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CREEL AND ESCAPEMENT STATISTICS FOR COHO SALMON AND CHINOOK SALMON ON THE LITTLE SUSITNA RIVER, ALASKA, DURING 1989[1]

By

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ABSTRACT

Coho *Oncorhynchus kisutch* and chinook *Oncorhynchus tshawytscha* salmon returns to the Little Susitna River were assessed with a creel survey to estimate sport harvest and a weir to estimate spawning escapement. Creel surveys were conducted at two major access points to the Little Susitna River from 15 July through 4 September 1989 to estimate the effort for and catch and harvest of coho salmon by the sport fishery. An estimated 14,150 coho salmon were harvested and an additional 1,564 coho salmon were caught and released during 68,518 angler-hours of effort. The majority of the effort (66,626 hours) and harvest (13,750) occurred at the Burma Road survey site. Bait was the lure of choice by most anglers fishing for and harvesting coho salmon. Most of the harvested coho salmon were age 1.1. The contribution of hatchery-produced coho salmon to the sport harvest and escapement past the weir was estimated to be 75 and 46 percent, respectively, all of which originated from a 1988 smolt release in Nancy Lake.

The estimated return of coho salmon to the Little Susitna River during 1989 was 28,982. An unknown number of coho salmon are harvested in the mixed-stock commercial fisheries of upper Cook Inlet. A total of 14,150 fish were harvested in the sport fishery: 13,127 fish below the weir and 1,023 fish above the weir. Spawning escapement was estimated at 13,808 fish. Coho salmon are not known to spawn downstream of the weir. Inriver exploitation by the sport fishery was estimated at 48 percent.

A creel survey was conducted at Burma Road access point to the Little Susitna River from 27 May through 9 July to estimate the effort for and catch and harvest of chinook salmon by the sport fishery. An estimated 2,265 chinook salmon were harvested and an additional 461 chinook salmon were caught and released during 64,412 angler-hours of effort. An unknown number of Little Susitna River chinook salmon are harvested in the mixed-stock commercial fisheries of upper Cook Inlet. A total of 6,346 chinook salmon entered the Little Susitna River in 1989. This is based on an estimated escapement of 4,081 chinook salmon above the weir, an estimated sport harvest of 286 chinook salmon above the weir, and an estimated sport harvest of 1,979 chinook salmon below the weir. The sport harvest of 2,265 fish represents a minimum inriver exploitation rate by the sport fishery of 36 percent. Most of the chinook salmon harvested were age 1.4.

KEY WORDS: chinook salmon, *Oncorhynchus tshawytscha*, coho salmon, *Oncorhynchus kisutch*, creel survey, effort, harvest, catch, hatchery contribution, escapement, age, sex, length.

INTRODUCTION

The Little Susitna River (Figure 1) supports the largest sport fisheries for chinook salmon *Oncorhynchus tshawytscha* and coho salmon *O. kisutch* in the Matanuska-Susitna Valley (Mills 1979-1989). Angler effort in this fishery increased 250% from 1977 through 1988. Over this same period, harvests of chinook salmon and coho salmon have increased 1,200% and 286%, respectively. In response to these large increases, the Little Susitna River has been annually stocked with coho salmon since 1982 (ADFG 1981, Chlupach 1988).

The Alaska Department of Fish and Game (ADFG), Division of Sport Fish, began an annual creel survey of the sport fishery for chinook salmon in the Little Susitna River in 1979 and for coho salmon in 1981. An annual life-history study of coho salmon in the Little Susitna River was begun in 1982. As part of this study, a weir was constructed in 1986 to estimate the escapements of chinook salmon and coho salmon. These surveys and life history studies are summarized in a series of annual progress reports (Watsjold 1980; Bentz 1983, 1986, 1987; Bartlett and Conrad 1988; Bartlett and Vincent-Lang 1989).

The objectives of this report are to present:

1. estimates of angler effort and harvest (number kept) and catch (number kept plus number released) of coho salmon and chinook salmon in the Little Susitna River sport fishery during 1989;

2. estimates of the spawning escapements of chinook salmon and coho salmon to the Little Susitna River and other selected northern Cook Inlet index streams during 1989;

3. estimates of the contribution of hatchery-reared coho salmon to the sport harvest and escapement during 1989; and

4. estimates of the age, sex, and length compositions of the chinook salmon and coho salmon in the sport harvest and escapement in the Little Susitna River during 1989.

METHODS

Creel Surveys

Approximately 113 km of the Little Susitna River were open to salmon fishing by regulation during 1989 (ADFG 1989). Within this area, there were two major points of access to the fishery: (1) the Burma Road boat launch at river km 45.1; and (2) the boat launch at Miller's Landing in the city of Houston at river km 111.7 (Figure 1). During 1989, daily bag and possession limits were one chinook salmon of 406 mm (16 inches) or greater total length and three coho salmon of 406 mm (16 inches) or greater total length. The open season for chinook salmon closed at 2400 hours on 13 July. The open season for coho salmon was not restricted.

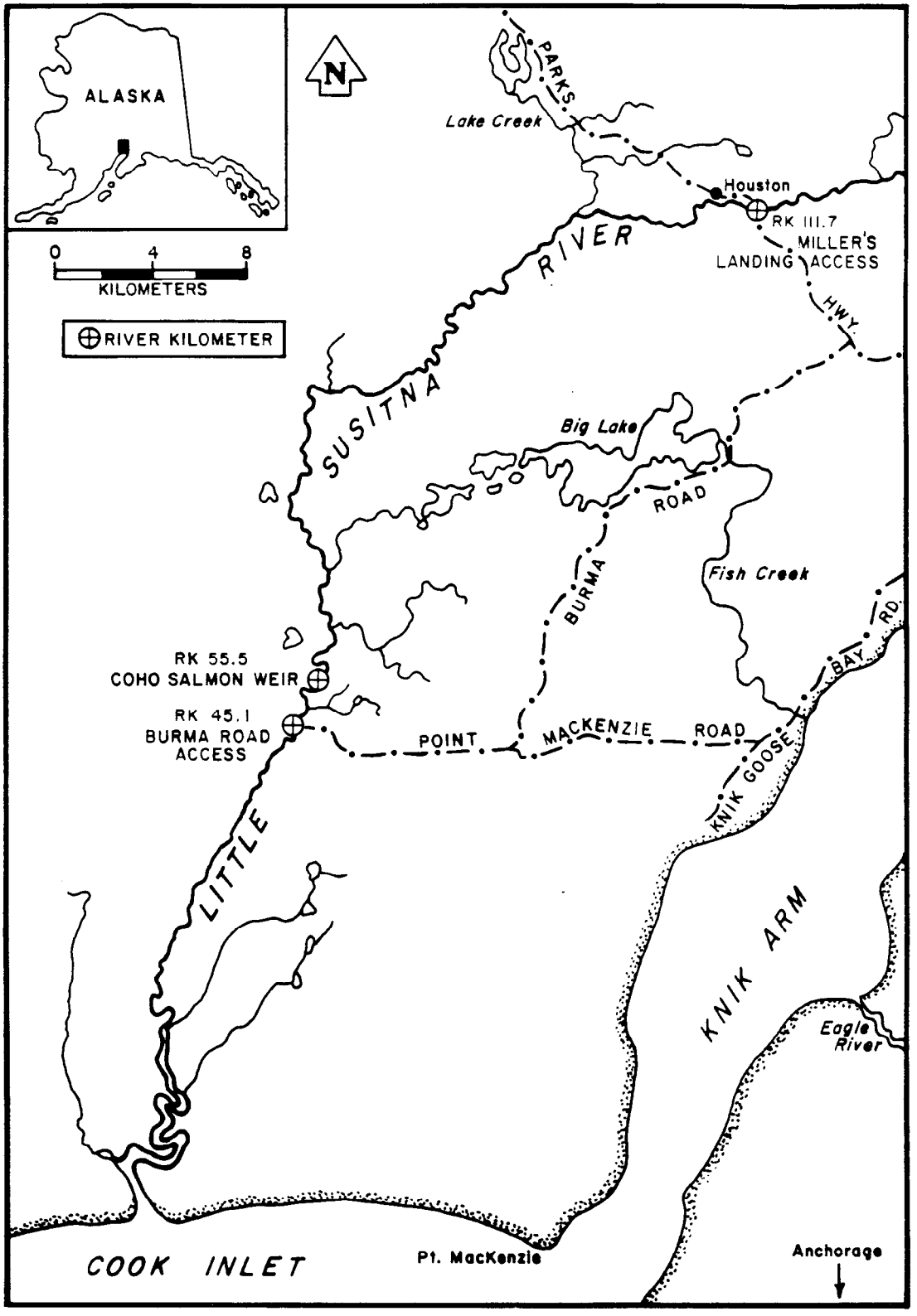

Figure 1. Map of the Little Susitna River.

Creel surveys were used to estimate chinook salmon and coho salmon harvest and catch by both boat and shore anglers at the Burma Road access point and the coho salmon harvest and catch by boat anglers at Miller's Landing. Boat anglers at both sites were surveyed via a direct expansion survey. Shore anglers at Burma Road were surveyed via a roving creel survey (Neuhold and Lu 1957).

Direct Expansion Creel Surveys:

Direct expansion surveys census all anglers exiting an access site during a sampling period. The information is then expanded to include periods not surveyed. Direct expansion surveys were implemented for boat anglers at the Burma Road and Miller's Landing access locations. Boat anglers are defined as anglers who accessed their fishing site via a boat. This includes anglers who used a boat to travel to a fishing site but fished from shore once they reached the site.

The direct expansion survey of chinook salmon boat anglers at Burma Road was conducted from 27 May through 9 July. The survey was designed for a 16-hour fishing day (0800-2400 hr). Each fishing day was stratified into three periods: A (0800 to 1159 hr), B (1200 to 1759 hr), and C (1800 to 2400 hr).

The direct expansion survey of coho salmon anglers at Burma Road was conducted from 15 July through 4 September. From 15 July through 20 August, each fishing day at Burma Road was 16 hours long (0800-2400 hr) and was stratified in the same way as the chinook salmon survey. The Burma Road survey was reduced to 12-hour days (0800-2000 hr) with two daily periods from 21 August through 4 September because of the decreased number of daylight hours. From 21 August through 4 September, period A was from 0800 to 1359 hr, and period B was from 1400 through 2000 hr.

At Miller's Landing, the creel survey of coho salmon boat anglers was conducted from 5 August through 4 September. The survey at Miller's Landing was designed for a 16-hour fishing day (0600-2200 hr). Fishing days were stratified into two, 8-hour survey periods: A (0600 to 1359 hr) and B (1400 to 2200 hr). On 25 August, the Miller's Landing survey was split to survey anglers exiting the fishery at Miller's Reach boat landing. Miller's Reach is downstream 4.7 km from Miller's Landing. Anglers exiting the fishery at both locations are fishing the same area (near the mouth of Nancy Lake Creek).

A stratified, random sample design was used for the direct expansion creel surveys. Each location was surveyed 5 days each week. All Saturdays, Sundays, and holidays were surveyed. The 2 days not surveyed were selected by first choosing a day from Monday through Thursday not to sample and then choosing the following day also. Days were drawn in this way to allow the creel clerk two consecutive days off as required by union rules. Effort, harvest, and catch were estimated separately for the weekdays and weekend/holidays in each week.

Each period (A, B, and C) was sampled on a day selected for survey. Burma Road was surveyed for 2 hours during the 4-hour period and 2.5 hours during the 6-hour periods; 0.5 hour of the sampling time in each period was dedicated

to the angler counts for the roving survey of shore anglers. Miller's Landing (and Miller's Reach when surveyed) was surveyed for 3.5 hours during each period. On a day selected for sampling, a time to begin sampling in each period was randomly selected. Times to sample were chosen to allow the entire sample unit to fall within the defined period. The period surveyed at Miller's Reach (A or B) was randomly selected from the Miller's Landing periods.

A creel survey clerk was stationed at an access site to the surveyed fishery during a selected sample period. All anglers departing the fishery through the access site during the time sampled were interviewed by the survey clerk.

The following effort, catch, and harvest information were collected from each angler interviewed: completed-trip or incompleted-trip angler; number of hours spent fishing; number of fish harvested (kept) and number of fish released by species; shore or boat angler; guided or unguided angler; and fishing method (lure, bait, or both). In addition, at Burma Road, the following information on the locations fished by the angler was collected: angler fished upstream and/or downstream of the boat launch at Burma Road and angler fished upstream and/or downstream of the weir.

The estimation of angler effort by a direct expansion creel survey can be considered as a problem of estimating a rate. Effort in temporal component j (E_j) was estimated in units of angler-hours. The rate estimated was the number of angler-hours leaving an access site during each hour the fishery was in progress. Only completed-trip angler interviews were used in the analyses. The product of this rate and the total number of possible fishing hours in the fishery is an estimate of angler effort. This can be expressed as:

$$\hat{E}_j = \sum_{i=1}^{p} H_i \, (e_i/h_i) \qquad [1]$$

where:

p = the total number of daily time periods in temporal component j,

H_i = the total number of hours of possible fishing time in period i during temporal component j,

h_i = the number of hours sampled during period i of temporal component j, and

e_i = the amount of effort in hours expended by interviewed anglers during period i during temporal component j.

The variance of effort was estimated as:

$$\hat{V}(E_j) = \sum_{i=1}^{p} H_i^2 V(\bar{e}_i/\bar{h}_i) \; . \qquad [2]$$

The variance of the rate, e_i/h_i, was approximated by the variance for the quotient of the mean of two random variables (Jessen 1978):

$$V(\bar{e}_i/\bar{h}_i) \approx (\bar{e}_i/\bar{h}_i)^2 * (s_e^2/\bar{e}_i^2 + s_h^2/\bar{h}_i^2 - 2\mathrm{cov}(e_i,h_i)/(\bar{e}_i*\bar{h}_i)) \quad [3]$$

where,

$$s_e^2 = (1-(h_i/H_i))*s_b^2/d_i + [h_i/(H_i*d_i)]s_w^2/d_i, \quad [4]$$

$$s_h^2 = (1-(h_i/H_i))*[1/(d_i(d_i-1))]* \sum_{k=1}^{d_i} (h_{ik}-\bar{h}_i)^2, \quad [5]$$

$$\mathrm{cov}(e_i,h_i) = (1-(h_i/H_i))*[1/(d_i(d_i-1)] \sum_{k=1}^{d_i} (e_{ik}-\bar{e}_i)(h_{ik}-\bar{h}_i), \quad [6]$$

where:

e_{ik} = the number of hours of angler effort recorded in period i on day k,

$\bar{e}_i$ = the mean effort of anglers interviewed during period i of temporal component j,

d_i = the number of days sampled in period i during temporal component j, and

h_{ik} = the number of hours sampled in period i on day k.

Because all anglers were interviewed during the time sampled during this creel survey, the number of angler hours, e_{ik}, leaving the fishery during the time sampled is known, and within-sample (between-angler) variance, s^2_w, was zero, so the variance of e_{ik} has one component, the between sample variance, s^2_b;

$$s_e^2 = (1-(h_i/H_i))^2 * s_b/d_i, \quad [8]$$

where:

s_b^2 = the between sample variance of angler effort

$$= (1/(d_i-1)) \sum_{k=1}^{d_i} (e_{ik} - \bar{e}_i)^2. \quad [9]$$

Also, because there was no variation within a period and temporal component in the number of hours sampled during this creel survey, the covariance term was zero, as was the variance of the hours sampled (s^2_h), so $V(e_i/h_i)$ reduced to:

$$V(\bar{e}_i/\bar{h}_i) = (\bar{e}_i/\bar{h}_i)^2 * (s_e^2/\bar{e}_i^2) \quad . \qquad [10]$$

The harvest and catch of a species and their variances were estimated with the same procedures used to estimate effort by substituting the corresponding quantities for harvest or catch in place of effort.

Assumptions necessary for the direct expansion creel survey design are:

1. No significant fishing effort occurs during the hours not included in the fishing day.

2. All anglers participating in the fishery exit the fishery through a surveyed access site.

3. All anglers who are not interviewed are counted and all non-interviewed anglers are completed-trip anglers.

Roving Creel Survey:

The effort, harvest, and catch by shore anglers fishing for chinook salmon and coho salmon near the Burma Road access site were estimated using a roving creel survey (Neuhold and Lu 1957). The roving creel survey at Burma Road was incorporated into the direct expansion survey schedule. Within the periods and survey times for the direct expansion survey, 0.5 hour was randomly selected for conducting the angler count for the roving survey. A count of all shore anglers within 1.6 km upstream and 1.6 km downstream of the Burma Road survey location was conducted from a riverboat. One angler count was conducted during each survey period. Angler counts took 30 minutes to complete and were considered instantaneous (Neuhold and Lu 1957). Shore anglers exiting the fishery at Burma Road were interviewed following the same schedule as the direct expansion creel survey.

