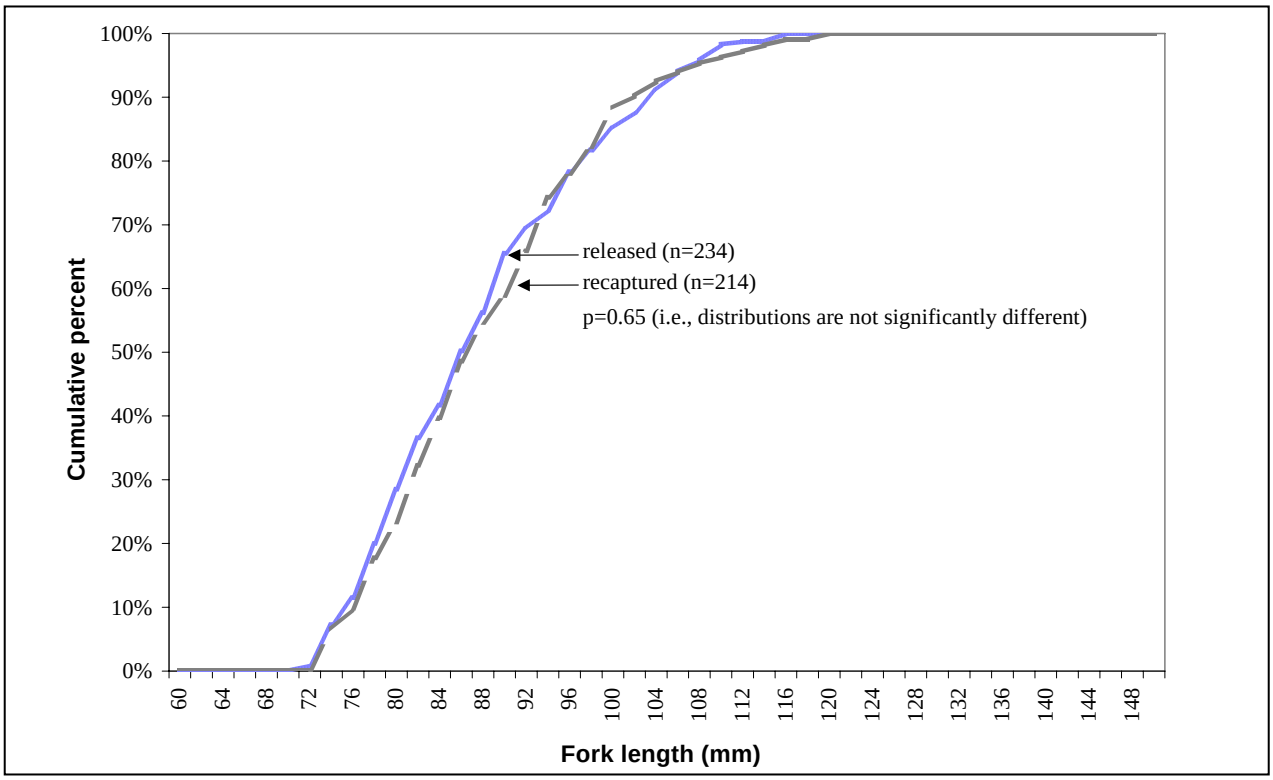


**Figure 18.–**Length frequency distributions of coho salmon smolt at the time of first capture and again during recapture at Canyon Island on the Taku River during 2002. Probability corresponds to a two-sample Kolmogorov-Smirnov test.

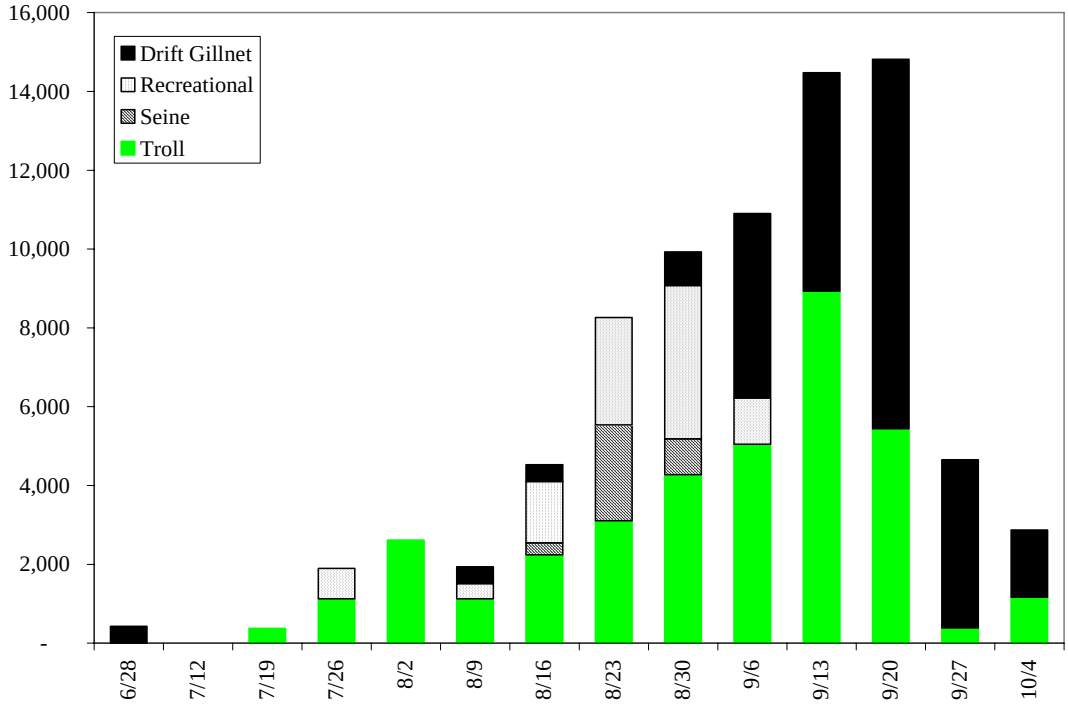


**Figure 19.–**Estimated harvests of coho salmon bound for Taku River in 2003, assigned to marine commercial and recreational fishery by statistical week (weekly estimates of harvest in the troll fishery approximated).

**Table 9.–**Estimates of smolt abundance in 2002, of adult harvest, escapement and run size in 2003 for the Taku River stock of coho salmon.

| | Estimate | SE | Exploitation rate | SE | Removal rate | SE |
|---|---|---|---|---|---|---|
| Smolt abundance (2002) | 2,988,349 | 1,008,886 | | | | |
| Marine survival | 0.089 | 0.031 | | | | |
| Adult run (2003) | 265,089 | 20,485 | | | | |
| Total harvest (2003) | 82,051 | 20,485 | 31.0% | 5.7% | | |
| Total marine harvest (2003) | 78,277 | 10,271 | 29.5% | 3.3% | 29.5% | 3.3% |
| Troll fishery subtotal | 36,433 | 6,649 | 13.7% | 2.0% | 13.7% | 2.0% |
| NW Quadrant | 34,674 | 6,595 | 13.1% | 1.9% | | |
| NE Quadrant | 1,759 | 845 | 0.7% | 0.2% | | |
| Seine fishery subtotal | 3,646 | 1,249 | 1.4% | 0.3% | 1.6% | 0.3% |
| District 112 | 3,535 | 1,244 | 1.3% | 0.3% | | |
| District 114 | 111 | 110 | 0.0% | 0.0% | | |
| Recreational fishery subtotal | 10,504 | 2,862 | 4.0% | 0.8% | 4.7% | 0.8% |
| Sitka | 412 | 412 | 0.2% | 0.1% | | |
| Gustavus | 4,200 | 2,220 | 1.6% | 0.6% | | |
| Yakutat | 470 | 338 | 0.2% | 0.1% | | |
| Juneau | 5,421 | 1,727 | 2.0% | 0.5% | | |
| Drift gillnet subtotal | 27,694 | 7,178 | 10.4% | 2.0% | 12.9% | 2.0% |
| District 111 | 19,659 | 6,937 | 7.4% | 1.9% | | |
| District 115 | 8,035 | 1,844 | 3.0% | 0.5% | | |
| U.S. personal use harvest (2003)[a] | 57 | | | | | |
| Total Canadian harvest (2003)[b] | 3,717 | | 1.4% | 0.1% | 2.0% | 0.2% |
| Inriver run (2003)[c] | 186,755 | 17,724 | | | | |
| Escapement past all fisheries (2003)[d] | 183,038 | 17,724 | | | | |

[a] U.S. personal use harvest mostly occurs downriver of the mark and recapture locations.

[b] Total Canadian harvest includes the inriver commercial, test, and aboriginal fisheries.

[c] Inriver run is the estimated number of coho salmon above Canyon Island.

[d] Escapement past all fisheries is the inriver run minus the total Canadian harvest.

**Table 10.–**Numbers of adult coho salmon sampled and adipose fin-clips recovered at Canyon Island and in the Canadian test fishery in 2003. Also shown are the numbers sampled in the Canadian inriver commercial fishery and the spaghetti tag marked percents encountered at both inriver fisheries, the program used to estimate inriver abundance.

| | **Canyon Island** | | | | **Test Fishery** | | | | **Commercial Fishery** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | | | | Number | | Marked % | | | |
| Date | Examined | Ad clips | Valid | Marked % Ad clips | Examined | Ad clips | Ad clips | Spag tags | Number Examined | Marked % Spag tags |
| June 22–Aug 16 | 312 | 1 | 1 | 0.32% | | | | | 2,130 | 1.64% |
| Aug 17–Aug 30 | 354 | 2 | 2 | 0.56% | 570 | 7 | 1.23% | 0.18% | 497 | 0.60% |
| Aug 31–Sept 13 | 1,143 | 13 | 10 | 1.14% | 1,507 | 12 | 0.80% | 2.06% | 615 | 0.49% |
| Sept 14–Sept 27 | 778 | 7 | 7 | 0.90% | 1,185 | 16 | 1.35% | 1.35% | | |
| Sept 28–Oct 11 | 416 | 7 | 7 | 1.68% | 828 | 23 | 2.78% | 2.29% | | |
| Total | 3,003 | 30 | 27 | 1.00% | 4,090 | 58 | 1.42% | 1.64% | 3,242 | 1.26% |

weekly harvests by fishery. Estimated mean date of harvest, using techniques detailed in Mundy (1984), was 27 August for the troll fishery compared to 9 September for the gillnet fishery (Appendix E4). Mean date of estimated harvest in all marine fisheries occurred on 30 August, similar to 2002 but about two weeks late compared with previous years (McPherson and Bernard 1995, 1996; McPherson et al. 1997, 1998; Yanusz et al. 1999). Estimated harvest of coho salmon bound for the Taku River above Canyon Island in the Juneau marine recreational fishery was 5,421 fish or 6.6% of all estimated marine and inriver harvests (82,051). Expanded to 6,950 (5,421/0.78) for the entire Taku River drainage, this was 37% of the estimated 18,682 coho salmon caught in the Juneau area marine fishery (Wendt and Jaenicke *In prep*).

An estimated 186,755 (SE = 17,724) adults passed upstream of Canyon Island in 2003. Between 2 July and 8 October, 3,003 coho salmon were captured at Canyon Island of which 2,775 were marked and released. From 22 June through 13 September, 3,242 coho salmon, 41 with

spaghetti tags, were harvested and examined in the upstream commercial fishery. From 17 August through 11 October, 4,090 fish were caught (59 of these were harvested) in the test fishery and of the total 67 carried spaghetti tags; another 416 fish were harvested in the aboriginal fishery. The mark-recapture data were stratified by week (Appendix E5) and tests for consistency in SPAS (Arnason et al. 1996) indicated near equal proportions of tags were recovered in the commercial and test fisheries ($\chi^2$ = 21.57, df = 15, P = 0.12). Comparisons of marked fractions in both fisheries were also similar ($\chi^2$ = 1.74, df = 1, P = 0.19). Since commercial and test fisheries were consecutive, results of these tests are evidence for having only a single stratum in the mark-recapture experiment, that is Chapman's modification of Petersen's estimator (Seber 1982) could be (and was) used to estimate abundance. Given that 3,717 coho salmon were harvested above Canyon Island, estimated spawning escapement of coho salmon past all fisheries in 2003 was 183,038 (SE = 17,724) (Table 9).

# DISCUSSION

High quality stock assessment for the Taku River stock of coho salmon is essential in order to develop and implement abundance-based management and to develop a revised MSY escapement goal as mandated in the Pacific Salmon Treaty 1999 Revised Annexes (p. 17, paragraph 2(b)(2)(i)). Results from this project are contributing to development of a long-term database. Smolt production was estimated in 1999 through 2002 and adult production 2000 through 2003, representing eleven consecutive years these parameters have been estimated for this population (Appendix F1). Escapements and inriver run sizes have been estimated by ADF&G and DFO since 1987 (Appendices F1 and F2). Methods have been developed to forecast smolt abundance and run strength since 1999. This information, along with inseason assessment of catch, escapement, and

total run (McPherson et al. 1998), have provided the tools necessary for abundance-based management, and in the near future will allow us to analyze the production relationship between parent year adults and subsequent production of adults and smolt to refine escapement goal(s) for this stock.

From 1991 to 1996, rotary screw traps were used to capture smolt. In 1997, the screw traps were decommissioned and smolt were captured using baited minnow traps. Capture with minnow traps has been shown to be size selective, catching less smaller smolt and more larger smolt. This introduced bias into the smolt abundance estimates, using a simple two-event Petersen-type estimator, and necessitated the need to generate stratified abundance estimates that began in 1999. This required tagging smolt in two size groups (small fish 70/75mm to 85mm; large fish greater than 85mm) and taking scales to estimate age structure of each size group. In 1999, the minnow trapping effort was increased to boost the numbers of smolt released with coded wire tags thereby increasing the numbers of adults recovered with CWTs for each of these four size and age categories (i.e., small age-1.1 and age-2.1 and large age-1.1 and age-2.1 fish). The results from 1999 to 2002 indicated that the simple pooled Petersen estimate underestimated the true smolt abundance by an average of 10%. The smolt abundance estimates generated 1991 to 1996 (unstratified) and 1999 to 2002 (stratified) are likely unbiased, but estimates generated in 1997 and 1998 were likely biased low by about 10%. Results from this study suggest that marine survival varies substantially by age as well as size. Smaller, younger fish had lower marine survivals than larger, older fish; moreover, larger fish survived at higher rates than younger fish even within a given size group. In general, if smolt are captured using size-selective gear, then stratified estimates are required to produce an asymptotically unbiased estimate of smolt abundance.

Coho salmon smolt captured and tagged in 1999 were smaller than those seen in prior years, 1991-1997 (Elliott and Bernard 1994; McPherson et al. 1994; McPherson and Bernard 1995, 1996; McPherson et al. 1998; Yanusz et al. 1999), and in subsequent years, 2000–2001. Not surprising, estimated rate of marine survival for the 1999 smolt was the lowest seen to date. Sizes of adults in 2000 were typical of other years. Some evidence for larger smolt having a higher probability of being captured in minnow traps was perhaps an artifact of growth in body size. Smolt recaptured in minnow traps soon after release were significantly larger than those captured only once in 1999 and 2001, but not 2000. One obvious explanation for this circumstance was that fish might grow between release and recapture, yet this was not the case for fish in 2000.

Generally during smolt trapping, water temperatures increase dramatically over the first few weeks of work (Figures 4, 10, 15), and accelerated growth typically results. Average smolt size was larger in May than April for all years of this study. However, growth from April to May in a year does not affect the estimate of $\lambda$ (catchability); that indicated larger smolts were more likely to be captured. Estimated rates of marine survival of smolts in 1999 and 2000 were 5.4% and 6.4%, respectively, which were well below the average rates observed for earlier years (1993–1998 12.7% average over 1993–1998 from Yanusz et al. 2000; Appendix F1). For smolt in 2001, the estimated rate of marine survival increased dramatically (11.2%) to near average levels.

From 1987 to 2000, fish wheels were used to capture adult coho salmon at Canyon Island. During most of these years, budget restrictions and/or water levels resulted in ADF&G operating the fish wheels for only part of September and as a result inriver run estimates were expanded, by using information on fishery performance, to estimate the remainder of the escapement through the first week of October. Beginning in 2001, to ameliorate these budget shortfalls and improve stock assessment, additional funding from the Southeast Sustainable Salmon Fund was granted to extend the project through the first week of October. When fish wheels were not operable, set gillnets were used to capture adult coho salmon for tagging requirements. These efforts enabled estimation of the inriver run size and escapement

through the duration of the run, which is vital to improving management and the pending escapement goal analyses.

During periods of low water, fish wheels will spin at less than optimal rates and gillnets are then used to capture fish. The specific gauge levels vary from year to year but low water levels can be generalized as 4 ft or less and fish wheel revolutions of 2 per minute. At higher water levels, fish wheels spin at greater than optimal rates decreasing efficiency. The use of gillnets was avoided if there was too much drag on the net (due to high flow rates) which caused significant mortality rates on fish. Equal probability of recapture was also attempted during event 2 by having weekly openings of the Canadian commercial fishery. However, this fishery ceased by early September in all three years and sampling was then dependent on the test fishery.

The estimates of escapement generated by this study were minimum estimates for the entire Taku River as many fish spawn downstream of Canyon Island. As much as 22% of the spawning occurs below the Canadian border (Eiler et al. 1993), and only a small portion of the U.S. population is believed to spawn above Canyon Island. Using that expansion, we estimated coho salmon escapement in the entire Taku River in 2000 at 85,536 ([65,751 + 4,395]/0.78 – 4,395), marine harvest at 49,963 (38,971/0.78), and total run at 139,894; in 2001 at 135,492 ([105,173 + 2,320]/0.78 – 2,320), marine harvest at 70,851 (55,264/0.78), and total run at 208,662; and in 2002 at 282,303 ([219,360 + 3,802]/0.78 – 3,802), marine harvest at 102,702 (80,108/0.78), and total run at 388,808 (Appendix F1). Exploitation rates and marine survival rates for populations spawning downstream of Canyon Island were assumed to be the same as rates for fish spawning above Canyon Island. Studies on downstream tributaries such as Yehring Creek indicated fish that spawn in these tributaries rear in these tributaries (Elliott and Sterritt 1990), making estimates of smolt abundance at Canyon Island germane to populations spawning upstream.

Continued efforts to maximize the numbers of smolt tagged with CWTs are recommended to increase precision of smolt and adult parameter estimates. Tagging smolt early each spring helps to cover a greater proportion of smolt emigration and adding a third trap line during the peak of outmigration substantially increases smolt catches. Minnow traps have proven to be size-selective so future studies should continue to tag smolt stratified by size thereby emphasizing the need to continue sampling scales from smolt for age composition analyses. Just as important, increasing the numbers tagged for each size and age category is mandatory in order to increase our precision by boosting our adult recovery rates inriver the following year. Sampling of adults at Canyon Island using gillnets and fish wheels should also be maximized with catchability rates held nearly consistent throughout the run to increase the precision in estimates of marked fractions. The inriver capture-recapture program should continue to be funded to produce escapement estimates through the first week in October. Set gillnetting has worked well as a means to capture and mark fish when river levels late in the season became too low to operate the fish wheels adequately.

