Fishery Data Series No. 91-12

Creel and Escapement Statistics for the Chinook Salmon Sport Fishery in the Lower Naknek River, Alaska, during 1990

by

Dan O. Dunaway
and
Allen E. Bingham

June 1991

Alaska Department of Fish and Game

Division of Sport Fish

FISHERY DATA SERIES NO. 91-12

CREEL AND ESCAPEMENT STATISTICS FOR THE CHINOOK SALMON SPORT FISHERY IN THE LOWER NAKNEK RIVER, ALASKA, DURING 1990[1]

By

Dan O. Dunaway
and
Allen E. Bingham

Alaska Department of Fish and Game
Division of Sport Fish
Anchorage, Alaska

June 1991

[1] This investigation was partially financed by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777K) under Project F-10-6, Job No. S-2-1.

The Fishery Data Series was established in 1987 for the publication of technically oriented results for a single project or group of closely related projects. Fishery Data Series reports are intended for fishery and other technical professionals. Distribution is to state and local publication distribution centers, libraries and individuals and, on request, to other libraries, agencies, and individuals. This publication has undergone editorial and peer review.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

An estimated 39,653 hours of effort were expended by recreational anglers fishing the lower Naknek River from 1 June through 31 July 1990. Anglers caught (landed) and harvested (kept) an estimated 4,265 and 3,250 (76 percent harvested) chinook salmon *Oncorhynchus tshawytscha*, 478 and 474 (99 percent harvested) chum salmon *Oncorhynchus keta*, 411 and 225 (55 percent harvested) pink salmon *Oncorhynchus gorbuscha*, and 537 and 73 (14 percent harvested) rainbow trout *Oncorhynchus mykiss*, respectively. Age 1.3 (35 percent) and 1.4 chinook salmon (31 percent) dominated the harvest. The spawning escapement of chinook salmon, as determined by aerial survey counts of live fish, was estimated to be 6,900 fish. This is slightly below the long term average of 7,161 fish. An emergency order prohibiting the harvest of chinook salmon greater than 71 centimeters (28 inches) in length took effect 8 July and most likely resulted in a reduced harvest of large chinook salmon and an increased escapement after that date. The bag limit restriction probably reduced sport fishing effort on the Naknek River.

KEY WORDS: chinook salmon, *Oncorhynchus tshawytscha*, chum salmon, *Oncorhynchus keta*, pink salmon, *Oncorhynchus gorbuscha*, rainbow trout, *Oncorhynchus mykiss*, sport harvest, sport effort, creel survey, escapement, Naknek River, Bristol Bay.

INTRODUCTION

The Naknek River (Figure 1) supports the largest chinook salmon *Oncorhynchus tshawytscha*, coho salmon *Oncorhynchus kisutch*, and rainbow trout *Oncorhynchus mykiss* sport fisheries in southwestern Alaska. Sport fishing effort in the Naknek River drainage has increased steadily from 4,675 angler-days in 1977 to 14,120 angler-days in 1989 (Mills 1979-1990). On-site creel surveys conducted in 1987, 1988, and 1989 indicate a high level of effort averaging over 80,000 angler-hours per year (Dunaway 1990), and angling effort is expected to increase. Ease of access to the river and regularly scheduled airline service from Anchorage to King Salmon contribute to the increasing popularity of the Naknek River sport fisheries.

On-site creel surveys have been conducted by the Alaska Department of Fish and Game (ADFG) on the Naknek River sporadically since 1967, and have documented increasing levels of catch and harvest for all species. In some instances, the sport harvest has constituted a significant removal of the total annual return. For example, in 1987, anglers harvested an estimated 11,420 chinook salmon, or nearly 48% of the total annual return (Minard and Brookover 1988). This signified the sport fishery as the largest component of harvest followed by the commercial fishery (21%) and subsistence fishery (4%), which harvested 5,000 and 1,000 chinook salmon respectively, The chinook and coho salmon fishery on the Naknek River occurs primarily in the lower portion of the river between Smelt Creek and Big Creek (Figure 1).

In 1988, newly implemented regulations for the sport fishery in the Naknek River, including restrictions in the daily bag and possession limits of chinook salmon, a shortened season, and a bait restriction (ADFG 1988), helped reduce the annual sport harvest of chinook salmon. Although effort increased considerably from 1987, results of the 1988 creel survey indicate anglers harvested 5,539 chinook salmon (22%) from a total run of 24,807 (Minard 1989). In 1989 anglers harvested 3,879 chinook salmon (28%) from a total run of 13,883 (Dunaway 1990). The 1987, 1988, and 1989 surveys were expanded to include the fisheries for other anadromous and resident species (Minard and Brookover 1988; Minard 1989; Dunaway 1990). The survey is used to estimate sport fishing effort, catch (fish landed), and harvest (fish retained) and the age, sex, and size compositions of the harvest.

The objectives of the 1990 lower Naknek River creel survey were:

1. To estimate angling effort (in angler-hours), catch (fish kept plus released), harvest (fish kept only), and catch per unit effort (CPUE) for the chinook salmon sport fishery in the lower Naknek River during the period 1 June to 31 July 1990.

2. To estimate the age, sex, and length composition of chinook salmon harvested by the sport fishery in the lower Naknek River.

3. To estimate the age, sex, and length composition of the chinook salmon escapement into Big Creek and the main stem of the Naknek River.

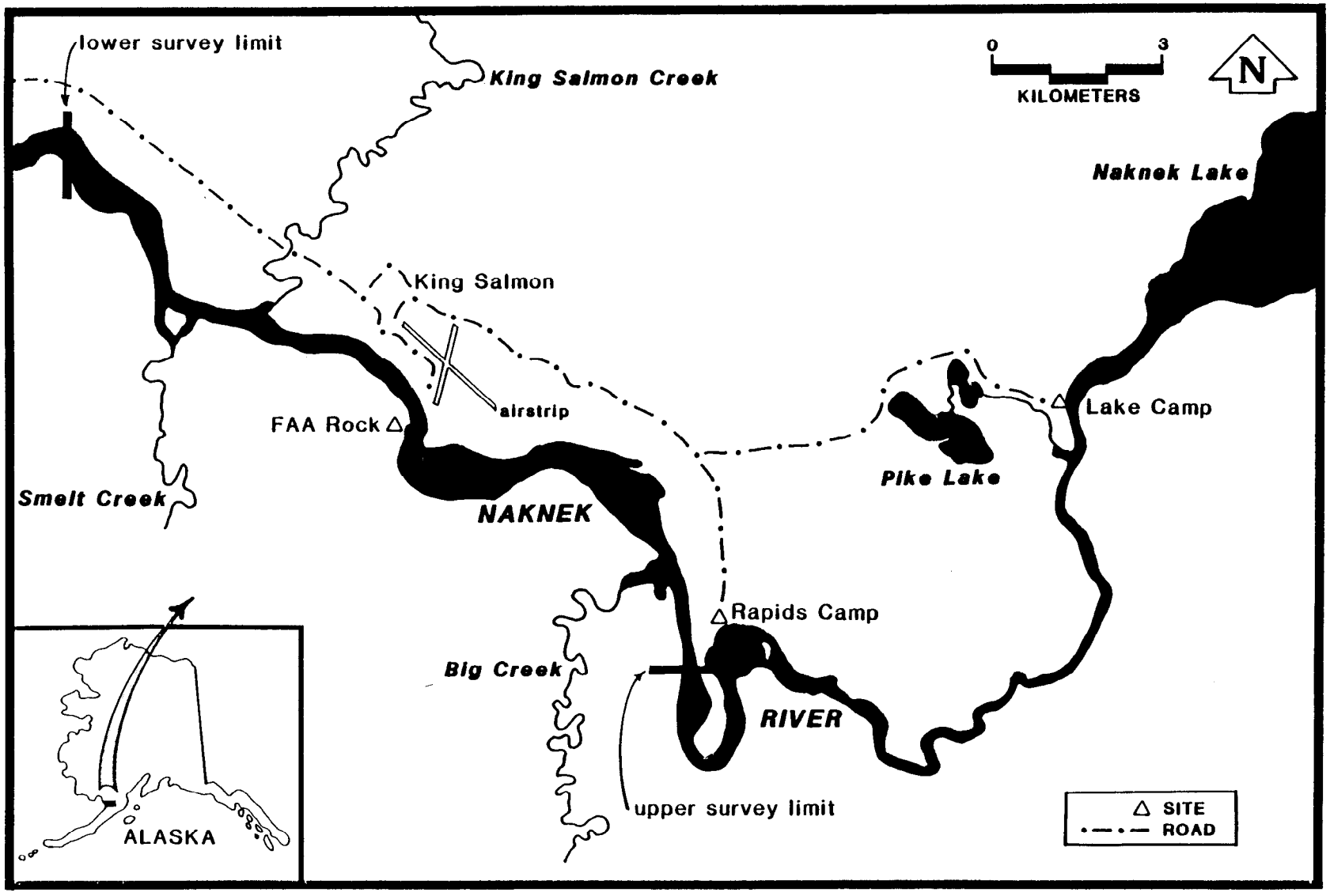

Figure 1. The Naknek River study site.

On-site surveys of the sport fishery for chinook salmon in the Naknek River were most recently conducted in 1975 (Gwartney 1976), 1978 (Gwartney 1979), 1979 (Gwartney 1980), 1986 (Minard 1987), 1987 (Minard and Brookover 1988), 1988 (Minard 1989), and 1989 (Dunaway 1990).

Initial regulations for anglers seeking chinook salmon on the Naknek River during 1990 permitted a daily bag and possession limit, from 1 May to 31 July, of three chinook salmon, only one of which could be greater than 71 cm (28 in) in length (ADFG 1990a). Beginning 8 July, Emergency Order 2-KS-5-12-90 prohibited the harvest of chinook salmon greater than 71 cm (28 inches). No chinook salmon were permitted to be retained after 31 July. Harvests of five other salmon (sockeye *O. nerka*, chum *O. keta*, coho, or pink *O. gorbuscha*) with no size limit, and two rainbow trout, 45.7 cm (18 inches) or less in length, were also allowed. Only unbaited artificial lures were permitted in the Naknek River drainage from 1 March through 14 November. Fishing was prohibited above the ADFG markers at Rapids Camp (Figure 1) from 10 April through 7 June, to protect spawning rainbow trout.

METHODS

Creel Survey

From 1 June to 31 July, the creel survey was conducted on the lower Naknek River from the confluence of Big Creek downstream to the mouth of Smelt Creek (Figure 1). The fishery in the survey area primarily targets chinook salmon during this time of year. Adult chinook salmon first enter the Naknek River in late May. The majority of the run migrates through the lower section of river during a 4 to 5 week period beginning in mid-June, and abundance peaks in early July.

A stratified three-stage random sampling design was used to estimate effort (in angler-hours) and catch and harvest rates (fish per angler-hour). A roving creel survey (Neuhold and Lu 1957) was conducted to count and interview anglers as well as sample the sport harvest. Angler counts were considered instantaneous counts and represent angler effort for the sample in which the count is conducted. Angler interviews were used to estimate catch and harvest rates. Estimates of catch and harvest are the product of the estimated effort and the estimated catch or harvest rates.

The 61-day creel survey was divided into the following six temporal components: component 1 (6/1-6/21), component 2 (6/22-6/30), component 3 (7/1-7/7), component 4 (7/8-7/14), component 5 (7/15-7/21), and component 6 (7/22-7/31). These components were selected to coincide with shifts in angling effort and are identical to those used in previous surveys. For the purpose of the 1990 survey the length of the angling day was considered to be 18 hours in length. The day was stratified into peak and non-peak periods as follows: non-peak period A 0600-0859 (3 hours), peak period B 0900-2059 (12 hours) and non-peak period C 2100-2359 (3 hours). This stratification is a product of an exploratory data analysis using 1989 data, results of which suggested that both early morning and late evening hours had less angler effort than did the middle of the day. Sampling intensity varied by temporal

component and was primarily dependent upon the amount of creel survey technician time available. Allocation of sampling effort between peak and non-peak strata was in the ratio of 3 peak days sampled to every non-peak day sampled. This allocation was based on a cursory analysis of the 1989 data in an attempt to most efficiently split resources.

During the first temporal component, (6/1-6/21), one creel survey technician was employed. Previous surveys indicate that this period represents the building phase of the fishery, and accordingly, less resources are needed to sample the fishery during this component. A total of 30 hours per 7-day week were available for creel survey work. Each sampling trip consisted of a 3-hour shift, and the survey technician was responsible for two shifts per sampling day. A total of 15 count-interview combinations were allocated between peak and non-peak strata during temporal component 1. Twelve days were randomly selected without replacement from the 21 available for sampling the peak stratum. For each of the 12 days selected for sampling the peak stratum, two of the possible four periods were selected at random without replacement.

Following the selection of days to sample the peak stratum, and the random selection of periods, 3 more days were randomly selected from the remaining days within component 1 for sampling the non-peak stratum. Since sampling of days for the non-peak stratum was constrained to be from days remaining after selection for the peak stratum, then we expected that estimates would be biased by an unknown amount for this stratum (i.e., first temporal component/non-peak stratum). Since we expected minimal amounts of angling effort, catch, or harvest to occur during the non-peak stratum, then the effect of this bias should have been minimal for total estimates (i.e., peak and non-peak stratum combined).

Sampling of periods for the non-peak stratum for the selected days amounted to a census of the periods since only two 3-hour periods existed per day.

During the remaining temporal components, a second survey technician was assigned to the project and sampling intensity was increased. For the 7-day temporal components two through five, sampling was increased to 42 hours, or 14, 3-hour sampling shifts. Allocation of sample units followed the 3 to 1 split between peak and non-peak strata, equating to 10 sampling trips allocated to peak strata and the remaining four allotted to the non-peak periods. As was the case with the first temporal component, sampling of the non-peak strata for a given day was a census of those periods. With two survey technicians, the study was not limited to sampling one stratum per day, therefore, days to sample were selected independently for both the peak and non-peak time of day strata. The selection of periods for sampling were as follows: for the peak stratum, 5 of the 7 days available in a given temporal component were randomly selected without replacement for sampling. Following the selection of days in which peak periods were to be sampled, two of the four possible periods were randomly selected. Two days for sampling the non-peak stratum were also randomly selected without replacement, and both of the available non-peak periods (early and late) were sampled (censused) for each day selected. The selection of whole-hour start time for initiating angler-counts was also a product of random selection (counts take 1 hour to conduct).

