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ABSTRACT

As part of an ongoing study of the production of coho salmon *Oncorhynchus kisutch* from Taku River, near Juneau, Alaska, the Division of Sport Fish implanted coded wire tags in smolt leaving the river in spring 1992. Subsequent recovery of these fish was used to estimate the harvest, production, exploitation rate in 1993, and abundance of smolt in 1992. In 1992 two 12' diameter rotary smolt traps were fished at Barrel Point, Taku River, and caught 7,234 coho salmon smolt from 11 May to 12 June. Of these, 2,315 were coded wire tagged and released with tag code 04-28-50, and 4,332 were tagged and released with tag code 04-28-51, for a total of 6,647. Of the remainder (587 fish), 71 were <70 mm, 441 died in traps prior to tagging and 75 died after tagging. Smolt sampled from the catch averaged 105 mm fork length and were 34% age 1.0, 65% age 2.0, and 1% age 3.0. In 1993, 121 adult coho salmon bearing coded wire tags implanted at Barrel Point (in 1992) were recovered in random sampling of marine fisheries to produce an estimate of total marine harvest of 125,331 (SE = 24,687). Of this harvest, the troll fishery took an estimated 63%, drift gill net fisheries took 32%, and recreational and seine fisheries each took about 3%. A mark-recapture experiment conducted by the Commercial Fisheries Management and Development Division estimated the in-river escapement of coho salmon in Taku River past Canyon Island at 123,964 (SE = 15,617) fish. The estimated total run for 1993, the sum of escapement and harvest, was 249,295 (SE = 29,212) and the exploitation rate of the return was an estimated 50% (SE = 6%). The estimated smolt abundance in 1992 was 1,451,954 (SE = 351,396).

KEY WORDS: Coho salmon, *Oncorhynchus kisutch*, Taku River, harvest, troll fishery, drift gill net fishery, recreational fishery, seine fishery, escapement, migratory timing, timing, production, return, exploitation rate.

## INTRODUCTION

The Taku River produces an estimated 100,000-300,000 adult coho salmon *Oncorhynchus kisutch* annually, many of which are caught in commercial and recreational fisheries in northern Southeast Alaska (Elliott and Bernard 1994; PSC 1993). Coho salmon returning to the Taku River first pass through an offshore troll fishery before they enter inside waters through Icy Strait (Figure 1). These fish then pass through a seine fishery in Icy and Chatham straits and a drift gill net fishery in lower Lynn Canal. They next transit the recreational fishery near Juneau and the drift gill net 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 gill net fishery just inside Canada (Figure 2). Due to the potential 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, the U.S. National Marine Fisheries Service, and the Canadian Department of Fisheries and Oceans have all recently conducted studies of this stock. In these studies, fingerlings or smolts were implanted with coded wire tags (CWTs) or given pigment marks either where they resided or as they left Yehring Creek, the Nahlin River, Tatsamenie Lake, other tributaries, or the lower Taku River (Figure 2). In some studies, weirs were used to sample returning adults to estimate the fraction of each stock marked with CWTs. Information from these assessment studies were used to estimate harvest of tributary stocks in commercial and recreational fisheries and, where possible, to estimate the abundance of smolt leaving these tributaries. Table 1 is a short bibliography of reports generated from some of these studies.

Our studies began in 1986 on coho salmon in Yehring Creek and Nahlin River, each tributaries to Taku River. Because these stocks are small relative to total Taku River production, the emphasis of our work shifted from tributaries to assessment of production of all coho salmon from the Taku River in 1991 (Elliott and Bernard 1994) and has continued since.

The objectives of this study were to estimate (1) the abundance of coho salmon smolt leaving the Taku River in 1992, (2) the mean length of these smolt, (3) the age composition of these smolt, and (4) the harvest of adults returning to the Taku River in marine fisheries in 1993.

These objectives were accomplished by tagging and sampling smolt in 1992 in the lower Taku River. Other projects in our agency supplied information on returning adults that were harvested or escaped in 1993.

## METHODS

### Smolt Capture, Coded Wire Tagging, and Sampling

Two rotary smolt traps, constructed by E.G. Solutions of Corvallis, Oregon, were fished at Barrel Point near tidewater above the mouth of Taku River to capture smolt (Figure 3). One trap was fished from 11 May to 12 June, and the second was fished from 23 May to 11 June. Each trap had a 12-ft diameter upstream opening and was positioned in the thalweg along a steep rock bank where emigrating smolt were presumed to be concentrated. The first trap was located at Barrel Point and the second about 1 km downstream at the Rock Pile (Figure 3). Both traps were held about 10 m offshore by a boom log and secured with ½-in. galvanized steel cable to ¾-in. steel rods driven into holes bored in upstream rock outcrops.

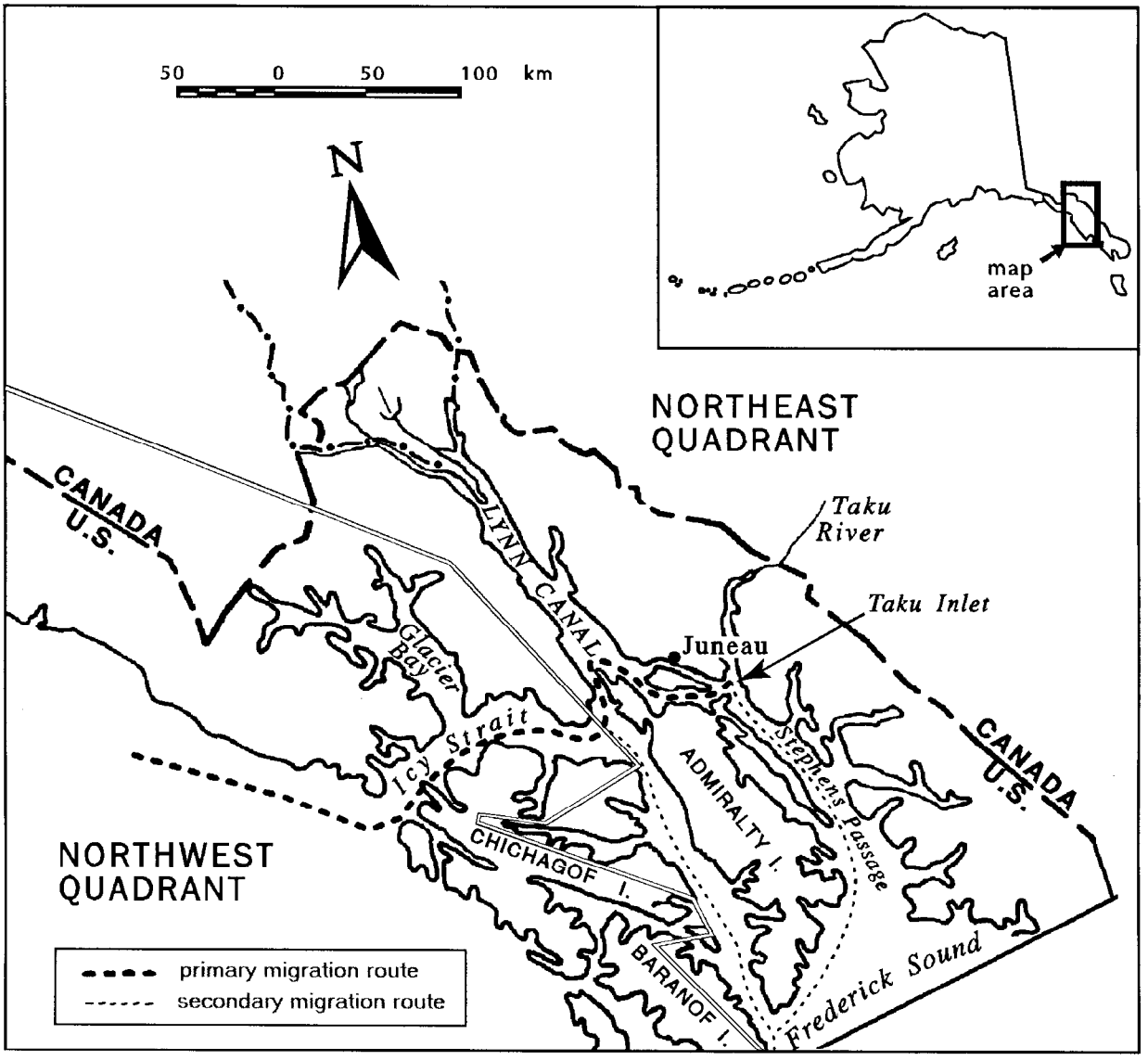


Figure 1. Migration routes of coho salmon bound for Taku River, through northern Southeast Alaska.

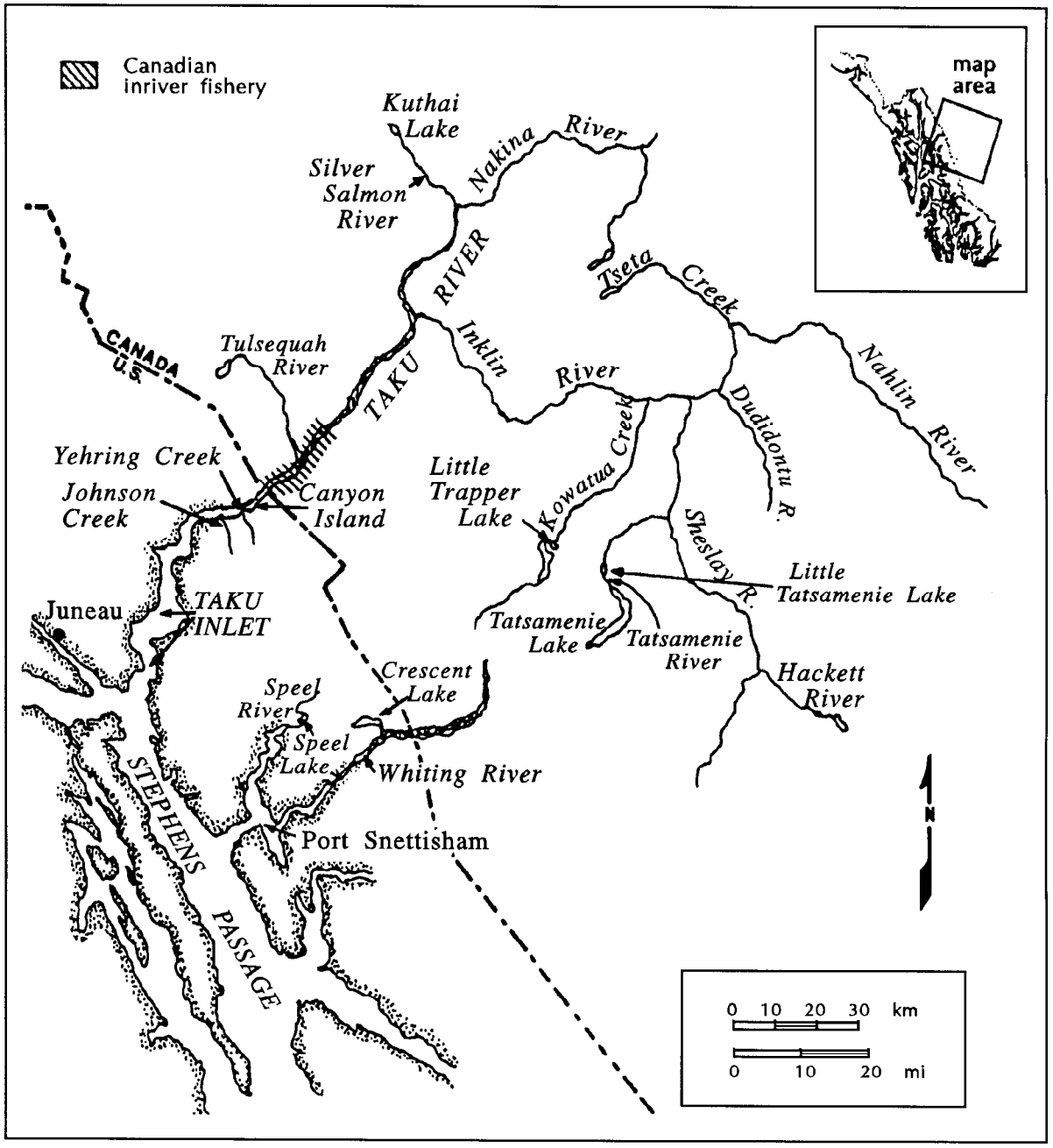


Figure 2. Taku River drainage, northwestern British Columbia and Southeast Alaska.

Table 1. Bibliography of stock assessment studies conducted on the Taku River.

| Citation | Location | Objective |
|---|---|---|
| Eiler et al. *in press* | Taku River | Spawning distribution |
| Elliott 1987 | Yehring Creek | 1986 escapement |
| Elliott and Kuntz 1988 | Yehring Creek | 1987 smolt samples<br>1987 escapement |
| Elliott et al. 1989 | Yehring Creek | 1988 harvest and escapement<br>1987 smolt abundance and survival<br>1988 smolt abundance |
| | Nahlin River | 1988 harvest and escapement<br>1988 juvenile tagging |
| Elliott and Sterritt 1990 | Yehring Creek | 1989 harvest and escapement<br>1988 smolt abundance and survival<br>1989 smolt abundance |
| Elliott and Sterritt 1991 | Yehring Creek | 1990 harvest and escapement<br>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 |
| McGregor and Clark 1988 | Taku River | Estimated escapement |
| McGregor and Clark 1989 | Taku River | Estimated escapement |
| McGregor et al. 1991 | Taku River | Estimated escapement |
| Murphy et al. 1988 | Taku River | 1987 smolt tagging |
| PSC 1993 | Taku River | Estimated escapement |
| Shaul 1987 | Nahlin River | 1986 escapement<br>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 |
| Shaul 1990 | Nahlin River | 1989 harvest |
| | Mainstem | 1989 harvest |
| | Tatsameni L. | 1989 harvest |
| | Yehring Creek | 1989 harvest |
| | U.S. tribs. | 1989 escapement |
| Shaul 1992 | Nahlin River | 1990 harvest |
| | Mainstem | 1990 harvest |
| | Tatsameni L. | 1990 harvest |
| | Yehring Creek | 1990 harvest |
| | U.S. tribs. | 1990 escapement |

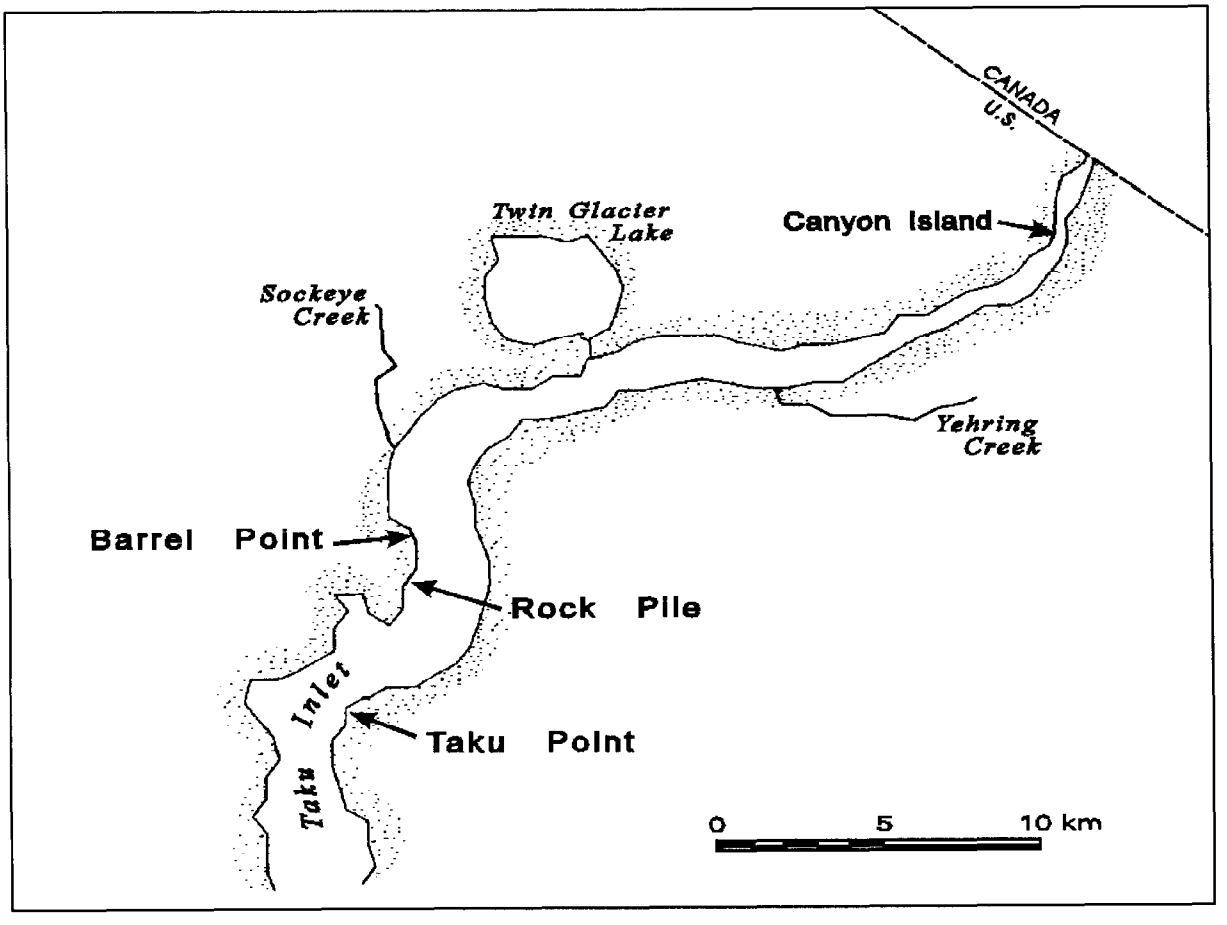


Figure 3. Study area on lower Taku River.

