

Salmon Escapements to the Norton Sound–Port Clarence Area, 2015–2016

by

Jenefer Bell

and

Justin M. Leon

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code		all standard mathematical signs, symbols and abbreviations	
deciliter	dL		AAC		
gram	g	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H _A
hectare	ha			base of natural logarithm	<i>e</i>
kilogram	kg	all commonly accepted		catch per unit effort	CPUE
kilometer	km	professional titles	e.g., Dr., Ph.D., R.N., etc.	coefficient of variation	CV
liter	L			common test statistics	(F, t, χ^2 , etc.)
meter	m	at	@	confidence interval	CI
milliliter	mL	compass directions:		correlation coefficient (multiple)	R
millimeter	mm	east	E	correlation coefficient (simple)	r
Weights and measures (English)		north	N	covariance	cov
cubic feet per second	ft ³ /s	south	S	degree (angular)	°
foot	ft	west	W	degrees of freedom	df
gallon	gal	copyright	©	expected value	<i>E</i>
inch	in	corporate suffixes:		greater than	>
mile	mi	Company	Co.	greater than or equal to	≥
nautical mile	nmi	Corporation	Corp.	harvest per unit effort	HPUE
ounce	oz	Incorporated	Inc.	less than	<
pound	lb	Limited	Ltd.	less than or equal to	≤
quart	qt	District of Columbia	D.C.	logarithm (natural)	ln
yard	yd	et alii (and others)	et al.	logarithm (base 10)	log
Time and temperature		et cetera (and so forth)	etc.	logarithm (specify base)	log ₂ , etc.
day	d	exempli gratia (for example)	e.g.	minute (angular)	'
degrees Celsius	°C	Federal Information Code	FIC	not significant	NS
degrees Fahrenheit	°F	id est (that is)	i.e.	null hypothesis	H ₀
degrees kelvin	K	latitude or longitude	lat or long	percent	%
hour	h	monetary symbols		probability	P
minute	min	(U.S.)	\$, ¢	probability of a type I error (rejection of the null hypothesis when true)	α
second	s	months (tables and figures): first three letters	Jan.,...,Dec	probability of a type II error (acceptance of the null hypothesis when false)	β
Physics and chemistry		registered trademark	®	second (angular)	"
all atomic symbols		trademark	™	standard deviation	SD
alternating current	AC	United States (adjective)	U.S.	standard error	SE
ampere	A	United States of America (noun)	USA	variance	
calorie	cal	U.S.C.	United States Code	population sample	Var var
direct current	DC	U.S. state	use two-letter abbreviations (e.g., AK, WA)		
hertz	Hz				
horsepower	hp				
hydrogen ion activity (negative log of)	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

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**SALMON ESCAPEMENTS TO THE NORTON SOUND-PORT
CLARENCE AREA, 2015–2016**

by

Jenefer Bell and Justin M. Leon

Alaska Department of Fish and Game, Division of Commercial Fisheries, Nome

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

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Jenefer Bell and Justin M. Leon
Alaska Department of Fish and Game, Division of Commercial Fisheries,
Box 1148, Nome, AK, 99762, USA

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ABSTRACT

Five species of Pacific salmon (*Oncorhynchus* spp.) return to the Norton Sound–Port Clarence Area. Historically, returns of salmon to river drainages in this area have supported well-established subsistence fisheries and small-scale commercial salmon fisheries forming the cornerstone of cash economies in several remote villages. The Alaska Department of Fish and Game (ADF&G) and Norton Sound Economic Development Corporation (NSEDG) operated 12 salmon enumeration projects within Norton Sound–Port Clarence, with assistance from the Native Village of Unalakleet (NVU), U.S. Bureau of Land Management (BLM), and U.S. Fish and Wildlife Service Office of Subsistence Management (USFWS OSM). Management decisions affecting subsistence, commercial, and sport fisheries for salmon in the Norton Sound–Port Clarence Area were based largely on escapement counts obtained from these projects. This report summarizes escapement and age, sex, and length (ASL) data collected from 12 projects operated during the 2015 and 2016 field seasons within Norton Sound.

Key words: Chinook salmon, *Oncorhynchus*, age, sex, and length ASL, sustainable escapement goal SEG, biological escapement goal BEG, weir, tower, resistance board weir, Unalakleet River, North River, Glacial Lake, Norton Sound–Port Clarence Area

INTRODUCTION

Norton Sound–Port Clarence Area encompasses commercial salmon fishing districts as well as several river drainages (Figure 1). Five species of Pacific salmon (chum salmon *Oncorhynchus keta*, pink salmon *O. gorbuscha*, Chinook salmon *O. tshawytscha*, sockeye salmon *O. nerka*, and coho salmon *O. kisutch*) return to Norton Sound–Port Clarence Area marine waters and anadromous streams. Other salmonids, including Arctic grayling *Thymallus arcticus*, Dolly Varden *Salvelinus malma*, and whitefish species *Coregonus* and *Prosopium* spp. also occur in most Norton Sound–Port Clarence Area drainages.

Historically, returns of salmon to these drainages have supported well established subsistence fisheries. Since 1961, small-scale commercial salmon fisheries have occurred in Norton Sound and form the cornerstone of cash economies in several remote villages. Most of the income generated by commercial salmon fishing is used by residents to conduct subsistence-related activities throughout the year. Until the 1990s, subsistence and commercial salmon fisheries in the area were managed using a combination of commercial comparative catch statistics, test fishery catches, aerial surveys, and escapement data from 1 counting tower project located near the village of Elim. Since the mid-1990s, ADF&G and local organizations have collaborated successfully to implement a management regime that relies more heavily on ground-based escapement data collected at enumeration projects located throughout the area.

In 2015 and 2016, ADF&G operated 3 escapement projects to enumerate salmon, including weir projects located on Nome River and Solomon River in Norton Sound Subdistrict 1 (Nome Subdistrict), and Kwiniuk River counting tower in Subdistrict 3 (Elim Subdistrict). Norton Sound Economic Development Corporation (NSEDG) operated a resistance-board weir on the Pilgrim River (Port Clarence), a weir on Eldorado River in Subdistrict 1, a counting tower on Inglutalik River in Subdistrict 4 (Norton Bay Subdistrict), a counting tower on Shaktoolik River in Subdistrict 5 (Shaktoolik Subdistrict), and a counting tower on North River in Subdistrict 6 (Unalakleet Subdistrict). In addition to these projects, ADF&G and NSEDG worked cooperatively operating a weir on Snake River and a video weir on Glacial Lake in Subdistrict 1, a counting tower on Fish River in Subdistrict 2 (Golovnin Bay Subdistrict), and a resistance-board weir on Unalakleet River in Subdistrict 6. Other entities have also contributed funding to projects including Native Village of Unalakleet (NVU), Bureau of Land Management (BLM), and United States Fish & Wildlife Service Office of Subsistence Management (USFWS OSM).

Obtaining timely and accurate stock assessment information (e.g., escapement counts and age, sex, and length (ASL) data) from these projects is used to make informed decisions about management of subsistence, commercial, and sport salmon fisheries in the Norton Sound–Port Clarence Area. This report summarizes escapement data collected from all Norton Sound–Port Clarence projects for the 2015 and 2016 seasons.

PROJECT BACKGROUND

Pilgrim River Weir

Pilgrim River is 1 of the 2 largest salmon producing drainages in the Port Clarence District. Salmon Lake, whose outflow begins at Pilgrim River, is an ultra-oligotrophic lake located approximately 55 km north of Nome with a surface area of 7.49 km² (1,851 acres), an average depth of 14.9 m, and a maximum depth of 40 m (Todd and Kyle 1997; Hamazaki et al. 2012). The northernmost sockeye salmon run of significant size in North America is supported by Salmon Lake. Smolt size and emigration estimates, limnological data, and other historical data collected in the mid-1990s led to the decision to fertilize Salmon Lake to enhance sockeye salmon production (Todd and Kyle 1997). Salmon Lake was fertilized from 1997 to 2001, in 2004, and from 2007 to 2012; the amount of fertilizer deposited has varied over the years and sockeye salmon smolt abundance and size data have been monitored since 1995 (Todd and Kyle 1997; Hamazaki et al. 2012). Adult sockeye salmon returning to Salmon Lake have been enumerated intermittently since 1995 on Pilgrim River. Chum and pink salmon also return to Pilgrim River, and other salmon species return in small numbers. From 1995 to 1998, a fixed-picket weir was operated on the river and a counting tower was used from 2000 to 2002 (Waitman and Dunmall 2003). However, tower counts were not reliable due to flood conditions and inaccuracy in apportioning counts to species (Hamazaki et al. 2012). Additionally, late season aerial survey counts of sockeye salmon in Salmon Lake were often much higher than sockeye salmon passage estimates collected at the tower during these years. To obtain more reliable estimates of Pilgrim River salmon escapements, a resistance board weir was installed by ADF&G and Kawerak, Inc. in 2003 using funds from the Norton Sound Fishery Disaster Act of 1999. Kawerak, Inc. operated the weir from 2003 to 2007 (Dunmall 2008) and NSEDC has operated the weir since 2008. The weir and campsite were located roughly 10.5 km downstream of the Kougarok Highway Bridge (GPS coordinates 65°06.170 N, 164°49.450 W; Figure 2). Typically, Pilgrim River weir was operated from the beginning of July until the end of August.

Glacial Lake Weir

Sinuk River is an important sockeye salmon spawning tributary that originates in the western Kigluaik Mountains and flows 66 kilometers southwest to empty into the northwestern portion of the Nome Subdistrict. Near its headwaters lies Glacial Creek, a small tributary that drains Glacial Lake, an ultra-oligotrophic lake with an estimated surface area of 4 km², an average depth of 5.8 m, and a maximum recorded depth of 22 m (Todd and Kyle 1997). The project to enumerate sockeye salmon began as a weir in 2000, led by BLM with assistance from ADF&G and NSEDC. Sockeye salmon are the predominant salmon species returning to Glacial Creek but there are very few pink and chum salmon. The project documented the abundance, age and size structure, and run timing of sockeye salmon spawning escapement (2000–2005) and smolt outmigration (2003–2005); limnological data was also collected during this time and added to the existing limnological database (Parker 2008). Beginning in 2006 ADF&G became the sole operator of the project. In 2012, a video monitoring system was put in place to test the feasibility

of an unstaffed escapement project. Glacial Creek weir was located on Glacial Creek just downstream of its outlet from Glacial Lake (GPS coordinates 64°50.200 N, 165°42.400 W; Figure 2). A video monitoring system allowed the project to operate from the end of June to mid-August. This project was discontinued after the 2015 field season.

Snake River Weir

Snake River flows 27 river kilometers south from the Kigluaik Mountains and drains into Norton Sound at the Port of Nome. Chum and pink salmon are the predominant salmon species returning to Snake River; other species return in small numbers. From 1995 to 2001, Kawerak, Inc. operated a counting tower and ADF&G analyzed the data and produced project summary reports (Jones and Knuepfer 2002). In 2002 the counting tower was replaced with a fixed-picket weir and from 2002 to 2007 Kawerak, Inc. funded and operated the project, conducted data analyses, and produced annual project summary reports (Dunmall 2008). In 2008, NSEDC and ADF&G took over operation of the Snake River weir and it has remained a joint project through present. Snake River weir was located approximately 8 km upstream from the Nome small boat harbor (GPS coordinates 64°31.180 N, 165°28.740 W; Figure 2). The Snake River weir was typically operated from the end of June until mid-September.

Nome River Weir

Nome River flows approximately 53 river kilometers south from the Kigluaik Mountains and drains into Norton Sound approximately 5 kilometers east of Nome. Chum and pink salmon are the predominant salmon species returning to Nome River; other species return in small numbers. The enumeration project began as a counting tower in 1993 operated by ADF&G. In 1996, a fixed-picket weir replaced the counting tower and the project continued to be operated by ADF&G. Nome River weir was located approximately 5 river kilometers upriver from the Nome River bridge on Nome-Council Road (GPS coordinates 64°29.856 N, 165°12.980 W; Figure 2). Typically, the weir was operated from late June until mid-September.

Eldorado River Weir

Eldorado River is the largest tributary of the Flambeau River; it flows 45 river kilometers south from the Kigluaik Mountains and drains into Safety Sound approximately 23 kilometers east of Nome. Chum and pink salmon return to Eldorado River; no other Pacific salmon species returns frequently or in large numbers. The enumeration project on this river began as a counting tower in 1995 as a cooperative project between Sitnasuak Native Corporation, Kawerak, Inc., and Nome Eskimo Community with data analysis and report writing conducted by ADF&G (Rob 1995). Kawerak, Inc. operated the tower project with equipment and technical assistance from ADF&G from 1996 to 2002 (Waitman and Dunmall 2003). In 2003, a fixed-picket weir replaced the counting tower and Kawerak, Inc. continued weir operations until 2007 (Dunmall 2008). In 2008, funding constraints prevented Kawerak, Inc. from continuing the project which ultimately led to NSEDC and ADF&G taking over operations. NSEDC took control of the project in 2009 and has remained sole operator through present. Eldorado River weir was located approximately 24 km upstream from the Safety Sound Bridge on the Nome-Council Highway (GPS coordinates 64°34.410 N, 165°56.240 W; Figure 2). The weir was installed in late June and dismantled in early August at the end of the chum salmon run.

Solomon River Weir

The Solomon River is the eastern-most river within Norton Sound Subdistrict 1. Flowing south, it enters Norton Sound approximately 56 km east of Nome. Pink and chum salmon are the major salmon species in this system but other species can be present in small numbers. The enumeration project began in 2013 to help address data gaps in the Subdistrict 1 chum salmon escapement goal analysis. The Solomon River enumeration project was intended as a 5 year project. Solomon River weir was located approximately 5 km up river (GPS coordinates 64°34.667 N, 164°24.823 W; Figure 2). The weir operated from the first week of July through the third week of August.

Fish River Tower

The Fish River, located on the southern Seward Peninsula, flows south to empty into Golovnin Bay in Norton Sound. Fish River has consistent runs of Chinook, chum, pink, and coho salmon. Fish River counting tower started in 2014 to provide an estimate of escapement and assist commercial fisheries management within Subdistrict 2. The Fish River counting tower was located about 24 km upstream from the village of White Mountain (GPS coordinates 64°46.360 N, 163°25.220 W; Figure 2). The counting tower operated from mid-June until the end of August.

Kwiniuk River Tower

The Kwiniuk River flows 62 km out of the Kwiktalik Mountains and drains into Norton Sound just east of Elim, approximately 160 kilometers east of Nome. Chum, pink, and coho salmon are the predominant salmon species returning to Kwiniuk River; other species return in small numbers. Kwiniuk River tower has been the longest running salmon stock assessment project in the region. Since 1965, Kwiniuk River tower camp has been located approximately 6 km upstream from the mouth of the river (GPS coordinates 64°43.236 N, 162°01.004 W; Figure 2). The tower operated from mid-June through mid-September.

Inglutalik River Tower

In 2011, an enumeration tower project was initiated by NSEDC on the Inglutalik River to provide an index of salmon escapement to Subdistrict 4 (Norton Bay). Inglutalik River flows 153 km out of the Nulato Hills to drain into Norton Bay. The counting tower and associated field camp were located on BLM land approximately 29 river kilometers upstream of the mouth (GPS coordinates 64°49.570 N, 160°39.990 W; Figure 2). The tower operated from late June to mid-August.

Shaktoolik River Tower and Sonar

Shaktoolik River is located at the eastern end of the Seward Peninsula and flows out of the Nulato Hills draining into Norton Sound. In 2006, NSEDC's Norton Sound Fisheries Research and Development (NSFR&D) surveyed the Shaktoolik River for locations to operate a test net, resistance board weir, counting tower, and/or sonar. After analyzing the river for potential sites, it was assessed that a dual-frequency identification sonar (DIDSON)¹ would have the greatest chance of success. In 2007, NSFR&D contracted with LGL Limited to test the feasibility of using a DIDSON to enumerate salmon at several sites on the Shaktoolik River (Johnson and

¹ Product names used in this report are included for scientific completeness, but do not constitute a product endorsement.

Jones 2007). A site at river mile 3 (from the mouth, 64°22.298 N, 161°7.724 W) was chosen to operate the sonar. In 2008, NSFR&D purchased a DIDSON and began to assemble the infrastructure to run a sonar project. The DIDSON was deployed in 2010 as a viable option for enumerating salmon on the Shaktoolik River. However, apportioning the salmon species was problematic; therefore, escapement data were not utilized for several years. Starting in 2014, a counting tower became the primary tool for enumerating salmon. Although DIDSON is used in situations when the tower is not operational, it was not used to estimate counts in 2015 and 2016. The project was located approximately 3 miles up from the mouth (GPS coordinates 64°22.198 N, 161°06.374 W, Figure 2). The tower operated from mid-June through the end of August.

North River Tower

North River flows 104 km out of the Nulato Hills. An important spawning tributary of Unalakleet River drainage, the North River enters Unalakleet River 8 kilometers above the mouth. All Pacific salmon species return to North River except that sockeye salmon return infrequently or in small numbers. ADF&G operated North River tower from 1972 to 1974 and again from 1984 to 1986 (Lean 1987). From 1984 to 1986, the North River tower project was conducted at various sites upstream from the confluence of the Unalakleet River. The project was discontinued in 1987 due to lack of funding and a decline in the chum salmon commercial fishery. The project resumed operations in 1996, largely because of available funding and increasingly important Chinook, pink, and coho salmon commercial fisheries. Kawerak, Inc. operated the tower project from 1996 to 2001 (Kohler 2002) and NVU operated the project from 2002 to 2004 (Jones 2006). During the 2007–2009 seasons, ADF&G personnel conducted tower operations with assistance from NVU (2007–2008) and NSEDC (2009). In 2010, NSEDC became the sole operator. Since 2008, the North River tower has been located approximately 3 kilometers upstream from the confluence with the Unalakleet River (GPS coordinates 63°53.168 N, 160°39.484 W; Figure 2). The tower operated from mid-June through mid-September.

Unalakleet River Weir

The Unalakleet River drainage encompasses 5,400 square km and extends westward from the Nulato Hills for approximately 210 km to Norton Sound. The 2010 season marked the inception of the Unalakleet River weir, a cooperative project between ADF&G, NVU, BLM, and NSEDC. Unalakleet River weir was installed on the mainstem approximately 22 kilometers upstream from the mouth (GPS coordinates 63°53.32 N, 160°29.41 W; Figure 2). Unalakleet River weir was primarily implemented to monitor Chinook salmon, but all Pacific salmon species except sockeye salmon return to Unalakleet River. The weir operated from mid- to late June to mid-August.

OBJECTIVES

Enumeration projects within the Norton Sound–Port Clarence Area had 2 tasks:

1. Obtain daily and seasonal estimates of magnitude and timing of salmon escapements.
2. Estimate ASL composition of Chinook, chum, coho, and sockeye salmon escapements.

METHODS

ENUMERATION TOWERS

Tower Construction and Maintenance

Towers were constructed from aluminum scaffold and placed on the river bank where observers could see the width of the river. Guy wires were staked to the ground or cabled to trees to stabilize towers.

Flash panels (usually white plastic, vinyl, or canvas) were placed perpendicular across the river bottom to provide a contrasting background to help facilitate species identification and counting. Flash panels were anchored with sand bags placed on the upstream side of panels; stakes were used on the ends to hold panels in place. Flash panels were cleaned when needed using a stiff long-handled scrub brush or broom.

Partial or diversionary weirs were used to force migrating fish over the flash panel for easier observation. Diversionary weirs extended from the river bank opposite the tower scaffolding toward mid-channel over the flash panel end. Weirs were inspected daily, and woody debris and fish carcasses removed. Historically, the North River counting project did not use a diversionary weir. Instead an orange buoy was placed mid-panel and counting was conducted from both sides of the river. In 2016, North River tower changed methods: a diversionary weir was used to count salmon from only 1 bank.

To count fish at night from late July into September, lights were placed either on the tower (Inglutalik, Kwiniuk, and Fish rivers) or on guy wires tied to both towers (North River in 2015 only). A 12-volt battery system or 120-volt generator system provided power for lighting.

Salmon Enumeration

Counting migrating salmon was completed 24 hours a day and each day was divided into three 8-hour shifts. At projects with towers on just 1 river bank (e.g., North (in 2016 only), Shaktoolik, Inglutalik, Kwiniuk, and Fish rivers), salmon were counted by species for 20 min each hour; counts typically commenced at the top of the hour. In 2015, at North River, where counting took place on both river banks, two 10-min counting periods were scheduled every hour. The first 10-minute count commenced at the top of the hour on the west bank and included only fish passing between the west bank and the offshore buoy. The east bank count immediately followed the west bank count and only fish passing between the east bank and the mid-panel buoy were enumerated.

Passage was defined as movement across the full width of the flash panel and upstream (+) and downstream (-) passage were recorded to provide a net upstream passage during each 10-min for each channel of the river or 20-min count for the river. Carcasses as well as obviously moribund salmon passively moving downstream were not tallied as downstream passage. Hourly and daily salmon passage was determined using 3 different scenarios as outlined by Perry-Plake and Antonovich (2009).

For days when all counts were conducted under excellent to poor conditions (Scenario 1), daily passage, (\hat{N}_d) was calculated by expanding counts within a shift for day (d):

$$\hat{N}_d = \frac{M_d}{m_d} \sum_{j=1}^{m_d} y_{dj} . \quad (1)$$

Variance for each period was calculated as:

$$s_d^2 = \frac{1}{2(m_d - 1)} \sum_{j=2}^{m_d} (y_{dj} - y_{d(j-1)})^2 , \quad (2)$$

and variance for the expanded daily passage was estimated as:

$$\hat{V}(\hat{N}_d) = \left(1 - \frac{m_d}{M_d}\right) M_d^2 \frac{s_d^2}{m_d} , \quad (3)$$

where:

d = day;

j = 20 min counting period or paired 10 min counting period (a paired 10 min counting period consists of 10 min counts, 1 per channel, during a given hour);

y = observed period count (both channels combined);

m = number of 20 min counting periods or paired 10 min counting periods sampled; and,

M = total number of possible 20 min counting periods or paired 10 min counting periods.

For periods with very poor or unobservable counts within a day (Scenario 2) the number of fish observed (y_{dj}) was estimated using known counts for that day and the estimated diurnal pattern. For each species, the period of peak passage was determined using the shortest, continuous period that accounted for 80% of the seasonal passage. If counts were conducted for a portion of the day that represents 25% or more of the expected passage for that day and if at least 25% of the periods during peak passage were successfully counted, then the channel-specific interpolated count was estimated:

$$y_{dc,interp} = y_{dc,actual} \times \frac{1 - p_{edp}}{p_{edp}} , \quad (4)$$

where:

$y_{dc,interp}$ = interpolated sum of counts for missing (i.e. very poor or unobservable) 10 min periods by channel;

$y_{dc,actual}$ = daily sum of successful 10 min counts by channel; and

p_{edp} = proportion of expected daily passage successfully counted.

The interpolated count was apportioned among the missing counting periods based on the diurnal pattern of the season. In Scenario 2, daily variance was adjusted by decreasing the number of counting periods (m_d) sampled each day by the proportion of the expected daily passage successfully counted on that day.

If counts were conducted for a portion of the day that represented less than 25% of the expected daily passage for that day or if less than 25% of the periods during peak passage were counted successfully (Scenario 3), then passage for the full day was estimated and the successful counts for that day were disregarded. Daily estimates were calculated using the same method for interpolating missed passage. When counts for k consecutive days were missed, the moving average estimate for the missing day (i) was calculated as:

$$\hat{N}_i = \frac{\sum_{j=i-k}^{i+k} I_j \hat{N}_j}{\sum_{j=i-k}^{i+k} I_j}, \quad (5)$$

where:

$$I_j = \begin{cases} 1 & \text{if counting was successfully conducted on day } j \\ 0 & \text{otherwise.} \end{cases} \quad (6)$$

The interpolated values were the point estimates for the daily counts and daily variance for missed days was the maximum variance for k days before and k days after the uncounted day i . Total upstream passage and its variance combined daily passage from all 3 scenarios and were estimated as (Cochran 1977):

$$\hat{N}_{PT} = \sum_{d=1}^D \hat{N}_d \quad \text{and}, \quad (7)$$

$$\hat{V}(\hat{N}_{PT}) = \sum_{d=1}^D \hat{V}(\hat{N}_d), \quad (8)$$

where d is the total number of possible days.

Finally, if interpolation was completed, a standard error (SE) was calculated for the entire upstream passage:

$$SE = \sqrt{\hat{V}(\hat{N}_{PT})}. \quad (9)$$

In years when the target operational period of a project was not fully monitored, or the project had a predetermined end date, regardless of run timing, it was necessary to determine which species runs were complete using the 1% rule (Tim Sands and Jim Menard, Commercial Fisheries Biologists, Alaska Department of Fish and Game; personal communication). If each of the last 3 days were less than 1% of the cumulative escapement on that day, then the run was considered complete. If the 1% rule was not met, the species run was considered incomplete and the escapement was considered a minimum estimate.

WEIRS

Fixed-picket weirs

Fixed-picket weirs were built across the entire river and designed to minimize unmonitored fish passage. Typically, weir sections were spanned using 3-meter long aluminum stringers supported by metal “A” frame bipods or tripods with galvanized steel or aluminum conduit pickets placed in the stringer holes. Pickets were spaced three-fourths inch apart to ensure all salmon and anadromous Dolly Varden could not pass upstream undetected. Fixed-picket weirs were equipped with a gate, usually in the thalweg of the river, to allow fish to pass while counted.

Additionally, pickets could be removed to allow fish to pass. Fixed-picket weirs had boat gates, consisting of removable panels that can be moved to accommodate boat passage. Lighting systems like those deployed on tower projects were used to illuminate the weir area to count fish passage at night. All weirs were monitored several times a day for breaches such as substrate scouring and pushed up pickets.

Resistance Board Weirs

Resistance board or floating weirs have become increasingly important as a salmon stock assessment tool throughout western Alaska (Bavilla et al. 2010; Stewart et al. 2010; Whitton 2003). Floating weirs are comprised of a series of linked PVC pipe panels attached to a substrate rail anchored to the stream bed with rebar stakes and earth anchors. Installation of floating weirs followed installation methods outlined by Stewart (2003).

Like fixed-picket weirs, fish were funneled through a passage chute for accurate enumeration or into live traps to facilitate biological sampling. Unlike fixed-picket weirs, resistance board weirs had modified boat passage panels and tow rope systems that permitted unassisted boat traffic across the weir. Resistance board weirs also offered a flood-resistant alternative to fixed-picket weirs. When a resistant board weir was subjected to flood conditions, the panels were forced below the surface, which allowed debris to pass unobstructed downstream.

Salmon Enumeration

Weirs were checked regularly throughout the day and night for milling fish and opened to allow fish to pass when necessary. Counting occurred at different times each day and night to account for changes in diurnal migratory patterns or operational constraints such as suboptimal viewing conditions. When the weir was opened, staff monitored salmon migrating upstream. Fish were identified by species and counted on multiple tally counters for a minimum of 30 min or until fish passage diminished. Individual counts of salmon passage throughout the night and day were added together for a total daily passage by species.

Methods for Interpolating Missed Counts

Missing daily counts for weirs were interpolated using the moving average method (equation 5) described in Perry-Plake and Antonovich (2009). Interpolation of missed daily counts was completed when 10 or fewer days were missed and there were at least 9 days of full counts before and after the missed days. If greater than 10 days were missed, then there was no interpolation for that time and the escapement estimate was considered a minimum count. Partial-count days were considered days of minimum passage and therefore were not used to interpolate missed passage for days when the weir was not operational. Standard errors were not calculated for weir projects because total count is a complete census not an estimate.

Like towers, in years when the target operational period of a project was not fully monitored, or the project had a predetermined end date, regardless of run timing, it was necessary to determine which species runs were complete using the 1% rule (Tim Sands and Jim Menard, Commercial Fisheries Biologists, Alaska Department of Fish and Game; personal communication). If each of the last 3 days was less than 1% of the cumulative escapement on that day the run was considered complete. If the 1% rule was not met, the species run was considered incomplete and the escapement was considered a minimum estimate.

AGE, SEX, AND LENGTH

ASL Sample Size and Distribution

Minimum sample size targets were determined for each species of each project based on conventions described by Bromaghin (1993) such that the age composition estimate was within 20% of the actual estimate 90% of the time and the sex composition estimate was within 10% of the actual estimate 95% of the time. Sample size targets were based on assumptions that all salmon have 2 sex categories, Chinook salmon and sockeye salmon have 5 age categories, chum salmon have 4 age categories, and coho salmon have 3 age categories, with a finite or unknown population size. Minimum sample size targets were increased by 20–25% to account for unreadable scales and collection errors during weir or tower protocols. Scales were not collected at Glacial Lake and Solomon and Fish river projects and preseason targets were not set for Shaktoolik River counting tower in either year (Table 1).

Different sampling strategies were implemented over the time frame of this report. Typically, pulse sampling was employed in situations when sampling events were costlier or required multiple individuals to collect samples. For example, pulse sampling was initiated at counting tower projects because sampling required capture of salmon in beach seines at remote sites not in proximity to the counting tower. Funding constraints and limited personnel allowed for only a handful of sampling events to achieve sampling goals. Pulse sampling was scheduled to occur over a range of dates corresponding to 5-year, 10-year and/or long-term average run timing quartiles (e.g., Table 2). Pulse sampling was completed by dividing the sample goal by 4 and collecting the entire sample size within 2 days of the quartile date. The other sampling strategy was to collect ASL data evenly throughout the run following daily collection schedules (e.g., Table 3). This more systematic approach was used at weir projects because the weir trap facilitated daily capture and handling of salmon and often only required a single individual to collect ASL samples. Small adjustments were also made to daily sampling targets inseason when observed run timing deviated significantly from expected run timing.

Age and sex compositions were provided only for those species and projects where sample size allowed for 90% and 95% confidence intervals, respectively, given the actual escapement abundance observed (Table 4).

ASL Sample Collection Procedures

Samples were obtained from salmon caught in fish traps at weir sites and from salmon captured in beach seines in proximity to tower locations. If salmon were not effectively captured in the weir live trap, fish were seined in proximity to the weir site, using similar methods to tower-associated seining. During seining events, the seine was incrementally worked up onto a bank or gravel bar until a net pen was created to temporarily contain salmon until they could be sampled.

Weir traps consisted of an entrance gate, holding pen, and exit gate or chute. Salmon were trapped by opening the entrance gate while the exit gate remained closed. The holding pen was filled with fish until a reasonable number of salmon were available for sampling. Crew members used a dip net to capture fish within the holding pen or net pen. To obtain length data and aid in scale collection, fish were removed from the dip net and placed into a partially submerged fish cradle outfitted with a measuring tape, or onto a polyethylene foam-covered fish measuring board that beveled towards the center. After sampling, each fish was released upstream of the

weir or several meters away from the net pen during seining events. The procedure was repeated until the holding pen or net pen was emptied or the required number of salmon was sampled.

An active sampling approach was implemented at the Unalakleet River weir to increase the effectiveness of sampling Chinook salmon. Chinook salmon are often reluctant to enter fish traps filled with pink and chum salmon, which occurred when the exit gate was closed. Active sampling consists of capturing and sampling salmon individually or in small numbers while actively passing and counting all salmon (Linderman et al. 2002). One crew member counted fish normally at the upstream end of the trap while a second crew member sat at the back of the trap and observed fish as they entered through the fyke opening. When a Chinook salmon was observed entering the trap, the crew members concurrently closed the front and rear gates to trap the fish. Active sampling was also completed by a single crew member using a short length of 2x4 lumber secured to a piece of rope, such that the front and back gates could be closed simultaneously.

Sex of each sampled fish was determined by visually examining external characteristics (such as body symmetry, kype development, and presence of an ovipositor) and length was measured to the nearest 1 mm from middle of the eye to the tail fork (METF). Scales were taken from the preferred area, cleaned and mounted on gummed cards, and impressions were made in cellulose acetate for age determination following methods described by Clutter and Whitesel (1956). Impressions were read with a microfiche reader and ages were determined from reading annuli as described by Mosher (1969). European notation was used to report ages: 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 1962). Sex and length data were recorded on numbered data sheets that corresponded with numbers on the gum cards used for scale preservation. After sampling was completed, the original ASL gum cards, acetates, and ASL data forms were archived at the ADF&G office in Anchorage. Only ASL data that met minimum sample sizes were reported.

WEATHER AND STREAM OBSERVATIONS

Stream and ambient air temperature (°C) and relative water levels were measured twice daily at all escapement projects. Stream and air temperatures were typically measured using a glass immersion thermometer. In some instances (e.g., Glacial Lake), water temperature was measured using a HOBO Water Temp Pro v2 logger. Other atmospheric observations (e.g., percent cloud cover, wind speed and direction, and precipitation) were also recorded daily. Water levels were monitored using a staff gauge consisting of a metal rod driven into the stream channel with a meter stick attached. Relative height of the water surface, as measured from the meter stick, represented the “stage” of the river above the original depth at which it was set. Occasionally, stream gauges needed to be re-driven at another location or lengthened when water levels either dropped below or rose above the meter stick.

RESULTS AND DISCUSSION

PILGRIM RIVER

In 2016, the weir boat gate was submerged from August 2 to August 6 which resulted in unmonitored salmon passage; therefore, 2016 escapements should be considered minimum estimates for all species.

Chum Salmon

Annual escapement of chum salmon at Pilgrim River weir was 41,121 fish in 2015 and 21,379 fish in 2016. The 2015 and 2016 escapements were not complete; therefore, escapements should be considered minimum estimates (Table 5).

In 2015, chum salmon were observed the first day of project operations, which began about 7 days later than average. In 2016, the first chum salmon was detected about a week earlier. Chum salmon were present throughout the remainder of project operations in both years (Appendices A1–A2).

Pilgrim River chum salmon ASL sample sizes were 195 in 2015 and 196 in 2016. Chum salmon were predominantly age-0.3 and age-0.4 fish in both years and a small number of age-0.5 chum salmon were also present. The female composition was 46% in 2015 and 54% in 2016 (Appendix A3).

Pink Salmon

Annual escapement of pink salmon at Pilgrim River weir was 2,807 fish in 2015 and 2,986 fish in 2016. The 2015 escapement was the third lowest since 2003 and the 2016 escapement were not complete and therefore should be considered a minimum estimate (Table 5).

Pink salmon were first observed approximately a week later in 2015 than 2016 before trailing off in mid-August in both years. Pink salmon median passage occurred in the last week of July in 2015 (Appendices A1–A2).

ASL samples were not collected for pink salmon at Pilgrim River weir.

Chinook Salmon

Annual escapement of Chinook salmon at Pilgrim River weir was 99 salmon in 2015 and 34 salmon in 2016. These 2 years continue the longest consecutive record low escapements, which began in 2008, of Chinook salmon at Pilgrim River weir (Table 5).

Chinook salmon were first observed around the same time in both 2015 and 2016. In both years, most Chinook salmon passed the weir in early to mid-July. The median passage date of Chinook salmon occurred in the middle of July in 2015 (Appendices A1–A2).

ASL data for Chinook salmon were not collected in 2015 and 2016 (Appendix A4).

Coho Salmon

Annual escapement of coho salmon at Pilgrim River was 296 salmon in 2015 and 554 salmon in 2016. Escapements in 2015 and 2016 were not complete and therefore should be considered minimum estimates (Table 5).

Coho salmon were first observed in late July in both years and continued until operations ceased (Appendices A1–A2).

ASL data for coho salmon were not collected in 2015 and 2016 (Appendix A5).

Sockeye Salmon

Annual escapement of sockeye salmon at Pilgrim River was 36,052 fish in 2015 and 15,066 fish in 2016. The 2015 escapement was the highest since 2007 and the 2016 escapement was not complete and therefore should be considered a minimum estimate (Table 5).

Sockeye salmon were first observed about a week later in 2015 than 2016 and persisted throughout the project operational period. The median passage of sockeye salmon in 2015 was July 21 (Appendices A1–A2).

A total of 224 Pilgrim River sockeye salmon ASL samples were collected in 2015 and 231 were collected in 2016. In 2015, age-1.2, age-1.3, age-2.2, and age-2.3 made up the age composition and sockeye salmon were predominantly age-1.3 in 2016. The female composition was 46% in 2015 and the 56% in 2016 (Appendix A6).

Environmental Conditions

In both 2015 and 2016 water levels were within an acceptable range to allow continuous weir operations (Figure 3; Appendix A7).

GLACIAL LAKE

Sockeye Salmon

Annual escapement of sockeye salmon at Glacial Lake was 9,257 salmon in 2015. Lack of rain caused the river water level to drop below the video camera making counting salmon impossible. Therefore, escapement should be considered a minimum estimate. The 2015 escapement was the second highest since the project's inception in 2000 (Table 6). The project was not operational in 2016.

In 2015, sockeye salmon were detected by the camera on June 25 and were present throughout the rest of project operations. Sockeye salmon median passage was not calculated because the full run was not enumerated (Appendix B1).

ASL data were not collected in 2015 (Appendix B2).

Environmental Conditions

Water temperature and depth were not collected in 2015.

SNAKE RIVER

Chinook and sockeye salmon were not present in numbers large enough to present results, though a few were counted at Snake River weir in most years (Table 7).

Chum Salmon

Annual escapement of chum salmon at Snake River weir was 4,241 fish in 2015 and 3,666 fish in 2016. Chum salmon escapements in 2015 and 2016 were near average (Table 7).

Chum salmon were observed on the first day of project operations in both years. Chum salmon median passage occurred days apart in the middle of July in both years (Appendices C1–C2).

