

**SNAKE RIVER SALMON COUNTING TOWER
PROJECT, 2001**

By

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and

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ABSTRACT

The Snake River counting tower is located approximately 8 kilometers from Nome or about 15 minutes by boat upstream from the boat harbor. The Snake River counting tower project is a cooperative project funded and operated by the Kawerak Corporation. A counting tower has been operated for seven consecutive years on the Snake River. The objective of the project is to obtain daily and seasonal information concerning the timing and magnitude of the chum, pink, chinook and coho salmon escapement to the Snake River. Counting began on 8 July and ended on 5 September in 2001. During scheduled one hour counts, thirty minutes of each hour's salmon passage was counted. The counts for each half-hour shift were doubled to produce the expanded hourly counts for each species. The expanded counts for 2001 were: 2,182 chum salmon, 1,295 pink salmon, 33 chinook salmon, and 1,335 coho salmon.

KEY WORDS: chum salmon, Dolly Varden, chinook salmon, pink salmon, coho salmon, counting tower, Snake River, *Oncorhynchus*

INTRODUCTION

The Snake River counting tower is a cooperative project funded and operated by the Kawerak Corporation. The Alaska Department of Fish & Game (ADF&G) analyzed the tower count data and produced this report as part of its contribution to this cooperative effort.

This was the seventh consecutive year a counting tower has been operated on the Snake River (Rob 1995, 1997, 1998, 1999 and Kohler 2000, 2001). The project is operated to obtain timely and accurate escapement information required for the active management of the salmon stocks throughout the season. The Snake River drains into Norton Sound at the Port of Nome (Figure 1).

OBJECTIVES

1. To obtain daily and seasonal information concerning the timing and magnitude of the chum, pink, chinook and coho salmon escapement to the Snake River.
2. Obtain age-sex-length data from chum and coho salmon.

METHODS

The Snake River counting tower camp is located approximately 8 kilometers from Nome where the Snake River turns north. The camp is approximately 15 minutes by boat from the Nome boat harbor.

A tent camp with two tent frames and an outhouse was established during late June. A 5 m high scaffolding tower was erected on the east bank of the river to serve as an observation platform. A 15 x 2.5 m vinyl canvas flash panel was placed on the river bottom directly in front of the tower. A weir built from the mid-stream end of the flash panel to the opposite bank directed the fish over the flash panel. An array of 120-volt lights mounted on the tower illuminated the flash panel during periods of low light and darkness.

The counting schedule began on 8 July and ended on 5 September. The two-person crew counted 18 half-hour counts each day from 12 noon to 0530 hours the following day. One 24-hour counting day a week was scheduled and one day off was scheduled weekly. Daily counts were radioed to the Nome office of the Kawerak Corporation, which relayed them to the Nome office of ADF&G every morning. These numbers were expanded to account for the time periods not counted.

The expanded counts for this report were calculated using the following methods. The 18-hour counts for the days off were estimated by adding the counts of each hour of the day before to the counts of each hour of the day following, and dividing the result by two. Next, an expansion factor was calculated to compensate for the 6 hours not normally counted. This factor was derived from the weekly 24-hour count by dividing the total count from 0600 hours to 1200 hours during the 24-hour count, by the total normal 18-hour count during the 24-hour count. Then each 18-hour count for the remaining days was expanded to 24-hour counts by applying the expansion factor to the three days before and after each 24-hour count by multiplying each day's 18-hour total by the 24 hour expansion factor, and adding that number to the 18-hour count for each day. This expansion was done for all species counted.

The expanded counts for the days missed were linearly interpolated. For a day with the normal 24-hour count missed, the count for the missing day was calculated by adding the counts of each hour of the day before the missed period, to the counts of each hour of the day following the missed period, and dividing the result by two. If two or more days were missed, the count for the missing days was calculated by adding the counts of each hour of the day before the missed period, to the counts of each hour of the day following the missed period, and dividing the result by two.¹

Expanded counts for the calendar days were then calculated to give daily totals that can be compared to those of other years (Rob 1999).

RESULTS

The expanded daily and cumulative totals for each salmon species are shown in Table 1. Figure 2 shows the cumulative migration of all salmon species. The expanded counts were: 2,182 chum salmon, 1,295 pink salmon, 33 chinook salmon, and 1,335 coho salmon (Tables 2-5). The reported total hourly counts were: 1,886 chum salmon, 1,048 pink salmon, 26 chinook salmon, and 1,220 coho salmon (Tables 6-9). Dolly Varden were not counted.

Chum salmon were observed on 8 July, the first day of counting. Chinook salmon were first observed on 10 July. Pink salmon were first observed on 13 July. Coho salmon were first observed on 14 July. The daily peak count of 273 chum salmon occurred on 16 July; the daily peak count of 165 pink salmon occurred on 3 August; the daily peak count of 166 coho salmon occurred on 30 August (Table 1).

During the period from 8 July through 1 August 86% of the chum salmon returned (Table 2 and Figures 3 and 4). During the period from 22 July through 11 August 82% of pink

¹ From Rob 1999

salmon returned (Table 3 and Figures 5 and 6). Coho salmon were counted passing the tower from 14 July to 2 September (Table 5 and Figures 7 and 8).

All species counted exhibited a diurnal pattern of migration. The greatest chum salmon passage occurred during the period from 1700 to 0500 hours when 93% passed the tower (Table 2 and Figure 9). The greatest pink salmon passage occurred during the period from 2300 and 0500 hours when 82% passed the tower (Table 3 and Figure 10). The greatest coho salmon passage occurred between 0100 and 0600 hours when 96% passed the tower (Table 5 and Figure 11).

An aerial survey of the Snake River flown on 31 July produced a count of 737 chum salmon of which 722 were above the counting tower. This represents 40% of the expanded chum salmon tower count of 1,793 on that date. An aerial survey of the Snake River flown on 27 August produced a count of 466 coho salmon of which 389 were above the counting tower. This represents 43% of the expanded coho salmon tower count of 906 on that date.

A total of 273 usable chum salmon samples were collected during the period from 6 August to 21 August 2001. The age, sex and mean length composition of the samples is presented in Appendix Table 3. Analysis of the chum salmon scale samples showed that 1.1% of the fish sampled were age-0.2, 41.8% were age-0.3, 56.4% were age-0.4, and 0.7% were age-0.5. A total of 110 usable coho salmon samples were collected during the period from 7 September to 11 September, 2001. The age, sex and mean length composition of the samples is presented in Appendix Table 4. Analysis of the coho salmon scale samples showed that 3.6% of the fish sampled were age-1.1, 78.2% were age-2.1 and 10.0% were age-3.1.

DISCUSSION

This was the seventh consecutive year of operation for the Kawerak Incorporated, Snake River counting tower project. Counting began on 8 July. The first chum salmon were observed on the first day of counting. Counting ended on 5 September. Counts were missed from 13 August through 15 August and from 29 August through 1 September.

The chum salmon escapement in 2001 was near average in timing and the third lowest recorded since the project began in 1995 (Figures 12 and 15). The odd year pink salmon escapement in 2001 was earlier than previous odd-numbered years (Figure 13) and was below the average recorded since the project began (Figure 16). Even year pink salmon escapements are shown for comparison in Figure 17. There was no escapement of chinook salmon estimated in 1995, 5 chinook salmon were estimated in 1996, 12 chinook salmon were estimated in 1997, 0 chinook salmon in 1998, 10 chinook salmon in 1999, 28 chinook salmon in 2000, there were 33 estimated this year (Appendix 1). The observed coho salmon escapement in 2001 was later than in previous years of operation (Figure 14) and the escapement magnitude was below average (Figure 18).

This report summarizes the data provided by Kawerak Incorporated. It should be noted that there may be some problems with species identification. During seining operations conducted between 6 August and 11 September 322 chum salmon, 123 coho salmon, and 21 sockeye salmon were captured. No sockeye salmon were reported from the counting tower. The percentage of salmon by species that were estimated each year from 1995 to 2001 is shown in Appendix 2.

The value of a counting tower on this watershed is evident. The salmon escapements documented in the past by the Snake River tower provided fishery managers a relatively consistent tool to assess returns to this Nome area watershed for four different species.

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Table 1. Expanded daily and cumulative salmon migration past the Snake River counting tower, Norton Sound, 2001.

Date	Cumulative		Cumulative		Cumulative		Cumulative	
	Daily Chum	Chum	Daily Pink	Pink	Daily King	King	Daily Coho	Coho
8-Jul	2	2	0	0	0	0	0	0
9-Jul	44	46	0	0	0	0	0	0
10-Jul	2	48	0	0	2	2	0	0
11-Jul	22	70	0	0	0	2	0	0
12-Jul	75	145	0	0	0	2	0	0
13-Jul	67	212	1	1	0	2	0	0
14-Jul	141	353	4	5	0	2	2	2
15-Jul	212	565	4	9	2	4	0	2
16-Jul	273	838	0	9	0	4	0	2
17-Jul	91	929	4	13	0	4	0	2
18-Jul	57	986	0	13	0	4	0	2
19-Jul	78	1,064	4	17	0	4	0	2
20-Jul	111	1,175	1	18	0	4	0	2
21-Jul	102	1,277	2	20	0	4	0	2
22-Jul	98	1,375	4	24	0	4	0	2
23-Jul	96	1,471	26	50	-2	2	0	2
24-Jul	2	1,473	2	52	0	2	2	4
25-Jul	73	1,546	10	62	2	4	0	4
26-Jul	24	1,570	34	96	0	4	0	4
27-Jul	39	1,609	42	138	0	4	0	4
28-Jul	40	1,649	47	185	0	4	0	4
29-Jul	48	1,697	62	247	0	4	0	4
30-Jul	86	1,783	105	352	0	4	8	12
31-Jul	10	1,793	60	412	0	4	-2	10
1-Aug	92	1,885	120	532	2	6	6	16
2-Aug	2	1,887	2	534	0	6	0	16
3-Aug	45	1,932	165	699	0	6	10	26
4-Aug	28	1,960	131	830	0	6	6	32
5-Aug	8	1,968	38	868	0	6	2	34
6-Aug	43	2,011	76	944	0	6	23	57
7-Aug	83	2,094	40	984	0	6	4	61
8-Aug	37	2,131	24	1,008	2	8	80	141
9-Aug	20	2,151	38	1,046	0	8	40	181
10-Aug	10	2,161	20	1,066	1	9	27	208
11-Aug	7	2,168	16	1,082	1	10	28	236
12-Aug	0	2,168	4	1,086	2	12	11	247
13-Aug	0	2,168	4	1,090	0	12	10	257
14-Aug	-1	2,167	10	1,100	0	12	11	268
15-Aug	-1	2,166	15	1,115	0	12	11	279
16-Aug	-4	2,162	-4	1,111	0	12	14	293
17-Aug	1	2,163	20	1,131	2	14	19	312
18-Aug	1	2,164	37	1,168	3	17	39	351
19-Aug	4	2,168	30	1,198	4	21	43	394
20-Aug	12	2,180	8	1,206	2	23	50	444
21-Aug	0	2,180	13	1,219	0	23	68	512
22-Aug	-2	2,178	-2	1,217	2	25	51	563
23-Aug	0	2,178	8	1,225	2	27	66	629
24-Aug	0	2,178	8	1,233	1	28	62	691
25-Aug	0	2,178	-2	1,231	1	29	67	758
26-Aug	2	2,180	-2	1,229	0	29	52	810
27-Aug	2	2,182	6	1,235	2	31	96	906
28-Aug	0	2,182	32	1,267	0	31	100	1,006
29-Aug	0	2,182	7	1,274	0	31	59	1,065
30-Aug	0	2,182	19	1,293	2	33	166	1,231
31-Aug	0	2,182	1	1,294	0	33	78	1,309
1-Sep	0	2,182	1	1,295	0	33	22	1,331
2-Sep	0	2,182	0	1,295	0	33	4	1,335
3-Sep	0	2,182	0	1,295	0	33	0	1,335
4-Sep	0	2,182	0	1,295	0	33	0	1,335
5-Sep	0	2,182	0	1,295	0	33	0	1,335
Total	2,182		1,295		33		1,335	

Table 2. Expanded daily hourly chum salmon migration past the Snake River counting tower, Norton Sound, 2001.

