Regional Information Report No. 1J14-10

Northern Chatham Strait Sockeye Salmon: 2014 Updated Stock Status, Fishery Management, and Subsistence Fisheries

by

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and

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December 2014

Alaska Department of Fish and Game **Division of Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, Special Publications and the Division of Commercial Fisheries Regional Reports. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

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

Mathematics, statistics

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

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The Regional Information Report Series was established in 1987 and was redefined in 2007 to meet the Division of Commercial Fisheries regional need for publishing and archiving information such as project operational plans, area management plans, budgetary information, staff comments and opinions to Board of Fisheries proposals, interim or preliminary data and grant agency reports, special meeting or minor workshop results and other regional information not generally reported elsewhere. Reports in this series may contain raw data and preliminary results. Reports in this series receive varying degrees of regional, biometric and editorial review; information in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author or the Division of Commercial Fisheries if in doubt of the level of review or preliminary nature of the data reported. Regional Information Reports are available through the Alaska State Library and on the Internet at: http://www.adfg.alaska.gov/sf/publications/

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ABSTRACT

Staff of the Alaska Department of Fish and Game updated available technical information related to sockeye salmon (*Oncorhynchus nerka*) stocks in the northern Chatham Strait area. Detailed information was synthesized for Kanalku Lake, Sitkoh Lake, Kook Lake, Hasselborg River/Salt Lake, and Hanus Bay (Lake Eva) sockeye salmon stocks, which are important traditional subsistence stocks for the community of Angoon. Although escapement estimates were available for Sitkoh Lake for six years before 2001, for Kook Lake for two years before 2001, and for Lake Eva for four years before 2001, our core escapement time series started in 2001 (no escapement estimates are available for Hasselborg River in any year). We provide a detailed description of the State of Alaska's management of the subsistence fishery, together with estimates of subsistence harvest in Angoon. Additionally, we developed extensive information about the northern Chatham Strait commercial purse seine fisheries, including a description of management, and time and area catch statistics.

Key words: Angoon, Basket Bay, Chatham Strait, escapement, fishery management, Hasselborg Lake, Kanalku Lake, Kook Lake, Lake Eva, *Oncorhynchus nerka*, Salt Lake, Sitkoh Lake, sockeye salmon, stock status, subsistence.

INTRODUCTION

The status of sockeye salmon (*Oncorhynchus nerka*) stocks in Northern Chatham Strait area has been the subject of ongoing discussions since 2001, when very low escapements were documented at Kanalku Lake, the preferred subsistence location for the community of Angoon. In October of 2006, United States Department of Agriculture (USDA) Forest Service and Alaska Department of Fish and Game (ADF&G) personnel met to share perspectives on the status of northern Chatham sockeye salmon stocks. After that meeting, ADF&G staff completed a report that provided detailed information on sockeye salmon stock assessment and management in the Chatham Strait corridor (Geiger et al. 2007). Much of the information in that report was updated by Bednarski et al. (2012). This report is intended as a concise update of the 2007 and 2012 reports, including information on escapement and commercial harvest and management through 2014, and subsistence and sport fish harvest through 2013.

Since 2001, ADF&G, the USDA Forest Service, and the Angoon Community Association have implemented cooperative studies to estimate escapements of sockeye salmon at sites important to the community of Angoon. These studies examined three of the five sockeye-producing systems near Angoon (Figure 1). Kanalku Lake, closest to the village, is accessible by small boat via the sheltered waters of Mitchell Bay, and is the area most village residents prefer for subsistence fishing for sockeye salmon. Sitkoh Lake is located directly across Chatham Strait from Angoon, and Kook Lake/Basket Bay is located across Chatham Strait northwest of Angoon. The two additional systems used by residents of Angoon are the Hasselborg/Salt Lake system, also located within Mitchell Bay, and Lake Eva (Hanus Bay), located inside Peril Strait, seven miles to the west of Sitkoh Bay.

On 10 May 2010, Kootznoowoo, Inc. filed a petition with the Secretaries of the U.S. departments of Interior and Agriculture requesting extraterritorial jurisdiction over state waters to manage or close commercial fisheries in order to address concerns about subsistence fisheries important to the community of Angoon. On 23 August 2012, the Secretaries responded that final action on the petition would be deferred for three years to allow stakeholder discussions that would promote locally developed solutions to the perceived problem: that commercial purse seine fisheries in portions of Icy and Chatham straits interfere with the ability of Angoon residents to meet their subsistence needs for salmon. In response to the Secretaries' recent action, and in support of forthcoming discussions, this report is provided by the State of Alaska to help facilitate those discussions.

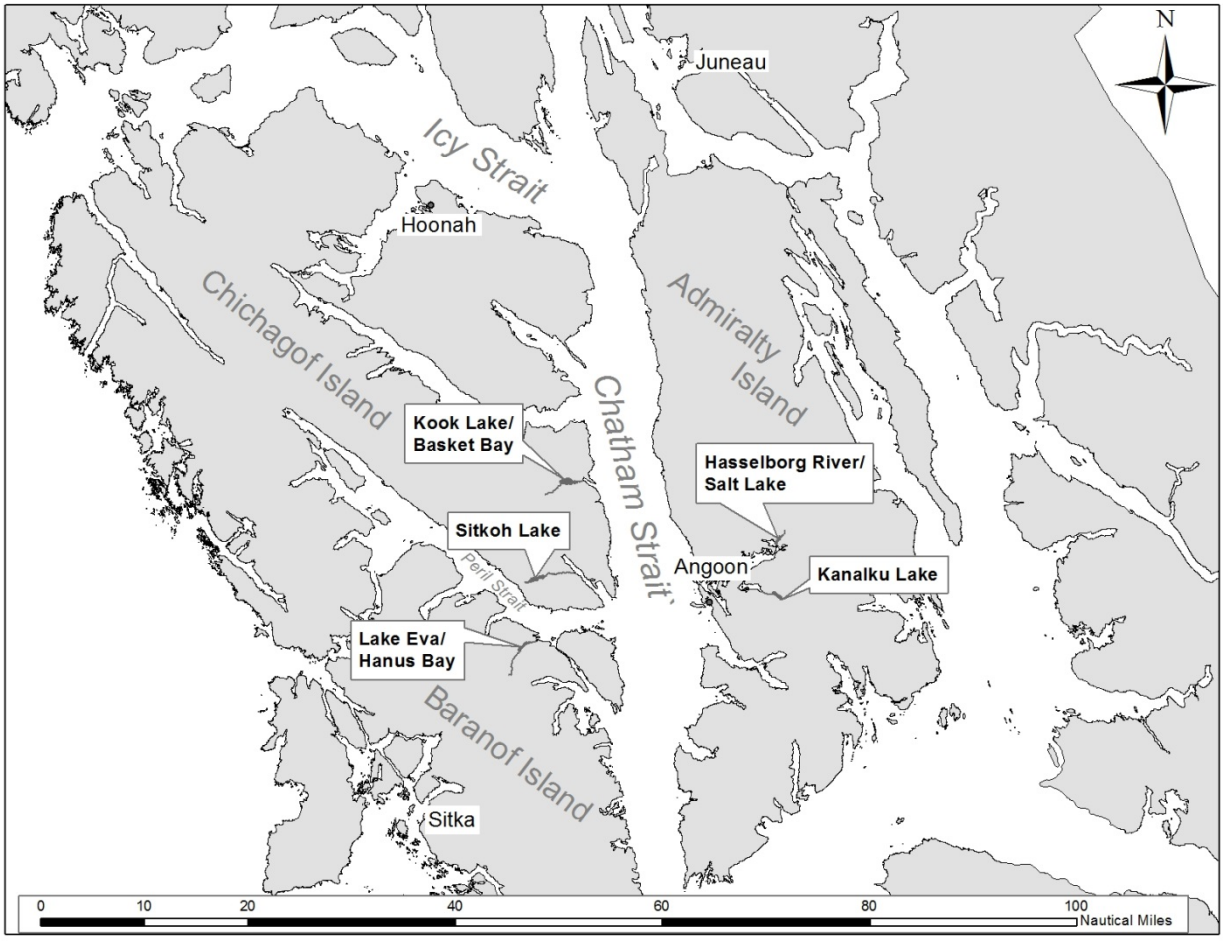


Figure 1.–Map of Southeast Alaska showing the location of Kanalku, Kook, and Sitkoh Lakes, Lake Eva, Hasselborg River, and the village of Angoon.

MEASURES OF ESCAPEMENT

In consideration of their importance to subsistence fisheries, a substantial amount of information has been collected since 2001 about escapements to northern Chatham Strait sockeye salmon systems. Estimates of sockeye salmon escapement are available for Kanalku Lake 2001–2014; Kook Lake in 1994, 1995, 2005–2007, and 2010–2014 (and partial estimates in 2001 and 2002); and Sitkoh Lake in 1996–2006 and 2010–2014 (Table 1). Only a limited amount of escapement information exists for Hasselborg River and Lake Eva.

ADF&G also has escapement statistics for some of the larger stocks that likely also contribute sockeye salmon to Chatham Strait commercial fishery harvests. Escapements for some large stocks, such as Chilkoot and Chilkat lakes, in Upper Lynn Canal, and the Taku River, have been measured going back in some cases to the 1970s (Appendix A). In addition to these wild stocks, the Snettisham Hatchery, operated by Douglas Island Pink and Chum, Inc., has made significant contributions to the sockeye salmon harvests in northern Southeast Alaska since 1996. This addition to wild production of sockeye salmon has contributed to the commercial purse seine harvest of sockeye salmon in the area. ADF&G has published these escapement statistics in several places (e.g., Heinl et al. 2011).

Table 1.–Escapements of sockeye salmon at four Angoon-area lakes estimated from weirs, mark-recapture studies, a combination of both, or "expanded mark-recapture" estimates.

Lake	Year	Type of Estimate	Estimated Escapement[a]	Citation
Kanalku Lake (above partial barrier falls)	2001	expanded mark-recapture	250	Conitz and Cartwright 2005
	2002	expanded mark-recapture	1,600	Conitz and Cartwright 2005
	2003	expanded mark-recapture	280	Conitz and Cartwright 2005
	2004	expanded mark-recapture	1,250	Conitz and Cartwright 2007
	2005	expanded mark-recapture	1,100	Burril and Conitz 2007
	2006	expanded mark-recapture	1,300	Conitz and Burril 2008
	2007	weir with mark-recapture	630	Vinzant et al. 2009
	2008	weir with mark-recapture	1,200	Vinzant et al. 2010
	2009	weir with mark-recapture	2,664	Vinzant and Bednarski 2010
	2010	weir with mark-recapture	2,970	Vinzant et al. 2011
	2011	weir with mark-recapture	728	Vinzant et al. 2012
	2012	weir with mark-recapture	1,123	Vinzant et al. 2013
	2013	weir with mark-recapture	1,427	Vinzant and Heinl 2014
	2014	weir and video weir	1,398	ADF&G unpublished data
Kanalku Creek (below partial barrier falls)	2008	net-video weir	2,518	USDA Forest Service unpublished data
	2009	net-video weir	3,281	USDA Forest Service unpublished data
	---			
	2012	video weir	2,289	Vinzant et al. 2013
	2013	video weir	1,938	Vinzant and Heinl 2014
	2014	video weir	2,148	ADF&G unpublished data
Kook	1994	weir count	1,812	Conitz and Cartwright 2005
	1995	weir count	5,817	Conitz and Cartwright 2005

	2001	expanded mark-recapture	*380*[b]	Conitz and Cartwright 2005
	2002	expanded mark-recapture	*3,600*[b]	Conitz and Cartwright 2005

	2005	weir with mark-recapture	1,994	Van Alen 2008
	2006	weir with mark-recapture	10,165	Van Alen 2008
	2007	weir with mark-recapture	2,958	Van Alen 2008

	2010	net-video weir	6,565	Van Alen and Mahara 2011a
	2011	net-video weir	2,701	Van Alen and Mahara 2011b
	2012	net-video weir	7,651	Van Alen and Mahara 2012a
	2013	net-video weir	1,129	Van Alen et al. 2013a
	2014	net-video weir	7,621	USDA Forest Service unpublished data

–continued–

Table 1.–Page 2 of 2.

Lake	Year	Type of Estimate	Estimated Escapement[a]	Citation
Sitkoh	1982	weir count	7,228	ADF&G unpublished data

	1996	weir with mark-recapture	16,336	Kelley and Josephson 1997
	1997	mark-recapture	5,979	Crabtree 2000
	1998	expanded mark-recapture	6,649	Crabtree 2000; Crabtree 2001
	1999	expanded mark-recapture	10,499	Crabtree 2001
	2000	expanded mark-recapture	17,040	Crabtree 2001
	2001	expanded mark-recapture	15,200	Conitz and Cartwright 2005
	2002	expanded mark-recapture	11,900	Conitz and Cartwright 2005
	2003	expanded mark-recapture	8,500	Conitz and Cartwright 2005
	2004	expanded mark-recapture	3,700	Conitz and Cartwright 2007
	2005	expanded mark-recapture	13,400	Burril and Conitz 2007
	2006	expanded mark-recapture	14,800	Conitz and Burril 2008

	2010	expanded mark-recapture	15,324	Van Alen and Mahara 2011c
	2011	expanded mark-recapture	3,347	Van Alen and Mahara 2011d
	2012	expanded mark-recapture	10,460	Van Alen and Mahara 2012b
	2013	expanded mark-recapture	644	Van Alen et al. 2013b
	2014	expanded mark-recapture	9,450	USDA Forest Service unpublished data
Lake Eva	1962	weir count	13,847	Blackett and Armstrong 1965
	1963	weir count	2,925	Blackett and Armstrong 1965
	1964	weir count	1,428	Blackett and Armstrong 1965

	1995	weir count	*7,605*[c]	Yanusz and Schmidt 1996

[a] Estimated escapement numbers were rounded in Geiger et al. (2007).
[b] Kook Lake sockeye salmon escapement estimates in 2001 and 2002 were not complete (Conitz and Cartwright 2005).
[c] In 1995, Lake Eva weir was operated through 31 July; escapement estimate in that year was not complete.

KANALKU LAKE

Kanalku Lake (Anadromous Waters Catalogue [AWC] stream no. 112-67-10600-0020; 57° 29.21' N, 134° 21.10' W) is located in the Kootznoowoo Wilderness, on Admiralty Island, about 20 km east of Angoon (Figure 1). The Kanalku Lake watershed area is approximately 32 km^2, with one major inlet stream draining into the east end of the lake. The lake elevation is about 28 m, its surface area is 113 ha, average depth is 15 m, and maximum depth is 22 m. The outlet stream, Kanalku Creek (AWC stream no. 112-67-10600), flows west 1.7 km into the east end of Kanalku Bay. Sockeye salmon spawn in the lake and are not known to spawn in the inlet stream (Vinzant et al. 2009). In addition to the sockeye salmon run, large numbers of pink salmon (*O. gorbuscha*) spawn in the lower part of the outlet creek and intertidal area. A few coho (*O. kisutch*) and chum salmon (*O. keta*) spawn in the Kanalku system, and resident populations of cutthroat trout (*O. clarkii*), Dolly Varden char (*Salvelinus malma*), and sculpin (*Cottus* sp.) are found in the lake. A waterfall, approximately 8–10 m high and about 0.8 km upstream from the tidewater, forms a partial barrier to migrating sockeye salmon.

From 2001 to 2006, ADF&G, the USDA Forest Service, and the Angoon Community Association estimated sockeye salmon escapement into Kanalku Lake using expanded mark-recapture methods. Since 2007, a weir/mark-recapture project has been operated at the outlet of Kanalku Lake to estimate sockeye salmon spawning escapements (Table 1). Additional studies were conducted to estimate the total escapement of sockeye salmon into the Kanalku system,

below the partial barrier falls on Kanalku Creek, using video weirs in 2008 and 2009 (USDA Forest Service) and from 2012 to 2014 (ADF&G). Sockeye salmon escapements into Kanalku Lake averaged 1,280 fish, and ranged from a minimum of 250 fish in 2001 to a maximum of 2,970 fish in 2010. Total sockeye salmon escapements into Kanalku Creek, as measured below the barrier falls, ranged from a minimum of 1,938 in 2013 and to a maximum of 3,281 fish in 2008 (Table 1).

In 2008, 2009, and 2012–2014, weir counts of sockeye salmon at the lake outlet were compared to counts made below the falls in Kanalku Creek. In 2008, a year of relatively high water flow, sockeye salmon movement above the falls was considerably delayed: an estimated 1,000 sockeye salmon had already entered the system below the falls by 10 July but it took another 22 days before 1% of those 1,000 fish arrived at the upper weir (Figure 2). The upper weir (above the falls) was in place for 33 days (29 June–31 July) before any fish passed into the lake. On average, 50% of the sockeye salmon escapement entered Kanalku Creek by 23 July (range 16 July 2009–30 July 2014), and more than 75% of the escapement entered Kanalku Creek by 31 July (range 26 July 2009–7 August 2014).

KOOK LAKE (BASKET BAY)

Kook Lake (AWC stream no. 112-12-10250-0010; 57° 39.91’ N, 134° 59.04’ W) is located on the east side of Chichagof Island, about 32 km northeast of Angoon (Figure 1). The Kook Lake watershed area is about 54 km^2, and two main inlet streams enter the southwest end of the lake. The lake elevation is about 13 m, its surface area is 240 ha, average depth is 30 m, and maximum depth is 44 m. The outlet stream, Kook Creek (AWC stream no. 112-12-10250), flows east 1.2 km into Basket Bay, in Chatham Strait. Salmon must swim through at least two natural caves in the carbonate bedrock of the Kook Creek channel, each about 150–300 m long, to reach the lake. Sockeye salmon spawn in the main inlet stream (earlier-running fish) and at several areas in the lake (later-running fish; Van Alen 2008). The lake also supports runs of coho, chum, and pink salmon; resident fish include Dolly Varden char, cutthroat trout, threespine stickleback (*Gasterosteus aculeatus*), and sculpin. The Kook Lake watershed was extensively clear-cut and crossed by a logging road system, which connects with the Corner Bay logging camp in Tenakee Inlet.

