

Niukluk River Salmon Counting Tower
Project Summary Report. 1999

by

Tom Kohler

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

Regional Informational Report¹ No. 3A00-09

January 2000

¹The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports.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 the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Commercial Fisheries 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	3
Discussion	4
Acknowledgments.....	6
Literature Cited.....	6
Tables	7
Figures.....	21

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Expanded daily and cumulative migration of all salmonid species past the Niukluk River counting tower, Norton Sound 1999.....	7
2. Expanded daily hourly chum salmon migration past the Niukluk River counting tower, Norton Sound, 1999.....	8
3. Expanded daily hourly pink salmon migration past the Niukluk River counting tower, Norton Sound, 1999.....	9
4. Expanded daily hourly king salmon migration past the Niukluk River counting tower, Norton Sound, 1999.....	10
5. Expanded daily hourly coho salmon migration past the Niukluk River counting tower, Norton Sound, 1999.....	11
6. Expanded daily hourly Dolly Varden migration past the Niukluk River counting tower, Norton Sound, 1999.....	12
7. Reported hourly chum salmon observations at the Niukluk River counting tower, Norton Sound, 1999.....	13
8. Reported hourly pink salmon observations at the Niukluk River counting tower, Norton Sound, 1999.....	14
9. Reported hourly king salmon observations at the Niukluk River counting tower, Norton Sound, 1999.....	15
10. Reported hourly coho salmon observations at the Niukluk River counting tower, Norton Sound, 1999.....	16
11. Reported hourly Dolly Varden observations at the Niukluk River counting tower, Norton Sound, 1999.....	17
12. Age, sex and length composition of chum salmon beach seine samples, Niukluk River, Norton Sound, 1999.....	18
13. Niukluk River counting tower climatological and stream observations, Norton Sound, 1999.....	19

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1.	Area location map of the Niukluk River counting tower project site, Norton Sound, 1999	20
2.	Cumulative passage of all salmonid species past the Niukluk River counting tower, Norton Sound, 1999	21
3.	Daily chum salmon migration past the Niukluk River counting tower, Norton Sound, 1999	22
4.	Cumulative chum salmon migration past the Niukluk River counting tower, Norton Sound, 1999	22
5.	Daily pink salmon migration past the Niukluk River counting tower, Norton Sound, 1999	23
6.	Cumulative pink salmon migration past the Niukluk River counting tower, Norton Sound, 1999	23
7.	Daily king salmon migration past the Niukluk River counting tower, Norton Sound, 1999	24
8.	Cumulative king salmon migration past the Niukluk River counting tower, Norton Sound, 1999	24
9.	Daily coho salmon migration past the Niukluk River counting tower, Norton Sound, 1999	25
10.	Cumulative coho salmon migration past the Niukluk River counting tower, Norton Sound, 1999	25
11.	Daily Dolly Varden migration past the Niukluk River counting tower, Norton Sound, 1999	26
12.	Cumulative Dolly Varden migration past the Niukluk River counting tower, Norton Sound, 1999	26
13.	Diurnal pattern of chum salmon migration past the Niukluk River counting tower, Norton Sound, 1999	27

List of Figures(Continued)

<u>Figure</u>	<u>Page</u>
14. Diurnal pattern of pink salmon migration past the Niukluk River counting tower, Norton Sound, 1999.....	27
15. Diurnal pattern of king salmon migration past the Niukluk River counting tower, Norton Sound, 1999.....	28
16. Diurnal pattern of coho salmon migration past the Niukluk River counting tower, Norton Sound, 1999.....	28
17. Diurnal pattern of Dolly Varden migration past the Niukluk River counting tower, Norton Sound, 1999.....	29
18. Chum salmon run-timing, Niukluk River counting tower, Norton Sound, 1995-1999.....	30
19. Pink salmon run-timing, Niukluk River counting tower, Norton Sound, 1995-1999.....	30
20. King salmon run-timing, Niukluk River counting tower, Norton Sound, 1995-1999.....	31
21. Coho salmon run-timing, Niukluk River counting tower, Norton Sound, 1995-1999.....	31
22. Dolly Varden run-timing, Niukluk River counting tower, Norton Sound, 1996-1999.....	32
23. Cumulative chum salmon passage past the Niukluk River counting tower, Norton Sound, 1995-1999.....	33
24. Odd year cumulative pink salmon passage past the Niukluk River counting tower, Norton Sound, 1995-1999.....	33
25. Cumulative king salmon passage past the Niukluk River counting tower, Norton Sound, 1995-1999.....	34
26. Cumulative coho salmon passage past the Niukluk River counting tower, Norton Sound, 1995-1999.....	34
27. Cumulative Dolly Varden passage past the Niukluk River counting tower, Norton Sound, 1995-1999.....	35

INTRODUCTION

The Niukluk River is a tributary of the Fish River, which empties into Golovin Bay on the north coast of Norton Sound. The Niukluk River enters the Fish River approximately ten miles above the village of White Mountain (Figure 1). The village of Council is located on the Niukluk River approximately twelve miles from it's confluence with the Fish River. There is road access to the Niukluk River at the village of Council. Subsistence and sport fisheries occur on the Niukluk River.

The counting tower has successfully operated since 1995 (Rob 1995, 1997, 1998 and 1999). A counting tower on the Niukluk River was operated for approximately three weeks in 1979 (Schaefer, 1979). The project is operated to obtain more timely and accurate escapement information required for the active management of salmon stocks throughout the season and as a means to calibrate the accuracy of aerial surveys on the other components of the Fish River system.

OBJECTIVES

1. Obtain daily and seasonal estimates of the timing and magnitude of the salmon and Dolly Varden escapement, by species, to the Niukluk River.
2. Collect and analyze age, sex and length information from beach seine sampled chum and coho salmon.

METHODS

The Niukluk River tower camp is located approximately 2 miles upstream from the confluence of the Fish and Niukluk Rivers (Figure 1). The tower camp is just upstream of Tom Gray's camp, which is locally known as Mosquito Bar. A letter of understanding from the Council Native Corporation authorizes the tower and weir operation. Permits for the weir were issued by the Alaska Department of Fish & Game (ADF&G), Habitat Division and the Alaska Department of Natural Resources, Division of Land. The camp and tower site is leased for five years on an annual renewal basis from Tom Gray.

Crewmembers began working in Nome on 1 July, 1999. The first two days were spent inventorying and purchasing equipment and supplies. The equipment and supplies were trucked to Council, with the assistance of additional ADF&G personnel from Nome. The boats were prepared for use and loaded up. Two trips were needed to ferry all of the supplies and equipment to the tower site. The site was inventoried and the camp was set up.

For 1999, the tower, flash panel and partial weir were installed directly in front of the sleeping tent, the same location as in 1996. The counting tower, partial weir and flash

panel were installed using the same methods as reported in detail in the 1995 project report (Rob, 1995). The partial weir installation proceeded smoothly and rapidly because three additional crewmembers from Nome provided assistance.

A 120 volt lighting system was installed on the tower to illuminate the flash panel during dark periods. These lights were powered by a portable generator. Beginning in early August the lights operated continuously from dusk to dawn.

The ADF&G, Commercial Fisheries Division (CFD) provided operational funding for the Niukluk River counting tower for the period beginning 4 July and ending 8 September. In previous years ADF&G, Sport Fish Division provided funding for the month from 16 August through 15 September. Counting began at 0000 hours on 4 July. The crew counted 18 half-hour counts in three six hour shifts each day except Tuesdays and Wednesdays. The first shift ran from 0000 hours to 0530 hours, the second ran from 1200 hours to 1730 hours and the third shift ran from 1800 hours to 2330 hours. On Tuesdays the half-hour counts ran for 24 hours in three eight hour shifts. Wednesdays were the day off. To reduce the risk of missing the peak hours of the coho salmon escapement, the ADF&G, Sport Fish Division requested that the schedule be modified during the first two weeks of August to count from 0000 through 0500 hours on the day off.

The counts for each half hour shift were doubled to produce the reported hourly counts for each species. Each day the reported hourly counts were added to produce a daily subtotal. Every day, the daily and cumulative subtotals for each species were relayed to the Nome office by radio.

The expanded counts for this report were calculated using the following methods. The 18 hour counts for Wednesdays (the day off) were estimated by adding the counts of each hour of the day before (Tuesdays) to the counts of each hour of the day following (Thursdays) and dividing the result by two, giving expanded hourly counts for 18 hours of the day off. Escapement during the 6 hours not normally counted was estimated using data observed during the 24 hour count days. For each 24 hour count day, the ratio of the count from 0600 hours to 1200 hours to the count during the normal 18 hour counting period was computed. The 18 hour count for the three days before and after each 24 hour count day was multiplied by the ratio to estimate escapement during the 6 hours not normally counted. This 6 hour estimate was added to the 18 hour count for each day. This was done for all species counted.

The expanded counts for the hours missed, during the days off or while the crew was beach seining, were estimated as follows. For a day the normal 18 hour count was missed, the count for each missing hour was calculated by adding the count of the hour of the day before the missed period to the counts of the hour of the day following the missed period and dividing the result by two (Rob 1999).

On most Wednesdays the crew went to White Mountain to pick up groceries, supplies and mail that were sent from Nome via air. Groceries, supplies and mail were also periodically brought to Council by Nome staff.

Beginning 19 July, the crew began beach seining and sampling chum salmon for age, length and sex data. If 40 or less chum salmon were available, then all were sampled. If more than 40 chum salmon were available, then 40 were sampled. Coho salmon were not sampled this year because the large numbers of pink salmon made any beach seining difficult during July and early August and high water ended the counting season early this year.

RESULTS

Table 1 shows the expanded daily and cumulative totals for each species.

The reported total hourly counts were: 21,714 chum salmon, 11,970 pink salmon, 38 king salmon, 3,106 coho salmon, and 1,860 Dolly Varden (Tables 7-11). The expanded counts were: 35,240 chum salmon, 20,355 pink salmon, 40 king salmon, 4,260 coho salmon, and 3,170 Dolly Varden (Tables 2-6). Figure 2 shows a graph of the daily cumulative expanded passage of all salmonid species counted, except pink salmon. Figures 3-12 show graphs of the expanded daily totals and the cumulative daily totals for each species.

Chum salmon and Dolly Varden, were observed on 4 July, the first day of counting. King salmon were first observed on 11 July and coho salmon were first observed on 28 July (Table 1). The daily peak count of 2,197 chum salmon occurred on 18 July, the daily peak count of 1,218 pink salmon occurred on 4 August, the daily peak count of 10 king salmon occurred on 12 July, the daily peak count of 425 coho salmon occurred on 2 September, the daily peak count of 229 Dolly Varden occurred on 26 August (Table 1).

Most chum salmon returned during the first three weeks of counting when 89% passed the tower (Table 1 and Figures 3 and 4). Most pink salmon returned during the first three weeks of counting when 73% passed the tower (Table 1 and Figures 5 and 6). All king salmon returned during the first four weeks of counting (Table 1 and Figures 7 and 8). Most coho salmon returned during the last four weeks of counting when 81% passed the tower (Table 1 and Figures 9 and 10). Dolly Varden returned in pulses with peaks on 11 July and on 22 and 26 August (Table 1 and Figures 11 and 12).

All species counted exhibited a diurnal pattern of migration past the counting tower. The greatest hourly chum salmon migration occurred during the hour from 2100 to 2200 hours, when 10.9% passed the tower. During the eleven hour period from 1500 through 0200 hours, 73.0% of the chum salmon passed the tower (Table 2 and Figure 13). The greatest hourly pink salmon migration occurred during the hour from 1800 to 1900 hours and during the hour from 2200 to 2300 hours, when 8.2% passed the tower. During the ten hour period from 1600 through 0200 hours, 60% of the pink salmon passed the tower

(Table 3 and Figure 14). The greatest hourly king salmon migration occurred during the hour from 0100 to 2000, when 25% passed the tower. During the six hour period from 1900 through 0100 hours 92.5% of the king salmon passed the tower. There was a net downstream migration of king salmon during the hours from 0300 through 1500 hours (Table 4 and Figure 15). The greatest hourly coho salmon migration occurred during the hour from 0000 through 0100 hours, when 13.4% passed the tower. During the three hour period from 2300 through 0200 hours 31.1% of the coho salmon passed the tower. During the seven hour period from 2100 through 0400 hours, 47.3% of the coho salmon passed the tower (Table 5 and Figure 16). The greatest hourly Dolly Varden migration occurred during the hour from 2200 to 2300, when 10.1% passed the tower. During the eight hour period from 2200 through 0600 hours, 48% of the Dolly Varden passed the tower (Table 6 and Figure 17).

An aerial survey of the entire Niukluk River counted 640 chum salmon on 24 August, 1999. The total season expanded tower count of chum salmon was 35,240. The aerial survey counted 1.5% of the total season expanded tower count of chum salmon. The aerial survey counted 540 chum salmon above the counting tower on 24 August, when the cumulative tower count of chum salmon was 35,124. The aerial survey counted 1.5% of the cumulative tower count on 24 August (Table 1). The aerial survey was conducted too late to get a good estimate of chum escapement.

An aerial survey of the entire Niukluk River counted no pink salmon on 24 August, 1999. The total season expanded tower count of pink salmon was 20,355. The aerial survey counted 0% of the total season expanded tower count of pink salmon. The aerial survey was conducted too late in the season to get a good count on pink salmon above the counting tower (Table 1).

Readable scales were collected from a total of 350 chum salmon. Beach seine samples were collected from 19 July through 29 August. The age composition of the beach seine sample was 1.1% age-0.2, 67.4% age-0.3, and 31.4% age-0.4. Male chum salmon were 47.4% and female chum salmon were 52.6% of the sample. For all age-sex categories younger fish were smaller and males were larger than females (Tables 12).

Climatological and stream observations are shown in Table 13.

DISCUSSION

A counting tower project was operated on the Niukluk River in 1979. That project collected incomplete data from 9 July to 27 July (Schaefer, 1979).

The Niukluk River counting tower project was operated as a cooperative project between ADF&G and the Kawerak Corporation in 1994. Rains throughout the summer kept water levels high and an early August flood washed out the partial weir so that no useable data was collected. However, much was accomplished in 1994, the camp infrastructure of tent

platforms was built and an appreciation of the difficulties associated with operating on the Niukluk River was gained (Charles Lean, ADF&G, CF Division, personal communication). In 1995 the Niukluk River counting tower operated successfully for the first time. Steadily decreasing water levels for most of the season and improved partial weir equipment were the primary reasons for this success (Rob, 1996). In 1996 the counting tower was operated successfully again, except for the period from 25 July through 3 August when the partial weir was washed out (Rob 1997). In 1997 the counting tower was operated successfully again, except for the five day period from 30 August through 4 September when high water prevented counting (Rob 1998). In 1998, counting began at 0000 hours on 4 July. The estimated passage of 883 chum, 931 pink salmon, 42 king salmon and 74 Dolly Varden by midnight on 4 July indicates that passage began several days earlier (Rob 1999).

In 1999, counting began at 0000 hours on 4 July. The estimated passage of 4 chum salmon and 55 Dolly Varden by midnight on 4 July indicates that passage began several days earlier (Tables 2-4 and 6). Coho salmon passage began well after the tower began operating (Table 5).

The run-timing of chum salmon in 1999 was later than the 1995-1998 average run-timing. The magnitude of the escapement was about 42% of the 1995-1998 average escapement (Figures 18 and 23). The run-timing of the odd year pink salmon escapement in 1999 was about ten days later than the odd year average escapement and the magnitude of the 1999 escapement was about 16% greater than the odd year escapement average (Figures 19 and 24). The run-timing of the king salmon escapement in 1999 was much later than 1995-1998 average run-timing. The king salmon escapement in 1999 was the lowest since the project began in 1995 (Figures 20 and 25). The run-timing of the coho salmon escapement in 1999 was approximately eight days later than the 1995-1998 average. The magnitude of the 1999 coho salmon escapement was similar to the 1995 and 1997 levels (Figures 21 and 26). The run-timing of the 1999 Dolly Varden escapement was similar to the 1996-1998 average run-timing. The magnitude of the 1999 Dolly Varden escapement was similar to the 1996 and 1995 level (Figures 22 and 27).

Beach seine sampling was successful in achieving sufficient scales for age and length determination.

Difficulties encountered over the years while counting from the tower included species identification problems at the far end of the flash panel during times of poor visibility, severe glare from sunlight in the evening, spawning fish covering portions of the flash panel with gravel, and occasional wind turbulence that made species identification problematic along the length of the flash panel. Counting accuracy decreases when the rate of passage increases.

ACKNOWLEDGEMENTS

Carl "Bones" Brown was the crew leader for the entire season. Liz Korenek worked as a crew member until 19 August. Gus Kasnoc was a Norton Sound Economic Development Corporation (NSEDC) intern. NSEDC hired and provided funding for the interns. Gary Knuepfer of ADF&G provided assistance and expertise as needed throughout the season. A draft of this report was reviewed by Larry Buklis.

LITERATURE CITED

- Adler, H. L. and Roessler, E. B. 1964. Introduction to Probability and Statistics third edition. W.H. Freeman and Company. San Francisco and London.
- Rob, P. J. 1995. Niukluk River Salmon Counting Tower Project Summary Report 1995. Alaska Department of Fish and Game, Commercial Fisheries Division, Anchorage. Regional Information Report 3A95-27.
- _____. 1997. Niukluk River Salmon Counting Tower Project Summary Report 1996. Alaska Department of Fish and Game, Commercial Fisheries Division, Anchorage. Regional Information Report 3A97-04
- _____. 1998. Niukluk River Salmon Counting Tower Project Summary Report 1997. Alaska Department of Fish and Game, Commercial Fisheries Division, Anchorage. Regional Information Report 3A98-19.
- _____. 1999. Niukluk River Salmon Counting Tower Project Summary Report 1998. Alaska Department of Fish and Game, Commercial Fisheries Division, Anchorage. Regional Information Report 3A99-10.
- Schaefer, G. 1979. Niukluk River Counting Tower Project. AYK Region, Norton Sound Escapement Report 21.

Table 1. Expanded daily and cumulative migration of all salmonid species past the Nluktuk River counting tower, Norton Sound, 1999.

