# Estimates of Total Return by Age for Kenai River Chinook Salmon, 1986-1990

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Sandra Sonnichsen
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Marianna Alexandersdottir

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AGE FOR KENAI RIVER CHINOOK SALMON, 1986-1990[1]

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

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ABSTRACT

Age composition and run strength data for early and late-run Kenai River chinook salmon *Oncorhynchus tshawytscha* from 1976 through 1990 are compiled to be available for future estimation of return per spawner ratios. Return per spawner ratios can not be calculated for any brood years to date because spawning escapement can only be estimated for returns beginning in 1985, however, the effect of strong brood years can be followed across years in the data we have now.

In 1986 through 1990, both the early and late runs of Kenai River chinook salmon have been dominated by age 1.3 and age 1.4 fish. The total run strength of the early run of chinook salmon to the Kenai River from 1985 to 1990 has ranged from 27,080 fish in 1986 to 10,808 in 1990. Complete brood year returns are only available for 1982 and 1983 brood years; these were 30,970 and 16,911 fish respectively. The return from the 1981 brood year was at least 28,923, with the abundance of age 4 unknown. The large returns from the 1981 and 1982 brood years were largely responsible for the strength of the early run in the Kenai River in 1986 through 1988.

The total run strength of the late run from 1985 through 1990 has ranged from 39,656 chinook salmon in 1990 to 79,837 in 1986. For the late run, the 1981 brood year return was at least 92,586, with the abundance of age 3 and age 4 fish unknown, and the return from the 1982 brood year was 90,723 with the abundance of age 3 fish unknown. As for the early run, the 1981 and 1982 brood years are responsible for the large late runs of chinook salmon in the Kenai River in 1986 through 1988.

KEYWORDS:     Kenai River, chinook salmon, *Oncorhynchus tshawytscha*, age composition, return per spawner.

INTRODUCTION

The Kenai River is a glacial stream located in southcentral Alaska on the Kenai Peninsula. The Kenai River supports the largest sport fishery in Alaska (Mills 1990), with chinook salmon *Oncorhynchus tshawytscha* being the target of a large portion of the sport fishing effort. The sport harvest of chinook salmon from the Kenai River is the largest in the state, with a record harvest of 41,961 fish in 1988 (Hammarstrom 1989).

The Kenai River has two stocks of chinook salmon: an early run which enters the river from mid-May until late June, and a late run which enters the river from late June through early August (Burger et al. 1985). In 1988, the Alaska Board of Fisheries chose to delineate the early and late runs arbitrarily at 1 July for the purpose of stock allocation and in-season management. Although the definitions of the early run (mid May to 30 June) and the late run (1 July to mid August) are convenient representations of the timing of the runs, in reality there is overlap in their timing.

Management of the recreational fishery for chinook salmon in the Kenai River is complicated by the relatively large harvests of Kenai River chinook salmon by sport and commercial fisheries in the marine waters of Cook Inlet. By 1988, the growth of the major fisheries that harvest Kenai River chinook salmon fueled severe allocation disputes and heightened both public and agency concerns that stocks were vulnerable to over-exploitation. To address these concerns, in December of 1988 the Board of Fisheries adopted management plans for the early and late returns of chinook salmon to the Kenai River. These plans stipulate both the specific escapement goal by which the fisheries will be managed, and the manner in which selected fisheries are to be managed in the event of a conservation shortfall. The Kenai River chinook salmon fishery has been managed on the basis of these mangagement plan escapement goals since 1989.

The Board set the escapement goals at 9,000 spawning fish for the early run, and 22,300 for the late run. Determination of escapement goals for Pacific salmon is largely a matter of compiling return statistics and estimating the resulting production from a given brood or escapement. For the Kenai River, a simple model to estimate the necessary escapement to produce a desired level of return was used (McBride et al. 1989):
Escapement Goal = Desired Total Return / Average Rate of Return per Spawner.
The key parameter in this model is the average rate of return per spawner. In order to estimate average return per spawner, managers must have several years of known spawning escapements, coupled with known returns from those escapements. Such a data base was not available for the Kenai River in 1988, so an average rate of return of 3 to 1 was chosen as the most likely estimate of long term production, based on available information from other west coast chinook salmon stocks (McBride et al. 1989). This 3 to 1 ratio was used in conjunction with known returns from 1984 through 1988 to determine the escapement goals included in the early and late-run management plans.

It is, of course, more desirable to base escapement goals (and therefore management of the fishery) on known return per spawner ratios from the Kenai River. With this in mind, a program was begun in 1984 to estimate the total

return and spawning escapement by age class of chinook salmon in the Kenai River.

The objective of this report is to compile historic age composition, harvest, and escapement data. This report is intended to serve as a baseline reference document and starting point for future return-per-spawner analysis.

## METHODS

Chinook salmon pass through the marine waters of Cook Inlet and return to the Kenai River during May through August. The fisheries to which they may be vulnerable in Cook Inlet include the recreational fishery off the mouth of Deep Creek from May through July, the commercial drift net fishery targeting sockeye salmon *Oncorhynchus nerka* during July and August, and the commercial set net fishery along the east side of Cook Inlet, also targeting sockeye salmon during July and August. Once the runs enter the Kenai River, they are vulnerable to in-river sport and subsistence fisheries.

### Estimation of Total Run Strength and Escapement

Total run strength of chinook salmon is defined as the total number of mature fish from all brood years that return in a single year (for instance all the chinook salmon that return in 1985). Escapement is defined as those salmon which escape all marine and in-river fisheries and, therefore, are potential spawners. Total brood year return is defined as the total number of mature chinook salmon that are produced from the spawning escapement.

In order to estimate run strength, the harvest in each of the marine and in-river fisheries must be estimated, as well as the final spawning escapement.

Early Run:

Early-run fish are harvested in both marine and freshwater fisheries. Marine harvests are from mixed-stock recreational fisheries. The largest marine sport fishery occurs during May and June in waters off of Deep Creek (Figure 1) and has averaged approximately 2,500 fish since 1972 (Hammarstrom and Larson 1986, Hammarstrom et al. 1987, Mills 1988-1990). The harvest consists of a mix of stocks that originate from throughout Upper Cook Inlet, and the contribution of early-run fish from the Kenai River is unknown. A large number of other stocks of upper Cook Inlet origin are available at the Deep Creek Fishery during this time; in particular, stocks destined for the Susitna River (Figure 1), which outnumber early-run Kenai River stocks by an order of magnitude (McBride et al. 1985). Other stocks of similar run timing that are likely contributors include those bound for the Anchor River, Deep Creek, Ninilchik River, and Kasilof River. Given these factors, it is unlikely that an accounting of the contribution of early-run Kenai River fish in the Deep Creek fishery would alter any conclusions regarding stock status (McBride et al. 1989). We therefore chose not to include any of the early-run Deep Creek harvest in our estimates of total return.
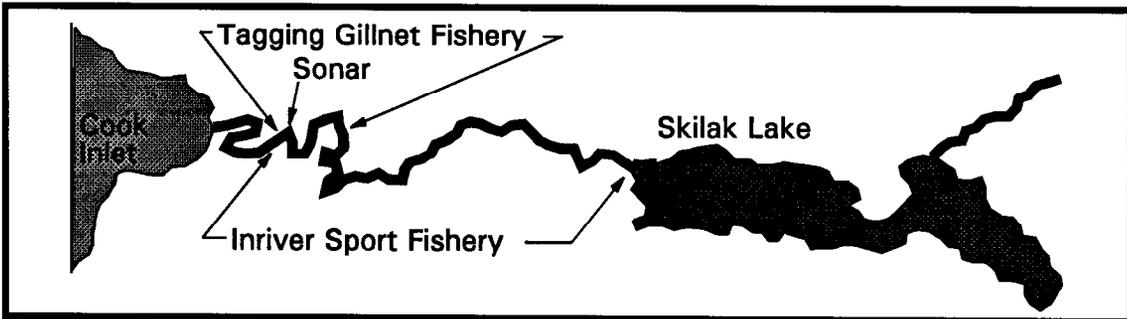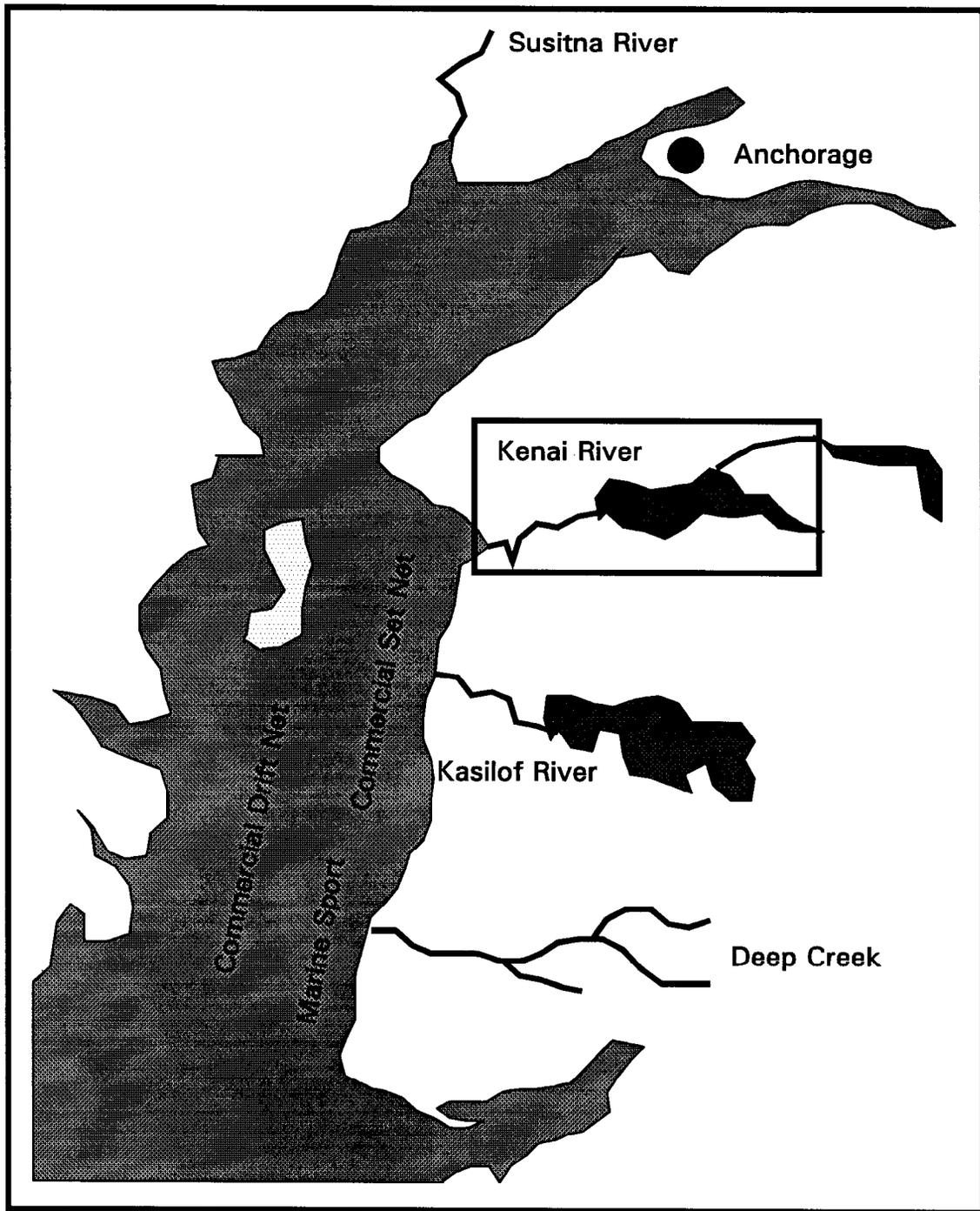
Figure 1. Map of Cook Inlet showing commercial fishing areas and the Kenai River.

Migration of early-run fish is relatively unimpeded from the Deep Creek fishery until they enter the lower Kenai River. Near the mouth of the river a few chinook salmon have been harvested since 1989 by educational gill nets. This harvest is taken by native Kenaitze tribal members as a subsitiute for a subsistence harvest. This harvest may increase as legal subsistence fishing rights for Kenai River stocks are established, but through 1990 the reported harvest has been less than 100 fish.

Total in-river return above the educational gill nets has been estimated by two independent methods, tagging and hydroacoustic assessment (sonar), since 1984. A mark-recapture tagging study was initiated for the late run in 1984 and was expanded to include the early run in 1985 (Hammarstrom et al. 1985, Hammarstrom and Larson 1986, Conrad and Larson 1987, Conrad 1988, Carlon and Alexandersdottir 1989, Alexandersdottir and Marsh 1990). Fish to be tagged were captured with drift gill nets in the lower portion of the river and subsequently recaptured in the in-river sport fishery. The tagging project continued from 1985 through 1990, but in 1990 closures of the in-river sport fishery resulted in very few recaptures of tagged fish and therefore no estimate of abundance from tagging was made.

The feasibility of using hydroacoustics (sonar) to estimate in-river return was investigated beginning in 1984, although the first useable estimates were only achieved during the late run of 1987. Sonar has since been accepted as the best estimate of in-river abundance. Currently, estimates of variance are not available for these estimates however, a large fraction of the migration (approximately 33%) is sampled by this gear and the variances for the seasonal estimate of abundance is low relative to the estimate (D. Burwen, Alaska Department of Fish and Game, Anchorage, personal communication). Estimates of total run strength for the early run are simply the sum of the in-river return plus the harvest in the educational gill nets.

Estimates of the in-river sport harvest are available from on site creel surveys since 1974 (Hammarstrom 1974-1981, 1988-1991; Hammarstrom and Larson 1982-1984, 1986; Hammarstrom et al. 1985; Conrad and Hammarstrom 1987). Annual harvest of the early run in this fishery has averaged 5,000 fish since 1974 and a record harvest of 13,281 fish was taken in 1987. Total release of early-run fish in the sport fishery has been estimated since 1986, and has ranged from 3,200 to 5,900 fish annually. The rate of mortality due to hook and release during the early run was measured in 1990 and 1991 (Bendock and Alexandersdottir 1991, and *In prep*) and averaged 6.4% (SE=3.4). Spawning escapement is the difference between the total in-river return and the sport harvest (including hooking mortality).

Late Run:

Late-run Kenai River chinook salmon are harvested in several marine fisheries in addition to the freshwater sport fishery. Most of the marine harvest of late-run fish occurs during July and early August in the commercial set gill net fishery along the east side of upper Cook Inlet (Figure 1). Harvests from commercial fisheries are measured through sales receipts (fish tickets). Estimates of stock contribution to this fishery are available only for 1984 (McBride et al. 1985). During 1984, the contribution of late-run Kenai River

chinook salmon to the 3-ocean and 4-ocean components of the set net harvest was estimated to be 79%. Those age components comprised 70% of the harvest during that year. Given this estimate, we consider the contributions of other stocks to this fishery to be inconsequential and have not attempted to partition the harvest by stock (McBride et al. 1989). Reported harvests in the set net fishery have been declining since 1985, and have averaged roughly 14,000 chinook salmon (Table 1). Harvests in the upper Cook Inlet drift net fishery are also believed to be comprised primarily of late-run Kenai River origin, and have averaged roughly 2,000 fish since 1985. A small number of chinook salmon are caught by commercial fishermen and retained for their own use; the reported harvest was only 4 fish in 1989, and in 1990 it was 91 fish.

Sport harvest in the Deep Creek marine recreational fishery during July also probably consists primarily of late-run Kenai River fish (McBride et al. 1989). The chinook salmon harvest in the Deep Creek marine sport fishery has been estimated since 1972 (Hammarstrom and Larson 1986, Hammarstrom et al. 1987, Mills 1988-1990). From 1972 through 1986, harvest was estimated via an on-site creel survey, yielding estimates of early and late-run chinook salmon harvest. From 1987 through 1990, harvests were estimated via a state-wide postal harvest survey. The state-wide postal survey yields estimates for the entire season, not segregated into early and late runs. We segregated estimates from the state-wide postal survey into early and late runs using the mean contribution of each run to the total harvest from 1972 through 1986. Estimates of the variance associated with the harvest estimates from the creel survey are only available for 1987. Variance estimates were not calculated for the state-wide postal survey estimates.

As with the early run, small numbers of late-run fish are harvested by native educational gill nets in the lower river. This harvest has taken place since 1989 and, to date, has been less than 50 fish each year (S. Hammarstrom, Alaska Department of Fish and Game, Soldotna, personal communication).

Total in-river return above the educational gill nets for the late run has been estimated as for the early run with a mark-recapture tagging project and sonar counts. Estimates from the mark-recapture tagging project for the late run are available for 1984 through 1989 (Hammarstrom et al. 1985, Hammarstrom and Larson 1986, Conrad and Larson 1987, Conrad 1988, Carlon and Alexandersdottir 1989, Alexandersdottir and Marsh 1990). Estimates from the sonar project are available from 1987 through 1990, and are the considered the best estimates of in-river abundance for year they are available. The total in-river return has ranged from 29,035 to 57,563 from 1984 through 1990 (Table 1). Estimates of total run strength for the late run are the sum of the commercial set net harvest, the commercial drift net harvest, the Deep Creek marine recreational harvest, the educational gill net harvest, and the in-river return (Table 1).

Estimates of the in-river sport harvest of the late run are available since 1974 (Hammarstrom 1974-1981, 1988-1991; Hammarstrom and Larson 1982-1984, 1986; Hammarstrom et al. 1985; Conrad and Hammarstrom 1987). Harvest of the late run in this fishery has averaged roughly 7,000 fish since 1974 and peaked at 17,512 in 1988. Total release in the sport fishery has been estimated since 1986 and has ranged from 2,390 to 6,372. The rate of mortality due to

Table 1. Total return and spawning escapement for Kenai River chinook salmon, 1984-1990.

| Year | Deep Creek Marine | Set net Harvest | Drift net Harvest | Commercial Personal Use | Educational Gill Net | In-River Return | Total Return | Sport Harvest | Hook and Release Mortality[a] | Spawning Escapement |
|---|---|---|---|---|---|---|---|---|---|---|
| Early Run | | | | | | | | | | |
| 1985 | | | | | | 15,972 | 15,972 | 7,971 | NA[b] | 8,001 |
| 1986 | | | | | | 27,080 | 27,080 | 7,561 | 292 | 19,227 |
| 1987 | | | | | | 25,643 | 25,643 | 13,281 | 374 | 11,988 |
| 1988 | | | | | | 20,880 | 20,880 | 12,747 | 377 | 7,756 |
| 1989 | | | | | 73 | 17,992 | 18,065 | 7,256 | 169 | 10,640 |
| 1990 | | | | | 40 | 10,768 | 10,808 | 1,735 | 285 | 8,788 |
| Late Run | | | | | | | | | | |
| 1984 | 835 | 6,165 | 1,377 | | | 39,172[c] | 47,549 | 7,376 | NA[b] | 31,796 |
| 1985 | 1,731 | 17,723 | 2,046 | | | 29,763 | 51,263 | 8,055 | NA[b] | 21,708 |
| 1986 | 630 | 19,810 | 1,834 | | | 57,563 | 79,837 | 9,004 | 522 | 48,037 |
| 1987 | 1,097 | 20,588 | 4,551 | | | 48,123 | 74,359 | 12,237 | 368 | 35,518 |
| 1988 | 1,262 | 12,870 | 2,217 | | | 52,008 | 68,357 | 17,512 | 472 | 34,024 |
| 1989 | 1,294 | 10,919 | 0 | | 22 | 29,035 | 41,270 | 9,127 | 327 | 19,581 |
| 1990 | 1,318 | 4,139 | 621 | 91 | 13 | 33,474 | 39,656 | 6,247 | 141 | 27,086 |

a   See Appendix A7 and Appendix B14.
b   Estimates of sport catch, and therefore of hook and release mortality, are not available for 1984 and 1985.
c   Does not include returns after 31 July.  Hammarstrom et al. (1985) estimated that the August segment of the run was 25% of the July segment, or 9,783 fish.

hook and release during the late run was measured in 1989 and 1990 (Bendock and Alexandersdottir 1990, 1991), and averaged 8.3% (SE=3.3). Spawning escapement is the difference between the total in-river return and the sport harvest (including hooking mortality).

## Estimation of Brood Year Returns

Kenai River chinook salmon spend 0 to 2 (usually 1) years in fresh water and 1 to 6 years in salt water, but three age classes, 1.3-1.5[1] (one freshwater winter and three to five saltwater winters, or 4-6 total years) make up the majority of the return. Inputs to estimate total return from any brood year are estimates of numbers by age of Kenai River chinook salmon in significant marine commercial and sport fisheries and from the in-river return over several years. Age composition samples are taken annually from many sport and commercial chinook salmon fisheries in Cook Inlet. Age compositions are known to change within a season, so most samples for age composition are stratified by some combination of weeks within the season.

Deep Creek Marine Sport Fishery:

The age composition of the late-run sport harvest in the Deep Creek marine sport fishery was published annually from 1976 through 1986 (Hammarstrom 1977 - 1981; Hammarstrom and Larson 1982 - 1984, 1986; Hammarstrom et al. 1985, 1987). For years after 1986, we used the age composition from the Kenai River late-run sport harvest to estimate harvest of each age class at Deep Creek. For 1983 through 1986, the age compositions of the late-run Deep Creek marine harvest and the late-run Kenai River sport harvest were not significantly different at $\alpha = 0.05$ in any year.

Letting $p_{ad}$ equal the estimated proportion of age class a in a sample, the variance of $p_{ad}$ was estimated as:

$$\hat{V}(\hat{p}_{ad}) = (\hat{p}_{ad})(1-\hat{p}_{ad}) / (n-1) , \tag{1}$$

where:

$\hat{p}_{ad}$ = the estimated proportion of age class a in the Deep Creek sample, and

n = the number of chinook salmon sampled for age.

The number of chinook salmon in the Deep Creek harvest in each age class was then estimated by:

$$\hat{H}_{ad} = \hat{p}_{ad}\hat{H}_{d} \tag{2}$$

Where:

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[1] Age class is defined using the European system (Koo 1962), where the first number represents the number of freshwater winters and the second number represents the number of saltwater winters. The total age of the fish at return is the sum of the freswater and saltwater winters plus one.

$\hat{H}_{ad}$ = the estimated number of fish in the Deep Creek harvest in age class a for a run,

$\hat{H}_d$ = the estimate of total late-run harvest from Deep Creek.

From the method of Goodman (1960), the variance of $H_{ad}$ is equal to:

$$\hat{V}(\hat{H}_{ad}) = \hat{V}(\hat{H}_d)\hat{P}_{ad}^2 + \hat{V}(\hat{P}_{ad})\hat{H}_d^2 - \hat{V}(\hat{H}_d)\hat{V}(\hat{P}_{ad}). \qquad (3)$$

For years with no estimate of the variance of the harvest, the harvest was treated as a constant and the above formula reduces to the formula for the variance of a constant times a random variable:

$$\hat{V}(\hat{H}_{ad}) = \hat{V}(\hat{P}_{ad})H_d^2. \qquad (4)$$

This is an underestimate of the variance of $H_{ad}$.

Commercial Fisheries:

The age composition of chinook salmon in the commercial set net fishery has been estimated since 1983 (Cross 1985, Cross et al. *In Press*, Waltemyer 1989, D. Waltemyer, Alaska Department of Fish and Game, Soldotna, personal communication). No age composition information is available for the Central District drift net fishery, so the set net age compositions were applied to the drift net harvest.

The proportion of each age class in each sampling strata and its variance was calculated as for the Deep Creek data, using equations 1, 2, and 4, substituting commercial harvest from fish tickets for the sport harvest ($H_d$)

The number of fish in each age class for all strata combined was simply the sum of the number of fish in each strata. The variance was also summed across strata. The proportion of fish in each age class for all strata combined was:

$$\hat{P}_{ac} = \hat{H}_{ac} / \sum_{k=1}^{s} H_{ck} , \qquad (5)$$

where:

$\hat{H}_{ac}$ = The estimate of the number of fish in age class a for all strata combined in the commercial set net harvest, and

$H_{ck}$ = The number of fish in the commercial set net harvest in strata k, and,

s = The total number of strata.

With variance (Scheaffer et al. 1979):

$$\hat{V}(\hat{P}_{ac}) = \sum_{k=1}^{s} \hat{V}(\hat{H}_{ack}) / (\sum_{k=1}^{m} H_{ck})^2, \tag{6}$$

where:

$\hat{H}_{ack}$ = the estimated commercial set net harvest of age class a in strata k.

The proportions of each age class in all strata combined in the commercial set net harvest were used to estimate the harvest of each age class in the drift net harvest and in the commercial personal use harvest (which were not sampled).

$$\hat{H}_{af} = \hat{P}_{ac}H_f \tag{7}$$

where:

$\hat{H}_{af}$ = the estimated harvest of age class a in the commercial drift net or commercial personal use fishery, and

$H_f$ = the total harvest in the commercial drift net or commercial personal use fishery.

The variance of $H_{af}$ is calculated as for the Deep Creek marine sport harvest (equation 4), substituting $P_{ac}$ for $P_{ad}$ and $H_f$ for $H_d$.

Educational Gill Nets:

No age composition samples have been taken from the harvest in the educational gill nets. For the early run we assumed that the age composition of the educational gill net harvest was the same as the age composition of the in-river return. For the late run, we assumed the age composition was the same as the commercial set net harvest. Total harvest by age class was calculated as for the Deep Creek harvest, substituting the proportion from either the in-river return or the commercial set nets for $P_{ad}$, and the total educational gill net harvest for $H_d$.

In-River Return:

Estimates of age composition of the in-river return from the mark-recapture project sampling are available since 1986 and are published in the same reports as the mark-recapture population estimates (Conrad and Larson 1987, Conrad 1988, Carlon and Alexandersdottir 1989, Alexandersdottir and Marsh 1990).

The proportion of each age class and the number of fish in each age class in each sampling strata of the in-river return and their variances were calculated as for the Deep Creek marine data, using equations 1-3. For strata

in which the sonar counts were used to estimate the in-river return, the return is treated as a constant and equation 4 is used to estimate the variance.

Estimates of the number of fish in each age class and their variances for each sampling strata were then summed across strata to give estimates of in-river return by age class for the entire run.

Kenai River Sport Harvest:

The number of fish of each age class in each sampling strata of the Kenai River sport harvest and its variance were calculated as for the Deep Creek marine data, using equations 1-3, substituting Kenai River sport harvest for the Deep Creek marine sport harvest. Estimates of harvest by age class and their variances were summed across strata. The proportion of fish in each age class for all strata combined was calculated as for the commercial set net data, using equations 5 and 6.

Hook and Release Mortality:

The rate of mortality among fish caught and released during the sport fishery is known to vary by sex and size of fish (Bendock and Alexandersdottir 1990, 1991). The age composition of these mortalities is unknown, so we did not attempt to apportion the mortalities among age classes.

Spawning Escapement:

Spawning escapement by age was calculated by subtracting the sport harvest for each age class from the in-river return. In cases where this resulted in a negative number for minor age classes, the spawning escapement was set to zero. The variance of the spawning escapement was calculated as the sum of the variance of the sport harvest and the variance of the in-river return for each age.


## Relationships Between Ages Within a Brood Year

Age structure is a conservative trait in salmonids, the age classes represented within brood years in a stock do not change drastically across years. The distribution of numbers returning in each age class within a brood year may also be a stable character within a stock. This relationship between ages within a brood year, or sibling relationships, may be used to estimate expected return in future years for a brood year.

A sibling ratio, $r_a$, is the ratio of one age to one or more younger ages in a brood year. For any brood year b, the number that have returned to date is:

$$n_{\cdot b} = \sum_{j=3}^{a-1} n_{jb} \qquad (9)$$

where,

$n_{jb}$ = number returning at age j (j begins at 3 since no Kenai River fish return at ages younger than 3),

and the sibling ratio of the abundance returning at age a to the total abundance of preceding ages in a brood year is,

$$r_{ab} = n_{ab}/n._b \qquad (10)$$

where,

$n_{ab}$ = number returning at age a.

The variance of the sum of abundances at ages 3 to a-1 is the sum of the variances of each abundance at age:

$$V[n._b] = \sum_{j=3}^{a-1} V[n_{jb}] \qquad (11)$$

and the variance of the sibling ratio is:

$$V[r_{ab}] = r_{ab}^2 \left( \frac{V[n_{ab}]}{n_{ab}^2} + \frac{V[n._b]}{n._2} \right) . \qquad (12)$$

Sibling ratios for each age can be estimated for all brood years for which data are available and an average ratio estimated, by:

$$\bar{r}_a = \sum_{b=1}^{m} r_{ab} / m \qquad (13)$$

where,

m = number of brood years for which $r_{ab}$ is available.

The complete variance for the sibling ratio for age a is:

$$V[r_a] = \frac{\sum_{b=1}^{m} (r_{ab} - \bar{r}_a)^2}{m(m-1)} + \frac{\sum_{b=1}^{m} V[r_{ab}]}{m} . \qquad (14)$$

The second component accounts for variation from estimated age compositions while the first represents variation among brood years.

The expected return in year k of fish of age a from brood year b can be estimated using this ratio and the sum of returns from brood year b in previous years. The return to date is estimated by:

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$$\overset{\wedge}{n}_{.b} = \sum_{j=3}^{a-1} n_{jb} \ , \tag{15}$$

and the expected return at age a is estimated by:

$$\overset{\wedge}{n}_{ab} = \overline{r}_{ab} \overset{\wedge}{n}_{.b} \tag{16}$$

and its variance by:

$$V[\overset{\wedge}{n}_{ab}] = \overline{r}_{ab}^2 V[\overset{\wedge}{n}_{.b}] \ + \ V[\overline{r}_{ab}] \overset{\wedge}{n}_{.b}^2 \ - \ V[\overline{r}_{ab}] \ V[\overset{\wedge}{n}_{.b}] \ . \tag{17}$$

We used mean sibling ratios to estimate the 1990 run strength, and compared this estimate to the known 1990 run strength. A predictive model of returns should not include as a variable the sibling ratios calculated from the predicted year's returns. Thus, only the mean of the sibling ratios from 1985 through 1989 returns was used to estimate the 1990 expected returns. The expected returns for 1991 were estimated using the mean of the sibling ratios from 1985 through 1990 returns.