A total of 170 Snake River chum salmon ASL samples were collected in 2015 and 149 in 2016. Chum salmon were predominantly age-0.3 in 2015 and age-0.4 salmon made up the next most abundant component. This pattern was the same in 2016 (Appendix C3).

Pink Salmon

Annual escapement of pink salmon at Snake River weir was 16,321 salmon in 2015 and 204,641 salmon in 2016. The 2015 escapement was the largest odd-year count in project history and the

2016 escapement was the second highest even-year count since project inception in 1995 (Table 7).

Pink salmon were observed on the first day of operations in 2015 and the second day in 2016 and were present until the final days of the project in each year. Pink salmon median passage occurred a couple days apart at the end of July in both years (Appendices C1–C2).

ASL samples were not collected for pink salmon at Snake River weir.

Coho Salmon

Annual escapement of coho salmon at Snake River weir in 2015 was 1,638 salmon and 1,115 salmon in 2016. Neither year was a complete run; therefore, escapements should be considered minimum estimates (Table 7).

Coho salmon were first observed in mid-July in both 2015 and 2016 and were present throughout the remainder of the project in both years (Appendices C1–C2).

Snake River coho salmon ASL samples did not meet sample size requirements in 2015 and 2016. (Appendix C4).

Environmental Conditions

Water levels were within an acceptable range for the majority of the 2015 season. Water levels hindered weir operations from August 25 to August 29 and counts were interpolated. In 2016, water levels were within an acceptable range to allow continuous weir operations (Figure 4; Appendix C5).

NOME RIVER WEIR

Chinook and sockeye salmon were not present in large enough numbers to present results, though a few were counted at Nome River weir in most years (Table 8).

Chum Salmon

Annual escapement of chum salmon at Nome River weir was 6,111 salmon in 2015 and 7,093 salmon in 2016. The 2015 escapement was the third largest escapement since project inception and 2016 was the largest escapement (Table 8).

Chum salmon were first observed on the opening day of the project (July 2) in 2015 and the second day (July 1) in 2016. Chum salmon median passage occurred in the third week of July in both 2015 and 2016 (Appendices D1–D2).

Nome River chum ASL sample sizes were 181 fish in 2015 and 186 fish in 2016. In both years age-0.3 chum salmon were the predominant age class and age-0.4 salmon were the next most abundant. The sex composition was 55% and 61% female in 2015 and 2016, respectively (Appendix D3).

Pink Salmon

Annual escapement of pink salmon at Nome River weir was 75,603 fish in 2015 and 1,175,723 fish in 2016. Pink salmon escapements in 2015 and 2016 were the second largest odd-year and even-year escapements since project inception (Table 8).

Pink salmon were first observed on the opening day of the project (July 2) in 2015 and the second day (July 1) in 2016 and were present throughout the remainder of the project. Pink salmon median passage occurred in the last week of July in both 2015 and 2016 (Appendices D1–D2).

ASL samples were not collected for pink salmon at Nome River weir.

Coho Salmon

Annual escapement of coho salmon at Nome River weir was 2,418 salmon in 2015 and 2,331 salmon in 2016. Neither year was a complete run; therefore, escapements should be considered minimum estimates (Table 8).

Coho salmon were first observed in mid-July in 2015 and about a week later in 2016 and were present until operations ceased in both years (Appendices D1–D2).

Nome River coho salmon ASL samples were not collected in 2015 and 2016 (Appendix D4).

Environmental Conditions

Water levels in 2015 and 2016 were within acceptable ranges to allow continuous weir operations (Figure 5; Appendix D5).

ELDORADO RIVER

Chinook, coho, and sockeye salmon were not present in large enough numbers to present results, though minor runs did exist in Eldorado River (Table 9).

Chum Salmon

Annual escapement of chum salmon at Eldorado River weir was 25,560 salmon in 2015 and 18,938 salmon in 2016. Neither year was a complete run; therefore, escapements should be considered minimum estimates (Table 9).

Chum salmon were first observed on June 26 in both 2015 and 2016 and were present throughout operations in both years (Appendices E1–E2).

Eldorado River chum salmon ASL sample sizes were 203 fish in 2015 and 182 salmon in 2016. Age-0.3 was the predominant age class in both 2015 and 2016 with age-0.4 as the next most abundant age class. Sex compositions of 53% and 47% female were observed in 2015 and 2016, respectively (Appendix E3).

Pink Salmon

Annual escapement of pink salmon at Eldorado River weir was 1,483 salmon in 2015 and 42,699 salmon in 2016. Neither year was a complete run; therefore, escapements should be considered minimum estimates (Table 9).

Pink salmon were first observed on July 4 in 2015 and about a week earlier (June 26) in 2016. Pink salmon were present throughout operations in both years (Appendices E1–E2).

ASL samples were not collected for pink salmon at Eldorado River weir.

Environmental Conditions

Water levels were within an acceptable range to allow continuous weir operations in 2015 and 2016 (Figure 6; Appendix E4).

SOLOMON RIVER

Coho and sockeye salmon were not present in large enough numbers to present results, though minor runs did exist in Solomon River (Table 10).

Chum Salmon

Annual escapement of chum salmon at Solomon River weir was 1,128 salmon in 2015 and 2,016 salmon in 2016 (Table 10).

Chum salmon were first observed on July 4 in 2015 and on June 30 in 2016. In both years, chum salmon were present over the entire project season. Chum median passage occurred the third week of July in both years (Appendices F1–F2).

Solomon River chum salmon ASL samples were not collected in 2015 or 2016.

Pink Salmon

Annual escapement of pink salmon at Solomon River weir was 18,764 salmon in 2015 and 128,046 salmon in 2016 (Table 10).

Pink salmon were first observed on July 12 in 2015 and on July 6 in 2016 and were present throughout the season in both years. Pink salmon median passage occurred at the end of July in 2015 and about 5 days earlier in 2016 (Appendices F1–F2).

ASL samples were not collected for pink salmon at Solomon River weir.

Environmental Conditions

Water levels in 2015 were within acceptable ranges to allow continuous weir operations but high water in 2016 hindered operations 3 times and counts were interpolated (Figure 7; Appendix F3).

FISH RIVER

Chum Salmon

Annual escapement of chum salmon at Fish River tower was 144,690 salmon in 2015 and 71,005 salmon in 2016 (Table 11).

Chum salmon were first observed on the second day of project operations in 2015 and the first day in 2016. Chum salmon median passage occurred on July 8 in 2015 and about 5 days earlier (July 3) in 2016 (Appendices G1–G2).

Fish River chum salmon ASL samples were not collected in 2015 and 2016.

Pink Salmon

Annual escapement of pink salmon at Fish River tower was 218,525 fish in 2015 and 1,282,892 fish in 2016 (Table 11).

Pink salmon were first observed on June 29 in 2015 and about a week earlier in 2016. Pink salmon median passage occurred on July 22 in 2015 and was not calculated in 2016 (Appendices G1–G2).

ASL samples were not collected for pink salmon at Fish River tower.

Chinook Salmon

Annual escapement of Chinook salmon at Fish River tower was 2,299 in 2015 and 838 in 2016 (Table 11).

Chinook salmon were first observed on June 20 and June 21 in 2015 and 2016. Chinook salmon median passage occurred on July 5 in 2015 and about a week earlier (June 29) in 2016 (Appendices G1–G2).

ASL samples were not collected for Chinook salmon at Fish River tower.

Coho Salmon

Annual escapement of coho salmon at Fish River tower was 14,729 fish in 2015 and 3,300 fish in 2016 (Table 11).

Coho salmon were first observed in mid-July in both 2015 and 2016. Coho salmon median passage occurred on August 15 in 2015 and was not calculated in 2016 (Appendices G1–G2).

ASL samples were not collected for coho salmon at Fish River tower.

Environmental Conditions

Water levels in 2015 were within acceptable ranges to allow continuous tower operations. In 2016 high water hindered counting in mid-July and finally halted operations on July 30 (Figure 8; Appendix G3).

KWINIUK RIVER

Chum Salmon

Annual escapement of chum salmon at Kwiniuk River tower was 37,812 salmon in 2015 and 8,526 salmon in 2016. The 2015 escapement was the fifth largest since 1995 and the 2016 escapement was the third smallest since 1995 (Table 12).

Chum salmon were observed from the beginning of the season in mid-June until the first week of August in both 2015 and 2016. Chum salmon median passage occurred on July 5 in 2015 and 4 days earlier (July 1) in 2016 (Appendices H1–H2).

Kwiniuk River chum salmon ASL sample size was 185 fish in 2015. Age composition was predominantly age-0.4 and age-0.3 made up about a quarter of the aged salmon. Approximately 51% of the sampled fish were female in 2015. In 2016, chum salmon ASL samples were insufficient to meet minimum sample size requirements (Appendix H3).

Pink Salmon

Annual escapement of pink salmon at Kwiniuk River tower was 67,295 fish in 2015 and 1,909,949 salmon in 2016. The 2015 escapement was the second largest odd-year count since 1995 and 2016 was the second highest even-year escapement of pink salmon since 1995 (Table 12).

Pink salmon appeared on June 18 in 2015 and a couple days later (June 21) in 2016 and were present throughout most of the project in both years. Pink salmon median passage occurred on July 21 in 2015 and about 1 week earlier (July 13) in 2016 (Appendices H1–H2).

ASL samples were not collected for pink salmon at Kwiniuk River tower.

Chinook Salmon

Annual escapement of Chinook salmon at Kwiniuk River tower was 318 salmon in 2015 and 135 salmon in 2016. Both escapements were within the ranges of escapements at this project (Table 12).

Chinook salmon were first observed on June 23 in 2015 and a couple of days later (June 26) in 2016. Chinook salmon were present generally through mid-July in both years. Chinook salmon median passage occurred on July 6 in 2015 and July 3 in 2016 (Appendices H1–H2).

ASL samples were not collected in 2015 and 2016 for Chinook salmon at Kwiniuk River tower (Appendix H4).

Coho Salmon

Annual escapement of coho salmon at Kwiniuk River tower was 6,252 fish in 2015 and 9,210 fish in 2016. Coho escapement in both years was within the range of historical escapements (Table 12).

Coho salmon were first observed July 20 in 2015 and a few days earlier in 2016. Coho salmon median passage occurred on August 17 in 2015 and about 11 days later (August 28) in 2016 (Appendices H1–H2).

ASL samples were not collected in 2015 and 2016 for coho salmon at Kwiniuk River tower (Appendix H5).

Environmental Conditions

Water levels in 2015 and 2016 were generally within acceptable ranges to allow for continuous tower operations. There was 1 high water event in 2015 and 2 high water events in 2016 that hindered counting (Figure 9; Appendix H6).

INGLUTALIK RIVER

Although coho salmon were present during tower operations, the total run of coho salmon was not monitored; therefore, escapements should be considered minimum estimates (Table 13). In 2016 high water rendered the counting tower inoperable after July 17; therefore, all escapements should be considered minimum estimates.

Chum Salmon

Annual escapement of chum salmon at Inglutalik River tower was 82,156 salmon in 2015 and 43,226 salmon in 2016 (Table 13).

The first chum salmon was observed at Inglutalik River tower on June 23 in 2015 and on June 17 in 2016. Chum salmon median passage occurred on July 20 in 2015 and was not calculated in 2016 (Appendices I1–I2).

Chum salmon ASL sample size was 86 fish in 2015. Sex composition was 42% female and the sample size was insufficient for age composition analysis. Chum salmon ASL samples were not collected in 2016 (Appendix I3).

Pink Salmon

Annual escapement of pink salmon at Inglutalik River tower was 1,041,693 salmon in 2015 and 78,916 salmon in 2016 (Table 13). Pink salmon escapements to Inglutalik River appear to be opposite of other river systems. That is, pink salmon abundance is highest in odd years and most of the monitored runs in Norton Sound are more abundant in even years.

The first pink salmon was observed at Inglutalik River tower on June 23 in 2015 and on June 26 in 2016. Pink salmon median passage occurred July 27 in 2015 and was not calculated in 2016 (Appendices I1–I2).

ASL samples were not collected for pink salmon at Inglutalik River tower.

Chinook Salmon

Annual escapement of Chinook salmon at Inglutalik River tower was 1,543 fish in 2015 and 3,285 salmon in 2016 (Table 13).

The first Chinook salmon was observed at Inglutalik River tower on June 23 in 2015 and on June 17 in 2016. Chinook salmon median passage occurred on July 5 in 2015 and was about a week earlier (June 29) in 2016 (Appendices I1–I2).

ASL samples were not collected for Chinook salmon at Inglutalik River tower.

Environmental Conditions

Water levels in 2015 hindered counting operations 2 times in August and high water in 2016 halted counting operations the third week of July (Figure 10; Appendix I4).

SHAKTOOLIK RIVER

Although coho salmon are present during tower operations, the total run of coho salmon was not monitored therefore escapements should be considered minimum estimates (Table 14). In 2016 high water rendered the counting tower inoperable after July 18; therefore, all escapements should be considered minimum estimates.

Chum Salmon

Annual escapement of chum salmon at Shaktoolik River tower was 31,895 salmon in 2015 and 14,907 salmon in 2016 (Table 14).

The first chum salmon was observed at Shaktoolik River tower on June 15 in 2015 and a couple days earlier on June 12 in 2016. Chum salmon median passage occurred on July 11 in 2015 and was not calculated in 2016 (Appendices J1–J2).

ASL samples for chum salmon ASL sample size was 186 fish in 2015. Age-0.3 chum salmon were the predominant age class (50%) and age-0.4 was the next most abundant (44%). In 2016, chum salmon ASL samples were insufficient to meet minimum sample size requirements (Appendix J3).

Pink Salmon

Annual escapement of pink salmon at Shaktoolik River tower was 491,445 salmon in 2015 and 1,206,892 salmon in 2016 (Table 14).

The first pink salmon was observed at Shaktoolik River tower at the end of June in 2015 and about a week earlier in 2016. Pink salmon median passage occurred July 18 in 2015 and was not calculated in 2016 (Appendices J1–J2).

ASL samples were not collected for pink salmon at Shaktoolik River tower.

Chinook Salmon

Annual escapement of Chinook salmon at Shaktoolik River tower was 654 salmon in 2015 and 354 salmon in 2016 (Table 14).

The first Chinook salmon was observed at Shaktoolik River tower on June 19 in 2015 and 3 days earlier on June 16 in 2016. Chinook salmon median passage occurred on July 5 in 2015 and about 1 week earlier (June 30) in 2016 (Appendices J1–J2).

Chinook salmon ASL samples were insufficient to meet minimum sample size requirements in 2015 and 2016 (Appendix J4).

Environmental Conditions

Water levels in 2015 hindered counting operations 2 times in August and high water in 2016 halted counting operations in the middle of July (Figure 11; Appendix J6).

NORTH RIVER

Counting operations in 2016 were hindered by high water for a large segment of the season: from July 20–August 19 and again from August 25 through August 26. Interpolation could not be completed because diurnal patterns could be not established. Therefore, escapements should be considered minimum estimates.

Chum Salmon

Annual escapement of chum salmon at North River tower was 23,100 fish in 2015 and 16,014 fish in 2016. The 2015 chum salmon escapement was the largest since 1996. Despite incomplete counts, the 2016 escapement was the fourth largest escapement since 1996 (Table 15).

Chum salmon were first observed in the third week of June in both 2015 and 2016. Chum salmon median passage occurred in mid-July in 2015 and was not calculated for 2016 (Appendices K1–K2).

ASL samples were not collected for chum salmon at North River tower in 2015 and 2016 (Appendix K3).

Pink Salmon

Annual escapement of pink salmon at North River tower was 465,681 salmon in 2015 and 1,045,410 salmon in 2016. The 2015 pink salmon escapement was the second highest odd-year escapement since 1996 and the 2016 escapement, despite being incomplete was third largest even-year escapement since 1996 (Table 15).

Pink salmon were first observed the third week of June in both 2015 and 2016. Pink salmon median passage occurred on July 23 in 2016 and was not calculated for 2016 (Appendices K1–K2).

ASL samples were not collected for pink salmon at North River tower.

Chinook Salmon

Annual escapement of Chinook salmon at North River tower was 1,950 fish in 2015 and 513 fish in 2016. The 2015 Chinook salmon escapement was within the historical range of escapements (Table 15).

Chinook salmon were first observed on June 20 in 2015 and about a week later in 2016. Chinook salmon median passage occurred July 12 in 2015 and was not calculated for 2016 (Appendices K1–K2).

ASL samples were not collected for Chinook salmon at North River tower in 2015 and 2016 (Appendix K4).

Coho Salmon

Annual escapement of coho salmon at North River tower was 9,432 fish in 2015 and 2,241 fish in 2016. The 2015 coho salmon escapement was similar to escapements during the late 1990s and early 2000s (Table 15).

Coho salmon were first observed in the third week of July in 2015 and first counted the third week of August in 2016. Coho salmon median passage occurred in mid-August in 2015 and was not calculated in 2016 (Appendices K1–K2).

ASL samples were not collected for coho salmon at North River tower in 2015 and 2016 (Appendix K5).

Environmental Conditions

Water levels in 2015 hindered counting for a week in late August. In 2016, high water ceased counting operations for a month in the middle of the project (Figure 12; Appendix K6).

UNALAKLEET RIVER

Although sockeye salmon were not present in large enough numbers to present results, minor runs did exist in Unalakleet River (Table 16). High water in 2016 rendered the project inoperable after July 22; therefore, escapements of chum and pink salmon were incomplete.

Chum Salmon

Annual escapement of chum salmon at Unalakleet River weir was 97,885 salmon in 2015 and 31,756 salmon in 2016 (Table 16).

Chum salmon were observed from the third day of project operations (June 19) in 2015 and about a week earlier in 2016. Chum salmon median passage occurred on July 14 in 2015 and was not calculated in 2016 (Appendices L1–L2).

Unalakleet River chum salmon ASL sample sizes were 206 in 2015 and 90 in 2016. Female composition was 49% in 2015 and 54% in 2016. Age-0.3 fish were the predominant age class in 2015. The 2016 sample size did not meet minimum requirements to estimate age composition (Appendix L3).

Pink Salmon

Annual escapement of pink salmon at Unalakleet River weir was 1,616,042 salmon in 2015 and 4,752,639 salmon in 2016 (Table 16).

Pink salmon were first observed on June 22 in 2015 and about a week earlier in 2016. Pink salmon median passage occurred on July 25 in 2015 and was not calculated in 2016 (Appendices L1–L2).

ASL samples were not collected for pink salmon at Unalakleet River weir.

Chinook Salmon

Annual escapement of Chinook salmon at Unalakleet River weir was 2,789 fish in 2015 and 505 fish in 2016 (Table 16).

Chinook salmon were first observed on June 22 in 2015 and about a week earlier in 2016. Chinook salmon median passage occurred on July 11 in 2015 and about 5 days earlier (July 6) in 2016 (Appendices L1–L2).

Unalakleet River Chinook salmon ASL sample sizes were 180 in 2015 and 18 in 2016. Female composition was 37% and age-1.3 salmon were the predominant age class in 2015. In 2016 sample size did not meet the minimum requirements to estimate female proportion and age composition (Appendix L4).

Coho Salmon

Annual escapement of coho salmon at Unalakleet River weir was 40,964 fish in 2015 and 132 fish in 2016 (Table 16). Project operations do not encompass the entire coho salmon run and these escapements should be considered minimum estimates.

Coho salmon were first observed the second week of July in both years (Appendices L1–L2).

ASL samples were not collected for coho salmon at Unalakleet River weir.

Environmental Conditions

Water levels in 2015 were within acceptable ranges to allow for continuous weir operations. In 2016 high water halted the counting project the third week of July (Figure 14; Appendix L5).

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REFERENCES CITED

- Bavilla, J., D. Bue, H. Carroll, T. Elison, D. Taylor, J. Estensen and C. Brazil. 2010. 2009 Kuskokwim area management report. Alaska Department of Fish and Game, Fishery Management Report No. 10-56, Anchorage.
- Bromaghin, J. F. 1993. Sample size determination for interval estimation of multinomial probabilities. *American Statistics* 47(3): 203–206.
- Clutter, R., and L. Whitesel. 1956. Collection and interpretation of sockeye salmon scales. *Bulletin of International Pacific Salmon Fisheries Commission* No. 9. Vancouver, British Columbia.
- Cochran, W. G. 1977. *Sampling techniques*, third edition. John Wiley, New York.
- Dunmall, K. 2008. Kawerak, Inc. Norton Sound salmon escapement projects: Summary of Snake River 1995-2007, Eldorado River 1997–2007, and Pilgrim River 2003–2007. Kawerak, Inc., Fisheries Department, Nome, Alaska.

REFERENCES CITED (Continued)

- Hamazaki, T. 2003. Kwiniuk River salmon counting tower project review and variance estimation. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A03-20, Anchorage.
- Hamazaki, T., L. I. Wilson, and G. Todd. 2012. Sockeye salmon studies in Salmon Lake; limnology and fishery investigations relative to a nutrient addition program, 1994-2008. Alaska Department of Fish and Game, Fishery Data Series No. 12-28, Anchorage.
- Johnson P. N., and W. W. Jones. 2007. Feasibility of using dual-frequency identification sonar (DIDSON) for estimating abundance of adult salmon in the Shaktolik River, Alaska. LGL Northwest, North Bonneville, WA.
- Jones, W. W., and G. Knuepfer. 2002. Niukluk River salmon counting tower project 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A02-46, Anchorage.
- Jones, W. W. 2006. North River salmon counting tower project, 2002-2004. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A06-04, Anchorage.
- Kohler, T. 2002. Eldorado River salmon counting tower project summary report, 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A02-14, Anchorage.
- Koo, T. S. Y. 1962. Age designation on salmon. Pages 37-48 [In]: T. S. Y. Koo, editor, Studies of Alaska red salmon. University of Washington Publications in Fisheries, New Series, Volume I, Seattle.
- Lean, C. 1987. Norton Sound-Kotzebue escapement report #47. Alaska Department of Fish and Game, Division of Commercial Fisheries, NSK Report No. 47, Anchorage.
- Linderman, J. C., D. B. Molyneaux, L. DuBois, and W. Morgan. 2002. Tatlawiksuk River weir salmon studies 1998-2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A02-11, Anchorage.
- Mosher, K. H. 1969. Identification of Pacific salmon and steelhead trout by scale characteristics. United States Department of the Interior, U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington D.C., Circular 317.
- Parker, D. 2008. Open file report 110. Glacial Lake sockeye salmon restoration project, 2000 to 2005. Bureau of Land Management.
- Perry-Plake, L. J., and A. B. Antonovich. 2009. Chinook salmon escapement in the Gulkana River, 2007-2008. Alaska Department of Fish and Game, Fishery Data Series No. 09-35, Anchorage.
- Rob, P. J. 1995. Eldorado River counting tower: project completion report 1995. A cooperative project funded by Sitnasuak Native Corporation. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Nome.
- Stewart, R. 2003. Techniques for installing a resistance board fish weir. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A03-26, Anchorage.
- Stewart, R., C. Goods, and C. A. Shelden. 2010. Takotna River salmon studies, 2009. Alaska Department of Fish and Game, Fishery Data Series No. 10-52, Anchorage.
- Todd, G. L., and G. B. Kyle. 1997. Limnological and sockeye salmon productivity investigations in salmon and glacial lakes: project completion report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 5J97-05, Juneau.
- Waitman, S., and K. Dunmall. 2003. The Snake River, Eldorado River, and Pilgrim River salmon escapement enumeration and sampling project summary report, 2002. A report prepared for the Norton Sound Initiative.
- Whitton, K. S. 2003. Abundance and run timing of adult Pacific salmon in Big Creek, Becharof National Wildlife Refuge, Alaska, 2000-2002. U.S. Fish and Wildlife Service, King Salmon Fish and Wildlife Field Office, Alaska Fisheries Technical Report Number 65, King Salmon, Alaska.

TABLES AND FIGURES

Table 1.–Target ASL sample sizes for Norton Sound escapement projects, 2015.

Escapement project	Species	Sample size
Pilgrim weir	Chum	220
	Sockeye	225
Snake weir	Chum	210
	Coho	180
Nome weir	Chum	210
	Coho	190
Eldorado weir	Chum	220
Kwiniuk tower	Chum	220
Inglutalik tower	Chinook	210
	Chum	220
	Coho	190
Shaktoolik tower	Chinook	^a
	Chum	^a
North tower	Chinook	200
	Chum	220
	Coho	200
Unalakleet weir	Chinook	190
	Chum	215

Table 2.–Example of pulse sampling for chum salmon, Kwiniuk River tower, Norton Sound, 2016.

	Quartile date	Sampling period dates	Pulse sample size	Cumulative sample total
Quarter point	7/3	6/24–7/03	55	55
Midpoint	7/7	7/04–7/07	55	110
Three-quarter point	7/12	7/08–7/12	55	165
~90% point	7/19	7/13–7/19	55	220

Table 3.–Example of daily sampling goals for chum salmon, Nome River weir, Norton Sound, 2016.

	Quartile date	Sampling period dates	Number of samples collected/day	Cumulative sample total
Quarter point	7/14	7/6–7/14	6	54
Midpoint	7/22	7/15–7/22	7	110
Three-quarter point	7/30	7/23–7/30	7	166
~90% point	8/9	7/31–8/9	5	216

Table 4.—Age and sex minimum sample sizes for Norton Sound escapement projects required for age and sex composition estimates with 90% and 95% confidence intervals, respectively.

Escapement project	Species	Year	
		2015	2016
Pilgrim weir	Chum	121/73	121/73
	Sockeye	130/73	130/73
Snake weir	Chum	118/72	117/71
	Coho	103*/70*	102*/69*
Nome weir	Chum	119/72	118/72
	Coho	105*/71*	105*/71*
Eldorado weir	Chum	121/73	121/73
Kwiniuk tower	Chum	121/73	120/72
Inglutalik tower	Chinook	121*/70*	95*/66*
	Chum	121*/72	121*/73*
	Coho	108*/72*	126*/71*
Shaktoolik tower	Chinook	131*/73*	131*/73*
	Chum	122/73	122*/73
North tower	Chinook	123*/70*	104*/64*
	Chum	121*/73*	121*/73*
	Coho	108*/72*	121*/73*
Unalakleet weir	Chinook	125/71	80*/54*
	Chum	121/73	120*/72

Note: Age minimum sample sizes are to the left of each common slash and sex minimum sample sizes are to the right of each common slash. Asterisk indicates that the target sample size was not achieved.

Table 5.—Historical salmon escapements and median passage (Med. pass.) dates, Pilgrim River weir, Port Clarence, 2003–2016.

Year	Operating period	Chum salmon		Pink salmon		Chinook salmon		Coho salmon		Sockeye salmon	
		Number	Med. pass.	Number	Med. pass.	Number	Med. pass.	Number	Med. pass.	Number	Med. pass.
2003	Jun 21–Sep 14	15,200	8/3	14,100	7/24	1,016	7/13	677	8/26	42,729	7/17
2004	Jun 21–Sep 14	10,239	7/23	50,760	7/14	925	7/9	1,573 ^a	8/22 ^a	85,417	7/11
2005	Jun 24–Sep 05	9,685	7/30	13,218	7/18	216	7/13	304	8/25	55,951	7/14
2006	Jun 30–Sep 09	45,361	8/2	17,701	7/23	275	7/22	973	9/3	52,323	7/19
2007	Jun 29–Sep 10	35,334	7/31	3,616	7/22	501	7/13	605	8/20	43,432	7/15
2008	Jun 25–Sep 01	24,550	8/2	92,471	7/22	137	7/19	260	^b	20,452	7/17
2009	Jun 26–Aug 31	5,427	^b	483	7/28	52	7/28	18	—	953	7/22
2010	Jun 24–Sep 01	25,379	8/4	29,239	7/22	44	7/28	272	^b	1,654	7/25
2011	Jun 28–Sep 01	41,740	7/30	3,364	7/31	44	^b	269	^b	8,449	7/19
2012	Jun 26–Aug 19	25,733	^b	46,201	7/20	65	^b	95	^b	7,090	7/21
2013	Jun 27–Sep 08	47,557	8/3	1,060	7/24	37	7/18	890	9/2	12,428	7/12
2014	Jun 25–Aug 26	25,634	8/2	4,197	7/14	48	7/14	425	8/16	9,719	7/23
2015	Jul 03–Aug 25	41,121	^b	2,807	7/28	99	7/15	296	^b	36,052	7/21
2016 ^c	Jun 23–Aug 23	21,379		2,986		34		554		15,066	

Note: En dash means the median passage was not calculated for less than 20 fish.

^a Count and median passage date are unreliable due to misidentification; approximately 30% of scale samples were sockeye salmon.

^b Median passage date was not calculated because the entire run was not counted. Escapement should be considered a minimum estimate.

^c From August 2 to August 6, the boat gate was underwater, which resulted in unmonitored passage of salmon. All escapements should be considered minimum estimates.

Table 6.—Historical salmon escapements and median passage (Med. pass.) dates at Glacial Lake weir, Norton Sound, 2000–2016.

Year	Operating period	Sockeye salmon	
		Number	Med. pass.
2000	Jul 12–Jul 30	884	7/21
2001	Jul 02–Jul 28	2,487	7/12
2002	Jun 25–Jul 26	1,047	7/11
2003	Jun 24–Jul 28	2,004	7/8
2004	Jun 18–Jul 25	8,115	7/2
2005	Jun 20–Jul 25	11,135	6/30
2006	Jul 04–Jul 18	6,849	7/12
2007	Jul 05–Jul 20	4,533	7/10
2008	Jun 27–Jul 28	1,794	7/8
2009	Jun 20–Jul 27	826	^a
2010	Jun 26–Jul 28	1,047	7/13
2011	Jun 28–Jul 26	1,697	7/9
2012	Jul 02–Jul 31	1,602	7/17
2013	Jun 30–Aug 12	2,544	7/11
2014	Jun 30–Aug 07	4,211	7/6
2015	Jun 24–Jul 12	9,257	^a

^a Median passage date not shown because the entire run was not counted.

Table 7.—Historical salmon escapements, standard error (SE), and median passage (Med. pass.) dates at Snake River counting tower (1995–2002) and weir (2003–2016), Norton Sound.

Year	Operating period	Chum salmon			Pink salmon			Chinook salmon			Coho salmon			Sockeye salmon	
		Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	Med. pass.
1995	Jul 01–Aug 18	4,393	a	7/22	917	a	7/30	0	a		856	a	8/13	b	b
1996	Jul 03–Aug 22	2,772	a	7/11	44,558	a	7/19	5	a	7/11	1,638	a	8/7	b	b
1997	Jul 07–Aug 18	6,184	a	7/23	6,742	a	7/28	12	a	7/12	1,157	a	8/13	b	b
1998	Jul 01–Aug 11	11,067	a	7/17	219,679	a	7/18	0	a		178	a	8/8	b	b
1999	Jul 01–Aug 14	484	a	7/30	116	a	8/7	20	a	8/10	90	a	8/10	b	b
2000	Jun 29–Aug 25	1,911	a	7/15	4,723	a	7/22	28	a	8/9	406	a	8/11	b	b
2001	Jul 08–Sep 05	2,182	a	7/20	1,295	a	8/3	33	a	8/18	1,335	a	8/24	b	b
2002	Jun 28–Sep 16	2,776	a	7/15	4,103	a	7/16	9	a	7/29	851	a	9/2	8	8/5
2003	Jun 26–Sep 11	2,201	NA	7/25	2,856	NA	7/30	50	NA	8/9	489	NA	8/23	84	8/11
2004	Jun 23–Sep 03	2,146	NA	7/13	126,917	NA	7/17	17	NA	8/24	474 ^c	NA	8/21	22	8/20
2005	Jun 27–Sep 11	2,967	NA	7/18	13,813	NA	7/23	31	NA	8/11	2,948	NA	8/28	275	8/15
2006	Jul 01–Sep 11	4,160	NA	7/19	74,028	NA	7/21	32	NA	8/16	4,776	NA	8/24	302	8/20
2007	Jul 01–Sep 11	8,147	NA	7/23	4,634	NA	7/25	61	NA	8/20	1,781	NA	8/26	1,354	9/2
2008	Jul 06–Sep 06	1,244	NA	7/26	145,761	NA	7/23	13	NA	8/29	5,206	NA	^d	143	8/30
2009	Jul 08–Aug 30	891	NA	7/25	769	NA	7/25	6	NA	–	50 ^c	NA	^d	2	–
2010	Jul 03–Sep 11	6,973	NA	7/24	51,099	NA	7/23	43	NA	8/15	2,243	NA	9/3	124	8/26
2011	Jul 09–Sep 11	4,352	NA	7/20	7,090	NA	7/25	1	NA	–	343	NA	^d	14	–
2012	Jul 06–Aug 15	978	NA	7/23	8,601	NA	^d	1	NA	–	22	NA	^d	3	–
2013	Jul 09–Sep 10	2,755	NA	7/20	1,333	NA	8/1	8	NA	–	1,203	NA	8/27	163	^e
2014	Jul 05–Sep 10	3,983	NA	7/16	20,067	NA	7/23	11	NA	–	1,424	NA	^d	86	8/9
2015	Jul 05–Sep 14	4,241	NA	7/19	16,321	NA	7/28	7	NA	–	1,638	NA	^d	56	8/27
2016	Jul 01–Sep 21	3,666	NA	7/21	204,641	NA	7/25	15	NA	–	1,115	NA	^d	120	8/17

Note: En dash means the median passage was not calculated for less than 20 fish. NA means SE not calculated because weir-based escapement is a census not an estimate.

^a Standard errors on tower counts (1995–2002) are being recovered.

^b Enumeration of sockeye salmon began in mid-July 2002, after a fixed-picket weir replaced the counting tower.

^c Aerial survey estimates in 2004 and 2009 were 1,916 and 700 coho salmon, respectively. These surveys were flown under excellent viewing conditions. Weir counts of coho salmon were lower in these years because pickets were pulled to relieve pressure on the weir during flood conditions and the majority of coho salmon escaped without being enumerated. Escapements should be considered minimum estimates and median passages were not estimated.

^d Median passage date was not calculated because the entire run was not counted. Escapement should be considered a minimum estimate.

^e Median passage not shown because the majority of sockeye salmon were counted over 2 days.

Table 8.– Historical salmon escapements, standard errors (SE), and median passage (Med. pass.) dates at Nome River counting tower (1993–1995) and weir (1996–2016), Norton Sound.

Year	Operating period	Chum salmon			Pink salmon			Chinook salmon			Coho salmon			Sockeye salmon	
		Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	Med. pass.
1993 ^a	Jul 25–Aug 28	1,859			13,036			63			4,349			^c	^c
1994	Jun 24–Aug 15	2,969	^b	7/15	142,604	^b	7/23	54	^b	7/19	726	^b	8/4	^c	^c
1995	Jun 22–Sep 06	5,093	^b	7/20	13,893	^b	7/30	5	^b	7/9	1,650	^b	8/22	^c	^c
1996 ^a	Jun 26–Jul 23	3,339	NA		95,681	NA		5	NA		66	NA		^c	^c
1997	Jun 27–Aug 27	5,147	NA	7/19	8,035	NA	7/29	22	NA	7/18	321	NA	8/13	^c	^c
1998 ^a	Jul 01–Aug 11	1,930	NA		359,469	NA		70	NA		96	NA		^c	^c
1999	Jul 02–Aug 25	1,048	NA	7/31	2,033	NA	8/7	3	NA	–	417	NA	8/19	6	–
2000	Jun 29–Aug 25	4,056	NA	7/18	41,673	NA	7/23	25	NA	8/16	698	NA	8/20	19	–
2001	Jul 08–Sep 11	2,859	NA	7/21	3,138	NA	8/4	7	NA	–	2,418	NA	8/27	55	8/4
2002	Jun 29–Sep 11	1,720	NA	7/17	35,057	NA	7/17	7	NA	–	3,418	NA	8/30	29	8/4
2003	Jul 05–Sep 10	1,957	NA	7/26	11,402	NA	7/30	12	NA	–	548	NA	8/28	47	8/11
2004	Jun 25–Sep 08	3,903	NA	7/16	1,051,146	NA	7/15	51	NA	7/27	2,283	NA	8/27	114	8/21
2005	Jun 27–Sep 11	5,584	NA	7/18	285,759	NA	7/21	69	NA	8/9	5,848	NA	8/28	381	8/25
2006	Jul 02–Sep 07	5,677	NA	7/14	578,555	NA	7/14	43	NA	8/13	8,308	NA	8/26	196	7/17
2007	Jul 04–Sep 16	7,034	NA	7/23	24,395	NA	7/29	13	NA	–	2,437	NA	8/23	534	9/1
2008	Jul 02–Sep 17	2,607	NA	7/26	1,186,554	NA	7/24	28	NA	7/13	4,605	NA	^d	90	8/12
2009	Jul 03–Sep 20	1,565	NA	7/28	16,490	NA	7/26	10	NA	–	1,370	NA	^d	103	7/29
2010	Jun 30–Sep 16	5,877	NA	7/24	165,934	NA	7/22	9	NA	–	4,114	NA	8/30	43	8/11
2011	Jul 06–Sep 12	3,578	NA	7/21	14,384	NA	7/29	12	NA	–	1,831	NA	^d	22	9/6
2012	Jul 05–Aug 15	2,028	NA	^d	151,791	NA	7/23	6	NA	–	237	NA	^d	48	7/19
2013	Jul 05–Sep 16	4,811	NA	7/23	10,257	NA	7/25	14	NA	–	2,624	NA	8/26	38	8/17
2014	Jul 05–Sep 11	5,589	NA	7/17	96,397	NA	7/26	8	NA	–	2,637	NA	^d	34	8/7
2015	Jul 02–Sep 20	6,111	NA	7/22	75,603	NA	7/27	23	NA	8/3	2,418	NA	^d	96	8/4
2016	Jun 30–Sep 20	7,093	NA	7/20	1,175,723	NA	7/25	25	NA	8/10	2,331	NA	^d	254	8/7

Note: En dash means the median passage was not calculated for less than 20 fish. NA means SE not calculated because weir-based escapement is a census not an estimate.