Angler effort (angler-hours) and its variance were estimated separately for the weekdays and weekend/holiday days each week.

Effort was estimated for each temporal component of the fishery using a stratified random sampling approach by period. Within each temporal component, effort (E_j) was estimated as follows:

$$\hat{E}_j = \sum_{i=1}^{p} H_i \bar{x}_i; \qquad [11]$$

where:

p = total number of periods in temporal component j,

H_i = the total number of hours of possible fishing time in period i during temporal component j, and

$\bar{x}_i$ = the mean angler count for period i during temporal component j.

The variance of the estimate of E_j was estimated as follows:

$$\hat{V}(\hat{E}_j) = \sum_{i=1}^{p} H_i^2 \, (s_i^2/m_i); \quad [12]$$

where:

$$s_i^2 = [\sum_{k=1}^{m_i} (x_{ik} - \bar{x}_i)^2]/(m_i - 1) \quad [13]$$

and:

x_{ik} = a count of anglers made during day k, period i, and temporal component j, and

m_i = the number of counts of anglers conducted during period i and temporal component j.

The total number of angler-hours of effort for the season was estimated by summing the estimates of effort for each of the temporal components. Because these are independent estimates, the variance for the total number of angler-hours of effort is the sum of the individual variances for each temporal component estimate.

Mean catch per unit effort (catch per angler-hour) was estimated for each temporal component as:

$$\overline{CPUE}_j = \sum_{h=1}^{d_j} \sum_{o=1}^{m_h} c_{jho} \; / \; \sum_{h=1}^{d_j} \sum_{o=1}^{m_h} e_{jho}; \quad [14]$$

where:

d_j = the number of days sampled for angler interviews during temporal component j,

m_h = the number of anglers interviewed during sample h and temporal component j,

c_{jho} = the catch by angler o interviewed during sample h and temporal component j, and

e_{jho} = the effort (number of hours) expended by angler o interviewed during sample h and temporal component j.

The variance of mean $CPUE_j$ was approximated as (Jessen 1978):

$$\hat{V}(\overline{CPUE}_j) = (\bar{C}_j/\bar{E}_j)^2 [s_c^2/\bar{C}_j + s_e^2/\bar{E}_j - (2r_j s_c s_e/\bar{C}_j\bar{E}_j)]; \quad [15]$$

where:

$$\bar{C}_j = (\sum_{h=1}^{d_j} \sum_{o=1}^{m_h} c_{jho}) / \sum_{h=1}^{d_j} m_h \quad [16]$$

$$\bar{E}_j = (\sum_{h=1}^{d_j} \sum_{o=1}^{m_h} e_{jho}) / \sum_{h=1}^{d_j} m_h \quad [17]$$

$$s_c^2 = (1/d_j)[\sum_{h=1}^{d_j} (\bar{c}_{jh}-\bar{C}_j)^2/(d_j-1) + \sum_{h=1}^{d_j} (1/m_h) \sum_{o=1}^{m_h} (c_{jho}-\bar{c}_{jh})^2/(m_h-1)] \quad [18]$$

$$\bar{c}_{jh} = \sum_{o=1}^{m_j} c_{jho} / m_h \quad [19]$$

$$s_e^2 = (1/d_j)[\sum_{h=1}^{d_j} (\bar{e}_{jh}-\bar{E}_j)^2/(d_j-1) + \sum_{h=1}^{d_j} (1/m_h) \sum_{o=1}^{m_h} (e_{jho}-\bar{e}_{jh})^2/(m_h-1)] \quad [20]$$

$$\bar{e}_{jh} = \sum_{o=1}^{m_j} e_{jho} / m_h \quad [21]$$

$$r_j = \frac{\sum_{h=1}^{d_j} \sum_{o=1}^{m_h} (c_{jho}-\bar{C}_j)(e_{jho}-\bar{E}_j)}{[\sum_{h=1}^{d_j} \sum_{o=1}^{m_h} (c_{jho}-\bar{C}_j)^2][\sum_{h=1}^{d_j} \sum_{o=1}^{m_h} (e_{jho}-\bar{E}_j)^2]} . \quad [22]$$

The catch of each species during temporal component j was estimated by:

$$\hat{C}_j = \hat{E}_j(\overline{CPUE}_j) . \quad [23]$$

The variance of the estimated catch of each species was estimated using the product of two independent random variables as described by Goodman (1960):

$$\hat{V}(\hat{C}_j) = \hat{E}_j^2 \hat{V}(\overline{CPUE}_j) + \overline{CPUE}_j^2 \hat{V}(\hat{E}_j) - \hat{V}(\hat{E}_j)\hat{V}(\overline{CPUE}_j) . \quad [24]$$

Harvest rates and total harvest of each species were estimated for each temporal component by substituting appropriate harvests for catches in equations 12-22.

The total harvest and catch were estimated by summing the estimates for all the weekday and weekend/holiday components. Since these are considered independent estimates, the estimated variance of the total was the sum of the variances.

Several necessary assumptions are:

1. Angler counts made during the same day and on consecutive days are independent.

2. Catch and harvest rates of shore anglers for coho salmon exiting the fishery at Burma Road are representative of those for shore anglers counted during the roving creel survey.

3. The number of anglers interviewed during any day is proportional to the effort on that day.

4. No significant fishing effort occurs during the hours not surveyed.

Gear Type

The percent of coho salmon and chinook salmon anglers using bait, lures, or bait and lures, and their respective harvest and catch rates, were calculated. A lure is defined as a artificial lure which is man-made and does not include salmon eggs or other chemically treated or processed foods.

Escapement

A weir was constructed across the Little Susitna River at river km 52. Daily and cumulative counts of five salmon species were recorded from 24 May through 26 August as the salmon passed through the weir and over a white flash panel. The salmon were counted during daylight hours when visibility was sufficient to identify the fish to species. The total estimated escapement of chinook and coho salmon through the weir is the number counted through the weir less the estimated sport harvest upstream of the weir. The harvest upstream of the weir was estimated by sorting the interview files for anglers who fished upstream of the weir and applying the analysis for direct expansion creel surveys to this group.

Coho salmon spawning in index areas of selected Matanuska-Susitna Valley streams were counted either on foot or by canoe during peak spawning periods. Peak periods were identified through periodic inspections of spawning activity in streams which are easily monitored. Surveyors wore Polaroid glasses while taking surveys. Live and dead fish were counted separately and recorded in field notebooks.

Age, Sex, and Length Compositions

Chinook salmon and coho salmon were randomly sampled for age, sex, and length information from the escapement passed at the weir and the harvest exiting at Burma Road during the creel survey. Three scales were collected from each

fish and mounted on adhesive-coated cards (Clutter and Whitesel 1956). Impressions of scales were thermohydraulically made in cellulose acetate and the impressions were examined using a microfiche reader. Age was recorded using the European method (Koo 1962) where the numeral preceding the decimal is the number of freshwater annuli and the numeral following the decimal is the number of marine annuli. Total age from brood is the sum of the two numerals plus one. The mid-eye to fork-of-tail length of sampled fish was also recorded to the nearest 0.5 centimeter for each sampled fish. Sex was recorded for each sampled fish based on external characteristics.

The proportional age composition of the sampled portions of the escapement and sport harvest were estimated. Letting p_h equal the estimated proportion of age group h in the sample, the variance of p_h was estimated (Scheaffer et al. 1979)

$$\hat{V}(p_h) = \hat{p}_h(1-\hat{p}_h)/(n_T-1) \quad [25]$$

where n_T is the total number of legible scales collected from coho salmon.

Mean length-at-age by sex and its variance were estimated using standard normal procedures. Differences in age and length compositions between the sport harvests at Burma Road and Miller's Landing and between the sport harvest and the escapement at the weir were tested for significance at $\alpha = 0.05$ using chi-square tests.

Hatchery Contributions

Adult coho salmon were expected to return to the Little Susitna River in 1989 from smolt stocked during 1988 and fingerling stocked during 1986. A portion of the coho salmon harvested by the sport fishery were examined for a missing adipose fin at the two survey locations: Burma Road and Miller's Landing. In addition, a portion of the coho salmon passed through the weir were examined for a missing adipose fin. Coho salmon having a missing adipose fin were assumed to contain a coded-wire tag (CWT) implanted at a hatchery. The heads of fish having a missing adipose fin were bagged, labeled, frozen, and transferred to the Fisheries Rehabilitation, Enhancement, and Development (FRED) Division CWT lab for CWT removal and decoding.

The contributions to the harvest of coho salmon from hatchery stockings were calculated using the procedures of Clark and Bernard (1987). The numbers of unmarked fish and fish having a missing adipose fin collected at each creel survey location were compared with chi-square statistics to determine if the proportions of marked coho salmon observed at the survey locations were equal. Based on these tests, there were significant differences ($\alpha = 0.05$) in the proportions of finclipped coho salmon observed at the survey locations and so the contribution at each survey location was estimated separately.

The numbers of unmarked fish and fish having a missing adipose fin collected from the sport harvest at Burma Road were stratified by week and compared with a chi-square statistic to determine if the proportions of marked coho salmon observed by weekly strata were equal. Based on these tests, there were no significant differences ($\alpha = 0.05$) in the proportions of finclipped coho

salmon observed between weeks 1 through 3 and between weeks 4 through 8. These weeks were pooled into two groups and the contribution of weeks 1-3 and 4-8 were estimated separately and combined for a total estimate.

The estimated contribution of a release, $(\hat{C}_r)$, was:

$$\hat{C}_r = (m_1/m_2)\ (a_1/a_2)\ (\hat{C}_T/n_2)\ (m_c/R) \qquad [26]$$

where:

$\hat{C}_T$ = total estimated harvest of coho salmon by the fishery,

n_2 = number of coho salmon examined from the harvest,

a_1 = number of coho salmon with an adipose finclip that were observed in the harvest,

a_2 = number of heads from coho salmon with an adipose finclip collected from the harvest and sent to the tag lab,

m_1 = number of CWTs that are detected in the heads at the tag lab,

m_2 = number of CWTs decoded at the tag lab,

m_c = number of CWTs having a unique code, and

R = the proportion of the total number of coho salmon smolt released that were tagged with CWT and received an adipose finclip.

The variance of $\hat{C}_r$ was calculated as the variance of a product divided by a constant.

$$V(\hat{C}_r) = [\hat{C}_T^2\ V(\hat{m}_c) + \hat{m}_c^2\ V(\hat{C}_T) - V(\hat{m}_c)\ V(\hat{C}_T)]\ [(m_1a_1)/(m_2a_2n_2R)]^2 \qquad [27]$$

and the variance of $\hat{m}_c$ (Clark and Bernard 1987) was calculated as follows:

$$V[m_c] = \left[\frac{m_2\,[m_2-1]\,a_2\,[a_2-1]\,n_2\,[n_2-1]\,\hat{C}\,[\hat{C}-1]R^2}{m_1\,[m_1-1]\,a_1\,[a_1-1]\,\hat{C}_T\,[\hat{C}_T-1]} \right] + \left[\frac{m_2\,a_2\,n_2\,\hat{C}\,R}{m_1\,a_1\,\hat{C}_T} \right] - \left[\frac{(m_2\,a_2\,n_2\,\hat{C}\,R)^2}{(m_1\,a_1\,\hat{C}_T)^2} \right] . \quad [28]$$

The estimated hatchery contribution of coho salmon in the escapement past the weir (N_h) was calculated as follows:

$$\hat{N}_h = ([a_1/n_2]/R)\,(N_p) \quad [29]$$

where:

a_1 = the number of marked coho salmon passed through the weir,

n_2 = the number of coho salmon passed through the weir which were examined for a clipped adipose fin,

R = the ratio of marked to unmarked smolt released, and

N_p = the number of coho salmon passed through the weir.

The numbers of unmarked fish and fish having a missing adipose fin collected at the weir were stratified by week and compared with a chi-square statistic to determine if the proportions of marked coho salmon observed by weekly strata were equal. Based on these tests, there were no significant differences ($\alpha = 0.05$) in the proportions of finclipped coho salmon observed between weeks 3 and 4 and between weeks 5 and 6. These weeks were pooled into two groups and the contribution of weeks 3-4, 5-6, and 7 were estimated separately. Weeks 1 and 2 did not contribute to the estimate.

RESULTS

Creel Estimates

Coho salmon:

Burma Road. The direct expansion creel survey for coho salmon harvested by boat anglers exiting at the Burma Road access site was conducted from 15 July through 4 September. The number of boat anglers exiting the fishery at Burma Road during a surveyed period ranged from 0 to 126 (Appendix A1). The busiest parts of the day with respect to the number of anglers departing the fishery were periods B and C. Estimated angler effort during the survey for boat anglers exiting the fishery at Burma Road was 46,067 angler-hours of which 50%

(23,056 angler-hours) occurred during the weekend/holiday component and 50% (23,011 angler-hours) during the weekday component (Table 1).

Daily harvest rates of coho salmon for boat anglers exiting the fishery at Burma Road ranged from 0.044 to 0.727 fish per hour (Appendix A2). The weekday component from 28 August to 1 September had the highest coho salmon harvest rate, 0.571 fish per hour for boat anglers (Table 2). Catch rates of coho salmon peaked from 28 August to 1 September for boat anglers, also (Table 2).

The estimated harvest of coho salmon by boat anglers exiting the fishery at Burma Road was 11,615 fish; 4,609 coho salmon (40%) were harvested during the weekend/holiday component and 7,006 coho salmon (60%) were harvested during the weekday component (Table 3). An estimated 623 of the 11,615 coho salmon harvested by boat anglers exiting the sport fishery through the Burma Road were harvested upstream of the weir. Boat anglers exiting the sport fishery in the Little Susitna River at Burma Road released about 10% of the coho salmon they had caught (Table 3).

Shore Anglers Near Burma Road. The roving creel survey of the shore anglers near Burma Road was conducted from 15 July to 4 September. Counts of shore anglers in the area near Burma Road ranged from 0 to 84 (Appendix A3). Estimated angler effort during the survey was 20,559 angler-hours; 8,116 angler-hours (40%) during the weekend/holiday component and 12,443 angler-hours (60%) during the weekday component (Table 4). About 50% of the total effort occurred from 5 August to 18 August (Table 4).

Daily harvest rates of coho salmon for shore anglers exiting the fishery at Burma Road ranged from 0.000 to 0.385 fish per hour (Appendix A4). Catch and harvest rates of coho salmon peaked during the 12 August to 13 August period (Table 5).

The estimated harvest of coho salmon by shore anglers fishing near the Burma Road access site was 2,135 fish; 889 coho salmon (42%) were harvested during the weekend/holiday component and 1,246 coho salmon (58%) were harvested during the weekday component (Table 6). Shore anglers released about 7% of the coho salmon they had caught.

Miller's Landing. The direct expansion creel survey at Miller's Landing was conducted from 5 August to 4 September. The number of anglers exiting the fishery in the Little Susitna River at Miller's Landing during a surveyed period ranged from 0 to 17 (Appendix A5). Most anglers exited the fishery during period B. Estimated angler effort during the survey was 1,892 angler-hours; 938 angler-hours (50%) during the weekend/holiday component and 954 angler-hours (50%) during the weekday component (Table 7).

Daily harvest rates of coho salmon for anglers exiting the fishery at Miller's Landing ranged from 0.000 to 0.561 fish per hour (Appendix A6). The weekend/holiday component from 2 September to 4 September had the highest coho salmon harvest rate, 0.368 fish per hour (Table 8). Catch rates of coho salmon peaked during the 18 August to 19 August weekend period (Table 8).

Table 1. Estimated effort by boat anglers exiting the coho salmon sport fishery in the Little Susitna River at the Burma Road access site, 1989.

