KOGRUKLUK RIVER WEIR SALMON ESCAPEMENT REPORT, 2001

By

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and

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OEO/ADA STATEMENT

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ABSTRACT

The Holitna River is the largest salmon-producing tributary of the Kuskokwim River. In 1976, the Alaska Department of Fish and Game (ADF&G), recognizing the importance of this river system for salmon, established a weir on the Kogrukluk River, the main branch of the Holitna River. The weir site is located approximately 750 km from the mouth of the Kuskokwim River. In 2001 the weir became operational on 5 July and continued until 25 September. Estimated chinook salmon escapement was 9,299, 7% below the escapement goal of 10,000. Estimated chum salmon escapement was 30,570, 2% above the escapement goal of 30,000. Estimated sockeye salmon escapement was 8,776, slightly less than the recent average of about 9,000 fish. Estimated coho salmon escapement was 19,387, 22% below the escapement goal of 25,000. The age, sex and length (ASL) composition of the chinook, chum and coho salmon escapements was estimated such that simultaneous 95% interval estimates of the age composition had a maximum width of 0.20. Carcass washout rate and timing by species was monitored. Variability in stream hydrological and meteorological conditions was recorded for potential environmental effects on salmon production and timing. In 2001, two mark-and-recapture projects tagged salmon that were subsequently retrieved at the Kogrukluk River Weir. Components to install a resistance board (floating) weir at the Kogrukluk River site -were transported and stored on site for use beginning in 2002.

INTRODUCTION

The Holitna River is the largest salmon-producing tributary of the Kuskokwim River. Recorded evidence of salmon escapements in the Holitna has been documented since 1961 (Schneiderhan 1983, Burkey 1994), when the earliest aerial survey of the Holitna River was conducted. The importance of the Holitna River as a salmon producer and the necessity to more closely monitor salmon escapement motivated the Alaska Department of Fish and Game (ADF&G) to establish a weir on the Kogrukluk River, a tributary of the Holitna, in 1976 (Baxter 1976) (Figure 1).

Chinook (*Oncorhynchus tshawytscha)*, chum (*O. keta)*, sockeye (*O. nerka)*, coho (*O. kisutch)*, and pink salmon (*O. gorbuscha)* spawn in the Kogrukluk River. Kogrukluk River salmon escapements are a relatively small percentage of the overall escapement in the Kuskokwim River drainage. Salmon stocks are widely dispersed and Kuskokwim River drainage monitoring program is limited. It is believed that significant numbers of chinook, sockeye, chum, and coho salmon pass the Kogrukluk River weir when compared to escapements in most other systems within the Kuskokwim River drainage (Burkey et al. 1999).

A unique feature of the Kogrukluk River weir is that it is currently the only site in the Kuskokwim River drainage with a history of enumerating sockeye salmon. Typical sockeye salmon rearing habitat, i.e. large volume lakes, is absent from the Kogrukluk River drainage, although there are some small headwater lakes with an unknown capacity for sockeye salmon production. Sockeye salmon have been observed spawning in the mainstem and in backwaters and sloughs. Sockeye salmon have been documented in several tributaries in the Kuskokwim Basin (Burkey and Salomone 1999) but little is known about these populations. The rearing ecology of these "river-type" sockeye salmon is unknown; apparently they have adapted to a lotic environment. In the Kuskokwim drainage, the contribution of these river-type sockeye salmon to the overall salmon population should not be overlooked. Wood et al. (1987) found that river-type sockeye contributed 39-48% to the total return of sockeye salmon to the Stikine River in 1984 and 1985.

The relative abundance of pink salmon is unknown in the Kogrukluk River because they are able to swim between the weir pickets, but the annual numbers observed are usually very low (less than 20). Considering that the Kogrukluk River weir is approximately 750 km from the mouth of the Kuskokwim River, these pink salmon are among the furthest-inland spawning pink salmon in the world (Morrow 1980, Groot and Margolis 1991).

Subsistence and commercial fishers who live along the Kuskokwim River place major cultural and economic importance on harvests of salmon. Commercial fisheries occur in two non-contiguous districts in the Kuskokwim River stretching from the river mouth to Chuathbaluk. The 10-year average (1990 to 1999) commercial harvest for both districts combined is approximately 23,000 chinook, 59,000 sockeye, 261,000 chum, and 469,000 coho salmon (Burkey et al. 2001). The 1990 to 1999 average subsistence harvest of chinook, sockeye, chum, and coho salmon in the Kuskokwim River is approximately 83,000, 38,000, 75,000 and 38,000 respectively (Burkey et al. 2001).

In the early 1980s, commercial fisheries management began to shift from a strategy emphasizing

guideline-harvest-levels to abundance based strategy. ADF&G established species-specific escapement objectives for streams that had sufficient historical information (Buklis 1993). In most cases, these objectives, later termed biological escapement goals (BEGs), represent simple averages or medians of historical information. The underlying principle in establishing BEGs was that the maintenance of average or above average spawning escapement should provide for sustained yield consistent with historical levels. Although commercial fishery harvests usually occur before many escapements can be fully assessed, postseason escapement assessments are useful for evaluating the effectiveness of fishery management plans and inseason management decisions.

In 1983, BEGs for the Kogrukluk River weir were established for chinook (10,000), chum (20,000), sockeye (2,000), and coho salmon (20,000). In 1984, BEGs were increased to 30,000 for chum salmon, and 25,000 for coho salmon. The Kogrukluk River weir is the only project in the Kuskokwim River drainage with a BEG for coho salmon.

In the winter of 2000 the escapement goal policy underwent the latest in a series of reviews that resulted in the reclassification of escapement goal definitions. The established goals at the Kogrukluk River weir were redefined as Sustainable Escapement Goals (SEGs), which are expressed as a range but have yet to be developed as ranges for this project. Specifically, "A level of escapement, indicated by an index or an escapement estimate that is known to provide for sustained yields over a 5 to 10 year period", is used in situations where a lack of stock specific catch estimates prohibits establishing a BEG. The SEG is the primary management objective for escapement, unless the Board of Fisheries adopts an Optimal Escapement Goal or in-river escapement goal. An SEG will be developed from the best available biological information by the Department of Fish and Game and will be stated as a range that takes into account data uncertainty. The department will seek to maintain escapements within the bounds of the SEG. A more detailed discussion of escapement goals is available in the Sustainable Fisheries Policy, Alaska Administrative Code section 5AAC. 39.222., Policy for the Management of Sustainable Salmon Fisheries.

2001

During the winter of 2001 plans were made to upgrade the current fixed picket weir design with a resistance board (floating) weir design employed elsewhere by Kuskokwim River escapement projects. This design has proven more capable of withstanding high water events, which are a common occurrence in the Kuskokwim drainage, and often results in weir damage or cessation of operations. A site survey was completed in the fall of 2000 on the Kogrukluk River and a suitable site was identified about 200 m downstream from the current location.

Fabrication of the components was accomplished at the Division of Sportfish shop in Palmer with construction completed by mid April. The finished components were transported to Red Devil via a chartered DC-6 aircraft in early May. From there they were loaded onto a small, self propelled barge and transported up the mainstem of the Holitna River to approximately river mile 90 (144 km) during a period of relatively high water in May. The weir crew transported the components over the final leg of the journey to the weir site by skiff, a process that was finished in late June.

Another new aspect of the project in 2001 was to act as a tag recovery site for two different mark and recapture studies. The first was a radio telemetry study involving chinook, chum, and coho salmon. This study was designed to determine the proportion of Holitna River system salmon represented by weir counts for those species. The results of this study are reported by Wuttig *(in prep)*.

The second study was designed to develop population estimates of coho salmon for the entire Kuskokwim River Drainage. Fish were tagged at a location near the village of Kalskag with three different colors of tags, each representing a different capture method. The results of this study are reported by Kerkvliet (*in prep*).

Study Site

The Kogrukluk River is formed by surface runoff from the north side of the plateau that divides the Tikchik Lakes and Nushagak River drainages from the Kuskokwim River drainage. Beginning at a point about five miles from Nishlik Lake, the uppermost lake of the Tikchiks, the Kogrukluk River flows northerly for about 69 km before it joins the Chukowan River about 1.5 km above the site of Kashegelok village (Figure 1). The Kogrukluk River weir is located about 3 km upstream from the confluence with the Chukowan River and 1 km below the confluence of Shotgun Creek.

Project History

The Kogrukluk River weir has the longest operational history of current salmon escapement assessment projects in the Kuskokwim area, and has been operated under a number of different names by various project leaders. Salmon escapement was originally enumerated by means of a counting tower from 1969 to 1978. The tower was originally located about 2 km above the confluence of Shotgun Creek. The tower was moved in some years to different locations because of annual changes in the river channel, but remained above the confluence of Shotgun Creek. Initial installation of a weir was attempted in 1971, but it was destroyed by high water early in the season. Tower (and weir) operation in this section of the Kogrukluk River has been hindered by log jams and shifting channels. The presence of a suitable weir site below the confluence of Shotgun Creek resulted in the replacement of the tower by a weir between 1976 and 1978. Because the weir was located below the confluence of Shotgun Creek, the tower and weir were operated concurrently from 1976 to 1978 to compare escapement estimates between projects. Only the 1978 operations provided an acceptable set of data from each project. In 1978, the tower counts of chinook, chum, and sockeye salmon were 56%, 37% and 47%, respectively, of the weir counts (Baxter 1979). Beginning in 1981, the weir operational period was extended to include coho salmon.

OBJECTIVES

The objectives of the Kogrukluk River weir project are to:

1. Enumerate the daily and total annual spawning escapement of chinook, chum, sockeye, and coho salmon, by sex.

2. Estimate the age, sex and length (ASL) composition of the chinook, chum and coho salmon escapements such that simultaneous 95% interval estimates of the age composition will have a maximum width of 0.20.

3. Monitor the carcass washout rate and timing by species.

4. Monitor variability in stream hydrological and meteorological conditions to provide information relating to potential environmental effects on salmon production and timing.

METHODS

Weir Operation

The weir consists of pickets made of 2 cm black iron pipe held in position by two angle-iron stringers (Figure 2). Each stringer is 3 m in length and perforated to receive about 45 pickets. The stringers are overlapped and braced by "A" shaped steel pipe support pods at each 3 m juncture to span the 70 m wide river. The triangular "A" pods are constructed of 3.8 cm black iron pipe (schedule 80) and Kee Klamps™[2]. The trap is constructed of pickets and stringers to dimensions of 1.8 m wide, 3 m long, and 1.2 m deep. It has a funnel shaped entrance and is placed just upstream of an opening in the weir. Other details of weir construction may be found in *Ignatti Weir Construction Manual* (Baxter 1981).

Salmon Counts

Between 0730 and 2400 hours, salmon were enumerated periodically from an observation position located either on a boardwalk on the weir or on top of the trap. If fish are not needed for ASL sampling, four or five pickets were pulled out of the weir to allow salmon to pass. Generally, salmon were allowed to pass 4 to 8 times a day, with the frequency depending on fish

[2] Mention of brand or product names does not constitute an endorsement by Alaska Department of Fish and Game.

behavior and run magnitude. The weir and trap were normally closed from 2400 to 0730 hours because few salmon migrate upstream during this time. When ASL samples were needed, salmon were sampled from the trap and allowed to proceed upstream. Seven data categories were tallied on different counters. The various categories were: male chinook, jack chinook, female chinook, male chum, female chum, male sockeye, female sockeye, male coho, and female coho. Salmon carcasses that wash down the river and were stopped by the weir were counted by species during daily weir cleaning.

Escapement Estimation / Migration-Timing Database

Every year the Kogrukluk River weir has experienced one or more periods of ineffective operation because of high water levels or funding restrictions. Schneiderhan (1989) used an expansion method for estimating daily counts and, hence, total escapement. After the 1988 field season, he subjectively expanded the historical salmon counts to the historic earliest and latest operational dates to produce a run-timing database with as many years represented as possible. The criteria for accepting a given year for inclusion into the database at that time mandated that more than 50% of the estimates had to be derived from actual counts. The run-timing database then consisted of nine years of data for chinook, sockeye, and chum salmon (1976, 1978, 1979, 1981, 1982, 1984, 1985, 1986, and 1988) and eight years of data for coho salmon (1981-1988). For each species, the salmon migrations in each year were characterized as early, normal, or late depending on the relationship of each year's mean passage to the mean date of all years combined. Early-, normal- and late-run models were used in subsequent years to estimate missing or partial daily counts and total escapement (Appendix A). Since 1988, the migration-timing database has been updated annually and consists of daily and daily cumulative proportions of actual and estimated weir counts of each species for all years with "adequate" operational duration (Appendix B). In 1999 the acceptable criteria was changed; only years where actual counts comprised more than 80% of the total estimated escapement were included in the database that is used to estimate escapement for days when the weir is not operational.

In 1991, the methodology for establishing run-timing models was altered. For each salmon species mentioned above, the historical daily proportions (from actual and estimated counts) were ranked across years. Run-timing models were then based on the 25th (late-run model), 50th (normal-run model), and 75th (early-run model) percentiles of the ranked daily proportions. This modeling method attempts to incorporate both the relative timing of the midpoint of the run and the rate at which the run develops (i.e., number of days between quartiles).

Before an appropriate model was chosen, the normal model was used to estimate missing daily counts. The sum of the model daily proportions, for days with actual counts during the current season, was assumed to be the proportion of the total escapement that was actually counted. Estimates of missing counts were calculated by multiplying the actual cumulative count by the ratio of the daily model proportion to the total proportion assumed to have been actually counted. The final step was a subjective choice of the model. The model chosen was based on a visual "best-fit" of the actual data. This was accomplished by comparing midpoints of the normal model and the reconstructed run, and, to a lesser extent, by comparing the daily estimates to actual counts on days before and after. If the midpoint of the reconstructed run was closer to the midpoint of either the

early or late model, then the estimates were again calculated with the appropriate model. No attempt was made to partition the estimated daily counts by sex.

Age, Sex and Length

Beginning in 1992, the age, sex and length (ASL) sampling plan was altered to a "pulse" sampling design described by Molyneaux and Dubois (1996). The goal of pulse sampling is to collect samples from each temporal stratum in as short a time as possible and from as many strata as possible. A minimum sample of three strata has been established for each species. Sample size goals for each time stratum were 210 chinook, 200 chum, and 170 coho salmon. Sockeye salmon were not sampled. These sample sizes were sufficient to construct simultaneous 95% interval estimates of the age composition having a maximum width of 0.20 using the methods of Bromaghin (1993). The recommended sample sizes were increased to account for the typical proportion of scale samples that are unusable. Within each stratum, a single species was sampled until the objective is achieved, after which another species was sampled.

ASL information was collected from salmon caught in the trap. Length was measured from mid-eye to fork-of-tail to the nearest 5 mm and sex was determined by inspection of external characteristics. After being sampled, salmon were released on the upstream side of the weir. Scales are taken from the preferred area (INPFC 1963) and mounted on gum cards. Gum cards were pressed in acetate using methods described by Clutter and Whitesel (1956). Scale impressions were viewed through a microfiche reader and age was determined by visual identification of annuli. Ages were recorded on mark-sense forms, which were also used to record sex and length data. Completed mark-sense forms were processed through an OPSCAN machine to produce ASCII computer files. These files were then summarized using various custom computer programs. Estimates of age, sex, and length compositions from each stratum were weighted by fish passage to provide estimates for the entire escapement (Molyneaux and Dubois 1999).

Meteorological and Hydrological Factors

Water temperature was measured to the nearest 1° C with a non-calibrated thermometer. Precipitation for the prior 24-hour period was measured to the nearest 1 mm using a standard precipitation gauge (10 to 1 ratio). The observer estimates the amount of cloud cover, wind speed and direction. Water level was measured to the nearest 5 mm from a meter stick set at an arbitrary point in the river. A standardized water level was obtained by measuring the distance between the water level and a benchmark height of 5 m (Baxter 1981). The time was recorded when the meteorological and hydrological measurements were made. Generally, measurements are taken at 1700 hours.

Tag Recapture

Early in the season it became apparent that the current method for passing fish, by removing a couple of weir pickets, was not going to be effective in identifying tagged fish in time to affect capture for examination. The crew was tasked with developing a method to identify a tagged fish and then capture it as it passed through the weir. The methodology of passing fish through the weir was modified so that all fish migrating through the weir were routed through the fish trap. The trap was relocated as close to the thalweg as possible. The trap itself has been redesigned so that it has doors on the upstream and downstream side.

During counting operations the observer was located on a platform located over the downstream entrance to the trap, so that the observer could face downstream over the fyke that connects the trap to the weir. The view from this location is such that any fish attempting to enter the trap through the fyke has to pass directly below the observer *before* it actually enters the trap. The crew designed a "glass bottomed bucket" from an old boat gas tank and a piece of ½" thick Plexiglas to allow them to see through surface glare and get a clear view of any fish attempting to enter the trap. This unit was hung from the fyke so that it was in contact with (floating on) the surface of the water and was vertically adjustable to allow for changing water levels throughout the season.

As a tagged fish entered the fyke it was allowed to pass through the downstream door into the trap, at which time a release was triggered on the upstream door, closing it. Closing the back door completed the capture process. The fish was then removed from the trap and examined. Data such asspecies, length, sex, time, tag number, secondary marks, etc., were recorded on the proper form. The fish was then released on the upstream side of the weir to continue on its merry way to the great reproductive party.

RESULTS

Weir Operation

The weir was installed and operational by 1800 on 4 July and removed for the season 25 September. Actual fish counting operations began on 5 July. The weir experienced two periods in which fish enumeration was not possible. The weir washed out due to high water on 19 July and was not operational until 28 July. On 19 August rising water prompted the crew to remove pickets at 1800 hrs resulting in no enumeration being made from that time until 22 August. The coho migration into the Kogrukluk River had started increasing in strength when the pickets were removed. An estimate for days when the weir was not operational is derived from the historic run-timing database. The exception is the estimate for coho on 19 August, which is proportioned from actual counts using normal methods. No estimates are made for the days after the weir was removed for the season. The operational period in 2001 provided fairly complete seasonal coverage of the

coho migration.

