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Abundance and Run Timing of Adult Pacific Salmon in the East Fork Andreafsky River, Yukon Delta National Wildlife Refuge, Alaska, 2004

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Abstract

A resistance board weir was used to collect abundance, run timing, and biological data from salmon returning to the East Fork Andreafsky River, a tributary to the lower Yukon River, between June 23 and September 19, 2004. In 2004, an estimated total of 8,045 Chinook salmon *Oncorhynchus tshawytscha* migrated through the weir. The run timing was early compared to the 1994-2003 average. Four age groups were identified from 517 Chinook salmon sampled with age 1.2 and 1.3 (both 39%) dominating. The sex ratio was 35% female, 65% male. The mean length for 178 females was 759 mm, range 495 mm to 980 mm, and the mean length for 339 males was 648 mm, range 480 mm to 900 mm. An estimated total of 64,883 chum salmon *O. keta* migrated through the weir. The run timing was early compared to the 1994-2003 average. Four age groups were identified from 703 chum salmon sampled, with age 0.3 (69%) dominating. The sex ratio was 51% female, 49% male. The mean length for 372 females was 522 mm, range 395 mm to 610 mm, and the mean length for 331 males was 562 mm, range 460 mm to 685 mm. An estimated total of 11,146 coho salmon *O. kisutch* migrated through the weir. The run timing was late compared to the 1995-2003 average. Three age groups were identified from 544 coho salmon sampled, with age 2.1 (92%) dominating. The sex ratio was 49% female, 51% male. The mean length for 275 females was 531 mm, range 400 mm to 620 mm, and the mean length for 269 males was 524 mm, range 420 mm to 645 mm. An estimated total of 508 sockeye salmon *O. nerka* and 399,678 pink salmon *O. gorbuscha* migrated through the weir. Other species counted through the weir during 2004 included 5,747 whitefish (Coregoninae), 9 Arctic grayling *Thymallus arcticus*, and 89 northern pike *Esox lucius*.

Introduction

The Andreafsky River is one of several lower Yukon River tributaries on the Yukon Delta National Wildlife Refuge (Refuge). The Andreafsky River and its primary tributary, the East Fork Andreafsky River, provide important spawning and rearing habitat for Chinook *Oncorhynchus tshawytscha*, chum *O. keta*, coho *O. kisutch*, pink *O. gorbuscha*, and sockeye *O. nerka* salmon (USFWS 1991). The Andreafsky River supports one of the largest returns of Chinook salmon, has the second largest return of summer chum salmon (Bergstrom et al. 1998), and is believed to have the largest return of pink salmon in the Yukon River drainage (USFWS 1991). These Andreafsky River salmon stocks contribute to a large subsistence fishery in the lower Yukon River.

The Alaska National Interest Lands Conservation Act (ANILCA) mandates that salmon populations and their habitats be conserved within National Wildlife Refuge lands, international

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treaty obligations be fulfilled, and subsistence opportunities for local residents be maintained (USFWS 1991). Compliance with ANILCA mandates cannot be ensured without reliable data on salmon stocks originating from within Refuge boundaries. It is the goal of the U.S. Fish and Wildlife Service (USFWS) to conserve fish and wildlife populations, maintain habitats in their natural diversity, and provide the opportunity for continued subsistence use by local residents.

Due to recent declines in Yukon River salmon runs, particularly summer and fall chum salmon, there have been harvest restrictions, complete fishery closures, and spawning escapement below management goals on many tributaries in the Yukon River drainage (Vania et al. 2002; Kruse 1998). The need to collect accurate escapement estimates is required to maintain genetic diversity, determine exploitation rates and spawner recruit relationships (Labelle 1994). Data on escapement counts, which are necessary for effective management, are lacking for many individual stocks in the Yukon River drainage. Individual stocks of various salmon species, that are returning in low numbers or having early and late run timing, may be incidentally over-harvested. Federal and State fishery managers attempt to distribute salmon harvest over time to avoid over-harvesting individual salmon stocks. This type of management conserves salmon stocks, as each may have distinct migratory timing (Mundy 1982).

In compliance with ANILCA mandates, the USFWS has operated a weir on the East Fork Andreafsky River since 1994. Specific objectives of the project were to: (1) enumerate adult salmon escapement; (2) describe run timing of Chinook, chum, and coho salmon returns; (3) estimate age, sex, and length composition of adult Chinook, chum and coho salmon populations; and (4) identify and count other fish species passing through the weir.

Study Area

The Andreafsky River is located in the lower Yukon River drainage in western Alaska (Figure 1). The regional climate is subarctic with extreme temperatures reaching 28˚ and – 42˚C at St. Mary's, Alaska (Leslie 1989). Mean July high and February low temperatures between 1976 and 2000 were 18˚ and –22˚C respectively. Average yearly precipitation is approximately 48 cm of rain and 172 cm of snow. The Andreafsky River ice breakup typically occurs in May or early June, and usually begins to freeze in late October (USFWS 1991). Maximum discharge is most often reached following breakup. Sporadic high discharge periods generated by heavy rains occur between late July and early September.

The Andreafsky River is one of the three largest Yukon River tributaries within Refuge boundaries (USFWS 1991) and drains a watershed of about 5,450 km^2. The Andreafsky River and the East Fork Andreafsky River parallel each other in a southwesterly direction for more than 200 river-kilometers (rkm) before converging 7 rkm above its confluence with the Yukon River. The mouth of the Andreafsky River is approximately 160 rkm upstream from the mouth of the Yukon River. The East Fork Andreafsky River and the Andreafsky River flow through the Andreafsky Wilderness and the portions of each river within Refuge boundaries are designated as Wild and Scenic Rivers.

The East Fork Andreafsky River originates in the Nulato Hills at approximately 700 m elevation and drains an area of about 1,950 km^2 (USFWS 1991). The river cuts through alpine tundra at an average gradient of 7.6 m per km for 48 rkm. It then flows for 130 rkm through a forested river valley bordered by hills that rarely exceed 400 m elevation. Willow, spruce, alder, and birch dominate the riparian zone and much of the hillsides. This section drops at an average rate of 1.4 m per km and is characterized by glides and riffles with a gravel and rubble substrate. The river widens in the lowermost 38 rkm and the gradient changes to 0.14 m per km. The valley here is a wetland, interspersed with forest and tundra and bordered by hills that are typically less than 230 m elevation. Smaller substrate particles allow an abundance of aquatic vegetation to grow in the lower stream channel. Water level fluctuations on the Yukon River also affect the stage height in the lower sections of the East Fork Andreafsky River and the Andreafsky River.

Methods

Weir Operation

A modified resistance board weir (Zabkar and Harper 2003; Tobin 1994; Tobin and Harper 1995) spanning 105 m was installed in the East Fork Andreafsky River (62^{o}07'N, 162^{o} 48'W) approximately 43 rkm upstream from the Yukon-Andreafsky River confluence and 26 air-km NE of St. Mary's, Alaska (Figure 1). The weir site is located approximately 2.4 rkm downstream from the 1994 weir site described by Tobin and Harper (1995) and 2.1 rkm downstream from the sonar and counting tower site described by Sandone (1989). The weir was moved downstream to a wider section of river in June 1995 to enhance its performance during high water conditions. Weir operation was extended in 1995 into September to collect coho salmon data.

A staff gauge was installed upstream of the weir to measure daily water levels. Staff gauge measurements were calibrated to correspond with the average water depth across the river channel at the upstream edge of the weir. Water temperatures were generally collected once daily between 0800 and 0900 hours.

Two passage chutes were installed, one approximately 30 feet from the left bank and the other approximately 25 feet from the right bank A fish trap was installed on the right passage chute to facilitate efficient fish sampling during various river stage heights. The left passage chute was for use during extreme low water levels or when large numbers of fish began stacking up below the weir. It was used intermittently in 2004. All fish, except whitefish (Coregoninae), were enumerated to species as they passed through the live trap. Panel picket spacing (4.8 cm) was designed to remain functional during higher water flow. Small salmon and resident fish that were able to pass through the gaps between pickets were not counted. Fish were counted 24 hours per day and numbers were recorded hourly.

The weir was cleaned and its integrity visually checked daily. Cleaning consisted of raking debris from the upstream surface of the weir or walking across each panel to submerge it enough to allow the current to wash debris downstream. Repairs were made as necessary.

Biological Data

Adult salmon were identified and counted as they migrated through the weir each day to determine run timing and escapement. A stratified random sampling design was used to collect age, length, and sex ratio information for Chinook, chum, and coho salmon, with single statistical weeks being defined as strata (Cochran 1977). Sample weeks or strata began on a Sunday and ended the following Saturday. Sampling generally commenced at the beginning of the week, and an effort was made to obtain a weekly quota of 160 Chinook, 160 chum, and 120 coho salmon spread over a minimum four-day period. All target species within the trap were sampled to prevent bias. Non-target species were identified and counted but not sampled. Whitefish species were grouped together under the subfamily Coregoninae.

Fish sampling consisted of identifying salmon species, determining sex, measuring length, and collecting scales, and then releasing the fish upstream of the weir. Secondary sex characteristics were utilized to determine sex. Length was measured from mid-eye to the fork of the caudal fin and rounded to the nearest 5 mm. Scales were removed from the preferred area for age determination (Koo 1962; Devries and Frie 1996). Three scales were collected from each Chinook and coho salmon sampled. One scale was collected from each chum salmon sampled. Scale impressions were made on cellulose acetate cards using a heated scale press and examined with a microfiche reader (Zabkar and Harper 2003). Age was determined by an Alaska Department of Fish and Game (ADF&G) biologist and reported according to the European Method (Koo 1962). Daily sex ratios were collected by the sexing of each fish when sampling for age and length. The daily escapement counts and sex ratios were reported daily to the USFWS Fairbanks Fish and Wildlife Field Office and ADF&G.

