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Norton Sound Subdistrict 5 (Shaktoolik) and Subdistrict 6 (Unalakleet) King Salmon Stock Status and Action Plan, 2019: a Report to the Alaska Board of Fisheries

by

Justin M. Leon

December 2018

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

Symbols and Abbreviations

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

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

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NORTON SOUND SUBDISTRICT 5 (SHAKTOOLIK) AND SUBDISTRICT 6 (UNALAKLEET) KING SALMON STOCK STATUS AND ACTION PLAN, 2019: A REPORT TO THE ALASKA BOARD OF FISHERIES

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ABSTRACT

In response to the guidelines established in the *Policy for Management of Sustainable Salmon Fisheries* (SSFP; 5 AAC 39.222), the Alaska Board of Fisheries (board) classified Norton Sound Subdistrict 5 (Shaktoolik) and Norton Sound Subdistrict 6 (Unalakleet) king salmon *Oncorhynchus tshawytscha* as a stock of yield concern at its January 2004 meeting. An action plan was developed by the Alaska Department of Fish and Game (department) and acted upon by the board. The board continued the Subdistrict 5 and Subdistrict 6 king salmon classification as a stock of yield concern in 2007 and adopted a king salmon management plan (5 AAC 04.395) in order to increase escapements and restore the stock to historical levels of abundance. In 2010 and 2013, the board continued the stock of concern designation and modified the management plan to provide direction for targeting commercial chum (*O. keta*) and pink (*O. gorbuscha*) salmon fisheries in times of low king salmon abundance. Gillnet mesh size restrictions and fishery closures were required to achieve the North River escapement goal in 2007, 2009, 2010, 2014, 2015 and 2018. Escapement goals were not achieved in 2008, 2012, 2013, 2016 and 2017 despite similar conservation measures. The 2011 escapement could not be determined. From 2016–2018 Subdistricts 5 and 6 king salmon stock yields have remained well below historical average (1994–1999), despite the use of specific management measures. Therefore, Subdistricts 5 and 6 king salmon continue to meet the definition for a stock of yield concern as defined in the SSFP and the department recommends continuing the stock of yield concern classification.

Key words: Norton Sound, king salmon, *Oncorhynchus tshawytscha*, stock of concern, yield concern, commercial, fishing, department, sustainable salmon fisheries policy, Alaska Board of Fisheries

INTRODUCTION

The *Policy for Management of Sustainable Salmon Fisheries* (SSFP) directs the Alaska Department of Fish and Game (department) to provide the Alaska Board of Fisheries (board) with reports on the status of salmon stocks and identify any salmon stocks that present a concern related to yield, management, or conservation during regular board meetings. In response to the guidelines established in the SSFP, the board classified the Norton Sound Subdistricts 5 and 6 king (Chinook) salmon *Oncorhynchus tshawytscha* stock as a yield concern at the January 2004 board meeting. A stock of yield concern is defined as "a concern arising from a chronic inability, despite the use of specific management measures, to maintain expected yields, or harvestable surpluses, above a stock's escapement needs" (5 AAC 39.222(f)(42)). The SSFP defines a chronic inability as "the continuing or anticipated inability to meet expected yields over a 4 to 5 year period," and expected yields are defined as "mean levels at or near the lower range of recent historical harvests if they are deemed sustainable." This report provides the department's reassessment of the Norton Sound Subdistricts 5 (Shaktoolik) and 6 (Unalakleet) king salmon stock of concern designation.

The stock of concern designation has been continued during each regulatory cycle since 2007 and action plans have been revised as needed. An action plan developed by the department (Jones 2003) was acted upon by the board in January 2004. The department recommended continuing the stock of yield concern classification in 2007 following 3 consecutive years (2004–2006) of failing to meet escapement goals despite reductions in harvests and the continuing inability to meet expected yields over a 5-year period (Kent and Bergstrom 2006). The board agreed with this determination at its February 2007 meeting and adopted the *Subdistricts 5 and 6 of the Norton Sound District and the Unalakleet River King Salmon Management Plan* (5 AAC 04.395) in an effort to further conserve king salmon and restore the stock to historical yield levels. The management plan incorporates a restrictive subsistence fishing schedule and 50% reductions in the bag, possession, and annual sport fish bag limits. The plan specified that subsistence fishing from June 15 to July 15 in Subdistricts 5 and 6 is limited to two 48-hour periods per week in the marine waters and two 36-hour periods per week in Unalakleet River. Likewise, the Unalakleet River sport fish bag and possession limit for king salmon, 20 inches or greater, was reduced to 1 fish per

day, and the annual harvest limit was reduced from 4 to 2 fish. The plan provides authority to the department to liberalize subsistence fishing time and the sport fishing annual limit if the midpoint of the king salmon escapement goal range is projected to be exceeded. The intent of the management plan was to increase king salmon escapements by providing escapement windows between subsistence fishing periods and by reducing sport fish harvests. At the 2010 board meeting, the board maintained the stock of yield concern designation on Subdistricts 5 and 6 king salmon based on escapement goals being achieved in only 2 of the 3 previous years and harvestable surpluses remaining well below historical (1989–1998 average) yield levels. Similarly, poor king salmon run performance resulted in the board continuing the stock of yield concern designation at the January 2013 meeting. At the 2016 board meeting, the board again maintained the stock of yield concern designation on Subdistricts 5 and 6 king salmon based on escapement goals being reached in only 2 of the 3 previous years and record low harvests from 2011–2015 compared to historical (1994–1999 average) yield levels.

In accordance with the SSFP, the department recommended continuing the designation of Norton Sound Subdistricts 5 and 6 king salmon as a stock of yield concern at the October 2018 Alaska Board of Fisheries work session. This recommendation was based on escapement goals being reached in only 1 year since 2015 and record low harvests during the most recent 5-year period (2014–2018) compared to the 1994–1999 average yields for commercial, subsistence, and sport harvests. The 1994–1999 time period was chosen as the baseline for comparison beginning in 2013 because it represents the range of years prior to the decline in harvest (i.e., 1999) for which reliable total harvest data exists.

STOCK ASSESSMENT BACKGROUND

Subdistricts 5 and 6 are management units of the Norton Sound District and support subsistence, commercial, and sport fisheries (Figure 1). Subdistricts 5 and 6 salmon fisheries are managed as one unit because tagging studies (Gaudet and Schaeffer 1982) have shown that salmon bound for these subdistricts intermingle in marine waters; thus, marine harvests likely contain fish bound for both rivers. In Subdistrict 5, most freshwater subsistence fishing occurs in the Shaktoolik River and in Subdistrict 6, most freshwater subsistence fishing occurs in the Unalakleet River. Prior to 1994, subsistence harvest data was not collected annually and methods used to estimate harvest varied over time. Since 1994 standardized subsistence harvest estimates have been available. Prior to 2013, Unalakleet River and marine king salmon test fishery catches were distributed to subsistence users and were added to subsistence survey harvest estimates. Test fisheries are no longer operated by the department in Unalakleet Subdistrict. Commercial harvest occurs in both subdistricts and total harvest is available from fish tickets. Sport fishing harvest and effort information has been collected from anglers on the Unalakleet River by the department since 1983, and total catch information (including fish that were released) is available starting in 1990. However, only 1 king salmon has been harvested in the sport fishery since 2011 due to the fishery either being restricted to catch-and-release only (2012–2013) or closed at the beginning of the season (2014–2018).

Historically, king salmon abundance in Subdistricts 5 and 6 has been evaluated using a combination of inseason subsistence fishery surveys and passage estimates obtained at a counting tower project located on the North River (1984–1986, 1996–2018), an important spawning tributary of Unalakleet River. More recently, additional assessments have been obtained from mainstem weir counts on the Unalakleet River using a resistance-board weir since 2010 (Kent et

al. 2014). King salmon test fishery catches in the lower Unalakleet River had historically been used only to gauge run timing from 1985–2012 (Kent 2010). In 2012, a nearshore variable mesh gillnet marine test fishery was also conducted near the village of Unalakleet to describe run timing and age, sex, and size structure of the Subdistricts 5 and 6 king salmon run. Unalakleet River and Unalakleet Subdistrict marine test fishery projects were discontinued in 2012. Aerial surveys are also flown on the Shaktoolik and Unalakleet river drainages in order to ground truth North River tower counts, calibrate survey estimates, and correlate surveys with historical data.

Escapement

The North River serves as an important index of king salmon escapement to the Unalakleet River and achieving adequate escapement levels to this system is a management priority. Radiotelemetry studies (Wuttig 1999; Joy and Reed 2014) showed that North River accounted for 37% (1997), 40% (1998), 34% (2009), and 53% (2010) of the Unalakleet River king salmon drainagewide escapement. The North River counting tower has been operated continually since 1996 by various entities, including Kawerak Inc. (1996–2001), Native Village of Unalakleet (NVU, 2002–2006), NVU and the department (2007–2008), and most recently, Norton Sound Economic Development Corporation (NSEDC, 2009–2018) (Table 1). The *Subdistricts 5 and 6 of the Norton Sound District and the Unalakleet River King Salmon Management Plan* is largely focused on reaching the North River tower-based sustainable escapement goal (SEG) range of 1,200–2,600 fish.