## RESULTS

### Early Run

The total run strength has ranged from 27,080 chinook salmon in 1986 to 10,808 in 1990 (Table 1). Age 1.4 fish usually dominate the in-river return and spawning escapement (Tables 2 and 3 and Appendices A1-A5). The only exception was in 1986 when age 1.3 fish were more numerous. The dominant age class in all years in the sport fishery has been 1.4 (Table 4, Appendix A6).

Complete brood year returns for the early-run chinook salmon are only available for the 1982 and 1983 brood years; these were 30,970 and 16,911 fish, respectively (Table 5). The return from the 1981 brood year was at least 28,923, with the abundance of age 4 fish unknown (Table 5). The majority of Kenai River early-run chinook salmon return at ages 4 to 7, with age 6 fish having the largest representation followed by the age 5 fish (Table 5). The large return from the 1981 and 1982 brood years was largely responsible for the strength of the runs in the Kenai River in 1986-1988 (Table 2).

Sibling ratios from the 1985 through 1990 returns were highly variable (Table 6). The ratio of age 6 to age 5 is of particular interest because these two ages account for the majority of each brood year's return. A pattern of high ratios for brood years with low age 5 return and low ratios for years with high age 5 returns has begun to develop (Figure 2). If this pattern continues as we collect more data, a more accurate model of brood year returns may be developed. The percent difference between observed and expected returns expressed as a percentage of the expected return ranged from 14-47% for the

Table 2. Estimates by age class of the total number of early-run Kenai River chinook salmon, 1986-1990.

|  |  |  |  |  |  | Age Class |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | Total |
| **1986** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 4,554 | 11,730 | 8,880 | 1,908 | 0 | 0 | 0 | 0 | 7 | 27,080 |
| SE | | | | | | 1,755 | 4,239 | 3,195 | 703 | | | | | 19 | 9,799 |
| **1987** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 386 | 9,653 | 14,883 | 589 | 0 | 0 | 0 | 31 | 101 | 25,643 |
| SE | | | | | | 125 | 2,080 | 3,732 | 226 | | | | 31 | 56 | 5,928 |
| **1988** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 358 | 3,088 | 15,077 | 2,279 | 57 | 0 | 0 | 21 | 0 | 20,880 |
| SE | | | | | | 97 | 260 | 335 | 237 | 40 | | | 21 | | 0 |
| **1989** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 759 | 2,853 | 12,789 | 1,665 | 0 | 0 | 0 | 0 | 0 | 18,065[a] |
| SE | | | | | | 137 | 250 | 311 | 195 | | | | | | 0 |
| **1990** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 800 | 2,818 | 6,540 | 648 | 0 | 0 | 0 | 0 | 0 | 10,808[b] |
| SE | | | | | | 133 | 214 | 241 | 114 | | | | | | 0 |

[a] Includes 73 fish harvested in educational gill nets.
[b] Includes 40 fish harvested in educational gill nets.

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Table 3. Estimates by age class of the early-run Kenai River chinook salmon spawning escapement, 1986-1990.

| Year | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | Total Aged[a] | Hook and Release Mortality[b] | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1986** | | | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 4,014 | 8,989 | 5,289 | 1,233 | 0 | 0 | 0 | 0 | 7 | 19,519 | 292 | 19,227 |
| SE | | | | | 14 | 1,757 | 4,245 | 3,207 | 710 | | | | | 19 | 9,810 | 161 | 9,811 |
| **1987** | | | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 273 | 5,519 | 6,558 | 0 | 0 | 0 | 0 | 31 | 16 | 12,362 | 374 | 11,988 |
| SE | | | | | | 137 | 2,117 | 3,783 | 264 | | | | 31 | 74 | 5,992 | 214 | 5,996 |
| **1988** | | | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 114 | 1,533 | 5,061 | 1,413 | 57 | 0 | 0 | 21 | 0 | 8,133 | 377 | 7,756 |
| SE | | | | | 22 | 122 | 325 | 694 | 277 | 40 | | | 21 | 31 | 722 | 209 | 752 |
| **1989** | | | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 518 | 938 | 8,177 | 1,182 | 0 | 0 | 0 | 0 | 0 | 10,809 | 169 | 10,640 |
| SE | | | | | 56 | 168 | 369 | 519 | 238 | | | | | | 517 | 100 | 527 |
| **1990** | | | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 699 | 2,710 | 5,222 | 402 | 0 | 0 | 0 | 0 | 0 | 9,073 | 285 | 8,788 |
| SE | | | | | | 142 | 220 | 330 | 140 | | | | | | 277 | 97 | 293 |

[a] For some age classes in some years, the estimate of the number harvested in the sport fishery is greater than the estimate of the number in the in-river return. The spawning escapement for the age class in this case was set to zero. When this occurred, the total spawning escapement (calculated by subtracting total sport harvest from total in-river return) is not the sum of the spawning escapements across age classes.

[b] The rate of mortality due to hook and release is known to vary by size and sex of fish, but the exact age composition of fish killed by hook and release is unknown.

Table 4.  Estimates by age class of the number of early-run chinook salmon harvested in the Kenai River sport fishery, 1986-1990.

| | | | | | | | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | Total |
| **1986** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 14 | 540 | 2,741 | 3,591 | 675 | 0 | 0 | 0 | 0 | 0 | 7,561 |
| SE | | | | | 14 | 89 | 229 | 274 | 100 | | | | | | 470 |
| **1987** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 113 | 4,134 | 8,325 | 623 | 0 | 0 | 0 | 0 | 85 | 13,281 |
| SE | | | | | | 57 | 392 | 621 | 136 | | | | | 49 | 871 |
| **1988** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 22 | 244 | 1,555 | 10,016 | 866 | 0 | 0 | 0 | 0 | 44 | 12,747 |
| SE | | | | | 22 | 74 | 195 | 608 | 143 | | | | | 31 | 722 |
| **1989** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 79 | 238 | 1,903 | 4,560 | 476 | 0 | 0 | 0 | 0 | 0 | 7,256 |
| SE | | | | | 56 | 97 | 272 | 416 | 137 | | | | | | 517 |
| **1990** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 98 | 98 | 1,295 | 244 | 0 | 0 | 0 | 0 | 0 | 1,735 |
| SE | | | | | | 50 | 50 | 225 | 81 | | | | | | 277 |

Table 5.   Number of early-run Kenai River chinook salmon returning 1986-1990 by brood year.

| Brood Year | Spawning Escapement | Return at Age | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | 3 | 4 | 5 | 6 | 7 | 8 | |
| **1978** | | | | | | | | |
| Estimate | NAᵃ | | | | | | 0 | 0 |
| SE | | | | | | | | |
| **1979** | | | | | | | | |
| Estimate | NAᵃ | | | | | 1,915 | 0 | 1,915 |
| SE | | | | | | 703 | | 703 |
| **1980** | | | | | | | | |
| Estimate | NAᵃ | | | | 8,880 | 690 | 57 | 9,627 |
| SE | | | | | 3,195 | 233 | 40 | 3,204 |
| **1981** | | | | | | | | |
| Estimate | NAᵃ | | | 11,730 | 14,914 | 2,279 | 0 | 28,923 |
| SE | | | | 4,239 | 3,732 | 237 | | 5,653 |
| **1982** | | | | | | | | |
| Estimate | NAᵃ | | 4,554 | 9,653 | 15,098 | 1,665 | 0 | 30,970 |
| SE | | | 1,755 | 2,080 | 336 | 195 | | 2,749 |
| **1983** | | | | | | | | |
| Estimate | NAᵃ | 0 | 386 | 3,088 | 12,789 | 648 | | 16,911 |
| SE | | | 125 | 260 | 311 | 114 | | 439 |
| **1984** | | | | | | | | |
| Estimate | NAᵃ | 0 | 358 | 2,853 | 6,540 | | | 9,751 |
| SE | | | 97 | 250 | 241 | | | 360 |
| **1985** | | | | | | | | |
| Estimate | 8,001 | 0 | 759 | 2,818 | | | | 3,577 |
| SE | NA | | 137 | 214 | | | | 254 |
| **1986** | | | | | | | | |
| Estimate | 19,227 | 0 | 800 | | | | | 800 |
| SE | 9,811 | | 133 | | | | | 133 |
| **1987** | | | | | | | | |
| Estimate | 11,988 | 0 | | | | | | 0 |
| SE | 5,996 | | | | | | | |

ᵃ   Spawning escapements for 1978 - 1984 are not available.

Table 6.   Sibling return ratios for early-run Kenai River chinook
           salmon from brood years 1980-1986.

| Brood Year | Age 5/ Age 4 | Age 6/ Age 5 | Age 6/ Age 4+5 | Age 7/ Age 6 | Age 7/ Age 5+6 | Age 7/ Age 4+5+6 |
|---|---|---|---|---|---|---|
| 1980 | NA[a] | NA | NA | 0.08 | NA | NA |
| 1981 | NA | 1.27 | NA | 0.15 | 0.09 | NA |
| 1982 | 2.12 | 1.56 | 1.06 | 0.11 | 0.07 | 0.06 |
| 1983 | 8.00 | 4.14 | 3.68 | 0.05 | 0.04 | 0.04 |
| 1984 | 8.00 | 2.29 | 2.04 | NA | NA | NA |
| 1985 | 3.71 | NA | NA | NA | NA | NA |

Mean sibling ratio using 1985-1990 return data[b]

| | | | | | | |
|---|---|---|---|---|---|---|
| Mean | 5.45 | 2.32 | 2.26 | 0.10 | 0.06 | 0.05 |
| SD | 3.52 | 1.35 | 1.30 | 0.05 | 0.03 | 0.01 |
| %CV[c] | 65 | 58 | 59 | 54 | 41 | 30 |
| Maximum | 8.00 | 4.14 | 3.68 | 0.15 | 0.09 | 0.06 |
| Minimum | 2.12 | 1.27 | 1.06 | 0.05 | 0.04 | 0.04 |

Mean sibling ratio using 1985-1989 return data[d]

| | | | | | | |
|---|---|---|---|---|---|---|
| Mean | 6.03 | 2.33 | 2.37 | 0.11 | 0.08 | 0.06 |
| SD | 3.98 | 1.64 | 1.87 | 0.05 | 0.02 | |

[a]  NA = not available.
[b]  Used to predict 1991 returns.
[c]  Percent coefficient of variation.
[d]  Used to predict 1990 returns.
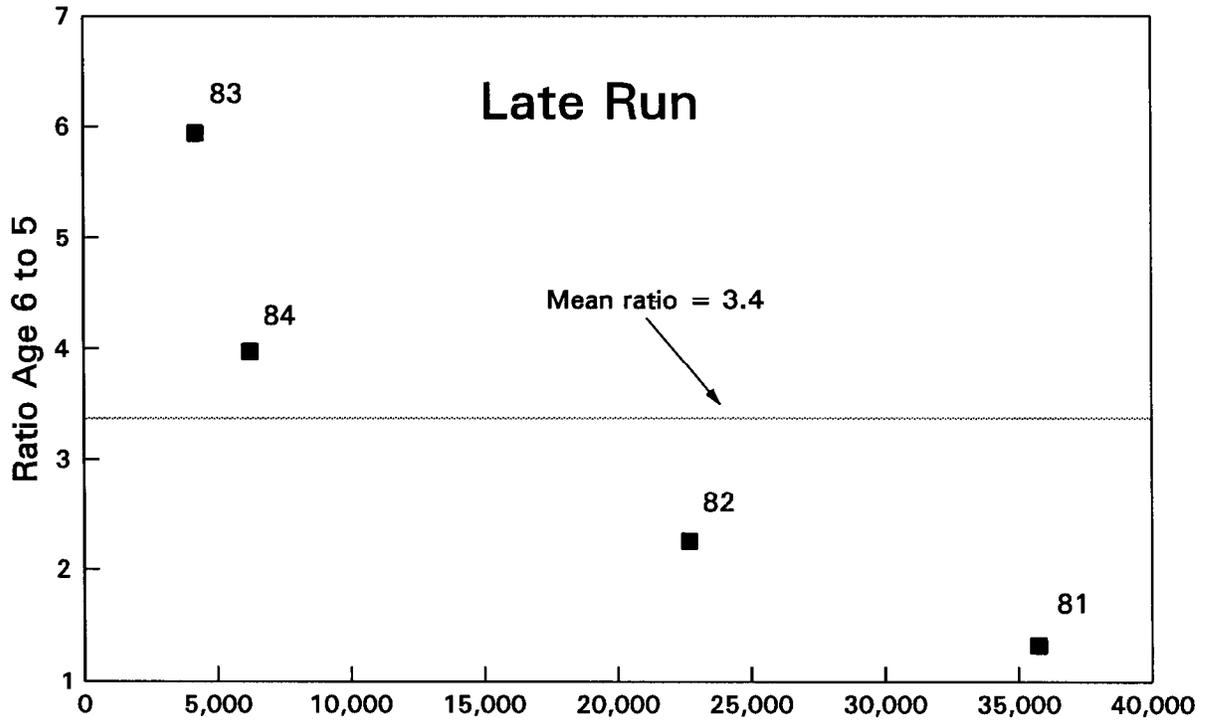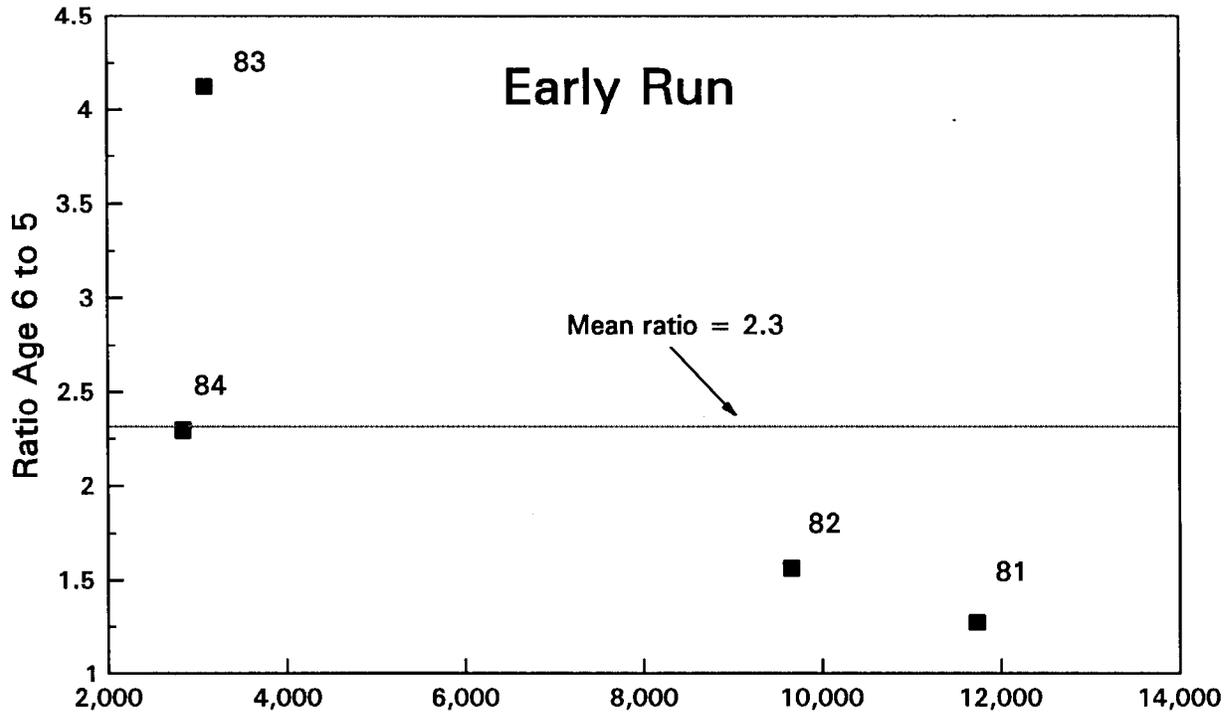
Figure 2. Ratio of age 6 to age 5 compared to returns at age 5 for early and late run, brood years 1981-1985.

individual ages and was 28% for the total return. The observed total run strength was 10,806 for the early run in 1990, which was 4,114 higher than the expected return of 14,920 salmon (Table 7). The observed return was well within the confidence of the forecast.

We used sibling ratios estimated from data collected during the 1985 through 1990 seasons to estimate the 1991 early-run return. The expected early-run return in 1991 is 14,291, with relative precision of the 95% confidence interval at 48% (Table 7).

Late Run

The total run strength of the late run has ranged from 39,656 chinook salmon in 1990 to 79,837 in 1986 (Table 1). The spawning escapement has ranged from 19,581 in 1989 to 48,037 in 1986 (Table 1).

Age classes 1.2, 1.3, 1.4 and 1.5 are the major age classes in the late run, although a wide range of age classes are represented (Tables 8-11, Appendices B1-B12). The 1.4 age class was the most numerous in all years except 1986 when, as in the early run, age 1.3 returned in higher numbers (Tables 8-11). The spawning escapements were also dominated by age 1.4 except in 1986 (Table 12). Age 1.4 was the dominant age class in the in-river sport harvest for all years from 1986-1990 (Table 13, Appendix B13). Age 1.4 in 1988 was the largest age class for all years in the in-river sport harvest.

The majority of Kenai River late-run chinook salmon return at ages 4 to 7, with age 6 fish having the largest representation followed by the age 5 fish (Table 14). A few age 3 and age 8 chinook salmon have been identified in the late run. The return from the 1981 brood year was at least 92,586, with the abundance of age 3 and 4 fish unknown (Table 14) and the return from the 1982 brood year was at least 90,723 with age 3 fish unaccounted for. As for the early run, these two brood years are responsible for the large late runs of chinook salmon in the Kenai River in 1986, 1987 and 1988 (Tables 8 and 14). The weak returns from the 1983, 1984 and 1985 brood years have contributed to the small late runs seen in the Kenai River in 1989 and 1990 (Tables 8 and 14).

A mean of sibling ratios estimated using data collected during the 1985-1989 seasons (Table 15) was used to calculate expected returns by age class for the 1990 season and compared to the observed return in 1990 (Table 16). The percent difference between observed and expected returns expressed as a percentage of the expected return ranged from 29-447% for the individual ages but was only 19% for the total return. The observed total run strength was 39,656 for the late run in 1990, which was 6,445 higher than the expected return of 33,517 salmon (Table 16). The observed return was well within the confidence of the forecast.

We used sibling ratios estimated from data collected during the 1985 through 1990 seasons to estimate the 1991 late-run return. The expected late-run return in 1991 is 43,482, with relative precision of the 95% confidence interval at 30% (Table 16).

Table 7.    Expected and observed 1990 return and expected
            1991 return of early-run Kenai River chinook
            salmon

|  | Return at age | | | | |
|  | 4 | 5 | 6 | 7 | Total |
|---|---|---|---|---|---|
| **1990** | | | | | |
| Expected[a] | 1,514[b] | 4,576 | 7,616 | 1,213[c] | 14,920 |
| SE | 1,017 | 1,905 | 4,280 | 232 | 5,113 |
| Observed | 800 | 2,818 | 6,540 | 648 | 10,806 |
| **Difference** | | | | | |
| Obs.-Exp. | -714 | -1,758 | -1,076 | -565 | -4,114 |
| % of Exp. | 47 | 38 | 14 | 47 | 28 |
| **1991** | | | | | |
| Expected[d] | 1,371[a] | 4,363 | 8,085 | 471[e] | 14,291 |
| SE | 801 | 1,568 | 2,741 | 100 | 3,632 |

[a]   Expected returns for 1990 were calculated using using
      sibling ratios calculated from the 1985-1989 returns.
[b]   Mean of previous returns at age 4.
[c]   Calculated using ratio of age 7 to age 5+6 because SE
      could not be calulated for 1985-1989 mean ratio of age 7
      to age 4+5+6.
[d]   Expected returns for 1991 were calculated using sibling
      ratios calculated from the 1985-1990 returns.
[c]   Calculated using ratio of age 7 to age 4+5+6.

Table 8. Estimates by age class of the total return of late-run Kenai River chinook salmon, 1986-1990.

| | | | | | | | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | Total |
| **1986** | | | | | | | | | | | | | | | |
| Estimated Number | 43 | 43 | 22 | 22 | 260 | 12,017 | 35,314 | 29,039 | 2,774 | 22 | 43 | 43 | 152 | 43 | 79,837 |
| SE | 24 | 24 | 17 | 17 | 60 | 3,436 | 9,106 | 6,482 | 776 | 17 | 24 | 24 | 46 | 24 | 19,458 |
| **1987** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 361 | 3,635 | 22,427 | 46,813 | 775 | 99 | 51 | 44 | 97 | 58 | 74,359 |
| SE | | | | | 75 | 315 | 796 | 823 | 173 | 70 | 51 | 23 | 57 | 50 | 0 |
| **1988** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 35 | 0 | 454 | 2,235 | 4,116 | 51,233 | 10,120 | 0 | 0 | 46 | 15 | 101 | 68,356 |
| SE | | | 17 | | 72 | 241 | 375 | 820 | 735 | | | 23 | 13 | 36 | 0 |
| **1989** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 108 | 5,052 | 6,193 | 24,906 | 4,887 | 76 | 0 | 34 | 0 | 13 | 41,270 |
| SE | | | | | 38 | 438 | 468 | 662 | 456 | 69 | | 24 | | 13 | 0 |
| **1990** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 11 | 11 | 0 | 65 | 5,749 | 6,572 | 25,237 | 1,841 | 0 | 45 | 23 | 23 | 79 | 39,656 |
| SE | | 10 | 10 | | 22 | 480 | 519 | 655 | 307 | | 19 | 14 | 14 | 26 | 0 |

Table 9. Estimates by age class of the number of chinook salmon harvested in the Central District drift net and Upper Subdistrict set net fishery, 1986-1990.

| Year | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1986** | | | | | | | | | | | | | | | |
| Estimated Number | 43 | 43 | 22 | 22 | 260 | 4,978 | 8,008 | 7,251 | 714 | 22 | 43 | 43 | 152 | 43 | 21,644 |
| SE | 24 | 24 | 17 | 17 | 60 | 238 | 300 | 289 | 99 | 17 | 24 | 24 | 46 | 24 | 0 |
| **1987** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 356 | 2,726 | 8,770 | 12,897 | 241 | 0 | 0 | 44 | 97 | 8 | 25,139 |
| SE | | | | | 75 | 236 | 386 | 400 | 73 | | | 23 | 57 | 6 | 0 |
| **1988** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 35 | 0 | 445 | 1,604 | 2,186 | 10,381 | 273 | 0 | 0 | 46 | 15 | 101 | 15,086 |
| SE | | | 17 | | 72 | 137 | 158 | 206 | 59 | | | 23 | 13 | 36 | 0 |
| **1989** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 100 | 1,906 | 2,313 | 5,608 | 958 | 0 | 0 | 34 | 0 | 0 | 10,919 |
| SE | | | | | 37 | 155 | 163 | 198 | 110 | | | 24 | | | 0 |
| **1990** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 11 | 11 | 0 | 57 | 1,413 | 1,425 | 1,606 | 158 | 0 | 45 | 23 | 23 | 79 | 4,851 |
| SE | | 10 | 10 | | 22 | 92 | 92 | 95 | 36 | | 19 | 14 | 14 | 26 | 0 |

Table 10. Estimates by age class of the number of late-run chinook salmon harvested in the Deep Creek marine sport fishery, 1986-1990.

| Year | | | | | | | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | Total |
| **1986** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 30 | 165 | 375 | 60 | 0 | 0 | 0 | 0 | 0 | 630 |
| SE | | | | | | 22 | 72 | 144 | 35 | | | | | | 230 |
| **1987** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 5 | 11 | 250 | 797 | 34 | 0 | 0 | 0 | 0 | 0 | 1,097 |
| SE | | | | | 3 | 5 | 21 | 22 | 9 | | | | | | NA |
| **1988** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 9 | 3 | 42 | 992 | 215 | 0 | 0 | 0 | 0 | 0 | 1,262 |
| SE | | | | | 5 | 3 | 11 | 25 | 23 | | | | | | NA |
| **1989** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 13 | 141 | 922 | 205 | 0 | 0 | 0 | 0 | 13 | 1,294 |
| SE | | | | | | 13 | 73 | 418 | 101 | | | | | 13 | NA |
| **1990** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 8 | 128 | 209 | 819 | 155 | 0 | 0 | 0 | 0 | 0 | 1,318 |
| SE | | | | | 5 | 21 | 26 | 35 | 23 | | | | | | NA |

Table 11. Estimates by age class of the number of late-run chinook salmon in the in-river return to the Kenai River, 1986-1990.

| Year | | | | | | | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | Total |
| **1986** | | | | | | | | | | | | | | | |
| Estimated Return | 0 | 0 | 0 | 0 | 0 | 7,009 | 27,141 | 21,413 | 2,000 | 0 | 0 | 0 | 0 | 0 | 57,563 |
| SE | | | | | | 3,428 | 9,101 | 6,474 | 769 | | | | | | 19,457 |
| **1987** | | | | | | | | | | | | | | | |
| Estimated Return | 0 | 0 | 0 | 0 | 0 | 898 | 13,407 | 33,119 | 500 | 99 | 51 | 0 | 0 | 50 | 48,123 |
| SE | | | | | | 209 | 696 | 719 | 157 | 70 | 51 | | | 50 | 0 |
| **1988** | | | | | | | | | | | | | | | |
| Estimated Return | 0 | 0 | 0 | 0 | 0 | 628 | 1,888 | 39,860 | 9,632 | 0 | 0 | 0 | 0 | 0 | 52,008 |
| SE | | | | | | 198 | 340 | 793 | 732 | | | | | | 0 |
| **1989** | | | | | | | | | | | | | | | |
| Estimated Return | 0 | 0 | 0 | 0 | 8 | 3,129 | 3,734 | 18,365 | 3,722 | 76 | 0 | 0 | 0 | 0 | 29,035 |
| SE | | | | | 8 | 409 | 437 | 629 | 440 | 69 | | | | | 0 |
| **1990** | | | | | | | | | | | | | | | |
| Estimated Return | 0 | 0 | 0 | 0 | 0 | 4,204 | 4,934 | 22,808 | 1,528 | 0 | 0 | 0 | 0 | 0 | 33,474 |
| SE | | | | | | 471 | 510 | 647 | 304 | | | | | | 0 |

Table 12. Estimates by age class of the late-run Kenai River chinook salmon spawning escapement, 1986-1990.

| Year | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | Total Aged[a] | Hook and Release Mortality[b] | Total |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| **1986** | | | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 6,096 | 23,634 | 17,340 | 1,525 | 0 | 0 | 0 | 0 | 0 | 48,559 | 522 | 48,037 |
| SE | | | | | 26 | 3,431 | 9,105 | 6,480 | 775 | | | | | | 19,462 | 220 | 19,463 |
| **1987** | | | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 771 | 10,620 | 24,226 | 120 | 99 | 51 | 0 | 0 | 50 | 35,886 | 368 | 35,518 |
| SE | | | | | 36 | 217 | 755 | 944 | 186 | 70 | 51 | | | 50 | 769 | 174 | 788 |
| **1988** | | | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 586 | 1,299 | 26,095 | 6,643 | 0 | 0 | 0 | 0 | 0 | 34,496 | 472 | 34,024 |
| SE | | | | | 73 | 202 | 375 | 1,190 | 819 | | | | | | 1,036 | 225 | 1,060 |
| **1989** | | | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 8 | 3,039 | 2,740 | 11,859 | 2,276 | 76 | 0 | 0 | 0 | 0 | 19,908 | 327 | 19,581 |
| SE | | | | | 8 | 419 | 525 | 859 | 559 | 69 | | | | 90 | 582 | 148 | 601 |
| **1990** | | | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 3,429 | 3,821 | 19,218 | 794 | 0 | 0 | 0 | 0 | 0 | 27,227 | 141 | 27,086 |
| SE | | | | | 26 | 467 | 519 | 716 | 327 | | | | | | 445 | 65 | 450 |

[a] For some age classes in some years, the estimate of the number harvested in the sport fishery is greater than the estimate of the number in the in-river return. The spawning escapement for the age class in this case was set to zero. When this occurred, the total spawning escapement (calculated by subtracting total sport harvest from total in-river return) is not the sum of the spawning escapements across age classes.

[b] The rate of mortality due to hook and release is known to vary by size and sex of fish, but the exact age composition of fish killed by hook and release is unknown.