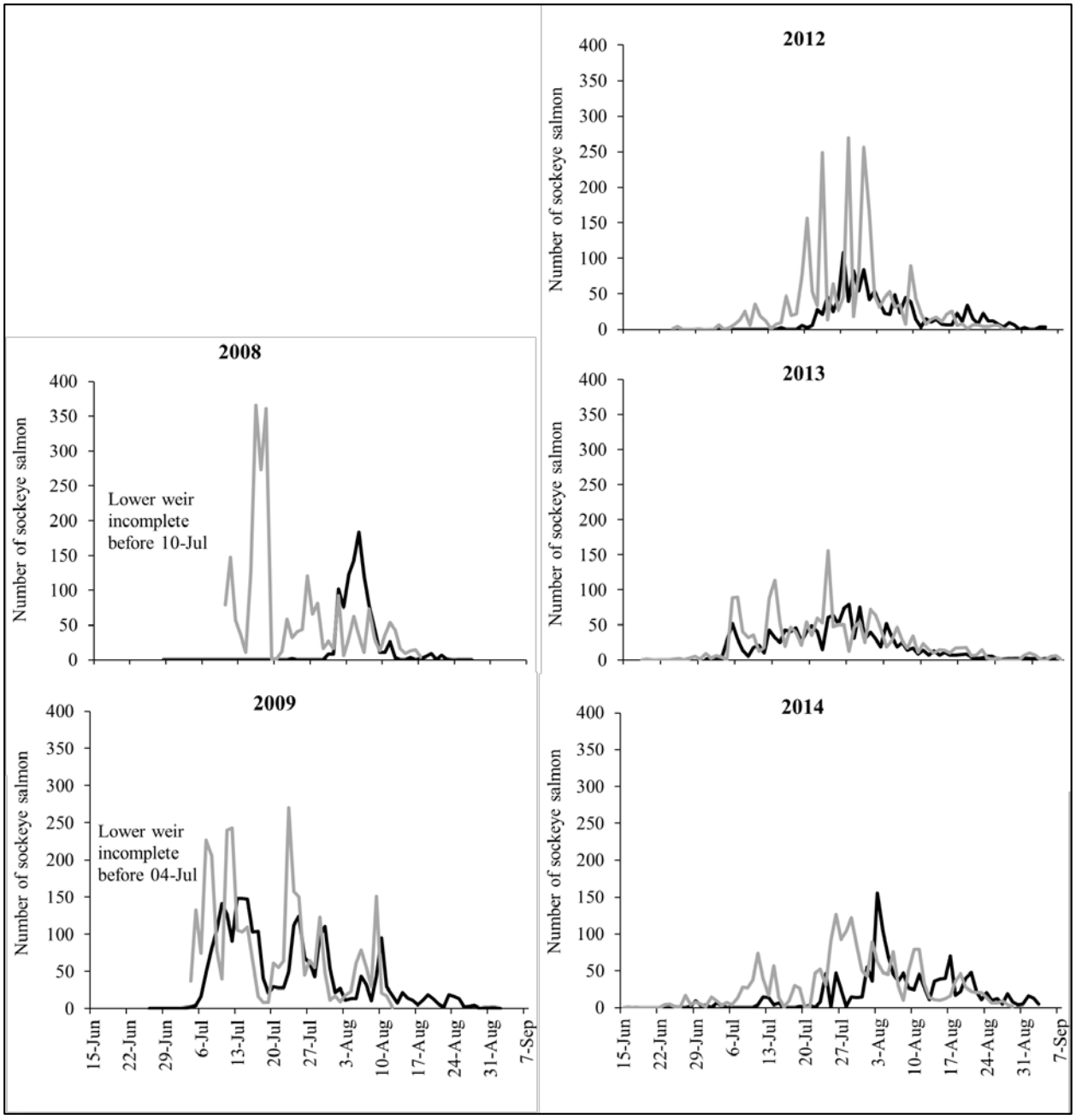


Figure 2.–Sockeye salmon weir counts above the partial barrier falls (black line) and below the partial barrier falls (gray line) in Kanalku Creek, 2008, 2009, and 2012–2014. Note: the lower weir was not in operation until 10 July 2008 and 4 July 2009.

From 2001 to 2003, ADF&G, the USDA Forest Service, and the Angoon Community Association attempted to estimate sockeye salmon escapement into Kook Lake using modified mark-recapture methods. Imprecise, or "rough", escapement estimates were obtained in 2001 (380 fish) and 2002 (3,600 fish), and no estimate was obtained in 2003 (Conitz and Cartwright 2005). As a result, those escapement estimates are probably not comparable to estimates obtained from weir or mark-recapture studies in other years. ADF&G and the USDA Forest Service operated a weir at the outlet of Kook Lake in 1994 and 1995, and the USDA Forest Service, Angoon Community Association, and ADF&G, cooperatively conducted weir/mark-recapture studies in 2005–2007, and net-video weirs in 2010–2014. Sockeye salmon escapement estimates during those years ranged from a minimum of 1,129 fish in 2013 to a maximum of 10,165 fish in 2006 (Table 1). Daily weir counts show that, on average, 50% of the sockeye salmon escapement passed into the lake by 26 July (Figure 3).

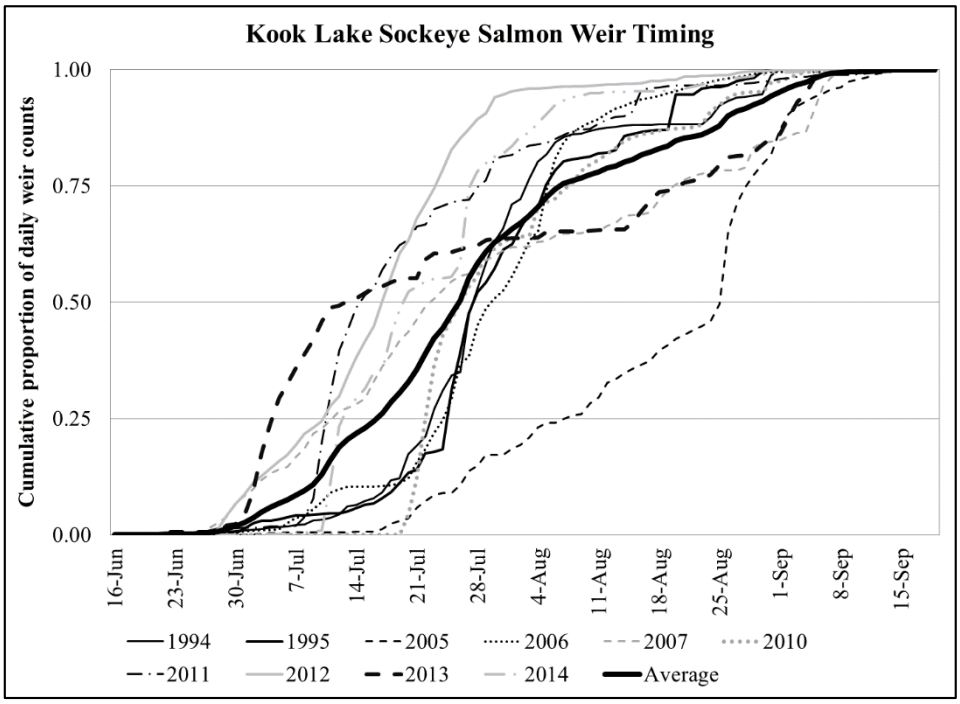


Figure 3.–Cumulative daily proportions of Kook Lake sockeye salmon weir counts, 1994, 1995, 2005–2007, and 2010–2014.

SITKOH LAKE

Sitkoh Lake (AWC stream no. 113-59-10040-0010; 57° 30.45' N, 135° 4.47' W) is located on the southeastern tip of Chichagof Island, about 30 km west of Angoon (Figure 1). The Sitkoh Lake watershed area is about 31 km^2. Several steep-gradient inlet streams enter the lake on the north and south sides, ending in productive alluvial fans on the lakeshore. The lake elevation is about 59 m, its surface area is 189 ha, average depth is 20 m, and maximum depth is 39 m. The outlet stream, Sitkoh Lake Creek (AWC stream no. 113-59-10040), is about six km long, has at least two tributaries, and drains east into Sitkoh Bay. The sockeye salmon run consists entirely of lake spawners. In addition to sockeye, coho, pink, and chum salmon, the lake supports a large population of anadromous Dolly Varden char, several thousand sea-run cutthroat trout, smaller numbers of summer resident cutthroat trout, and a moderately large steelhead (*O. mykiss*) run

(Yanusz 1997; Brookover et al. 1999). The Sitkoh drainage was extensively clear-cut between 1969 and 1974.

ADF&G operated an adult sockeye salmon enumeration weir in Sitkoh Creek in 1982 and 1996. The sockeye salmon escapement, based only on weir counts (i.e., not verified through mark-recapture) was 7,228 fish in 1982 (ADF&G unpublished data). In 1996, a mark-recapture study was conducted in association with the weir project. The sockeye salmon escapement based on the mark-recapture study was 16,336 fish in 1996 (Cook 1998). Sockeye salmon escapements were estimated using expanded mark-recapture methods in 1998–2006 (ADF&G) and 2010–2014 (Van Alen and Mahara 2011c; USDA Forest Service unpublished data). Escapements during those years ranged from a minimum of 664 fish in 2013 to a maximum of 17,040 fish in 2000 (Table 1). Daily counts from the two years of weir data show that 50% of the sockeye salmon passed into the lake by 29 August 1982 and 11 August 1996 (Figure 4).

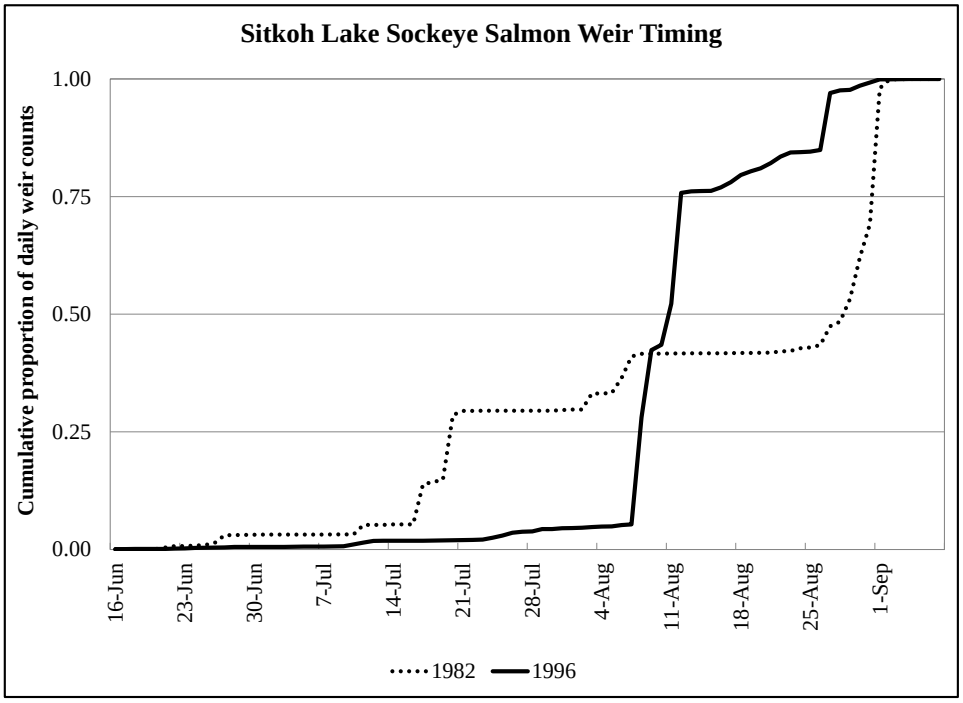


Figure 4.–Cumulative daily proportions of Sitkoh Lake sockeye salmon weir counts, 1982 and 1996.

HASSELBORG RIVER (SALT LAKE)

Hasselborg Lake (5,500 ha) is the largest lake in a series of lakes covering 55 km^2 in the interior of Admiralty Island, in the Kootznoowoo Wilderness. The outlet stream, Hasselborg River (AWC stream no. 112-67-10350), flows 13.3 km southwest into the Salt Lake estuary (at 57° 35.53' N, 134° 19.85' W) at the extreme east end of Mitchell Bay. Two waterfalls on Hasselborg River prevent sockeye and other salmon from reaching the lake. The lower falls, about 1.8 km upstream of Salt Lake, is about 5.5 m high and forms a partial barrier to fish passage; some migrating salmon are able to successfully jump the falls. The upper falls, in a steep section of the valley about 2.5 km upstream of the lower falls, is 9.2 m high and forms a total barrier to fish passage. Salt Lake, a brackish water estuary, is separated from the rest of Mitchell Bay by a tidal falls, and can only be reached by boat during high tide. Sockeye, pink, chum, and coho salmon spawn in the Hasselborg River, and it is thought that this could be the largest coho salmon

producing system on Admiralty Island. Steelhead, cutthroat trout, and Dolly Varden char are also present.

Sockeye salmon escapement information for the Hasselborg/Salt Lake system is limited to survey counts conducted in various years by boat, airplane, helicopter, and on foot. These surveys are not considered reliable estimates of total escapement, which would be much greater than a one-day survey count. Sockeye and coho salmon were usually present in the survey area together, and surveyors frequently commented on the difficulty of distinguishing the two species. Peak counts of sockeye salmon ranged from 2 to 9,000 fish and there were numerous counts of 2,000 of more fish (Conitz and Cartwright 2002). The Hasselborg River was included in a subsistence sockeye salmon stock assessment project led by ADF&G in 2001, but field crews were unable to effectively sample fish and estimate total escapement (Conitz and Cartwright 2002).

LAKE EVA (HANUS BAY)

Lake Eva (AWC stream no. 113-52-10040-0010; 57 23.96'N; 135 6.44' W) is located on northeast Baranof Island, about 32 km southwest of Angoon (Figure 1). The Lake Eva watershed area is about 47.7 km^2, with one major inlet stream draining into the head of the lake. The lake elevation is about 14 m, its surface area is 98 ha, and maximum depth is 22 m. The outlet stream, Eva Creek (AWC No. 113-52-10040), flows 1.5 km northeast into Hanus Bay, in Peril Strait. Sockeye salmon spawn in the inlet stream. The system also supports chum, coho, and pink salmon, and steelhead (Johnson and Blanche 2011), and is an important over-wintering site for Dolly Varden char and anadromous cutthroat trout populations (Heiser 1966; Armstrong 1971).

Sockeye salmon escapement information for the Lake Eva system is limited to weir counts made in conjunction with trout and Dolly Varden char studies conducted at Eva Creek in 1962–1964 and 1995 (Table 1). The 1960s escapements ranged from 1,400 to 13,600 fish (Blackett and Armstrong 1965), and 7,605 sockeye salmon were counted through the weir in 1995 (Yanusz and Schmidt 1996).

SUBSISTENCE MANAGEMENT AND HARVEST

ADF&G manages subsistence salmon fisheries in Southeast Alaska under the terms of subsistence fishing permits [5 AAC 01.730]. Subsistence salmon fishing permits establish harvest limits, allowable gear types, fishing seasons, and other general harvest requirements. Permit stipulations are reviewed annually by area and regional salmon managers. In some cases harvest limits and fishing seasons are modified for specific fishing areas depending upon perceptions of sockeye salmon abundance based on recent trends in harvests and escapements. Data on harvest, harvest timing, and gear type are collected on catch calendars that must be filled out by subsistence users for each fishing day. The Federal subsistence management program for sockeye salmon fishing in Southeast Alaska relies heavily on the State's subsistence fishing permit system. State subsistence permits are valid in Federal jurisdiction, unless specifically superseded by Federal regulation.

Each spring, ADF&G staff travels to the community of Angoon to issue subsistence salmon permits for the upcoming season and collect permits from the past season. This meeting with members of the public provides an opportunity to discuss issues and collect feedback from Angoon residents and is an important part of the department's management of subsistence fisheries in Chatham Strait.

SUBSISTENCE HARVEST

Information about subsistence harvest was derived from ADF&G subsistence permits. There are known problems with using the sum of reported harvests to represent the actual magnitude of the harvest (Walker 2009). First, the sum of the reported harvests captures information from returned permits only. Some harvest was likely taken by individuals who did not return a permit. In addition, those that did return permits may have under-reported their harvest (Walker 2009). Although reported subsistence harvest tends to under-represent the true community harvest when compared with information generated from household surveys, the reported harvests are useful for examining trends in subsistence catch (Geiger et al. 2007).

As discussed above, there are five small systems in the northern Chatham Strait area that support subsistence fisheries for sockeye salmon: Kook (Basket Bay) and Sitkoh lakes on Chichagof Island, Kanalku Lake and Hasselborg River on Admiralty Island, and Lake Eva (Hanus Bay) on Baranof Island. Under the State Subsistence Salmon Permits in 2014, a household in Angoon could harvest 175 sockeye salmon in the Angoon traditional area (Tables 2 and 3; Figure 5). The average annual reported harvest of sockeye salmon by Angoon residents during the period 1985–2013 was 962 fish (Table 4). The average annual reported subsistence harvest by all communities from all five systems combined for the period 1985–2013 was 1,531 sockeye salmon (Table 5; Figure 6).

Table 2.–Subsistence salmon fishing permit stipulations for Kanalku Lake, Sitkoh Lake, and Hanus Bay (Lake Eva) sockeye salmon, 1988–2014. The individual (indiv.) or possession (poss.) limit is the maximum number of fish a person may have in their possession if the fish have not been processed. The Household (house.) or annual limit is the entire season limit.

	Kanalku Lake[a]			Sitkoh Lake			Hanus Bay (Lake Eva)		
		Limits			Limits			Limits	
Year	Season	Indiv.	House.	Season	Indiv.	House.	Season	Indiv.	House.
1988–1991	1 Jun–31 Jul	25	25	1 Jun–31 Jul	10	10	None		
1992–2000	1 Jun–31 Jul	25	25	1 Jun–31 Jul	10	10	1 Jun–31 Jul	10	10
2001	1 Jun–31 Jul	25	25	1 Jun–31 Aug	15	15	1 Jun–1 Aug	15	15
		Poss.	Annual		Poss.	Annual		Poss.	Annual
2002	1 Jun–31 Jul	25	25	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2003	1 Jun–31 Jul	25	25	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2004	1 Jun–31 Jul	25	25	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2005	1 Jun–31 Jul	25	25	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2006	20 Jul–15 Aug	15	15	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2007	1 Jun–31 Jul	15	15	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2008	1 Jun–31 Jul	15	15	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2009	1 Jun–31 Jul	15	15	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2010	1 Jun–31 Jul	15	15	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2011	1 Jun–31 Jul	15	15	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2012	1 Jun–31 Jul	20	20	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2013	1 Jun–31 Jul	20	20	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50
2014	1 Jun–31 Jul	25	25	1 Jun–31 Aug	50	50	1 Jun–15 Aug	50	50

[a] A voluntary closure agreement was in place for Kanalku Lake with the community of Angoon, 2002–2005.

Table 3.–Subsistence salmon fishing permit stipulations for Basket Bay (Kook Lake) and Hasselborg River (Salt Lake) sockeye salmon, 1988–2014. The individual (indiv.) or possession (poss.) limit is the maximum number of fish a person may have in their possession if the fish have not been processed. The Household (house.) or annual limit is the entire season limit.