In 1999, an escapement goal range of 1,200–2,400 was first established for the North River (Fair et al. 1999), and later revised to an SEG with the current upper bound of 2,600 salmon (ADF&G 2004). The North River SEG has only been met in 3 of last 5 years and 10 of the 19 years since goals were first established (Table 1; Figure 2). In 2016, a record low escapement count of 513 king salmon was observed at the North River tower, though it was considered a minimum count due to high water events. The 2017 king salmon tower count was twice the 2016 king salmon tower count but the lower bound of the escapement goal range was not achieved. The 2018 tower count was the third largest escapement on record. The relatively large 2018 escapement was a result of severe restrictions to the subsistence fishery, a closure to the sport fishery, and a delay to the start of the chum salmon directed commercial fishery.

Since 2010, Unalakleet River mainstem king salmon escapements have been monitored using a resistance-board weir (Kent et al. 2014). There were 505 king salmon counted in 2016, 2,934 king salmon counted in 2017, and 3,326 king salmon counted in 2018 (Table 1). The 2016 and 2018 escapement counts should be considered a minimum. In 2016, project operations ended early due to prolonged high water, and the amount of unmonitored salmon passage was likely substantial. In 2018, high water early in the season resulted in a delay to project operations but only a small number of unmonitored salmon likely passed during that time.

Additional escapement data in Subdistricts 5 and 6 exists in the form of aerial surveys. Aerial surveys of king salmon spawning areas in the Shaktoolik and Unalakleet River drainages have periodically been flown to help evaluate tower and weir counts and make comparisons with historical data. In 1999, aerial survey SEG ranges were established for Shaktoolik (400–800 king salmon) and the upper Unalakleet (550–1,100 king salmon) rivers. The Unalakleet River aerial survey index area encompasses the upper 80 km of the mainstem of Unalakleet River, as well as the Old Woman River tributary (Fair et al. 1999; ADF&G 2004). However, evaluating these goals has been problematic and challenging. The Unalakleet River aerial survey index area is difficult to survey even when water levels are low because the upper river is heavily braided with forested

riparian zones. Aircraft speed of fixed-wing aircraft coupled with the shadow and sunken timber create suboptimal viewing conditions even when water levels are low. Although the use of helicopters could mitigate some of these effects, helicopters are cost prohibitive in these areas because of ferry time costs. Consequently, since 1999, there have only been 2 complete surveys of the Unalakleet River index area (2007 and 2009) conducted during the peak king salmon spawning phase, and only 5 acceptable surveys of Shaktoolik River (2001, 2004, 2007, and 2011) conducted since these SEGs were established. For this reason, aerial survey data are only marginally used in analyses. Limited aircraft availability precluded aerial surveys being conducted on the spawning grounds from 2016–2018.

YIELD

Declines in total run size of Unalakleet River king salmon have resulted in commercial fishery closures for king salmon and a reduction in total harvest in Subdistricts 5 and 6. Although historical total run data are limited, a 70% decline in total run is evident from 1997 and 1998 compared to recent years (Table 1). Commercial harvest of king salmon in Subdistricts 5 and 6 has been incidental to directed chum *O. keta*, pink *O. gorbuscha*, and coho *O. kisutch* salmon fisheries since 2001, except for a small directed commercial harvest of king salmon in 2005. Combined commercial harvests for Subdistricts 5 and 6 averaged 6,745 king salmon for the historical period 1994–1999 (Table 2). Commercial harvests over the recent 5-year (2014–2018) period averaged 338 king salmon, which represents a 95% decline from the historical commercial harvest average.

Although subsistence harvests have decreased in Subdistricts 5 and 6 over the last 21 years, the decrease was not as dramatic as that of the commercial harvest. Subsistence fishing closures in Subdistricts 5 and 6 were implemented in 2003, 2004, and annually since the 2006 season because of difficulty achieving the North River tower SEG (Figure 2) and low Unalakleet River weir escapement counts of king salmon. Subdistricts 5 and 6 subsistence harvests averaged 988 king salmon from 2014–2018, a 78% decline from the 1994–1999 average subsistence harvest of 4,438 king salmon (Table 2). Large decreases in combined king salmon commercial and subsistence harvest patterns have been apparent within each subdistrict since 2011 (Figures 3 and 4). The average combined harvest (commercial and subsistence) of both Subdistricts 5 and 6 from 2014–2018 (1,326 king salmon) decreased 88% from the historical 1994–1999 average combined harvest of 11,184 king salmon (Table 2; Figure 5).

As with subsistence, sport fishing closures have been implemented in 2003, 2004, and annually since 2006 to assist in meeting escapement objectives. Sport fisheries have been active on Unalakleet River for many years, both by local residents and nonresidents. Pre-emptive catch-and-release only restrictions and complete closures to the king salmon sport fishery from 2012–2015 resulted in no sport fish harvests of king salmon reported during that time. The recent 5-year (2014–2018) average harvest of 23 king salmon represents a 95% decline from the (1994–1999) average harvest of 465 king salmon (Table 3). Sport fishing effort in Shaktoolik River is very low and the small amount of sport fishing that does occur is generally focused on coho salmon.

STOCK OF CONCERN RECOMMENDATION

Management direction provided in the Subdistricts 5 and 6 king salmon management plan has enabled the department to implement actions and successfully control harvests for the purpose of reaching escapement goals in 3 of the previous 5 years. It is possible that escapement goals were achieved in 2014 and 2016, but high water levels precluded obtaining reliable assessments of North

River king salmon escapement. However, given the continued inability to maintain near-average yields despite management measures, the Norton Sound Subdistricts 5 and 6 king salmon stock continues to meet the criteria of a stock of yield concern. Therefore, based on the definitions provided in the SSFP in 5 AAC 39.222(f)(42), the board continued the yield concern classification for the Norton Sound Subdistricts 5 and 6 king salmon stock at the October 2018 work session.

OUTLOOK

The 2019 king salmon run in Norton Sound Subdistricts 5 and 6 is expected to be similar to king salmon runs observed in 2017 and 2018 with a strong possibility for continued improvement in run performance. An increase in run size is possible based on the upward trend in runs observed since 2014, with the exception of 2016 when high water made assessment difficult. Age-sex-length data also indicates good survival of king salmon originating from the 2014 and 2015 brood years.

The slight increase in run sizes should continue to allow the department to provide a limited amount of marine subsistence fishing opportunity with restricted mesh size. However, any large mesh periods focusing on king salmon will probably not be considered. The goal of the 6-inch mesh restriction is to allow for chum salmon harvest with only incidental king salmon harvest. As has been the case since 2006, it is not anticipated that directed commercial king fishing will be allowed and it will be necessary to implement preseason restrictions to sport and inriver subsistence fisheries in order to maintain low rates of exploitation and reach king salmon escapement goals. Specific management measures expected in 2019 include inriver and marine gillnet mesh-size restrictions, reductions in marine subsistence fishing time, and catch-and-release restrictions and/or annual possession limit reductions to the sport fishery for king salmon. Additional conservation measures may be necessary in 2019 if the observed run abundance inseason is tracking below forecasted abundance.

ESCAPEMENT GOAL EVALUATION

The department has undertaken triennial reviews of escapement goals since 1999 for several Norton Sound salmon stocks where long-term escapement, catch, and age composition data exist that enable development of biological escapement goals (BEGs) or SEGs based on analysis of production consistent with the escapement goal policy. At the most recent escapement goal review undertaken in 2018, the review panel discussed possible revisions to the North River tower king salmon SEG range (1,200–2,600 fish) to include more recent data and update recommendations for using percentile ranges to establish escapement goals. If implemented those changes would have resulted in a reduction to the lower bound of the SEG. In general, the department and stakeholders were not in support of reducing the escapement goal at this time.

MANAGEMENT ACTION PLAN OPTIONS FOR ADDRESSING STOCKS OF CONCERN AS OUTLINED IN THE *POLICY FOR MANAGEMENT OF SUSTAINABLE SALMON FISHERIES*

NORTON SOUND SUBDISTRICTS 5 AND 6 KING SALMON MANAGEMENT PLAN REVIEW/DEVELOPMENT

Current Stock Status

In response to guidelines established in the SSFP, the department recommended continuing the designation of the Subdistricts 5 and 6 king salmon stock as a yield concern at the October 2015 board work session. The board, after reviewing stock status information and public input during the October 2018 work session, continued the classification of Subdistricts 5 and 6 king salmon stock as a yield concern. This determination is based on the inability, despite the use of specific management measures, to maintain expected yields, or harvestable surpluses, above a stock's escapement needs during the last 5 years (2014–2018).

Customary and Traditional Use Finding and Amount Necessary for Subsistence Uses

The board has made a positive finding for customary and traditional uses of salmon in the Norton Sound–Port Clarence Area. The amount necessary for subsistence uses was determined to be 96,000–160,000 salmon of all species for the Norton Sound–Port Clarence Area (5 AAC 01.186). Subsistence fishing restrictions targeting the king salmon stocks have occurred over the last 13 years (2006–2018) in Subdistricts 5 and 6.

HABITAT FACTORS ADVERSELY AFFECTING THE STOCK

There has been minimal fish habitat alteration in the Unalakleet River drainage due to road construction. An access road has altered natural rates of estuarine exchange within the lower Unalakleet River estuary, although fish passage is maintained through other channels. Historically, this area and the Shaktoolik River drainage have not been mined, unlike northern Norton Sound drainages. The upper Unalakleet River is designated as "wild" under the Wild and Scenic River Act and there are only a few seasonal fish camps located on the lower Shaktoolik River. Spawning and rearing habitats within both drainages remain pristine.

