Fishery Data Series No. 10-06

Age Composition and Spawning Escapement of Chinook Salmon in Karluk, Ayakulik, and Chignik Rivers, Alaska, 2004-2005

by

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and

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March 2010

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

Symbols and Abbreviations

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

fork length	FL
mid eye to fork	MEF
mid eye 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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ABSTRACT

In 1993 the Alaska Department of Fish and Game, Division of Sport Fish, initiated a project to monitor the status of Chinook salmon *Oncorhynchus tshawytscha* stocks of Karluk, Ayakulik and Chignik rivers. This report presents data collected during 2004 and 2005. During this time period the inriver returns of Chinook salmon to Karluk and Ayakulik rivers were censused by counting fish passing through weirs on the rivers, while inriver returns to Chignik River were estimated from sample weir counts taken at hourly intervals. Age and sex compositions of inriver returns were estimated by sampling Chinook salmon at the weirs. Total sport fishing effort, and catch and harvest of Chinook salmon for Karluk and Ayakulik rivers were estimated annually through the Statewide Harvest Survey (SWHS); sport fisheries occurring upriver of weirs at both drainages were censused during 2004.

In 2004, the inriver return to Karluk River was 7,525 Chinook salmon. Anglers harvested an estimated 1,113 (720 above the weir, from census) Chinook salmon and released 1,974. Estimated sport fishing effort for the entire season was 2,249 angler-days. Estimated spawning escapement was 6,805 Chinook salmon.

In 2005, the inriver return to Karluk River was 4,798 Chinook salmon. Anglers harvested an estimated 368 Chinook salmon (114 above the weir, SE = 68) and released 715. Estimated sport fishing effort for the entire season was 3,332 angler-days. Estimated spawning escapement was 4,684 (SE = 165) Chinook salmon.

In 2004, the inriver return to Ayakulik River was 24,830 Chinook salmon. Census statistics of sport fishery catch, harvest, and total effort include 405 Chinook harvested, 7,417 released and 1,423 days of directed Chinook salmon angler effort. Spawning escapement was 24,425 Chinook salmon.

In 2005, the inriver return to Ayakulik River was 8,340 Chinook salmon. Anglers harvested an estimated 489 (SE = 176) Chinook salmon and released 7,545. Estimated sport fishing effort for the entire season was 2,515 angler-days. Estimated spawning escapement was 7,851 (SE = 176) Chinook salmon.

In 2004, the estimated inriver return to Chignik River was 7,840 Chinook salmon. A total of 2,520 Chinook salmon were harvested in the commercial purse seine fishery in Chignik Lagoon. In 2005, the estimated inriver return to the Chignik River was 6,486 Chinook salmon. A total of 2,714 Chinook salmon were harvested in the commercial purse seine fishery in Chignik Lagoon.

Key words: Chinook salmon, *Oncorhynchus tshawytscha,* escapement, Karluk River, Ayakulik River, Chignik River, age, length, sex composition, sport harvest, sport effort.

INTRODUCTION

The largest Chinook salmon *Oncorhynchus tshawytscha* populations in the Kodiak Management Area (the Kodiak Island Archipelago, Alaska Peninsula waters west of Cape Douglas on the Pacific side and Cape Mensikof on the Bering side, and the Aleutian Islands) occur in Karluk, Ayakulik, and Chignik rivers. All three populations support sport fisheries and are also harvested incidentally by commercial fisheries targeting sockeye salmon *Oncorhynchus nerka*. Subsistence fisheries also harvest relatively small numbers of Chinook salmon from each of these drainages. In order to improve Chinook salmon management for the benefit of users it is essential to establish escapement goals that accurately reflect the production capacities of each stock. The goals of this study are to estimate the age, sex, and length compositions of Chinook salmon returns, estimate total spawning escapements, and document estimated or censused sport harvests and total incidental commercial catch. These data can be used to construct brood tables and refine escapement goals. Adjusting escapement goals to the most effective level will allow for maximum production and harvest opportunity.

THE KARLUK RIVER

Karluk River, located on the southwest end of Kodiak Island (Figure 1), contains one of only two native populations of Chinook salmon found on the Kodiak Archipelago. From its source at the outlet of Karluk Lake, Karluk River flows 35.2 km (22-mi) to its terminus at Karluk Lagoon.

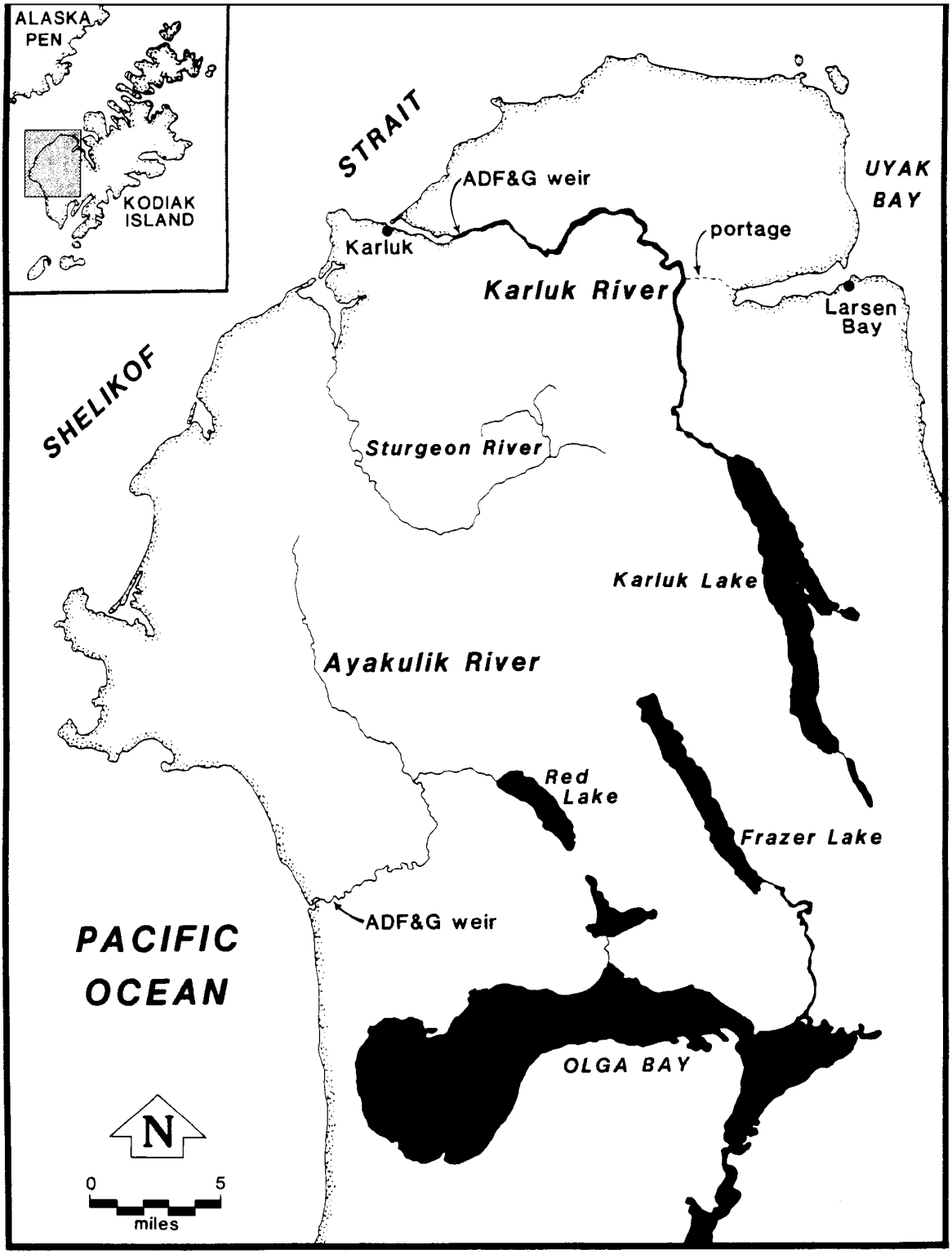

Figure 1.─Karluk and Ayakulik rivers on Kodiak Island with the general location of ADF&G weirs.

Large portions of the uplands surrounding Karluk River are currently held in private ownership. Chinook salmon of Karluk River origin are harvested in sport, commercial, and subsistence fisheries.

The primary commercial harvest of Karluk River Chinook salmon likely occurs in a mixed-stock fishery along the west side of Kodiak Island (Appendix A1). Chinook salmon incidentally harvested in this area probably includes stocks from Karluk and Ayakulik rivers, but also stocks of unknown origin. This fishery annually opens by regulation as early as 1 June. Because 94% of the escapement to Karluk River typically occurs by 15 July, mature Karluk River Chinook salmon are susceptible to commercial exploitation from around 1 June through 15 July. The Alaska Department of Fish and Game Commercial Fisheries Division (CFD) documents commercial harvests of Chinook salmon through fish ticket reports received from fish processors.

Residents of Karluk Village also harvest Karluk River Chinook salmon for subsistence. Harvest in this fishery is documented through subsistence permits issued by the CFD. Between 1996 and 2005 the reported annual harvests ranged from 4 to 165 Chinook salmon (Table 1).

Chinook salmon are harvested in the sport fishery throughout Karluk River and in Karluk Lagoon. Anglers typically access this fishery by flying in with an aircraft charter service. Wheelplanes land and take off from the airstrip in the village of Karluk. Floatplanes touch down and lift off from Karluk Lake, Karluk Lagoon, or mid-river in an area known as the Portage. Guided anglers also access the Portage area by an overland trail from the community of Larsen Bay. Also, fly-in parties, who access the fishery upstream, often float the river to its terminus.

Sport harvests of Karluk River Chinook salmon as well as overall fishing effort are estimated by the Statewide Harvest Survey (SWHS) (Howe et al. 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009). In addition, sport fishery catch and effort information is available from a creel census of the sport fishery above the lagoon conducted in 2002 through 2004 and a partial census in 2005 (Schwarz et al. 2003; Schwarz et al. *In prep*). Between the late 1980s and early 1990s estimated total sport fishing effort on Karluk River Chinook salmon doubled (Mills 1988-1994; Howe et al. 1995), while the estimated annual harvests of Chinook salmon also increased during this period. During the mid-1990s both effort and harvest remained relatively stable (Howe et al. 1996, 2001 a-c;), although between 1999 and 2000 the estimated Chinook salmon harvest increased by more than 60% (Howe et al. 2001d; Walker et al. 2003). In 2001, 2002, and 2004 the estimated sport harvest remained relatively stable although the effort decreased (Jennings et al. 2004, 2006a, 2007). In 2003, both the estimated sport harvest and effort were at a 10-year low (Jennings et al. 2006b, Table 1, Figure 2).

The CFD operates a weir on Karluk River located approximately 1/4 mile upriver of Karluk Lagoon. Between 1996 and 2005, counts of Chinook salmon migrating through the weir have ranged from 4,453 to 13,443 fish and the 1996-2004 mean was 9,296 fish (Table 1, Figure 2, and Appendix B1). Weir counts prior to 1996 (dating back to 1976) averaged around 9,000 fish (Schwarz et al. 2002).

Table 1.—Total commercial harvest of Chinook salmon from Inner and Outer Karluk Section statistical areas, Karluk River inriver Chinook salmon return, estimated sport harvests, 1996-2005; and reported subsistence harvests, 1996-2005.

	Inner and Outer Karluk Section	Karluk River					
	Statistical Area	Subsistence	Inriver	Sport Fishery[d]			
Year	Harvest[a]	Harvest[b]	Return[c]	Harvest	(SE)	Release	Effort[e]
1996	1,662	4	10,051	1,695	353	8,641	4,665
1997	1,445	17	13,443	1,574	285	9,119	5,043
1998	252	4	10,239	1,173	224	6,150	4,223
1999	1,067	7	13,063	1,766	317	5,957	6,239
2000	693	22	10,460	2,581	427	8,165	8,301
2001	2,588	24	4,453	1,304	257	3,676	5,589
2002[f]	1,262	165	7,175	1,086	307	2,533	3,119
2003[g]	1,336	6	7,256	584	139	1,872	1,785
2004[h]	2,249	15	7,525	1,113	144	1,974	2,249
2005[i]	339[j]	5	4,798	368	165	715	3,332
1996-2004 Mean	1,395	29	9,296	1,431	273	5,343	4,579

[a] Source: ADF&G, Division of Commercial Fisheries statewide electronic fish ticket database. Includes all Chinook salmon harvested annually between Rocky Point and Cape Karluk through 15 July. See Appendix A1 for harvest by inclusive statistical areas.

[b] Based on subsistence harvest records maintained by ADF&G, Division of Commercial Fisheries, Westward Region; includes all reported harvest in Karluk Sections.

[c] Census of Chinook salmon passing Karluk River weir (Spalinger 2006)

[d] Statewide Harvest Survey (SWHS, Howe et al. 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009).

[e] Units are angler-days. Includes effort directed toward all species.

[f] Sport fishery estimates include census above weir of 601 fish harvested, 2,268 released, and 1,745 angler-days (numbers corrected from original reported by Schwarz et al. (2003)) and SWHS estimates of 485 fish harvested, 265 released, and 1,374 angler-days below the weir (Jennings et al. 2006a).

[g] Sport fishery estimates include census above weir of 291 fish harvested, 1,513 released, and 758 angler-days (Schwarz et al. *In prep*) and SWHS estimates of 293 (SE = 139) fish harvested, 359 released, and 1,027 angler-days below the weir (Jennings et al. 2006b).

[h] Sport fishery estimates include census above weir of 720 fish harvested, 1,359 released, and 605 angler-days (Schwarz et al. *In prep*) and SWHS estimates of 393 (SE = 144) fish harvested, 615 released, and 1,644 angler-days below the weir (Jennings et al. 2007).

[i] Sport fishery estimates include SWHS estimates of 114 (SE = 68) fish harvested, 505 released, and 1,044 angler-days above the weir and 254 (SE = 150) fish harvested, 210 released, and 2,288 angler-days below the weir (Jennings et al. 2009).

[j] Total commercial harvest comprised only of fish < 28 in because of inseason regulations prohibiting retention of larger fish.

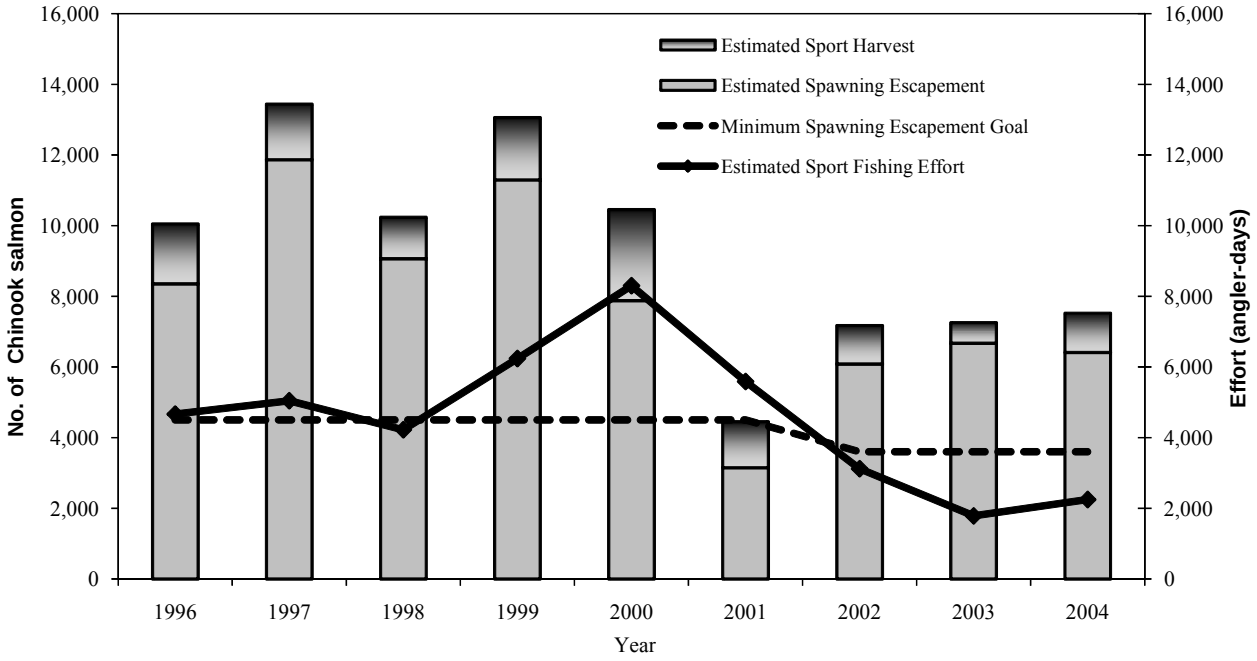

Figure 2.–Chinook salmon inriver return, estimated Chinook salmon sport harvest, and spawning escapement, 1996-2005, and sport fishing effort (angler-days) for all species at Karluk River, 1996-2005.