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# APPENDIX A

**Appendix A1.–**Bibliography of historical stock assessment studies conducted on the Taku River.

| Citation | Location | Objective(s) |
|---|---|---|
| Eiler et al. 1993 | Taku River | Spawning distribution |
| Elliott and Kuntz 1988 | Yehring Creek | 1986 escapement |
| Elliott and Kuntz 1988 | Yehring Creek | 1987 smolt samples |
| | | 1987 escapement |
| Elliott et al. 1989 | Yehring Creek | 1988 harvest and escapement |
| | | 1987 smolt abundance and survival |
| | | 1988 smolt abundance |
| | Nahlin River | 1988 harvest and escapement |
| | | 1988 juvenile tagging |
| Elliott and Sterritt 1990 | Yehring Creek | 1989 harvest and escapement |
| | | 1988 smolt abundance and survival |
| | | 1989 smolt abundance |
| Elliott and Sterritt 1991 | Yehring Creek | 1990 harvest and escapement |
| | | 1989 smolt abundance and survival |
| | Nahlin River | 1990 smolt tagging |
| Elliott 1992 | Yehring Creek | Smolt capture methods |
| Elliott and Bernard 1994 | Taku River | 1991 smolt abundance and 1992 adult harvest and escapement |
| Gray et al. 1978 | Moose Creek | Harvest estimate |
| | Johnson Creek | Harvest estimate |
| | Yehring Creek | Harvest estimate |
| | Other tribs. | Harvest estimate |
| McPherson et al. 1998 | Taku River | 1995 escapement |
| McPherson et al. 1998 | Taku River | 1996 escapement |
| Kelley and Milligan 1999 | Taku River | 1997 escapement |
| McGregor and Clark. 1988 | Taku River | 1987 escapement |
| McGregor and Clark 1989 | Taku River | 1988 escapement |
| McGregor et al. 1991 | Taku River | 1989 escapement |
| McPherson et al. 1994 | Taku River | 1992 smolt abundance and survival |
| | | 1993 harvest and escapement |
| McPherson and Bernard 1995 | Taku River | 1993 smolt abundance and survival |
| | | 1994 harvest and escapement |
| McPherson and Bernard 1996 | Taku River | 1994 smolt abundance and survival |
| | | 1995 harvest and escapement |
| McPherson et al. 1997 | Taku River | 1995 smolt abundance and survival |
| | | 1996 harvest and escapement |
| McPherson et al. 1998 | Taku River | 1996 smolt abundance and survival |
| | | 1997 harvest and escapement |
| Murphy et al. 1988 | Taku River | 1987 smolt tagging |
| PSC 1993 | Taku River | 1992 escapement |
| Shaul 1987 | Nahlin River | 1986 escapement |
| | | 1986 juvenile tagging |
| | Tatsamenie L. | 1986 escapement |
| Shaul 1987 | Tatsamenie L. | 1986 juvenile tagging |
| | Dudidontu R. | 1986 escapement |
| Shaul 1988 | Tatsamenie L. | 1987 juvenile tagging |
| Shaul 1989 | Nahlin River | 1988 harvest |
| | Mainstem | 1988 harvest |
| | Tatsamenie L. | 1988 harvest |
| | Sheslay R. | 1988 harvest |
| | Yehring Creek | 1988 harvest |
| | U.S. tribs. | 1988 escapement |

-continued-

**Appendix A1.**–Page 2 of 2.

| Citation | Location | Objective(s) |
|---|---|---|
| Shaul 1990 | Nahlin River | 1989 harvest |
| | Mainstem | 1989 harvest |
| | Tatsamenie L. | 1989 harvest |
| | Yehring Creek | 1989 harvest |
| | U.S. tribs. | 1989 escapement |
| Shaul et al. 2003 | Nahlin River | 1990 harvest |
| | Mainstem | 1990 harvest |
| | Tatsamenie L. | 1990 harvest |
| | Yehring Creek | 1990 harvest |
| | U.S. tribs. | 1990 escapement |
| Yanusz et al. 1999 | Taku River | 1997 smolt abundance and survival |
| | | 1998 harvest and escapement |
| Yanusz et al. 2000 | Taku River | 1998 smolt abundance and survival |
| | | 1999 harvest and escapement |

**Appendix A2.–**Estimating abundance with group-specific rates of being marked and of surviving.

When a population is divided into two groups labeled (1) and (2), Petersen's model of a mark-recapture experiment can be expressed as:

$$N_1 + N_2 = (N_1\alpha_1 + N_2\alpha_2)\frac{N_1\alpha_1 S_1\beta_1 + N_2\alpha_2 S_2\beta_2 + N_1(1-\alpha_1)S_1\beta_1 + N_2(1-\alpha_2)S_2\beta_2}{N_1\alpha_1 S_1\beta_1 + N_2\alpha_2 S_2\beta_2}$$

where $N$ is abundance, $\alpha$ is the rate at which members of the group are marked (tagged), $S$ the rate at which members survive to return as adults, and $\beta$ the rate at which surviving members are captured. If all adults have an equal probability of being captured in the experiment regardless of group membership, and of their having or not having a mark, then $\beta_1 = \beta_2 = \beta$, and the equation above reduces to:

$$N_1 + N_2 = (N_1\alpha_1 + N_2\alpha_2)\frac{N_1\alpha_1 S_1 + N_2\alpha_2 S_2 + N_1(1-\alpha_1)S_1 + N_2(1-\alpha_2)S_2}{N_1\alpha_1 S_1 + N_2\alpha_2 S_2}$$

Relationships between capture rates and between survival rates by group can be expressed as $\alpha_2 = \alpha_1\lambda$ and $S_2 = S_1\delta$, respectively. Plugging these relationships into the equation immediately above and simplifying produces:

$$N_1 + N_2 = \frac{(N_1 + \lambda N_2)(N_1 + \delta N_2)}{N_1 + \lambda\delta N_2}$$

Note that this result is false only when $\lambda \neq 1$ (i.e., $\alpha_1 \neq \alpha_2$) <u>and</u> $\delta \neq 1$ (i.e., $S_1 \neq S_2$), that is, when groups of smolts are tagged at different rates and survive at different rates.

Note that for an estimate using Chapman's modification of Petersen's model, $\hat{N} = (M_1 + M_2 + 1)(C + 1)/(R_1 + R_2 + 1)$ where $M$ is the number marked by group, $C$ the number inspected for marks, and $R$ the number of marks recovered by group. Since $\lambda > 1$ and $\delta > 1$, $N > \hat{N}$. However, if group (1) had had the same marking rate as group (2), $\lambda M_1$ smolt would have been marked and $\lambda R_1$ would have been recaptured as adults. Plugging an estimate for $\lambda$ into the model produces a rescaled estimate of abundance:

$$\hat{N} = \frac{(\hat{\lambda}M_1 + M_2 + 1)(C+1)}{\hat{\lambda}R_1 + R_2 + 1} - 1$$

The expected value of $\hat{N}$ is $N$ because in the rescaled situation the two groups have the same effective marking rate. Unfortunately, values for $R$ must often be estimated because not all recaptured adults can be assigned to a smolt group; tags are shed or heads are lost before tags can be retrieved and decoded. If there are $R_3$ of such recaptured fish of unknown origin, a naïve adjustment to the estimator would be:

$$\hat{N} = \frac{(\hat{\lambda}M_1 + M_2 + 1)(C+1)}{\hat{\lambda}(R_1 + \pi R_3) + R_2 + (1-\pi)R_3 + 1} - 1$$

where $\pi$ is the fraction of recaptured fish from group (1) recaptured as adults. Tags summed by group no matter how recovered from adults can be used to estimate $\pi$.

**Appendix A3.–**Estimation of the ratio of catchabilities between large and small smolt.

The fraction $p$ of adults with 1-freshwater age (age-1.) can be expressed as:

$$p = \frac{N_1\phi_1 S_1 + N_2\phi_2 S_2}{N_1 S_1 + N_2 S_2} = \frac{N_1\phi_1 S_1 + N_2\phi_2\delta S_1}{N_1 S_1 + N_2\delta S_1} = \frac{N_1\phi_1 + N_2\phi_2\delta}{N_1 + N_2\delta}$$

where $N$ is smolt number by smolt size group, $S$ their survival rate, $\phi$ the fraction of the smolt group comprised of age-1. smolt, and $\delta$ is the ratio of survival rates $S_2/S_1$. This relationship simplifies to:

$$\frac{N_1}{N_2} = \frac{\delta(\phi_2 - p)}{(p - \phi_1)}$$

If $\alpha$ is the capture rate of smolts, then $M_1 = \alpha_1 N_1$ and $M_2 = \alpha_2 N_2$, and:

$$\frac{N_1}{N_2} = \frac{M_1}{M_2}\frac{\alpha_2}{\alpha_1} = \frac{\delta(\phi_2 - p)}{(p - \phi_1)}$$

If $\lambda$ is the ratio of catchability for the two groups of smolts, then $\lambda = \alpha_2/\alpha_1$ since fishing effort by definition is equal for both groups. Substitution creates:

$$\lambda = \frac{M_2\delta(\phi_2 - p)}{M_1(p - \phi_1)}$$

A naïve estimate of $\hat{\lambda}$ is therefore:

$$\hat{\lambda} = \frac{M_2\hat{\delta}(\hat{\phi}_2 - \hat{p})}{M_1(\hat{p} - \hat{\phi}_1)}$$

Noting that the estimate for the ratio of survival rates is:

$$\hat{\delta} = \frac{\hat{T}_2}{M_2}\frac{M_1}{\hat{T}_1}$$

A simpler estimate for $\lambda$ is:

$$\hat{\lambda} = \frac{\hat{T}_2(\hat{\phi}_2 - \hat{p})}{\hat{T}_1(\hat{p} - \hat{\phi}_1)}$$

**Appendix A4.–**Listing of QuickBASIC program SMLTTAKU.BAS.

Program is initialized to bootstrap the estimate of abundance for the stock of Taku River coho salmon smolt outmigrating in 1999.

```
10 CLS
50 OPEN "TakCoh99.TXT" FOR OUTPUT AS #1
100 DIM CDF(10), N(10), PHI(2), PHIP(2)
150 RANDOMIZE
190 REM -------------------------------------------Inputs
195 NITER = 200
196 PI = 98 / (98 + 158)
197 N(2) = 18712 - 98
200 N(3) = 11972 - 158
210 N(4) = 19
220 N(5) = 14
230 N(6) = 2 * PI
251 N(7) = 2 * (1 - PI)
261 N(8) = 98 - 19 - PI * 2
265 N(9) = 158 - 14 - (1 - PI) * 2
266 N(10) = 1877 - 19 - 14 - 2
275 PHI(1) = 178 / 184
280 PHI(2) = 30 / 62
282 SSRATE = 125
283 P = 515 / 648
284 ASMPLS = 648
285 REM ---------------------------------------Notation
286 REM N(1-10), phi, pi, R, M, T, C, LAMBDA as defined in report
287 REM SSRATE is the rate at which smolts were sampled to determine age (one out of every SSRATE smolt tagged)
288 REM ASMPLS is the number of adults sampled to determine age composition
290 REM --------------------------------------Estimate Abundance
292 R1 = N(4): R2 = N(5): R3 = N(6) + N(7)
297 T1 = N(8) + R1 + N(6): T2 = N(9) + R2 + N(7)
303 C = N(10) + R1 + R2 + R3
305 M1 = N(2) + T1: M2 = N(3) + T2
307 PI = T1 / (T1 + T2)
312 A = (PHI(2) - P) * T2 / (P - PHI(1)) / T1
320 NS = (A * M1 + M2 + 1) * (C + 1) / (A * (R1 + PI * R3) + R2 + (1 - PI) * R3 + 1)
325 PRINT X; R1; R2; R3; T1; T2; M1; M2; C; PI; PHI(1); PHI(2); P; A; NS
326 PRINT #1, X; R1; R2; R3; T1; T2; M1; M2; C; PI; PHI(1); PHI(2); P; A; NS
330 REM --------------------------------------Set up CDF
332 N(1) = NS - M1 - M2 - C + R1 + R2 + R3
335 CDF(1) = N(1) / NS
340 FOR I = 2 TO 10
350 CDF(I) = N(I) / NS + CDF(I - 1)
352 NEXT I
460 REM ---------------------------------------Iterate ===== START HERE
465 NPSQ = NPSUM = 0
470 FOR I = 1 TO NITER
480 FOR J = 1 TO 10: N(J) = 0: NEXT J
490 FOR J = 1 TO NS
500 X = RND
510 FOR K = 1 TO 9
```

-continued-

**Appendix A4**.–Page 2 of 2

```
520 IF X < CDF(K) THEN N(K) = N(K) + 1: GOTO 540
530 NEXT K
535 N(10) = N(10) + 1
540 NEXT J
550 REM -------------Recalculate statistics
555 R1 = N(4): R2 = N(5): R3 = N(6) + N(7)
560 T1 = N(8) + R1 + N(6): T2 = N(9) + R2 + N(7)
565 C = N(10) + R1 + R2 + R3
570 M1 = N(2) + T1: M2 = N(3) + T2
575 PI = T1 / (T1 + T2)
576 REM ------------------------------------Simulate phi's and p
577 SN = INT(M1 / SSRATE + .5): SS = 0
579 FOR J = 1 TO SN: IF RND < PHI(1) THEN SS = SS + 1
580 NEXT J: PHIP(1) = SS / SN
581 SN = INT(M2 / SSRATE + .5): SS = 0
582 FOR J = 1 TO SN: IF RND < PHI(2) THEN SS = SS + 1
583 NEXT J: PHIP(2) = SS / SN
588 SS = 0
590 FOR J = 1 TO ASMPLS: IF RND < P THEN SS = SS + 1
592 NEXT J: PP = SS / ASMPLS
605 LAMBDA = (PHIP(2) - PP) * T2 / (PP - PHIP(1)) / T1
610 NP = (LAMBDA * M1 + M2 + 1) * (C + 1) / (LAMBDA * (R1 + PI * R3) + R2 + (1 - PI) * R3 + 1)
710 REM ------------Tally statistics
720 NPSQ = NP * NP + NPSQ: NPSUM = NP + NPSUM
725 PRINT #1, I; R1; R2; R3; T1; T2; M1; M2; C; PI; PHIP(1); PHIP(2); PP; LAMBDA; NP
726 PRINT I; R1; R2; R3; T1; T2; M1; M2; C; PI; PHIP(1); PHIP(2); PP; LAMBDA; NP
730 NEXT I
740 REM -------------------------------------Output statistics
750 NB = NPSUM / NITER: SEN = SQR((NPSQ - NPSUM * NPSUM / NITER) / (NITER - 1))
760 PRINT NB; SEN
770 END
```

# APPENDIX B

**Appendix B1.–**Number of salmon smolt caught in minnow traps near Canyon Island on the Taku River during 1999. Days with trap sets but no catches indicate that fish caught were held one, two, or three days until enough were accumulated for tagging.

| | | Daily catch | | Catch per trap | | Air temperature (°C) | | | Water | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Trap sets | Coho | Chinook | Coho | Chinook | Min. | Max. | Precipitation (inches) | Temp. (°C) | Stage (ft.) |
| 15-Apr | 13 | | | | | | | | | |
| 16-Apr | 52 | | | | | | | | | |
| 17-Apr | 84 | | | | | | | | | |
| 18-Apr | 98 | 934 | 688 | 4 | 3 | | | | 2.0 | |
| 19-Apr | 100 | | | | | | | | | |
| 20-Apr | 81 | | | | | | | | | |
| 21-Apr | 92 | 1,404 | 438 | 5 | 2 | | | | 2.0 | 0.3 |
| 22-Apr | 114 | | | | | | | | | |
| 23-Apr | 115 | 734 | 187 | 3 | 1 | | | | 2.0 | 0.3 |
| 24-Apr | 120 | | | | | | | | | |
| 25-Apr | 110 | 1,850 | 451 | 8 | 2 | -1 | 9 | | 2.0 | 0.3 |
| 26-Apr | 130 | 952 | 349 | 7 | 3 | -1 | 10 | | 2.5 | 0.0 |
| 27-Apr | 139 | 994 | 339 | 8 | 3 | -6 | 11 | | 2.5 | -0.1 |
| 28-Apr | 139 | 1,639 | 481 | 12 | 4 | -2 | 16 | 0.02 | 2.5 | |
| 29-Apr | 133 | 1,473 | 559 | 11 | 4 | -1 | 11 | 0.01 | 3.0 | |
| 30-Apr | 128 | | | | | -1 | 12 | | 4.0 | |
| 1-May | 137 | 1,580 | 836 | 6 | 3 | 2 | 14 | 0.03 | 4.0 | |
| 2-May | 140 | | | | | -2 | 8 | 0.61 | 4.0 | |
| 3-May | 144 | 1,753 | 1,315 | 6 | 5 | -3 | 7 | | 4.5 | |
| 4-May | 127 | 354 | 264 | 3 | 2 | -5 | 12 | | 4.5 | |
| 5-May | 136 | 1,577 | 1,066 | 11 | 7 | -1 | 16 | | 4.5 | -0.8 |
| 6-May | 141 | 686 | 1,413 | 5 | 10 | 5 | 17 | | 4.5 | |
| 7-May | 139 | 2,205 | 430 | 19 | 4 | 1 | 12 | 0.12 | 4.5 | |
| 8-May | 142 | 639 | 342 | 6 | 3 | | | | 5.0 | |
| 9-May | 140 | 499 | 351 | 4 | 3 | -4 | 19 | | 5.5 | |
| 10-May | 141 | 646 | 656 | 10 | 11 | -2 | 18 | | 5.5 | |
| 11-May | 137 | 567 | 378 | 12 | 8 | -5 | 17 | | 6.0 | |
| 12-May | 146 | | | | | 4 | 19 | 0.15 | 6.5 | |
| 13-May | 139 | 677 | 428 | 2 | 2 | 2 | 17 | | 7.0 | 0.2 |
| 14-May | 116 | | | | | | 22 | 0.01 | 7.0 | |
| 15-May | 115 | 732 | 153 | 3 | 1 | | | | 6.5 | |
| 16-May | 118 | 695 | 68 | 6 | 1 | -2 | 19 | | 6.5 | |
| 17-May | 62 | 707 | 125 | 11 | 2 | 4 | 19 | | 6.0 | |
| 18-May | 47 | 593 | 190 | 13 | 4 | 5 | 15 | 0.03 | 6.5 | |
| 19-May | 71 | 387 | 127 | 5 | 2 | 3 | 18 | 0.04 | 7.0 | 3.0 |
| 20-May | 68 | 803 | 571 | 12 | 8 | 5 | 18 | 0.12 | 6.5 | 3.0 |
| 21-May | 70 | 843 | 733 | 12 | 10 | 4 | 14 | 0.17 | 6.5 | 3.0 |
| 22-May | 65 | 527 | 593 | 8 | 9 | 9 | 18 | 0.15 | 6.5 | 3.1 |
| 23-May | 66 | 540 | 888 | 8 | 13 | 4 | 17 | 0.01 | 6.0 | 3.1 |
| 24-May | 63 | 427 | 994 | 7 | 16 | 4 | 9 | 0.86 | 5.5 | 3.2 |
| 25-May | 45 | 218 | 694 | 5 | 15 | 4 | 7 | 0.25 | 6.0 | 4.3 |
| 26-May | 62 | | | | | 3 | 10 | 0.23 | | |
| 27-May | 57 | 358 | 552 | 3 | 5 | 4 | 16 | 0.04 | | 3.3 |
| 28-May | 68 | 303 | 437 | 4 | 6 | 3 | 17 | 0.29 | | 3.0 |
| 29-May | 149 | | | | | | | | | |
| 30-May | 143 | 700 | 973 | 2 | 3 | 4 | 16 | 0.06 | 9.0 | 2.4 |

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**Appendix B1**.–Page 2 of 2.

| | | Daily catch | | Catch per trap | | Air temperature (°C) | | | Water | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Trap sets** | **Coho** | **Chinook** | **Coho** | **Chinook** | **Min.** | **Max.** | **Precipitation (inches)** | **Temp. (°C)** | **Stage (ft)** |
| 31-May | 142 | | | | | 3 | 13 | 0.35 | | |
| 1-Jun | 133 | 572 | 531 | 2 | 2 | | 18 | 0.01 | 8.0 | |
| 2-Jun | 100 | | | | | 8 | 23 | | 9.0 | |
| 3-Jun | 29 | 732 | 305 | 3 | 4 | 5 | 17 | 0.14 | 7.0 | |
| 4-Jun | 29 | 44 | 109 | | | 4 | 14 | 0.03 | 8.0 | |
| 5-Jun | 89 | | 5 | | | 9 | 18 | 0.02 | 8.0 | |
| 6-Jun | 62 | | 7 | 4 | 2 | 4 | 18 | 0.03 | 8.0 | |
| 7-Jun | | 732 | 305 | 3 | 4 | | | | | |
| 8-Jun | | 44 | 109 | | | | | | | |
| 13-Jun | | | 5 | | | | | | | |
| Total | 5,426 | 30,684 | 19,531 | | | | | 3.78 | | |
| Mean | | | | 7 .0 | 5 .0 | | | | | |

**Appendix B2.–**Estimated marine harvest of adult coho salmon bound for the Taku River above Canyon Island in 2000. Calculations follow equations in Table 2 of Bernard and Clark (1996) with 0.0176 used as an estimate of θ and 0.0190 for G(θ -1). Definitions of notation used to label these and other statistics are immediately below. In fishing periods and fishing quadrants for which no CWT was recovered with the appropriate code, harvest was assumed to be zero.

| | | |
|---|---|---|
| $a_i$ | = | number of adults missing adipose fins in a sample from catch in a stratum |
| $a_i'$ | = | number of heads that arrive at Juneau for dissection (subset of $a_i$) in a stratum |
| $r_i$ | = | number of adults from the stock harvested in a stratum in year *j* |
| $m_{ci}$ | = | number of CWTs with the appropriate code(s) (subset of $t_i'$) in a stratum |
| $n_i$ | = | number of adults caught in a stratum inspected for missing adipose fins |
| $t_i$ | = | number of heads with tags detected magnetically (subset of $a_i'$) in a stratum |
| $t_i'$ | = | number of CWTs found through dissection and decoded (subset of $t_i$) in a stratum |
| $\theta$ | = | fraction of the stock with CWTs |
| $G(\theta^{-1})$ | = | squared coefficient of variation for the estimate of $1/\theta$ |

**TROLL FISHERY**

| Stat. weeks | Dates | Per. | Quad. | $H$ | v($H$) | $n$ | $a$ | $a'$ | $t$ | $t'$ | $m_c$ | $\hat{r}$ | SE($\hat{r}$) | RP($\hat{r}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28-32 | 7/5–8/11 | 3 | NW | 516,094 | | 146,026 | 3,164 | 3,127 | 2,576 | 2,573 | 47 | 9,571 | 1,909 | 39% |
| 28 | 7/7 | 3 | NE | 11,916 | | 5,758 | 109 | 106 | 86 | 86 | 1 | 121 | 121 | 195% |
| 29 | 7/13 | 3 | SW | 25,198 | | 18,133 | 294 | 291 | 227 | 227 | 1 | 80 | 79 | 195% |
| 33-34 | 8/7–8/14 | 4 | NW | 128,318 | | 45,686 | 1,147 | 1,138 | 945 | 944 | 14 | 2,257 | 672 | 58% |
| 33 | 8/8 | 4 | NE | 18,021 | | 4,589 | 66 | 64 | 51 | 51 | 1 | 230 | 230 | 196% |
| 35-37 | 8/24–9/8 | 5 | NW | 135,765 | | 52,283 | 1,735 | 1,720 | 1,501 | 1,497 | 33 | 4,930 | 1,086 | 43% |
| 35-36 | 8/26–8/29 | 5 | NE | 10,494 | | 5,617 | 78 | 75 | 67 | 67 | 3 | 332 | 194 | 115% |
| 38-39 | 9/11–9/21 | 6 | NW | 33,409 | | 13,063 | 504 | 499 | 442 | 441 | 24 | 3,534 | 863 | 48% |
| 38 | 9/11–9/13 | 6 | NE | 978 | | 614 | 23 | 23 | 19 | 19 | 2 | 181 | 129 | 139% |
| Subtotal troll fishery | | | | 880,193 | | 291,769 | 7,120 | 7,043 | 5,914 | 5,905 | 126 | 21,236 | 2,480 | 22.9% |

