Fishery Data Series No. 14-37

Chinook Salmon Creel Survey and Inriver Gillnetting Study, Lower Kenai River, Alaska, 2012

by

Jeff Perschbacher

September 2014

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

Symbols and Abbreviations

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

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

FISHERY DATA SERIES NO. 14-37

CHINOOK SALMON CREEL SURVEY AND INRIVER GILLNETTING STUDY, LOWER KENAI RIVER, ALASKA, 2012

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ABSTRACT

Sport-angler effort, catch, and harvest of early- and late-run Chinook salmon (*Oncorhynchus tshawytscha*) were estimated from a creel survey conducted on the lower Kenai River 16 May–21 June (early run) and 1–18 July (late run) 2012. Emergency orders restricted harvest of Chinook salmon measuring 20–55 inches total length during the early run (15–21 June) and late run (10–18 July) before closing to all Chinook salmon harvest for the remainder of each run. During the early run, anglers caught 471 (SE 109) and harvested 316 (SE 93) Chinook salmon with 20,681 (SE 1,483) angler-hours of effort. Guided anglers accounted for 65% of effort and 73% of harvest; the remaining effort and harvest were unguided. The estimated age composition of harvested early-run Chinook salmon was 2.6% age-1.2 fish, 23.7% age-1.3 fish, and 73.7% age-1.4 fish. During the late run, anglers caught 1,250 (SE 160) and harvested 103 (SE 52) Chinook salmon with 32,354 (SE 2,671) angler-hours of effort. Guided anglers accounted for 63% of effort and 57% of harvest; the remaining effort and harvest were unguided. The age composition of harvested late-run Chinook salmon was not estimated due to low sample size. A standardized inriver gillnetting program estimated species catch rates and composition near the Chinook salmon sonar site 16 May–15 August 2012. The early-run inriver gillnetting program caught 104 Chinook salmon and 934 sockeye salmon. The estimated age composition of early-run Chinook salmon was 4.9% age-1.1 fish, 8.5% age-1.2 fish, 35.4% age-1.3 fish, 50.0% age-1.4 fish, and 1.2% age-1.5 fish. The late-run inriver gillnetting program caught 472 Chinook salmon, 3,548 sockeye salmon, 77 coho salmon, 3 pink salmon, and 6 Dolly Varden. The estimated age composition of late-run Chinook salmon was 1.7% age-1.1 fish, 9.9% age-1.2 fish, 40.1% age-1.3 fish, 44.4% age-1.4 fish, and 3.9% age-1.5 fish.

Key words: Kenai River, *Oncorhynchus tshawytscha*, Chinook salmon, creel survey, effort, harvest, gillnet, CPUE, age composition.

INTRODUCTION

The Kenai River (Figure 1) supports the largest freshwater sport fishery in Alaska. Anglers fish for Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), pink salmon (*O. gorbuscha*), Dolly Varden (*Salvelinus malma*), and rainbow trout (*O. mykiss*). The Kenai River Chinook salmon fishery between the Warren Ames Bridge (river mile [RM] 5.2) and Soldotna Bridge (RM 21.1), and a standardized inriver gillnetting study (approximately RM 8.5) are the subject of this report (Figure 2).

Chinook salmon returning to the Kenai River exhibit 2 distinct run timing patterns: early (late April–late June) and late (late June–early August) (Bendock and Alexandersdottir 1992; Burger et al. 1985; Reimer 2013). For management purposes, the early run is composed of all Chinook salmon entering the river before 1 July and the late run is composed of all fish entering on or after 1 July. Sport fish anglers value fish from both runs because of their large size, especially late-run fish, which average approximately 18 kg (40 lb) and can exceed 36 kg (80 lb). The world record sport-caught Chinook salmon (44.1 kg; 97 lb 4 oz) was harvested from the Kenai River in May 1985.

The Alaska Department of Fish and Game (ADF&G) implemented a creel survey in 1974 in response to an increase in the number of boat anglers targeting Chinook salmon, and to monitor the age, sex, and length (ASL) composition of harvested Chinook salmon. Angler effort and harvest increased through 1988 but declined in the early 1990s as well as in the past few years because of low Chinook salmon runs and fishery restrictions (Figures 3–4). Beginning in 1981, separate effort and harvest estimates have been produced for guided and unguided anglers (Figures 3–4).

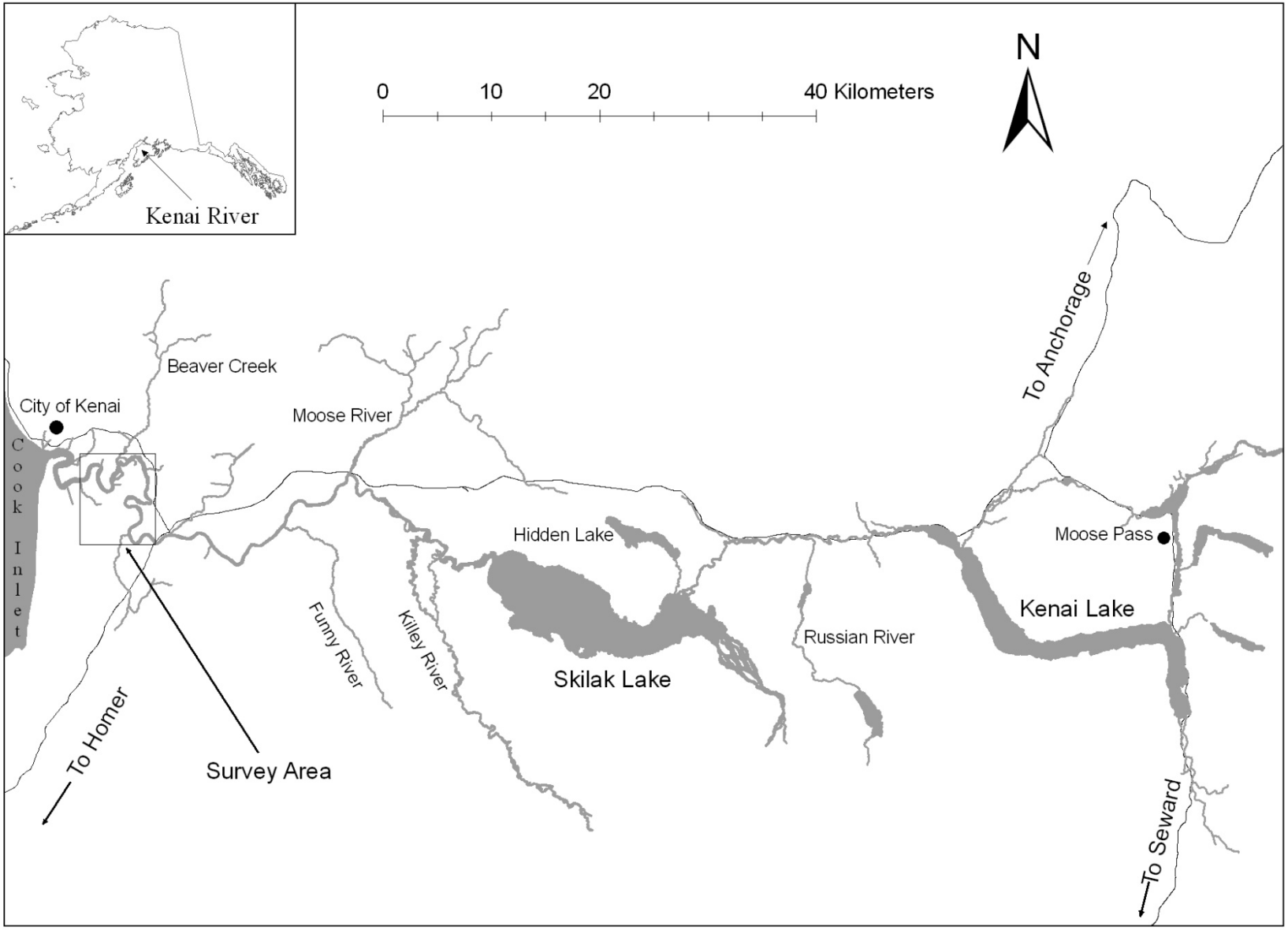

Figure 1.–Kenai River drainage on the Kenai Peninsula in Southcentral Alaska.