The current Karluk River Chinook salmon minimum biological escapement goal was set at 3,600 spawning fish based on an analysis of age composition and escapement data available through 2004 (Nelson et al. 2005). The sport fishery is allowed to proceed without inseason restrictions if interim escapement levels projecting a total spawning escapement at or above the minimum goal are achieved. The current management approach assumes a Chinook salmon sport fishing mortality above the weir within the range of 1,000 to 1,500 fish.

THE AYAKULIK RIVER

Ayakulik River, located about 25 miles south of Karluk River (Figure 1), contains the only other native population of Chinook salmon on Kodiak Island. With the exception of approximately 1 square mile surrounding the stream terminus, all uplands surrounding Ayakulik River are public lands within Kodiak National Wildlife Refuge. Chinook salmon of Ayakulik River origin are harvested in the mixed-stock commercial fishery along the west side of Kodiak Island (Table 2). Reported subsistence harvests of Ayakulik River Chinook salmon have been negligible, averaging 16 fish annually since 1996

Chinook salmon are also harvested in the sport fishery, which generally occurs between the confluence of the Ayakulik and Red rivers and Ayakulik Lagoon. Anglers typically access this fishery via seaplane; landing either at the lagoon or upriver near the confluence of Ayakulik River and Bare Creek. Upriver anglers often raft down Ayakulik River and exit the fishery at the lagoon. Two commercial sport-fishing lodges located near Ayakulik Lagoon also provide

Table 2.–Total commercial harvest of Chinook salmon from Inner and Outer Ayakulik Section statistical areas, Ayakulik River inriver Chinook salmon return, estimated sport harvests, 1996-2005; and reported subsistence harvests, 1996-2005.

	Inner and Outer Ayakulik Section Statistical Area	Ayakulik River					
		Subsistence	Inriver	Sport Fishery[d]			
Year	Harvest[a]	Harvest[b]	Return[c]	Harvest	(SE)	Release	Effort[e]
1996	3,723	0	10,344	419	(168)	1,972	1,524
1997	812	0	14,357	1,190	(451)	5,989	3,374
1998	3,795	0	14,038	259	(93)	3,245	1,314
1999	3,564	26	13,503	609	(207)	2,825	2,165
2000	3,416	38	20,527	803	(209)	7,578	1,808
2001	6,727	16	13,929	568	(182)	8,135	3,173
2002	85	37	12,552	362	(135)	5,282	1,715
2003	0	14	17,557	451	(0)	4,768	1,725
2004	158	16	24,830	405	(0)	7,417	1,423
2005	0	8	8,340	489	(176)	7,545	2,515
1996-2004 Mean	2,476	16	15,737	563		5,246	2,025

[a] Source: ADF&G, Division of Commercial Fisheries Statewide electronic fish ticket database. Includes all Chinook salmon harvested annually between Cape Ikolik and approximately N57.05.00' through 15 July. See Appendix A1 for harvest by inclusive statistical areas.

[b] Based on subsistence harvest records maintained by ADF&G, Division of Commercial Fisheries, Westward Region; includes all reported harvest in Red (Ayakulik) River Section.

[c] Census of Chinook salmon passing Ayakulik River weir (Spalinger 2006).

[d] 1996-2002 and 2005 numbers are from Statewide Harvest Survey (SWHS; Howe et al. 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009). 2003, 2004, and 2005 data are from creel census (Tracy and Schmidt *In prep*; Schwarz et al. *In prep*).

[e] Units are angler-days; includes effort directed toward all species.

accommodations for anglers. During years when aircraft cannot access the lagoon because of low water levels, most visitors exit the fishery from the upriver location. In other years as many as 50 angler parties have floated downriver from Bare Creek to exit at the lagoon. Estimated sport harvests of Ayakulik River Chinook salmon have varied, ranging from 259 to 1,190 fish annually since 1996 (Table 2, Figure 3). Between 1996 and 2004 estimates of overall sport fishing effort averaged 2,025 angler-days.

Annual Chinook salmon inriver escapements are enumerated through a weir operated by the CFD just upstream of Ayakulik Lagoon. From 1996 through 2004, Chinook salmon escapements averaged 15,737 fish, with a peak escapement of 24,830 fish in 2004. Other relatively large escapements (i.e., exceeding 17,000 fish) occurred in 2000 and 2003 (Table 2, Figure 3, Appendix B2).

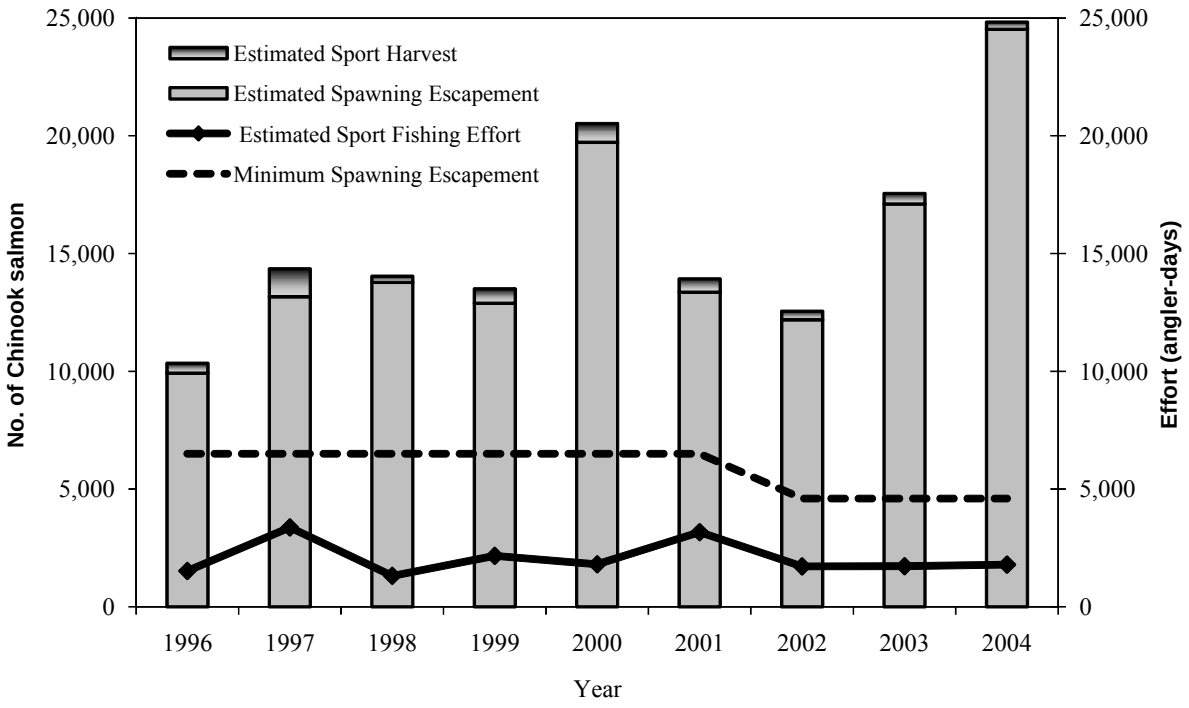

Figure 3.—Ayakulik River Chinook salmon inriver return, estimated Chinook salmon sport harvest, and spawning escapement, 1996-2005, and sport fishing effort (angler-days) for all species, 1996-2005.

The current Ayakulik River Chinook salmon minimum biological escapement goal was set at 4,600 spawning fish based on an analysis of age composition and escapement data available through 2004 (Nelson et al. 2005). A prior assessment of the Ayakulik River Chinook salmon stock, conducted by the U.S. Fish and Wildlife Service (USFWS) in 1989, estimated a maximum available spawning habitat capable of accommodating approximately 10,400 adult fish (Handler and Chatto 1989).

Similar to management of Karluk River, the Ayakulik River sport fishery is allowed to proceed without inseason restrictions if interim escapement levels projecting a total inriver count (minus an average estimated upriver sport harvest) meeting or exceeding the minimum goal are achieved. The current management approach assumes an annual Chinook salmon sport fishing mortality above the weir of less than 1,000 fish.

THE CHIGNIK RIVER

Chignik River, located on the Alaska Peninsula near the village of Chignik (Figure 4), is the largest Chinook salmon-producing system on the southern shore of the Alaska Peninsula. Sport, commercial, and subsistence fisheries harvest Chinook salmon of Chignik River origin.

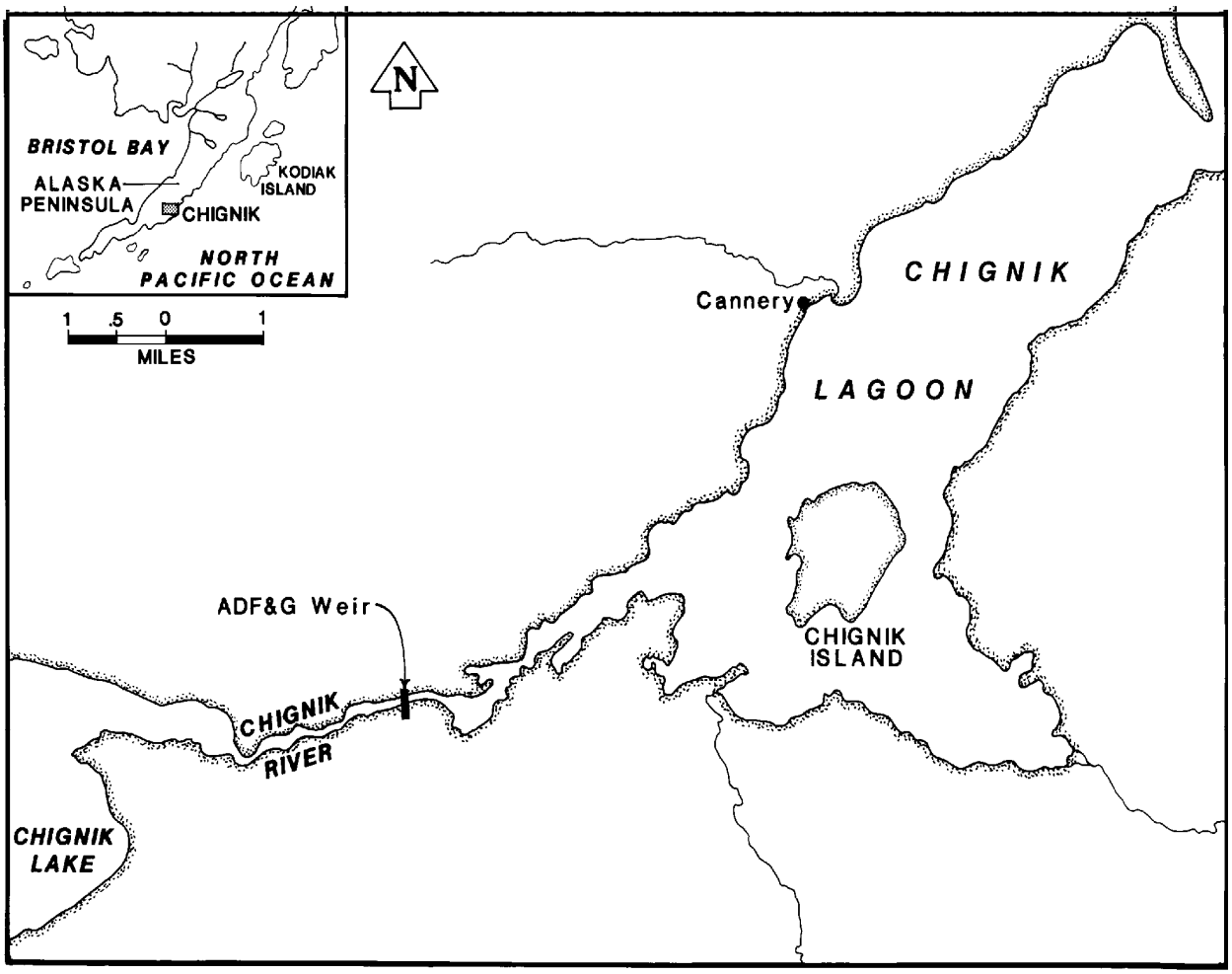

Figure 4.—Chignik River on Alaska Peninsula with the general location of the ADF&G weir.

Commercial harvests of Chignik River-bound Chinook salmon occur incidentally in the Chignik commercial sockeye salmon fishery which takes place both in Chignik Lagoon and in outside waters. Peak Chinook salmon harvests typically occur during July. Between 1996 and 2005, commercial harvests of Chinook salmon from Chignik Lagoon ranged from 595 to 2,834 fish and the 1996-2004 mean was 1,631 fish (Table 3). Reported subsistence harvests of Chignik River Chinook salmon since 1996 have ranged from 28 to 267 fish.

The sport fishery occurs primarily in a 2-mile reach of Chignik River between an ADF&G weir and the outlet of Chignik Lake. Annual estimates of total sport harvests of Chignik River Chinook salmon have not been published by the SWHS because annual sample sizes were too small to precisely estimate effort, harvest, and catch. However, a creel survey conducted by ADF&G in 1998 estimated a harvest of 168 Chinook salmon (Schwarz et al. 2002), and the unpublished harvest estimates from the SWHS (Table 3) were similarly low, though increasing in 2004 and 2005.

Table 3.–Commercial and subsistence harvests, estimated sport harvests, and inriver returns of Chignik River Chinook salmon, 1996-2005.

Year	Total Chignik Area Commercial Harvest[a]	Chignik Lagoon Commercial Harvest[b]	Inriver Return[c]	Subsistence Harvest[d]	Sport Harvest[e]
1996	3,105	1,579	3,485	48	-
1997	3,032	1,289	3,824	28	-
1998	4,395	1,700	3,075	91	168(0)
1999	3,296	2,101	3,728	243	22(23)
2000	2,592	595	4,285	162	87(46)
2001	2,849	1,142	2,992	170	190(127)
2002	1,521	920	3,028	74	99(70)
2003	3,059	2,834	6,412	267	164(93)
2004	2,520	2,520	7,840	88	349(n/a)
2005	3,408	2,714	6,486	224	364(n/a)
1996-2004 Mean	2,930	1,631	4,297	130	-

[a, b] Source: ADF&G, Division of Commercial Fisheries statewide electronic fish ticket database. Total Chignik Area includes all Chinook harvested during the entire fishing season within salmon statistical areas between Kilokak Rocks and Kupreanof Point on the Alaska Peninsula; Chignik Lagoon includes all Chinook harvested during the entire fishing season within statistical area 271-10.

[c] Inriver returns based on tallies from replayed video counts recorded daily during all hours of weir operation (Stichert 2007).

[d] Based on subsistence harvest records maintained by ADF&G, Division of Commercial Fisheries and Division of Subsistence; figures given are the sum of all communities reporting harvest estimates for the Chignik Management Area (Stichert 2007).

[e] Sport harvest estimate for 1998 is from a creel survey (Schwarz et al. 2002). Others are unpublished Statewide Harvest Survey estimates (*unpublished data*, G. B. Jennings, project manager, Alaska Statewide Harvest Survey, Alaska Department of Fish and Game, Division of Sport Fish, Anchorage; see Methods, standard errors in parentheses where available). "-" = value can't be calculated due to limitations of the data.

The CFD operates the ADF&G weir on Chignik River located approximately midway between Chignik Lagoon and Chignik Lake. Between 1996 and 2005, estimates of total Chinook salmon escapement ranged from approximately 3,028 to 7,840 fish and the 1996-2004 mean was 4,297 fish (Table 3, Figure 5, Appendix B3).

In 1993, a Ricker stock-recruit model (Ricker 1975) was constructed using limited available data to develop a Chinook salmon BEG (Len Schwarz, ADF&G Kodiak, personal communication). The model output estimated maximum sustained yield at an escapement level of 3,000 fish, although a minimum escapement goal of 1,750 fish was selected in order to provide escapement sufficient to sustain the return while allowing fisheries to proceed during lower escapement

years. Because of an apparent 18% overestimation error of inriver return discovered in 1993, the BEG range of 1,750-3,000 fish was subsequently lowered by 18%. The current Chignik River Chinook salmon minimum biological escapement goal has been set at 1,300 spawning fish based on an analysis of age composition and escapement data available through 2004 (Nelson et al. 2005). The sport fishery is allowed to proceed without inseason restrictions if interim escapement levels project an inriver estimate that will meet or exceed the minimum goal. The current management approach assumes a Chinook salmon sport fishing mortality above the weir of approximately 200 fish.

STUDY OBJECTIVES

Study objectives were as follows:

1. Count the inriver return of Chinook salmon to Karluk and Ayakulik weirs; estimate the inriver return to Chignik weir.
2. Estimate the age, sex, and length composition of the inriver return of Chinook salmon to the weirs on Karluk, Ayakulik, and Chignik rivers.
3. Census the fishing effort, harvest, and catch of Chinook salmon of anglers traveling downstream past Karluk and Ayakulik weirs from 1 June to 15 July.