Component[a]		Effort in angler-hours	Standard Error	Relative Precision[b]
WE	7/15-7/16	1,082.7	504.9	91.4%
WD	7/17-7/21	1,674.2	493.4	57.8%
WE	7/22-7/23	2,424.3	339.9	27.5%
WD	7/24-7/28	3,648.1	696.0	37.4%
WE	7/29-7/30	4,231.3	322.7	14.9%
WD	7/31-8/04	7,880.8	1,557.6	38.7%
WE	8/05-8/06	7,071.5	171.8	4.8%
WD	8/07-8/11	4,791.7	1,252.5	51.2%
WE	8/12-8/13	5,078.8	610.8	23.6%
WD	8/14-8/18	4,243.9	841.3	38.9%
WE	8/19-8/20	2,858.2	298.7	20.5%
WD	8/21-8/25	708.3	380.1	105.2%
WE	8/26-8/27	146.0	9.9	13.3%
WD	8/28-9/01	64.2	23.2	70.8%
WE	9/02-9/04	163.0	85.3	102.6%
WE	Total	23,055.8	986.8	8.4%
WD	Total	23,011.2	2,361.3	20.1%
Grand Total		46,067.0	2,559.2	10.9%

[a] WD = weekday; WE = weekend/holiday.

[b] Relative precision of 95% confidence interval.

Table 2. Estimated rates of harvest and catch (fish per hour) of coho salmon by boat anglers exiting the sport fishery at the Burma Road access site, 1989.

Component[a]		Number of Interviews	Harvest Rate	Standard Error	Catch Rate	Standard Error
WE	7/15-7/16	69	0.0523	0.0169	0.0523	0.0169
WD	7/17-7/21	74	0.0676	0.0154	0.0657	0.0154
WE	7/22-7/23	172	0.0544	0.0090	0.0544	0.0090
WD	7/24-7/28	150	0.3934	0.0543	0.3361	0.0621
WE	7/29-7/30	258	0.2788	0.0162	0.2921	0.0172
WD	7/31-8/04	344	0.2275	0.0494	0.2444	0.0634
WE	8/05-8/06	474	0.1108	0.0079	0.1137	0.0081
WD	8/07-8/11	232	0.4042	0.0522	0.4613	0.0849
WE	8/12-8/13	348	0.3335	0.0164	0.3859	0.0194
WD	8/14-8/18	226	0.4501	0.0296	0.4907	0.0265
WE	8/19-8/20	217	0.2535	0.0179	0.3086	0.0265
WD	8/21-8/25	58	0.2588	0.0962	0.2776	0.0969
WE	8/26-8/27	27	0.3151	0.0835	0.3836	0.1122
WD	8/28-9/01	10	0.5714	0.1863	2.0779	0.7651
WE	9/02-9/04	23	0.1472	0.0641	0.1718	0.0781
WE	Total	1,588	0.2017	0.0112	0.2241	0.0135
WD	Total	1,094	0.3074	0.0271	0.3443	0.0566
Grand Total		2,682	0.2416	0.0153	0.2695	0.0297

[a] WD = weekday; WE = weekend/holiday.

Table 3. Estimated harvest and catch of coho salmon by boat anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1989.

Component[a]		Harvest	Standard Error	Rel. Pre.[b]	Catch	Standard Error	Rel. Pre.[b]
WE	7/15-7/16	55	20.7	73.8%	55	20.7	73.8%
WD	7/17-7/21	110	57.1	101.7%	110	57.1	101.7%
WE	7/22-7/23	132	31.9	47.4%	132	31.9	47.4%
WD	7/24-7/28	1,092	324.5	58.2%	1,211	378.4	61.2%
WE	7/29-7/30	1,172	58.2	9.7%	1,226	67.4	10.8%
WD	7/31-8/04	1,769	255.1	28.3%	1,901	275.3	28.4%
WE	8/05-8/06	775	102.0	25.8%	796	114.2	28.1%
WD	8/07-8/11	1,918	235.0	24.0%	2,182	208.6	18.7%
WE	8/12-8/13	1,683	318.8	37.1%	1,946	433.0	43.6%
WD	8/14-8/18	1,896	292.4	30.2%	2,071	282.6	26.7%
WE	8/19-8/20	722	73.7	20.0%	870	76.9	17.3%
WD	8/21-8/25	184	61.0	65.0%	197	63.0	62.7%
WE	8/26-8/27	46	15.6	66.5%	56	22.6	79.1%
WD	8/28-9/01	37	12.2	64.6%	133	45.1	66.5%
WE	9/02-9/04	24	12.0	98.0%	28	14.0	98.0%
WE	Total	4,609	350.3	14.9%	5,109	461.7	17.7%
WD	Total	7,006	564.1	15.8%	7,805	593.0	14.9%
GRAND TOTAL		11,615	664.0	11.2%	12,914	751.5	11.4%

[a] WD = weekday; WE = weekend/holiday.

[b] Relative precision of 95% confidence interval.

Table 4. Estimated effort by shore anglers near the Burma Road access site for the sport fishery in the Little Susitna River, 1989.

Component[a]		Effort in angler-hours	Standard Error	Relative Precision[b]
WE	7/15-7/16	171.0	33.7	38.7%
WD	7/17-7/21	596.0	114.3	37.6%
WE	7/22-7/23	395.0	93.0	46.1%
WD	7/24-7/28	1,538.0	365.9	46.6%
WE	7/29-7/30	1,611.0	116.2	14.1%
WD	7/31-8/04	3,351.0	423.5	24.8%
WE	8/05-8/06	2,352.0	143.6	12.0%
WD	8/07-8/11	2,907.0	382.4	25.8%
WE	8/12-8/13	1,968.0	185.8	18.5%
WD	8/14-8/18	3,031.0	324.0	21.0%
WE	8/19-8/20	1,451.0	231.4	31.3%
WD	8/21-8/25	960.0	313.3	64.0%
WE	8/26-8/27	84.0	35.0	81.6%
WD	8/28-9/01	60.0	41.0	133.9%
WE	9/02-9/04	84.0	44.1	102.9%
WE	Total	8,116.0	367.6	8.9%
WD	Total	12,443.0	823.0	13.0%
Grand Total		20,559.0	901.4	8.6%

[a] WD = weekday; WE = weekend/holiday.

[b] Relative precision of 95% confidence interval.

Table 5. Estimated rates of harvest and catch (fish per hour) of coho salmon by interviewed shore anglers sport fishing near the Little Susitna River Burma Road access site, 1989.

Component[a]		Number of Interviews	Harvest Rate[b]	Standard Error	Catch Rate[b]	Standard Error
WE	7/15-7/16	11	0.0690	0.0931	0.0690	0.0931
WD	7/17-7/21	34	0.0258	0.0111	0.0258	0.0111
WE	7/22-7/23	37	0.0000	0.0000	0.0000	0.0000
WD	7/24-7/28	51	0.0290	0.0338	0.0435	0.0348
WE	7/29-7/30	105	0.1130	0.0202	0.1186	0.0211
WD	7/31-8/04	80	0.1294	0.0800	0.1294	0.0800
WE	8/05-8/06	79	0.0495	0.0202	0.0495	0.0202
WD	8/07-8/11	82	0.1044	0.0227	0.1205	0.0314
WE	8/12-8/13	56	0.2130	0.0353	0.2261	0.0378
WD	8/14-8/18	77	0.1064	0.0308	0.1277	0.0412
WE	8/19-8/20	69	0.1092	0.0309	0.1092	0.0309
WD	8/21-8/25	37	0.1319	0.0867	0.1319	0.0867
WE	8/26-8/27	32	0.0225	0.0229	0.0225	0.0229
WD	8/28-9/01	7	0.0000	0.0000	0.0000	0.0000
WE	9/02-9/04	25	0.0000	0.0000	0.0000	0.0000

[a] WD = weekday; WE = weekend/holiday.

[b] Harvest and catch rates of interviewed shore anglers.

Table 6. Estimated harvest and catch of coho salmon by shore anglers fishing near the Burma Road access site in the Little Susitna River, 1989.

Component[a]		Harvest	Standard Error	Rel. Pre.[b]	Catch	Standard Error	Rel. Pre.[b]
WE	7/15-7/16	12	15.8	257.7%	12	15.8	257.7%
WD	7/17-7/21	15	7.1	93.3%	15	7.1	93.3%
WE	7/22-7/23	0			0		
WD	7/24-7/28	45	51.6	224.9%	67	54.3	158.9%
WE	7/29-7/30	182	35.0	37.7%	191	36.6	37.5%
WD	7/31-8/04	434	271.4	122.6%	434	271.4	122.6%
WE	8/05-8/06	116	47.9	81.0%	116	47.9	81.0%
WD	8/07-8/11	303	76.6	49.6%	350	101.5	56.8%
WE	8/12-8/13	419	79.8	37.3%	445	85.1	37.5%
WD	8/14-8/18	322	98.9	60.2%	387	130.9	66.3%
WE	8/19-8/20	158	50.9	63.2%	158	50.9	63.2%
WD	8/21-8/25	127	88.9	137.2%	127	88.9	137.2%
WE	8/26-8/27	2	1.9	187.9%	2	1.9	187.9%
WD	8/28-9/01	0			0		
WE	9/02-9/04	0			0		
WE	Total	889	112.8	24.9%	924	117.1	24.8%
WD	Total	1,246	316.1	49.7%	1,380	334.7	47.5%
GRAND TOTAL		2,135	335.6	30.8%	2,304	334.6	30.2%

[a] WD = weekday; WE = weekend/holiday.

[b] Relative precision of 95% confidence interval.

Table 7. Estimated effort by anglers exiting the coho salmon sport fishery in the Little Susitna River at the Miller's Landing access site, 1989[a].

Component[b]		Effort in angler-hours	Standard Error	Relative Precision[c]
WE	7/30-7/31	304.0	31.3	20.2%
WE	8/05-8/06	202.3	37.6	36.4%
WD	8/07-8/11	277.8	72.9	51.4%
WE	8/12-8/13	180.4	31.1	33.8%
WD	8/14-8/18	304.1	138.1	89.0%
WE	8/19-8/20	342.4	42.8	24.5%
WD	8/21-8/25	342.9	39.0	22.3%
WE	8/26-8/27	130.3	13.4	20.2%
WD	8/28-9/01	29.3	23.6	157.9%
WE	9/02-9/04	82.9	29.6	70.0%
WE	Total	938.3	72.6	15.2%
WD	Total	954.1	162.7	33.4%
GRAND TOTAL		1,892.4	403.9	18.4%

[a] Includes Miller's Reach from 8/26-9/04.

[b] WD = weekday; WE = weekend/holiday.

[c] Relative precision of 95% confidence interval.

Table 8. Estimated rates of harvest and catch (fish per hour) of coho salmon by anglers exiting the sport fishery in the Little Susitna River at the Miller's Landing access site, 1989[a].

Component[b]		Number of Interviews	Harvest Rate	Standard Error	Catch Rate	Standard Error
WE	8/05-8/06	30	0.0339	0.0155	0.0339	0.0155
WD	8/07-8/11	25	0.0411	0.0240	0.0411	0.0240
WE	8/12-8/13	31	0.3101	0.0650	0.3101	0.0650
WD	8/14-8/18	29	0.2526	0.0761	0.2526	0.0761
WE	8/19-8/20	33	0.2365	0.0308	0.4189	0.0754
WD	8/21-8/25	32	0.2586	0.0673	0.3707	0.1061
WE	8/26-8/27	17	0.2059	0.0400	0.2353	0.0526
WD	8/28-9/01	4	0.1951	0.0660	0.1951	0.0660
WE	9/02-9/04	13	0.3676	0.1388	0.4108	0.1581

[a] Includes Miller's Reach from 8/26-9/04.

[b] WD = weekday; WE = weekend/holiday.

The estimated harvest of coho salmon by anglers exiting the fishery at Miller's Landing was 400 fish; 224 coho salmon (56%) were harvested during the weekend/holiday component and 176 coho salmon (44%) were harvested during the weekday component (Table 9). Anglers exiting the sport fishery in the Little Susitna River at Miller's Landing released about 19% of the coho salmon caught.

Angler interviews from Miller's Reach, which were collected from 26 August through 4 September, were not recorded separately from those at Miller's Landing. Thus it was not possible to produce a separate estimate for each of the two sites. The interviews from the two access sites were combined and treated as if they were collected at one site. This treatment ignores the fact that two access sites were being sampled, and the estimates of effort and harvest for the 26 August through 4 September strata at Miller's Landing and Reach are therefore underestimates. However, few anglers were exiting at either Miller's Landing or Miller's Reach at that time, and the estimated harvest for 26 August through 4 September is only 60 fish (Table 9). We do not believe that the underestimate of harvest during this time significantly affected our estimate of the total coho salmon harvest from the Little Susitna River.

Summary. When the estimates from all creel surveys were totaled, there were an estimated 68,518 angler-hours of effort by the sport fishery in the Little Susitna River during the creel survey period; 14,150 coho salmon were harvested from a total of 15,714 caught (Table 10). Boat anglers exiting the fishery through the Burma Road access site were responsible for the majority of the angler effort (67%), coho salmon harvest (82%), and coho salmon catch (82%). Shore anglers fishing near Burma Road were the next largest component of the fishery. These shore anglers were responsible for 30% of the angler effort, 15% of the coho salmon harvest, and 15% of the coho salmon catch. Anglers exiting the fishery at the Miller's Landing access site had 3% of the effort, harvest and catch. For the entire fishery, 10% of the coho salmon caught by anglers (1,564 fish) were released.

Angler effort and harvest and catch of coho salmon by unguided boat anglers and guided boat anglers exiting at the Burma Road access site were estimated. Nearly all guided anglers participating in the sport fishery in the Little Susitna River use this site; most anglers using commercial services at Miller's Landing are only transported to fishing areas and are not guided in the fishing effort. Guided boat anglers exiting the fishery at Burma Road expended 4,064 (9%) of the angler-hours of effort from Burma Road boat anglers (Table 11). Guided anglers harvested 11% of the coho salmon harvested by boat anglers and 12% of the coho salmon caught by boat anglers exiting the fishery at Burma Road.

Chinook Salmon:

Burma Road Boat Anglers. The direct expansion creel survey for chinook salmon boat anglers at the Burma Road access site was conducted from 27 May through 9 July 1989. The number of boat anglers exiting the fishery in the Little Susitna River at Burma Road during a surveyed period ranged from 0 to 65 (Appendix A7). The busiest parts of the day with respect to the number of

Table 9. Estimated harvest and catch of coho salmon by anglers exiting the sport fishery in the Little Susitna River at the Miller's Landing access site, 1989[a].

Component[b]		Harvest	Standard Error	Rel. Pre.[c]	Catch	Standard Error	Rel. Pre.[c]
WE	8/05-8/06	7	1.6	44.8%	7	1.6	44.8%
WD	8/07-8/11	12	4.6	75.1%	12	4.6	75.1%
WE	8/12-8/13	91	39.6	85.3%	91	39.6	85.3%
WD	8/14-8/18	72	30.9	84.1%	72	30.9	84.1%
WE	8/19-8/20	72	5.4	14.7%	124	15.8	25.0%
WD	8/21-8/25	86	20.7	47.2%	123	32.2	51.3%
WE	8/26-8/27	24	15.5	126.6%	27	17.7	128.5%
WD	8/28-9/01	6	4.6	150.3%	6	4.6	150.3%
WE	9/02-9/04	30	14.3	93.4%	34	15.9	91.7%
WE	Total	224	45.2	39.6%	283	48.9	33.8%
WD	Total	176	37.8	42.0%	213	45.1	41.5%
GRAND TOTAL		400	58.9	28.9%	496	66.5	26.3%

[a] Includes Miller's Reach from 8/26-9/04.

[b] WD = weekday; WE = weekend/holiday.

[c] Relative precision of 95% confidence interval.

Table 10. Summary of estimated angler-effort (angler-hours), coho salmon harvest, and coho salmon catch for the creel surveys of the sport fishery in the Little Susitna River, 1989.

Location	Effort in Angler-Hours	Relative Precision[a]	Harvest	Relative Precision[a]	Catch	Relative Precision[a]
Burma Road Boat Anglers	46,067	10.9%	11,615	11.2%	12,914	9.0%
Shore Anglers near Burma Road	20,559	8.4%	2,135	14.4%	2,304	15.4%
Miller's Landing	1,892	18.4%	400	28.9%	496	26.3%
Total	68,518	7.8%	14,150	10.3%	15,714	10.4%

[a] Relative precision of 95% confidence interval.

Table 11. Estimated effort (angler-hours), coho salmon harvest, and coho salmon catch by unguided and guided boat anglers exiting the sport fishery in the Little Susitna River at Burma Road, 1989.