DO NEW OR EXPANDING FISHERIES ON THIS STOCK EXIST?

There are no new or expanding fisheries on this stock. King salmon of Norton Sound origin are likely taken as bycatch in the Bering Sea–Aleutian Islands (BSAI) groundfish fisheries along with other stocks from the coastal western Alaska stock grouping but impacts to Subdistricts 5 and 6 origin fish are likely small. Studies of bycatch samples show that over half of the king salmon caught as bycatch in the pollock fishery are of Western Alaskan origin (which includes the Unalakleet and Shaktoolik rivers) (Guthrie et al. 2014). It is unknown what proportion of Western Alaska stocks in the bycatch would have originated in Unalakleet and Shaktoolik rivers, but it is probably small because these rivers produce far fewer fish than Yukon, Kuskokwim, and Nushagak rivers, which are more significant contributors to this stock group. After record bycatch in 2007 of approximately 130,000 king salmon from all stock groups, the North Pacific Fishery

Management Council implemented several actions to reduce king salmon bycatch in this fishery, with actions first initiated in 2011. Since 2011, total bycatch in this fishery has remained below 30,000 king salmon of all stock groups.

EXISTING MANAGEMENT PLAN

5 AAC 04.395 *Subdistricts 5 and 6 of the Norton Sound District and the Unalakleet River king salmon management plan*.

ACTION PLAN DEVELOPMENT

NORTON SOUND SUBDISTRICTS 5 AND 6 KING SALMON ACTION PLAN GOALS

The action plan goals are as follows:

1. Reduce fishing mortality in order to meet spawning escapement goals,
2. Provide reasonable opportunity for subsistence fishing,
3. Rebuild run size in order to
    a. re-establish historical levels of subsistence harvest, and
    b. increase directed king salmon harvest by commercial and sport fisheries to sustainable levels.

REVIEW OF MANAGEMENT ACTION PLAN

Regulation Changes Adopted in February 2004

In January 2004, after review of the management action plan options addressing this stock of concern (Jones 2003), the board adopted subsistence fishing regulations 5 AAC 01.170(j)(1) and sport fishing regulations 5 ACC 70.011(c)(9). Under regulation 5 AAC 01.170(j)(1), during times in which the commissioner determines it is necessary for the conservation of king salmon, the commissioner may, by emergency order, close the subsistence fishing season in Subdistricts 5 and 6 and immediately reopen the season in those subdistricts during which gillnets must have a mesh size not exceeding 6 inches. The sport fish bag and possession limit in regulation 5 ACC 70.011(c)(9) for king salmon less than 20 inches was reduced from 10 to 1 fish, effectively reducing the overall bag limit from 11 to 2 fish. However, the bag limit can only be composed of 1 fish exceeding 20 inches in length. In addition, this regulation placed an annual sport fish limit of 4 king salmon 20 inches or greater in the Unalakleet River drainage, of which only 2 can be taken from the North River. Regulation 5 ACC 70.011(c)(9) also stipulated that anglers targeting king salmon in the Unalakleet River drainage must possess and complete a current harvest record as described in 5 AAC 70.024.

Regulation Changes Adopted in February 2007

In February 2007, after review of the management action plan options addressing this stock of concern (Kent and Bergstrom 2006), the board adopted 5 AAC 04.395 *Subdistricts 5 and 6 of the Norton Sound District and Unalakleet River King Salmon Management Plan*. Regulation 5 AAC 04.395(b)(1) directs the commissioner to close the subsistence fishery and reopen it no earlier than June 15 to a subsistence fishing schedule of two 48-hour periods per week in the ocean and two 36-hour periods per week in Unalakleet River. Regulation 5 AAC 04.395(b)(2) directs the commissioner to reduce the bag and possession limit to 2 king salmon drainagewide, of which

only 1 can be 20 inches and greater, and the annual possession limit for fish 20 inches or greater in length is 2 fish. Additionally, 5 AAC 04.395(c) states that if the projected escapement is below the lower end of the escapement goal range, all fishing for king salmon will be closed; and in 5 AAC 04.395(d)(3), the commissioner may open a commercial king salmon fishery of no more than two 24-hour periods per week only if the midpoint of the escapement goal is projected to be reached. In the subsistence fishery, gillnet mesh size could be reduced to 4.5 inches or less by emergency order (5 AAC 01.170(k)) enabling the department to allow for subsistence fishing targeting pink salmon while conserving king salmon.

Regulation Changes Adopted in January 2010

In January 2010, the board further modified 5 AAC 04.395 based on an action plan alternative proposed by the department in the management action plan (Kent and Bergstrom 2009). Regulation 5 AAC 04.395(h) provides the department discretion to allow commercial pink or chum salmon fisheries provided there is a harvestable surplus of pink or chum salmon available and that commercial fishing for these species will not have a significant impact on king salmon escapement needs and subsistence uses of king salmon. However, this regulation also explicitly directs the department to not allow directed pink or chum salmon commercial fisheries to occur prior to July 1 if gillnet mesh size or fishing periods are restricted in the king salmon subsistence fishery. In the subsistence fishery, gillnet mesh size could be reduced to 7 inches or less by emergency order (5 AAC 01.170(j)(1)(B) and 5 AAC 01.170(k)(3)), enabling the department to target smaller king salmon and still protect larger king salmon, particularly female king salmon.

Regulation Changes Adopted in January 2013

In January 2013, the board further modified 5 AAC 04.395 based on an action plan alternative submitted by the department (Kent and Bergstrom 2012). The plan now gives the department the flexibility to allow directed pink and chum salmon commercial harvest opportunities prior to July 1 as long as there are no reductions to allowable mesh size or fishing period length in the marine king salmon subsistence fishery. The management plan was further modified to prohibit the commercial sale of king salmon incidentally harvested in chum and pink salmon commercial fisheries unless the midpoint of the North River tower-based king salmon escapement goal is projected to be reached. When commercial sale is prohibited, incidentally caught king salmon may be retained for personal use but not sold.

Regulation Changes Adopted in January 2016

In January 2016, the board further modified 5 AAC 04.395 based on an action plan alternative submitted by the department (Kent and Bergstrom 2015). A commercial beach seine fishery was established for chum and pink salmon in Subdistricts 5 that can be opened by emergency order. The plan now gives the department the flexibility to allow directed pink and chum salmon commercial harvest opportunities prior to July 1 even when additional king salmon conservation measures are necessary. All king salmon caught must be returned immediately to the water alive. A beach seine may not be constructed of monofilament web, may not exceed 150 fathoms in length, may not exceed 100 meshes in depth, and may not exceed a mesh size of 4 inches stretched measure.

MANAGEMENT REVIEW

Commercial Fisheries

Historical management actions related to Subdistricts 5 and 6 salmon fisheries are summarized in Table 4. Prior to the mid-2000s, the department would wait until increasing test fishery and subsistence catches were observed for at least 7 days in the Unalakleet River before allowing directed commercial king salmon fishing in Subdistricts 5 and 6. In most years, king salmon commercial fishing consisted of twice-weekly 24-hour periods to prevent fishing on milling king salmon and co-migrating Yukon River stocks, and to allow for adequate escapement. However, diminishing abundance since 2007 necessitated a much more conservative management regime. The management plan was modified in 2007 so that a commercial king salmon fishery may only occur if the midpoint of the North River tower king salmon escapement goal range is projected to be reached. King salmon directed commercial fisheries have not occurred during the recent 5-year period because managers either projected that escapement goals would not be reached or that severe restrictions to subsistence fisheries would be necessary to achieve goals.

There has been a resurgence of market interest in Norton Sound chum and pink salmon since 2010. There is also increased interest in commencing commercial salmon fishing for these species prior to July 1 in order to target these species earlier in their migration to increase harvests and improve the quality of the harvest. This has been especially the case since 2014 with salmon runs showing early to normal run timing compared to the late runs of salmon observed from 2007–2013. Chum and pink salmon stocks in Subdistricts 5 and 6 could sustain considerably higher commercial harvest rates in most years, but the fishery has been managed conservatively for the first 2 weeks of July in order to minimize incidental harvest of king salmon. Generally, this has involved limiting chum salmon fishing periods to 24–36 hours in duration. In some years, only the southern half of the Unalakleet Subdistrict was opened to protect king salmon as they move through the northern half of the subdistrict and enter the Unalakleet River.

Incidental harvests of king salmon in recent chum and pink salmon commercial harvests have been small and are not expected to increase significantly if these fisheries are prosecuted earlier. Harvests of king salmon in the Subdistricts 5 and 6 directed commercial chum salmon fishery have been very low since 2007. Average chum salmon commercial harvest in Subdistricts 5 and 6 during the recent period (2014–2018) was approximately 66,000 fish, whereas average annual king salmon incidental harvest was approximately 240 fish (Table 5). There was a directed pink salmon fishery in 2014 and incidental harvest of king salmon in directed pink salmon openings was even lower than in chum salmon openings. In accordance with the management plan, the commercial sale of king salmon has been prohibited in Subdistricts 5 and 6 by emergency order since 2013. When commercial sale is prohibited, incidentally caught king salmon may be retained for personal use and by regulation, all fish caught but not sold must be recorded on fish tickets.

