2021 Takotna River Salmon Run Timing and Abundance

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KUSKOKWIM RIVER
INTER-TRIBAL FISH COMMISSION

TELIDA | NIKOLAI | TAKOTNA | MCGRATH | LIME VILLAGE | STONY RIVER | SLEETMUTE | RED DEVIL
GEORGETOWN | CROOKED CREEK | NAPAIMUTE | CHUATHBALUK | ANIAK | UPPER KALSKAG | LOWER KALSKAG | TULUKSAK
AKIAK | AKIACHAK | KWETHLUK | BETHEL | OSCARVILLE | NAPASKIAK | NAPAKIAK | KASIGLUK | ATMAUTLUAK
NUNAPITCHUK | TUNTUTULIAK | EEK | QUINHAGAK | KONGIGANAK | KWIGILLINGOK | KIPNUK | CHEFORNAK

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Report covers work performed during the field season from June through August of 2021.

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II. ABSTRACT:

The Kuskokwim River Inter-Tribal Fish Commission, assisted by the Takotna Tribal Council and local fish technicians, monitored the escapement of Chinook salmon (*Oncorhynchus tshawytscha*) and chum salmon (*O. keta*) returning to the Takotna River. A resistance board weir was used from July 12 through August 10, 2021, to collect abundance and run timing of both Chinook and chum salmon, slightly shorter than the traditional target period of July 1 to August 10. Age, sex, and length data were collected from a subsample of the Chinook salmon. Data collected at the weir support management of the salmon fisheries that occur in the Kuskokwim River drainage. An estimated total escapement of 318 Chinook salmon and an observed total of 151 chum salmon passed the weir during the target period of July 1 to August 10, 2021. Five Chinook salmon passed the weir site after August 10, bringing the 2021 total to 323 Chinook salmon. The midpoint of cumulative passage was July 19 for Chinook salmon and July 29 for chum salmon. The predominant Chinook salmon ages were age 1.2 from the 2017 brood year for males and age 1.3 from the 2016 brood year for females. Females comprised 43% of the estimated total return of Chinook salmon in 2021. Mean lengths were 732 mm for female Chinook salmon and 570 mm for males. Four of the Chinook salmon sampled for age, sex, and length were larger than 800 mm, and all were female.

III. INTRODUCTION:

The Kuskokwim River historically supported the largest subsistence salmon (*Oncorhynchus* spp*.)* fishery in the state of Alaska, in both the number of residents who participate in the fishery and the number of salmon harvested (Fall et al. 2012). With some of the lowest per capita monetary incomes in the United States, subsistence use in this region is extremely valuable locally and is characterized by a high production of wild foods for local use (Wolfe and Walker

1987). In recent decades, residents of the Kuskokwim region have annually harvested over 360 pounds of wild foods per person for human consumption, with fish comprising up to 85% of the total poundage of subsistence harvests, and salmon contributing up to 53% of subsistence harvests (Simon et al. 2007; Wolfe et al. 2011). Residents harvest all five species of Pacific salmon: Chinook (*O. tshawytscha*), chum (*O. keta*), coho (*O. kisutch*), pink (*O. gorbuscha*), and sockeye (*O. nerka*).

The importance of salmon, particularly Chinook salmon, to local residents extends well beyond nutrition and economic values and includes socio-cultural and personal identities (Ikuta et al. 2013). Kuskokwim River Chinook salmon stocks have been in a period of low productivity since 2007, requiring managers to enact significant subsistence fishing restrictions to meet established escapement goals. Since 2009, subsistence harvests of Chinook salmon in the Kuskokwim River have been below the range of 67,200–109,800 fish designated in 2013 by the Alaska Board of Fisheries as Amounts Reasonably Necessary for Subsistence (ANS) for the Kuskokwim River (Lipka and Tiernan 2018; Tiernan et al. 2018; McDevitt et al. 2021). Estimated subsistence harvests of chum salmon in the Kuskokwim River are still being finalized at the timing of this report but are likely well below the ANS range of 41,200–116,400 fish designated by the Alaska Board of Fisheries, (S. Larson. ADF&G, per. com.)

A weir has been operated on the Takotna River for 19 years (2000–2013 and 2017–2021) as an upper Kuskokwim River index for salmon escapement (Figure 1). Between 1996–1998, enumeration of the Takotna River salmon escapement was estimated using a counting tower. Tower operation employed students and staff of Takotna Charter School and Training Center with assistance from Alaska Department of Fish and Game (ADF&G). However, tower operations were only considered successful in 1996 and 1997 as water conditions impeded accurate counting of salmon passage in other years (Molyneaux et al. 2000). Beginning in 2000, a resistance board weir has been operated with a live trap to allow enumeration and collection of biological data from passing fish, including during most high-water conditions with poor visibility (Williams and Blain 2013; Whitworth 2021).

