Tanana Chiefs Conference, Fisheries Program

Abundance and Run Timing of Adult Salmon in Henshaw Creek, Kanuti National Wildlife Refuge, Alaska, 2014

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Cover Photos: Henshaw Creek Camp: top 2013, bottom 2014.

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Abstract

The Tanana Chiefs Conference Fisheries program planned to operate a resistance board weir in 2014 to collect information on abundance and run timing of Chinook salmon *Oncorhynchus tshawytscha* and chum salmon *O. keta* migrating up Henshaw Creek, a tributary to the Koyukuk River, Alaska. However, due to periods of heavy rainfall and associated high water, the Henshaw Creek weir was not installed in 2014, and no escapement data were collected. This represents just the second time in the 15 year history of this project that the weir was not operational (2006, 2014). Although no data were collected in 2014, the continued operation of this weir provides a valuable long term data set dating back to the year 2000. The continuation of this project, and other escapement projects, is vital to the successful management of Chinook salmon and chum salmon, as the data they provide aid managers in developing stock specific spawner-recruit relationships and evaluating how tributary systems respond to management actions. Furthermore, quality escapement data from tributaries like the Henshaw Creek can help managers understand the contributions smaller tributaries make to the overall salmon runs throughout the Yukon River.

Introduction

Henshaw Creek, a tributary to the Koyukuk River, is located within the Kanuti National Wildlife Refuge (KNWR) in the Interior of Alaska. Henshaw Creek provides spawning and rearing habitat for Chinook salmon *Oncorhynchus tshawytscha* and chum salmon *O. keta*, as well as several other resident fish species. Chinook salmon and summer chum salmon from Henshaw Creek contribute to the mixed-stock fisheries in the Yukon and Koyukuk rivers (USFWS 1993). Since 1997, Chinook salmon and summer chum salmon runs of the Yukon River Basin have demonstrated an overall decline in productivity (Bergstrom et al. 2001; JTC 2013). These declines have led to harvest restrictions, fishery closures, and spawning escapements below management goals (Kruse 1998; JTC 2013). In 2000, the Alaska Board of Fisheries classified Yukon River Chinook salmon as a stock of yield concern in response to low returns (Hayes et al. 2006). Low returns of Chinook salmon in 2008 and 2009 resulted in a commercial fishery failure pursuant to the Magnuson-Stevens Fishery Act. Low returns of Chinook salmon continued in 2012 and 2013, and led to intensified gear restrictions on subsistence fishers and closures to subsistence fishing periods. These in-season management efforts were enacted by fishery managers in an attempt to meet escapement goals and to comply with international treaty obligations. The 2014 pre-season forecast suggested a continuing trend of a low return of Chinook salmon (JTC 2014). In response to the negative pre-season forecast, Native Alaskan communities and subsistence fishers passed a moratorium on the harvest of Chinook salmon in an attempt to conserve and protect their salmon resources (TCC 2014). These conservative

management actions coupled with the user imposed Chinook moratorium have resulted in increased hardships for Native Alaskans who rely heavily upon salmon as a subsistence food resource as well as a means to continue to practice their ancestral, cultural and traditional way of life. Because of the current state of the Yukon River Chinook salmon, and the complexity of mixed stock fisheries for both Chinook salmon and summer chum salmon, responsible management of these resources is paramount. To ensure proper management strategies are enacted, fishery managers need high quality data describing Chinook salmon and summer chum salmon escapements and demographic data including age, sex, and length data (ASL). Without accurate escapement estimates from multiple Yukon River tributaries, managers are unable to determine stock specific spawner-recruit relationships (Labelle 1994), and will lack data to evaluate how these systems respond to management actions. Furthermore, quality escapement data from tributaries throughout the Yukon drainage can help to better understand the contributions smaller tributaries make to the overall salmon runs in the Yukon River.