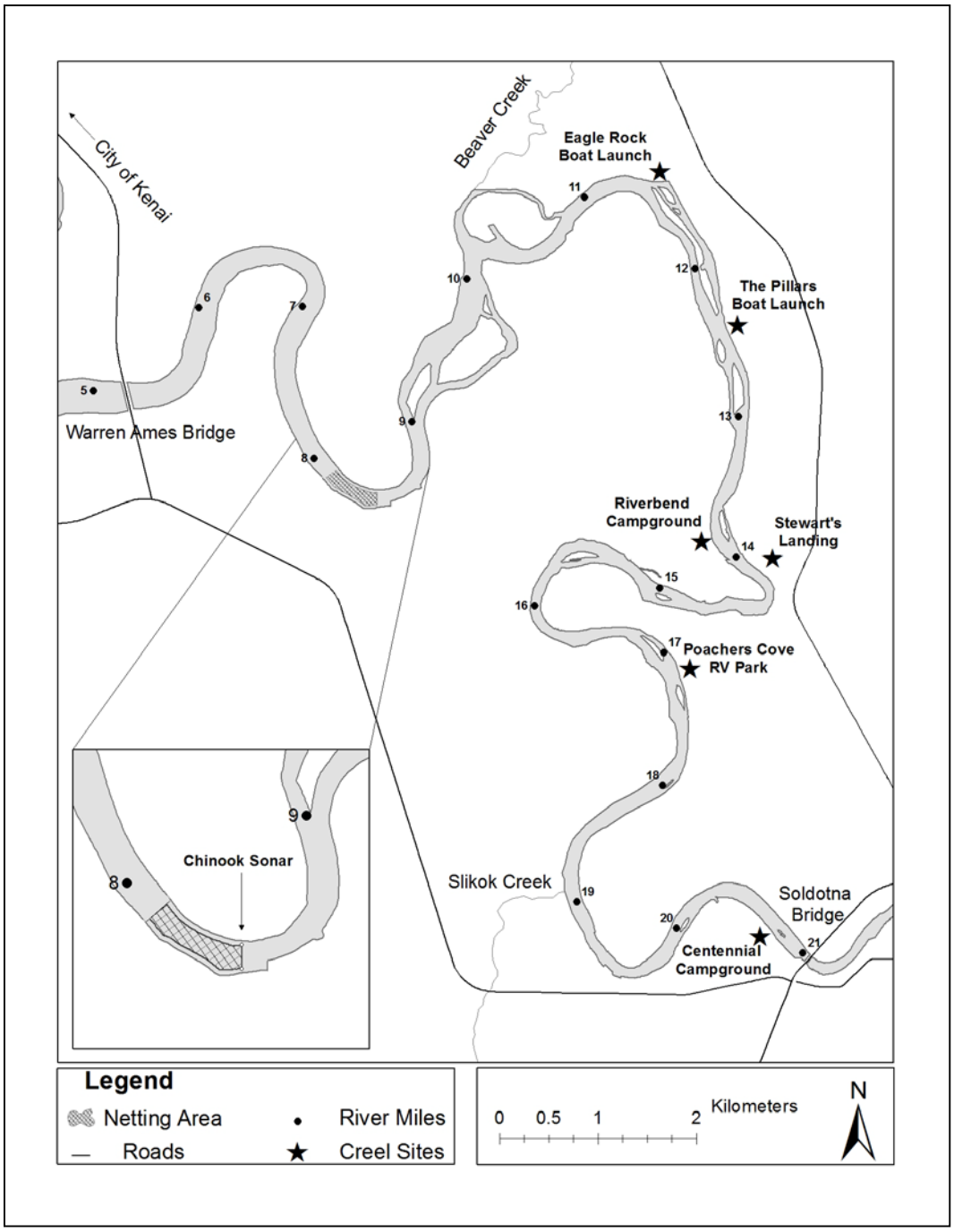

Figure 2.–Lower Kenai River from Warren Ames Bridge (RM 5.2) to Soldotna Bridge (RM 21.1).

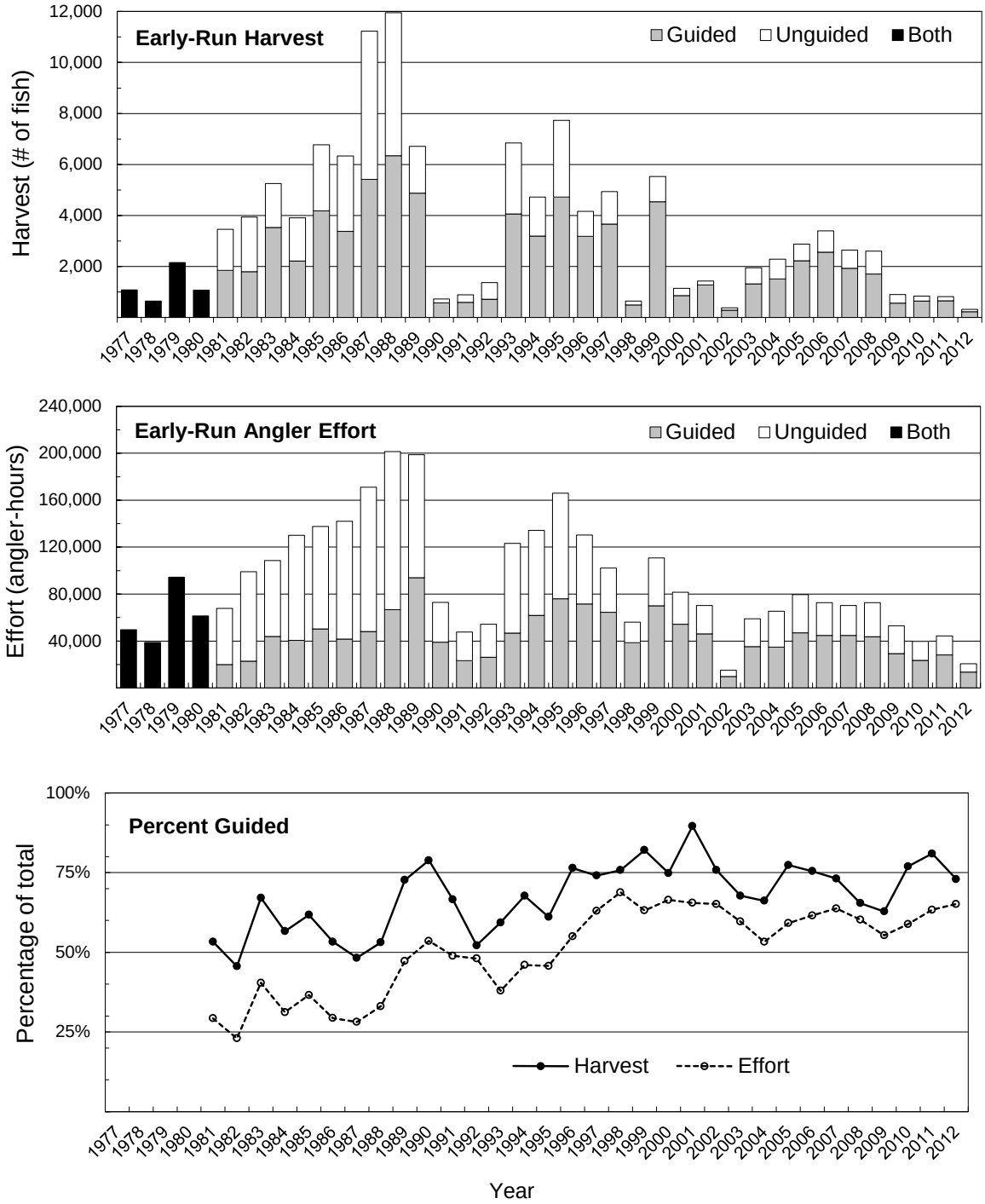

Figure 3.–Guided and unguided sport harvest (top), angler effort (middle), and percent of guided anglers (bottom) from ADF&G creel surveys for the early-run Kenai River Chinook salmon fishery between Soldotna Bridge and Warren Ames Bridge, 1977–2012.

Sources: Conrad and Hammarstrom (1987); Eskelin (2007, 2009-2010); Hammarstrom (1977-1981, 1988-1994); Hammarstrom et al. (1985); Hammarstrom and Larson (1982-1984, 1986); King (1996-1997); Marsh (1999, 2000); Perschbacher (2012a-d); Reimer (2003, 2004a-b, 2007); Reimer et al. (2002); and Schwager-King (1995).

Note: Prior to 1981, there was no distinction between guided and unguided anglers.