Outlined areas indicate hours not counted. Numbers in outlined areas indicate estimated passage.

Date	0000	0100	0200	0300	0400	0500	0600-1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total	
8-Jul								0	0	0	0	0	0	0	0	0	0	0	0	2	0.1%	
9-Jul	40	0	0	0	4	0		0	0	0	0	0	0	0	0	0	0	0	0	44	2.0%	
10-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	2	0.1%	
11-Jul	0	0	0	24	0	0		0	0	0	0	0	0	0	-2	0	0	0	0	22	1.0%	
12-Jul	38	0	36	0	0	0		0	0	0	2	0	0	0	0	-1	0	0	0	75	3.4%	
13-Jul	20	0	32	0	11	0		0	0	0	4	0	0	0	0	0	0	0	0	67	3.1%	
14-Jul	2	0	28	0	22	0		-11	0	0	8	0	0	30	0	16	34	12	0	141	6.5%	
15-Jul	0	46	28	92	0	0		-16	2	0	0	0	0	4	4	26	10	0	16	212	9.7%	
16-Jul	8	16	24	98	-2	0		-21	-2	4	0	6	38	6	14	10	42	0	8	273	12.5%	
17-Jul	8	20	-12	-16	28	-6		-7	-1	0	2	2	0	0	-2	0	25	0	46	91	4.2%	
18-Jul	0	0	22	-10	4	0		-4	0	0	1	1	0	0	0	25	0	4	14	57	2.6%	
19-Jul	0	4	8	6	10	28		-6	0	0	0	0	2	0	0	8	18	0	0	78	3.6%	
20-Jul	6	0	50	6	4	0		3	0	0	0	0	0	1	0	0	30	11	0	111	5.1%	
21-Jul	9	2	25	14	-5	-1		2	0	0	0	0	0	0	0	52	4	0	0	102	4.7%	
22-Jul	12	4	0	22	-14	-2		2	0	0	0	0	0	0	0	0	0	0	74	98	4.5%	
23-Jul	16	18	8	14	6	10		0	0	0	0	0	0	0	0	0	14	10	0	96	4.4%	
24-Jul	0	0	2	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	2	0.1%	
25-Jul	2	3	0	28	14	-4		0	0	0	0	0	0	0	0	0	0	12	18	73	3.3%	
26-Jul	4	6	6	8	0	0		0	0	0	0	0	0	0	0	0	0	0	0	24	1.1%	
27-Jul	16	8	10	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	39	1.8%	
28-Jul	9	11	8	1	0	1		0	0	0	0	0	0	0	0	0	0	0	10	40	1.8%	
29-Jul	2	14	6	2	0	2		0	0	0	0	0	0	0	22	0	0	0	0	48	2.2%	
30-Jul	0	72	0	0	0	0		0	0	0	0	0	0	0	12	0	0	0	2	86	3.9%	
31-Jul	0	0	0	0	0	-2		0	0	0	0	0	0	0	0	0	0	0	12	10	0.5%	
1-Aug	32	8	20	18	8	4		0	0	0	0	0	0	0	0	0	0	2	0	92	4.2%	
2-Aug	0	0	0	2	0	0		0	0	0	0	0	0	0	0	0	0	0	0	2	0.1%	
3-Aug	0	4	16	20	2	2		0	0	0	0	0	0	0	0	0	1	0	0	45	2.1%	
4-Aug	0	2	9	13	1	1		0	0	0	0	0	0	0	0	2	0	0	0	28	1.3%	
5-Aug	0	0	2	6	0	0		0	0	0	0	0	0	0	0	0	0	0	0	8	0.4%	
6-Aug	0	0	10	16	0	0		17	0	0	0	0	0	0	0	0	0	0	0	43	2.0%	
7-Aug	6	2	22	0	12	8		33	0	0	0	0	0	0	0	0	0	0	0	83	3.8%	
8-Aug	0	2	-4	6	8	10		15	0	0	0	0	0	0	-2	0	0	0	2	37	1.7%	
9-Aug	4	0	-2	6	0	0		8	0	0	0	0	0	2	0	0	0	2	0	20	0.9%	
10-Aug	2	0	-1	3	0	0		4	0	0	0	0	0	1	0	0	0	1	0	10	0.5%	
11-Aug	2	0	-1	3	0	0		3	0	0	0	0	0	0	0	0	0	0	0	7	0.3%	
12-Aug	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
13-Aug	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
14-Aug	0	0	0	0	-1	0		0	0	0	0	0	0	0	0	0	0	0	0	-1	0.0%	
15-Aug	0	0	0	0	-1	0		0	0	0	0	0	0	0	0	0	0	0	0	-1	0.0%	
16-Aug	0	0	0	0	-2	0		-2	0	0	0	0	0	0	0	0	0	0	0	-4	-0.2%	
17-Aug	0	2	0	0	-1	0		0	0	0	0	0	0	0	0	0	0	0	0	1	0.0%	
18-Aug	0	2	0	0	-1	0		0	0	0	0	0	0	0	0	0	0	0	0	1	0.0%	
19-Aug	0	2	0	0	0	0		0	0	2	0	0	0	0	0	0	0	0	2	4	0.2%	
20-Aug	0	4	4	0	0	0		0	0	0	0	0	0	0	4	0	0	0	0	12	0.5%	
21-Aug	0	0	2	-2	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
22-Aug	0	0	0	0	2	0		0	0	-4	0	0	0	0	0	0	0	0	0	-2	-0.1%	
23-Aug	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
24-Aug	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
25-Aug	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
26-Aug	0	0	0	0	0	0		2	0	0	0	-2	0	0	0	0	0	0	2	2	0.1%	
27-Aug	0	0	0	2	0	0		0	0	0	0	0	0	0	0	0	0	0	0	2	0.1%	
28-Aug	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
29-Aug	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
30-Aug	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
31-Aug	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
1-Sep	0	0	0	0	0	0		0	0	0	5	0	0	0	0	0	0	0	0	0	0.0%	
2-Sep	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
3-Sep	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
4-Sep	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
5-Sep	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Total	238	252	358	382	109	51	0	22	-1	0	5	23	36	9	49	47	224	94	97	187	2,182	100.0%
	10.9%	11.5%	16.4%	17.5%	5.0%	2.3%	0.0%	1.0%	0.0%	0.0%	0.2%	1.1%	1.6%	0.4%	2.2%	2.2%	10.3%	4.3%	4.4%	8.6%	100.0%	

Table 3. Expanded daily hourly pink salmon migration past the Snake River counting tower, Norton Sound, 2001.

Outlined areas indicate hours not counted. Numbers in outlined areas indicate estimated passage.

Date	0000	0100	0200	0300	0400	0500	0600	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total	
8-Jul									0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
9-Jul	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
10-Jul	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
11-Jul	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
12-Jul	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
13-Jul	0	0	0	1	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1%
14-Jul	0	0	0	2	0	0			0	0	0	0	0	0	0	0	0	0	0	2	0	4	0.3%
15-Jul	0	0	0	4	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.3%
16-Jul	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
17-Jul	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	2	2	4	0.3%
18-Jul	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
19-Jul	0	0	0	0	2	0			0	0	0	0	0	2	0	0	0	0	0	0	0	4	0.3%
20-Jul	0	0	0	0	0	0			0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1%
21-Jul	1	0	0	0	0	1			0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.2%
22-Jul	2	0	0	0	0	2			0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.3%
23-Jul	2	0	10	4	8	2			0	0	0	0	0	0	0	0	0	0	0	0	0	26	2.0%
24-Jul	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	2	0	0	2	0.2%
25-Jul	4	2	0	4	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.8%
26-Jul	8	4	12	10	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	34	2.6%
27-Jul	14	14	10	2	0	0			0	0	0	0	0	0	0	0	0	2	0	0	0	42	3.2%
28-Jul	7	16	9	6	2	3			0	0	0	0	0	0	0	0	0	4	0	0	0	47	3.6%
29-Jul	0	18	8	10	4	6			0	0	0	0	0	0	0	0	14	0	0	0	62	4.8%	
30-Jul	2	50	0	-2	0	0			0	0	0	0	0	0	0	0	36	7	0	0	12	105	8.1%
31-Jul	4	18	2	0	10	2			0	0	0	0	0	0	0	0	0	0	0	0	24	60	4.6%
1-Aug	22	22	34	22	12	8			0	0	0	0	0	0	0	0	0	0	0	0	0	120	9.3%
2-Aug	0	0	-8	6	2	0			0	0	0	0	0	0	0	0	0	0	2	0	0	2	0.2%
3-Aug	0	32	24	60	24	4			0	0	0	0	0	0	0	0	1	11	4	5	165	12.7%	
4-Aug	-4	29	16	35	12	2			0	0	0	0	0	0	0	0	2	22	6	10	131	10.1%	
5-Aug	-8	26	8	12	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	38	2.9%
6-Aug	6	0	46	24	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	76	5.9%
7-Aug	22	-2	6	0	10	4			0	0	0	0	0	0	0	0	0	0	0	0	0	40	3.1%
8-Aug	-4	0	-4	8	6	4			0	4	0	0	0	0	0	0	0	0	2	8	0	24	1.9%
9-Aug	6	2	10	10	-2	2			0	-2	0	-2	0	2	0	0	4	0	4	4	0	38	2.9%
10-Aug	3	1	5	5	-1	1			0	-1	0	0	-1	0	1	0	0	2	1	2	2	20	1.5%
11-Aug	3	1	5	5	-1	1			0	0	0	0	0	0	0	0	0	2	0	0	0	16	1.2%
12-Aug	0	0	0	0	0	0			0	2	0	0	0	0	0	0	0	0	2	0	0	4	0.3%
13-Aug	2	0	2	0	0	2			0	0	0	-6	0	0	2	0	2	-1	1	0	0	4	0.3%
14-Aug	-2	1	1	-1	0	0			0	0	2	0	2	0	1	1	0	5	-1	1	0	10	0.8%
15-Aug	-2	1	1	-1	0	0			0	0	2	6	0	2	0	0	8	-2	0	0	0	15	1.2%
16-Aug	-6	2	0	-2	0	-2			-4	0	0	0	0	2	0	2	2	0	0	2	0	-4	-0.3%
17-Aug	0	0	0	0	2	1			0	0	0	0	0	2	0	1	1	1	5	7	0	20	1.5%
18-Aug	4	3	2	-1	2	1			0	0	0	0	0	2	0	0	0	2	10	12	0	37	2.9%
19-Aug	8	6	4	-2	4	4			0	0	0	0	0	0	0	0	4	0	2	0	0	30	2.3%
20-Aug	-6	0	2	0	6	0			-2	0	0	0	0	0	2	2	0	-2	2	4	0	8	0.6%
21-Aug	2	6	2	4	0	0			-3	0	0	0	0	0	0	0	0	2	0	0	0	13	1.0%
22-Aug	-2	2	2	2	0	0			0	0	0	0	0	0	0	0	0	0	2	-8	0	-2	-0.2%
23-Aug	4	0	0	4	0	0			-2	0	0	0	0	0	0	0	0	0	2	0	0	8	0.6%
24-Aug	2	0	1	3	2	0			-2	0	-1	0	0	-1	2	0	0	0	1	1	0	8	0.6%
25-Aug	2	0	1	3	2	0			-12	0	-2	0	0	-2	4	0	0	0	0	2	0	-2	-0.2%
26-Aug	0	0	2	2	4	0			-10	0	0	0	2	0	0	0	-2	0	0	0	0	-2	-0.2%
27-Aug	0	0	-2	4	-2	0			2	0	0	2	0	0	0	0	2	0	0	0	0	6	0.5%
28-Aug	4	18	2	4	4	-2			0	0	0	0	0	0	0	2	0	0	0	0	0	32	2.5%
29-Aug	2	0	0	2	0	0			0	0	0	2	0	0	1	0	0	0	0	0	0	7	0.5%
30-Aug	2	6	6	4	0	0			0	0	0	1	0	0	0	0	0	0	0	0	0	19	1.5%
31-Aug	0	0	0	0	0	0			0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1%
1-Sep	0	0	0	0	0	0			0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1%
2-Sep	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
3-Sep	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
4-Sep	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
3-Sep	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total	104	278	219	254	112	46	0	-33	-1	3	4	6	-3	21	8	43	56	37	52	89	1,295	100.0%	
	8.0%	21.5%	16.9%	19.6%	8.6%	3.6%	0.0%	-2.5%	-0.1%	0.2%	0.3%	0.5%	-0.2%	1.6%	0.6%	3.3%	4.3%	2.9%	4.0%	6.9%	100.0%		

Table 4. Expanded daily hourly chinook salmon migration past the Snake River counting tower, Norton Sound, 2001.

