

# Salcha River Chinook and Chum Salmon Counting Tower, 2012

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## 1. Introduction:

### *Summary:*

The Salcha River operation monitors and characterizes the largest escapement of Chinook salmon in the Yukon River drainage, as well as a significant chum salmon run. The 2012 escapement estimates are 7,165 Chinook and 46,410 chum salmon. The chum estimate does not include chum salmon passing after the tower operations ended August 21. The Alaska Department of Fish and Game (ADF&G) (via the Alaska Board of Fisheries) has a Chinook salmon biological escapement goal (BEG), the number of adults reaching the spawning grounds believed to be sustainable to produce harvestable returns, for the Salcha, which is a range of 3,300 – 6,500. No goal has been established for chum salmon due to lack of appropriate data. Salcha River tower counts have been successful 18 of the 19 years in estimating and characterizing Chinook salmon escapement. Escapement estimates by tower counts date to 1993, mark-recapture (M-R) methods from 1987–1992, and aerial surveys have been conducted, in most years, since 1973 by ADF&G. Bering Sea Fishermen's Association has successfully operated the Salcha River tower since 1999.

### *Objectives:*

- Estimate the total escapement of Chinook salmon in the Salcha River using tower counting techniques such that the estimates are within 15% of the actual value 95% of the time;
- Estimate age, sex, and length compositions of the escapement of Chinook salmon in the Salcha River such that all estimated proportions are within 5 percentage points of the actual proportions 95% of the time;
- Estimate the escapement of Chum salmon through the Salcha River using tower counting techniques through August 15.

**2. Study Area:** Salcha River, 45 miles east of Fairbanks, Alaska (Figure 1).

**3. Licenses and Permits:** Permits were let by ADF&G and to BSFA for carcass survey collections, and Department of Natural Resource divisions of Lands and Parks for the tower site permits.

## 4. Methods:

### *Operation:*

The Salcha River counting tower operation is located 1km upstream of the Richardson Highway Bridge, within the Salcha River State Park (Figure 1). Technicians count Chinook and chum salmon as they swim upstream over a white flash panel that spans the river (from one bank directly across (diagonal to stream flow) to the other bank). The flash panel is made up of nine 21 foot long and 10 feet wide fabric panels held on the stream bottom by 21 foot (3 inch diameter) steel pipes that are linked together end to end. Technicians count 20 minutes per hour,

24 hours a day from July through mid-August (24 counts per day every day). Total hourly escapement is calculated by multiplying each hourly 20-minute count by three, resulting in an expanded count estimate. The sum of each day's expanded hourly counts yields an estimated daily escapement total for Chinook and chum salmon. Results are phoned to ADF&G daily. Aerial surveys are at times done when tower counting operations are compromised (e.g. flooding).

Carcass surveys are spread out over time (15-30 days) and space (each covers all 65 miles (75km) of stream of the historic index area) so as to account for the potential collection bias associated with different mortality periods (related to multiple issues such as fish, condition, size (large/small), sex (male/female), spawning date, and environmental (floods, water temperature)). Carcass survey data yields the age, sex and length (ASL) information used to characterize the Chinook and chum salmon escapement compositions. A minimum of three carcass surveys are done each year, weather permitting. Escapement and ASL analysis and summary estimates are then generated and reported by ADF&G.

*Data Analysis:* All data analysis is performed by ADF&G.

## **5. Results:**

In 2012, the Salcha tower became operational July 17 and ran until August 21. A later than expected ending date was requested by ADF&G managers and approved by the U.S. Fish and Wildlife Service (FWS) due to weather conditions (Table 1). The escapement estimates are 7,165 Chinook and 46,410 chum salmon (estimates by ADF&G, chum escapement is roughly 75% of assumed total assuming historic run timing). High water precluded operations prior to July 17 (we likely missed a few hundred Chinook and chum), and slightly for 3 days, July 21-23, during operation (counters were placed on both sides of the river during a portion of these 3 days for better coverage). The 2012 Chinook salmon escapement is 22% below the last 25-year average of 9,219 (Table 2).

Carcass survey teams collected ASL from 504 Chinook and 160 chum. Carcass collection survey dates were August 3, 6-9, 14-15, and 17-20. The Chinook salmon ASL summary data developed by ADF&G is presented in Table 3 and Chum salmon ASL summary data in Table 4. The 2012 Chinook salmon female portion (60%) of the Salcha Chinook salmon escapement was higher than the 25 year average (42%) and makes sense due to the higher than average age-6 portion (59%) in 2012 escapement, whereas the 25 year average is 46%. Female Chinook commonly return at an older age than male Chinook, rarely before age-5, and predominately ages 5 and 6. Female Chinook salmon lengths ranged from 650 to 930 mm, and male Chinook salmon ranged from 366 to 990 mm (Table 3). The chum salmon data table was generated by BSFA staff biologist and author of this report, at the request of funding agency (FWS) and is not intended to supersede any future analysis by ADF&G, nor is it an objective of this project. No Salcha River chum salmon escapement historic data is compared in this report; that would be the preview of ADF&G as requested by ADF&G.