Table 13. Estimates by age class of the number of late-run chinook salmon harvested in the Kenai River sport fishery, 1986-1990.

| Year | | | | | | | | Age Class | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | |
| **1986** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 37 | 913 | 3,507 | 4,073 | 475 | 0 | 0 | 0 | 0 | 0 | 9,004 |
| SE | | | | | 26 | 131 | 266 | 289 | 94 | | | | | | 458 |
| **1987** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 51 | 127 | 2,787 | 8,893 | 380 | 0 | 0 | 0 | 0 | 0 | 12,237 |
| SE | | | | | 36 | 57 | 292 | 611 | 99 | | | | | | 769 |
| **1988** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 126 | 42 | 589 | 13,765 | 2,989 | 0 | 0 | 0 | 0 | 0 | 17,512 |
| SE | | | | | 73 | 42 | 159 | 887 | 368 | | | | | | 1,036 |
| **1989** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 0 | 90 | 994 | 6,506 | 1,446 | 0 | 0 | 0 | 0 | 90 | 9,127 |
| SE | | | | | | 90 | 291 | 585 | 345 | | | | | 90 | 582 |
| **1990** | | | | | | | | | | | | | | | |
| Estimated Number | 0 | 0 | 0 | 0 | 37 | 605 | 989 | 3,884 | 733 | 0 | 0 | 0 | 0 | 0 | 6,247 |
| SE | | | | | 26 | 109 | 142 | 322 | 121 | | | | | | 445 |

Table 14. Number of late-run Kenai River chinook salmon returning from each brood year, 1986-1990.

| Brood Year | Spawning Escapement | Return at Age | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | 3 | 4 | 5 | 6 | 7 | 8 | |
| **1978** | | | | | | | | |
| Estimate | NA[a] | | | | | | 22 | 22 |
| SE | | | | | | | 17 | 17 |
| **1979** | | | | | | | | |
| Estimate | NA[a] | | | | | 2,818 | 99 | 2,917 |
| SE | | | | | | 776 | 70 | 780 |
| **1980** | | | | | | | | |
| Estimate | NA[a] | | | | 29,212 | 833 | 0 | 30,045 |
| SE | | | | | 6,482 | 181 | 0 | 6,485 |
| **1981** | | | | | | | | |
| Estimate | NA[a] | | | 35,379 | 46,910 | 10,221 | 76 | 92,586 |
| SE | | | | 9,106 | 825 | 736 | 69 | 9,173 |
| **1982** | | | | | | | | |
| Estimate | NA[a] | | 12,104 | 22,471 | 51,248 | 4,900 | 0 | 90,723 |
| SE | | | 3,473 | 796 | 820 | 456 | 0 | 3,650 |
| **1983** | | | | | | | | |
| Estimate | NA[a] | 303 | 3,686 | 4,197 | 24,906 | 1,920 | | 35,013 |
| SE | | 64 | 319 | 376 | 662 | 308 | | 884 |
| **1984** | | | | | | | | |
| Estimate | 31,796 | 361 | 2,235 | 6,227 | 25,259 | | | 34,082 |
| SE | | 75 | 241 | 469 | 655 | | | 844 |
| **1985** | | | | | | | | |
| Estimate | 21,708 | 454 | 5,052 | 6,606 | | | | 12,112 |
| SE | NA | 72 | 438 | 519 | | | | 683 |
| **1986** | | | | | | | | |
| Estimate | 48,037 | 108 | 5,806 | | | | | 5,914 |
| SE | 19,463 | 38 | 481 | | | | | 482 |
| **1987** | | | | | | | | |
| Estimate | 35,518 | 65 | | | | | | 65 |
| SE | 788 | 22 | | | | | | 22 |

[a] Spawning escapements for 1978-1983 are not available.

Table 15. Sibling return ratios for late-run Kenai River chinook salmon from brood years 1980-1986.

| Brood Year | Age 4/ Age 3 | Age 5/ Age 4 | Age 6/ Age 5 | Age 6/ Age 4+5 | Age 7/ Age 6 | Age 7/ Age 5+6 | Age 7/ Age 4+5+6 |
|---|---|---|---|---|---|---|---|
| 1980 | NA[a] | NA | NA | NA | 0.03 | NA | NA |
| 1981 | NA | NA | 1.32 | NA | 0.22 | 0.12 | NA |
| 1982 | NA | 1.86 | 2.28 | 1.48 | 0.10 | 0.07 | 0.06 |
| 1983 | 12.17 | 1.14 | 5.93 | 3.16 | 0.08 | 0.07 | 0.06 |
| 1984 | 6.19 | 2.79 | 4.06 | 2.99 | NA | NA | NA |
| 1985 | 11.12 | 1.31 | NA | NA | NA | NA | NA |
| 1986 | 53.76 | NA | NA | NA | NA | NA | NA |

Mean sibling ratio using 1985-1990 return data[a]

| | Age 4/ Age 3 | Age 5/ Age 4 | Age 6/ Age 5 | Age 6/ Age 4+5 | Age 7/ Age 6 | Age 7/ Age 5+6 | Age 7/ Age 4+5+6 |
|---|---|---|---|---|---|---|---|
| Mean | 20.81 | 1.77 | 3.40 | 2.54 | 0.10 | 0.09 | 0.06 |
| SD | 22.22 | 0.82 | 2.06 | 1.08 | 0.08 | 0.04 | 0.01 |
| %CV[b] | 107 | 46 | 61 | 42 | 78 | 42 | 14 |
| Maximum | 53.76 | 2.79 | 5.93 | 3.16 | 0.22 | 0.12 | 0.06 |
| Minimum | 6.19 | 1.14 | 1.33 | 1.48 | 0.03 | 0.07 | 0.06 |

Mean sibling ratio using 1985-1989 return data[c]

| | Age 4/ Age 3 | Age 5/ Age 4 | Age 6/ Age 5 | Age 6/ Age 4+5 | Age 7/ Age 6 | Age 7/ Age 5+6 | Age 7/ Age 4+5+6 |
|---|---|---|---|---|---|---|---|
| Mean | 9.83 | 1.93 | 3.18 | 2.32 | 0.11 | 0.10 | 0.06 |
| SD | 3.89 | 0.91 | 2.46 | 1.20 | 0.10 | 0.04 | |

[a] NA = not available.
[b] Used to predict 1991 returns.
[c] Percent coefficient of variation.
[d] Used to predict 1990 returns.

Table 16. Expected and observed 1990 return and expected 1991 return of late-run Kenai River chinook salmon.

| | Age at return | | | | | |
| | 3 | 4 | 5 | 6 | 7 | Total |
|---|---|---|---|---|---|---|
| **1990** | | | | | | |
| Expected[a] | 306[b] | 1,061 | 9,736 | 19,639 | 2,775[c] | 33,517 |
| SE | 146 | 437 | 2,778 | 7,274 | 881 | 7,848 |
| | | | | | | |
| Observed | 65 | 5,806 | 6,606 | 25,259 | 1,920 | 39,656 |
| | | | | | | |
| **Difference** | | | | | | |
| Obs.-Exp. | -242 | 4,745 | -3,130 | 5,620 | -855 | 6,445 |
| % of exp | 79 | 447 | 32 | 29 | 31 | 19 |
| | | | | | | |
| **1991** | | | | | | |
| Expected[d] | 258[b] | 1,353 | 10,289 | 29,637 | 1,950[e] | 43,488 |
| SE | 166 | 819 | 2,512 | 7,453 | 196 | 7,912 |

[a] Expected returns for 1990 were calculated using sibling ratios calculated from the 1985-1989 returns.
[b] Mean of previous returns at age 3.
[c] Calculated using ratio of age 7 to age 5+6 because SE could not be calculated for 1985-1989 ratio of age 7 to age 4+5+6.
[d] Expected returns for 1991 were calculated using sibling ratios calculated from the 1985-1989 returns.
[e] Calculated using ratio of age 7 to age 4+5+6.

## DISCUSSION

Age compositions for the in-river return are only available since 1986 and so the first brood year returns available are for the 1979 spawners. Total return and spawning escapement are only available for the Kenai River chinook salmon since 1985. The estimated spawning escapement has been under the escapement goals set in 1988 in two of six years since 1985 for the early run (1985 and 1988) and once for the late run (1989). The estimated escapements have exceeded the goal by over 50% in one year (1986) for the early run and three years (1986-1988) for the late run. Complete returns are available for the 1982 and 1983 brood years, and the first complete brood year return for a known escapement, 1985, will be available after the 1992 season. This database will eventually provide return-per-spawner estimates and allow the evaluation of the escapement goals.

The trends in brood year return are similar for both the early and late runs. Although the data are incomplete it is obvious that the returns from the 1981 and 1982 escapements were large (Tables 5 and 14), but the size of those escapements are unknown. Subsequent brood year returns, from escapements in 1983 and later, are smaller in size. The sibling ratios observed for the early and late runs are very variable, and it is too early to evaluate their usefulness in the prediction of the total size of a brood year return.

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APPENDIX A

EARLY-RUN AGE COMPOSITION TABLES

Appendix A1.  Estimates by age class of the number of early-run chinook salmon in the in-river return to the Kenai River, 1986.[a]

| | | | | Age Class | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |

**Strata 1 (5/17-5/31)**

Female

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 20 | 49 | 14 | 0 | 0 | 0 | 1 | 84 |
| Percent | 0.00 | 12.58 | 30.82 | 8.81 | 0.00 | 0.00 | 0.00 | 0.63 | 52.83 |
| SE Percent | 0.00 | 2.64 | 3.67 | 2.25 | 0.00 | 0.00 | 0.00 | 0.63 | 3.97 |
| Return | 0 | 74 | 182 | 52 | 0 | 0 | 0 | 4 | 313 |
| SE Return | 0 | 149 | 370 | 104 | 0 | 0 | 0 | 4 | 637 |

Male

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 10 | 26 | 29 | 9 | 0 | 0 | 0 | 1 | 75 |
| Percent | 6.29 | 16.35 | 18.24 | 5.66 | 0.00 | 0.00 | 0.00 | 0.63 | 47.17 |
| SE Percent | 1.93 | 2.94 | 3.07 | 1.84 | 0.00 | 0.00 | 0.00 | 0.63 | 3.97 |
| Return | 37 | 97 | 108 | 34 | 0 | 0 | 0 | 4 | 279 |
| SE Return | 73 | 195 | 218 | 66 | 0 | 0 | 0 | 4 | 568 |

Combined

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 10 | 46 | 78 | 23 | 0 | 0 | 0 | 2 | 159 |
| Percent | 6.29 | 28.93 | 49.06 | 14.47 | 0.00 | 0.00 | 0.00 | 1.26 | 100.00 |
| SE Percent | 1.93 | 3.61 | 3.98 | 2.80 | 0.00 | 0.00 | 0.00 | 0.89 | |
| Return | 37 | 171 | 290 | 86 | 0 | 0 | 0 | 7 | 592 |
| SE Return | 73 | 347 | 591 | 172 | 0 | 0 | 0 | 12 | 1,208 |

**Strata 2 (6/01-6/15)**

Female

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 4 | 138 | 156 | 30 | 0 | 0 | 0 | 0 | 328 |
| Percent | 0.52 | 18.09 | 20.45 | 3.93 | 0.00 | 0.00 | 0.00 | 0.00 | 42.99 |
| SE Percent | 0.26 | 1.39 | 1.46 | 0.70 | 0.00 | 0.00 | 0.00 | 0.00 | 1.79 |
| Return | 77 | 2,657 | 3,004 | 578 | 0 | 0 | 0 | 0 | 6,315 |
| SE Return | 47 | 1,088 | 1,228 | 252 | 0 | 0 | 0 | 0 | 2,560 |

Male

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 113 | 201 | 97 | 24 | 0 | 0 | 0 | 0 | 435 |
| Percent | 14.81 | 26.34 | 12.71 | 3.15 | 0.00 | 0.00 | 0.00 | 0.00 | 57.01 |
| SE Percent | 1.29 | 1.60 | 1.21 | 0.63 | 0.00 | 0.00 | 0.00 | 0.00 | 1.79 |
| Return | 2,176 | 3,870 | 1,868 | 462 | 0 | 0 | 0 | 0 | 8,376 |
| SE Return | 895 | 1,576 | 771 | 205 | 0 | 0 | 0 | 0 | 3,388 |

Combined

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 117 | 339 | 253 | 54 | 0 | 0 | 0 | 0 | 763 |
| Percent | 15.33 | 44.43 | 33.16 | 7.08 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 1.31 | 1.80 | 1.71 | 0.93 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 2,253 | 6,527 | 4,871 | 1,040 | 0 | 0 | 0 | 0 | 14,691 |
| SE Return | 926 | 2,645 | 1,979 | 438 | 0 | 0 | 0 | 0 | 5,928 |

- continued -

|  | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
|  | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
| **Strata 3 (6/16-6/30)** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Sample Size | 16 | 60 | 64 | 14 | 0 | 0 | 0 | 0 | 154 |
| Percent | 3.79 | 14.22 | 15.17 | 3.32 | 0.00 | 0.00 | 0.00 | 0.00 | 36.49 |
| SE Percent | 0.93 | 1.70 | 1.75 | 0.87 | 0.00 | 0.00 | 0.00 | 0.00 | 2.35 |
| Return | 447 | 1,677 | 1,789 | 391 | 0 | 0 | 0 | 0 | 4,305 |
| SE Return | 304 | 1,106 | 1,179 | 267 | 0 | 0 | 0 | 0 | 2,821 |
| **Male** | | | | | | | | | |
| Sample Size | 65 | 120 | 69 | 14 | 0 | 0 | 0 | 0 | 268 |
| Percent | 15.40 | 28.44 | 16.35 | 3.32 | 0.00 | 0.00 | 0.00 | 0.00 | 63.51 |
| SE Percent | 1.76 | 2.20 | 1.80 | 0.87 | 0.00 | 0.00 | 0.00 | 0.00 | 2.35 |
| Return | 1,817 | 3,355 | 1,929 | 391 | 0 | 0 | 0 | 0 | 7,492 |
| SE Return | 1,198 | 2,201 | 1,271 | 267 | 0 | 0 | 0 | 0 | 4,900 |
| **Combined** | | | | | | | | | |
| Sample Size | 81 | 180 | 133 | 28 | 0 | 0 | 0 | 0 | 422 |
| Percent | 19.19 | 42.65 | 31.52 | 6.64 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 1.92 | 2.41 | 2.26 | 1.21 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 2,264 | 5,032 | 3,718 | 783 | 0 | 0 | 0 | 0 | 11,797 |
| SE Return | 1,489 | 3,295 | 2,438 | 523 | 0 | 0 | 0 | 0 | 7,708 |
| **Strata 1, 2, and 3 Combined** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Return | 524 | 4,409 | 4,975 | 1,021 | 0 | 0 | 0 | 4 | 10,933 |
| SE Return | 307 | 1,559 | 1,742 | 381 | 0 | 0 | 0 | 4 | 3,862 |
| Percent | 1.9 | 16.3 | 18.4 | 3.8 | 0.0 | 0.0 | 0.0 | 0.0 | 40.4 |
| SE Percent | 1.14 | 5.76 | 6.43 | 1.41 | 0.00 | 0.00 | 0.00 | 0.01 | 14.26 |
| **Male** | | | | | | | | | |
| Return | 4,030 | 7,322 | 3,905 | 887 | 0 | 0 | 0 | 4 | 16,147 |
| SE Return | 1,497 | 2,714 | 1,502 | 343 | 0 | 0 | 0 | 4 | 5,984 |
| Percent | 14.9 | 27.0 | 14.4 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 | 59.6 |
| SE Percent | 5.53 | 10.02 | 5.55 | 1.27 | 0.00 | 0.00 | 0.00 | 0.01 | 22.10 |
| **Combined** | | | | | | | | | |
| Return | 4,554 | 11,730 | 8,880 | 1,908 | 0 | 0 | 0 | 7 | 27,080 |
| SE Return | 1,755 | 4,239 | 3,195 | 703 | 0 | 0 | 0 | 12 | 9,799 |
| Percent | 16.8 | 43.3 | 32.8 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| SE Percent | 6.48 | 15.65 | 11.80 | 2.60 | 0.00 | 0.00 | 0.00 | 0.04 | |

[a]  Estimates of the total in-river return for each strata are taken from the mark-recapture tagging project (Conrad and Larson 1987).  Age samples were also taken from the mark-recapture tagging project.  The number of fish sampled in each age class was taken directly from the project data files (Appendix C1).

Appendix A2.    Estimates by age class of the number of early-run chinook salmon in the in-river return to the Kenai River, 1987.[a]

| | | | | Age Class | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |

Strata 1 (5/20-6/03)
Female

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 34 | 117 | 5 | 0 | 0 | 0 | 1 | 157 |
| Percent | 0.00 | 10.83 | 37.26 | 1.59 | 0.00 | 0.00 | 0.00 | 0.32 | 50.00 |
| SE Percent | 0.00 | 1.76 | 2.73 | 0.71 | 0.00 | 0.00 | 0.00 | 0.32 | 2.83 |
| Return | 0 | 988 | 3,400 | 145 | 0 | 0 | 0 | 29 | 4,563 |
| SE Return | 0 | 514 | 1,715 | 92 | 0 | 0 | 0 | 29 | 2,294 |

Male

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 1 | 47 | 100 | 8 | 0 | 0 | 0 | 1 | 157 |
| Percent | 0.32 | 14.97 | 31.85 | 2.55 | 0.00 | 0.00 | 0.00 | 0.32 | 50.00 |
| SE Percent | 0.32 | 2.02 | 2.63 | 0.89 | 0.00 | 0.00 | 0.00 | 0.32 | 2.83 |
| Return | 29 | 1,366 | 2,906 | 232 | 0 | 0 | 0 | 29 | 4,563 |
| SE Return | 29 | 702 | 1,469 | 136 | 0 | 0 | 0 | 29 | 2,294 |

Combined

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 1 | 81 | 217 | 13 | 0 | 0 | 0 | 2 | 314 |
| Percent | 0.32 | 25.80 | 69.11 | 4.14 | 0.00 | 0.00 | 0.00 | 0.64 | 100.00 |
| SE Percent | 0.32 | 2.47 | 2.61 | 1.13 | 0.00 | 0.00 | 0.00 | 0.45 | |
| Return | 29 | 2,354 | 6,306 | 378 | 0 | 0 | 0 | 58 | 9,125 |
| SE Return | 29 | 1,194 | 3,163 | 209 | 0 | 0 | 0 | 46 | 4,567 |

Strata 2 (6/04-6/14)
Female

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 96 | 124 | 1 | 0 | 0 | 0 | 1 | 222 |
| Percent | 0.00 | 22.80 | 29.45 | 0.24 | 0.00 | 0.00 | 0.00 | 0.24 | 52.73 |
| SE Percent | 0.00 | 2.05 | 2.22 | 0.24 | 0.00 | 0.00 | 0.00 | 0.24 | 2.44 |
| Return | 0 | 2,037 | 2,632 | 21 | 0 | 0 | 0 | 21 | 4,712 |
| SE Return | 0 | 685 | 876 | 21 | 0 | 0 | 0 | 21 | 1,546 |

Male

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 8 | 95 | 89 | 6 | 0 | 0 | 0 | 1 | 199 |
| Percent | 1.90 | 22.57 | 21.14 | 1.43 | 0.00 | 0.00 | 0.00 | 0.24 | 47.27 |
| SE Percent | 0.67 | 2.04 | 1.99 | 0.58 | 0.00 | 0.00 | 0.00 | 0.24 | 2.44 |
| Return | 170 | 2,016 | 1,889 | 127 | 0 | 0 | 0 | 21 | 4,223 |
| SE Return | 79 | 678 | 637 | 64 | 0 | 0 | 0 | 21 | 1,388 |

Combined

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 8 | 191 | 213 | 7 | 0 | 0 | 0 | 2 | 421 |
| Percent | 1.90 | 45.37 | 50.59 | 1.66 | 0.00 | 0.00 | 0.00 | 0.48 | 100.00 |
| SE Percent | 0.67 | 2.43 | 2.44 | 0.62 | 0.00 | 0.00 | 0.00 | 0.34 | |
| Return | 170 | 4,054 | 4,521 | 149 | 0 | 0 | 0 | 42 | 8,935 |
| SE Return | 79 | 1,334 | 1,484 | 71 | 0 | 0 | 0 | 32 | 2,905 |

Appendix A2.    (Page 2 of 2).

| | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |

Strata 3 (6/15-6/30)
 Female

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 54 | 68 | 1 | 0 | 0 | 1 | 0 | 124 |
| Percent | 0.00 | 22.22 | 27.98 | 0.41 | 0.00 | 0.00 | 0.41 | 0.00 | 51.03 |
| SE Percent | 0.00 | 2.67 | 2.89 | 0.41 | 0.00 | 0.00 | 0.41 | 0.00 | 3.21 |
| Return | 0 | 1,685 | 2,122 | 31 | 0 | 0 | 31 | 0 | 3,870 |
| SE Return | 0 | 570 | 707 | 31 | 0 | 0 | 31 | 0 | 1,255 |

 Male

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 6 | 50 | 62 | 1 | 0 | 0 | 0 | 0 | 119 |
| Percent | 2.47 | 20.58 | 25.51 | 0.41 | 0.00 | 0.00 | 0.00 | 0.00 | 48.97 |
| SE Percent | 1.00 | 2.60 | 2.80 | 0.41 | 0.00 | 0.00 | 0.00 | 0.00 | 3.21 |
| Return | 187 | 1,560 | 1,935 | 31 | 0 | 0 | 0 | 0 | 3,713 |
| SE Return | 93 | 531 | 649 | 31 | 0 | 0 | 0 | 0 | 1,206 |

 Combined

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 6 | 104 | 130 | 2 | 0 | 0 | 1 | 0 | 243 |
| Percent | 2.47 | 42.80 | 53.50 | 0.82 | 0.00 | 0.00 | 0.41 | 0.00 | 100.00 |
| SE Percent | 1.00 | 3.18 | 3.21 | 0.58 | 0.00 | 0.00 | 0.41 | 0.00 | |
| Return | 187 | 3,245 | 4,057 | 62 | 0 | 0 | 31 | 0 | 7,583 |
| SE Return | 93 | 1,059 | 1,313 | 46 | 0 | 0 | 31 | 0 | 2,417 |

Strata 1, 2, and 3 Combined
 Female

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Return | 0 | 4,711 | 8,154 | 198 | 0 | 0 | 31 | 50 | 13,144 |
| SE Return | 0 | 1,028 | 2,052 | 99 | 0 | 0 | 31 | 36 | 3,038 |
| Percent | 0.0 | 18.4 | 31.8 | 0.8 | 0.0 | 0.0 | 0.1 | 0.2 | 51.3 |
| SE Percent | 0.00 | 4.01 | 8.00 | 0.39 | 0.00 | 0.00 | 0.12 | 0.14 | 11.85 |

 Male

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Return | 386 | 4,942 | 6,730 | 391 | 0 | 0 | 0 | 50 | 12,499 |
| SE Return | 125 | 1,111 | 1,728 | 153 | 0 | 0 | 0 | 36 | 2,940 |
| Percent | 1.5 | 19.3 | 26.2 | 1.5 | 0.0 | 0.0 | 0.0 | 0.2 | 48.7 |
| SE Percent | 0.49 | 4.33 | 6.74 | 0.60 | 0.00 | 0.00 | 0.00 | 0.14 | 11.47 |

 Combined

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| Return | 386 | 9,653 | 14,883 | 589 | 0 | 0 | 31 | 101 | 25,643 |
| SE Return | 125 | 2,080 | 3,732 | 226 | 0 | 0 | 31 | 56 | 5,928 |
| Percent | 1.5 | 37.6 | 58.0 | 2.3 | 0.0 | 0.0 | 0.1 | 0.4 | 100.0 |
| SE Percent | 0.49 | 8.11 | 14.56 | 0.88 | 0.00 | 0.00 | 0.12 | 0.22 | |

[a]  Estimates of the total in-river return for each strata are taken from the mark-recapture tagging project (Conrad 1988). Age samples were also taken from the mark-recapture tagging project. The number of fish sampled in each age class was taken directly from the project data files (Appendix C1).

Appendix A3.   Estimates by age class of the number of early-run chinook salmon in the in-river return to the Kenai River, 1988.[a]

| | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |

**Strata 1 (5/16-5/31)**

Female
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 9 | 95 | 6 | 0 | 0 | 0 | 0 | 110 |
| Percent | 0.00 | 4.59 | 48.47 | 3.06 | 0.00 | 0.00 | 0.00 | 0.00 | 56.12 |
| SE Percent | 0.00 | 1.50 | 3.58 | 1.23 | 0.00 | 0.00 | 0.00 | 0.00 | 3.55 |
| Return | 0 | 256 | 2,702 | 171 | 0 | 0 | 0 | 0 | 3,128 |
| SE Return | 0 | 83 | 199 | 69 | 0 | 0 | 0 | 0 | 198 |

Male
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 9 | 49 | 26 | 2 | 0 | 0 | 0 | 86 |
| Percent | 0.00 | 4.59 | 25.00 | 13.27 | 1.02 | 0.00 | 0.00 | 0.00 | 43.88 |
| SE Percent | 0.00 | 1.50 | 3.10 | 2.43 | 0.72 | 0.00 | 0.00 | 0.00 | 3.55 |
| Return | 0 | 256 | 1,394 | 739 | 57 | 0 | 0 | 0 | 2,446 |
| SE Return | 0 | 83 | 172 | 135 | 40 | 0 | 0 | 0 | 198 |

Combined
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 18 | 144 | 32 | 2 | 0 | 0 | 0 | 196 |
| Percent | 0.00 | 9.18 | 73.47 | 16.33 | 1.02 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.00 | 2.07 | 3.16 | 2.65 | 0.72 | 0.00 | 0.00 | 0.00 | |
| Return | 0 | 512 | 4,095 | 910 | 57 | 0 | 0 | 0 | 5,574 |
| SE Return | 0 | 115 | 176 | 147 | 40 | 0 | 0 | 0 | 0 |

**Strata 2 (6/01-6/15)**

Female
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 25 | 134 | 4 | 0 | 0 | 0 | 0 | 163 |
| Percent | 0.00 | 7.06 | 37.85 | 1.13 | 0.00 | 0.00 | 0.00 | 0.00 | 46.05 |
| SE Percent | 0.00 | 1.36 | 2.58 | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 2.65 |
| Return | 0 | 531 | 2,845 | 85 | 0 | 0 | 0 | 0 | 3,461 |
| SE Return | 0 | 102 | 194 | 42 | 0 | 0 | 0 | 0 | 199 |

Male
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 9 | 54 | 101 | 26 | 0 | 0 | 1 | 0 | 191 |
| Percent | 2.54 | 15.25 | 28.53 | 7.34 | 0.00 | 0.00 | 0.28 | 0.00 | 53.95 |
| SE Percent | 0.84 | 1.91 | 2.40 | 1.39 | 0.00 | 0.00 | 0.28 | 0.00 | 2.65 |
| Return | 191 | 1,147 | 2,145 | 552 | 0 | 0 | 21 | 0 | 4,056 |
| SE Return | 63 | 144 | 180 | 104 | 0 | 0 | 21 | 0 | 199 |

Combined
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 9 | 79 | 235 | 30 | 0 | 0 | 1 | 0 | 354 |
| Percent | 2.54 | 22.32 | 66.38 | 8.47 | 0.00 | 0.00 | 0.28 | 0.00 | 100.00 |
| SE Percent | 0.84 | 2.22 | 2.51 | 1.48 | 0.00 | 0.00 | 0.28 | 0.00 | |
| Return | 191 | 1,678 | 4,990 | 637 | 0 | 0 | 21 | 0 | 7,517 |
| SE Return | 63 | 166 | 189 | 111 | 0 | 0 | 21 | 0 | 0 |

- continued -

| | \| | | Age Class | | | | | \| | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |

**Strata 3 (6/16-6/30)**

Female

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 15 | 102 | 9 | 0 | 0 | 0 | 0 | 126 |
| Percent | 0.00 | 6.41 | 43.59 | 3.85 | 0.00 | 0.00 | 0.00 | 0.00 | 53.85 |
| SE Percent | 0.00 | 1.60 | 3.25 | 1.26 | 0.00 | 0.00 | 0.00 | 0.00 | 3.27 |
| Return | 0 | 499 | 3,395 | 300 | 0 | 0 | 0 | 0 | 4,194 |
| SE Return | 0 | 125 | 252 | 98 | 0 | 0 | 0 | 0 | 254 |

Male

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 5 | 12 | 78 | 13 | 0 | 0 | 0 | 0 | 108 |
| Percent | 2.14 | 5.13 | 33.33 | 5.56 | 0.00 | 0.00 | 0.00 | 0.00 | 46.15 |
| SE Percent | 0.95 | 1.45 | 3.09 | 1.50 | 0.00 | 0.00 | 0.00 | 0.00 | 3.27 |
| Return | 166 | 399 | 2,596 | 433 | 0 | 0 | 0 | 0 | 3,595 |
| SE Return | 74 | 112 | 240 | 117 | 0 | 0 | 0 | 0 | 254 |

Combined

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 5 | 27 | 180 | 22 | 0 | 0 | 0 | 0 | 234 |
| Percent | 2.14 | 11.54 | 76.92 | 9.40 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.95 | 2.09 | 2.76 | 1.91 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 166 | 899 | 5,992 | 732 | 0 | 0 | 0 | 0 | 7,789 |
| SE Return | 74 | 163 | 215 | 149 | 0 | 0 | 0 | 0 | 0 |

**Strata 1, 2, and 3 Combined**

Female

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|
| Return | 0 | 1,286 | 8,942 | 555 | 0 | 0 | 0 | 0 | 10,784 |
| SE Return | 0 | 182 | 375 | 127 | 0 | 0 | 0 | 0 | 378 |
| Percent | 0.0 | 6.2 | 42.8 | 2.7 | 0.0 | 0.0 | 0.0 | 0.0 | 51.6 |
| SE Percent | 0.00 | 0.87 | 1.80 | 0.61 | 0.00 | 0.00 | 0.00 | 0.00 | 1.81 |

Male

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|
| Return | 358 | 1,802 | 6,135 | 1,724 | 57 | 0 | 21 | 0 | 10,096 |
| SE Return | 97 | 200 | 346 | 207 | 40 | 0 | 21 | 0 | 378 |
| Percent | 1.7 | 8.6 | 29.4 | 8.3 | 0.3 | 0.0 | 0.1 | 0.0 | 48.4 |
| SE Percent | 0.46 | 0.96 | 1.66 | 0.99 | 0.19 | 0.00 | 0.10 | 0.00 | 1.81 |

Combined

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|
| Return | 358 | 3,088 | 15,077 | 2,279 | 57 | 0 | 21 | 0 | 20,880 |
| SE Return | 97 | 260 | 335 | 237 | 40 | 0 | 21 | 0 | 0 |
| Percent | 1.7 | 14.8 | 72.2 | 10.9 | 0.3 | 0.0 | 0.1 | 0.0 | 100.0 |
| SE Percent | 0.46 | 1.24 | 1.61 | 1.13 | 0.19 | 0.00 | 0.10 | 0.00 | |

[a]   Estimates of the total in-river return for each strata are taken from the sonar project (D. L. Burwen, Alaska Department of Fish and Game, Anchorage, personal communication). Age samples were taken from the mark-recapture tagging project (Carlon and Alexandersdottir 1989). The number of fish sampled in each age class was taken directly from the tagging project data files (Appendix C1).