Two members of a three-technician crew were on duty or on call at all times to keep the trap fishing 24 hours a day. Early in the season, the trap was fished with little difficulty, but with increased spring run-off, debris became a constant problem. Logs and sticks frequently jammed the cone and halted its rotation. At times, debris clogged the throat of the cone and smolt were killed or badly scaled. Technicians visited traps about every 4-6 hours at the beginning of the season, and every 2 hours at the peak of the migration, or whenever debris stopped rotation. Each morning and evening, fine debris was removed from the cone by a high pressure jet of water supplied by a gasoline-powered water pump. Both traps were damaged enough by debris to deem them inoperable after 12 June.

Salmonid smolt and fry were removed from trap live boxes and processed each morning. Coho and chinook salmon *Oncorhynchus tshawytscha* smolt were separated by inspection from other species of *Oncorhynchus* and from Dolly Varden *Salvelinus malma* and transported to a nearby tagging shed. There, fish were carefully examined and species were separated using a combination of characters. If identity was in doubt, the adipose fin was inspected with a hand lens for the presence of a "window" in the pigmentation (Meehan and Vania 1961) that indicated a chinook salmon smolt.

All coho salmon smolt $\geq$ 70 mm fork length were tranquilized in a buffered 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 a constant river temperature by pumping the solution through a continuous loop containing a coil of aluminum tubing submerged in the river. All fish were tagged with a CWT and marked by excision of the adipose fin, following methods in Koerner (1977), and released.

Tagged fish were held during the day in floating live boxes, transported upstream and released during the evening. The first 200 fish in each day's batch were held in a separate live box and checked for the retention of CWTs and tagging mortality 24 hours later. The number of fish tagged, number of tagging related mortalities, and number of fish that had shed their tags were compiled and recorded on an *ADF&G CWT Tagging Summary and Release Information Form*. Completed forms were submitted to the Fisheries Rehabilitation Enhancement and Development Division[1] tag lab in Juneau when field work ended.

Age composition of emigrating coho salmon smolts in 1992 was estimated by systematically sampling every 18th smolt captured at Barrel Point. Each sampled smolt was measured to the nearest mm fork length (FL). A smear of scales was taken two rows above the lateral line on the left side of each sampled smolt just ahead of the adipose fin (the "preferred area" for sampling scales from coho smolt described in Anas [1963]). Scales were mounted between two 25-mm by 75-mm glass slides and viewed through a microfiche reader at 70x magnification. Age was determined once for each fish and are reported in European notation. Proportions in the age composition and their variances were estimated as

$$\hat{p}_i = \frac{y_i}{n_s} \qquad V[\hat{p}_i] = \frac{\hat{p}_i(1 - \hat{p}_i)}{n_s - 1} \tag{1}$$

[1] This agency is now named Commercial Fisheries Management and Development Division (CFMADD).

where $y_i$ = the number of smolts in the sample determined to be of age i (see Table 2 for definitions of the remaining notation in equation [1]).

Estimate of Smolt Abundance

An abundance estimate of smolt leaving the Taku River in 1992 was done with a mark-recapture experiment using a Petersen estimate with Bailey's modifications (Bailey 1951, 1952):

$$\hat{N}_s = \frac{n_c\,(n_e-1)}{m_e+1} \qquad V[\hat{N}_s] = \frac{n_c^2\,(n_e+1)(n_e-m_e)}{(m_e+1)^2(m_e+2)} \tag{2}$$

where $N_s$ = the number of smolts emigrating from the Taku River in 1992, $n_c$ = the number of smolt CWTd in 1992, $n_e$ = the number of adults sampled in 1993 to estimate $\theta$ and $m_e$ = the number of adults past Canyon Island in 1993 with missing adipose fins from Barrel Point.

Estimate of Harvest

Harvest of coho salmon from the Taku River in 1993 was estimated from samples taken from catches in commercial and recreational fisheries (Figure 1) and from samples from the escapement taken at Canyon Island (Figure 2). A subset of the catch was counted and inspected to find recaptured fish, those salmon without adipose fins. Whenever possible, heads of recaptured salmon were retrieved, marked, and sent to Juneau for dissection. Heads that arrived in Juneau were passed through a magnetometer to detect a CWT and were dissected if the presence of metal was indicated. If a CWT was found and the tag was undamaged, its code was read under a microscope. Oliver (1990) and Hubartt et al. (*In press*) present details of sampling commercial and recreational fisheries, respectively. The fraction of the return to the Taku River carrying CWTs was estimated from catches in fish wheels located at Canyon Island and from the inriver fishery in Canada, described by McGregor and Clark (1991). Information from catch and field sampling programs was expanded to estimate harvest of coho salmon bound for the Taku River:

$$\hat{n}_1 = \frac{m_1}{m_2}\frac{a_1}{a_2}\frac{H}{n_2}\frac{m_c}{\theta} = H\,\theta^{-1}\hat{M} \tag{3}$$

where $\hat{M}$ is the final statistic obtained through sampling catches (remaining notation is defined in Table 2). All CWTs with codes corresponding to smolts tagged at Barrel Point in 1992 were tallied to calculate $m_c$.

The bootstrap of Efron (1982) as modified by Buckland and Garthwaite (1991) was used to estimate M, its variance, and bias. Each fish inspected during a catch sampling program was placed into one of six capture histories depending on its fate in the program (Table 3). A multinomial, empirical density distribution with six cells was created with the data from the catch sampling program.

Table 2. Notation used to describe the parameters involved in estimators of harvest, escapement, and smolt abundance of coho salmon from the Taku River. Coded wire tags are abbreviated as CWTs.

| | | |
|---|---|---|
| $a_1$ | = | Number of adults missing adipose fins in a sample from a 1993 harvest |
| $a_2$ | = | Number of heads that arrive at Juneau for dissection (subset of $a_1$) |
| E | = | Exploitation rate of adults in commercial and sport fisheries in 1993 |
| H | = | Number of adults in a harvest in 1993 |
| $\lambda$ | = | Fraction of harvest in District 111 prior to 12 September, 1993 |
| $m_1$ | = | Number of heads with CWTs detected magnetically (subset of $a_2$) |
| $m_2$ | = | Number of CWTs found through dissection and decoded (subset of $m_1$) |
| $m_c$ | = | Number of CWTs with the appropriate code(s) (subset of $m_2$) |
| $m_e$ | = | Number of adults past Canyon Is. with missing adipose fins in 1993 |
| $n_1$ | = | Number of adults in a harvest from the appropriate stock in 1993 |
| $n_2$ | = | Number of adults in a harvest inspected (the sample) in 1993 |
| $n_c$ | = | Number of smolt CWTd in 1992 |
| $n_e$ | = | Number of adults sampled in 1993 to estimate $\theta$ |
| $n_s$ | = | Number of smolt sampled to estimate age composition in 1992 |
| $N_e$ | = | Number of adults in escapement past Canyon Island in 1993 |
| $N_e^*$ | = | Number of adults in escapement prior to 12 September, 1993 |
| $N_H$ | = | Number of adults harvested in all strata and all fisheries in 1993 |
| $N_f$ | = | Number of adults harvested in fishery f in 1993 |
| $N_r$ | = | Number of adults returning to the Taku River in 1993 |
| $N_s$ | = | Number of smolts emigrating from the Taku River in 1992 |
| $p_i$ | = | Fraction of smolt with freshwater age i in 1992 |
| $P_{tf}$ | = | Fraction of catch in stratum t in fishery f in 1993 |
| $\theta$ | = | Fraction of the stock tagged with CWTs |

Table 3. Possible capture histories for salmon inspected in 1993 during a catch sampling program based on CWTs.

| |
|---|
| 1) Adipose fin was present |
| 2) Adipose fin was missing, but head never reached the lab |
| 3) Head arrived at lab, but was not dissected |
| 4) Head was dissected, but no tag was decoded |
| 5) Tag was decoded, but did not carry the appropriate code |
| 6) Tag did carry the appropriate code |

With respect to the capture histories in Table 3, the probabilities of drawing a single sample from this distribution were calculated from the original data as follows:

$$\frac{n_2-a_1}{n_2} \qquad \frac{a_1-a_2}{n_2} \qquad \frac{a_2-m_1}{n_2} \qquad \frac{m_1-m_2}{n_2} \qquad \frac{m_2-m_c}{n_2} \qquad \frac{m_c}{n_2}$$

The bootstrap began with drawing a sample of size $n_2$ with replacement from the empirical distribution according to the probabilities based on the original data. Two thousand such samples were drawn, and the results of each (say the $b^{th}$ sample) were tallied to obtain a new set of statistics $(a_1^*, a_2^*, m_1^*, m_2^*, m_c^*)_b$ and a value of $M_b$. The mean of $M_b$ ($\bar{M}$) and its variance $V[\bar{M}]$ were calculated as

$$V[\bar{M}] = \frac{\sum_{b=1}^{B}\left(M_b-\bar{M}\right)^2}{B-1} \qquad \text{with} \quad \bar{M} = \frac{\sum_{b=1}^{B} M_b}{B}$$

where B is the number of bootstrap samples drawn (=2000). From Efron (1982), $\hat{M}-\bar{M}$ is a measure of bias in the statistic $\hat{M}$.

Once the bootstrap had been completed, information on harvest and from the field sampling program at Canyon Island were combined with the bootstrapped statistics to estimate harvest and its variance. Equation (3) was used to estimate harvests of coho salmon from the Taku River in commercial and sport fisheries. In the case of wild stocks harvested in commercial fisheries where H is known and $\theta$ is estimated with error, the variance of the estimate was calculated according to the procedures of Goodman (1960):

$$V[\hat{n}_1] = H^2\left(V[\bar{M}]\ \hat{\theta}^{-2} + V[\hat{\theta}^{-1}]\ \hat{M}^2 - V[\bar{M}]\ V[\hat{\theta}^{-1}]\right) \tag{4}$$

Note that $\hat{M}$ and not $\bar{M}$ was used in Equation (4) even though $V[\bar{M}]$ was used as an approximation to $V[\hat{M}]$. If H and $\theta$ are both estimated with error (as in the case of wild stocks in sport fisheries where harvest is estimated) the variance can be estimated:

$$\begin{aligned} V[\hat{n}_1] = {} & V[\hat{N}]\ M^2\ \hat{\theta}^{-2} + V[\bar{M}]\ \hat{N}^2\ \hat{\theta}^{-2} + V[\hat{\theta}^{-1}]\hat{N}^2\ M^2 \\ & - V[\hat{N}]\ V[\bar{M}]\ \hat{\theta}^{-2} - V[\bar{M}]V[\hat{\theta}^{-1}]\ \hat{N}^2 - V[\hat{N}]V[\hat{\theta}^{-1}]\ M^2 \\ & + V[\hat{N}]\ V[\bar{M}]\ V[\hat{\theta}^{-1}] \end{aligned} \tag{5}$$

where V[H] can be estimated from the angler surveys, $V[\hat{\theta}^{-1}]$ can be estimated from a Monte Carlo simulation (e.g., Geiger 1990), and V[M] can be estimated using the bootstrap technique (Efron 1982). In this study, equation (4) was used when CWT's were recovered in commercial fishery strata, and (5) was used when CWT's were recovered in sport fishery strata.

The statistic $V[\hat{\theta}^{-1}]$ was estimated from a Monte Carlo simulation (see Geiger 1990). Since sampling with the fish wheels at Canyon Island was continuous with equal sampling effort expended throughout the passage of the escapement, the binomial probability distribution was considered an adequate model for the recovery of tagged fish. A large set of simulated statistics $\{\theta_1^*, \theta_2^*, \ldots \theta_B^*\}$ was drawn from Binom $(\hat{\theta}, n_e)$ from which

$$\left\{\frac{1}{\theta_1^*}, \frac{1}{\theta_1^*}, \ldots \frac{1}{\theta_B^*}\right\} = \{y_1^*, y_2^*, \ldots y_B^*\}; \qquad \overset{\wedge}{V}[\theta^{-1}] = \frac{\sum_{b=1}^{B} (y_b^* - \bar{y}^*)^2}{B-1} \tag{6}$$

where y = the subset of $n_e$ that had no adipose fins and valid Barrel Point tags.

Because several fisheries exploited coho salmon over several months in 1993, the harvest of coho salmon from the Taku River was estimated over several strata, each a combination of time, area, and type of fishery. Statistics from the commercial troll fishery were stratified by fishing period and by fishing quadrant. Statistics from drift gill net fisheries were stratified by week and by fishing district. Statistics from the recreational fishery were stratified by fortnight. An estimate of the harvest $\hat{n}_1$ was calculated for each stratum, then summed across strata and across fisheries to obtain an estimate of the total harvest:

$$\hat{N}_c = \sum_{h=1}^{L} \hat{n}_{1h} \qquad V[\hat{N}_c] = \sum_{h=1}^{L} V[\hat{n}_{1h}] \tag{7}$$

where L is the number of strata. The variance of the sum of the estimates was calculated as the sum of the variances across strata because sampling was independent across strata and across fisheries.

Estimate of Escapement

An estimate of escapement of coho salmon past Canyon Island in 1993 was calculated by expanding a partial estimate available from an ongoing mark-recapture experiment in another division of the Department (see McGregor and Clark [1988] for a description of this experiment). Coho salmon in this experiment were captured in two fish wheels at Canyon Island, tagged through the back with individually numbered plastic spaghetti tags, released, and recovered along with unmarked fish in set gill net fisheries 5 to 10 km upstream in Canada. The estimated escapement past Canyon Island prior to 12 September was obtained directly from the mark-recapture experiment (J. E. Clark and A. McGregor, Alaska Department of Fish and Game, Douglas; P. Milligan, Department of Fisheries and Oceans, Whitehorse, Canada, personal communication). After 12 September, flows in the Taku River decreased, and catches of fish in the fish wheels dropped accordingly. Sampling catches in the inriver fishery also declined after this date. Under these circumstances, our mark-recapture experiment to estimate passage after 12 September was not successful. This partial estimate was expanded by the estimated fraction of the escapement that had passed Canyon Island by 11 September:

$$\hat{N}_e = \hat{N}_e^{*}\lambda^{-1} \qquad V[\hat{N}_e] = V[\hat{N}_e^{*}]\lambda^{-2} \tag{8}$$

The statistic $\lambda$ is the fraction of the harvest in the drift gill net fishery in Taku Inlet (District 111) during 1993 that occurred prior to 12 September (transit time of coho salmon between Taku Inlet and Canyon Island was considered negligible). The statistic $V[\hat{N}_e]$ is a minimum because the measurement error in $\lambda$ is unknown.

Estimates of Return and the Rate of Exploitation

Estimates of return of coho salmon to the Taku River in 1993 and their exploitation rate in commercial and sport fisheries are based on the sum of estimated harvest and estimated escapement ($\hat{N}_r = \hat{N}_H + \hat{N}_e$). The variance of the estimated return was calculated as the sum of the variances for estimated escapement and estimated harvest ($V[\hat{N}_r] = V[\hat{N}_e] + V[\hat{N}_H]$). The estimate of exploitation rate was calculated as

$$\hat{E} = \frac{\hat{N}_H}{\hat{N}_r} \qquad V[\hat{E}] \approx \frac{V[\hat{N}_H]\hat{N}_e^{2}}{\hat{N}_r^{4}} + \frac{V[\hat{N}_e]\hat{N}_H^{2}}{\hat{N}_r^{4}} \tag{9}$$

The variance in Equation 10 was approximated with the delta method (see Seber 1982, page 7).

Estimates of Mean Date of Harvest

Estimates of the mean dates of harvest for commercial and sport fisheries were calculated from the time series of estimated proportions of catches by strata within a fishery following the methods of Mundy (1982):

$$P_{tf} = \frac{n_{tf}}{N_{Hf}} \tag{10}$$

where $n_{tf}$ is the estimated catch of Taku River coho salmon in stratum t and fishery f; remaining notation is given in Table 2.

For a migration over a time interval of $n$ strata, the mean of $t$:

$$\bar{t} = \sum_{t=1}^{n} t\,(P_{tf}) \tag{11}$$

is the mean date of harvest measured in statistical weeks. The mean statistical week was converted to a calendar week; e.g., a measure of 35.0 was converted to 25 August, as that is the central date within the statistical week of 22-28 August.