Subsistence Fisheries

Since 2013, exceptionally weak runs of king salmon have necessitated major reductions in marine subsistence fishing time in conjunction with mesh size restrictions in the marine subsistence fishery in Subdistricts 5 and 6. Additionally, subsistence fisheries in the Unalakleet and Shaktoolik rivers have been restricted to set gillnets with mesh sizes of 4.5 or 4 inches or less, and king salmon captured in beach seine gear while targeting other species have been required to be released immediately, alive and unharmed. Other outlying areas, such as from Black Point south to Wood

Point, east of St. Michael, as well as the marine waters from Cape Denbigh east to Point Dexter north of Shaktoolik, were closed entirely during the month of June in 2014 and 2015. In 2016, the lower Unalakleet River downstream of the confluence of the North River was closed to all gillnetting from June 12 until July 1. The lower Unalakleet River downstream of the confluence of the North River was closed to all gillnetting for the entire month of June in 2017 and 2018. These measures were enacted at the start of the season to prevent southern Norton Sound subsistence users from targeting king salmon migrating through these coastal waters to Subdistricts 5 and 6.

As a result of recent management measures, particularly over the past 8–9 years, subsistence users in Subdistricts 5 and 6 are shifting some harvest pressure toward abundant chum salmon runs in these areas. Additionally, recent management strategies have resulted in the vast majority of king salmon harvests and fishing effort occurring in the marine waters where fish are less vulnerable to capture in gillnets due to less milling behavior. Hazardous surf conditions in the marine waters during storm events also offer escapement windows for migrating king salmon even when the subsistence fishery is open because it is not safe to fish, or the conditions limit the effectiveness of set gillnet gear.

Sport Fisheries

Sport fishery management actions are taken inseason, when necessary, in accordance with guidelines in the king salmon management plan. The sport fishery for king salmon has been closed by emergency order 14 out of the last 16 years due to low projected escapements and was not reopened in the 5 years in which the lower end of the escapement goal had been met later in the season (2003, 2007, 2009, 2010, and 2016). These closures apply not only to the Unalakleet River drainage but also to Shaktoolik River, as well as marine waters in Subdistricts 5 and 6. In addition to estimating sport harvest and catch of king salmon through a mail-out Statewide Harvest Survey sent to licensed anglers, beginning in 2005, all sport fishing guides must maintain department guide logbooks, and record all catch and harvest from clients. For 2006–2012, the harvest of king salmon by guided anglers ranged from 29 to 64 fish annually, and only 1 king salmon has been harvested by guided anglers since 2013 (Table 3).

2019 ALASKA BOARD OF FISHERIES REGULATORY PROPOSALS AFFECTING NORTON SOUND SUBDISTRICTS 5 AND 6 KING SALMON

SUBSISTENCE

No proposals submitted for this board cycle.

COMMERCIAL

No proposals submitted for this board cycle.

RESEARCH PLAN

RESEARCH AND STOCK ASSESSMENT PROJECTS

Since 2007, department personnel have documented the age, sex, and size composition of king salmon escapement to the Unalakleet River by capturing king salmon upstream from subsistence fishing areas using beach seines and, more recently, the Unalakleet River weir. Similarly, the age,

sex, and size composition of the subsistence harvest has been documented during this time. Additionally, 140 genetic tissue samples were collected annually from 2007–2009 marine subsistence harvests of Subdistricts 5 and 6 king salmon. If proper genetic markers become available, the department intends to sequence these samples in efforts to more accurately apportion marine harvests from this regional mixed-stock fishery. Genetic baseline collections from king salmon spawning populations in Norton Sound–Port Clarence Area are ongoing and there has been significant progress developing baselines for the Golsovia, Inglutalik, Pilgrim, Shaktoolik, Tubutulik, Unalakleet, and Ungalik rivers.

Stock-specific length-fecundity and age-fecundity relationships for Unalakleet River king salmon were also recently examined from 2008–2010 (Bell and Kent 2012). A total of 110 king salmon were harvested and sampled. A total of 84 salmon were aged. Average fecundity was 9,223 eggs per fish. As expected, fecundity was positively correlated with length and there were distinct length-fecundity relationships for age-1.3 and age-1.4 king salmon. Fecundity-at-length was larger for age-1.3 salmon than age-1.4 fish. Relationships between length and fecundity by age are unclear and may vary by region and system. Future work should explore other aspects of the reproductive potential of Unalakleet River king salmon, such as competitive interactions, egg deposition, and survival on the spawning grounds.

NSEDC has operated a Dual Frequency Identification Sonar (DIDSON) unit on the Shaktoolik River for 9 seasons. The first 5 years were used to pinpoint a favorable site, develop local hires, and develop sonar expertise. The 2012 season was the first season that NSEDC evaluated varying methods to apportion sonar counts by species. Beginning in 2014, the project was modified to an enumeration tower project supplemented by DIDSON sonar counts apportioned from diurnal migration patterns for each species based on tower counts. Sonar counts are used when conditions preclude using the enumeration tower platform. Additionally, under a cooperative agreement, the department provided funding and technical support to NSEDC on this project.

The department has applied for funding to develop a marine acoustic tagging program in Subdistricts 5 and 6 for king salmon to better understand stock of origin in marine harvests when genetic differentiation between adjacent stocks is not possible, such as for Unalakleet River king salmon and Shaktoolik River king salmon. A feasibility study using this technology has been used to describe chum salmon marine movement and river of origin in Subdistrict 1 in northern Norton Sound. Successful implementation of this research could provide estimates of the proportion of Shaktoolik, Unalakleet, and possibly Yukon River king salmon contributing to marine harvests in southern Norton Sound.

Additional salmon research and assessment in this area continues to be conducted in cooperation and coordination with multiple local entities, including NSEDC, U.S. Fish and Wildlife Service, Bureau of Land Management, Native Village of Unalakleet, and Unalakleet Native Corporation. The efforts of these organizations contribute to strengthening knowledge of these stocks and improving the management capabilities of the department.

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TABLES AND FIGURES

Table 1.–Estimated escapement, total harvest, and total run, Unalakleet River king salmon, 1996–2018.

Year	Escapement: North River [a]	Escapement: Unalakleet Mainstem	Drainagewide escapement [b]	Combined harvest [c]	Total estimated run size	Exploitation rate (percent) [d]
1996	1,197			7,051	[e]	[e]
1997	4,185		11,204	14,100	25,304	55.7
1998	2,100		5,220	10,992	16,212	67.8
1999	1,639 [f]			9,279	[e]	[e]
2000	1,046			3,356	[e]	[e]
2001	1,337 [f]			3,176	[e]	[e]
2002	1,484			2,915	[e]	[e]
2003	1,452			2,692	[e]	[e]
2004	1,125			3,185	[e]	[e]
2005	1,015			2,510	[e]	[e]
2006	906			2,842	[e]	[e]
2007	1,948			1,826	[e]	[e]
2008	905			2,047	[e]	[e]
2009	2,357		6,932	2,207	9,139	24.1
2010	1,256	1,021	2,277	1,234	3,511	35.1
2011	841 [g]	1,030 [g]	1,871 [g]	1,149	[e]	[e]
2012	972	823	1,795	965 [h]	2,760	35.0
2013	580	667	1,247	599 [h]	1,846	32.4
2014	3,452 [g]	1,126 [g]	4,578 [g]	512 [h]	[e]	[e]
2015	1,950	2,789	4,739	1,523 [h]	6,262	24.3
2016	513 [g]	505 [g]	1,018	1,016	[e]	[e]
2017	1,045	2,934	3,979	836	4,815	17.4
2018	2,577	3,326	5,903	1,665 [i]	7,568	22.0
Historical average [j]	2,494		8,212	12,546	20,758	61.8
2014-2018 Average [k]	1,857	3,016	4,874	1,110	6,215	15.9

Note: Blank cells denote no data available.

[a] North River SEG range is 1,200–2,600 king salmon.

[b] Drainagewide escapement estimates prior to 2010 are calculated by expanding tower counts by the proportion of king salmon migrating into the North River, 1997 (34%), 1998 (40%; Wuttig 1999), and 2009 (34%; Joy and Reed 2014).

[c] Harvest includes sport, commercial, and subsistence, assuming 100% of the marine subsistence and commercial king salmon harvest was of Unalakleet River origin.

[d] Because marine harvests in the Unalakleet Subdistrict represent mixed stocks, rates presented here may overestimate actual exploitation rate in years when marine harvest is a larger component of the overall harvest.

[e] Lack of or incomplete escapement data preclude calculation of total run and exploitation rates for those years.

[f] Project started late. King salmon escapement underestimated.

[g] King salmon escapement underestimated in 2011, 2014 and 2016 due to poor counting conditions.

[h] No sport harvests reported from 2012–2015 due to preseason restrictions and closures. Combined harvest is subsistence and commercial only.

[i] Sport fish catch data unavailable. Sport fish harvest in 2018 is likely small due to closures.

[j] Historical average is from 1996–1999, excluding those years footnoted to be incomplete estimates.

[k] Recent 5-year average 2014–2018, excluding those years footnoted to be incomplete estimates.

Table 2.–Subdistricts 5 (Shaktoolik) and 6 (Unalakleet) commercial and subsistence king salmon harvest, Norton Sound District, 1994–2018.