Following the lowest escapement of Chinook salmon to the Takotna River ever documented in 2013, combined with budget cuts and revised assessment priorities, ADF&G withdrew funding of this project beginning in 2014. Unfortunately, 2012–2014 also produced the lowest total Chinook salmon returns ever estimated for the Kuskokwim River drainage (Larson 2021). In response, regulatory changes adopted in 2016 closed salmon fishing during the early portion of the Chinook salmon spawning run, with the understanding that most of these early fish are upstream spawners (Clark and Smith 2019). However, there are few upstream spawning tributaries with an extended history of weir operation to assess the effects of the early season closures and/or to assess the status of small stocks. The Takotna River weir is the only upriver tributary with a long-term data series suitable for evaluating the effects of the early season closures on headwater stocks.

Recognizing the importance of this project, the Takotna River weir was re-established in 2017 to measure Chinook salmon returns. The project historically operated as a community-based

project with strong involvement from local villages to build local capacity and increase participation of upper Kuskokwim River stakeholders in the Chinook salmon management process. The weir project is designed to continue with this approach, under administrative oversight by the Kuskokwim River Inter-Tribal Fish Commission (KRITFC) and with support from the Takotna Tribal Council.

IV. OBJECTIVES:

The overarching project goal is to continue a long-term ground-based project that will adequately index salmon escapement to the headwater tributaries of the Kuskokwim River. By continuing the only long-term data set dedicated to evaluating salmon escapement to a Kuskokwim River headwater tributary, including continuing the time series of environmental data, this project provides local residents, researchers, and managers with data and insights for understanding the local impacts of climate change and fishery management practices. Specific project objectives include:

- Enumerate the daily passage and characterize the run timing of Chinook salmon through the resistance board weir from July 1 to August 10.
- Enumerate the daily passage and characterize the run timing of chum salmon and resident fish species through the resistance board weir from July 1 to August 10.
- Estimate the weekly sex and age composition of Chinook salmon such that the simultaneous 95% confidence intervals have a maximum width of 0.20.
- Collect environmental data (air/water temperature, flow volume, precipitation, etc.).
- Serve as a platform to develop local talent/capacity in a community-based stock assessment project and conduct community outreach.
- Serve as a platform for future research projects such as tagging studies, heat-stress studies, collection of genetics data, and monitoring of environmental data.

V. METHODS:

1. Project Area:

Originating in the central Kuskokwim Mountains of the upper Kuskokwim River, the Takotna River (Figure 1) is formed by the confluence of Moore Creek and Little Walden Fork (Brown 1983). From this confluence, the Takotna River flows northeast, passing the community of Takotna at river kilometer (rkm) 80 (river mile [rm] 50), before turning southeast near the confluence with the Nikon Fork at rkm 24 (rm 15). The Tatalina River enters the Takotna at rkm 5 (rm 3), and then the Takotna River merges with the Kuskokwim River across from McGrath at rkm 752 (rm 467) from the mouth of the Kuskokwim River. The Takotna River is

about 160 km (99 miles) long with a drainage of 5,646 square kilometers (2,180 square miles).

The Takotna River region has a sub-arctic climate characterized by extremes in temperature. Summer temperatures average 6 to 27 ˚C (42 to 80 ˚F), whereas winter temperatures average -18 to 6 ˚C (0 to 43 ˚F). Average yearly precipitation is approximately 30.5 cm (12 inches), with the majority falling between June and October. The rivers in this area generally become ice-free in the slow current sections by early May and freeze over during November.

During 2000–2013, and 2017–2021, the Takotna River weir was installed at 62°58.0' N., 156°05.9' W., a site several hundred meters above the Takotna River bridge near the community of Takotna (Williams and Blain 2013) and about 17 air miles west of McGrath (Figure 1). The location provides for enumeration of most salmon spawning in the Takotna River drainage, excluding the Nixon Fork tributary returns. At the Takotna River weir site, the river channel is about 85 meters (279 feet) wide and less than 1 meter (3 feet) deep during normal summer flows, with a substrate of gravel mixed with some sand and cobble. Non-salmon species commonly found at this location include Arctic grayling (*Thymallus arcticus*), whitefish (*Coregonus spp*.), northern pike (*Esox Lucius*), and longnose suckers (*Catostomus castostomus*).