Days when the weir was operational, with no fish counted, were reported as zero counts. Historically, days when the weir was not operational and no fish were counted were left blank. Escapement estimates were calculated post season for full and partial days in 2004 when the weir was not operational. Full days were based on a linear interpolation of the counts before and after the missed day(s) of counting. Counts for partial days of 6 to 23 hours of counting were expanded to 24 hours. Historical data prior to 2001 (Appendices 2, 3, and 5) were not corrected for days with missing data. In Appendix 4, missing data for 2001 coho salmon were estimated using the average daily proportion of passage collected from 1995 to 2000 (Zabkar and Harper 2003). The annual counts are a minimum estimate of escapement for those years when the weir had periods it was not operational.

High water conditions in 2001 caused the weir to be installed on July 15. According to historical data, Chinook and chum salmon counts started after the average third quartile passage date. Because of the late start, data for 2001 were not used to compare with other years.

Data Analysis

The adjustment for the partial days (June 23, Aug 17) was made by dividing the day's count by the number of hours counted and multiplying by 24. Missing daily counts since 2003 were estimated using a linear interpolation of the preceding and subsequent days' counts. Estimates for 2001 were made using historical percent passage data from 1995 to 2000 (Zabkar and Harper 2003).

Strata generally were one week long and began on Sunday and ended the following Saturday. Stratum with small sample sizes were combined in order to approximately equalize sample size. Within a stratum, the proportion of the samples composed of a given sex or age, p_{ij}, was calculated as:

$$\hat{p}_{ij} = \frac{n_{ij}}{n_j},$$

where n_{ij} is the number of fish of sex i or age i sampled in week j, and n_j is the total number of fish sampled in week j. The variance of p_{ij} was calculated as:

$$\hat{v}(\hat{p}_{ij}) = \frac{\hat{p}_{ij}(1 - \hat{p}_{ij})}{n_j - 1}.$$

Sex and age compositions for the total run of Chinook, chum, and coho salmon of a given sex/age, p_i, were calculated as:

$$\hat{p}_i = \sum \left(\frac{N_j}{N} \right) \hat{p}_{ij} ,$$

where N_j equals the total number of fish of a given species passing through the weir during week j, and N is the total number of fish of a given species passing through the weir during the run. Variances of sex and age compositions for the run were calculated as:

$$\hat{v}(\hat{p}_i) = \sum \left(\frac{N_j}{N} \right)^2 \hat{v}(\hat{p}_{ij}) .$$

Results

Weir Operation

The weir was operational at 1500 on June 23 and operated until September 19, 2004, except from August 13-17 when high water submerged the weir and trap. Counting resumed at 1800 on Aug 17. The average stage height was 39 cm with a range between 13 cm and 164 cm (Figure 2). Water temperatures averaged 12°C from June 18 to September 15 and ranged between 4° and 17°C (Figure 2).

Biological Data

An estimated 8,045 Chinook, 64,883 chum, 11,146 coho, 399,678 pink, and 508 sockeye salmon migrated through the weir (Table 1). Non-salmon species recorded moving through the weir include 5,747 whitefish, 9 Arctic grayling *Thymallus arcticus*, and 89 northern pike *Esox lucius*.

Chinook salmon—An estimated escapement of 8,045 Chinook salmon passed the weir between June 23 and September 19 (Table 2). Peak passage (N=4,015) occurred during the week of July 4 to 10 (Table 1; Figure 3). The median run passage date at the weir was July 6 (Table 2), four days earlier than the historical average. The daily passage rate did not exceed 1% of the run total after July 15.

The average female Chinook salmon length was 759 mm with a range from 495 mm to 980 mm and the average male Chinook salmon length was 648 mm with a range from 480 mm to 900 mm (Table 3). Females composed an estimated 35% of the overall escapement, and were predominant before July 4 (Table 4; Figure 4). A total of 572 Chinook salmon were sampled for age composition and 55 (10%) were unreadable principally because of reabsorption. Four age groups were identified from a sample of 517 Chinook salmon between June 23 and September 19 (Table 4). Age 1.2 and 1.3 Chinook salmon were most abundant (both 39%), followed by age 1.4 (21%) and age 1.5 (1%). The age distributions of female and male Chinook salmon were different with age class 1.4 (53%) dominating for females and age 1.2 (49%) dominating for males (Table 4).

Chum salmon—An estimated escapement of 64,883 chum salmon passed the weir between June 23 and September 19 (Table 2). Peak passage (N=31,419) occurred during the week of June 27 to July 3 (Table 1; Figure 3), and the median run passage date was July 3 (Table 2), three days earlier than the historical average. The daily passage rate did not exceed 1% of run total after July 15.

The average female chum salmon length was 522 mm with a range from 395 mm to 610 mm and the average male chum salmon length was 562 mm with a range from 460 mm to 685 mm (Table 3). Females composed an estimated 51% of the overall escapement, and were predominant for each strata until August 1 (Table 5) and each week until Aug 17 (Figure 4). A total of 794 chum salmon were sampled for age composition and 91 (11%) were classified as unreadable principally because of reabsorption. Four age groups were identified from a sample of 703 chum salmon between June 23 and September 19 (Table 5). Age 0.3 chum salmon were most abundant (69%), followed by age 0.4 (20%), age 0.2 (11%), and one age 0.5 female. The age distributions of female and male chum salmon were similar with age class 0.3 dominate (females 68% and males 70%; Table 5).

Coho salmon—An estimated escapement of 11,146 coho salmon passed the weir between June 23 and September 19 (Table 2). The first fish passed through the weir on July 19. Peak passage (*N*=4,879) occurred during the week of September 5 to 11 (Table 1; Figure 3). The median run passage date was September 5 (Table 2), five days later than the historical average.

The average female coho salmon length was 531 mm with a range from 400 mm to 620 mm and the average male coho salmon length was 524 mm with a range from 420 mm to 645 mm (Table 3). Females composed an estimated 49% of the overall escapement, and were predominate before August 15 and after September 4 (Table 6; Figure 4). A total of 611 coho salmon were sampled for age composition and 67 (11%) were unreadable principally because of reabsorption. Three age groups were identified from a sample of 544 coho salmon (Table 6). The age distributions for female and male coho salmon were similar with age 2.1 dominate (females 90% and males 93%), followed by age 1.1 (Table 6). The daily passage rate was above 1% of run total on the last day of counting, September 19.

Pink salmon—An estimated minimum escapement of 399,678 pink salmon passed through the weir between June 23 and September 19 (Table 2). Small pink salmon were able to pass uncounted between the pickets in the panels due to picket spacing. Peak passage (*N*=127,461) occurred during the week of July 11 to 17 (Table 1; Figure 3).

Sockeye salmon—An estimated escapement of 508 sockeye salmon passed through the weir between June 23 and September 19 (Table 2). Peak passage (*N*=88) occurred during the week of July 4 to July 10 (Table 1).

Discussion

Weir Operations

The 2004 weir operations were interrupted by a flood event (August 13-17). The gates to the trap were left open to prevent salmon from stacking up below the weir. Escapement counts for missing data were estimated using a linear interpolation of the preceding and subsequent days' counts. August 17 counts were expanded to 24 hours by dividing the number of hours counted into the daily count and multiplying by 24.

Picket spacing in the weir panels allowed smaller pink salmon and resident fish to pass unhindered through the weir, yet effectively blocked passage of other salmon species and larger fish (Zabkar and Harper 2003). Consequently, pink salmon, whitefish, Arctic grayling, and northern pike counts are conservative.

Biological Data

In general, Yukon River Chinook and chum salmon runs have improved during the years 2000 to 2002 (JTC 2002). Chinook and chum salmon started entering the Yukon River earlier than normal in 2004 and monitoring projects throughout the drainage indicated continued run strength similar to that experienced in 2003 for returning Chinook salmon (R. Holder, USFWS, personal communication). Escapement goals were generally met and in some cases established new record levels despite the very weak (Bergstrom et al. 1998, 2001) to extremely weak parent runs. Preliminary ADF&G reports indicated the 2004 summer chum run would be stronger than 2002 and 2003, but several projects in the drainage indicated a lower abundance. The 2004 East Fork Andreafsky River summer chum salmon run was near the historical average for the weir.

The East Fork Andreafsky River Chinook salmon stock showed marked improvement since the low escapement of 2000 at the weir (Appendix 1; Figure 5). The chum salmon stock has fluctuated widely over the past five years and has been generally decreasing since 1994 (Zabkar and Harper 2003; Appendix 1). The 2001 Chinook and chum salmon counts were not included in analytical computations due to high water delaying weir installation until after the historical average third quartile passage date.

Eleven years of data have been collected from the East Fork Andreafsky River weir, which allows for short-term trends to be analyzed. Chinook salmon escapement counts show a trend where the escapement counts alternate between high and low production cycles over 4 to 5 years (Figure 5). Chum salmon escapement counts could possibly represent a longer cyclical pattern. The 1994 and 1995 escapement counts could represent the high levels of a declining production trend, and starting in 1997 and thru to 2003 represent declining production with a return to a higher level of production in 2004 (Figure 5). A longer time series data set is needed to fully understand the high-low production cycle of all of the East Fork Andreafsky River salmon stocks.

Chinook salmon—The estimated 2004 Chinook salmon escapement (*N*=8,045), a new high, is 96% above the 1994-2003 (excluding 2001) average (*N*=4,105). Chinook salmon escapement estimates ranged from 1,344 (2000) to 7,801 (1994) fish between 1994 and 2003 (Figure 5; Appendix 1; Appendix 2). Chinook salmon run timing in 2004 was early compared to average (Tobin and Harper 1995; 1996; 1997; 1998; Zabkar and Harper 2003; Appendix 2). The first fish were already migrating past the weir site when the weir became operational on June 23. The first quartile passed on June 28, five days earlier than the July 6 average. The median run passage date at the weir was July 6, four days earlier than the July 10 average; and the third quartile passage date was July 9, six days before the July 16 average (Table 2). The proportion of females in the 2004 escapement (35%; Table 4) was about average compared to previous weir escapement counts (range 23% to 51%; Zabkar and Harper 2003).