	Shaktoolik (5)			Unalakleet (6)			Subdistricts 5 & 6		
Year	Commercial	Subsistence	Total	Commercial	Subsistence	Total	Commercial	Subsistence	Total
1994	885	1,175	2,060	4,400	3,035	7,435	5,285	4,210	9,495
1995	1,239	1,275	2,514	7,617	3,114	10,731	8,856	4,389	13,245
1996	1,340	1,114	2,454	3,644	3,023	6,667	4,984	4,137	9,121
1997	2,449	1,146	3,595	9,067	4,191	13,258	11,516	5,337	16,853
1998	910	982	1,892	6,413	4,066	10,479	7,323	5,048	12,371
1999	581	818	1,399	1,927	2,691	4,618	2,508	3,509	6,017
2000	160	440	600	582	2,429	3,011	742	2,869	3,611
2001	90	936	1,026	116	2,810	2,926	206	3,746	3,952
2002	1	1,230	1,231	4	2,367	2,371	5	3,597	3,602
2003	2	806	808	10	2,585	2,595	12	3,391	3,403
2004	0	943	943	0	2,829	2,829	0	3,772	3,772
2005	50	807	857	101	2,193	2,294	151	3,000	3,151
2006	0	382	382	12	2,537	2,549	12	2,919	2,931
2007	5	515	520	13	1,666	1,679	18	2,181	2,199
2008	6	422	428	65	1,402	1,467	71	1,824	1,895
2009	4	417	421	80	1,892	1,972	84	2,309	2,393
2010	4	327	331	124	1,257	1,381	128	1,584	1,712
2011	45	235	280	124	607	731	169	842	1,011
2012	25	214	239	157	808	965	182	1,022	1,204
2013	6	136	142	131	468	599	137	604	741
2014	16	158	174	70	442	512	86	600	686
2015	49	178	227	384	1,139	1,523	433	1,317	1,750
2016	23	290	313	101	837	938	124	1,127	1,251
2017	52	177	229	327	496	823	379	673	1,052
2018	19	208	227	648	1,017	1,665	667	1,225	1,892
Historical Average (1994-1999)	1,234	1,085	2,319	5,511	3,353	8,865	6,745	4,438	11,184
2014-2018 Average	32	202	234	306	786	1,092	338	988	1,326

Table 3.–Unalakleet River king salmon sport fish harvest and catch estimates for 1994–2018.

Year	Total king salmon catch	Total king salmon harvest	Guided king salmon catch	Guided king salmon harvest
1994	517	379		
1995	588	259		
1996	2,059	384		
1997	5,144	842		
1998	1,539	513		
1999	669	415		
2000	1,045	345		
2001	542	250		
2002	835	544		
2003	505	97		
2004	1,930	356		
2005	431	216		
2006	2,511	394	445	64
2007	776	147	696	43
2008	796	580	373	49
2009	515	248	362	41
2010	99	61	185	36
2011	534	53	589	29
2012	17	0	184	47
2013	184	0	65	0
2014	0	0	9	0
2015	16	0	23	0
2016	188	78	15	1
2017	369	13	[a]	[a]
2018	[a]	[a]	[a]	[a]
Historical average (1994-1999)	1,753	465	NA	NA
2014-2018 Average	143	23	16	0

Note: Sport harvest and catch is estimated using responses from a Statewide Harvest Survey and has an upper and lower range around the estimate, whereas guide harvests and catches are census data.

[a] Sport fish catch data unavailable. Sport fish harvest in 2018 is likely small due to closures.

Table 4.–Subdistricts 5 (Shaktoolik) and 6 (Unalakleet) historical management actions.

1994	King salmon commercial periods (unrestricted mesh size) limited to two 24-hour periods per week. Pink salmon commercial fishing opened continuously. There was no commercial fishermen interest in chum salmon.
1995	Strong king salmon run. Five king salmon directed commercial fishing periods were opened in both subdistricts. Buyer expressed limited interest in pink and chum salmon with only 3 chum salmon directed (6 inch or smaller mesh size) and 3 pink salmon directed (4 ½ inch or less mesh size) fishing periods.
1996	Early run of king salmon. Six king salmon directed commercial fishing periods in both subdistricts. No chum salmon directed periods. Pink salmon commercial fishing opened continuously.
1997	The last year the majority of the king salmon commercial periods were two 48-hour periods per week. Two 24-hour directed king salmon commercial fishing periods in both subdistricts at the start of season, then 48-hour fishing periods for remainder of king salmon season with no mesh restrictions. Very large king salmon commercial harvest. Limited market for chum salmon with buyer suspending operations in Subdistrict 5 after July 2 until early August.
1998	The majority of directed king salmon commercial periods reduced to 24 hours in length. There were 3 king salmon fishing periods in Subdistrict 5 and 5 king salmon fishing periods in Subdistrict 6. Limited market for chum salmon. Pink salmon commercial fishing opened continuously because of large surplus of pink salmon.
1999	Weak runs of king, chum, and coho salmon. Four 24-hour directed king salmon commercial fishing periods in both subdistricts.
2000	Only two 24-hour directed king salmon commercial fishing periods. Low commercial king and chum salmon harvest. Pink salmon commercial fishing opened continuously to allow buyer to more effectively direct fleet. Pink salmon commercial catches were below average which was attributed to low volumes of fish and lack of fishing interest.
2001	Only two 24-hour directed king salmon commercial fishing periods. Low commercial king and chum salmon harvests.
2002	No commercial king or chum salmon fishing because of weak runs. No market interest in pink salmon unless there was a 500,000 pink salmon harvest projection.
2003	No commercial king or chum salmon fishing because of weak runs. Three-week (July 3-25) subsistence salmon fishing closure to protect king and chum salmon in Shaktoolik and Unalakleet river drainages. Subsistence beach seining for pink salmon was allowed. Unalakleet and Shaktoolik rivers sport fishing closed to the retention of king salmon from July 3 through August 15 and use of bait was prohibited during this period.
2004	No commercial king salmon fishing periods. Unalakleet River drainage closed to salmon gillnet fishing effective July 10. Beach seining was permitted to target large numbers of pink salmon but closed to the retention of king salmon. Sport fishing was allowed in the Unalakleet River, but all king salmon had to be immediately released, effective July 1 through August 3, and the use of bait was prohibited during this period.
2005	Two 24-hour directed king salmon commercial fishing periods were allowed beginning June 27 and ending June 30. King salmon commercial catches were poor, and test fish catches and tower counts also dropped off abruptly in early July. As a result, commercial fishing was not permitted until coho salmon season.
2006	No commercial king salmon fishing periods. Unalakleet River test fish catches and North River tower counts of king salmon were well below average. As a result, the fresh and marine waters of Subdistricts 5 and 6 were closed to salmon gillnet fishing effective July 10. Beach seining was allowed, but king salmon had to be immediately released. Marine and fresh waters of Subdistricts 5 and 6 were closed to sport fishing for king salmon from July 8 through August 15, and the use of bait was prohibited during this period.

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2007	No commercial king salmon fishing periods. On June 16, Subdistricts 5 and 6 marine waters placed on subsistence fishing schedule of two 48-hour periods per week and Unalakleet River placed on subsistence fishing schedule of two 36-hour periods per week. Subsistence fishing closed to set gillnets in Subdistricts 5 and 6 effective July 4. Sport fishery closed July 5. Beach seining allowed for other salmon species during the regularly scheduled periods. Beach seining for other salmon allowed 7 days a week effective July 16. Also, effective July 16, gillnetting reopens 7 days a week in the marine waters and in the Unalakleet River below the confluence of the North River to set gillnets with a mesh size of 6 inches or less. Two 24-hour commercial openings directed at chum salmon on July 18 and July 20.
2008	No commercial king salmon fishing periods. Lower river subsistence mesh-size restrictions (6 inches or less) imposed on the Unalakleet River, effective June 30, due to anticipated difficulty in reaching escapement goals. Restrictions were timed to coincide with peak migration period of king salmon entering the lower Unalakleet River. Subsistence fishery closed to set gillnets and sport fishery closed to retention of king salmon on July 5. Subsistence salmon fishing with set gillnets reopens in the marine waters of Subdistricts 5 and 6 on July 7. From July 8–15, daily pink salmon commercial openings occur, each ranging from 6–8 hours. Effective July 16, all marine and fresh waters of Subdistricts 5 and 6 reopens to subsistence salmon fishing with set gillnets 7 days a week, but gillnets are restricted to a mesh size of 6 inches or less. Commercial chum salmon fishing occurs from July 17–25, consisting of one 24-hour and two 48-hour periods.
2009	No commercial king salmon fishing periods. Subsistence fishing schedule goes into effect June 15 for Subdistricts 5 and 6. Lower river mesh-size restrictions (6 inches or less) implemented for the Unalakleet River effective June 29 in order to protect king salmon during their peak migration period in the lower Unalakleet River. On July 4, king salmon set gillnet subsistence and sport fisheries closed due to below-average tower counts. Beach seining allowed 7 days per week for other salmon. On July 8, one 24-hour commercial pink salmon opening allowed in Subdistricts 5 and 6. Subsistence salmon fishing with set gillnets reopens in the marine waters of Subdistricts 5 and 6 with mesh size restricted to 6 inches or less on July 10. On July 10–16, commercial chum salmon openings occur consisting of four 24-hour periods in Subdistricts 5 and 6 with set gillnets restricted to 6 inches or less. On July 16, subsistence king salmon fishery reopens to 7 days per week in the marine waters and all fresh waters, except for the Unalakleet River drainage above the confluence of the North River. Schedule of 48-hour commercial chum salmon openings occur from July 17–31.
2010	No commercial king salmon fishing periods. Subsistence fishing schedule goes into effect June 15 for Subdistricts 5 and 6. Lower river mesh-size restrictions (6 inches or less) implemented for the Unalakleet River, effective July 5, in order to protect king salmon during their peak migration period in the lower Unalakleet River. July 9, beach seining allowed until July 31 in all fresh and marine waters of Subdistricts 5 and 6 to target salmon other than king salmon for subsistence purposes. On July 10, king salmon set gillnet subsistence and sport fisheries closed due to below-average tower counts. Subsistence fishing with set gillnets with a mesh size of 6 inches or less allowed 7 days per week in marine waters to target other salmon. Commercial salmon fishing opens July 2 for one 24-hour period directed at chum salmon (mesh size 6 inches or less) in Subdistrict 5 and southern half of Subdistrict 6. Subdistricts 5 and 6 reopened to commercial chum salmon fishing for 48 and 36 hours, respectively. However, northern half of Subdistrict 6 closed to commercial fishing. Entire Subdistrict 6 and Subdistrict 5 reopen to commercial chum salmon fishing for 36 hours on July 10. On July 12, commercial chum salmon fishing schedule set for Subdistricts 5 and 6 for the remainder of the July.