Group	Effort	Standard Error	Harvest	Standard Error	Catch	Standard Error
BOAT ANGLERS						
Unguided	42,003	2,455.9	10,318	625.5	11,310	695.0
Guided	4,064	496.4	1,298	178.4	1,603	259.0
TOTAL	46,067	2,559.2	11,616	664.0	12,913	751.5

anglers departing the fishery were periods B and C. Estimated boat angler effort was 45,631 angler-hours of which 24,318 angler-hours (53%) occurred during the weekend/holiday component and 21,313 angler-hours (47%) during the weekday component (Table 12).

Daily harvest rates of chinook salmon for boat anglers exiting the fishery at Burma Road ranged from 0.000 to 0.125 fish per hour (Appendix A8). The weekday component from 12 June to 16 June had the highest chinook salmon harvest rate, 0.0608 fish per hour (Table 13). Catch rates of chinook salmon peaked from 10 June to 16 June (Table 13).

The estimated harvest of chinook salmon by boat anglers exiting the fishery at Burma Road was 1,825 fish of which 42% (773) were harvested during the weekend/holiday component and 57% (1,052) were harvested during the weekday component (Table 14). An estimated 286 of the 1,825 chinook salmon were harvested upstream of the weir. Boat anglers exiting the sport fishery in the Little Susitna River at Burma Road released about 19% of the chinook salmon they had caught (Table 14).

Angler effort and harvest and catch of chinook salmon by unguided boat anglers and guided boat anglers exiting the Burma Road access site were estimated. Guided boat anglers exiting the fishery at Burma Road expended 4,087 (9%) of the angler-hours of effort from interviewed Burma Road anglers (Table 15). Guided anglers harvested 21% of the chinook salmon harvested by boat anglers and 20% of the chinook salmon caught by boat anglers exiting the fishery at Burma Road.

Shore Anglers Near Burma Road. The roving creel survey of the shore anglers near Burma Road was conducted from 27 May to 9 July. Counts of shore anglers in the area near Burma Road ranged from 0 to 125 (Appendix A9). Estimated angler effort during the survey was 18,781 angler-hours; 9,595 angler-hours (51%) during the weekend/holiday component and 9,186 angler-hours (49%) during the weekday component (Table 16). About 91% of the total effort occurred from 27 May through 23 June (Table 16).

Daily harvest rates of chinook salmon for shore anglers exiting the fishery at Burma Road ranged from 0.000 to 0.084 fish per hour (Appendix A10). The weekday component from 30 May to 2 June had the highest chinook salmon harvest rate, 0.041 fish per hour (Table 17). Catch rates of chinook salmon peaked during the final weekend of the survey (Table 17).

The estimated harvest of chinook salmon by shore anglers fishing near the Burma Road access site was 440 fish; 255 chinook salmon (58%) were harvested during the weekend/holiday component and 185 chinook salmon (42%) were harvested during the weekday component (Table 18). Shore anglers released about 15% of the chinook salmon they had caught.

Gear Type

Sixty-nine percent of the interviewed boat anglers who fished for coho salmon and exited the sport fishery through Burma Road during 1989 used bait (salmon eggs); 10% used lures and 21% used both bait and lures. Eighty-two percent of

Table 12. Estimated effort by chinook salmon boat anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1989.

Component[a]		Effort in angler-hours	Standard Error	Relative Precision[b]
WE	5/27-5/29	6,191.2	1,473.1	46.6%
WD	5/30-6/02	2,543.0	770.4	59.4%
WE	6/03-6/04	3,780.3	683.3	35.4%
WD	6/05-6/09	5,164.3	867.4	32.9%
WE	6/10-6/11	5,111.3	621.2	23.8%
WD	6/12-6/16	4,838.6	718.7	29.1%
WE	6/17-6/18	4,315.1	707.8	32.1%
WD	6/19-6/23	4,574.2	418.6	17.9%
WE	6/24-6/25	3,124.0	691.6	43.4%
WD	6/26-6/30	3,456.4	668.9	37.9%
WE	7/01-7/04	1,678.1	513.5	60.0%
WD	7/03-7/07	736.7	442.9	117.8%
WE	7/08-7/09	118.0	79.5	132.1%
WE	Total	24,318.0	2,066.9	16.7%
WD	Total	21,313.2	1,637.4	15.1%
Grand	Total	45,631.2	2,636.9	11.3%

[a] WD = weekday; WE = weekend/holiday.

[b] Relative precision of 95% confidence interval.

Table 13. Estimated rates of harvest and catch (fish per hour) of chinook salmon by boat anglers exiting the Little Susitna River sport fishery at the Burma Road access site, 1989.

Component[a]		Number of Interviews	Harvest Rate	Standard Error	Catch Rate	Standard Error
WE	527-529	291	0.0176	0.0032	0.0176	0.0032
WD	530-602	70	0.0540	0.0093	0.0680	0.0121
WE	603-604	165	0.0410	0.0053	0.0434	0.0057
WD	605-609	164	0.0469	0.0075	0.0526	0.0086
WE	610-611	212	0.0456	0.0049	0.0876	0.0142
WD	612-616	167	0.0608	0.0093	0.0709	0.0113
WE	617-618	214	0.0254	0.0046	0.0260	0.0046
WD	619-623	149	0.0601	0.0131	0.0718	0.0183
WE	624-625	160	0.0335	0.0057	0.0383	0.0069
WD	626-630	108	0.0256	0.0063	0.0298	0.0062
WE/H	701-704	81	0.0366	0.0130	0.0419	0.0144
WD	703-707	51	0.0268	0.0149	0.0268	0.0149
WE	708-709	8	0.0250	0.0254	0.0250	0.0254

[a] WD = weekday; WE = weekend/holiday.

Table 14. Estimated harvest and catch of chinook salmon by boat anglers exiting the Little Susitna River sport fishery at the Burma Road access site, 1989.

Component[a]		Harvest	Standard Error	Rel. Pre.[b]	Catch	Standard Error	Rel. Pre.[b]
WE	5/27-5/29	108	29.6	53.7%	108	29.6	53.7%
WD	5/30-6/02	136	49.3	71.0%	171	41.5	47.6%
WE	6/03-6/04	154	5.9	7.5%	163	2.1	2.5%
WD	6/05-6/09	240	47.6	38.9%	269	50.1	36.5%
WE	6/10-6/11	232	38.5	32.5%	448	117.5	51.4%
WD	6/12-6/16	293	76.3	51.0%	340	87.8	50.6%
WE	6/17-6/18	108	25.8	46.8%	111	27.3	48.2%
WD	6/19-6/23	274	49.6	35.5%	328	66.9	40.0%
WE	6/24-6/25	105	30.3	56.6%	120	42.3	69.1%
WD	6/26-6/30	89	18.3	40.3%	104	26.4	49.8%
WE	7/01-7/04	63	0.0	0.0%	73	5.6	15.0%
WD	7/03-7/07	20	14.3	140.1%	20	14.3	140.1%
WE	7/08-7/09	3	2.1	137.2%	3	2.1	137.2%
WE	Total	773	63.1	16.0%	1,026	131.4	25.1%
WD	Total	1,052	116.3	21.7%	1,232	131.6	20.9%
GRAND TOTAL		1,825	132.3	14.2%	2,258	185.9	16.1%

[a] WD = weekday; WE = weekend/holiday.

[b] Relative precision of 95% confidence interval.

Table 15. Estimated effort (angler-hours), chinook salmon harvest and chinook salmon catch by unguided and guided boat anglers exiting the Little Susitna River sport fishery at the Burma Road access site, 1989.

Group	Effort	Standard Error	Harvest	Standard Error	Catch	Standard Error
BOAT ANGLERS						
Unguided	41,544	2,581.5	1,444	119.1	1,797	169.5
Guided	4,087	537.7	381	57.6	461	76.3
TOTAL	45,631	2,636.9	1,825	132.3	2,258	185.9

Table 16. Estimated effort by shore anglers sport fishing for chinook salmon in the Little Susitna River near the Burma Road access site, 1989.

Component[a]	Effort in angler-hours	Standard Error	Relative Precision[b]
WE/H 527-529	1,691	247.9	28.7%
WD 530-602	2,443	432.8	34.7%
WE 603-604	2,533	322.9	25.0%
WD 605-609	1,040	497.4	93.7%
WE 610-611	3,056	382.5	24.5%
WD 612-616	3,289	509.3	30.3%
WE 617-618	1,483	128.1	16.9%
WD 619-623	1,627	431.9	52.0%
WE 624-625	459	64.2	27.4%
WD 626-630	631	57.9	18.0%
WE/H 701-704	240	51.0	41.7%
WD 703-707	156	57.5	72.3%
WE 708-709	133	46.5	68.5%
WE Total	9,595	580.8	11.9%
WD Total	9,186	941.9	20.1%
Grand Total	18,781	1,106.6	11.5%

[a] WD = weekday; WE = weekend/holiday.

[b] Relative precision of 95% confidence interval.

Table 17. Estimated rates of harvest and catch (fish per hour) of chinook salmon by interviewed shore anglers sport fishing near the Little Susitna River Burma Road access site, 1989.

Component[a]		Number of Interviews	Harvest Rate[b]	Standard Error	Catch Rate[b]	Standard Error
WE/H	527-529	113	0.0243	0.0081	0.0265	0.0090
WD	530-602	44	0.0408	0.0418	0.0408	0.0418
WE	603-604	68	0.0339	0.0129	0.0339	0.0129
WD	605-609	96	0.0188	0.0080	0.0188	0.0080
WE	610-611	97	0.0343	0.0079	0.0389	0.0096
WD	612-616	115	0.0147	0.0142	0.0171	0.0167
WE	617-618	90	0.0113	0.0059	0.0113	0.0059
WD	619-623	102	0.0103	0.0040	0.0103	0.0040
WE	624-625	58	0.0040	0.0032	0.0040	0.0032
WD	626-630	46	0.0000	0.0000	0.0000	0.0000
WE/H	701-704	82	0.0000	0.0000	0.0000	0.0000
WD	703-707	16	0.0000	0.0000	0.0000	0.0000
WE	708-709	16	0.0299	0.0143	0.0448	0.0264

[a] WD = weekday; WE = weekend/holiday.

[b] Harvest and catch rates of interviewed shore anglers.

Table 18. Estimated harvest and catch of chinook salmon by shore anglers fishing in the Little Susitna River near the Burma Road access site, 1989.

Component[a]		Harvest	Standard Error	Rel. Pre.[b]	Catch	Standard Error	Rel. Pre.[b]
WE	5/27-5/29	41	14.9	71.2%	45	16.4	71.4%
WD	5/30-6/02	100	102.0	199.9%	100	102.0	199.9%
WE	6/03-6/04	86	34.2	77.9%	86	34.2	77.9%
WD	6/05-6/09	20	11.9	116.2%	20	11.9	116.2%
WE	6/10-6/11	105	27.2	50.8%	119	32.6	53.6%
WD	6/12-6/16	48	46.6	190.4%	56	55.0	192.3%
WE	6/17-6/18	17	8.8	101.2%	17	8.8	101.2%
WD	6/19-6/23	17	7.7	89.2%	17	7.7	89.2%
WE	6/24-6/25	2	1.5	144.8%	2	1.5	144.8%
WD	6/26-6/30	0			0		
WE	7/01-7/04	0			0		
WD	7/03-7/07	0			0		
WE	7/08-7/09	4	2.3	110.6%	6	3.9	127.3%
WE	Total	255	47.1	36.2%	275	50.9	24.8%
WD	Total	185	113.1	119.8%	193	116.7	47.5%
GRAND TOTAL		440	122.5	54.6%	468	127.4	30.2%

[a] WD = weekday; WE = weekend/holiday.

[b] Relative precision of 95% confidence interval.

the coho salmon harvested by interviewed anglers who exited the sport fishery through Burma Road were taken with bait; 5% with lures and 14% by anglers who used both bait and lures (Figure 2).

Thirty-three percent of the interviewed coho salmon shore anglers exiting the sport fishery through Burma Road used bait; 35% used lures and 32% used both bait and lures. Sixty percent of the coho salmon harvested by interviewed shore anglers who exited the fishery through Burma Road were taken with bait; 18% with lures and 22% by anglers who used both bait and lures (Figure 2).

Thirteen percent of the interviewed chinook salmon boat anglers who exited the sport fishery through Burma Road during 1989 used bait (salmon eggs); 12% used lures and 75% used both bait and lures. Thirteen percent of the chinook salmon harvested by interviewed boat anglers were harvested with bait; 13% with lures and 74% by anglers using both bait and lures (Figure 3).

Seven percent of the interviewed chinook salmon shore anglers exiting the sport fishery through Burma Road used bait; 35% used lures and 58% used both bait and lures. Fifteen percent of the chinook salmon harvested by interviewed shore anglers were taken with bait; 38% with lures and 46% by anglers using both bait and lures.

Escapement

From 24 May through 26 August, 4,367 chinook salmon; 6,203 sockeye salmon; 13,876 chum salmon; 15,855 coho salmon; and 57 pink salmon were passed through the weir at river km 52. (Appendix A11).

The escapement of chinook salmon through the weir adjusted for the estimated harvest of chinook salmon by sport anglers fishing upstream of the weir and exiting the fishery at Burma Road was 4,081 fish. This number does not consider unsurveyed fisheries near the town of Houston at river km 111.7. Chinook salmon are known to spawn in the 5.5 km reach of the Little Susitna River between the Burma Road access and the weir. Turbid water prevented an accurate peak count but the number of chinook salmon that spawned in this reach was estimated to be about 200 fish. Fifty percent of the chinook salmon escapement through the weir occurred before 16 June (Figure 4).

The escapement of coho salmon through the weir adjusted for the estimated harvest of coho salmon by sport anglers fishing upstream of the weir and exiting the sport fishery at Burma Road and at Miller's Landing was 14,832 fish. Fifty percent of the known coho salmon escapement through the weir occurred before 15 August (Figure 5). The weir submerged under high water on 27 August and an unknown number of coho salmon migrated past the weir on and after this date. Coho salmon are not known to spawn downstream of the weir.

An aerial count of coho salmon escapement in index areas on the Little Susitna River was not conducted during 1989 because of poor flying weather during the peak spawning period. A foot count was conducted during the peak spawning period on a heavily used spawning reach to compare this reach to previous years. The 1989 count (814 coho salmon) exceeds the mean of the previous three counts (464 coho salmon; range 220 to 946 coho salmon).

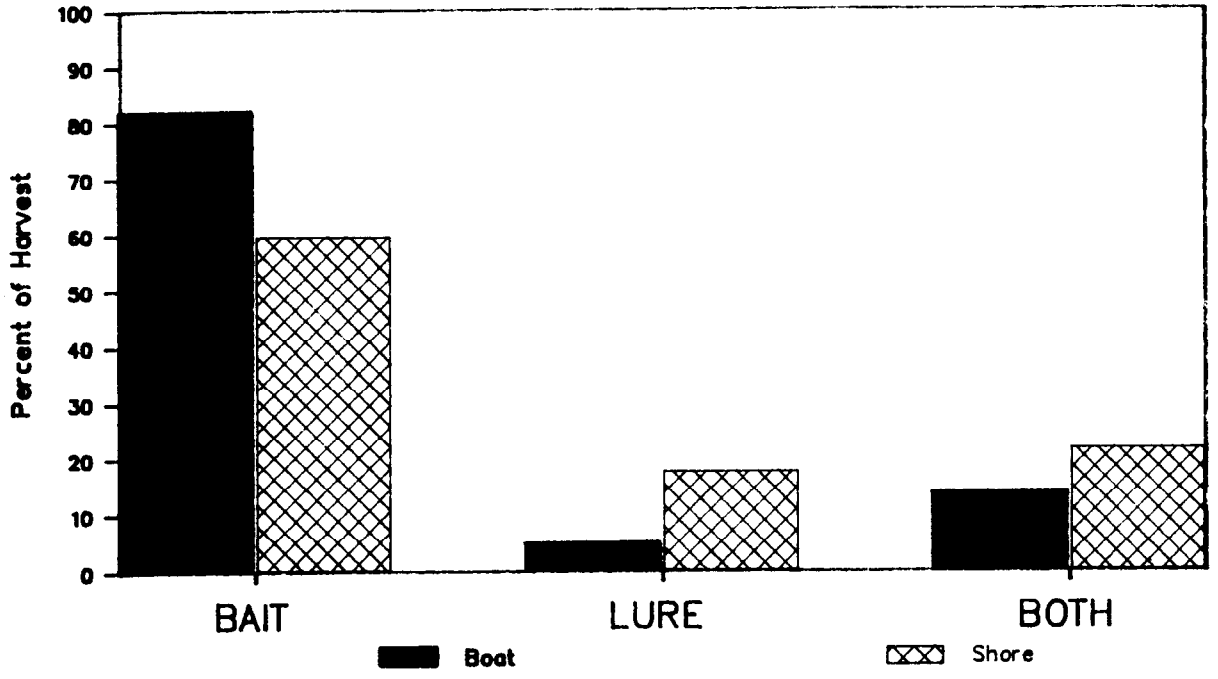

Figure 2. Percent of harvest by gear type, coho salmon, Burma Road Little Susitna River, 1989.