**SEINE FISHERY**

| Stat. week | Dates | District | $H$ | v($H$) | $n$ | $a$ | $a'$ | $t$ | $t'$ | $m_c$ | $\hat{r}$ | SE($\hat{r}$) | RP($\hat{r}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 7/27 | 112 | 2,124 | | 699 | 5 | 5 | 4 | 4 | 1 | 173 | 172 | 195% |
| 34 | 8/16–8/19 | 112 | 1,605 | | 5,501 | 114 | 112 | 93 | 93 | 8 | 1,482 | 557 | 74% |
| 35 | 8/24 | 113 | 2,388 | | 1,034 | 31 | 31 | 27 | 27 | 2 | 263 | 187 | 139% |
| 35 | 8/23–8/24 | 112 | 7,096 | | 3,773 | 74 | 74 | 62 | 62 | 2 | 214 | 152 | 139% |
| Subtotal seine fishery | | | 29,213 | | 11,007 | 224 | 222 | 186 | 186 | 13 | 2,132 | 630 | 58.0% |

**SPORT FISHERY**

| Biweek | Dates | Derby | Area | $H$ | v($H$) | $n$ | $a$ | $a'$ | $t$ | $t'$ | $m_c$ | $\hat{r}$ | SE($\hat{r}$) | RP($\hat{r}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 7/3–7/16 | No | Juneau | 41 | 326 | 21 | 1 | 1 | 1 | 1 | 1 | 111 | 111 | 195% |
| 16 | 7/31–8/13 | No | Juneau | 2,005 | 247,310 | 493 | 16 | 16 | 14 | 14 | 5 | 1,157 | 593 | 100% |
| 17 | 8/14–8/27 | Yes | Juneau | 1,046 | | 1,046 | 74 | 74 | 66 | 66 | 15 | 853 | 246 | 57% |
| 17 | 8/14–8/27 | No | Juneau | 4,200 | 3,150,318 | 755 | 32 | 29 | 25 | 25 | 4 | 1,397 | 878 | 123% |
| 18 | 8/28–9/10 | No | Juneau | 3,073 | 755,275 | 1,212 | 58 | 54 | 51 | 51 | 4 | 620 | 351 | 111% |
| Subtotal sport fishery | | | | 10,365 | 4,153,229 | 3,527 | 181 | 174 | 157 | 157 | 29 | 4,137 | 1,148 | 54.4% |

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**Appendix B2.**–Page 2 of 2.

| GILLNET FISHERY | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Stat. week** | **Dates** | **District** | ***H*** | **v(** $H$ **)** | ***n*** | ***a*** | ***a'*** | ***t*** | ***t'*** | $m_c$ | $\hat{r}$ | **SE(** $\hat{r}$ **)** | **RP(** $\hat{r}$ **)** |
| 30 | 7/16–7/22 | 111 | 204 | | 41 | 2 | 2 | 1 | 1 | 1 | 283 | 283 | 196% |
| 32 | 7/30–8/5 | 111 | 148 | | 75 | 1 | 1 | 1 | 1 | 1 | 112 | 112 | 195% |
| 33 | 8/6–8/12 | 111 | 1,336 | | 879 | 16 | 16 | 16 | 16 | 9 | 778 | 277 | 70% |
| 34 | 8/13–8/19 | 111 | 844 | | 565 | 8 | 8 | 6 | 6 | 4 | 340 | 174 | 100% |
| 36 | 8/27–9/2 | 111 | 1,945 | | 834 | 27 | 27 | 25 | 25 | 14 | 1,857 | 553 | 58% |
| 37 | 9/3–9/9 | 115 | 7,217 | | 1,001 | 39 | 39 | 36 | 36 | 2 | 820 | 585 | 140% |
| 37 | 9/3–9/9 | 111 | 965 | | 304 | 30 | 30 | 26 | 26 | 6 | 1,083 | 462 | 84% |
| 38 | 9/10–9/16 | 115 | 9,181 | | 1,119 | 61 | 60 | 53 | 52 | 3 | 1,451 | 853 | 115% |
| 38 | 9/10–9/16 | 111 | 800 | | 149 | 15 | 14 | 10 | 10 | 4 | 1,309 | 672 | 101% |
| 39 | 9/17–9/23 | 115 | 5,631 | | 2,409 | 168 | 160 | 156 | 155 | 10 | 1,405 | 479 | 67% |
| 39 | 9/17–9/23 | 111 | 845 | | 133 | 11 | 10 | 10 | 10 | 4 | 1,590 | 816 | 101% |
| 40 | 9/24–9/30 | 115 | 5,057 | | 1,971 | 158 | 158 | 155 | 155 | 3 | 438 | 257 | 115% |
| Subtotal gillnet fishery | | | 34,173 | | 9,480 | 536 | 525 | 495 | 493 | 61 | 11,466 | 1,789 | 30.6% |
| **TOTAL** | | | **953,944** | **4,153,229** | **315,783** | **8,061** | **7,964** | **6,752** | **6,741** | **229** | **38,971** | **3,326** | **16.7%** |

**Appendix B3.–**Numbers of coded wire tagged and untagged coho salmon sampled in Canyon Island fish wheels and gillnets in 2000. Numbers of coded wire tagged and untagged coho salmon in samples of immigrating salmon at Canyon Island fish wheels and the Canadian set/drift gill net fishery in 1993.

| | | Canyon Island[a] | | | | Test Fishery[b] | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Stat week** | **Number examined** | **Number ad clips** | **Number valid** | **Tag codes** | **Number examined** | **Number ad clips** | **Number valid** | **Tag codes** |
| 7/9 | 29 | 2 | | | | | | | |
| 7/10 | 29 | 1 | | | | | | | |
| 7/11 | 29 | 0 | | | | | | | |
| 7/12 | 29 | 1 | | | | | | | |
| 7/13 | 29 | 3 | | | | | | | |
| 7/14 | 29 | 0 | | | | | | | |
| 7/15 | 29 | 1 | | | | | | | |
| 7/16 | 30 | 0 | | | | | | | |
| 7/17 | 30 | 0 | | | | | | | |
| 7/18 | 30 | 4 | | | | | | | |
| 7/19 | 30 | 3 | | | | | | | |
| 7/20 | 30 | 2 | | | | | | | |
| 7/21 | 30 | 5 | | | | | | | |
| 7/22 | 30 | 4 | | | | | | | |
| 7/23 | 31 | 6 | | | | | | | |
| 7/24 | 31 | 0 | | | | | | | |
| 7/25 | 31 | | | | | | | | |
| 7/26 | 31 | | | | | | | | |
| 7/27 | 31 | 1 | | | | | | | |
| 7/28 | 31 | 4 | | | | | | | |
| 7/29 | 31 | 2 | | | | | | | |
| 7/30 | 32 | 8 | | | | | | | |
| 7/31 | 32 | 2 | | | | | | | |
| 8/1 | 32 | 11 | | | | | | | |
| 8/2 | 32 | 5 | | | | | | | |
| 8/3 | 32 | 6 | | | | | | | |
| 8/4 | 32 | 7 | | | | | | | |
| 8/5 | 32 | 14 | | | | | | | |
| 8/6 | 33 | 22 | | | | | | | |
| 8/7 | 33 | 18 | | | | | | | |
| 8/8 | 33 | 9 | | | | | | | |
| 8/9 | 33 | 7 | | | | | | | |
| 8/10 | 33 | 16 | 1 | 1 | 40132 | | | | |
| 8/11 | 33 | 20 | | | | | | | |
| 8/12 | 33 | 15 | | | | | | | |
| 8/13 | 34 | 26 | 1 | 1 | 40132 | | | | |
| 8/14 | 34 | 42 | | | | | | | |
| 8/15 | 34 | 24 | 1 | | No tag | | | | |
| 8/16 | 34 | 27 | | | | | | | |
| 8/17 | 34 | 44 | | | | | | | |
| 8/18 | 34 | 29 | | | | | | | |

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**Appendix B3.**–Page 2 of 3.

| | | Canyon Island[a] | | | | Test Fishery[b] | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Stat week** | **Number examined** | **Number ad clips** | **Number valid** | **Tag codes** | **Number examined** | **Number ad clips** | **Number valid** | **Tag codes** |
| 8/19 | 34 | 23 | | | | | | | |
| 8/20 | 35 | 18 | | | | | | | |
| 8/21 | 35 | 24 | | | | | | | |
| 8/22 | 35 | 14 | 1 | 1 | 40126 | | | | |
| 8/23 | 35 | 10 | | | | | | | |
| 8/24 | 35 | 14 | | | | | | | |
| 8/25 | 35 | 23 | 1 | 1 | 40131 | | | | |
| 8/26 | 35 | 27 | | | | | | | |
| 8/27 | 36 | 24 | | | | | | | |
| 8/28 | 36 | 45 | 1 | 1 | 40127 | | | | |
| 8/29 | 36 | 25 | 2 | 1 | 40127 | | | | |
| | | | | | No tag | | | | |
| 8/30 | 36 | 30 | 1 | 1 | 40126 | | | | |
| 8/31 | 36 | 35 | | | | | | | |
| 9/1 | 36 | 31 | 1 | 1 | 40131 | | | | |
| 9/2 | 36 | 11 | | | | | | | |
| 9/3 | 37 | 46 | | | | | | | |
| 9/4 | 37 | 5 | | | | | | | |
| 9/5 | 37 | 81 | 2 | 2 | 40126 | | | | |
| | | | | | 40131 | | | | |
| 9/6 | 37 | 66 | | | | | | | |
| 9/7 | 37 | 28 | | | | | | | |
| 9/8 | 37 | 59 | | | | | | | |
| 9/9 | 37 | 46 | 1 | 1 | 40127 | | | | |
| 9/10 | 38 | 33 | 1 | 1 | 40126 | | | | |
| 9/11 | 38 | 18 | 1 | 1 | 40127 | | | | |
| 9/12 | 38 | 38 | 2 | 2 | 40127 | | | | |
| | | | | | 40132 | | | | |
| 9/13 | 38 | 41 | | | | | | | |
| 9/14 | 38 | 29 | | | | | | | |
| 9/15 | 38 | 40 | 2 | 2 | 40126 | | | | |
| | | | | | 40126 | | | | |
| 9/16 | 38 | 32 | 1 | 1 | 40127 | 194 | 8 | 4 | 40126 |
| | | | | | | | | | 40126 |
| | | | | | | | | | 40127 |
| | | | | | | | | | 40131 |
| 9/17 | 39 | 10 | | | | | | | |
| 9/18 | 39 | 34 | | | | | | | |
| 9/19 | 39 | 56 | 2 | 2 | 40126 | | | | |
| | | | | | 40127 | | | | |
| 9/20 | 39 | 57 | 2 | 2 | 40126 | | | | |
| | | | | | 40132 | | | | |

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**Appendix B3.**–Page 3 of 3.

| | | Canyon Island[a] | | | | Test Fishery[b] | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Stat week | Number examined | Number ad clips | Number valid | Tag codes | Number examined | Number ad clips | Number valid | Tag codes |
| 9/21 | 39 | 48 | 2 | 2 | 40126 | | | | |
| | | | | | 40131 | | | | |
| 9/22 | 39 | 42 | 3 | 3 | 40126 | 200 | 7 | 4 | 40126 |
| | | | | | 40127 | | | | 40127 |
| | | | | | 40127 | | | | 40127 |
| | | | | | | | | | 40132 |
| 9/23 | 39 | 20 | | | | | | | |
| 9/24 | 40 | 21 | 1 | 1 | 40131 | | | | |
| 9/25 | 40 | 26 | | | | | | | |
| 9/26 | 40 | 22 | | | | | | | |
| 9/27 | 40 | 59 | 1 | 1 | 40126 | | | | |
| 9/28 | 40 | 70 | 2 | 2 | 40127 | 177 | 2 | 1 | 40127 |
| | | | | | 40131 | | | | |
| 9/29 | 40 | 26 | | | | | | | |
| 9/30 | 40 | 53 | 1 | 1 | 40126 | | | | |
| 10/1 | 41 | 10 | 1 | 1 | 40126 | | | | |
| 10/2 | 41 | 11 | | | | | | | |
| 10/3 | 41 | 5 | | | | | | | |
| 10/4 | 41 | | | | | | | | |
| 10/5 | 41 | | | | | | | | |
| 10/6 | 41 | | | | | | | | |
| 10/7 | 41 | | | | | 32 | 2 | 1 | 40131 |
| Total | | 1,877 | 35 | 33 | | 603 | 19 | 10 | |

[a] At Canyon, all adipose fin-clipped coho salmon were sacrificed for coded wire tag sampling.

[b] In the test fishery, all adipose fin-clipped coho salmon were sacrificed for coded wire tag sampling. Five heads were lost during shipping and four did not possess valid coded wire.

**Appendix B4.–**Estimated harvests of coho salmon bound for the Taku River above Canyon Island in 2000 in the marine commercial troll and gillnet fisheries by statistical week. Harvest in the troll fishery was approximated by weighting period catches by the number of coded wire tags recovered in a statistical week

| | | Troll | | Gillnet | | Total | | Weekly prop of harvest | | | Weekly prop of harvest times Statistical week | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Statistical week | Ending date | Tags | Harvest | Tags | Harvest | Tags | Harvest | Troll | Gillnet | Total | Troll | Gillnet | Total |
| 27 | 07/01 | 4 | 798 | | | 4 | 798 | 0.04 | | 0.02 | 1.05 | | 0.68 |
| 28 | 07/08 | 15 | 2,991 | | | 15 | 2,991 | 0.14 | | 0.09 | 4.09 | | 2.65 |
| 29 | 07/15 | 9 | 1,795 | 1 | 188 | 10 | 1,983 | 0.08 | 0.02 | 0.06 | 2.54 | 0.49 | 1.82 |
| 30 | 07/22 | 11 | 2,194 | | | 11 | 2,194 | 0.1 | | 0.07 | 3.2 | | 2.08 |
| 31 | 07/29 | 10 | 1,994 | 1 | 188 | 11 | 2,182 | 0.09 | 0.02 | 0.07 | 3.01 | 0.52 | 2.14 |
| 32 | 08/05 | 12 | 1,990 | 9 | 1,692 | 21 | 3,681 | 0.09 | 0.15 | 0.11 | 3.09 | 4.87 | 3.71 |
| 33 | 08/12 | 3 | 497 | 4 | 752 | 7 | 1,249 | 0.02 | 0.07 | 0.04 | 0.8 | 2.23 | 1.3 |
| 34 | 08/19 | 6 | 877 | | | 6 | 877 | 0.04 | | 0.03 | 1.45 | | 0.94 |
| 35 | 08/26 | 15 | 2,192 | 14 | 2,632 | 29 | 4,824 | 0.1 | 0.23 | 0.15 | 3.72 | 8.26 | 5.31 |
| 36 | 09/02 | 15 | 2,192 | 8 | 1,504 | 23 | 3,696 | 0.1 | 0.13 | 0.11 | 3.82 | 4.85 | 4.18 |
| 37 | 09/09 | 13 | 1,858 | 7 | 1,316 | 20 | 3,174 | 0.09 | 0.11 | 0.1 | 3.32 | 4.36 | 3.69 |
| 38 | 09/16 | 13 | 1,858 | 14 | 2,632 | 27 | 4,489 | 0.09 | 0.23 | 0.14 | 3.41 | 8.95 | 5.35 |
| 39 | 09/23 | | | 3 | 564 | 3 | 564 | | 0.05 | 0.02 | | 1.97 | 0.69 |
| 40 | 09/30 | | | | | | | | | | | | |
| 41 | 10/07 | | | | | | | | | | | | |
| 42 | 10/14 | | | | | | | | | | | | |
| | Total | 126 | 21,236 | 61 | 11,466 | 187 | 32,702 | 1.00 | 1.00 | 1.00 | 33.49 | 36.51 | 34.55 |
| | | | | | | | Estimated mean date of harvest | | | | 8/9/00 | 8/31/00 | 8/17/00 |

**Appendix B5.–**Number of marked coho salmon released at Canyon Island and recaptured and examined for marks in the inriver test and Canadian commercial fisheries by statistical week in 2000.

| Release stat week | Date | Number of fish released | Recovery stat week | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
| 29 | 7/9–7/15 | 5 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 7/16–7/ | 6 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | 7/23–7/29 | 16 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 32 | 7/30–8/5 | 37 | 0 | 0 | 0 | 7 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 33 | 8/6–8/12 | 89 | 0 | 0 | 0 | 0 | 18 | 7 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 34 | 8/13–8/19 | 189 | 0 | 0 | 0 | 0 | 0 | 15 | 11 | 4 | 0 | 0 | 0 | 0 | 0 |
| 35 | 8/20–8/26 | 123 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 7 | 0 | 0 | 0 | 0 | 0 |
| 36 | 8/27–9/2 | 199 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 1 | 0 | 0 | 0 | 0 |
| 37 | 9/3–9/9 | 253 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 |
| 38 | 9/10–9/16 | 247 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 3 | 1 | 0 |
| 39 | 9/17–9/23 | 254 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 9 | 2 | 0 |
| 40 | 9/24–9/30 | 245 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 2 |
| 41 | 10/1–10/7 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 1,763 | 0 | 3 | 0 | 8 | 20 | 22 | 23 | 28 | 4 | 7 | 13 | 6 | 2 |
| | | Marked percent | 0.0 | 5.1 | 0.0 | 2.1 | 3.4 | 2.5 | 3.5 | 2.3 | 0.7 | 2.8 | 3.3 | 2.1 | 1.7 |
| | | Number of fish examined | 12 | 59 | 37 | 375 | 586 | 874 | 667 | 1,234 | 551 | 248 | 395 | 288 | 121 |

# APPENDIX C

**Appendix C1.–**Number of salmon smolt caught in minnow traps near Canyon Island on the Taku River during 2000. Days with trap sets but no catches indicate that fish caught were held one, two, or three days until enough were accumulated for tagging.

| | | Daily catch | | Catch per trap | | Air temperature (°C) | | | Water | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Trap sets | Coho | Chinook | Coho | Chinook | Min. | Max. | Precipitation(inches) | Temp. (°C) | Stage (ft.) |
| 9-Apr | 26 | | | | | | | | | |
| 10-Apr | 70 | | | | | | | | | |
| 11-Apr | 120 | 770 | 525 | 4 | 2 | | | | | |
| 12-Apr | 114 | | | | | | | | | |
| 13-Apr | 130 | | | | | | | | 1 | |
| 14-Apr | 109 | | | | | -2 | 13 | | 2 | |
| 15-Apr | 114 | 1,257 | 559 | 3 | 1 | -6 | 13 | | 3 | |
| 16-Apr | 138 | | | | | -5 | 14 | | 4 | -2.3 |
| 17-Apr | 140 | 1,621 | 462 | 6 | 2 | 2 | 12 | | 4 | |
| 18-Apr | 137 | | | | | | 10 | 0.45 | 4 | |
| 19-Apr | 126 | 2,365 | 618 | 9 | 2 | 0 | 5 | 0.47 | 4 | -1.9 |
| 20-Apr | 115 | | | | | 0 | 12 | 0.07 | 5 | -1.8 |
| 21-Apr | 127 | 1,870 | 375 | 8 | 2 | 0 | 13 | 0.61 | 4 | -1.7 |
| 22-Apr | 118 | | | | | 0 | 13 | 0.15 | 5 | -1.5 |
| 23-Apr | 119 | | | | | -6 | 10 | 0.01 | 4 | -1.6 |
| 24-Apr | 118 | 3,141 | 521 | 9 | 1 | -4 | 13 | | 4 | -1.7 |
| 25-Apr | 173 | | | | | -4 | 14 | | 5 | -1.8 |
| 26-Apr | 199 | 2,440 | 357 | 7 | 1 | -4 | 15 | | 5 | -1.7 |
| 27-Apr | 210 | | | | | -3 | 17 | | 5 | -1.6 |
| 28-Apr | 211 | 2,555 | 448 | 6 | 1 | | | | | |
| 29-Apr | 201 | 1,631 | 218 | 8 | 1 | 2 | 17 | 0.25 | 6 | -1.0 |
| 30-Apr | 212 | | | | | 3 | 13 | 0.21 | 6 | -0.9 |
| 1-May | 206 | 2,632 | 372 | 6 | 1 | 3 | 12 | 0.26 | 6 | -0.7 |
| 2-May | 199 | | | | | 0 | 14 | 0.06 | 7 | -0.5 |
| 3-May | 199 | 2,635 | 219 | 7 | 1 | | | | 6 | -0.3 |
| 4-May | 192 | | | | | 1 | 19 | 0.04 | 6 | -0.1 |
| 5-May | 184 | 2,147 | 203 | 6 | 1 | 0 | 17 | | 6 | 0.1 |
| 6-May | 199 | | | | | 1 | 20 | | 6 | 0.3 |
| 7-May | 182 | 3,549 | 374 | 9 | 1 | 4 | 20 | | 7 | 0.6 |
| 8-May | 170 | | | | | -4 | 17 | | 7 | 1.2 |
| 9-May | 203 | | | | | 0 | 20 | | 7 | 1.5 |
| 10-May | 199 | 1,941 | 207 | 3 | 0 | 0 | 21 | | | 1.9 |
| 11-May | 189 | | | | | 6 | 24 | | 8 | 2.3 |
| 12-May | 132 | | | | | 0 | 23 | | 8 | 2.9 |
| 13-May | 99 | 952 | 107 | 2 | 0 | 5 | 22 | 0.05 | 8 | 2.4 |
| 14-May | 125 | | | | | 5 | 20 | 0.02 | 8 | 2.7 |
| 15-May | 118 | 1,754 | 455 | 7 | 2 | 4 | 16 | 0.01 | 8 | 2.6 |
| 16-May | 170 | 981 | 387 | 6 | 2 | 5 | 21 | 0.07 | 8 | 2.3 |
| 17-May | 230 | 1,213 | 646 | 5 | 3 | 5 | 17 | 0.05 | 8 | 2.3 |
| 18-May | 217 | 1,006 | 836 | 5 | 4 | 5 | 17 | 0.10 | 8 | 2.7 |
| 19-May | 222 | 861 | 806 | 4 | 4 | 4 | 18 | 0.10 | 8 | 3.4 |
| 20-May | 222 | | | | | 4 | 14 | 0.05 | 7 | 3.5 |
| 21-May | 217 | 1,116 | 1,109 | 3 | 3 | 3 | 17 | 0.02 | 8 | 3.1 |
| 22-May | 214 | 733 | 625 | 3 | 3 | 5 | 17 | 0.17 | 8 | 2.6 |
| 23-May | 205 | 704 | 776 | 3 | 4 | 3 | 15 | 0.05 | 8 | 2.9 |
| 24-May | 226 | 753 | 712 | 3 | 3 | 2 | 15 | 0.02 | 7 | 2.6 |

