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Abundance and Run Timing of Adult Pacific Salmon in the East Fork Andreafsky River, Yukon Delta National Wildlife Refuge, Alaska, 2015

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Cover Photo: USFWS East Fork Andreafsky River weir, July 2015.

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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 of the lower Yukon River, from June 17 to July 31, 2015. An estimated 5,474 Chinook Salmon *Oncorhynchus tshawytscha* migrated through the weir. Four age groups were identified from the 559 Chinook Salmon sampled, with age 1.2 (60%) predominant. The weighted sex composition was 39.8% female. An estimated 48,809 summer Chum Salmon *O. keta* also migrated through the weir. Four age groups were identified from 1,061 summer Chum Salmon sampled, with ages 0.3 (31%) and 0.4 (69%) predominant. The weighted sex composition was 36.3% female. Additionally, 783 Pink Salmon *O. gorbuscha*, 259 Sockeye Salmon *O. nerka*, and 5 Coho Salmon *O. Kisutch* were counted passing through the weir. Other species counted during 2015 included 1,286 Whitefish (Coregoninae), 4 Dolly Varden *Salvelinus malma*, and 67 Northern Pike *Esox Lucius*.

Introduction

The Alaska National Interest Lands Conservation Act of 1980 (ANILCA) mandates that salmon populations and their habitats be conserved in their natural diversity on National Wildlife Refuge lands, international treaty agreements be fulfilled, and a subsistence priority for rural residents be maintained (USFWS 1991). Compliance with ANILCA mandates requires reliable data on salmon stocks originating from and returning to refuge waters. The Andreafsky River is one of several lower Yukon River tributaries within 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 Salmon *Oncorhynchus tshawytscha*, summer Chum Salmon *O. keta*, Coho Salmon *O. kisutch*, Pink Salmon *O. gorbuscha*, and Sockeye Salmon *O. nerka* (USFWS 1991). The Andreafsky River supports one of the largest returns of Chinook Salmon, a large return of summer Chum Salmon (Bergstrom et al. 1998), and is thought to have the largest return of Pink Salmon in the Yukon River drainage (USFWS 1991).

In the past, Andreafsky River salmon stocks have contributed to a subsistence fishery in the lower Yukon River. Consequently, accurate and timely escapement estimates from tributaries like the Andreafsky River are required by Yukon River salmon "in-season" managers to help determine exploitation rates, spawner-recruit relationships and maintain genetic diversity for the Yukon River Basin (Labelle 1994). Throughout the Yukon River basin there are a limited number of monitoring projects that collect these data. Therefore, Federal and State fishery managers utilize information from escapement projects, main-stem sonar stations, and test

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fisheries to distribute salmon harvest over time to avoid over-harvesting individual salmon stocks (Mundy 1982). .

Escapement monitoring on the East Fork Andreafsky River started with aerial surveys conducted by the U.S. Fish and Wildlife Service (USFWS) from 1954 to 1960, and continued by the Alaska Department of Fish and Game (ADF&G) from 1961 to the present. Sonar and tower counts were added by ADF&G from 1981 through 1988 (Appendix 1). The present weir project (operated by the USFWS Kenai Fish and Wildlife Field Office from 1994 to 2002 and the USFWS Fairbanks Fish and Wildlife Field Office since 2003) has provided accurate escapement and biological data since 1994 for Chinook Salmon, and for summer Chum Salmon, Pink Salmon, and Coho Salmon from 1995 to 2005. The Andreafsky River weir is one of the longest running escapement projects in the Yukon River drainage.

Periodic poor Chum Salmon returns and declining productivity for Chinook Salmon have resulted in harvest restrictions, complete fishery closures, and spawning escapements below management goals on many tributaries in the Yukon River basin (Vania et al. 2002; Kruse 1998, JTC 2016). Chinook Salmon and summer Chum Salmon runs had harvestable surpluses from 2002 to 2006 (JTC 2007), but Chinook Salmon runs have been low since 2007 (JTC 2016). This project provides information on tributary run strength and quality of escapement for in-season management decisions, especially during years with low returns. It is also downriver of where most harvest occurs on the Yukon River.

Objectives

The project objectives for 2015 were: (1) enumerate adult salmon escapement; (2) describe run timing of Chinook Salmon and summer Chum Salmon returns; (3) estimate the age, sex, and length composition of the adult Chinook Salmon population; (4) estimate age, sex, and length composition of the adult summer Chum Salmon population; (5) 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 ranging from 28˚C in summer to –42˚C in winter at St. Mary's, Alaska (Leslie 1989). Mean monthly high and low temperatures between 1976 and 2000 were 18˚C in July and –22˚C in February. 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 typically follows breakup. Sporadic high discharges generated by heavy rains occur between late July and early September.

The Andreafsky River is one of the three largest Yukon River tributaries within the Refuge boundaries (USFWS 1991) and drains a watershed of approximately 5,450 km^2. The main-stem Andreafsky River and the East Fork Andreafsky River parallel each other, flowing southwesterly for more than 200 river-kilometers (rkm) and converge 7 rkm upstream of their confluence with the Yukon River. The mouth of the Andreafsky River is approximately 160 rkm upstream from the mouth of the Yukon River. The main-stem Andreafsky River and East Fork Andreafsky River flow through the Andreafsky Wilderness Area and the portions of each river within Refuge boundaries are federally 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 flows through alpine tundra at an average gradient of 7.6 m/km for 48 rkm. It then flows 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 forested river section drops at an average rate of 1.4 m/km and is characterized by glides and riffles with gravel and rubble substrate. The river widens in the lowermost 38 rkm and the gradient drops to 0.14 m/km. The valley here is wetlands, interspersed with forest and tundra, and bordered by hills that are typically less than 230 m elevation. Aquatic vegetation grows in the slower-flowing stream channels. Water level fluctuations on the Yukon River affect the stage height in the lower sections of the East Fork and main-stem Andreafsky rivers.

Methods

Weir Operation

A modified, resistance-board weir (Tobin 1994; Tobin and Harper 1995; Zabkar and Harper 2003) spanning 105 m was installed from June 17 to July 31, 2015, in the East Fork Andreafsky River (62° 07'N, 162° 48.4'W) approximately 43 rkm upstream from the Yukon-Andreafsky River confluence and 26 air-km northeast 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 1981-1988 sonar and counting tower site described by Sandone (1989). Weir panel picket spacing (4.8 cm inside edge to inside edge) was designed to remain functional during higher water flow, but allowed smaller Pink Salmon and resident fish to pass through the weir undetected (Zabkar and Harper 2003).

A staff gauge was installed at the weir to measure daily water levels. Staff gauge measurements were calibrated to a monument with the three-foot mark on the staff gauge 12.5 feet below the horizontal from the monument. Two Onset Hobo Pro v2 (Bourne, Massachusetts) loggers collected water temperature data throughout the season, and were left on site to collect data year round. Water temperature was collected twice daily at approximately 0800 hours and 2000 hours, using a YSI Professional Plus Multiprobe (Yellow Springs, Ohio) for in-season reporting. Additionally, a YSI 6920 (Yellow Springs, Ohio) sonde was installed to record water temperature, dissolved oxygen, conductivity, pH, and turbidity every 15 minutes.

Two passage chutes were installed in the weir, one approximately one-third of the way across from the left bank, and the other centered between the banks, in water deep enough to allow fish passage in the event of low water conditions. A fish trap was installed on one passage chute to facilitate biological sampling. All fish were enumerated and identified to species as they passed through the live trap, except Whitefish spp., which were grouped under the subfamily Coregoninae. Fish were counted 24 hours per day and the numbers were recorded hourly from June 17 to July 31.

In 2015, a video weir monitoring system, installed and tested in 2014, was used on the East Fork Andreafsky River to enumerate fish passage. The video system components consist of a camera box (containing a CAM-AM070 Color Analog Video Camera, built by Applied MicroVideo) and passage chute, which were attached to the upriver side of the fish trap. This video camera box funnels fish into a narrow passage that enables review of motion capture footage to identify species. Video footage is archived and retained in the Fairbanks Fish and Wildlife Field Office.

The system was enabled with motion capture software (Security Spy/ Bensoftware). The system was tested during 2015 to ensure that traditional manual counts and video counts did not differ by more than 3% for Chinook Salmon and Chum Salmon. After the test period, fish counting from motion capture files was used for the remainder of the season. In 2015, counts were derived from the motion capture files beginning July 2, before this date all counts were manual counts.

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 when necessary.

Biological Data

Adult salmon counting and sampling occurred daily to determine run timing and escapement. A stratified, random sampling design (Cochran 1977) was used to collect age, length, and sex data for Chinook Salmon and summer Chum Salmon. Biological sampling of Chinook Salmon and summer Chum Salmon occurred each week, with a sampling goal of 160 individuals per species spread throughout each week, and daily sampling spread throughout each 24-hour period. All target species within the trap were sampled to prevent bias. Non-target species were identified and counted, but not sampled.

Sampling consisted of identifying salmon to species, determining sex, measuring fish lengths, collecting scales, and releasing fish upstream of the weir. Secondary external characteristics were used to determine sex. Lengths were measured from mid-eye to the fork of the caudal fin (MEFK) to the nearest 1 mm. Scales were removed from the area above the lateral line and posterior to the dorsal fin following the methods outlined by Koo (1962) and Devries and Frie (1996). Four scales were collected from each Chinook and Sockeye Salmon sampled, and one scale was collected from each summer Chum Salmon sampled. Scales were sent to ADF&G post season for age determination, from impressions 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 ADF&G biologist and reported according to the European method (Koo 1962). Daily sex ratios were collected by visually examining each fish for external morphological features when sampling for age and length. The escapement counts and sex ratios were reported daily to the USFWS Fairbanks Fish and Wildlife Field Office and forwarded to ADF&G staff.

Data Analysis

Calculations for age and sex information were calculated using a stratified random sample (Cochran 1977), with sampling weeks as the strata. Chinook Salmon less than 650 mm (MEFK) and age-1.2 Chinook Salmon were assumed to be males (Brady 1983; Bales 2007; Karpovich and DuBois 2007) regardless of their field determination. Each statistical week was defined as beginning on Sunday and ending the following Saturday. Incomplete weeks, or weeks with low fish passage were collated with weeks before or after that week to maximize sample size in all strata. Within a stratum, the proportion of the samples composed of a given sex or age, $\hat{p}_{ij}$ was calculated as:

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

where n_{ij} is the number of fish by 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 $\hat{p}_{ij}$ 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 and summer Chum salmon of a given sex or age, $\hat{p}_i$ were calculated as:

$$\hat{p}_i = \sum_{j-1} \hat{W}_j \hat{p}_{ij,}$$

where the stratum weight $\hat{W}_j$ was calculated as:

$$\hat{W}_j = \frac{N_j}{N},$$

and 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. Variance, $\hat{v}(\hat{p}_i)$ of sex and age compositions for the run was calculated as:

$$\hat{v}(\hat{p}_i) = \sum_{j-1} \hat{W}_j^2 \hat{v}(\hat{p}_{ij}).$$

Results and Discussion

Weir Operation

The weir was operational from June 17 through July 31, 2015. Chinook and Chum Salmon bypass was detected from July 17 (from approximately 0600 hours) through July 18 (at 1200 hours), due to high water levels. Therefore, the counts should be considered conservative. Sampling for age, sex, and length was suspended on June 21 and 22 when water temperatures exceeded 20°C. Sampling was limited to times when the water temperature was below 20°C on June 23 and 24. The average river stage height during weir operations was 0.81 m, and ranged from 0.70 to 1.24 m (Figure 2). Water temperature during weir operations averaged 16.0°C and daily averages ranged from 12.22 to 20.56°C (Figure 2, Appendix 9).

Biological Data

Counts at the weir included 5,474 Chinook Salmon, 48,809 summer Chum Salmon, 783 Pink Salmon, 259 Sockeye Salmon, and 5 Coho Salmon through the passage chute in 2015 (Table 1). Non-salmon species recorded moving through the passage chute included 1,286 Whitefish, 67 Northern Pike and 4 Dolly Varden.

While the East Fork Andreafsky River weir recorded above-average Chinook Salmon escapement in 2015 (Figure 3, productivity remained low across the Yukon River basin (JTC

2016). The summer Chum Salmon escapement recorded at the weir in 2015 was below average (Figure 4), and basin-wide escapements were near average (JTC 2016).

