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Alaska Department of Fish and Game
Division of Commercial Fisheries
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Upper Cook Inlet Salmon Escapement Studies, 1986

by
Bruce E. King
and
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State of Alaska

Steve Cowper, Governor

The Technical Fishery Report Series was established in 1987, replacing the Technical Data Report Series. The scope of this new series has been broadened to include reports that may contain data analysis, although data oriented reports lacking substantial analysis will continue to be included. The new series maintains an emphasis on timely reporting of recently gathered information, and this may sometimes require use of data subject to minor future adjustments. Reports published in this series are generally interim, annual, or iterative rather than final reports summarizing a completed study or project. They are technically oriented and intended for use primarily by fishery professionals and technically oriented fishing industry representatives. Publications in this series have received several editorial reviews and at least one *blind* peer review refereed by the division's editor and have been determined to be consistent with the division's publication policies and standards.

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ABSTRACT

Sockeye salmon (*Oncorhynchus nerka*) escapements in 1986 for three major river systems of Upper Cook Inlet, Alaska were estimated using Bendix Corp. side-scanning sonar equipment. Escapements totaled 501,157 fish into the Kenai River, 275,963 fish into the Kasilof River, and 92,077 into the Yentna River. An escapement range of 95,631-128,618 was generated for the Crescent River based on sonar counts for part of the season and commercial fishery exploitation rates. Escapements of pink salmon (*O. gorbuscha*), chum salmon (*O. keta*), and coho salmon (*O. kisutch*) were also monitored during the sockeye salmon return. Numbers of these species counted prior to project termination were 673,973 pink, 56,657 chum, and 23,457 coho salmon. Age composition of sockeye salmon was predominantly 1.3 and 1.2 for the Kenai, Kasilof, and Yentna Rivers, and 2.3 for Crescent River. Mean weight and length by age class and sex of sockeye salmon are also presented for each river. In addition, sockeye salmon migratory behavior data in the form of spatial and temporal distribution and migratory timing information are given. Finally, escapement information for Upper Cook Inlet streams compiled by other Alaska Department of Fish and Game Divisions, state and federal agencies, and nonprofit corporations are documented.

KEY WORDS: Pacific salmon escapements, hydroacoustic enumeration, biological sampling, migratory behavior, Upper Cook Inlet

INTRODUCTION

A description of the Upper Cook Inlet (UCI), Alaska management area and its major sockeye salmon producing rivers is presented in Tarbox et al. (1983). Historical information on escapement enumeration efforts can be found in Waltemyer et al. (1980).

In the early 1960's the Alaska Department of Fish and Game (ADF&G) contracted the Bendix Corporation to develop sonar equipment to count the number of sockeye salmon migrating to spawning grounds in the major rivers of Cook Inlet. Glacial silt in these rivers severely limited direct visual means of escapement assessment. The contract eventually resulted in the installation of Bendix Corp. side-scanning sonar counters (1978- 1981 models) in the Kenai River, Kasilof River, Susitna River and Crescent River.

However, recent work on the mainstem Susitna River by Ransom et al. (1986) and King (1987) indicated that the existing program provided questionable information concerning the magnitude and species composition of the fish (all species combined) escaping the commercial fishery. This information, combined with subsequent budget reductions, led to the decision prior to the 1986 season to focus enumeration efforts in the Yentna River, a major tributary of the Susitna River. Experiments with new equipment and techniques, which may lead to resumption of counting efforts in the mainstem Susitna River in the future, were continued in the mainstem.

In 1986 sockeye salmon (*Oncorhynchus nerka*) escapements were monitored daily by the ADF&G in the Kenai, Kasilof, Crescent and Yentna River drainages of Upper Cook Inlet (Figures 1 through 4). Pink salmon (*O. gorbuscha*), chum salmon (*O. keta*), and coho salmon (*O. kisutch*) escapements into the Yentna River were also monitored during the sockeye salmon run.

The primary objectives of UCI escapement projects conducted by the Commercial Fisheries Division on the Kenai River, Kasilof River, Yentna River and Crescent River in 1986 were to estimate:

- 1) the magnitude of escapement and migration timing of sockeye salmon in the mainstem river, and
- 2) the age, weight, length (AWL), and sex characteristics of the sockeye salmon escapement.

A secondary objective was to investigate the magnitude, timing, and distribution of spawning sockeye salmon within established tributary index areas of the Kenai and Kasilof River drainages.

Population estimates or peak counts of salmon in Upper Cook Inlet streams made by ADF&G divisions, as well as federal agencies, private consultants, and nonprofit corporations have also been included in this report.

METHODS

A detailed description of the theory of operation of the Bendix Corporation side-scanning sonar counter (Figure 5) and a description of the electronic equipment are presented in Gaudet (1983). Procedures for deployment and operation of the equipment are described in Bendix Corp. (1980). Calibration and data summary procedures are summarized in Tarbox et al. (1983). Essentially, the sounder/processor enumerates targets on the basis of returning echo strength and number of echoes returned. The processor accumulates and prints the counts on paper tape, in one hour intervals, for each of the linear sectors. Hourly counts are tabulated, adjusted for debris, and reported as a daily total.

Field enumeration activities in 1986 began and ended on the following dates:

Kenai River - 22 June to 31 July
Kasilof River - 13 June to 31 July
Yentna River - 29 June to 31 July
Crescent River - 25 June to 16 July

The Crescent River escapement enumeration program was terminated on 16 July due to in-season budget reductions. Consequently, in-season escapement counts for that system do not represent an estimate of total escapement.

Estimates of escapement into the Kasilof, Kenai and Yentna Rivers prior to and after termination of hydroacoustic activities were calculated by using cumulative escapement data for the years 1979-1985 (1981-1984 for Yentna River) to generate yearly cumulative performance profiles of the form:

$$Y = 1/1+e[-(a+b*t)]$$

where: Y = cumulative proportion of total escapement
t = day
a and b = estimated coefficients of the model

An estimate of the total escapement was derived using the methodology of Mundy (1979). This method generated an estimate of total escapement by comparing the entry pattern of the 1986 return and each year of complete historical escapement data. This analysis resulted in a calculated minimum sums of squares (mss) value. The minimum sums of squares values calculated for each year were then compared, with the smallest value representing the best fit. Within each yearly comparison, a range of mss values were calculated by lagging the 1986 entry pattern curve by a range of 1-10 days early and late. This process allowed further refinement of the 1986 escapement estimate to account for differences in the run timing of the 1986 return and each historical data base. This represented the best estimate relative to the historical model selected, and that year's escapement profile was then used to estimate the daily escapement for the 1986 postenumeration period.

An estimate of sockeye salmon escapement into Crescent River after 16 July was not generated in a similar manner because the program was terminated prior to entry of adequate numbers of fish to establish a cumulative

prior to entry of adequate numbers of fish to establish a cumulative performance profile. Consequently, commercial set gill net catch reported for the Western Subdistrict and exploitation rates from 1986 (established for the period of enumeration) and previous years were used to estimate the 1986 escapement range.

Two estimates were generated to provide a range of possible escapement. The low end was established using the calculated exploitation rate prior to cessation of enumeration activities in 1986. The high end was based on an average exploitation rate for the years 1979-82. Exploitation rates for 1983-85 were not included because fishing time in those years increased substantially over previous years as a result of the proximity of the counting site to the commercial fishery. The number and frequency of fishing days were approximately equal in 1986 and the years used in the analysis.

The Susitna River sockeye salmon escapement goal (established in 1979) is 200,000 fish (Tarbox et al. 1983). Prior to the 1986 season an attempt was made to determine an appropriate level of escapement into the Yentna River which would indicate that in most years an adequate number of spawners had reached the mainstem Susitna River. In the years 1981-85, an estimate of the sockeye salmon escapement was made by combining the sonar counts from Yentna Station with a Peterson mark/recapture estimate from Sunshine Station (Thompson et. al 1986). These data were subjected to linear regression analysis to determine if adequate correlation existed between the two estimates for predictive purposes. This analysis failed to provide accurate statistics for predictive purposes, however the data revealed that in four of the five years that the escapement into the Yentna River exceeded 100,000 fish, the total escapement into the mainstem river was over 200,000 fish. Therefore, the desired Yentna River sockeye salmon escapement level was set at 100,000 to 150,000 fish.

Migratory behavior of sockeye salmon at the sonar site was assessed by analysis of distribution from shore (expressed in percentage of targets by counting sector), hourly distribution, bank preference for travel, and cumulative percentage of sonar counts by day (migratory timing).

Fish wheels were installed at all sites except Crescent River to assist in assessing migrational timing of salmon species, estimate species composition of sonar counts, and obtain escapement samples. To derive species composition of sonar counts, daily fish wheel catches were grouped into samples of at least 150 salmon and the species proportions calculated. The daily sonar count was then multiplied by those proportions to get the sonar count by species. All fish captured in the fish wheels were enumerated by species and sampled for age (scale samples), weight, length and sex characteristics.

Collection of fish for sonar count apportionment and AWL samples at Crescent River was accomplished using a 2-m gill net drifted immediately downstream of the substrate. The leading, or downstream portion of the net, was sunk immediately upon contact with a fish, creating a bagging effect to trap fish not gilled or tangled in the mesh. This was done to minimize potential gear selectivity.

Length (mid eye to fork of tail) and weight data obtained from sockeye salmon were generally limited to approximately 600 samples per river. Early

numbers of fish to meet these and following age composition sampling levels. All fish captured were sampled until this level was achieved under the assumption that weights by age class and sex did not change significantly through time. All fish captured for age composition samples were measured and examined for sex related characteristics. Sex ratios were calculated by grouping all samples together regardless of timing of sampling.

Scales were taken from the first 300 sockeye adults captured to provide "known" growth pattern samples for the stock identification catch composition program. The scale sampling program was then scheduled to provide data necessary to determine the age composition of the escapement.

In the years 1983-85, studies were undertaken on the Kenai, Kasilof, and Susitna Rivers to determine the degree of change in age composition of the sockeye escapement over time (King and Tarbox 1984, 1986, 1987). The data indicated that the age structure of the Kenai River remained essentially constant, while that of the Kasilof and Yentna Rivers changed as the season progressed. These results were assumed sufficient basis to reduce the 1986 scale sampling program for the Kenai river to one major sampling period during the peak of the escapement. The Kasilof River sampling program of three or more periods with one major sampling effort during each period remained unchanged in 1986. Age composition sampling at Yentna Station in 1986 also consisted of one period, although previous years' analysis indicated that the age structure changed as the season progressed. Sampling was restricted because of emergency in-season budget reductions by the Office of the Governor. AWL sampling of other salmon species was deleted from the operation for the same reason.

Bernard (1983) outlined the sample size by period necessary to estimate the true proportion of the major age group in the escapement within plus or minus five percentage points 90 percent of the time. The sample sizes presented below are maximum numbers of samples necessary to meet the above precision level and are based on historical age composition data for each site. Because there was generally a larger degree of variation in the proportion of the dominant age class in historical data, the maximum sample level given in Bernard (1983) was used for the Kasilof and Yentna Rivers.

Kenai River. The first day after sockeye salmon sonar counts reached 10,000 per day, 600 fish were sampled in 24 hours.

Kasilof River. When daily fish wheel catches of sockeye salmon approached the necessary sample size, 640 fish were sampled in the shortest feasible time frame within a 5-7 day period. This sampling schedule was continued until fish wheel catches dropped below the level where 640 sockeye salmon could be obtained in 2-3 days.

Yentna River. The first day after sockeye salmon sonar counts reached 10,000 per day, 640 fish were sampled as time permitted.

Kasilof River age composition data analysis consisted of breaking the escapement into several periods and weighting the age composition within each period by the apportioned sonar count obtained during that period. These data were then recombined to derive a weighted total season age composition. The

number of fish (E_j), variance (V), and confidence interval (CI) of each major age class were calculated using the following formulae (Cochran 1977).

$$E_{tj} = E_t * P_{tj}$$

$$V[E_{tj}] = (E_t)^2 * P_{tj}(1-P_{tj})/N_t-1$$

$$E_j = \sum_{t=1}^T E_{tj}$$

$$V[E_j] = \sum_{t=1}^T V[E_{tj}]$$

$$CI = +/- V[E_j] * t(\alpha = 0.05, n-1 \text{ d.f.})$$

Where:

E_t = Estimated number of fish escaping during stratum t .

P_{tj} = Proportion of the sample taken during stratum t that is age j .

N_t = Sample size for stratum t .

E_{tj} = Estimated number of fish of age j escaping during stratum t .

T = Number of strata

E_j = Estimated number of fish age j escaping during the season.

Data were then formatted in a contingency table using number of fish by age class (R) by sampling period (C). A chi-square test was performed on the data set to determine if the proportions of fish by age class was independent of time of sampling. If the null hypothesis was rejected (indicating a difference in age class frequency by period), then the chi-square test was repeated between sampling periods to determine when changes in age composition occurred.

Index-area escapement surveys were conducted by staff personnel on the Kenai River and Kasilof River. A combination of fixed wing aircraft and foot surveys were conducted from 1 August to 15 September. Index area counts and other survey data documented in this report represent peak live and dead counts. Data from additional surveys are stored in Commercial Fisheries Division stream survey files in Soldotna.

RESULTS AND DISCUSSION

The following escapement data are presented by drainage. Factors affecting accuracy of counts, and sources of mortality above the sonar site (notably the sport fishing harvest) are presented where known.

Kenai River

During the period of 22 June through 31 July, 462,201 fish targets were enumerated in the Kenai River (Appendix A.1). The sockeye salmon total of 449,324 fish was expanded to 501,157 fish to account for fish passing the sonar site after 31 July (Table 1). The 1983 escapement entry pattern curve provided the best fit (minimum sums of squares value = 0.000281; 6-day late lag time) for estimating the postenumeration escapement. This level of escapement approximates the upper bound of the desired escapement goal range (350,000-500,000 fish). The estimated number of potential spawners (sonar count minus sport harvest above the Soldotna bridge) was 411,957 fish (Table 2).

Individual tributary escapement estimates and sources of data are presented in Tables 3 and 4. The Russian River contribution to the escapement was 46,422 fish, the lowest on record since 1977. Two of the four largest producing tributary systems (Quartz Creek and Ptarmigan Creek) were not surveyed in 1986. The combination of relatively low Russian River escapement and absence of data from the above two systems resulted in the lowest total index area escapement since 1977.

As in previous years, bank orientation of the salmon escapement changed as the season progressed (Appendices A.2 and A.3). In the early part of the season (prior to 20 July), fish appeared to be widely distributed from shore. However, this may have been an artifact of counter logic, a higher proportion of chinook salmon in the escapement and propensity for this species for holding (and thus overcounting) near the offshore end of the substrate, or relatively low and slow flow conditions. During that portion of the escapement period encompassing greater than 85% of the total (20 July through 31 July), over 80% (a range of 81.8 to 97.2%) of the recorded fish targets were within 6 m of the transducer.

Throughout the enumeration period, however, there appeared to be a tendency for the counter to undercount fish in the middle sectors (primarily sectors 5 through 8), although oscilloscope observations indicated that returning echoes from these fish were of sufficient amplitude and duration to count. In order to provide the most accurate estimate of escapement, the pulse repetition rate of the counter was set so that fish that undercounted in the middle sectors were compensated for by overcounting in other sectors. These counter adjustments biased the results of shore orientation analysis to some unmeasured degree.

There is also some evidence that shore orientation was influenced by the artificial substrate (figure 5). Specifically, it appears that some proportion of the escapement reacted to the presence of the structure by

moving offshore and crossing the substrate in deeper water or going around the offshore end. Experimental work with the 1984 Bendix Corp. substrateless side-scanning sonar counter indicated that even when fish were observed crossing the substrate out to the offshore end, they returned immediately to shore prior to entering the substrateless counter beam approximately 30 m upstream (King 1987b).

Hourly distribution of fish targets was concentrated between 1900 hours and 0100 hours on the north bank and between 1600 hours and 2300 hours on the south bank (Appendices A.4 and A.5). This pattern was consistent with results from previous years.

Sixty-two percent of the recorded fish targets were counted on the north bank in 1986 (Table 5). The peak sockeye salmon passage date on both banks (Appendices A.6 and A.7) was 1 day after the calculated 25 July midpoint of the run (Table 6). The midpoint of the run occurred approximately 5 days later than the mean midpoint of 19 July (range of 14 July to 25 July) for the previous 6 years. Eighty percent of the escapement passed the sonar counters in a period of 11 days (Table 6), 3 days less than the mean for the previous 6 years.

A total of 1,586 sockeye salmon was captured in fish wheels (Appendices A.8 and A.9). Length and weight data were obtained from 789 and 662 fish, respectively. Average length, average weight, and ratio of males to females are presented by age class and sex in Appendices A.10 and A.11.

An analysis of the age composition sampling program conducted over the previous three seasons resulted in the conclusion that the age structure of the sockeye salmon major age classes did not change with time (King and Tarbox 1986). These results led to a restructuring of the sampling program in 1986 to one major sampling effort during the peak of the escapement. This sample was used to characterize the entire escapement. The resultant age structure was made up predominantly of age-1.3 (39.5%), -1.2 (31.8%) and -2.3 (18.0%) fish (Table 7).

Fish targets attributed to pink salmon, coho salmon, and chinook salmon are considered minimum estimates. Run timing, counter limitations, and spawning site locations relative to the sonar site are factors discussed in Tarbox et al. (1981 and 1983) which influence accuracy of escapement estimates for these species. No additional pink salmon and coho salmon escapement estimates were made for the mainstem Kenai River, but available information concerning tributary spawning populations is summarized in Table 4. The Sport Fish Division estimated 71,171 late run chinook salmon (range 47,017 - 95,325) entered the Kenai River in 1986, with a harvest of 9,040 fish (Nelson 1986). The early run total return was estimated to be 27,050 fish (range 13,603 - 40,497) including a harvest of 7,565.

Sonar counts attributed to sockeye salmon appear to be a relatively accurate measurement of escapement within the Kenai River drainage. The magnitude of the run and short duration of entry are ideal for counting with the Bendix system. The entry pattern of sockeye salmon into the drainage is also earlier than coho salmon and pink salmon escapements. Finally, the extreme difference in run size between sockeye salmon and chinook salmon suggests that errors

caused by misapportionment of fish targets from chinook salmon to sockeye salmon does not appreciably alter the estimate of sockeye salmon escapement.

Kasilof River

A total of 248,076 fish targets were counted at the Kasilof River sonar site from 13 June through 31 July, 1986 (Appendix A.12). The sockeye salmon count of 242,736 fish was expanded to account for fish migration into the system prior to 13 June and after 31 July, resulting in a total sockeye escapement estimate of 275,963 fish (Table 1). The 1980 escapement entry pattern curve provided the best fit (minimum sums of squares value = 0.001134; 2-day late lag time) for estimating the postenumeration escapement. This level of escapement slightly exceeded the upper bound of the desired escapement goal range (150,000-250,000 fish) established prior to the 1986 season. The estimated number of potential natural spawners (sonar count minus fish used for artificial propagation of Tustumena Lake) was 264,011 fish (Table 8).

The Fisheries Rehabilitation, Enhancement, and Development Division (FRED) Crooked Creek Hatchery contribution to the escapement was estimated to be approximately 35 percent (Flagg 1986).

Hatchery contribution varied by spawning tributary, accounting for an estimated 48.7% and 77.6% of the adults returning to Bear Creek and Glacier Flats Creek, respectively. A higher proportion of hatchery fish was expected in these tributaries where the majority of the Crooked Creek facility sockeye fry were released.

Approximately 73% of the estimated sockeye salmon escapement was enumerated in tributaries of Tustumena Lake (Table 9). Eighty-one percent of the counted tributary spawners entered Bear and Glacier Flat Creeks (Table 10). The number of spawners in these two tributaries and Moose Creek exceeded maximum spawner densities presented in Tarbox et al. (1983).

Run timing information indicated that the midpoint of the estimated escapement occurred on 14 July, 1 day prior to the mean 50% date for the previous 6 years (Table 11). Eighty percent of the escapement occurred in 32 days, typical of recent run duration data.

Fifty-seven percent of the enumerated fish targets occurred on the north bank at the sonar site (Table 5 and Appendices A.13 and A.14). Migratory behavior, as expressed in terms of shore orientation, showed a tendency for more offshore distribution early in the season (Appendices A.15 and A.16). As at the Kenai site, this phenomenon was probably due to a combination of factors including compensatory overcounting for middle sectors and relatively low flow conditions. However, as the passage rate of fish increased, the proportion of fish within 6 m of the transducer approached 90%. As in previous years, there was very little change in passage rate throughout the day (Appendices A.17 and A.18).

A total of 7,801 salmon were captured in fish wheels at the Kasilof River sonar site from 28 June through 31 July (Appendices A.19 and A.20), including 7,591 sockeye salmon. Age-1.3 (42.0%), -1.2 (40.9%) and -2.2 (11.9%) fish

were the dominant age classes of sockeye salmon (Table 12). Chi-square analysis of age composition over time revealed an increase in the proportion of age-1.2 fish and a decrease in the proportion of age-1.3 fish as the season progressed. Examination of the changes between sampling periods (period dates and proportion of fish by age class by period are presented in Table 13) revealed that significant change occurred between all periods. Sockeye salmon average length and weight data by age class, and sex ratios (males to females) are presented in Appendices A.21 and A.22.

Run timing, counter limitations, and spawning locations relative to the sonar site are factors which prevent escapement estimates for Kasilof River pink salmon, coho salmon, and chinook salmon. Weir counts of chinook salmon and coho salmon were conducted by the Division of Fisheries Rehabilitation, Enhancement and Development (FRED) on Crooked Creek (a lower river tributary of the Kasilof River). A return (escapement and sport fishing harvest) of 12,656 chinook salmon of Crooked Creek origin was estimated in 1986 (Flagg 1986). The return consisted of 67% hatchery reared fish. The coho salmon count at the weir was 4,294 (Och, ADF&G, FRED Division, Kasilof, Alaska, personal communication).

It appears from the data gathered that fish targets attributed to sockeye salmon are a relatively accurate measure of the escapement of this species into the Kasilof River. Shore and bottom oriented migratory behavior conducive to counting with the Bendix counter are likely a result of relatively high water velocities which are found at this site. Additionally, the predominance of sockeye salmon in fish wheel catches indicated this was primarily a single species system during the monitoring period, and finally, documented sockeye salmon spawning areas are above the sonar site.

Crescent River

A total of 20,385 fish targets were enumerated entering Crescent River from 25 June through 16 July 1986, all of which were assigned as sockeye salmon (Table 1 and Appendix A.23). Because enumeration activities were terminated early in the escapement, Western Subdistrict catch data were used to calculate an estimated return to the river. The range of calculated escapement generated by this method was 95,631 (based on 1986 exploitation rate) to 128,618 (based on 1979-1982 mean exploitation rate) sockeye salmon. Escapement, catch and exploitation rate data used for this analysis are presented in Table 14. The escapement goal established for this system prior to the 1986 season was 50,000 to 100,000 fish (King and Tarbox 1986).

As in previous years at this site, fish movement was concentrated very close to shore, with over 95% of the fish targets enumerated within 2 m of the transducer (Appendices A.24 and A.25). Fish movement occurred primarily between 1300 hours and 2200 hours on the north bank, but was relatively evenly distributed throughout the day on the south bank (Appendices A.26 and A.27). Both parameters (shore orientation and hourly distribution) were similar to the range of historical data collected at the Crescent Lake outlet site, and the existing lower river site in 1984 and 1985.

Run timing information given in Table 15 assumes a 1986 escapement of 95,631 (the low end of the escapement range), and is presented only to provide a reference comparable to previous years. Although the timing is comparable to that of 1980-1983, these data were collected at a site estimated to be approximately 5-6 days travel time upstream from the existing site. Relative to timing information for the years 1984 and 1985 (data collected at the existing site), the 1986 escapement was approximately 7 days late. Returns to the Kenai, Kasilof, and Yentna Rivers were also estimated to be from 2 to 7 days late in 1986. As in previous years, there was a relatively constant passage rate of 2% to 3% of the escapement entering the river each day.

A total of 139 sockeye salmon were sampled for age, length, and weight data. Age structure of fish sampled was 64.0% age-2.3 fish, 15.8% age-1.3 fish, and 13.0% age-2.2 fish (Table 16). The inadequate sample size resulted in 95% confidence intervals which greatly exceeded the proportions of the latter two age classes. Average length and weight by sex and age class, and the ratio of males to females for sockeye salmon collected are presented in Appendices A.28 and A.29.

Evaluation of migratory behavior information (targets inshore and near bottom) was interpreted to mean that most fish were available to ensonification by the Bendix counter. In addition, fish passage occurred primarily during the daylight hours when counter accuracy could be measured to some degree by visual observation. Other factors entering the process of evaluating the accuracy of the sockeye salmon escapement estimate were the absence of other species of salmon in the sampling program, and the absence of known sockeye salmon spawning sites downriver of the site. The combination of these factors implies that the total number of fish targets attributed to sockeye salmon during the counting period is probably accurate.

There is, however, no way of gauging the accuracy of the total escapement estimate. Regression analysis of 1985 data (King and Tarbox 1986) revealed that there was no significant correlation between daily commercial harvest in the Western Subdistrict and daily escapement into the river. However, the cumulative exploitation rate stabilized with the onset of continuous fishing and remained constant for the duration of the enumeration period. This phenomenon was also observed in 1984. If this also held true in 1986, then the calculated escapement range is probably reasonable.

Susitna River

Escapement estimates provided by hydroacoustic methods were limited to the Yentna River drainage in 1986. These escapement monitoring activities were conducted at Yentna Station, approximately 6 miles upstream of the confluence of the Yentna and Susitna Rivers. Stream survey and weir counts for tributaries of the mainstem Susitna River are also provided where known.

Sockeye Salmon

During the period of 29 June through 6 August, 841,646 fish targets were enumerated in the Yentna River (Appendix A.30). The apportioned sockeye

salmon count of 86,516 fish was expanded to 92,077 to account for fish passing the site after 6 August (Table 1). The 1983 escapement entry pattern curve provided the best fit (minimum sums of squares value = 0.000575; 7-day late lag time) for estimation of postcounting escapement.

Spawning ground survey information is presented in Table 17. Counts from a weir placed at the outlet of Larson Lake (32,322 sockeye salmon) were the only significant sockeye salmon escapement information collected from tributaries of the mainstem Susitna River above its confluence with the Yentna River. Aerial surveys of established index areas were discontinued in 1986 for budget reasons.

The midpoint of the return to the Yentna River passed the counters on 28 July, 1 day prior to the peak passage date (Table 18). Run timing, as measured by the midpoint, was approximately 7 days (21 July) later than the mean for the previous 5 years. The south bank sockeye salmon count, which contributed 68% of the total (Table 5), peaked on 29 July, 1 day after the north bank (Appendices A.31 and A.32). Eighty percent of the escapement passed the counters in 11 days (Table 18), making the 1986 escapement of short duration relative to previous years.

Sector distribution data analysis of the south bank fish targets indicated that greater than 90% of the fish counted during the peak of sockeye escapement (23 July through 3 August; over 90% of the escapement) were within 6 m of the transducer (Appendix A.33). In contrast to previous years, north bank fish targets were also consistently recorded within 6 m of the transducer (Appendix A.34). As at other sites, field observation indicated that a portion of the inshore and offshore sector counts were compensatory for fish undercounting in the middle sectors. Counts on both banks were relatively evenly distributed throughout the day (Appendices A.35 and A.36).

Fish wheel catches at Yentna Station are presented in Appendices A.37 and A.38. A total of 1,192 sockeye salmon were captured of which 688 were used for AWL analysis. The age structure of the escapement consisted of 56.5% age-1.3 fish, 22.7% age-1.2 fish, and 10.0% age-2.3 fish (Table 19). Of passing interest is the high percentage of freshwater age-0 fish in the return (4% of the adults sampled were age-0.2 and -0.3). These fish, which do not appear to rear in freshwater, were likely headed for spawning grounds in the headwaters of the West Fork of the Yentna River. Parent year adult returns to this spawning area were estimated at 9000-10,000 in 1983 and 1984. Calculated mean length and weight of sockeye salmon by age class and sex, as well as ratio of males to females are presented in Table 19.

Pink Salmon

The pink salmon sonar count at Yentna Station in 1986 was 673,973 (Appendix A.30). This total was expanded to 735,691 to account for fish passing the counters after termination of escapement activities. The 1982 pink salmon entry pattern curve provided the best fit (minimum sums of squares value of 0.001459) when lagged 2 days early. Spawning ground survey data were available only from Shell Lake (172 fish) and Larson Lake (1,938 fish; Table 17).

The daily pink salmon count recorded at Yentna Station peaked on 27 July, 1 day after the midpoint of the total pink salmon count (Table 20). Eighty percent of the fish targets attributed to pink salmon were recorded in 11 days, typical of run duration for even year pink runs in previous years at this site. Migratory behavior analysis indicates that, as with sockeye salmon, nearly all targets counted (>90%) were within 6 m of the transducer (Appendices A.33 and A.34). No differences were detected in fish passage relative to time of day (Appendices A.35 and A.36).

It is apparent from sonar and fish wheel data that pink salmon migratory behavior influenced the analysis of shore orientation and hourly distribution presented in the above appendices. The large numbers of this species relative to other species (pink salmon were 79% of the estimated total salmon escapement) implies that their migratory behavior effectively masked the behavior of all species with similar run timing.

No AWL data were collected from pink salmon entering the Yentna River due to in-season budget cuts which eliminated personnel available for sampling.

Chum Salmon

Fish targets assigned to chum salmon at Yentna Station numbered 56,657 in 1986 (Appendix A.30). The estimated total escapement for this species was the highest total on record for the Yentna River drainage. Spawning ground counts were limited to the 108 fish enumerated entering Larson Lake (Table 17).

Complete migratory timing information for chum salmon was not available from Yentna Station due to cessation of enumeration activities in early August. However, in the years 1981-1984 when counting efforts extended into September, a range of 64.2% to 85.4% of the chum salmon counts were recorded by 6 August (Table 21). The peak daily count of chum salmon in 1986 occurred on 30 July.

No AWL data were collected from chum salmon entering the Yentna River due to in-season budget cuts which eliminated personnel available for sampling.

Coho Salmon

The coho salmon sonar count at Yentna Station numbered 23,457 in 1986 (Appendix A.30). The estimated escapement was the second highest total on record for Yentna Station despite early cessation of counting activities relative to this species. Ninety-seven coho salmon were enumerated entering Larson Lake and 87 entering Shell Lake (Table 17). No other spawning ground counts were available in 1986.

As with chum salmon, migratory timing information at Yentna Station was not available for this species. In the years 1981-1984, 61.1% to 84.0% of the sonar counts attributed to coho salmon occurred prior to 7 August (Table 22). The relative abundance of other species migrating concurrent to coho salmon during peak periods effectively masked additional migratory behavior data collected by sonar for this species.

No AWL data were collected from coho salmon entering the Yentna River due to in-season budget cuts which eliminated personnel available for sampling.

Chinook Salmon

Chinook salmon escapement estimates have not been generated using hydroacoustic equipment at Susitna Station since 1978. Migratory behavior not conducive to enumeration by side-scan sonar, and early run timing in comparison to other salmon species are the primary reasons for the lack of an enumeration program. Petersen mark/recapture estimates reported in previous years were not available due to termination of the Susitna Hydroelectric project prior to the 1986 season. Sport Fish Division stream surveys enumerated 48,597 fish to selected tributaries within the drainage (ADF&G 1986). This total was considered a minimum estimate because not all potential spawning grounds were surveyed, and the methodology does not lend itself to complete enumeration of all spawners within streams surveyed. Individual tributary counts are presented in Table 17.

Evaluation of Data

Data from various studies conducted on the Susitna River indicated that, in general, chum salmon, coho salmon, and chinook salmon do not exhibit strong inshore orientation in the lower Susitna and Yentna Rivers (Waltemyer et al. 1980, Tarbox et al. 1981, Tarbox et al. 1983). Therefore, only that component of the escapement migrating within the counting range of the respective sonar equipment was included in the total fish target counts. Additionally, various siting criteria (King 1987) must be met to insure that even normally shore oriented species (sockeye salmon and pink salmon) move through the hydroacoustic beam during migration. Failure to meet these criteria can result in undercounting.