Resistance Board Weir

Water levels were high during the last half of June prohibiting installation of the fixed picket weir. However, the same high water afforded an opportunity to move weir components from the downstream cache site at rm 90 (144 km) on the Holitna River, to the project site at rm 137 (219 km). Complete transfer was accomplished over the course of one week and involved 2 crewmembers and 2 skiffs for each round trip of approximately 130 miles (208 km). The crew logged approximately 1,800 skiff miles, 170 man hours, consumed 500 gallons of fuel and several outboard props to move approximately 20,000 lbs of material the final leg of the trip. These logistical details are mentioned to illustrate the remoteness of the project and the magnitude of the logistics associated with operating in such a remote site.

Salmon Counts and Estimates

Chinook Salmon

The actual count of chinook salmon was 4,502 males (which included 795 jacks) and 2,066 females (Table 1) for a total of 6,568 fish. Females comprised 31% of the actual counts. The midpoint of the migration occurred on 11 July, which was one day earlier than the historical median ("normal") date of 12 July (Figure 3). Using a normal run-timing model (Table 2) to estimate passage for the period during which the weir was inoperative an escapement estimate of 9,299 fish was calculated. A total of 2731 fish were estimated using this method, 29% of the total. Peak days of passage were from 7-17 July, with the highest single day passage of 796 occurring on 9 July. A total of 978 chinook carcasses were recovered from the weir (Table 3).

Sockeye Salmon

The actual count of sockeye salmon was 3,950 males and 2,687 females (Table 1) for a total of 6,637 fish. Females comprised 40% of the actual counts. The midpoint of the run occurred on 13 July, which coincides with the historical median date of 13 July (Figure 4). Using a normal-run-timing model (Table 2) to estimate passage for the time the weir was inoperative, an estimated escapement of 8,776 fish was calculated. A total of 2,139 fish were estimated using this method, or 24% of the total. Days of peak passage were from 10-19 July with the highest single day passage of 849 fish occurring on 14 July. A total of 822 sockeye salmon carcasses were recovered on the weir (Table 3).

Chum Salmon

The actual count of chum salmon was 16,670 males and 5,881 females (Table 1) for a total of 22,551 fish. Females comprised 26% of the actual counts. The midpoint of the run occurred on 18

July, six days later than the historical median date of 12 July (Figure 5). A late-run model (Table 2) was used to estimate passage for the days the weir was inoperative an estimated escapement of 30,570 fish was calculated. A total of 8,019 fish were estimated using this method, 26% of the total. Days of peak passage were from 13-24 July, with the highest single day passage of 1,846 occurring on 14 July. A total of 6,191 chum salmon carcasses were recovered on the weir (Table 3).

Coho Salmon

The actual count of coho salmon was 9,835 males and 8,041 females (Table 1) for a total of 17,876. Females comprised 45% of the actual counts. In contrast to the other species, the coho run in 2001 was early. The midpoint occurred on 28 August, four days earlier than the historical mean date of 2 September (Figure 6). An early run-timing model (Table 2) was used to estimate counts for the inoperative period of 20-21 August. An expansion of actual counts was used to extrapolate coho escapement for 19 August utilizing the normal method. The number of fish estimated was 1,511 fish or 8% of the total escapement estimate of 19,387 fish. Days of peak escapement occurred from 22 August to 2 September. The largest single day coho passage in 2001 was 1,441 occurring on 29 August. Thirty-three carcasses were counted, however project operation terminated well before most of the coho salmon could be expected to have died.

Age, Sex and Length

Chinook Salmon

ASL data were obtained from 397 live specimens in three temporal strata. The age composition of fish sampled was 15.3% age-1.2, 39.3% age-1.3, 43.8% age-1.4, and 1.5% age-1.5. The sex composition was 71.5% male and 28.5% female (Table 4). The mean lengths of females ages-1.2, -1.3, -1.4, and -1.5, were 560 mm (n=1), 716 mm (n=10), 855 mm (n=104), and 903 mm (n=4). The mean lengths of males ages-1.2, -1.3, -1.4, and –1.5, were 556mm (n=62), 678 mm (n=128), 818 mm (n=85), and 799 mm (n=3)(Table 5).

Chum Salmon

ASL data were obtained from 738 live specimens in five temporal strata. The age composition of fish sampled was 0.5% age-0.2, 58.5% age-0.3 and 41.0% age-0.4. The sex composition of the ASL samples was 82.6% male and 17.4% female (Table 6). The mean lengths of females age-0.2, age-0.3, and age-0.4 were 541 mm (n=2), 562 mm (n=57), and 584mm (n=35) respectively. The mean lengths of males age-0.2, age-0.3, and age-0.4 were 530 mm (n=1), 579 mm (n=481), and 601 mm (n=162) respectively (Table 7).

Coho Salmon

A total of 504 live specimens from three temporal strata were sampled. Based on these samples the estimated age composition of the escapement was 1.5% age-1.1, 91.3% age-2.1, and 7.2% age-3.1. The sex composition was 50.9 male and 49.1 female (Table 8). The mean length of

females age-1.1, age-2.1, and age-3.1 were 585 mm (n=1), 579 mm (n=222), and 580 mm (n=23), respectively. The mean lengths of males age-1.1, age-2.1, and age-3.1 were 572 mm (n=7), 575 mm (n=238), and 578mm (n=13), respectively (Table 9).

Meteorological and Hydrological Factors

Water levels were above the historic average at the beginning of the season and remained above average until 3 August when water levels dipped slightly below the historic average. Water levels remained slightly below average until 18 August when the water level rose, peaking on 20 August. The water level then receded and fell below the historic average on 1 September. The water level remained below the historic average from that point until the end of the season (Figure 7).

Water temperatures were below historical values initially, then warmed as the season progressed, averaging 10.8° C compared to 11.1° C historically (Figure 8). This is likely the result of limited solar warming due to a predominance of overcast days.

Rainfall was above historical mean throughout most of the field season in 2001. Total rainfall was 227 mm for the season, which is 25% above the historical mean of 182 mm (Figure 9).

Tag Recovery

Telemetry tags were placed in chinook and chum salmon captured in gillnets in the lower Holitna River near Sleetmute. Tags were also deployed in coho salmon as the season progressed. Radio tags were recovered from 9 chinook, 4 chum, and 29 coho salmon. For a complete report of the telemetry results see Wuttig *in prep.*

The second group of tags was deployed by ADF&G Comfish Division as part of a study designed to help develop a population estimate for the entire Kuskokwim River coho salmon run in 2001. Coho salmon captured by a fish wheel or drift gillnets near the village of Kalskag were tagged with plastic spaghetti tags. Tags were color coded according to type of gear or location of capture. A total of 130 tagged spaghetti tagged coho salmon were recaptured from this project at the Kogrukluk River weir in 2001. For a complete report of the Kuskokwim River coho mark and recapture study results see Kerkviliet *in prep.*

DISCUSSION

Annual Escapements

Chinook Salmon

Commercial fishing for chum salmon remained closed on the Kuskokwim River in 2001 due to the low abundance of returning chum salmon. The relationship between commercial chum salmon harvest and incidental harvest of chinook salmon has been discussed in earlier reports in this series (Cappiello, 1997). It is assumed that, all other factors being equal, the commercial harvest of chinook salmon will vary as effort in the commercial chum salmon fishery varies.

The number of chinook counted at the weir during the 2001 season nearly met the 10,000 fish escapement goal set for the Kogrukluk River. The estimated escapement for chinook was 9,299, 7% below the escapement goal. The weir washing out and the crew removing pickets as a precaution resulted in coverage levels for chinook salmon escapement being nearly 70% complete in 2001.

Sockeye Salmon

The sockeye salmon run was not fully enumerated in 2001. Nearly 75% of the sockeye migration was counted in 2001 in spite of the problems encountered. The sockeye run displayed normal run-timing and nearly met its average, from recent years, of approximately 9,000. Though the Kogrukluk River system does not have an escapement goal for sockeye salmon, 8,776 fish escaped into the Kogrukluk River system. This represents 98% of the recent average.

Annual escapements of sockeye salmon at the Kogrukluk River weir have been highly variable, ranging from 1,670 in 1978 to 29,358 fish in 1993. As with chinook salmon, sockeye salmon are not a targeted species in the commercial fishery and are caught incidentally during the directed chum salmon fishery. The Kogrukluk River weir is the only project currently operating in the Kuskokwim system that has a history of sockeye salmon assessment.

Chum Salmon

Chum salmon escapement coverage at the Kogrukluk River weir in 2001 represented nearly 75% of the run. There were three periods when counting operations at the weir could not be conducted; first of these periods was before 5 July, second was between 20-27 July, and the third occurred between 19-21 August. The run met escapement goals with the second latest run-timing on record. 30,569 chum escaped into the Kogrukluk River, thus producing a surplus of 569 fish, roughly 2% over the escapement goal of 30,000..

Although the escapement goal for the Kogrukluk River was obtained in 2001, the chum run continues to remain weak. The causes behind these weak returns are not entirely clear. Discussion among staff has revolved around ocean conditions being poor for survival of Bering

Sea stocks of salmon in particular, but definitive evidence is lacking. In the period between 1991 and 2001 the chum escapement goal of 30,000 has not been met in 5 of 11 years in the Kogrukluk River. Continued close monitoring is essential, however, and continued careful management is necessary to reduce human-induced impact on stocks that are likely already stressed by natural conditions.

Coho Salmon

Commercial fishing for coho salmon in 2001 opened for 10 periods in the Kuskokwim River with a total harvest of approximately 194,528 fish. This is 59% below the average commercial harvest levels obtained during the 1990's, which averaged approximately 469,000. This was the third lowest harvest of coho salmon in recent years and was at levels similar to that of the early 1970's. Reduced fish processing potential may have also impacted the number of fish commercially harvested. But given the weakness of the coho run in 2001, surplus harvest levels seen during the 1990's would not have been possible with current escapement goals. In the winter of 2000 the Board of Fisheries adopted a regulation dividing fishing district W-1 into two sub-districts, one above Bethel and one below. Fishing periods were alternated between districts to provide a manageable and consistent level of supply to the sole processor buying fish for most of the season. Fishing effort remained below historical averages in 2001. The impact of fishing effort on the harvest level may or may not be significant, given the weakness of the run. The 2001 Kogrukluk River coho salmon escapement was relatively well documented and coverage was near complete with less than 8% of the coho numbers being extrapolated. An estimated 19,387 fish escaped into the Kogrukluk River system in 2001. This escapement is 22% below the escapement goal of 25,000. The escapement for the parent year of 1997 also failed to reach escapement goals by 51% and appeared to be well below average given the magnitude of the harvest. Thus 2001 marks an improvement over its parent year in overall run strength. The stock also shows reason to hope conditions are improving for coho by the noted increase in mean length experienced in 2001.

The 2001 escapement to the Kogrukluk River represents a reversal in the trend of lower escapements of the past two years for chinook and the past five years for chums. Reasons for this are probably varied, but include several major components. In the winter of 2001, recognizing a need for more conservative management in view of several years of declining escapements and in anticipation of another poor run, the Board of Fisheries adopted a schedule for the subsistence fishery during June and July. The purpose of the subsistence fishing schedule was twofold: 1) to create windows of time to allow salmon to proceed upriver during which they would not be subjected to intense netting activities, 2) to spread the subsistence opportunity throughout the Kuskokwim drainage. The practical effect of this policy was to change the status of the subsistence fishery from an unmanaged to a managed fishery. This condition existed during years when there was no commercial fishing in that subsistence fishing was allowed 24hrs/day seven days a week. During years when commercial fishing is allowed, closures around the commercial fishing periods limit subsistence opportunity to approximately 112 hrs /week. The subsistence schedule adopted by the Board allowed for approximately 96 hrs/week.

Another factor that contributed to increased escapements for chinook and chum salmon was that the 2001 run materialized larger than was originally anticipated. While this is probably a marginal

amount at best, especially considering the lack of a commercial fishery, the larger run size did contribute somewhat to the larger escapements. Reasons for the larger than anticipated run are not apparent but may be indicative of conditions in the ocean being more favorable for salmon survival.

Yet another factor that may have contributed to the larger than predicted chum salmon return to the Kuskokwim in 2001 is that the Board of Fish drastically reduced the fishing time allowed for the commercial fishery in the Shumigan Islands area of the Alaska peninsula (Area M), which has been documented to catch western Alaska chum salmon incidentally to a targeted sockeye salmon fishery. The Board reduced fishing time in the Area M fishery to no more than three 16 hour openers per week. Assessing what impact this had on Kuskokwim bound chum salmon is further compounded by a fisher strike during the season. However, it is likeythat the reduced commercial fishery in Area M did result in some unquantifiable increase in the Kuskokwim chum salmon return.

An additional factor that may have contributed to the increased chinook, chum, and sockeye salmon escapements seen throughout the Kuskokwim basin in 2001 was an appeal throughout the basin for subsistence fishers to review their needs for salmon and to take less if that was feasible in view of the weak projected returns. While another unquantifiable variable, this action likely resulted in more fish making to the spawning grounds.

Each of the above factors contributed to the larger than predicted escapement of chinook, chum and sockeye salmon in the Kuskokwim in 2001 on some level. However, considering that no commercial harvest occurred and that harvest has recently averaged somewhere near 500,000 chum, 50,000 chinook, and 40,000 sockeye salmon, the 2001 return of these species must still be classified as poor. It is encouraging to note that efforts to increase escapements while still providing for subsistence opportunity did prove successful while delivering what are arguably the best documented chum salmon *escapements* since 1997.

Age, Sex, and Length

Age compositions of escapements may be utilized in developing stock-recruitment models, which can predict run size. It is unfortunate that this is not possible for any one spawning aggregate, or the Kuskokwim River drainage in general, because stock specific exploitation and total run size, for most years, is unknown. Still, age composition information can help predict the relative magnitude of future runs. Strong or weak returns from the younger returning adults may be indicative of the survival of those cohorts, hence, strength of spawner returns from those cohorts in following years. Such interpretations should be made with caution for several reasons: (1) there is a tendency in some species for the age compositions to shift towards younger fish as the run progresses, therefore, thoroughness of the sampling regimen is important, (2) disparate removal of age classes in the commercial and subsistence fisheries may occur, (3) seemingly high percentages of one age class could also be caused by low percentages of another, and (4) scale aging error within and among readers has not been fully assessed.

Comparisons between ASL data collected at the Kogrukluk River weir and other escapement

projects should be made with the weir's location in mind. The Kogrukluk River weir is within the upper drainage area (altitude ~107 m) 205 km from the confluence of the Holitna and Kuskokwim Rivers. Most of the salmon that enter the Holitna River drainage spawn in the mainstem and tributaries downstream from the Kogrukluk River. How these factors come into play is uncertain, but most escapement assessment projects are located closer to the Kuskokwim River or Bay and downstream of major spawning grounds, hence may be more representative of the entire primary-tributary spawning aggregates. Comparisons made in this discussion are non-statistical.

Chinook Salmon

The male-female ratio from the ASL samples in 2001 was 71.5%-29.5%. A total of 397 live chinook salmon were sampled over the course of the migration (Table 4), compared to 98 chinook sampled in 2000. This represents a marked improvement over past years in the sample size obtained for ASL data collection with 299 additional fish sampled when compared with 2000. The sex ratio of the actual counts was 31% female (Table 1). The sex ratio obtained from ASL data and weir counts showed a great deal of agreement with less than a 2% deviation.

Chinook salmon from ASL sampling data in 2001 showed a decrease in the mean length over all age classes with the exception of females aged-1.5, which agreed with the historical mean length of 903 mm. The largest divergence from the historical mean was for males age-1.5, which showed a decrease of 113 mm from the historical mean of 912 mm. This large deveation from the historical mean may be an artifact due to the small size of the sample, 3 males age-1.5, given the fact that females age-1.5 agreed with the historical mean. Males and females age-1.4 both showed a decrease in mean length, 10 mm and 13 mm respectively. Age-1.3 chinook showed a 4%, (males) and 8% (females) decrease in the mean length compared to the historical mean. Jack chinook salmon (age-1.2) showed a 14 mm decrease from the historical mean. One female age-1.2 was sampled and fell 32 mm below the historical mean, although females age-1.2 are rare and only represent 7 fish in the historical data base for the Kogrukluk River. Decreases in mean length may indicate the oceanic conditions encountered. Chinook salmon spend a significant portion of their life cycle in the marine environment, thus may help in identifying trends. Female chinook salmon, age-1.5, mean length agreed with the historical mean. This indicates that conditions encountered by this year class were normal, or near normal. The decrease in mean length in subsequent year classes may indicate an increase in pressure on these stocks. Discussion among staff members has revolved around possible oceanic conditions and their effects associated with the last El-nino event, but evidence is, at this point, lacking.

Chum Salmon

Females comprised 17.4% of the ASL sample in 2001 (Table 6) and comprised 19% of the actual counts (Table 1). The percentage of females in the actual counts represents an improvement over ratios from the last few years when the percentage of females was around 16%. The percentage of females derived from ASL data is significantly higher in 2001 (17.4%) than it was in 2000 (8.5%). The ratio for females in the ASL and count data shows less than a 2% discrepancy, which is an improvement over past years ratios. This discrepancy is not as significant as the continued low percentage of female spawners, which for unexplained reasons, has been exhibiting a

downward trend in recent years (Molyneaux and DuBios 1999). A possible reason is that the project is located high in the Holitna drainage with a great deal of suitable chum salmon spawning habitat below the project site. Females may simply be selecting and using suitable spawning habitat down stream of the weir, then remain near these areas. Males may continue to move up the drainage, thus biasing the counts. This disparity may be more acute in years when abundance is low and competition among females for available spawning space is reduced. However, this is speculative. Sampling effort needs to be conducted closer to the main stem Kuskokwim River in order to determine if an abnormal ratio exists in the entire Holitna drainage.

