ANVIK RIVER SONAR
CHUM SALMON ESCAPEMENT STUDY, 2001

By

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OEO/ADA STATEMENT

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ABSTRACT

The Anvik River sonar project uses side-looking sonar from mid June until the end of July of each year, since 1979, to estimate the passage of summer chum salmon *Oncorhynchus keta.* In 2001, an estimated 224,058 summer chum salmon passed the sonar site, failing to meet the lower range of the Anvik River Biological Escapement Goal of 400,000 to 800,000 chum salmon. The timing of the 2001 chum salmon run was late, quartile passage dates were 2 to 4 days later than the long term mean dates, based on 1979-1985 and 1987-2000 data. Eighty percent of the combined sonar estimates occurred in the nearshore half of the sonar counting ranges in 2001. The predominant nearshore migration pattern of chum salmon, accuracy of sonar estimates, and species composition of passing fish were verified by periodic paired acoustic and visual tower counts. A consistent diurnal pattern of the chum salmon migration was observed in 2001. Chum salmon passed the sonar site at the highest hourly rates during the darkest hours of the day, with 27.9% of sonar estimates occurring in the 6-hr period between 2200 and 0400 hours. Based upon biological samples collected by beach seine, the sex ratio of chum salmon escapements was 55.3% females in 2001. The proportion of females increased through the peak of the run, then decreased as the run progressed. Combined age-4 and age-5 fish comprised 98% of annual chum salmon in 2001. Age-5 fish were the dominant age class with 83.9% of the samples.

KEY WORDS: chum salmon, Chinook salmon, Oncorhynchus, Anvik, sonar, oscilloscope

INTRODUCTION

The purpose of the Anvik River sonar project is to monitor the escapement of summer chum salmon, *Oncorhynchus keta*, to the Anvik River drainage, which is thought to be the largest producer of summer chum salmon in the Yukon River drainage (Bergstrom et al. 1999). Additional major spawning populations of summer chum salmon occur in other tributaries of the Yukon River: the Andreafsky located at river kilometer (rkm) 167), Rodo (rkm 719), Nulato (rkm 777), Melozitna (rkm 938), and Tozitna Rivers (rkm 1,096). Spawning tributaries in the Koyukuk River are (rkm 817) the Gisasa (rkm 907) and Hogatza (rkm 1,255) Rivers; and in tributaries to the Tanana River (rkm 1,118): Chena (rkm 1,480), and Salcha (rkm 1,553) Rivers (Figure 1). Chinook *O. tshawytscha* and pink salmon *O. gorbuscha* spawn in the Anvik River concurrently with summer chum salmon. Fall chum, a later run chum salmon, and coho salmon *O. kisutch* have been reported to spawn in the Anvik River drainage later during the fall.

Timely and accurate reporting of information from the Anvik River sonar project is critical for Yukon River summer chum salmon managers to accurately assess the strength of the Anvik River run to meet the established Biological Escapement Goal range of 400,000 to 800,000 summer chum salmon. This information is important in the assessment of the strength of the summer chum salmon run on the Yukon River upstream from the mouth of the Anvik River. This assessment is necessary to determine if summer chum salmon abundance will meet upstream harvest and escapement needs. A side-looking sonar, capable of detecting migrating salmon along the banks, has been in place in the Anvik River since 1980.

The Electrodynamics Division of the Bendix Corporation developed the side-looking sonar[2] and conducted a pilot study using the side-looking sonar to estimate chum salmon escapement to the Anvik River in 1979. The results indicated that sonar-based estimation of chum salmon escapements to the Anvik River was superior to the counting tower method used at that time (Mauney and Buklis 1980).

Project results for escapement studies using sonar technology on the Anvik River from 1979 to 1995 have been reported by Mauney and Buklis (1980), Buklis (1981, 1982, 1983, 1984a, 1984b, 1985, 1986, 1987), Sandone (1989, 1990a, 1990b, 1993, 1994a, 1994b, 1995, 1996), Fair (1997), Chapell (2001), Moore and Lingnau (2002).

Background Information

Commercial and subsistence harvests of Anvik River chum salmon occur throughout the mainstem Yukon River from the delta to the mouth of the Anvik River, and within the first 19 rkm of the Anvik River. This section of the Yukon River includes Lower Yukon Area Districts 1, 2, and 3, and the lower portion of Subdistrict 4-A in the Upper Yukon Area (Figure 1). Most of the effort and

[2]Use of a company's name does not constitute endorsement.

harvest of this stock occurs in Districts 1 and 2, and in the lower portion of Subdistrict 4-A below the confluence of the Anvik and Yukon Rivers.

In the Lower Yukon Area, run timing of summer chum and chinook salmon overlap, with runs beginning at river-ice breakup through early July. During this time, commercial fisheries in the Lower Yukon Area have traditionally targeted chinook salmon, while Subdistrict 4-A commercial fisheries have targeted summer chum salmon. In the Lower Yukon Area, large-mesh gillnets (stretch mesh greater than 15.2 cm) were employed to harvest chinook salmon. Although these were very efficient for chinook salmon, the associated harvest of summer chum salmon through 1984 was minor in relation to the size of the chum salmon run. Therefore, before the 1985 season, the Alaska Board of Fisheries (BOF), in order to allow directed harvests of summer chum salmon in the Lower Yukon, adopted regulations allowing fishing periods restricted to small-mesh (15.2 cm maximum stretch mesh) gillnets during the chinook salmon season provided that (1) the summer chum salmon run was of sufficient size to support additional exploitation, and (2) the incidental harvest of chinook salmon during these small-mesh fishing periods did not adversely affect conservation of that species.

Increased market demand prompted allocation disputes between fishers in different districts. In February 1990, the BOF established a guideline harvest range of 400,000 to 1,200,000 summer chum salmon for the entire Yukon River, allocated by district and subdistrict based on the average harvests of the previous 15 years (ADF&G 1990). Summer chum salmon escapement to the Anvik River exceeded the lower range of the Anvik River Biological Escapement Goal (Clark and Sandone 2001) of 400,000 salmon by an average of 233,000 salmon from 1979 to 1993.

To allow commercial exploitation of surplus chum salmon returning to the Anvik River, in March of 1994 the BOF adopted the Anvik River chum salmon fishery management plan, which permits a commercial harvest of summer chum salmon in the terminal Anvik River Management Area (ARMA) (ADF&G 1994). In 1996, the BOF established a harvest limit of 100,000 pounds of chum salmon roe for the ARMA (JTC 1996). A more complete history and background information can be found in the Annual Management Reports for the Yukon Area published each year by the Alaska Department of Fish and Game.

Objectives

The purpose of this project is to monitor the escapement of summer chum salmon to the Anvik River and to assess the age and sex composition of the escapement. The two objectives of this project are to:

1. Estimate the daily summer chum salmon escapement passing the Anvik River sonar site; and

2. Estimate the age and sex composition of the summer chum salmon spawning escapements.

METHODS

Study Area

The Anvik River originates at an elevation of 400 m and flows in a southerly direction approximately 200 km to its mouth at rkm 512 of the Yukon River (Figure 1). It is a narrow runoff stream with a substrate of mainly gravel and cobble. Bedrock is exposed in some of the upper reaches. The Yellow River (Figure 2) is a major tributary of the Anvik drainage and is located approximately 100 km upstream from the mouth of the Anvik River. Downstream from the confluence of the Yellow River, the Anvik River changes from a moderate gradient system to a low gradient system meandering through a much broader flood plain. Turbid waters from the Yellow River greatly reduce the water clarity of the Anvik River below their confluence. Numerous oxbows, old channel cutoffs, and sloughs are found throughout the lower Anvik River.

Anvik River salmon escapements were partially estimated from visual counts made at counting towers from 1972 to 1979 above the confluence of the Anvik and Yellow Rivers (Figure 2). A site 9 km above the Yellow River on the mainstem Anvik River was used from 1972 to 1975 (Lebida 1973; Trasky 1974, 1976; Mauney 1977). From 1976 to 1979 a site on the mainstem Anvik River near the confluence of Robinhood Creek and the Anvik River was used (Figure 2; Mauney 1979, 1980; Mauney and Geiger 1977). Other than 1974, aerial surveys have been conducted in each year since 1961 in fixed-wing aircraft to estimate salmon abundance below the tower site. Since 1979, the Anvik River sonar project has been located approximately 76 km upstream of the confluence of the Anvik and Yukon Rivers, 5 km below Theodore Creek (Figure 2) in Section 35, Township 31 North, Range 61 West, Seward Meridian. The land is public, managed by BLM, and presently unclassified. Aerial survey data indicate chum salmon spawn primarily upstream of the sonar site.

Sonar Deployment and Operation

The sonar system operates by transmitting sound waves outward along the riverbed, from transducers located near the shore. Echoes from targets passing through the sonar beam are reflected back to the transducer and filtered and processed in the transceiver. Echoes, which satisfy the criteria for strength and frequency are considered valid and are counted as fish. Echo selection criteria, are designed to estimate fish passage and minimize debris counts. Echoes are counted and combined to estimate fish abundance. For the Anvik River sonar salmon counting project, all fish targets are considered salmon. Paired visual counts confirm that the nearly all fish observed are salmon.

During the 2001 season, 1981-model sonar "counters" (transceivers) were deployed and operated according to guidelines described by Bendix Corporation (1981) on each bank of the Anvik River to estimate chum salmon passage (Figure 2). The transducers were deployed and operated without the prescribed artificial aluminum substrate throughout the season. This practice of operating without an artificial substrate was first employed on the Anvik River in 1986 (Buklis 1986). The right (west) and left (east) bank sites used in previous years were probed to locate uniform river bottom gradients that would provide optimum linear surfaces for ensonification.

Each sonar transducer was mounted to a pipe configuration, which allowed the transducer to be moved during aiming without affecting stability. Sandbags were placed on top of the pipe base to ensure stability. Transducers were aimed perpendicular to the current and were offset to prevent interference (cross-talk) between opposite banks (Figure 3). To prevent fish passage inshore of the transducer, fish leads constructed of T-stakes and rectangular mesh fencing were installed downstream of the transducer. Extending from shore to approximately 1 m beyond the transducer, the fish leads were at an oblique angle from shore leading upstream. On the right bank, a counting tower of aluminum scaffolding material approximately 3 m in height was placed between the bank and the transducer in the river upstream of the fish lead for visual observation of salmon when water conditions permitted. An identical tower on the left bank was placed on the shore downstream of the fish lead. Transducers, leads, and counting towers were moved inshore or offshore as required by fluctuating water levels.

Transducers were aimed, and ranges adjusted, so that echoes resulting from the stream bottom or surface interface did not register as 'counts' by the sonar electronics. Sensitivity, as measured in voltage from peak to peak, was adjusted to the highest level without registering false 'counts'. This level was usually the maximum possible for the equipment. Sonar ensonification ranges were adjusted in response to changing river conditions. The 1981-model counter has a maximum range of 30 m. Because of the conical shape of the sonar beam, its width and height increase with distance from the transducer. The ensonified zone of the river encompassed approximately the bottom one-half of the vertical water column within the counting range throughout operations.

The counters used on the Anvik River sonar project divided each of the ensonified ranges into 16 sectors of equal length. Sector length was dependent on each transducer's total range of ensonification and was therefore 1/16 of the total range. In subsequent analyses of data, the range is divided into the 16 sectors with the numbers originating at the transducer face and continuing offshore toward the thalweg.

The sonar was installed approximately 150 m upstream from the field campsite. The right bank transducer was situated on a gradually sloping gravel bar on the inside of a slight bend in the river. The left bank transducer was located on the outside of the bend where the water level increased at a more rapid rate and the current was faster than at the site inside of the bend.

Historical run timing was used to plan the Anvik River sonar project start dates. In most years, some salmon pass the sonar site before and after the cessation of sonar operations. However, these numbers likely comprise only a small fraction of the total run. The criteria for terminating sonar sampling were daily chum salmon passage estimates of one percent or less of the season's total passage estimate for three out of four days.

Sonar Calibration and Sampling

Each sonar transceiver was calibrated at least four times daily by observing passing fish targets using an oscilloscope. In this and past studies using the Bendix system, the term calibrate refers to adjusting the pulse rate (also known as ping rate) of the transducer to account for variable fish

swimming speeds. Fish passing through the sonar beam produce a distinctive oscilloscope trace that resembles a tall, momentarily suspended spike. During each calibration period, the number of fish detected by an operator using an oscilloscope was compared to estimates automatically recorded by the sonar electronics. The fish velocity control setting, which controls the sonar counter's ping rate, was adjusted immediately after a calibration if the sonar: oscilloscope estimate ratio varied from 1.0 by 15% or more. If the ratio was greater than 1.15 or less than 0.85 the existing fish velocity setting was multiplied by the calculated ratio to obtain a new fish velocity control setting. If adjustments were made to the sonar unit, the change was documented in the calibration log, and an additional calibration was made to ensure the new sonar:oscilloscope estimate ratio was within the accepted limits and to initialize the counting period. Each initial calibration lasted for at least 15 minutes, until the observer estimated 100 fish had passed, or if the observer noticed immediately fish velocity settings were erroneous, whichever came first.

During daytime sonar calibration periods, operators also attempted to visually count passing fish from counting towers. This helped train personnel in oscilloscope monitoring and gave an estimate of the daily proportion of pink salmon since sonar counters do not distinguish between species of fish. This daily proportion of pink salmon was applied to the adjusted daily fish passage estimate to yield a daily estimate of pink salmon passage. No estimates were made for pink salmon in 2001 because of the small numbers encountered during the visual counting periods. Observers wore polarized sunglasses to reduce water surface glare. Glare, low light, wind ripples, rain, and turbid water conditions at times hampered tower observations. Aerial and carcass surveys were used to obtain a separate estimate for chinook salmon abundance. These estimates were not subtracted from the sonar fish estimate because chinook salmon abundance is low relative to the other salmon runs in the Anvik River.

Four daily calibration times were deemed adequate to monitor the diurnal-timing pattern of the salmon migration (Sandone 1996). Calibrations were normally conducted during 0600, 1200, 1800, and 2400 hours. Occasionally, calibration times deviated from prescribed times. Counting periods were defined by each calibration event. An adjustment factor, specific to each counting period and to each bank was calculated using the following formula:

$$A_{b,n} = \frac{OC_{b,n}}{SC_{b,n}}$$

Where A = periodic adjustment factor,
b = right or left bank,
n = counting period (0000-0600, 0600-1200, 1200-1800, or 1800-2400),
OC = oscilloscope counts, and
SC = sonar counts.

For each bank, adjusted passage estimates were calculated by multiplying each calibration period's adjustment factor by the unadjusted sonar estimates for each hour within the calibration period. Adjusted estimates were further corrected for missing data and corrected hourly estimates were entered into a spreadsheet program on a desktop computer. The resulting corrected sonar estimates for each hour within a day were summed, yielding the estimated fish passage for that day for that

bank. The daily passage of fish for the whole river was determined by summing the daily bank-specific estimates. Daily adjustment or correction factors for each bank and for both banks combined were calculated by dividing the daily-corrected estimates by the raw sonar estimates. Raw sector estimates for each day were corrected using the overall daily correction factor. Corrected hourly and sector estimates were used to describe the temporal and spatial distribution of the run.

If hourly sector estimates were lacking because of debris, printer malfunction, or weather-related disruptions of sonar operations, passage estimates were calculated by averaging sector estimates for the hour before and after the missing data. When hourly data were not recorded for three to 12 hours within one day, the daily estimate was calculated by dividing the corrected partial daily value by the mean proportion of corrected estimates of the corresponding hours for the first day before and after the day in question with complete data collection. When conditions forced a suspension of sonar sampling on only one bank for 12 hours or more, that bank's daily estimates were calculated from fish passage on the opposite bank in conjunction with a bank-specific passage proportion based on all days during the season with full counts from both banks. When sampling was suspended on both banks for an entire day, the daily total fish passage estimate was made using straight-line interpolation between the previous day's, and the following day's whole river corrected estimates. To recreate the spatial and temporal distribution of estimates made for time periods with no recorded data for more than two hours, the seasonal total fish estimate for each hour and sector of each bank was divided by the season adjusted total for that bank. The resulting proportions (one for every hour and sector) were multiplied by the interpolated daily estimate, resulting in an interpolated estimate of the spatial and temporal fish passage.

Age-Sex-Length Sampling

Temporal strata, used to characterize the age and sex composition of the chum salmon escapement, were defined as quartiles using the dates on which 25%, 50%, 75%, and 100% of the total run had passed the sonar site. These quartile-sampling strata were determined postseason based on 2001 run timing data. They represent an attempt to sample the escapement for age-sex-length (ASL) information in relative proportion to the total run. In 2001, these strata were: Pre-5 July, 6 July,-10 July, 11-15 July, and 16 July until the end of the season.

To meet region-wide standards for the sample size needed to describe a salmon population, the initial seasonal ASL sample goal was 608 chum salmon, with a minimum of 162 chum salmon samples collected during each temporal stratum (Bromaghin 1993). The sample size goals are based on accuracy (d) and precision (α) objectives of $d = 0.10$ and $\alpha = 0.05$, assuming two major age classes, and two minor age classes with a scale rejection rate of 15%. The beach seining goal for chinook salmon was to sample all fish captured while pursuing the chum salmon sampling goal.

A beach seine (31 m long, 66 meshes deep, 6.35-cm mesh) was drifted, beginning approximately 10 m downstream of the sonar site to capture chum and chinook salmon to collect ASL data (Figure 4). All resident fresh-water fish captured were tallied by species and released. Pink salmon were counted by sex, based on external characteristics, and released. Chum salmon were placed in a

holding pen and each was noted for sex, measured to the nearest 5 mm from mid-eye to fork-of-tail, and one scale was taken for age determination. Where possible, scales were removed from an area posterior to the base of the dorsal fin and above the lateral line on the left side of the fish (Clutter and Whitesel 1956). The adipose fin was clipped on each sampled chum salmon to prevent re-sampling. If any chinook salmon were caught, they were sampled using the same methods, except that three scale samples were taken from each fish. A separate project to characterize the age and sex composition of Anvik River chinook salmon involved collecting ASL samples from chinook salmon carcasses immediately after the sonar program terminated.

Climatological and Hydrologic Sampling

Climatological and hydrologic data were collected at approximately 1800 hours each day at the campsite. Relative river depth was monitored by staff gauge marked in 1 cm increments. Change in water depth was presented as negative or positive increments from the initial reading of 0.0 cm. Water temperature was measured in degrees Celsius (C) near shore at a depth of approximately 50 cm. Daily maximum and minimum air temperatures were recorded in degrees C. Subjective notes on wind speed and direction, cloud cover, and precipitation were recorded.

RESULTS

Sonar Assessment

Two sonar systems, one on each bank, were operated in 2001. These sites were the same sonar sites used in 2000 when the location was moved up river to avoid an island, which had formed in the middle of the river. The right bank transducer was deployed on a slight inside bend in the river, where a gravel bar slopes gently toward the thalweg. The left bank transducer was deployed from a more steeply sloping cut-bank on the outside of the same bend.

In 2001, right bank sonar system operations began on 26 June. The left bank sonar system became operational on 27 June. The water conditions varied through the season, which sometimes allowed excellent visual confirmation of sonar passage estimates and species apportionment and other times did not. The sonar systems on both banks operated through 28 July.

Escapement Estimates and Run Timing

The 2001 total fish passage estimate for the 32-day period from 26 June through 28 July was 224,058 fish (Table 1). This includes estimates for missing sector/hourly counts and expansions for left bank passage on 16-23 July and 28 July. No pink salmon were observed in 2001; therefore all counts were attributed to summer chum salmon. The median day of summer chum salmon passage, 10 July, was also the peak passage day when 22,636 summer chum salmon, 0.101 proportion of the estimated total escapement (Table 2), were estimated to have passed (Figure 5).