Analysis of Flathorn Station tag recovery information in 1985 (Thompson et al. 1986) indicated that there was some degree of crossover which occurred in the Susitna River below the Yentna River confluence. That is, some proportion of the fish tagged on the west bank were later recaptured at Sunshine Station, and fish tagged of the east bank were later recaptured at Yentna Station. The proportion of fish exhibiting this behavior varied by species and ranged from 4% (west bank caught chum salmon recaptured at Sunshine Station) to 43% (east bank caught pink salmon recaptured at Yentna Station). Sockeye salmon crossover rates were 10.5% west bank to east bank, and 19.6% east bank to west bank. This behavior may also be apparent at Yentna Station, however it appears that increased water velocity relative to Susitna Station counting sites may limit this type of activity.

Accuracy of assigning sonar counts to species can also be affected by differences in migratory behavior between species (Thompson and Barrett 1983). This results in problems in apportioning total fish targets based on fish wheel catches. Fish that cross the substrate in the outer sectors may not be subject to fish wheel capture, resulting in apportioned fish targets being biased toward those species which exhibit the strongest inshore preference. The degree to which these factors affect the accuracy of the fish target apportioning process is dependent yearly on shore orientation and run strength of each species relative to the others. If one assumes that shore orientation of all species on the south bank at Yentna Station was the same at the fish wheel site as at the sonar counting site, then the majority of the fish were within the offshore range of the fish wheel. However, there are other factors which influence fish wheel efficiency, such as location of the

wheel, daily timing of openings (on days when the fish wheel is fished less than 24 h) and fish avoidance. These factors can also affect the validity of the apportionment process. Results of changing fish wheel locations inseason at Flathorn Station in 1985 are documented in Thompson et al. (1986).

Despite the potential problems mentioned above, it is felt that the existing sonar system provides a reasonably good indicator of the sockeye escapement into the Yentna River. River velocities comparable to the Kenai and Kasilof sites seem adequate to orient fish close to shore. Run timing appears to fall primarily within the confines of the existing operation dates, keeping modeling of the postenumeration segment of the escapement to a minimum. In addition, work by Thompson and Barrett (1983) suggested that fish wheel catches were a reasonably accurate measure of the proportion sockeye salmon passing their sampling sites. Estimates of escapement of other species should be viewed as indices given the potential problems discussed above.

The minimum counted sockeye salmon escapement, defined as the total of Yentna Station sonar counts and the weir count from Larson Lake, was 124,399 sockeye salmon. In the previous two years (1984-1985), escapement counts from the above two sites accounted for 66% and 64% of the combined Yentna Station/Sunshine Station sockeye salmon total. Some proportion of the total river sockeye salmon escapement also spawns in tributaries below the confluence of the Talkeetna and Susitna Rivers.

Upper Cook Inlet Minor Systems

Escapement estimates for various Upper Cook Inlet rivers (Figure 6) not regularly monitored by Commercial Fisheries Division staff are summarized in Table 23. Additional detail is provided for systems where an effort was made to quantify total escapement, or where index areas have been established to provide relative year to year comparative data.

Fish Creek (Big Lake)

Salmon enumeration was accomplished primarily through a weir operated below Big Lake. Final escapement counts were 29,800 sockeye salmon and 2,166 coho salmon (Chlupach, ADF&G, FRED Division, Palmer, Alaska, personal communication). Migratory timing information and AWL data for sockeye salmon spawning in this drainage are presented in Tables 24 and 25, respectively. As with other systems monitored by Commercial Fisheries Division, run timing appeared to be approximately 5 to 7 days late relative to previous years.

Packers Lake (Kalgin Island)

A total of 29,604 sockeye salmon were counted through a weir established below the outlet of Packers Lake (Marcuson 1986d). The cited report also contains adult salmon AWL information and results of smolting projects.

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TABLES AND FIGURES

TABLES AND FIGURES

Table 1. Estimated sockeye salmon escapement recorded by side scan sonar in the Kenai, Kasilof, Crescent, and Susitna Rivers, 1978-1986.

Year	System			
	Kenai R. ^a	Kasilof R.	Crescent R.	Susitna R. ^b
1978	398,900	116,600 ^c	d	94,400
1979	285,020	152,179 ^c	86,654	156,890
1980	464,038	187,154 ^c	90,863	190,866
1981	407,639	256,625 ^c	41,213	340,232
1982	619,831	180,239 ^c	58,957	215,856 ^e -265,332 ^f
1983	630,340	210,271 ^c	92,343	112,314 -175,936 ^f
1984	344,571	231,685 ^c	118,345	194,480 ^e -279,446 ^f
1985	502,820	505,049 ^c	128,628	227,924 ^f
1986	501,157	275,963 ^c	20,385 ^g	92,077 ^h

^a Includes counts after 21 June only.

^b Apportioned sonar counts from Susitna Station unless otherwise indicated.

^c Includes counts or estimates from designated early period (prior to 15 June).

^d No counts conducted.

^e Apportioned sonar counts from Yentna Station and Susitna Station east bank.

^f Apportioned sonar count from Yentna Station and mark/recapture estimate from Sunshine Station.

^g Counts through 16 July only.

^h Counts from Yentna Station only.

Table 2. Late run Kenai River sockeye salmon escapement summary, 1968-1986.

Year	Estimated Escapement at Sonar Site ^a	Russian River Sport Harvest ^b	Kenai River Mainstem Sport Harvest ^c	Estimated Total Harvest Above Sonar Site ^d	Sonar Count Less Sport Harvest ^e
1968	88,000	5,820			
1969	53,000	1,150			
1970	73,000	600			
1971	--	10,730			
1972	318,000	16,050			
1973	367,000	8,930			
1974	161,000	8,500	8,030	16,530 ^f	144,470
1975	142,000	8,390	5,110	13,500 ^f	128,500
1976	380,000	13,700	13,140	26,840 ^f	353,160
1977	708,000	27,440	16,933	44,373 ^f	663,627
1978	398,900	24,530	24,542	49,072 ^f	349,828
1979	285,020	26,830	12,328	39,158 ^f	245,862
1980	464,038	33,490	18,592	52,082 ^f	411,956
1981	407,639	23,720	14,451	38,171	369,468
1982	619,831	10,321	38,397	48,718	571,113
1983	630,340	16,000	48,306	64,306	560,034
1984	344,571	21,970	11,280	33,250	311,321
1985	502,820	58,410	42,272	100,682	402,138
1986	501,157	34,200	55,000 ^g	89,200 ^g	411,957

^a Multiple transducer sonar 1968-1977, side scan sonar 1978-1986.

^b Nelson (1986).

^c Data from Sport Fish Division Statewide Harvest Estimate. Includes harvest above the Soldotna bridge (and sonar site) only.

^d Total of Russian River sport harvest and Kenai River mainstem harvest above the Soldotna bridge.

^e Considered estimate of spawners above the sonar site.

^f Cross et al. 1983.

^g Preliminary.

Table 3. Peak late run sockeye salmon escapement counts in eight index areas, Kenai River drainage, 1969-1985.

Year	Railroad Creek	Johnson Creek	Carter- Moose Creek	Ptarmigan Creek	Tern (Mud) Lake	Quartz Creek	Hidden Lake ^a	Russian River ^b	Total Index Area Escapement ^c
1969	100	75	598	5	487	487	500	30,020	32,300
1970	99	118	348	7	561	200	323	28,420	30,100
1971	194	160	3,201	45	1,370	808	1,958	64,430	72,200
1972	700	150	3,400	d	1,200	d	4,956	85,000	95,400
1973	521	1,714	660	1,041	1,731	3,173	690	31,660	41,200
1974	d	46	939	558	d	255	1,150	26,860	29,800
1975	522	105	1,278	186	1,214	1,068	1,375	32,600	38,400
1976	1,032	d	5,558	d	1,548	3,372	4,860	35,420	51,800
1977	1,262	450	6,515	1,513	2,230	3,037	1,055	38,500	54,600
1978	1,749	780	1,933	3,529	1,126	10,627	4,647	52,560	77,000
1979	--	588	3,986	523	1,693	277	5,762	91,840	104,700
1980	1,259	253	4,879	5,752	2,575	7,982	27,448	87,200	137,300
1981	1,276	142	4,370	1,421	3,402	5,998	15,939	48,690	81,200
1982	2,518	498	4,752	7,525	4,300	70,540 ^e	8,648	75,630	174,400
1983	1,289	338	1,819	9,709	d	73,345 ^e	11,297	78,000	176,000
1984	2,090 ^f	939 ^f	5,927 ^f	18,000 ^f	2,728 ^f	37,659 ^f	27,792	95,660	190,800
1985	2,884 ^f	151 ^f	5,928 ^f	26,879	d	d	24,784	145,620	206,200
1986	600 ^f	245 ^f	1,659 ^f	f	d	d	17,530	46,422	66,500

^a Weir count in the years 1971, 1973, 1976-1986.

^b Includes total weir counts of fish entering Lower Russian Lake and peak count of escapement below falls. Nelson et al., 1986.

^c Total of individual counts rounded to the nearest hundred fish.

^d No counts conducted.

^e F.R.E.D. Division weir count.

^f Personal communication, Ralph Browning, United States Department of Agriculture, Forest Service, Seward, Alaska.

Table 4. Salmon escapement counts conducted on selected tributaries of the Kenai River, 1986.

	Method	Peak Count			
		Sockeye	Pink	Coho	Chinook
Russian River ^a	Weir	36,200		1,814	159
Crescent Creek	Stream Count				113
Grant Creek ^b	Weir	675	3	846	46
Juneau Creek	Stream Count				127
Moose River ^c	Stream Count	1,323		4,035	
	pop estimate	2,919			

^a Sockeye salmon count includes early run only. Nelson et al. 1986.
Coho count incomplete.

^b Marcuson 1986a.

^c Booth, 1987.

Table 5. Bank distribution of sockeye salmon escapement recorded by side scan sonar in the Kenai, Kasilof, Crescent, and Yentna Rivers, 1981-1986.

	Percent of Total Fish Targets ^a					
	1981	1982	1983	1984	1985	1986
Kenai River						
North Bank	72	39	42	65	54	62
South Bank	28	61	58	35	46	38
Kasilof River						
North Bank	69	73	51	56	70	57
South Bank	31	27	49	44	30	43
Crescent River						
North Bank	57	54	39	71	70	84
South Bank	43	46	61	29	30	16
Yentna River						
North Bank					9	32
South Bank					91	68

^a Does not include estimates of numbers of fish which entered the systems prior to or after enumeration operations.

Table 6. Cumulative proportion by date of late run sockeye salmon counts recorded in the Kenai River, 1980.

Date	Cumulative Proportion						
	1980	1981	1982	1983	1984	1985	1986
22-Jun	0.002	0.001	0.002	0.001	0.003	0.001	0.001
23-Jun	0.004	0.001	0.003	0.001	0.007	0.002	0.002
24-Jun	0.005	0.002	0.004	0.002	0.010	0.003	0.003
25-Jun	0.006	0.003	0.004	0.003	0.012	0.004	0.004
26-Jun	0.008	0.004	0.005	0.004	0.013	0.005	0.004
27-Jun	0.008	0.006	0.006	0.005	0.015	0.006	0.005
28-Jun	0.009	0.007	0.007	0.006	0.017	0.007	0.006
29-Jun	0.010	0.008	0.007	0.006	0.018	0.009	0.007
30-Jun	0.011	0.009	0.008	0.007	0.021	0.010	0.008
01-Jul	0.012	0.010	0.009	0.007	0.023	0.014	0.009
02-Jul	0.013	0.012	0.010	0.008	0.024	0.016	0.010
03-Jul	0.014	0.012	0.011	0.008	0.025	0.017	0.011
04-Jul	0.015	0.013	0.011	0.009	0.027	0.019	0.012
05-Jul	0.016	0.013	0.012	0.009	0.029	0.021	0.013
06-Jul	0.016	0.014	0.012	0.009	0.031	0.024	0.014
07-Jul	0.017	0.016	0.013	0.010	0.032	0.026	0.016
08-Jul	0.017	0.018	0.013	0.010	0.036	0.030	0.016
09-Jul	0.018	0.064	0.015	0.011	0.044	0.032	0.016
10-Jul	0.018	0.186	0.016	0.013	0.054	0.033	0.017
11-Jul	0.019	0.262	0.016	0.017	0.063	0.036	0.017
12-Jul	0.020	0.366	0.017	0.021	0.067	0.038	0.018
13-Jul	0.020	0.463	0.019	0.041	0.071	0.039	0.020
14-Jul	0.021	0.512	0.021	0.085	0.073	0.048	0.044
15-Jul	0.027	0.549	0.026	0.174	0.076	0.066	0.057
16-Jul	0.057	0.559	0.047	0.242	0.112	0.104	0.068
17-Jul	0.310	0.572	0.067	0.297	0.173	0.111	0.081
18-Jul	0.489	0.605	0.182	0.437	0.307	0.114	0.095
19-Jul	0.607	0.667	0.322	0.566	0.363	0.115	0.114
20-Jul	0.777	0.747	0.474	0.695	0.406	0.116	0.126
21-Jul	0.899	0.803	0.563	0.766	0.464	0.120	0.194
22-Jul	0.920	0.835	0.598	0.796	0.555	0.178	0.300
23-Jul	0.926	0.848	0.642	0.813	0.652	0.291	0.359
24-Jul	0.932	0.864	0.681	0.833	0.720	0.463	0.426
25-Jul	0.935	0.876	0.722	0.844	0.781	0.574	0.525
26-Jul	0.938	0.894	0.752	0.861	0.833	0.693	0.689
27-Jul	0.944	0.911	0.842	0.865	0.867	0.753	0.814
28-Jul	0.947	0.921	0.883	0.872	0.897	0.822	0.874
29-Jul	0.952	0.932	0.903	0.878	0.913	0.864	0.910
30-Jul	0.955	0.940	0.918	0.882	0.921	0.897	0.961
31-Jul	0.957	0.948	0.931	0.891	0.928	0.911	1.000

- Continued -

Table 6. (page 2 of 2)

Date	Cumulative Proportion						
	1980	1981	1982	1983	1984	1985	1986
01-Aug	0.960	0.955	0.940	0.906	0.933	0.919	
02-Aug	0.962	0.964	0.946	0.916	0.937	0.922	
03-Aug	0.964	1.000	0.951	0.920	0.943	0.925	
04-Aug	0.966		0.955	0.934	0.948	0.929	
05-Aug	0.968		1.000	0.964	0.956	0.931	
06-Aug	0.970			0.977	0.960	0.935	
07-Aug	97.2			98.3	96.3	93.8	
08-Aug	97.4			98.9	96.9	94.3	
09-Aug	97.5			99.3	100.0	94.7	
10-Aug	97.8			99.6		95.3	
11-Aug	98.2			99.9		96.0	
12-Aug	98.5			100.0		100.0	
13-Aug	99.2						
14-Aug	99.3						
15-Aug	99.3						
16-Aug	99.5						
17-Aug	99.6						
18-Aug	99.7						
19-Aug	99.7						
20-Aug	99.7						
21-Aug	99.8						
22-Aug	99.8						
23-Aug	99.9						
24-Aug	99.9						
25-Aug	99.9						
26-Aug	99.9						
27-Aug	99.9						
28-Aug	100.0						
29-Aug	100.0						
30-Aug	100.0						
31-Aug	100.0						
01-Sep	100.0						
02-Sep	100.0						
03-Sep	100.0						
04-Sep	100.0						

Table 7. Age composition of sockeye salmon collected in the Kenai River, 1970-1986.

Year	Percent Composition by Age Class ^{a,b}								Sample Size
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	
1970	tr	10.0	17.0	tr	26.0	25.0	15.0	6.0	225
1971	0	8.0	39.0	1.0	3.0	38.0	11.0	0	168
1972	0	21.0	34.0	0	0	23.0	20.0	0	403
1973	0	5.0	68.0	1.0	1.0	8.0	16.0	0	632
1974	2.0	18.0	46.0	0	3.0	18.0	12.0	0	295
1975	2.0	10.0	36.0	2.0	4.0	31.0	14.0	1.0	163
1976	1.0	46.0	20.0	0	2.0	22.0	8.0	1.0	948
1977	0	6.0	76.0	1.0	tr	7.0	10.0	0	1,265
1978	0	2.5	86.7	0	0	4.9	5.4	tr	811
1979	tr	20.2	61.1	0	0	11.8	6.2	tr	601
1980	0	27.7	45.1	0	0	16.2	10.1	tr	715
1981	0	16.2	70.9	0	0	8.1	4.8	0	1,757
1982	0.1	5.8	87.5	tr	0	2.9	3.7	0	1,787
1983	0.4	8.2	79.1	0.2	0.5	2.2	8.9	0.4	1,765
1984	0.2	23.4	38.2	3.5	0.6	12.8	19.2	2.2	2,364
1985	0.1	15.9	56.4	0.3	0.1	14.7	11.4	1.1	2,201
		(20.3)	(7.7)			(21.0)	(24.8)		
1986	0	31.8	39.5	0.7	0.3	8.2	18.0	1.5	789
		(10.2)	(8.6)				(14.9)		

^a Percentages weighted by total numbers of fish in escapement: 1978 (Bethe et al. 1980) 1979-1982, 1984-1986.

^b 95% confidence interval: +/- figures in parentheses.

Table 8. Kasilof River sockeye salmon escapement summary, 1968-1986.

Year	Escapement Estimated by Sonar Count ^a	Fish Used for Artificial Propagation of Tustumena Lake	Sonar Count Less Egg Take ^b
1968	89,000		
1969	46,000		
1970	38,000		
1971	---		
1972	113,000		
1973	40,000		
1974	70,000	205 ^c	69,795
1975	48,000	3,365	44,635
1976	139,000	5,463	133,537
1977	155,300	1,794	153,506
1978	116,600	6,681	109,919
1979	152,179	3,024	149,155
1980	187,154	6,030	181,124
1981	256,625	9,700 ^d	246,925
1982	180,239	11,571	168,668
1983	210,271	9,903	200,368
1984	231,685	11,141	220,544
1985	505,049	11,280	493,769
1986	275,963	11,952 ^e	264,011

- Continued -

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- a Multiple transducer sonar counts rounded to the nearest thousand (1968-1977) from Namtvedt et al. (1979). Side scan sonar counts (1979-1981) from Tarbox et al. (1983).
 - b Considered estimate of natural spawners above sonar site.
 - c From Cross et al. (1983): 1974-1980.
 - d Personal communication, Waite, ADF&G, FRED Division, Soldotna, Alaska: 1981-1985.
 - e Personal communication, Litchfield, ADF&G, FRED Division, Soldotna, Alaska.

Table 9. Peak sockeye salmon escapement counts in seven index areas, Kasilof River drainage, 1975-1986.

Year ^a	Nikolai	Crystal	Clear	Glacier Flat ^b	Seepage	Moose	Bear ^b	Total Index Count ^c
1975	5,700	400	300	14,400	3,700	3,300	27,700	55,500
1976	12,000	800	300	7,100	800	14,000	51,800	86,800
1977	29,100	600	1,800	5,800	800	16,600	58,000	112,700
1978	34,200	200	200	4,700	1,100	15,900	43,400	99,700
1979	19,100	500	400	5,600	800	8,100	35,900	70,400
1980	10,000	1,000	2,100	15,500	1,800	15,600	125,000	171,400
1981	36,000	860	2,978	40,071	3,376	12,968	75,117	171,400
1982	16,800	1,785	4,183	17,348	1,638	13,400	51,350	106,500
1983	17,100	1,657	860	38,776	3,305	19,245	61,957	142,900
1984	8,270	141	2,619	76,217	6,250	13,999	54,328	161,800
1985	17,500	800	3,500	121,400	5,700	9,200	120,400	278,500
1986 ^d	11,900	1,400	2,700	60,600	2,000	21,200	102,900	202,700

^a Counts standardized to common unit for years entire stream was not surveyed. Relative abundance per section (when entire system surveyed) was used to extrapolate for years when only a portion of stream was surveyed. Numbers rounded to nearest hundred fish.

^b F.R.E.D. Division weir count, 1980-1986.

^c Rounded to nearest 100 fish.

^d Flagg, 1986.

Table 10. Distribution (percent) of total index count of sockeye salmon in the major tributary systems of Tustumena Lake, 1975-1986.

Year	Nikolai	Moose	Bear ^a	Glacier Flat ^a	Other
1975	10.2	5.9	49.9	25.9	8.1
1976	13.8	16.2	59.8	8.2	2.0
1977	25.8	14.7	51.5	5.1	2.9
1978	34.3	15.9	43.5	4.7	1.6
1979	27.1	11.5	51.0	7.9	2.5
1980	5.8	9.1	73.1	9.0	3.0
1981	21.0	7.6	43.8	23.3	4.3
1982	15.8	12.6	48.2	16.3	7.1
1983	12.0	13.5	43.4	27.1	4.0
1984	5.1	8.7	33.6	47.1	5.6
1985	6.0	3.0	43.0	44.0	4.0
1986	5.9	10.4	50.8	29.9	3.0

^a F.R.E.D. Division weir count, 1980-1986.

Table 11. Cumulative proportion by date of sockeye salmon counts recorded in the Kasilof River, 1980-1986. Proportion accrued on first day (1983-1986) and last day (1981-1986) represents that portion of the escapement estimated before and after enumeration activities.

Date	Cumulative Proportion						
	1980	1981	1982	1983	1984	1985	1986
14-May		0.000					
15-May		0.001					
16-May		0.003					
17-May		0.003					
18-May		0.005					
19-May		0.006					
20-May		0.006					
21-May		0.007					
22-May		0.008					
23-May		0.008					
24-May		0.010					
25-May		0.011					
26-May		0.012					
27-May		0.013					
28-May		0.014					
29-May		0.015					
30-May		0.016					
31-May		0.018					
01-Jun		0.020					
02-Jun		0.022					
03-Jun		0.025					
04-Jun		0.027					
05-Jun		0.030					
06-Jun		0.032					
07-Jun		0.035					
08-Jun		0.038					
09-Jun		0.040			0.007		
10-Jun		0.043	0.001	0.045	0.008		
11-Jun		0.045	0.003	0.046	0.009		
12-Jun		0.047	0.005	0.048	0.011	0.002	0.037
13-Jun		0.049	0.007	0.050	0.012	0.003	0.041
14-Jun		0.051	0.008	0.051	0.013	0.003	0.045
15-Jun		0.055	0.010	0.053	0.015	0.004	0.048
16-Jun		0.059	0.011	0.056	0.018	0.004	0.053
17-Jun		0.064	0.013	0.058	0.020	0.005	0.059
18-Jun		0.075	0.015	0.060	0.022	0.005	0.062
19-Jun		0.082	0.027	0.063	0.025	0.006	0.066

- Continued -

Table 11. (page 2 of 2)

Date	Cumulative Proportion						
	1980	1981	1982	1983	1984	1985	1986
20-Jun		0.099	0.035	0.065	0.031	0.007	0.068
21-Jun		0.114	0.040	0.068	0.039	0.007	0.071
22-Jun	0.003	0.133	0.043	0.070	0.048	0.008	0.073
23-Jun	0.007	0.162	0.045	0.074	0.058	0.009	0.074
24-Jun	0.009	0.195	0.049	0.076	0.069	0.012	0.075
25-Jun	0.022	0.223	0.053	0.078	0.075	0.015	0.077
26-Jun	0.035	0.261	0.055	0.080	0.080	0.017	0.079
27-Jun	0.051	0.288	0.058	0.082	0.089	0.019	0.082
28-Jun	0.075	0.342	0.061	0.085	0.099	0.022	0.085
29-Jun	0.094	0.389	0.064	0.090	0.111	0.025	0.095
30-Jun	0.136	0.438	0.069	0.110	0.123	0.029	0.121
01-Jul	0.166	0.500	0.078	0.153	0.136	0.035	0.153
02-Jul	0.217	0.512	0.091	0.165	0.150	0.039	0.180
03-Jul	0.250	0.522	0.104	0.188	0.157	0.044	0.198
04-Jul	0.280	0.529	0.115	0.212	0.178	0.056	0.215
05-Jul	0.314	0.534	0.122	0.221	0.217	0.066	0.228
06-Jul	0.338	0.543	0.129	0.231	0.243	0.071	0.245
07-Jul	0.353	0.551	0.136	0.240	0.263	0.078	0.257
08-Jul	0.366	0.562	0.145	0.247	0.304	0.095	0.261
09-Jul	0.379	0.604	0.156	0.263	0.358	0.103	0.269
10-Jul	0.393	0.649	0.164	0.294	0.391	0.114	0.289
11-Jul	0.413	0.677	0.177	0.315	0.411	0.119	0.323
12-Jul	0.421	0.712	0.197	0.344	0.416	0.126	0.337
13-Jul	0.426	0.746	0.217	0.395	0.427	0.148	0.430
14-Jul	0.436	0.797	0.247	0.465	0.445	0.208	0.501
15-Jul	0.464	0.838	0.293	0.514	0.484	0.267	0.513
16-Jul	0.528	0.863	0.358	0.547	0.543	0.382	0.528
17-Jul	0.570	0.877	0.404	0.663	0.590	0.418	0.544
18-Jul	0.609	0.891	0.491	0.759	0.636	0.432	0.562
19-Jul	0.649	0.904	0.577	0.775	0.693	0.436	0.575
20-Jul	0.693	0.922	0.642	0.785	0.739	0.439	0.586
21-Jul	0.715	0.936	0.702	0.804	0.778	0.464	0.601
22-Jul	0.738	0.942	0.744	0.822	0.810	0.551	0.611
23-Jul	0.775	0.947	0.759	0.833	0.832	0.609	0.618
24-Jul	0.788	0.952	0.769	0.842	0.864	0.649	0.627
25-Jul	0.803	0.954	0.784	0.849	0.888	0.683	0.717
26-Jul	0.818	0.957	0.800	0.854	0.910	0.733	0.795
27-Jul	0.830	0.959	0.818	0.858	0.918	0.791	0.806
28-Jul	0.840	0.962	0.836	0.862	0.926	0.826	0.812
29-Jul	0.853	0.963	0.847	0.867	0.933	0.842	0.829
30-Jul	0.864	0.964	0.857	0.874	0.939	0.853	0.888

- Continued -

Table 11. (page 3 of 3).

Date	Cumulative Percent						
	1980	1981	1982	1983	1984	1985	1986
31-Jul	0.878	0.966	0.866	0.889	0.943	0.865	0.917
01-Aug	0.889	1.000	0.876	1.000	1.000	0.875	1.000
02-Aug	0.900		0.886			0.881	
03-Aug	0.906		0.895			0.890	
04-Aug	0.915		1.000			0.898	
05-Aug	0.925					0.904	
06-Aug	0.932					0.909	
07-Aug	0.939					0.917	
08-Aug	0.946					0.927	
09-Aug	0.961					0.938	
10-Aug	0.968					0.945	
11-Aug	0.979					0.949	
12-Aug	0.988					1.000	
13-Aug	1.000						

Table 12. Age composition of sockeye salmon collected in the Kasilof River, 1969-1986.

Sample Period	Percent Composition by Age Class ^{a,b}								Sample Size
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	
6/23 - 7/12/86		13.2	72.9	0.6	0	8.6	4.6	0.2	654
7/13 - 7/23/86		51.8	29.9	0.4	0	13.7	3.9	0.4	512
7/24 - 7/31/86		57.3	23.7	0	0.2	13.6	5.1	0.2	494
Seasonal Summary									
1969	0	14.0	39.0	1.0	0	30.0	16.0	0	399
1970	tr	32.0	37.0	2.0	0	16.0	11.0	1.0	297
1971	0	6.0	69.0	0	0	8.0	16.0	0	153
1972	tr	42.0	36.0	1.0	tr	3.0	18.0	tr	668
1973	0	20.0	57.0	0	0	19.0	4.0	0	374
1974	0	35.0	59.0	0	tr	4.0	2.0	0	254
1975	1.0	29.0	7.0	0	0	58.0	4.0	1.0	931
1976	tr	32.0	20.0	0	tr	35.0	12.0	0	755
1977	tr	30.0	30.0	0	1.0	28.0	11.0	0	1,209
1978	0	42.0	35.0	0	0	14.0	9.0	0	967
1979	0	52.2	37.2	0	tr	8.4	1.7	tr	590
1980	0	58.7	27.8	0	0	8.0	4.5	1.0	899
1981	0	30.2	62.2	0	0	6.0	1.6	0	1,479
1982	1.0	34.0	49.5	0	0.1	10.7	4.7	0.1	1,518
1983	0	48.4	34.3	0	0	12.8	4.5	0	1,997
1984	0	50.5	24.8	tr	0.2	17.9	6.6	0	2,269
1985	0.2	57.3	21.8	0.1	0.1	17.8	2.6	0	3,063
		(5.2)	(10.9)			(12.8)			
1986	0	40.9	42.0	0.3	0.8	11.9	4.6	0.2	1,660
		(5.5)	(5.3)			(14.5)			

^a Percentages weighted by total numbers in escapement: 1979-1986.

^b 95% confidence interval: +/- figures in parentheses.

Table 13. Summary of chi-square analysis of temporal change in Kasilof River sockeye salmon age composition, 1986.

Periods ^a	No. Age Classes ^b	Chi Square					
		Table				Signif?	Hypoth ^c
		Calc.	Alpha	DF	Value		
1-3	2	363.63	0.05	3	7.81	yes	reject
1-2	2	241.76	0.05	1	3.84	yes	reject
2-3	2	4.99	0.05	1	3.84	yes	reject

^a Period 1: 6/23-7/12.

Period 2: 7/13-7/23.

Period 3: 7/24-7/31.

^b Age classes: 1.2, 1.3.

^c Hypothesis: Age class structure is independent of time of sampling.

Table 14. Crescent River sockeye salmon escapement, Western Subdistrict catch, and calculated exploitation rate, 1979-1986.^a

	Year							
	1979	1980	1981	1982	1983	1984	1985	1986
Escapement	86654	90863	41213	58957	92122	118345	128628	20385
Catch	56807	75612	21739	21840	60384	119001	185375	15858
Total Return	143461	166475	62952	80797	152506	237346	314003	36243
Exploitation Rate	39.6%	45.4%	34.5%	27.0%	39.6%	50.1%	59.0%	43.8%

^a 1986 escapement through 16 July, catch through 13 July.
 Total 1986 Western Subdistrict catch (through 15 August) = 74,394.
 Average exploitation rate, 1979-1982 = 36.6%
 Calculated 1986 escapement using 1986 exploitation rate through 13 July and total Western Subdistrict catch = 95,631
 Calculated 1986 escapement using average exploitation rate (1979-1982) and total Western Subdistrict catch = 128,618

Table 15. Cumulative proportion by date of sockeye salmon counts recorded in the Crescent River, 1980-1986. Proportion accrued on last day (1982-1985) represents that portion of the escapement estimated after termination of enumeration activities. Calculated proportions for 1986 based on an estimated total escapement of 95,361.