The 2004 ADF&G aerial survey conducted on the Andreafsky River estimated Chinook salmon escapement at 2,879 for the East Fork and 1,317 for the West Fork (Appendix 1). These counts were above the minimum Sustainable Escapement Goals of 960 to 1,600 Chinook salmon (East Fork) and 640 to 1600 (West Fork; ADF&G 2004).

Chum salmon—Chum salmon escapement (*N*=64,883) to the East Fork Andreafsky River in 2004 was the highest since 1998 (Appendix 1; Appendix 3; Figure 5). The minimum Biological Escapement Goal was set at 65,000 to 135,000 in 2001 (ADF&G 2004), above the average return (43,488) for the previous two generations (1997-2004). The average escapement count (80,123) from the weirs inception includes the three high years of 1994 (200,981) thru 1996 (108,450). The 2004 run timing was earlier than average. The first quartile passed on June 28, three days before the July 1 average. The median run passage date at the weir was July 3, three days earlier than the July 6 average. The third quartile passage date was July 7, five days earlier than the July 12 average (Table 2).

The Yukon River drainage escapement data indicated summer chum salmon returns were generally better than average during 2004. Parent year escapement counts for the 2004 returns were primarily 2000 (age 0.3) and 1999 (age 0.4), both years with poor escapement and low productivity (Table 5; Figure 5; Appendix 1).

Coho salmon—The East Fork Andreafsky River weir is one of three escapement projects, and the only weir dedicated to providing escapement data for coho salmon on the Yukon River. A high water event caused portions of the weir to flood during August 13-17, 2004. No fish were observed passing over the weir during this period. Coho salmon escapement during 2004 (*N*=11,146) was 37% higher than the 1995-2003 (excluding 1998) average (*N*=8,127). The escapement counts ranged from 2,963 (1999) to 13,650 (2001) fish between 1995 and 2003 (Figure 5; Appendix 1, Appendix 4). The year 1998 was excluded from average computations due to an incomplete count caused by an 11 day high water event in the early stages of the run. Coho salmon run timing during 2004 was later than average. The first quartile passed on August 30, two days later than the August 28 average. The median run passage date at the weir was September 5, five days later than the August 31 average, and the third quartile passage date was September 7, three days later than the September 4 average (Table 2).

Pink salmon—Pink salmon have strong returns to the East Fork Andreafsky River during even years and relatively weak returns during odd years. Escapement to the East Fork Andreafsky River during 2004 was the strongest even year return since the weir was installed. The pink salmon escapement for 2004 (*N*=399,678) was over double the average (*N*=192,327) from 1994 to 2002 (Figure 5). The run median passage date at the weir was July 17, while the first quartile passed on July 11, and the third quartile passed on July 22 (Table 2).

Picket interval spacing on half of the weir panels was designed to allow passage of smaller pink salmon and remain functional during higher water flows from 1994 to 2000. In 2001, 90% of the weir panels were replaced with narrower panels with picket spacing being equal to the largest spacing found in the older panels. Pink salmon counts are a measure of relative abundance in all years of operation with the possibility of a larger number of small pink salmon passing through the panels after 2000.

Sockeye salmon—Large populations of sockeye salmon are absent in the Yukon River drainage (Bergstrom et al. 1995). The East Fork Andreafsky River escapement did not exceed 248 sockeye salmon between 1994 and 2002, and was 494 for 2003. Sockeye salmon escapement during 2004 (*N*=508) was the highest observed escapement returning to the East Fork Andreafsky River. The run median passage date at the weir was July 25, while the first quartile passed on July 12, and the third quartile passed on August 12 (Table 2).

Recommendations

The East Fork Andreafsky River weir has been an important tool for monitoring refuge-originating salmon stocks and assisting both ADF&G and USFWS in-season managers with management of Yukon River fisheries. This project continues to build a long-term database that cannot be replicated in any other lower Yukon River drainage. The present weir project provides accurate escapement and biological data dating back to 1994 for Chinook, chum, pink, and sockeye salmon, and 1995 for coho salmon. Prior data from 1981 through 1988 using sonar and tower methodologies also adds to this important database. The USFWS recognized the importance of managing the commercial and subsistence fisheries in the Andreafsky River system and started aerial surveys in 1954 (Barton 1984).

Continued operation of the East Fork Andreafsky River weir will be of key importance as part of a system to monitor the impacts of the environment and various fisheries on the Andreafsky and Yukon Rivers salmon stocks. It is recommended to continue weir operation for long term monitoring of all salmon species. It is also recommended that spawning and rearing locations for sockeye salmon should be investigated to assure long-term viability of this unique population.

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Table 1. Escapement estimates, by stratum, recorded at the East Fork Andreafsky River weir, Alaska, 2004.

Stratum dates	Chinook salmon	Chum salmon	Coho salmon	Pink salmon	Sockeye salmon
Jun 23 - 26	163	7,559	0	160	0
Jun 27 - Jul 3	2,448	31,419	0	4,950	18
Jul 4 - 10	4,015	16,371	0	80,993	88
Jul 11 - 17	813	7,030	0	127,461	81
Jul 18 - 24	208	1,213	1	111,129	57
Jul 25 - 31	102	521	5	62,790	65
Aug 1 - 7	49	177	37	9,468	46
Aug 8 - 14	138	203	526	1,963	34
Aug 15 - 21	80	173	1,069	425	24
Aug 22 - 28	11	40	1,132	45	31
Aug 29 - Sep 4	9	93	2,509	99	26
Sep 5 - 11	7	60	4,879	176	30
Sep 12 - 18	1	21	831	19	7
Sep 19	1	3	157	0	1
Total	8,045	64,883	11,146	399,678	508

Table 2. Daily and total estimates of Chinook, chum, coho, pink, and sockeye salmon escapement through the East Fork Andreafsky River weir, Alaska, 2004.

Date	Chinook salmon	Chum salmon	Coho salmon	Pink salmon	Sockeye salmon
23-Jun	67 *	3,045 *	0	19 *	0
24-Jun	26	1,062	0	15	0
25-Jun	15	985	0	24	0
26-Jun	55	2,467	0	102	0
27-Jun	181	4,638	0	189	1
28-Jun	534	8,461	0	341	2
29-Jun	290	3,807	0	374	5
30-Jun	461	7,081	0	1,671	2
1-Jul	582	1,590	0	1,049	0
2-Jul	25	153	0	140	3
3-Jul	375	5,689	0	1,186	5
4-Jul	353	3,940	0	2,327	3
5-Jul	263	2,011	0	5,175	9
6-Jul	1,187	1,791	0	4,203	7
7-Jul	878	2,474	0	17,994	22
8-Jul	463	2,096	0	13,079	18
9-Jul	503	1,990	0	16,044	14
10-Jul	368	2,069	0	22,171	15
11-Jul	122	1,609	0	15,664	18
12-Jul	315	1,815	0	15,661	16
13-Jul	106	1,071	0	15,313	19
14-Jul	105	896	0	25,780	10
15-Jul	53	605	0	16,578	3
16-Jul	58	569	0	22,322	6
17-Jul	54	465	0	16,143	9
18-Jul	29	326	0	14,713	7
19-Jul	40	217	1	15,635	12
20-Jul	57	276	0	28,631	12
21-Jul	40	142	0	19,851	7
22-Jul	13	59	0	12,446	2
23-Jul	17	77	0	9,880	7
24-Jul	12	116	0	9,973	10
25-Jul	19	171	0	12,352	16
26-Jul	5	85	0	12,184	9
27-Jul	14	69	0	10,978	16
28-Jul	23	73	2	9,686	6
29-Jul	19	52	0	7,911	5
30-Jul	7	37	1	5,421	6
31-Jul	15	34	2	4,258	7
1-Aug	13	17	1	2,669	8
2-Aug	4	21	4	2,342	9
3-Aug	3	28	0	1,206	3
4-Aug	6	22	0	843	7
5-Aug	5	25	8	890	2
6-Aug	10	31	10	729	8
7-Aug	8	33	14	789	9

Table 2. Continued.

Date	Chinook salmon	Chum salmon	Coho salmon	Pink salmon	Sockeye salmon
8-Aug	6	16	16	513	8
9-Aug	13	36	98	439	6
10-Aug	39	26	62	384	3
11-Aug	17	34	115	205	5
12-Aug	23	26	86	152	5
13-Aug	21 **	30 **	78 **	141 **	4 **
14-Aug	19 **	35 **	71 **	130 **	3 **
15-Aug	17 **	39 **	63 **	118 **	2 **
16-Aug	16 **	44 **	56 **	107 **	1 **
17-Aug	14 *	48 *	48 *	96 *	0
18-Aug	10	18	163	34	6
19-Aug	9	7	384	35	4
20-Aug	6	12	170	17	5
21-Aug	8	5	185	17	6
22-Aug	5	4	150	7	3
23-Aug	1	3	80	5	0
24-Aug	3	14	185	6	5
25-Aug	1	5	243	7	15
26-Aug	0	2	453	12	4
27-Aug	1	2	17	4	2
28-Aug	0	10	4	4	2
29-Aug	0	8	38	5	2
30-Aug	4	19	178	11	4
31-Aug	2	20	490	18	1
1-Sep	2	22	505	13	6
2-Sep	0	14	897	35	6
3-Sep	0	5	234	6	2
4-Sep	1	5	167	11	5
5-Sep	1	16	609	34	15
6-Sep	2	8	1,550	47	6
7-Sep	0	11	1,011	30	1
8-Sep	1	12	578	24	2
9-Sep	1	4	337	22	4
10-Sep	0	3	535	13	1
11-Sep	2	6	259	6	1
12-Sep	0	2	13	4	1
13-Sep	0	6	57	1	0
14-Sep	0	3	37	3	0
15-Sep	0	3	201	3	0
16-Sep	0	2	240	3	1
17-Sep	1	5	241	2	3
18-Sep	0	0	42	3	2
19-Sep	1	3	157	0	1
Total	8,045	64,883	11,146	399,678	508

[grey box] = indicates dates at which 25, 50, and 75 percent of the run.had passed the weir.
[yellow box] = adjusted (*) or estimated (**) counts.

