

3A97-07

Snake River Salmon Counting Tower
Project Summary Report, 1996

by

Peter J. Rob

Alaska Department of Fish & Game
Commercial Fisheries Management and Development Division, AYK Region
333 Raspberry Road
Anchorage, Alaska 99518-1599

Regional Informational Report¹ No. 3A97-07

January 1997

¹The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in formal literature. Consequently, these reports should not be cited without prior approval of the author or the Commercial Fisheries Management and Development Division.

OFFICE OF EQUAL OPPORTUNITY (OEO) STATEMENT

The Alaska Department of Fish and Game conducts all programs and activities free from discrimination on the basis of sex, color, race, religion, national origin, age, marital status, pregnancy, parenthood or disability. For information on alternative formats available for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-4120, (TDD) 1-800-478-3648, or (fax) 907-586-6596. Any person who believes s/he has been discriminated against should write to: ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; or O.E.O., U.S. Department of Interior, Washington, DC 20240.

TABLE OF CONTENTS

List of Tables . . . . .	. ii
List of Figures . . . . .	. iii
Introduction . . . . .	. 1
Objectives. . . . .	. 1
Methods . . . . .	. 1
Results . . . . .	. 2
Discussion . . . . .	. 3
Acknowledgments . . . . .	. 3
Literature Cited . . . . .	. 4
Tables. . . . .	. 5
Figures. . . . .	. 14

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1.	Expanded daily and cumulative Salmon migration past the Snake River counting tower, Norton Sound, 1996.	5
2.	Expanded daily hourly chum salmon migration past the Snake River counting tower, Norton Sound, 1996.	6
3.	Expanded daily hourly pink salmon migration past the Snake River counting tower, Norton Sound, 1996.	7
4.	Expanded daily hourly king salmon migration past the Snake River counting tower, Norton Sound, 1996.	8
5.	Expanded daily hourly coho salmon migration past the Snake River counting tower, Norton Sound, 1996.	9
6.	Reported hourly chum salmon observations at the Snake River counting tower, Norton Sound, 1996.	10
7.	Reported hourly pink salmon observations at the Snake River counting tower, Norton Sound, 1996.	11
8.	Reported hourly king salmon observations at the Snake River counting tower, 1996.	12
9.	Reported hourly coho salmon observations at the Snake River counting tower, 1996.	13

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Area location map of the Snake River counting tower project site, Norton Sound, 1996. . . . .	. 14
2. Cumulative salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 15
3. Daily chum salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 16
4. Cumulative chum salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 16
5. Daily pink salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 17
6. Cumulative pink salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 17
7. Daily king salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 18
8. Cumulative king salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 18
9. Daily coho salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 19
10. Cumulative coho salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 19
11. Diurnal pattern of chum salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 20
12. Diurnal pattern of pink salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 20
13. Diurnal pattern of king salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 21

<u>Figure</u>		<u>Page</u>
14.	Diurnal pattern of coho salmon migration past the Snake River counting tower, Norton Sound, 1996. . . . .	. 21
15.	Chum salmon run-timing past the Snake Rive counting tower, Norton Sound, 1995-1996. . . . .	. 22
16.	Pink salmon run-timing past the Snake Rive counting tower, Norton Sound, 1995-1996. . . . .	. 22
17.	Coho salmon run-timing past the Snake Rive counting tower, Norton Sound, 1995-1996. . . . .	. 23

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 second consecutive year a counting tower has been operated on the Snake River (Rob 1995). 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, king and coho salmon escapement to the Snake River.
2. To establish a logistical base for egg-takes to facilitate rehabilitation of the salmon stocks of the Snake River.

METHODS

The Snake River counting tower camp is located approximately 5 miles 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 15 foot high scaffolding tower was erected on the east bank of the river to serve as an observation platform. A 50 x 8 foot vinyl canvas flash panel was placed on the river bottom directly in front of the tower. A weir to direct the fish over the flash panel was built from the mid-stream end of the flash panel to the opposite bank. This weir was made of livestock fencing and thawfield pipes. An array of 120 volt lights was mounted on the tower to illuminate the flash panel during periods of low light and darkness.

The counting schedule began on 3 July and ended on 22 August. The two person crew counted 18 half-hour counts each day from 12 noon to 0600 hours the following day. A 24 hour count was conducted weekly and one day was taken off 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 counts were then expanded to account for the time periods not counted.

The expanded counts in this report were calculated by first multiplying the half hour counts by two to obtain hourly counts. On the days that the count ran for 24 hours the

crew counted continuously so that the reported counts represent actual observations (not doubled half hour counts). 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, giving expanded hourly counts for the 18 hours of the day off. 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 eighteen 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 days 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 because of high water were linearly interpolated as follows. For a day with the normal 18 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 normal 18 hour count days were missed the count for the two 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. If three such days were missed the count for the middle 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; the count for the first missing day was calculated by adding the counts of each hour of the day before the missed period to the calculated counts of each hour of the middle missing day and dividing the result by two; the count for the third missing day was calculated by adding the counts of each hour of the day following the missed period to the counts of each hour of the calculated missing day and dividing the result by two. Then each 18 hour count was expanded to a 24 hour count by multiplying each days 18 hour total by the nearest 24 hour expansion factor, and adding that number to the 18 hour count for each day.

High water at the end of July prevented the collection and holding of broodstock at the counting tower site.

RESULTS

Table 1 shows the expanded daily and cumulative totals for each salmon species. The reported total hourly counts were: 2,452 chum salmon, 29,810 pink salmon, 4 king salmon, and 898 coho salmon (Tables 6-9). The expanded counts were: 2,772 chum salmon, 44,558 pink salmon, 5 king salmon, and 1,638 coho salmon (Tables 2-5). Dolly Varden were not counted.

Chum salmon were observed on 3 July, the first day of counting. Pink salmon were first observed on 4 July. King salmon were first observed on 10 July. Coho salmon were first observed on 20 July. The daily peak count of 279 chum salmon occurred on 11 July; the daily peak count of 5,313 pink salmon occurred on 20 July; there were two daily peak counts of 2 king salmon on 11 July and 29 July; the peak daily count of 187 coho salmon occurred on 7 August (Table 1).

Most chum salmon returned during the first eighteen days of counting when 94% passed the tower (Table 2 and Figures 3 and 4). Most pink salmon returned during the period from 10 to 26 July when 81% passed the tower (Table 3 and Figures 5 and 6). The count of king salmon occurred during three days of operation, 10-11 July and 29 July (Table 4 and Figures 7 and 8). Most coho salmon passed during the last three weeks of tower operation (Table 5 and Figures 9 and 10).

All species counted exhibited a diurnal pattern of migration past the counting tower. The greatest hourly chum salmon passage occurred during the hour from 0000 to 0100 hours when 18.5% passed the tower. During the eight hour period from 2000 through 0300 hours, 87% of the chum salmon passed the tower (Table 2 and Figure 11). The greatest hourly pink salmon passage occurred during the hour from 0200 to 0300 hours when 15.9% passed the tower. During the eight hour period from 1900 through 0200 hours, 80% of the pink salmon passed the tower (Table 3 and Figure 12). King salmon were only observed during the hours from 1300 to 1400 and 2000 to 2100 hours (Table 4 and Figure 13). The greatest hourly coho salmon passage occurred during the hour from 0300 to 0400 hours when 10.1% passed the tower. During the eight hour period from 2100 through 0400 hours, 65% of the coho salmon passed the tower (Table 5 and Figure 14).

An aerial survey of the Snake River counted 405 chum salmon on 8 July, 1996. The total season expanded tower count of chum salmon was 2,772. The aerial survey counted 15% of the total season expanded tower count of chum salmon. The aerial survey counted 210 chum salmon above the counting tower on 8 July, when the cumulative tower count of chum salmon was 904. The aerial survey counted 23% of the cumulative tower count on 8 July (Table 1).

An aerial survey of the Snake River counted 4,140 pink salmon on 20 July, 1996. The total season expanded tower count of pink salmon was 44,558. The aerial survey counted 9% of the total season expanded tower count of pink salmon. The aerial survey counted 4,020 pink salmon above the counting tower on 20 July, when the cumulative tower count of pink salmon was 27,705. The aerial survey counted 15% of the cumulative tower count on 20 July (Table 1).

An aerial survey of the Snake River counted 398 coho salmon on 27 August, 1996. The total season expanded tower count of coho salmon was 1,638. The aerial survey counted 24% of the total season expanded tower count of coho salmon (Table 1).

DISCUSSION

This was the second consecutive year of operation for the Snake River counting tower project. Bill Cheaney of Kawerak Incorporated supervised the project. Counting began on 3 July and 86 chum salmon were counted that day, indicating that the beginning of the chum salmon escapement was missed this year.

The chum salmon escapement was one week to twelve days earlier in 1996 (Figure 15) and was only 63% of the size of the 1995 escapement (Rob 1995). The even year pink salmon escapement in 1996 was almost two weeks earlier than the odd year escapement in 1995 (Figure 16) The pink salmon escapement in 1995 was 2% of the size of the 1996 escapement (Rob 1995). There was no escapement of king salmon observed in 1995. The coho salmon escapement was about one week earlier in 1996 (Figure 17) and was double the size of 1995 by the end of the counting season (Rob 1995).

The value of a counting tower on this watershed is evident. The salmon escapements documented by the Snake River tower confirm the low numbers of fish returning to the river and also provided fishery managers a valuable tool for assessing the salmon returns to the Nome area watersheds.

ACKNOWLEDGMENTS

The ADF&G thanks Kawerak Incorporated for funding and operating this project. A draft of this report was reviewed by Larry Buklis.

LITERATURE CITED

Rob, P. 1995. Snake River Counting Tower. A cooperative project funded and operated by Kawerak Corporation. Project Summary Report, 1995. Alaska Department of Fish & Game, Commercial Fisheries Management and Development Division, Nome.

Table 1. Expanded daily and cumulative salmon migration past the Snake River counting tower, Norton Sound, 1996.