Mean lengths of all age classes of chum salmon were very near historical values ($\leq$) in 2001. This was true for both sexes. The exception is for age-0.2 males where the mean length was 530mm and the historical mean value is 567mm. But the sample for age-0.2 males contained only one specimen. Age-0.2 chum usually comprise only a small portion of the escapement historically.

Coho Salmon

The 2001 coho salmon run at the weir was 49.1 female according to the ASL data (Table 8), whereas the actual counts were identified as 45% female (Table 1). Coho aged-2.1 comprised 91.3% of the run compared to the historical mean of 92.8% (Table 8).

Coho salmon lengths in 2001 were generally larger than their historical average. Male's age-1.1, 2.1, and 3.1 had corresponding lengths of 572 mm (n=7), 575 mm (n=238), and 578 mm (n=13). Females age-1.1, 2.1, and 3.1 had corresponding lengths of 585 mm (n=1), 579 mm (n=222), and 580 mm (n=23). Males age-1.1 was the only group that did not exceed its historic average of 558 mm. Males age-2.1 and 1.3 exceeded their historical average by 6 mm (569 mm) and 7 mm (571 mm) respectively. The largest disparity between mean lengths and historical averages in 2001 occurred in female's age-1.1 with a mean length of 585 mm (n=1), compared to the historical mean length of 571mm. But the sample for age-1.1 contained only one specimen. Females age-2.1 and 3.1 were also significantly larger in 2001 compared to their historic average by 12 mm (567 mm) and 13 mm (567 mm) respectively. Preliminary data from other sites in the Kuskokwim River drainage tend to indicate an increase in length over the historical mean values. Since coho spend only one year of their life cycle in the marine environment, and obtain a large portion of their growth during this period, a general increase in length could be indicative of improved foraging conditions in the marine environment. The coho run in 2001 was a weak run. Low numbers of of a given age class in the marine environment would likely reduce the intra-species competition for the year class, thus making increases in length likely. Improvements in marine conditions for salmon, reduced intra-species competition, or a combination of these factors may account for the increase in mean length observed in 2001.

Historically there have been differences between sex ratios of ASL data and observer derived ratios for all species passing the Kogrukluk River weir. Reasons for the disparity between ASL and observer data is unknown but may be due to some type of selectivity related to the location of the trap, to observer identification error, sample sizes or a combination of all three. In 2001, discrepancies in the sex data from ASL and count data showed a marked improvement over that of past years with the less than 4 % difference in the species sampled for ASL data.. A likely

factor is that the fish trap was relocated nearer the thalweg in 2001, allowing for a more representative sample. The improvement noted may have been effected by the use of the "glass bottom bucket", used to identify tagged salmon for recovery efforts, by improving viewing conditions.

Discrepancies in ASL and count data are of concern because the Kogrukluk River weir is the only project currently being operated in the Kuskokwim River drainage that obtains comparative sex data from both ASL and actual counts. All the other projects rely on ASL information to apportion counts by sex. The quality of escapement is often judged by the ratio of males to females, thus if current ASL methodology is flawed there may be a danger in placing unwarranted faith in the male-female ratios. A possible way to address this concern would be to refine a systematic approach for obtaining ASL samples. The current technique is based loosely on passage and opportunity without much regard given to methods other than the "pulse" based strategy. This strategy basically mandates that a pulse of ASL data be collected in the shortest temporal span and that a minimum of three pulses be collected for a given species per season. This method has not been standardized, in terms of how and when sampling should occur, in fact because of operational nuances between projects it may be incompatible with standardization. As another option, counts by sex in locations other than the Kogrukluk River as a method to contrast the results found there with other locations in the Kuskokwim River drainage. This method may add observer bias, which would be another variable to consider.

Resistance Board Weir

Once the weir was on site, water levels remained too high to install until mid August. This was late enough in the season that it was decided to postpone installation of the resistance board weir until the summer of 2002.

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Table 1. Actual daily and estimated counts of chinook, sockeye, chum and coho salmon, Kogrukluk River weir, 2001.
Bold italic numbers are estimates derived using run timing models.

	chinook				chum			sockeye			coho		
Date	male	jacks[a]	female	Totals	male	female	Totals	male	female	Totals	male	female	Totals
21-Jun				*1*									
22-Jun				*3*						*1*			
23-Jun				*7*						*2*			
24-Jun				*9*						*4*			
25-Jun				*17*						*4*			
26-Jun				*27*						*10*			
27-Jun				*44*						*5*			
28-Jun				*29*			*6*			*10*			
29-Jun				*124*			*26*			*15*			
30-Jun				*54*			*9*			*23*			
1-Jul				*139*			*37*			*134*			
2-Jul				*255*			*86*			*91*			
3-Jul				*242*			*152*			*143*			
4-Jul				*543*			*338*			*199*			
5-Jul	115	13	45	160	315	108	423	13	37	50			
6-Jul	326	30	71	397	320	43	363	55	75	130			
24-Jan	264	40	122	386	457	163	620	128	117	245			
8-Jul	515	56	183	698	593	178	771	268	219	487			
9-Jul	603	100	193	796	627	291	918	315	288	603			
10-Jul	229	36	107	336	700	344	1,044	183	162	345			
	450	105	194	644	686	373	1,059	296	338	634			
12-Jul	359	82	156	515	816	395	1,211	402	346	748			
13-Jul	273	46	135	408	1,251	514	1,765	322	202	524			
	288	46	160	448	1,286	560	1,846	530	316	846			
15-Jul	165	26	56	221	1,181	408	1,589	358	141	499			
16-Jul	268	45	176	444	1,314	497	1,811	238	108	346			
17-Jul	147	30	83	230	297	483	780	182	49	231			
18-Jul	67	15	44	111	943	278	1,221	101	44	145			
19-Jul	189	30	127	316	1,282	370	1,652	177	58	235			
20-Jul				*264*			*1,207*			*317*			
21-Jul				*184*			*1,285*			*320*			
22-Jul				*208*			*1,254*			*165*			
23-Jul				*218*			*765*			*152*			
24-Jul				*141*			*990*			*140*			
25-Jul				*115*			*681*			*96*			
26-Jul				*57*			*703*			*126*			
27-Jul				*43*			*459*			*103*			
28-Jul	19	7	31	50	267	140	407			77			0
29-Jul	41	21	31	72	635	145	780	64	35	99			0
30-Jul	31	15	46	77	703	148	851	57	35	92			0
31-Jul	24	10	22	46	444	95	539	44	17	61	2		2
	16	5	13	29	388	61	449	56	17	73	2	0	2
2-Aug	28	8	25	53	477	78	555	34	18	52	9	0	9
3-Aug	11	1	13	24	289	29	318	25	12	37	3	2	5
4-Aug	11	5	6	17	236	20	256	20	12	32	9	3	12
5-Aug	5	1	4	9	304	35	339	17	6	23	2	2	4
6-Aug	7	5	7	14	204	23	227	11	7	18	13	7	20

-Continued-

Table 1. (page 2 of 2)

	chinook				chum			sockeye			coho		
Date	male	jacks[a]	female	Totals	male	female	Totals	male	female	Totals	male	female	Totals
7-Aug	3	1	1	4	156	12	168	5	4	9	4	3	7
8-Aug	9	5	3	12	133	21	154	6	10	16	22	10	32
9-Aug	1	0	0	1	60	8	68	3	0	3	9	7	16
10-Aug	5	3	1	6	66	8	74	5	3	8	6	3	9
11-Aug	3	1	0	3	60	15	75	1	3	4	25	19	44
12-Aug	1	0	0	1	61	13	74	10	1	11	111	79	190
13-Aug	5	0	2	7	27	4	31	6	1	7	49	55	104
14-Aug	4	2	0	4	20	4	24	5	2	7	131	111	242
15-Aug	5	2	6	11	17	1	18	2	2	4	137	100	237
16-Aug	1	1	1	2	23	5	28	1	0	1	503	264	767
17-Aug	1	1	0	1	9	4	13	2	1	3	222	164	386
18-Aug	0	0	0	0	10	1	11	1	0	1	491	324	815
19-Aug				*4*			*8*			*1*			*576*[b]
20-Aug				*0*			*7*			*0*			*312*
21-Aug				*1*			*7*			*0*			*623*
22-Aug	1	0	0	1	2	0	2	0	0	0	555	512	1,067
23-Aug	1	0	0	1	5	0	5	0	1	1	343	214	557
24-Aug	1	0	0	1	1	2	3	1	0	1	601	405	1,006
25-Aug	2	0	0	2	2	0	2	2	0	2	434	280	714
26-Aug	1	1	1	2	0	1	1	0	0	0	364	267	631
27-Aug	3	0	0	3	0	0	0	1	0	1	519	387	906
28-Aug	0	0	0	0	0	0	0	0	0	0	378	340	718
29-Aug	0	0	0	0	1	0	1	0	0	0	823	618	1,441
30-Aug	1	0	0	1	0	0	0	0	0	0	401	368	769
31-Aug	1	0	0	1	0	0	0	0	0	0	453	414	867
1-Sep	0	0	0	0	0	0	0	1	0	1	330	299	629
2-Sep	0	0	0	0	0	0	0	0	0	0	426	357	783
3-Sep	0	0	0	0	0	0	0	0	0	0	179	143	322
4-Sep	0	0	0	0	0	0	0	0	0	0	233	219	452
5-Sep	0	0	0	0	0	1	1		0	0	216	185	401
6-Sep	0	0	0	0	0	0	0	0	0	0	62	44	106
7-Sep	0	0	0	0	0	0	0	0	0	0	110	90	200
8-Sep	0	0	1	1	0	0	0	0	0	0	295	278	573
9-Sep	0	0	0	0	0	0	0	0	0	0	149	139	288
10-Sep	0	0	0	0	0	0	0	0	0	0	156	208	364
11-Sep	0	0	0	0	0	0	0	0	0	0	45	39	84
12-Sep	1	0	0	1	0	0	0	0	0	0	78	94	172
13-Sep	0	0	0	0	0	0	0	0	0	0	87	90	177
14-Sep	0	0	0	0	0	0	0	1	0	1	71	66	137
15-Sep	0	0	0	0	0	1	1	0	0	0	41	51	92
16-Sep	0	0	0	0	0	0	0	0	0	0	288	284	572
17-Sep	0	0	0	0	0	1	1	0	0	0	129	129	258
18-Sep	0	0	0	0	0	0	0	0	0	0	81	86	167
19-Sep	0	0	0	0	0	0	0	0	0	0	52	55	107
20-Sep	1	0	0	1	0	0	0	0	0	0	32	30	62
21-Sep	0	0	0	0	0	0	0	0	0	0	67	69	136
22-Sep	0	0	0	0	0	0	0	0	0	0	32	30	62
23-Sep	0	0	0	0	0	0	0	0	0	0	26	41	67
24-Sep	0	0	0	0	1	0	1	0	0	0	10	27	37
25-Sep	0	0	0	0	1	0	1	1	0	1	19	30	49
Totals	4,502	795	2,066	***9,299***	16,670	5,881	***30,570***	3,950	2,687	8,776	9,835	8,041	***19,387***

[a] Chinook jacks included in male totals.

[b] estimated from partial counts (18 hr counts of 432 /.75 to yield a 24hr count of 576)

Table 2. Run timing models (cumulative proportion) used to calculate missing total and daily counts of salmon at the Kogrukluk River weir, 2001.
Bold italic proportions were used to estimate days of missing fish passage.

Date	Run Timing (N) chinook	Run Timing (N) sockeye	Run Timing (L) chum	Run Timing (E) coho
21-Jun	***0.000***	***0.000***	***0.000***	***0.0000***
22-Jun	***0.001***	***0.000***	***0.000***	***0.0000***
23-Jun	***0.001***	***0.000***	***0.000***	***0.0000***
24-Jun	***0.002***	***0.001***	***0.000***	***0.0000***
25-Jun	***0.004***	***0.001***	***0.000***	***0.0000***
26-Jun	***0.007***	***0.002***	***0.001***	***0.0000***
27-Jun	***0.012***	***0.003***	***0.001***	***0.0000***
28-Jun	***0.015***	***0.004***	***0.003***	***0.0000***
29-Jun	***0.028***	***0.006***	***0.005***	***0.0000***
30-Jun	***0.034***	***0.009***	***0.011***	***0.0000***
01-Jul	***0.049***	***0.024***	***0.022***	***0.0000***
02-Jul	***0.076***	***0.035***	***0.034***	***0.0000***
03-Jul	***0.103***	***0.051***	***0.048***	***0.0000***
04-Jul	***0.161***	***0.075***	***0.069***	***0.0000***
05-Jul	0.203	0.091	0.088	0.0000
24-Jan	0.215	0.125	0.109	0.0000
07-Jul	0.251	0.169	0.145	0.0000
08-Jul	0.323	0.228	0.175	0.0000
09-Jul	0.377	0.291	0.227	0.0000
	0.425	0.324	0.287	0.0000
11-Jul	0.489	0.389	0.333	0.0000
12-Jul	0.561	0.448	0.395	0.0000
	0.581	0.498	0.439	0.0000
14-Jul	0.626	0.570	0.483	0.0000
15-Jul	0.687	0.646	0.528	0.0000
16-Jul	0.738	0.701	0.585	0.0000
17-Jul	0.783	0.738	0.625	0.0000
18-Jul	0.805	0.757	0.669	0.0000
19-Jul	0.830	0.782	0.711	0.0000
20-Jul	***0.858***	***0.819***	***0.736***	0.0000
21-Jul	***0.878***	***0.856***	***0.769***	0.0000
22-Jul	***0.900***	***0.876***	***0.792***	0.0000
23-Jul	***0.924***	***0.893***	***0.816***	0.0000
24-Jul	***0.939***	***0.910***	***0.831***	***0.0000***
25-Jul	***0.951***	***0.921***	***0.842***	***0.0000***
26-Jul	***0.957***	***0.935***	***0.859***	***0.0000***
27-Jul	***0.962***	***0.947***	***0.874***	***0.0000***
28-Jul	0.968	0.956	0.890	***0.0000***
29-Jul	0.971	0.966	0.902	***0.0001***
30-Jul	0.975	0.971	0.916	***0.0002***
	0.980	0.975	0.930	***0.0002***
01-Aug	0.985	0.982	0.941	0.0003
02-Aug	0.986	0.987	0.952	0.0005
03-Aug	0.988	0.990	0.961	0.0007
04-Aug	0.990	0.992	0.968	0.0010
05-Aug	0.990	0.993	0.974	0.0016
06-Aug	0.992	0.995	0.979	0.0018
07-Aug	0.994	0.995	0.982	0.0024
08-Aug	0.995	0.996	0.984	0.0030
09-Aug	0.995	0.997	0.987	0.0047
10-Aug	0.996	0.998	0.989	0.0062
11-Aug	0.997	0.998	0.991	0.0085
12-Aug	0.998	0.999	0.992	0.0134
13-Aug	0.998	0.999	0.994	0.0193

(Continued)

Table 2. Continued Page 2 of 2

Date continued	Run Timing (N) chinook	Run Timing (N) sockeye	Run Timing (L) chum	Run Timing (E) coho
14-Aug	0.999	0.999	0.995	0.0268
15-Aug	0.999	0.999	0.996	0.0317
16-Aug	0.999	0.999	0.997	0.0424
17-Aug	0.999	0.999	0.998	0.0512
18-Aug	0.999	0.999	0.999	0.0652
19-Aug	***1.000***	***1.000***	***0.999***	***0.1360***
20-Aug	***1.000***	***1.000***	***0.999***	***0.1510***
21-Aug	***1.000***	***1.000***	***0.999***	***0.1810***
22-Aug	1.000	1.000	0.999	0.1490
23-Aug	1.000	1.000	0.999	0.1701
24-Aug	1.000	1.000	1.000	0.1910
25-Aug	1.000	1.000	1.000	0.2108
26-Aug	1.000	1.000	1.000	0.2371
27-Aug	1.000	1.000	1.000	0.2667
28-Aug	1.000	1.000	1.000	0.3054
29-Aug	1.000	1.000	1.000	0.3365
30-Aug	1.000	1.000	1.000	0.3647
31-Aug	1.000	1.000	1.000	0.4268
01-Sep	1.000	1.000	1.000	0.4909
02-Sep	1.000	1.000	1.000	0.5529
03-Sep	1.000	1.000	1.000	0.5872
04-Sep	1.000	1.000	1.000	0.6404
05-Sep	1.000	1.000	1.000	0.6840
06-Sep	1.000	1.000	1.000	0.7133
07-Sep	1.000	1.000	1.000	0.7536
08-Sep	1.000	1.000	1.000	0.8023
09-Sep	1.000	1.000	1.000	0.8413
10-Sep	1.000	1.000	1.000	0.8583
11-Sep	1.000	1.000	1.000	0.8856
12-Sep	1.000	1.000	1.000	0.9017
13-Sep	1.000	1.000	1.000	0.9119
14-Sep	1.000	1.000	1.000	0.9222
15-Sep	1.000	1.000	1.000	0.9233
16-Sep	1.000	1.000	1.000	0.9240
17-Sep	1.000	1.000	1.000	0.9371
18-Sep	1.000	1.000	1.000	0.9404
19-Sep	1.000	1.000	1.000	0.9470
20-Sep	1.000	1.000	1.000	0.9581
21-Sep	1.000	1.000	1.000	0.9624
22-Sep	1.000	1.000	1.000	0.9685
23-Sep	1.000	1.000	1.000	0.9758
24-Sep	1.000	1.000	1.000	0.9805
25-Sep	1.000	1.000	1.000	0.9836
26-Sep	1.000	1.000	1.000	0.9876
27-Sep	1.000	1.000	1.000	0.9907
28-Sep	1.000	1.000	1.000	0.9926
29-Sep	1.000	1.000	1.000	0.9942
30-Sep	1.000	1.000	1.000	0.9940
01-Oct	1.000	1.000	1.000	0.9956
02-Oct	1.000	1.000	1.000	0.9972
03-Oct	1.000	1.000	1.000	0.9985
04-Oct	1.000	1.000	1.000	0.9991
05-Oct	1.000	1.000	1.000	1.0000
6-Aug	1.000	1.000	1.000	1.0000