Table 3. Mid-eye to fork length (mm) at age of female and male Chinook, chum, and coho salmon sampled at East Fork Andreafsky River weir, Alaska, 2004.

	Female					Male				
Age	N	Mean	Median	SE	Range	N	Mean	Median	SE	Range
					Chinook salmon					
1.2	37	575	570	6.4	495-660	166	589	590	3.2	480-710
1.3	44	726	740	10.6	550-860	160	697	698	4.1	490-870
1.4	94	842	845	5.5	560-980	13	810	810	13.0	750-900
1.5	3	900	890	15.3	880-930	0				
Total	178	759	805	9.0	495-980	339	648	640	4.2	480-900
					Chum salmon					
0.2	45	496	495	4.0	395-540	31	534	535	4.1	485-590
0.3	254	521	520	1.8	420-610	231	560	560	2.1	460-645
0.4	72	544	543	2.7	500-600	69	583	585	4.2	505-685
0.5	1	610	610	0.0		0				
Total	372	522	523	1.6	395-610	331	562	560	1.9	460-685
					Coho salmon					
1.1	23	515	515	8	435-580	15	520	530	8.1	470-560
2.1	248	531	535	2.3	400-620	251	525	530	2.8	420-645
3.1	4	581	583	9.7	560-600	3	475	460	17.6	455-510
Total	275	531	535	2.2	400-620	269	524	525	2.7	420-645

Table 4. Age and sex ratio estimates by stratum of Chinook salmon sampled at East Fork Andreafsky River weir, Alaska, 2004. Standard errors are in parentheses. Season totals are calculated from weighted strata totals. Beginning and ending strata have combined weeks due to small numbers of fish at the beginning and end of run. Unknown age data are from unreadable scale samples and are listed for informational purposes. They were not included in calculations.

					Brood year and age			
					1997	1998	1999	2000
Strata	Run size (N)	Sample size (n)	Unknown age	Percent female	1.5	1.4	1.3	1.2
Jun 23 - Jul 3	2,611	104	8	52 (4.9)	1% (1.0)	13% (3.4)	42% (4.9)	43% (4.9)
Jul 4 - 10	4,015	143	17	25 (3.6)	0% (0.0)	13% (2.8)	45% (4.2)	42% (4.1)
Jul 11 - 17	813	141	16	35 (4.0)	1% (0.7)	30% (3.9)	41% (4.2)	28% (3.8)
Jul 18 - Sep 19	606	129	14	29 (4.0)	1% (0.8)	25% (3.8)	29% (4.0)	45% (4.4)
Total	8,045	517	55	35 (2.5)	1% (0.3)	21% (1.8)	39% (2.2)	39% (2.1)
Female	2,833	178	21		2% (1.0)	53% (3.8)	25% (3.2)	21% (3.1)
Male	5,212	339	34		0% (0.0)	4% (1.0)	47% (2.7)	49% (2.7)

Table 5. Age and sex ratio estimates by stratum of chum salmon sampled at East Fork Andreafsky River weir, Alaska, 2004. Standard errors are in parentheses. Season totals are calculated from weighted strata totals. Beginning and ending strata have combined weeks due to small numbers of fish at the beginning and end of run. Unknown age data are from unreadable scale samples and are listed for informational purposes. They were not included in calculations.

					Brood year and age			
					1998	1999	2000	2001
Strata	Run size (N)	Sample size (n)	Unknown age	Percent female	0.5	0.4	0.3	0.2
Jun 23 - Jul 3	38,978	144	16	51 (4.2)	0% (0.0)	24% (3.6)	74% (3.7)	2% (1.2)
Jul 4 - 10	16,371	146	14	51 (4.2)	0% (0.0)	29% (3.8)	68% (3.9)	3% (1.4)
Jul 11 - 17	7,030	161	24	53 (3.9)	0% (0.0)	13% (2.7)	75% (3.4)	12% (2.6)
Jul 18 - 31	1,213	128	14	60 (4.3)	1% (0.8)	22% (3.7)	63% (4.3)	15% (3.2)
Aug 1 - Sep 19	1,291	124	23	49 (4.5)	0% (0.0)	13% (3.0)	63% (4.4)	24% (3.9)
Total	64,883	703	91	51 (2.8)	0% (0.1)	20% (1.5)	69% (1.7)	11% (1.2)
Female	33,290	372	48		0% (0.3)	19% (2.1)	68% (2.4)	12% (1.7)
Male	31,594	331	43		0% (0.0)	21% (2.2)	70% (2.5)	9% (1.6)

Table 6. Age and sex ratio estimates by stratum of coho salmon sampled at East Fork Andreafsky River weir, Alaska, 2004. Standard errors are in parentheses. The totals are calculated from weighted strata totals. Beginning and ending strata have combined weeks due to small numbers of fish at the beginning of the run and an incomplete week at the end of the run. Unknown age data are from unreadable scale samples and are listed for informational purposes. They were not included in calculations.

					Brood year and age		
					1999	2000	2001
Strata	Run size (N)	Sample size (n)	Unknown age	Percent female	3.1	2.1	1.1
Jun 23 - Aug 14	569	103	13	56 (4.9)	0% (0.0)	98% (1.4)	2% (1.4)
Aug 15 - 28	2,201	126	20	41 (4.4)	1% (0.8)	91% (2.5)	8% (2.4)
Aug 29 - Sep 4	2,509	113	7	44 (4.7)	3% (1.5)	91% (2.7)	6% (2.3)
Sep 5 - 11	4,879	105	15	50 (4.9)	1% (1.0)	89% (3.1)	10% (3.0)
Sep 12 - 19	988	97	12	64 (4.9)	2% (1.5)	90% (3.1)	8% (2.8)
Total	11,146	544	67	49 (2.6)	1% (0.5)	92% (1.2)	7% (1.1)
Female	5,433	275	35		1% (0.7)	90% (1.8)	8% (1.7)
Male	5,713	269	32		1% (0.6)	93% (1.5)	6% (1.4)

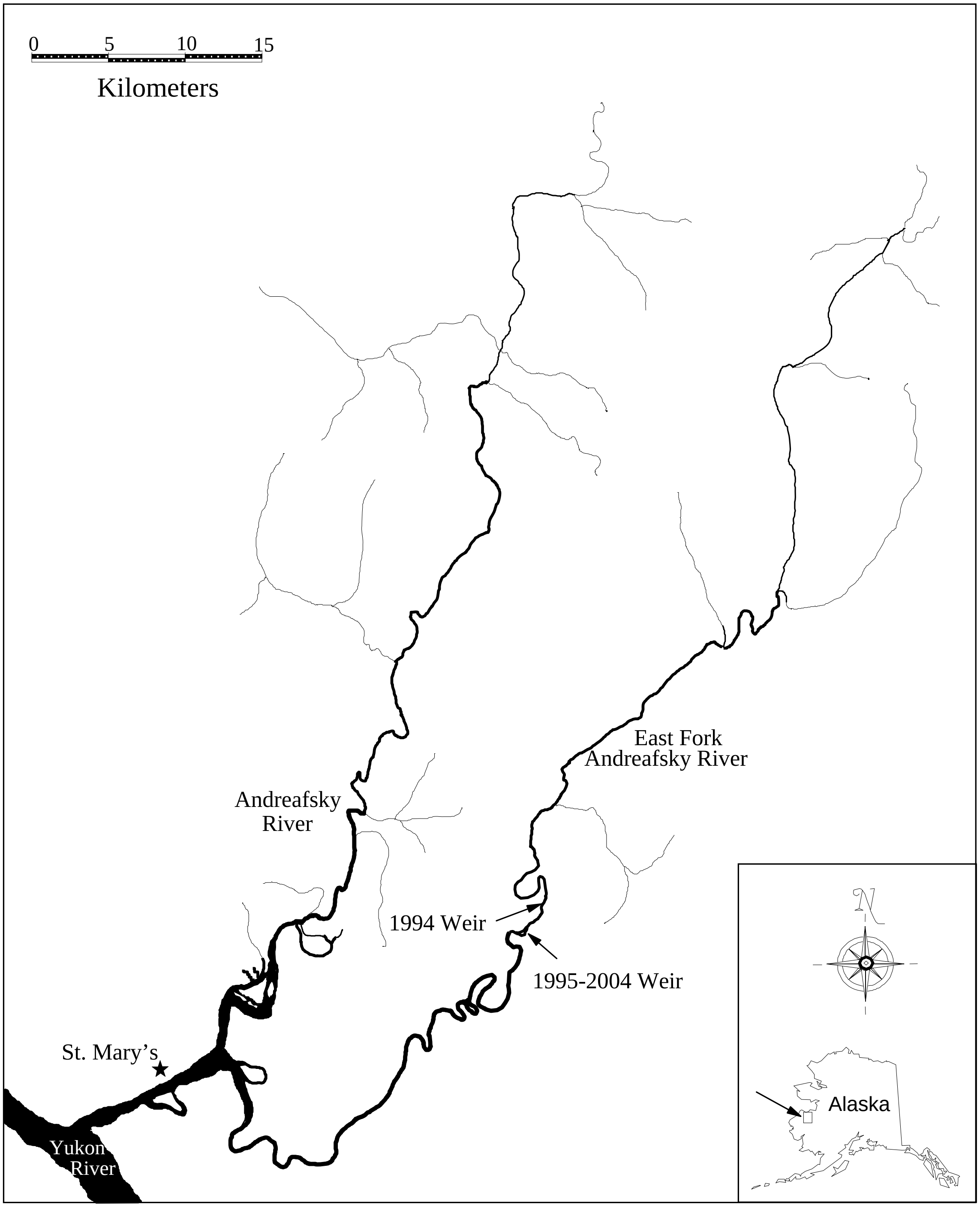

Figure 1. Weir locations in the East Fork Andreafsky River, Alaska, 1994-2004.