Date	Daily Chum	Cumulative Chum	Daily Pink	Cumulative Pink	Daily King	Cumulative King	Daily Coho	Cumulative Coho
3-Jul	86	86	0	0	0	0	0	0
4-Jul	226	312	62	62	0	0	0	0
5-Jul	176	488	328	390	0	0	0	0
6-Jul	170	658	418	808	0	0	0	0
7-Jul	22	680	116	924	0	0	0	0
8-Jul	224	904	208	1,132	0	0	0	0
9-Jul	186	1,090	836	1,968	0	0	0	0
10-Jul	245	1,335	2,148	4,116	1	1	0	0
11-Jul	279	1,614	3,215	7,331	2	3	0	0
12-Jul	104	1,718	3,188	10,519	0	3	0	0
13-Jul	84	1,802	1,179	11,698	0	3	0	0
14-Jul	96	1,898	787	12,485	0	3	0	0
15-Jul	48	1,946	533	13,018	0	3	0	0
16-Jul	90	2,036	1,678	14,696	0	3	0	0
17-Jul	163	2,199	3,079	17,775	0	3	0	0
18-Jul	125	2,324	2,539	20,314	0	3	0	0
19-Jul	116	2,440	2,078	22,392	0	3	0	0
20-Jul	158	2,598	5,313	27,705	0	3	16	16
21-Jul	50	2,648	1,268	28,973	0	3	2	18
22-Jul	9	2,657	1,010	29,983	0	3	6	24
23-Jul	33	2,690	2,554	32,537	0	3	14	38
24-Jul	35	2,725	2,353	34,890	0	3	36	74
25-Jul	28	2,753	1,905	36,795	0	3	26	100
26-Jul	28	2,781	1,260	38,055	0	3	20	120
27-Jul	22	2,803	874	38,929	0	3	10	130
28-Jul	22	2,825	479	39,408	0	3	12	142
29-Jul	34	2,859	418	39,826	2	5	19	161
30-Jul	1	2,860	430	40,256	0	5	19	180
31-Jul	1	2,861	488	40,744	0	5	35	215
1-Aug	0	2,861	452	41,196	0	5	38	253
2-Aug	0	2,861	508	41,704	0	5	53	306
3-Aug	1	2,862	535	42,239	0	5	68	374
4-Aug	0	2,862	519	42,758	0	5	70	444
5-Aug	0	2,862	580	43,338	0	5	141	585
6-Aug	-5	2,857	140	43,478	0	5	71	656
7-Aug	-20	2,837	215	43,693	0	5	187	843
8-Aug	-20	2,817	247	43,940	0	5	148	991
9-Aug	-50	2,767	194	44,134	0	5	46	1,037
10-Aug	5	2,772	93	44,227	0	5	46	1,083
11-Aug	-1	2,771	24	44,251	0	5	24	1,107
12-Aug	0	2,771	34	44,285	0	5	67	1,174
13-Aug	0	2,771	71	44,356	0	5	62	1,236
14-Aug	0	2,771	71	44,427	0	5	52	1,288
15-Aug	0	2,771	34	44,461	0	5	64	1,352
16-Aug	0	2,771	27	44,488	0	5	90	1,442
17-Aug	0	2,771	7	44,495	0	5	66	1,508
18-Aug	0	2,771	15	44,510	0	5	40	1,548
19-Aug	1	2,772	11	44,521	0	5	24	1,572
20-Aug	0	2,772	15	44,536	0	5	20	1,592
21-Aug	0	2,772	12	44,548	0	5	30	1,622
22-Aug	0	2,772	10	44,558	0	5	16	1,638

Table 2. Expanded daily hourly chum salmon migration past the Snake River counting tower, Norton Sound, 1996.

Shaded areas indicate hours not counted. Numbers in shaded 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	
3-Jul								6	0	0	0	34	68	0	18	0	0	0	0	0	86	3.1%
4-Jul								0	0	0	0	0	150	36	0	0	0	0	0	0	226	8.2%
5-Jul	72	18	20	34	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	176	6.3%
6-Jul	24	30	74	28	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	170	6.1%
7-Jul	2	10	0	6	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	22	0.8%
8-Jul	0	0	8	22	30	0	0	0	0	0	0	0	0	0	0	22	14	108	20	224	8.1%	
9-Jul	4	74	50	22	0	0	0	0	0	0	0	0	0	0	0	0	0	4	32	186	6.7%	
10-Jul	100	6	22	4	0	0	0	0	0	0	0	0	0	0	0	90	0	2	21	245	8.8%	
11-Jul	52	9	29	2	-1	-2	0	0	0	0	0	0	0	0	0	180	0	0	10	279	10.1%	
12-Jul	4	12	36	0	-2	-4	0	0	0	0	0	0	0	0	0	0	6	44	8	104	3.8%	
13-Jul	24	18	36	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	84	3.0%	
14-Jul	-2	6	4	12	0	2	0	0	0	0	0	0	4	0	6	0	18	36	12	96	3.5%	
15-Jul	4	-1	11	9	24	0	0	0	0	0	0	1	0	0	0	0	0	0	0	48	1.7%	
16-Jul	0	4	12	24	0	0	0	0	0	0	0	0	0	0	0	0	2	22	6	90	3.2%	
17-Jul	92	6	30	0	0	0	0	0	1	0	0	1	0	0	0	10	2	11	10	163	5.9%	
18-Jul	54	16	17	9	6	3	0	0	2	0	0	2	0	0	0	0	2	0	14	125	4.5%	
19-Jul	16	26	4	18	12	6	0	0	0	0	0	0	0	0	0	0	2	12	20	116	4.2%	
20-Jul	28	60	44	0	2	0	0	0	0	0	0	0	0	16	6	0	2	0	0	158	5.7%	
21-Jul	2	16	22	6	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	50	1.8%	
22-Jul	2	1	-1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	9	0.3%	
23-Jul	2	6	6	2	-4	1	0	0	0	0	0	2	0	0	0	0	2	2	14	33	1.2%	
24-Jul	6	18	-2	2	-8	-2	0	1	-1	2	1	1	2	0	0	1	2	2	10	35	1.3%	
25-Jul	5	14	-1	2	-6	-2	0	1	-1	3	1	1	2	0	0	1	1	1	6	28	1.0%	
26-Jul	3	10	1	1	-3	-1	0	2	-2	5	2	2	2	0	0	2	1	1	2	28	1.0%	
27-Jul	2	6	3	1	-1	-1	0	2	-2	6	2	2	2	0	2	2	0	0	2	22	0.8%	
28-Jul	0	2	4	0	2	0	0	0	0	0	0	0	0	2	2	0	0	2	8	22	0.8%	
29-Jul	1	0	0	0	0	0	0	0	0	-1	0	0	-1	8	5	7	8	2	5	34	1.2%	
30-Jul	4	0	-2	0	-1	0	0	0	0	0	0	0	0	-2	0	2	0	0	0	1	0.0%	
31-Jul	4	-2	0	0	-2	0	0	0	1	0	0	0	0	-2	0	2	0	0	0	1	0.0%	
1-Aug	3	-2	0	0	-2	0	0	0	1	0	0	0	0	-2	0	2	0	0	0	0	0.0%	
2-Aug	3	-2	0	0	-2	0	0	0	1	0	0	0	0	-1	0	1	0	0	0	0	0.0%	
3-Aug	2	-1	0	0	-1	0	0	0	1	0	0	0	0	-1	0	1	0	0	0	1	0.0%	
4-Aug	1	-1	0	0	-1	0	0	0	1	0	0	0	0	-1	0	1	0	0	0	0	0.0%	
5-Aug	1	-1	0	0	-1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.0%	
6-Aug	0	0	0	0	0	0	-6	0	1	0	0	0	0	0	0	0	0	0	0	-5	-0.2%	
7-Aug	0	0	0	2	0	0	-24	0	1	0	0	0	0	0	0	1	0	0	0	-20	-0.7%	
8-Aug	0	0	1	1	0	0	-24	0	0	0	0	0	0	0	0	2	0	0	0	-20	-0.7%	
9-Aug	0	0	2	0	0	0	-60	0	4	0	0	0	0	0	0	0	2	2	0	-50	-1.8%	
10-Aug	-2	0	0	0	0	0	6	0	1	0	0	-2	0	0	0	0	2	0	0	5	0.2%	
11-Aug	0	0	0	0	0	0	3	0	-2	0	0	-4	0	0	0	0	2	0	0	-1	0.0%	
12-Aug	0	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	0.0%	
14-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
15-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
16-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
17-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
18-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
19-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.0%	
20-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
21-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
22-Aug	0	0	0	0	0	0	End of counting season														0	0.0%
Total =	513	358	430	208	61	7	-105	12	8	15	6	38	231	55	40	353	66	254	222	2,772		
	18.5%	12.9%	15.5%	7.5%	2.2%	0.3%	-3.8%	0.4%	0.3%	0.5%	0.2%	1.4%	8.3%	2.0%	1.4%	12.7%	2.4%	9.2%	8.0%			

Table 3. Expanded daily hourly pink salmon migration past the Snake River counting tower, Norton Sound, 1996.

Shaded areas indicate hours not counted. Numbers in shaded 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	
3-Jul													0	0	0	0	0	0	0	0	0	0.0%
4-Jul								0	0	0	0	0	0	0	0	0	10	10	42	62	0.1%	
5-Jul	0	54	70	110	26	4	0	0	2	0	0	0	0	0	0	0	5	5	52	328	0.7%	
6-Jul	16	76	102	118	108	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	418	0.9%
7-Jul	14	30	10	22	36	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	116	0.3%
8-Jul	0	0	26	10	36	0	0	0	0	0	0	0	0	0	4	8	16	88	20	208	0.5%	
9-Jul	14	198	160	48	4	0	0	0	0	0	0	0	0	0	0	0	0	28	384	836	1.9%	
10-Jul	926	190	100	24	2	0	0	0	0	0	0	0	0	0	0	582	15	50	259	2,148	4.8%	
11-Jul	528	464	777	34	-12	-6	30	0	0	0	0	0	0	0	0	1,164	30	72	134	3,215	7.2%	
12-Jul	130	738	1,454	44	-26	-12	30	0	0	0	0	0	0	0	10	110	312	220	178	3,188	7.2%	
13-Jul	268	238	690	96	-2	-18	11	0	0	0	-2	14	0	2	-68	-48	-10	0	8	1,179	2.6%	
14-Jul	-52	8	24	84	-6	-6	7	0	2	0	0	0	36	2	12	20	154	348	154	787	1.8%	
15-Jul	169	10	61	66	122	0	5	-1	0	0	0	0	39	26	2	11	2	0	21	533	1.2%	
16-Jul	26	76	146	108	36	6	18	0	0	0	0	0	-4	8	8	386	96	678	92	1,678	3.8%	
17-Jul	1,144	182	666	2	0	2	29	0	1	-1	1	20	21	10	6	226	140	362	268	3,079	6.9%	
18-Jul	812	306	367	68	73	45	24	0	2	-2	2	40	46	12	4	66	184	46	444	2,539	5.7%	
19-Jul	480	430	68	134	146	88	292	24	28	54	24	26	48	0	0	0	2	44	190	2,078	4.7%	
20-Jul	436	878	658	84	14	64	747	26	10	10	14	14	10	276	1,136	290	384	122	140	5,313	11.9%	
21-Jul	64	272	382	62	4	24	178	10	4	10	8	6	48	2	102	42	50	0	0	1,268	2.8%	
22-Jul	4	-53	93	18	9	34	142	7	4	35	0	22	18	102	42	74	79	183	197	1,010	2.3%	
23-Jul	288	416	330	-15	-14	-12	359	16	24	30	20	14	100	32	128	174	-16	98	582	2,554	5.7%	
24-Jul	358	678	80	-48	-36	-58	331	24	36	40	45	27	91	38	100	134	-4	80	439	2,353	5.3%	
25-Jul	275	517	68	-38	-34	-44	268	32	47	49	70	40	82	43	71	93	8	62	296	1,905	4.3%	
26-Jul	193	356	55	-28	-31	-29	3	40	59	59	95	53	73	49	43	53	20	44	153	1,260	2.8%	
27-Jul	112	195	43	-18	-29	-15	2	48	70	68	120	66	64	54	14	12	32	26	10	874	2.0%	
28-Jul	30	34	30	-8	-26	0	1	28	34	28	18	42	66	28	36	30	26	34	48	479	1.1%	
29-Jul	99	39	0	0	0	0	1	4	12	9	11	13	13	62	21	26	35	18	55	418	0.9%	
30-Jul	82	72	88	2	3	2	1	18	10	18	20	8	40	16	22	2	2	10	14	430	1.0%	
31-Jul	128	34	68	4	6	4	1	20	9	21	25	11	33	22	33	5	10	27	27	488	1.1%	
1-Aug	101	28	57	6	12	4	1	21	8	21	25	11	33	22	33	5	10	27	27	452	1.0%	
2-Aug	101	28	57	6	12	4	1	22	6	24	30	14	25	28	43	8	17	43	39	508	1.1%	
3-Aug	74	22	46	8	18	4	1	23	6	27	35	17	18	34	54	11	25	60	52	535	1.2%	
4-Aug	47	16	35	10	24	4	22	23	5	27	35	17	18	34	54	11	25	60	52	519	1.2%	
5-Aug	47	16	35	10	24	4	25	25	4	30	40	20	10	40	64	14	32	76	64	580	1.3%	
6-Aug	20	10	23	11	30	3	6	28	2	-8	-5	3	0	0	10	-4	3	8	2	140	0.3%	
7-Aug	28	22	50	18	8	2	9	27	9	-3	-3	5	10	0	11	11	4	4	3	215	0.5%	
8-Aug	21	24	54	14	4	1	11	28	16	2	0	6	20	0	12	26	4	0	4	247	0.6%	
9-Aug	14	26	58	10	0	0	8	4	16	8	8	6	2	0	6	2	0	16	10	194	0.4%	
10-Aug	24	16	20	0	0	0	4	6	10	3	-4	-2	2	-2	0	10	6	0	0	93	0.2%	
11-Aug	6	4	6	6	-6	4	6	8	4	-2	-16	-10	2	6	-2	-4	12	4	-4	24	0.1%	
12-Aug	4	5	7	2	1	0	7	1	0	8	0	2	-1	0	-2	0	-2	1	1	34	0.1%	
13-Aug	4	8	2	-2	0	2	15	4	0	4	0	6	6	6	2	2	2	6	4	71	0.2%	
14-Aug	4	14	2	2	6	2	15	-1	0	3	3	0	7	4	3	1	2	1	3	71	0.2%	
15-Aug	2	7	2	2	6	-2	7	-6	0	2	6	-6	8	2	4	0	2	-4	2	34	0.1%	
16-Aug	0	0	2	2	6	-6	5	0	0	2	0	0	0	10	2	0	-4	8	0	27	0.1%	
17-Aug	-4	-2	2	4	-2	6	1	-2	0	0	0	0	0	-2	0	0	0	2	4	7	0.0%	
18-Aug	2	-4	-2	2	6	0	3	0	0	2	2	4	-2	0	0	0	2	0	0	15	0.0%	
19-Aug	-2	0	2	1	0	3	2	-1	2	0	0	0	0	0	2	0	2	0	0	11	0.0%	
20-Aug	0	-6	0	0	4	2	3	2	0	0	0	0	0	2	6	0	0	0	2	15	0.0%	
21-Aug	-4	2	0	4	0	4	2	0	0	0	0	0	0	0	0	0	-2	6	0	12	0.0%	
22-Aug	2	2	-4	10	0	0	End of counting season														10	0.0%
Total =	7,033	6,676	7,070	1,109	562	114	2,632	506	442	578	627	509	982	970	2,028	3,553	1,722	2,973	4,472	44,558		
	15.8%	15.0%	15.9%	2.5%	1.3%	0.3%	5.9%	1.1%	1.0%	1.3%	1.4%	1.1%	2.2%	2.2%	4.6%	8.0%	3.9%	6.7%	10.0%			