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**Appendix C1.**–Page 2 of 2.

| Date | Trap Sets | Daily catch | | Catch per trap | | Air temperature (°C) | | Precipitation (inches) | Water | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Coho | Chinook | Coho | Chinook | Min. | Max. | | Temp. (°C) | Stage (ft) |
| 25-May | 222 | 683 | 686 | 3 | 3 | 0 | 18 | | 7 | 2.3 |
| 26-May | 212 | 546 | 652 | 3 | 3 | -2 | 17 | 0.01 | 8 | 2.2 |
| 27-May | 207 | | | | | | | | | |
| 28-May | 206 | 393 | 510 | 3 | 3 | 4 | 24 | | 10 | 2.7 |
| 29-May | 207 | | | 2 | 2 | 6 | 19 | 0.25 | 8 | 3.3 |
| 30-May | 215 | 585 | 824 | | | -1 | 19 | 0.05 | 8 | 3.8 |
| 31-May | 193 | | | 1 | 2 | 0 | | | 8 | 4.0 |
| 1-Jun | 188 | 349 | 478 | | | 3 | 24 | | 9 | 4.4 |
| 2-Jun | 106 | | | 1 | 2 | | | | 9 | 5.2 |
| 3-Jun | 96 | 155 | 194 | | | | | | 9 | 5.4 |
| 4-Jun | 55 | | | 1 | 1 | 1 | 25 | | 9 | 6.1 |
| 5-Jun | 56 | 120 | 255 | | | 4 | 21 | | 9 | 6.3 |
| 6-Jun | 62 | | | 1 | 2 | 6 | 22 | | 8 | 7.1 |
| 7-Jun | 43 | | | | | 6 | 14 | 0.36 | 8 | 7.6 |
| 8-Jun | 36 | 39 | 151 | | | 5 | 14 | 0.07 | 8 | 7.8 |
| 9-Jun | 50 | | | 0 | 1 | 3 | 29 | | 8 | 7.8 |
| 10-Jun | 56 | 24 | 198 | | | 7 | 21 | 0.03 | 8 | 7.8 |
| 11-Jun | 62 | | | 0 | 2 | 4 | 24 | 0.02 | 8 | 9.0 |
| 12-Jun | 48 | 12 | 78 | | | 5 | 21 | | 8 | 9.8 |
| 13-Jun | 37 | | | 0 | 1 | 5 | 25 | | 8 | 10.1 |
| 14-Jun | 44 | 23 | 28 | | | 4 | 19 | 0.12 | 8 | 10.2 |
| 15-Jun | 29 | 393 | 510 | 0 | 0 | 7 | 17 | 0.07 | 5 | 11.6 |
| Total | 9,976 | 44,807 | 17,298 | | | | | 4.27 | | |
| Mean | | | | 4 .1 | 1 .9 | | | | | |

**Appendix C2.–**Estimated marine harvest of adult coho salmon bound for the Taku River above Canyon Island in 2001. Calculations follow equations in Table 2 of Bernard and Clark (1996) with 0.0239 used as an estimate of θ and 0.0172 for G(θ -1). Definitions of notation used to label these and other statistics are immediately below. In fishing periods and fishing quadrants for which no CWT was recovered with the appropriate code, harvest was assumed to be zero.

| | | |
|---|---|---|
| $a_i$ | = | number of adults missing adipose fins in a sample from catch in a stratum |
| $a_i'$ | = | number of heads that arrive at Juneau for dissection (subset of $a_i$) in a stratum |
| $r_i$ | = | number of adults from the stock harvested in a stratum in year *j* |
| $m_{ci}$ | = | number of CWTs with the appropriate code(s) (subset of $t_i'$) in a stratum |
| $n_i$ | = | number of adults caught in a stratum inspected for missing adipose fins |
| $t_i$ | = | number of heads with tags detected magnetically (subset of $a_i'$) in a stratum |
| $t_i'$ | = | number of CWTs found through dissection and decoded (subset of $t_i$) in a stratum |
| $\theta$ | = | fraction of the stock with CWTs |
| $G(\theta^{-1})$ | = | squared coefficient of variation for the estimate of $1/\theta$ |

**TROLL FISHERY**

| Stat. weeks | Dates | Per. | Quad. | *H* | v( *H* ) | *n* | *A* | *a'* | *t* | *t'* | $m_c$ | $\hat{r}$ | SE( $\hat{r}$ ) | RP( $\hat{r}$ ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27-32 | 7/5-8/11 | 3 | NW | 796,959 | | 144,935 | 2,673 | 2,662 | 2,221 | 2,217 | 96 | 22,172 | 3,670 | 32% |
| 27-32 | 7/5-8/11 | 3 | SW | 95,191 | | 49,926 | 640 | 615 | 478 | 476 | 1 | 83 | 83 | 195% |
| 33-39 | 8/12-9/29 | 4 | NW | 383,090 | | 104,643 | 2,277 | 2,264 | 1,971 | 1,969 | 11 | 1,693 | 551 | 64% |
| 33-39 | 8/12-9/29 | 4 | NE | 73,122 | | 23,819 | 440 | 438 | 375 | 375 | 111 | 14,293 | 2,304 | 32% |
| 33-39 | 8/12-9/29 | 4 | SE | 6,640 | | 3,679 | 45 | 40 | 28 | 28 | 1 | 85 | 84 | 195% |
| Subtotal troll fishery | | | | 1,355,002 | | 327,002 | 6,075 | 6,019 | 5,073 | 5,065 | 220 | 38,326 | 4,370 | 22.3% |

**SEINE FISHERY**

| Stat.week | Dates | District | *H* | v( *H* ) | n | a | a' | t | t' | $m_c$ | $\hat{r}$ | SE( $\hat{r}$ ) | RP( $\hat{r}$ ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 7/22-7/28 | 112 | 2,926 | | 1,146 | 24 | 24 | 20 | 20 | 1 | 107 | 106 | 195% |
| 31 | 7/29-8/4 | 109 | 15,901 | | 4,428 | 67 | 66 | 60 | 60 | 2 | 304 | 216 | 139% |
| 31 | 7/29-8/4 | 112 | 6,555 | | 2,124 | 51 | 45 | 38 | 38 | 1 | 146 | 146 | 195% |
| 32 | 8/5-8/11 | 112 | 5,579 | | 3,864 | 87 | 87 | 80 | 80 | 1 | 60 | 60 | 194% |
| 32 | 8/5-8/11 | 114 | 1,780 | | 188 | 3 | 3 | 3 | 3 | 1 | 395 | 395 | 196% |
| 33 | 8/12-8/18 | 112 | 2,284 | | 1,817 | 68 | 68 | 63 | 63 | 4 | 210 | 107 | 100% |
| 34 | 8/19-8/25 | 112 | 10,297 | | 3,263 | 89 | 89 | 73 | 73 | 6 | 791 | 335 | 83% |
| 35 | 8/26-9/1 | 112 | 5,913 | | 4,709 | 104 | 104 | 92 | 91 | 1 | 53 | 53 | 194% |
| 38 | 9/16-9/22 | 109[a] | | | | | | | | 1 | | | |
| Subtotal seine fishery | | | 51,235 | | 21,539 | 493 | 486 | 429 | 428 | 18 | 2,066 | 604 | 57.3% |

**SPORT FISHERY**

| Biweek | Dates | Derby | Area | *H* | v( *H* ) | n | A | a' | t | t' | $m_c$ | $\hat{r}$ | SE( $\hat{r}$ ) | RP( $\hat{r}$ ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 6/18-7/1 | No | Sitka | 6,291 | 1,974,332 | 1,766 | 16 | 16 | 15 | 15 | 1 | 149 | 148 | 195% |
| 14 | 7/2-7/15 | No | Sitka | 10,816 | 11,969,993 | 2,947 | 43 | 41 | 38 | 37 | 1 | 165 | 165 | 195% |
| 15 | 7/16-7/29 | No | Sitka | 21,656 | 22,447,237 | 6,344 | 76 | 75 | 66 | 66 | 1 | 144 | 144 | 195% |
| 15 | 7/16-7/29 | No | Juneau | 1,118 | 72,714 | 459 | 4 | 4 | 4 | 4 | 3 | 305 | 188 | 121% |
| 16 | 7/30-8/12 | No | Juneau | 2,665 | 227,276 | 1,048 | 25 | 23 | 20 | | 4 | 462 | 246 | 105% |
| 17 | 8/13-8/26 | No | Yakutat [b] | | | | | | | | 1 | | | |
| 17 | 8/13-8/26 | No | Sitka | 16,680 | 12,759,327 | 5,340 | 90 | 90 | 81 | 81 | 1 | 130 | 130 | 195% |
| 17 | 8/13-8/26 | Yes | Juneau | 2,339 | | 2,339 | 106 | 106 | 100 | 100 | 9 | 376 | 132 | 69% |
| 17 | 8/13-8/26 | No | Juneau | 3,322 | 624,844 | 785 | 17 | 16 | 14 | 14 | 1 | 188 | 187 | 196% |
| 18 | 8/27-9/9 | No | Juneau | 3,276 | 333,278 | 1,240 | 62 | 55 | 53 | 53 | 2 | 249 | 179 | 141% |
| 19 | 9/10-9/23 | No | Juneau | 1,452 | 225,566 | 144 | 11 | 10 | 9 | 9 | 2 | 926 | 693 | 147% |
| Subtotal sport fishery | | | | 69,615 | 50,634,567 | 22,412 | 450 | 436 | 400 | 399 | 26 | 3,094 | 865 | 54.8% |

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**Appendix C2.**–Page 2 of 2.

| GILLNET FISHERY | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Stat. week** | **Dates** | **District** | ***H*** | **v(*H*)** | **n** | **A** | **a'** | **t** | **t'** | $m_c$ | $\hat{r}$ | **SE($\hat{r}$)** | **RP($\hat{r}$)** |
| 27 | 7/1-7/7 | 106 | 4,227 | | 1,035 | 59 | 59 | 57 | 55 | 1 | 177 | 176 | 195% |
| 29 | 7/15-7/21 | 106 | 18,515 | | 4,767 | 202 | 195 | 179 | 178 | 1 | 169 | 168 | 195% |
| 29 | 7/15-7/21 | 115 | 95 | | 115 | 1 | 1 | 1 | 1 | 1 | 34 | 34 | 193% |
| 30 | 7/22-7/28 | 111 | 187 | | 104 | 1 | 1 | 1 | 1 | 1 | 75 | 75 | 195% |
| 33 | 8/12-8/18 | 106 | 5,588 | | 1,509 | 17 | 17 | 17 | 17 | 1 | 155 | 154 | 195% |
| 33 | 8/12-8/18 | 111 | 3,470 | | 474 | 5 | 5 | 4 | 3 | 2 | 815 | 581 | 140% |
| 34 | 8/19-8/25 | 111 | 1,501 | | 485 | 10 | 10 | 10 | 10 | 6 | 775 | 329 | 83% |
| 35 | 8/26-9/1 | 111 | 1,581 | | 173 | 5 | 5 | 5 | 5 | 1 | 382 | 381 | 196% |
| 36 | 9/2-9/8 | 111 | 1,174 | | 810 | 47 | 47 | 45 | 45 | 8 | 484 | 180 | 73% |
| 37 | 9/9-9/15 | 111 | 1,129 | | 645 | 31 | 28 | 23 | 22 | 6 | 508 | 215 | 83% |
| 37 | 9/9-9/15 | 115 | 6,124 | | 629 | 35 | 34 | 32 | 32 | 3 | 1,255 | 736 | 115% |
| 38 | 9/16-9/22 | 111 | 2,003 | | 1,092 | 67 | 65 | 61 | 59 | 23 | 1,877 | 458 | 48% |
| 38 | 9/16-9/22 | 115 | 5,448 | | 1,381 | 36 | 34 | 34 | 33 | 2 | 359 | 256 | 139% |
| 39 | 9/23-9/29 | 111 | 1,995 | | 910 | 55 | 52 | 50 | 50 | 26 | 2,517 | 588 | 46% |
| 39 | 9/23-9/29 | 115 | 6,960 | | 1,712 | 71 | 70 | 70 | 69 | 1 | 175 | 174 | 195% |
| 40 | 9/30-10/6 | 111 | 1,136 | | 96 | 6 | 5 | 5 | 5 | 3 | 1,779 | 1,044 | 115% |
| 40 | 9/30-10/6 | 115 | 5,327 | | 989 | 76 | 71 | 68 | 68 | 1 | 241 | 240 | 196% |
| Subtotal gillnet fishery | | | 66,460 | | 16,926 | 724 | 699 | 662 | 653 | 87 | 11,777 | 1,760 | 29.3% |
| **TOTAL** | | | 1,542,312 | 50,634,567 | 387,879 | 7,742 | 7,640 | 6,564 | 6,545 | 351 | 55,264 | 4,828 | 17.1% |

[a] No harvest reported; PNP Cost Rec fish.

[b] Harvest not estimated in Yakutat, only catch composition.

**Appendix C3.–**Numbers of coded wire tagged and untagged coho salmon sampled in Canyon Island fish wheels and gillnets in 2001. Numbers of coded wire tagged and untagged coho salmon in samples of immigrating salmon at Canyon Island fish wheels and the Canadian set/drift gill net fishery in 1993.

| | | Canyon Island[a] | | | | Test Fishery[b] | |
|---|---|---|---|---|---|---|---|
| Date | Stat Week | Number Examined | Number ad clips | Number valid | Tag codes | Number examined | Number ad clips |
| 7/3 | 27 | 1 | | | | | |
| 7/4 | 27 | 0 | | | | | |
| 7/5 | 27 | 1 | | | | | |
| 7/6 | 27 | 0 | | | | | |
| 7/7 | 27 | 1 | | | | | |
| 7/8 | 28 | 1 | | | | | |
| 7/9 | 28 | 0 | | | | | |
| 7/10 | 28 | 0 | | | | | |
| 7/11 | 28 | 2 | | | | | |
| 7/12 | 28 | 2 | | | | | |
| 7/13 | 28 | 3 | | | | | |
| 7/14 | 28 | 2 | | | | | |
| 7/15 | 29 | 1 | | | | | |
| 7/16 | 29 | 4 | | | | | |
| 7/17 | 29 | 2 | | | | | |
| 7/18 | 29 | 3 | | | | | |
| 7/19 | 29 | 2 | | | | | |
| 7/20 | 29 | 2 | | | | | |
| 7/21 | 29 | 6 | | | | | |
| 7/22 | 30 | 2 | | | | | |
| 7/23 | 30 | 1 | | | | | |
| 7/24 | 30 | 7 | | | | | |
| 7/25 | 30 | 4 | | | | | |
| 7/26 | 30 | 3 | | | | | |
| 7/27 | 30 | 7 | | | | | |
| 7/28 | 30 | 2 | | | | | |
| 7/29 | 31 | 4 | | | | | |
| 7/30 | 31 | 10 | 1 | | No tag | | |
| 7/31 | 31 | 5 | | | | | |
| 8/1 | 31 | 8 | | | | | |
| 8/2 | 31 | 11 | | | | | |
| 8/3 | 31 | 1 | | | | | |
| 8/4 | 31 | 2 | | | | | |
| 8/5 | 32 | 6 | | | | | |
| 8/6 | 32 | 8 | | | | | |
| 8/7 | 32 | 14 | | | | | |
| 8/8 | 32 | 4 | | | | | |
| 8/9 | 32 | 3 | | | | | |
| 8/10 | 32 | 0 | | | | | |
| 8/11 | 32 | 4 | | | | | |
| 8/12 | 33 | 15 | | | | | |

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**Appendix C3.–**Page 2 of 4.

| | | Canyon Island[a] | | | | Test Fishery[b] | |
|---|---|---|---|---|---|---|---|
| **Date** | **Stat week** | **Number examined** | **Number ad clips** | **Number valid** | **Tag codes** | **Number examined** | **Number ad clips** |
| 8/13 | 33 | 6 | | | | | |
| 8/14 | 33 | 8 | | | | | |
| 8/15 | 33 | 9 | | | | | |
| 8/16 | 33 | 12 | 2 | 2 | 40252 | | |
| | | | | | 40360 | | |
| 8/17 | 33 | 20 | | | | | |
| 8/18 | 33 | 16 | 1 | 1 | 40360 | | |
| 8/19 | 34 | 16 | 1 | 1 | 40254 | | |
| 8/20 | 34 | 22 | | | | | |
| 8/21 | 34 | 8 | | | | | |
| 8/22 | 34 | 7 | | | | | |
| 8/23 | 34 | 8 | | | | | |
| 8/24 | 34 | 16 | | | | | |
| 8/25 | 34 | 17 | | | | | |
| 8/26 | 35 | 21 | 3 | 3 | 40254 | | |
| | | | | | 40255 | | |
| | | | | | 40255 | | |
| 8/27 | 35 | 16 | | | | | |
| 8/28 | 35 | 29 | 2 | 2 | 40252 | | |
| | | | | | 40254 | | |
| 8/29 | 35 | 18 | | | | | |
| 8/30 | 35 | 34 | 1 | 1 | 40255 | | |
| 8/31 | 35 | 54 | | | | | |
| 9/1 | 35 | 39 | 1 | 1 | 40254 | 92 | 2 |
| 9/2 | 36 | 36 | | | | 81 | 0 |
| 9/3 | 36 | 35 | | | | 76 | 1 |
| 9/4 | 36 | 19 | | | | 98 | 2 |
| 9/5 | 36 | 22 | | | | 106 | 3 |
| 9/6 | 36 | 30 | 2 | 2 | 40253 | 122 | 0 |
| | | | | | 40254 | | |
| 9/7 | 36 | 35 | | | | 138 | 5 |
| 9/8 | 36 | 69 | 3 | 2 | 40252 | 101 | 3 |
| | | | | | 40255 | | |
| | | | | | No tag | | |
| 9/9 | 37 | 46 | 3 | 3 | 40252 | | |
| | | | | | 40254 | | |
| | | | | | 40254 | | |
| 9/10 | 37 | 66 | 3 | 3 | 40253 | 88 | 2 |
| | | | | | 40253 | | |
| | | | | | 40254 | | |
| 9/11 | 37 | 50 | 1 | 1 | 40360 | 147 | 1 |
| 9/12 | 37 | 49 | 1 | 1 | 40255 | 117 | 4 |

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**Appendix C3.**–Page 3 of 4.

| | | Canyon Island[a] | | | | Test Fishery[b] | |
|---|---|---|---|---|---|---|---|
| Date | Stat week | Number examined | Number ad clips | Number valid | Tag codes | Number examined | Number ad clips |
| 9/13 | 37 | 9 | | | | 68 | 0 |
| 9/14 | 37 | 52 | | | | | |
| 9/15 | 37 | 77 | 2 | 1 | Released | | |
| | | | | | No tag | | |
| 9/16 | 38 | 95 | 3 | 3 | Released | 84 | 2 |
| | | | | | Released | | |
| | | | | | Released | | |
| 9/17 | 38 | 71 | 3 | 3 | 40131 | 81 | 0 |
| | | | | | 40253 | | |
| | | | | | 40254 | | |
| 9/18 | 38 | 55 | 3 | 3 | 40253 | 138 | 3 |
| | | | | | 40254 | | |
| | | | | | 40254 | | |
| 9/19 | 38 | 63 | 1 | 1 | Released | 109 | 3 |
| 9/20 | 38 | 55 | | | | | |
| 9/21 | 38 | 50 | 2 | 2 | 40252 | | |
| | | | | | 40255 | | |
| 9/22 | 38 | 71 | 3 | 3 | 40252 | | |
| | | | | | 40252 | | |
| | | | | | 40360 | | |
| 9/23 | 39 | 35 | 1 | 1 | 40253 | 108 | 1 |
| 9/24 | 39 | 84 | 4 | 4 | 40252 | 134 | 1 |
| | | | | | 40254 | | |
| | | | | | 40255 | | |
| | | | | | Nonsense[c] | | |
| 9/25 | 39 | 97 | 1 | 1 | Released | 170 | 2 |
| 9/26 | 39 | 20 | 1 | 1 | Released | | |
| 9/27 | 39 | 82 | 3 | 3 | Released | 102 | 2 |
| | | | | | Released | | |
| | | | | | Released | | |
| 9/28 | 39 | 75 | 1 | 1 | 40255 | | |
| 9/29 | 39 | 77 | 3 | 3 | 40252 | | |
| | | | | | Released | | |
| | | | | | Released | | |
| 9/30 | 40 | 0 | | | | 191 | 1 |
| 10/1 | 40 | 34 | | | | 184 | 2 |
| 10/2 | 40 | 68 | 1 | 1 | Released | 66 | 3 |
| 10/3 | 40 | 101 | 3 | 2 | Released | 66 | 1 |
| | | | | | Released | | |
| | | | | | No tag | | |
| 10/4 | 40 | 87 | 1 | 1 | Released | | |
| 10/5 | 40 | 35 | | | | | |

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**Appendix C3.**–Page 4 of 4.

| | | Canyon Island[a] | | | | Test Fishery[b] | |
|---|---|---|---|---|---|---|---|
| **Date** | **Stat week** | **Number examined** | **Number ad clips** | **Number valid** | **Tag codes** | **Number examined** | **Number ad clips** |
| 10/6 | 40 | | | | | | |
| 10/7 | 41 | | | | | 102 | 2 |
| 10/8 | 41 | | | | | 92 | 2 |
| 10/9 | 41 | | | | | 19 | 1 |
| 10/10 | 41 | | | | | 112 | 2 |
| Total | | 2,380 | 61 | 57 | | 2,992 | 51 |

[a] At Canyon Island, adipose fin-clipped coho salmon that tested positive for the presence of valid coded wire using a handheld magnetic wand detector were subsequently released. One fish tagged as a Chinook salmon smolt in the spring of 2000 was recaptured as an adult coho salmon sampled on 9/24.