Appendix A4. Estimates by age class of the number of early-run chinook salmon in the in-river return to the Kenai River, 1989.[a]

| | Age Class | | | | | | | | |
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|
| **Strata 1 (5/17-5/31)** | | | | | | | | | |
| *Female* | | | | | | | | | |
| Sample Size | 0 | 11 | 63 | 4 | 0 | 0 | 0 | 0 | 78 |
| Percent | 0.00 | 6.96 | 39.87 | 2.53 | 0.00 | 0.00 | 0.00 | 0.00 | 49.37 |
| SE Percent | 0.00 | 2.03 | 3.91 | 1.25 | 0.00 | 0.00 | 0.00 | 0.00 | 3.99 |
| Return | 0 | 272 | 1,555 | 99 | 0 | 0 | 0 | 0 | 1,925 |
| SE Return | 0 | 79 | 152 | 49 | 0 | 0 | 0 | 0 | 155 |
| *Male* | | | | | | | | | |
| Sample Size | 1 | 12 | 57 | 10 | 0 | 0 | 0 | 0 | 80 |
| Percent | 0.63 | 7.59 | 36.08 | 6.33 | 0.00 | 0.00 | 0.00 | 0.00 | 50.63 |
| SE Percent | 0.63 | 2.11 | 3.83 | 1.94 | 0.00 | 0.00 | 0.00 | 0.00 | 3.99 |
| Return | 25 | 296 | 1,407 | 247 | 0 | 0 | 0 | 0 | 1,975 |
| SE Return | 25 | 82 | 149 | 76 | 0 | 0 | 0 | 0 | 155 |
| *Combined* | | | | | | | | | |
| Sample Size | 1 | 23 | 120 | 14 | 0 | 0 | 0 | 0 | 158 |
| Percent | 0.63 | 14.56 | 75.95 | 8.86 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.63 | 2.81 | 3.41 | 2.27 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 25 | 568 | 2,962 | 346 | 0 | 0 | 0 | 0 | 3,900 |
| SE Return | 25 | 109 | 133 | 88 | 0 | 0 | 0 | 0 | 0 |
| **STRATA 2 (6/01-6/15)** | | | | | | | | | |
| *Female* | | | | | | | | | |
| Sample Size | 0 | 19 | 115 | 10 | 0 | 0 | 0 | 0 | 144 |
| Percent | 0.00 | 7.22 | 43.73 | 3.80 | 0.00 | 0.00 | 0.00 | 0.00 | 54.75 |
| SE Percent | 0.00 | 1.60 | 3.06 | 1.18 | 0.00 | 0.00 | 0.00 | 0.00 | 3.08 |
| Return | 0 | 544 | 3,294 | 286 | 0 | 0 | 0 | 0 | 4,125 |
| SE Return | 0 | 120 | 230 | 89 | 0 | 0 | 0 | 0 | 231 |
| *Male* | | | | | | | | | |
| Sample Size | 14 | 34 | 64 | 7 | 0 | 0 | 0 | 0 | 119 |
| Percent | 5.32 | 12.93 | 24.33 | 2.66 | 0.00 | 0.00 | 0.00 | 0.00 | 45.25 |
| SE Percent | 1.39 | 2.07 | 2.65 | 0.99 | 0.00 | 0.00 | 0.00 | 0.00 | 3.08 |
| Return | 401 | 974 | 1,833 | 201 | 0 | 0 | 0 | 0 | 3,409 |
| SE Return | 104 | 156 | 199 | 75 | 0 | 0 | 0 | 0 | 231 |
| *Combined* | | | | | | | | | |
| Sample Size | 14 | 53 | 179 | 17 | 0 | 0 | 0 | 0 | 263 |
| Percent | 5.32 | 20.15 | 68.06 | 6.46 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 1.39 | 2.48 | 2.88 | 1.52 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 401 | 1,518 | 5,128 | 487 | 0 | 0 | 0 | 0 | 7,534 |
| SE Return | 104 | 186 | 217 | 114 | 0 | 0 | 0 | 0 | 0 |

| | | | Age Class | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |

**STRATA 3 (6/16-6/30)**

*Female*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 12 | 99 | 13 | 0 | 0 | 0 | 0 | 124 |
| Percent | 0.00 | 4.32 | 35.61 | 4.68 | 0.00 | 0.00 | 0.00 | 0.00 | 44.60 |
| SE Percent | 0.00 | 1.22 | 2.88 | 1.27 | 0.00 | 0.00 | 0.00 | 0.00 | 2.99 |
| Return | 0 | 283 | 2,335 | 307 | 0 | 0 | 0 | 0 | 2,925 |
| SE Return | 0 | 80 | 188 | 83 | 0 | 0 | 0 | 0 | 196 |

*Male*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 14 | 20 | 98 | 22 | 0 | 0 | 0 | 0 | 154 |
| Percent | 5.04 | 7.19 | 35.25 | 7.91 | 0.00 | 0.00 | 0.00 | 0.00 | 55.40 |
| SE Percent | 1.31 | 1.55 | 2.87 | 1.62 | 0.00 | 0.00 | 0.00 | 0.00 | 2.99 |
| Return | 330 | 472 | 2,312 | 519 | 0 | 0 | 0 | 0 | 3,633 |
| SE Return | 86 | 102 | 188 | 106 | 0 | 0 | 0 | 0 | 196 |

*Combined*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 14 | 32 | 197 | 35 | 0 | 0 | 0 | 0 | 278 |
| Percent | 5.04 | 11.51 | 70.86 | 12.59 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 1.31 | 1.92 | 2.73 | 1.99 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 330 | 755 | 4,647 | 826 | 0 | 0 | 0 | 0 | 6,558 |
| SE Return | 86 | 126 | 179 | 130 | 0 | 0 | 0 | 0 | 0 |

**Strata 1, 2, and 3 Combined**

*Female*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Return | 0 | 1,099 | 7,185 | 692 | 0 | 0 | 0 | 0 | 8,976 |
| SE Return | 0 | 165 | 334 | 131 | 0 | 0 | 0 | 0 | 340 |
| Percent | 0.0 | 6.1 | 39.9 | 3.8 | 0.0 | 0.0 | 0.0 | 0.0 | 49.9 |
| SE Percent | 0.00 | 0.91 | 1.86 | 0.73 | 0.00 | 0.00 | 0.00 | 0.00 | 1.89 |

*Male*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Return | 756 | 1,742 | 5,552 | 966 | 0 | 0 | 0 | 0 | 9,016 |
| SE Return | 137 | 203 | 312 | 150 | 0 | 0 | 0 | 0 | 340 |
| Percent | 4.2 | 9.7 | 30.9 | 5.4 | 0.0 | 0.0 | 0.0 | 0.0 | 50.1 |
| SE Percent | 0.76 | 1.13 | 1.73 | 0.84 | 0.00 | 0.00 | 0.00 | 0.00 | 1.89 |

*Combined*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Return | 756 | 2,841 | 12,737 | 1,658 | 0 | 0 | 0 | 0 | 17,992 |
| SE Return | 137 | 250 | 311 | 195 | 0 | 0 | 0 | 0 | 0 |
| Percent | 4.2 | 15.8 | 70.8 | 9.2 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| SE Percent | 0.76 | 1.39 | 1.73 | 1.08 | 0.00 | 0.00 | 0.00 | 0.00 | |

[a]  Estimates of the total in-river return for each strata are taken from the sonar project (D. L. Burwen, Alaska Department of Fish and Game, Anchorage, personal communication). Age samples were taken from the mark-recapture tagging project (Alexandersdottir and Marsh 1990). The number of fish sampled in each age class was taken directly from the tagging project data files (Appendix C1).

Appendix A5. Estimates by age class of the number of early-run chinook salmon in the in-river return to the Kenai River, 1990.[a]

| | | | | Age Class | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Strata 1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
| **Strata 1 (5/16-5/31)** | | | | | | | | | |
| Female | | | | | | | | | |
| Sample Size | 3 | 11 | 27 | 3 | 0 | 0 | 0 | 0 | 44 |
| Percent | 3.70 | 13.58 | 33.33 | 3.70 | 0.00 | 0.00 | 0.00 | 0.00 | 54.32 |
| SE Percent | 2.11 | 3.83 | 5.27 | 2.11 | 0.00 | 0.00 | 0.00 | 0.00 | 5.57 |
| Return | 58 | 212 | 520 | 58 | 0 | 0 | 0 | 0 | 847 |
| SE Return | 33 | 59 | 82 | 33 | 0 | 0 | 0 | 0 | 86 |
| Male | | | | | | | | | |
| Sample Size | 2 | 2 | 25 | 8 | 0 | 0 | 0 | 0 | 37 |
| Percent | 2.47 | 2.47 | 30.86 | 9.88 | 0.00 | 0.00 | 0.00 | 0.00 | 45.68 |
| SE Percent | 1.73 | 1.73 | 5.16 | 3.34 | 0.00 | 0.00 | 0.00 | 0.00 | 5.57 |
| Return | 38 | 38 | 481 | 154 | 0 | 0 | 0 | 0 | 712 |
| SE Return | 27 | 27 | 80 | 52 | 0 | 0 | 0 | 0 | 86 |
| Combined | | | | | | | | | |
| Sample Size | 5 | 13 | 52 | 11 | 0 | 0 | 0 | 0 | 81 |
| Percent | 6.17 | 16.05 | 64.20 | 13.58 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 2.69 | 4.10 | 5.36 | 3.83 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 96 | 250 | 1,001 | 212 | 0 | 0 | 0 | 0 | 1,559 |
| SE Return | 42 | 64 | 83 | 59 | 0 | 0 | 0 | 0 | 0 |
| **Strata 2 (6/01-6/15)** | | | | | | | | | |
| Female | | | | | | | | | |
| Sample Size | 2 | 40 | 68 | 7 | 0 | 0 | 0 | 0 | 117 |
| Percent | 0.85 | 17.09 | 29.06 | 2.99 | 0.00 | 0.00 | 0.00 | 0.00 | 50.00 |
| SE Percent | 0.60 | 2.47 | 2.97 | 1.12 | 0.00 | 0.00 | 0.00 | 0.00 | 3.28 |
| Return | 43 | 851 | 1,447 | 149 | 0 | 0 | 0 | 0 | 2,491 |
| SE Return | 30 | 123 | 148 | 55 | 0 | 0 | 0 | 0 | 163 |
| Male | | | | | | | | | |
| Sample Size | 13 | 43 | 54 | 7 | 0 | 0 | 0 | 0 | 117 |
| Percent | 5.56 | 18.38 | 23.08 | 2.99 | 0.00 | 0.00 | 0.00 | 0.00 | 50.00 |
| SE Percent | 1.50 | 2.54 | 2.76 | 1.12 | 0.00 | 0.00 | 0.00 | 0.00 | 3.28 |
| Return | 277 | 915 | 1,149 | 149 | 0 | 0 | 0 | 0 | 2,491 |
| SE Return | 75 | 126 | 137 | 55 | 0 | 0 | 0 | 0 | 163 |
| Combined | | | | | | | | | |
| Sample Size | 15 | 83 | 122 | 14 | 0 | 0 | 0 | 0 | 234 |
| Percent | 6.41 | 35.47 | 52.14 | 5.98 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 1.60 | 3.13 | 3.27 | 1.55 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 319 | 1,767 | 2,597 | 298 | 0 | 0 | 0 | 0 | 4,981 |
| SE Return | 80 | 156 | 163 | 77 | 0 | 0 | 0 | 0 | 0 |

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| Strata 1 | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
| **Strata 3 (6/16-6/30)** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Sample Size | 4 | 8 | 56 | 2 | 0 | 0 | 0 | 0 | 70 |
| Percent | 2.58 | 5.16 | 36.13 | 1.29 | 0.00 | 0.00 | 0.00 | 0.00 | 45.16 |
| SE Percent | 1.28 | 1.78 | 3.87 | 0.91 | 0.00 | 0.00 | 0.00 | 0.00 | 4.01 |
| Return | 109 | 218 | 1,528 | 55 | 0 | 0 | 0 | 0 | 1,909 |
| SE Return | 54 | 75 | 163 | 38 | 0 | 0 | 0 | 0 | 169 |
| **Male** | | | | | | | | | |
| Sample Size | 10 | 21 | 51 | 3 | 0 | 0 | 0 | 0 | 85 |
| Percent | 6.45 | 13.55 | 32.90 | 1.94 | 0.00 | 0.00 | 0.00 | 0.00 | 54.84 |
| SE Percent | 1.98 | 2.76 | 3.79 | 1.11 | 0.00 | 0.00 | 0.00 | 0.00 | 4.01 |
| Return | 273 | 573 | 1,391 | 82 | 0 | 0 | 0 | 0 | 2,319 |
| SE Return | 83 | 116 | 160 | 47 | 0 | 0 | 0 | 0 | 169 |
| **Combined** | | | | | | | | | |
| Sample Size | 14 | 29 | 107 | 5 | 0 | 0 | 0 | 0 | 155 |
| Percent | 9.03 | 18.71 | 69.03 | 3.23 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 2.31 | 3.14 | 3.73 | 1.42 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 382 | 791 | 2,919 | 136 | 0 | 0 | 0 | 0 | 4,228 |
| SE Return | 97 | 132 | 157 | 60 | 0 | 0 | 0 | 0 | 0 |
| **ALL Strata** | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
| **Female** | | | | | | | | | |
| Return | 209 | 1,281 | 3,495 | 261 | 0 | 0 | 0 | 0 | 5,247 |
| SE Return | 70 | 156 | 235 | 75 | 0 | 0 | 0 | 0 | 250 |
| Percent | 1.9 | 11.9 | 32.5 | 2.4 | 0.0 | 0.0 | 0.0 | 0.0 | 48.7 |
| SE Percent | 0.65 | 1.44 | 2.18 | 0.70 | 0.00 | 0.00 | 0.00 | 0.00 | 2.32 |
| **Male** | | | | | | | | | |
| Return | 588 | 1,527 | 3,022 | 385 | 0 | 0 | 0 | 0 | 5,521 |
| SE Return | 115 | 174 | 225 | 89 | 0 | 0 | 0 | 0 | 250 |
| Percent | 5.5 | 14.2 | 28.1 | 3.6 | 0.0 | 0.0 | 0.0 | 0.0 | 51.3 |
| SE Percent | 1.07 | 1.61 | 2.09 | 0.83 | 0.00 | 0.00 | 0.00 | 0.00 | 2.32 |
| **Combined** | | | | | | | | | |
| Return | 797 | 2,808 | 6,516 | 646 | 0 | 0 | 0 | 0 | 10,768 |
| SE Return | 133 | 214 | 241 | 114 | 0 | 0 | 0 | 0 | 0 |
| Percent | 7.4 | 26.1 | 60.5 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| SE Percent | 1.23 | 1.99 | 2.24 | 1.06 | 0.00 | 0.00 | 0.00 | 0.00 | |

[a]   Estimates of the total in-river return for each strata are taken from the sonar project (D. L. Burwen, Alaska Department of Fish and Game, Anchorage, personal communication).   Age samples were taken with large mesh gill nets as part of the mark-recapture tagging project.   The number of fish sampled in each age class was taken directly from the tagging project data files (Appendix C1).

Appendix A6. Estimates by age class of the number of early-run chinook salmon harvested in educational gill nets, 1989-1990.[a]

| | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | All |
| **1989** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Harvest | 0 | 4 | 29 | 3 | 0 | 0 | 0 | 0 | 36 |
| SE Harvest | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| **Male** | | | | | | | | | |
| Harvest | 3 | 7 | 23 | 4 | 0 | 0 | 0 | 0 | 37 |
| SE Harvest | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| **Combined** | | | | | | | | | |
| Harvest | 3 | 12 | 52 | 7 | 0 | 0 | 0 | 0 | 73 |
| SE Harvest | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| **1990** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Harvest | 1 | 5 | 13 | 1 | 0 | 0 | 0 | 0 | 19 |
| SE Harvest | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| **Male** | | | | | | | | | |
| Harvest | 2 | 6 | 11 | 1 | 0 | 0 | 0 | 0 | 21 |
| SE Harvest | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| **Combined** | | | | | | | | | |
| Harvest | 3 | 10 | 24 | 2 | 0 | 0 | 0 | 0 | 40 |
| SE Harvest | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

[a] Total harvest data is from S. Hammarstrom (Alaska Department of Fish and Game, Soldotna, personal communication). The age composition of chinook salmon harvested in educational gill nets during the early run is assumed to be the same as the age composition of the fish sampled in all strata combined of the in-river return.

Appendix A7. Estimates by age class of the number of early-run chinook salmon harvested in the Kenai River sport fishery, 1976-1990.[a]

| | Age Class | | | | | | | | | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.3 | 2.4 | 2.5 | | |
| **1976** | | | | | | | | | | | |
| Number | 8 | 54 | 49 | 86 | 5 | 0 | 2 | 0 | 0 | | 204 |
| Percent | 3.9 | 26.5 | 24.0 | 42.2 | 2.5 | 0.0 | 1.0 | 0.0 | 0.0 | | |
| SE % | 1.4 | 3.1 | 3.0 | 3.5 | 1.1 | | 0.7 | | | | |
| Estimated Harvest | 61 | 411 | 373 | 655 | 38 | | 15 | | | | 1,554 |
| SE Harvest | 21 | 48 | 47 | 54 | 17 | | 11 | | | | NA |
| **1977** | | | | | | | | | | | |
| Number | 0 | 29 | 61 | 108 | 3 | 0 | 1 | 3 | 1 | | 206 |
| Percent | 0.0 | 14.1 | 29.6 | 52.4 | 1.5 | 0.0 | 0.5 | 1.5 | 0.5 | | |
| SE % | | 2.4 | 3.2 | 3.5 | 0.8 | | 0.5 | 0.8 | 0.5 | | |
| Estimated Harvest | | 306 | 643 | 1,139 | 32 | | 11 | 32 | 11 | | 2,173 |
| SE Harvest | | 53 | 69 | 76 | 18 | | 11 | 18 | 11 | | NA |
| **1978** | | | | | | | | | | | |
| Number | 0 | 11 | 13 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 69 |
| Percent | 0.0 | 15.9 | 18.8 | 65.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| SE % | | 4.4 | 4.7 | 5.8 | | | | | | | |
| Estimated Harvest | | 246 | 291 | 1,006 | | | | | | | 1,542 |
| SE Harvest | | 68 | 73 | 89 | | | | | | | NA |
| **1979** | | | | | | | | | | | |
| Number | 0 | 6 | 32 | 54 | 12 | 0 | 0 | 0 | 0 | 0 | 104 |
| Percent | 0.0 | 5.8 | 30.8 | 51.9 | 11.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| SE % | | 2.3 | 4.5 | 4.9 | 3.1 | | | | | | |
| Estimated Harvest | | 154 | 819 | 1,382 | 307 | | | | | | 2,661 |
| SE Harvest | | 61 | 121 | 131 | 84 | | | | | | NA |
| **1980** | | | | | | | | | | | |
| Number | 0 | 20 | 33 | 155 | 14 | 0 | 0 | 0 | 0 | 0 | 222 |
| Percent | 0.0 | 9.0 | 14.9 | 69.8 | 6.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| SE % | | 1.9 | 2.4 | 3.1 | 1.6 | | | | | | |
| Estimated Harvest | | 175 | 289 | 1,359 | 123 | | | | | | 1,946 |
| SE Harvest | | 37 | 47 | 60 | 32 | | | | | | NA |
| **1981** | | | | | | | | | | | |
| Number | | 32 | 70 | 112 | 7 | | | | | 5 | 226 |
| Percent | | 14.2 | 31.0 | 49.6 | 3.1 | | | | | 2.2 | |
| SE % | | 2.3 | 3.1 | 3.3 | 1.2 | | | | | 1.0 | |
| Estimated Harvest | | 641 | 1,402 | 2,242 | 140 | | | | | 100 | 4,525 |
| SE Harvest | | 105 | 139 | 151 | 52 | | | | | 44 | NA |

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| | | | | Age Class | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.3 | 2.4 | 2.5 | Other | Total |
| **1982** | | | | | | | | | | | |
| Number | | 10 | 37 | 99 | 7 | | | | | 6 | 159 |
| Percent | | 6.3 | 23.3 | 62.3 | 4.4 | | | | | 3.8 | |
| SE % | | 1.9 | 3.4 | 3.9 | 1.6 | | | | | 1.5 | |
| Estimated Harvest | | 344 | 1,272 | 3,403 | 241 | | | | | 206 | 5,466 |
| SE Harvest | | 106 | 184 | 211 | 89 | | | | | 83 | NA |
| **1983** | | | | | | | | | | | |
| Number | | 5 | 10 | 44 | 3 | | | | | 8 | 70 |
| Percent | | 7.1 | 14.3 | 62.9 | 4.3 | | | | | 11.4 | |
| SE % | | 3.1 | 4.2 | 5.8 | 2.4 | | | | | 3.8 | |
| Estimated Harvest | | 454 | 909 | 3,998 | 273 | | | | | 727 | 6,360 |
| SE Harvest | | 197 | 268 | 370 | 155 | | | | | 244 | NA |
| **1984** | | | | | | | | | | | |
| Number | 0 | 10 | 81 | 180 | 20 | 0 | 0 | 0 | 0 | | 291 |
| Percent | 0.0 | 3.4 | 27.8 | 61.9 | 6.9 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE % | | 1.1 | 2.6 | 2.9 | 1.5 | | | | | | |
| Estimated Harvest | | 170 | 1,380 | 3,066 | 341 | | | | | | 4,956 |
| SE Harvest | | 53 | 130 | 141 | 74 | | | | | | NA |
| **1985** | | | | | | | | | | | |
| Number | 0 | 18 | 39 | 225 | 12 | 0 | 0 | 0 | 0 | | 294 |
| Percent | 0.0 | 6.1 | 13.3 | 76.5 | 4.1 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE % | | 1.4 | 2.0 | 2.5 | 1.2 | | | | | | |
| Estimated Harvest | | 488 | 1,057 | 6,100 | 325 | | | | | | 7,971 |
| SE Harvest | | 112 | 158 | 197 | 92 | | | | | | NA |
| **1986** | | | | | | | | | | | |
| Female | | | | | | | | | | | |
| Number | 0 | 5 | 94 | 170 | 24 | 0 | 0 | 0 | 0 | | 293 |
| Percent | 0.0 | 0.9 | 16.8 | 30.4 | 4.3 | 0.0 | 0.0 | 0.0 | 0.0 | | 52.3 |
| SE % | | 0.4 | 1.6 | 1.9 | 0.9 | | | | | | 2.1 |
| Estimated Harvest | | 68 | 1,269 | 2,295 | 324 | | | | | | 3,956 |
| SE Harvest | | 30 | 143 | 205 | 68 | | | | | | 293 |
| Male | | | | | | | | | | | |
| Number | 1 | 35 | 109 | 96 | 26 | 0 | 0 | 0 | 0 | | 267 |
| Percent | 0.2 | 6.3 | 19.5 | 17.1 | 4.6 | 0.0 | 0.0 | 0.0 | 0.0 | | 47.7 |
| SE % | 0.2 | 1.0 | 1.7 | 1.6 | 0.9 | | | | | | 2.1 |
| Estimated Harvest | 14 | 473 | 1,472 | 1,296 | 351 | | | | | | 3,605 |
| SE Harvest | 14 | 83 | 156 | 145 | 71 | | | | | | 275 |
| Combined | | | | | | | | | | | |
| Number | 1 | 40 | 203 | 266 | 50 | 0 | 0 | 0 | 0 | | 560 |
| Percent | 0.2 | 7.1 | 36.3 | 47.5 | 8.9 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE % | 0.2 | 1.1 | 2.0 | 2.1 | 1.2 | | | | | | |
| Estimated Harvest | 14 | 540 | 2,741 | 3,591 | 675 | | | | | | 7,561 |
| SE Harvest | 14 | 89 | 229 | 274 | 100 | | | | | | 470 |

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| | | | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.3 | 2.4 | 2.5 | Other | Total |

**1987**
Female

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.3 | 2.4 | 2.5 | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | 0 | 1 | 81 | 190 | 11 | 0 | 0 | 1 | 0 | | 284 |
| Percent | 0.0 | 0.2 | 17.3 | 40.5 | 2.3 | 0.0 | 0.0 | 0.2 | 0.0 | | 60.6 |
| SE % | | 0.2 | 1.7 | 2.3 | 0.7 | | | 0.2 | | | 2.3 |
| Estimated Harvest | | 28 | 2,294 | 5,380 | 311 | | | 28 | | | 8,042 |
| SE Harvest | | 28 | 276 | 464 | 95 | | | 28 | | | 606 |

Male

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.3 | 2.4 | 2.5 | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | 0 | 3 | 65 | 104 | 11 | 0 | 0 | 2 | 0 | | 185 |
| Percent | 0.0 | 0.6 | 13.9 | 22.2 | 2.3 | 0.0 | 0.0 | 0.4 | 0.0 | | 39.4 |
| SE % | | 0.4 | 1.6 | 1.9 | 0.7 | | | 0.3 | | | 2.3 |
| Estimated Harvest | | 85 | 1,841 | 2,945 | 311 | | | 57 | | | 5,239 |
| SE Harvest | | 49 | 244 | 319 | 95 | | | 40 | | | 456 |

Combined

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.3 | 2.4 | 2.5 | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | 0 | 4 | 146 | 294 | 22 | 0 | 0 | 3 | 0 | | 469 |
| Percent | 0.0 | 0.9 | 31.1 | 62.7 | 4.7 | 0.0 | 0.0 | 0.6 | 0.0 | | |
| SE % | | 0.4 | 2.1 | 2.2 | 1.0 | | | 0.4 | | | |
| Estimated Harvest | | 113 | 4,134 | 8,325 | 623 | | | 85 | | | 13,281 |
| SE Harvest | | 57 | 392 | 621 | 136 | | | 49 | | | 871 |

**1988**
Female

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.3 | 2.4 | 2.5 | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | 0 | 2 | 29 | 300 | 6 | 0 | 0 | 1 | 0 | | 338 |
| Percent | 0.0 | 0.3 | 5.1 | 52.3 | 1.0 | 0.0 | 0.0 | 0.2 | 0.0 | | 58.9 |
| SE % | | 0.2 | 0.9 | 2.1 | 0.4 | | | 0.2 | | | 2.1 |
| Estimated Harvest | | 44 | 644 | 6,662 | 133 | | | 22 | | | 7,506 |
| SE Harvest | | 31 | 122 | 461 | 55 | | | 22 | | | 499 |

Male

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.3 | 2.4 | 2.5 | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | 1 | 9 | 41 | 151 | 33 | 0 | 0 | 1 | 0 | | 236 |
| Percent | 0.2 | 1.6 | 7.1 | 26.3 | 5.7 | 0.0 | 0.0 | 0.2 | 0.0 | | 41.1 |
| SE % | 0.2 | 0.5 | 1.1 | 1.8 | 1.0 | | | 0.2 | | | 2.1 |
| Estimated Harvest | 22 | 200 | 911 | 3,353 | 733 | | | 22 | | | 5,241 |
| SE Harvest | 22 | 67 | 146 | 301 | 131 | | | 22 | | | 396 |

Combined

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.3 | 2.4 | 2.5 | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | 1 | 11 | 70 | 451 | 39 | 0 | 0 | 2 | 0 | | 574 |
| Percent | 0.2 | 1.9 | 12.2 | 78.6 | 6.8 | 0.0 | 0.0 | 0.3 | 0.0 | | |
| SE % | 0.2 | 0.6 | 1.4 | 1.7 | 1.1 | | | 0.2 | | | |
| Estimated Harvest | 22 | 244 | 1,555 | 10,016 | 866 | | | 44 | | | 12,747 |
| SE Harvest | 22 | 74 | 195 | 608 | 143 | | | 31 | | | 722 |

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| | Age Class | | | | | | | | | | |
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.3 | 2.4 | 2.5 | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1989** | | | | | | | | | | | |
| Female | | | | | | | | | | | |
| Number | 0 | 1 | 29 | 59 | 3 | 0 | 0 | 0 | 0 | | 92 |
| Percent | 0.0 | 0.5 | 15.8 | 32.2 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | | 50.3 |
| SE % | | 0.5 | 2.7 | 3.5 | 0.9 | | | | | | 3.7 |
| Estimated Harvest | | 40 | 1,150 | 2,339 | 119 | | | | | | 3,648 |
| SE Harvest | | 40 | 212 | 301 | 69 | | | | | | 374 |
| Male | | | | | | | | | | | |
| Number | 2 | 5 | 19 | 56 | 9 | 0 | 0 | 0 | 0 | | 91 |
| Percent | 1.1 | 2.7 | 10.4 | 30.6 | 4.9 | 0.0 | 0.0 | 0.0 | 0.0 | | 49.7 |
| SE % | 0.8 | 1.2 | 2.3 | 3.4 | 1.6 | | | | | | 3.7 |
| Estimated Harvest | 79 | 198 | 753 | 2,220 | 357 | | | | | | 3,608 |
| SE Harvest | 56 | 89 | 172 | 294 | 119 | | | | | | 372 |
| Combined | | | | | | | | | | | |
| Number | 2 | 6 | 48 | 115 | 12 | 0 | 0 | 0 | 0 | | 183 |
| Percent | 1.1 | 3.3 | 26.2 | 62.8 | 6.6 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE % | 0.8 | 1.3 | 3.3 | 3.6 | 1.8 | | | | | | |
| Estimated Harvest | 79 | 238 | 1,903 | 4,560 | 476 | | | | | | 7,256 |
| SE Harvest | 56 | 97 | 272 | 416 | 137 | | | | | | 517 |
| **1990** | | | | | | | | | | | |
| Female | | | | | | | | | | | |
| Number | 0 | 1 | 3 | 30 | 4 | 0 | 0 | 0 | 0 | | 38 |
| Percent | 0.0 | 1.4 | 4.2 | 42.3 | 5.6 | 0.0 | 0.0 | 0.0 | 0.0 | | 53.5 |
| SE % | | 1.4 | 2.4 | 5.9 | 2.8 | | | | | | 6.0 |
| Estimated Harvest | | 24 | 73 | 733 | 98 | | | | | | 929 |
| SE Harvest | | 24 | 43 | 155 | 50 | | | | | | 180 |
| Male | | | | | | | | | | | |
| Number | 0 | 3 | 1 | 23 | 6 | 0 | 0 | 0 | 0 | | 33 |
| Percent | 0.0 | 4.2 | 1.4 | 32.4 | 8.5 | 0.0 | 0.0 | 0.0 | 0.0 | | 46.5 |
| SE % | | 2.4 | 1.4 | 5.6 | 3.3 | | | | | | 6.0 |
| Estimated Harvest | | 73 | 24 | 562 | 147 | | | | | | 806 |
| SE Harvest | | 43 | 24 | 131 | 62 | | | | | | 164 |
| Combined | | | | | | | | | | | |
| Number | 0 | 4 | 4 | 53 | 10 | 0 | 0 | 0 | 0 | | 71 |
| Percent | 0.0 | 5.6 | 5.6 | 74.6 | 14.1 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE % | | 2.8 | 2.8 | 5.2 | 4.2 | | | | | | |
| Estimated Harvest | | 98 | 98 | 1,295 | 244 | | | | | | 1,735 |
| SE Harvest | | 50 | 50 | 225 | 81 | | | | | | 277 |

[a]  Sources for 1976 - 1985 age composition and sport harvest data: Hammarstrom 1977 - 81; Hammarstrom and Larson 1982 - 84, 1986; Hammarstrom et al. 1985; S. Hammarstrom (Alaska Department of Fish and Game, Soldotna, personal communication).  Sport harvest estimates for 1986 through 1990 were taken from Conrad and Hammarstrom 1987, and Hammarstrom 1988 - 91. The number of fish sampled in each age class for 1986 - 1990 was taken directly from the project data files.