2. Project Design:

All salmon passing upstream through the weir were counted to achieve a complete visual count of escapement during operations. Counts, by species as the fish passed, were made daily. The timing and number of counting sessions were adjusted in-season depending on the timing and abundance of fish passing through the weir (Molyneaux et al. 2010). The historical target operational period was July 1 through August 10.

A resistance board weir was installed across the entire 85-meter channel following the techniques described by Stewart (2003) and employed in prior years at this site. Weir installation is targeted for mid-June during a typical low water period. The weir has two sectional components: (1) a substrate rail and resistance board panels placed in the middle 75-meter portion of the channel; and (2) fixed weir materials (picket fence) installed from the stream bank to the floating panels. The floating and fixed weir lengths were adjusted as needed to accommodate river width and depth. Specific details of the design and materials for weir construction are provided by Tobin (1994), with panel modifications as presented by Stewart (2003). The Takotna River weir design applied a 4.29 cm (1 11/16 in) gap between pickets, which is enough to stop all adult salmon, except pink salmon, from upstream migration (Williams and Blain 2013). A live trap and skiff gate were incorporated into the weir structure at the deeper portion of the channel. The live trap was set to either allow fish to freely pass upstream while being counted, or to retain fish for collection of age, sex, and length (ASL) samples. The skiff gate allows boat operators to pass with little or no involvement of the weir crew, while minimizing or preventing passage of migrating salmon during boat passage.

During the period of weir operation, several non-salmon species (e.g., longnose suckers) migrate downstream. To provide for such migrations, "downstream passage chutes" were established by releasing the resistance boards on a pair of adjacent weir panels so that the downstream ends of the panel settled slightly below the water surface. The weir crew monitored and adjusted these chutes as needed to ensure downstream migrant passage while preventing upstream migration of adult salmon.

The composition of spawning Chinook salmon (escapement quality) was estimated by sampling salmon retained by the live trap. Sampling techniques were consistent with standard methods described by Molyneaux et al. (2010), using a conventional fish trap design described by Linderman et al. (2002). Chinook salmon escapement was sampled daily, approximately in proportion to observed passage abundance.

Climatological, stage height, and air and water temperature data were collected and recorded daily. Stream gage stage height was measured and recorded each morning at 0900 hours.

3. Data Collection and Reduction:

a. Escapement Monitoring

Similar to the past four years, the Takotna River weir objectives focused on enumerating Chinook and chum salmon escapements. To achieve the objectives, July 1 to August 10 remained the target operational dates. These data continued the 21-plus years of Takotna River Chinook and chum salmon escapement estimates.

Historically, the weir was used to assess most Takotna River salmon runs, including coho salmon, which have a later run timing than other species.

During the operational period, weir crews recorded daily and cumulative escapements by salmon species including estimated passage missed due to weir problems. The weir was inspected daily for holes and the potential for fish passage documented. Weir panels were cleaned daily, or as needed, of carcasses and debris. Carcasses were identified, and daily counts recorded by species and sex.

Counts of passing fish were made at a frequency of four to eight shifts per day between 0700 and 2400 hours. Counting effort increased during times of high fish passage, regardless of fish species, to reduce stress to fish being held in the weir live trap. During counting, a crew member opened the passage gate to allow fish to pass freely. The crew member then identified each fish being passed upstream by species, and the count was recorded on a multiple tally counter. The crew ensured the passage gate was securely closed at the end of a counting shift.

b. Age, Sex, and Length Composition

Collection of ASL data is crucial to evaluating the composition of salmon returning to any stream, and how management strategies and escapement composition may interact

to affect long-term productivity within environmental constraints. Per Bromaghin (1993), ASL samples should be collected from a minimum of 190 Chinook salmon passing through the Takotna weir, assuming 10 age-sex categories, an unknown population size, and 95% confidence intervals for each age-sex bin. The Takotna River presently supports a relatively small population of Chinook salmon and counting tower/weir counts ranged from 104 to 1,197 during 1996-2020, with a historical average escapement of 406 Chinook salmon. The smallest observed escapement, 104 Chinook salmon, occurred in 2013 (Larson 2021). While there are indications of improved returns in recent years, the rate of improvement has been slower than following historical declines. Therefore, it was anticipated that ASL samples should be collected from as many of the Chinook salmon being passed through the weir as was reasonable and prudent.

