Fishery Data Series No. 06-22

Salmonid Escapements at Kwiniuk, Niukluk and Nome Rivers, 2005

by

Scott Kent

May 2006

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

FISHERY DATA SERIES NO. 06-22

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ABSTRACT

The Alaska Department of Fish and Game (ADF&G) operated counting tower projects on the Kwiniuk and Niukluk Rivers and a weir project on the Nome River during the 2005 season. Runs 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* were enumerated. Objectives of the projects were to obtain daily and seasonal estimates of the timing and magnitude of salmon escapements and to collect biological data (age, sex, and length) from sampled chum and coho salmon.

Expanded tower counts at Kwiniuk River were: 12,083 chum salmon, 341,048 pink salmon, 342 Chinook salmon, 12,950 coho salmon, and 11,361 Dolly Varden. Expanded tower counts at Niukluk River were: 25,598 chum salmon, 270,424 pink salmon, 41 Chinook salmon, 2,727 coho salmon, and 2,444 Dolly Varden. Total cumulative counts at the Nome River weir were: 5,584 chum salmon, 285,759 pink salmon, 69 Chinook salmon, 5,848 coho salmon, 381 sockeye salmon, and 1,471 Dolly Varden. The Niukluk River and Nome River pink salmon escapements were both records for odd-numbered year pink salmon runs.

Predominant age compositions during 2005 for the sampled chum salmon escapements by river were: Kwiniuk River 77% age 0.3 and 17% age 0.4, Niukluk River 90% age 0.3 and 7% age 0.4, and Nome River 90% age 0.3 and 7% age 0.4. Most of the coho salmon escapement samples were age class 2.1 representing 80% from Kwiniuk River, Niukluk River 79%, and 91% from the Nome River.

Key words: Kwiniuk, Niukluk, Nome, escapement, *Oncorhynchus tshawytscha, O. nerka, O. keta, O. kisutch, O. gorbuscha.*

INTRODUCTION

The 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 6 commercial salmon fishing subdistricts. All 5 species of pacific salmon *(Oncorhynchus spp.)* 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 (ADF&G) in this district include 2 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, 6 escapement counting projects are operated by cooperating agencies. Kawerak Inc. operates 2 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, and an enumeration tower on the Pikmiktalik River near Stebbins. 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 ADF&G and cooperative projects. ADF&G 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. In this report, we summarize 2005 data from ADF&G tower and weir projects.

The Kwiniuk River drains into Norton Sound just east of Moses Point, approximately 160 km east of Nome (Figures 1 and 2). 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). There were no commercial salmon harvested in this subdistrict in 2005. Subsistence fisheries occur in both drainages and in marine waters in the subdistrict. Subsistence permits for salmon fishing were required for the first time in this subdistrict in 2004. In previous years, harvest data was gathered through ADF&G Division of Subsistence village surveys. Since 1965, a salmon counting tower has operated on the Kwiniuk River enumerating chum, pink, and Chinook salmon runs. Only since 2001 has the tower operated through the coho salmon run (Lean 1994; Kohler 2000a, 2003; Kohler and Knuepfer 2001, 2002a; Kohler and Todd 2003; Menard and Kent 2005; Rob 1996a, b, 1997a, 1998b, 1999c). The project provides fish passage data, age, sex, and length (ASL) data, and allows management biologists to calibrate aerial surveys.

The 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 2). The 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, a seasonal 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. As in the Moses Point Subdistrict, subsistence permits for salmon fishing were required for the first time in 2004 in the Golovnin Bay Subdistrict. Subsistence and sport fisheries occur on the Niukluk and Fish Rivers for all salmon species, Arctic grayling *Thymallus arcticus*, whitefish species *Prosopium spp.* and *Coregonus spp.*, and Dolly Varden. Commercial salmon fishing has been conducted sporadically in Subdistrict 2, and no commercial fisheries occurred during 2005.

The Niukluk River counting tower has successfully operated since 1995 (Jones and Knuepfer 2002; Kohler 2000b, 2001, 2003; Kohler and Todd 2003; Menard and Kent 2005; Rob 1995b, 1997c, 1998c, 1999b), and previously operated for approximately 3 weeks during 1979 (Schaefer 1979). The project is operated to obtain escapement information, ASL data, and as a means to calibrate the accuracy of aerial surveys of other tributaries in the Fish River drainage. Coho salmon passage at the tower is used in the Fish River telemetry project to estimate coho salmon escapement in the Fish River drainage.

Nome River flows approximately 50 km south from the Kigluaik Mountains and drains into Norton Sound approximately 5 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 restricted 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 subsistence fishing in Nome River. Subsistence harvests are reported to ADF&G Division of Commercial Fisheries through returned catch calendars.

A salmon counting tower was first operated on the Nome River in 1993 (Bue 1994; Rob 1995a, c). 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 2005 season was the tenth year of weir operations (Kohler 2000c, 2003; Kohler and Knuepfer 2000, 2002b; Kohler and Todd 2003; Rob 1997b, 1998a, 1999a).

All ADF&G enumeration projects, and cooperative projects, operate as a means to obtain timely and accurate escapement information and for the collection of biological data (ASL) spread throughout salmon runs. Daily count totals by species are relayed to the Nome ADF&G office via single sideband (UHF), marine (VHF) radio or satellite phone.

OBJECTIVES

The objectives of these projects were to:

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 chum and coho salmon runs and collect ASL data for development of brood tables and age, sex, and length frequencies for comparison of seasonal and yearly variations.

METHODS

Tower project crews 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 1 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 where an observer sits or stands on the elevated platform to count fish. Guy wires are attached to the tower and staked to the ground or cabled to trees to stabilize the tower. A flash panel (usually white plastic, vinyl, or canvas) is placed across the river bottom perpendicular to the river at the tower site and is anchored in place with sand bags and stakes. 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 midchannel over the panel ends to force migrating fish over the panel for easy observation. The Alaska Department of Natural Resources issued permits for all weirs and partial weirs. 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. The Nome River weir has aluminum weir stringers, top and bottom, that span the river and are supported by metal “A” frames. Metal conduit pickets are placed in the stringer holes and pounded into the bottom substrate, effectively blocking fish passage. Picket spacing determines the size of fish to be passed and enumerated. Fish are enumerated through the weir by opening a gate or pulling weir pickets and counting the fish as they migrate through the opening. The weir has a “boat gate” that allows the weir to be quickly opened between two “A” frames to allow for boat passage. Lighting systems similar to tower projects are used to illuminate the weir area for counting fish passage at night.

At tower projects, ASL sampling for chum and coho salmon is conducted using a beach seine whereas at weir sites samples are collected from salmon caught using a live box. The live box is installed and built into the upstream face of the weir. However, fish are seined near the weir if the live box does not effectively capture fish. In 2005, sampling goals for the Niukluk and

Kwiniuk projects were to obtain 480 chum salmon and 160 coho salmon. For chum salmon, tower crew attempted to collect 3 pulses (groups of samples) of 160 chum salmon each during the early, middle, and latter portions of the run. For coho salmon, one pulse of 160 samples was collected when adequate seining opportunities arose. Despite large numbers of pink salmon in the Nome River, crew members were able to use the weir trap to sample chum and coho salmon throughout duration of the run. Scales were taken for age determination, sex was determined by visually examining external characteristics (e.g., body symmetry, kype development, presence of an ovipositor), and lengths were measured to the nearest 0.5 cm from mideye to tail fork (METF) 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. Once 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. Ages were reported in European notation in which the first digit refers to the freshwater age, not including the year spent in the gravel, and the second digit refers to the ocean age (Koo 1962a, b). Chum salmon escapement age structure was apportioned by dividing chum ASL samples into 4 temporal strata for the Kwiniuk and Nome projects and 3 temporal strata for the Niukluk River.

KWINIUK RIVER TOWER

Kwiniuk River tower camp is located approximately 6 km upstream from the mouth of the Kwiniuk River, on land leased to ADF&G by Hans Jemewouk of Moses Point (Figure 2). Access to the site is by jet outboard riverboat from the seasonal village of Moses Point where aircraft deliver personnel, supplies and equipment. Additional ADF&G staff from Nome helped during tower installation and set up. A 15 m vinyl flash panel 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 the end of the flash panel to the shore opposite the tower. A 12-volt battery lighting system illuminated the flash panel during dark counting periods.

Counting began on 18 June at 1400 hours and ended after the count at 2300 hours on 12 September 2005. The 3 person crew counted one 20-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 from 1200-1500 hours on 9 August. Expanded counts for missed times in this report were calculated as follows. For the day that counts did not occur, the preceding day's count for a particular hour was added to the following day's count for the same hour and the total was divided by 2. If 2 days of counts for a particular hour were missed, the 2 preceding day's counts for that hour and the following 2 day's counts for that same hour were added and the total divided by 4. If more consecutive days were missed, the same number of preceding day's counts for that hour were added together with the same number of the following day's counts for that hour and the total divided by the total number of counts taken to obtain an average. Small adjustments were made to account for rounding to whole numbers.

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 ADF&G to use their lands to conduct the tower operation. Access to this site is via road to Council and by

jet outboard riverboat from Council to the tower. In 2005, 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 ADF&G staff provided assistance during project installation and set up. A 120-volt generator lighting system was installed on the tower to illuminate the flash panel during dark periods.

Counting began at 1200 hours on 28 June, and ended after the 1100 count on 9 September 2005. 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 1600–1700 hours on 7 July, the 1100 and 1700 hours counts on 8 July, from 0000 hours on 12 July until 1100 on 14 July, the 1900 hours count on 13 August, and from 1600 hours on 29 August until 0700 hours on 31 August. An average of the previous and following day's counts for the same time period was used as described above and the expanded count methods used were the same as those described for Kwiniuk tower.

NOME RIVER WEIR

Nome River weir camp is located approximately 5 km upstream from the mouth of the river on land that ADF&G leases from Sitnasuak Native Corporation (Figure 2). The weir is made of a series of 3.2 cm (1¼") pipes assembled in pairs using locking metal brackets. Aluminum stringers 5.6 m (12') long connect the pairs of pipes horizontally. Metal conduit pipes of varying lengths, depending on water depth, are inserted vertically in holes drilled in the stringers on 4.5 cm (1¾") centers. Pipes in the weir are removed to create openings that allow fish to pass and to be enumerated. The weir was designed for easy cleaning, easy removal in case of a flood, and to prevent unmonitored escapement of fish.

The project crew, with the help of additional ADF&G staff, began installing the weir on 27 June and was in operation from 27 June through 11 September 2005. The weir was inoperable for two brief periods on 15 July and 29 August because of high water. It is not known for how long each breach occurred, but both were discovered during the routine 0700 weir inspection and cleaning. The 15 July breach was repaired immediately. The 29 August breach occurred for at least 5 hours, as it was not repaired until 1200 hours. On 15 July, an estimated 175 chum salmon are thought to have escaped and on 29 August, an estimated 500 coho salmon are thought to have escaped without being enumerated. These assessments are based on visual surveys of the number of fish holding behind the weir prior to bedtime. Expanded counts for chum and coho salmon include the estimated numbers of these species that escaped during these brief periods.

RESULTS

ESCAPEMENT

Kwiniuk Tower expanded cumulative counts for 2005 were: 12,083 chum salmon, 341,048 pink salmon, 342 Chinook salmon, 12,950 coho salmon, and 11,361 Dolly Varden (Table 1).