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2011	No commercial king salmon fishing periods. Subsistence fishing schedule goes into effect June 16 for Subdistricts 5 and 6. Lower river mesh-size restrictions (6 inches or less) implemented for the Unalakleet River effective July 1 in order to protect king salmon in the lower Unalakleet River. On July 9, beach seining allowed until August 15 in all fresh and marine waters of Subdistricts 5 and 6 to target salmon other than king salmon for subsistence purposes. King salmon set gillnet subsistence and sport fisheries closed due to below-average tower counts. Subsistence fisheries in fresh waters were immediately reopened to subsistence fishing 7 days per week with 4.5-inch mesh. From July 3–5, Subdistricts 5 and 6 opened to commercial fishing for chum salmon for two 24-hour periods. Northern half of Subdistrict 6 remains closed. From July 8–12, Subdistricts 5 and 6 reopened to commercial fishing for chum salmon for two 36-hour periods. On July 9, northern half of Subdistrict 6 reopened to commercial fishing. On July 12, Subdistricts 5 and 6 placed on a commercial chum salmon schedule for the remainder of July. Periods range from 48 to 72 hours in duration.
2012	No commercial king salmon fishing periods. Subsistence fishing schedule goes into effect June 24 for Subdistricts 5 and 6 due to a very late run. On June 27, beach seining allowed 7 days per week until August 15 in all fresh and marine waters of Subdistricts 5 and 6 to target salmon other than king salmon for subsistence purposes. Beach seining was opened earlier to take advantage of good drying weather. Sport fisheries were closed July 11 due to below average tower counts.
2013	No commercial king salmon fishing periods. Commercial sale of king salmon caught in Subdistricts 5 and 6 commercial fishery prohibited by regulation because of weak runs. Sport fishery for king salmon restricted to catch-and-release at the onset of the season in all freshwaters of Subdistricts 5 and 6. Beginning June 16, Subdistrict 6 marine subsistence fishery placed on reduced schedule of two 24-hour periods per week with no mesh size restrictions. Subdistrict 5 marine subsistence fishery placed on normal fishing schedule of two 48-hour periods per week with mesh size restricted to 6 inches or less. Unalakleet River placed on schedule of two 36-hour periods per week with gillnets restricted to a mesh size of 4½ inches or less. Shaktoolik River open 24 hours a day, 7 days per week but restricted to gillnets with a mesh size of 4½ inches or smaller. On July 1, all freshwaters of Subdistricts 5 and 6 open to subsistence beach seining 7 days per week for all salmon but king salmon. Sport fisheries were closed July 11 due to below average tower counts.
2014	No commercial king salmon fishing periods. Commercial sale of king salmon caught in Subdistricts 5 and 6 commercial fishery prohibited by regulation because of weak runs. Sport fishery for king salmon closed at the start of the season in Subdistricts 5 and 6. Beginning June 9, subsistence fishing closed in all Subdistricts 5 and 6 freshwater areas and all marine waters from Point Dexter to Wood Point until June 30. From June 16–30, only one 24-hour marine subsistence fishing period per week scheduled for the Subdistricts 5 and 6 marine waters from Cape Denbigh to Black Point; gillnets during these periods restricted to a mesh size of 6 inches or smaller. Multiple marine subsistence openings restricted to either 4½ inch or 6 inch stretched measure beginning July 1 concurrent with directed chum and pink salmon commercial fisheries. Beginning June 25, two 24–30 hour freshwater subsistence beach seine openings per week for all salmon but king salmon in Subdistricts 5 and 6.
2015	No commercial king salmon fishing periods. Commercial sale of king salmon caught in Subdistricts 5 and 6 commercial fishery prohibited by regulation because of weak runs. Sport fishery for king salmon closed at start of the season in Subdistricts 5 and 6. Beginning June 8, subsistence fishing closed in all Subdistricts 5 and 6 freshwater areas and all marine waters from Point Dexter to Wood Point until June 30. Week of June 15, one 24-hour marine subsistence fishing period scheduled in Subdistricts 5 and 6 with gillnets restricted to 6-inch mesh or smaller. For the week beginning Monday, June 22: two 24-hour subsistence fishing periods scheduled with 6-inch mesh or smaller and for the week beginning June 29, two 48-hour subsistence fishing periods with 6 inch mesh or smaller scheduled. From June 8–28, Subdistricts 5 and 6 freshwaters open only to set gillnets with a mesh size of 4 inches or less, 7 days per week. For the week beginning June 29, two 36-hour fishing periods allowing beach seines and set gillnets with a mesh size of 4½ inches or less. King salmon captured in beach seines required to be immediately released alive and unharmed. For the week beginning Monday, July 6, two 36-hour fishing periods allowing beach seines and with set gillnets with a mesh size of 6 inches or less.

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2016	No commercial king salmon fishing periods. Commercial sale of king salmon caught in Subdistricts 5 and 6 commercial fishery prohibited by regulation because of weak runs. Sport fishery for king salmon began season with a reduced annual bag limit of one king salmon in the Unalakleet River drainage. Beginning June 8, subsistence fishing closed in all Subdistrict 5 and 6 freshwater areas and all marine waters from Point Dexter to Wood Point until June 30. Week of June 15, one 24-hour marine subsistence fishing period scheduled in Subdistricts 5 and 6 with gillnets restricted to 6-inch mesh or smaller. For the week beginning Monday, June 22: two 24-hour subsistence fishing periods scheduled with 6-inch mesh or smaller and for the week beginning June 29, two 48-hour subsistence fishing periods with 6 inch mesh or smaller scheduled. From June 8–28, Subdistricts 5 and 6 freshwaters open only to set gillnets with a mesh size of 4 inches or less, 7 days per week. For the week beginning June 29, two 36-hour fishing periods allowing beach seines and set gillnets with a mesh size of 4½ inches or less. King salmon captured in beach seines required to be immediately released alive and unharmed. For the week beginning Monday, July 6, two 36-hour fishing periods allowing beach seines and with set gillnets with a mesh size of 6 inches or less. Sport fishery for king salmon closed July 9 in Subdistricts 5 and 6.
2017	No commercial king salmon fishing periods. Commercial sale of king salmon caught in Subdistricts 5 and 6 commercial fishery prohibited by regulation because of weak runs. Sport fishery for king salmon closed at start of the season in Subdistricts 5 and 6. Beginning June 8, subsistence fishing closed in all Subdistricts 5 and 6 freshwater areas and all marine waters from Point Dexter to Wood Point until June 30. Week of June 15, one 24-hour marine subsistence fishing period scheduled in Subdistricts 5 and 6 with gillnets restricted to 6-inch mesh or smaller. For the week beginning Monday, June 22: two 24-hour subsistence fishing periods scheduled with 6-inch mesh or smaller and for the week beginning June 29, two 48-hour subsistence fishing periods with 6-inch mesh or smaller scheduled. From June 8–28, Subdistrict 5 and 6 freshwaters open only to set gillnets with a mesh size of 4 inches or less, 7 days per week. For the week beginning June 29, two 36-hour fishing periods allowing beach seines and set gillnets with a mesh size of 4½ inches or less. King salmon captured in beach seines required to be immediately released alive and unharmed. For the week beginning Monday, July 6, two 36-hour fishing periods allowing beach seines and with set gillnets with a mesh size of 6 inches or less. Beginning July 14, the sport fishery reopened with an annual limit of one king salmon.
2018	No commercial king salmon fishing periods. Commercial sale of king salmon caught in Subdistricts 5 and 6 commercial fishery prohibited by regulation because of weak runs. Sport fishery for king salmon closed at start of the season in Subdistricts 5 and 6. Beginning June 8, subsistence fishing closed in all Subdistrict 5 and 6 freshwater areas and all marine waters from Point Dexter to Wood Point until June 30. Week of June 15, one 24-hour marine subsistence fishing period scheduled in Subdistricts 5 and 6 with gillnets restricted to 6-inch mesh or smaller. For the week beginning Monday, June 22: two 24-hour subsistence fishing periods scheduled with 6-inch mesh or smaller and for the week beginning June 29, two 48-hour subsistence fishing periods with 6-inch mesh or smaller scheduled. From June 8–28, Subdistricts 5 and 6 freshwaters open only to set gillnets with a mesh size of 4 inches or less, 7 days per week. For the week beginning June 29, two 36-hour fishing periods allowing beach seines and set gillnets with a mesh size of 4½ inches or less. King salmon captured in beach seines required to be immediately released alive and unharmed. For the week beginning Monday, July 6, two 36-hour fishing periods allowing beach seines and with set gillnets with a mesh size of 6 inches or less. Beginning July 19, the sport fishery reopened with a bag and possession limit of one king salmon and an annual limit of 2 fish.