## RESULTS

### Smolt Tagging, Age and Length in 1992

From 11 May to 23 June, 1992, 7,234 coho salmon smolt were captured in two rotary smolt traps, one at Barrel Point and one at the Rock Pile on the Taku River (Figure 3). Six thousand six hundred forty-seven (6,647) fish were marked, implanted with CWTs, and released (Table 4). This total included 2,315 fish tagged with code 04-28-50 between 11 May and 25 May and 4,332 fish tagged with coded 04-28-51 between 26 May and 12 June. It was estimated that all (100%) of the released fish retained their tags for at least 24 hours. Of the remaining 587 fish, 71 were <70 mm FL, 441 died in traps prior to tagging, and 75 suffered tag-induced mortality. Frequency of catches of coho salmon smolts (Figure 4) reflected a combination of the low catch rates in the Rock Pile trap and the late start of the Barrel Point trap on 23 May (Table 4). Overall catches were low until 22 May when the Barrel Point trap catches commenced; 91% of the catches occurred thereafter. According to estimates of migratory timing from Meehan and Siniff (1962), approximately one-half to one-third of all emigrating coho salmon smolts would pass Barrel Point before 23 May. Fishing was relatively constant after startup, but the Rock Pile trap was not operated from 27 May to 30 May, and the Barrel Point trap was not operated from 27 May to 28 May or from 1 June to 3 June, due to shutdowns caused by debris. Damage from debris forced the shutdown of both traps after 12 June. Smolts and young of other species of salmon were also captured, but were not marked or tagged: 2,789 chinook salmon, 3,314 sockeye salmon *O. nerka* (Table 4), and uncounted numbers of steelhead trout *O. mykiss*, chum salmon *O. keta*, pink salmon *O. gorbuscha*, eulachon *Thaleichthys pacificus*, and Dolly Varden. Coho salmon smolts averaged 105 mm FL (Table 5; Figure 5). Age composition of captured coho salmon smolts was 34.5% age 1.0, 65.0% age 2.0, and 0.5% age 3.0 (Table 5).

### Coded Wire Tag Recovery

In 1993, 121 CWTs with tag codes 04-28-50 and 04-28-51 were recovered in the various fisheries (Appendix A1). Most of the CWTs (62) were recovered in the troll fishery, with the majority (60) recovered from the Northwest Quadrant on the outside coast (Figure 1). Four CWTs were recovered in the seine fishery in upper Chatham Strait during August, and four CWTs were recovered in marine recreational fisheries around Juneau during August and early September. The remaining CWTs were harvested in the drift gill net fisheries in District 111 (Taku Inlet and Stephens Passage) and District 115 (Lynn Canal), with the majority (45) recovered in District 111.

Coho salmon bearing Barrel Point tags were recovered with similar relative frequencies throughout the duration of the District 111 gill net fishery, though the fraction marked was smaller during the first one-third of the catch (0.122%), compared to the second one-third (0.201%) and the last one-third (0.172%; Table 6). Both tag codes were recovered throughout this fishery, but a greater percentage of tag code 04-28-50 was recovered during the first two-thirds of the gill net coho season.

The opposite was true in the Northwest Quadrant of the troll fishery, where most recoveries of tag code 04-28-50 occurred after 15 August and the majority of tag code 04-28-51 recoveries occurred prior to 15 August (Table 6). These data indicate that significant mixing of the two tag codes did occur in marine waters.

Table 4. Daily catches and releases of salmon smolt in two 12-foot diameter rotary smolt traps near Barrel Point on the Taku River, 1992.

| Date | Rock pile | | | Barrel Point | | | Coho totals | | | Total chinook | Total sockeye | Coho CWTd | Coho released |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coho | Chinook | Sockeye | Coho | Chinook | Sockeye | Live | Morts | Total | | | | |
| 11-May | 18 | 5 | 7 | | | | 18 | 0 | 18 | 5 | 7 | | |
| 12-May | 20 | 8 | 0 | | | | 20 | 0 | 20 | 8 | 0 | | |
| 13-May | 22 | 7 | 10 | | | | 22 | 0 | 22 | 7 | 10 | | |
| 14-May | 23 | 21 | 12 | | | | 23 | 3 | 26 | 21 | 12 | 83 | 0 |
| 15-May | 28 | 27 | 10 | | | | 28 | 0 | 28 | 27 | 10 | 28 | 80 |
| 16-May | 17 | 37 | 6 | | | | 17 | 1 | 18 | 37 | 6 | 17 | 28 |
| 17-May | 16 | 22 | 7 | | | | 16 | 0 | 16 | 22 | 7 | 16 | 17 |
| 18-May | 21 | 39 | 7 | | | | 21 | 0 | 21 | 39 | 7 | 21 | 15 |
| 19-May | 79 | 163 | 9 | | | | 79 | 0 | 79 | 163 | 9 | 79 | 21 |
| 20-May | 79 | 93 | 4 | | | | 79 | 0 | 79 | 93 | 4 | 75 | 79 |
| 21-May | 161 | 149 | 20 | | | | 161 | 0 | 161 | 149 | 20 | 160 | 75 |
| 22-May | 104 | 108 | 6 | | | | 104 | 0 | 104 | 108 | 6 | 101 | 160 |
| 23-May | 141 | 89 | 9 | 491 | 261 | 63 | 632 | 3 | 635 | 350 | 72 | 631 | 532 |
| 24-May | 256 | 138 | 7 | 298 | 92 | 57 | 554 | 1 | 555 | 230 | 64 | 552 | 550 |
| 25-May | 319 | 140 | 24 | 242 | 105 | 31 | 561 | 1 | 562 | 245 | 55 | 558 | 558 |
| 26-May | 78 | 115 | 1 | 172 | 71 | 23 | 250 | 160 | 410 | 186 | 24 | 248 | 277 |
| 27-May | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 146 |
| 28-May | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29-May | | | | 319 | 209 | 158 | 319 | 10 | 329 | 209 | 158 | 318 | 118 |
| 30-May | | | | 528 | 157 | 261 | 528 | 58 | 586 | 157 | 261 | 522 | 511 |
| 31-May | 69 | 27 | 16 | 101 | 30 | 37 | 170 | 32 | 202 | 57 | 53 | 166 | 186 |
| 01-Jun | 24 | 5 | 6 | | | | 24 | 0 | 24 | 5 | 6 | 24 | 154 |
| 02-Jun | 218 | 28 | 25 | | | | 218 | 1 | 219 | 28 | 25 | 218 | 40 |
| 03-Jun | 17 | 4 | 4 | | | | 17 | 0 | 17 | 4 | 4 | 17 | 199 |
| 04-Jun | 101 | 23 | 28 | 328 | 109 | 144 | 429 | 17 | 446 | 132 | 172 | 427 | 243 |
| 05-Jun | 128 | 23 | 37 | 280 | 29 | 131 | 408 | 46 | 454 | 52 | 168 | 404 | 403 |
| 06-Jun | 100 | 23 | 28 | 660 | 77 | 434 | 760 | 3 | 763 | 100 | 462 | 755 | 755 |
| 07-Jun | 49 | 8 | 27 | 31 | 8 | 33 | 80 | 1 | 81 | 16 | 60 | 77 | 200 |
| 08-Jun | 119 | 38 | 77 | 290 | 88 | 313 | 409 | 40 | 449 | 126 | 390 | 405 | 281 |
| 09-Jun | 56 | 23 | 96 | 366 | 102 | 575 | 422 | 45 | 467 | 125 | 671 | 414 | 414 |
| 10-Jun | 61 | 18 | 63 | 128 | 20 | 187 | 189 | 17 | 206 | 38 | 250 | 182 | 381 |
| 11-Jun | 36 | 8 | 91 | 172 | 35 | 200 | 208 | 1 | 209 | 43 | 291 | 199 | 199 |
| 12-Jun | 27 | 7 | 30 | | | | 27 | 1 | 28 | 7 | 30 | 25 | 25 |
| Total | 2,387 | 1,396 | 667 | 4,406 | 1,393 | 2,647 | 6,793 | 441 | 7,234 | 2,789 | 3,314 | 6,722 | 6,647 |

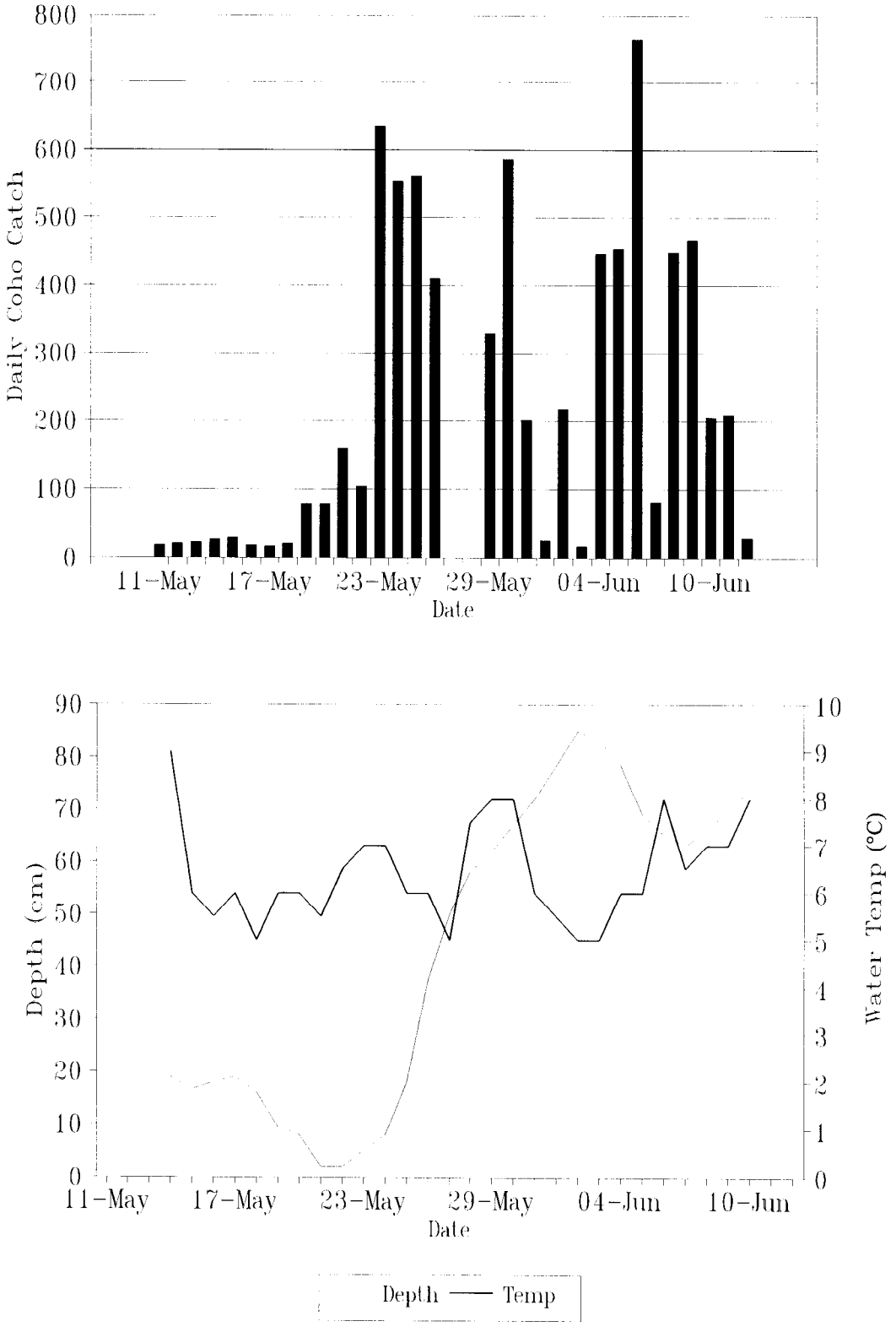


Figure 4. Catch of coho salmon smolt, daily water temperature and depth at Barrel Point, 1992.

Table 5. Mean fork length and age composition of coho salmon smolts sampled in two 12-foot diameter rotary smolt traps at Barrel Point, Taku River, 1992.

| | Parent Year | | | |
|---|---|---|---|---|
| | 1990 | 1989 | 1988 | |
| | Age 1. | Age 2. | Age 3. | Total |
| Number sampled | 130 | 245 | 2 | 377 |
| Mean length (mm) | 96 | 109 | 136 | 105 |
| SD | 10.0 | 11.6 | 8.5 | 12.8 |
| SE | 0.9 | 0.7 | 6.0 | 0.7 |
| Percent composition | 34.5 | 65.0 | 0.5 | 100.0 |
| SE | 2.4 | 2.4 | 0.4 | |

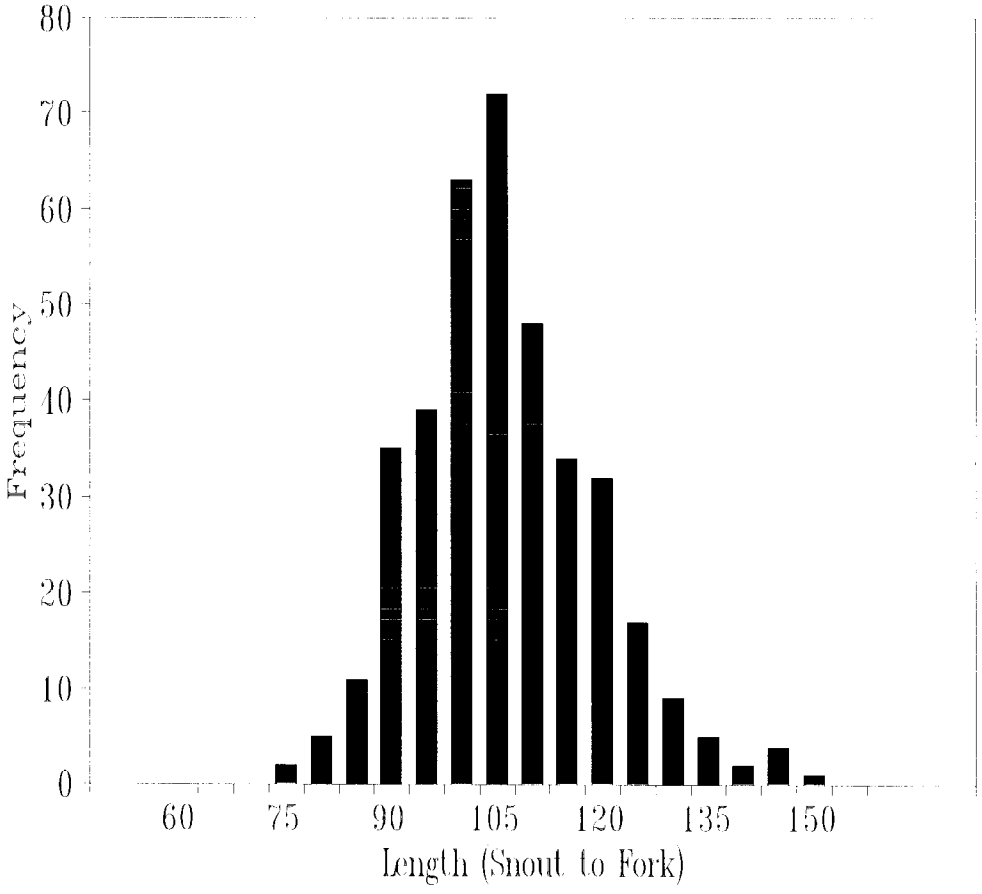


Figure 5. Length frequency of coho salmon smolt captured and measured at Barrel Point, 1992.

Table 6. Frequency of CWTs recovered during sampling of the harvest of coho salmon in the drift gill net fishery in District 111 and in the troll fishery in the Northwest Quadrant in 1993. Recoveries are from smolt marked at Barrel Point in 1992 with codes 04-28-50 and 04-28-51.