	Basket Bay (Kook Lake)			Hasselborg/Salt Lake		
		Limits			Limits	
Year	Season	Indiv.	House.	Season	Indiv.	House.
1988–1991	1 Jun–31 Jul	25	25		None	
1992–2000	1 Jun–31 Jul	10	20		None	
2001	1 Jun–31 Jul	10	20		None	
		Poss.	Annual		Poss.	Annual
2002	1 Jun–31 Jul	15	15	1 Jun–15 Aug	25	25
2003	1 Jun–31 Jul	15	15	1 Jun–15 Aug	25	25
2004	1 Jun–31 Jul	15	15	1 Jun–15 Aug	25	25
2005	1 Jun–31 Jul	15	15	1 Jun–15 Aug	25	25
2006	1 Jun–31 Jul	15	15	1 Jun–15 Aug	25	25
2007	1 Jun–31 Jul	15	30	1 Jun–15 Aug	25	25
2008	1 Jun–31 Jul	15	30	1 Jun–15 Aug	25	25
2009	1 Jun–31 Jul	15	30	1 Jun–15 Aug	25	25
2010	1 Jun–31 Jul	15	30	1 Jun–15 Aug	25	25
2011	1 Jun–31 Jul	15	30	1 Jun–15 Aug	25	25
2012	1 Jun–31 Jul	15	30	1 Jun–15 Aug	25	25
2013	1 Jun–31 Jul	15	30	1 Jun–15 Aug	25	25
2014	1 Jun–31 Jul	15	30	1 Jun–15 Aug	25	25

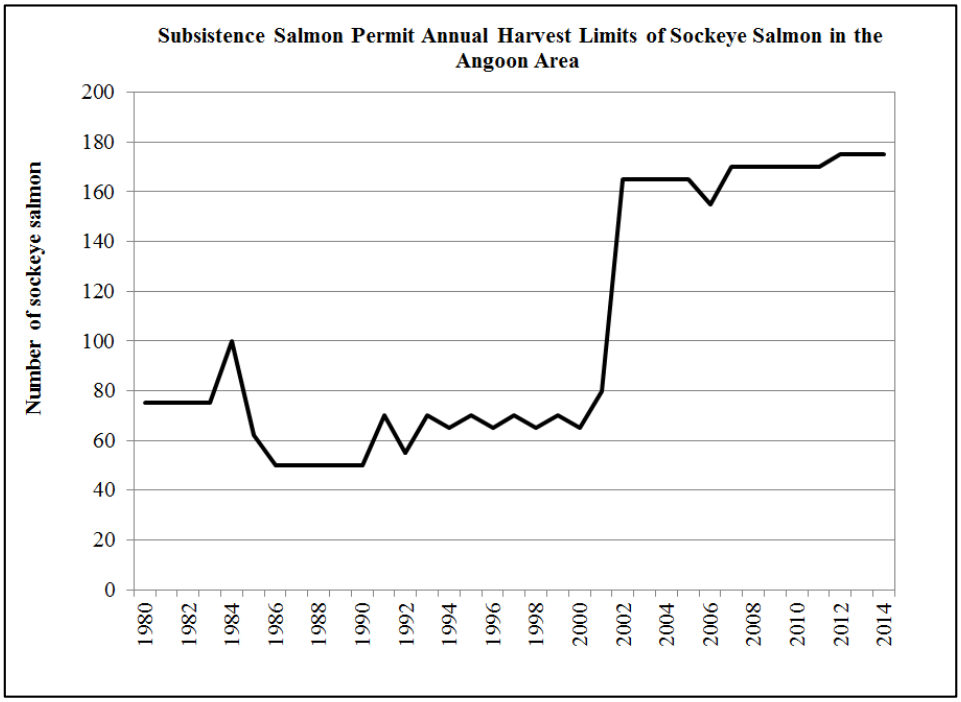


Figure 5.–Cumulative annual sockeye salmon subsistence permit harvest limits per household for the five subsistence sockeye salmon systems near Angoon, 1980–2014.

Table 4.–Subsistence salmon harvest reported from permits by residents of Angoon, 1985–2013.

Year	Sockeye	Chinook	Coho	Pink	Chum
1985	732	0	300	250	140
1986	1,057	0	250	0	470
1987	646	0	105	85	50
1988	226	0	12	75	53
1989	429	1	100	57	1
1990	1,032	0	124	75	29
1991	696	0	175	75	24
1992	769	0	160	50	0
1993	901	0	425	0	1
1994	1,300	0	223	90	103
1995	936	0	243	115	64
1996	1,408	0	350	198	95
1997	1,495	0	437	184	130
1998	1,554	0	367	100	50
1999	1,620	0	291	32	3
2000	1,344	0	147	19	50
2001	1,147	1	213	133	83
2002	751	0	40	67	21
2003	1,496	0	36	6	2
2004	1,479	0	107	107	58
2005	261	0	12	25	0
2006	658	0	20	9	0
2007	56	1	47	62	0
2008	637	0	120	0	15
2009	942	0	70	55	5
2010	1,332	0	155	112	29
2011	997	8	186	10	11
2012	1,028	0	40	40	0
2013	927	0	15	6	0
Average	961	0	164	70	51

Table 5.–Reported annual sockeye salmon subsistence harvest from five systems in northern Chatham Strait, 1985–2013.

	Location					
Year	**Hanus Bay**	**Hasselborg**	**Kanalku[a]**	**Kook**	**Sitkoh**	**Total**
1985	0	0	473	450	313	1,236
1986	88	60	931	1,427	677	3,183
1987	0	45	645	1,233	636	2,559
1988	10	0	258	316	322	906
1989	0	0	425	493	248	1,166
1990	36	25	762	477	181	1,481
1991	0	50	556	406	0	1,012
1992	0	0	571	602	90	1,263
1993	80	25	901	475	0	1,481
1994	36	87	1,282	348	36	1,789
1995	59	45	936	387	10	1,437
1996	50	78	1,627	302	50	2,107
1997	53	110	1,538	187	60	1,948
1998	158	67	1,482	327	16	2,050
1999	60	60	1,666	418	36	2,240
2000	0	40	1,443	252	75	1,810
2001	0	40	951	279	276	1,546
2002	99	50	14	645	184	992
2003	95	70	90	976	647	1,878
2004	2	25	60	691	1055	1,833
2005	0	44	50	169	275	538
2006	67	20	51	507	350	995
2007	55	15	10	146	0	226
2008	97	0	708	172	101	1,078
2009	31	50	600	170	676	1,527
2010	118	215	626	553	164	1,676
2011	171	32	419	434	362	1,418
2012	17	25	801	101	323	1,267
2013	62	143	549	135	334	1,223
Average	50	49	704	451	259	1,513

[a] A voluntary closure agreement was in place at Kanalku Lake, 2002–2005.

Subsistence Harvest by Gear Type

As much as 95% of the reported subsistence harvest of sockeye salmon in the Angoon area was taken with gear used in marine waters (based on ADF&G subsistence use permits, 1985–2013; Table 6). Beach seines, purse seines, and gillnets were used in marine waters, whereas cast nets, gaffs, and dip nets were used in freshwater. Beach seines were the most common subsistence gear used to harvest sockeye salmon, accounting for 86% of the total harvest. The importance of beach seines for harvesting subsistence sockeye salmon has also been documented in traditional ecological studies on subsistence salmon fishing in Southeast Alaska (George and Bosworth 1988; Turek et al. 2005; Walker 2009).

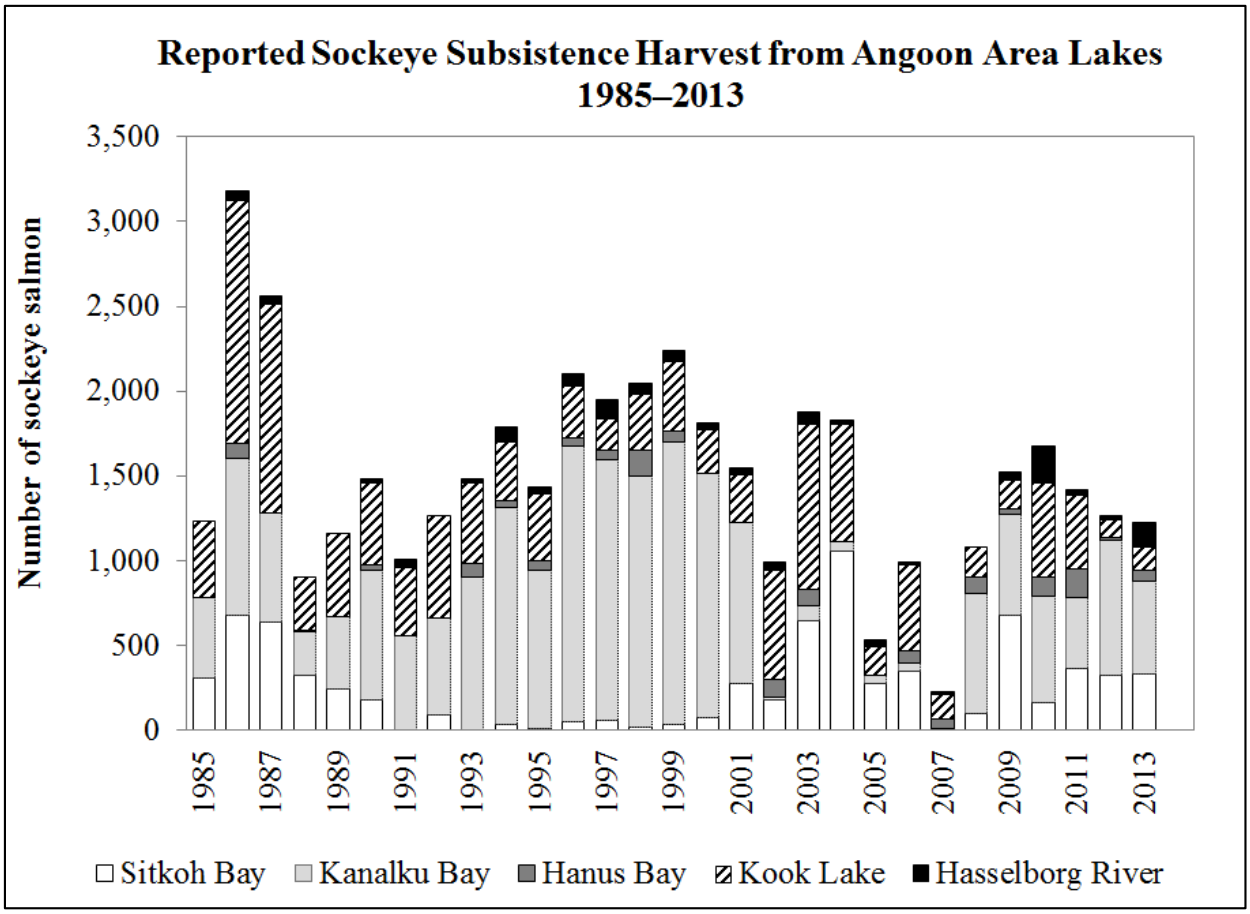


Figure 6.–Reported annual sockeye salmon subsistence harvest for five Angoon area sites, 1985–2013.

Table 6.–Estimated proportion of reported sockeye salmon subsistence harvest in marine and freshwater by gear type for the five subsistence sockeye salmon systems near Angoon, 1985–2013. Total is based on total fish by gear type by total fish harvested.

	Saltwater Gear Types				Freshwater Gear Types			
Location	Beach Seine	Gillnet	Purse Seine	Total	Cast Net	Dip Net	Gaff	Total
Hanus Bay	60%	18%	3%	81%	1%	18%	0%	19%
Hasselborg River	92%	2%	2%	96%	1%	3%	0%	4%
Kanalku Bay	89%	3%	2%	94%	0%	5%	0%	6%
Kook Lake	80%	17%	1%	99%	0%	1%	0%	1%
Sitkoh Lake	92%	5%	0%	97%	0%	3%	0%	3%
Total	86%	8%	1%	95%	0%	4%	0%	5%

Kanalku Lake

Kanalku Bay is the area most Angoon residents prefer for subsistence harvest of sockeye salmon. From 1985 to 2001, an average 85% of reported sockeye salmon subsistence harvest by residents of Angoon occurred at Kanalku Bay. During that time, reported annual sockeye salmon subsistence harvest and participation at Kanalku increased substantially: from an average of approximately 580 fish and 24 permits, 1985–1992, to an average of approximately 1,300 fish and 58 permits, 1993–2001 (Figure 7; Table 5).

Following the high sockeye salmon harvests in the late 1990s and subsequent low returns to Kanalku, the department determined there was an immediate need for conservation of Kanalku sockeye salmon. This concern was shared by the residents of Angoon. During a task force meeting held in Sitka on 5 March 2002, the department and the Angoon Community Association developed a plan to rebuild the Kanalku stock. This plan was in place for the 2002–2005 seasons. The centerpiece of the plan was a voluntary closure—an agreement by Angoon residents to forgo harvests at Kanalku in order to rebuild the run. Standard practice by the department in this circumstance is to implement a subsistence fishing closure on the subsistence fishing permit or by emergency order. In order to provide ample opportunity for Angoon residents to fulfill their subsistence needs, the department liberalized annual permit limits for sockeye salmon from the traditionally used systems of Sitkoh and Hanus Bay (Table 2; Figure 5). Sockeye salmon harvest limits for Hasselborg/Salt Lake (Table 3) were also added to the permit, further expanding the allowed annual harvest of sockeye salmon provided by the permit. This voluntary moratorium was generally observed from the 2002 through the 2005 season. In 2006, the department and the community agreed to end the voluntary closure at Kanalku. The annual limit for Kanalku was reduced from 25 to 15 fish per household (Table 2) to allow a conservative harvest and continue rebuilding the run. From 1985 to 2011, an average 80% of subsistence harvest in the terminal area of Kanalku Lake was completed by 19 July.

Kook Lake (Basket Bay)

From 1985 to 2013, reported annual sockeye salmon subsistence harvest from Basket Bay (Kook Lake) averaged approximately 450 fish and participation averaged 28 permits (Figure 8; based on returned ADF&G subsistence permits). During that time, the annual harvest by Angoon residents averaged approximately 150 fish and participation averaged eight permits. Participation

by Angoon residents increased from an average of four permits from 1985 to 2001 to an average of 23 permits from 2002 to 2005 and the average annual harvest of sockeye salmon increased from around 75 to 430 fish. The increase in participation was likely a response to the voluntary closure of Kanalku. Also, annual subsistence harvest limits were increased in 2007 (Table 3). From 1985 to 2013, an average 80% of subsistence harvest in Kook Bay was completed by 20 July.

Sitkoh Lake

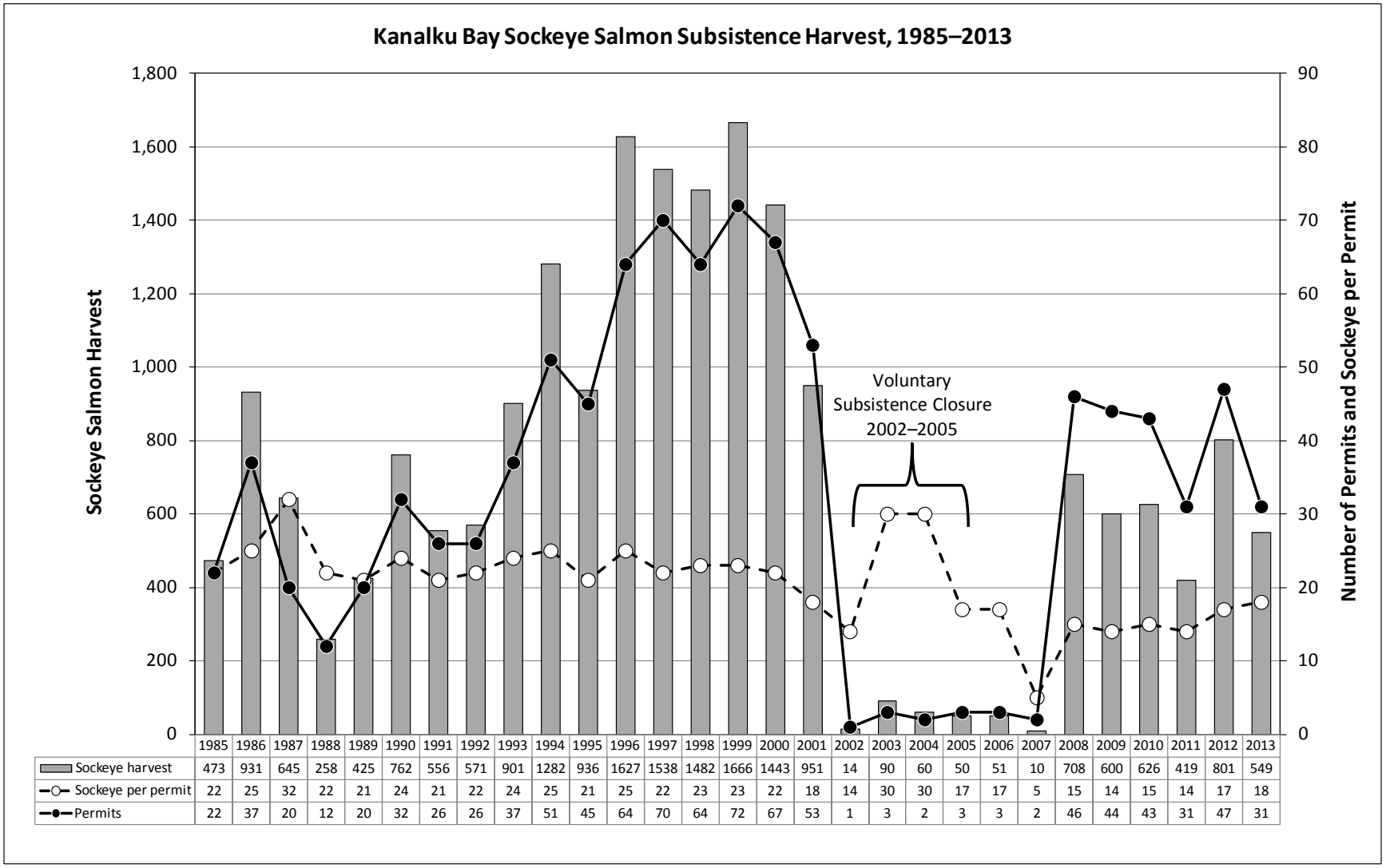
From 1985 to 2013, reported annual sockeye salmon subsistence harvest from Sitkoh Bay averaged approximately 250 fish and participation averaged 15 permits (Figure 9; based on returned ADF&G subsistence permits). During that time, the annual harvest by Angoon residents averaged approximately 115 fish and participation averaged four permits. Participation by Angoon residents increased from an average of two permits from 1985 to 2001 to an average of 18 permits from 2002 to 2005, and the average annual harvest of sockeye salmon increased from 110 to 470 fish. The increase in participation was likely a response to the voluntary closure of Kanalku. From 1985 to 2013, an average 80% of subsistence harvest in Sitkoh Bay was completed by 23 July.

Hasselborg River (Salt Lake)

In 1981 Salt Lake, at the mouth of the Hasselborg River, was designated as one of the two subsistence coho salmon fisheries in Southeast Alaska (George and Kookesh 1982) and was originally restricted to Angoon residents. In 2002, Hasselborg River/Salt Lake sockeye salmon was added to the State Subsistence Salmon Permit to provide additional fishing opportunity in response to the voluntary closure at Kanalku (Table 3). Prior to 2002, sockeye salmon were harvested incidentally during coho salmon subsistence fisheries. From 1985 to 2013, reported annual subsistence harvests averaged about 50 sockeye and 130 coho salmon (Figure 10; Table 5; based on returned ADF&G subsistence permits). During that time, the annual harvest by Angoon residents averaged approximately 40 fish and participation averaged seven permits. Participation by Angoon residents decreased from an average of 11 permits per year from 1985 to 2001 to an average of three permits per year from 2002 to 2013, although the average annual harvest of sockeye salmon stayed about the same (42 fish).