Outlined areas indicate hours not counted. Numbers in outlined areas indicate estimated passage.

Date	0000	0100	0200	0300	0400	0500	0600	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total		
8-Jul									0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
9-Jul	0	0	0	0	0	0																	0	0.0%
10-Jul	0	0	0	2	0	0																	2	6.1%
11-Jul	0	0	0	0	0	0																	0	0.0%
12-Jul	0	0	0	0	0	0																	0	0.0%
13-Jul	0	0	0	0	0	0																	0	0.0%
14-Jul	0	0	0	0	0	0																	0	0.0%
15-Jul	0	2	0	0	0	0																	2	6.1%
16-Jul	0	0	0	0	0	0																	0	0.0%
17-Jul	0	0	0	0	0	0																	0	0.0%
18-Jul	0	0	0	0	0	0																	0	0.0%
19-Jul	0	0	0	0	0	0																	0	0.0%
20-Jul	0	0	0	0	0	0																	0	0.0%
21-Jul	0	0	0	0	0	0																	0	0.0%
22-Jul	0	0	0	0	0	0																	0	0.0%
23-Jul	-2	0	0	0	0	0																	-2	-6.1%
24-Jul	0	0	0	0	0	0																	0	0.0%
25-Jul	0	0	0	0	2	0																	2	6.1%
26-Jul	0	0	0	0	0	0																	0	0.0%
27-Jul	0	0	0	0	0	0																	0	0.0%
28-Jul	0	0	0	0	0	0																	0	0.0%
29-Jul	0	0	0	0	0	0																	0	0.0%
30-Jul	0	0	0	0	0	0																	0	0.0%
31-Jul	0	0	0	0	0	0																	0	0.0%
1-Aug	0	0	0	0	0	0																	2	6.1%
2-Aug	0	0	0	0	0	0																	0	0.0%
3-Aug	0	0	0	0	0	0																	0	0.0%
4-Aug	0	0	0	0	0	0																	0	0.0%
5-Aug	0	0	0	0	0	0																	0	0.0%
6-Aug	0	0	0	0	0	0																	0	0.0%
7-Aug	0	0	0	0	0	0																	0	0.0%
8-Aug	0	2	0	0	0	0																	2	6.1%
9-Aug	0	0	0	0	0	0																	0	0.0%
10-Aug	0	0	0	0	1	0																	1	3.0%
11-Aug	0	0	0	0	1	0																	1	3.0%
12-Aug	0	0	0	0	2	0																	2	6.1%
13-Aug	0	0	0	0	0	0																	0	0.0%
14-Aug	0	0	0	0	0	0																	0	0.0%
15-Aug	0	0	0	0	0	0																	0	0.0%
16-Aug	0	0	0	0	0	0																	0	0.0%
17-Aug	0	2	0	0	0	0																	2	6.1%
18-Aug	0	3	0	0	0	0																	3	9.1%
19-Aug	0	4	0	0	0	0																	4	12.1%
20-Aug	0	0	0	2	0	0																	2	6.1%
21-Aug	0	0	0	0	0	0																	0	0.0%
22-Aug	0	0	0	0	0	0																	2	6.1%
23-Aug	0	0	0	2	0	0																	2	6.1%
24-Aug	0	0	0	1	0	0																	1	3.0%
25-Aug	0	0	0	1	0	0																	1	3.0%
26-Aug	0	0	0	0	0	0																	0	0.0%
27-Aug	0	2	0	0	0	0																	2	6.1%
28-Aug	0	0	0	0	0	0																	0	0.0%
29-Aug	0	0	0	0	0	0																	0	0.0%
30-Aug	0	0	0	2	0	0																	2	6.1%
31-Aug	0	0	0	0	0	0																	0	0.0%
1-Sep	0	0	0	0	0	0																	0	0.0%
2-Sep	0	0	0	0	0	0																	0	0.0%
3-Sep	0	0	0	0	0	0																	0	0.0%
4-Sep	0	0	0	0	0	0																	0	0.0%
5-Sep	0	0	0	0	0	0																	0	0.0%
Total	-2	15	0	10	6	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	33	100.0%
	-6.1%	45.5%	0.0%	30.3%	18.2%	0.0%	0.0%	0.0%	6.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.1%	0.0%	100.0%	

Table 5. Expanded daily hourly coho salmon migration past the Snake River counting tower, Norton Sound, 2001.

Outlined areas indicate hours not counted. Numbers in outlined areas indicate estimated passage.

Date	0000	0100	0200	0300	0400	0500	0600-1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total	
8-Jul								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
9-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
10-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
11-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
12-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
13-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
14-Jul	0	0	0	0	0	0		0	0	0	0	0	0	2	0	0	0	0	0	0	2	0.1%
15-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
16-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
17-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
18-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
19-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
20-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
21-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
22-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
23-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
24-Jul	0	0	2	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.1%
25-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
26-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
27-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
28-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
29-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
30-Jul	0	4	0	0	0	0		0	0	0	0	0	0	0	4	0	0	0	0	0	8	0.6%
31-Jul	0	0	0	0	-2	0		0	0	0	0	0	0	0	0	0	0	0	0	0	-2	-0.1%
1-Aug	0	4	2	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	6	0.4%
2-Aug	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
3-Aug	0	6	2	2	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.7%
4-Aug	0	3	2	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	6	0.4%
5-Aug	0	0	2	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.1%
6-Aug	0	4	8	10	0	2		1	0	0	0	0	0	0	0	0	-2	0	0	0	23	1.7%
7-Aug	4	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.3%
8-Aug	0	2	-8	24	18	12		4	0	2	0	0	0	2	0	0	12	2	10	0	80	6.0%
9-Aug	12	6	16	0	2	0		2	0	-2	0	0	4	0	0	0	0	0	0	0	40	3.0%
10-Aug	8	2	12	0	1	0		1	0	-1	0	0	2	0	0	0	0	1	1	0	27	2.0%
11-Aug	8	2	12	0	1	0		1	0	0	0	0	0	0	0	0	0	2	2	0	28	2.1%
12-Aug	4	-2	8	0	0	0		1	0	0	0	0	0	0	0	0	0	0	0	0	11	0.8%
13-Aug	0	2	12	4	0	0		-22	0	0	0	0	0	0	2	8	4	0	0	0	10	0.7%
14-Aug	-7	7	7	2	-13	28		-25	0	2	0	0	0	1	0	1	4	4	0	0	11	0.8%
15-Aug	-7	7	7	2	-13	28		-25	0	2	0	0	2	0	0	0	8	0	0	0	11	0.8%
16-Aug	-14	12	2	0	-26	56		-30	0	0	0	0	0	0	0	0	0	0	14	0	14	1.0%
17-Aug	-14	10	4	0	-11	43		-41	0	0	0	0	0	0	0	0	0	6	22	0	19	1.4%
18-Aug	3	18	27	2	-11	43		-85	0	0	0	0	0	0	0	0	0	12	30	0	39	2.9%
19-Aug	20	26	50	4	4	30		-91	0	0	0	0	0	0	0	0	0	0	0	0	43	3.2%
20-Aug	18	4	2	6	24	0		-4	0	0	0	0	0	0	0	0	0	0	0	0	50	3.7%
21-Aug	2	22	6	10	22	12		-8	0	0	0	0	0	0	0	0	0	0	0	0	68	5.1%
22-Aug	0	24	10	18	8	0		-5	0	0	0	0	0	0	0	0	0	0	-4	0	51	3.8%
23-Aug	12	18	10	10	6	14		-6	0	2	0	0	0	0	0	0	0	0	0	0	66	4.9%
24-Aug	10	12	5	9	13	13		-6	0	1	0	0	0	0	5	0	0	0	0	0	62	4.6%
25-Aug	10	12	5	9	13	13		-5	0	0	0	0	0	0	10	0	0	0	0	0	67	5.0%
26-Aug	8	6	0	8	20	12		-4	0	0	0	0	2	0	0	0	0	0	0	0	52	3.9%
27-Aug	6	14	18	22	20	10		0	0	0	0	0	0	0	0	4	0	2	0	0	96	7.2%
28-Aug	20	14	16	24	30	-4		0	0	0	0	0	0	0	0	0	0	0	0	0	100	7.5%
29-Aug	10	4	8	12	10	4		0	0	0	0	0	0	0	0	0	0	0	11	0	59	4.4%
30-Aug	18	36	22	38	24	10		-4	0	0	0	0	0	0	0	0	0	0	22	0	166	12.4%
31-Aug	8	6	10	14	6	8		-4	0	0	0	0	0	0	9	0	0	0	13	0	78	5.8%
1-Sep								0	0	0	0	0	0	0	18	0	0	0	4	0	22	1.6%
2-Sep	0	0	2	0	0	0		2	0	0	0	0	0	0	0	0	0	0	0	0	4	0.3%
3-Sep	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
4-Sep	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
5-Sep	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total	139	285	281	231	146	334	2	-345	0	7	-1	0	0	11	4	49	16	26	25	125	1,335	100.0%
	10.4%	21.3%	21.0%	17.3%	10.9%	25.0%	0.1%	-25.8%	0.0%	0.5%	-0.1%	0.0%	0.0%	0.8%	0.3%	3.7%	1.2%	1.9%	1.9%	9.4%	100.0%	

Table 6. Reported hourly chum salmon observations at the Snake River counting tower, Norton Sound, 2001.