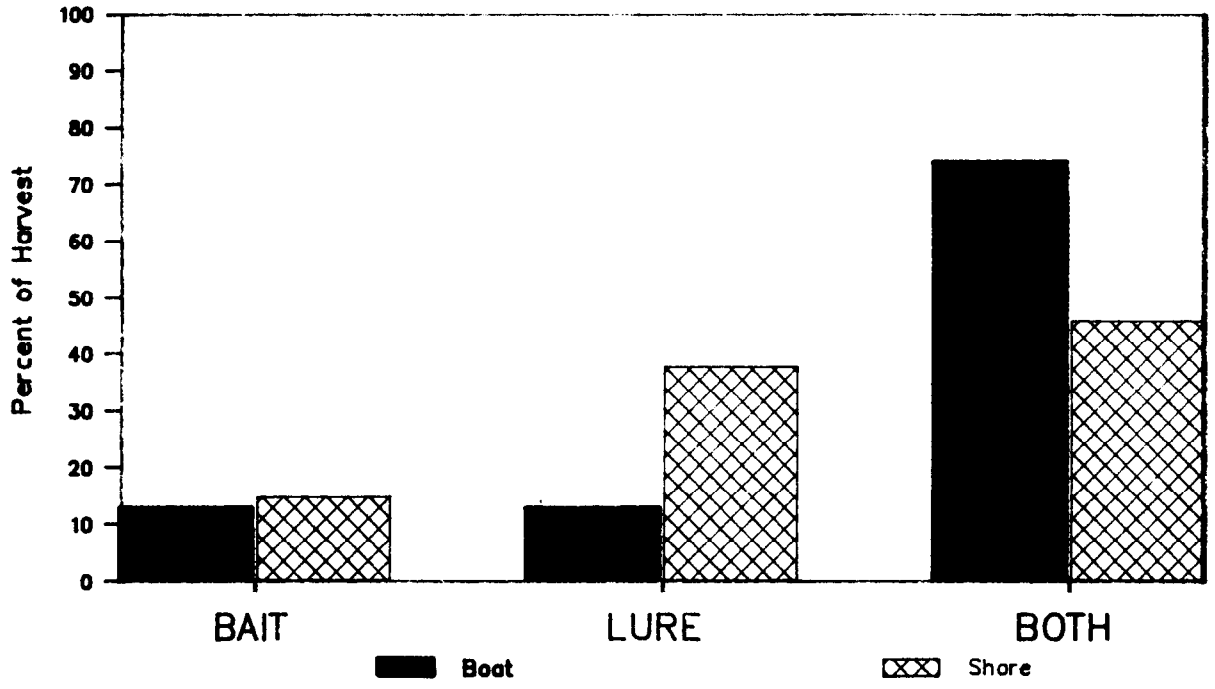

Figure 3. Percent of harvest by gear type, chinook salmon, Burma Road Little Susitna River, 1989.

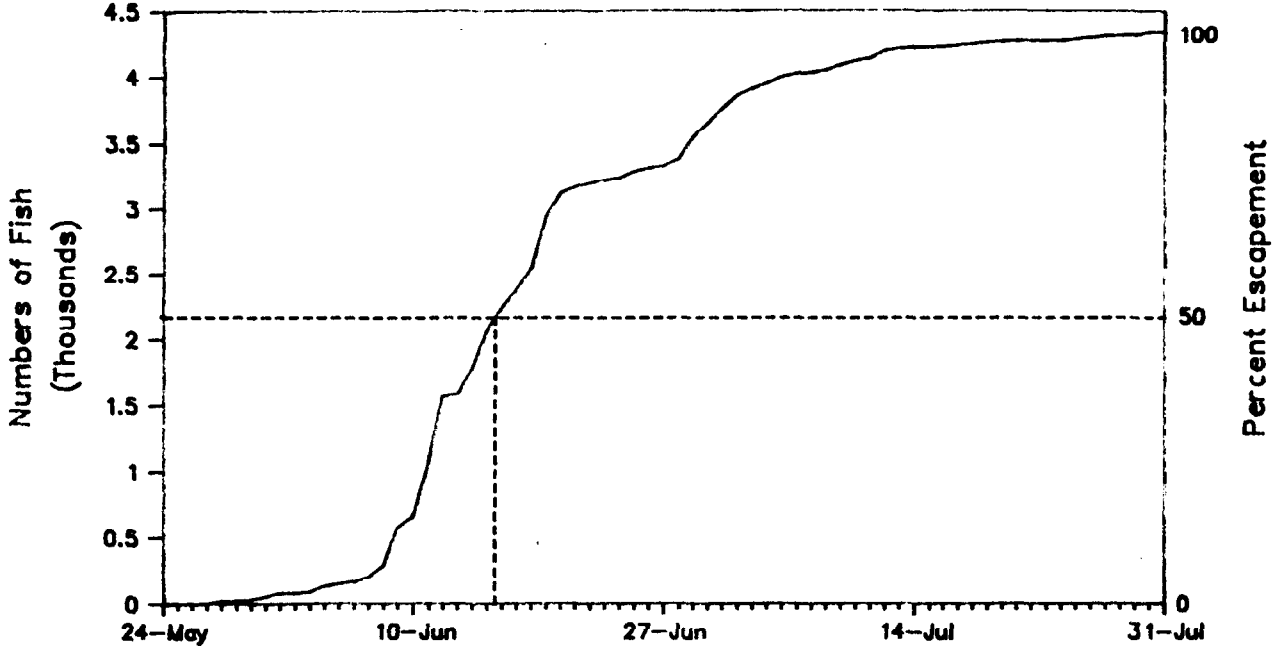

Figure 4. Cumulative escapement, chinook salmon, Little Susitna River weir, 1989.

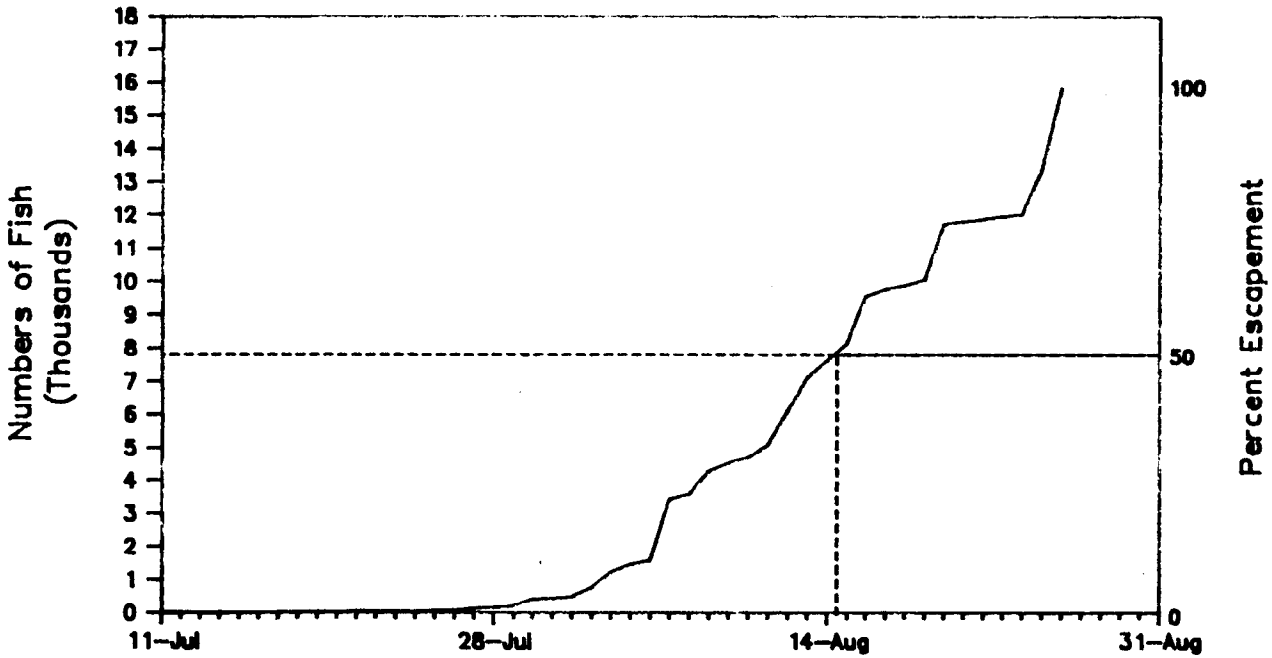

Figure 5. Cumulative escapement, coho salmon, Little Susitna River weir, 1989.

Counts of coho salmon in the index areas of other Matanuska-Susitna Valley streams ranged from 20 to 597 fish (Appendix A12). The observed escapement of chinook salmon to index areas in the upper reaches of the Little Susitna River are reported by Sweet and Webster (1990).

Age, Sex, and Length Compositions

Coho Salmon:

A total of 480 coho salmon from the Burma Road sport harvest were identified to sex and their scales aged. Males and females represented 48% and 52% of the sample, respectively (Table 19). Age 1.1 coho salmon were the most abundant age group comprising 97% of the sample. Age groups 2.1 and 3.1 comprised the remainder of the sample.

A total of 589 coho salmon from the escapement past the weir were identified to sex, and their scales aged. Males and females represented 63% and 37% of the sample, respectively (Table 20). Age 1.1 coho salmon were the most abundant age group as they comprised 94% of the sample. Age group 2.1 comprised the remainder of the sample. Age and sex composition was significantly different ($P < 0.05$) between the Burma Road harvest and the escapement.

The sex composition of coho salmon between the Burma Road harvest and the escapement was significantly different ($P < 0.05$). There were more males in the escapement than in the Burma Road harvest (Tables 19 and 20).

Mean lengths at age of male and female coho salmon sampled from the sport harvest and the escapement were not significantly different at $\alpha = 0.05$ (Tables 21 and 22).

A total of 94 coho salmon from the Miller's Landing sport harvest were identified to sex and their scales aged. Males and females represented 55.3% and 44.7% of the sample, respectively (Table 23). Age 1.1 coho salmon were the most abundant age group comprising 89.4% of the sample. Age group 2.1 comprised the remainder of the sample. Age and sex composition were not significantly different ($P > 0.05$) between the Miller's Landing harvest and the escapement.

Mean lengths at age of male and female coho salmon sampled from the sport harvest were not significantly different at $\alpha = 0.05$ (Table 24).

Chinook Salmon:

A total of 255 chinook salmon from the sport harvest at Burma Road were identified to sex and their scales aged. Males and females represented 43% and 57% of the sample, respectively (Table 25). Age 1.4 chinook salmon were the most abundant age group comprising 70.2% of the sample. Age group 1.3 was the second-most abundant comprising 17% of the sample. Age groups 1.1, 1.2, 1.5, and 2.3 comprised the remainder of the sample.

Table 19. Sex and age composition of coho salmon sampled from the Burma Road sport fishery, Little Susitna River, 1989.

	Age Group			
	1.1	2.1	3.1	Total
Females:				
Number in Sample	244	7		251
Percentage	50.8	1.5		52.3
Standard Error[a]	2.3	0.6		2.3
Males:				
Number in Sample	222	6	1	229
Percentage	46.3	1.3	0.2	47.7
Standard Error[a]	2.3	0.5	0.2	2.3
Sexes Combined:				
Number in Sample	466	13	1	480
Percentage	97.1	2.7	0.2	100.0
Standard Error[a]	0.8	0.7	0.2	

[a] Standard error of proportional estimate X 100.

Table 20. Sex and age composition of coho salmon sampled from the escapement in the Little Susitna River, 1989.

	Age Group		
	1.1	2.1	Total
Females:			
Number in Sample	206	12	218
Percentage	35.0	2.0	37.0
Standard Error[a]	2.0	0.6	2.0
Males:			
Number in Sample	347	24	371
Percentage	58.9	4.1	63.0
Standard Error[a]	2.0	0.8	2.0
Sexes Combined:			
Number in Sample	553	36	589
Percentage	93.9	6.1	100.0
Standard Error[a]	1.0	1.0	

[a] Standard error of proportional estimate X 100.

Table 21. Mean length (in cm) by sex and age group of coho salmon sampled from the Burma Road sport fishery, Little Susitna River, 1989.

	Age Group		
	1.1	2.1	3.1
Females:			
Mean	56.9	61.3	
Standard Error	3.4	9.5	
Sample Size	242	7	
Minimum	53.0	57.0	
Maximum	65.5	65.0	
Males:			
Mean	57.6	62.4	66.0
Standard Error	3.2	15.0	0.0
Sample Size	219	6	1
Minimum	37.0	58.5	66.0
Maximum	66.5	68.5	66.0

Table 22. Mean length (in cm) by sex and age group of coho salmon sampled from the escapement in the Little Susitna River, 1989.

	Age Group	
	1.1	2.1
Females:		
Mean	58.3	59.2
Standard Error	2.2	6.9
Sample Size	206	12
Minimum	47.5	54.5
Maximum	65.0	62.0
Males:		
Mean	60.4	62.3
Standard Error	2.1	9.1
Sample Size	347	24
Minimum	45.5	49.5
Maximum	68.0	67.0

Table 23. Sex and age composition of coho salmon sampled from the Miller's Landing sport fishery, Little Susitna River, 1989.

	Age Group		
	1.1	2.1	Total
Females:			
Number in Sample	38	4	42
Percentage	40.4	4.3	44.7
Standard Error[a]	5.1	2.1	5.2
Males:			
Number in Sample	46	6	52
Percentage	48.9	6.4	55.3
Standard Error[a]	5.2	2.5	5.2
Sexes Combined:			
Number in Sample	84	10	94
Percentage	89.4	10.6	100.0
Standard Error[a]	3.2	3.2	

[a] Standard error of proportional estimate X 100.

Table 24. Mean length (in cm) by sex and age group of coho salmon sampled from the Miller's Landing sport fishery, Little Susitna River, 1989.

	Age Group	
	1.1	2.1
Females:		
Mean	56.5	58.1
Standard Error	6.4	25.2
Sample Size	38	4
Minimum	48.5	52.0
Maximum	63.0	62.5
Males:		
Mean	58.4	62.3
Standard Error	5.7	13.0
Sample Size	46	6
Minimum	48.0	59.5
Maximum	67.0	67.0

Table 25. Sex and age composition of chinook salmon sampled from the sport fishery in the Little Susitna River, 1989.

	Age Group						
	1.1	1.2	1.3	1.4	1.5	2.3	TOTAL
Females:							
Number in Sample	1	2	29	107	5	1	145
Percentage	0.4	0.8	11.4	42.0	2.0	0.4	56.9
Standard Error[a]	0.4	0.6	2.0	3.1	0.9	0.4	3.1
Males:							
Number in Sample	3	11	14	72	10		110
Percentage	1.2	4.3	5.5	28.2	3.9		43.1
Standard Error[a]	0.7	1.3	1.4	2.8	1.2		3.1
Sexes Combined:							
Number in Sample	4	13	43	179	15	1	255
Percentage	1.6	5.1	16.9	70.2	5.9	0.4	100.0
Standard Error[a]	0.8	1.4	2.4	2.9	1.5	0.4	

[a] Standard error of proportional estimate X 100.

A total of 368 chinook salmon from the escapement at the weir were identified to sex, and their scales aged. Males and females represented 39% and 61% of the sample, respectively (Table 26). Age 1.4 chinook salmon were the most abundant age group comprising 75% of the sample. Age groups 1.2, 1.3, and 1.5 comprised the remainder of the sample. There was no significant difference ($P > 0.05$) in age composition between the harvest and escapement.

Mean lengths at age of male and female chinook salmon sampled from the sport harvest and the escapement at the weir were not significantly different at $\alpha = 0.05$ (Tables 27 and 28).