Niukluk Tower expanded cumulative counts for 2005 were: 25,598 chum salmon, 270,424 pink salmon, 41 Chinook salmon, 2,727 coho salmon, and 2,444 Dolly Varden (Table 2).

Nome River weir total cumulative counts for 2005 were: 5,584 chum salmon, 285,759 pink salmon, 69 Chinook salmon, 5,848 coho salmon, 381 sockeye salmon, and 1,471 Dolly Varden (Table 3). Carcass counts are presented in Table 4.

AGE AND SEX COMPOSITION AND LENGTH FREQUENCY

Chum salmon age and sex composition during 2005 for the 3 rivers were as follows: Kwiniuk River samples (434) were 5.5% age-0.2, 77% age-0.3, 17.1% age-0.4 and 0.5% age-0.5 fish, and 70% females (Table 5). Age composition of 625 Niukluk River samples was 2.2% age-0.2, 89.9% age-0.3, 7% age-0.4, and 0.8% age-0.5 fish. The sex composition was 50% females (Table 6). Age composition of 326 Nome River samples was 1.2% age-0.2, 89.6% age-0.3, and 7.4% age-0.4 fish, and 1.8% females (Table 7).

Kwiniuk River chum salmon mean lengths (METF) for the major age classes were 575 mm for age-0.3 males and 542 mm for females, and age-0.4 chum were 610 mm for males and 562 mm for females. Niukluk age-0.3 chum salmon were 586 mm for males and 550 mm for females, and age-0.4 chum were 590 mm for males and 563 mm for females. Nome age 0.3 males were 588 mm and females 549 mm, and age 0.4 males were 596 mm and age 0.4 females were 559 mm.

Coho salmon escapement samples from the Kwiniuk (154), Niukluk (72), and Nome (158) Rivers were 80%, 79%, and 91% age 2.1, respectively (Tables 8, 9, and 10). Mean lengths by age group for all samples collected ranged from 562 mm for age 1.1 males in the Kwiniuk River escapement sample to 605 mm for age 3.1 males from the Nome River samples. Females comprised 62% of the samples at Kwiniuk River, 47% at Niukluk River, and 55% at Nome River.

DISCUSSION

Lower than normal water levels were encountered throughout the Norton Sound area from June through August in 2005. However, high water levels resulted in suspended counts for several hours at the Kwiniuk and Nome rivers and for 4 days (July 7–8, 12, and 14) in July and 4 days (August 13, 29–31) in August at the Niukluk River. Flooding and turbidity associated with high water conditions are normally encountered in August and September reducing visibility for species determination and accuracy of enumeration, and causing days of missed counts.

Chum salmon passage at Kwiniuk River tower was 12,083 fish, which was slightly above the low end of the current escapement goal range of 11,500–23,000 fish, and was 49% of the average tower count since 1965 (Figure 3; Appendix A1). Chinook salmon passage of 342 fish was slightly above the low end of the escapement goal range of 300–550 fish (Figure 5). Pink salmon passage of 341,048 fish at the Kwiniuk River tower was second only to the odd numbered year record of 566,417 pink salmon counted in 1981 and was 381% above the average tower count for odd numbered years since 1965 (Figure 4; Appendix A1). Funds from the Norton Sound Salmon Research & Restoration fund extended counting tower operations through the coho salmon run for the fifth consecutive year and coho salmon passage was 12,950, the highest recorded to date (Figure 6).

At Niukluk River counting tower, the 2005 expanded count of 25,598 chum salmon was the third lowest recorded and was 59% of the 1995–2004 average (Figure 7; Appendix A2). Pink salmon escapement of 270,424 fish was more than 3 times the previous odd numbered year record of 75,855 pink salmon counted in 2003, and was more than 8 times the odd numbered year average return since the project began in 1995 (Figure 7). Chinook salmon escapement of 41 fish was the third lowest on record (Appendix A2). Coho salmon escapement of 2,727 fish was the third lowest recorded for years when the majority of the run was counted (Figure 7).

Nome River 2005 salmon escapements were above average (Appendix A3). The weir was only inoperable for several hours as previously discussed. It is estimated that approximately 175 chum salmon and 500 coho salmon escaped during breaches on 15 July and 29 August, respectively, and total cumulative counts for both chum and coho salmon take account of these estimates. Chum salmon passage through the weir was a record at 5,584 fish and well above the high end of the current escapement goal range of 2,900–4,300 fish (Figure 8). Pink salmon passage of 285,759 was the third highest on record overall and a record for odd numbered year pink salmon runs (Figure 8). The Chinook salmon escapement of 69 fish was the fifth time since counting began in 1993 that escapement exceeded 50 fish. Coho salmon escapement was 5,848 fish and was a record for the 5 years during which the majority of the run has been counted (Figure 8).

ASL samples from all 3 projects had a slightly higher than normal percentage of age-0.2 chum salmon (Tables 5–7). Usually the percentage of age-0.2 chum salmon is less than 1%, but this year the percentages ranged from 1.2% at Nome River to 5.5% at Kwiniuk River. A high percentage of age-0.2 fish is often an indication of good survival rates for that brood year and forecasts a strong run of age-0.3 fish for the following year.

Kwiniuk and Nome project crews were able to get the required 160 coho salmon samples by either seining or using the weir trap, as was the case at Nome River. However, at Niukluk River, the crew was only able to capture 102 coho with the seine because of low numbers of fish, and only 72 of these coho samples yielded readable scales.

Age-2.1 coho salmon represented 80% of Kwiniuk River samples (Table 8), 79% of Niukluk River samples (Table 9), and 91%, of Nome River samples (Table 10). This age composition was similar to those observed in previous years.

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TABLES AND FIGURES

Table 1.–Expanded daily and cumulative migration of all salmonid species past Kwiniuk River counting tower, Norton Sound, 2005.

Date	Daily Chum Salmon	Cum. Chum Salmon	Daily Pink Salmon	Cum. Pink Salmon	Daily Chinook Salmon	Cum. Chinook Salmon	Daily Coho Salmon	Cum. Coho Salmon	Daily Dolly Varden	Cum. Dolly Varden
18-Jun	-6	-6	18	18	6	6	0	0	0	0
19-Jun	12	6	111	129	0	6	0	0	24	24
20-Jun	0	6	57	186	3	9	0	0	21	45
21-Jun	6	12	312	498	3	12	0	0	-9	36
22-Jun	24	36	48	546	0	12	0	0	-15	21
23-Jun	42	78	339	885	3	15	0	0	12	33
24-Jun	54	132	591	1,476	6	21	0	0	15	48
25-Jun	150	282	279	1,755	15	36	0	0	-27	21
26-Jun	447	729	303	2,058	-6	30	0	0	0	21
27-Jun	840	1,569	468	2,526	15	45	0	0	18	39
28-Jun	1,293	2,862	1,683	4,209	24	69	0	0	15	54
29-Jun	1,398	4,260	6,912	11,121	15	84	0	0	3	57
30-Jun	396	4,656	1,713	12,834	18	102	0	0	6	63
1-Jul	696	5,352	5,880	18,714	15	117	0	0	3	66
2-Jul	165	5,517	441	19,155	9	126	0	0	12	78
3-Jul	336	5,853	4,341	23,496	15	141	0	0	0	78
4-Jul	801	6,654	13,467	36,963	12	153	0	0	0	78
5-Jul	240	6,894	2,403	39,366	9	162	0	0	3	81
6-Jul	369	7,263	2,205	41,571	42	204	0	0	-6	75
7-Jul	147	7,410	2,796	44,367	6	210	0	0	0	75
8-Jul	18	7,428	552	44,919	-3	207	0	0	0	75
9-Jul	51	7,479	843	45,762	0	207	3	3	3	78
10-Jul	204	7,683	60	45,822	-3	204	0	3	3	81
11-Jul	57	7,740	192	46,014	9	213	0	3	0	81
12-Jul	39	7,779	321	46,335	9	222	3	6	3	84
13-Jul	945	8,724	3,351	49,686	24	246	3	9	-3	81
14-Jul	303	9,027	2,733	52,419	6	252	0	9	3	84
15-Jul	606	9,633	5,709	58,128	15	267	18	27	6	90
16-Jul	1,047	10,680	44,142	102,270	45	312	30	57	-3	87
17-Jul	162	10,842	8,115	110,385	-3	309	6	63	0	87
18-Jul	423	11,265	23,655	134,040	12	321	33	96	0	87
19-Jul	171	11,436	27,858	161,898	3	324	18	114	0	87
20-Jul	153	11,589	17,946	179,844	0	324	30	144	3	90
21-Jul	57	11,646	12,714	192,558	0	324	39	183	0	90
22-Jul	93	11,739	15,906	208,464	0	324	78	261	0	90
23-Jul	102	11,841	46,806	255,270	6	330	78	339	3	93
24-Jul	48	11,889	11,196	266,466	0	330	45	384	0	93
25-Jul	27	11,916	14,889	281,355	0	330	39	423	3	96
26-Jul	18	11,934	15,021	296,376	3	333	66	489	-3	93
27-Jul	6	11,940	744	297,120	0	333	48	537	0	93
28-Jul	9	11,949	3,645	300,765	0	333	78	615	0	93
29-Jul	48	11,997	10,473	311,238	0	333	252	867	6	99
30-Jul	30	12,027	12,102	323,340	3	336	228	1,095	0	99
31-Jul	12	12,039	7,698	331,038	3	339	246	1,341	0	99
1-Aug	-2	12,038	1,970	333,008	0	339	62	1,403	9	108

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Table 1.–Page 2 of 2.

