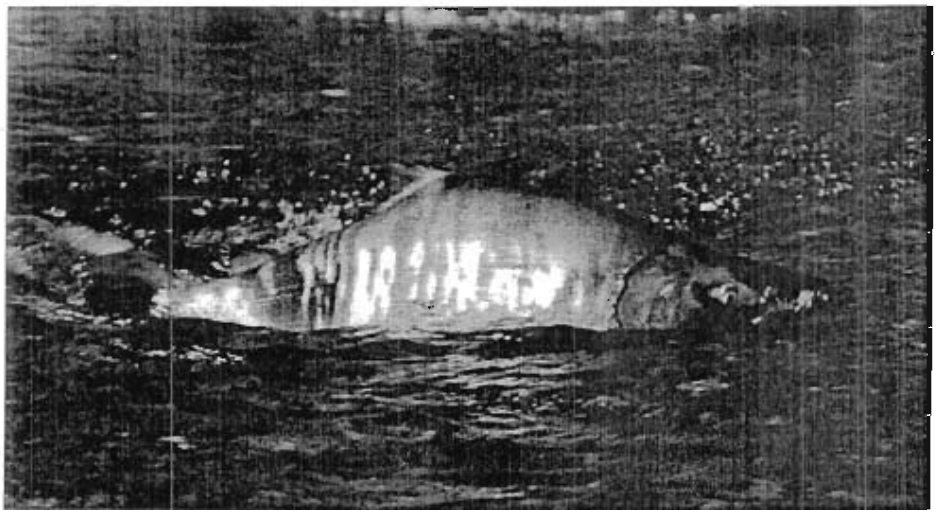
SALMONID ESCAPEMENTS INTO SELECTED NORTON SOUND DRAINAGES USING TOWERS AND WEIRS, 2003



by

Tom G. Kohler

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AUTHOR

Tom G. Kohler is the Assistant Area Biologist for crab and herring in Norton Sound for the Alaska Department of Fish and Game, Commercial Fisheries Division, Pouch 1148, 103E. Front Street, Nome, Alaska 99762.

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Nome Weir: Don Putnam and Chris Miller (NSEDC).
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ABSTRACT

The Alaska Department of Fish and Game (ADFG) counted 12,123 chum salmon, 22,329 pink salmon, 744 chinook salmon, 5,490 coho salmon, and -603 Dolly Varden (negative counts are down-river migrating fish) in the Kwiniuk and 20,018 chum salmon, 75,855 pink salmon, 179 king salmon, 1,282 coho salmon, and 3,190 Dolly Varden Niukluk Rivers using counting towers; and counted 1,957 chum salmon, 11,402 pink salmon, 12 chinook salmon, 548 coho salmon, 47 sockeye salmon, and 767 Dolly Varden in the Nome River using a weir during the 2003 season. Objectives of the projects were to obtain daily and seasonal estimates of the timing and magnitude of the salmon escapement and to collect biological data (age, sex, and length) from sampled chum and coho salmon. Predominant age compositions for the sampled chum salmon escapements by river were: Kwiniuk River 34% age-0.3 and 64% age-0.4, Niukluk River 51% age-0.3 and 48% age-0.4, and Nome River 83% age-0.3 and 15% age-0.4. Most of the coho salmon escapement samples were age class 2.1 representing 63% from Kwiniuk River and 79% from Nome River.

KEY WORDS: Norton Sound, escapement, *Oncorhynchus tshawytscha, O. nerka, O. keta, O. kisutch, O. gorbuscha*, age-sex-length composition, Niukluk River, Kwiniuk River, Nome River

INTRODUCTION

Norton Sound Salmon Management District includes all waters between the latitude of Point Romanof in the south and north to the latitude of Cape Douglas. This district includes six commercial salmon fishing subdistricts. Five species of pacific salmon (*Oncorhynchus*) return to natal rivers in Norton Sound and numerous anadromous streams are located within district boundaries (Figure 1). Current salmonid enumeration programs operated by the Alaska Department of Fish and Game (ADFG) in this district include two counting towers located on the Kwiniuk River, which drains into Subdistrict 3 (Moses Point), and Niukluk River, a tributary of the Fish River, which empties into Subdistrict 2 (Golovin), one weir project located on the Nome River, east of the city of Nome, in Subdistrict 1, and one test fish project on the Unalakleet River in Subdistrict 6. Additionally, five escapement counting projects are operated by cooperating agencies. Kawerak Inc. operates two weir projects in Subdistrict 1, on the Eldorado River and the Snake River, and a weir on the Pilgrim River in the Port Clarence District to the north. Unalakleet IRA council operates a tower project on the North River, a tributary of the Unalakleet River, which drains into Subdistrict 6 (Unalakleet). U.S. Bureau of Land Management (BLM) operates a weir on a tributary of the Sinuk River, which empties into the northwestern portion of Norton Sound Subdistrict 1. Returns of chum salmon *Oncorhynchus keta*, pink salmon *O. gorbuscha*, chinook salmon *O. tshawytscha*, sockeye salmon *O. nerka,* coho salmon *O. kisutch,* and Dolly Varden *Salvelinus malma* are enumerated at ADFG and cooperator projects. ADFG personnel also conduct numerous inseason aerial surveys on selected district rivers to monitor adult salmon escapements and assess run timing. Some aerial surveys are conducted on rivers with enumeration projects to ground truth and calibrate survey counts and to correlate data with historical data. This report summarizes 2003 data from ADFG enumeration projects.

Kwiniuk River drains into Norton Sound just east of the village of Moses Point, approximately 160 km east of Nome (Figure 1). Kwiniuk and Tubutulik Rivers are the primary salmon spawning tributaries in Subdistrict 3 (Moses Point). In 1962, commercial salmon fishing began in Subdistrict 3, primarily targeting chum, pink and coho salmon. No significant chum salmon commercial harvest has occurred since 1988 (Bue and Lean 1997). No commercial salmon were harvested in this subdistrict in 2003. Subsistence fisheries occur in both drainages and in saltwater in the subdistrict. ADFG Subsistence Division reports harvest data gathered through village surveys. Since 1965, a salmon counting tower has operated on the Kwiniuk River enumerating chum, pink, and chinook salmon runs, but only recently has the tower operated through the coho salmon run (see Lean 1994, and Rob 1996a, 1996b, 1997a, 1998b, 1999c, Kohler 2000a, 2001a, 2001b and Kohler and Todd 2003 for recent year's results). Current location of the counting tower is shown in Figure 2.

Niukluk River is a major tributary of the Fish River drainage and enters the Fish River approximately 16 km above the village of White Mountain (Figures 1 and 3). Fish River empties into Golovnin Bay (Subdistrict 2) on the north coast of Norton Sound, and is the primary salmon spawning drainage in this subdistrict. Council village is located on the Niukluk River approximately 20 km above the confluence with Fish River. A road provides access from Nome to the Niukluk River at Council. Subsistence and sport fisheries occur on the Niukluk and Fish Rivers for all salmon species, Arctic grayling *Thymallus arcticus*, whitefish species *Prosopium*

and *Coregonus*, and Dolly Varden. Subsistence Division reports harvests by residents of the communities of White Mountain and Golovin. Subsistence harvests by residents of Nome are currently not monitored, but are thought to be increasing because of continued fishery restrictions and closures in Subdistrict 1. Commercial salmon fishing has been conducted sporadically in Subdistrict 2, and no commercial fisheries occurred during 2003.

Niukluk River counting tower has successfully operated since 1995 (Rob 1995b, 1997c, 1998c, 1999b, Kohler 2000b, 2001, Jones and Knuepfer 2002, and Kohler and Todd 2003), and previously operated for approximately three weeks during 1979 (Schaefer 1979). This project is operated to obtain accurate escapement information of inriver salmon stocks and Dolly Varden and as a means to calibrate the accuracy of aerial surveys to other tributaries in the Fish River drainage.

Nome River flows approximately 50 km south from the Kigluaik Mountains and drains into Norton Sound approximately five km east of Nome (Figures 1 and 2). Commercial fishing has been progressively reduced through regulatory restrictions since the late 1970s and marine waters near the mouth (Subdistrict 1) have been closed since 1984. Sport and subsistence fishing in Nome River have been closed in recent years because of low salmon returns (primarily chum salmon) and Arctic grayling population concerns. Subsistence and sport fisheries are currently managed similar to a commercial fishery, with Emergency Orders regulating restrictions and fishing periods. A Tier I or Tier II subsistence permit/catch calendar is required when fishing in Nome River. Subsistence harvests are reported to ADFG Commercial Fishery Division by the returned catch calendars.

A salmon counting tower first operated on the Nome River in 1993 (Bue 1994, Rob 1995a, and 1995b). Beginning in 1996, a weir replaced the counting tower and the camp/enumeration location was moved down river approximately 5 km to the current site. The 2003 season was the eighth year of weir operations (Rob 1997b, 1998a, 1999a, Kohler 2000c, 2001c and Kohler and Todd 2003).

These ADFG enumeration projects, and cooperative projects, operate as a means to obtain timely and accurate escapement information and for the collection of biological data on salmon age, sex, and length (ASL) throughout the runs. Daily, the previous days count totals by species are relayed to the Nome ADFG office via single sideband (UHF) or marine (VHF) radio or satellite phone.

Objectives

1. Obtain daily and seasonal estimates of timing and magnitude of salmon and Dolly Varden escapements to the Kwiniuk, Niukluk, and Nome Rivers.

2. Sample the chum and coho salmon runs; collect ASL data for development of brood tables and for age, sex, and length frequencies to compare seasonal and yearly variations.