Table 4. Expanded daily hourly king salmon migration past the Snake River counting tower, Norton Sound, 1996.

Shaded areas indicate hours not counted. Numbers in shaded 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	
3-Jul														0	0	0	0	0	0	0	0	0.0%
4-Jul								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
5-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
6-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
7-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
8-Jul	0	0	0	0	0	0	0	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	0.0%
10-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	20.0%
11-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	40.0%
12-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
13-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
14-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
15-Jul	0	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	0.0%
17-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
18-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
19-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
20-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
21-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
22-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
23-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
24-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
25-Jul	0	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	0.0%
27-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
28-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
29-Jul	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	40.0%
30-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
31-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
1-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
2-Aug	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
4-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
5-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
6-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
7-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
8-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
9-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
10-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
11-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
12-Aug	0	0	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	0.0%
14-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
15-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
16-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
17-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
18-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
19-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
20-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
21-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
22-Aug	0	0	0	0	0	0	End of counting season					0	0	0	0	0	3	0	0	0	0	0.0%
Total =	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	3	0	0	0	0	5	
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%	0.0%	0.0%	0.0%	0.0%		

Table 5. Expanded daily hourly coho salmon migration past the Snake River counting tower, Norton Sound, 1996.

Shaded areas indicate hours not counted. Numbers in shaded 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	
3-Jul													0	0	0	0	0	0	0	0	0	0.0%
4-Jul								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
5-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
6-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
7-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
8-Jul	0	0	0	0	0	0	0	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	0.0%
10-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
11-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
12-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
13-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
14-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
15-Jul	0	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	0.0%
17-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
18-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
19-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
20-Jul	0	0	4	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	4	16	1.0%
21-Jul	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0.1%
22-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	0.4%
23-Jul	4	0	0	0	0	0	0	0	0	0	0	2	2	0	0	2	0	2	2	2	14	0.9%
24-Jul	10	16	0	0	0	0	0	0	0	0	0	2	2	0	0	2	0	2	2	2	36	2.2%
25-Jul	8	12	0	0	1	0	0	0	0	0	0	1	1	0	0	1	0	1	1	1	26	1.6%
26-Jul	6	8	0	0	1	0	0	0	0	0	0	1	1	0	0	1	0	1	1	1	20	1.2%
27-Jul	4	4	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.6%
28-Jul	2	0	0	0	2	0	0	0	0	0	0	2	0	0	2	2	0	2	0	0	12	0.7%
29-Jul	1	1	0	0	0	0	0	0	0	1	0	0	0	2	2	3	4	1	4	4	19	1.2%
30-Jul	6	4	4	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	1.2%
31-Jul	0	0	8	6	2	2	0	1	1	0	0	0	0	0	1	2	4	5	3	35	2.1%	
1-Aug	1	0	8	6	3	2	0	1	2	0	0	0	0	0	1	2	4	5	3	38	2.3%	
2-Aug	1	0	8	6	3	2	0	1	3	0	0	0	0	0	2	4	8	10	5	53	3.2%	
3-Aug	1	0	7	6	4	2	0	1	3	0	0	0	0	0	3	6	12	15	8	68	4.2%	
4-Aug	2	0	6	6	5	2	0	1	4	0	0	0	0	0	3	6	12	15	8	70	4.3%	
5-Aug	2	0	6	6	5	2	55	2	5	0	0	0	0	0	4	8	16	20	10	141	8.6%	
6-Aug	2	0	5	5	5	1	28	2	6	5	2	0	0	0	1	9	0	0	0	71	4.3%	
7-Aug	8	-4	16	30	30	0	73	2	3	3	1	0	0	8	2	1	14	0	0	187	11.4%	
8-Aug	7	1	10	15	17	0	58	2	0	0	0	0	0	16	4	0	18	0	0	148	9.0%	
9-Aug	6	6	4	0	4	0	18	0	0	0	0	2	0	0	0	0	2	4	0	46	2.8%	
10-Aug	10	4	2	4	2	2	18	0	0	1	0	1	0	2	-2	0	2	0	0	46	2.8%	
11-Aug	4	2	0	0	0	0	10	0	0	2	0	0	0	0	0	0	0	2	4	24	1.5%	
12-Aug	5	7	6	4	3	3	2	0	1	0	0	1	0	1	4	7	1	2	20	67	4.1%	
13-Aug	6	14	4	4	6	0	2	0	6	2	0	0	0	0	0	2	6	2	8	62	3.8%	
14-Aug	6	4	2	6	4	2	2	0	4	2	0	0	0	1	3	1	4	6	5	52	3.2%	
15-Aug	5	6	4	12	6	3	2	0	2	2	0	0	0	2	6	0	2	10	2	64	3.9%	
16-Aug	4	8	6	18	8	4	0	4	6	-8	0	-4	2	2	10	12	4	6	8	90	5.5%	
17-Aug	6	16	12	8	6	4	0	0	0	0	4	6	0	0	0	0	0	0	4	66	4.0%	
18-Aug	14	4	6	0	2	6	0	0	0	0	0	0	0	0	2	2	0	0	4	40	2.4%	
19-Aug	1	2	1	10	1	0	0	0	0	0	0	0	0	0	2	1	6	0	0	24	1.5%	
20-Aug	6	4	0	0	2	2	0	0	0	0	0	0	0	0	0	0	2	4	0	20	1.2%	
21-Aug	6	8	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8	30	1.8%	
22-Aug	6	0	0	8	2	0	End of counting season										16	1.0%				
Total =	150	127	131	165	127	40	268	17	46	10	7	14	10	38	53	66	130	119	120	1,638		
	9.2%	7.8%	8.0%	10.1%	7.8%	2.4%	16.4%	1.0%	2.8%	0.6%	0.4%	0.9%	0.6%	2.3%	3.2%	4.0%	7.9%	7.3%	7.3%			

Table 6. Reported hourly chum salmon observations at the Snake River counting tower, Norton Sound, 1996

Shaded 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	
3-Jul																		68	0	18	0	0	0	0	86	3.5%	
4-Jul													6	0	0	0	34	150	36	0	0	0	0	0	226	9.2%	
5-Jul	72	18	20	34	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	176	7.2%	
6-Jul	24	30	74	28	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	170	6.9%	
7-Jul	2	10	0	6	0	0							0	0	0	0	0	0	2	2	0	0	0	0	22	0.9%	
8-Jul	0	0	8	22	30	0							0	0	0	0	0	0	0	0	22	14	108	20	224	9.1%	
9-Jul	4	74	50	22	0					0	0	0	0	0	0	0	0	0	0	0	0	0	4	32	186	7.6%	
10-Jul	100	6	22	4	0	0	0	0	2																134	5.5%	
11-Jul													0	0	0	0	0	0	0	0	180	0	0	10	190	7.7%	
12-Jul	4	12	36	0	-2	-4							0	0	0	0	0	0	0	0	0	6	44	8	104	4.2%	
13-Jul	24	18	36	0	0	0							0	0	0	0	0	0	0	0	6	0	0	0	84	3.4%	
14-Jul	-2	6	4	12	0	2							0	0	0	0	0	4	0	6	0	16	36	12	96	3.9%	
15-Jul	4	-1	11	9	24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	48	2.0%	
16-Jul	0	4	12	24	0	0							0	0	0	0	0	0	0	0	20	2	22	6	90	3.7%	
17-Jul	92	6	30	0	0	0																			128	5.2%	
18-Jul													0	2	0	0	2	0	0	0	0	2	0	14	20	0.8%	
19-Jul	16	26	4	18	12	6							0	0	0	0	0	0	0	0	0	2	12	20	116	4.7%	
20-Jul	28	60	44	0	2	0							0	0	0	0	0	16	6	0	2	0	0	0	158	6.4%	
21-Jul	2	16	22	6	0	4							0	0	0	0	0	0	0	0	0	0	0	0	50	2.0%	
22-Jul	2	1	-1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	9	0.4%	
23-Jul	2	6	6										0	0	0	0	0	2	0	0	0	2	2	14	34	1.4%	
24-Jul	6	18	-2	2	-8	-2																			14	0.6%	
25-Jul																									0	0.0%	
26-Jul																									0	0.0%	
27-Jul												-2	2	-2	6	2	2	2	0	0	2	0	0	-2	10	0.4%	
28-Jul	0	2	4	0	2	0							0	0	0	0	0	0	2	2	0	0	2	8	22	0.9%	
29-Jul	1	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	-1	8	5	7	8	2	5	34	1.4%	
30-Jul	4	0	-2										0	0	0	0	0	0	-2	0	2	0	0	0	2	0.1%	
31-Jul	4	-2	0	0	-2	0																			0	0.0%	
1-Aug																									0	0.0%	
2-Aug																									0	0.0%	
3-Aug																									0	0.0%	
4-Aug																									0	0.0%	
5-Aug																0	0	0	0	0	0	0	0	0	0	0	0.0%
6-Aug	0	0	0	0	0	0	0	1	0					1	0	0	0	0	0	0	0	0	0	0	2	0.1%	
7-Aug	0	0	0	2	0	0																			2	0.1%	
8-Aug													0	0	0	0	0	0	0	0	2	0	0	0	2	0.1%	
9-Aug	0	0	2	0	0	0							0	4	0	0	0	0	0	0	0	2	2	0	10	0.4%	
10-Aug	-2	0	0	0	0	0	0	0	0	0	2	0	4						0	0	0	2	0	0	6	0.2%	
11-Aug	0	0	0	0	0	0							0	-2	0	0	-4	0	0	0	0	2	0	0	-4	-0.2%	
12-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%
13-Aug	0	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	0	0																			0	0	0.0%
15-Aug													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
16-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
17-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
18-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
19-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.0%	
20-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
21-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
22-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total	387	310	380	190	78	9	0	0	1	2	0	2	8	3	5	2	35	225	62	40	241	60	237	173	2,452	100.0%	
	15.8%	12.6%	15.5%	7.7%	3.2%	0.4%	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%	0.3%	0.1%	0.2%	0.1%	1.4%	9.2%	2.5%	1.6%	9.8%	2.4%	9.7%	7.1%			