Chinook Salmon

The 2015 Chinook Salmon escapement estimate (5,474 fish) was above the 1994-2014 historical average of 4,198 fish, and the ADF&G Sustainable Escapement Goal (SEG) of 2,100 to 4,900 fish was exceeded (Figure 3; Appendix 1). Peak passage (871) occurred on July 16 (Table 1; Appendix 2). The 2015 run timing was near average. The first quartile passed on July 8 (historical average July 7), the mid-point of the run at the weir was July 12 (historical average July 12), and the third quartile passage date was July 15 (historical average July 17) (Appendix 2). Chinook Salmon passage calculations were not adjusted for differences in project duration among years.

Of the 5,474 Chinook Salmon that passed through the weir in 2015, 559 (10.2% of the observed run) were sampled for age, sex, and length composition. Female Chinook Salmon lengths ranged from 660 to 965 mm, and male Chinook Salmon ranged from 460 to 874 mm (Table 2). Of the 559 Chinook Salmon sampled for age composition, 12 were classified as unreadable, primarily due to scale regeneration and absorption. The weighted age composition of the remaining 547 sampled Chinook Salmon included four age groups: age-1.2 (36.4%), age-1.3 (14.6%), age-1.4 (49.0%), and age 2.2 at <0.01% (Table 3). Females composed an estimated 39.8% of the overall escapement. This estimate is 2.8 percentage points higher than the historical average sex ratio of 37% females (Appendices 7 and 8). The age distributions for female and male Chinook Salmon were predominantly age-1.2 (60.2%) for males and age-1.4 (92.9%) for females.

In 2015, the USFWS continued assisting ADF&G in the collection of egg samples from Chinook Salmon for use in a Yukon River basin-wide thiamine analysis project. This effort was funded by the North Pacific Research Board under the title “Exploration of AYK Chinook salmon egg thiamine levels as a potential mechanism contributing to recent low productivity patterns” (NPRB project 1422), submitted by Sean Larson of ADF&G. The sampling was conducted August 14–15, on the East Fork Andreafsky River. Sampling occurred between points N62°14’27.59”, W162°40’28.98” and N62°36’18.1”, W162°6’35.56”. This equates to a reach of the East Fork of the Andreafsky River that is 16 to 64 air kilometers up river from the weir location. In total, 30 Chinook salmon were captured using hook and line (25 females/ 5 males).However, many of the female Chinook Salmon were spent and egg samples could only be collected from 13 of the 25 female Chinook Salmon.

Summer Chum Salmon

The 2015 summer Chum Salmon escapement estimate of 48,809 fish was below the 1994-2014 historical average of 70,287 (Figure 4; Appendix 1 and 3), however, it met ADF&Gs Biological Escapement Goal (BEG) of >40,000 fish (JTC 2016). The 2015 run timing was early, and peak passage (7,079) occurred on July 5 (Table 1; Figure 4). The first quartile passed on July 1 (historical average July 5), the mid-point of the run at the weir was July 5 (historical average July 9), and the third quartile passage date was July 8 (historical average July 15) (Appendix 3). Summer Chum Salmon passage calculations were not adjusted for differences in project duration among years.

Female summer Chum Salmon lengths ranged from 430 to 650 mm and males ranged from 450 to 715 mm (Table 2). There were 1,061 summer Chum Salmon sampled for age composition, with 115 (10.9%) classified as unreadable, primarily due to scale regeneration or absorption. The age composition of the remaining summer Chum Salmon sampled included four age groups: age-0.2 (0.3%), age-0.3 (30.6%), age-0.4 (68.6%) and age-0.5 (0.1%) (Table 4). Females comprised an estimated 36.3% of the overall escapement (Table 5). This estimate is 11 percentage points lower than the historical sex ratio (47%)(Appendix 8). Female summer Chum Salmon were predominantly age-0.4 (62.2%), and male summer Chum Salmon were also predominantly age-0.4 (72.5%).

Pink Salmon

Pink Salmon have strong runs to the East Fork Andreafsky River during even-numbered years and relatively weak runs during odd-numbered years (Appendix 5). The 2015 escapement through the weir (783 fish) was less than the 1995-2013 historical odd-year average of 6,159. Pink Salmon counts on the Andreafsky River are not precise estimates, but are a measure of relative year-to-year abundance, as smaller Pink Salmon are able to pass uncounted between the weir pickets. The highest days of passage occurred on July 21 and 22 (78 fish each day) (Table 1, Appendix 5).

Sockeye Salmon

The 2015 Sockeye Salmon escapement estimate of 259 fish was above the 1995-2014 historical average of 215 (Appendix 6). Large populations of Sockeye Salmon are not present in the Yukon River drainage (Bergstrom et al. 1995), but small populations have been identified in several Yukon River tributaries (Alt 1983; O'Brien 2006), including the Andreafsky River. In 2014, post-season Chinook Salmon sampling in the Andreafsky led to the identification of a spawning congregation of Sockeye Salmon. This group contained approximately 100 individuals in a tributary of the East Fork located at 61° 36' 14.9"N, 162° 07' 07.1"W. A nomination to the Anadromous Waters Catalog was made in 2014, and accepted in 2015. The same site was resurveyed in August 2015, and a spawning aggregation of approximately 250 individuals was observed.

Of the 259 Sockeye Salmon that passed through the weir in 2015, 39 (15% of the run) were sampled for age, sex, length and genetic samples were collected. The proportion of female Sockeye Salmon was 53.8% of the total sample size. Male Sockeye ranged in length from 418 to 580 mm MEFK and female Sockeye ranged in length from 440 to 556 mm (Table 2). Of the 39 Sockeye Salmon sampled for age composition, two were unreadable. The age composition of the remaining 37 sampled Sockeye Salmon included three age groups: age-0.3 (21.6%), age-1.2 (8.1%), and age-1.3 (70.2%). Male Sockeye Salmon were predominantly age-1.3 (60.0%) and female Sockeye Salmon were also predominantly age-1.3 (77.3%; Table 5).

Coho Salmon

The weir has not operated when Coho Salmon typically migrate on the Andreafsky River since 2005, and only five individuals were counted in 2015.

Conclusion

The East Fork Andreafsky River weir is an important tool for monitoring salmon stocks originating on the Refuge, and in assisting both ADF&G and USFWS in-season managers with management of Yukon River fisheries. Due to the complexity of the Yukon River mixed-stock salmon fishery and the difficulty in managing specific stocks, it is vital to continue collecting information from individual salmon populations, including those in the Andreafsky River drainage. The East Fork Andreafsky River weir is unique because it is the only enumeration project in the lower river downstream of the Pilot Station sonar. The numerical, biological, and run timing information collected from the East Fork Andreafsky River weir project is assumed to represent other Lower Yukon River systems experiencing lower salmon exploitation due to their location in the lower portion of the Yukon River drainage. This project allows managers to evaluate escapement goals, analyze trends in population size, length, age, and gender, formulate run projections, determine harvest allocations, and monitor long-term changes associated with climate change, harvest fluctuations, diseases, and other stressors.

Chinook Salmon escapement counts to the East Fork Andreafsky River were above the 20-year project average in 2015, and the upper end of the sustainable escapement goal was exceeded. Run timing for Chinook was near average. The ASL sample size was adequate to apportion the run accurately.

Summer Chum returns were below the 20-year project average; however, the biological escapement goal was met. Run timing for summer Chum Salmon was early in 2015. The number of ASL samples collected was sufficient for accurate apportionment in 2015.

An investigation of spawning and rearing locations for Sockeye Salmon recommended in prior reports continued in 2015. Inter-annual use of the spawning locations found in 2014 was confirmed in 2015. Additionally, Sockeye Salmon age, sex and length data were collected at the weir, as well as genetic samples. Given the relatively small population size of Sockeye Salmon on East Fork Andreafsky, sample collections will remain opportunistic.

The weir functioned well in 2015, but there was a limited time when fish bypass was detected. Therefore, counts for 2015 should be considered conservative. Sampling for age, sex, and length was also interrupted at the beginning of the run due to high water temperatures. This led to the development of a “heat” protocol to be used in the future. If high water temperature conditions become more persistent, ASL sampling may need to be adapted to mitigate any additional stress to the fish.

Additionally, if concerns about Coho Salmon populations in the Yukon River drainage become a priority, the East Fork Andreafsky weir should be considered a suitable data collection site, as Coho Salmon data was collected at this location prior to 2006.

With the limited commercial fishery since 2003, and the historical subsistence use for Arctic Lamprey *Lethenteron camschaticum*, the East Fork Andreafsky River weir project has also collected baseline biological data on lamprey spp. This was the fourth year during which length-frequency data on lamprey ammocoetes was collected.

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Table 1. — Daily and cumulative escapement estimates of Chinook Salmon, summer Chum Salmon, Pink Salmon, and Sockeye Salmon, and daily and total escapement estimates of Whitefish spp. and Northern Pike through the East Fork Andreafsky River weir, Alaska, 2015.

	Chinook salmon		Summer Chum		Pink Salmon		Sockeye	White fish	Pike	Grayling	Dolly Varden
Date	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Daily	Daily	Daily	Daily
17-Jun	0	0	1	1	0	0	0	31	5	0	0
18-Jun	0	0	9	10	0	0	0	43	3	0	0
19-Jun	0	0	1	11	0	0	0	12	1	0	0
20-Jun	0	0	0	11	0	0	0	10	0	0	0
21-Jun	2	2	1	12	0	0	0	18	0	0	0
22-Jun	1	3	24	36	0	0	0	32	0	0	0
23-Jun	1	4	108	144	0	0	0	73	1	0	0
24-Jun	7	11	67	211	0	0	0	83	0	0	0
25-Jun	26	37	569	780	0	0	0	132	0	0	0
26-Jun	5	42	1,603	2,383	0	0	2	64	2	0	0
27-Jun	1	43	660	3,043	0	0	1	43	3	0	0
28-Jun	5	48	1,520	4,563	0	0	1	28	2	0	0
29-Jun	45	93	4,104	8,667	0	0	2	40	2	0	0
30-Jun	20	113	1,616	10,283	0	0	4	53	4	0	0
1-Jul	10	123	2,254	12,537	0	0	1	5	3	0	0
2-Jul	49	172	1,946	14,483	1	1	13	25	2	0	0
3-Jul	23	195	2,007	16,490	1	2	12	22	1	0	0
4-Jul	76	271	6,527	23,017	0	2	19	15	0	0	0
5-Jul	128	399	7,079	30,096	2	4	15	19	1	0	0
6-Jul	484	883	5,056	35,152	9	13	26	38	4	0	0
7-Jul	309	1,192	1,353	36,505	2	15	6	26	2	0	0
8-Jul	236	1,428	521	37,026	0	15	11	22	3	0	0
9-Jul	705	2,133	3,713	40,739	7	22	30	15	0	0	0
10-Jul	250	2,383	1,707	42,446	0	22	12	20	1	0	0
11-Jul	166	2,549	290	42,736	2	24	3	17	0	0	0
12-Jul	491	3,040	974	43,710	7	31	11	16	0	0	0
13-Jul	495	3,535	507	44,217	15	46	9	39	3	0	3
14-Jul	463	3,998	258	44,475	5	51	3	23	3	0	1
15-Jul	161	4,159	303	44,778	14	65	5	19	1	0	0
16-Jul	871	5,030	807	45,585	30	95	5	40	0	0	0
17-Jul	97	5,127	282	45,867	15	110	4	55	0	0	0
18-Jul	0	5,127	88	45,955	8	118	3	8	0	0	0
19-Jul	6	5,133	189	46,144	9	127	8	46	1	0	0
20-Jul	18	5,151	585	46,729	22	149	9	20	6	0	0
21-Jul	30	5,181	508	47,237	78	227	8	36	0	0	0
22-Jul	36	5,217	241	47,478	78	305	9	19	3	0	0
23-Jul	24	5,241	190	47,668	73	378	5	8	4	0	0
24-Jul	21	5,262	112	47,780	52	430	7	6	1	0	0
25-Jul	6	5,268	98	47,878	44	474	0	2	0	0	0
26-Jul	33	5,301	150	48,028	56	530	4	4	0	0	0
27-Jul	52	5,353	196	48,224	32	562	2	6	0	0	0
28-Jul	34	5,387	202	48,426	56	618	3	5	1	0	0
29-Jul	25	5,412	116	48,542	67	685	1	7	0	0	0
30-Jul	43	5,455	173	48,715	48	733	3	17	3	0	0
31-Jul	19	5,474	94	48,809	50	783	2	24	1	0	0
Total	5,474		48,809		783		259	1,286	67	0	4

Table 2. — Lengths (in mm from mid-eye to fork in the caudal fin) at age of female and male Chinook Salmon, summer Chum Salmon and Sockeye Salmon sampled in 2015 at the E.F. Andreafsky River weir, Alaska.