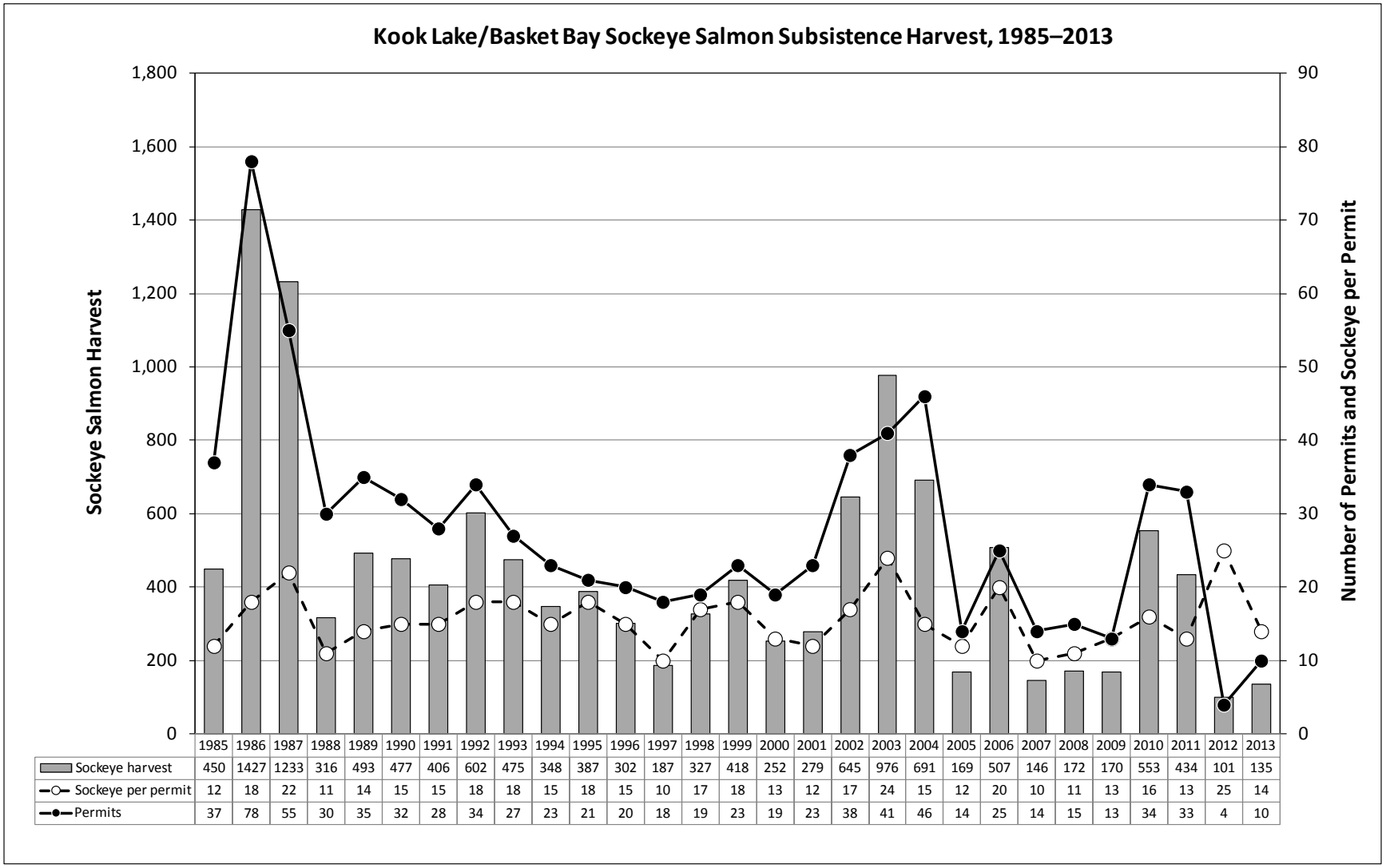
Lake Eva (Hanus Bay)

Sockeye salmon subsistence harvests have been reported from Hanus Bay since 1986 (Figure 11; Table 5). From 1985 to 2013, the total reported subsistence harvest averaged 50 sockeye salmon per year (based on returned ADF&G subsistence permits). Harvests by Angoon residents were reported only in 2010 (20 fish) and 2011 (14 fish).



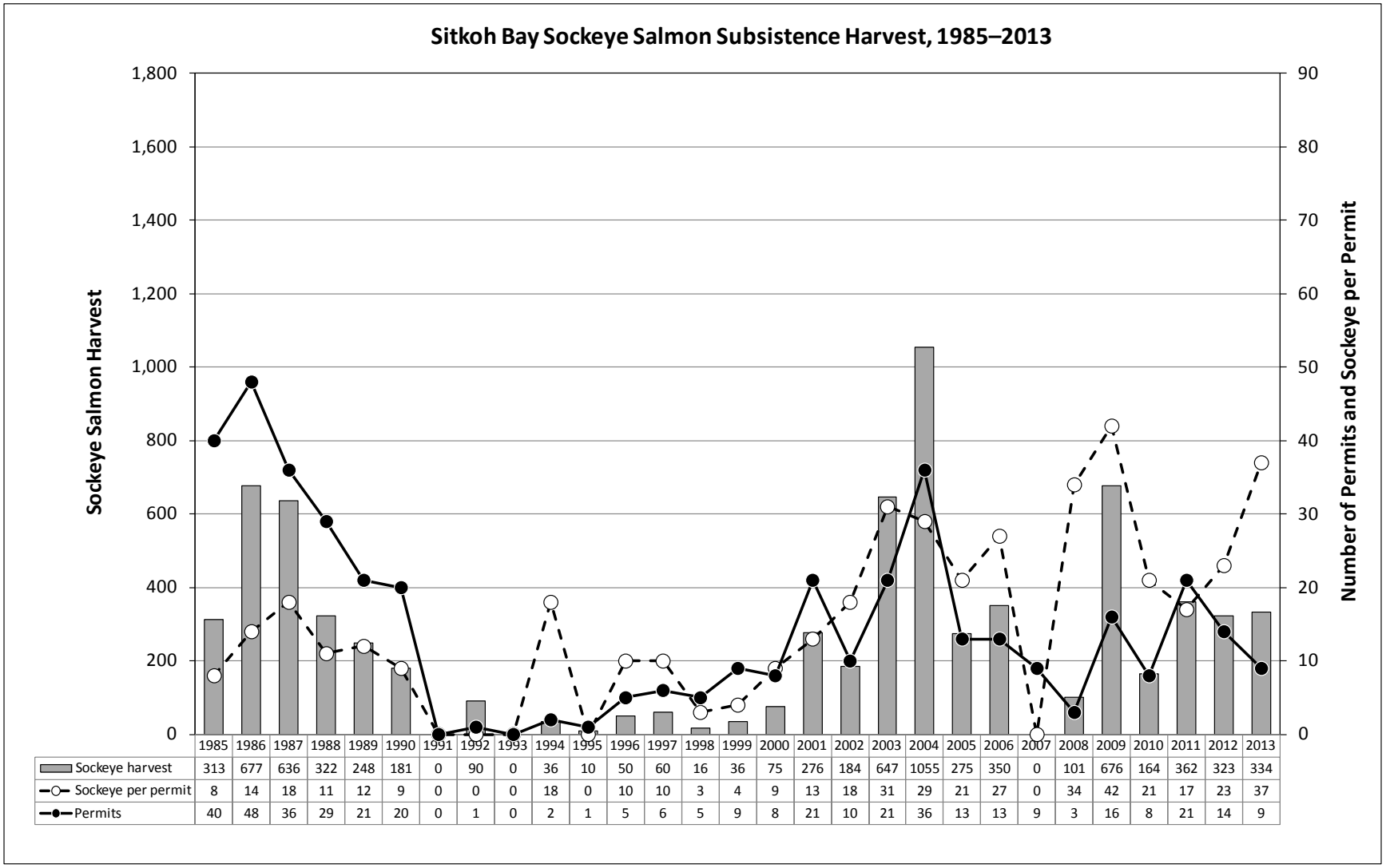
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Sockeye harvest	473	931	645	258	425	762	556	571	901	1282	936	1627	1538	1482	1666	1443	951	14	90	60	50	51	10	708	600	626	419	801	549
Sockeye per permit	22	25	32	22	21	24	21	22	24	25	21	25	22	23	23	22	18	14	30	30	17	17	5	15	14	15	14	17	18
Permits	22	37	20	12	20	32	26	26	37	51	45	64	70	64	72	67	53	1	3	2	3	3	2	46	44	43	31	47	31

Figure 7.–Reported sockeye salmon subsistence harvest, number of permits fished, and number of sockeye salmon harvested per permit at Kanalku Bay, 1985–2013.



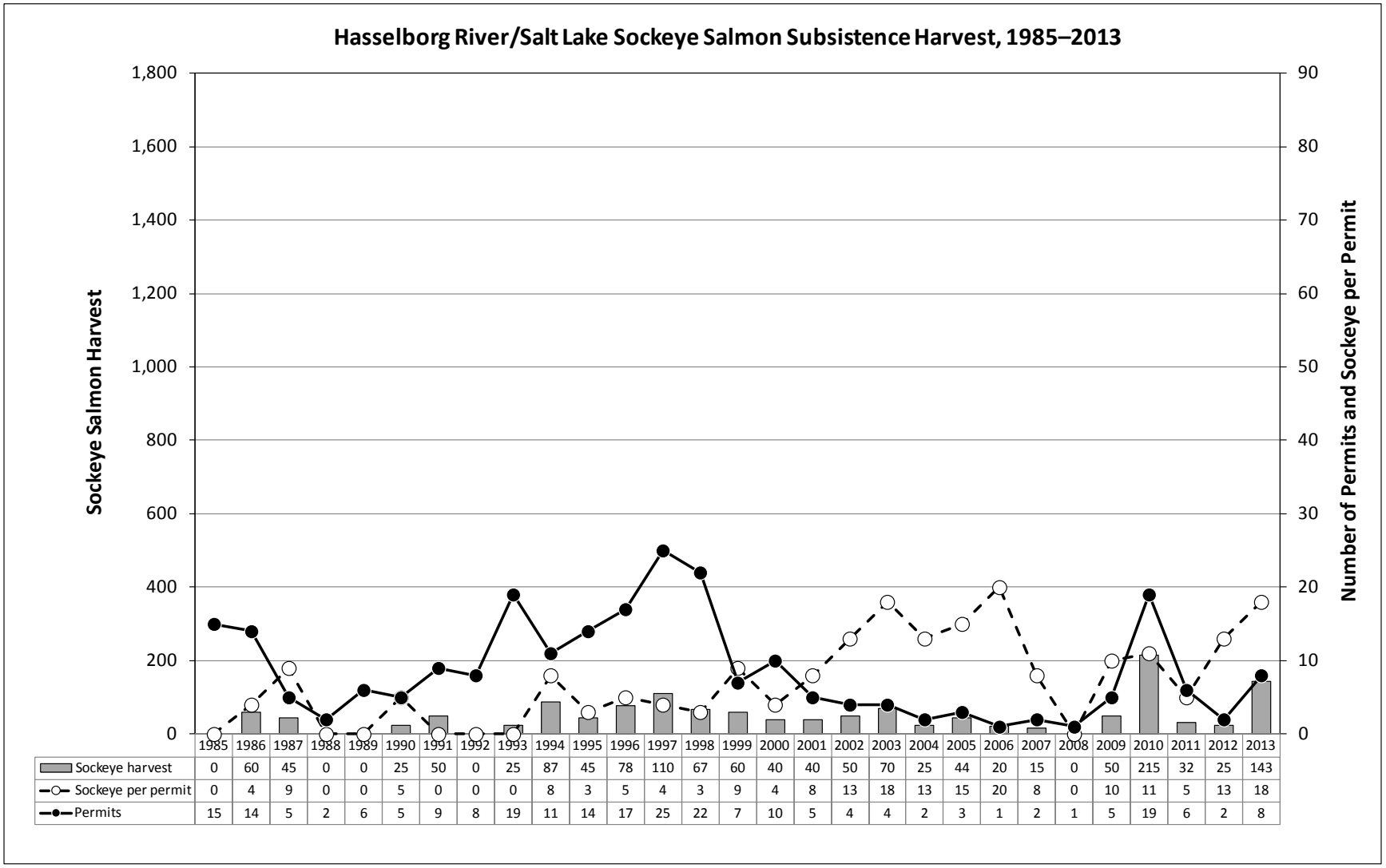
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Sockeye harvest	450	1427	1233	316	493	477	406	602	475	348	387	302	187	327	418	252	279	645	976	691	169	507	146	172	170	553	434	101	135
Sockeye per permit	12	18	22	11	14	15	15	18	18	15	18	15	10	17	18	13	12	17	24	15	12	20	10	11	13	16	13	25	14
Permits	37	78	55	30	35	32	28	34	27	23	21	20	18	19	23	19	23	38	41	46	14	25	14	15	13	34	33	4	10

Figure 8.–Reported sockeye salmon subsistence harvest, number of permits fished, and number of sockeye salmon harvested per permit at Kook Lake/Basket Bay, 1985–2013.



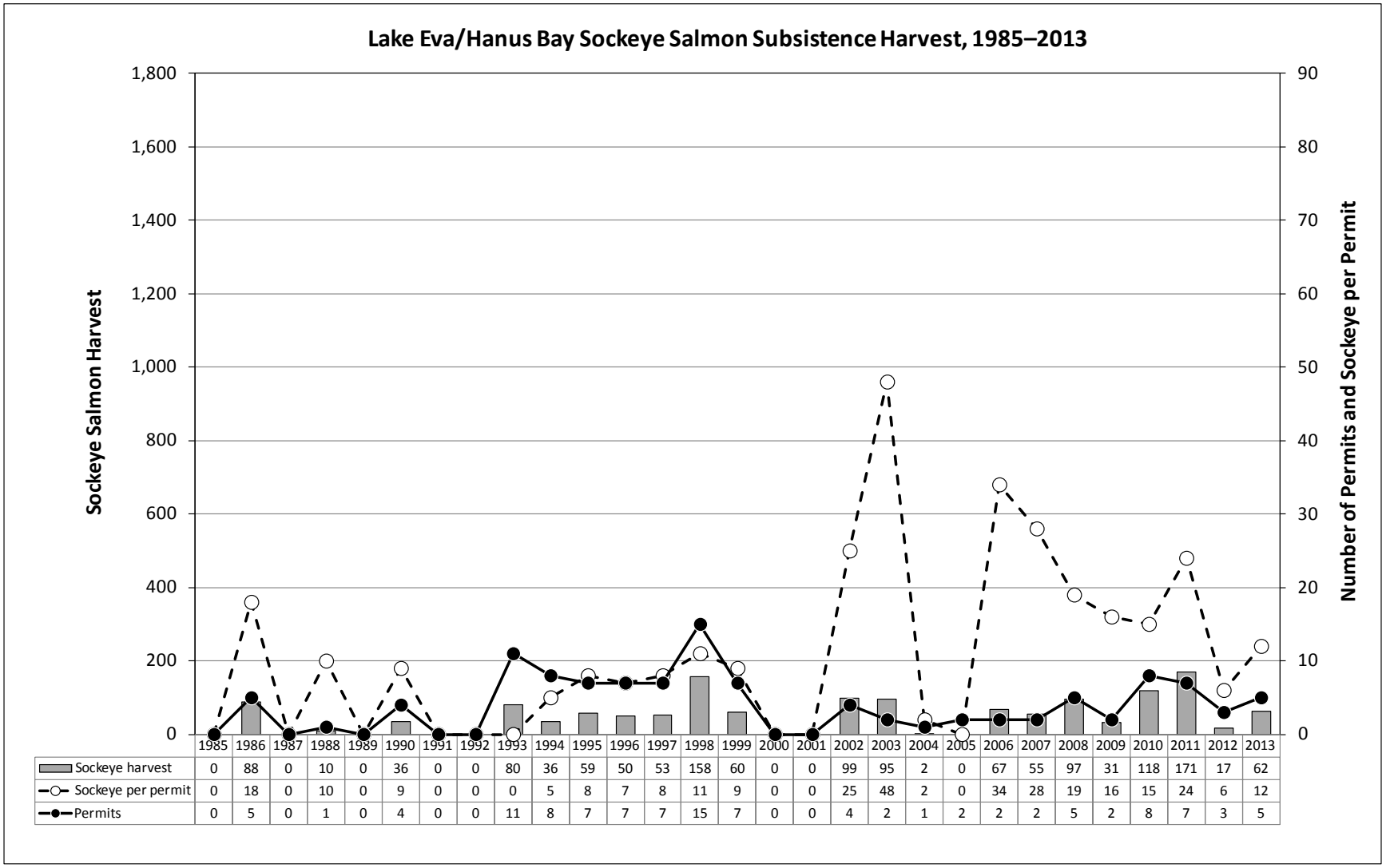
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Sockeye harvest	313	677	636	322	248	181	0	90	0	36	10	50	60	16	36	75	276	184	647	1055	275	350	0	101	676	164	362	323	334
Sockeye per permit	8	14	18	11	12	9	0	0	0	18	0	10	10	3	4	9	13	18	31	29	21	27	0	34	42	21	17	23	37
Permits	40	48	36	29	21	20	0	1	0	2	1	5	6	5	9	8	21	10	21	36	13	13	9	3	16	8	21	14	9

Figure 9.–Reported sockeye salmon subsistence harvest, number of permits fished, and number of sockeye salmon harvested per permit at Sitkoh Bay, 1985–2013.



	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Sockeye harvest	0	60	45	0	0	25	50	0	25	87	45	78	110	67	60	40	40	50	70	25	44	20	15	0	50	215	32	25	143
Sockeye per permit	0	4	9	0	0	5	0	0	0	8	3	5	4	3	9	4	8	13	18	13	15	20	8	0	10	11	5	13	18
Permits	15	14	5	2	6	5	9	8	19	11	14	17	25	22	7	10	5	4	4	2	3	1	2	1	5	19	6	2	8

Figure 10.–Reported sockeye salmon subsistence harvest, number of permits fished, and number of sockeye salmon harvested per permit at Hasselborg River/Salt Lake, 1985–2013.



	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Sockeye harvest	0	88	0	10	0	36	0	0	80	36	59	50	53	158	60	0	0	99	95	2	0	67	55	97	31	118	171	17	62
Sockeye per permit	0	18	0	10	0	9	0	0	0	5	8	7	8	11	9	0	0	25	48	2	0	34	28	19	16	15	24	6	12
Permits	0	5	0	1	0	4	0	0	11	8	7	7	7	15	7	0	0	4	2	1	2	2	2	5	2	8	7	3	5

Figure 11.–Reported sockeye salmon subsistence harvest, number of permits fished, and number of sockeye salmon harvested per permit at Lake Eva/Hanus Bay, 1985–2013.

Angoon Subsistence Salmon Harvests and Participation in Commercial Fisheries

The Angoon community has historically participated in commercial fishing and cannery work in Chatham Strait. Families would harvest a portion of their subsistence salmon for home use while participating in commercial fisheries, on the way to or from distant locations and job sites, or during breaks from cannery work (George and Bosworth 1988). As a result, subsistence harvest effort was distributed over a large area that included a number of small sockeye salmon systems. A 1984 household survey of Angoon residents reported that 27% of salmon harvested per household was harvested using commercial gear (purse seine, power troll, and hand troll; George and Bosworth 1988). However, the retention of subsistence salmon caught in the commercial harvest is likely species specific. A greater number of Chinook (66%) salmon *(O. tshawytscha)* were caught with commercial gear, whereas a greater number of coho (72%), sockeye (95%), pink (54%), and chum (87%) salmon were caught with non-commercial gear; the most productive gear used to harvest household salmon was the beach seine (George and Bosworth 1988).

More recently, the Angoon community's subsistence activities have been concentrated closer to home. This is likely due to the loss of canneries and fish buying facilities in the area, and the steady decline in commercial fishing participation in the community, which has reduced the available number of functional larger boats in the Angoon community (Turek et al. 2005). Angoon community participation in commercial fishing activities declined dramatically from 1980 to the present, as documented in Commercial Fisheries Entry Commission census reports[1] (Figure 12). In 1980, 90 Angoon residents fished 134 commercial fisheries permits. By 1990, 76 Angoon residents fished 119 permits. By 2000, 37 Angoon residents fished 46 commercial permits. In 2010, six Angoon residents fished six commercial permits, and in 2013, only three fishermen fished three permits. Between 1980 and 2013, the most significant decline of participation by Angoon residents was in the hand troll fishery, declining from 79 Angoon owned permits participating in 1980 to one in 2013. The number of purse seine permits fished during this time went from five to zero, and the number of power troll permits fished was never more than five and declined to one in 2013.

The loss in regional mobility has often been associated with the decline in seine boats/permits in Angoon (Geiger et al. 2007); however, it is likely that the more numerous hand troll vessels provided mobility to a greater portion of the community than the smaller number of Angoon-based seine boats did. The small open boats most people have now are not well suited for traveling on the open exposed waters of Chatham Strait to access sockeye salmon at Kook and Sitkoh lakes. This loss of mobility and the loss of opportunity to retain fish caught while commercial fishing have likely contributed to increased subsistence harvest pressure on Kanalku and other Angoon-area sockeye salmon systems.