For each sample period selected, peak or non-peak, one of the three whole-hour start times was selected independently. Since only one count per period was conducted, we could not estimate within-period variance and, as such, estimates of total sampling variance were expected to be negatively biased.

The sampling days, periods, and starting times in the 10-day temporal component 6 (7/22 to 7/31), were picked in the same proportions and in the same manner as in components 2 through 5. A total of 7 peak stratum-days in component 6 were sampled, whereas 3 non-peak days were sampled during this component.

Sampling consisted of angler counts, obtaining CPUE and harvest per unit effort (HPUE) information from anglers who had completed fishing (completed-trip interviews), and collecting age, weight, and length information from harvested fishes. As noted above, 1 hour of each 3-hour period was devoted to counting anglers. During the remaining 2 hours, completed-trip information was collected from anglers exiting the fishery. Since we did not necessarily interview all anglers with equal probability during the entire 3-hour period, our estimates are biased by an unknown amount. We anticipated this bias to be rather minor as catch and harvest rates would not be expected to vary significantly within a 3-hour time period.

Angler effort, catch, and harvest, their associated variances, and standard errors were estimated for the creel survey using the following procedures. A random estimator was used to estimate angler effort on a sample by sample basis. Catch and harvest estimates for each sample were obtained by a ratio estimator which was computed by combining the estimated effort (for the sample) with estimates of catch per unit effort (CPUE) and harvest per unit effort (HPUE) obtained from the angler interviews. The CPUE and HPUE estimates were obtained by the jackknife estimation approach (Efron 1982). The jackknife approach for estimating CPUE and HPUE was used since most other estimators are known to be biased (for use as ratio estimators, i.e., for expansion), and the jackknife estimate has been shown to be less biased and procedures exist for correcting some of this bias (as noted below) (see Cochran 1977, section 6.15, pages 174-177; and Smith 1980).

The following equations were not used to obtain estimates of CPUE or HPUE (and their variances) to describe individual angler catch or harvest rates. The CPUE and HPUE estimates presented here are only appropriate for expansion purposes (i.e., as used in a ratio estimation procedure).

The individual sample estimates of effort, catch, and harvest were then used in a stratified three-stage estimation approach to obtain total estimates, both within strata and across strata, as noted below.

The first step involved obtaining the jackknife estimated sample mean of CPUE (or HPUE) as follows:

$\overset{*}{CPUE}_{hijk}$ = the jackknifed CPUE for angler k in sample j within day i and stratum h;

$$= \frac{\sum_{\substack{o=1 \\ o \neq k}}^{m_{hij}} c_{hijo}}{\sum_{\substack{o=1 \\ o \neq k}}^{m_{hij}} e_{hijo}}; \qquad (1)$$

where:

m_{hij} = the number of anglers interviewed within sampled period during each sampled day;

c_{hijo} = the catch of each angler interviewed, and

e_{hijo} = the angling effort (in hours) of each angler interviewed.

The jackknife mean CPUE for sample j within day i and stratum h was then obtained as:

$$\overline{\overset{*}{CPUE}}_{hij} = \frac{\sum_{k=1}^{m_{hij}} \overset{*}{CPUE}_{hijk}}{m_{hij}}. \qquad (2)$$

Then the bias correction (adapted from Efron 1982, equation 2.8, page 6) was performed:

$$\overline{\overset{*\dagger}{CPUE}}_{hij} = [m_{hij} (\overline{CPUE}_{hij} - \overline{\overset{*}{CPUE}}_{hij})] + [\overline{\overset{*}{CPUE}}_{hij}]; \qquad (3)^1$$

where:

$$\overline{CPUE}_{hij} = \frac{\sum_{o=1}^{m_{hij}} c_{hijo}}{\sum_{o=1}^{m_{hij}} e_{hijo}}. \qquad (4)$$

---

[1] Note that if the bias correction, equation 3, resulted in a negative value, then the uncorrected version, equation 2, was used in all following equations.

The bias-corrected jackknife mean was then expanded by the estimated angler effort for the sample to obtain the estimated catch for each sample period within each sampled day:

$$\hat{C}_{hij} = \hat{E}_{hij} \overline{CPUE}_{hij}^{*\dagger}; \quad (5)$$

where:

$\hat{E}_{hij}$ = estimated angler effort (in hours) for each sample period;

$$= H_{hij}\, x_{hij}; \quad (6)$$

H_{hij} = number of hours in sampling period j within day i and stratum h; and

x_{hij} = the number of anglers counted fishing during each sample.

The harvest for the sample was estimated similarly by substituting the appropriate harvest statistics into equations 1 to 5, above.

Estimates of angler effort, catch, and harvest for each day sampled were obtained as follows:

$\bar{\hat{Y}}_{hi}$ = mean of the sample estimates for each sampled day; in which Y represents E, C, or H for effort, catch, and harvest, respectively;

$$= \frac{\sum_{j=1}^{Phi} \hat{Y}_{hij}}{Phi}; \quad (7)$$

where:

p_{hi} = number of periods sampled within each sampled day; and

$\hat{Y}_{hij}$ = estimated sample value for effort (E, as obtained from equation 6, above), catch or harvest (C or H, as obtained from equation 5, above).

The estimated daily effort, catch, and harvest were obtained by expanding the number of sampling periods in the day:

$$\hat{Y}_{hi} = P_{hi}\, \bar{\hat{Y}}_{hi}; \quad (8)$$

where:

P_{hi} = the number of possible sampling periods within each day i for stratum h.

Similarly, we obtained estimates for each sampling stratum as follows:

$\bar{\hat{Y}}_h$ = mean of the daily estimates for stratum h; in which Y represents E, C, or H for effort, catch, and harvest, respectively;

$$= \frac{\sum_{i=1}^{d_h} \hat{Y}_{hi}}{d_h}; \tag{9}$$

where:

d_h = the number of days sampled within each stratum.

The estimated stratum effort, catch, and harvest were obtained by expanding the number of days in each stratum:

$$\hat{Y}_h = D_h \bar{\hat{Y}}_h; \tag{10}$$

where:

D_h = the number of days within each stratum.

The variance of the estimated catch for stratum h was obtained by the three-stage variance equation (following the approach outlined by Cochran 1977), omitting the finite population correction factor (FPC) for the third stage units:

$$\begin{aligned} \hat{V}[\hat{C}_h] = & \left[(1 - f_{1h}) D_h^2 \frac{S_{1h}^2}{d_h} \right] \\ & + \left[f_{1h} \frac{D_h^2}{d_h^2} \sum_{i=1}^{d_h} (1 - f_{2hi}) P_{hi}^2 \frac{S_{2hi}^2}{p_{hi}} \right] \\ & + \left[f_{1h} \frac{D_h^2}{d_h^2} \sum_{i=1}^{d_h} f_{2hi} \frac{P_{hi}^2}{p_{hi}^2} \sum_{j=1}^{p_{hi}} \hat{V}[\hat{C}_{hij}] \right]; \end{aligned} \tag{11}$$

where:

f_{1h} = the sampling fraction for days (i.e., d_h / D_h);

f_{2hi} = the sampling fraction for periods within each day (i.e., p_{hi} / P_{hi});

s^2_{1h} = the among day variance for the total angler catch estimate over all days sampled in each;

$$= \frac{\sum_{i=1}^{d_h} (\hat{C}_{hi} - \bar{\hat{C}}_h)^2}{d_h - 1}; \quad (12)$$

s^2_{2hi} = the among period variance for sampled day;

$$= \frac{\sum_{j=1}^{P_{hi}} (\hat{C}_{hij} - \bar{\hat{C}}_{hi})^2}{p_{hi} - 1}; \quad (13)$$

$\hat{V}[\hat{C}_{hij}]$ = the within period variance for the estimated sample catch for each sample period, obtained by treating the first term on the right hand side of equation 5 as a constant[2] and as such, we approximated the variance by using the equation for a product of a constant and an estimate (Kish 1965, equation 2.8.5, page 60);

$$\approx \hat{E}^2_{hij}\, s^{*2}_{3hij} \text{ ; and} \quad (14)$$

s^{*2}_{3hij} = jackknife estimate of the variance for the jackknifed sample mean CPUE (adapted from Efron 1982, equation 3.2, page 13);

$$= \frac{(m_{hij} - 1)}{m_{hij}} \sum_{k=1}^{m_{hij}} (CPUE^*_{hijk} - \overline{CPUE}^*_{hij})^2 . \quad (15)$$

Variance estimates for the estimated harvest were obtained by replacing the appropriate harvest statistics (h's and H's) for the catch statistics (c's and C's) in equations 11 through 17.

---

[2] Only one angler count was conducted within each sampled period.

Stratum estimates of the variance of the angler effort were obtained in a similar manner to those for catch and harvest. The primary difference occurred in the absence of the third major term in equation 11, since we could not estimate the within period component of variance for angler effort, and accordingly our variance estimate was only approximate and assumed to be negatively biased:

$$\hat{V}[\hat{E}_h] \approx \left\{ (1 - f_{1h})\, D_h^2\, \frac{s_{1h}^2}{d_h} \right\} + \left\{ f_{1h}\, \frac{D_h^2}{d_h^2} \sum_{i=1}^{d_h} (1 - f_{2hi})\, P_{hi}^2\, \frac{s_{2hi}^2}{p_{hi}} \right\} \qquad (16)$$

The values for the terms in equation 16 were obtained by replacing the catch statistics (C's) by the appropriate effort statistics (E's), in equations 12 and 13.

Total angler effort, catch, or harvest across all strata and the associated variances were calculated by summing statistics across strata.

Since our estimates of angler effort, catch, and harvest are estimates of totals, then standard errors (SE's) were obtained by taking the square root of the associated variances.

Catch per unit effort (CPUE) of anglers participating in the 1990 lower Naknek chinook salmon fishery were estimated by the procedures noted below. The estimates obtained by these procedures are reflective of the individual rates experienced by anglers rather than the rates obtained by the harvest and effort estimation procedures (i.e., the jackknifed CPUE's and HPUE's used for expansion purposes)[3].

The estimates of CPUE were weighted by sample weights. This weighting procedure ensures that each angler's CPUE information is proportional to the angler effort at the time of the sample. The weighted CPUE for each angler was obtained as follows:

$$CPUE'_{hijo} = w_{hij}\, \frac{c_{hijo}}{e_{hijo}}\ ; \qquad (17)$$

where:

w_{hij} = sample weight for sample j within day i and stratum h;

[3] As obtained by equation 2 or 3, above.

$$= \frac{x_{hij}}{\bar{x}_{hi}} ; \quad (18)$$

$\bar{x}_{hi}$ = mean angler count for day i within stratum h;

$$= \frac{\sum_{j=1}^{p_{hi}} x_{hij}}{p_{hi}} ; \text{ and} \quad (19)$$

x_{hij}, c_{hijo}, e_{hijo}, and d_h are as defined above.

The weighted mean CPUE was estimated for each sample as:

$$\overline{CPUE}'_{hij} = \frac{\sum_{o=1}^{m_{hij}} CPUE'_{hijo}}{m_{hij}} ; \quad (20)$$

where:

m_{hij} is as defined above.

The daily estimates of CPUE were obtained as a mean of mean weighted CPUE:

$$\overline{\overline{CPUE}}_{hi} = \frac{\sum_{j=1}^{p_{hi}} \overline{CPUE}'_{hij}}{p_{hi}} . \quad (21)$$

The stratum estimates of CPUE were then obtained as a mean of the daily mean weighted CPUE:

$$\hat{CPUE}_h = \frac{\sum_{i=1}^{d_h} \overline{\overline{CPUE}}_{hi}}{d_h} . \quad (22)$$

To obtain estimates of mean CPUE across all strata, or select combinations of strata, we weighted the individual stratum estimates of CPUE by the relative size of each stratum in terms of the estimated number of angler-trips (following the procedures explained in Cochran 1977, Equation 10.45, page 288), as follows:

$$\hat{CPUE} = \sum_{h=1}^{s} \hat{W}_h \hat{CPUE}_h ; \quad (23)$$

where:

s = number of strata to be combined;

$\hat{W}_h$ = estimated relative stratum weight of stratum h;

$$= \frac{\hat{A}_h}{\hat{A}} ; \qquad (24)$$

$\hat{A}_h$ = estimated number of anglers participating in the fishery within stratum h, which was obtained from the ratio of the angler effort estimate to the weighted mean effort expended by interviewed anglers who had completed their trips;

$$= \frac{\hat{E}_h}{\bar{\bar{e}}'_h} ; \qquad (25)$$

$\hat{E}_h$ = angler effort estimate (in angler-hours) obtained by the procedures outlined above (see equation 10);

$\bar{\bar{e}}'_h$ = mean of means weighted angler effort for completed-trip anglers interviewed within stratum h;

$$= \frac{\sum_{i=1}^{d_h} e'_{hi}}{d_h} ; \qquad (26)$$

$$\bar{e}'_{hi} = \frac{\sum_{j=1}^{p_{hi}} \bar{e}'_{hij}}{p_{hi}} ; \qquad (27)$$

$$\bar{e}'_{hij} = \frac{\sum_{o=1}^{m_{hij}} e'_{hijo}}{m_{hij}} ; \qquad (28)$$

$$e'_{hijo} = w_{hij}\, e_{hijo} ; \text{ and} \qquad (29)$$

$\hat{A}$ = the sum of the total estimated number of anglers participating in the fishery across all strata.

The variance of the across stratum CPUE estimate was obtained by treating the estimated stratum weights as if they were constants (see Kish 1965, equations 2.8.5 and 2.8.7, pages 60 and 61); accordingly, our variance estimate is only approximate:

$$\hat{V}[\hat{CPUE}] \approx \sum_{h=1}^{s} \hat{W}_h^2 \, \hat{V}[\hat{CPUE}_h] \; ; \tag{30}$$

where:

$\hat{V}[\hat{CPUE}_h]$ = estimated variance of the stratum estimates of the stratum estimate for CPUE, which was obtained by the usual three-stage equation (see Cochran 1977, equation 10.36, page 287), omitting the FPC factor for the third stage units (i.e., the anglers interviewed):

$$= \left[(1 - f_{1h}) \frac{s_{1h}^2}{d_h} \right] + \left[\frac{f_{1h}}{d_h^2} \sum_{i=1}^{d_h} (1 - f_{2hi}) \frac{s_{2hi}^2}{p_{hi}} \right] + \left[\frac{f_{1h}}{d_h^2} \sum_{i=1}^{d_h} \frac{f_{2hi}}{p_{hi}^2} \sum_{j=1}^{P_{hi}} \frac{s_{3hij}^2}{m_{hij}} \right] \tag{31}$$

f_{1h} and f_{2hi} are as defined above;

s_{1h}^2 = among day variance for the weighted CPUE;

$$= \frac{\sum_{i=1}^{d_h} (\overline{CPUE}_{hi}' - \hat{CPUE}_h')^2}{d_h - 1} \; ; \tag{32}$$

s_{2hi}^2 = among sample variance for the weighted CPUE;

$$= \frac{\sum_{j=1}^{P_{hi}} (\overline{CPUE}_{hij}' - \overline{CPUE}_{hi}')^2}{P_{hi} - 1} \; ; \text{ and} \tag{33}$$

s^2_{3hij} = among angler variance for the weighted CPUE;

$$= \frac{\sum_{o=1}^{m_{hij}} (CPUE'_{hijo} - \overline{CPUE}'_{hij})^2}{m_{hij} - 1} . \quad (34)$$

Standard errors were obtained by taking the square roots of the variance estimates.