Date	Daily Chum Salmon	Cum. Chum Salmon	Daily Pink Salmon	Cum. Pink Salmon	Daily Chinook Salmon	Cum. Chinook Salmon	Daily Coho Salmon	Cum. Coho Salmon	Daily Dolly Varden	Cum. Dolly Varden
2-Aug	0	12,038	1,365	334,373	0	339	144	1,547	21	129
3-Aug	6	12,044	1,698	336,071	3	342	108	1,655	42	171
4-Aug	21	12,065	1,374	337,445	0	342	87	1,742	21	192
5-Aug	-3	12,062	1,317	338,762	0	342	453	2,195	27	219
6-Aug	0	12,062	591	339,353	0	342	90	2,285	15	234
7-Aug	0	12,062	111	339,464	0	342	60	2,345	3	237
8-Aug	3	12,065	408	339,872	0	342	99	2,444	417	654
9-Aug	0	12,065	207	340,079	0	342	225	2,669	1,023	1,677
10-Aug	0	12,065	210	340,289	0	342	150	2,819	843	2,520
11-Aug	3	12,068	261	340,550	0	342	228	3,047	732	3,252
12-Aug	0	12,068	129	340,679	0	342	369	3,416	1,206	4,458
13-Aug	6	12,074	75	340,754	0	342	498	3,914	1,419	5,877
14-Aug	0	12,074	42	340,796	0	342	741	4,655	1,716	7,593
15-Aug	0	12,074	54	340,850	0	342	744	5,399	1,383	8,976
16-Aug	0	12,074	42	340,892	0	342	279	5,678	303	9,279
17-Aug	0	12,074	39	340,931	0	342	120	5,798	1,125	10,404
18-Aug	0	12,074	24	340,955	0	342	129	5,927	174	10,578
19-Aug	0	12,074	-3	340,952	0	342	120	6,047	489	11,067
20-Aug	0	12,074	-3	340,949	0	342	225	6,272	198	11,265
21-Aug	0	12,074	-3	340,946	0	342	147	6,419	384	11,649
22-Aug	0	12,074	0	340,946	0	342	444	6,863	612	12,261
23-Aug	0	12,074	3	340,949	0	342	615	7,478	591	12,852
24-Aug	0	12,074	6	340,955	0	342	1,209	8,687	768	13,620
25-Aug	0	12,074	9	340,964	0	342	-147	8,540	3	13,623
26-Aug	0	12,074	12	340,976	0	342	96	8,636	-330	13,293
27-Aug	0	12,074	6	340,982	0	342	48	8,684	69	13,362
28-Aug	0	12,074	9	340,991	0	342	1,815	10,499	-66	13,296
29-Aug	0	12,074	0	340,991	0	342	72	10,571	0	13,296
30-Aug	3	12,077	0	340,991	0	342	69	10,640	9	13,305
31-Aug	0	12,077	-3	340,988	0	342	27	10,667	-24	13,281
1-Sep	0	12,077	3	340,991	0	342	-156	10,511	-105	13,176
2-Sep	3	12,080	3	340,994	0	342	-15	10,496	-207	12,969
3-Sep	0	12,080	9	341,003	0	342	48	10,544	-348	12,621
4-Sep	0	12,080	6	341,009	0	342	114	10,658	-708	11,913
5-Sep	0	12,080	6	341,015	0	342	108	10,766	-393	11,520
6-Sep	0	12,080	0	341,015	0	342	84	10,850	21	11,541
7-Sep	0	12,080	0	341,015	0	342	141	10,991	-84	11,457
8-Sep	3	12,083	9	341,024	0	342	153	11,144	-102	11,355
9-Sep	0	12,083	6	341,030	0	342	372	11,516	9	11,364
10-Sep	0	12,083	15	341,045	0	342	1,239	12,755	-3	11,361
11-Sep	0	12,083	3	341,048	0	342	159	12,914	0	11,361
12-Sep	0	12,083	0	341,048	0	342	36	12,950	0	11,361
13-Sep	0	12,083	0	341,048	0	342	0	12,950	0	11,361
Total	12,083		341,048		342		12,950		11,361	

Note: Cum. = cumulative.

Table 2.–Expanded daily and cumulative migration of all salmonid species past Niukluk River counting tower, Norton Sound, 2005.

Date	Daily Chum Salmon	Cum. Chum Salmon	Daily Pink Salmon	Cum. Pink Salmon	Daily Chinook Salmon	Cum. Chinook Salmon	Daily Coho Salmon	Cum. Coho Salmon	Daily Dolly Varden	Cum. Dolly Varden
28-Jun	351	351	1,356	1,356	6	6	0	0	0	0
29-Jun	1,134	1,485	2,694	4,050	12	18	0	0	48	48
30-Jun	408	1,893	696	4,746	6	24	0	0	12	60
1-Jul	285	2,178	333	5,079	12	36	0	0	12	72
2-Jul	48	2,226	-48	5,031	0	36	0	0	6	78
3-Jul	102	2,328	87	5,118	-3	33	0	0	27	105
4-Jul	681	3,009	117	5,235	0	33	0	0	24	129
5-Jul	1,884	4,893	510	5,745	0	33	0	0	36	165
6-Jul	2,001	6,894	2,661	8,406	3	36	0	0	3	168
7-Jul	1,520	8,414	8,741	17,147	2	38	0	0	15	183
8-Jul	34	8,448	310	17,457	-3	35	0	0	18	201
9-Jul	105	8,553	138	17,595	0	35	0	0	21	222
10-Jul	603	9,156	2,010	19,605	0	35	0	0	12	234
11-Jul	999	10,155	1,737	21,342	0	35	0	0	18	252
12-Jul	505	10,660	1,693	23,035	0	35	0	0	11	263
13-Jul	260	10,920	855	23,890	0	35	0	0	8	271
14-Jul	954	11,874	3,726	27,616	0	35	0	0	25	296
15-Jul	1,179	13,053	6,462	34,078	0	35	0	0	36	332
16-Jul	1,665	14,718	8,745	42,823	0	35	0	0	24	356
17-Jul	1,608	16,326	12,195	55,018	0	35	0	0	24	380
18-Jul	1,275	17,601	13,311	68,329	0	35	3	3	81	461
19-Jul	594	18,195	6,612	74,941	0	35	3	6	39	500
20-Jul	816	19,011	10,902	85,843	0	35	3	9	24	524
21-Jul	951	19,962	13,053	98,896	0	35	3	12	33	557
22-Jul	1,422	21,384	26,700	125,596	0	35	6	18	48	605
23-Jul	1,269	22,653	46,941	172,537	0	35	12	30	69	674
24-Jul	396	23,049	27,441	199,978	0	35	21	51	57	731
25-Jul	366	23,415	10,053	210,031	0	35	9	60	27	758
26-Jul	372	23,787	9,519	219,550	0	35	18	78	15	773
27-Jul	291	24,078	7,917	227,467	0	35	12	90	18	791
28-Jul	324	24,402	10,881	238,348	0	35	30	120	21	812
29-Jul	309	24,711	10,632	248,980	0	35	30	150	18	830
30-Jul	204	24,915	6,777	255,757	0	35	18	168	27	857
31-Jul	138	25,053	3,747	259,504	0	35	30	198	9	866
1-Aug	42	25,095	1,938	261,442	0	35	21	219	18	884
2-Aug	99	25,194	2,829	264,271	0	35	39	258	15	899
3-Aug	108	25,302	2,385	266,656	0	35	33	291	6	905
4-Aug	39	25,341	1,038	267,694	3	38	15	306	15	920
5-Aug	63	25,404	711	268,405	3	41	18	324	15	935
6-Aug	33	25,437	489	268,894	0	41	24	348	15	950
7-Aug	30	25,467	486	269,380	0	41	39	387	6	956
8-Aug	33	25,500	309	269,689	0	41	36	423	9	965
9-Aug	3	25,503	273	269,962	0	41	33	456	3	968
10-Aug	12	25,515	204	270,166	0	41	30	486	6	974
11-Aug	9	25,524	90	270,256	0	41	135	621	21	995

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Table 2.–Page 2 of 2.

Date	Daily Chum Salmon	Cum. Chum Salmon	Daily Pink Salmon	Cum. Pink Salmon	Daily Chinook Salmon	Cum. Chinook Salmon	Daily Coho Salmon	Cum. Coho Salmon	Daily Dolly Varden	Cum. Dolly Varden
12-Aug	21	25,545	54	270,310	0	41	144	765	27	1,022
13-Aug	8	25,553	57	270,367	0	41	53	818	93	1,115
14-Aug	9	25,562	27	270,394	0	41	87	905	48	1,163
15-Aug	6	25,568	9	270,403	0	41	90	995	24	1,187
16-Aug	18	25,586	18	270,421	0	41	87	1,082	165	1,352
17-Aug	9	25,595	3	270,424	0	41	126	1,208	72	1,424
18-Aug	3	25,598	0	270,424	0	41	84	1,292	39	1,463
19-Aug	0	25,598	0	270,424	0	41	57	1,349	78	1,541
20-Aug	0	25,598	0	270,424	0	41	57	1,406	84	1,625
21-Aug	0	25,598	0	270,424	0	41	54	1,460	51	1,676
22-Aug	0	25,598	0	270,424	0	41	114	1,574	213	1,889
23-Aug	0	25,598	0	270,424	0	41	117	1,691	111	2,000
24-Aug	0	25,598	0	270,424	0	41	105	1,796	87	2,087
25-Aug	0	25,598	0	270,424	0	41	69	1,865	12	2,099
26-Aug	0	25,598	0	270,424	0	41	72	1,937	33	2,132
27-Aug	0	25,598	0	270,424	0	41	114	2,051	51	2,183
28-Aug	0	25,598	0	270,424	0	41	168	2,219	3	2,186
29-Aug	0	25,598	0	270,424	0	41	90	2,309	9	2,195
30-Aug	0	25,598	0	270,424	0	41	66	2,375	6	2,201
31-Aug	0	25,598	0	270,424	0	41	55	2,430	3	2,204
1-Sep	0	25,598	0	270,424	0	41	18	2,448	15	2,219
2-Sep	0	25,598	0	270,424	0	41	42	2,490	39	2,258
3-Sep	0	25,598	0	270,424	0	41	39	2,529	12	2,270
4-Sep	0	25,598	0	270,424	0	41	54	2,583	84	2,354
5-Sep	0	25,598	0	270,424	0	41	45	2,628	24	2,378
6-Sep	0	25,598	0	270,424	0	41	48	2,676	30	2,408
7-Sep	0	25,598	0	270,424	0	41	12	2,688	15	2,423
8-Sep	0	25,598	0	270,424	0	41	21	2,709	9	2,432
9-Sep	0	25,598	0	270,424	0	41	18	2,727	12	2,444
Total	25,598		270,424		41		2,727		2,444	

Note: Cum. = cumulative.

Table 3.–Daily and cumulative passage of all salmonid species at Nome River weir, Norton Sound, 2005.

Date	Daily Chum Salmon	Cum. Chum Salmon	Daily Pink Salmon	Cum. Pink Salmon	Daily Chinook Salmon	Cum. Chinook Salmon	Daily Coho Salmon	Cum. Coho Salmon	Daily Dolly Varden	Cum. Dolly Varden	Daily Sockeye Salmon	Cum. Sockeye Salmon
27-Jun	0	0	1	1	1	1	0	0	2	2	0	0
28-Jun	2	2	3	4	1	2	0	0	6	8	0	0
29-Jun	7	9	26	30	0	2	0	0	7	15	0	0
30-Jun	2	11	4	34	0	2	0	0	0	15	0	0
1-Jul	3	14	3	37	0	2	0	0	1	16	0	0
2-Jul	0	14	0	37	0	2	0	0	0	16	0	0
3-Jul	3	17	2	39	0	2	0	0	0	16	0	0
4-Jul	2	19	5	44	0	2	0	0	0	16	0	0
5-Jul	96	115	29	73	0	2	0	0	0	16	0	0
6-Jul	356	471	240	313	0	2	0	0	7	23	0	0
7-Jul	16	487	23	336	0	2	0	0	0	23	0	0
8-Jul	6	493	51	387	0	2	0	0	1	24	0	0
9-Jul	21	514	159	546	0	2	0	0	0	24	0	0
10-Jul	687	1,201	2,014	2,560	1	3	0	0	3	27	0	0
11-Jul	26	1,227	89	2,649	0	3	0	0	0	27	0	0
12-Jul	138	1,365	1,483	4,132	0	3	0	0	2	29	0	0
13-Jul	73	1,438	840	4,972	0	3	0	0	0	29	0	0
14-Jul	168	1,606	3,787	8,759	0	3	0	0	1	30	0	0
15-Jul	413	2,019	7,749	16,508	0	3	0	0	2	32	0	0
16-Jul	529	2,548	33,442	49,950	0	3	0	0	5	37	2	2
17-Jul	116	2,664	7,761	57,711	0	3	0	0	0	37	0	2
18-Jul	184	2,848	30,596	88,307	0	3	0	0	0	37	0	2
19-Jul	90	2,938	8,160	96,467	1	4	1	1	0	37	0	2
20-Jul	243	3,181	12,355	108,822	0	4	9	10	0	37	0	2
21-Jul	181	3,362	38,121	146,943	0	4	4	14	0	37	7	9
22-Jul	125	3,487	17,512	164,455	2	6	4	18	3	40	4	13
23-Jul	309	3,796	42,697	207,152	1	7	11	29	4	44	6	19
24-Jul	182	3,978	27,104	234,256	2	9	6	35	2	46	5	24
25-Jul	41	4,019	3,954	238,210	0	9	2	37	4	50	3	27
26-Jul	194	4,213	16,007	254,217	2	11	22	59	7	57	1	28
27-Jul	25	4,238	1,536	255,753	1	12	5	64	10	67	2	30
28-Jul	166	4,404	3,688	259,441	1	13	22	86	18	85	5	35
29-Jul	113	4,517	4,189	263,630	0	13	19	105	10	95	4	39
30-Jul	83	4,600	3,648	267,278	1	14	20	125	14	109	2	41
31-Jul	37	4,637	2,087	269,365	1	15	9	134	10	119	1	42

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Table 3.–Page 2 of 3.