Outlined areas indicate hours not counted

Date	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total	
8-Jul																										2	0.1%
9-Jul	40	0	0	0	4																					44	2.3%
10-Jul	0	0	0	0	0																					2	0.1%
11-Jul	0	0	0	24	0																					22	1.2%
12-Jul	38	0	36	0	0																					74	3.9%
13-Jul																										4	0.2%
14-Jul	2	0	28	0	22																					152	8.1%
15-Jul	0	46	28	92	0																					228	12.1%
16-Jul	8	16	24	98	-2																					294	15.6%
17-Jul	8	20	-12	-16	28	-8																				74	3.9%
18-Jul	0	0	22	-10	4																					34	1.8%
19-Jul	0	4	8	6	10	28	0	-4	-4	0	2	0	0	0	0	0	0	2	0	0	0	8	18	0	78	4.1%	
20-Jul	6	0	50	6	4	0	0	0	0																	66	3.5%
21-Jul																										56	3.0%
22-Jul	12	4	0	22	-14	-2																				96	5.1%
23-Jul	16	18	8	14	6	10																				96	5.1%
24-Jul	0	0	2	0	0																					2	0.1%
25-Jul																										68	3.6%
26-Jul	4	6	6	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	1.3%	
27-Jul	16	8	10	0	0	0	0	0	0																	34	1.8%
28-Jul																										10	0.5%
29-Jul	2	14	6	2	0	2																				48	2.5%
30-Jul	0	72	0	0	0	0																				86	4.6%
31-Jul	0	0	0	0	0	-2																				10	0.5%
1-Aug	32	8	20	18	8	4																				92	4.9%
2-Aug	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.1%	
3-Aug	0	4	16	20	2	2																				44	2.3%
4-Aug																										2	0.1%
5-Aug	0	0	2	6	0	0																				8	0.4%
6-Aug	0	0	10	16	0	0																				26	1.4%
7-Aug	6	2	22	0	12	8																				50	2.7%
8-Aug	0	2	-4	6	8	10																				22	1.2%
9-Aug	4	0	-2	6	0	0	0	6	0	0	0	2	0	0	0	0	0	2	0	0	0	0	2	0	20	1.1%	
10-Aug																										0	0.0%
11-Aug																										0	0.0%
12-Aug	0	0	0	0	0	0																				0	0.0%
13-Aug	0	0	0	0	0	0																				0	0.0%
14-Aug																										0	0.0%
15-Aug																										0	0.0%
16-Aug	0	0	0	0	-2	0	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-4	-0.2%	
17-Aug	0	2	0	0																						2	0.1%
18-Aug																										0	0.0%
19-Aug	0	2	0	0	0	0																				4	0.2%
20-Aug	0	4	4	0	0	0																				12	0.6%
21-Aug	0	0	2	-2	0	0																				0	0.0%
22-Aug	0	0	0	0	2	0																				-2	-0.1%
23-Aug	0	0	0	0	0	0																				0	0.0%
24-Aug																										0	0.0%
25-Aug																										0	0.0%
26-Aug	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	-2	0	0	0	0	0	0	0	2	0.1%	
27-Aug	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.1%	
28-Aug	0	0	0	0	0	0																				0	0.0%
29-Aug	0	0	0	0	0																					0	0.0%
30-Aug	0	0	0	0	0	0																				0	0.0%
31-Aug	0	0	0	0	0	0	0	0	0	0	0	0														0	0.0%
1-Sep																										0	0.0%
2-Sep	0	0	0	0	0	0	0	0	0	0	0	0														0	0.0%
3-Sep	0	0	0	0	0	0	0	0	0	0	0	0														0	0.0%
4-Sep	0	0	0	0	0	0	0	0	0	0	0	0														0	0.0%
5-Sep	0	0	0	0	0	0	0	0	0	0	0	0														0	0.0%
Total	194	232	286	348	106	50	-2	2	-4	0	4	2	0	0	4	20	36	8	48	48	144	82	96	182	1,886	100.0%	
	10.3%	12.3%	15.2%	18.5%	5.6%	2.7%	-0.1%	0.1%	-0.2%	0.0%	0.2%	0.1%	0.0%	0.0%	0.2%	1.1%	1.9%	0.4%	2.5%	2.5%	7.6%	4.3%	5.1%	9.7%	100.0%		

Table 7. Reported hourly pink salmon observations at the Snake River counting tower, Norton Sound, 2001.

Outlined areas indicate hours not counted

Date	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total		
8-Jul													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
9-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
10-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
11-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
12-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
13-Jul													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
14-Jul	0	0	0	2	0	0							0	0	0	0	0	0	0	0	0	0	0	2	0	4	0.4%	
15-Jul	0	0	0	4	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.4%	
16-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
17-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	2	2	4	0.4%		
18-Jul	0	0	0	0	0	0							0													0	0.0%	
19-Jul	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.4%	
20-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
21-Jul													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
22-Jul	2	0	0	0	0	2							0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.4%	
23-Jul	2	0	10	4	8	2							0	0	0	0	0	0	0	0	0	0	0	0	0	26	2.5%	
24-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	2	0	0	2	0.2%	
25-Jul				4	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.4%	
26-Jul	8	4	12	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	3.2%	
27-Jul	14	14	10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	3.8%	
28-Jul													0	0	0	0	0	0	0	0	0	4	0	0	0	4	0.4%	
29-Jul	0	18	8	10	4	6							0	0	0	0	0	0	0	0	14	0	0	2	62	5.9%		
30-Jul	2	50	0	-2	0	0							0	0	0	0	0	0	0	0	36	0	0	12	98	9.4%		
31-Jul	4	18	2	0	10	2							0	0	0	0	0	0	0	0	0	0	0	24	60	5.7%		
1-Aug	22	22	34	22	12	8							0	0	0	0	0	0	0	0	0	0	0	0	0	120	11.5%	
2-Aug	0	0	-8	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0.2%		
3-Aug	0	32	24	60	24	4															0	2	22	6	10	144	13.7%	
4-Aug																										40	3.8%	
5-Aug	-8	26	8	12	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	38	3.6%	
6-Aug	6	0	46	24	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	76	7.3%	
7-Aug	22	-2	6	0	10	4							0	0	0	0	0	0	0	0	0	0	0	0	0	40	3.8%	
8-Aug	-4	0	-4	8	6	4							0	4	0	0	0	0	0	0	0	0	0	2	8	24	2.3%	
9-Aug	6	2	10	10	-2	2	0	2	0	0	-2	0	-2	0	0	-2	0	2	0	0	4	0	4	4	38	3.6%		
10-Aug																										0	0.0%	
11-Aug													0	0	0	0	0	0	0	0	0	0	2	0	0	2	0.2%	
12-Aug	0	0	0	0	0	0							2	0	0	0	0	0	0	0	0	0	2	0	4	0.4%		
13-Aug	2	0	2	0	0	2							0	0	0	-6	0	0	2	0	2	0	2	0	4	0.4%		
14-Aug													2	0	2											4	0.4%	
15-Aug													0	0	0	0	2	6	0	2	0	0	8	-2	0	16	1.5%	
16-Aug	-6	2	0	-2	0	-2	-4	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2	0	0	2	-4	-0.4%	
17-Aug	0	0	0	0	0	0																				0	0.0%	
18-Aug													0	0	0	0	0	2	0	0	0	0	2	10	12	26	2.5%	
19-Aug	8	6	4	-2	4	-4							0	0	0	0	0	0	0	0	4	0	2	0	30	2.9%		
20-Aug	-6	0	2	0	6	0							0	0	0	0	0	2	2	0	0	-2	2	4	10	1.0%		
21-Aug	2	6	2	4	0	0							0	0	0	0	0	0	0	0	0	0	2	0	0	16	1.5%	
22-Aug	-2	2	2	2	0	0							0	0	0	0	0	0	0	0	0	0	2	-8	-2	-0.2%		
23-Aug	4	0	0	4	0	0	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	8	0.8%	
24-Aug																										0	0.0%	
25-Aug													0	-2	0	0	-2	4	0	0	0	0	0	0	2	2	0.2%	
26-Aug	0	0	2	2	4	0	-2	-6	-2	0	0	0	0	0	0	2	0	0	0	0	0	-2	0	0	0	-2	-0.2%	
27-Aug	0	0	-2	4	-2	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	6	0.6%	
28-Aug	4	18	2	4	4	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	32	3.1%	
29-Aug	2	0	0	2	0	0							0	0	0	2	0	0	0	0	0	0	0	0	0	6	0.6%	
30-Aug	2	6	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	1.7%	
31-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
1-Sep																										0	0.0%	
2-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
3-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
4-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
5-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total	86	224	178	198	92	36	-8	-2	-2	0	-2	0	0	4	4	4	-2	14	6	42	38	26	38	74	1,048	100.0%		
	8.2%	22.4%	17.8%	19.8%	8.8%	3.4%	-0.8%	-0.2%	-0.2%	0.0%	-0.2%	0.0%	0.0%	0.4%	0.4%	0.4%	-0.2%	1.3%	0.6%	4.0%	3.6%	2.5%	3.6%	7.1%	100.0%			

Table 8. Reported hourly chinook salmon observations at the Snake River counting tower, Norton Sound, 2001.

Outlined areas indicate hours not counted

Date	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total		
8-Jul																										0	0.0%	
9-Jul	0	0	0	0	0	0																					0	0.0%
10-Jul	0	0	0	2	0	0																					2	7.7%
11-Jul	0	0	0	0	0	0																					0	0.0%
12-Jul	0	0	0	0	0	0																					0	0.0%
13-Jul																											0	0.0%
14-Jul	0	0	0	0	0	0																					0	0.0%
15-Jul	0	2	0	0	0	0																					2	7.7%
16-Jul	0	0	0	0	0	0																					0	0.0%
17-Jul	0	0	0	0	0	0																					0	0.0%
18-Jul	0	0	0	0	0	0																					0	0.0%
19-Jul	0	0	0	0	0	0																					0	0.0%
20-Jul	0	0	0	0	0	0																					0	0.0%
21-Jul																											0	0.0%
22-Jul	0	0	0	0	0	0																					0	0.0%
23-Jul	-2	0	0	0	0	0																					-2	-7.7%
24-Jul	0	0	0	0	0	0																					0	0.0%
25-Jul					2	0																					2	7.7%
26-Jul	0	0	0	0	0	0																					0	0.0%
27-Jul	0	0	0	0	0	0																					0	0.0%
28-Jul																											0	0.0%
29-Jul	0	0	0	0	0	0																					0	0.0%
30-Jul	0	0	0	0	0	0																					0	0.0%
31-Jul	0	0	0	0	0	0																					0	0.0%
1-Aug	0	0	0	0	0	0																				2	7.7%	
2-Aug	0	0	0	0	0	0																					0	0.0%
3-Aug	0	0	0	0	0	0																					0	0.0%
4-Aug																											0	0.0%
5-Aug	0	0	0	0	0	0																					0	0.0%
6-Aug	0	0	0	0	0	0																					0	0.0%
7-Aug	0	0	0	0	0	0																					0	0.0%
8-Aug	0	2	0	0	0	0																					2	7.7%
9-Aug	0	0	0	0	0	0																					0	0.0%
10-Aug																											0	0.0%
11-Aug																											0	0.0%
12-Aug	0	0	0	0	2	0																					2	7.7%
13-Aug	0	0	0	0	0	0																					0	0.0%
14-Aug																											0	0.0%
15-Aug																											0	0.0%
16-Aug	0	0	0	0	0	0																					0	0.0%
17-Aug	0	2	0	0																							2	7.7%
18-Aug																											0	0.0%
19-Aug	0	4	0	0	0	0																					4	15.4%
20-Aug	0	0	0	2	0	0																					2	7.7%
21-Aug	0	0	0	0	0	0																					0	0.0%
22-Aug	0	0	0	0	0	0																					2	7.7%
23-Aug	0	0	0	2	0	0																					2	7.7%
24-Aug																											0	0.0%
25-Aug																											0	0.0%
26-Aug	0	0	0	0	0	0																					0	0.0%
27-Aug	0	2	0	0	0	0																					2	7.7%
28-Aug	0	0	0	0	0	0																					0	0.0%
29-Aug	0	0	0	0	0	0																					0	0.0%
30-Aug	0	0	0	2	0	0																					2	7.7%
31-Aug	0	0	0	0	0	0																					0	0.0%
1-Sep																											0	0.0%
2-Sep	0	0	0	0	0	0																					0	0.0%
3-Sep	0	0	0	0	0	0																					0	0.0%
4-Sep	0	0	0	0	0	0																					0	0.0%
5-Sep	0	0	0	0	0	0																					0	0.0%
Total	-2	12	0	8	4	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	26	100.0%
	-7.7%	46.2%	0.0%	30.8%	15.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	100.0%	

Table 9. Reported hourly coho salmon observations at the Snake River counting tower, Norton Sound, 2001.