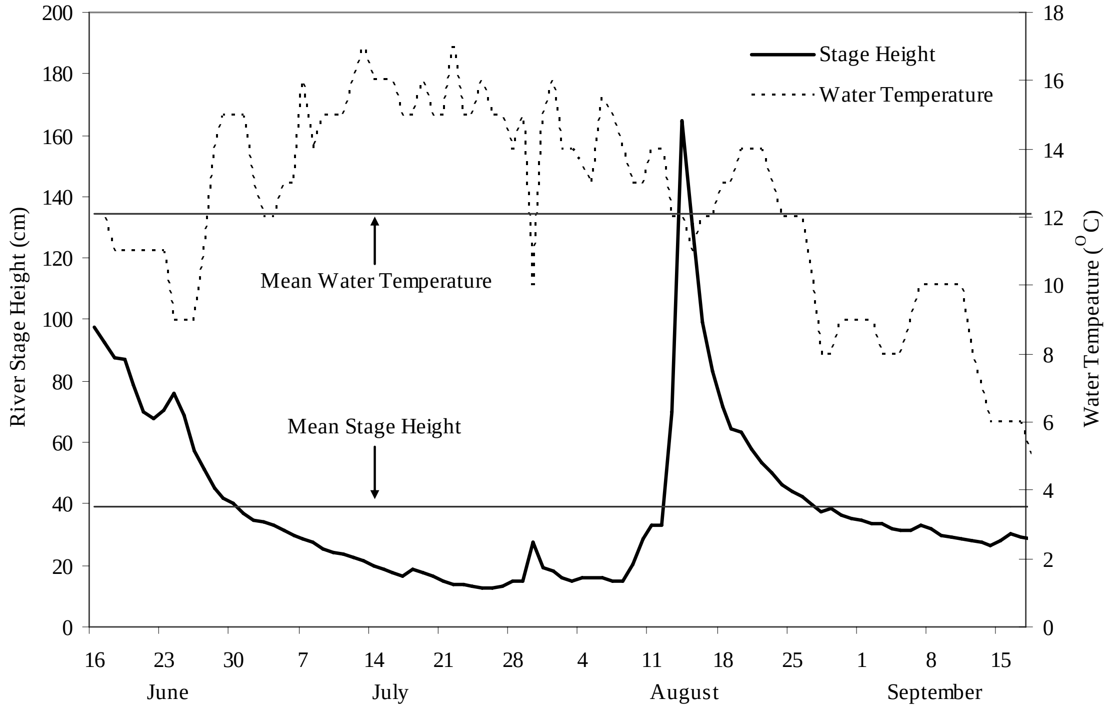

Figure 2. River stage heights and water temperatures at the East Fork Andreafsky River weir, 2003.

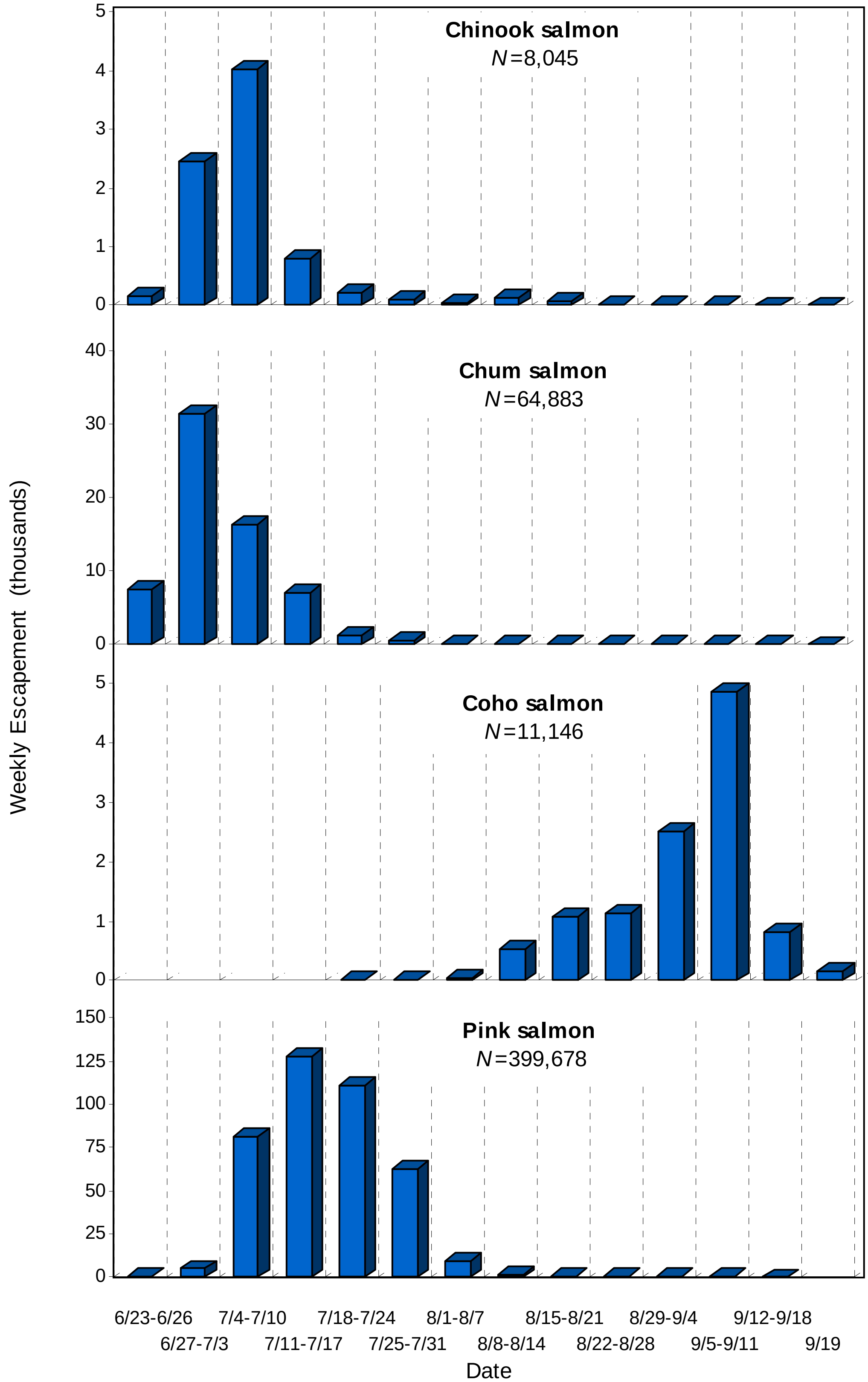

Figure 3. Weekly Chinook, chum, coho, and pink salmon escapement estimates through the East Fork Andreafsky River weir, Alaska, Jun 23 to Sep 19, 2004.

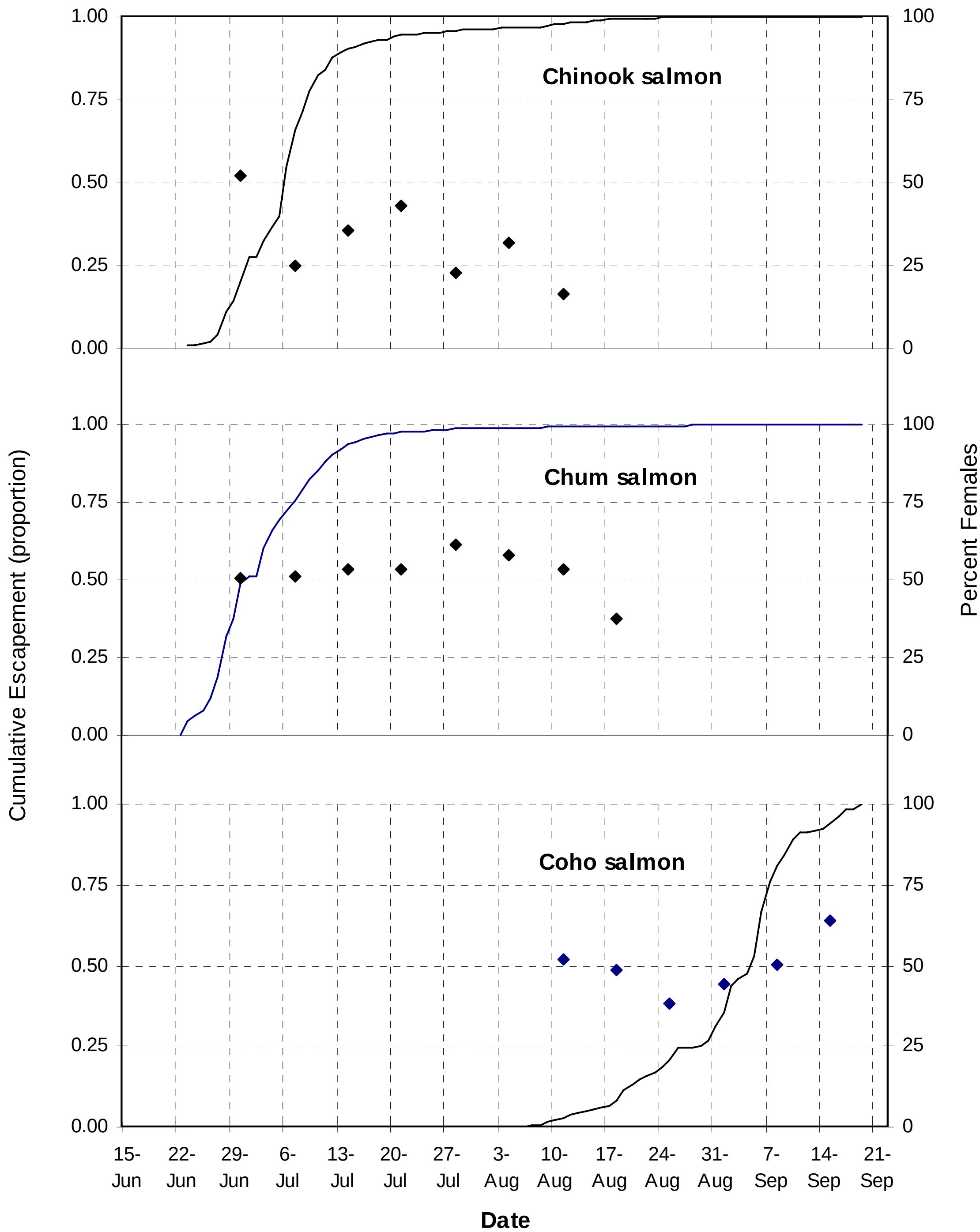

Figure 4. Cumulative escapement expressed as a proportion of total run (solid line) and the percent females of weekly samples (diamonds) of Chinook, chum, and coho salmon escapement through the East Fork Andreafsky River weir, Alaska, June 23 to September 19, 2004.