Date	Daily Chum Salmon	Cum. Chum Salmon	Daily Pink Salmon	Cum. Pink Salmon	Daily Chinook Salmon	Cum. Chinook Salmon	Daily Coho Salmon	Cum. Coho Salmon	Daily Dolly Varden	Cum. Dolly Varden	Daily Sockeye Salmon	Cum. Sockeye Salmon
1-Aug	32	4,669	1,870	271,235	0	15	5	139	4	123	0	42
2-Aug	20	4,689	1,276	272,511	0	15	5	144	26	149	0	42
3-Aug	117	4,806	2,754	275,265	2	17	40	184	18	167	1	43
4-Aug	13	4,819	488	275,753	0	17	5	189	9	176	0	43
5-Aug	20	4,839	2,241	277,994	1	18	6	195	5	181	1	44
6-Aug	1	4,840	187	278,181	0	18	2	197	0	181	0	44
7-Aug	147	4,987	2,561	280,742	10	28	97	294	57	238	6	50
8-Aug	35	5,022	698	281,440	3	31	23	317	30	268	0	50
9-Aug	25	5,047	686	282,126	5	36	19	336	149	417	1	51
10-Aug	13	5,060	545	282,671	3	39	10	346	25	442	2	53
11-Aug	44	5,104	702	283,373	2	41	32	378	197	639	0	53
12-Aug	35	5,139	496	283,869	2	43	69	447	291	930	3	56
13-Aug	27	5,166	297	284,166	0	43	19	466	72	1,002	4	60
14-Aug	34	5,200	358	284,524	0	43	81	547	85	1,087	11	71
15-Aug	62	5,262	207	284,731	0	43	145	692	35	1,122	22	93
16-Aug	17	5,279	46	284,777	0	43	14	706	12	1,134	2	95
17-Aug	9	5,288	99	284,876	0	43	32	738	28	1,162	7	102
18-Aug	9	5,297	56	284,932	0	43	64	802	27	1,189	10	112
19-Aug	0	5,297	16	284,948	0	43	0	802	17	1,206	0	112
20-Aug	5	5,302	98	285,046	0	43	6	808	5	1,211	3	115
21-Aug	13	5,315	59	285,105	0	43	72	880	5	1,216	6	121
22-Aug	22	5,337	96	285,201	2	45	264	1,144	16	1,232	24	145
23-Aug	14	5,351	54	285,255	5	50	231	1,375	9	1,241	16	161
24-Aug	13	5,364	35	285,290	1	51	266	1,641	3	1,244	29	190
25-Aug	7	5,371	38	285,328	3	54	292	1,933	11	1,255	14	204
26-Aug	5	5,376	27	285,355	5	59	186	2,119	4	1,259	18	222
27-Aug	1	5,377	11	285,366	0	59	41	2,160	10	1,269	0	222
28-Aug	43	5,420	143	285,509	4	63	1,709	3,869	26	1,295	49	271
29-Aug	5	5,425	16	285,525	2	65	654	4,523	20	1,315	14	285
30-Aug	0	5,425	8	285,533	1	66	16	4,539	20	1,335	1	286
31-Aug	2	5,427	9	285,542	0	66	7	4,546	4	1,339	2	288
1-Sep	0	5,427	0	285,542	0	66	0	4,546	0	1,339	0	288
2-Sep	28	5,455	64	285,606	3	69	319	4,865	18	1,357	23	311
3-Sep	0	5,455	4	285,610	0	69	10	4,875	5	1,362	2	313
4-Sep	6	5,461	15	285,625	0	69	3	4,878	0	1,362	2	315

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Table 3.–Page 3 of 3.

Date	Daily Chum Salmon	Cum. Chum Salmon	Daily Pink Salmon	Cum. Pink Salmon	Daily Chinook Salmon	Cum. Chinook Salmon	Daily Coho Salmon	Cum. Coho Salmon	Daily Dolly Varden	Cum. Dolly Varden	Daily Sockeye Salmon	Cum. Sockeye Salmon
5-Sep	0	5,461	0	285,625	0	69	0	4,878	0	1,362	0	315
6-Sep	18	5,479	20	285,645	0	69	81	4,959	8	1,370	5	320
7-Sep	13	5,492	6	285,651	0	69	43	5,002	13	1,383	1	321
8-Sep	15	5,507	14	285,665	0	69	43	5,045	29	1,412	5	326
9-Sep	30	5,537	25	285,690	0	69	184	5,229	16	1,428	15	341
10-Sep	15	5,552	23	285,713	0	69	189	5,418	26	1,454	9	350
11-Sep	32	5,584	46	285,759	0	69	430	5,848	17	1,471	31	381
Total	5,584		285,759		69		5,848		1,471		381	

Note: Cum. = cumulative.

Table 4.–Daily and cumulative count of all salmonid species carcasses at Nome River weir, Norton Sound, 2005.

Date	Daily Chum Salmon	Cum. Chum Salmon	Daily Pink Salmon	Cum. Pink Salmon	Daily Chinook Salmon	Cum. Chinook Salmon	Daily Coho Salmon	Cum. Coho Salmon	Daily Dolly Varden	Cum. Dolly Varden	Daily Sockeye Salmon	Cum. Sockeye Salmon
27-Jun	0	0	0	0	0	0	0	0	0	0	0	0
28-Jun	0	0	0	0	0	0	0	0	0	0	0	0
29-Jun	0	0	0	0	0	0	0	0	2	2	0	0
30-Jun	0	0	2	2	0	0	0	0	0	2	0	0
1-Jul	0	0	1	3	0	0	0	0	0	2	0	0
2-Jul	0	0	0	3	0	0	0	0	0	2	0	0
3-Jul	0	0	0	3	0	0	0	0	0	2	0	0
4-Jul	0	0	0	3	0	0	0	0	1	3	0	0
5-Jul	0	0	0	3	0	0	0	0	0	3	0	0
6-Jul	0	0	0	3	0	0	0	0	1	4	0	0
7-Jul	0	0	1	4	0	0	0	0	1	5	0	0
8-Jul	0	0	0	4	0	0	0	0	0	5	0	0
9-Jul	0	0	0	4	0	0	0	0	0	5	0	0
10-Jul	0	0	0	4	0	0	0	0	0	5	0	0
11-Jul	0	0	0	4	0	0	0	0	0	5	0	0
12-Jul	4	4	0	4	0	0	0	0	0	5	0	0
13-Jul	3	7	0	4	0	0	0	0	0	5	0	0
14-Jul	0	7	0	4	0	0	0	0	0	5	0	0
15-Jul	0	7	0	4	0	0	0	0	0	5	0	0
16-Jul	3	10	2	6	0	0	0	0	0	5	0	0
17-Jul	5	15	6	12	0	0	0	0	0	5	0	0
18-Jul	7	22	9	21	0	0	0	0	0	5	0	0
19-Jul	8	30	4	25	0	0	0	0	0	5	0	0
20-Jul	1	31	2	27	0	0	0	0	0	5	0	0
21-Jul	5	36	7	34	0	0	0	0	0	5	0	0
22-Jul	9	45	11	45	0	0	0	0	0	5	0	0
23-Jul	9	54	8	53	0	0	0	0	0	5	0	0
24-Jul	4	58	16	69	1	1	0	0	0	5	0	0
25-Jul	14	72	30	99	0	1	0	0	0	5	0	0
26-Jul	14	86	17	116	0	1	0	0	0	5	0	0
27-Jul	30	116	30	146	0	1	0	0	0	5	0	0
28-Jul	43	159	23	169	0	1	0	0	0	5	0	0
29-Jul	36	195	26	195	0	1	0	0	0	5	0	0

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Table 4.–Page 2 of 3.

Date	Daily Chum Salmon	Cum. Chum Salmon	Daily Pink Salmon	Cum. Pink Salmon	Daily Chinook Salmon	Cum. Chinook Salmon	Daily Coho Salmon	Cum. Coho Salmon	Daily Dolly Varden	Cum. Dolly Varden	Daily Sockeye Salmon	Cum. Sockeye Salmon
30-Jul	34	229	26	221	0	1	0	0	0	5	2	2
31-Jul	27	256	20	241	0	1	0	0	1	6	0	2
1-Aug	44	300	22	263	0	1	0	0	0	6	0	2
2-Aug	36	336	11	274	0	1	0	0	0	6	0	2
3-Aug	42	378	17	291	0	1	0	0	2	8	0	2
4-Aug	43	421	12	303	0	1	1	1	1	9	0	2
5-Aug	30	451	26	329	0	1	0	1	0	9	0	2
6-Aug	22	473	16	345	0	1	0	1	0	9	0	2
7-Aug	47	520	138	483	0	1	0	1	0	9	0	2
8-Aug	55	575	112	595	0	1	1	2	0	9	0	2
9-Aug	115	690	57	652	0	1	0	2	4	13	0	2
10-Aug	42	732	126	778	0	1	0	2	1	14	0	2
11-Aug	96	828	467	1,245	0	1	0	2	0	14	0	2
12-Aug	81	909	613	1,858	0	1	0	2	3	17	0	2
13-Aug	74	983	752	2,610	0	1	0	2	2	19	0	2
14-Aug	27	1,010	780	3,390	0	1	1	3	2	21	1	3
15-Aug	42	1,052	941	4,331	0	1	0	3	3	24	0	3
16-Aug	26	1,078	840	5,171	0	1	1	4	9	33	0	3
17-Aug	30	1,108	657	5,828	0	1	2	6	11	44	1	4
18-Aug	27	1,135	518	6,346	0	1	0	6	21	65	2	6
19-Aug	23	1,158	294	6,640	0	1	1	7	20	85	0	6
20-Aug	16	1,174	198	6,838	0	1	0	7	15	100	2	8
21-Aug	12	1,186	140	6,978	0	1	0	7	15	115	0	8
22-Aug	16	1,202	157	7,135	0	1	0	7	26	141	0	8
23-Aug	13	1,215	152	7,287	0	1	2	9	24	165	1	9
24-Aug	16	1,231	111	7,398	0	1	1	10	24	189	0	9
25-Aug	7	1,238	75	7,473	0	1	0	10	5	194	2	11
26-Aug	7	1,245	49	7,522	0	1	0	10	4	198	1	12
27-Aug	4	1,249	53	7,575	0	1	0	10	2	200	0	12
28-Aug	9	1,258	101	7,676	0	1	0	10	5	205	1	13
29-Aug	4	1,262	22	7,698	0	1	1	11	0	205	0	13
30-Aug	7	1,269	51	7,749	0	1	1	12	1	206	0	13
31-Aug	3	1,272	28	7,777	0	1	0	12	0	206	0	13
1-Sep	4	1,276	18	7,795	0	1	1	13	0	206	0	13

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Table 4.–Page 3 of 3.