The assumptions necessary for unbiased point and variance estimates of angler effort, catch, harvest, and CPUE obtained by the procedures outlined above are:

1. interviewed anglers accurately reported their hours of fishing effort and the number of fish by species released;

2. interviewed anglers were representative of the total angler population;

3. no significant fishing effort occurred during the hours not included in the fishing day;

4. no significant fishing effort occurred in areas not covered by the survey; and

5. catch rate and duration of fishing trip are independent (DiConstanzo 1956).

Spawning Escapement Surveys

The numbers of spawning chinook salmon of all sizes in the Naknek River drainage were estimated from aerial counts conducted from fixed wing aircraft. No accounting was made for fish that had already spawned and left the system or for fish that were undetectable or had not yet arrived.

Size, Sex, and Age Sampling

Sport harvested chinook salmon encountered during the angler interview portion of the creel survey were measured to the nearest millimeter for mid-eye to fork-of-tail length, weighed to the nearest 10 grams, and sexed based on external characteristics. In addition, three scales were removed from the preferred area[4] and mounted on an adhesive-coated card. Adhesive-coated cards

[4] The left side of the fish approximately two rows above the lateral line and on the diagonal row downward from the posterior insertion of the dorsal fin as used on sockeye salmon by Clutter and Whitesel (1956).

were later thermohydraulically pressed against acetate cards and the resulting scale impressions were displayed on a microfiche projector for age determination[5].

The sample size required for the precision levels was determined during the planning phases of this project and were adjusted for a scale regeneration rate and the finite population correction factor for the projected harvest. The sample size goal for the Naknek River fishery was 410 fish based on an expected harvest of approximately 5,000 fish. The sample size was obtained by following the procedures outlined in Thompson (1987) for estimating multinomial proportions (i.e., proportions of fish in different age or length categories by sex). For a relative precision of ± 5% and an α level of 0.10, Thompson gives the goal sample size of 403. The adjusted sample size was obtained by first adjusting for the FPC factor (using the approach suggested by Cochran 1977, equation 4.3, page 76), and then discounting for a scale regeneration rate of approximately 10%.

Chinook salmon escapements into the Naknek River drainage were to be sampled for size, sex, and age information during the second and third weeks of August. The carcasses of chinook salmon found in the spawning areas of Big Creek and the mainstem of the Naknek River were to be sampled in the same manner as fish harvested in the sport fishery.

Estimates of mean (and associated standard error) length and weight by age group of chinook salmon sampled from the sport harvest were calculated using the procedures outlined by Sokal and Rohlf (1981, Boxes 4.2 and 7.1, pages 56 and 139). Note, that although the harvest is sampled by a stratified multistage approach, we will treat our samples of fish lengths as if collected by a simple random sampling program within each temporal component (i.e., combining non-peak and peak sampled fish). Accordingly, both our estimates of mean length and its standard error are biased by an unknown amount. We assume that length at age does not vary substantially from stage to stage or stratum to stratum within each temporal component, and as such feel that the magnitude of this bias will be small.

Each proportion was calculated according to the following equations:

$\hat{p}_{ut}$ = estimated proportion of the sampled chinook salmon harvested that are age u within temporal component t;

$$= \frac{n_{ut}}{n_t}; \qquad (35)$$

---

[5] For salmon, the numeral preceding the decimal is the number of freshwater annuli, whereas the numeral following the decimal is the number of marine annuli (European method). Total age from brood year is the sum of the two numerals plus one.

where:

n_{ut} = the number of the sampled chinook salmon harvested that are age u; and

n_t = the number of chinook salmon harvested within each temporal component that were subsampled for lengths.

The estimated proportion by age class (across all strata) was then obtained as follows:

$$\hat{P}_u = \sum_{t=1}^{T} \hat{W}_t \hat{P}_{uh} \qquad (36)$$

where:

T = the number of temporal components;

$\hat{W}_t$ = estimated "stratum" weight (relative size of harvest in each temporal component compared to all other temporal components);

$$= \frac{\hat{H}_t}{\hat{H}}; \qquad (37)$$

$\hat{H}_t$ = estimated harvest of chinook salmon in each temporal component; and

$\hat{H}$ = total harvest of all chinook salmon in the fishery.

The variance of the estimate of p_u was obtained by viewing equation 36, above, as a product of a random variable and a constant, that is, treating the weights as constants. Since we must estimate the size of the harvest in each stratum, then our variance estimates are biased as the weights themselves are estimates. However, the form of the variance for equation 40 is "intractable" and this bias is not currently addressable. As such, the estimated variance was obtained approximately by (see Kish 1965, equation 2.8.5, page 60):

$$\hat{V}[\hat{p}_u] \approx \sum_{t=1}^{T} \hat{W}_t^2 \hat{V}[\hat{p}_{ut}] \; ; \qquad (38)$$

where:

$\hat{V}[\hat{p}_{ut}]$ = estimated variance of the estimated proportion of age class u fish in each temporal component, obtained approximately by the standard equation for the variance of a binomial proportion (Cochran 1977, equation 3.8, page 52):

$$\approx \left(1 - \frac{n_t}{\hat{H}_t}\right) \frac{\hat{p}_{ut}\,(1 - \hat{p}_{ut})}{n_t - 1} . \qquad (39)$$

RESULTS

Creel Statistics

The creel survey on the lower Naknek River was conducted from 1 June to 31 July 1990. Total effort in the lower river was estimated to be 39,653 angler-hours (SE = 2,186), with about 52% of the effort occurring during the month of July (Table 1 and Appendix A1). Analysis of 1,266 completed-trip interviews indicated that the catch rate for chinook salmon was highest in component 2 (6/22-6/30) (Table 2 and Appendix A2). An estimated 4,265 chinook salmon (SE = 528) were caught (landed) in the study area, of which 3,250 (SE = 434) (76%) were harvested (Table 3).

A large portion (29%) of the angler effort was expended during the 22-30 June 1990 temporal component (Table 1). During this period, 32% of the chinook salmon catch and 40% of the harvest occurred (Table 3). Correspondingly, catch rates peaked during this temporal component (Table 2).

Anglers are estimated to have also caught 478, and kept 474, chum salmon (Table 4 and Appendix A3). Anglers caught an estimated 411 pink salmon of which they kept 225 or 55% (Table 5 and Appendix A4). During the study period, the catch of rainbow trout was estimated to be 537 fish with only 73 fish or 8% being retained (Table 6 and Appendix A5). The study did not include some of the best months for rainbow trout or coho salmon angling. Hence the estimates for the rainbow trout fishery must be considered incomplete. No significant catch of coho salmon had been recorded by the end of the survey on 31 July.

Spawning Escapement

To get an early indication of run strength, an aerial survey was conducted on 2 July. The survey found very few fish in King Salmon Creek or Big Creek, and almost no fish were seen in the mainstem of the Naknek River.

Aerial surveys of the Naknek River drainage chinook salmon spawning areas conducted on 6 August (the customary period for spawning surveys) counted an escapement of 6,900 fish (Table 7). Approximately 4,500 fish (65%) were

Table 1. Estimated effort (angler-hours) by temporal component, for the sport fishery in the lower Naknek River, 1 June to 31 July 1990.

Temporal Component and Date	Stratum[a]	Days Sampled	Estimated Angler-Hours	SE	95% Confidence Interval		RP[b]
					Lower	Upper	
1	N	3	1,386.00	542.0	323.78 -	2,448.22	76.6%
(6/1-6/21)	P	12	6,237.00	628.2	5,005.83 -	7,468.17	19.7%
	ALL		7,623.00	829.6	5,996.94 -	9,249.06	21.3%
2	N	2	1,620.00	976.3	0.00 -	3,533.51	118.1%
(6/22-6/30)	P	5	9,860.40	1,257.6	7,395.46 -	12,325.34	25.0%
	ALL		11,480.40	1,592.1	8,359.91 -	14,600.89	27.2%
3	N	2	1,638.00	124.2	1,394.49 -	1,881.51	14.9%
(7/1-7/7)	P	5	5,754.00	929.3	3,932.59 -	7,575.41	31.7%
	ALL		7,392.00	937.6	5,554.39 -	9,229.61	24.9%
4	N	2	808.50	168.6	478.03 -	1,138.97	40.9%
(7/8-7/14)	P	5	4,267.20	507.5	3,272.56 -	5,261.84	23.3%
	ALL		5,075.70	534.8	4,027.60 -	6,123.80	20.6%
5	N	2	430.50	115.4	204.39 -	656.61	52.5%
(7/15-7/21)	P	5	3,864.00	534.2	2,816.98 -	4,911.02	27.1%
	ALL		4,294.50	546.5	3,223.34 -	5,365.66	24.9%
6	N	3	350.00	155.0	46.29 -	653.71	86.8%
(7/22-7/31)	P	7	3,437.14	261.1	2,925.46 -	3,948.82	14.9%
	ALL		3,787.14	303.6	3,192.11 -	4,382.17	15.7%
SEASON TOTAL							
	N	14	6,233.00	1,152.4	3,974.30 -	8,491.70	36.2%
	P	39	33,419.74	1,857.6	29,778.77 -	37,060.71	10.9%
	ALL		39,652.74	2,186.1	35,368.08 -	43,937.40	10.8%

[a] Stratum: N = Nonpeak; period A (0600-0859)
period F (2100-2359)
P = Peak; period B (0900-1159), period C (1200-1459), period D (1500-1759), period E (1800-2059)

[b] RP = Relative precision; ((1.96*SE)/POINT EST.)*100) WHERE ALPHA = 0.05.

Table 2. Catch per unit effort as an indicator of angler success for anglers in the chinook salmon sport fishery in the lower Naknek River, 1 June to 31 July 1990.

Temporal Component	CPUE[a]	Standard Error	95% Confidence Interval	
			Lower	Upper
1 (6/1-6/21)	0.07691	0.0	0.02684	- 0.12699
2 (6/22-6/30)	0.18899	0.0	0.10934	- 0.26864
3 (7/1-7/7)	0.12401	0.0	0.08643	- 0.16160
4 (7/8-7/14)	0.14338	0.0	0.05149	- 0.23527
5 (7/15-7/21)	0.10844	0.0	0.05945	- 0.15742
6 (7/22-7/31)	0.07173	0.0	0.03738	- 0.10609
All	0.1270	0.0	0.09773	- 0.15617

[a] Catch per unit effort.

Table 3. Estimated catch and harvest of chinook salmon by the sport fishery in the lower Naknek River, 1 June to 31 July 1990.

Temporal Component and Date	STR.[b]	Catch[a] Number	SE	95% Confidence Interval Lower	Upper	RP[c]	Harvest Number	SE	95% Confidence Interval Lower	Upper	RP[c]	Percent of Catch Harvested
1	N	52	48.4	0 -	147	183.5%	52	48.4	0 -	147	183.5%	100%
(6/1-6/21)	P	603	200.2	211 -	996	65.1%	599	199.8	207 -	990	65.4%	99%
	ALL	655	206.0	251 -	1,059	61.6%	650	205.6	247 -	1,053	62.0%	99%
2	N	132	22.5	88 -	176	33.3%	119	12.4	95 -	144	20.4%	90%
(6/22-6/30)	P	1,241	395.3	466 -	2,015	62.5%	1,165	326.3	525 -	1,804	54.9%	94%
	ALL	1,373	396.0	597 -	2,149	56.5%	1,284	326.6	644 -	1,924	49.9%	94%
3	N	148	36.8	76 -	220	48.6%	148	36.8	76 -	220	48.6%	100%
(7/1-7/7)	P	753	184.4	392 -	1,115	48.0%	715	172.4	378 -	1,053	47.2%	95%
	ALL	901	188.1	533 -	1,270	40.9%	864	176.3	518 -	1,209	40.0%	96%
4	N	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
(7/8-7/14)	P	484	131.2	227 -	741	53.1%	138	38.6	62 -	213	54.8%	28%
	ALL	484	131.2	227 -	741	53.1%	138	38.6	62 -	213	54.8%	28%
5	N	39	10.4	19 -	59	52.3%	7	6.4	0 -	20	172.4%	19%
(7/15-7/21)	P	454	126.2	207 -	702	54.5%	173	68.8	38 -	308	78.1%	38%
	ALL	493	126.7	245 -	741	50.4%	180	69.1	44 -	315	75.3%	36%
6	N	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
(7/22-7/31)	P	359	105.1	153 -	565	57.4%	134	49.2	38 -	231	71.7%	37%
	ALL	359	105.1	153 -	565	57.4%	134	49.2	38 -	231	71.7%	37%
SEASON	N	371	65.7	243 -	500	34.7%	327	62.4	204 -	449	37.4%	88%
TOTAL	P	3,894	524.0	2,866 -	4,921	26.4%	2,924	429.9	2,081 -	3,766	28.8%	75%
	ALL	4,265	528.1	3,230 -	5,300	24.3%	3,250	434.4	2,399 -	4,102	26.2%	76%

[a] Catch = total fish kept + total fish released.

[b] Stratum: N = Nonpeak; period A (0600-0859) and period F (2100-2359)
P = Peak; period B (0900-1159), period C (1200-1459), period D (1500-1759), period E (1800-2059)

[c] RP = Relative precision; ((1.96*SE)/POINT EST.)*100 where alpha = 0.05.

Table 4. Estimated catch and harvest of chum salmon by the sport fishery in the lower Naknek River, 1 June to 31 July 1990.