Hatchery Contributions

Out of a total of 1,857 coho salmon examined from the Burma Road sport fishery, 81 had a missing adipose fin. Of these, 57 had their heads removed and sent to the FRED Division CWT lab for processing. A total of 54 fish had coded-wire tags which were present and could be decoded. All decodable tags were from the 1988 Nancy Lake smolt release. Based on these data, the estimated contribution of hatchery-produced coho salmon to the sport harvest in the Little Susitna River through Burma Road during 1989 was 10,331 fish (Table 29). This represents 75% of the total harvest of coho salmon through the Burma Road access site.

A total of 143 coho salmon from the Miller's Landing sport fishery were examined for a missing adipose fin. Of these, 8 were observed to have a missing adipose fin, and had their heads removed and sent to the FRED Division CWT lab for processing. A total of 7 fish had coded-wire tags which were present and decodable. All decodable tags were from the 1988 Nancy Lake smolt release. Based on these data, the estimated contribution of hatchery-produced coho salmon to the sport harvest in the Little Susitna River through Miller's Landing during 1989 was 329 fish (Table 29). This represents 82% of the total harvest of coho salmon through the Miller's Landing access site. The chi-square test comparing tag recovery rates at Burma Road and Miller's Landing was not significant ($P > 0.05$), but the data from the two recovery sites were estimated separately.

A total of 3,223 coho salmon from the escapement past the weir were examined for a missing adipose fin of which 87 were observed to have a missing adipose. Based on these data, the hatchery contribution to the escapement of 15,855 coho salmon was estimated to be 7,191 fish or about 46% of the total escapement past the weir (Table 29). No heads were collected from coho salmon passing through the weir. We assume, however, based on tag decoding information obtained in the sport fishery recoveries, that these fish originate from the 1988 Nancy Lake smolt release.

DISCUSSION

Coho Salmon

The estimated 68,518 angler-hours of effort for coho salmon was the fourth largest on record for the Little Susitna River, while the estimated harvest of

Table 26. Sex and age composition of chinook salmon sampled from the escapement in the Little Susitna River, 1989.

	Age Group				
	1.2	1.3	1.4	1.5	Total
Females:					
Number in Sample		35	182	9	226
Percentage		9.5	49.5	2.4	61.4
Standard Error[a]		1.5	2.6	0.8	2.5
Males:					
Number in Sample	25	20	93	4	142
Percentage	6.8	5.4	25.3	1.1	38.6
Standard Error[a]	1.3	1.2	2.3	0.5	2.5
Sexes Combined:					
Number in Sample	25	55	275	13	368
Percentage	6.8	14.9	74.7	3.5	100.0
Standard Error[a]	1.3	1.9	2.3	1.0	

[a] Standard error of proportional estimate X 100.

Table 27. Mean length (in cm) by sex and age group of chinook salmon sampled from the sport fishery in the Little Susitna River, 1989.

	Age Group					
	1.1	1.2	1.3	1.4	1.5	2.3
Females:						
Mean		62.0	83.0	92.8	94.6	91.0
Standard Error			9.5	4.8	7.5	
Sample Size		1	27	95	5	1
Minimum		62.0	70.0	81.0	92.0	91.0
Maximum		62.0	92.0	101.0	96.0	91.0
Males:						
Mean	36.0	57.4	81.3	97.8	106.1	
Standard Error	5.8	27.1	17.0	5.5	24.8	
Sample Size	3	11	14	66	9	
Minimum	35.0	40.0	67.0	84.0	100.0	
Maximum	37.0	70.0	87.0	110.0	122.0	

Table 28. Mean length (in cm) by sex and age group of chinook salmon sampled from the escapement in the Little Susitna River, 1989.

	Age Group			
	1.2	1.3	1.4	1.5
Females:				
Mean		84.5	92.9	101.8
Standard Error		6.0	3.1	17.3
Sample Size		35	182	9
Minimum		74.5	81.0	93.5
Maximum		90.0	103.0	110.0
Males:				
Mean	62.7	82.4	98.1	102.3
Standard Error	8.6	17.8	5.5	25.0
Sample Size	25	19	93	4
Minimum	51.0	66.0	85.0	95.0
Maximum	70.0	93.0	110.5	106.0

Table 29. Contributions of hatchery-reared smolt to the sport harvest and escapement past the weir in the Little Susitna River, 1989.

Location	Total		Hatchery		
	Harvest	S.E.	Harvest	S.E.	Percent
Fishery					
Burma Road[a]	13,750	744.0	10,331	1,258.8	75.1
M. Landing[b]	400	58.9	329	203.9	82.3
Total	14,150	746.3	10,660	1,275.2	75.0
Weir[b]	15,855	[c]	7,191	757.6	45.9

[a] Hatchery-reared smolt originated from the 1988 Nancy Lake smolt releases.

[b] Hatchery-reared smolt originated from the 1988 Nancy Lake smolt release.

[c] Measured without error.

14,150 coho salmon harvest was the second largest since 1981. Effort decreased 5,147 angler-hours from that estimated in 1988 (Bartlett and Vincent-Lang 1989) while the harvest increased by 1,391 fish suggesting that coho salmon anglers may be using more efficient angling techniques.

The estimated total return of coho salmon to the Little Susitna River during 1989 was 28,982. This estimate is based on an estimated escapement of 14,832 coho salmon above the weir, an estimated sport harvest of 1,023 coho salmon above the weir, and an estimated sport harvest of 13,127 coho salmon below the weir. Coho salmon are not known to spawn downstream of the weir. Based on a total estimated sport harvest of 14,150, this represents a minimum inriver exploitation rate by the sport fishery of 48%. It is not possible at this time to estimate total return or exploitation rate as an unknown number of coho salmon are harvested in the mixed-stock commercial fisheries of upper Cook Inlet.

An estimated 46% of the 15,855 coho salmon that passed the weir originated from stocking efforts. We assume, based on tag decoding information obtained in the sport fishery recoveries, that these fish originate from the 1988 Nancy Lake smolt release.

The estimated hatchery contribution in the Burma Road harvest was 75%. This represents a 63% increase over the 46% estimated in the escapement. A similar difference in magnitude between the Burma Road coho harvest and the escapement was observed in 1988 (Bartlett and Vincent-Lang 1988).

Chinook Salmon

The estimated 64,412 angler-hours of effort for chinook salmon was the third largest on record for the Little Susitna River, while the harvest of 2,265 chinook salmon was the largest since 1979. Estimated effort increased 21,457 hours over that estimated in 1988 and the estimated harvest increased by 705 fish over that estimated in 1988 (Bartlett and Vincent-Lang 1989).

The estimated total return of chinook salmon to the Little Susitna River during 1989 was 6,346. This is based on an estimated escapement of 4,081 chinook salmon above the weir, an estimated sport harvest of 286 chinook salmon above the weir, and an estimated sport harvest of 1,979 chinook salmon below the weir. Based on an estimated sport harvest of 2,265, this represents a minimum inriver exploitation rate by the sport fishery of 36%. As was the case for coho salmon, it is not possible at this time to estimate total return or exploitation rate as an unknown number of chinook salmon are harvested in the mixed-stock commercial fisheries of upper Cook Inlet.

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APPENDIX A

Appendix A1. Daily totals for fishing effort, coho salmon harvest, and coho salmon catch by completed-trip boat anglers exiting the Little Susitna River at the Burma Road access site during periods A, B, and C, 1989.

Date	Hours Surveyed	Number of Interviews	Angler Hours	Coho Salmon Harvest	Coho Salmon Catch	Missed Anglers
Period A [a]						
715	1.5	0	0.0	0	0	0
716	1.5	4	19.0	6	6	0
717	1.5	0	0.0	0	0	0
718						
719						
720	1.5	2	1.5	0	0	0
721	1.5	0	0.0	0	0	0
722	1.5	1	3.5	0	0	0
723	1.5	0	0.0	0	0	0
724	1.5	0	0.0	0	0	0
725	1.5	0	0.0	0	0	0
726						
727						
728	1.5	14	48.5	42	43	0
729	1.5	14	58.0	29	29	0
730	1.5	24	127.0	47	55	0
731	1.5	26	90.0	59	65	0
801						
802						
803	1.5	7	36.0	15	15	0
804	1.5	3	12.0	0	0	0
805	1.5	10	37.5	24	24	0
806	1.5	10	37.5	8	8	0
807	1.5	4	9.0	1	1	0
808						
809						
810	1.5	9	25.5	24	32	0
811	1.5	11	23.3	32	45	0
812	1.5	12	29.5	30	34	0
813	1.5	10	34.0	25	32	0
814	1.5	6	15.0	18	18	0
815	1.5	29	90.5	52	52	0
816						
817						
818	1.5	3	13.5	9	9	0

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Appendix A1. (Page 2 of 4).

Date	Hours Surveyed	Number of Interviews	Angler Hours	Coho Salmon Harvest	Coho Salmon Catch	Missed Anglers
Period A [a]						
819	1.5	17	59.5	24	24	0
820	1.5	6	28.5	6	40	0
821	1.5	5	13.5	8	12	0
822						
823						
824	1.5	4	8.0	12	12	0
825	1.5	6	13.0	0	0	0
826	1.5	0	0.0	0	0	0
827	1.5	0	0.0	0	0	0
828	1.5	4	3.3	2	9	0
829	1.5	1	2.0	3	15	0
830						
831						
901	1.5	0	0.0	0	0	0
902	1.5	0	0.0	0	0	0
903	1.5	6	18.0	6	7	0
904	1.5	0	0.0	0	0	0
Period B [a]						
715	2.0	5	16.0	1	1	0
716	2.0	33	192.0	7	7	0
717	2.0	27	129.0	14	14	0
718						
719						
720	2.0	14	67.0	3	3	0
721	2.0	9	32.0	1	1	0
722	2.0	39	184.0	11	11	0
723	2.0	41	152.0	10	10	0
724	2.0	17	65.0	15	15	0
725	2.0	30	146.0	35	42	0
726						
727						
728	2.0	43	192.0	82	98	0
729	2.0	56	331.0	85	85	0
730	2.0	53	259.0	68	69	0
731	2.0	19	71.0	38	49	0
801						
802						

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Appendix A1. (Page 3 of 4).

Date	Hours Surveyed	Number of Interviews	Angler Hours	Coho Salmon Harvest	Coho Salmon Catch	Missed Anglers
Period B [a]						
803	2.0	75	387.5	67	69	0
804	2.0	32	133.0	46	46	0
805	2.0	125	639.5	99	104	0
806	2.0	122	635.0	60	60	0
807	2.0	60	370.5	105	105	0
808						
809						
810	2.0	22	77.0	58	84	0
811	2.0	40	160.0	68	75	0
812	2.0	74	434.0	140	144	0
813	2.0	126	590.0	211	269	0
814	2.0	55	231.0	103	103	0
815	2.0	29	119.5	67	79	0
816						
817						
818	2.0	28	92.0	47	53	0
819	2.0	47	233.0	85	90	0
820	2.0	74	349.0	70	79	0
821	2.0	30	150.0	22	22	0
822						
823						
824	2.0	2	10.0	0	0	0
825	2.0	11	18.0	13	13	0
826	2.0	16	40.0	17	22	0
827	2.0	11	33.0	6	6	0
828	2.0	0	0.0	0	0	0
829	2.0	3	5.0	2	5	0
830						
831						
901	2.0	2	9.0	4	11	0
902	2.0	0	0.0	0	0	0
903	2.0	2	4.0	0	0	0
904	2.0	15	59.5	6	7	0

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Appendix A1. (Page 4 of 4).

Date	Hours Surveyed	Number of Interviews	Angler Hours	Coho Salmon Harvest	Coho Salmon Catch	Missed Anglers
Period C [a]						
715	2.0	3	15.0	1	1	0
716	2.0	24	121.0	4	4	0
717	2.0	5	26.0	0	0	0
718						
719						
720	2.0	0	0.0	0	0	0
721	2.0	17	79.5	4	4	0
722	2.0	36	167.0	5	5	0
723	2.0	55	302.0	18	18	0
724	2.0	4	32.0	6	6	0
725	2.0	26	146.0	15	15	0
726						
727						
728	2.0	16	105.5	28	28	0
729	2.0	51	281.5	82	90	0
730	2.0	60	374.5	88	90	0
731	2.0	36	167.0	53	61	0
801						
802						
803	2.0	76	362.5	52	52	0
804	2.0	70	332.5	32	32	0
805	2.0	101	543.0	38	40	0
806	2.0	106	473.0	33	33	0
807	2.0	44	153.0	39	39	0
808						
809						
810	2.0	17	40.5	22	23	0
811	2.0	25	106.0	41	41	0
812	2.0	41	209.0	26	26	0
813	2.0	85	403.5	135	151	0
814	2.0	8	26.0	15	16	0
815	2.0	42	165.0	45	48	0
816						
817						
818	2.0	26	109.5	32	45	0
819	2.0	28	133.0	19	19	0
820	2.0	45	159.5	40	45	0

[a] Period A: 7/15-8/20 = 0800-1159, 8/21-9/04 = 0800-1359.
Period B: 7/15-8/20 = 1200-1759, 8/21-9/04 = 1400-2000.
Period C: 7/15-8/20 = 1800-2400, 8/21-9/04 = No Survey.

Appendix A2. Daily summary statistics for fishing effort, coho salmon harvest, and coho salmon catch by boat anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1989.

Date	We/ Wd	SS[a]	Effort (hrs) Mean	Effort (hrs) SE[b]	Harvest Mean	Harvest SE[b]	Harvest HPUE[c]	Catch Mean	Catch SE[b]	Catch CPUE[d]
715	We	8	3.9	0.44	0.25	0.164	0.065	0.25	0.164	0.065
716	We	61	5.4	0.45	0.28	0.078	0.051	0.28	0.078	0.051
717	Wd	32	4.8	0.30	0.44	0.118	0.090	0.44	0.118	0.090
720	Wd	16	4.3	0.58	0.19	0.136	0.044	0.19	0.136	0.044
721	Wd	26	4.3	0.49	0.19	0.079	0.045	0.19	0.079	0.045
722	We	76	4.7	0.27	0.21	0.054	0.045	0.21	0.054	0.045
723	We	96	4.7	0.34	0.29	0.069	0.062	0.29	0.069	0.062
724	Wd	21	4.6	0.48	1.00	0.218	0.216	1.00	0.218	0.216
725	Wd	56	5.2	0.33	0.89	0.163	0.171	1.02	0.198	0.195
728	Wd	73	4.7	0.21	2.08	0.139	0.439	2.32	0.202	0.488
729	We	121	5.5	0.23	1.62	0.111	0.292	1.69	0.121	0.304
730	We	137	5.6	0.27	1.48	0.103	0.267	1.56	0.106	0.281
731	Wd	81	4.0	0.17	1.85	0.134	0.457	2.16	0.170	0.534
803	Wd	158	5.0	0.19	0.85	0.088	0.170	0.86	0.089	0.173
804	Wd	105	4.5	0.21	0.74	0.110	0.163	0.74	0.110	0.163
805	We	236	5.2	0.18	0.68	0.067	0.132	0.71	0.069	0.138
806	We	238	4.8	0.18	0.42	0.048	0.088	0.42	0.048	0.088
807	Wd	108	4.9	0.26	1.34	0.115	0.272	1.34	0.115	0.272
810	Wd	48	3.0	0.18	2.17	0.169	0.727	2.90	0.329	0.972
811	Wd	76	3.8	0.19	1.86	0.141	0.487	2.12	0.206	0.557
812	We	127	5.3	0.23	1.54	0.116	0.291	1.61	0.128	0.303
813	We	221	4.6	0.16	1.68	0.082	0.361	2.05	0.110	0.440
814	Wd	69	3.9	0.20	1.97	0.153	0.500	1.99	0.154	0.504
815	Wd	100	3.8	0.18	1.64	0.131	0.437	1.79	0.158	0.477
818	Wd	57	3.8	0.21	1.54	0.172	0.409	1.88	0.250	0.498
819	We	92	4.6	0.21	1.39	0.132	0.301	1.45	0.139	0.313
820	We	125	4.3	0.18	0.93	0.090	0.216	1.31	0.196	0.305
821	Wd	35	4.7	0.42	0.86	0.189	0.183	0.97	0.207	0.208
824	Wd	6	3.0	0.71	2.00	0.632	0.667	2.00	0.632	0.667
825	Wd	17	1.8	0.19	0.76	0.315	0.419	0.76	0.315	0.419
826	We	16	2.5	0.40	1.06	0.281	0.425	1.38	0.455	0.550
827	We	11	3.0	0.33	0.55	0.312	0.182	0.55	0.312	0.182
828	Wd	4	0.8	0.19	0.50	0.289	0.615	2.25	0.854	2.769
829	Wd	4	1.8	0.48	1.25	0.750	0.714	5.00	3.536	2.857
901	Wd	2	4.5	0.00	2.00	1.000	0.444	5.50	0.500	1.222

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Appendix A2. (Page 2 of 2).