Date	Daily chum salmon	Cumulative chum salmon	Daily pink salmon	Cumulative pink salmon	Daily king salmon	Cumulative king salmon	Daily coho salmon	Cumulative coho salmon	Daily Dolly Varden	Cumulative Dolly Varden
4-Jul	4	4	0	0	0	0	0	0	55	55
5-Jul	4	9	2	2	0	0	0	0	94	149
6-Jul	-2	7	0	2	0	0	0	0	69	217
7-Jul	-4	2	16	18	0	0	0	0	41	259
8-Jul	24	26	15	34	0	0	0	0	22	281
9-Jul	430	456	49	74	0	0	0	0	40	320
10-Jul	836	1,292	94	138	0	0	0	0	58	378
11-Jul	1,824	3,116	55	194	6	6	0	0	138	516
12-Jul	1,677	4,793	80	274	10	16	0	0	62	578
13-Jul	468	5,261	50	324	0	16	0	0	26	604
14-Jul	1,020	6,281	46	370	6	22	0	0	34	638
15-Jul	372	6,653	14	384	-2	20	0	0	12	650
16-Jul	598	7,251	20	404	-1	19	0	0	16	666
17-Jul	824	8,076	26	430	0	19	0	0	19	685
18-Jul	2,197	10,273	14	444	0	19	0	0	14	699
19-Jul	1,166	11,439	22	466	0	19	0	0	12	711
20-Jul	1,103	12,542	60	526	0	19	0	0	7	718
21-Jul	645	13,187	184	710	-1	18	0	0	12	730
22-Jul	1,031	14,217	205	915	0	18	0	0	26	757
23-Jul	1,031	15,248	205	1,121	0	18	0	0	42	799
24-Jul	1,692	16,940	372	1,493	0	18	0	0	81	880
25-Jul	1,853	18,793	323	1,815	8	26	0	0	50	930
26-Jul	1,269	20,062	282	2,097	2	28	0	0	23	954
27-Jul	995	21,057	750	2,848	6	34	0	0	66	1,019
28-Jul	1,456	22,513	1,028	3,875	2	36	2	2	73	1,092
29-Jul	1,110	23,623	1,058	4,933	0	36	0	2	54	1,146
30-Jul	1,061	24,684	1,021	5,955	1	37	4	6	58	1,204
31-Jul	1,061	25,745	1,021	6,976	1	38	4	10	58	1,262
1-Aug	1,061	26,806	1,021	7,998	1	39	4	14	58	1,320
2-Aug	1,338	28,144	1,086	9,083	1	40	5	19	47	1,367
3-Aug	1,437	29,582	958	10,041	0	40	7	26	49	1,416
4-Aug	952	30,534	1,218	11,259	0	40	5	31	44	1,460
5-Aug	454	30,988	1,008	12,267	0	40	24	55	44	1,504
6-Aug	537	31,524	939	13,207	0	40	23	78	55	1,559
7-Aug	619	32,143	871	14,078	0	40	22	99	66	1,625
8-Aug	466	32,609	731	14,809	0	40	2	102	53	1,678
9-Aug	418	33,025	472	15,281	0	40	13	115	37	1,715
10-Aug	291	33,316	658	15,939	0	40	20	135	22	1,737
11-Aug	126	33,442	491	16,430	0	40	31	166	10	1,747
12-Aug	234	33,676	318	16,748	0	40	62	228	18	1,765
13-Aug	220	33,896	381	17,129	0	40	61	289	13	1,778
14-Aug	207	34,103	443	17,572	0	40	60	348	8	1,786
15-Aug	190	34,293	325	17,898	0	40	78	426	26	1,812
16-Aug	212	34,505	590	18,488	0	40	118	544	22	1,834
17-Aug	88	34,593	361	18,849	0	40	115	659	22	1,856
18-Aug	163	34,756	549	19,399	0	40	136	794	14	1,870
19-Aug	104	34,860	282	19,681	0	40	191	985	15	1,885
20-Aug	82	34,941	217	19,898	0	40	184	1,170	15	1,900
21-Aug	54	34,995	116	20,014	0	40	165	1,335	11	1,910
22-Aug	49	35,044	62	20,076	0	40	185	1,520	155	2,066
23-Aug	24	35,069	53	20,129	0	40	194	1,714	79	2,145
24-Aug	55	35,124	44	20,173	0	40	163	1,877	63	2,208
25-Aug	24	35,148	9	20,182	0	40	224	2,101	19	2,227
26-Aug	-10	35,138	9	20,190	0	40	93	2,194	229	2,456
27-Aug	15	35,153	10	20,201	0	40	99	2,293	126	2,584
28-Aug	41	35,194	12	20,212	0	40	106	2,399	27	2,611
29-Aug	22	35,217	29	20,242	0	40	151	2,551	68	2,680
30-Aug	0	35,217	9	20,251	0	40	138	2,689	46	2,726
31-Aug	2	35,219	29	20,280	0	40	179	2,867	19	2,745
1-Sep	4	35,223	3	20,283	0	40	231	3,098	44	2,789
2-Sep	0	35,223	6	20,289	0	40	425	3,523	60	2,849
3-Sep	-1	35,222	1	20,290	0	40	278	3,801	38	2,887
4-Sep	-2	35,220	-3	20,287	0	40	131	3,932	16	2,903
5-Sep	4	35,224	24	20,311	0	40	131	4,063	38	2,941
6-Sep	0	35,224	15	20,325	0	40	36	4,099	25	2,966
7-Sep	8	35,232	26	20,352	0	40	99	4,199	150	3,116
8-Sep	8	35,240	3	20,355	0	40	61	4,260	55	3,170

Table 2. Expanded daily hourly chum salmon migration past the Nukluk River counting tower, Norton Sound, 1999.

Outlined areas indicate hours not counted. Numbers in outlined areas indicate estimated passage.																			Total	% of Total	
Date	0000	0100	0200	0300	0400	0500	0600-1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total
4-Jul	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	4	0.0%
5-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0.0%
6-Jul	0	0	0	0	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	-0.0%
7-Jul	0	0	0	-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-4	-0.0%
8-Jul	0	0	2	4	0	2	2	2	2	0	0	0	0	0	0	0	4	6	0	24	0.1%
9-Jul	30	21	33	2	19	7	36	1	1	0	12	-1	23	-22	20	63	127	57	1	430	1.2%
10-Jul	40	42	64	0	33	12	78	0	0	0	34	-2	46	-44	40	126	250	106	2	836	2.4%
11-Jul	76	34	64	56	116	54	153	10	-6	6	12	10	334	74	170	142	294	200	76	1,834	5.2%
12-Jul	78	236	28	138	118	70	133	1	0	6	0	4	2	0	84	206	480	90	20	1,677	4.8%
13-Jul	84	48	40	16	0	0	38	10	-2	2	6	40	24	2	6	22	148	0	4	460	1.3%
14-Jul	-32	36	62	48	0	162	82	6	12	4	36	58	116	34	16	30	140	120	6	1,020	2.9%
15-Jul	-24	8	20	-2	4	0	30	76	-2	24	4	20	74	90	10	4	40	18	-2	372	1.0%
16-Jul	19	52	7	-31	1	1	48	37	1	-6	99	161	81	38	19	24	-3	60	-12	596	1.7%
17-Jul	62	96	-6	-20	-2	2	66	-2	4	-36	194	302	88	26	-75	44	-46	102	-22	824	2.3%
18-Jul	70	66	16	8	-8	4	177	52	50	-6	178	102	94	252	88	354	378	278	84	2,197	6.2%
19-Jul	138	32	54	32	-32	-16	94	-12	-62	64	14	132	70	46	268	54	220	-106	196	1,166	3.3%
20-Jul	126	8	32	-42	-15	-28	89	-18	26	-10	24	46	92	-128	190	158	54	362	180	1,103	3.1%
21-Jul	-78	118	-372	-264	-62	38	92	32	25	12	50	34	87	-14	190	244	130	258	165	645	1.8%
22-Jul	-34	32	-202	-126	-30	29	149	32	25	12	50	34	87	-14	190	244	130	258	165	1,031	2.9%
23-Jul	-34	32	-202	-126	-30	29	149	32	25	12	50	34	87	-14	190	244	130	258	165	1,031	2.9%
24-Jul	10	-34	-32	12	2	20	244	82	34	34	76	22	82	100	190	330	246	154	150	1,892	4.9%
25-Jul	120	148	158	70	76	178	267	32	36	18	32	24	44	112	92	20	64	140	158	1,833	5.1%
26-Jul	222	22	-102	-28	-8	26	183	-4	14	16	18	38	104	280	130	90	128	80	140	1,289	3.6%
27-Jul	-6	4	-12	6	6	-14	143	30	-6	22	6	10	70	60	80	146	130	122	218	995	2.8%
28-Jul	100	110	70	-38	50	160	230	-4	-4	6	20	-4	8	104	76	86	122	82	210	1,456	4.1%
29-Jul	64	128	36	70	60	158	360	8	10	2	6	18	64	26	34	74	70	68	44	1,110	3.1%
30-Jul	63	97	47	53	49	103	153	14	3	8	10	22	51	37	76	86	67	70	52	1,061	3.0%
31-Jul	61	97	47	53	49	103	153	14	3	8	10	22	51	37	76	86	67	70	52	1,061	3.0%
1-Aug	61	97	47	53	49	103	153	14	3	8	10	22	51	37	76	86	67	70	52	1,061	3.0%
2-Aug	61	97	47	53	49	103	430	14	3	8	10	22	51	37	76	86	67	70	52	1,330	3.6%
3-Aug	61	97	47	53	49	103	462	14	3	8	14	36	58	48	118	90	64	72	60	1,437	4.1%
4-Aug	58	36	38	36	38	48	306	20	0	14	20	50	10	44	36	36	30	32	40	952	2.7%
5-Aug	50	36	40	4	56	42	346	22	0	4	2	12	-30	-8	0	30	30	-4	32	454	1.3%
6-Aug	47	30	18	17	26	29	473	22	1	8	3	20	-6	8	24	34	36	12	33	537	1.5%
7-Aug	44	34	-4	30	-4	16	499	22	2	12	4	28	18	24	48	38	52	28	38	619	1.8%
8-Aug	6	8	18	14	-10	18	130	8	20	28	4	12	34	22	26	-2	16	68	26	466	1.3%
9-Aug	20	14	26	12	14	16	78	0	2	-2	14	10	-14	14	48	28	36	36	44	410	1.2%
10-Aug	26	40	10	-8	10	22	53	14	22	-14	10	-6	20	26	12	22	7	-12	40	291	0.8%
11-Aug	38	36	-2	10	10	16	24	-10	6	-12	4	-10	-6	-6	30	22	-6	-4	6	126	0.4%
12-Aug	18	16	3	-2	4	18	44	6	8	6	12	12	12	8	0	10	16	26	12	234	0.7%
13-Aug	20	17	13	10	-2	11	41	3	13	14	-2	9	-3	11	2	11	11	13	23	220	0.6%
14-Aug	22	10	14	22	-8	4	99	0	22	22	-16	6	-2	14	4	12	10	0	32	267	0.8%
15-Aug	16	16	14	10	6	8	36	-2	10	-6	8	8	2	2	14	2	12	20	14	190	0.5%
16-Aug	6	38	48	16	24	-10	4	4	8	8	4	-6	12	26	20	-12	10	14	7	212	0.6%
17-Aug	-4	14	2	-8	-2	2	2	6	2	10	8	14	14	-8	8	8	-2	-10	24	88	0.2%
18-Aug	30	2	12	18	2	18	3	14	8	4	0	-4	18	12	-12	-4	14	10	10	163	0.5%
19-Aug	2	0	8	-2	10	0	2	10	6	12	12	8	-4	-10	24	0	9	11	6	104	0.3%
20-Aug	3	-2	3	2	0	1	2	6	4	6	7	6	2	-4	13	0	8	11	6	82	0.2%
21-Aug	3	-2	3	2	0	1	1	6	2	0	2	4	6	2	2	4	4	4	2	54	0.2%
22-Aug	4	-4	2	6	2	2	1	2	0	6	0	4	6	-4	0	8	0	4	10	49	0.1%
23-Aug	4	0	0	2	2	2	0	-2	2	0	6	4	2	-2	-2	4	2	2	-2	24	0.1%
24-Aug	2	0	0	1	-4	-2	1	2	8	8	10	6	0	6	4	4	-2	2	2	55	0.2%
25-Aug	2	2	0	2	2	2	0	0	0	0	6	-2	0	0	2	4	0	4	4	34	0.1%
26-Aug	-4	-4	0	0	-2	0	0	0	0	0	0	0	-2	0	0	0	2	0	0	-10	-0.0%
27-Aug	3	3	1	1	2	0	0	-1	0	-1	0	1	1	-1	0	0	3	2	1	15	0.0%
28-Aug	10	10	2	2	6	0	1	-2	0	-2	0	2	4	-2	0	0	4	4	2	41	0.1%
29-Aug	-4	0	4	2	0	2	0	0	2	0	0	2	2	4	2	-2	4	4	4	22	0.1%
30-Aug	2	2	0	0	-4	0	0	0	0	0	-4	2	2	0	0	2	0	0	0	0	0.0%
31-Aug	0	-2	-2	0	6	0	0	0	0	0	0	0	0	2	-2	0	-2	0	0	2	0.0%
1-Sep	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0.0%
2-Sep	0	2	2	-2	-2	0	0	0	0	0	0	0	0	0	-2	0	2	0	0	0	0.0%
3-Sep	-1	1	1	-1	-1	0	0	0	0	0	0	0	0	0	-1	0	1	0	0	-1	-0.0%
4-Sep	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	-0.0%
5-Sep	2	0	0	2	0	0	0	0	0	0	0	-2	0	0	0	0	0	0	0	2	0.0%
6-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	-2	0	0.0%
7-Sep	0	0	0	2	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	8	0.0%
8-Sep	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	8	0.0%
Total	1,853	2,035	242	365	714	1,675	5,236	610	340	349	1,073	1,458	2,026	1,296	2,725	3,410	3,833	3,366	2,628	35,240	100%
	5.3%	5.8%	0.7%	1.0%	2.0%	4.8%	14.9%	1.7%	1.0%	1.0%	3.0%	4.1%	5.7%	3.7%	7.7%	9.7%	10.9%	9.6%	7.5%	100%	

Table 3. Expanded daily hourly pink salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

Outlined areas indicate hours not counted. Numbers in outlined areas indicate estimated passage.																				Total	% of Total	
Date	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total		
4-Jul	0	0	0	0	0	0	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	2	2	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	2	0	0	0	0	0	0	0	0	0	2	0	4	4	2	2	16	0.1%	
8-Jul	0	0	0	2	0	0	0	4	0	0	0	0	0	4	2	4	0	4	0	16	0.1%	
9-Jul	3	4	9	5	3	1	0	2	0	0	0	0	0	2	-1	2	3	3	4	40	0.2%	
10-Jul	6	8	18	8	6	2	0	0	0	0	0	0	0	0	0	0	6	2	8	84	0.3%	
11-Jul	0	2	6	6	6	4	0	0	0	0	4	14	0	2	0	0	0	0	4	56	0.3%	
12-Jul	0	8	10	18	5	2	0	0	0	4	2	-2	0	6	0	6	8	2	80	0.4%		
13-Jul	6	4	10	10	0	0	0	6	0	4	0	6	2	2	0	0	0	0	0	50	0.2%	
14-Jul	6	0	10	6	2	0	0	0	2	2	6	6	4	0	0	0	2	0	2	46	0.2%	
15-Jul	0	0	4	2	0	0	0	0	0	0	0	0	4	0	0	0	0	4	0	19	0.1%	
16-Jul	0	1	2	2	0	0	0	0	0	0	2	4	4	0	0	0	0	2	1	20	0.1%	
17-Jul	0	2	0	2	0	0	0	0	0	0	4	12	4	0	0	0	0	0	2	36	0.1%	
18-Jul	0	4	0	0	0	0	0	0	0	0	0	0	0	2	2	6	0	0	0	14	0.1%	
19-Jul	0	0	2	0	2	2	0	0	2	-2	0	0	4	2	4	2	0	0	4	22	0.1%	
20-Jul	5	0	4	0	2	4	0	0	2	4	6	0	2	12	2	2	-2	10	4	60	0.3%	
21-Jul	-2	-4	2	0	0	0	0	0	42	28	28	17	7	20	11	9	11	3	8	134	0.6%	
22-Jul	11	-7	-1	-1	0	-1	0	14	42	28	28	17	7	20	11	9	13	5	8	2	205	1.0%
23-Jul	11	-7	-1	-1	0	-1	0	14	42	28	28	17	7	20	11	9	13	5	8	2	205	1.0%
24-Jul	24	-4	-4	-2	0	-2	0	26	84	54	52	28	14	38	10	16	24	12	6	0	372	1.8%
25-Jul	8	16	18	10	0	4	0	23	8	8	4	-2	34	18	44	26	56	20	26	34	323	1.6%
26-Jul	42	8	7	2	0	-2	0	20	20	16	8	12	20	26	32	10	18	16	20	12	282	1.4%
27-Jul	4	2	0	-2	8	-2	0	52	34	30	28	36	-4	30	72	80	64	78	88	122	2.9%	
28-Jul	25	18	10	20	24	50	0	72	18	22	12	34	44	58	116	108	74	136	80	88	1,020	5.0%
29-Jul	16	18	14	18	14	22	0	74	12	26	16	14	26	66	120	138	118	118	108	120	1,050	5.2%
30-Jul	21	47	18	7	32	37	0	71	19	32	18	21	28	41	122	116	92	96	98	108	1,021	5.0%
31-Jul	23	47	18	7	32	37	0	71	19	32	18	21	28	41	122	116	92	96	98	108	1,021	5.0%
1-Aug	21	47	18	7	32	37	0	71	19	32	18	21	28	41	122	116	92	96	98	108	1,021	5.0%
2-Aug	21	47	18	7	32	37	0	136	19	32	18	21	28	41	122	116	92	96	98	108	1,084	5.3%
3-Aug	21	47	18	7	32	37	0	120	19	32	18	21	28	30	124	94	60	74	88	80	938	4.7%
4-Aug	26	16	22	-4	16	32	0	152	26	38	20	8	34	6	122	108	96	134	120	108	1,218	6.0%
5-Aug	44	22	42	16	0	20	0	126	34	60	68	60	44	44	58	54	42	68	68	62	1,308	5.9%
6-Aug	56	39	27	32	9	46	0	172	22	29	37	43	43	28	36	50	50	82	73	78	939	4.6%
7-Aug	68	56	12	48	10	42	0	109	10	-2	6	10	42	14	94	46	56	96	78	66	871	4.3%
8-Aug	38	16	34	26	22	4	0	91	8	16	12	12	14	36	52	44	46	48	96	116	731	3.6%
9-Aug	66	42	24	26	-4	0	0	88	6	12	22	24	24	14	14	30	12	30	22	20	472	2.3%
10-Aug	26	20	16	30	30	10	0	112	18	-6	26	-4	18	6	62	66	34	50	108	28	618	3.2%
11-Aug	24	40	16	22	22	20	0	83	-2	12	12	22	6	-2	22	50	10	38	30	40	491	2.4%
12-Aug	10	30	14	22	14	18	0	54	-2	4	22	-8	6	16	22	26	14	26	38	2	318	1.6%
13-Aug	57	49	-10	54	22	13	0	65	-5	13	16	-4	23	11	15	15	22	21	22	8	501	2.5%
14-Aug	104	68	-14	56	30	8	0	75	-8	18	10	16	36	6	8	4	30	16	6	14	443	2.2%
15-Aug	14	16	16	14	16	18	0	55	-2	6	-4	10	36	0	2	44	30	32	12	4	325	1.6%
16-Aug	36	8	14	30	16	12	0	100	14	-20	24	14	20	24	34	40	34	30	16	-20	590	2.9%
17-Aug	14	0	-6	16	8	24	0	115	10	18	16	8	22	18	8	16	16	24	16	8	361	1.8%
18-Aug	14	34	24	44	26	10	0	173	24	14	16	10	12	22	0	18	22	22	34	22	549	2.7%
19-Aug	18	22	10	8	0	6	0	90	10	12	16	8	10	6	14	-4	13	10	18	11	282	1.4%
20-Aug	10	16	6	4	2	6	0	49	3	8	9	6	7	6	9	3	13	10	18	11	217	1.1%
21-Aug	10	16	6	4	2	6	0	37	3	8	2	4	4	6	4	2	4	-2	2	6	118	0.6%
22-Aug	4	10	2	2	4	6	0	20	-4	2	0	0	6	2	0	2	2	0	2	7	62	0.3%
23-Aug	6	4	6	4	4	2	0	17	4	0	0	0	2	2	0	2	0	2	-2	0	37	0.2%
24-Aug	14	4	4	2	0	0	0	14	0	0	0	2	0	0	0	2	2	0	2	-2	44	0.2%
25-Aug	-2	0	0	2	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	9	0.0%
26-Aug	0	0	2	2	0	0	0	3	0	0	0	0	0	4	-2	0	0	0	0	0	9	0.0%
27-Aug	0	-1	1	1	0	0	0	3	1	0	1	0	0	2	-1	0	2	1	0	0	10	0.1%
28-Aug	0	-2	0	0	0	0	0	0	2	0	2	0	0	0	0	0	4	2	0	0	13	0.1%
29-Aug	4	0	0	0	0	-2	0	0	0	2	0	4	2	2	2	4	0	0	2	0	29	0.1%
30-Aug	2	0	0	0	0	0	0	0	0	0	0	0	2	-3	0	1	0	0	2	0	9	0.0%
31-Aug	2	4	0	6	0	-2	0	0	0	0	0	2	0	0	4	0	0	0	0	0	26	0.1%
1-Sep	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0.0%
2-Sep	0	0	0	0	0	-2	0	0	0	0	0	0	0	0	0	0	2	-7	0	2	6	0.0%
3-Sep	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	-3	-1	1	1	0.0%
4-Sep	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	-2	0	-1	0.0%
5-Sep	0	0	0	0	0	0	0	0	0	0	2	2	4	2	4	0	0	2	0	0	24	0.1%
6-Sep	0	0	0	0	0	0	0	0	0	0	0	4	0	0	2	0	2	2	0	0	11	0.1%
7-Sep	-2	0	0	0	2	0	0	0	2	0	10	0	0	0	0	4	0	2	0	0	26	0.1%
8-Sep	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0.0%
Total	951	903	463	555	549	688	1,670	581	693	661	578	746	832	1,660	1,816	1,424	1,601	1,643	1,579	20,355	100%	
	4.7%	4.4%	2.3%	2.7%	2.7%	3.3%	13.1%	2.9%	3.4%	3.2%	2.8%	3.7%	4.1%	8.2%	7.9%	7.0%	7.9%	8.2%	7.6%	100%		

Table 4. Expanded daily hourly king salmon migration past the Naukuk River counting tower, Norton Sound, 1999.