METHODS

DATA COLLECTION

Inriver Return

During the 2004-2005 seasons all species of immigrant and outmigrant anadromous fish passing through weirs on Karluk, Ayakulik, and Chignik rivers were enumerated during the respective dates of operation according to CFD operational plans for each project. Nearly complete census counts of Chinook salmon inriver returns were obtained each year for Karluk and Ayakulik river stocks.

Inriver returns to Chignik River were estimated. Prior to 1993, Chinook salmon were visually counted through the weir on a daily basis during the first 10-minute interval of each hour from 0700 to 2200 hours. Total daily passage was then estimated by expanding the hourly counts and summing the results. In 1993 Chinook salmon were counted for the first 30 minutes of daily weir operation and during the first 10 minutes of each hour of operation thereafter (Owen 1993; Owen and Quimby 1997). Additionally, until 1994, weir-based estimates of Chinook salmon escapement did not account for fish less than approximately 650 mm in length mid eye to tail fork (METF), counts of which were instead included in estimates of sockeye salmon escapement because of a similarity in size. Estimated total Chinook salmon counts incorporated the smaller fish escapement component by using age composition estimates for the run. Beginning in 1994, an underwater video camera was installed at the weir to identify and enumerate escapement by species. In 2004 and 2005, underwater video equipment was used to count fish passing through two open gates in the weir. Total numbers of fish passing the weir during the first 10 minutes of each hour were enumerated and the resulting counts multiplied by 6 to obtain hourly estimates of fish passage. These hourly estimates were summed to provide an estimate of daily fish passage.

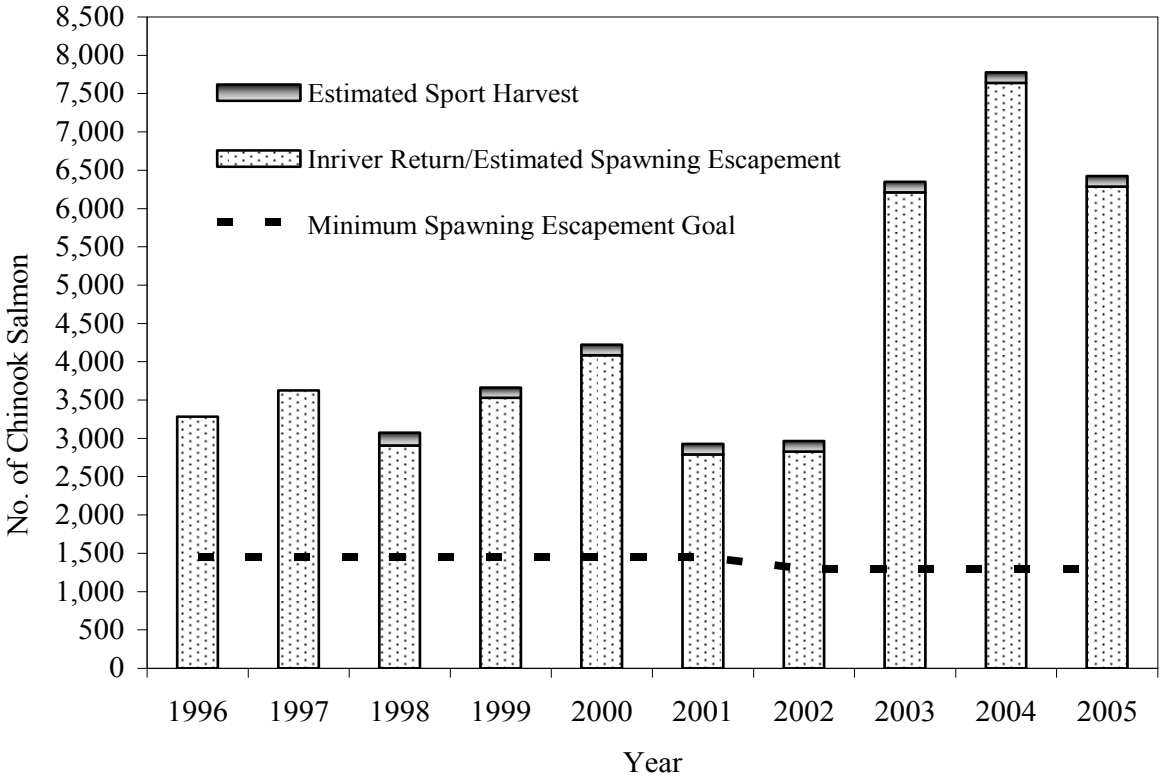

Figure 5.—Inriver return of Chinook salmon to Chignik River, 1996-1997, and estimated sport harvest and spawning escapement, 1998-2005.

Age and Sex Composition of Inriver Return

The inriver returns of Chinook salmon were sampled from weir traps at each location. In 2004, sampling strategies for each system consisted of stratification by seven weekly intervals (Table 4) with sample goals of 15-60 fish during each stratum, proportional to historic abundance by time period. Cumulative Chinook salmon sampling goals for each location totaled 300 fish annually. In 2005, the number of Chinook salmon sampled was a fixed proportion of the number of fish counted past the weir since the last sampling event. For Karluk and Ayakulik rivers, this proportion was 2.5% and 1.0%, respectively resulting in sample goals of 201 and 174 fish.

In 2004, the inriver return of Chinook salmon to Chignik River was sampled for age, sex, and length at the weir. The sampling strategy consisted of stratification by six weekly intervals (Table 4) with sample goals of 10-40 fish during each stratum, proportional to historic abundance by time period, resulting in an overall sample goal of 150. In 2005, the number of Chinook salmon sampled was a fixed proportion of the number of fish counted through the weir since the previous sampling event. For Chignik River, this proportion was 2.5%, which resulted in a sample goal of 97 fish.

Table 4.–Age sex length sampling dates for Chinook salmon, Karkuk, Ayakulik, and Chignik rivers, 2004-2005.

River and Year	Stratum						
Karluk River	1	2	3	4	5	6	7
2004	Before 31 May	31 May – 6 June	7-13 June	14-20 June	21-27 June	28 June – 4 July	After 4 July
2005	2.5% of the number of fish counted through the weir since the last sampling event						
Ayakulik River							
2004	Before 31 May	31 May – 6 June	7-13 June	14-20 June	21-27 June	28 June – 4 July	After 4 July
2005	1.0% of the number of fish counted through the weir since the last sampling event						
Chignik River:							
2004	Before 30 June	30 June – 6 July	7–13 July	14–20 July	21–27 July	After 27 July	
2005	2.5% of the number of fish counted through the weir since the last sampling event						

METF lengths were recorded to the nearest millimeter for each fish sampled. Sex was determined on the basis of external characteristics. Whenever possible, four scales were removed from the left side of the body, at a point on a diagonal line from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin, two rows above the lateral line (Welander 1940). Sample scales were placed on a gum card for subsequent analysis. Scales not available from the preferred area were taken from the area bounded dorsally by the fourth row of scales above the lateral line, ventrally by the lateral line, and between lines drawn vertically from the posterior insertion of the dorsal fin and the anterior insertion of the anal fin. If no scales were available in the preferred area on the left side of the fish, then scale samples were collected from the preferred area on the opposite side. Ages of sampled Chinook salmon were determined from scales using criteria described in Mosher (1969).

Sport Harvest and Effort

Total sport fishing effort, catch, and harvest of Chinook salmon at Karluk and Ayakulik rivers were estimated by the SWHS for 2004 and 2005. Estimates for Karluk River were split above and below the weir beginning in 2002. SWHS estimates for Chignik River sport fishery have not previously been published because of small numbers of respondents to the mailed survey, yielding imprecise estimates. Here we report Chignik River sport harvest estimates for the first time because despite the imprecision of the individual estimates, the entire 8-year series contains useful information about the fishery.

In addition to SWHS estimates, in 2004 sport fishing effort was recorded from verbal interviews of anglers fishing upstream of Karluk weir prior to 16 July, and interviews of all anglers visiting Ayakulik River prior to this date. In 2005 a partial census was completed for the sport fishery at both locations. On Ayakulik River, the partial census interviewed anglers exiting the fishery from the lagoon but none departing upriver, while at Karluk River all upriver anglers passing through the ADF&G weir were interviewed but only a portion of those leaving from Portage. The following information was recorded for each interview:

1. Number of days fished;
2. Number of Chinook and sockeye salmon, steelhead, and Dolly Varden harvested;

3. Number of Chinook and sockeye salmon, steelhead, and Dolly Varden released;
4. Residency: (a) local = an Alaska resident who lives on Kodiak Island, (b) non-local = an Alaska resident who does not live on Kodiak Island, (c) U.S. = a non Alaskan who is a citizen of the United States, and (d) alien = a non Alaskan who is not a citizen of the United States, and who does not have a petition for naturalization pending before the district court ;
5. Guided or unguided.

DATA ANALYSIS

Abundance by Age and Sex

The proportion of Chinook salmon in age/sex class *j* during temporal stratum *i* and its variance were estimated as (Cochran 1977):

$$\hat{p}_{ij} = \frac{n_{ij}}{n_i}, \text{ and} \tag{1}$$

$$\hat{\text{var}}(\hat{p}_{ij}) = \left[\frac{N_i - n_i}{N_i}\right]\frac{\hat{p}_{ij}\left(1-\hat{p}_{ij}\right)}{n_i - 1}, \tag{2}$$

where:

n_{ij} = the number of Chinook salmon in age/sex class *j* during stratum *i*,

n_i = the total number of Chinook salmon sampled during stratum *i*, and

N_i = the inriver return, total return, or escapement of Chinook salmon during stratum *i*.

The abundance of Chinook salmon by age/sex class *j* was estimated as:

$$\hat{N}_{ij} = N_i \hat{p}_{ij}, \tag{3}$$

with estimated variance (Goodman 1960):

$$\hat{\text{var}}(\hat{N}_{ij}) = \hat{N}_i^2\,\hat{\text{var}}(\hat{p}_{ij}) + \hat{p}_{ij}^2\,\hat{\text{var}}(\hat{N}_i) - \hat{\text{var}}(\hat{p}_j)\,\hat{\text{var}}(\hat{N}_i)\,. \tag{4}$$

For the Karluk and Ayakulik rivers, age/sex composition data were initially summarized by week, then pooled across some pairs of adjacent weeks with small sample sizes (<10). The final number of strata ranged from 3 to 6 per year. For Karluk and Ayakulik rivers, estimates of age/sex composition were stratified even when statistical tests did not show significant differences among strata. Historically, there has been a consistent tendency for age composition to shift toward younger fish late in the season, though the differences have not always been statistically significant. In this context, stratification was clearly desirable. Chignik River age/sex estimates were not temporally stratified because of small sample sizes.

Inriver return was counted with zero variance on Karluk and Ayakulik rivers. Sampling error was small and positive for Chignik inriver return; however, variance estimates were not available, so they were also assumed to be zero. Spawning escapement was estimated by subtracting sport harvest above the weir from inriver returns. On Ayakulik and Chignik rivers,

almost all of the sport harvest occurs above the weir, so the entire sport harvest was subtracted. For Karluk and Ayakulik rivers, sport harvest was obtained by creel census (zero variance) in 2004, and estimated by mail survey (variance from SWHS) in 2005. For Chignik River, unpublished estimates of sport harvest were obtained from the Alaska Department of Fish and Game Statewide Harvest Survey 1999-2005 databases[1]. Total returns were calculated by summing commercial harvests, inriver returns, and sport harvest below the weir. Commercial harvest was tallied from fish ticket receipts and was considered to be known with zero variance.

RESULTS

KARLUK RIVER

2004

The Karluk weir was installed in 2004 on 22 May and operated through 6 October.

The inriver return of Chinook salmon through the weir was 7,525 fish. Age was determined for 235 of 278 Chinook salmon sampled at the weir. Estimates of abundance by age were stratified by time period: through 12 June, 13-26 June, and after 26 June (Appendix C1). Estimates of abundance and length by age and sex are given in Table 5. The inriver return was 64% female.

The creel census at the weir and Karluk Portage in 2004 recorded 605 angler-days of effort above the weir, during which 720 Chinook salmon were harvested and 1,359 were released (Appendix D1). Of the 439 anglers interviewed, approximately 60% were nonresident and guided. Angler residency and guided-unguided status was unknown for 33% of interview respondents.

The 2004 Statewide Harvest Survey estimated that anglers fishing Karluk River below the weir harvested an estimated 393 (SE = 144) Chinook salmon and released 615, expending 1,644 angler-days of effort for all species during the entire year (Jennings et al. 2007). In all, sport anglers harvested an estimated 1,113 (SE = 144) Chinook salmon and released 1,974, expending 2,249 angler-days of effort (Table 1).

The 2004 Karluk River estimated spawning escapement (inriver return minus harvest above weir) was 6,805 (SE = 0) Chinook salmon, of which 4,382 (SE = 208) were females and 2,423 (SE = 208) were males.

2005

The Karluk weir was installed in 2005 on 27 May and operated through 24 September.

The inriver return of Chinook salmon through the weir was 4,798 fish. Age was determined for 77 of 118 Chinook salmon sampled from the inriver return. Estimates of abundance by age were stratified by time period: through 19 June, 20-26 June, and after 26 June (Appendix C2). Estimates of abundance and length by age and sex are given in Table 6. The inriver return was 58% female.

The 2005 Statewide Harvest Survey estimated that anglers fishing Karluk River above the weir harvested an estimated 114 (SE = 68) Chinook salmon and released 505, expending 1,044

[1] State of Alaska Network. Project leader G. B. Jennings, Division of Sport Fish, Research and Technical Services, Anchorage. Accessed February 2007.

Table 5.–Estimated age and sex composition of inriver return, and mid eye to fork length by age and sex for Karluk River Chinook salmon, 2004.

	1.1	1.2	1.3	1.4	1.5	2.2	2.3	2.4	unkn.	Total
Females										
Percent	0.0	1.2	17.8	41.1	3.8	0.0	0.0	0.5		64.4
SE	0.0	0.7	2.4	3.1	1.3	0.0	0.0	0.5		3.1
Inriver Return	0	87	1,340	3,096	289	0	0	36		4,848
SE	0	50	184	236	98	0	0	36		230
Number Sampled		3	42	94	8			1	28	176
Mean Length		619	741	804	830			819	796	786
Std Dev Length		35	58	46	45				43	60
Minimum Length		593	571	643	763			819	725	571
Maximum Length		658	837	890	885			819	880	890
Males										
Percent	1.5	3.1	16.0	13.6	1.3	0.0	0.0	0.0		35.6
SE	0.7	1.1	2.3	2.2	0.8	0.0	0.0	0.0		3.1
Return	114	235	1,204	1,026	99	0	0	0		2,677
SE	56	81	176	166	56	0	0	0		230
Number Sampled	4	8	39	33	3				15	102
Mean Length	370	600	716	770	882				684	711
Std Dev Length	33	37	94	87	74				154	130
Minimum Length	343	538	427	536	797				349	343
Maximum Length	412	658	870	893	932				894	932
Total										
Percent	1.5	4.3	33.8	54.8	5.2	0.0	0.0	0.5		100.0
SE	0.7	1.2	3.0	3.1	1.5	0.0	0.0	0.5		0.0
Return	114	321	2,544	4,121	388	0	0	36		7,525
SE	56	94	222	236	112	0	0	36	0	0
Number Sampled	4	11	81	127	11			1	43	278
Mean Length	370	605	795	795	844			819	757	759
Std Dev Length	33	36	78	61	56				109	99
Minimum Length	343	538	536	536	763			819	349	343
Maximum Length	412	658	893	893	932			819	894	932

Note: Age and sex composition were stratified by time period (see Appendix C1) based on samples obtained 28 May–28 June 2004. unkn = unknown, fish for which age was not determined.

Table 6.–Estimated age and sex composition of inriver return, and mid eye to fork length by age and sex for Karluk River Chinook salmon, 2005.