## **6. Discussion:**

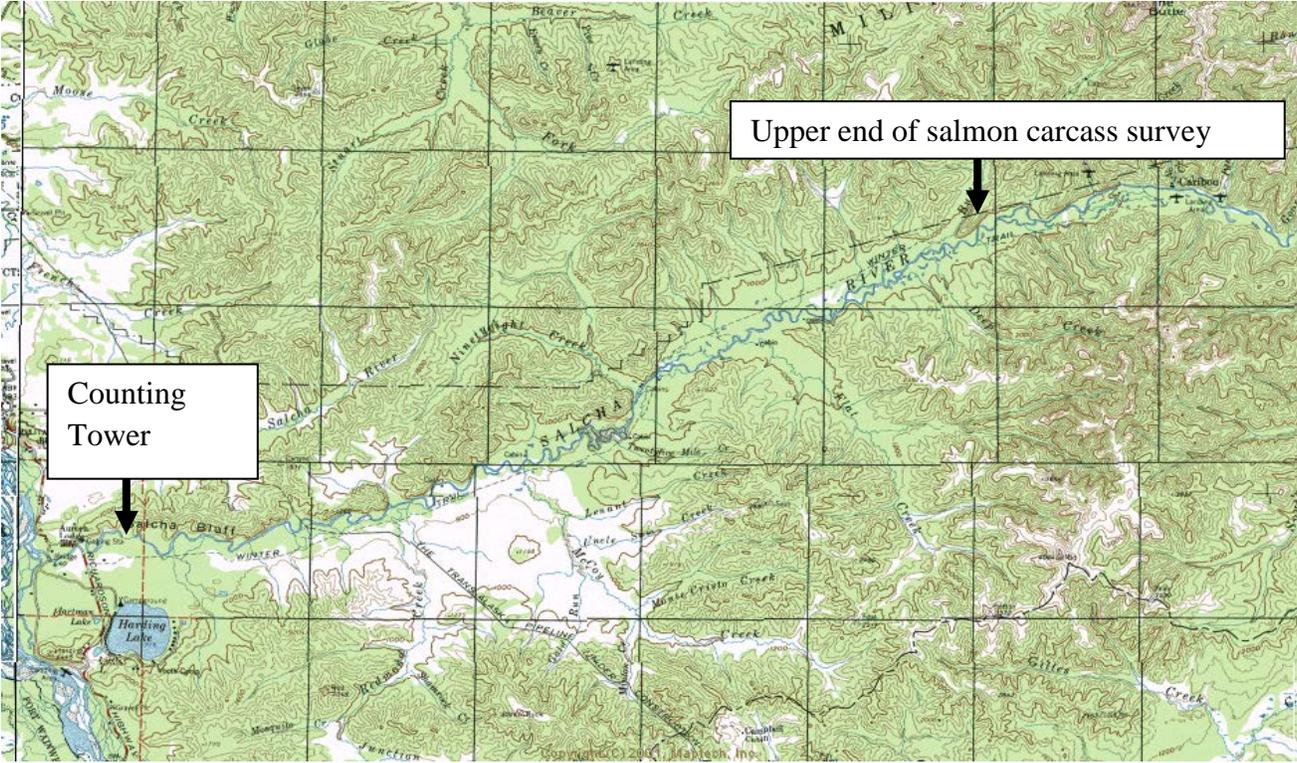
All in all, 2012 Salcha tower operations ran relatively smoothly and were successful in meeting objectives. Although high water stalled early operation deployment, fortunately the Chinook run

was believed to be days later than historic averages thus allowing the tower to count most all the Chinook escapement with only minor flooding once the operations began. We were able to work with in-season requests from managers to extend the project and ASL collections for both Chinook and chum salmon and were successful in attaining sufficient sample sizes to describe escapements.

The Salcha River Chinook and chum salmon escapements seem to be holding relatively steady during recent years of Yukon River drainage-wide Chinook declines and chum increases. One might speculate that perhaps due to its more remote nature the Salcha River spawning and rearing habitat remains in better condition than say the Chena which has lower segments listed as impaired waters by DEC. There are however some spawning and rearing habitat problems arising within the Salcha watershed, but are beyond the scope of this project. These issues have been brought to ADF&G and DNR staff's attention. There does seem to be a decline in juvenile (fry) Chinook salmon numbers.