[1] Permit data retrieved from the Commercial Fisheries Entry Commission website December 2014: http://www.cfec.state.ak.us/fishery_statistics/earnings.htm.

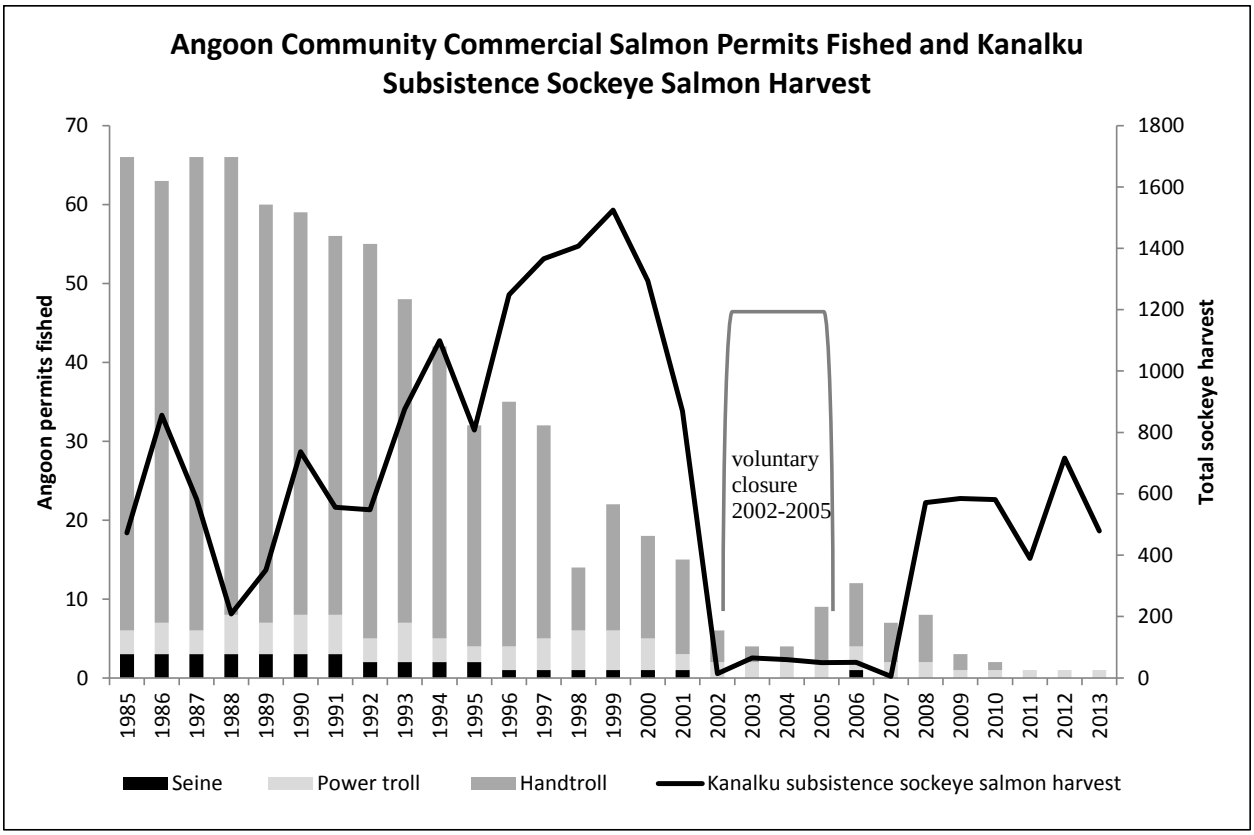


Figure 12.–The number of commercial salmon fishing permits by gear type fished each year by the Angoon community, and Angoon community yearly total subsistence harvest of Kanalku Lake sockeye salmon**.**

COMMERCIAL PURSE SEINE HARVEST AND MANAGEMENT

Accurate commercial catch information is available from detailed records, which in some cases extend back to the 19th Century. Commercial transactions are used for tax records, bank records, and many other business purposes, so the commercial catch statistics are a reliable record of the actual catch level. In modern times, failure to report commercial catches involves criminal penalties. ADF&G maintains a database of commercial catch records going back to 1960, containing detailed statistics on time and area of harvest, and time and areas of fishery openings.

Commercial purse seine fisheries in District 12, the upper Chatham Strait area, can take place within approximately 700 square miles of State of Alaska managed marine waters extending from the latitude of Point Couverden south to Point Gardner and including Tenakee Inlet. With the exception of the Hidden Falls Hatchery chum salmon fishery, the purse seine fisheries in District 12 are directed at the harvest of pink salmon, and Chinook, chum, sockeye, and coho salmon are harvested incidentally. District 12 pink salmon harvests averaged 5.7 million fish from 1985 to 2013 (Appendix A). Sockeye salmon harvests in District 12 averaged less than 1% of pink salmon harvests (46,400 fish; Appendix A). District 12 purse seine fisheries initially open in late June, and the total annual commercial harvest is apportioned into 21 subdistricts or

statistical areas (Figure 13; Appendix B). For example, statistical area 112-16 refers to District 12, Sub-district 16 (Figure 13). Since salmon harvests are reported by statistical area we will examine each in turn below. Of the 21 statistical areas that have seen historical purse seine harvests (Table 7), 18 may currently be opened depending on pink salmon run strength. Funter Bay (112-63) and Hawk Inlet proper (112-65) have not been opened since 1965, and Southern Lynn Canal (112-15) has not been opened since 1987.

STATISTICAL AREA 112-16

Purse seine openings in statistical area 112-16 can occur along the west Admiralty shoreline from Point Hepburn north to the latitude of Point Couverden. The portion of this area north of Point Marsden is known as the Hawk Inlet shoreline. This area is managed in July in accordance with the *Northern Southeast Seine Salmon Fishery Management Plan* (5 AAC 33.366), which addresses conservation of salmon stocks in the area. This plan stipulates that any portion of the area north of Point Marsden may be opened when a harvestable surplus of pink salmon is observed, and that no more than 15,000 wild sockeye salmon can be harvested in the month of July. In years when this area is opened, the department documents boats actively fishing along this shoreline, generally via aerial surveys, and the sockeye salmon harvest of boats identified for that opening are apportioned to the Hawk Inlet shoreline. The sockeye salmon harvest is sampled for otoliths to determine the contribution of wild and enhanced fish, and the area is closed for the remainder of July once the 15,000 wild fish harvest limit is reached (Appendix C). From 2001 to 2014, the average July sockeye salmon harvest (in years fished) along the Hawk Inlet shoreline was approximately 12,400 fish, of which 10,400 fish were estimated to be wild; about 85% of the catch (Figure 13; Appendix C). The July limit of 15,000 wild sockeye salmon was exceeded only in 2011 (Davidson et al. 2012; Appendix C). Several tools are used to assess the run strength of northbound (District 11 and 15) pink salmon, including a test fishery conducted along the Hawk Inlet shoreline from late June to early July (Ingledue 1989). From 1985 to 2014, the harvest of sockeye salmon in the Hawk Inlet test fishery averaged 845 fish.

In July, openings in statistical area 112-16 generally consist of 8-, 10-, or 15-hour fishing periods once or twice per week. From 1985 to 2014, the average date of the first commercial purse seine opening in this area was 19 July. The recent 10-year average purse seine sockeye salmon harvest in this statistical area was 38,000 fish (Table 7; Figure 14). Historically, fisheries in this statistical area account for 64% of all sockeye salmon harvested in District 12. which is not unexpected because the major north-migrating sockeye salmon stocks, Chilkoot, Chilkat, Taku, and Snettisham hatchery, migrate through this area, and these stocks have been assumed to account for the majority of the total sockeye salmon harvest in northern Southeast Alaska (Eggers et al. 2010; Appendix A). In 2013, 56% of the total commercial purse seine harvest of sockeye salmon in District 12 came from this statistical area.

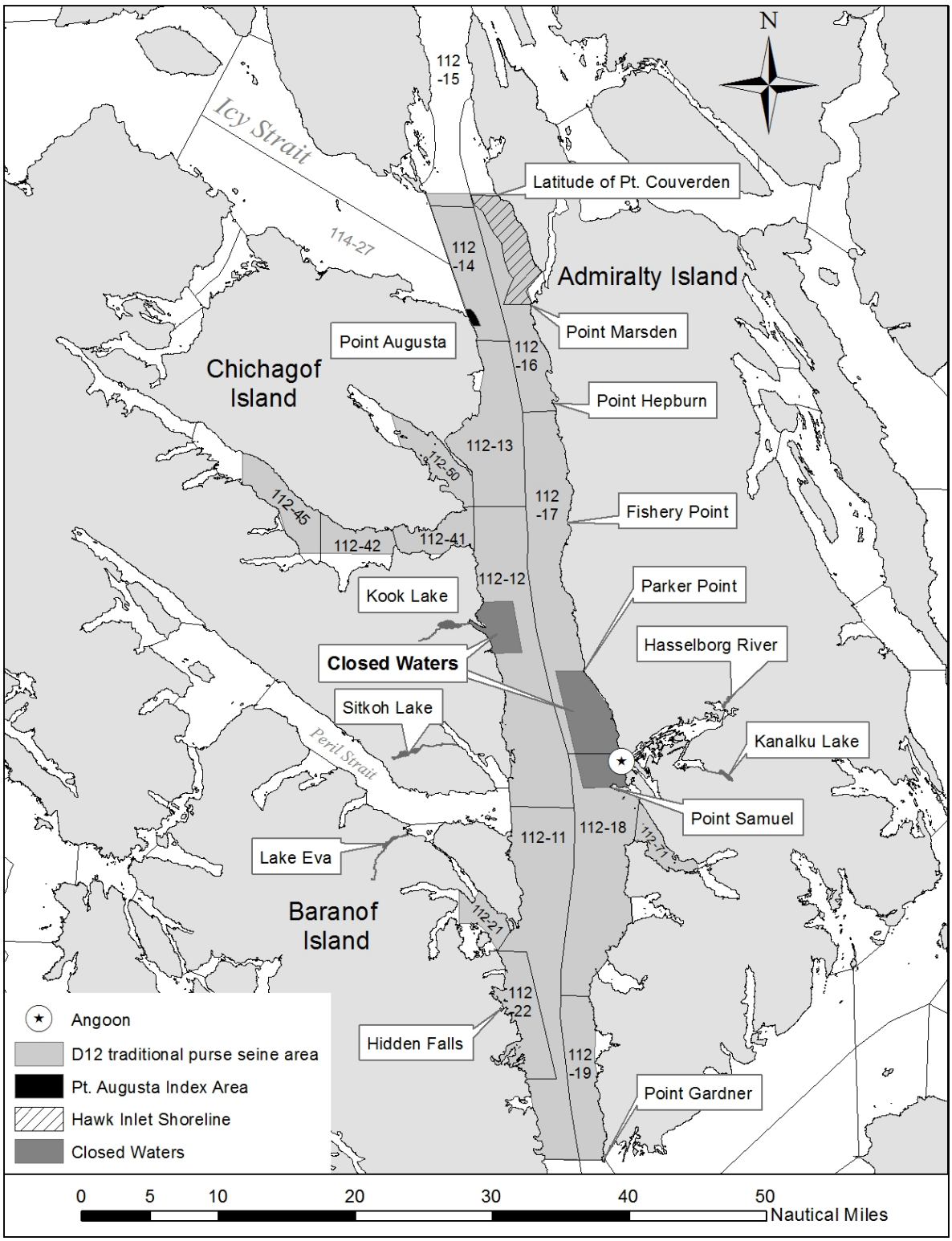


Figure 13.–District 12 purse seine fishing statistical areas in Chatham Strait, northern Southeast Alaska.

STATISTICAL AREA 112-17

Statistical area 112-17, the continuation of the west Admiralty shoreline to the south, may be open to commercial purse seining from Point Hepburn south to Parker Point, approximately six nautical miles north of the entrance of Kootznahoo Inlet. Southern boundaries for the fishery are typically extended south by steps into statistical area 112-17, first from Point Hepburn to Fishery Point and then to Parker Point in the last week of July or in August. From 1985 to 2013, the average date of the first commercial purse seine opening in this area was 28 July. The recent 10-year average sockeye salmon harvest was approximately 3,100 fish, or 5% of the total District 12 sockeye salmon harvest (Table 7).

STATISTICAL AREA 112-14

The Point Augusta pink salmon index fishery takes place along a one-mile stretch of the Chatham Strait shoreline on the northeastern corner of Chichagof Island in statistical area 112-14. This area has been opened annually since 1992, between late June and mid-July, to monitor incoming pink salmon run strength into northern Chatham Strait. The remainder of the statistical area is opened only in years when pink salmon run strength warrents. From 1985 to 2014, the average date of the first commercial purse seine opening in this area was 22 June. The recent 10-year average sockeye salmon harvest, for the entire statistical area, was approximately 4,500 fish, or 11% of the total District 12 sockeye salmon harvest (Table 7).

STATISTICAL AREA 112-13

The False Bay/Freshwater Bay fishery takes place along the northeastern Chichagof Island shoreline in statistical area 112-13. From 1985 to 2014, the average date of the first commercial purse seine opening in this area was 25 July. The recent 10-year average sockeye salmon harvest was approximately 890 fish, or 2% of the total District 12 sockeye salmon harvest (Table 7).

STATISTICAL AREA 112-12

The Basket Bay fishery takes place along the Chichagof Island shoreline south of Tenakee Inlet in statistical area 112-12 and targets returns of pink salmon to Tenakee Inlet, Peril Strait, and local streams. From 1985 to 2014, the average date of the first commercial purse seine opening in this area was 28 July. The recent 10-year average sockeye salmon harvest was approximately 2,100 fish, or 4% of the total District 12 sockeye salmon harvest (Table 7).

STATISTICAL AREA 112-22

The Hidden Falls hatchery fishery takes place in statistical area 112-22. Openings typically begin after the third week of June and continue through July. From 1985 to 2014, the average date of the first commercial purse seine opening in this area was 24 June. Common property purse seine fisheries are typically restricted to one or two days per week through mid-July, while cost recovery harvest often occurs throughout the week. The recent 10-year average harvest of sockeye salmon in common property fisheries was approximately 2,400 fish. The recent 10-year average harvest of chum salmon was 918,000 fish. An average of 50 sockeye salmon were also harvested annually in cost recovery fisheries. Over the last 10 years, the average total sockeye salmon harvest at Hidden Falls accounted for 6% of the total District 12 sockeye salmon harvest (Table 7). Fishing effort has declined in the Hidden Falls fishery since the mid-1990s, due both to declining chum salmon returns and an overall reduction in the number of permits participating in the Southeast Alaska purse seine fishery.

Table 7.–Total District 12 commercial sockeye salmon purse seine harvest by statistical area for the past decade, 2005–2014.

Statistical Area Name	Statistical Area	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	10-yr Avg.	Percent of 10-yr Avg. Harvest
Outer Kelp Bay	11	5,322	372	904	0	861	0	3,978	0	1,952	0	1,339	3.14%
Basket Bay	12	2,021	1,131	1,237	0	580	0	7,317	0	2,203	0	1,449	3.40%
False Bay	13	958	0	0	0	271	0	5,221	0	2,486	0	894	2.10%
Pt. Augusta	14	5,481	3,112	7,737	2,594	2,212	2,640	6,526	5,977	5,083	3,604	4,497	10.55%
S. Lynn Canal	15	0	0	0	0	0	0	0	0	0	0	0	0.00%
W. Mans. Peninsula	16	74,685	17,515	33,308	658	32,692	649	61,430	1,826	25,385	2,051	25,020	58.68%
Angoon to Hepburn	17	6,440	0	441	0	3,108	0	11,984	0	17	0	2,199	5.16%
Angoon to Whitewater	18	3,248	53	2,333	0	3,584	0	2,703	0	508	0	1,243	2.91%
Wilson Cove Area	19	13,262	0	458	0	1,137	0	596	0	416	0	1,587	3.72%
Kelp Bay	21	532	30	3	0	247	0	1,454	0	162	0	243	0.57%
Hidden Falls	22	1,374	6,618	2,704	1,323	2,762	2,351	331	1,740	4,302	503	2,401	5.63%
Outer Tenakee	41	3,203	2,169	2,473	57	364	266	2,102	0	2,436	0	1,307	3.07%
Tenakee Springs	42	43	904	155	14	138	0	458	0	537	0	225	0.53%
Central Tenakee	45	8	315	1	2	8	0	33	0	16	0	38	0.09%
Freshwater Bay	50	0	0	0	0	0	0	1,163	0	161	0	132	0.31%
Howard Bay	61	0	0	0	0	0	0	0	0	0	0	0	0.00%
Funter Bay	63	0	0	0	0	0	0	0	0	0	0	0	0.00%
Hawk Inlet	65	0	0	0	0	0	0	0	0	0	0	0	0.00%
Outer Hood Bay	71	0	0	0	0	241	0	0	0	3	0	24	0.06%
Chaik Bay	80	0	101	1	0	0	0	164	2	0	0	27	0.06%
Whitewater Bay	90	145	0	0	0	0	0	0	0	0	0	15	0.03%
	Total	116,722	32,320	51,755	4,648	48,205	5,906	105,460	9,545	45,667	6,158	42,639	100.00%

Note: does not include test fishery harvest.

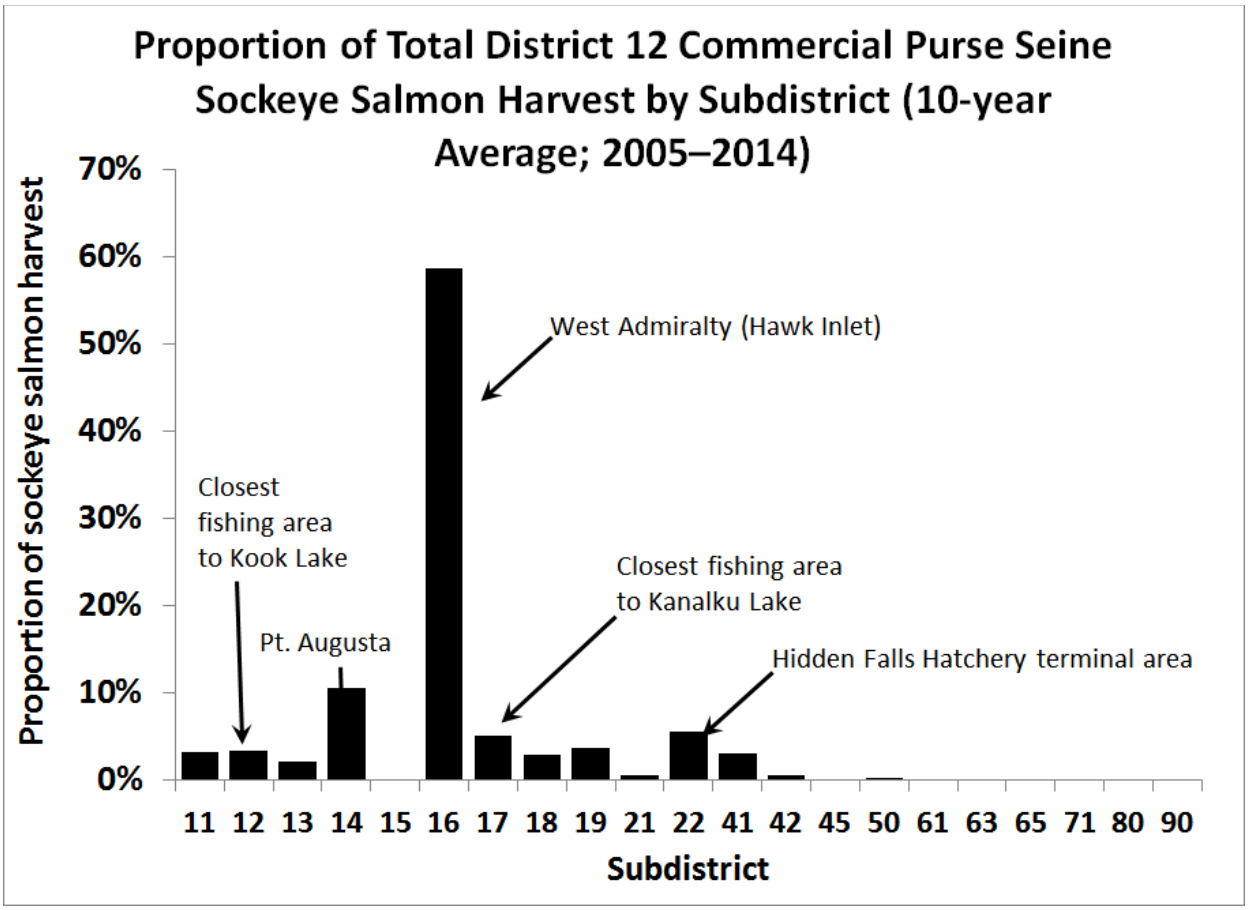


Figure 14.–Average distribution of the total District 12 commercial purse seine sockeye salmon harvest by statistical area, 2005–2014.