Table 5.–Combined Subdistricts 5 and 6 incidental king and chum salmon commercial harvests during directed chum salmon openings, 2007–2018.

				Subdistricts 5 and 6 combined			
				Incidental king salmon harvest data [a]			
Year		Date of first commercial opening	Number of periods	Caught and sold	Caught but not sold	Total king salmon harvest	Chum salmon harvest
2007		18-Jul	5	12	2	14	11,734
2008		17-Jul	4	43	17	60	15,588
2009	[b]	10-Jul	8	0	61	61	22,724
2010		2-Jul	9	92	106	198	59,497
2011		2-Jul	9	114	33	147	53,094
2012	[b]	5-Jul	7	0	182	182	43,212
2013	[c]	1-Jul	9	0	130	130	68,720
2014	[c]	1-Jul	8	0	69	69	53,402
2015	[c]	1-Jul	9	0	205	205	62,400
2016	[c]	1-Jul	13	0	62	62	19,701
2017	[c]	1-Jul	12	51	229	280	94,310
2018		1-Jul	8	47	534	581	99,387
Totals			101	359	1,630	1,989	603,769
2014-2018 Average			-		220	239	65,840

[a] Does not include king salmon caught during the coho salmon and pink salmon directed fisheries.

[b] Incidentally caught king salmon were not purchased by the buyer.

[c] Commercial sale of king salmon prohibited by regulation due to king salmon conservation concerns.

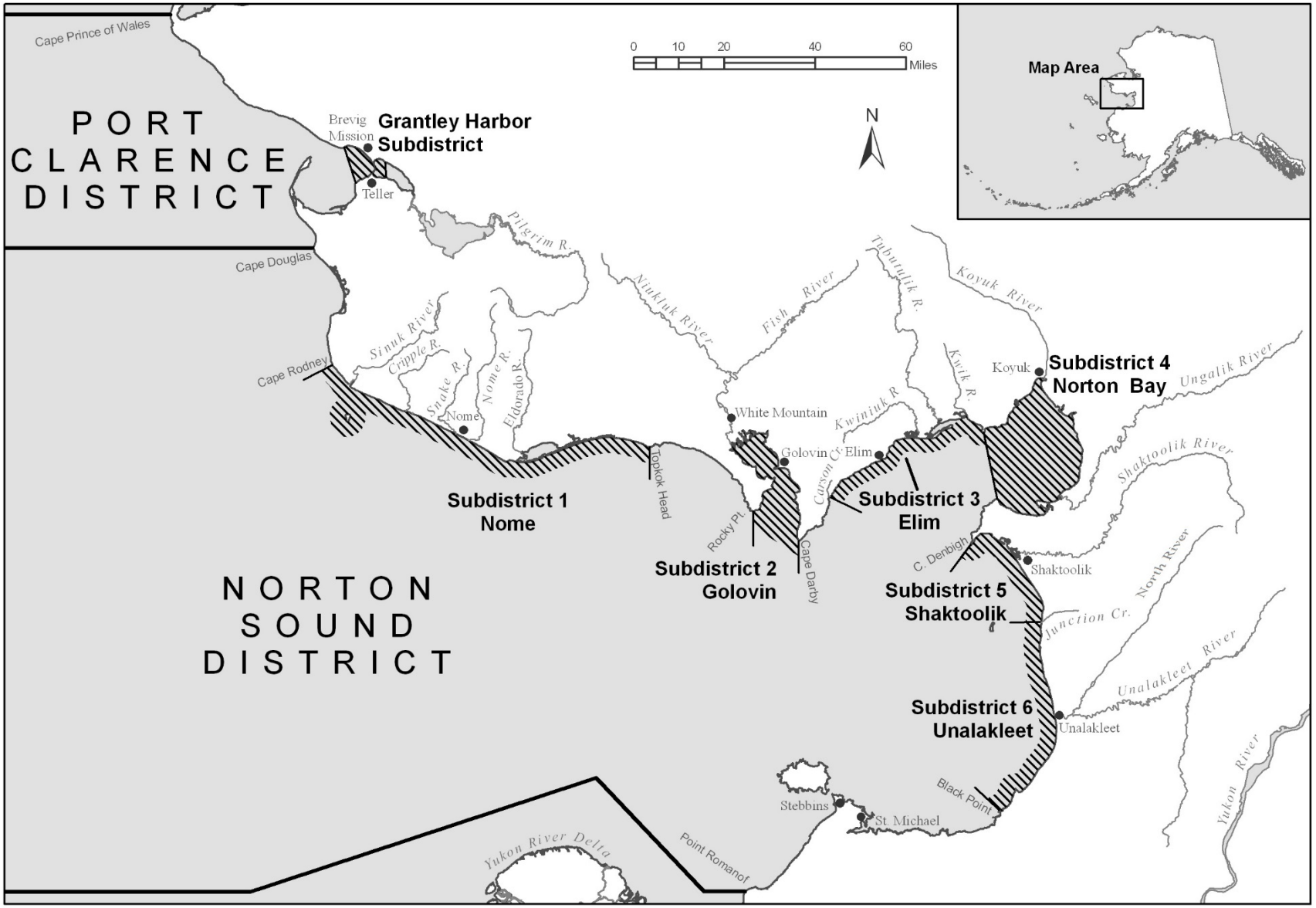

Figure 1.–Salmon commercial fishing subdistricts and rivers in Norton Sound.

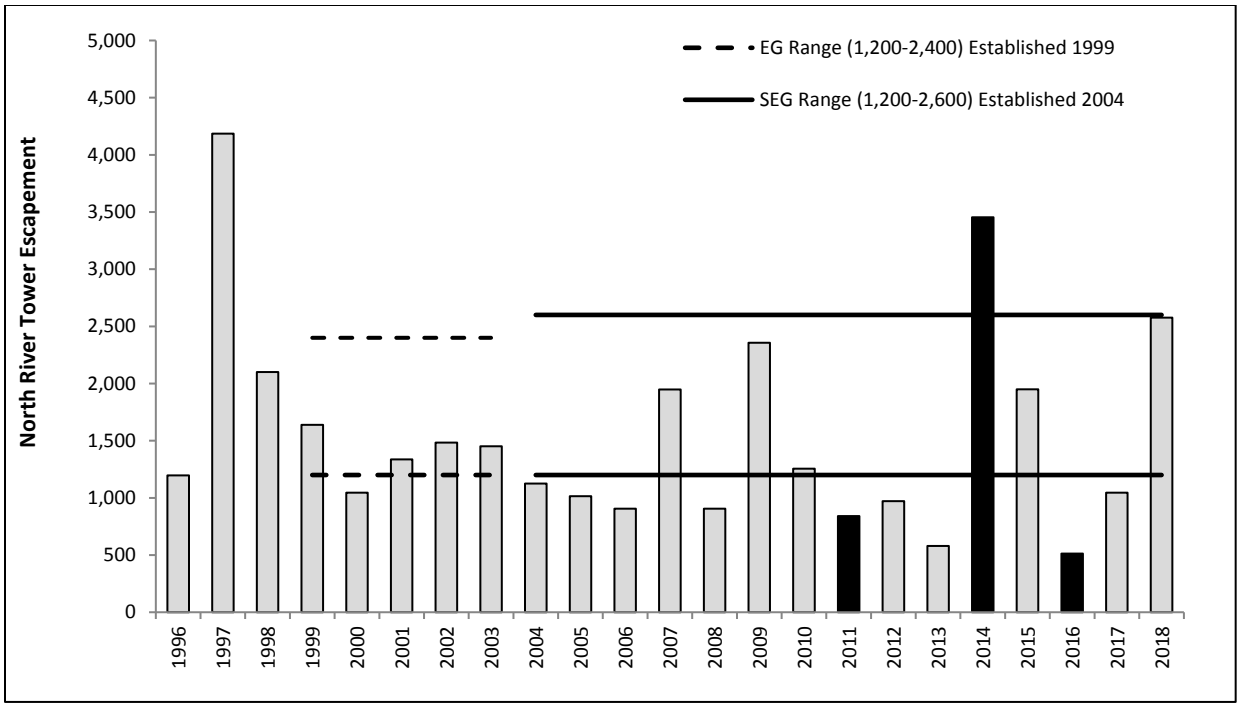

Figure 2.–Annual king salmon escapement compared with established escapement goal ranges, 1996–2018, North River counting tower, Unalakleet River drainage, Norton Sound District.