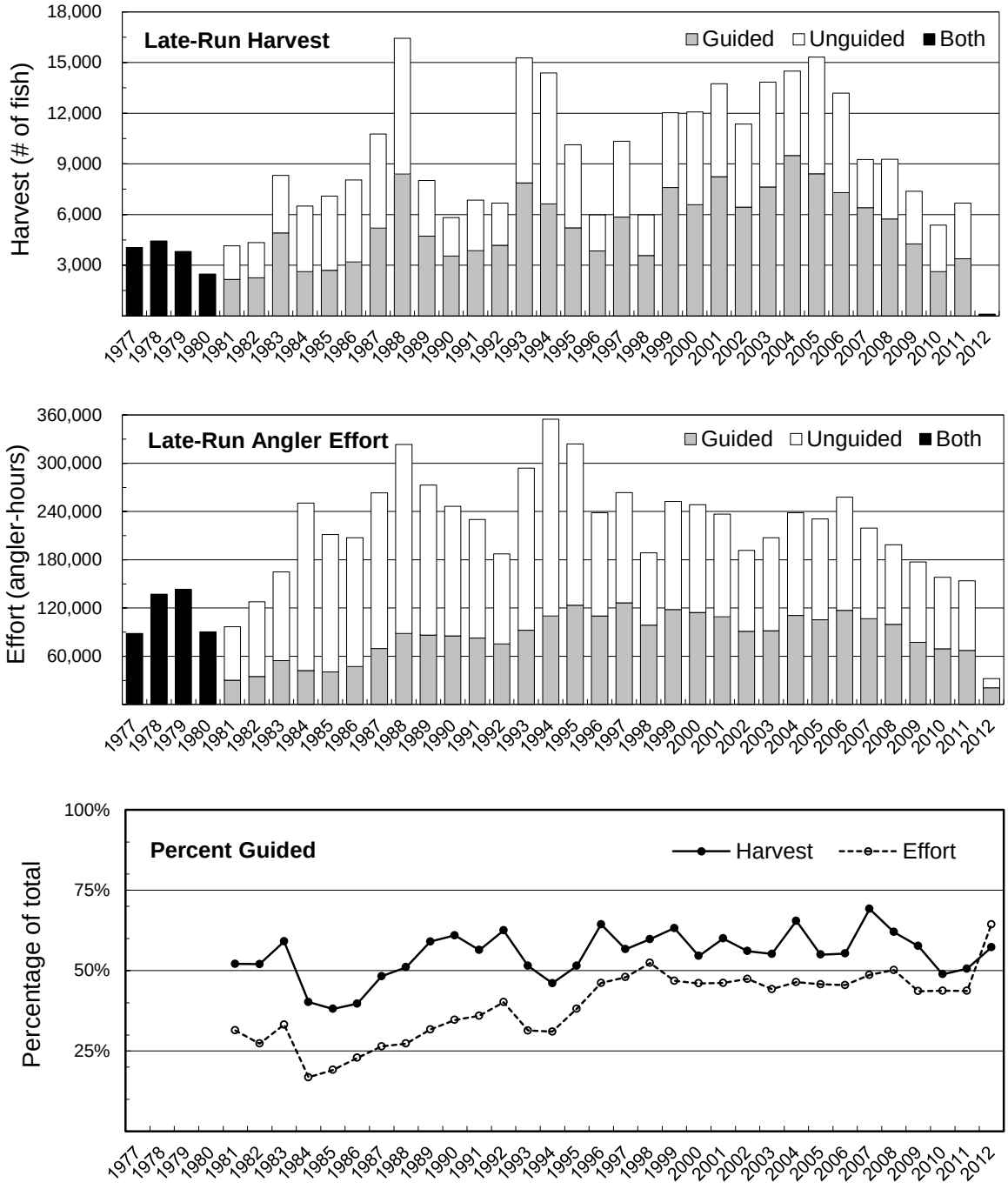

Figure 4.–Guided and unguided sport harvest (top), angler effort (middle), and percent of guided anglers (bottom) from ADF&G creel surveys for the late-run Kenai River Chinook salmon fishery between Soldotna Bridge and Warren Ames Bridge, 1977–2012.

Sources: Conrad and Hammarstrom (1987); Eskelin (2007, 2009-2010); Hammarstrom (1977-1981, 1988-1994); Hammarstrom et al. (1985); Hammarstrom and Larson (1982-1984, 1986); King (1996-1997); Marsh (1999, 2000); Perschbacher (2012a-d); Reimer (2003, 2004a-b, 2007); Reimer et al. (2002); and Schwager-King (1995).

Note: Prior to 1981, there was no distinction between guided and unguided anglers.

In 1979, ADF&G began monitoring the ASL composition of the inriver run by implementing an inriver gillnetting program. Inriver gillnetting was standardized in 1998 to include catch rates near the Chinook salmon sonar site at RM 8.5 and further standardized in 2002 to include species composition. The creel survey and inriver gillnetting programs coupled with the Chinook salmon sonar project are critical to inseason management and development of management plans and escapement goals for Kenai River Chinook salmon.

MANAGEMENT PLANS

The Alaska Board of Fisheries (BOF) has adopted separate management plans for the early and late Kenai River Chinook salmon runs. Management within these plans utilizes estimates of inriver run and harvest. Estimates of inriver run are obtained with sonar (Miller et al. 2011) while estimates of harvest are obtained from creel surveys. Previous Kenai River Chinook salmon creel surveys are published in Conrad and Hammarstrom (1987); Eskelin (2007, 2009-2010); Hammarstrom (1977-1981, 1988-1994); Hammarstrom et al. (1985); Hammarstrom and Larson (1982-1984, 1986); King (1996-1997); Marsh (1999, 2000); Perschbacher (2012a-d); Reimer (2003, 2004a-b, 2007); Reimer et al. (2002); and Schwager-King (1995).

The early run is managed to attain an optimal escapement goal (OEG) of 5,300 to 9,000 Chinook salmon. If the spawning escapement is projected to exceed 9,000 fish, the fishery is liberalized to allow bait. If the spawning escapement is projected to be less than 5,300 fish, ADF&G closes the fishery or implements more conservative regulations (adopted by BOF) that restrict the harvest of Chinook salmon less than 55 inches total length (TL). In March 2003, BOF introduced a slot limit (harvest restricted between minimum and maximum sizes) into the *Kenai River and Kasilof River Early-Run King Salmon Conservation Management Plan* (Alaska Administrative Code 5 AAC 57.160). Under the slot limit, anglers were allowed to retain Chinook salmon less than 44 inches TL or 55 inches TL or greater until 1 July below the Soldotna Bridge and until 15 July above the Soldotna Bridge. This change was implemented to protect early-run Chinook salmon that spend 5 winters in salt water. In March 2008, BOF liberalized the slot limit by raising the lower end from 44 inches TL to 46 inches TL. The recent modification to the slot limit was implemented to allow more harvest of younger Chinook salmon while continuing to protect those that spend 5 winters in salt water.

Management of the late-run Chinook salmon sport fishery is complex because multiple fisheries harvest Chinook salmon prior to the inriver sport fishery. The inriver late-run Chinook salmon sport fishery is managed under the *Kenai River Late-Run King Salmon Management Plan* (Alaska Administrative Code 5 AAC 21.359 updated through register 174), which mandates the late run be managed to achieve a spawning escapement of 17,800 to 35,700 Chinook salmon.

FISHING REGULATIONS

Regulations for the Chinook salmon sport fishery in the Kenai River are complex. Although fish do not enter the river in appreciable numbers until mid-May, the Chinook salmon season is open 1 January through 31 July. The area open to Chinook salmon fishing extends from the outlet of Skilak Lake to Cook Inlet, with the exception of the confluence areas of Slikok Creek (RM 18.9), Funny River (RM 30.4), Moose River (RM 36.4), and the Lower Killey River (RM 44.0) (Figures 1–2). The Slikok Creek, Lower Killey River, and Funny River confluence areas are closed from 1 January through 31 July; the Moose River confluence area is closed from 15 May through 31 July. The portion of the Kenai River between the Upper Killey River and the

outlet of Skilak Lake is closed to all fishing 2 May through 10 June. In addition, the area between Centennial Campground (RM 20.3) and the Soldotna Bridge (RM 21.1) (Figure 2), and the area around Morgan's Hole (approximately RM 31) are closed to fishing from boats for the entire Chinook salmon fishing season. The confluence areas restrict Chinook salmon fishing based on telemetry studies in the early 1980s and early 1990s when early-run Chinook salmon were observed to hold in these areas into July before ascending tributaries to spawn (McKinley et al. 2002).