MANAGEMENT OVERVIEW

To understand what the available harvest data tell us, one needs to know how commercial purse seine fisheries are prosecuted throughout Southeast Alaska. In the case of Chatham Strait, understanding the timing and location of the openings is imperative to understanding the impact commercial purse seine fisheries may have on individual sockeye salmon stocks. In Southeast Alaska, sockeye salmon production is the result of run strength to many small stocks and a few very large stocks. To prevent over fishing of individual stocks, the majority of the purse seine effort is directed into mixed stock areas, held to conservative levels, and spread over as many stocks as possible. Van Alen (2000) maintained that this style of management "effectively moderates exploitation rates and reduces the risk of overexploiting individual runs or temporal segments of runs, as occurred historically."

Although we have no historical data on the purse seine interception of Kanalku Lake, Kook Lake, and other small sockeye salmon stocks in upper Chatham Strait, management is based on the assumption that this interception is minimal. Further time and area management actions in statistical areas 112-17 and 112-12 have been designed and implemented specifically to provide conservation measures for these small but important stocks.

TIMING AND LOCATION

The District 12 commercial purse seine fisheries in northern Chatham Strait begin in mid- to late June. During June through mid-July, only three areas are open to seining and openings are usually limited to 15 hours on Sundays: the Point Augusta index area (statistical area 112-14), Tenakee Inlet (statistical area 112-41), and the Hidden Falls Hatchery Terminal Harvest area (statistical area 112-22). Thus, in a typical week from June through mid-July, the District 12 purse seine fishery is open 9% of the available time in approximately 12% of the total available fishing area. As the pink salmon run progresses, and if the pink run is strong, the time and area available for fishing is conservatively increased.

In years of high pink salmon abundance, the first expansion of the purse seine fishery occurs in mid- to late July with the addition of statistical area 112-16, the southern boundary of which is approximately 40 nautical miles north of Kanalku Bay. This area is managed in July in accordance with the *Northern Southeast Seine Salmon Fishery Management Plan* (5 AAC 33.366), which stipulates that any portion of the area north of Point Marsden may be opened when a harvestable surplus of pink salmon is observed. Also, the plan specifically limits the harvest of wild sockeye salmon to 15,000 fish in July. In late July, further southward expansion of the District 12 purse seine fishery area includes statistical areas 112-17 and 112-12. Fishing time is also increased with the start of a 2-day-on and 2-day-off fishing regime if pink salmon abundance is sufficient.

Kanalku Lake

Both the timing of commercial fishery openings and the distance of the openings from Kanalku Lake allow purse seine fishing to target pink salmon returns while protecting Kanalku Lake sockeye salmon. The majority of the District 12 sockeye salmon commercial harvest (65%) is taken in statistical area 112-16. Since 1985, the average date of the first commercial purse seine opening in statistical area 112-16 was 19 July, 40 nautical miles distant from Kanalku Bay. Subsistence permit harvest data indicates an average 80% of the subsistence harvest in Kanalku Bay is completed by this date (1985–2014; Figures 15 and 16). Statistical area 112-17, Point Hepburn to Danger Point, is nearer to Angoon and to Kanalku Lake than statistical area 112-16. Since 1985, the average opening date for statistical area 112-17 was 28 July. Subsistence permit harvest data indicates an average 92% of the subsistence harvest in Kanalku Bay is completed by this date (1985–2013; Figures 15 and 16). In the five years that a weir was operated in lower Kanalku Creek, at least 50% of the run had entered the Kanalku system by 19 July 2008, 16 July 2009, 28 July 2012, 27 July 2013, and 29 July, 2014, and more than 75% of the run by 29 July 2008, 26 July 2009, 1 August 2012, 3 August 2013, and 7 August 2014 (Figure 2).

In recent years, ADF&G has taken additional conservation measures to protect Kanalku sockeye salmon beyond time restrictions in commercial fishery openings. Since 1999, the Admiralty Island shoreline along an area of approximately nine nautical miles from Parker Point to Point Samuel (west and north of Kootznahoo Inlet, the community of Angoon, and Kanalku Inlet) has been closed to the purse seine fishery (Figure 13). The area from Point Samuel south to Point Gardner typically opens in August, well after the majority of the Kanalku sockeye salmon are inside the bay or lake.

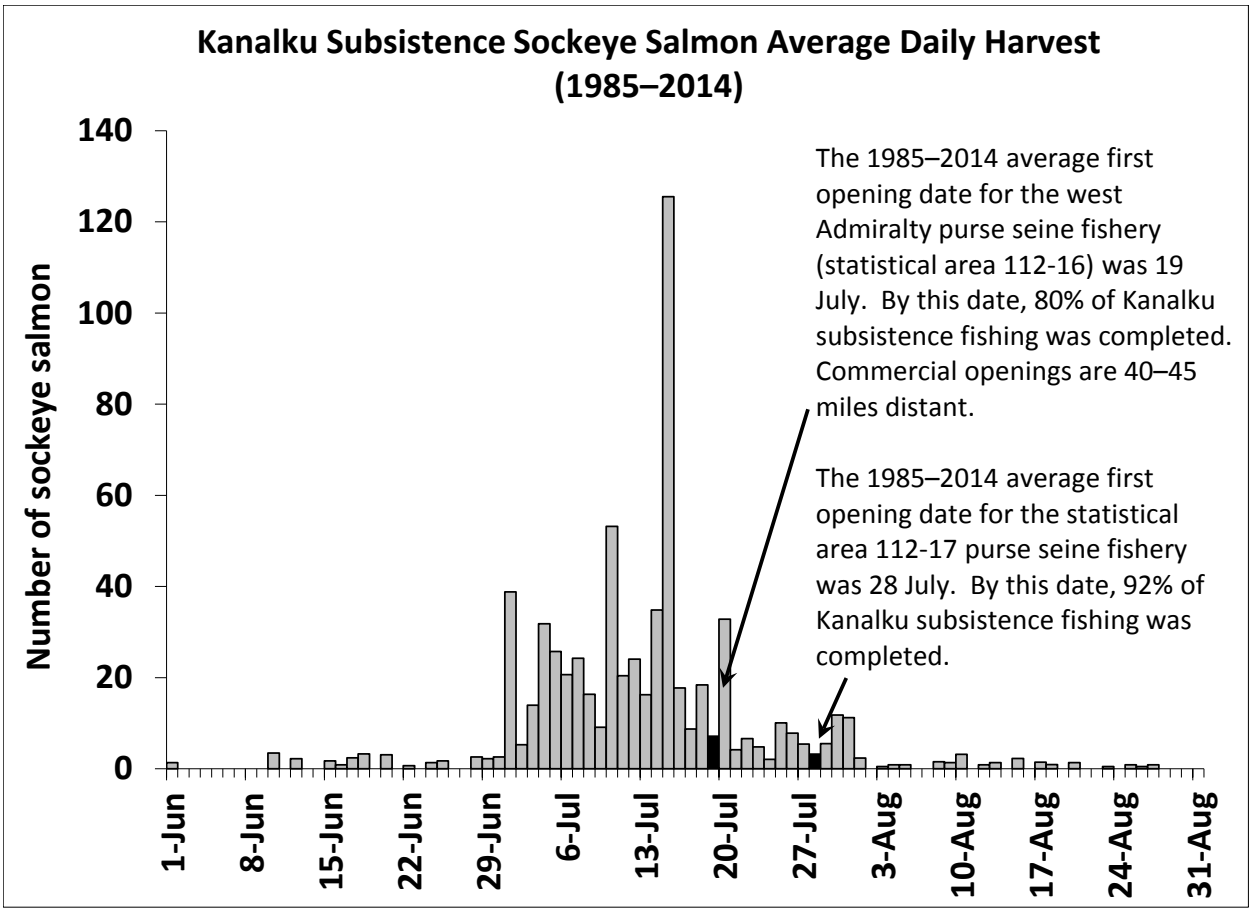


Figure 15.–Average daily subsistence harvest of Kanalku Lake sockeye salmon, 1985–2014.

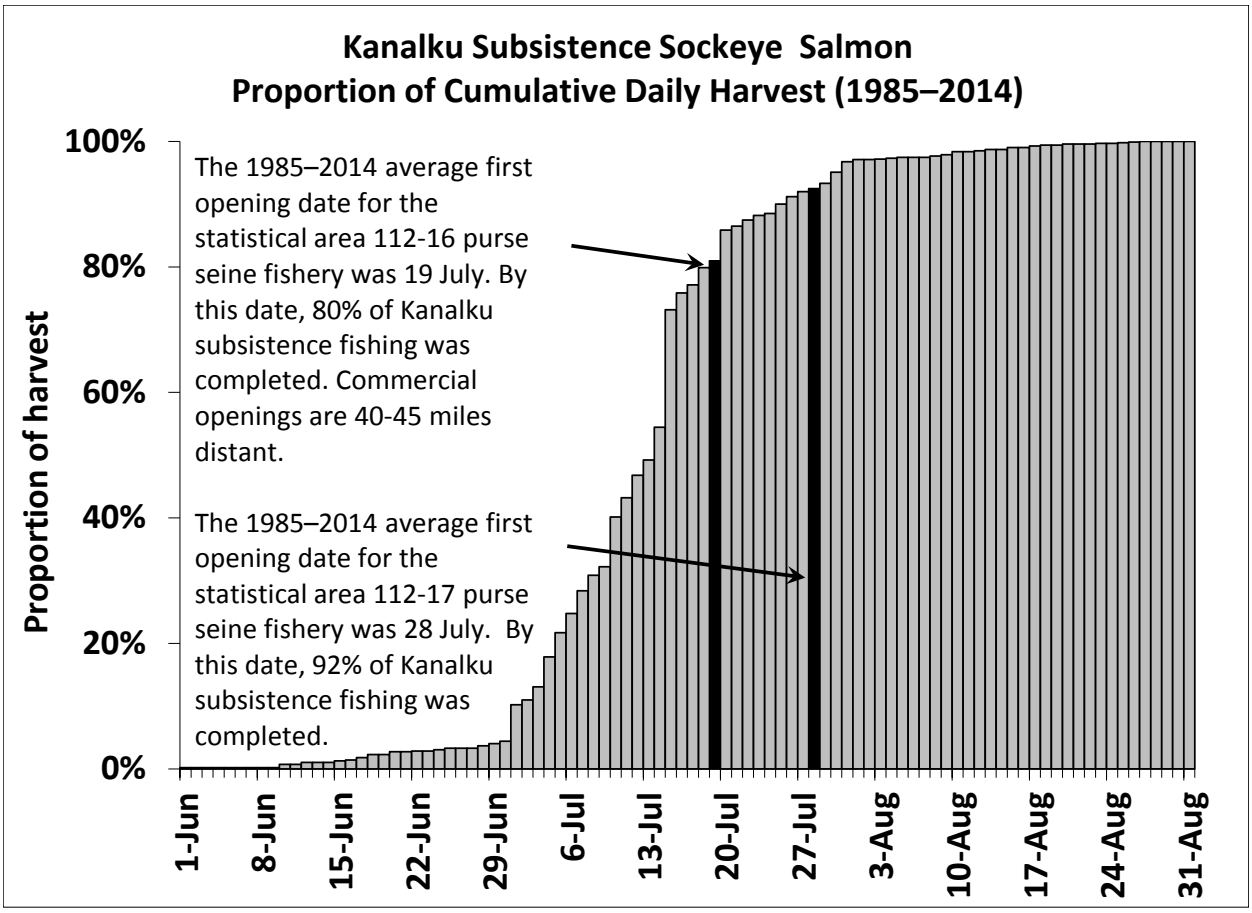


Figure 16.–Daily proportion of the cumulative subsistence harvest of Kanalku Lake sockeye salmon compared to the average opening date of the statistical area 112-16 and 112-17 purse seine fisheries, 1985–2014.

Kook Lake (Basket Bay)

Since 1985, the average first purse seine opening along the Chichagof Island shoreline in statistical area 112-12 was 28 July. Subsistence permit harvest data indicates an average 92% of the Basket Bay sockeye salmon subsistence harvest is completed by this date (1985–2014; Figures 17 and 18). In addition, an average 50% of the Kook Lake sockeye salmon escapement had entered the system by 26 July, based on ten years of weir operations at the lake (1994, 1995, 2005–2007, and 2010–2014; Figure 3). In recent years, ADF&G has taken additional action to protect Kook Lake (Basket Bay) sockeye salmon. Since the late 1990s, the Chichagof Island shoreline along an area of approximately four nautical miles in statistical area 112-12 around the entrance to Basket Bay has been closed to the purse seine fishery (Figure 13) to conserve Basket Bay sockeye salmon milling in Chatham Strait.

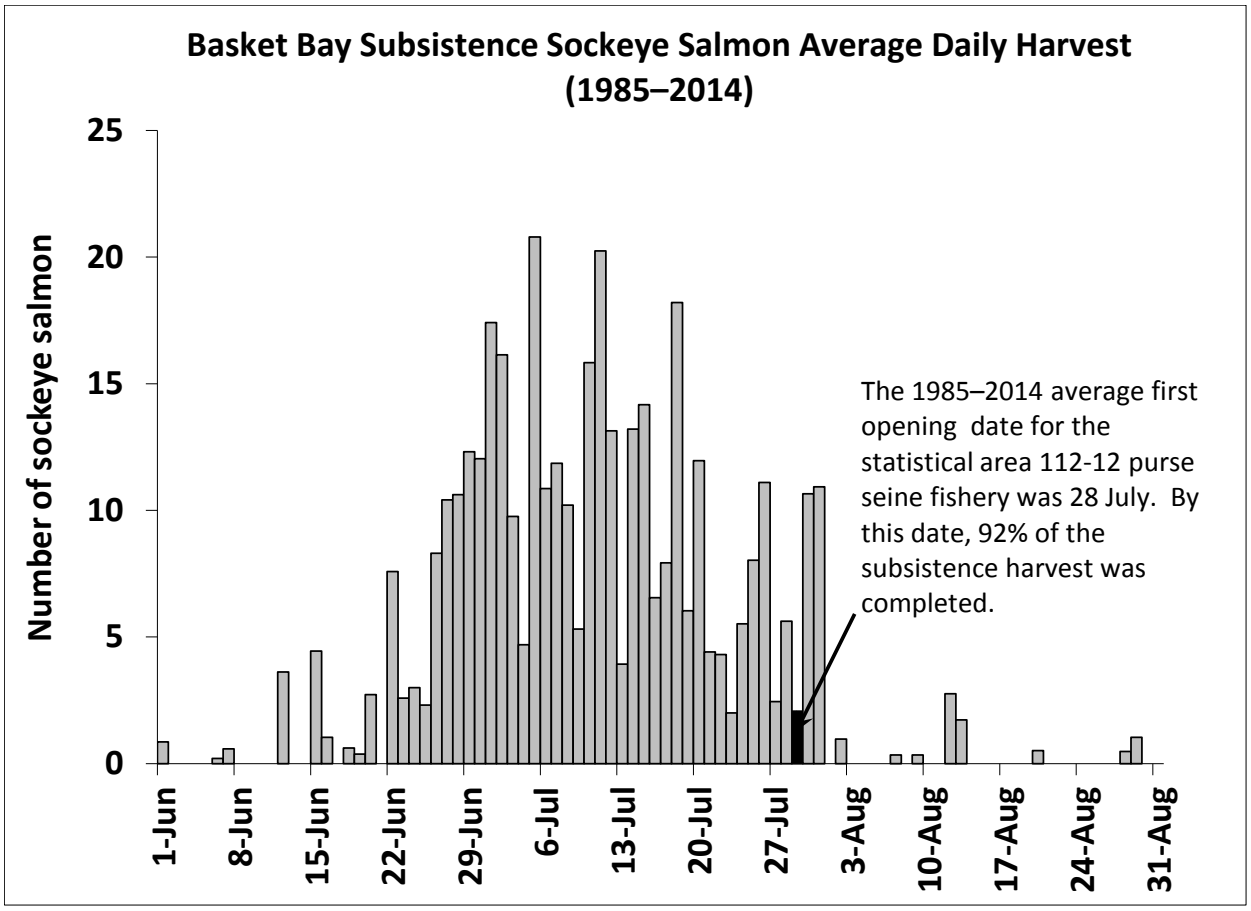


Figure 17.–Average daily subsistence harvest of Basket Bay (Kook Lake) sockeye salmon, 1985–2014.

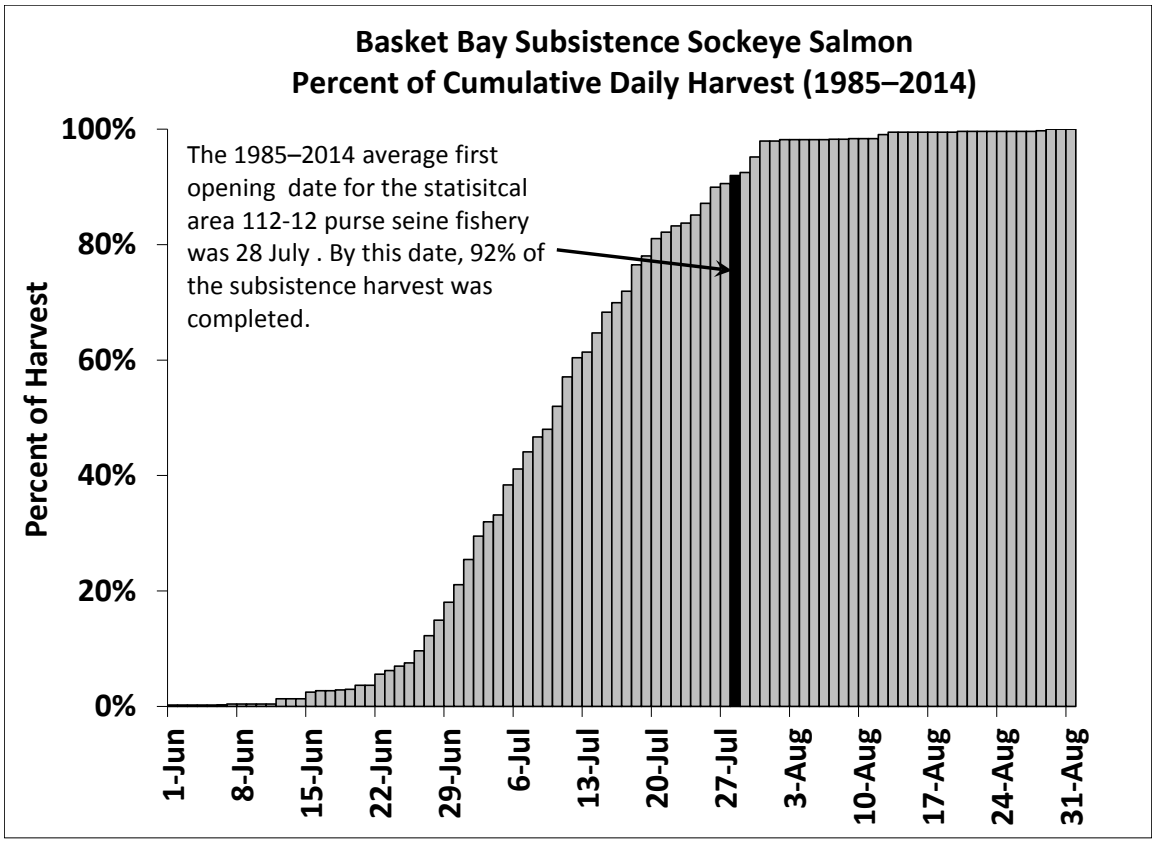


Figure 18.–Daily proportion of the cumulative subsistence harvest of Basket Bay (Kook Lake) sockeye salmon compared to the average opening date of the statistical area 112-12 purse seine fishery, 1985–2014.