Table 7. Reported hourly pink salmon observations at the Snake River counting tower, Norton Sound, 1996

Shaded 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	
3-Jul													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
4-Jul													0	0	0	0	0	0	0	0	0	0	10	10	42	62	0.2%
5-Jul	0	54	70	110	26	4	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	52	318	1.1%	
6-Jul	16	76	102	118	108	-2							0	0	0	0	0	0	0	0	0	0	0	0	0	418	1.4%
7-Jul	14	30	10	22	36	2							0	0	0	0	0	0	2	0	0	0	0	0	116	0.4%	
8-Jul	0	0	26	10	36	0							0	0	0	0	0	0	0	4	8	16	88	20	208	0.7%	
9-Jul	14	198	160	48	4					0	0	0	0	0	0	0	0	0	0	0	0	0	28	384	836	2.8%	
10-Jul	926	190	100	24	2	0	0	8	0																1,250	4.2%	
11-Jul													0	0	0	0	0	0	0	0	1,164	30	72	134	1,400	4.7%	
12-Jul	130	738	1,454	44	-26	-12							0	0	0	0	0	0	0	10	110	312	220	178	3,158	10.6%	
13-Jul	268	238	690	96	-2	-18							0	0	0	-2	14	0	2	-68	-48	-10	0	8	1,168	3.9%	
14-Jul	-52	8	24	84	-6	-6							0	2	0	0	0	36	2	12	20	154	348	154	780	2.6%	
15-Jul	169	10	61	66	122	0	2	2	1	0	0	0	-1	0	0	0	0	39	26	2	11	2	0	21	533	1.8%	
16-Jul	26	76	146	108	36	6							0	0	0	0	0	-4	8	8	386	96	678	92	1,662	5.6%	
17-Jul	1,144	182	666	2	0	2																				1,996	6.7%
18-Jul													0	2	-2	2	40	46	12	4	66	184	46	444	844	2.8%	
19-Jul	480	430	68	134	146	88							24	28	54	24	26	48	0	0	0	2	44	190	1,786	6.0%	
20-Jul	436	878	658	84	14	64							26	10	10	14	14	10	276	1,136	290	384	122	140	4,566	15.3%	
21-Jul	64	272	382	62	4	24							10	4	10	8	6	48	2	102	42	50	0	0	1,090	3.7%	
22-Jul	4	-53	93	18	9	34	79	24	39	0	0	0	7	4	35	0	22	18	102	42	74	79	183	197	1,010	3.4%	
23-Jul	288	416	330										16	24	30	20	14	100	32	128	174	-16	98	582	2,236	7.5%	
24-Jul	356	678	80	-48	-36	-58																				972	3.3%
25-Jul																										0	0.0%
26-Jul																										0	0.0%
27-Jul											0		48	70	68	120	66	64	54	14	12	32	26	10	584	2.0%	
28-Jul	30	34	30	-8	-26	0							28	34	28	18	42	66	28	36	30	26	34	48	478	1.6%	
29-Jul	99	39	0	0	0	0	0	0	0	0	0	1	4	12	9	11	13	13	62	21	26	35	18	55	418	1.4%	
30-Jul	82	72	88										18	10	18	20	8	40	16	22	2	2	10	14	422	1.4%	
31-Jul	128	34	68	4	6	4																				244	0.8%
1-Aug																										0	0.0%
2-Aug																										0	0.0%
3-Aug																										0	0.0%
4-Aug																										0	0.0%
5-Aug																30	40	20	10	40	64	14	32	76	64	390	1.3%
6-Aug	20	10	23	11	30	3	5	-2	13				2	-8	-5	3	0	0	10	-4	3	8	8	2	124	0.4%	
7-Aug	28	22	50	18	8	2																				128	0.4%
8-Aug													28	16	2	0	6	20	0	12	26	4	0	4	118	0.4%	
9-Aug	14	26	58	10	0	0							4	16	8	8	6	2	0	6	2	0	16	10	186	0.6%	
10-Aug	24	16	20	0	0	0	4	-4	8	0	0	-4							-2	0	10	6	0	0	78	0.3%	
11-Aug	6	4	6	6	-6	4							8	4	-2	-16	-10	2	6	-2	-4	12	4	-4	18	0.1%	
12-Aug	4	5	7	2	1	0	3	2	0	-1	1	2	1	0	8	0	2	-1	0	-2	0	-2	1	1	34	0.1%	
13-Aug	4	8	2	-2	0	2							4	0	4	0	6	6	6	2	2	2	6	4	56	0.2%	
14-Aug	4	14	2	2	6	2																				30	0.1%
15-Aug													-6	0	2	6	-6	8	2	4	0	2	-4	2	10	0.0%	
16-Aug	0	0	2	2	6	-6							0	0	2	0	0	0	10	2	0	-4	8	0	22	0.1%	
17-Aug	-4	-2	2	4	-2	6							-2	0	0	0	0	0	-2	0	0	0	2	4	6	0.0%	
18-Aug	2	-4	-2	2	6	0							0	0	2	2	4	-2	0	0	0	2	0	0	12	0.0%	
19-Aug	-2	0	2	1	0	3	0	0	2	0	0	0	-1	2	0	0	0	0	0	2	0	2	0	0	11	0.0%	
20-Aug	0	-6	0	0	4	2							2	0	0	0	0	0	2	6	0	0	0	2	12	0.0%	
21-Aug	-4	2	0	4	0	4							0	0	0	0	0	0	0	0	0	-2	6	0	10	0.0%	
22-Aug	2	2	-4	10	0	0	End of counting season															10	10	0.0%			
Total	4,720	4,697	5,474	1,048	506	154	93	30	63	-1	1	-1	218	242	308	270	296	569	686	1,577	2,413	1,445	2,148	2,854	29,810	100.0%	
	15.8%	15.8%	18.4%	3.5%	1.7%	0.5%	0.3%	0.1%	0.2%	0.0%	0.0%	0.0%	0.7%	0.8%	1.0%	0.9%	1.0%	1.9%	2.3%	5.3%	8.1%	4.8%	7.2%	9.6%			

Table 8. Reported hourly king salmon observations at the Snake River counting tower, Norton Sound, 1996

Shaded 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	
3-Jul													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
4-Jul													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
5-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%
6-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
7-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
8-Jul	0	0	0	0	0	0							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	0.0%
10-Jul	0	0	0	0	0	0	0	0	0																	0	0.0%
11-Jul													0	0	0	0	0	0	0	0	0	2	0	0	0	2	50.0%
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	0	0	0	0	0	0	0	0	0.0%
15-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%
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%
18-Jul													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	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	0	0	0	0																				0	0.0%
25-Jul																										0	0.0%
26-Jul																										0	0.0%
27-Jul												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	2	0	0	0	0	0	0	0	0	0	0	0	2	50.0%
30-Jul	0	0	0										0	0	0	0	0	0	0	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%
2-Aug																										0	0.0%
3-Aug																										0	0.0%
4-Aug																										0	0.0%
5-Aug																0	0	0	0	0	0	0	0	0	0	0	0.0%
6-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%
7-Aug	0	0	0	0	0	0																				0	0.0%
8-Aug													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
9-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
10-Aug	0	0	0	0	0	0	0	0	0	0	0	0														0	0.0%
11-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
12-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%
13-Aug	0	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	0	0																				0	0.0%
15-Aug													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
16-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
17-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
18-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
19-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%
20-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
21-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
22-Aug	0	0	0	0	0	0	End of counting season																		0	0.0%	
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	4	100.0%

Table 9. Reported hourly coho salmon observations at the Snake River counting tower, Norton Sound, 1996

Shaded 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	
3-Jul																		0	0	0	0	0	0	0	0	0	0.0%
4-Jul													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
5-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%
6-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
7-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
8-Jul	0	0	0	0	0	0							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	0.0%
10-Jul	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%
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	0	0	0	0	0	0	0	0	0.0%
15-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%
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%
18-Jul													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	4	0	0	0							0	0	0	0	0	0	4	4	0	0	0	0	4	16	1.8%
21-Jul	0	0	0	0	0	0							0	0	0	0	0	2	0	0	0	0	0	0	0	2	0.2%
22-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	6	6	0.7%
23-Jul	4	0	0										0	0	0	0	0	2	2	0	0	2	0	2	2	14	1.6%
24-Jul	10	16	0	0	0	0																				26	2.9%
25-Jul																										0	0.0%
26-Jul																										0	0.0%
27-Jul												0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
28-Jul	2	0	0	0	2	0							0	0	0	0	2	0	0	2	2	0	2	0	0	12	1.3%
29-Jul	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	2	3	4	1	4	4	19	2.1%
30-Jul	6	4	4											0	0	0	0	0	0	0	0	0	0	0	0	14	1.6%
31-Jul	0	0	8	6	2	2																				18	2.0%
1-Aug																										0	0.0%
2-Aug																										0	0.0%
3-Aug																										0	0.0%
4-Aug																										0	0.0%
5-Aug																0	0	0	0	0	4	8	16	20	10	58	6.5%
6-Aug	2	0	5	5	5	1	0	3	0					6	5	2	0	0	0	0	1	9	0	0	0	44	4.9%
7-Aug	8	-4	16	30	30	0																				80	8.9%
8-Aug													2	0	0	0	0	0	16	4	0	18	0	0	0	40	4.5%
9-Aug	6	6	4	0	4	0							0	0	0	0	2	0	0	0	0	2	4	0	0	28	3.1%
10-Aug	10	4	2	4	2	2	6	0	2	-2	4	8							2	-2	0	2	0	0	0	44	4.9%
11-Aug	4	2	0	0	0	0							0	0	2	0	0	0	0	0	0	0	2	4	4	14	1.6%
12-Aug	5	7	6	4	3	3	2	0	0	0	0	0	0	1	0	0	1	0	1	4	7	1	2	20	67	7.5%	
13-Aug	6	14	4	4	6	0								0	6	2	0	0	0	0	0	2	6	2	8	60	6.7%
14-Aug	6	4	2	6	4	2																				24	2.7%
15-Aug													0	2	2	0	0	0	2	6	0	2	10	2	2	26	2.9%
16-Aug	4	8	6	18	8	4							4	6	-8	0	-4	2	2	10	12	4	6	8	90	10.0%	
17-Aug	6	16	12	8	6	4							0	0	0	4	6	0	0	0	0	0	0	4	66	7.3%	
18-Aug	14	4	6	0	2	6							0	0	0	0	0	0	0	2	2	0	0	4	40	4.5%	
19-Aug	1	2	1	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	6	0	0	24	2.7%	
20-Aug	6	4	0	0	2	2							0	0	0	0	0	0	0	0	0	2	4	0	20	2.2%	
21-Aug	6	8	2	2	0	0							0	0	0	0	0	0	0	0	0	0	4	8	30	3.3%	
22-Aug	6	0	0	8	2	0	End of counting season																		16	1.8%	
Total	113	96	82	105	79	26	8	3	2	-2	4	8	6	21	4	6	9	6	29	38	40	72	59	84	898	100.0%	
	12.6%	10.7%	9.1%	11.7%	8.8%	2.9%	0.9%	0.3%	0.2%	-0.2%	0.4%	0.9%	0.7%	2.3%	0.4%	0.7%	1.0%	0.7%	3.2%	4.2%	4.5%	8.0%	6.6%	9.4%			