Date	Daily Chum Salmon	Cum. Chum Salmon	Daily Pink Salmon	Cum. Pink Salmon	Daily Chinook Salmon	Cum. Chinook Salmon	Daily Coho Salmon	Cum. Coho Salmon	Daily Dolly Varden	Cum. Dolly Varden	Daily Sockeye Salmon	Cum. Sockeye Salmon
2-Sep	3	1,279	27	7,822	0	1	1	14	2	208	0	13
3-Sep	5	1,284	24	7,846	0	1	1	15	1	209	0	13
4-Sep	0	1,284	14	7,860	0	1	0	15	0	209	0	13
5-Sep	1	1,285	9	7,869	0	1	0	15	1	210	0	13
6-Sep	2	1,287	16	7,885	0	1	0	15	0	210	0	13
7-Sep	0	1,287	6	7,891	0	1	1	16	0	210	0	13
8-Sep	0	1,287	8	7,899	0	1	0	16	0	210	3	16
9-Sep	0	1,287	6	7,905	0	1	0	16	0	210	0	16
10-Sep	4	1,291	4	7,909	0	1	1	17	0	210	1	17
11-Sep	1	1,292	3	7,912	0	1	3	20	0	210	4	21
Total	1,292		7,912		1		20		210		21	

Note: Cum. = cumulative.

Table 5.–Chum salmon age and sex composition, and mean length (mm) by sampling period, Kwiniuk River, Norton Sound, 2005.

		Brood Year and (Age Group)				
		2002 (0.2)	2001 (0.3)	2000 (0.4)	1999 (0.5)	Total
Sampling Dates:	6/29-7/03					
Sample Size:	93					
Male	Percent of Samples	1.1	36.6	6.5	1.1	45.2
	Number of Samples	1	34	6	1	42
	Mean Length [a]	510.0	577.1	606.7	565.0	579.4
Female	Percent of Samples	2.2	40.9	10.8	1.1	54.8
	Number of Samples	2	38	10	1	51
	Mean Length [a]	517.5	549.6	571.0	550.0	552.5
Total	Percent of Sample	3.2	77.4	17.2	2.2	100.0
	Number of Samples	3	72	16	2	93
	Mean Length [a]	515.0	562.6	584.4	557.5	564.7
Sampling Dates:	7/05-7/08					
Sample Size:	112					
Male	Percent of Samples	1.8	22.3	8.9		33.0
	Number of Samples	2	25	10	0	37
	Mean Length [a]	565.0	572.4	622.0		585.4
Female	Percent of Samples	3.6	51.8	11.6		67.0
	Number of Samples	4	58	13	0	75
	Mean Length [a]	546.3	551.6	563.8		553.5
Total	Percent of sample	5.4	74.1	20.5		100.0
	Number of Samples	6	83	23	0	112
	Mean Length [a]	552.5	557.9	589.1		564.0
Sampling Dates:	7/11-7/13					
Sample Size:	98					
Male	Percent of Samples		18.4	1.0		19.4
	Number of Samples	0	18	1	0	19
	Mean Length [a]		584.2	535.0		581.6
Female	Percent of Samples	2.0	64.3	14.3		80.6
	Number of Samples	2	63	14	0	79
	Mean Length [a]	540.0	532.2	564.3		538.1
Total		2.0	82.7	15.3		100.0
	Number of Samples	2	81	15	0	98
	Mean Length [a]	540.0	543.8	562.3		546.5

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Table 5.–Page 2 of 2.

		Brood Year and (Age Group)				
		2002 (0.2)	**2001 (0.3)**	**2000 (0.4)**	**1999 (0.5)**	**Total**
Sampling Dates:	7/14-7/27					
Sample Size:	131					
Male	Percent of Samples	0.8	20.6	3.1		24.4
	Number of Samples	1	27	4	0	32
	Mean Length [a]	445.0	568.3	602.5		568.8
Female	Percent of Samples	9.2	54.2	12.2		75.6
	Number of Samples	12	71	16	0	99
	Mean Length [a]	521.3	537.7	552.2		538.0
Total	Percent of Samples	9.9	74.8	15.3		100.0
	Number of Samples	13	98	20	0	131
	Mean Length [a]	515.4	546.1	562.3		545.5
Sampling Dates:	6/29-7/27	**Season Total**				
Sample Size:	434					
Male	Percent of Samples	0.9	24.0	4.8	0.2	30.0
	Number of Samples	4	104	21	1	130
	Mean Length [a]	521.3	574.9	609.8	565.0	578.8
Female	Percent of Samples	4.6	53.0	12.2	0.2	70.0
	Number of Samples	20	230	53	1	304
	Mean Length [a]	527.8	541.7	561.8	550.0	544.3
Total [b]	Percent of Samples	5.5	77.0	17.1	0.5	100.0
	Number of Samples	24	334	74	2	434
	Mean Length [a]	526.7	552.0	575.4	557.5	554.6

[a] Length was measured from mideye to tail fork (METF).

[b] The number of fish in total is the sum of the strata; total percentages are derived from the sums.

Table 6.–Chum salmon age and sex composition, and mean length (mm), Niukluk River, Norton Sound, 2005.

		Brood Year and (Age Group)				
		2002 (0.2)	2001 (0.3)	2000 (0.4)	1999 (0.5)	Total
Sampling Dates:	7/07-7/08					
Sample Size:	271					
Male	Percent of Samples	0.4	45.8	4.1	0.4	50.6
	Number of Samples	1	124	11	1	137
	Mean Length [a]	548.0	587.9	580.1	683.0	587.7
Female	Percent of Samples	1.8	41.7	5.2	0.7	49.4
	Number of Samples	5	113	14	2	134
	Mean Length [a]	551.6	558.8	568.2	601.5	560.2
Percent	Percent of Samples	2.2	87.5	9.2	1.1	100.0
	Number of Samples	6	237	25	3	271
	Mean Length [a]	551.0	574.0	573.4	628.7	574.1
Sampling Dates:	7/16-7/19					
Sample Size:	146					
Male	Percent of Samples	0.7	55.5	4.1		60.3
	Number of Samples	1	81	6	0	88
	Mean Length [a]	571.0	585.3	604.1		586.4
Female	Percent of Samples	0.7	38.4	0.0	0.7	39.7
	Number of Samples	1	56	0	1	58
	Mean Length [a]	546.0	548.4	0.0	560.0	548.6
Total	Percent of Samples	1.4	93.8	4.1	0.7	100.0
	Number of Samples	2	137	6	1	146
	Mean Length [a]	558.5	570.2	604.1	560.0	571.4
Sampling Dates:	7/21-7/30					
Sample Size:	208					
Male	Percent of Samples	0.5	36.5	3.8	0.5	41.3
	Number of Samples	1	76	8	1	86
	Mean Length [a]	603.0	583.1	592.7	554.0	583.9
Female	Percent of Samples	2.4	53.8	2.4		58.7
	Number of Samples	5	112	5	0	122
	Mean Length [a]	536.2	542.7	549.6		542.7
Total	Percent of Samples	2.9	90.4	6.3	0.5	100.0
	Number of Samples	6	188	13	1	208
	Mean Length [a]	547.3	559.0	576.1	554.0	559.7
Sampling Dates:	7/07-7/30	**Season Total**				
Sample Size:	625					
Male	Percent of Samples	0.5	45.0	4.0	0.3	49.8
	Number of Samples	3	281	25	2	311
	Mean Length [a]	574.0	585.9	589.9	618.5	586.3
Female	Percent of Samples	1.8	45.0	3.0	0.5	50.2
	Number of Samples	11	281	19	3	314
	Mean Length [a]	544.1	550.3	563.3	587.7	551.2
Total [b]	Percent of Samples	2.2	89.9	7.0	0.8	100.0
	Number of Samples	14	562	44	5	625
	Mean Length [a]	550.5	568.1	578.4	600.0	568.7

[a] Length was measured from mideye to tail fork (METF).

[b] The number of fish in total is the sum of the samples; total percentages are derived from the sums.

Table 7.–Chum salmon age and sex composition, and mean length (mm) by sampling period, Nome River, Norton Sound, 2005.

		Brood Year and (Age Group)				
		2002 (0.2)	2001 (0.3)	2000 (0.4)	1999 (0.5)	Total
Sampling Dates:	7/03-7/13					
Sample Size:	83					
Male	Percent of Samples	1.2	34.9	6.0	2.4	44.6
	Number of Samples	1	29	5	2	37
	Mean Length [a]	535.0	585.4	596.6	604.5	586.6
Female	Percent of Samples		53.0	2.4		55.4
	Number of Samples	0	44	2	0	46
	Mean Length [a]		559.8	587.5		561.0
Total	Percent of Samples	1.2	88.0	8.4	2.4	100.0
	Number of Samples	1	73	7	2	83
	Mean Length [a]	535.0	570.0	594.0	604.5	572.4
Sampling Dates:	7/14-7/20					
Sample Size:	41					
Male	Percent of Samples		34.1	7.3		41.5
	Number of Samples	0	14	3	0	17
	Mean Length [a]		590.0	593.3		590.5
Female	Percent of Samples		51.2	4.9	2.4	58.5
	Number of Samples	0	21	2	1	24
	Mean Length [a]		552.0	562.5	565.0	553.4
Total [b]	Percent of Samples		85.4	12.2	2.4	100.0
	Number of Samples	0	35	5	1	41
	Mean Length [a]		567.2	581.0	565.0	568.8
Sampling Dates:	7/20-7/28					
Sample Size:	71					
Male	Percent of Samples	1.4	26.8	2.8	1.4	32.4
	Number of Samples	1	19	2	1	23
	Mean Length [a]	570.0	591.0	610.0	660.0	595.9
Female	Percent of Samples		67.6			67.6
	Number of Samples	0	48	0	0	48
	Mean Length [a]		548.0			548.0
Total [b]	Percent of Samples	1.4	94.4	2.8	1.4	100.0
	Number of Samples	1	67	2	1	71
	Mean Length [a]	570.0	560.2	610.0	660.0	563.1

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Table 7.–Page 2 of 2.