TRENDS IN COMMERCIAL PURSE SEINE EFFORT

Participation in Southeast Alaska commercial purse seine fisheries has declined over the past 15 years. In 1997, 351 permits were fished compared to 276 permits fished in 2013. Participation in the Southeast Alaska purse seine fishery reached its lowest level in 2008 with 212 purse seine permits fished, and has varied annually depending on the strength of the pink salmon return to the region. Fishing effort in the primary statistical areas fished in District 12, however, has been relatively stable over the last 10 years, with upward and downward swings related to pink salmon abundance. Figure 19 shows the annual effort from 1990 to 2014 in District 12 based on analysis of fish ticket data. Boat days were calculated as the sum of boats times one day for each day that a boat actually reported catching fish; any calendar day counts as one boat day, even if the opening was only 6, 8, 12, or 15 hours in duration. The traditional method of determining boat days is to simply multiply the number of boats times the number of days open for a specific fishing period. During multi-day openings, however, processors sometimes put seine boats on harvest limits or did not buy fish for all the days in the opening; therefore, all boats did not necessarily fish each day of an opening. Because of this, the traditional method of calculating boat days can overstate actual effort.

The processors' influence on fishing effort has changed in recent years due to increased processing capacity, and harvest limits have been imposed less frequently on the purse seine fleet. The department has compensated for the increased fishery efficiency by minimizing the use of extended openings.

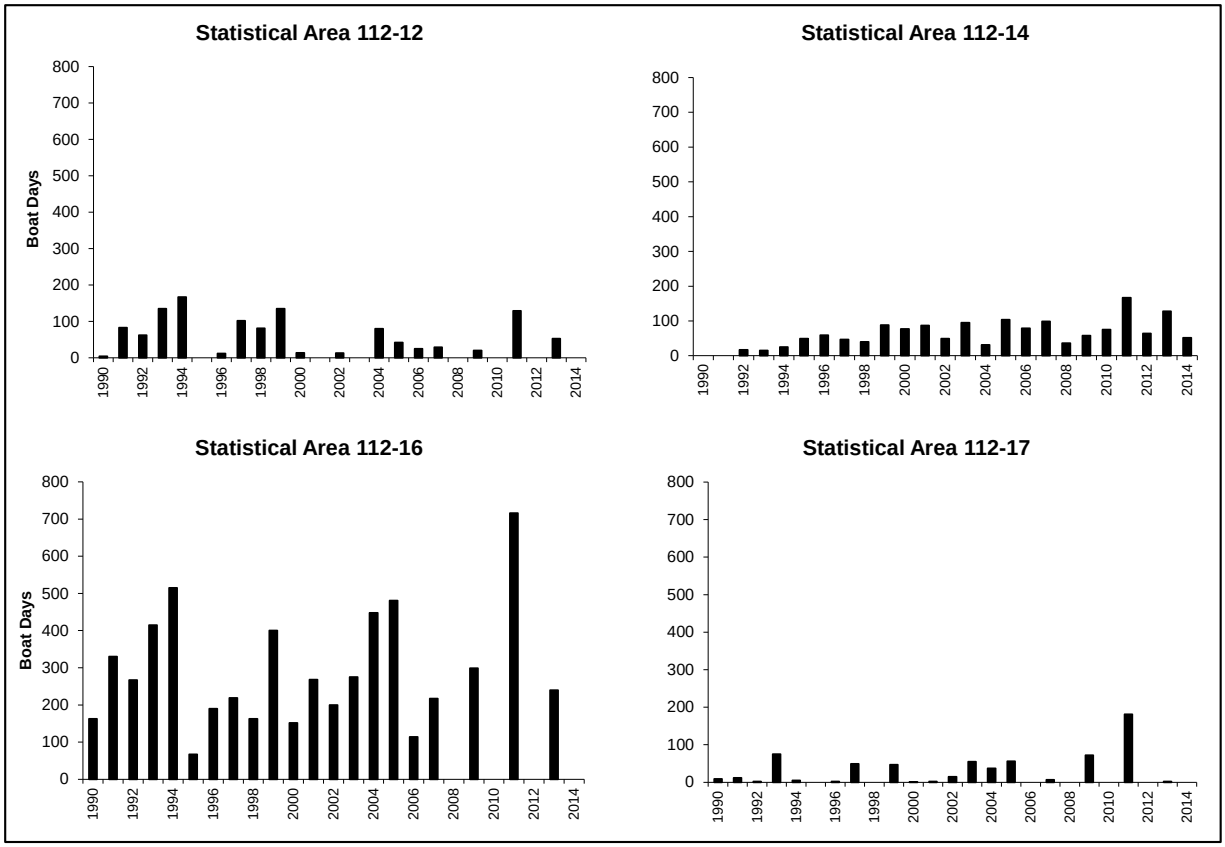


Figure 19.–Boat-days for traditional purse seine effort in District 12 statistical areas 12, 14, 16, and 17; 1990–2014. Note the boat-days axis for the combined chart is different than for specific statistical areas.

SPORT FISHERY HARVEST AND MANAGEMENT

Harvest data for sockeye salmon from the Chatham Strait area sport fishery were extracted from the ADF&G Statewide Angler Harvest Survey database for the years 1996–2013. The data query included Kanalku Bay and Lake, Salt Lake, Mitchell Bay, Hasselborg Creek, Kook Lake and Creek, Basket Bay, Sitkoh Creek, and "Angoon Area". As is typical for small fisheries and remote drainages, the number of survey respondents for the site-specific bays and drainages was either nonexistent or so low that expanded harvest estimates were not useful, with the exception that few or no angler responses suggest low levels of fishing effort. Of the sites that were queried, no responses were found for Kanalku Lake, Kanalku Creek, or Kanalku Bay.

Angler responses for the "Angoon Area" were sufficient to generate harvest estimates for that site (Table 8). The sockeye salmon harvest numbers presented for Angoon included boat and shore anglers and resident and nonresident angler harvests. Because very few respondents reported a harvest of sockeye salmon, it is likely that most angler effort was directed at species other than sockeye salmon (e.g., Chinook and coho salmon and halibut *Hippoglossus stenolepis*).

Charter harvest of sockeye salmon for the Chatham Strait area was extracted from the Saltwater Charter Logbook database for the period 1999–2013 (Table 9). The total annual sockeye salmon harvest averaged only 45 fish. The largest reported harvests occurred in areas near the west side of Point Retreat (statistical area 112-15), adjacent to Funter Bay and Hawk Inlet (statistical area 112-16), and adjacent to Angoon (statistical area 112-18).

The regional ADF&G sport fish bag limit of six sockeye salmon daily with a possession limit of 12 fish applies in both fresh and salt waters. Over the last 10 years there have been no emergency orders restricting traditional sport fishing for salmon within any of the drainages located proximate to the community of Angoon. There have been no significant biological concerns forwarded to ADF&G that would precipitate sport angler restrictions in the Chatham area based upon existing levels of effort or harvest.

Table 8.–Estimated sockeye salmon harvest by recreational anglers within the Angoon Area, 1996–2013.

Year	Number of Respondents	Estimated Effort (angler days)	Estimated Harvest
1996	70	3,250	334
1997	61	3,637	21
1998	0	0	0
1999	75	6,410	430
2000	0	0	0
2001	71	6,109	449
2002	12	706	151
2003	47	4,262	251
2004	39	2,944	11
2005	42	5,647	36
2006	1	17	11
2007	7	1,072	32
2008	34	3,378	98
2009	43	4,372	347
2010	1	168	220
2011	18	1,942	110
2012	0	0	0
2013	41	4211	68
Average	37	3,208	171

Table 9.–Reported sockeye salmon harvest by chartered anglers in the Chatham Strait area, 2005–2013.

Statistical Area	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
112-11	0	0	0	0	1	0	0	0	3	0
112-12	0	0	0	1	0	1	0	0	0	0
112-13	0	0	0	0	0	0	0	0	0	0
112-14	0	0	5	0	0	0	0	0	0	1
112-15	47	70	57	15	18	13	8	32	63	36
112-16	28	16	17	6	16	8	4	12	36	16
112-17	1	0	0	0	0	0	6	3	1	1
112-18	6	0	3	12	1	0	6	12	9	5
112-19	0	1	0	0	0	0	0	0	0	0
112-21	0	0	0	0	0	0	0	0	1	0
112-22	1	0	0	0	0	0	19	24	1	5
112-65	0	0	0	0	0	0	0	0	0	0
112-67	0	1	0	0	0	0	0	0	0	0
112-71	0	0	0	0	0	0	0	0	0	0
112-72	0	0	0	0	0	0	0	0	0	0
112-80	0	0	0	0	0	0	0	0	0	0
112-90	0	0	0	0	0	0	0	0	0	0
District 12 Total	83	88	82	34	36	22	43	83	114	65
113-59 Sitkoh Bay	0	0	0	0	0	0	0	0	0	0

HABITAT ASSESSMENT

We were unable to find any fully developed habitat assessments for the drainages supporting the key sockeye salmon stocks in northern Chatham Strait. The Sitkoh watershed has been extensively logged. About 20% of the 5,000 hectare drainage was affected by logging and there are about 30 km of logging roads in this watershed. The Kook Lake watershed was also logged in the 1970s and 1980, and about 18% of the watershed was affected. The outlet stream and sections of the inlet stream were clear-cut to the riverbanks. This system is unique in that some portions of the outlet stream flow through at least two subterranean caverns. The upstream entrances to these caverns have at times been partially blocked with logs and woody debris, which we assume is likely a result of the logging. The USDA Forest Service documented possible fish blockages to the underground cavern entrances in the early 2000s (Conitz and Cartwright 2005; Van Alen 2008). Both the Hasselborg River and Kanalku Lake are in the Kootznoowoo Wilderness, and we assume they have been minimally affected by habitat alterations.

The effect of the partial barrier falls in Kanalku Creek has been an ongoing concern. Kanalku Lake sockeye salmon must ascend this falls to reach spawning grounds in the lake. Sockeye salmon sit in pools below the falls for variable lengths of time, depending on water flow, where they are subjected to high rates of predation and additional physical stress as they repeatedly attempt to scale the falls. In 1970, the USDA Forest Service and ADF&G blasted four shallow step pools on the left side apron of Kanalku falls to improve fish passage (Geiger et al. 2007; USDAFS 2011). The effect of the barrier modification in 1970 is not known, since no pre- or post-modification studies were conducted to assess sockeye salmon passage over the falls. In 2012, ADF&G began estimating the total escapement of sockeye salmon into the Kanalku system and estimate the mortality rate at the Kanalku falls. The in-river mortality rate associated with Kanalku falls was 51% in 2012 (Table 1; Vinzant et al. 2013), 24% in 2013 (Table 1; Vinzant and Heinl 2014), and 37% in 2014 (ADFG unpublished data October 2014). In-river mortality reduced the potential sockeye salmon spawning escapement into Kanalku Lake by approximately 1,200 fish in 2012, 511 fish in 2013, and 750 fish in 2014.

It is quite possible that existing zooplankton production in Kanalku Lake could support more sockeye salmon fry, should further modification of the partial barrier falls successfully increase escapement. A limnology study conducted at Kanalku Lake in 1995 revealed that Kanalku Lake ranks relatively high in macrozooplankton abundance compared to other sockeye salmon rearing lakes in Southeast Alaska (Barto and Cook 1996). Similar high levels of zooplankton abundance were documented at Kanalku Lake from 2001 to 2003 and in 2007 (Conitz and Cartwright 2005; Vinzant et al. 2009). Barto and Cook (1996) concluded that "the existing carrying capacity of the lake is vastly underutilized by juvenile sockeye salmon."

Barto and Cook (1996) further concluded that Kanalku Lake would not be a good candidate for nutrient enrichment (lake fertilization), based on guidelines for lake enrichment projects established by ADF&G in 1979. Those guidelines stipulated that the mean depth of the lake should be greater than the depth of the euphotic zone (the depth to which light penetrates the water), the lake water residence time should be greater than one year, and the shoreline should be steep with little littoral zone vegetation. Kanalku Lake is shallow and the mean depth (only 15 m) is approximately equal to the euphotic zone depth (Barto and Cook 1996; Vinzant et al. 2009), the water residence time was approximately 0.18 years in 1995 (Barto and Cook 1996), and the shoreline is shallow with abundant littoral zone vegetation located near existing sockeye salmon spawning areas (Vinzant et al. 2009).

ADDITIONAL PROJECTS

CHATHAM COMMERCIAL FISHERY STOCK COMPOSITION

In order to better understand the contribution, run timing, and distribution of Chatham Strait sockeye salmon harvested in the commercial purse seine fisheries in northern Chatham Strait, ADF&G initiated a 3-year genetic mixed stock analysis study in 2012 to estimate stock compositions of sockeye salmon harvests in these fisheries. Mixed stock fishery samples were collected from selected commercial purse seine harvest in statistical areas 112-16, 112-14, and 114-27 (Icy Strait), as well as drift gillnet harvest from Lynn Canal (District 15) to the north. Fishery harvests were sampled to achieve levels of precision and accuracy sufficient for fishery management. Genetic baseline samples were also collected from several stocks in the area that were not adequately represented in the current ADF&G sockeye salmon genetic baseline (Kook, Hasselborg, Eva, Kutlaku, Sitkoh, Pavlof). Results of this study are expected to be published in early 2015 (Gilk-Baumer et al. *in prep*).

KANALKU FALLS

ADF&G and the USDA Forest Service have been working cooperatively to improve fish passage in order to increase sockeye salmon production from the drainage. The Alaska State Legislature allocated $200,000 in capital funds in fiscal year 2009 for work on further barrier modification of the falls. A National Environmental Protection Act (NEPA) review of the drainage was completed, and a Finding of No Significant Action (FONSI) was signed by the USDA Forest Service Supervisor in February 2012. The USDA Forest Service, in conjunction with ADF&G, conducted Phase I of the Kanalku Falls modification on 28 August 2013. A large shelf of bedrock was blasted out of the plunge-pool at the base of Kanalku Falls to widen and deepen the pool to allow sockeye salmon a better jump at the falls (Greg Albrecht, Habitat Biologist, ADF&G, Douglas; memorandum 24 September 2013). If Phase I of the falls modification fails to improve the spawning escapement of sockeye salmon reaching Kanalku Lake, Phase II of the barrier modification may be implemented, which would consist of constructing an 18–24 inch concrete sill that would raise the water level of the plunge pool at the base of the falls.

KANALKU TOTAL ESCAPEMENT

Assessments of total run size and harvest rates for Kanalku Lake sockeye salmon will also require a better accounting of the mortality rate at the Kanalku falls. ADF&G initiated a study in 2012 to estimate the total escapement of sockeye salmon entering Kanalku Creek, below Kanalku falls, using passive video weirs to enumerate fish passage. The in-river mortality rate of sockeye salmon migrating past Kanalku falls was then estimated by comparison of the total escapement count at the lower creek video weir to the spawning escapement estimated at the standard picket weir located above the falls at Kanalku Lake. The total escapement of sockeye salmon was estimated for two seasons, 2012 and 2013, prior to the modification work done at Kanalku falls. The in-river mortality of sockeye salmon between the lower creek video weirs and Kanalku Lake picket weir was estimated to be 51% in 2012 (Vinzant et al. 2013) and 24% in 2013 (Vinzant and Heinl 2014). In 2014, after the falls was modified, the in-river mortality of sockeye salmon was estimated at approximately 37% (Vinzant and Heinl *in prep*). ADF&G, in cooperation with the USDA Forest Service and the Angoon Community Association, will continue to monitor the total sockeye salmon escapement below Kanalku falls and the spawning escapement at Kanalku Lake to assess any improvement in the ability of sockeye salmon to reach the spawning grounds in Kanalku Lake. ADF&G was awarded a grant from the Alaska

Sustainable Salmon Fund to continue monitoring the total sockeye salmon escapement at Kanalku through the 2015 field season.

SUBSISTENCE HARVEST INFORMATION

In early 2013, ADF&G Division of Subsistence conducted a comprehensive wild food harvest survey in the communities of Angoon and Hoonah, the two largest communities within Districts 12 and 14. In-person surveys were conducted in both communities on all wild foods harvested by household, including resource harvested under subsistence, sport, and personal use regulations. Detailed information was gathered on all resource categories (fish, marine invertebrates, vegetation, and mammals), including all salmon species, for the 2012 calendar year. The subsistence information collected included harvest amounts, locations, sharing, and receiving of resources, methods and means, as well as changes in the subsistence salmon fisheries. In 2014, an additional comprehensive survey was conducted in Hoonah for salmon harvested by Hoonah households in the 2013 calendar year. The 2012 and 2013 data will be published by the Division of Subsistence. The information gathered can be used by managers to help maintain salmon populations necessary for subsistence fishing. These studies will provide much needed current information to address any potential changes to the amount reasonably necessary for subsistence (ANS) for the Juneau management area at the next Southeast Board of Fisheries meeting (2014/2015).

REFERENCES CITED

Armstrong, R. H. 1971. Age, food, and migration of sea-run cutthroat trout, *Salmo clarki*, in Eva Lake, Southeastern Alaska. Transactions of the American Fisheries Society 100:302–306.

Barto, D. L., and B. T. Cook. 1996. A limnology and fisheries investigation of Kanalku Lake. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 5J96-18, Juneau.

Blackett, R., and R. Armstrong. 1965. Investigations of anadromous Dolly Varden populations in the Lake Eva-Hanus Bay drainages, southeastern Alaska. Alaska Department of Fish and Game, Annual Report of Progress, 1964–1965, Federal Aid in Fish Restoration, Project F-5-R-6, Sport Fish Investigations of Alaska, Volume 6, Report No. 2-B, pp. 22–55.

Brookover, T. E., P. A. Hansen, and R. D. Harding. 1999. Population status of summer resident cutthroat trout at Sitkoh Lake, Southeast Alaska. Alaska Department of Fish and Game, Fishery Data Series No. 99-30, Anchorage.

Burril, S. E., and J. M. Conitz. 2007. Kanalku and Sitkoh lakes subsistence sockeye salmon project: 2005 annual report. Alaska Department of Fish and Game, Fishery Data Series No. 07-68, Anchorage.