Chinook salmon used for ASL sample collections were captured from the weir live trap. During weir operation, salmon migrating upstream pass the entrance gate while the exit gate is closed. A V-shaped entrance gate prevents fish from easily returning downstream. The live trap was allowed to fill with fish until a reasonable number was inside. Weir crew members removed fish from the live trap using a short-handled dipnet, and fish were placed in a partially submerged fish "cradle." Scales were removed from the preferred area of the fish (INPFC 1963) and transferred to numbered gum cards as described in Molyneaux et al. (2010). Sex was determined through visual examination of the external morphology, focusing on the prominence of a kype, roundness of the belly, and the presence or absence of an ovipositor. Length (mid-eye to tail fork; nearest mm) was measured with a straight-edged meter stick. Sex and length data were recorded on standardized numbered data sheets that correspond to numbers on the gummed scale cards. Immediately after sampling, fish were released upstream of the weir and the process repeated until the live trap was empty. At the end of a sampling session, data on sampling date, sampling location, sex, length, and corresponding gum card numbers were transferred to an Excel spreadsheet. Salmon scales were cleaned and properly affixed to gummed scale cards. Scale cards were completed according to ADF&G procedures for the Kuskokwim Area (Buklis 1985; Merritt 1987).

Subsequent scale analysis and reporting by ADF&G followed methods described by Mosher (1969). Age determinations for Chinook salmon include the number of years spent in freshwater as a juvenile and the number of years spent in saltwater. The ASL data were archived within the Alaska-Yukon-Kuskokwim-Database Management System by ADF&G staff.

c. Environmental Monitoring

Water and air temperature data (°C) were recorded in a designated logbook at approximately 0900 and 1700 hours daily beginning on the evening of July 5 and extending the completion of weir operations on August 10. Additional information included wind direction, wind speed, cloud cover, precipitation, and river depth. Precipitation (in millimeters) was recorded based on a rain gauge. River depth was

determined using a standardized gauge consisting of a metal rod driven into the stream channel with a meter stick attached. The gauge was calibrated to a semi-permanent benchmark that corresponded to a stage measurement of 300 cm (Williams and Blain 2013).

4. Data Analysis:

Daily escapement counts and ASL data underwent a standardized post-season quality control review. Estimates of missed upstream passage of Chinook salmon were made for all days in which the weir was inoperable because of delayed installation, flood events, or minor structural damage. Standardized Bayesian estimation methods were used by ADF&G staff, consistent with other ADF&G escapement monitoring projects (Dickerson et al. 2019). Daily averages were calculated for water temperature and water stage data. Age and size composition data for dates when no ASL samples were collected were estimated as average compositions from adjacent dates.

Project Monitoring and Evaluation:

The two primary objectives of this project are to operate a resistance board weir to count passage of Chinook and chum salmon during the period of July 1 to August 10, and to collect ASL data from Chinook salmon passing the weir. The project is deemed successful if the weir is operated by local hire technicians with a minimum of down time due to environmental conditions and counts of fish passage are obtained by species. This information will be summarized for consideration during the in-season decision processes by fishery managers and advisory groups. The secondary objective of collecting Chinook salmon ASL data will be deemed successful if up to 190 ASL samples are collected, contingent on the magnitude of the Chinook salmon escapement return. The ASL data will be used as input data into postseason stock assessment models. Collection of environmental data during the period of weir operation will provide a synopsis of conditions during the spawning season and will also serve as a basis for interannual comparisons to document the effects of climate change.

VI. RESULTS:

Weir Operation:

In 2021, the Takotna River weir crew started preparing the weir and setting up camp on June 8. The crew consisted of five local hires from the community of Takotna. Due to high water, the weir was not fully installed until July 12. Because the weir was fully operational for only part of July 12, Chinook salmon counts for that date were estimated (Dickerson et al. 2019), but ASL samples were collected from Chinook salmon passing through the operational weir. The weir was fish tight from July 12 through the entire monitoring season, except for August 2–4 due to high-water flood events. The weir was dismantled starting on August 11.

Environmental Data:

The average water level recorded was 84.8 cm between July 6 and August 10. The highest water level was 132 cm on July 9 and 10. The lowest water level was 72.0 cm on 8 and 9. The average daily water temperature (averaged between morning and evening readings) was 12.7 ˚C (Figure 2). The highest water temperature recorded in the morning was 15 ˚C on July 19, and in the evening was 19 ˚C, also on July 19. The lowest water temperature in the morning was 9˚C on July 10, and in the evening was 9 ˚C on July 9. Average air temperatures recorded in the morning and evening were 13.0 ˚C and 17.8 ˚C, respectively. The highest air temperature recorded in the morning was 18 ˚C on July 13, and in the evening was 26 ˚C on July 19 and August 3. The lowest air temperature in the morning was 8 ˚C on August 10, and in the evening was 10 ˚C on July 6.