The summer chum salmon passage quartiles were two to four days later than the historical mean. The first quartile was four days later, the median day was two days later, and the third quartile was three days later than the historic mean (Table 3). The central half of the run passed between 6 July and 15 July (Table 3) and its duration, 9 days, was near the historic mean of 10.0 days. Daily passage estimates between the first and third quartile days ranged from 7,171 to 22,636 fish (Table 1). In the 9 days of the central half of the chum salmon run an estimated 122,628 fish passed the sonar sites. In the 2001 season, the only days that had passage estimates over 10,000 fish were located around the median day, 8 –15 July, and within these dates 59% of the season total passed. Relative to historic timing statistics based on 1979-1985 and 1987-1999 data, the early portion of the 2001 summer chum salmon run was late. However, because the large pulse of fish passed the sonar site July 9-12, the 2001 summer chum salmon run timing more closely resembled a normal run timing during the later part of the run (Figure 5).

From 26 June through 28 July 2001 a total of 37:11 h of sonar calibrations were conducted at the right bank site (Table 4). Right bank sonar:oscilloscope proportions averaged 1.18. A total of 2,679 chum, 42 chinook, and 3 pink salmon were visually counted from a tower in 15.38 h of visual monitoring on the right bank. On the left bank a total of 31:18 h of sonar calibrations were conducted. The left bank sonar:oscilloscope proportions averaged 0.95. A total of 181 chum and 4 chinook salmon were visually counted from the left bank tower in 3:13 of visual monitoring (Table 4).

In 2001, the pink salmon return was very weak. This was expected for pink salmon in odd years. The low numbers of returning pink salmon were not deducted from the sonar counts because visual observations indicated the pink salmon return was so weak that their numbers were negligible (Table 5). Only 3 pink salmon were observed in 68-1/2 hours of tower counting.

Buklis (1982) expanded the season escapement estimates for 1972 through 1978, making it possible to compare earlier visual estimates to more recent annual sonar estimates (Appendix Table A.). The 2001 chum salmon escapement estimate of 224,058 was 68.4% below the mean Anvik River escapement estimate of 709,762 fish, based on 1972-2000 data. The 2001 escapement failed to meet the lower range of the recently adopted Biological Escapement Goal (BEG) of 400,000 to 800,000 summer chum salmon, achieving only 56% of the lower range. Detailed passage estimate and proportions for each hour and each sector for the season can be found in Appendix Table B.

Spatial and Temporal Distribution

Buklis (1982) first reported a distinct diurnal salmon migration pattern during the 1981 season with a higher proportion of the migration passing the sonar site during the darker hours of the day (Table 6, Figure 6). Similar diurnal patterns were reported from 1985 through 1999. The temporal distribution of sonar estimates indicates a distinct diurnal pattern. Between the six hours of 2200 and 0400, 27.9% of the estimates were recorded.

Before 2001, in all but three years that sonar was used to estimate Anvik River chum salmon escapement, most of the escapement passage had been associated with the right bank. In the three

exceptional years only 43%, 45%, and 39% (1992, 1996, and 1997), respectively, of the total adjusted estimates were observed on the right bank (Sandone 1994a; Fair 1997; Chapell 2001). The shift to left bank was attributed to low water conditions that affected chum salmon migration patterns at the sonar site. The 2001 chum salmon migrations followed the dominant right bank orientation trend with 84.3% of estimated chum salmon passing on the right bank (Table 7 and Figure 7).

A fundamental assumption of the Anvik River Sonar project is that, because of the bank-oriented migration behavior of chum salmon, the two sonar systems based on opposite shores detect essentially all chum salmon passing the sonar site. In 2001, this assumption was supported by the lower relative passage estimates in the offshore sonar sectors (Table 7, Figure 7). During the 2001 season the sonar sectors in the near-shore half of the right bank counting range accumulated 94% of the annual right bank sonar estimates. On the left bank, the near-shore half of the sonar counting range accumulated 7% of the annual left bank sonar estimates (Table 7, Figure 7). The very low (7%) near-shore passage on the left bank in 2001 is most likely explained by the short counting range on the left bank, which is the "cut" bank. Because of continued high water throughout the season, the crew was never able to locate the transducer beyond the base of the cut bank, which would have allowed for a longer counting range. If the transducer had been placed at the base of the cut bank, the bulk of the salmon would have passed in the near shore sectors.

During the 2001 season, minor day-to-day changes of fish passage proportions between sector estimates were probably caused by changes in placement and aiming of the transducer in response to fluctuating water levels, rather than by changes caused by fish migratory patterns.

Age and Sex Composition

In 2001, beach seines were set on 13 individual days from 25 June to 20 July (Table 8). Of the 608 fish that were sampled, 538 could be aged (Table 9). The number of fish sampled sizes for the first through fourth passage strata were 188, 117, 147, and 156 chum salmon, consecutively. Of those fish sampled for ASL data in each stratum, 169, 106, 131, and 132 had scales, which could be aged. Of the 608 chum salmon sampled, 538 (88.5%) scales were aged, nearly equal to the 85% expected rate.

The four strata that had samples during the 2001 season were dominated by age-5 chum salmon, accounting for 93.5%, 91.5%, 69.5%, and 81.7% of the passage (Appendix Table C, Figure 8). The overall age composition of the escapement, using temporal strata determined by the closest sample dates and weighted by escapement estimates, was 0.2% age-3, 14.0% age-4, 83.9% age-5, and 2.0% age-6 (Appendix Table C). The predominant age classes of age-4 and age-5 salmon accounted for 97.9% of the four age classes observed in 2001. In comparison to historical mean values from 1972-2000, the age-4 proportion of the 2001 run was 43.5% lower and the age-5 proportion was 44.6% higher. These results would indicate a poor survival rate for age-4 fish during their life history. If age-4 fish had a normal survival rate, the 2001 escapement into the Anvik River may have been closer to 265,000 chum salmon.

The age and sex composition of the Anvik River chum salmon escapement passing the sonar site usually changes through the duration of the run. Usually the trend is an increasing proportion of younger salmon and a higher proportion of female salmon as the run progresses (Fair 1997). This trend was also observed in the 2001 run (Figure 9). When samples were temporally stratified and weighted by escapement estimates, females comprised of 52.7% in the first stratum, 52.8% in the second stratum, 66.4% in the third stratum and 53.4%. in the fourth stratum. Of the entire run, 55.3% were females.

Since 1979, females have dominated the escapement in 21 of the 23 years. The exceptions were 1995 and 1996 (Figure 9). Females have dominated the sex composition of age-4 Anvik River chum salmon in all years with the exception for 1995. The ratio of age-4 females:males averaged 1.6 in 1979-2000. The 2001 age-4 female to male ratio was 1.43, slightly lower than the historical average of 1.30. Age-5 female and male chum salmon have been more closely matched in numbers, with a 1979-2000 female to male ratio of 1 to 1. However, this was not the case in 2001 with an age-5 female to male ratio of 1.19. Chum salmon were also sampled for length. Table 9 compares mean length by age and sex.

Hydrologic and Climatological Conditions

The Anvik River water level dropped steadily until 15 July when it reached 101.6 cm below the start of the season on 21 June. The water level then rose 38.1 cm to 63.5 cm below the initial setting on 21 July. (Table 10, Figure 10). The water level continued to drop after 21 July to 114.3 cm below the initial setting by the season end on 28 July. The maximum daily water temperature was 15°C and the minimum daily water temperature 6°C. The maximum daily air temperature was 26°C and the minimum daily air temperature was 3°C (Table 10, Figure 10). Water temperatures primarily remained bounded by the maximum/minimum air temperatures throughout the season. The water temperature showed a steady increase from 21 June to 28 July while the water level showed a steady decrease with only temporary increases associated with rainfall.

DISCUSSION

The 2001 summer chum salmon run continued to exhibit the decline in productivity observed in recent years. Summer chum salmon abundance has been below average to poor since 1997, although parent-year escapements were very good from 1994 through 1996. With 83.9% of these fish being 5-year-olds, the indication is that the survival of the 1996 offspring was significantly better than the survival rate of the 1997 brood year. A low snow cover during the winter of 1995-96 may account for some of the decline in chum salmon abundance. However, changing climate and ocean conditions appear to have also impacted salmon survival.

In 2001, Yukon River run assessment projects, as well as the Anvik River sonar project provided early indications that the Yukon River summer chum salmon run was very weak. The 2001 Yukon River and Anvik River sonar projects' assessments of summer chum salmon runs agreed with the below average escapement estimates in the Andreafsky, Nulato, Gisasa, and Chena Rivers, and the

Clear, Caribou, Henshaw, and Kaltag Creeks (JTC 2001). There were no commercial openings in the Yukon Area in 2001. On July 7, all subsistence fishing gear was restricted to large mesh gillnets so that the harvests of summer chum salmon would be minimal. The preliminary summer chum salmon subsistence harvest for 2001 is 68,600 and test fish harvests of 930 for a total estimated harvest of 69,530 summer chum salmon. This is 80% below the recent 10-year average (1990-2000) average of 349,500.

The 2001 Anvik River chum salmon escapement was 68.4% below the 1979-2000 average escapement of 709,762 and 44.0% lower than the lower range of the Biological Escapement Goal of 400,000 summer chum salmon. The Anvik River 2001 summer chum salmon escapement was the second lowest on record, only 2000 being lower, since escapement monitoring began in 1979.

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Tables
and
Figures

Table 1. Anvik River summer chum salmon daily and cumulative counts by bank and total, 2001.

	Daily			Cumulative		
Date	Right Bank	Left Bank	Total	Right Bank	Left Bank	Total
21-Jun				0	0	0
22-Jun				0	0	0
23-Jun				0	0	0
24-Jun				0	0	0
25-Jun				0	0	0
26-Jun	577	94	671	577	94	671
27-Jun	382	62	445	959	156	1,115
28-Jun	818	133	951	1,777	289	2,066
29-Jun	1,814	295	2,109	3,591	584	4,175
30-Jun	5,339	869	6,208	8,930	1,453	10,383
1-Jul	3,149	512	3,661	12,079	1,965	14,045
2-Jul	3,157	514	3,671	15,237	2,479	17,716
3-Jul	10,754	1,750	12,503	25,991	4,229	30,219
4-Jul	8,685	1,413	10,098	34,675	5,642	40,317
5-Jul	7,895	1,285	9,180	42,571	6,926	49,497
6-Jul	7,542	1,227	8,769	50,113	8,153	58,266
7-Jul	6,017	1,155	7,171	56,130	9,308	65,438
8-Jul	10,836	2,492	13,328	66,965	11,800	78,766
9-Jul	9,433	2,302	11,735	76,398	14,102	90,500
10-Jul	21,030	1,606	22,636	97,429	15,708	113,137
11-Jul	12,303	598	12,901	109,731	16,307	126,038
12-Jul	9,810	1,431	11,241	119,541	17,738	137,279
13-Jul	9,924	1,827	11,751	129,465	19,564	149,029
14-Jul	10,441	1,369	11,810	139,906	20,934	160,839
15-Jul	9,719	1,567	11,286	149,624	22,501	172,125
16-Jul	6,125	1,648	7,773	155,749	24,149	179,898
17-Jul	6,179	1,765	7,944	161,928	25,914	187,842
18-Jul	3,822	1,371	5,193	165,750	27,285	193,035
19-Jul	4,388	1,785	6,173	170,138	29,070	199,208
20-Jul	5,435	1,381	6,816	175,574	30,451	206,024
21-Jul	3,211	1,235	4,446	178,785	31,686	210,471
22-Jul	3,058	1,014	4,072	181,843	32,700	214,543
23-Jul	1,763	501	2,264	183,606	33,201	216,807
24-Jul	1,349	642	1,992	184,955	33,843	218,798
25-Jul	1,473	723	2,197	186,429	34,566	220,995
26-Jul	1,218	279	1,496	187,646	34,845	222,491
27-Jul	578	147	725	188,224	34,991	223,216
28-Jul	725	118	843	188,949	35,109	224,058
Total	188,949	35,109	224,058			

Table 2. Anvik River summer chum salmon daily and cumulative proportions by bank and total, 2001. [a]

	Daily			Cumulative		
Date	Right Bank	Left Bank	Total	Right Bank	Left Bank	Total
21-Jun	0.000	0.000	0.000	0.000	0.000	0.000
22-Jun	0.000	0.000	0.000	0.000	0.000	0.000
23-Jun	0.000	0.000	0.000	0.000	0.000	0.000
24-Jun	0.000	0.000	0.000	0.000	0.000	0.000
25-Jun	0.000	0.000	0.000	0.000	0.000	0.000
26-Jun	0.003	0.000	0.003	0.003	0.000	0.003
27-Jun	0.002	0.000	0.002	0.004	0.001	0.005
28-Jun	0.004	0.001	0.004	0.008	0.001	0.009
29-Jun	0.008	0.001	0.009	0.016	0.003	0.019
30-Jun	0.024	0.004	0.028	0.040	0.006	0.046
1-Jul	0.014	0.002	0.016	0.054	0.009	0.063
2-Jul	0.014	0.002	0.016	0.068	0.011	0.079
3-Jul	0.048	0.008	0.056	0.116	0.019	0.135
4-Jul	0.039	0.006	0.045	0.155	0.025	0.180
5-Jul	0.035	0.006	0.041	0.190	0.031	0.221
6-Jul	0.034	0.005	0.039	0.224	0.036	0.260
7-Jul	0.027	0.005	0.032	0.251	0.042	0.292
8-Jul	0.048	0.011	0.059	0.299	0.053	0.352
9-Jul	0.042	0.010	0.052	0.341	0.063	0.404
10-Jul	0.094	0.007	0.101	0.435	0.070	0.505
11-Jul	0.055	0.003	0.058	0.490	0.073	0.563
12-Jul	0.044	0.006	0.050	0.534	0.079	0.613
13-Jul	0.044	0.008	0.052	0.578	0.087	0.665
14-Jul	0.047	0.006	0.053	0.624	0.093	0.718
15-Jul	0.043	0.007	0.050	0.668	0.100	0.768
16-Jul	0.027	0.007	0.035	0.695	0.108	0.803
17-Jul	0.028	0.008	0.035	0.723	0.116	0.838
18-Jul	0.017	0.006	0.023	0.740	0.122	0.862
19-Jul	0.020	0.008	0.028	0.759	0.130	0.889
20-Jul	0.024	0.006	0.030	0.784	0.136	0.920
21-Jul	0.014	0.006	0.020	0.798	0.141	0.939
22-Jul	0.014	0.005	0.018	0.812	0.146	0.958
23-Jul	0.008	0.002	0.010	0.819	0.148	0.968
24-Jul	0.006	0.003	0.009	0.825	0.151	0.977
25-Jul	0.007	0.003	0.010	0.832	0.154	0.986
26-Jul	0.005	0.001	0.007	0.837	0.156	0.993
27-Jul	0.003	0.001	0.003	0.840	0.156	0.996
28-Jul	0.003	0.001	0.004	0.843	0.157	1.000
Total	0.843	0.157	1.000			

[a] Second and third quartiles in box. Mean quartile in bold outlined box.

Table 3. Annual Anvik River sonar passage estimates and associated passage timing statistics for the summer chum salmon runs, 1979-2001. [a]

Year	Sonar Passage Estimate [b]	Day of First Salmon Counts	First Quartile Day	Median Day	Third Quartile Day	First Count & First Quartile	Days Between Quartiles: First & Median	Median & Third	First & Third
1979	277,712	23-Jun	2-Jul	8-Jul	12-Jul	9	6	4	10
1980	482,181	28-Jun	6-Jul	11-Jul	16-Jul	8	5	5	10
1981	1,479,582	20-Jun	27-Jun	2-Jul	7-Jul	7	5	5	10
1982	444,581	25-Jun	7-Jul	11-Jul	14-Jul	12	4	3	7
1983	362,912	21-Jun	30-Jun	7-Jul	12-Jul	9	7	5	12
1984	891,028	22-Jun	5-Jul	9-Jul	13-Jul	13	4	4	8
1985	1,080,243	5-Jul	10-Jul	13-Jul	16-Jul	5	3	3	6
1986	1,085,750	21-Jun	29-Jun	2-Jul	6-Jul	8	3	4	7
1987	455,876	21-Jun	5-Jul	12-Jul	16-Jul	14	7	4	11
1988	1,125,449	21-Jun	30-Jun	3-Jul	9-Jul	9	3	6	9
1989	636,906	20-Jun	1-Jul	7-Jul	13-Jul	11	6	6	12
1990	403,627	22-Jun	2-Jul	7-Jul	15-Jul	10	5	8	13
1991	847,772	21-Jun	1-Jul	10-Jul	16-Jul	10	9	6	15
1992	775,626	29-Jun	5-Jul	8-Jul	12-Jul	6	3	4	7
1993	517,409	19-Jun	5-Jul	12-Jul	18-Jul	16	7	6	13
1994	1,124,689	19-Jun	1-Jul	7-Jul	11-Jul	12	6	4	10
1995	1,339,418	19-Jun	1-Jul	6-Jul	11-Jul	12	5	5	10
1996	933,240	18-Jun	25-Jun	1-Jul	6-Jul	7	6	5	11
1997	605,752	19-Jun	28-Jun	3-Jul	10-Jul	9	5	7	12
1998	487,301	22-Jun	5-Jul	10-Jul	14-Jul	13	5	4	9
1999	437,356	27-Jun	6-Jul	10-Jul	16-Jul	9	4	6	10
2000	196,349	21-Jun	8-Jul	11-Jul	13-Jul	17	3	2	5
2001	224,058	26-Jun	6-Jul	10-Jul	15-Jul	10	4	5	9
Mean [c]	709,762	22-Jun	2-Jul	8-Jul	12-Jul	10.4	5.1	4.9	10.0
Median [c]	621,329	21-Jun	2-Jul	8-Jul	13-Jul	10.0	5.0	5.0	10.0
SE	360,913		3.8	3.5	3.1	3.1	1.6	1.4	2.5

[a] The mean and standard error of the timing statistics includes estimates from years 1979-1985 and 1987-1999. In 1986, sonar counting operations were terminated early, probably resulting in the incorrect calculation of the quartile statistics. Therefore, the 1986 run timing statistics were excluded from the calculation of the overall mean and timing statistic and associated SE.

[b] Includes 1986 passage data.

[c] Does not include data from 2001 so that the current year can be compared to the historical averages.

Table 4. Daily summary of sonar calibrations and visual salmon counts from towers, Anvik River, 2001.