Outlined areas indicate hours not counted

Date	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total		
8-Jul													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
9-Jul																											0	0.0%
10-Jul																											0	0.0%
11-Jul																											0	0.0%
12-Jul																											0	0.0%
13-Jul																											0	0.0%
14-Jul																											2	0.2%
15-Jul																											0	0.0%
16-Jul																											0	0.0%
17-Jul																											0	0.0%
18-Jul																											0	0.0%
19-Jul																											0	0.0%
20-Jul																											0	0.0%
21-Jul																											0	0.0%
22-Jul																											0	0.0%
23-Jul																											0	0.0%
24-Jul																											2	0.2%
25-Jul																											0	0.0%
26-Jul																											0	0.0%
27-Jul																											0	0.0%
28-Jul																											0	0.0%
29-Jul																											0	0.0%
30-Jul																											8	0.7%
31-Jul																											-2	-0.2%
1-Aug																											6	0.5%
2-Aug																											0	0.0%
3-Aug																											10	0.8%
4-Aug																											0	0.0%
5-Aug																											2	0.2%
6-Aug																											22	1.8%
7-Aug																											4	0.3%
8-Aug																											76	6.2%
9-Aug																											40	3.3%
10-Aug																											0	0.0%
11-Aug																											4	0.3%
12-Aug																											10	0.8%
13-Aug																											28	2.3%
14-Aug																											2	0.2%
15-Aug																											12	1.0%
16-Aug																											14	1.1%
17-Aug																											0	0.0%
18-Aug																											42	3.4%
19-Aug																											134	11.0%
20-Aug																											54	4.4%
21-Aug																											74	6.1%
22-Aug																											56	4.6%
23-Aug																											66	5.4%
24-Aug																											0	0.0%
25-Aug																											10	0.8%
26-Aug																											52	4.3%
27-Aug																											96	7.9%
28-Aug																											100	8.2%
29-Aug																											48	3.9%
30-Aug																											166	13.6%
31-Aug																											56	4.6%
1-Sep																											22	1.8%
2-Sep																											4	0.3%
3-Sep																											0	0.0%
4-Sep																											0	0.0%
5-Sep																											0	0.0%
Total	114	222	204	206	166	166	-34	-6	2	0	2	0	0	6	0	0	0	8	4	34	12	18	18	78	1,220	100.0%		
	9.3%	18.2%	16.7%	16.9%	13.6%	13.6%	-2.8%	-0.5%	0.2%	0.0%	0.2%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.7%	0.3%	2.8%	1.0%	1.5%	1.5%	6.4%	100.0%			

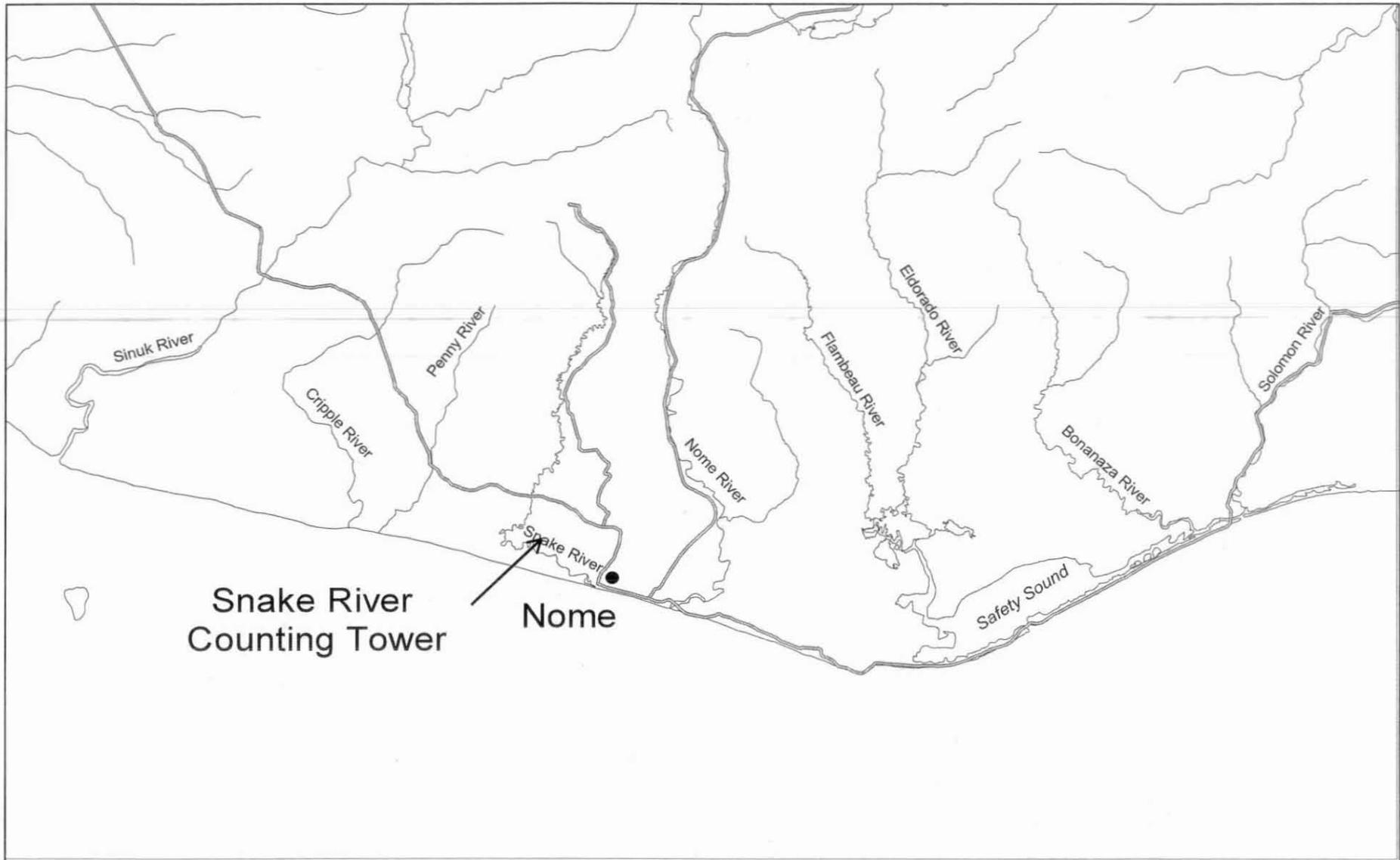


Figure 1. Area location map of the Snake River counting tower project site, Norton Sound, 2001.

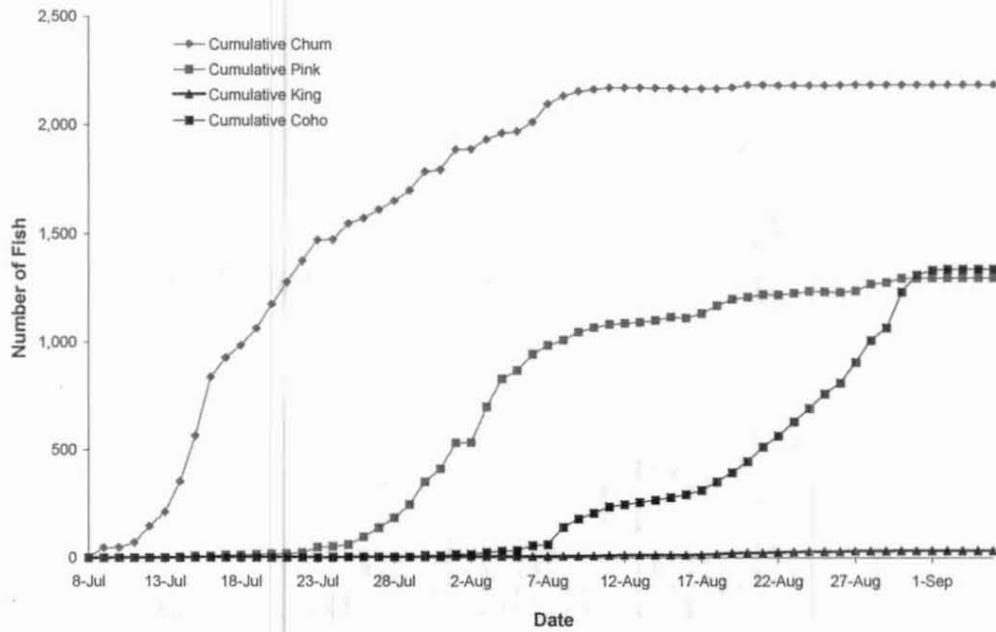


Figure 2. Cumulative migration of all species past the Snake River counting tower, Norton Sound, 2001.

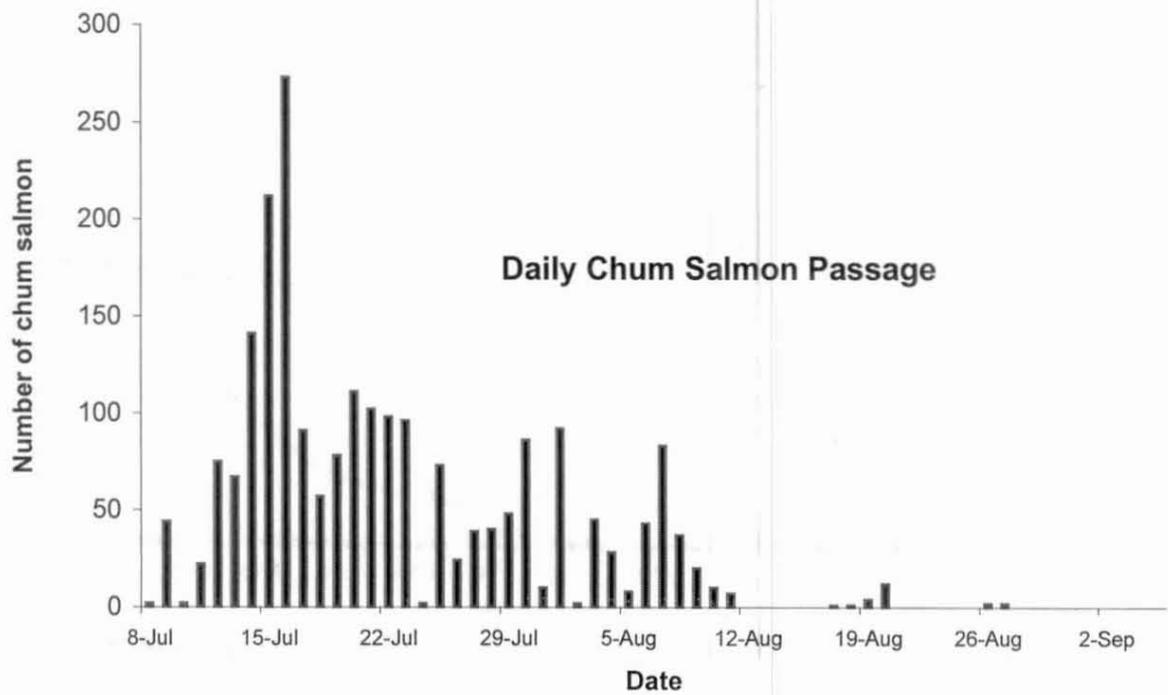


Figure 3. Daily chum salmon migration past the Snake River counting tower, Norton Sound, 2001.