Biological Data:

Chinook Salmon – An estimated total of 318 Chinook salmon passed the weir location during July 1 through August 10, 2021 (Table 1). An estimated 5 additional fish passed following weir operations, bringing the 2021 total to 323 Chinook salmon. The weir first counted Chinook salmon on July 12, the first day of weir operation, but because the weir was fully installed for only part of this day, counts were considered incomplete and were instead estimated. The peak weekly passage (measured as Sunday to Saturday) of 94 Chinook salmon occurred July 18–24, and the midpoint of passage occurred on July 19. An estimated 89 Chinook salmon were missed during the high-water periods of July 1–12 (prior to weir installation) and during August 2–5. An additional five Chinook salmon are estimated to have passed following the August 10 end of the traditional weir coverage period.

Chum Salmon – An observed total of 151 chum salmon passed the weir during July 1 to August 10, 2021 (Table 1). No estimate of missed passage was made. The first chum was observed on July 13. The peak weekly passage of 54 Chum salmon occurred July 18–24, and the midpoint of passage occurred on July 29.

ASL Data – Age, sex, and length data were collected from 70 Chinook salmon (no ASL data were collected from chum salmon). Of the 70 samples, 58 had a readable scale and sex was identified. Data were not extrapolated beyond the weir coverage period. Four age classes (1.1, 1.2, 1.3, and 1.4) were identified from scale samples (Table 2). The predominant age classes were 1.2 for males and 1.3 for females. After weighting the estimated passage by the ASL samples where age and sex were available, females comprised of 43% of Takotna River Chinook salmon return. The mean length was 732.4 mm for females and 570.3 mm for males. Four of the Chinook salmon sampled for ASL measured larger than 800 mm; all were female, and none were larger than 900 mm. Of the age-6 Chinook salmon identified, eight were females ranging from 680 to 844 mm in length, and three were males that ranging from 735 to 760 mm in length.

Other Species – Other migrant and resident fish species counted during the weir operational period from July 12 through August 10, 2021, included 34 sockeye salmon and 37 coho salmon.

VII. DISCUSSION:

The Takotna River weir project was generally successful in meeting the goals and objectives within environmental complications. The Chinook and chum salmon resistance board weir was fully installed and operational on July 12 (instead of July 1) due to high water, and operated through August 10, except for August 2 to 4 when high water again prevented weir operation. The Chinook salmon passage of 0 fish on July 19 was notable in that relatively large numbers of Chinook salmon passed on adjacent days, but the weir crew found no issues with the weir. However, per the temperature results noted above, July 19 was also a relatively warm day. Takotna River Chinook and chum salmon escapement and escapement quality data were collected and delivered to ADF&G, processed, archived, and distributed to interested parties. The 2021 total estimated escapement of 323 Chinook salmon was 21% less than the average escapement of 406 fish during 1996–2020 (Figure 3). The 2021 observed passage of 151 chum salmon during the standardized period of July 1 to August 10 was 97% lower than the average escapement of 4,853 fish during 1996–2020 (Figure 3). We note that because these annual escapement data (Figure 2) were standardized to the July 1 to August 10 period, and an ADF&G Bayesian statistical approach was used to fill in days missed due to high water conditions or other problems, the standardized annual estimates may differ from fish passages reported in other documents. However, a clear concern remains over chum salmon that have generally declined in the past decade, and uncertainty over Chinook salmon that show improvement over the past decade but are still highly variable and below the long-term average return.

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Table 1. Daily, cumulative (Cum), and cumulative percent (%) passage for Chinook, sockeye, chum, and coho salmon at the Takotna River weir, 2021.