Conitz, J. M., and S. E. Burril. 2008. Kanalku and Sitkoh lakes subsistence sockeye salmon project: 2006 annual report. Alaska Department of Fish and Game, Fishery Data Series No. 08-29, Anchorage.

Conitz, J., and M. Cartwright. 2002. Kanalku, Hasselborg, and Sitkoh subsistence sockeye salmon stock assessment, 2001 annual report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 1J02-29, Juneau.

Conitz, J. M., and M. A. Cartwright. 2005. Kanalku, Sitkoh, and Kook Lakes subsistence sockeye salmon project: 2003 annual report and 2001–2003 final report. Alaska Department of Fish and Game, Fishery Data Series No. 05-57, Anchorage.

Conitz, J. M., and M. A. Cartwright. 2007. Kanalku and Sitkoh lakes subsistence sockeye salmon project: 2004 annual report. Alaska Department of Fish and Game, Fishery Data Series No. 07-01, Anchorage.

Cook, B. T. 1998. Mark-recapture studies of Sitkoh Lake adult sockeye salmon stocks, 1997. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 1J98-19, Juneau.

REFERENCES CITED (Continued)

Crabtree, K. F. 2000. Sockeye salmon escapement estimation for Sitkoh Lake, 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 1J00-09, Juneau.

Crabtree, K. F. 2001. Sockeye salmon escapement estimation for Sitkoh Lake, 1999 and 2000. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 1J01-31, Juneau.

Davidson, W., R. Bachman, D. Gordon, A. Piston, K. Jensen, K. Monagle, T. Thynes and S. Walker. 2012. Annual management report of the 2011 Southeast Alaska commercial purse seine and drift gillnet fisheries. Alaska Department of Fish and Game, Fishery Management Report No 12-03, Anchorage.

Eggers, D. M., R. L. Bachman, and J. Stahl. 2010. Stock status and escapement goals for Chilkat Lake sockeye salmon in Southeast Alaska. Alaska Department of Fish and Game, Fishery Manuscript No. 10-05, Anchorage.

Geiger, H., and staff. 2007. Northern Chatham Strait Sockeye Salmon: stock status, fishery management, and subsistence fisheries. Alaska Department of Fish and Game, Special Publication No. 07-15, Anchorage

George, G., and R. G. Bosworth. 1988. Use of fish and wildlife by residents of Angoon, Admiralty Island, Alaska. Alaska Department of Fish and Game, Division of Subsistence, Technical Paper No. 159. Juneau.

George, G., and M. Kookesh. 1982. Salt Lake coho subsistence permit fishery. Alaska Department of Fish and Game, Division of Subsistence, Technical Paper No. 70. Juneau.

Gilk-Baumer, S., S. Rogers Olive, D. K. Harris, , S. C. Heinl, E. K. C. Fox, and W. D. Templin. *In prep*. Genetic mixed stock analysis of sockeye salmon harvests in selected Northern Chatham Strait commercial fisheries, Southeast Alaska, 2012–2014. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Heinl, S. C., R. L. Bachman, and K. Jensen. 2011. Sockeye salmon stock status and escapement goals in Southeast Alaska. Alaska Department of Fish and Game, Special Publication No. 11-20, Anchorage.

Heiser, D. W. 1966. Age and growth of anadromous Dolly Varden char *Salvelinus malma* (Walbaum) in Eva Creek, Baranof Island, Southeastern Alaska. Alaska Department of Fish and Game, Research Report No. 5, Juneau.

Ingledue, D. 1989. Hawk Inlet shoreline purse seine fishery, 1989. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 1J89-31, Juneau.

Johnson, J., and P. Blanche. 2011. Catalog of waters important for spawning, rearing, or migration of anadromous fishes – Southeastern Region, effective June 1, 2011. Alaska Department of Fish and Game, Special Publication No. 11-07, Anchorage.

Kelley, M. S., and R. P. Josephson. 1997. Sitkoh Creek weir results, June 8 to September 7, 1996. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 1J97-05, Douglas.

Turek, M., A. Paige, E. Cheney, J. Dizard, and N. Soboleff. 2005. Kake Subsistence Salmon Harvest Use Pattern. USFWS Office of Subsistence Management, Fisheries Resource Monitoring Program, Final Report No. FIS01-104, Anchorage, Alaska

USDAFS (United States Department of Agriculture Forest Service). 2011. Kanalku Fish Passage Barrier Modification. Environmental Assessment, R10-MB-720, Juneau.

Van Alen, B. W. 2000. Status and stewardship of salmon stocks in Southeast Alaska. Pages 161–194 [*In*] E. E Knudsen, C. R. Steward, D. D. McDonald, J. E. Williams, D. W. Reiser, editors. Sustainable Fisheries Management: Pacific salmon. CRC Press. Boca Raton.

Van Alen, B. W. 2008. Kook Lake sockeye salmon stock assessment, 2005 to 2007. U.S. Fish and Wildlife Service, Office of Subsistence Management, Fishery Resource Monitoring Program, Final Report Study No. 05-601. Anchorage, Alaska.

Van Alen, B. W., and C. J. Mahara. 2011a. Kook Lake sockeye salmon stock assessment, 2010. U.S. Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program, 2010 Annual Report (Study 10-610), Anchorage, Alaska.

REFERENCES CITED (Continued)

Van Alen, B. W., and C. J. Mahara. 2011b. Kook Lake sockeye salmon stock assessment, 2011. U.S. Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program, 2011 Annual Report (Study10-610), Anchorage, Alaska.

Van Alen, B. W., and C. J. Mahara. 2011c. Sitkoh Lake sockeye salmon stock assessment, 2010. U. S. Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program, Annual Report (Study 10-605), Anchorage,Alaska.

Van Alen, B. W., and C. J. Mahara. 2011d. Sitkoh Lake sockeye salmon stock assessment, 2011. U. S. Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program, Annual Report (Study No. 10-605), Anchorage, Alaska.

Van Alen, B. W., and C. J. Mahara. 2012a. Kook Lake sockeye salmon stock assessment, 2012. U. S. Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program, Annual Report (Study No. 10-605), Anchorage, Alaska.

Van Alen, B. W., and C. J. Mahara. 2012b. Sitkoh Lake sockeye salmon stock assessment, 2012. U. S. Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program, Annual Report (Study No. 10-605), Anchorage, Alaska.

Van Alen, B. W., T. N. Eide, and C. J. Mahara. 2013a. Kook Lake sockeye salmon stock assessment, 2013. U. S. Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program, Annual Report (Study No. 10-605), Anchorage, Alaska.

Van Alen, B. W., T. N. Eide, and C. J. Mahara. 2013b. Sitkoh Lake sockeye salmon stock assessment, 2013. U. S. Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program, Annual Report (Study No. 10-605), Anchorage, Alaska.

Vinzant, R. F., and J. Bednarski. 2010. Kanalku Lake subsistence sockeye salmon project: 2009 annual report. Alaska Department of Fish and Game, Fishery Data Series No. 10-67, Anchorage.

Vinzant, R. F., and S. C. Heinl. 2014. Kanalku Lake subsistence sockeye salmon project: 2013 annual report. Alaska Department of Fish and Game, Fishery Data Series No. 14-39, Anchorage.

Vinzant, R. F., and S. C. Heinl. *In prep*. Kanalku Lake subsistence sockeye salmon project: 2014 annual report. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Vinzant, R. F., S. A. Host, and J. M. Conitz. 2009. Kanalku Lake subsistence sockeye project: 2007 annual report. Alaska Department of Fish and Game, Fishery Data Series No. 09-71, Anchorage.

Vinzant, R. F., J. M. Conitz, and M. A. Blikshteyn. 2010. Kanalku Lake subsistence sockeye salmon project: 2008 annual report. Alaska Department of Fish and Game, Fishery Data Series No. 10-13, Anchorage.

Vinzant, R. F., J. Bednarski, and S. C. Heinl. 2011. Kanalku Lake subsistence sockeye salmon project: 2010 annual report. Alaska Department of Fish and Game, Fishery Data Series No. 11-40, Anchorage.

Vinzant, R. F., J. Bednarski and S. C. Heinl. 2012. Kanalku Lake subsistence sockeye salmon project: 2011 annual report. Alaska Department of Fish and Game, Fishery Data Series No. 12-76, Anchorage.

Vinzant, R. F., J. Bednarski, and S. C. Heinl. 2013. Kanalku Lake subsistence sockeye salmon project: 2012 annual report. Alaska Department of Fish and Game, Fishery Data Series No. 13-33, Anchorage.

Walker, R. 2009. The validity and reliability of fisheries harvest monitoring methods, Southeast Alaska. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 286. Anchorage.

Yanusz, R. J. 1997. Status of sea-run cutthroat trout, sea-run Dolly Varden, and steelhead populations at Sitkoh Creek, Southeast Alaska, during 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-23, Anchorage.

Yanusz, R. J., and A. E. Schmidt. 1996. Sea-run and resident cutthroat trout and sea-run Dolly Varden population status at Lake Eva, Southeast Alaska, during 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-47, Anchorage.

APPENDICES

Appendix A.–Total run (and percent) of major northern Southeast Alaska sockeye salmon stocks and total District 12 commercial purse seine harvest (harvest includes traditional and terminal fisheries), 1985–2013.

	Total Run					Percent of Total Production				District 12 Total Harvest		
Year	Snettisham[a]	Taku	Chilkat	Chilkoot	Total	Snettisham	Taku	Chilkat	Chilkoot	Sockeye	Pink	Boat Days
1985	---	198,261	193,227	221,350	612,838	0%	32%	32%	36%	37,136	6,051,946	1,545
1986	---	175,689	192,000	198,454	566,143	0%	31%	34%	35%	8,377	335,198	884
1987	---	150,986	119,000	430,180	700,166	0%	22%	17%	61%	44,943	1,741,239	1,253
1988	---	118,427	104,000	335,242	557,669	0%	21%	19%	60%	3,867	611,863	650
1989	---	177,434	300,000	346,763	824,197	0%	22%	36%	42%	48,532	5,406,082	967
1990	---	226,858	207,000	252,188	686,046	0%	33%	30%	37%	17,437	1,393,660	650
1991	---	260,143	113,000	314,679	687,822	0%	38%	16%	46%	39,692	7,976,543	1,236
1992	---	288,551	210,000	207,790	706,341	0%	41%	30%	29%	54,102	3,389,352	1,144
1993	---	284,236	310,000	103,251	697,487	0%	41%	44%	15%	80,563	8,885,469	1,817
1994	---	229,642	276,000	62,830	568,472	0%	40%	49%	11%	75,468	10,428,014	2,271
1995	---	238,434	248,000	15,155	501,589	0%	48%	49%	3%	19,264	851,192	2,148
1996	34,000	322,379	359,000	69,600	784,979	4%	41%	46%	9%	36,067	2,969,327	1,714
1997	65,000	174,565	309,000	73,167	621,732	10%	28%	50%	12%	25,272	5,147,980	1,361
1998	55,000	139,824	430,000	14,541	639,365	9%	22%	67%	2%	29,934	4,092,525	1,502
1999	40,000	176,764	399,000	23,542	639,306	6%	28%	62%	4%	54,880	15,109,519	2,015
2000	162,137	246,954	210,000	58,229	677,320	24%	36%	31%	9%	29,834	2,666,295	1,691
2001	286,433	396,678	191,000	143,785	1,017,896	28%	39%	19%	14%	62,623	3,741,496	1,184
2002	116,375	251,633	182,000	82,636	632,644	18%	40%	29%	13%	23,867	4,588,480	1,201
2003	224,368	330,332	167,000	106,778	828,478	27%	40%	20%	13%	68,316	7,305,119	1,098
2004	514,616	204,059	178,000	142,133	1,038,808	50%	20%	17%	14%	173,008	10,464,221	1,239

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Appendix A.–Page 2 of 2.

	Total Run					Percent of Total Production				District 12 Total Harvest		
Year	**Snettisham**	**Taku**	**Chilkat**	**Chilkoot**	**Total**	**Snettisham**	**Taku**	**Chilkat**	**Chilkoot**	**Sockeye**	**Pink**	**Boat Days**
2005	231,905	188,244	108,000	80,498	608,647	38%	31%	18%	13%	116,038	16,740,253	1,419
2006	327,721	233,425	89,150	215,464	865,760	38%	27%	10%	25%	31,783	3,175,302	1,039
2007	129,624	170,141	82,226	204,889	586,880	22%	29%	14%	35%	50,240	4,540,091	865
2008	90,642	163,260	116,043	40,440	410,385	22%	40%	28%	10%	3,983	83,241	818
2009	112,231	119,329	237,948	50,584	520,092	22%	23%	46%	10%	47,319	6,790,714	1,198
2010	66,024	155,795	146,821	103,543	472,183	14%	33%	31%	22%	5,196	290,491	724
2011	144,288	211,731	79,215	92,693	527,927	27%	40%	15%	18%	104,962	19,936,394	1,965
2012	209,261	207,612	162,642	238,545	818,060	26%	25%	20%	29%	7,717	171,434	571
2013	162,189	206,493	186,655	69,276	624,613	26%	33%	30%	11%	43,762	9,081,651	1,312
Averages:												
Total	165,101	215,444	203,653	148,215	669,788	14%	33%	31%	22%	46,351	5,653,969	1,262
Pre-snet. 85–95	---	213,515	206,566	226,171	646,252	---	33%	32%	34%	39,035	4,279,142	1,300
10-year	198,850	186,009	138,670	123,807	647,336	28%	30%	23%	19%	58,401	7,127,379	1,072
Difference 10-year to pre snet.		-27,506	-67,896	-102,365	1,084	28%	-3%	-9%	-16%	19,366	2,848,238	-228
Percent difference	---	0.87	0.67	0.55	1.00	---	90%	71%	54%	150%	167%	82%

[a] 1996 was the first year adult Snettisham hatchery sockeye salmon returned.

Appendix B.–First commercial purse seine opening each year and the total boat days per year from statistical areas 112-14, 112-16, 112-12, and 112-17, 1985–2014.

	First Opening Date				Boat Days			
Year	**112-14**	**112-16**	**112-12**	**112-17**	**112-14**	**112-16**	**112-12**	**112-17**
1985	18-Jul	18-Jul	18-Jul	18-Jul	20	567	14	44
1986	Not Open	7-Aug	Not Open	11-Aug	0	43	0	0
1987	Not Open	12-Jul	22-Aug	Not Open	0	547	20	0
1988	Not Open	7-Aug	14-Aug	Not Open	0	15	63	0
1989	Not Open	9-Jul	20-Jul	20-Jul	0	463	80	43
1990	Not Open	29-Jul	21-Aug	29-Jul	0	163	4	9
1991	Not Open	17-Jul	11-Jul	21-Jul	0	330	83	12
1992	28-Jun	23-Jul	19-Jul	26-Jul	17	267	62	2
1993	27-Jun	11-Jul	15-Jul	25-Jul	15	415	135	75
1994	26-Jun	15-Jul	31-Jul	12-Aug	25	515	167	5
1995	25-Jun	30-Jul	22-Aug	Not Open	49	67	0	0
1996	23-Jun	25-Jul	28-Jul	28-Jul	59	190	12	2
1997	22-Jun	28-Jul	16-Jul	9-Aug	47	219	102	49
1998	21-Jun	23-Jul	23-Jul	17-Aug	40	163	81	0
1999	23-Jun	18-Jul	21-Jul	25-Jul	88	400	135	47
2000	22-Jun	30-Jul	6-Aug	6-Aug	77	152	14	1
2001	21-Jun	19-Jul	Not Open	2-Aug	87	268	0	2
2002	23-Jun	21-Jul	1-Aug	25-Jul	49	200	13	15
2003	22-Jun	10-Jul	19-Aug	16-Jul	95	275	0	55
2004	20-Jun	8-Jul	15-Jul	18-Jul	31	448	80	37
2005	19-Jun	7-Jul	21-Jul	21-Jul	104	481	42	56
2006	18-Jun	6-Jul	3-Aug	Not Open	79	114	25	0
2007	17-Jun	22-Jul	1-Aug	5-Aug	99	217	29	7
2008	22-Jun	Not Open	Not Open	Not Open	36	0	0	0
2009	21-Jun	12-Jul	30-Jul	26-Jul	58	299	20	72
2010	20-Jun	Not Open	Not Open	Not Open	75	0	0	0
2011	19-Jun	7-Jul	14-Jul	22-Jul	167	716	129	181
2012	17-Jun	Not Open	Not Open	Not Open	64	0	0	0
2013	16-Jun	18-Jul	18-Jul	28-Jul	128	240	53	2
2014	15-Jun	Not Open	Not Open	Not Open	52	0	0	0
Average	22-Jun	19-Jul	28-Jul	28-Jul	52	259	45	24
Earliest	15-Jun	6-Jul	11-Jul	16-Jul				
10-Year Average	18-Jun	12-Jul	24-Jul	26-Jul	86	207	30	32
10-Year Earliest	15-Jun	6-Jul	14-Jul	21-Jul				

Appendix C.–July commercial purse seine openings and salmon harvest on the Hawk Inlet shoreline, including estimated wild and hatchery sockeye salmon harvest as determined from otolith sampling, 1989–2014.

	July Purse Seine Openings				July Salmon Harvest					
Year	First	Last	Number	Total Hours	Total Sockeye Salmon	Hatchery Sockeye Salmon[a]	Wild Sockeye Salmon	Percent Wild Sockeye Salmon	Pink Salmon	Chum Salmon
1989	9-Jul	16-Jul	2	54	15,032	---	15,032	100%	671,590	19,186
1990	Not Open	---	---	---	---	---	---	---	---	---
1991	Not Open	---	---	---	---	---	---	---	---	---
1992	23-Jul	---	1	15	12,529	---	12,529	100%	218,873	18,673
1993	11-Jul	---	1	12	6,120	---	6,120	100%	80,471	30,325
1994	15-Jul	18-Jul	2	23	10,323	---	10,323	100%	408,913	52,912
1995	Not Open	---	---	---	---	---	---	---	---	---
1996	Not Open	---	---	---	---	---	---	---	---	---
1997	Not Open	---	---	---	---	---	---	---	---	---
1998	Not Open	---	---	---	---	---	---	---	---	---
1999	18-Jul	21-Jul	2	23	5,876	1,035	4,841	80%	597,674	46,365
2000	Not Open	---	---	---	---	---	---	---	---	---
2001	19-Jul	---	1	12	10,579	2,962	7,617	70%	194,624	16,508
2002	Not Open	---	---	---	---	---	---	---	---	---
2003	10-Jul	13-Jul	2	20	10,186	970	9,216	90%	178,219	38,693
2004	8-Jul	15-Jul	3	40	17,490	5,374	12,116	70%	625,243	173,633
2005	7-Jul	17-Jul	4	55	15,763	5,690	10,073	60%	1,708,714	123,181
2006	6-Jul	27-Jul	7	56	12,603	1,243	11,360	90%	339,697	172,259
2007	Not Open	---	---	---	---	---	---	---	---	---
2008	Not Open	---	---	---	---	---	---	---	---	---
2009	12-Jul	30-Jul	6	102	17,401	3,168	14,233	80%	1,505,408	55,816
2010	Not Open	---	---	---	---	---	---	---	---	---
2011	7-Jul	18-Jul	4	75	25,315	5,075	20,240	80%	2,509,400	157,632
2012	Not Open	---	---	---	---	---	---	---	---	---
2013	28-Jul	29-Jul	1	39	2,155	465	1,690	78%	346,476	5,284
2014	Not Open	---	---	---	---	---	---	---	---	---
Average			3	41	13,268	3,190	11,142	84%	753,236	75,432

[a] 1996 was the first year adult Snettisham hatchery sockeye salmon returned.