Female						Male					
Age	*N*	Mean	Median	SE	Range	Age	*N*	Mean	Median	SE	Range
Chinook Salmon											
1.2	0*					1.1	0				
1.3	14	754	760	11.3	660-825	1.2	210	579	578	3.5	460-743
1.4	203	831	825	3.3	700-965	1.3	63	691	687	6.7	556-839
1.5	0					1.4	60	778	771	7.2	656-874
UNK	4					UNK	8				
All Ages	221					All Ages	341				
Chum Salmon											
0.2	10	486	485	4.9	466-510	0.2	4	468	466	8.3	450-490
0.3	146	513	512	2.6	423-595	0.3	203	549	550	2.2	460-645
0.4	195	537	538	2.5	430-650	0.4	384	579	579	1.9	461-715
0.5	0					0.5	4	578	592	27.3	507-624
UNK	37					UNK	78				
All Ages	388					All Ages	673				
Sockeye Salmon											
0.3	3	521	528	7.5	506-529	0.3	5	521	528	6.8	526-564
1.2	2	461	461	20.5	440-481	1.2	1	542	539	2	437-686
1.3	17	512	515	7.2	442-550	1.3	9	576	577	3.6	459-650
UNK	0					UNK	2				
All Ages	21					All Ages	17				

*age 1.2 Chinook Salmon are considered male.

Table 3. — Age and sex ratio estimates by stratum of Chinook Salmon sampled at East Fork Andreafsky River weir, Alaska, 2015. Standard errors are shown in parentheses. Season totals are calculated from weighted weekly strata totals. Unknown age data are from unreadable scale samples and were included in percent female calculations.

					Brood year and age							
					2012	2011	2010		2009			2008
Strata Dates	Run Size (*N*)	Samples Size (*n*)	Unknown Age	Percent Female	1.1	1.2	1.3	2.2	1.4	2.3	1.5	2.4
Jun 17-July 07	883	121	0	36.4%(4.4)	0%	41.3%(4.5)	19.0%(3.6)	0%	39.7%(4.5)	0%	0%	0%
July 08-Jul 12	2,157	161	3	42.9%(3.9)	0%	25.6%(3.5)	17.9%(3.1)	0%	56.4%(4.0)	0%	0%	0%
Jul 13-Jul 22	2,177	161	4	38.5%(3.8)	0%	43.9%(4.0)	10.2%(2.4)	0%	45.9%(4.0)	0%	0%	0%
Jul 23-Jul 31	257	116	3	36.2%(4.5)	0%	45.1%(4.7)	08.8%(2.7)	<0.1%	45.1%(4.7)	0%	0%	0%
Total	5,474	559	10	39.8%(2.3)	0%	36.4%(2.2)	14.6%(1.7)	0%	50.0%(2.4)	0%	0%	0%
Female	2,177	217	4	-	0%	0%	07.1%(1.9)	0%	92.9%(1.9)	0%	0%	0%
Male	3,297	342	6	-	0%	60.2%(2.9)	19.5%(2.4)	<0.1%	20.2%(2.4)	0%	0%	0%

Table 4. — Age and sex ratio estimates by stratum of summer Chum Salmon sampled at East Fork Andreafsky River weir, Alaska, 2015. Standard errors are shown in parentheses. Season totals are calculated from weighted weekly strata totals. Unknown age data are from unreadable scale samples are listed for informational purposes, and were not included in age calculations, but were used in the cumulative percent female calculation.

					Brood year and age				
					2012	2011	2010	2009	2008
Strata Dates	Run Size (*N*)	Samples Size (*n*)	Unknown Age	Percent Female	0.2	0.3	0.4	0.5	0.6
Jun 17-Jun 27	3,043	151	13	34.4%(3.9)	0%	11.9%(2.8)	87.4%(2.9)	0.7%(0.7)	0%
Jun 28-Jul 02	11,440	182	11	33.5%(3.5)	0%	18.7%(3.0)	80.7%(3.0)	0.5%(0.6)	0%
Jul 03-Jul 11	28,253	243	25	37.0%(3.1)	0%	32.6%(3.2)	67.4%(3.2)	0%	0%
Jul 12-Jul 18	3,219	179	24	37.4%(3.6)	1.9%(1.1)	49.7%(4.0)	48.4%(4.0)	0%	0%
July 19-July 24	1,825	159	14	47.8%(4.0)	4.8%(1.8)	59.3%(4.1)	34.5%(4.0)	1.4%(1.0)	
July 25-July 31	1,029	147	25	28.6%(2.7)	3.3%(1.6)	54.9%(4.5)	41.8%(4.5)	0%	
Total	48,809	1,061	115	36.3%(2.0)	0.3%(0.1)	30.6%(2.0)	68.6%(2.0)	0.2%(0.1)	0%
Female	17,717	388	37	-	0.7%(0.0)	37.0%(3.5)	62.2%(3.5)	0%	0%
Male	31,092	673	78	-	0.2%(0.0)	27.0%(2.4)	72.5%(2.4)	0.3%(0.2)	0%

Table 5. — Age and sex ratio estimates of Sockeye Salmon sampled at East Fork Andreafsky River weir, Alaska, 2015. Standard errors are shown in parentheses. Season totals are calculated from combined sample. Unknown age data are from unreadable scale samples are listed for informational purposes, and were not included in age calculations, but were used in the cumulative percent female calculation.

					2012	2011	2010
Dates	Run Size (*N*)	Samples Size (*n*)	Unknown Age	Percent Female	1.1	1.2	1.3
June 17-July 31	259	39	0	56.4%(12.8)	21.6%(6.9)	8.1%(4.5)	70.3%(7.6)
Female	146	22	0	-	13.6%(7.5)	9.1%(6.3)	77.3%(9.1)
Male	113	17	2	-	33.3%(12.6)	6.7%(6.7)	60.0%(13.1)

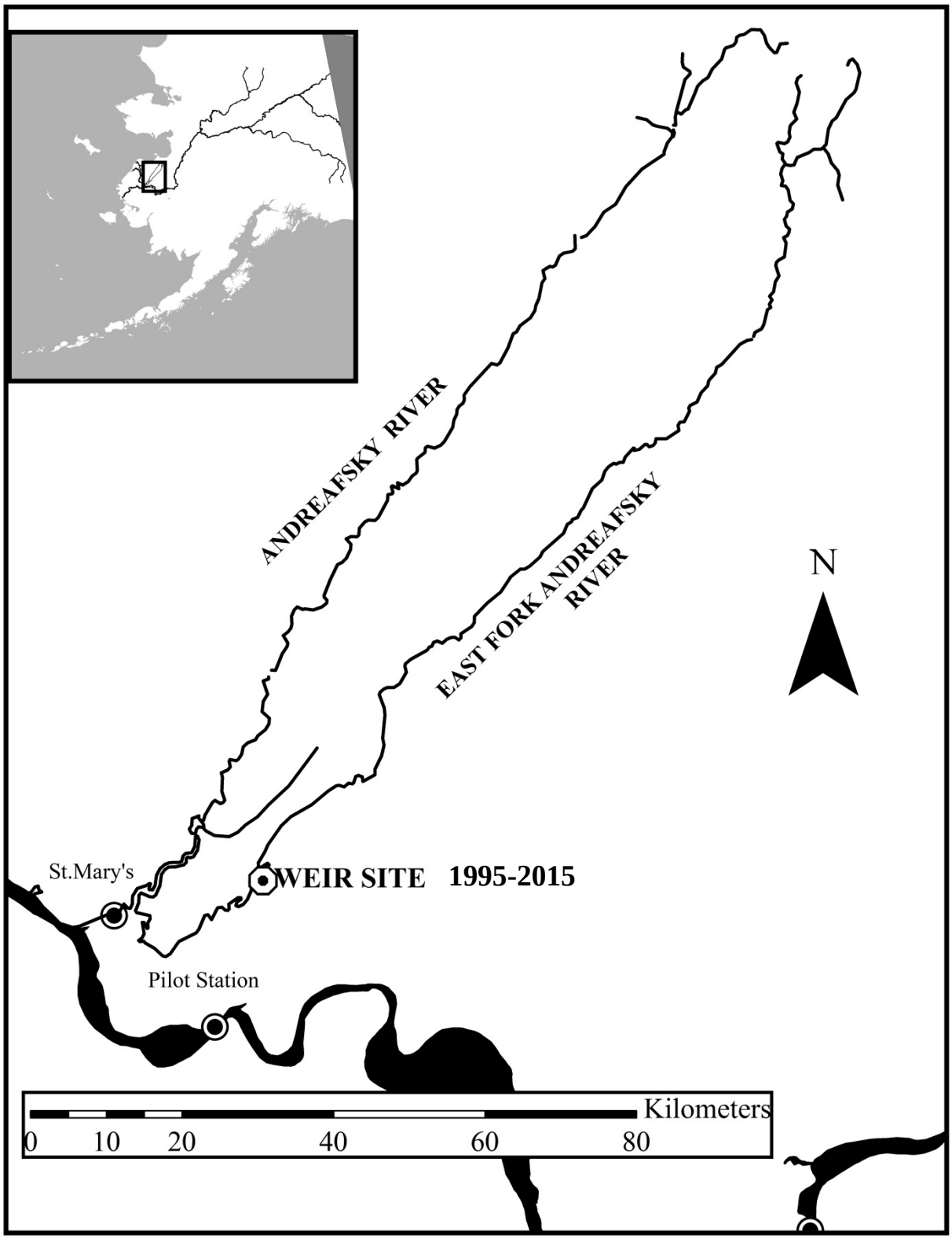

Figure 1. — Weir location on the East Fork Andreafsky River, Alaska, 1995-2015.

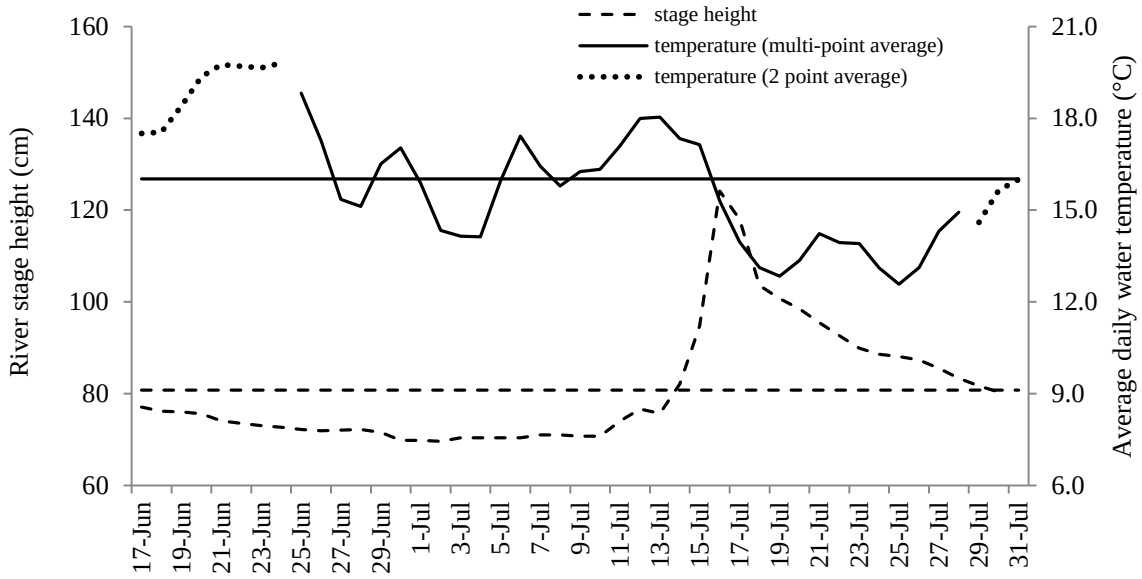

Figure 2. — River stage heights (cm) and water temperatures (°C) at the East Fork Andreafsky River weir, 2015, with seasonal averages (straight lines). Solid lines indicate seasonal average and 30-minute interval daily average water temperature; dashed lines indicate seasonal average and daily average water height; dotted line is am/pm average water temperature.