METHODS

Tower projects enumerate fish passage up and down river from a tower in timed periods. Usually, counts are conducted for a 20-minute period each hour and the counts are expanded to the whole hour; count times three equals one hour (20 min. x 3 = 60 min.). If all periods for 24 hours each day are counted, further expansion is not necessary and the expanded hourly total counts are summed to produce a daily total. Expansion methods used when count periods were missed are explained under each project. Negative count numbers signify down river passage. A tower or scaffold made of wood, aluminum or steel is placed on the bank next to the river (on both banks for wide rivers) where an observer sits on the elevated platform to count fish. Guy wires attached to the tower and staked to the ground or cabled to trees stabilize the tower during windy conditions. A flash panel (usually white plastic, vinyl, or canvas) was placed across the river bottom perpendicular to the river at the tower site, and was anchored in place with sand bags and stakes to keep fish from passing underneath. A flash panel provides a contrasting background to aid identification and count of passing fish. Partial (diversion) weirs are placed from the river bank(s) toward mid channel over the panel ends to force migrating fish out over the panel for easy observation. To count fish during darkness, lights are placed on the tower or suspended from a cable strung across the river above the flash panel. Either a 12-volt battery system or 120-volt generator system is used to provide power for lighting.

Weirs are built across the entire river and do not allow unmonitored fish passage. Aluminum weir stringers, top and bottom, span the river and are supported by metal or wood "A" frames or tripods. Metal conduit pickets are placed in the stringer holes and pounded into the bottom substrate effectively blocking fish passage. Picket spacing determined the size of fish to be passed and enumerated. Fish were enumerated through a weir by opening a gate or pulling weir pickets and counting the fish as they migrate through the opening. Weirs installed on rivers with boat traffic have boat gates opened by the project crew members to allow for boat passage, or have floating sections that boats can pass over; the weir section sinks when a boat passed and then re-floated after the boat departed. If fish passage occurred at night, lighting systems similar to tower projects were used to illuminate the weir area.

ASL samples at tower projects are collected from chum and coho salmon by seining in river with a beach seine. Fish for sampling are normally collected from a live box at weir sites; the live box is installed and built into the upstream face of the weir. If insufficient numbers of fish enter the live box for sampling, additional fish are seined to meet goals. In 2003, the goal for Niukluk and Kwiniuk projects was three pulses of 160 fish for chum salmon and one 160 fish sample for coho salmon. The goal at the Nome River weir was 160 chum salmon samples taken in proportion to the run passage and one 160 fish sample for coho salmon. Scales were taken for age determination, sex identified by visually examining external characteristics (such as: snout, vent, and body symmetry), and fork lengths measured on all sampled fish. Scales were removed from the left side of the fish in an area 2-3 scale rows above the lateral line crossed by a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. Cleansed of slime, scales were mounted on gummed cards, and impressions later made in cellulose acetate cards with a scale press for age determination. Scale impressions were read with the aid of a microfiche reader and ages were reported in European notation where the first digit refers to the freshwater age and does

not include the year spent in the gravel and the second digit refers to the ocean age (Koo 1962). Fish length was measured to the nearest 0.5 cm from mid-eye to fork-of-tail. ASL samples for chum salmon were divided into three segments (three samples of 160) by time to track changes in age and sex composition.

At all three enumeration projects, field crews beach seined chum and coho salmon for ASL samples. At Nome River weir, in addition to the seined samples, chum salmon were collected from the weir trap. Additional ADFG staff from Nome supported the project crews during sampling to prevent missed scheduled tower counting periods.

Kwiniuk River Tower

Kwiniuk River tower camp was located approximately 6 km upstream from the mouth of the Kwiniuk River, on land leased to ADFG by Hans Jemewouk of Moses Point (Figure 2). The site was accessed by jet, motor-powered riverboat from the village of Moses Point, where aircraft deliver personnel, supplies, and equipment. Additional ADFG staff from Nome helped during tower installation and camp set-up. A 15 m vinyl flash panel was used at the Kwiniuk site and covered approximately half the width of the river. One 6 m high aluminum scaffold tower was used for counting and the diversion weir extended from midstream (end of the flash panel) to the shore opposite the tower. A 12-volt lighting system illuminated the flash panel during dark counting periods.

Counting began on 15 June at 1500 hrs and continued until 1200 hrs on 15 September 2003. The three-person crew counted one twenty-minute period each hour for 24 hours, from midnight to midnight the following day. Daily counts presented in this report ran from midnight to midnight the following day. The only hours not counted this season were the hours from 0900 to 1400 from 15 through 24 June. Expanded counts for missed times in this report were calculated as follows. On days of 18-hour period counts, the hourly counts of the day before and the day following were added and the result was divided by two, giving expanded hourly counts for the 18 hours. An expansion factor was calculated to compensate for the 6 hour periods not counted and was derived using data from the 24-hour count day, by dividing the total counts from 0600 to 1200 hours during the 24-hour count day by the total normal 18-hour count during the 24-hour count. This expansion factor was applied to data from the three days before and after each 24-hour count by multiplying each day's 18-hour total by the 24-hour expansion factor, and adding that number to the 18-hour count for each day. This expansion was done for all enumerated species.

Niukluk River Tower

Niukluk River tower camp is located approximately 4 km upstream from the confluence of the Fish and Niukluk Rivers (Figure 2), just upstream of Tom Gray's camp, known locally as Mosquito Bar. A letter of understanding from the Council Native Corporation allowed ADFG to

use their lands to conduct the tower operation. ADFG Habitat Division and the Alaska Department of Natural Resources Division of Lands issued permits for the inriver diversion weir. Access to this site is via road to Council and by jet, motor-powered riverboat from Council to the tower. For 2003, the counting tower, partial weir, and flash panel were installed using the same methods as reported in detail in the 1995 Niukluk project report (Rob, 1995b). Additional ADFG staff provided assistance during project installation and camp set-up. A 120-volt lighting system was installed on the tower to illuminate the flash panel during dark periods.

Counting began at 1200 hours on 26 June, and through the end of the season, 15 September 2003, one 20 minute period was counted each hour for 24 hours, from midnight to midnight the following day. The only hours not counted this season were from 1900 hrs 29 June until 1200 hrs 3 July, from 0600 hrs to 1500 hrs 12 August, and from 0500 hrs 26 Aug to 1200 hrs 27 August. An average of the previous and following day counts for the same time period was used. Expanded count methods and daily totals are the same as Kwiniuk tower (above).

Nome River Weir

Nome River weir camp is located approximately 5 km upstream from the mouth of the river, on land leased to ADFG by Sitnasuak Native Corporation (Figure 4). The project crew began installing the weir on 1 July and the weir was operated from 5 July through 10 September 2003. The weir was made of a series of 3.2 cm (1¼") pipes assembled in pairs using locking metal brackets. Aluminum stringers 5.6m (12') long connected the pairs of pipes horizontally. Metal conduit pipes of varying lengths, depending on water depth, were inserted vertically in holes drilled in the stringers on 4.5cm (1¾") centers. A gate in the weir was used during fish passage and enumeration. This weir was designed to be easily cleaned, fish tight, and easily removed in the event of a flash flood.

RESULTS

Kwiniuk River expanded daily and cumulative total counts by species for 2003 are shown in Table 1. Expanded seasonal counts were: 12,123 chum salmon, 22,329 pink salmon, 744 chinook salmon, 5,490 coho salmon, and -603 (downstream) Dolly Varden. Expanded daily migration by year and species are shown in Appendix Table A.1. Actual recorded period expanded hourly counts were: 12,123 chum salmon, 22,332 pink salmon, 744 chinook salmon, and 5,490 coho salmon, and -603 Dolly Varden.

Niukluk Tower expanded counts for 2003 were: 20,018 chum salmon, 75,855 pink salmon, 179 chinook salmon, 1,282 coho salmon, and 3,190 Dolly Varden (Table 2). Actual reported total hourly expanded counts were: 19,800 chum salmon, 75,738 pink salmon, 183 chinook salmon, 1,212 coho salmon, and 3,063 Dolly Varden. Historical escapements at the Niukluk River counting tower by species are shown in Appendix A.2.

Nome River weir total cumulative counts for 2003 were: 1,957 chum salmon, 11,402 pink salmon, 12 chinook salmon, 548 coho salmon, 47 sockeye salmon, and 767 Dolly Varden (Table 3). Historical escapements at the Nome River weir by species are shown in Appendix A.3.

Age and Sex Composition, and Length Frequency

Predominant chum salmon age compositions during 2003 for the three rivers were as follows. Kwiniuk River was comprised of 34.2% age-0.3 and 64.3% age-0.4, and females comprised 53.5% of the sample (Table 4). Niukluk River was comprised of 50.8% age-0.3, 47.7% age-0.4, and 1.0% age-0.5, with 41.5% of the samples female (Table 5). Nome River was comprised of 82.9% age-0.3, 15.2% age-0.4, and 1.9% age-0.5 (Table 6). Females comprised 45.6% of the run.

Kwiniuk River chum salmon mean lengths (mid-eye to fork) for the major age classes were 578 mm for age-0.3 males and 556 mm for females, and age 0.4 fish were 617 mm males and 579 mm females. Niukluk age-0.3 were 584 mm for males and 547 mm for females, and age-0.4 were 617 mm males and 568 mm females. Nome age-0.3 males were 585 mm and females 562 mm, and age-0.4 males were 603 mm and females 580 mm. Chum salmon samples were stratified into three time periods (pulse samples) at all projects.

Coho salmon escapement samples from the Kwiniuk and Nome Rivers were 63% and 79% age-2.1, respectively (Tables 7 and 8). Mean lengths by age group for all samples collected ranged from 527 mm for age-1.1 females in the Kwiniuk River escapement sample to 623 mm for age-3.1 males from the Nome River samples. Males comprised 49.7% of the samples at Kwiniuk River and 55.2% at Nome River.