PANEL A. District 111 gill net fishery

| Stat. week | Dates | Tag code 04-28-50 | Tag code 04-28-51 | Total tags | Sampled harvest | Percent marked | Total harvest | Percent sampled |
|---|---|---|---|---|---|---|---|---|
| 26 | Jun 20-26 | 0 | 0 | 0 | 10 | 0.00 | 16 | 62.5 |
| 27 | 27-03 | 0 | 0 | 0 | 297 | 0.00 | 47 | 631.9 |
| 28 | Jul 04-10 | 0 | 0 | 0 | 35 | 0.00 | 137 | 25.5 |
| 29 | 11-17 | 1 | 0 | 1 | 214 | 0.47 | 619 | 34.6 |
| 30 | 18-24 | 0 | 0 | 0 | 166 | 0.00 | 559 | 29.7 |
| 31 | 25-31 | 1 | 0 | 1 | 652 | 0.15 | 1,698 | 38.4 |
| 32 | Aug 01-07 | 0 | 0 | 0 | 418 | 0.00 | 1,903 | 22.0 |
| 33 | 08-14 | 0 | 0 | 0 | 1,936 | 0.00 | 4,467 | 43.3 |
| 34 | 15-21 | 1 | 1 | 2 | 1,492 | 0.13 | 4,902 | 30.4 |
| 35 | 22-28 | 2 | 3 | 5 | 2,137 | 0.23 | 5,321 | 40.2 |
| 36 | 29-04 | 0 | 0 | 0 | 505 | 0.00 | 2,965 | 17.0 |
| 37 | Sep 05-11 | 1 | 1 | 2 | 2,164 | 0.09 | 5,081 | 42.6 |
| 38 | 12-18 | 8 | 13 | 21 | 8,775 | 0.24 | 14,775 | 59.4 |
| 39 | 19-25 | 2 | 10 | 12 | 6,607 | 0.18 | 17,047 | 38.8 |
| 40 | 26-02 | 0 | 1 | 1 | 938 | 0.11 | 5,999 | 15.6 |
| Total | | 16 | 29 | 45 | 26,346 | 0.17 | 65,536 | 40.2 |

PANEL B. District 111 gill net fishery combined into three equal (approx.) periods.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 26-35 | Jun 20-Aug 28 | 5 | 4 | 9 | 7,357 | 0.122 | 19,669 | 37.4 |
| 36-38 | Aug 29-Sep 18 | 9 | 14 | 23 | 11,444 | 0.201 | 22,821 | 50.1 |
| 39-40 | Sep 19-Oct 02 | 2 | 11 | 13 | 7,545 | 0.172 | 23,046 | 32.7 |
| Total | | 16 | 29 | 45 | 26,346 | 0.171 | 65,536 | 40.2 |

PANEL C. Northwest quadrant troll fishery

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 27-28 | Jul 06-Jul 10 | 0 | 2 | 2 | 39,028 | 0.005 | 134,561 | 29.0 |
| 29-33 | Jul 11-Aug 14 | 3 | 24 | 27 | 225,044 | 0.012 | 798,572 | 28.2 |
| 34-37 | Aug 15-Sep 12 | 11 | 12 | 23 | 110,451 | 0.021 | 481,417 | 22.9 |
| 38-39 | Sep 11-Sep 10 | 5 | 3 | 8 | 44,327 | 0.018 | 193,893 | 22.9 |
| Total | | 19 | 41 | 60 | 418,850 | 0.014 | 1,608,443 | 26.0% |

Estimates of $\theta$ and smolt abundance

The estimate of $\theta$ was 0.003148 (=11/3494) with SE = 0.000948, and the estimate of smolt abundance $N_s$ in 1992 was 1,451,954 with SE = 351,396. Both estimates were based on 3,494 coho salmon adults inspected in 1993 at Canyon Island (2,390 fish) and in the drift/set gill net fishery in Canada (1,104 fish; Appendix A2). Twenty-three (23) of the fish inspected were missing adipose fins and all were sacrificed to determine the tag codes present. One head was lost, and of the remaining 22 heads, 10 bore tags applied at Barrel Point, six bore tags applied at Tatsamenie Lake (a tributary of the Taku River), and six contained no tag. This equates to a long-term tag retention rate of 73% (16/22) for both tagging locations combined, which is common among groups of CWTd fish (S. Bertoni, Alaska Department of Fish and Game, Juneau, personal communication). The tags from Tatsamenie Lake (Appendices A1 and A2) were not used for subsequent calculations because those tags represent fish from only one tributary to the Taku River. To estimate harvest, $\theta$ was estimated from 11 of 3,494 fish having valid Barrel Point tags (10 fish decoded with Barrel Point tags and the lost head, which was assumed to have contained a valid Barrel Point tag). For the smolt estimate, it was assumed that 15 fish with missing adipose fins were from fish tagged and released at Barrel Point (the 10 decoded tags, plus four of the six fish without tags and the fish with the lost head, all of which were assumed to have been from Barrel Point), yielding a smolt estimate of ($\hat{N}_s$) at 1,451,954 [$=6,647(3,494+1)(15+1)^{-1}$].

Estimates of Harvest, Escapement and Exploitation in 1993

On the basis of CWT recoveries, it was estimated that 125,331 (SE = 24,687) Taku River coho salmon were harvested in commercial and sport fisheries in 1993 (Table 7). Estimates of relative bias in $\hat{M}$ across strata ranged from 0.0% to 2.5%. The troll fishery in the Northwest and Northeast Quadrants (Figure 1) took 63% of the harvest, and the drift gill net fisheries in Lynn Canal and Taku Inlet (see Figures 1 and 2) took 32% of the harvest (Table 8). Harvests in these fisheries occurred from July through September. The majority (approximately 67%) of troll harvests occurred in July and August and the majority (80%) of gill net harvests occurred in September (Figure 6). The estimated mean date of harvest in the troll fishery was 18 August, compared to 11 September for the gill net fishery (Appendix A3). Taku River coho salmon contributed an estimated 50% (32,456 fish) of the District 111 gill net catch (65,536 fish). Fifty percent of the estimated total harvest was taken by 28 August and comprised primarily troll catches (Appendix A3; Figure 6). After that date, troll catches dropped and gill net catches increased. Estimated harvests in the troll fishery shown in Figure 6 were approximated as the number of recovered fish with appropriate codes, expanded by period/quadrant strata and tagging fraction, and summed by statistical week (Appendix A3). The estimated contribution to the Juneau marine recreational fishery was 3,222 fish or 2.6% of the total Taku River harvest; this equates to 20.2% of the estimated 15,921 coho salmon caught in the Juneau marine fishery, using harvest and sampling data from Hubartt et al. (*In press*). The seine fishery in upper Chatham Strait (south of Lynn Canal) caught an estimated 2.7% of the total Taku River harvest.

Table 7. Estimated harvest of adult coho salmon bound for the Taku River in 1993 with $\hat{\theta} = 0.003148$ and $V[1/\hat{\theta}] = 20,772$. Random seed for bootstrap estimation of the SE was 287573800. In fishing periods and fishing quadrants for which no CWT was recovered with the appropriate code, harvest was assumed to be zero.

Troll fishery

| Statistical week | Dates | Period | Quad. | H | Var[H] | n2 | a1 | a2 | m1 | m2 | mc | n1 | Bias (%) | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27-28 | 7/06-7/10 | 3 | NW | 134,561 | 0 | 39,028 | 506 | 503 | 430 | 430 | 2 | 2,203 | -1.1% | 1,740 |
| 29-33 | 7/11-8/14 | 4 | NW | 798,572 | 0 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 | 27 | 30,810 | -0.1% | 14,938 |
| 34-37 | 8/15-9/12 | 5 | NW | 481,417 | 0 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 | 23 | 32,030 | 0.1% | 15,724 |
| 35 | 8/22-8/28 | 5 | NE | 62,638 | 0 | 20,114 | 371 | 332 | 289 | 289 | 1 | 1,105 | -1.4% | 1,124 |
| 38-39 | 9/10-9/20 | 6 | NW | 193,893 | 0 | 44,327 | 1,015 | 1,010 | 914 | 914 | 8 | 11,170 | 0.3% | 6,157 |
| 39 | 9/19-9/25 | 6 | NE | 7,048 | 0 | 2,201 | 29 | 28 | 25 | 25 | 1 | 1,053 | -3.4% | 1,069 |
| Subtotal troll fishery | | | | 1,678,129 | 0 | 441,165 | 7,677 | 7,575 | 6,569 | 6,567 | 62 | 78,371 | -0.0% | 22,666 |

Gill net fishery

| Statistical week | Dates | District | H | Var[N] | n2 | a1 | a2 | m1 | m2 | mc | n1 | Bias | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 7/11-7/17 | 111 | 619 | 0 | 214 | 2 | 2 | 1 | 1 | 1 | 919 | -1.1% | 916 |
| 31 | 7/25-7/31 | 115 | 287 | 0 | 155 | 2 | 2 | 2 | 2 | 1 | 588 | -2.0% | 588 |
| 31 | 7/25-7/31 | 111 | 1,698 | 0 | 652 | 3 | 3 | 3 | 3 | 1 | 827 | -1.9% | 833 |
| 34 | 8/15-8/21 | 111 | 4,902 | 0 | 1,492 | 3 | 3 | 3 | 3 | 2 | 2,087 | -1.7% | 1,621 |
| 35 | 8/22-8/28 | 111 | 5,321 | 0 | 2,137 | 24 | 24 | 18 | 18 | 5 | 3,954 | -0.1% | 2,369 |
| 37 | 9/05-9/11 | 111 | 5,081 | 0 | 2,164 | 14 | 14 | 12 | 12 | 2 | 1,492 | 0.7% | 1,146 |
| 37 | 9/05-9/11 | 115 | 6,391 | 0 | 1,284 | 22 | 22 | 20 | 20 | 1 | 1,581 | 0.8% | 1,579 |
| 38 | 9/12-9/18 | 111 | 14,775 | 0 | 8,775 | 142 | 141 | 118 | 118 | 21 | 11,311 | -0.3% | 5,579 |
| 38 | 9/12-9/18 | 115 | 8,610 | 0 | 4,028 | 175 | 173 | 167 | 167 | 1 | 687 | -1.5% | 688 |
| 39 | 9/19-9/25 | 111 | 17,047 | 0 | 6,607 | 183 | 183 | 161 | 161 | 12 | 9,835 | 0.4% | 5,113 |
| 39 | 9/19-9/25 | 115 | 17,182 | 0 | 1,667 | 98 | 98 | 93 | 93 | 1 | 3,274 | -0.9% | 3,293 |
| 40 | 9/26-10/2 | 115 | 16,204 | 0 | 5,979 | 365 | 365 | 359 | 359 | 2 | 1,722 | 1.4% | 1,324 |
| 40 | 9/26-10/2 | 111 | 5,999 | 0 | 938 | 39 | 39 | 36 | 36 | 1 | 2,031 | 2.5% | 2,036 |
| Subtotal gill net fishery | | | 104,116 | 0 | 36,092 | 1,072 | 1,069 | 993 | 993 | 51 | 40,308 | -0.0% | 9,403 |

-continued-

Table 7. (Page 2 of 2).

Seine fishery

| Statistical week | Dates | District | H | Var[N] | n2 | a1 | a2 | m1 | m2 | mc | n1 | Bias | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | 8/01-8/07 | 112 | 7,563 | 0 | 1,653 | 16 | 16 | 11 | 11 | 1 | 1,453 | -3.1% | 1,469 |
| 34 | 8/15-8/21 | 112 | 7,399 | 0 | 3,566 | 47 | 47 | 41 | 41 | 3 | 1,977 | 3.3% | 1,341 |
| Subtotal seine fishery | | | 14,962 | 0 | 5,219 | 63 | 63 | 52 | 52 | 4 | 3,430 | 0.6% | 2,810 |

Sport fishery

| Biweek | Dates | Derby | Area | H | Var[N] | n2 | a1 | a2 | m1 | m2 | mc | n1 | Bias | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 8/13-8/15 | yes | Juneau | 2,031 | 6,624 | 1,578 | 15 | 15 | 11 | 11 | 2 | 818 | 0.6% | 635 |
| 17 | 8/15-8/29 | | Juneau | 4,928 | 769,303 | 1,993 | 21 | 15 | 15 | 15 | 1 | 1,100 | 2.3% | 1,096 |
| 18 | 8/30-9/12 | | Juneau | 4,739 | 1,009,803 | 1,299 | 27 | 24 | 22 | 22 | 1 | 1,304 | -1.0% | 1,317 |
| Subtotal sport fishery | | | | 11,698 | 1,785,730 | 4,870 | 63 | 54 | 48 | 48 | 4 | 3,222 | 0.5% | 3,048 |
| Total all fisheries | | | | 1,808,905 | 1,785,730 | 487,346 | 8,875 | 8,761 | 7,662 | 7,660 | 121 | 125,331 | 0.0% | 24,687 |

Table 8. Harvest and exploitation rate of Taku River coho salmon in Southeast Alaska fisheries in 1993.

| Fishery | Area | Estimated harvest | SE | Percent of harvest | Exploitation rate (%) |
|---|---|---|---|---|---|
| U.S. troll | NE Quad | 2,158 | 1,551 | 1.7 | 0.9 |
| | NW Quad | 76,213 | 22,612 | 60.8 | 30.6 |
| | Subtotal | 78,371 | 22,666 | 62.5 | 31.4 |
| Gill net | Dist. 111 | 32,456 | 8,515 | 25.9 | 13.0 |
| | Dist. 115 | 7,852 | 3,989 | 6.3 | 3.1 |
| | Subtotal | 40,308 | 9,403 | 32.2 | 16.2 |
| Seine | Dist. 112 | 3,430 | 1,989 | 2.7 | 1.4 |
| | Subtotal | 3,430 | 1,989 | 2.7 | 1.4 |
| Sport | Juneau | 3,222 | 1,827 | 2.6 | 1.3 |
| | Subtotal | 3,222 | 1,827 | 2.6 | 1.3 |
| Total harvest | | 125,331 | 24,687 | 100.0 | 50.3 |
| Escapement | | 123,964[a] | 15,617 | | |
| TOTAL RUN | | 249,295 | 29,212 | | |

[a] Includes Canadian inriver harvest of 4,626.

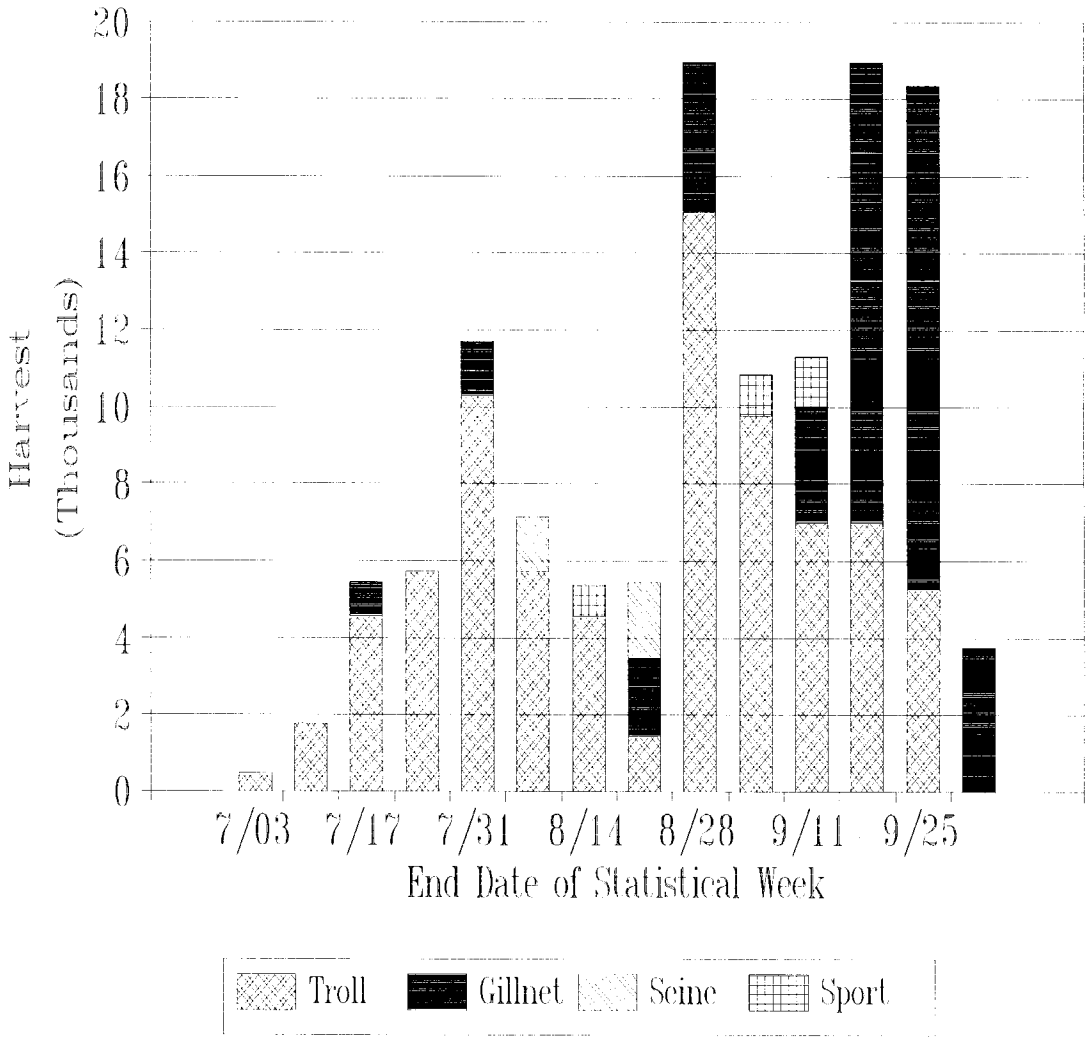


Figure 6. Estimated harvest of coho salmon bound for Taku River by commercial and recreational fisheries in 1993 by statistical week. Weekly estimates of harvest in the troll fishery are approximated.

The estimated exploitation rate for coho salmon from the Taku River in commercial and sport fisheries ($\hat{E}$) of 50.3% (SE = 5.8%) (Table 8) was based on an estimated total run ($\hat{N}_r$) of 249,295 (SE = 29,212). In sampling in the 1993 mark-recapture experiment at Canyon Island, escapement was estimated at 57,813 ($SE[\hat{N}_e^*]$ = 7,283) coho salmon prior to 12 September (J. E. Clark and A. McGregor, Alaska Department of Fish and Game, Douglas, personal communication). Because 46.6% (= $\lambda$100) of the harvest in District 111 drift gill net fishery occurred prior to 12 September (after subtracting hatchery fish), the estimate for all escapement of coho salmon past Canyon Island in 1993 is then 123,964 ($SE[\hat{N}_e]$= 15,167) and includes 4,626 fish taken in the Canadian inriver set/drift gill net fishery.