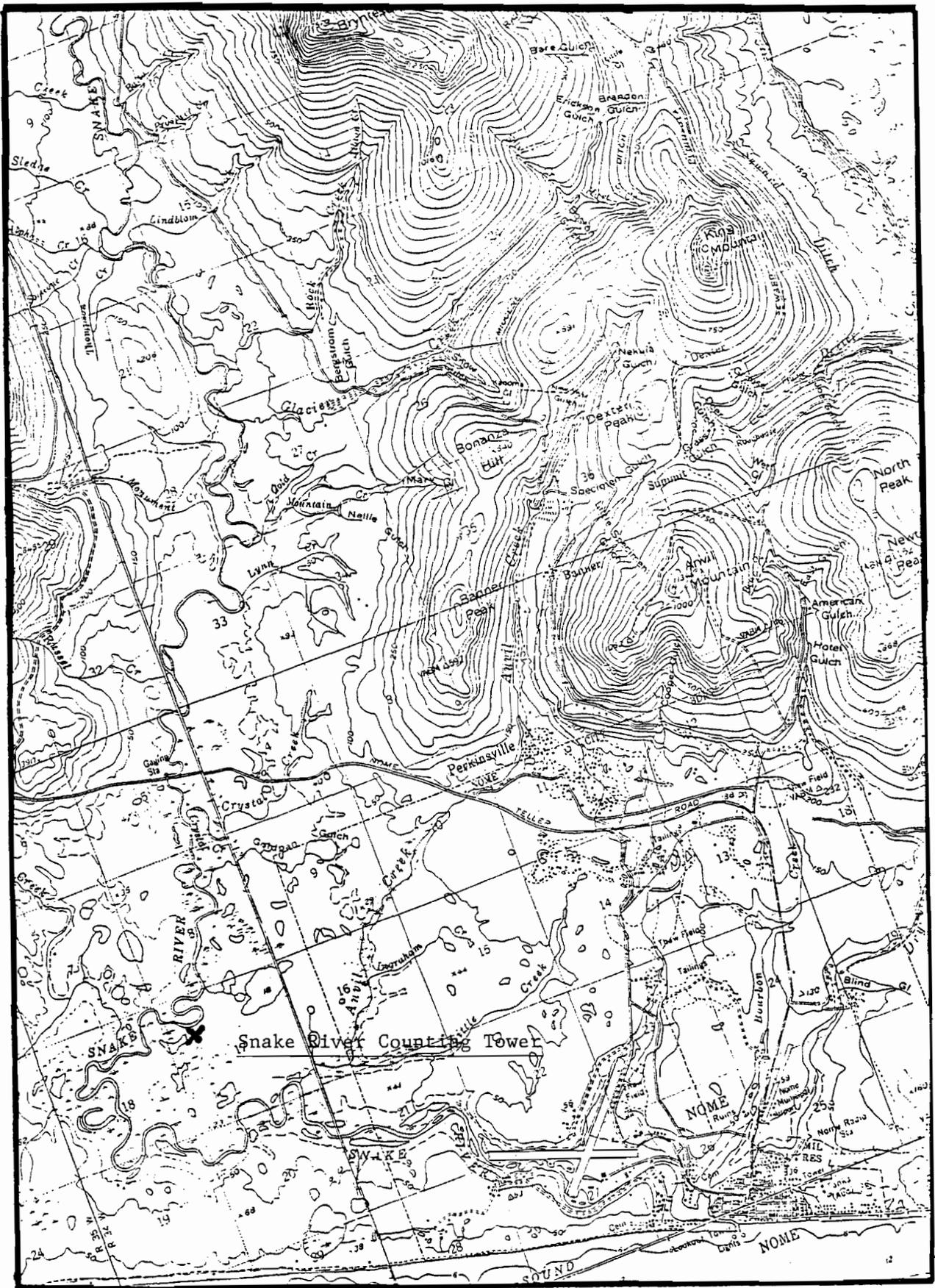


Figure 1. Area location map of the Snake River counting tower project site, Norton Sound, 1996.

Figure 2. Cumulative migration of all species past the Snake River counting tower, Norton Sound, 1996.

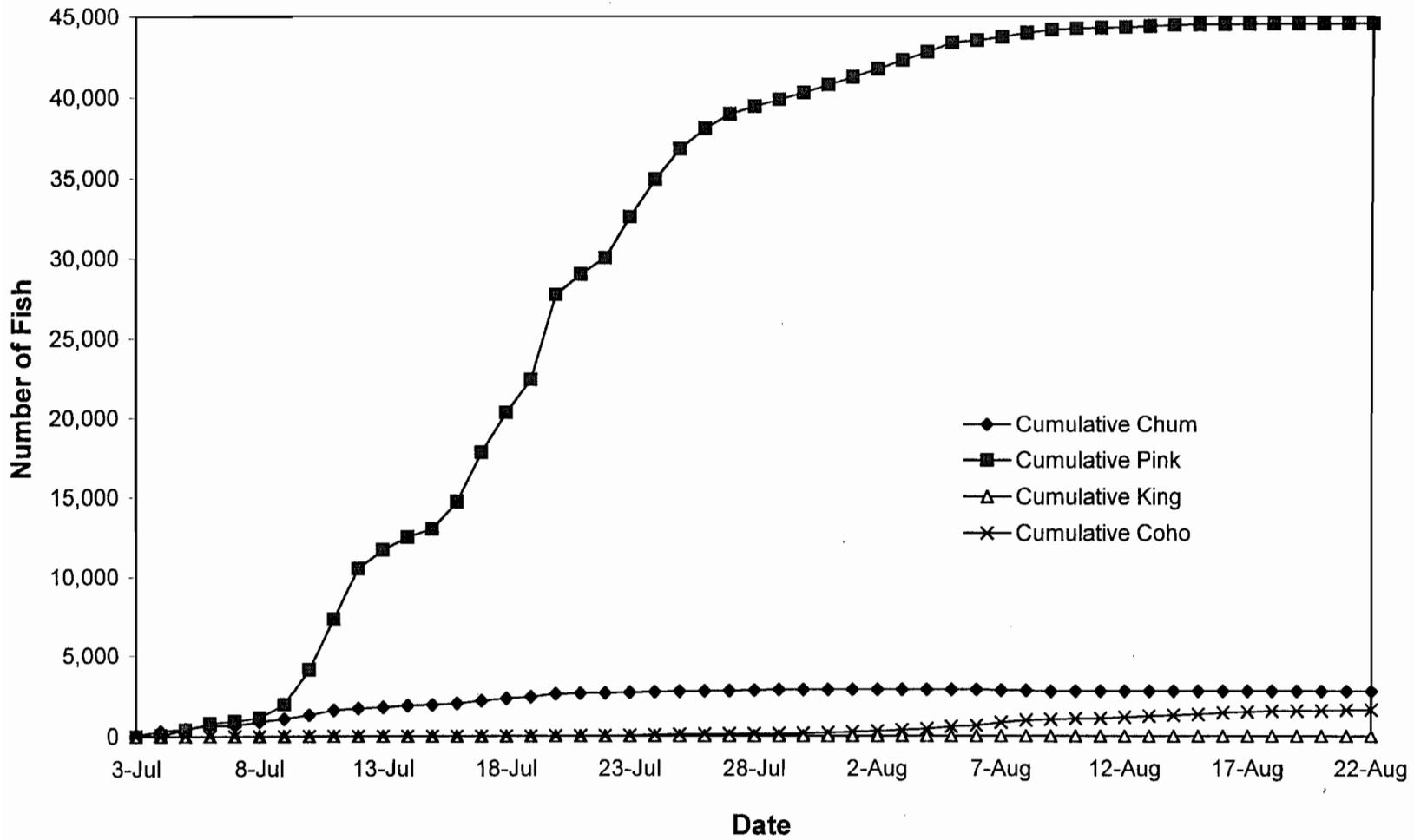


Figure 3. Daily chum salmon migration past the Snake River counting tower, Norton Sound, 1996.

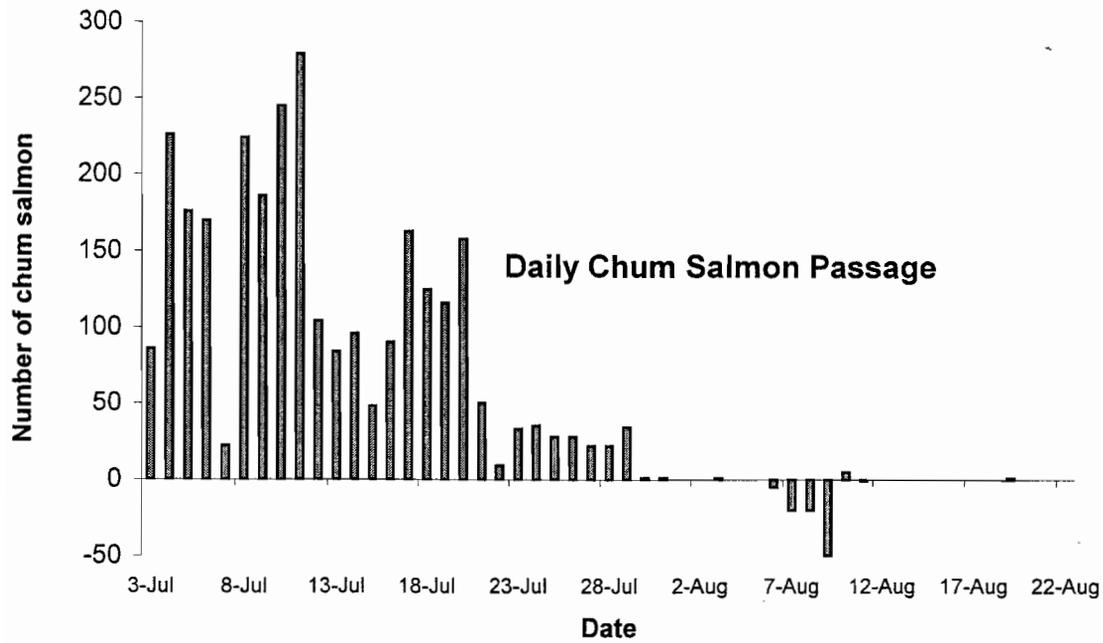


Figure 4. Cumulative chum salmon migration past the Snake River counting tower, Norton Sound, 1996.