DISCUSSION

Low to average precipitation and river levels were encountered throughout the Norton Sound area during 2003 and helped make all projects successful. Flooding and turbidity associated with high water conditions normally encountered in the fall reduce visibility for species determination and accuracy of enumeration and cause missed counting days.

Kwiniuk River counting tower was the only escapement project operating Subdistrict 3 (Moses Point) during 2003. Chum salmon escapement was 12,123, which was within of the current tower goal range of 11,500-23,000 and was 47% of the average tower count since 1965. Escapements were below the odd year average for pink salmon, and the 2003 chinook salmon escapement was 157% of the average since 1981 (Figure 3). Funds from the Norton Sound Initiative extended counting tower operations through the coho salmon run for the third year. Coho salmon escapement was 5,490, 69% of the 2001and 2002 escapement average.

At Niukluk River counting tower, the 2003 expanded count of 20,018 chum salmon was 38% of the 1995-2002 average. Pink salmon escapement of 75,855 was the highest odd year return since the project began in 1995. Chinook salmon escapement was below average since 1995 and the coho salmon escapement was the lowest recorded for the years that most of the run was counted (Figure 4).

Nome River 2003 escapements were below average. Chum salmon count of 1,957 failed to meet the lower level of the escapement goal range of 2,900-4,300. This goal has only been reached in one of the last five years. Pink salmon escapement of 11,402 was below the 13,000-escapement goal but still the best odd-numbered year escapement since 1995. Historical chinook salmon escapements into the Nome River are shown in Figure 5. Coho salmon escapement was the lowest for the years most of the run was counted (Figure 5).

Although the chum ASL samples were divided into three strata, no effort was made to apportion the escapement age structure by time period. This stratification was because, with the exception of Nome River where part of the samples were collected as they entered the system, there was no way of knowing if the fish sampled had just entered or had been present for a while before being seined. The older chum salmon tended to have a higher abundance during the earlier sampling periods, as expected. Age by system varied from a high of 83% age-0.3 in the Nome River to a low of 34% in the Kwiniuk River.

Most coho salmon escapement samples were age class 2.1 representing 63% from Kwiniuk River and 79%, from Nome River.

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Table 1. Expanded daily and cumulative migration of all salmon species past the Kwiniuk River counting tower, Norton Sound, 2003.

Date	Daily chum salmon	Cumulative chum salmon	Daily pink salmon	Cumulative pink salmon	Daily chinook salmon	Cumulative chinook salmon	Daily coho salmon	Cumulative coho salmon	Daily Dolly Varden	Cumulative Dolly Varden
15-Jun	0	0	0	0	0	0	0	0	0	0
16-Jun	0	0	0	0	6	6	0	0	0	0
17-Jun	27	27	0	0	0	6	0	0	0	0
18-Jun	75	102	0	0	6	12	0	0	0	0
19-Jun	0	102	0	0	6	18	0	0	0	0
20-Jun	3	105	0	0	-3	15	0	0	3	3
21-Jun	15	120	0	0	6	21	0	0	3	6
22-Jun	477	597	0	0	6	27	0	0	6	12
23-Jun	195	792	9	9	21	42	0	0	0	6
24-Jun	126	918	6	15	3	45	0	0	0	6
25-Jun	9	927	0	15	0	45	0	0	0	6
26-Jun	342	1,269	3	18	6	51	0	0	3	9
27-Jun	696	1,965	9	27	12	63	0	0	6	15
28-Jun	84	2,049	15	42	6	69	0	0	6	21
29-Jun	282	2,331	30	72	33	102	0	0	42	63
30-Jun	-33	2,298	-3	69	-18	84	0	0	3	66
1-Jul	171	2,469	3	72	6	90	0	0	0	66
2-Jul	486	2,955	30	102	21	111	0	0	12	78
3-Jul	72	3,027	9	111	-3	108	0	0	0	78
4-Jul	69	3,096	-3	108	0	108	0	0	3	81
5-Jul	180	3,276	3	111	0	108	0	0	0	81
6-Jul	1,101	4,377	48	159	39	147	0	0	6	87
7-Jul	735	5,112	93	252	15	162	0	0	39	126
8-Jul	1,011	6,123	276	528	12	174	0	0	39	165
9-Jul	564	6,687	243	771	147	321	0	0	3	168
10-Jul	339	7,026	87	858	-6	315	0	0	9	177
11-Jul	-3	7,023	-9	852	-9	306	0	0	-3	174
12-Jul	789	7,812	435	1,287	18	324	0	0	15	189
13-Jul	1,383	9,195	1,758	3,045	57	381	0	0	21	210
14-Jul	294	9,489	807	3,852	24	405	0	0	0	210
15-Jul	-18	9,471	-90	3,762	-21	384	0	0	6	216
16-Jul	12	9,483	162	3,924	30	414	0	0	0	216
17-Jul	30	9,513	165	4,089	21	435	0	0	0	216
18-Jul	324	9,837	852	4,941	18	453	0	0	12	228
19-Jul	456	10,293	732	5,673	81	534	0	0	21	249
20-Jul	549	10,842	3,645	9,318	87	621	3	3	9	258
21-Jul	309	11,151	3921	13,239	39	660	0	3	0	258
22-Jul	21	11,172	723	13,962	3	663	0	3	6	264
23-Jul	204	11,376	357	14,319	15	678	15	18	6	270
24-Jul	150	11,526	762	15,081	15	693	15	36	54	324
25-Jul	132	11,658	1206	16,287	0	693	21	57	-6	318
26-Jul	27	11,685	270	16,557	9	702	15	72	6	324
27-Jul	30	11,715	408	16,965	6	708	9	81	0	324
28-Jul	39	11,754	711	17,676	12	720	12	93	6	330
29-Jul	108	11,862	483	18,159	6	726	24	117	3	333
30-Jul	33	11,895	207	18,366	3	729	30	147	9	342
31-Jul	24	11,919	699	19,065	3	732	42	189	3	345
1-Aug	39	11,958	270	19,335	0	732	78	267	3	348
2-Aug	33	11,991	630	19,965	0	732	63	330	12	360
3-Aug	27	12,018	417	20,382	6	738	177	507	3	363
4-Aug	6	12,024	363	20,745	0	738	45	552	12	375
5-Aug	21	12,045	189	20,934	0	738	99	651	9	384
6-Aug	15	12,060	312	21,246	6	744	126	777	-15	369
7-Aug	3	12,063	252	21,498	0	744	201	978	21	390
8-Aug	9	12,072	150	21,648	-3	741	54	1,032	48	438
9-Aug	6	12,078	270	21,918	3	744	192	1,224	690	1,128
10-Aug	3	12,081	111	22,029	3	747	333	1,557	498	1,626
11-Aug	0	12,081	108	22,137	0	747	462	2,019	24	1,650
12-Aug	3	12,084	39	22,176	0	747	114	2,133	456	2,106
13-Aug	-3	12,081	6	22,182	0	747	3	2,136	126	2,232
14-Aug	3	12,084	18	22,200	0	747	-18	2,118	228	2,460
15-Aug	3	12,087	24	22,224	0	747	45	2,163	387	2,847
16-Aug	3	12,090	21	22,245	-3	744	36	2,199	288	3,135
17-Aug	6	12,096	6	22,251	0	744	108	2,307	99	3,234
18-Aug	3	12,099	9	22,260	0	744	111	2,418	546	3,780
19-Aug	3	12,102	6	22,266	0	744	66	2,484	1944	5,424
20-Aug	3	12,105	6	22,272	0	744	114	2,598	6	5,430
21-Aug	3	12,108	9	22,281	0	744	195	2,793	81	5,511
22-Aug	3	12,111	15	22,296	0	744	426	3,219	-1545	3,966
23-Aug	0	12,111	0	22,296	0	744	105	3,324	-1572	2,394
24-Aug	0	12,111	0	22,296	0	744	153	3,477	-129	2,265
25-Aug	3	12,114	15	22,311	0	744	393	3,870	-333	1,932
26-Aug	0	12,114	0	22,311	0	744	96	3,966	-57	1,875
27-Aug	0	12,114	0	22,311	0	744	6	3,972	-1155	720
28-Aug	0	12,114	0	22,311	0	744	27	3,999	-24	696
29-Aug	3	12,117	0	22,311	0	744	57	4,056	-90	606
30-Aug	0	12,117	0	22,311	0	744	93	4,149	-843	-237
31-Aug	0	12,117	0	22,317	0	744	93	4,242	0	-237
1-Sep	0	12,117	3	22,320	0	744	75	4,317	18	-219
2-Sep	3	12,120	3	22,323	0	744	111	4,428	0	-219
3-Sep	3	12,123	0	22,323	0	744	99	4,527	0	-219
4-Sep	0	12,123	3	22,326	0	744	84	4,611	0	-219
5-Sep	0	12,123	0	22,326	0	744	45	4,656	0	-219
6-Sep	0	12,123	3	22,329	0	744	81	4,737	-6	-225
7-Sep	0	12,123	3	22,332	0	744	279	5,016	-123	-348
8-Sep	0	12,123	0	22,332	0	744	165	5,181	-198	-546
9-Sep	0	12,123	0	22,332	0	744	153	5,334	0	-546
10-Sep	0	12,123	0	22,332	0	744	72	5,406	-9	-555
11-Sep	0	12,123	0	22,332	0	744	33	5,439	-27	-582
12-Sep	0	12,123	0	22,332	0	744	33	5,472	0	-582
13-Sep	0	12,123	-3	22,329	0	744	-9	5,463	0	-582
14-Sep	0	12,123	9	22,329	9	744	27	5,490	-21	-603
15-Sep	0	12,123	0	22,329	0	744	0	5,490	0	-603
Total	12,123		22,329		744		5,490		-603	

Table 2. Expanded daily and cumulative migration of all salmonid species past the Niukluk River counting tower, Norton Sound, 2003.