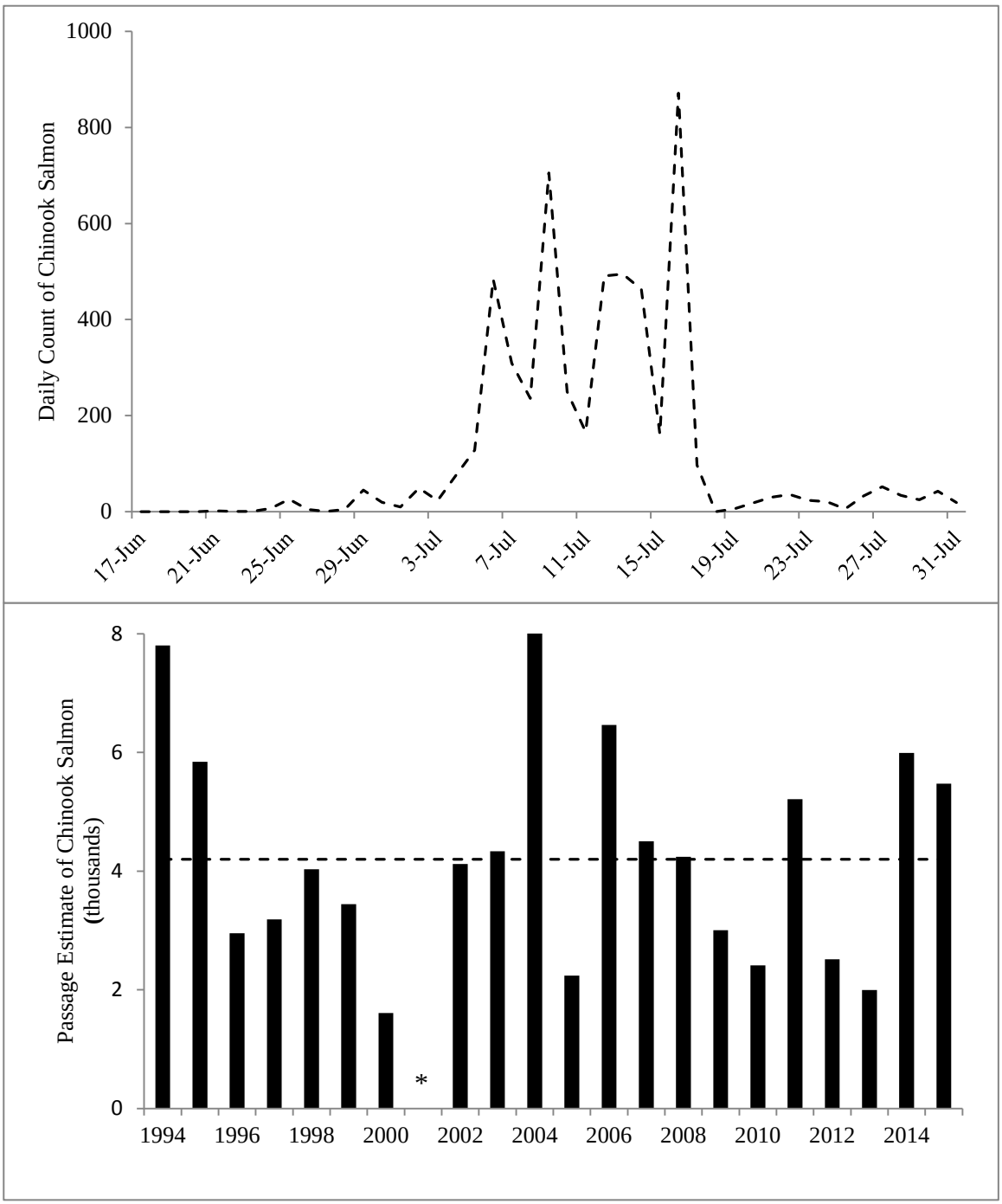

Figure 3. — Daily count (2015) and annual escapement (1994-2015) estimates of Chinook Salmon migrating through the East Fork Andreafsky River weir, Alaska. Historical average is represented by the dashed, horizontal line. Asterisk denotes missing annual count due to high water.

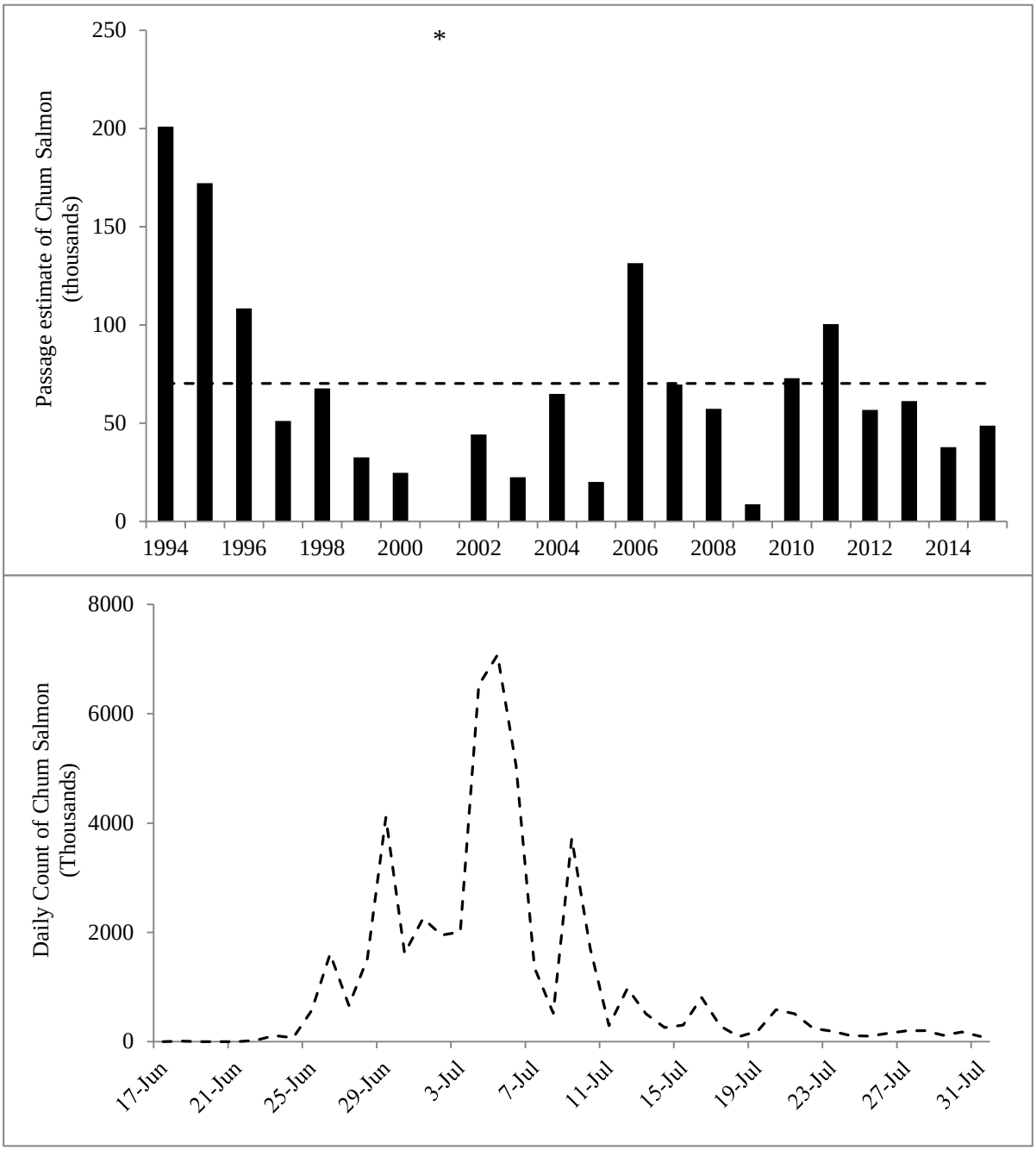

Figure 4. — Daily count (2015) and annual escapement (1994-2015) estimates of summer Chum Salmon migrating through the East Fork Andreafsky River weir, Alaska. Historical average is represented by the dashed, horizontal line. Asterisk denotes missing annual count due to high water.

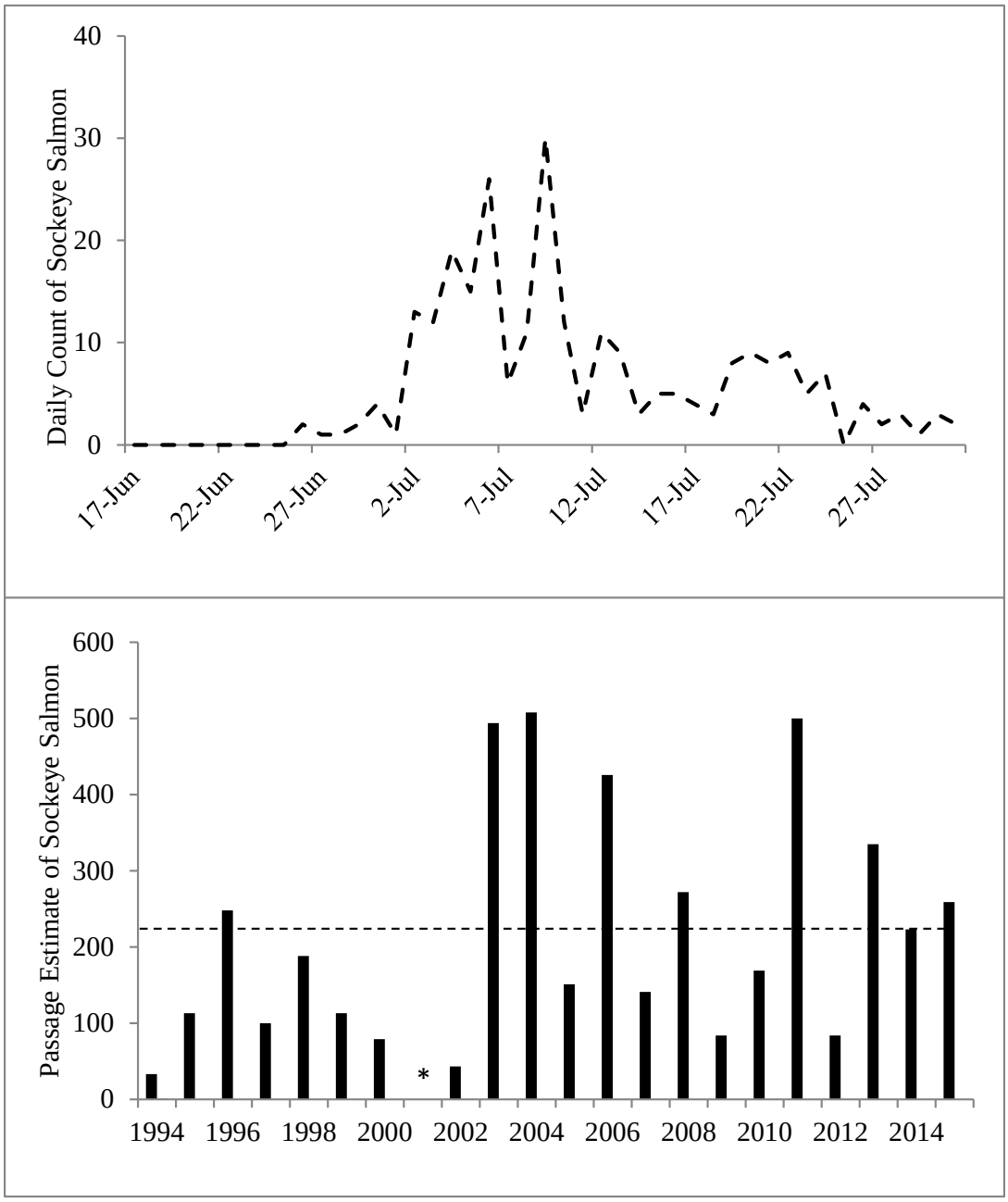

Figure 5. ─ Daily count (2015) and annual escapement (1994-2015) estimates of Sockeye Salmon migrating through the East Fork Andreafsky River weir, Alaska. Historical average is represented by the dashed, horizontal line. Asterisk denotes missing annual count.

Appendix 1. — Historical Chinook Salmon, summer Chum Salmon, and Coho Salmon escapement estimates recorded for the Andreafsky River, Alaska, 1954-2014. Data provided by ADF&G from JTC (2016).