	Right Bank								Left Bank							
	Sonar Calibrations				Visual Counts				Sonar Calibrations				Visual Counts			
	Elapsed				Elapsed	Net Upstream			Elapsed				Elapsed	Net Upstream		
	Time [a]	Sonar	Scope	Sonar/	Time a	Salmon Passage			Time	Sonar	Scope	Sonar/	Time [a]	Salmon Passage		
Date	(hrs:min)	Count	Count	Scope	(hrs:min)	Chum	Chinook	Pink	(hrs:min)	Count	Count	Scope	(hrs:min)	Chum	Chinook	Pink
21-Jun																
22-Jun																
23-Jun																
24-Jun																
25-Jun																
26-Jun	1:00	44	17	2.59	0:00				0:00	0	0		0:00			
27-Jun	1:00	46	25	1.84	0:15				0:15	0	0		0:00			
28-Jun	1:00	123	102	1.21	0:30	1			1:00	7	7	1.00	0:00			
29-Jun	1:00	361	315	1.15	0:30	53			1:00	8	12	0.67	0:00			
30-Jun	1:10	356	399	0.89	0:30	35			1:00	6	8	0.75	0:00			
1-Jul	1:15	304	294	1.03	0:30	37			1:00	7	9	0.78	0:00			
2-Jul	1:05	714	316	2.26	1:00	141			1:00	7	9	0.78	0:00			
3-Jul	1:00	697	540	1.29	0:10	20			1:00	6	12	0.50	0:00			
4-Jul	1:00	691	723	0.96	0:00	0			1:00	10	10	1.00	0:10			
5-Jul	1:00	492	492	1.00	0:05	20			1:00	8	10	0.80	0:00			
6-Jul	1:25	566	512	1.11	0:20	82			0:45	20	25	0.80	0:00			
7-Jul	1:00	555	577	0.96	0:43	134	-1		1:00	80	70	1.14	0:00			
8-Jul	0:58	767	734	1.04	0:28	301	2		1:25	152	168	0.90	0:25	79		
9-Jul	0:50	647	706	0.92	0:36	257	6		1:10	121	91	1.33	0:42	80	1	
10-Jul	0:54	739	735	1.01	0:19	259	9		1:15	23	37	0.62	0:30	7	1	
11-Jul	0:56	439	473	0.93	0:30	116	2		1:00	71	58	1.22	0:15	1		
12-Jul	1:02	596	554	1.08	0:49	233	2		1:00	91	98	0.93	0:00			
13-Jul	1:53	591	558	1.06	0:30	189	5		0:55	72	83	0.87	0:00			
14-Jul	0:59	572	572	1.00	0:37	209	4		1:00	93	100	0.93	0:20	16		
15-Jul	1:09	686	557	1.23	0:30	112	2		1:00	399	115	3.47	0:00			
16-Jul	1:27	543	476	1.14	0:47	133	2		1:00	91	97	0.94	0:00			
17-Jul	1:10	374	331	1.13	0:32	41			1:00	76	80	0.95	0:00			
18-Jul	1:30	309	319	0.97	0:40	62	1		1:00	70	77	0.91	0:05		1	
19-Jul	1:30	316	302	1.05	0:40	143	2		1:00	102	126	0.81	0:00			
20-Jul	1:00	342	366	0.93	0:00	0			1:02	118	109	1.08	0:00			
21-Jul	1:21	264	233	1.13	0:00	0			1:00	62	88	0.70	0:00			
22-Jul	1:23	242	181	1.34	0:43	38	2		1:06	45	54	0.83	0:06	1	1	
23-Jul	1:05	169	107	1.58	0:09	8			1:00	30	33	0.91	0:00			
24-Jul	1:05	84	92	0.91	0:20	17	1	1	1:00	9	19	0.47	0:15	-2		
25-Jul	0:45	83	92	0.90	0:50	9		1	0:40	15	24	0.63	0:10			
26-Jul	1:29	108	116	0.93	0:45	11	1		1:00	10	11	0.91	0:00			
27-Jul	1:00	80	67	1.19	0:45	11		1	1:00	12	13	0.92	0:15	-1		
28-Jul	0:50	93	69	1.35	0:35	7	2		0:45	4	4	1.00	0:00			
Total	37:11	12,993	11,952		15:38	2,679	42	3	31:18	1,825	1,657		3:13	181	4	0
Mean	1:07			1.18	0:28				0:58			0.95				

a Most visual tower counts were concurrent with sonar calibrations.

Table 5. Anvik River raw sonar estimates, calibration adjustment factors, chum and pink salmon passage estimates by bank and day, 2001.

	Right Bank					Left Bank					Combined Banks					
	Raw		Corrected	Counts Attributed to		Raw		Corrected	Counts Attributed to		Raw	Corrected	Counts Attributed to			
	Daily	Adjust	Daily	Chum	Pink	Daily	Adjust	Daily	Chum	Pink	Daily	Daily	Chum Salmon		Pink Salmon	
Date	Estimate	Factor	Estimate	Salmon	Salmon	Estimate	Factor	Estimate	Salmon	Salmon	Estimate	Estimate	Daily	Cumulative	Daily	Cumulative
21-Jun [a]																
22-Jun																
23-Jun																
24-Jun																
25-Jun																
26-Jun	1,351	0.43	577	577	0	0	0.00	94	94	0	1,351	671	671	671	0	0
27-Jun	655	0.58	382	382	0	133	0.47	62	62	0	788	445	445	1,115	0	0
28-Jun	970	0.84	818	818	0	29	4.59	133	133	0	999	951	951	2,066	0	0
29-Jun	2,002	0.91	1,814	1,814	0	301	0.98	295	295	0	2,303	2,109	2,109	4,175	0	0
30-Jun	4,665	1.14	5,339	5,339	0	60	14.48	869	869	0	4,725	6,208	6,208	10,383	0	0
1-Jul	3,187	0.99	3,149	3,149	0	50	10.25	512	512	0	3,237	3,661	3,661	14,045	0	0
2-Jul	4,296	0.73	3,157	3,157	0	83	6.19	514	514	0	4,379	3,671	3,671	17,716	0	0
3-Jul	14,188	0.76	10,754	10,754	0	267	6.55	1,750	1,750	0	14,455	12,503	12,503	30,219	0	0
4-Jul	8,311	1.04	8,685	8,685	0	159	8.89	1,413	1,413	0	8,470	10,098	10,098	40,317	0	0
5-Jul	7,926	1.00	7,895	7,895	0	71	18.09	1,285	1,285	0	7,997	9,180	9,180	49,497	0	0
6-Jul	8,282	0.91	7,542	7,542	0	280	4.38	1,227	1,227	0	8,562	8,769	8,769	58,266	0	0
7-Jul	5,758	1.04	6,017	6,017	0	990	1.17	1,155	1,155	0	6,748	7,171	7,171	65,438	0	0
8-Jul	11,325	0.96	10,836	10,836	0	2,210	1.13	2,492	2,492	0	13,535	13,328	13,328	78,766	0	0
9-Jul	9,862	0.96	9,433	9,433	0	3,000	0.77	2,302	2,302	0	12,862	11,735	11,735	90,500	0	0
10-Jul	21,413	0.98	21,030	21,030	0	929	1.73	1,606	1,606	0	22,342	22,636	22,636	113,137	0	0
11-Jul	9,801	1.26	12,303	12,303	0	655	0.91	598	598	0	10,456	12,901	12,901	126,038	0	0
12-Jul	10,463	0.94	9,810	9,810	0	1,260	1.14	1,431	1,431	0	11,723	11,241	11,241	137,279	0	0
13-Jul	10,489	0.95	9,924	9,924	0	1,589	1.15	1,827	1,827	0	12,078	11,751	11,751	149,029	0	0
14-Jul	11,708	0.89	10,441	10,441	0	1,222	1.12	1,369	1,369	0	12,930	11,810	11,810	160,839	0	0
15-Jul	11,790	0.82	9,719	9,719	0	2,482	0.63	1,567	1,567	0	14,272	11,286	11,286	172,125	0	0
16-Jul	6,823	0.90	6,125	6,125	0	1,616	1.02	1,648	1,648	0	8,439	7,773	7,773	179,898	0	0
17-Jul	6,900	0.90	6,179	6,179	0	1,664	1.06	1,765	1,765	0	8,564	7,944	7,944	187,842	0	0
18-Jul	3,725	1.03	3,822	3,822	0	1,271	1.08	1,371	1,371	0	4,996	5,193	5,193	193,035	0	0
19-Jul	4,450	0.99	4,388	4,388	0	1,435	1.24	1,785	1,785	0	5,885	6,173	6,173	199,208	0	0
20-Jul	5,304	1.02	5,435	5,435	0	1,464	0.94	1,381	1,381	0	6,768	6,816	6,816	206,024	0	0
21-Jul	3,562	0.90	3,211	3,211	0	830	1.49	1,235	1,235	0	4,392	4,446	4,446	210,471	0	0
22-Jul	3,562	0.86	3,058	3,058	0	830	1.22	1,014	1,014	0	4,392	4,072	4,072	214,543	0	0
23-Jul	1,882	0.94	1,763	1,763	0	400	1.25	501	501	0	2,282	2,264	2,264	216,807	0	0
24-Jul	1,216	1.11	1,349	1,349	0	261	2.46	642	642	0	1,477	1,992	1,992	218,798	0	0
25-Jul	1,365	1.08	1,473	1,473	0	331	2.19	723	723	0	1,696	2,197	2,197	220,995	0	0
26-Jul	1,050	1.16	1,218	1,218	0	252	1.11	279	279	0	1,302	1,496	1,496	222,491	0	0
27-Jul	655	0.88	578	578	0	133	1.10	147	147	0	788	725	725	223,216	0	0
28-Jul [b]	1,210	0.60	725	725	0	28 [b]		118	118	0	1,238	843	843	224,058	0	0
Total	200,146		188,949	188,949	0	26,285		35,109	35,109	0	226,431	224,058	224,058		0	
Percent	88.4%		84.3%	84.3%	0.0%	11.6%		15.7%	15.7%	0.0%					0.0%	
Mean		0.92					3.15									

[a] Counting began at 00:00.

[b] Counting ended at 24:00.

Table 6. Anvik River summer chum salmon estimated passage and proportions by hour and bank, 2001.

Hour	Right Bank		Left Bank		Proportion of the Run		
Ending	Count	Cum.	Count	Cum.	Right Bank	Left Bank	Total
0100	8,794	8,794	1,898	1,898	0.039	0.008	0.048
0200	8,862	17,657	1,600	3,497	0.040	0.007	0.047
0300	8,585	26,241	1,546	5,044	0.038	0.007	0.045
0400	8,199	34,440	1,708	6,752	0.037	0.008	0.044
0500	8,314	42,754	1,737	8,489	0.037	0.008	0.045
0600	8,023	50,777	1,523	10,012	0.036	0.007	0.043
0700	8,586	59,363	1,708	11,721	0.038	0.008	0.046
0800	8,827	68,191	1,282	13,003	0.039	0.006	0.045
0900	8,176	76,367	1,181	14,184	0.036	0.005	0.042
1000	8,557	84,924	1,228	15,412	0.038	0.005	0.044
1100	8,456	93,381	1,080	16,492	0.038	0.005	0.043
1200	7,991	101,372	1,062	17,554	0.036	0.005	0.040
1300	7,567	108,939	976	18,530	0.034	0.004	0.038
1400	6,990	115,929	1,038	19,568	0.031	0.005	0.036
1500	6,860	122,789	1,046	20,614	0.031	0.005	0.035
1600	6,740	129,529	1,271	21,886	0.030	0.006	0.036
1700	7,038	136,567	1,185	23,071	0.031	0.005	0.037
1800	7,233	143,800	1,334	24,405	0.032	0.006	0.038
1900	6,742	150,542	1,581	25,986	0.030	0.007	0.037
2000	6,780	157,322	1,690	27,676	0.030	0.008	0.038
2100	7,061	164,383	1,711	29,387	0.032	0.008	0.039
2200	6,971	171,354	1,902	31,289	0.031	0.008	0.040
2300	8,639	179,992	1,836	33,125	0.039	0.008	0.047
2400	8,957	188,949	1,985	35,109	0.040	0.009	0.049
Totals		188,949		35,109	0.843	0.157	1.000

Table 7. Anvik River summer chum salmon estimated counts and proportions by sector and bank, 2001.

	Right Bank		Left Bank		Proportion of the Run		
Sector [a]	Count	Cum.	Count	Cum.	Right Bank	Left Bank	Cum.
1	5,261	5,261	51	51	0.000	0.023	0.000
2	32,078	37,339	292	343	0.001	0.143	0.001
3	54,736	92,074	248	591	0.001	0.244	0.001
4	44,730	136,805	266	857	0.001	0.200	0.001
5	18,187	154,992	241	1,098	0.001	0.081	0.001
6	11,648	166,640	235	1,333	0.001	0.052	0.001
7	6,308	172,948	339	1,672	0.002	0.028	0.002
8	4,180	177,128	904	2,576	0.004	0.019	0.004
9	3,238	180,366	1,784	4,360	0.008	0.014	0.008
10	3,487	183,853	3,483	7,842	0.016	0.016	0.016
11	1,584	185,437	3,880	11,722	0.017	0.007	0.017
12	1,135	186,572	5,698	17,420	0.025	0.005	0.025
13	904	187,476	5,294	22,714	0.024	0.004	0.024
14	488	187,963	4,405	27,120	0.020	0.002	0.020
15	499	188,463	3,889	31,008	0.017	0.002	0.017
16	486	188,949	4,101	35,109	0.018	0.002	0.018
Total	188,949		35,109		0.157	0.843	0.157

[a] Sector counts begin at the transducer.

Table 8. Anvik River beach seine catch by species, sex, day, and stratum, and the number of chum salmon sampled for age, sex, and length information, 2001.

	Chum Salmon									Other Fish					
	Number Captured			Number Sampled			Number Aged			Salmon					
Date	Male	Female	Total	Male	Female	Total	Male	Female	Total	Pink	Chinook	Grayling	Whitefish	Dolly Varden	Other
25-Jun	0	0	0	0	0	0	0	0	0	0	0	2	9	0	
28-Jun	6	7	13	7	6	13	7	4	11			1	32		
29-Jun	62	51	113	62	51	113	52	48	100				3		2 Char
30-Jun	15	16	31	14	17	31	12	15	27						
5-Jul	21	15	36	18	13	31	18	13	31		1		1		
Subtotal (Strata 1)	104	89	193	101	87	188	89	80	169	0	0	3	44	0	
6-Jul	32	25	57	30	27	57	29	25	54						
7-Jul	9	21	30	11	19	30	11	13	24		1				
8-Jul	25	54	79	10	20	30	10	18	28					1	
Subtotal (Strata 2)	66	100	166	51	66	117	50	56	106	0	2	3	45	1	
12-Jul	30	73	103	30	72	102	28	63	91				1		
12-Jul	17	28	45	17	28	45	16	24	40		2				
Subtotal (Strata 3)	47	101	148	47	100	147	44	87	131	0	4	3	46	2	
18-Jul	39	28	67	35	25	60	29	21	50						
19-Jul	30	42	72	27	38	65	22	32	54						
20-Jul	13	21	34	12	19	31	10	18	28						
Subtotal (Strata 4) [a]	82	91	173	74	82	156	61	71	132	0	0	0	0	0	
Season Total	299	381	680	273	335	608	244	294	538	0	6	9	135	3	

[a] The beach seine data form was lost for the last strata. The estimated number of fish caught in beach seines was calculated using the previous three strata sample to captured ratio.

Table 9. Anvik River summer chum salmon escapement age and sex composition, and mean length (mm), 2001.

		Brood Year and Age Group				
		1998	1997	1996	1995	
		0.2	0.3	0.4	0.5	Total
Sample Size:	518					
Female	No. in Escapement	0	18,552	103,632	1,794	123,978
	Percent of Sample	0.0	8.3	46.3	0.8	55.3
	Mean Length	0.0	545.0	572.0	583.0	
	Std. Error	0.0	4.0	2.0	13.0	
Male	No. in Escapement	396	12,791	84,275	2,619	100,081
	Percent of Sample	0.2	5.7	37.6	1.2	44.7
	Mean Length	490.0	564.0	603.0	614.0	
	Std. Error	0.0	5.0	2.0	16.0	
Total	No. in Escapement	396	31,342	187,907	4,412	224,058
	Percent of Sample	0.2	14.0	83.9	2.0	100.0

Table 10. Anvik River climatological and hydrological observaitions at the sonar site, 2001.

					Temperature (C)			Water Height			
Date	Precipitation	Wind Direction	Velocity	Sky Code	Air Min.	Air Max.	Water Temp.	Actual (cm)	Relative (cm)	Water Color	Comments
21-Jun	O	Calm	0	1	5	24	6	152.4	0.0	BR	Water gage set at 20 inches.
22-Jun	O	North	5-10	1	5	25	7	139.7	-12.7	BR	
23-Jun	O	Calm	0	2	5	26	7	132.1	-20.3	BR	
24-Jun	O	Calm	0	3	6	25	7	127.0	-25.4	BR	
25-Jun	O	Calm	0	2	7	21	8	114.3	-38.1	LT	
26-Jun	O	Calm	0	4	7	10	8	102.9	-49.5	LT	Reset water gage from 4 to 20
27-Jun	O	Calm	0	2	7	10	8	91.4	-61.0	LT	
28-Jun	O	Variable	0-5	5	4	15	9	88.9	-63.5	LT	
29-Jun	T	Calm	0	4	6	18	9	81.3	-71.1	LT	
30-Jun	I	Calm	0	4	6	21	10	76.2	-76.2	LT	
1-Jul	I	Calm	0	4	8	15	9	78.7	-73.7	BR	
2-Jul	O	Calm	0	3	10	13	9	73.7	-78.7	LT	
3-Jul	I	North	5	4	8	16	10	69.9	-82.6	BR	
4-Jul	O	Calm	0	4	6	15	10	92.7	-59.7	BR	Water level crested at 14.5
5-Jul	O	Calm	0	3	5	14	9	88.9	-63.5	BR	
6-Jul	O	Calm	0	2	3	13	9	76.2	-76.2	LT	
7-Jul	O	Calm	0	2	5	16	10	64.8	-87.6	LT	Reset water gage from 1 to 25
8-Jul	O	Calm	0	1	3	21	12	58.4	-94.0	LT	
9-Jul	I	Calm	0	3	7	21	14	53.3	-99.1	LT	
10-Jul	R	North	5	4	7	20	11	53.3	-99.1	LT	
11-Jul	R	North	5	4	8	21	10	55.9	-96.5	LT	
12-Jul	O	Calm	0	3	10	18	11	57.2	-95.3	BR	
13-Jul	O	North	0-5	3	10	18	12	55.9	-96.5	BR	
14-Jul	O	North	10	3	6	20	12	53.3	-99.1	LT	
15-Jul	I	North	10	4	11	13	12	50.8	-101.6	LT	
16-Jul	O	North	15	4	11	12	12	53.3	-99.1	LT	
17-Jul	O	North	15	3	9	12	11	63.5	-88.9	LT	
18-Jul	I	SE	10-15	3	3	18	12	54.6	-97.8	LT	
19-Jul	I	SE	5	3	12	17	14	53.3	-99.1	LT	
20-Jul	O	Calm	0	4	14	18	13	77.5	-74.9	BR	
21-Jul	O	Calm	0	4	14	18	13	88.9	-63.5	DK	Reset water gage from 35 to 15
22-Jul	O	Variable	5-10	2	14	21	14	80.0	-72.4	LT	
23-Jul	O	Variable	5-10	4	10	18	15	71.1	-81.3	LT	
24-Jul	O	Calm	0	2	8	18	15	61.0	-91.4	CL	
25-Jul	O	Calm	0	3	10	15	13	55.9	-96.5	CL	
26-Jul	I	Calm	0	4	8	13	12	48.3	-104.1	CL	Reset water gage from 0 to 20
27-Jul	O	Calm	0	3	9	14	13	43.2	-109.2	CL	
28-Jul	O	Calm	0	1	10	20	14	38.1	-114.3	CL	

Weather Codes

SKY		PRECIPITATION		WATER COLOR	
0	No observation made.	I	Intermittent rain	Cl	Clear
1	Clear sky, cloud cover < 10% of sky.	R	Continuous rain	Lt	Light Brown
2	Cloud cover 10% - 50% of sky.	S	Snow	Br	Brown
3	Cloud cover > 50% of sky.	S&R	Mixed snow and rain	Dk	Dark Brown
4	Completely overcast.	H	Hail	Tr	Turbid: murky or glacial
5	Fog or thick haze or smoke.	T	Thunder showers		