Table 3. Daily counts of chinook, chum, and sockeye salmon carcasses at the Kogrukluk River weir, 2001

Date	Chinook	Sockeye	Chum
5-Jul			
6-Jul			6
7-Jul			7
8-Jul			11
9-Jul			19
10-Jul			12
11-Jul		1	19
12-Jul		2	21
13-Jul		3	34
14-Jul		0	29
15-Jul		2	37
16-Jul		0	60
17-Jul		0	80
18-Jul		2	80
19-Jul		0	119
20-Jul			
21-Jul			
22-Jul			
24-Jan			
24-Jul			
25-Jul			
26-Jul			
28-Jul			
29-Jul	17	4	305
	16	2	294
31-Jul	26	2	346
1-Aug	32	2	364
2-Aug	49	4	348
3-Aug	53	3	381
4-Aug	49	5	236
5-Aug	42	12	259
6-Aug	49	12	271
7-Aug	72	25	382
8-Aug	111	33	448
9-Aug	82	59	327
10-Aug	40	36	199
11-Aug	62	59	327
12-Aug	69	53	266
13-Aug	98	81	234
14-Aug	35	61	152
15-Aug	24	54	146
16-Aug	16	47	138
17-Aug	13	77	93
18-Aug	16	61	72
19-Aug			
20-Aug			
21-Aug			
22-Aug	0	3	5
23-Aug	0	16	8
24-Aug	1	16	6
25-Aug	0	13	9
26-Aug	0	17	6
27-Aug	2	8	8
28-Aug	0	14	7
29-Aug	0	0	0
30-Aug	0	7	1
31-Aug	0	6	6
1-Sep	0	0	0
2-Sep	0	0	0
3-Sep	1	6	5
4-Sep	0	0	0
5-Sep	1	6	4
6-Sep	0	0	0
7-Sep	0	6	2
8-Sep	0	0	0
9-Sep	0	0	0
10-Sep	0	0	0
11-Sep	0	0	0
12-Sep	0	1	1
13-Sep	0	0	0
14-Sep	0	0	0
15-Sep	0	0	0
16-Sep	0	0	0
17-Sep	0	0	1
18-Sep	0	0	0
19-Sep	0	0	0
20-Sep	2	1	0
21-Sep	0	0	0
22-Sep	0	0	0
23-Sep	0	0	0
24-Sep	0	0	0
25-Sep	0	0	0
Total	978	822	6191

* Except Coho. In most years project operations are terminated before a majority of the Coho salmon can be expected to have died.

Table 4. Mean length (mm) by sex and age based on samples of trap caught chinook salmon at the Kogrukluk River weir, 2001.

Year	Sample Dates (Stratum Dates)	Sample Size	Age Class Sex	1.1 Esc.	%	1.2 Esc.	%	1.3 Esc.	%	2.2 Esc.	%	1.4 Esc.	%
2001	7/6, 8, 10 (6/21-7/11)	140	M	-	0.0	632.00	12.9	2,316.00	47.1	-	0.0	842.00	17.2
			F	-	0.0	35.00	0.7	245.00	5.0	-	0.0	807.00	16.4
			Subtotal	-	0.0	667.00	13.6	2,561.00	52.1	-	0.0	1,649.00	33.6
	7/13-18 (7/12-23)	219	M	-	0.0	587.00	16.4	912.00	25.6	-	0.0	961.00	27.0
			F	-	0.0	-	0.0	33.00	0.9	-	0.0	1,010.00	28.3
			Subtotal	-	0.0	587.00	16.4	945.00	26.5	-	0.0	1,971.00	55.3
	7/30-8/2, 4 (7/24-8/29)	38	M	-	0.0	171.00	21.1	129.00	15.8	-	0.0	43.00	5.3
			F	-	0.0	-	0.0	21.00	2.6	-	0.0	407.00	50.0
			Subtotal	-	0.0	171.00	21.1	150.00	18.4	-	0.0	450.00	55.3
	Season	397	M	-	0.0	1,390.00	14.9	3,356.00	36.1	-	0.0	1,846.00	19.9
			F	-	0.0	35.00	0.4	300.00	3.2	-	0.0	2,224.00	23.9
			Total	-	0.0	1,425.00	15.3	3,656.00	39.3	-	0.0	4,070.00	43.8
	Historical Total	6,534.00	M	332.74	0.3	17,564.41	16.7	35,683.03	33.9	39.05	0.0	15,543.21	14.7
			F	-	0.0	279.63	0.3	5,907.75	5.6	-	0.0	27,128.25	25.7
			Total	332.74	0.3	17,844.03	16.9	41,590.78	39.5	39.05	0.0	42,671.46	40.5

Year	Sample Dates (Stratum Dates)	Sample Size	Age Class Sex	2.3 Esc.	%	1.5 Esc.	%	2.4 Esc.	%	1.6 Esc.	%	Total Esc.	%
2001	7/6, 8, 10 (6/21-7/11)	140	M	-	0.0	-	0.0	-	0.0	-	0.0	3,789.00	77.1
			F	-	0.0	35.00	0.7	-	0.0	-	0.0	1,123.00	22.9
			Subtotal	-	0.0	35.00	0.7	-	0.0	-	0.0	4,912.00	100.0
	7/13-18 (7/12-23)	219	M	-	0.0	33.00	0.9	-	0.0	-	0.0	2,493.00	69.9
			F	-	0.0	32.00	0.9	-	0.0	-	0.0	1,075.00	30.1
			Subtotal	-	0.0	65.00	1.8	-	0.0	-	0.0	3,568.00	100.0
	7/30-8/2, 4 (7/24-8/29)	38	M	-	0.0	22.00	2.7	-	0.0	-	0.0	364.00	44.7
			F	-	0.0	21.00	2.6	-	0.0	-	0.0	450.00	55.3
			Subtotal	-	0.0	43.00	5.3	-	0.0	-	0.0	814.00	100.0
	Season	397	M	-	0.0	54.00	0.6	-	0.0	-	0.0	6,646.00	71.5
			F	-	0.0	89.00	0.9	-	0.0	-	0.0	2,648.00	28.5
			Total	-	0.0	143.00	1.5	-	0.0	-	0.0	9,294.00	100.0
	Historical Total	6,534.00	M	65.87	0.1	486.27	0.5	12.54	0.0	-	0.0	69,725.89	66.2
			F	-	0.0	2,330.79	2.2	-	0.0	8.46	0.0	35,658.26	33.8
			Total	65.87	0.1	2,817.07	2.7	12.54	0.0	8.46	0.0	105,379.00	100.0

Table 5. Mean length (mm) of chinook salmon at the Kogrukluk River weir based on escapement samples collected with a fish trap.

Year	Sample Dates (Stratum Dates)	Sex		Age Class 1.1	1.2	1.3	2.2	1.4	2.3	1.5	2.4	1.6
2001	7/6, 8, 10 (6/21-7/11)	M	Mean Length		554	677		796				
			Std. Error		10	6		16				
			Range		485-615	536-800	0	604-970				
			Sample Size	0	18	66		24	0	0	0	0
		F	Mean Length		560	715		845		870		
			Std. Error		-	24		11		-		
			Range		560-560	624-806		707-920		870-870		
			Sample Size	0	1	7	0	23	0	1	0	0
	7/13-18 (7/12-23)	M	Mean Length		563	682		839		801		
			Std. Error		7	6		8		11		
			Range		460-654	577-779		650-969		790-812		
			Sample Size	0	36	56	0	59	0	2	0	0
		F	Mean Length			686		858		888		
			Std. Error			38		6		7		
			Range			648-724		745-989		881-894		
			Sample Size	0	0	2	0	62	0	2	0	0
	7/30-8/2, 4 (7/24-8/29)	M	Mean Length		542	676		782		797		
			Std. Error		4	13		22		-		
			Range		520-554	632-714		760-803		797-797		
			Sample Size	0	8	6	0	2	0	1	0	0
		F	Mean Length			766		865		980		
			Std. Error			-		13		-		
			Range			766-766		740-951		980-980		
			Sample Size	0	0	1	0	19	0	1	0	0
	Season	M	Mean Length		556	678		818		799		
			Range		460-654	536-800		604-970		790-812		
			Sample Size	0	62	128	0	85	0	3	0	0
		F	Mean Length		560	716		855		903		
			Range		560-560	642-806		707-989		870-980		
			Sample Size	0	1	10	0	104	0	4	0	0
	Historic Total	M	Mean Length	427	570	705	660	828	826	912	775	
			Range	355- 639	381- 760	481- 935	550- 660	530- 1100	777- 875	786- 1089	775- 775	
			Sample Size	12	1,091	2,600	2	955	2	56	1	0
		F	Mean Length		592	782		868		903		912
			Range		568- 635	613- 963		695- 1035		740- 1072		873- 950
			Sample Size	0	7	301	0	1,691	0	207	0	2

Table 6. Escapement of chum salmon partitioned by age, sex, and time stratum based on trap caught samples for the Kogrukluk River weir, 2001.

Year	Sample Dates (Stratum Dates)	Sample Size	Sex	Age Class 0.2 Esc.	0.2 %	0.3 Esc.	0.3 %	0.4 Esc.	0.4 %	0.5 Esc.	0.5 %	Total Esc.	Total %
2001	07/07, 07/08	65	M	0	0.0	1,769	36.9	2,212	46.2	0	0.0	3,981	83.1
			F	0	0.0	148	3.1	663	13.8	0	0.0	811	16.9
	6/28-7/10		Subtotal	0	0.0	1,917	40.0	2,875	60.0	0	0.0	4,792	100.0
	07/12, 07/13	161	M	0	0.0	6,132	39.8	6,036	39.1	0	0.0	12,168	78.9
	7/14		F	96	0.6	1,629	10.6	1,533	9.9	0	0.0	3,258	21.1
	7/11-7/21		Subtotal	96	0.6	7,761	50.3	7,569	49.1	0	0.0	15,426	100.0
	7/29, 7/30	171	M	0	0.0	5,298	67.3	1,520	19.3	0	0.0	6,818	86.5
			F	46	0.6	737	9.4	277	3.5	0	0.0	1,060	13.5
	7/22-8/1		Subtotal	46	0.6	6,035	76.6	1,797	22.8	0	0.0	7,878	100.0
	8/03, 8/04	180	M	0	0.0	1,166	79.4	187	12.7	0	0.0	1,353	92.2
			F	0	0.0	82	5.6	33	2.2	0	0.0	115	7.8
	8/02-8/05		Subtotal	0	0.0	1,248	85.0	220	15.0	0	0.0	1,468	100.0
	8/06, 8/07	161	M	6	0.6	838	83.8	81	8.1	0	0.0	925	92.5
	8/08		F	0	0.0	75	7.5	0	0.0	0	0.0	75	7.5
	8/6-8/29		Subtotal	6 0	0.6	913	91.3	81	8.1	0	0.0	1,000	100.0
	Season	738	M	6 0	0.0	15,203	49.7	10,036	32.8	0	0.0	25,245	82.6
			F	142 0	0.5	2,671	8.7	2,506	8.2	0	0.0	5,319	17.4
			Total	148 0	0.5	17,874	58.5	12,542	41.0	0	0.0	30,564	100.0
	Historical	9,216	M	1,768	0.4	173,601	37.7	152,352	33.1	3,746	0.8	331,449	71.9
	Total		F	966	0.2	68,378	14.8	58,945	12.8	1,018	0.2	129,299	28.1
			Total	2,734	0.6	241,979	52.5	211,298	45.9	4,654	1.0	460,748	100.0

Table 7. Mean length (mm) by sex and age based on samples of trap caught chum salmon at the Kogrukluk River weir, 2001.

Year	Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
2001	7/07, 7/08 (6/28-7/10)	M	Mean Length		595	604	
			Std. Error		7	4	
			Range		530-692	564-645	
			Sample Size	0	24	79	0
		F	Mean Length		576	602	
			Std. Error		34	9	
			Range		542-610	571-650	
			Sample Size	0	2	9	0
	7/12, 7/13, 7/14 (7/11-7/21)	M	Mean Length		579	601	
			Std. Error		4	4	
			Range		503-650	520-685	
			Sample Size	0	64	63	0
		F	Mean Length	561	561	577	
			Std. Error		8	6	
			Range	561-561	508-632	535-620	
			Sample Size	1	17	16	0
	7/29, 7/30 (7/22-8/01)	M	Mean Length		575	598	
			Std. Error		2	5	-
			Range		502-648	548-682	
			Sample Size	0	115	33	0
		F	Mean Length	498	561	577	
			Std. Error		7	8	
			Range	498-498	514-611	543-591	
			Sample Size	1	16	6	0
	8/03, 8/04 (8/02-8/05)	M	Mean Length		577	597	
			Std. Error		2	6	
			Range		505-660	550-660	
			Sample Size	0	143	23	0
		F	Mean Length		564	584	
			Std. Error		4	2	
			Range		545-585	580-590	
			Sample Size	0	10	4	0
	8/06, 8/07 8/08 (8/06-8/29)	M	Mean Length	530	568	603	
			Std. Error		2	9	
			Range	530-530	500-630	530-650	
			Sample Size	1	135	13	0
		F	Mean Length		574		
			Std. Error		8		
			Range		525-610		
			Sample Size	0	12	0	0
	Seasonal Total	M	Mean Length	530	579	601	
			Std. Error		2	3	
			Range	530-530	500-692	520-685	
			Sample size	1	481	162	0
		F	Mean Length	541	562	584	
			Std. Error		5	5	
			Range	498-561	508-632	535-650	
			Sample size	2	57	35	0
	Historical total	M	Mean Length	564	583	604	613
			Range	470- 654	470- 692	470- 654	470- 654
			Sample size	53	4,206	2,792	76
		F	Mean Length	544	562	579	576
			Range	470- 654	470- 654	470- 654	470- 654
			Sample size	23	1,195	835	28

Years excluded are 1971 - 1973, 1983, 1987, 1989, 1994 and 1998.

Table 8. Escapement of coho salmon partitioned by age, sex, and time stratum based on trap caught samples for the Kogrukluk River weir, 2001.

Year	Sample Dates (Stratum Dates)	Sample Size	Sex	Age Class									
				1.1		2.1		2.2		3.1		Total	
				Esc.	%	Esc.	%	Esc.	%	Esc.	%	Esc.	%
2001	8/09,8/11, 8/12	174	M	40	1.1	1,739	50.0	0	0.0	80	2.3	1,859	53.4
	8/13, 8/14		F	20	0.6	1,460	42.0	0	0.0	140	4.0	1,620	46.6
	(7/31-8/19)		Subtotal	60	1.7	3,199	92.0	0	0.0	220	6.3	3,479	100.0
	8/25, 8/26, 8/27	180	M	107	1.1	4,699	48.9	0	0.0	213	2.2	5,019	52.2
			F	0	0.0	4,218	43.9	0	0.0	374	3.9	4,592	47.8
	(8/20-8/31)		Subtotal	107	1.1	8,917	92.8	0	0.0	587	6.1	9,611	100.0
	9/04, 9/06, 9/07	150	M	126	2.0	2,645	42.0	0	0.0	210	3.3	2,981	47.3
	9/08		F	0	0.0	2,938	46.7	0	0.0	378	6.0	3,316	52.7
	(9/01-9/25)		Subtotal	126	2.0	5,583	88.7	0	0.0	588	9.3	6,297	100.0
	Season	504	M	273	1.4	9,083	46.9	0	0.0	503	2.6	9,859	50.9
			F	20	0.1	8,616	44.4	0	0.0	892	4.6	9,528	49.1
			Total	293	1.5	17,699	91.3	0	0.0	1,395	7.2	19,387	100.0
	Historical	4,064	M	3,647	1.7	120,068	57.0	6	0.0	5,687	2.7	129,525	61.4
	Total		F	1,534	0.7	75,312	35.7	0	0.0	4,388	2.1	81,262	38.6
			Total	5,181	2.5	195,380	92.7	6	0.0	10,075	4.8	210,783	100.0

Table 9. Mean length (mm) by sex and age based on samples of trap caught coho salmon at the Kogrukluk River weir, 2001.