Henshaw Creek has been determined to be an important producer of Chinook salmon and summer chum salmon, and has been monitored with a weir since 2000 (Barton 1984; Dupuis, 2012). The U.S. Fish and Wildlife Service (USFWS), Fairbank Fish and Wildlife Field Office (FFWFO) and, most recently, the Tanana Chiefs Conference (TCC) have collected salmon escapement and ASL data from the weir since the project's inception (e.g., VanHatten 2002; O'Brien and Berkbigler 2005). The Henshaw Creek weir project is one of two salmon escapement projects currently operated within the Koyukuk River drainage (Carlson, 2012). Since 2000, escapement estimates in Henshaw Creek have ranged from 244 to 1,796 Chinook salmon and from 22,556 to 292,082 summer chum salmon (Figures 1 & 2, Appendix 1). In 2011, 2012, and 2013, Henshaw Creek weir summer chum salmon escapement totals represented an estimated 14.0%, 13.7%, and 10.6%, respectively, of the entire Yukon summer chum salmon run counted by the Pilot Station Sonar (JTC 2012, JTC 2013, & JTC 2014). Both Chinook salmon and summer chum salmon from Henshaw Creek contribute to the subsistence harvests of villages within the Kanuti National Wildlife Refuge as well as to the harvests of subsistence and commercial fisheries occurring in the Yukon River. Information collected at the Henshaw Creek weir is important to fisheries managers who have the difficult task of managing the complex mixed stock, subsistence and commercial salmon fisheries in the Yukon River. Pre-season estimates, in-season management actions and post season evaluations of management actions are enhanced by the data from this project. Furthermore, the analyses provided from this project, and the data that support them, are important for determining the impacts of fishing regulation changes (e.g. net mesh size restrictions), fishery closures, and the effects of climate change on salmon stocks in the Yukon River.

Objectives of the Henshaw Creek weir were to (1) determine daily escapement and run timing of adult salmon, (2) determine age, sex, and length compositions of adult salmon, (3) document upstream movement and presence of resident fishes, and (4) serve as an outreach platform for KNWR staff and Partners Program fisheries biologist to conduct an onsite science camp.

Study Area

Henshaw Creek is a small, clear water tributary of the Koyukuk River in north-central Alaska (Figure 1). The creek originates in the Alatna Hills and flows southeasterly for approximately 144 km before entering the Koyukuk River. The weir site is approximately 1.5 km upstream

from the mouth of Henshaw Creek. This site was selected for its optimal width (30m), and depth (0.6m), and substrate composition (small cobble 50-150mm in diameter).

The climate of this area is cold and continental, and is characterized by extreme seasonal temperature variations and low precipitation. Summer air temperatures range from 18˚C to 21˚C, with winter lows nearing -57˚C (USFWS 1993). Stream discharge is the highest during the spring in response to snow melt with occasional peak discharge periods in the summer as a result of heavy rain showers. Channel configuration is typically meandering with alternating cut banks and gravel bars. The substrate is composed primarily of medium to large gravel (8–64 mm), and small cobble (64–128 mm) in the areas of higher water velocity. Sand and silt substrate is common in the pools.

Methods

Due to high water in 2014, the weir was not installed and no data were collected.

Results and Discussion

The Henshaw Creek weir was not installed in 2014 due to high water. Interior Alaska received excessive amounts of rainfall throughout the summer. The water level in Henshaw Creek was too high to allow for weir installation or operation, and at times threatened the safety of the crew. The project start date was based on previous years' run timing data, coupled with the ADF&G's preseason forecast for an early run year (JTC 2014). The Henshaw Creek crew departed for the Henshaw Creek weir site on June 16. The living quarters and the cook tent were completed by June 18. The weir was planned to be installed and fully operational by June 21. However, high water delayed weir installation, and on July 15 the crew was evacuated from the weir site for safety precautions. The water level exceeded bank full, was continuing to rise, and was approaching the top of the platforms that are used as sleeping quarters for the weir crew. The Henshaw Creek water level did not recede to a safe and operational level until July 29. The decision was made to forgo weir installation at that time, as the majority of the run had already passed through the weir site. The Henshaw Creek weir 2000 - 2013 average daily run timing suggest that 90% of the escapement had passed through the weir site by July 24 and July 29 for Chinook and chum salmon, respectively (Figures 4 & 5). No damage was sustained during the flood. The Henshaw Creek camp was dismantled, and the weir panels and materials were stored away for the 2015 season.