		Brood Year and (Age Group)				
		2002 (0.2)	2001 (0.3)	2000 (0.4)	1999 (0.5)	Total
Sampling Dates:	7/29-9/04					
Sample Size:	131					
Male	Percent of Samples	0.8	33.6	2.3		36.6
	Number of Samples	1	44	3	0	48
	Mean Length [a]	545.0	587.5	590.0		586.8
Female	Percent of Samples	0.8	55.7	5.3	1.5	63.4
	Number of Samples	1	73	7	2	83
	Mean Length [a]	565.0	542.0	550.0	600.0	544.3
Total [b]	Percent of Samples	1.5	89.3	7.6	1.5	100.0
	Number of Samples	2	117	10	2	131
	Mean Length [a]	555.0	559.1	562.0	600.0	559.9
Sampling Dates:	7/03-9/04	**Season Total**				
Sample Size:	326					
Male	Percent of Samples	0.9	32.5	4.0	0.9	38.3
	Number of Samples	3	106	13	3	125
	Mean Length [a]	550.0	587.9	596.4	623.0	588.7
Female	Percent of Samples	0.3	57.1	3.4	0.9	61.7
	Number of Samples	1	186	11	3	201
	Mean Length [a]	565.0	548.9	559.1	588.3	550.1
Total [b]	Percent of Samples	1.2	89.6	7.4	1.8	100.0
	Number of Samples	4	292	24	6	326
	Mean Length [a]	553.8	563.0	579.3	605.7	564.9

[a] Length was measured from mideye to tail fork (METF).

[b] The number of fish in total is the sum of the samples; total percentages are derived from the sums.

Table 8.–Coho salmon age and sex composition, and mean length (mm), Kwiniuk River, Norton Sound, 2005.

		Brood Year and (Age Group)			
		2002 (1.1)	2001 (2.1)	2000 (3.1)	Total
Sampling Dates:	7/20-8/20				
Sample Size:	154				
Male	Percent of Samples	9.1	29.2		38.3
	Number of Samples	14	45	0	59
	Mean Length [a]	588.6	592.4		591.5
Female	Percent of Samples	10.4	50.6	0.6	61.7
	Number of Samples	16	78	1	95
	Mean Length [a]	562.2	585.2	610.0	581.6
Total [b]	Percent of Samples	19.5	79.9	0.6	100.0
	Number of Samples	30	123	1	154
	Mean Length [a]	574.5	587.8	610.0	585.4

Table 9.–Coho salmon age and sex composition, and mean length (mm), Niukluk River, Norton Sound, 2005.

		Brood Year and (Age Group)			
		2002 (1.1)	2001 (2.1)	2000 (3.1)	Total
Sampling Dates:	7/27-8/26				
Sample Size:	72				
Male	Percent of Samples	12.5	40.3		52.8
	Number of Samples	9	29	0	38
	Mean Length [a]	578.2	585.1		583.5
Female	Percent of Samples	5.6	38.9	2.8	47.2
	Number of Samples	4	28	2	34
	Mean Length [a]	567.3	583.1	581.0	581.1
Total [b]	Percent of Samples	18.1	79.2	2.8	100.0
	Number of Samples	13	57	2	72
	Mean Length [a]	574.8	584.1	581.0	582.4

Table 10.–Coho salmon age and sex composition, and mean length (mm), Nome River, Norton Sound, 2005.

		Brood Year and (Age Group)			
		2002 (1.1)	2001 (2.1)	2000 (3.1)	Total
Sampling Dates:	7/26-9/04				
Sample Size:	158				
Male	Percent of Samples	4.4	40.5		44.9
	Number of Samples	7	64	0	71
	Mean Length [a]	584.3	580.6		581.0
Female	Percent of Samples	3.8	50.0	1.3	55.1
	Number of Samples	6	79	2	87
	Mean Length [a]	574.2	585.9	605.0	585.6
Total [b]	Percent of Samples	8.2	90.5	1.3	100.0
	Number of Samples	13	143	2	158
	Mean Length [a]	579.6	583.6	605.0	583.5

[a] Length was measured from mideye to tail fork (METF).

[b] The number of fish in total is the sum of the samples; total percentages are derived from the sums.

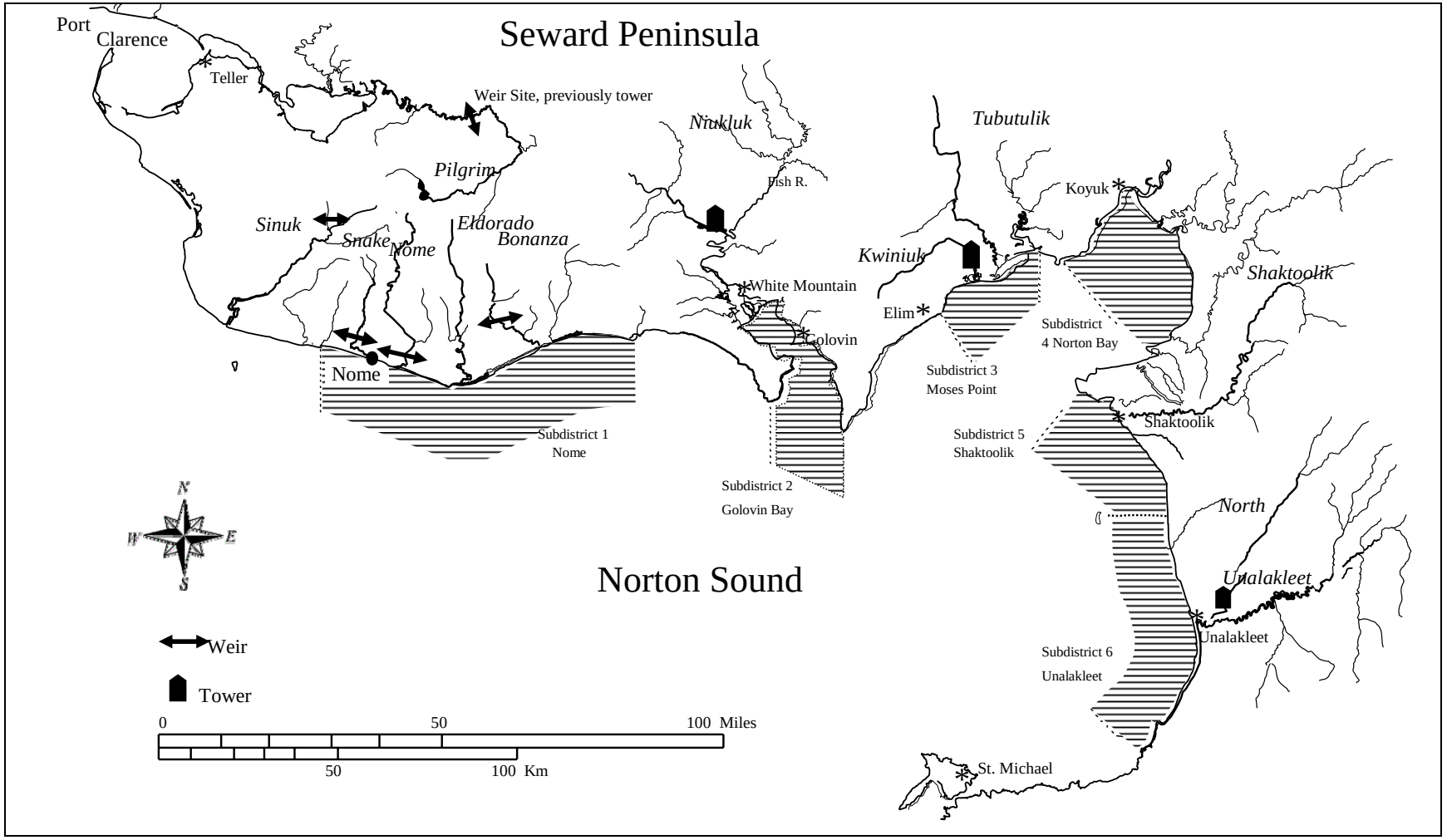


Figure 1.–Norton Sound and southern Seward Peninsula, Alaska, showing commercial fishery subdistricts and tower or weir enumeration project locations.

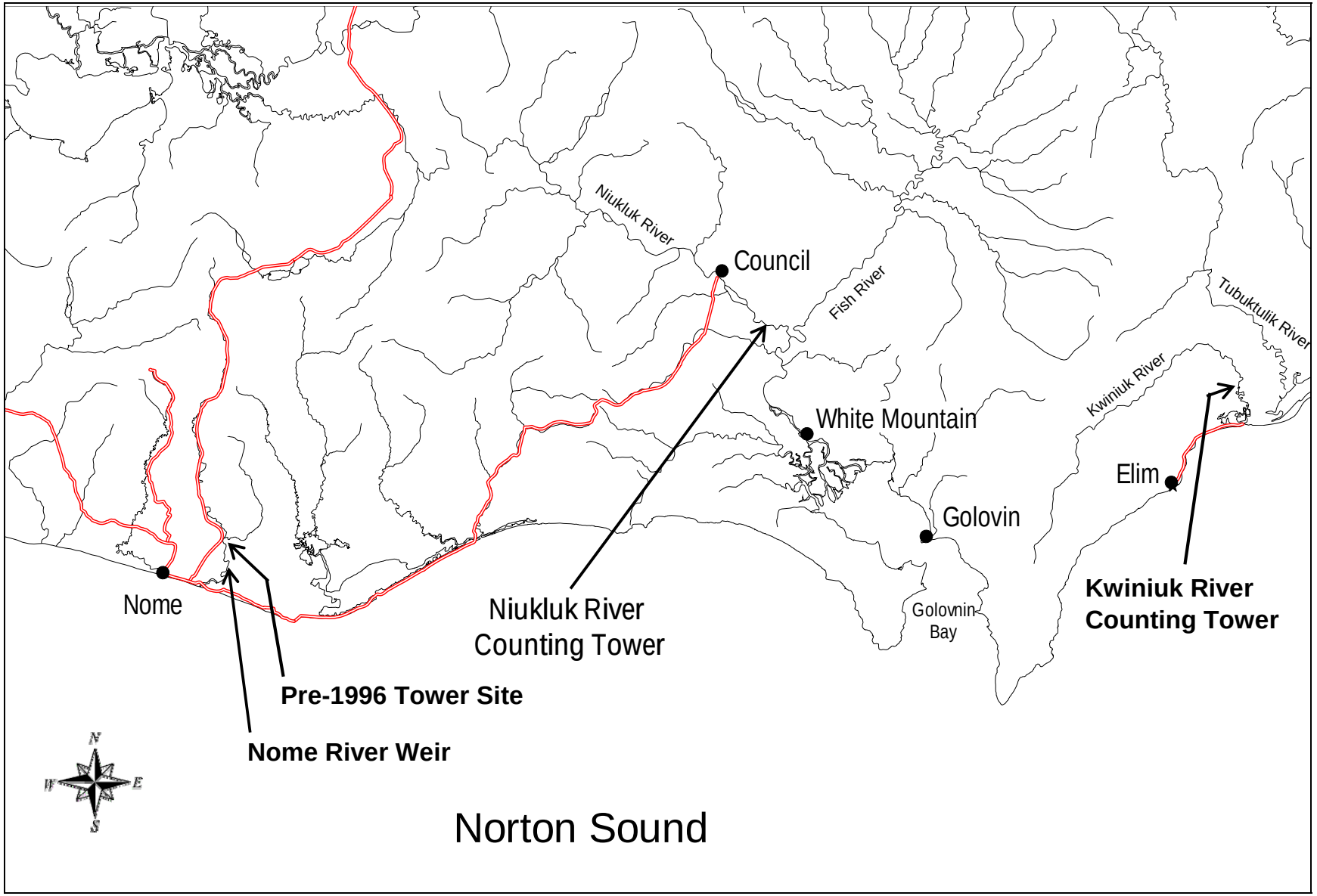


Figure 2.–ADF&G escapement project sites; Kwiniuk and Niukluk counting towers and Nome River weir and previous tower site, Norton Sound.