Date	Daily chum salmon	Cumulative chum salmon	Daily pink salmon	Cumulative pink salmon	Daily chinook salmon	Cumulative chinook salmon	Daily coho salmon	Cumulative coho salmon	Daily Dolly Varden	Cumulative Dolly Varden
26-Jun	12	12	0	0	3	3	0	0	6	6
27-Jun	39	51	0	0	18	21	0	0	3	9
28-Jun	96	147	12	12	0	21	0	0	63	72
29-Jun	111	258	6	18	-3	18	0	0	8	80
30-Jun	60	318	4	22	-1	17	0	0	7	87
1-Jul	56	374	4	26	-1	16	0	0	6	93
2-Jul	54	428	5	31	-1	15	0	0	5	98
3-Jul	29	457	2	33	-1	14	0	0	4	102
4-Jul	-99	358	0	33	0	14	0	0	3	105
5-Jul	30	388	3	36	0	14	0	0	54	159
6-Jul	627	1,015	45	81	12	26	0	0	18	177
7-Jul	714	1,729	258	339	-6	20	0	0	33	210
8-Jul	543	2,272	210	549	51	71	0	0	87	297
9-Jul	582	2,854	288	837	12	83	0	0	42	339
10-Jul	159	3,013	201	1,038	9	92	0	0	51	390
11-Jul	912	3,925	207	1,245	6	98	0	0	24	414
12-Jul	2,055	5,980	1,305	2,550	18	116	0	0	33	447
13-Jul	981	6,961	1,680	4,230	3	119	0	0	60	507
14-Jul	1,230	8,191	3,438	7,668	42	161	0	0	9	516
15-Jul	-57	8,134	-321	7,347	6	167	0	0	12	528
16-Jul	297	8,431	1,263	8,610	-6	161	0	0	21	549
17-Jul	948	9,379	2,667	11,277	9	170	0	0	12	561
18-Jul	1,671	11,050	3,807	15,084	0	170	0	0	48	609
19-Jul	1,641	12,691	5,880	20,964	3	173	0	0	24	633
20-Jul	1,113	13,804	6,264	27,228	0	173	0	0	18	651
21-Jul	831	14,635	4,353	31,581	-3	170	0	0	45	696
22-Jul	69	14,704	1,416	32,997	0	170	0	0	27	723
23-Jul	252	14,956	3,510	36,507	0	170	0	0	42	765
24-Jul	774	15,730	5,790	42,297	3	173	0	0	57	822
25-Jul	441	16,171	4,767	47,064	6	179	0	0	39	861
26-Jul	216	16,387	3,249	50,313	6	185	3	3	63	924
27-Jul	249	16,636	2,370	52,683	3	188	0	3	18	942
28-Jul	243	16,879	4,281	56,964	0	188	6	9	45	987
29-Jul	168	17,047	1,992	58,956	-6	182	3	12	42	1,029
30-Jul	186	17,233	891	59,847	0	182	0	12	6	1,035
31-Jul	447	17,680	2,676	62,523	0	182	6	18	48	1,083
1-Aug	195	17,875	1,509	64,032	0	182	3	21	48	1,131
2-Aug	222	18,097	1,161	65,193	-3	179	3	24	81	1,212
3-Aug	195	18,292	1,365	66,558	0	179	6	30	39	1,251
4-Aug	258	18,550	933	67,491	0	179	42	72	24	1,275
5-Aug	243	18,793	2,103	69,594	0	179	18	90	51	1,326
6-Aug	264	19,057	1,485	71,079	0	179	9	99	45	1,371
7-Aug	144	19,201	537	71,616	0	179	12	111	60	1,431
8-Aug	144	19,345	336	71,952	0	179	33	144	96	1,527
9-Aug	126	19,471	534	72,486	0	179	15	159	156	1,683
10-Aug	102	19,573	477	72,963	0	179	45	204	192	1,875
11-Aug	33	19,606	285	73,248	0	179	75	279	117	1,992
12-Aug	24	19,630	528	73,776	0	179	73	352	84	2,076
13-Aug	12	19,642	396	74,172	0	179	63	415	75	2,151
14-Aug	63	19,705	333	74,505	0	179	18	433	147	2,298
15-Aug	3	19,708	333	74,838	0	179	15	448	75	2,373
16-Aug	-9	19,699	288	75,126	0	179	21	469	42	2,415
17-Aug	-21	19,678	72	75,198	0	179	15	484	30	2,445
18-Aug	81	19,759	42	75,240	0	179	48	532	15	2,460
19-Aug	60	19,819	90	75,330	0	179	54	586	21	2,481
20-Aug	45	19,864	69	75,399	0	179	24	610	24	2,505
21-Aug	60	19,924	165	75,564	0	179	45	655	60	2,565
22-Aug	33	19,957	84	75,648	0	179	24	679	51	2,616
23-Aug	-6	19,951	108	75,756	0	179	111	790	33	2,649
24-Aug	21	19,972	0	75,756	0	179	39	829	30	2,679
25-Aug	18	19,990	12	75,768	0	179	114	943	12	2,691
26-Aug	13	20,003	6	75,774	0	179	63	1,006	43	2,734
27-Aug	6	20,009	3	75,777	0	179	42	1,048	57	2,791
28-Aug	0	20,009	42	75,819	0	179	21	1,069	114	2,905
29-Aug	0	20,009	0	75,819	0	179	66	1,135	138	3,043
30-Aug	0	20,009	0	75,819	0	179	15	1,150	153	3,196
31-Aug	0	20,009	0	75,819	0	179	21	1,171	66	3,262
1-Sep	3	20,012	9	75,828	0	179	12	1,183	12	3,274
2-Sep	0	20,012	6	75,834	0	179	3	1,186	12	3,286
3-Sep	3	20,015	3	75,837	0	179	9	1,195	-99	3,187
4-Sep	0	20,015	6	75,843	0	179	21	1,216	-129	3,058
5-Sep	3	20,018	0	75,843	0	179	33	1,249	-144	2,914
6-Sep	0	20,018	0	75,843	0	179	12	1,261	96	3,010
7-Sep	0	20,018	12	75,855	0	179	21	1,282	180	3,190
Total	20,018		75,855		179		1,282		3,190	

Table 3. Daily and cumulative passage of all salmonid species at the Nome River weir, Norton Sound, 2003.

Date	Daily chum salmon	Cumulative chum salmon	Daily pink salmon	Cumulative pink salmon	Daily chinook salmon	Cumulative chinook salmon	Daily coho salmon	Cumulative coho salmon	Daily Dolly Varden	Cumulative Dolly Varden	Daily Sockeye salmon	Cumulative Sockeye salmon
5-Jul	0	0	0	0	0	0	0	0	0	0	0	0
6-Jul	0	0	1	1	0	0	0	0	0	0	0	0
7-Jul	9	9	0	1	0	0	0	0	0	0	0	0
8-Jul	4	13	2	3	0	0	0	0	0	0	0	0
9-Jul	8	21	0	3	0	0	0	0	0	0	0	0
10-Jul	6	27	1	4	0	0	0	0	0	0	0	0
11-Jul	0	27	7	11	0	0	0	0	1	1	0	0
12-Jul	72	99	24	35	0	0	0	0	0	1	0	0
13-Jul	88	187	8	43	0	0	0	0	4	5	0	0
14-Jul	27	214	24	67	0	0	0	0	1	6	0	0
15-Jul	68	282	32	99	0	0	0	0	1	7	0	0
16-Jul	21	303	23	122	0	0	0	0	0	7	0	0
17-Jul	53	356	58	180	0	0	0	0	9	16	1	1
18-Jul	84	440	222	402	0	0	0	0	4	20	2	3
19-Jul	132	572	78	480	0	0	0	0	1	21	5	8
20-Jul	21	593	438	918	0	0	0	0	1	22	0	8
21-Jul	82	675	1,033	1,951	0	0	0	0	0	22	0	8
22-Jul	89	764	53	2,004	0	0	0	0	0	22	0	8
23-Jul	5	769	651	2,655	1	1	0	0	2	24	4	12
24-Jul	70	839	499	3,154	0	1	0	0	1	25	0	12
25-Jul	74	913	69	3,223	0	1	0	0	0	25	0	12
26-Jul	7	920	497	3,720	0	1	0	0	2	27	0	12
27-Jul	88	1,008	527	4,247	1	2	0	0	3	30	0	12
28-Jul	44	1,052	898	5,145	1	3	0	0	16	46	3	15
29-Jul	102	1,154	169	5,314	0	3	0	0	1	47	0	15
30-Jul	3	1,157	395	5,709	0	3	0	0	2	49	2	17
31-Jul	21	1,178	882	6,591	0	3	1	1	11	60	0	17
1-Aug	47	1,225	168	6,759	0	3	0	1	2	62	0	17
2-Aug	22	1,247	235	6,994	0	3	0	1	0	62	0	17
3-Aug	0	1,247	193	7,187	0	3	0	1	0	62	0	17
4-Aug	14	1,261	639	7,826	2	5	0	1	11	73	0	17
5-Aug	73	1,334	874	8,700	1	6	8	9	17	90	0	17
6-Aug	134	1,468	649	9,349	2	8	5	14	28	118	2	19
7-Aug	53	1,521	215	9,564	0	8	0	14	10	128	0	19
8-Aug	6	1,527	411	9,975	1	9	9	23	30	158	2	21
9-Aug	46	1,573	493	10,468	1	10	2	25	55	213	2	23
10-Aug	92	1,665	132	10,600	0	10	0	25	10	223	0	23
11-Aug	16	1,681	319	10,919	1	11	10	35	31	254	8	31
12-Aug	80	1,761	102	11,021	0	11	2	37	6	260	0	31
13-Aug	3	1,764	27	11,048	0	11	0	37	2	262	0	31
14-Aug	1	1,765	0	11,048	0	11	0	37	0	262	0	31
15-Aug	0	1,765	30	11,078	0	11	0	37	8	270	0	31
16-Aug	3	1,768	32	11,110	0	11	0	37	33	303	0	31
17-Aug	15	1,783	12	11,122	0	11	0	37	2	305	1	32
18-Aug	1	1,784	12	11,134	0	11	0	37	1	306	0	32
19-Aug	19	1,803	11	11,145	0	11	0	37	1	307	0	32
20-Aug	9	1,812	26	11,171	0	11	4	41	12	319	0	32
21-Aug	3	1,815	14	11,185	0	11	1	42	9	328	0	32
22-Aug	11	1,826	23	11,208	0	11	2	44	10	338	1	33
23-Aug	15	1,841	32	11,240	0	11	51	95	124	462	2	35
24-Aug	25	1,866	27	11,267	0	11	6	101	73	535	0	35
25-Aug	5	1,871	18	11,285	1	12	105	206	7	542	0	35
26-Aug	3	1,874	11	11,296	0	12	10	216	9	551	0	35
27-Aug	2	1,876	14	11,310	0	12	50	266	42	593	3	38
28-Aug	22	1,898	16	11,326	0	12	12	278	28	621	1	39
29-Aug	2	1,900	6	11,332	0	12	21	299	78	699	1	40
30-Aug	9	1,909	7	11,339	0	12	4	303	37	736	0	40
31-Aug	3	1,912	9	11,348	0	12	2	305	4	740	0	40
1-Sep	2	1,914	0	11,348	0	12	0	305	1	741	0	40
2-Sep	11	1,925	5	11,353	0	12	3	308	16	757	0	40
3-Sep	4	1,929	2	11,355	0	12	1	309	1	758	1	41
4-Sep	3	1,932	5	11,360	0	12	0	309	0	758	0	41
5-Sep	1	1,933	3	11,363	0	12	4	313	1	759	1	42
6-Sep	4	1,937	21	11,384	0	12	222	535	5	764	5	47
7-Sep	12	1,949	0	11,384	0	12	2	537	0	764	0	47
8-Sep	5	1,954	12	11,396	0	12	5	542	3	767	0	47
9-Sep	3	1,957	2	11,398	0	12	4	546	0	767	0	47
10-Sep	0	1,957	4	11,402	0	12	2	548	0	767	0	47
Total	1,957		11,402		12		548		767		47	