## DISCUSSION

Smolt captured in 1992 were larger than smolt captured in earlier years on the Taku River, most likely due to differences in capture methods, sampling strategies, and interannual variability. In 1992 smolt captured at Barrel Point averaged 105 mm, compared to 100 mm at Barrel Point in 1991 (Elliott and Bernard 1994), 93 mm at Canyon Island in 1960 (Meehan and Siniff 1962), and 74 mm in May 1987 and 85 mm in June 1987 two miles below Canyon Island (Murphy et al. 1988). The difference between 1991 and 1992 at Barrel Point is attributable to a larger percentage of age-2. fish in 1992, since the same capture gear (rotary traps) and sampling strategy (sampled fish $\geq$70 mm) were employed in both years. Coho salmon smolt in 1992 were 34.5% age 1.0 and 65% age 2.0, compared to 56% age 1.0 and 43% age 2.0 in 1991 (Elliott and Bernard 1994). These data suggest stronger production from the 1989 brood than from the 1988 or 1990 broods. Differences in other years are a result of gear differences, inclusion of fish <70 mm, or interannual variability. Meehan and Siniff (1962) used an incline plane trap and reported that about 10% of catches were <70 mm. Murphy et al. (1988) used a fyke net to capture fish, and 15-35% of fish captured were <70 mm. It is unlikely that our late start at Barrel Point in both years captured larger smolts, as Meehan and Siniff (1962) found that smolt lengths do not vary significantly over time. Nor is it likely that rotary traps caught only large fish, for Elliott and Bernard (1994) found that rotary smolt traps were not size-selective.

Our estimate of escapement above Canyon Island (123,964) is a minimum estimate of total escapement and, because many fish spawn downstream of Canyon Island, the exploitation rate may be as low as 45% for the 1993 run. The estimate of harvest included fish from the entire Taku River drainage because the fish were tagged with CWTs at Barrel Point, which is below all major spawning and rearing locations. The estimate of escapement, however, included only fish spawning above Canyon Island and did not include fish that spawn below Canyon Island. As much as 22% of the spawning occurs below the Canadian border (Eiler et al. *In press*), and only a small portion of the U.S. population spawns above Canyon Island.

The various assumptions in this study may have produced underestimates of the marine harvest and smolt production and may have affected the estimate of escapement. Harvest contributions are estimated from decoded tags, and we assumed the lost head (from the Canadian test fishery) was a valid Barrel Point tag since the majority of decoded tags (10/16) were from Barrel Point and the majority (16/22) of other heads had valid tags. If this assumption is false, the total harvest was 10% higher (137,864 vs. 125,331).

Since, in estimating smolt production, $n_c$ and $n_e$ included all fish with adipose clips (with and without valid tags), we assumed a portion of the fish without

valid tags were from Barrel Point to make $m_e$ equivalent to the other two parameters. In doing so, four of the six fish without tags were assumed to be from Barrel Point, approximating the ratio of valid Barrel Point tags to valid Tatsamenie Lake tags (10:6). If none of the untagged fish were from Barrel Point, the smolt estimate would have been 1.94 million versus the 1.45 million we estimated. Regarding the estimate of escapement, we expanded the measured escapement for the period during which the mark-recapture experiment for returning adults failed, which introduced an unquantified amount of measurement error into the estimate of escapement.

The recovery data and patterns of migration indicate that the estimate of smolt production was unbiased. Bailey's modification of the Petersen estimate was used because of the systematic nature of the sampling of smolts and adults (see below). While the population in this experiment was not closed to losses from mortality, it was closed to recruitment, because salmon return to their natal stream to spawn. Under these conditions, the experiment produced an unbiased estimate of the number of smolt leaving Taku River in 1992, so long as marked fish (those carrying CWTs implanted at Barrel Point) had mixed completely with unmarked fish during their 14 to 16 months at sea. The pattern of recovery of CWTs in commercial fisheries indicates that marked fish did mix significantly with unmarked fish (see Table 6 and below).

The recovery of CWTs in commercial fisheries is indicative of the representative sampling needed to produce accurate estimates of harvest. The models we used to estimate harvest of coho salmon from the Taku River are based on sampling as a random process, yet our capture of smolts at Barrel Point and the catch sampling of harvests were not random, but systematic. Like two-event mark-recapture experiments, representative samples can be drawn with a systematic process only if 1) every smolt has an equal chance of being marked, 2) every adult has an equal chance of being sampled, or 3) marked and unmarked fish mix completely between sampling events. Although our sampling effort at Barrel Point was relatively constant once both traps were started in 1992, catches of smolt were small prior to 23 May, and few smolts emigrating prior to that date had a chance of being captured and tagged. Fortunately, the drawn-out recovery of CWTs indicated considerable mixing of marked and unmarked coho salmon while at sea. Recoveries of CWTs in District 111 from coho salmon tagged at Barrel Point did not come from later harvests, but were spread throughout this fishery in rough proportion to harvests. While the evidence of mixing between marked and unmarked fish can be detected through inspecting the temporal pattern of recovered tags, sufficiency of that mixing cannot. If mixing had been complete, $\hat{\theta}$ would be time invariant. Too few coho salmon were recaptured at the fish wheels at Canyon Island to look for changes in $\hat{\theta}$ with time, and, while many fish were recovered in the samples from the harvest in District 111, harvest of any coho salmon in District 111 not bound for the Taku River would cloud any inference drawn from the fishery as to variability in $\theta$. For example, coho salmon bound for Gastineau Hatchery (private-non-profit hatcheries operated by Douglas Island Pink and Chum Inc. [DIPAC]) near Juneau were intercepted during the later days of the gill net fishery in District 111 (Appendix A4), and certainly other wild and hatchery stocks contribute to this fishery as well.

The Taku River wild and DIPAC (Gastineau and Sheep Creek releases) coho salmon should prove to be reliable indicator stocks for the Juneau area. Together, these populations constituted an estimated 61% of the District 111 gill net harvests and 29% of the Juneau marine boat harvest (Table 8; Appendix A5). Exploitation rates were similar—50% for Taku fish and 57% for DIPAC fish.

Distribution of harvests were similar (Figures 6, 7); however, a greater percentage of DIPAC harvests was taken in the troll fishery (74% vs. 63%) and a lesser percentage was taken in the District 111 gill net fishery (22% vs. 32%). Mean dates of overall harvest were similar—26 August for Taku fish and 30 August for DIPAC fish (Appendices A3 and A6). It is anticipated that data taken from these two runs can be developed to assess run strength of coho salmon in the Juneau area on an inseason basis.

The small estimated harvest of coho salmon from the Taku River in the sport fishery near Juneau may be misleading because of small sample sizes. First, the estimated harvest of 818 Taku River coho salmon in a derby harvest of 2,031 indicates that 40% of coho salmon harvested in the derby were of Taku stock. Secondly, the two recovered tags from an inspected harvest of 1,578 during the Golden North Derby (13-15 August) indicate that approximately 0.127% of the harvest carried CWTs representing the Taku River (from Barrel Point). Within the two-week period in which the Derby took place, 127 coho salmon were sampled from an estimated harvest of 1,525 made before and after the Derby (from data reported in Hubartt et al. *In press*). The probability of recovering no CWTs, given an expected rate of recovery of 0.127%, is 0.85 $[=1-0.00127)^{127}]$. Sample sizes in other sampling strata varied from 1 to 1,993; at least one Barrel Point tag was recovered in each of the three strata in which 1,000 or more fish were sampled. Since these strata are based on the passage of time, the expected rate of recovery could have changed if the mix of stocks in the fishery had varied.

## CONCLUSION AND RECOMMENDATIONS

Results from this project are contributing to development of a long-term database for the Taku River coho salmon population. We estimated smolt production in 1992 and adult production in 1993, providing the second year of estimates for this population. We feel that this program, in the future, will enable us to provide valuable management tools, such as inseason assessment of run strength, evaluation of adult production parameters, and refinement of escapement goals.

Since this project is planned to be implemented annually, we recommend some strategies to improve the precision of smolt and adult parameter estimates. First, estimates of harvest and smolt abundance can be improved by tagging more smolt with CWTs. This can be accomplished by starting earlier to cover a greater proportion of smolt emigration and by deploying more rotary smolt traps; a greater number of tags would then be recovered from the fisheries, and this would increase the precision of $\theta$, estimated from sampling adults inriver. Additionally, we can test whether $\theta$ is time invariant during the return migration. Second, the estimate of harvest in the sport fishery can be improved by sampling a greater fraction of the harvest. We recommend that a small portion of project funds be devoted to this activity, if the gain in precision is cost-effective and balanced with tagging more smolt. Third, the estimate of escapement can be improved by operating the mark-recapture experiment through the duration of the immigration of adults. We recommend a design be developed for a fish wheel that can be operated during the low-water conditions which often prevail during the fall season.

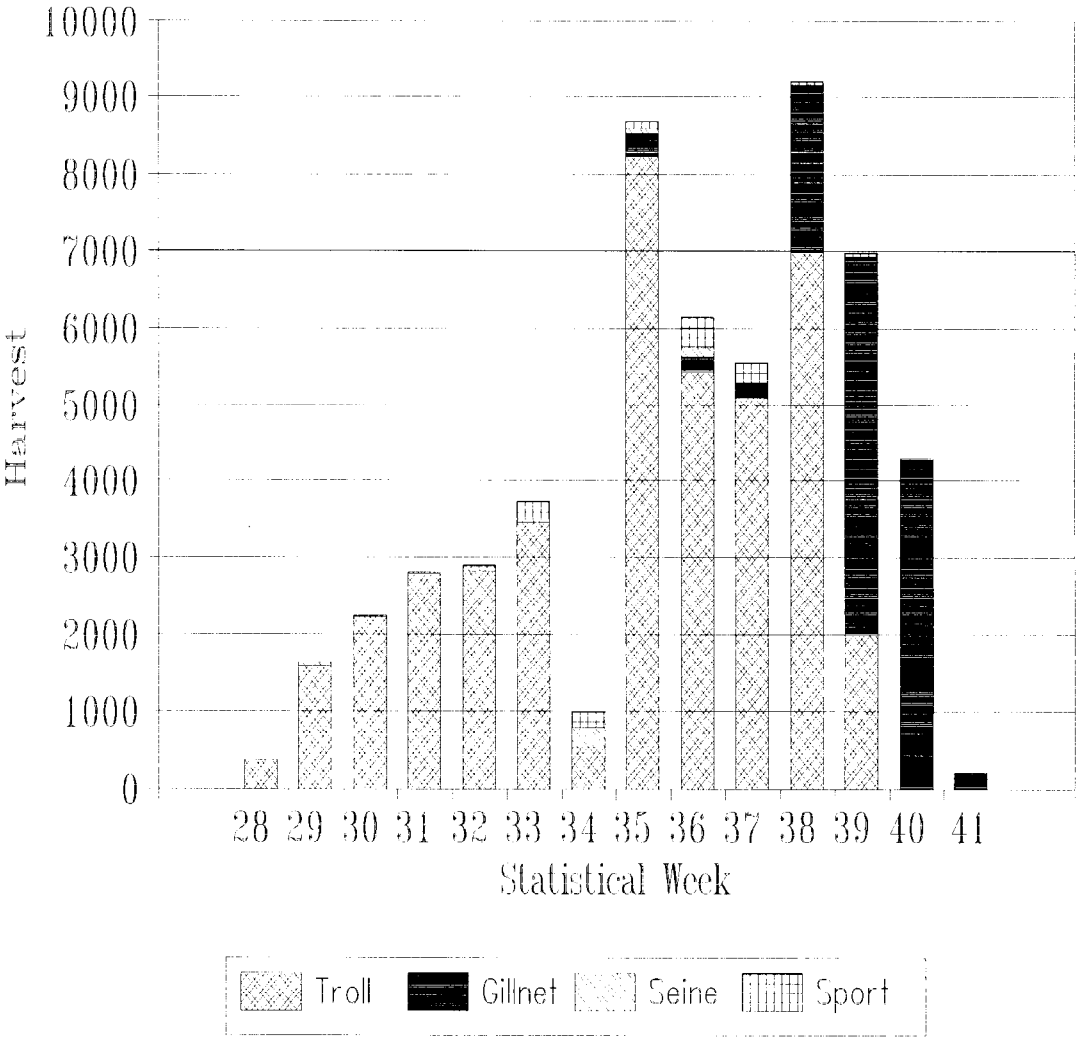


Figure 7. Estimated harvest of coho salmon bound for Gastineau Hatchery by commercial and recreational fisheries in 1993 by statistical week. Weekly estimates of harvest in the troll fishery are approximated.

ACKNOWLEDGMENTS

We thank Jarbo Crete, Jerry Owens, and Cliff Kemmerling for operating the rotary screw traps and collecting the smolt data; Andy McGregor, Dr. John E. Clark and Pat Milligan for providing estimates of escapement; Heather Stilwell, Jerry Owens, Chris Staroska, Pat Milligan, Erin Deacon, Sandra Beitz, and Bruce Skea for collecting inriver data from adults; Glen Oliver for commercial fisheries CWT recoveries; Paul Suchanek and Dennis Hubartt for recreational fishery harvests and CWT recoveries; Rick Focht for providing terminal run data for DIPAC releases; and Sam Bertoni and the CFMADD Tag Lab in Juneau for dissecting and decoding heads and providing data on CWT recoveries.

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APPENDIX A

Appendix A1. Random and select recoveries of coded wire tagged coho salmon bound for Taku River in 1993.

| Head Number | Tag Code | Release Site | Gear | Recovery Date | Stat. Week | Troll Period | Quad rant | District | Length | H | $n_2$ | $a_1$ | $a_2$ | $m_1$ | $m_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RANDOM RECOVERIES** | | | | | | | | | | | | | | | |
| 62211 | 042850 | BARREL PT | ESC SUR | 23-Aug-93 | 35 | 5 | NE | 111-32 | 440 | | | | | | |
| 62219 | 042850 | BARREL PT | ESC SUR | 11-Sep-93 | 37 | 5 | NE | 111-32 | 635 | | | | | | |
| 62216 | 042850 | BARREL PT | ESC SUR | 08-Sep-93 | 37 | 5 | NE | 111-32 | 630 | | | | | | |
| 62226 | 042850 | BARREL PT | ESC SUR | 28-Sep-93 | 40 | 6 | NE | 111-32 | | | | | | | |
| 62210 | 042851 | BARREL PT | ESC SUR | 20-Aug-93 | 34 | 5 | NE | 111-32 | 460 | | | | | | |
| 62217 | 042851 | BARREL PT | ESC SUR | 08-Sep-93 | 37 | 5 | NE | 111-32 | 655 | | | | | | |
| 62218 | 042851 | BARREL PT | ESC SUR | 10-Sep-93 | 37 | 5 | NE | 111-32 | 620 | | | | | | |
| 62222 | 042851 | BARREL PT | ESC SUR | 24-Sep-93 | 39 | 6 | NE | 111-32 | 500 | | | | | | |
| 62221 | 042851 | BARREL PT | ESC SUR | 19-Sep-93 | 39 | 6 | NE | 111-32 | 535 | | | | | | |
| 62224 | 042851 | BARREL PT | ESC SUR | 27-Sep-93 | 40 | 6 | NE | 111-32 | 515 | | | | | | |
| 98692 | 042850 | BARREL PT | GILLN | 13-Jul-93 | 29 | 4 | NE | 111-31 | 727 | 619 | 214 | 2 | 2 | 1 | 1 |
| 84199 | 042850 | BARREL PT | GILLN | 28-Jul-93 | 31 | 4 | NE | 115 | 681 | 287 | 155 | 2 | 2 | 2 | 2 |
| 11784 | 042850 | BARREL PT | GILLN | 28-Jul-93 | 31 | 4 | NE | 111 | 705 | 1,698 | 652 | 3 | 3 | 3 | 3 |
| 12102 | 042850 | BARREL PT | GILLN | 19-Aug-93 | 34 | 5 | NE | 111 | 583 | 4,902 | 1,492 | 3 | 3 | 3 | 3 |
| 98647 | 042850 | BARREL PT | GILLN | 24-Aug-93 | 35 | 5 | NE | 111-32 | 670 | 5,321 | 2,137 | 24 | 24 | 18 | 18 |
| 98645 | 042850 | BARREL PT | GILLN | 24-Aug-93 | 35 | 5 | NE | 111-32 | 685 | 5,321 | 2,137 | 24 | 24 | 18 | 18 |
| 98757 | 042850 | BARREL PT | GILLN | 06-Sep-93 | 37 | 5 | NE | 111 | 708 | 5,081 | 2,164 | 14 | 14 | 12 | 12 |
| 88110 | 042850 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 645 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88087 | 042850 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 788 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88117 | 042850 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 629 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 98768 | 042850 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 772 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88135 | 042850 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 624 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88935 | 042850 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 730 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88091 | 042850 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 682 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88101 | 042850 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 717 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88340 | 042850 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111-32 | 735 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 98816 | 042850 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111 | 697 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 98641 | 042851 | BARREL PT | GILLN | 19-Aug-93 | 34 | 5 | NE | 111-32 | 655 | 4,902 | 1,492 | 3 | 3 | 3 | 3 |
| 12281 | 042851 | BARREL PT | GILLN | 25-Aug-93 | 35 | 5 | NE | 111 | 719 | 5,321 | 2,137 | 24 | 24 | 18 | 18 |
| 98644 | 042851 | BARREL PT | GILLN | 24-Aug-93 | 35 | 5 | NE | 111-32 | 705 | 5,321 | 2,137 | 24 | 24 | 18 | 18 |
| 88951 | 042851 | BARREL PT | GILLN | 24-Aug-93 | 35 | 5 | NE | 111-32 | 524 | 5,321 | 2,137 | 24 | 24 | 18 | 18 |
| 12478 | 042851 | BARREL PT | GILLN | 07-Sep-93 | 37 | 5 | NE | 115 | 754 | 6,391 | 1,284 | 22 | 22 | 20 | 20 |
| 88788 | 042851 | BARREL PT | GILLN | 06-Sep-93 | 37 | 5 | NE | 111-32 | 643 | 5,081 | 2,164 | 14 | 14 | 12 | 12 |
| 12762 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 697 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |