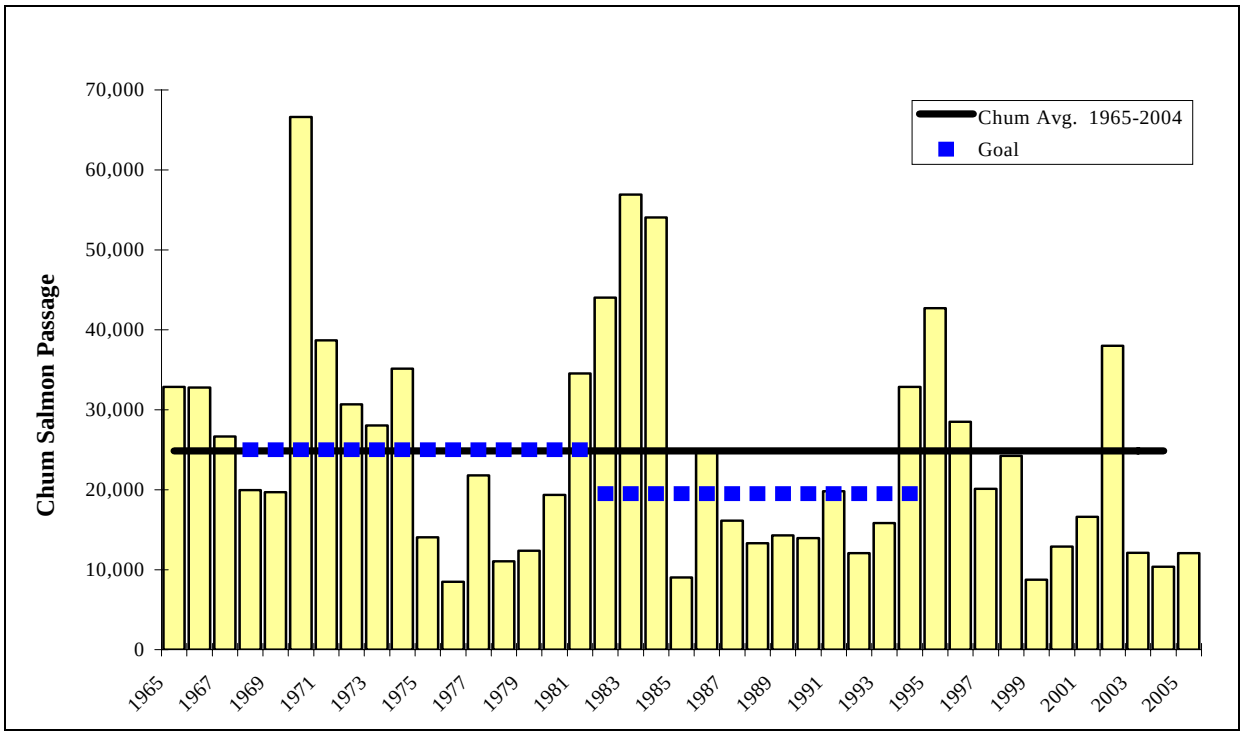


Figure 3.–Annual chum salmon passage and historical average at the Kwiniuk River counting tower, 1965–2005, Norton Sound.

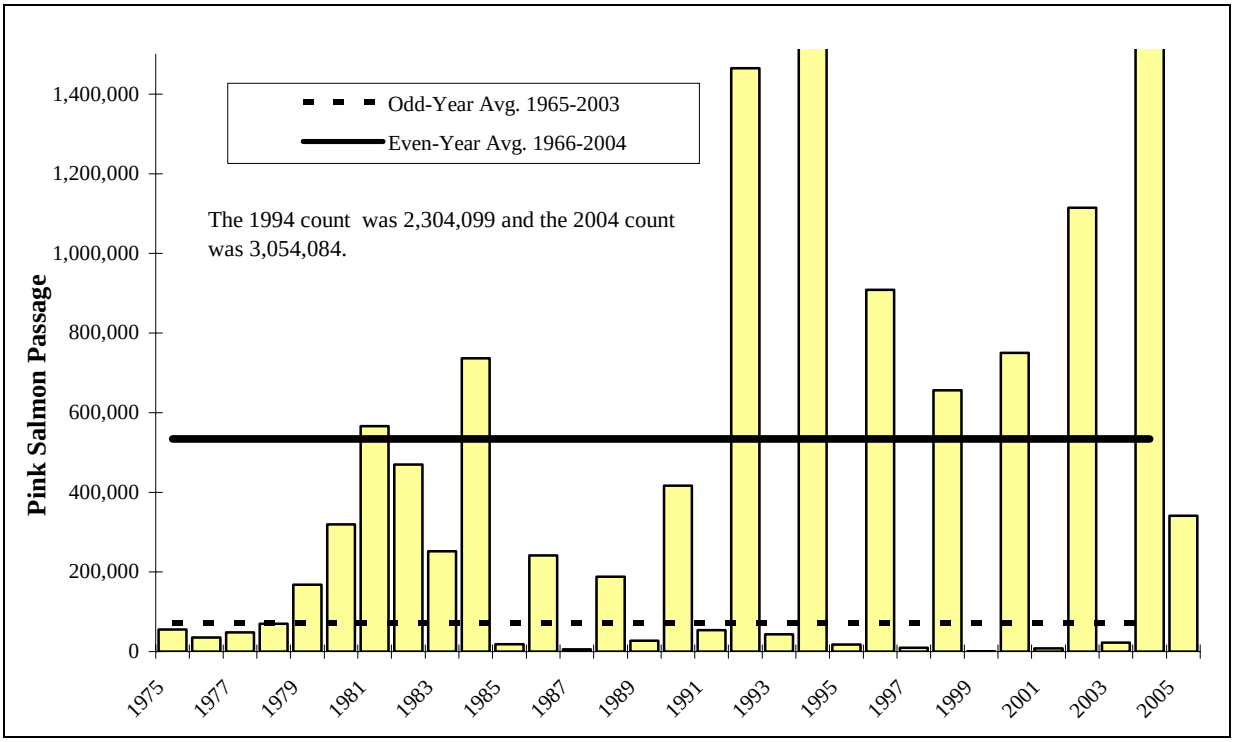


Figure 4.–Annual pink salmon passage and historical odd and even-year averages at the Kwiniuk River counting tower, 1975–2005, Norton Sound.

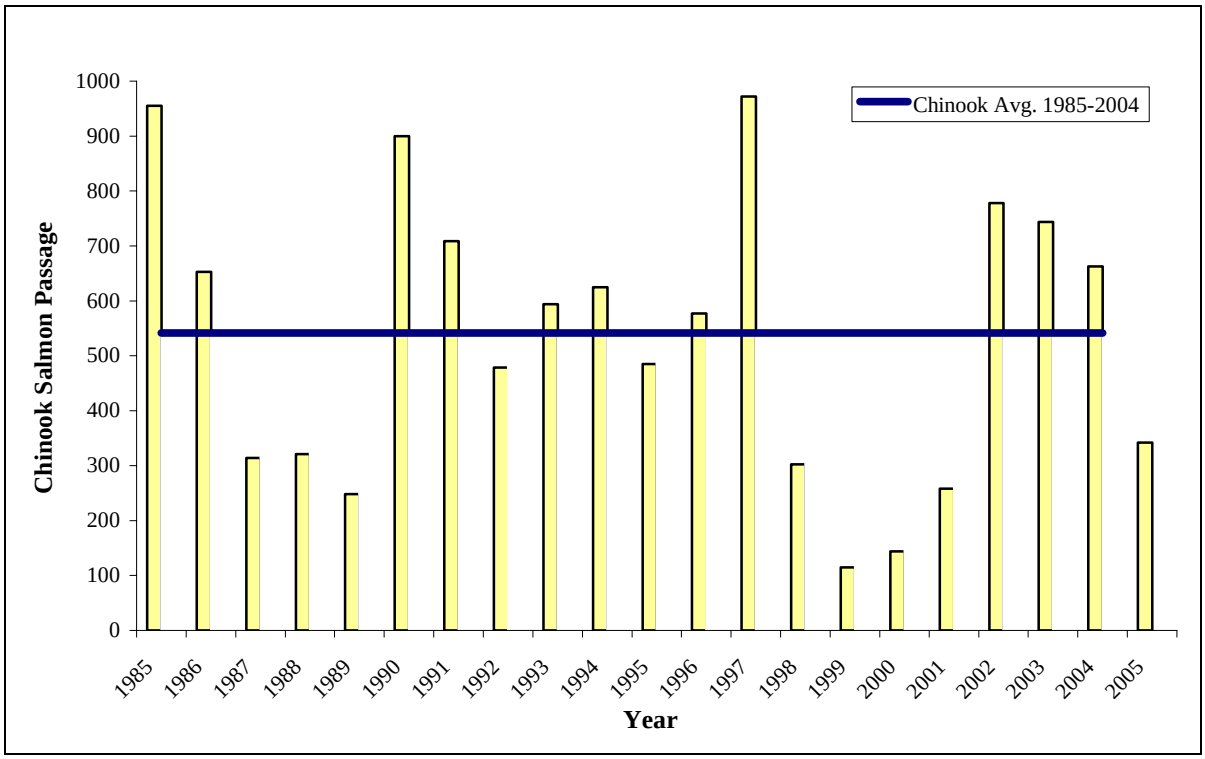


Figure 5.–Annual Chinook salmon passage and historical average at the Kwiniuk River counting tower, (1985–2005), Norton Sound.