	East Fork Andreafsky River												Main stem 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				213	*b*				
1995	1,635						5,841		172,148		10,901		1,108					

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Year	East Fork Andreafsky River						Main stem Andreafsky River		
	Aerial Index Estimates			Sonar, Tower, or Weir			Aerial Index Estimates		
	Chinook Salmon	Chum Salmon	Coho Salmon	Chinook Salmon	Chum Salmon	Coho Salmon	Chinook Salmon	Chum Salmon	Coho Salmon
1996				2,955	108,450	8,037	624		
1997	1,140			3,186	51,139	9,472	1,510		
1998	1,027			4,034	67,720	5,417 *e*	1,249		
1999	*b*			3,444	32,587	2,963	870		
2000	1,018	2,094		1,609	24,785	8,451	427 *b*	18,989	
2001	1,065			1,148 *f*	2,134 *f*	15,896 *e*	570 *b*		
2002	1,447			4,123	44,194	3,577	977		
2003	1,116 *b*			4,336	22,461	8,231	1,578		
2004	2,879			8,045	64,883	11,146	1,317		
2005	1,715			2,239	20,127	5,303	1,492 *b*		
2006	590 *b*	3,100		6,463	102,260	23 *g*	824	617	
2007	1,758			4,504	69,642	9 *g*	976		
2008	278 *b*	9,300		4,242	57,259	2 *g*	262	25,850	
2009	80 *b*	736		3,004	8,770	4 *g*	1,664	3,877	
2010	537 *b*	1,982		2,413	72,893	10 *g*	849 *b*	24,380	
2011	620	12,889		5,213	100,473	0 *g*	1,141	10,020	
2012	*b*			2,516	56,680	5 *g*	227		
2013	1,441	10,965		1,998	61,234	0 *g*	1,090	9,685	
2014	*b*			5,949	37,793	23 *g*	1,695 *b*		
2015	2167 *b*	6,004		5,474	48,809	5 *g*	1,356 *b*	2,837	
SEG *h*	960 - 1,900			2,100 - 4,900			640- 1,600		
BEG *i*					>40,000				

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 Incomplete count, missing data not estimated.
f Weir installed too late for an accurate count.
g Incomplete count, weir removed.
h Sustainable Escapement Goals.
i Biological Escapement Goals.

Appendix 2. — Historical daily Chinook Salmon escapements recorded at the East Fork Andreafsky River weir 1994-2015. Data for 2001 were not used in calculations and are shown for informational purposes only. Boxes represent quartiles, highlighted boxes indicate midpoint in the run.

Date	1994	1995	1996	1997	1998	1999	2000	2001
15-Jun				0				
16-Jun		0		0				
17-Jun		0		0		0		
18-Jun		0		0		0		
19-Jun		0	0	0		0		
20-Jun		1	0	0		0		
21-Jun		0	10	0		0		
22-Jun		1	0	0		0		
23-Jun		0	33	14	0	0		
24-Jun		2	6	21	0	0		
25-Jun		0	0	59	0	0		
26-Jun		0	59	0	0	0		
27-Jun		41	42	101	1	0		
28-Jun		48	19	11	0	0		
29-Jun	1	67	6	1	10	0		
30-Jun	188	104	8	0	34	47	9	
1-Jul	141	81	72	75	93	19	16	
2-Jul	54	71	21	24	17	9	39	
3-Jul	222	17	205	29	36	0	89	
4-Jul	156	55	124	49	75	12	74	
5-Jul	651	107	309	98	336	97	38	
6-Jul	225	678	258	356	373	42	407	
7-Jul	1,156	433	280	227	386	114	18	
8-Jul	108	155	244	123	204	197	71	
9-Jul	351	260	186	49	129	216	17	
10-Jul	375	250	111	64	167	256	30	
11-Jul	288	382	72	69	255	507	57	
12-Jul	581	1,022	52	88	138	214	35	
13-Jul	779	697	100	15	62	331	55	
14-Jul	433	375	96	16	61	97	18	
15-Jul	352	292	62	124	91	22	90	169
16-Jul	389	97	95	274	197	33	76	87
17-Jul	144	46	110	91	263	75	62	41
18-Jul	285	38	55	25	184	63	48	196
19-Jul	161	25	42	70	240	65	34	71
20-Jul	53	37	69	264	67	302	22	107
21-Jul	66	74	51	148	129	55	12	175
22-Jul	62	33	26	35	117	67	21	66
23-Jul	209	24	2	103	57	15	6	15
24-Jul	149	7	4	57	66	54	11	5
25-Jul	25	78	6	0	12	24	10	17
26-Jul	51	21	3	11	8	5	9	7
27-Jul	92	12	6	3	8	34	7	17
28-Jul	20	15	16	29	11	6	3	10
29-Jul	10	9	13	58	23	159	57	41
30-Jul	13	5	7	144	31	80	4	16
31-Jul	10	1	10	2	17	59	20	11
1-Aug	1	8	4	8	20	38	12	8
2-Aug		2	2	4	4	18	4	12
3-Aug		13	2	128	11	42	24	4
4-Aug		5	5	2	1	11	19	8
5-Aug		6	6	1	7	5	14	6
6-Aug		6	2	0	9	2	9	1
7-Aug		19	7	1	10	1	4	11
8-Aug - 23-Sept		121	37	115	74	51	58	47
Total	7,801	5,841	2,955	3,186	4,034	3,444	1,609	**

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Date	2002	2003	2004	2005	2006	2007	2008	2009
15-Jun								
16-Jun								
17-Jun								
18-Jun								
19-Jun	0	0				0		
20-Jun	0	0				0		
21-Jun	1	0				0	0	
22-Jun	20	0				0	0	0
23-Jun	0	4	67			0	0	0
24-Jun	0	2	26			0	0	0
25-Jun	3	7	15			7	1	0
26-Jun	1	3	55	16		2	0	0
27-Jun	26	12	181	2		0	5	0
28-Jun	314	19	534	42	0	0	1	0
29-Jun	119	4	290	88	6	4	10	0
30-Jun	27	0	461	238	51	7	7	0
1-Jul	319	176	582	11	40	134	14	1
2-Jul	105	295	25	89	13	197	44	1
3-Jul	230	22	375	135	51	75	41	2
4-Jul	5	6	353	114	128	277	50	0
5-Jul	20	83	263	111	276	141	133	0
6-Jul	356	136	1,187	154	437	476	301	3
7-Jul	307	336	878	271	574	442	610	15
8-Jul	130	469	463	169	392	157	777	7
9-Jul	178	823	503	46	86	299	110	0
10-Jul	191	48	368	7	165	255	7	2
11-Jul	264	107	122	15	449	86	11	34
12-Jul	166	345	315	9	1,108	653	23	247
13-Jul	191	311	106	58	201	103	53	106
14-Jul	158	340	105	108	67	96	76	142
15-Jul	140	2	53	49	117	28	265	13
16-Jul	210	7	58	55	262	25	355	13
17-Jul	119	25	54	30	714	34	277	251
18-Jul	94	235	29	14	371	132	283	37
19-Jul	75	158	40	22	264	78	130	76
20-Jul	50	28	57	17	164	35	57	53
21-Jul	29	10	40	50	161	95	58	112
22-Jul	12	2	13	51	166	249	130	201
23-Jul	32	23	17	15	117	59	104	222
24-Jul	16	58	12	22	48	63	75	126
25-Jul	7	31	19	46	25	102	49	104
26-Jul	3	4	5	4	8	33	35	39
27-Jul	6	22	14	4	2	149	26	37
28-Jul	3	108	23	4		4	61	262
29-Jul	4	28	19	0		4	39	221
30-Jul	2	4	7	4		3	24	172
31-Jul	46	0	15	3				178
1-Aug	55	2	13	2				171
2-Aug	48	5	4	2				94
3-Aug	10	1	3	8				62
4-Aug	3	1	6	4				
5-Aug	3	4	5	8				
6-Aug	4	0	10	4				
7-Aug	4	1	8	3				
8-Aug - 23-Sept	17	29	247	135				
Total	4,123	4,336	8,045	2,239	6,463	4,504	4,242	3,004

-continued-

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Date	2010	2011	2012	2013	2014	2015
15-Jun						
16-Jun						
17-Jun					0	0
18-Jun					0	0
19-Jun					0	0
20-Jun	0	0			0	0
21-Jun	0	0			0	2
22-Jun	0	0			1	1
23-Jun	0	0			3	1
24-Jun	0	0			4	7
25-Jun	0	1			4	26
26-Jun	1	1			1	5
27-Jun	3	1			23	1
28-Jun	0	0			29	5
29-Jun	13	9			0	45
30-Jun	16	25	13		39	20
1-Jul	18	29	3		252	10
2-Jul	41	41	12	24	66	49
3-Jul	54	33	2	9	176	23
4-Jul	25	19	10	37	83	76
5-Jul	41	20	24	18	393	128
6-Jul	124	261	117	34	714	484
7-Jul	16	149	30	91	69	309
8-Jul	36	385	101	82	2555	236
9-Jul	353	473	107	68	167	705
10-Jul	295	346	13	525	191	250
11-Jul	69	300	26	170	129	166
12-Jul	92	489	16	128	108	491
13-Jul	24	14	24	197	231	495
14-Jul	34	26	25	109	73	463
15-Jul	27	121	303	145	51	161
16-Jul	278	319	133	34	41	871
17-Jul	274	194	82	30	9	97
18-Jul	21	64	38	59	146	0
19-Jul	7	517	103	52	22	6
20-Jul	9	275	428	54	97	18
21-Jul	32	343	220	27	24	30
22-Jul	22	306	78	15	45	36
23-Jul	47	140	34	11	38	24
24-Jul	59	74	16	12	29	21
25-Jul	59	51	3	13	48	6
26-Jul	81	44	144	16	21	33
27-Jul	23	48	107	7	23	52
28-Jul	94	61	24	18	15	34
29-Jul	101	24	197	11	7	25
30-Jul	14	10	80	2	12	43
31-Jul	10		3		10	19
1-Aug			1			
2-Aug						
3-Aug						
4-Aug						
5-Aug						
6-Aug						
7-Aug						
8-Aug – 23-Sept						
Total	2,413	5,213	2,517	1,998	5,949	5,474

Appendix 3. — Historical daily summer Chum Salmon escapement estimates recorded at the East Fork Andreafsky River weir 1994-2014. Data for 2001 were not used in calculations and are shown for informational purposes only. Boxes represent quartiles, highlighted boxes indicate midpoint in the run.

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	551	133	581	123	569
17-Jul	4,886	2,739	774	1,150	3,038	547	464	95	420	445	465
18-Jul	4,532	1,495	852	715	1,580	494	377	229	492	1,078	326
19-Jul	2,977	651	1,848	624	1,365	666	290	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	200	172	10	119	80	34
1-Aug	239	160	93	134	191	158	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	83	17	40	91	22
5-Aug		77	132	101	73	45	57	13	3	182	25
6-Aug		115	215	77	71	17	31	2	7	52	31
7-Aug		76	163	29	104	11	5	7	13	85	33
8-Aug - 23-Sept		1,879	1,934	1,396	743	331	302	219	76	575	593
Total	200,981	172,148	108,450	51,139	67,720	32,587	24,785	**	44,194	22,461	64,883