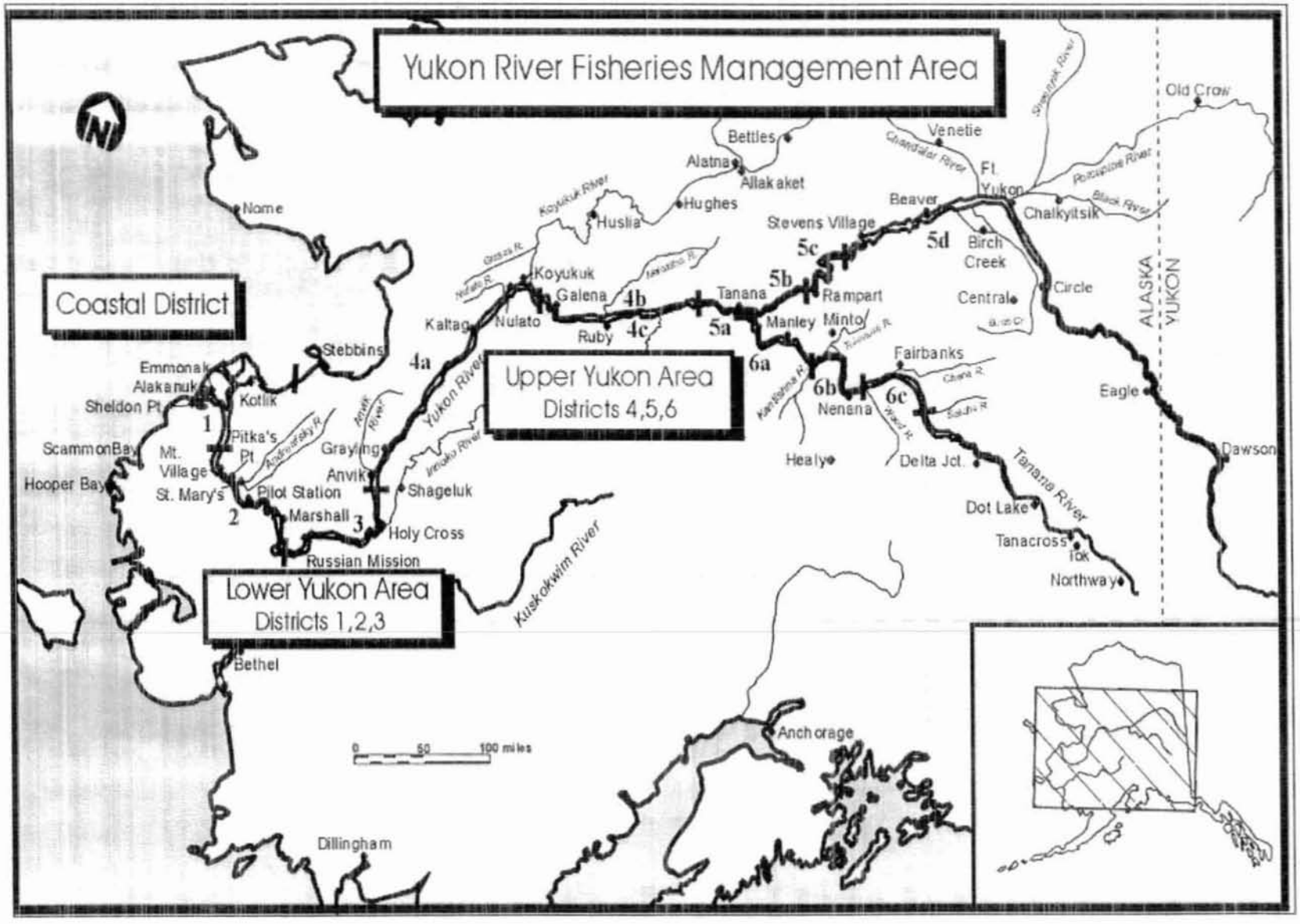


Figure 1. Alaska portion of the Yukon River drainage showing communities and fishing districts.

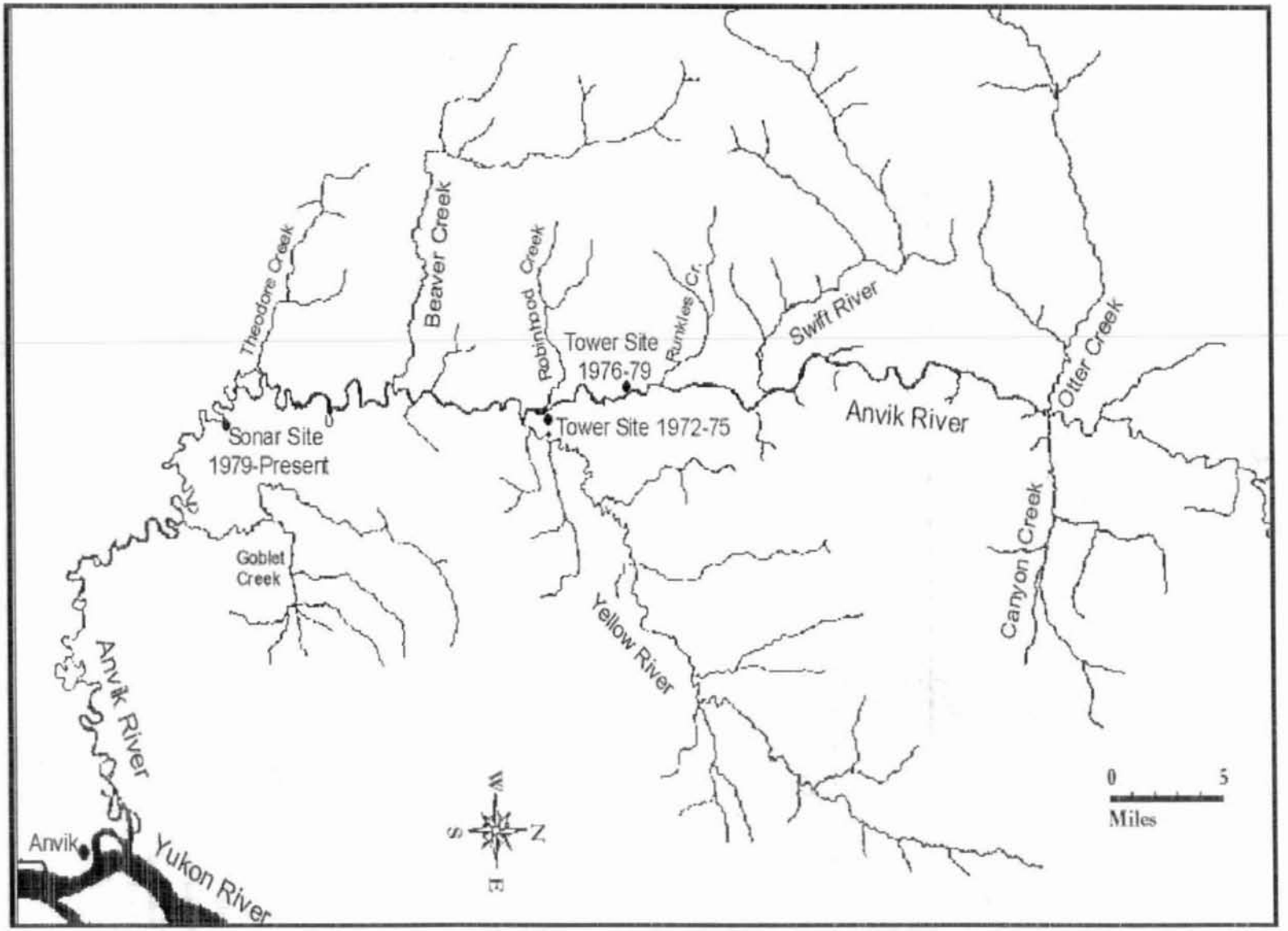


Figure 2. Map of the Anvik River drainage with historical chum salmon escapement project locations.

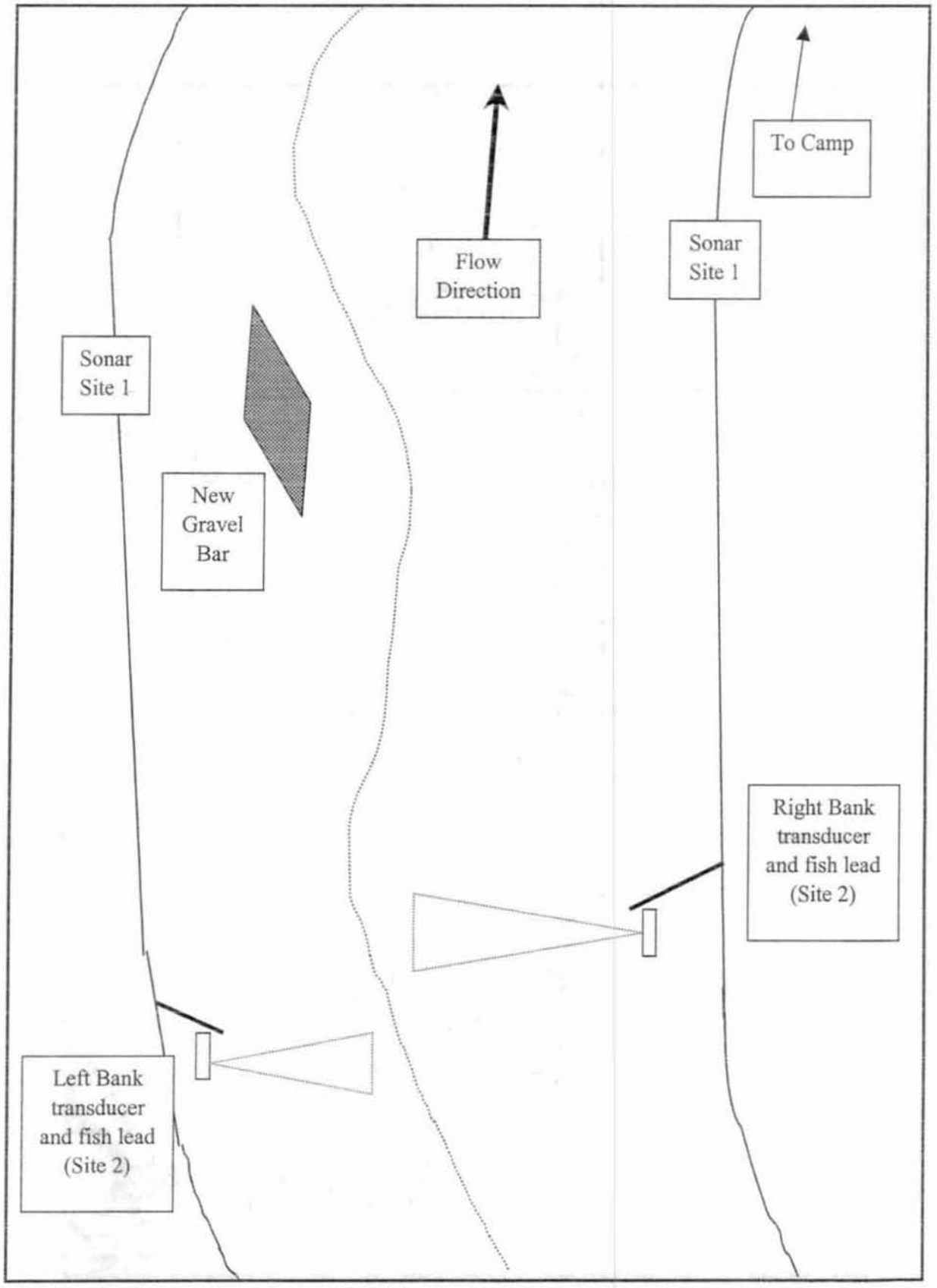


Figure 3. Anvik River summer chum salmon sonar site area, 2001.

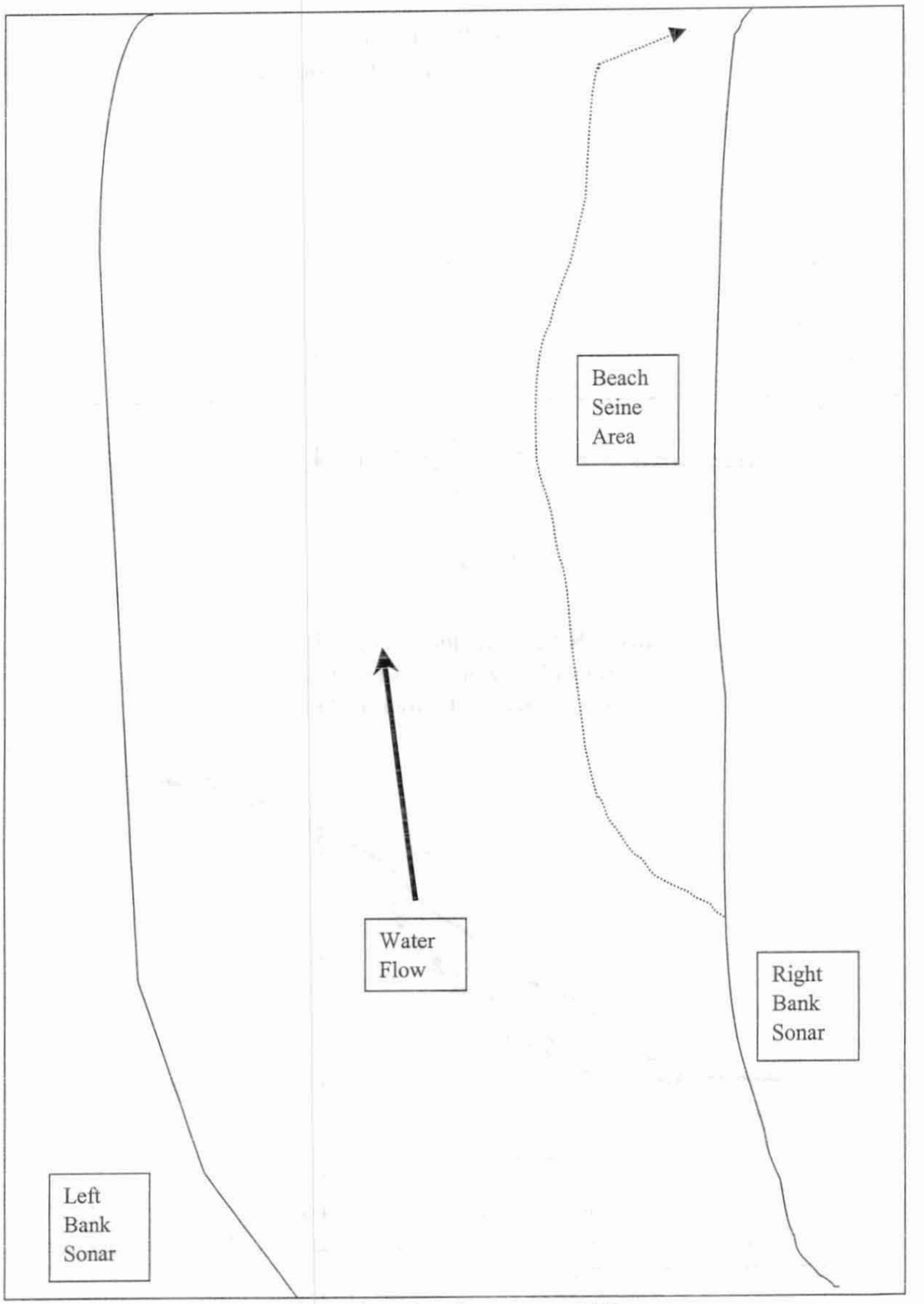
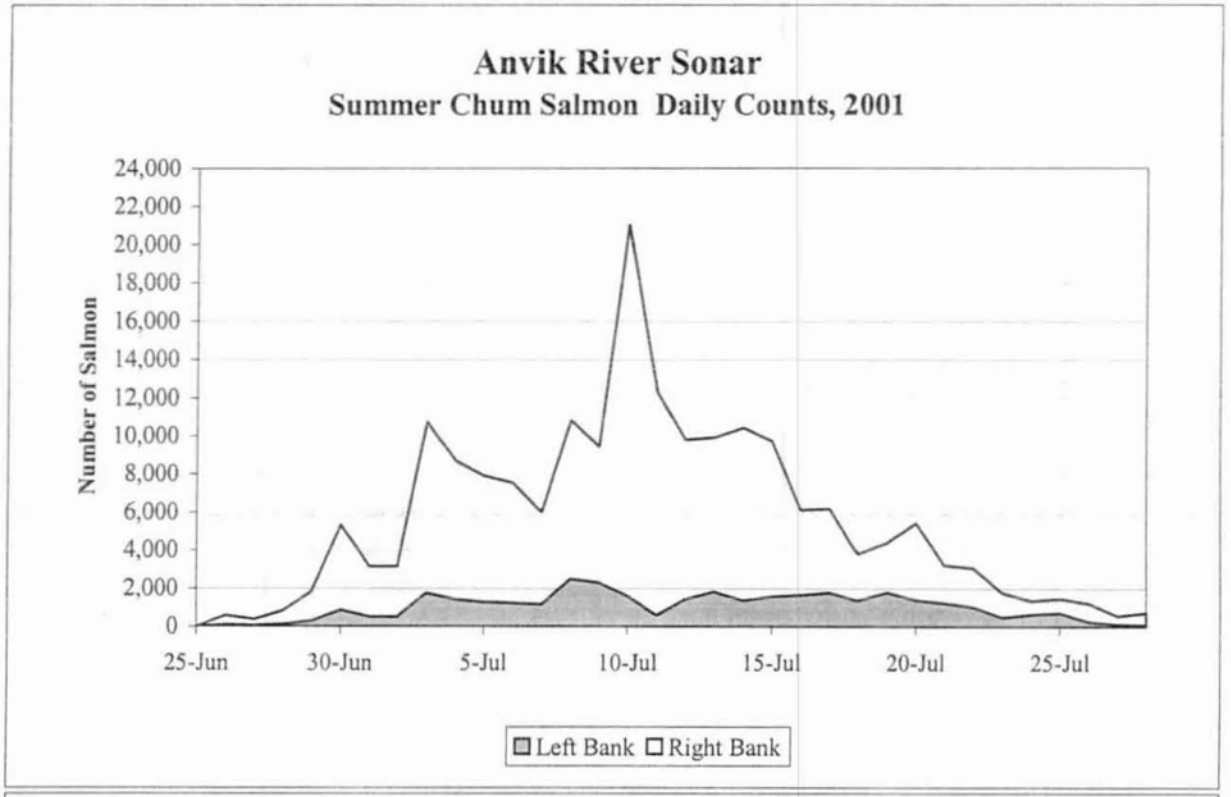


Figure 4. Anvik River summer chum salmon beach seine area, 2001.