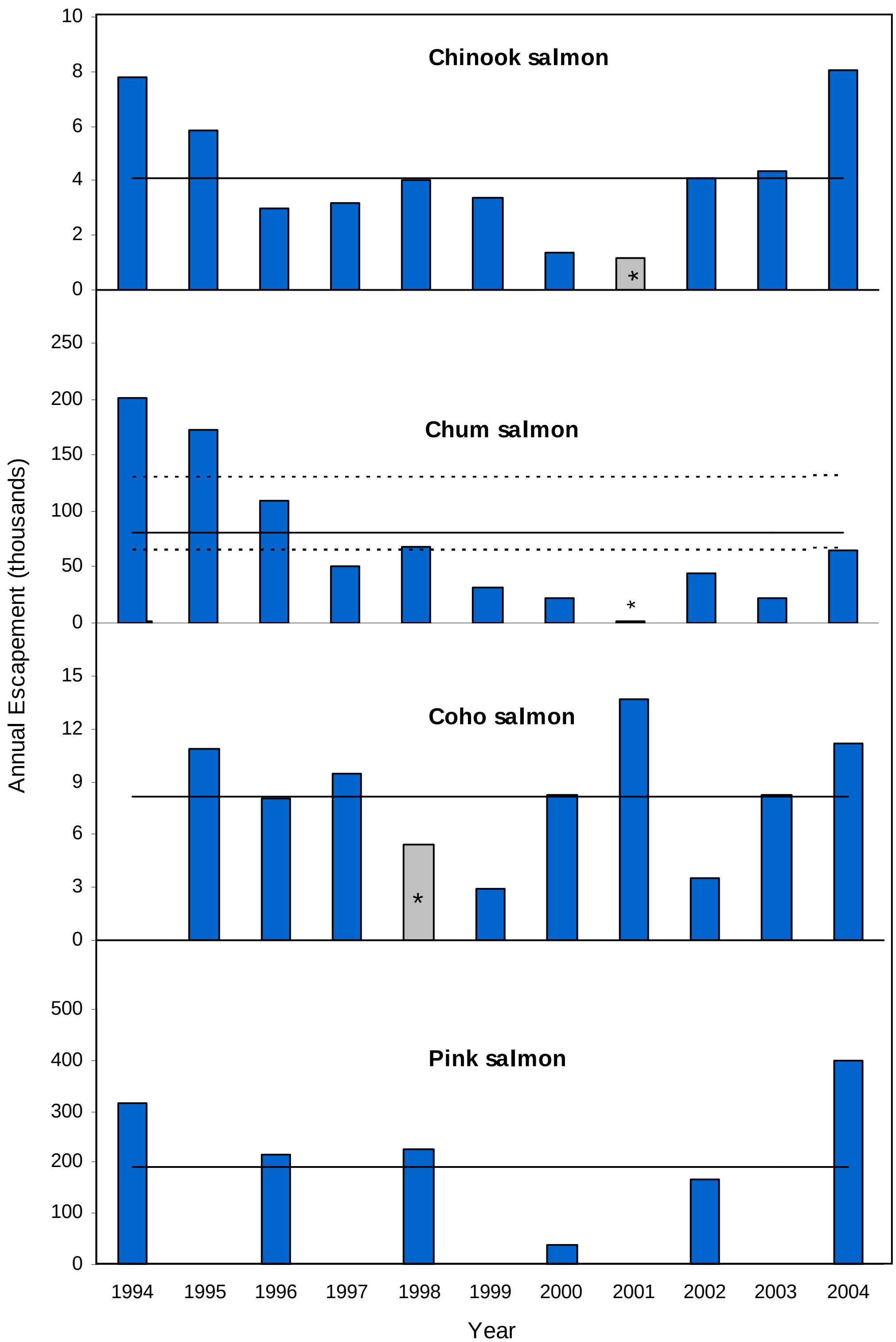

Figure 5. Annual escapement estimates of Chinook, chum, coho, and pink salmon migrating through the East Fork Andreafsky River weir, Alaska, 1994 to 2004. Years with an asterisk were not included in the historical average represented by the solid horizontal line. The dotted horizontal lines in the chum salmon chart represent the maximum and minimum BEG.

Appendix 1. Historical Chinook, chum, and coho salmon escapement estimates recorded for the Andreafsky River, Alaska, 1954-2004. Weir counts reflect actual number of fish counted passing through the weir (see Appendices 2, 3, or 4 for escapement counts adjusted for data gaps). Data from Barton, L.H. (1984), Bergstrom et al. (1998), Zabkar and Harper (2003), and ADF&G (2004).

	East Fork Andreafsky River						Andreafsky River		
	Aerial Index Estimates			Sonar, Tower, or Weir			Aerial Index Estimates		
Year	Chinook salmon	Chum salmon	Coho salmon	Chinook salmon	Chum salmon	Coho salmon	Chinook salmon	Chum salmon	Coho salmon
1954	*a*	*a*					2,000 *a*	7,000 *a*	
1955									
1956	336 *b*	15,356 *b*							
1957									
1958	50 *b*	3,500 *b*					150 *b*	30,000 *b*	
1959	150 *b*	4,000 *b*					300 *b*	7,000 *b*	
1960	1,020	10,530					1,220	6,016	
1961	1,003	8,110							
1962	675 *b*	18,040					762 *b*	19,530	
1963									
1964	867	8,863					705	12,810	
1965							355 *b*	14,670 *b*	
1966	361	25,619 *b*					303	18,145	
1967							276 *b*	14,495 *b*	
1968	380	17,600					383 *b*	74,600 *b*	
1969	231 *b*	119,000					374 *b*	159,500 *b*	
1970	665	84,090					574 *b*	91,710 *b*	
1971	1,904	98,095					1,682	71,745	
1972	798 *b*	41,460 *b*					582 *b*	25,573	
1973	825	10,149 *b*					788	51,835	
1974		3,215 *b*					285	33,578	
1975	993	223,485					301	235,954	
1976	818	105,347					643	118,420	
1977	2,008	112,722					1,499	63,120	
1978	2,487	127,050					1,062	57,321	
1979	1,180	66,471					1,134	43,391	
1980	958 *b*	36,823 *b*					1,500	115,457	
1981	2,146 *b*	81,555	1,657 *b*	5,343 *c*	147,312 *c*		231 *b*		
1982	1,274	7,501 *b*			180,078 *c*		851	7,267 *b*	
1983				2,720 *c*	110,608 *c*				
1984	1,573 *b*	95,200 *b*			70,125 *c*		1,993	238,565	
1985	1,617	66,146					2,248	52,750	
1986	1,954	83,931		1,530 *d*	167,614 *d*		3,158	99,373	
1987	1,608	6,687 *b*		2,011 *d*	45,221 *d*		3,281	35,535	
1988	1,020	43,056	1,913	1,339 *d*	68,937 *d*		1,448	45,432	830
1989	1,399	21,460 *b*					1,089		
1990	2,503	11,519 *b*					1,545	20,426 *b*	
1991	1,938	31,886					2,544	46,657	
1992	1,030 *b*	11,308 *b*					2,002 *b*	37,808 *b*	
1993	5,855	10,935 *b*					2,765	9,111 *b*	
1994	300 *b*			7,801	200,981 *b*		213 *b*		
1995	1,635			5,841	172,148	10,901	1,108		
1996				2,955	108,450	8,037	624		
1997	1,140			3,186	51,139	9,472	1,510		
1998	1,027			4,011	67,591	5,417 *b*	1,249 *b*		
1999				3,347 *e*	32,229 *e*	2,963	870 *b*		

Appendix 1. Continued.

	East Fork Andreafsky River						Andreafsky River		
	Aerial Index Estimates			Sonar, Tower, or Weir			Aerial Index Estimates		
Year	Chinook salmon	Chum salmon	Coho salmon	Chinook salmon	Chum salmon	Coho salmon	Chinook salmon	Chum salmon	Coho salmon
2000	1,018			1,344 *e*	22,918 *e*	8,225 *e*	427		
2001	1,065			1,148 *f*	2,086 *f*	9,252 *e*	570		
2002	1,447			4,123 *e*	44,194 *e*	3,534 *e*	977		
2003				4,330 *e*	22,356 *e*	7,937 *e*	1,578 *b*		
2004	2,879			7,920 *e*	62,798 *e*	10,844 *e*	1,317		
SEG *g*	960 - 1,900						640 - 1,600		
BEG *h*					65,000 - 135,000				

a Counts for both forks were combined into Andreafsky River count.
b Incomplete survey and/or poor survey timing or conditions resulting in minimal or inaccurate count.
c Sonar count.
d Tower count.
e Data missing for one or more days.
f Weir installed to late for an accurate count.
g Sustainable Escapement Goal.
h Biological Escapement Goal.