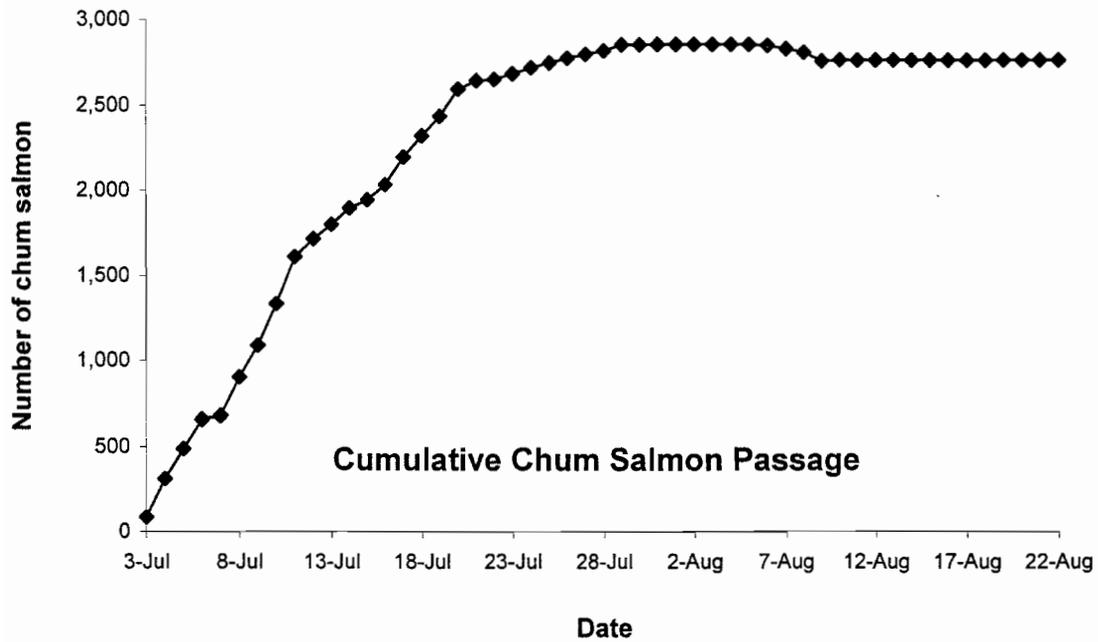


Figure 5. Daily pink salmon migration past the Snake River counting tower, Norton Sound, 1996.

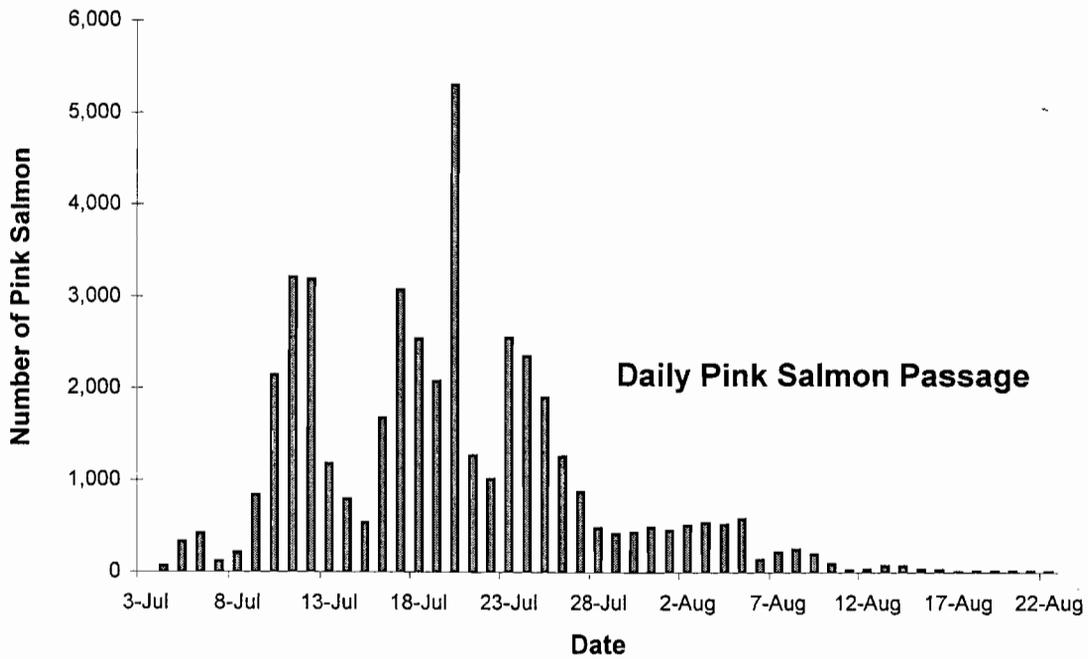


Figure 6. Cumulative pink salmon migration past the Snake River counting tower, Norton Sound, 1996.

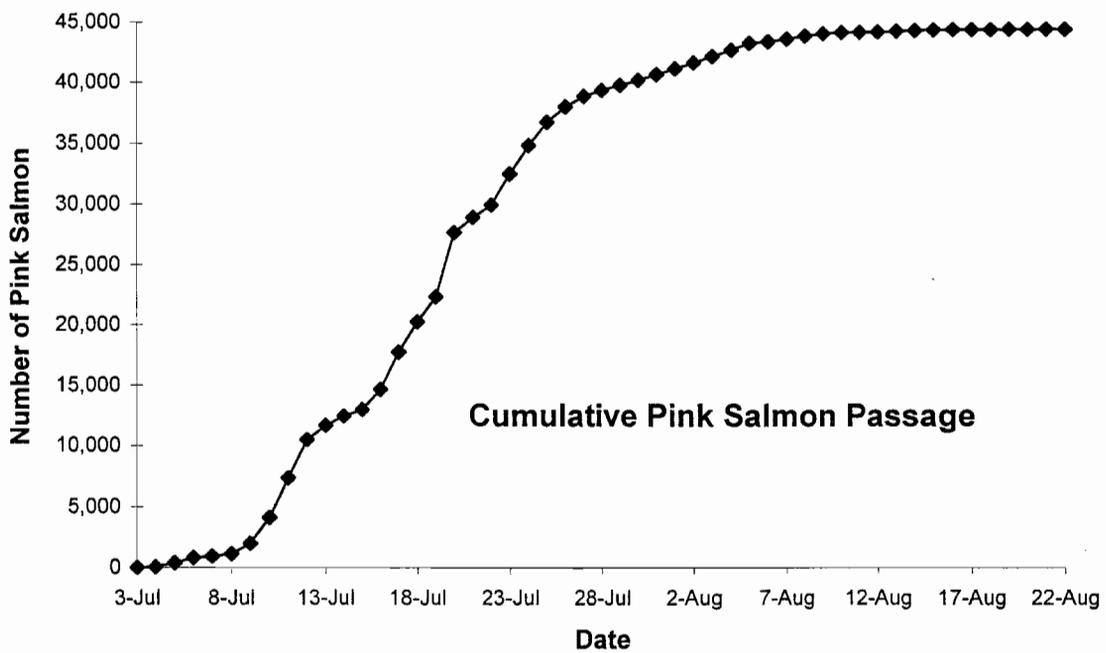


Figure 7. Daily king salmon migration past the Snake River counting tower, Norton Sound, 1996.

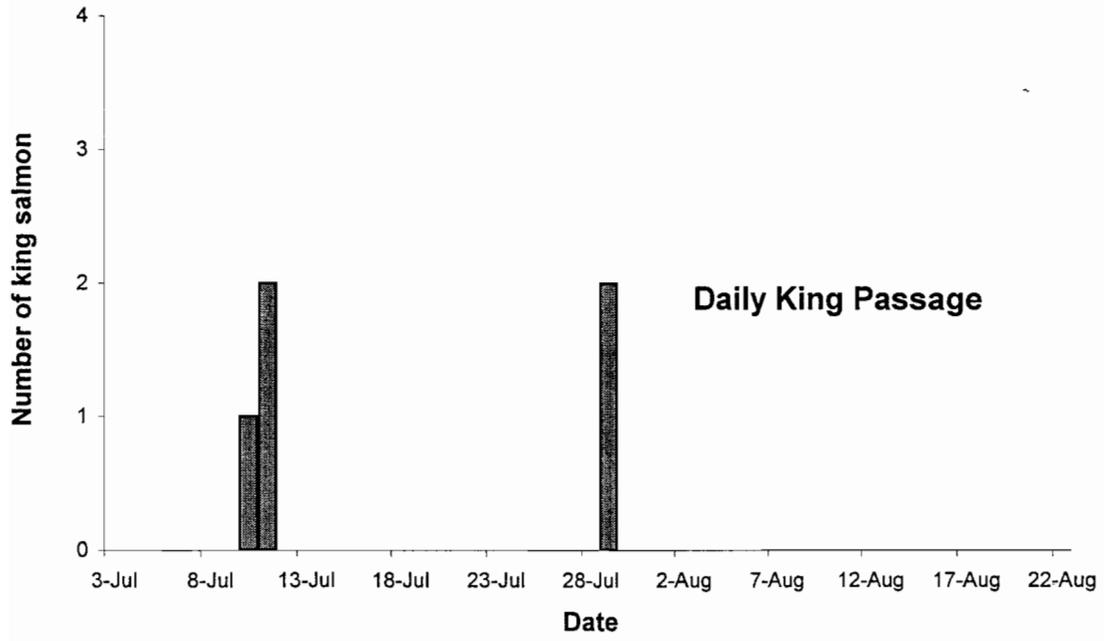


Figure 8. Cumulative king salmon migration past the Snake River counting tower, Norton Sound, 1996.