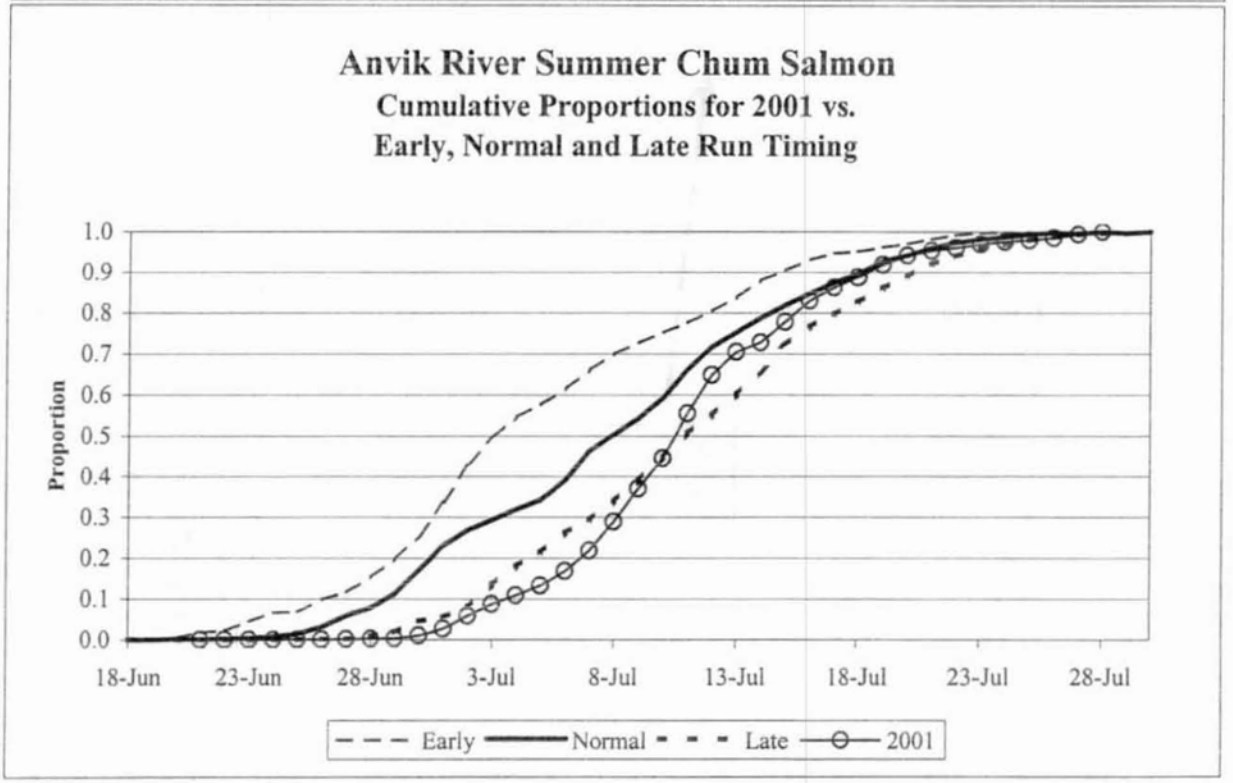


Figure 5. Anvik River summer chum salmon estimated daily escapement by bank and the 2001 cumulative escapement proportions compared to Early, Normal and Late run timing based on historical run timing.

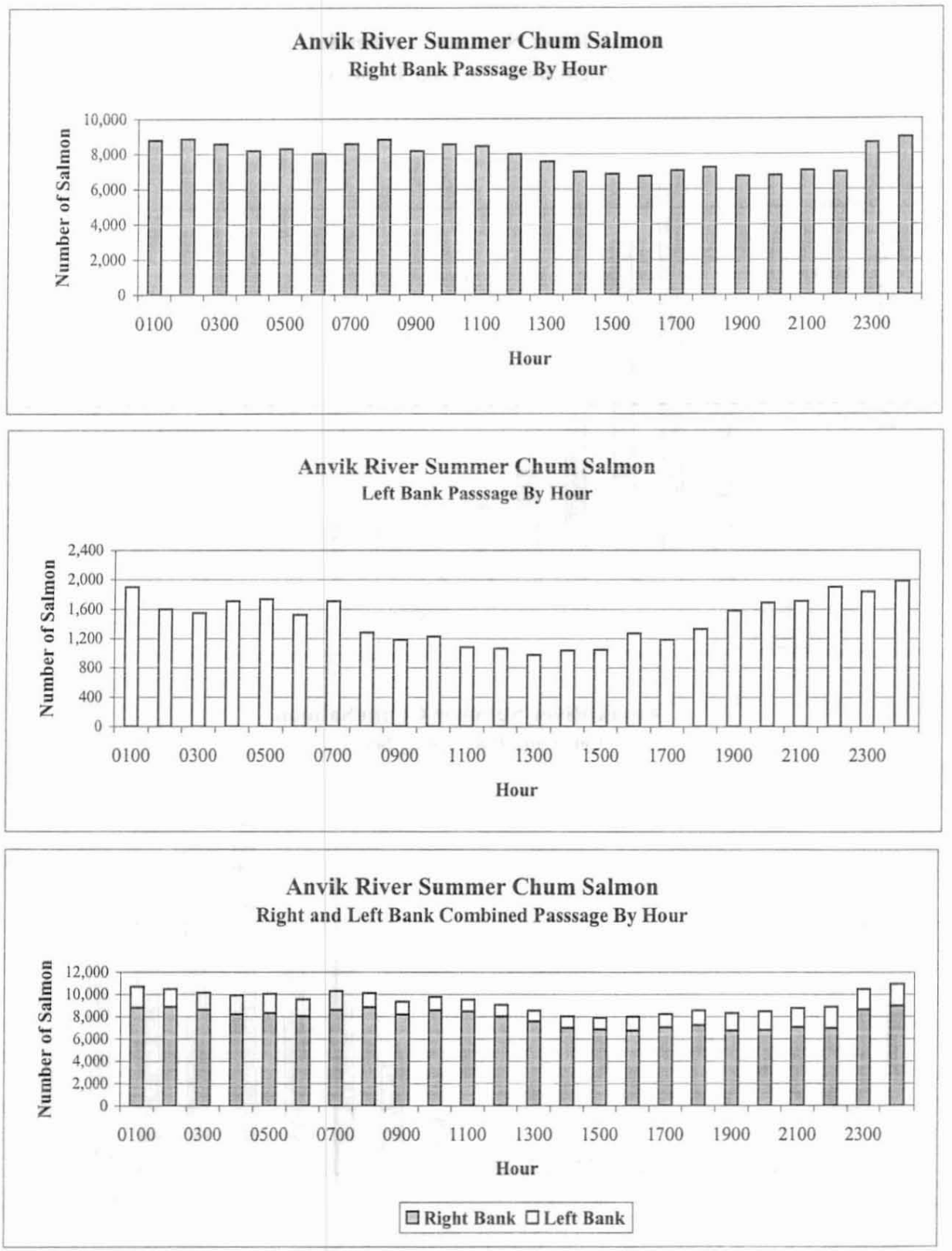
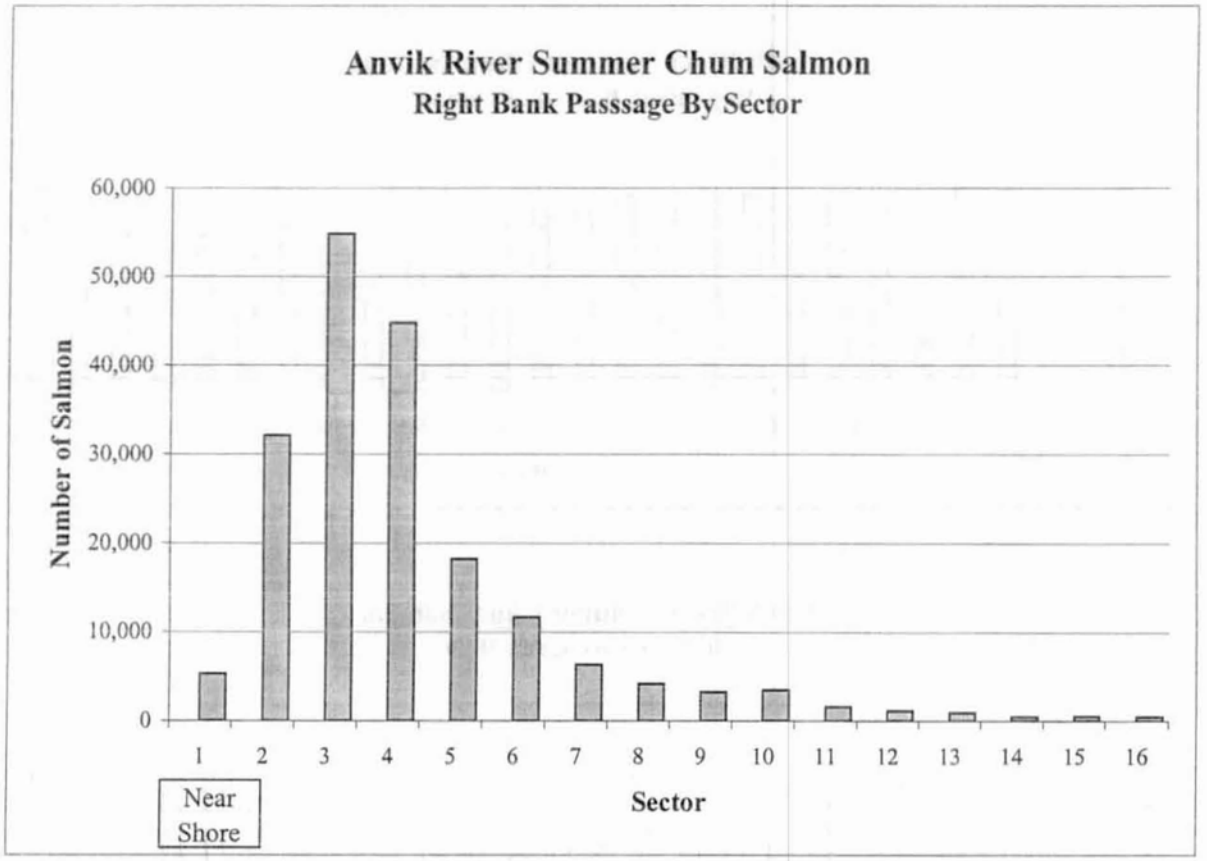


Figure 6. Anvik River summer chum salmon estimated passage by hour for left bank, right bank and both banks combined, 2001.



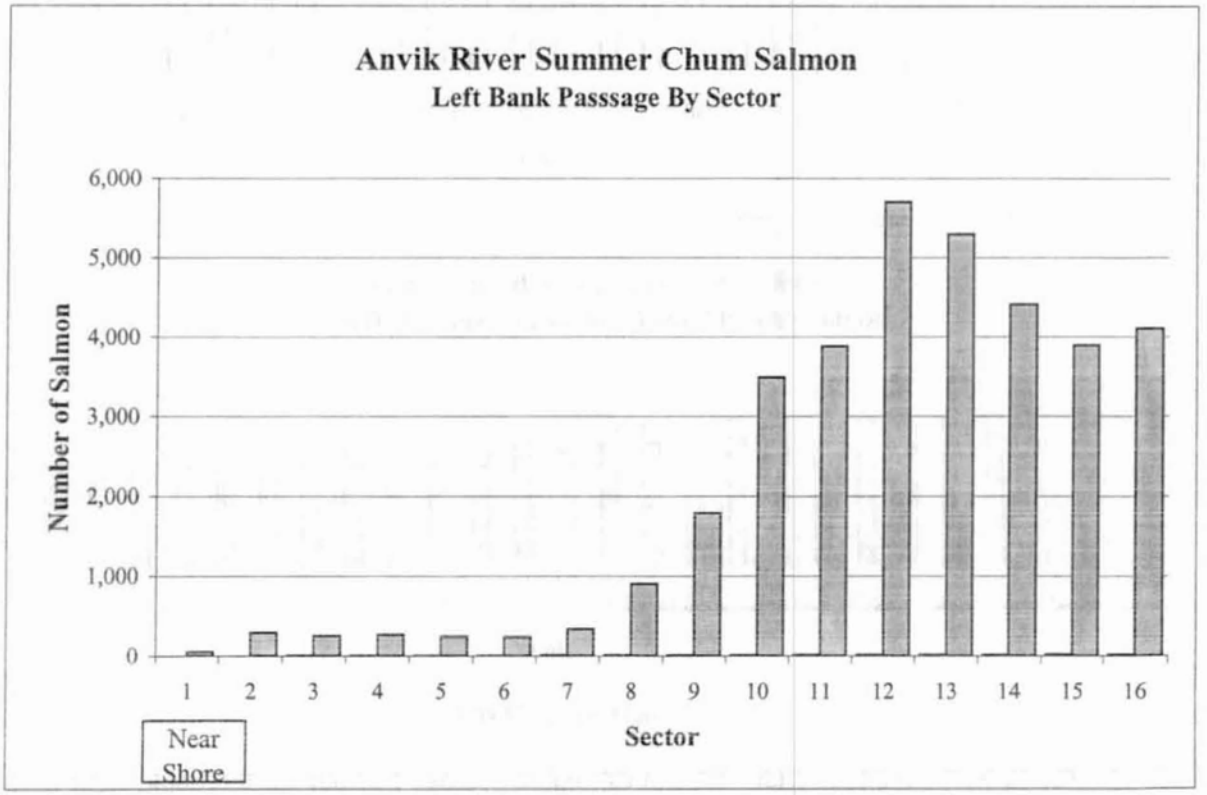
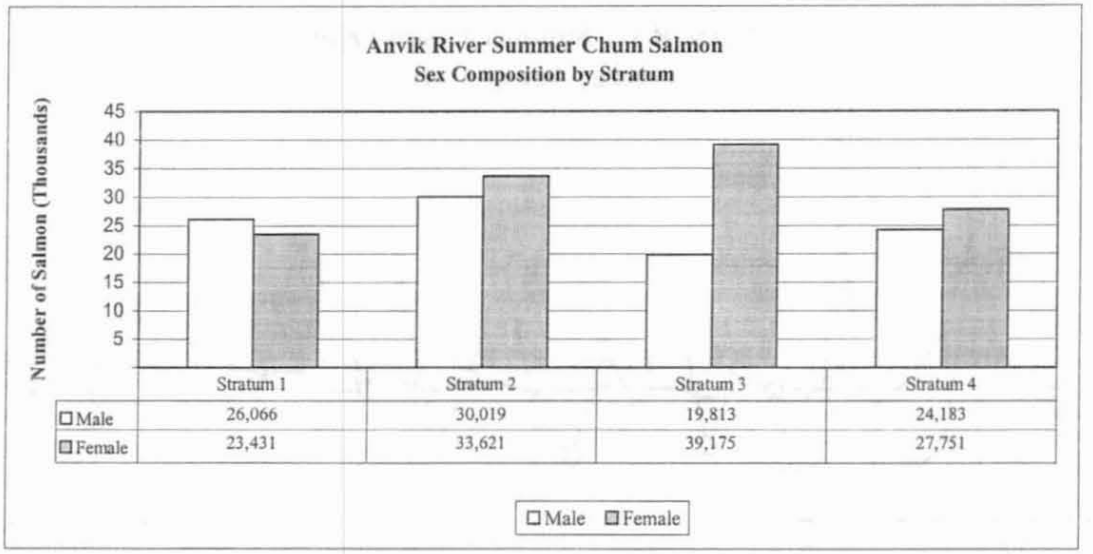
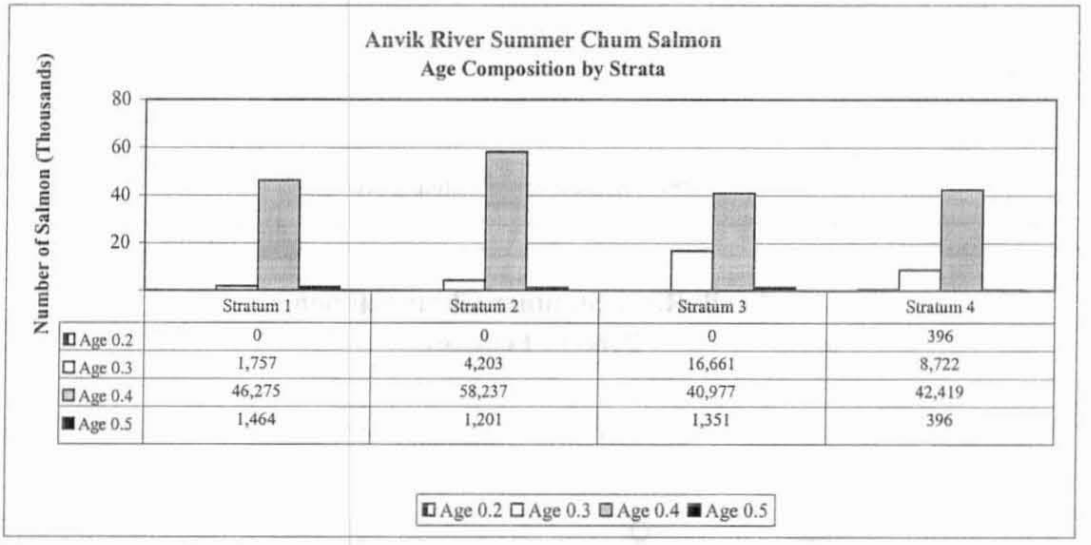


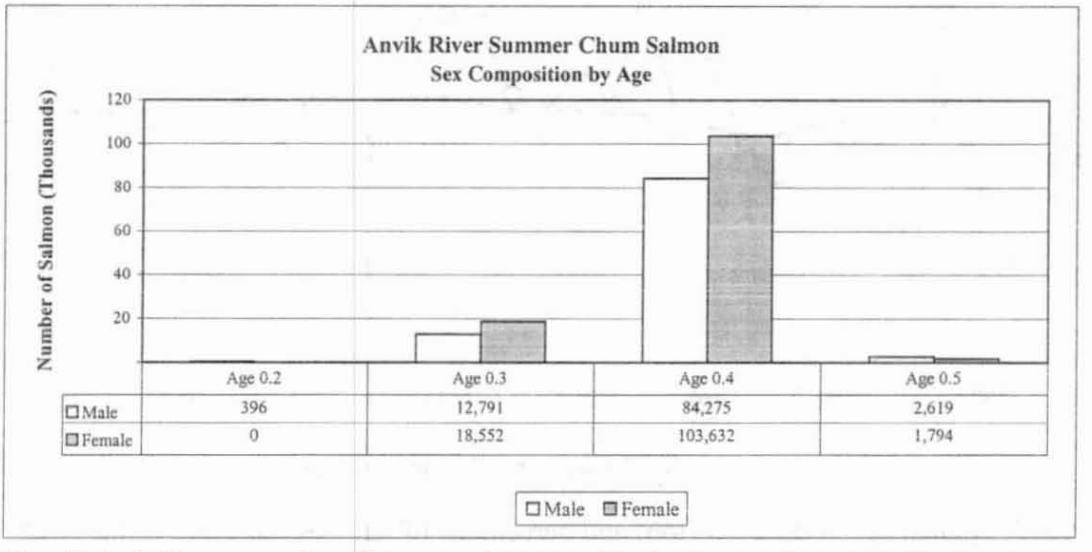
Figure 7. Anvik River summer chum salmon sonar counts by sector for left and right bank, 2001.