Temporal Component and Date	STR.[b]	Catch[a] Number	SE	95% Confidence Interval Lower	Upper	RP[c]	Harvest Number	SE	95% Confidence Interval Lower	Upper	RP[c]	Percent of Catch Harvested
1	N	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
(6/1-6/21)	P	12	7.8	0 -	27	127.3%	12	7.8	0 -	27	127.3%	100%
	ALL	12	7.8	0 -	27	127.3%	12	7.8	0 -	27	127.3%	100%
2	N	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
(6/22-6/30)	P	87	38.0	12 -	161	86.2%	87	38.0	12 -	161	86.2%	100%
	ALL	87	38.0	12 -	161	86.2%	87	38.0	12 -	161	86.2%	100%
3	N	11	10.6	0 -	31	196.9%	11	10.6	0 -	31	196.9%	100%
(7/1-7/7)	P	57	27.0	4 -	110	93.3%	53	27.4	0 -	106	101.7%	93%
	ALL	67	29.0	10 -	124	84.5%	63	29.3	6 -	121	90.9%	94%
4	N	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
(7/8-7/14)	P	41	20.1	2 -	81	95.5%	41	20.1	2 -	81	95.5%	100%
	ALL	41	20.1	2 -	81	95.5%	41	20.1	2 -	81	95.5%	100%
5	N	12	3.7	5 -	19	60.9%	12	3.7	5 -	19	60.9%	100%
(7/15-7/21)	P	17	16.3	0 -	49	193.0%	17	16.3	0 -	49	193.0%	100%
	ALL	29	16.7	0 -	61	114.9%	29	16.7	0 -	61	114.9%	100%
6	N	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
(7/22-7/31)	P	242	17.4	208 -	276	14.1%	242	17.4	208 -	276	14.1%	100%
	ALL	242	17.4	208 -	276	14.1%	242	17.4	208 -	276	14.1%	100%
SEASON	N	23	11.2	1 -	45	97.8%	23	11.2	1 -	45	97.8%	100%
TOTAL	P	455	56.7	344 -	567	24.4%	451	56.8	340 -	563	24.7%	99%
	ALL	478	57.8	365 -	591	23.7%	474	57.9	360 -	587	24.0%	99%

[a] Catch = total fish kept + total fish released.

[b] Stratum: N = Nonpeak; period A (0600-0859) and period F (2100-2359)
P = Peak; period B (0900-1159), period C (1200-1459), period D (1500 1759), period E (1800-2059)

[c] RP = Relative precision; ((1.96*SE)/POINT EST.)*100 where alpha = 0.05.

Table 5. Estimated catch and harvest of pink salmon by the sport fishery in the lower Naknek River, 1 June to 31 July 1990.

Temporal Component and Date	STR.[b]	Catch[a] Number	SE	95% Confidence Interval Lower	Upper	RP[c]	Harvest Number	SE	95% Confidence Interval Lower	Upper	RP[c]	Percent of Catch Harvested
1	N	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
(6/1-6/21)	P	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
	ALL	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
2	N	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
(6/22-6/30)	P	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
	ALL	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
3	N	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
(7/1-7/7)	P	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
	ALL	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
4	N	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
(7/8-7/14)	P	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
	ALL	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
5	N	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
(7/15-7/21)	P	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
	ALL	0	0.0	0 -	0	0	0	0.0	0 -	0	0	0
6	N	160	143.5	0 -	441	175.8%	80	71.7	0 -	221	175.7%	50%
(7/22-7/31)	P	251	126.2	4 -	498	98.5%	145	70.1	7 -	282	95.1%	58%
	ALL	411	191.1	36 -	786	91.1%	225	100.3	28 -	421	87.5%	55%
SEASON	N	160	143.5	0 -	441	175.8%	80	71.7	0 -	221	175.7%	50%
TOTAL	P	251	126.2	4 -	498	98.5%	145	70.1	7 -	282	95.1%	58%
	ALL	411	191.1	36 -	786	91.1%	225	100.3	28 -	421	87.5%	55%

[a] Catch = total fish kept + total fish released.
[b] Stratum: N = Nonpeak; period A (0600-0859) and period F (2100-2359)
P = Peak; period B (0900-1159), period C (1200-1459), period D (1500-1759), period E (1800-2059)
[c] RP = Relative precision; ((1.96*SE)/POINT EST.)*100 where alpha = 0.05.

Table 6. Estimated catch and harvest of rainbow trout by the sport fishery in the lower Naknek River, 1 June to 31 July 1990.

Temporal Component and Date	STR.[b]	Catch[a] Number	SE	95% Confidence Interval Lower	Upper	RP[c]	Harvest Number	SE	95% Confidence Interval Lower	Upper	RP[c]	Percent of Catch Harvested
1	N	0	0.0	0	0	0	0	0.0	0	0	0	0
(6/1-6/21)	P	73	26.5	21	125	71.5%	14	9.0	0	31	128.3%	19%
	ALL	73	26.5	21	125	71.5%	14	9.0	0	31	128.3%	19%
2	N	6	5.8	0	17	186.7%	0	0.0	0	0	0	0%
(6/22-6/30)	P	0	0.0	0	0	0	0	0.0	0	0	0	0
	ALL	6	5.8	0	17	186.7%	0	0.0	0	0	0	0%
3	N	0	0.0	0	0	0	0	0.0	0	0	0	0
(7/1-7/7)	P	21	12.7	0	46	120.1%	9	6.8	0	23	141.9%	46%
	ALL	21	12.7	0	46	120.1%	9	6.8	0	23	141.9%	46%
4	N	0	0.0	0	0	0	0	0.0	0	0	0	0
(7/8-7/14)	P	174	31.5	112	236	35.6%	6	5.6	0	17	177.3%	4%
	ALL	174	31.5	112	236	35.6%	6	5.6	0	17	177.3%	4%
5	N	7	8.0	0	23	218.6%	0	0.0	0	0	0	0%
(7/15-7/21)	P	121	21.1	80	162	34.1%	4	2.9	0	10	135.1%	3%
	ALL	128	22.6	84	172	34.5%	4	2.9	0	10	135.1%	3%
6	N	0	0.0	0	0	0	0	0.0	0	0	0	0
(7/22-7/31)	P	136	8.6	119	152	12.4%	39	6.8	26	53	33.6%	29%
	ALL	136	8.6	119	152	12.4%	39	6.8	26	53	33.6%	29%
SEASON	N	13	9.9	0	33	146.3%	0	0.0	0	0	0	0%
TOTAL	P	524	48.8	428	619	18.2%	73	14.6	44	102	39.2%	14%
	ALL	537	49.8	439	634	18.2%	73	14.6	44	102	39.2%	14%

[a] Catch = total fish kept + total fish released.

[b] Stratum: N = Nonpeak; period A (0600-0859) and period F (2100-2359)
P = Peak; period B (0900-1159), period C (1200-1459), period D (1500-1759), period E (1800-2059)

[c] RP = Relative precision; ((1.96*SE)/POINT EST.)*100 where alpha = 0.05.

Table 7. Aerial escapement counts of chinook salmon in the Naknek River drainage, 1967-1990.[a]

Year	Mainstream Naknek	Paul's Creek	King Salmon Creek	Big Creek	Total
1967	NA[b]	NA[b]	NA[b]	NA[b]	2,218
1968	NA[b]	NA[b]	NA[b]	NA[b]	7,120
1969	NA[b]	NA[b]	NA[b]	NA[b]	8,922
1970	2,500	182[c]	260	1,600	4,542
1971	1,620	52	704	490	2,866
1972	351	156	1,224	1,060	2,791
1973	1,315	106[c]	115	1,106	2,642
1974	450	91	495	1,010	2,046
1975	2,250	144	279	779	3,452
1976	5,950	31	180	1,070	7,231
1977	4,830	391[c]	1,860	2,700	9,781
1978	4,000	250	300	4,800	9,350
1979	1,750	298[c]	1,750	3,650	7,448
1980	NC[d]	NC[d]	NC[d]	NC[d]	NC[d]
1981	3,470	334[c]	591	3,950	8,345
1982	6,000	1,000	3,900	6,900	17,800
1983	3,000	800	1,400	9,000	14,200
1984	2,250	800	1,200	8,800	13,050
1985	700	170	500	2,900	4,270
1986	1,990	236	284	6,000	8,510
1987	2,800	400	800	2,500	6,500
1988	7,400	150	600	3,600	11,750
1989	1,700	50	100	860	2,710
23 Year Average	2,859	297	871	3,304	7,161
Percent	39.93%	4.15%	12.16%	46.14%	
1990	4,500	150	250	2,000	6,900

[a] Unpublished data, ADFG Sport Fish and Commercial Fisheries Divisions aerial survey files, King Salmon and Dillingham Alaska.
[b] Escapement counts by spawning area are not available.
[c] Estimated from the mean contribution (4%).
[d] No counts made.

observed spawning in the main stem of the Naknek River. Another 2,000 fish or nearly 29% of the escapement were counted in Big Creek.

Size, Sex, and Age Compositions

Over 51% of the 125 chinook salmon sampled from the sport harvest were males (Table 8). The majority of the catch was age 1.3 fish (35%) or age 1.4 fish (31%). Age 1.2 fish comprised over 23% of the catch. Data collected from the sport harvest of chinook salmon yielded a mean length of 716 mm (SE = 14.72, n = 125) and a mean weight of 7.09 kg (SE = .36, n = 123). The largest chinook salmon sampled measured 1,010 mm (40 inches) in length and weighed 17.5 kg (38 lbs).

Harvest restrictions in effect after 8 July likely influenced the size, sex, and age compositions observed in the 1990 sport harvest. These data describe the sport harvest only and may not be representative of the returning chinook salmon population.

The objective of sampling age, sex, and length composition of the Naknek River drainage chinook salmon escapement was abandoned in early July. The poor run strength made it too difficult to collect an adequate sample from the escapement.

DISCUSSION

Data from 1986-1989 were reanalyzed by temporal components comparable[6] to those used in 1990 (Table 9 and Figure 2)[7]. During June (the first two temporal components) fishing statistics were similar to the average of the previous four seasons. However, by the end of the third temporal component, and before the bag limit was reduced, the effort estimate had dropped slightly below the average, and the catch and harvest estimates had dropped well below the average (Table 9). With the declining trend in estimates of effort, the lower than average catch and harvest estimates, and the few chinook salmon observed in the 2 July aerial survey, the 1990 run of chinook salmon appeared to be similar to the very poor run of 1989. In response to the indications of a poor run of chinook salmon in the Naknek River in 1990, the Department issued Emergency Order 2-KS-5-12-90 to prohibit the taking of chinook salmon greater than 71 cm (28 inches). The low estimates of effort, catch, and harvest observed after 8 July were most likely due to these restrictions (Table 9).

---

[6] The repartitioning and reanalysis of portions of the previous 4 years' data (corresponding to the 1990 time periods) produced different estimates than appear in the original reports.

[7] Minard (1989). Note: addition producing June & July total effort estimate in Minard (1989) (Table 1, page 10) was incorrect as published, and should be 75,260 angler-hours.

Table 8. Age composition (percent), mean length (millimeters), and mean weight (kilograms) of chinook salmon, by sex and age group, of samples collected from the sport harvest on the lower Naknek River during 1 June to 21 July 1990.

	Age Group						
	Unknown	1.1	1.2	1.3	1.4	1.5	Total[a]
Females							
Percent[b]			4.96	18.33	23.12	2.64	48.39
SE[c]			2.2	3.7	4.1	1.8	4.2
Sample Size	8		5	20	24	2	59
Mean Length[d]	813		617	757	862	887	800
SE[d]	22.8		13.5	16.9	13.7	2.5	12.8
Sample Size	8		5	20	24	2	59
Mean Weight[d]	8.97		4.30	7.39	10.72	11.75	8.84
SE[d]	0.8		0.3	0.5	0.5	0.5	0.4
Sample Size	8		5	20	24	2	59
Males							
Percent[b]		5.17	18.71	16.78	8.10	2.18	51.61
SE[c]		1.4	3.1	3.7	2.6	1.6	4.2
Sample Size	12	6	17	18	9	2	64
Mean Length[d]	615	410	524	691	867	917	638
SE[d]	56.4	13.8	16.9	24.3	15.7	62.5	21.9
Sample Size	12	6	17	18	9	2	64
Mean Weight[d]	5.08	1.38	2.66	5.99	11.37	12.87	5.42
SE[d]	0.1	0.1	0.3	0.6	0.9	0.3	0.5
Sample Size	12	6	16	18	8	2	62

-Continued-

Table 8. (Page 2 of 2).

	Age Group						
	Unknown	1.1	1.2	1.3	1.4	1.5	Total[a]
Both Sexes							
Percent[b]		5.17	23.67	35.11	31.22	4.82	100.0
SE[c]		1.4	3.7	4.5	4.4	2.3	
Sample Size	20	6	22	38	33	4	123
Mean Length[d]	694	410	545	726	865	902	716
SE[d]	40.9	13.8	15.1	15.4	10.5	27.0	14.7
Sample Size	20	6	23[e]	38	34[f]	4	125
Mean Weight[d]	6.64	1.38	3.03	6.72	10.90	12.31	7.09
SE[d]	1.0	0.1	0.3	0.4	0.4	1.1	0.4
Sample Size	20	6	22[e]	38	33[f]	4	123

[a] Total includes both aged and unaged samples.
[b] Percent age compositions are weighted (i.e., estimated through a stratified design).
[c] SE of percent age compositions are also weighted and are the square root of the variance with the finite population correction factor applied.
[d] Estimated mean lengths, weights, and associated SE's are not weighted (i.e., estimated as if they were obtained through a simple random sampling design).
[e] Includes one age 1.2 fish of unknown sex.
[f] Includes one age 1.4 fish of unknown sex.