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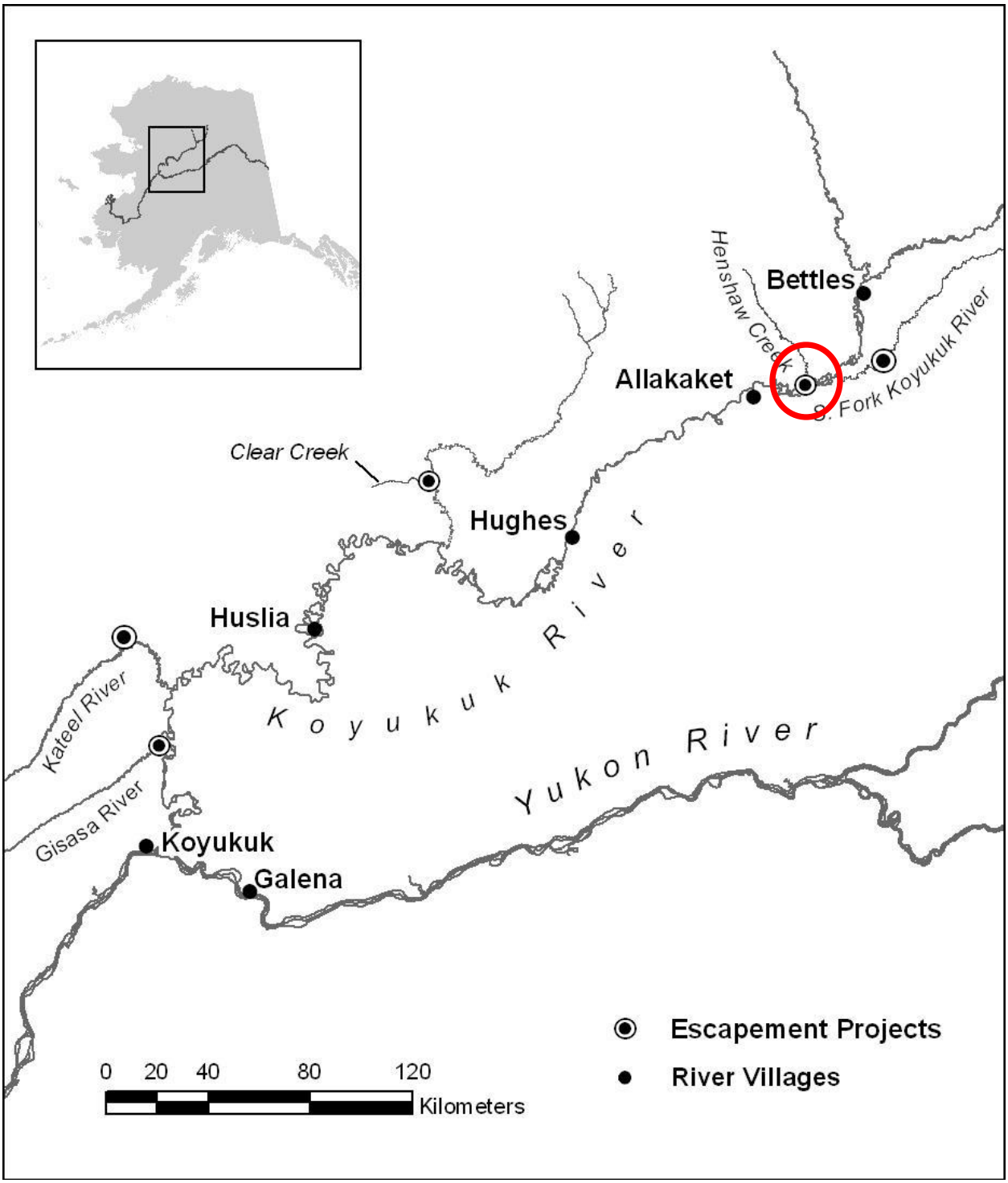

Figure 1. — Location of the Henshaw Creek weir and other active and historical tributary escapement project sites in the Koyukuk River drainage, Alaska.