Note: The 2011, 2014, and 2016 North River tower counts are considered incomplete estimates of escapement because of poor counting conditions.

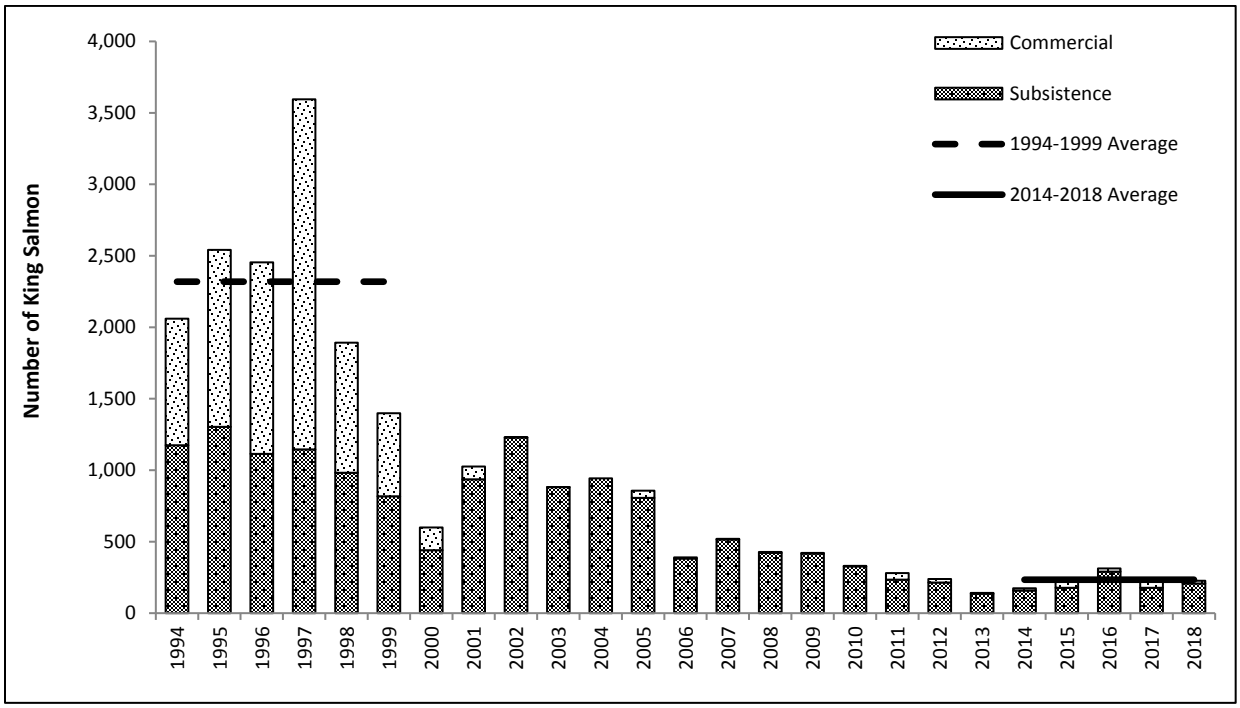

Figure 3.–Subdistrict 5 combined (subsistence + commercial) king salmon harvests, compared to the recent 5-year (2014–2018) and historical (1994–1999) averages.

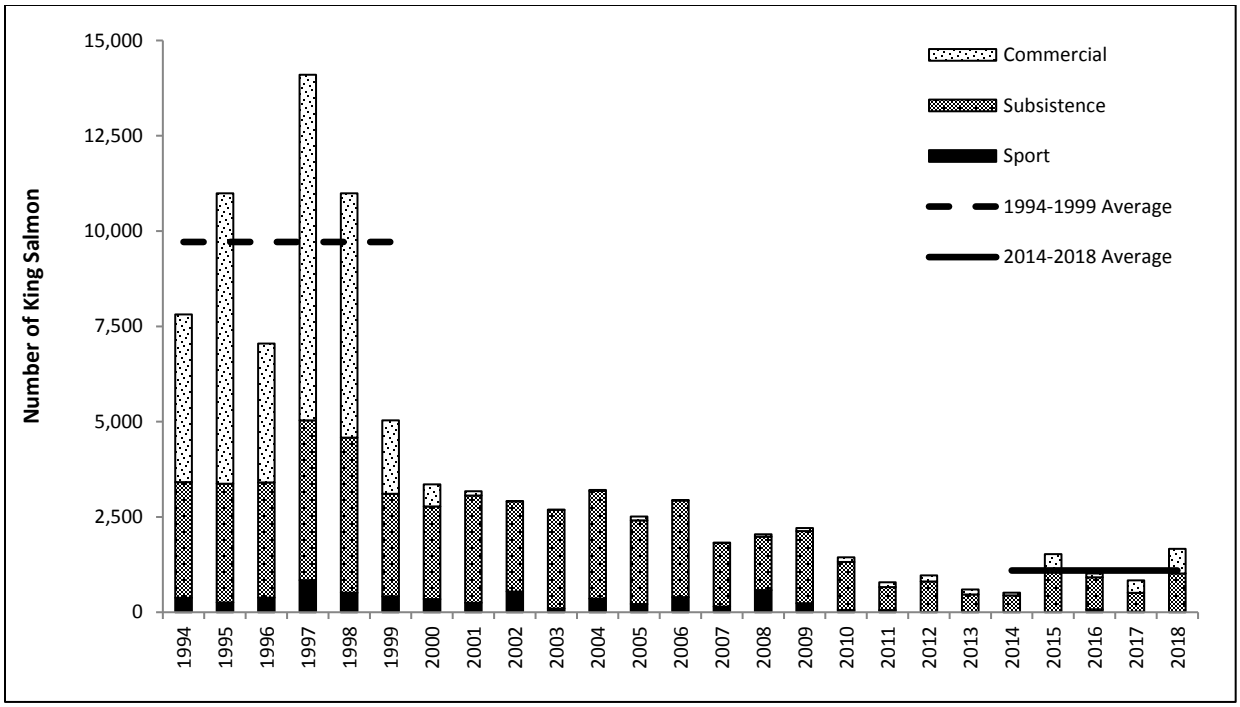

Figure 4.–Subdistrict 6 combined (subsistence + commercial + sport) king salmon harvests compared to the recent 5-year (2014–2018) and historical (1994–1999) averages.

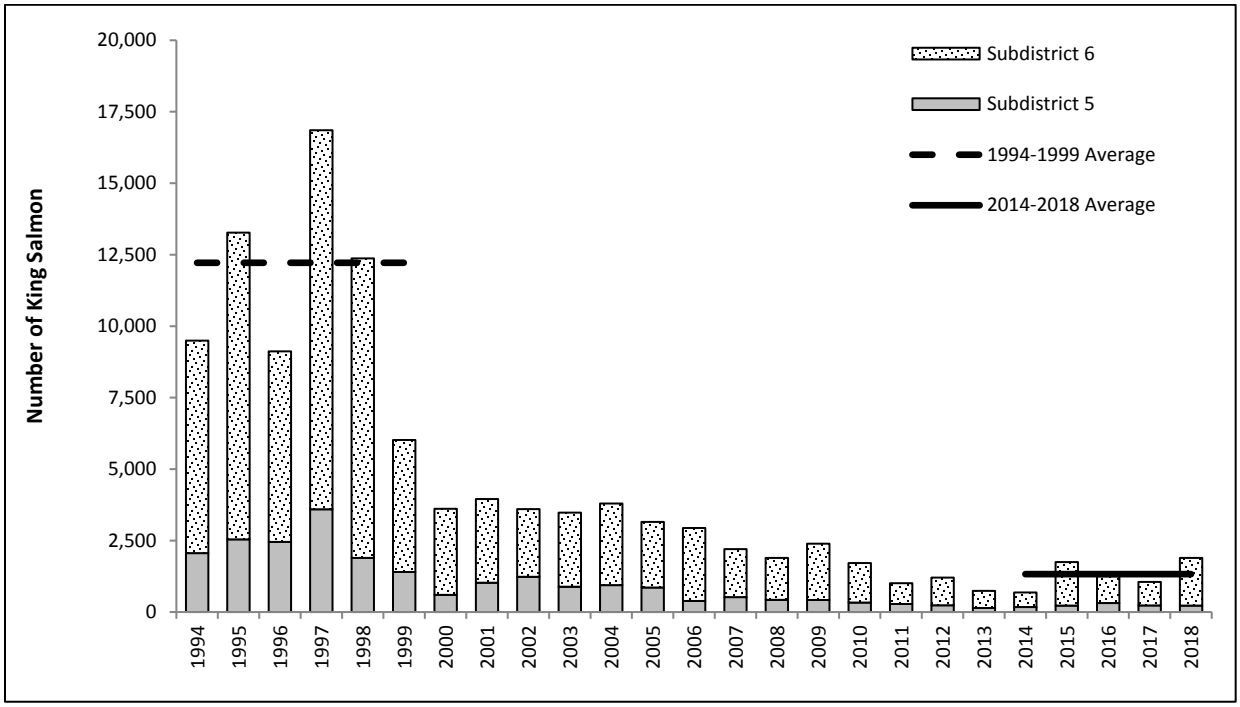

Figure 5.–Subdistricts 5 and 6 combined king salmon harvests, compared to the recent 5-year (2014–2018) and historical (1994–1999) averages.