Table 9. Historical estimates of effort (angler-hours), catch, and harvest from creel surveys conducted on the lower Naknek River chinook salmon sport fishery.[a]

Temporal Component	1986[b]	1987[c]	1988[d]	1989[e]	'86-89 Average	Accumulated Average Est.	1990	1990 Accumulated Effort
Fishing Effort (Angler-Hours)								
6/1-6/21	3,996	4,193	9,734	7,655	6,395	6,395	7,623	7,623
6/22-6/30	10,350	8,401	17,241	16,949	13,235	19,630	11,480	19,103
7/1-7/7	9,781	11,195	11,110	11,613	10,925	30,555	7,392	26,495
7/8-7/14	9,597	10,416	9,366	7,665	9,261	39,816	5,076	31,571
7/15-7/21	2,604	6,334	8,671	6,006	5,904	45,719	4,295	35,866
7/22-7/31	3,906	5,902	10,396	5,745	6,487	52,207	3,787	39,653
Catch Estimates								
6/1-6/21	741	309	248	413	428	428	655	655
6/22-6/30	877	2,682	1,081	1,037	1,419	1,847	1,373	2,028
7/1-7/7	2,339	3,432	961	908	1,910	3,757	901	2,929
7/8-7/14	2,377	2,546	724	830	1,619	5,377	484	3,413
7/15-7/21	549	1,859	1,014	603	1,006	6,383	493	3,906
7/22-7/31	860	1,621	1,314	444	1,060	7,443	359	4,265
Harvest Estimates								
6/1-6/21	670	309	248	413	410	410	650	650
6/22-6/30	816	2,414	947	976	1,288	1,698	1,284	1,934
7/1-7/7	1,976	2,636	724	784	1,530	3,228	864	2,798
7/8-7/14	2,118	2,495	642	554	1,452	4,680	138	2,936
7/15-7/21	443	1,615	758	508	831	5,511	180	3,116
7/22-7/31	845	1,178	1,229	586	960	6,471	134	3,250

[a] This table was produced by partitioning and reanalyzing portions of the original data that correspond to the temporal components used in 1990. The reanalysis was done only for the portions of each survey that occurred between 1 June and 31 July; estimates presented here may differ from those in the original reports.

[b] Minard (1987).

[c] Minard and Brookover (1988).

[d] Minard (1989). Note: addition producing June and July total effort estimate (Table 1, page 10 in Minard 1989) is incorrect and should be 75,260 angler hours.

[e] Dunaway (1990).

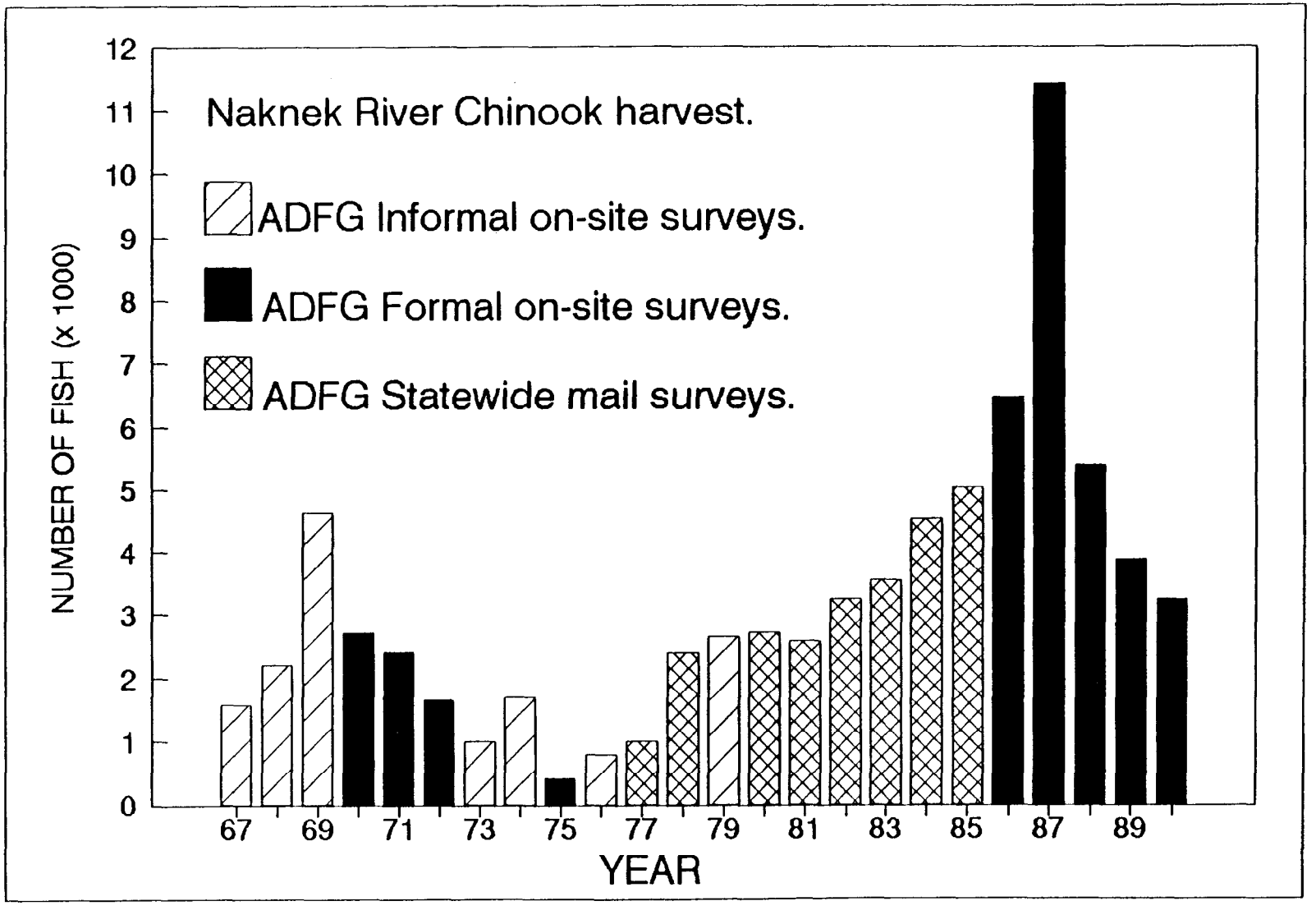

Figure 2. Estimated harvest of chinook salmon by the sport fishery in the Naknek River, 1967-1990.

In summary, the estimated 1990 sport catch and harvest were similar to those of 1989 and 1988 but significantly less than the estimates of 1986 and 1987 (Table 10). In spite of the bag limit restriction implemented on 8 July, the realized harvest was similar to the 23-year average harvest (Table 11 and Figure 3). The 1990 escapement of 6,900 chinook salmon was greater than the 2,710 fish counted in 1989, and approached the long term average (Table 11). The combined harvest by the 1990 sport, commercial, and subsistence fisheries was approximately 53% of the entire return; a more acceptable level than the 81% exploitation rate of 1989 (Table 11).

ACKNOWLEDGEMENTS

We wish to thank Mac Minard for his help with this report. Thanks to Keith Webster and Sandy Sonnichsen of the biometric staff for their help with data analyses.

Table 10. Effort, catch, and harvest estimates from creel surveys conducted on the lower Naknek River chinook salmon sport fishery, 1986-1990.

Year & Location[a]	Survey Period	Effort (angler-hours) Point Estimate	SE	95% Confidence Interval Lower	Upper	Catch Point Estimate	SE	95% Confidence Interval Lower	Upper	Harvest Point Estimate	SE	95% Confidence Interval Lower	Upper
1986[b]													
L	5/28-7/25	37,532	2,871	31,905-	43,159	7,263	527	6,230-	8,296	6,462	471	5,539-	7,385
U		no survey											
	Total	37,532	2,871	31,905-	43,159	7,263	527	6,230-	8,296	6,462	471	5,539-	7,385
1987[c]													
L	6/1-9/13	59,932	3,868	52,351-	67,513	14,250	1,129	12,037-	16,463	11,419	918	9,620-	13,218
U	6/8-10/30	10,441	1,022	8,438-	12,444	0		0-	0	0		0-	0
	Total	70,373	4,001	62,532-	78,214	14,250	1,129	12,037-	16,463	11,419	918	9,620-	13,218
1988[d]													
L	6/1-9/13	89,129	7,436	74,554-	103,704	6,357	643	5,097-	7,617	5,359	603	4,177-	6,541
U	6/8-10/30	11,817	1,082	9,696-	13,938	39	1,454	0-	2,889	21	952	0-	1,887
	Total	100,946	7,514	86,218-	115,674	6,396	1,590	3,280-	9,512	5,380	1,127	3,171-	7,589
1989[e]													
L	6/1-9/15	65,993	5,346	55,515-	76,471	4,121	846	2,463-	5,779	3,854		3,854-	3,854
U	6/8-10-12	15,226	1,303	12,672-	17,780	231	285	0-	790	25	56	0-	135
	Total	81,219	5,503	70,434-	92,004	4,352	893	2,602-	6,102	3,879	56	3,769-	3,989
1990													
L	6/1-7/31	39,653	2,186	35,368-	43,938	4,265	528	3,230-	5,300	3,250	434	2,399-	4,101
U		no survey											
	Total	39,653	2,186	35,368-	43,938	4,265	528	3,230-	5,300	3,250	434	2,399-	4,101

[a] L = lower Naknek River: from the mouth of Smelt Creek upstream to 1.5 km above the mouth of Big Creek (exact boundaries have varied from year to year).
U = upper Naknek River: from the outlet of Naknek Lake downstream to 1.5 km above the mouth of Big Creek (exact boundaries have varied from year to year).

[b] Minard (1987). Note: confidence intervals appearing on page 11 of Minard (1987) appear to be incorrect; for this table the SE shown in Minard (1987) were assumed to be correct.

[c] Minard and Brookover (1988).

[d] Minard (1989). Note: addition producing June & July total effort estimate (Table 1, page 10 of Minard 1987) is incorrect and should be 75,260 angler hours.

[e] Dunaway (1990).

Table 11. Harvests and escapements of chinook salmon returning to the Naknek River, 1967-1990.

Year	Harvest				Escapement Index[d]	Total Run[e]	Exploitation By Sport Fishery	Exploitation Of Total Run
	Comm.[a]	Subsist.[b]	Sport[c]	Total				
1967	3,705	500	1,579	5,784	2,218	8,002	20%	72%
1968	6,398	500	2,203	9,101	7,120	16,221	14%	56%
1969	19,016	400	4,631	24,047	8,922	32,969	14%	73%
1970	19,037	300	2,730	22,067	4,542	26,609	10%	83%
1971	10,254	200	2,417	12,871	2,866	15,737	15%	82%
1972	2,262	400	1,668	4,330	2,791	7,121	23%	61%
1973	951	600	1,000	2,551	2,642	5,193	19%	49%
1974	480	1,000	1,700	3,180	2,046	5,226	33%	61%
1975	964	700	427	2,091	3,452	5,543	8%	38%
1976	4,064	900	800	5,764	7,231	12,995	6%	44%
1977	4,373	1,300	1,005	6,678	9,781	16,459	6%	41%
1978	6,930	1,200	2,406	10,536	9,350	19,886	12%	53%
1979	10,415	1,200	2,669	14,284	7,448	21,732	12%	66%
1980	7,517	1,500	2,729	11,746	NE[f]			
1981	11,048	1,000	2,581	14,629	8,345	22,974	11%	64%
1982	12,425	1,100	3,264	16,789	17,800	34,589	9%	49%
1983	8,955	1,000	3,545	13,500	14,200	27,700	13%	49%
1984	8,972	900	4,524	14,396	13,050	27,446	16%	52%
1985	5,697	1,179	5,038	11,914	4,270	16,184	31%	74%
1986	3,188	1,295	6,462	10,945	8,510	19,455	33%	56%
1987	5,175	1,289	11,419	17,883	6,500	24,383	47%	73%
1988	6,677	1,057	5,380	13,114	11,750	24,864	22%	53%
1989	6,463	1,000	3,879	11,342	2,710	14,052	28%	81%
23 Year Average	7,172	892	3,220	11,284	7,161	18,446	17%	61%
() = preliminary numbers								
1990	(3,749)	(890)	3,250	(7,889)	6,900	(14,789)	(22%)	(53%)

[a] ADFG (1990b).

[b] ADFG Subsistence Division.

[c] Dunaway (1990); Sport harvest estimated by informal on-site creel survey for 1967, 1968, 1969, 1973, 1974, and 1976. Sport harvest estimated by formal on-site creel survey 1970, 1971, 1972, 1975, 1986, 1987, 1988, and 1989. Sport harvest estimated by statewide mail survey 1977-1985 (Mills 1979, 1980, 1981a, 1981b, 1982, 1983, 1984, 1985, 1986).

[d] Unpublished data, ADFG Sport Fish and Commercial Fisheries Divisions aerial survey files, King Salmon and Dillingham Alaska.

[e] In all years, total run is to be considered a minimum number.

[f] NE = no estimate.

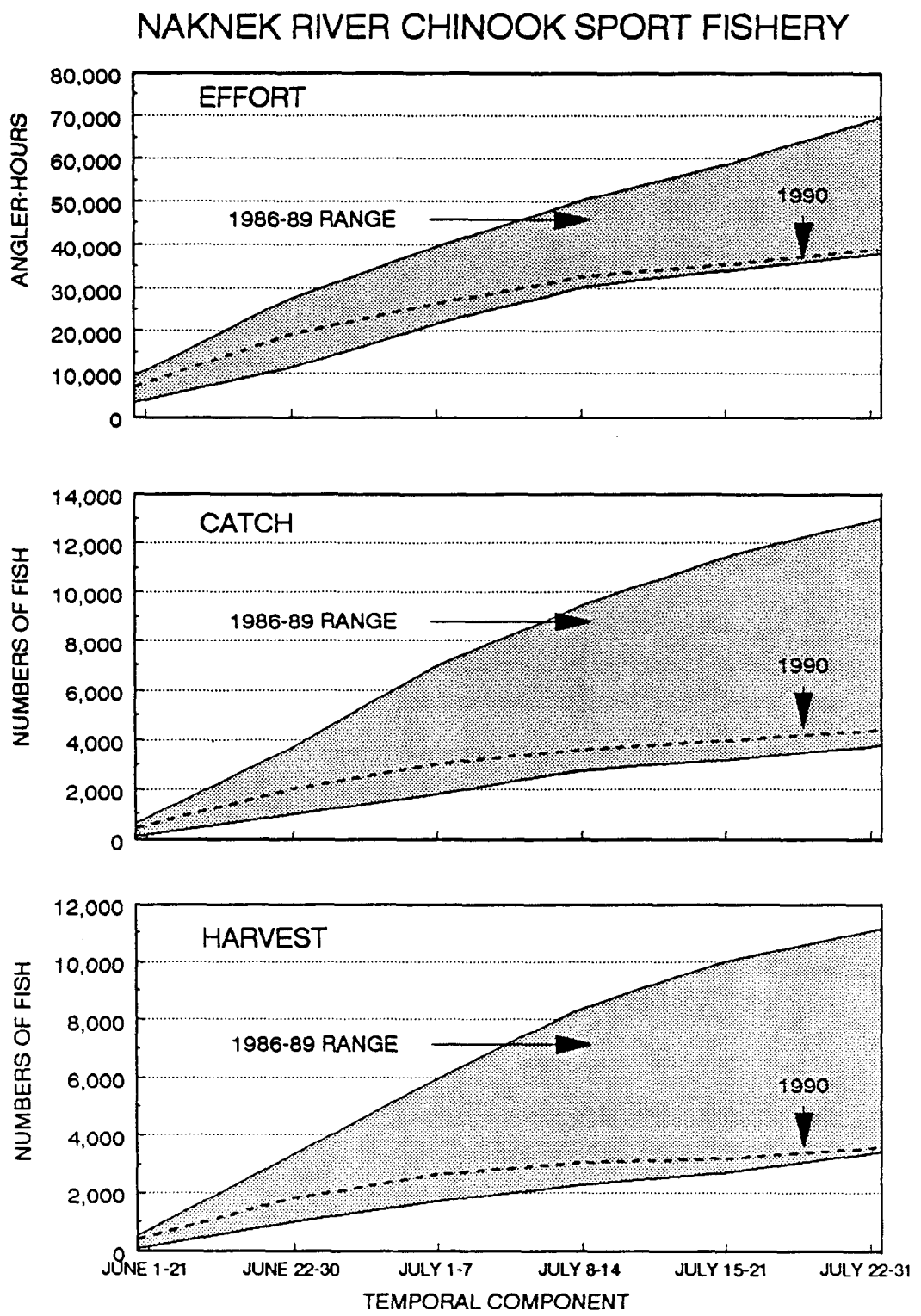

Figure 3. Comparison of 1990 estimates of effort, catch, and harvest with range of historic estimates, 1986-1989.