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Date	2003	2004	2005	2006	2007	2008	2009	2010
15-Jun								
16-Jun								
17-Jun								
18-Jun								
19-Jun	0				0			
20-Jun	0				0			0
21-Jun	2				0	1		0
22-Jun	87				2	57	0	0
23-Jun	564	3,045			0	30	0	2
24-Jun	182	1,062			29	73	6	0
25-Jun	484	985			1,166	34	10	6
26-Jun	183	2,467	256		348	1,160	0	410
27-Jun	396	4,638	9		70	902	5	285
28-Jun	546	8,461	424	1,272	362	865	19	53
29-Jun	219	3,807	473	2,822	1,644	1,920	289	5,435
30-Jun	271	7,081	432	14,912	1,785	1,095	78	3,088
1-Jul	928	1,590	239	10,229	3,581	1,718	228	1,534
2-Jul	339	153	1,081	2,395	3,463	2,963	417	3,196
3-Jul	713	5,689	1,063	1,272	2,694	2,367	114	5,269
4-Jul	175	3,940	1,238	2,822	4,834	4,572	10	3,338
5-Jul	484	2,011	993	14,912	4,725	8,125	17	2,689
6-Jul	1,051	1,791	1,218	10,229	3,852	5,285	1,137	7,086
7-Jul	1,376	2,474	1,839	2,395	1,980	2,598	583	1,136
8-Jul	2,476	2,096	1,270	7,291	1,919	2,763	42	5,336
9-Jul	2,025	1,990	1,112	14,018	4,559	1,438	11	7,921
10-Jul	244	2,069	1,370	9,389	6,021	193	176	3,878
11-Jul	412	1,609	195	7,738	1,455	300	549	1,808
12-Jul	1,762	1,815	197	4,225	2,362	1,276	634	1,470
13-Jul	586	1,071	1,458	3,614	1,219	1,955	269	702
14-Jul	254	896	1,242	2,351	1,394	2,019	547	1,391
15-Jul	33	605	557	3,478	860	2,322	411	1,405
16-Jul	123	569	449	2,631	1,867	3,646	498	4,138
17-Jul	445	465	196	1,609	3,294	1,497	483	2,378
18-Jul	1,078	326	246	725	3,834	1,324	224	281
19-Jul	708	217	141	330	1,349	896	176	400
20-Jul	681	276	523	1,127	468	691	186	525
21-Jul	283	142	493	1,441	700	594	235	1,189
22-Jul	47	59	182	2,564	1,895	572	332	930
23-Jul	306	77	167	1,637	1,417	535	175	785
24-Jul	222	116	54	1,294	1,208	383	164	896
25-Jul	348	171	80	924	1,784	335	113	1,030
26-Jul	218	85	28	944	645	142	165	686
27-Jul	220	69	32	921	444	191	72	585
28-Jul	389	73	100		95	149	148	956
29-Jul	220	52	112		179	168	47	284
30-Jul	61	37	74		139	105	33	200
31-Jul	80	34	79				33	192
1-Aug	104	17	50				25	
2-Aug	111	21	25				64	
3-Aug	40	28	23				45	
4-Aug	91	22	5					
5-Aug	182	25	24					
6-Aug	52	31	30					
7-Aug	85	33	14					
8-Aug – 23-Sept	575	593	334					
Total	22,461	64,883	20,127	131,511	69,642	57,259	8,770	72,893

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Date	2011	2012	2013	2014	2015
15-Jun					
16-Jun					
17-Jun				6	1
18-Jun				14	9
19-Jun				0	1
20-Jun	146			75	0
21-Jun	19			69	1
22-Jun	2			5	24
23-Jun	21			668	108
24-Jun	1,294			143	67
25-Jun	2,935			323	569
26-Jun	381			154	1603
27-Jun	1,088			391	660
28-Jun	684			632	1520
29-Jun	2,522			2	4104
30-Jun	4,900	3,773		3862	1616
1-Jul	5,090	698		4934	2254
2-Jul	7,241	1,728	3,082	1883	1946
3-Jul	6,694	366	1,988	1412	2007
4-Jul	1,486	3,536	6,132	2573	6527
5-Jul	2,975	5,011	3,444	1537	7079
6-Jul	6,172	8,580	4,841	3204	5056
7-Jul	2,753	3,040	7,385	23	1353
8-Jul	5,628	4,313	4,760	2795	521
9-Jul	8,644	2,657	2,582	591	3713
10-Jul	4,639	1,615	6,777	1224	1707
11-Jul	6,598	1,975	4,017	1906	290
12-Jul	5,788	976	2,882	1088	974
13-Jul	683	989	2,731	1192	507
14-Jul	1,725	1,829	1,034	337	258
15-Jul	4,069	4,181	476	747	303
16-Jul	2,990	1,265	936	420	807
17-Jul	3,911	1,027	614	218	282
18-Jul	1,006	470	1,028	909	88
19-Jul	1,554	1,356	1,473	299	189
20-Jul	1,319	1,610	831	505	585
21-Jul	1,498	952	851	765	508
22-Jul	930	1,295	876	533	241
23-Jul	581	539	616	501	190
24-Jul	425	266	598	505	112
25-Jul	468	286	378	315	98
26-Jul	478	1,001	339	240	150
27-Jul	466	412	229	233	196
28-Jul	384	184	138	121	202
29-Jul	181	536	84	158	116
30-Jul	105	179	112	135	173
31-Jul		28		146	94
1-Aug		7			
2-Aug					
3-Aug					
4-Aug					
5-Aug					
6-Aug					
7-Aug					
8-Aug - 23-Sept					
Total	100,473	56,680	61,234	37,793	48,809

Appendix 4. — Historical daily Coho Salmon escapement estimates recorded at the East Fork Andreafsky River weir, 1995-2014. Data for 1998 and 2001 were not used in calculations and are shown for informational purposes only. From 2005 to 2015 all Coho numbers are incomplete due to weir removal timing.

Date	1995	1996	1997	1998	1999	2000	2001
15-Jun - 4-Aug	1	85	0	16	9	52	0
5-Aug	0	20	0	8	4	14	0
6-Aug	0	10	0	5	4	13	0
7-Aug	1	26	1	16	0	12	0
8-Aug	1	20	0	9	0	35	0
9-Aug	3	26	0	5	1	79	0
10-Aug	8	138	0	8	2	125	0
11-Aug	12	105	0	3	2	89	0
12-Aug	5	50	10	4	5	51	0
13-Aug	3	16	47	111	1	211	0
14-Aug	3	11	35	71	1	137	1
15-Aug	9	19	6	9	0	64	22
16-Aug	5	276	8	61	5	34	33
17-Aug	11	92	7		2	23	5
18-Aug	24	179	12		0	137	5
19-Aug	41	1,052	13	8	0	108	51
20-Aug	24	100	50		1	333	532
21-Aug	95	149	414		42	303	270
22-Aug	246	9	222		48	59	312
23-Aug	305	32	22		0	10	343
24-Aug	414	12	16		26	44	583
25-Aug	245	1,539	577		8	533	217
26-Aug	692	449	150		4	1,401	857
27-Aug	1,436	5	10		4	1,643	382
28-Aug	368	1	24		3	279	403
29-Aug	938	179	2,335	371	0	626	103
30-Aug	335	1,489	2,714	618	2	278	1,078
31-Aug	265	374	122	568	1	192	2,264
1-Sep	444	374	73	336	411	358	1,576
2-Sep	863	147	53	17	162	238	
3-Sep	14	100	421	80	1,255	162	
4-Sep	29	250	355	490	704	160	
5-Sep	6	337	219	228	122	39	
6-Sep	21	78	514	591	40	46	
7-Sep	164	84	435	12	0	52	
8-Sep	2,403	24	169	0	14	48	
9-Sep	854	16	223	94	19	55	
10-Sep	391	1	52	555	41	94	85
11-Sep	127	0	83	1,104	20	31	30
12-Sep	95	0	64	6		79	20
13-Sep		0	16	13		30	43
14-Sep		0				22	21
15-Sep		3				16	16
16-Sep		160				28	
17-Sep						19	
18-Sep						3	
19-Sep						5	
20-Sep						5	
21-Sep						34	
22-Sep						32	
23-Sep						10	
Total	10,901	8,037	9,472	5,417	2,963	8,451	9,252

****** incomplete count, missing data not estimated.
***** incomplete count, weir removed.

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Date	2002	2003	2004	2005	2006*	2007*	2008*
15-Jun - 4-Aug	1	12	11	2	23	9	2
5-Aug	0	2	8	0			
6-Aug	0	4	10	0			
7-Aug	0	28	14	1			
8-Aug	0	25	16	4			
9-Aug	0	27	98	2			
10-Aug	1	5	62	2			
11-Aug	0	9	115	0			
12-Aug	0	19	86	0			
13-Aug	0	40	78	0			
14-Aug	0	194	71	4			
15-Aug	0	146	63	9			
16-Aug	0	98	56	37			
17-Aug	0	50	48	6			
18-Aug	0	2	163	173			
19-Aug	1	7	384	24			
20-Aug	0	21	170	4			
21-Aug	0	11	185	2			
22-Aug	3	3	150	2			
23-Aug	6	24	80	21			
24-Aug	3	263	185	101			
25-Aug	7	1,744	243	19			
26-Aug	0	634	453	102			
27-Aug	0	288	17	128			
28-Aug	2	197	4	1,084			
29-Aug	0	243	38	475			
30-Aug	0	552	178	647			
31-Aug	0	729	490	218			
1-Sep	0	172	505	23			
2-Sep	14	107	897	23			
3-Sep	29	9	234	476			
4-Sep	43	646	167	483			
5-Sep	640	275	609	77			
6-Sep	738	14	1,550	128			
7-Sep	413	42	1,011	207			
8-Sep	345	459	578	80			
9-Sep	103	268	337	194			
10-Sep	237	9	535	343			
11-Sep	117	211	259	202			
12-Sep	726	231	13				
13-Sep	113	399	57				
14-Sep	35	8	37				
15-Sep		4	201				
16-Sep			240				
17-Sep			241				
18-Sep			42				
19-Sep			157				
20-Sep							
21-Sep							
22-Sep							
23-Sep							
Total	3,577	8,231	11,146	5,303	23	9	2

****** incomplete count, missing data not estimated.
***** incomplete count, weir removed.

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Appendix 4. — Page 3 of 3.

Date	2009*	2010*	2011*	2012*	2013*	2014*	2015*
15-Jun - 4-Aug	4	10	0	5	0	23	5
5-Aug							
6-Aug							
7-Aug							
8-Aug							
9-Aug							
10-Aug							
11-Aug							
12-Aug							
13-Aug							
14-Aug							
15-Aug							
16-Aug							
17-Aug							
18-Aug							
19-Aug							
20-Aug							
21-Aug							
22-Aug							
23-Aug							
24-Aug							
25-Aug							
26-Aug							
27-Aug							
28-Aug							
29-Aug							
30-Aug							
31-Aug							
1-Sep							
2-Sep							
3-Sep							
4-Sep							
5-Sep							
6-Sep							
7-Sep							
8-Sep							
9-Sep							
10-Sep							
11-Sep							
12-Sep							
13-Sep							
14-Sep							
15-Sep							
16-Sep							
17-Sep							
18-Sep							
19-Sep							
20-Sep							
21-Sep							
22-Sep							
23-Sep							
Total	4	10	0	5	0	23	5

****** incomplete count, missing data not estimated.
***** incomplete count, weir removed.

Appendix 5. — Historical daily Pink Salmon escapement estimates recorded at the East Fork Andreafsky River weir, 1994-2015. Data for 2001 were not used in calculations and are shown for informational purposes only.

Date	1994	1995	1996	1997	1998	1999	2000	2001
15-Jun				0				
16-Jun		0		0				
17-Jun		0		0		0		
18-Jun		0		0		0		
19-Jun		0	12	0		0		
20-Jun		0	4	0		0		
21-Jun		0	40	0		0		
22-Jun		0	42	0		0		
23-Jun		0	157	0	0	0		
24-Jun		0	67	0	0	0		
25-Jun		0	24	0	8	0		
26-Jun		0	153	0	3	0		
27-Jun		1	218	1	22	0		
28-Jun		0	80	0	2	0		
29-Jun	8	2	78	0	112	0		
30-Jun	451	3	41	0	258	0	18	
1-Jul	409	13	184	2	750	0	5	
2-Jul	194	4	107	0	65	0	383	
3-Jul	305	4	347	0	704	0	52	
4-Jul	780	5	1,254	1	1,008	0	224	
5-Jul	1,027	9	6,678	0	3,595	0	162	
6-Jul	772	98	4,676	2	4,136	2	1,228	
7-Jul	4,026	77	3,834	0	4,292	2	354	
8-Jul	1,736	4	7,472	1	2,968	1	972	
9-Jul	4,263	18	8,905	2	1,382	2	1,680	
10-Jul	4,744	33	10,290	1	1,169	10	897	
11-Jul	3,313	23	5,822	2	9,872	20	7,849	
12-Jul	8,447	100	4,662	4	21,285	17	2,726	
13-Jul	13,568	109	9,484	6	11,399	18	7,044	
14-Jul	24,842	94	11,760	1	5,846	7	1,468	
15-Jul	22,460	81	9,754	35	21,785	2	966	10
16-Jul	20,612	64	13,476	31	11,087	2	1,206	4
17-Jul	27,053	60	12,222	13	23,930	4	1,446	5
18-Jul	18,277	31	12,682	5	31,639	4	1,686	26
19-Jul	20,792	15	14,282	6	27,014	14	1,926	15
20-Jul	23,511	30	17,477	4	7,204	69	2,170	47
21-Jul	10,872	40	18,780	4	4,672	38	2,549	61
22-Jul	8,975	48	13,018	4	2,460	41	1,143	19
23-Jul	17,692	77	4,744	5	3,512	25	454	18
24-Jul	15,120	25	3,778	2	7,181	23	609	38
25-Jul	3,566	216	2,473	0	5,278	22	1,055	12
26-Jul	10,225	88	3,365	6	3,496	11	335	53
27-Jul	13,821	37	3,768	13	1,186	24	731	68
28-Jul	15,302	20	5,036	9	1,496	11	612	94
29-Jul	9,736	14	1,035	20	1,134	26	415	56
30-Jul	6,159	29	205	26	982	13	202	22
31-Jul	2,476	11	706	2	1,315	2	244	10
1-Aug	996	22	169	7	962	10	145	17
2-Aug		23	107	2	474	5	129	19
3-Aug		44	127	8	440	48	81	17
4-Aug		20	300	3	303	60	65	12
5-Aug		17	237	3	127	28	49	5
6-Aug		22	61	1	73	14	33	10
7-Aug		37	109	1	104	13	17	10
8-Aug - 23-Sep		304	535	196	478	175	161	60
Total	316,53	1,972	214,837	429	227,208	743	43,491	82

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Appendix 5. — Page 2 of 3.