^a Median passage dates and standard errors not shown because the target operational period for project was not fully monitored. Escapements should be considered minimum estimates.

^b Standard errors for tower counts (1993–1995) are being recovered.

^c Enumeration of sockeye salmon began in 1999.

^d Median passage date was not calculated because the entire run was not counted. Escapement should be considered a minimum estimate.

Table 9.—Historical salmon escapements, standard errors (SE), and median passage (Med. pass.) dates at Eldorado River counting tower (1997–2002) and weir (2003–2016), Norton Sound.

Year	Operating period	Chum salmon			Pink salmon			Chinook salmon			Coho salmon			Sockeye salmon	
		Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	Med. pass.
1997	Jun 29–Aug 19	14,302	^a	7/15	1,022	^a	8/9	98	^a	7/16	194	^a	8/9	^c	^c
1998	Jun 29–Aug 12	13,808	^a	7/12	137,283	^a	7/13	^b	^a	^b	21	^a	8/9	^c	^c
1999	Jul 10–Sep 01	4,218	^a	7/19	977	^a	8/9	28	^a	7/21	510	^a	8/25	^c	^c
2000	Jun 29–Aug 25	11,617	^a	7/10	55,992	^a	7/12	33	^a	7/9	192	^a	8/19	^c	^c
2001	Jul 08–Sep 13	11,635	^a	7/14	488	^a	8/7	50	^a	7/19	1,509	^a	9/2	^c	^c
2002	Jun 24–Sep 10	10,215	^a	7/10	119,098	^a	7/10	26	^a	7/8	540	^a	9/6	10	—
2003	Jun 21–Sep 08	3,591	NA	7/17	173	NA	7/24	29	NA	7/18	115	NA	8/26	0	—
2004	Jun 22–Sep 09	3,277	NA	7/9	60,866	NA	7/11	25	NA	7/15	1,151	NA	9/1	57	8/27
2005	Jun 23–Sep 02	10,369	NA	7/15	12,356	NA	7/22	32	NA	8/10	689	NA	8/28	10	—
2006	Jun 26–Aug 03	42,105	NA	7/15	222,348	NA	7/17	41	NA	7/12	55	NA	7/29	1	—
2007	Jun 26–Aug 03	21,312	NA	7/14	833	NA	7/21	14	NA	—	2	NA	—	22	7/31
2008	Jun 27–Jul 31	6,746	NA	^d	244,641	NA	^d	36	NA	7/13	38	NA	^d	3	—
2009	Jul 02–Aug 03	4,943	NA	7/18	1,119	NA	7/23	31	NA	7/23	2	NA	—	0	—
2010	Jun 30–Jul 24	21,211	NA	^d	48,136	NA	^d	23	NA	—	2	NA	—	8	—
2011	Jul 01–Aug 03	16,273	NA	7/12	507	NA	^d	3	NA	—	1	NA	—	0	—
2012	Jul 02–Jul 25	13,348	NA	^d	59,318	NA	^d	0	NA	—	1	NA	—	0	—
2013	Jun 29–Aug 05	26,111	NA	7/16	1,029	NA	^d	9	NA	—	15	NA	—	0	—
2014	Jun 23–Jul 27	27,054	NA	^d	46,746	NA	^d	18	NA	—	0	NA	—	0	—
2015	Jun 22–Jul 30	25,560	NA	^d	1,483	NA	^d	25	NA	7/14	1	NA	—	0	—
2016	Jun 25–Aug 02	18,938	NA	^d	42,699	NA	^d	0	NA	—	41	NA	^d	16	—

Note: En dash means the median passage was not calculated for less than 20 fish. NA means SE not calculated because weir-based escapement is a census not an estimate.

^a Standard errors for tower counts (1993–1995) are being recovered.

^b 1998 Eldorado River Chinook salmon count of 446 fish was not considered reliable and no median passage date was estimated.

^c Enumeration of sockeye salmon began in 2002.

^d Median passage date was not calculated because the entire run was not counted. Escapement should be considered a minimum estimate.

Table 10.—Salmon escapements and median passage (Med. pass.) dates at the Solomon River weir, Norton Sound, 2013–2016.

Year	Operating period	Chum salmon		Pink salmon		Coho salmon		Sockeye salmon	
		Number	Med. pass.	Number	Med. pass.	Number	Med. pass.	Number	Med. pass.
2013	Jul 05–Aug 26	1,377	7/21	2,733	7/24	168	^a	3	—
2014	Jul 02–Aug 20	1,502	7/20	20,616	7/21	79	^a	0	—
2015	Jun 26–Aug 24	1,128	7/22	18,764	7/28	46	^a	3	—
2016	Jun 30–Aug 18	2,016	7/17	128,046	7/23	215	^a	11	—

Note: En dash means the median passage was not calculated for less than 20 fish.

^a Median passage date was not calculated because the entire run was not counted. Escapement should be considered a minimum estimate.

Table 11.—Salmon escapements, standard errors (SE), and median passage (Med. pass.) dates at the Fish River counting tower, Norton Sound, 2014–2016.

Year	Operating period	Chum salmon			Pink salmon			Chinook salmon			Coho salmon		
		Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.
2014 ^a	Jun 18–Aug 31	63,348			312,498			1,205			18,278		
2015	Jun 19–Aug 24	144,690	3,718	7/8	218,525	3,633	7/22	2,299	136	7/5	14,729	397	8/15
2016	Jun 18–Jul 30	71,005	1,574	7/3	1,282,892	^b	^b	838	71	6/29	3,300	^b	^b

^a Counting was predominantly completed on one bank of the river; therefore, interpolation of missed counts was only completed for that bank, and total escapement should be considered a minimum estimate. Median passage dates and standard errors not shown because the entire run was not fully monitored.

^b Median passage date and standard error was not calculated because the entire run was not counted. Escapement should be considered a minimum estimate.

Table 12.—Historical salmon escapements, standard errors (SE), and median passage (Med. pass.) dates at Kwiniuk River counting tower, Norton Sound, 1965–2016.

Year	Operating period	Chum salmon			Pink salmon			Chinook salmon			Coho salmon		
		Number	SE	Med. pass.	Number	SE	Med. pass.	Number ^b	SE	Med. pass.	Number	SE	Med. pass.
1965	Jun 18–Jul 19	32,860	a	—	8,643	a	—	19	a	—	ND		—
1966	Jun 19–Jul 28	32,751	a	—	10,933	a	—	7	a	—	ND		—
1967	Jun 18–Jul 28	26,436	a	—	3,615	a	—	13	a	—	ND		—
1968	Jun 18–Jul 24	18,993	a	—	129,150	a	—	26	a	—	ND		—
1969	Jun 26–Jul 26	19,800	a	—	57,509	a	—	12	a	—	ND		—
1970	Jun 25–Jul 29	68,527	685	—	235,371	2,354	—	ND		—	ND		—
1971	Jun 29–Jul 29	39,206	392	—	16,599	166	—	ND		—	ND		—
1972	Jun 28–Jul 27	30,922	309	—	62,526	625	—	ND		—	ND		—
1973	Jun 25–Jul 25	28,837	288	—	38,466	385	—	ND		—	ND		—
1974	Jun 20–Jul 26	36,183	362	—	40,858	409	—	ND		—	ND		—
1975	July 04–Jul 26	14,454	145	—	57,318	573	—	ND		—	ND		—
1976	July 04–Jul 25	6,914	69	—	27,735	277	—	ND		—	ND		—
1977	Jun 26–Jul 25	22,890	229	—	46,156	462	—	ND		—	ND		—
1978	Jul 04–Jul 22	11,298	113	—	73,727	737	—	ND		—	ND		—
1979	Jun 28–Jul 25	12,189	122	—	168,732	1,687	—	ND		—	ND		—
1980	Jun 22–Jul 28	19,538	195	—	325,905	3,259	—	ND		—	ND		—
1981	Jun 19–Aug 02	34,309	686	7/9	555,723	11,114	7/21	ND		7/4	ND		NA
1982	Jun 21–Jul 26	42,023	840	7/5	455,366	9,107	7/8	ND		7/7	ND		NA
1983	Jun 19–Jul 27	52,914	1,587	7/5	166,197	3,324	7/19	ND		7/3	ND		NA
1984	Jun 19–Jul 25	53,195	1,596	7/3	720,226	36,011	7/10	ND		7/11	ND		NA
1985	Jun 26–Jul 28	9,859	197	7/13	18,087	3,617	7/16	959	173	7/20	ND		NA
1986	Jun 19–Jul 26	85,908	3,436	7/5	831,031	49,862	7/8	2390	191	7/5	ND		NA
1987	Jun 25–Jul 23	16,306	326	7/6	5,665	227	7/17	266	8	7/13	ND		NA
1988	Jun 18–Jul 26	13,313	799	6/30	19,482	584	7/11	318	92	7/10	ND		NA
1989	Jun 27–Jul 27	9,758	195	7/3	28,796	288	7/16	245	15	7/7	54	4	c
1990	Jun 21–Jul 25	14,052	281	7/4	774,586	775	7/8	940	94	7/2	ND		NA
1991	Jun 18–Jul 27	19,731	592	7/12	53,541	1,071	7/23	578	52	7/3	ND		NA
1992	Jun 27–Jul 28	23,228	2,555	7/8	1,186,630	177,995	7/17	455	18	7/16	ND		NA
1993	Jun 27–Jul 27	15,888	318	7/11	43,341	867	7/20	683	61	7/9	ND		NA

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Table 12.–Page 2 of 2.

Year	Operating period	Chum salmon			Pink salmon			Chinook salmon			Coho salmon		
		Number	SE	Med. pass.	Number	SE	Med. pass.	Number ^b	SE	Med. pass.	Number	SE	Med. pass.
1994	Jun 23–Aug 09	31,495	630	7/5	2,264,050	67,922	7/16	578	29	7/12	2,917	^c	^c
1995	Jun 21–Jul 26	34,828	697	7/6	17,148	1,886	7/18	462	14	7/8	114	^c	^c
1996	Jun 20–Jul 25	27,556	827	6/30	946,677	28,400	7/10	588	47	7/6	458	^c	^c
1997	Jun 18–Jul 27	20,420	408	7/6	9,805	392	7/22	1,005	40	7/3	ND		NA
1998	Jun 18–Jul 27	18,963	474	7/7	693,660	27,746	7/22	330	17	7/9	ND		NA
1999	Jun 25–Jul 28	8,662	260	7/11	562	185	7/20	121	7	7/14	ND		NA
2000	Jun 22–Jul 27	13,764	551	7/5	803,801	64,304	7/10	147	6	7/7	ND		NA
2001	Jun 27–Sep 15	16,598	^d	7/4	8,423	^d	7/23	261	^d	7/15	9,532	^d	8/25
2002	Jun 17–Sep 11	37,995	^d	7/6	1,114,410	^d	7/10	778	^d	7/5	6,459	^d	8/23
2003	Jun 15–Sep 15	12,123	^d	7/8	22,329	^d	7/21	744	^d	7/13	5,490	^d	8/21
2004	Jun 16–Sep 14	10,362	^d	6/30	3,054,684	^d	7/10	663	^d	7/6	11,240	^d	8/25
2005	Jun 18–Sep 12	12,083	^d	7/4	341,048	^d	7/20	342	^d	7/6	12,950	^d	8/22
2006	Jun 22–Sep 12	39,519	^d	7/6	1,347,090	^d	7/11	195	^d	7/10	22,341	^d	8/19
2007	Jun 21–Sep 10	27,756	^d	7/6	54,255	^d	7/21	258	^d	7/8	9,429	^d	8/15
2008	Jun 23–Sep 07	9,483	394	7/4	1,444,228	60,502	7/7	237	29	7/7	10,462	431	8/18
2009	Jun 24–Sep 13	8,739	580	7/12	42,963	2,440	7/22	444	38	7/13	8,705	^c	^c
2010	Jun 25–Sep 08	71,403	9,322	7/5	634,169	86,381	7/10	138	26	7/8	8,058	^c	^c
2011	Jun 20–Sep 11	32,239	4,480	7/8	30,913	3,904	7/28	57	19	7/9	3,290	^c	^c
2012	Jun 23–Aug 16	5,577	364	7/9	393,030	21,073	7/12	60	18	7/19	781	^c	^c
2013	Jun 23–Sep 11	5,625	636	7/13	13,212	790	7/24	15	6	–	3,729	^c	^c
2014	Jun 15–Sep 09	39,774	2,478	7/4	322,830	12,207	7/8	438	48	7/5	14,637	898	8/14
2015	Jun 15–Sep 03	37,812	4,503	7/5	67,295	4,472	7/21	318	39	7/6	6,252	475	8/17
2016	Jun 17–Sep 16	8,526	462	7/1	1,909,949	64,752	7/13	135	18	7/3	9,210	406	8/28

Source: From 1965 to 2000, escapement and SE data are from Hamazaki 2003.

Note: En dash means the median passage was not calculated 1965–1980 and for less than 20 fish in years after 1980.

- ^a From 1965 to 1969, there are no standard errors because the entire run was not counted. Escapements should be considered minimum estimates
- ^b From 1965 to 1984, Chinook salmon hourly counts were not expanded to account for passage of fish while not actively monitoring salmon passage (30 min/hour). From 1985 and after, counts were expanded to account for passage while salmon passage was not actively monitored.
- ^c Median passage date and standard error not shown because the entire run was not counted. Escapement should be considered a minimum estimate.
- ^d Standard errors for 2001–2007 are being recovered.

Table 13.—Salmon escapements, standard errors (SE), and median passage (Med. pass.) dates at Inglutalik River counting tower, Norton Sound, 2011–2016.

		Chum salmon			Pink salmon			Chinook salmon			Coho salmon		
Year	Operating period	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.
2011	Jun 24–Aug 12	62,897	3,434	7/12	475,167	26,650	7/27	1,469	134	7/5	862	^a	^a
2012	Jun 21–Aug 23	33,123	1,535	7/13	90,831	3,246	7/16	1,159	73	7/12	1,431	69	8/10
2013	Jun 21–Aug 11	51,099	^b	^b	201,438	^b	^b	3,411	^b	^b	4,488	^b	^b
2014	Jun 20–Jul 12	62,153	^a	^a	61,752	^a	^a	1,676	^a	^a	978	^a	^a
2015	Jun 23–Aug 21	82,156	6,296	7/20	1,041,693	55,920	7/27	1,543	164	7/5	8,247	^a	^a
2016	Jun 16–Jul 17	43,226	^a	^a	78,916	^a	^a	3,285	240	6/29	693	^a	^a

^a Median passage date and standard error not shown because the entire run was not counted. Escapement should be considered a minimum estimate.

^b Median passage date and standard error not shown because counting did not occur during all hours of the day; therefore, interpolation of missed passage could not be completed. Escapement should be considered a minimum estimate.

Table 14.—Salmon escapements, standard errors (SE), and median passage (Med. pass.) dates at Shaktoolik River counting tower, Norton Sound, 2015–2016.

		Chum salmon			Pink salmon			Chinook salmon			Coho salmon		
Year	Operating period	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.
2015	Jun 10–Aug 21	31,895	2,051	7/11	491,445	18,481	7/18	654	54	7/5	10,863	^a	^a
2016	Jun 10–Jul 18	14,907	^a	^a	1,206,892	^a	^a	354	36	6/30	498	^a	^a

^a Median passage date and standard error not shown because the entire run was not counted. Escapement should be considered a minimum estimate.

Table 15.—Historical salmon escapements, standard error (SE), and median passage (Med. pass.) dates at North River tower, Norton Sound, 1972–1974, 1984–1986, and 1996–2016.

Year	Operating period	Chum salmon			Pink salmon			Chinook salmon			Coho salmon		
		Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.	Number	SE	Med. pass.
1972	Jul 07–Jul 28	2,332	a	—	54,934	a	—	561	a	—	a		—
1973	Jun 29–Jul 23	4,334	a	—	26,542	a	—	298	a	—	a		—
1974	Jun 25–Jul 17	826	a	—	143,789	a	—	196	a	—	a		—
				—			—			—			—
1984	Jun 25–Jul 28	2,915	a	—	458,387	a	—	2,844	a	—	a		—
1985	Jun 27–Aug 31	4,567	a	—	4,360	a	—	1,426	a	—	2,045	a	—
1986	Jun 25–Jul 18	3,738	a	—	236,487	a	—	1,613	a	—	a		—
1996	Jun 16–Jul 25	9,789	a	7/8	332,539	a	7/8	1,197	a	7/8	1,229	a	7/22
1997	Jun 16–Aug 21	6,904	a	7/19	127,926	a	7/21	4,185	a	7/1	5,768	a	8/12
1998	Jun 15–Aug 12	1,526	a	7/18	74,045	a	7/10	2,100	a	7/13	3,361	a	8/5
1999	Jun 30–Aug 31	5,600	a		48,993	a		1,639	a		4,792	a	
2000	Jun 17–Aug 12	4,971	a	7/11	69,703	a	7/4	1,046	a	7/8	6,961	a	8/5
2001	Jul 05–Sep 15	6,515	a		24,737	a		1,337	a		12,383	a	
2002	Jun 19–Aug 29	6,143	a	7/21	324,595	a	7/3	1,484	a	7/6	3,210	a	8/16
2003	Jun 15–Sep 13	9,859	a	7/26	280,212	a	7/19	1,452	a	7/12	5,837	a	8/10
2004	Jun 15–Sep 14	10,036	a	7/20	1,162,978	a	7/11	1,125	a	7/8	11,187	a	8/12
2005	Jun 15–Sep 15	11,984	a	7/16	1,670,934	a	7/15	1,015	a	7/6	19,189	a	8/17
2006	Jun 18–Sep 11	5,385	a	7/12	2,169,890	a	7/8	906	a	7/9	9,835	a	8/15
2007	Jun 16–Sep 05	8,046	a	7/25	583,320	a	7/22	1,948	a	7/12	19,944	a	8/6
2008	Jun 19–Sep 13	9,502	349	8/7	241,798	6,314	7/12	905	100	7/15	15,648	848	8/15
2009	Jun 19–Sep 11	9,795	413	7/22	190,289	6,741	7/21	2,357	185	7/13	22,274	c	c
2010	Jun 19–Sep 07	16,215	499	7/20	150,688	5,070	7/13	1,256	91	7/23	7,723	c	c
2011	Jun 23–Sep 08	21,396	3,124	7/15	138,542	4,195	7/26	841	104	7/12	4,975	c	c
2012	Jun 26–Aug 19	9,120	c	c	137,012	3,319	7/17	972	97	7/19	3,258	c	c
2013	Jun 21–Sep 02	11,201	441	7/25	48,097	1,898	7/20	580	65	7/18	9,115	c	c
2014	Jun 14–Sep 01	13,872	1,010	7/15	246,075	1,010	7/12	3,454	403	7/11	4,995	c	c
2015	Jun 17–Sep 08	23,100	1,131	7/17	465,681	11,302	7/23	1,950	124	7/12	9,432	575	8/18
2016	Jun 13–Sep 07	16,014	c	c	1,045,410	c	c	513	c	c	2,241	c	c

Note: En dash means the median passage was not calculated for 1972–1974 and 1984–1986.

^a Standard errors prior to 2008 are being recovered.

^b Median passage dates not shown because target operational period for project was not fully monitored. Escapements should be considered minimum estimates.

^c Median passage dates and standard errors not shown because the entire run was not counted. Escapement should be considered a minimum estimate.

Table 16.—Historical salmon escapements and median passage (Med. pass.) dates at the Unalakleet River weir, Norton Sound, 2010–2016.

Year	Operating period	Chum salmon		Pink salmon		Chinook salmon		Coho salmon		Sockeye salmon	
		Number	Med. pass.	Number	Med. pass.	Number	Med. pass.	Number	Med. pass.	Number	Med. pass.
2010	Jun 23–Jul 31	70,811	a	832,904	a	1,021	7/16	5,382	a	130	a
2011	Jun 17–Aug 07	104,050	a	354,361	a	1,030	7/18	10,231	a	181	a
2012	Jun 24–Aug 15	70,859	a	674,250	7/16	823	7/22	17,548	a	237	a
2013	Jun 20–Aug 22	106,715	7/17	143,250	7/23	667	7/11	25,550	a	217	7/18
2014	Jun 28–Aug 27	55,341	a	1,194,708	a	1,126	a	44,524	a	206	a
2015	Jun 17–Aug 15	97,885	7/14	1,616,042	7/25	2,789	7/11	40,964	a	996	7/11
2016	Jun 10–Jul 22	31,756	a	4,752,639	a	505	7/6	132	a	580	a

^a Median passage dates and standard errors not shown because the entire run was not counted. Escapement should be considered a minimum estimate.

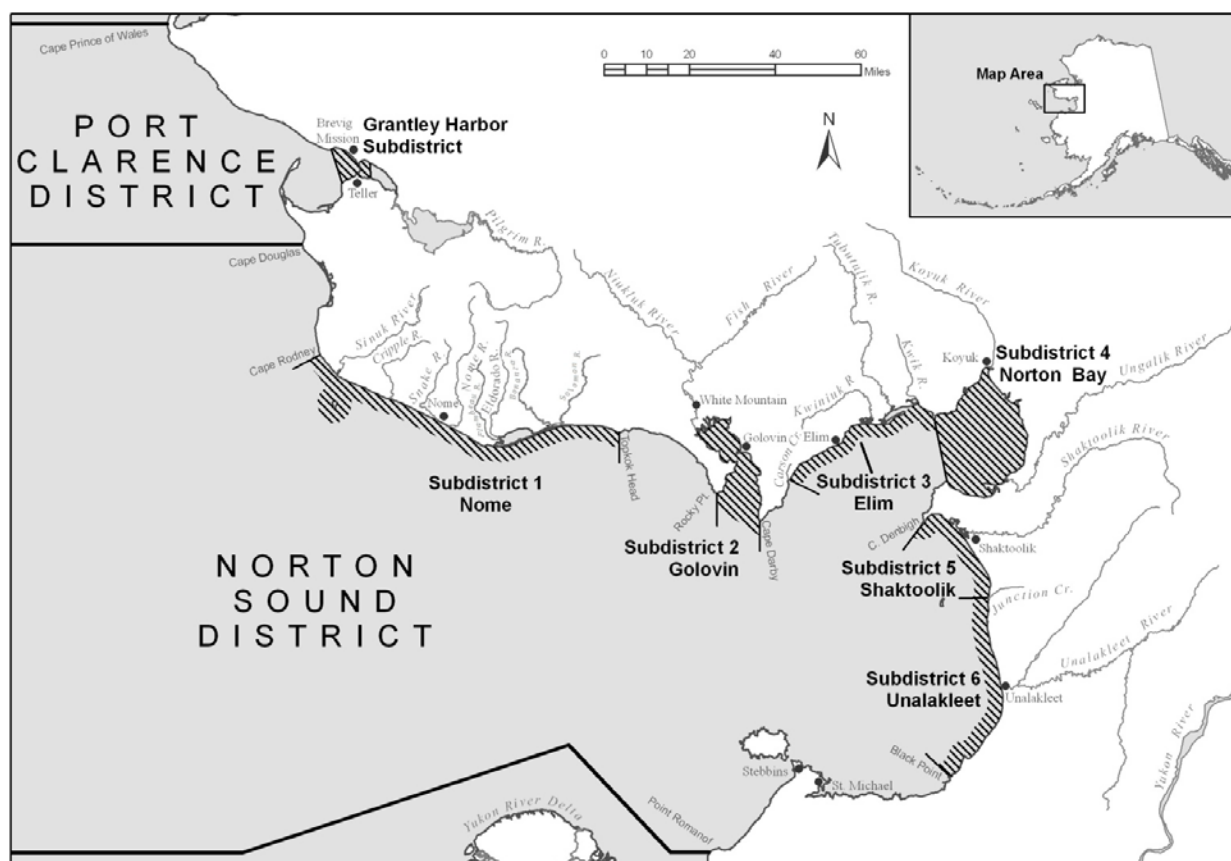


Figure 1.—Commercial salmon fishing districts and subdistricts and major salmon-producing drainages in the Norton Sound–Port Clarence Area.

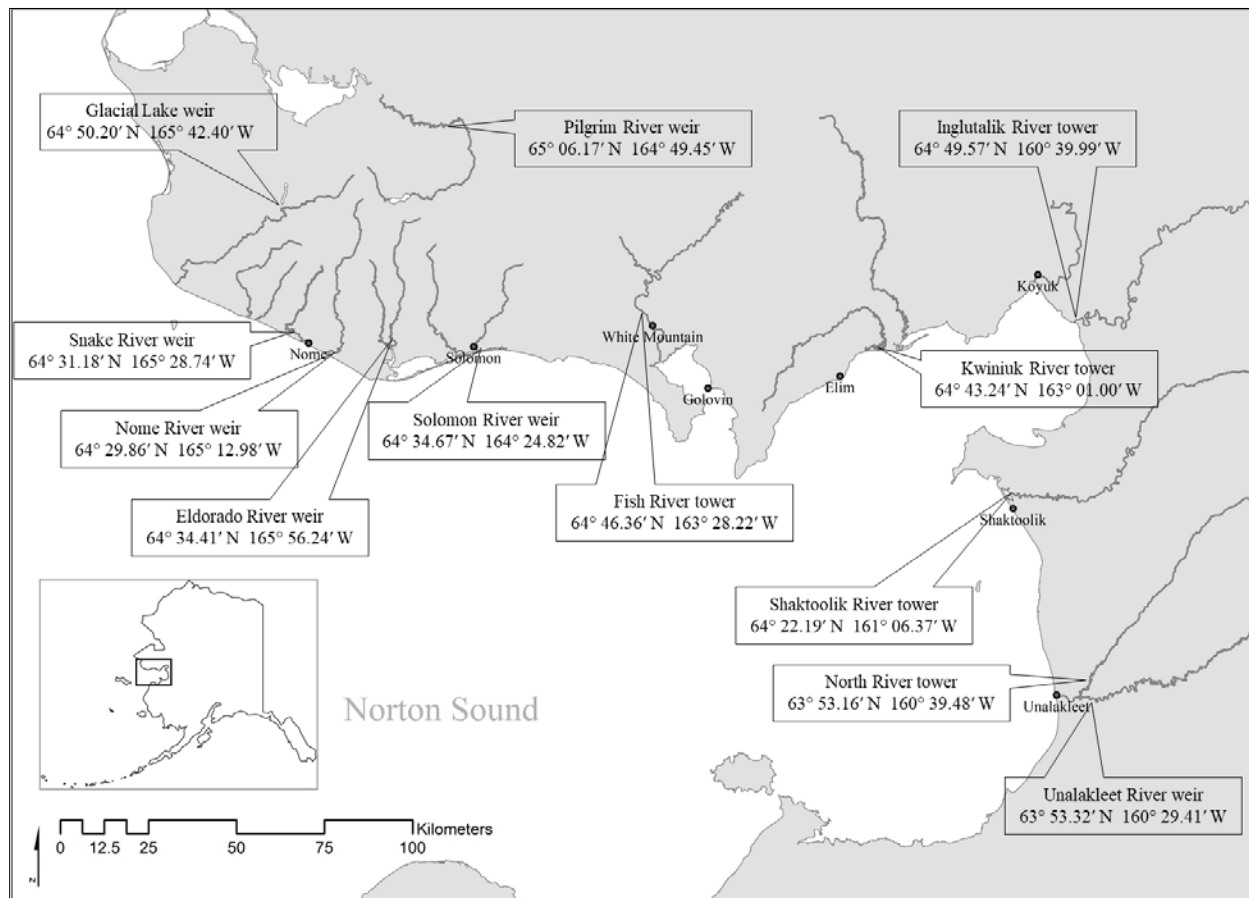


Figure 2.—Enumeration projects operating Norton Sound-Port Clarence Area, 2015–2016.

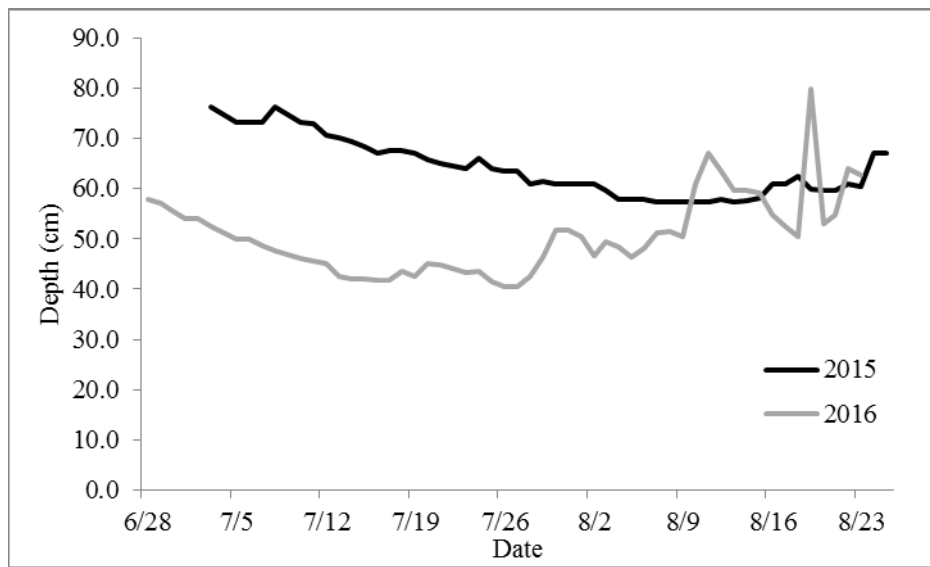


Figure 3.—Daily relative water level at Pilgrim River weir, 2015–2016.

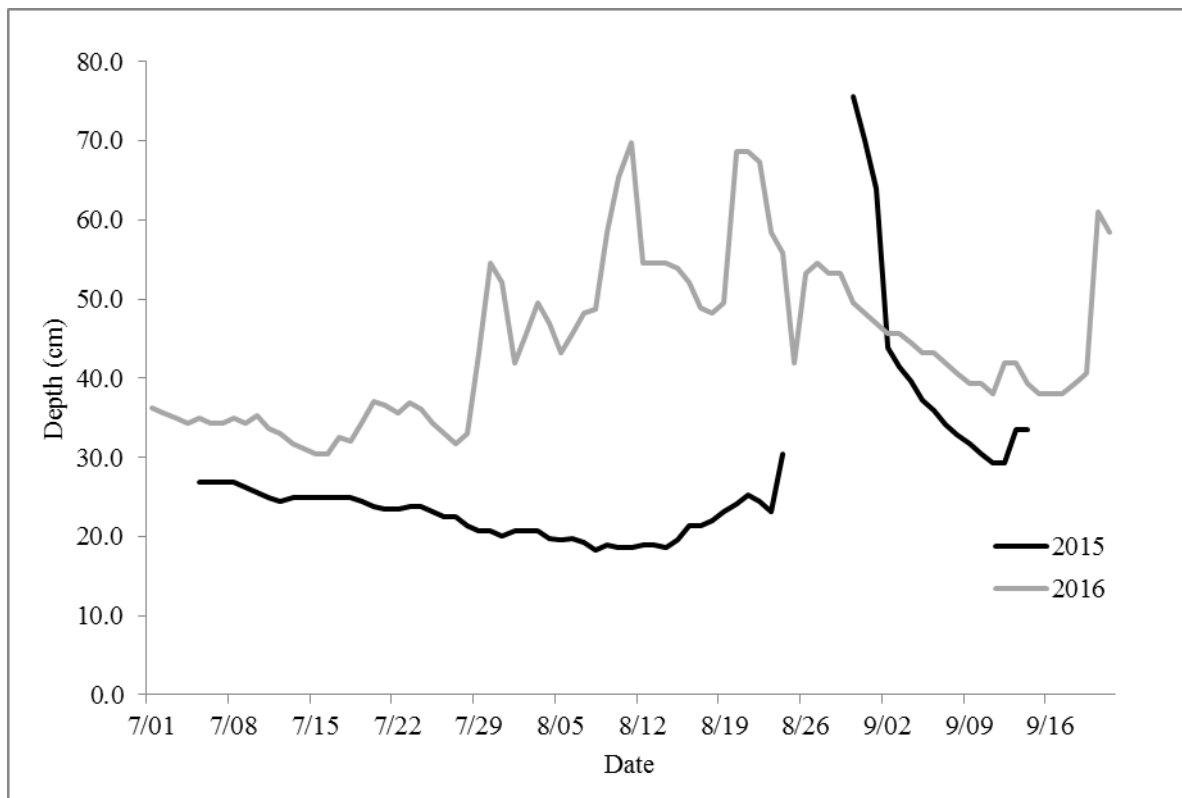


Figure 4.—Daily relative water level at Snake River weir, 2015–2016.

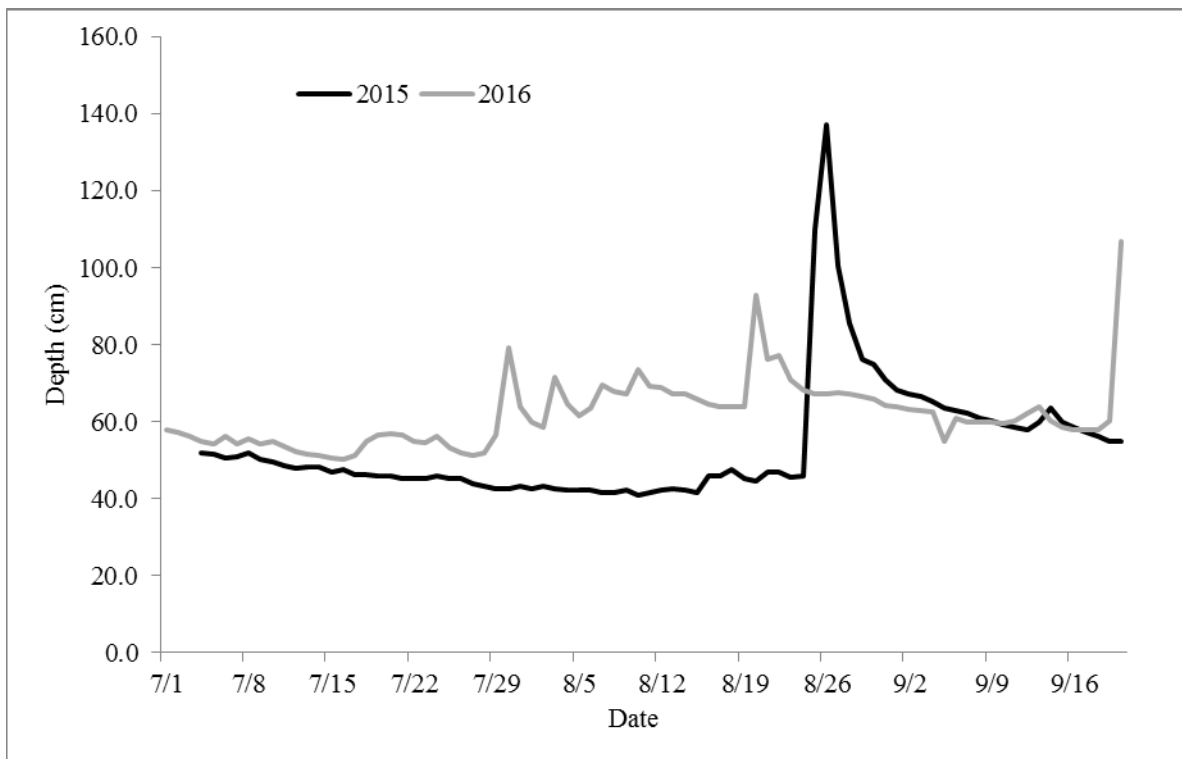


Figure 5.—Daily relative water level at Nome River weir, 2015–2016.

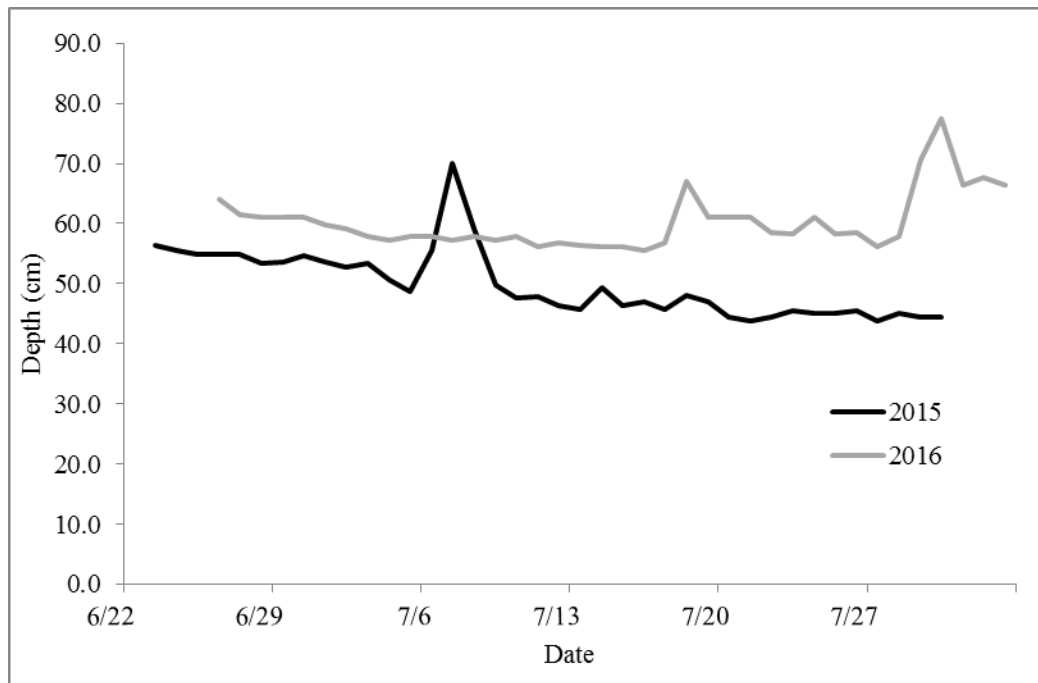


Figure 6.—Daily relative water level at Eldorado River weir, 2015–2016.