The daily bag and possession limits for Kenai River Chinook salmon are 1 per day, 20 inches TL or longer, or 10 Chinook salmon measuring less than 20 inches TL per day. The annual limit is 2 Chinook salmon either measuring 28 inches TL or longer prior to 1 July, or 20 inches TL or longer from 1 July through 31 July. Chinook salmon measuring 46 inches TL to 55 inches TL may not be retained before 1 July downstream of the Soldotna Bridge or before 15 July upstream of the Soldotna Bridge. A person who retains a Chinook salmon 20 inches TL or longer is prohibited from fishing from a boat in the Kenai River downstream of Skilak Lake for the remainder of that day. The use of multiple hooks and treble hooks is prohibited in the early- and late-run fisheries. During the early-run fishery, use of bait is not allowed, whereas bait is allowed during the late-run fishery. On Sundays and Mondays, only unguided fishing is allowed, and on Mondays, unguided boat anglers may only fish from nonmotorized vessels downstream of the outlet of Skilak Lake.

Kenai River Chinook salmon 55 inches TL or greater must be "sealed" within 3 days of harvest at the Soldotna ADF&G office. The seal consists of a numbered tag that is affixed to the lower jaw after ASL data are recorded and a sample tissue is collected for genetic analysis. In addition, an angler interview is conducted to collect information regarding the harvest of the largest Kenai River Chinook salmon.

There are additional restrictions for fishing guides and guided anglers. Guided anglers are only allowed to fish from 0600 to 1800 hours. Guides are also prohibited from personally fishing while conducting clients and are prohibited from conducting clients on Sundays and Mondays, with the exception of Memorial Day, and a designated Sunday in June for the benefit of the Wounded Warriors Project.

To achieve escapement goals during 2012, the early- and late-run Chinook salmon sport fisheries, personal use fisheries (non-retention of Chinook salmon), and eastside setnet (ESSN) commercial fisheries were restricted inseason by emergency orders to limit harvest of Chinook salmon. During the early run, the Kenai River drainage from the mouth upstream to Skilak Lake, and the Moose River from its confluence with the Kenai River upstream to the Sterling Highway bridge, were closed to harvest of Chinook salmon 20–55 inches TL from 15 June through 21 June. These areas became closed to all Chinook salmon fishing from 22 June through 30 June. During the late run, the Kenai River drainage upstream of the Slikok Creek confluence area (RM 18.9) was closed to harvest of Chinook salmon 20–55 inches TL, and the use of bait was prohibited upstream of the Kenai River mouth 1 July through 9 July. The size restriction (20–55 inches TL) of harvested Chinook salmon was imposed river-wide 10 July through 18 July before the fishery was closed to all Chinook salmon fishing 19 July through 31 July. This was the first time that the late-run Chinook salmon sport fishery was closed, resulting in a closure of the ESSN fishery as outlined in the *Kenai River Late-Run King Salmon Management Plan.*

OBJECTIVES

Objectives for the 2012 study were as follows:

1) Estimate catch and harvest[1] of Chinook salmon by the sport fishery in the mainstem Kenai River between the Warren Ames and Soldotna bridges from 16 May through 30 June (early run) and from 1 July through 31 July (late run) such that the relative precision of the estimates for each run is within 20% or 1,000 fish of the true value 95% of the time.

2) Estimate the proportion by age of the Chinook salmon population passing the Chinook salmon sonar site (RM 8.5) from 16 May through 15 August such that all age-proportion estimates for each run are within 10 percentage points of the true values 95% of the time[2].

3) Estimate the proportion by age of Chinook salmon harvested by the sport fishery in the mainstem Kenai River downstream from the Soldotna Bridge such that all age-proportion estimates for each run are within 20 percentage points of the true values 80% of the time.

In addition to the objectives outlined above, the project was responsible for completing the following tasks[3]:

1) Estimate by run the total sport angler effort in angler-hours. Precision of the effort estimates is driven by that of the catch and harvest estimates (Objective 1).

2) Estimate daily catch per unit effort (CPUE) of Chinook salmon captured in inriver gillnets at RM 8.5. Precision of the CPUE estimates is driven by that of the Chinook salmon proportion estimates by age (Objective 2).

3) Calculate the proportion of fish captured in the inriver drift gillnets that are Chinook salmon.

4) Examine Chinook salmon sampled from the sport harvest and the inriver drift gillnets for external sexual characteristics, presence or absence of the adipose fin, and presence of a radio tag.

5) Collect tissue samples for genetic analysis from Kenai River Chinook salmon sampled from inriver gillnets and the sport fish harvest.

6) Insert esophageal radio transmitters into Chinook salmon captured in inriver gillnets from 16 May through 15 August in conjunction with the *Kenai River Chinook Salmon Abundance and Migratory Timing Study* (A. Reimer, Fishery Biologist, ADF&G Division of Sport Fish, Soldotna, personal communication).

7) Collect Secchi disk and water temperature readings midchannel at RM 15.3 during creel survey sampling days and collect daily Secchi disk readings at RM 8.5.

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[1] Harvest is the number of fish caught and retained, whereas catch is the total number of fish caught (including those intentionally released).

[2] The inriver gillnetting study was extended through 15 August in 2012 due to later than average run timing of late-run Chinook salmon.

[3] Tasks are of secondary importance and collected as ancillary information.

METHODS

CREEL SURVEY

A stratified, 2-stage roving-access creel survey (Bernard et al. 1998) was employed to estimate sport fishing effort, catch, and harvest of Chinook salmon from the Warren Ames Bridge (RM 5.2) to the Soldotna Bridge (RM 21.1) (Figure 2). Although the 2012 creel survey was planned for 16 May–30 June and 1–30 July, fishery closures restricted the creel survey to 16 May–21 June and 1–18 July. First-stage sampling units were days. The unguided angler-day was assumed to be 20 h long (0400 to 2400 hours), whereas the guided angler-day was 12 h long (0600 to 1800 hours) by regulation. Daily catch and harvest were estimated as the product of effort (angler-hours) and CPUE or harvest per unit effort (HPUE). Second-stage units for estimating angler effort and CPUE or HPUE were periodic angler counts and angler trips. Angler trips were sampled by interviewing anglers at the end of their fishing trips.

Stratification accounted for the geographical, temporal, and regulatory factors affecting the fishery. Because significant harvest below the sonar site would affect inriver run and escapement estimates, angler counts were geographically stratified into 2 areas: 1) between the Soldotna Bridge and the Chinook salmon sonar site and 2) between the Chinook salmon sonar site and the Warren Ames Bridge. Angler interviews did not include this level of stratification because past attempts to estimate catch and harvest downstream of the sonar site using geographically stratified angler interviews were ineffective (Marsh 2000). Therefore, catch and harvest downstream of the sonar site are based on estimated effort downstream of the sonar site, and CPUE and HPUE are assumed constant throughout the study area.

Because the harvest and catch rates of anglers can differ by time and by whether or not they are guided, the creel survey was temporally stratified by week and day type (weekday or weekends and holidays) (King 1996-1997; Schwager-King 1995), and by angler type (guided or unguided). "Late-run Mondays" (for which unguided angler effort, catch, and harvest are generated based on an "index" angler count and ad hoc method) were also included as day-type strata in 2011and 2012 because of an increasing trend in harvest estimates (Perschbacher 2012a)[4]. The index conversion factor of 78%, estimated in 2001 to generate estimates for the years 2002–2008, was recalibrated to 52% in 2011 as a result of including late-run Mondays into the creel survey sampling design during the years 2009–2010 (Perschbacher 2012c). The new conversion factor of 52% is based on average effort in 2009–2010 during the index period (0800–1400 hours) in relation to the daily mean angler effort. The selection of CPUE and HPUE from plotted creel survey estimates versus day (with angler interviews) was found to be a reliable substitution when angler interviews were unavailable on late-run Mondays. The sampling strata used for conducting Kenai River Chinook salmon angler counts and estimating creel statistics are presented in Table 1.

Two of 4 available weekdays and both weekend days were sampled each week the fishery was open to Chinook salmon fishing. An exception was the week of 24–30 May, when 2 days were selected randomly from the 3 weekend or holiday days available. The early run was composed of 24 strata. The late run was composed of 16 strata.

[4] See "Angler Effort, Catch, and Harvest on Mondays" in the Data Analysis section below for an explanation of Monday angler counts.

Water clarity was measured to the nearest 0.05 m with a Secchi disk, and temperature was measured to the nearest 0.1°F twice daily near midchannel at RM 15.3.

Table 1.–Sampling strata used for conducting Kenai River Chinook salmon angler counts and estimating creel statistics, 2012.