Date	Cumulative Percent						
	1980	1981	1982	1983	1984	1985	1986
15-Jun					0.000	0.000	
16-Jun					0.001	0.000	
17-Jun					0.002	0.000	
18-Jun					0.003	0.000	
19-Jun					0.003	0.000	
20-Jun					0.005	0.001	
21-Jun					0.008	0.001	
22-Jun					0.012	0.001	
23-Jun					0.017	0.001	
24-Jun					0.020	0.001	
25-Jun					0.024	0.001	0.000
26-Jun					0.027	0.001	0.000
27-Jun					0.036	0.002	0.000
28-Jun	0.000				0.041	0.002	0.001
29-Jun	0.000				0.049	0.005	0.005
30-Jun	0.000				0.069	0.007	0.008
01-Jul	0.000	0.000	0.000	0.000	0.081	0.008	0.017
02-Jul	0.000	0.012	0.000	0.000	0.100	0.012	0.031
03-Jul	0.000	0.036	0.001	0.001	0.118	0.016	0.054
04-Jul	0.000	0.061	0.001	0.002	0.140	0.057	0.077
05-Jul	0.000	0.083	0.002	0.019	0.156	0.138	0.084
06-Jul	0.000	0.097	0.002	0.041	0.170	0.188	0.094
07-Jul	0.000	0.117	0.005	0.068	0.184	0.196	0.110
08-Jul	0.000	0.149	0.021	0.098	0.225	0.226	0.126
09-Jul	0.000	0.166	0.057	0.118	0.268	0.251	0.134
10-Jul	0.029	0.180	0.098	0.137	0.322	0.274	0.144
11-Jul	0.089	0.193	0.127	0.167	0.360	0.293	0.154
12-Jul	0.126	0.202	0.157	0.207	0.387	0.319	0.165
13-Jul	0.132	0.215	0.190	0.266	0.409	0.364	0.184
14-Jul	0.145	0.234	0.217	0.338	0.425	0.388	0.197
15-Jul	0.161	0.266	0.245	0.392	0.454	0.415	0.204
16-Jul	0.176	0.311	0.258	0.431	0.499	0.445	0.213
17-Jul	0.193	0.347	0.286	0.457	0.548	0.480	
18-Jul	0.228	0.386	0.328	0.499	0.599	0.506	
19-Jul	0.286	0.434	0.377	0.559	0.639	0.525	
20-Jul	0.370	0.493	0.460	0.617	0.684	0.546	

- Continued -

Table 15. (continued: p 2 of 2)

Date	Cumulative Proportion						
	1980	1981	1982	1983	1984	1985	1986
21-Jul	0.455	0.550	0.533	0.667	0.721	0.573	
22-Jul	0.520	0.604	0.586	0.702	0.743	0.596	
23-Jul	0.596	0.655	0.636	0.732	0.783	0.632	
24-Jul	0.651	0.703	0.685	0.764	0.802	0.665	
25-Jul	0.681	0.727	0.713	0.787	0.813	0.698	
26-Jul	0.721	0.741	0.751	0.813	0.824	0.729	
27-Jul	0.750	0.760	0.784	0.839	0.838	0.756	
28-Jul	0.786	0.776	0.801	0.858	0.852	0.775	
29-Jul	0.811	0.798	0.816	0.881	0.870	0.794	
30-Jul	0.837	0.821	0.826	0.915	0.882	0.821	
31-Jul	0.856	0.836	0.833	0.945	0.893	1.000	
01-Aug	0.878	0.847	1.000	1.000	1.000		
02-Aug	0.896	0.866					
03-Aug	0.914	0.886					
04-Aug	0.932	0.901					
05-Aug	0.944	0.918					
06-Aug	0.954	0.934					
07-Aug	0.961	0.949					
08-Aug	0.970	0.964					
09-Aug	0.980	0.973					
10-Aug	0.985	1.000					
11-Aug	0.989						
12-Aug	0.994						
13-Aug	0.998						
14-Aug	1.000						

Table 16. Age composition of sockeye salmon collected in the Crescent River, 1979-1986.

Year	Percent Composition by Age Class ^{a, b}								Sample Size
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	
1979	tr	27.8	70.1	0	0	tr	tr	tr	643
1980	0	6.5	86.9	0	0	2.9	1.6	2.1	511
1981	0	8.2	32.1	0	0	9.6	49.9	tr	1,117
1982	0	12.9	79.2	.10	0	0.8	7.0	0	711
1983	0	10.9	42.2	0.2	0.7	27.4	18.6	0	731
1984	0	3.5	16.9	0	0	20.0	59.4	tr	780
1985	0.2	4.7	31.3	0	0.3	20.5	43.0	0	594
1986	0	6.5	15.8 (102.4)	0	0	13.0 (128.7)	64.0 (15.8)	0.7	139

^a Percentages weighted by total numbers in escapement: 1979-1981, 1986.

^b 95% confidence interval: +/- figures in parentheses.

Table 17. Salmon escapement observations in Susitna River tributaries, 1986. Aerial and ground counts were not considered total escapement counts unless indicated.

Stream	Method	Number of fish observed or estimated				
		Sockeye	Pink	Chum	Coho	Chinook
Alexander Creek ^a	air					5,225
Caswell Creek ^b	air	50				
Deception Creek ^a	air					521
Deshka River ^a	air					21,080
Goose Creek ^a	air					630
Larson Lake ^c	weir	32,322	1,938	108	97	
Little Willow Cr. ^a	air					2,133
Peters Creek ^a	air					1,915
Prairie Creek ^a	air					8,500
Red Shirt Lake ^b	air	5,300				
Sheep Creek ^a	air					1,285
Shell Lake ^d	weir	4,237	172		87	
Talachulitna R. ^a	air					3,686
Willow Creek ^a	air					2,059

^a ADF&G 1986.

^b Personal communication, Marcuson, Cook Inlet Aquaculture, Soldotna, Alaska.

^c Marcuson 1986c.

^d Marcuson 1986b.

Table 18. Cumulative proportion by date of sockeye salmon counts recorded in the Yentna River, 1981-1986. Proportion accrued on last day (1986) represents that portion of the escapement estimated after termination of enumeration activities.

Date	Cumulative Proportion					
	1981	1982	1983	1984	1985	1986
27-Jun		0.000				
28-Jun		0.000				
29-Jun	0.001	0.000				0.001
30-Jun	0.004	0.000	0.000			0.002
01-Jul	0.008	0.001	0.001	0.001	0.000	0.002
02-Jul	0.013	0.001	0.001	0.001	0.001	0.003
03-Jul	0.016	0.001	0.002	0.002	0.001	0.003
04-Jul	0.017	0.002	0.003	0.003	0.001	0.004
05-Jul	0.018	0.002	0.003	0.004	0.001	0.005
06-Jul	0.020	0.002	0.004	0.004	0.002	0.005
07-Jul	0.021	0.002	0.004	0.005	0.003	0.006
08-Jul	0.023	0.002	0.004	0.005	0.003	0.006
09-Jul	0.026	0.002	0.005	0.006	0.004	0.007
10-Jul	0.056	0.002	0.005	0.007	0.005	0.008
11-Jul	0.092	0.003	0.006	0.009	0.006	0.009
12-Jul	0.155	0.003	0.008	0.011	0.007	0.010
13-Jul	0.230	0.003	0.011	0.012	0.008	0.011
14-Jul	0.344	0.003	0.034	0.015	0.009	0.011
15-Jul	0.454	0.004	0.059	0.017	0.010	0.014
16-Jul	0.521	0.005	0.096	0.023	0.010	0.022
17-Jul	0.563	0.016	0.131	0.142	0.011	0.027
18-Jul	0.599	0.043	0.179	0.232	0.012	0.036
19-Jul	0.638	0.155	0.351	0.345	0.013	0.041
20-Jul	0.681	0.329	0.567	0.458	0.014	0.042
21-Jul	0.732	0.527	0.693	0.554	0.014	0.043
22-Jul	0.801	0.627	0.722	0.626	0.016	0.052
23-Jul	0.846	0.665	0.758	0.681	0.019	0.162
24-Jul	0.882	0.711	0.786	0.755	0.145	0.193
25-Jul	0.905	0.734	0.824	0.785	0.359	0.253
26-Jul	0.925	0.780	0.867	0.808	0.507	0.371
27-Jul	0.940	0.811	0.894	0.836	0.636	0.491
28-Jul	0.950	0.831	0.905	0.855	0.782	0.606
29-Jul	0.958	0.847	0.913	0.866	0.903	0.752
30-Jul	0.969	0.859	0.921	0.874	0.942	0.831
31-Jul	0.976	0.890	0.925	0.885	0.960	0.861
01-Aug	0.980	0.933	0.929	0.893	0.970	0.882
02-Aug	0.986	0.948	0.937	0.901	0.978	0.908
03-Aug	0.988	0.955	0.941	0.909	0.983	0.917

- Continued -

Table 18. (p 2 of 2)

Date	Cumulative Proportion					
	1981	1982	1983	1984	1985	1986
04-Aug	0.990	0.962	0.945	0.920	0.987	0.924
05-Aug	0.991	0.965	0.949	0.926	0.990	0.935
06-Aug	0.992	0.967	0.953	0.934	0.994	0.940
07-Aug	0.992	0.970	0.955	0.939	0.997	1.000
08-Aug	0.992	0.972	0.958	0.944	1.000	
09-Aug	0.993	0.975	0.959	0.949		
10-Aug	0.994	0.977	0.959	0.954		
11-Aug	0.995	0.979	0.962	0.958		
12-Aug	0.996	0.981	0.968	0.962		
13-Aug	0.997	0.982	0.974	0.965		
14-Aug	0.997	0.984	0.977	0.968		
15-Aug	0.998	0.985	0.979	0.970		
16-Aug	0.998	0.986	0.982	0.973		
17-Aug	0.998	0.987	0.985	0.975		
18-Aug	0.998	0.988	0.987	0.977		
19-Aug	0.998	0.989	0.988	0.979		
20-Aug	0.999	0.990	0.990	0.980		
21-Aug	0.999	0.990	0.991	0.981		
22-Aug	0.999	0.990	0.992	0.984		
23-Aug	0.999	0.991	0.993	0.987		
24-Aug	1.000	0.992	0.994	0.989		
25-Aug	1.000	0.993	0.994	0.992		
26-Aug	1.000	0.994	0.995	0.994		
27-Aug	1.000	0.994	0.996	0.996		
28-Aug	1.000	0.995	0.997	0.996		
29-Aug	1.000	0.996	0.998	0.998		
30-Aug		0.997	0.998	0.999		
31-Aug		0.997	0.999	0.999		
01-Sep		0.998	0.999	1.000		
02-Sep		0.999	0.999	1.000		
03-Sep		0.999	0.999	1.000		
04-Sep		1.000	1.000	1.000		
05-Sep		1.000	1.000	1.000		

- a. Proportion accrued on last day (1986) represents that portion of the escapement estimated after termination of enumeration activities.
- b. Repeat percentage total result from rounding to one digit after decimal point.

Table 19. Yentna River escapement of sockeye salmon, age, length (mid-eye to fork) and weight by sex, 1986.

	Percent Composition by Age Class									
	1.1	0.3	1.2	2.1	1.3	2.2	1.4	2.3	3.3	Total
MALES										
PERCENT	1.60	.90	15.10	.60	25.10	3.30	.10	3.60	.10	50.40
AV LENGTH(mm)	447.09	552.67	455.27	375.75	578.81	462.17	574.00	587.64	574.00	527.71
STD ERROR	4.42	14.20	3.13	48.07	2.79	8.62	.00	4.87	.00	1.91
SAMP SIZE	11	6	104	4	172	23	1	25	1	347
AV WEIGHT(kg)	1.34	2.76	1.43	1.33	3.25	1.57	3.04	3.36	.00	2.51
STD ERROR	.04	.29	.04	.93	.06	.10	.00	.14	.00	.03
SAMP SIZE	10	5	98	2	138	21	1	19	0	294
FEMALES										
PERCENT	.30	1.20	7.60	.00	31.40	2.60	.10	6.40	.00	49.60
AV LENGTH(mm)	424.00	566.88	471.62	.00	562.56	539.11	536.00	554.77	.00	545.60
STD ERROR	14.00	4.32	5.41	.00	1.51	55.32	.00	4.37	.00	3.23
SAMP SIZE	2	8	52	0	216	18	1	44	0	341
AV WEIGHT(kg)	1.10	2.82	1.56	.00	2.77	1.62	2.42	2.59	.00	2.49
STD ERROR	.16	.09	.06	.00	.03	.11	.00	.06	.00	.02
SAMP SIZE	2	6	47	0	188	15	1	34	0	293
SEXES COMBINED										
PERCENT	1.90	2.10	22.70	.60	56.50	5.90	.20	10.00	.10	100.00
AV LENGTH(mm)	443.44	560.79	460.74	375.75	569.78	496.08	555.00	566.60	574.00	536.58
STD ERROR	4.32	6.57	2.76	48.07	1.50	24.76	.00	3.30	.00	1.87
SAMP SIZE	13	14	156	4	388	41	2	69	1	688
AV WEIGHT(kg)	1.30	2.79	1.47	1.33	2.98	1.59	2.73	2.87	.00	2.50
STD ERROR	.04	.14	.03	.93	.03	.08	.00	.06	.00	.02
SAMP SIZE	12	11	145	2	326	36	2	53	0	587

Table 20. Cumulative proportion by date of pink salmon counts recorded in the Yentna River, 1981-1986. Proportion accrued on last day (1986) represents that portion of the escapement estimated after termination of enumeration activities.

Date	Cumulative Proportion					
	1981	1982	1983	1984	1985	1986
27-Jun		0.000				
28-Jun		0.000				
29-Jun	0.000	0.000				0.000
30-Jun	0.002	0.000	0.000			0.000
01-Jul	0.003	0.000	0.001	0.000	0.001	0.000
02-Jul	0.005	0.000	0.001	0.000	0.002	0.000
03-Jul	0.007	0.000	0.001	0.000	0.003	0.000
04-Jul	0.008	0.000	0.002	0.000	0.003	0.000
05-Jul	0.008	0.000	0.003	0.000	0.005	0.000
06-Jul	0.011	0.000	0.003	0.000	0.007	0.001
07-Jul	0.015	0.000	0.003	0.000	0.011	0.001
08-Jul	0.021	0.000	0.003	0.000	0.012	0.001
09-Jul	0.025	0.000	0.004	0.000	0.015	0.001
10-Jul	0.037	0.000	0.004	0.000	0.018	0.001
11-Jul	0.039	0.000	0.005	0.001	0.021	0.001
12-Jul	0.039	0.000	0.006	0.001	0.025	0.001
13-Jul	0.042	0.000	0.009	0.001	0.030	0.001
14-Jul	0.050	0.000	0.030	0.001	0.033	0.001
15-Jul	0.057	0.000	0.039	0.001	0.038	0.002
16-Jul	0.061	0.000	0.056	0.001	0.042	0.006
17-Jul	0.062	0.001	0.098	0.003	0.046	0.010
18-Jul	0.072	0.002	0.171	0.008	0.050	0.012
19-Jul	0.082	0.010	0.288	0.023	0.053	0.014
20-Jul	0.105	0.021	0.400	0.067	0.056	0.015
21-Jul	0.132	0.040	0.511	0.126	0.060	0.015
22-Jul	0.158	0.056	0.565	0.190	0.064	0.019
23-Jul	0.236	0.078	0.638	0.277	0.078	0.054
24-Jul	0.311	0.126	0.704	0.365	0.135	0.115
25-Jul	0.398	0.162	0.743	0.420	0.226	0.203
26-Jul	0.464	0.192	0.791	0.466	0.329	0.338
27-Jul	0.512	0.237	0.820	0.510	0.475	0.490
28-Jul	0.580	0.330	0.843	0.578	0.636	0.637
29-Jul	0.639	0.447	0.855	0.669	0.763	0.760
30-Jul	0.705	0.562	0.864	0.728	0.833	0.819
31-Jul	0.752	0.654	0.871	0.784	0.877	0.846
01-Aug	0.795	0.735	0.879	0.837	0.903	0.877
02-Aug	0.819	0.824	0.903	0.873	0.926	0.897
03-Aug	0.834	0.896	0.908	0.903	0.942	0.908

- Continued -

Table 20. (p. 2 of 2)

Date	Cumulative Proportion					
	1981	1982	1983	1984	1985	1986
04-Aug	0.849	0.934	0.912	0.925	0.956	0.913
05-Aug	0.865	0.953	0.918	0.943	0.966	0.915
06-Aug	0.883	0.962	0.924	0.956	0.978	0.916
07-Aug	0.897	0.969	0.931	0.962	0.991	1.000
08-Aug	0.905	0.978	0.936	0.969	1.000	
09-Aug	0.913	0.984	0.937	0.975		
10-Aug	0.918	0.989	0.938	0.982		
11-Aug	0.924	0.991	0.943	0.986		
12-Aug	0.929	0.994	0.951	0.988		
13-Aug	0.930	0.996	0.958	0.991		
14-Aug	0.931	0.997	0.966	0.992		
15-Aug	0.935	0.998	0.971	0.994		
16-Aug	0.942	0.998	0.978	0.994		
17-Aug	0.949	0.999	0.984	0.995		
18-Aug	0.958	0.999	0.988	0.996		
19-Aug	0.967	0.999	0.990	0.997		
20-Aug	0.979	0.999	0.992	0.997		
21-Aug	0.984	0.999	0.993	0.997		
22-Aug	0.989	1.000	0.993	0.998		
23-Aug	0.992	1.000	0.994	0.998		
24-Aug	0.995	1.000	0.995	0.998		
25-Aug	0.997	1.000	0.996	0.999		
26-Aug	0.999	1.000	0.996	0.999		
27-Aug	1.000	1.000	0.997	0.999		
28-Aug	1.000	1.000	0.998	0.999		
29-Aug		1.000	0.998	0.999		
30-Aug		1.000	0.999	1.000		
31-Aug		1.000	0.999	1.000		
01-Sep		1.000	0.999	1.000		
02-Sep		1.000	0.999	1.000		
03-Sep		1.000	1.000	1.000		
04-Sep		1.000	1.000	1.000		
05-Sep		1.000	1.000	1.000		

Table 21. Cumulative proportion by date of chum salmon counts recorded in the Yentna River, 1981-1984. Proportion accrued on last day (1986) represents that portion of the escapement estimated after termination of enumeration activities.

Date	Cumulative Percent			
	1981	1982	1983	1984
27-Jun		0.000		
28-Jun		0.000		
29-Jun	0.001	0.000		
30-Jun	0.004	0.000	0.000	
01-Jul	0.007	0.000	0.000	0.001
02-Jul	0.012	0.000	0.000	0.002
03-Jul	0.013	0.000	0.001	0.003
04-Jul	0.013	0.000	0.001	0.004
05-Jul	0.013	0.000	0.001	0.004
06-Jul	0.013	0.000	0.001	0.004
07-Jul	0.013	0.000	0.001	0.005
08-Jul	0.014	0.000	0.002	0.005
09-Jul	0.015	0.000	0.002	0.006
10-Jul	0.019	0.000	0.002	0.007
11-Jul	0.021	0.000	0.002	0.009
12-Jul	0.022	0.000	0.003	0.010
13-Jul	0.034	0.000	0.005	0.012
14-Jul	0.039	0.000	0.020	0.013
15-Jul	0.046	0.000	0.041	0.015
16-Jul	0.050	0.000	0.066	0.020
17-Jul	0.061	0.003	0.096	0.047
18-Jul	0.088	0.012	0.138	0.091
19-Jul	0.117	0.063	0.234	0.142
20-Jul	0.146	0.099	0.310	0.188
21-Jul	0.179	0.163	0.383	0.225
22-Jul	0.224	0.206	0.451	0.250
23-Jul	0.268	0.218	0.538	0.280
24-Jul	0.311	0.237	0.573	0.309
25-Jul	0.357	0.248	0.592	0.332
26-Jul	0.411	0.255	0.616	0.349
27-Jul	0.451	0.262	0.626	0.362
28-Jul	0.496	0.269	0.640	0.374
29-Jul	0.525	0.286	0.644	0.387
30-Jul	0.563	0.320	0.647	0.406
31-Jul	0.590	0.439	0.648	0.433
01-Aug	0.619	0.595	0.649	0.481
02-Aug	0.629	0.681	0.654	0.516
03-Aug	0.640	0.746	0.656	0.561

- Continued -

Table 21. (p 2 of 2)

Date	Cumulative Proportion			
	1981	1982	1983	1984
04-Aug	0.658	0.785	0.657	0.592
05-Aug	0.673	0.836	0.657	0.620
06-Aug	0.683	0.854	0.662	0.642
07-Aug	0.692	0.863	0.667	0.661
08-Aug	0.700	0.870	0.675	0.681
09-Aug	0.710	0.888	0.676	0.705
10-Aug	0.727	0.903	0.677	0.732
11-Aug	0.745	0.912	0.684	0.753
12-Aug	0.764	0.920	0.698	0.766
13-Aug	0.773	0.926	0.712	0.780
14-Aug	0.783	0.930	0.727	0.787
15-Aug	0.790	0.933	0.739	0.792
16-Aug	0.800	0.936	0.771	0.798
17-Aug	0.812	0.940	0.805	0.803
18-Aug	0.830	0.945	0.824	0.807
19-Aug	0.854	0.952	0.838	0.810
20-Aug	0.887	0.958	0.853	0.812
21-Aug	0.910	0.960	0.867	0.813
22-Aug	0.930	0.963	0.874	0.819
23-Aug	0.944	0.965	0.888	0.835
24-Aug	0.953	0.967	0.904	0.847
25-Aug	0.958	0.970	0.917	0.859
26-Aug	0.963	0.971	0.925	0.873
27-Aug	0.970	0.973	0.944	0.902
28-Aug	0.974	0.974	0.958	0.917
29-Aug	0.976	0.976	0.968	0.939
30-Aug	0.982	0.978	0.973	0.961
31-Aug	0.985	0.980	0.979	0.978
01-Sep	0.990	0.983	0.982	0.988
02-Sep	0.996	0.988	0.985	0.992
03-Sep	1.000	0.994	0.990	0.995
04-Sep	1.000	0.999	0.995	0.999
05-Sep	1.000	1.000	1.000	1.000

Table 22. Cumulative proportion by date of coho salmon counts recorded in the Yentna River, 1981-1984. Proportion accrued on last day (1986) represents that portion of the escapement estimated after termination of enumeration activities.

Date	Cumulative Proportion			
	1981	1982	1983	1984
27-Jun		0.000		
28-Jun		0.000		
29-Jun	0.000	0.000		
30-Jun	0.000	0.000	0.001	
01-Jul	0.000	0.000	0.001	0.000
02-Jul	0.000	0.000	0.002	0.000
03-Jul	0.000	0.000	0.002	0.000
04-Jul	0.000	0.000	0.003	0.000
05-Jul	0.000	0.000	0.003	0.000
06-Jul	0.000	0.000	0.004	0.000
07-Jul	0.001	0.000	0.004	0.000
08-Jul	0.001	0.000	0.004	0.000
09-Jul	0.001	0.000	0.005	0.000
10-Jul	0.002	0.000	0.005	0.000
11-Jul	0.002	0.000	0.006	0.000
12-Jul	0.002	0.000	0.007	0.000
13-Jul	0.002	0.000	0.009	0.000
14-Jul	0.003	0.000	0.019	0.001
15-Jul	0.004	0.001	0.035	0.001
16-Jul	0.008	0.001	0.088	0.001
17-Jul	0.008	0.005	0.142	0.008
18-Jul	0.010	0.014	0.190	0.014
19-Jul	0.013	0.053	0.310	0.022
20-Jul	0.020	0.075	0.376	0.036
21-Jul	0.029	0.097	0.454	0.066
22-Jul	0.072	0.143	0.513	0.101
23-Jul	0.130	0.163	0.585	0.156
24-Jul	0.164	0.184	0.642	0.219
25-Jul	0.173	0.198	0.670	0.258
26-Jul	0.232	0.206	0.703	0.284
27-Jul	0.274	0.218	0.735	0.307
28-Jul	0.358	0.246	0.760	0.343
29-Jul	0.396	0.304	0.773	0.370
30-Jul	0.460	0.335	0.785	0.380
31-Jul	0.502	0.381	0.793	0.394
01-Aug	0.580	0.584	0.803	0.419
02-Aug	0.632	0.696	0.822	0.443
03-Aug	0.659	0.750	0.826	0.494

- Continued -

Table 22. (p 2 of 2)

Date	Cumulative Proportion			
	1981	1982	1983	1984
04-Aug	0.689	0.782	0.829	0.542
05-Aug	0.718	0.820	0.833	0.595
06-Aug	0.732	0.840	0.840	0.611
07-Aug	0.749	0.854	0.847	0.622
08-Aug	0.761	0.863	0.854	0.659
09-Aug	0.772	0.876	0.855	0.687
10-Aug	0.788	0.886	0.856	0.721
11-Aug	0.804	0.894	0.864	0.766
12-Aug	0.813	0.899	0.877	0.796
13-Aug	0.816	0.905	0.891	0.828
14-Aug	0.819	0.911	0.900	0.851
15-Aug	0.838	0.916	0.908	0.868
16-Aug	0.867	0.920	0.916	0.877
17-Aug	0.897	0.925	0.927	0.885
18-Aug	0.921	0.931	0.934	0.892
19-Aug	0.941	0.935	0.940	0.897
20-Aug	0.970	0.939	0.948	0.901
21-Aug	0.978	0.941	0.953	0.906
22-Aug	0.984	0.943	0.955	0.918
23-Aug	0.989	0.945	0.961	0.931
24-Aug	0.993	0.949	0.966	0.944
25-Aug	0.996	0.952	0.971	0.956
26-Aug	0.999	0.956	0.974	0.966
27-Aug	0.999	0.960	0.980	0.973
28-Aug	0.999	0.964	0.985	0.978
29-Aug	0.999	0.968	0.989	0.984
30-Aug	0.999	0.971	0.991	0.989
31-Aug	0.999	0.974	0.993	0.994
01-Sep	0.999	0.977	0.994	0.996
02-Sep	0.999	0.986	0.995	0.998
03-Sep	1.000	0.993	0.997	0.999
04-Sep	1.000	0.999	0.999	1.000
05-Sep	1.000	1.000	1.000	1.000

Table 23. Salmon escapement observations in selected Upper Cook Inlet anadromous streams, 1986.

Stream	Method	Number of fish observed or estimated				
		Sockeye	Pink	Chum	Coho	Chinook
Fitz Creek ^b	air			825		
Clearwater Creek ^b	air			9100		
Polly Creek ^c	air			1200		
Little Jack Sl. ^{c,d}	air	3050				
Cannery Creek ^c	air				60	
Chuitna River ^e	air					3946
Threemile Creek ^c	air	2400				
Theodore River ^e	air					1281
Lewis River ^e	air					722
Little Susitna R. ^e	weir				7000	
Fish Creek ^f	weir	29800	305	4	2166	5
Cottonwood Creek ^e	ground				121	
Spring Creek ^e	ground				147	
McRoberts Creek ^e	ground				439	
Rabbit Creek ^e	ground				169	
Cambell Creek ^e	ground				99	
Bird Creek ^e	ground				3	
Placer River ^c	air	400				
Silvertip Creek ^g	ground					6
Canyon Creek ^g	ground					31
Bishop Creek ^c	air	2063				
Ninilchik River ^h	air					790
Deep Creek ^h	air					2430
Anchor River ^h	air					2390
Packers Lake ⁱ	weir	29604	6			

- Continued -

Table 23. (p 2 of 2)

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- a Aerial and ground counts are not considered total escapement counts unless indicated.
 - b ADF&G Commercial Fisheries Division surveys.
 - c Personal communication, Pat Marcuson, Cook Inlet Aquaculture Association, Soldotna, Alaska.
 - d Includes Blue (Elling) Lake.
 - e ADF&G, 1986.
 - f Personal communication, Bob Clupach, Alaska Department of Fish and Game, Fisheries Rehabilitation, Enhancement and Development Division, Big Lake, Alaska.
 - g Personal communication, Ralph Browning, United States Department of Agriculture, Forest Service, Seward, Alaska.
 - h Nelson, 1986.
 - i Marcuson, 1986d.

Table 24. Cumulative proportion by date of sockeye salmon escapement into Fish Creek (Big Lake), 1980-1986.

Date	Cumulative Proportion						
	1980	1981	1982	1983	1984	1985	1986
29-Jun					0.001		
30-Jun					0.001		
01-Jul					0.001		
02-Jul					0.001		
03-Jul					0.001		
04-Jul	0.000				0.001		
05-Jul	0.001			0.000	0.001		
06-Jul	0.001			0.000	0.001		
07-Jul	0.001			0.000	0.001		
08-Jul	0.002			0.000	0.001	0.000	
09-Jul	0.002	0.008		0.000	0.001	0.000	
10-Jul	0.003	0.012		0.000	0.001	0.000	
11-Jul	0.003	0.059		0.000	0.004	0.002	
12-Jul	0.003	0.128	0.000	0.000	0.006	0.002	
13-Jul	0.003	0.164	0.000	0.000	0.013	0.003	
14-Jul	0.004	0.271	0.001	0.002	0.023	0.004	
15-Jul	0.004	0.413	0.001	0.004	0.030	0.005	0.000
16-Jul	0.004	0.521	0.001	0.008	0.032	0.007	0.001
17-Jul	0.005	0.578	0.001	0.010	0.032	0.008	0.004
18-Jul	0.064	0.638	0.002	0.011	0.078	0.008	0.005
19-Jul	0.135	0.708	0.013	0.023	0.128	0.008	0.009
20-Jul	0.175	0.754	0.065	0.042	0.186	0.008	0.016
21-Jul	0.287	0.787	0.131	0.138	0.211	0.010	0.033
22-Jul	0.397	0.825	0.246	0.299	0.279	0.025	0.042
23-Jul	0.524	0.834	0.305	0.390	0.338	0.043	0.078
24-Jul	0.679	0.851	0.439	0.460	0.422	0.063	0.105
25-Jul	0.802	0.874	0.517	0.551	0.565	0.082	0.137
26-Jul	0.846	0.899	0.590	0.607	0.622	0.112	0.162
27-Jul	0.864	0.902	0.649	0.676	0.698	0.133	0.165
28-Jul	0.911	0.933	0.724	0.720	0.745	0.242	0.196
29-Jul	0.919	0.937	0.784	0.762	0.762	0.365	0.227
30-Jul	0.927	0.969	0.854	0.792	0.765	0.422	0.377
31-Jul	0.943	0.977	0.858	0.804	0.799	0.500	0.491
01-Aug	0.953	0.984	0.861	0.828	0.833	0.546	0.552
02-Aug	0.961	0.986	0.880	0.864	0.859	0.584	0.605
03-Aug	0.971	0.988	0.891	0.871	0.871	0.659	0.637
04-Aug	0.982	0.990	0.892	0.913	0.878	0.703	0.736
05-Aug	0.985	0.991	0.896	0.939	0.880	0.739	0.783
06-Aug	0.988	0.991	0.896	0.942	0.889	0.771	0.822
07-Aug	0.990	0.993	0.897	0.949	0.900	0.911	0.873

- Continued -

Table 24. (p. 2 of 2)

Date	Cumulative Proportion						
	1980	1981	1982	1983	1984	1985	1986
08-Aug	0.992	0.993	0.903	0.950	0.927	0.921	0.916
09-Aug	0.993	0.997	0.905	0.966	0.934	0.921	0.936
10-Aug	0.995	0.998	0.907	0.973	0.936	0.922	0.937
11-Aug	0.995	0.998	0.917	0.979	0.940	0.935	0.960
12-Aug	0.996	0.999	0.921	0.979	0.940	0.943	0.965
13-Aug	0.997	0.999	0.924	0.981	0.945	0.968	0.975
14-Aug	0.998	0.999	0.928	0.984	0.948	0.986	0.977
15-Aug	0.998	0.999	0.932	0.984	0.955	0.992	0.979
16-Aug	0.999	1.000	0.934	0.987	0.958	0.992	0.983
17-Aug	0.999	1.000	0.939	0.990	0.959	0.995	0.985
18-Aug	0.999	1.000	0.952	0.991	0.960	0.996	0.989
19-Aug	1.000	1.000	0.958	0.993	0.963	0.998	0.992
20-Aug	1.000	1.000	0.961	0.993	0.964	0.998	0.995
21-Aug	1.000	1.000	0.962	0.994	0.970	0.999	0.996
22-Aug	1.000	1.000	0.963	0.994	0.971	0.999	0.998
23-Aug	1.000		0.964	0.996	0.972	0.999	0.998
24-Aug	1.000		0.965	0.997	0.982	1.000	0.999
25-Aug	1.000		0.966	0.998	0.991	1.000	1.000
26-Aug	1.000		0.970	0.998	0.994	1.000	1.000
27-Aug	1.000		0.971	0.999	0.995	1.000	
28-Aug			0.973	1.000	0.995	1.000	
29-Aug			0.975	1.000	0.995	1.000	
30-Aug			0.976	1.000	0.996		
31-Aug			0.979		0.996		
01-Sep			0.981		0.997		
02-Sep			0.982		0.998		
03-Sep			0.985		0.998		
04-Sep			0.986		0.998		
05-Sep			0.987		0.999		
06-Sep			0.987		0.999		
07-Sep			0.988		0.999		
08-Sep			0.989		0.999		
09-Sep			1.000		1.000		
10-Sep					1.000		
11-Sep					1.000		
12-Sep					1.000		
13-Sep					1.000		
14-Sep					1.000		
15-Sep					1.000		
16-Sep					1.000		
17-Sep					1.000		
18-Sep					1.000		
19-Sep					1.000		

Table 25. Fish Creek escapement of sockeye salmon, age, length (mid-eye to fork) and weight by sex, 1986.