[b] In the test fishery, all adipose fin-clipped coho salmon were released and not sacrificed.

[C] ADF&G Coded Wire Tag Laboratory tag status for a mismatched species.

**Appendix C4.–**Estimated harvests of coho salmon bound for Taku River above Canyon Island in 2001 in marine commercial troll and gillnet fisheries by statistical week. Harvest in the troll fishery was approximated by weighting period catches by the number of coded wire tags recovered in a statistical week

| | | Troll | | Gillnet | | Total | | Weekly prop of harvest | | | Weekly prop of harvest times Statistical week | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Statistical week | Ending date | Tags | Harvest | Tags | Harvest | Tags | Harvest | Troll | Gillnet | Total | Troll | Gillnet | Total |
| 26 | 6/30 | | | | | | | | | | | | |
| 27 | 7/7 | 4 | 887 | 1 | 131 | 5 | 1,017 | 0.02 | 0.01 | 0.02 | 0.65 | 0.31 | 27 |
| 28 | 7/14 | 6 | 1,330 | | | 6 | 1,330 | 0.04 | | 0.03 | 1.01 | | 28 |
| 29 | 7/21 | 18 | 3,990 | 2 | 262 | 20 | 4,251 | 0.11 | 0.02 | 0.09 | 3.12 | 0.67 | 29 |
| 30 | 7/28 | 24 | 5,320 | 1 | 131 | 25 | 5,451 | 0.14 | 0.01 | 0.11 | 4.31 | 0.34 | 30 |
| 31 | 8/4 | 20 | 4,433 | | | 20 | 4,433 | 0.12 | | 0.09 | 3.71 | | 31 |
| 32 | 8/11 | 25 | 5,542 | | | 25 | 5,542 | 0.15 | | 0.12 | 4.79 | | 32 |
| 33 | 8/18 | 20 | 2,525 | 3 | 392 | 23 | 2,917 | 0.07 | 0.03 | 0.06 | 2.25 | 1.14 | 33 |
| 34 | 8/25 | 20 | 2,525 | 6 | 785 | 26 | 3,309 | 0.07 | 0.07 | 0.07 | 2.32 | 2.34 | 34 |
| 35 | 9/1 | 20 | 2,525 | 1 | 131 | 21 | 2,655 | 0.07 | 0.01 | 0.06 | 2.39 | 0.40 | 35 |
| 36 | 9/8 | 27 | 3,408 | 8 | 1,046 | 35 | 4,454 | 0.09 | 0.09 | 0.09 | 3.31 | 3.31 | 36 |
| 37 | 9/15 | 16 | 2,020 | 9 | 1,177 | 25 | 3,197 | 0.05 | 0.10 | 0.07 | 2.02 | 3.83 | 37 |
| 38 | 9/22 | 18 | 2,272 | 25 | 3,270 | 43 | 5,542 | 0.06 | 0.29 | 0.12 | 2.33 | 10.92 | 38 |
| 39 | 9/29 | 2 | 252 | 27 | 3,531 | 29 | 3,784 | 0.01 | 0.31 | 0.08 | 0.27 | 12.10 | 39 |
| 40 | 10/6 | | | 4 | 523 | | | | 0.05 | | | 1.84 | 40 |
| 41 | 10/13 | | | | | | | | | | | | 41 |
| 42 | 10/20 | | | | | | | | | | | | |
| | Total | 220 | 37,027 | 87 | 11,378 | 303 | 47,882 | 1.00 | 1.00 | 1.00 | 32.47 | 37.21 | 33 .52 |
| | | | | | | | | Estimated mean date of harvest | | | 8/8/01 | 9/11/01 | 8/16/01 |

**Appendix C5.–**Number of marked coho salmon released at Canyon Island and recaptured and examined for marks in the inriver test and Canadian commercial fisheries by statistical week in 2001.

| | | | Recovery stat week | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Release stat week** | **Date** | **Number of fish released** | **28** | **29** | **30** | **31** | **32** | **33** | **34** | **35** | **36** | **37** | **38** | **39** | **40** | **41** |
| 27 | 7/1–7/7 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 | 7/8–7/14 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | 7/15–7/21 | 19 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 7/22–7/29 | 23 | 0 | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | 7/29–8/4 | 37 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 32 | 8/5–8/11 | 39 | 0 | 0 | 0 | 0 | 3 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 33 | 8/12–8/18 | 82 | 0 | 0 | 0 | 0 | 0 | 2 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 34 | 8/19–8/25 | 89 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 0 |
| 35 | 8/26–9/1 | 193 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 0 | 0 | 0 | 0 | 0 |
| 36 | 9/2–9/8 | 237 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 |
| 37 | 9/9–9/15 | 334 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 1 | 1 | 0 |
| 38 | 9/16–9/22 | 422 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 6 | 2 | 0 |
| 39 | 9/23–9/29 | 442 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 12 | 0 |
| 40 | 9/30–10/6 | 303 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 |
| | Total | 2,230 | 0 | 2 | 4 | 6 | 4 | 13 | 21 | 2 | 16 | 6 | 14 | 11 | 16 | 5 |
| | | Marked percent | 0.0 | 4.2 | 4.0 | 1.7 | 0 .94 | 1.6 | 3.6 | 2.2 | 2.2 | 1.1 | 2.6 | 1.5 | 2.9 | 1.5 |
| | Number of fish examined | | 20 | 47 | 99 | 348 | 427 | 789 | 590 | 92 | 735 | 529 | 544 | 735 | 549 | 325 |

# APPENDIX D

**Appendix D1.-–**Number of salmon smolt caught in minnow traps near Canyon Island on the Taku River during 2001. Days with trap sets but no catches indicate that fish caught were held one, two, or three days until enough were accumulated for tagging.

| | | Daily catch | | Catch per trap | | Air | | Water | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Trap sets | Coho | Chinook | Coho | Chinook | temperature[a] (°C) | Precipitation (inches) | Temp. (°C) | Stage (ft.) |
| 9-Apr | | | | | | | | | |
| 10-Apr | | | | | | | | | |
| 11-Apr | | | | | | | | | |
| 12-Apr | 61 | | | | | | | | |
| 13-Apr | 118 | 400 | 187 | 2 | 1 | | | | |
| 14-Apr | 148 | 600 | 280 | 4 | 2 | | | | |
| 15-Apr | 178 | 720 | 478 | 4 | 3 | | | 3 | -2.4 |
| 16-Apr | 174 | 1,280 | 456 | 7 | 3 | | | | |
| 17-Apr | 174 | 1,000 | 560 | 6 | 3 | | | | |
| 18-Apr | 196 | 1,500 | 560 | 8 | 3 | | | 3 | -2.1 |
| 19-Apr | 200 | 1,000 | 560 | 5 | 3 | | | 4 | -1.9 |
| 20-Apr | 212 | 1,000 | 654 | 5 | 3 | | | 4 | -1.8 |
| 21-Apr | 190 | 1,500 | 467 | 8 | 2 | | | 4 | -1.6 |
| 22-Apr | 217 | 1,000 | 654 | 5 | 3 | | | 4 | -1.4 |
| 23-Apr | 220 | 500 | 654 | 2 | 3 | | | | |
| 24-Apr | 234 | 1,242 | 683 | 5 | 3 | | | 4 | -1.2 |
| 25-Apr | 227 | 758 | 345 | 3 | 2 | | 0.1 | 4 | -1.0 |
| 26-Apr | 190 | 1,366 | 445 | 7 | 2 | | 0.1 | 4 | -1.0 |
| 27-Apr | 184 | 1,134 | 955 | 6 | 5 | | 0.2 | 4 | -1.0 |
| 28-Apr | 243 | 2,000 | 934 | 8 | 4 | | 0.1 | 4 | -0.9 |
| 29-Apr | 249 | 1,500 | 467 | 6 | 2 | | 0.0 | 4 | -0.9 |
| 30-Apr | 212 | 1,500 | 934 | 7 | 4 | | 0.1 | | 0.0 |
| 1-May | 216 | 1,061 | 956 | 5 | 4 | | | 5 | 0.0 |
| 2-May | 220 | 939 | 911 | 4 | 4 | | 0.1 | 5 | 0.0 |
| 3-May | 211 | 1,000 | 934 | 5 | 4 | | 0.7 | 4 | -0.6 |
| 4-May | 218 | 1,500 | 934 | 7 | 4 | | 0.6 | 4 | -0.5 |
| 5-May | 229 | 1,500 | 934 | 7 | 4 | | 0.1 | 4 | -0.6 |
| 6-May | 225 | 1,335 | 1,138 | 6 | 5 | | 0.0 | 5 | -0.8 |
| 7-May | 266 | 1,451 | 1,437 | 5 | 5 | | | 6 | -0.9 |
| 8-May | 267 | 1,214 | 2,094 | 5 | 8 | | 0.4 | 6 | -0.8 |
| 9-May | 269 | 1,500 | 1,868 | 6 | 7 | | 0.2 | 6 | -0.8 |
| 10-May | 272 | 1,780 | 2,366 | 7 | 9 | | 0.0 | 6 | -0.7 |
| 11-May | 218 | 920 | 996 | 4 | 5 | | | | 0.0 |
| 12-May | 213 | 1,000 | 1,074 | 5 | 5 | | | 7 | -0.6 |
| 13-May | 207 | 1,008 | 1,081 | 5 | 5 | | 0.3 | 7 | -0.2 |
| 14-May | 186 | 884 | 568 | 5 | 3 | | 0.0 | 6 | 0.3 |
| 15-May | 194 | 884 | 568 | 5 | 3 | | 0.0 | 6 | 0.5 |
| 16-May | 173 | 853 | 627 | 5 | 4 | | 0.1 | 6 | 0.8 |
| 17-May | 159 | 853 | 627 | 5 | 4 | | | | 0.0 |
| 18-May | 244 | 1,204 | 1,381 | 5 | 6 | | | | 0.0 |
| 19-May | 223 | 1,101 | 1,262 | 5 | 6 | | | | 0.0 |
| 20-May | 231 | 1,140 | 1,308 | 5 | 6 | | | 7 | 0.6 |
| 21-May | 241 | 1,190 | 1,364 | 5 | 6 | | 0.2 | 7 | 0.7 |

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**Appendix D1.–**Page 2 of 2.

| | | Daily catch | | Catch per trap | | | | Water | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Trap Sets | Coho | Chinook | Coho | Chinook | Air temperature[a] (°C) | Precipitation (inches) | Temp. (°C) | Stage (ft) |
| 22-May | 183 | 903 | 1,036 | 5 | 6 | | 0.1 | 7 | 0.8 |
| 23-May | 175 | 864 | 991 | 5 | 6 | | 0.1 | | 1.3 |
| 24-May | 203 | 1,002 | 1,149 | 5 | 6 | | 0.2 | | 1.5 |
| 25-May | 208 | 1,027 | 1,178 | 5 | 6 | | | | |
| 26-May | | | | | | | | | |
| 27-May | 201 | 992 | 1,138 | 5 | 6 | | | | |
| 28-May | 134 | 661 | 759 | 5 | 6 | | | | |
| 29-May | 80 | 395 | 453 | 5 | 6 | | | | |
| 30-May | | | | | | | | | |
| 31-May | | | | | | | | | |
| 1-Jun | | | | | | | | | |
| 2-Jun | | | | | | | | | |
| 3-Jun | | | | | | | | | |
| 4-Jun | | | | | | | | | |
| 5-Jun | | | | | | | | | |
| 6-Jun | | | | | | | | | |
| 7-Jun | 27 | 133 | 153 | 5 | 6 | | | | |
| 8-Jun | 29 | 143 | 164 | 5 | 6 | | | | |
| 9-Jun | 20 | 99 | 113 | 5 | 6 | | | | |
| Total | 9,569 | 50,535 | 41,836 | | | | 3.54 | | |
| Mean | | | | 5.2 | 4.4 | | | | |

[a] Air temperature was not recorded during smolt operations in 2001 due to a malfunctioning thermometer.

**Appendix D1.–**Estimated marine harvest of adult coho salmon bound for the Taku River above Canyon Island in 2002. Calculations follow equations in Table 2 of Bernard and Clark (1996) with 0.0202 used as an estimate of θ and 0.0141 for G(θ -1). Definitions of notation used to label these and other statistics are immediately below. In fishing periods and fishing quadrants for which no CWT was recovered with the appropriate code, harvest was assumed to be zero.

| | | |
|---|---|---|
| $a_i$ | = | number of adults missing adipose fins in a sample from catch in a stratum |
| $a_i'$ | = | number of heads that arrive at Juneau for dissection (subset of $a_i$) in a stratum |
| $r_i$ | = | number of adults from the stock harvested in a stratum in year *j* |
| $m_{ci}$ | = | number of CWTs with the appropriate code(s) (subset of $t_i'$) in a stratum |
| $n_i$ | = | number of adults caught in a stratum inspected for missing adipose fins |
| $t_i$ | = | number of heads with tags detected magnetically (subset of $a_i'$) in a stratum |
| $t_i'$ | = | number of CWTs found through dissection and decoded (subset of $t_i$) in a stratum |
| $\theta$ | = | fraction of the stock with CWTs |
| $G(\theta^{-1})$ | = | squared coefficient of variation for the estimate of $1/\theta$ |

**TROLL FISHERY**

| Stat. weeks | Dates | Per. | Quad. | *H* | v( *H* ) | *n* | *a* | *a'* | *t* | *t'* | $m_c$ | $\hat{r}$ | SE( $\hat{r}$ ) | RP( $\hat{r}$ ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | 6/23–6/29 | 2 | NW[a] | 667 | | 286 | 2 | 2 | 2 | 2 | 1 | 116 | 115 | 195 % |
| 27–32 | 6/30–8/10 | 3 | NW | 341,306 | | 113,254 | 2,224 | 2,210 | 1,845 | 1,844 | 63 | 9,470 | 1,630 | 34 % |
| 26 | 6/30–8/11 | 3 | NE | 102,015 | | 35,428 | 1,363 | 1,351 | 1,200 | 1,197 | 1 | 144 | 144 | 195 % |
| 26 | 6/30–8/12 | 3 | SE | 65,133 | | 24,561 | 475 | 469 | 372 | 372 | 1 | 133 | 133 | 195 % |
| 33-40 | 8/11–10/5 | 4 | NW | 461,263 | | 125,974 | 3,234 | 3,201 | 2,819 | 2,817 | 152 | 27,876 | 3,994 | 28 % |
| 33-40 | 8/11–10/5 | 4 | NE | 82,886 | | 26,757 | 866 | 857 | 739 | 737 | 8 | 1,244 | 460 | 72 % |
| 33-40 | 8/11–10/5 | 4 | SW | 50,368 | | 35,540 | 518 | 511 | 407 | 407 | 1 | 71 | 71 | 195 % |
| Subtotal troll fishery | | | | 1,103,638 | | 361,800 | 8,682 | 8,601 | 7,384 | 7,376 | 227 | 39,054 | 4,345 | 21.8% |

**SEINE FISHERY**

| Stat. week | Dates | District | *H* | v( *H* ) | *n* | *a* | *a'* | *t* | *t'* | $m_c$ | $\hat{r}$ | SE( $\hat{r}$ ) | RP( $\hat{r}$ ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 7/14–7/20 | 112 | 751 | | 493 | 6 | 6 | 6 | 6 | 2 | 151 | 107 | 139 % |
| 30 | 7/21–7/27 | 110 | 6,946 | | 2,230 | 12 | 12 | 11 | 11 | 1 | 154 | 154 | 195 % |
| 30 | 7/21-7/27 | 112 | 4,661 | | 560 | 9 | 9 | 7 | 7 | 1 | 412 | 412 | 196 % |
| 31 | 7/28–8/3 | 112 | 9,442 | | 1,314 | 23 | 23 | 17 | 17 | 3 | 1,068 | 624 | 115 % |
| 31 | 7/28–8/3 | 114 | 6,377 | | 3,366 | 65 | 65 | 53 | 52 | 2 | 191 | 136 | 139 % |
| 32 | 8/4–8/10 | 112 | 11,402 | | 1,133 | 20 | 20 | 17 | 17 | 1 | 499 | 498 | 196 % |
| 32 | 8/4–8/10 | 114 | 2,478 | | 941 | 18 | 18 | 16 | 16 | 1 | 130 | 130 | 195 % |
| 33 | 8/11–8/17 | 112 | 6,536 | | 685 | 14 | 14 | 14 | 14 | 1 | 473 | 472 | 196 % |
| 33 | 8/11–8/17 | 114 | 6,172 | | 2,571 | 69 | 69 | 59 | 59 | 1 | 119 | 118 | 195 % |
| 34 | 8/18–8/24 | 114 | 1,505 | | 1,438 | 52 | 52 | 47 | 47 | 5 | 259 | 118 | 89 % |
| Subtotal seine fishery | | | 56,270 | | 14,731 | 288 | 288 | 247 | 246 | 18 | 3,457 | 1,062 | 60.2% |

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**Appendix D2.–**Page 2 of 2.

**SPORT FISHERY**

| Bi-week | Dates | Derby | Area | $H$ | v( $H$ ) | $n$ | $a$ | $a'$ | $t$ | $t'$ | $m_c$ | $\hat{r}$ | SE( $\hat{r}$ ) | RP( $\hat{r}$ ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 7/8–7/21 | No | Sitka | 9,614 | 11,525,161 | 2,327 | 36 | 36 | 33 | 33 | 1 | 205 | 204 | 195 % |
| 14 | 7/8–7/21 | No | Elfin Cove[a] | 324 | | 324 | 10 | 10 | 7 | 7 | 1 | 50 | 49 | 195 % |
| 11-14 | 7/8–7/21 | No | Juneau | 2,271 | 445,161 | 275 | 3 | 3 | 3 | 3 | 1 | 409 | 409 | 195 % |
| 15 | 7/22–8/4 | No | Juneau | 3,417 | 617,744 | 613 | 6 | 4 | 4 | 4 | 1 | 414 | 414 | 121 % |
| 16 | 8/5–8/18 | No | Juneau | 8,480 | 5,104,552 | 2,165 | 42 | 37 | 33 | 33 | 11 | 2,423 | 990 | 105 % |
| 16-17 | 8/5–9/1 | No | Yakutat[b] | | | | 6 | 6 | 5 | 5 | 2 | | | |
| 17 | 8/19–9/1 | Yes | Juneau-DE | 4,824 | | 4,824 | 170 | 170 | 147 | 147 | 31 | 1,536 | 327 | 195 % |
| 17 | 8/19–9/1 | Yes | Juneau-DT | 1,818 | 156,514 | 476 | 14 | 11 | 10 | 10 | 2 | 482 | 350 | 69 % |
| 17 | 8/19–9/1 | No | Juneau-MB | 2,763 | 3,349,739 | 818 | 17 | 16 | 14 | 14 | 1 | 178 | 178 | 195 % |
| 18-19 | 9/2–9/15 | No | Juneau | 2,700 | 817,779 | 553 | 34 | 33 | 31 | 31 | 3 | 748 | 482 | 141 % |
| 15-18 | 7/22–9/15 | No | Gustavus[a] | 2,884 | | 2,884 | 48 | 48 | 37 | 37 | 4 | 198 | 100 | 147 % |
| Subtotal sport fishery | | | | 39,095 | 22,016,650 | 15,259 | 386 | 374 | 324 | 324 | 58 | 6,641 | 1,366 | 40.3% |

**GILLNET FISHERY**

| Stat. week | Dates | District | $H$ | v( $H$ ) | $n$ | $a$ | $a'$ | $t$ | $t'$ | $m_c$ | $\hat{r}$ | SE( $\hat{r}$ ) | RP( $\hat{r}$ ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25-27 | 6/16–7/6 | 111 | 43 | | 25 | 1 | 1 | 1 | 1 | 1 | 85 | 85 | 195 % |
| 28-29 | 7/7–7/20 | 115 | 418 | | 339 | 4 | 4 | 3 | 3 | 2 | 122 | 86 | 138 % |
| 30 | 7/21–7/27 | 111 | 3,098 | | 741 | 3 | 3 | 3 | 3 | 1 | 207 | 207 | 196 % |
| 31 | 7/28–8/3 | 111 | 2,840 | | 488 | 5 | 5 | 5 | 5 | 3 | 865 | 505 | 115 % |
| 30-31 | 7/21–8/3 | 115 | 481 | | 277 | 5 | 5 | 3 | 3 | 1 | 86 | 86 | 195 % |
| 32-33 | 8/4–8/17 | 111 | 5,357 | | 1,710 | 15 | 15 | 11 | 10 | 4 | 683 | 348 | 100 % |
| 34-35 | 8/18–8/31 | 111 | 4,731 | | 1,105 | 20 | 20 | 20 | 20 | 9 | 1,909 | 670 | 69 % |
| 36 | 9/1–9/7 | 111 | 6,720 | | 2,324 | 36 | 35 | 30 | 30 | 20 | 2,947 | 740 | 49 % |
| 37 | 9/8–9/14 | 111 | 8,967 | | 1,099 | 28 | 28 | 27 | 27 | 20 | 8,084 | 2,033 | 49 % |
| 37 | 9/8–9/14 | 115 | 30,323 | | 7,329 | 252 | 245 | 225 | 225 | 12 | 2,530 | 783 | 61 % |
| 38 | 9/15–9/21 | 115 | 21,682 | | 5,426 | 234 | 231 | 220 | 220 | 3 | 602 | 351 | 114 % |
| 38-41 | 9/15–10/12 | 111 | 6,808 | | 387 | 14 | 14 | 14 | 14 | 14 | 12,201 | 3,545 | 57 % |
| 39-41 | 9/22–9/28 | 115 | 6,884 | | 3,038 | 187 | 183 | 175 | 175 | 5 | 574 | 263 | 90 % |
| Subtotal gillnet fishery | | | 98,352 | | 24,288 | 804 | 789 | 737 | 736 | 95 | 30,894 | 4,352 | 27.6% |
| **TOTAL** | | | 1,297,355 | 22,016,650 | 416,078 | 10,160 | 10,052 | 8,692 | 8,682 | 398 | 80,046 | 6,389 | 15.6% |

[a] Catch sampling program, variance of harvest not available.