Table 4. Chum salmon age and sex composition, and mean length by sampling period, Kwiniuk River, Norton Sound, 2003.

		Brood Year and (Age Group)				
		2000 (0.2)	1999 (0.3)	1998 (0.4)	1997 (0.5)	Total
Stratum Dates:						
Sampling Dates:	6/25-7/4					
Sample Size:	143					
Male	Percent of Sample	0.0%	12.6%	37.1%	0.7%	50.3%
	Number in sample	0	18	53	1	72
	Mean Length (mm)[1]		588	614	585	
Female	Percent of Sample	0.0%	11.9%	37.8%	0.0%	49.7%
	Number in sample	0	17	54	0	71
	Mean Length (mm)[1]		572	586		
Total	Percent of Sample	0.0%	24.5%	74.8%	0.7%	100.0%
	Number in sample	0	35	107	1	143
Stratum Dates:						
Sampling Dates:	7/5-7/10					
Sample Size:	159					
Male	Percent of Sample	0.0%	11.9%	32.1%	0.6%	44.7%
	Number in sample	0	19	51	1	71
	Mean Length (mm)[1]		585	624	665	
Female	Percent of Sample	0.6%	17.6%	37.1%	0.0%	55.3%
	Number in sample	1	28	59	0	88
	Mean Length (mm)[1]	530	564	582		
Total	Percent of Sample	0.6%	29.6%	69.2%	0.6%	100.0%
	Number in sample	1	47	110	1	159
Stratum Dates:						
Sampling Dates:	7/11-7/14					
Sample Size:	171					
Male	Percent of Sample	1.2%	20.5%	22.8%	0.6%	45.0%
	Number in sample	2	35	39	1	77
	Mean Length (mm)[1]	545	568	614	650	
Female	Percent of Sample	0.6%	26.3%	28.1%	0.0%	55.0%
	Number in sample	1	45	48	0	94
	Mean Length (mm)[1]	565	545	569		
Total	Percent of Sample	1.8%	46.8%	50.9%	0.6%	100.0%
	Number in sample	3	80	87	1	171
Stratum Dates:						
Sampling Dates:	6/25-7/14			Season Total		
Sample Size:	473					
Male	Percent of Sample	0.4%	15.2%	30.2%	0.6%	46.5%
	Number in sample	2	72	143	3	220
	Mean Length (mm)[1]	545	578	617	633	
Female	Percent of Sample	0.4%	19.0%	34.0%	0.0%	53.5%
	Number in sample	2	90	161	0	253
	Mean Length (mm)[1]	548	556	579		
Total[2]	Percent of Sample	0.8%	34.2%	64.3%	0.6%	100.0%
	Number in sample	4	162	304	3	473

[1] Length was measured from mid-eye to fork-of-tail (MEF).

[2] The number of fish in total are the stratum sums; total percentages are derived from the sums.

Table 5. Chum salmon age and sex composition, and mean length by sampling period, Niukluk River, Norton Sound, 2003.

		Brood Year and (Age Group)					
		2000 (0.2)	1999 (0.3)	1998 (0.4)	1997 (0.5)	1996 (0.6)	Total
Stratum Dates:							
Sampling Date:	7/5-7/12						
Sample Size:	111						
Male	Percent of Sample	0.0%	18.0%	41.4%	0.0%	0.9%	60.4%
	Number in sample	0	20	46	0	1	67
	Mean Length (mm)[1]	0	580	624	0	625	
Female	Percent of Sample	0.0%	12.6%	25.2%	1.8%	0.0%	39.6%
	Number in sample	0	14	28	2	0	44
	Mean Length (mm)[1]	0	557	569	595	0	
Total	Percent of Sample	0.0%	30.6%	66.7%	1.8%	0.9%	100.0%
	Number in sample	0	34	74	2	1	111
Stratum Dates:							
Sampling Date:	7/13						
Sample Size:	195						
Male	Percent of Sample	0.5%	34.9%	25.6%	0.0%	0.0%	61.0%
	Number in Escapement	1	68	50	0	0	119
	Mean Length (mm)[1]	588	584	615	0	0	
Female	Percent of Sample	0.0%	22.1%	16.9%	0.0%	0.0%	39.0%
	Number in Escapement	0	43	33	0	0	76
	Mean Length (mm)[1]	0	543	574	0	0	
Total	Percent of Sample	0.5%	56.9%	42.6%	0.0%	0.0%	100.0%
	Number in sample	1	111	83	0	0	195
Stratum Dates:							
Sampling Date:	7/22-8/1						
Sample Size:	111						
Male	Percent of Sample	0.0%	30.6%	20.7%	0.9%	0.0%	52.3%
	Number in sample	0	34	23	1	0	58
	Mean Length (mm)[1]	0	587	608	528	0	
Female	Percent of Sample	0.0%	29.7%	17.1%	0.9%	0.0%	47.7%
	Number in sample	0	33	19	1	0	53
	Mean Length (mm)[1]	0	547	556	555	0	
Total	Percent of Sample	0.0%	60.4%	37.8%	1.8%	0.0%	100.0%
	Number in sample	0	67	42	2	0	111
Stratum Dates:							
Sampling Date:	7/5-8/1			Season Total			
Sample Size:	417						
Male	Percent of Sample	0.2%	29.3%	28.5%	0.2%	0.2%	58.5%
	Number in sample	1	122	119	1	1	244
	Mean Length (mm)[1]	588	584	617	528	625	
Female	Percent of Sample	0.0%	21.6%	19.2%	0.7%	0.0%	41.5%
	Number in sample	0	90	80	3	0	173
	Mean Length (mm)[1]	0	547	568	582	0	
Total[2]	Percent of Sample	0.2%	50.8%	47.7%	1.0%	0.9%	100.0%
	Number in sample	1	212	199	4	1	417

[1] Length was measured from mid-eye to fork-of-tail (MEF).

[2] The number of fish in total are the stratum sums; total percentages are derived from the sums.

Table 6. Chum salmon age and sex composition, and mean length by sampling period, Nome River, Norton Sound, 2003.

		Brood Year and (Age Group)				
		2000 (0.2)	1999 (0.3)	1998 (0.4)	1997 (0.5)	Total
Sampling Dates:	7/7-7/17					
Sample Size:	64					
Male	Percent of Sample	0.0%	45.3%	9.4%	4.7%	59.4%
	Number in Sample	0	29	6	3	38
	Mean Length (mm)[1]	0	591	581	590	
Female	Percent of Sample	0.0%	29.7%	10.9%	0.0%	40.6%
	Number in Sample	0	19	7	0	26
	Mean Length (mm)[1]	0	573	574	0	
Total	Percent of Sample	0.0%	75.0%	20.3%	4.7%	100.0%
	Number in Sample	0	48	13	3	64
Sampling Dates:	7/19-7/25					
Sample Size:	35					
Male	Percent of Sample	0.0%	40.0%	5.7%	0.0%	45.7%
	Number in Sample	0	14	2	0	16
	Mean Length (mm)[1]	0	564	640	0	
Female	Percent of Sample	0.0%	45.7%	8.6%	0.0%	54.3%
	Number in Sample	0	16	3	0	19
	Mean Length (mm)[1]	0	562	592	0	
Total	Percent of Sample	0.0%	85.7%	14.3%	0.0%	100.0%
	Number in Sample	0	30	5	0	35
Sampling Dates:	7/26-8/23					
Sample Size:	59					
Male	Percent of Sample	0.0%	47.5%	6.8%	0.0%	54.2%
	Number in Sample	0	28	4	0	32
	Mean Length (mm)[1]	0	591	616	0	
Female	Percent of Sample	0.0%	42.4%	3.4%	0.0%	45.8%
	Number in Sample	0	25	2	0	27
	Mean Length (mm)[1]	0	554	580	0	
Total	Percent of Sample	0.0%	89.8%	10.2%	0.0%	100.0%
	Number in Sample	0	53	6	0	59
Sampling Dates:	7/7-8/23	Season Total				
Sample Size:	158					
Male	Percent of Sample	0.0%	44.9%	7.6%	1.9%	54.4%
	Number in Sample	0	71	12	3	86
	Mean Length (mm)[1]		585	603	590	
Female	Percent of Sample	0.0%	38.0%	7.6%	0.0%	45.6%
	Number in Sample	0	60	12	0	72
	Mean Length (mm)[1]		562	580		
Total[2]	Percent of Sample		82.9%	15.2%	1.9%	100.0%
	Number in Sample	0	131	24	3	158

[1] Length was measured from mid-eye to fork-of-tail (MEF).