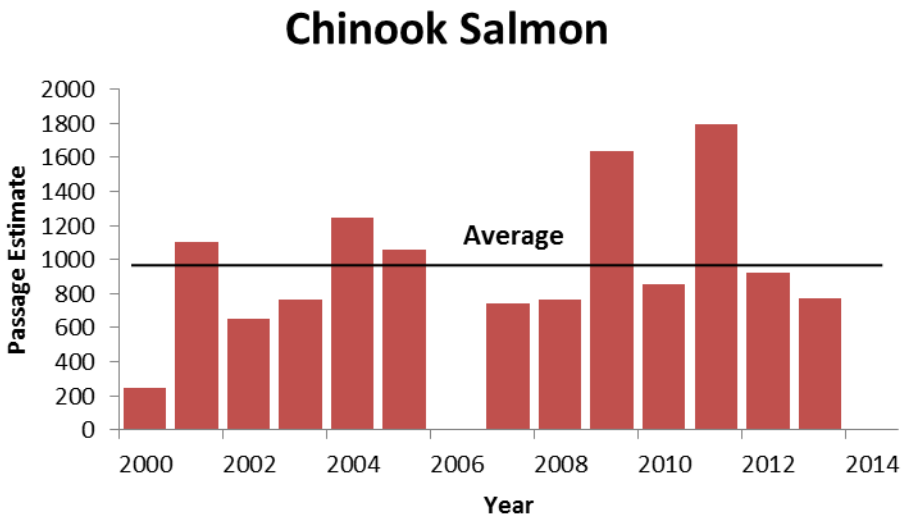

Figure 2. — Annual estimates of Chinook salmon escapement at Henshaw Creek weir, Alaska, 2000 through 2014. The weir was not operational in 2006 and 2014 due to high water events. Therefore, no data was collected in 2006 and 2014. The horizontal line represents the average escapement estimate (N = 966) from 2000 through 2013, omitting 2006.

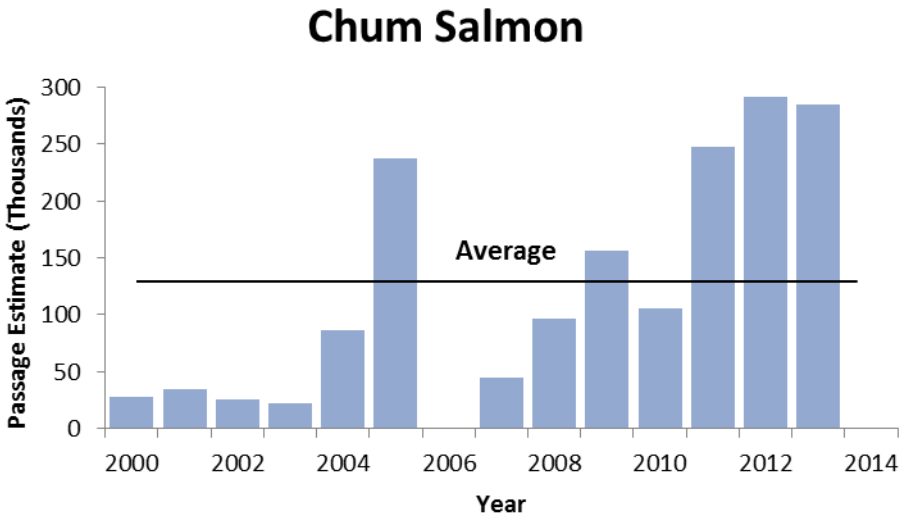

Figure 3. — Annual estimates of Chum salmon escapement at Henshaw Creek weir, Alaska, 2000 through 2014. The weir was not operational in 2006 and 2014 due to high water events. Therefore, no data was collected in 2006 and 2014. The horizontal line represents the average escapement estimate (N = 127,914) from 2000 through 2013, omitting 2006.

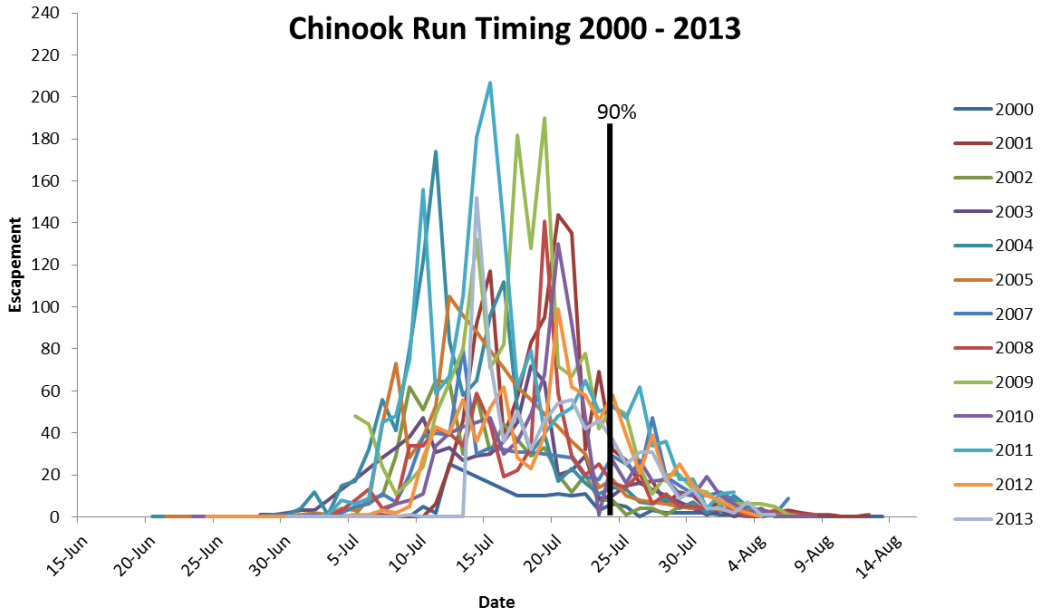

Figure 4. — Historical daily run timing for Chinook salmon from 2000 – 2013 (omitting 2006). The solid black line represents the date when 90% of the Chinook salmon have passed through the weir.