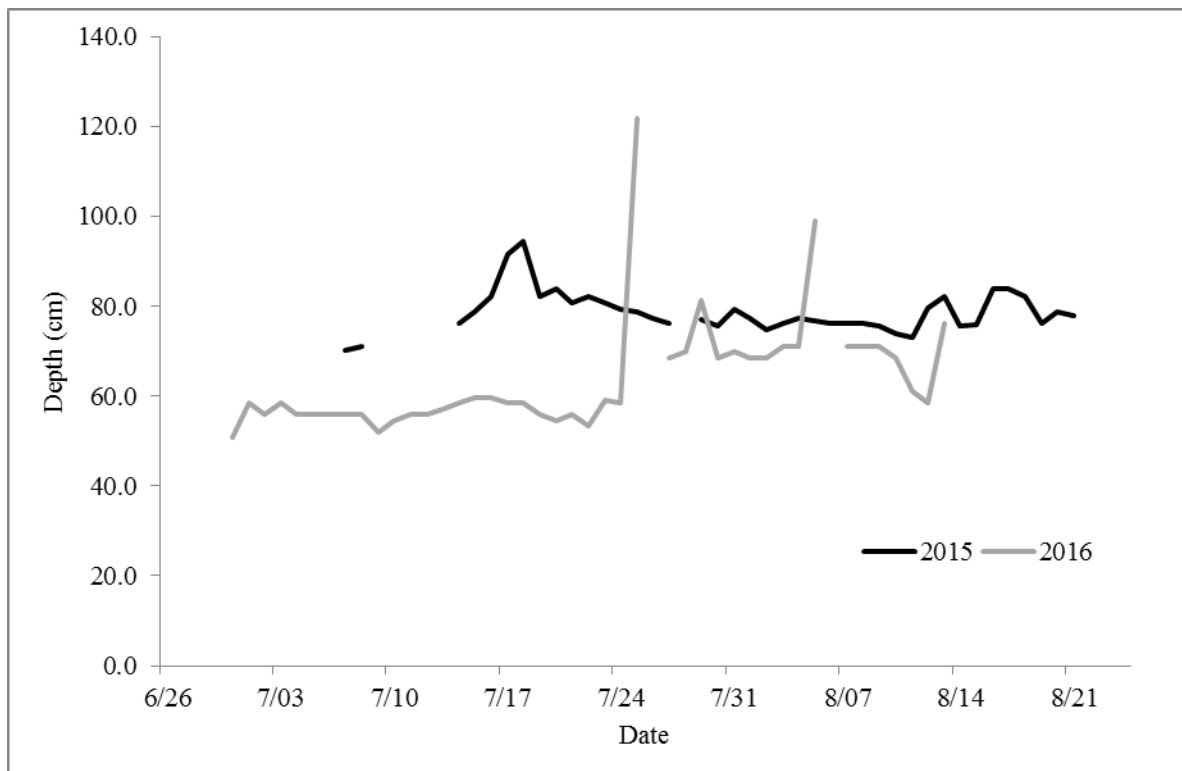


Figure 7.—Daily relative water level at Solomon River weir, 2015–2016.

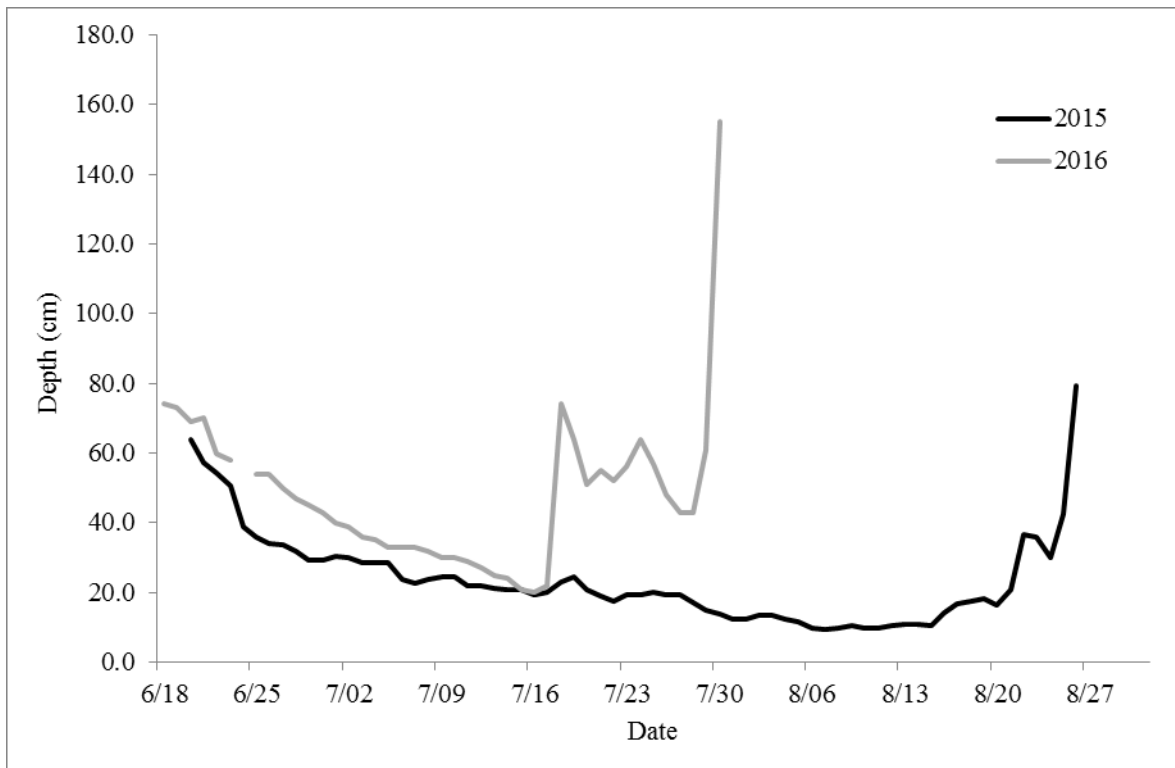


Figure 8.—Daily relative water level at Fish River tower, 2015–2016.

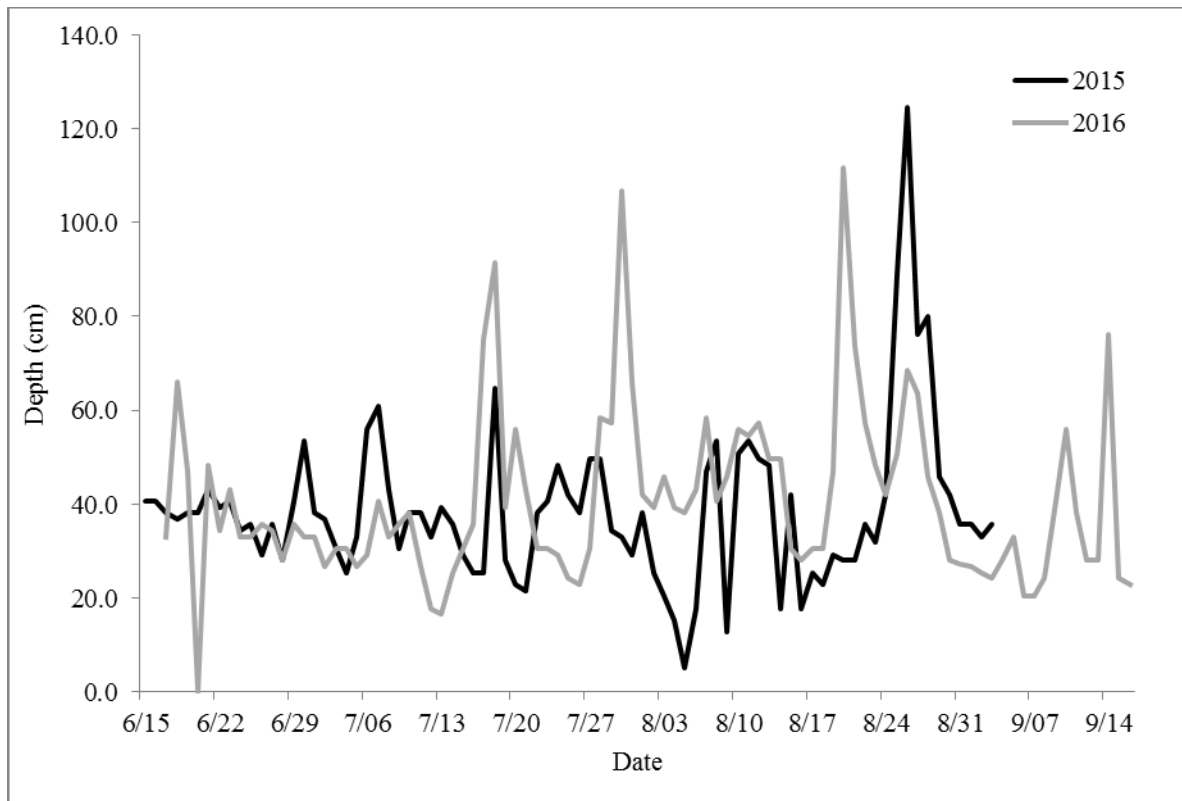


Figure 9.–Daily relative water level at Kwiniuk River tower, 2015–2016.

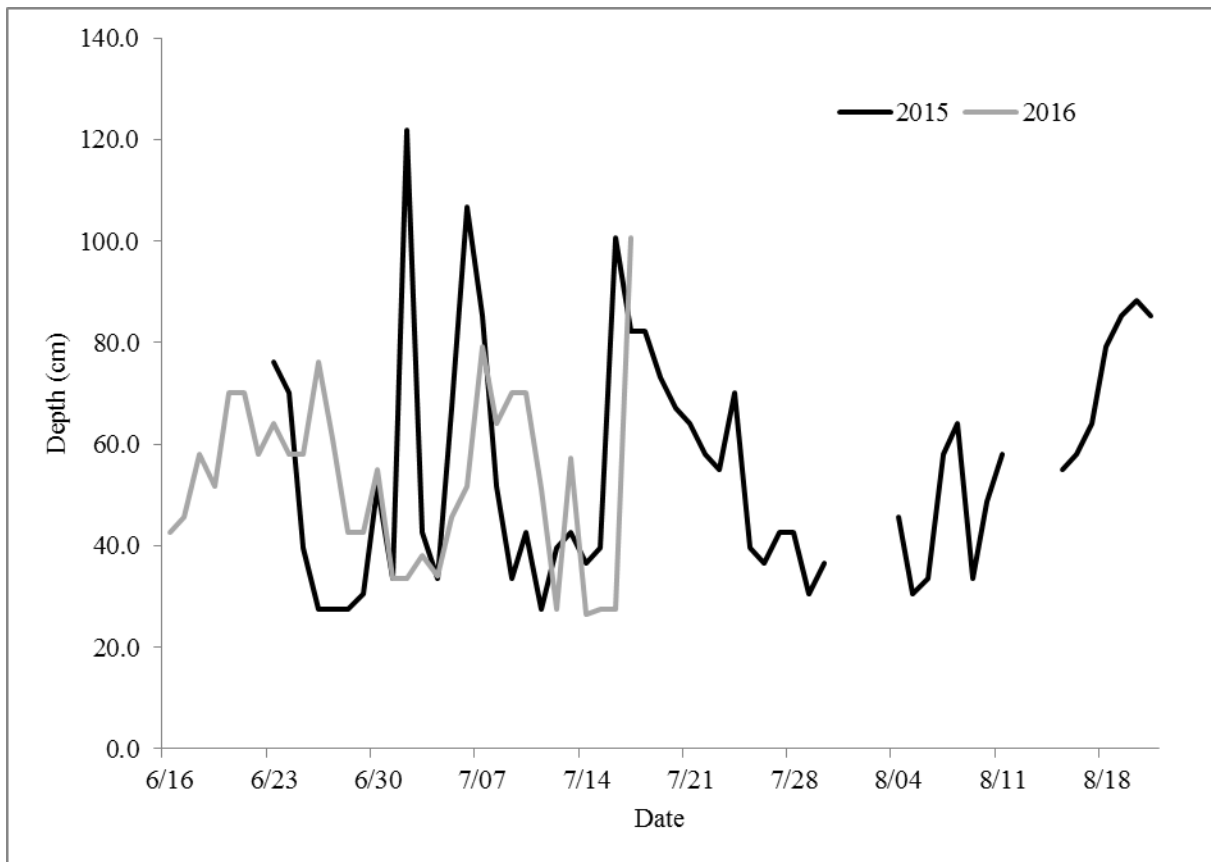


Figure 10.—Daily relative water level at Inglutalik River tower, 2015–2016.

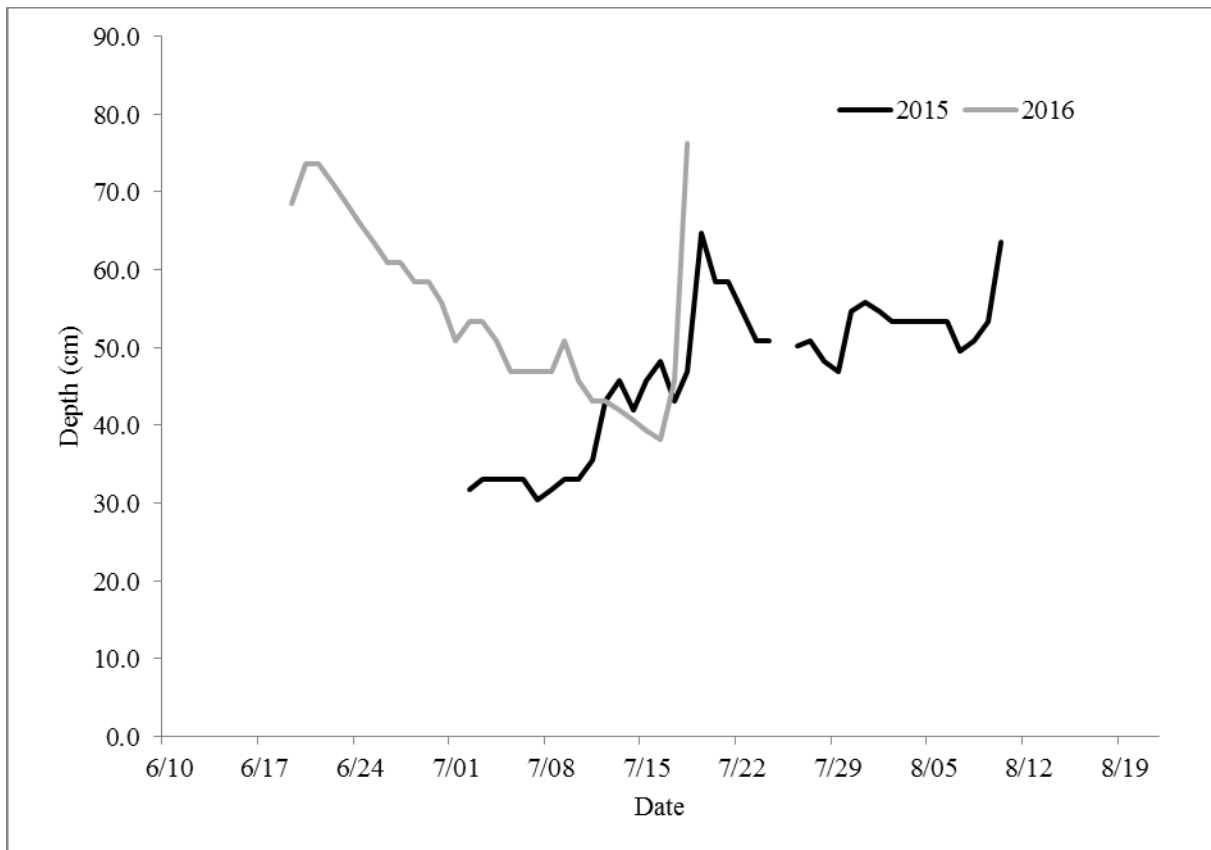


Figure 11.—Daily relative water level at Shaktoolik River tower, 2015–2016.

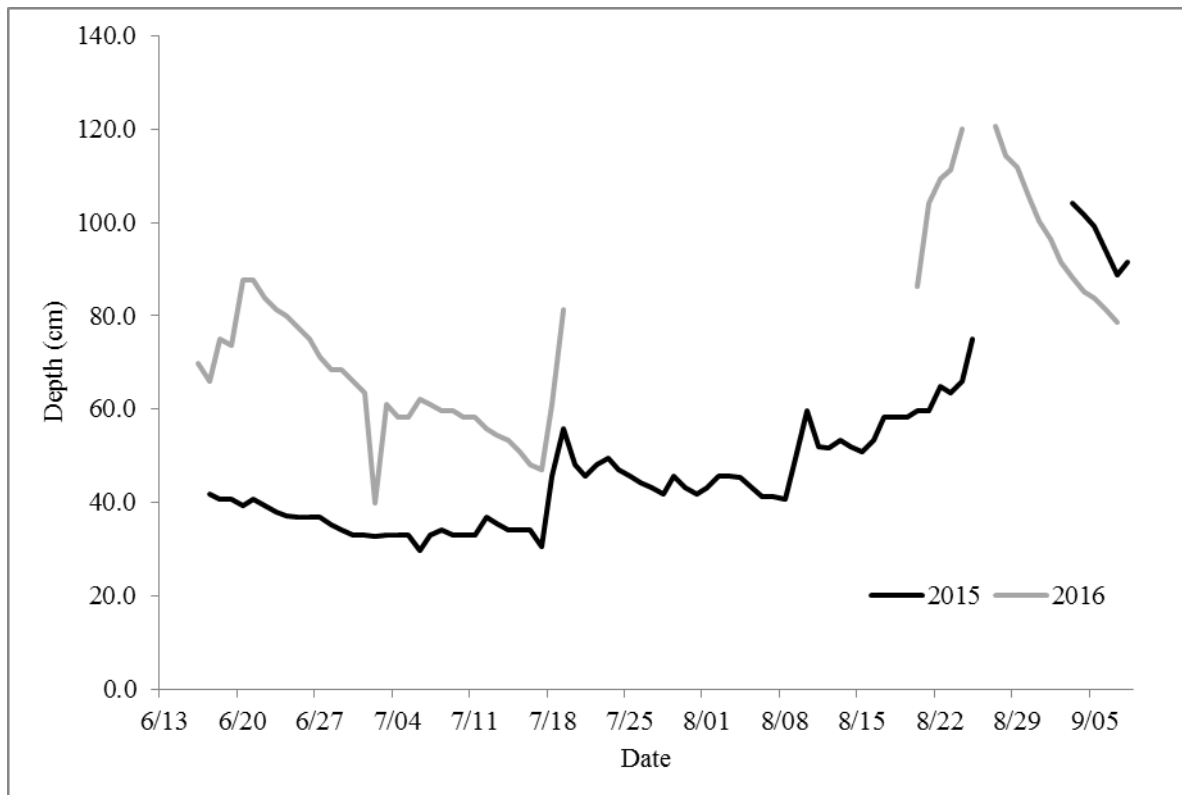


Figure 12.—Daily relative water level at North River tower, 2015–2016.

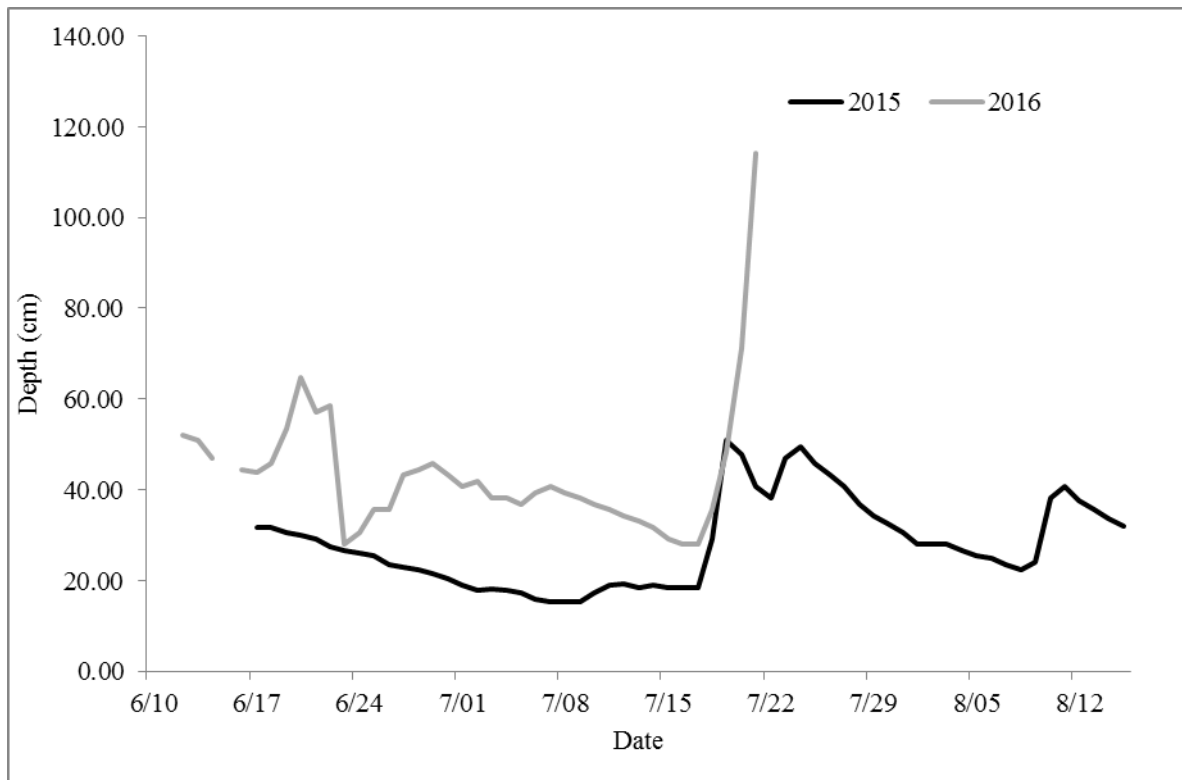


Figure 13.—Daily relative water level at Unalakleet River weir, 2015–2016.

APPENDIX A: PILGRIM RIVER WEIR

Appendix A1.–Daily and cumulative (Cum.) migration of all salmonid species past Pilgrim River weir, Port Clarence, 2015.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
7/03	17	17	0	0	0	0	0	0	0	0
7/04	67	84	0	0	1	1	0	0	32	32
7/05	155	239	0	0	0	1	0	0	525	557
7/06	108	347	1	1	0	1	0	0	837	1,394
7/07	141	488	12	13	0	1	0	0	1,257	2,651
7/08	72	560	7	20	0	1	0	0	172	2,823
7/09	53	613	10	30	0	1	0	0	332	3,155
7/10	256	869	12	42	2	3	0	0	391	3,546
7/11	612	1,481	24	66	1	4	0	0	1,017	4,563
7/12	140	1,621	8	74	0	4	0	0	185	4,748
7/13	206	1,827	24	98	5	9	0	0	940	5,688
7/14	731	2,558	41	139	18	27	0	0	2,934	8,622
7/15	516	3,074	11	150	16	43	0	0	1,702	10,324
7/16	1,736	4,810	38	188	18	61	0	0	2,083	12,407
7/17	552	5,362	18	206	0	61	0	0	92	12,499
7/18	766	6,128	84	290	2	63	0	0	1,051	13,550
7/19	2,413	8,541	203	493	3	66	0	0	802	14,352
7/20	239	8,780	25	518	5	71	0	0	1,012	15,364
7/21	2,033	10,813	92	610	11	82	0	0	1,994	17,358
7/22	565	11,378	46	656	2	84	0	0	1,820	19,178
7/23	2,516	13,894	153	809	1	85	1	1	1,859	21,037
7/24	1,421	15,315	111	920	1	86	0	1	1,621	22,658
7/25	377	15,692	44	964	0	86	2	3	926	23,584
7/26	1,889	17,581	198	1,162	0	86	11	14	1,115	24,699
7/27	635	18,216	59	1,221	0	86	10	24	400	25,099
7/28	2,242	20,458	196	1,417	1	87	14	38	1,381	26,480
7/29	1,577	22,035	149	1,566	1	88	1	39	1,086	27,566
7/30	1,858	23,893	138	1,704	0	88	1	40	1,646	29,212
7/31	956	24,849	159	1,863	0	88	0	40	594	29,806
8/01	883	25,732	146	2,009	2	90	7	47	484	30,290
8/02	1,070	26,802	127	2,136	0	90	10	57	745	31,035
8/03	1,000	27,802	122	2,258	0	90	9	66	473	31,508
8/04	809	28,611	63	2,321	0	90	3	69	309	31,817
8/05	889	29,500	85	2,406	0	90	0	69	563	32,380
8/06	855	30,355	77	2,483	0	90	4	73	414	32,794
8/07	893	31,248	58	2,541	3	93	14	87	315	33,109
8/08	588	31,836	22	2,563	0	93	6	93	397	33,506
8/09	356	32,192	15	2,578	0	93	1	94	61	33,567
8/10	628	32,820	34	2,612	0	93	7	101	283	33,850
8/11	871	33,691	25	2,637	0	93	6	107	164	34,014
8/12	942	34,633	28	2,665	1	94	2	109	218	34,232
8/13	536	35,169	15	2,680	0	94	1	110	163	34,395
8/14	986	36,155	18	2,698	1	95	14	124	435	34,830
8/15	517	36,672	21	2,719	2	97	5	129	123	34,953
8/16	531	37,203	14	2,733	1	98	17	146	145	35,098
8/17	213	37,416	12	2,745	1	99	8	154	91	35,189
8/18	189	37,605	7	2,752	0	99	7	161	85	35,274
8/19	550	38,155	20	2,772	0	99	9	170	128	35,402
8/20	457	38,612	5	2,777	0	99	3	173	119	35,521

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Appendix A1.–Page 2 of 2.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
8/21	771	39,383	7	2,784	0	99	27	200	175	35,696
8/22	368	39,751	5	2,789	0	99	6	206	88	35,784
8/23	612	40,363	7	2,796	0	99	25	231	115	35,899
8/24	361	40,724	5	2,801	0	99	14	245	68	35,967
8/25	397	41,121	6	2,807	0	99	51	296	85	36,052
Total	41,121		2,807		99		296		36,052	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles not shown for chum and coho salmon because the entire runs were not counted and escapements should be considered minimum estimates.

Appendix A2.–Daily and cumulative (Cum.) migration of all salmonid species past Pilgrim River weir, Port Clarence, 2016.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
6/25	0	0	0	0	0	0	0	0	0	0
6/26	0	0	0	0	0	0	0	0	1	1
6/27	1	1	0	0	0	0	0	0	1	2
6/28	8	9	6	6	0	0	0	0	63	65
6/29	38	47	3	9	0	0	0	0	198	263
6/30	34	81	2	11	0	0	0	0	98	361
7/01	177	258	9	20	0	0	0	0	634	995
7/02	239	497	6	26	0	0	0	0	611	1,606
7/03	885	1,382	30	56	1	1	0	0	875	2,481
7/04	169	1,551	9	65	3	4	0	0	144	2,625
7/05	187	1,738	1	66	1	5	0	0	148	2,773
7/06	229	1,967	9	75	2	7	0	0	277	3,050
7/07	417	2,384	45	120	3	10	0	0	543	3,593
7/08	140	2,524	12	132	0	10	0	0	127	3,720
7/09	298	2,822	20	152	1	11	0	0	312	4,032
7/10	286	3,108	32	184	3	14	0	0	462	4,494
7/11	243	3,351	19	203	5	19	0	0	461	4,955
7/12	580	3,931	93	296	2	21	0	0	1,091	6,046
7/13	1,225	5,156	261	557	3	24	0	0	951	6,997
7/14	335	5,491	34	591	0	24	0	0	78	7,075
7/15	649	6,140	270	861	2	26	0	0	283	7,358
7/16	935	7,075	324	1,185	0	26	0	0	934	8,292
7/17	133	7,208	19	1,204	0	26	0	0	50	8,342
7/18	17	7,225	1	1,205	1	27	0	0	2	8,344
7/19	417	7,642	37	1,242	0	27	0	0	119	8,463
7/20	336	7,978	43	1,285	0	27	0	0	91	8,554
7/21	642	8,620	104	1,389	0	27	0	0	630	9,184
7/22	900	9,520	55	1,444	0	27	0	0	245	9,429
7/23	880	10,400	358	1,802	0	27	0	0	408	9,837
7/24	443	10,843	83	1,885	0	27	0	0	255	10,092
7/25	802	11,645	91	1,976	1	28	0	0	409	10,501
7/26	679	12,324	122	2,098	0	28	0	0	518	11,019
7/27	303	12,627	48	2,146	0	28	0	0	105	11,124
7/28	491	13,118	91	2,237	0	28	1	1	230	11,354
7/29	243	13,361	25	2,262	0	28	0	1	39	11,393
7/30	733	14,094	158	2,420	0	28	0	1	197	11,590
7/31	490	14,584	98	2,518	0	28	1	2	501	12,091
8/01	638	15,222	63	2,581	0	28	7	9	184	12,275
8/02	^a 253	15,475	21	2,602	0	28	6	15	86	12,361
8/03	^a 341	15,816	46	2,648	0	28	125	140	568	12,929
8/04	^a 513	16,329	49	2,697	0	28	33	173	353	13,282
8/05	^a 450	16,779	78	2,775	1	29	30	203	399	13,681
8/06	^a 543	17,322	55	2,830	0	29	38	241	450	14,131
8/07	322	17,644	11	2,841	0	29	12	253	170	14,301
8/08	232	17,876	14	2,855	0	29	1	254	48	14,349
8/09	371	18,247	24	2,879	0	29	17	271	113	14,462
8/10	294	18,541	13	2,892	0	29	12	283	67	14,529
8/11	452	18,993	18	2,910	0	29	72	355	106	14,635
8/12	440	19,433	22	2,932	1	30	63	418	48	14,683

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Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
8/13	377	19,810	19	2,951	0	30	33	451	56	14,739
8/14	300	20,110	8	2,959	0	30	16	467	38	14,777
8/15	187	20,297	4	2,963	2	32	16	483	46	14,823
8/16	117	20,414	3	2,966	0	32	0	483	29	14,852
8/17	266	20,680	8	2,974	1	33	5	488	104	14,956
8/18	140	20,820	6	2,980	0	33	1	489	22	14,978
8/19	81	20,901	0	2,980	0	33	0	489	8	14,986
8/20	194	21,095	3	2,983	0	33	24	513	35	15,021
8/21	92	21,187	0	2,983	0	33	1	514	8	15,029
8/22	87	21,274	2	2,985	1	34	13	527	13	15,042
8/23	105	21,379	1	2,986	0	34	27	554	24	15,066
Total	21,379		2,986		34		554		15,066	

Note: Species quartiles not shown because the entire run was not counted. Escapements should be considered minimum estimates.

^a Partial count day because boat gate was underwater.

Appendix A3.—Age and sex compositions by year for Pilgrim River chum salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(0.1)	(0.2)	(0.3)	(0.4)	(0.5)	(0.6)	(0.7)
2001			No data collected.								
2002	7/20–8/06	471	59.0	41.0	0.0	0.2	80.5	14.0	5.3	0.0	0.0
2003	7/03–7/30	235	54.5	45.5	0.0	0.0	50.6	47.7	1.7	0.0	0.0
2004	6/26–9/14	381	52.2	47.8	0.0	6.8	37.5	54.9	0.8	0.0	0.0
2005	6/29–9/04	528	52.1	47.9	0.0	0.6	83.9	14.4	1.1	0.0	0.0
2006	7/08–9/08	611	46.5	53.5	0.0	2.1	50.7	47.0	0.2	0.0	0.0
2007	7/03–9/06	506	50.2	49.8	0.0	0.6	45.0	48.7	5.7	0.0	0.0
2008	7/06–8/28	486	68.3	31.7	0.0	0.0	7.6	82.5	9.5	0.4	0.0
2009	7/02–8/20	424	58.7	41.3	0.0	14.2	30.9	30.2	23.8	0.9	0.0
2010	7/08–8/27	215	62.3	37.7	0.0	0.9	87.9	11.2	0.0	0.0	0.0
2011	7/15–9/05	185	48.2	51.8	0.0	0.0	31.4	68.6	0.0	0.0	0.0
2012	7/08–8/16	155	56.1	43.9	0.0	0.6	54.4	38.3	6.7	0.0	0.0
2013	7/15–8/25	194	58.2	41.8	0.0	0.9	44.5	54.5	0.0	0.0	0.0
2014	7/04–8/05	178	54.1	45.9	0.0	0.0	33.9	57.3	8.7	0.0	0.0
2015	7/04–8/25	195	54.4	45.6	0.0	1.7	59.7	36.0	2.5	0.0	0.0
2016	7/07–8/02	196	45.9	54.1	0.0	0.0	49.5	49.5	1.0	0.0	0.0

Appendix A4.—Age and sex compositions by year for Pilgrim River Chinook salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(1.1)	(1.2)	(1.3)	(1.4)	(2.3)	(1.5)	(2.4)
2001			No data collected.								
2002	7/20	4	a,b,								
2003	7/05–7/31	10	b,								
2004			No data collected.								
2005	7/07–8/26	12	b,								
2006	7/11–9/02	43	b,								
2007			No data collected.								
2008	7/27–8/12	2	b,								
2009	7/12–8/27	37		48.6							
2010	7/20–8/31	9	b								
2011			No data collected.								
2012			No data collected.								
2013			No data collected.								
2014			No data collected.								
2015			No data collected.								
2016			No data collected.								

^a No age data collected.

^b Sample size insufficient for sex composition analysis.

Appendix A5.—Age and sex compositions by year for Pilgrim River chum salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)				
			Male	Female	(1.1)	(2.1)	(2.2)	(3.1)	(4.1)
2001			No data collected.						
2002			No data collected.						
2003	8/29-9/07	23 ^{a,b}							
2004	8/07-9/14	143	54.5	45.5	7.7	89.5	0.0	2.8	0.0
2005	8/05-9/04	90 ^b	56.7	43.3					
2006	7/22-9/08	217	58.1	41.9	21.7	77.0	0.0	1.4	0.0
2007	8/09-9/09	57 ^{a,b}							
2008	8/11-9/01	86 ^b	59.3	40.7					
2009			No data collected.						
2010			No data collected.						
2011			No data collected.						
2012			No data collected.						
2013			No data collected.						
2014			No data collected.						
2015			No data collected.						
2016			No data collected.						

^a No age data collected.

^b Sample size insufficient for sex composition analysis.

Appendix A6.—Age and sex compositions by year for Pilgrim River sockeye salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)											
			Male	Female	(0.2)	(0.3)	(1.2)	(2.1)	(1.3)	(2.2)	(3.1)	(1.4)	(2.3)	(3.2)	(2.4)	(3.3)
2001	8/10–9/13	278 ^a	42.4	57.6	0.0	0.0	0.4	0.0	15.8	1.8	0.0	0.0	81.7	0.0	0.4	0.0
2002	7/20–8/13	198 ^a	42.4	57.6	0.0	0.0	1.0	0.0	2.0	74.2	0.5	0.0	18.2	3.0	1.0	0.0
2003	7/01–8/29	248	39.1	60.9	0.0	0.0	3.6	0.0	5.2	61.3	0.0	0.0	29.4	0.0	0.4	0.0
2004	6/25–9/14	605	38.7	61.3	0.0	0.2	5.6	0.2	15.7	43.6	0.0	0.5	34.0	0.0	0.3	0.0
2005	6/29–7/02	705	43.7	56.3	0.0	0.1	6.0	0.0	13.3	44.8	0.0	0.0	35.3	0.0	0.4	0.0
2006	7/08–9/05	706	49.2	50.8	0.1	0.0	14.5	0.0	28.8	10.6	0.0	0.0	45.8	0.0	0.1	0.0
2007	7/03–9/03	428	48.6	51.4	0.0	0.0	4.2	0.0	73.1	4.4	0.0	0.0	18.0	0.0	0.2	0.0
2008	7/06–8/22	332	55.4	44.6	0.0	0.0	0.0	0.0	48.2	0.9	0.0	0.6	50.0	0.0	0.3	0.0
2009	7/06–8/10	159	66.7	33.3	0.0	0.0	0.6	0.0	18.2	0.6	0.0	47.8	13.8	0.0	18.9	0.0
2010	7/04–8/09	405	44.0	56.0	0.0	0.0	5.9	0.2	3.2	6.7	0.0	0.0	82.5	0.0	1.5	0.0
2011	7/03–8/08	221	39.8	60.2	0.0	0.0	1.8	0.0	92.8	0.0	0.0	0.5	5.0	0.0	0.0	0.0
2012	7/08–8/07	231	34.9	65.1	0.0	0.0	4.1	0.0	15.4	26.1	0.0	12.0	37.8	0.0	4.6	0.0
2013	7/08–8/19	229	50.6	49.4	0.0	0.0	1.3	0.0	21.8	19.7	0.0	0.4	54.4	0.4	0.8	1.3
2014	7/03–8/03	270 ^b			0.0	0.0	41.1	0.0	11.1	10.7	0.0	0.0	34.1	0.0	1.9	1.1
2015	7/05–8/05	224	54.2	45.8	0.0	0.0	20.8	0.0	29.2	22.1	0.0	0.0	27.1	0.0	0.0	1.0
2016	7/05–8/03	231	44.2	55.8	0.0	0.0	42.4	0.0	52.8	0.1	0.0	0.0	3.9	0.0	0.0	0.0

^a Age, sex, and length data collected near outlet of Salmon Lake.