Appendix A8.    Estimates of early-run Kenai River chinook salmon hook and release mortality from the Kenai River sport fishery, 1986-1990[a].

| Year | Sport Catch | Sport Harvest | Number Released | SE Release | Percent Mortality | SE Percent | Hook and Release Mortality | SE Mortality |
|------|------|------|------|------|------|------|------|------|
| 1986 | 12,117 | 7,561 | 4,556 | 845 | 6.4[b] | 3.39 | 292 | 161 |
| 1987 | 19,119 | 13,281 | 5,838 | 1,492 | 6.4[b] | 3.39 | 374 | 214 |
| 1988 | 18,643 | 12,747 | 5,896 | 1,129 | 6.4[b] | 3.39 | 377 | 209 |
| 1989 | 9,901 | 7,256 | 2,645 | 831 | 6.4[b] | 3.39 | 169 | 100 |
| 1990 | 4,973 | 1,735 | 3,238 | 630 | 8.8 | 2.50 | 285 | 97 |

[a]   Catch and harvest estimates from Conrad and Hammarstrom 1987, and Hammarstrom 1988-1991.   Percent mortality from Bendock and Alexandersdottir 1990, 1991, and *In prep*; and M. Alexandersdottir (Alaska Department of Fish and Game, Anchorage, personal communication).

[b]   Percent mortality for 1986-1989 is the average of the measured 1990 percent mortality (8.8), and the measured 1991 percent mortality of 4.0.

APPENDIX B.

LATE-RUN AGE COMPOSITION TABLES

Appendix B1. Estimates by age class of the number of chinook salmon harvested in the Central District drift net and Upper Subdistrict set net commercial fisheries, 1986.[a]

| | | | | | | Age Class | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
| **Set Net Harvest** | | | | | | | | | | | | | | | |
| **Female (n=538)** | | | | | | | | | | | | | | | |
| Percent | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 3.2 | 18.7 | 16.2 | 1.6 | 0.0 | 0.0 | 0.2 | 0.4 | 0.1 | 40.6 |
| SE Percent | 0.00 | 0.00 | 0.09 | 0.09 | 0.00 | 0.48 | 1.07 | 1.01 | 0.34 | 0.00 | 0.00 | 0.12 | 0.17 | 0.09 | 1.35 |
| Harvest | 0 | 0 | 20 | 20 | 0 | 634 | 3,704 | 3,209 | 317 | 0 | 0 | 40 | 79 | 20 | 8,043 |
| SE Harvest | 0 | 0 | 17 | 17 | 0 | 96 | 212 | 201 | 68 | 0 | 0 | 24 | 34 | 17 | 267 |
| **Male (n=786)** | | | | | | | | | | | | | | | |
| Percent | 0.2 | 0.2 | 0.0 | 0.0 | 1.2 | 19.8 | 18.3 | 17.3 | 1.7 | 0.1 | 0.2 | 0.0 | 0.3 | 0.1 | 59.4 |
| SE Percent | 0.12 | 0.12 | 0.00 | 0.00 | 0.30 | 1.10 | 1.06 | 1.04 | 0.36 | 0.09 | 0.12 | 0.00 | 0.15 | 0.09 | 1.35 |
| Harvest | 40 | 40 | 0 | 0 | 238 | 3,922 | 3,625 | 3,427 | 337 | 20 | 40 | 0 | 59 | 20 | 11,767 |
| SE Harvest | 24 | 24 | 0 | 0 | 59 | 217 | 211 | 206 | 70 | 17 | 24 | 0 | 30 | 17 | 267 |
| **Combined** | | | | | | | | | | | | | | | |
| Percent | 0.2 | 0.2 | 0.1 | 0.1 | 1.2 | 23.0 | 37.0 | 33.5 | 3.3 | 0.1 | 0.2 | 0.2 | 0.7 | 0.2 | 100.0 |
| SE Percent | 0.12 | 0.12 | 0.09 | 0.09 | 0.30 | 1.16 | 1.33 | 1.30 | 0.49 | 0.09 | 0.12 | 0.12 | 0.23 | 0.12 | |
| Harvest | 40 | 40 | 20 | 20 | 238 | 4,556 | 7,330 | 6,636 | 654 | 20 | 40 | 40 | 139 | 40 | 19,810 |
| SE Harvest | 24 | 24 | 17 | 17 | 59 | 229 | 263 | 257 | 97 | 17 | 24 | 24 | 45 | 24 | 0 |

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|  | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Drift Net Harvest** | | | | | | | | | | | | | | | |
| **Female** | | | | | | | | | | | | | | | |
| Harvest | 0 | 0 | 2 | 2 | 0 | 59 | 343 | 297 | 29 | 0 | 0 | 4 | 7 | 2 | 745 |
| SE Harvest | 0 | 0 | 2 | 2 | 0 | 9 | 20 | 19 | 6 | 0 | 0 | 2 | 3 | 2 | 25 |
| **Male** | | | | | | | | | | | | | | | |
| Harvest | 4 | 4 | 0 | 0 | 22 | 363 | 336 | 317 | 31 | 2 | 4 | 0 | 6 | 2 | 1,089 |
| SE Harvest | 2 | 2 | 0 | 0 | 5 | 20 | 19 | 19 | 7 | 2 | 2 | 0 | 3 | 2 | 25 |
| **Combined** | | | | | | | | | | | | | | | |
| Harvest | 4 | 4 | 2 | 2 | 22 | 422 | 679 | 614 | 61 | 2 | 4 | 4 | 13 | 4 | 1,834 |
| SE Harvest | 2 | 2 | 2 | 2 | 5 | 21 | 24 | 24 | 9 | 2 | 2 | 2 | 4 | 2 | 0 |
| **Set Net and Drift Net Combined** | | | | | | | | | | | | | | | |
| **Female** | | | | | | | | | | | | | | | |
| Harvest | 0 | 0 | 22 | 22 | 0 | 693 | 4,047 | 3,506 | 346 | 0 | 0 | 43 | 87 | 22 | 8,787 |
| SE Harvest | 0 | 0 | 17 | 17 | 0 | 96 | 213 | 202 | 69 | 0 | 0 | 24 | 35 | 17 | 269 |
| **Male** | | | | | | | | | | | | | | | |
| Harvest | 43 | 43 | 0 | 0 | 260 | 4,286 | 3,961 | 3,744 | 368 | 22 | 43 | 0 | 65 | 22 | 12,857 |
| SE Harvest | 24 | 24 | 0 | 0 | 60 | 218 | 211 | 207 | 71 | 17 | 24 | 0 | 30 | 17 | 269 |
| **Combined** | | | | | | | | | | | | | | | |
| Harvest | 43 | 43 | 22 | 22 | 260 | 4,978 | 8,008 | 7,251 | 714 | 22 | 43 | 43 | 152 | 43 | 21,644 |
| SE Harvest | 24 | 24 | 17 | 17 | 60 | 238 | 300 | 289 | 99 | 17 | 24 | 24 | 46 | 24 |  |

Age Class

[a]  Age compositions are based on samples taken from the set net fishery (Cross et al. *In press*).  Age composition in the drift net fishery is assumed to be the same as the set net fishery.  Total harvest figures are taken from Ruesch (1991).

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Appendix B2. Estimates by age class of the number of chinook salmon harvested in the Central District drift net and Upper Subdistrict set gill net commercial fisheries, 1987.[a]

| | Age Class | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
| **Set Net Harvest** | | | | | | | | | | | |
| **Strata 1 (7/01-7/06)** | | | | | | | | | | | |
| *Female* | | | | | | | | | | | |
| Sample Size | 0 | 19 | 32 | 43 | 0 | 0 | 0 | 1 | 0 | 1 | 96 |
| Percent | 0.00 | 10.22 | 17.20 | 23.12 | 0.00 | 0.00 | 0.00 | 0.54 | 0.00 | 0.54 | 51.61 |
| SE Percent | 0.00 | 2.23 | 2.77 | 3.10 | 0.00 | 0.00 | 0.00 | 0.54 | 0.00 | 0.54 | 3.67 |
| Harvest | 0 | 117 | 197 | 264 | 0 | 0 | 0 | 6 | 0 | 6 | 590 |
| SE Harvest | 0 | 25 | 32 | 35 | 0 | 0 | 0 | 6 | 0 | 6 | 42 |
| *Male* | | | | | | | | | | | |
| Sample Size | 5 | 10 | 18 | 55 | 2 | 0 | 0 | 0 | 0 | 0 | 90 |
| Percent | 2.69 | 5.38 | 9.68 | 29.57 | 1.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 48.39 |
| SE Percent | 1.19 | 1.66 | 2.17 | 3.36 | 0.76 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.67 |
| Harvest | 31 | 61 | 111 | 338 | 12 | 0 | 0 | 0 | 0 | 0 | 553 |
| SE Harvest | 14 | 19 | 25 | 38 | 9 | 0 | 0 | 0 | 0 | 0 | 42 |
| *Combined* | | | | | | | | | | | |
| Sample Size | 5 | 29 | 50 | 98 | 2 | 0 | 0 | 1 | 0 | 1 | 186 |
| Percent | 2.69 | 15.59 | 26.88 | 52.69 | 1.08 | 0.00 | 0.00 | 0.54 | 0.00 | 0.54 | 100.00 |
| SE Percent | 1.19 | 2.67 | 3.26 | 3.67 | 0.76 | 0.00 | 0.00 | 0.54 | 0.00 | 0.54 | |
| Harvest | 31 | 178 | 307 | 602 | 12 | 0 | 0 | 6 | 0 | 6 | 1,143 |
| SE Harvest | 14 | 30 | 37 | 42 | 9 | 0 | 0 | 6 | 0 | 6 | 0 |
| **Strata 2 (7/07-7/13)** | | | | | | | | | | | |
| *Female* | | | | | | | | | | | |
| Sample Size | 0 | 36 | 29 | 53 | 1 | 0 | 0 | 0 | 0 | 0 | 119 |
| Percent | 0.00 | 16.14 | 13.00 | 23.77 | 0.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 53.36 |
| SE Percent | 0.00 | 2.47 | 2.26 | 2.86 | 0.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.35 |
| Harvest | 0 | 375 | 302 | 553 | 10 | 0 | 0 | 0 | 0 | 0 | 1,241 |
| SE Harvest | 0 | 57 | 52 | 66 | 10 | 0 | 0 | 0 | 0 | 0 | 78 |
| *Male* | | | | | | | | | | | |
| Sample Size | 13 | 10 | 28 | 51 | 2 | 0 | 0 | 0 | 0 | 0 | 104 |
| Percent | 5.83 | 4.48 | 12.56 | 22.87 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 46.64 |
| SE Percent | 1.57 | 1.39 | 2.22 | 2.82 | 0.63 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.35 |
| Harvest | 136 | 104 | 292 | 532 | 21 | 0 | 0 | 0 | 0 | 0 | 1,084 |
| SE Harvest | 37 | 32 | 52 | 66 | 15 | 0 | 0 | 0 | 0 | 0 | 78 |
| *Combined* | | | | | | | | | | | |
| Sample Size | 13 | 46 | 57 | 104 | 3 | 0 | 0 | 0 | 0 | 0 | 223 |
| Percent | 5.83 | 20.63 | 25.56 | 46.64 | 1.35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 1.57 | 2.72 | 2.93 | 3.35 | 0.77 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Harvest | 136 | 480 | 594 | 1,084 | 31 | 0 | 0 | 0 | 0 | 0 | 2,325 |
| SE Harvest | 37 | 63 | 68 | 78 | 18 | 0 | 0 | 0 | 0 | 0 | 0 |

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Appendix B2.    (Page 2 of 5).

| | Age Class | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |

Set Net Harvest (continued)

Strata 3 (7/14-7/20)
Female

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 3 | 27 | 37 | 0 | 0 | 0 | 0 | 0 | 0 | 67 |
| Percent | 0.00 | 2.33 | 20.93 | 28.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 51.94 |
| SE Percent | 0.00 | 1.33 | 3.60 | 4.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.42 |
| Harvest | 0 | 122 | 1,099 | 1,506 | 0 | 0 | 0 | 0 | 0 | 0 | 2,727 |
| SE Harvest | 0 | 70 | 189 | 210 | 0 | 0 | 0 | 0 | 0 | 0 | 232 |

Male

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 1 | 7 | 24 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 62 |
| Percent | 0.78 | 5.43 | 18.60 | 23.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 48.06 |
| SE Percent | 0.78 | 2.00 | 3.44 | 3.73 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.42 |
| Harvest | 41 | 285 | 977 | 1,221 | 0 | 0 | 0 | 0 | 0 | 0 | 2,524 |
| SE Harvest | 41 | 105 | 181 | 196 | 0 | 0 | 0 | 0 | 0 | 0 | 232 |

Combined

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 1 | 10 | 51 | 67 | 0 | 0 | 0 | 0 | 0 | 0 | 129 |
| Percent | 0.78 | 7.75 | 39.53 | 51.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.78 | 2.36 | 4.32 | 4.42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Harvest | 41 | 407 | 2,076 | 2,727 | 0 | 0 | 0 | 0 | 0 | 0 | 5,251 |
| SE Harvest | 41 | 124 | 227 | 232 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Strata 4 (7/21-7/24)
Female

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 10 | 22 | 29 | 1 | 0 | 0 | 1 | 0 | 0 | 63 |
| Percent | 0.00 | 5.75 | 12.64 | 16.67 | 0.57 | 0.00 | 0.00 | 0.57 | 0.00 | 0.00 | 36.21 |
| SE Percent | 0.00 | 1.77 | 2.53 | 2.83 | 0.57 | 0.00 | 0.00 | 0.57 | 0.00 | 0.00 | 3.65 |
| Harvest | 0 | 150 | 330 | 435 | 15 | 0 | 0 | 15 | 0 | 0 | 945 |
| SE Harvest | 0 | 46 | 66 | 74 | 15 | 0 | 0 | 15 | 0 | 0 | 95 |

Male

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 3 | 11 | 44 | 50 | 2 | 0 | 0 | 1 | 0 | 0 | 111 |
| Percent | 1.72 | 6.32 | 25.29 | 28.74 | 1.15 | 0.00 | 0.00 | 0.57 | 0.00 | 0.00 | 63.79 |
| SE Percent | 0.99 | 1.85 | 3.30 | 3.44 | 0.81 | 0.00 | 0.00 | 0.57 | 0.00 | 0.00 | 3.65 |
| Harvest | 45 | 165 | 660 | 750 | 30 | 0 | 0 | 15 | 0 | 0 | 1,664 |
| SE Harvest | 26 | 48 | 86 | 90 | 21 | 0 | 0 | 15 | 0 | 0 | 95 |

| Combined | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 3 | 21 | 66 | 79 | 3 | 0 | 0 | 2 | 0 | 0 | 174 |
| Percent | 1.72 | 12.07 | 37.93 | 45.40 | 1.72 | 0.00 | 0.00 | 1.15 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.99 | 2.48 | 3.69 | 3.79 | 0.99 | 0.00 | 0.00 | 0.81 | 0.00 | 0.00 | |
| Harvest | 45 | 315 | 990 | 1,185 | 45 | 0 | 0 | 30 | 0 | 0 | 2,609 |
| SE Harvest | 26 | 65 | 96 | 99 | 26 | 0 | 0 | 21 | 0 | 0 | 0 |

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| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Age Class | | | | | | |

Set Net Harvest (continued)

Strata 5 (7/25-7/31)
Female

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 8 | 17 | 22 | 1 | 0 | 0 | 0 | 0 | 0 | 48 |
| Percent | 0.00 | 6.06 | 12.88 | 16.67 | 0.76 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 36.36 |
| SE Percent | 0.00 | 2.08 | 2.93 | 3.26 | 0.76 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.20 |
| Harvest | 0 | 316 | 672 | 870 | 40 | 0 | 0 | 0 | 0 | 0 | 1,897 |
| SE Harvest | 0 | 109 | 153 | 170 | 40 | 0 | 0 | 0 | 0 | 0 | 219 |

Male

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 1 | 9 | 30 | 41 | 1 | 0 | 0 | 0 | 2 | 0 | 84 |
| Percent | 0.76 | 6.82 | 22.73 | 31.06 | 0.76 | 0.00 | 0.00 | 0.00 | 1.52 | 0.00 | 63.64 |
| SE Percent | 0.76 | 2.20 | 3.66 | 4.04 | 0.76 | 0.00 | 0.00 | 0.00 | 1.07 | 0.00 | 4.20 |
| Harvest | 40 | 356 | 1,186 | 1,621 | 40 | 0 | 0 | 0 | 79 | 0 | 3,321 |
| SE Harvest | 40 | 115 | 191 | 211 | 40 | 0 | 0 | 0 | 56 | 0 | 219 |

Combined

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 1 | 17 | 47 | 63 | 2 | 0 | 0 | 0 | 2 | 0 | 132 |
| Percent | 0.76 | 12.88 | 35.61 | 47.73 | 1.52 | 0.00 | 0.00 | 0.00 | 1.52 | 0.00 | 100.00 |
| SE Percent | 0.76 | 2.93 | 4.18 | 4.36 | 1.07 | 0.00 | 0.00 | 0.00 | 1.07 | 0.00 | |
| Harvest | 40 | 672 | 1,858 | 2,490 | 79 | 0 | 0 | 0 | 79 | 0 | 5,218 |
| SE Harvest | 40 | 153 | 218 | 228 | 56 | 0 | 0 | 0 | 56 | 0 | 0 |

Strata 6 (8/01-8/14)
Female

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 6 | 20 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 69 |
| Percent | 0.00 | 4.48 | 14.93 | 32.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 51.49 |
| SE Percent | 0.00 | 1.79 | 3.09 | 4.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.33 |
| Harvest | 0 | 181 | 603 | 1,297 | 0 | 0 | 0 | 0 | 0 | 0 | 2,081 |
| SE Harvest | 0 | 72 | 125 | 164 | 0 | 0 | 0 | 0 | 0 | 0 | 175 |

Male

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 0 | 25 | 39 | 1 | 0 | 0 | 0 | 0 | 0 | 65 |
| Percent | 0.00 | 0.00 | 18.66 | 29.10 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 48.51 |
| SE Percent | 0.00 | 0.00 | 3.38 | 3.94 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.33 |
| Harvest | 0 | 0 | 754 | 1,176 | 30 | 0 | 0 | 0 | 0 | 0 | 1,961 |
| SE Harvest | 0 | 0 | 137 | 159 | 30 | 0 | 0 | 0 | 0 | 0 | 175 |

Combined

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 0 | 6 | 45 | 82 | 1 | 0 | 0 | 0 | 0 | 0 | 134 |
| Percent | 0.00 | 4.48 | 33.58 | 61.19 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.00 | 1.79 | 4.10 | 4.23 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Harvest | 0 | 181 | 1,357 | 2,473 | 30 | 0 | 0 | 0 | 0 | 0 | 4,042 |
| SE Harvest | 0 | 72 | 166 | 171 | 30 | 0 | 0 | 0 | 0 | 0 | 0 |

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| | | | | Age Class | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |

**Set Net Harvest All Strata**

Female

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 0 | 1,261 | 3,203 | 4,924 | 65 | 0 | 0 | 21 | 0 | 6 | 9,841 |
| SE Harvest | 0 | 167 | 288 | 333 | 44 | 0 | 0 | 16 | 0 | 6 | 387 |
| Percent | 0.0 | 6.1 | 15.6 | 23.9 | 0.3 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 46.1 |
| SE Percent | 0.00 | 0.81 | 1.40 | 1.62 | 0.21 | 0.00 | 0.00 | 0.08 | 0.00 | 0.03 | 1.88 |

Male

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 291 | 971 | 3,979 | 5,638 | 133 | 0 | 0 | 15 | 79 | 0 | 11,107 |
| SE Harvest | 74 | 167 | 314 | 349 | 57 | 0 | 0 | 15 | 56 | 0 | 387 |
| Percent | 1.4 | 4.7 | 19.3 | 27.4 | 0.6 | 0.0 | 0.0 | 0.1 | 0.4 | 0.0 | 53.9 |
| SE Percent | 0.36 | 0.81 | 1.52 | 1.70 | 0.28 | 0.00 | 0.00 | 0.07 | 0.27 | 0.00 | 1.88 |

Combined

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 291 | 2,233 | 7,182 | 10,562 | 198 | 0 | 0 | 36 | 79 | 6 | 20,588 |
| SE Harvest | 74 | 230 | 377 | 390 | 71 | 0 | 0 | 22 | 56 | 6 | 0 |
| Percent | 1.4 | 10.8 | 34.9 | 51.3 | 1.0 | 0.0 | 0.0 | 0.2 | 0.4 | 0.0 | 100.0 |
| SE Percent | 0.36 | 1.12 | 1.83 | 1.90 | 0.35 | 0.00 | 0.00 | 0.11 | 0.27 | 0.03 | |

**Drift Net Harvest**

Female

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 0 | 279 | 708 | 1,089 | 14 | 0 | 0 | 5 | 0 | 1 | 2,096 |
| SE Harvest | 0 | 37 | 64 | 74 | 10 | 0 | 0 | 4 | 0 | 1 | 85 |

Male

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 64 | 215 | 880 | 1,246 | 29 | 0 | 0 | 3 | 17 | 0 | 2,455 |
| SE Harvest | 16 | 37 | 69 | 77 | 13 | 0 | 0 | 3 | 12 | 0 | 85 |

Combined

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 64 | 494 | 1,588 | 2,335 | 44 | 0 | 0 | 8 | 17 | 1 | 4,551 |
| SE Harvest | 16 | 51 | 83 | 86 | 16 | 0 | 0 | 5 | 12 | 1 | |

Appendix B2.   (Page 5 of 5).

| | Age Class | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |

Set Net and Drift Net Combined

Female

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 0 | 1,540 | 3,911 | 6,013 | 79 | 0 | 0 | 26 | 0 | 8 | 11,577 |
| SE Harvest | 0 | 172 | 294 | 341 | 45 | 0 | 0 | 17 | 0 | 6 | 396 |

Male

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 356 | 1,186 | 4,859 | 6,884 | 162 | 0 | 0 | 18 | 97 | 0 | 13,562 |
| SE Harvest | 75 | 171 | 321 | 358 | 58 | 0 | 0 | 15 | 57 | 0 | 396 |

Combined

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 356 | 2,726 | 8,770 | 12,897 | 241 | 0 | 0 | 44 | 97 | 8 | 25,139 |
| SE Harvest | 75 | 236 | 386 | 400 | 73 | 0 | 0 | 23 | 57 | 6 | |

[a]   Age compositions are based on samples taken from the set net fishery
      (Waltemyer 1989).   Age composition in the drift net fishery is assumed to
      be the same as the age composition from all strata combined in the set net
      fishery.   Total harvest figures are taken from Waltemyer (1989).   Total
      harvest does not include fish harvested by set nets prior to 01 July.