[2] The number of fish in total are the sample sums; total percentages are derived from the sums.

Table 7. Coho salmon age and sex composition, and mean length, by sampling period, Kwiniuk River, Norton Sound, 2003.

		Brood Year and (Age Group)			
		2000 (1.1)	1999 (2.1)	1998 (3.1)	Total
Sampling Dates:	7/21-8/14				
Sample Size:	126				
Male	Percent of Sample	14.3%	36.5%	7.9%	58.7%
	Number in Sample	18	46	10	74
	Mean Length (mm)[1]	600	584	595	
Female	Percent of Sample	6.3%	24.6%	10.3%	41.3%
	Number in Sample	8	31	13	52
	Mean Length (mm)[1]	583	598	591	
Total	Percent of Sample	20.6%	61.1%	18.3%	100.0%
	Number in Sample	26	77	23	126
Sampling Dates:	8/16-8/28				
Sample Size:	140				
Male	Percent of Sample	15.7%	32.1%	2.9%	50.7%
	Number in Sample	22	45	4	71
	Mean Length (mm)[1]	568	593	579	
Female	Percent of Sample	9.3%	32.1%	7.9%	49.3%
	Number in Sample	13	45	11	69
	Mean Length (mm)[1]	602	608	605	
Total	Percent of Sample	25.0%	64.3%	10.7%	100.0%
	Number in Sample	35	90	15	140
Sampling Dates:	8/29-9/08				
Sample Size:	118				
Male	Percent of Sample	13.6%	22.9%	2.5%	39.0%
	Number in Sample	16	27	3	46
	Mean Length (mm)[1]	0	591	616	
Female	Percent of Sample	18.6%	41.5%	0.8%	61.0%
	Number in Sample	22	49	1	72
	Mean Length (mm)[1]	0	554	580	
Total	Percent of Sample	32.2%	64.4%	3.4%	100.0%
	Number in Sample	38	76	4	118
Sampling Dates:	7/21-9/8	Season Total			
Sample Size:	384				
Male	Percent of Sample	14.6%	30.7%	4.4%	49.7%
	Number in Sample	56	118	17	191
	Mean Length (mm)[1]	568	596	617	
Female	Percent of Sample	11.2%	32.6%	6.5%	50.3%
	Number in Sample	43	125	25	193
	Mean Length (mm)[1]	527	555	581	
Total[2]	Percent of Sample	25.8%	63.3%	10.9%	100.0%
	Number in Sample	99	243	42	384

[1] Length was measured from mid-eye to fork-of-tail (MEF).

[2] The number of fish in total are the sample sums; total percentages are derived from the sums.

Table 8. Coho salmon age and sex composition, and mean length, Nome River, Norton Sound, 2003.

		Brood Year and (Age Group)			
		2000 (1.1)	1999 (2.1)	1998 (3.1)	Total
Sampling Dates:	8/4-9/7				
Sample Size:	143				
Male	Percent of Sample	9.8%	44.1%	1.4%	55.2%
	Number in Sample	14	63	2	79
	Mean Length (mm)[1]	581	606	623	
Female	Percent of Sample	4.9%	35.0%	4.9%	44.8%
	Number in Sample	7	50	7	64
	Mean Length (mm)[1]	572	581	585	
Total	Percent of Sample	14.7%	79.0%	6.3%	100.0%
	Number in Sample	21	113	9	143

[1] Length was measured from mid-eye to fork-of-tail (MEF).

[2] The number of fish in total are the sample sums; total percentages are derived from the sums.

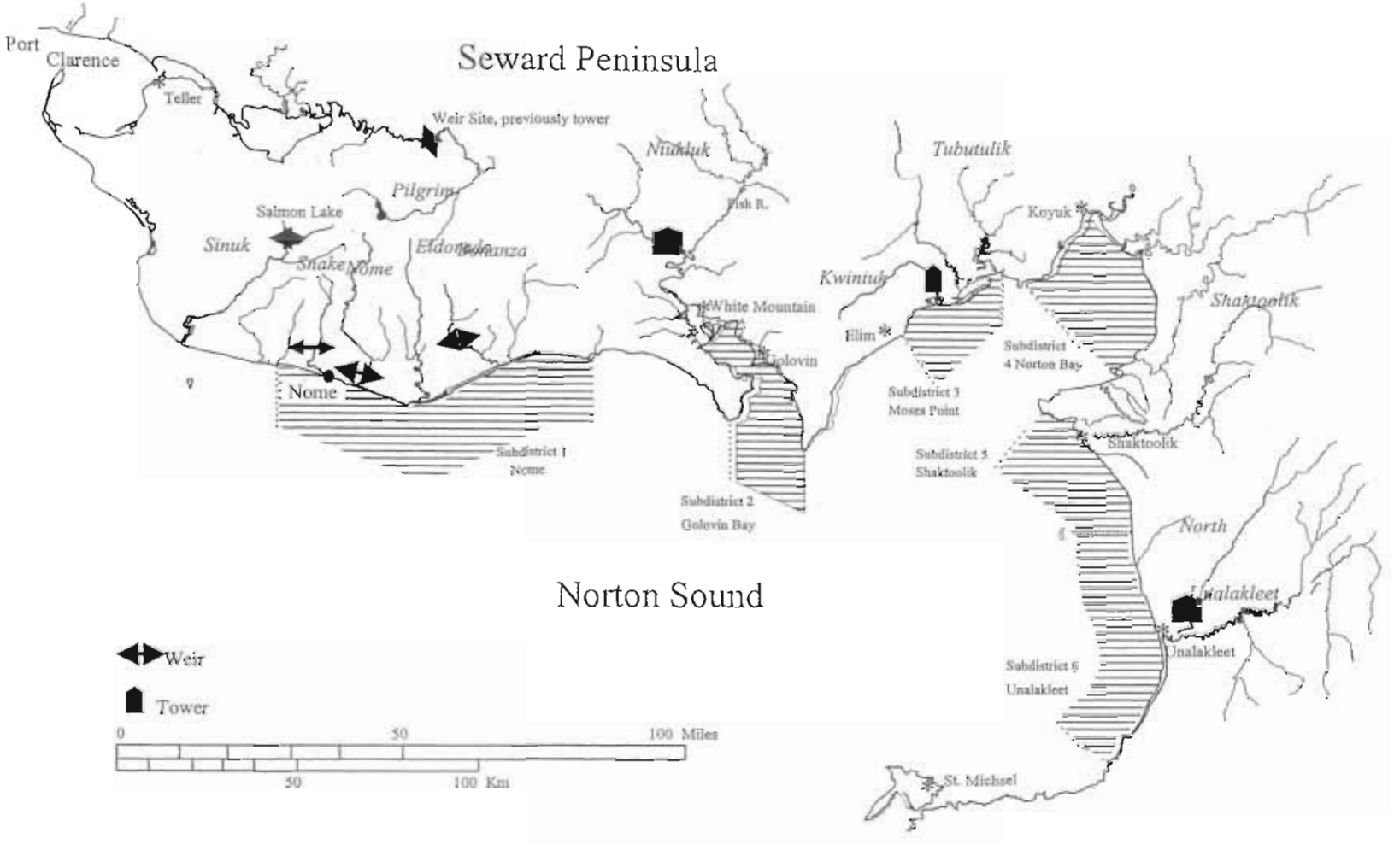

Figure 1. Norton Sound and southern Seward Peninsula, Alaska, area map with commercial fishery subdistricts and tower or weir enumeration project locations.