LITERATURE CITED

ADFG (Alaska Department of Fish and Game). 1988. 1988 Alaska sport fishing regulations summary. Alaska Department of Fish and Game, Juneau.

_____. 1990a. 1990 Alaska sport fishing regulations summary. Alaska Department of Fish and Game, Juneau.

_____. 1990b. Commercial Fisheries Annual Management Report, 1989. Bristol Bay Area. Alaska Department of Fish and Game, Commercial Fish Division, Juneau.

Cochran, W. G. 1977. Sampling techniques. Third edition. John Wiley and Sons, New York.

Clutter, R. I. and L. E. Whitesel. 1956. Collection and interpretation of sockeye salmon scales. International Pacific Salmon Fishery Commission, Bulletin 9.

DiConstanzo, C. J. 1956. Creel census techniques and harvest of fishes in Clear Lake, Iowa. Ph. D. dissertation, Iowa State College, Ames, Iowa.

Efron, B. 1982. The jackknife, the bootstrap and other resampling plans. Society for Industrial and Applied Mathematics, CBMS-NSF Monograph 38, Philadelphia.

Dunaway, D. O. 1990. Creel and escapement statistics for the Naknek River, Alaska, during 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-27, Anchorage.

Gwartney, L. A. 1976. Inventory and cataloging of the sport fish and sport fish waters of the Bristol Bay Area. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Performance, 1975-1976, Project F-9-8, 17(G-I-E):87-105. Juneau.

_____. 1979. Inventory and cataloging of the sport fish and sport fish waters in the Bristol Bay area. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Performance, 1978-1979, Project F-9-11, 20(G-I-E):1-25. Juneau.

_____. 1980. Inventory and cataloging of the sport fish and sport fish waters of the Bristol Bay area. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Performance, 1979-1980, Project F-9-12, 21(G-1-E):1-20. Juneau.

Kish, L. 1965. Survey sampling. John Wiley and Sons, New York.

Mills, M. J. 1979. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1978-1979, Project F-9-11, 20(SW-I-A), Juneau.

_____. 1980. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1979-1980, Project F-9-12, 21(SW-I-A), Juneau.

_____. 1981a. Alaska statewide sport fish harvest studies (1979). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1980-1981, Project F-9-13, 22(SW-I-A), Juneau.

_____. 1981b. Alaska statewide sport fish harvest studies (1980). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1980-1981, Project F-9-13, 22(SW-I-A), Juneau.

_____. 1982. Alaska statewide sport fish harvest studies (1981). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1981-1982, Project F-9-14, 23(SW-I-A), Juneau.

_____. 1983. Alaska statewide sport fish harvest studies (1982). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1982-1983, Project F-9-15, 24(SW-I-A), Juneau.

_____. 1984. Alaska statewide sport fish harvest studies (1983). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1983-1984, Project F-9-16, 25(SW-I-A), Juneau.

_____. 1985. Alaska statewide sport fish harvest studies (1984). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1984-1985, Project F-9-17, 26(SW-I-A), Juneau.

_____. 1986. Alaska statewide sport fish harvest studies (1985). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1985-1986, Project F-10-1, 27(RT-2), Juneau.

_____. 1987. Alaska statewide sport fisheries harvest report. 1986 data. Alaska Department of Fish and Game, Fishery Data Series Report No. 2, Juneau.

_____. 1988. Alaska statewide sport fisheries harvest report. 1987 data. Alaska Department of Fish and Game, Fishery Data Series Report No. 52, Juneau.

_____. 1989. Alaska statewide sport fisheries harvest report. 1988 data. Alaska Department of Fish and Game, Fishery Data Series Report No. 122, Juneau.

_____. 1990. Harvest and participation in Alaska sport fisheries during 1989. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series No. 90-44, Anchorage.

Minard, R. E. 1987. Effort and catch statistics for the chinook salmon *Oncorhynchus tshawytscha* sport fishery in the lower Naknek River, 1986. Alaska Department of Fish and Game. Fishery Data Series No. 28, Juneau.

_____. 1989. Creel and escapement statistics for the Naknek River, Alaska, during 1988. Alaska Department of Fish and Game. Fishery Data Series No. 91, Juneau.

Minard, R. E., and T. E. Brookover. 1988. Effort and catch statistics for the sport fishery in the Naknek River, 1987. Alaska Department of Fish and Game. Fishery Data Series No. 49, Juneau.

Neuhold, J. M. and K. H. Lu. 1957. Creel census method. Utah State Department of Fish and Game. Publication 8. Salt Lake City, Utah.

Smith, S. J. 1980. Comparison of two methods of estimating the variance of the estimate of catch per unit effort. Canadian Journal of Fisheries and Aquatic Sciences 37:2346-2351.

Sokal, R. R., and F. J. Rohlf. 1989. Biometry. W. H. Freeman and Company, New York.

Thompson, S. K. 1987. Sample size for estimating multinomial proportions. The American Statistician 41:42-46.

APPENDIX A

Selected Summaries of Fishery Statistics

Appendix A1. Angler counts in the lower Naknek River sport fishery, 1990.

		Time Periods					
		Non-Peak	Peak Stratum				Non-Peak
		A	B	C	D	E	F
TC[a]	Date	0600 0859	0900 1159	1200 1459	1500 1759	1800 2059	2100 2359
1	06/01						
1	06/02			29		37	
1	06/03			29		15	
1	06/04						
1	06/05						
1	06/06	4					0
1	06/07		3	7			
1	06/08		7		24		
1	06/09				3	8	
1	06/10		34			16	
1	06/11	14					21
1	06/12						
1	06/13			20		34	
1	06/14						
1	06/15		45		27		
1	06/16		47		43		
1	06/17	3					24
1	06/18		26			31	
1	06/19			21	47		
1	06/20						
1	06/21		23	18			
2	06/22		29	55			
2	06/23						
2	06/24		78	104			
2	06/25						
2	06/26	1					18
2	06/27			87		64	
2	06/28		90	114			
2	06/29	62					39
2	06/30		142		150		

-Continued-

Appendix A1. (Page 2 of 2).

TC[a]	Date	Time Periods: Non-Peak A 0600 0859	Peak Stratum B 0900 1159	Peak Stratum C 1200 1459	Peak Stratum D 1500 1759	Peak Stratum E 1800 2059	Non-Peak F 2100 2359
3	07/01						
3	07/02			104			35
3	07/03	57		134		55	28
3	07/04				71	8	
3	07/05				43	31	
3	07/06	18			136	68	53
3	07/07						
4	7/08		74		69		
4	7/09		60			11	
4	7/10	48		74	21		0
4	7/11			60		51	
4	7/12						
4	7/13	27					2
4	7/14			66		22	
5	07/15	0		58	93		14
5	07/16			72	27		
5	07/17		50			12	
5	07/18		43			25	
5	07/19		57	23			
5	07/20	14					13
6	07/21						
6	07/22		30	22			
6	07/23	18					6
6	07/24	4	25		29		1
6	07/25						
6	07/26		41	28			
6	07/27			38		8	
6	07/28			50	26		
6	07/29						
6	07/30	0		31	23		6
6	07/31		19		31		

[a] Temporal component.

Appendix A2. Summary of daily angler effort (angler-hours), catch rates (CPUE, fish caught per angler-hour), and harvest rates (HPUE, fish kept per angler-hour) for chinook salmon in the sport fishery in the lower Naknek River, 1990.

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Interviewed	Estimates by Period: CPUE Mean	CPUE Variance	Catch Estimate	Catch Variance	HPUE Mean	HPUE Variance	Harvest Estimate	Harvest Variance
1	0	900606	A	3	4	12	4	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900606	F	3	0	0	10	0.036	0.001	0.0	0.0	0.036	0.001	0.0	0.0
1	0	900611	A	3	14	42	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900611	F	3	21	63	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900617	A	3	3	9	6	0.267	0.007	2.4	0.6	0.267	0.007	2.4	0.6
1	0	900617	F	3	24	72	15	0.070	0.001	5.0	6.9	0.070	0.001	5.0	6.9
1	1	900602	C	3	29	87	5	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900602	E	3	37	111	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900603	C	3	29	87	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900603	E	3	15	45	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900607	B	3	3	9	0								
1	1	900607	C	3	7	21	0								
1	1	900608	B	3	7	21	3	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900608	D	3	24	72	7	0.143	0.020	10.3	105.8	0.143	0.020	10.3	105.8
1	1	900609	D	3	3	9	15	0.024	0.001	0.2	0.1	0.024	0.001	0.2	0.1
1	1	900609	E	3	8	24	4	0.165	0.023	4.0	13.0	0.165	0.023	4.0	13.0
1	1	900610	B	3	34	102	0								
1	1	900610	E	3	16	48	8	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900613	C	3	20	60	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900613	E	3	34	102	30	0.088	0.000	8.9	4.2	0.088	0.000	9.0	4.2
1	1	900615	B	3	45	135	14	0.101	0.001	13.6	26.7	0.101	0.001	13.6	26.7
1	1	900615	D	3	27	81	10	0.151	0.000	12.2	0.8	0.136	0.000	11.0	1.9
1	1	900616	B	3	47	141	11	0.128	0.004	18.1	82.3	0.128	0.004	18.1	82.3
1	1	900616	D	3	43	129	22	0.115	0.001	14.8	9.6	0.115	0.001	14.8	9.6
1	1	900618	B	3	26	78	10	0.064	0.001	5.0	6.7	0.064	0.001	5.0	6.7
1	1	900618	E	3	31	93	15	0.068	0.001	6.3	6.2	0.068	0.001	6.3	6.2
1	1	900619	C	3	21	63	11	0.024	0.001	1.5	2.3	0.024	0.001	1.5	2.3
1	1	900619	D	3	47	141	11	0.051	0.001	7.2	12.8	0.051	0.001	7.2	12.8
1	1	900621	B	3	23	69	6	0.738	0.281	50.9	1338.4	0.738	0.281	50.9	1338.4
1	1	900621	C	3	18	54	2	0.091	0.008	4.9	24.1	0.091	0.008	4.9	24.1
2	0	900626	A	3	1	3	0								
2	0	900626	F	3	18	54	27	0.113	0.001	6.1	4.0	0.113	0.001	6.1	4.0
2	0	900629	A	3	62	186	0								
2	0	900629	F	3	39	117	17	0.074	0.001	8.6	7.6	0.061	0.000	7.2	4.9
2	1	900622	B	3	29	87	0								
2	1	900622	C	3	55	165	13	0.135	0.003	22.3	78.5	0.135	0.003	22.3	78.5
2	1	900624	B	3	78	234	8	0.144	0.004	33.8	238.5	0.144	0.004	33.8	238.5
2	1	900624	C	3	104	312	28	0.162	0.001	50.4	73.8	0.162	0.001	50.4	73.8
2	1	900627	C	3	87	261	40	0.097	0.001	25.2	34.8	0.097	0.001	25.2	34.8
2	1	900627	E	3	64	192	59	0.084	0.000	16.1	4.3	0.084	0.000	16.1	4.3
2	1	900628	B	3	90	270	18	0.066	0.001	17.7	64.2	0.066	0.001	17.7	64.2
2	1	900628	C	3	114	342	20	0.383	0.012	131.1	1432.4	0.322	0.004	110.0	422.4
2	1	900630	B	3	142	426	3	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900630	D	3	150	450	59	0.057	0.000	25.8	41.1	0.057	0.000	25.8	41.1

-Continued-

Appendix A2. (Page 2 of 3).