Outlined areas indicate hours not counted. Numbers in outlined areas indicate estimated passage.																				Total	% of Total	
Date	0000	0100	0200	0300	0400	0500	0600-1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total	
4-Jul	0	0	0	0	0	0	0	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	2	0	0	4	0	0	0	0	0	0	0	6	15.0%
12-Jul	0	4	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	10	25.0%
13-Jul	0	0	2	0	0	-2	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	4	0	0	0	0	0	2	0	0	6	15.0%
15-Jul	0	0	0	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	-5.0%
16-Jul	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	-2.5%
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	-2	0	0	0	0	0	0	2	0	0	0	0	0	0	0.0%
21-Jul	0	2	0	0	-2	0	0	-1	0	0	-1	0	0	0	1	0	0	0	0	0	-1	-2.5%
22-Jul	1	1	0	0	-1	0	0	-1	0	0	-1	0	0	0	1	0	0	0	0	0	0	0.0%
23-Jul	1	1	0	0	-1	0	0	-1	0	0	-1	0	0	0	1	0	0	0	0	0	0	0.0%
24-Jul	2	0	0	0	0	0	0	0	0	0	-2	0	0	0	0	0	0	0	0	0	0	0.0%
25-Jul	0	2	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	8	20.0%
26-Jul	0	0	0	0	2	0	0	0	0	0	0	-2	0	0	0	2	0	0	0	0	2	5.0%
27-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	6	15.0%
28-Jul	0	0	0	0	0	0	0	0	-2	0	0	0	0	0	4	0	0	0	0	0	2	5.0%
29-Jul	0	0	0	0	0	0	0	-2	0	0	0	2	0	0	0	0	0	0	0	0	0	0.0%
30-Jul	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2.5%
31-Jul	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2.5%
1-Aug	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2.5%
2-Aug	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2.5%
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
23-Aug	0	0	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	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	0.0%
26-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
27-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
28-Aug	0	0	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	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	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	0.0%
1-Sep	0	0	0	0	0	0	0	0	0	0	0	0	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	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%
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%
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%
6-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
7-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
8-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total	4	10	6	-1	-2	-2	-2	-3	-2	2	-5	6	6	0	9	0	6	2	6	40	100.0%	

Table 5. Expanded daily hourly coho salmon migration past the Nukluk River counting tower, Norton Sound, 1999.

Outlined areas indicate hours not counted. Numbers in outlined areas indicate estimated passage.																							Total	% of Total
Date	0000	0100	0200	0300	0400	0500	0600-1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total			
4-Jul	0	0	0	0	0	0	0	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	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	2	0	0	0	0	2	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	0.0%		
30-Jul	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	1	0	4	4	0.1%		
31-Jul	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	1	0	4	4	0.1%		
1-Aug	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	1	0	4	4	0.1%		
2-Aug	0	0	0	0	0	0	0	1	0	2	0	0	0	0	1	0	0	1	0	5	5	0.1%		
3-Aug	0	0	0	0	0	0	0	1	0	2	0	0	0	0	2	0	0	2	0	7	7	0.2%		
4-Aug	0	0	0	0	0	0	0	1	0	4	0	0	0	0	0	0	0	0	0	5	5	0.1%		
5-Aug	2	0	2	0	2	0	0	4	0	4	0	0	0	2	2	0	2	0	0	4	24	0.6%		
6-Aug	4	1	1	2	1	1	0	4	0	2	0	1	0	2	1	0	1	1	0	2	23	0.5%		
7-Aug	6	2	0	4	0	2	0	4	0	0	2	0	0	0	0	0	2	0	0	22	0.5%			
8-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2	0.1%		
9-Aug	0	0	2	0	2	0	0	1	0	0	0	2	0	0	0	4	0	0	2	13	0.3%			
10-Aug	0	0	2	0	0	4	0	2	0	2	0	4	0	2	0	2	2	0	0	30	0.7%			
11-Aug	0	0	0	2	0	2	0	2	0	0	2	0	4	0	6	4	4	0	4	31	0.7%			
12-Aug	2	0	2	2	0	2	0	6	0	0	8	4	2	6	0	10	6	4	12	62	1.5%			
13-Aug	2	0	0	0	0	2	0	6	0	3	4	2	1	8	2	6	8	5	12	61	1.4%			
14-Aug	2	0	2	2	0	2	0	6	0	6	0	0	10	4	4	4	14	16	78	1.8%				
15-Aug	4	4	2	2	2	4	0	8	2	2	0	4	2	0	4	4	14	16	78	1.8%				
16-Aug	10	8	24	22	8	6	0	14	0	4	2	4	2	0	2	0	4	8	118	2.8%				
17-Aug	4	12	6	12	4	10	0	13	4	2	0	4	2	6	0	2	4	4	36	115	2.7%			
18-Aug	12	16	14	8	6	8	0	16	2	4	2	4	6	6	30	0	4	0	2	136	3.2%			
19-Aug	18	8	0	20	2	2	0	22	4	6	14	2	8	20	10	26	5	4	17	191	4.5%			
20-Aug	35	11	6	13	4	8	0	21	5	3	7	2	5	12	5	20	5	4	17	184	4.3%			
21-Aug	35	11	6	13	4	8	0	19	5	9	0	6	2	4	0	4	6	8	34	0	165	3.9%		
22-Aug	52	14	12	6	10	14	0	21	6	4	0	0	8	2	2	2	0	6	10	18	185	4.4%		
23-Aug	20	24	30	52	20	8	0	22	4	0	0	4	2	0	0	0	2	4	6	194	4.6%			
24-Aug	22	32	30	16	12	2	0	19	2	2	8	0	0	2	0	0	-2	4	4	20	163	3.8%		
25-Aug	46	46	24	26	14	6	0	26	0	0	0	2	0	0	2	0	0	2	30	224	5.3%			
26-Aug	16	16	2	0	8	10	0	11	0	0	0	0	0	0	6	2	0	4	0	18	93	2.2%		
27-Aug	18	21	9	6	7	11	0	11	0	0	0	0	0	0	3	1	0	2	0	10	99	2.3%		
28-Aug	20	26	16	12	6	13	0	12	0	0	0	0	0	0	0	0	0	0	0	2	106	2.5%		
29-Aug	4	22	16	28	18	10	0	17	2	0	2	0	0	2	0	2	2	0	6	18	131	3.0%		
30-Aug	22	20	24	6	10	2	0	16	0	0	0	0	0	6	0	2	10	4	4	12	138	3.2%		
31-Aug	48	8	16	26	18	2	0	21	2	0	0	4	2	6	2	10	0	0	0	14	179	4.2%		
1-Sep	28	8	16	16	12	13	0	27	0	2	2	0	4	0	6	4	4	22	26	42	233	5.4%		
2-Sep	46	26	12	24	48	10	0	49	0	6	0	4	8	10	0	26	14	12	40	84	425	10.0%		
3-Sep	25	15	15	16	27	5	0	32	0	3	4	2	4	16	1	13	9	7	25	49	278	6.5%		
4-Sep	34	4	18	8	6	0	0	15	0	0	8	0	0	22	2	0	4	2	4	14	131	3.1%		
5-Sep	34	14	6	8	4	0	0	15	-2	0	0	2	0	2	6	8	8	12	0	16	131	3.1%		
6-Sep	-4	-6	10	8	2	0	0	4	0	0	-4	0	0	0	2	2	6	0	6	10	36	0.8%		
7-Sep	6	8	6	6	6	4	0	11	0	0	4	2	0	13	-4	8	0	10	8	-4	99	2.3%		
8-Sep	-2	6	2	12	6	-2	0	7	0	0	0	4	4	2	2	2	2	2	0	14	61	1.4%		
Total	511	377	319	372	263	167	488	32	34	62	49	69	144	110	170	114	146	260	493	4,266	100.0%			
	13.4%	8.9%	7.5%	8.7%	6.2%	3.9%	11.4%	0.8%	1.3%	1.5%	1.2%	1.6%	3.4%	2.6%	4.0%	2.7%	3.4%	6.1%	11.6%	100%				

Table 6. Expanded daily hourly Dolly Varden migration past the Niukluk River counting tower, Norton Sound, 1999.

Outlined areas indicate hours not counted. Numbers in outlined areas indicate estimated passage.																			Total	% of Total	
Date	0000	0100	0200	0300	0400	0500	0600-1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	% of Total
4-Jul	14	2	0	0	2	2	15	4	6	4	0	0	0	4	2	0	0	0	4	55	1.7%
5-Jul	2	10	4	0	0	10	26	0	0	0	0	0	0	8	6	8	4	4	6	94	2.9%
6-Jul	0	2	8	4	4	0	19	4	4	0	2	0	0	6	4	2	0	2	2	69	2.2%
7-Jul	4	2	4	0	0	6	11	2	0	2	-2	0	4	6	0	0	0	0	2	41	1.3%
8-Jul	0	0	0	4	2	0	6	0	2	0	0	0	0	2	0	0	0	2	4	22	0.7%
9-Jul	1	2	2	4	1	0	11	0	2	-1	4	3	1	1	0	1	0	3	5	40	1.3%
10-Jul	1	4	4	4	0	0	16	0	2	-2	8	6	2	0	0	2	0	4	6	58	1.8%
11-Jul	8	10	10	6	6	2	38	0	0	0	0	8	0	8	2	4	28	8	138	4.3%	
12-Jul	8	6	12	10	2	10	10	0	0	0	0	0	4	0	0	0	0	0	0	62	2.0%
13-Jul	4	8	2	0	6	0	4	0	2	0	0	0	0	0	0	0	0	0	0	26	0.8%
14-Jul	2	6	8	2	0	4	6	0	2	0	0	4	0	0	0	0	0	0	0	34	1.1%
15-Jul	0	0	0	0	0	0	6	2	4	0	0	0	0	0	0	0	0	0	0	32	0.4%
16-Jul	3	1	0	1	1	4	3	2	0	0	0	0	1	0	0	0	0	0	0	16	0.5%
17-Jul	6	2	0	2	2	2	3	0	0	0	0	0	2	0	0	0	0	0	0	19	0.6%
18-Jul	4	0	0	0	0	0	2	0	0	0	2	0	0	0	0	4	0	0	2	14	0.5%
19-Jul	0	4	0	0	4	4	2	-4	0	0	-4	4	0	0	0	0	0	0	2	12	0.4%
20-Jul	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	7	0.2%
21-Jul	0	-2	0	0	0	2	3	2	1	-1	-1	1	0	3	1	0	1	1	2	12	0.4%
22-Jul	2	-1	2	2	2	5	4	2	1	-1	-1	1	0	3	1	0	1	1	2	26	0.8%
23-Jul	2	-1	2	2	2	5	30	2	1	-1	-1	1	0	3	1	0	1	1	2	42	1.3%
24-Jul	4	0	4	4	4	8	39	4	2	-2	-2	2	0	6	2	0	2	0	4	81	2.6%
25-Jul	0	4	0	0	0	0	24	2	2	0	0	4	2	0	0	4	4	2	2	50	1.6%
26-Jul	4	0	0	0	0	0	11	0	0	0	0	0	0	0	0	2	4	2	0	23	0.7%
27-Jul	2	2	0	2	2	4	32	2	0	8	-4	0	4	4	0	2	2	0	4	66	2.1%
28-Jul	8	-2	-2	2	2	0	35	0	0	-2	4	2	0	6	4	2	2	8	4	73	2.3%
29-Jul	6	2	0	0	4	0	26	2	4	0	0	2	0	0	2	2	0	0	4	54	1.7%
30-Jul	6	3	-1	0	3	1	28	1	5	1	0	3	0	0	3	1	2	0	2	58	1.8%
31-Jul	6	3	-1	0	3	1	28	1	5	1	0	3	0	0	3	1	2	0	2	58	1.8%
1-Aug	6	3	-1	0	3	1	28	1	5	1	0	3	0	0	3	1	2	0	2	58	1.8%
2-Aug	6	3	-1	0	3	1	17	1	5	1	0	3	0	0	3	1	2	0	2	47	1.5%
3-Aug	6	3	-1	0	3	1	18	1	5	1	0	4	0	0	4	0	4	0	0	49	1.5%
4-Aug	6	4	-2	0	2	2	16	0	6	2	2	0	0	0	-2	4	2	0	2	44	1.4%
5-Aug	2	2	0	0	0	0	16	2	0	2	0	4	4	2	0	4	0	2	4	44	1.4%
6-Aug	4	2	0	1	0	-1	20	4	0	1	2	2	4	1	0	6	2	3	4	55	1.7%
7-Aug	6	2	0	2	0	-2	24	6	0	0	4	0	4	0	0	8	4	4	4	66	2.1%
8-Aug	4	2	6	2	0	-2	19	-2	4	6	4	-2	2	0	2	0	4	4	4	53	1.7%
9-Aug	2	2	4	4	4	0	0	0	0	0	0	-1	2	2	2	8	4	0	4	37	1.2%
10-Aug	4	0	-2	2	2	2	6	2	0	0	2	0	4	0	0	4	0	2	0	22	0.7%
11-Aug	0	2	0	0	0	0	0	0	0	2	2	0	0	2	0	0	2	0	0	10	0.3%
12-Aug	0	2	4	2	0	4	0	0	0	2	0	0	0	2	0	0	0	0	2	18	0.6%
13-Aug	-1	1	3	0	0	4	0	0	0	1	1	-1	0	1	0	1	0	1	2	13	0.4%
14-Aug	-2	0	2	-2	0	4	0	0	0	0	2	-2	0	0	0	2	0	2	2	8	0.3%
15-Aug	4	2	0	0	4	0	0	0	0	2	-2	0	0	4	0	0	4	0	8	26	0.8%
16-Aug	0	0	0	0	4	0	6	2	-2	4	0	0	0	0	2	0	4	4	-2	22	0.7%
17-Aug	2	0	0	0	0	0	6	2	4	2	-2	0	-2	0	6	0	0	2	2	22	0.7%
18-Aug	2	0	2	0	0	0	4	0	2	0	2	0	2	0	0	0	0	0	0	14	0.4%
19-Aug	0	0	0	0	0	0	4	-2	4	0	2	0	2	2	0	1	1	0	1	15	0.5%
20-Aug	3	2	0	0	1	0	4	-2	3	-1	1	0	2	0	-1	1	1	0	1	15	0.5%
21-Aug	3	3	0	0	1	0	3	-2	2	-2	0	0	2	-2	-2	2	2	0	2	11	0.3%
22-Aug	6	4	0	0	2	0	41	-2	2	0	2	2	0	0	2	-2	58	32	8	155	4.9%
23-Aug	14	6	10	10	4	2	21	2	-2	2	2	4	2	0	0	0	2	0	0	79	2.5%
24-Aug	6	6	10	10	6	4	17	0	0	0	0	2	0	-2	0	2	0	0	2	63	2.0%
25-Aug	4	4	0	0	6	0	5	-2	0	2	0	2	0	-2	2	0	0	-2	0	19	0.6%
26-Aug	6	2	0	0	0	4	61	0	0	0	0	0	0	0	0	24	0	90	42	229	7.2%
27-Aug	3	2	1	3	1	2	34	1	0	0	0	0	0	0	0	12	0	46	23	128	4.0%
28-Aug	0	2	2	6	2	0	7	2	0	0	0	0	0	0	0	0	0	2	4	27	0.9%
29-Aug	2	10	4	6	4	2	18	4	2	0	0	0	0	-2	4	2	2	2	8	68	2.2%
30-Aug	4	2	6	6	2	0	13	0	0	-2	2	0	0	2	4	4	0	2	2	46	1.5%
31-Aug	4	4	4	2	4	0	5	0	0	-2	0	0	0	0	2	0	0	-4	0	19	0.6%
1-Sep	4	4	8	4	2	-2	12	0	0	0	0	2	0	0	2	2	0	0	6	44	1.4%
2-Sep	10	6	6	2	4	0	16	2	0	0	0	0	0	0	0	4	2	4	4	60	1.9%
3-Sep	6	4	3	2	2	2	10	1	0	0	0	0	0	0	0	2	1	3	2	38	1.2%
4-Sep	2	2	0	2	0	4	4	0	0	0	0	0	0	0	0	0	0	2	0	16	0.5%
5-Sep	4	2	-2	0	2	0	10	0	0	0	0	0	0	0	0	0	0	10	12	38	1.2%
6-Sep	2	0	4	0	0	0	7	0	0	0	0	0	0	0	0	2	0	0	10	25	0.8%
7-Sep	8	0	18	18	0	4	40	-2	0	0	0	0	0	2	0	2	0	46	8	150	4.7%
8-Sep	2	6	-20	0	-2	-2	15	0	0	0	0	0	0	0	2	0	0	4	10	55	1.7%
Total	242	177	166	131	114	122	944	49	81	38	31	58	56	64	70	130	130	321	254	3,170	100.0%
	7.6%	5.6%	5.2%	4.1%	3.6%	3.8%	29.3%	1.5%	2.6%	0.9%	1.0%	1.8%	1.8%	2.0%	2.2%	4.1%	4.1%	10.1%	8.0%	100%	

Table 7. Reported hourly chum salmon observations at the Niukluk River counting tower, Norton Sound, 1999.