	Percent Composition by Age Class							
	1.1	1.2	2.1	1.3	2.2	1.4	2.3	Total
MALE	3,775	4,876	811	2,216	641	0	102	12,421
PERCENT	12.67	16.36	2.72	7.44	2.15	.00	.34	41.68
AV LENGTH (mm)	372.10	500.86	395.70	588.25	546.91	.00	613.74	473.75
STD ERROR	2.46	3.31	5.89	3.90	6.57	.00	20.27	1.77
SAMP SIZE	164	224	27	92	28	0	5	540
AV WEIGHT (kg)	.72	1.82	.83	2.98	2.32	.00	3.40	1.67
STD ERROR	.02	.04	.04	.07	.09	.00	.28	.02
SAMP SIZE	164	223	27	92	28	0	5	539
FEMALE	66	11,279	66	3,259	2,410	50	249	17,379
PERCENT	.22	37.85	.22	10.94	8.09	.17	.84	58.32
AV LENGTH (mm)	504.00	506.94	453.50	558.73	540.59	518.82	575.99	522.13
STD ERROR	3.00	1.12	12.50	2.76	2.92	.00	10.58	.98
SAMP SIZE	2	519	2	136	96	2	9	766
AV WEIGHT (kg)	1.80	1.75	1.25	2.39	2.09	1.98	2.47	1.93
STD ERROR	.10	.01	.15	.04	.04	.00	.15	.01
SAMP SIZE	2	518	2	136	96	2	9	765
BOTH SEX	3,841	16,155	877	5,475	3,051	50	351	29,800
PERCENT	12.89	54.21	2.94	18.37	10.24	.17	1.18	100.00
AV LENGTH (mm)	374.36	505.11	400.05	570.68	541.92	518.82	586.96	501.96
STD ERROR	2.43	1.27	5.55	2.28	2.71	.00	9.94	.93
SAMP SIZE	166	743	29	228	124	2	14	1,306
AV WEIGHT (kg)	.74	1.77	.86	2.63	2.14	1.98	2.74	1.82
STD ERROR	.02	.02	.03	.04	.04	.00	.14	.01
SAMP SIZE	166	741	29	228	124	2	14	1,304

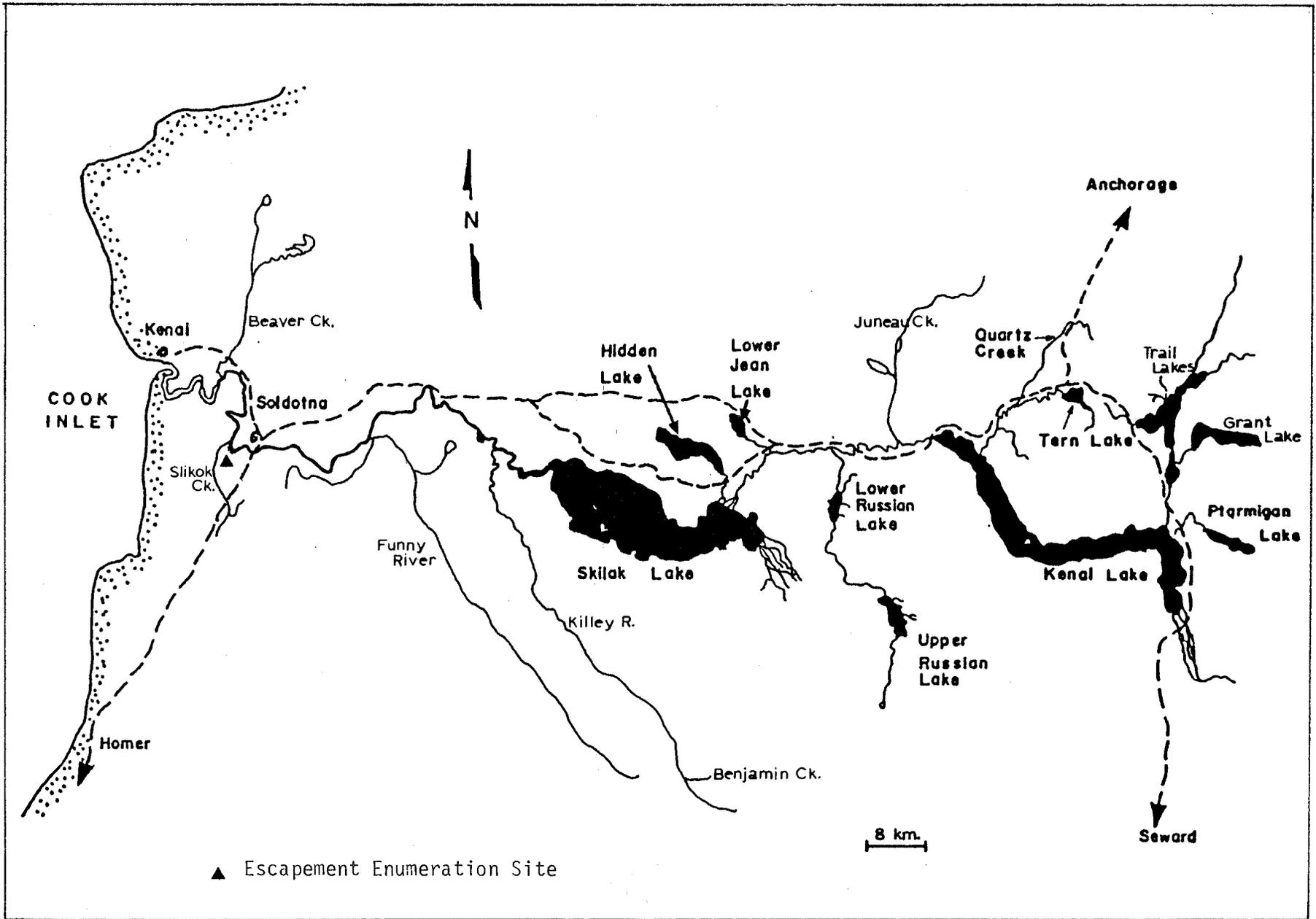


Figure 1. Kenai River drainage and major sockeye salmon rearing lakes.

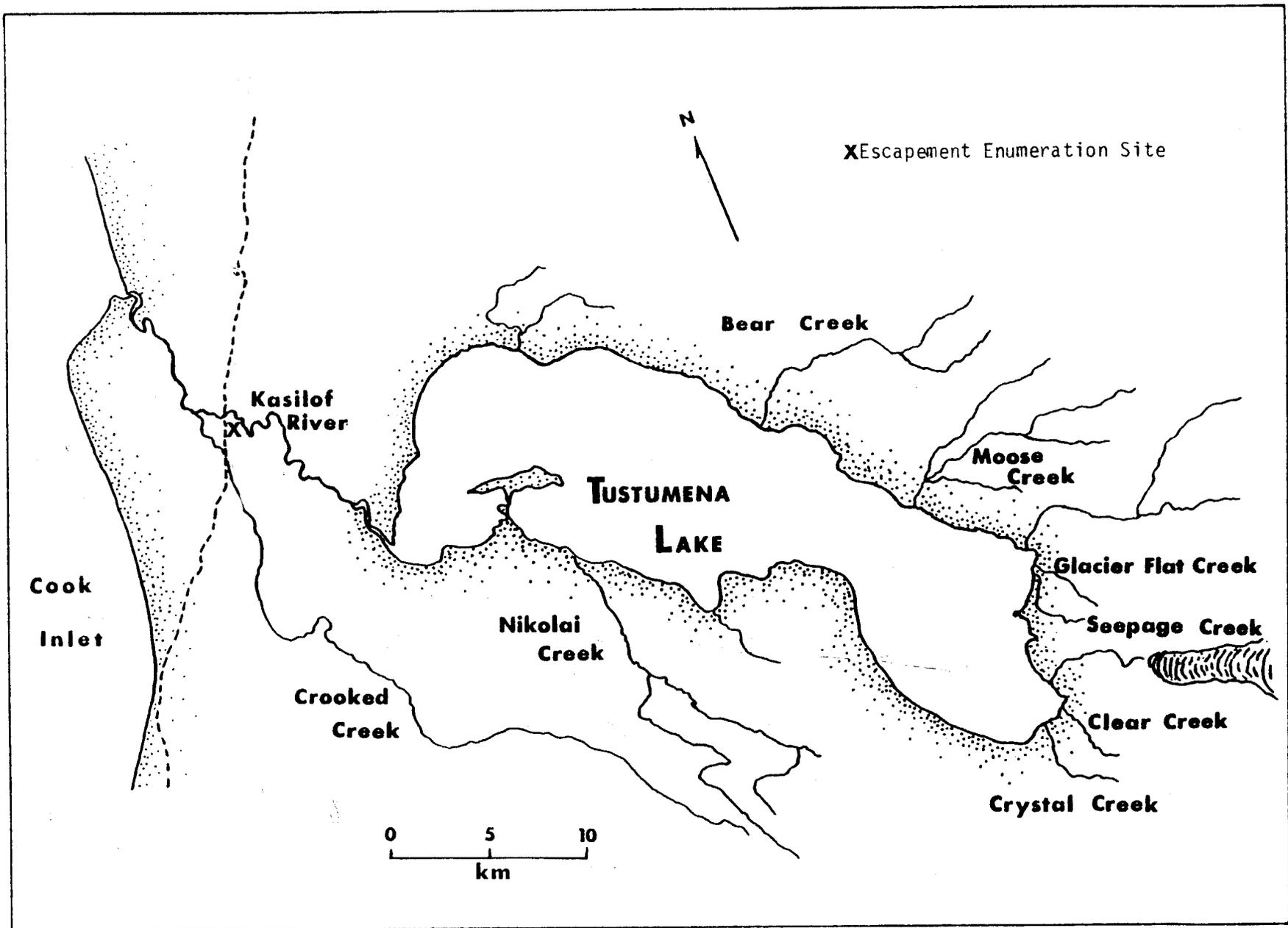


Figure 2. Kasilof River drainage and major sockeye salmon spawning and rearing areas.

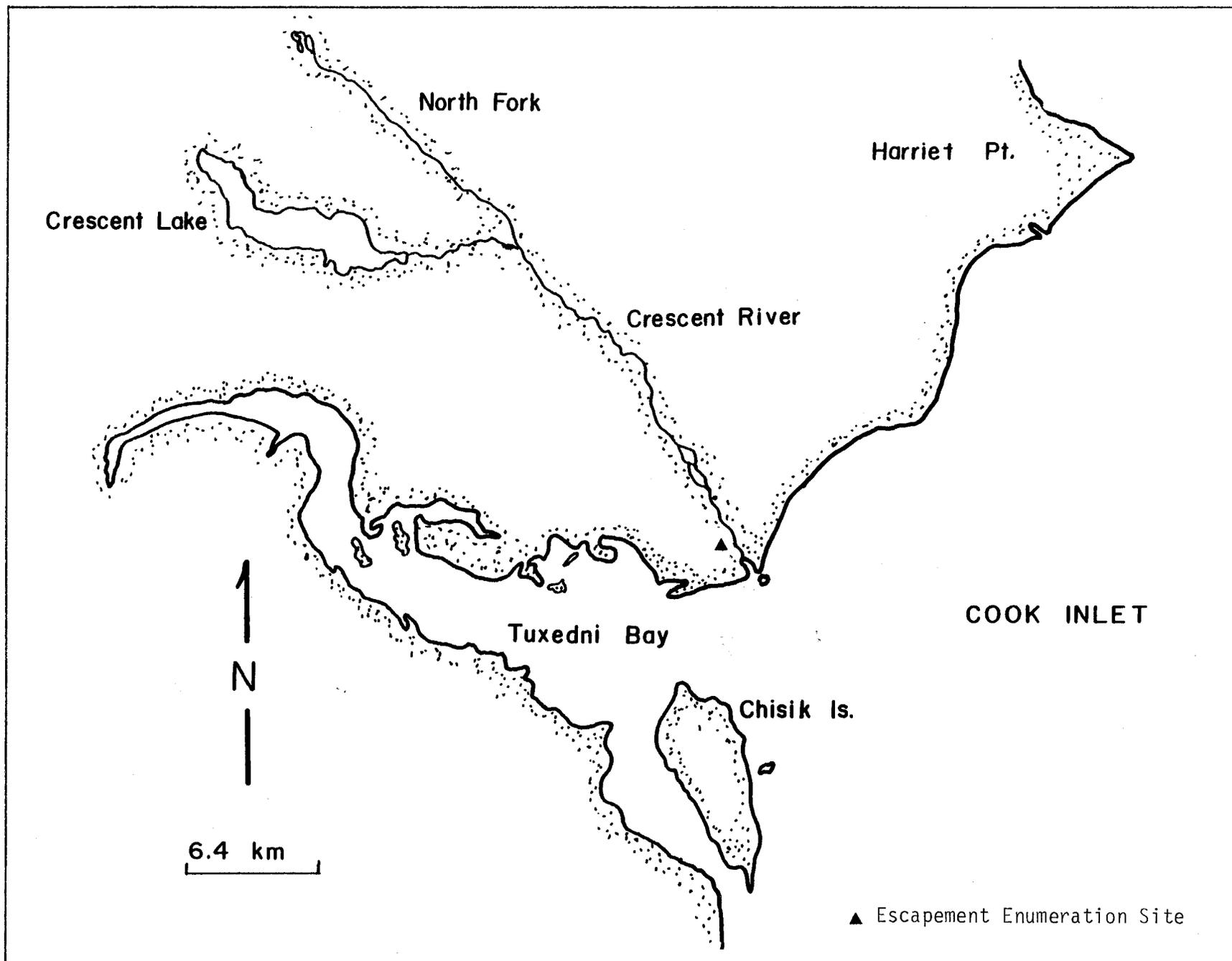


Figure 3. Crescent River drainage and major sockeye salmon rearing lake.

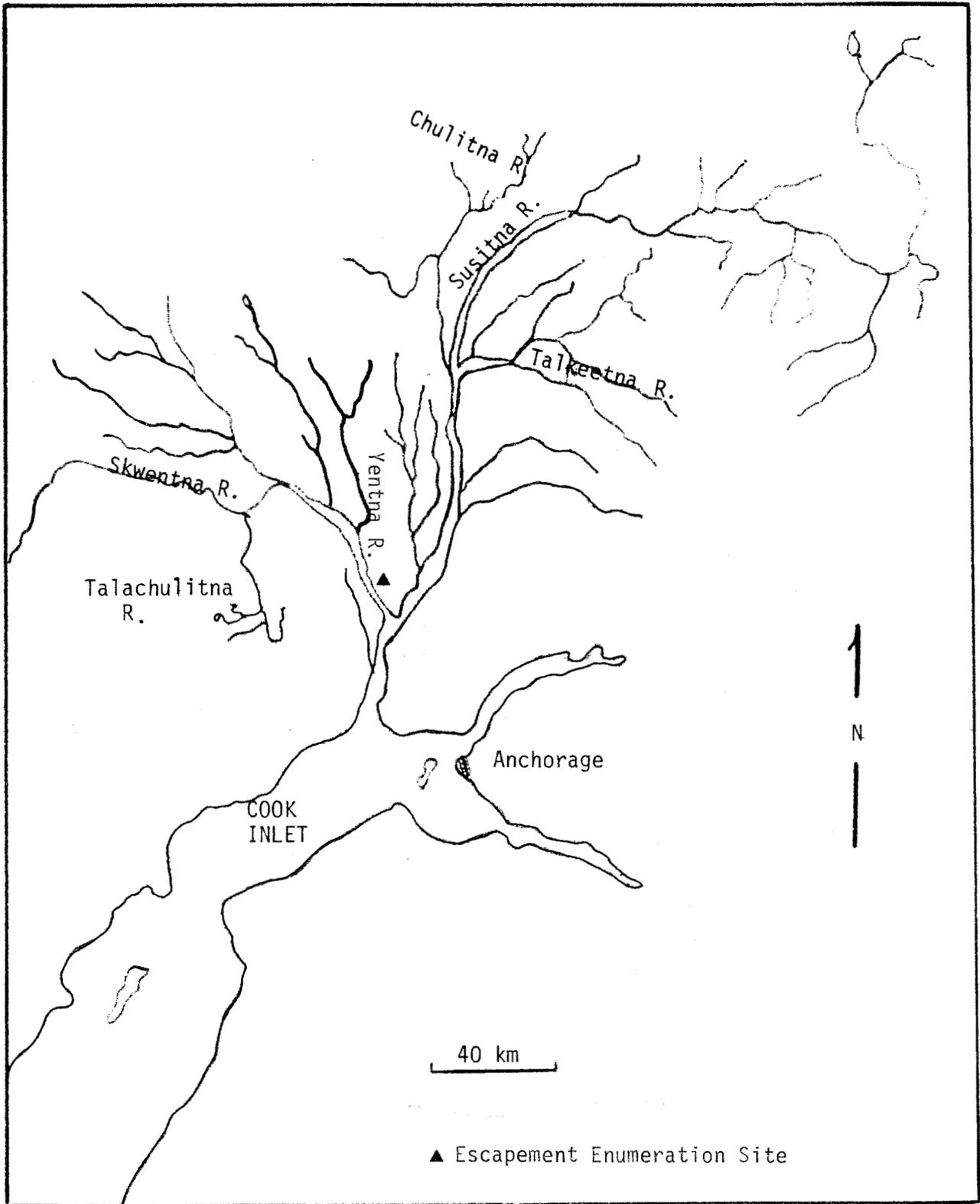


Figure 4. Susitna River drainage and major tributary rivers.

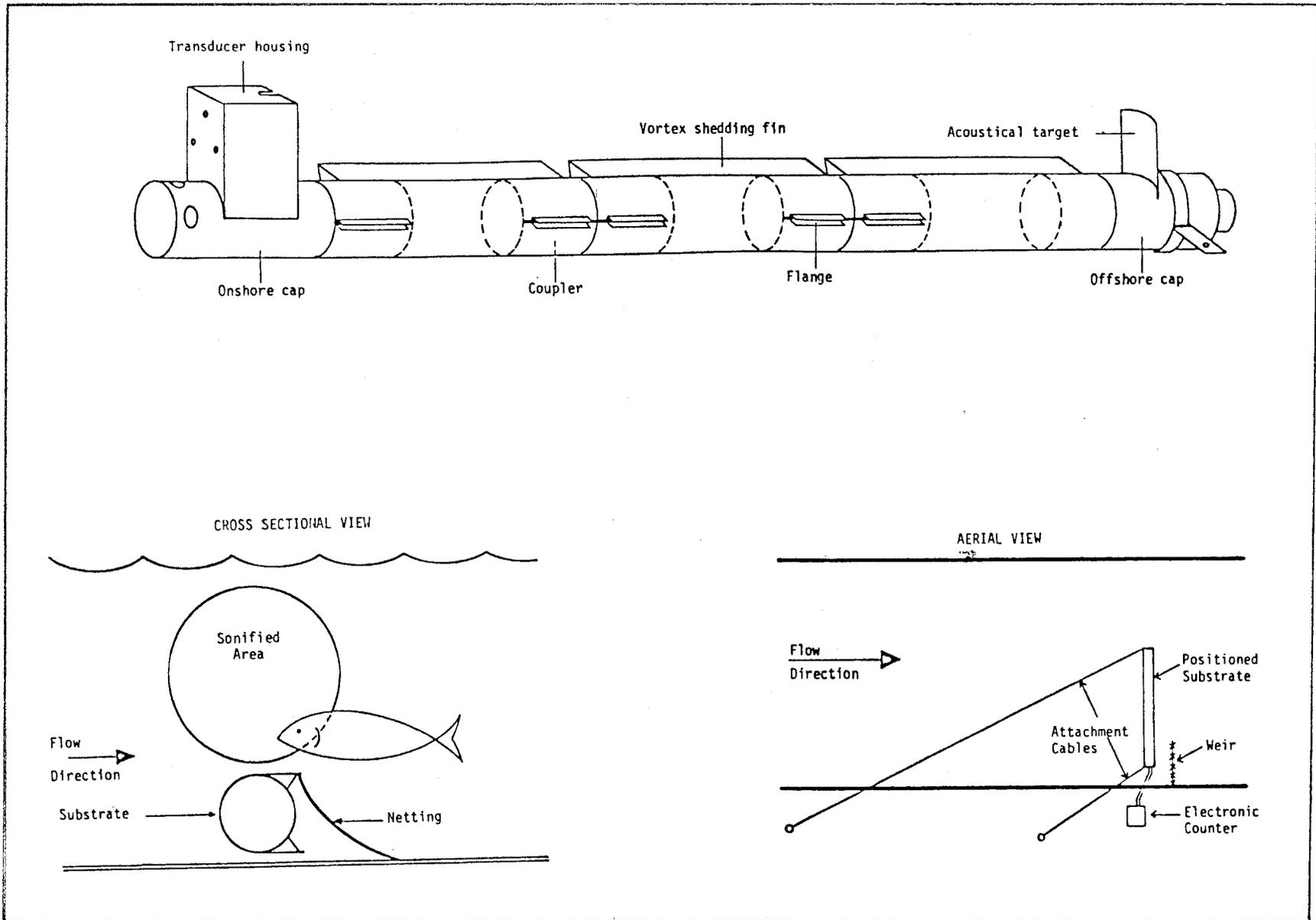


Figure 5. Side scan sonar system used to count salmon in Upper Cook Inlet, Alaska.

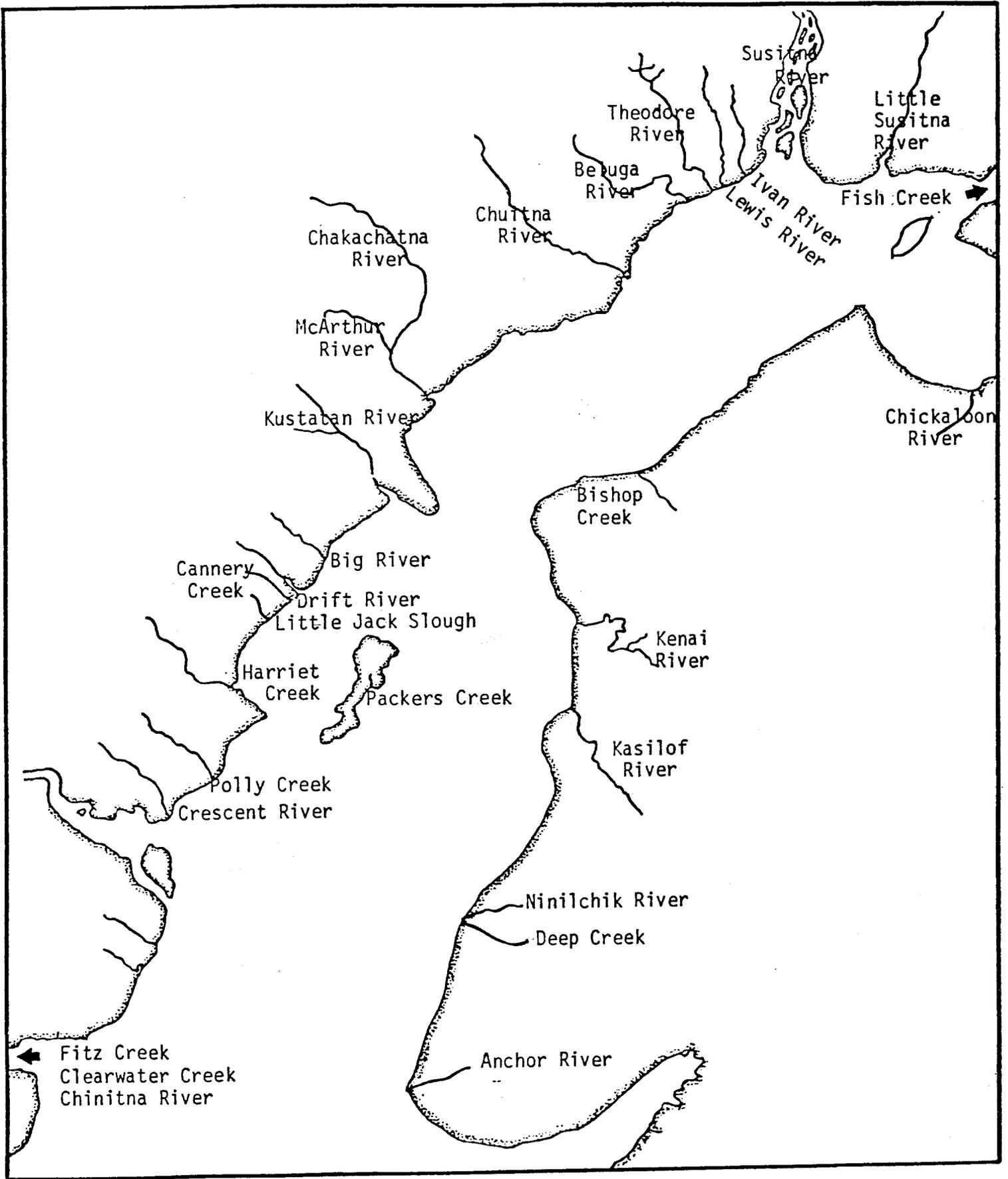


Figure 6. Anadromous streams of Upper Cook Inlet, Alaska.

APPENDICES

Appendix A.1. Fish targets recorded in the Kenai River, north and south banks combined, 22 June through 31 July, 1986. a

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
22-Jun	239	239	0	0	1	1	10	10
23-Jun	627	866	12	12	2	3	25	36
24-Jun	478	1344	4	15	2	5	20	56
25-Jun	395	1740	6	22	1	6	16	72
26-Jun	196	1935	3	24	1	7	8	80
27-Jun	313	2248	5	30	1	8	13	93
28-Jun	552	2800	7	37	2	10	23	116
29-Jun	358	3158	5	42	1	11	15	131
30-Jun	257	3416	3	45	1	12	11	141
01-Jul	512	3927	11	55	1	14	20	162
02-Jul	440	4367	8	63	1	15	18	180
03-Jul	570	4937	13	75	2	17	23	202
04-Jul	507	5444	12	87	1	18	20	222
05-Jul	386	5831	8	95	1	19	15	238
06-Jul	629	6460	19	114	1	21	24	262
07-Jul	587	7047	23	137	1	21	21	283
08-Jul	212	7259	6	143	0	22	8	291
09-Jul	132	7391	2	145	0	22	5	297
10-Jul	92	7483	2	147	0	22	4	300
11-Jul	281	7765	3	149	1	24	12	312
12-Jul	434	8198	10	160	1	25	17	329
13-Jul	975	9173	25	184	2	27	38	367
14-Jul	10462	19635	447	632	8	36	374	741
15-Jul	6138	25773	207	839	10	46	230	971
16-Jul	4781	30554	122	961	12	57	186	1157
17-Jul	5788	36342	184	1144	11	68	219	1376
18-Jul	6535	42877	277	1421	5	74	234	1610
19-Jul	8156	51033	247	1668	16	90	311	1920
20-Jul	5513	56546	154	1823	12	102	212	2133
21-Jul	30804	87349	1218	3040	165	267	757	2889
22-Jul	47390	134739	403	3443	641	908	495	3384
23-Jul	26606	161345	0	3443	0	908	205	3589
24-Jul	30222	191567	0	3443	0	908	251	3840
25-Jul	44552	236119	0	3443	340	1247	0	3840
26-Jul	73598	309717	0	3443	1586	2834	0	3840
27-Jul	55980	365697	488	3931	707	3541	0	3840
28-Jul	26790	392487	263	4194	748	4289	0	3840
29-Jul	16559	409046	79	4273	158	4447	0	3840
30-Jul	22961	432007	52	4325	104	4551	0	3840
31-Jul	17317	449324	53	4379	106	4658	0	3840
Total b	51833	501157						

a. Sonar counts apportioned by fishwheel catch.

b. Estimate of escapement after 31 July based on minimum sums of squares analysis.

Appendix A.2. Kenai River north bank sonar counts by sector, 22 June through 31 July 1986.

Date	Count by Sector												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
22-Jun	3	0	0	0	0	0	0	0	0	0	0	0	3
23-Jun	9	1	18	5	3	0	16	27	24	60	37	35	235
24-Jun	3	0	1	0	0	0	0	0	0	20	30	4	58
25-Jun	0	0	0	0	0	0	2	4	14	13	84	17	134
Total	15	1	19	5	3	0	18	31	38	93	151	56	430
Percent	3.5%	0.2%	4.4%	1.2%	0.7%	0.0%	4.2%	7.2%	8.8%	21.6%	35.1%	13.0%	100.0%
26-Jun	0	0	0	0	0	0	1	5	9	20	7	0	42
27-Jun	0	0	0	0	0	0	3	10	20	41	24	24	122
28-Jun	0	0	0	0	0	0	1	15	22	66	24	24	152
29-Jun	4	0	2	0	0	0	1	3	23	42	16	23	114
Total	4	0	2	0	0	0	6	33	74	169	71	71	430
Percent	0.9%	0.0%	0.5%	0.0%	0.0%	0.0%	1.4%	7.7%	17.2%	39.3%	16.5%	16.5%	100.0%
30-Jun	0	0	1	0	0	0	1	2	5	26	14	5	54
01-Jul	2	3	2	0	0	0	2	24	38	71	47	51	240
02-Jul	3	3	3	0	0	0	0	9	27	28	21	71	165
03-Jul	0	4	4	0	0	0	3	22	32	77	33	93	268
Total	5	10	10	0	0	0	6	57	102	202	115	220	727
Percent	0.7%	1.4%	1.4%	0.0%	0.0%	0.0%	0.8%	7.8%	14.0%	27.8%	15.8%	30.3%	100.0%
04-Jul	2	1	0	0	0	0	0	7	36	76	74	49	245
05-Jul	1	1	2	0	0	0	1	5	22	52	37	50	171
06-Jul	6	2	0	0	0	0	1	4	30	42	195	119	399
07-Jul	1	0	0	0	0	0	1	6	21	15	208	241	493
Total	10	4	2	0	0	0	3	22	109	185	514	459	1308
Percent	0.8%	0.3%	0.2%	0.0%	0.0%	0.0%	0.2%	1.7%	8.3%	14.1%	39.3%	35.1%	100.0%
08-Jul	4	3	2	0	0	0	0	6	14	7	52	36	124
09-Jul	12	8	1	0	0	0	2	3	3	3	11	10	53
10-Jul	2	4	0	0	0	0	0	2	6	2	7	9	32
11-Jul	2	7	3	0	0	0	1	4	9	9	9	10	54
Total	20	22	6	0	0	0	3	15	32	21	79	65	263
Percent	7.6%	8.4%	2.3%	0.0%	0.0%	0.0%	1.1%	5.7%	12.2%	8.0%	30.0%	24.7%	100.0%
12-Jul	19	20	23	7	6	4	6	5	19	8	12	18	147
13-Jul	74	67	111	50	14	1	19	26	45	91	131	193	822
14-Jul	501	2990	2634	835	90	34	104	156	234	524	524	862	9488
15-Jul	735	754	735	291	33	9	59	77	142	420	459	682	4396
Total	1329	3831	3503	1183	143	48	188	264	440	1043	1126	1755	14853
Percent	8.9%	25.8%	23.6%	8.0%	1.0%	0.3%	1.3%	1.8%	3.0%	7.0%	7.6%	11.8%	100.0%

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Appendix A.2. (continued: p 2 of 2).

Count by Sector													
Date	1	2	3	4	5	6	7	8	9	10	11	12	Total
16-Jul	338	427	259	90	9	9	46	147	135	426	467	460	2813
17-Jul	151	392	580	258	34	7	57	142	129	450	662	1033	3895
18-Jul	489	1388	1666	347	26	6	36	75	125	400	638	683	5879
19-Jul	708	765	1355	339	24	3	32	89	180	613	402	407	4917
Total	1686	2972	3860	1034	93	25	171	453	569	1889	2169	2583	17504
Percent	9.6%	17.0%	22.1%	5.9%	0.5%	0.1%	1.0%	2.6%	3.3%	10.8%	12.4%	14.8%	100.0%
20-Jul	757	915	707	158	29	22	30	53	87	210	143	166	3277
21-Jul	2213	11443	5824	1784	152	43	90	115	176	354	484	1407	24085
22-Jul	1484	12710	5193	1849	81	14	49	48	67	149	294	991	22929
23-Jul	632	10960	4330	838	45	5	20	30	29	83	243	152	17367
Total	5086	36028	16054	4629	307	84	189	246	359	796	1164	2716	67658
Percent	7.5%	53.3%	23.7%	6.8%	0.5%	0.1%	0.3%	0.4%	0.5%	1.2%	1.7%	4.0%	100.0%
24-Jul	397	10451	5642	906	43	14	20	24	41	227	134	277	18176
25-Jul	865	17625	7987	1387	33	2	12	19	31	161	166	308	28596
26-Jul	1446	14166	14974	13064	687	179	101	67	105	194	270	253	45506
27-Jul	742	6852	11765	10211	931	423	166	162	205	571	567	655	33250
Total	3450	49094	40368	25568	1694	618	299	272	382	1153	1137	1493	125528
Percent	2.7%	39.1%	32.2%	20.4%	1.3%	0.5%	0.2%	0.2%	0.3%	0.9%	0.9%	1.2%	100.0%
28-Jul	319	2166	5644	4795	652	269	145	115	90	215	279	263	14952
29-Jul	430	2551	2302	1064	209	134	77	121	171	759	979	807	9604
30-Jul	561	3601	6135	4963	190	121	102	108	199	696	789	876	18341
31-Jul	345	1676	3628	5502	206	167	100	75	93	376	314	523	13005
Total	1655	9994	17709	16324	1257	691	424	419	553	2046	2361	2469	55902
Percent	3.0%	17.9%	31.7%	29.2%	2.2%	1.2%	0.8%	0.7%	1.0%	3.7%	4.2%	4.4%	100.0%

Appendix A.3. Kenai River south bank sonar counts by sector, 22 June through 31 July 1986.