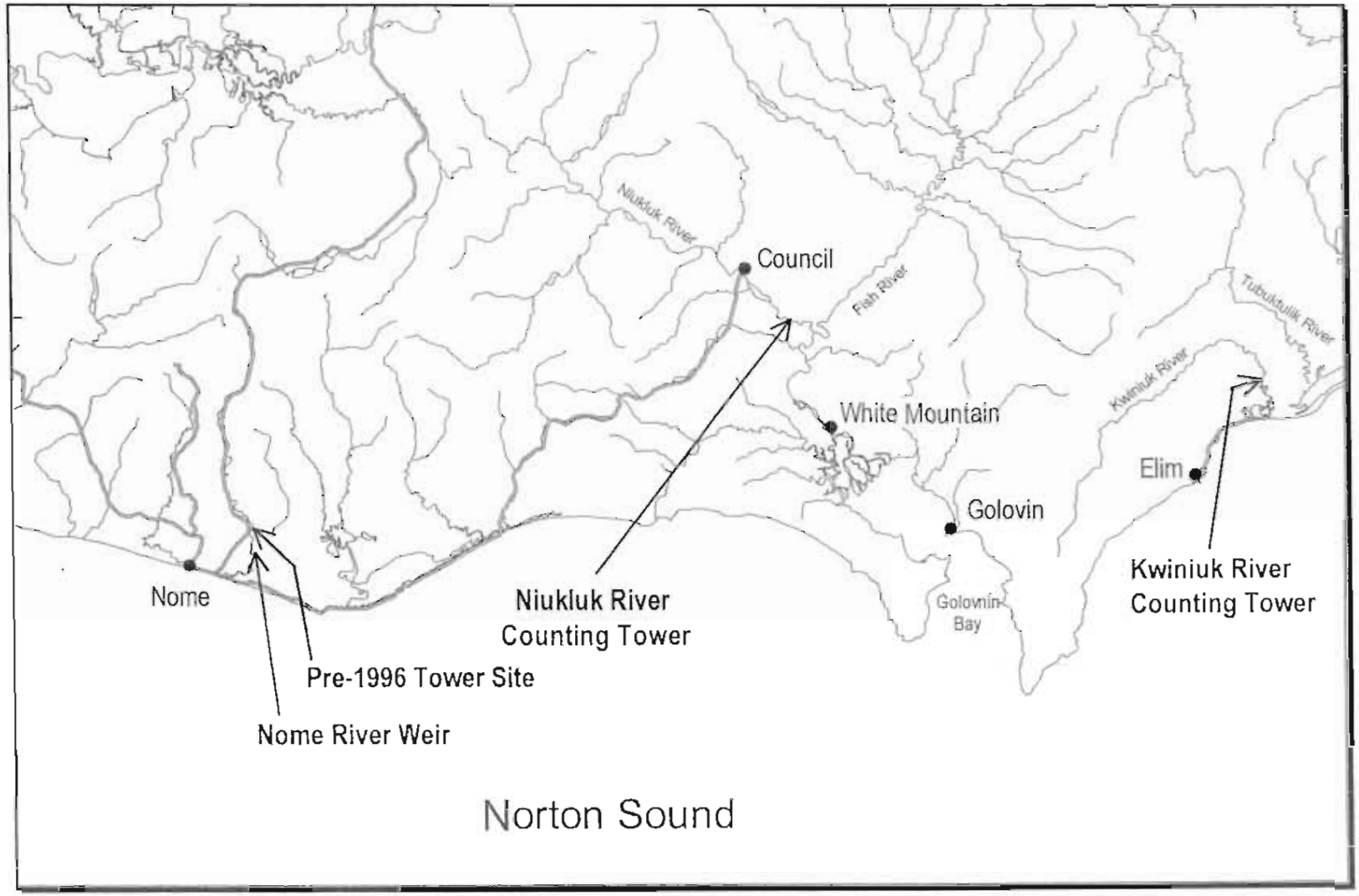

Figure 2. Area location map of Department escapment project sites; Kwiniuk and Niukluk counting towers and Nome River weir and previous tower site, Norton Sound, Alaska.

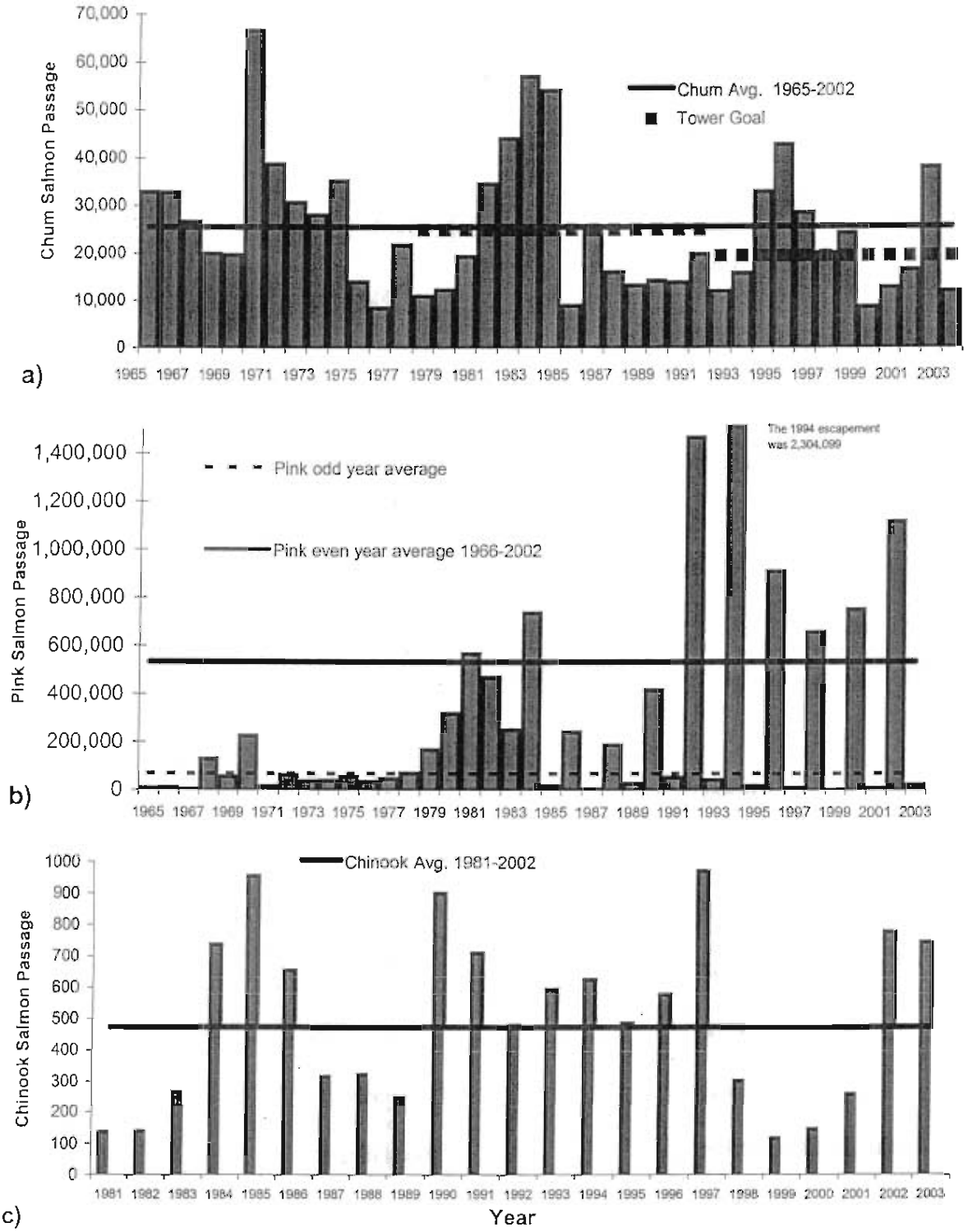

Figure 3. Annual salmon passage and average for (a) chum and (b) pink salmon (1965-2003), and (c) chinook salmon (1981-2003) at the Kwiniuk River counting tower, Norton Sound. Note – scales are not the same.

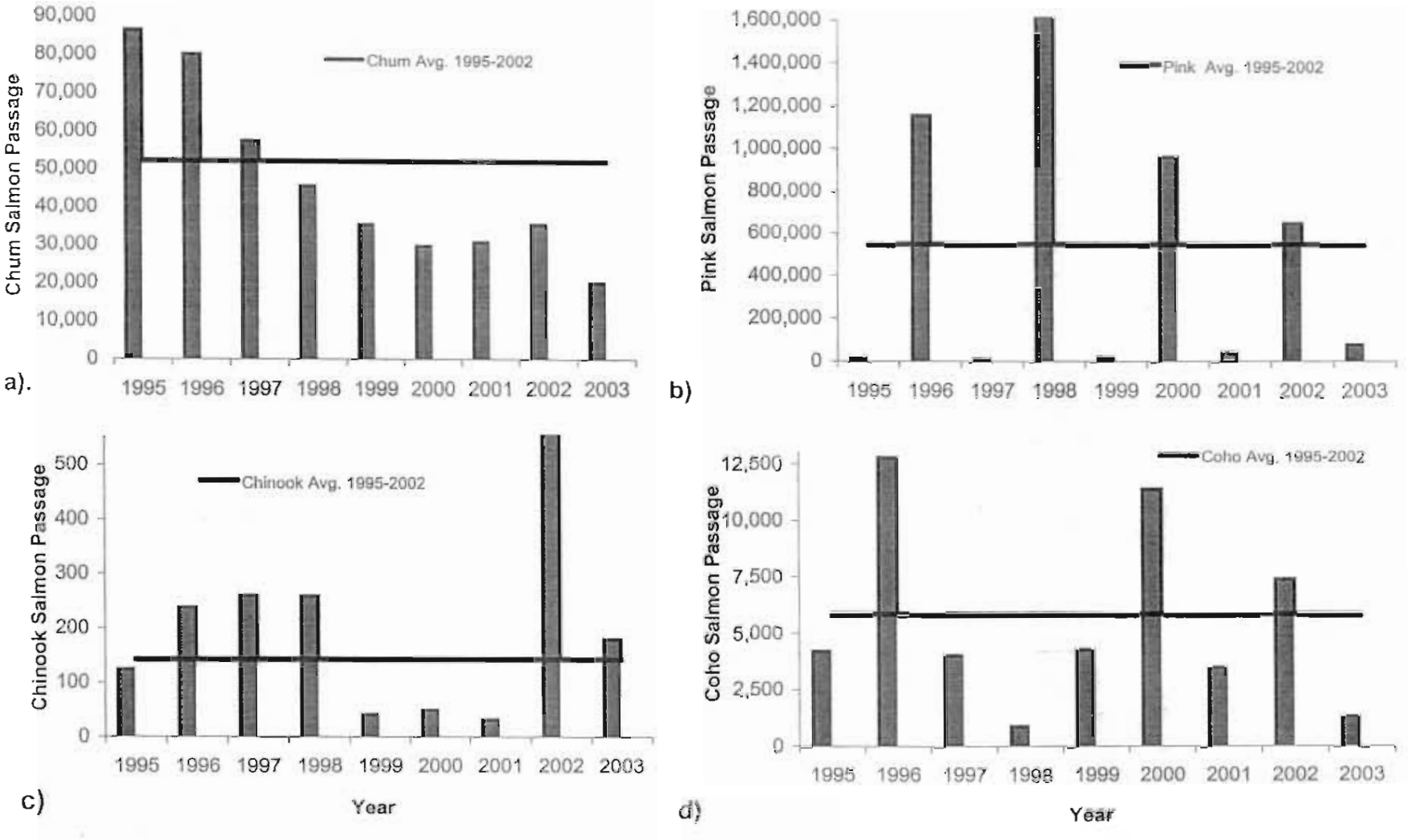

Figure 4. **Annual salmon passage and average for (a) chum, (b) pink, (c) chinook, and (d) coho salmon at the Niukluk River tower (1995-2003), Norton Sound. Note – scales are not the same.**