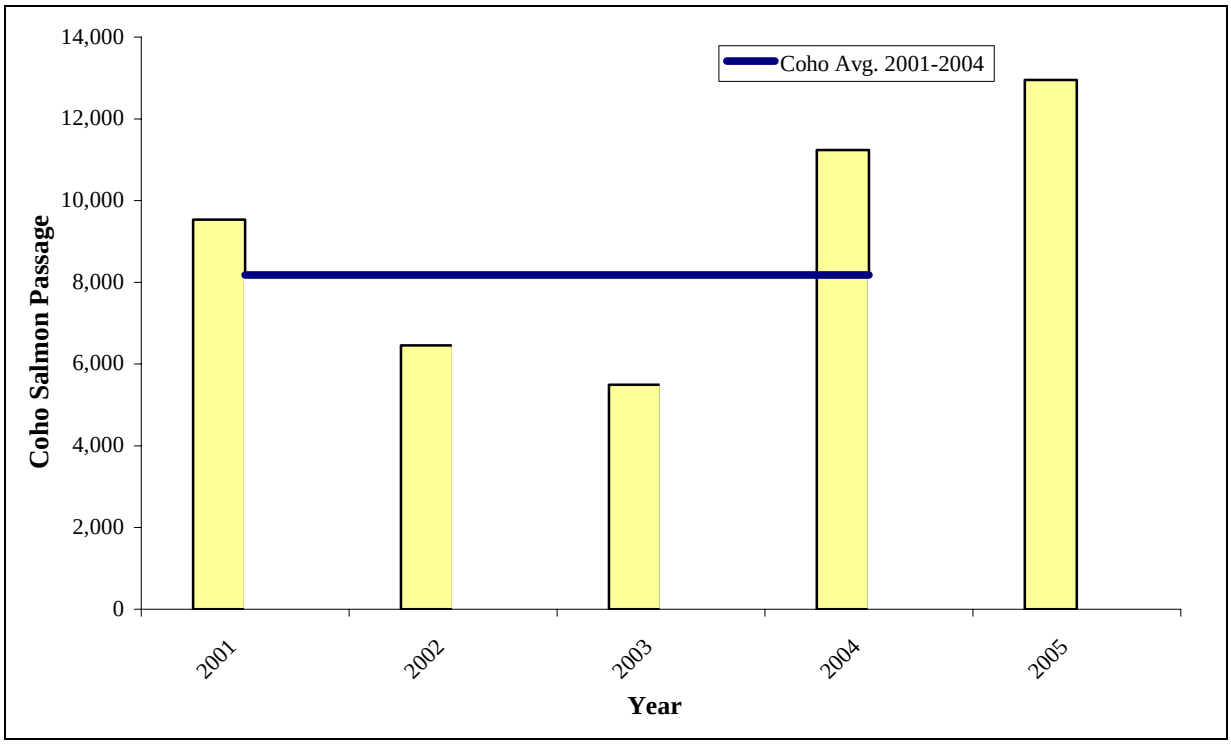
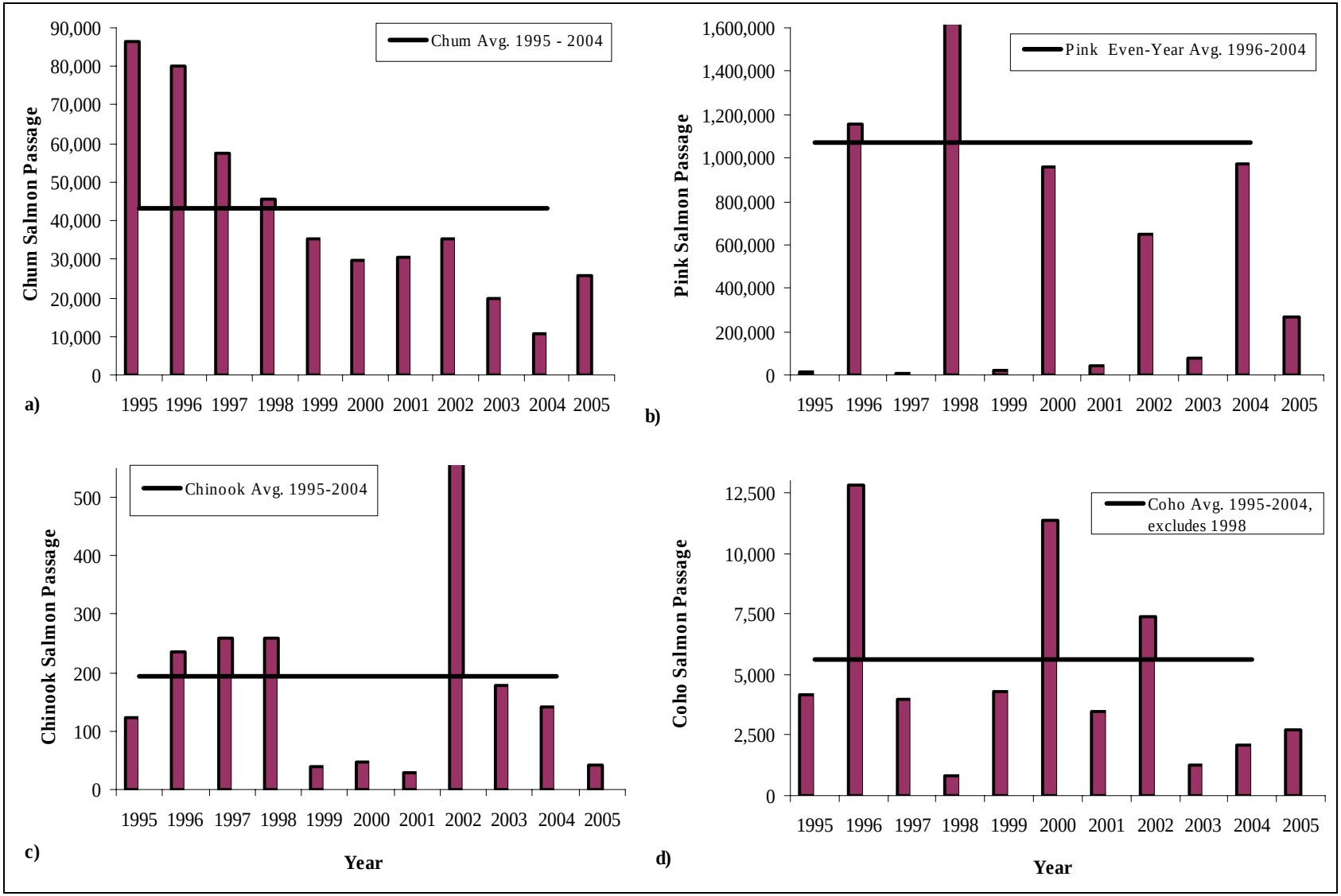
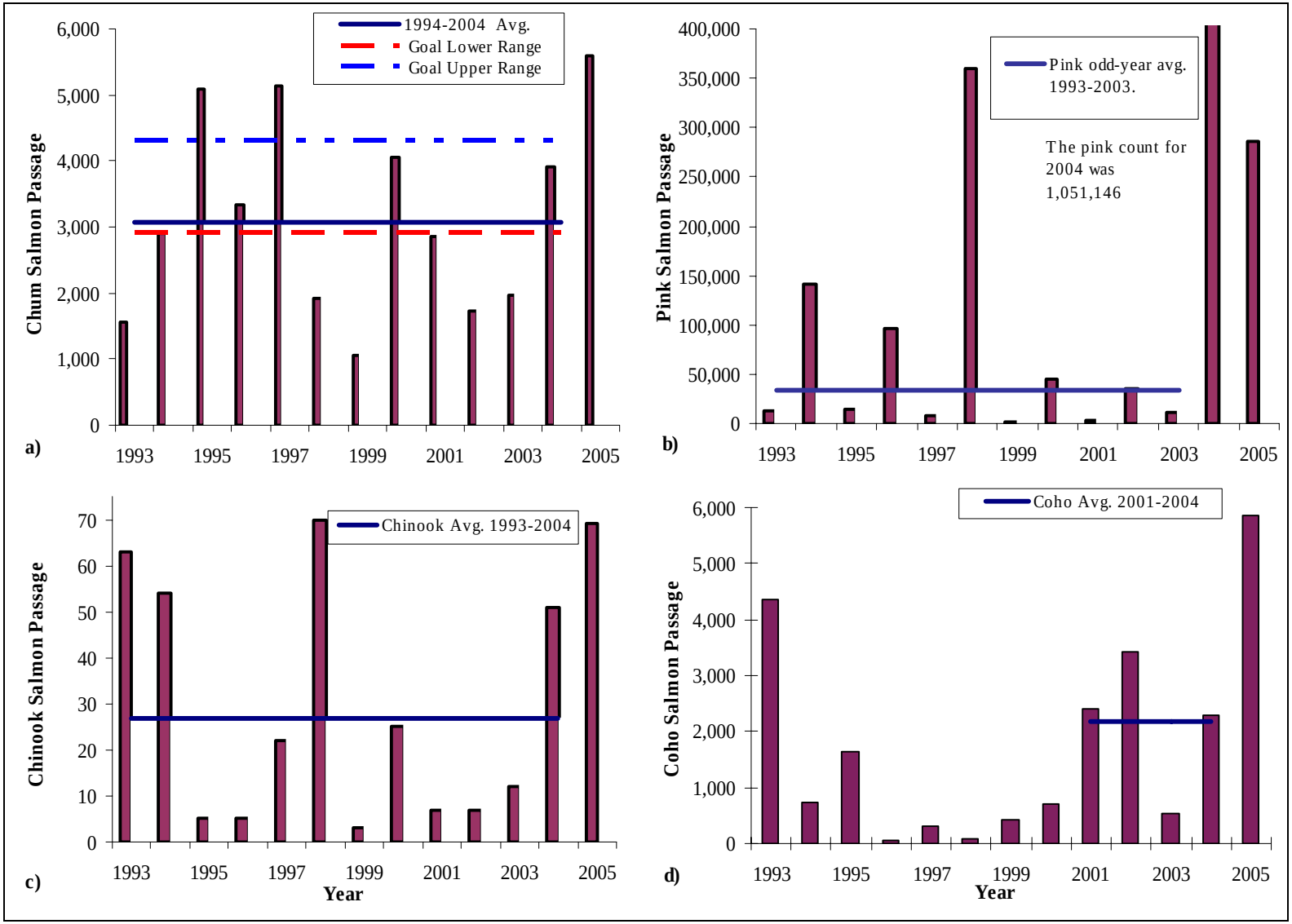


Figure 6.–Annual coho salmon passage and historical average at the Kwiniuk River counting tower, (2001–2005), Norton Sound.



Note: scales are not the same.

Figure 7.–Annual salmon passage and average for (a) chum, (b) pink, (c) Chinook, and (d) coho salmon at Niukluk River tower (1995–2005), Norton Sound.



Note: scales are not the same.

Figure 8.–Annual salmon passage and average for (a) chum, (b) pink, (c) Chinook, and (d) coho salmon at Nome River tower (1993–1995) and weir (1996–2005), Norton Sound.

APPENDIX A

Appendix A1.–Historical salmon escapements at Kwiniuk River counting tower, 1965–2005.

Year [a]	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 [b]	
1985	June 26-Jul 28	9,013	18,237	955 [c]	
1986	June 19-Jul 26	24,704	241,446	653	
1987	June 25-Jul 23	16,134	5,567	314	
1988	June 18-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	
1998	June 18-Jul 27	24,248	655,933	302	
1999	June 25-Jul 28	8,763	608	115	
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
2004	June 16-Sept 14	10,362	3,054,684	663	11,240
2005	June 18-Sept 12	12,083	341,048	342	12,950
	Average 1965-2004 [c, d]	24,852	365,379	353	8,180

[a] Counts from 1965–1994 taken from the original project reports located in the Nome ADF&G office, counts for 1995–2003 are from Kohler 2003.

[b] Chinook salmon counts from 1965–1984 are not expanded.

[c] Chinook salmon counts in 1985 and after were expanded. Chinook salmon average is from 1985–2004.

[d] Coho salmon average is from 2001–2004 as the majority of the run has been counted only since 2001.

Appendix A2.–Historical salmon escapements at Niukluk River counting tower, 1995–2005.

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
2004	June 25-Sept 8	10,770	975,895	141	2,064
2005	June 28-Sept 9	25,598	270,424	41	2,727
	Average 1995-2004 [a]	43,091	552,735	194	5,644

[a] Coho salmon average excludes 1998 because the majority of the run was not counted that year.

Appendix A3.–Historical salmon escapements at Nome River counting tower, 1993–1995, and weir 1996–2005.

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 [a]	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
2004	June 25-Sept 8	3,903	1,051,146	51	2,283
2005	June 27-Sept 11	5,584	285,759	69	5,848
	Average 1993-2004 [b]	2,958	66,123	27	2,167

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

[b] Coho salmon average is from 2001–2004 as the majority of the run has been counted only since 2001.