		1.1	1.2	1.3	1.4	1.5	2.2	2.3	2.4	unkn.	Total
Females											
	Percent	1.6	5.4	23.5	15.8	0.0	1.7	7.1	3.3		58.4
	SE	1.6	2.7	5.2	4.6	0.0	1.6	3.2	2.3		6.0
	Inriver Return	77	259	1,128	758	0	79	340	158		2,801
	SE	77	131	248	219	0	79	155	108		289
	Number Sampled	1	4	19	11		1	5	2	19	62
	Mean Length	581	625	774	776		634	767	812	775	760
	Std Dev Length		92	38	42			62	11	33	63
	Minimum Length	581	554	715	701		634	689	804	720	554
	Maximum Length	581	759	870	843		634	853	819	856	870
Males											
	Percent	2.2	7.2	14.8	15.9	0.0	1.6	0.0	0.0		41.6
	SE	1.7	3.0	4.4	4.4	0.0	1.6	0.0	0.0		6.0
	Return	105	345	709	762	0	77	0	0		1,997
	SE	81	142	211	213	0	77	0	0		289
	Number Sampled	2	7	11	13		1			22	56
	Mean Length	552	664	777	816		644			749	750
	Std Dev Length	5	72	55	56					80	89
	Minimum Length	548	567	669	724		644			572	548
	Maximum Length	555	744	852	900		644			846	900
Total											
	Percent	3.8	12.6	38.3	31.7	0.0	3.3	7.1	3.3		100.0
	SE	2.3	3.9	6.0	5.7	0.0	2.3	3.2	2.3		0.0
	Return	182	604	1,837	1,520	0	156	340	158		4,798
	SE	110	187	287	275	0	110	155	108		0
	Number Sampled	3	11	30	24		2	5	2	41	118
	Mean Length	561	649	775	798		639	767	812	761	755
	Std Dev Length	17	78	44	53		7	62	11	63	76
	Minimum Length	548	554	669	701		634	689	804	572	548
	Maximum Length	581	759	870	900		644	853	819	856	900

Note: Age and sex composition were stratified by time period (see Appendix C2) based on samples obtained 6 June–13 July 2005. unkn = unknown, fish for which age was not determined.

angler-days of effort for all species during the entire year (Jennings et al. 2009). Below the weir 254 (SE = 150) Chinook salmon were harvested, 210 fish were released, and there were 2,288 angler-days of effort. The resulting estimate of spawning escapement was 4,684 Chinook salmon, of which 2,735 (SE = 284) were females and 1,949 (SE = 282) were males.

The creel census, which did not have complete coverage in 2005, recorded 635 angler-days of effort above the weir, 187 Chinook salmon harvested, and 576 fish were released (Appendix D2). Of the 268 anglers interviewed at Karluk weir in 2005, 95% were nonresident and 93% were guided.

AYAKULIK RIVER

2004

The Ayakulik River weir was installed in 2004 on 26 May and operated through 27 August.

The inriver return of Chinook salmon through the weir was 24,830 fish. Age was determined for 227 of 304 Chinook salmon sampled at the weir. Estimates of abundance by age were stratified by time period: through 5 June, 6-12 June, 13-19 June, 20-26 June, 27 June–3 July and after 3 July (Appendix C3). Estimates of abundance and length by age and sex are given in Table 7. The inriver return was 55% female.

In 2004, census results indicated that anglers fishing Ayakulik River released 7,417 Chinook salmon and harvested 405 fish, expending 1,423 angler-days of directed Chinook salmon effort during the entire year (Table 2; Tracy and Schmidt *In prep*). The result was a spawning escapement of 24,425 Chinook salmon, of which 13,019 (SE = 879) were females and 11,406 (SE = 879) were males.

Of the 272 anglers interviewed at the Ayakulik weir and Bare Creek in 2004, 67% were non-Alaska residents and 58% were guided (Appendix D3).

The Statewide Harvest Survey estimated that anglers fishing the Ayakulik River in 2004 harvested an estimated 304 (SE = 144) Chinook salmon and released 2,876, expending 1,792 angler-days of effort for all species during the entire year (Jennings et al. 2007).

2005

The Ayakulik River weir was installed in 2005 on 19 May and operated until 5 September.

The inriver return of Chinook salmon through the weir was 8,340 fish. Age was determined for 159 of 190 Chinook salmon sampled from the inriver return. Estimates of abundance by age were stratified by time period: through 12 June, 13-19 June, 20-26 June, and after 26 June (Appendix C4). Estimates of abundance and length by age and sex are given in Table 8. The inriver return was 70% female.

The Statewide Harvest Survey estimated that anglers fishing Ayakulik River in 2005 harvested an estimated 489 (SE = 176) Chinook salmon and released 7,545, expending 2,515 angler-days of effort for all species during the entire year (Table 2; Jennings et al. 2009). The resulting estimate of spawning escapement was 7,851 (SE = 176) Chinook salmon, of which 5,456 (SE = 337) were females and 2,395 (SE = 319) were males.

The creel census, which did not have complete coverage in 2005, recorded 165 harvested and 1,553 released Chinook salmon, as well as 1,140 angler-days of directed Chinook salmon effort during the entire year (Appendix D4; Tracy and Schmidt *In prep*). Of the 131 anglers interviewed at the Ayakulik River weir in 2005, 78% were nonresident and 66% were guided (Appendix D4).

Table 7.–Estimated age and sex composition of inriver return, and mid eye to fork length by age and sex for Ayakulik River Chinook salmon, 2004.

	Age									
	0.2	0.4	1.1	1.2	1.3	1.4	1.5	2.4	unkn.	Total
Females										
Percent	0.0	0.0	0.0	0.0	11.1	42.5	1.7	0.0		55.3
SE	0.0	0.0	0.0	0.0	2.1	3.5	0.8	0.0		3.6
Inriver Return	0	0	0	0	2,749	10,565	424	0		13,738
SE	0	0	0	0	515	877	203	0		893
Number Sampled					29	90	5		46	170
Mean Length					767	825	789		818	812
Std Dev Length					45	39	90		46	49
Minimum Length					661	657	631		696	631
Maximum Length					875	932	847		922	932
Males										
Percent	0.0	0.0	1.8	2.2	16.3	23.2	1.2	0.0		44.7
SE	0.0	0.0	0.9	1.0	2.4	3.2	0.7	0.0		0.0
Return	0	0	454	539	4,042	5,752	306	0		11,092
SE	0	0	227	251	587	788	182	0		0
Number Sampled			4	6	46	44	3		31	134
Mean Length			354	554	742	842	889		732	756
Std Dev Length			10	80	48	59	61		149	130
Minimum Length			340	471	606	678	819		332	332
Maximum Length			363	667	822	966	933		903	966
Total										
Percent	0.0	0.0	1.8	2.2	27.4	65.7	2.9	0.0		100.0
SE	0.0	0.0	0.9	1.0	2.8	3.0	1.1	0.0		0.0
Return	0	0	454	539	6,791	16,316	730	0		24,830
SE	0	0	227	251	705	739	269	0		0
Number Sampled			4	6	75	134	8		77	304
Mean Length			354	554	752	830	827		783	787
Std Dev Length			10	80	48	47	92		109	98
Minimum Length			340	471	606	657	631		332	332
Maximum Length			363	667	875	966	933		922	966

Note: Age and sex composition were stratified by time (see Appendix C3) based on samples obtained 31 May–9 July 2004. unkn = unknown, fish for which age was not determined.

Table 8.–Estimated age and sex composition of inriver return, and mid eye to fork length by age and sex for Ayakulik River Chinook salmon, 2005.

	Age									
	0.2	0.4	1.1	1.2	1.3	1.4	1.5	2.4	unkn.	Total
Females										
Percent	0.4	1.9	3.1	8.3	30.6	22.9	1.9	0.4		69.5
SE	0.4	1.3	1.5	2.3	3.9	3.5	1.3	0.4		4.0
Inriver Return	35	156	255	694	2,554	1,910	156	35		5,794
SE	34	110	126	192	324	296	110	34		330
Number Sampled	1	2	4	14	51	37	2	1	22	134
Mean Length	589	767	539	617	770	792	881	803	764	753
Std Dev Length		80	59	107	32	44	44		67	85
Minimum Length	589	710	476	499	709	721	850	803	583	476
Maximum Length	589	823	612	792	836	915	912	803	877	915
Males										
Percent	0.0	0.0	0.8	4.1	11.4	14.3	0.0	0.0		30.5
SE	0.0	0.0	0.6	1.5	2.8	3.1	0.0	0.0		4.0
Return	0	0	69	338	949	1,190	0	0		2,546
SE	0	0	48	125	232	258	0	0		330
Number Sampled			2	8	17	20			9	56
Mean Length			570	592	763	810			758	748
Std Dev Length			6	121	59	42			97	105
Minimum Length			565	486	612	707			596	486
Maximum Length			574	866	844	893			864	893
Total										
Percent	0.4	1.9	3.9	12.4	42.0	37.2	1.9	0.4		100.0
SE	0.4	1.3	1.6	2.7	4.2	4.1	1.3	0.4		0.0
Return	35	156	324	1,032	3,503	3,100	156	35		8,340
SE	34	110	135	222	351	344	110	34		0
Number Sampled	1	2	6	22	68	57	2	1	31	190
Mean Length	589	767	549	608	768	798	881	803	762	751
Std Dev Length		80	48	110	40	44	44		75	91
Minimum Length	589	710	476	486	612	707	850	803	583	476
Maximum Length	589	823	612	866	844	915	912	803	877	915

Note: Age and sex composition were stratified by time (see Appendix C4) based on samples obtained 29 May–12 July 2005. unkn = unknown, fish for which age was not determined.

CHIGNIK RIVER

2004

Chignik River weir was installed in 2004 on 30 May and operated through 4 September.

The estimated Chinook salmon inriver return of 7,840 fish was the largest on record. With the reported commercial harvest of 2,520 Chinook salmon in Chignik Lagoon and the reported subsistence catch of 88 Chinook salmon, the total estimated return equaled 10,448 fish.

Sport harvest in the Chignik River was estimated to be 349 (SE not available) Chinook salmon in 2004 (Table 3). The resulting estimate of escapement was 7,491 fish (SE not available).

Age was determined for 26 of 33 Chinook salmon sampled at Chignik River weir. Ages 1.2 and 1.3 were dominant (Table 9). Sampled fish were 46% female.

Age composition and length sample results for carcasses of spawned-out Chinook salmon washed up on the weir are given in Appendix E1.

2005

The Chignik River weir was installed in 2005 on 1 June and operated through 3 September.

The estimated Chinook salmon inriver return of 6,486 fish was the second largest on record. With a reported commercial harvest of 2,714 fish in Chignik Lagoon and a reported subsistence catch of 224 fish, the total estimated Chinook salmon return equaled 9,788 fish.

Sport harvest in Chignik River was estimated to be 364 (SE not available) Chinook salmon in 2005 (Table 3). The resulting estimate of escapement was 6,122 fish (SE not available).

Age was determined for 53 of 62 Chinook salmon sampled at Chignik River weir. Ages 1.3 and 1.4 were dominant (Table 10). Sampled fish were 64% female.

Age composition and length sample results for carcasses of spawned-out Chinook salmon washed up on the weir are given in Appendix E2.

DISCUSSION

The intent of this report series is to document assessment of sport fishing effort, harvest, and catch along with age and sex compositions of Chinook salmon stocks of Karluk, Ayakulik, and Chignik rivers. These assessments are necessary to generate brood tables useful for projecting future returns from brood year escapements, which in turn can be used to evaluate and refine escapement goals. Management of fisheries toward appropriate escapement goals will ensure maximum sustained yields are achieved for each of these three Chinook salmon stocks.

Karluk and Ayakulik 2004

The 2004 inriver return of 7,525 Chinook salmon to Karluk River was 1,300 fish below the recent 10-year average. Conversely, the Ayakulik River return of 24,830 Chinook salmon was the highest since 1983 (Schwarz et al. 2002) and more than 10,000 fish above the recent 10-year average. The combined 2004 commercial harvest of 2,407 Chinook salmon from the Inner and Outer Karluk and Ayakulik sections was 68% of the average annual harvest since 1996.

Table 9.—Estimated age and sex composition of total return, and mid eye to fork length by age and sex for Chignik River Chinook salmon, 2004.

		Age					
		1.1	1.2	1.3	1.4	unkn.	Total
Females							
	Percent	0.0	15.4	26.9	3.8		46.2
	SE	0.0	7.2	8.9	3.8		10.0
	Return	0	1,607	2,813	402		4,822
	SE	0	753	926	401		1,040
	Number Sampled		4	7	1	3	15
	Mean Length		743	804	1028	774	797
	Std Dev Length		73	37		98	89
	Minimum Length		670	736	1028	661	661
	Maximum Length		840	840	1028	835	1028
Males							
	Percent	3.8	23.1	23.1	3.8		53.8
	SE	3.8	8.4	8.4	3.8		10.0
	Return	402	2,411	2,411	402		5,626
	SE	401	879	879	401		1,040
	Number Sampled	1	6	6	1	4	18
	Mean Length	625	689	786	850	717	733
	Std Dev Length		33	45		162	94
	Minimum Length	625	645	720	850	588	588
	Maximum Length	625	735	850	850	954	954
Total							
	Percent	3.8	38.5	50.0	7.7		100.0
	SE	3.8	9.7	10.0	5.3		0.0
	Return	402	4,018	5,224	804		10,448
	SE	401	1,015	1,043	556		0
	Number Sampled	1	10	13	2	7	33
	Mean Length	625	710	796	939	741	762
	Std Dev Length		56	40	126	131	96
	Minimum Length	625	645	720	850	588	588
	Maximum Length	625	840	850	1,028	954	1,028

Note: Estimates are based on samples obtained at the weir from 8 July–31 August 2004. Total return is the sum of the inriver return, the subsistence harvest, and Chignik Lagoon commercial harvest. unkn = unknown, fish for which age was not determined.

Table 10.─Estimated age and sex composition of inriver return, and mid eye to fork length by age and sex for Chignik River Chinook salmon, 2005.

		Age						
		1.2	1.3	1.4	1.5	2.2	unkn.	Total
Females								
	Percent	0.0	38.5	23.1	0.0	1.9		63.5
	SE	0.0	6.8	5.9	0.0	1.9		6.7
	Return	0	3,538	2,123	0	177		5,838
	SE	0	625	541	0	176		619
	Number Sampled		20	12		1	6	39
	Mean Length		799	878		632	784	817
	Std Dev Length		39	77			81	76
	Minimum Length		710	787		632	638	632
	Maximum Length		870	1050		632	870	1050
Males								
	Percent	3.8	25.0	5.8	0.0	1.9		36.5
	SE	2.7	6.0	3.3	0.0	1.9		6.7
	Return	354	2,300	531	0	177		3,362
	SE	247	556	300	0	176		619
	Number Sampled	2	13	3		1	2	21
	Mean Length	623	827	914		627	570	786
	Std Dev Length	96	74	39			18	127
	Minimum Length	555	724	875		627	557	555
	Maximum Length	691	953	952		627	582	953
Total								
	Percent	3.8	63.5	28.8	0.0	3.8		100.0
	SE	2.7	6.7	6.3	0.0	2.7		0.0
	Return	354	5,838	2,654	0	354		9,200
	SE	247	619	582	0	247		0
	Number Sampled	2	34	15		2	9	62
	Mean Length	623	810	885		630	730	806
	Std Dev Length	96	56	72		4	120	97
	Minimum Length	555	710	787		627	557	0
	Maximum Length	691	953	1,050		632	870	1,050

Note: Estimates are based on samples obtained at the weir from 23 June–26 August 2005. Total return is the sum of the inriver return and Chignik Lagoon commercial harvest. unkn = unknown, fish for which age was not determined.

In 2004 age-1.3 and -1.4 fish again dominated returns to Karluk and Ayakulik rivers. Ninety-three percent of the Ayakulik inriver return and 89% of the Karluk inriver return consisted of fish aged 1.3 or 1.4.

Chignik 2004

The inriver return of 7,840 Chinook salmon to Chignik River in 2004 is the highest on record (Schwarz et al. 2002). Similarly, the reported commercial harvest from Chignik Lagoon was the third highest on record during the most recent 10 year period. The estimated total return of 10,448 fish from the combined inriver return, subsistence, and commercial harvests also was the highest on record.

Karluk and Ayakulik 2005

The 2005 inriver return of 4,798 Chinook salmon to Karluk River was the second lowest on record since 1996. The Ayakulik River return of 8,340 fish was the lowest on record during the same time period. The total 2005 commercial harvest from the Inner and Outer Karluk and Ayakulik sections of 339 fish was the lowest on record since 1996, although an absence of commercial fishery openings in the Ayakulik sections and inseason restrictions on retention of large Chinook salmon (≥28 in) in the Karluk sections likely affected the harvest magnitude.

As in previous years, age-1.3 and -1.4 fish were predominant in both Karluk and Ayakulik inriver returns. Age-1.2 fish comprised about 13% of the return to each drainage. Approximately 79% of the Ayakulik inriver return and 70% of the Karluk inriver return consisted of fish age-1.3 or -1.4.

Chignik 2005

The 2005 inriver return of 6,486 Chinook salmon to Chignik River was the second highest on record. Similarly, the commercial harvest in the lagoon of 2,714 fish was the second highest since 1996. An estimated total return of 9,788 fish from the combined inriver return, subsistence, and commercial harvests is the second highest on record since 1996.

Karluk and Ayakulik Sport Fishing

Between 1999 and 2003 sport fishing effort in the Kodiak Management Area, as estimated by the SWHS, was measurably higher than average levels of effort during the preceding 5 years (Schwarz et al. *In prep*). In contrast, SWHS estimates of angler effort in the Ayakulik River sport fishery have widely fluctuated since 1996 with no apparent trend, illustrated by the fact that the highest and lowest effort during this period occurred on consecutive years. Levels of estimated annual angler effort at Karluk River have also fluctuated since 1996, even though the lowest estimates of total effort occurred consecutively in 2003 and 2004.