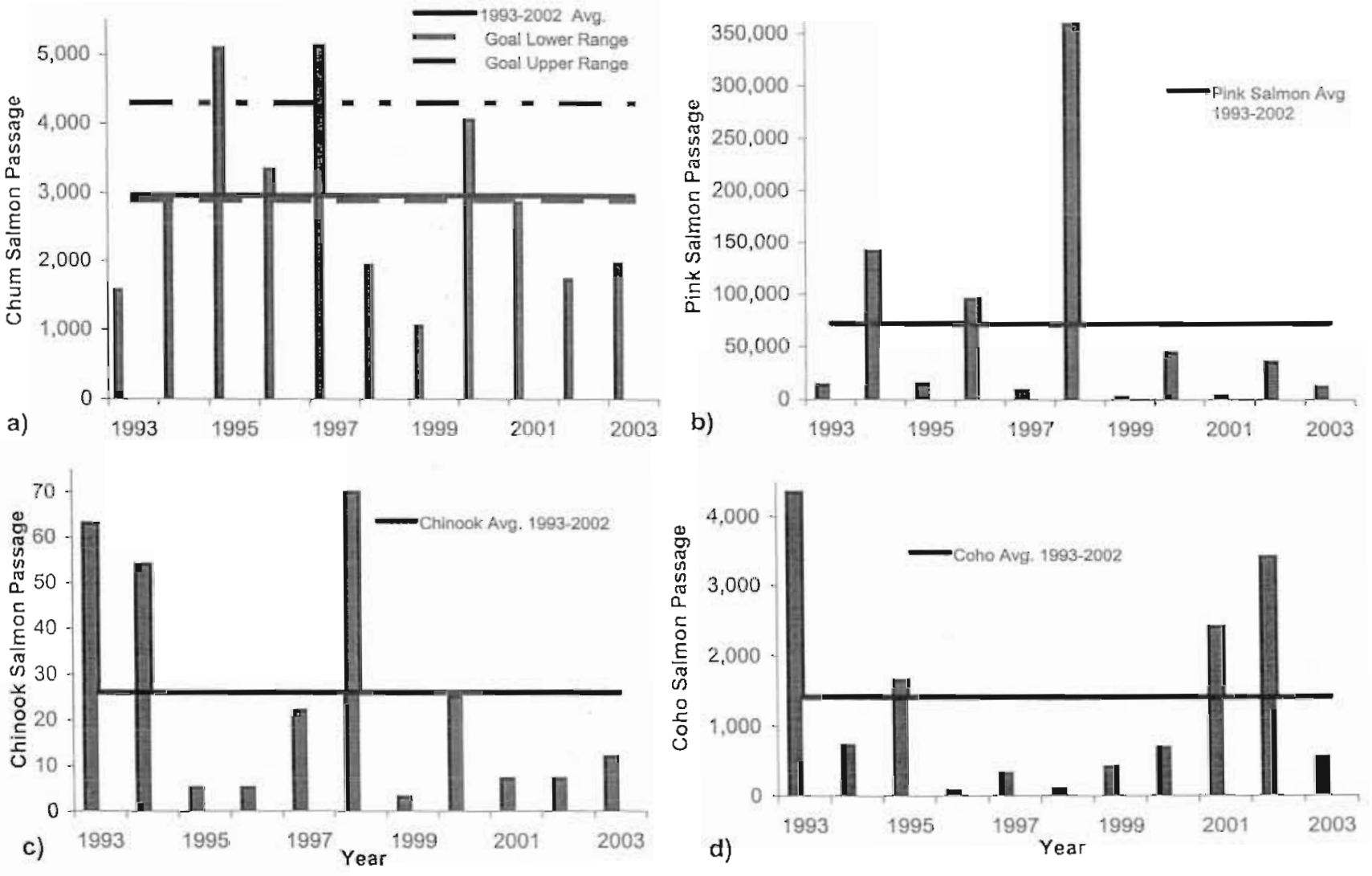

Figure 5. Annual salmon passage and average for (a) chum, (b) pink, (c) chinook, and (d) coho salmon at the Nome River tower (1993-1995) and weir (1996-2003), Norton Sound. Note – scales are not the same.

Appendix A.1. Historical salmon escapements at the Kwiniuk River counting tower, 1965-2003.[1]

Year	Operating period	Chum	Pink	Chinook	Coho
1965	June 18-Jul 19	32,861	8,668	19	
1966	June 19-Jul 28	32,786	10,629	7	
1967	June 18-Jul 28	26,661	3,587	13	
1968	June 18-Jul 24	19,976	129,052	27	
1969	June 26-Jul 26	19,687	56,683	12	
1970	June 25-Jul 29	66,604	226,831		
1971	June 29-Jul 29	38,679	16,634		
1972	June 28-Jul 27	30,686	62,461	65	
1973	June 25-Jul 25	28,029	37,070	57	
1974	June 20-Jul 26	35,161	39,375	62	
1975	July 4-Jul 26	14,049	55,293	44	
1976	July 4-Jul 25	8,508	35,226	12	
1977	June 26-Jul 25	21,798	47,934		
1978	July 4-Jul 22	11,049	70,148		
1979	June 28-Jul 25	12,355	167,492	107	
1980	June 22-Jul 28	19,374	319,363	177	
1981	June 19-Aug 2	34,561	566,417	136	
1982	June 21-Jul 26	44,036	469,674	138	
1983	June 19-Jul 27	56,927	251,965	267	
1984	June 19-Jul 25	54,043	736,544	736 [2]	
1985	June 26-Jul 28	9,013	18,237	955 [3]	
1986	June 19-Jul 26	24,704	241,446	653	
1987	June 25-Jul 23	16,134	5,567	314	
1988	June18-Jul 26	13,302	187,991	321	
1989	June 27-Jul 27	14,282	27,487	248	
1990	June 21-Jul 25	13,957	416,511	900	
1991	June 18-Jul 27	19,800	53,499	709	
1992	June 27-Jul 28	12,077	1,464,717	479	
1993	June 27-Jul 27	15,823	43,065	594	
1994	June 23-Aug 9	32,875	2,304,099	625	2,547
1995	June 21-Jul 26	42,703	17,509	485	114
1996	June 20-Jul 25	28,493	907,894	577	461
1997	June 18-Jul 27	20,118	9,536	972	0
1998	June 18-Jul 27	24,248	655,933	302	0
1999	June 25-Jul 28	8,763	608	115	0
2000	June 22-Jul 27	12,878	750,173	144	41
2001	June 27-Sept 15	16,598	8,423	258	9,532
2002	June 17-Sept 11	37,995	1,114,410	778	6,459
2003	June 15-Sept 15	12,123	22,329	744	5,490
	Average 1965-2002	25,568	303,636	333	2,128

[1] Counts from 1965-1994 taken from the original project reports located in the Nome office of Fish and Game, counts for 1995-2001are from Kohler 2002.

[2] Chinook salmon counts from 1965-1984 not expanded.

[3] Chinook salmon counts after 1985 were expanded.

Appendix A.2. Historical salmon escapements at the Niukluk River counting tower, 1995-2003.

Year	Operating period	Chum	Pink	Chinook	Coho
1995	June 29-Sept 12	86,333	17,089	123	4,173
1996	June 23-Sept 12	80,121	1,154,881	237	12,781
1997	June 28-Sept 9	57,304	10,466	259	3,994
1998	July 4-August 9	45,587	1,624,436	258	839
1999	June 4-Sept 4	35,240	20,355	40	4,260
2000	July 4-Aug-27	29,572	961,603	48	11,382
2001	July 10-Sept 8	30,662	41,625	30	3,468
2002	June 25-Sept 10	35,307	645,141	621	7,391
2003	June 25-Sept 10	20,018	75,855	179	1,282
	Average 1995-2001	52,117	547,208	142	5,842

Appendix Table A.3. Historical salmon escapements at the Nome River counting tower, 1993-1995, and weir 1996-2003.

Year	Operating period	Chum	Pink	Chinook	Coho
1993	July 25-Aug 28	1,566	13,034	63	4,349
1994	June 24-Aug 15	2,893	141,246	54	726
1995	June 22-Sept 6	5,092	13,890	5	1,650
1996	June 26-Jul 23	3,339	95,681 [1]	5	66
1997	June 27-Aug 27	5,131	8,035	22	321
1998	July 01-Aug 11	1,930	359,469	70	96
1999	July 02-Aug 25	1,048	2,033	3	417
2000	June 29-Aug 25	4,056	44,368	25	698
2001	July 8-Sept 11	2,859	3,138	7	2,418
2002	June 29-Sept 11	1,720	35,057	7	3,418
2003	July 5-Sept 10	1,957	11,402	12	548
	Average 1993-2002	2,963	71,595	26	1,416

[1] In 1996 the majority of pink salmon escaped through the pickets and were not counted.