It should be noted that while harvest levels do affect escapement numbers and composition, no harvest data is accounted for relative to escapement estimates presented in this report, thus are not comparable to production of Salcha River salmon stocks. Those harvests are accounted for when the BEG is estimated by ADFG. As an example harvest effects on escapement; when Yukon salmon fishing net restrictions (reduced size of mesh) were in effect as in 2012, it is likely that action resulted in a larger portion of larger fish and females reaching the spawning grounds and being recorded in escapement surveys, although that larger number may be in part due to a stronger year class survival. The Salcha River Chinook that spawned in 2006 yielded large returns in both the 2011 and 2012 escapements. The last large number of Chinook females to spawn and reach maturity (return) was in 2006.

Figure 1. Location of the Salcha River counting tower and carcass survey areas in 2012 .



**Table 1.** Daily passage (escapement) and cumulative count for Chinook and chum salmon past the Salcha River counting tower, 2012.

<b>Date</b>	<b>Chinook Daily</b>	<b>Chinook Cumulative</b>	<b>Chum Daily</b>	<b>Chum Cumulative</b>
<b>17-Jul</b>	115	115	101	101
<b>18-Jul</b>	249	364	102	203
<b>19-Jul</b>	453	817	165	368
<b>20-Jul</b>	411	1,228	132	500
<b>21-Jul</b>	171	1,399	45	545
<b>22-Jul</b>	198	1,597	95	639
<b>23-Jul</b>	333	1,930	195	834
<b>24-Jul</b>	726	2,656	297	1,131
<b>25-Jul</b>	597	3,253	270	1,401
<b>26-Jul</b>	738	3,991	294	1,695
<b>27-Jul</b>	984	4,975	540	2,235
<b>28-Jul</b>	651	5,626	960	3,195
<b>29-Jul</b>	453	6,079	1,143	4,338
<b>30-Jul</b>	216	6,295	1,518	5,856
<b>31-Jul</b>	219	6,514	1,359	7,215
<b>1-Aug</b>	123	6,637	1,839	9,054
<b>2-Aug</b>	102	6,739	1,506	10,560
<b>3-Aug</b>	159	6,898	1,560	12,120
<b>4-Aug</b>	60	6,958	1,761	13,881
<b>5-Aug</b>	45	7,003	2,019	15,900
<b>6-Aug</b>	42	7,045	2,445	18,345
<b>7-Aug</b>	60	7,105	2,616	20,961
<b>8-Aug</b>	42	7,147	2,817	23,778
<b>9-Aug</b>	12	7,159	2,916	26,694
<b>10-Aug</b>	9	7,168	2,487	29,181
<b>11-Aug</b>	-3	7,165	2,364	31,545
<b>12-Aug</b>	0	7,165	2,130	33,675
<b>13-Aug</b>	0	7,165	2,280	35,955
<b>14-Aug</b>	0	7,165	1,677	37,632
<b>15-Aug</b>	0	7,165	1,434	39,066
<b>16-Aug</b>	0	7,165	1,176	40,242
<b>17-Aug</b>	0	7,165	915	41,157
<b>18-Aug</b>	0	7,165	1,233	42,390
<b>19-Aug</b>	0	7,165	1,179	43,569
<b>20-Aug</b>	0	7,165	1,179	44,748
<b>21-Aug</b>	0	7,165	1,662	46,410

**Table 2.** Historic Chinook salmon Salcha River escapement, number of females, proportion of females and proportion of escapement age estimates.

<b>Year</b>	<b>Chinook Total Escapement</b>	<b>Female Escapement</b>	<b>Females Percent</b>	<b>Age 6 Percent</b>
1987	4,771	2,481	52	74
1988	4,322	1,959	45	36
1989	3,294	1,441	44	58
1990	10,728	3,883	36	49
1991	5,608	2,283	41	48
1992	7,862	2,831	36	28
1993	10,007	2,643	26	31
1994	18,399	8,574	47	53
1995	13,643	7,609	56	63
1996	7,570	1,982	26	23
1997	18,514	8,917	48	69
1998	5,027	1,495	30	18
1999	9,198	4,727	51	66
2000	4,595	1,819	40	24
2001	13,328	4,933	37	52
2002	9,000	3,093	34	39
2003	15,500	6,536	42	44
2004	15,761	9,851	63	82
2005	5,988	3,279	55	46
2006	10,679	4,690	44	43
2007	6,425	2,295	36	50
2008	5,447	2,124	39	36
2009	12,774	4,982	39	47
2010	6,900	2,070	30	14
2011	7,200	3,024	42	48
2012	7,165	4,299	60	59
<b>Average</b>	<b>9,219</b>	<b>3,993</b>	<b>42</b>	<b>46</b>