Type	Number	Description	
Geographic[a]	2	Warren Ames Bridge (RM 5.1) to Chinook salmon sonar site (RM 8.5)	
		Chinook salmon sonar site (RM 8.5) to Soldotna Bridge (RM 21.1)	
Temporal[b]	6	Early run:	16–20 May, 22–28 May, 29 May–3 June, 5–10 June, 12–17 June, 19–21 June
	4	Late run:	1 July, 3–8 July, 10–15 July, 17–18 July
Day type[c]	3	Weekdays	
		Weekends and holidays	
		Late-run Mondays	
Angler type	2	Guided	
		Unguided	

[a] Used for angler counts only.

[b] The early- and late-run Chinook salmon sport fisheries were closed 22–30 June and 19–31 July, respectively.

[c] Creel statistics for Mondays were not sampled but estimated using an index during the late run.

Angler Counts

Four angler counts were conducted during each sampled day. The first count began at the start of a randomly chosen hour (0400, 0500, 0600, 0700, or 0800 hours) with the remaining counts done every 5 hours. The schedule ensured that at least 2 angler counts were conducted while guided anglers were fishing (between 0600 and 1800 hours) each day.

Counts were conducted from a survey boat between the Soldotna Bridge and the Warren Ames Bridge, a distance of 15.9 mi. To maximize interview time, the direction (upstream or downstream) traveled to conduct angler counts was preselected to minimize total distance traveled and time spent conducting the count. Anglers were counted while driving the survey boat through the survey area, and counts were typically completed in less than 1 hour. Angler counts were treated as instantaneous counts; they reflect fishing effort at the time the count began. Anglers were counted if they were fishing or rigging their lines when observed during an angler count. Boats were counted as fishing if the boat contained at least 1 angler. Ten thumb counters were used to sum the following categories for each geographic stratum: 1) unguided power boats, 2) unguided drift boats, 3) guided power boats, 4) guided drift boats, 5) unguided anglers in power boats, 6) unguided anglers in drift boats, 7) guided anglers in power boats (excluding the guide), 8) guided anglers in drift boats (excluding the guide), 9) active boats[5], and

[5] Boats were counted as active boats if there were no anglers actively fishing from the boat but the boat and motor were in operation.

10) non-active boats[6]. Only categories 5–8 were required for this project; categories 1–4, and 9–10 were supplementary information for management purposes.

The boat count, completed between 0800 and 1400 hours for each Monday of the late run (restricted to unguided drift boats), was used to generate index estimates of effort, catch, and harvest.

Angler Interviews

Anglers who completed fishing were interviewed at the following boat launch sites (Figure 2):

1) Centennial Campground
2) Poacher's Cove
3) Riverbend Campground
4) Stewart's Landing
5) Pillars Boat Launch
6) Eagle Rock Campground

When the creel survey began on 16 May, interviews were conducted only at Pillar's Boat Launch. The other boat launch sites were added to the sampling schedule immediately after sufficient boat traffic was observed. Riverbend Campground was added to the sampling schedule on 30 May, Stewart's Landing was added on 2 June, Centennial Campground was added on 3 June, Poacher's Cove was added on 16 June, and Eagle Rock Campground was added on 6 July. Stewart's Landing is a private boat launch, and access to conduct angler interviews was granted during the early run only. For each day sampled, the first randomly scheduled boat count of the day was completed prior to conducting interviews (between 0500 and 0900 hours); therefore, there was a smaller probability of sampling the first 1–4 hours of the angler-day. The chance of introducing length-of-stay bias (Bernard et al. 1998) is small; in 2001, only 2% of the interviews were conducted from 0400 to 0859 hours, and the mean CPUE for that period was similar to the overall mean (Reimer 2003). This is typical across years.

There were 4 time intervals per day during which interviews could be conducted: 3 intervals between consecutive angler counts and 1 interval after the last angler count. During the early run, when there were more interview periods than active boat launches, each launch was sampled once before it was repeated in the daily schedule. During the late run, when there were more accessible boat launches than interview periods, access location was chosen with replacement from the locations available. Time and boat launch were paired randomly.

The following information was recorded for each interviewed angler: 1) time of interview, 2) guided or unguided angler, 3) number of hours spent fishing downstream of the Soldotna Bridge[7], 4) number of Chinook salmon harvested downstream of the Soldotna Bridge, 5) number of Chinook salmon released downstream of the Soldotna Bridge, and (during the early run only) 6) whether released Chinook salmon were less than 46 inches TL, 46–55 inches TL, or 55 inches TL or greater.

[6] Boats were counted as non-active boats if there were no anglers actively fishing from the boat and the motor was not in operation, but it was obvious the motor had been run during the day.

[7] Hours fishing were rounded to the nearest 0.25 hour and included when an angler's line was in the water or being rigged but did not include travel time or time after an angler had harvested a fish.

Age, Sex, and Length of the Sport Harvest

Harvested Chinook salmon were sampled for ASL during angler interviews. Sex was identified from external morphological characteristics (i.e., protruding ovipositor on females or a developing kype on males). Lengths from mid eye to tail fork (METF) were measured to the nearest half-centimeter. Three scales were removed from the preferred area of each fish and placed on an adhesive coated card (Clutter and Whitesel 1956; Welander 1940). Acetate impressions of the scales were aged using a microfiche reader.

Additionally, a tissue sample (tip of axillary process) was taken from harvested fish for genetic analysis, and each fish was inspected for an adipose fin. A missing adipose fin indicates the fish is either missing the fin naturally or received a coded wire tag as a juvenile. Presence of a coded wire tag may identify a hatchery-produced Chinook salmon stray or a wild Chinook salmon tagged in another river system that strayed to the Kenai River. If a fish without an adipose fin was found, and permission was granted from the angler, the fish's head was removed and examined later for a coded wire tag.

Additionally, all harvested Chinook salmon sampled for ASL in the creel survey were examined for the presence of an esophageal radio transmitter. If a fish with a radio transmitter was found, the transmitter was collected, and the date and location (RM) where the angler caught the Chinook salmon was recorded.

INRIVER GILLNETTING

The inriver gillnetting program began in 1979 and has been modified several times to meet the changing needs of the Kenai River Chinook salmon fishery. Due to concerns of net selectivity bias with respect to CPUE, species composition estimates, abundance estimates, and gillnetting time and area considerations, the gillnetting program was standardized in 2002 to estimate ASL of inriver runs, CPUE, and species composition (Reimer 2004b). Inriver gillnetting was conducted 6 hours each day from 16 May through 15 August in an area approximately 0.6 km in length located immediately downstream of the Chinook salmon sonar site at RM 8.5 (Figure 2). Nets of 2 mesh sizes were fished with equal frequency. Specifications of the nets used during the years 2002–2012 are shown below:

1) 5.0 inch (stretched mesh) multifiber, 80 meshes deep, 10 fathoms long, Shade 1 (clear-steel blue), MS73 (14 strand) twine
2) 7.5 inch (stretched mesh) multifiber, 55 meshes deep, 10 fathoms long, Shade 1, MS93 (18 strand) twine

During the years 2004–2006, gillnet sampling was conducted approximately 6 hours per day from 3 hours before to 3 hours after a low tide. By examining the percentage of fish passing the sonar site at particular tide stages, it became clear that potentially more fish could be intercepted by inriver gillnets if sampling were to begin as close to high tide as possible without interfering with the gillnetting crews' ability to drift the net effectively (Eskelin 2010). During 2007–2011, sampling was scheduled for 6 consecutive hours beginning 5 hours before low tide. One tide was sampled each day, excluding hours of darkness (2300–0400 hours). This sampling schedule change has resulted in the interception of a higher percentage of fish compared to what might have been observed with the old inriver gillnetting schedule in 8 out of the past 8 years (Perschbacher 2012d). As a result, the 2012 study was scheduled in the same way as those

conducted during the years 2007–2011: one tide per day beginning 5 hours before low tide for 6 consecutive hours excluding hours of darkness.

Each drift was positioned to sample fish that pass through the insonified river channel (approximately 15 m offshore from the right-bank transducer to 10 m offshore from the left-bank transducer). The drift area began immediately downstream from the sonar transducers (RM 8.5) and ended approximately 0.3 mi downstream (RM 8.2). Drifts were terminated when either 1) the crew believed there were 5 fish in the net, 2) the net was drifting within approximately 30 m of either bank, 3) the net became snagged on the bottom or was not fishing properly, or 4) the end of the drift area was reached. Drifts always began at the upstream end of the study area. Two drifts (1 starting on each bank) were completed with 1 mesh size before switching to the other mesh size. For each set, the mesh size, starting bank, start and stop times, and number of fish caught by species were recorded on a Juniper Systems Allegro CX[8] field computer.