Count by Sector													
Date	1	2	3	4	5	6	7	8	9	10	11	12	Total
22-Jun	2	10	12	6	2	1	16	29	40	14	27	42	201
23-Jun	40	52	54	9	6	0	21	34	34	80	42	48	420
24-Jun	93	53	36	8	3	3	14	21	38	56	36	68	429
25-Jun	15	10	6	2	2	1	12	24	27	79	37	73	288
Total	150	125	108	25	13	5	63	108	139	229	142	231	1338
Percent	11.2%	9.3%	8.1%	1.9%	1.0%	0.4%	4.7%	8.1%	10.4%	17.1%	10.6%	17.3%	100.0%
26-Jun	1	0	0	1	1	1	6	9	4	44	28	54	149
27-Jun	0	1	0	0	3	2	5	30	18	57	47	60	223
28-Jun	20	11	8	7	3	5	11	84	25	94	75	85	428
29-Jun	19	5	5	4	0	0	12	34	26	77	50	51	283
Total	40	17	13	12	7	8	34	157	73	272	200	250	1083
Percent	3.7%	1.6%	1.2%	1.1%	0.6%	0.7%	3.1%	14.5%	6.7%	25.1%	18.5%	23.1%	100.0%
30-Jun	24	16	10	1	0	0	8	21	8	38	40	41	207
01-Jul	33	27	17	11	0	1	20	41	17	70	48	38	323
02-Jul	33	33	17	6	0	0	8	28	22	61	58	35	301
03-Jul	27	47	40	3	1	0	12	50	11	66	46	38	341
Total	117	123	84	21	1	1	48	140	58	235	192	152	1172
Percent	10.0%	10.5%	7.2%	1.8%	0.1%	0.1%	4.1%	11.9%	4.9%	20.1%	16.4%	13.0%	100.0%
04-Jul	31	22	18	6	1	0	6	29	18	76	63	26	296
05-Jul	28	25	23	1	0	2	5	10	11	48	52	31	236
06-Jul	74	43	25	7	0	1	4	9	11	45	37	18	274
07-Jul	28	17	5	0	2	2	4	9	9	17	27	20	140
Total	161	107	71	14	3	5	19	57	49	186	179	95	946
Percent	17.0%	11.3%	7.5%	1.5%	0.3%	0.5%	2.0%	6.0%	5.2%	19.7%	18.9%	10.0%	100.0%
08-Jul	23	19	7	4	0	1	4	4	12	11	19	9	113
09-Jul	7	10	4	0	0	0	0	4	8	15	25	12	85
10-Jul	11	10	7	1	0	0	1	6	2	1	4	5	48
11-Jul	16	6	14	1	0	1	11	24	30	36	45	27	211
Total	57	45	32	6	0	2	16	38	52	63	93	53	457
Percent	12.5%	9.8%	7.0%	1.3%	0.0%	0.4%	3.5%	8.3%	11.4%	13.8%	20.4%	11.6%	100.0%
12-Jul	82	39	35	1	0	0	5	8	13	24	26	12	245
13-Jul	100	93	66	9	1	0	6	16	23	64	78	59	515
14-Jul	139	250	528	215	15	4	5	34	82	158	200	173	1803
15-Jul	200	274	421	222	30	14	31	42	104	203	325	332	2198
Total	521	656	1050	447	46	18	47	100	222	449	629	576	4761
Percent	10.9%	13.8%	22.1%	9.4%	1.0%	0.4%	1.0%	2.1%	4.7%	9.4%	13.2%	12.1%	100.0%

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Appendix A.3. (continued: p 2 of 2).

Date	Count by Sector												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
16-Jul	79	177	370	301	48	30	19	33	96	315	451	616	2535
17-Jul	202	152	341	163	21	1	11	15	27	143	541	668	2285
18-Jul	296	217	153	74	11	1	11	12	30	60	225	98	1188
19-Jul	1183	613	580	295	24	3	8	12	31	92	214	429	3484
Total	1760	1159	1444	833	104	35	49	72	184	610	1431	1811	9492
Percent	18.5%	12.2%	15.2%	8.8%	1.1%	0.4%	0.5%	0.8%	1.9%	6.4%	15.1%	19.1%	100.0%
20-Jul	1029	653	436	76	4	3	5	19	31	76	102	183	2617
21-Jul	3021	1746	1202	333	29	0	9	28	37	121	400	668	7594
22-Jul	19988	3158	1164	233	19	1	7	13	21	78	244	578	25504
23-Jul	5776	2380	1074	205	13	3	5	53	27	53	133	316	10038
Total	29814	7937	3876	847	65	7	26	113	116	328	879	1745	45753
Percent	65.2%	17.3%	8.5%	1.9%	0.1%	0.0%	0.1%	0.2%	0.3%	0.7%	1.9%	3.8%	100.0%
24-Jul	4558	4595	2053	592	35	0	12	10	10	33	82	317	12297
25-Jul	5949	6218	2746	850	67	1	23	22	17	43	89	270	16295
26-Jul	10030	10575	6201	2261	354	17	37	20	10	49	76	145	29775
27-Jul	7899	7918	5566	1971	168	10	31	22	23	54	92	176	23930
Total	28436	29306	16566	5674	624	28	103	74	60	179	339	908	82297
Percent	34.6%	35.6%	20.1%	6.9%	0.8%	0.0%	0.1%	0.1%	0.1%	0.2%	0.4%	1.1%	100.0%
28-Jul	3716	3421	3470	1155	48	10	19	20	30	83	145	784	12901
29-Jul	1727	1393	2011	1066	97	8	17	33	56	417	580	753	8158
30-Jul	1398	905	1141	622	88	18	21	23	60	24	24	24	4348
31-Jul	881	956	1102	799	436	61	88	6	13	23	35	69	4469
Total	7722	6675	7724	3642	669	97	145	82	159	547	784	1630	29876
Percent	25.8%	22.3%	25.9%	12.2%	2.2%	0.3%	0.5%	0.3%	0.5%	1.8%	2.6%	5.5%	100.0%

Appendix A.4. Kenai River north bank side scan sonar counts by hour, 22 June through 31 July 1986.

Date	Counts by Hour																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
22-Jun	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
23-Jun	4	3	5	3	3	3	3	2	4	1	1	6	12	14	18	15	15	35	15	20	13	20	7	13
24-Jun	3	1	1	0	0	3	2	0	0	2	4	0	5	2	2	3	3	3	4	4	5	2	4	5
25-Jun	6	5	2	9	5	5	5	4	9	8	1	13	19	4	3	4	4	5	2	7	6	3	2	3
26-Jun	5	14	2	0	0	4	0	0	1	0	0	3	0	0	1	0	1	0	2	4	0	1	2	2
27-Jun	2	10	11	7	2	5	3	6	8	2	6	2	5	2	2	3	4	8	7	5	7	5	5	5
28-Jun	4	7	4	4	5	2	7	12	9	2	3	10	4	2	7	9	8	3	5	3	13	10	11	8
29-Jun	13	14	6	3	12	12	5	4	6	4	10	1	1	3	4	0	0	1	11	0	2	2	0	0
30-Jun	4	0	1	2	2	0	0	3	0	0	1	9	1	7	1	2	5	1	2	3	8	0	1	1
01-Jul	9	14	17	4	9	10	9	8	2	1	12	15	10	6	4	21	12	14	9	8	23	13	6	4
02-Jul	1	9	2	1	2	0	1	5	4	3	5	2	2	7	11	2	12	22	12	14	13	19	11	5
03-Jul	23	8	15	8	18	9	8	10	12	20	10	8	11	7	7	8	15	9	5	15	5	10	13	14
04-Jul	12	12	9	5	7	10	15	7	12	20	7	8	4	15	13	3	5	14	13	11	3	16	10	14
05-Jul	9	8	12	2	2	3	8	17	5	12	5	4	7	5	4	3	4	4	5	5	3	14	15	15
06-Jul	7	14	8	7	4	9	7	4	9	11	17	13	11	10	18	22	27	32	33	38	24	20	29	25
07-Jul	21	29	11	26	30	28	32	32	33	18	18	24	31	11	26	7	11	20	16	13	16	17	13	10
08-Jul	2	4	6	2	7	10	6	7	11	1	1	8	4	13	2	0	4	6	9	4	1	5	4	7
09-Jul	5	2	2	1	3	1	3	0	0	3	1	0	0	0	0	1	2	1	0	6	4	9	8	1
10-Jul	3	3	1	0	0	0	3	1	5	0	1	1	3	0	0	1	0	0	0	1	1	4	3	1
11-Jul	2	4	3	7	5	1	3	3	1	5	0	0	0	1	0	0	1	4	1	0	3	2	5	3
12-Jul	7	13	6	4	3	6	1	3	0	3	3	6	6	0	0	0	0	0	0	0	0	40	19	27
13-Jul	25	8	13	30	17	16	9	35	46	22	53	22	32	29	3	6	34	48	80	44	42	32	54	122
14-Jul	240	498	377	255	112	43	69	107	170	135	237	132	126	104	186	60	160	146	332	1465	2022	1285	773	454
15-Jul	614	669	399	299	146	62	136	108	117	87	92	160	100	95	61	80	78	123	106	97	122	192	306	147
16-Jul	198	159	129	160	107	64	107	70	43	32	120	90	215	301	114	143	97	139	132	101	78	53	18	143
17-Jul	261	391	239	103	126	83	104	103	120	176	69	129	125	110	59	71	119	107	156	118	160	142	247	577
18-Jul	454	598	323	216	58	70	88	122	112	113	71	89	81	93	72	108	39	212	415	667	617	476	431	354
19-Jul	792	388	331	237	115	103	109	78	100	166	65	115	92	111	50	52	32	33	66	100	143	595	248	796
20-Jul	576	298	151	112	62	34	38	78	76	34	53	116	72	138	128	98	66	84	100	95	126	188	163	391
21-Jul	801	700	432	361	292	379	370	524	527	564	657	303	435	669	410	1188	1949	1250	2763	2942	3147	1512	779	1131
22-Jul	1238	1183	1035	786	546	450	340	675	1001	845	879	1428	2058	1808	669	364	981	695	1216	863	1198	638	1176	857

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Appendix A.4. (continued: p 2 of 2).

Counts by Hour																								
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
23-Jul	579	353	552	402	392	218	94	295	572	479	639	588	365	1	822	466	699	1127	1289	1500	1941	1580	1502	912
24-Jul	490	344	321	224	182	113	135	187	233	259	542	402	427	205	279	45	162	903	1641	1656	2128	2788	3018	1492
25-Jul	660	552	446	540	222	276	372	903	1239	922	774	923	737	1605	2065	1667	687	1278	1241	2045	2443	2241	2546	2212
26-Jul	930	509	232	277	792	1258	1849	1650	3824	4002	1576	970	1826	1107	1277	1119	1425	1450	2684	3224	3594	3155	3829	2947
27-Jul	2646	1288	936	1000	1393	642	1106	1461	1375	710	628	1517	668	1024	1090	1059	1258	1528	1608	1574	1731	1394	2479	3135
28-Jul	1517	1146	728	714	431	146	118	497	1157	484	132	124	324	257	226	468	458	485	386	454	853	1148	1327	1372
29-Jul	1750	1366	1192	720	757	101	45	108	215	165	137	209	238	119	201	242	252	222	154	160	303	266	342	340
30-Jul	2910	1839	1479	640	351	95	53	115	125	106	132	120	168	271	445	259	255	563	916	1459	1878	1598	1261	1303
31-Jul	1163	376	382	408	118	103	137	160	245	270	222	178	391	365	424	319	297	644	432	612	847	779	1543	2590
Percent	6.3%	4.5%	3.5%	2.7%	2.2%	1.5%	1.9%	2.6%	4.0%	3.4%	2.5%	2.7%	3.0%	3.0%	3.1%	2.8%	3.2%	3.9%	5.6%	6.8%	8.3%	7.1%	7.8%	7.5%

Appendix A.5. Kenai River south bank side scan sonar counts by hour, 22 June through 31 July 1986.

Counts by Hour																								
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
22-Jun	0	1	2	2	0	1	2	0	4	1	0	1	1	14	22	13	18	15	14	23	14	15	24	14
23-Jun	32	48	59	24	16	6	7	2	4	1	1	6	12	14	18	15	15	35	15	27	13	20	16	14
24-Jun	13	48	42	31	1	5	8	11	9	5	17	3	8	6	8	14	15	15	13	25	20	17	46	49
25-Jun	9	25	6	5	9	3	3	2	8	3	1	1	10	5	10	9	19	31	8	42	36	17	18	8
26-Jun	0	0	3	1	0	3	3	8	7	3	10	0	0	3	2	8	5	10	11	4	21	20	18	9
27-Jun	7	5	3	3	4	4	3	9	17	4	1	7	0	2	0	3	22	9	6	13	25	32	27	17
28-Jun	5	14	8	2	11	17	30	9	30	7	4	31	8	4	8	7	19	20	28	32	36	29	45	24
29-Jun	7	15	9	7	1	9	14	14	11	16	7	7	6	11	9	8	10	13	20	36	17	13	17	6
30-Jun	14	19	17	7	11	1	12	0	1	1	3	1	10	7	6	14	5	22	6	3	19	7	13	8
01-Jul	6	12	10	2	9	24	4	1	4	5	2	17	13	8	17	16	26	17	32	24	19	17	19	19
02-Jul	21	9	4	6	7	5	2	4	9	4	3	5	7	6	18	6	9	19	21	34	18	16	30	38
03-Jul	18	10	13	5	3	7	11	12	15	18	7	9	8	13	14	19	20	21	31	19	11	19	21	17
04-Jul	5	14	9	6	7	23	7	7	0	4	8	5	11	3	13	12	26	26	11	9	25	17	22	26
05-Jul	17	8	4	4	1	10	16	8	2	34	8	10	3	2	4	5	4	8	8	9	18	23	18	12
06-Jul	13	6	15	4	4	6	5	6	16	8	8	7	19	10	10	6	19	13	35	15	14	17	8	10
07-Jul	15	4	13	4	5	9	6	6	0	1	2	4	1	8	0	11	10	13	3	9	3	4	4	5
08-Jul	0	3	4	7	1	0	7	1	10	1	3	4	12	1	3	2	2	7	11	3	1	10	11	9
09-Jul	6	4	11	0	0	5	3	1	0	0	0	1	2	2	3	0	0	5	1	5	6	16	9	5
10-Jul	2	1	2	4	1	4	3	8	5	0	5	0	4	1	1	0	3	0	4	0	0	0	0	0
11-Jul	6	6	6	6	6	6	6	4	9	3	7	1	7	11	2	15	12	12	13	27	17	9	8	12
12-Jul	34	22	9	11	1	9	14	5	4	2	1	0	8	6	7	0	6	21	15	13	10	17	16	14
13-Jul	17	15	11	8	9	11	9	19	3	3	6	19	7	9	23	14	10	41	60	60	32	33	44	52
14-Jul	61	27	21	12	11	16	31	34	22	18	51	62	54	50	55	102	63	77	160	361	202	151	68	94
15-Jul	99	41	23	53	48	27	24	31	38	45	75	97	84	85	156	180	92	107	112	133	119	174	240	115
16-Jul	73	61	22	24	25	22	43	48	39	25	103	142	111	144	215	209	120	106	239	102	196	211	155	100
17-Jul	64	128	72	17	13	33	51	71	36	47	35	56	66	59	37	34	37	26	77	144	265	331	312	274
18-Jul	106	124	144	19	11	24	8	16	22	11	6	17	41	40	25	44	46	26	35	58	98	73	93	101
19-Jul	129	238	229	113	77	42	108	33	103	72	68	62	175	190	49	46	89	96	92	214	323	313	237	386
20-Jul	194	350	100	73	31	29	28	46	57	62	70	89	148	174	130	93	78	111	109	98	137	179	122	109
21-Jul	122	67	29	47	59	63	73	75	135	255	189	166	599	256	227	465	298	313	597	830	659	713	848	509
22-Jul	322	238	89	157	131	238	161	376	359	529	429	96	2005	921	2017	2959	3134	2744	1310	2625	1889	1415	645	715

-Continued-

Appendix A.5. (continued: p 2 of 2).

Counts by Hour																								
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
23-Jul	638	537	381	200	142	56	106	376	220	201	217	254	93	532	383	474	533	899	1069	686	760	468	495	318
24-Jul	226	138	239	354	61	95	300	134	75	99	176	133	142	446	1017	299	444	806	1704	1390	1374	1433	839	373
25-Jul	647	811	478	660	291	463	321	307	191	153	228	137	278	147	605	907	1522	1547	1442	1816	980	896	988	480
26-Jul	543	511	393	438	496	562	350	1038	656	460	410	847	915	805	740	1950	2593	1323	3394	3074	2746	2792	1756	983
27-Jul	755	1087	1643	852	746	362	342	701	844	407	502	633	437	1732	1030	756	1506	1424	1548	1575	1746	1109	1067	1126
28-Jul	1025	1022	551	761	395	273	131	455	634	520	339	416	527	243	312	638	885	768	536	382	454	540	546	548
29-Jul	663	859	337	139	190	59	17	46	117	258	197	202	210	368	441	455	450	495	426	431	370	491	535	402
30-Jul	482	505	276	140	91	46	33	32	22	34	49	80	165	78	154	104	113	148	95	58	279	626	336	402
31-Jul	606	537	118	59	56	55	84	94	82	92	56	22	60	27	70	115	362	250	214	271	195	375	284	385
Percent	4.0%	4.3%	3.1%	2.4%	1.7%	1.5%	1.3%	2.3%	2.2%	1.9%	1.9%	2.1%	3.5%	3.6%	4.4%	5.7%	7.1%	6.6%	7.6%	8.3%	7.4%	7.1%	5.6%	4.4%

Appendix A.6. Fish targets recorded on the north bank of the Kenai River, 22 June through 31 July 1986. a

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
22-Jun	6	6	0	0	0	0	0	0
23-Jun	227	232	12	12	0	0	8	8
24-Jun	69	301	4	15	0	0	2	10
25-Jun	122	423	6	22	0	0	4	14
26-Jun	53	476	3	24	0	0	2	16
27-Jun	101	578	5	30	0	0	3	20
28-Jun	144	722	7	37	0	0	5	25
29-Jun	91	813	5	42	0	0	3	28
30-Jun	60	873	3	45	0	0	2	30
01-Jul	205	1078	11	55	0	0	7	37
02-Jul	152	1230	8	63	0	0	5	42
03-Jul	245	1475	13	75	0	0	8	50
04-Jul	226	1701	12	87	0	0	8	58
05-Jul	158	1859	8	95	0	0	5	63
06-Jul	368	2226	19	114	0	0	13	76
07-Jul	454	2681	23	137	0	0	15	91
08-Jul	114	2795	6	143	0	0	4	95
09-Jul	49	2844	2	145	0	0	2	97
10-Jul	29	2873	2	147	0	0	1	98
11-Jul	50	2923	3	149	0	0	2	100
12-Jul	200	3123	10	160	0	0	7	106
13-Jul	484	3607	25	184	0	0	16	123
14-Jul	8743	12349	447	632	0	0	298	421
15-Jul	4048	16397	207	839	0	0	138	559
16-Jul	2388	18786	122	961	0	0	81	640
17-Jul	3592	22378	184	1144	0	0	122	763
18-Jul	5412	27790	277	1421	0	0	184	947
19-Jul	4836	32625	247	1668	0	0	165	1112
20-Jul	3016	35641	154	1823	0	0	103	1215
21-Jul	22194	57836	1135	2958	0	0	757	1972
22-Jul	22599	80435	165	3122	165	165	495	2467
23-Jul	16763	97198	0	3122	0	165	0	2467
24-Jul	18176	115374	0	3122	0	165	0	2467
25-Jul	28595	143969	0	3122	0	165	0	2467
26-Jul	44438	188407	0	3122	966	1131	0	2467
27-Jul	32541	220947	0	3122	707	1838	0	2467
28-Jul	14152	235099	0	3122	748	2587	0	2467
29-Jul	10170	245269	0	3122	0	2587	0	2467
30-Jul	18737	264006	0	3122	0	2587	0	2467
31-Jul	13008	277014	0	3122	0	2587	0	2467

a. Sonar counts apportioned by fishwheel catch.

Appendix A.7. Fish targets recorded on the south bank of the Kenai River, 22 June through 31 July 1986. a

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
22-Jun	234	234	0	0	1	1	10	10
23-Jun	400	634	0	0	2	3	18	28
24-Jun	409	1043	0	0	2	5	18	46
25-Jun	274	1317	0	0	1	6	12	58
26-Jun	142	1459	0	0	1	7	6	64
27-Jun	212	1671	0	0	1	8	9	73
28-Jun	408	2079	0	0	2	10	18	91
29-Jun	267	2346	0	0	1	11	12	103
30-Jun	197	2543	0	0	1	12	9	112
01-Jul	306	2849	0	0	1	14	13	125
02-Jul	288	3137	0	0	1	15	13	138
03-Jul	325	3462	0	0	2	17	14	152
04-Jul	281	3743	0	0	1	18	12	164
05-Jul	229	3972	0	0	1	19	10	174
06-Jul	261	4233	0	0	1	21	11	186
07-Jul	133	4366	0	0	1	21	6	192
08-Jul	98	4464	0	0	0	22	4	196
09-Jul	83	4547	0	0	0	22	4	200
10-Jul	63	4610	0	0	0	22	3	202
11-Jul	232	4842	0	0	1	24	10	213
12-Jul	234	5075	0	0	1	25	10	223
13-Jul	491	5566	0	0	2	27	22	244
14-Jul	1719	7286	0	0	8	36	75	320
15-Jul	2090	9376	0	0	10	46	92	412
16-Jul	2392	11768	0	0	12	57	105	517
17-Jul	2196	13964	0	0	11	68	96	613
18-Jul	1123	15087	0	0	5	74	49	662
19-Jul	3320	18407	0	0	16	90	146	808
20-Jul	2497	20904	0	0	12	102	110	918
21-Jul	8609	29514	83	83	165	267	0	918
22-Jul	24791	54304	238	320	476	743	0	918
23-Jul	9843	64147	0	320	0	743	205	1123
24-Jul	12046	76193	0	320	0	743	251	1374
25-Jul	15957	92151	0	320	340	1082	0	1374
26-Jul	29160	121310	0	320	620	1703	0	1374
27-Jul	23440	144750	488	809	0	1703	0	1374
28-Jul	12638	157388	263	1072	0	1703	0	1374
29-Jul	6389	163777	79	1151	158	1860	0	1374
30-Jul	4224	168000	52	1203	104	1965	0	1374
31-Jul	4309	172310	53	1256	106	2071	0	1374

a. Sonar counts apportioned by fishwheel catch.

Appendix A.8. Daily asjuted fishwheel catch by species from the north bank of the Kenai River, 7 July through 31 July 1986. a

Date	Hours Open	Sockeye		Pink		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
07-Jul	10	0	0	0	0	0	0	5	5
08-Jul	24.5	0	0	0	0	0	0	0	5
09-Jul	28.5	1	1	0	0	0	0	0	5
10-Jul	20.5	0	1	0	0	0	0	0	5
11-Jul	24	0	1	0	0	0	0	0	5
12-Jul	27	0	1	0	0	0	0	0	5
13-Jul	20.5	2	3	0	0	0	0	0	5
14-Jul	24.3	6	9	0	0	0	0	0	5
15-Jul	23.5	7	16	0	0	0	0	0	5
16-Jul	23	9	25	0	0	0	0	1	6
17-Jul	25.5	13	38	0	0	0	0	0	6
18-Jul	23	15	53	0	0	0	0	0	6
19-Jul	24	25	78	0	0	0	0	0	6
20-Jul	24	29	107	0	0	0	0	0	6
21-Jul	13	54	161	9	9	0	0	0	6
22-Jul	12	274	435	2	11	2	2	0	6
23-Jul	4	384	819	0	11	0	2	0	6
24-Jul	5.5	196	1015	0	11	0	2	0	6
25-Jul	3	296	1311	0	11	0	2	0	6
26-Jul	4.2	120	1431	0	11	0	2	0	6
27-Jul	4	1260	2691	0	11	30	32	0	6
28-Jul	6.25	227	2918	0	11	12	44	0	6
29-Jul	6.25	115	3033	0	11	0	44	0	6
30-Jul	20	26	3059	0	11	0	44	0	6
31-Jul	8	108	3167	0	11	0	44	0	6

a. Fishwheel catch adjusted for 24 hours: (daily catch * 24 hours)/hours open.
 Actual catch by species: 797 sockeye salmon; 5 pink salmon; 9 coho salmon; 3 chinook salmon.

Appendix A.9. Daily adjusted fishwheel catch by species from the south bank of the Kenai River, 7 July through 30 July 1986. a

Date	Hours Open	Sockeye		Pink		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
07-Jul	20	1	1	0	0	0	0	1	1
08-Jul	29	1	2	0	0	0	0	2	3
09-Jul	20	0	2	0	0	0	0	1	4
10-Jul	24	0	2	0	0	0	0	0	4
11-Jul	23.5	4	6	0	0	0	0	0	4
12-Jul	25.5	3	9	0	0	0	0	0	4
13-Jul	23	9	18	0	0	0	0	0	4
14-Jul	23.5	9	27	0	0	0	0	0	4
15-Jul	23	16	43	0	0	0	0	2	6
16-Jul	25	14	57	0	0	0	0	2	8
17-Jul	25	31	88	0	0	1	1	0	8
18-Jul	24	33	121	0	0	0	1	1	9
19-Jul	13	70	191	0	0	0	1	0	9
20-Jul	10	98	289	2	0	1	2	0	9
21-Jul	10	319	608	2	2	7	9	0	9
22-Jul	4.5	357	965	0	2	0	9	4	13
23-Jul	6	52	1017	0	2	0	9	0	13
24-Jul	6.5	107	1124	0	2	4	13	0	13
25-Jul	6.5	81	1205	0	2	0	13	0	13
26-Jul	6	128	1333	0	2	0	13	0	13
27-Jul	6.75	64	1397	4	6	0	13	0	13
28-Jul	6.5	81	1478	0	6	4	17	0	13
29-Jul	27.5	24	1502	1	7	0	17	0	13
30-Jul	20.5	57	1559	1	8	0	17	0	13

a. Fishwheel catch adjusted for 24 hours: (daily catch * 24 hours)/hours open.

Actual catch by species: 789 sockeye salmon; 5 pink salmon; 8 coho salmon; 3 chinook salmon.

Appendix A.10. Length composition of the major age classes of sockeye salmon collected in the Kenai River, 1980-1986.^a

Year	Age Class	Male			Female			Total			Ratio Male-Female
		Average Length (mm)	Standard Error	Sample Size	Average Length (mm)	Standard Error	Sample Size	Average Length (mm)	Standard Error	Sample Size	
1980	1.2	482	3.9	168	494	3.6	100	486		268	1.7:1
1981		493	5.6	85	513	5.6	73	502		158	1.2:1
1982		483	8.9	70	505	12.6	32	490	10.0	63	2.2:1
1983		524	8.7	25	520	5.5	30	522	5.0	55	0.8:1
1984		474	2.8	280	473	3.5	196	474	2.2	476	1.4:1
1985		492	3.3	184	490	3.0	186	491	2.2	370	1.0:1
1986		488	4.3	155	492	6.2	96	489	3.6	251	1.6:1
1980	1.3	580	2.9	180	561	2.2	192	570		372	0.9:1
1981		590	1.8	290	569	1.3	430	577		720	0.7:1
1982		596	1.9	723	572	1.3	841	583	1.6	1,564	0.9:1
1983		598	2.1	215	577	1.2	269	586	1.1	484	0.8:1
1984		582	1.6	385	559	1.4	395	571	1.0	780	1.0:1
1985		575	1.5	496	552	0.9	824	560	0.8	1,320	0.6:1
1986		584	3.1	112	564	1.9	200	571	1.7	312	0.6:1
1984	2.2	505	3.6	116	508	3.0	159	507	2.3	275	0.7:1
1985		513	3.5	132	513	2.6	196	513	2.1	328	0.7:1
1980	2.3	589	2.7	67	579	3.2	80	584		147	0.8:1
1982		598	4.9	46	580	8.4	21	592	6.0	67	2.2:1
1983		595	4.2		582	4.2		587	3.0	61	0.7:1
1984		570	2.3	210	557	1.7	192	564	1.5	402	1.1:1
1985		570	2.8	106	555	2.1	129	562	1.7	235	0.8:1
1986		585	5.2	53	568	2.8	89	575	2.6	142	0.6:1

^a Length measured mid-eye to fork of tail.

Appendix A.11. Weight composition of the major age classes of sockeye salmon collected in the Kenai River, 1981-1986.

Year	Age Class	Male			Female			Total		
		Average Weight (kg)	Standard Error	Sample Size	Average Weight (kg)	Standard Error	Sample Size	Average Weight (kg)	Standard Error	Sample Size
1981	1.2	2.1	0.07	85	2.3	0.07	73	2.2		158
1982		1.9	0.15	47	2.0	0.20	16	1.9	0.17	63
1983		2.2	0.09	25	2.2	0.07	30	2.2	0.06	55
1984		1.9	0.07	66	1.9	0.07	54	1.9	0.05	120
1985		1.9	0.06	56	1.8	0.05	45	1.8	0.04	101
1986		2.1	0.06	129	1.9	0.05	77	2.1	0.04	206
1981	1.3	3.8	0.04	290	3.2	0.02	430	3.4		720
1982		4.0	0.06	413	3.3	0.04	444	3.7	0.05	857
1983		3.7	0.04	215	3.2	0.02	269	3.4	0.02	484
1984		3.2	0.07	96	3.0	0.05	103	3.1	0.04	199
1985		3.2	0.05	127	2.7	0.02	218	2.9	0.02	345
1986		3.6	0.08	87	3.1	0.04	173	3.3	0.04	260
1981	2.2	2.3	0.08	42	2.3	0.06	46	2.3		88
1985		2.0	0.07	33	1.8	0.05	50	1.9	0.04	83
1981	2.3	3.3	0.13	20	3.3	0.10	27	3.3		47
1982		3.6	0.16	26	3.3	0.26	13	3.5	0.19	39
1983		3.5	0.10	26	3.2	0.07	35	3.3	0.06	61
1984		3.2	0.10	36	2.8	0.05	62	3.0	0.05	98
1985		3.0	0.10	26	2.7	0.06	21	2.8	0.06	47
1986		3.6	0.09	46	3.1	0.06	76	3.3	0.05	122

Appendix A.12. Fish targets recorded in the Kasilof River, north and south banks combined, 13 June through 31 July 1986. a

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
13-Jun	1127	11371	70	70	0	0	35	35
14-Jun	1128	12499	69	139	0	0	35	70
15-Jun	787	13286	37	176	0	0	21	90
16-Jun	1307	14593	113	289	0	0	52	142
17-Jun	1577	16170	162	450	0	0	71	213
18-Jun	916	17086	68	519	0	0	33	245
19-Jun	1087	18173	103	622	0	0	46	292
20-Jun	701	18874	66	689	0	0	30	321
21-Jun	672	19546	62	750	0	0	28	349
22-Jun	620	20166	53	803	0	0	24	373
23-Jun	322	20488	29	832	0	0	13	386
24-Jun	293	20781	26	858	0	0	12	398
25-Jun	466	21247	43	901	0	0	19	418
26-Jun	622	21869	57	958	0	0	26	443
27-Jun	742	22611	15	973	0	0	3	446
28-Jun	862	23473	18	990	0	0	3	449
29-Jun	2639	26112	26	1017	0	0	7	456
30-Jun	7164	33276	78	1095	0	0	6	462
01-Jul	8918	42194	4	1099	0	0	11	473
02-Jul	7417	49611	4	1103	0	0	10	483
03-Jul	5077	54688	22	1125	0	0	47	530
04-Jul	4754	59442	4	1129	0	0	9	539
05-Jul	3612	63054	6	1135	0	0	46	585
06-Jul	4478	67532	17	1152	0	0	87	672
07-Jul	3377	70909	37	1190	17	17	176	849
08-Jul	1078	71987	10	1199	3	20	41	890
09-Jul	2335	74322	21	1220	7	28	89	979
10-Jul	5317	79639	46	1265	16	44	195	1173
11-Jul	9583	89222	19	1284	0	44	67	1240
12-Jul	3652	92874	7	1291	0	44	18	1258
13-Jul	25845	118719	64	1356	0	44	161	1419
14-Jul	19587	138306	41	1397	0	44	102	1521
15-Jul	3155	141461	16	1413	0	44	26	1547
16-Jul	4232	145693	11	1424	0	44	52	1600
17-Jul	4357	150050	0	1424	0	44	60	1659
18-Jul	4951	155001	20	1444	0	44	183	1843
19-Jul	3709	158710	0	1444	0	44	66	1909
20-Jul	3135	161845	16	1460	0	44	74	1983
21-Jul	3999	165844	17	1477	0	44	17	2000
22-Jul	2707	168551	0	1477	0	44	98	2098
23-Jul	2082	170633	0	1477	0	44	152	2250
24-Jul	2515	173148	24	1501	7	51	35	2284
25-Jul	24774	197922	92	1593	0	51	0	2284
26-Jul	21440	219361	99	1692	198	248	99	2383

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Appendix A.12. (continued: p 2 of 2).