Date	2002	2003	2004	2005	2006	2007	2008	2009
15-Jun								
16-Jun								
17-Jun								
18-Jun								
19-Jun	0	0				0		
20-Jun	0	0				0		
21-Jun	52	0				0	0	
22-Jun	462	0				0	10	0
23-Jun	0	0	19			0	13	0
24-Jun	22	0	15			0	5	0
25-Jun	148	3	24			0	83	0
26-Jun	338	0	102	0		0	214	0
27-Jun	431	6	189	2		0	343	0
28-Jun	7,808	4	341	10	43	0	393	0
29-Jun	5,076	3	374	27	54	3	964	0
30-Jun	1,509	0	1,671	97	314	2	580	0
1-Jul	6,192	16	1,049	15	281	5	883	0
2-Jul	3,345	12	140	89	134	38	2,197	2
3-Jul	6,876	13	1,186	453	326	36	1,969	2
4-Jul	257	13	2,327	652	1,431	143	4,814	0
5-Jul	1,626	16	5,175	985	281	184	19,968	1
6-Jul	13,433	24	4,203	2,334	134	251	19,672	6
7-Jul	10,268	94	17,994	3,071	326	164	24,204	26
8-Jul	4,815	172	13,079	2,443	1,431	125	16,687	38
9-Jul	8,765	259	16,044	1,692	1,325	278	4,900	9
10-Jul	12,942	16	22,171	1,266	3,092	461	331	9
11-Jul	10,764	43	15,664	1,453	8,096	112	247	57
12-Jul	9,207	185	15,661	385	13,219	315	645	73
13-Jul	9,161	173	15,313	2,865	7,941	74	1,351	84
14-Jul	7,819	189	25,780	5,106	11,605	129	1,559	94
15-Jul	6,958	28	16,578	2,489	13,327	103	3,432	94
16-Jul	8,224	13	22,322	1,992	14,844	367	6,532	74
17-Jul	6,724	96	16,143	678	7,204	518	6,793	90
18-Jul	8,701	702	14,713	945	1,117	843	7,304	125
19-Jul	6,058	459	15,635	450	2,858	524	7,461	99
20-Jul	1,983	288	28,631	1,140	2,816	642	5,356	94
21-Jul	1,239	98	19,851	1,852	8,969	342	6,588	239
22-Jul	564	18	12,446	814	17,205	1,040	2,759	133
23-Jul	1,060	107	9,880	723	18,690	393	2,995	183
24-Jul	1,092	107	9,973	256	18,357	306	5,388	191
25-Jul	385	124	12,352	158	13,319	1,231	2,986	83
26-Jul	429	43	12,184	425	16,186	475	2,450	104
27-Jul	232	47	10,978	307	11,435	403	4,106	107
28-Jul	305	130	9,686	889		143	7,982	156
29-Jul	49	140	7,911	744		206	8,201	45
30-Jul	62	29	5,421	687		236	7,543	32
31-Jul	232	65	4,258	341				38
1-Aug	131	69	2,669	430				28
2-Aug	61	54	2,342	140				50
3-Aug	73	33	1,206	79				29
4-Aug	34	34	843	55				
5-Aug	11	35	890	91				
6-Aug	13	17	729	114				
7-Aug	7	20	789	41				
8-Aug - 23-Sep	48	306	2,719	245				
Total	165,991	4,303	399,670	39,030	196,360	10,092	189,908	2,395

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Appendix 5. — Page 3 of 3.

Date	2010	2011	2012	2013	2014	2015
15-Jun						
16-Jun						
17-Jun					0	0
18-Jun					2	0
19-Jun					1	0
20-Jun	0	0			1	0
21-Jun	0	0			4	0
22-Jun	2	0			6	0
23-Jun	0	0			48	0
24-Jun	2	2			11	0
25-Jun	8	11			74	0
26-Jun	69	0			40	0
27-Jun	105	0			114	0
28-Jun	8	0			772	0
29-Jun	1,756	0	0		45	0
30-Jun	2,641	0	568		491	0
1-Jul	1,284	0	198		1,468	0
2-Jul	8,021	0	271	3	1,226	1
3-Jul	7,348	0	51	0	964	1
4-Jul	3,307	0	534	2	812	0
5-Jul	1,633	0	1,756	4	1,468	2
6-Jul	4,088	0	3,492	2	947	9
7-Jul	246	0	2,018	11	209	2
8-Jul	3,532	1	3,435	7	2,098	0
9-Jul	25,726	0	2,385	6	1,511	7
10-Jul	28,744	0	1,091	14	1,929	0
11-Jul	12,550	1	1,258	24	3,750	2
12-Jul	10,095	0	2,303	45	3,167	7
13-Jul	6,127	0	3,183	20	5,890	15
14-Jul	5,145	0	2,109	14	3,070	5
15-Jul	6,053	7	4,607	13	4,380	14
16-Jul	37,603	10	979	21	2,563	30
17-Jul	42,852	11	2,062	7	2,021	15
18-Jul	12,174	8	1,219	25	4,858	8
19-Jul	10,984	76	4,173	22	640	9
20-Jul	13,445	48	8,378	12	2,471	22
21-Jul	12,256	103	7,618	29	1,425	78
22-Jul	15,201	132	8,040	47	1,713	78
23-Jul	11,412	77	2,915	29	1,391	73
24-Jul	6,490	79	2,700	48	1,280	52
25-Jul	10,558	67	2,389	37	772	44
26-Jul	9,282	93	1,747	32	1,192	56
27-Jul	9,708	183	1,056	31	1,133	32
28-Jul	7,151	165	978	38	937	56
29-Jul	2,908	86	648	29	897	67
30-Jul	4,733	59	305	17	400	48
31-Jul	3,811		161		804	50
1-Aug			55			
2-Aug						
3-Aug						
4-Aug						
5-Aug						
6-Aug						
7-Aug						
8-Aug - 23-Sept						
Total	339,058	1,219	74,682	589	58,995	783

Appendix 6. — Historical daily Sockeye Salmon estimates recorded at the East Fork Andreafsky River weir, 1994-2015. Data for 2001 were not used in calculations and are shown for informational purposes only.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
15-Jun				0						
16-Jun		0		0						
17-Jun		0		0		0				
18-Jun		0		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
24-Jun		0	0	0	0	0			0	0
25-Jun		0	0	0	0	0			0	0
26-Jun		0	0	0	0	0			0	0
27-Jun		0	0	0	0	0			0	0
28-Jun		0	0	0	0	0			0	0
29-Jun	0	0	0	1	3	1			0	1
30-Jun	0	0	0	0	0	0	0		0	0
1-Jul	0	2	0	1	0	0	0		0	0
2-Jul	0	0	6	0	0	0	0		0	0
3-Jul	0	1	9	0	0	0	0		0	0
4-Jul	0	0	16	0	0	1	0		0	1
5-Jul	0	1	6	0	0	8	0		0	4
6-Jul	0	4	1	0	0	1	0		1	4
7-Jul	2	0	7	1	0	2	0		0	4
8-Jul	1	0	0	0	3	6	0		0	2
9-Jul	0	0	10	0	0	2	0		0	2
10-Jul	0	1	6	1	0	0	0		0	13
11-Jul	1	1	6	0	4	7	1		0	14
12-Jul	0	0	8	0	8	0	0		1	4
13-Jul	0	0	7	0	3	0	0		0	4
14-Jul	0	0	9	2	0	0	1		0	1
15-Jul	1	0	4	1	10	0	0	0	0	8
16-Jul	2	0	5	2	7	1	0	0	3	13
17-Jul	0	0	4	1	5	5	0	0	1	23
18-Jul	2	3	8	1	13	2	0	1	2	0
19-Jul	0	0	7	0	17	0	0	0	3	9
20-Jul	3	1	6	1	3	2	0	0	1	3
21-Jul	2	2	3	0	1	0	0	0	1	1
22-Jul	0	0	4	2	6	0	0	4	1	8
23-Jul	0	0	4	1	3	0	0	1	2	11
24-Jul	1	0	1	0	1	0	0	2	4	11
25-Jul	1	8	1	0	9	1	0	1	0	2
26-Jul	1	2	3	0	0	0	0	0	0	15
27-Jul	5	1	3	0	0	0	0	2	1	25
28-Jul	4	0	2	3	6	0	0	0	2	19
29-Jul	3	1	0	3	5	0	0	0	0	9
30-Jul	2	3	0	2	5	1	1	0	0	18
31-Jul	0	0	5	0	4	1	1	0	4	7
1-Aug	2	4	1	3	5	0	0	0	3	16
2-Aug		0	1	2	1	0	0	0	3	4
3-Aug		3	1	1	6	0	1	1	0	11
4-Aug		0	4	0	4	1	1	0	0	40
5-Aug		0	1	0	3	0	1	0	0	5
6-Aug		0	4	0	2	2	0	0	1	11
7-Aug		1	3	0	5	0	0	0	0	9
8-Aug - 23-Sep	0	74	82	71	46	69	72	3	9	162
Total	33	113	248	100	188	113	79	15	43	494

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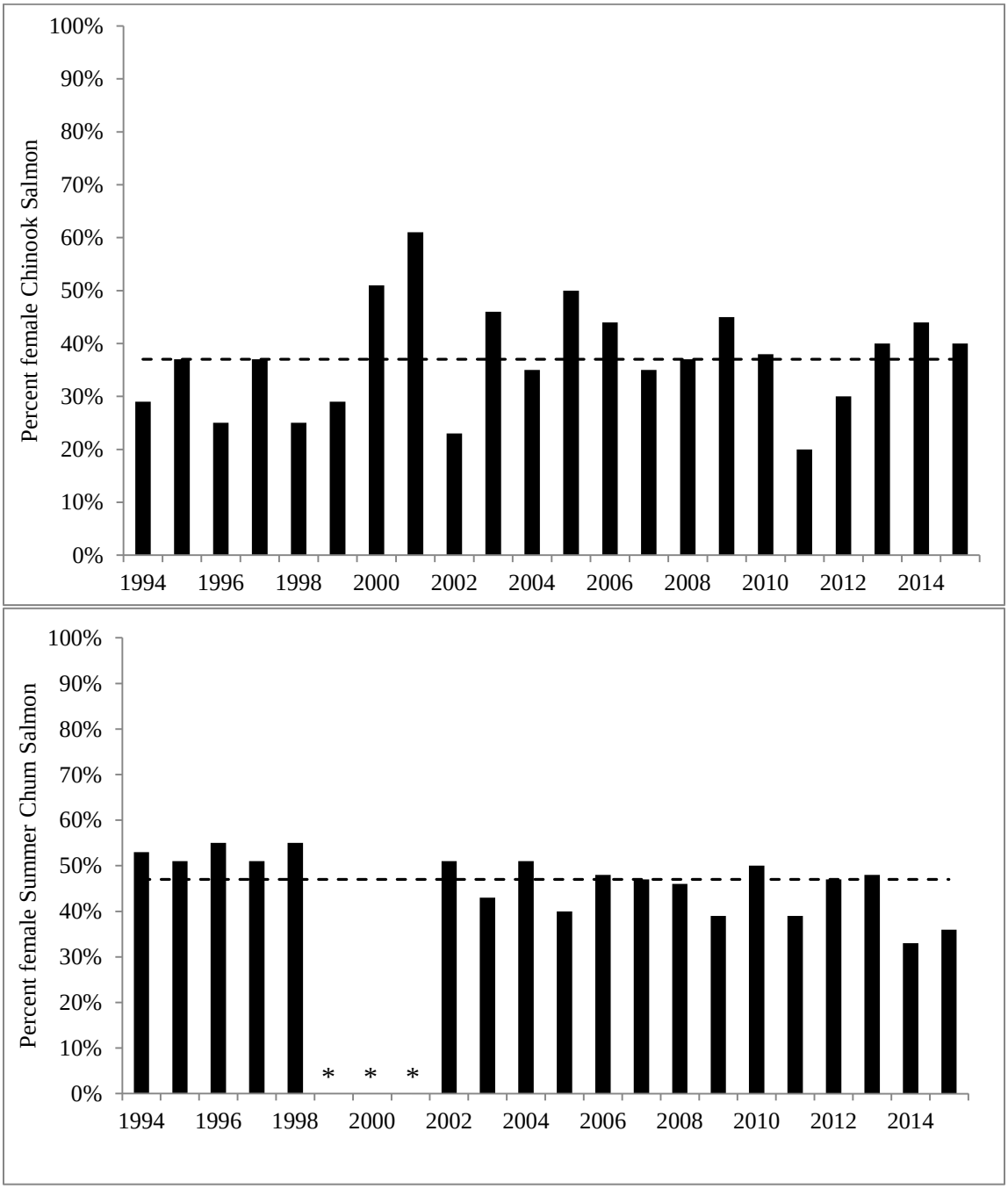
Appendix 6. — Page 2 of 2.