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Appendix A1. (Page 2 of 6).

| Head Number | Tag Code | Release Site | Gear | Recovery Date | Stat. Week | Troll Period | Quadrant | District | Length | H | $n_2$ | $a_1$ | $a_2$ | $m_1$ | $m_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 88088 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 682 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 98796 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 705 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 98770 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 630 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 98782 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111-32 | 552 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 12746 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 115 | 584 | 8,610 | 4,028 | 175 | 173 | 167 | 167 |
| 88128 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 550 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88123 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 748 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88131 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 682 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88950 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 643 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88133 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 789 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88111 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 657 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88103 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 727 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88093 | 042851 | BARREL PT | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 686 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 14385 | 042851 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111-32 | 566 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 88344 | 042851 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111-32 | 670 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 14352 | 042851 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111-32 | 382 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 14399 | 042851 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111-32 | 661 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 14364 | 042851 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111-32 | 661 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 14211 | 042851 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 115 | 619 | 17,182 | 1,667 | 98 | 98 | 93 | 93 |
| 98831 | 042851 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111-32 | 658 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 98822 | 042851 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111-32 | 647 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 98818 | 042851 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111 | 701 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 88321 | 042851 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111-32 | 692 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 88316 | 042851 | BARREL PT | GILLN | 22-Sep-93 | 39 | 6 | NE | 111-32 | 715 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 14456 | 042851 | BARREL PT | GILLN | 29-Sep-93 | 40 | 6 | NE | 111 | 621 | 5,999 | 938 | 39 | 39 | 36 | 36 |
| 27069 | 042851 | BARREL PT | GILLN | 02-Oct-93 | 40 | 6 | NE | 115 | 700 | 16,204 | 5,979 | 365 | 365 | 359 | 359 |
| 26865 | 042851 | BARREL PT | GILLN | 02-Oct-93 | 40 | 6 | NE | 115 | 693 | 16,204 | 5,979 | 365 | 365 | 359 | 359 |
| 83714 | 042850 | BARREL PT | SEINE | 19-Aug-93 | 34 | 5 | NE | 112-11 | 554 | 7,399 | 3,566 | 47 | 47 | 41 | 41 |
| 11625 | 042851 | BARREL PT | SEINE | 02-Aug-93 | 32 | 4 | NE | 112 | 606 | 7,563 | 1,653 | 16 | 16 | 11 | 11 |
| 12053 | 042851 | BARREL PT | SEINE | 18-Aug-93 | 34 | 5 | NE | 112-16 | 473 | 7,399 | 3,566 | 47 | 47 | 41 | 41 |
| 12016 | 042851 | BARREL PT | SEINE | 15-Aug-93 | 34 | 5 | NE | 112-16 | 595 | 7,399 | 3,566 | 47 | 47 | 41 | 41 |
| 15214 | 042850 | BARREL PT | SPORT | 29-Aug-93 | 36 | 5 | NE | 111-50 |  | 4928 | 1993 | 21 | 15 | 15 | 15 |
| 69131 | 042851 | BARREL PT | SPORT | 14-Aug-93 | 33 | 4 | NE | 111-50 | 725 | 1633 | 1578 | 15 | 15 | 11 | 11 |
| 15273 | 042851 | BARREL PT | SPORT | 14-Aug-93 | 33 | 4 | NE | 111-50 | 695 | 1633 | 1578 | 15 | 15 | 11 | 11 |
| 15220 | 042851 | BARREL PT | SPORT | 08-Sep-93 | 37 | 4 | NE | 111-40 |  | 4739 | 1299 | 27 | 24 | 22 | 22 |
| 11223 | 042850 | BARREL PT | TROLL | 13-Jul-93 | 29 | 4 | NW |  | 621 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |

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Appendix A1. (Page 3 of 6).

| Head Number | Tag Code | Release Site | Gear | Recovery Date | Stat. Week | Troll Period | Quad rant | District | Length | H | $n_2$ | $a_1$ | $a_2$ | $m_1$ | $m_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18009 | 042850 | BARREL PT | TROLL | 31-Jul-93 | 31 | 4 | NW | 113 | 545 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31375 | 042850 | BARREL PT | TROLL | 13-Aug-93 | 33 | 4 | NW | | 470 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 18588 | 042850 | BARREL PT | TROLL | 15-Aug-93 | 34 | 5 | NW | | 565 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 34760 | 042850 | BARREL PT | TROLL | 26-Aug-93 | 35 | 5 | NW | 189-30 | 676 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 12236 | 042850 | BARREL PT | TROLL | 24-Aug-93 | 35 | 5 | NW | | 666 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 12057 | 042850 | BARREL PT | TROLL | 22-Aug-93 | 35 | 5 | NW | | 766 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 12365 | 042850 | BARREL PT | TROLL | 26-Aug-93 | 35 | 5 | NW | | 794 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 2584 | 042850 | BARREL PT | TROLL | 25-Aug-93 | 35 | 5 | NE | 112-63 | 632 | 62,638 | 20,114 | 371 | 332 | 289 | 289 |
| 31679 | 042850 | BARREL PT | TROLL | 31-Aug-93 | 36 | 5 | NW | | 735 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 2718 | 042850 | BARREL PT | TROLL | 01-Sep-93 | 36 | 5 | NW | 114-21 | 723 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 34899 | 042850 | BARREL PT | TROLL | 31-Aug-93 | 36 | 5 | NW | 189-30 | 739 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 2794 | 042850 | BARREL PT | TROLL | 04-Sep-93 | 36 | 5 | NW | 114-23 | 657 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 2815 | 042850 | BARREL PT | TROLL | 07-Sep-93 | 37 | 5 | NW | 114-21 | 705 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 19927 | 042850 | BARREL PT | TROLL | 07-Sep-93 | 37 | 5 | NW | 113-91 | 697 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 2988 | 042850 | BARREL PT | TROLL | 16-Sep-93 | 38 | 6 | NW | 183-10 | 720 | 193,893 | 44,327 | 1,015 | 1,010 | 914 | 914 |
| 2976 | 042850 | BARREL PT | TROLL | 15-Sep-93 | 38 | 6 | NW | 114-21 | 679 | 193,893 | 44,327 | 1,015 | 1,010 | 914 | 914 |
| 2907 | 042850 | BARREL PT | TROLL | 13-Sep-93 | 38 | 6 | NW | 114-25 | 707 | 193,893 | 44,327 | 1,015 | 1,010 | 914 | 914 |
| 28339 | 042850 | BARREL PT | TROLL | 20-Sep-93 | 39 | 6 | NW | 113-41 | 657 | 193,893 | 44,327 | 1,015 | 1,010 | 914 | 914 |
| 3499 | 042850 | BARREL PT | TROLL | 20-Sep-93 | 39 | 6 | NW | 114-25 | 674 | 193,893 | 44,327 | 1,015 | 1,010 | 914 | 914 |
| 3058 | 042850 | BARREL PT | TROLL | 21-Sep-93 | 39 | 6 | NE | 112-63 | 648 | 7,048 | 2,201 | 29 | 28 | 25 | 25 |
| 85378 | 042851 | BARREL PT | TROLL | 02-Jul-93 | 27 | 3 | NW | 113 | 630 | 134,561 | 39,028 | 506 | 503 | 430 | 430 |
| 67688 | 042851 | BARREL PT | TROLL | 07-Jul-93 | 28 | 3 | NW | 113-91 | 617 | 134,561 | 39,028 | 506 | 503 | 430 | 430 |
| 11311 | 042851 | BARREL PT | TROLL | 14-Jul-93 | 29 | 4 | NW | | 601 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 15807 | 042851 | BARREL PT | TROLL | 17-Jul-93 | 29 | 4 | NW | 189-30 | 612 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 16733 | 042851 | BARREL PT | TROLL | 17-Jul-93 | 29 | 4 | NW | | 545 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 15819 | 042851 | BARREL PT | TROLL | 19-Jul-93 | 30 | 4 | NW | 181-60 | 570 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 2166 | 042851 | BARREL PT | TROLL | 19-Jul-93 | 30 | 4 | NW | 114-23 | 570 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 11430 | 042851 | BARREL PT | TROLL | 19-Jul-93 | 30 | 4 | NW | | 540 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 11452 | 042851 | BARREL PT | TROLL | 19-Jul-93 | 30 | 4 | NW | | 696 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31044 | 042851 | BARREL PT | TROLL | 20-Jul-93 | 30 | 4 | NW | 116-12 | 550 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 15922 | 042851 | BARREL PT | TROLL | 27-Jul-93 | 31 | 4 | NW | 181-60 | 620 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 17130 | 042851 | BARREL PT | TROLL | 26-Jul-93 | 31 | 4 | NW | | 650 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 16955 | 042851 | BARREL PT | TROLL | 30-Jul-93 | 31 | 4 | NW | 113-81 | 571 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 17233 | 042851 | BARREL PT | TROLL | 29-Jul-93 | 31 | 4 | NW | | 550 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 11779 | 042851 | BARREL PT | TROLL | 27-Jul-93 | 31 | 4 | NW | | | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31113 | 042851 | BARREL PT | TROLL | 25-Jul-93 | 31 | 4 | NW | 189 | 575 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31119 | 042851 | BARREL PT | TROLL | 25-Jul-93 | 31 | 4 | NW | 113-91 | 670 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |

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Appendix A1. (Page 4 of 6).

| Head Number | Tag Code | Release Site | Gear | Recovery Date | Stat. Week | Troll Period | Quad rant | District | Length | H | $n_2$ | $a_1$ | $a_2$ | $m_1$ | $m_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16863 | 042851 | BARREL PT | TROLL | 26-Jul-93 | 31 | 4 | NW | | 570 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31238 | 042851 | BARREL PT | TROLL | 06-Aug-93 | 32 | 4 | NW | 116 | 673 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 2418 | 042851 | BARREL PT | TROLL | 04-Aug-93 | 32 | 4 | NW | 114-23 | 558 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 2451 | 042851 | BARREL PT | TROLL | 06-Aug-93 | 32 | 4 | NW | 113-91 | 620 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 11824 | 042851 | BARREL PT | TROLL | 05-Aug-93 | 32 | 4 | NW | 114 | 579 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 15932 | 042851 | BARREL PT | TROLL | 03-Aug-93 | 32 | 4 | NW | 181-60 | 733 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 34606 | 042851 | BARREL PT | TROLL | 11-Aug-93 | 33 | 4 | NW | 181-50 | 668 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 15983 | 042851 | BARREL PT | TROLL | 10-Aug-93 | 33 | 4 | NW | 181-60 | 662 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 34616 | 042851 | BARREL PT | TROLL | 12-Aug-93 | 33 | 4 | NW | 181-50 | 675 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31668 | 042851 | BARREL PT | TROLL | 28-Aug-93 | 35 | 5 | NW | 114 | 639 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 19488 | 042851 | BARREL PT | TROLL | 28-Aug-93 | 35 | 5 | NW | 113-91 | 651 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 31665 | 042851 | BARREL PT | TROLL | 28-Aug-93 | 35 | 5 | NW | 114 | 600 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 18770 | 042851 | BARREL PT | TROLL | 25-Aug-93 | 35 | 5 | NW | 113-45 | 585 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 12290 | 042851 | BARREL PT | TROLL | 26-Aug-93 | 35 | 5 | NW | 114 | 725 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 12081 | 042851 | BARREL PT | TROLL | 22-Aug-93 | 35 | 5 | NW | | 706 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 19645 | 042851 | BARREL PT | TROLL | 03-Sep-93 | 36 | 5 | NW | 113-91 | 660 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 19640 | 042851 | BARREL PT | TROLL | 03-Sep-93 | 36 | 5 | NW | 113-91 | 685 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 2799 | 042851 | BARREL PT | TROLL | 04-Sep-93 | 36 | 5 | NW | 114-23 | 590 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 2843 | 042851 | BARREL PT | TROLL | 11-Sep-93 | 37 | 5 | NW | 114 | 618 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 19929 | 042851 | BARREL PT | TROLL | 07-Sep-93 | 37 | 5 | NW | 113-19 | 668 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 3810 | 042851 | BARREL PT | TROLL | 07-Sep-93 | 37 | 5 | NW | 189-30 | 579 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 28255 | 042851 | BARREL PT | TROLL | 17-Sep-93 | 38 | 6 | NW | 113-45 | 687 | 193,893 | 44,327 | 1,015 | 1,010 | 914 | 914 |
| 3936 | 042851 | BARREL PT | TROLL | 15-Sep-93 | 38 | 6 | NW | 189-30 | 680 | 193,893 | 44,327 | 1,015 | 1,010 | 914 | 914 |
| 28303 | 042851 | BARREL PT | TROLL | 20-Sep-93 | 39 | 6 | NW | 114-21 | 608 | 193,893 | 44,327 | 1,015 | 1,010 | 914 | 914 |
| 62205 | 042943 | BC TATSA ESC SUR | | 14-Aug-93 | 33 | 4 | NE | 111-32 | 500 | | | | | | |
| 62208 | 042943 | BC TATSA ESC SUR | | 17-Aug-93 | 34 | 5 | NE | 111-32 | 390 | | | | | | |
| 62213 | 042943 | BC TATSA ESC SUR | | 28-Aug-93 | 35 | 5 | NE | 111-32 | 580 | | | | | | |
| 62214 | 042943 | BC TATSA ESC SUR | | 31-Aug-93 | 36 | 5 | NE | 111-32 | 550 | | | | | | |
| 62215 | 042943 | BC TATSA ESC SUR | | 01-Sep-93 | 36 | 5 | NE | 111-32 | 590 | | | | | | |
| 62207 | 043103 | BC TATSA ESC SUR | | 16-Aug-93 | 34 | 5 | NE | 111-32 | 595 | | | | | | |
| 50216 | 042943 | BC TATSA GILLN | | 19-Jun-93 | 25 | 2 | PW | 212 | 680 | 1,000 | 302 | 1 | 1 | 1 | 1 |
| 51520 | 042943 | BC TATSA GILLN | | 17-Jul-93 | 29 | 4 | PW | 212 | 571 | 4,385 | 1,963 | 19 | 18 | 16 | 16 |
| 12285 | 042943 | BC TATSA GILLN | | 25-Aug-93 | 35 | 5 | NE | 111 | 673 | 5,321 | 2,137 | 24 | 24 | 18 | 18 |
| 98650 | 042943 | BC TATSA GILLN | | 24-Aug-93 | 35 | 5 | NE | 111 | 706 | 5,321 | 2,137 | 24 | 24 | 18 | 18 |
| 88957 | 042943 | BC TATSA GILLN | | 24-Aug-93 | 35 | 5 | NE | 111-31 | 683 | 5,321 | 2,137 | 24 | 24 | 18 | 18 |

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Appendix A1. (Page 5 of 6).