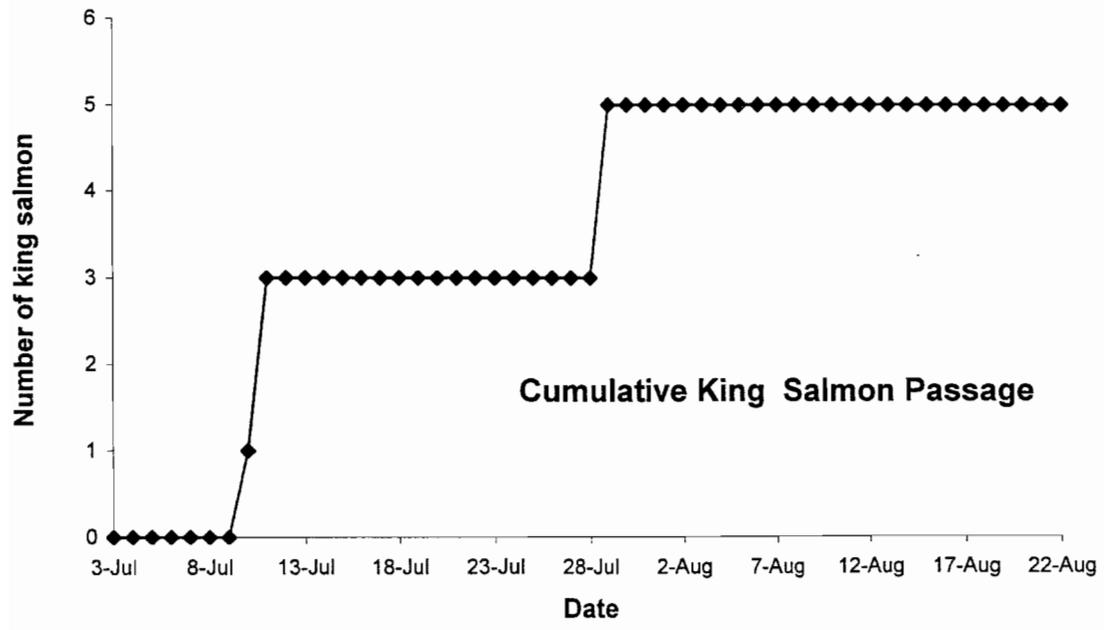


Figure 9. Daily coho salmon migration past the Snake River counting tower, Norton Sound, 1996.

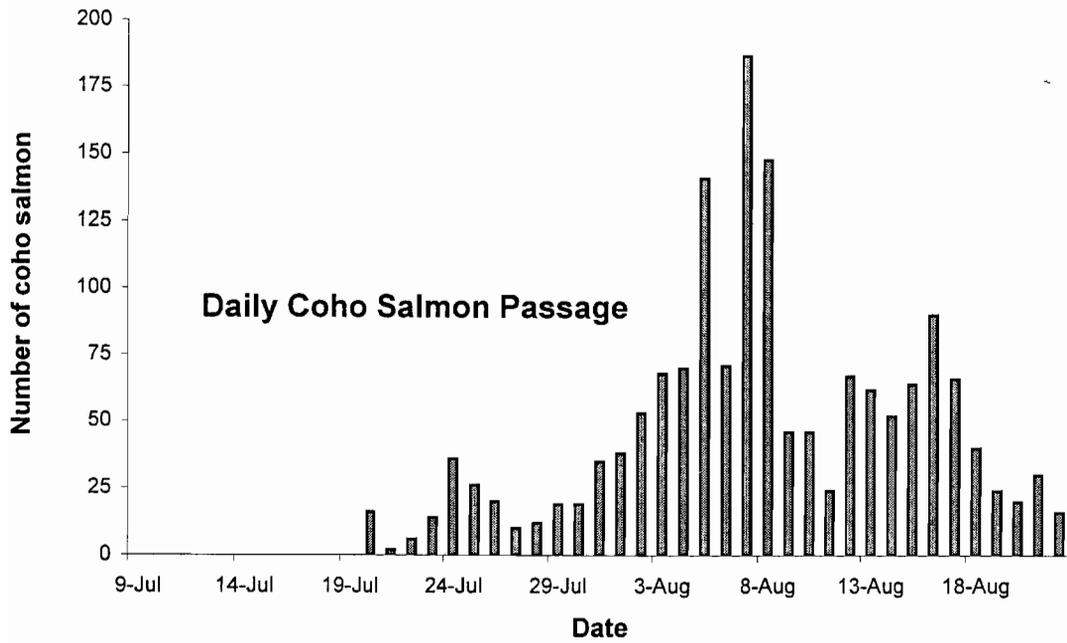


Figure 10. Cumulative coho salmon migration past the Snake River counting tower, Norton Sound, 1996.

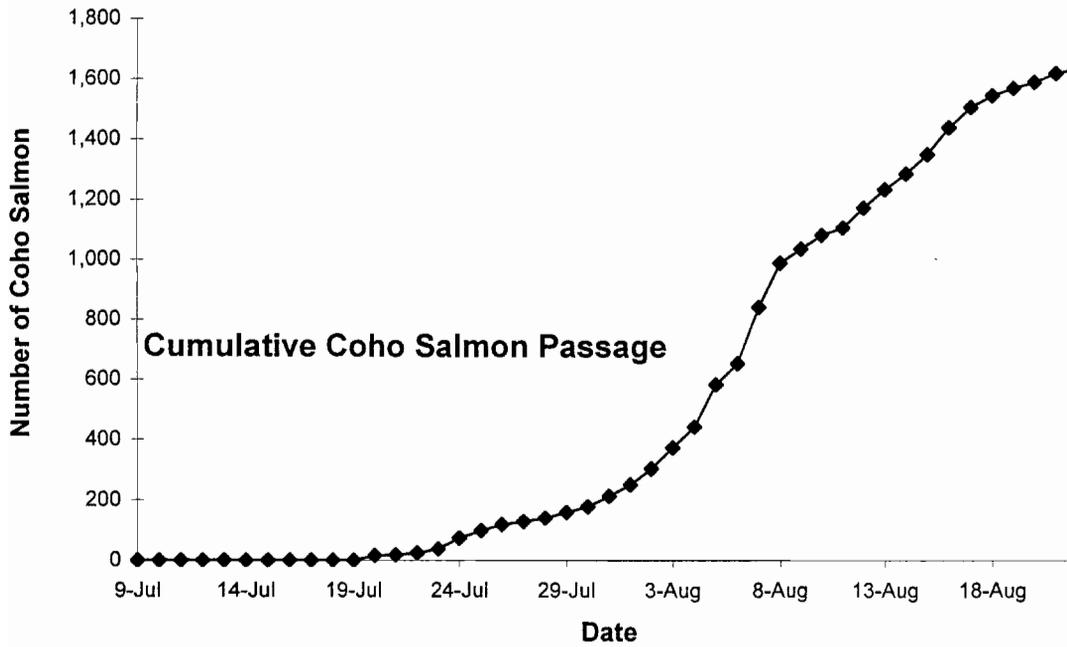


Figure 11. Diurnal pattern of chum salmon migration past the Snake River counting tower, Norton Sound, 1996.

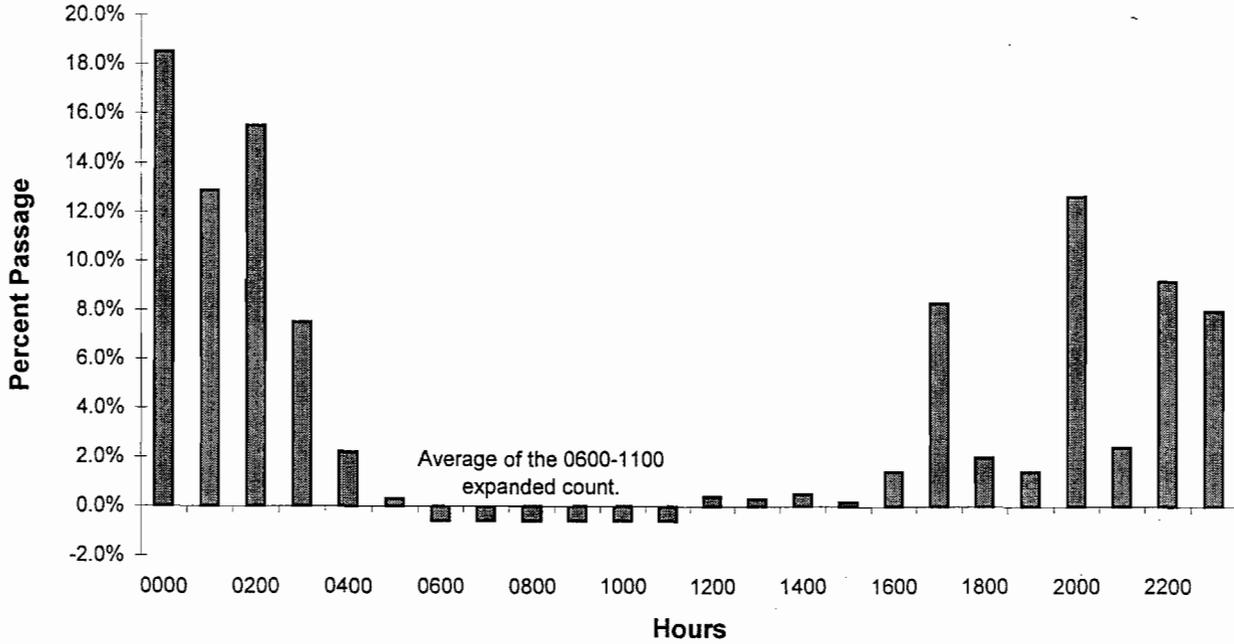


Figure 12. Diurnal pattern of pink salmon migration past the Snake River counting tower, Norton Sound, 1996.

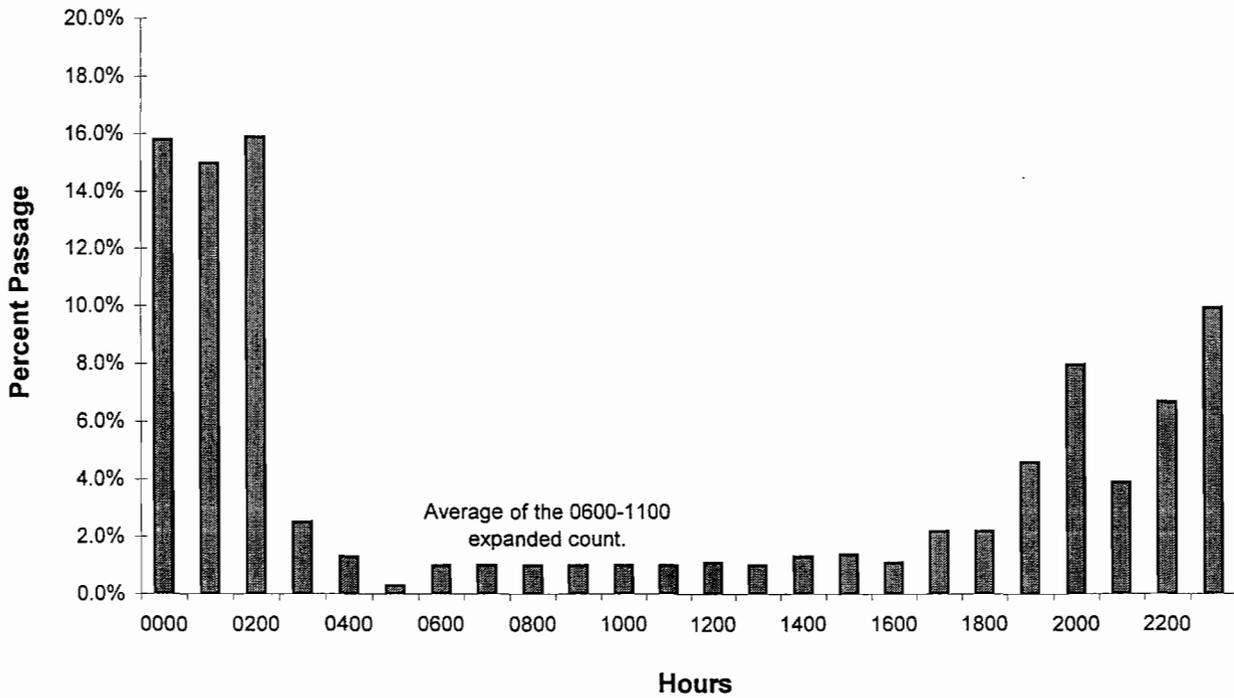


Figure 13. Diurnal pattern of king salmon migration past the Snake River counting tower, Norton Sound, 1996.