Ayakulik River Chinook salmon harvests estimated by the SWHS have also been highly variable since 1996, roughly ranging between 200 and 1,200 fish, and showing no apparent trend even though the second lowest estimated harvest on record occurred in 2002. Estimated harvests for Karluk River during the same period have generally been higher than those for Ayakulik River, averaging around 1,500 fish, but have also fluctuated significantly between years, ranging as high as approximately 2,600 fish and as low as 580. Restrictions on public access to Karluk River implemented in 2003 combined with below average inriver returns are likely important factors affecting recent angler interest in the Chinook salmon fishery.

With the exception of relatively weak Karluk River Chinook salmon returns from 2001-2005, consistently high escapements during previous years have constrained more precise analysis of stock productivity factors. A continuation of the data collections initiated in 1993 may provide the basis for better understanding the role of these variables across a greater spectrum of adult returns.

Although Ayakulik River Chinook salmon returns since 1996 have been somewhat less variable than those of Karluk River, inclusion of inriver returns dating back to the late 1970s suggest that Chinook salmon populations have experienced relatively high levels of production in the years during which stock assessment data have been available.

Current levels of sport fishing activity at Karluk and Ayakulik rivers probably have minimal impacts upon the magnitude of returns generated by a specific brood year. However, development of a trend of increasing harvest and effort at Karluk River could increase the significance of the sport fishery to achievement of escapement goals, particularly in conjunction with below average inriver returns such as those in 2001-2005. Hook and release mortality and sex-based harvest selectivity does not appear to be a significant problem of sport fisheries occurring at either location. If hooking mortality rate is similar to other fisheries (e.g., Bendock and Alexandersdottir 1992, 7%) the effect from this aspect of the sport fisheries on escapement has probably been minimal.

Overall, during the most recent 10-year period, both Karluk and Ayakulik rivers have maintained sustainable populations of Chinook salmon. During most years the sum of escapement counts for these two systems has been equal to or greater than the combined incidental commercial, subsistence, and sport harvests of Chinook salmon around Kodiak Island. It appears unlikely that any near term changes in prosecution of these fisheries will substantially increase current harvest levels.

Chignik Sport Fishing

Due to an insufficient number of survey respondents, published SWHS estimates of sport fishing effort and harvest for any species in Chignik River had not previously been published. These estimates, though imprecise, show that current levels of angling activity are low by comparison to Karluk and Ayakulik river fisheries. As the result of recent dynamics in the local commercial salmon fishing-based economy, future interest in Chignik River Chinook salmon by the sport fish guiding industry may increase. Consequently, it is possible that even though the 2,700 fish upper end of the current Chignik River escapement goal has been surpassed by the inriver return during each year since 1994, difficulties achieving desired future escapements may be encountered if measurable increases in sport fishing effort coincide with periods of below average inriver returns.

Brood tables constructed from Chinook salmon returns since initiation of the stock assessment project in 1993 have provided the basis for evaluating existing escapement goals and re-estimating the optimum magnitude of escapements for Karluk, Ayakulik, and Chignik river stocks as necessary (Nelson et al. 2005). However, because the historic range of Chinook salmon escapement to Chignik River prior to 2003 has generally been narrow and the relative magnitude of those escapements has been high, factors affecting stock productivity in addition to escapement remain poorly understood. Moreover, poor success in attainment of the Chignik River Chinook salmon annual sampling objectives during recent years has further constrained precise evaluation of productivity parameters.

Although currently stable and abundant, the Chignik River Chinook salmon stock may be more vulnerable to expanding sport, commercial, or subsistence harvests because of its relatively small size. Harvest increases in local fisheries of lesser relative magnitude than those potentially affecting the Karluk and Ayakulik river fisheries could have greater impacts on achievement of the Chignik Chinook salmon escapement goal. However, because of past problems with attainment of data collection goals, the Chignik River component of the Chinook salmon assessment project should be discontinued until such time that direct random systematic sampling of the inriver escapement through the weir can be accomplished. This measure will aid in more precise assessment of the variables influencing stock productivity and, correspondingly, the potential impact of increased fishery removal rates and other sources of adult mortality.

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APPENDIX A. COMMERCIAL HARVEST OF CHINOOK SALMON FROM THE WEST SIDE OF KODIAK ISLAND, BY STATISTICAL AREA, 1996-2005

Appendix A1.–Numbers of Chinook salmon harvested commercially from the west side of Kodiak Island by statistical area, 1 June through 15 July, 1996-2005.

	Commercial harvest (no. of Chinook salmon)									
Statistical Area	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
253-11 (Uganik)	122	84	84	28	47	103	220	277	1,064	242
254-10 (Rocky Point)	633	326	659	484	296	887	349	1,086	1,267	509
254-20 (Inner Uyak)	76	109	128	132	94	93	264	339	175	76
254-30 (Zachar)	48	2	27	21	92	56	44	32	74	60
254-40 (Spiridon)	441	177	478	161	143	34	292	203	1,076	356
254-50 Spiridon Term. area)	0	0	72	112	10	1	388	43	115	1
255-10 (Inner Karluk)	487	790	0	380	231	1,051	543	634	1,517	104
255-20 (Outer Karluk)	1,175	655	252	687	462	1,537	719	702	732	235
256-10 (S. Ayakulik)	1	0	73	198	210	12	14	0	0	0
256-15 (Inner Ayakulik)	107	4	73	444	824	3,414	32	0	0	0
256-20 (N. Ayakulik)	3,615	808	3,649	2,922	2,382	3,301	39	0	158	0
256-25 (Gurney Bay)	20	75	323	151	22	20	0	0	41	0
256-30 (Halibut Bay)	20	364	231	475	168	423	0	0	194	0
256-40 (Sturgeon)	0	0	0	0	18	0	0	0	0	0
257-10 (Sukhoi)	0	0	2	27	8	0	0	0	3	0
257-20 (Tannerhead)	279	152	1,047	73	291	401	0	127	866	369
Total	7,024	3,546	7,098	6,295	5,298	11,333	2,904	3,443	7,282	1,952
Avg. weight (lb.)	15	14	15	15	17	13	10	11	13	13

Source: ADF&G, Division of Commercial Fisheries statewide electronic fish ticket database.

APPENDIX B. KARLUK, AYAKULIK, AND CHIGNIK RIVERS CHINOOK SALMON WEIR COUNTS, 1996-2005

Appendix B1.–Daily cumulative weir counts of Karluk River Chinook salmon, 25 May through 1 August 1996-2005.

	1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		1996-2005
Date	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
25-May	14	0	298	2	116	1	0	0	8	0	3	0	14	0	17	0	85	1	0	0	1
26-May	29	0	461	3	230	2	0	0	23	0	9	0	60	1	24	0	118	2	0	0	1
27-May	49	0	609	5	396	4	27	0	48	0	18	0	105	1	33	0	159	2	0	0	1
28-May	179	2	848	6	562	5	49	0	118	1	43	1	145	2	41	1	186	2	2	0	2
29-May	274	3	964	7	595	6	82	1	138	1	141	3	149	2	45	1	308	4	2	0	3
30-May	399	4	1,105	8	728	7	122	1	179	2	211	5	149	2	61	1	398	5	3	0	3
31-May	502	5	1,178	9	813	8	189	1	308	3	340	8	181	3	63	1	433	6	18	0	4
1-Jun	679	7	1,421	11	936	9	218	2	464	4	352	8	291	4	67	1	660	9	33	1	5
2-Jun	779	8	1,831	14	1,112	11	377	3	733	7	666	15	359	5	67	1	849	11	52	1	8
3-Jun	1,006	10	1,993	15	1,301	13	460	4	886	8	917	21	632	9	360	5	1,065	14	57	1	10
4-Jun	1,180	12	2,208	16	1,458	14	651	5	934	9	1,010	23	816	11	586	8	1,411	19	89	2	12
5-Jun	1,457	14	2,480	18	1,687	16	840	6	977	9	1,056	24	967	13	739	10	1,608	21	168	4	14
6-Jun	1,713	17	2,730	20	1,903	19	1,161	9	1,035	10	1,268	28	1,149	16	803	11	2,037	27	183	4	16
7-Jun	1,994	20	3,265	24	2,138	21	1,800	14	1,111	11	1,436	32	1,354	19	909	13	2,221	30	199	4	19
8-Jun	2,174	22	3,711	28	2,395	23	2,268	17	2,259	22	1,573	35	1,497	21	1,050	14	2,406	32	215	4	22
9-Jun	2,402	24	3,866	29	2,705	26	3,125	24	2,914	28	1,709	38	1,561	22	1,147	16	2,442	32	217	5	24
10-Jun	2,612	26	4,155	31	2,997	29	4,037	31	3,394	32	1,848	42	1,774	25	1,447	20	2,495	33	260	5	27
11-Jun	2,755	27	4,265	32	3,265	32	4,447	34	3,606	34	2,156	48	2,140	30	1,466	20	2,969	39	270	6	30
12-Jun	2,985	30	4,469	33	3,620	35	4,562	35	3,734	36	2,277	51	2,417	34	1,564	22	3,171	42	292	6	32
13-Jun	3,242	32	5,030	37	4,000	39	5,130	39	4,517	43	2,525	57	2,686	37	1,640	23	3,363	45	347	7	36
14-Jun	4,189	42	5,740	43	4,468	44	5,318	41	4,752	45	2,690	60	3,092	43	1,767	24	3,500	47	449	9	40
15-Jun	4,419	44	6,366	47	4,811	47	5,509	42	5,216	50	2,867	64	3,250	45	1,826	25	3,548	47	581	12	42
16-Jun	4,854	48	6,861	51	5,190	51	5,787	44	5,528	53	3,062	69	3,350	47	1,832	25	3,947	52	891	19	46
17-Jun	5,036	50	7,270	54	5,432	53	6,354	49	6,152	59	3,243	73	3,694	51	1,835	25	4,258	57	1,117	23	49
18-Jun	5,191	52	7,892	59	5,826	57	6,952	53	6,636	63	3,391	76	3,839	54	1,845	25	4,379	58	1,505	31	53
19-Jun	5,465	54	8,510	63	6,030	59	7,388	57	6,813	65	3,434	77	3,934	55	1,971	27	4,563	61	1,663	35	55
20-Jun	5,580	56	9,353	70	6,828	67	7,715	59	7,133	68	3,528	79	4,201	59	2,030	28	4,921	65	1,677	35	59
21-Jun	6,024	60	9,715	72	6,911	67	7,876	60	7,340	70	3,641	82	4,464	62	2,269	31	5,043	67	1,916	40	61
22-Jun	6,565	65	10,027	75	7,275	71	8,508	65	7,429	71	3,725	84	4,786	67	2,774	38	5,109	68	2,009	42	65
23-Jun	7,048	70	10,287	76	7,380	72	8,940	68	7,518	72	3,861	87	4,931	69	2,825	39	5,282	70	2,106	44	67

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	1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		1996-2005
Date	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
24-Jun	7,374	73	10,856	81	7,431	73	9,145	70	7,845	75	3,980	89	5,013	70	2,859	39	5,308	71	2,240	47	69
25-Jun	7,651	76	11,309	84	7,838	77	9,498	73	8,220	79	4,060	91	5,100	71	3,074	42	5,411	72	2,323	48	71
26-Jun	7,766	77	11,404	85	8,117	79	9,817	75	8,784	84	4,067	91	5,121	71	3,519	48	5,512	73	2,329	49	73
27-Jun	8,031	80	11,429	85	8,449	83	10,149	78	8,806	84	4,086	92	5,183	72	3,767	52	5,590	74	2,568	54	75
28-Jun	8,160	81	11,505	86	8,795	86	10,491	80	9,069	87	4,086	92	5,352	75	3,795	52	5,681	75	2,822	59	77
29-Jun	8,397	84	11,547	86	8,856	86	10,792	83	9,199	88	4,104	92	5,391	75	3,852	53	5,892	78	3,069	64	79
30-Jun	8,671	86	11,752	87	8,961	88	10,984	84	9,281	89	4,119	92	5,436	76	3,909	54	5,899	78	3,187	66	80
1-Jul	8,696	87	12,189	91	9,094	89	11,169	86	9,435	90	4,124	93	5,944	83	4,008	55	5,945	79	3209	67	82
2-Jul	8,713	87	12,409	92	9,239	90	11,283	86	9,503	91	4,133	93	6,079	85	4,086	56	5,979	79	3262	68	83
3-Jul	8,735	87	12,469	93	9,275	91	11,452	88	9,616	92	4,138	93	6,109	85	4,093	56	5,992	80	3387	71	83
4-Jul	8,791	87	12,531	93	9,337	91	11,602	89	9,673	92	4,142	93	6,153	86	4,108	57	5,998	80	3431	72	84
5-Jul	8,809	88	12,565	93	9,438	92	11,716	90	9,756	93	4,175	94	6,184	86	4,178	58	6,010	80	3431	72	85
6-Jul	8,817	88	12,609	94	9,469	92	11,758	90	9,790	94	4,180	94	6,216	87	4,286	59	6,014	80	3461	72	85
7-Jul	8,818	88	12,844	95	9,490	93	12,101	93	9,862	94	4,211	95	6,262	87	4,310	59	6,016	80	3463	72	86
8-Jul	8,828	88	12,905	96	9,588	94	12,197	93	9,897	95	4,220	95	6,305	88	4,746	65	6,035	80	3,497	73	87
9-Jul	8,836	88	12,934	96	9,729	95	12,283	94	9,941	95	4,222	95	6,333	88	5,872	81	6,714	89	3,541	74	90
10-Jul	8,842	88	12,962	96	9,853	96	12,341	94	9,957	95	4,231	95	6,367	89	6,407	88	6,807	90	3,859	80	91
11-Jul	8,844	88	13,041	97	9,901	97	12,442	95	9,974	95	4,235	95	6,401	89	6,455	89	6,904	92	3,878	81	92
12-Jul	8,859	88	13,054	97	9,921	97	12,459	95	9,987	95	4,252	95	6,502	91	6,673	92	6,931	92	4,051	84	93
13-Jul	8,860	88	13,058	97	9,933	97	12,471	95	10,008	96	4,262	96	6,505	91	6,703	92	7,001	93	4,137	86	93
14-Jul	8,862	88	13,065	97	9,942	97	12,597	96	10,015	96	4,279	96	6,533	91	6,719	93	7,007	93	4,147	86	93
15-Jul	8,864	88	13,078	97	9,945	97	12,637	97	10,020	96	4,293	96	6,591	92	6,802	94	7,017	93	4,151	87	94
16-Jul	8,880	88	13,108	97	9,951	97	12,657	97	10,061	96	4,296	96	6,636	93	6,811	94	7,039	94	4,156	87	94
17-Jul	8,904	89	13,116	98	9,953	97	12,672	97	10,070	96	4,296	96	6,659	93	6,832	94	7,039	94	4,183	87	94
18-Jul	8,930	89	13,123	98	9,955	97	12,700	97	10,074	96	4,297	96	6,704	93	6,836	94	7,042	94	4,196	87	94
19-Jul	8,944	89	13,137	98	9,955	97	12,737	98	10,099	97	4,309	97	6,745	94	6,840	94	7,043	94	4,224	88	94
20-Jul	9,357	93	13,137	98	9,956	97	12,764	98	10,101	97	4,320	97	6,758	94	6,852	94	7,057	94	4,241	88	95
21-Jul	9,383	93	13,151	98	9,984	98	12,786	98	10,107	97	4,321	97	6,784	95	6,866	95	7,069	94	4,475	93	96
22-Jul	9,515	95	13,152	98	10,000	98	12,796	98	10,123	97	4,334	97	6,803	95	6,869	95	7,077	94	4,478	93	96
23-Jul	9,602	96	13,156	98	10,014	98	12,811	98	10,128	97	4,339	97	6,821	95	6,893	95	7,096	94	4,538	95	96
24-Jul	9,608	96	13,233	98	10,044	98	12,835	98	10,136	97	4,361	98	6,897	96	6,906	95	7,115	95	4,550	95	97

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	1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		1996-2005
Date	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
25-Jul	9,638	96	13,233	98	10,052	98	12,841	98	10,168	97	4,365	98	6,912	96	6,907	95	7,122	95	4,555	95	97
26-Jul	9,650	96	13,233	98	10,056	98	12,862	98	10,170	97	4,370	98	6,925	97	6,913	95	7,154	95	4,616	96	97
27-Jul	9,656	96	13,234	98	10,059	98	12,892	99	10,172	97	4,372	98	6,928	97	6,929	95	7,154	95	4,625	96	97
28-Jul	9,755	97	13,239	98	10,078	98	12,894	99	10,191	97	4,373	98	6,944	97	6,949	96	7,162	95	4,626	96	97
29-Jul	9,796	97	13,242	98	10,083	98	12,918	99	10,220	98	4,379	98	6,966	97	6,952	96	7,162	95	4,630	96	97
30-Jul	9,801	98	13,243	98	10,094	99	12,929	99	10,226	98	4,385	98	6,987	97	6,980	96	7,166	95	4,642	97	98
31-Jul	9,850	98	13,269	99	10,122	99	12,930	99	10,288	98	4,394	99	7,006	98	7,021	97	7,185	95	4,645	97	98
1-Aug	9,886	98	13,295	99	10,132	99	13,057	100	10,458	100	4,453	100	7,016	98	7,035	97	7,188	96	4,661	97	98
Total count	10,051		13,450		10,239		13,063		10,460		4,453		7,174		7,256		7,525		4,798		

Note: N = daily cumulative weir count (number of Chinook salmon).