| Head Number | Tag Code | Release Site | Gear | Recovery Date | Stat. Week | Troll Period | Quadrant | District | Length | H | $n_2$ | $a_1$ | $a_2$ | $m_1$ | $m_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 98763 | 042943 | BC TATSA | GILLN | 06-Sep-93 | 37 | 5 | NE | 111-32 | 711 | 5,081 | 2,164 | 14 | 14 | 12 | 12 |
| 88126 | 042943 | BC TATSA | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 700 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88937 | 042943 | BC TATSA | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 655 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88132 | 042943 | BC TATSA | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 732 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 12670 | 042943 | BC TATSA | GILLN | 14-Sep-93 | 38 | 6 | NE | 115 | 715 | 8,610 | 4,028 | 175 | 173 | 167 | 167 |
| 88080 | 042943 | BC TATSA | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 647 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 98778 | 042943 | BC TATSA | GILLN | 14-Sep-93 | 38 | 6 | NE | 111-32 | 514 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88122 | 042943 | BC TATSA | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 672 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 88119 | 042943 | BC TATSA | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 737 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 98835 | 042943 | BC TATSA | GILLN | 22-Sep-93 | 39 | 6 | NE | 111 | 713 | 17,047 | 6,607 | 183 | 183 | 161 | 161 |
| 88106 | 043103 | BC TATSA | GILLN | 14-Sep-93 | 38 | 6 | NE | 111 | 646 | 14,775 | 8,775 | 142 | 141 | 118 | 118 |
| 11968 | 042943 | BC TATSA | SEINE | 14-Aug-93 | 33 | 4 | NE | 112-16 | 707 | 7,779 | 2,514 | 27 | 27 | 22 | 22 |
| 12003 | 042943 | BC TATSA | SEINE | 13-Aug-93 | 33 | 4 | NE | 112-16 | 658 | 7,779 | 2,514 | 27 | 27 | 22 | 22 |
| 12034 | 042943 | BC TATSA | SEINE | 18-Aug-93 | 34 | 5 | NE | 112-16 | 599 | 7,399 | 3,566 | 47 | 47 | 41 | 41 |
| 12014 | 042943 | BC TATSA | SEINE | 15-Aug-93 | 34 | 5 | NE | 112-16 | 703 | 7,399 | 3,566 | 47 | 47 | 41 | 41 |
| 11995 | 042943 | BC TATSA | SEINE | 15-Aug-93 | 34 | 5 | NE | 112 | 745 | 7,399 | 3,566 | 47 | 47 | 41 | 41 |
| 69126 | 042943 | BC TATSA | SPORT | 14-Aug-93 | 33 | 4 | NE | 111-50 | 690 | 1633 | 1578 | 15 | 15 | 11 | 11 |
| 69106 | 042943 | BC TATSA | SPORT | 14-Aug-93 | 33 | 4 | NE | 111-50 | 730 | 1633 | 1578 | 15 | 15 | 11 | 11 |
| 15280 | 042943 | BC TATSA | SPORT | 14-Aug-93 | 33 | 4 | NE | 111-50 | 730 | 1633 | 1578 | 15 | 15 | 11 | 11 |
| 15125 | 042943 | BC TATSA | SPORT | 20-Aug-93 | 34 | 5 | NE | 112-16 |  | 4928 | 1993 | 21 | 15 | 15 | 15 |
| 15213 | 042943 | BC TATSA | SPORT | 28-Aug-93 | 35 | 5 | NE | 111-40 |  | 4928 | 1993 | 21 | 15 | 15 | 15 |
| 11135 | 042943 | BC TATSA | TROLL | 06-Jul-93 | 28 | 3 | NW |  | 659 | 134,561 | 39,028 | 506 | 503 | 430 | 430 |
| 2307 | 042943 | BC TATSA | TROLL | 24-Jul-93 | 30 | 4 | NW | 116-14 | 604 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 2213 | 042943 | BC TATSA | TROLL | 21-Jul-93 | 30 | 4 | NW | 114-23 | 599 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 15831 | 042943 | BC TATSA | TROLL | 21-Jul-93 | 30 | 4 | NW | 181-60 | 637 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31130 | 042943 | BC TATSA | TROLL | 26-Jul-93 | 31 | 4 | NW |  | 617 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31159 | 042943 | BC TATSA | TROLL | 31-Jul-93 | 31 | 4 | NW | 113-91 | 672 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 2426 | 042943 | BC TATSA | TROLL | 04-Aug-93 | 32 | 4 | NW | 114-23 | 580 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31194 | 042943 | BC TATSA | TROLL | 03-Aug-93 | 32 | 4 | NW | 116-12 | 680 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 18037 | 042943 | BC TATSA | TROLL | 01-Aug-93 | 32 | 4 | NW | 116 | 664 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 18057 | 042943 | BC TATSA | TROLL | 01-Aug-93 | 32 | 4 | NW | 116 | 625 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31405 | 042943 | BC TATSA | TROLL | 12-Aug-93 | 33 | 4 | NW |  | 665 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 34614 | 042943 | BC TATSA | TROLL | 12-Aug-93 | 33 | 4 | NW | 189-40 | 681 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 15991 | 042943 | BC TATSA | TROLL | 10-Aug-93 | 33 | 4 | NW | 183-10 | 650 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31285 | 042943 | BC TATSA | TROLL | 11-Aug-93 | 33 | 4 | NW | 116-12 | 669 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31371 | 042943 | BC TATSA | TROLL | 13-Aug-93 | 33 | 4 | NW |  | 597 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31273 | 042943 | BC TATSA | TROLL | 10-Aug-93 | 33 | 4 | NW | 116 | 645 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |

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Appendix A1. (Page 6 of 6).

| Head Number | Tag Code | Release Site | Gear | Recovery Date | Stat. Week | Troll Period | Quadrant | District | Length | H | $n_2$ | $a_1$ | $a_2$ | $m_1$ | $m_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31278 | 042943 | BC TATSA | TROLL | 10-Aug-93 | 33 | 4 | NW | 116 | 610 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 19461 | 042943 | BC TATSA | TROLL | 28-Aug-93 | 35 | 5 | NW | 113-91 | 592 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 2526 | 042943 | BC TATSA | TROLL | 22-Aug-93 | 35 | 5 | NW | 114-25 | 709 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 2699 | 042943 | BC TATSA | TROLL | 30-Aug-93 | 36 | 5 | NW | 116 | 450 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 88694 | 042943 | BC TATSA | TROLL | 04-Sep-93 | 36 | 5 | NE | 112 | 669 | 62,638 | 20,114 | 371 | 332 | 289 | 289 |
| 88823 | 042943 | BC TATSA | TROLL | 02-Sep-93 | 36 | 5 | SE | 105-10 | 684 | 56,005 | 10,628 | 185 | 184 | 153 | 153 |
| 31790 | 042943 | BC TATSA | TROLL | 06-Sep-93 | 37 | 5 | NW | 116-11 | 668 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 12548 | 042943 | BC TATSA | TROLL | 07-Sep-93 | 37 | 5 | NW |  | 724 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| 2945 | 042943 | BC TATSA | TROLL | 14-Sep-93 | 38 | 6 | NW | 113 | 685 | 193,893 | 44,327 | 1,015 | 1,010 | 914 | 914 |
| 24639 | 042943 | BC TATSA | TROLL | 16-Sep-93 | 38 | 6 | NW |  | 612 | 193,893 | 44,327 | 1,015 | 1,010 | 914 | 914 |
| 11467 | 043103 | BC TATSA | TROLL | 19-Jul-93 | 30 | 4 | NW |  | 640 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 31087 | 043103 | BC TATSA | TROLL | 22-Jul-93 | 30 | 4 | NW | 116-12 | 571 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 15981 | 043103 | BC TATSA | TROLL | 10-Aug-93 | 33 | 4 | NW | 181-60 | 618 | 798,572 | 225,044 | 3,537 | 3,496 | 2,992 | 2,990 |
| 2623 | 043103 | BC TATSA | TROLL | 26-Aug-93 | 35 | 5 | NW | 114-21 | 730 | 481,417 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 |
| **SELECT AND VOLUNTARY RECOVERIES** | | | | | | | | | | | | | | | |
| 15265 | 042851 | TAKU R 1 | SPORT | 13-Aug-93 | 33 | 4 | NE | 111-50 | 530 |  |  |  |  |  |  |
| 18284 | 042850 | TAKU R 1 | TROLL | 15-Aug-93 | 34 | 5 |  |  |  |  |  |  |  |  |  |
| 26728 | 042850 | TAKU R 1 | TROLL | 23-Sep-93 | 39 | 6 |  |  |  |  |  |  |  |  |  |
| 28182 | 042850 | TAKU R 1 | TROLL | 23-Sep-93 | 39 | 6 | NW | 189 |  |  |  |  |  |  |  |
| 16276 | 042851 | TAKU R 1 | TROLL | 08-Jul-93 | 28 | 3 |  |  |  |  |  |  |  |  |  |
| 17470 | 042851 | TAKU R 1 | TROLL | 20-Jul-93 | 30 | 4 |  |  |  |  |  |  |  |  |  |
| 2438 | 042851 | TAKU R 1 | TROLL | 04-Aug-93 | 32 | 4 |  |  | 634 |  |  |  |  |  |  |
| 15122 | 042943 | BC TATSA | SPORT | 31-Jul-93 | 31 | 4 | NE | 111-50 |  |  |  |  |  |  |  |
| 2672 | 042943 | BC TATSA | TROLL | 29-Aug-93 | 36 | 5 |  |  | 652 |  |  |  |  |  |  |

Appendix A2. 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.

PANEL A. Canyon Island Fish Wheels

| Date | Number Examined | Number of Clips | Valid Tags | Head Number | Tag Source | Tag Code | Comments |
|---|---|---|---|---|---|---|---|
| 14-Jul | 2 | 0 | | | | | |
| 15-Jul | 2 | 0 | | | | | |
| 16-Jul | 0 | 0 | | | | | |
| 17-Jul | 0 | 0 | | | | | |
| 18-Jul | 4 | 0 | | | | | |
| 19-Jul | 0 | 0 | | | | | |
| 20-Jul | 1 | 0 | | | | | |
| 21-Jul | 0 | 0 | | | | | |
| 22-Jul | 3 | 0 | | | | | |
| 23-Jul | 3 | 0 | | | | | |
| 24-Jul | 8 | 0 | | | | | |
| 25-Jul | 3 | 0 | | | | | |
| 26-Jul | 1 | 0 | | | | | |
| 27-Jul | 0 | 0 | | | | | |
| 28-Jul | 0 | 0 | | | | | |
| 29-Jul | 7 | 0 | | | | | |
| 30-Jul | 8 | 0 | | | | | |
| 31-Jul | 4 | 0 | | | | | |
| 01-Aug | 32 | 0 | | | | | |
| 02-Aug | 19 | 0 | | | | | |
| 03-Aug | 27 | 0 | | | | | |
| 04-Aug | 17 | 0 | | | | | |
| 05-Aug | 31 | 0 | | | | | |
| 06-Aug | 38 | 0 | | | | | |
| 07-Aug | 23 | 0 | | | | | |
| 08-Aug | 20 | 0 | | | | | |
| 09-Aug | 36 | 0 | | | | | |
| 10-Aug | 53 | 0 | | | | | |
| 11-Aug | 43 | 0 | | | | | |
| 12-Aug | 21 | 0 | | | | | |
| 13-Aug | 48 | 0 | | | | | |
| 14-Aug | 33 | 1 | 1 | 62205 | L. Tatsamenie | 04-29-43 | |
| 15-Aug | 25 | 0 | | | | | |
| 16-Aug | 47 | 1 | | 62206 | No Tag | | |
| 17-Aug | 50 | 1 | 1 | 62208 | L. Tatsamenie | 04-29-43 | |
| 18-Aug | 63 | 0 | | | | | |

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Appendix A2. (Page 2 of 4).

PANEL A. Canyon Island Fish Wheels (continued)

| Date | Number Examined | Number of Clips | Valid Tags | Head Number | Tag Source | Tag Code | Comments |
|---|---|---|---|---|---|---|---|
| 19-Aug | 83 | 1 | | 62209 | No Tag | | |
| 20-Aug | 52 | 1 | 1 | 62210 | Barrel Pt. | 04-28-51 | |
| 21-Aug | 53 | 0 | | | | | |
| 22-Aug | 56 | 0 | | | | | |
| 23-Aug | 63 | 1 | 1 | 62211 | Barrel Pt. | 04-28-50 | |
| 24-Aug | 54 | 0 | | | | | |
| 25-Aug | 52 | 1 | | 62212 | No Tag | | |
| 26-Aug | 54 | 0 | | | | | |
| 27-Aug | 28 | 0 | | | | | |
| 28-Aug | 15 | 1 | 1 | 62213 | L. Tatsamenie | 04-29-43 | |
| 29-Aug | 18 | 0 | | | | | |
| 30-Aug | 24 | 0 | | | | | |
| 31-Aug | 58 | 1 | 1 | 62214 | L. Tatsamenie | 04-29-43 | |
| 01-Sep | 104 | 1 | 1 | 62215 | L. Tatsamenie | 04-29-43 | |
| 02-Sep | 79 | 0 | | | | | |
| 03-Sep | 4 | 0 | | | | | |
| 04-Sep | 0 | 0 | | | | | |
| 05-Sep | 15 | 0 | | | | | |
| 06-Sep | 15 | 0 | | | | | |
| 07-Sep | 33 | 0 | | | | | |
| 08-Sep | 135 | 2 | 2 | 62216 | Barrel Pt. | 04-28-50 | |
| | | | | 62217 | Barrel Pt. | 04-28-51 | |
| 09-Sep | 131 | 0 | | | | | |
| 10-Sep | 134 | 1 | 1 | 62218 | Barrel Pt. | 04-28-51 | |
| 11-Sep | 92 | 1 | 1 | 62219 | Barrel Pt. | 04-28-50 | |
| 12-Sep | 13 | 0 | | | | | |
| 13-Sep | Inoperable | | | | | | |
| 14-Sep | " | | | | | | |
| 15-Sep | " | | | | | | |
| 16-Sep | " | | | | | | |
| 17-Sep | " | | | | | | |
| 18-Sep | " | | | | | | |
| 19-Sep | " | | | | | | |
| 20-Sep | " | | | | | | |
| 21-Sep | " | | | | | | |
| 22-Sep | 45 | 0 | | | | | |

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Appendix A2. (Page 3 of 4).

PANEL A. Canyon Island Fish Wheels (continued)

| Date | Number Examined | Number of Clips | Valid Tags | Head Number | Tag Source | Tag Code | Comments |
|---|---|---|---|---|---|---|---|
| 23-Sep | 44 | 0 | | | | | |
| 24-Sep | 83 | 1 | 1 | 62222 | Barrel Pt. | 04-28-51 | |
| 25-Sep | 57 | 1 | | 62223 | No Tag | | |
| 26-Sep | 31 | 0 | | | | | |
| 27-Sep | 34 | 1 | 1 | 62224 | Barrel Pt. | 04-28-51 | |
| 28-Sep | 37 | 0 | | | | | |
| 29-Sep | 22 | 0 | | | | | |
| Fish Wheel Total | 2,390 | 17 | 13 | 8 Barrel Pt. tags, 5 Tatsamenie tags | | | |
| Marked/Unmarked Ratio | | 0.0071 | 0.0054 | | | | |



PANEL B. Canadian Fishery

| Date | Number Examined | Number of Clips | Valid Tags | Head Number | Tag Source | Tag Code | Comments |
|---|---|---|---|---|---|---|---|
| 16-Aug | 22 | 1 | 1 | 62207 L. | Tatsamenie | 04-31-06 | Commercial Catch |
| 24-Aug | 81 | 0 | | | | | Commercial Catch |
| 2 Sep-11 Sep | 505 | 2 | 1 | 62220 | No Tag | | Test Fishery,2nd head lost |
| 12 Sep-18 Sep | 463 | 1 | 1 | 62221 | Barrel Pt. | 04-28-51 | Test Fishery |
| 27-Sep | 9 | 1 | | 62225 | No Tag | | Test Fishery |
| 28-Sep | 10 | 1 | 1 | 62226 | Barrel Pt. | 04-28-50 | Test Fishery |
| 29-Sep | 3 | 0 | | | | | Test Fishery |
| 30-Sep | 5 | 0 | | | | | Test Fishery |
| 1-Oct | 6 | 0 | | | | | Test Fishery |
| Canada Total | 1,104 | 6 | 4 | (Assumes lost head from 9/2-11 had a valid tag) | | | |
| Marked to Unmarked | | 0.005435 | 0.003623 | | | | |

-continued-

Appendix A2. (Page 4 of 4).