	Stratum 1	Stratum 2	Stratum 3	Stratum 4
Male	26,066	30,019	19,813	24,183
Female	23,431	33,621	39,175	27,751

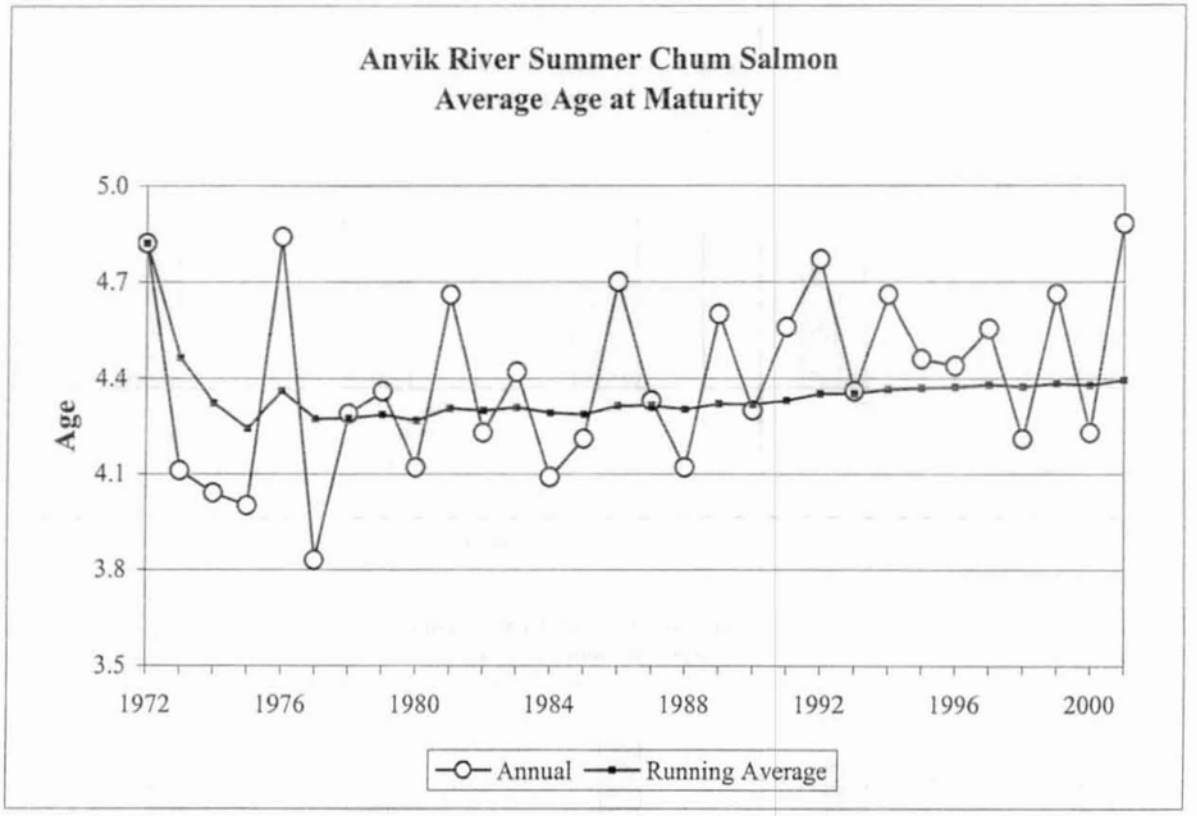


	Stratum 1	Stratum 2	Stratum 3	Stratum 4
Age 0.2	0	0	0	396
Age 0.3	1,757	4,203	16,661	8,722
Age 0.4	46,275	58,237	40,977	42,419
Age 0.5	1,464	1,201	1,351	396



	Age 0.2	Age 0.3	Age 0.4	Age 0.5
Male	396	12,791	84,275	2,619
Female	0	18,552	103,632	1,794

Figure 8. Anvik River summer chum salmon age and sex composition by stratum, and sex composition by age group, 2001.



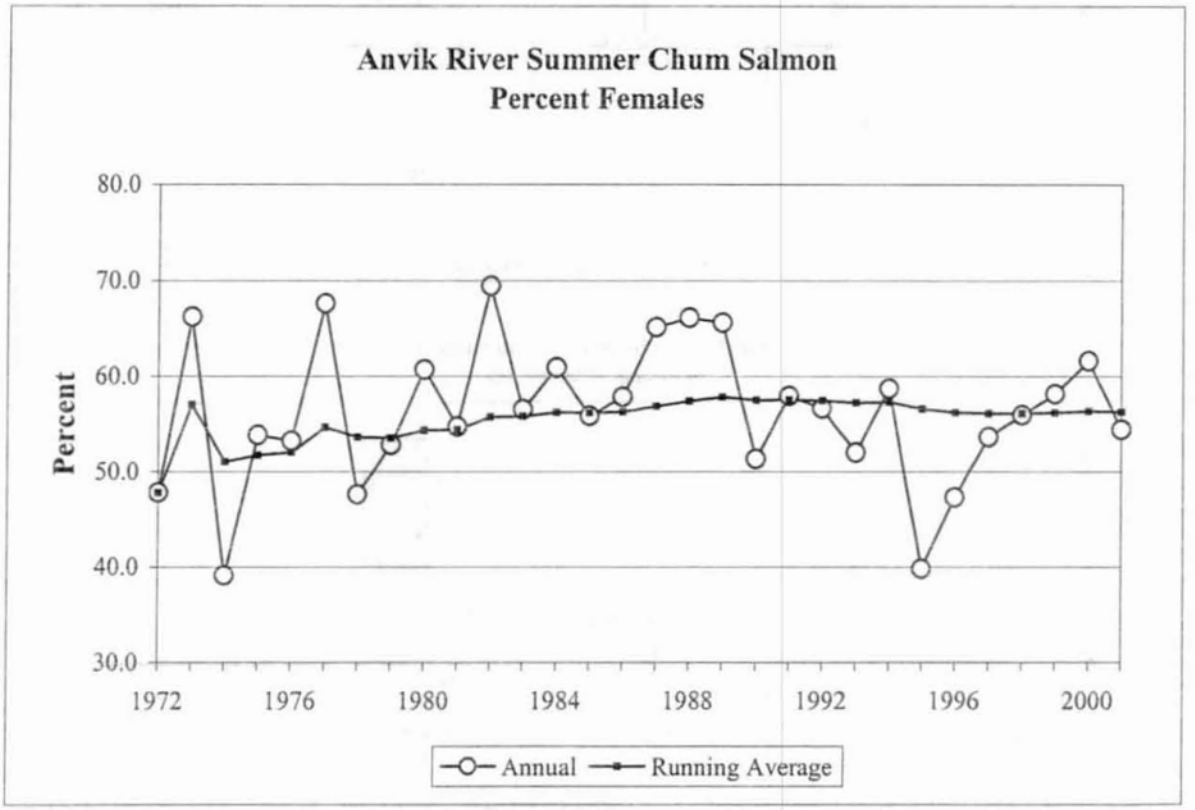
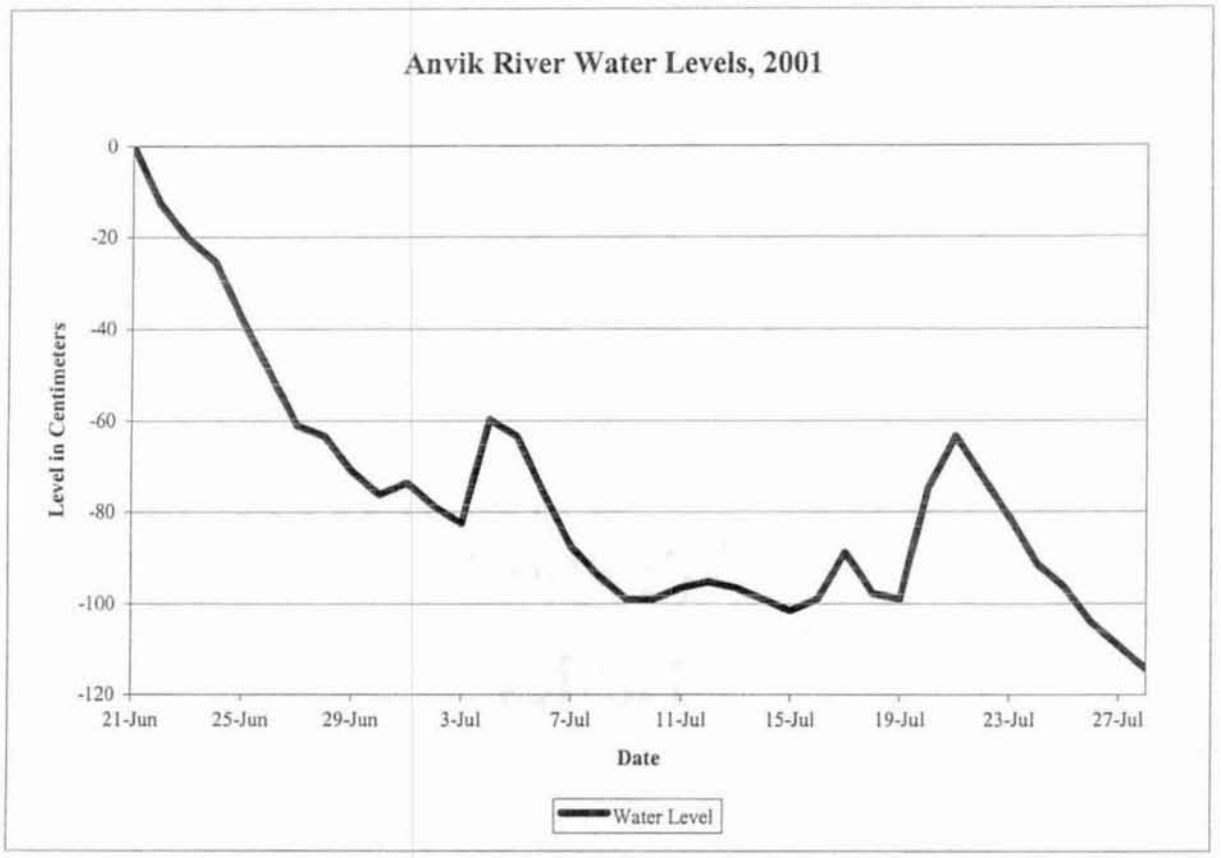


Figure 9. Annual age at maturity (top) and percentage of females (bottom) of the Anvik River chum salmon escapement, 1972-2001.



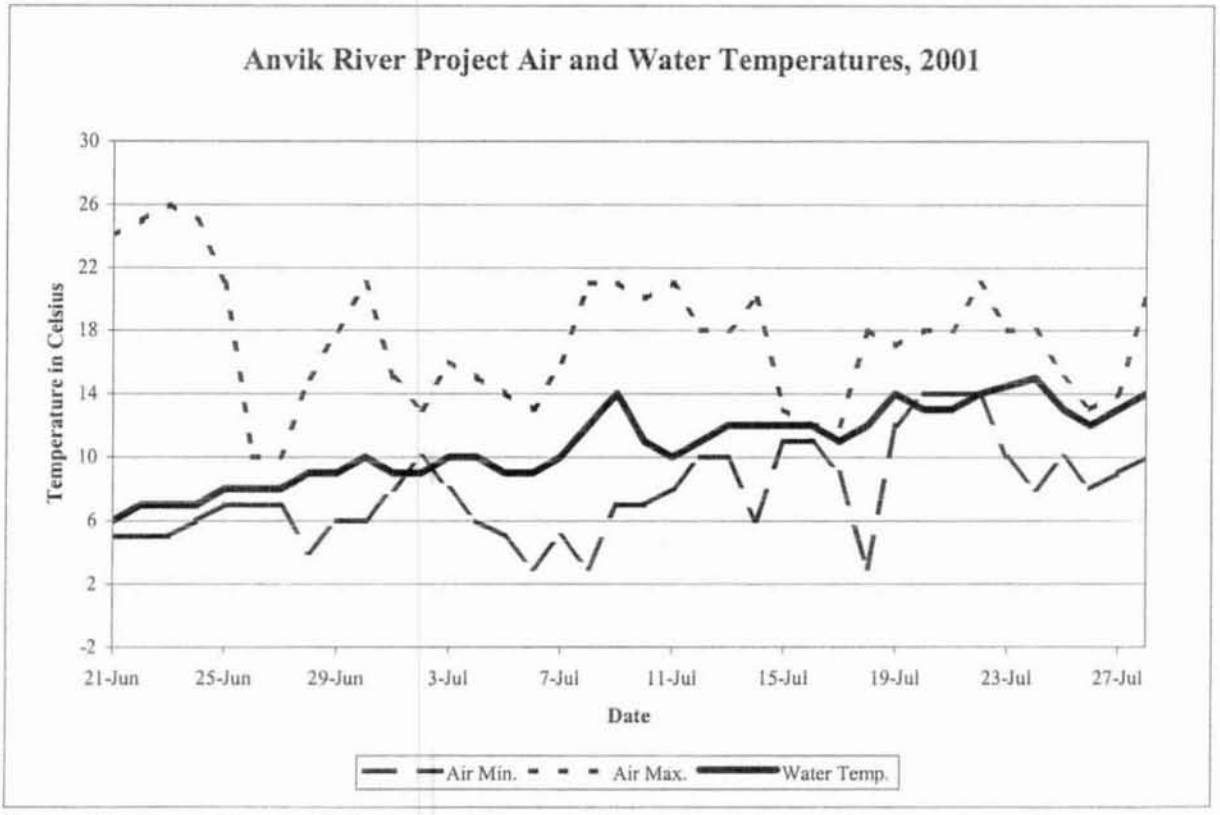


Figure 10. Anvik River hydrological and climatological observaitions at the sonar site, 2001.

Appendix

Tables

Appendix Table A.1. Historic daily and cumulative Anvik River summer chum salmon escapements, 1979-2001.

	1979		1980		1981		1982	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
18-Jun								
19-Jun								
20-Jun					2,760	2,760		
21-Jun					5,795	8,555		
22-Jun					8,226	16,781		
23-Jun	813	813			54,097	70,878		
24-Jun	1,679	2,492			91,826	162,704		
25-Jun	1,549	4,041			115,356	278,060	715	715
26-Jun	1,926	5,967			82,910	360,970	2,436	3,151
27-Jun	5,639	11,606	839	839	44,491	405,461	6,026	9,177
28-Jun	8,469	20,075	3,688	4,527	36,737	442,198	3,744	12,921
29-Jun	11,232	31,307	7,604	12,131	111,356	553,554	3,669	16,590
30-Jun	18,211	49,518	17,528	29,659	69,581	623,135	4,445	21,035
1-Jul	14,692	64,210	25,744	55,403	89,992	713,127	3,795	24,830
2-Jul	11,503	75,713	22,123	77,526	80,312	793,439	3,762	28,592
3-Jul	15,027	90,740	11,898	89,424	76,740	870,179	9,671	38,263
4-Jul	13,178	103,918	9,105	98,529	88,481	958,660	23,642	61,905
5-Jul	12,433	116,351	17,000	115,529	78,032	1,036,692	22,454	84,359
6-Jul	11,667	128,018	16,809	132,338	42,931	1,079,623	22,261	106,620
7-Jul	8,718	136,736	10,877	143,215	40,410	1,120,033	14,333	120,953
8-Jul	11,578	148,314	19,080	162,295	25,856	1,145,889	27,291	148,244
9-Jul	10,454	158,768	18,442	180,737	28,654	1,174,543	40,527	188,771
10-Jul	21,370	180,138	31,980	212,717	36,015	1,210,558	25,882	214,653
11-Jul	16,770	196,908	29,926	242,643	61,612	1,272,170	19,988	234,641
12-Jul	22,118	219,026	17,757	260,400	38,459	1,310,629	36,197	270,838
13-Jul	13,709	232,735	23,542	283,942	18,149	1,328,778	33,836	304,674
14-Jul	10,114	242,849	30,746	314,688	20,979	1,349,757	33,232	337,906
15-Jul	8,612	251,461	33,689	348,377	30,072	1,379,829	18,757	356,663
16-Jul	7,449	258,910	29,092	377,469	23,569	1,403,398	13,672	370,335
17-Jul	4,375	263,285	23,053	400,522	15,523	1,418,921	14,982	385,317
18-Jul	2,751	266,036	29,042	429,564	7,766	1,426,687	12,970	398,287
19-Jul	2,810	268,846	19,761	449,325	9,809	1,436,496	11,402	409,689
20-Jul	2,705	271,551	14,676	464,001	9,922	1,446,418	7,566	417,255
21-Jul	3,436	274,987	8,117	472,118	6,041	1,452,459	7,455	424,710
22-Jul	1,276	276,263	6,202	478,320	6,397	1,458,856	5,352	430,062
23-Jul	1,449	277,712	814	479,134	10,063	1,468,919	4,685	434,747
24-Jul			1,450	480,584	5,078	1,473,997	5,530	440,277
25-Jul			1,597	482,181	2,885	1,476,882	2,167	442,444
26-Jul					1,709	1,478,591	2,137	444,581
27-Jul					991	1,479,582		
28-Jul								
29-Jul								
30-Jul								
Total	277,712		482,181		1,479,582		444,581	

(Continued)

Appendix Table A.1. Page 2 of 6.

	1983		1984		1985		1986	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
18-Jun								
19-Jun								
20-Jun								
21-Jun	217	217					234	234
22-Jun	1,351	1,568	293	293			2,970	3,204
23-Jun	1,430	2,998	307	600			4,894	8,098
24-Jun	3,293	6,291	404	1,004			12,192	20,290
25-Jun	10,836	17,127	11,528	12,532			15,769	36,059
26-Jun	12,533	29,660	16,740	29,272			18,392	54,451
27-Jun	10,132	39,792	23,824	53,096			34,844	89,295
28-Jun	16,227	56,019	16,855	69,951			88,531	177,826
29-Jun	10,894	66,913	26,456	96,407			100,102	277,928
30-Jun	23,141	90,054	25,756	122,163			117,778	395,706
1-Jul	21,532	111,586	18,148	140,311			111,472	507,178
2-Jul	11,146	122,732	21,584	161,895			89,247	596,425
3-Jul	15,906	138,638	24,471	186,366			58,444	654,869
4-Jul	13,669	152,307	28,122	214,488			58,997	713,866
5-Jul	11,653	163,960	23,509	237,997	7,998	7,998	39,913	753,779
6-Jul	9,505	173,465	40,714	278,711	47,245	55,243	55,902	809,681
7-Jul	11,792	185,257	45,103	323,814	56,091	111,334	45,280	854,961
8-Jul	17,499	202,756	53,194	377,008	58,578	169,912	40,688	895,649
9-Jul	20,358	223,114	80,563	457,571	60,265	230,177	41,088	936,737
10-Jul	22,898	246,012	58,385	515,956	61,952	292,129	37,960	974,697
11-Jul	22,800	268,812	60,851	576,807	63,641	355,770	28,766	1,003,463
12-Jul	18,866	287,678	71,000	647,807	96,664	452,434	16,250	1,019,713
13-Jul	15,618	303,296	64,041	711,848	128,110	580,544	14,092	1,033,805
14-Jul	16,348	319,644	40,196	752,044	109,585	690,129	23,838	1,057,643
15-Jul	6,972	326,616	24,561	776,605	77,433	767,562	28,107	1,085,750
16-Jul	8,628	335,244	18,008	794,613	63,007	830,569		
17-Jul	10,300	345,544	13,343	807,956	44,349	874,918		
18-Jul	7,404	352,948	13,013	820,969	37,498	912,416		
19-Jul	4,460	357,408	16,347	837,316	27,196	939,612		
20-Jul	2,465	359,873	17,643	854,959	35,903	975,515		
21-Jul	1,745	361,618	11,666	866,625	27,103	1,002,618		
22-Jul	843	362,461	5,534	872,159	22,272	1,024,890		
23-Jul	451	362,912	7,532	879,691	14,768	1,039,658		
24-Jul			4,091	883,782	11,554	1,051,212		
25-Jul			2,325	886,107	10,031	1,061,243		
26-Jul			2,841	888,948	8,133	1,069,376		
27-Jul			2,080	891,028	5,977	1,075,353		
28-Jul					4,890	1,080,243		
29-Jul								
30-Jul								
Total	362,912		891,028		1,080,243		1,085,750	

(Continued)