[b] Harvest not estimated in Yakutat, only catch composition

**Appendix D2.–**Numbers of coded wire tagged and untagged coho salmon sampled in Canyon Island fish wheels and gillnets in 2002. Numbers of coded wire tagged and untagged coho salmon in samples of immigrating salmon at Canyon Island fish wheels and the Canadian set/drift gill net fishery in 1993.

| | | Canyon Island[a] | | | | Test Fishery[b] | |
|---|---|---|---|---|---|---|---|
| Date | Stat week | Number examined | Number ad clips | Number valid | Tag codes | Number examined | Number ad clips |
| 7/2 | 27 | 1 | | | | | |
| 7/3 | 27 | 0 | | | | | |
| 7/4 | 27 | 1 | | | | | |
| 7/5 | 27 | 0 | | | | | |
| 7/6 | 27 | 0 | | | | | |
| 7/7 | 28 | 0 | | | | | |
| 7/8 | 28 | 1 | | | | | |
| 7/9 | 28 | 2 | | | | | |
| 7/10 | 28 | 2 | | | | | |
| 7/11 | 28 | 2 | | | | | |
| 7/12 | 28 | 4 | | | | | |
| 7/13 | 28 | 2 | | | | | |
| 7/14 | 29 | 5 | | | | | |
| 7/15 | 29 | 11 | | | | | |
| 7/16 | 29 | 5 | | | | | |
| 7/17 | 29 | 7 | 1 | 1 | 40294 | | |
| 7/18 | 29 | 5 | | | | | |
| 7/19 | 29 | 13 | | | | | |
| 7/20 | 29 | 11 | 1 | 1 | 40454 | | |
| 7/21 | 30 | 12 | | | | | |
| 7/22 | 30 | 12 | | | | | |
| 7/23 | 30 | 18 | | | | | |
| 7/24 | 30 | 17 | | | | | |
| 7/25 | 30 | 12 | | | | | |
| 7/26 | 30 | 18 | | | | | |
| 7/27 | 30 | 15 | | | | | |
| 7/28 | 31 | 6 | | | | | |
| 7/29 | 31 | 8 | | | | | |
| 7/30 | 31 | 11 | | | | | |
| 7/31 | 31 | 13 | | | | | |
| 8/1 | 31 | 15 | 1 | 1 | 40294 | | |
| 8/2 | 31 | 23 | 1 | 1 | 40454 | | |
| 8/3 | 31 | 25 | | | | | |
| 8/4 | 32 | 33 | 2 | 1 | 40456 | | |
| | | | | | No tag | | |
| 8/5 | 32 | 33 | 1 | 1 | 40294 | | |
| 8/6 | 32 | 28 | 1 | | No tag | | |
| 8/7 | 32 | 14 | | | | | |
| 8/8 | 32 | 19 | | | | | |
| 8/9 | 32 | 12 | | | | | |
| 8/10 | 32 | 12 | | | | | |
| 8/11 | 33 | 26 | | | | | |

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**Appendix D3.**–Page 2 of 4.

| | | Canyon Island[a] | | | | Test Fishery[b] | |
|---|---|---|---|---|---|---|---|
| Date | Stat week | Number examined | Number ad clips | Number valid | Tag codes | Number examined | Number ad clips |
| 8/12 | 33 | 11 | | | | | |
| 8/13 | 33 | 5 | | | | | |
| 8/14 | 33 | 2 | 1 | | Tag lost | | |
| 8/15 | 33 | 25 | | | | | |
| 8/16 | 33 | 9 | | | | | |
| 8/17 | 33 | | | | | | |
| 8/18 | 34 | 0 | | | | | |
| 8/19 | 34 | 36 | | | | | |
| 8/20 | 34 | 34 | | | | | |
| 8/21 | 34 | 18 | | | | 9 | |
| 8/22 | 34 | 66 | 3 | 2 | 40294 | 14 | 1 |
| | | | | | 40294 | | |
| | | | | | No tag | | |
| 8/23 | 34 | 49 | 2 | 1 | 40294 | 2 | |
| | | | | | No tag | | |
| 8/24 | 34 | 40 | | | | 1 | |
| 8/25 | 35 | 184 | 4 | 4 | 40454 | | |
| | | | | | 40454 | | |
| | | | | | 40455 | | |
| | | | | | 40455 | | |
| 8/26 | 35 | 109 | | | | 14 | |
| 8/27 | 35 | 96 | | | | 55 | |
| 8/28 | 35 | 59 | | | | | |
| 8/29 | 35 | 80 | 3 | 3 | 40454 | 34 | |
| | | | | | 40454 | | |
| | | | | | 40455 | | |
| 8/30 | 35 | 128 | 3 | 3 | 40454 | 41 | |
| | | | | | 40455 | | |
| | | | | | 40455 | | |
| 8/31 | 35 | 138 | 2 | 2 | 40293 | 247 | |
| | | | | | 40454 | | |
| 9/1 | 36 | 68 | | | | 168 | |
| 9/2 | 36 | 98 | 3 | 3 | 40454 | 137 | 4 |
| | | | | | 40455 | | |
| | | | | | Released | | |
| 9/3 | 36 | 52 | 1 | 1 | Released | 244 | 7 |
| 9/4 | 36 | 66 | | | | 36 | |
| 9/5 | 36 | 64 | | | | 168 | 1 |
| 9/6 | 36 | 98 | | | | 145 | 1 |
| 9/7 | 36 | 79 | 1 | | No tag | | |
| 9/8 | 37 | 51 | 4 | 4 | 40454 | 102 | |
| | | | | | Released | | |

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**Appendix D3.**–Page 3 of 4.

| | | Canyon Island[a] | | | | Test Fishery[b] | |
|---|---|---|---|---|---|---|---|
| **Date** | **Stat week** | **Number examined** | **Number ad clips** | **Number valid** | **Tag codes** | **Number Examined** | **Number ad clips** |
| | | | | | Released | | |
| | | | | | Released | | |
| 9/9 | 37 | 43 | 1 | 1 | 40455 | 96 | |
| 9/10 | 37 | 29 | 1 | 1 | Released | 102 | 1 |
| 9/11 | 37 | 85 | 3 | 3 | 40294 | 92 | |
| | | | | | 40454 | | |
| | | | | | Released | | |
| 9/12 | 37 | 148 | 8 | 8 | 40293 | | |
| | | | | | 40454 | | |
| | | | | | Released | | |
| | | | | | Released | | |
| | | | | | Released | | |
| | | | | | Released | | |
| | | | | | Released | | |
| | | | | | Released | | |
| 9/13 | 37 | 87 | 7 | 6 | 40294 | 47 | |
| | | | | | 40455 | | |
| | | | | | Released | | |
| | | | | | Released | | |
| | | | | | Released | | |
| | | | | | Released | | |
| | | | | | Head Lost | | |
| 9/14 | 37 | 102 | 1 | 1 | Released | 16 | |
| 9/15 | 38 | | | | | | |
| 9/16 | 38 | 81 | 1 | 1 | Released | | |
| 9/17 | 38 | 64 | 2 | 1 | Released | 70 | |
| | | | | | No tag | | |
| 9/18 | 38 | 68 | 3 | 3 | 40293 | 65 | |
| | | | | | 40455 | | |
| | | | | | Released | | |
| 9/19 | 38 | 70 | 3 | 3 | Released | 201 | 5 |
| | | | | | Released | | |
| | | | | | Released | | |
| 9/20 | 38 | 97 | | | | 137 | |
| 9/21 | 38 | | | | | | |
| 9/22 | 39 | | | | | 78 | 4 |
| 9/23 | 39 | 81 | 1 | 1 | Released | 72 | |
| 9/24 | 39 | 157 | 1 | 1 | Released | 174 | 2 |
| 9/25 | 39 | 45 | 1 | 1 | Released | 97 | 2 |
| 9/26 | 39 | 40 | 4 | 4 | 40293 | 57 | |
| | | | | | 40456 | | |
| | | | | | 40456 | | |

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**Appendix D3.**–Page 4 of 4.

| | | Canyon Island[a] | | | | Test Fishery[b] | |
|---|---|---|---|---|---|---|---|
| **Date** | **Stat week** | **Number examined** | **Number ad clips** | **Number valid** | **Tag codes** | **Number examined** | **Number ad clips** |
| | | | | | Released | | |
| 9/27 | 39 | 64 | | | | 58 | |
| 9/28 | 39 | 49 | | | | | |
| 9/29 | 40 | | | | | 50 | 2 |
| 9/30 | 40 | 69 | 1 | 1 | 40294 | 161 | 2 |
| 10/1 | 40 | 18 | | | | 121 | 3 |
| 10/2 | 40 | 76 | 3 | 3 | 40293 | 162 | 5 |
| | | | | | 40293 | | |
| | | | | | 40454 | | |
| 10/3 | 40 | 46 | 1 | 1 | Released | 163 | 6 |
| 10/4 | 40 | 41 | 1 | 1 | Released | 45 | |
| 10/5 | 40 | 36 | 3 | 3 | 40295 | | |
| | | | | | 40456 | | |
| | | | | | Released | | |
| 10/6 | 41 | | | | | 33 | 2 |
| 10/7 | 41 | 50 | 1 | 1 | Released | 55 | 4 |
| 10/8 | 41 | | | | | 73 | 1 |
| 10/9 | | | | | | 56 | 1 |
| 10/10 | | | | | | 71 | 3 |
| 10/11 | | | | | | 30 | |
| Total | | 3,765 | 82 | 74 | | 3,799 | 57 |

[a] At Canyon Island, adipose fin-clipped coho salmon that tested positive for the presence of valid coded wire using a handheld magnetic wand detector were subsequently released. One head was lost on the floor at the lab for a fish sacrificed on 8/14 and another was lost during shipping for a fish sacrificed on 9/13.

[b] In the test fishery, all adipose fin-clipped coho salmon were released and not sacrificed.

**Appendix D3.–**Estimated harvests of coho salmon bound for Taku River above Canyon Island in 2002 in marine commercial troll and gillnet fisheries by statistical week. Harvest in the troll fishery was approximated by weighting period catches by the number of coded wire tags recovered in a statistical week.

| Statistical week | Ending date | Troll | | Gillnet | | Total | | Weekly prop of harvest | | | Weekly prop of harvest times Statistical week | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Tags | Harvest | Tags | Harvest | Tags | Harvest | Troll | Gillnet | Total | Troll | Gillnet | Total |
| 26 | 6/30 | 2 | 116 | | | 2 | 116 | 0.00 | | 0.00 | 0.08 | 0.04 | 0.08 |
| 27 | 6/30 | 3 | 450 | 1 | 281 | 4 | 731 | 0.01 | 0.01 | 0.01 | 0.31 | 0.25 | 0.28 |
| 28 | 7/7 | 2 | 300 | 1 | 281 | 3 | 581 | 0.01 | 0.01 | 0.01 | 0.22 | 0.25 | 0.23 |
| 29 | 7/14 | 5 | 750 | 1 | 281 | 6 | 1,031 | 0.02 | 0.01 | 0.01 | 0.56 | 0.26 | 0.43 |
| 30 | 7/21 | 9 | 1,350 | 1 | 281 | 10 | 1,631 | 0.03 | 0.01 | 0.02 | 1.04 | 0.27 | 0.70 |
| 31 | 7/28 | 20 | 2,999 | 4 | 1,123 | 24 | 4,123 | 0.08 | 0.04 | 0.06 | 2.38 | 1.13 | 1.83 |
| 32 | 8/4 | 26 | 3,899 | 4 | 1,123 | 30 | 5,022 | 0.10 | 0.04 | 0.07 | 3.19 | 1.16 | 2.30 |
| 33 | 8/11 | 1 | 178 | | | 1 | 178 | 0.00 | - | 0.00 | 0.15 | - | 0.08 |
| 34 | 8/18 | 19 | 3,382 | 11 | 3,089 | 30 | 6,471 | 0.09 | 0.10 | 0.09 | 2.94 | 3.40 | 3.15 |
| 35 | 8/25 | 35 | 6,230 | | | 35 | 6,230 | 0.16 | - | 0.09 | 5.58 | - | 3.12 |
| 36 | 9/1 | 25 | 4,450 | 20 | 5,617 | 45 | 10,067 | 0.11 | 0.18 | 0.14 | 4.10 | 6.55 | 5.18 |
| 37 | 9/8 | 36 | 6,408 | 45 | 12,638 | 81 | 19,046 | 0.16 | 0.41 | 0.27 | 6.07 | 15.14 | 10.07 |
| 38 | 9/15 | 32 | 5,696 | 3 | 843 | 35 | 6,538 | 0.15 | 0.03 | 0.09 | 5.54 | 1.04 | 3.55 |
| 39 | 9/22 | 14 | 2,492 | 9 | 2,528 | 23 | 5,020 | 0.06 | 0.08 | 0.07 | 2.49 | 3.19 | 2.80 |
| 40 | 9/29 | 2 | 356 | 10 | 2,809 | 12 | 3,165 | 0.01 | 0.09 | 0.05 | 0.36 | 3.64 | 1.81 |
| 41 | 10/6 | | | | | | | | | | | | |
| 42 | 10/13 | | | | | | | | | | | | |
| Total | | 231 | 39,054 | 110 | 30,894 | 341 | 69,948 | 1.00 | 1.00 | 1.00 | 35.02 | 36.27 | 35.57 |
| | | | | | | | | Estimated mean date of harvest | | | 8/25/02 | 9/03/02 | 8/27/02 |

**Appendix D4.** Number of marked coho salmon released at Canyon Island and recaptured and examined for marks in the inriver test and Canadian commercial fisheries by statistical week in 2002.

| Release stat week | Date | Number of fish released | RECOVERY STAT WEEK | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
| 27 | 6/30–7/6 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 | 7/7–/13 | 11 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | 7/14–7/20 | 51 | 0 | 2 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 7/21–7/27 | 98 | 0 | 0 | 4 | 24 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | 7/28–8/3 | 93 | 0 | 0 | 0 | 2 | 14 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 32 | 8/4–8/10 | 136 | 0 | 0 | 0 | 0 | 5 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 33 | 8/11–8/17 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 34 | 8/18–8/24 | 226 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 1 | 0 | 0 |
| 35 | 8/25–8/31 | 750 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 10 | 0 | 0 | 0 | 0 | 0 |
| 36 | 9/1–9/7 | 507 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 3 | 0 | 0 | 0 | 0 |
| 37 | 9/8–9/14 | 503 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 0 | 0 | 2 |
| 38 | 9/15–9/21 | 359 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 1 | 0 |
| 39 | 9/22–9/28 | 403 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| 40 | 9/29–10/5 | 263 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 |
| 41 | 10/6–10/11 | 46 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 3,518 | 0 | 5 | 10 | 26 | 25 | 10 | 0 | 13 | 20 | 4 | 8 | 4 | 6 | 7 |
| | | **Marked percent** | 0.0% | 1.7% | 2.3% | 3.6% | 1.9% | 4.1% | 0.0% | 2.3% | 2.3% | 0.9% | 1.3% | 0.8% | 0.9% | 2.2% |
| | | **Number of fish examined** | 53 | 294 | 431 | 717 | 1,337 | 244 | 26 | 559 | 878 | 459 | 612 | 536 | 681 | 318 |

# APPENDIX E

**Appendix E1.–**Number of salmon smolt caught in minnow traps near Canyon Island on the Taku River during 2002. Days with trap sets but no catches indicate that fish caught were held one, two, or three days until enough were accumulated for tagging.

| | | Daily catch | | Catch per trap | | | | Water[a] | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Trap sets | Coho | Chinook | Coho | Chinook | Air temperature[a] (°C) | Precipitation[a] (inches) | Temp. (°C) | Stage (ft.) |
| 12-Apr | | | | | | | | | |
| 13-Apr | | | | | | | | | |
| 14-Apr | | | | | | | | | |
| 15-Apr | | | | | | | | | |
| 16-Apr | | | | | | | | | |
| 17-Apr | | | | | | | | | |
| 18-Apr | | | | | | | | | -3.3 |
| 19-Apr | 69 | 352 | 572 | 5 | 8 | | | | -3.3 |
| 20-Apr | 115 | 545 | 885 | 5 | 8 | | | | -2.9 |
| 21-Apr | 117 | 483 | 785 | 4 | 7 | | | | -2.8 |
| 22-Apr | 116 | 443 | 720 | 4 | 6 | | | | -2.5 |
| 23-Apr | 134 | 588 | 955 | 4 | 7 | | 0.2 | | -2.5 |
| 24-Apr | 144 | 662 | 1,074 | 5 | 7 | | | | -2.7 |
| 25-Apr | 154 | 680 | 1,105 | 4 | 7 | | | | -2.9 |
| 26-Apr | 149 | 769 | 1,249 | 5 | 8 | | | 4 | -2.9 |
| 27-Apr | 153 | 779 | 1,265 | 5 | 8 | | | 4 | -2.8 |
| 28-Apr | 153 | 984 | 1,599 | 6 | 10 | | | 4 | -2.7 |
| 29-Apr | 157 | 1,011 | 1,642 | 6 | 10 | | | 4 | -2.3 |
| 30-Apr | 157 | 969 | 1,574 | 6 | 10 | -3 | | 4 | -1.5 |
| 01-May | 145 | 587 | 954 | 4 | 7 | 3 | | 5 | -0.5 |
| 02-May | 114 | 134 | 218 | 1 | 2 | 1 | 0.0 | 3 | 0.7 |
| 03-May | 85 | 109 | 178 | 1 | 2 | -4 | | 3 | 0.5 |
| 04-May | 120 | 395 | 641 | 3 | 5 | -2 | | 3 | -0.2 |
| 05-May | 131 | 580 | 942 | 4 | 7 | -1 | | 3 | -0.7 |
| 06-May | 134 | 848 | 1,377 | 6 | 10 | 1 | | 4 | -1.0 |
| 07-May | 144 | 874 | 1,419 | 6 | 10 | -2 | | 5 | -1.0 |
| 08-May | 153 | 796 | 1,294 | 5 | 8 | -3 | | 5 | -1.2 |
| 09-May | 150 | 1,203 | 1,954 | 8 | 13 | 1 | | 6 | -1.3 |
| 10-May | 150 | 1,239 | 2,012 | 8 | 13 | 4 | 0.1 | 6 | -1.0 |
| 11-May | 145 | 1,369 | 2,224 | 9 | 15 | 4 | 0.0 | 7 | -0.7 |
| 12-May | 147 | 1,070 | 1,738 | 7 | 12 | 4 | 0.3 | 7 | -0.5 |
| 13-May | 155 | 1,429 | 2,321 | 9 | 15 | 4 | 0.1 | 7 | -0.1 |
| 14-May | 151 | 940 | 1,526 | 6 | 10 | 4 | 0.2 | 7 | 0.8 |
| 15-May | 150 | 585 | 951 | 4 | 6 | 4 | | 7 | 1.5 |
| 16-May | 138 | 533 | 866 | 4 | 6 | 5 | | 7 | 1.7 |
| 17-May | 145 | 604 | 981 | 4 | 7 | 3 | | 7 | 1.9 |
| 18-May | 138 | 381 | 619 | 3 | 4 | 3 | 0.0 | 7 | 2.5 |
| 19-May | 124 | 118 | 192 | 1 | 2 | 7 | 0.2 | 7 | 3.5 |
| 20-May | | | | | | 9 | | 7 | 4.8 |
| 21-May | | | | | | 15 | | 7 | 6.2 |
| 22-May | | | | | | 8 | 0.1 | 6 | 6.6 |
| 23-May | 44 | 62 | 101 | 1 | 2 | 8 | 0.1 | 6 | 6.6 |
| 24-May | 82 | 225 | 366 | 3 | 4 | 8 | | 7 | 6.5 |
| 25-May | 110 | 234 | 380 | 2 | 3 | 3 | | 7 | 6.7 |
| 26-May | 108 | 158 | 257 | 1 | 2 | 3 | | 8 | 7.5 |
| 27-May | 76 | 98 | 159 | 1 | 2 | 9 | 0.0 | 8 | 8.3 |
| 28-May | | | | | | 8 | 0.1 | 8 | 8.6 |
| 29-May | | | | | | 8 | 0.2 | 8 | 9.2 |
| 30-May | | | | | | 7 | 0.2 | 7 | 9.3 |
| 31-May | 66 | 26 | 43 | 0 | 1 | 2 | 0.0 | 8 | 8.0 |

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**Appendix E1.–**Page 2 of 2.

| | | Daily catch | | Catch per trap | | | | Water[a] | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Trap sets** | **Coho** | **Chinook** | **Coho** | **Chinook** | **Air temperature[a] (°C)** | **Precipitation[a] (inches)** | **Temp. (°C)** | **Stage (ft)** |
| 01-Jun | 72 | 30 | 49 | 0 | 1 | 7 | 0 .1 | 7 | 6.7 |
| 02-Jun | 95 | 48 | 78 | 1 | 1 | 7 | 0 .0 | 8 | 6.2 |
| 03-Jun | 93 | 79 | 128 | 1 | 1 | 8 | 0 .1 | 8 | 5.9 |
| 04-Jun | 99 | 81 | 132 | 1 | 1 | 8 | 0 .1 | 8 | 6.3 |
| 05-Jun | 97 | 58 | 94 | 1 | 1 | 8 | 0 .2 | 8 | 6.4 |
| 06-Jun | 90 | 34 | 56 | 0 | 1 | 8 | 0 .0 | 8 | 6.3 |
| 07-Jun | 89 | 34 | 55 | 0 | 1 | 7 | | 8 | 5.6 |
| 08-Jun | 89 | 31 | 50 | 0 | 1 | 7 | | 8 | 5.3 |
| 09-Jun | | | | | | | | | |
| 10-Jun | | 30 | 49 | | | 7 | 0 .1 | | |
| Total | 5,447 | 23,258 | 37,776 | | | | 2 .24 | | |
| Mean | | | | 3 .8 | 6 .1 | | | | |

[a] Air temperature, precipitation, and water temperature and stage were recorded daily around 8 a.m.