PANEL C. Summary

| Period | Inspected | Missing Ad. Fins | Heads w/o Tags | Observed Valid Tags: Barrel Pt. Tags | Observed Valid Tags: L. Tats. Tags | Expanded Valid Tags: SportF Tags | Expanded Valid Tags: Tats Tags |
|---|---|---|---|---|---|---|---|
| 1. 7/14-8/13 | 454 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2. 8/14-9/1 | 1,035 | 11 | 3 | 2 | 6 | 3 | 8 |
| 3. 9/2-11 | 1,143 | 6 | 2 | 4 | 0 | 6 | 0 |
| 4. 9/12-10/1 | 862 | 6 | 2 | 4 | 0 | 6 | 0 |
| Total | 3,494 | 23 | 7 | 10 | 6 | 15 | 8 |
| Total | 3,494 | 23 | | 15 | 8 | | |
| Marked/Unmarked for smolt estimate | | | | 0.00429307 | (15/3494) | | |
| Long-term Tag Retention | | | | 72.73% | (16/22) | | |
| Marked/Unmarked ($\theta$) for harvest contribution | | | | 0.00314825 | (11/3494) | | |

Appendix A3. Harvests of coho salmon bound for Taku River in 1993 in commercial and sport fisheries by statistical week. Harvest in the troll fishery (NW Quadrant) was approximated by weighting period catches by the number of tags recovered in a statistical week.

| | | Estimated Harvest by Fishery | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Troll Northwest Quadrant | | | | | | | | | | | |
| Stat Week | Ending Date | NW Troll Tags | NW Quad. Troll Period | NW Quad. Troll Stat. Wk | NE Quad. Troll | Total Troll | Gill net | Seine | Sport | TOTAL | Estimated Weekly Prop. Harvest | Estimated Cum. Total Harvest | Estimated Cum. Prop. Harvest |
| 27 | 7/03 | 1 | | 434 | | 434 | | | | 434 | 0.003 | 434 | 0.003 |
| 28 | 7/10 | 1 | 2,203 | 1,769 | | 1,769 | | | | 1,769 | 0.014 | 2,203 | 0.018 |
| 29 | 7/17 | 4 | | 4,564 | | 4,564 | 919 | | | 5,483 | 0.044 | 7,686 | 0.061 |
| 30 | 7/24 | 5 | | 5,706 | | 5,706 | | | | 5,706 | 0.046 | 13,392 | 0.107 |
| 31 | 7/31 | 9 | | 10,270 | | 10,270 | 1,415 | | | 11,685 | 0.093 | 25,077 | 0.200 |
| 32 | 8/07 | 5 | | 5,706 | | 5,706 | | 1,453 | | 7,159 | 0.057 | 32,236 | 0.257 |
| 33 | 8/14 | 4 | 30,810 | 4,564 | | 4,564 | | | 818 | 5,382 | 0.043 | 37,618 | 0.300 |
| 34 | 8/21 | 1 | | 1,393 | | 1,393 | 2,087 | 1,977 | | 5,457 | 0.044 | 43,075 | 0.344 |
| 35 | 8/28 | 10 | | 13,926 | 1,105 | 15,031 | 3,954 | | | 18,985 | 0.151 | 62,060 | 0.495 |
| 36 | 9/04 | 7 | | 9,748 | | 9,748 | | | 1,100 | 10,848 | 0.087 | 72,908 | 0.582 |
| 37 | 9/11 | 5 | 32,030 | 6,963 | | 6,963 | 3,073 | | 1,304 | 11,340 | 0.090 | 84,248 | 0.672 |
| 38 | 9/18 | 5 | | 6,981 | | 6,981 | 11,998 | | | 18,979 | 0.151 | 103,227 | 0.824 |
| 39 | 9/25 | 3 | 11,170 | 4,189 | 1,053 | 5,242 | 13,109 | | | 18,351 | 0.146 | 121,578 | 0.970 |
| 40 | 10/02 | | | | | 0 | 3,753 | | | 3,753 | 0.030 | 125,331 | 1.000 |
| Total | | 60 | 76,213 | 76,213 | 2,158 | 78,371 | 40,308 | 3,430 | 3,222 | 125,331 | 1.000 | | |
| Estimated Mean Date of Harvest | | | | | | 8/18 | 9/11 | 8/19 | 8/29 | 8/26 | | | |

Appendix A4. Number of coho salmon released in 1992 by DIPAC (Panel A) and estimated harvests from recoveries of CWTs in fisheries in 1993 (Panel B).

PANEL A. Number of coho salmon released and tagged in 1992 by DIPAC at Gastineau Hatchery and the Sheep Creek net pen site

| Tag Code | Brood Year | Release Site | Number Released | Number Tagged |
|---|---|---|---|---|
| 04-38-31 | 1990 | Sheep Creek | 16,934 | 16,307 |
| 04-38-32 | 1990 | Sheep Creek | 193,222 | 16,609 |
| 04-38-33 | 1990 | Sheep Creek | 193,069 | 16,902 |
| 04-38-34 | 1990 | Gastineau Hatchery | 198,304 | 16,274 |
| 04-38-35 | 1990 | Gastineau Hatchery | 194,204 | 16,276 |
| 04-38-44 | 1990 | Sheep Creek | 179,614 | 16,165 |
| Total | | | 975,247 | 98,533 |

Appendix A4. (Page 2 of 2).

Panel B. Estimated harvest of adult coho salmon bound for Gastineau Hatchery in 1993 with $\hat{\theta}$ = 0.10103400 and $v[1/\hat{\theta}]$ = 0.00089400. Random seed for bootstrap estimation of the SE was 859115781. In fishing periods and fishing quadrants for which no CWT was recovered with the appropriate code, harvest was assumed to be zero.

| Type | Gear | Week | District/ Quadrant | Harvest N | Var[N] | n2 | a1 | a2 | m1 | m2 | mc | -----Contribution----- n1 | Boot-Est | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adult | GILLN | 31 | 115 | 287 | 0 | 155 | 2 | 2 | 2 | 2 | 1 | 18 | 18 | 18 |
| Adult | GILLN | 35 | 111 | 5,321 | 0 | 2,137 | 24 | 24 | 18 | 18 | 7 | 173 | 174 | 67 |
| Adult | GILLN | 35 | 200 | 7,417 | 0 | 732 | 2 | 2 | 1 | 1 | 1 | 100 | 99 | 100 |
| Adult | GILLN | 35 | 212 | 54,639 | 0 | 9,768 | 14 | 14 | 4 | 4 | 1 | 55 | 54 | 53 |
| Adult | GILLN | 36 | 115 | 4,910 | 0 | 793 | 10 | 10 | 8 | 8 | 2 | 123 | 124 | 85 |
| Adult | GILLN | 36 | 200 | 18,947 | 0 | 7,720 | 13 | 13 | 5 | 5 | 2 | 49 | 48 | 34 |
| Adult | GILLN | 36 | 212 | 54,139 | 0 | 22,139 | 27 | 27 | 14 | 14 | 1 | 24 | 24 | 24 |
| Adult | GILLN | 37 | 111 | 5,081 | 0 | 2,164 | 14 | 14 | 12 | 12 | 7 | 163 | 161 | 64 |
| Adult | GILLN | 37 | 115 | 6,391 | 0 | 1,284 | 22 | 22 | 20 | 20 | 1 | 49 | 49 | 49 |
| Adult | GILLN | 38 | 111 | 14,775 | 0 | 8,775 | 142 | 141 | 118 | 118 | 84 | 1,410 | 1,412 | 154 |
| Adult | GILLN | 38 | 115 | 8,610 | 0 | 4,028 | 175 | 173 | 167 | 167 | 30 | 642 | 640 | 115 |
| Adult | GILLN | 38 | 200 | 36,133 | 0 | 14,818 | 30 | 27 | 14 | 14 | 4 | 107 | 108 | 55 |
| Adult | GILLN | 38 | 212 | 54,840 | 0 | 13,852 | 41 | 41 | 10 | 10 | 1 | 39 | 40 | 40 |
| Adult | GILLN | 39 | 111 | 17,047 | 0 | 6,607 | 183 | 183 | 161 | 161 | 137 | 3,499 | 3,508 | 305 |
| Adult | GILLN | 39 | 115 | 17,182 | 0 | 1,667 | 98 | 98 | 93 | 93 | 14 | 1,428 | 1,430 | 384 |
| Adult | GILLN | 40 | 111 | 5,999 | 0 | 938 | 39 | 39 | 36 | 36 | 33 | 2,089 | 2,099 | 347 |
| Adult | GILLN | 40 | 115 | 16,204 | 0 | 5,979 | 365 | 365 | 359 | 359 | 82 | 2,200 | 2,188 | 239 |
| Adult | GILLN | 41 | 115 | 3,814 | 0 | 2,696 | 232 | 232 | 225 | 225 | 15 | 210 | 211 | 54 |
| Adult | SEINE | 30 | 112 | 952 | 0 | 545 | 4 | 4 | 2 | 2 | 2 | 35 | 34 | 24 |
| Adult | SEINE | 31 | 109 | 326 | 0 | 164 | 5 | 5 | 5 | 5 | 1 | 20 | 19 | 19 |
| Adult | SEINE | 32 | 114 | 1,962 | 0 | 408 | 3 | 3 | 3 | 3 | 1 | 48 | 48 | 47 |
| Adult | SEINE | 33 | 112 | 6,807 | 0 | 2,514 | 27 | 27 | 22 | 22 | 1 | 27 | 26 | 26 |
| Adult | SEINE | 33 | 226 | 1,359 | 0 | 448 | 6 | 6 | 6 | 6 | 1 | 30 | 30 | 29 |
| Adult | SEINE | 34 | 112 | 7,399 | 0 | 3,566 | 47 | 47 | 41 | 41 | 14 | 288 | 290 | 78 |
| Adult | SEINE | 35 | 112 | 3,252 | 0 | 1,980 | 23 | 23 | 18 | 18 | 4 | 65 | 67 | 33 |
| Adult | SEINE | 36 | 109 | 6,936 | 0 | 1,827 | 20 | 20 | 19 | 19 | 1 | 38 | 37 | 37 |
| Adult | SEINE | 36 | 112 | 4,538 | 0 | 1,547 | 15 | 15 | 11 | 11 | 3 | 87 | 85 | 49 |
| Adult | SPORT | 16 | Derby | 1,633 | 0 | 1,578 | 15 | 15 | 11 | 11 | 5 | 51 | 51 | 23 |
| Adult | SPORT | 16 | Marine Boat | 1,525 | 265,486 | 127 | 2 | 1 | 1 | 1 | 1 | 238 | 194 | 197 |
| Adult | SPORT | 17 | Marine Boat | 4,928 | 769,303 | 1,993 | 21 | 15 | 15 | 15 | 10 | 343 | 344 | 114 |
| Adult | SPORT | 18 | Marine Boat | 4,739 | 1,009,803 | 1,299 | 27 | 24 | 22 | 22 | 17 | 691 | 688 | 213 |
| Adult | SPORT | 19 | Marine Boat | 756 | 73,699 | 509 | 20 | 16 | 14 | 14 | 6 | 110 | 110 | 56 |
| Adult | TROLL | 3 | NW | 127,858 | 0 | 39,015 | 506 | 503 | 430 | 430 | 11 | 359 | 358 | 110 |
| Adult | TROLL | 4 | NE | 112,682 | 0 | 30,941 | 471 | 464 | 397 | 396 | 3 | 110 | 110 | 65 |
| Adult | TROLL | 4 | NW | 794,991 | 0 | 225,044 | 3,537 | 3,497 | 2,993 | 2,991 | 361 | 12,775 | 12,767 | 685 |
| Adult | TROLL | 4 | SW | 302,388 | 0 | 109,768 | 1,220 | 1,205 | 969 | 968 | 1 | 28 | 27 | 27 |
| Adult | TROLL | 5 | NE | 62,638 | 0 | 20,114 | 371 | 332 | 289 | 289 | 12 | 413 | 410 | 122 |
| Adult | TROLL | 5 | NW | 481,278 | 0 | 110,451 | 2,219 | 2,206 | 1,919 | 1,919 | 435 | 18,871 | 18,851 | 910 |
| Adult | TROLL | 6 | NE | 7,048 | 0 | 2,201 | 29 | 28 | 25 | 25 | 3 | 98 | 97 | 56 |
| Adult | TROLL | 6 | NW | 193,893 | 0 | 44,327 | 1,015 | 1,010 | 914 | 914 | 203 | 8,832 | 8,842 | 610 |
| Adult | TROLL | 6 | SE | 41,446 | 0 | 10,469 | 279 | 270 | 233 | 233 | 1 | 40 | 41 | 40 |
| Adult | TERM SEINE | 29 | 112 | 446 | 0 | 93 | 3 | 3 | 2 | 2 | 1 | 47 | 48 | 48 |
| Total | | | | 2,503,516 | 2,118,291 | 717,180 | 11,318 | 11,166 | 9,628 | 9,624 | 1,521 | 56,022 | 55,961 | 1,523 |

Appendix A5. Harvest and exploitation rate of coho salmon from DIPAC in Southeast Alaska fisheries in 1993.

| Fishery | Area | Estimated harvest | SE | Percent of harvest | Exploitation rate |
|---|---|---|---|---|---|
| U.S. troll fishery | NE Quad | 621 | 149 | 1.1 | 0.6 |
| | NW Quad | 40,837 | 1,297 | 72.9 | 41.6 |
| | SE Quad | 40 | 40 | 0.1 | 0.0 |
| | SW Quad | 28 | 27 | 0.0 | 0.0 |
| | Subtotal | 41,526 | 1,306 | 74.1 | 42.3 |
| Drift gill net | Dist. 111 | 7,334 | 496 | 13.1 | 7.5 |
| | Dist. 115 | 4,670 | 480 | 8.3 | 4.8 |
| | Dist. 200, 213 | 374 | 138 | 0.7 | 0.4 |
| | Subtotal | 12,378 | 704 | 22.1 | 12.6 |
| Seine fishery | All district | 685 | 123 | 1.2 | 0.7 |
| | Subtotal | 685 | 123 | 1.2 | 0.7 |
| Recreational | Juneau marine boat | 1,433 | 366 | 2.6 | 1.5 |
| | Subtotal | 1,433 | 366 | 2.6 | 1.5 |
| Total harvest | | 56,022 | 1,533 | 100.0 | 57.1 |
| Terminal run | Terminal sport | 7,350 | 1,451 | | |
| | Cost recovery | 28,637 | 1,356 | | |
| | Raceway | 6,054 | 0 | | |
| | Subtotal | 42,041 | 1,986 | | |
| TOTAL RUN | | 98,063 | 2,509 | | |

Appendix A6. Harvests of coho salmon bound for Gastineau Hatchery in 1993 in commercial and sport fisheries by statistical week. Harvest in the troll fishery was approximated by weighting period catches by the number of tags recovered in a statistical week.

| Stat Week | Ending Date | Estimated Harvest by Fishery | | | | | Estimated Weekly Prop. Harvest | Estimated Cum. Total Harvest | Estimated Cum. Prop. Harvest |
|---|---|---|---|---|---|---|---|---|---|
| | | Troll | Gill net | Seine | Sport | TOTAL | | | |
| 27 | 7/03 | 0 | | | | 0 | 0.000 | 0 | 0.000 |
| 28 | 7/10 | 359 | | | | 359 | 0.006 | 359 | 0.006 |
| 29 | 7/17 | 1,592 | | 47 | | 1,639 | 0.029 | 1,998 | 0.036 |
| 30 | 7/24 | 2,229 | | 35 | | 2,264 | 0.040 | 4,262 | 0.076 |
| 31 | 7/31 | 2,795 | 18 | 20 | | 2,833 | 0.051 | 7,095 | 0.127 |
| 32 | 8/07 | 2,830 | | 48 | 51 | 2,929 | 0.052 | 10,024 | 0.179 |
| 33 | 8/14 | 3,467 | | 57 | 238 | 3,762 | 0.067 | 13,786 | 0.246 |
| 34 | 8/21 | 518 | | 288 | 229 | 1,034 | 0.018 | 14,820 | 0.265 |
| 35 | 8/28 | 8,240 | 328 | 65 | 114 | 8,747 | 0.156 | 23,568 | 0.421 |
| 36 | 9/04 | 5,436 | 196 | 125 | 408 | 6,165 | 0.110 | 29,733 | 0.531 |
| 37 | 9/11 | 5,091 | 212 | | 283 | 5,585 | 0.100 | 35,318 | 0.630 |
| 38 | 9/18 | 6,977 | 2,198 | | 50 | 9,225 | 0.165 | 44,543 | 0.795 |
| 39 | 9/25 | 1,993 | 4,927 | | 60 | 6,980 | 0.125 | 51,523 | 0.920 |
| 40 | 10/02 | | 4,289 | | | 4,289 | 0.077 | 55,812 | 0.996 |
| 41 | 10/09 | | 210 | | | 210 | 0.004 | 56,022 | 1.000 |
| Total | | 41,526 | 12,378 | 685 | 1,433 | 56,022 | 1.000 | | |
| Mean Date of Harvest | | 8/24 | 9/22 | 8/15 | 8/27 | 8/30 | | | |

Appendix A7. Computer data files on 1992 Taku River coho salmon smolt and subsequent estimates of 1993 Taku River adult coho salmon run parameters.

| File Name | Description |
|---|---|
| FINAL2.wq1 | Spreadsheet of random and select recoveries of CWTd Taku River coho salmon in 1993 including condensed strata of random recoveries for input into *CWT4.exe*. |
| BARRCWT4.ou3 | ASCII file of estimated harvests: output from *CWT4.exe* for random Barrel Point recoveries in 1993. |
| DIPACCWT.wq1 | Spreadsheet of recoveries of CWTd DIPAC coho salmon in 1993 with summary by gear and strata. |
| DAYCAT92.wq1 | Spreadsheet of daily catches of juvenile salmon at Barrel Point on the Taku River in 1992. |
| 43SMOBAR.92r | ASCII data file of age and length data for coho salmon smolt caught at Barrel Point in 1992. |
| 93TAKREP.wq1 | Spreadsheet of inriver recovery from Canyon Island fish wheels and Canadian set/drift gill net fishery, theta estimate, smolt estimate, exploitation rate calculations, frequency of CWT recoveries by fishery, harvest by fishery, and mean date of harvest calculations. |
| CWT4.EXE | Program to estimate harvests from CWT recovery data. |
| NSECOH93.FN4 | WORDPERFECT 5.1 (DOS) file of this FDS report. |