Date	We/ Wd	SS[a]	Effort (hrs) Mean	Effort (hrs) SE[b]	Harvest Mean	Harvest SE[b]	Harvest HPUE[c]	Catch Mean	Catch SE[b]	Catch CPUE[d]
903	We	8	2.8	0.37	0.75	0.412	0.273	0.88	0.515	0.318
904	We	15	4.0	0.72	0.40	0.131	0.101	0.47	0.133	0.118

[a] Sample size (number of anglers interviewed).
[b] Standard error.
[c] Harvest per unit of effort.
[d] Catch per unit of effort.

Appendix A3. Counts of shore anglers fishing near the Burma Road access site to the Little Susitna River, 1989.

Date	We/ Wd	Period A	Period B	Period C
715	We	2	7	5
716	We	3	8	7
717	Wd	3	8	4
718	Wd			
719	Wd			
720	Wd	4	16	5
721	Wd	10	5	12
722	We	7	17	11
723	We	7	23	9
724	Wd	9	7	2
725	Wd	21	26	18
726	Wd			
727	Wd			
728	Wd	29	26	35
729	We	65	55	42
730	We	52	46	42
731	Wd	30	35	21
801	Wd			
802	Wd			
803	Wd	37	38	47
804	Wd	57	51	61
805	We	84	72	58
806	We	82	79	66
807	Wd	29	27	22
808	Wd			
809	Wd			
810	Wd	62	45	28
811	Wd	26	52	36
812	We	59	65	58
813	We	41	80	66
814	Wd	45	40	32
815	Wd	22	24	62
816	Wd			
817	Wd			
818	Wd	24	43	49
819	We	73	36	52
820	We	50	43	18

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Appendix A3. (Page 2 of 2).

Date	We/ Wd	Period A	Period B	Period C
821	Wd	34	28	
822	Wd			
823	Wd			
824	Wd	7	5	
825	Wd	18	4	
826	We	8	3	
827	We	0	3	
828	Wd	2	0	
829	Wd	0	0	
830	Wd			
831	Wd			
901	Wd	4	0	
902	We	9	2	
903	We	0	2	
904	We	0	1	

Appendix A4. Daily summary statistics for fishing effort, coho salmon harvest, and coho salmon catch by shore anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1989.

Date	We/ Wd	SS[a]	Effort (hrs) Mean	Effort (hrs) SE[b]	Harvest Mean	Harvest SE[b]	Harvest HPUE[c]	Catch Mean	Catch SE[b]	Catch CPUE[d]
715	We	2	4.0	1.00	0.50	0.500	0.125	0.50	0.500	0.125
716	We	9	2.3	0.32	0.11	0.111	0.048	0.11	0.111	0.048
717	Wd	6	2.2	0.40	0.00	0.000	0.000	0.00	0.000	0.000
720	Wd	8	2.3	0.23	0.00	0.000	0.000	0.00	0.000	0.000
721	Wd	20	4.3	0.46	0.15	0.082	0.035	0.15	0.082	0.035
722	We	30	3.0	0.38	0.00	0.000	0.000	0.00	0.000	0.000
723	We	7	2.6	0.20	0.00	0.000	0.000	0.00	0.000	0.000
724	Wd	11	2.0	0.24	0.27	0.273	0.133	0.27	0.273	0.133
725	Wd	23	3.0	0.40	0.00	0.000	0.000	0.00	0.000	0.000
728	Wd	17	2.7	0.31	0.06	0.059	0.022	0.18	0.128	0.065
729	We	59	3.4	0.32	0.51	0.124	0.149	0.54	0.133	0.159
730	We	46	3.3	0.24	0.22	0.082	0.065	0.22	0.082	0.065
731	Wd	23	3.6	0.38	1.13	0.303	0.313	1.13	0.303	0.313
803	Wd	14	2.9	0.28	0.14	0.097	0.049	0.14	0.097	0.049
804	Wd	43	2.5	0.25	0.05	0.032	0.018	0.05	0.032	0.018
805	We	42	3.2	0.29	0.10	0.057	0.030	0.10	0.057	0.030
806	We	37	2.9	0.24	0.22	0.111	0.075	0.22	0.111	0.075
807	Wd	28	3.5	0.44	0.32	0.146	0.092	0.32	0.146	0.092
810	Wd	31	3.0	0.31	0.39	0.165	0.131	0.52	0.258	0.175
811	Wd	23	2.6	0.28	0.22	0.108	0.084	0.22	0.108	0.084
812	We	15	3.3	0.64	0.53	0.274	0.160	0.53	0.274	0.160
813	We	41	4.4	0.32	1.00	0.198	0.228	1.07	0.227	0.244
814	Wd	24	3.1	0.25	0.38	0.132	0.121	0.38	0.132	0.121
815	Wd	29	3.4	0.30	0.52	0.169	0.152	0.69	0.228	0.202
818	Wd	24	2.6	0.25	0.04	0.042	0.016	0.04	0.042	0.016
819	We	44	3.2	0.29	0.30	0.090	0.094	0.30	0.090	0.094
820	We	25	2.5	0.34	0.36	0.181	0.144	0.36	0.181	0.144
821	Wd	17	2.5	0.38	0.29	0.187	0.119	0.29	0.187	0.119
824	Wd	15	2.4	0.39	0.13	0.091	0.056	0.13	0.091	0.056
825	Wd	5	2.6	0.60	1.00	0.447	0.385	1.00	0.447	0.385
826	We	16	1.8	0.40	0.06	0.063	0.034	0.06	0.063	0.034
827	We	16	0.9	0.04	0.00	0.000	0.000	0.00	0.000	0.000
829	Wd	3	2.5	0.00	0.00	0.000	0.000	0.00	0.000	0.000
901	Wd	4	4.0	0.00	0.00	0.000	0.000	0.00	0.000	0.000

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Appendix A4. (Page 2 of 2).

Date	We/ Wd	SS[a]	Effort (hrs) Mean	Effort (hrs) SE[b]	Harvest Mean	Harvest SE[b]	Harvest HPUE[c]	Catch Mean	Catch SE[b]	Catch CPUE[d]
902	We	11	2.3	0.22	0.00	0.000	0.000	0.00	0.000	0.000
903	We	12	1.5	0.09	0.00	0.000	0.000	0.00	0.000	0.000
904	We	2	2.0	0.00	0.00	0.000	0.000	0.00	0.000	0.000

[a] Sample size (number of anglers interviewed).
[b] Standard error.
[c] Harvest per unit of effort.
[d] Catch per unit of effort.

Appendix A5. Daily totals for fishing effort, coho salmon harvest, and coho salmon catch by completed-trip anglers exiting the Little Susitna River at the Miller's Landing access site during periods A and B, 1989.

Date	Hours Surveyed	Number of Interviews	Angler Hours	Coho Salmon Harvest	Coho Salmon Catch	Missed Anglers
Period A [a]						
805	3.5	6	30.0	1	1	0
806	3.5	2	6.0	0	0	0
807						
808						
809	3.5	2	2.0	0	0	0
810	3.5	3	8.5	0	0	0
811	3.5	2	2.0	1	1	0
812	3.5	17	34.0	6	6	0
813	3.5	9	59.5	15	15	0
814	3.5	0	0.0	0	0	0
815						
816						
817	3.5	0	0.0	0	0	0
818	3.5	3	7.5	9	9	0
819	3.5	9	16.0	1	1	0
820	3.5	4	14.0	3	15	0
821	3.5	3	4.5	0	0	0
822	3.5	0	0.0	0	0	0
823						
824						
825	3.5	2	2.0	0	0	1
826	3.5	1	0.5	0	0	2
827	3.5	0	0.0	0	0	0
828	3.5	0	0.0	0	0	0
829						
830						
831	3.5	0	0.0	0	0	0
901	3.5	0	0.0	0	0	0
902	3.5	7	14.3	8	8	1
903	3.5	0	0.0	0	0	3
904	3.5	0	0.0	0	0	0

-Continued-

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Date	Hours Surveyed	Number of Interviews	Angler Hours	Coho Salmon Harvest	Coho Salmon Catch	Missed Anglers
Period B [a]						
805	3.5	9	29.0	2	2	0
806	3.5	13	53.0	1	1	0
807						
808						
809	3.5	4	28.0	2	2	0
810	3.5	11	46.3	1	1	0
811	3.5	3	10.5	0	0	0
812	3.5	0	0.0	0	0	0
813	3.5	5	3.3	9	9	0
814	3.5	2	9.0	0	0	0
815						
816						
817	3.5	11	31.3	5	5	0
818	3.5	13	23.5	4	4	0
819	3.5	10	60.0	18	26	0
820	3.5	10	58.0	13	20	0
821	3.5	7	39.0	7	13	0
822	3.5	11	44.0	7	7	0
823						
824						
825	3.5	9	26.5	16	23	0
826	3.5	9	43.0	14	16	0
827	3.5	7	24.5	0	0	2
828	3.5	0	0.0	0	0	0
829						
830						
831	3.5	4	10.3	2	2	0
901	3.5	0	0.0	0	0	0
902	3.5	2	8.0	0	0	0
903	3.5	0	0.0	0	0	0
904	3.5	4	24.0	9	11	0

[a] Period A: 0600-1359.
Period B: 1400-2200.

Appendix A6. Daily summary statistics for fishing effort, coho salmon harvest, and coho salmon catch by anglers exiting the sport fishery in the Little Susitna River at the Miller's Landing access site, 1989.

Date	We/ Wd	SS[a]	Effort (hrs) Mean	Effort (hrs) SE[b]	Harvest Mean	Harvest SE[b]	Harvest HPUE[c]	Catch Mean	Catch SE[b]	Catch CPUE[d]
805	We	15	3.9	0.41	0.20	0.107	0.051	0.20	0.107	0.051
806	We	15	3.9	0.27	0.07	0.067	0.017	0.07	0.067	0.017
809	Wd	6	5.0	1.26	0.33	0.211	0.067	0.33	0.211	0.067
810	Wd	14	3.9	0.59	0.07	0.071	0.018	0.07	0.071	0.018
811	Wd	5	2.5	0.61	0.20	0.200	0.080	0.20	0.200	0.080
812	We	17	2.0	0.39	0.35	0.242	0.176	0.35	0.242	0.176
813	We	14	4.5	1.36	1.71	0.425	0.382	1.71	0.425	0.382
814	Wd	2	4.5	0.00	0.00	0.000	0.000	0.00	0.000	0.000
817	Wd	11	2.8	0.45	0.45	0.207	0.160	0.45	0.207	0.160
818	Wd	16	1.9	0.34	0.81	0.319	0.419	0.81	0.319	0.419
819	We	19	4.0	0.82	1.00	0.306	0.250	1.42	0.497	0.355
820	We	14	5.1	0.70	1.14	0.345	0.222	2.50	0.717	0.486
821	Wd	10	4.3	0.64	0.70	0.396	0.161	1.30	0.790	0.299
822	Wd	11	4.0	0.79	0.64	0.203	0.159	0.64	0.203	0.159
825	Wd	11	2.6	0.54	1.45	0.366	0.561	2.09	0.694	0.807
826	We	10	4.3	1.08	1.40	0.452	0.322	1.60	0.562	0.368
827	We	7	3.5	0.71	0.00	0.000	0.000	0.00	0.000	0.000
831	Wd	4	2.6	0.90	0.50	0.289	0.195	0.50	0.289	0.195
902	We	9	2.5	0.46	0.89	0.455	0.360	0.89	0.455	0.360
904	We	4	6.0	0.00	2.25	0.250	0.375	2.75	0.250	0.458

[a] Sample size (number of anglers interviewed).
[b] Standard error.
[c] Harvest per unit of effort.
[d] Catch per unit of effort.

Appendix A7. Daily totals for fishing effort, chinook salmon harvest, and chinook salmon catch by completed-trip boat anglers exiting the Little Susitna River at the Burma Road access site during periods A, B, and C, 1989.

Date	Hours Surveyed	Number of Interviews	Angler Hours	Coho Salmon Harvest	Coho Salmon Catch	Missed Anglers
Period A [a]						
527	1.5	6	36.0	2	2	0
528	1.5	16	162.0	2	2	0
529	1.5	10	106.0	6	6	0
530						
531						
601	1.5	6	9.8	3	4	0
602	1.5	2	12.0	0	0	0
603	1.5	7	45.0	3	3	0
604	1.5	4	17.0	2	2	0
605	1.5	11	76.5	6	7	0
606	1.5	4	24.0	1	1	0
607						
608						
609	1.5	4	9.0	2	2	0
610	1.5	11	43.5	2	2	0
611	1.5	9	33.0	5	5	0
612	1.5	13	86.5	6	9	0
613						
614						
615	1.5	3	15.0	1	3	0
616	1.5	12	72.0	5	6	0
617	1.5	4	24.0	0	0	0
618	1.5	27	159.5	10	10	0
619	1.5	4	39.0	1	4	0
620						
621						
622	1.5	5	20.0	0	0	0
623	1.5	5	100.0	9	9	0
624	1.5	0	0.0	0	0	0
625	1.5	6	24.0	0	0	0
626	1.5	10	90.5	0	0	0
627	1.5	4	21.0	1	1	0
628						
629						
630	1.5	3	7.5	0	0	0
701	1.5	4	28.0	0	0	0

-Continued-

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Date	Hours Surveyed	Number of Interviews	Angler Hours	Coho Salmon Harvest	Coho Salmon Catch	Missed Anglers
702	1.5	13	56.0	0	0	0
703	1.5	6	21.0	0	0	0
704						
705						
706	1.5	0	0.0	0	0	0
707	1.5	0	0.0	0	0	0
708	1.5	0	0.0	0	0	0
709	1.5	2	6.0	1	1	0
Period B [a]						
527	2.0	14	58.5	3	3	0
528	2.0	54	264.5	1	1	0
529	2.0	65	611.5	12	12	0
530						
531						
601	2.0	9	53.5	1	5	0
602	2.0	20	140.5	8	8	0
603	2.0	38	274.5	19	19	0
604	2.0	53	468.0	18	19	0
605	2.0	23	141.3	8	9	0
606	2.0	19	105.5	2	3	0
607						
608						
609	2.0	24	169.0	12	12	0
610	2.0	50	337.3	17	18	0
611	2.0	55	585.0	21	60	0
612	2.0	28	162.5	11	11	0
613						
614						
615	2.0	23	132.0	7	7	0
616	2.0	19	146.0	5	5	0
617	2.0	46	247.8	3	3	0
618	2.0	53	463.0	9	10	0
619	2.0	23	143.0	7	7	0
620						
621						
622	2.0	20	123.0	3	3	0
623	2.0	20	104.0	9	11	0
624	2.0	26	156.0	12	12	0
625	2.0	59	437.5	9	9	0

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Appendix A7. (Page 3 of 4).

Date	Hours Surveyed	Number of Interviews	Angler Hours	Coho Salmon Harvest	Coho Salmon Catch	Missed Anglers
626	2.0	20	118.0	4	7	0
627	2.0	21	165.0	3	3	0
628						
629						
630	2.0	6	34.0	2	2	0
701	2.0	8	6.0	4	4	0
702	2.0	25	126.0	4	5	0
703	2.0	14	33.0	1	1	0
704						
705						
706	2.0	0	0.0	0	0	0
707	2.0	0	0.0	0	0	0
708	2.0	0	0.0	0	0	0
709	2.0	2	2.0	0	0	0
Period C [a]						
527	2.0	20	107.0	0	0	0
528	2.0	47	252.0	5	5	0
529	2.0	59	500.0	6	6	0
530						
531						
601	2.0	24	160.5	8	9	0
602	2.0	9	50.0	3	3	0
603	2.0	21	131.5	6	6	0
604	2.0	42	331.0	4	6	0
605	2.0	18	97.5	3	3	0
606	2.0	28	132.0	8	8	0
607						
608						
609	2.0	33	290.3	7	10	0
610	2.0	34	330.0	9	21	0
611	2.0	53	383.5	24	44	0
612	2.0	33	168.0	18	21	0
613						
614						
615	2.0	26	179.0	7	8	0
616	2.0	10	26.0	0	0	0
617	2.0	50	359.0	7	7	0
618	2.0	34	205.5	8	8	0
619	2.0	27	148.5	10	10	0

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Date	Hours Surveyed	Number of Interviews	Angler Hours	Coho Salmon Harvest	Coho Salmon Catch	Missed Anglers
620						
621						
622	2.0	22	95.0	5	5	0
623	2.0	23	160.0	12	18	0
624	2.0	43	217.0	13	18	0
625	2.0	26	209.5	1	1	0
626	2.0	14	122.0	1	1	0
627	2.0	19	100.5	5	5	0
628						
629						
630	2.0	11	46.0	2	2	0
701	2.0	14	62.3	3	4	0
702	2.0	17	104.0	3	3	0
703	2.0	29	125.5	4	4	0
704						
705						
706	2.0	2	7.0	0	0	0
707	2.0	0	0.0	0	0	0
708	2.0	4	32.0	0	0	0
709	2.0	0	0.0	0	0	0

[a] Period A: 0800-1159.
Period B: 1200-1759.
Period C: 1800-2400.