Year	Sample Dates (Stratum Dates)	Sex		Age Class 1.1	2.1	2.2	3.1
2001	8/09, 8/11, 8/12, 8/14	M	Mean Length	535	573		578
			Std. Error	50	4		17
			Range	485-585	490-640		540-620
			Sample Size	2	87	0	4
	(7/31-8-19)						
		F	Mean Length	585	573		573
			Std. Error		3		6
			Range	585-585	510-670		550-600
			Sample Size	1	73	0	7
	8/25, 8/26, 8/27, 8/30	M	Mean Length	580	572		576
			Std. Error	20	4		11
			Range	560-600	475-640		560-605
			Sample Size	2	88	0	4
	(8/20-8/31)						
		F	Mean Length		579		573
			Std. Error		3		6
			Range		470-690		555-600
			Sample Size	0	79	0	7
	9/04, 9/06, 9/07, 9/8	M	Mean Length	577	583		580
			Std. Error	29	5		9
			Range	520-615	520-790		555-610
			Sample Size	3	63	0	5
	(9/01-9/25)						
		F	Mean Length		582		589
			Std. Error		3		6
			Range		525-645		565-610
			Sample Size		70	0	9
	Season	M	Mean Length	572	575		578
			Std. Error	17	3		6
			Range	485-615	475-790		540-620
			Sample Size	7	238	0	13
		F	Mean Length	585	579		580
			Std. Error		2		4
			Range	585-585	470-690		550-610
			Sample Size	1	222	0	23
	Historical Total	M	Mean Length	559	569	555	570
			Range	495- 670	435- 695	555- 555	480- 655
			Sample Size	107	2,432	1	111
		F	Mean Length	572	570		572
			Range	490- 610	465- 665		500- 650
			Sample size	26	1,345	0	90

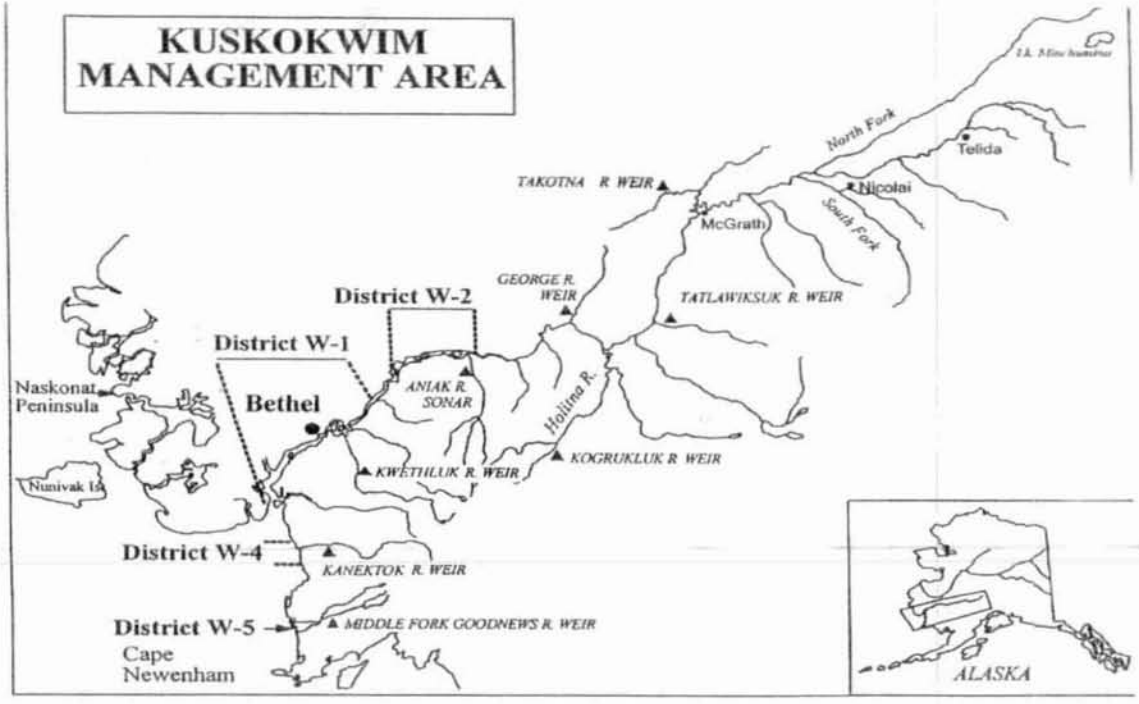

Figure 1. Kuskokwim Area map showing management districts and escapement monitoring projects.

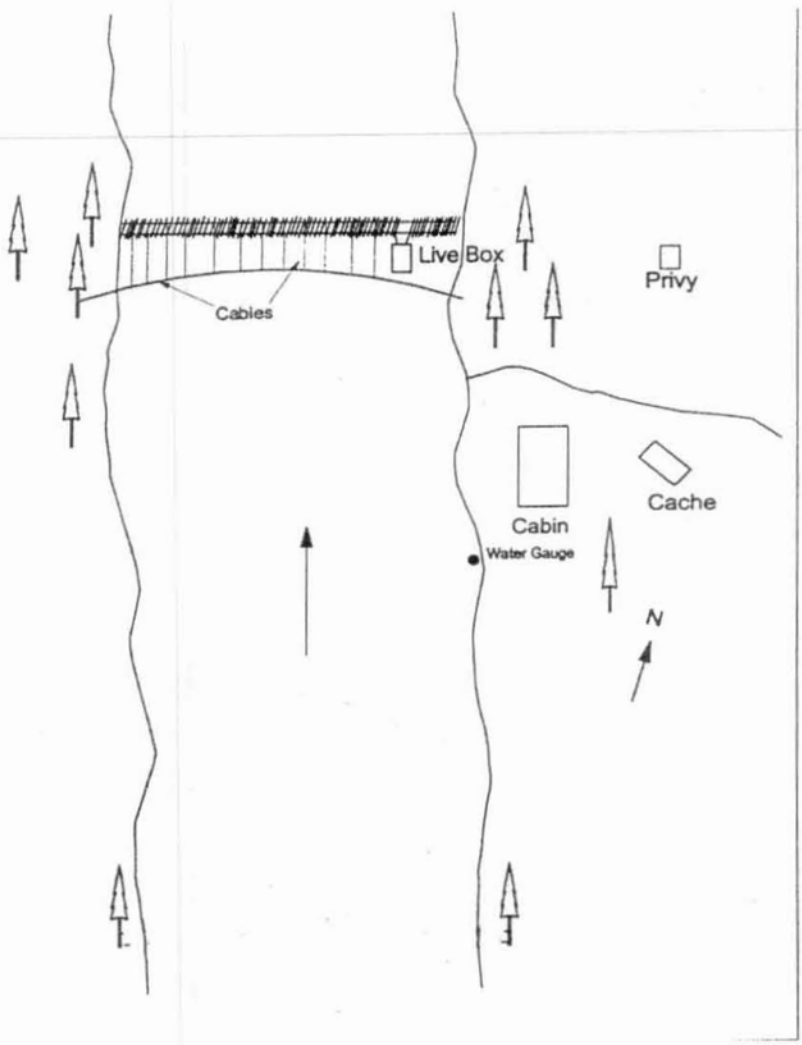

Figure 2. Schematic of the Kogrukluk Weir camp site.

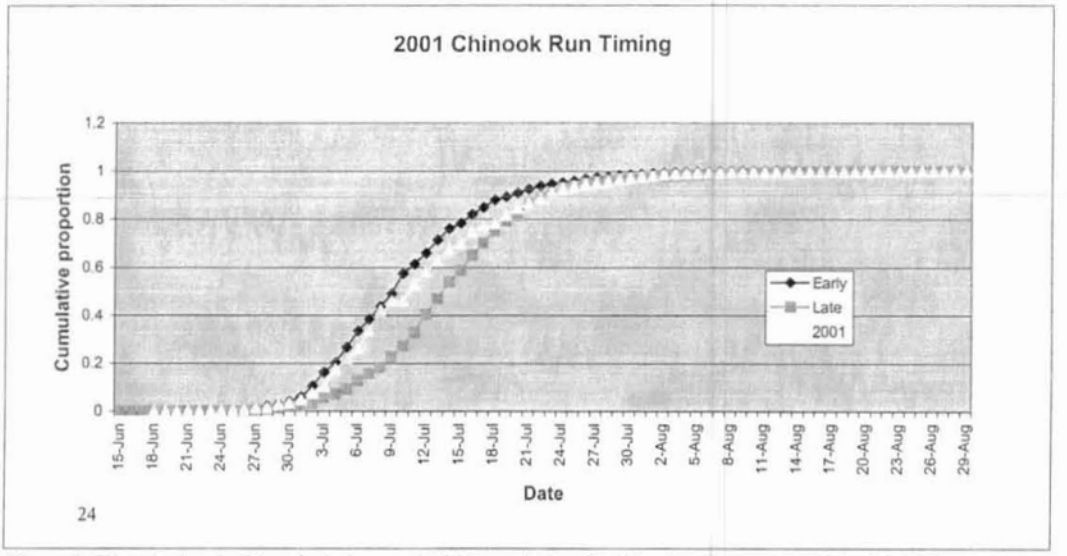

Figure 3. Historical early, historicaly late, and 2001 run timing for chinook salmon at the Kogrukluk River weir.

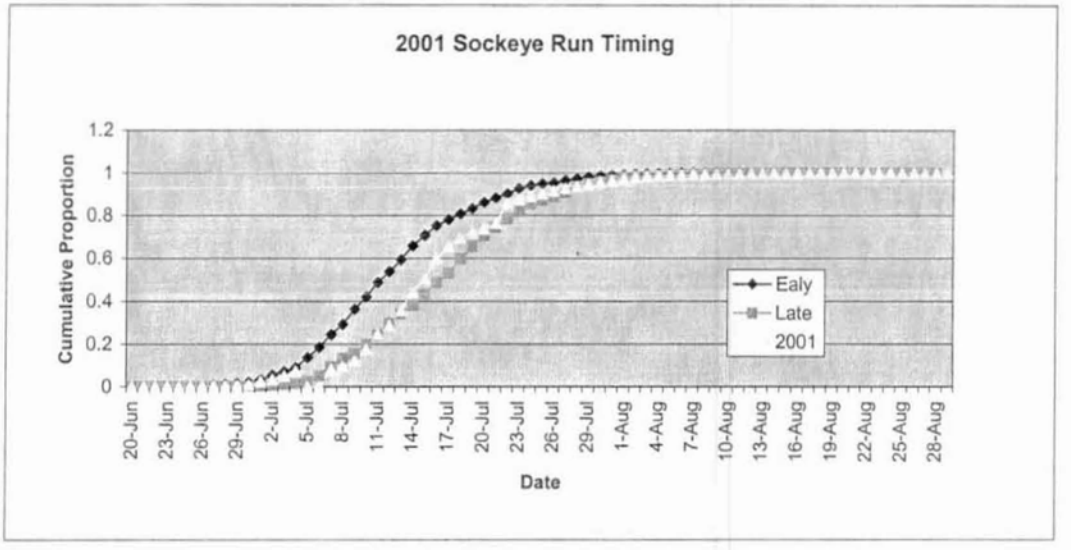

Figure 4. Historical early, historicaly late, and 2001 run timing for sockeye salmon at the Kogrukluk River weir.

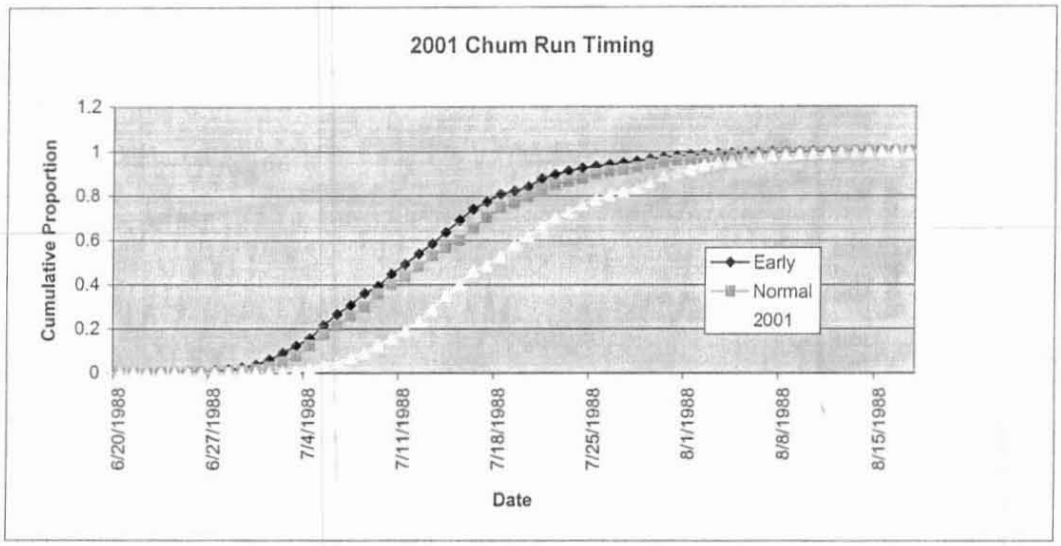

Figure 5. Historical early, historical normal, and 2001 run timing for chum salmon at the Kogrukluk River weir.

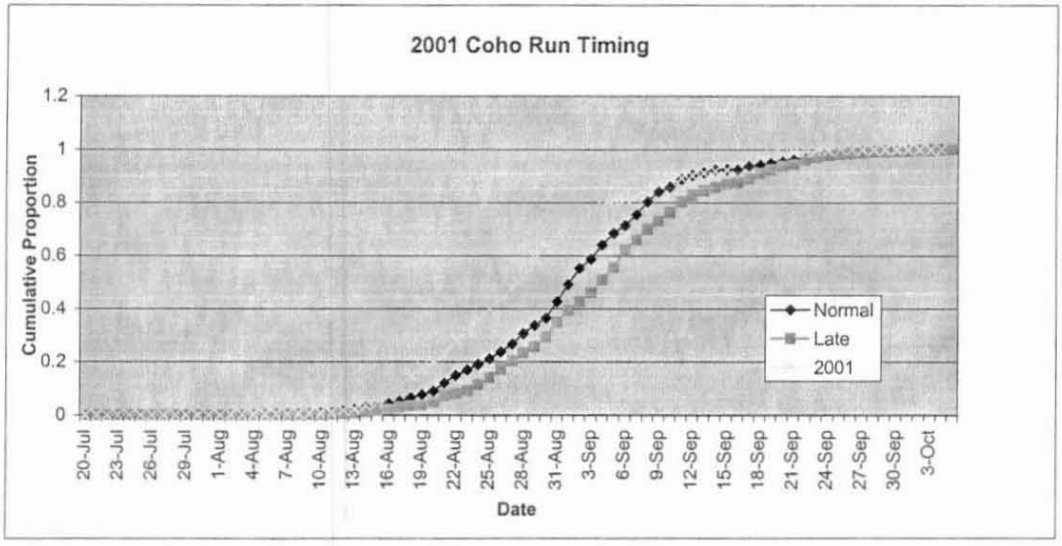

Figure 6. Historical normal, historical late, and 2001 run timing for coho salmon at the Kogrukluk River weir.

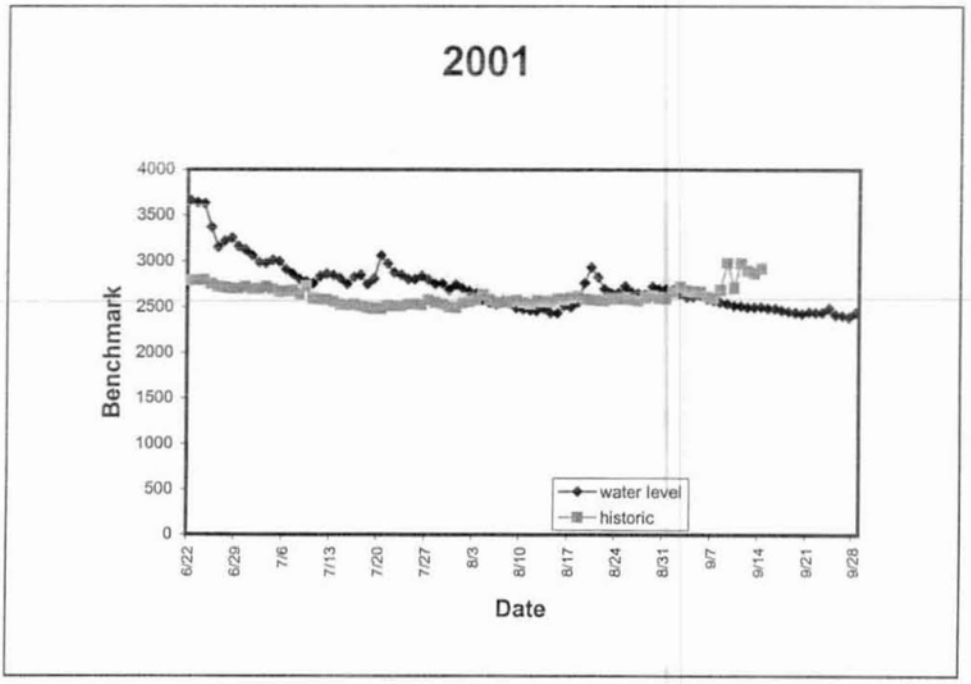

Figure 7. Daily water level in 2001 and historic daily average water level at the Kogrukluk River weir.

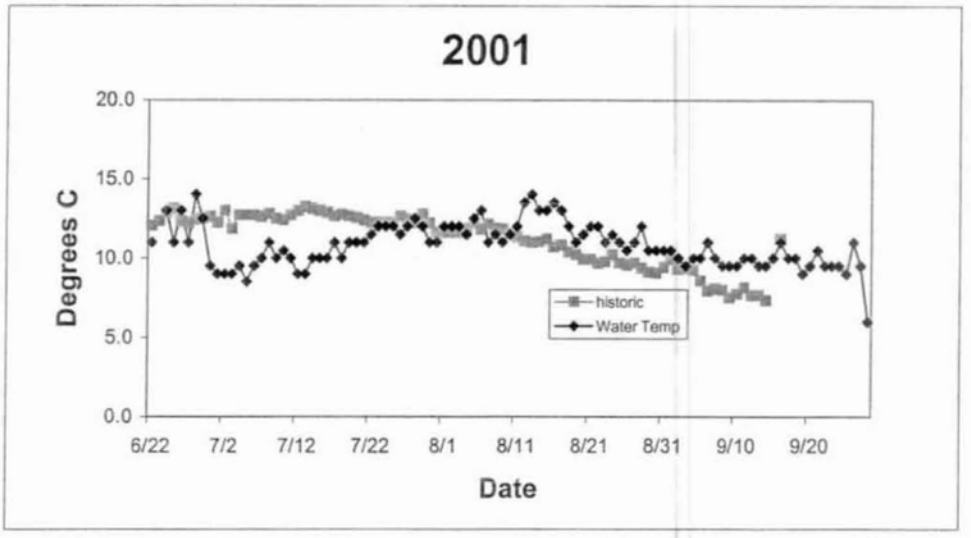

Figure 8. Daily water temperature in 2001 and historic average water temperatures at the Kogrukluk River weir.