Appendix B2.─Daily cumulative weir counts of Ayakulik River Chinook salmon, 25 May through 1 August 1996-2005.

	1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		1996-2005
Date	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
25-May	65	1	24	0	177	1		0	155	1	101	1	72	1	2	0		0	5	0	0
26-May	73	1	34	0	236	2		0	197	1	152	1	92	1	4	0	0	0	5	0	1
27-May	75	1	56	0	422	3	46	0	210	1	177	1	100	1	5	0	0	0	11	0	1
28-May	91	1	68	0	604	4	48	0	215	1	399	3	173	1	6	0	2	0	11	0	1
29-May	111	1	70	0	732	5	55	0	216	1	797	6	179	1	13	0	5	0	19	0	2
30-May	123	1	123	1	848	6	55	0	262	1	1,079	8	230	2	53	0	200	1	28	0	2
31-May	318	3	132	1	1,049	7	55	0	282	1	1,227	9	295	2	147	1	1,210	5	49	1	3
1-Jun	622	6	151	1	1,413	10	55	0	437	2	1,476	11	607	5	275	2	2,496	10	49	1	5
2-Jun	961	9	215	1	1,858	13	71	1	464	2	1,760	13	786	6	541	3	3,843	15	53	1	6
3-Jun	1642	16	316	2	2,170	15	405	3	581	3	3,277	24	825	7	947	5	4,327	17	159	2	9
4-Jun	1822	18	483	3	2,536	18	537	4	2,047	10	3,657	26	1,242	10	1,742	10	9,521	38	267	3	14
5-Jun	2,020	20	706	5	2,941	21	610	5	3,434	17	5,325	38	1,280	10	2,183	12	10,037	40	357	4	17
6-Jun	2,988	29	920	6	3,477	25	634	5	4,810	23	6,952	50	1,511	12	2,596	15	10,504	42	540	6	21
7-Jun	3,317	32	1,344	9	3,940	28	1,089	8	5,050	25	8,179	59	1,749	14	3,865	22	11,712	47	555	7	25
8-Jun	3,404	33	1,429	10	4,347	31	1,298	10	5,129	25	9,115	65	2,011	16	4,128	24	11,866	48	764	9	27
9-Jun	3,413	33	1,741	12	4,825	34	1,857	14	5,312	26	9,605	69	2,316	18	4,334	25	11,934	48	955	11	29
10-Jun	3,473	34	3,019	21	5,328	38	2,447	18	6,561	32	9,889	71	2,483	20	5,095	29	12,081	49	958	11	32
11-Jun	3,511	34	3,978	28	5,799	41	3,405	25	6,981	34	10,204	73	2,651	21	6,689	38	12,399	50	1,101	13	36
12-Jun	3,585	35	4,553	32	6,147	44	6,148	46	8,204	40	10,450	75	2,713	22	6,889	39	12,457	50	1,112	13	40
13-Jun	3,740	36	4,782	33	6,612	47	8,135	60	9,545	46	10,592	76	2,848	23	6,999	40	12,915	52	1,248	15	43
14-Jun	4,080	39	4,905	34	6,840	49	8,863	66	10,379	51	10,669	77	3,229	26	7,831	45	16,445	66	1,812	22	47
15-Jun	4,773	46	5,547	39	7,150	51	9,190	68	10,994	54	10,721	77	3,338	27	8,563	49	16,980	68	2,321	28	51
16-Jun	5,579	54	6,038	42	7,575	54	9,256	69	13,324	65	10,818	78	3,728	30	9,151	52	17,735	71	3,028	36	55
17-Jun	6,015	58	6,723	47	7,972	57	9,329	69	15,467	75	10,948	79	4,869	39	9,874	56	18,574	75	3,226	39	59
18-Jun	6,113	59	7,095	49	8,225	59	9,586	71	15,913	78	11,003	79	5,533	44	10,046	57	18,611	75	3,538	42	61
19-Jun	6,161	60	7,428	52	8,585	61	9,953	74	16,077	78	11,283	81	6,119	49	10,760	61	18,722	75	3,588	43	63
20-Jun	6,428	62	7,814	54	8,779	63	10,050	74	16,425	80	11,421	82	7,490	60	10,864	62	19,406	78	3,609	43	66
21-Jun	7,144	69	8,213	57	9,327	66	10,113	75	16,663	81	11,504	83	7,693	61	10,984	63	20,045	81	3,809	46	68
22-Jun	7,583	73	8,530	59	9,717	69	10,257	76	17,347	85	11,963	86	7,855	63	11,343	65	20,653	83	4,045	49	71
23-Jun	8,746	85	10,077	70	10,360	74	10,414	77	17,389	85	12,147	87	8,672	69	11,515	66	20,809	84	4,234	51	75

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	1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		1996-2005
Date	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
24-Jun	8,819	85	12,048	84	10,938	78	10,460	77	18,189	89	12,335	89	9,353	75	11,608	66	20,936	84	4,271	51	78
25-Jun	8,915	86	12,560	87	11,380	81	10,559	78	18,582	91	12,376	89	10,249	82	11,845	67	21,087	85	5,378	64	81
26-Jun	9,010	87	12,626	88	11,645	83	10,926	81	18,724	91	12,436	89	10,484	84	11,868	68	21,265	86	5,646	68	82
27-Jun	9,083	88	12,778	89	11,984	85	11,438	85	19,087	93	12,553	90	10,668	85	12,127	69	21,307	86	6,207	74	84
28-Jun	9,269	90	12,839	89	12,247	87	11,631	86	19,195	94	12,671	91	10,884	87	12,962	74	22,179	89	6,231	75	86
29-Jun	9,434	91	12,881	90	12,453	89	11,862	88	19,462	95	12,899	93	11,088	88	13,693	78	22,792	92	6,325	76	88
30-Jun	9,557	92	12,964	90	12,664	90	12,000	89	19,583	95	12,971	93	11,172	89	13,897	79	22,831	92	6,623	79	89
1-Jul	9,582	93	13,177	92	12,816	91	12,116	90	19,620	96	13,128	94	11,259	90	14,222	81	23,291	94	6,758	81	90
2-Jul	9,642	93	13,418	93	13,035	93	12,226	91	19,722	96	13,286	95	11,495	92	14,623	83	23,519	95	6,761	81	91
3-Jul	9,750	94	13,577	95	13,212	94	12,230	91	19,772	96	13,325	96	11,546	92	14,783	84	23,631	95	6,878	82	92
4-Jul	9,809	95	13,701	95	13,348	95	12,266	91	19,795	96	13,397	96	11,728	93	15,122	86	23,825	96	7,621	91	94
5-Jul	9,858	95	13,766	96	13,408	96	12,366	92	19,888	97	13,397	96	11,917	95	15,317	87	23,857	96	7,646	92	94
6-Jul	9,988	97	13,852	96	13,511	96	12,392	92	19,990	97	13,496	97	11,942	95	15,547	89	23,945	96	7,686	92	95
7-Jul	10,087	98	13,928	97	13,601	97	12,465	92	19,992	97	13,541	97	11,978	95	15,719	90	23,958	96	7,798	94	95
8-Jul	10,132	98	13,980	97	13,690	98	12,522	93	19,992	97	13,549	97	12,012	96	15,882	90	23,977	97	7,802	94	96
9-Jul	10,153	98	14,035	98	13,731	98	12,757	94	20,046	98	13,598	98	12,036	96	16,021	91	24,080	97	7,855	94	96
10-Jul	10,153	98	14,094	98	13,779	98	12,884	95	20,116	98	13,650	98	12,174	97	16,301	93	24,223	98	7,855	94	97
11-Jul	10,172	98	14,120	98	13,825	98	12,965	96	20,140	98	13,678	98	12,189	97	16,724	95	24,247	98	7,867	94	97
12-Jul	10,194	99	14,153	99	13,862	99	13,089	97	20,200	98	13,700	98	12,208	97	16,754	95	24,282	98	7,867	94	97
13-Jul	10,194	99	14,165	99	13,872	99	13,129	97	20,253	99	13,755	99	12,252	98	16,762	95	24,378	98	7,867	94	98
14-Jul	10,202	99	14,177	99	13,904	99	13,165	97	20,287	99	13,765	99	12,306	98	16,823	96	24,410	98	8,007	96	98
15-Jul	10,211	99	14,181	99	13,916	99	13,188	98	20,292	99	13,791	99	12,307	98	16,840	96	24,481	99	8,021	96	98
16-Jul	10,227	99	14,191	99	13,924	99	13,188	98	20,325	99	13,803	99	12,335	98	16,929	96	24,530	99	8,041	96	98
17-Jul	10,234	99	14,212	99	13,933	99	13,195	98	20,329	99	13,825	99	12,367	99	16,934	96	24,539	99	8,073	97	98
18-Jul	10,249	99	14,216	99	13,946	99	13,203	98	20,334	99	13,836	99	12,373	99	16,980	97	24,563	99	8,075	97	98
19-Jul	10,256	99	14,248	99	13,969	99	13,203	98	20,365	99	13,843	99	12,386	99	17,078	97	24,637	99	8,079	97	99
20-Jul	10,260	99	14,274	99	13,973	99	13,287	98	20,378	99	13,843	99	12,397	99	17,368	99	24,719	100	8,134	98	99
21-Jul	10,266	99	14,280	99	13,977	99	13,297	98	20,396	99	13,844	99	12,401	99	17,384	99	24,723	100	8,143	98	99
22-Jul	10,289	99	14,293	99	13,978	99	13,347	99	20,407	99	13,846	99	12,406	99	17,485	100	24,727	100	8,198	98	99
23-Jul	10,291	99	14,299	99	13,981	99	13,371	99	20,421	99	13,849	99	12,415	99	17,488	100	24,741	100	8,201	98	99
24-Jul	10,293	99	14,302	99	13,984	99	13,376	99	20,437	100	13,856	99	12,416	99	17,492	100	24,764	100	8,201	98	99

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	1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		1996-2005
Date	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
25-Jul	10,298	99	14,303	99	13,986	99	13,386	99	20,445	100	13,877	100	12,416	99	17,527	100	24,790	100	8,201	98	99
26-Jul	10,301	99	14,308	99	13,992	99	13,404	99	20,452	100	13,885	100	12,416	99	17,528	100	24,794	100	8,221	99	99
27-Jul	10,305	99	14,314	99	13,993	99	13,435	99	20,463	100	13,891	100	12,416	99	17,530	100	24,794	100	8,289	99	99
28-Jul	10,307	99	14,322	99	14,004	99	13,446	100	20,477	100	13,892	100	12,416	99	17,537	100	24,794	100	8,292	99	99
29-Jul	10,308	99	14,323	99	14,005	99	13,449	100	20,479	100	13,893	100	12,429	99	17,537	100	24,794	100	8,295	99	99
30-Jul	10,314	99	14,325	99	14,009	99	13,467	100	20,479	100	13,900	100	12,429	99	17,544	100	24,794	100	8,297	99	99
31-Jul	10,316	99	14,325	99	14,013	99	13,474	100	20,483	100	13,901	100	12,429	99	17,544	100	24,802	100	8,301	100	99
1-Aug	10,321	99	14,326	99	14,017	99	13,475	100	20,487	100	13,902	100	12,429	99	17,545	100	24,806	100	8,302	100	99
Total count	10,344		14,357		14,038		13,503		20,527		13,929		12,551		17,557		24,830		8,340		

Note: N = daily cumulative weir count (number of Chinook salmon).

Appendix B3.─Daily cumulative weir counts of Chignik River Chinook salmon, 15 June through 15 August 1996-2005.

	1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		1996-2005
Date	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
16-Jun	7	0	6	0			2	0					6	0	26	0	0	0	0	0	
17-Jun	7	0	19	0	12	0	8	0					12	0	27	0	6	0	0	0	
18-Jun	7	0	19	0	24	1	8	0					12	0	33	1	18	0	0	0	
19-Jun	14	0	19	0	25	1	14	0					36	1	69	1	18	0	0	0	
20-Jun	62	2	55	1	58	2	14	0	39	1			42	1	69	1	24	0	6	0	
21-Jun	74	2	73	2	95	3	14	0	47	1			42	1	105	2	48	1	84	1	
22-Jun	80	2	106	3	108	4	20	1	60	1	18	1	67	2	135	2	48	1	117	2	2
23-Jun	94	3	124	3	114	4	38	1	73	2	18	1	79	2	159	2	66	1	196	3	2
24-Jun	124	4	130	3	150	5	63	2	94	2	18	1	85	2	183	3	114	1	262	4	3
25-Jun	136	4	160	4	198	6	85	2	124	3	18	1	122	3	219	3	210	3	292	5	3
26-Jun	142	4	218	6	222	7	97	3	163	4	18	1	226	6	279	4	312	4	460	7	5
27-Jun	250	7	280	7	276	9	109	3	219	5	18	1	256	7	388	6	348	4	605	9	6
28-Jun	394	11	358	9	369	12	111	3	300	7	54	2	305	9	448	7	486	6	719	11	8
29-Jun	532	15	382	10	441	14	135	4	399	9	85	3	389	11	485	8	654	8	909	14	10
30-Jun	574	16	462	12	495	16	184	5	467	11	128	4	551	16	534	8	780	10	1,065	16	11
1-Jul	691	20	528	14	525	17	214	6	557	13	257	8	599	17	552	9	926	12	1,223	19	13
2-Jul	725	21	582	15	561	18	280	8	643	15	485	16	659	19	612	10	1,064	14	1,345	21	16
3-Jul	798	23	624	16	621	20	354	9	763	18	647	21	678	19	668	10	1,154	15	1,579	24	18
4-Jul	822	24	693	18	665	22	390	10	887	21	731	24	843	24	848	13	1,295	17	1,982	31	20
5-Jul	912	26	778	20	755	25	459	12	1,033	24	779	26	891	25	1,071	17	1,626	21	2,144	33	23
6-Jul	946	27	848	22	794	26	495	13	1,234	29	857	28	958	27	1,254	20	1,782	23	2,338	36	25
7-Jul	946	27	990	26	942	31	647	17	1,384	32	965	32	1,060	30	1,296	20	1,873	24	2,569	40	28
8-Jul	964	28	1,137	30	1,092	36	695	19	1,581	37	1,088	36	1,144	32	1,602	25	2,072	26	2,894	45	31
9-Jul	976	28	1,398	37	1,110	36	761	20	1,753	41	1,158	38	1,228	35	1,932	30	2,253	29	3,452	53	35
10-Jul	1,246	36	1,533	40	1,221	40	828	22	1,954	46	1,218	40	1,324	37	2,161	34	2,398	31	3,742	58	38
11-Jul	1,288	37	1,664	44	1,305	42	967	26	2,103	49	1,280	42	1,408	40	2,564	40	2,698	34	3,875	60	41
12-Jul	1,402	40	1,793	47	1,383	45	1,111	30	2,343	55	1,304	43	1,579	45	3,081	48	2,944	38	4,055	63	45
13-Jul	1,527	44	1,890	49	1,440	47	1,292	35	2,512	59	1,328	44	1,675	47	3,408	53	3,323	42	4,211	65	48
14-Jul	1,599	46	1,921	50	1,521	49	1,463	39	2,608	61	1,436	47	1,729	49	3,649	57	3,732	48	4,358	67	51
15-Jul	1,709	49	1,975	52	1,635	53	1,702	46	2,728	64	1,496	49	1,867	53	3,921	61	4,020	51	4,461	69	55
16-Jul	1,819	52	2,131	56	1,659	54	1,790	48	2,836	66	1,656	55	1,935	55	4,085	64	4,243	54	4,609	71	57