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Interviewed	Estimates by Period: CPUE Mean	CPUE Variance	Catch Estimate	Catch Variance	HPUE Mean	HPUE Variance	Harvest Estimate	Harvest Variance
3	0	900703	A	3	57	171	0								
3	0	900703	F	3	28	84	26	0.102	0.001	8.6	6.0	0.102	0.001	8.6	6.0
3	0	900706	A	3	18	54	2	0.250	0.063	13.5	182.3	0.250	0.063	13.5	182.3
3	0	900706	F	3	53	159	16	0.074	0.001	11.7	32.1	0.074	0.001	11.7	32.1
3	1	900702	C	3	104	312	38	0.183	0.001	57.0	91.1	0.183	0.001	57.0	91.1
3	1	900702	E	3	35	105	45	0.091	0.000	9.5	5.3	0.072	0.000	7.5	2.2
3	1	900703	C	3	134	402	38	0.199	0.001	79.9	176.5	0.177	0.001	71.0	118.8
3	1	900703	E	3	55	165	42	0.107	0.000	17.6	8.2	0.107	0.000	17.6	8.2
3	1	900704	D	3	71	213	32	0.056	0.000	11.9	19.7	0.050	0.000	10.6	18.6
3	1	900704	E	3	8	24	32	0.063	0.000	1.5	0.2	0.063	0.000	1.5	0.2
3	1	900705	D	3	43	129	25	0.121	0.000	15.6	3.8	0.121	0.000	15.6	3.8
3	1	900705	E	3	31	93	44	0.151	0.000	14.0	3.5	0.146	0.000	13.5	3.7
3	1	900706	D	3	136	408	54	0.118	0.000	48.0	70.9	0.118	0.000	48.0	70.9
3	1	900706	E	3	68	204	43	0.069	0.000	14.0	19.6	0.065	0.000	13.2	16.0
4	0	900710	A	3	48	144	0								
4	0	900710	F	3	0	0	10	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	0	900713	A	3	27	81	0								
4	0	900713	F	3	2	6	0								
4	1	900708	B	3	74	222	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900708	D	3	69	207	21	0.086	0.001	17.7	27.2	0.065	0.000	13.4	15.3
4	1	900709	B	3	60	180	6	0.231	0.010	41.6	338.2	0.000	0.000	0.0	0.0
4	1	900709	E	3	11	33	31	0.084	0.000	2.8	0.5	0.040	0.000	1.3	0.3
4	1	900710	C	3	74	222	26	0.141	0.001	31.3	42.3	0.060	0.000	13.4	24.2
4	1	900710	D	3	21	63	25	0.030	0.000	1.9	1.3	0.022	0.000	1.4	0.7
4	1	900711	C	3	60	180	17	0.059	0.001	10.6	23.2	0.029	0.000	5.2	13.4
4	1	900711	E	3	51	153	23	0.067	0.000	10.2	8.8	0.022	0.000	3.4	2.9
4	1	900714	C	3	66	198	17	0.247	0.007	49.0	257.2	0.036	0.001	7.1	22.8
4	1	900714	E	3	22	66	25	0.119	0.001	7.9	4.0	0.060	0.000	3.9	1.6
5	0	900715	A	3	0	0									
5	0	900715	F	3	14	42	6	0.094	0.001	4.0	2.2	0.000	0.000	0.0	0.0
5	0	900720	A	3	14	42									
5	0	900720	F	3	13	39	8	0.092	0.001	3.6	1.5	0.026	0.000	1.0	0.4
5	1	900715	C	3	58	174	15	0.092	0.003	16.0	76.2	0.031	0.001	5.3	28.7
5	1	900715	D	3	93	279	39	0.073	0.001	20.2	43.4	0.034	0.000	9.6	20.0
5	1	900716	C	3	72	216	14	0.027	0.000	5.8	16.6	0.000	0.000	0.0	0.0
5	1	900716	D	3	27	81	41	0.026	0.000	2.1	0.6	0.019	0.000	1.6	0.5
5	1	900717	B	3	50	150	17	0.133	0.002	20.0	40.9	0.033	0.001	5.0	11.6
5	1	900717	E	3	12	36	15	0.131	0.001	4.7	1.9	0.065	0.001	2.4	0.8
5	1	900718	B	3	43	129	8	0.064	0.002	8.3	25.2	0.000	0.000	0.0	0.0
5	1	900718	E	3	25	75	4	0.722	0.026	54.2	144.7	0.361	0.011	27.1	62.2
5	1	900719	B	3	57	171	0								
5	1	900719	C	3	23	69	24	0.225	0.006	15.5	28.0	0.078	0.001	5.4	5.8
6	0	900723	A	3	18	54	0								
6	0	900723	F	3	6	18	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	0	900724	A	3	4	12	0								
6	0	900724	F	3	1	3	0								
6	0	900730	A	3	0	0	0								

-Continued-

Appendix A2. (Page 3 of 3).

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Interviewed	Estimates by Period							
								CPUE		Catch		HPUE		Harvest	
								Mean	Variance	Estimate	Variance	Mean	Variance	Estimate	Variance
6	0	900730	F	3	6	18	5	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900722	B	3	30	90	12	0.093	0.002	8.4	14.2	0.038	0.001	3.4	4.8
6	1	900722	C	3	22	66	9	0.241	0.005	15.9	23.6	0.134	0.004	8.9	19.5
6	1	900724	B	3	25	75	18	0.070	0.002	5.2	9.2	0.000	0.000	0.0	0.0
6	1	900724	D	3	29	87	21	0.064	0.001	5.6	4.4	0.022	0.000	1.9	1.7
6	1	900726	B	3	41	123	0								
6	1	900726	C	3	28	84	11	0.024	0.001	2.0	3.8	0.000	0.000	0.0	0.0
6	1	900727	C	3	38	114	15	0.016	0.000	1.9	3.7	0.000	0.000	0.0	0.0
6	1	900727	E	3	8	24	0								
6	1	900728	C	3	50	150	27	0.158	0.003	23.7	71.3	0.095	0.003	14.2	61.6
6	1	900728	D	3	26	78	18	0.383	0.011	29.9	64.6	0.143	0.002	11.2	14.4
6	1	900730	C	3	31	93	18	0.292	0.004	27.1	36.8	0.082	0.001	7.6	10.1
6	1	900730	D	3	23	69	17	0.029	0.000	12.0	2.1	0.000	0.000	0.0	0.0
6	1	900731	B	3	19	57	3	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900731	D	3	31	93	14	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0

[a] Temporal Components: 1 (6/1-6/21); 2 (6/22-6/30); 3 (7/1-7/7); 4 (7/8-7/14); 5 (7/15-7/21); 6 (7/22-7/31).

[b] Stratum 0 = Nonpeak; periods A and F. Stratum 1 = Peak; periods B, C, D, E.

[c] Daily periods: A (0600-859); B (0900-1159); C (1200-1459); D (1500-1759); E (1800-2059); F (2100-2359).

Appendix A3. Summary of daily angler effort (angler-hours), catch rates (CPUE, fish caught per angler-hour), and harvest rates (HPUE, fish kept per angler-hour) for chum salmon in the sport fishery in the lower Naknek River, 1990.

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Interviewed	Estimates by Period: CPUE Mean	CPUE Variance	Catch Estimate	Catch Variance	HPUE Mean	HPUE Variance	Harvest Estimate	Harvest Variance
1	0	900606	A	3	4	12	4	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900606	F	3	0	0	10	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900611	A	3	14	42	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900611	F	3	21	63	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900617	A	3	3	9	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900617	F	3	24	72	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900602	C	3	29	87	5	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900602	E	3	37	111	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900603	C	3	29	87	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900603	E	3	15	45	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900607	B	3	3	9	0								
1	1	900607	C	3	7	21	0								
1	1	900608	B	3	7	21	3	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900608	D	3	24	72	7	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900609	D	3	3	9	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900609	E	3	8	24	4	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900610	B	3	34	102	0								
1	1	900610	E	3	16	48	8	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900613	C	3	20	60	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900613	E	3	34	102	30	0.006	0.000	0.6	0.4	0.006	0.000	0.6	0.4
1	1	900615	B	3	45	135	14	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900615	D	3	27	81	10	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900616	B	3	47	141	11	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900616	D	3	43	129	22	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900618	B	3	26	78	10	0.016	0.000	1.3	1.6	0.016	0.000	1.3	1.6
1	1	900618	E	3	31	93	15	0.014	0.000	1.3	1.7	0.014	0.000	1.3	1.7
1	1	900619	C	3	21	63	11	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900619	D	3	47	141	11	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900621	B	3	23	69	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900621	C	3	18	54	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	0	900626	A	3	1	3	0								
2	0	900626	F	3	18	54	27	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	0	900629	A	3	62	186	0								
2	0	900629	F	3	39	117	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900622	B	3	29	87	0								
2	1	900622	C	3	55	165	13	0.027	0.001	4.4	20.7	0.027	0.001	4.4	20.7
2	1	900624	B	3	78	234	8	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900624	C	3	104	312	28	0.009	0.000	2.8	7.8	0.009	0.000	2.8	7.8
2	1	900627	C	3	87	261	40	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900627	E	3	64	192	59	0.002	0.000	0.5	0.2	0.002	0.000	0.5	0.2
2	1	900628	B	3	90	270	18	0.033	0.001	8.9	78.5	0.033	0.001	8.9	78.5
2	1	900628	C	3	114	342	20	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0

-Continued-

Appendix A3. (Page 2 of 3).

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Interviewed	Estimates by Period: CPUE Mean	CPUE Variance	Catch Estimate	Catch Variance	HPUE Mean	HPUE Variance	Harvest Estimate	Harvest Variance
2	1	900630	B	3	142	426	3	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900630	D	3	150	450	59	0.007	0.000	3.1	5.2	0.007	0.000	3.1	5.2
3	0	900703	A	3	57	171	0								
3	0	900703	F	3	28	84	26	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	0	900706	A	3	18	54	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	0	900706	F	3	53	159	16	0.019	0.000	3.0	9.4	0.019	0.000	3.0	9.4
3	1	900702	C	3	104	312	38	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900702	E	3	35	105	45	0.020	0.000	2.0	1.1	0.020	0.000	2.1	1.1
3	1	900703	C	3	134	402	38	0.007	0.000	3.0	8.8	0.007	0.000	3.0	8.8
3	1	900703	E	3	55	165	42	0.007	0.000	1.1	0.6	0.007	0.000	1.1	0.6
3	1	900704	D	3	71	213	32	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900704	E	3	8	24	32	0.005	0.000	0.1	0.1	0.005	0.000	0.1	0.0
3	1	900705	D	3	43	129	25	0.006	0.000	0.7	0.6	0.000	0.000	0.0	0.0
3	1	900705	E	3	31	93	44	0.003	0.000	0.2	0.1	0.003	0.000	0.2	0.1
3	1	900706	D	3	136	408	54	0.028	0.000	11.6	28.3	0.028	0.000	11.6	28.3
3	1	900706	E	3	68	204	43	0.007	0.000	1.5	1.1	0.004	0.000	0.7	0.6
4	0	900710	A	3	48	144	0								
4	0	900710	F	3	0	0	10	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	0	900713	A	3	27	81	0								
4	0	900713	F	3	2	6	0								
4	1	900708	B	3	74	222	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900708	D	3	69	207	21	0.007	0.000	1.5	2.2	0.007	0.000	1.5	2.2
4	1	900709	B	3	60	180	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900709	E	3	11	33	31	0.022	0.000	0.7	0.1	0.022	0.000	0.7	0.1
4	1	900710	C	3	74	222	26	0.010	0.000	2.2	5.0	0.010	0.000	2.2	5.0
4	1	900710	D	3	21	63	25	0.008	0.000	0.5	0.2	0.008	0.000	0.5	0.2
4	1	900711	C	3	60	180	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900711	E	3	51	153	23	0.052	0.001	8.0	28.3	0.052	0.001	8.0	28.3
4	1	900714	C	3	66	198	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900714	E	3	22	66	25	0.027	0.000	1.8	0.6	0.027	0.000	1.8	0.6
5	0	900715	A	3	0	0	0								
5	0	900715	F	3	14	42	6	0.032	0.001	1.4	1.8	0.032	0.001	1.4	1.8
5	0	900720	A	3	14	42	0								
5	0	900720	F	3	13	39	8	0.026	0.000	1.0	0.4	0.026	0.000	1.0	0.4
5	1	900715	C	3	58	174	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900715	D	3	93	279	39	0.021	0.000	5.9	12.4	0.021	0.000	5.9	12.4
5	1	900716	C	3	72	216	14	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900716	D	3	27	81	41	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900717	B	3	50	150	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900717	E	3	12	36	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900718	B	3	43	129	8	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900718	E	3	25	75	4	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900719	B	3	57	171	0								
5	1	900719	C	3	23	69	24	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0

-Continued-

Appendix A3. (Page 3 of 3).

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Interviewed	Estimates by Period: CPUE Mean	CPUE Variance	Catch Estimate	Catch Variance	HPUE Mean	HPUE Variance	Harvest Estimate	Harvest Variance
6	0	900723	A	3	18	54	0								
6	0	900723	F	3	6	18	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	0	900724	A	3	4	12	0								
6	0	900724	F	3	1	3	0								
6	0	900730	A	3	0	0	0								
6	0	900730	F	3	6	18	5	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900722	B	3	30	90	12	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900722	C	3	22	66	9	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900724	B	3	25	75	18	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900724	D	3	29	87	21	0.022	0.000	1.9	3.5	0.022	0.000	1.9	3.5
6	1	900726	B	3	41	123	0								
6	1	900726	C	3	28	84	11	0.071	0.001	6.0	7.6	0.071	0.001	6.0	7.6
6	1	900727	C	3	38	114	15	0.081	0.001	9.2	16.7	0.081	0.001	9.2	16.7
6	1	900727	E	3	8	24	0								
6	1	900728	C	3	50	150	27	0.244	0.007	36.7	163.9	0.244	0.007	36.7	163.9
6	1	900728	D	3	26	78	18	0.076	0.002	5.9	13.4	0.076	0.002	5.9	13.4
6	1	900730	C	3	31	93	18	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900730	D	3	23	69	17	0.125	0.003	8.6	15.6	0.125	0.003	8.6	15.6
6	1	900731	B	3	19	57	3	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900731	D	3	31	93	14	0.014	0.000	1.3	1.7	0.014	0.000	1.3	1.7

[a] Temporal Components: 1 (6/1-6/21); 2 (6/22-6/30); 3 (7/1-7/7); 4 (7/8-7/14); 5 (7/15-7/21); 6 (7/22-7/31).

[b] Stratum 0 = Nonpeak; periods A and F. Stratum 1 = Peak; periods B, C, D, E.

[c] Daily periods: A (0600-0859); B (0900-1159); C (1200-1459); D (1500-1759); E (1800-2059); F (2100-2359).

Appendix A4. Summary of daily angler effort (angler-hours), catch rates (CPUE, fish caught per angler-hour), and harvest rates (HPUE, fish kept per angler-hour) for pink salmon in the sport fishery in the lower Naknek River, 1990.