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
27-Jul	3025	222387	115	1807	0	248	115	2498
28-Jul	1709	224096	65	1873	0	248	65	2563
29-Jul	4677	228773	62	1934	0	248	62	2625
30-Jul	16410	245183	328	2263	0	248	109	2735
31-Jul	7797	252980	48	2310	0	248	48	2782
Total b	22983	275963						

a. Sonar counts apportioned by fishwheel catch.

b. Estimate of escapement after 31 July based on minimum sums of squares analysis.

Appendix A.13. Fish targets recorded on the north bank of the Kasilof River, 13 June through 31 July 1986. a

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
13-Jun	534	534	67	67	0	0	28	28
14-Jun	523	1057	66	133	0	0	28	56
15-Jun	275	1331	35	167	0	0	15	70
16-Jun	883	2215	111	278	0	0	47	117
17-Jun	1275	3490	160	439	0	0	68	185
18-Jun	529	4019	67	505	0	0	28	213
19-Jun	812	4831	102	608	0	0	43	256
20-Jun	522	5352	66	673	0	0	28	283
21-Jun	484	5836	61	734	0	0	26	309
22-Jun	411	6247	52	786	0	0	22	331
23-Jun	227	6473	29	814	0	0	12	343
24-Jun	207	6680	26	840	0	0	11	354
25-Jun	335	7015	42	883	0	0	18	371
26-Jun	445	7460	56	939	0	0	24	395
27-Jun	518	7979	14	952	0	0	0	395
28-Jun	632	8611	17	969	0	0	0	395
29-Jun	2043	10654	23	992	0	0	0	395
30-Jun	6626	17280	76	1068	0	0	0	395
01-Jul	7995	25275	0	1068	0	0	0	395
02-Jul	6582	31857	0	1068	0	0	0	395
03-Jul	3881	35738	17	1084	0	0	33	428
04-Jul	3995	39733	0	1084	0	0	0	428
05-Jul	2317	42050	0	1084	0	0	31	459
06-Jul	3413	45463	12	1097	0	0	75	534
07-Jul	2530	47993	33	1130	17	17	166	701
08-Jul	526	48519	7	1137	3	20	35	735
09-Jul	1139	49657	15	1152	7	28	75	810
10-Jul	2445	52102	32	1184	16	44	161	971
11-Jul	5522	57624	0	1184	0	44	19	990
12-Jul	2158	59782	0	1184	0	44	0	990
13-Jul	12133	71915	0	1184	0	44	0	990
14-Jul	10863	82778	0	1184	0	44	0	990
15-Jul	1907	84685	10	1194	0	44	10	1000
16-Jul	2675	87360	11	1205	0	44	11	1011
17-Jul	2785	90145	0	1205	0	44	22	1033
18-Jul	2818	92963	12	1217	0	44	104	1138
19-Jul	2179	95142	0	1217	0	44	39	1177
20-Jul	1056	96198	5	1222	0	44	25	1202
21-Jul	1000	97198	4	1226	0	44	4	1206
22-Jul	891	98088	0	1226	0	44	32	1238
23-Jul	1333	99421	0	1226	0	44	97	1335
24-Jul	1665	101086	16	1242	5	48	23	1358
25-Jul	14019	115105	52	1294	0	48	0	1358
26-Jul	14310	129415	66	1360	132	180	66	1424

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Appendix A.13. (continued: p 2 of 2).

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
27-Jul	2123	131539	81	1441	0	180	81	1505
28-Jul	1251	132789	48	1489	0	180	48	1553
29-Jul	2169	134958	29	1517	0	180	29	1581
30-Jul	6714	141672	134	1652	0	180	45	1626
31-Jul	3392	145063	21	1672	0	180	21	1647

a. Sonar counts apportioned by fishwheel catch.

Appendix A.14. Fish targets recorded on the south bank of the Kasilof River, 13 June through 31 July 1986. a

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
13-Jun	585	585	3	3	0	0	7	7
14-Jun	598	1183	3	6	0	0	7	14
15-Jun	508	1691	2	8	0	0	6	20
16-Jun	415	2106	2	10	0	0	5	25
17-Jun	291	2397	1	12	0	0	3	28
18-Jun	381	2778	2	13	0	0	4	33
19-Jun	268	3045	1	15	0	0	3	36
20-Jun	174	3220	1	15	0	0	2	38
21-Jun	184	3403	1	16	0	0	2	40
22-Jun	206	3609	1	17	0	0	2	43
23-Jun	93	3703	0	18	0	0	1	44
24-Jun	84	3786	0	18	0	0	1	45
25-Jun	128	3914	1	19	0	0	2	46
26-Jun	172	4086	1	20	0	0	2	48
27-Jun	222	4309	1	21	0	0	3	51
28-Jun	228	4537	1	22	0	0	3	54
29-Jun	593	5130	3	24	0	0	7	61
30-Jun	535	5665	3	27	0	0	6	67
01-Jul	919	6584	4	31	0	0	11	78
02-Jul	831	7415	4	35	0	0	10	88
03-Jul	1190	8606	6	41	0	0	14	102
04-Jul	756	9361	4	44	0	0	9	110
05-Jul	1289	10650	6	50	0	0	15	126
06-Jul	1060	11710	5	55	0	0	13	138
07-Jul	843	12553	4	59	0	0	10	148
08-Jul	549	13102	3	62	0	0	6	155
09-Jul	1190	14293	6	68	0	0	14	169
10-Jul	2859	17151	13	81	0	0	34	202
11-Jul	4042	21194	19	100	0	0	48	250
12-Jul	1487	22681	7	107	0	0	18	268
13-Jul	13648	36329	64	172	0	0	161	429
14-Jul	8683	45012	41	213	0	0	102	531
15-Jul	1381	46393	7	219	0	0	16	547
16-Jul	1710	48102	0	219	0	0	41	588
17-Jul	1548	49650	0	219	0	0	37	626
18-Jul	2133	51783	9	228	0	0	79	705
19-Jul	1530	53313	0	228	0	0	27	732
20-Jul	2079	55392	11	238	0	0	49	781
21-Jul	2999	58391	12	251	0	0	12	794
22-Jul	1816	60207	0	251	0	0	66	860
23-Jul	749	60957	0	251	0	0	55	914
24-Jul	850	61806	8	259	2	2	12	926
25-Jul	10755	72561	40	299	0	2	0	926
26-Jul	7130	79691	33	332	66	68	33	959

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Appendix A.14. (continued: p 2 of 2).

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
27-Jul	902	80593	34	366	0	68	34	993
28-Jul	458	81051	17	384	0	68	17	1011
29-Jul	2509	83560	33	417	0	68	33	1044
30-Jul	9696	93257	194	611	0	68	65	1109
31-Jul	4405	97662	27	638	0	68	27	1136

a. Sonar counts apportioned by fishwheel catch.

Appendix A.15. Kasilof River north bank sonar counts by sector, 13 June through 31 July 1986.

Date	Count by Sector												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
13-Jun	37	148	90	21	14	6	18	49	80	63	29	75	630
14-Jun	25	84	105	32	18	8	25	56	87	66	54	54	614
15-Jun	21	39	22	14	21	6	4	33	40	53	22	50	325
16-Jun	109	141	79	10	3	3	12	46	69	77	71	421	1041
17-Jun	409	320	130	25	6	3	38	120	133	167	85	67	1503
Total	601	732	426	102	62	26	97	304	409	426	261	667	4113
Percent	14.6%	17.8%	10.4%	2.5%	1.5%	0.6%	2.4%	7.4%	9.9%	10.4%	6.3%	16.2%	100.0%
18-Jun	114	97	49	9	5	8	60	64	75	44	51	48	624
19-Jun	354	227	92	27	2	3	30	48	32	65	44	33	957
20-Jun	31	106	196	28	4	3	37	45	46	40	32	47	615
21-Jun	13	70	92	12	2	0	27	52	43	125	70	64	570
22-Jun	30	37	30	5	0	1	43	60	82	77	58	61	484
Total	542	537	459	81	13	15	197	269	278	351	255	253	3250
Percent	16.7%	16.5%	14.1%	2.5%	0.4%	0.5%	6.1%	8.3%	8.6%	10.8%	7.8%	7.8%	100.0%
23-Jun	7	4	3	0	0	1	35	55	38	62	33	29	267
24-Jun	1	4	3	3	1	0	22	47	57	53	32	21	244
25-Jun	3	9	20	7	0	1	37	74	79	87	47	29	393
26-Jun	8	37	26	6	2	3	55	82	108	106	57	35	525
27-Jun	19	46	43	17	4	4	57	77	87	69	50	59	532
Total	38	100	95	33	7	9	206	335	369	377	219	173	1961
Percent	1.9%	5.1%	4.8%	1.7%	0.4%	0.5%	10.5%	17.1%	18.8%	19.2%	11.2%	8.8%	100.0%
28-Jun	22	31	101	40	5	0	78	102	86	97	53	34	649
29-Jun	199	708	582	76	10	1	64	82	107	109	50	78	2066
30-Jun	1503	2922	1467	208	24	2	74	82	150	131	48	91	6702
01-Jul	1935	2713	1941	591	99	23	193	150	141	113	53	43	7995
02-Jul	1331	2466	1698	427	80	29	117	129	139	81	53	32	6582
Total	4990	8840	5789	1342	218	55	526	545	623	531	257	278	23994
Percent	20.8%	36.8%	24.1%	5.6%	0.9%	0.2%	2.2%	2.3%	2.6%	2.2%	1.1%	1.2%	100.0%
03-Jul	895	1510	862	249	40	18	88	63	71	67	35	31	3929
04-Jul	674	1087	935	318	84	16	111	137	273	227	68	65	3995
05-Jul	471	494	445	152	54	6	138	147	189	112	48	92	2348
06-Jul	837	1043	663	167	93	19	127	143	182	85	67	74	3500
07-Jul	653	1071	535	87	30	4	70	63	69	87	44	37	2750
Total	3530	5205	3440	973	301	63	534	553	784	578	262	299	16522
Percent	21.4%	31.5%	20.8%	5.9%	1.8%	0.4%	3.2%	3.3%	4.7%	3.5%	1.6%	1.8%	100.0%

-Continued-

Count by Sector													
Date	1	2	3	4	5	6	7	8	9	10	11	12	Total
08-Jul	127	105	64	11	6	2	41	42	57	50	27	39	571
09-Jul	169	321	207	30	24	10	48	84	117	136	49	40	1235
10-Jul	217	1173	560	95	28	8	54	88	137	170	60	64	2654
11-Jul	638	3055	1038	129	52	5	57	64	113	261	59	70	5541
12-Jul	348	1078	316	27	11	4	34	58	84	114	27	57	2158
Total	1499	5732	2185	292	121	29	234	336	508	731	222	270	12159
Percent	12.3%	47.1%	18.0%	2.4%	1.0%	0.2%	1.9%	2.8%	4.2%	6.0%	1.8%	2.2%	100.0%
13-Jul	1448	7531	1366	121	36	21	157	263	310	483	170	227	12133
14-Jul	946	6761	1903	141	23	9	127	152	213	306	79	203	10863
15-Jul	256	952	285	26	11	3	59	57	59	143	31	45	1927
16-Jul	602	1474	302	28	10	6	10	39	71	93	18	44	2697
17-Jul	750	1586	280	23	5	3	18	20	20	53	22	27	2807
Total	4002	18304	4136	339	85	42	371	531	673	1078	320	546	30427
Percent	13.2%	60.2%	13.6%	1.1%	0.3%	0.1%	1.2%	1.7%	2.2%	3.5%	1.1%	1.8%	100.0%
18-Jul	689	1232	663	30	3	2	28	31	44	101	70	40	2933
19-Jul	724	678	510	32	7	2	15	25	58	84	33	52	2220
20-Jul	351	94	24	4	2	2	26	64	94	192	153	80	1086
21-Jul	445	153	17	3	2	5	24	18	60	124	126	31	1008
22-Jul	424	94	16	0	0	3	15	47	111	118	68	29	925
Total	2633	2251	1230	69	14	14	108	185	367	619	450	232	8172
Percent	32.2%	27.5%	15.1%	0.8%	0.2%	0.2%	1.3%	2.3%	4.5%	7.6%	5.5%	2.8%	100.0%
23-Jul	743	239	42	3	4	2	19	18	70	135	97	57	1429
24-Jul	1164	249	33	11	3	2	21	39	58	57	61	16	1714
25-Jul	8142	4597	252	299	482	109	5	17	43	64	32	24	14066
26-Jul	8840	4904	274	10	4	4	21	23	123	205	101	65	14574
27-Jul	1148	725	121	8	3	6	26	15	36	77	63	58	2286
Total	20037	10714	722	331	496	123	92	112	330	538	354	220	34069
Percent	58.8%	31.4%	2.1%	1.0%	1.5%	0.4%	0.3%	0.3%	1.0%	1.6%	1.0%	0.6%	100.0%
28-Jul	594	373	77	8	6	3	31	17	37	74	58	68	1346
29-Jul	1146	712	87	16	3	0	19	20	33	56	64	71	2227
30-Jul	4856	1717	109	5	2	2	13	10	50	60	45	24	6893
31-Jul	2259	953	73	3	0	2	12	7	27	45	20	32	3433
Total	8855	3755	346	32	11	7	75	54	147	235	187	195	13899
Percent	63.7%	27.0%	2.5%	0.2%	0.1%	0.1%	0.5%	0.4%	1.1%	1.7%	1.3%	1.4%	100.0%

Appendix A.16. Kasilof River south bank sonar counts by sector, 13 June through 31 July 1986.

Date	Count by Sector												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
13-Jun	20	9	3	1	3	1	28	45	112	179	105	89	595
14-Jun	24	5	7	5	0	2	27	30	98	167	129	115	609
15-Jun	25	30	13	19	11	12	27	16	30	108	102	126	519
16-Jun	102	23	10	1	1	0	0	1	9	83	19	173	422
17-Jun	31	8	4	3	0	0	0	0	6	94	63	88	297
Total	202	75	37	29	15	15	82	92	255	631	418	591	2442
Percent	8.3%	3.1%	1.5%	1.2%	0.6%	0.6%	3.4%	3.8%	10.4%	25.8%	17.1%	24.2%	100.0%
18-Jun	31	7	8	10	0	0	0	2	8	150	83	88	387
19-Jun	20	3	7	3	0	0	0	3	6	127	85	30	284
20-Jun	60	12	8	1	0	0	2	4	2	24	27	44	184
21-Jun	51	2	2	0	0	0	0	4	2	54	31	42	188
22-Jun	29	5	2	0	7	0	0	3	3	59	26	74	208
Total	191	29	27	14	7	0	2	16	21	414	252	278	1251
Percent	15.3%	2.3%	2.2%	1.1%	0.6%	0.0%	0.2%	1.3%	1.7%	33.1%	20.1%	22.2%	100.0%
23-Jun	30	6	1	0	0	0	0	1	7	19	12	19	95
24-Jun	22	3	0	0	0	0	0	0	3	21	12	24	85
25-Jun	30	1	0	0	0	0	0	1	9	39	22	28	130
26-Jun	44	13	12	0	0	0	0	1	5	32	37	32	176
27-Jun	32	5	9	0	0	0	1	1	15	29	46	88	226
Total	158	28	22	0	0	0	1	4	39	140	129	191	712
Percent	22.2%	3.9%	3.1%	0.0%	0.0%	0.0%	0.1%	0.6%	5.5%	19.7%	18.1%	26.8%	100.0%
28-Jun	37	8	0	0	0	0	5	9	29	51	71	22	232
29-Jun	77	10	2	0	2	0	1	27	69	105	187	123	603
30-Jun	38	14	3	0	0	0	0	24	63	129	168	104	543
01-Jul	227	20	3	0	1	0	4	63	111	164	186	157	936
02-Jul	323	10	3	1	0	2	4	85	87	103	124	103	845
Total	702	62	11	1	3	2	14	208	359	552	736	509	3159
Percent	22.2%	2.0%	0.3%	0.0%	0.1%	0.1%	0.4%	6.6%	11.4%	17.5%	23.3%	16.1%	100.0%
03-Jul	322	283	7	4	1	0	3	129	71	87	123	177	1207
04-Jul	167	72	38	0	0	0	60	71	96	97	109	58	768
05-Jul	178	120	167	55	17	30	168	137	126	90	96	119	1303
06-Jul	143	217	121	56	12	0	26	21	36	76	155	215	1078
07-Jul	81	141	89	32	8	5	44	36	58	102	90	121	807
Total	891	833	422	147	38	35	301	394	387	452	573	690	5163
Percent	17.3%	16.1%	8.2%	2.8%	0.7%	0.7%	5.8%	7.6%	7.5%	8.8%	11.1%	13.4%	100.0%

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Date	Count by Sector												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
08-Jul	29	45	64	10	1	0	15	23	60	151	99	61	558
09-Jul	126	113	130	12	2	2	35	68	144	207	156	216	1211
10-Jul	599	793	351	25	5	2	80	92	203	341	251	165	2907
11-Jul	1109	1013	423	43	9	4	84	122	337	505	263	195	4107
12-Jul	315	293	110	12	0	0	33	34	99	238	204	173	1511
Total	2178	2257	1078	102	17	8	247	339	843	1442	973	810	10294
Percent	21.2%	21.9%	10.5%	1.0%	0.2%	0.1%	2.4%	3.3%	8.2%	14.0%	9.5%	7.9%	100.0%
13-Jul	6314	4016	972	26	1	1	106	173	338	969	584	374	13874
14-Jul	1424	2560	1406	93	3	3	158	246	529	1131	798	475	8826
15-Jul	221	295	201	15	1	1	32	32	96	205	164	141	1404
16-Jul	507	533	151	6	0	0	25	45	83	174	133	94	1751
17-Jul	444	529	191	9	0	0	12	26	49	186	72	67	1585
Total	8910	7933	2921	149	5	5	333	522	1095	2665	1751	1151	27440
Percent	32.5%	28.9%	10.6%	0.5%	0.0%	0.0%	1.2%	1.9%	4.0%	9.7%	6.4%	4.2%	100.0%
18-Jul	740	757	196	7	0	0	19	15	78	231	99	79	2221
19-Jul	670	415	85	2	0	0	6	6	46	134	89	104	1557
20-Jul	827	744	160	6	0	0	8	11	52	151	89	92	2140
21-Jul	1245	1337	265	23	20	20	3	8	14	36	29	24	3024
22-Jul	899	789	122	3	0	0	0	2	9	19	17	22	1882
Total	4381	4042	828	41	20	20	36	42	199	571	323	321	10824
Percent	40.5%	37.3%	7.6%	0.4%	0.2%	0.2%	0.3%	0.4%	1.8%	5.3%	3.0%	3.0%	100.0%
23-Jul	406	276	21	1	0	0	3	4	8	16	25	44	804
24-Jul	314	362	27	1	0	0	4	4	5	31	42	82	872
25-Jul	7001	3591	109	3	0	0	0	1	3	14	26	47	10795
26-Jul	4314	2699	144	1	0	0	3	5	5	15	23	52	7261
27-Jul	551	359	22	0	0	0	0	1	0	3	9	25	970
Total	12586	7287	323	6	0	0	10	15	21	79	125	250	20702
Percent	60.8%	35.2%	1.6%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.4%	0.6%	1.2%	100.0%
28-Jul	312	142	3	0	0	0	0	2	2	4	8	18	491
29-Jul	1809	690	27	0	0	0	2	0	0	1	8	38	2575
30-Jul	7664	2157	84	0	0	0	0	1	2	5	6	36	9955
31-Jul	3352	999	47	2	0	0	2	1	7	6	13	30	4459
Total	13137	3988	161	2	0	0	4	4	11	16	35	122	17480
Percent	75.2%	22.8%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.7%	100.0%

Appendix A.17. Kasilof River north bank side scan sonar counts by hour, 13 June through 31 July 1986.

Date	Counts by Hour																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
13-Jun	45	92	167	77	26	15	19	20	15	24	6	13	3	19	2	10	2	5	7	10	5	18	11	19
14-Jun	60	108	69	60	27	31	13	24	20	14	21	11	16	11	13	16	7	11	8	10	11	11	20	22
15-Jun	11	33	41	33	12	28	10	7	15	5	6	4	8	6	8	9	2	3	6	13	14	12	15	24
16-Jun	74	182	262	133	96	41	37	18	18	6	2	11	8	5	9	15	7	9	5	7	13	14	27	42
17-Jun	65	223	466	183	56	30	41	39	27	23	30	13	13	10	17	19	22	20	15	33	45	35	37	41
18-Jun	40	64	69	87	66	43	11	28	14	16	5	9	8	11	10	2	14	16	17	26	21	13	18	16
19-Jun	27	69	107	276	127	55	39	18	7	7	2	4	4	0	4	12	23	17	29	19	21	37	29	24
20-Jun	42	41	80	66	98	51	27	9	14	2	2	3	1	5	7	13	17	17	13	10	24	26	24	23
21-Jun	20	33	28	21	46	58	14	28	11	6	6	11	13	6	13	17	12	6	20	28	57	41	32	43
22-Jun	28	27	14	48	30	41	24	11	31	8	13	10	12	28	16	5	6	13	2	19	27	30	21	20
23-Jun	29	14	17	11	18	18	20	5	6	5	3	7	17	9	2	9	8	1	3	5	17	22	8	13
24-Jun	7	16	5	6	11	7	11	2	9	4	14	9	8	16	7	9	15	8	12	10	9	11	20	18
25-Jun	14	12	26	18	11	16	1	11	23	5	16	30	16	21	35	14	12	14	13	8	7	17	36	17
26-Jun	39	44	44	36	14	18	21	6	5	4	14	12	5	24	23	25	26	28	22	23	19	32	25	16
27-Jun	53	54	42	32	37	19	4	13	6	3	0	6	6	11	15	18	19	23	19	20	28	24	29	51
28-Jun	58	42	34	25	14	12	10	17	20	4	12	18	17	16	25	29	46	47	44	36	26	43	23	31
29-Jun	17	27	18	22	24	13	17	8	6	15	26	24	20	38	48	12	32	92	246	262	242	355	306	196
30-Jun	312	107	79	56	66	22	19	16	15	23	19	17	23	30	39	119	69	97	132	377	1467	1421	1161	1016
01-Jul	965	265	154	156	153	90	92	94	65	96	132	82	70	95	166	286	937	503	302	438	880	1011	618	345
02-Jul	176	93	88	65	225	361	285	167	123	120	125	209	339	360	252	330	394	431	348	309	397	448	531	406
03-Jul	150	71	85	194	257	198	181	152	104	108	61	47	58	97	106	89	108	306	283	203	243	262	274	292
04-Jul	205	106	131	141	259	223	233	196	168	190	72	82	96	119	122	106	290	336	262	121	174	145	139	79
05-Jul	111	114	129	99	97	45	39	89	64	110	55	72	103	85	98	96	87	74	117	57	102	96	159	250
06-Jul	204	244	270	272	230	217	110	67	147	177	136	51	44	64	67	70	64	58	116	102	92	206	258	234
07-Jul	247	312	381	317	324	244	176	93	59	114	68	30	29	10	35	16	45	51	19	55	49	45	11	20
08-Jul	26	20	8	16	18	28	42	26	27	8	17	31	18	6	17	12	20	30	18	24	42	44	35	38
09-Jul	31	43	24	12	15	21	52	53	42	32	50	96	58	51	36	26	48	47	44	51	62	58	99	184
10-Jul	72	75	69	94	63	50	82	74	129	54	31	34	97	151	141	121	62	95	146	177	218	267	187	165
11-Jul	369	478	270	274	124	169	100	150	412	388	147	52	255	563	392	281	162	141	144	127	124	73	126	220
12-Jul	101	53	49	47	39	19	21	38	85	122	80	44	135	115	100	71	182	176	174	120	108	107	93	79
13-Jul	176	188	223	223	299	280	487	469	279	333	586	418	343	993	936	725	494	791	917	678	571	601	748	375

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Appendix A.17. (continued: p 2 of 2).

Counts by Hour																								
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
14-Jul	227	307	475	742	577	929	872	799	608	589	526	794	550	255	235	266	252	235	241	414	289	271	183	227
15-Jul	302	139	81	45	80	81	96	50	62	39	63	73	83	109	134	74	70	48	65	51	43	46	61	32
16-Jul	60	77	51	40	49	52	96	83	37	110	96	152	143	137	223	212	91	148	147	135	146	150	143	119
17-Jul	270	377	146	111	108	205	113	127	92	52	105	52	119	91	76	95	128	158	60	51	63	91	50	67
18-Jul	55	97	75	66	62	44	51	79	106	64	92	26	80	105	174	270	363	192	126	91	180	203	202	130
19-Jul	135	111	123	307	147	108	84	139	110	74	73	54	112	86	17	50	99	160	58	34	36	45	28	30
20-Jul	17	30	33	44	65	55	44	46	55	60	40	17	27	15	35	67	109	33	51	39	57	49	61	37
21-Jul	66	23	22	39	94	35	68	42	54	48	56	36	19	32	51	28	27	35	23	50	35	38	22	65
22-Jul	20	19	29	8	26	17	42	49	41	39	31	28	28	33	67	56	33	68	45	44	28	57	47	70
23-Jul	43	28	28	33	39	32	52	157	60	65	89	138	90	64	30	31	33	20	25	51	95	48	81	97
24-Jul	84	54	43	51	75	78	59	97	261	113	63	34	94	67	42	33	21	17	44	38	71	72	90	113
25-Jul	236	160	83	140	234	352	310	250	293	322	90	742	559	545	652	622	840	783	1013	965	1032	1790	1414	639
26-Jul	370	448	419	354	548	698	699	836	928	1132	1430	1178	613	697	796	563	466	377	250	207	289	331	574	371
27-Jul	203	80	71	30	50	111	128	141	144	80	87	126	105	76	68	128	116	77	91	57	69	76	98	74
28-Jul	21	31	15	45	23	57	63	65	70	46	44	31	68	104	45	75	71	97	87	58	57	65	59	49
29-Jul	28	28	25	36	26	66	43	60	33	47	71	123	89	225	230	186	138	92	132	47	210	120	113	59
30-Jul	32	47	9	12	33	115	393	385	269	411	372	425	383	328	370	443	412	653	596	599	292	169	111	34
31-Jul	26	10	16	16	15	69	83	152	89	105	111	149	122	149	270	262	227	257	417	379	183	174	107	45
Percent	4.0%	3.6%	3.5%	3.5%	3.5%	3.7%	3.7%	3.7%	3.6%	3.6%	3.5%	3.8%	3.5%	4.1%	4.2%	4.1%	4.5%	4.7%	4.7%	4.5%	5.6%	6.3%	5.8%	4.4%

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Appendix A.18. Kasilof River south bank side scan sonar counts by hour, 13 June through 31 July 1986.