^b A large number of aged scales had no gender associated with them and sex composition could not be determined.

Appendix A7.—Pilgrim River weir water temperature (Temp.) and stream stage (Depth) observations, Port Clarence 2015–2016.

Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
6/28			12.5	57.9
6/29			11.0	57.0
6/30			12.0	55.5
7/01			12.5	53.9
7/02			12.5	53.9
7/03	8.0	76.2	13.5	52.4
7/04	10.0	74.7	12.0	51.2
7/05	13.0	73.2	12.5	50.0
7/06	13.0	73.2	12.0	50.0
7/07	13.0	73.2	12.0	48.8
7/08	13.0	76.2	12.0	47.5
7/09	11.0	74.7	11.5	46.9
7/10	12.0	73.2	10.0	46.0
7/11	12.0	72.8	13.0	45.7
7/12	13.0	70.7	14.0	45.1
7/13	12.0	70.1	14.0	42.7
7/14	12.0	69.5	14.0	42.1
7/15	13.0	68.3	14.0	42.1
7/16	13.0	67.1	13.0	41.8
7/17	12.0	67.7	12.0	41.8
7/18	12.0	67.7	11.0	43.6
7/19	13.0	67.1	11.5	42.7
7/20	11.0	65.8	11.0	45.1
7/21	12.0	64.9	11.0	44.8
7/22	12.0	64.6	11.0	44.2
7/23	12.0	64.0	11.0	43.3
7/24	13.0	66.1	11.0	43.6
7/25	12.0	64.0	12.0	41.5
7/26	11.0	63.4	12.5	40.5
7/27	11.0	63.4	12.0	40.5
7/28	12.0	61.0	12.0	42.7
7/29	12.0	61.6	10.5	46.3
7/30	11.0	61.0	9.0	51.8
7/31	12.0	61.0	9.0	51.8
8/01	12.0	61.0	8.5	50.6
8/02	12.0	61.0	11.5	46.6
8/03	12.0	59.7	8.3	49.4
8/04	12.0	57.9	10.5	48.5
8/05	12.0	57.9	11.5	46.3
8/06	10.0	57.9	12.0	48.2
8/07	13.0	57.3	12.0	51.2
8/08	10.0	57.3	12.0	51.5
8/09	10.0	57.3	13.0	50.6
8/10	9.0	57.3	12.0	61.0
8/11	9.0	57.3	12.0	67.1
8/12	10.0	57.9	11.5	63.4

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Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
8/13	10.0	57.3	12.5	59.7
8/14	10.0	57.6	11.0	59.7
8/15	11.0	58.2	10.0	59.1
8/16	10.0	61.0	10.0	54.9
8/17	11.0	61.0	10.0	52.4
8/18	10.0	62.5	12.0	50.6
8/19	10.0	60.0	12.0	79.9
8/20	10.0	59.7	10.0	53.0
8/21	9.0	59.7	12.0	54.9
8/22	9.0	61.0	12.0	64.0
8/23	10.0	60.4	8.0	62.8
8/24	9.0	67.1		
8/25	9.0	67.1		

Note: Recorded water temperatures are morning water temperatures, except when morning temperatures were not available. Recorded water depths are highest recorded daily water depth.

APPENDIX B: GLACIAL LAKE WEIR

Appendix B1.–Daily and cumulative
(Cum.) sockeye salmon migration past
Glacial Lake weir, Norton Sound, 2015.

Date	Daily sockeye	Cum. sockeye
6/24	0	0
6/25	2	2
6/26	343	345
6/27	52	397
6/28	192	589
6/29	516	1,105
6/30	303	1,408
7/01	145	1,553
7/02	39	1,592
7/03	143	1,735
7/04	1,961	3,696
7/05	1,327	5,023
7/06	1,216	6,239
7/07	683	6,922
7/08	761	7,683
7/09	482	8,165
7/10	406	8,571
7/11	453	9,024
7/12	233	9,257
Total	9,257	

Note: Quartiles are not shown because the target operational period of the project was not fully monitored.

Appendix B2.—Age and sex compositions by year for Glacial Lake sockeye salmon ASL samples, 2001–2015.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)											
			Male	Female	(0.2)	(0.3)	(1.2)	(2.1)	(1.3)	(2.2)	(3.1)	(1.4)	(2.3)	(3.2)	(2.4)	(3.3)
2001																
2002																
2003																
2004																
2005																
2006	7/05–7/15	248	52.8	47.2	0.0	0.0	0.0	0.0	0.0	20.6	0.0	0.0	79.0	0.0	0.4	0.0
2007	7/06–7/21	122	44.3	55.7												
2008	7/02–7/28	152	36.8	63.2	0.0	0.0	1.3	0.0	2.6	8.6	0.0	0.7	82.2	0.0	4.6	0.0
2009	7/02–7/27	40 ^a														
2010	7/10–7/12	40 ^a														
2011																
2012																
2013																
2014																
2015																

^a Sample size insufficient for sex composition analysis.

APPENDIX C: SNAKE RIVER WEIR

Appendix C1.–Daily and cumulative (Cum.) passage of all salmonid species at Snake River weir, Norton Sound, 2015.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
7/05	54	54	4	4	0	0	0	0	0	0
7/06	12	66	5	9	0	0	0	0	0	0
7/07	0	66	1	10	0	0	0	0	0	0
7/08	0	66	0	10	0	0	0	0	0	0
7/09	208	274	3	13	0	0	0	0	0	0
7/10	292	566	11	24	0	0	0	0	0	0
7/11	722	1,288	314	338	0	0	0	0	0	0
7/12	179	1,467	362	700	0	0	0	0	0	0
7/13	0	1,467	0	700	0	0	0	0	0	0
7/14	0	1,467	0	700	0	0	0	0	0	0
7/15	153	1,620	23	723	0	0	0	0	0	0
7/16	185	1,805	388	1,111	0	0	0	0	0	0
7/17	248	2,053	452	1,563	0	0	0	0	0	0
7/18	42	2,095	74	1,637	0	0	0	0	0	0
7/19	5	2,100	14	1,651	0	0	1	1	0	0
7/20	13	2,113	35	1,686	0	0	0	1	0	0
7/21	96	2,209	188	1,874	0	0	0	1	0	0
7/22	173	2,382	738	2,612	0	0	0	1	0	0
7/23	471	2,853	2,700	5,312	0	0	20	21	0	0
7/24	27	2,880	189	5,501	0	0	1	22	0	0
7/25	47	2,927	607	6,108	0	0	0	22	0	0
7/26	65	2,992	295	6,403	0	0	0	22	0	0
7/27	151	3,143	553	6,956	0	0	1	23	0	0
7/28	271	3,414	1,997	8,953	0	0	0	23	0	0
7/29	27	3,441	34	8,987	0	0	0	23	0	0
7/30	58	3,499	764	9,751	0	0	0	23	0	0
7/31	16	3,515	61	9,812	0	0	1	24	0	0
8/01	5	3,520	37	9,849	0	0	1	25	0	0
8/02	51	3,571	438	10,287	0	0	1	26	0	0
8/03	25	3,596	21	10,308	0	0	0	26	0	0
8/04	89	3,685	1,226	11,534	0	0	4	30	0	0
8/05	97	3,782	644	12,178	0	0	5	35	0	0
8/06	52	3,834	341	12,519	1	1	1	36	0	0
8/07	78	3,912	451	12,970	0	1	0	36	0	0
8/08	20	3,932	322	13,292	0	1	3	39	0	0
8/09	29	3,961	216	13,508	0	1	3	42	0	0
8/10	17	3,978	126	13,634	1	2	3	45	0	0
8/11	27	4,005	222	13,856	0	2	2	47	0	0
8/12	38	4,043	353	14,209	0	2	3	50	0	0
8/13	29	4,072	545	14,754	1	3	16	66	0	0
8/14	16	4,088	357	15,111	0	3	10	76	0	0
8/15	9	4,097	157	15,268	0	3	1	77	1	1
8/16	11	4,108	193	15,461	0	3	7	84	2	3
8/17	16	4,124	193	15,654	0	3	5	89	4	7
8/18	4	4,128	48	15,702	0	3	0	89	2	9
8/19	9	4,137	53	15,755	0	3	5	94	2	11
8/20	5	4,142	94	15,849	2	5	2	96	1	12
8/21	16	4,158	127	15,976	1	6	19	115	1	13
8/22	10	4,168	46	16,022	0	6	13	128	2	15

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Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
8/23	9	4,177	32	16,054	0	6	2	130	1	16
8/24	4	4,181	38	16,092	0	6	18	148	6	22
8/25	8	4,189	56	16,148	1	7	9	157	2	24
8/26	7	4,196	44	16,193	0	7	50	207	2	26
8/27	5	4,201	26	16,219	0	7	63	270	2	28
8/28	4	4,205	19	16,237	0	7	64	334	2	30
8/29	3	4,208	14	16,251	0	7	69	402	2	31
8/30	1	4,209	0	16,251	0	7	0	402	0	31
8/31	4	4,213	23	16,274	0	7	247	649	2	33
9/01	4	4,217	17	16,291	0	7	99	748	1	34
9/02	1	4,218	1	16,292	0	7	15	763	0	34
9/03	2	4,220	2	16,294	0	7	33	796	0	34
9/04	1	4,221	6	16,300	0	7	93	889	4	38
9/05	0	4,221	2	16,302	0	7	28	917	1	39
9/06	4	4,225	5	16,307	0	7	42	959	3	42
9/07	9	4,234	5	16,312	0	7	19	978	1	43
9/08	7	4,241	6	16,318	0	7	52	1,030	7	50
9/09	0	4,241	2	16,320	0	7	103	1,133	6	56
9/10	0	4,241	1	16,321	0	7	5	1,138	0	56
9/11	0	4,241	0	16,321	0	7	8	1,146	0	56
9/12	0	4,241	0	16,321	0	7	5	1,151	0	56
9/13	0	4,241	0	16,321	0	7	224	1,375	0	56
9/14	0	4,241	0	16,321	0	7	263	1,638	0	56
Total	4,241		16,321		7		1,638		56	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles are not shown for coho salmon because entire run was not counted. Dates in italics indicate days when counts were interpolated.

Appendix C2.–Daily and cumulative (Cum.) passage of all salmonid species at Snake River weir, Norton Sound, 2016.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
7/01	50	50	0	0	0	0	0	0	0	0
7/02	42	92	18	18	0	0	0	0	0	0
7/03	2	94	1	19	0	0	0	0	0	0
7/04	3	97	1	20	0	0	0	0	0	0
7/05	135	232	29	49	0	0	0	0	0	0
7/06	95	327	1	50	0	0	0	0	0	0
7/07	25	352	0	50	0	0	0	0	0	0
7/08	13	365	1	51	0	0	0	0	0	0
7/09	0	365	0	51	0	0	0	0	0	0
7/10	12	377	0	51	0	0	0	0	0	0
7/11	73	450	1	52	0	0	0	0	0	0
7/12	165	615	234	286	0	0	0	0	3	3
7/13	233	848	3,951	4,237	0	0	0	0	5	8
7/14	317	1,165	8,015	12,252	0	0	0	0	1	9
7/15	103	1,268	2,732	14,984	0	0	0	0	0	9
7/16	11	1,279	104	15,088	0	0	0	0	0	9
7/17	113	1,392	3,076	18,164	0	0	0	0	0	9
7/18	166	1,558	8,131	26,295	0	0	0	0	0	9
7/19	56	1,614	1,496	27,791	0	0	0	0	0	9
7/20	93	1,707	4,330	32,121	1	1	0	0	1	10
7/21	189	1,896	9,233	41,354	0	1	0	0	1	11
7/22	283	2,179	18,734	60,088	2	3	0	0	4	15
7/23	45	2,224	5,864	65,952	1	4	1	1	0	15
7/24	153	2,377	16,282	82,234	0	4	2	3	0	15
7/25	247	2,624	20,398	102,632	0	4	0	3	0	15
7/26	176	2,800	28,280	130,912	2	6	5	8	0	15
7/27	19	2,819	2,035	132,947	0	6	0	8	0	15
7/28	37	2,856	7,917	140,864	0	6	1	9	0	15
7/29	203	3,059	29,870	170,734	0	6	1	10	2	17
7/30	106	3,165	8,471	179,205	0	6	2	12	1	18
7/31	25	3,190	2,725	181,930	0	6	1	13	0	18
8/01	29	3,219	4,007	185,937	0	6	0	13	0	18
8/02	32	3,251	1,520	187,457	0	6	0	13	0	18
8/03	79	3,330	5,380	192,837	0	6	8	21	4	22
8/04	27	3,357	1,435	194,272	0	6	11	32	2	24
8/05	22	3,379	1,618	195,890	2	8	7	39	1	25
8/06	61	3,440	1,443	197,333	0	8	15	54	0	25
8/07	76	3,516	3,177	200,510	0	8	19	73	1	26
8/08 ^a	16	3,532	463	200,973	0	8	0	73	0	26
8/09 ^a	22	3,554	1,085	202,058	3	11	20	93	1	27
8/10	15	3,569	764	202,822	1	12	26	119	6	33
8/11	2	3,571	135	202,957	1	13	3	122	1	34
8/12	2	3,573	117	203,074	0	13	10	132	3	37
8/13	10	3,583	495	203,569	1	14	55	187	4	41
8/14	5	3,588	286	203,855	0	14	18	205	6	47
8/15	4	3,592	45	203,900	0	14	1	206	5	52
8/16	6	3,598	58	203,958	0	14	1	207	1	53
8/17	15	3,613	229	204,187	0	14	8	215	9	62
8/18 ^a	0	3,613	9	204,196	0	14	1	216	2	64

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Appendix C2.–Page 2 of 2.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
8/19	^a 0	3,613	9	204,205	0	14	0	216	0	64
8/20	4	3,617	24	204,229	0	14	8	224	1	65
8/21	3	3,620	2	204,231	0	14	0	224	1	66
8/22	^a 0	3,620	3	204,234	0	14	4	228	0	66
8/23	2	3,622	4	204,238	0	14	12	240	0	66
8/24	1	3,623	4	204,242	0	14	6	246	0	66
8/25	^a 0	3,623	0	204,242	0	14	0	246	0	66
8/26	0	3,623	9	204,251	0	14	3	249	0	66
8/27	2	3,625	17	204,268	0	14	1	250	2	68
8/28	1	3,626	32	204,300	0	14	7	257	0	68
8/29	10	3,636	74	204,374	0	14	40	297	4	72
8/30	10	3,646	76	204,450	0	14	64	361	2	74
8/31	5	3,651	55	204,505	0	14	52	413	3	77
9/01	5	3,656	26	204,531	0	14	77	490	2	79
9/02	3	3,659	13	204,544	0	14	28	518	0	79
9/03	3	3,662	11	204,555	0	14	39	557	2	81
9/04	1	3,663	13	204,568	0	14	53	610	4	85
9/05	1	3,664	13	204,581	0	14	45	655	3	88
9/06	0	3,664	3	204,584	0	14	2	657	1	89
9/07	1	3,665	9	204,593	0	14	56	713	1	90
9/08	0	3,665	6	204,599	0	14	51	764	6	96
9/09	0	3,665	9	204,608	0	14	89	853	6	102
9/10	0	3,665	5	204,613	0	14	41	894	3	105
9/11	0	3,665	0	204,613	0	14	0	894	1	106
9/12	0	3,665	14	204,627	1	15	106	1,000	5	111
9/13	0	3,665	1	204,628	0	15	49	1,049	1	112
9/14	1	3,666	2	204,630	0	15	3	1,052	0	112
9/15	0	3,666	1	204,631	0	15	0	1,052	0	112
9/16	0	3,666	3	204,634	0	15	4	1,056	1	113
9/17	0	3,666	0	204,634	0	15	7	1,063	0	113
9/18	0	3,666	5	204,639	0	15	15	1,078	3	116
9/19	0	3,666	2	204,641	0	15	34	1,112	2	118
9/20	0	3,666	0	204,641	0	15	3	1,115	2	120
9/21	0	3,666	0	204,641	0	15	0	1,115	0	120
Total	3,666		204,641		15		1,115		120	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles are not shown for coho salmon because entire run was not counted. Dates in italics indicate days when counts were interpolated.

^a Partial count day due to high water.

Appendix C3.—Age and sex compositions by year for Snake River chum salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(0.1)	(0.2)	(0.3)	(0.4)	(0.5)	(0.6)	(0.7)
2001	8/06–8/21	297	54.5	45.5	0.0	1.0	43.1	55.6	0.7	0.0	0.0
2002	7/15–8/10	475	40.8	59.2	0.0	1.3	64.0	33.5	1.3	0.0	0.0
2003	7/06–9/06	171	54.4	45.6	0.0	0.0	73.7	22.2	4.1	0.0	0.0
2004	6/29–8/03	266	51.1	48.9	0.0	3.0	45.5	51.1	0.4	0.0	0.0
2005	6/29–9/09	386	44.0	56.0	0.0	1.3	83.7	13.7	1.3	0.0	0.0
2006	7/01–9/11	537	44.1	55.9	0.0	1.5	75.0	22.3	1.1	0.0	0.0
2007	7/03–9/11	607	51.4	48.6	0.0	0.2	49.8	46.6	3.5	0.0	0.0
2008	7/11–9/01	52 ^a									
2009	7/17–8/28	260	55.4	44.6	0.0	8.5	30.0	57.7	3.5	0.4	0.0
2010	7/07–9/07	305	38.4	61.6	0.0	1.0	90.8	8.2	0.0	0.0	0.0
2011	7/21–7/31	157	42.8	57.2	0.0	0.6	15.7	83.6	0.0	0.0	0.0
2012	7/12–8/14	112 ^a	52.3	47.7							
2013			No data collected.								
2014	7/12–7/19	51 ^a									
2015	7/15–7/27	170	45.3	54.7	0.0	6.3	60.7	33.0	0.0	0.0	0.0
2016	7/08–8/06	149	40.3	59.7	0.0	2.7	69.1	28.2	0.0	0.0	0.0

^a Sample size insufficient for sex composition analysis.

Appendix C4.—Age and sex compositions by year for Snake River coho salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)				
			Male	Female	(1.1)	(2.1)	(2.2)	(3.1)	(4.1)
2001	9/07–9/11	124	45.2	54.8	No data collected				
2002	8/26–9/04	192	55.2	44.8	2.6	87.5	0.0	9.9	0.0
2003	8/04–9/07	132	47.0	53.0	6.8	83.3	0.0	9.8	0.0
2004	7/23–8/24	131	37.4	62.6	10.7	83.2	0.0	6.1	0.0
2005	7/30–9/10	188	61.7	38.3	9.6	86.2	0.0	4.3	0.0
2006	7/14–9/11	244	49.2	50.8	6.1	91.0	0.0	2.9	0.0
2007	8/02–9/12	105 ^a	59.0	41.0					
2008	8/08–9/05	47 ^a							
2009	8/10–8/28	27 ^a							
2010	8/16–9/03	130	46.9	53.1	4.6	91.5	0.0	3.9	0.0
2011	8/18–9/12	60 ^a	59.8	40.2					
2012	7/14–8/14	5 ^a							
2013			No data collected.						
2014			No data collected.						
2015	7/24–8/23	11 ^a							
2016	8/06–8/24	21 ^a							

^a Sample size insufficient for sex composition analysis.

Appendix C5.–Snake River weir water temperature (Temp.) and stream stage (Depth) observations, Norton Sound, 2015–2016.

Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
7/01			ND	36.2
7/02			12.0	35.6
7/03			13.0	34.9
7/04			16.0	34.3
7/05	12.0	26.8	13.0	34.9
7/06	13.0	26.8	11.0	34.3
7/07	11.0	26.8	11.0	34.3
7/08	10.0	26.8	10.0	34.9
7/09	11.0	26.2	10.0	34.3
7/10	12.0	25.6	9.0	35.3
7/11	12.0	25.0	11.0	33.7
7/12	12.0	24.4	12.0	33.0
7/13	13.0	25.0	11.0	31.8
7/14	11.0	25.0	12.0	31.1
7/15	12.0	25.0	12.0	30.5
7/16	13.0	25.0	11.0	30.5
7/17	13.0	25.0	10.0	32.5
7/18	10.0	25.0	9.0	32.0
7/19	11.0	24.4	10.0	34.5
7/20	9.0	23.8	9.0	37.1
7/21	10.0	23.5	9.0	36.6
7/22	11.0	23.5	9.0	35.6
7/23	13.0	23.8	10.0	36.8
7/24	11.0	23.8	10.0	36.1
7/25	9.0	23.2	12.0	34.3
7/26	10.0	22.6	12.0	33.0
7/27	10.0	22.6	11.0	31.8
7/28	11.0	21.3	10.0	33.0
7/29	12.0	20.7	9.0	43.2
7/30	12.0	20.7	9.0	54.6
7/31	9.0	20.1	7.0	52.1
8/01	9.0	20.7	9.0	41.9
8/02	11.0	20.7	9.0	45.7
8/03	10.0	20.7	8.0	49.5
8/04	10.0	19.8	9.0	47.0
8/05	11.0	19.5	8.0	43.2
8/06	11.0	19.8	11.0	45.7
8/07	11.0	19.2	11.0	48.3
8/08	10.0	18.3	9.5	48.8
8/09	9.0	18.9	11.0	58.4
8/10	9.0	18.6	10.5	65.4
8/11	10.0	18.6	10.0	69.9
8/12	9.0	18.9	10.0	54.6
8/13	9.0	18.9	10.0	54.6
8/14	10.0	18.6	9.5	54.6
8/15	10.0	19.5	9.0	54.0

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Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
8/16	10.0	21.3	8.0	52.1
8/17	10.0	21.3	9.0	48.9
8/18	9.0	21.9	10.0	48.3
8/19	10.0	23.2	10.0	49.5
8/20	10.0	24.1	9.0	68.6
8/21	10.0	25.3	10.0	68.6
8/22	10.0	24.4	8.0	67.3
8/23	9.0	23.2	8.0	58.4
8/24	9.5	30.5	8.0	55.9
8/25	9.0	ND	8.0	41.9
8/26	ND	ND	8.5	53.3
8/27	ND	ND	9.0	54.6
8/28	ND	ND	9.0	53.3
8/29	ND	ND	9.0	53.3
8/30	4.0	75.6	9.0	49.5
8/31	4.0	70.1	9.0	48.3
9/01	6.0	64.0	9.0	47.0
9/02	7.0	43.9	9.0	45.7
9/03	7.0	41.5	8.0	45.7
9/04	7.0	39.6	9.0	44.5
9/05	7.0	37.2	8.0	43.2
9/06	7.0	36.0	5.0	43.2
9/07	6.5	34.1	5.0	41.9
9/08	5.0	32.9	6.0	40.6
9/09	5.0	31.7	5.0	39.4
9/10	5.0	30.5	7.0	39.4
9/11	4.0	29.3	6.0	38.1
9/12	4.0	29.3	6.0	41.9
9/13	6.0	33.5	4.0	41.9
9/14	6.0	33.5	4.0	39.4
9/15			4.0	38.1
9/16			4.0	38.1
9/17			4.5	38.1
9/18			5.0	39.4
9/19			6.0	40.6
9/20			6.0	61.0
9/21			6.0	58.4

Note: Recorded water temperatures are morning water temperatures, except when morning temperatures were not available. Recorded water depths are highest recorded daily water depth.

APPENDIX D: NOME RIVER WEIR

Appendix D1.–Daily and cumulative (Cum.) passage of all salmonid species at Nome River weir, Norton Sound, 2015.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
7/02	1	1	1	1	0	0	0	0	0	0
7/03	0	1	0	1	0	0	0	0	0	0
7/04	17	18	3	4	0	0	0	0	1	1
7/05	43	61	28	32	0	0	0	0	0	1
7/06	25	86	8	40	0	0	0	0	5	6
7/07	17	103	7	47	0	0	0	0	0	6
7/08	9	112	4	51	0	0	0	0	0	6
7/09	37	149	9	60	0	0	0	0	0	6
7/10	152	301	16	76	0	0	0	0	0	6
7/11	327	628	82	158	0	0	1	1	1	7
7/12	33	661	11	169	0	0	0	1	2	9
7/13	109	770	87	256	0	0	0	1	0	9
7/14	435	1,205	2,805	3,061	1	1	0	1	2	11
7/15	331	1,536	5,541	8,602	1	2	2	3	0	11
7/16	214	1,750	2,613	11,215	0	2	1	4	3	14
7/17	243	1,993	3,210	14,425	1	3	0	4	1	15
7/18	87	2,080	337	14,762	0	3	0	4	0	15
7/19	291	2,371	3,158	17,920	0	3	0	4	2	17
7/20	2	2,373	17	17,937	0	3	0	4	0	17
7/21	121	2,494	300	18,237	0	3	0	4	0	17
7/22	678	3,172	2,178	20,415	0	3	0	4	2	19
7/23	641	3,813	4,815	25,230	2	5	0	4	1	20
7/24	191	4,004	4,805	30,035	0	5	2	6	1	21
7/25	36	4,040	1,022	31,057	0	5	0	6	0	21
7/26	91	4,131	1,852	32,909	1	6	3	9	4	25
7/27	250	4,381	5,786	38,695	2	8	0	9	2	27
7/28	226	4,607	5,418	44,113	0	8	1	10	3	30
7/29	131	4,738	5,719	49,832	0	8	2	12	4	34
7/30	162	4,900	6,525	56,357	0	8	6	18	3	37
7/31	102	5,002	4,843	61,200	0	8	1	19	2	39
8/01	4	5,006	34	61,234	0	8	1	20	0	39
8/02	94	5,100	1,783	63,017	2	10	1	21	5	44
8/03	12	5,112	141	63,158	1	11	0	21	0	44
8/04	119	5,231	1,351	64,509	2	13	3	24	5	49
8/05	100	5,331	1,779	66,288	0	13	0	24	0	49
8/06	50	5,381	1,003	67,291	5	18	3	27	6	55
8/07	76	5,457	1,532	68,823	0	18	2	29	0	55
8/08	62	5,519	927	69,750	2	20	1	30	2	57
8/09	30	5,549	1,277	71,027	0	20	1	31	2	59
8/10	17	5,566	294	71,321	0	20	1	32	0	59
8/11	16	5,582	226	71,547	0	20	0	32	0	59
8/12	10	5,592	276	71,823	0	20	2	34	0	59
8/13	18	5,610	357	72,180	1	21	2	36	1	60
8/14	68	5,678	923	73,103	1	22	30	66	4	64
8/15	13	5,691	382	73,485	0	22	2	68	2	66
8/16	43	5,734	496	73,981	0	22	6	74	4	70
8/17	27	5,761	479	74,460	0	22	5	79	5	75
8/18	18	5,779	108	74,568	0	22	5	84	0	75
8/19	6	5,785	74	74,642	0	22	1	85	1	76

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Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
8/20	17	5,802	67	74,709	0	22	0	85	2	78
8/21	60	5,862	206	74,915	1	23	84	169	3	81
8/22	6	5,868	35	74,950	0	23	0	169	1	82
8/23	11	5,879	68	75,018	0	23	1	170	0	82
8/24	65	5,944	164	75,182	0	23	377	547	2	84
8/25	28	5,972	95	75,277	0	23	92	639	1	85
8/26	16	5,989	53	75,330	0	23	76	715	1	86
8/27	16	6,005	47	75,377	0	23	88	803	1	87
8/28	14	6,018	34	75,411	0	23	88	891	1	87
8/29	0	6,018	0	75,411	0	23	0	891	0	87
8/30	0	6,018	0	75,411	0	23	0	891	0	87
8/31	3	6,021	2	75,413	0	23	60	951	2	89
9/01	0	6,021	4	75,417	0	23	5	956	0	89
9/02	0	6,021	3	75,420	0	23	1	957	0	89
9/03	10	6,031	29	75,449	0	23	64	1,021	0	89
9/04	6	6,037	8	75,457	0	23	42	1,063	0	89
9/05	6	6,043	9	75,466	0	23	24	1,087	0	89
9/06	14	6,057	14	75,480	0	23	106	1,193	0	89
9/07	6	6,063	6	75,486	0	23	43	1,236	0	89
9/08	3	6,066	6	75,492	0	23	13	1,249	0	89
9/09	6	6,072	3	75,495	0	23	44	1,293	0	89
9/10	1	6,073	4	75,499	0	23	8	1,301	0	89
9/11	0	6,073	4	75,503	0	23	8	1,309	0	89
9/12	1	6,074	4	75,507	0	23	2	1,311	0	89
9/13	15	6,089	36	75,543	0	23	456	1,767	2	91
9/14	9	6,098	40	75,583	0	23	361	2,128	4	95
9/15	3	6,101	2	75,585	0	23	24	2,152	1	96
9/16	3	6,104	7	75,592	0	23	19	2,171	0	96
9/17	2	6,106	4	75,596	0	23	52	2,223	0	96
9/18	0	6,106	0	75,596	0	23	18	2,241	0	96
9/19	0	6,106	4	75,600	0	23	101	2,342	0	96
9/20	5	6,111	3	75,603	0	23	76	2,418	0	96
Total	6,111		75,603		23		2,418		96	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles are not shown for coho salmon because entire run was not counted. Dates in italics indicate days when counts were interpolated.

Appendix D2.–Daily and cumulative (Cum.) passage of all salmonid species at Nome River weir, Norton Sound, 2016.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
6/30	0	0	0	0	0	0	0	0	0	0
7/01	10	10	4	4	0	0	0	0	1	1
7/02	60	70	9	13	0	0	0	0	0	1
7/03	81	151	987	1,000	0	0	0	0	2	3
7/04	34	185	126	1,126	0	0	0	0	0	3
7/05	21	206	29	1,155	0	0	0	0	0	3
7/06	73	279	51	1,206	0	0	0	0	0	3
7/07	175	454	162	1,368	0	0	0	0	0	3
7/08	187	641	628	1,996	0	0	0	0	8	11
7/09	165	806	596	2,592	0	0	0	0	1	12
7/10	814	1,620	21,380	23,972	0	0	0	0	7	19
7/11	354	1,974	24,772	48,744	0	0	0	0	5	24
7/12	106	2,080	19,602	68,346	0	0	0	0	5	29
7/13	246	2,326	47,601	115,947	0	0	0	0	6	35
7/14	331	2,657	70,496	186,443	0	0	0	0	4	39
7/15	97	2,754	42,269	228,712	0	0	0	0	1	40
7/16	91	2,845	11,433	240,145	0	0	0	0	0	40
7/17	51	2,896	1,562	241,707	0	0	0	0	1	41
7/18	349	3,245	9,978	251,685	1	1	0	0	4	45
7/19	148	3,393	11,620	263,305	0	1	0	0	3	48
7/20	208	3,601	29,606	292,911	0	1	0	0	4	52
7/21	232	3,833	24,754	317,665	0	1	0	0	2	54
7/22	512	4,345	48,303	365,968	0	1	20	20	4	58
7/23	178	4,523	45,340	411,308	1	2	7	27	4	62
7/24	109	4,632	16,655	427,963	1	3	6	33	5	67
7/25	376	5,008	258,615	686,578	1	4	9	42	7	74
7/26	183	5,191	203,006	889,584	0	4	4	46	12	86
7/27	108	5,299	87,653	977,237	0	4	1	47	1	87
7/28	68	5,367	5,223	982,460	0	4	0	47	2	89
7/29	144	5,511	18,354	1,000,814	0	4	1	48	2	91
7/30	98	5,609	6,160	1,006,974	1	5	5	53	5	96
7/31	135	5,744	4,532	1,011,506	0	5	2	55	5	101
8/01	111	5,855	12,740	1,024,246	0	5	4	59	1	102
8/02	51	5,906	8,953	1,033,199	0	5	2	61	2	104
8/03	84	5,990	10,295	1,043,494	0	5	3	64	1	105
8/04	98	6,088	8,564	1,052,058	1	6	8	72	4	109
8/05	130	6,218	25,432	1,077,490	1	7	14	86	4	113
8/06	88	6,306	26,395	1,103,885	2	9	27	113	10	123
8/07	77	6,383	19,226	1,123,111	2	11	28	141	4	127
8/08	36	6,419	6,367	1,129,478	1	12	11	152	14	141
8/09	75	6,494	16,205	1,145,683	0	12	23	175	12	153
8/10	69	6,563	8,001	1,153,684	0	12	47	222	9	162
8/11	37	6,600	3,240	1,156,924	4	16	13	235	10	172
8/12	157	6,757	9,146	1,166,070	1	17	66	301	20	192
8/13	39	6,796	3,101	1,169,171	1	18	40	341	14	206
8/14	38	6,834	1,335	1,170,506	1	19	14	355	6	212
8/15	10	6,844	789	1,171,295	2	21	8	363	2	214
8/16	14	6,858	613	1,171,908	0	21	1	364	1	215
8/17	17	6,875	574	1,172,482	0	21	12	376	1	216

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Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
8/18	18	6,893	520	1,173,002	1	22	11	387	4	220
8/19	^a 12	6,905	484	1,173,486	0	22	3	390	3	223
8/20	15	6,920	461	1,173,947	0	22	7	397	2	225
8/21	15	6,935	328	1,174,275	0	22	8	405	3	228
8/22	15	6,950	208	1,174,483	1	23	7	412	2	230
8/23	^a 0	6,950	42	1,174,525	0	23	1	413	0	230
8/24	12	6,962	138	1,174,663	0	23	2	415	1	231
8/25	11	6,973	80	1,174,743	0	23	6	421	4	235
8/26	17	6,990	93	1,174,836	1	24	8	429	0	235
8/27	2	6,992	85	1,174,921	0	24	14	443	2	237
8/28	6	6,998	60	1,174,981	0	24	15	458	4	241
8/29	7	7,005	74	1,175,055	0	24	25	483	0	241
8/30	18	7,023	79	1,175,134	0	24	58	541	2	243
8/31	7	7,030	42	1,175,176	0	24	41	582	1	244
9/01	7	7,037	39	1,175,215	0	24	19	601	0	244
9/02	5	7,042	73	1,175,288	0	24	136	737	0	244
9/03	1	7,043	71	1,175,359	0	24	35	772	0	244
9/04	7	7,050	51	1,175,410	0	24	55	827	2	246
9/05	6	7,056	52	1,175,462	0	24	17	844	0	246
9/06	1	7,057	17	1,175,479	0	24	6	850	0	246
9/07	4	7,061	68	1,175,547	0	24	45	895	1	247
9/08	2	7,063	29	1,175,576	0	24	35	930	0	247
9/09	12	7,075	42	1,175,618	0	24	128	1,058	0	247
9/10	4	7,079	26	1,175,644	0	24	184	1,242	4	251
9/11	1	7,080	4	1,175,648	0	24	10	1,252	0	251
9/12	11	7,091	23	1,175,671	1	25	378	1,630	2	253
9/13	0	7,091	8	1,175,679	0	25	81	1,711	0	253
9/14	1	7,092	11	1,175,690	0	25	99	1,810	1	254
9/15	0	7,092	3	1,175,693	0	25	4	1,814	0	254
9/16	0	7,092	10	1,175,703	0	25	144	1,958	0	254
9/17	0	7,092	2	1,175,705	0	25	35	1,993	0	254
9/18	1	7,093	1	1,175,706	0	25	6	1,999	0	254
9/19	0	7,093	17	1,175,723	0	25	304	2,303	0	254
9/20	0	7,093	0	1,175,723	0	25	28	2,331	0	254
Total	7,093		1,175,723		25		2,331		254	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles are not shown for coho salmon because entire run was not counted. Dates in italics indicate days when counts were interpolated.

^a Partial count day due to high water.

Appendix D3.—Age and sex compositions by year for Nome River chum salmon ASL samples, 1995–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(0.1)	(0.2)	(0.3)	(0.4)	(0.5)	(0.6)	(0.7)
1995	7/20–8/29	1,272	49.0	51.0	0.0	2.0	56.0	40.0	2.0	0.0	0.0
1996			No data collected.								
1997	7/25–7/31	173	46.0	53.0	0.0	1.0	36.0	61.0	2.0	0.0	0.0
1998			No data collected.								
1999			No data collected.								
2000			No data collected.								
2001	7/24–8/03	234	45.7	54.3	0.0	1.3	12.8	85.9	0.0	0.0	0.0
2002	7/04–8/10	438	46.1	53.9	0.0	0.7	64.6	29.5	5.3	0.0	0.0
2003	7/07–8/23	158	54.3	45.7	0.0	0.0	82.9	15.2	1.9	0.0	0.0
2004	7/01–8/06	157	42.7	57.3	0.0	7.0	49.7	43.3	0.0	0.0	0.0
2005	7/03–9/04	326	38.0	62.0	0.0	1.2	89.6	7.4	1.8	0.0	0.0
2006	7/06–8/10	458	47.4	52.6	0.0	1.7	52.8	45.4	0.0	0.0	0.0
2007	7/06–9/06	678	45.4	54.6	0.0	0.0	58.0	38.1	4.0	0.0	0.0
2008	7/23–9/06	222	52.3	47.7	0.0	0.5	43.2	47.3	8.6	0.5	0.0
2009	7/12–8/11	223	39.0	61.0	0.0	17.0	23.3	54.7	4.9	0.0	0.0
2010	7/10–8/11	240	60.0	40.0	0.0	1.7	94.6	3.8	0.0	0.0	0.0
2011	7/21–9/08	146	39.2	60.8	0.0	0.0	15.8	84.2	0.0	0.0	0.0
2012	7/07–8/15	126 ^a	38.7	61.3							
2013	7/13–8/18	183	39.0	61.0	0.0	0.0	65.7	33.8	0.5	0.0	0.0
2014	7/10–7/29	180	40.0	60.0	0.0	0.0	51.4	47.1	1.4	0.0	0.0
2015	7/10–8/13	181	45.2	54.7	0.0	7.1	60.5	31.9	0.5	0.0	0.0
2016	7/16–8/09	186	38.7	61.3	0.0	9.1	64.0	26.4	0.1	0.0	0.0

^a Sample size insufficient for age composition analysis.