Water clarity was measured to the nearest 0.05 m with a Secchi disk 3 times daily (beginning, middle, and end of scheduled shift) in midchannel, near the sonar site.

Age, Sex, and Length of the Inriver Run

Prior to 30 June, every Chinook salmon captured in gillnets was removed and placed in a tagging cradle (Larson 1995) and sampled for ASL data, which were recorded on a field computer. To prevent resampling, a quarter-inch hole was punched in the dorsal lobe of the caudal fin on every Chinook salmon handled, and each captured Chinook salmon was examined for a hole-punch prior to sampling. Chinook salmon were also checked for an adipose fin. If a Chinook salmon adipose fin was missing, the fish was sacrificed, and the head was removed and examined later for a coded wire tag. Injuries sustained by Chinook salmon during the capture and handling process were also recorded. Samples were stratified into 2 approximately 3-week strata during each run with a sample-size goal of 149 fish for each stratum. Strata for the early run were 16 May–9 June and 10–30 June; strata for the late run were 1–20 July and 21 July–15 August.

The number and species of all fish captured were recorded. In addition, METF lengths of captured sockeye, pink, and coho salmon were measured every other day. Length distribution of captured salmon was used as one variable in a mixture model to evaluate species composition in the insonified area at RM 8.5 (Miller et al. 2005).

Tissue samples (dorsal finclips) were collected from all Chinook salmon captured. Samples were placed in individually numbered 2 ml plastic tubes and immersed in an alcohol buffer. Each tube had a unique number and was stored at the ADF&G Gene Conservation Laboratory for future analysis.

After 30 June, only every other captured Chinook salmon per drift was sampled for ASL data. All other captured Chinook salmon were not placed in the cradle but had a tissue sample taken for genetic analysis and were given a hole-punch on the dorsal lobe of the caudal fin to prevent resampling before being released. Estimates of age, sex, and length composition of the inriver run were generated using the Chinook salmon catches from 5.0- and 7.5-inch mesh gillnets combined.

[8] Product names used in this publication are included for completeness but do not constitute product endorsement.

Radio Transmitter Deployment

The inriver gillnetting study served as the marking event for a separate *Kenai River Chinook Salmon Abundance and Migratory Timing Study* (A. Reimer, Fisheries Biologist, ADF&G Division of Sport Fish, Soldotna, personal communication). Every Chinook salmon sampled for ASL from 16 May through 30 June, and every other Chinook salmon sampled for ASL from 1 July through 15 August, received an Advanced Telemetry Systems (ATS; Isanti, MN) model F1845B radio transmitter. Fish with either profusely bleeding gills, or measuring 550 mm TL or less, or those observed to be injured were released without tagging to minimize potential differences in survival and behavior between tagged and untagged populations.

DATA ANALYSIS

Effort, catch, and harvest were estimated separately for guided and unguided anglers using the following procedures.

Angler Effort

The mean number of anglers on day *i* in stratum *h* was estimated as follows:

$$\bar{x}_{hi} = \frac{\sum_{g=1}^{r_{hi}} x_{hig}}{r_{hi}}, \tag{1}$$

where

x_{hig} = the number of anglers observed in the *g*th count of day *i* in stratum *h*, and

r_{hi} = the number of counts on day *i* in stratum *h*.

Angler counts were conducted systematically within each sample day. The variance of the mean angler count was estimated as follows:

$$\hat{V}\left(\bar{x}_{hi}\right) = \frac{\sum_{g=2}^{r_{hi}} \left(x_{hig} - x_{hi(g-1)}\right)^2}{2r_{hi}\left(r_{hi} - 1\right)}. \tag{2}$$

Effort (angler-hours) during day *i* in stratum *h* was estimated by

$$\hat{E}_{hi} = L_{hi}\bar{x}_{hi}, \tag{3}$$

where

L_{hi} = length of the sample day (20 hours for unguided anglers, 12 hours for guided anglers).

The within-day variance (effort) was estimated as follows:

$$\hat{V}\left(\hat{E}_{hi}\right) = L_{hi}^2 \hat{V}\left(\bar{x}_{hi}\right). \tag{4}$$

The mean effort for stratum *h* was estimated by

$$\overline{E}_h = \frac{\sum_{i=1}^{d_h} \hat{E}_{hi}}{d_h}, \tag{5}$$

where

d_h = number of days sampled in stratum *h*.

The sample variance of daily effort for stratum *h* was estimated as follows:

$$S^2(E)_h = \frac{\sum_{i=1}^{d_h} \left(\hat{E}_{hi} - \overline{E}_h\right)^2}{\left(d_h - 1\right)}. \tag{6}$$

Total effort for stratum *h* was estimated by

$$\hat{E}_h = D_h \overline{E}_h, \tag{7}$$

where

D_h = total number of days the fishery was open in stratum *h*.

The variance of total effort for each stratum in a 2-stage design, omitting the finite population correction factor for the second stage, was estimated by Bernard et al. (1988) as follows:

$$\hat{V}\left(\hat{E}_h\right) = (1 - f) D_h^2 \frac{S^2(E)_h}{d_h} + f D_h^2 \frac{\sum_{i=1}^{d_h} \hat{V}\left(\hat{E}_{hi}\right)}{d_h^2}, \tag{8}$$

where

f = fraction of days sampled (= d_h / D_h).

Catch and Harvest

Catch and harvest per unit (hour) of effort for day *i* was estimated from angler interviews using the jackknife method to minimize the bias of these ratio estimators (Efron 1982). The jackknife estimate of CPUE (similarly HPUE) for angler *j* was as follows:

$$CPUE^*_{hij} = \frac{\sum_{\substack{a=1 \\ a \neq j}}^{m_{hi}} c_{hia}}{\sum_{\substack{a=1 \\ a \neq j}}^{m_{hi}} e_{hia}}, \tag{9}$$

where

c_{hia} = catch of angler *a* interviewed on day *i* in stratum *h*,

e_{hia} = effort (hours fished) by angler *a* interviewed on day *i* in stratum *h*, and

m_{hi} = number of anglers interviewed on day *i* in stratum *h*.

The jackknife estimate of mean CPUE for day *i* was the mean of the angler estimates:

$$\overline{CPUE}^{*}_{hi} = \frac{\sum_{j=1}^{m_{hi}} CPUE^{*}_{hij}}{m_{hi}}, \tag{10}$$

and the bias corrected mean was

$$\overline{CPUE}^{**}_{hi} = m_{hi}\left(\overline{CPUE}_{hi} - \overline{CPUE}^{*}_{hi}\right) + \overline{CPUE}^{*}_{hi}, \tag{11}$$

where

$$\overline{CPUE}_{hi} = \frac{\sum_{j=1}^{m_{hi}} c_{hij}}{\sum_{j=1}^{m_{hi}} e_{hij}}. \tag{12}$$

The variance of the jackknife estimate of CPUE was estimated as follows:

$$\hat{V}\left(\overline{CPUE}^{**}_{hi}\right) = \frac{m_{hi}-1}{m_{hi}} \sum_{j=1}^{m_{hi}} \left(CPUE^{*}_{hij} - \overline{CPUE}^{*}_{hi}\right)^2. \tag{13}$$

Catch during each sample day was estimated as the product of effort and CPUE by

$$\hat{C}_{hi} = \hat{E}_{hi}\,\overline{CPUE}^{**}_{hi} \tag{14}$$

and the variance was estimated as follows (Goodman 1960):

$$\hat{V}\left(\hat{C}_{hi}\right) = \hat{V}\left(\hat{E}_{hi}\right)\left(\overline{CPUE}^{**}_{hi}\right)^2 + \hat{V}\left(\overline{CPUE}^{**}_{hi}\right)\hat{E}^2_{hi} - \hat{V}\left(\hat{E}_{hi}\right)\hat{V}\left(\overline{CPUE}^{**}_{hi}\right). \tag{15}$$

HPUE was estimated by substituting angler harvest for angler catch in equations (9) through (13). Harvest during sample day *i* was estimated by substituting the appropriate $HPUE_{hi}$ statistics into equations (14) and (15). Total catch and harvest during stratum *h* was estimated using equations (5) through (8), substituting estimated catch ($\hat{C}_{hi}$) and harvest ($\hat{H}_{hi}$) during sample day *i* for the estimated effort ($\hat{E}_{hi}$) during day *i*.

When no interviews from a particular angler type were obtained during a particular day, there were no CPUE and HPUE estimates to pair with angler counts. For these days, pooled estimates of CPUE and HPUE calculated from interviews obtained during the remaining days within the stratum, or similar strata, were imputed. A bootstrap procedure was used to estimate the variance introduced by use of imputed values.