	Chinook			Chum			Sockeye			Coho		
Date	Daily	Cum	%	Daily	Cum	%	Daily	Cum	%	Daily	Cum	%
6/24	0	0	0									
6/25	0	0	0									
6/26	0	0	0									
6/27	0	0	0									
6/28	0	0	0									
6.29	0	0	0									
6/30	0	0	0									
7/1	0	0	0									
7/2	0	0	0									
7/3	1	1	0									
7/4	2	3	1									
7/5	3	6	2									
7/6	5	11	3									
7/7	7	18	6									
7/8	8	26	8									
7/9	11	37	12									
7/10	13	50	16									
7/11	15	65	20									
7/12	16	81	25									
7/13	3	84	26	1	1	1	0	0	0	0	0	0
7/14	3	87	27	4	5	3	0	0	0	0	0	0
7/15	21	108	34	0	5	3	0	0	0	0	0	0
7/16	16	124	39	2	7	5	0	0	0	0	0	0
7/17	5	129	41	0	7	5	0	0	0	0	0	0
7/18	23	152	48	11	18	12	0	0	0	0	0	0
7/19	0	152	48	2	20	13	0	0	0	0	0	0
7/20	38	190	60	14	34	23	2	2	6	0	0	0
7/21	10	200	63	3	37	25	0	2	6	0	0	0
7/22	1	201	63	7	44	29	0	2	6	0	0	0
7/23	8	209	66	7	51	34	0	2	6	0	0	0
7/24	14	223	70	6	57	38	0	2	6	0	0	0
7/25	3	226	71	7	64	42	0	2	6	0	0	0
7/26	12	238	75	3	67	44	2	4	12	0	0	0
7/27	8	246	77	4	71	47	0	4	12	0	0	0
7/28	2	248	78	1	72	48	0	4	12	0	0	0
7/29	3	251	79	3	75	50	0	4	12	0	0	0
7/30	7	258	81	12	87	58	4	8	24	0	0	0
7/31	18	276	87	18	105	70	5	13	37	0	0	0

-continued-

Table 1.–Page 2 of 2.

	Chinook			Chum			Sockeye			Coho		
Date	Daily	Cum	%	Daily	Cum	%	Daily	Cum	%	Daily	Cum	%
8/1	14	290	91	14	119	79	6	19	56	0	0	0
8/2	3	293	92	1	120	79		19	56		0	0
8/3	3	296	93		120	79		19	56		0	0
8/4	2	298	94	7	127	84		19	56		0	0
8/5	3	301	95	6	133	88	0	19	56	5	5	14
8/6	6	307	97	7	140	93	4	23	68	8	13	35
8/7	4	311	98	4	144	95	1	24	71	4	17	46
8/8	1	312	98	4	148	98	7	31	91	8	25	68
8/9	1	313	98	1	149	99	3	34	100	10	35	95
8/10	5	318	100	2	151	100	0	34	100	2	37	100
8/11	1											
8/12	1											
8/13	1											
8/14	1											
8/15	1											
8/16	0											
8/17	0											
8/18	0											
8/19	0											
8/20	0											
8/21												
8/22												
8/23												
8/24												
8/25												
8/26												
8/27												
8/28												
8/29												
8/30												
8/31												
Weir	318			151			34			37		
Total	323											

Notes:

Shaded dates are when the weir did not operate, and Chinook passage was estimated. Missed days not estimated for chum, sockeye, and coho salmon.

Boxes for % show the cumulative 25%, 50%, and 75% passage of Chinook and chum salmon during the traditional weir monitoring period of July 1 to August 10.

Weir includes season Chinook salmon estimates before and after the weir operation, and when the weir was not operational, during of July 1 to August 10.

Total includes estimates after August 10 for Chinook salmon.

Table 2. Kuskokwim River Chinook salmon age, sex, and length (mm) composition after weighting ASL samples to the total passage (N=318) from the Takotna River weir escapement project, 2021.

		2018			2017			2016			2015					
Age		1.1			1.2			1.3			1.4				Total	
		N	%		N	%		N	%		N		%		N	%
Agecmp																
Male		20	6.3		91	28.5		47	14.9		23		7.2		181	56.9
Female		0	0.0		0	0.0		86	27.1		51		16.0		137	43.1
Total		20	6.3		91	28.5		134	42.0		74		23.2		318	100.0
Size																
Male		412.0			546.2			598.9			745.0				570.3	
Female								715.1			761.5				732.4	
Total		412.0			546.2			674.0			756.4				640.1	

Notes: Agecmp = age composition.