Appendix D4.—Age and sex compositions by year for Nome River coho salmon ASL samples, 2001-2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)				
			Male	Female	(1.1)	(2.1)	(2.2)	(3.1)	(4.1)
2001	8/10–9/10	445	51.2	48.8	10.1	89.2	0.0	0.7	0.0
2002	8/11–8/28	139	51.1	48.9	1.4	80.6	0.0	16.5	1.4
2003	8/20–9/05	144	55.6	44.4	14.6	78.5	0.7	6.3	0.0
2004	8/23–8/27	150	66.0	34.0	23.3	72.7	0.0	4.0	0.0
2005	6/26–9/04	158	44.9	55.1	8.2	90.5	0.0	1.3	0.0
2006	7/24–9/02	191	39.3	60.7	8.9	87.0	0.0	4.2	0.0
2007	7/31–9/12	104	^a 48.1	51.9					
2008	8/08–9/09	122	^a 45.9	54.1					
2009	8/28–9/09	130	54.6	45.4	13.8	78.5	0.0	7.7	0.0
2010	8/20–9/06	116	^a 54.3	45.7					
2011	7/21–8/06	84	^a 56.1	43.9					
2012				No data collected.					
2013	8/18–9/15	31	^a						
2014				No data collected.					
2015				No data collected.					
2016				No data collected.					

^a Sample size insufficient for age composition analysis.

Appendix D5.—Nome River weir water temperature (Temp.) and stream stage (Depth) observations, Norton Sound, 2015–2016.

Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
7/01			ND	57.9
7/02	ND	ND	14.0	57.3
7/03	ND	ND	14.0	56.1
7/04	16.0	51.8	12.0	54.9
7/05	13.0	51.5	14.0	54.3
7/06	15.0	50.6	12.0	56.1
7/07	13.0	50.9	12.0	54.3
7/08	13.0	51.8	11.0	55.5
7/09	12.0	50.3	11.0	54.3
7/10	14.0	49.4	10.0	54.9
7/11	13.0	48.5	12.0	53.6
7/12	14.0	47.9	13.0	52.1
7/13	13.0	48.2	12.0	51.5
7/14	13.0	48.2	13.0	51.2
7/15	14.0	46.9	14.0	50.6
7/16	14.0	47.5	12.0	50.3
7/17	14.0	46.3	11.0	51.2
7/18	12.0	46.3	10.0	54.9
7/19	12.0	45.7	11.0	56.7
7/20	11.0	45.7	10.0	57.0
7/21	11.0	45.1	11.0	56.7
7/22	12.0	45.1	11.0	54.9
7/23	14.0	45.1	11.0	54.6
7/24	13.0	45.7	10.0	56.1
7/25	11.0	45.1	13.0	53.3
7/26	12.0	45.1	13.0	51.8
7/27	12.0	43.9	12.0	51.2
7/28	13.0	43.3	12.0	51.8
7/29	13.0	42.7	11.0	56.7
7/30	13.0	42.7	9.0	79.2
7/31	13.0	43.3	9.0	64.0
8/01	11.0	42.7	10.0	59.7
8/02	11.0	43.3	11.0	58.5
8/03	11.0	42.7	9.0	71.6
8/04	10.0	42.1	11.0	64.6
8/05	12.0	42.1	12.0	61.6
8/06	11.0	42.1	13.0	63.4
8/07	13.0	41.5	13.0	69.5
8/08	11.0	41.5	12.0	68.0
8/09	10.0	42.1	12.0	67.1
8/10	10.0	40.8	12.0	73.5
8/11	10.0	41.5	11.0	69.2
8/12	11.0	42.1	12.0	68.9
8/13	10.0	42.7	12.0	67.1
8/14	10.0	42.1	11.0	67.1
8/15	11.0	41.5	11.0	65.8

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Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
8/16	11.0	45.7	10.0	64.6
8/17	11.0	45.7	11.0	64.0
8/18	10.0	47.5	11.0	64.0
8/19	11.0	45.1	11.0	64.0
8/20	11.0	44.5	10.0	92.7
8/21	10.0	46.9	11.0	76.2
8/22	10.0	46.9	10.0	77.1
8/23	9.0	45.4	9.0	70.7
8/24	10.0	45.7	10.0	68.3
8/25	10.0	109.7	8.0	67.1
8/26	9.0	137.2	10.0	67.1
8/27	8.0	100.6	10.0	67.4
8/28	8.0	85.3	10.0	67.1
8/29	6.0	76.2	10.0	66.4
8/30	6.0	74.7	11.0	65.8
8/31	5.0	70.7	10.0	64.3
9/01	6.0	68.3	10.0	63.7
9/02	7.0	67.1	10.0	63.1
9/03	8.0	66.4	10.0	62.8
9/04	8.0	65.2	10.5	62.5
9/05	9.0	63.4	10.0	54.9
9/06	8.0	62.8	7.0	61.0
9/07	8.0	62.2	5.0	59.7
9/08	5.0	61.0	7.0	59.7
9/09	5.0	60.4	7.0	59.7
9/10	5.0	59.1	8.0	59.4
9/11	4.0	58.5	7.0	60.0
9/12	4.0	57.9	7.0	62.2
9/13	6.0	59.7	6.0	63.7
9/14	5.0	63.4	4.0	60.4
9/15	5.0	59.7	3.0	58.5
9/16	5.0	58.5	4.0	57.9
9/17	5.0	57.3	4.0	57.9
9/18	3.0	56.1	4.0	57.9
9/19	2.0	54.9	7.0	60.4
9/20	3.0	54.864	7.0	106.7

Note: Recorded water temperatures are morning water temperatures, except when morning temperatures were not available. Recorded water depths are highest recorded daily water depth.

APPENDIX E: ELDORADO RIVER WEIR

Appendix E1.–Daily and cumulative (Cum.) passage of all salmonid species at Eldorado River weir, Norton Sound, 2015.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
6/22	0	0	0	0	0	0	0	0	0	0
6/23	0	0	0	0	0	0	0	0	0	0
6/24	0	0	0	0	0	0	0	0	0	0
6/25	0	0	0	0	0	0	0	0	0	0
6/26	6	6	0	0	0	0	0	0	0	0
6/27	65	71	0	0	0	0	0	0	0	0
6/28	600	671	0	0	0	0	0	0	0	0
6/29	1	672	0	0	0	0	0	0	0	0
6/30	6	678	0	0	0	0	0	0	0	0
7/01	1	679	0	0	0	0	0	0	0	0
7/02	354	1,033	0	0	0	0	0	0	0	0
7/03	295	1,328	0	0	0	0	0	0	0	0
7/04	1,745	3,073	2	2	0	0	0	0	0	0
7/05	382	3,455	26	28	2	2	0	0	0	0
7/06	913	4,368	36	64	0	2	0	0	0	0
7/07	1,163	5,531	29	93	0	2	0	0	0	0
7/08	231	5,762	1	94	0	2	0	0	0	0
7/09	1,256	7,018	0	94	1	3	0	0	0	0
7/10	2,006	9,024	46	140	4	7	0	0	0	0
7/11	2,634	11,658	157	297	1	8	0	0	0	0
7/12	1,859	13,517	92	389	1	9	0	0	0	0
7/13	720	14,237	22	411	0	9	0	0	0	0
7/14	2,785	17,022	66	477	3	12	0	0	0	0
7/15	2,409	19,431	153	630	0	12	0	0	0	0
7/16	781	20,212	76	706	0	12	0	0	0	0
7/17	653	20,865	61	767	0	12	0	0	0	0
7/18 ^a	330	21,195	24	791	0	12	0	0	0	0
7/19	219	21,414	2	793	0	12	0	0	0	0
7/20	583	21,997	22	815	0	12	0	0	0	0
7/21	987	22,984	82	897	5	17	0	0	0	0
7/22	256	23,240	73	970	0	17	0	0	0	0
7/23	459	23,699	106	1,076	2	19	1	1	0	0
7/24	200	23,899	19	1,095	0	19	0	1	0	0
7/25	128	24,027	56	1,151	0	19	0	1	0	0
7/26	488	24,515	102	1,253	0	19	0	1	0	0
7/27	355	24,870	142	1,395	4	23	0	1	0	0
7/28	370	25,240	65	1,460	1	24	0	1	0	0
7/29	92	25,332	10	1,470	1	25	0	1	0	0
7/30	228	25,560	13	1,483	0	25	0	1	0	0
Total	25,560		1,483		25		1		0	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on ends on the third quartile. Quartiles are not shown for chum, pink, coho, and sockeye salmon because entire run was not counted.

^a Partial day count because weir was flooded.

Appendix E2.–Daily and cumulative (Cum.) passage of all salmonid species at Eldorado River weir, Norton Sound, 2016.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
6/25	0	0	0	0	0	0	0	0	0	0
6/26	116	116	2	2	0	0	0	0	0	0
6/27	66	182	9	11	0	0	0	0	0	0
6/28	168	350	3	14	0	0	0	0	0	0
6/29	324	674	6	20	0	0	0	0	0	0
6/30	725	1,399	9	29	0	0	0	0	0	0
7/01	1,191	2,590	35	64	0	0	0	0	0	0
7/02	828	3,418	83	147	0	0	0	0	0	0
7/03	1,757	5,175	126	273	0	0	0	0	1	1
7/04	400	5,575	14	287	0	0	0	0	0	1
7/05	813	6,388	27	314	0	0	0	0	0	1
7/06	474	6,862	9	323	0	0	0	0	0	1
7/07	763	7,625	95	418	0	0	0	0	0	1
7/08	883	8,508	56	474	0	0	0	0	0	1
7/09	513	9,021	51	525	0	0	0	0	0	1
7/10	1,445	10,466	364	889	0	0	0	0	0	1
7/11	601	11,067	293	1,182	0	0	0	0	0	1
7/12	803	11,870	689	1,871	0	0	0	0	0	1
7/13	457	12,327	563	2,434	0	0	0	0	1	2
7/14	602	12,929	835	3,269	0	0	0	0	0	2
7/15	517	13,446	1,221	4,490	0	0	0	0	0	2
7/16	9	13,455	15	4,505	0	0	0	0	0	2
7/17	34	13,489	2	4,507	0	0	0	0	0	2
7/18	505	13,994	352	4,859	0	0	0	0	0	2
7/19	525	14,519	1,161	6,020	0	0	0	0	0	2
7/20	341	14,860	1,551	7,571	0	0	0	0	5	7
7/21	230	15,090	1,086	8,657	0	0	0	0	2	9
7/22	453	15,543	2,503	11,160	0	0	0	0	1	10
7/23	134	15,677	703	11,863	0	0	0	0	1	11
7/24	551	16,228	2,623	14,486	0	0	0	0	3	14
7/25	392	16,620	4,812	19,298	0	0	2	2	0	14
7/26	189	16,809	1,742	21,040	0	0	4	6	2	16
7/27	103	16,912	509	21,549	0	0	2	8	0	16
7/28	495	17,407	2,713	24,262	0	0	3	11	0	16
7/29	710	18,117	6,037	30,299	0	0	19	30	0	16
7/30	246	18,363	4,175	34,474	0	0	5	35	0	16
7/31	208	18,571	4,732	39,206	0	0	5	40	0	16
8/01	285	18,856	2,983	42,189	0	0	1	41	0	16
8/02	82	18,938	510	42,699	0	0	0	41	0	16
Total	18,938		42,699		0		41		16	

Note: Species quartiles are not shown because entire run was not counted. Escapements should be considered minimum estimates.

Appendix E3.—Age and sex compositions by year for Eldorado River chum salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(0.1)	(0.2)	(0.3)	(0.4)	(0.5)	(0.6)	(0.7)
2001	7/22–8/16	586	58.4	41.6	0.0	0.5	4.5	94.4	0.6	0.0	0.0
2002	7/04–9/03	367	49.0	51.0	0.0	1.6	88.3	6.5	3.5	0.0	0.0
2003	7/05–7/24	301	62.8	37.2	0.0	0.0	53.8	45.5	0.7	0.0	0.0
2004	6/23–9/09	272	50.7	49.3	0.0	4.0	48.9	46.0	1.1	0.0	0.0
2005	6/28–8/28	548	42.3	57.7	0.0	1.6	84.9	13.1	0.4	0.0	0.0
2006	6/29–7/30	459	46.4	53.6	0.0	0.4	57.5	41.0	1.0	0.0	0.0
2007	6/29–8/01	443	54.9	45.1	0.0	0.5	47.0	49.0	3.6	0.0	0.0
2008	6/29–7/24	128 ^a	62.5	37.5							
2009	7/02–8/03	539	55.5	44.5	0.0	15.2	41.3	34.9	8.2	0.4	0.0
2010	7/03–7/23	240	49.2	50.8	0.0	0.4	94.6	4.6	0.4	0.0	0.0
2011	7/02–7/30	210	62.9	37.1	0.0	0.0	3.1	96.4	0.4	0.0	0.0
2012	7/03–7/22	157	61.3	38.7	0.0	1.1	71.5	21.0	6.5	0.0	0.0
2013	7/03–7/30	198	66.1	33.9	0.0	0.5	52.0	47.5	0.0	0.0	0.0
2014	7/01–7/26	190	63.4	36.6	0.0	0.9	57.3	39.0	2.8	0.0	0.0
2015	7/03–7/30	203	46.8	53.2	0.0	2.2	49.1	47.8	0.9	0.0	0.0
2016	6/26–7/24	182	52.7	47.3	0.0	4.4	54.9	38.5	2.2	0.0	0.0

^a Sample size insufficient for age composition analysis.

Appendix E4.–Eldorado River weir water temperature (Temp.) and stream stage (Depth) observations, Norton Sound, 2015–2016.

Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
6/22	ND	ND		
6/23	16.0	56.4		
6/24	14.0	55.5		
6/25	11.0	54.9	ND	ND
6/26	6.0	54.9	11.5	64.0
6/27	6.0	54.9	10.0	61.6
6/28	9.0	53.3	10.0	61.0
6/29	11.0	53.6	9.5	61.0
6/30	8.0	54.6	10.0	61.0
7/01	7.0	53.6	12.0	59.7
7/02	7.0	52.7	13.0	59.1
7/03	7.0	53.3	13.0	57.9
7/04	8.0	50.6	12.0	57.3
7/05	12.0	48.8	13.0	57.9
7/06	14.0	55.5	11.0	57.9
7/07	13.0	70.1	11.0	57.3
7/08	11.0	59.1	10.5	57.9
7/09	11.0	49.7	11.5	57.3
7/10	12.0	47.5	9.0	57.9
7/11	12.0	47.9	9.0	56.1
7/12	13.0	46.3	11.0	56.7
7/13	12.0	45.7	11.5	56.4
7/14	12.0	49.4	12.8	56.1
7/15	13.0	46.3	13.0	56.1
7/16	13.0	46.9	12.0	55.5
7/17	13.0	45.7	10.5	56.7
7/18	12.0	48.2	9.5	67.1
7/19	12.0	46.9	10.0	61.0
7/20	12.0	44.5	9.5	61.0
7/21	11.5	43.9	10.0	61.0
7/22	12.0	44.5	10.0	58.5
7/23	13.0	45.4	11.0	58.2
7/24	12.5	45.1	10.0	61.0
7/25	11.0	45.1	12.5	58.2
7/26	11.0	45.4	13.0	58.5
7/27	10.0	43.9	13.0	56.1
7/28	13.0	45.1	12.0	57.9
7/29	12.0	44.5	10.5	70.7
7/30	13.0	44.5	7.0	77.4
7/31			8.0	66.4
8/01			8.0	67.7
8/02			11.0	66.4

Note: Recorded water temperatures are morning water temperatures, except when morning temperatures were not available. Recorded water depths are highest recorded daily water depth.

APPENDIX F: SOLOMON RIVER WEIR

Appendix F1.–Daily and cumulative (Cum.) migration of all salmonid species past Solomon River weir, Norton Sound, 2015.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
6/26	0	0	0	0	0	0	0	0	0	0
6/27	0	0	0	0	0	0	0	0	0	0
6/28	0	0	0	0	0	0	0	0	0	0
6/29	0	0	0	0	0	0	0	0	0	0
6/30	0	0	0	0	0	0	0	0	0	0
7/01	0	0	0	0	0	0	0	0	0	0
7/02	0	0	0	0	0	0	0	0	0	0
7/03	0	0	0	0	0	0	0	0	0	0
7/04	26	26	0	0	0	0	0	0	0	0
7/05	0	26	0	0	0	0	0	0	0	0
7/06	9	35	0	0	0	0	0	0	0	0
7/07	15	50	0	0	0	0	0	0	0	0
7/08	9	59	0	0	0	0	0	0	0	0
7/09	3	62	0	0	0	0	0	0	0	0
7/10	2	64	0	0	0	0	0	0	0	0
7/11	19	83	0	0	0	0	0	0	0	0
7/12	33	116	1	1	0	0	0	0	0	0
7/13	5	121	1	2	0	0	0	0	0	0
7/14	20	141	5	7	0	0	0	0	0	0
7/15	138	279	36	43	0	0	1	1	0	0
7/16	67	346	143	186	0	0	0	1	0	0
7/17	1	347	45	231	0	0	0	1	0	0
7/18	9	356	245	476	0	0	0	1	0	0
7/19	1	357	3	479	0	0	0	1	0	0
7/20	78	435	1,751	2,230	0	0	0	1	0	0
7/21	28	463	693	2,923	0	0	0	1	0	0
7/22	86	549	1,990	4,913	0	0	0	1	0	0
7/23	45	594	1,361	6,274	0	0	0	1	0	0
7/24	0	594	0	6,274	0	0	0	1	0	0
7/25	1	595	402	6,676	0	0	1	2	0	0
7/26	20	615	942	7,618	0	0	1	3	0	0
7/27	3	618	235	7,853	0	0	0	3	0	0
7/28	4	622	1,211	9,064	0	0	0	3	0	0
7/29	43	665	1,871	10,935	0	0	3	6	0	0
7/30	34	699	1,095	12,030	0	0	0	6	0	0
7/31	0	699	0	12,030	0	0	0	6	0	0
8/01	1	700	264	12,294	0	0	0	6	0	0
8/02	11	711	335	12,629	0	0	0	6	0	0
8/03	63	774	1,080	13,709	0	0	2	8	0	0
8/04	3	777	1,115	14,824	0	0	1	9	0	0
8/05	18	795	493	15,317	0	0	3	12	0	0
8/06	53	848	974	16,291	0	0	2	14	0	0
8/07	19	867	96	16,387	0	0	0	14	0	0
8/08	16	883	203	16,590	0	0	0	14	0	0
8/09	21	904	518	17,108	0	0	2	16	0	0
8/10	14	918	103	17,211	0	0	0	16	0	0
8/11	25	943	528	17,739	0	0	8	24	0	0
8/12	16	959	121	17,860	0	0	1	25	0	0
8/13	30	989	205	18,065	0	0	2	27	0	0

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Appendix F1.–Page 2 of 2.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
8/14	36	1,025	101	18,166	0	0	2	29	0	0
8/15	3	1,028	76	18,242	0	0	0	29	0	0
8/16	15	1,043	136	18,378	0	0	4	33	0	0
8/17	11	1,054	83	18,461	0	0	0	33	0	0
8/18	17	1,071	120	18,581	0	0	6	39	3	3
8/19	15	1,086	68	18,649	0	0	0	39	0	3
8/20	2	1,088	8	18,657	0	0	0	39	0	3
8/21	17	1,105	46	18,703	0	0	2	41	0	3
8/22	9	1,114	24	18,727	0	0	2	43	0	3
8/23	11	1,125	24	18,751	0	0	1	44	0	3
8/24	3	1,128	13	18,764	0	0	2	46	0	3
Total	1,128		18,764		0		46		3	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles are not shown for coho salmon because entire run was not counted.

Appendix F2.–Daily and cumulative (Cum.) migration of all salmonid species past Solomon River weir, Norton Sound, 2016.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
6/30	5	5	0	0	0	0	0	0	0	0
7/01	0	5	0	0	0	0	0	0	0	0
7/02	3	8	0	0	0	0	0	0	0	0
7/03	0	8	0	0	0	0	0	0	0	0
7/04	6	14	0	0	0	0	0	0	0	0
7/05	0	14	0	0	0	0	0	0	0	0
7/06	17	31	11	11	0	0	0	0	0	0
7/07	12	43	8	19	0	0	0	0	0	0
7/08	59	102	34	53	0	0	0	0	0	0
7/09	22	124	4	57	0	0	0	0	0	0
7/10	158	282	362	419	0	0	0	0	0	0
7/11	28	310	147	566	0	0	0	0	0	0
7/12	47	357	406	972	0	0	0	0	0	0
7/13	277	634	5,923	6,895	0	0	1	1	0	0
7/14	140	774	11,262	18,157	0	0	0	1	0	0
7/15	81	855	7,596	25,753	0	0	2	3	0	0
7/16	113	968	7,310	33,063	0	0	0	3	0	0
7/17	39	1,007	7,234	40,297	0	0	0	3	0	0
7/18	32	1,039	2,621	42,918	0	0	0	3	0	0
7/19	10	1,049	856	43,774	0	0	0	3	0	0
7/20	160	1,209	5,323	49,097	0	0	1	4	0	0
7/21	160	1,369	6,254	55,351	0	0	2	6	0	0
7/22	60	1,429	5,674	61,025	0	0	1	7	0	0
7/23	31	1,460	2,776	63,801	0	0	0	7	0	0
7/24	20	1,480	2,484	66,285	0	0	1	8	0	0
7/25	65	1,545	7,663	73,948	0	0	9	17	1	1
7/26	17	1,562	2,816	76,764	1	1	4	21	1	2
7/27	58	1,620	7,078	83,842	0	1	8	29	1	3
7/28	60	1,680	8,032	91,874	0	1	9	38	0	3
7/29 ^a	26	1,706	2,659	94,533	0	1	1	39	0	3
7/30	51	1,757	6,331	100,864	0	1	8	47	0	3
7/31 ^a	13	1,770	2,880	103,744	0	1	3	50	0	3
8/01	41	1,811	4,629	108,373	0	1	7	57	0	3
8/02	3	1,814	615	108,988	0	1	0	57	0	3
8/03 ^a	52	1,866	3,306	112,294	0	1	21	78	1	4
8/04	18	1,884	2,011	114,305	0	1	15	93	0	4
8/05	15	1,899	1,422	115,727	1	2	7	100	0	4
8/06	39	1,938	3,122	118,849	1	3	20	120	3	7
8/07	20	1,958	2,680	121,529	0	3	13	133	0	7
8/08	23	1,981	2,286	123,815	0	3	10	143	1	8
8/09	12	1,993	1,507	125,322	1	4	2	145	1	9
8/10	6	1,999	786	126,108	1	5	4	149	1	10
8/11 ^a	1	2,000	591	126,699	0	5	17	166	0	10
8/12	6	2,006	786	127,485	1	6	4	170	1	11
8/13 ^a	7	2,013	304	127,789	0	6	19	189	0	11

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Appendix F2.–Page 2 of 2.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
8/14	0	2,013	64	127,853	0	6	6	195	0	11
8/15	0	2,013	95	127,948	0	6	9	204	0	11
8/16	1	2,014	48	127,996	0	6	3	207	0	11
8/17	0	2,014	28	128,024	0	6	6	213	0	11
8/18	2	2,016	22	128,046	0	6	2	215	0	11
Total	2,016		128,046		6		79		11	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles are not shown for coho salmon because entire run was not counted.

^a Partial day count because weir was flooded.

Appendix F3.–Solomon river weir water temperature (Temp.) and stream stage (Depth) observations, Norton Sound, 2015–2016.

Date	2015		2016	
	Temp. (°C) ^a	Depth (cm)	Temp. (°C)	Depth (cm)
6/26	ND	ND		
6/27	ND	ND		
6/28	ND	ND		
6/29	ND	ND		
6/30	ND	ND	ND	ND
7/01	ND	ND	ND	ND
7/02	ND	ND	ND	ND
7/03	ND	ND	ND	ND
7/04	ND	ND	ND	50.8
7/05	10.2	ND	12.0	58.4
7/06	11.7	ND	11.0	55.9
7/07	11.5	70.1	13.0	58.4
7/08	10.6	71.0	11.0	55.9
7/09	10.3	ND	9.0	55.9
7/10	11.0	70.1	10.0	55.9
7/11	10.9	ND	12.0	55.9
7/12	10.8	71.9	11.0	55.9
7/13	10.7	ND	12.0	52.1
7/14	10.5	76.2	12.0	54.6
7/15	11.0	78.6	13.0	55.9
7/16	11.4	82.3	11.0	55.9
7/17	11.3	91.4	12.0	57.2
7/18	10.8	94.5	11.0	58.4
7/19	10.0	82.3	12.0	59.7
7/20	9.3	83.8	12.0	59.7
7/21	10.3	80.8	10.0	58.4
7/22	10.5	82.3	10.0	58.4
7/23	10.8	80.8	10.0	55.9
7/24	10.5	79.2	11.0	54.6
7/25	9.8	78.6	11.0	55.9
7/26	10.0	77.4	11.0	53.3
7/27	10.0	76.2	12.0	59.1
7/28	10.2	ND	12.0	58.4
7/29	10.3	77.1	9.0	121.9
7/30	10.6	75.6	ND	ND
7/31	11.0	79.2	8.0	68.6
8/01	10.0	77.4	10.0	69.9
8/02	9.8	74.7	8.0	81.3
8/03	9.3	76.2	9.0	68.6
8/04	9.7	77.4	10.0	69.9
8/05	10.0	76.8	11.0	68.6
8/06	9.2	76.2	9.0	68.6
8/07	10.2	76.2	10.0	71.1
8/08	9.5	76.2	10.0	71.1
8/09	8.1	75.6	10.0	99.1
8/10	6.9	73.8	ND	ND

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Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
8/11	8.3	73.2	10.0	71.1
8/12	8.9	79.6	10.0	71.1
8/13	8.7	82.3	10.0	71.1
8/14	8.7	75.6	8.0	68.6
8/15	9.3	75.9	8.0	61.0
8/16	8.9	83.8	8.0	58.4
8/17	9.3	83.8	9.0	76.2
8/18	9.1	82.3	ND	ND
8/19	8.9	76.2		
8/20	8.9	78.6		
8/21	8.9	78.0		
8/22	8.8	ND		
8/23	7.7	ND		
8/24	8.9	ND		

Note: Recorded water temperatures are morning water temperatures, except when morning temperatures were not available. Recorded water depths are highest recorded daily water depth.

^a Temperature recorded with a HOBO Water Temp Pro v2 logger.

APPENDIX G: FISH RIVER TOWER

Appendix G1.–Expanded daily and cumulative (Cum.) migration of all salmonid species past Fish River tower, Norton Sound, 2015.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
6/19	0	0	0	0	0	0	0	0
6/20	918	918	0	0	12	12	0	0
6/21	984	1,902	0	0	138	150	0	0
6/22	2,088	3,990	0	0	72	222	0	0
6/23	2,346	6,336	0	0	120	342	0	0
6/24	990	7,326	0	0	60	402	0	0
6/25	396	7,722	0	0	96	498	0	0
6/26	804	8,526	0	0	114	612	0	0
6/27	870	9,396	0	0	36	648	0	0
6/28	1,134	10,530	0	0	24	672	0	0
6/29	3,072	13,602	162	162	48	720	0	0
6/30	1,464	15,066	126	288	36	756	0	0
7/01	2,058	17,124	72	360	42	798	0	0
7/02	1,572	18,696	72	432	108	906	0	0
7/03	3,570	22,266	18	450	66	972	0	0
7/04	4,308	26,574	42	492	78	1,050	0	0
7/05	13,110	39,684	438	930	138	1,188	0	0
7/06	17,772	57,456	1,918	2,848	234	1,422	0	0
7/07	11,160	68,616	2,226	5,074	180	1,602	0	0
7/08	5,622	74,238	3,336	8,410	90	1,692	0	0
7/09	5,544	79,782	6,492	14,902	78	1,770	0	0
7/10	7,602	87,384	7,572	22,474	60	1,830	0	0
7/11	5,694	93,078	7,740	30,214	156	1,986	0	0
7/12	2,154	95,232	7,152	37,366	18	2,004	0	0
7/13	2,712	97,944	5,694	43,060	18	2,022	0	0
7/14	5,814	103,758	7,728	50,788	25	2,047	0	0
7/15	5,820	109,578	6,498	57,286	12	2,059	0	0
7/16	5,652	115,230	8,358	65,644	72	2,131	6	6
7/17	2,244	117,474	12,510	78,154	6	2,137	0	6
7/18	1,758	119,232	4,500	82,654	12	2,149	0	6
7/19	2,016	121,248	8,958	91,612	6	2,155	0	6
7/20	1,152	122,400	4,500	96,112	18	2,173	12	18
7/21	1,980	124,380	6,504	102,616	12	2,185	18	36
7/22	3,114	127,494	8,616	111,232	6	2,191	6	42
7/23	3,492	130,986	9,378	120,610	36	2,227	12	54
7/24	2,280	133,266	9,900	130,510	42	2,269	6	60
7/25	1,788	135,054	6,078	136,588	18	2,287	18	78
7/26	1,362	136,416	5,700	142,288	-6	2,281	12	90
7/27	2,118	138,534	8,508	150,796	0	2,281	36	126
7/28	1,518	140,052	11,436	162,232	6	2,287	72	198
7/29	1,194	141,246	10,422	172,654	0	2,287	198	396
7/30	858	142,104	5,616	178,270	0	2,287	132	528
7/31	444	142,548	5,118	183,388	0	2,287	222	750
8/01	384	142,932	4,866	188,254	0	2,287	294	1,044
8/02	186	143,118	4,806	193,060	0	2,287	432	1,476
8/03	330	143,448	4,752	197,812	6	2,293	630	2,106
8/04	486	143,934	6,174	203,986	6	2,299	810	2,916
8/05	144	144,078	3,462	207,448	0	2,299	672	3,588

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Appendix G1.–Page 2 of 2.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
8/06	198	144,276	1,740	209,188	0	2,299	378	3,966
8/07	72	144,348	1,836	211,024	0	2,299	432	4,398
8/08	72	144,420	1,920	212,944	0	2,299	408	4,806
8/09	12	144,432	1,002	213,946	0	2,299	354	5,160
8/10	72	144,504	504	214,450	0	2,299	264	5,424
8/11	48	144,552	798	215,248	0	2,299	180	5,604
8/12	18	144,570	690	215,938	0	2,299	354	5,958
8/13	24	144,594	498	216,436	0	2,299	348	6,306
8/14	36	144,630	534	216,970	0	2,299	594	6,900
8/15	24	144,654	426	217,396	0	2,299	822	7,722
8/16	6	144,660	228	217,624	0	2,299	678	8,400
8/17	6	144,666	162	217,786	0	2,299	594	8,994
8/18	24	144,690	228	218,014	0	2,299	822	9,816
8/19	0	144,690	192	218,206	0	2,299	624	10,440
8/20	0	144,690	138	218,344	0	2,299	396	10,836
8/21	0	144,690	81	218,425	0	2,299	659	11,495
8/22	0	144,690	76	218,501	0	2,299	1,091	12,586
8/23	0	144,690	24	218,525	0	2,299	660	13,246
8/24	0	144,690	0	218,525	0	2,299	732	13,978
8/25	0	144,690	0	218,525	0	2,299	691	14,669
8/26	0	144,690	0	218,525	0	2,299	60	14,729
8/27	0	144,690	0	218,525	0	2,299	0	14,729
8/28	0	144,690	0	218,525	0	2,299	0	14,729
8/29	0	144,690	0	218,525	0	2,299	0	14,729
8/30	0	144,690	0	218,525	0	2,299	0	14,729
8/31	0	144,690	0	218,525	0	2,299	0	14,729
Total	144,690		218,525		2,299		14,729	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Dates in italics indicate days when some portion of the day's count was interpolated.

Appendix G2.—Expanded daily and cumulative (Cum) migration of all salmonid species past Fish River tower, Norton Sound, 2016.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
6/18	136	136	0	0	0	0	0	0
6/19	18	154	0	0	0	0	0	0
6/20	264	418	0	0	0	0	0	0
6/21	318	736	60	60	24	24	0	0
6/22	1,032	1,768	126	186	18	42	0	0
6/23	1,026	2,794	150	336	30	72	0	0
6/24	1,092	3,886	120	456	54	126	0	0
6/25	1,632	5,518	240	696	96	222	0	0
6/26	5,388	10,906	1,482	2,178	60	282	0	0
6/27	1,128	12,034	786	2,964	30	312	0	0
6/28	3,012	15,046	1,590	4,554	24	336	0	0
6/29	3,726	18,772	1,698	6,252	72	408	0	0
6/30	5,808	24,580	7,920	14,172	66	474	0	0
7/01	4,572	29,152	9,246	23,418	90	564	0	0
7/02	4,476	33,628	17,214	40,632	42	606	0	0
7/03	2,772	36,400	20,274	60,906	12	618	0	0
7/04	1,860	38,260	12,702	73,608	24	642	0	0
7/05	1,704	39,964	15,948	89,556	24	666	0	0
7/06	1,392	41,356	11,604	101,160	6	672	0	0
7/07	2,202	43,558	12,870	114,030	6	678	0	0
7/08	2,280	45,838	10,140	124,170	6	684	0	0
7/09	1,974	47,812	7,518	131,688	36	720	0	0
7/10	1,416	49,228	6,462	138,150	12	732	0	0
7/11	3,078	52,306	31,758	169,908	24	756	0	0
7/12	3,520	55,826	45,930	215,838	30	786	0	0
7/13	2,636	58,462	73,644	289,482	28	814	0	0
7/14	948	59,410	85,712	375,194	12	826	6	6
7/15	1,169	60,579	55,740	430,934	0	826	0	6
7/16	372	60,951	30,354	461,288	0	826	0	6
7/17	180	61,131	7,242	468,530	0	826	0	6
7/18	906	62,037	8,478	477,008	0	826	0	6
7/19	1,356	63,393	24,240	501,248	0	826	78	84
7/20	840	64,233	30,552	531,800	0	826	192	276
7/21	534	64,767	17,124	548,924	0	826	84	360
7/22	1,488	66,255	62,970	611,894	0	826	372	732
7/23	1,212	67,467	127,878	739,772	6	832	906	1,638
7/24	792	68,259	88,020	827,792	0	832	312	1,950
7/25	888	69,147	144,132	971,924	0	832	258	2,208
7/26	942	70,089	158,910	1,130,834	0	832	204	2,412
7/27	402	70,491	75,054	1,205,888	6	838	96	2,508
7/28	294	70,785	51,630	1,257,518	0	838	240	2,748
7/29	156	70,941	12,108	1,269,626	0	838	252	3,000
7/30	64	71,005	13,266	1,282,892	0	838	300	3,300
Total	71,005		1,282,892		838		3,300	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Dates in italics indicate days when some portion of the day's count was interpolated. Interpolation not completed and quartiles not shown for pink and coho salmon because runs were not complete. Escapements should be considered minimum estimates.

Appendix G3.–Fish River tower water temperature (Temp.) and stream stage (Depth) observations, Norton Sound, 2015–2016.

Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
6/18			13.0	74.0
6/19	ND	ND	11.0	73.0
6/20	ND	64.0	11.0	69.0
6/21	ND	57.3	12.0	70.0
6/22	ND	54.3	12.5	60.0
6/23	ND	50.6	13.0	58.0
6/24	18.0	39.0	ND	ND
6/25	16.0	36.0	13.0	54.0
6/26	13.0	34.1	15.0	53.8
6/27	12.0	33.5	14.0	50.0
6/28	12.0	32.0	14.0	47.0
6/29	10.0	29.3	14.0	45.0
6/30	7.0	29.3	15.5	43.0
7/01	11.0	30.5	16.0	40.0
7/02	10.0	29.9	16.0	39.0
7/03	9.0	28.7	16.0	36.0
7/04	10.0	28.7	15.0	35.0
7/05	14.0	28.7	17.0	33.0
7/06	16.0	23.8	15.0	33.0
7/07	16.0	22.6	14.0	33.0
7/08	15.0	23.8	14.0	32.0
7/09	15.0	24.4	13.0	30.0
7/10	15.0	24.4	13.0	30.0
7/11	15.0	21.9	13.0	29.0
7/12	15.0	21.9	ND	27.0
7/13	14.5	21.3	15.0	25.0
7/14	13.0	20.7	17.0	24.0
7/15	14.0	20.7	16.0	21.0
7/16	14.5	19.5	15.0	20.0
7/17	15.5	20.1	13.0	22.0
7/18	14.0	23.2	12.0	74.0
7/19	14.5	24.4	13.0	64.0
7/20	13.0	20.7	12.0	51.0
7/21	13.0	18.9	12.0	55.0
7/22	14.0	17.7	13.0	52.0
7/23	14.0	19.5	13.0	56.0
7/24	15.0	19.5	11.0	64.0
7/25	14.0	20.1	13.0	57.0
7/26	14.0	19.5	14.0	48.0
7/27	14.0	19.5	14.0	43.0
7/28	15.0	17.1	14.5	43.0
7/29	15.0	14.9	13.0	61.0
7/30	16.0	13.7	11.0	155.0
7/31	15.0	12.5		
8/01	14.0	12.2		
8/02	13.0	13.4		
8/03	13.0	13.4		

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Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
8/04	13.0	12.2		
8/05	14.0	11.6		
8/06	13.5	9.8		
8/07	14.0	9.4		
8/08	13.0	9.8		
8/09	11.0	10.4		
8/10	9.5	9.8		
8/11	10.0	9.8		
8/12	11.0	10.7		
8/13	11.0	11.0		
8/14	10.0	11.0		
8/15	11.5	10.7		
8/16	11.5	14.0		
8/17	12.0	16.8		
8/18	11.0	17.7		
8/19	12.0	18.3		
8/20	11.0	16.5		
8/21	11.0	20.7		
8/22	11.5	36.6		
8/23	11.0	36.0		
8/24	11.0	29.9		
8/25	10.5	42.7		
8/26	11.0	79.2		
8/27	ND	ND		
8/28	ND	ND		
8/29	ND	ND		
8/30	ND	ND		
8/31	ND	ND		

Note: Recorded water temperatures are morning water temperatures, except when morning temperatures were not available. Recorded water depths are highest recorded daily water depth.

APPENDIX H: KWINIUK RIVER TOWER

Appendix H1.–Expanded daily and cumulative (Cum.) migration of all salmonid species past Kwiniuk River tower, Norton Sound, 2015.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
6/15	36	36	0	0	0	0	0	0
6/16	39	75	0	0	0	0	0	0
6/17	12	87	0	0	0	0	0	0
6/18	0	87	15	15	0	0	0	0
6/19	9	96	0	15	0	0	0	0
6/20	75	171	15	30	0	0	0	0
6/21	1,275	1,446	42	72	0	0	0	0
6/22	1,791	3,237	18	90	0	0	0	0
6/23	369	3,606	24	114	12	12	0	0
6/24	981	4,587	0	114	15	27	0	0
6/25	159	4,746	0	114	9	36	0	0
6/26	189	4,935	0	114	-6	30	0	0
6/27	1,461	6,396	0	114	0	30	0	0
6/28	369	6,765	0	114	0	30	0	0
6/29	495	7,260	0	114	9	39	0	0
6/30	534	7,794	0	114	-3	36	0	0
7/01	15	7,809	0	114	-9	27	0	0
7/02	-15	7,794	-3	111	-3	24	0	0
7/03	1,377	9,171	24	135	6	30	0	0
7/04	7,260	16,431	24	159	15	45	0	0
7/05	1,800	18,231	18	177	21	66	0	0
7/06	5,388	23,619	48	225	90	156	0	0
7/07	777	24,396	24	249	12	168	0	0
7/08	540	24,936	114	363	3	171	0	0
7/09	942	25,878	150	513	9	180	0	0
7/10	612	26,490	150	663	15	195	0	0
7/11	1,326	27,816	543	1,206	27	222	0	0
7/12	1,113	28,929	885	2,091	0	222	0	0
7/13	2,340	31,269	1,065	3,156	24	246	0	0
7/14	396	31,665	156	3,312	0	246	0	0
7/15	252	31,917	234	3,546	12	258	0	0
7/16	1,506	33,423	858	4,404	15	273	0	0
7/17	1,155	34,578	8,646	13,050	21	294	0	0
7/18	273	34,851	567	13,617	15	309	0	0
7/19	93	34,944	726	14,343	0	309	0	0
7/20	957	35,901	6,480	20,823	0	309	0	0
7/21	639	36,540	11,325	32,148	0	309	3	3
7/22	135	36,675	3,579	35,727	3	312	3	6
7/23	57	36,732	474	36,201	0	312	9	15
7/24	111	36,843	3,240	39,441	0	312	18	33
7/25	75	36,918	1,623	41,064	0	312	24	57
7/26	78	36,996	657	41,721	0	312	12	69
7/27	195	37,191	1,773	43,494	0	312	12	81
7/28	348	37,539	9,894	53,388	6	318	81	162
7/29	42	37,581	3,123	56,511	0	318	60	222
7/30	33	37,614	633	57,144	0	318	36	258
7/31	33	37,647	978	58,122	3	321	45	303
8/01	18	37,665	840	58,962	0	321	39	342

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Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
8/02	27	37,692	1,053	60,015	-6	315	30	372
8/03	39	37,731	1,095	61,110	0	315	69	441
8/04	36	37,767	1,689	62,799	3	318	105	546
8/05	9	37,776	831	63,630	0	318	93	639
8/06	0	37,776	156	63,786	0	318	60	699
8/07	0	37,776	648	64,434	0	318	153	852
8/08	9	37,785	756	65,190	0	318	162	1,014
8/09	3	37,788	300	65,490	0	318	120	1,134
8/10	0	37,788	156	65,646	0	318	45	1,179
8/11	3	37,791	519	66,165	0	318	66	1,245
8/12	0	37,791	162	66,327	0	318	273	1,518
8/13	6	37,797	147	66,474	0	318	243	1,761
8/14	0	37,797	141	66,615	0	318	144	1,905
8/15	3	37,800	138	66,753	0	318	255	2,160
8/16	0	37,800	54	66,807	0	318	213	2,373
8/17	0	37,800	81	66,888	0	318	600	2,973
8/18	3	37,803	81	66,969	0	318	249	3,222
8/19	6	37,809	114	67,083	0	318	357	3,579
8/20	0	37,809	36	67,119	0	318	177	3,756
8/21	0	37,809	18	67,137	0	318	267	4,023
8/22	0	37,809	63	67,200	0	318	252	4,275
8/23	0	37,809	9	67,209	0	318	69	4,344
8/24	0	37,809	18	67,227	0	318	312	4,656
8/25	0	37,809	36	67,263	0	318	1,704	6,360
8/26	0	37,809	0	67,263	0	318	0	6,360
8/27	0	37,809	11	67,274	0	318	-6	6,354
8/28	0	37,809	6	67,280	0	318	-27	6,327
8/29	0	37,809	3	67,283	0	318	-111	6,216
8/30	3	37,812	3	67,286	0	318	-183	6,033
8/31	0	37,812	9	67,295	0	318	87	6,120
9/01	0	37,812	0	67,295	0	318	30	6,150
9/02	0	37,812	0	67,295	0	318	45	6,195
9/03	0	37,812	0	67,295	0	318	57	6,252
Total	37,812		67,295		318		6,252	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Dates in italics indicate days when some portion of the day's count was interpolated.

Appendix H2.–Expanded daily and cumulative (Cum.) migration of all salmonid species past Kwiniuk River tower, Norton Sound, 2016.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
6/17	15	15	0	0	0	0	0	0
6/18	0	15	0	0	0	0	0	0
6/19	9	24	0	0	0	0	0	0
6/20	69	93	0	0	0	0	0	0
6/21	54	147	45	45	0	0	0	0
6/22	48	195	36	81	0	0	0	0
6/23	0	195	12	93	0	0	0	0
6/24	198	393	18	111	0	0	0	0
6/25	135	528	12	123	0	0	0	0
6/26	531	1,059	141	264	3	3	0	0
6/27	42	1,101	18	282	0	3	0	0
6/28	576	1,677	384	666	0	3	0	0
6/29	519	2,196	450	1,116	6	9	0	0
6/30	1,068	3,264	2,769	3,885	6	15	0	0
7/01	1,170	4,434	18,750	22,635	9	24	0	0
7/02	582	5,016	43,107	65,742	39	63	0	0
7/03	147	5,163	15,162	80,904	3	66	0	0
7/04	291	5,454	31,959	112,863	18	84	0	0
7/05	429	5,883	54,810	167,673	-3	81	0	0
7/06	63	5,946	10,962	178,635	6	87	0	0
7/07	324	6,270	47,655	226,290	3	90	0	0
7/08	195	6,465	43,533	269,823	0	90	0	0
7/09	159	6,624	15,456	285,279	6	96	0	0
7/10	252	6,876	33,783	319,062	0	96	0	0
7/11	219	7,095	140,388	459,450	18	114	0	0
7/12	144	7,239	279,708	739,158	9	123	0	0
7/13	66	7,305	198,909	938,067	0	123	0	0
7/14	108	7,413	176,010	1,114,077	0	123	0	0
7/15	195	7,608	193,089	1,307,166	0	123	0	0
7/16	141	7,749	117,591	1,424,757	0	123	0	0
7/17	36	7,785	-1,734	1,423,023	0	123	0	0
7/18	78	7,863	-11,526	1,411,497	0	123	3	3
7/19	156	8,019	34,551	1,446,048	0	123	9	12
7/20	48	8,067	9,162	1,455,210	0	123	6	18
7/21	45	8,112	7,602	1,462,812	0	123	-3	15
7/22	186	8,298	62,799	1,525,611	0	123	12	27
7/23	27	8,325	107,079	1,632,690	0	123	12	39
7/24	12	8,337	22,167	1,654,857	0	123	0	39
7/25	24	8,361	78,717	1,733,574	0	123	21	60
7/26	48	8,409	95,850	1,829,424	0	123	33	93
7/27	33	8,442	48,378	1,877,802	6	129	63	156
7/28	15	8,457	11,079	1,888,881	0	129	39	195
7/29	9	8,466	1,203	1,890,084	6	135	21	216
7/30	0	8,466	-1,983	1,888,101	0	135	0	216
7/31	0	8,466	342	1,888,443	0	135	6	222
8/01	0	8,466	954	1,889,397	0	135	0	222
8/02	0	8,466	1,599	1,890,996	0	135	6	228
8/03	0	8,466	942	1,891,938	0	135	9	237

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Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
8/04	0	8,466	1,368	1,893,306	0	135	21	258
8/05	9	8,475	1,383	1,894,689	0	135	33	291
8/06	3	8,478	4,884	1,899,573	0	135	177	468
8/07	0	8,478	2,790	1,902,363	0	135	87	555
8/08	6	8,484	1,560	1,903,923	0	135	72	627
8/09	3	8,487	2,040	1,905,963	0	135	174	801
8/10	0	8,487	765	1,906,728	0	135	48	849
8/11	9	8,496	378	1,907,106	0	135	153	1,002
8/12	3	8,499	201	1,907,307	0	135	117	1,119
8/13	0	8,499	426	1,907,733	0	135	165	1,284
8/14	0	8,499	261	1,907,994	0	135	291	1,575
8/15	-3	8,496	99	1,908,093	0	135	114	1,689
8/16	0	8,496	81	1,908,174	0	135	21	1,710
8/17	0	8,496	135	1,908,309	0	135	300	2,010
8/18	6	8,502	150	1,908,459	0	135	390	2,400
8/19	3	8,505	165	1,908,624	0	135	564	2,964
8/20	3	8,508	126	1,908,750	0	135	42	3,006
8/21	0	8,508	272	1,909,022	0	135	300	3,306
8/22	0	8,508	192	1,909,214	0	135	-12	3,294
8/23	3	8,511	111	1,909,325	0	135	24	3,318
8/24	0	8,511	33	1,909,358	0	135	27	3,345
8/25	0	8,511	114	1,909,472	0	135	174	3,519
8/26	3	8,514	108	1,909,580	0	135	291	3,810
8/27	3	8,517	78	1,909,658	0	135	480	4,290
8/28	3	8,520	63	1,909,721	0	135	273	4,563
8/29	0	8,520	15	1,909,736	0	135	96	4,659
8/30	3	8,523	48	1,909,784	0	135	543	5,202
8/31	0	8,523	24	1,909,808	0	135	177	5,379
9/01	0	8,523	27	1,909,835	0	135	303	5,682
9/02	0	8,523	15	1,909,850	0	135	282	5,964
9/03	0	8,523	45	1,909,895	0	135	132	6,096
9/04	0	8,523	3	1,909,898	0	135	162	6,258
9/05	0	8,523	0	1,909,898	0	135	282	6,540
9/06	0	8,523	3	1,909,901	0	135	207	6,747
9/07	0	8,523	0	1,909,901	0	135	21	6,768
9/08	3	8,526	6	1,909,907	0	135	501	7,269
9/09	0	8,526	0	1,909,907	0	135	222	7,491
9/10	0	8,526	3	1,909,910	0	135	378	7,869
9/11	0	8,526	3	1,909,913	0	135	414	8,283
9/12	0	8,526	27	1,909,940	0	135	531	8,814
9/13	0	8,526	0	1,909,940	0	135	306	9,120
9/14	0	8,526	3	1,909,943	0	135	39	9,159
9/15	0	8,526	6	1,909,949	0	135	15	9,174
9/16	0	8,526	0	1,909,949	0	135	36	9,210
Total	8,526		1,909,949		135		9,210	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Dates in italics indicate days when some portion of the day's count was interpolated.

Appendix H3.—Age and sex compositions by year for Kwiniuk River chum salmon ASL samples, 1995–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(0.1)	(0.2)	(0.3)	(0.4)	(0.5)	(0.6)	(0.7)
1995	6/30–7/25	341	52.0	48.0	0.0	0.0	56.0	40.0	4.0	0.0	0.0
1996	7/03–7/13	57 ^a									
1997	7/04–7/24	409	41.0	59.0	0.0	0.0	53.0	46.0	1.0	0.0	0.0
1998	6/26–7/24	499	52.0	48.0	0.0	1.0	80.0	19.0	1.0	0.0	0.0
1999	7/01–7/23	247	49.0	51.0	0.0	0.0	47.0	52.0	1.0	0.0	0.0
2000	6/28–7/27	308	43.0	57.0	0.0	0.0	87.0	13.0	0.0	0.0	0.0
2001	6/30–8/14	763	46.0	54.0	0.0	4.0	9.0	86.0	1.0	0.0	0.0
2002	6/19–7/21	484	43.0	57.0	0.0	0.0	92.0	7.0	1.0	0.0	0.0
2003	6/25–7/24	473	47.0	54.0	0.0	1.0	34.0	64.0	1.0	0.0	0.0
2004	6/23–8/02	302	43.0	57.0	0.0	4.0	65.0	29.0	2.0	0.0	0.0
2005	6/29–7/27	434	43.0	57.0	0.0	4.0	65.0	29.0	2.0	0.0	0.0
2006	6/28–7/14	474	51.0	49.0	0.0	0.5	75.0	24.0	0.5	0.0	0.0
2007	6/26–7/23	506	46.0	54.0	0.0	0.0	40.0	58.0	3.0	0.0	0.0
2008	7/01–7/10	86 ^a	60.0	40.0							
2009	7/05–7/27	214	44.0	56.0	0.0	58.0	18.0	13.0	11.0	0.0	0.0
2010	6/28–7/22	241	42.0	58.0	0.0	1.0	97.0	2.0	0.0	0.0	0.0
2011	6/24–7/23	236	42.8	57.2	0.0	0.4	33.2	66.0	0.0	0.4	0.0
2012	7/10–7/13	4 ^a									
2013	6/27–7/29	202	41.7	58.3	0.0	0.4	57.8	40.8	0.9	0.0	0.0
2014			No data collected.								
2015	6/24–7/19	185	48.7	51.3	0.0	0.9	26.4	71.3	1.4	0.0	0.0
2016	7/02–7/19	48 ^a									

^a Sample size insufficient for sex composition analysis.

Appendix H4.–Age and sex compositions by year for Kwiniuk River Chinook salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(1.1)	(1.2)	(1.3)	(1.4)	(2.3)	(1.5)	(2.4)
2001				No data collected.							
2002				No data collected.							
2003				No data collected.							
2004	8/04	5 ^{ac}									
2005	7/08	4 ^a									
2006				No data collected.							
2007				No data collected.							
2008				No data collected.							
2009				No data collected.							
2010				No data collected.							
2011				No data collected.							
2012				No data collected.							
2013				No data collected.							
2014				No data collected.							
2015				No data collected.							
2016				No data collected.							

^a Sample size insufficient for sex composition analysis.

Appendix H5.—Age and sex compositions by year for Kwiniuk River coho salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)				
			Male	Female	(1.1)	(2.1)	(2.2)	(3.1)	(4.1)
2001			No data collected.						
2002	8/03–8/23	157	60.5	39.5	7.6	86.6	1.3	3.8	0.6
2003	7/21–9/08	424	50.2	49.8	24.1	64.9	0.0	11.1	0.0
2004	7/26–8/10	152	53.9	46.1	11.8	88.2	0.0	0.0	0.0
2005	7/20–8/20	154	38.3	61.7	19.5	79.9	0.0	0.6	0.0
2006	8/13–8/26	182	43.4	56.6	22.5	74.7	0.0	2.7	0.0
2007	8/15–8/23	106	^a 54.7	45.3					
2008			No data collected.						
2009			No data collected.						
2010			No data collected.						
2011			No data collected.						
2012			No data collected.						
2013			No data collected.						
2014			No data collected.						
2015			No data collected.						
2016			No data collected.						

^a Sample size insufficient for sex composition analysis.

Appendix H6.–Kwiniuk River tower water temperature (Temp.) and stream stage (Depth) observations, Norton Sound, 2015–2016.

Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
6/15	9.0	40.6		
6/16	10.0	40.6		
6/17	11.0	38.1	ND	33.0
6/18	11.0	36.8	8.0	66.0
6/19	13.0	38.1	8.0	47.0
6/20	14.0	38.1	ND	0.0
6/21	14.0	43.2	9.0	48.3
6/22	14.0	39.4	10.0	34.3
6/23	14.0	40.6	10.0	43.2
6/24	13.0	34.3	8.0	33.0
6/25	12.0	35.6	9.0	33.0
6/26	8.5	29.2	10.0	35.6
6/27	9.0	35.6	10.0	34.3
6/28	9.0	27.9	10.0	27.9
6/29	10.0	40.6	11.0	35.6
6/30	9.0	53.3	12.0	33.0
7/01	9.0	38.1	12.0	33.0
7/02	7.0	36.8	12.0	26.7
7/03	6.0	30.5	11.0	30.5
7/04	8.0	25.4	12.0	30.5
7/05	12.0	33.0	11.0	26.7
7/06	14.0	55.9	10.0	29.2
7/07	14.0	61.0	10.0	40.6
7/08	13.0	43.2	10.0	33.0
7/09	11.0	30.5	10.0	35.6
7/10	12.0	38.1	9.0	38.1
7/11	12.0	38.1	10.0	26.7
7/12	12.0	33.0	11.0	17.8
7/13	11.0	39.4	13.0	16.5
7/14	10.0	35.6	14.0	25.4
7/15	10.0	29.2	14.0	30.5
7/16	10.0	25.4	12.0	35.6
7/17	13.0	25.4	11.0	74.9
7/18	10.0	64.8	9.0	91.4
7/19	10.0	27.9	9.0	39.4
7/20	10.0	22.9	9.0	55.9
7/21	11.0	21.6	8.0	43.2
7/22	12.0	38.1	8.0	30.5
7/23	11.0	40.6	10.0	30.5
7/24	12.0	48.3	9.0	29.2
7/25	11.0	41.9	11.0	24.1
7/26	10.0	38.1	12.0	22.9
7/27	11.0	49.5	12.0	30.5
7/28	13.0	49.5	12.0	58.4
7/29	11.0	34.3	9.0	57.2
7/30	12.0	33.0	8.0	106.7
7/31	12.0	29.2	7.0	66.0

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Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
8/01	11.0	38.1	8.0	41.9
8/02	10.0	25.4	9.0	39.4
8/03	10.0	20.3	7.0	45.7
8/04	12.0	15.2	9.0	39.4
8/05	11.0	5.1	10.0	38.1
8/06	11.0	17.8	10.0	43.2
8/07	10.0	47.0	10.0	58.4
8/08	9.0	53.3	9.0	40.6
8/09	9.0	12.7	10.0	45.7
8/10	11.0	50.8	10.0	55.9
8/11	7.0	53.3	10.0	54.6
8/12	8.0	49.5	9.0	57.2
8/13	8.0	48.3	9.0	49.5
8/14	8.0	17.8	10.0	49.5
8/15	9.0	41.9	9.0	30.5
8/16	9.0	17.8	9.0	27.9
8/17	9.0	25.4	8.0	30.5
8/18	10.0	22.9	9.0	30.5
8/19	9.0	29.2	10.0	47.0
8/20	9.0	27.9	9.0	111.8
8/21	8.0	27.9	10.0	73.7
8/22	9.0	35.6	10.0	57.2
8/23	7.0	31.8	9.0	48.3
8/24	7.0	41.9	8.0	41.9
8/25	8.0	88.9	8.0	50.8
8/26	ND	124.5	9.0	68.6
8/27	7.0	76.2	9.0	63.5
8/28	8.0	80.0	9.0	45.7
8/29	5.0	45.7	9.0	38.1
8/30	4.0	41.9	9.0	27.9
8/31	4.0	35.6	9.0	27.3
9/01	4.0	35.6	8.0	26.7
9/02	5.0	33.0	8.0	25.4
9/03	4.0	35.6	8.0	24.1
9/04			8.0	27.9
9/05			8.0	33.0
9/06			5.0	20.3
9/07			4.0	20.3
9/08			5.0	24.1
9/09			6.0	40.6
9/10			5.0	55.9
9/11			5.0	38.1
9/12			5.0	27.9
9/13			5.0	27.9
9/14			5.0	76.2
9/15			3.0	24.1
9/16			3.0	22.9

Note: Recorded water temperatures are morning water temperatures, except when morning temperatures were not available. Recorded water depths are highest recorded daily water depth.

APPENDIX I: INGLUTALIK RIVER TOWER

Appendix II.—Expanded daily and cumulative (Cum.) migration of all salmonid species past Inglutalik River tower, Norton Sound, 2015.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
6/23	96	96	15	15	18	18	0	0
6/24	378	474	57	72	111	129	0	0
6/25	264	738	120	192	27	156	0	0
6/26	24	762	18	210	12	168	0	0
6/27	6	768	0	210	12	180	0	0
6/28	75	843	15	225	15	195	0	0
6/29	984	1,827	153	378	252	447	0	0
6/30	144	1,971	105	483	51	498	0	0
7/01	48	2,019	24	507	-18	480	0	0
7/02	48	2,067	6	513	24	504	0	0
7/03	963	3,030	33	546	18	522	0	0
7/04	1,233	4,263	114	660	48	570	0	0
7/05	93	4,356	1,602	2,262	267	837	0	0
7/06	1,215	5,571	696	2,958	99	936	0	0
7/07	3,156	8,727	4,148	7,106	124	1,060	0 ^a	0
7/08	3,477	12,204	6,009	13,115	120	1,180	0	0
7/09	6,018	18,222	6,057	19,172	135	1,315	0	0
7/10	3,315	21,537	11,928	31,100	12	1,327	0	0
7/11	4,110	25,647	11,679	42,779	30	1,357	0	0
7/12	2,877	28,524	418	43,197	16	1,373	0 ^a	0
7/13	1,643	30,167	1,791	44,988	36	1,409	0 ^a	0
7/14	1,044	31,211	2,511	47,499	6	1,415	0	0
7/15	2,536	33,747	11,004	58,503	73	1,488	^b	0
7/16	1,450	35,197	5,949	64,452	38	1,526	^b	0
7/17	363	35,560	893	65,345	3	1,529	60 ^a	60
7/18	467	36,027	1,783	67,128	2	1,531	18 ^a	78
7/19	571	36,598	2,673	69,801	0	1,531	252 ^a	330
7/20	6,849	43,447	11,757	81,558	0	1,531	429	759
7/21	6,750	50,197	49,524	131,082	12	1,543	939	1,698
7/22	8,217	58,414	62,955	194,037	0	1,543	1,401	3,099
7/23	783	59,197	72,191	266,228	0	1,543	456	3,555
7/24	4,299	63,496	83,541	349,769	0	1,543	1,356	4,911
7/25	1,434	64,930	32,742	382,511	0	1,543	129	5,040
7/26	279	65,209	13,692	396,203	0	1,543	138	5,178
7/27	1,653	66,862	143,934	540,137	0	1,543	582	5,760
7/28	180	67,042	116,694	656,831	0	1,543	258	6,018
7/29	639	67,681	34,239	691,070	0	1,543	129	6,147
7/30	444	68,125	43,878	734,948	0	1,543	249	6,396
7/31	879	69,004	71,068	806,016	0	1,543	^b	6,396
8/01	975	69,979	43,985	850,001	0	1,543	^b	6,396
8/02	1,155	71,134	24,110	874,111	0	1,543	^b	6,396
8/03	1,425	72,559	23,315	897,426	0	1,543	^b	6,396
8/04	1,478	74,037	16,594	914,020	0	1,543	294 ^a	6,690
8/05	2,136	76,173	8,522	922,542	0	1,543	336 ^a	7,026
8/06	1,077	77,250	17,315	939,857	0	1,543	282 ^a	7,308
8/07	1,989	79,239	30,264	970,121	0	1,543	249	7,557
8/08	804	80,043	14,493	984,614	0	1,543	183	7,740
8/09	180	80,223	9,468	994,082	0	1,543	138	7,878

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Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
8/10	210	80,433	11,208	1,005,290	0	1,543	117	7,995
8/11	680	81,113	362	1,005,652	0	1,543	9 ^a	8,004
8/12	300	81,413	8,113	1,013,765	0	1,543	^b	8,004
8/13	145	81,558	5,676	1,019,441	0	1,543	^b	8,004
8/14	119	81,677	4,522	1,023,963	0	1,543	^b	8,004
8/15	217	81,894	0	1,023,963	0	1,543	15 ^a	8,019
8/16	90	81,984	5,397	1,029,360	0	1,543	96	8,115
8/17	28	82,012	2,307	1,031,667	0	1,543	15 ^a	8,130
8/18	48	82,060	3,699	1,035,366	0	1,543	33	8,163
8/19	33	82,093	3,414	1,038,780	0	1,543	42	8,205
8/20	63	82,156	2,082	1,040,862	0	1,543	36	8,241
8/21	0	82,156	831	1,041,693	0	1,543	6	8,247
Total	82,156		1,041,693		1,543		8,247	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Dates in italics indicate days when some portion of the day's count was interpolated.

^a Partial count and interpolation was not completed because could not establish a diurnal pattern for coho salmon.

^b Project was not operational on these days and interpolation was not completed because could not establish a diurnal pattern for coho salmon.

Appendix I2.—Expanded daily and cumulative (Cum.) migration of all salmonid species past Inglutalik River tower, Norton Sound, 2016.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
6/16	0	0	0	0	0	0	0	0
6/17	48	48	0	0	27	27	0	0
6/18	75	123	0	0	39	66	0	0
6/19	0	123	0	0	0	66	0	0
6/20	3	126	0	0	0	66	0	0
6/21	0	126	0	0	0	66	0	0
6/22	12	138	0	0	3	69	0	0
6/23	108	246	0	0	63	132	0	0
6/24	93	339	0	0	75	207	0	0
6/25	243	582	0	0	93	300	0	0
6/26	1,719	2,301	18	18	117	417	0	0
6/27	426	2,727	0	18	96	513	0	0
6/28	735	3,462	24	42	150	663	0	0
6/29	3,798	7,260	102	144	949	1,612	0	0
6/30	2,733	9,993	135	279	174	1,786	0	0
7/01	2,868	12,861	222	501	155	1,941	0	0
7/02	1,559	14,420	60	561	81	2,022	0	0
7/03	2,172	16,592	309	870	147	2,169	0	0
7/04	986	17,578	469	1,339	152	2,321	0	0
7/05	861	18,439	528	1,867	236	2,557	0	0
7/06	1,206	19,645	1,011	2,878	219	2,776	0	0
7/07	1,651	21,296	682	3,560	136	2,912	0	0
7/08	2,220	23,516	807	4,367	93	3,005	0	0
7/09	1,488	25,004	1,662	6,029	105	3,110	0	0
7/10	990	25,994	1,584	7,613	45	3,155	0	0
7/11	2,085	28,079	4,656	12,269	73	3,228	0	0
7/12	1,050	29,129	4,767	17,036	45	3,273	0	0
7/13	3,813	32,942	16,770	33,806	6	3,279	0	0
7/14	5,259	38,201	24,902	58,708	0	3,279	45	45
7/15	3,915	42,116	13,899	72,607	0	3,279	426	471
7/16	918	43,034	5,517	78,124	6	3,285	162	633
7/17	192	43,226	792	78,916	0	3,285	60	693
Total	43,226		78,916		3,285		693	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles are not shown for chum, pink, and coho salmon because entire run was not counted. Dates in italics indicate days when some portion of the day's count was interpolated.

Appendix I3.–Age and sex compositions by year for Inglutalik River chum salmon ASL samples, 2011–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(0.1)	(0.2)	(0.3)	(0.4)	(0.5)	(0.6)	(0.7)
2011	7/09–8/10	131 ^a	40.7	59.3							
2012	7/09–7/25	56 ^a									
2013	7/07–7/18	144 ^a	54.1	45.9							
2014				No data collected.							
2015	6/29–7/23	86 ^a	58.1	41.9							
2016				No data collected.							

^a Sample size insufficient for sex composition analysis.

Appendix I4.—Inglutalik River tower water temperature (Temp.) and stream stage (Depth) observations, Norton Sound, 2015–2016.

Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
6/16			ND	42.7
6/17			15.0	45.7
6/18			12.0	57.9
6/19			12.0	51.8
6/20			11.0	70.1
6/21			11.0	70.1
6/22			9.0	57.9
6/23	17.0	76.2	13.0	64.0
6/24	16.0	70.1	12.0	57.9
6/25	14.0	39.6	12.0	57.9
6/26	19.0	27.4	13.0	76.2
6/27	18.0	27.4	15.0	61.0
6/28	ND	27.4	14.0	42.7
6/29	ND	30.5	15.0	42.7
6/30	14.0	51.8	15.0	54.9
7/01	13.0	33.5	15.0	33.5
7/02	10.0	121.9	15.0	33.5
7/03	9.0	42.7	15.0	38.1
7/04	12.0	33.5	15.0	34.1
7/05	ND	67.1	15.0	45.7
7/06	11.0	106.7	15.0	51.8
7/07	13.0	85.3	14.0	79.2
7/08	15.0	51.8	14.0	64.0
7/09	15.0	33.5	15.0	70.1
7/10	16.0	42.7	9.0	70.1
7/11	16.0	27.4	13.0	51.2
7/12	14.0	39.6	10.0	27.4
7/13	15.0	42.7	15.0	57.3
7/14	13.0	36.6	16.0	26.5
7/15	14.0	39.6	17.0	27.4
7/16	13.0	100.6	16.0	27.4
7/17	13.0	82.3	14.0	100.6
7/18	11.0	82.3		
7/19	9.0	73.2		
7/20	13.0	67.1		
7/21	9.0	64.0		
7/22	14.0	57.9		
7/23	14.0	54.9		
7/24	15.0	70.1		
7/25	13.0	39.6		
7/26	14.0	36.6		
7/27	15.0	42.7		
7/28	15.0	42.7		
7/29	16.0	30.5		
7/30	15.0	36.6		
7/31	ND	ND		

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Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
8/01	ND	ND		
8/02	ND	ND		
8/03	ND	ND		
8/04	12.0	45.7		
8/05	12.0	30.5		
8/06	11.0	33.5		
8/07	13.0	57.9		
8/08	12.0	64.0		
8/09	10.0	33.5		
8/10	8.0	48.8		
8/11	10.0	57.9		
8/12	ND	ND		
8/13	ND	ND		
8/14	ND	ND		
8/15	ND	54.9		
8/16	11.0	57.9		
8/17	12.0	64.0		
8/18	11.0	79.2		
8/19	11.0	85.3		
8/20	11.0	88.4		
8/21	10.0	85.3		

Note: Recorded water temperatures are morning water temperatures, except when morning temperatures were not available. Recorded water depths are highest recorded daily water depth.

APPENDIX J: SHAKTOOLIK RIVER TOWER

Appendix J1.–Expanded daily and cumulative (Cum.) migration of all salmonid species past Shaktolik River tower, Norton Sound, 2015.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
6/10	0	0	0	0	0	0	0	0
6/11	0	0	0	0	0	0	0	0
6/12	0	0	0	0	0	0	0	0
6/13	0	0	0	0	0	0	0	0
6/14	0	0	0	0	0	0	0	0
6/15	3	3	0	0	0	0	0	0
6/16	0	3	0	0	0	0	0	0
6/17	15	18	0	0	0	0	0	0
6/18	-6	12	0	0	0	0	0	0
6/19	0	12	0	0	3	3	0	0
6/20	39	51	0	0	3	6	0	0
6/21	81	132	0	0	12	18	0	0
6/22	90	222	0	0	15	33	0	0
6/23	258	480	0	0	18	51	0	0
6/24	69	549	0	0	9	60	0	0
6/25	99	648	0	0	15	75	0	0
6/26	72	720	0	0	12	87	0	0
6/27	174	894	0	0	12	99	0	0
6/28	204	1,098	0	0	12	111	0	0
6/29	792	1,890	12	12	21	132	0	0
6/30	369	2,259	596	608	23	155	0	0
7/01	261	2,520	705	1,313	9	164	0	0
7/02	588	3,108	285	1,598	21	185	0	0
7/03	462	3,570	300	1,898	33	218	0	0
7/04	924	4,494	435	2,333	45	263	0	0
7/05	738	5,232	427	2,760	29	292	0	0
7/06	3,627	8,859	3,030	5,790	93	385	0	0
7/07	303	9,162	1,638	7,428	30	415	0	0
7/08	417	9,579	1,260	8,688	21	436	0	0
7/09	769	10,348	2,746	11,434	39	475	0	0
7/10	1,102	11,450	4,251	15,685	16	491	0	0
7/11	3,229	14,679	40,054	55,739	63	554	0	0
7/12	5,923	20,602	41,002	96,741	42	596	0	0
7/13	991	21,593	9,157	105,898	19	615	0	0
7/14	220	21,813	949	106,847	0	615	0	0
7/15	296	22,109	1,886	108,733	-3	612	0	0
7/16	1,065	23,174	14,484	123,217	15	627	15	15
7/17	4,458	27,632	84,651	207,868	15	642	168	183
7/18	276	27,908	39,126	246,994	0	642	63	246
7/19	232	28,140	21,017	268,011	4	646	-3	243
7/20	187	28,327	2,908	270,919	8	654	84	327
7/21	270	28,597	10,620	281,539	0	654	3,261	3,588
7/22	277	28,874	18,871	300,410	0	654	492	4,080
7/23	222	29,096	12,771	313,181	0	654	549	4,629
7/24	304	29,400	12,412	325,593	0	654	135	4,764
7/25	312	29,712	21,936	347,529	0	654	132	4,896
7/26	305	30,017	24,416	371,945	0	654	927	5,823
7/27	476	30,493	25,410	397,355	0	654	780	6,603

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Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
7/28	305	30,798	23,493	420,848	0	654	399	7,002
7/29	153	30,951	12,438	433,286	0	654	552	7,554
7/30	211	31,162	17,996	451,282	0	654	768	8,322
7/31	84	31,246	3,204	454,486	0	654	192	8,514
8/01	71	31,317	3,834	458,320	0	654	117	8,631
8/02	60	31,377	2,181	460,501	0	654	162	8,793
8/03	36	31,413	1,668	462,169	0	654	312	9,105
8/04	33	31,446	3,423	465,592	0	654	246	9,351
8/05	30	31,476	3,516	469,108	0	654	213	9,564
8/06	36	31,512	3,684	472,792	0	654	210	9,774
8/07	52	31,564	2,631	475,423	0	654	264	10,038
8/08	30	31,594	2,712	478,135	0	654	180	10,218
8/09	46	31,640	1,915	480,050	0	654	105	10,323
8/10	28	31,668	1,950	482,000	0	654	0	10,323
8/11	10	31,678	403	482,403	0	654	66	10,389
8/12	31	31,709	1,769	484,172	0	654	0	10,389
8/13	27	31,736	1,180	485,352	0	654	0	10,389
8/14	56	31,792	2,193	487,545	0	654	102	10,491
8/15	15	31,807	945	488,490	0	654	120	10,611
8/16	27	31,834	822	489,312	0	654	111	10,722
8/17	0	31,834	578	489,890	0	654	63	10,785
8/18	3	31,837	287	490,177	0	654	54	10,839
8/19	3	31,840	464	490,641	0	654	63	10,902
8/20	39	31,879	294	490,935	0	654	66	10,968
8/21	16	31,895	510	491,445	0	654	57	11,025
Total	31,895		491,445		654		11,025	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles are not shown for coho salmon because entire run was not counted. Dates in italics indicate days when some portion of the day's count was interpolated.