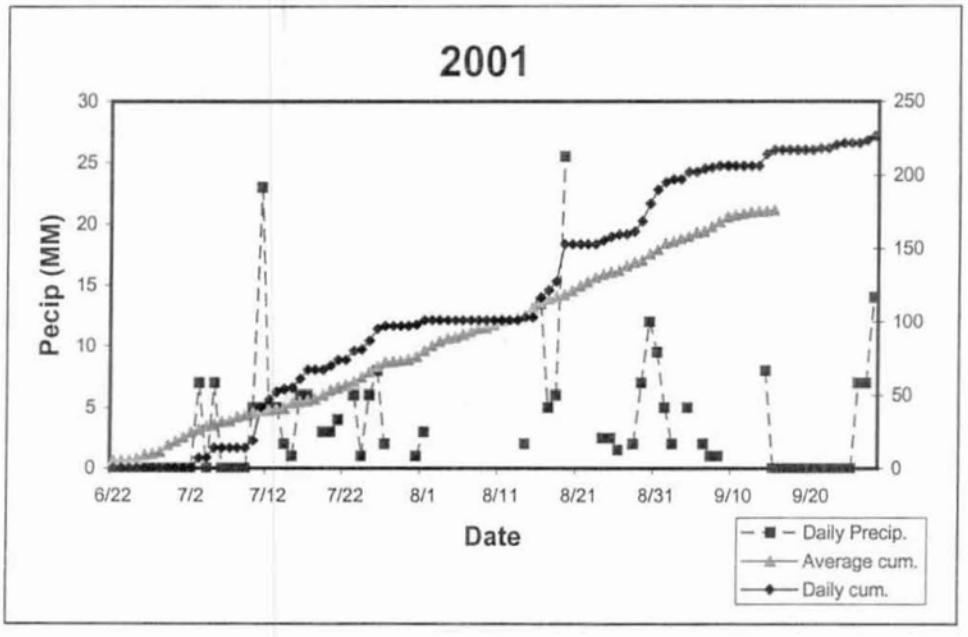

Figure 9. Daily, accumulative daily, and average seasonal precipitation at the Kogrukluk River, 2001. weir.

Appendix A. Factor table for historical salmon escapement estimates, Kogrukluk River 1976-2001.

Chinook				Sockeye				Coho[a]				Chum			
Y	T[b]	Count	Prop. Missed	Est'd Total	T[b]	Count	Prop. Missed	Est'd Total	T[b]	Count	Prop. Missed	Est'd Total	T[b]	Count	Prop. Missed	Est'd Total
#	L	5,500	0.0142	5,579	N	2,302	0.0103	2,326					N	8,046	0.0087	8,117
#	(N)	763	0.6077	1,945	(N)	732	0.5527	1,637					(N)	7,404	0.6192	19,443
#	N	13,102	0.0413	13,667	N	1,646	0.0144	1,670					N	47,099	0.0213	48,125
#	N	10,104	0.1088	11,338	N	2,432	0.0746	2,638					L	13,959	0.2495	18,599
#		676	c	6,572		403	c	3,200						5,638	c	41,777
#	E	16,052	0.0362	16,655	E	17,691	0.0208	18,066	N	11,450	0.0004	11,455	E	56,262	0.0192	57,365
#	E	5,325	0.5156	10,993	E	11,729	0.3219	17,297	N	35,582	0.0586	37,796	N	40,549	0.3672	64,077
#	(N)	1,032	0.6551	2,992	(N)	375	0.6812	1,176	L	8,327	0.0247	8,538	(N)	3,248	0.6547	9,407
#	N	4,928	0.0000	4,928	N	4,133	0.0000	4,133	E	25,304	0.0830	27,595	N	41,484	0.0000	41,484
#	L	4,034	0 0.0682	4,619	L	4,344	0.0034	4,359	E	14,318	0.1291	16,441	L	13,851	0.0769	15,005
#	L	2,922	0.4200	5,038	N	3,252	0.2301	4,224	E	14,717	0.3461	22,506	N	11,980	0.1846	14,693
#		d		4,063		d		973	N	19,756	0.1343	22,821		d		17,422
#	N	7,677	0.0974	8,505	E	4,235	0.0368	4,397	N	11,722	0.1325	13,512	E	28,498	0.2793	39,540
#	N	4,908	0.5889	11,940	N	2,599	0.5527	5,811				e	N	15,543	0.6070	39,540
#	N	10,097	0.0118	10,218	N	8,382	0.0029	8,406	L	2,736	0.5538	6,132	N	26,555	0.0078	26,765
#	N	6,132	0.2189	7,850	N	14,450	0.1218	16,455	L	7,059	0.2915	6,132	L	21,331	0.1181	24,188
#	N	6,397	0.0530	6,755	L	7,328	0.0210	7,540	(N)	2,715	0.8958	26,057	N	32,051	0.0602	34,105
#	N	10,516	0.1473	12,332	N	27,219	0.0729	29,358	(N)	4,437	0.7837	20,517	N	26,926	0.1559	31,899
#	(E)	8,310	0.4543	1 15,227	L	5,676	0.6001	14,192	(E)	27,461	0.2085	34,695	(E)	23,756	0.4490	46,635
#	E	18,856	0.0860	20,630	N	10,581	0.0377	10,996	E	17,492	0.3721	27,861	N	28,292	0.0923	31,265
#	E	13,734	0.0327	14,199	N	15,221	0.0107	15,385	E	47,011	0.0701	50,555	E	47,010	0.0306	48,495
#	E	13,112	0.0131	13,286	N	13,059	0.0014	13,078	L	11,611	0.0511	12,237	L	7,902	0.0071	7,958
#	(L)	3,009	0.7515	12,107	(L)	5,321	0.6828	16,773	L	22,614	0.0710	24,348	(L)	13,104	0.6429	36,441
#	L	5,472	0.0176	5,570	L	5,777	0.0015	5,864	L	10,094	0.1994	12,609	L	13,497	0.0233	13,820
#	L	3,180	0.0393	3,310	L	2,778	0.0310	2,867	E	32,875	0.0070	33,135	L	11,077	0.0360	11,491
#	N	6,567	0.2937	9,298	N	6,634	0.2441	8,776	E	18,308	0.0557	19,387	L	23,009	0.2473	30,569

a Coho migrations were not monitored prior to 1981

b The timing model used for estimating missed counts depends on the distribution of the mean date of migration (E-early, N-normal, L- late). The use of () indicates assumed timing.

c From Baxter (1980); insufficient data to estimate escapements using time series techniques.

d Except for coho, escapements were estimated from a ratio of unknown 1987 escapement and known 1987 aerial assesments to known 1988 escapement and known 1988 aerial assesment. Coho escapments estimated using time series techniques.

e Heavy rain and high river levels allowed only two days of counts during the coho migration.

Appendix B1. Historical cumulative estimated escapement of chinook salmon at the Kogrukluk River weir for years with adequate data.

Date	1976(L)	1978(N)	1979(N)	1981(E)	1984(N)	1985(L)	1988(N)	1990(N)	1992(N)	1993(N)	1995(E)	1996(E)	1997(E)	1999 (L)	2000 (L)	2001(N)
	5,579	13,667	11,338	16,655	4,928	4,619	8,505	10,218	6,755	12,332	20,630	14,199	13,286	5,570	3,310	9,299
17-Jun				*0*												
18-Jun		*0*		*1*												
19-Jun		*1*		*3*	1			*1*		*1*	*2*		*1*			
20-Jun		*3*	*0*	*8*	1			*1*	*1*	*2*	*4*	*1*	*2*			
21-Jun		*6*	*1*	*18*	1			*3*	*2*	*4*	*6*	*3*	*4*			*1*
22-Jun		*11*	*3*	*38*	1			*6*	*4*	*8*	*12*	*7*	*8*			*4*
23-Jun		*19*	*7*	*78*	3			*13*	*9*	*17*	*29*	*19*	*17*			*11*
24-Jun		*29*	*15*	*158*	4	0	*0*	*25*	*17*	*31*	*52*	*35*	*32*			*20*
25-Jun		*49*	*30*	*318*	6	1	*3*	*47*	*31*	*57*	*95*	*65*	*60*			*36*
26-Jun		*99*	*60*	*418*	7	*3*	*8*	*72*	*47*	*87*	*146*	*102*	*94*			*64*
27-Jun		*179*	*105*	*738*	11	*6*	*18*	*121*	*79*	*146*	*243*	*170*	*161*			*108*
28-Jun		*279*	*130*	1,072	68	*11*	*48*	127	*123*	*227*	*380*	*265*	212			*137*
29-Jun	0	391	*205*	1,605	155	*21*	*98*	150	*190*	*349*	*588*	*412*	822			*261*
30-Jun	5	456	*290*	2,167	200	*41*	*178*	269	*259*	*474*	*794*	492	1,418			*315*
01-Jul	21	798	*420*	2,784	515	*61*	*228*	318	*331*	*724*	*1,211*	756	1,925	6		*454*
02-Jul	23	916	576	3,688	819	*111*	*338*	781	586	*1,017*	*1,727*	1,754	2,097	*8*	1	*709*
03-Jul	41	1,401	683	4,567	1,073	*231*	*553*	1,142	973	1,623	2,040	2,585	3,024	*10*	43	*952*
04-Jul	56	2,205	941	5,307	1,212	*276*	*828*	1,321	1,136	1,985	4,064	2,982	3,611	*15*	83	*1,495*
05-Jul	126	2,834	1,312	6,308	1,309	*311*	1,177	1,748	1,371	2,642	5,526	4,446	4,636	*58*	178	1,655
06-Jul	169	3,179	1,694	7,388	1,547	*333*	1,642	2,201	1,445	3,350	7,305	6,134	5,426	*75*	357	2,052
07-Jul	235	3,432	2,003	8,603	1,721	*393*	2,338	2,456	1,590	4,226	8,611	7,922	6,568	128	465	2,438
08-Jul	392	4,051	2,393	9,376	1,865	499	2,921	3,298	1,728	4,941	9,744	8,802	7,054	169	511	3,136
09-Jul	704	4,935	2,736	10,423	2,030	618	3,492	3,449	2,545	5,821	10,423	9,485	7,762	225	700	3,932
10-Jul	1,165	5,606	3,355	11,406	2,053	1,034	4,176	4,677	2,870	6,825	12,249	10,037	7,981	373	824	4,268
11-Jul	1,512	6,307	3,817	12,155	2,157	1,200	4,880	5,205	3,301	7,508	13,046	10,376	8,205	572	1,058	4,912
12-Jul	1,786	6,939	4,577	12,681	2,442	1,445	5,538	6,206	3,786	8,161	14,760	10,794	8,737	830	1,340	5,427
13-Jul	2,502	7,536	5,509	13,172	2,704	1,750	6,030	6,317	3,924	8,849	15,524	11,509	9,040	1,034	1,489	5,835
14-Jul	2,814	8,149	6,491	13,630	3,028	2,019	6,625	6,704	4,229	9,275	15,899	12,024	9,592	1,321	1,641	6,283
15-Jul	3,065	8,822	7,039	14,190	3,359	2,165	7,075	7,759	4,637	9,642	16,145	12,306	9,990	1,450	1,827	6,504
16-Jul	3,312	9,549	7,739	14,642	3,635	2,493	7,386	8,406	4,802	10,051	16,919	12,487	10,314	1,805	2,048	6,948
17-Jul	3,599	10,201	8,409	15,021	3,860	2,668	7,536	8,624	5,128	10,385	17,608	12,724	10,691	2,136	2,198	7,178
18-Jul	4,023	10,689	8,873	15,343	3,965	2,967	7,639	9,032	5,408	10,796	17,981	12,951	11,168	2,262	2,300	7,289
19-Jul	4,306	11,250	9,228	15,641	4,064	3,226	7,763	9,092	5,603	10,958	18,456	13,211	11,525	2,657	2,403	7,605
20-Jul	4,400	11,725	9,562	15,884	4,201	3,403	7,810	9,189	5,747	11,230	18,730	13,299	11,917	2,878	2,454	*7,869*
21-Jul	4,792	11,996	9,907	16,071	4,325	3,554	7,917	9,386	5,914	11,430	18,996	13,479	12,263	3,666	2,531	*8,053*
22-Jul	4,982	12,298	10,085	16,254	4,436	3,626	8,025	9,487	6,079	11,489	19,358	13,577	12,471	3,931	2,644	*8,262*
23-Jul	5,153	12,501	10,216	16,372	4,525	3,730	8,109	9,615	6,238	11,590	19,509	13,633	12,581	4,161	2,722	*8,480*
24-Jul	5,235	12,800	10,524	16,450	4,594	3,900	8,165	9,672	6,341	11,678	19,643	13,710	12,634	4,396	2,815	*8,621*
25-Jul	5,322	12,980	*10,640*	16,492	4,630	4,016	8,211	9,709	6,425	11,730	19,863	13,809	12,668	4,825	2,872	*8,736*
26-Jul	5,378	13,094	*10,780*	16,533	4,674	4,146	8,249	9,764	6,458	11,806	20,022	13,840	12,768	4,906	2,902	*8,793*
27-Jul	5,428	13,186	*10,846*	16,564	4,704	4,212	8,276	9,799	6,484	11,883	20,157	13,865	12,781	5,019	2,955	*8,836*
28-Jul	5,448	13,258	*10,944*	16,600	4,741	4,290	8,292	9,843	6,511	12,004	20,224	13,892	12,862	5,087	2,980	8,886
29-Jul	5,476	13,322	*10,999*	16,631	4,773	4,345	8,319	9,913	6,541	*12,080*	20,291	13,944	12,899	5,180	2,999	8,958
30-Jul	5,500	13,381	*11,037*	16,655	4,799	4,373	8,350	9,960	6,561	*12,110*	20,367	14,043	12,946	5,268	3,013	9,035
31-Jul	*5,518*	*13,433*	*11,070*		4,821	4,406	8,373	10,016	6,582	12,129	20,394	14,062	12,982	5,320	3,054	9,081
01-Aug	*5,533*	*13,467*	*11,112*		4,837	4,441	*8,390*	10,061	6,599	12,143	20,418	14,078	13,002	5,374	3,078	9,110
02-Aug	*5,545*	*13,487*	*11,147*		4,859	4,476	*8,400*	10,103	6,624	12,150	20,443	14,090	13,032	5,415	3,115	9,163
03-Aug	*5,554*	*13,519*	*11,173*		4,877	4,500	8,404	10,132	6,634	12,166	20,490	14,099	13,057	5,439	*3,150*	9,187
04-Aug	*5,560*	*13,543*	*11,180*		4,889	4,507	8,416	10,143	*6,643*	12,191	20,511	14,106	13,070	5,457	*3,179*	9,204
05-Aug	*5,563*	*13,559*	*11,195*		4,893	4,521	8,422	10,157	*6,653*	12,214	20,522	14,108	13,088	*5,480*	*3,205*	9,213
06-Aug	*5,566*	*13,577*	*11,209*		4,896	4,535	8,429	10,168	*6,661*	12,234	20,532	14,114	13,107	*5,497*	*3,227*	9,227
07-Aug	*5,567*	*13,604*	*11,212*		4,900	4,537	8,435	10,174	*6,674*	12,263	20,536	14,122	13,120	5,504	*3,245*	9,231
08-Aug	*5,568*	*13,624*	*11,230*		4,908	4,555	8,445	10,183	*6,687*	12,284	20,551	14,132	13,130	5,514	3,249	9,243
09-Aug	*5,570*	*13,635*	*11,239*		4,911	4,563	8,448	10,190	*6,702*	12,295	20,561	14,134	13,153	5,518	3,256	9,244
10-Aug	*5,575*	*13,643*	*11,258*		4,912	4,582	8,449	10,192	*6,709*	12,310	*20,571*	14,148	13,181	5,520	3,266	9,250
11-Aug	*5,577*	*13,653*	*11,272*		4,915	4,595	8,454	10,202	6,716	12,315	*20,581*	*14,155*	13,214	5,522	3,269	9,253
12-Aug	*5,578*	*13,658*	*11,284*		4,916	4,607	8,464	10,206	6,723	12,326	*20,596*	*14,165*	*13,223*	5,530	3,272	9,254
13-Aug	*5,579*	*13,662*	*11,290*		4,921	4,612	8,466	10,208	6,731	12,332	*20,602*	*14,170*	*13,227*	5,535	3,281	9,261
14-Aug	*5,579*	*13,665*	*11,296*		4,922	4,618	8,469	10,209	6,732		*20,606*	*14,173*	13,231	5,539	3,287	9,265
15-Aug		*13,666*	*11,298*		4,923	4,619	8,471	10,212	6,737		*20,608*	14,178	13,244	5,540	3,292	9,276
16-Aug		*13,666*	*11,298*		4,924	4,619	8,474	10,214	6,746		20,609	14,179	13,250	5,542	3,293	9,278
17-Aug		*13,667*	*11,304*		4,925	4,619	8,479	10,214	6,748		20,612	14,179	13,255	5,545	3,293	9,279
18-Aug		*13,667*	*11,307*		4,925	4,619	8,483	10,215	6,752		20,614	14,180	13,256	5,548	3,293	9,279
19-Aug			*11,316*		4,927	4,619	8,486	10,216	6,754		20,614	14,180	13,261	5,548	3,294	*9,283*
20-Aug			*11,323*		4,927	4,619	8,489	10,216	6,755		20,616	14,183	13,265	5,549	3,297	*9,283*
21-Aug			*11,327*		4,928	4,619	8,492	10,217	6,755		20,619	14,185	13,266	5,549	3,297	*9,284*
22-Aug			*11,332*			4,619	8,495	10,217			20,620	14,188	13,268	5,551	3,298	9,285
23-Aug			*11,335*			4,619	8,497	10,218			20,621	14,192	13,269	5,551	3,300	9,286
24-Aug			*11,337*			4,619	8,497	10,218			20,621	14,193	13,269	5,552	3,300	9,287
25-Aug			*11,338*			4,619	8,498	10,218			20,621	14,193	13,271	5,554	3,301	9,289
26-Aug			*11,338*			4,619	8,499	10,218			20,621	14,195	13,275	5,555	3,301	9,291
27-Aug						4,619	8,500	10,218			20,624	14,196	13,279	5,557	3,303	9,294
28-Aug						4,619	8,504	10,218			20,626	14,197	13,279	5,557	3,306	9,294
29-Aug						4,619	8,505	10,218			20,630	14,199	13,286	5,557	3,306	9,299

[a] Letters next to year indicate run-timing model used for estimating missing counts: L = late; N = normal; E = early.