Appendix B3.  Estimates by age class of the number of chinook salmon harvested in the Central District drift net and Upper Subdistrict set net commercial fisheries, 1988.

| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Set Net Harvest** [a] | | | | | | | | | | | | |
| **Strata 1 (7/01-7/18)** | | | | | | | | | | | | |
| **Female** | | | | | | | | | | | | |
| Sample Size | 1 | 4 | 37 | 34 | 156 | 5 | 0 | 0 | 2 | 1 | 2 | 242 |
| Percent | 0.21 | 0.83 | 7.69 | 7.07 | 32.43 | 1.04 | 0.00 | 0.00 | 0.42 | 0.21 | 0.42 | 50.31 |
| SE Percent | 0.21 | 0.41 | 1.22 | 1.17 | 2.14 | 0.46 | 0.00 | 0.00 | 0.29 | 0.21 | 0.29 | 2.28 |
| Harvest | 13 | 53 | 487 | 448 | 2,055 | 66 | 0 | 0 | 26 | 13 | 26 | 3,187 |
| SE Harvest | 13 | 26 | 77 | 74 | 135 | 29 | 0 | 0 | 19 | 13 | 19 | 145 |
| **Male** | | | | | | | | | | | | |
| Sample Size | 0 | 21 | 17 | 27 | 166 | 5 | 0 | 0 | 1 | 0 | 2 | 239 |
| Percent | 0.00 | 4.37 | 3.53 | 5.61 | 34.51 | 1.04 | 0.00 | 0.00 | 0.21 | 0.00 | 0.42 | 49.69 |
| SE Percent | 0.00 | 0.93 | 0.84 | 1.05 | 2.17 | 0.46 | 0.00 | 0.00 | 0.21 | 0.00 | 0.29 | 2.28 |
| Harvest | 0 | 277 | 224 | 356 | 2,186 | 66 | 0 | 0 | 13 | 0 | 26 | 3,148 |
| SE Harvest | 0 | 59 | 53 | 67 | 137 | 29 | 0 | 0 | 13 | 0 | 19 | 145 |
| **Combined** | | | | | | | | | | | | |
| Sample Size | 1 | 25 | 54 | 61 | 322 | 10 | 0 | 0 | 3 | 1 | 4 | 481 |
| Percent | 0.21 | 5.20 | 11.23 | 12.68 | 66.94 | 2.08 | 0.00 | 0.00 | 0.62 | 0.21 | 0.83 | 100.00 |
| SE Percent | 0.21 | 1.01 | 1.44 | 1.52 | 2.15 | 0.65 | 0.00 | 0.00 | 0.36 | 0.21 | 0.41 | |
| Harvest | 13 | 329 | 711 | 803 | 4,241 | 132 | 0 | 0 | 40 | 13 | 53 | 6,335 |
| SE Harvest | 0 | 64 | 91 | 96 | 136 | 41 | 0 | 0 | 23 | 13 | 26 | 0 |
| **Strata 2 (7/19-8/15)** | | | | | | | | | | | | |
| **Female** | | | | | | | | | | | | |
| Sample Size | 1 | 0 | 13 | 18 | 112 | 3 | 0 | 0 | 0 | 0 | 2 | 149 |
| Percent | 0.26 | 0.00 | 3.35 | 4.64 | 28.87 | 0.77 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 38.40 |
| SE Percent | 0.26 | 0.00 | 0.91 | 1.07 | 2.30 | 0.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.36 | 2.47 |
| Harvest | 17 | 0 | 219 | 303 | 1,886 | 51 | 0 | 0 | 0 | 0 | 34 | 2,510 |
| SE Harvest | 17 | 0 | 60 | 70 | 151 | 29 | 0 | 0 | 0 | 0 | 24 | 162 |
| **Male** | | | | | | | | | | | | |
| Sample Size | 0 | 3 | 26 | 45 | 162 | 3 | 0 | 0 | 0 | 0 | 0 | 239 |
| Percent | 0.00 | 0.77 | 6.70 | 11.60 | 41.75 | 0.77 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 61.60 |
| SE Percent | 0.00 | 0.45 | 1.27 | 1.63 | 2.51 | 0.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.47 |
| Harvest | 0 | 51 | 438 | 758 | 2,729 | 51 | 0 | 0 | 0 | 0 | 0 | 4,025 |
| SE Harvest | 0 | 29 | 83 | 106 | 164 | 29 | 0 | 0 | 0 | 0 | 0 | 162 |
| **Combined** | | | | | | | | | | | | |
| Sample Size | 1 | 3 | 39 | 63 | 274 | 6 | 0 | 0 | 0 | 0 | 2 | 388 |
| Percent | 0.26 | 0.77 | 10.05 | 16.24 | 70.62 | 1.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 100.00 |
| SE Percent | 0.26 | 0.45 | 1.53 | 1.87 | 2.32 | 0.63 | 0.00 | 0.00 | 0.00 | 0.00 | 0.36 | |
| Harvest | 17 | 51 | 657 | 1,061 | 4,615 | 101 | 0 | 0 | 0 | 0 | 34 | 6,535 |
| SE Harvest | 17 | 29 | 100 | 123 | 151 | 41 | 0 | 0 | 0 | 0 | 24 | 0 |

Age Class (header spanning columns 0.4 through 2.4)

- continued -

Appendix B3.    (Page 2 of 3).

| | | | | | Age Class | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |

**Set Net Harvest All Strata**

Female

| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 30 | 53 | 706 | 751 | 3,941 | 116 | 0 | 0 | 26 | 13 | 60 | 5,697 |
| SE Harvest | 21 | 26 | 98 | 102 | 202 | 41 | 0 | 0 | 19 | 13 | 30 | 217 |
| Percent | 0.2 | 0.4 | 5.5 | 5.8 | 30.6 | 0.9 | 0.0 | 0.0 | 0.2 | 0.1 | 0.5 | 44.3 |
| SE Percent | 0.17 | 0.20 | 0.76 | 0.79 | 1.57 | 0.32 | 0.00 | 0.00 | 0.14 | 0.10 | 0.23 | 1.68 |

Male

| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 0 | 327 | 662 | 1,114 | 4,915 | 116 | 0 | 0 | 13 | 0 | 26 | 7,173 |
| SE Harvest | 0 | 66 | 99 | 125 | 214 | 41 | 0 | 0 | 13 | 0 | 19 | 217 |
| Percent | 0.0 | 2.5 | 5.1 | 8.7 | 38.2 | 0.9 | 0.0 | 0.0 | 0.1 | 0.0 | 0.2 | 55.7 |
| SE Percent | 0.00 | 0.51 | 0.77 | 0.98 | 1.66 | 0.32 | 0.00 | 0.00 | 0.10 | 0.00 | 0.14 | 1.68 |

Combined

| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 30 | 380 | 1,368 | 1,864 | 8,856 | 232 | 0 | 0 | 40 | 13 | 86 | 12,870 |
| SE Harvest | 17 | 70 | 135 | 156 | 203 | 58 | 0 | 0 | 23 | 13 | 35 | 0 |
| Percent | 0.2 | 2.9 | 10.6 | 14.5 | 68.8 | 1.8 | 0.0 | 0.0 | 0.3 | 0.1 | 0.7 | 100.0 |
| SE Percent | 0.13 | 0.55 | 1.05 | 1.21 | 1.58 | 0.45 | 0.00 | 0.00 | 0.18 | 0.10 | 0.28 | |

**Drift Net Harvest**

Female

| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 5 | 9 | 122 | 129 | 679 | 20 | 0 | 0 | 5 | 2 | 10 | 981 |
| SE Harvest | 4 | 5 | 17 | 18 | 35 | 7 | 0 | 0 | 3 | 2 | 5 | 37 |

Male

| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 0 | 56 | 114 | 192 | 846 | 20 | 0 | 0 | 2 | 0 | 5 | 1,235 |
| SE Harvest | 0 | 11 | 17 | 22 | 37 | 7 | 0 | 0 | 2 | 0 | 3 | 37 |

Combined

| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 5 | 65 | 236 | 321 | 1,525 | 40 | 0 | 0 | 7 | 2 | 15 | 2,216 |
| SE Harvest | 3 | 12 | 23 | 27 | 35 | 10 | 0 | 0 | 4 | 2 | 6 | |

Appendix B3.    (Page 3 of 3).

| | Age Class | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
| **Set Net and Drift Net Combined** | | | | | | | | | | | | |
| **Female** | | | | | | | | | | | | |
| Harvest | 35 | 62 | 828 | 880 | 4,620 | 136 | 0 | 0 | 31 | 15 | 70 | 6,678 |
| SE Harvest | 22 | 27 | 99 | 103 | 205 | 42 | 0 | 0 | 19 | 13 | 31 | 220 |
| **Male** | | | | | | | | | | | | |
| Harvest | 0 | 383 | 776 | 1,305 | 5,761 | 136 | 0 | 0 | 15 | 0 | 31 | 8,408 |
| SE Harvest | 0 | 67 | 100 | 127 | 217 | 42 | 0 | 0 | 13 | 0 | 19 | 220 |
| **Combined** | | | | | | | | | | | | |
| Harvest | 35 | 445 | 1,604 | 2,186 | 10,381 | 273 | 0 | 0 | 46 | 15 | 101 | 15,086 |
| SE Harvest | 17 | 72 | 137 | 158 | 206 | 59 | 0 | 0 | 23 | 13 | 36 | |

[a]   Age compositions are based on samples taken from the set net fishery
(Waltemyer 1990).   Age composition in the drift net fishery is assumed to
be the same as the age composition from all strata combined in the set net
fishery.   Total harvest figures are taken from Ruesch (1991).

Appendix B4. Estimates by age class of the number of chinook salmon harvested in the Upper Subdistrict of the Central District set net commercial fishery, 1989.[a]

| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Strata 1 (7/03-7/26)** | | | | | | | | | | | | |
| **Female** | | | | | | | | | | | | |
| Sample Size | 0 | 2 | 44 | 50 | 96 | 12 | 0 | 0 | 1 | 0 | 0 | 205 |
| Percent | 0.00 | 0.44 | 9.59 | 10.89 | 20.92 | 2.61 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 | 44.66 |
| SE Percent | 0.00 | 0.31 | 1.38 | 1.46 | 1.90 | 0.75 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 | 2.32 |
| Harvest | 0 | 34 | 752 | 854 | 1,640 | 205 | 0 | 0 | 17 | 0 | 0 | 3,502 |
| SE Harvest | 0 | 24 | 108 | 114 | 149 | 58 | 0 | 0 | 17 | 0 | 0 | 182 |
| **Male** | | | | | | | | | | | | |
| Sample Size | 0 | 2 | 53 | 48 | 126 | 24 | 0 | 0 | 1 | 0 | 0 | 254 |
| Percent | 0.00 | 0.44 | 11.55 | 10.46 | 27.45 | 5.23 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 | 55.34 |
| SE Percent | 0.00 | 0.31 | 1.49 | 1.43 | 2.09 | 1.04 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 | 2.32 |
| Harvest | 0 | 34 | 905 | 820 | 2,152 | 410 | 0 | 0 | 17 | 0 | 0 | 4,338 |
| SE Harvest | 0 | 24 | 117 | 112 | 163 | 82 | 0 | 0 | 17 | 0 | 0 | 182 |
| **Combined** | | | | | | | | | | | | |
| Sample Size | 0 | 4 | 97 | 98 | 222 | 36 | 0 | 0 | 2 | 0 | 0 | 459 |
| Percent | 0.00 | 0.87 | 21.13 | 21.35 | 48.37 | 7.84 | 0.00 | 0.00 | 0.44 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.00 | 0.43 | 1.91 | 1.91 | 2.34 | 1.26 | 0.00 | 0.00 | 0.31 | 0.00 | 0.00 | |
| Harvest | 0 | 68 | 1,657 | 1,674 | 3,792 | 615 | 0 | 0 | 34 | 0 | 0 | 7,840 |
| SE Harvest | 0 | 34 | 150 | 150 | 183 | 98 | 0 | 0 | 24 | 0 | 0 | 0 |
| **Strata 2 (7/27-8/14)** | | | | | | | | | | | | |
| **Female** | | | | | | | | | | | | |
| Sample Size | 0 | 1 | 8 | 18 | 102 | 20 | 0 | 0 | 0 | 0 | 0 | 149 |
| Percent | 0.00 | 0.25 | 2.03 | 4.56 | 25.82 | 5.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 37.72 |
| SE Percent | 0.00 | 0.25 | 0.71 | 1.05 | 2.20 | 1.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.44 |
| Harvest | 0 | 8 | 62 | 140 | 795 | 156 | 0 | 0 | 0 | 0 | 0 | 1,161 |
| SE Harvest | 0 | 8 | 22 | 32 | 68 | 34 | 0 | 0 | 0 | 0 | 0 | 75 |
| **Male** | | | | | | | | | | | | |
| Sample Size | 0 | 3 | 24 | 64 | 131 | 24 | 0 | 0 | 0 | 0 | 0 | 246 |
| Percent | 0.00 | 0.76 | 6.08 | 16.20 | 33.16 | 6.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 62.28 |
| SE Percent | 0.00 | 0.44 | 1.20 | 1.86 | 2.37 | 1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.44 |
| Harvest | 0 | 23 | 187 | 499 | 1,021 | 187 | 0 | 0 | 0 | 0 | 0 | 1,918 |
| SE Harvest | 0 | 13 | 37 | 57 | 73 | 37 | 0 | 0 | 0 | 0 | 0 | 75 |
| **Combined** | | | | | | | | | | | | |
| Sample Size | 0 | 4 | 32 | 82 | 233 | 44 | 0 | 0 | 0 | 0 | 0 | 395 |
| Percent | 0.00 | 1.01 | 8.10 | 20.76 | 58.99 | 11.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.00 | 0.50 | 1.37 | 2.04 | 2.48 | 1.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Harvest | 0 | 31 | 249 | 639 | 1,816 | 343 | 0 | 0 | 0 | 0 | 0 | 3,079 |
| SE Harvest | 0 | 16 | 42 | 63 | 76 | 49 | 0 | 0 | 0 | 0 | 0 | 0 |

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| | | | | | Age Class | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | All |

**All Strata**
**Female**

| | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | All |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvest | 0 | 42 | 814 | 994 | 2,435 | 361 | 0 | 0 | 17 | 0 | 0 | 4,663 |
| SE Harvest | 0 | 25 | 110 | 119 | 164 | 68 | 0 | 0 | 17 | 0 | 0 | 197 |
| Percent | 0.0 | 0.4 | 7.5 | 9.1 | 22.3 | 3.3 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 42.7 |
| SE Percent | 0.00 | 0.23 | 1.01 | 1.09 | 1.50 | 0.62 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 1.80 |
| **Male** | | | | | | | | | | | | |
| Harvest | 0 | 58 | 1,092 | 1,319 | 3,173 | 597 | 0 | 0 | 17 | 0 | 0 | 6,256 |
| SE Harvest | 0 | 28 | 123 | 126 | 179 | 90 | 0 | 0 | 17 | 0 | 0 | 197 |
| Percent | 0.0 | 0.5 | 10.0 | 12.1 | 29.1 | 5.5 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 57.3 |
| SE Percent | 0.00 | 0.25 | 1.12 | 1.15 | 1.64 | 0.82 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 1.80 |
| **Combined** | | | | | | | | | | | | |
| Harvest | 0 | 100 | 1,906 | 2,313 | 5,608 | 958 | 0 | 0 | 34 | 0 | 0 | 10,919[b] |
| SE Harvest | 0 | 37 | 155 | 163 | 198 | 110 | 0 | 0 | 24 | 0 | 0 | 0 |
| Percent | 0.0 | 0.9 | 17.5 | 21.2 | 51.4 | 8.8 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 100.0 |
| SE Percent | 0.00 | 0.34 | 1.42 | 1.49 | 1.82 | 1.01 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 | |

[a]  There was no harvest of chinook salmon by the Central District drift net fleet in 1989 due to the Exxon Valdez oil spill.  Age compositions and harvests are from D.  Waltemyer (Alaska Department of Fish and Game, Soldotna, personal communication).  Total harvest does not include 4 chinook salmon caught and retained by commercial fishermen for their own use (S. Hammarstrom, Alaska Department of Fish and Game, Soldotna, personal communication).

Appendix B5.    Estimates by age class of the number of chinook salmon harvested in the Central District drift net and Upper Subdistrict set net commercial fisheries, 1990.[a]

| | | | | | | Age Class | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.3 | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
| **Set Net Harvest** | | | | | | | | | | | | | |
| Female | | | | | | | | | | | | | |
| Sample Size | 1 | 0 | 0 | 49 | 38 | 39 | 6 | 0 | 0 | 0 | 1 | 2 | 136 |
| Percent | 0.2 | 0.0 | 0.0 | 11.4 | 8.9 | 9.1 | 1.4 | 0.0 | 0.0 | 0.0 | 0.2 | 0.5 | 31.7 |
| SE Percent | 0.23 | 0.00 | 0.00 | 1.54 | 1.37 | 1.39 | 0.57 | 0.00 | 0.00 | 0.00 | 0.23 | 0.33 | 2.25 |
| Harvest | 10 | 0 | 0 | 473 | 367 | 376 | 58 | 0 | 0 | 0 | 10 | 19 | 1,312 |
| SE Harvest | 10 | 0 | 0 | 64 | 57 | 58 | 23 | 0 | 0 | 0 | 10 | 14 | 93 |
| Male | | | | | | | | | | | | | |
| Sample Size | 0 | 1 | 5 | 76 | 88 | 103 | 8 | 0 | 4 | 2 | 1 | 5 | 293 |
| Percent | 0.0 | 0.2 | 1.2 | 17.7 | 20.5 | 24.0 | 1.9 | 0.0 | 0.9 | 0.5 | 0.2 | 1.2 | 68.3 |
| SE Percent | 0.00 | 0.23 | 0.52 | 1.85 | 1.95 | 2.06 | 0.65 | 0.00 | 0.46 | 0.33 | 0.23 | 0.52 | 2.25 |
| Harvest | 0 | 10 | 48 | 733 | 849 | 994 | 77 | 0 | 39 | 19 | 10 | 48 | 2,827 |
| SE Harvest | 0 | 10 | 21 | 76 | 81 | 85 | 27 | 0 | 19 | 14 | 10 | 21 | 93 |
| Combined | | | | | | | | | | | | | |
| Sample Size | 1 | 1 | 5 | 125 | 126 | 142 | 14 | 0 | 4 | 2 | 2 . | 7 | 429 |
| Percent | 0.2 | 0.2 | 1.2 | 29.1 | 29.4 | 33.1 | 3.3 | 0.0 | 0.9 | 0.5 | 0.5 | 1.6 | 100.0 |
| SE Percent | 0.23 | 0.23 | 0.52 | 2.20 | 2.20 | 2.27 | 0.86 | 0.00 | 0.46 | 0.33 | 0.33 | 0.61 | |
| Harvest | 10 | 10 | 48 | 1,206 | 1,216 | 1,370 | 135 | 0 | 39 | 19 | 19 | 68 | 4,139 |
| SE Harvest | 10 | 10 | 21 | 91 | 91 | 94 | 36 | 0 | 19 | 14 | 14 | 25 | 0 |
| **Drift Net Harvest** | | | | | | | | | | | | | |
| Female | | | | | | | | | | | | | |
| Harvest | 1 | 0 | 0 | 71 | 55 | 56 | 9 | 0 | 0 | 0 | 1 | 3 | 197 |
| SE Harvest | 1 | 0 | 0 | 10 | 9 | 9 | 4 | 0 | 0 | 0 | 1 | 2 | 14 |
| Male | | | | | | | | | | | | | |
| Harvest | 0 | 1 | 7 | 110 | 127 | 149 | 12 | 0 | 6 | 3 | 1 | 7 | 424 |
| SE Harvest | 0 | 1 | 3 | 11 | 12 | 13 | 4 | 0 | 3 | 2 | 1 | 3 | 14 |
| Combined | | | | | | | | | | | | | |
| Harvest | 1 | 1 | 7 | 181 | 182 | 206 | 20 | 0 | 6 | 3 | 3 | 10 | 621 |
| SE Harvest | 1 | 1 | 3 | 14 | 14 | 14 | 5 | 0 | 3 | 2 | 2 | 4 | |

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| | Age Class | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.3 | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | ALL |
| **Commercial Personal Use[b]** | | | | | | | | | | | | | |
| Female | | | | | | | | | | | | | |
| Harvest | 0 | 0 | 0 | 10 | 8 | 8 | 1 | 0 | 0 | 0 | 0 | 0 | 29 |
| SE Harvest | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 2 |
| Male | | | | | | | | | | | | | |
| Harvest | 0 | 0 | 1 | 16 | 19 | 22 | 2 | 0 | 1 | 0 | 0 | 1 | 62 |
| SE Harvest | 0 | 0 | 0 | 2 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 2 |
| Combined | | | | | | | | | | | | | |
| Harvest | 0 | 0 | 1 | 27 | 27 | 30 | 3 | 0 | 1 | 0 | 0 | 1 | 91 |
| SE Harvest | 0 | 0 | 0 | 2 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | |
| **Set Net, Drift Net, and Commercal Personal Use Combined** | | | | | | | | | | | | | |
| Female | | | | | | | | | | | | | |
| Harvest | 11 | 0 | 0 | 554 | 430 | 441 | 68 | 0 | 0 | 0 | 11 | 23 | 1,538 |
| SE Harvest | 10 | 0 | 0 | 64 | 57 | 58 | 24 | 0 | 0 | 0 | 10 | 14 | 94 |
| Male | | | | | | | | | | | | | |
| Harvest | 0 | 11 | 57 | 859 | 995 | 1,165 | 90 | 0 | 45 | 23 | 11 | 57 | 3,313 |
| SE Harvest | 0 | 10 | 22 | 77 | 82 | 86 | 27 | 0 | 19 | 14 | 10 | 22 | 94 |
| Combined | | | | | | | | | | | | | |
| Harvest | 11 | 11 | 57 | 1,413 | 1,425 | 1,606 | 158 | 0 | 45 | 23 | 23 | 79 | 4,851 |
| SE Harvest | 10 | 10 | 22 | 92 | 92 | 95 | 36 | 0 | 19 | 14 | 14 | 26 | |

[a]  Age composition is from D. Waltemyer (Alaska Department of Fish and Game, Soldotna, personal communication), based on samples taken from the set net fishery.  Age composition in the drift net fishery is assumed to be the same as the set net fishery.  Total harvest in the set net fishery is taken from D. Waltemyer (personal communication).  Total harvest in the drift net fishery is from Ruesch (1991).

[b]  Fish caught and retained by commercial fishermen for their own use.  Age composition is assumed to be the same as the set net fishery.  Total commercial personal use harvest is from S. Hammarstrom (Alaska Department of Fish and Game, Soldotna, personal communication).

Appendix B6.   Estimates by age class of the number of late-run Kenai River chinook salmon harvested in the Deep Creek Marine sport fishery, 1976-1989.

| | | | | | Age Class | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.2 | 2.3 | 2.4 | Other | Total |
| **1976** | | | | | | | | | | | |
| Number | | 6 | 16 | 89 | 9 | 0 | 0 | 0 | 0 | | 120 |
| Percent | | 5.0 | 13.3 | 74.2 | 7.5 | | | | | | |
| SE Percent | | 2.0 | 3.1 | 4.0 | 2.4 | | | | | | |
| Harvest | | 69 | 184 | 1,025 | 104 | | | | | | 1,382 |
| SE Harvest [b] | | 28 | 43 | 55 | 33 | | | | | | NA |
| **1977** | | | | | | | | | | | |
| Number | 0 | 19 | 65 | 3 | | 1 | | 0 | | | 88 |
| Percent | | 21.6 | 73.9 | 3.4 | | 1.1 | | | | | |
| SE Percent | | 4.4 | 4.7 | 1.9 | | 1.1 | | | | | |
| Harvest | | 79 | 270 | 12 | | 4 | | | | | 366 |
| SE Harvest [b] | | 16 | 17 | 7 | | 4 | | | | | NA |
| **1978** | | | | | | | | | | | |
| Number | | 2 | 5 | 79 | 4 | | | | | | 90 |
| Percent | | 2.2 | 5.6 | 87.8 | 4.4 | | | | | | |
| SE Percent | | 1.6 | 2.4 | 3.5 | 2.2 | | | | | | |
| Harvest | | 60 | 150 | 2,364 | 120 | | | | | | 2,693 |
| SE Harvest [b] | | 42 | 65 | 93 | 59 | | | | | | NA |
| **1979** | | | | | | | | | | | |
| Number | | 1 | 7 | 53 | 13 | | | | | | 74 |
| Percent | | 1.4 | 9.5 | 71.6 | 17.6 | | | | | | |
| SE Percent | | 1.4 | 3.4 | 5.3 | 4.5 | | | | | | |
| Harvest | | 16 | 110 | 834 | 204 | | | | | | 1,164 |
| SE Harvest [b] | | 16 | 40 | 61 | 52 | | | | | | NA |
| **1980** | | | | | | | | | | | |
| Number | | 0 | 4 | 23 | 5 | | | | | | 32 |
| Percent | | | 12.5 | 71.9 | 15.6 | | | | | | |
| SE Percent | | | 5.9 | 8.1 | 6.5 | | | | | | |
| Harvest | | | 93 | 537 | 117 | | | | | | 747 |
| SE Harvest [b] | | | 44 | 60 | 49 | | | | | | NA |
| **1981** | | | | | | | | | | | |
| Number | | 0 | 2 | 14 | 3 | | | | | 0 | 19 |
| Percent | | | 10.5 | 73.7 | 15.8 | | | | | | |
| SE Percent | | | 7.2 | 10.4 | 8.6 | | | | | | |
| Harvest | | | 18 | 125 | 27 | | | | | | 170 |
| SE Harvest [b] | | | 12 | 18 | 15 | | | | | | NA |

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| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.2 | 2.3 | 2.4 | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1982** | | | | | | | | | | | |
| Number | | 0 | 3 | 26 | 9 | | | | | 0 | 38 |
| Percent | | | 7.9 | 68.4 | 23.7 | | | | | | |
| SE Percent | | | 4.4 | 7.6 | 7.0 | | | | | | |
| Harvest | | | 93 | 803 | 278 | | | | | | 1,173 |
| SE Harvest [b] | | | 52 | 90 | 82 | | | | | | NA |
| **1983** | | | | | | | | | | | |
| Number | | 3 | 8 | 77 | 5 | | | | | 2 | 95 |
| Percent | | 3.2 | 8.4 | 81.1 | 5.3 | | | | | 2.1 | |
| SE Percent | | 1.8 | 2.9 | 4.0 | 2.3 | | | | | 1.5 | |
| Harvest | | 54 | 144 | 1,384 | 90 | | | | | 36 | 1,707 |
| SE Harvest [b] | | 31 | 49 | 69 | 39 | | | | | 25 | NA |
| **1984** | | | | | | | | | | | |
| Number | | 6 | 8 | 75 | 11 | | | | | | 100 |
| Percent | | 6.0 | 8.0 | 75.0 | 11.0 | | | | | | |
| SE Percent | | 2.4 | 2.7 | 4.4 | 3.1 | | | | | | |
| Harvest | | 50 | 67 | 626 | 92 | | | | | | 835 |
| SE Harvest [b] | | 20 | 23 | 36 | 26 | | | | | | NA |
| **1985** | | | | | | | | | | | |
| Number | | 1 | 9 | 60 | 8 | | | | | 0 | 78 |
| Percent | | 1.3 | 11.5 | 76.9 | 10.3 | | | | | | |
| SE Percent | | 1.3 | 3.6 | 4.8 | 3.5 | | | | | | |
| Harvest | | 22 | 200 | 1,332 | 178 | | | | | | 1,731 |
| SE Harvest [b] | | 22 | 63 | 83 | 60 | | | | | | NA |
| **1986** | | | | | | | | | | | |
| **Female** | | | | | | | | | | | |
| Number | | 0 | 7 | 13 | 3 | | | | | | 23 |
| Percent | | 0.0 | 16.7 | 31.0 | 7.1 | | | | | | 54.8 |
| SE Percent | | 0.0 | 5.8 | 7.2 | 4.0 | | | | | | 7.8 |
| Harvest | | 0 | 105 | 195 | 45 | | | | | | 345 |
| SE Harvest | | 0 | 51 | 83 | 29 | | | | | | 134 |
| **Male** | | | | | | | | | | | |
| Number | | 2 | 4 | 12 | 1 | | | | | | 19 |
| Percent | | 4.8 | 9.5 | 28.6 | 2.4 | | | | | | 45.2 |
| SE Percent | | 3.3 | 4.6 | 7.1 | 2.4 | | | | | | 7.8 |
| Harvest | | 30 | 60 | 180 | 15 | | | | | | 285 |
| SE Harvest | | 22 | 35 | 78 | 15 | | | | | | 114 |
| **Combined** | | | | | | | | | | | |
| Number | | 2 | 11 | 25 | 4 | | | | | | 42 |
| Percent | | 4.8 | 26.2 | 59.5 | 9.5 | | | | | | |
| SE Percent | | 3.3 | 6.9 | 7.7 | 4.6 | | | | | | |
| Harvest | | 30 | 165 | 375 | 60 | | | | | | 630 |
| SE Harvest | | 22 | 72 | 144 | 35 | | | | | | 230 |

- continued -

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| | | | | Age Class | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.2 | 2.3 | 2.4 | Other | Total |
| **1987** | | | | | | | | | | | |
| Female | | | | | | | | | | | |
| Percent [c] | 0.2 | 0.4 | 11.6 | 38.1 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | | 50.9 |
| SE Percent | 0.2 | 0.3 | 1.5 | 2.2 | 0.4 | | | | | | 2.3 |
| Harvest [d] | 2 | 5 | 127 | 418 | 7 | | | | | | 559 |
| SE Harvest [b] | 2 | 3 | 16 | 24 | 4 | | | | | | 25 |
| Male | | | | | | | | | | | |
| Percent [c] | 0.2 | 0.6 | 11.2 | 34.6 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | | 49.1 |
| SE Percent | 0.2 | 0.4 | 1.4 | 2.2 | 0.7 | | | | | | 2.3 |
| Harvest [d] | 2 | 7 | 123 | 379 | 27 | | | | | | 538 |
| SE Harvest [b] | 2 | 4 | 16 | 24 | 8 | | | | | | 25 |
| Combined | | | | | | | | | | | |
| Percent [c] | 0.4 | 1.0 | 22.8 | 72.7 | 3.1 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE Percent | 0.3 | 0.5 | 1.9 | 2.0 | 0.8 | | | | | | |
| Harvest [d] | 5 | 11 | 250 | 797 | 34 | | | | | | 1,097 |
| SE Harvest [b] | 3 | 5 | 21 | 22 | 9 | | | | | | NA |
| **1988** | | | | | | | | | | | |
| Female | | | | | | | | | | | |
| Percent [c] | 0.0 | 0.0 | 1.0 | 43.5 | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 | | 53.6 |
| SE Percent | | | 0.5 | 2.4 | 1.4 | | | | | | 2.4 |
| Harvest [d] | | | 12 | 549 | 115 | | | | | | 677 |
| SE Harvest [b] | | | 6 | 31 | 18 | | | | | | 27 |
| Male | | | | | | | | | | | |
| Percent [c] | 0.7 | 0.2 | 2.4 | 35.1 | 7.9 | 0.0 | 0.0 | 0.0 | 0.0 | | 46.4 |
| SE Percent | 0.4 | 0.2 | 0.8 | 2.3 | 1.3 | | | | | | 2.4 |
| Harvest [d] | 9 | 3 | 30 | 443 | 100 | | | | | | 585 |
| SE Harvest [b] | 5 | 3 | 9 | 30 | 17 | | | | | | 31 |
| Combined | | | | | | | | | | | |
| Percent [c] | 0.7 | 0.2 | 3.4 | 78.6 | 17.1 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE Percent | 0.4 | 0.2 | 0.9 | 2.0 | 1.8 | | | | | | |
| Harvest [d] | 9 | 3 | 42 | 992 | 215 | | | | | | 1,262 |
| SE Harvest [b] | 5 | 3 | 11 | 25 | 23 | | | | | | NA |

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| | Age Class | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.2 | 2.3 | 2.4 | Other | Total |
| **1989** | | | | | | | | | | | |
| *Female* | | | | | | | | | | | |
| Percent [c] | 0.0 | 0.0 | 6.9 | 35.6 | 5.0 | 0.0 | 0.0 | 0.0 | 1.0 | | 48.5 |
| SE Percent | | | 2.5 | 4.8 | 2.2 | | | | 1.0 | | 5.0 |
| Harvest [d] | | | 90 | 461 | 64 | | | | 13 | | 628 |
| SE Harvest [b] | | | 33 | 62 | 28 | | | | 13 | | 65 |
| *Male* | | | | | | | | | | | |
| Percent [c] | 0.0 | 1.0 | 4.0 | 35.6 | 10.9 | 0.0 | 0.0 | 0.0 | 0.0 | | 51.5 |
| SE Percent | | 1.0 | 2.0 | 4.8 | 3.1 | | | | | | 5.0 |
| Harvest [d] | | 13 | 51 | 461 | 141 | | | | | | 666 |
| SE Harvest [b] | | 13 | 25 | 62 | 40 | | | | | | 65 |
| *Combined* | | | | | | | | | | | |
| Percent [c] | 0.0 | 1.0 | 10.9 | 71.3 | 15.8 | 0.0 | 0.0 | 0.0 | 1.0 | | |
| SE Percent | | 1.0 | 3.1 | 4.5 | 3.7 | | | | 1.0 | | |
| Harvest [d] | | 13 | 141 | 922 | 205 | | | | 13 | | 1,294 |
| SE Harvest [b] | | 13 | 40 | 59 | 47 | | | | 13 | | NA |
| | | | | | | | | | | | |
| **1990** | | | | | | | | | | | |
| *Female* | | | | | | | | | | | |
| Percent | 0.0 | 2.3 | 5.9 | 29.3 | 5.6 | 0.0 | 0.0 | 0.0 | 0.0 | | 43.1 |
| SE % | 0.0 | 0.8 | 1.3 | 2.5 | 1.2 | | | | | | 2.7 |
| Estimated Harv | 0 | 31 | 77 | 387 | 73 | | | | | | 568 |
| SE Harvest | 0 | 11 | 17 | 33 | 16 | | | | | | 35 |
| *Male* | | | | | | | | | | | |
| Percent | 0.6 | 7.3 | 10.0 | 32.8 | 6.2 | 0.0 | 0.0 | 0.0 | 0.0 | | 56.9 |
| SE % | 0.4 | 1.4 | 1.6 | 2.5 | 1.3 | | | | | | 2.7 |
| Estimated Harv | 8 | 97 | 131 | 433 | 81 | | | | | | 750 |
| SE Harvest | 5 | 19 | 21 | 34 | 17 | | | | | | 35 |
| *Combined* | | | | | | | | | | | |
| Percent | 0.6 | 9.7 | 15.8 | 62.2 | 11.7 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE % | 0.4 | 1.6 | 2.0 | 2.6 | 1.7 | | | | | | |
| Estimated Harv | 8 | 128 | 209 | 819 | 155 | | | | | | 1,318 |
| SE Harvest | 5 | 21 | 26 | 35 | 23 | | | | | | NA |

[a]  Data from Hammarstrom (1977-81); Hammarstrom and Larson (1982-84, 1986); Hammarstrom et al. (1985, 1987); and Mills (1988-1991).