Appendix J2.—Expanded daily and cumulative (Cum.) migration of all salmonid species past Shaktoolik River tower, Norton Sound, 2016.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
6/10	0	0	0	0	0	0	0	0
6/11	0	0	0	0	0	0	0	0
6/12	4	4	0	0	0	0	0	0
6/13	3	7	0	0	0	0	0	0
6/14	9	16	0	0	0	0	0	0
6/15	18	34	0	0	0	0	0	0
6/16	78	112	0	0	3	3	0	0
6/17	60	172	0	0	0	3	0	0
6/18	18	190	0	0	6	9	0	0
6/19	18	208	0	0	0	9	0	0
6/20	24	232	0	0	6	15	0	0
6/21	0	232	0	0	6	21	0	0
6/22	28	260	0	0	3	24	0	0
6/23	60	320	99	99	6	30	0	0
6/24	496	816	306	405	3	33	0	0
6/25	156	972	375	780	12	45	0	0
6/26	378	1,350	1,419	2,199	15	60	0	0
6/27	477	1,827	3,405	5,604	42	102	0	0
6/28	661	2,488	6,959	12,563	9	111	0	0
6/29	711	3,199	8,529	21,092	24	135	0	0
6/30	837	4,036	17,334	38,426	30	165	0	0
7/01	1,173	5,209	30,006	68,432	42	207	0	0
7/02	1,056	6,265	38,142	106,574	6	213	0	0
7/03	1,053	7,318	41,787	148,361	24	237	0	0
7/04	732	8,050	22,551	170,912	21	258	0	0
7/05	1,404	9,454	88,642	259,554	28	286	0	0
7/06	165	9,619	9,441	268,995	0	286	0	0
7/07	822	10,441	50,259	319,254	14	300	0	0
7/08	671	11,112	51,452	370,706	16	316	0	0
7/09	902	12,014	62,575	433,281	12	328	0	0
7/10	369	12,383	25,381	458,662	3	331	0	0
7/11	390	12,773	28,548	487,210	3	334	0	0
7/12	358	13,131	75,080	562,290	4	338	0	0
7/13	639	13,770	245,295	807,585	15	353	75	75
7/14	570	14,340	242,379	1,049,964	6	359	123	198
7/15	438	14,778	147,314	1,197,278	3	362	165	363
7/16	135	14,913	24,327	1,221,605	0	362	81	444
7/17	75	14,988	1,455	1,223,060	-3	359	36	480
7/18	-81	14,907	-16,168	1,206,892	-5	354	0	480
Total	14,907		1,206,892		354		480	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles are not shown for chum, pink, and coho salmon because entire run was not counted. Dates in italics indicate days when some portion of the day's count was interpolated.

Appendix J3.—Age and sex compositions by year for Shaktoolik River chum salmon ASL samples, 2015–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(0.1)	(0.2)	(0.3)	(0.4)	(0.5)	(0.6)	(0.7)
2015	6/30–8/19	186	35.9	64.1	0.0	2.7	50.0	44.1	3.2	0.0	0.0
2016	6/22–7/11	43 ^a									

^a Sample size insufficient for sex composition analysis.

Appendix J4.—Age and sex compositions by year for Shaktoolik River Chinook salmon ASL samples, 2015–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(1.1)	(1.2)	(1.3)	(1.4)	(2.3)	(1.5)	(2.4)
2015	7/02–7/18	10 ^a									
2016	6/22–7/07	5 ^a									

^a Sample size insufficient for sex composition analysis.

Appendix J5.—Age and sex compositions by year for Shaktoolik River coho salmon ASL samples, 2015–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)				
			Male	Female	(1.1)	(2.1)	(2.2)	(3.1)	(4.1)
2015	7/24–8/19	109 ^a	49.6	50.4					
2016			No data collected.						

^a Sample size insufficient for sex composition analysis.

Appendix J6.–North River tower water temperature (Temp.) and stream stage (Depth) observations, Norton Sound, 2015–2016.

Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
6/10	ND	ND	ND	ND
6/11	ND	ND	ND	ND
6/12	ND	ND	ND	ND
6/13	ND	ND	ND	ND
6/14	ND	ND	ND	ND
6/15	ND	ND	ND	ND
6/16	ND	ND	ND	ND
6/17	ND	ND	ND	ND
6/18	ND	ND	ND	ND
6/19	ND	ND	9.0	68.6
6/20	ND	ND	9.0	73.7
6/21	ND	ND	9.0	73.7
6/22	ND	ND	8.0	71.1
6/23	ND	ND	10.0	68.6
6/24	ND	ND	10.0	66.0
6/25	ND	ND	10.0	63.5
6/26	ND	ND	11.0	61.0
6/27	ND	ND	12.0	61.0
6/28	ND	ND	12.0	58.4
6/29	ND	ND	13.0	58.4
6/30	ND	ND	14.0	55.9
7/01	ND	ND	13.0	50.8
7/02	10.0	31.8	13.0	53.3
7/03	10.0	33.0	12.0	53.3
7/04	10.0	33.0	12.0	50.8
7/05	12.0	33.0	13.0	47.0
7/06	13.0	33.0	12.0	47.0
7/07	14.0	30.5	12.0	47.0
7/08	14.0	31.8	12.0	47.0
7/09	13.0	33.0	12.0	50.8
7/10	14.0	33.0	11.0	45.7
7/11	14.0	35.6	10.0	43.2
7/12	14.0	43.2	10.0	43.2
7/13	13.0	45.7	12.0	41.9
7/14	12.0	41.9	12.0	40.6
7/15	12.0	45.7	14.0	39.4
7/16	12.0	48.3	14.0	38.1
7/17	15.0	43.2	12.0	45.7
7/18	13.0	47.0	11.0	76.2
7/19	11.0	64.8		
7/20	14.0	58.4		
7/21	12.0	58.4		
7/22	13.0	54.6		
7/23	14.0	50.8		
7/24	12.0	50.8		
7/25	ND	ND		

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Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
7/26	11.0	50.2		
7/27	12.0	50.8		
7/28	15.0	48.3		
7/29	13.0	47.0		
7/30	14.0	54.6		
7/31	14.0	55.9		
8/01	13.0	54.6		
8/02	11.0	53.3		
8/03	11.0	53.3		
8/04	11.0	53.3		
8/05	11.0	53.3		
8/06	12.0	53.3		
8/07	12.0	49.5		
8/08	11.0	50.8		
8/09	11.0	53.3		
8/10	9.0	63.5		
8/11	ND	ND		
8/12	ND	ND		
8/13	ND	ND		
8/14	ND	ND		
8/15	ND	ND		
8/16	ND	ND		
8/17	ND	ND		
8/18	ND	ND		
8/19	ND	ND		
8/20	ND	ND		
8/21	ND	ND		

Note: Recorded water temperatures are morning water temperatures, except when morning temperatures were not available. Recorded water depths are highest recorded daily water depth.

APPENDIX K: NORTH RIVER TOWER

Appendix K1.–Expanded daily and cumulative (Cum.) migration of all salmonid species past North River tower, Norton Sound, 2015.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
6/17	0	0	0	0	0	0	0	0
6/18	0	0	0	0	0	0	0	0
6/19	0	0	0	0	0	0	0	0
6/20	0	0	0	0	22	22	0	0
6/21	0	0	0	0	6	28	0	0
6/22	0	0	0	0	0	28	0	0
6/23	0	0	0	0	18	46	0	0
6/24	18	18	6	6	-6	40	0	0
6/25	12	30	0	6	0	40	0	0
6/26	30	60	36	42	0	40	0	0
6/27	24	84	0	42	6	46	0	0
6/28	0	84	6	48	12	58	0	0
6/29	39	123	39	87	12	70	0	0
6/30	54	177	12	99	36	106	0	0
7/01	132	309	6	105	21	127	0	0
7/02	12	321	0	105	6	133	0	0
7/03	3	324	0	105	6	139	0	0
7/04	1,128	1,452	72	177	102	241	0	0
7/05	966	2,418	66	243	144	385	0	0
7/06	519	2,937	1,053	1,296	171	556	0	0
7/07	330	3,267	660	1,956	72	628	0	0
7/08	294	3,561	1,188	3,144	60	688	0	0
7/09	312	3,873	1,122	4,266	54	742	0	0
7/10	378	4,251	1,002	5,268	36	778	0	0
7/11	1,686	5,937	10,602	15,870	108	886	0	0
7/12	804	6,741	7,260	23,130	96	982	0	0
7/13	240	6,981	1,596	24,726	36	1,018	0	0
7/14	162	7,143	1,620	26,346	30	1,048	0	0
7/15	984	8,127	5,262	31,608	90	1,138	0	0
7/16	756	8,883	10,368	41,976	90	1,228	0	0
7/17	2,622	11,505	37,176	79,152	270	1,498	0	0
7/18	1,788	13,293	30,630	109,782	150	1,648	0	0
7/19	360	13,653	5,880	115,662	12	1,660	0	0
7/20	630	14,283	12,750	128,412	0	1,660	0	0
7/21	1,062	15,345	26,148	154,560	72	1,732	54	54.00
7/22	978	16,323	43,206	197,766	66	1,798	60	114.00
7/23	450	16,773	25,644	223,410	24	1,822	42	156.00
7/24	360	17,133	18,810	242,220	6	1,828	54	210.00
7/25	540	17,673	31,650	273,870	12	1,840	114	324.00
7/26	402	18,075	21,036	294,906	6	1,846	192	516.00
7/27	612	18,687	30,306	325,212	0	1,846	282	798.00
7/28	486	19,173	20,910	346,122	18	1,864	84	882.00
7/29	294	19,467	15,960	362,082	12	1,876	222	1,104.00
7/30	240	19,707	22,044	384,126	6	1,882	192	1,296.00
7/31	144	19,851	13,278	397,404	0	1,882	174	1,470.00
8/01	132	19,983	13,164	410,568	0	1,882	138	1,608.00
8/02	256	20,239	9,769	420,337	7	1,889	164	1,772.00
8/03	30	20,269	2,922	423,259	0	1,889	54	1,826.00

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Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
8/04	78	20,347	5,868	429,127	6	1,895	60	1,886.00
8/05	144	20,491	4,098	433,225	12	1,907	96	1,982.00
8/06	144	20,635	5,412	438,637	-6	1,901	174	2,156.00
8/07	90	20,725	3,600	442,237	0	1,901	42	2,198.00
8/08	198	20,923	3,594	445,831	0	1,901	102	2,300.00
8/09	138	21,061	3,450	449,281	6	1,907	450	2,750.00
8/10	108	21,169	1,986	451,267	0	1,907	294	3,044.00
8/11	102	21,271	1,728	452,995	6	1,913	102	3,146.00
8/12	102	21,373	1,758	454,753	6	1,919	84	3,230.00
8/13	180	21,553	1,806	456,559	18	1,937	108	3,338.00
8/14	144	21,697	1,596	458,155	6	1,943	198	3,536.00
8/15	174	21,871	1,314	459,469	0	1,943	216	3,752.00
8/16	168	22,039	882	460,351	6	1,949	468	4,220.00
8/17	108	22,147	858	461,209	0	1,949	342	4,562.00
8/18	90	22,237	996	462,205	0	1,949	282	4,844.00
8/19	138	22,375	672	462,877	0	1,949	414	5,258.00
8/20	150	22,525	462	463,339	0	1,949	294	5,552.00
8/21	156	22,681	306	463,645	0	1,949	348	5,900.00
8/22	54	22,735	240	463,885	0	1,949	636	6,536.00
8/23	66	22,801	132	464,017	0	1,949	198	6,734.00
8/24	24	22,825	132	464,149	0	1,949	330	7,064.00
8/25	15	22,840	468	464,617	1	1,950	797	7,861.00
8/26	77	22,917	381	464,998	0	1,950	348	8,209.00
8/27	67	22,984	295	465,293	0	1,950	311	8,520.00
8/28	52	23,036	195	465,488	0	1,950	282	8,802.00
8/29	35	23,071	126	465,614	0	1,950	243	9,045.00
8/30	18	23,089	80	465,694	0	1,950	217	9,262.00
8/31 ^a	11	23,100		465,694	0	1,950	89	9,351.00
9/01 ^a		23,100		465,694		1,950		9,351.00
9/02 ^a		23,100		465,694		1,950		9,351.00
9/03	0	23,100	0	465,694	0	1,950	12	9,363.00
9/04	0	23,100	12	465,706	0	1,950	18	9,381.00
9/05	6	23,106	0	465,706	0	1,950	-12	9,369.00
9/06	0	23,106	-7	465,699	0	1,950	15	9,384.00
9/07	-6	23,100	-18	465,681	0	1,950	36	9,420.00
9/08	0	23,100	0	465,681	0	1,950	12	9,432.00
Total	23,100		465,681		1,950		9,432	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Dates in italics indicate days when some portion of the day's count was interpolated.

^a Interpolation could not be completed for these dates (pink salmon only on August 31) because there were not enough days left in the season to complete analysis.

Appendix K2.—Expanded daily and cumulative (Cum.) migration of all salmonid species past North River tower, Norton Sound, 2016.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
6/13	0	0	0	0	0	0	0	0
6/14	0	0	0	0	0	0	0	0
6/15	0	0	0	0	0	0	0	0
6/16	0	0	0	0	0	0	0	0
6/17	0	0	0	0	0	0	0	0
6/18	0	0	0	0	0	0	0	0
6/19	0	0	0	0	0	0	0	0
6/20	18	18	0	0	0	0	0	0
6/21	3	21	0	0	0	0	0	0
6/22	0	21	15	15	0	0	0	0
6/23	27	48	72	87	0	0	0	0
6/24	12	60	66	153	0	0	0	0
6/25	12	72	60	213	0	0	0	0
6/26	66	138	69	282	0	0	0	0
6/27	87	225	312	594	9	9	0	0
6/28	153	378	702	1,296	6	15	0	0
6/29	174	552	1,251	2,547	15	30	0	0
6/30	177	729	2,919	5,466	6	36	0	0
7/01	573	1,302	13,194	18,660	24	60	0	0
7/02	618	1,920	10,854	29,514	9	69	0	0
7/03	1,008	2,928	45,582	75,096	39	108	0	0
7/04	396	3,324	11,583	86,679	3	111	0	0
7/05	1,164	4,488	38,478	125,157	63	174	0	0
7/06	99	4,587	5,982	131,139	12	186	0	0
7/07	30	4,617	1,329	132,468	6	192	0	0
7/08	195	4,812	5,154	137,622	21	213	0	0
7/09	213	5,025	10,218	147,840	15	228	0	0
7/10	486	5,511	21,798	169,638	21	249	0	0
7/11	708	6,219	31,464	201,102	21	270	0	0
7/12	1,050	7,269	38,529	239,631	39	309	0	0
7/13	4,401	11,670	244,917	484,548	114	423	0	0
7/14	1,872	13,542	241,044	725,592	30	453	0	0
7/15	1,218	14,760	187,500	913,092	24	477	0	0
7/16	576	15,336	71,079	984,171	18	495	0	0
7/17	135	15,471	21,948	1,006,119	3	498	0	0
7/18	462	15,933	36,462	1,042,581	12	510	0	0
7/19	60	15,993	2,175	1,044,756	0	510	0	0
7/20	^a	15,993		1,044,756		510		0
7/21	^a	15,993		1,044,756		510		0
7/22	^a	15,993		1,044,756		510		0
7/23	^a	15,993		1,044,756		510		0
7/24	^a	15,993		1,044,756		510		0
7/25	^a	15,993		1,044,756		510		0
7/26	^a	15,993		1,044,756		510		0
7/27	^a	15,993		1,044,756		510		0
7/28	^a	15,993		1,044,756		510		0
7/29	^a	15,993		1,044,756		510		0
7/30	^a	15,993		1,044,756		510		0

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Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho
7/31	^a	15,993		1,044,756		510		0
8/01	^a	15,993		1,044,756		510		0
8/02	^a	15,993		1,044,756		510		0
8/03	^a	15,993		1,044,756		510		0
8/04	^a	15,993		1,044,756		510		0
8/05	^a	15,993		1,044,756		510		0
8/06	^a	15,993		1,044,756		510		0
8/07	^a	15,993		1,044,756		510		0
8/08	^a	15,993		1,044,756		510		0
8/09	^a	15,993		1,044,756		510		0
8/10	^a	15,993		1,044,756		510		0
8/11	^a	15,993		1,044,756		510		0
8/12	^a	15,993		1,044,756		510		0
8/13	^a	15,993		1,044,756		510		0
8/14	^a	15,993		1,044,756		510		0
8/15	^a	15,993		1,044,756		510		0
8/16	^a	15,993		1,044,756		510		0
8/17	^a	15,993		1,044,756		510		0
8/18	^a	15,993		1,044,756		510		0
8/19	^a	15,993		1,044,756		510		0
8/20	45	16,038	321	1,045,077	0	510	360	360
8/21	-9	16,029	54	1,045,131	0	510	375	735
8/22	-21	16,008	3	1,045,134	0	510	171	906
8/23	-30	15,978	54	1,045,188	0	510	195	1,101
8/24	3	15,981	3	1,045,191	0	510	24	1,125
8/25	^a	15,981		1,045,191		510		1,125
8/26	^a	15,981		1,045,191		510		1,125
8/27	3	15,984	33	1,045,224	0	510	171	1,296
8/28	0	15,984	39	1,045,263	0	510	162	1,458
8/29	3	15,987	18	1,045,281	0	510	180	1,638
8/30	0	15,987	9	1,045,290	0	510	48	1,686
8/31	3	15,990	9	1,045,299	0	510	96	1,782
9/01	9	15,999	12	1,045,311	3	513	63	1,845
9/02	9	16,008	24	1,045,335	0	513	84	1,929
9/03	0	16,008	9	1,045,344	0	513	99	2,028
9/04	0	16,008	33	1,045,377	0	513	63	2,091
9/05	3	16,011	12	1,045,389	0	513	36	2,127
9/06	3	16,014	15	1,045,404	0	513	93	2,220
9/07	0	16,014	6	1,045,410	0	513	21	2,241
Total	16,014		1,045,410		513		2,241	

Note: Species quartiles are not shown because entire run was not counted. Escapements should be considered minimum estimates.

^a Daily passage is unknown due to high water.

Appendix K3.—Age and sex compositions by year for North River chum salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(0.1)	(0.2)	(0.3)	(0.4)	(0.5)	(0.6)	(0.7)
2001				No data collected.							
2002				No data collected.							
2003				No data collected.							
2004				No data collected.							
2005				No data collected.							
2006				No data collected.							
2007				No data collected.							
2008				No data collected.							
2009				No data collected.							
2010				No data collected.							
2011	7/10–8/08	200	57.6	42.4	0.0	0.0	35.9	63.1	0.5	0.5	0.0
2012	7/21–8/14	116 ^a	47.3	52.7							
2013	7/12–8/05	3 ^a									
2014				No data collected.							
2015				No data collected.							
2016				No data collected.							

^a Sample size insufficient for age composition analysis.

Appendix K4.—Age and sex compositions by year for North River Chinook salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(1.1)	(1.2)	(1.3)	(1.4)	(2.3)	(1.5)	(2.4)
2001				No data collected.							
2002				No data collected.							
2003				No data collected.							
2004				No data collected.							
2005				No data collected.							
2006				No data collected.							
2007				No data collected.							
2008				No data collected.							
2009				No data collected.							
2010				No data collected.							
2011	7/08–8/11	142	88.9	11.1	5.6	69.1	18.5	6.8	0.0	0.0	0.0
2012				No data collected.							
2013	7/12–8/05	69 ^a	79.2	20.8							
2014	7/07–7/18	61 ^a									
2015				No data collected.							
2016				No data collected.							

^a Sample size insufficient for age composition analysis.

Appendix K5.–Age and sex compositions by year for North River coho salmon ASL samples, 2001–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)				
			Male	Female	(1.1)	(2.1)	(2.2)	(3.1)	(4.1)
2001				No data collected.					
2002				No data collected.					
2003				No data collected.					
2004				No data collected.					
2005				No data collected.					
2006				No data collected.					
2007				No data collected.					
2008				No data collected.					
2009				No data collected.					
2010				No data collected.					
2011				No data collected.					
2012	8/14	14 ^a		No data collected.					
2013				No data collected.					
2014				No data collected.					
2015				No data collected.					
2016				No data collected.					

^a Sample size insufficient for age composition analysis.

Appendix K6.—North River tower water temperature (Temp.) and stream stage (Depth) observations, Norton Sound, 2015–2016.

Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
6/13			7.0	ND
6/14			7.0	ND
6/15			8.0	ND
6/16			11.0	69.9
6/17	12.0	41.9	14.0	66.0
6/18	12.0	40.6	11.0	74.9
6/19	12.0	40.6	10.0	73.7
6/20	13.0	39.4	11.0	87.6
6/21	15.0	40.6	11.0	87.6
6/22	14.0	39.4	9.0	83.8
6/23	14.0	38.1	13.0	81.3
6/24	13.0	37.1	11.0	80.0
6/25	14.0	36.8	11.0	77.5
6/26	13.0	36.8	12.0	74.9
6/27	11.0	36.8	14.0	71.1
6/28	11.0	35.2	14.0	68.6
6/29	13.0	34.3	15.0	68.6
6/30	13.0	33.0	15.0	66.0
7/01	12.0	33.0	10.0	63.5
7/02	10.0	32.7	13.0	40.0
7/03	9.0	33.0	14.0	61.0
7/04	9.0	33.0	14.0	58.4
7/05	12.0	33.0	15.0	58.4
7/06	15.0	29.8	14.0	62.2
7/07	15.0	33.0	13.0	61.0
7/08	14.0	34.3	13.0	59.7
7/09	12.0	33.0	14.0	59.7
7/10	14.0	33.0	12.0	58.4
7/11	14.0	33.0	12.0	58.4
7/12	12.0	36.8	12.0	55.9
7/13	13.0	35.6	15.0	54.6
7/14	11.0	34.3	16.0	53.3
7/15	12.0	34.3	16.0	50.8
7/16	11.0	34.3	16.0	48.3
7/17	11.0	30.5	13.0	47.0
7/18	10.0	45.7	14.0	61.0
7/19	10.0	55.9	12.0	81.3
7/20	10.0	48.3	ND	ND
7/21	11.0	45.7	ND	ND
7/22	12.0	48.3	ND	ND
7/23	11.0	49.5	ND	ND
7/24	10.0	47.0	ND	ND
7/25	10.0	45.7	ND	ND
7/26	11.0	44.5	ND	ND
7/27	13.0	43.2	ND	ND
7/28	10.0	41.9	ND	ND

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Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
7/29	13.0	45.7	ND	ND
7/30	13.0	43.2	ND	ND
7/31	13.0	41.9	ND	ND
8/01	11.0	43.2	ND	ND
8/02	10.0	45.7	ND	ND
8/03	10.0	45.7	ND	ND
8/04	10.0	45.4	ND	ND
8/05	10.0	43.2	ND	ND
8/06	11.0	41.3	ND	ND
8/07	10.0	41.3	ND	ND
8/08	11.0	40.6	ND	ND
8/09	10.0	49.5	ND	ND
8/10	8.0	59.7	ND	ND
8/11	8.0	52.1	ND	ND
8/12	9.0	51.8	ND	ND
8/13	9.0	53.3	ND	ND
8/14	9.0	52.1	ND	ND
8/15	10.0	50.8	ND	ND
8/16	9.0	53.3	ND	ND
8/17	10.0	58.4	ND	ND
8/18	10.0	58.4	ND	ND
8/19	9.0	58.4	ND	ND
8/20	9.0	59.7	10.0	86.4
8/21	8.0	59.7	9.0	104.1
8/22	9.0	64.8	10.0	109.2
8/23	7.0	63.5	10.0	111.1
8/24	8.0	66.0	10.0	120.0
8/25	8.0	74.9	ND	ND
8/26	ND	ND	ND	ND
8/27	ND	ND	8.0	120.7
8/28	ND	ND	11.0	114.3
8/29	ND	ND	10.0	111.8
8/30	ND	ND	10.0	105.4
8/31	ND	ND	10.0	100.3
9/01	ND	ND	9.0	96.5
9/02	ND	ND	9.0	91.4
9/03	6.0	104.1	9.0	88.3
9/04	6.0	101.6	10.0	85.1
9/05	6.0	99.1	9.0	83.8
9/06	6.0	94.0	8.0	81.3
9/07	6.0	88.9	7.0	78.7
9/08	6.0	91.4		

Note: Recorded water temperatures are morning water temperatures, except when morning temperatures were not available. Recorded water depths are highest recorded daily water depth.

APPENDIX L: UNALAKLEET RIVER WEIR

Appendix L1.–Daily and cumulative (Cum.) migration of all salmonid species past the Unalakleet River weir, Norton Sound, 2015.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
6/17	0	0	0	0	0	0	0	0	0	0
6/18	0	0	0	0	0	0	0	0	0	0
6/19	10	10	0	0	0	0	0	0	0	0
6/20	12	22	0	0	0	0	0	0	0	0
6/21	5	27	0	0	0	0	0	0	0	0
6/22	73	100	4	4	1	1	0	0	0	0
6/23	76	176	3	7	3	4	0	0	0	0
6/24	69	245	7	14	1	5	0	0	0	0
6/25	48	293	1	15	0	5	0	0	0	0
6/26	61	354	2	17	0	5	0	0	0	0
6/27	258	612	13	30	2	7	0	0	1	1
6/28	683	1,295	22	52	11	18	0	0	0	1
6/29	1,276	2,571	37	89	9	27	0	0	0	1
6/30	976	3,547	38	127	10	37	0	0	0	1
7/01	1,132	4,679	32	159	3	40	0	0	4	5
7/02	496	5,175	24	183	2	42	0	0	0	5
7/03	1,200	6,375	28	211	4	46	0	0	4	9
7/04	3,919	10,294	101	312	37	83	0	0	38	47
7/05	6,937	17,231	457	769	222	305	0	0	86	133
7/06	7,653	24,884	1,116	1,885	369	674	0	0	114	247
7/07	1,926	26,810	933	2,818	49	723	0	0	27	274
7/08	2,174	28,984	2,436	5,254	272	995	0	0	52	326
7/09	1,337	30,321	1,383	6,637	147	1,142	0	0	30	356
7/10	2,504	32,825	2,266	8,903	96	1,238	0	0	58	414
7/11	5,412	38,237	7,598	16,501	307	1,545	0	0	98	512
7/12	5,621	43,858	17,223	33,724	237	1,782	2	2	75	587
7/13	1,805	45,663	10,817	44,541	143	1,925	1	3	30	617
7/14	1,936	47,599	9,916	54,457	89	2,014	3	6	42	659
7/15	2,865	50,464	17,083	71,540	86	2,100	12	18	12	671
7/16	3,508	53,972	24,180	95,720	119	2,219	34	52	56	727
7/17	5,266	59,238	82,012	177,732	247	2,466	142	194	70	797
7/18	3,335	62,573	118,187	295,919	106	2,572	175	369	21	818
7/19	394	62,967	2,111	298,030	47	2,619	35	404	1	819
7/20	1,651	64,618	28,318	326,348	41	2,660	216	620	18	837
7/21	3,041	67,659	74,784	401,132	34	2,694	357	977	28	865
7/22	2,750	70,409	111,251	512,383	24	2,718	484	1,461	17	882
7/23	2,132	72,541	145,500	657,883	17	2,735	469	1,930	11	893
7/24	777	73,318	66,883	724,766	3	2,738	260	2,190	13	906
7/25	2,061	75,379	101,523	826,289	5	2,743	668	2,858	10	916
7/26	2,041	77,420	90,828	917,117	6	2,749	931	3,789	10	926
7/27	2,296	79,716	72,121	989,238	1	2,750	1,550	5,339	15	941
7/28	1,736	81,452	90,874	1,080,112	2	2,752	1,265	6,604	4	945
7/29	2,059	83,511	108,518	1,188,630	5	2,757	1,159	7,763	5	950
7/30	2,000	85,511	89,292	1,277,922	2	2,759	1,138	8,901	2	952
7/31	1,516	87,027	86,622	1,364,544	1	2,760	1,378	10,279	2	954
8/01	525	87,552	32,503	1,397,047	1	2,761	513	10,792	1	955
8/02	547	88,099	25,912	1,422,959	4	2,765	690	11,482	1	956
8/03	1,035	89,134	36,792	1,459,751	3	2,768	1,813	13,295	8	964
8/04	724	89,858	23,429	1,483,180	0	2,768	1,302	14,597	12	976

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Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
8/05	1,384	91,242	34,196	1,517,376	2	2,770	2,100	16,697	5	981
8/06	1,189	92,431	26,126	1,543,502	1	2,771	2,260	18,957	3	984
8/07	1,131	93,562	24,807	1,568,309	0	2,771	1,583	20,540	1	985
8/08	648	94,210	13,626	1,581,935	0	2,771	1,541	22,081	0	985
8/09	555	94,765	10,442	1,592,377	4	2,775	1,993	24,074	3	988
8/10	754	95,519	6,874	1,599,251	5	2,780	3,054	27,128	0	988
8/11	678	96,197	6,707	1,605,958	3	2,783	3,018	30,146	1	989
8/12	497	96,694	4,624	1,610,582	0	2,783	2,005	32,151	0	989
8/13	403	97,097	2,274	1,612,856	1	2,784	3,785	35,936	5	994
8/14	361	97,458	1,494	1,614,350	3	2,787	2,617	38,553	1	995
8/15	427	97,885	1,692	1,616,042	2	2,789	2,411	40,964	1	996
Total	97,885		1,616,042		2,789		40,964		996	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles are not shown for coho salmon because entire run was not counted.

^a Partial count day; therefore, total escapement should be considered a minimum estimate.

Appendix L2.–Daily and cumulative (Cum.) migration of all salmonid species past the Unalakleet River weir, Norton Sound, 2016.

Date	Daily Chum	Cum. Chum	Daily Pink	Cum. Pink	Daily Chinook	Cum. Chinook	Daily Coho	Cum. Coho	Daily Sockeye	Cum. Sockeye
6/10	0	0	0	0	0	0	0	0	0	0
6/11	0	0	0	0	0	0	0	0	0	0
6/12	0	0	0	0	0	0	0	0	0	0
6/13	2	2	0	0	0	0	0	0	0	0
6/14	2	4	1	1	0	0	0	0	0	0
6/15	10	14	2	3	1	1	0	0	0	0
6/16	67	81	18	21	3	4	0	0	0	0
6/17	114	195	9	30	5	9	0	0	0	0
6/18	63	258	18	48	10	19	0	0	0	0
6/19	23	281	11	59	1	20	0	0	0	0
6/20	273	554	53	112	20	40	0	0	0	0
6/21	494	1,048	108	220	9	49	0	0	7	7
6/22	97	1,145	75	295	2	51	0	0	2	9
6/23	300	1,445	258	553	3	54	0	0	0	9
6/24	312	1,757	244	797	9	63	0	0	0	9
6/25	632	2,389	774	1,571	20	83	0	0	1	10
6/26	1,493	3,882	2,285	3,856	81	164	0	0	1	11
6/27	3,735	7,617	17,620	21,476	31	195	0	0	2	13
6/28	1,689	9,306	39,551	61,027	9	204	0	0	5	18
6/29	1,055	10,361	52,490	113,517	9	213	0	0	4	22
6/30	850	11,211	69,763	183,280	3	216	0	0	1	23
7/01	541	11,752	122,034	305,314	3	219	0	0	1	24
7/02	338	12,090	148,623	453,937	0	219	0	0	1	25
7/03	178	12,268	103,057	556,994	1	220	0	0	0	25
7/04	404	12,672	104,355	661,349	1	221	0	0	4	29
7/05	787	13,459	184,103	845,452	16	237	0	0	11	40
7/06	835	14,294	154,735	1,000,187	9	246	0	0	9	49
7/07 ^a	824	15,118	102,582	1,102,769	18	264	0	0	6	55
7/08	1,242	16,360	165,595	1,268,364	19	283	0	0	5	60
7/09	827	17,187	130,217	1,398,581	9	292	0	0	9	69
7/10	572	17,759	137,717	1,536,298	6	298	0	0	19	88
7/11	1,605	19,364	164,154	1,700,452	9	307	0	0	68	156
7/12	953	20,317	194,174	1,894,626	7	314	2	2	46	202
7/13 ^a	3,447	23,764	744,897	2,639,523	58	372	2	4	75	277
7/14	2,383	26,147	759,887	3,399,410	64	436	5	9	59	336
7/15	1,719	27,866	810,490	4,209,900	52	488	15	24	46	382
7/16	842	28,708	337,566	4,547,466	12	500	12	36	52	434
7/17	334	29,042	92,828	4,640,294	0	500	5	41	45	479
7/18	370	29,412	36,088	4,676,382	0	500	7	48	20	499
7/19	938	30,350	47,526	4,723,908	2	502	20	68	28	527
7/20	655	31,005	16,500	4,740,408	1	503	53	121	4	531
7/21	729	31,734	12,120	4,752,528	2	505	11	132	47	578
7/22 ^a	22	31,756	111	4,752,639	0	505	0	132	2	580
Total	31,756		4,752,639		505		132		580	

Note: The inside box in the cumulative column is the midpoint of the total; the outside box starts on the first quartile and ends on the third quartile. Quartiles are not shown for chum, pink, coho, and sockeye salmon because entire run was not counted.

^a Partial day count.

Appendix L3.—Age and sex compositions by year for Unalakleet River chum salmon ASL samples, 2010–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(0.1)	(0.2)	(0.3)	(0.4)	(0.5)	(0.6)	(0.7)
2010	7/05–7/29	247	41.3	58.7	0.0	6.1	78.1	15.0	0.8	0.0	0.0
2011	6/27–8/07	221	47.8	52.2	0.0	1.3	54.3	44.3	0.0	0.0	0.0
2012	6/24–7/28	199	50.7	49.3	0.0	0.0	49.3	47.4	3.3	0.0	0.0
2013	6/21–7/31	204	46.0	54.0	0.0	0.0	60.0	38.6	1.4	0.0	0.0
2014	6/30–8/14	213	48.3	51.7	0.0	0.0	20.9	77.8	1.3	0.0	0.0
2015	6/23–8/4	206	50.5	49.5	0.0	0.4	57.1	39.7	2.7	0.0	0.0
2016	6/25–7/19	90 ^a	45.6	54.4							

^a Sample size insufficient for age composition analysis.

Appendix L4.—Age and sex compositions by year for Unalakleet River Chinook salmon ASL samples, 2010–2016.

Year	Sampling dates	Number of samples	Percent by sex		Percent by (age group)						
			Male	Female	(1.1)	(1.2)	(1.3)	(1.4)	(2.3)	(1.5)	(2.4)
2010	7/14–7/23	23 ^a									
2011	6/24–7/25	179	73.5	26.5	0.0	56.4	28.4	15.2	0.0	0.0	0.0
2012	6/24–7/30	208	64.8	35.2	0.0	27.4	58.3	14.3	0.0	0.0	0.0
2013	6/26–8/04	97	48.0	52.0							
2014	6/28–7/13	165	67.4	32.6	0.0	7.1	67.9	23.4	0.0	1.6	0.0
2015	6/23–7/23	180	63.3	36.7	0.5	21.2	39.9	34.7	1.0	2.6	0.0
2016	6/26–7/14	18 ^a									

^a Sample size insufficient for age composition analysis.

Appendix L5.—Unalakleet River weir water temperature (Temp.) and stream stage (Depth) observations, Norton Sound, 2015–2016.

Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
6/10			9.0	48.3
6/11			ND	ND
6/12			7.0	52.1
6/13			6.0	50.8
6/14			8.0	47.0
6/15			ND	ND
6/16			13.0	44.5
6/17	13.0	31.8	10.0	43.8
6/18	11.0	31.8	11.0	45.7
6/19	11.0	30.5	11.0	53.3
6/20	13.0	29.8	10.0	64.8
6/21	13.0	29.2	9.0	57.2
6/22	13.0	27.3	10.0	58.4
6/23	12.5	26.7	10.5	27.9
6/24	12.0	26.0	9.5	30.5
6/25	12.0	25.4	11.0	35.6
6/26	12.0	23.5	12.0	35.6
6/27	10.5	22.9	15.0	43.2
6/28	9.5	22.2	13.0	44.5
6/29	11.0	21.6	10.0	45.7
6/30	11.5	20.3	13.0	43.2
7/01	11.0	19.1	13.0	40.6
7/02	10.0	17.8	10.0	41.9
7/03	9.0	18.1	13.0	38.1
7/04	9.0	17.8	13.0	38.1
7/05	10.5	17.1	13.0	36.8
7/06	13.0	15.9	13.0	39.4
7/07	12.0	15.2	13.0	40.6
7/08	12.0	15.2	13.0	39.4
7/09	11.5	15.2	13.0	38.1
7/10	11.5	17.1	13.0	36.8
7/11	12.0	19.1	11.0	35.6
7/12	12.0	19.1	15.0	34.3
7/13	12.5	18.4	16.0	33.0
7/14	11.5	19.1	14.0	31.8
7/15	11.0	18.4	13.0	29.2
7/16	10.5	18.4	13.0	27.9
7/17	11.5	18.4	13.0	27.9
7/18	10.5	29.2	11.0	35.6
7/19	9.5	50.8	10.0	48.3
7/20	9.5	47.6	12.0	71.1
7/21	10.0	40.6	9.5	114.3
7/22	11.0	38.1		
7/23	11.0	47.0		
7/24	9.0	49.5		
7/25	9.5	45.7		

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Date	2015		2016	
	Temp. (°C)	Depth (cm)	Temp. (°C)	Depth (cm)
7/26	10.0	43.2		
7/27	10.5	40.6		
7/28	10.5	36.8		
7/29	11.0	34.3		
7/30	10.5	32.4		
7/31	11.5	30.5		
8/01	11.0	27.9		
8/02	10.0	27.9		
8/03	9.5	27.9		
8/04	9.5	26.7		
8/05	9.3	25.4		
8/06	10.0	24.8		
8/07	11.0	23.5		
8/08	10.5	22.4		
8/09	10.5	24.1		
8/10	8.0	38.1		
8/11	8.0	40.6		
8/12	9.0	37.5		
8/13	8.0	35.6		
8/14	7.5	33.7		
8/15	9.5	32.0		

Note: Recorded water temperatures are morning water temperatures, except when morning temperatures were not available. Recorded water depths are highest recorded daily water depth.