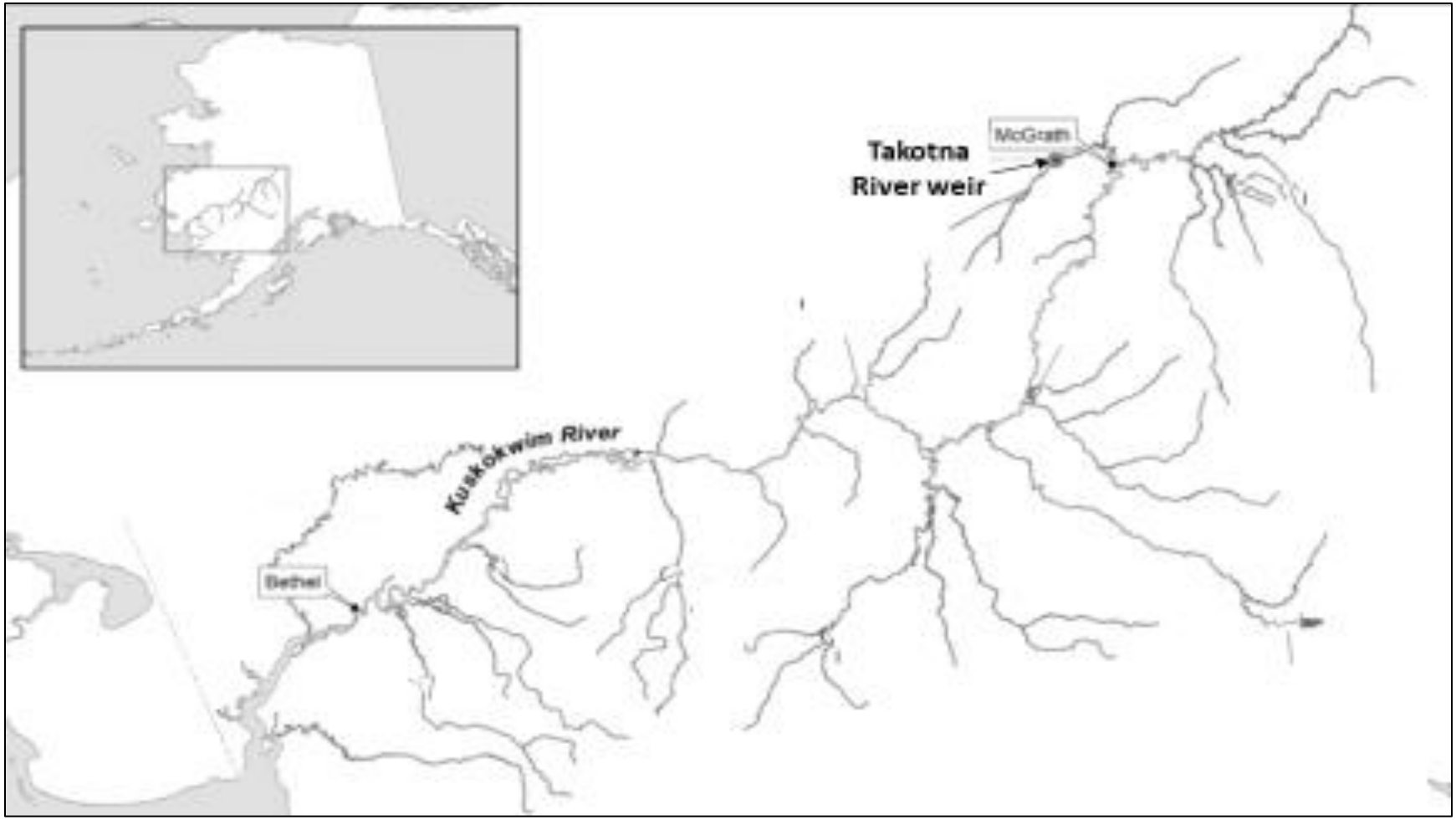

Figure 1. Location of the Takotna River weir project on the Upper Kuskokwim River.