Outlined areas indicate hours not counted																								Total	% of Total						
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					
4-Jul	0	0	0	2	0	0							2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.0%			
5-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	-4	0.0%	
6-Jul	0	0	0	0	-2	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0.0%	
7-Jul	0	0	0	-4	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-4	0.0%	
8-Jul	0	0	2	4	0	2	0	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	4	6	0	24	0.1%				
9-Jul																															
10-Jul	60	42	64	0	38	12							0	0	0	24	-2	46	-44	40	126	250	108	2	766	3.5%					
11-Jul	76	34	14	56	116	54							10	-6	6	12	10	334	74	170	142	294	200	76	3,672	7.7%					
12-Jul	78	216	28	138	118	70							2	0	6	0	4	2	0	84	206	480	96	20	5,542	7.1%					
13-Jul	64	48	40	16	0	0							10	-2	2	6	40	24	2	6	22	148	0	4	430	2.0%					
14-Jul	52	36	62	48	0	162							6	12	4	36	58	116	34	16	30	140	120	6	938	4.3%					
15-Jul	-24	8	20	-2	4	0	8	8	6	0	4	-4	76	-2	24	4	20	74	90	-10	4	40	18	-2	372	1.7%					
16-Jul																															
17-Jul	62	96	-6	-20	-2	2							-2	4	-36	194	302	88	26	-28	44	-46	102	-22	758	3.5%					
18-Jul	70	66	16	8	-8	4							32	50	-6	178	102	94	232	88	354	378	278	84	2,020	9.3%					
19-Jul	138	32	54	32	-52	-16							-12	-62	64	14	132	70	46	268	54	220	-106	196	1,072	4.9%					
20-Jul	126	8	32	-42	-18	-20							-18	26	-10	24	46	92	-128	190	158	14	362	180	1,014	4.7%					
21-Jul	-78	118	-372	-264	-62	38																					-620	-2.9%			
22-Jul																															
23-Jul																															
24-Jul	10	-54	-32	12	2	20							82	24	34	76	22	82	100	190	330	246	154	150	1,448	6.7%					
25-Jul	120	148	158	70	76	170							32	36	18	32	84	44	112	92	20	68	140	158	1,586	7.3%					
26-Jul	222	22	-102	-28	-8	26							-4	14	16	18	38	104	200	130	90	128	80	140	1,086	5.0%					
27-Jul	-6	4	-12	6	6	-14							30	-6	22	6	10	70	60	60	146	130	122	218	852	3.9%					
28-Jul	100	110	70	58	50	160							4	-8	6	20	-4	8	104	76	86	122	82	210	1,246	5.7%					
29-Jul	64	138	36	70	60	158	46	52	32	18	16	-4	8	10	2	6	18	64	26	34	74	70	68	44	1,110	5.1%					
30-Jul																															
31-Jul																															
1-Aug																															
2-Aug																															
3-Aug																															
4-Aug	58	56	58	36	38	48							20	0	14	20	50	10	44	56	36	30	32	40	538	2.5%					
5-Aug	50	36	40	4	56	42	40	52	14	8	26	6	22	0	4	2	12	-30	8	0	30	20	-4	32	646	3.0%					
6-Aug																															
7-Aug	44	24	-4	30	-4	16							22	2	12	4	28	18	24	48	38	52	28	38	420	1.9%					
8-Aug	6	8	18	14	-10	18							8	20	28	4	12	34	22	26	-2	16	68	26	316	1.5%					
9-Aug	20	14	26	12	14	16							0	2	-2	14	10	-14	14	48	28	36	56	44	338	1.6%					
10-Aug	26	40	10	-8	10	22							14	22	-14	10	-6	20	26	12	22	2	-12	40	236	1.1%					
11-Aug	38	16	-2	10	10	16							-10	6	-12	4	-10	-6	-6	30	22	6	-4	6	102	0.5%					
12-Aug	18	16	8	-2	4	18	6	16	-8	6	12	12	6	8	6	12	12	12	8	0	10	16	26	12	234	1.1%					
13-Aug																															
14-Aug	22	10	14	22	-8	-4							0	22	22	-16	6	-2	14	4	12	10	0	32	168	0.8%					
15-Aug	16	16	14	10	6	8							-2	10	-6	8	8	2	2	14	2	12	20	14	154	0.7%					
16-Aug	6	38	46	16	24	-10							4	6	8	4	-6	12	26	20	-12	10	14	2	208	1.0%					
17-Aug	4	14	2	-8	-2	2							6	2	10	8	14	14	-8	8	8	2	-10	24	86	0.4%					
18-Aug	30	2	12	18	2	18							14	8	4	0	-4	18	12	-12	-4	14	18	10	160	0.7%					
19-Aug	2	0	8	-2	10	0	0	-8	4	2	-4	8	10	6	12	12	8	-4	-10	24					78	0.4%					
20-Aug																															
21-Aug																															
22-Aug	4	-4	2	6	2	2							2	0	6	0	4	6	-4	0	8	0	4	10	48	0.2%					
23-Aug	4	0	0	2	2	2							-2	2	0	6	4	2	-2	-2	4	2	2	-2	24	0.1%					
24-Aug	2	0	0	2	-4	-2							2	8	8	8	10	6	0	6	4	4	-2	2	54	0.2%					
25-Aug	2	2	0	2	2	2							0	0	0	0	6	-2	0	0	2	4	0	4	24	0.1%					
26-Aug	-4	-4	0	0	-2	0							0	0	0	0	0	-2	0	0	0	2	0	0	-10	0.0%					
27-Aug																															
28-Aug	10	10	2	2	6	0							-2	0	-2	0	2	4	-2	0	0	4	4	2	40	0.2%					
29-Aug	-4	0	4	2	0	2							0	2	0	0	0	2	2	4	2	-2	4	4	4	22	0.1%				
30-Aug	2	2	0	0	-6	0							0	0	0	-4	2	2	0	0	2	0	0	0	0	0	0	0	0	0	0
31-Aug	0	-2	-2	0	6	0							0	0	0	2	0	0	0	2	-2	0	-2	0	2	0	2	0	0	0	0
1-Sep	2	2	0	0	0	0							0	0	0	0	0	-2	0	0	0	0	2	0	2	0	4	0	0	0	0
2-Sep	0	2	2	-2	-2	0							0	0	0	0	0	0	0	0	-2	0	2	0	0	0	0	0	0	0	0
3-Sep																															
4-Sep	-2	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0.0%		
5-Sep	2	0	0	2	0	0							0	0	0	0	-2	0	0	0	0	0	0	0	0	0	2	4	0.0%		
6-Sep	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	2	-2	0	0	0	0	0	0
7-Sep	0	0	0	2	0	0							0	0	2	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0
8-Sep	0	0	0	0	0	0							-4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,492	1,370	390	330	472	1,052	100	122	48	34	54	26	370	224	252	764	1,072	1,456	1,140	1,832	2,202	2,980	2,146	1,866	21,714	100.0%					
	6.9%	6.3%	1.5%	1.5%	2.2%	4.8%	0.5%	0.6%	0.2%	0.2%	0.2%	0.1%	1.7%	1.0%	1.2%	3.5%	4.9%	6.7%	5.3%	8.3%	10.1%	13.7%	9.9%	8.6%	100.0%						

Table 9 Reported hourly king salmon observations at the Nuukuk River counting tower, Norton Sound, 1999.

Outlined areas indicate hours not counted																								Total	% of Total			
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		
4-Jul	0	0	0	0	0	0							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%	
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																												
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	2	0	0	4	0	0	0	0	0	0	0	6	15.8%	
12-Jul	0	4	2	2	0	0							0	0	0	0	0	0	0	0	0	0	2	0	10	26.3%		
13-Jul	0	0	1	0	0	-2							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	4	0	0	0	0	2	0	6	15.8%		
15-Jul	0	0	0	-2	0	0							0	0	0	0	0	0	0	0	0	0	0	0	-2	-2	-5.3%	
16-Jul																												
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							-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
21-Jul	0	2	0	0	-2	0														2	0	0	0	0	0	0	0	0.0%
22-Jul																												
23-Jul																												
24-Jul	2	0	0	0	0	0							0	0	0	-2	0	0	0	0	0	0	0	0	0	0	0.0%	
25-Jul	0	2	2	0	0	0							2	0	0	0	0	0	0	0	0	0	0	0	2	8	21.1%	
26-Jul	0	0	0	0	2	0							0	0	0	0	-2	0	0	0	0	2	0	0	2	2	5.3%	
27-Jul	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	2	0	4	6	15.8%		
28-Jul	0	0	0	0	0	0							0	-2	0	0	0	0	0	4	0	0	0	0	2	2	5.3%	
29-Jul	0	0	0	0	0	0							0	0	0	0	2	0	0	0	0	0	0	0	0	0	0.0%	
30-Jul																												
31-Jul																												
1-Aug																												
2-Aug																												
3-Aug																												
4-Aug	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%	
6-Aug																												
7-Aug	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%	
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	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%	
13-Aug																												
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	0	0	0	0	0	0	0.0%	
20-Aug																												
21-Aug																												
22-Aug	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
23-Aug	0	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	0.0%	
25-Aug	0	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							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
27-Aug																												
28-Aug	0	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	0.0%	
30-Aug	0	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	0.0%	
1-Sep	0	0	0	0	0	0							0	0	0	0	0	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	0.0%	
3-Sep																												
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%	
6-Sep	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
7-Sep	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
8-Sep	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Total	2	6	6	0	0	-2	0	0	0	0	0	-2	0	-2	2	-2	2	6	0	6	0	6	2	0	38	100.0%	100.0%	

Table 10. Reported hourly coho salmon observations at the Niukluk River counting tower, Norton Sound, 1999.

Outlined areas indicate hours not counted																								Total	% of Total																	
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																
4-Jul	0	0	0	0	0	0	[Outlined]						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%													
5-Jul	0	0	0	0	0	0							[Outlined]						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													[Outlined]						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																			[Outlined]						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	0							0	0	0	0.0%								
9-Jul	[Outlined]																								0	0.0%																
10-Jul	0	0	0	0	0	0	[Outlined]						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							[Outlined]						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													[Outlined]						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																			[Outlined]						0	0	0	0	0	0	0	0	0	0	0	0
14-Jul	0	0	0	0	0	0	[Outlined]						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	0.0%								
16-Jul	[Outlined]																								0	0.0%																
17-Jul	0	0	0	0	0	0	[Outlined]						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							[Outlined]						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													[Outlined]						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																			[Outlined]						0	0	0	0	0	0	0	0	0	0	0	0
21-Jul	0	0	0	0	0	0	[Outlined]						0	0	0	0	0	0	0	0	0	0	0	0							0	0	0	0	0.0%							
22-Jul	[Outlined]																								0	0.0%																
23-Jul	[Outlined]																								0	0.0%																
24-Jul	0	0	0	0	0	0	[Outlined]						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							[Outlined]						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													[Outlined]						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																			[Outlined]						0	0	0	0	0	0	0	0	0	0	0	0
28-Jul	0	0	0	0	0	0	[Outlined]						0	0	0	0	0	0	0	0	0	0	2	0							0	0	0	2	0.1%							
29-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	0.0%								
30-Jul	[Outlined]																								0	0.0%																
31-Jul	[Outlined]																								0	0.0%																
1-Aug	[Outlined]																								0	0.0%																
2-Aug	[Outlined]																								0	0.0%																
3-Aug	[Outlined]																								0	0.0%																
4-Aug	0	0	0	0	0	0	[Outlined]						0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.1%												
5-Aug	2	0	2	0	2	0							2	2	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4	0.1%								
6-Aug	[Outlined]																								0	0.0%																
7-Aug	6	2	0	4	0	2	[Outlined]						0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	18	0.6%													
8-Aug	0	0	0	0	0	0							[Outlined]						0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	2	0.1%					
9-Aug	0	0	2	0	2	0													[Outlined]						0	0	0	0	2	0	0	0	0	0	4	0	0	2	12	0.4%		
10-Aug	0	0	2	0	0	4																			[Outlined]						0	0	2	0	4	0	2	0	2	2	0	2
11-Aug	0	0	0	2	0	2	[Outlined]						0	0	0	2	0	4	0	6	4	4	0	4							0	4	28	0.9%								
12-Aug	2	0	2	-2	0	2							-2	2	4	0	0	2	0	0	0	8	4	2	6	0	10	6	4	12	62	2.0%										
13-Aug	[Outlined]																								0	0.0%																
14-Aug	2	0	-2	2	0	2	[Outlined]						0	0	6	0	0	0	10	4	2	10	6	12	54	1.7%																
15-Aug	4	4	2	2	2	4							[Outlined]						2	2	0	4	2	0	0	4	4	4	4	14	16	70	2.3%									
16-Aug	10	8	24	22	6	6													[Outlined]						0	0	4	2	4	2	0	2	2	0	4	8	104	3.3%				
17-Aug	4	12	6	12	4	10																			[Outlined]						4	2	0	-4	2	6	0	2	0	2	4	4
18-Aug	12	16	14	8	6	8	[Outlined]						-2	4	2	4	6	6	30	0	4	0	0	2							120	3.9%										
19-Aug	18	8	0	20	-2	2							18	0	2	-2	2	2	4	6	14	-2	8	20	10	36	164	5.3%														
20-Aug	[Outlined]																								0	0.0%																
21-Aug	[Outlined]																								0	0.0%																
22-Aug	52	14	12	6	10	14	[Outlined]						6	4	0	0	6	2	2	2	0	6	10	18	164	5.3%																
23-Aug	20	24	30	52	20	8							[Outlined]						4	0	0	0	4	-2	0	0	0	2	4	6	172	5.5%										
24-Aug	22	32	20	16	12	2													[Outlined]						2	2	8	0	0	2	0	0	-2	4	4	20	144	4.6%				
25-Aug	46	46	24	26	14	6																			[Outlined]						0	0	0	2	0	0	2	0	0	0	2	30
26-Aug	16	16	2	0	8	10	[Outlined]						0	0	0	0	0	0	6	2	0	4	0	18							82	2.6%										
27-Aug	[Outlined]																								0	0.0%																
28-Aug	20	26	16	12	6	12	[Outlined]						0	0	0	0	0	0	0	0	0	0	0	0	2	94	3.0%															
29-Aug	4	22	16	28	18	10							[Outlined]						2	0	2	0	0	2	0	2	2	2	6	18	134	4.3%										
30-Aug	22	20	24	6	10	2													[Outlined]						0	0	0	0	0	6	0	2	10	4	4	12	122	3.9%				
31-Aug	48	3	16	24	18	2																			[Outlined]						2	0	0	4	2	6	3	10	0	0	0	14
1-Sep	58	8	16	14	12	12	[Outlined]						0	2	2	0	4	0	6	4	4	22	26	42							204	6.6%										
2-Sep	46	26	12	24	48	10							[Outlined]						0	6	0	4	4	2	2	2	2	2	12	46	84	376	12.1%									
3-Sep	[Outlined]																								0	0.0%																
4-Sep	24	4	18	8	8	0													[Outlined]						0	0	8	0	0	22	2	0	4	2	4	14	116	3.7%				
5-Sep	24	14	6	4	4	0	[Outlined]						-2	0	0	2	0	2							6	8	8	12	0	0	116	3.7%										
6-Sep	-4	-6	10	8	2	0							[Outlined]												0	0	-4	0	8	0	2	-2	6	0	6	10	32	1.0%				
7-Sep	6	8	6	6	6	4																			[Outlined]						0	0	4	2	8	12	4	8	0	10	8	4
8-Sep	-2	6	2	12	8	-2	[Outlined]						0	0	0	4	4	2	2	2	2	2	0	14							34	1.3%										
Total	442	318	282	322	220	132							18	-4	6	-2	2	-4	22	36	48	40	58	114	92	130	88	126	192	418	3,106	100.0%										
	14.2%	10.2%	9.1%	10.4%	7.1%	4.2%	0.6%	0.1%	0.2%	-0.1%	0.1%	0.1%	0.7%	1.2%	1.5%	1.3%	1.9%	3.7%	3.0%	4.2%	2.8%	3.8%	6.2%	13.5%	100.0%																	

Table 11. Reported hourly Dolly Varden observations at the Niukluk River counting tower, Norton Sound, 1999.