Bold italics represent estimated counts. Boxed areas are middle 50% of run. Midpoint is bounded by double lines. **ESCAPEMENT GOAL = 10,000**

Appendix B2. Historical cummulative estimated escapement of sockeye salmon at the Kogrukluk Weir for years with adequate data.*

Date	1976(N)	1978(N)	1979(N)	1981(E)	1984(N)	1985(L)	1988(E)		1991(N)	1992(L)	1993(N)	1995(N)	1996(N)	1997(N)	1999(L)	2000 (L)	2001 (N)
20-Jun				*1*	1						*1*	*0*		0			
21-Jun				*10*	1			*1*	*1*		*3*	*1*	*1*	0			
22-Jun				*29*	1			*2*	*3*	*1*	*6*	*2*	*3*	0			*1*
23-Jun				*79*	4			*5*	*10*	*4*	*17*	*6*	*9*	0			*2*
24-Jun				*155*	6		*2*	*10*	*19*	*8*	*34*	*13*	*17*	0			*7*
25-Jun				*246*	7		*3*	*15*	*29*	*13*	*52*	*20*	*27*	0			*10*
26-Jun				*375*	9		*11*	*24*	*47*	*21*	*85*	*32*	*44*	0			*20*
27-Jun		0		*597*	12		*15*	*24*	*75*	*34*	*134*	*49*	*68*	0			*25*
28-Jun	1	0		1,137	22		*25*	24	*145*	*66*	*260*	*92*	*129*	0			*35*
29-Jun	1	1		1,842	34		*57*	29	*245*	*112*	*437*	*155*	*139*	8			*50*
30-Jun	2	12	0	2,816	41		*74*	35	*381*	*145*	*679*	*236*	214	91			*73*
01-Jul	6	48	1	4,068	126	*2*	*86*	112	*610*	*233*	*1,089*	*383*	471	121			*107*
02-Jul	13	103	9	5,008	250	*3*	*104*	267	*868*	414	*1,209*	*414*	856	225			*198*
03-Jul	15	175	28	5,632	307	*11*	*150*	374	*1,148*	545	1,707	650	1,099	316			*441*
04-Jul	32	233	42	6,430	358	*15*	*225*	645	*1,202*	650	*2,231*	1,033	1,551	635			*840*
05-Jul	59	299	51	7,271	639	*24*	375	1,105	*1,282*	727	*2,879*	1,570	2,087	926		16	690
06-Jul	125	330	126	7,866	817	43	658	1,406	*1,388*	860	4,005	2,028	2,893	1,463	1	24	820
07-Jul	258	431	250	8,502	1,031	93	1,134	2,040	*1,520*	921	5,376	2,458	3,539	2,037	8	36	1,065
08-Jul	462	536	311	9,204	1,190	169	1,639	2,244	2,277	1,066	7,533	2,959	4,644	2,614	14	53	1,552
09-Jul	669	679	376	9,639	1,214	260	2,058	3,071	3,036	1,191	10,050	3,667	5,589	3,163	28	94	2,155
10-Jul	789	795	460	10,286	1,276	389	2,565	3,508	3,408	1,546	11,949	4,473	6,543	3,424	69	185	2,500
11-Jul	927	850	644	10,778	1,571	610	2,930	4,125	3,997	1,812	13,745	4,810	7,451	3,754	114	354	3,134
12-Jul	1,157	922	959	11,199	1,744	844	3,169	4,241	5,033	2,037	15,563	5,205	8,990	4,131	206	571	3,882
13-Jul	1,269	1,049	1,229	11,583	2,082	980	3,447	4,763	6,020	2,431	17,065	5,417	10,112	4,559	349	606	4,406
14-Jul	1,370	1,115	1,449	12,052	2,521	1,167	3,718	5,500	6,762	2,847	18,887	5,779	10,933	4,980	493	628	5,252
15-Jul	1,513	1,178	1,687	12,647	2,740	1,375	3,897	5,963	7,540	3,253	20,915	6,400	11,391	5,648	721	731	5,751
16-Jul	1,615	1,252	1,861	13,068	2,932	1,560	4,006	6,372	*8,354*	3,492	22,955	7,094	11,759	6,474	1,121	1,016	6,097
17-Jul	1,762	1,300	2,007	13,498	3,016	1,733	4,089	6,801	9,282	3,958	24,666	7,463	12,058	6,917	1,439	1,166	6,328
18-Jul	1,841	1,345	2,089	13,884	3,079	1,992	4,135	6,891	10,230	4,376	25,498	7,957	12,443	7,872	1,675	1,335	6,473
19-Jul	1,893	1,396	2,179	14,270	3,290	2,168	4,172	7,048	11,159	4,648	26,843	8,220	12,652	8,723	2,023	1,425	6,708
20-Jul	2,059	1,420	2,262	14,865	3,369	2,275	4,212	7,231	11,913	4,893	27,222	8,713	13,022	9,590	2,275	1,519	*7,025*
21-Jul	2,154	1,469	2,310	15,391	3,557	2,502	4,241	7,424	12,672	5,031	27,442	9,185	13,290	10,210	2,713	1,742	*7,146*
22-Jul	2,197	1,509	2,357	15,756	3,646	2,617	4,274	7,561	13,289	5,349	27,728	9,443	13,523	10,776	3,058	1,960	*7,511*
23-Jul	2,230	1,550	2,432	16,101	3,729	2,844	4,302	7,634	13,891	5,610	27,930	9,659	13,774	11,050	3,306	2,107	*7,663*
24-Jul	2,264	1,582	2,464	16,398	3,767	3,086	4,311	7,691	*14,477*	5,852	28,121	9,891	14,082	11,561	3,746	2,220	*7,803*
25-Jul	2,269	1,597	*2,482*	16,655	3,827	3,246	4,320	7,774	14,972	6,004	28,335	10,028	14,149	11,713	4,100	2,242	*7,900*
26-Jul	2,276	1,605	*2,496*	16,942	3,877	3,410	4,324	7,795	15,394	6,249	28,565	10,286	14,266	11,842	4,257	2,320	*8,026*
27-Jul	2,285	1,620	*2,528*	17,184	3,934	3,604	4,334	7,868	15,650	6,485	28,747	10,378	14,365	12,035	4,565	2,423	*8,129*
28-Jul	2,288	1,631	*2,553*	17,373	3,966	3,761	4,340	7,985	15,831	6,767	28,909	10,481	14,601	12,378	4,713	2,486	*8,205*
29-Jul	2,296	1,639	*2,576*	17,514	3,984	3,892	4,349	8,066	15,959	6,979	*29,051*	10,632	14,845	12,505	4,861	2,531	8,304
30-Jul	2,302	1,646	*2,596*	17,624	3,998	3,985	4,361	8,126	16,095	7,128	*29,138*	10,688	14,926	12,594	5,093	2,565	8,396
31-Jul	2,304	1,648	*2,604*	17,704	4,030	4,093	4,369	8,185	16,199	7,228	29,189	10,730	14,997	12,683	5,255	2,645	8,457
01-Aug	*2,307*	*1,651*	*2,606*	17,771	4,055	4,150	*4,373*	8,249	16,282	7,380	29,218	10,800	15,058	12,745	5,420	2,672	8,530
02-Aug	*2,310*	*1,654*	*2,609*	17,836	4,078	4,193	*4,374*	8,294	16,330	7,442	29,237	10,854	15,109	12,799	5,515	2,704	8,582
03-Aug	*2,313*	*1,657*	*2,612*	17,877	4,098	4,234	4,377	8,311	16,366	7,461	29,253	10,892	15,141	12,836	5,592	*2,729*	8,619
04-Aug	*2,314*	*1,658*	*2,615*	17,895	4,106	4,261	4,380	8,339	16,390	*7,472*	29,269	10,911	15,179	12,874	5,667	*2,750*	8,651
05-Aug	*2,320*	*1,664*	*2,616*	17,922	4,108	4,288	4,382	8,351	16,404	*7,485*	29,289	10,920	15,226	12,915	5,735	*2,768*	8,674
06-Aug	*2,323*	*1,667*	*2,622*	17,935	4,111	4,299	4,383	8,365	16,414	*7,499*	29,313	10,928	15,257	12,931	5,754	*2,782*	8,692
07-Aug	*2,323*	*1,667*	*2,625*	17,950	4,114	4,326	4,383	8,378	16,417	*7,502*	29,330	10,945	15,280	12,957	5,782	*2,793*	8,701
08-Aug	*2,324*	*1,668*	*2,625*	17,973	4,117	4,334	4,384	8,383	16,420	*7,508*	29,344	10,955	15,289	12,972	5,804	2,794	8,717
09-Aug	*2,325*	*1,669*	*2,626*	17,993	4,118	4,341	4,387	8,384	16,424	*7,514*	29,346	10,962	15,320	12,986	5,818	2,804	8,720
10-Aug	*2,325*	*1,669*	*2,627*	18,001	4,124	4,342	4,388	8,388	16,430	7,518	29,348	*10,966*	15,326	13,006	5,831	2,813	8,728
11-Aug	*2,325*	*1,669*	*2,627*	18,013	4,127	4,355	4,389	8,394	16,439	7,525	29,354	*10,972*	*15,335*	13,038	5,838	2,823	8,732
12-Aug	*2,325*	*1,669*	*2,627*	18,023	4,127	4,357	4,390	8,398	16,443	7,531	29,358	*10,975*	*15,339*	13,052	5,843	2,830	8,743
13-Aug	*2,326*	*1,670*	*2,627*	18,033	4,128	4,358	4,391	8,401	16,443	7,535		*10,987*	*15,353*	*13,057*	5,846	2,836	8,750
14-Aug	*2,326*	*1,670*	*2,628*	18,038	4,129	4,359	4,391	8,403	16,444	7,535		*10,987*	*15,362*	*13,061*	5,852	2,843	8,757
15-Aug			*2,628*	18,044	4,129	4,359	4,391	8,403	16,445	7,535		*10,987*	15,363	13,066	5,855	2,849	8,761
16-Aug				18,051	4,129	4,359	4,391	8,406	16,446	7,539		10,988	15,365	13,068	5,858	2,852	8,762
17-Aug				18,052	4,129	4,359	4,393	8,406	16,450	7,539		10,989	15,370	13,072	5,861	2,854	8,765
18-Aug				18,054	4,130	4,359	4,394	8,406	16,450	7,539		10,991	15,370	13,073	5,861	2,855	8,766
19-Aug				18,056	4,130	4,359	4,394	8,406	16,451	7,539		10,992	15,371	13,074	5,863	2,856	*8,768*
20-Aug				18,056	4,131	4,359	4,395	8,406	16,451	7,540		10,993	15,371	13,074	5,864	2,857	*8,768*
21-Aug				18,058	4,131	4,359	4,396	8,406	16,451			10,993	15,373	13,074	5,864	2,858	*8,768*
22-Aug				18,058	4,131	4,359	4,396	8,406	16,451			10,993	15,377	13,075	5,864	2,859	8,768
23-Aug				18,061	4,131	4,359	4,396	8,406	16,452			10,993	15,378	13,075	5,864	2,860	8,769
24-Aug				18,061	4,132	4,359	4,396	8,406	16,452			10,993	15,379	13,075	5,864	2,861	8,770
25-Aug				18,062	4,133	4,359	4,396	8,406	16,454			10,993	15,381	13,075	5,864	2,862	8,772
26-Aug				18,063	4,133	4,359	4,397	8,406	16,454			10,993	15,381	13,076	5,864	2,862	8,772
27-Aug				18,064	4,133	4,359	4,397	8,406	16,454			10,993	15,381	13,077	5,864	2,862	8,773
28-Aug				18,066	4,133	4,359	4,397	8,406	16,455			10,996	15,385	13,078	5,864	2,862	8,773
29-Aug															5,864	2,867	8,773
																	8,776

* Letters next to year indicate run-timing model used for estimating missing counts: L = late; N = normal; E = early.
Bold italics represent estimated counts. Boxed areas are middle 50% of run. Midpoint is bounded by double lines. NO ESCAPEMENT GOAL

Appendix B3 Historical cummulative estimated escapement of chum salmon at the Kogrukluk Weir for years with adequate data.*