Total effort, catch, and harvest estimates, and their respective variances, were summed across strata within each run. Technically, estimates of catch and harvest by geographic location and angler type were not statistically independent, because HPUE and CPUE were estimated from the same interviews for both geographic strata, and estimates were post-stratified by angler type. This lack of independence between strata could underestimate variances; however, the bias in variance estimates is small.

Angler Effort, Catch, and Harvest on Mondays

Regulations allow only unguided fishing from drift boats or from shore on Mondays. Due to budgetary constraints, the creel survey was not conducted on Mondays for the years 2001–2008 and 2011–2012; rather, "index" angler counts were conducted each late-run Monday between 0800 and 1400 hours. The index count was used in the following ad hoc procedure to estimate effort, catch, and harvest on drift-boat Mondays:

1) The relationship between index counts and mean angler counts on Mondays for 2009–2010 angler count data was used to estimate the relationship between index counts and mean angler counts on Mondays for 2012. The mean number of anglers was approximately 52% of the number of anglers counted during the "index" period.
2) To estimate angler-hours of effort *E*, the estimated mean count was multiplied by the length of the unguided angler-day (20 hours).
3) To estimate CPUE and HPUE on Mondays without angler interviews, we exploited the tendency for angler success to exhibit an autocorrelated time trend. CPUE and HPUE were plotted versus time for days sampled with angler interviews, and then we imputed CPUE and HPUE values for each Monday.
4) Catch and harvest were estimated as the product of the imputed values of CPUE and HPUE and the estimate of *E* derived from the index count.

CPUE of Inriver Gillnetting

Two gillnet mesh sizes were deployed: 5.0 and 7.5 inches. Two drifts, originating from each side (*k*) of the river, were conducted with 1 mesh size; the sequence was then repeated with the other mesh size. A repetition *j* consisted of a complete set of 4 such drifts. Daily CPUE *r* of species *s* in mesh *m* for day *i* was estimated as follows:

$$\hat{r}_{smi} = \frac{\sum_{j=1}^{J_i}\sum_{k=1}^{2} c_{smijk}}{\sum_{j=1}^{J_i}\sum_{k=1}^{2} e_{mijk}}, \tag{16}$$

with variance

$$\hat{V}(\hat{r}_{smi}) = \frac{\sum_{j=1}^{J_i}\left(c_{smij\cdot} - \hat{r}_{smi} e_{mij\cdot}\right)^2}{\bar{e}_{mi}{}^2 J_i (J_i - 1)}, \tag{17}$$

where c_{smijk} is the catch of species *s* in mesh *m* during a drift originating from bank *k* during repetition *j* on day *i*, e_{mijk} is the effort (soak time in minutes) for that drift, J_i is the number of

repetitions completed on day *i*, c_{smij} is the catch of species *i* in mesh *m* summed across drifts on both banks conducted during repetition *j* of day *i*, $e_{mij.}$ is the effort for mesh *m* summed across drifts on both banks conducted during repetition *j* of day *i*, and $\bar{e}_{mi}$ is the mean of e_{mij} across all repetitions *j* for mesh *m* on day *i*. The variance follows Cochran (1977: 66).

Proportion of Chinook Salmon Captured by Inriver Gillnetting

The proportion of species *s* passing through the insonified zone of the river channel during the test-netting period on day *i* was estimated as follows:

$$\hat{p}_{si} = \frac{\sum_{j}^{J_i} \hat{r}_{sij}}{\sum_{s}\sum_{j}^{J_i} \hat{r}_{sij}}, \tag{18}$$

with variance

$$\hat{V}(\hat{p}_{si}) = \frac{\sum_{j=1}^{J_i} \left(\hat{r}_{sij} - \hat{p}_{si}\hat{r}_{\cdot ij}\right)^2}{\bar{r}_i^{\,2} J_i (J_i - 1)}, \tag{19}$$

where CPUE *r* of species *s* during repetition *j* of day *i* is estimated as the mean of the CPUEs, pooled across bank, for each mesh size:

$$\hat{r}_{sij} = \frac{1}{2}\sum_{m=1}^{2} \frac{\sum_{k=1}^{2} c_{smijk}}{\sum_{k=1}^{2} e_{mijk}}, \tag{20}$$

and where

$\hat{r}_{.ij} = \sum_{s} \hat{r}_{sij}$ is the CPUE summed across all species caught during repetition *j* of day *i*, and

$\bar{r}_i = \frac{\sum_{j=1}^{J_i} \hat{r}_{.ij}}{J_i}$ is the mean CPUE of salmon (all species) caught across all drifts *k* during day *i*.

Only data from repetitions with at least one drift with each mesh were used for estimation of species proportions.

Age and Sex Composition

Age and sex compositions of the Chinook salmon harvest were estimated for each run by time stratum *t*. The proportion of Chinook salmon in age or sex group *b* in time stratum *t* was estimated as follows:

$$\hat{p}_{bt} = \frac{n_{bt}}{n_t}, \tag{21}$$

where

n_{bt} = the number of Chinook salmon of age or sex group *b* sampled during stratum *t*, and

n_t = the number of successfully aged Chinook salmon sampled during stratum *t*.

The variance of $\hat{p}_{bt}$ was approximated[9] as follows (Cochran 1977):

$$\hat{V}(\hat{p}_{bt}) = \frac{\hat{p}_{bt}(1-\hat{p}_{bt})}{(n_t - 1)}. \tag{22}$$

Contingency tables and chi-square tests were used to determine if age or sex composition differed significantly ($P < 0.05$) among strata. If not, the proportion of Chinook salmon in age or sex group *b* during an entire run, and its variance, were estimated by pooling data across strata (Equations 21–22 without stratum subscripts *t*).

The harvest of each age or sex group by time stratum *t* and geographic stratum *g* (above and below the sonar), was estimated by

$$\hat{H}_{gbt} = \hat{H}_{gt}\hat{p}_{bt}, \tag{23}$$

with variance (Goodman 1960)

$$\hat{V}\left(\hat{H}_{gbt}\right) = \hat{H}_{gt}^2\hat{V}\left(\hat{p}_{bt}\right) + \hat{p}_{bt}^2\hat{V}\left(\hat{H}_{gt}\right) - \hat{V}\left(\hat{p}_{bt}\right)\hat{V}\left(\hat{H}_{gt}\right), \tag{24}$$

where

$\hat{H}_{gt}$ and $\hat{\mathrm{V}}\left(\hat{\mathrm{H}}_{\mathrm{gt}}\right)$ = estimated harvest and its variance in geographic stratum *g* during temporal stratum *t*.

If age or sex composition differed ($P < 0.05$) among strata, a weighted proportion and its variance were calculated as follows:

$$\hat{p}_{gb} = \frac{\sum_t \hat{H}_{gt}\hat{p}_{bt}}{\sum_t \hat{H}_{gt}}, \text{ and} \tag{25}$$

$$\hat{V}(\hat{p}_{gb}) = \frac{1}{\hat{H}_g^2}\left[\frac{\hat{v}(\hat{H}_{g1})\left[\hat{p}_{b1}\hat{H}_{g2} - \hat{H}_{gb2}\right]^2}{\hat{H}_g^2} + \frac{v(\hat{H}_{g2})\left[\hat{p}_{b2}\hat{H}_{g1} - \hat{H}_{gb1}\right]^2}{\hat{H}_g^2} + \hat{v}(\hat{p}_{b1})\hat{H}_{g1}^2 + \hat{v}(\hat{p}_{b2})\hat{H}_{g2}^2\right]. \tag{26}$$

[9] Variance estimates for species proportions assume that each fish sampled is an independent observation (i.e., that simple random sampling, SRS, was employed). In reality, the sport harvest is sampled with a multistage design (creel survey) and the inriver run with a cluster design (netting), and technically, the age proportion variances should be estimated in the context of those designs. However, age composition changes very slowly over time, and in the past we have assumed that variability between sampling stages and among clusters is negligible. To verify this, we reanalyzed the 2006 netting data, calculated the age proportions using a modified version of Equation 8, and compared them to the SRS estimates in Equation 21. The point estimates and their standard errors were essentially equivalent. Based on this evidence, we continue to use the SRS equations for convenience.