Counts by Hour																								
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
13-Jun	69	80	102	42	83	21	21	23	11	23	14	6	9	8	9	4	4	8	8	2	3	15	14	16
14-Jun	53	51	54	34	29	30	15	25	20	27	24	18	26	30	27	19	16	9	9	8	13	24	19	29
15-Jun	38	40	58	37	41	55	27	22	16	13	3	5	9	6	15	12	11	22	4	5	2	2	5	71
16-Jun	27	26	30	31	28	55	58	25	12	20	27	9	2	7	2	2	1	1	5	19	7	2	7	19
17-Jun	12	9	25	15	12	4	10	8	7	7	20	3	3	7	5	20	9	17	12	17	24	15	18	18
18-Jun	28	27	30	18	25	30	40	6	10	9	9	10	6	12	6	10	11	8	16	20	17	13	14	12
19-Jun	15	12	24	18	19	25	20	11	7	6	8	10	11	4	2	4	10	14	8	7	9	8	11	21
20-Jun	9	6	14	8	5	5	6	9	8	12	0	0	1	6	34	12	14	4	4	7	4	9	3	4
21-Jun	3	6	2	7	21	19	5	10	8	2	9	6	15	8	4	11	5	2	3	4	18	7	7	6
22-Jun	6	4	8	8	2	16	16	24	14	6	5	9	3	5	11	4	1	2	15	10	9	15	12	3
23-Jun	4	2	5	2	6	1	1	0	9	2	5	10	3	7	7	3	3	2	13	0	7	1	0	2
24-Jun	0	0	5	1	0	4	8	3	3	7	6	4	1	2	3	7	9	0	4	1	3	7	3	4
25-Jun	1	4	0	5	4	2	4	1	6	3	3	10	10	12	1	6	3	12	8	0	6	6	9	14
26-Jun	8	5	9	24	3	4	6	6	3	4	5	2	1	1	4	7	9	8	8	7	7	20	16	9
27-Jun	13	17	51	11	9	9	7	4	3	3	3	2	3	5	9	10	8	4	9	12	8	5	7	14
28-Jun	6	3	3	5	5	5	5	3	1	2	7	12	16	8	11	7	26	22	22	23	7	16	14	3
29-Jun	11	15	16	12	7	9	8	6	13	12	15	9	22	61	30	36	20	34	44	82	48	27	30	36
30-Jun	30	18	10	10	11	8	13	8	17	22	13	16	21	17	30	33	35	32	76	42	15	23	34	9
01-Jul	22	29	42	31	22	25	20	22	34	70	39	30	43	34	39	29	29	27	12	30	63	139	68	37
02-Jul	30	19	13	33	30	17	38	43	52	44	44	32	45	35	35	36	23	40	38	32	51	48	33	34
03-Jul	31	27	23	41	37	43	29	41	23	23	48	51	65	62	103	153	90	75	79	95	7	18	15	28
04-Jul	19	14	77	38	31	34	24	26	40	27	41	37	29	69	59	44	34	18	25	19	10	15	20	18
05-Jul	22	11	7	28	8	35	26	34	20	25	18	29	88	69	109	99	79	154	154	127	26	52	50	33
06-Jul	31	49	67	56	72	101	49	43	33	88	52	34	40	35	31	50	33	24	40	42	16	31	44	17
07-Jul	23	19	23	24	54	46	40	48	47	56	36	32	44	43	39	42	34	20	29	50	18	15	14	11
08-Jul	37	27	20	11	18	9	7	10	6	16	24	49	17	22	15	51	19	12	14	17	24	44	51	38
09-Jul	42	40	43	34	39	15	43	35	36	92	50	66	49	44	41	45	34	44	30	29	49	36	73	202
10-Jul	167	191	160	158	153	122	175	297	329	164	99	51	63	100	66	53	73	76	72	61	55	80	60	82
11-Jul	215	222	217	291	244	305	420	160	280	347	162	81	54	114	140	90	78	99	103	64	98	97	143	83
12-Jul	41	23	28	23	21	23	23	21	75	103	120	85	52	94	62	50	84	86	85	109	41	105	104	53
13-Jul	70	114	141	149	73	143	269	600	740	1652	891	322	399	265	354	573	620	346	632	768	1045	1395	1398	915

-Continued-

Date	Counts by Hour																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
14-Jul	420	331	274	470	460	477	490	641	718	456	661	708	451	282	180	242	145	289	175	209	199	151	209	188
15-Jul	128	65	50	39	66	53	71	60	75	103	54	50	64	63	69	88	58	35	31	40	43	38	41	20
16-Jul	15	19	21	18	13	29	36	17	45	78	66	89	74	88	146	205	153	106	116	94	57	73	81	112
17-Jul	106	135	75	45	59	122	94	61	37	52	45	34	48	38	37	56	65	77	73	57	63	69	69	68
18-Jul	77	94	169	124	77	108	139	104	97	63	83	71	65	30	58	85	167	95	100	96	103	38	81	97
19-Jul	72	56	61	55	41	102	100	89	81	85	69	67	59	57	36	59	31	83	61	36	99	53	64	41
20-Jul	43	48	72	92	329	180	102	137	74	87	57	31	53	37	18	38	39	62	96	41	39	148	184	133
21-Jul	79	53	28	24	61	166	379	286	209	133	252	332	126	57	73	66	97	72	78	98	22	54	109	170
22-Jul	108	58	46	49	47	131	266	212	127	80	139	97	94	50	50	38	39	39	24	38	34	38	29	49
23-Jul	64	37	27	25	22	49	160	141	69	61	33	3	5	10	6	7	9	1	5	5	9	11	9	36
24-Jul	70	52	27	11	25	19	17	51	181	69	35	41	27	20	21	18	15	22	25	18	32	39	18	19
25-Jul	35	153	167	168	130	122	160	103	277	642	778	418	278	337	554	293	466	843	685	431	763	1304	1245	443
26-Jul	104	347	474	383	389	404	399	556	456	472	152	410	283	192	124	245	104	127	152	128	185	239	501	435
27-Jul	149	108	41	32	28	57	131	69	63	28	24	29	13	23	15	4	26	7	8	15	27	26	15	32
28-Jul	48	25	35	24	8	19	41	29	23	36	11	13	7	6	11	23	17	11	4	4	16	15	16	49
29-Jul	17	22	27	20	21	17	26	34	14	35	40	80	110	21	77	158	241	185	184	145	192	392	289	228
30-Jul	90	57	77	53	92	273	473	439	687	689	798	870	791	967	719	715	628	214	49	126	377	401	235	135
31-Jul	98	67	57	52	37	153	232	218	274	141	207	357	376	402	347	192	218	179	49	140	211	201	178	73
Percent	2.8%	2.9%	3.1%	2.9%	3.0%	3.7%	4.8%	4.8%	5.4%	6.2%	5.3%	4.8%	4.1%	3.9%	3.9%	4.1%	4.0%	3.7%	3.5%	3.4%	4.2%	5.6%	5.7%	4.2%

Appendix A.19. Daily adjusted fishwheel catch by species from the north bank of the Kasilof River, 20 June through 31 July 1986. a

Date	Hours Open	Sockeye		Pink		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
20-Jun	25	23	23	0	0	0	0	4	4
21-Jun			23	0	0	0	0	0	4
22-Jun	47.5	27	50	1	1	0	0	0	4
23-Jun			50	0	1	0	0	0	4
24-Jun	48	15	65	5	6	0	0	1	5
25-Jun			65	0	6	0	0	0	5
26-Jun	43	42	107	6	12	0	0	2	7
27-Jun	22.2	65	172	6	18	0	0	0	7
28-Jun	9	163	335	0	18	0	0	0	7
29-Jun	14.2	110	445	23	41	0	0	0	7
30-Jun	15.2	854	1299	0	41	0	0	0	7
01-Jul	7	535	1834	0	41	0	0	0	7
02-Jul	3	1720	3554	0	41	0	0	0	7
03-Jul	7.5	700	4254	3	44	0	0	6	13
04-Jul	7	545	4799	0	44	0	0	0	13
05-Jul	13.5	297	5096	0	44	0	0	4	17
06-Jul	15.5	274	5370	1	45	0	0	6	23
07-Jul	12	112	5482	0	45	0	0	0	23
08-Jul			5482	0	45	0	0	0	23
09-Jul	40.5	40	5522	2	47	1	1	10	33
10-Jul	22	316	5838	2	49	0	1	8	41
11-Jul	10	569	6407	0	49	0	1	2	43
12-Jul	17	241	6648	0	49	0	1	0	43
13-Jul	2	1932	8580	0	49	0	1	0	43
14-Jul	4	3750	12330	0	49	0	1	0	43
15-Jul	9.5	389	12719	2	51	0	1	2	45
16-Jul	7.5	733	13452	3	54	0	1	3	48
17-Jul	14.5	250	13702	0	54	0	1	2	50
18-Jul	15	486	14188	2	56	0	1	18	68
19-Jul	14	281	14469	0	56	0	1	5	73
20-Jul	7	590	15059	3	59	0	1	14	87
21-Jul	15.5	241	15300	1	60	0	1	1	88
22-Jul	10.5	496	15796	0	60	0	1	18	106
23-Jul	10	398	16194	0	60	0	1	29	135
24-Jul	23	722	16916	7	67	2	3	10	145
25-Jul	4	1614	18530	6	73	0	3	0	145
26-Jul	3	1736	20266	8	81	16	19	8	153
27-Jul	29.5	137	20403	4	85	0	19	3	156
28-Jul	24	73	20476	4	89	0	19	5	161
29-Jul	16	227	20703	3	92	0	19	3	164
30-Jul	8	450	21153	9	101	0	19	3	167
31-Jul	10.5	327	21480	2	103	0	19	2	169

a. Fishwheel catch adjusted for 24 hours: (daily catch * 24 hours)/hours open.

Actual catch: 7186 sockeye salmon; 77 pink salmon; 6 coho salmon; 108 chinook salmon.

Appendix A.20. Daily adjusted fishwheel catch by species for the south bank of the Kasilof River, 9 June through 16 June 1986. a

Date	Hours Open	Sockeye		Pink		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum
09-Jun	34	25	25	1	1	2	2
10-Jun	0		25		1		2
11-Jun	0		25		1		2
12-Jun			25		1		2
13-Jun	46.5	79	104	1	2	3	5
14-Jun	12	320	424	0	2	0	5
15-Jun			424		2		5
16-Jun	34	40	464	0	2	5	10

a. Fishwheel catch adjusted for 24 hours: (daily catch * 24 hours)/hours open.
 Actual catch: 405 sockeye salmon; 3 pink salmon; 16 chinook salmon.

Appendix A.21. Length composition of the major age classes of sockeye salmon collected in the Kasilof River, 1980-1986.

Year	Class	Male			Female			Total			Ratio Male:Female
		Average Length (mm) ^a	Standard Error	Sample Size	Average Length (mm)	Standard Error	Sample Size	Average Length (mm)	Standard Error	Sample Size	
1980	1.2	474	2.4	189	464	1.2	376	467		565	0.5:1
1981		503	2.0	241	492	2.5	146	499		387	1.7:1
1982		481	2.2	285	466	1.8	235	474	2.0	475	1.2:1
1983		493	1.9	113	491	2.5	78	492	1.5	191	1.4:1
1984		480	1.2	544	478	1.1	428	479	0.8	972	2.6:1
1985		474	0.8	723	472	0.6	897	473	0.5	1,620	0.8:1
1986		482	1.7	266	482	1.4	368	482	1.1	634	0.7:1
1980	1.3	531	6.8	35	516	2.4	115	520		150	0.3:1
1981		566	1.2	422	558	1.4	369	562		791	1.1:1
1982		549	1.4	377	542	1.1	428	545	1.2	805	0.9:1
1983		558	1.9	170	547	1.9	187	552	1.3	357	0.9:1
1984		539	1.4	304	533	1.3	383	535	0.9	687	0.8:1
1985		531	1.5	341	527	1.1	433	529	0.9	774	0.8:1
1986		550	1.8	342	543	1.3	405	546	1.1	747	0.8:1
1982	2.2	479	3.2	65	472	2.7	81	475	2.9	146	0.8:1
1984		484	1.8	202	482	1.4	223	483	1.1	425	0.9:1
1985		482	1.5	248	476	1.2	319	479	0.9	567	0.8:1
1986		492	4.1	78	489	2.1	115	490	2.1	193	0.7:1
1982	2.3	548	4.3	41	543	3.8	40	546	4.1	86	1.0:1
1984		533	2.6	102	526	3.0	80	530	2.0	182	1.3:1

^a Lengths measured from mid-eye to fork of tail.

Appendix A.22. Weight composition of the major age classes of sockeye salmon collected in the Kasilof River, 1981-1986.

Year	Age Class	Male			Female			Total		
		Average Weight (kg)	Standard Error	Sample Size	Average Weight (kg)	Standard Error	Sample Size	Average Weight (kg)	Standard Error	Sample Size
1981	1.2	2.2	0.05	241	1.9	0.03	146	2.1		387
1982		1.8	0.03	235	1.5	0.02	240	1.7	0.03	475
1983		2.04	0.06	113	1.84	0.03	78	1.96	0.04	191
1984		1.86	0.03	101	1.81	0.04	39	1.85	0.02	140
1985		1.77	0.02	141	1.64	0.02	122	1.70	0.01	263
1986		2.11	0.09	30	1.84	0.12	13	1.95	0.07	43
1981	1.3	3.0	0.04	422	2.9	0.03	369	3.0		791
1982		2.7	0.02	377	2.44	0.02	428	2.56	0.02	805
1983		2.78	0.03	168	2.47	0.02	187	2.62	0.02	355
1984		2.67	0.03	146	2.53	0.03	182	2.59	0.02	328
1985		2.51	0.04	80	2.27	0.02	113	2.38	0.02	193
1986		2.68	0.02	235	2.49	0.03	203	2.58	0.02	438
1981	2.2	2.3	0.08	40	2.0	0.07	33	2.2		73
1982		1.7	0.05	65	1.6	0.04	81	1.7	0.04	146
1984		2.07	0.10	31	1.79	0.05	27	1.95	0.06	58
1985		1.79	0.04	46	1.63	0.03	64	1.70	0.02	110
1986		1.96	0.11	23	1.90	0.08	17	1.92	0.07	40
1982	2.3	2.6	0.07	41	2.3	0.5	34	2.5	0.06	75
1984		2.72	0.10	32	2.63	0.14	31	2.68	0.09	63

Appendix A.23. Sockeye salmon counts recorded in the Crescent River, 25 June through 16 July 1986. a

Date	North Bank		South Bank		Total	
	Daily	Cum	Daily	Cum	Daily	Cum
25-Jun	2	2	0	0	2	2
26-Jun	0	2	0	0	0	2
27-Jun	6	8	0	0	6	8
28-Jun	69	77	3	3	72	80
29-Jun	354	431	8	11	362	442
30-Jun	338	769	8	19	346	788
01-Jul	758	1527	92	111	850	1638
02-Jul	1249	2776	51	162	1300	2938
03-Jul	2091	4867	101	263	2192	5130
04-Jul	1873	6740	391	654	2264	7394
05-Jul	414	7154	249	903	663	8057
06-Jul	661	7815	286	1189	947	9004
07-Jul	1206	9021	336	1525	1542	10546
08-Jul	1224	10245	254	1779	1478	12024
09-Jul	601	10846	145	1924	746	12770
10-Jul	784	11630	218	2142	1002	13772
11-Jul	859	12489	123	2265	982	14754
12-Jul	886	13375	178	2443	1064	15818
13-Jul	1619	14994	132	2575	1751	17569
14-Jul	1175	16169	128	2703	1303	18872
15-Jul	456	16625	164	2867	620	19492
16-Jul	565	17190	328	3195	893	20385

a. Sonar counts apportioned by gillnet catch.

Appendix A.24. Crescent River north bank sonar counts by sector, 25 June through 16 July 1986.

Date	Count by Sector												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
25-Jun	1	1	0	0	0	0	0	0	0	0	0	0	2
26-Jun	0	0	0	0	0	0	0	1	0	0	0	0	1
27-Jun	3	0	0	2	1	0	0	0	0	0	0	0	6
28-Jun	8	6	15	16	9	8	4	2	0	0	0	0	68
29-Jun	13	4	8	14	61	127	32	47	22	19	6	2	355
Total	25	11	23	32	71	135	36	50	22	19	6	2	432
Percent	5.8%	2.5%	5.3%	7.4%	16.4%	31.3%	8.3%	11.6%	5.1%	4.4%	1.4%	0.5%	100.0%
30-Jun	67	41	37	29	42	41	48	16	9	3	4	2	339
01-Jul	286	349	58	7	2	8	44	4	1	0	0	2	761
02-Jul	306	539	244	55	26	33	25	5	24	5	5	17	1284
03-Jul	713	993	295	58	15	5	2	3	3	1	0	3	2091
04-Jul	701	764	284	55	8	3	0	1	1	1	32	20	1870
Total	2073	2686	918	204	93	90	119	29	38	10	41	44	6345
Percent	32.7%	42.3%	14.5%	3.2%	1.5%	1.4%	1.9%	0.5%	0.6%	0.2%	0.6%	0.7%	100.0%
05-Jul	167	195	40	2	1	0	0	0	1	4	0	4	414
06-Jul	169	75	40	22	21	21	7	7	9	8	9	13	401
07-Jul	367	541	197	39	12	9	3	0	41	2	1	0	1212
08-Jul	68	417	519	177	29	4	0	0	0	10	0	0	1224
09-Jul	27	152	361	47	10	4	0	0	0	0	0	0	601
Total	798	1380	1157	287	73	38	10	7	51	24	10	17	3852
Percent	20.7%	35.8%	30.0%	7.5%	1.9%	1.0%	0.3%	0.2%	1.3%	0.6%	0.3%	0.4%	100.0%
10-Jul	50	231	410	60	12	11	1	1	1	3	1	3	784
11-Jul	141	309	334	32	2	1	0	2	1	1	13	24	860
12-Jul	469	276	62	8	1	0	14	4	2	16	9	17	878
13-Jul	507	846	205	24	5	22	1	0	0	0	3	4	1617
14-Jul	228	392	368	120	36	20	4	2	1	2	0	2	1175
Total	1395	2054	1379	244	56	54	20	9	5	22	26	50	5314
Percent	26.3%	38.7%	26.0%	4.6%	1.1%	1.0%	0.4%	0.2%	0.1%	0.4%	0.5%	0.9%	100.0%
15-Jul	61	171	147	39	16	8	7	3	3	0	1	0	456
16-Jul	70	104	159	93	59	34	27	9	5	3	2	0	565
Total	131	275	306	132	75	42	34	12	8	3	3	0	1021
Percent	12.8%	26.9%	30.0%	12.9%	7.3%	4.1%	3.3%	1.2%	0.8%	0.3%	0.3%	0.0%	100.0%

Appendix A.25. Crescent River south bank sonar counts by sector, 25 June through 16 July 1986.

Date	Count by Sector												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
25-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Jun	3	0	0	0	0	0	0	0	0	0	0	0	3
27-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Jun	5	2	1	0	0	0	0	0	0	0	0	0	8
Total	8	2	1	0	0	0	0	0	0	0	0	0	11
Percent	72.7%	18.2%	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
30-Jun	6	2	0	0	0	0	0	0	0	0	0	0	8
01-Jul	90	1	1	0	0	0	0	0	0	0	0	0	92
02-Jul	54	3	1	0	0	0	0	0	0	0	0	0	58
03-Jul	98	6	0	0	0	0	0	0	0	0	0	0	104
04-Jul	388	4	0	0	0	0	0	0	0	0	0	0	392
Total	636	16	2	0	0	0	0	0	0	0	0	0	654
Percent	97.2%	2.4%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
05-Jul	231	14	3	1	0	0	0	0	0	0	0	0	249
06-Jul	255	18	5	1	0	0	0	0	0	0	0	0	279
07-Jul	208	102	22	3	1	0	0	0	0	0	0	0	336
08-Jul	169	63	21	1	0	0	0	0	0	0	0	0	254
09-Jul	73	52	12	4	0	1	2	1	0	0	0	0	145
Total	936	249	63	10	1	1	2	1	0	0	0	0	1263
Percent	74.1%	19.7%	5.0%	0.8%	0.1%	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	100.0%
10-Jul	89	93	25	9	1	0	0	0	1	0	0	0	218
11-Jul	70	44	7	2	0	0	0	0	0	0	0	0	123
12-Jul	85	76	14	2	0	0	1	0	0	0	0	0	178
13-Jul	65	51	13	3	2	0	0	0	0	2	2	0	138
14-Jul	71	37	10	5	5	0	0	0	0	0	0	0	128
Total	380	301	69	21	8	0	1	0	1	2	2	0	785
Percent	48.4%	38.3%	8.8%	2.7%	1.0%	0.0%	0.1%	0.0%	0.1%	0.3%	0.3%	0.0%	100.0%
15-Jul	94	48	13	3	0	4	2	0	0	0	0	0	164
16-Jul	134	145	29	11	2	2	2	2	1	0	0	0	328
Total	228	193	42	14	2	6	4	2	1	0	0	0	492
Percent	46.3%	39.2%	8.5%	2.8%	0.4%	1.2%	0.8%	0.4%	0.2%	0.0%	0.0%	0.0%	100.0%

Appendix A.26. Crescent River north bank side scan sonar counts by hour, 25 June through 16 July 1986.

Counts by Hour																								
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
25-Jun	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Jun	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0
28-Jun	0	1	0	0	3	0	0	0	9	7	0	0	0	0	2	2	6	3	14	3	1	4	2	11
29-Jun	2	3	0	0	1	0	0	0	0	1	1	3	10	28	42	28	25	61	73	39	19	3	8	8
30-Jun	9	10	6	4	15	11	9	4	7	3	1	6	24	41	29	23	35	41	33	13	5	4	4	2
01-Jul	7	8	14	12	21	45	7	5	5	6	4	14	12	25	23	75	148	78	83	28	27	12	47	55
02-Jul	26	44	42	36	26	26	24	26	31	54	28	25	45	88	114	86	43	35	130	125	64	85	27	54
03-Jul	44	30	26	31	26	61	4	4	5	10	10	28	66	77	107	134	141	210	398	359	230	63	10	17
04-Jul	23	41	69	49	59	33	15	2	5	3	4	19	41	60	81	255	264	246	297	160	122	21	1	0
05-Jul	1	8	1	0	3	0	2	1	7	9	5	10	23	31	34	36	82	66	13	28	33	13	4	4
06-Jul	1	4	1	0	1	5	7	11	24	24	24	24	24	24	24	23	67	12	10	17	29	29	10	6
07-Jul	3	30	2	1	3	48	3	9	25	27	39	105	139	135	181	121	40	72	46	23	74	59	23	4
08-Jul	2	5	4	4	0	2	10	8	7	14	15	46	88	101	108	80	63	60	80	137	221	116	49	4
09-Jul	5	4	1	4	0	3	1	2	3	4	1	30	81	49	28	28	28	20	17	24	107	110	40	11
10-Jul	5	2	1	0	6	1	4	6	0	2	9	21	25	82	52	26	69	48	27	17	114	123	120	24
11-Jul	15	8	10	7	10	21	12	9	13	19	68	63	89	96	35	31	19	18	9	16	41	180	51	20
12-Jul	17	10	4	9	35	10	15	15	28	22	64	67	76	62	60	43	44	22	12	10	7	70	123	53
13-Jul	19	7	8	5	3	12	9	6	1	11	5	26	124	221	195	302	178	48	32	8	19	26	232	120
14-Jul	30	31	22	22	8	9	15	25	4	11	55	18	49	189	140	164	132	41	20	3	10	8	55	114
15-Jul	26	33	23	17	7	37	7	14	11	39	12	12	21	27	33	59	28	7	10	9	13	7	4	0
16-Jul	4	12	26	2	3	13	13	13	11	8	16	64	47	58	6	13	23	31	70	31	71	17	8	5
Percent	1.4%	1.7%	1.5%	1.2%	1.4%	2.0%	0.9%	0.9%	1.2%	1.6%	2.1%	3.4%	5.8%	8.2%	7.6%	9.0%	8.5%	6.6%	8.1%	6.2%	7.1%	5.6%	4.8%	3.0%

Appendix A.27. Crescent River south bank side scan sonar counts by hour, 25 June through 16 July 1986.

Date	Counts by Hour																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
25-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Jun	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Jun	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
30-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	4	0	1	1
01-Jul	4	6	2	11	21	13	14	13	4	0	0	0	1	0	0	0	0	0	1	0	1	1	0	0
02-Jul	0	0	0	0	1	0	0	0	0	0	9	8	3	2	4	5	3	2	5	6	2	2	2	4
03-Jul	1	3	1	1	3	1	2	1	21	3	11	3	1	5	0	1	0	0	3	11	5	10	6	11
04-Jul	17	58	69	85	3	4	3	78	25	21	3	1	1	1	0	2	2	0	2	5	3	1	7	
05-Jul	6	16	23	19	34	16	20	12	11	7	6	12	7	4	7	3	4	6	6	5	5	6	9	5
06-Jul	2	3	2	10	5	7	14	6	9	5	7	12	11	11	19	14	15	16	13	20	24	24	18	12
07-Jul	10	10	7	4	9	8	8	4	10	12	6	7	10	11	7	17	31	24	24	47	36	24	6	4
08-Jul	4	7	4	9	13	10	11	8	17	11	10	18	21	19	7	8	6	1	0	17	21	23	8	1
09-Jul	5	10	8	7	2	6	5	3	4	6	2	6	10	4	8	4	5	6	9	2	10	9	12	2
10-Jul	7	7	5	5	5	1	0	3	2	8	4	9	19	14	12	14	5	7	5	8	20	32	21	5
11-Jul	6	4	1	0	6	8	3	3	6	22	16	9	3	5	0	1	0	1	0	0	3	19	5	2
12-Jul	0	0	0	4	0	2	4	4	2	2	16	17	17	13	5	10	3	4	2	3	2	12	29	27
13-Jul	6	1	2	2	1	9	0	1	5	2	5	7	12	7	16	4	9	5	0	0	0	1	24	19
14-Jul	11	16	6	4	1	3	0	2	0	5	4	6	7	8	9	7	4	3	5	1	2	0	12	12
15-Jul	19	12	5	4	5	3	4	1	7	13	3	6	5	11	15	13	9	10	8	3	5	1	1	1
16-Jul	3	91	32	10	1	8	4	1	13	10	7	8	15	12	26	4	19	10	14	10	21	3	5	1
Percent	3.2%	7.6%	5.3%	5.5%	3.6%	3.1%	2.9%	4.4%	4.2%	4.0%	3.4%	4.0%	4.5%	4.0%	4.3%	3.3%	3.6%	3.0%	3.0%	4.2%	5.2%	5.3%	5.0%	3.6%

Appendix A.2B. Length composition of the major age classes of sockeye salmon collected in the Crescent River, 1980-1986.

Year	Age Class	Male			Female			Total			Ratio Male-female
		Average Length (mm) ^a	Standard Error	Sample Size	Average Length (mm)	Standard Error	Sample Size	Average Length (mm)	Standard Error	Sample Size	
1981	1.2	472	6.3	47	471	7.2	31	472		78	1.5:1
1982		522	8.6	59	491	8.6	33	511	8.6	92	1.8:1
1983		467	6.1	47	487	6.5	25	474	4.6	72	1.9:1
1980	1.3	568	2.1	167	549	1.5	223	557		390	0.7:1
1981		576	2.5	121	555	2.6	172	564		293	0.7:1
1982		586	1.4	303	556	1.4	259	572	1.4	562	1.2:1
1983		570	2.1	111	542	1.8	169	553	1.3	280	0.7:1
1984		574	4.7	60	552	2.4	72	562	2.5	132	0.8:1
1985		565	3.7	75	551	1.7	111	557	1.8	186	0.7:1
1986		569	7.5	12	546	4.9	10	559	4.6	22	1.2:1
1981	2.2	487	55.0	40	519	4.5	57	506		97	0.7:1
1983		494	3.9	93	488	3.0	89	491	2.5	182	1.0:1
1984		499	4.2	81	507	3.7	75	503	2.8	156	1.1:1
1985		496	5.4	75	490	3.5	47	494	3.6	122	1.6:1
1986		495	11.5	9	513	12.7	9	504	8.6	18	1.0:1
1981	2.3	584	2.0	158	554	1.6	237	566		395	0.7:1
1983		569	3.5	43	550	2.1	80	556	1.8	123	0.5:1
1984		581	1.5	261	553	1.6	202	569	1.1	463	1.3:1
1985		568	3.6	94	551	1.6	161	557	1.7	255	0.6:1
1986		573	4.8	44	556	2.7	45	564	2.7	89	1.0:1

^a Lengths measured mid-eye to fork of tail.

Appendix A.29. Weight composition of the major age classes of sockeye salmon collected in the Crescent River, 1980-1986.

Year	Age Class	Male			Female			Total		
		Average Weight (kg)	Standard Error	Sample Size	Average Weight (kg)	Standard Error	Sample Size	Average Weight (kg)	Standard Error	Sample Size
1981	1.2	2.0	0.10	47	1.8	0.09	31	2.0		78
1982		2.7	0.15	59	2.0	0.11	33	2.5	0.13	92
1983		1.8	0.08	47	2.0	0.09	25	1.9	0.06	72
1980	1.3	3.1	0.07	59	2.7	0.04	91	2.9		150
1981		3.5	0.05	121	2.9	0.04	172	3.2		293
1982		3.7	0.03	303	2.9	0.02	258	3.3	0.03	561
1983		3.3	0.04	111	2.7	0.03	169	2.9	0.02	280
1984		3.5	0.09	60	2.8	0.04	72	3.1	0.04	132
1985		2.97	0.06	75	2.50	0.03	111	2.69	0.03	186
1986		3.18	0.14	12	2.57	0.08	10	2.90	0.09	22
1981	2.2	2.4	0.13	40	2.5	0.07	57	2.4		97
1983		2.3	0.06	93	2.0	0.03	89	2.1	0.04	182
1984		2.3	0.07	81	2.2	0.06	75	2.2	0.05	156
1985		1.98	0.07	75	1.81	0.04	47	1.91	0.05	122
1986		2.05	0.16	9	2.22	0.23	9	2.14	0.14	18
1981	2.3	3.7	0.04	158	2.9	0.03	237	3.2		395
1983		3.2	0.06	43	2.8	0.03	80	2.9	0.03	123
1984		3.7	0.03	261	2.8	0.03	202	3.3	0.02	463
1985		2.98	0.06	94	2.56	0.03	161	2.72	0.03	255
1986		3.20	0.09	44	2.71	0.04	45	2.95	0.05	89

Appendix A.30. Fish targets recorded in the Yentna River, north and south banks combined, 29 June through 6 August 1986. a

Date	Sockeye		Pink		Chum		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
29-Jun	98	98	87	87	5	5	116	116	117	117
30-Jun	61	159	52	140	4	8	78	194	50	168
01-Jul	51	210	43	183	3	12	66	260	37	205
02-Jul	50	260	42	225	3	15	64	324	37	242
03-Jul	49	310	43	268	3	18	62	386	45	287
04-Jul	59	369	51	319	3	21	75	460	50	337
05-Jul	48	417	42	360	3	24	60	520	45	382
06-Jul	57	474	49	409	3	27	70	590	54	436
07-Jul	61	535	52	461	4	31	78	668	50	485
08-Jul	62	597	52	514	4	35	80	748	45	531
09-Jul	52	649	44	558	3	38	67	816	37	568
10-Jul	63	712	52	609	4	42	83	899	36	604
11-Jul	87	799	72	681	6	48	114	1013	52	656
12-Jul	93	892	77	758	6	54	123	1136	54	710
13-Jul	79	971	66	824	5	59	103	1240	50	760
14-Jul	67	1038	189	1013	13	72	47	1287	17	778
15-Jul	223	1261	799	1812	46	117	152	1438	11	789
16-Jul	806	2066	2878	4690	165	283	548	1986	40	829
17-Jul	426	2492	2524	7214	190	472	359	2345	16	844
18-Jul	777	3269	1961	9175	186	658	530	2875	0	844
19-Jul	481	3751	1237	10412	180	839	430	3305	9	853
20-Jul	145	3895	427	10839	57	896	132	3437	3	857
21-Jul	99	3995	297	11136	10	906	20	3458	1	858
22-Jul	836	4830	3127	14263	126	1032	238	3696	13	870
23-Jul	10049	14880	25402	39665	744	1776	1560	5256	47	917
24-Jul	2876	17756	44814	84480	149	1925	313	5569	39	957
25-Jul	5549	23305	65081	149561	325	2250	330	5899	127	1083
26-Jul	10882	34187	99024	248585	1223	3473	554	6453	0	1083
27-Jul	11017	45204	111850	360434	1234	4707	1609	8062	0	1083
28-Jul	10626	55830	108089	468523	3413	8120	2237	10299	0	1083
29-Jul	13417	69247	90560	559084	5733	13853	3030	13328	0	1083
30-Jul	7304	76550	43270	602354	12496	26350	2826	16154	0	1083
31-Jul	2686	79237	20369	622724	6079	32429	1211	17366	0	1083
01-Aug	1966	81203	22210	644934	4717	37145	1437	18802	0	1083
02-Aug	2394	83597	14994	659928	7159	44305	2462	21264	0	1083
03-Aug	812	84409	7762	667690	4009	48313	1503	22767	30	1113
04-Aug	655	85064	3732	671422	4248	52561	377	23145	0	1113
05-Aug	1022	86086	1569	672991	2760	55322	214	23358	0	1113
06-Aug	430	86516	912	673903	1335	56657	99	23457	0	1113
Total	5561	92077	61788	735691						

a. Sonar counts apportioned by fishwheel catch.

b. Estimate of escapement after 6 August based on minimum sums of squares analysis.

Appendix A.31. Fish targets recorded on the north bank of the Yentna River, 29 June through 6 August 1986. a

Date	Sockeye		Pink		Chum		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
29-Jun	51	51	49	49	2	2	52	52	95	95
30-Jun	15	66	15	64	0	2	16	68	29	124
01-Jul	10	76	9	73	0	2	10	78	18	142
02-Jul	10	86	10	83	0	3	10	88	19	161
03-Jul	15	101	15	98	0	3	16	104	29	190
04-Jul	16	117	16	114	0	4	17	121	30	220
05-Jul	16	133	15	129	0	4	16	137	29	250
06-Jul	20	152	19	148	1	5	20	157	37	286
07-Jul	15	167	15	162	0	5	16	173	28	315
08-Jul	12	179	11	174	0	5	12	184	22	336
09-Jul	9	188	9	183	0	6	9	194	17	354
10-Jul	5	193	5	187	0	6	5	199	9	362
11-Jul	8	201	8	195	0	6	9	207	16	378
12-Jul	8	209	8	203	0	6	8	215	15	393
13-Jul	9	218	9	212	0	7	10	225	18	410
14-Jul	9	227	8	220	0	7	9	234	16	427
15-Jul	36	263	224	444	7	13	31	265	8	435
16-Jul	128	391	790	1234	23	37	110	376	29	464
17-Jul	66	458	566	1801	43	80	51	426	16	480
18-Jul	108	565	299	2099	25	104	68	495	0	480
19-Jul	41	606	114	2213	9	114	26	521	0	480
20-Jul	9	615	80	2293	4	118	8	528	1	480
21-Jul	9	624	83	2376	4	122	8	536	1	481
22-Jul	166	790	1535	3911	83	205	145	681	10	491
23-Jul	221	1011	2048	5960	111	316	194	875	14	505
24-Jul	227	1238	4898	10858	19	335	0	875	0	505
25-Jul	854	2093	18439	29296	71	406	0	875	0	505
26-Jul	353	2445	25607	54904	187	593	0	875	0	505
27-Jul	1420	3865	37865	92769	575	1168	428	1303	0	505
28-Jul	1831	5696	49069	141838	1099	2266	732	2036	0	505
29-Jul	1794	7490	42161	183999	1570	3836	1121	3157	0	505
30-Jul	1038	8528	22612	206611	2580	6417	692	3849	0	505
31-Jul	308	8836	7573	214185	308	6724	308	4156	0	505
01-Aug	207	9042	7528	221712	1473	8197	447	4603	0	505
02-Aug	175	9217	5070	226783	1923	10120	816	5419	0	505
03-Aug	139	9357	4992	231774	1126	11246	478	5897	30	535
04-Aug	82	9439	1866	233640	1162	12408	82	5979	0	535
05-Aug	209	9648	1064	234704	608	13016	38	6017	0	535
06-Aug	178	9825	754	235458	666	13681	44	6061	0	535

a. Sonar counts apportioned by fishwheel catch.