Appendix 2. Historical daily Chinook salmon escapements recorded at the East Fork Andreafsky River weir 1994-2004. Missing daily counts in 2003 and 2004 were estimated using a linear interpolation of the preceding and subsequent days' counts. Partial days count was divided by number of hours counted and multiplied by 24. Data for 2001 were not used in calculations and is shown for information purposes only.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
15-Jun				0							
16-Jun		0		0							
17-Jun		0		0		0					
18-Jun		0		0		0					
19-Jun		0	0	0		0			0	0	
20-Jun		1	0	0		0			0	0	
21-Jun		0	10	0		0			1	0	
22-Jun		1	0	0		0			20	0	
23-Jun		0	33	14	0	0			0	4	67
24-Jun		2	6	21	0	0			0	2	26
25-Jun		0	0	59	0	0			3	7	15
26-Jun		0	59	0	0	0			1	3	55
27-Jun		41	42	101	1	0			26	12	181
28-Jun		48	19	11	0	0			314	19	534
29-Jun	1	67	6	1	10	0			119	4	290
30-Jun	188	104	8	0	34	47	9		27	0	461
1-Jul	141	81	72	75	93	19	16		319	176	582
2-Jul	54	71	21	24	17	9	39		105	295	25
3-Jul	222	17	205	29	36	0	89		230	22	375
4-Jul	156	55	124	49	75	12	74		5	6	353
5-Jul	651	107	309	98	336	97	38		20	83	263
6-Jul	225	678	258	356	373	42	407		356	136	1,187
7-Jul	1,156	433	280	227	386	114	18		307	336	878
8-Jul	108	155	244	123	204	197	71		130	469	463
9-Jul	351	260	186	49	129	216	17		178	823	503
10-Jul	375	250	111	64	167	256	30		191	48	368
11-Jul	288	382	72	69	255	507	57		264	107	122
12-Jul	581	1,022	52	88	138	214	35		166	345	315
13-Jul	779	697	100	15	62	331	55		191	311	106
14-Jul	433	375	96	16	61	97	18		158	340	105
15-Jul	352	292	62	124	91	22	90	169	140	2	53
16-Jul	389	97	95	274	197	33		87	210	7	58
17-Jul	144	46	110	91	263	75		41	119	25	54
18-Jul	285	38	55	25	184	63		196	94	235	29
19-Jul	161	25	42	70	240	65		71	75	158	40
20-Jul	53	37	69	264	67	302	22	107	50	28	57
21-Jul	66	74	51	148	129	55	12	175	29	10	40
22-Jul	62	33	26	35	117	67	21	66	12	2	13
23-Jul	209	24	2	103	57	15	6	15	32	23	17
24-Jul	149	7	4	57	66	54	11	5	16	58	12
25-Jul	25	78	6	0	12	24	10	17	7	31	19
26-Jul	51	21	3	11	8	5	9	7	3	4	5
27-Jul	92	12	6	3	8	34	7	17	6	22	14
28-Jul	20	15	16	29	11	6	3	10	3	108	23
29-Jul	10	9	13	58	23	159	57	41	4	28	19
30-Jul	13	5	7	144	31	80	4	16	2	4	7
31-Jul	10	1	10	2	17		20	11	46	0	15
1-Aug	1	8	4	8	20		12	8	55	2	13
2-Aug		2	2	4	4	18	4	12	48	5	4
3-Aug		13	2	128	11	42	24	4	10	1	3
4-Aug		5	5	2	1	11		8	3	1	6

Appendix 2. Continued.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
5-Aug		6	6	1	7	5		6	3	4	5
6-Aug		6	2	0	9	2		1	4	0	10
7-Aug		19	7	1	10	1	4	11	4	1	8
8-Aug		20	3	2	3	4	7	0	0	3	6
9-Aug		25	2	2	5	0	10	4	0	1	13
10-Aug		25	5	1	7	1	3	2	0	0	39
11-Aug		7	2	1	1	2	8	1	4	1	17
12-Aug		4	3	7	8	5	4	1	0	1	23
13-Aug		11	0	14	7	3	1	10	1	2	21
14-Aug		2	0	18	1	9		0	1	3	19
15-Aug		2	0	26	0	2	6	11	0	3	17
16-Aug		3	3	2	12	4	2	8	0	2	16
17-Aug		3	0	4		7	1	2	3	1	14
18-Aug		3	2	3		3	2	2	0	1	10
19-Aug		2	2	3	2	0	2	2	1	2	9
20-Aug		1	3	2		6	3	1	0	2	6
21-Aug		2	3	1		0	1	0	0	0	8
22-Aug		0	0	4		1	1	1	5	0	5
23-Aug		1	2	2		0	0	0	0	0	1
24-Aug		1	0	1		0	1	1	1	2	3
25-Aug		0	0	4		0	0	0	0	2	1
26-Aug		0	1	0		1	2	0	0	1	0
27-Aug		0	0	0		1	0	0	0	0	1
28-Aug		3	0	1		0	0	0	0	0	0
29-Aug		1	2	2	0	0	0	0	0	0	0
30-Aug		0	1	3	1	0	0	0	1	0	4
31-Aug		0	2	1	1	0	0	0	0	0	2
1-Sep		1	0	0	0	0	0	0	0	0	2
2-Sep		0	0	0	0	1	1			0	0
3-Sep		0	0	4	0	0	0			0	0
4-Sep		0	0	0	0	0	0		0	0	1
5-Sep		1	0	1	0	1	0		0	0	1
6-Sep		0	1	1	0	0			0	0	2
7-Sep		0	0	0	1	0	0		0	0	0
8-Sep		3	0	2	0	0	0		0	0	1
9-Sep		0	0	1	1	0	0		0	1	1
10-Sep		0	0	0	0	0	0	0	0	0	0
11-Sep		0	0	0	1	0	0	0	0	0	2
12-Sep		0	0	2	0		0	0	0	0	0
13-Sep			0	0	0		0	0	0	0	0
14-Sep			0				0	0	0	0	0
15-Sep			0				0	1		1	0
16-Sep			0				0				0
17-Sep			0				0				1
18-Sep							0				0
19-Sep							0				1
20-Sep							0				
21-Sep							0				
22-Sep							0				
23-Sep							0				
Total	7,801	5,841	2,955	3,186	4,011	3,347	1,344	1,148	4,123	4,336	8,045

[yellow box] = adjusted or estimated escapement counts
[gray box] = no counts, no estimates made

Appendix 3. Historical daily chum salmon estimates recorded at the East Fork Andreafsky River weir 1994-2004. Missing daily counts in 2003 and 2004 were estimated using a linear interpolation of the preceding and subsequent days' counts. Partial days count was divided by number of hours counted and multiplied by 24. Data for 2001 were not used in calculations and is shown for information purposes only.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
15-Jun				0							
16-Jun		52		1							
17-Jun		332		4		0					
18-Jun		191		71		0					
19-Jun		423	62	539		0			0	0	
20-Jun		2,198	424	981		0			0	0	
21-Jun		861	3,315	192		0			117	2	
22-Jun		1,170	1,036	53		0			1,782	87	
23-Jun		228	11,195	3,141	13	1			0	564	3,045
24-Jun		1,951	798	1,620	18	1			6	182	1,062
25-Jun		364	303	1,422	264	0			522	484	985
26-Jun		504	7,306	208	175	7			694	183	2,467
27-Jun		12,620	3,435	1,691	535	8			2,448	396	4,638
28-Jun		11,201	1,463	1,196	65	0			6,754	546	8,461
29-Jun	609	9,256	2,335	61	3,153	331			1,765	219	3,807
30-Jun	19,254	10,938	314	80	4,585	4,459	837		836	271	7,081
1-Jul	12,435	8,654	9,164	1,537	4,003	765	1,725		4,403	928	1,590
2-Jul	2,840	5,553	3,326	619	652	459	1,460		2,467	339	153
3-Jul	4,973	2,710	8,973	756	1,687	24	1,750		2,291	713	5,689
4-Jul	13,321	10,678	10,018	1,264	3,561	3,000	2,070		28	175	3,940
5-Jul	12,552	10,026	7,355	831	7,996	4,605	2,300		347	484	2,011
6-Jul	4,043	23,584	3,351	3,428	6,030	1,185	3,717		4,423	1,051	1,791
7-Jul	27,527	8,514	3,124	2,980	4,696	1,619	72		2,254	1,376	2,474
8-Jul	5,251	732	4,771	2,440	3,088	1,569	1,548		845	2,476	2,096
9-Jul	3,883	4,808	3,500	1,799	845	1,754	942		2,265	2,025	1,990
10-Jul	12,416	6,473	2,303	3,195	1,003	2,135	727		1,732	244	2,069
11-Jul	6,896	6,072	1,275	1,792	4,003	1,897	855		1,221	412	1,609
12-Jul	8,424	3,973	1,497	1,738	4,401	501	477		1,099	1,762	1,815
13-Jul	14,628	4,552	1,680	1,062	829	710	911		1,055	586	1,071
14-Jul	11,611	2,990	1,038	1,302	1,248	1,223	352		544	254	896
15-Jul	8,275	2,874	935	3,222	2,160	412	638	196	1,014	33	605
16-Jul	4,690	3,449	1,280	2,441	2,747	507		133	581	123	569
17-Jul	4,886	2,739	774	1,150	3,038	547		95	420	445	465
18-Jul	4,532	1,495	852	715	1,580	494		229	492	1,078	326
19-Jul	2,977	651	1,848	624	1,365	666		102	392	708	217
20-Jul	1,091	1,150	1,721	1,220	370	816	206	74	192	681	276
21-Jul	1,351	807	1,116	800	335	242	424	228	153	283	142
22-Jul	2,228	591	605	668	304	240	280	72	61	47	59
23-Jul	1,320	742	246	405	248	201	116	29	201	306	77
24-Jul	868	290	291	313	200	173	84	32	98	222	116
25-Jul	1,349	1,214	196	121	220	131	159	155	26	348	171
26-Jul	1,977	521	365	339	166	73	130	116	22	218	85
27-Jul	2,196	605	278	400	130	132	64	110	60	220	69
28-Jul	841	265	738	219	202	92	43	88	123	389	73
29-Jul	564	211	334	234	145	245	173	78	17	220	52
30-Jul	524	248	272	131	115	242	70	37	36	61	37
31-Jul	410	94	260	86	140		172	10	119	80	34
1-Aug	239	160	93	134	191		89	24	81	104	17
2-Aug		81	158	81	91	118	125	40	33	111	21
3-Aug		147	91	182	76	124	109	28	36	40	28
4-Aug		59	192	48	56	117		17	40	91	22