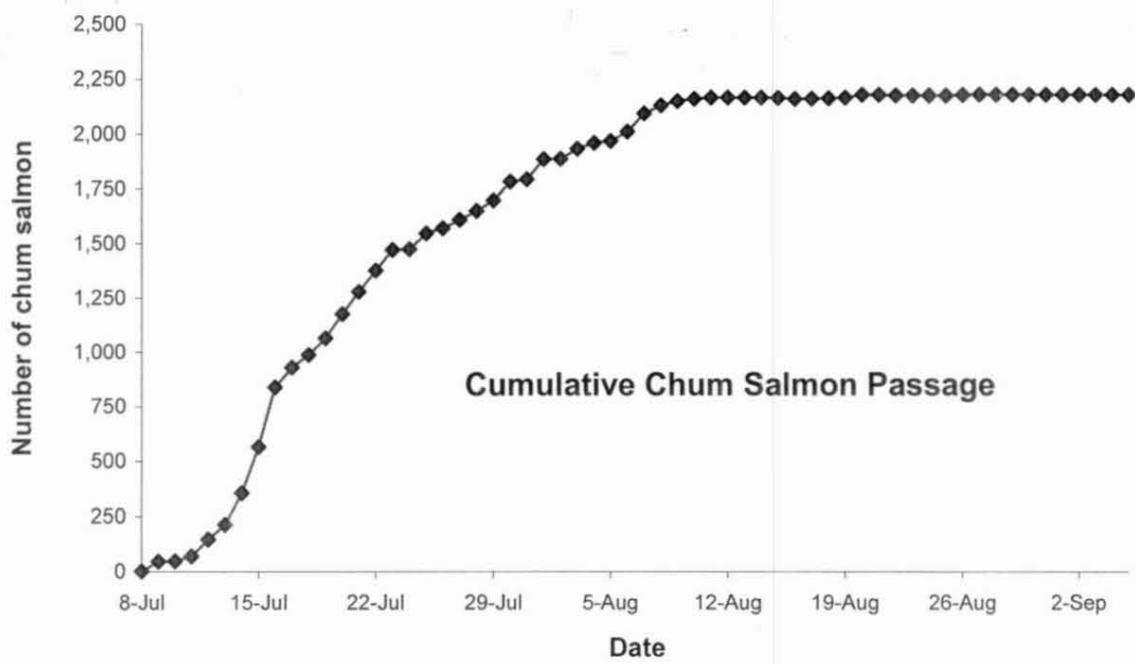


Figure 4. Cumulative chum salmon migration past the Snake River counting tower, Norton Sound, 2001.

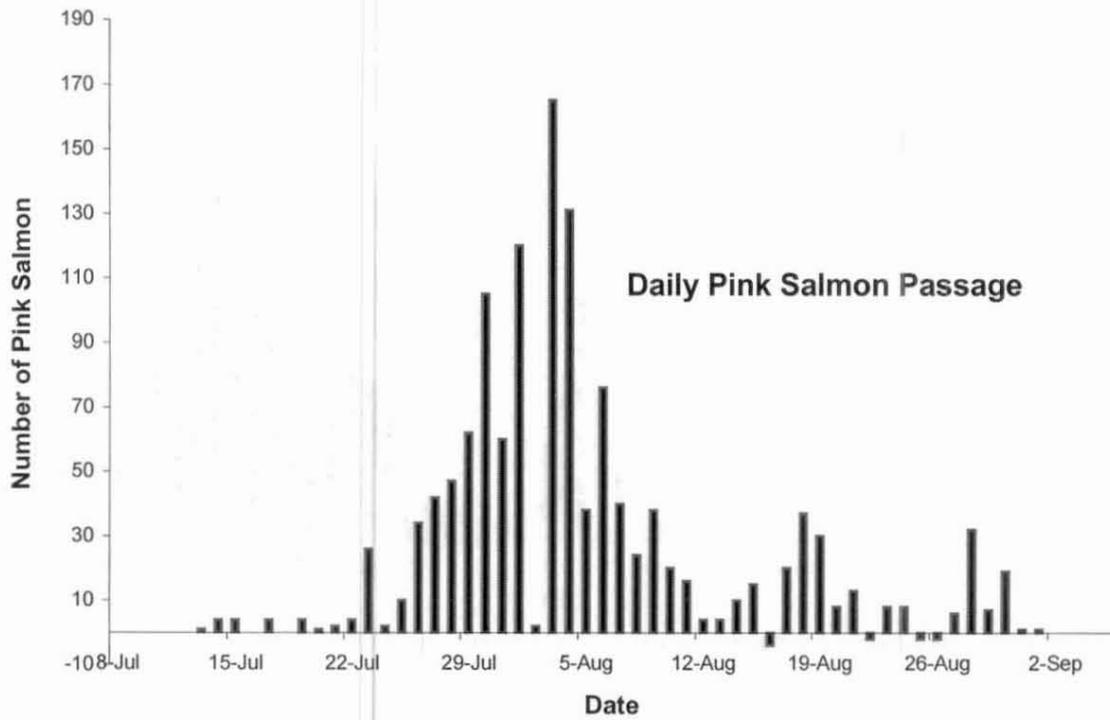


Figure 5. Daily pink salmon migration past the Snake River counting tower, Norton Sound, 2001.

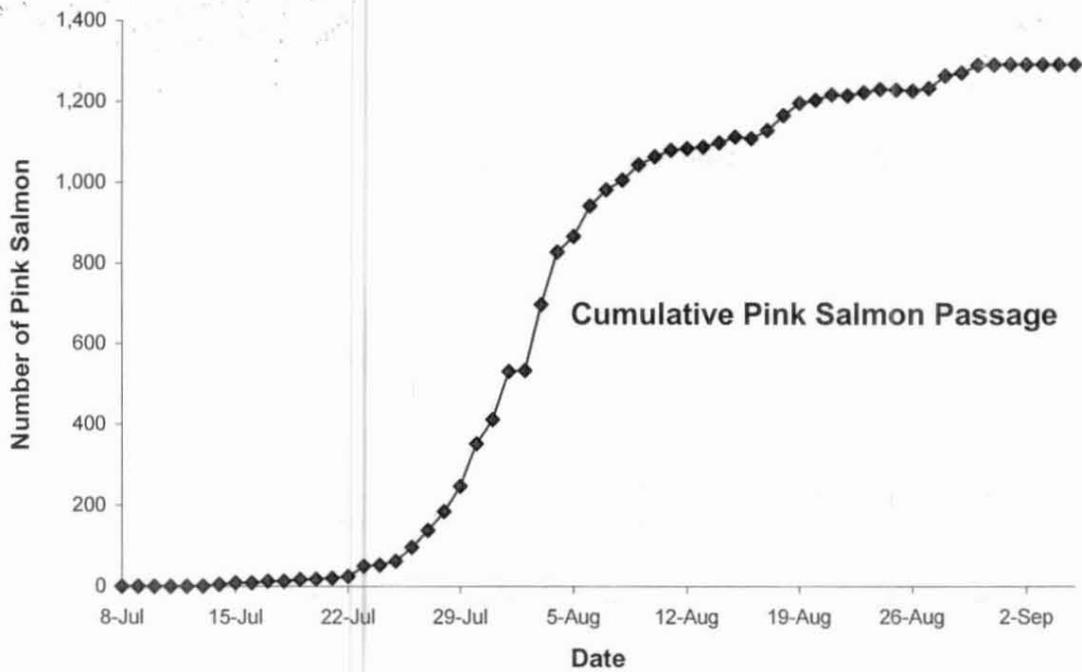


Figure 6. Cumulative pink salmon migration past the Snake River counting tower, Norton Sound, 2001.

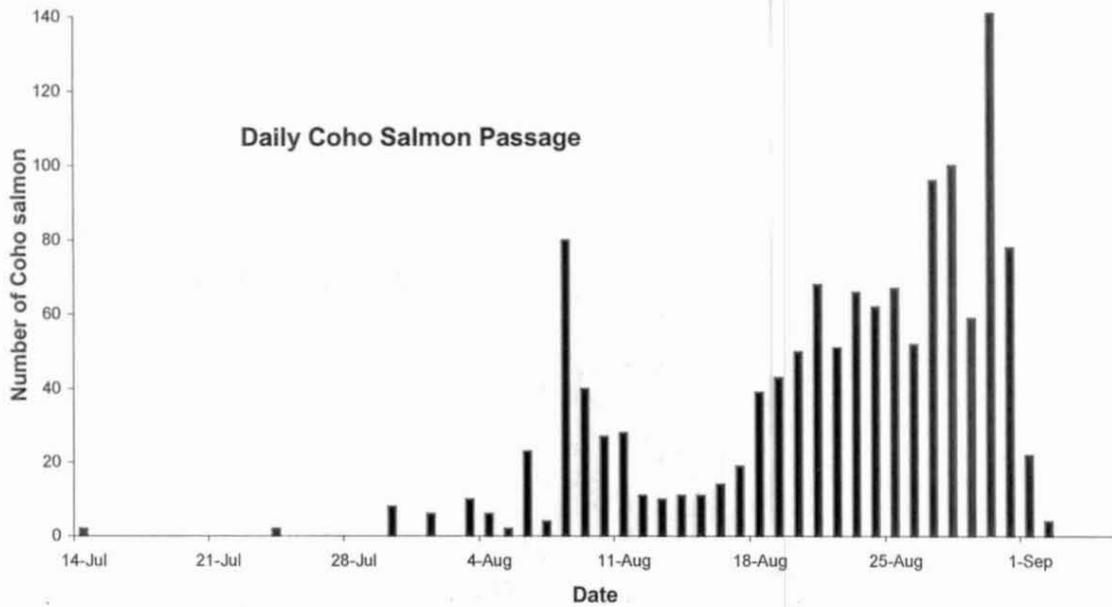


Figure 7. Daily coho salmon migration past the Snake River counting tower, Norton Sound, 2001.

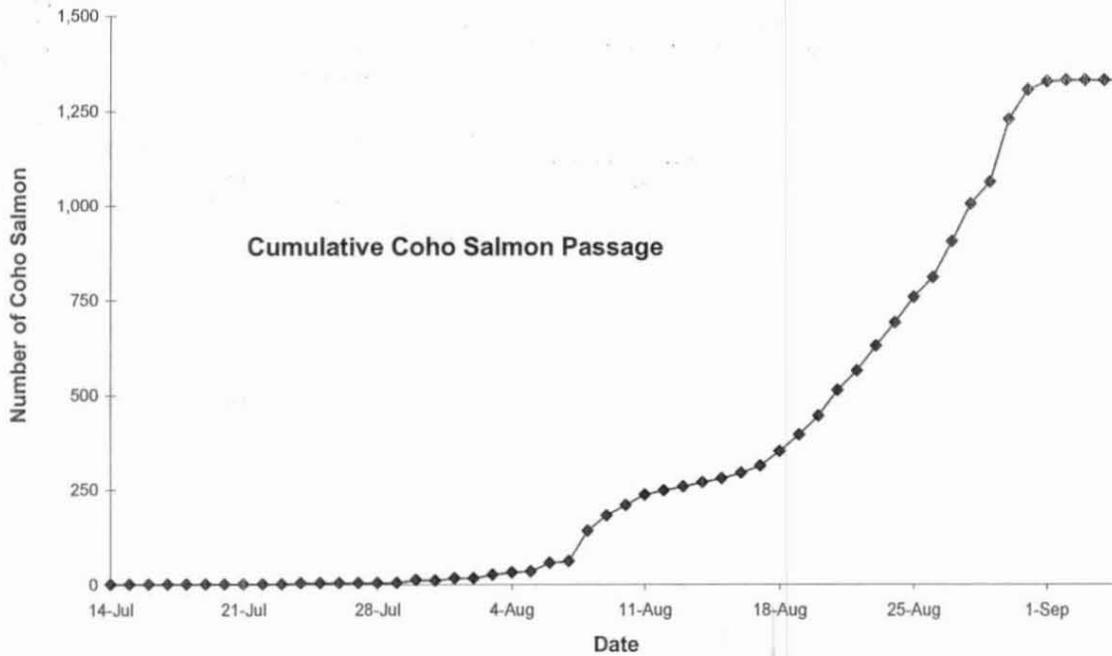


Figure 8. Cumulative coho salmon migration past the Snake River counting tower, Norton Sound, 2001.