Date	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
15-Jun											
16-Jun											
17-Jun										0	0
18-Jun										0	0
19-Jun			0							0	0
20-Jun			0			0	1			0	0
21-Jun			0	0		0	0			1	0
22-Jun			0	0	0	0	0			2	0
23-Jun			0	0	0	1	3			5	0
24-Jun			0	0	0	0	5			1	0
25-Jun			0	0	0	1	12			2	0
26-Jun	0		0	0	0	2	10			0	2
27-Jun	0		1	0	0	0	16			6	1
28-Jun	0	0	0	0	0	0	18			3	1
29-Jun	0	0	0	0	0	9	31	0		0	2
30-Jun	1	0	0	0	1	1	33	0		20	4
1-Jul	1	0	6	1	0	1	42	0	0	17	1
2-Jul	0	0	8	16	0	2	33	2	0	6	13
3-Jul	0	9	2	10	0	2	24	1	23	12	12
4-Jul	0	50	17	29	0	6	6	4	10	3	19
5-Jul	0	15	5	27	0	10	15	13	17	12	15
6-Jul	0	27	0	15	5	5	24	6	57	19	26
7-Jul	0	16	6	18	3	3	15	6	25	4	6
8-Jul	0	12	6	25	0	6	16	3	37	16	11
9-Jul	0	13	9	3	1	9	36	2	43	5	30
10-Jul	0	12	6	2	3	15	23	3	19	2	12
11-Jul	0	16	2	2	5	5	16	1	19	12	3
12-Jul	1	20	6	5	9	2	8	2	8	10	11
13-Jul	0	4	2	5	2	3	4	3	2	13	9
14-Jul	15	3	1	3	5	1	8	3	2	2	3
15-Jul	0	7	1	15	2	1	15	2	4	7	5
16-Jul	1	5	2	6	2	7	11	5	6	3	5
17-Jul	0	18	4	5	6	2	5	1	12	3	4
18-Jul	0	21	5	2	3	2	2	0	10	6	3
19-Jul	0	26	5	5	4	5	13	5	2	4	8
20-Jul	0	21	3	6	1	5	3	4	9	7	9
21-Jul	2	32	1	5	2	5	14	2	4	5	8
22-Jul	0	12	4	2	2	3	7	1	6	2	9
23-Jul	0	31	4	9	5	12	4	1	6	1	5
24-Jul	5	19	4	3	4	3	10	1	4	3	7
25-Jul	5	15	8	5	3	6	1	0	4	1	0
26-Jul	2	13	8	12	6	9	4	4	2	3	4
27-Jul	5	9	4	12	1	7	7	3	1	3	2
28-Jul	4		5	7	4	3	1	0	1	2	3
29-Jul	7		5	7	2	3	2	2	2	0	1
30-Jul	1		1	10	1	3	2	1		0	3
31-Jul	1				0	9		3		0	2
1-Aug	0				2			0			
2-Aug	0				0						
3-Aug	0				0						
4-Aug	0										
5-Aug	2										
6-Aug	4										
7-Aug	0										
8-Aug - 23-Sept	94										
Total	151	426	141	272	84	169	500	84	335	223	259

Appendix 7. — Percent female by year for Chinook Salmon and summer Chum Salmon. Asterisks denote unavailable data.

Year	Chinook	Summer Chum
1994	29%	53%
1995	37%	51%
1996	25%	55%
1997	37%	51%
1998	25%	55%
1999	29%	*
2000	51%	*
2001	61%	*
2002	23%	51%
2003	46%	43%
2004	35%	51%
2005	50%	40%
2006	44%	48%
2007	35%	47%
2008	37%	46%
2009	45%	39%
2010	38%	50%
2011	20%	39%
2012	30%	47%
2013	40%	48%
2014	44%	33%
2015	40%	36%
Average	37%	46%

Appendix 8. — Annual estimates of percent female for Chinook Salmon and Summer Chum Salmon from 1994-2015 at the East Fork Andreafsky River weir, Alaska. Dashed line denotes average percent female from 1994-2014.



*data unavailable

Appendix 9. — Water quality data at the E.F. Andreafsky River weir, Alaska, 2015. Reported values are the arithmetic mean for daily readings collected at 15 minute intervals.

Date	Water Temp(°C)	Height(cm)	Dissolved Oxygen(mg/L)	Conductivity(µs/cm)	pH
17-Jun	17.50				
18-Jun	17.55	77.1			
19-Jun	18.40	76.2			
20-Jun	19.35	76.1			
21-Jun	19.75	75.6			
22-Jun	19.70	74.1			
23-Jun	19.65	73.5			
24-Jun	19.80	73.0			
25-Jun	18.82	72.7	12.9	64.2	7.5
26-Jun	17.27	72.2	13.2	61.9	7.4
27-Jun	15.35	71.9	13.4	58.6	7.3
28-Jun	15.12	72.1	14.5	58.1	7.4
29-Jun	16.51	72.2	14.0	60.8	7.4
30-Jun	17.03	71.6	13.6	62.3	7.4
1-Jul	15.88	69.8	13.4	60.8	7.3
2-Jul	14.33	69.8	14.5	56.2	7.4
3-Jul	14.15	69.7	14.4	50.2	7.4
4-Jul	14.13	70.4	14.6	50.5	7.4
5-Jul	15.96	70.4	13.8	57.0	7.4
6-Jul	17.42	70.4	13.1	63.5	7.5
7-Jul	16.44	70.4	13.5	61.7	7.5
8-Jul	15.79	71.0	13.9	61.7	7.4
9-Jul	16.26	71.0	13.7	62.3	7.4
10-Jul	16.33	70.7	13.8	62.3	7.4
11-Jul	17.09	70.7	13.3	64.5	7.5
12-Jul	18.00	74.0	13.1	66.8	7.5
13-Jul	18.04	76.7	12.9	68.2	7.5
14-Jul	17.34	75.7	13.2	67.2	7.5
15-Jul	17.13	82.1	13.1	65.6	7.5
16-Jul	15.30	94.8	13.7	61.4	7.5
17-Jul	13.96	124.2	13.7	49.6	7.3
18-Jul	13.13	118.0	14.4	46.4	7.3
19-Jul	12.84	103.6	14.9	50.4	7.4
20-Jul	13.35	100.7	15.1	52.8	7.4
21-Jul	14.23	98.5	14.6	55.4	7.5
22-Jul	13.94	95.5	14.7	57.2	7.5
23-Jul	13.91	92.7	14.7	58.9	7.5
24-Jul	13.11	89.9	15.0	58.7	7.5
25-Jul	12.58	88.6	15.1	58.6	7.5
26-Jul	13.12	88.1	15.1	60.0	7.5
27-Jul	14.31	87.4	14.7	62.1	7.6
28-Jul	14.93	85.5	14.0	63.2	7.5
29-Jul	14.6	83.4			
30-Jul	15.7	81.7			
31-Jul	16.0	80.4			
Average	16.0	80.8	14.0	59.4	7.4

Appendix 10. — Sampling Report from the East Fork Andreafsky River 2015 for the collection of Chinook Salmon eggs to determine thiamine levels.

2015 Thiamine sampling in the Yukon Drainage
USFWS subsistence Branch /FFWCO

Jeremy Mears

In August of 2015 helicopter-based surveys of East Fork Andreafsky, Gisasa, and Melozitna Rivers were conducted and Chinook Salmon eggs collected to help determine the levels of thiamine present in Yukon River Chinook Salmon. Thiamine deficiency has been linked to decreased productivity in other salmonid species (Fischer et al. 1996; Marcquenski and Brown 1997; Norrgren et al 1998). The data from this collection will help in resolving whether or not thiamine deficiency is a contributing factor in the decline of Yukon River Chinook Salmon. This effort is in support of a project led by the Alaska Department of Fish and Game (ADF&G) and the National Oceanic and Atmospheric Administration (NOAA) under the title "Exploration of AYK Chinook salmon egg thiamine levels as a potential mechanism contributing to recent low productivity patterns" (NPRB project 1422). The project is funded by the North Pacific Research Board and this is the second year the Subsistence Branch of the USFWS Fairbanks Field Office has participated. The results of the larger study are scheduled to be published in 2017. This appendix only describes the collection of samples on the East Fork Andreafsky in 2015.

Sample Sites:
East Fork Andreafsky River

Chinook Salmon eggs were collected on August 14 and 15, 2015, on the East Fork Andreafsky River. The Andreafsky River is a tributary of the Yukon River and has a divided watershed with two major tributaries, the east and west forks; our collection occurred in the East Fork between points N62.24100°, W162.674717° and N62.60503°, W162.10988°. This area is 16 to 64 kilometers line of sight from the weir location run by the USFWS on the East Fork Andreafsky River (Mears 2015). We flew as far as N62.75644°, W162.10988°, but observed few live Chinook on redds in the upper reaches of the East Fork. For a broader description of the Andreafsky River see Mears (2015). All samples were collected within the Yukon Delta National Wildlife Refuge/Andreafsky Wilderness with the approval of the Refuge.

Collection Methods

All Chinook Salmon samples were collected by hook and line using weighted snagging hooks. Individual groups of fish were spotted from the air utilizing a Robinson R44r Helicopter at an altitude of 100-150ft. Each of the reaches of the river was marked with GPS points to avoid repeated capture. All fish that were captured had the axillary process clipped for genetics baseline data, and females were sampled for eggs. Collected eggs were placed in a Ziploc bag in a chilled container until they could be frozen and samples were delivered to ADF&G for analysis.

Collection Results

On August 14 the upper reaches of the East Fork Andreafsky were surveyed. Total survey time was 11.5 hours. Using tail coloration as a way to distinguish males from females from the air, we landed and sampled at 10 locations. Sixteen fish were captured (13 females/3males). Of the 13 females, 3 produced egg samples, 10 were spent. All fish were released alive. Weather conditions did not limit our ability to see salmon from the helicopter, but intermittent rain showers during the day made it difficult to spot fish in the river after landing.

On August 15 an additional survey was conducted for a total survey time of 10.5 hours, which resulted in 14 Chinook being captured (12 females/2 males). Of the 12 females, 8 produced egg samples, 4 were spent. All fish were released alive. Weather conditions did not limit our ability to see salmon from the helicopter, but intermittent rain showers during the day made it difficult to spot fish in the river after landing. Total sample time for the day 10.5 hours.

Similar to observations in 2014, there appeared to be large numbers of small male Chinook Salmon. No effort was made to collect or verify the sex of these fish.

Discussion

The intent of this sample collection was to collect egg samples after peak spawning. However, perhaps due to higher than average water temperatures throughout the Yukon River basin and difficulty in predicting run timing we were not able to collect as many samples as hoped. If these studies continue in the future sampling fish at the weir site may be most cost effective and allow for an adequate sample size.

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