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	1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		1996-2005
Date	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
17-Jul	2,094	60	2,263	59	1,798	58	1,938	52	2,938	69	1,818	60	2,121	60	4,281	67	4,552	58	4,794	74	62
18-Jul	2,270	65	2,451	64	1,879	61	1,992	53	3,016	70	2,016	67	2,271	64	4,369	68	4,985	64	4,932	76	65
19-Jul	2,384	68	2,543	67	2,138	70	2,214	59	3,159	74	2,152	71	2,362	67	4,460	70	5,256	67	5,106	79	69
20-Jul	2,535	73	2,587	68	2,222	72	2,281	61	3,244	76	2,237	74	2,464	70	4,600	72	5,478	70	5,204	80	71
21-Jul	2,577	74	2,621	69	2,312	75	2,378	64	3,352	78	2,325	77	2,526	71	4,752	74	5,721	73	5,337	82	74
22-Jul	2,626	75	2,729	71	2,365	77	2,458	66	3,442	80	2,452	81	2,640	75	4,896	76	5,843	75	5,513	85	76
23-Jul	2,663	76	2,858	75	2,431	79	2,573	69	3,650	85	2,513	83	2,772	78	5,005	78	5,987	76	5,622	87	79
24-Jul	2,740	79	2,972	78	2,505	81	2,729	73	3,766	88	2,609	86	2,904	82	5,011	78	6,131	78	5,904	91	81
25-Jul	2,855	82	3,045	80	2,555	83	2,777	74	3,786	88	2,663	88	2,982	84	5,149	80	6,311	80	5,976	92	83
26-Jul	2,905	83	3,057	80	2,585	84	2,897	78	3,788	88	2,702	89	3,054	86	5,203	81	6,488	83	6,000	93	85
27-Jul	3,030	87	3,073	80	2,603	85	3,001	80	3,806	89	2,714	90	3,084	87	5,371	84	6,632	85	6,099	94	86
28-Jul	3,078	88	3,131	82	2,625	85	3,031	81	3,848	90	2,726	90	3,108	88	5,495	86	6,728	86	6,147	95	87
29-Jul	3,131	90	3,215	84	2,680	87	3,290	88	3,885	91	2,744	91	3,144	89	5,610	87	6,824	87	6,196	96	89
30-Jul	3,163	91	3,257	85	2,696	88	3,348	90	3,923	92	2,756	91	3,156	89	5,694	89	6,956	89	6,202	96	90
31-Jul	3,171	91	3,349	88	2,708	88	3,384	91	3,953	92	2,816	93	3,180	90	5,766	90	7,076	90	6,214	96	91
1-Aug	3,196	92	3,387	89	2,732	89	3,402	91	3,973	93	2,822	93	3,192	90	5,808	91	7,100	91	6,226	96	91
2-Aug	3,214	92	3,407	89	2,753	90	3,432	92	4,063	95	2,858	94	3,198	90	5,820	91	7,173	91	6,232	96	92
3-Aug	3,227	93	3,414	89	2,765	90	3,462	93	4,111	96	2,876	95	3,234	91	5,874	92	7,252	93	6,253	96	93
4-Aug	3,233	93	3,420	89	2,789	91	3,501	94	4,135	96	2,906	96	3,258	92	5,880	92	7,324	93	6,273	97	93
5-Aug	3,264	94	3,434	90	2,825	92	3,522	94	4,147	97	2,924	97	3,270	92	5,928	92	7,324	93	6,273	97	94
6-Aug	3,300	95	3,465	91	2,825	92	3,528	95	4,189	98	2,930	97	3,294	93	5,928	92	7,324	93	6,291	97	94
7-Aug	3,306	95	3,564	93	2,855	93	3,564	96	4,189	98	2,930	97	3,312	94	5,934	93	7,324	93	6,321	97	95
8-Aug	3,313	95	3,627	95	2,882	94	3,584	96	4,189	98	2,943	97	3,337	94	5,988	93	7,324	93	6,351	98	95
9-Aug	3,331	95	3,651	95	2,915	95	3,602	97	4,213	98	2,955	98	3,373	95	6,024	94	7,324	93	6,351	98	96
10-Aug	3,345	96	3,696	97	2,933	95	3,626	97	4,219	98	2,961	98	3,391	96	6,102	95	7,324	93	6,352	98	96
11-Aug	3,388	97	3,716	97	2,933	95	3,650	98	4,249	99	2,967	98	3,415	96	6,144	96	7,324	93	6,354	98	97
12-Aug	3,412	98	3,728	97	2,945	96	3,662	98	4,249	99	2,967	98	3,421	97	6,192	97	7,324	93	6,366	98	97
13-Aug	3,418	98	3,729	98	2,975	97	3,692	99	4,255	99	2,979	98	3,433	97	6,207	97	7,324	93	6,374	98	97
14-Aug	3,418	98	3,729	98	2,981	97	3,704	99	4,267	100	2,979	98	3,439	97	6,243	97	7,324	93	6,398	99	98
15-Aug	3,438	99	3,761	98	2,999	98	3,704	99	4,267	100	2,986	99	3,445	97	6,261	98	7,324	93	6,428	99	98
Total count	3,488		3,824		3,075		3,728		4,285		3,028		3,541		6,412		7,840		6,486		

Note: N = daily cumulative weir count (number of Chinook salmon).

APPENDIX C. AGE COMPOSITIONS AND ESTIMATED INRIVER RETURN FROM KARLUK AND AYAKULIK RIVERS CHINOOK SALMON ESCAPEMENT BY TIME STRATUM, 2004-2005

Appendix C1.–Estimated inriver return of Chinook salmon by time stratum and age, Karluk River, 2004.

Year									
2004	1.1	1.2	1.3	1.4	1.5	2.2	2.3	2.4	Total
Through 30 May									
Females:									
Number sampled	0	0	2	19	3	0	0	1	25
Percent	0.0	0.0	6.9	65.5	10.3	0.0	0.0	3.4	86.2
SE Percent			4.6	8.6	5.5			3.3	6.3
Inriver Return at Weir	0	0	27	261	41	0	0	14	343
SE Return	0	0	18	34	22	0	0	13	25
Males:									
Number sampled	0	0	2	2	0	0	0	0	4
Percent	0.0	0.0	6.9	6.9	0.0	0.0	0.0	0.0	13.8
SE Percent			4.6	4.6					6.3
Inriver Return at Weir	0	0	27	27	0	0	0	0	55
SE Return	0	0	18	18	0	0	0	0	25
All:									
Number sampled	0	0	4	21	3	0	0	1	29
Percent	0.0	0.0	13.8	72.4	10.3	0.0	0.0	3.4	100.0
SE Percent			6.3	8.1	5.5			3.3	0.0
Inriver Return at Weir	0	0	55	288	41	0	0	14	398
SE Return	0	0	25	32	22	0	0	13	0
31 May - 5 June									
Females:									
Number sampled	0	0	1	1	1	0	0	0	3
Percent	0.0	0.0	20.0	20.0	20.0	0.0	0.0	0.0	60.0
SE Percent			20.0	20.0	20.0				24.4
Inriver Return at Weir	0	0	242	242	242	0	0	0	726
SE Return	0	0	241	241	241	0	0	0	296
Males:									
Number sampled	0	0	0	2	0	0	0	0	2
Percent	0.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0	40.0
SE Percent				24.4					24.4
Inriver Return at Weir	0	0	0	484	0	0	0	0	484
SE Return	0	0	0	296	0	0	0	0	296
All:									
Number sampled	0	0	1	3	1	0	0	0	5
Percent	0.0	0.0	20.0	60.0	20.0	0.0	0.0	0.0	100.0
SE Percent			20.0	24.4	20.0				0.0
Inriver Return at Weir	0	0	242	726	242	0	0	0	1,210
SE Return	0	0	241	296	241	0	0	0	0

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Year									
2004	1.1	1.2	1.3	1.4	1.5	2.2	2.3	2.4	Total
6 - 12 June									
Females:									
Number sampled	0	0	6	28	2	0	0	0	36
Percent	0.0	0.0	11.3	52.8	3.8	0.0	0.0	0.0	67.9
SE Percent			4.3	6.8	2.6				6.4
Inriver Return at Weir	0	0	177	826	59	0	0	0	1,062
SE Return	0	0	68	106	41	0	0	0	99
Males:									
Number sampled	1	0	6	8	2	0	0	0	17
Percent	1.9	0.0	11.3	15.1	3.8	0.0	0.0	0.0	32.1
SE Percent	1.9		4.3	4.9	2.6				6.4
Inriver Return at Weir	29	0	177	236	59	0	0	0	501
SE Return	29	0	68	76	41	0	0	0	99
All:									
Number sampled	1	0	12	36	4	0	0	0	53
Percent	1.9	0.0	22.6	67.9	7.5	0.0	0.0	0.0	100.0
SE Percent	1.9		5.7	6.4	3.6				0.0
Inriver Return at Weir	29	0	354	1,062	118	0	0	0	1,563
SE Return	29	0	89	99	56	0	0	0	0
13 - 19 June									
Females:									
Number sampled	0	1	4	13	0	0	0	0	18
Percent	0.0	2.6	10.3	33.3	0.0	0.0	0.0	0.0	46.2
SE Percent		2.5	4.9	7.5					8.0
Inriver Return at Weir	0	36	143	464	0	0	0	0	642
SE Return	0	35	68	105	0	0	0	0	111
Males:									
Number sampled	1	3	10	7	0	0	0	0	21
Percent	2.6	7.7	25.6	17.9	0.0	0.0	0.0	0.0	53.8
SE Percent	2.5	4.3	7.0	6.1					8.0
Inriver Return at Weir	36	107	357	250	0	0	0	0	750
SE Return	35	59	97	85	0	0	0	0	111
All:									
Number sampled	1	4	14	20	0	0	0	0	39
Percent	2.6	10.3	35.9	51.3	0.0	0.0	0.0	0.0	100.0
SE Percent	2.5	4.9	7.7	8.0					0.0
Inriver Return at Weir	36	143	500	714	0	0	0	0	1,392
SE Return	35	68	107	111	0	0	0	0	0

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Year									
2004	1.1	1.2	1.3	1.4	1.5	2.2	2.3	2.4	Total
20 - 26 June									
Females:									
Number sampled	0	1	12	16	0	0	0	0	29
Percent	0.0	1.9	23.1	30.8	0.0	0.0	0.0	0.0	55.8
SE Percent		1.9	5.7	6.3					6.8
Inriver Return at Weir	0	18	219	292	0	0	0	0	529
SE Return	0	18	54	60	0	0	0	0	64
Males:									
Number sampled	2	2	9	9	1	0	0	0	23
Percent	3.8	3.8	17.3	17.3	1.9	0.0	0.0	0.0	44.2
SE Percent	2.6	2.6	5.2	5.2	1.9				6.8
Inriver Return at Weir	37	37	164	164	18	0	0	0	420
SE Return	25	25	49	49	18	0	0	0	64
All:									
Number sampled	2	3	21	25	1	0	0	0	52
Percent	3.8	5.8	40.4	48.1	1.9	0.0	0.0	0.0	100.0
SE Percent	2.6	3.2	6.7	6.8	1.9				0.0
Inriver Return at Weir	37	55	383	456	18	0	0	0	949
SE Return	25	30	63	65	18	0	0	0	0
After 26 June									
Females:									
Number sampled	0	1	17	17	2	0	0	0	37
Percent	0.0	1.8	29.8	29.8	3.5	0.0	0.0	0.0	64.9
SE Percent		1.7	6.0	6.0	2.4				6.3
Inriver Return at Weir	0	35	600	600	71	0	0	0	1,307
SE Return	0	35	121	121	49	0	0	0	127
Males:									
Number sampled	0	3	12	5	0	0	0	0	20
Percent	0.0	5.3	21.1	8.8	0.0	0.0	0.0	0.0	35.1
SE Percent		2.9	5.4	3.7					6.3
Inriver Return at Weir	0	106	424	177	0	0	0	0	706
SE Return	0	59	108	75	0	0	0	0	127
All:									
Number sampled	0	4	29	22	2	0	0	0	57
Percent	0.0	7.0	50.9	38.6	3.5	0.0	0.0	0.0	100.0
SE Percent		3.4	6.6	6.4	2.4				0.0
Inriver Return at Weir	0	141	1,024	777	71	0	0	0	2,013
SE Return	0	68	133	129	49	0	0	0	0

Appendix C2.–Estimated inriver return of Chinook salmon by time stratum and age, Karluk River, 2005.

Year									
2005	1.1	1.2	1.3	1.4	1.5	2.2	2.3	2.4	Total
Through 19 June									
Females:									
Number sampled	0	0	4	4	0	1	2	2	13
Percent	0.0	0.0	19.0	19.0	0.0	4.8	9.5	9.5	61.9
SE Percent			8.7	8.7		4.7	6.5	6.5	10.8
Inriver Return at Weir	0	0	317	317	0	79	158	158	1,029
SE Return	0	0	145	145	0	79	108	108	179
Males:									
Number sampled	0	1	4	3	0	0	0	0	8
Percent	0.0	4.8	19.0	14.3	0.0	0.0	0.0	0.0	38.1
SE Percent		4.7	8.7	7.8					10.8
Inriver Return at Weir	0	79	317	238	0	0	0	0	634
SE Return	0	79	145	129	0	0	0	0	179
All:									
Number sampled	0	1	8	7	0	1	2	2	21
Percent	0.0	4.8	38.1	33.3	0.0	4.8	9.5	9.5	100.0
SE Percent		4.7	10.8	10.5		4.7	6.5	6.5	0.0
Inriver Return at Weir	0	79	634	554	0	79	158	158	1,663
SE Return	0	79	179	174	0	79	108	108	0
20 - 26 June									
Females:									
Number sampled	0	1	7	2	0	0	1	0	11
Percent	0.0	4.2	29.2	8.3	0.0	0.0	4.2	0.0	45.8
SE Percent		4.1	9.3	5.7			4.1		10.2
Inriver Return at Weir	0	28	194	56	0	0	28	0	305
SE Return	0	27	62	38	0	0	27	0	68
Males:									
Number sampled	1	4	3	5	0	0	0	0	13
Percent	4.2	16.7	12.5	20.8	0.0	0.0	0.0	0.0	54.2
SE Percent	4.1	7.6	6.8	8.3					10.2
Inriver Return at Weir	28	111	83	139	0	0	0	0	361
SE Return	27	51	45	55	0	0	0	0	68
All:									
Number sampled	1	5	10	7	0	0	1	0	24
Percent	4.2	20.8	41.7	29.2	0.0	0.0	4.2	0.0	100.0
SE Percent	4.1	8.3	10.1	9.3			4.1		0.0
Inriver Return at Weir	28	139	278	194	0	0	28	0	666
SE Return	27	55	67	62	0	0	27	0	0

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Year									
2005	1.1	1.2	1.3	1.4	1.5	2.2	2.3	2.4	Total
After 26 June									
Females:									
Number sampled	1	3	8	5	0	0	2	0	19
Percent	3.1	9.4	25.0	15.6	0.0	0.0	6.3	0.0	59.4
SE Percent	3.1	5.2	7.7	6.5			4.3		8.8
Inriver Return at Weir	77	231	617	386	0	0	154	0	1,466
SE Return	77	128	191	160	0	0	107	0	216
Males:									
Number sampled	1	2	4	5	0	1	0	0	13
Percent	3.1	6.3	12.5	15.6	0.0	3.1	0.0	0.0	40.6
SE Percent	3.1	4.3	5.9	6.5		3.1			8.8
Inriver Return at Weir	77	154	309	386	0	77	0	0	1,003
SE Return	77	107	146	160	0	77	0	0	216
All:									
Number sampled	2	5	12	10	0	1	2	0	32
Percent	6.3	15.6	37.5	31.3	0.0	3.1	6.3	0.0	100.0
SE Percent	4.3	6.5	8.6	8.3		3.1	4.3		0.0
Inriver Return at Weir	154	386	926	772	0	77	154	0	2,469
SE Return	107	160	213	204	0	77	107	0	0

Appendix C3.–Estimated inriver return of Chinook salmon by time stratum and age, Ayakulik River, 2004.