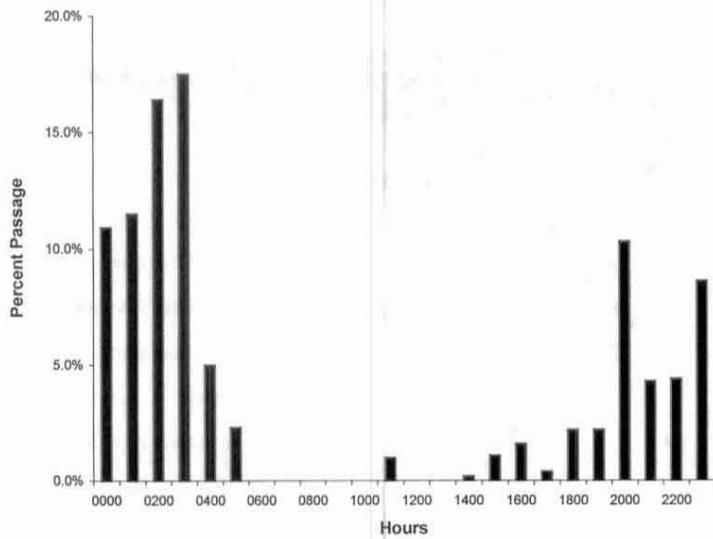


Figure 9. Diurnal pattern of chum salmon migration past the Snake River counting tower, Norton Sound, 2001.

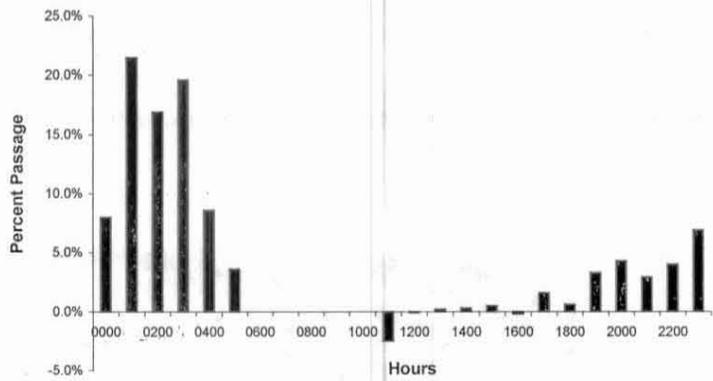


Figure 10. Diurnal pattern of pink salmon migration past the Snake River counting tower, Norton Sound, 2001.

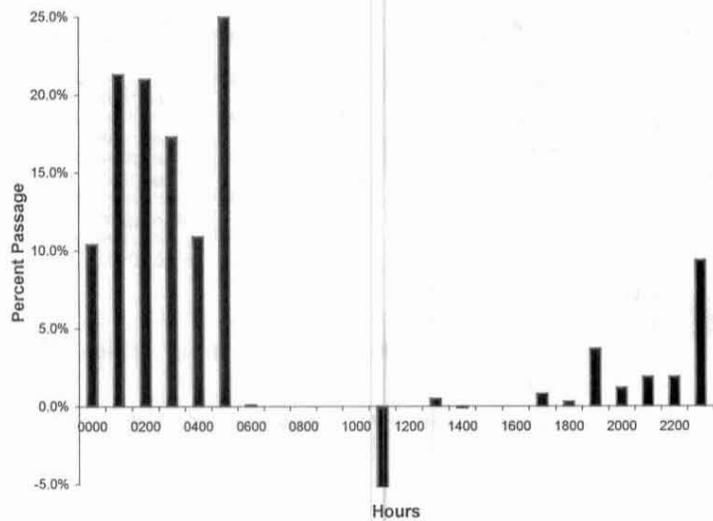


Figure 11. Diurnal pattern of coho salmon migration past the Snake River counting tower, Norton Sound, 2001.

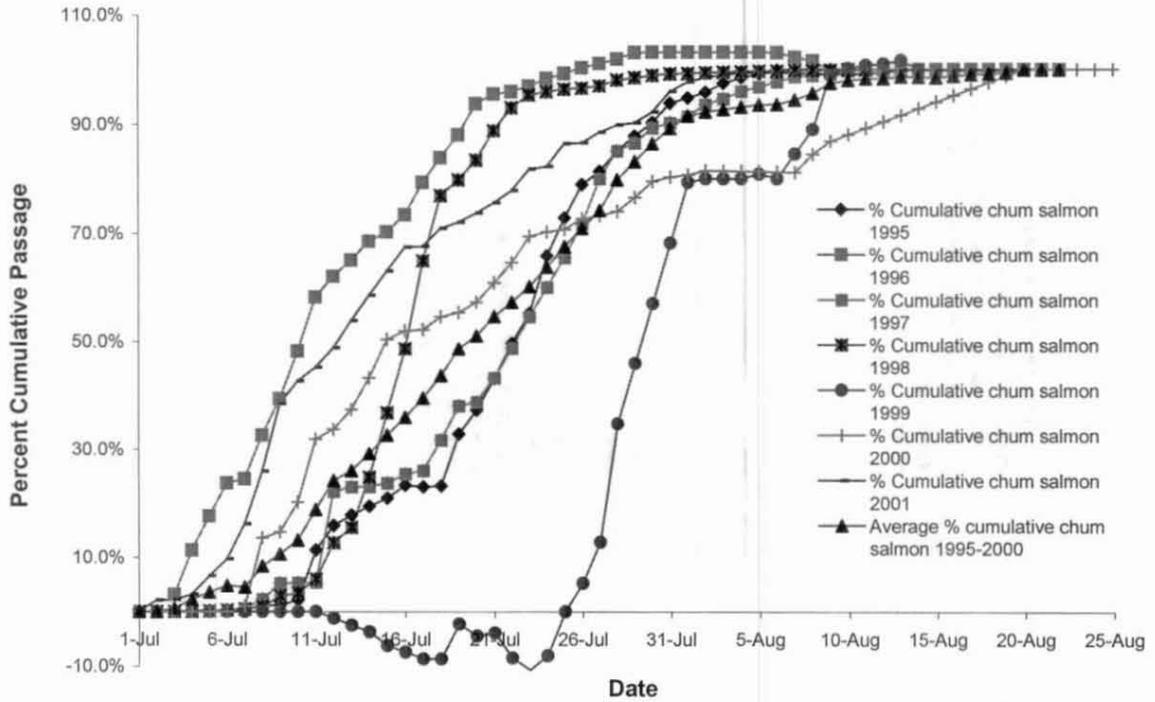


Figure 12. Chum salmon run-timing past the Snake River counting tower, Norton Sound, 1995-2001.

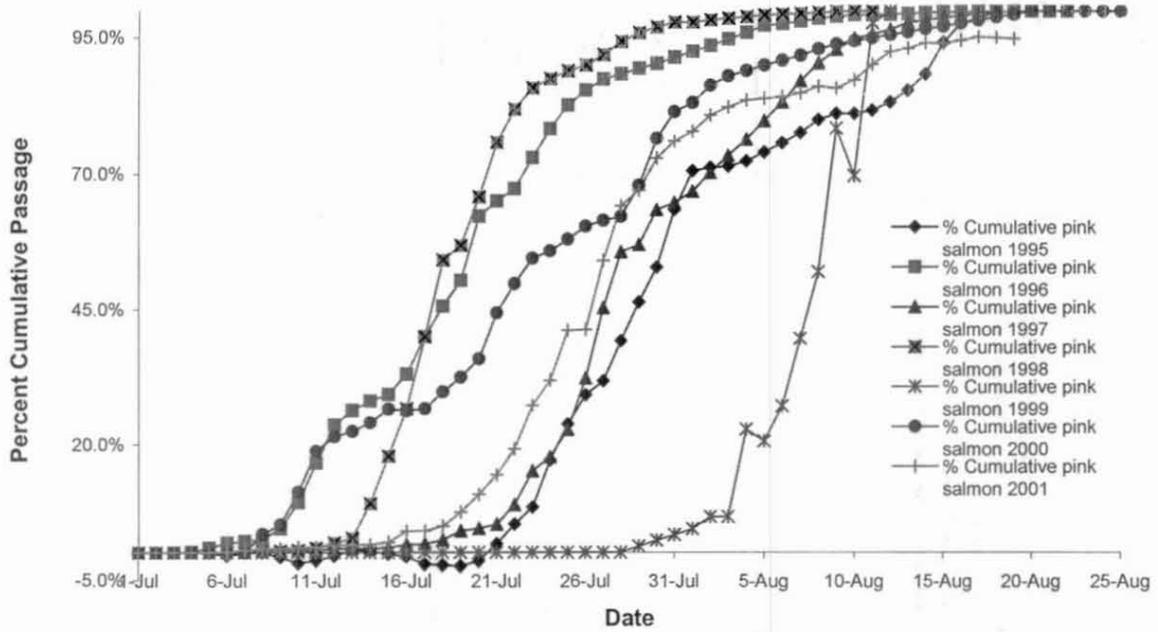


Figure 13. Pink salmon run-timing past the Snake River counting tower, Norton Sound, 1995-2001.

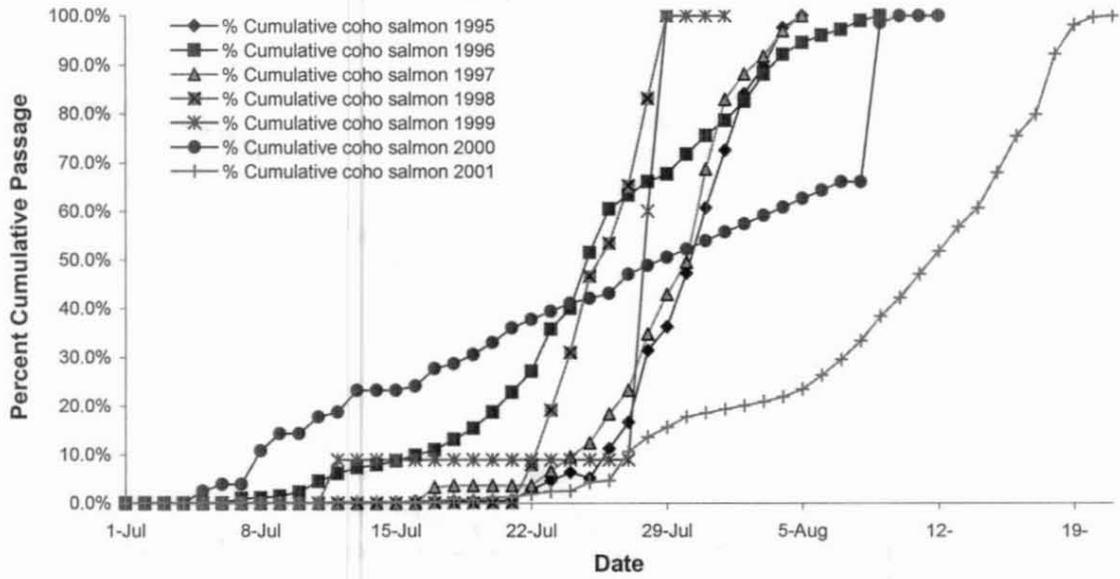


Figure 14. Coho salmon run-timing past the Snake River counting tower, Norton Sound, 1995-2001.