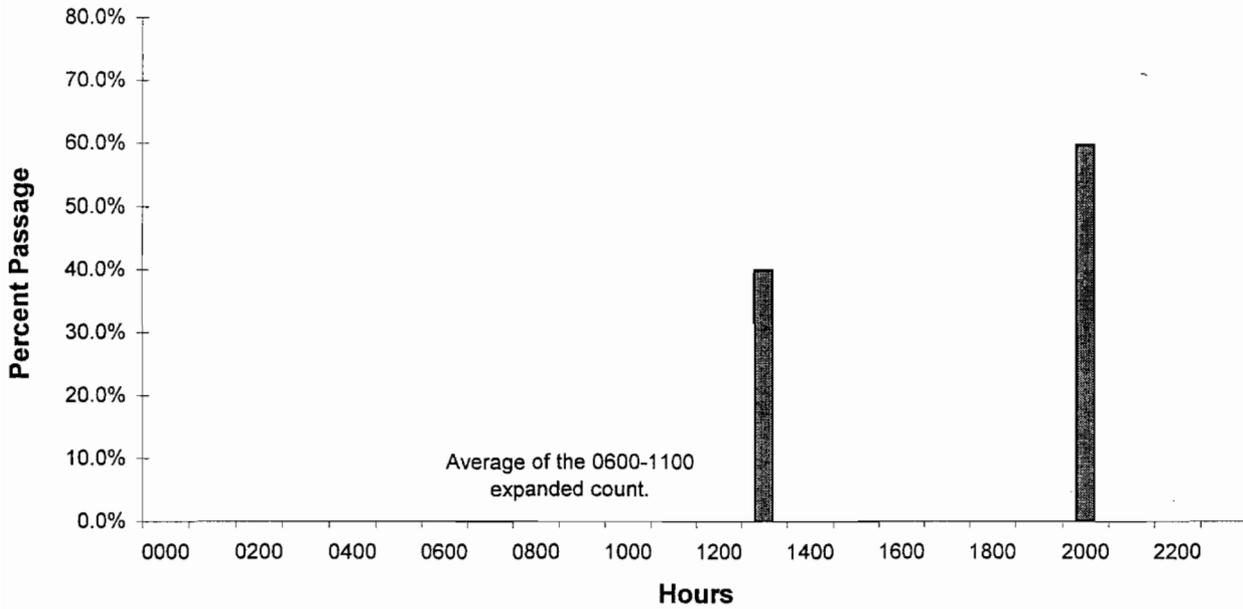


Figure 14. Diurnal pattern of coho salmon migration past the Snake River counting tower, Norton Sound, 1996.

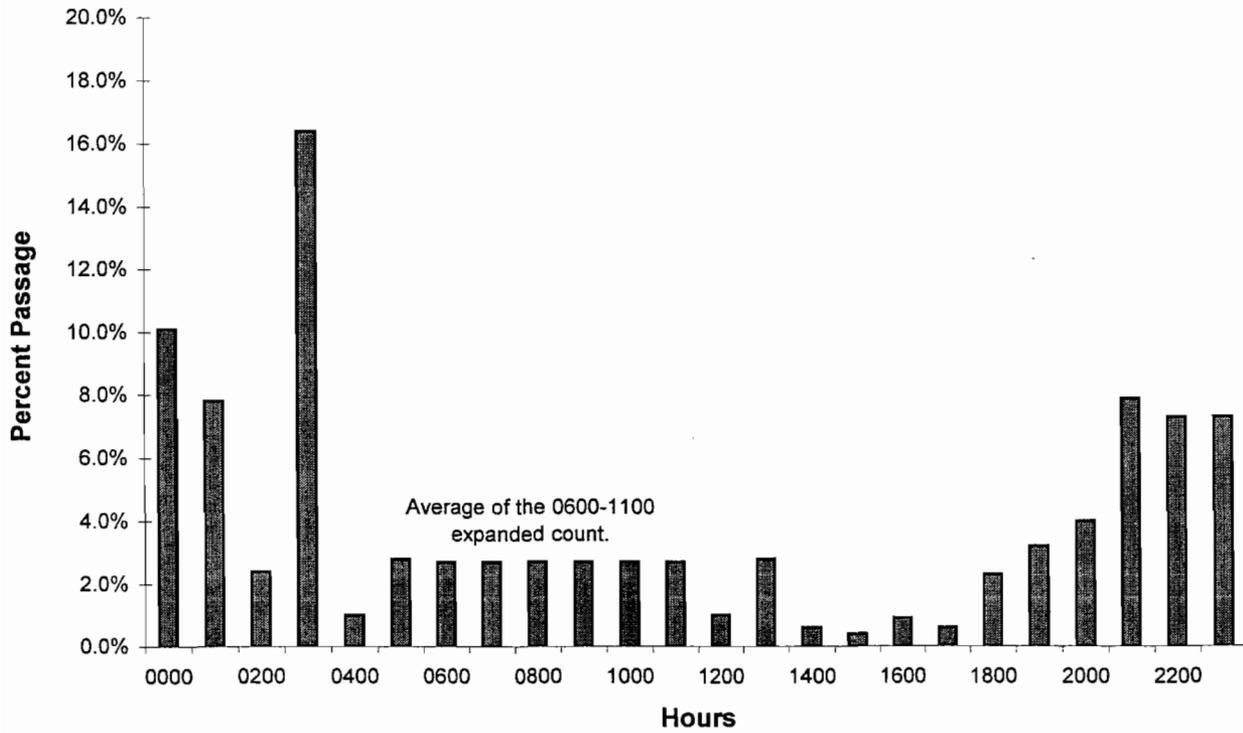


Figure 15. Chum salmon run-timing past the Snake River counting tower, Norton Sound, 1995-1996.

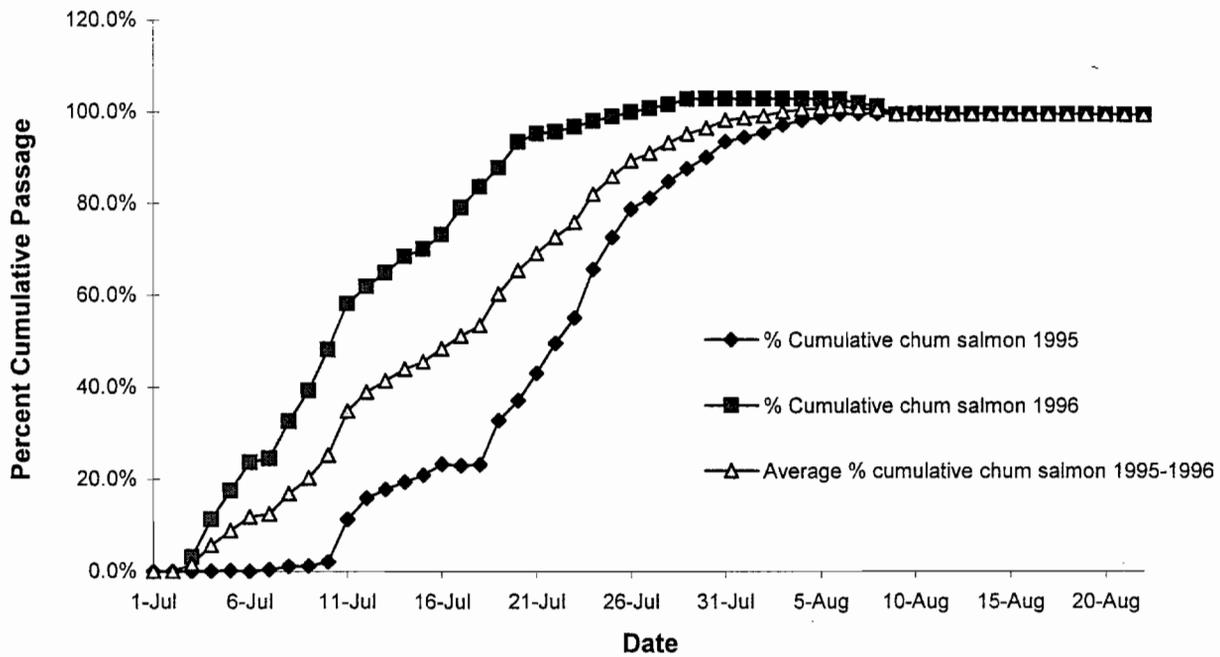


Figure 16. Pink salmon run-timing past the Snake River counting tower, Norton Sound, 1995-1996.

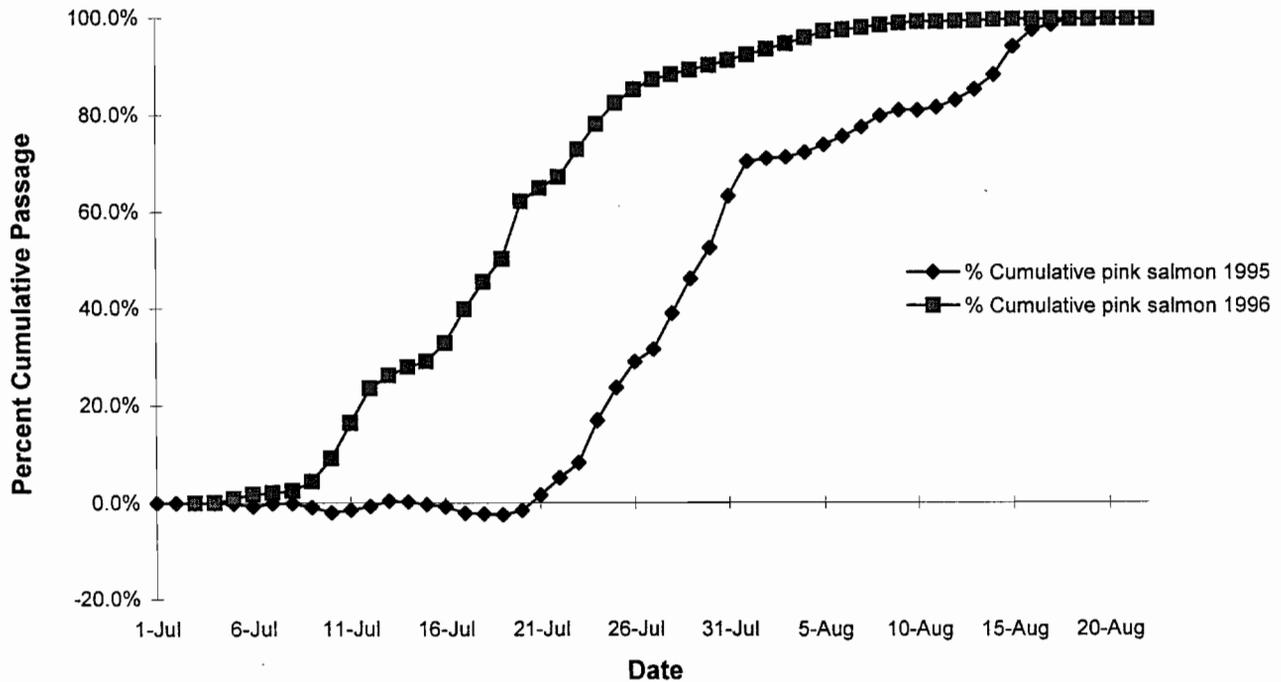


Figure 17. Coho salmon run-timing past the Snake River counting tower, Norton Sound, 1995-1996.