Outlined areas indicate hours not counted																								Total	% of Total		
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	
4-Jul	14	2	0	0	-2	2							4	6	4	0	0	0	4	2	0	0	0	4	40	2.2%	
5-Jul	2	10	4	0	0	16							0	0	0	0	0	0	8	6	8	4	4	6	68	3.7%	
6-Jul	0	2	8	4	4	6							4	4	0	2	0	0	6	4	2	0	2	2	50	2.7%	
7-Jul	4	2	4	0	0	6							2	0	2	-2	0	4	6	0	0	0	0	2	30	1.6%	
8-Jul	0	0	0	4	2	0		2	0	2	2	0	0	2	0	0	0	0	2	0	0	0	2	4	22	1.2%	
9-Jul																											
10-Jul	2	4	4	4	0	0							0	2	-2	8	6	2	0	0	2	0	4	6	42	2.3%	
11-Jul	8	10	10	6	6	2							0	0	0	0	0	8	0	8	2	4	28	8	100	5.4%	
12-Jul	8	6	12	10	2	10							0	0	0	0	0	4	0	0	0	0	0	0	52	2.8%	
13-Jul	4	8	2	0	6	0							0	2	0	0	0	0	0	0	0	0	0	0	22	1.2%	
14-Jul	2	6	8	2	0	-4							0	2	0	0	4	0	0	0	0	0	0	0	28	1.5%	
15-Jul	0	0	0	0	0	6		0	2	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	12	0.6%	
16-Jul																											
17-Jul	6	2	0	2	2	2							0	0	0	0	0	2	0	0	0	0	0	0	16	0.9%	
18-Jul	4	0	0	0	0	0							0	0	0	2	0	0	0	0	4	0	0	2	12	0.6%	
19-Jul	0	4	0	0	4	4							-4	0	0	-4	4	0	0	0	0	0	0	2	10	0.5%	
20-Jul	0	4	0	0	0	0							0	0	0	0	0	0	0	0	0	0	2	0	6	0.3%	
21-Jul	0	-2	0	0	0	2																			0	0.0%	
22-Jul																											
23-Jul																											
24-Jul	4	0	4	4	4	8							4	2	-2	-2	2	0	6	2	0	2	0	4	42	2.3%	
25-Jul	0	4	0	0	0	0							2	2	0	0	4	2	0	0	4	4	2	2	26	1.4%	
26-Jul	4	0	0	0	0	0							0	0	0	0	0	0	0	0	2	4	2	0	12	0.6%	
27-Jul	2	2	0	2	2	4							2	0	8	-4	0	4	4	0	2	2	0	4	34	1.8%	
28-Jul	8	-2	-2	2	2	0							0	0	-2	4	2	0	6	4	2	2	8	4	38	2.0%	
29-Jul	6	2	0	0	4	0		8	8	4	4	2	2	4	0	0	2	0	0	2	2	0	0	4	54	2.9%	
30-Jul																											
31-Jul																											
1-Aug																											
2-Aug																											
3-Aug																0	4	0	0	4	0	4	0	0	12	0.6%	
4-Aug	6	4	-2	0	2	2							0	6	2	2	0	0	0	-2	4	2	0	2	28	1.5%	
5-Aug	2	2	0	0	0	0		-2	-2	14	0	6	2	0	2	0	4	4	2	0	4	0	2	4	44	2.4%	
6-Aug																											
7-Aug	6	2	0	2	0	-2							6	0	0	4	0	4	0	0	8	4	4	4	42	2.3%	
8-Aug	4	2	6	2	0	-2							-2	4	6	4	-2	2	0	2	0	0	4	4	34	1.8%	
9-Aug	2	2	4	4	4	6							0	0	0	0	2	2	2	2	8	4	0	4	40	2.2%	
10-Aug	4	0	-2	2	2	2							2	0	0	2	0	4	0	0	4	0	2	0	22	1.2%	
11-Aug	0	2	0	0	0	0							0	0	2	2	0	0	2	0	0	2	0	0	10	0.5%	
12-Aug	0	2	4	2	0	4		0	4	0	-2	-2	0	0	2	0	0	0	2	0	0	0	0	2	18	1.0%	
13-Aug																											
14-Aug	-2	0	2	-2	0	-4							0	0	0	2	-2	0	0	0	2	0	2	2	8	0.4%	
15-Aug	4	2	0	0	4	0							0	0	2	-2	0	0	4	0	0	4	0	8	26	1.4%	
16-Aug	0	0	0	0	4	0							2	-2	4	0	0	0	0	2	0	4	4	-2	16	0.9%	
17-Aug	2	0	0	0	0	0							2	4	2	-2	0	-2	0	6	0	0	2	2	16	0.9%	
18-Aug	2	0	2	0	0	0							0	2	0	2	0	2	0	0	0	0	0	0	10	0.5%	
19-Aug	0	0	0	0	0	0		2	0	0	0	2	0	4	0	2	0	2	2	0					12	0.6%	
20-Aug																											
21-Aug																											
22-Aug	6	4	0	0	2	0							-2	2	0	2	2	0	0	2	-2	2	2	0	4	4	0.2%
23-Aug	14	6	10	10	4	2							2	-2	2	2	4	2	0	0	0	2	0	0	58	3.1%	
24-Aug	6	6	10	10	6	4							0	0	0	2	0	-2	0	2	0	0	2	0	46	2.5%	
25-Aug	4	4	0	0	6	0							-2	0	2	0	2	0	-2	2	0	0	-2	0	14	0.8%	
26-Aug	6	2	0	0	0	4							0	0	0	0	0	0	0	24	0	90	42	168	9.0%		
27-Aug																											
28-Aug	0	2	2	6	2	0							2	0	0	0	0	0	0	0	0	0	2	4	20	1.1%	
29-Aug	2	10	4	6	4	2							4	2	0	0	0	-2	4	2	2	2	8	8	50	2.7%	
30-Aug	4	2	6	6	2	0							0	0	-2	2	0	0	2	4	4	0	2	2	34	1.8%	
31-Aug	4	4	4	2	4	0							0	0	-2	0	0	0	0	2	0	0	-4	0	14	0.8%	
1-Sep	4	4	8	4	2	-2							0	0	0	0	2	0	0	0	2	2	0	6	32	1.7%	
2-Sep	10	6	6	2	4	0							2	0	0	0	0	0	0	4	2	4	4	4	44	2.4%	
3-Sep																											
4-Sep	2	2	0	2	0	4							0	0	0	0	0	0	0	0	0	0	2	0	12	0.6%	
5-Sep	4	2	-2	0	2	0							0	0	0	0	0	0	0	0	0	10	12	12	23	1.5%	
6-Sep	2	0	4	0	0	0							0	0	0	0	0	0	0	2	0	0	0	10	18	1.0%	
7-Sep	8	6	18	18	0	4							-2	0	0	0	0	2	0	2	0	46	8	110	5.9%		
8-Sep	2	6	20	0	-2	-2							0	0	0	0	0	0	2	0	0	4	16	16	40	2.2%	
Total	186	148	158	116	88	96	10	12	20	4	8	0	34	48	28	26	42	48	52	56	102	114	262	202	1,860	100%	
	10.0%	8.0%	8.5%	6.2%	4.7%	5.2%	0.5%	0.6%	1.1%	0.2%	0.4%	0.0%	1.8%	2.6%	1.5%	1.4%	2.3%	2.6%	2.8%	3.0%	5.3%	6.1%	14.1%	10.9%	100.0%		

Table 12. Age, sex and length composition of chum salmon beach seine samples, Niukluk F Norton Sound, 1999.

		<u>Brood Year and (Age Group)</u>			
		<u>1996</u>	<u>1995</u>	<u>1994</u>	
		(0.2)	(0.3)	(0.4)	Total
Sampling Dates:	7/19 - 8/29/99				
Sample Size:	350				
Female	Percent of Sample	0.5%	36.0%	16.0%	52.6%
	Number in Sample	2	126	56	184
	Mean length (mm) ^a	520	557	574	
Male	Percent of Sample	0.6%	31.4%	15.4%	47.4%
	Number in Sample	2	110	54	166
	Mean length (mm) ^a	573	601	611	
Total	Percent of Sample	1.1%	67.4%	31.4%	100.0%
	Number in Sample	4	236	110	350

^a Length was from mid-eye to fork of tail.

Table 13. Niukluk River counting tower climatological and stream observations, Norton Sound 1999.

Date	Time	Air Temp °C	Water Temp °C	% Cloud Cover	Water Gauge	Water Visibility	Remarks
4-Jul	13:30	14	11	60%	23.00	Clear	
5-Jul	13:30	19	12	20%	22.50	Clear	
6-Jul	13:30	17	12	20%	21.75	Clear	
7-Jul	14:30	9.5	11.5	90%	20.75	Clear	
8-Jul	14:30	15	11.5	90%	20.75	Clear	
9-Jul	13:45	20	13.5	1%	20.75	Clear	
10-Jul	11:40	21	16.5	30%	19.50	Clear	
11-Jul	13:30	21.5	16	20%	19.25	Clear	
12-Jul	13:30	22	16	20%	19.00	Clear	
13-Jul	13:30	20	15.5	80%	18.75	Clear	
14-Jul	13:30	19	15	80%	18.25	Clear	
15-Jul	10:30	17	14	100%	19.00	Clear	Rain
16-Jul							
17-Jul	13:30	11	12	90%	18.50	Clear	
18-Jul	13:30	16	12	90%	18.00	Clear	
19-Jul	13:30	12	12	100%	18.50	Clear	
20-Jul	13:30	9.5	10.5	100%	23.75	Bit Murky	
21-Jul	14:00	6.5	9	100%	40.50	Very Murky	Pickets out
22-Jul							
23-Jul							Pickets in
24-Jul	13:30	13	10	100%	24.25	Clear	
25-Jul	13:30	12.0	11.0	100%	25.75	Clear	
26-Jul	13:30	11.0	11.0	100%	32.50	Bit Murky	
27-Jul	13:30	11.5	11.0	90%	33.25	Bit Murky	
28-Jul	13:30	15.0	11.5	100%	31.00	Clear	
29-Jul	13:30	12.0	11.0	90%	30.00	Clear	
30-Jul							
31-Jul							Pickets out
1-Aug	13:30	9.0	9.0	100%	51.50	Murky	Pickets out
2-Aug	13:30	9.5	8.0	100%	45.75	Murky	Pickets out
3-Aug	16:30	22.0	11.0	50%	41.25	Clear	Pickets in
4-Aug	12:30	18.0	11.0	100%	39.00	Clear	
5-Aug	12:30	14.0	11.0	75%	37.50	Clear	Windy
6-Aug						Clear	
7-Aug	12:30	15.0	11.0	100%	34.00	Clear	
8-Aug	12:30	13.0	10.0	75%	33.00	Clear	
9-Aug	13:30	25.0	10.0	50%	31.00	Clear	
10-Aug	14:30	12.0	11.0	100%	31.50	Clear	Rain; Windy
11-Aug	13:30	10.5	11.0	100%	36.70	Clear	
12-Aug	10:00	10.0	9.5	100%	36.00	Clear	
13-Aug							
14-Aug	12:30	12.0	9.0	100%	32.00	Clear	
15-Aug	15:30	17.0	10.0	75%	31.00	Clear	
16-Aug	13:30	13.0	10.0	100%	30.50	Clear	
17-Aug	13:30	12.0	11.0	100%	29.00	Clear	
18-Aug	15:15	14.0	9.5	100%	28.50	Clear	
19-Aug	21:00	10.5	10.0	100%	42.00	Clear	Rain; Windy
20-Aug							Pickets out
21-Aug	18:30	17.5	12.0	20%	33.50	Clear	Pickets in
22-Aug	12:30	15.0	10.0	50%	32.50	Clear	Light rain
23-Aug	13:30	15.0	10.0	0%	31.50	Clear	
24-Aug	13:00	14.5	9.5	0%	30.25	Clear	
25-Aug	15:30	15.0	9.5	95%	29.50	Clear	Windy
26-Aug	12:30	16.0	9.0	1%	29.00	Clear	Light wind
27-Aug	13:00	11.0	9.5	5%	27.00	Clear	
28-Aug	13:00	10.0	9.5	10%	27.00	Clear	
29-Aug	13:00	10.0	8.5	0%	26.50	Clear	
30-Aug	12:30	10.0	8.5	75%	26.00	Clear	

Figure 1. Area location map of the Niukluk River counting tower project site, Norton Sound, 1999.

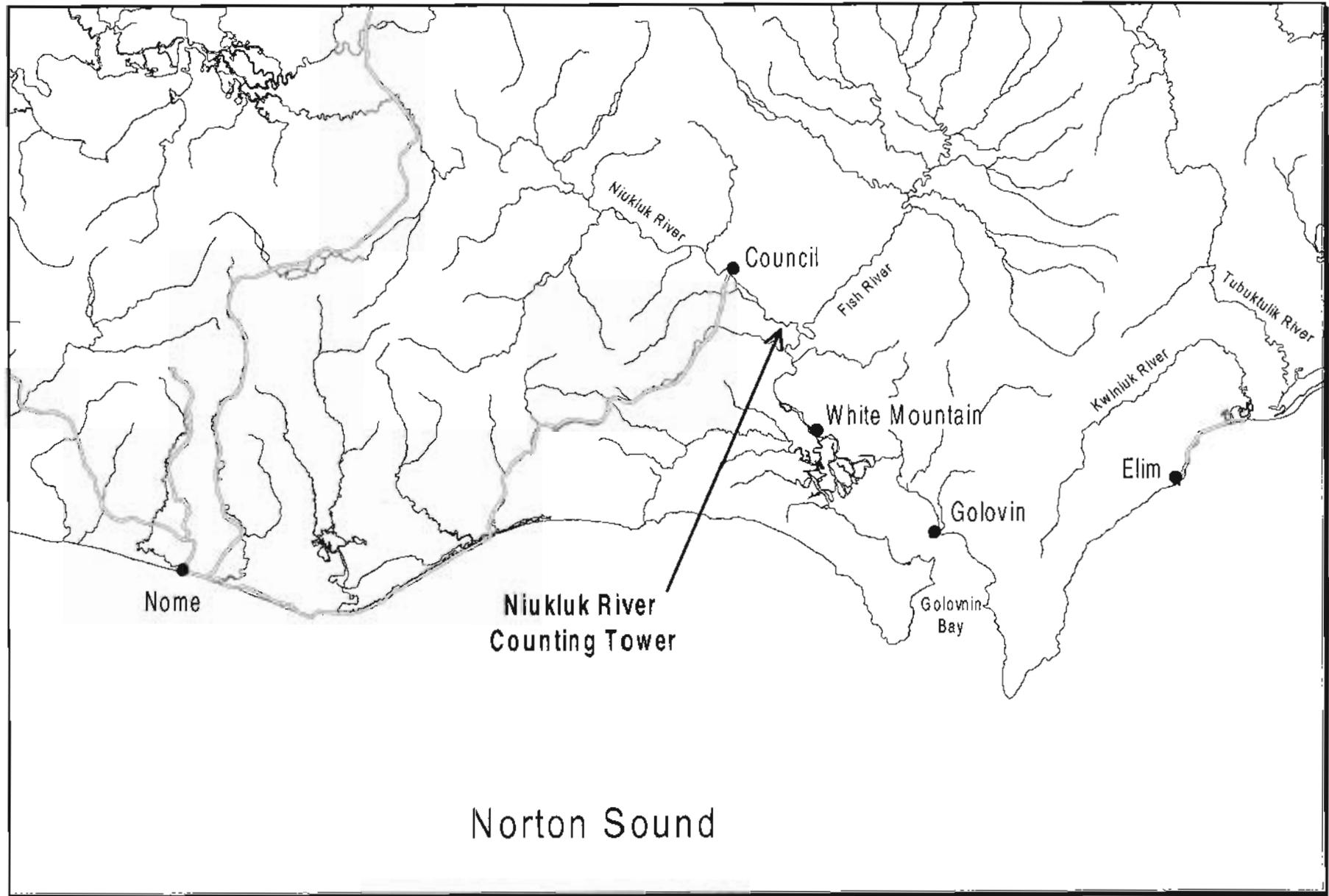


Figure 2. Cumulative passage of all salmonid species past the Niukluk River counting tower, Norton Sound, 1999.

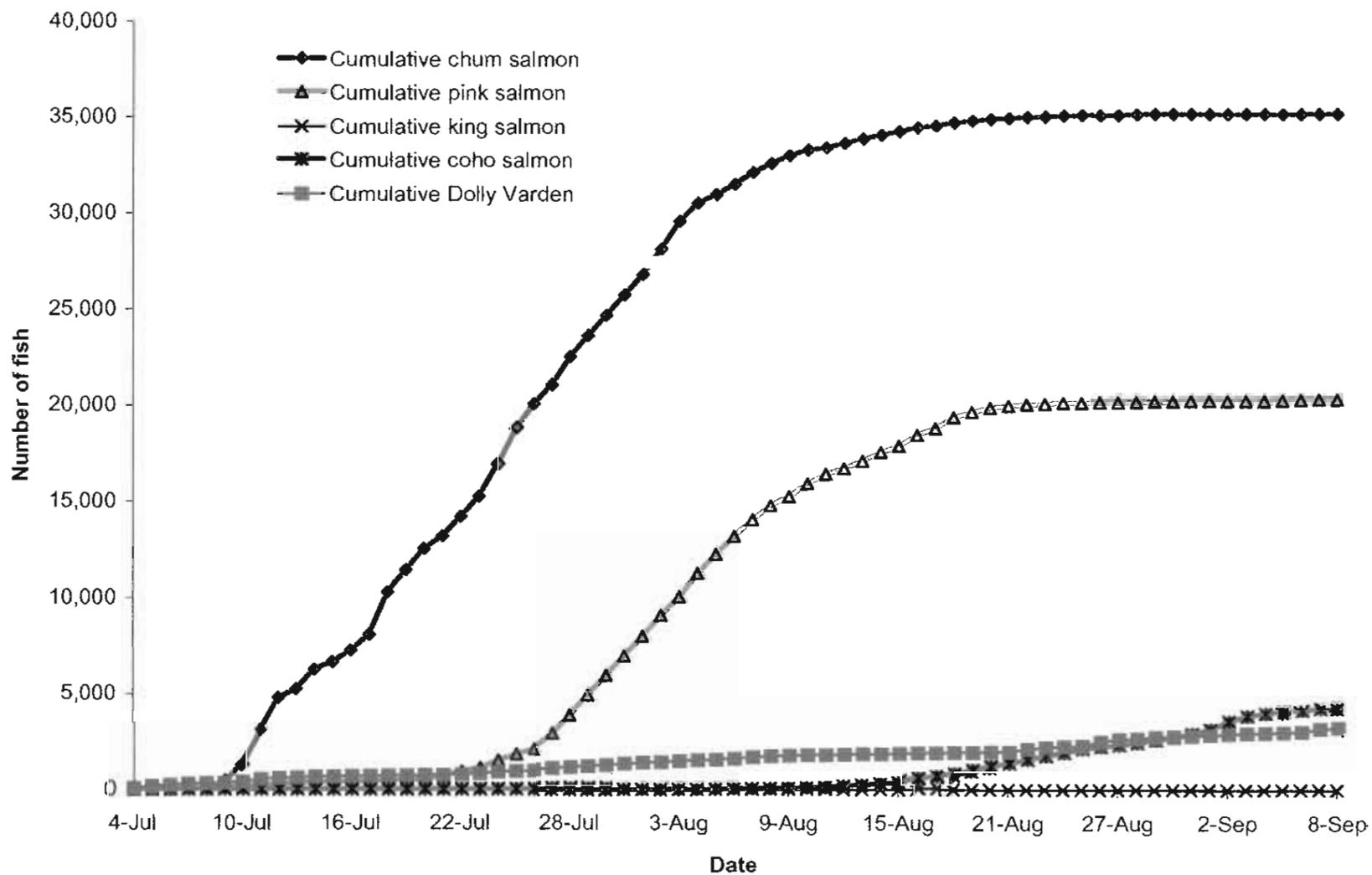


Figure 3. Daily chum salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

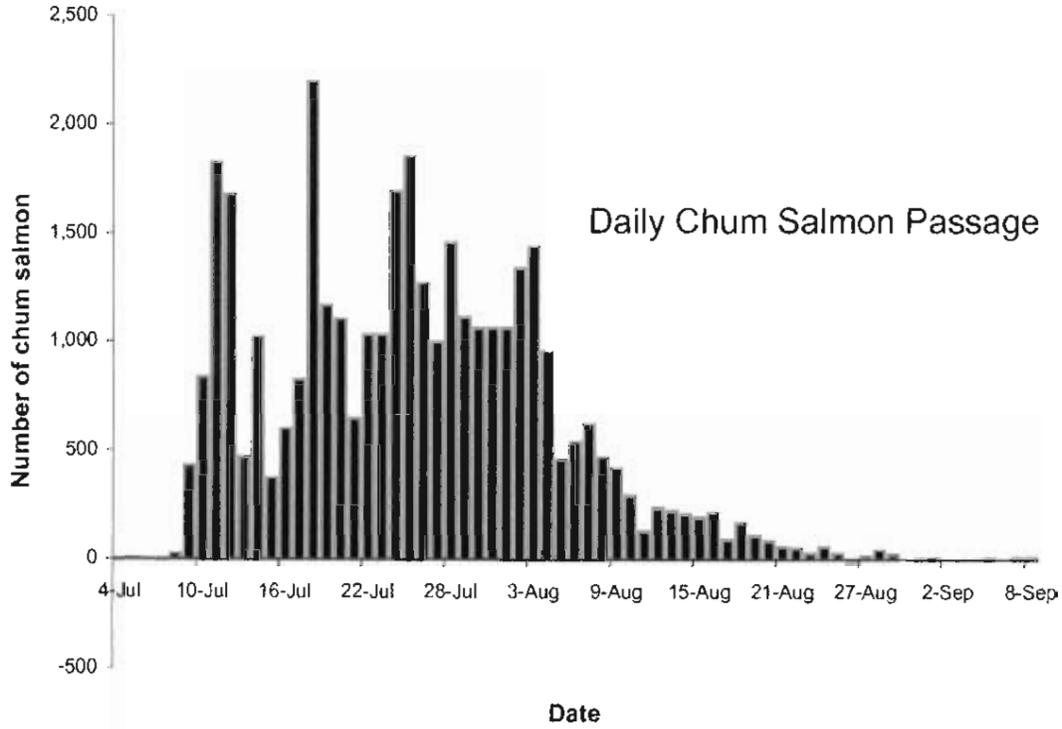


Figure 4. Cumulative chum salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