	1987		1988		1989		1990	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
18-Jun								
19-Jun								
20-Jun					162	162		
21-Jun	202	202	2,503	2,503	497	659		
22-Jun	339	541	1,092	3,595	2,244	2,903	158	158
23-Jun	425	966	1,841	5,436	4,919	7,822	1,515	1,673
24-Jun	467	1,433	1,853	7,289	5,258	13,080	1,603	3,276
25-Jun	605	2,038	5,264	12,553	7,268	20,348	1,838	5,114
26-Jun	1,586	3,624	9,187	21,740	7,353	27,701	7,419	12,533
27-Jun	3,043	6,667	24,682	46,422	17,792	45,493	14,742	27,275
28-Jun	3,731	10,398	57,538	103,960	21,632	67,125	5,830	33,105
29-Jun	6,401	16,799	96,842	200,802	33,533	100,658	15,800	48,905
30-Jun	14,571	31,370	84,240	285,042	36,228	136,886	19,919	68,824
1-Jul	8,637	40,007	94,566	379,608	37,460	174,346	26,093	94,917
2-Jul	13,065	53,072	104,891	484,499	33,743	208,089	25,566	120,483
3-Jul	14,974	68,046	73,286	557,785	29,033	237,122	22,724	143,207
4-Jul	21,226	89,272	57,432	615,217	24,058	261,180	12,268	155,475
5-Jul	25,487	114,759	60,081	675,298	25,797	286,977	24,385	179,860
6-Jul	36,536	151,295	68,021	743,319	22,668	309,645	16,799	196,659
7-Jul	25,139	176,434	40,829	784,148	23,907	333,552	11,987	208,646
8-Jul	16,094	192,528	42,795	826,943	28,232	361,784	11,669	220,315
9-Jul	6,074	198,602	46,130	873,073	27,763	389,547	12,419	232,734
10-Jul	11,533	210,135	25,614	898,687	20,790	410,337	11,197	243,931
11-Jul	11,624	221,759	23,131	921,818	21,804	432,141	28,262	272,193
12-Jul	13,444	235,203	30,350	952,168	28,737	460,878	14,091	286,284
13-Jul	23,464	258,667	30,468	982,636	33,821	494,699	6,170	292,454
14-Jul	29,136	287,803	26,287	1,008,923	26,856	521,555	4,872	297,326
15-Jul	35,855	323,658	27,474	1,036,397	30,602	552,157	3,535	300,861
16-Jul	28,964	352,622	15,922	1,052,319	17,803	569,960	5,673	306,534
17-Jul	15,179	367,801	5,340	1,057,659	5,003	574,963	11,394	317,928
18-Jul	13,744	381,545	12,676	1,070,335	10,460	585,423	7,304	325,232
19-Jul	13,599	395,144	11,987	1,082,322	10,035	595,458	7,535	332,767
20-Jul	16,658	411,802	5,382	1,087,704	10,872	606,330	10,970	343,737
21-Jul	13,530	425,332	7,000	1,094,704	8,299	614,629	10,280	354,017
22-Jul	9,148	434,480	5,323	1,100,027	5,300	619,929	11,819	365,836
23-Jul	8,301	442,781	5,460	1,105,487	5,490	625,419	10,739	376,575
24-Jul	6,518	449,299	6,264	1,111,751	3,366	628,785	10,662	387,237
25-Jul	3,813	453,112	8,105	1,119,856	3,827	632,612	3,403	390,640
26-Jul	2,764	455,876	4,378	1,124,234	4,294	636,906	3,663	394,303
27-Jul			1,215	1,125,449			3,181	397,484
28-Jul							2,724	400,208
29-Jul							2,216	402,424
30-Jul							1,203	403,627
Total	455,876		1,125,449		636,906		403,627	

(Continued)

	1991		1992		1993		1994	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
18-Jun								
19-Jun					185	185	279	279
20-Jun					1,068	1,253	1,392	1,671
21-Jun	22	22	0	0	10,606	11,859	2,316	3,987
22-Jun	112	134	0	0	5,564	17,423	2,489	6,476
23-Jun	1,652	1,786	0	0	5,348	22,771	9,694	16,170
24-Jun	2,279	4,065	0	0	2,240	25,011	16,985	33,155
25-Jun	8,263	12,328	0	0	1,215	26,226	26,789	59,944
26-Jun	22,209	34,537	0	0	4,916	31,142	38,879	98,823
27-Jun	27,704	62,241	0	0	4,969	36,111	32,807	131,630
28-Jun	44,919	107,160	0	0	3,703	39,814	24,563	156,193
29-Jun	40,384	147,544	121	121	2,186	42,000	16,679	172,872
30-Jun	26,729	174,273	4,807	4,928	5,302	47,302	40,910	213,782
1-Jul	27,946	202,219	20,059	24,987	11,294	58,596	75,582	289,364
2-Jul	25,607	227,826	41,940	66,927	17,247	75,843	50,288	339,652
3-Jul	20,499	248,325	56,972	123,899	14,622	90,465	38,322	377,974
4-Jul	22,438	270,763	60,901	184,800	21,548	112,013	24,661	402,635
5-Jul	18,578	289,341	81,125	265,925	19,782	131,795	54,242	456,877
6-Jul	13,939	303,280	60,959	326,884	18,380	150,175	52,855	509,732
7-Jul	13,887	317,167	52,314	379,198	21,856	172,031	51,181	560,913
8-Jul	38,260	355,427	57,138	436,336	12,183	184,214	84,341	645,254
9-Jul	58,068	413,495	59,744	496,080	17,018	201,232	57,076	702,330
10-Jul	45,739	459,234	41,593	537,673	26,667	227,899	71,095	773,425
11-Jul	45,295	504,529	30,892	568,565	20,962	248,861	88,585	862,010
12-Jul	33,138	537,667	28,065	596,630	28,977	277,838	45,795	907,805
13-Jul	32,539	570,206	26,358	622,988	20,952	298,790	33,023	940,828
14-Jul	29,932	600,138	19,458	642,446	16,878	315,668	28,019	968,847
15-Jul	26,330	626,468	17,755	660,201	19,859	335,527	18,002	986,849
16-Jul	23,180	649,648	15,873	676,074	18,692	354,219	13,468	1,000,317
17-Jul	23,252	672,900	20,765	696,839	25,152	379,371	25,032	1,025,349
18-Jul	17,176	690,076	12,025	708,864	26,508	405,879	27,190	1,052,539
19-Jul	13,163	703,239	9,854	718,718	21,339	427,218	26,148	1,078,687
20-Jul	17,168	720,407	7,282	726,000	22,573	449,791	11,762	1,090,449
21-Jul	20,051	740,458	11,563	737,563	19,510	469,301	7,412	1,097,861
22-Jul	26,610	767,068	9,928	747,491	11,351	480,652	14,192	1,112,053
23-Jul	28,801	795,869	11,314	758,805	6,779	487,431	12,636	1,124,689
24-Jul	21,070	816,939	9,002	767,807	5,903	493,334		
25-Jul	17,231	834,170	7,819	775,626	9,187	502,521		
26-Jul	13,602	847,772			8,076	510,597		
27-Jul					6,812	517,409		
28-Jul								
29-Jul								
30-Jul								
Total	847,772		775,626		517,409		1,124,689	

(Continued)

	1995		1996		1997		1998	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
18-Jun			10,213	10,213				
19-Jun	395	395	4,615	14,828	561	561		
20-Jun	3,648	4,043	16,836	31,664	5,761	6,321		
21-Jun	5,831	9,874	43,565	75,229	8,403	14,724	1	1
22-Jun	11,639	21,513	34,257	109,486	5,072	19,796	164	165
23-Jun	6,459	27,972	50,000	159,486	22,395	42,191	1,202	1,367
24-Jun	8,723	36,695	63,193	222,679	29,758	71,949	2,103	3,471
25-Jun	15,302	51,997	28,156	250,835	23,643	95,592	3,175	6,646
26-Jun	9,389	61,386	35,303	286,138	7,181	102,773	4,161	10,807
27-Jun	36,645	98,031	46,390	332,528	19,719	122,493	4,721	15,528
28-Jun	78,678	176,709	34,348	366,876	29,291	151,784	4,210	19,738
29-Jun	87,951	264,660	33,115	399,991	36,752	188,536	4,868	24,606
30-Jun	52,897	317,557	45,936	445,927	31,248	219,783	8,063	32,669
1-Jul	53,297	370,854	58,459	504,386	32,374	252,157	14,597	47,266
2-Jul	82,228	453,082	55,211	559,597	28,963	281,120	14,835	62,101
3-Jul	59,206	512,288	39,335	598,932	28,931	310,051	24,539	86,640
4-Jul	27,695	539,983	44,112	643,044	26,746	336,797	22,857	109,496
5-Jul	50,642	590,625	61,740	704,784	26,575	363,372	25,589	135,085
6-Jul	105,422	696,047	38,482	743,266	20,109	383,481	34,503	169,588
7-Jul	105,992	802,039	49,067	792,333	24,365	407,847	35,114	204,702
8-Jul	55,108	857,147	34,221	826,554	24,356	432,202	16,755	221,457
9-Jul	38,646	895,793	23,194	849,748	15,851	448,054	14,740	236,196
10-Jul	60,116	955,909	18,093	867,841	13,710	461,764	20,959	257,156
11-Jul	64,070	1,019,979	10,579	878,420	11,550	473,315	27,179	284,335
12-Jul	41,220	1,061,199	13,038	891,458	7,663	480,977	35,455	319,790
13-Jul	39,638	1,100,837	12,871	904,329	4,803	485,780	35,331	355,121
14-Jul	33,743	1,134,580	10,077	914,406	8,467	494,246	20,702	375,822
15-Jul	39,977	1,174,557	7,411	921,817	12,436	506,683	8,195	384,017
16-Jul	30,640	1,205,197	7,173	928,990	15,943	522,626	18,556	402,574
17-Jul	24,950	1,230,147	4,250	933,240	12,682	535,308	14,564	417,138
18-Jul	25,638	1,255,785			13,040	548,348	12,179	429,318
19-Jul	16,814	1,272,599			14,631	562,979	16,685	446,003
20-Jul	26,622	1,299,221			12,826	575,806	11,525	457,528
21-Jul	19,154	1,318,375			11,684	587,490	10,702	468,230
22-Jul	11,735	1,330,110			10,177	597,667	10,020	478,250
23-Jul	5,982	1,336,092			4,701	602,368	6,082	484,332
24-Jul	3,326	1,339,418			3,384	605,752	2,969	487,301
25-Jul								
26-Jul								
27-Jul								
28-Jul								
29-Jul								
30-Jul								
Total	1,339,418		933,240		605,752		487,301	

(Continued)

	1999		2000		2001	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.
18-Jun						
19-Jun						
20-Jun						
21-Jun			10	10		
22-Jun			9	19		
23-Jun			28	47		
24-Jun			25	72		
25-Jun			49	121		
26-Jun			49	170	671	671
27-Jun	85	85	218	388	445	1,115
28-Jun	274	359	97	485	951	2,066
29-Jun	1,546	1,905	104	589	2,109	4,175
30-Jun	3,176	5,081	2,167	2,756	6,208	10,383
1-Jul	10,336	15,417	5,174	7,930	3,661	14,045
2-Jul	11,038	26,455	6,427	14,357	3,671	17,716
3-Jul	15,497	41,952	6,369	20,727	12,503	30,219
4-Jul	20,660	62,612	3,904	24,631	10,098	40,317
5-Jul	31,112	93,724	4,457	29,088	9,180	49,497
6-Jul	27,755	121,479	7,322	36,410	8,769	58,266
7-Jul	33,489	154,968	9,465	45,875	7,171	65,438
8-Jul	28,502	183,470	14,495	60,370	13,328	78,766
9-Jul	22,090	205,560	17,712	78,082	11,735	90,500
10-Jul	28,185	233,745	15,124	93,206	22,636	113,137
11-Jul	21,647	255,392	23,105	116,311	12,901	126,038
12-Jul	17,370	272,761	19,212	135,523	11,241	137,279
13-Jul	15,215	287,976	11,882	147,405	11,751	149,029
14-Jul	13,615	301,591	4,334	151,739	11,810	160,839
15-Jul	13,034	314,626	10,464	162,202	11,286	172,125
16-Jul	17,692	332,318	7,362	169,565	7,773	179,898
17-Jul	14,841	347,159	4,816	174,380	7,944	187,842
18-Jul	13,842	361,001	3,750	178,130	5,193	193,035
19-Jul	15,313	376,314	4,384	182,515	6,173	199,208
20-Jul	13,196	389,511	3,244	185,758	6,816	206,024
21-Jul	12,888	402,398	1,706	187,464	4,446	210,471
22-Jul	8,474	410,873	1,318	188,782	4,072	214,543
23-Jul	8,485	419,358	1,567	190,349	2,264	216,806
24-Jul	6,452	425,810	1,255	191,604	1,992	218,798
25-Jul	4,484	430,294	907	192,510	2,197	220,995
26-Jul	2,465	432,759	1,102	193,612	1,496	222,491
27-Jul	2,747	435,506	1,569	195,181	725	223,216
28-Jul	1,850	437,356	1,168	196,349	843	224,058
29-Jul						
30-Jul						
Total	437,356		196,349		224,058	

Appendix Table B.1. Right bank Anvik River summer chum salmon counts by hour and sector, 2001.

Hour	Sector																	Total
Ending	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
100	204	1,301	2,353	2,256	1,174	599	330	126	452	295	71	43	41	32	24	17	9,318	8,794
200	427	1,738	2,369	2,520	1,020	526	258	99	86	154	51	39	45	15	20	23	9,390	8,862
300	493	1,946	2,298	2,036	933	550	262	119	143	189	35	26	17	8	16	25	9,096	8,585
400	678	2,351	2,116	1,654	714	399	285	97	113	133	34	31	26	28	15	13	8,687	8,199
500	609	1,858	2,454	1,926	907	488	171	84	78	99	43	28	18	15	11	20	8,809	8,314
600	233	1,698	2,591	2,003	859	512	193	122	85	84	44	18	19	9	16	15	8,501	8,023
700	167	1,258	2,655	2,631	926	677	368	139	81	100	43	15	11	4	13	9	9,097	8,586
800	149	1,271	2,701	2,341	1,074	693	437	223	118	129	66	39	32	24	34	22	9,353	8,827
900	147	1,082	2,741	2,330	841	580	335	203	99	101	59	42	22	24	27	30	8,663	8,176
1000	186	1,220	2,962	2,292	865	584	331	204	74	112	74	39	46	25	30	23	9,067	8,557
1100	149	1,192	2,710	2,437	898	562	330	196	119	131	78	44	29	28	28	29	8,960	8,456
1200	146	1,150	2,454	2,140	815	540	334	302	94	194	97	54	67	25	24	31	8,467	7,991
1300	177	664	1,555	1,931	925	750	474	817	187	191	88	88	77	33	29	32	8,018	7,567
1400	105	1,014	2,102	1,737	908	514	244	132	191	155	83	71	46	40	35	29	7,406	6,990
1500	142	1,125	2,208	1,535	726	462	243	191	180	177	70	66	58	28	29	29	7,269	6,860
1600	138	1,148	2,203	1,566	676	479	235	131	110	141	76	72	59	28	39	40	7,141	6,740
1700	166	1,369	2,318	1,577	626	535	173	145	117	125	101	62	55	32	30	26	7,457	7,038
1800	174	1,436	2,337	1,555	680	496	227	154	116	168	106	73	50	32	26	34	7,664	7,233
1900	131	935	1,744	1,635	706	640	393	198	214	237	100	67	56	28	32	27	7,143	6,742
2000	102	1,208	2,376	1,638	455	360	257	215	150	173	115	46	33	22	17	14	7,184	6,780
2100	183	1,458	2,567	1,823	495	275	156	91	125	132	71	58	28	7	6	5	7,481	7,061
2200	230	1,572	2,481	1,515	529	301	228	127	108	143	53	49	27	9	6	7	7,386	6,971
2300	224	2,336	2,817	1,821	662	421	231	149	152	136	51	70	48	14	14	8	9,153	8,639
2400	214	1,658	2,883	2,493	855	399	189	164	239	195	68	64	46	7	7	7	9,490	8,957
Total	5,575	33,988	57,995	47,394	19,270	12,342	6,684	4,429	3,431	3,695	1,678	1,203	958	517	529	515	200,200	188,949
Adjusted	5,261	32,078	54,736	44,730	18,187	11,648	6,308	4,180	3,238	3,487	1,584	1,135	904	488	499	486	188,949	

Appendix Table B.2. Left bank Anvik River summer chum salmon counts by hour and sector, 2001.

Hour	Sector																	Total
Ending	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
100	0	14	24	19	15	10	18	47	70	128	141	215	224	138	143	209	1,415	1,898
200	2	10	3	10	3	5	9	51	63	127	150	254	195	121	92	98	1,193	1,600
300	3	23	16	12	9	9	21	49	72	110	131	186	178	143	97	94	1,153	1,546
400	6	26	15	6	9	11	11	39	72	107	129	198	198	212	119	116	1,274	1,708
500	3	18	36	7	6	5	6	25	60	129	119	235	250	160	122	114	1,295	1,737
600	1	5	3	9	9	13	21	44	38	93	108	174	200	184	108	126	1,136	1,523
700	0	1	12	18	21	22	16	11	34	59	146	202	176	294	131	131	1,274	1,708
800	2	9	7	5	3	4	11	17	43	90	66	136	166	116	151	130	956	1,282
900	2	4	3	5	5	3	2	14	38	87	77	139	138	117	111	136	881	1,181
1000	0	26	2	1	0	1	5	33	51	87	71	154	152	116	96	121	916	1,228
1100	1	4	6	5	7	10	17	17	59	116	90	113	115	76	75	94	805	1,080
1200	0	1	1	0	2	5	4	21	60	117	73	94	105	67	108	134	792	1,062
1300	0	3	0	0	0	2	7	16	39	90	105	118	76	53	91	128	728	976
1400	1	5	0	1	11	18	26	22	36	86	94	127	103	70	82	92	774	1,038
1500	2	4	1	0	3	4	3	16	56	86	79	113	118	97	98	100	780	1,046
1600	1	7	5	1	1	2	5	27	65	112	120	158	128	85	116	115	948	1,271
1700	0	7	10	5	2	1	7	22	56	101	112	174	117	88	83	99	884	1,185
1800	2	5	2	1	2	5	8	26	56	119	107	161	159	120	103	119	995	1,334
1900	4	9	6	3	10	8	10	24	56	135	142	187	177	165	121	122	1,179	1,581
2000	1	3	4	13	25	12	14	24	49	116	164	228	186	156	139	126	1,260	1,690
2100	2	13	1	11	10	3	10	26	59	123	162	212	168	145	180	151	1,276	1,711
2200	0	7	6	30	8	5	2	30	60	140	168	214	210	202	179	157	1,418	1,902
2300	3	9	11	23	7	8	6	33	70	127	161	233	185	168	172	153	1,369	1,836
2400	2	5	11	13	12	9	14	40	68	112	178	224	224	192	183	193	1,480	1,985
Total	38	218	185	198	180	175	253	674	1,330	2,597	2,893	4,249	3,948	3,285	2,900	3,058	26,181	35,109
Adjusted	51	292	248	266	241	235	339	904	1,784	3,483	3,880	5,698	5,294	4,405	3,889	4,101	35,109	

Appendix Table B.3. Right and left bank Anvik River summer chum salmon counts by hour and sector, 2001.