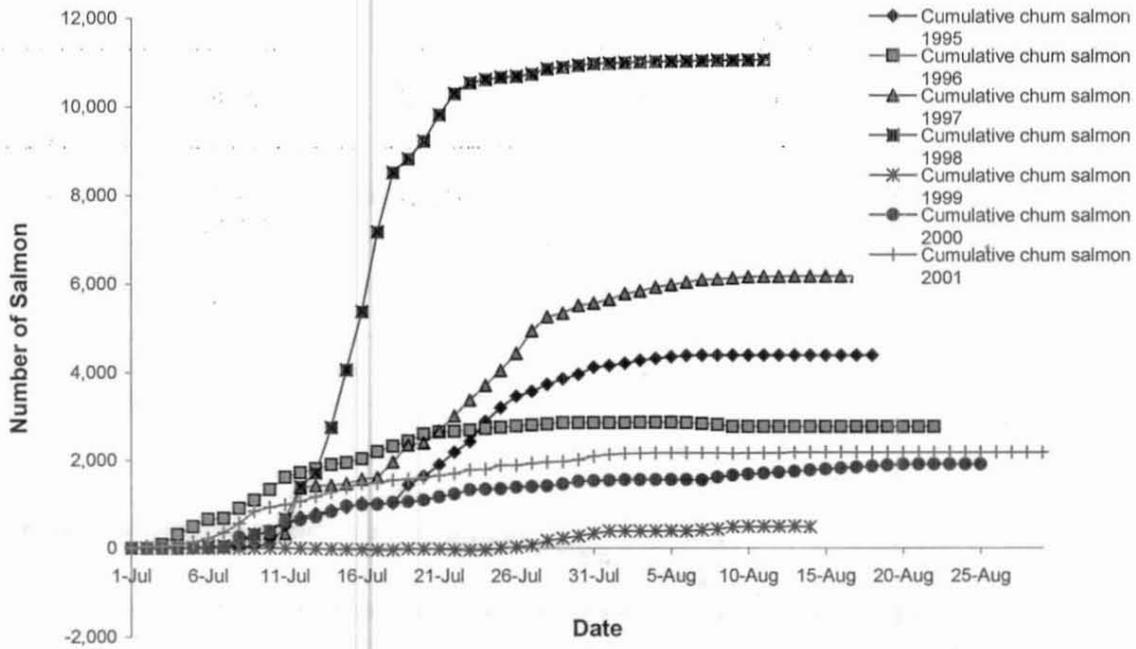


Figure 15. Cumulative chum salmon migration past the Snake River counting tower, Norton Sound, 1995-2001.

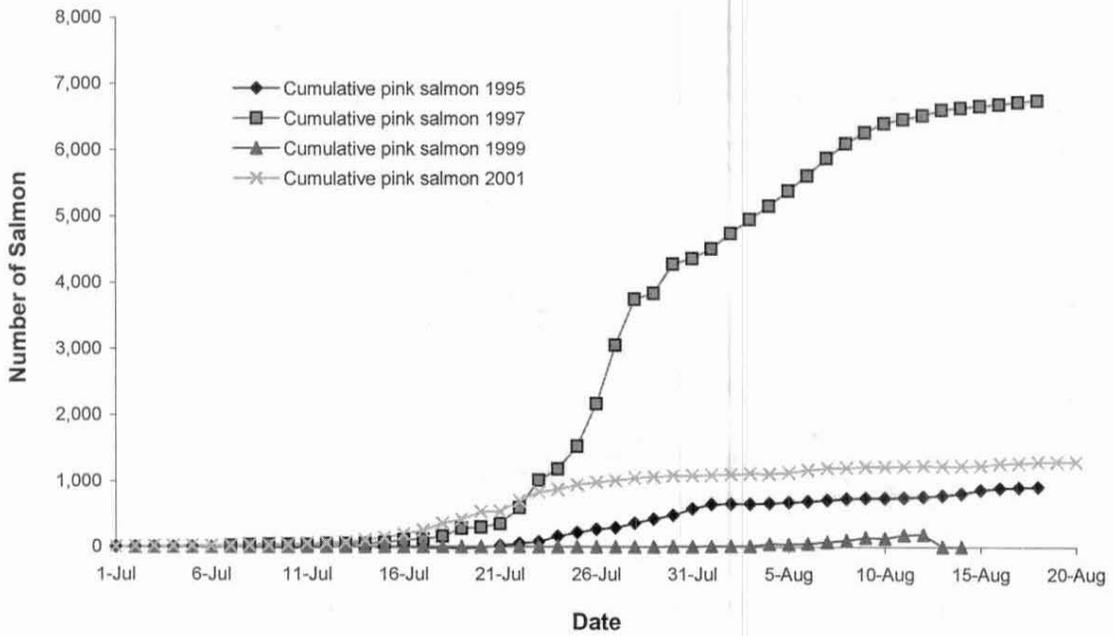


Figure 16. Cumulative odd year pink salmon migration past the Snake River counting tower, Norton Sound, 1995 - 2001.

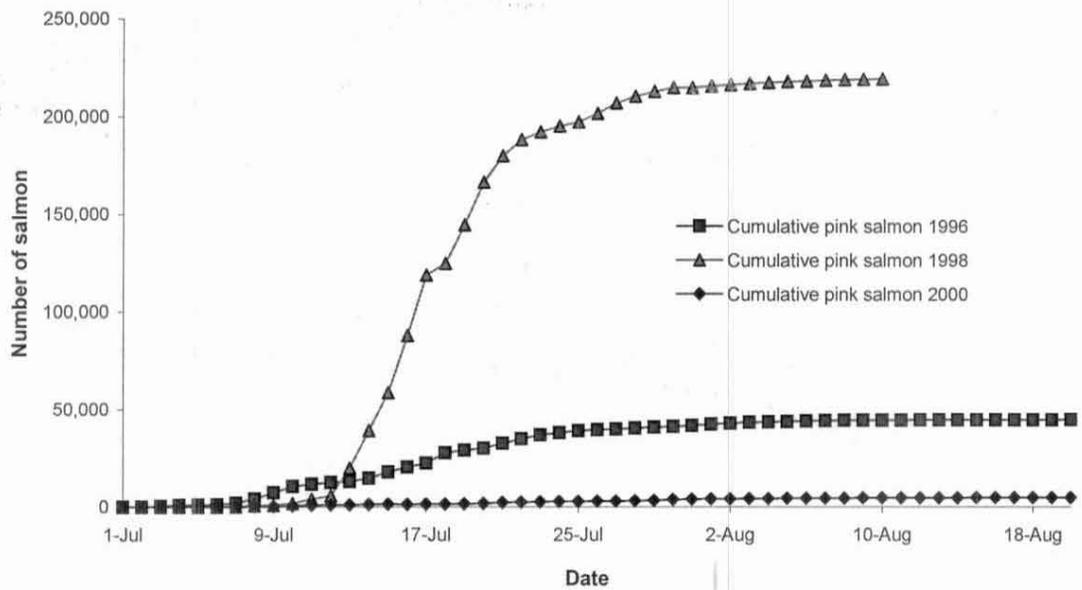


Figure 17. Cumulative even year pink salmon migration past the Snake River counting tower, Norton Sound, 1996 - 2001.

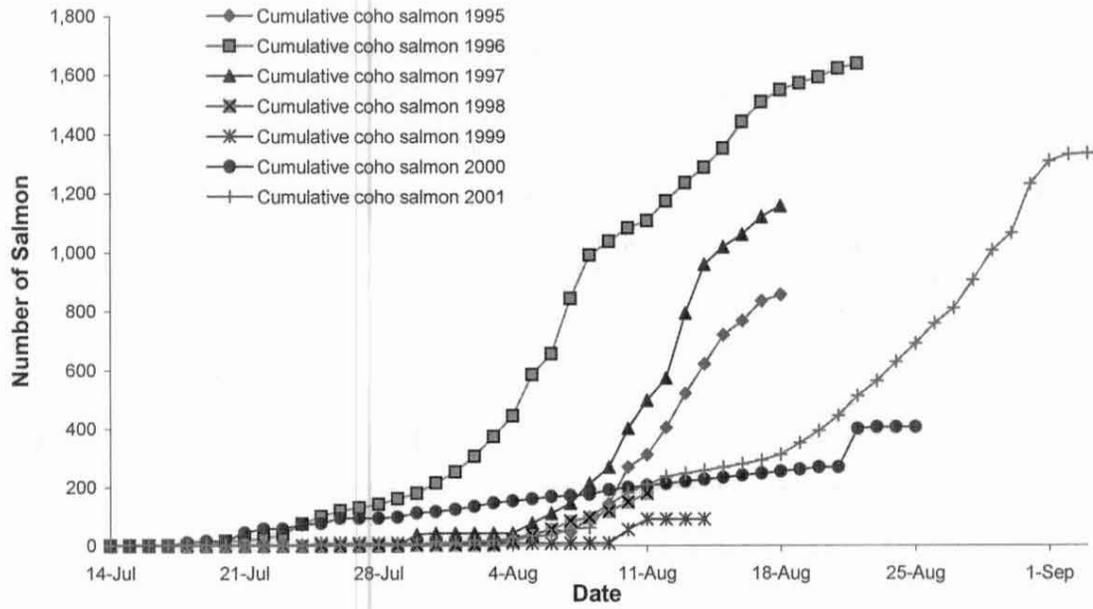


Figure 18. Cumulative coho salmon migration past the Snake River counting tower, Norton Sound, 1995-2001.

Appendix 1. Historical salmon migration past the Snake River counting tower, 1995-2001.

Year	Operating period	Chum	Pink	King	Coho
1995	July 1-Aug 18	4,393	917	0	856
1996	July 3-Aug 22	2,772	44,558	5	1,638
1997	July 7-Aug 18	6,184	6,742	12	1,157
1998	July 1-Aug 11	11,067	219,679	0	178
1999	July 1-Aug 14	484	116	10	90
2000	June 29-Aug 25	1,911	4,723	28	406
2001	July 8-Sept 5	2,182	1,295	33	1,335

Appendix 2. Percentage of salmon counts estimated at the Snake River counting tower, Norton Sound, 1995-2001.

Year	Operating period	Chum	Pink	King	Coho
1995	July 1-Aug 18	33.3%	37.9%	0.0%	40.0%
1996	July 3-Aug 22	12.0%	33.1%	20.0%	45.2%
1997	July 7-Aug 18	27.4%	46.6%	0.0%	41.1%
1998	July 1-Aug 11	41.0%	34.7%	0.0%	23.6%
1999	July 1-Aug 14	33.9%	-9.7%	-40.0%	0.0%
2000	June 29-Aug 25	28.5%	25.6%	21.4%	28.1%
2001	July 8-Sept 5	13.6%	19.1%	21.2%	8.6%

Appendix Table 3. Age, sex, and length composition of chum salmon samples, Snake River, Norton Sound, 2001.

		Brood Year and (Age Group)				
		1999	1998	1997	1996	Total
		(0.2)	(0.3)	(0.4)	(0.5)	
Sampling Dates:	8/6-8/21					
Sample Size:	273					
Male	Percent of Sample	1.1%	20.5%	31.1%	0.4%	53.1%
	Number in Sample	3	56	85	1	145
	Avg. Length(mm) ¹	566	579	619	595	
Female	Percent of Sample	0.0%	21.2%	25.3%	0.4%	46.9%
	Number in Sample	0	58	69	1	128
	Avg. Length(mm) ¹		546	571	565	
Total	Percent of Sample	1.1%	41.8%	56.4%	0.7%	100.0%
	Number in Sample	3	114	154	2	273

¹ Length was measured from mid-eye to fork-of-tail.

Appendix Table 4. Age, sex, and length composition of coho salmon samples, Snake River, Norton Sound, 2001.

		Brood Year and (Age Group)			
		1998	1997	1996	Total
		(1.1)	(2.1)	(3.1)	
Sampling Dates:	9/7-9/11				
Sample Size:	110				
Male	Percent of Sample	1.8%	36.4%	8.2%	46.4%
	Number in Sample	2	40	9	51
	Avg. Length(mm) ¹	571	599	560	
Female	Percent of Sample	1.8%	41.8%	10.0%	53.6%
	Number in Sample	2	46	11	59
	Avg. Length(mm) ¹	552	593	580	
Total	Percent of Sample	3.6%	78.2%	18.2%	100.0%
	Number in Sample	4	86	20	110

¹ Length was measured from mid-eye to fork-of-tail.