Date	1976(N)	1978(N)	1981(E)	1984(N)	1985(L)	1986(L)	1990(N)	1991(L)	1992(N)	1993(N)	1995(N)	1996(E)	1997(L)	1999(L)	2000(L)	2001(L)
13-Jun			*2*													
16-Jun		*2*	*2*										*8*			
17-Jun		*2*	*2*						*3*	*3*			*8*			
18-Jun		*2*	*12*				*3*		*3*	*3*			*9*			
19-Jun		*11*	*14*	2			*3*		*5*	*5*	*3*	*5*	*9*			
20-Jun		*14*	*27*	2			*5*		*6*	*7*	*3*	*5*	*9*			
21-Jun		*27*	*66*	2			*9*		*13*	*11*	*6*	*13*	*9*			
22-Jun		*66*	*100*	11			*14*		*24*	*22*	*15*	*39*	*1*			
23-Jun	*2*	*100*	*151*	14	*2*	*2*	*35*	*3*	*46*	*42*	*24*	*72*	*2*			
24-Jun	*2*	*151*	*189*	27	*2*	*2*	*51*	*3*	*68*	*63*	*40*	*107*	*4*			
25-Jun	*2*	*189*	*411*	66	*2*	*2*	*82*	*3*	*104*	*97*	*71*	*156*	*10*			
26-Jun	*11*	*411*	*686*	108	*11*	*11*	*111*	*18*	*165*	*155*	*115*	*278*	*18*			
27-Jun	*14*	*686*	*1,103*	151	*14*	*14*	*210*	*23*	*265*	*249*	*178*	*439*	*25*			
28-Jun	*27*	994	2,306	189	*27*	*27*	*228*	*44*	*448*	*414*	*285*	*668*	*69*			*6*
29-Jun	53	1,612	4,570	411	*66*	57	*297*	*94*	*745*	*722*	*428*	*1,096*	285			*11*
30-Jun	102	2,241	6,825	646	*166*	126	*428*	*174*	*1,125*	*1,149*	*599*	1,201	482			*48*
01-Jul	220	2,889	9,475	1,103	*151*	310	*607*	*243*	*2,179*	*1,824*	*817*	2,435	598	*3*		*77*
02-Jul	301	3,521	12,991	2,042	*189*	462	1,112	*304*	4,035	2,452	*1,162*	3,490	763	*18*	*27*	*161*
03-Jul	431	5,016	16,598	3,196	*411*	733	2,590	*662*	7,310	3,498	2,275	8,224	1,014	*25*	*88*	*313*
04-Jul	620	7,293	18,760	4,567	*686*	1,225	3,829	*1,195*	9,225	4,562	3,858	10,536	1,259	*46*	*209*	*653*
05-Jul	802	9,249	20,641	5,408	*1,103*	1,531	5,612	1,462	10,920	5,562	5,904	14,073	1,758	*87*	*299*	1,076
06-Jul	1,141	11,400	23,514	7,024	1,364	1,874	7,204	*1,782*	11,951	6,876	7,042	16,941	2,194	269	689	1,439
07-Jul	1,664	12,803	25,760	8,970	2,040	2,240	8,005	*2,464*	13,158	8,254	9,151	19,627	2,493	581	1,150	2,059
08-Jul	2,277	14,959	27,660	10,870	2,430	2,749	9,746	3,300	14,052	9,534	10,590	22,226	2,853	960	1,596	2,830
09-Jul	2,956	17,255	30,557	12,634	3,045	3,674	10,835	3,089	15,221	10,955	11,356	24,615	3,012	1,281	2,123	3,741
10-Jul	3,466	20,057	34,067	15,926	3,595	5,073	12,822	3,638	15,940	12,591	12,352	27,073	3,204	1,971	2,748	4,792
11-Jul	3,831	23,026	36,955	19,227	3,972	6,894	14,236	4,155	17,201	13,642	13,698	29,384	3,414	2,737	3,448	5,851
12-Jul	4,252	25,376	38,984	17,993	4,471	7,861	15,229	5,314	18,451	14,724	*15,817*	30,338	3,686	3,700	4,095	7,062
13-Jul	4,588	27,548	40,853	20,070	5,010	8,800	15,957	6,750	19,395	16,114	16,568	33,402	4,020	4,580	4,524	8,827
14-Jul	4,910	30,899	43,140	22,293	5,717	9,654	16,829	7,768	20,739	17,120	17,719	35,456	4,349	5,251	4,926	10,673
15-Jul	5,233	33,401	45,356	24,900	6,274	10,345	18,382	8,769	22,204	18,525	18,586	36,872	4,740	5,770	5,456	12,262
16-Jul	5,574	35,981	47,526	27,176	7,110	11,021	19,603	9,749	23,458	20,036	19,593	38,213	5,044	6,360	6,242	14,073
17-Jul	5,839	37,867	48,706	29,083	7,834	11,821	20,209	10,708	24,365	22,066	21,363	39,814	5,291	6,823	6,733	14,857
18-Jul	6,172	39,584	50,006	30,419	8,480	11,983	21,386	11,748	25,627	23,831	22,386	40,847	5,604	7,274	7,251	16,074
19-Jul	6,454	40,765	50,934	31,588	9,108	12,327	21,589	12,490	26,098	24,375	23,574	41,711	5,924	7,865	7,755	17,726
20-Jul	6,894	42,076	51,363	32,808	9,619	12,857	21,992	12,937	27,310	25,392	24,127	42,339	6,098	8,421	8,113	*18,913*
21-Jul	7,285	42,721	52,087	34,486	10,091	12,750	22,598	13,419	27,994	26,634	25,150	43,478	6,361	8,998	8,496	*20,218*
22-Jul	7,538	43,696	52,773	36,149	10,564	12,978	23,040	14,207	28,512	27,154	26,082	44,047	6,489	9,420	8,836	*21,472*
23-Jul	7,704	44,462	53,304	37,353	11,015	13,073	23,356	15,020	29,422	27,621	27,098	44,861	6,652	9,901	9,142	*22,257*
24-Jul	7,877	45,341	53,805	38,061	11,538	13,197	23,432	15,879	29,975	27,957	27,825	45,344	6,723	10,359	9,393	*23,227*
25-Jul	7,951	46,156	54,070	38,455	12,113	13,300	23,531	16,781	30,655	28,447	28,367	45,609	6,778	10,724	9,563	*23,909*
26-Jul	7,983	46,719	54,418	38,872	12,572	13,419	23,626	17,721	31,053	28,713	28,701	45,791	6,901	11,044	9,784	*24,611*
27-Jul	8,016	47,109	54,796	39,329	12,888	13,516	23,721	18,488	31,520	29,090	29,007	45,908	7,001	11,397	9,987	*25,470*
28-Jul	8,028	47,348	55,288	39,654	13,229	13,663	23,883	19,136	31,894	29,579	29,256	46,263	7,193	11,666	10,191	25,477
29-Jul	8,052	47,563	55,671	39,974	13,471	13,797	24,245	19,632	32,193	30,030	29,541	46,860	7,316	11,854	10,330	26,257
30-Jul	8,066	47,673	56,033	40,242	13,688	13,910	24,569	20,244	32,470	30,444	29,870	47,275	7,393	12,278	10,491	27,108
31-Jul	8,073	47,785	56,317	40,360	13,947	14,002	24,850	21,096	32,724	30,751	30,086	47,465	7,429	12,530	10,696	27,647
01-Aug	*8,085*	*47,885*	56,526	40,840	14,096	14,073	25,198	21,850	32,888	30,956	30,257	*47,615*	7,477	12,775	10,796	28,096
02-Aug	*8,097*	*47,958*	56,709	41,057	14,243	14,145	25,621	22,444	33,128	31,083	30,463	*47,786*	7,527	12,948	10,881	28,631
03-Aug	*8,102*	*47,991*	56,855	41,216	14,336	14,206	25,919	22,951	33,211	31,192	30,672	47,917	7,583	13,077	*10,988*	28,869
04-Aug	*8,111*	*48,024*	56,933	41,349	14,423	14,268	26,154	23,250	33,415	31,319	30,776	48,016	7,621	13,264	*11,079*	29,225
05-Aug	*8,112*	*48,056*	56,968	41,399	14,481	14,323	26,311	23,533	33,480	31,423	30,855	48,069	7,634	*13,387*	*12,162*	29,364
06-Aug	*8,112*	*48,068*	57,023	41,419	14,533	14,376	26,389	23,746	33,529	31,573	30,877	48,151	7,696	*13,490*	*12,223*	29,791
07-Aug	*8,112*	*48,074*	57,066	41,432	14,585	14,421	26,464	23,858	33,625	31,687	30,924	48,202	7,728	13,524	*12,295*	29,959
08-Aug	*8,113*	*48,085*	57,109	41,440	14,662	14,468	26,505	23,896	33,684	31,766	30,968	48,252	7,749	13,581	12,394	30,113
09-Aug	*8,113*	*48,095*	57,150	41,449	14,707	14,502	26,554	23,952	33,714	31,809	31,005	48,270	7,777	13,616	12,430	30,181
10-Aug	*8,114*	*48,105*	57,197	41,460	14,788	14,540	26,600	23,981	33,774	31,824	31,037	48,336	7,804	13,646	12,559	30,233
11-Aug	*8,116*	*48,119*	57,226	41,471	14,843	14,558	26,642	23,996	33,843	31,834	*11,078*	*48,351*	7,872	13,673	12,574	30,230
12-Aug	*8,117*	*48,119*	57,251	41,480	14,873	14,574	26,681	24,033	33,913	31,849	*11,111*	*48,370*	7,887	13,707	12,591	30,404
13-Aug		*48,120*	57,278	41,480	14,911	14,581	26,699	24,061	33,995	31,875	*11,178*	*48,399*	*7,901*	13,730	11,425	30,435
14-Aug		*48,120*	57,302	41,481	14,930	14,594	26,722	24,081	34,020	*31,879*	*11,206*	*48,404*	7,910	13,742	11,436	30,439
15-Aug		*48,120*	57,325	41,482	14,946	14,614	26,734	24,089	34,045	*31,879*	*11,222*	48,420	7,921	13,753	11,440	30,477
16-Aug		*48,121*	57,331	41,482	*14,961*	14,634	26,740	24,096	34,062	*31,881*	31,227	48,425	7,936	13,758	11,446	30,505
17-Aug		*48,121*	57,336	41,483	*14,971*	14,649	26,751	24,130	34,078	*31,887*	31,229	48,427	7,941	13,768	11,452	30,518
18-Aug		*48,122*	57,340	41,484	*14,985*	14,661	26,752	24,163	34,087	*31,891*	31,232	48,432	7,943	13,771	11,474	30,529
19-Aug		*48,124*	57,342	41,484	*14,994*	*14,673*	26,756	24,177	34,088	*31,895*	31,239	48,438	7,945	13,771	11,480	*30,537*
20-Aug		*48,125*	57,351	41,484	*14,999*	*14,678*	26,759	24,177	34,092	*31,899*	31,242	48,442	7,949	13,775	11,481	*30,544*
21-Aug			57,356		*15,000*	*14,687*	26,761	24,182	34,105		31,243	48,450	7,950	13,780	11,482	*30,551*
22-Aug			57,356		*15,000*	*14,688*	26,761	24,182			31,246	48,455	7,950	13,786	11,482	30,553
23-Aug			57,357		*15,000*	*14,688*	26,761	24,182			31,246	48,461	7,950	13,788	11,482	30,558
24-Aug			57,360		*15,001*	*14,688*	26,762	24,183			31,252	48,462	7,950	13,789	11,483	30,561
25-Aug			57,362		*15,001*	*14,689*	26,763	24,186			31,252	48,469	7,951	13,793	11,483	30,563
26-Aug			57,363		*15,002*	*14,689*	26,763	24,187			31,254	48,472	7,951	13,794	11,489	30,564
27-Aug			57,365		*15,004*	*14,690*	26,764	24,187			31,255	48,474	7,951	13,796	11,489	30,564
28-Aug			57,365		*15,005*	*14,692*	26,764	24,187			31,256	48,475	7,953	13,796	11,489	30,564
29-Aug			57,365			*14,693*	26,765	24,188			31,265	48,495	7,958	13,815	11,489	30,570

* Letters next to year indicate run-timing model used for estimating missing counts: L = late; N = normal; E = early.
Bold italics represent estimated counts. Boxed areas are middle 50% of run. Midpoint is bounded by double lines. ESCAPEMENT GOAL=30,000

Appendix B4. Historical cummulative estimated escapement of coho salmon at the Kogrukluk weir for years with adequate data.[a]

Date	1981(N)	1982(N)	1983(L)	1984(E)	1985(E)	1987(N)	1988(N)	1996(E)	1997 (L)	1998(L)	1999(L)	2000 (E)	2001 (E)
20-Jul	0	0		0	0		1	1	0	0			
21-Jul	0	0		0	0		1	3	0	0	0		
22-Jul	0	0		0	0		1	6	0	0	0		
23-Jul	0	0		0	0		1	6	0	0	0		
24-Jul	0	0		1	0		2	8	0	0	1		
25-Jul	0	0		5	0		2	14	0	0	1	3	
26-Jul	0	0		7	0		2	17	0	2	1	5	
27-Jul	0	0		8	0		2	20	0	4	1	8	
28-Jul	0	0		9	0		2	35	0	4	1	9	
29-Jul	0	0		13	0		2	60	2	4	1	10	
30-Jul	0	0		15	0		2	143	2	5	2	14	
31-Jul	0	0		18	0		2	169	3	7	2	24	2
01-Aug	0	0		29	6		2	*223*	7	9	2	25	4
02-Aug	0	5		43	10		2	*305*	12	12	2	34	13
03-Aug	0	11		62	17	*1*	2	415	15	22	2	67	18
04-Aug	2	26		94	24	*1*	2	456	19	29	2	99	30
05-Aug	7	43		112	38	*2*	2	492	42	43	2	*150*	34
06-Aug	12	59		165	46	*2*	6	707	64	49	2	*215*	54
07-Aug	14	101	*2*	264	64	*4*	12	858	111	56	2	*294*	61
08-Aug	24	137	*7*	308	113	*9*	23	998	122	61	4	388	93
09-Aug	50	192	*12*	427	126	12	38	1,243	148	78	5	580	109
10-Aug	70	234	*18*	479	220	20	63	1,849	213	84	11	905	118
11-Aug	92	340	*33*	701	279	38	101	*2,462*	302	111	15	1,138	162
12-Aug	154	431	*50*	816	397	67	181	*3,363*	*359*	128	19	1,788	352
13-Aug	216	489	68	1,040	465	102	267	*4,232*	*432*	163	30	2,660	456
14-Aug	349	567	103	1,187	547	141	313	*5,257*	*453*	290	35	3,627	698
15-Aug	503	762	159	1,366	631	202	338	6,380	517	381	59	4,430	935
16-Aug	644	818	177	1,510	*855*	288	443	7,764	640	625	121	4,775	1,702
17-Aug	753	1,329	203	1,596	*1,002*	428	600	9,237	724	850	170	4,874	2,088
18-Aug	863	1,794	249	2,854	*1,181*	671	858	10,344	817	904	185	5,433	2,903
19-Aug	1,159	2,165	273	3,849	*1,325*	870	1,060	11,379	934	928	191	6,584	*3,479*
20-Aug	1,473	2,448	284	4,386	*1,411*	1,168	1,350	13,521	1,172	1,056	429	7,683	*3,791*
21-Aug	1,660	2,857	287	4,707	*1,911*	1,580	1,702	16,031	1,621	1,803	498	8,926	*4,414*
22-Aug	1,845	2,999	354	6,119	*2,361*	1,866	2,085	18,578	2,049	2,101	686	10,069	5,481
23-Aug	2,042	3,227	506	7,849	*2,661*	2,184	2,408	21,243	2,528	2,361	877	11,120	6,038
24-Aug	2,297	3,874	606	9,039	2,982	2,711	2,797	23,661	2,953	3,301	1,052	12,185	7,044
25-Aug	2,713	4,742	641	11,070	3,213	3,369	3,055	26,388	3,564	3,771	1,223	12,777	7,758
26-Aug	3,031	5,546	647	13,106	3,413	4,145	3,953	28,734	4,149	5,102	1,300	13,185	8,389
27-Aug	3,400	6,492	674	13,837	3,886	4,907	4,331	30,687	4,550	5,540	1,561	15,066	9,295
28-Aug	3,667	7,312	944	14,421	4,776	5,721	4,949	33,117	4,900	6,021	1,664	17,739	10,013
29-Aug	3,811	7,944	993	14,791	5,593	6,872	5,502	34,492	5,200	6,611	1,870	20,805	11,454
30-Aug	4,113	9,432	1,021	15,479	6,087	8,013	6,272	36,548	5,907	7,514	2,135	23,369	12,223
31-Aug	4,435	11,112	1,182	16,386	6,946	9,837	6,766	38,646	6,815	8,955	2,343	24,785	13,090
01-Sep	4,731	12,649	1,762	16,999	8,326	10,845	7,096	40,650	7,379	10,360	2,692	25,890	13,719
02-Sep	5,059	14,554	1,789	17,820	9,597	12,618	7,465	42,598	7,630	11,934	3,174	26,754	14,502
03-Sep	5,355	16,534	2,258	18,533	10,163	13,778	7,703	44,090	8,061	13,329	3,675	27,481	14,824
04-Sep	5,967	17,819	2,621	19,386	10,720	16,728	7,940	45,080	8,130	15,311	4,551	27,907	15,276
05-Sep	6,502	19,600	2,721	20,173	11,351	17,781	8,111	45,970	8,670	16,500	5,552	28,459	15,677
06-Sep	7,157	24,613	3,277	20,915	11,881	18,743	8,281	46,877	8,904	17,142	5,976	29,755	15,783
07-Sep	7,663	27,832	3,482	21,258	12,734	*19,299*	8,434	47,912	9,626	17,384	6,506	30,551	15,983
08-Sep	8,184	29,997	3,593	22,365	13,552	*19,504*	8,879	48,687	10,223	17,867	7,035	31,153	16,556
09-Sep	8,751	31,457	3,744	23,446	14,141	*19,615*	9,058	49,204	10,638	18,291	7,441	31,598	16,844
10-Sep	9,086	32,683	4,602	23,493	14,480	*19,766*	9,492	49,664	10,980	19,058	7,854	31,878	17,208
11-Sep	9,369	33,604	4,962	24,323	14,635	*20,624*	10,458	50,009	11,175	19,780	8,112	32,336	17,292
12-Sep	9,615	34,326	4,977	24,686	14,943	*20,984*	10,894	50,239	11,277	20,333	8,458	32,606	17,464
13-Sep	9,854	35,074	5,152	24,910	15,176	*20,999*	11,151	50,367	11,357	20,760	8,683	32,796	17,641
14-Sep	10,048	35,582	6,039	25,267	15,435	*21,174*	11,303	50,483	11,419	21,030	9,292	32,898	17,778
15-Sep	10,205	*36,006*	6,173	25,304	15,676	21,195	11,415	50,555	11,471	21,386	9,734	32,968	17,870
16-Sep	10,373	*36,411*	6,324	*25,479*	15,816	21,256	11,536		11,560	21,749	9,862	33,001	18,442
17-Sep	10,505	*36,680*	6,748	*26,366*	15,929	21,379	11,722		11,649	22,184	10,094	33,040	18,700
18-Sep	10,654	*36,869*	7,153	*26,500*	16,013	21,454	*12,127*		11,713	22,413	*10,665*	33,083	18,867
19-Sep	10,772	*36,994*	7,422	*26,651*	16,151	21,605	*12,396*		11,751	22,614	*11,045*	33,107	18,974
20-Sep	10,910	*37,251*	7,611	*27,075*	16,241	21,858	*12,585*		11,779	*22,944*	*11,312*	33,135	19,036
21-Sep	11,013	*37,365*	7,736	*27,213*	16,301	21,968	*12,710*		11,805	*23,167*	*11,488*		19,172
22-Sep	11,127	*37,500*	7,993	*27,303*	16,339	22,021	*12,967*		*11,945*	*23,440*	*11,850*		19,234
23-Sep	11,205	*37,547*	8,107	*27,363*	16,348	22,196	*13,081*		*12,007*	*23,636*	*12,011*		19,301
24-Sep	11,249	*37,592*	8,242	*27,401*	*16,362*	*22,309*	*13,216*		*12,080*	*23,818*	*12,202*		19,338
25-Sep	11,279	*37,635*	8,289	*27,410*	*16,382*	*22,393*	*13,263*		*12,106*	*23,905*	*12,268*		19,387
26-Sep	11,308	*37,664*	8,334	*27,424*	*16,401*	*22,531*	*13,308*		*12,130*	*24,019*	*12,332*		
27-Sep	11,334	*37,690*	8,377	*27,444*	*16,419*	*22,621*	*13,351*		*12,144*	*24,078*	*12,392*		
28-Sep	11,347	*37,703*	*8,406*	*27,463*	*16,434*	*22,681*	*13,380*		*12,168*	*24,124*	*12,433*		
29-Sep	11,361	*37,717*	*8,432*	*27,481*	*16,441*	*22,719*	*13,406*		*12,185*	*24,161*	*12,470*		
30-Sep	11,381	*37,737*	*8,445*	*27,496*		*22,728*	*13,419*		*12,191*	*24,193*	*12,488*		
01-Oct	11,400	*37,756*	*8,459*	*27,503*		*22,742*	*13,433*		*12,199*	*24,218*	*12,508*		
02-Oct	11,418	*37,774*	*8,479*	*27,529*		*22,762*	*13,453*		*12,210*	*24,254*	*12,536*		
03-Oct	11,433	*37,789*	*8,498*	*27,542*		*22,781*	*13,472*		*12,220*	*24,288*	*12,563*		
04-Oct	11,440	*37,796*	*8,516*	*27,556*		*22,799*	*13,490*		*12,229*	*24,326*	*12,588*		
05-Oct	11,450		*8,531*	*27,576*		*22,814*	*13,505*		*12,237*	*24,348*	*12,609*		
06-Oct	11,455		*8,538*	*27,595*		*22,821*	*13,512*						

[a]Letters next to year indicate run-timing model used for estimating missing counts: L=late; N=normal; E= early

Bold Italics represent estimated counts. Boxed areas are middle 50% of the run. Midpoint is bounded by double lines. **ESCAPEMENT GOAL 25,000**