**Appendix E2.–**Estimated marine harvest of adult coho salmon bound for the Taku River above Canyon Island in 2003. Calculations follow equations in Table 2 of Bernard and Clark (1996) with 0.0095 used as an estimate of θ and 0.0460 for G(θ -1). Definitions of notation used to label these and other statistics are immediately below. In fishing periods and fishing quadrants for which no CWT was recovered with the appropriate code, harvest was assumed to be zero.

$a_i$ = number of adults missing adipose fins in a sample from catch in a stratum

$a_i'$ = number of heads that arrive at Juneau for dissection (subset of $a_i$) in a stratum

$r_i$ = number of adults from the stock harvested in a stratum in year *j*

$m_{ci}$ = number of CWTs with the appropriate code(s) (subset of $t_i'$) in a stratum

$n_i$ = number of adults caught in a stratum inspected for missing adipose fins

$t_i$ = number of heads with tags detected magnetically (subset of $a_i'$) in a stratum

$t_i'$ = number of CWTs found through dissection and decoded (subset of $t_i$) in a stratum

$\theta$ = fraction of the stock with CWTs

$G(\theta^{-1})$ = squared coefficient of variation for the estimate of $1/\theta$

**TROLL FISHERY**

| Stat. weeks | Dates | Per. | Quad. | $H$ | v($H$) | $n$ | $a$ | $a'$ | $t$ | $t'$ | $m_c$ | $\hat{r}$ | SE($\hat{r}$) | RP($\hat{r}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29-33 | 7/16-8/16 | 3 | NW | 259,598 | | 73,397 | 1,389 | 1,377 | 1,142 | 1,142 | 20 | 8,074 | 2,385 | 58 % |
| 34-40 | 8/18-10/1 | 4 | NW | 440,210 | | 128,461 | 3,480 | 3,452 | 2,961 | 2,959 | 68 | 26,600 | 6,149 | 45 % |
| 34-40 | 8/18-10/1 | 4 | NE | 63,455 | | 20,412 | 469 | 469 | 408 | 408 | 5 | 1,759 | 845 | 94 % |
| Subtotal troll fishery | | | | 763,263 | | 222,270 | 5,338 | 5,298 | 4,511 | 4,509 | 93 | 6,433 | 6,649 | 35.8% |

**SEINE FISHERY**

| Stat. week | Dates | District | $H$ | v($H$) | $n$ | $a$ | $a'$ | $t$ | $t'$ | $m_c$ | $\hat{r}$ | SE($\hat{r}$) | RP($\hat{r}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 8/10-8/16 | 112 | 3,541 | | 1,230 | 18 | 18 | 16 | 16 | 1 | 326 | 325 | 196 % |
| 34 | 8/17-8/23 | 112 | 14,406 | | 6,753 | 146 | 146 | 132 | 132 | 8 | 1,931 | 770 | 78 % |
| 35 | 8/24-8/30 | 112 | 5,683 | | 1,006 | 53 | 53 | 48 | 48 | 2 | 1,278 | 921 | 141 % |
| 35 | 8/24-8/30 | 114 | 43 | | 44 | 2 | 2 | 1 | 1 | 1 | 111 | 110 | 195 % |
| Subtotal seine fishery | | | 23,673 | | 9,033 | 219 | 219 | 197 | 197 | 12 | 3,646 | 1,249 | 67.1% |

**SPORT FISHERY**

| Bi-week | Dates | Derby | Area | $H$ | v($H$) | $n$ | $a$ | $a'$ | $t$ | $t'$ | $m_c$ | $\hat{r}$ | SE($\hat{r}$) | RP($\hat{r}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 7/21–8/3 | No | Sitka | 15,148 | 9,760,054 | 4,196 | 121 | 121 | 105 | 104 | 1 | 412 | 412 | 196 % |
| 15 | 7/21–8/3 | No | Gustavus/ Elfin cove[a] | 29,019 | | 3,191 | 50 | 49 | 46 | 46 | 4 | 4,200 | 2,220 | 104 % |
| 16-17 | 8/4–8/31 | No | Yakutat[b] | 8,093 | | 3,894 | 27 | 27 | 21 | 21 | 2 | 470 | 338 | 141 % |
| 16 | 8/4–8/17 | No | Juneau | 3,486 | 366,473 | 1,053 | 16 | 15 | 13 | 13 | 4 | 1,598 | 876 | 107 % |
| 17 | 8/18–8/31 | Yes | Juneau-DE[c] | 3,933 | | 3,933 | 118 | 118 | 104 | 104 | 12 | 1,358 | 468 | 68 % |
| 17 | 8/18–8/31 | Yes | Juneau-DT[c] | 932 | 42,829 | 258 | 6 | 6 | 6 | 6 | 1 | 409 | 408 | 196 % |
| 18 | 9/1–9/14 | No | Juneau | 4,235 | 2,047,474 | 758 | 53 | 50 | 45 | 44 | 3 | 2,056 | 1,352 | 129 % |
| Subtotal sport fishery | | | | 64,846 | 12,216,830 | 17,283 | 391 | 386 | 340 | 338 | 27 | 10,504 | 2,862 | 53.4% |

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**Appendix E2.**–Page 2 of 2.

| GILLNET FISHERY | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Stat. week** | **Dates** | **District** | ***H*** | **v(*H*)** | **n** | **a** | **a'** | **t** | **t'** | $m_c$ | $\hat{r}$ | **SE($\hat{r}$)** | **RP($\hat{r}$)** |
| 27 | 6/29–7/5 | 111 | 106 | | 18 | 1 | 1 | 1 | 1 | 1 | 665 | 665 | 196 % |
| 32 | 8/3–8/9 | 115 | 65 | | 63 | 3 | 3 | 3 | 3 | 1 | 117 | 116 | 195 % |
| 33 | 8/10–8/16 | 111 | 1,000 | | 463 | 1 | 1 | 1 | 1 | 1 | 244 | 244 | 196 % |
| 35 | 8/24–8/30 | 115 | 2,901 | | 1,983 | 54 | 54 | 51 | 51 | 2 | 331 | 238 | 141 % |
| 36 | 8/31–9/6 | 111 | 1,738 | | 653 | 21 | 21 | 18 | 18 | 10 | 3,012 | 1,107 | 72 % |
| 36 | 8/31–9/6 | 115 | 8,907 | | 5,031 | 197 | 196 | 182 | 181 | 1 | 202 | 202 | 196 % |
| 37 | 9/7–9/13 | 111 | 7,391 | | 1,833 | 49 | 49 | 46 | 46 | 12 | 5,475 | 1,891 | 68 % |
| 37 | 9/7–9/13 | 115 | 14,046 | | 2,357 | 136 | 135 | 132 | 131 | 1 | 685 | 684 | 196 % |
| 38 | 9/14–9/20 | 111 | 3,887 | | 1,143 | 163 | 163 | 150 | 149 | 10 | 3,874 | 1,424 | 72 % |
| 38 | 9/14–9/20 | 115 | 12,992 | | 4,076 | 275 | 273 | 269 | 269 | 12 | 4,360 | 1,505 | 68 % |
| 39 | 9/21–9/27 | 111 | 3,161 | | 56 | 3 | 3 | 3 | 3 | 1 | 6,387 | 6,387 | 196 % |
| 39 | 9/21–9/27 | 115 | 13,236 | | 7,425 | 453 | 452 | 433 | 433 | 9 | 1,819 | 694 | 75 % |
| 40 | 9/28–10/4 | 115 | 4,729 | | 4,108 | 289 | 289 | 281 | 281 | 4 | 521 | 275 | 103 % |
| Subtotal gillnet fishery | | | 74,159 | | 29,209 | 1,645 | 1,640 | 1,570 | 1,567 | 65 | 27,694 | 7,178 | 50.8% |
| **TOTAL** | | | 925,941 | 12,216,830 | 277,795 | 7,593 | 7,543 | 6,618 | 6,611 | 197 | 78,277 | 10,271 | 25.7% |

[a] Catch sampling program, variance of harvest not available.

[b] Harvest not estimated in Yakutat, only catch composition.

[c] DE or Derby Entered are fish turned in at the docks for derby prizes; DT or Derby Take Home are fish not turned in at the docks and are taken home for personal consumption.

**Appendix E3.–**Numbers of coded wire tagged and untagged coho salmon sampled in Canyon Island fish wheels and gillnets in 2003. Numbers of coded wire tagged and untagged coho salmon in samples of immigrating salmon at Canyon Island fish wheels and the Canadian set/drift gill net fishery in 1993.

| | | Canyon Island[a] | | | | Test Fishery[b] | |
|---|---|---|---|---|---|---|---|
| Date | Stat week | Number examined | Number ad clips | Number valid | Tag codes | Number examined | Number ad clips |
| 7/2 | 27 | 1 | | | | | |
| 7/3 | 27 | 0 | | | | | |
| 7/4 | 27 | 1 | | | | | |
| 7/5 | 27 | 0 | | | | | |
| 7/6 | 28 | 2 | | | | | |
| 7/7 | 28 | 3 | | | | | |
| 7/8 | 28 | 2 | | | | | |
| 7/9 | 28 | 1 | | | | | |
| 7/10 | 28 | 3 | | | | | |
| 7/11 | 28 | 0 | | | | | |
| 7/12 | 28 | 10 | | | | | |
| 7/13 | 29 | 8 | | | | | |
| 7/14 | 29 | 8 | | | | | |
| 7/15 | 29 | 10 | | | | | |
| 7/16 | 29 | 8 | | | | | |
| 7/17 | 29 | 4 | | | | | |
| 7/18 | 29 | 5 | | | | | |
| 7/19 | 29 | 3 | | | | | |
| 7/20 | 30 | 6 | | | | | |
| 7/21 | 30 | 6 | | | | | |
| 7/22 | 30 | 17 | | | | | |
| 7/23 | 30 | 12 | | | | | |
| 7/24 | 30 | 12 | | | | | |
| 7/25 | 30 | 11 | | | | | |
| 7/26 | 30 | 4 | | | | | |
| 7/27 | 31 | 5 | | | | | |
| 7/28 | 31 | 13 | | | | | |
| 7/29 | 31 | 4 | | | | | |
| 7/30 | 31 | 5 | 1 | 1 | 40544 | | |
| 7/31 | 31 | 7 | | | | | |
| 8/1 | 31 | 10 | | | | | |
| 8/2 | 31 | 11 | | | | | |
| 8/3 | 32 | 5 | | | | | |
| 8/4 | 32 | 9 | | | | | |
| 8/5 | 32 | 12 | | | | | |
| 8/6 | 32 | 12 | | | | | |
| 8/7 | 32 | 5 | | | | | |
| 8/8 | 32 | 16 | | | | | |
| 8/9 | 32 | 17 | | | | | |
| 8/10 | 33 | | | | | | |
| 8/11 | 33 | 0 | | | | | |

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**Appendix E3.**–Page 2 of 3.

| | | Canyon Island[a] | | | | Test Fishery[b] | |
|---|---|---|---|---|---|---|---|
| Date | Stat week | Number examined | Number ad clips | Number valid | Tag codes | Number examined | Number ad clips |
| 8/13 | 33 | 6 | | | | | |
| 8/14 | 33 | 10 | | | | | |
| 8/15 | 33 | 14 | | | | | |
| 8/16 | 33 | 8 | | | | | |
| 8/17 | 34 | 21 | | | | | |
| 8/18 | 34 | 44 | | | | | |
| 8/19 | 34 | 34 | | | | | |
| 8/20 | 34 | 18 | | | | | |
| 8/21 | 34 | 14 | | | | | |
| 8/22 | 34 | 19 | | | | | |
| 8/23 | 34 | 27 | | | | | |
| 8/24 | 35 | 9 | | | | | |
| 8/25 | 35 | 7 | | | | 836 | 7 |
| 8/26 | 35 | 15 | | | | | |
| 8/27 | 35 | 13 | | | | | |
| 8/28 | 35 | 41 | | | | | |
| 8/29 | 35 | 44 | 1 | 1 | 35607 | | |
| 8/30 | 35 | 48 | 1 | 1 | 40544 | | |
| 8/31 | 36 | 58 | 3 | 2 | 40550 | | |
| | | | | | Released | | |
| | | | | | No tag | | |
| 9/1 | 36 | 83 | 2 | 1 | 40544 | | |
| | | | | | No tag | | |
| 9/2 | 36 | 70 | | | | | |
| 9/3 | 36 | 163 | | | | | |
| 9/4 | 36 | 130 | | | | 931 | 12 |
| 9/5 | 36 | 35 | | | | | |
| 9/6 | 36 | 37 | 2 | 2 | 40551 | | |
| | | | | | Released | | |
| 9/7 | 37 | 72 | | | | | |
| 9/8 | 37 | 66 | | | | | |
| 9/9 | 37 | 89 | 1 | 1 | | | |
| 9/10 | 37 | 63 | 3 | 3 | 40544 | | |
| | | | | | 40544 | | |
| | | | | | Released | | |
| 9/11 | 37 | 107 | 1 | 1 | Released | | |
| 9/12 | 37 | 72 | | | | | |
| 9/13 | 37 | 98 | 1 | 1 | 40544 | | |
| 9/14 | 38 | 93 | 1 | 1 | 40551 | 814 | 5 |
| 9/15 | 38 | 64 | 1 | 1 | 40544 | | |
| 9/16 | 38 | 28 | | | | | |
| 9/17 | 38 | 40 | | | | | |

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**Appendix E3.**–Page 3 of 3.

| | | Canyon Island[a] | | | | Test Fishery[b] | |
|---|---|---|---|---|---|---|---|
| **Date** | **Stat week** | **Number examined** | **Number ad clips** | **Number valid** | **Tag codes** | **Number Examined** | **Number ad clips** |
| 9/18 | 38 | 45 | 1 | 1 | 40544 | | |
| 9/19 | 38 | 54 | 1 | 1 | 40551 | | |
| 9/20 | 38 | 45 | | | | | |
| 9/21 | 39 | | | | | 570 | 8 |
| 9/22 | 39 | 49 | 1 | 1 | 40551 | | |
| 9/23 | 39 | 47 | | | | | |
| 9/24 | 39 | 54 | | | | | |
| 9/25 | 39 | 34 | 1 | 1 | 40544 | | |
| 9/26 | 39 | 91 | | | | | |
| 9/27 | 39 | 134 | 1 | 1 | 40544 | 559 | 15 |
| 9/28 | 40 | | | | | | |
| 9/29 | 40 | 144 | | | | | |
| 9/30 | 40 | 97 | 1 | 1 | 40544 | | |
| 10/1 | 40 | 43 | 2 | 2 | 40550<br>40551 | | |
| 10/2 | 40 | 46 | 1 | 1 | 40551 | | |
| 10/3 | 40 | 34 | 1 | 1 | 40551 | | |
| 10/4 | 40 | 18 | | | | | |
| 10/5 | 41 | | | | | | |
| 10/6 | 41 | 21 | 2 | 2 | 40544<br>40551 | 380 | 11 |
| 10/7 | 41 | 0 | | | | | |
| 10/8 | 41 | 13 | | | | | |
| Total | | 3,003 | 30 | 28 | | 4,090 | 58 |

[a] At Canyon Island, adipose fin-clipped coho salmon that tested positive for the presence of valid coded wire using a handheld magnetic wand detector were subsequently released. One fish sacrificed on 8/29 was tagged at Switzer Creek in the spring of 2002; all other valid recoveries were germane to the Taku River.

[b] In the test fishery, no information was available regarding presence or absence of coded-wire for sampled adipose fin-clipped coho salmon.

**Appendix E4.–**Estimated harvests of coho salmon bound for Taku River above Canyon Island in 2003 in marine commercial troll and gillnet fisheries by statistical week. Harvest in the troll fishery was approximated by weighting period catches by the number of coded wire tags recovered in a statistical week.

| Statistical | Ending | Troll | | Gillnet | | Total | | Weekly prop of harvest | | | Weekly prop of harvest times Statistical week | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| week | date | Tags | Harvest | Tags | Harvest | Tags | Harvest | Troll | Gillnet | Total | Troll | Gillnet | Total |
| 27 | 6/28 | | | 1 | 394 | 1 | 394 | | | 0.01 | | 0.42 | 0.18 |
| 28 | 7/12 | | | | | | | | | | | | |
| 29 | 7/19 | 1 | 373 | | | 1 | 373 | 0.01 | | 0.01 | 0.32 | | 0.18 |
| 30 | 7/26 | 3 | 1,120 | | | 3 | 1,120 | 0.03 | | 0.02 | 1.00 | | 0.57 |
| 31 | 8/2 | 7 | 2,614 | | | 7 | 2,614 | 0.08 | | 0.04 | 2.40 | | 1.37 |
| 32 | 8/9 | 3 | 1,120 | 1 | 394 | 4 | 1,515 | 0.03 | 0.02 | 0.03 | 1.06 | 0.49 | 0.82 |
| 33 | 8/16 | 6 | 2,241 | 1 | 394 | 7 | 2,635 | 0.07 | 0.02 | 0.04 | 2.19 | 0.51 | 1.47 |
| 34 | 8/23 | 8 | 2,875 | | | 8 | 2,875 | 0.09 | | 0.05 | 2.90 | | 1.65 |
| 35 | 8/30 | 11 | 3,953 | 2 | 788 | 13 | 4,741 | 0.12 | 0.03 | 0.08 | 4.11 | 1.08 | 2.80 |
| 36 | 9/6 | 13 | 4,672 | 11 | 4,336 | 24 | 9,007 | 0.14 | 0.17 | 0.15 | 4.99 | 6.09 | 5.47 |
| 37 | 9/13 | 23 | 8,265 | 13 | 5,124 | 36 | 13,389 | 0.25 | 0.20 | 0.23 | 9.07 | 7.40 | 8.35 |
| 38 | 9/20 | 14 | 5,031 | 22 | 8,671 | 36 | 13,702 | 0.15 | 0.34 | 0.23 | 5.67 | 12.86 | 8.78 |
| 39 | 9/27 | 1 | 359 | 10 | 3,941 | 11 | 4,301 | 0.01 | 0.15 | 0.07 | 0.42 | 6.00 | 2.83 |
| 40 | 10/4 | 3 | 1,078 | 4 | 1,577 | 7 | 2,655 | 0.03 | 0.06 | 0.04 | 1.28 | 2.46 | 1.79 |
| 41 | 10/18 | | | | | | | | | | | | |
| Total | | 93 | 33,703 | 65 | 25,619 | 158 | 59,322 | 1.00 | 1.00 | 1.00 | 35.42 | 37.31 | 36.23 |
| | | | | | | | | Estimated mean date of harvest | | | 8/27/03 | 9/09/03 | 9/02/03 |

**Appendix E5.–**Number of marked coho salmon released at Canyon Island and recaptured and examined for marks in the inriver test and Canadian commercial fisheries by statistical week in 2003.