Appendix 3. Continued.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
5-Aug		77	132	101	73	45		13	3	182	25
6-Aug		115	215	77	71	17		2	7	52	31
7-Aug		76	163	29	104	11	5	7	13	85	33
8-Aug		78	54	31	77	16	12	7	5	44	16
9-Aug		70	110	44	34	10	10	7	5	21	36
10-Aug		61	137	17	57	32	13	4	13	21	26
11-Aug		35	63	14	39	14	10	4	11	27	34
12-Aug		60	65	65	77	29	9	3	2	40	26
13-Aug		73	26	36	100	16	22	15	0	21	30
14-Aug		62	35	33	58	6		9	0	52	35
15-Aug		49	59	31	34	10	4	9	1	43	39
16-Aug		95	80	46	32	13	4	11	6	35	44
17-Aug		64	35	37		10	5	6	1	27	48
18-Aug		83	33	58		6	13	6	2	19	18
19-Aug		41	110	43	16	3	5	10	0	32	7
20-Aug		45	33	95		3	3	7	2	22	12
21-Aug		47	64	54		19	0	7	0	21	5
22-Aug		43	27	37		2	1	3	2	10	4
23-Aug		35	37	31		6	2	10	3	12	3
24-Aug		35	26	41		5	4	5	3	11	14
25-Aug		56	103	41		5	6	4	3	24	5
26-Aug		53	35	18		2	19	2	1	13	2
27-Aug		57	26	20		9	17	3	0	11	2
28-Aug		31	39	38		7	13	3	1	5	10
29-Aug		53	78	57	2	5	10	1	0	14	8
30-Aug		34	66	73	4	11	9	4	0	6	19
31-Aug		63	31	21	11	13	2	11	0	2	20
1-Sep		48	38	14	8	18	6	10	0	1	22
2-Sep		75	40	13	4	19	5			1	14
3-Sep		36	49	53	5	15	4			5	5
4-Sep		25	48	28	8	5	2		0	0	5
5-Sep		30	37	38	1	4	1		0	0	16
6-Sep		50	29	31	8	4			0	2	8
7-Sep		60	50	51	6	3	1		1	4	11
8-Sep		96	39	28	4	2	0		0	2	12
9-Sep		42	32	22	3	2	0		0	3	4
10-Sep		42	32	24	9	3	9	2	2	1	3
11-Sep		37	24	48	10	4	3	0	1	0	6
12-Sep		15	16	42	3		5	1	8	16	2
13-Sep			18	23	4		1	1	2	3	6
14-Sep			39				2	3	1	1	3
15-Sep			33				5	3		3	3
16-Sep			38				18				2
17-Sep							3				5
18-Sep							6				0
19-Sep							4				3
20-Sep							8				
21-Sep							10				
22-Sep							1				
23-Sep							1				
Total	200,981	172,148	108,450	51,139	67,591	32,229	22,918	2,086	44,194	22,461	64,883

= adjusted or estimated escapement counts
= no counts, no estimates made

Appendix 4. Historical daily coho salmon estimates recorded at the East Fork Andreafsky River weir, 1995-2004. Missing daily counts in 2001 were estimated using the average daily proportion of passage collected from 1995 to 2000. Missing daily counts in 2003 and 2004 were estimated using a linear interpolation of the preceding and subsequent days' counts. A partial days count was adjusted by dividing by the number of hours counted and multiplying by 24.

Date	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
15-Jun			0							
16-Jun	0		0							
17-Jun	0		0		0					
18-Jun	0		0		0					
19-Jun	0	0	0		0			0	0	
20-Jun	0	0	0		0			0	0	
21-Jun	0	0	0		0			0	0	
22-Jun	0	0	0		0			0	0	
23-Jun	0	0	0	0	0			0	0	0
24-Jun	0	0	0	0	0			0	0	0
25-Jun	0	0	0	0	0			0	0	0
26-Jun	0	0	0	0	0			0	0	0
27-Jun	0	0	0	0	0			0	0	0
28-Jun	0	0	0	0	0			0	0	0
29-Jun	0	0	0	0	0			0	0	0
30-Jun	0	0	0	0	0	0		0	0	0
1-Jul	0	0	0	0	0	0		0	0	0
2-Jul	0	0	0	0	0	0		0	0	0
3-Jul	0	0	0	0	0	0		0	0	0
4-Jul	0	0	0	0	0	0		0	0	0
5-Jul	0	0	0	0	0	0		0	0	0
6-Jul	0	0	0	0	0	0		0	0	0
7-Jul	0	0	0	0	0	0		0	0	0
8-Jul	0	0	0	0	0	0		0	1	0
9-Jul	0	0	0	0	0	0		0	0	0
10-Jul	0	0	0	0	0	0		0	0	0
11-Jul	0	0	0	0	0	0		0	0	0
12-Jul	0	0	0	0	0	0		0	0	0
13-Jul	0	0	0	0	0	0		0	0	0
14-Jul	0	0	0	0	0	0		0	0	0
15-Jul	0	0	0	0	0	0	0	0	2	0
16-Jul	0	0	0	0	0		0	0	0	0
17-Jul	0	0	0	0	0		0	0	0	0
18-Jul	0	0	0	0	0		0	0	0	0
19-Jul	0	0	0	0	0		0	0	0	1
20-Jul	0	0	0	0	0	0	0	0	1	0
21-Jul	0	0	0	0	0	0	0	0	0	0
22-Jul	0	0	0	0	0	0	0	0	0	0
23-Jul	0	11	0	0	0	0	0	0	0	0
24-Jul	0	2	0	0	0	0	0	0	2	0
25-Jul	0	1	0	0	0	0	0	0	0	0
26-Jul	0	4	0	0	0	0	0	0	0	0
27-Jul	0	0	0	0	0	0	0	0	0	0
28-Jul	0	3	0	1	0	0	0	0	0	2
29-Jul	0	3	0	0	0	0	0	0	0	0
30-Jul	0	9	0	1	0	1	0	0	1	1

Appendix 4. Continued.

Date	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
31-Jul	0	25	0	0		1	0	0	2	2
1-Aug	0	1	0	0		7	0	0	0	1
2-Aug	0	7	0	1	0	9	0	0	1	4
3-Aug	1	4	0	5	0	18	0	0	1	0
4-Aug	0	15	0	8	9		0	1	1	0
5-Aug	0	20	0	8	4		0	0	2	8
6-Aug	0	10	0	5	4		0	0	4	10
7-Aug	1	26	1	16	0	12	0	0	28	14
8-Aug	1	20	0	9	0	35	0	0	25	16
9-Aug	3	26	0	5	1	79	0	0	27	98
10-Aug	8	138	0	8	2	125	0	1	5	62
11-Aug	12	105	0	3	2	89	0	0	9	115
12-Aug	5	50	10	4	5	51	0	0	19	86
13-Aug	3	16	47	111	1	211	0	0	40	78
14-Aug	3	11	35	71	1		1	0	194	71
15-Aug	9	19	6	9	0	64	22	0	146	63
16-Aug	5	276	8	61	5	34	33	0	98	56
17-Aug	11	92	7		2	23	5	0	50	48
18-Aug	24	179	12		0	137	5	0	2	163
19-Aug	41	1,052	13	8	0	108	51	1	7	384
20-Aug	24	100	50		1	333	532	0	21	170
21-Aug	95	149	414		42	303	270	0	11	185
22-Aug	246	9	222		48	59	312	3	3	150
23-Aug	305	32	22		0	10	343	6	24	80
24-Aug	414	12	16		26	44	583	3	263	185
25-Aug	245	1,539	577		8	533	217	7	1,744	243
26-Aug	692	449	150		4	1,401	857	0	634	453
27-Aug	1,436	5	10		4	1,643	382	0	288	17
28-Aug	368	1	24		3	279	403	2	197	4
29-Aug	938	179	2,335	371	0	626	103	0	243	38
30-Aug	335	1,489	2,714	618	2	278	1,078	0	552	178
31-Aug	265	374	122	568	1	192	2,264	0	729	490
1-Sep	444	374	73	336	411	358	1,576	0	172	505
2-Sep	863	147	53	17	162	238	432		107	897
3-Sep	14	100	421	80	1,255	162	1,174		9	234
4-Sep	29	250	355	490	704	160	953	43	646	167
5-Sep	6	337	219	228	122	39	349	640	275	609
6-Sep	21	78	514	591	40		429	738	14	1,550
7-Sep	164	84	435	12	0	52	182	413	42	1,011
8-Sep	2,403	24	169	0	14	48	573	345	459	578
9-Sep	854	16	223	94	19	55	306	103	268	337
10-Sep	391	1	52	555	41	94	85	237	9	535
11-Sep	127	0	83	1,104	20	31	30	117	211	259
12-Sep	95	0	64	6		79	20	726	231	13
13-Sep		0	16	13		30	43	113	399	57
14-Sep		0				22	21	35	8	37
15-Sep		3				16	16		4	201
16-Sep		160				28				240
17-Sep						19				241

Appendix 4. Continued.

Date	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
18-Sep						3				42
19-Sep						5				157
20-Sep						5				
21-Sep						34				
22-Sep						32				
23-Sep						10				
Total	10,901	8,037	9,472	5,417	2,963	8,225	13,650	3,534	8,231	11,146

(yellow) = adjusted or estimated escapement counts
(gray) = no counts, no estimates made