Appendix A8. Daily summary statistics for fishing effort, chinook salmon harvest, and chinook salmon catch by boat anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1989.

Date	We/ Wd	SS[a]	Effort (hrs) Mean	Effort (hrs) SE[b]	Harvest Mean	Harvest SE[b]	Harvest HPUE[c]	Catch Mean	Catch SE[b]	Catch CPUE[d]
527	We	40	5.0	0.57	0.13	0.053	0.025	0.13	0.053	0.025
528	We	117	5.8	0.41	0.07	0.029	0.012	0.07	0.029	0.012
529	We	134	9.1	0.62	0.18	0.036	0.020	0.18	0.036	0.020
601	Wd	39	5.7	0.58	0.31	0.075	0.054	0.46	0.109	0.080
602	Wd	31	6.5	0.43	0.35	0.119	0.054	0.35	0.119	0.054
603	We	66	6.8	0.48	0.42	0.072	0.062	0.42	0.072	0.062
604	We	99	8.2	0.51	0.24	0.046	0.029	0.27	0.055	0.033
605	Wd	52	6.1	0.39	0.33	0.076	0.054	0.37	0.087	0.060
606	Wd	51	5.1	0.32	0.22	0.058	0.042	0.24	0.060	0.046
609	Wd	61	7.7	0.73	0.34	0.070	0.045	0.39	0.082	0.051
610	We	95	7.5	0.52	0.29	0.052	0.039	0.43	0.086	0.058
611	We	117	8.6	0.57	0.43	0.057	0.050	0.93	0.223	0.109
612	Wd	74	5.6	0.37	0.47	0.070	0.084	0.55	0.091	0.098
615	Wd	52	6.3	0.57	0.29	0.084	0.046	0.35	0.091	0.055
616	Wd	41	6.0	0.90	0.24	0.109	0.041	0.27	0.116	0.045
617	We	100	6.3	0.39	0.10	0.039	0.016	0.10	0.039	0.016
618	We	114	7.3	0.57	0.24	0.044	0.033	0.25	0.044	0.034
619	Wd	54	6.1	0.35	0.33	0.065	0.054	0.39	0.081	0.064
622	Wd	47	5.1	0.47	0.17	0.055	0.034	0.17	0.055	0.034
623	Wd	48	7.6	0.81	0.63	0.106	0.082	0.79	0.160	0.104
624	We	69	5.4	0.32	0.36	0.062	0.067	0.43	0.079	0.080
625	We	91	7.4	0.66	0.11	0.040	0.015	0.11	0.040	0.015
626	Wd	44	7.5	0.64	0.11	0.048	0.015	0.18	0.067	0.024
627	Wd	44	6.5	0.83	0.20	0.062	0.031	0.20	0.062	0.031
630	Wd	20	4.4	0.46	0.20	0.092	0.046	0.20	0.092	0.046
701	We	26	3.7	0.60	0.27	0.089	0.073	0.31	0.092	0.083
702	We	55	5.2	0.51	0.13	0.045	0.024	0.15	0.048	0.028
703	Wd	49	3.7	0.39	0.10	0.044	0.028	0.10	0.044	0.028
706	Wd	2	3.5	0.00	0.00	0.000	0.000	0.00	0.000	0.000
708	We	4	8.0	0.00	0.00	0.000	0.000	0.00	0.000	0.000
709	We	4	2.0	0.58	0.25	0.250	0.125	0.25	0.250	0.125

[a] Sample size (number of anglers interviewed).
[b] Standard error.
[c] Harvest per unit of effort.
[d] Catch per unit of effort.

Appendix A9. Counts of shore anglers fishing for chinook salmon near the Burma Road access site to the Little Susitna River, 1989.

Date	We/ Wd	Period A	Period B	Period C
527	We	28	36	16
528	We	25	50	40
529	Wd	55	51	16
530	Wd			
531	Wd			
601	Wd	15	36	72
602	Wd	31	50	25
603	We	57	114	98
604	We	54	90	62
605	Wd	nc [a]	39	42
606	Wd	28	39	69
607	Wd			
608	Wd			
609	Wd	37	74	76
610	We	122	89	48
611	We	89	125	100
612	Wd	38	69	61
613	Wd			
614	Wd			
615	Wd	24	40	57
616	Wd	31	21	29
617	We	41	59	55
618	We	43	50	30
619	Wd	35	31	44
620	Wd			
621	Wd			
622	Wd	15	18	12
623	Wd	6	10	12
624	We	11	20	16
625	We	9	19	11
626	Wd	6	6	8
627	Wd	10	9	11
628	Wd			
629	Wd			
630	Wd	6	8	7
701	We	6	6	8
702	We	5	3	2
703	Wd	0	2	0

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Date	We/ Wd	Period A	Period B	Period C
704	Wd			
705	Wd			
706	Wd	2	2	3
707	Wd	1	9	3
708	We	0	5	10
709	We	3	4	3

[a] No count taken.

Appendix A10. Daily summary statistics for fishing effort, chinook salmon harvest, and coho salmon catch by shore anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1989.

Date	We/ Wd	SS[a]	Effort (hrs) Mean	Effort (hrs) SE[b]	Harvest Mean	Harvest SE[b]	Harvest HPUE[c]	Catch Mean	Catch SE[b]	Catch CPUE[d]
527	We	32	3.4	0.38	0.13	0.059	0.037	0.13	0.059	0.037
528	We	31	4.2	0.49	0.03	0.032	0.008	0.03	0.032	0.008
529	We	50	4.2	0.29	0.12	0.068	0.028	0.14	0.081	0.033
531	Wd	3	25.0	0.00	0.67	0.333	0.027	0.67	0.333	0.027
601	Wd	19	3.2	0.43	0.11	0.072	0.033	0.11	0.072	0.033
602	Wd	22	2.8	0.38	0.18	0.084	0.066	0.18	0.084	0.066
603	We	25	3.8	0.42	0.32	0.095	0.084	0.32	0.095	0.084
604	We	43	4.0	0.28	0.02	0.023	0.006	0.02	0.023	0.006
605	Wd	27	2.8	0.29	0.00	0.000	0.000	0.00	0.000	0.000
606	Wd	26	2.7	0.34	0.04	0.038	0.014	0.04	0.038	0.014
609	Wd	43	5.3	0.65	0.14	0.053	0.026	0.14	0.053	0.026
610	We	42	5.2	0.65	0.17	0.058	0.032	0.17	0.058	0.032
611	We	55	4.0	0.43	0.15	0.055	0.036	0.18	0.074	0.046
612	Wd	28	3.5	0.30	0.21	0.079	0.061	0.25	0.098	0.071
615	Wd	40	3.4	0.44	0.00	0.000	0.000	0.00	0.000	0.000
616	Wd	47	3.7	0.46	0.00	0.000	0.000	0.00	0.000	0.000
617	We	53	4.9	0.56	0.00	0.000	0.000	0.00	0.000	0.000
618	We	37	4.9	0.46	0.14	0.057	0.027	0.14	0.057	0.027
619	Wd	54	4.6	0.51	0.06	0.031	0.012	0.06	0.031	0.012
621	Wd	2	1.0	0.00	0.00	0.000	0.000	0.00	0.000	0.000
622	Wd	29	3.3	0.35	0.00	0.000	0.000	0.00	0.000	0.000
623	Wd	17	2.5	0.35	0.06	0.059	0.023	0.06	0.059	0.023
624	We	37	4.3	0.57	0.03	0.027	0.006	0.03	0.027	0.006
625	We	21	4.4	0.78	0.00	0.000	0.000	0.00	0.000	0.000
626	Wd	5	2.2	0.37	0.00	0.000	0.000	0.00	0.000	0.000
627	Wd	33	3.1	0.47	0.00	0.000	0.000	0.00	0.000	0.000
630	Wd	8	3.7	0.75	0.00	0.000	0.000	0.00	0.000	0.000
701	We	13	2.5	0.83	0.00	0.000	0.000	0.00	0.000	0.000
702	We	17	2.5	0.38	0.00	0.000	0.000	0.00	0.000	0.000
703	Wd	6	1.5	0.00	0.00	0.000	0.000	0.00	0.000	0.000
706	Wd	3	3.0	1.00	0.00	0.000	0.000	0.00	0.000	0.000

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Date	We/ Wd	SS[a]	Effort (hrs) Mean	Effort (hrs) SE[b]	Harvest Mean	Harvest SE[b]	Harvest HPUE[c]	Catch Mean	Catch SE[b]	Catch CPUE[d]
707	Wd	7	2.2	0.58	0.00	0.000	0.000	0.00	0.000	0.000
708	We	11	3.8	0.50	0.18	0.122	0.048	0.18	0.122	0.048
709	We	5	5.0	0.50	0.00	0.000	0.000	0.20	0.200	0.040

[a] Sample size (number of anglers interviewed).
[b] Standard error.
[c] Harvest per unit of effort.
[d] Catch per unit of effort.

Appendix A11. Daily and cumulative counts of salmon, by species, at the weir on the Little Susitna River, 1989.

Species:	Chinook		Sockeye		Chum		Coho		Pink	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
524	1	1	0	0						
525	0	1	0	0						
526	0	1	0	0						
527	5	6	3	3						
528	17	23	12	15						
529	5	28	37	52						
530	7	35	40	92						
531	22	57	33	125						
601	28	85	33	158						
602	1	86	24	182						
603	11	97	13	195						
604	41	138	46	241						
605	16	154	57	298						
606	16	170	80	378						
607	34	204	53	431						
608	87	291	15	446						
609	291	582	88	534						
610	84	666	50	584						
611	410	1,076	89	673						
612	502	1,578	56	729						
613	15	1,593	66	795						
614	197	1,790	46	841						
615	287	2,077	87	928						
616	171	2,248	39	967						
617	134	2,382	20	987						
618	168	2,550	25	1,012						
619	397	2,947	14	1,026						
620	184	3,131	5	1,031						
621	39	3,170	2	1,033						
622	34	3,204	3	1,036						
623	20	3,224	3	1,039						
624	17	3,241	1	1,040						
625	50	3,291	1	1,041						
626	24	3,315	1	1,042						
627	14	3,329	1	1,043						
628	54	3,383	2	1,045						
629	171	3,554	2	1,047						
630	101	3,655	2	1,049						
701	111	3,766	2	1,051						
702	100	3,866	2	1,053						

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Species:	Chinook		Sockeye		Chum		Coho		Pink	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
703	46	3,912	0	1,053	4	4				
704	44	3,956	0	1,053	16	20				
705	48	4,004	1	1,054	21	41				
706	25	4,029	0	1,054	5	46				
707	9	4,038	2	1,056	21	67				
708	19	4,057	12	1,068	64	131				
709	42	4,099	6	1,074	178	309				
710	28	4,127	4	1,078	209	518				
711	18	4,145	21	1,099	222	740	1	1		
712	56	4,201	11	1,110	149	889	0	1		
713	15	4,216	6	1,116	53	942	7	8	2	2
714	10	4,226	6	1,122	19	961	3	11	2	4
715	3	4,229	14	1,136	45	1,006	1	12	1	5
716	4	4,233	160	1,296	162	1,168	3	15	1	6
717	9	4,242	306	1,602	139	1,307	13	28	4	10
718	11	4,253	134	1,736	262	1,569	11	39	0	10
719	11	4,264	82	1,818	342	1,911	4	43	0	10
720	7	4,271	16	1,834	160	2,071	1	44	0	10
721	3	4,274	310	2,144	296	2,367	18	62	2	12
722	2	4,276	125	2,269	211	2,578	0	62	1	13
723	0	4,276	113	2,382	342	2,920	2	64	0	13
724	2	4,278	114	2,496	691	3,611	1	65	0	13
725	12	4,290	781	3,277	1,077	4,688	25	90	2	15
726	12	4,302	523	3,800	1,327	6,015	20	110	5	20
727	13	4,315	561	4,361	1,328	7,343	54	164	3	23
728	4	4,319	340	4,701	1,060	8,403	27	191	1	24
729	5	4,324	290	4,991	1,153	9,556	29	220	2	26
730	14	4,338	216	5,207	593	10,149	220	440	0	26
731	1	4,339	61	5,268	179	10,328	31	471	0	26
801	3	4,342	150	5,418	417	10,745	44	515	1	27
802	2	4,344	216	5,634	646	11,391	271	786	4	31
803	4	4,348	96	5,730	376	11,767	470	1,256	2	33
804	4	4,352	40	5,770	317	12,084	235	1,491	1	34
805	1	4,353	36	5,806	254	12,338	113	1,604	0	34
806	4	4,357	92	5,898	245	12,583	1,854	3,458	7	41
807	0	4,357	22	5,920	142	12,725	151	3,609	1	42
808	0	4,357	65	5,985	137	12,862	692	4,301	1	43
809	1	4,358	26	6,011	82	12,944	253	4,554	3	46
810	0	4,358	23	6,034	127	13,071	173	4,727	0	46
811	2	4,360	31	6,065	189	13,260	385	5,112	3	49

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Species:	Chinook		Sockeye		Chum		Coho		Pink	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
812	0	4,360	74	6,139	192	13,452	1,036	6,148	1	50
813	0	4,360	18	6,157	89	13,541	1,009	7,157	1	51
814	2	4,362	9	6,166	41	13,582	475	7,632	1	52
815	1	4,363	16	6,182	46	13,628	553	8,185	1	53
816	4	4,367	8	6,190	43	13,671	1,424	9,609	1	54
817	0	4,367	2	6,192	18	13,689	205	9,814	0	54
818	0	4,367	1	6,193	32	13,721	110	9,924	1	55
819	0	4,367	3	6,196	21	13,742	159	10,083	1	56
820	0	4,367	4	6,200	78	13,820	1,666	11,749	1	57
821	0	4,367	1	6,201	7	13,827	89	11,838	0	57
822	0	4,367	1	6,202	9	13,836	63	11,901	0	57
823	0	4,367	0	6,202	15	13,851	94	11,995	0	57
824	0	4,367	0	6,202	9	13,860	41	12,036	0	57
825	0	4,367	1	6,203	9	13,869	1,343	13,379	0	57
826	0	4,367	0	6,203	7	13,876	2,476	15,855	0	57
827	Weir submerged under high water, 8/27/89.									
Total		4,367		6,203		13,876		15,855		57

Appendix A12. Escapement counts of coho salmon for selected index areas in Matanuska-Susitna Valley streams, 1984-1989.

Stream	Year					
	1989	1988	1987	1986	1985	1984
Little Susitna River	15,232[a]	20,491[b]	4,865	1,038[c]	3,540	20,991
Spring (Wasilla) Creek	67	82	110	141	150	NS[d]
Yellow Creek	226	110	58	20	65	0
McRoberts Creek	597	1,911	667	439	662	NS
Spring (Flats) Creek	39	30	42	147	81	90
Cottonwood Creek	147	293	360	121	334	935
Wasilla Creek	NS	NS	251	NS	248	628
Rabideux Creek	20	230	50[e]	NS	82	480
Birch Creek	180	63	46	25	30	236
Question Creek	31	337	149	NS	89	60
Answer Creek	66	160	10	NS	9	57
Total	16,605	23,707	6,608	1,931	5,290	23,477

[a] Minimum estimate. Flood overtopped weir, 8-27-89.

[b] Weir count minus estimated harvest above weir.

[c] Incomplete survey.

[d] Not surveyed.

[e] Poor survey conditions.