[b]  For 1976 - 1985 and 1987-1989 the variance of the estimate of sport harvest is unknown.  For those years, the total harvest is treated as a constant in the calculation of the standard error of the harvest of each age class.

[c]  Age data was not collected from the Deep Creek marine sport harvest after 1986.  The age composition of the in-river sport harvest was applied to the total Deep Creek harvest to calculate harvest by age class.

[d]  Total harvest estimates for 1987-1990 are from the statewide postal harvest survey (Mills 1988 - 1991).  The statewide postal survey yields estimates for the entire year.  The estimates for the late run alone were calculated by using the mean contribution of the late run to the total harvest from 1972 through 1986 (29%).

Appendix B7. Estimates by age class of the number of late-run chinook salmon harvested in educational gill nets, 1989-1990.[a]

|  | Age Class | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | 0.3 | 0.4 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | All |
| **1989** | | | | | | | | | | | | | |
| Female | | | | | | | | | | | | | |
| Harvest |  | 0 | 0 | 2 | 2 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 9 |
| SE Harvest |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Male | | | | | | | | | | | | | |
| Harvest |  | 0 | 0 | 2 | 3 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 13 |
| SE Harvest |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Combined | | | | | | | | | | | | | |
| Harvest |  | 0 | 0 | 4 | 5 | 11 | 2 | 0 | 0 | 0 | 0 | 0 | 22 |
| SE Harvest |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **1990** | | | | | | | | | | | | | |
| Female | | | | | | | | | | | | | |
| Harvest | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| SE Harvest | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Male | | | | | | | | | | | | | |
| Harvest | 0 | 0 | 0 | 2 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| SE Harvest | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Combined | | | | | | | | | | | | | |
| Harvest | 0 | 0 | 0 | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| SE Harvest | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

[a] Total harvest data is from S. Hammarstrom (Alaska Department of Fish and Game, Soldotna, personal communication). The age composition of chinook salmon harvested in educational gill nets during the late run is assumed to be the same as the age composition of the fish sampled in all strata combined of the commercial set net harvest.

Appendix B8.   Estimates by age class of the number of late-run chinook salmon in the in-river return to the Kenai River, 1986.[a]

| | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
| **Strata 4 (7/01-7/15)** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Sample Size | 12 | 104 | 99 | 9 | 0 | 0 | 0 | 0 | 224 |
| Percent | 2.08 | 18.02 | 17.16 | 1.56 | 0.00 | 0.00 | 0.00 | 0.00 | 38.82 |
| SE Percent | 0.59 | 1.60 | 1.57 | 0.52 | 0.00 | 0.00 | 0.00 | 0.00 | 2.03 |
| Return | 88 | 766 | 729 | 66 | 0 | 0 | 0 | 0 | 1,650 |
| SE Return | 291 | 2,608 | 2,482 | 215 | 0 | 0 | 0 | 0 | 5,631 |
| **Male** | | | | | | | | | |
| Sample Size | 103 | 151 | 84 | 15 | 0 | 0 | 0 | 0 | 353 |
| Percent | 17.85 | 26.17 | 14.56 | 2.60 | 0.00 | 0.00 | 0.00 | 0.00 | 61.18 |
| SE Percent | 1.60 | 1.83 | 1.47 | 0.66 | 0.00 | 0.00 | 0.00 | 0.00 | 2.03 |
| Return | 758 | 1,112 | 619 | 110 | 0 | 0 | 0 | 0 | 2,599 |
| SE Return | 2,583 | 3,792 | 2,104 | 366 | 0 | 0 | 0 | 0 | 8,880 |
| **Combined** | | | | | | | | | |
| Sample Size | 115 | 255 | 183 | 24 | 0 | 0 | 0 | 0 | 577 |
| Percent | 19.93 | 44.19 | 31.72 | 4.16 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 1.66 | 2.07 | 1.94 | 0.83 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 847 | 1,878 | 1,348 | 177 | 0 | 0 | 0 | 0 | 4,249 |
| SE Return | 2,885 | 6,411 | 4,598 | 593 | 0 | 0 | 0 | 0 | 14,522 |
| **Strata 5 (7/16-7/28)** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Sample Size | 2 | 124 | 89 | 6 | 0 | 0 | 0 | 0 | 221 |
| Percent | 0.40 | 24.90 | 17.87 | 1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 44.38 |
| SE Percent | 0.28 | 1.94 | 1.72 | 0.49 | 0.00 | 0.00 | 0.00 | 0.00 | 2.23 |
| Return | 175 | 10,833 | 7,776 | 524 | 0 | 0 | 0 | 0 | 19,308 |
| SE Return | 129 | 3,313 | 2,414 | 256 | 0 | 0 | 0 | 0 | 5,802 |
| **Male** | | | | | | | | | |
| Sample Size | 65 | 122 | 82 | 8 | 0 | 0 | 0 | 0 | 277 |
| Percent | 13.05 | 24.50 | 16.47 | 1.61 | 0.00 | 0.00 | 0.00 | 0.00 | 55.62 |
| SE Percent | 1.51 | 1.93 | 1.66 | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 2.23 |
| Return | 5,679 | 10,659 | 7,164 | 699 | 0 | 0 | 0 | 0 | 24,200 |
| SE Return | 1,798 | 3,262 | 2,234 | 313 | 0 | 0 | 0 | 0 | 7,238 |
| **Combined** | | | | | | | | | |
| Sample Size | 67 | 246 | 171 | 14 | 0 | 0 | 0 | 0 | 498 |
| Percent | 13.45 | 49.40 | 34.34 | 2.81 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 1.53 | 2.24 | 2.13 | 0.74 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 5,853 | 21,492 | 14,939 | 1,223 | 0 | 0 | 0 | 0 | 43,508 |
| SE Return | 1,849 | 6,443 | 4,519 | 476 | 0 | 0 | 0 | 0 | 12,906 |

- continued -

Appendix B8.    (Page 2 of 2).

| | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |

**Strata 6 (7/29-8/14)**

Female

| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 2 | 123 | 159 | 23 | 0 | 0 | 0 | 0 | 307 |
| Percent | 0.35 | 21.50 | 27.80 | 4.02 | 0.00 | 0.00 | 0.00 | 0.00 | 53.67 |
| SE Percent | 0.25 | 1.72 | 1.87 | 0.82 | 0.00 | 0.00 | 0.00 | 0.00 | 2.09 |
| Return | 34 | 2,109 | 2,726 | 394 | 0 | 0 | 0 | 0 | 5,263 |
| SE Return | 24 | 284 | 348 | 91 | 0 | 0 | 0 | 0 | 608 |

Male

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 16 | 97 | 140 | 12 | 0 | 0 | 0 | 0 | 265 |
| Percent | 2.80 | 16.96 | 24.48 | 2.10 | 0.00 | 0.00 | 0.00 | 0.00 | 46.33 |
| SE Percent | 0.69 | 1.57 | 1.80 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 2.09 |
| Return | 274 | 1,663 | 2,400 | 206 | 0 | 0 | 0 | 0 | 4,543 |
| SE Return | 74 | 237 | 314 | 63 | 0 | 0 | 0 | 0 | 534 |

Combined

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Size | 18 | 220 | 299 | 35 | 0 | 0 | 0 | 0 | 572 |
| Percent | 3.15 | 38.46 | 52.27 | 6.12 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.73 | 2.04 | 2.09 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 309 | 3,772 | 5,126 | 600 | 0 | 0 | 0 | 0 | 9,806 |
| SE Return | 79 | 456 | 594 | 117 | 0 | 0 | 0 | 0 | 1,067 |

**Strata 4, 5, and 6 Combined**

Female

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Return | 297 | 13,708 | 11,230 | 985 | 0 | 0 | 0 | 0 | 26,220 |
| SE Return | 319 | 4,226 | 3,480 | 346 | 0 | 0 | 0 | 0 | 8,107 |
| Percent | 0.5 | 23.8 | 19.5 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 45.6 |
| SE Percent | 0.55 | 7.34 | 6.05 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 14.08 |

Male

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Return | 6,712 | 13,433 | 10,183 | 1,015 | 0 | 0 | 0 | 0 | 31,343 |
| SE Return | 3,148 | 5,007 | 3,085 | 486 | 0 | 0 | 0 | 0 | 11,468 |
| Percent | 11.7 | 23.3 | 17.7 | 1.8 | 0.0 | 0.0 | 0.0 | 0.0 | 54.4 |
| SE Percent | 5.47 | 8.70 | 5.36 | 0.84 | 0.00 | 0.00 | 0.00 | 0.00 | 19.92 |

Combined

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Return | 7,009 | 27,141 | 21,413 | 2,000 | 0 | 0 | 0 | 0 | 57,563 |
| SE Return | 3,428 | 9,101 | 6,474 | 769 | 0 | 0 | 0 | 0 | 19,457 |
| Percent | 12.2 | 47.2 | 37.2 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| SE Percent | 5.95 | 15.81 | 11.25 | 1.34 | 0.00 | 0.00 | 0.00 | 0.00 | |

[a]  Estimates of the total in-river return for each strata are taken from the mark-recapture tagging project (Conrad and Larson 1987).   Age samples were also taken from the mark-recapture tagging project.  The number of fish sampled in each age class was taken directly from the project data files (Appendix C1).

Appendix B9. Estimates by age class of the number of late-run chinook salmon in the in-river return to the Kenai River, 1987.[a]

| | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
| **Strata 4 (7/01-7/28)** | | | | | | | | | |
| *Female* | | | | | | | | | |
| Sample Size | 1 | 71 | 262 | 3 | 0 | 0 | 0 | 0 | 337 |
| Percent | 0.14 | 9.87 | 36.44 | 0.42 | 0.00 | 0.00 | 0.00 | 0.00 | 46.87 |
| SE Percent | 0.14 | 1.11 | 1.80 | 0.24 | 0.00 | 0.00 | 0.00 | 0.00 | 1.86 |
| Return | 50 | 3,532 | 13,033 | 149 | 0 | 0 | 0 | 0 | 16,764 |
| SE Return | 50 | 398 | 642 | 86 | 0 | 0 | 0 | 0 | 666 |
| *Male* | | | | | | | | | |
| Sample Size | 15 | 129 | 230 | 5 | 2 | 0 | 0 | 1 | 382 |
| Percent | 2.09 | 17.94 | 31.99 | 0.70 | 0.28 | 0.00 | 0.00 | 0.14 | 53.13 |
| SE Percent | 0.53 | 1.43 | 1.74 | 0.31 | 0.20 | 0.00 | 0.00 | 0.14 | 1.86 |
| Return | 746 | 6,417 | 11,441 | 249 | 99 | 0 | 0 | 50 | 19,003 |
| SE Return | 191 | 512 | 622 | 111 | 70 | 0 | 0 | 50 | 666 |
| *Combined* | | | | | | | | | |
| Sample Size | 16 | 200 | 492 | 8 | 2 | 0 | 0 | 1 | 719 |
| Percent | 2.23 | 27.82 | 68.43 | 1.11 | 0.28 | 0.00 | 0.00 | 0.14 | 100.00 |
| SE Percent | 0.55 | 1.67 | 1.73 | 0.39 | 0.20 | 0.00 | 0.00 | 0.14 | |
| Return | 796 | 9,949 | 24,475 | 398 | 99 | 0 | 0 | 50 | 35,767 |
| SE Return | 197 | 598 | 620 | 140 | 70 | 0 | 0 | 50 | 0 |
| **Strata 5 (7/29-8/11)** | | | | | | | | | |
| *Female* | | | | | | | | | |
| Sample Size | 0 | 32 | 120 | 1 | 0 | 0 | 0 | 0 | 153 |
| Percent | 0.00 | 13.17 | 49.38 | 0.41 | 0.00 | 0.00 | 0.00 | 0.00 | 62.96 |
| SE Percent | 0.00 | 2.17 | 3.21 | 0.41 | 0.00 | 0.00 | 0.00 | 0.00 | 3.10 |
| Return | 0 | 1,627 | 6,102 | 51 | 0 | 0 | 0 | 0 | 7,780 |
| SE Return | 0 | 268 | 396 | 51 | 0 | 0 | 0 | 0 | 383 |
| *Male* | | | | | | | | | |
| Sample Size | 2 | 36 | 50 | 1 | 0 | 1 | 0 | 0 | 90 |
| Percent | 0.82 | 14.81 | 20.58 | 0.41 | 0.00 | 0.41 | 0.00 | 0.00 | 37.04 |
| SE Percent | 0.58 | 2.28 | 2.60 | 0.41 | 0.00 | 0.41 | 0.00 | 0.00 | 3.10 |
| Return | 102 | 1,831 | 2,542 | 51 | 0 | 51 | 0 | 0 | 4,576 |
| SE Return | 72 | 282 | 320 | 51 | 0 | 51 | 0 | 0 | 383 |
| *Combined* | | | | | | | | | |
| Sample Size | 2 | 68 | 170 | 2 | 0 | 1 | 0 | 0 | 243 |
| Percent | 0.82 | 27.98 | 69.96 | 0.82 | 0.00 | 0.41 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.58 | 2.89 | 2.95 | 0.58 | 0.00 | 0.41 | 0.00 | 0.00 | |
| Return | 102 | 3,458 | 8,644 | 102 | 0 | 51 | 0 | 0 | 12,356 |
| SE Return | 72 | 356 | 363 | 72 | 0 | 51 | 0 | 0 | 0 |

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Appendix B9.    (Page 2 of 2).

| | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |

Strata 4 and 5 Combined

Female
| Return | 50 | 5,159 | 19,135 | 200 | 0 | 0 | 0 | 0 | 24,544 |
|---|---|---|---|---|---|---|---|---|---|
| SE Return | 50 | 480 | 754 | 100 | 0 | 0 | 0 | 0 | 768 |
| Percent | 0.1 | 10.7 | 39.8 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 51.0 |
| SE Percent | 0.10 | 1.00 | 1.57 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 1.60 |

Male
| Return | 848 | 8,248 | 13,984 | 300 | 99 | 51 | 0 | 50 | 23,579 |
|---|---|---|---|---|---|---|---|---|---|
| SE Return | 204 | 584 | 700 | 122 | 70 | 51 | 0 | 50 | 768 |
| Percent | 1.8 | 17.1 | 29.1 | 0.6 | 0.2 | 0.1 | 0.0 | 0.1 | 49.0 |
| SE Percent | 0.42 | 1.21 | 1.45 | 0.25 | 0.15 | 0.11 | 0.00 | 0.10 | 1.60 |

Combined
| Return | 898 | 13,407 | 33,119 | 500 | 99 | 51 | 0 | 50 | 48,123 |
|---|---|---|---|---|---|---|---|---|---|
| SE Return | 209 | 696 | 719 | 157 | 70 | 51 | 0 | 50 | 0 |
| Percent | 1.9 | 27.9 | 68.8 | 1.0 | 0.2 | 0.1 | 0.0 | 0.1 | 100.0 |
| SE Percent | 0.44 | 1.45 | 1.49 | 0.33 | 0.15 | 0.11 | 0.00 | 0.10 | |

[a]    Estimates of the total in-river return for each strata are
taken from the sonar project (D. L. Burwen, Alaska Department
of Fish and Game, Anchorage, personal communication).    Age
samples were taken from the mark-recapture tagging project
(Conrad 1988).    The number of fish sampled in each age class
was taken directly from the tagging project data files
(Appendix C1).

Appendix B10. Estimates by age class of the number of late-run chinook salmon in the in-river return to the Kenai River, 1988.[a]

| | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
| **Strata 4 (7/01-7/15)** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Sample Size | 0 | 5 | 203 | 22 | 0 | 0 | 0 | 0 | 230 |
| Percent | 0.00 | 1.02 | 41.51 | 4.50 | 0.00 | 0.00 | 0.00 | 0.00 | 47.03 |
| SE Percent | 0.00 | 0.46 | 2.23 | 0.94 | 0.00 | 0.00 | 0.00 | 0.00 | 2.26 |
| Return | 0 | 160 | 6,511 | 706 | 0 | 0 | 0 | 0 | 7,376 |
| SE Return | 0 | 71 | 349 | 147 | 0 | 0 | 0 | 0 | 354 |
| **Male** | | | | | | | | | |
| Sample Size | 7 | 16 | 188 | 48 | 0 | 0 | 0 | 0 | 259 |
| Percent | 1.43 | 3.27 | 38.45 | 9.82 | 0.00 | 0.00 | 0.00 | 0.00 | 52.97 |
| SE Percent | 0.54 | 0.81 | 2.20 | 1.35 | 0.00 | 0.00 | 0.00 | 0.00 | 2.26 |
| Return | 225 | 513 | 6,029 | 1,539 | 0 | 0 | 0 | 0 | 8,307 |
| SE Return | 84 | 126 | 345 | 211 | 0 | 0 | 0 | 0 | 354 |
| **Combined** | | | | | | | | | |
| Sample Size | 7 | 21 | 391 | 70 | 0 | 0 | 0 | 0 | 489 |
| Percent | 1.43 | 4.29 | 79.96 | 14.31 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.54 | 0.92 | 1.81 | 1.59 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 225 | 674 | 12,540 | 2,245 | 0 | 0 | 0 | 0 | 15,683 |
| SE Return | 84 | 144 | 284 | 248 | 0 | 0 | 0 | 0 | 0 |
| **STRATA 5 (7/16-7/31)** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Sample Size | 0 | 2 | 160 | 16 | 0 | 0 | 0 | 0 | 178 |
| Percent | 0.00 | 0.66 | 52.81 | 5.28 | 0.00 | 0.00 | 0.00 | 0.00 | 58.75 |
| SE Percent | 0.00 | 0.47 | 2.87 | 1.29 | 0.00 | 0.00 | 0.00 | 0.00 | 2.83 |
| Return | 0 | 161 | 12,917 | 1,292 | 0 | 0 | 0 | 0 | 14,370 |
| SE Return | 0 | 114 | 702 | 314 | 0 | 0 | 0 | 0 | 692 |
| **Male** | | | | | | | | | |
| Sample Size | 5 | 10 | 72 | 38 | 0 | 0 | 0 | 0 | 125 |
| Percent | 1.65 | 3.30 | 23.76 | 12.54 | 0.00 | 0.00 | 0.00 | 0.00 | 41.25 |
| SE Percent | 0.73 | 1.03 | 2.45 | 1.91 | 0.00 | 0.00 | 0.00 | 0.00 | 2.83 |
| Return | 404 | 807 | 5,813 | 3,068 | 0 | 0 | 0 | 0 | 10,092 |
| SE Return | 179 | 251 | 598 | 465 | 0 | 0 | 0 | 0 | 692 |
| **Combined** | | | | | | | | | |
| Sample Size | 5 | 12 | 232 | 54 | 0 | 0 | 0 | 0 | 303 |
| Percent | 1.65 | 3.96 | 76.57 | 17.82 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.73 | 1.12 | 2.44 | 2.20 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 404 | 969 | 18,730 | 4,360 | 0 | 0 | 0 | 0 | 24,462 |
| SE Return | 179 | 274 | 595 | 538 | 0 | 0 | 0 | 0 | 0 |

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Appendix B10.   (Page 2 of 2).

| | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
| **STRATA 6 (8/01-8/11)** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Sample Size | 0 | 2 | 78 | 10 | 0 | 0 | 0 | 0 | 90 |
| Percent | 0.00 | 1.38 | 53.79 | 6.90 | 0.00 | 0.00 | 0.00 | 0.00 | 62.07 |
| SE Percent | 0.00 | 0.97 | 4.15 | 2.11 | 0.00 | 0.00 | 0.00 | 0.00 | 4.04 |
| Return | 0 | 164 | 6,381 | 818 | 0 | 0 | 0 | 0 | 7,363 |
| SE Return | 0 | 115 | 491 | 250 | 0 | 0 | 0 | 0 | 478 |
| **Male** | | | | | | | | | |
| Sample Size | 0 | 1 | 27 | 27 | 0 | 0 | 0 | 0 | 55 |
| Percent | 0.00 | 0.69 | 18.62 | 18.62 | 0.00 | 0.00 | 0.00 | 0.00 | 37.93 |
| SE Percent | 0.00 | 0.69 | 3.24 | 3.24 | 0.00 | 0.00 | 0.00 | 0.00 | 4.04 |
| Return | 0 | 82 | 2,209 | 2,209 | 0 | 0 | 0 | 0 | 4,500 |
| SE Return | 0 | 82 | 384 | 384 | 0 | 0 | 0 | 0 | 478 |
| **Combined** | | | | | | | | | |
| Sample Size | 0 | 3 | 105 | 37 | 0 | 0 | 0 | 0 | 145 |
| Percent | 0.00 | 2.07 | 72.41 | 25.52 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE Percent | 0.00 | 1.19 | 3.72 | 3.63 | 0.00 | 0.00 | 0.00 | 0.00 | |
| Return | 0 | 245 | 8,590 | 3,027 | 0 | 0 | 0 | 0 | 11,863 |
| SE Return | 0 | 140 | 440 | 429 | 0 | 0 | 0 | 0 | 0 |
| **Strata 4, 5, and 6 Combined** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Return | 0 | 485 | 25,809 | 2,815 | 0 | 0 | 0 | 0 | 29,110 |
| SE Return | 0 | 177 | 925 | 427 | 0 | 0 | 0 | 0 | 912 |
| Percent | 0.0 | 0.9 | 49.6 | 5.4 | 0.0 | 0.0 | 0.0 | 0.0 | 56.0 |
| SE Percent | 0.00 | 0.34 | 1.78 | 0.82 | 0.00 | 0.00 | 0.00 | 0.00 | 1.75 |
| **Male** | | | | | | | | | |
| Return | 628 | 1,402 | 14,051 | 6,816 | 0 | 0 | 0 | 0 | 22,898 |
| SE Return | 198 | 293 | 790 | 639 | 0 | 0 | 0 | 0 | 912 |
| Percent | 1.2 | 2.7 | 27.0 | 13.1 | 0.0 | 0.0 | 0.0 | 0.0 | 44.0 |
| SE Percent | 0.38 | 0.56 | 1.52 | 1.23 | 0.00 | 0.00 | 0.00 | 0.00 | 1.75 |
| **Combined** | | | | | | | | | |
| Return | 628 | 1,888 | 39,860 | 9,632 | 0 | 0 | 0 | 0 | 52,008 |
| SE Return | 198 | 340 | 793 | 732 | 0 | 0 | 0 | 0 | 0 |
| Percent | 1.2 | 3.6 | 76.6 | 18.5 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| SE Percent | 0.38 | 0.65 | 1.52 | 1.41 | 0.00 | 0.00 | 0.00 | 0.00 | |

[a]   Estimates of the total in-river return for each strata are taken from the sonar project (D. L. Burwen, Alaska Department of Fish and Game, Anchorage, personal communication).   Age samples were taken from the mark-recapture tagging project (Carlon and Alexandersdottir 1989).   The number of fish sampled in each age class was taken directly from the tagging project data files (Appendix C1).

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Appendix B11.  Estimates by age class of the number of late-run chinook salmon in the in-river return to the Kenai River, 1989.[a]

|  | Age Class | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
|  | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
| **Strata 4 (7/01-7/15)** | | | | | | | | | | |
| Female | | | | | | | | | | |
| Sample Size | 0 | 8 | 15 | 86 | 22 | 1 | 0 | 0 | 0 | 132 |
| Percent | 0.00 | 3.28 | 6.15 | 35.25 | 9.02 | 0.41 | 0.00 | 0.00 | 0.00 | 54.10 |
| SE % | 0.00 | 1.14 | 1.54 | 3.06 | 1.84 | 0.41 | 0.00 | 0.00 | 0.00 | 3.20 |
| N hat | 0 | 546 | 1,024 | 5,872 | 1,502 | 68 | 0 | 0 | 0 | 9,013 |
| SE Nhat | 0 | 190 | 256 | 510 | 305 | 68 | 0 | 0 | 0 | 531 |
| Male | | | | | | | | | | |
| Sample Size | 0 | 22 | 16 | 61 | 13 | 0 | 0 | 0 | 0 | 112 |
| Percent | 0.00 | 9.02 | 6.56 | 25.00 | 5.33 | 0.00 | 0.00 | 0.00 | 0.00 | 45.90 |
| SE % | 0.00 | 1.84 | 1.59 | 2.78 | 1.44 | 0.00 | 0.00 | 0.00 | 0.00 | 3.20 |
| N hat | 0 | 1,502 | 1,092 | 4,165 | 888 | 0 | 0 | 0 | 0 | 7,647 |
| SE Nhat | 0 | 305 | 264 | 462 | 240 | 0 | 0 | 0 | 0 | 531 |
| Combined | | | | | | | | | | |
| Sample Size | 0 | 30 | 31 | 147 | 35 | 1 | 0 | 0 | 0 | 244 |
| Percent | 0.00 | 12.30 | 12.70 | 60.25 | 14.34 | 0.41 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE % | 0.00 | 2.11 | 2.14 | 3.14 | 2.25 | 0.41 | 0.00 | 0.00 | 0.00 | |
| N hat | 0 | 2,048 | 2,117 | 10,037 | 2,390 | 68 | 0 | 0 | 0 | 16,660 |
| SE Nhat | 0 | 350 | 355 | 522 | 374 | 68 | 0 | 0 | 0 | 0 |
| **Strata 5 (7/16-7/31)** | | | | | | | | | | |
| Female | | | | | | | | | | |
| Sample Size | 0 | 6 | 19 | 100 | 15 | 0 | 0 | 0 | 0 | 140 |
| Percent | 0.00 | 2.60 | 8.23 | 43.29 | 6.49 | 0.00 | 0.00 | 0.00 | 0.00 | 60.61 |
| SE % | 0.00 | 1.05 | 1.81 | 3.27 | 1.62 | 0.00 | 0.00 | 0.00 | 0.00 | 3.22 |
| N hat | 0 | 293 | 927 | 4,879 | 732 | 0 | 0 | 0 | 0 | 6,830 |
| SE Nhat | 0 | 118 | 204 | 367 | 183 | 0 | 0 | 0 | 0 | 362 |
| Male | | | | | | | | | | |
| Sample Size | 0 | 14 | 12 | 55 | 10 | 0 | 0 | 0 | 0 | 91 |
| Percent | 0.00 | 6.06 | 5.19 | 23.81 | 4.33 | 0.00 | 0.00 | 0.00 | 0.00 | 39.39 |
| SE % | 0.00 | 1.57 | 1.46 | 2.81 | 1.34 | 0.00 | 0.00 | 0.00 | 0.00 | 3.22 |
| N hat | 0 | 683 | 585 | 2,683 | 488 | 0 | 0 | 0 | 0 | 4,440 |
| SE Nhat | 0 | 177 | 165 | 316 | 151 | 0 | 0 | 0 | 0 | 362 |
| Combined | | | | | | | | | | |
| Sample Size | 0 | 20 | 31 | 155 | 25 | 0 | 0 | 0 | 0 | 231 |
| Percent | 0.00 | 8.66 | 13.42 | 67.10 | 10.82 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE % | 0.00 | 1.85 | 2.25 | 3.10 | 2.05 | 0.00 | 0.00 | 0.00 | 0.00 | |
| N hat | 0 | 976 | 1,512 | 7,562 | 1,220 | 0 | 0 | 0 | 0 | 11,270 |
| SE Nhat | 0 | 209 | 253 | 348 | 230 | 0 | 0 | 0 | 0 | 0 |

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| | Age Class | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
| **Strata 6 (8/01-8/07)** | | | | | | | | | | |
| Female | | | | | | | | | | |
| Sample Size | 1 | 1 | 6 | 60 | 9 | 0 | 0 | 0 | 0 | 77 |
| Percent | 0.73 | 0.73 | 4.38 | 43.80 | 6.57 | 0.00 | 0.00 | 0.00 | 0.00 | 56.20 |
| SE % | 0.73 | 0.73 | 1.75 | 4.25 | 2.12 | 0.00 | 0.00 | 0.00 | 0.00 | 4.25 |
| N hat | 8 | 8 | 48 | 484 | 73 | 0 | 0 | 0 | 0 | 621 |
| SE Nhat | 8 | 8 | 19 | 47 | 23 | 0 | 0 | 0 | 0 | 47 |
| Male | | | | | | | | | | |
| Sample Size | 0 | 12 | 7 | 35 | 5 | 1 | 0 | 0 | 0 | 60 |
| Percent | 0.00 | 8.76 | 5.11 | 25.55 | 3.65 | 0.73 | 0.00 | 0.00 | 0.00 | 43.80 |
| SE % | 0.00 | 2.42 | 1.89 | 3.74 | 1.61 | 0.73 | 0.00 | 0.00 | 0.00 | 4.25 |
| N hat | 0 | 97 | 56 | 282 | 40 | 8 | 0 | 0 | 0 | 484 |
| SE Nhat | 0 | 27 | 21 | 41 | 18 | 8 | 0 | 0 | 0 | 47 |
| Combined | | | | | | | | | | |
| Sample Size | 1 | 13 | 13 | 95 | 14 | 1 | 0 | 0 | 0 | 137 |
| Percent | 0.73 | 9.49 | 9.49 | 69.34 | 10.22 | 0.73 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE % | 0.73 | 2.51 | 2.51 | 3.95 | 2.60 | 0.73 | 0.00 | 0.00 | 0.00 | |
| N hat | 8 | 105 | 105 | 766 | 113 | 8 | 0 | 0 | 0 | 1,105 |
| SE Nhat | 8 | 28 | 28 | 44 | 29 | 8 | 0 | 0 | 0 | 0 |
| **Strata 4, 5, and 6 Combined** | | | | | | | | | | |
| Female | | | | | | | | | | |
| N hat | 8 | 847 | 2,000 | 11,235 | 2,307 | 68 | 0 | 0 | 0 | 16,464 |
| SE Nhat | 8 | 224 | 328 | 630 | 357 | 68 | 0 | 0 | 0 | 645 |
| Percent | 0.0 | 2.9 | 6.9 | 38.7 | 7.9 | 0.2 | 0.0 | 0.0 | 0.0 | 56.7 |
| SE % | 0.03 | 0.77 | 1.13 | 2.17 | 1.23 | 0.23 | 0.00 | 0.00 | 0.00 | 2.22 |
| Male | | | | | | | | | | |
| N hat | 0 | 2,282 | 1,734 | 7,131 | 1,416 | 8 | 0 | 0 | 0 | 12,571 |
| SE Nhat | 0 | 354 | 312 | 561 | 284 | 8 | 0 | 0 | 0 | 645 |
| Percent | 0.0 | 7.9 | 6.0 | 24.6 | 4.9 | 0.0 | 0.0 | 0.0 | 0.0 | 43.3 |
| SE % | 0.00 | 1.22 | 1.07 | 1.93 | 0.98 | 0.03 | 0.00 | 0.00 | 0.00 | 2.22 |
| Combined | | | | | | | | | | |
| N hat | 8 | 3,129 | 3,734 | 18,365 | 3,722 | 76 | 0 | 0 | 0 | 29,035 |
| SE Nhat | 8 | 409 | 437 | 629 | 440 | 69 | 0 | 0 | 0 | 0 |
| Percent | 0.0 | 10.8 | 12.9 | 63.3 | 12.8 | 0.3 | 0.0 | 0.0 | 0.0 | 100.0 |
| SE % | 0.03 | 1.41 | 1.50 | 2.17 | 1.52 | 0.24 | 0.00 | 0.00 | 0.00 | |

[a]  Estimates of the total in-river return for each strata are taken from the sonar project (D. L. Burwen, Alaska Department of Fish and Game, Anchorage, personal communication).  Age samples were taken from the mark-recapture tagging project (Alexandersdottir and Marsh 1990).  The number of fish sampled in each age class was taken directly from the tagging project data files (Appendix C1).