Year	Age								
2004	0.2	0.4	1.1	1.2	1.3	1.4	1.5	2.4	Total
Before 5 June									
Females:									
Number sampled	0	0	0	0	2	31	0	0	33
Percent	0.0	0.0	0.0	0.0	3.7	57.4	0.0	0.0	61.1
SE Percent					2.6	6.8			6.7
Inriver Return at Weir	0	0	0	0	372	5,762	0	0	6,134
SE Return	0	0	0	0	260	680	0	0	670
Males:									
Number sampled	0	0	0	1	3	17	0	0	21
Percent	0.0	0.0	0.0	1.9	5.6	31.5	0.0	0.0	38.9
SE Percent				1.8	3.1	6.4			6.7
Inriver Return at Weir	0	0	0	186	558	3,160	0	0	3,903
SE Return	0	0	0	185	315	639	0	0	670
All:									
Number sampled	0	0	0	1	5	48	0	0	54
Percent	0.0	0.0	0.0	1.9	9.3	88.9	0.0	0.0	0.0
SE Percent				1.8	4.0	4.3			0.0
Inriver Return at Weir	0	0	0	186	929	8,922	0	0	10,037
SE Return	0	0	0	185	399	432	0	0	0
6 - 12 June									
Females:									
Number sampled	0	0	0	0	5	23	2	0	30
Percent	0.0	0.0	0.0	0.0	10.6	48.9	4.3	0.0	63.8
SE Percent					4.5	7.3	2.9		7.0
Inriver Return at Weir	0	0	0	0	257	1,184	103	0	1,545
SE Return	0	0	0	0	109	177	71	0	170
Males:									
Number sampled	0	0	0	3	10	4	0	0	17
Percent	0.0	0.0	0.0	6.4	21.3	8.5	0.0	0.0	36.2
SE Percent				3.6	6.0	4.1			7.0
Inriver Return at Weir	0	0	0	154	515	206	0	0	875
SE Return	0	0	0	86	145	99	0	0	170
All:									
Number sampled	0	0	0	3	15	27	2	0	47
Percent	0.0	0.0	0.0	6.4	31.9	57.4	4.3	0.0	100.0
SE Percent				3.6	6.8	7.2	2.9		0.0
Inriver Return at Weir	0	0	0	154	772	1,390	103	0	2,420
SE Return	0	0	0	86	165	175	71	0	0

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Year	Age								
2004	0.2	0.4	1.1	1.2	1.3	1.4	1.5	2.4	Total
13 - 19 June									
Females:									
Number sampled	0	0	0	0	9	17	2	0	28
Percent	0.0	0.0	0.0	0.0	18.4	34.7	4.1	0.0	57.1
SE Percent					5.6	6.8	2.8		7.1
Inriver Return at Weir	0	0	0	0	1,151	2,174	256	0	3,580
SE Return	0	0	0	0	349	429	178	0	446
Males:									
Number sampled	0	0	3	1	8	8	1	0	21
Percent	0.0	0.0	6.1	2.0	16.3	16.3	2.0	0.0	42.9
SE Percent			3.4	2.0	5.3	5.3	2.0		7.1
Inriver Return at Weir	0	0	384	128	1,023	1,023	128	0	2,685
SE Return	0	0	216	127	333	333	127	0	446
All:									
Number sampled	0	0	3	1	17	25	3	0	49
Percent	0.0	0.0	6.1	2.0	34.7	51.0	6.1	0.0	100.0
SE Percent			3.4	2.0	6.8	7.2	3.4		0.0
Inriver Return at Weir	0	0	384	128	2,174	3,196	384	0	6,265
SE Return	0	0	216	127	429	450	216	0	0
20 - 26 June									
Females:									
Number sampled	0	0	0	0	6	12	1	0	19
Percent	0.0	0.0	0.0	0.0	15.4	30.8	2.6	0.0	48.7
SE Percent					5.8	7.4	2.5		8.0
Inriver Return at Weir	0	0	0	0	391	782	65	0	1,239
SE Return	0	0	0	0	148	189	65	0	205
Males:									
Number sampled	0	0	0	0	13	6	1	0	20
Percent	0.0	0.0	0.0	0.0	33.3	15.4	2.6	0.0	51.3
SE Percent					7.6	5.8	2.5		8.0
Inriver Return at Weir	0	0	0	0	848	391	65	0	1,304
SE Return	0	0	0	0	193	148	65	0	205
All:									
Number sampled	0	0	0	0	19	18	2	0	39
Percent	0.0	0.0	0.0	0.0	48.7	46.2	5.1	0.0	100.0
SE Percent					8.0	8.0	3.6		0.0
Inriver Return at Weir	0	0	0	0	1,239	1,174	130	0	2,543
SE Return	0	0	0	0	205	204	90	0	0

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Year	Age								
2004	0.2	0.4	1.1	1.2	1.3	1.4	1.5	2.4	Total
27 June - 3 July									
Females:									
Number sampled	0	0	0	0	2	4	0	0	6
Percent	0.0	0.0	0.0	0.0	9.5	19.0	0.0	0.0	28.6
SE Percent					6.5	8.7			10.1
Inriver Return at Weir	0	0	0	0	225	451	0	0	676
SE Return	0	0	0	0	155	207	0	0	238
Males:									
Number sampled	0	0	0	0	6	8	1	0	15
Percent	0.0	0.0	0.0	0.0	28.6	38.1	4.8	0.0	71.4
SE Percent					10.1	10.8	4.7		10.1
Inriver Return at Weir	0	0	0	0	676	901	113	0	1,690
SE Return	0	0	0	0	238	256	112	0	238
All:									
Number sampled	0	0	0	0	8	12	1	0	21
Percent	0.0	0.0	0.0	0.0	38.1	57.1	4.8	0.0	100.0
SE Percent					10.8	11.0	4.7		0.0
Inriver Return at Weir	0	0	0	0	901	1,352	113	0	2,366
SE Return	0	0	0	0	256	261	112	0	0
After 3 July									
Females:									
Number sampled	0	0	0	0	5	3	0	0	8
Percent	0.0	0.0	0.0	0.0	29.4	17.6	0.0	0.0	47.1
SE Percent					11.3	9.5			12.4
Inriver Return at Weir	0	0	0	0	353	212	0	0	564
SE Return	0	0	0	0	136	113	0	0	149
Males:									
Number sampled	0	0	1	1	6	1	0	0	9
Percent	0.0	0.0	5.9	5.9	35.3	5.9	0.0	0.0	52.9
SE Percent			5.8	5.8	11.9	5.8			12.4
Inriver Return at Weir	0	0	71	71	423	71	0	0	635
SE Return	0	0	70	70	142	70	0	0	149
All:									
Number sampled	0	0	1	1	11	4	0	0	17
Percent	0.0	0.0	5.9	5.9	64.7	23.5	0.0	0.0	100.0
SE Percent			5.8	5.8	11.9	10.5			0.0
Inriver Return at Weir	0	0	71	71	776	282	0	0	1,199
SE Return	0	0	70	70	142	126	0	0	0

Appendix C4.–Estimated inriver return of Chinook salmon by time stratum and age, Ayakulik River, 2005.

Year	Age								
2005	0.2	0.4	1.1	1.2	1.3	1.4	1.5	2.4	Total
Through 12 June									
Females:									
Number sampled	0	0	0	0	1	1	0	0	2
Percent	0.0	0.0	0.0	0.0	6.7	6.7	0.0	0.0	13.3
SE Percent					6.6	6.6			9.0
Inriver Return at Weir	0	0	0	0	74	74	0	0	148
SE Return	0	0	0	0	74	74	0	0	100
Males:									
Number sampled	0	0	0	2	5	6	0	0	13
Percent	0.0	0.0	0.0	13.3	33.3	40.0	0.0	0.0	86.7
SE Percent				9.0	12.5	13.0			9.0
Inriver Return at Weir	0	0	0	148	371	445	0	0	964
SE Return	0	0	0	100	139	145	0	0	100
All:									
Number sampled	0	0	0	2	6	7	0	0	15
Percent	0.0	0.0	0.0	13.3	40.0	46.7	0.0	0.0	100.0
SE Percent				9.0	13.0	13.2			0.0
Inriver Return at Weir	0	0	0	148	445	519	0	0	1,112
SE Return	0	0	0	100	145	147	0	0	0
13 - 19 June									
Females:									
Number sampled	0	0	0	0	2	3	0	0	5
Percent	0.0	0.0	0.0	0.0	20.0	30.0	0.0	0.0	50.0
SE Percent					13.3	15.2			16.6
Inriver Return at Weir	0	0	0	0	495	743	0	0	1,238
SE Return	0	0	0	0	329	377	0	0	412
Males:									
Number sampled	0	0	0	1	0	4	0	0	5
Percent	0.0	0.0	0.0	10.0	0.0	40.0	0.0	0.0	50.0
SE Percent				10.0		16.3			16.6
Inriver Return at Weir	0	0	0	248	0	990	0	0	1,238
SE Return	0	0	0	247	0	404	0	0	412
All:									
Number sampled	0	0	0	1	2	7	0	0	10
Percent	0.0	0.0	0.0	10.0	20.0	70.0	0.0	0.0	100.0
SE Percent				10.0	13.3	15.2			0.0
Inriver Return at Weir	0	0	0	248	495	1,733	0	0	2,476
SE Return	0	0	0	247	329	377	0	0	0

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Year	Age								
2005	0.2	0.4	1.1	1.2	1.3	1.4	1.5	2.4	Total
20 - 26 June									
Females:									
Number sampled	0	1	0	3	8	5	1	0	18
Percent	0.0	3.6	0.0	10.7	28.6	17.9	3.6	0.0	64.3
SE Percent		3.5		5.9	8.6	7.3	3.5		9.2
Inriver Return at Weir	0	74	0	221	588	368	74	0	1,323
SE Return	0	73	0	122	178	151	73	0	188
Males:									
Number sampled	0	0	0	1	4	5	0	0	10
Percent	0.0	0.0	0.0	3.6	14.3	17.9	0.0	0.0	35.7
SE Percent				3.5	6.7	7.3			9.2
Inriver Return at Weir	0	0	0	74	294	368	0	0	735
SE Return	0	0	0	73	138	151	0	0	188
All:									
Number sampled	0	1	0	4	12	10	1	0	28
Percent	0.0	3.6	0.0	14.3	42.9	35.7	3.6	0.0	100.0
SE Percent		3.5		6.7	9.5	9.2	3.5		0.0
Inriver Return at Weir	0	74	0	294	882	735	74	0	2,058
SE Return	0	73	0	138	195	188	73	0	0
After 26 June									
Females:									
Number sampled	1	1	4	9	36	23	1	1	76
Percent	0.9	0.9	3.8	8.5	34.0	21.7	0.9	0.9	71.7
SE Percent	0.9	0.9	1.8	2.7	4.5	3.9	0.9	0.9	4.3
Inriver Return at Weir	25	25	102	229	915	585	25	25	1,932
SE Return	25	25	49	72	122	106	25	25	116
Males:									
Number sampled	0	0	2	6	12	10	0	0	30
Percent	0.0	0.0	1.9	5.7	11.3	9.4	0.0	0.0	28.3
SE Percent			1.3	2.2	3.0	2.8			4.3
Inriver Return at Weir	0	0	51	152	305	254	0	0	762
SE Return	0	0	35	60	82	75	0	0	116
All:									
Number sampled	1	1	6	15	48	33	1	1	106
Percent	0.9	0.9	5.7	14.2	45.3	31.1	0.9	0.9	100.0
SE Percent	0.9	0.9	2.2	3.3	4.8	4.4	0.9	0.9	0.0
Inriver Return at Weir	25	25	152	381	1,220	839	25	25	2,694
SE Return	25	25	60	90	128	119	25	25	0

APPENDIX D. CHINOOK SALMON ANGLER CENSUS DATA FROM KARLUK AND AYAKULIK RIVERS, 2004-2005

Appendix D1.—Chinook salmon angler census data from Karluk River weir and Portage, 2004.

2004	Angler Type		Residency[a]					
	Guided	Unguided	Alaska resident		Non Alaska resident		Unknown	Total
			Local	Nonlocal	U.S.	Alien		
Anglers	261	33	9	16	240	29	145	439
Effort[b]	450	134	32	34	327	191	21	605
Harvest	452	37	4	22	413	50	231	720
Release	1,142	108	2	41	913	294	109	1,359

[a] Local = an Alaska resident who lives on Kodiak Island; Nonlocal = an Alaska resident who does not live on Kodiak Island; U.S. = a non Alaskan who is a citizen of the United States; Alien = a non Alaskan who is not a citizen of the United States, and who does not have a petition for naturalization pending before the district court. Residency undetermined for some anglers.

[b] Units of effort = angler-days.

Appendix D2.—Chinook salmon angler census data from Karluk River weir and Portage, 2005.

2005	Angler Type		Residency[a]					
	Guided	Unguided	Alaska resident		Non Alaska resident		Unknown	Total
			Local	Nonlocal	U.S.	Alien		
Anglers	249	19	3	11	166	88	0	268
Effort[b]	571	64	8	34	194	399	0	635
Harvest	180	7	0	10	140	37	0	187
Release	549	27	2	50	386	138	0	576

[a] Local = an Alaska resident who lives on Kodiak Island; Nonlocal = an Alaska resident who does not live on Kodiak Island; U.S. = a non Alaskan who is a citizen of the United States; Alien = a non Alaskan who is not a citizen of the United States, and who does not have a petition for naturalization pending before the district court. Residency undetermined for some anglers.

[b] Units of effort = angler-days.

Appendix D3.—Chinook salmon angler census data from Ayakulik River weir and Bare Creek, 2004.

2004	Angler Type		Residency[a]					
	Guided	Unguided	Alaska resident		Non Alaska resident		Unknown	Total
			Local	Nonlocal	U.S.	Alien		
Anglers	114	158	46	34	150	31	11	272
Effort[b]	510	913	199	165	741	307	11	1,423
Harvest	153	252	68	37	237	61	2	405
Release	3,736	3,681	1,108	540	5,002	767	0	7,417

[a] Local = an Alaska resident who lives on Kodiak Island; Nonlocal = an Alaska resident who does not live on Kodiak Island; U.S. = a non Alaskan who is a citizen of the United States; Alien = a non Alaskan who is not a citizen of the United States, and who does not have a petition for naturalization pending before the district court. Residency undetermined for some anglers.

[b] Units of effort = angler-days.

Appendix D4.—Chinook salmon angler census data from Ayakulik River weir and Bare Creek, 2005.

2005	Angler Type		Residency[a]					
	Guided	Unguided	Alaska resident		Non Alaska resident		Unknown	Total
			Local	Nonlocal	U.S.	Alien		
Anglers	44	87	8	21	77	25	0	131
Effort[b]	315	825	89	150	543	358	0	1,140
Harvest	71	94	9	27	85	44	0	165
Release	450	1,103	14	118	1,247	174	0	1,553

[a] Local = an Alaska resident who lives on Kodiak Island; Nonlocal = an Alaska resident who does not live on Kodiak Island; U.S. = a non Alaskan who is a citizen of the United States; Alien = a non Alaskan who is not a citizen of the United States, and who does not have a petition for naturalization pending before the district court. Residency undetermined for some anglers.

[b] Units of effort = angler-days.

APPENDIX E. AGE COMPOSITIONS FROM SPAWNED OUT CHIGNIK RIVER CHINOOK SALMON, 2004-2005

Appendix E1.—Age composition and mean length-at-age of spawned out Chignik River Chinook salmon, 2004.

	1.1	1.2	1.3	1.4	1.5	2.1	unkn	Total
2004[a]								
Females:								
Number sampled		1	6	3			7	17 [b]
Percent	0.0	3.8	23.1	11.5	0.0	0.0		42.5
SE Percent		3.8	8.4	6.4				7.9
Mean Length		868	879	844			809	845
Std Dev Length			62	27			98	75
Minimum Length		868	812	813			631	631
Maximum Length		868	942	864			910	942
Males:								
Number sampled	1	3	7	5			7	23 [b]
Percent	3.8	11.5	26.9	19.2	0.0	0.0		57.5
SE Percent	3.8	6.4	8.9	7.9				7.9
Mean Length	697	682	862	912			995	878
Std Dev Length		49	85	166			139	153
Minimum Length	697	626	753	619			885	619
Maximum Length	697	716	1022	1006			1266	1266
All:								
Number sampled	1	4	13	8	0	0	14	40 [b]
Percent	3.8	15.4	50.0	30.8	0.0	0.0		100.0
SE Percent	3.8	7.2	10.0	9.2				0.0
Mean Length	697	729	870	887			902	864
Std Dev Length		101	72	131			151	126
Minimum Length	697	626	753	619			631	619
Maximum Length	697	868	1022	1006			1266	1266

Note: unkn = unknown, fish for which age was not determined.

[a] Samples taken from carcasses of spawned-out fish collected at the weir between 1–15 September.

[b] Female, male and total statistics include 6, 6, and 12 fish, respectively, for which age was not determined.

Appendix E2.–Age composition and mean length-at-age of spawned out Chignik River Chinook salmon, 2005.

	1.1	1.2	1.3	1.4	1.5	2.4	unkn	Total
2005[a]								
Females:								
Number sampled			4	2		1	5	12 [b]
Percent	0.0	0.0	36.4	18.2	0.0	9.1		57.1
SE Percent			15.2	12.2		9.1		11.1
Mean Length			817	919		881	830	845
Std Dev Length			23	41			22	44
Minimum Length			791	890		881	796	791
Maximum Length			839	948		881	856	948
Males:								
Number sampled			3	1			5	9 [b]
Percent	0.0	0.0	27.3	9.1	0.0	0.0		42.9
SE Percent			14.1	9.1				11.1
Mean Length			891	1100			960	952
Std Dev Length			19				84	88
Minimum Length			873	1100			860	860
Maximum Length			911	1100			1043	1100
All:								
Number sampled	0	0	7	3	0	1	10	21 [b]
Percent	0.0	0.0	63.6	27.3	0.0	9.1		100.0
SE Percent			15.2	14.1		9.1		0.0
Mean Length			849	979		881	895	891
Std Dev Length			44	108			90	85
Minimum Length			791	890		881	796	791
Maximum Length			911	1100		881	1043	1100

Note: unkn = unknown, fish for which age was not determined.

[a] Samples taken from carcasses of spawned-out fish collected at the weir between 13 August–3 September.

[b] Female, male and total statistics include 5, 5, and 10 fish, respectively, for which age was not determined.