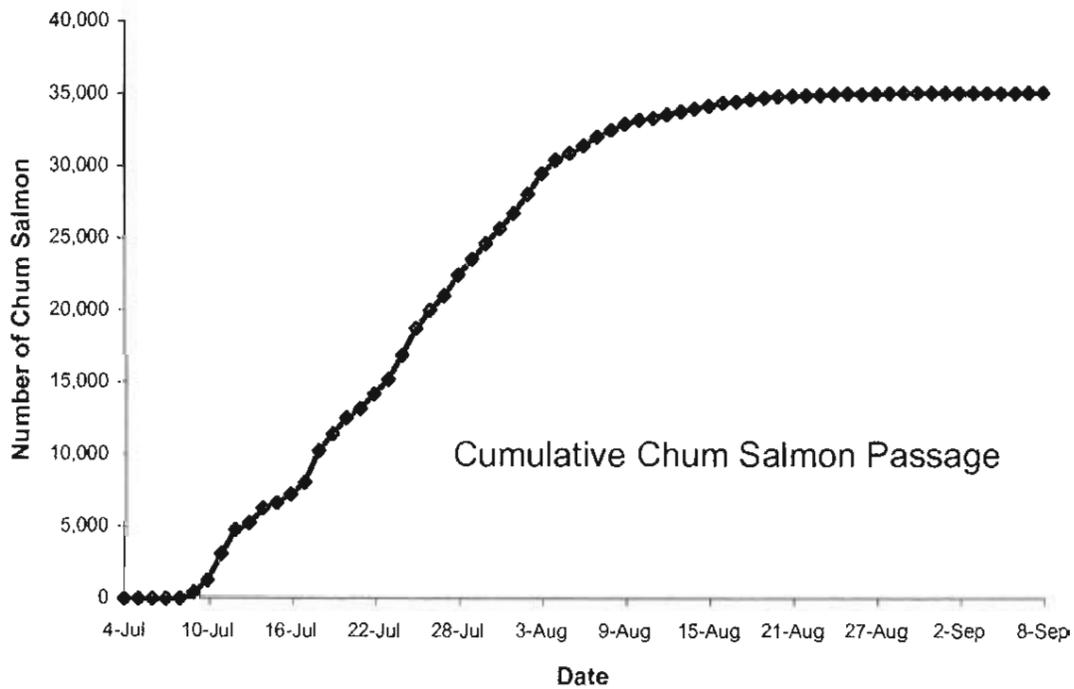


Figure 5. Daily pink salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

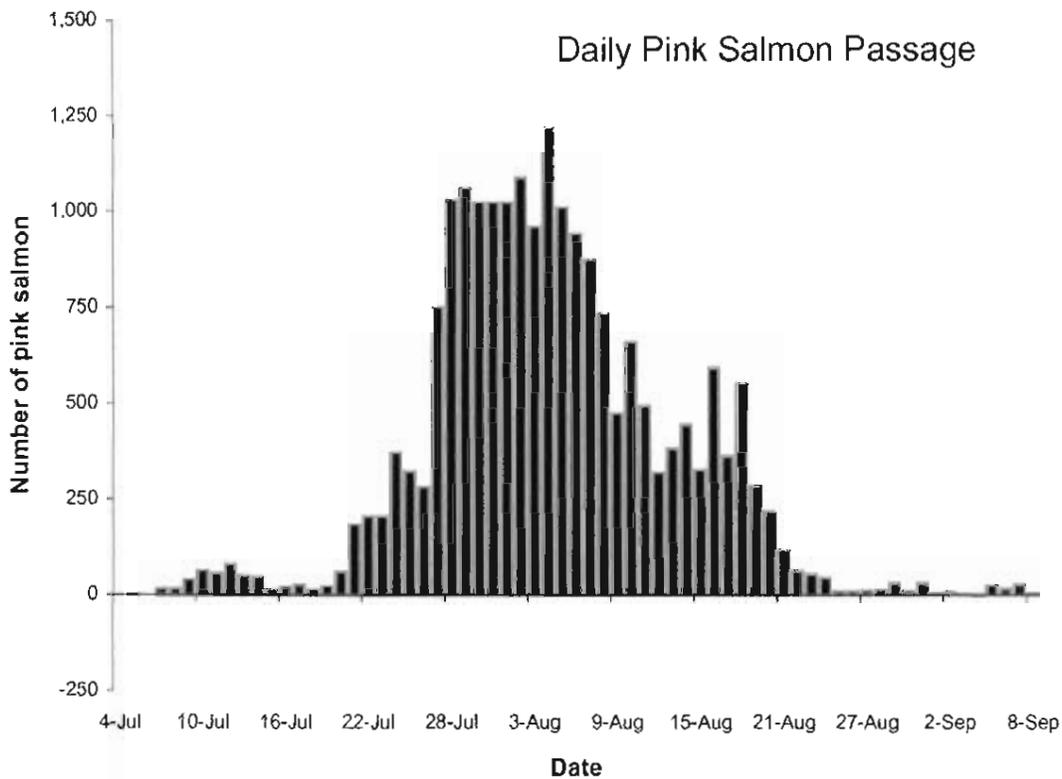


Figure 6. Cumulative pink salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

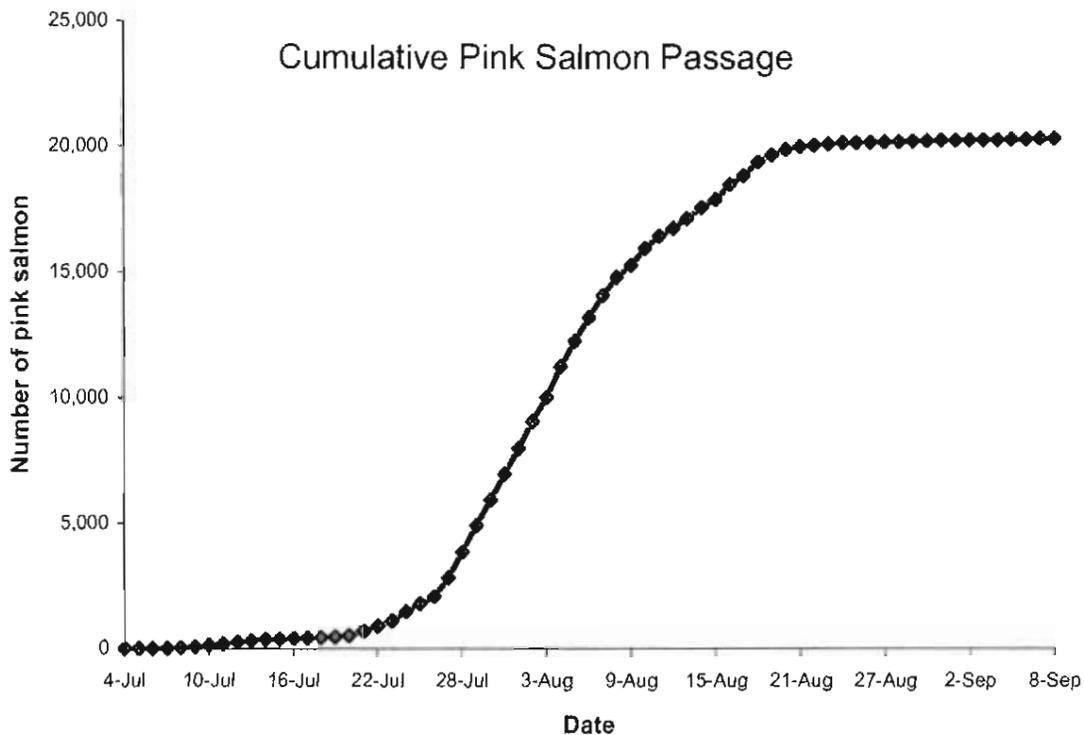


Figure 7. Daily king salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

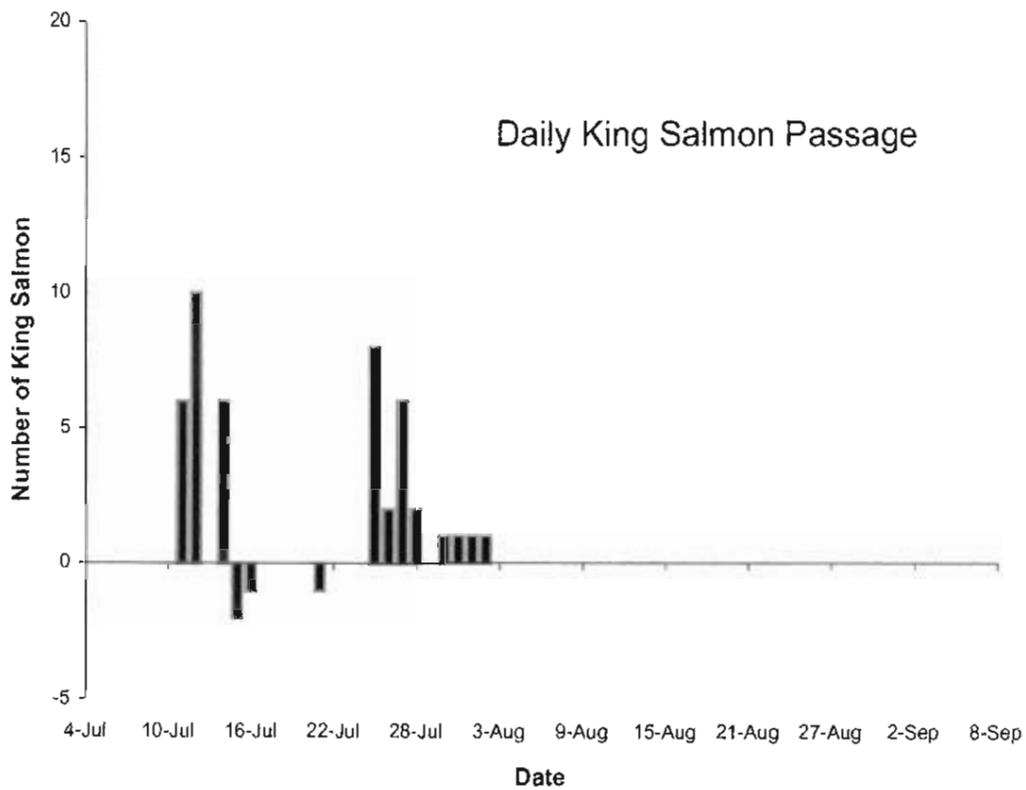


Figure 8. Cumulative king salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

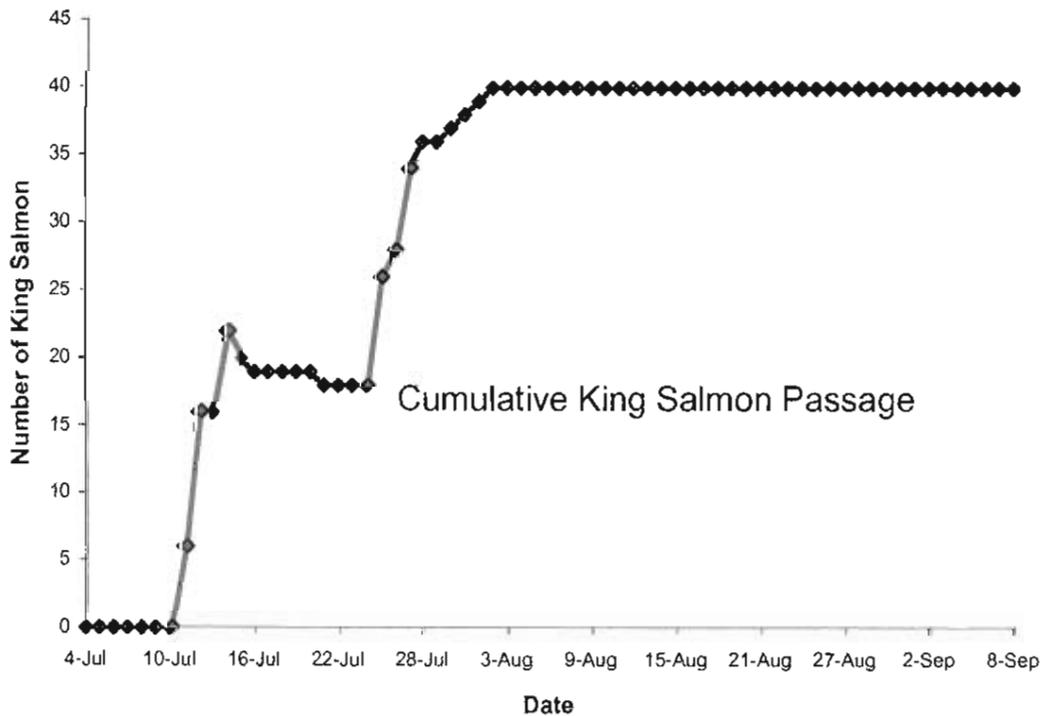


Figure 9. Daily coho salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

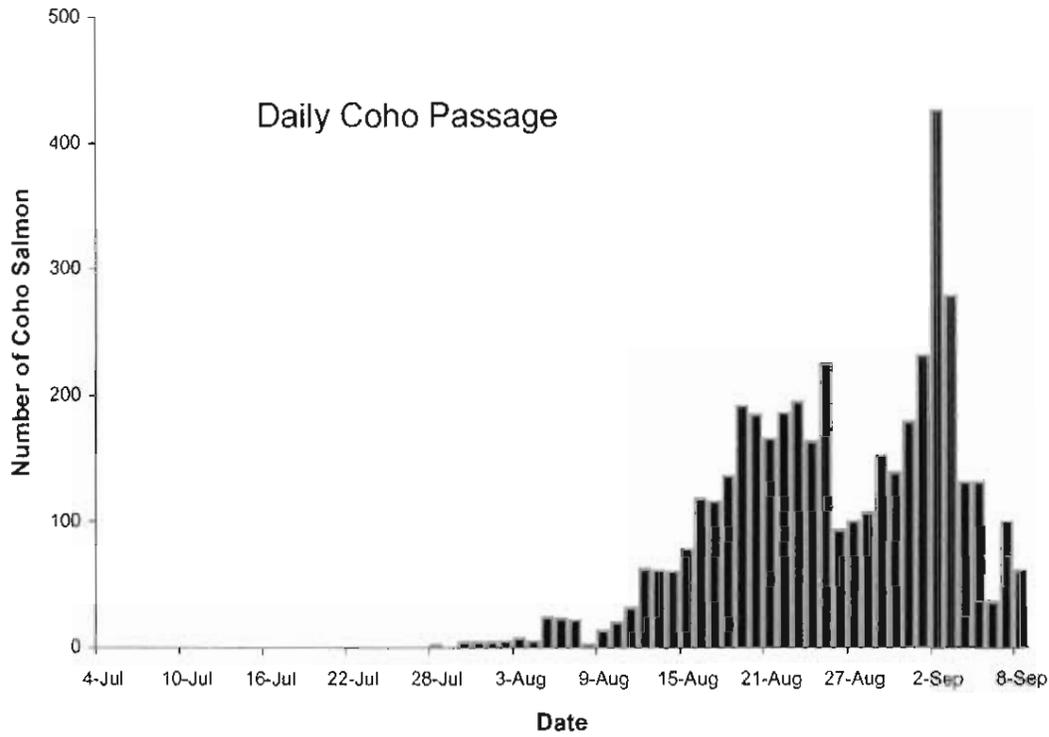


Figure 10. Cumulative coho salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

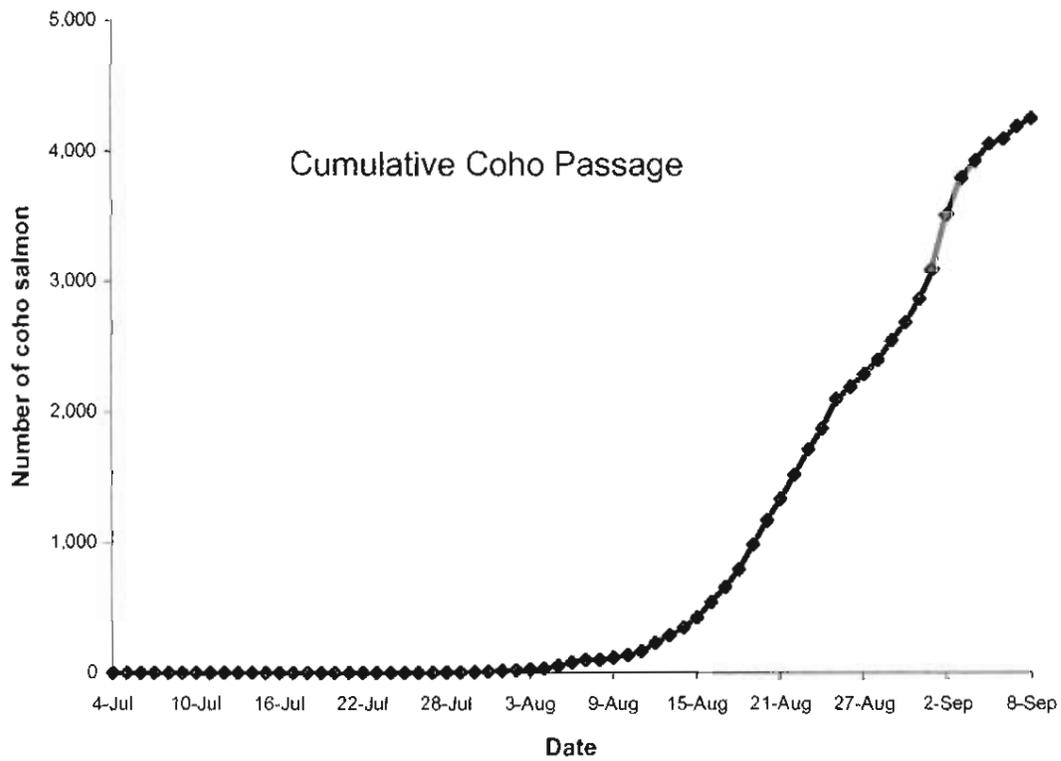


Figure 11. Daily Dolly Varden migration past the Niukluk River counting tower, Norton Sound, 1999.