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Interviewed	Estimates by Period: CPUE Mean	CPUE Variance	Catch Estimate	Catch Variance	HPUE Mean	HPUE Variance	Harvest Estimate	Harvest Variance
1	0	900606	A	3	4	12	4	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900606	F	3	0	0	10	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900611	A	3	14	42	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900611	F	3	21	63	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900617	A	3	3	9	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900617	F	3	24	72	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900602	C	3	29	87	5	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900602	E	3	37	111	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900603	C	3	29	87	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900603	E	3	15	45	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900607	B	3	3	9	0								
1	1	900607	C	3	7	21	0								
1	1	900608	B	3	7	21	3	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900608	D	3	24	72	7	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900609	D	3	3	9	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900609	E	3	8	24	4	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900610	B	3	34	102	0								
1	1	900610	E	3	16	48	8	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900613	C	3	20	60	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900613	E	3	34	102	30	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900615	B	3	45	135	14	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900615	D	3	27	81	10	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900616	B	3	47	141	11	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900616	D	3	43	129	22	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900618	B	3	26	78	10	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900618	E	3	31	93	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900619	C	3	21	63	11	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900619	D	3	47	141	11	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900621	B	3	23	69	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900621	C	3	18	54	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	0	900626	A	3	1	3	0								
2	0	900626	F	3	18	54	27	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	0	900629	A	3	62	186	0								
2	0	900629	F	3	39	117	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900622	B	3	29	87	0								
2	1	900622	C	3	55	165	13	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900624	B	3	78	234	8	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900624	C	3	104	312	28	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900627	C	3	87	261	40	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900627	E	3	64	192	59	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900628	B	3	90	270	18	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900628	C	3	114	342	20	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900630	B	3	142	426	3	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0

-Continued-

Appendix A4. (Page 2 of 3).

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Inter-viewed	Estimates by Period: CPUE Mean	CPUE Variance	Catch Estimate	Catch Variance	HPUE Mean	HPUE Variance	Harvest Estimate	Harvest Variance
2	1	900630	D	3	150	450	59	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	0	900703	A	3	57	171	0								
3	0	900703	F	3	28	84	26	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	0	900706	A	3	18	54	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	0	900706	F	3	53	159	16	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900702	C	3	104	312	38	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900702	E	3	35	105	45	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900703	C	3	134	402	38	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900703	E	3	55	165	42	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900704	D	3	71	213	32	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900704	E	3	8	24	32	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900705	D	3	43	129	25	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900705	E	3	31	93	44	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900706	D	3	136	408	54	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900706	E	3	68	204	43	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	0	900710	A	3	48	144	0								
4	0	900710	F	3	0	0	10	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	0	900713	A	3	27	81	0								
4	0	900713	F	3	2	6	0								
4	1	900708	B	3	74	222	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900708	D	3	69	207	21	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900709	B	3	60	180	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900709	E	3	11	33	31	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900710	C	3	74	222	26	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900710	D	3	21	63	25	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900711	C	3	60	180	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900711	E	3	51	153	23	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900714	C	3	66	198	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900714	E	3	22	66	25	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	0	900715	A	3	0	0	0								
5	0	900715	F	3	14	42	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	0	900720	A	3	14	42	0								
5	0	900720	F	3	13	39	8	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900715	C	3	58	174	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900715	D	3	93	279	39	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900716	C	3	72	216	14	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900716	D	3	27	81	41	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900717	B	3	50	150	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900717	E	3	12	36	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900718	B	3	43	129	8	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900718	E	3	25	75	4	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900719	B	3	57	171	0								
5	1	900719	C	3	23	69	24	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	0	900723	A	3	18	54	0								
6	0	900723	F	3	6	18	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	0	900724	A	3	4	12	0								
6	0	900724	F	3	1	3	0								

-Continued-

Appendix A4. (Page 3 of 3).

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Interviewed	Estimates by Period							
								CPUE		Catch		HPUE		Harvest	
								Mean	Variance	Estimate	Variance	Mean	Variance	Estimate	Variance
6	0	900730	A	3	0	0	0								
6	0	900730	F	3	6	18	5	1.778	0.074	32.0	24.0	0.889	0.015	16.0	4.7
6	1	900722	B	3	30	90	12	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900722	C	3	22	66	9	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900724	B	3	25	75	18	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900724	D	3	29	87	21	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900726	B	3	41	123	0								
6	1	900726	C	3	28	84	11	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900727	C	3	38	114	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900727	E	3	8	24	0								
6	1	900728	C	3	50	150	27	0.042	0.000	6.3	9.2	0.031	0.000	4.7	7.0
6	1	900728	D	3	26	78	18	0.010	0.000	0.8	0.7	0.010	0.000	0.8	0.7
6	1	900730	C	3	31	93	18	0.023	0.000	2.2	2.2	0.023	0.000	2.2	2.2
6	1	900730	D	3	23	69	17	0.105	0.003	7.3	14.3	0.086	0.003	5.9	13.5
6	1	900731	B	3	19	57	3	0.444	0.049	25.3	160.4	0.444	0.049	25.3	160.4
6	1	900731	D	3	31	93	14	0.495	0.036	46.0	308.1	0.125	0.002	11.6	14.2

[a] Temporal Components: 1 (6/1-6/21); 2 (6/22-6/30); 3 (7/1-7/7); 4 (7/8-7/14); 5 (7/15-7/21); 6 (7/22-7/31).

[b] Stratum 0 = Nonpeak; periods A and F. Stratum 1 = Peak; periods B, C, D, E.

[c] Daily periods: A (0600-859); B (0900-1159); C (1200-1459); D (1500-1759); E (1800-2059); F (2100-2359).

Appendix A5. Summary of daily angler effort (angler-hours), catch rates (CPUE, fish caught per angler-hour), and harvest rates (HPUE, fish kept per angler-hour) for rainbow trout in the sport fishery in the lower Naknek River, 1990.

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Interviewed	Estimates by Period: CPUE Mean	CPUE Variance	Catch Estimate	Catch Variance	HPUE Mean	HPUE Variance	Harvest Estimate	Harvest Variance
1	0	900606	A	3	4	12	4	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900606	F	3	0	0	10	0.108	0.011	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900611	A	3	14	42	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900611	F	3	21	63	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900617	A	3	3	9	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	0	900617	F	3	24	72	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900602	C	3	29	87	5	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900602	E	3	37	111	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900603	C	3	29	87	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900603	E	3	15	45	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900607	B	3	3	9	0								
1	1	900607	C	3	7	21	0								
1	1	900608	B	3	7	21	3	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900608	D	3	24	72	7	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900609	D	3	3	9	15	0.051	0.002	0.5	0.2	0.000	0.000	0.0	0.0
1	1	900609	E	3	8	24	4	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900610	B	3	34	102	0								
1	1	900610	E	3	16	48	8	0.058	0.002	2.8	3.5	0.031	0.001	1.5	2.0
1	1	900613	C	3	20	60	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900613	E	3	34	102	30	0.035	0.000	3.6	4.8	0.006	0.000	0.6	0.4
1	1	900615	B	3	45	135	14	0.019	0.000	2.6	7.5	0.000	0.000	0.0	0.0
1	1	900615	D	3	27	81	10	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900616	B	3	47	141	11	0.032	0.001	4.4	19.6	0.000	0.000	0.0	0.0
1	1	900616	D	3	43	129	22	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900618	B	3	26	78	10	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900618	E	3	31	93	15	0.026	0.000	2.4	3.5	0.000	0.000	0.0	0.0
1	1	900619	C	3	21	63	11	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900619	D	3	47	141	11	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900621	B	3	23	69	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
1	1	900621	C	3	18	54	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	0	900626	A	3	1	3	0								
2	0	900626	F	3	18	54	27	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	0	900629	A	3	62	186	0								
2	0	900629	F	3	39	117	17	0.006	0.000	0.7	0.5	0.000	0.000	0.0	0.0
2	1	900622	B	3	29	87	0								
2	1	900622	C	3	55	165	13	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900624	B	3	78	234	8	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900624	C	3	104	312	28	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900627	C	3	87	261	40	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900627	E	3	64	192	59	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900628	B	3	90	270	18	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900628	C	3	114	342	20	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
2	1	900630	B	3	142	426	3	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0

-Continued-

Appendix A5. (Page 2 of 3).

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Interviewed	Estimates by Period: CPUE Mean	CPUE Variance	Catch Estimate	Catch Variance	HPUE Mean	HPUE Variance	Harvest Estimate	Harvest Variance
2	1	900630	D	3	150	450	59	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	0	900703	A	3	57	171	0								
3	0	900703	F	3	28	84	26	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	0	900706	A	3	18	54	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	0	900706	F	3	53	159	16	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900702	C	3	104	312	38	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900702	E	3	35	105	45	0.006	0.000	0.7	0.2	0.000	0.000	0.0	0.0
3	1	900703	C	3	134	402	38	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900703	E	3	55	165	42	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900704	D	3	71	213	32	0.025	0.000	5.3	6.7	0.012	0.000	2.6	3.5
3	1	900704	E	3	8	24	32	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900705	D	3	43	129	25	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900705	E	3	31	93	44	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900706	D	3	136	408	54	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
3	1	900706	E	3	68	204	43	0.007	0.000	1.5	1.1	0.004	0.000	0.7	0.6
4	0	900710	A	3	48	144	0								
4	0	900710	F	3	0	0	10	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	0	900713	A	3	27	81	0								
4	0	900713	F	3	2	6	0								
4	1	900708	B	3	74	222	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900708	D	3	69	207	21	0.115	0.003	23.8	143.0	0.000	0.000	0.0	0.0
4	1	900709	B	3	60	180	6	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900709	E	3	11	33	31	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900710	C	3	74	222	26	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900710	D	3	21	63	25	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
4	1	900711	C	3	60	180	17	0.149	0.012	26.8	379.4	0.000	0.000	0.0	0.0
4	1	900711	E	3	51	153	23	0.052	0.000	7.9	10.5	0.015	0.000	2.2	2.4
4	1	900714	C	3	66	198	17	0.018	0.000	3.5	12.6	0.000	0.000	0.0	0.0
4	1	900714	E	3	22	66	25	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	0	900715	A	3	0	0	0								
5	0	900715	F	3	14	42	6	0.049	0.004	2.1	7.9	0.000	0.000	0.0	0.0
5	0	900720	A	3	14	42	0								
5	0	900720	F	3	13	39	8	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900715	C	3	58	174	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900715	D	3	93	279	39	0.017	0.000	4.8	5.1	0.000	0.000	0.0	0.0
5	1	900716	C	3	72	216	14	0.083	0.001	18.0	35.3	0.000	0.000	0.0	0.0
5	1	900716	D	3	27	81	41	0.039	0.000	3.1	2.5	0.000	0.000	0.0	0.0
5	1	900717	B	3	50	150	17	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900717	E	3	12	36	15	0.018	0.000	0.7	0.2	0.000	0.000	0.0	0.0
5	1	900718	B	3	43	129	8	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900718	E	3	25	75	4	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
5	1	900719	B	3	57	171	0								
5	1	900719	C	3	23	69	24	0.120	0.008	8.3	37.1	0.011	0.000	0.8	0.6
6	0	900723	A	3	18	54	0								
6	0	900723	F	3	6	18	2	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	0	900724	A	3	4	12	0								
6	0	900724	F	3	1	3	0								

-Continued-

Appendix A5. (Page 3 of 3).

Temporal Component[a]	Stratum[b]	Date	Period[c]	Hours in Period	Anglers Counted	Est. Effort in Period	Anglers Interviewed	Estimates by Period: CPUE Mean	CPUE Variance	Catch Estimate	Catch Variance	HPUE Mean	HPUE Variance	Harvest Estimate	Harvest Variance
6	0	900730	A	3	0	0	0								
6	0	900730	F	3	6	18	5	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900722	B	3	30	90	12	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900722	C	3	22	66	9	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900724	B	3	25	75	18	0.017	0.000	1.3	1.7	0.017	0.000	1.3	1.7
6	1	900724	D	3	29	87	21	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900726	B	3	41	123	0								
6	1	900726	C	3	28	84	11	0.023	0.001	1.9	3.8	0.023	0.001	1.9	3.8
6	1	900727	C	3	38	114	15	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900727	E	3	8	24	0								
6	1	900728	C	3	50	150	27	0.126	0.003	18.9	65.0	0.032	0.000	4.7	6.8
6	1	900728	D	3	26	78	18	0.144	0.006	11.2	34.8	0.022	0.000	1.7	1.2
6	1	900730	C	3	31	93	18	0.023	0.000	2.2	2.2	0.023	0.000	2.2	2.2
6	1	900730	D	3	23	69	17	0.127	0.007	8.7	34.6	0.000	0.000	0.0	0.0
6	1	900731	B	3	19	57	3	0.000	0.000	0.0	0.0	0.000	0.000	0.0	0.0
6	1	900731	D	3	31	93	14	0.014	0.000	1.3	1.7	0.000	0.000	0.0	0.0

[a] Temporal Components: 1 (6/1-6/21); 2 (6/22-6/30); 3 (7/1-7/7); 4 (7/8-7/14); 5 (7/15-7/21); 6 (7/22-7/31).

[b] Stratum 0 = Nonpeak; periods A and F. Stratum 1 = Peak; periods B, C, D, E.

[c] Daily periods: A (0600-859); B (0900-1159); C (1200-1459); D (1500-1759); E (1800-2059); F (2100-2359).

APPENDIX B

Data Files

Appendix B. Data files used to produce this report.

Data Files	
R007AIA0.DTA	Naknek R. angler interviews 2 June-30 June 1990.
R007AIB0.DTA	Naknek R. angler interviews 6 July-6 July 1990.
R007AIC0.DTA	Naknek R. angler interviews 8 July-14 July 1990.
R007AID0.DTA	Naknek R. angler interviews 15 July-20 July 1990.
R007AIE0.DTA	Naknek R. angler interviews 22 July-31 July 1990.
R007ACA0.DTA	Naknek R. angler counts 2 June-30 June 1990.
R007ACB0.DTA	Naknek R. angler counts 6 July-6 July 1990.
R007ACC0.DTA	Naknek R. angler counts 8 July-14 July 1990.
R007ACD0.DTA	Naknek R. angler counts 15 July-20 July 1990.
R007ACE0.DTA	Naknek R. angler counts 22 July-31 July 1990.
R1960CA0.DTA	Big Creek angler counts 2 June-31 July 1990.
R007ABA0.DTA	Naknek R. chinook salmon biological data (age, weight, length),
	Analysis Programs
NAK90NEW.SAS	Naknek R. effort, catch, harvest estimate program, 1990.
NAK90CPU.SAS	Naknek R. CPUE as estimator of abundance program, 1990.
CPUE.WK1	Weighting worksheet for use with products of NAK90CPU.SAS.
BBXPEXE	A series of programs that uses biological data files to produce tables of mean lengths and weights by sex and age group for a species. The program also produces a data set which may be used in Lotus 1-2-3 (tm) to create graphs.

The data files are all archived with the Alaska Department of Fish and Game, Sport Fish Division, Research and Technical Services Unit, 333 Raspberry Road, Anchorage, Alaska 99518-1599; Contact Gail Heineman or Donna Buchholz (907-267-2369) for copies of the files and descriptions of the file formats.