Hour	Sector																	Total
Ending	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
100	204	1,315	2,377	2,275	1,189	609	348	173	522	423	212	258	265	170	167	226	10,733	10,692
200	429	1,748	2,372	2,530	1,023	531	267	150	149	281	201	293	240	136	112	121	10,583	10,462
300	496	1,969	2,314	2,048	942	559	283	168	215	299	166	212	195	151	113	119	10,249	10,131
400	684	2,377	2,131	1,660	723	410	296	136	185	240	163	229	224	240	134	129	9,961	9,907
500	612	1,876	2,490	1,933	913	493	177	109	138	228	162	263	268	175	133	134	10,104	10,051
600	234	1,703	2,594	2,012	868	525	214	166	123	177	152	192	219	193	124	141	9,637	9,547
700	167	1,259	2,667	2,649	947	699	384	150	115	159	189	217	187	298	144	140	10,371	10,294
800	151	1,280	2,708	2,346	1,077	697	448	240	161	219	132	175	198	140	185	152	10,309	10,109
900	149	1,086	2,744	2,335	846	583	337	217	137	188	136	181	160	141	138	166	9,544	9,358
1000	186	1,246	2,964	2,293	865	585	336	237	125	199	145	193	198	141	126	144	9,983	9,786
1100	150	1,196	2,716	2,442	905	572	347	213	178	247	168	157	144	104	103	123	9,765	9,536
1200	146	1,151	2,455	2,140	817	545	338	323	154	311	170	148	172	92	132	165	9,259	9,053
1300	177	667	1,555	1,931	925	752	481	833	226	281	193	206	153	86	120	160	8,746	8,544
1400	106	1,019	2,102	1,738	919	532	270	154	227	241	177	198	149	110	117	121	8,180	8,028
1500	144	1,129	2,209	1,535	729	466	246	207	236	263	149	179	176	125	127	129	8,049	7,906
1600	139	1,155	2,208	1,567	677	481	240	158	175	253	196	230	187	113	155	155	8,089	8,011
1700	166	1,376	2,328	1,582	628	536	180	167	173	226	213	236	172	120	113	125	8,341	8,223
1800	176	1,441	2,339	1,556	682	501	235	180	172	287	213	234	209	152	129	153	8,659	8,568
1900	135	944	1,750	1,638	716	648	403	222	270	372	242	254	233	193	153	149	8,322	8,323
2000	103	1,211	2,380	1,651	480	372	271	239	199	289	279	274	219	178	156	140	8,444	8,470
2100	185	1,471	2,568	1,834	505	278	166	117	184	255	233	270	196	152	186	156	8,757	8,772
2200	230	1,579	2,487	1,545	537	306	230	157	168	283	221	263	237	211	185	164	8,804	8,872
2300	227	2,345	2,828	1,844	669	429	237	182	222	263	212	303	233	182	186	161	10,522	10,474
2400	216	1,663	2,894	2,506	867	408	203	204	307	307	246	288	270	199	190	200	10,970	10,941
Total	5,613	34,206	58,180	47,592	19,450	12,517	6,937	5,103	4,761	6,292	4,571	5,452	4,906	3,802	3,429	3,573	226,381	224,058
Adjusted	5,312	32,370	54,984	44,996	18,428	11,883	6,648	5,084	5,022	6,970	5,463	6,833	6,198	4,893	4,388	4,587	224,058	

Appendix Table B.4. Right bank Anvik River summer chum salmon proportions by hour and sector, 2001.

Hour	Sector																	Total
Ending	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
100	0.001	0.006	0.012	0.011	0.006	0.003	0.002	0.001	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.044
200	0.002	0.009	0.012	0.013	0.005	0.003	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.044
300	0.002	0.010	0.011	0.010	0.005	0.003	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.045	0.043
400	0.003	0.012	0.011	0.008	0.004	0.002	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.043	0.041
500	0.003	0.009	0.012	0.010	0.005	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.044	0.042
600	0.001	0.008	0.013	0.010	0.004	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.042	0.040
700	0.001	0.006	0.013	0.013	0.005	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.045	0.043
800	0.001	0.006	0.013	0.012	0.005	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.044
900	0.001	0.005	0.014	0.012	0.004	0.003	0.002	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.043	0.041
1000	0.001	0.006	0.015	0.011	0.004	0.003	0.002	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.045	0.043
1100	0.001	0.006	0.014	0.012	0.004	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.045	0.042
1200	0.001	0.006	0.012	0.011	0.004	0.003	0.002	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.042	0.040
1300	0.001	0.003	0.008	0.010	0.005	0.004	0.002	0.004	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.038
1400	0.001	0.005	0.010	0.009	0.005	0.003	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.037	0.035
1500	0.001	0.006	0.011	0.008	0.004	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.034
1600	0.001	0.006	0.011	0.008	0.003	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.034
1700	0.001	0.007	0.012	0.008	0.003	0.003	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.037	0.035
1800	0.001	0.007	0.012	0.008	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.038	0.036
1900	0.001	0.005	0.009	0.008	0.004	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.034
2000	0.001	0.006	0.012	0.008	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.036	0.034
2100	0.001	0.007	0.013	0.009	0.002	0.001	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.037	0.035
2200	0.001	0.008	0.012	0.008	0.003	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.037	0.035
2300	0.001	0.012	0.014	0.009	0.003	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.043
2400	0.001	0.008	0.014	0.012	0.004	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.045
Total	0.028	0.170	0.290	0.237	0.096	0.062	0.033	0.022	0.017	0.018	0.008	0.006	0.005	0.003	0.003	0.003	1.000	0.944
Adjusted	0.026	0.160	0.273	0.223	0.091	0.058	0.032	0.021	0.016	0.017	0.008	0.006	0.005	0.002	0.002	0.002	0.944	

Appendix Table B.5. Left bank Anvik River summer chum salmon proportions by hour and sector, 2001.

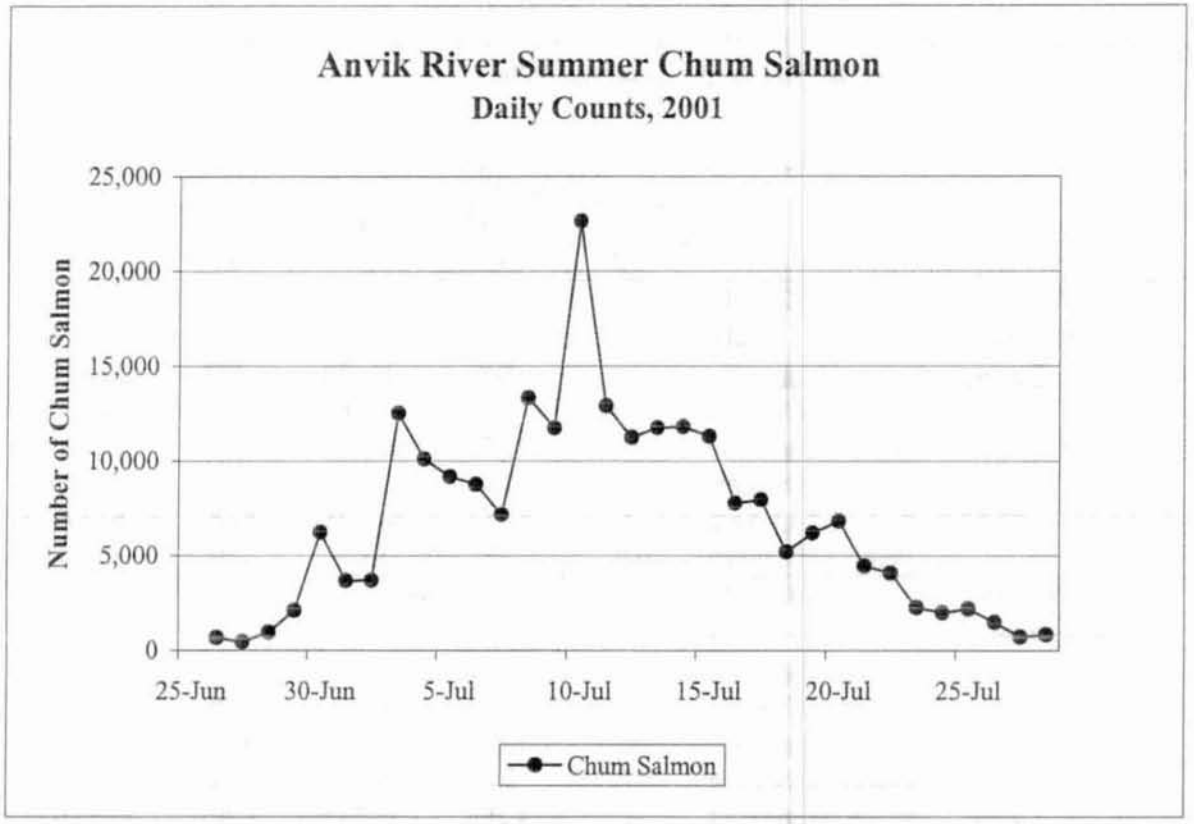
Hour	Sector																	Total
Ending	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
100	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.002	0.003	0.005	0.005	0.008	0.009	0.005	0.005	0.008	0.054	0.072
200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.005	0.006	0.010	0.007	0.005	0.004	0.004	0.046	0.061
300	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.002	0.003	0.004	0.005	0.007	0.007	0.005	0.004	0.004	0.044	0.059
400	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.003	0.004	0.005	0.008	0.008	0.008	0.005	0.004	0.049	0.065
500	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.002	0.005	0.005	0.009	0.010	0.006	0.005	0.004	0.049	0.066
600	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.001	0.004	0.004	0.007	0.008	0.007	0.004	0.005	0.043	0.058
700	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.002	0.006	0.008	0.007	0.011	0.005	0.005	0.049	0.065
800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.003	0.005	0.006	0.004	0.006	0.005	0.037	0.049
900	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.003	0.003	0.005	0.005	0.004	0.004	0.005	0.034	0.045
1000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.003	0.006	0.006	0.004	0.004	0.005	0.035	0.047
1100	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.004	0.003	0.004	0.004	0.003	0.003	0.004	0.031	0.041
1200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.004	0.003	0.004	0.004	0.003	0.004	0.005	0.030	0.041
1300	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.003	0.004	0.005	0.003	0.002	0.003	0.005	0.028	0.037
1400	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.003	0.004	0.005	0.004	0.003	0.003	0.004	0.030	0.040
1500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.003	0.004	0.005	0.004	0.004	0.004	0.030	0.040
1600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.004	0.005	0.006	0.005	0.003	0.004	0.004	0.036	0.049
1700	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.004	0.004	0.007	0.004	0.003	0.003	0.004	0.034	0.045
1800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.005	0.004	0.006	0.006	0.005	0.004	0.005	0.038	0.051
1900	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.005	0.005	0.007	0.007	0.006	0.005	0.005	0.045	0.060
2000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.002	0.004	0.006	0.009	0.007	0.006	0.005	0.005	0.048	0.065
2100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.005	0.006	0.008	0.006	0.006	0.007	0.006	0.049	0.065
2200	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.002	0.005	0.006	0.008	0.008	0.008	0.007	0.006	0.054	0.073
2300	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.003	0.005	0.006	0.009	0.007	0.006	0.007	0.006	0.052	0.070
2400	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.004	0.007	0.009	0.009	0.007	0.007	0.007	0.057	0.076
Total	0.001	0.008	0.007	0.008	0.007	0.007	0.010	0.026	0.051	0.099	0.110	0.162	0.151	0.125	0.111	0.117	1.000	1.341
Adjusted	0.002	0.011	0.009	0.010	0.009	0.009	0.013	0.035	0.068	0.133	0.148	0.218	0.202	0.168	0.149	0.157	1.341	

Appendix Table B.6. Right and left bank Anvik River summer chum salmon proportions by hour and sector, 2001.

Hour	Sector																	Total
Ending	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
100	0.001	0.006	0.010	0.010	0.005	0.003	0.002	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.047	0.047
200	0.002	0.008	0.010	0.011	0.005	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.047	0.046
300	0.002	0.009	0.010	0.009	0.004	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.045	0.045
400	0.003	0.010	0.009	0.007	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.044	0.044
500	0.003	0.008	0.011	0.009	0.004	0.002	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.045	0.044
600	0.001	0.008	0.011	0.009	0.004	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.043	0.042
700	0.001	0.006	0.012	0.012	0.004	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.046	0.045
800	0.001	0.006	0.012	0.010	0.005	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.046	0.045
900	0.001	0.005	0.012	0.010	0.004	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.042	0.041
1000	0.001	0.006	0.013	0.010	0.004	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.044	0.043
1100	0.001	0.005	0.012	0.011	0.004	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.043	0.042
1200	0.001	0.005	0.011	0.009	0.004	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.041	0.040
1300	0.001	0.003	0.007	0.009	0.004	0.003	0.002	0.004	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.039	0.038
1400	0.000	0.005	0.009	0.008	0.004	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.036	0.035
1500	0.001	0.005	0.010	0.007	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.036	0.035
1600	0.001	0.005	0.010	0.007	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.036	0.035
1700	0.001	0.006	0.010	0.007	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.037	0.036
1800	0.001	0.006	0.010	0.007	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.038	0.038
1900	0.001	0.004	0.008	0.007	0.003	0.003	0.002	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.037	0.037
2000	0.000	0.005	0.011	0.007	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.037	0.037
2100	0.001	0.006	0.011	0.008	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.039	0.039
2200	0.001	0.007	0.011	0.007	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.039	0.039
2300	0.001	0.010	0.012	0.008	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.046	0.046
2400	0.001	0.007	0.013	0.011	0.004	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.048	0.048
Total	0.025	0.151	0.257	0.210	0.086	0.055	0.031	0.023	0.021	0.028	0.020	0.024	0.022	0.017	0.015	0.016	1.000	0.990
Adjusted	0.023	0.143	0.243	0.199	0.081	0.052	0.029	0.022	0.022	0.031	0.024	0.030	0.027	0.022	0.019	0.020	0.990	

Appendix Table C.1 Anvik River summer chum salmon escapement age and sex composition by stratum, and weighted season total, 2001.

		Brood Year and Age Group				
		1998	1997	1996	1995	
		0.2	0.3	0.4	0.5	Total
Stratum:	6/28-7/05		*Stratum 1*			
Sample Size:	206					
Female	No. in Escapement	0	586	22,552	293	23,431
	Percent of Sample	0.0	1.2	45.6	0.6	47.3
Male	No. in Escapement	0	1,172	23,723	1,172	26,066
	Percent of Sample	0.0	2.4	47.9	2.4	52.7
Total	No. in Escapement	0	1,757	46,275	1,464	49,497
	Percent of Sample	0.0	3.6	93.5	3.0	100.0
Stratum:	7/06-7/10		*Stratum 2*			
Sample Size:	134					
Female	No. in Escapement	0	2,402	30,619	600	33,621
	Percent of Sample	0.0	3.8	48.1	0.9	52.8
Male	No. in Escapement	0	1,801	27,617	600	30,019
	Percent of Sample	0.0	2.8	43.4	0.9	47.2
Total	No. in Escapement	0	4,203	58,237	1,201	63,640
	Percent of Sample	0.0	6.6	91.5	1.9	100.0
Stratum:	7/11-7/15		*Stratum 3*			
Sample Size:	94					
Female	No. in Escapement	0	10,807	27,468	901	39,175
	Percent of Sample	0.0	18.3	46.6	1.5	66.4
Male	No. in Escapement	0	5,854	13,509	450	19,813
	Percent of Sample	0.0	9.9	22.9	0.8	33.6
Total	No. in Escapement	0	16,661	40,977	1,351	58,988
	Percent of Sample	0.0	28.2	69.5	2.3	100.0
Stratum:	7/16-7/19		*Stratum 4*			
Sample Size:	84					
Female	No. in Escapement	0	4,757	22,993	0	27,751
	Percent of Sample	0.0	9.2	44.3	0.0	53.4
Male	No. in Escapement	396	3,964	19,425	396	24,183
	Percent of Sample	0.8	7.6	37.4	0.8	46.6
Total	No. in Escapement	396	8,722	42,419	396	51,933
	Percent of Sample	0.8	16.8	81.7	0.8	100.0
Stratum:	6/26-7/28		*Season Total*			
Sample Size:	518					
Female	No. in Escapement	0	18,552	103,632	1,794	123,978
	Percent of Sample	0.0	8.3	46.3	0.8	55.3
Male	No. in Escapement	396	12,791	84,275	2,619	100,081
	Percent of Sample	0.2	5.7	37.6	1.2	44.7
Total	No. in Escapement	396	31,342	187,907	4,412	224,058
	Percent of Sample	0.2	14.0	83.9	2.0	100.0



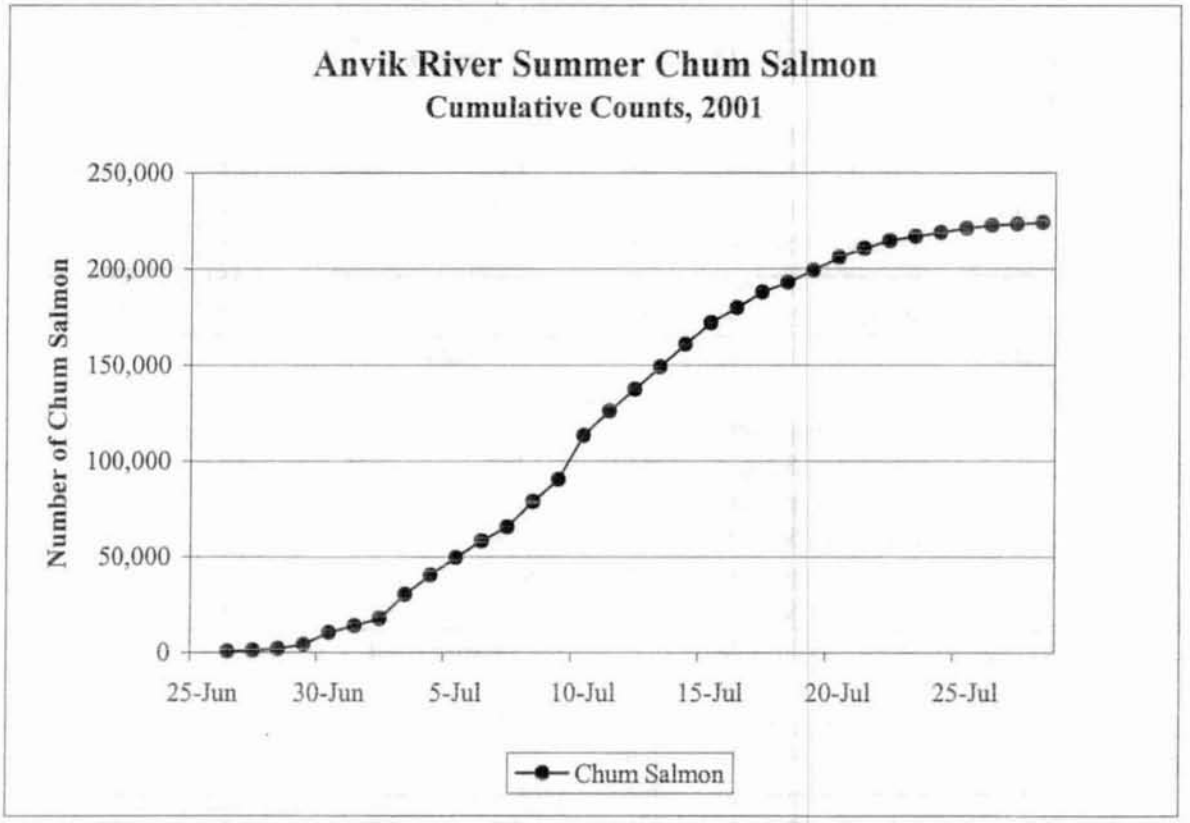


Figure 6. Anivk River summer chum salmon daily and cumulative escapement estimates, 2001.