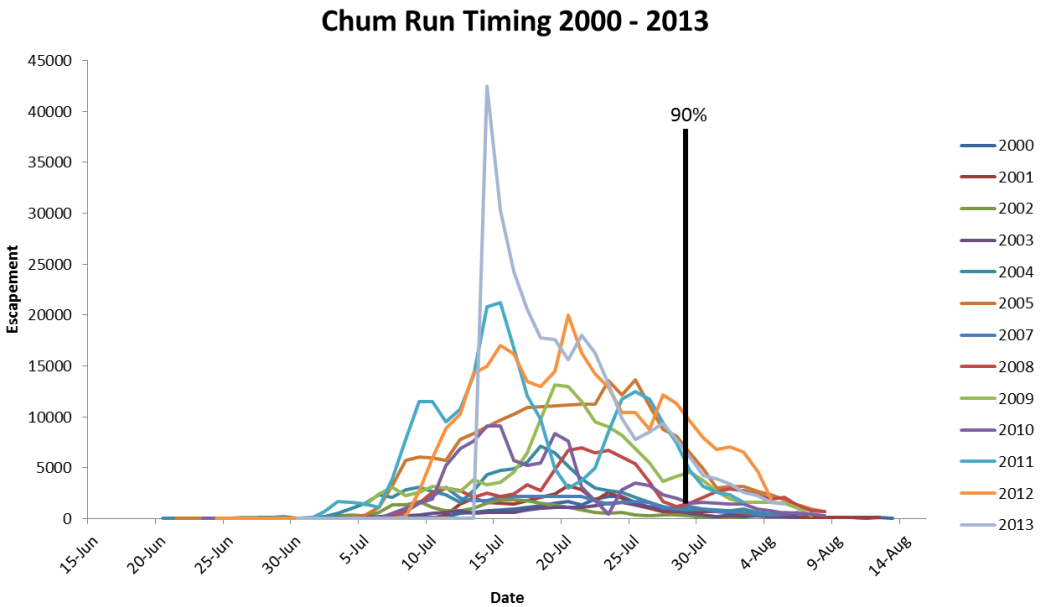

Figure 5. — Historical daily run timing for Chum salmon from 2000 – 2013 (omitting 2006). The solid black line represents the date when 90% of the Chinook salmon have passed through the weir

Appendix 1. — Historical estimates of Chinook salmon and summer chum salmon escapement at the Henshaw Creek weir, Alaska, 1960 – 2014 (Aerial index data from Baron 1984; Alaska Department of Fish and Game unpublished data).

Year	Aerial index estimates			Tower estimates		Weir estimates	
	Chinook salmon	Chum salmon	Survey rating	Chinook salmon	Chum salmon	Chinook salmon	Chum salmon
1960	Present		Poor				
1969	6	300	Not Rated				
1975	118	1,219	Not Rated				
1976	94	624	Fair				
1982	48	12	Fair				
1983	553	3,288	Good-Fair				
1984	253	532	Poor				
1985	393	3,724	Good				
1986	561	2,475	Fair				
1987	20	35	Not Rated				
1988	180	1,106	Good-Poor				
1990	369	1,237	Good-Fair				
1991	455	2,148	Good				
1992	Present	Present	Poor				
1993	330	1,173	Good				
1994	526	2,165	Fair				
1995	271	15,397	Good				
1996	69	12,890	Fair				
1997	593	1,800	Fair				
1998	97	151	Fair				
1999	119	2,703	Poor	0	1,510		
2000						244	27,271
2001						1,103	35,031
2002						649	25,249
2003						763	22,556
2004						1,248	86,474
2005						1,059	237,481
2006						0*	4*
2007						740	44,425
2008						766	96,731
2009						1,637	156,933
2010						857	105,398
2011						1,796	248,247
2012						922	292,082
2013						772	285,008
2014						0*	0*

*Escapement estimates in 2006 and 2014 were not completed due to flooding.

Appendix 2. — A comparison of Henshaw Creek weir and camp during high water and during average depth, 2013 and 2014.

2014

2013

2014

2013

2014

2013

2014

2013