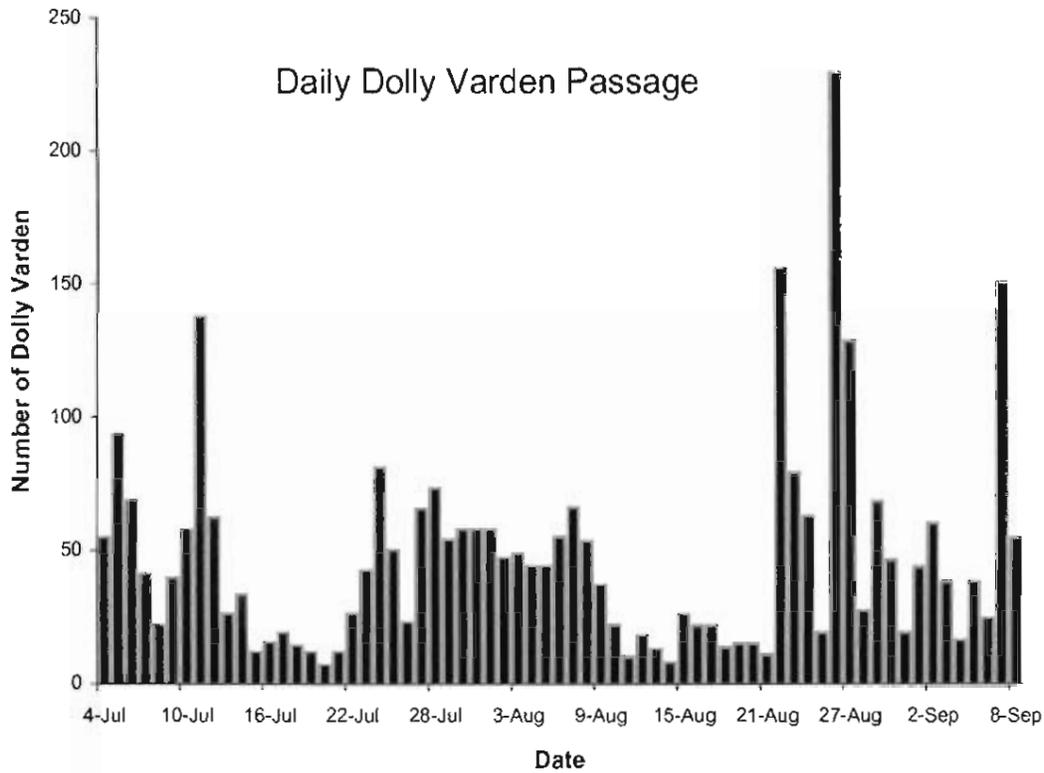


Figure 12. Cumulative Dolly Varden migration past the Niukluk River counting tower, Norton Sound, 1999.

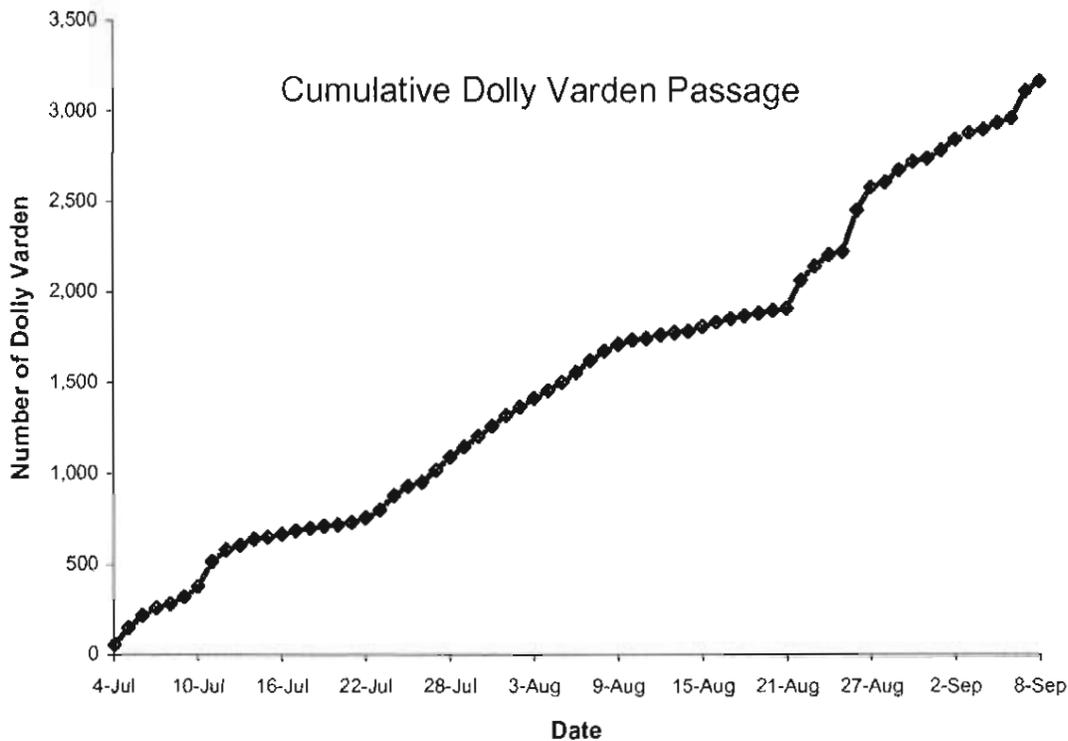


Figure 13. Diurnal pattern of chum salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

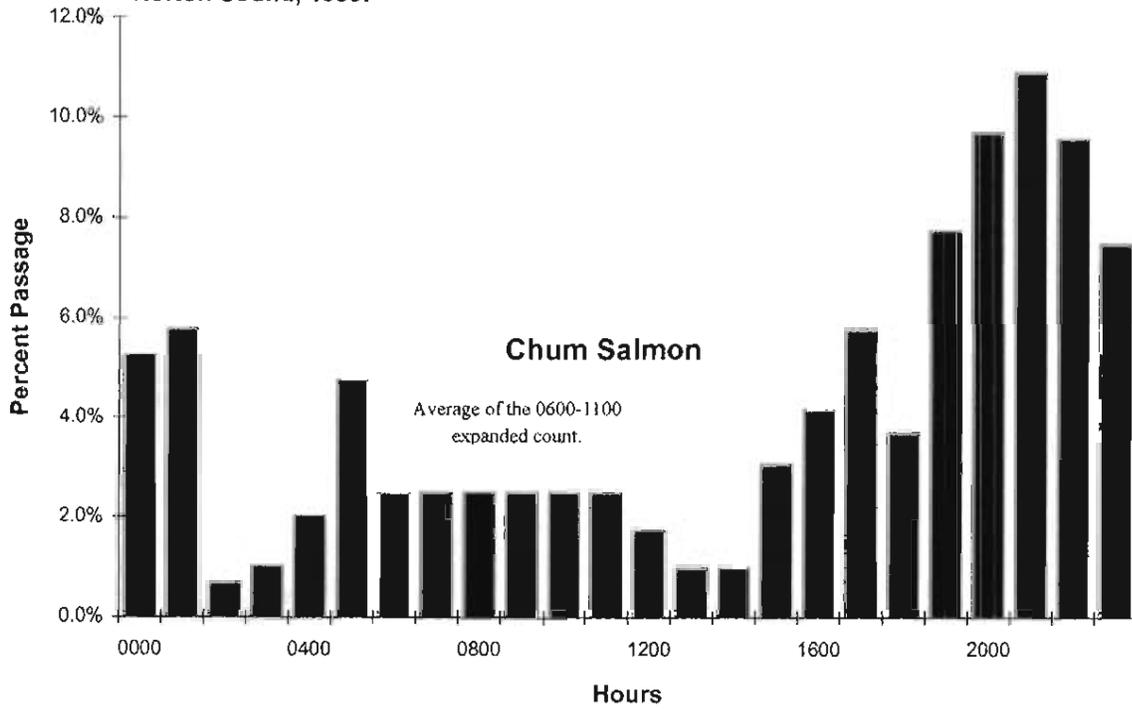


Figure 14. Diurnal pattern of pink salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

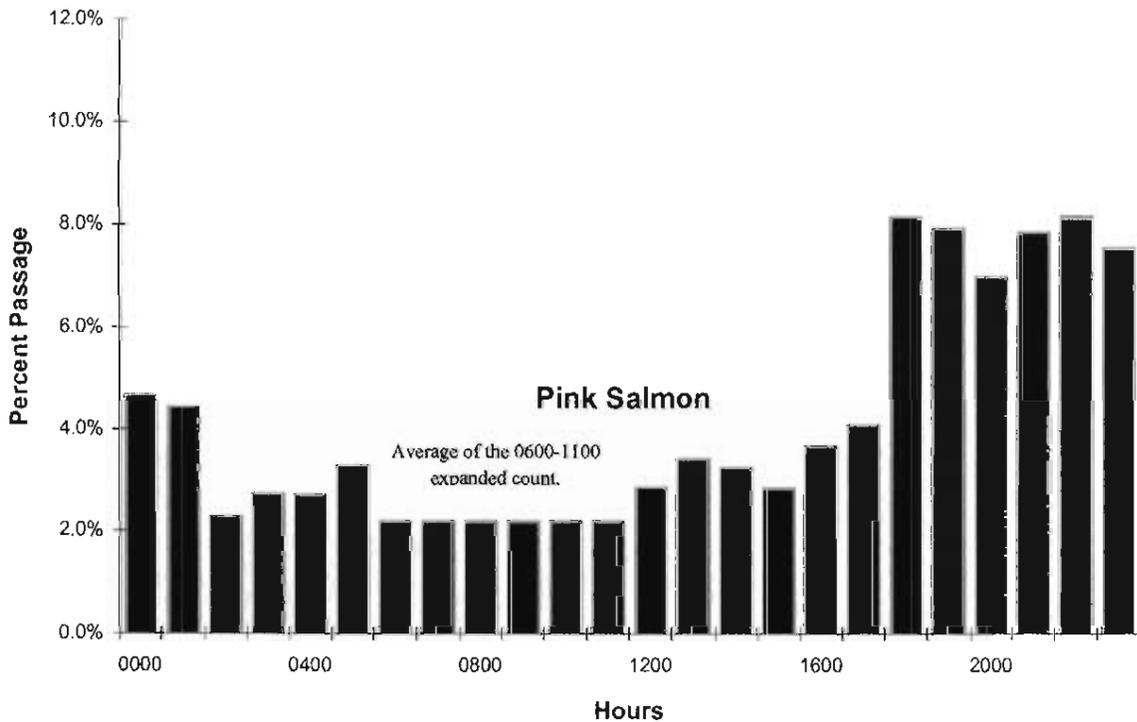


Figure 15. Diurnal pattern of king salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

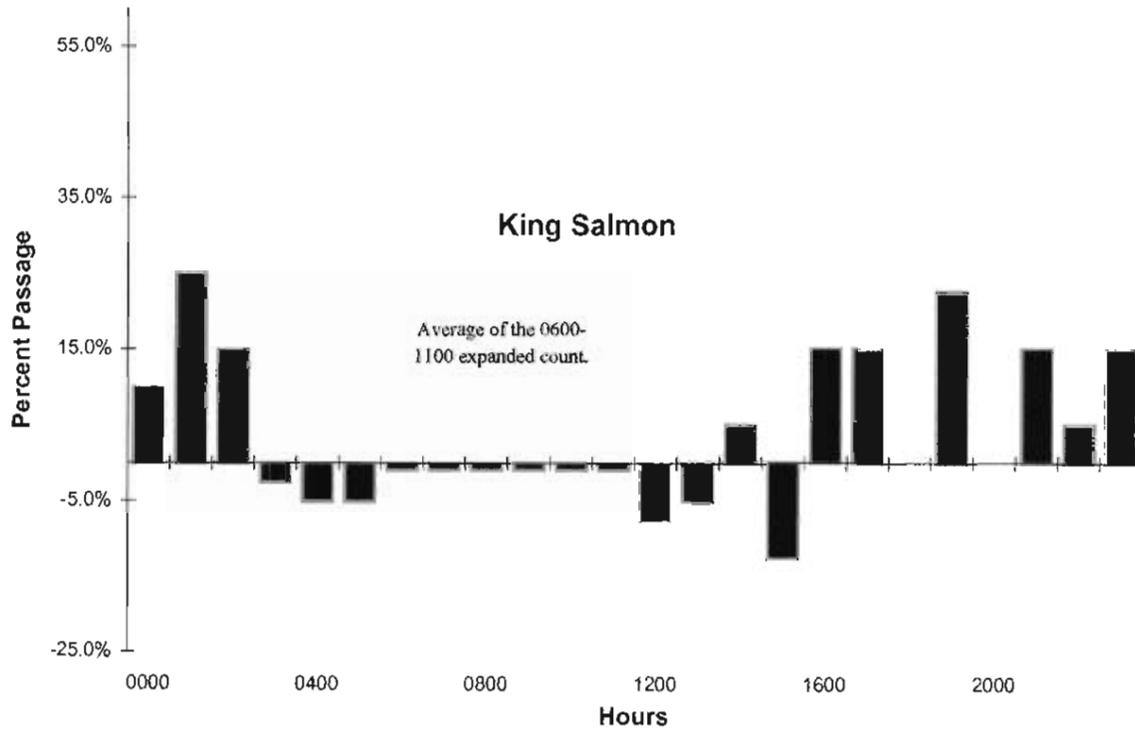


Figure 16. Diurnal pattern of coho salmon migration past the Niukluk River counting tower, Norton Sound, 1999.

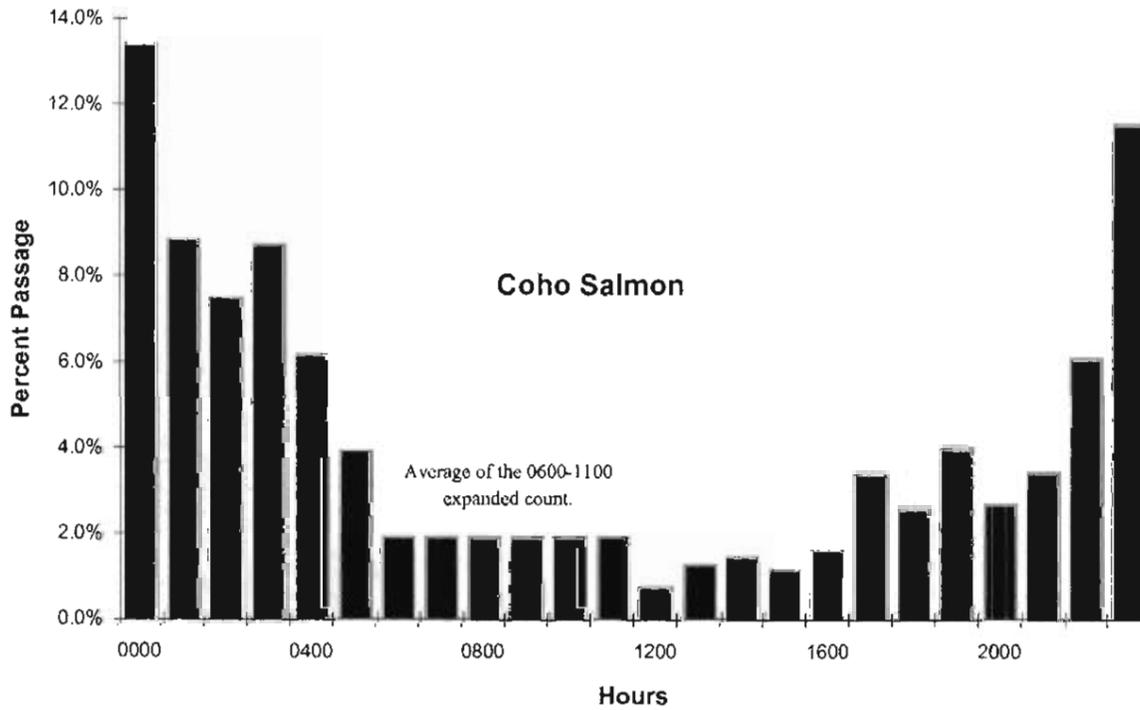


Figure 17. Diurnal pattern of Dolly Varden migration past the Niukluk River counting tower, Norton Sound, 1999.

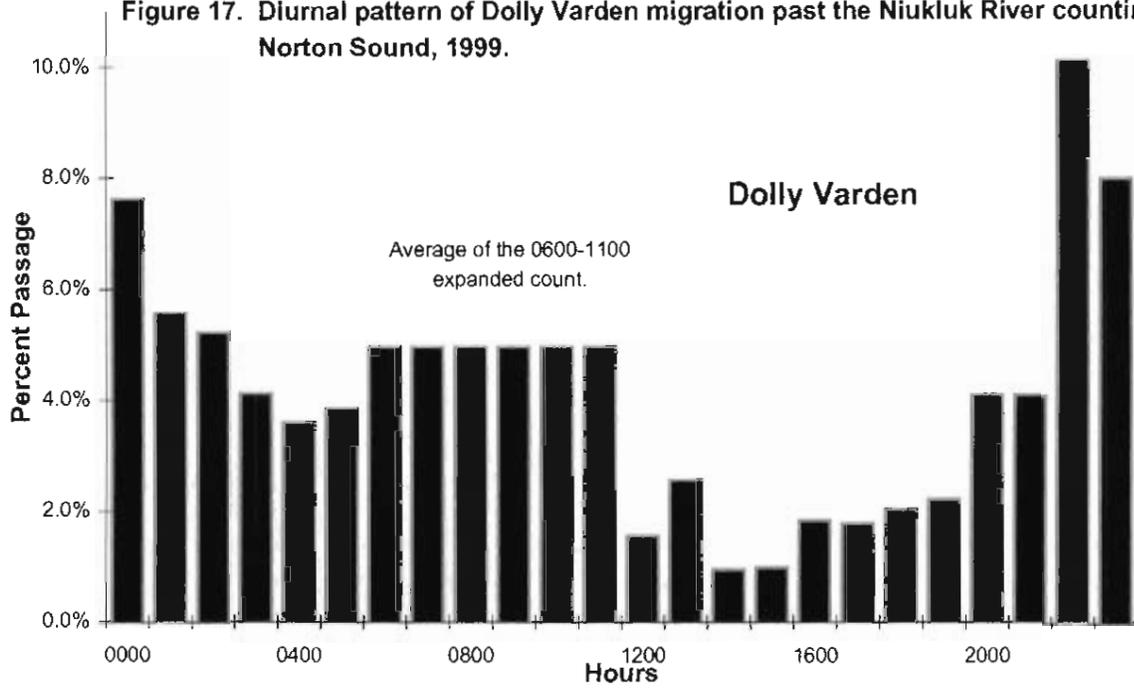


Figure 18. Chum salmon run-timing, Niukluk River counting tower, Norton Sound, 1995-1999.