Appendix B12. Estimates by age class of the number of late-run chinook salmon in the in-river return to the Kenai River, 1990.[a]

| | | | | Age Class | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
| **Strata 4 (7/01-7/15)** | | | | | | | | | |
| *Female* | | | | | | | | | |
| Sample Size | 8 | 6 | 37 | 3 | 0 | 0 | 0 | 0 | 54 |
| Percent | 5.13 | 3.85 | 23.72 | 1.92 | 0.00 | 0.00 | 0.00 | 0.00 | 34.62 |
| SE % | 1.77 | 1.54 | 3.42 | 1.10 | 0.00 | 0.00 | 0.00 | 0.00 | 3.82 |
| N hat | 545 | 409 | 2,519 | 204 | 0 | 0 | 0 | 0 | 3,677 |
| SE Nhat | 188 | 164 | 362 | 117 | 0 | 0 | 0 | 0 | 405 |
| *Male* | | | | | | | | | |
| Sample Size | 30 | 31 | 38 | 3 | 0 | 0 | 0 | 0 | 102 |
| Percent | 19.23 | 19.87 | 24.36 | 1.92 | 0.00 | 0.00 | 0.00 | 0.00 | 65.38 |
| SE % | 3.17 | 3.21 | 3.45 | 1.10 | 0.00 | 0.00 | 0.00 | 0.00 | 3.82 |
| N hat | 2,043 | 2,111 | 2,587 | 204 | 0 | 0 | 0 | 0 | 6,945 |
| SE Nhat | 335 | 339 | 365 | 117 | 0 | 0 | 0 | 0 | 405 |
| *Combined* | | | | | | | | | |
| Sample Size | 38 | 37 | 75 | 6 | 0 | 0 | 0 | 0 | 156 |
| Percent | 24.36 | 23.72 | 48.08 | 3.85 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE % | 3.45 | 3.42 | 4.01 | 1.54 | 0.00 | 0.00 | 0.00 | 0.00 | |
| N hat | 2,587 | 2,519 | 5,107 | 409 | 0 | 0 | 0 | 0 | 10,622 |
| SE Nhat | 365 | 362 | 425 | 164 | 0 | 0 | 0 | 0 | 0 |
| **Strata 5 (7/16-7/31)** | | | | | | | | | |
| *Female* | | | | | | | | | |
| Sample Size | 4 | 8 | 92 | 2 | 0 | 0 | 0 | 0 | 106 |
| Percent | 1.53 | 3.05 | 35.11 | 0.76 | 0.00 | 0.00 | 0.00 | 0.00 | 40.46 |
| SE % | 0.76 | 1.06 | 2.95 | 0.54 | 0.00 | 0.00 | 0.00 | 0.00 | 3.04 |
| N hat | 238 | 475 | 5,468 | 119 | 0 | 0 | 0 | 0 | 6,300 |
| SE Nhat | 118 | 166 | 459 | 84 | 0 | 0 | 0 | 0 | 472 |
| *Male* | | | | | | | | | |
| Sample Size | 21 | 26 | 101 | 8 | 0 | 0 | 0 | 0 | 156 |
| Percent | 8.02 | 9.92 | 38.55 | 3.05 | 0.00 | 0.00 | 0.00 | 0.00 | 59.54 |
| SE % | 1.68 | 1.85 | 3.01 | 1.06 | 0.00 | 0.00 | 0.00 | 0.00 | 3.04 |
| N hat | 1,248 | 1,545 | 6,003 | 475 | 0 | 0 | 0 | 0 | 9,272 |
| SE Nhat | 261 | 288 | 468 | 166 | 0 | 0 | 0 | 0 | 472 |
| *Combined* | | | | | | | | | |
| Sample Size | 25 | 34 | 193 | 10 | 0 | 0 | 0 | 0 | 262 |
| Percent | 9.54 | 12.98 | 73.66 | 3.82 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE % | 1.82 | 2.08 | 2.73 | 1.19 | 0.00 | 0.00 | 0.00 | 0.00 | |
| N hat | 1,486 | 2,021 | 11,471 | 594 | 0 | 0 | 0 | 0 | 15,572 |
| SE Nhat | 283 | 323 | 424 | 184 | 0 | 0 | 0 | 0 | 0 |

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| | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.3 | 2.4 | ALL |
| **Strata 6 (8/01-8/15)** | | | | | | | | | |
| **Female** | | | | | | | | | |
| Sample Size | 0 | 0 | 62 | 1 | 0 | 0 | 0 | 0 | 63 |
| Percent | 0.00 | 0.00 | 55.86 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 56.76 |
| SE % | 0.00 | 0.00 | 4.73 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 4.72 |
| N hat | 0 | 0 | 4,066 | 66 | 0 | 0 | 0 | 0 | 4,132 |
| SE Nhat | 0 | 0 | 343 | 65 | 0 | 0 | 0 | 0 | 342 |
| **Male** | | | | | | | | | |
| Sample Size | 2 | 6 | 33 | 7 | 0 | 0 | 0 | 0 | 48 |
| Percent | 1.80 | 5.41 | 29.73 | 6.31 | 0.00 | 0.00 | 0.00 | 0.00 | 43.24 |
| SE % | 1.27 | 2.16 | 4.36 | 2.32 | 0.00 | 0.00 | 0.00 | 0.00 | 4.72 |
| N hat | 131 | 394 | 2,164 | 459 | 0 | 0 | 0 | 0 | 3,148 |
| SE Nhat | 92 | 156 | 316 | 168 | 0 | 0 | 0 | 0 | 342 |
| **Combined** | | | | | | | | | |
| Sample Size | 2 | 6 | 95 | 8 | 0 | 0 | 0 | 0 | 111 |
| Percent | 1.80 | 5.41 | 85.59 | 7.21 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| SE % | 1.27 | 2.16 | 3.35 | 2.47 | 0.00 | 0.00 | 0.00 | 0.00 | |
| N hat | 131 | 394 | 6,231 | 525 | 0 | 0 | 0 | 0 | 7,280 |
| SE Nhat | 92 | 156 | 243 | 179 | 0 | 0 | 0 | 0 | 0 |
| **Strata 4, 5, and 6 Combined** | | | | | | | | | |
| **Female** | | | | | | | | | |
| N hat | 782 | 884 | 12,054 | 389 | 0 | 0 | 0 | 0 | 14,109 |
| SE Nhat | 222 | 233 | 678 | 158 | 0 | 0 | 0 | 0 | 710 |
| Percent | 2.3 | 2.6 | 36.0 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 42.1 |
| SE % | 0.66 | 0.70 | 2.02 | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 | 2.12 |
| **Male** | | | | | | | | | |
| N hat | 3,422 | 4,050 | 10,755 | 1,139 | 0 | 0 | 0 | 0 | 19,365 |
| SE Nhat | 435 | 471 | 672 | 263 | 0 | 0 | 0 | 0 | 710 |
| Percent | 10.2 | 12.1 | 32.1 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 57.9 |
| SE % | 1.30 | 1.41 | 2.01 | 0.79 | 0.00 | 0.00 | 0.00 | 0.00 | 2.12 |
| **Combined** | | | | | | | | | |
| N hat | 4,204 | 4,934 | 22,808 | 1,528 | 0 | 0 | 0 | 0 | 33,474 |
| SE Nhat | 471 | 510 | 647 | 304 | 0 | 0 | 0 | 0 | 0 |
| Percent | 12.6 | 14.7 | 68.1 | 4.6 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| SE % | 1.41 | 1.52 | 1.93 | 0.91 | 0.00 | 0.00 | 0.00 | 0.00 | |

[a] Estimates of the total in-river return for each strata are taken from the sonar project (D. L. Burwen, Alaska Department of Fish and Game, Anchorage, personal communication). Age samples were taken with large mesh gill nets as part of the mark-recapture tagging project. The number sampled in each age class was taken directly from the project data files (Appendix C1).

Appendix B13.   Estimates by age class of the number of late-run Kenai River chinook salmon harvested in the Kenai River sport fishery, 1976-1990.[a]

| | | | | | Age Class | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.2 | 2.3 | 2.4 | 2.5 | Other | Total |
| **1976** | | | | | | | | | | | | |
| Sample Size | 33 | 83 | 56 | 123 | 11 | 0 | 1 | 2 | 0 | 0 | | 307 |
| Percent | 10.7 | 27.0 | 18.2 | 40.1 | 3.6 | 0.0 | 0.3 | 0.7 | 0.0 | 0.0 | | |
| SE Percent | 1.8 | 2.5 | 2.2 | 2.8 | 1.1 | | 0.3 | 0.5 | | | | |
| Estimated Harvest | 481 | 1,210 | 817 | 1,794 | 160 | | 15 | 29 | | | | 4,477 |
| SE Harvest | 79 | 114 | 99 | 125 | 48 | | 15 | 21 | | | | NA |
| **1977** | | | | | | | | | | | | |
| Sample Size | 0 | 20 | 72 | 78 | 3 | 0 | 0 | 0 | 1 | 0 | | 174 |
| Percent | 0.0 | 11.5 | 41.4 | 44.8 | 1.7 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | | |
| SE Percent | | 2.4 | 3.7 | 3.8 | 1.0 | | | | 0.6 | | | |
| Estimated Harvest | | 592 | 2,130 | 2,308 | 89 | | | | 30 | | | 5,148 |
| SE Harvest | | 125 | 193 | 195 | 51 | | | | 30 | | | NA |
| **1978** | | | | | | | | | | | | |
| Sample Size | 0 | 22 | 14 | 136 | 3 | 0 | 0 | 0 | 0 | 0 | | 175 |
| Percent | 0.0 | 12.6 | 8.0 | 77.7 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE Percent | | 2.5 | 2.1 | 3.2 | 1.0 | | | | | | | |
| Estimated Harvest | | 701 | 446 | 4,335 | 96 | | | | | | | 5,578 |
| SE Harvest | | 140 | 115 | 176 | 55 | | | | | | | NA |
| **1979** | | | | | | | | | | | | |
| Sample Size | 0 | 11 | 13 | 40 | 9 | 0 | 0 | 0 | 0 | 0 | | 73 |
| Percent | 0.0 | 15.1 | 17.8 | 54.8 | 12.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE Percent | | 4.2 | 4.5 | 5.9 | 3.9 | | | | | | | |
| Estimated Harvest | | 698 | 825 | 2,539 | 571 | | | | | | | 4,634 |
| SE Harvest | | 195 | 209 | 272 | 180 | | | | | | | NA |
| **1980** | | | | | | | | | | | | |
| Sample Size | 0 | 59 | 60 | 139 | 21 | 0 | 0 | 0 | 0 | 0 | | 279 |
| Percent | 0.0 | 21.1 | 21.5 | 49.8 | 7.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE Percent | | 2.4 | 2.5 | 3.0 | 1.6 | | | | | | | |
| Estimated Harvest | | 763 | 776 | 1,798 | 272 | | | | | | | 3,608 |
| SE Harvest | | 88 | 89 | 108 | 57 | | | | | | | NA |
| **1981** | | | | | | | | | | | | |
| Sample Size | 0 | 15 | 26 | 73 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 117 |
| Percent | 0.0 | 12.8 | 22.2 | 62.4 | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| SE Percent | | 3.1 | 3.9 | 4.5 | 1.5 | | | | | | | |
| Estimated Harv | | 678 | 1,174 | 3,297 | 136 | | | | | | | 5,285 |
| SE Harvest | | 164 | 204 | 238 | 78 | | | | | | | NA |

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Appendix B13.   (Page 2 of 4).

| | Age Class | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.2 | 2.3 | 2.4 | 2.5 | Other | Total |
| **1982** | | | | | | | | | | | | |
| Sample Size | | 14 | 31 | 70 | 2 | | | | | | 2 | 119 |
| Percent | | 11.8 | 26.1 | 58.8 | 1.7 | | | | | | 1.7 | |
| SE Percent | | 3.0 | 4.0 | 4.5 | 1.2 | | | | | | 1.2 | |
| Estimated Harvest | | 566 | 1,253 | 2,829 | 81 | | | | | | 81 | 4,810 |
| SE Harvest | | 143 | 194 | 218 | 57 | | | | | | 57 | NA |
| **1983** | | | | | | | | | | | | |
| Sample Size | 0 | 3 | 4 | 70 | 2 | 0 | 0 | 0 | 2 | 0 | | 81 |
| Percent | 0.0 | 3.7 | 4.9 | 86.4 | 2.5 | 0.0 | 0.0 | 0.0 | 2.5 | 0.0 | | |
| SE Percent | | 2.1 | 2.4 | 3.8 | 1.7 | | | | 1.7 | | | |
| Estimated Harvest | | 340 | 453 | 7,928 | 227 | | | | 227 | | | 9,174 |
| SE Harvest | | 194 | 222 | 351 | 159 | | | | 159 | | | NA |
| **1984** | | | | | | | | | | | | |
| Sample Size | 0 | 43 | 78 | 305 | 62 | 0 | 0 | 0 | 0 | 0 | | 488 |
| Percent | 0.0 | 8.8 | 16.0 | 62.5 | 12.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE Percent | | 1.3 | 1.7 | 2.2 | 1.5 | | | | | | | |
| Estimated Harvest | | 650 | 1,179 | 4,610 | 937 | | | | | | | 7,376 |
| SE Harvest | | 95 | 122 | 162 | 111 | | | | | | | NA |
| **1985** | | | | | | | | | | | | |
| Sample Size | | 18 | 59 | 339 | 37 | | | | | | 8 | 461 |
| Percent | | 3.9 | 12.8 | 73.5 | 8.0 | | | | | | 1.7 | |
| SE Percent | | 0.9 | 1.6 | 2.1 | 1.3 | | | | | | 0.6 | |
| Estimated Harvest | | 315 | 1,031 | 5,923 | 646 | | | | | | 140 | 8,055 |
| SE Harvest | | 73 | 125 | 166 | 102 | | | | | | 49 | NA |
| **1986** | | | | | | | | | | | | |
| Female | | | | | | | | | | | | |
| Sample Size | 0 | 2 | 88 | 115 | 13 | 0 | 0 | 0 | 0 | 0 | | 218 |
| Percent | 0.0 | 0.4 | 17.8 | 23.3 | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 44.2 |
| SE Percent | | 0.3 | 1.7 | 1.9 | 0.7 | | | | | | | 2.2 |
| Estimated Harvest | | 37 | 1,607 | 2,100 | 237 | | | | | | | 3,981 |
| SE Harvest | | 26 | 175 | 202 | 66 | | | | | | | 286 |
| Male | | | | | | | | | | | | |
| Sample Size | 2 | 48 | 104 | 108 | 13 | 0 | 0 | 0 | 0 | 0 | | 275 |
| Percent | 0.4 | 9.7 | 21.1 | 21.9 | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 55.8 |
| SE Percent | 0.3 | 1.3 | 1.8 | 1.9 | 0.7 | | | | | | | 2.2 |
| Estimated Harvest | 37 | 877 | 1,899 | 1,972 | 237 | | | | | | | 5,023 |
| SE Harvest | 26 | 128 | 192 | 195 | 66 | | | | | | | 325 |
| Combined | | | | | | | | | | | | |
| Sample Size | 2 | 50 | 192 | 223 | 26 | 0 | 0 | 0 | 0 | 0 | | 493 |
| Percent | 0.4 | 10.1 | 38.9 | 45.2 | 5.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE Percent | 0.3 | 1.4 | 2.2 | 2.2 | 1.0 | | | | | | | |
| Estimated Harvest | 37 | 913 | 3,507 | 4,073 | 475 | | | | | | | 9,004 |
| SE Harvest | 26 | 131 | 266 | 289 | 94 | | | | | | | 458 |

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Appendix B13.   (Page 3 of 4).

| | | | | Age Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.2 | 2.3 | 2.4 | 2.5 | Other | Total |
| **1987** | | | | | | | | | | | | |
| **Female** | | | | | | | | | | | | |
| Sample Size | 1 | 2 | 56 | 184 | 3 | 0 | 0 | 0 | 0 | 0 | | 246 |
| Percent | 0.2 | 0.4 | 11.6 | 38.1 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 50.9 |
| SE Percent | 0.2 | 0.3 | 1.5 | 2.2 | 0.4 | | | | | | | 2.3 |
| Estimated Harvest | 25 | 51 | 1,419 | 4,662 | 76 | | | | | | | 6,233 |
| SE Harvest | 25 | 36 | 199 | 398 | 44 | | | | | | | 480 |
| **Male** | | | | | | | | | | | | |
| Sample Size | 1 | 3 | 54 | 167 | 12 | 0 | 0 | 0 | 0 | 0 | | 237 |
| Percent | 0.2 | 0.6 | 11.2 | 34.6 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 49.1 |
| SE Percent | 0.2 | 0.4 | 1.4 | 2.2 | 0.7 | | | | | | | 2.3 |
| Estimated Harvest | 25 | 76 | 1,368 | 4,231 | 304 | | | | | | | 6,004 |
| SE Harvest | 25 | 44 | 195 | 375 | 89 | | | | | | | 469 |
| **Combined** | | | | | | | | | | | | |
| Sample Size | 2 | 5 | 110 | 351 | 15 | 0 | 0 | 0 | 0 | 0 | | 483 |
| Percent | 0.4 | 1.0 | 22.8 | 72.7 | 3.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE Percent | 0.3 | 0.5 | 1.9 | 2.0 | 0.8 | | | | | | | |
| Estimated Harvest | 51 | 127 | 2,787 | 8,893 | 380 | | | | | | | 12,237 |
| SE Harvest | 36 | 57 | 292 | 611 | 99 | | | | | | | 769 |
| | | | | | | | | | | | | |
| **1988** | | | | | | | | | | | | |
| **Female** | | | | | | | | | | | | |
| Sample Size | 0 | 0 | 4 | 181 | 38 | 0 | 0 | 0 | 0 | 0 | | 223 |
| Percent | 0.0 | 0.0 | 1.0 | 43.5 | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 53.6 |
| SE Percent | | | 0.5 | 2.4 | 1.4 | | | | | | | 2.4 |
| Estimated Harvest | | | 168 | 7,619 | 1,600 | | | | | | | 9,387 |
| SE Harvest | | | 84 | 620 | 265 | | | | | | | 701 |
| **Male** | | | | | | | | | | | | |
| Sample Size | 3 | 1 | 10 | 146 | 33 | 0 | 0 | 0 | 0 | 0 | | 193 |
| Percent | 0.7 | 0.2 | 2.4 | 35.1 | 7.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 46.4 |
| SE Percent | 0.4 | 0.2 | 0.8 | 2.3 | 1.3 | | | | | | | 2.4 |
| Estimated Harvest | 126 | 42 | 421 | 6,146 | 1,389 | | | | | | | 8,125 |
| SE Harvest | 73 | 42 | 134 | 548 | 246 | | | | | | | 644 |
| **Combined** | | | | | | | | | | | | |
| Sample Size | 3 | 1 | 14 | 327 | 71 | 0 | 0 | 0 | 0 | 0 | | 416 |
| Percent | 0.7 | 0.2 | 3.4 | 78.6 | 17.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE Percent | 0.4 | 0.2 | 0.9 | 2.0 | 1.8 | | | | | | | |
| Estimated Harvest | 126 | 42 | 589 | 13,765 | 2,989 | | | | | | | 17,512 |
| SE Harvest | 73 | 42 | 159 | 887 | 368 | | | | | | | 1,036 |

| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.2 | 2.3 | 2.4 | 2.5 | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1989** | | | | | | | | | | | | |
| **Female** | | | | | | | | | | | | |
| Sample Size | 0 | 0 | 7 | 36 | 5 | 0 | 0 | 0 | 1 | 0 | | 49 |
| Percent | 0.0 | 0.0 | 6.9 | 35.6 | 5.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | | 48.5 |
| SE Percent | | | 2.5 | 4.8 | 2.2 | | | | 1.0 | | | 5.0 |
| Estimated Harvest | | | 633 | 3,253 | 452 | | | | 90 | | | 4,428 |
| SE Harvest | | | 235 | 483 | 200 | | | | 90 | | | 536 |
| **Male** | | | | | | | | | | | | |
| Sample Size | 0 | 1 | 4 | 36 | 11 | 0 | 0 | 0 | 0 | 0 | | 52 |
| Percent | 0.0 | 1.0 | 4.0 | 35.6 | 10.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 51.5 |
| SE Percent | | 1.0 | 2.0 | 4.8 | 3.1 | | | | | | | 5.0 |
| Estimated Harvest | | 90 | 361 | 3,253 | 994 | | | | | | | 4,699 |
| SE Harvest | | 90 | 179 | 483 | 291 | | | | | | | 545 |
| **Combined** | | | | | | | | | | | | |
| Sample Size | 0 | 1 | 11 | 72 | 16 | 0 | 0 | 0 | 1 | 0 | | 101 |
| Percent | 0.0 | 1.0 | 10.9 | 71.3 | 15.8 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | | |
| SE Percent | | 1.0 | 3.1 | 4.5 | 3.7 | | | | 1.0 | | | |
| Estimated Harvest | | 90 | 994 | 6,506 | 1,446 | | | | 90 | | | 9,127 |
| SE Harvest | | 90 | 291 | 585 | 345 | | | | 90 | | | 582 |
| **1990** | | | | | | | | | | | | |
| **Female** | | | | | | | | | | | | |
| Sample Size | 0 | 8 | 20 | 100 | 19 | 0 | 0 | 0 | 0 | 0 | | 147 |
| Percent | 0.0 | 2.3 | 5.9 | 29.3 | 5.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 43.1 |
| SE Percent | | 0.8 | 1.3 | 2.5 | 1.2 | | | | | | | 2.7 |
| Estimated Harvest | | 147 | 366 | 1,832 | 348 | | | | | | | 2,693 |
| SE Harvest | | 52 | 84 | 202 | 81 | | | | | | | 255 |
| **Male** | | | | | | | | | | | | |
| Sample Size | 2 | 25 | 34 | 112 | 21 | 0 | 0 | 0 | 0 | 0 | | 194 |
| Percent | 0.6 | 7.3 | 10.0 | 32.8 | 6.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 56.9 |
| SE Percent | 0.4 | 1.4 | 1.6 | 2.5 | 1.3 | | | | | | | 2.7 |
| Estimated Harvest | 37 | 458 | 623 | 2,052 | 385 | | | | | | | 3,554 |
| SE Harvest | 26 | 94 | 111 | 216 | 86 | | | | | | | 303 |
| **Combined** | | | | | | | | | | | | |
| Sample Size | 2 | 33 | 54 | 212 | 40 | 0 | 0 | 0 | 0 | 0 | | 341 |
| Percent | 0.6 | 9.7 | 15.8 | 62.2 | 11.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| SE Percent | 0.4 | 1.6 | 2.0 | 2.6 | 1.7 | | | | | | | |
| Estimated Harvest | 37 | 605 | 989 | 3,884 | 733 | | | | | | | 6,247 |
| SE Harvest | 26 | 109 | 142 | 322 | 121 | | | | | | | 445 |

a  Sources for 1976 - 1985 age composition and sport harvest data: Hammarstrom 1977 - 81; Hammarstrom and Larson 1982 - 84, 1986; Hammarstrom et al. 1985; S. Hammarstrom (Alaska Department of Fish and Game, Soldotna, personal communication).  Sport estimates for 1986 through 1990 were taken from Conrad and Hammarstrom 1987, and Hammarstrom 1988 - 91.  The number of fish sampled in each age class for 1986 - 1990 was taken directly from the project data files.

Appendix B14. Estimates of late-run Kenai River chinook salmon hook and release mortality from the Kenai River sport fishery, 1986-1990[a].

| Year | Sport Catch | Sport Harvest | Number Released | SE Release | Percent Mortality | SE Percent | Hook and Release Mortality | SE Mortality |
|------|-------------|---------------|-----------------|------------|-------------------|------------|----------------------------|--------------|
| 1986 | 15,331 | 9,004 | 6,327 | 872 | 8.3[b] | 3.32 | 522 | 220 |
| 1987 | 16,701 | 12,237 | 4,464 | 1,214 | 8.3[b] | 3.32 | 368 | 174 |
| 1988 | 23,238 | 17,512 | 5,726 | 1,590 | 8.3[b] | 3.32 | 472 | 225 |
| 1989 | 12,210 | 9,127 | 3,083 | 1,097 | 10.6 | 3.30 | 327 | 148 |
| 1990 | 8,637 | 6,247 | 2,390 | 709 | 5.9 | 2.20 | 141 | 65 |

[a] Catch and harvest estimates from Conrad and Hammarstrom 1987, and Hammarstrom 1988-1991. Percent mortality from Bendock and Alexandersdottir 1990, 1991, and *In prep*; and M. Alexandersdottir (Alaska Department of Fish and Game, Anchorage, personal communication).

[b] Percent mortality for 1986-1988 is the average mortality of the two measured years, 1989 and 1990.

APPENDIX C

DATA FILES USED TO PRODUCE THIS REPORT

Appendix C1.    Data Files Used to Produce This Report.


Kenai River creel survey age composition files:


P0001ZBB.DTA    1986 early and late run age and length samples taken from Kenai
                River chinook salmon sport harvest from downstream and upstream
                sections.

00010BF7.DTA    1987 early and late run age and length samples taken from Kenai
                River chinook salmon sport harvest from the downstream section.

00030BH7.DTA    1987 early and late run age and length samples taken from Kenai
                River chinook salmon sport harvest from the upstream section.

00010BH8.DTA    1988 early and late run age and length samples taken from Kenai
                River chinook salmon sport harvest from downstream and upstream
                sections.

00010BH9.DTA    1989 early and late run age and length samples taken from Kenai
                River chinook salmon sport harvest from the downstream section.

00020BC9.DTA    1989 early and late run age and length samples taken from Kenai
                River chinook salmon sport harvest from the upstream section.

00010BC0.DTA    1990 early-run age and length samples from the chinook salmon
                sport harvest from the downstream and upstream sections.

00010BD0.DTA    1990 late-run age and length samples from the chinook salmon
                sport harvest from the downstream and upstream sections.


Kenai River tagging project age composition files:


P00010BG.DTA    1986 early and late run age and length samples from the tagging
                gill nets.

00010BG7.DTA    1987 early and late run age and length samples from the tagging
                gill nets.

00010BG8.DTA    1988 early and late run age and length samples from the tagging
                gill nets.

00010BF9.DTA    1989 early-run age and length samples from the tagging gill
                nets.

00010BG9.DTA    1989 late-run age and length samples from the tagging gill
                nets.

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00010BE0.DTA    1990 early-run age and length samples from the tagging gill
                nets.

00010BF0.DTA    1990 late-run age and length samples from the tagging gill
                nets.