Appendix A.32. Fish targets recorded on the south bank of the Yentna River, 29 June through 6 August 1986.

Date	Sockeye		Pink		Chum		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
29-Jun	47	47	38	38	3	3	63	63	22	22
30-Jun	46	93	37	76	3	6	62	125	21	43
01-Jul	42	135	34	110	3	9	56	182	19	63
02-Jul	40	175	33	142	3	12	54	236	19	81
03-Jul	34	209	28	170	2	15	46	282	16	97
04-Jul	43	252	35	205	3	18	58	340	20	117
05-Jul	32	284	26	231	2	20	44	383	15	132
06-Jul	37	321	30	262	3	22	50	433	17	149
07-Jul	46	367	37	299	3	26	62	495	21	171
08-Jul	51	418	41	340	4	29	68	564	24	194
09-Jul	43	461	35	375	3	32	58	622	20	214
10-Jul	58	519	47	422	4	36	78	700	27	241
11-Jul	78	597	64	486	5	42	106	806	36	278
12-Jul	85	683	70	556	6	48	115	921	40	318
13-Jul	70	752	57	612	5	52	94	1015	32	350
14-Jul	59	811	180	793	12	65	38	1053	1	351
15-Jul	187	998	575	1368	39	104	120	1173	3	354
16-Jul	678	1675	2088	3456	142	246	437	1610	11	365
17-Jul	359	2035	1957	5413	147	393	308	1918	0	365
18-Jul	670	2704	1663	7076	162	554	462	2380	0	365
19-Jul	440	3145	1123	8199	171	725	404	2784	9	374
20-Jul	136	3281	347	8546	53	778	125	2909	3	377
21-Jul	90	3371	214	8760	6	784	13	2922	0	377
22-Jul	670	4040	1592	10352	43	827	93	3015	2	379
23-Jul	9828	13868	23354	33706	633	1460	1366	4381	33	412
24-Jul	2649	16517	39916	73622	130	1590	313	4694	39	452
25-Jul	4695	21212	46643	120265	254	1844	330	5024	127	579
26-Jul	10529	31741	73416	193681	1036	2880	554	5578	0	579
27-Jul	9597	41338	73985	267666	659	3539	1180	6759	0	579
28-Jul	8795	50133	59020	326685	2315	5854	1504	8263	0	579
29-Jul	11623	61756	48400	375085	4163	10017	1908	10171	0	579
30-Jul	6266	68023	20658	395743	9916	19933	2135	12306	0	579
31-Jul	2378	70401	12796	408539	5771	25704	903	13209	0	579
01-Aug	1760	72161	14682	423221	3244	28948	990	14199	0	579
02-Aug	2219	74380	9924	433145	5236	34185	1646	15845	0	579
03-Aug	673	75052	2771	435916	2883	37067	1025	16870	0	579
04-Aug	573	75625	1866	437782	3086	40154	296	17165	0	579
05-Aug	813	76438	505	438287	2152	42306	176	17341	0	579
06-Aug	253	76691	157	438444	669	42975	55	17396	0	579

a. Sonar counts apportioned by fishwheel catch.

Appendix A.33. Yentna River south bank sonar counts by sector, 29 June through 6 August 1986.

Count by Sector													
Date	1	2	3	4	5	6	7	8	9	10	11	12	Total
29-Jun	29	56	26	17	14	11	2	0	1	3	7	3	169
30-Jun	31	34	25	20	11	2	6	2	0	14	2	23	170
01-Jul	28	41	28	14	9	5	1	4	0	6	8	5	149
02-Jul	28	39	27	9	13	3	1	1	1	2	3	22	149
Total	116	170	106	60	47	21	10	7	2	25	20	53	637
Percent	18.2%	26.7%	16.6%	9.4%	7.4%	3.3%	1.6%	1.1%	0.3%	3.9%	3.1%	8.3%	100.0%
03-Jul	76	34	9	6	0	0	0	0	0	1	0	2	128
04-Jul	61	45	26	14	0	0	0	0	0	4	31	57	7
05-Jul	62	30	19	2	0	0	0	0	8	0	0	0	121
06-Jul	74	30	18	2	0	0	0	0	0	6	0	7	137
Total	273	139	72	24	0	0	0	0	8	11	31	66	624
Percent	43.8%	22.3%	11.5%	3.8%	0.0%	0.0%	0.0%	0.0%	1.3%	1.8%	5.0%	10.6%	100.0%
07-Jul	56	51	41	10	0	0	0	0	2	0	0	8	168
08-Jul	55	51	40	19	5	0	1	1	1	3	0	9	185
09-Jul	33	33	34	13	5	0	9	2	4	2	4	19	158
10-Jul	43	67	26	11	2	2	1	2	7	1	13	34	209
Total	187	202	141	53	12	2	11	5	14	6	17	70	720
Percent	26.0%	28.1%	19.6%	7.4%	1.7%	0.3%	1.5%	0.7%	1.9%	0.8%	2.4%	9.7%	100.0%
11-Jul	87	60	67	13	4	0	8	3	3	7	15	17	284
12-Jul	94	84	77	28	6	0	0	2	0	4	8	8	311
13-Jul	83	80	34	9	7	0	3	0	1	7	10	15	249
14-Jul	75	103	56	7	1	0	5	3	0	12	1	19	282
Total	339	327	234	57	18	0	16	8	4	30	34	59	1126
Percent	30.1%	29.0%	20.8%	5.1%	1.6%	0.0%	1.4%	0.7%	0.4%	2.7%	3.0%	5.2%	100.0%
15-Jul	247	254	179	98	41	10	20	21	14	7	16	22	929
16-Jul	716	1014	752	431	193	57	95	44	17	13	5	19	3356
17-Jul	487	901	610	324	87	19	106	71	41	37	31	57	2771
18-Jul	548	1062	742	330	77	14	58	35	12	23	31	23	2955
Total	1998	3231	2283	1183	398	100	279	171	84	80	83	121	10011
Percent	20.0%	32.3%	22.8%	11.8%	4.0%	1.0%	2.8%	1.7%	0.8%	0.8%	0.8%	1.2%	100.0%

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Date	Count by Sector												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
19-Jul	803	699	438	138	30	1	19	6	2	7	1	4	2148
20-Jul	212	235	139	32	4	0	6	3	0	5	4	22	662
21-Jul	218	99	6	0	0	0	0	0	0	0	0	0	323
22-Jul	1035	1093	267	5	0	0	0	0	0	0	0	0	2400
Total	2268	2126	850	175	34	1	25	9	2	12	5	26	5533
Percent	41.0%	38.4%	15.4%	3.2%	0.6%	0.0%	0.5%	0.2%	0.0%	0.2%	0.1%	0.5%	100.0%
23-Jul	11391	16593	6954	269	7	0	0	0	0	0	0	0	35214
24-Jul	15290	17417	8202	925	609	605	1	0	0	0	0	0	43049
25-Jul	6270	14109	20194	8189	2139	431	468	138	21	44	20	25	52048
26-Jul	11921	24880	25958	11601	5764	3951	678	258	110	108	117	170	85516
Total	44872	72999	61308	20984	8519	4987	1147	396	131	152	137	195	215827
Percent	20.8%	33.8%	28.4%	9.7%	3.9%	2.3%	0.5%	0.2%	0.1%	0.1%	0.1%	0.1%	100.0%
27-Jul	17373	33001	23219	7274	2171	486	843	374	162	139	145	234	85421
28-Jul	23755	26219	12982	4556	1439	294	646	412	253	288	195	595	71634
29-Jul	21730	23716	10910	4228	1413	320	883	600	456	476	457	905	66094
30-Jul	15586	11801	5946	1900	578	182	445	427	251	309	387	1163	38975
Total	78444	94737	53057	17958	5601	1282	2817	1813	1122	1212	1184	2897	262124
Percent	29.9%	36.1%	20.2%	6.9%	2.1%	0.5%	1.1%	0.7%	0.4%	0.5%	0.5%	1.1%	100.0%
31-Jul	6622	6510	3941	1570	609	231	548	361	312	234	212	699	21849
01-Aug	4232	5852	3697	1589	849	336	825	648	516	612	639	881	20676
02-Aug	4073	5446	3506	1671	814	383	707	671	281	249	300	924	19025
03-Aug	2348	2277	1296	540	189	62	131	77	38	59	52	282	7351
Total	17275	20085	12440	5370	2461	1012	2211	1757	1147	1154	1203	2786	68901
Percent	25.1%	29.2%	18.1%	7.8%	3.6%	1.5%	3.2%	2.6%	1.7%	1.7%	1.7%	4.0%	100.0%
04-Aug	2708	1803	925	254	59	12	23	14	3	7	3	10	5821
05-Aug	1544	1406	617	69	3	0	2	3	0	2	0	0	3646
06-Aug	385	486	240	21	0	2	0	0	0	0	0	0	1134
Total	4637	3695	1782	344	62	14	25	17	3	9	3	10	10601
Percent	43.7%	34.9%	16.8%	3.2%	0.6%	0.1%	0.2%	0.2%	0.0%	0.1%	0.0%	0.1%	100.0%

a. Daily count may differ from daily fish targets because of method used to average for debris.

Appendix A.34. Yentna River north bank sonar counts by sector, 29 June through 6 August 1986.

Count by Sector													
Date	1	2	3	4	5	6	7	8	9	10	11	12	Total
29-Jun	68	35	25	11	7	7	4	6	8	10	1	0	182
30-Jun	20	3	8	1	0	0	1	4	8	0	9	6	60
01-Jul	12	10	1	2	0	0	1	3	0	1	1	1	32
02-Jul	28	8	1	2	0	0	0	0	0	1	1	4	45
Total	128	56	35	16	7	7	6	13	16	12	12	11	319
Percent	40.1%	17.6%	11.0%	5.0%	2.2%	2.2%	1.9%	4.1%	5.0%	3.8%	3.8%	3.4%	100.0%
03-Jul	56	13	2	0	0	0	0	0	0	2	2	0	75
04-Jul	61	12	2	0	0	0	0	0	0	1	2	2	80
05-Jul	55	8	4	0	0	0	0	0	0	0	1	7	75
06-Jul	84	10	2	1	0	0	0	0	0	0	0	0	97
Total	256	43	10	1	0	0	0	0	0	3	5	9	327
Percent	78.3%	13.1%	3.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	1.5%	2.8%	100.0%
07-Jul	59	6	9	1	0	0	0	0	0	0	0	0	75
08-Jul	46	5	0	0	0	0	0	0	0	0	0	7	58
09-Jul	20	12	3	0	0	0	0	0	0	1	2	1	39
10-Jul	12	2	1	0	0	0	0	0	0	2	1	3	21
Total	137	25	13	1	0	0	0	0	0	3	3	11	193
Percent	71.0%	13.0%	6.7%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	1.6%	5.7%	100.0%
11-Jul	16	3	1	0	0	0	0	0	0	4	6	10	40
12-Jul	28	5	1	0	0	0	0	0	1	0	0	3	38
13-Jul	33	5	3	1	0	0	0	0	0	0	0	4	46
14-Jul	34	3	3	0	0	0	0	0	0	0	0	3	43
Total	111	16	8	1	0	0	0	0	1	4	6	20	167
Percent	66.5%	9.6%	4.8%	0.6%	0.0%	0.0%	0.0%	0.0%	0.6%	2.4%	3.6%	12.0%	100.0%
15-Jul	193	59	13	3	2	2	0	0	3	2	5	23	305
16-Jul	717	257	39	2	0	0	2	5	7	14	8	27	1078
17-Jul	426	225	35	7	0	0	1	0	3	16	16	9	738
18-Jul	270	169	16	1	0	0	0	0	1	10	8	24	499
Total	1606	710	103	13	2	2	3	5	14	42	37	83	2620
Percent	61.3%	27.1%	3.9%	0.5%	0.1%	0.1%	0.1%	0.2%	0.5%	1.6%	1.4%	3.2%	100.0%

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Appendix A.34. (continued: p 2 of 2).

Date	Count by Sector												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
19-Jul	125	46	7	0	0	0	0	0	2	0	5	5	190
20-Jul	57	36	7	1	1	1	0	0	0	1	0	3	107
21-Jul	102	3	1	0	0	0	0	0	0	0	0	0	106
22-Jul	1674	252	14	0	0	0	0	0	0	0	0	0	1940
Total	1958	337	29	1	1	1	0	0	2	1	5	8	2343
Percent	83.6%	14.4%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.2%	0.3%	100.0%
23-Jul	1969	531	34	18	18	18	0	0	0	0	0	0	2588
24-Jul	3633	1459	52	0	0	0	0	0	0	0	0	0	5144
25-Jul	11882	5693	957	286	259	268	1	0	0	2	1	0	19359
26-Jul	13178	6330	2203	1475	1449	1448	5	6	2	8	14	19	26137
Total	30662	14013	3246	1779	1736	1734	6	6	2	10	15	19	53228
Percent	57.6%	26.3%	6.1%	3.3%	3.3%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
27-Jul	22849	14219	2685	114	5	0	12	15	31	102	125	132	40289
28-Jul	22486	22621	5629	592	376	363	20	35	34	85	155	340	52736
29-Jul	19601	21059	4524	328	15	1	28	45	77	176	231	561	46646
30-Jul	10222	12151	3086	293	18	4	26	70	92	170	280	510	26922
Total	75158	70050	15924	1327	414	368	86	165	234	533	791	1543	166593
Percent	45.1%	42.0%	9.6%	0.8%	0.2%	0.2%	0.1%	0.1%	0.1%	0.3%	0.5%	0.9%	100.0%
31-Jul	3077	3483	980	182	63	54	20	28	43	110	164	294	8498
01-Aug	3582	3793	906	182	72	62	41	81	104	179	225	427	9654
02-Aug	2599	2634	718	269	195	189	87	133	157	253	297	466	7997
03-Aug	2808	1893	567	64	12	5	43	83	126	243	342	579	6765
Total	12066	11803	3171	697	342	310	191	325	430	785	1028	1766	32914
Percent	36.7%	35.9%	9.6%	2.1%	1.0%	0.9%	0.6%	1.0%	1.3%	2.4%	3.1%	5.4%	100.0%
04-Aug	1236	1151	386	62	23	21	17	29	36	59	55	115	3190
05-Aug	1055	620	191	17	0	0	0	0	3	11	9	12	1918
06-Aug	1241	272	90	7	4	0	2	4	5	9	2	5	1641
Total	3532	2043	667	86	27	21	19	33	44	79	66	132	6749
Percent	52.3%	30.3%	9.9%	1.3%	0.4%	0.3%	0.3%	0.5%	0.7%	1.2%	1.0%	2.0%	100.0%

Appendix A.35. Yentna River north bank side scan sonar counts by hour, 29 June through 6 August 1986.

Counts by Hour																								
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
29-Jun	17	9	6	1	3	7	15	5	12	10	6	15	2	11	2	22	7	6	6	6	6	6	0	2
30-Jun	1	3	1	2	10	4	7	11	1	3	0	0	0	0	2	1	0	0	0	1	0	2	4	7
01-Jul	1	1	3	3	6	2	0	3	0	4	0	0	0	0	0	0	0	2	0	0	3	1	1	2
02-Jul	2	0	4	2	7	2	3	0	1	1	0	1	1	3	0	4	5	1	2	0	2	0	3	1
03-Jul	1	4	2	0	4	11	5	1	5	2	2	5	3	2	0	2	4	1	3	12	1	1	2	2
04-Jul	1	0	4	7	5	3	6	7	5	6	2	1	7	2	3	1	1	7	0	0	2	1	3	6
05-Jul	3	3	4	3	0	3	0	0	5	10	4	4	8	4	2	2	1	0	1	5	3	1	4	5
06-Jul	4	3	1	3	7	4	6	9	3	8	5	8	2	5	1	0	1	1	4	4	2	2	5	9
07-Jul	8	6	4	5	2	4	4	3	1	3	5	6	3	1	1	2	2	5	0	2	0	1	4	3
08-Jul	3	3	4	1	2	3	1	3	1	5	0	4	2	0	3	5	2	2	1	4	2	5	2	0
09-Jul	2	4	3	0	0	6	7	0	0	0	1	3	4	0	0	0	0	3	1	1	0	2	0	2
10-Jul	0	0	1	0	0	2	5	0	1	0	0	1	2	0	0	0	2	0	4	1	1	1	0	0
11-Jul	2	1	1	1	1	1	1	1	0	3	1	1	2	0	2	1	0	2	3	7	2	3	0	4
12-Jul	1	0	1	2	4	2	2	2	1	0	2	3	2	3	0	2	2	2	1	2	0	1	1	2
13-Jul	4	0	0	2	2	2	2	2	1	3	0	1	3	3	1	8	0	1	1	0	4	1	2	3
14-Jul	2	2	4	0	2	1	3	2	2	2	2	3	2	2	5	1	0	0	0	1	1	2	0	4
15-Jul	6	5	1	1	3	6	5	5	7	12	5	10	8	8	12	11	31	21	24	21	26	21	22	34
16-Jul	22	41	23	25	17	39	31	17	29	41	35	27	39	60	59	34	100	109	77	53	33	58	53	56
17-Jul	43	59	44	51	28	37	41	28	44	47	29	28	43	36	20	33	21	1	9	18	21	9	18	30
18-Jul	35	20	13	32	18	13	12	12	18	8	10	19	26	15	22	23	21	25	24	29	24	32	18	30
19-Jul	20	12	11	13	10	11	10	10	10	11	7	3	8	6	8	2	7	5	2	6	4	2	8	4
20-Jul	6	7	6	5	10	5	6	2	2	6	3	6	3	1	2	4	2	2	6	3	1	4	7	8
21-Jul	3	5	5	6	8	7	1	1	1	5	9	8	3	3	1	0	2	2	3	8	6	6	6	7
22-Jul	10	15	41	27	29	37	41	12	4	3	5	15	17	11	9	32	159	250	276	259	206	166	173	143
23-Jul	153	175	162	123	120	94	103	108	133	116	139	34	34	96	89	94	91	92	67	56	131	99	159	120
24-Jul	146	178	179	244	216	241	239	151	36	44	75	106	103	167	119	148	153	149	164	367	344	506	558	511
25-Jul	585	666	651	665	572	564	413	548	625	418	347	424	713	649	765	738	1012	1516	1899	1709	1239	1033	804	804
26-Jul	1086	1086	1086	1086	1086	1086	1086	1086	1301	1003	652	439	1117	1082	898	1125	1079	1602	1018	821	991	1125	1636	1560
27-Jul	1476	1750	2273	1988	1812	1973	1897	1873	2057	1678	1446	1350	1164	1368	1138	472	1580	1157	1991	1636	1693	1939	2184	2394

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Appendix A.35. (continued: p 2 of 2).

Counts by Hour																								
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
28-Jul	2850	2728	2468	2703	2250	2239	2508	2247	2228	1701	2203	2202	1589	2477	2267	1639	1984	1767	1979	1996	1803	2132	2395	2381
29-Jul	2161	2106	2600	3030	2758	2781	2224	1914	1882	1281	662	1505	1165	1203	2114	2055	1665	1553	1378	2060	2131	2260	2017	2141
30-Jul	1937	2069	1766	1595	1413	1411	1048	1057	793	713	638	310	495	982	1063	1131	1059	1171	1044	1380	1099	1129	961	658
31-Jul	576	398	394	380	437	407	395	325	246	287	201	206	219	222	173	354	290	322	328	546	381	439	444	528
01-Aug	425	350	332	353	433	427	438	410	245	425	264	402	273	434	339	340	356	460	642	659	480	389	484	294
02-Aug	307	258	285	336	303	336	336	288	182	269	249	210	256	325	274	288	317	291	700	652	336	371	460	368
03-Aug	351	328	256	177	245	159	153	153	152	188	152	181	198	227	307	258	393	328	445	512	412	471	339	380
04-Aug	239	173	133	108	97	106	92	132	84	141	63	82	187	162	142	173	121	143	142	125	180	155	102	108
05-Aug	130	130	79	89	65	80	86	68	65	50	70	74	68	83	52	34	53	52	48	91	134	130	112	75
06-Aug	82	80	67	71	42	47	78	60	52	57	52	77	51	60	45	70	106	57	56	97	84	104	78	68
Percent	4.8%	4.8%	4.9%	5.0%	4.5%	4.6%	4.3%	4.0%	3.9%	3.2%	2.8%	2.9%	2.9%	3.7%	3.7%	3.4%	4.0%	4.2%	4.7%	5.0%	4.4%	4.8%	4.9%	4.8%

Appendix A.36. Yentna River south bank side scan sonar counts by hour, 29 June through 6 August 1986.

Date	Counts by Hour																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
29-Jun	6	3	8	6	5	11	3	8	6	1	7	6	6	7	1	2	1	5	13	15	16	3	10	20
30-Jun	4	9	6	5	4	4	1	13	10	7	4	9	5	9	3	8	8	20	8	9	15	7	1	1
01-Jul	3	10	5	4	9	6	5	11	11	2	3	2	6	5	5	2	9	10	1	4	7	12	9	8
02-Jul	9	11	6	6	9	8	12	6	5	4	7	11	6	4	3	6	2	6	9	7	3	4	2	3
03-Jul	4	2	3	4	2	4	7	1	2	4	16	15	2	8	3	14	6	8	1	5	2	2	6	7
04-Jul	1	9	9	9	2	1	9	12	2	19	3	3	3	9	3	2	5	6	13	4	6	9	13	6
05-Jul	8	8	10	5	15	7	16	6	2	3	2	2	5	4	3	1	2	3	0	4	3	2	4	6
06-Jul	12	11	3	4	3	8	11	1	5	9	0	4	14	5	5	7	4	7	3	3	4	5	5	4
07-Jul	9	13	9	3	2	8	2	3	8	2	9	2	2	4	13	7	11	4	11	10	5	4	18	9
08-Jul	13	6	5	7	8	2	8	14	2	3	4	2	7	11	8	13	4	13	13	13	4	9	7	9
09-Jul	7	9	8	3	6	19	5	8	5	6	7	10	7	3	5	6	3	1	7	7	10	2	3	11
10-Jul	7	13	9	6	7	6	3	2	8	2	14	4	18	9	10	11	4	3	16	15	9	17	8	8
11-Jul	12	8	7	2	17	9	8	3	16	8	13	9	16	14	5	14	13	9	10	12	14	14	20	31
12-Jul	24	31	8	10	3	15	7	8	11	8	13	12	21	13	8	9	13	9	16	18	21	12	14	7
13-Jul	9	18	8	16	15	8	6	10	18	5	14	12	9	9	25	2	6	7	5	9	10	11	10	7
14-Jul	10	12	25	4	6	16	9	12	16	14	8	16	19	13	14	12	11	5	4	23	6	9	5	13
15-Jul	9	16	10	23	12	12	13	10	9	15	24	8	38	40	42	50	6	72	52	87	111	96	90	84
16-Jul	152	188	188	171	135	216	197	126	184	146	115	115	110	153	98	162	267	140	116	78	99	76	60	64
17-Jul	101	109	134	143	130	145	172	92	84	102	102	135	145	76	87	106	127	97	103	108	121	115	89	148
18-Jul	163	122	152	109	143	166	161	132	150	159	75	104	181	113	75	101	123	139	96	119	83	122	61	106
19-Jul	148	171	135	144	141	150	147	103	84	114	80	51	56	70	72	73	61	76	57	34	60	54	35	32
20-Jul	49	66	50	45	32	32	28	36	27	38	21	25	13	10	27	27	15	28	22	15	15	21	5	15
21-Jul	16	27	24	15	14	10	11	14	10	10	6	5	15	13	5	10	21	30	15	7	10	12	14	9
22-Jul	17	15	13	15	14	20	14	18	9	15	37	31	49	49	79	76	94	119	148	171	338	309	412	338
23-Jul	445	759	814	1091	1164	1254	1231	1069	1060	893	1009	885	1337	1264	1312	1715	2426	1666	1881	2038	2140	2523	2778	2460
24-Jul	2519	2311	2108	2376	2454	2286	2085	1794	1939	1680	1552	1561	1657	1563	1449	1794	1122	1495	1472	2398	1462	1418	1322	1232
25-Jul	1212	1028	1009	1232	810	679	709	629	829	693	674	765	1211	1109	2049	1596	1077	4972	4859	5303	4380	4882	5616	4725
26-Jul	5887	3803	3564	3564	3564	3564	3564	3564	3803	2826	2244	2395	3749	3525	3918	3413	3979	3749	3880	3017	2903	3870	3508	3663
27-Jul	4077	4166	3561	3278	3934	3904	3111	3212	2764	2320	2470	2268	3740	3606	1239	5640	5140	4253	3875	4064	3925	3499	3816	3559

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Appendix A.36. (continued: p 2 of 2).

Counts by Hour																								
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
28-Jul	3667	3790	4060	3471	3176	3260	3301	3405	3278	2830	2448	2564	2355	3469	3101	2287	1824	2037	2072	2490	3021	3057	3332	3339
29-Jul	3746	4481	3897	3896	3940	4245	4195	3114	1960	1734	2202	2623	2292	1793	1830	2782	2669	2338	2001	2346	2401	1618	2131	1860
30-Jul	2734	2785	2420	2834	2521	2462	2310	2050	1603	1369	1287	1243	1141	1537	1367	1392	1177	1174	1019	978	750	880	895	1047
31-Jul	888	941	1158	1320	1377	1240	1219	1081	843	859	878	705	845	997	755	921	708	663	639	672	848	852	672	768
01-Aug	836	876	1030	905	905	767	720	851	827	767	719	705	419	646	767	828	867	985	1172	1066	824	1147	1102	945
02-Aug	908	952	884	752	901	919	1003	863	973	827	1102	924	984	948	519	859	564	719	942	717	520	443	427	375
03-Aug	384	331	329	351	339	349	391	404	318	383	290	272	284	213	165	183	350	268	401	263	329	218	261	275
04-Aug	237	326	263	374	346	371	136	157	257	257	160	131	188	231	220	337	223	252	194	193	253	216	262	237
05-Aug	280	268	243	301	277	240	217	229	110	112	127	110	93	78	82	64	97	108	108	113	121	109	77	82
06-Aug	87	79	53	69	33	52	21	30	31	33	23	43	49	37	73	43	55	41	41	38	47	36	61	59
Percent	5.0%	4.8%	4.6%	4.6%	4.6%	4.6%	4.4%	4.0%	3.7%	3.2%	3.1%	3.1%	3.7%	3.8%	3.4%	4.3%	4.0%	4.4%	4.4%	4.6%	4.3%	4.5%	4.7%	4.4%

Appendix A.37. Daily adjusted fishwheel catch by species for the north bank of the Yentna River,
3 July through 6 August 1986. a

Date	Hours Open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
03-Jul	19.3	0	0	0	0	0	0	1	1	7	7
04-Jul			0	0	0	0	0	0	1	0	7
05-Jul	49.4	1	1	0	0	0	0	0	1	10	17
06-Jul	21.7	2	3	4	4	1	1	1	2	1	18
07-Jul	28.1	3	6	0	4	0	1	2	4	8	26
08-Jul	21.7	3	9	0	4	0	1	2	6	6	32
09-Jul	26.7	4	13	0	4	0	1	5	11	4	36
10-Jul	22.3	3	16	1	5	0	1	6	17	8	44
11-Jul	22.1	2	18	4	9	0	1	4	21	4	48
12-Jul	26.2	2	20	2	11	0	1	5	26	2	50
13-Jul	20.4	7	27	7	18	0	1	2	28	1	51
14-Jul	23	2	29	14	32	0	1	6	34	11	62
15-Jul	22.9	5	34	15	47	0	1	2	36	2	64
16-Jul	28.2	17	51	121	168	4	5	17	53	3	67
17-Jul	19.8	17	68	145	313	11	16	13	66	4	71
18-Jul	23.8	15	83	72	385	8	24	17	83	0	71
19-Jul	25.2	17	100	53	438	6	30	13	96	1	72
20-Jul	22.6	4	104	22	460	7	37	10	106	0	72
21-Jul	OFF		104		460		37		106		72
22-Jul	OFF		104		460		37		106		72
23-Jul	23.4	12	116	126	586	1	38	4	110	1	73
24-Jul	20.3	5	121	86	672	0	38	0	110	0	73
25-Jul	24	7	128	173	845	1	39	0	110	0	73
26-Jul	7.5	51	179	3702	4547	27	66	0	110	0	73
27-Jul	1.9	126	305	3360	7907	51	117	38	148	0	73
28-Jul	2	60	365	1608	9515	36	153	24	172	0	73
29-Jul	3	64	429	1504	11019	56	209	40	212	0	73
30-Jul	3.7	39	468	850	11869	97	306	26	238	0	73
31-Jul	4	30	498	738	12607	30	336	30	268	0	73
01-Aug	5.8	25	523	910	13517	178	514	54	322	0	73
02-Aug	8	18	541	522	14039	198	712	84	406	0	73
03-Aug	7	14	555	501	14540	113	825	48	454	3	76
04-Aug	11.8	10	565	228	14768	142	967	10	464	0	76
05-Aug	10.9	22	587	112	14880	64	1031	4	468	0	76
06-Aug	16.5	16	603	68	14948	60	1091	4	472	0	76

a. Fishwheel catch adjusted for 24 hours: (daily catch * 24 hours)/hours open.

Actual catch: 219 sockeye salmon; 3571 pink salmon; 362 chum salmon; 194 coho salmon; 83 chinook salmon.

Appendix A.38. Daily adjusted fishwheel catch by species for the south bank of the Yentna River,
1 July through 6 August 1986. a

Date	Hours Open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
01-Jul	26.3	0	0	0	0	0	0	0	0	5	5
02-Jul	22.4	0	0	0	0	0	0	0	0	1	6
03-Jul	17.6	0	0	0	0	0	0	0	0	1	7
04-Jul	24	0	0	0	0	0	0	0	0	0	7
05-Jul	48	4	4	0	0	1	1	2	2	3	10
06-Jul	23.2	1	5	0	0	1	2	0	2	0	10
07-Jul	28.1	5	10	0	0	3	5	0	2	0	10
08-Jul	21.8	6	16	0	0	2	4	0	2	0	10
09-Jul	26.3	3	19	1	1	0	4	11	13	4	14
10-Jul	22.2	5	24	3	4	0	4	15	28	5	19
11-Jul	21.3	3	27	1	5	0	4	7	35	1	20
12-Jul	28.2	7	34	9	14	0	4	6	41	0	20
13-Jul	20.3	7	41	21	35	0	4	9	50	0	20
14-Jul	22.8	2	43	17	52	0	4	5	55	0	20
15-Jul	24.6	9	52	33	85	0	4	6	61	1	21
16-Jul	27.8	51	103	141	226	13	17	29	90	0	21
17-Jul	9.7	49	152	267	493	20	37	42	132	0	21
18-Jul	12	58	210	144	637	14	51	40	172	0	21
19-Jul	12.4	64	274	147	784	10	61	33	205	0	21
20-Jul	11.4	32	306	72	856	13	74	32	237	0	21
21-Jul	19.8	5	311	10	866	1	75	7	244	0	21
22-Jul	27.4	44	355	55	921	1	76	6	250	1	22
23-Jul	4.3	246	601	636	1557	17	93	28	278	0	22
24-Jul	7.1	203	804	3059	4616	10	103	24	302	3	25
25-Jul	9.6	185	989	1838	6454	10	113	13	315	5	30
26-Jul	7.2	437	1426	3047	9501	43	156	23	338	0	30
27-Jul	2.8	626	2052	4826	14327	43	199	77	415	0	30
28-Jul	4	456	2508	3060	17387	120	319	78	493	0	30
29-Jul	3	536	3044	2232	19619	192	511	88	581	0	30
30-Jul	5	182	3226	600	20219	288	799	62	643	0	30
31-Jul	10.2	129	3355	694	20913	313	1112	49	692	0	30
01-Aug	6.7	64	3419	534	21447	118	1230	36	728	0	30
02-Aug	7.3	89	3508	398	21845	210	1440	66	794	0	30
03-Aug	6.8	42	3550	173	22018	180	1620	64	858	0	30
04-Aug	10.2	31	3581	101	22119	167	1787	16	874	0	30
05-Aug	10.5	27	3608	16	22135	57	1844	7	881	0	30
06-Aug	16.5	10	3618	7	22142	41	1885	1	882	0	30

a. Fishwheel catch adjusted for 24 hours: (daily catch * 24 hours)/hours open.
Actual catch: 973 sockeye salmon; 5422 pink salmon; 589 chum salmon; 327 coho salmon; 28 chinook salmon.

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