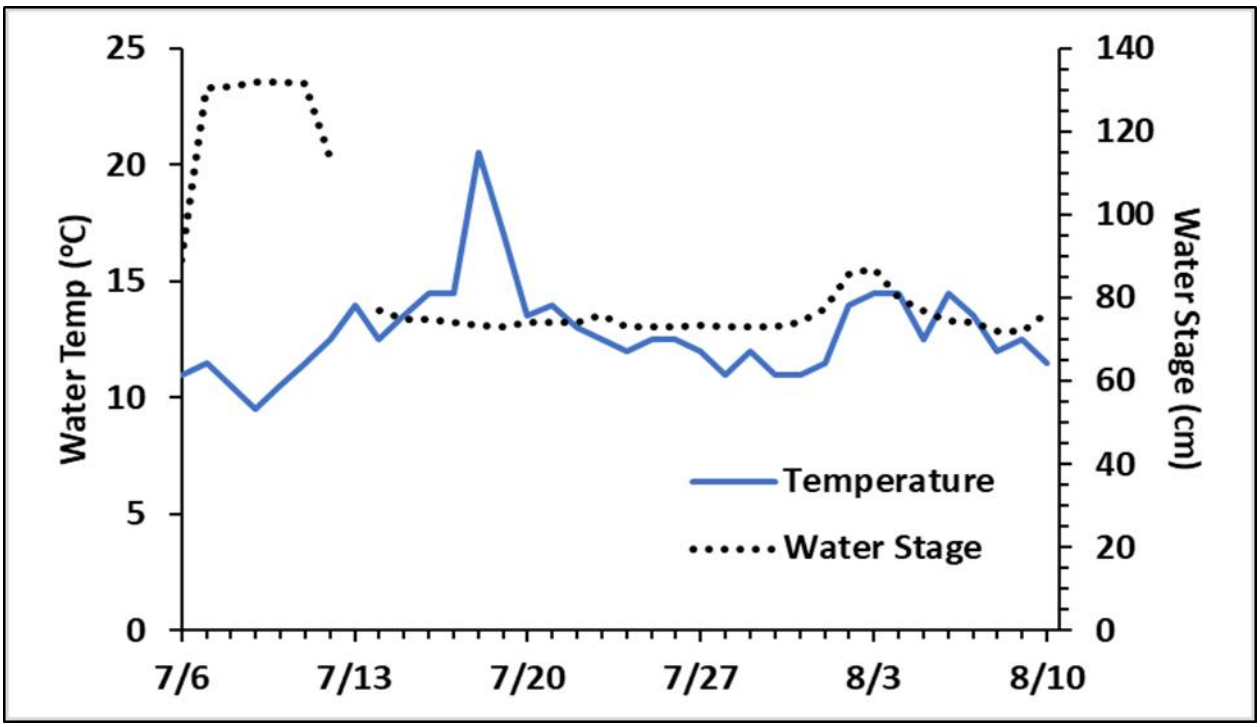

Figure 2. Average daily water temperature (solid line) and water stage (level; dotted line) recorded at the Takotna River weir, 2021.

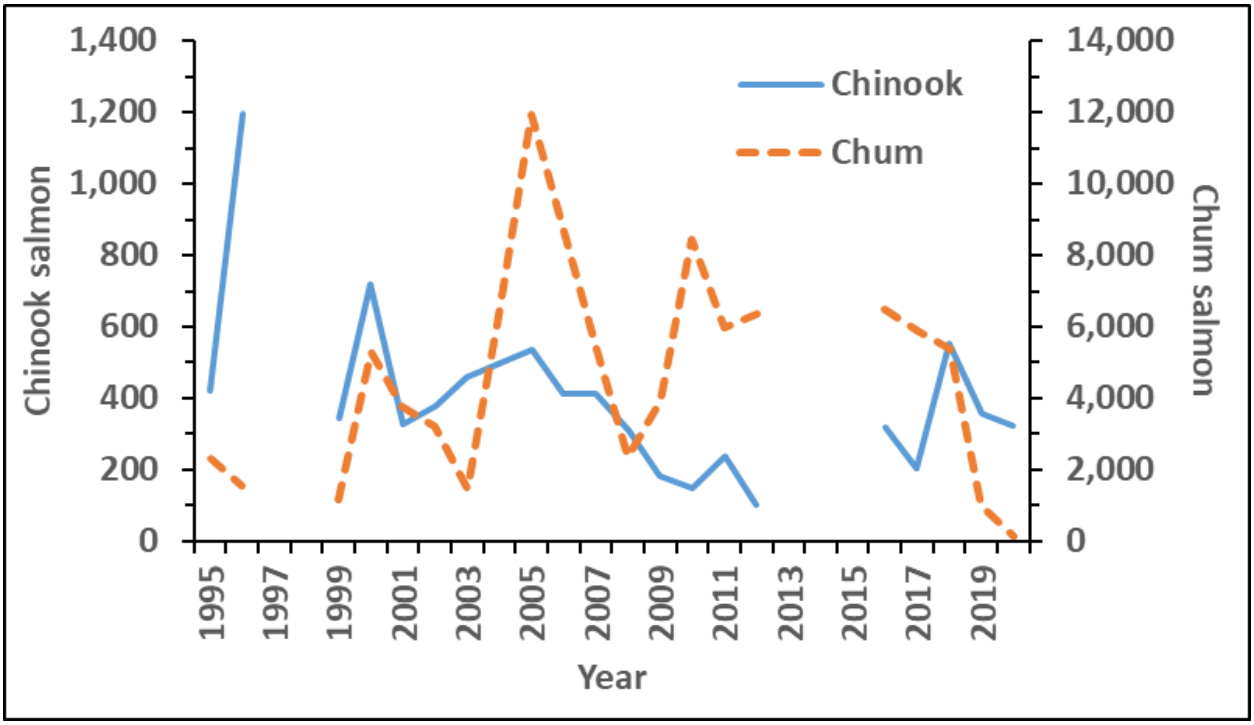

Figure 3. Annual escapements of Chinook and chum salmon to the Takotna River, 1996–2021.