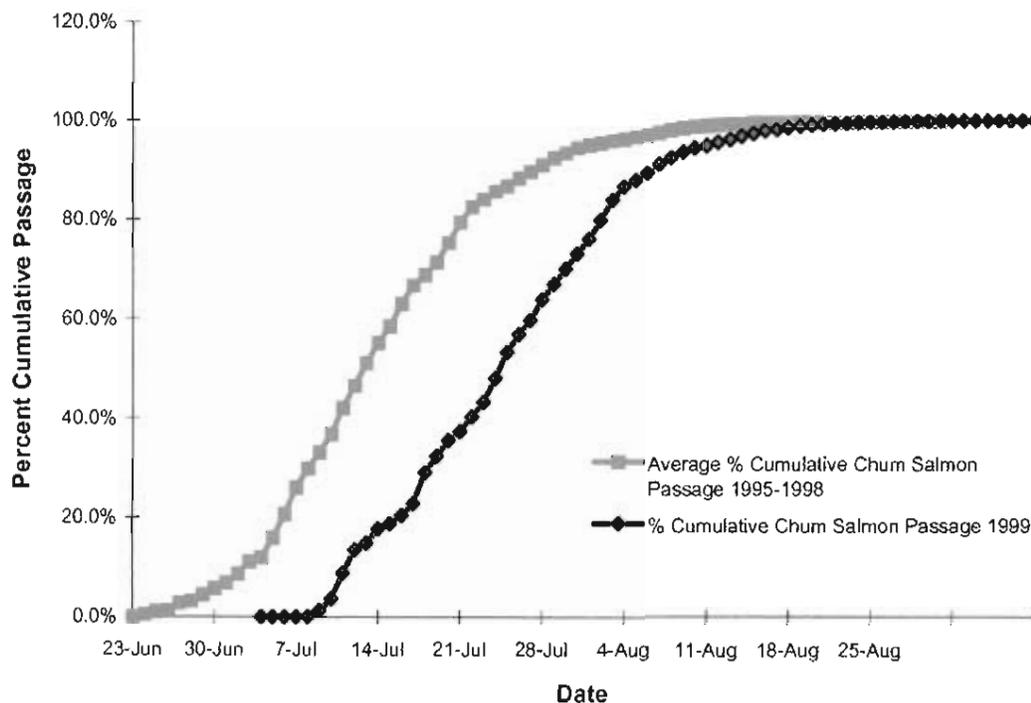


Figure 19. Pink salmon run-timing, Niukluk River counting tower, Norton Sound, 1995-1999.

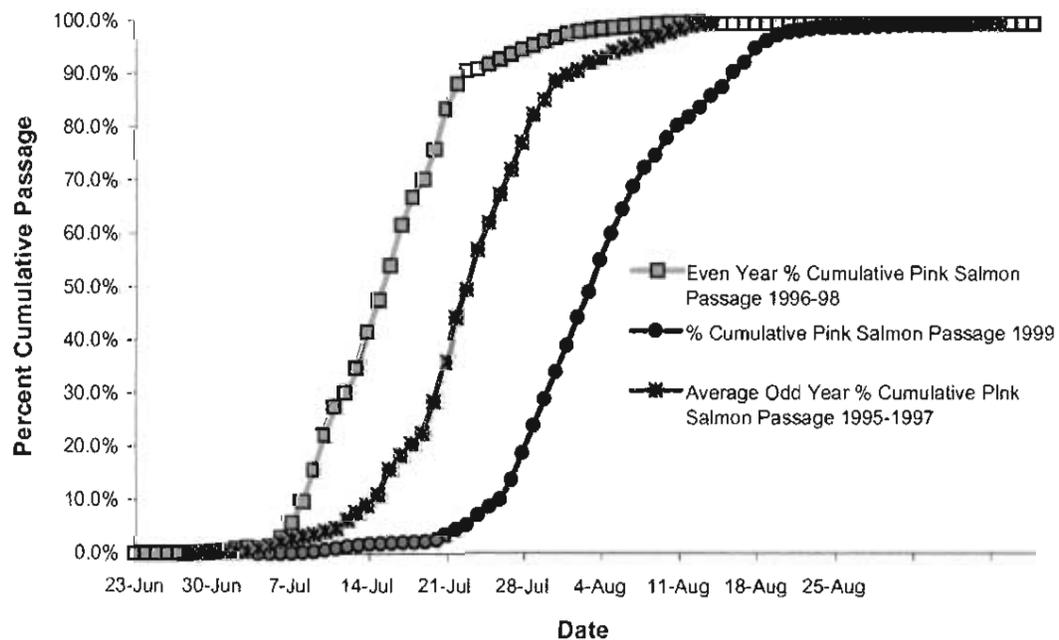


Figure 20. King salmon run-timing, Niukluk River counting tower, Norton Sound, 1995-1999.

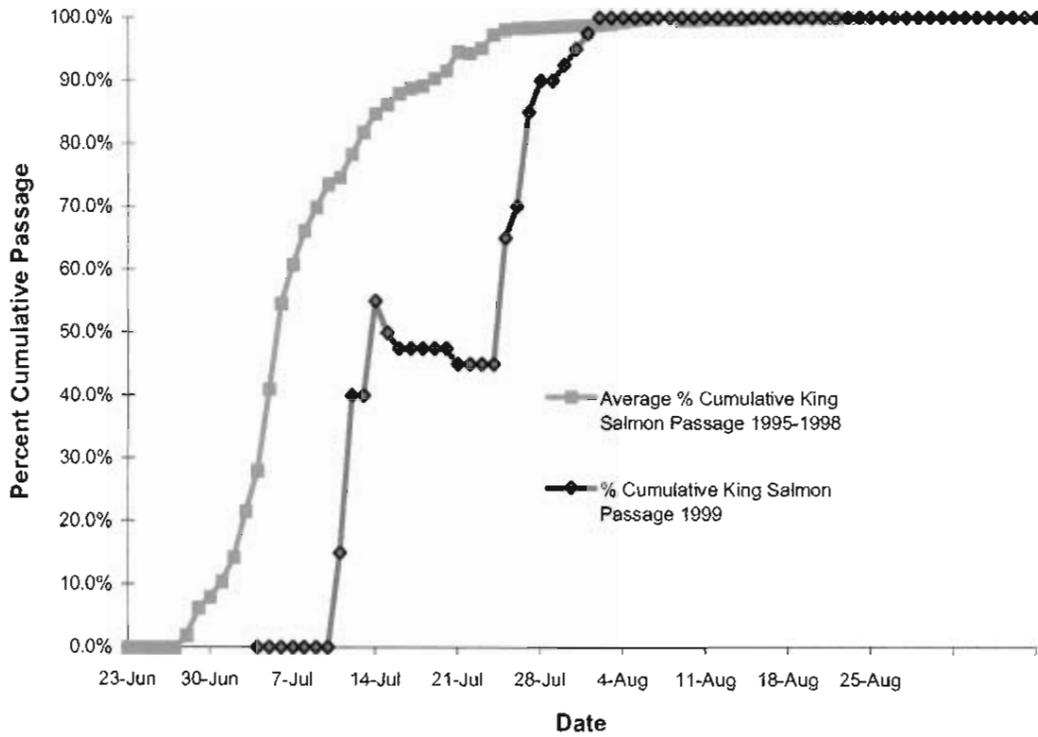


Figure 21. Coho salmon run-timing, Niukluk River counting tower, Norton Sound, 1995-1999.

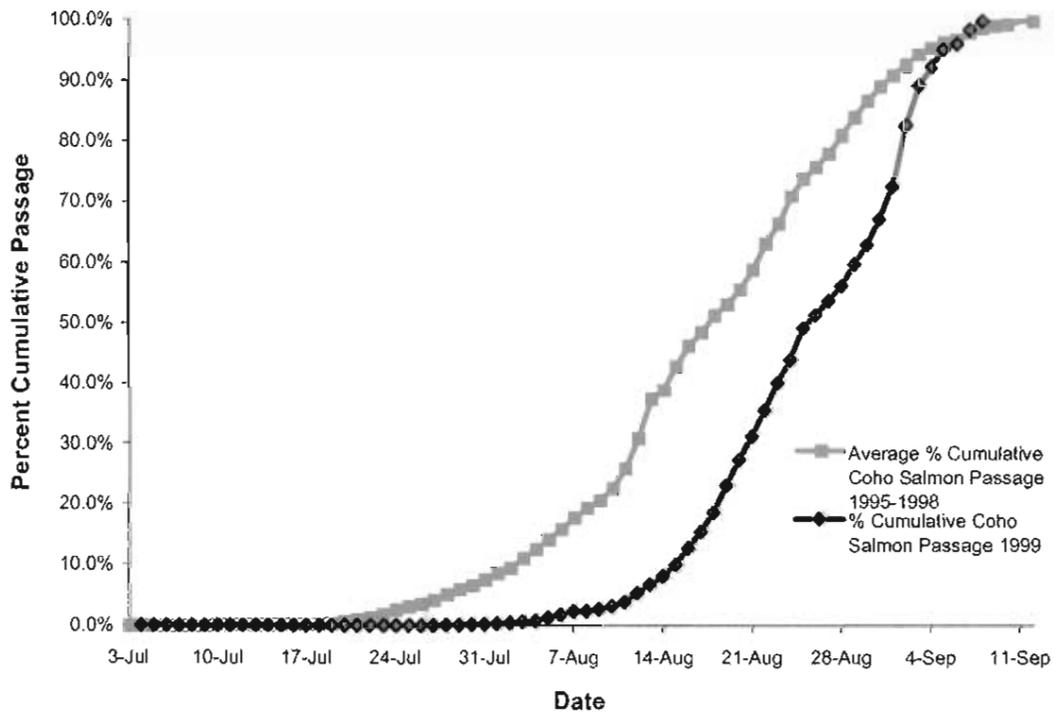


Figure 22. Dolly Varden run-timing, Niukluk River counting tower, Norton Sound, 1996-1999.

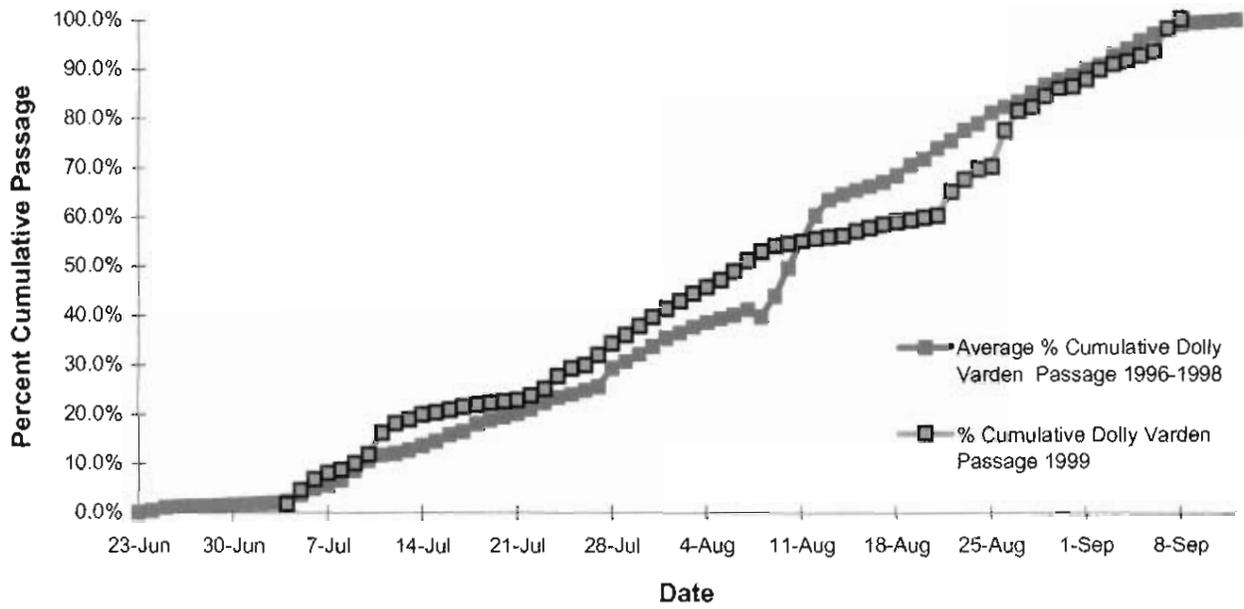


Figure 23. Cumulative chum salmon passage past the Niukluk River counting tower, Norton Sound, 1995-1999.

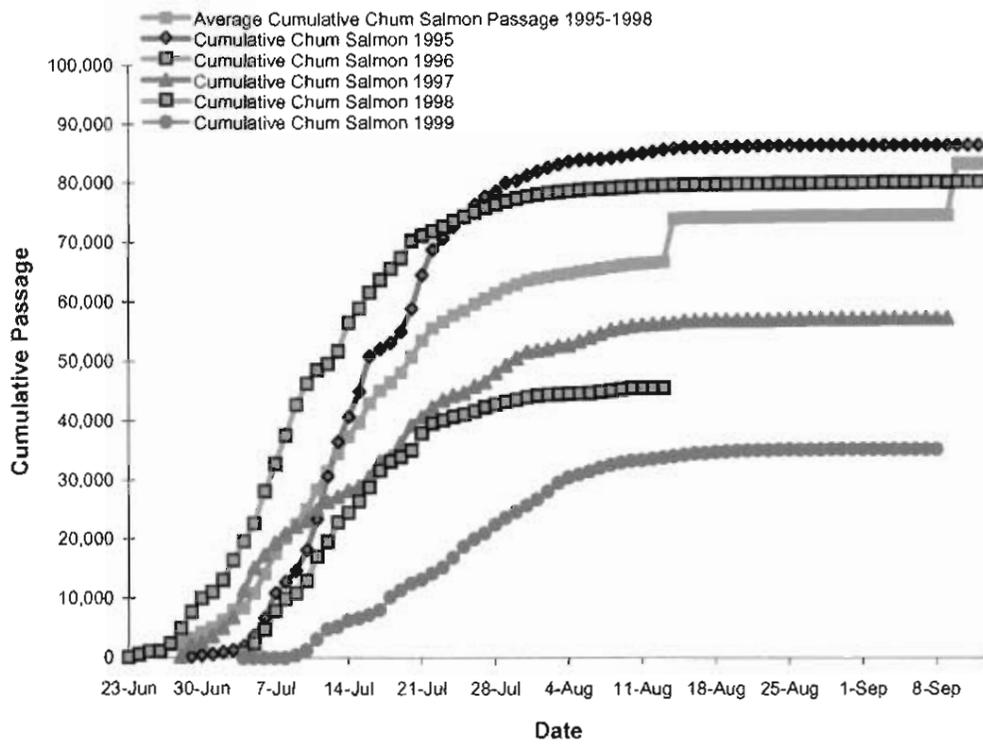


Figure 24. Odd year cumulative pink salmon passage past the Niukluk River counting tower, Norton Sound, 1995-1999.

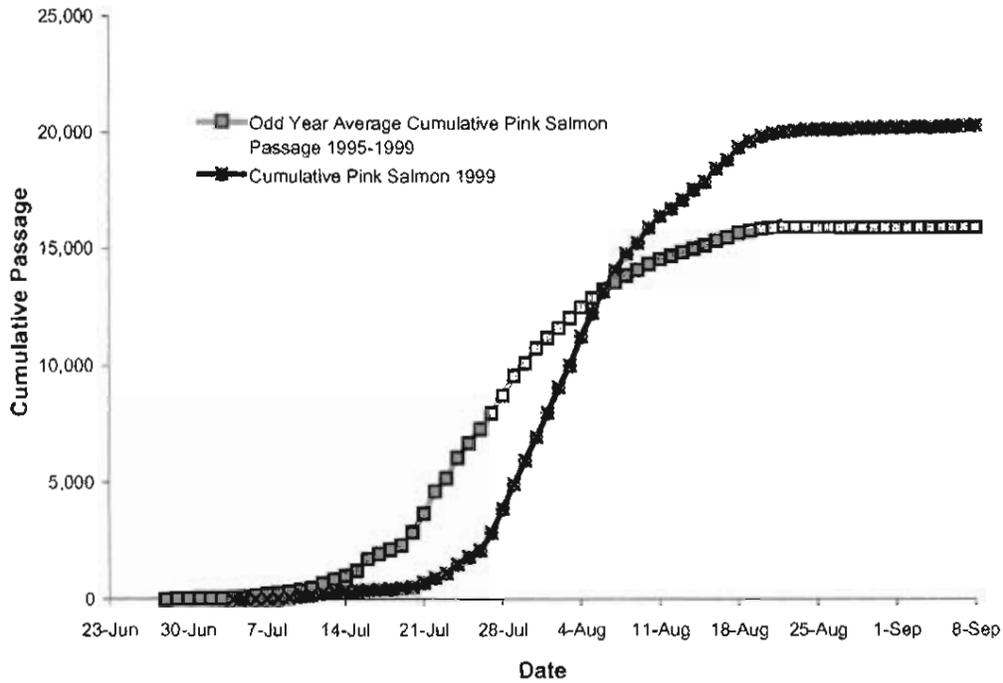


Figure 25. Cumulative king salmon passage past the Niukluk River counting tower, Norton Sound, 1995-1999.

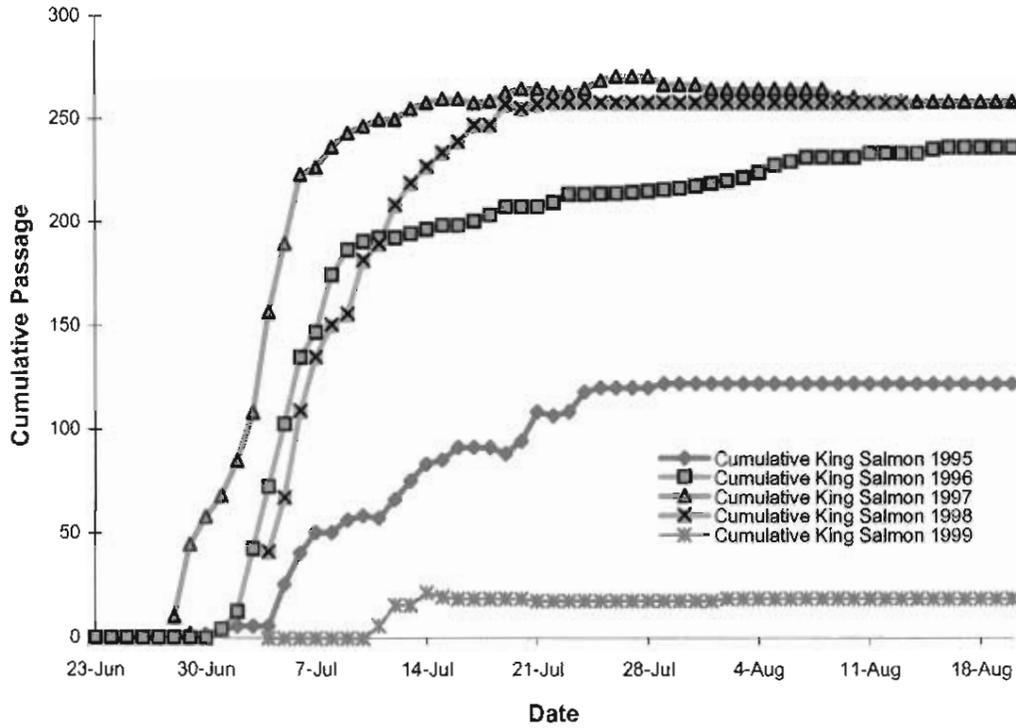


Figure 26. Cumulative coho salmon passage past the Niukluk River counting tower, Norton Sound, 1995-1999.