| | | | Recovery stat week | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Release stat week** | **Date** | **Number of fish released** | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
| 27 | 6/29–7/5 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 | 7/6–7/12 | 19 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | 7/13–7/19 | 42 | 0 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 7/20–7/26 | 61 | 0 | 0 | 0 | 0 | 2 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | 7/27–8/2 | 51 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 32 | 8/3–8/9 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 7 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 33 | 8/10–8/16 | 37 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 34 | 8/17–8/23 | 159 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 35 | 8/24–8/30 | 159 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 0 |
| 36 | 8/31–9/6 | 535 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 9 | 0 | 0 | 0 |
| 37 | 9/7–9/13 | 533 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 6 | 0 | 0 |
| 38 | 9/14–9/20 | 349 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 4 | 0 |
| 39 | 9/21–9/27 | 378 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 11 |
| 40 | 9/28–10/4 | 354 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41 | 10/5–10/10 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 2,775 | 0 | 0 | 3 | 6 | 6 | 12 | 8 | 3 | 1 | 17 | 17 | 11 | 5 | 11 | 8 |
| | **Marked percent** | | 0.0% | 0.0% | 1.9% | 1.8% | 2.7% | 1.8% | 1.1% | 1.3% | 0.1% | 1.6% | 1.6% | 1.9% | 0 .8% | 2.3% | 2.3% |
| | **Number of fish examined** | | 9 | 41 | 155 | 335 | 224 | 659 | 707 | 232 | 835 | 1,034 | 1,088 | 589 | 596 | 485 | 343 |

# APPENDIX F

**Appendix F 1.–**Summary of population parameters for the Taku River coho salmon run, 1987–2003.

| Calendar year | Escapement | Canadian harvest | Inriver run | Est. U.S. marine harv. | Est. total run | Total harv. rate (%) | U.S. marine harv. rate (%) | Smolt in year (t-1) | Marine survival (%) |
|---|---|---|---|---|---|---|---|---|---|
| **COHO SALMON ABOVE CANYON ISLAND** | | | | | | | | | |
| 1987 | 55,457 | 6,519 | 61,976 | | | | | | |
| 1988 | 39,450 | 3,643 | 43,093 | | | | | | |
| 1989 | 56,808 | 4,033 | 60,841 | | | | | | |
| 1990 | 72,196 | 3,685 | 75,881 | | | | | | |
| 1991 | 127,484 | 5,439 | 132,923 | | | | | | |
| 1992 | 84,853 | 5,541 | 90,394 | 96,283 | 186,677 | 54.5 | 51.6 | 743,000 | |
| 1993 | 109,457 | 4,634 | 114,091 | 97,758 | 211,849 | 48.3 | 46.1 | 1,510,000 | 14.0 |
| 1994 | 96,343 | 14,693 | 111,036 | 228,607 | 339,643 | 71.6 | 67.3 | 1,476,000 | 23.0 |
| 1995 | 55,710 | 13,738 | 69,448 | 111,571 | 181,019 | 69.2 | 61.6 | 1,525,000 | 11.9 |
| 1996 | 44,635 | 5,052 | 49,687 | 44,529 | 94,216 | 52.6 | 47.3 | 986,489 | 9.6 |
| 1997 | 32,345 | 2,690 | 35,035 | 15,825 | 50,860 | 36.4 | 31.1 | 759,763 | 6.7 |
| 1998 | 61,382 | 5,090 | 66,472 | 53,368 | 119,840 | 48.8 | 44.5 | 853,662 | 14.0 |
| 1999 | 60,768 | 5,575 | 66,343 | 50,789 | 117,132 | 48.1 | 43.4 | 1,184,195 | 9.9 |
| 2000 | 64,700 | 5,447 | 70,147 | 38,971 | 109,118 | 40.7 | 35.7 | 1,728,240 | 6.3 |
| 2001 | 104,394 | 3,099 | 107,493 | 55,264 | 162,756 | 35.9 | 34.0 | 1,846,629 | 8.8 |
| 2002 | 219,360 | 3,802 | 223,162 | 80,046 | 303,208 | 27.7 | 26.4 | 2,718,816 | 11.2 |
| 2003 | 183,038 | 3,717 | 186,755 | 78,277 | 265,032 | 30.9 | 29.5 | 2,988,349 | 8.9 |
| **Standard errors** | | | | | | | | | |
| 1992 | | | 19,033 | 24,005 | 30,635 | | 8.20 | 247,000 | |
| 1993 | | | 17,503 | 19,256 | 26,022 | | 6.20 | 418,051 | 4.2 |
| 1994 | | | 6,529 | 36,734 | 37,310 | | 3.80 | 368,411 | 6.3 |
| 1995 | | | 3,242 | 12,186 | 12,610 | | 2.80 | 339,822 | 2.8 |
| 1996 | | | 3,650 | 6,494 | 7,449 | | 4.10 | 214,152 | 2.2 |
| 1997 | | | 4,120 | 2,691 | 4,921 | | 4.40 | 154,051 | 1.5 |
| 1998 | | | 5,394 | 7,435 | 9,186 | | 4.00 | 147,260 | 2.6 |
| 1999 | | | 7,049 | 6,097 | 9,320 | | 3.90 | 207,576 | 1.9 |
| 2000 | | | 5,667 | 3,326 | 6,571 | | 2.59 | 255,147 | 1.0 |
| 2001 | | | 9,495 | 4,828 | 10,652 | | 2.75 | 276,385 | 1.4 |
| 2002 | | | 28,648 | 6,389 | 29,352 | | 2.92 | 363,071 | 1.8 |
| 2003 | | | 17,724 | 10,271 | 20,485 | | 3.32 | 1,008,886 | 3.1 |
| **COHO SALMON FROM ENTIRE TAKU RIVER DRAINAGE** | | | | | | | | | |
| 1987 | 72,937 | 6,519 | 79,456 | | | | | | |
| 1988 | 51,604 | 3,643 | 55,247 | | | | | | |
| 1989 | 73,968 | 4,033 | 78,001 | | | | | | |
| 1990 | 93,598 | 3,685 | 97,283 | | | | | | |
| 1991 | 164,975 | 5,439 | 170,414 | | | | | | |
| 1992 | 110,349 | 5,541 | 115,890 | 123,440 | 239,330 | 53.9 | 51.6 | 952,774 | |
| 1993 | 141,637 | 4,634 | 146,271 | 125,331 | 271,601 | 47.9 | 46.1 | 1,935,938 | 140 |
| 1994 | 127,661 | 14,693 | 142,354 | 293,086 | 435,440 | 70.7 | 67.3 | 1,892,147 | 230 |
| 1995 | 75,298 | 13,738 | 89,036 | 143,040 | 232,076 | 67.6 | 61.6 | 1,955,551 | 11.9 |
| 1996 | 58,649 | 5,052 | 63,701 | 57,088 | 120,790 | 51.4 | 47.3 | 1,264,729 | 9.6 |
| 1997 | 42,227 | 2,690 | 44,917 | 20,288 | 65,205 | 35.2 | 31.1 | 974,055 | 6.7 |
| 1998 | 80,131 | 5,090 | 85,221 | 68,421 | 153,641 | 47.8 | 44.5 | 1,094,438 | 14.0 |
| 1999 | 79,480 | 5,575 | 85,055 | 65,114 | 150,169 | 47.1 | 43.4 | 1,518,199 | 9.9 |
| 2000 | 84,485 | 5,447 | 89,932 | 49,962 | 139,894 | 39.6 | 35.7 | 2,215,692 | 6.3 |
| 2001 | 134,712 | 3,099 | 137,811 | 70,851 | 208,662 | 35.4 | 34.0 | 2,367,473 | 8.8 |
| 2002 | 282,303 | 3,802 | 286,105 | 102,623 | 388,728 | 27.4 | 26.4 | 3,485,662 | 11.2 |
| 2003 | 235,713 | 3,717 | 239,430 | 100,355 | 339,785 | 30.6 | 29.5 | 3,831,217 | 8.9 |
| **Standard errors** | | | | | | | | | |
| 1992 | | | 24,401 | 30,776 | 39,276 | | | 374,000 | |
| 1993 | | | 22,440 | 24,687 | 33,362 | | | 535,963 | |
| 1994 | | | 8,371 | 47,095 | 47,833 | | | 472,321 | |
| 1995 | | | 4,156 | 15,623 | 16,167 | | | 435,669 | |
| 1996 | | | 4,679 | 8,326 | 9,550 | | | 274,554 | |
| 1997 | | | 5,282 | 3,450 | 6,309 | | | 197,501 | |
| 1998 | | | 6,915 | 9,532 | 11,777 | | | 188,795 | |
| 1999 | | | 9,037 | 7,817 | 11,949 | | | 266,123 | |
| 2000 | | | 7,265 | 4,265 | 8,424 | | | 327,112 | |
| 2001 | | | 12,173 | 6,189 | 13,656 | | | 354,340 | |
| 2002 | | | 36,728 | 8,191 | 37,631 | | | 465,476 | |
| 2003 | | | 22,723 | 13,167 | 26,263 | | | 1,293,444 | |

**Appendix F2.–**Weekly and season estimates of inriver run, harvest and escapement of coho salmon above Canyon Island in the Taku River, 1987–2003.

| Recovery week | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | | | | | | | | | | 45 | | 11 | 7 | 19 | 29 | 60 | 50 |
| 28 | | | | | | | | | | 464 | 5 | 55 | 44 | 128 | 197 | 409 | 339 |
| 29 | | | | | | | | | 1,460 | 853 | 106 | 337 | 83 | 514 | 787 | 1,634 | 1,354 |
| 30 | | 548 | 1,425 | 1,479 | 2,517 | 3,298 | 641 | 3,348 | 2,628 | 1,525 | 134 | 1,968 | 275 | 1,492 | 2,286 | 4,746 | 3,931 |
| 31 | 3,841 | 1,060 | 878 | 2,186 | 2,209 | 1,741 | 2,386 | 5,026 | 4,582 | 2,159 | 843 | 2,932 | 1,127 | 2,155 | 3,303 | 6,857 | 5,680 |
| 32 | 2,529 | 1,526 | 2,693 | 1,051 | 4,157 | 10,040 | 3,186 | 3,988 | 2,100 | 6,216 | 738 | 5,226 | 1,221 | 3,109 | 4,764 | 9,890 | 8,193 |
| 33 | 3,623 | 1,257 | 300 | 1,910 | 4,867 | 4,875 | 4,550 | 4,308 | 5,299 | 5,337 | 1,265 | 4,116 | 2,327 | 3,064 | 4,696 | 9,749 | 8,076 |
| 34 | 4,721 | 7,412 | 9,598 | 11,095 | 1,740 | 500 | 12,759 | 9,827 | 8,764 | 6,589 | 1,542 | 4,428 | 3,148 | 5,715 | 8,758 | 18,182 | 15,062 |
| 35 | 3,503 | 8,366 | 8,385 | 17,739 | 27,296 | 2,170 | 3,424 | 15,029 | 10,565 | 7,861 | 2,589 | 6,007 | 1,984 | 7,997 | 12,255 | 25,443 | 21,077 |
| 36 | 4,061 | 5,583 | 14,038 | 17,855 | 5,924 | 13,332 | 19,703 | 7,904 | 10,951 | 7,362 | 3,028 | 5,508 | 4,725 | 8,349 | 12,795 | 26,563 | 22,005 |
| 37 | 3,843 | 11,371 | 10,181 | 12,563 | 17,411 | 14,601 | 15,427 | 34,400 | 7,118 | 2,900 | 10,211 | 5,758 | 10,403 | 10,870 | 16,657 | 34,580 | 28,647 |
| 38 | 6,009 | 1,446 | 3,351 | 9,596 | 4,708 | | | 13,583 | 5,889 | 1,312 | 10,236 | 3,265 | 8,225 | 5,561 | 8,523 | 17,693 | 14,657 |
| 39 | 11,440 | 4,524 | 8,031 | 407 | 9,100 | | | 787 | 2,109 | 1,549 | 1,462 | 4,384 | 3,582 | 3,896 | 5,971 | 12,396 | 10,269 |
| 40 | | | 1,960 | | 33,009 | | | 443 | 273 | | 2,875 | 5,293 | 10,654 | 7,045 | 10,795 | 22,412 | 18,566 |
| 41 | | | | | 11,371 | | | | | | | | 11,245 | 10,230 | 15,677 | 32,547 | 26,962 |
| 42 | | | | | 4,410 | | | | | | | | | | | | |
| 43 | | | | | 4,204 | | | | | | | | | | | | |
| Inriver run | 43,570 | 43,093 | 60,841 | 75,881 | 132,923 | 50,557 | 62,076 | 98,643 | 61,738 | 44,172 | 35,035 | 49,290 | 59,052 | 70,146 | 107,493 | 223,162 | 186,755 |
| SE | 3,096 | 7,162 | 11,174 | 21,813 | 19,051 | 10,645 | 9,523 | 5,800 | 2,882 | 3,405 | 4,160 | 4,485 | 6,650 | 5,667 | 9,495 | 28,648 | 17,724 |
| Inriver harvest | 6,519 | 3,643 | 4,033 | 3,685 | 5,439 | 5,541 | 4,634 | 14,693 | 13,738 | 5,052 | 2,690 | 5,090 | 5,575 | 5,447 | 3,099 | 3,802 | 3,717 |
| Expanded inriver run[a] | 61,976 | 43,093 | 60,841 | 75,881 | 132,923 | 90,394 | 114,091 | 111,036 | 69,448 | 49,687 | 35,035 | 66,472 | 66,343 | 70,146 | 107,493 | 223,162 | 186,755 |
| Final escapement | 55,457 | 39,450 | 56,808 | 72,196 | 127,484 | 84,901 | 109,457 | 96,343 | 55,710 | 44,635 | 32,345 | 61,382 | 60,768 | 64,699 | 104,394 | 219,360 | 183,038 |
| SE | 4,053 | 7,162 | 11,174 | 21,813 | 19,051 | 19,033 | 17,503 | 6,529 | 3,242 | 3,650 | 4,120 | 5,394 | 7,049 | 5,667 | 9,495 | 28,648 | 17,724 |
| Estimated U.S. harvest | | | | | | 96,283 | 97,758 | 228,607 | 111,571 | 44,529 | 15,825 | 53,368 | 50,789 | 39,002 | 55,286 | 80,114 | 78,334 |
| SE | | | | | | 24,005 | 19,256 | 36,734 | 12,186 | 6,494 | 2,691 | 7,435 | 6,097 | 3,326 | 4,828 | 6,389 | 10,271 |
| Estimated total run | | | | | | 186,677 | 211,849 | 339,643 | 181,019 | 94,216 | 50,860 | 119,840 | 117,132 | 109,148 | 162,779 | 303,276 | 265,089 |
| SE | | | | | | 30,635 | 26,022 | 37,310 | 12,610 | 7,449 | 4,921 | 9,186 | 9,320 | 6,571 | 10,652 | 29,352 | 20,485 |

[a] Inriver run expansions may be revised pending further studies.

**Appendix F3.–**Estimated age compositions of coho salmon sampled in Canyon Island fishwheels and gillnets, 1983–2003.

| | | Percent by age class | | | | | |
|---|---|---|---|---|---|---|---|
| **Year** | **Sample size** | **1.0** | **1.1** | **2.0** | **2.1** | **3.1** | **4.0** |
| 1983 | 477 | | 56.0 | | 44.2 | | |
| 1984 | 630 | 0.3 | 43.2 | 0.5 | 56.2 | 6.0 | |
| 1985 | 825 | | 44.5 | 0.2 | 51.4 | 4.0 | |
| 1986 | 475 | 0.6 | 44.0 | 0.4 | 52.8 | 2.7 | |
| 1987 | 1,700 | 0.1 | 32.4 | 0.3 | 65.1 | 2.4 | 0.1 |
| 1988 | 1,338 | 1.1 | 32.3 | 0.8 | 59.0 | 6.8 | |
| 1989 | 1,826 | | 49.3 | 0.1 | 48.5 | 2.1 | |
| 1990 | 1,463 | | 29.3 | | 67.9 | 2.9 | 0.1 |
| 1991 | 523 | 0.4 | 31.4 | | 67.7 | 1.3 | |
| 1992 | 534 | 0.4 | 51.5 | | 48.1 | | |
| 1993 | 498 | | 39.4 | 0.6 | 60.0 | 0.8 | |
| 1994 | 539 | | 44.8 | 0.6 | 55.0 | 0.4 | |
| 1995 | 582 | | 52.6 | | 47.8 | | |
| 1996 | 599 | | 56.3 | | 43.2 | 0.5 | |
| 1997 | 481 | | 64.7 | | 35.3 | | |
| 1998 | 610 | | 67.7 | | 32.3 | | |
| 1999 | 617 | | 79.3 | | 20.7 | | |
| 2000 | 648 | | 79.5 | | 20.5 | | |
| 2001 | 771 | | 81.3 | | 18.7 | | |
| 2002 | 1,112 | | 84.8 | | 15.2 | | |
| 2003 | 905 | | 90.2 | | 9.8 | | |
| Average (83–03) | 639 | 0.05 | 61.2 | 0.07 | 38.54 | 0.14 | 0.01 |
| SD (83–03) | | 0.12 | 14.71 | 0.14 | 14.47 | 0.20 | 0.04 |
| CV (83–03) | | 262% | 24% | 194% | 38% | 144% | 458% |

| | | Average length by age class in MEF (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| **Year** | **Sample size** | **1.0** | **1.1** | **2.0** | **2.1** | **3.1** | **Total** |
| 1983 | 476 | | 589 | | 610 | | 596 |
| 1984 | 620 | | 566 | 320 | 608 | 565 | 582 |
| 1985 | 765 | | 584 | | 616 | 625 | 599 |
| 1986 | 455 | 320 | 577 | | 598 | 645 | 587 |
| 1987 | 633 | 330 | 568 | 310 | 592 | 596 | 582 |
| 1988 | 607 | | 595 | | 612 | 655 | 604 |
| 1989 | 621 | | 581 | | 601 | 623 | 589 |
| 1990 | 639 | | 569 | | 623 | | 600 |
| 1991 | 592 | | 607 | | 623 | | 614 |
| 1992 | 524 | 303 | 574 | 325 | 606 | | 587 |
| 1993 | 567 | | 578 | 270 | 592 | 680 | 584 |
| 1994 | 553 | | 592 | 333 | 611 | | 599 |
| 1995 | 597 | | 584 | | 588 | | 586 |
| 1996 | 592 | | 575 | | 602 | 588 | 588 |
| 1997 | 478 | | 575 | | 603 | | 585 |
| 1998 | 609 | | 601 | | 616 | | 606 |
| 1999 | 617 | | 569 | | 594 | | 574 |
| 2000 | 648 | | 575 | | 603 | | 622 |
| 2001 | 771 | | 601 | | 616 | | 595 |
| 2002 | 1,112 | | 569 | | 594 | | 596 |

-continued-

**Appendix F3.**–Page 2 of 2.

| | | Average length by age class in MEF (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| **Year** | **Sample size** | **1.0** | **1.1** | **2.0** | **2.1** | **3.1** | **Total** |
| 2003 | 905 | | 614 | | 635 | | 616 |
| Average (83–03) | 637 | 318 | 583 | 312 | 607 | 622 | 595 |
| SD (83–03) | | 14 | 14 | 25 | 12 | 38 | 12 |
| CV (83–03) | | 4% | 2% | 8% | 2% | 6% | 2% |

# APPENDIX G

**Appendix G1.–**Computer data files on Taku River coho salmon, 1999-2003.

| File name | Description |
|---|---|
| SPAS.exe | SPAS program for estimating adult abundance |
| BootVar.bas | Quickbasic program for bootstrapping variance of adult abundance estimate |
| KS2.exe | Program for running Kolmogorov-Smirnov Two Sample Test for similarity in smolt length distributions |
| 1OVERTC.exe | Program for estimating Var (1/θ) |
| 99_Smolt Data.xls | Excel file containing 1999 smolt data |
| 99_Smolt_KS.prn | KS2.exe input file using 1999 smolt length data |
| 00_Taku_43.xls | Excel file containing 2000 adult data |
| 00_Taku BOOT_43.dat | BootVar.bas input file for variance of 2000 adult abundance |
| 00_Taku BOOT_43.out | BootVar.bas output file for variance of 2000 adult abundance |
| 00_Smolt Data.xls | Excel file containing 2000 smolt data |
| 00_Smolt_KS.prn | KS2.exe input file using 2000 smolt length data |
| 00_Taku SPAS_43.dat | SPAS.exe input file using 2000 adult data |
| 01_Taku_43.xls | Excel file containing 2001 adult data |
| 01_Taku BOOT_43.dat | BootVar.bas input file for variance of 2001 adult abundance |
| 01_Taku BOOT_43.out | BootVar.bas output file for variance of 2001 adult abundance |
| 01_Smolt Data.xls | Excel file containing 2001 smolt data |
| 01_Smolt_KS.prn | KS2.exe input file using 2001 smolt length data |
| 01_Taku SPAS_43.dat | SPAS.exe input file using 2001 adult data |
| 02_Taku_43.xls | Excel file containing 2002 adult data |
| 02_Smolt Data.xls | Excel file containing 2002 smolt data |
| 02_Smolt_KS.prn | KS2.exe input file using 2002 smolt length data |
| 02_Taku SPAS_43.dat | SPAS.exe input file using 2002 adult data |
| 02_Taku SPAS 2x2_43.dat | SPAS.exe input file using 2002 adult data and a 2x2 matrix |
| 03_Taku_43.xls | Excel file containing 2003 adult data |
| 03_Taku BOOT_43.dat | BootVar.bas input file for variance of 2003 adult abundance |
| 03_Taku BOOT_43.out | BootVar.bas output file for variance of 2003 adult abundance |
| 03_Taku SPAS_43.dat | SPAS.exe input file using 2003 adult data |