**Table 3.** Salcha River carcass survey, Chinook salmon escapement age and sex composition and mean length (mm), 2012.

Sample Dates	Sample Size	Sex	Brood Year (Age)																Total					
			2009		2008		2007		2006		2005		2004											
			(1.1)	(1.2)	(2.1)	(1.3)	(2.2)	(1.4)	(2.3)	(1.5)	(2.4)	(1.6)	(2.5)	N	%									
8/6-9 strata 1	265	Male	1	0.4	21	7.9	0	0.0	66	24.9	0	0.0	42	15.8	0	0.0	0	0.0	0	0.0	0	0.0	130	49.
		Female	0	0.0	0	0.0	0	0.0	25	9.4	0	0.0	105	39.6	0	0.0	5	1.9	0	0.0	0	0.0	135	50.
		Subtotal	1	0.4	21	7.9	0	0.0	91	34.3	0	0.0	147	55.5	0	0.0	5	1.9	0	0.0	0	0.0	265	100.
		Male Mean Length	366		568		-		706		-		810		-		-		-		-			
		SE	-		7		-		6		-		8		-		-		-		-			
		Range	-		500-628		-		619-830		-		703-907		-		-		-		-			
		n	1		21		-		66		-		41		-		-		-		-			
		Female Mean Length	-		-		-		762		-		832		-		897		-		-			
		SE	-		-		-		8		-		4		-		18		-		-			
		Range	-		-		-		650-821		-		740-940		-		833-930		-		-			
	n	-		-		-		25		-		105		-		5		-		-				
8/14-15, 17 strata 2	155	Male	0	0.0	4	2.6	0	0.0	20	12.9	0	0.0	15	9.7	0	0.0	0	0.0	0	0.0	0	0.0	39	25.
		Female	0	0.0	0	0.0	0	0.0	27	17.4	0	0.0	87	56.1	0	0.0	2	1.3	0	0.0	0	0.0	116	74.
		Subtotal	0	0.0	4	2.6	0	0.0	47	30.3	0	0.0	102	65.8	0	0.0	2	1.3	0	0.0	0	0.0	155	100.
		Male Mean Length	-		574		-		725		-		857		-		-		-		-			
		SE	-		24		-		15		-		18		-		-		-		-			
		Range	-		511-624		-		597-849		-		715-990		-		-		-		-			
		n	-		4		-		20		-		15		-		-		-		-			
		Female Mean Length	-		-		-		770		-		831		-		873		-		-			
		SE	-		-		-		6		-		5		-		4		-		-			
		Range	-		-		-		709-841		-		724-930		-		869-876		-		-			
	n	-		-		-		27		-		86		-		2		-		-				
Total	420	Male	1	0.2	25	6.0	0	0.0	86	20.5	0	0.0	57	13.6	0	0.0	0	0.0	0	0.0	0	0.0	169	40.
		Female	0	0.0	0	0.0	0	0.0	52	12.4	0	0.0	192	45.7	0	0.0	7	1.7	0	0.0	0	0.0	251	59.
		Total	1	0.2	25	6.0	0	0.0	138	32.9	0	0.0	249	59.3	0	0.0	7	1.7	0	0.0	0	0.0	420	100.
		Male Mean Length	366		569		-		711		-		822		-		-		-		-			
		SE	-		7		-		6		-		8		-		-		-		-			
		Range	-		500-628		-		597-849		-		703-990		-		-		-		-			
		n	1		25		-		86		-		56		-		-		-		-			
		Female Mean Length	-		-		-		766		-		832		-		890		-		-			
		SE	-		-		-		5		-		3		-		13		-		-			
		Range	-		-		-		650-841		-		724-940		-		833-930		-		-			
	n	-		-		-		52		-		191		-		7		-		-				

**Table 4.** Chum salmon carcass survey collection lengths (mean and range lengths at age, and age and sex percentages from Salcha River escapement project, collected in 2012.

Brood year Age	2009		2008		2007		2006		Total		
	3		4		5		6		N	%	
Males		2	1.3	31	19.4	20	12.5	3	1.9	56	35
	Mean	510		547		587		634			
	Range	495-525		505-605		540-645		595-670			
Females		0	0.0	71	44.4	28	17.5	5	3.1	104	65
	Mean	0		528		562		588			
	Range	0		470-590		520-620		570-605			
<b>Total</b>	<b>2</b>	<b>1.3</b>	<b>102</b>	<b>63.8</b>	<b>48</b>	<b>30.0</b>	<b>8</b>	<b>5.0</b>	<b>160</b>	<b>100</b>	