The number of Chinook salmon passing the sonar N was apportioned by age and sex similarly, using Equations 21–26, ignoring geographic stratum subscript g, substituting N for H, and using the net-captured Chinook salmon to estimate p. The inriver run R of age or sex group b was estimated as the sum of the age- or sex-specific sonar passage N_b and harvest below the sonar H_{2b} as follows:

$$\hat{R}_b = \hat{N}_b + \hat{H}_{2b}\,. \tag{27}$$

RESULTS

CREEL SURVEY

Effort, Catch, and Harvest

The creel survey was conducted from 16 May through 21 June, and 1 July through 18 July. During the early run, the creel survey sampled 64% (18/28) of the days the fishery was open to guided anglers and 66% (22/33) of the days open to unguided anglers (Table 2). During the late run, the creel survey sampled 67% (8/12) of the days the fishery was open to guided anglers and 73% (11/15) of the days the fishery was open to unguided anglers (Table 3). Index estimates of catch, harvest, and effort on the three late-run Mondays are not included in the unguided angler subtotals and season totals presented herein. A total of 1,148 angler interviews were conducted: 636 during the early run and 512 during the late run (Tables 2 and 3).

During the early run, angler counts from the Warren Ames Bridge to the Soldotna Bridge for all time strata ranged from 0 to 77 for unguided anglers and from 0 to 137 for guided anglers (Appendix A1). The largest count occurred on 10 June for unguided anglers and on 14 June for guided anglers. The largest count for any time stratum in the early run for guided and unguided anglers combined was 184 anglers during 0400–0859 hours on 9 June. During the late run, angler counts ranged from 1 to 218 for unguided anglers and from 32 to 289 for guided anglers (Appendix A2). The largest count occurred on 1 July for unguided anglers and on 17 July for guided anglers. The largest count for any time stratum in the late run for guided and unguided anglers combined was 341 during 0400–0859 hours on 17 July.

Estimated early-run effort was 20,681 (SE 1,483) angler-hours (Table 2), and late-run effort was 32,354 (SE 2,671) angler-hours (Table 3). Early-run effort was approximately 28% below the recent (2007–2011) 5-year average, and 53% below the historical (1977–2011) average, while the late-run effort was the lowest on record (Figures 3–4). Guided anglers accounted for 65% of the early-run effort and 64% of the late-run effort. The proportion of late-run effort attributed to guided anglers (64%) was the highest on record dating back to 1981 (Figure 4).

In the early run, daily CPUE varied from 0 to 0.062 and averaged 0.013 fish per hour for unguided anglers, whereas daily CPUE for guided anglers ranged from 0 to 0.074 and averaged 0.023 fish per hour (Appendices B1–B2). Daily CPUE in the early run was highest on 30 May for unguided anglers and on 5 June for guided anglers. In the late run, daily CPUE varied from 0 to 0.226 and averaged 0.062 fish per hour for unguided anglers, whereas daily CPUE for guided anglers ranged from 0 to 0.069 and averaged 0.035 fish per hour (Appendices B3–B4). Daily CPUE was highest in the late run on 14 July for both unguided and guided anglers, although unguided CPUE was more than three times as high as guided CPUE for that date.

Table 2.–Estimated early-run Kenai River Chinook salmon sport fishery effort, catch, and harvest between Soldotna Bridge and Warren Ames Bridge, 16 May–21 June 2012.

Fishing periods[a]	Days open to fishing from powerboats	Sampling days	Number of interviews	Effort		Chinook salmon			
						Catch[b]		Harvest[c]	
				Hours fished	SE	No. fish	SE	No. fish	SE
16–20 May									
Guided weekdays	3	2	11	96	42	1	1	1	1
Guided weekends	1	1	10	132	42	2	3	2	3
Unguided weekdays	3	2	11	158	70	0	0	0	0
Unguided weekends	2	2	22	180	46	3	3	0	0
22–28 May									
Guided weekdays	4	2	39	920	252	11	10	8	8
Guided weekends/holiday	2	2	33	804	193	12	8	12	8
Unguided weekdays	4	2	19	460	108	0	0	0	0
Unguided weekends/holiday	3	2	46	570	185	15	12	11	10
29 May–3 June									
Guided weekdays	4	2	30	1,816	396	38	33	31	28
Guided weekends	1	1	18	660	81	25	13	25	13
Unguided weekdays	4	2	31	840	143	21	18	21	18
Unguided weekends	2	2	54	860	127	14	7	7	5
5–10 June									
Guided weekdays	4	2	39	3,288	821	148	83	121	80
Guided weekends	1	1	49	1,344	216	18	10	14	8
Unguided weekdays	4	2	24	1,070	277	54	38	33	18
Unguided weekends	2	2	86	1,425	286	17	9	13	9

-continued-

Table 2.–Part 2 of 2.

Fishing periods[a]	Days open to fishing from powerboats	Sampling days	Number of interviews	Effort		Chinook salmon			
						Catch[b]		Harvest[c]	
				Hours fished	SE	No. fish	SE	No. fish	SE
12–17 June									
Guided weekdays	4	2	25	2,720	837	17	18	17	18
Guided weekends	1	1	16	472	118	35	14	0	0
Unguided weekdays	4	2	16	810	359	0	0	0	0
Unguided weekends	2	2	26	570	155	0	0	0	0
19–21 June									
Guided weekdays	3	2	15	1,224	305	42	31	0	0
Unguided weekdays	3	2	16	263	53	0	0	0	0
Day type subtotals									
Guided weekdays	22	12	159	10,064	1,300	256	96	179	87
Guided weekends/holiday	6	6	126	3,412	326	91	23	52	18
Unguided weekdays	22	12	117	3,600	495	75	42	54	25
Unguided weekends/holiday	11	10	234	3,605	398	49	17	31	14
Angler type subtotals									
Guided	28	18	285	13,476	1,340	348	99	231	89
% Guided			45%	65%		74%		73%	
Unguided[d]	33	22	351	7,205	635	124	45	86	29
% Unguided			55%	35%		26%		27%	
Early-run total[d]	61	40	636	20,681	1,483	471	109	316	93

[a] Sport fishery was closed to harvest of Chinook salmon 20–55 inches TL on 15 June, and closed to all Chinook salmon fishing 22–30 June.

[b] "Catch" = fish harvested plus fish released; catch estimates may not sum to total due to rounding.

[c] "Harvest" = fish kept; harvest estimates may not sum to total due to rounding.

[d] Because Mondays were not sampled, unguided angler estimates are biased and may underestimate the true value.

Table 3.–Estimated late-run Kenai River Chinook salmon sport fishery effort, catch, and harvest between Soldotna Bridge and Warren Ames Bridge, 1–18 July 2012.

Fishing periods[a]	Days open to fishing from powerboats	Sampling days	Number of interviews	Effort		Chinook salmon			
						Catch[b]		Harvest[c]	
				Hours fished	SE	No. fish	SE	No. fish	SE
1 July									
Unguided weekends	1	1	40	1,955	538	31	19	20	15
2-8 July									
Monday[d]	0	0	0	177	N/A	2	N/A	2	N/A
Guided weekdays	4	2	55	6,840	2,121	51	45	51	45
Guided weekends	1	1	24	1,348	487	8	8	8	8
Unguided weekdays	4	2	38	2,690	362	14	15	14	15
Unguided weekends	2	2	30	1,755	149	41	30	10	10
9-15 July									
Monday[d]	0	0	0	364	N/A	8	N/A	0	N/A
Guided weekdays	4	2	100	6,084	1,057	238	71	0	0
Guided weekends	1	1	49	1,872	192	129	27	0	0
Unguided weekdays	4	2	21	1,340	437	74	31	0	0
Unguided weekends	2	2	22	1,420	301	320	103	0	0
16-18 July									
Monday[d]	0	0	0	291	N/A	39	N/A	0	N/A
Guided weekdays	2	2	104	4,690	626	272	52	0	0
Unguided weekdays	2	2	29	2,360	364	74	44	0	0

-continued-

Table 3.–Part 2 of 2.

Fishing periods[a]	Days open to fishing from powerboats	Sampling days	Number of interviews	Effort		Chinook salmon Catch[b]		Chinook salmon Harvest[c]	
				Hours fished	SE	No. fish	SE	No. fish	SE
Day type subtotals									
Monday[d]	0	0	0	832	N/A	49	N/A	2	N/A
Guided weekdays	10	6	259	17,614	2,451	560	99	51	45
Guided weekends	2	2	73	3,220	523	137	28	8	8
Unguided weekdays	10	6	88	6,390	674	162	55	14	15
Unguided weekends	5	5	92	5,130	634	391	109	30	18
Angler type subtotals									
Guided	12	8	332	20,834	2,506	697	103	59	46
% Guided			65%	64%		56%		57%	
Unguided[e]	15	11	180	11,520	926	553	122	44	23
% Unguided			35%	36%		44%		43%	
Late-run total[e]	27	19	512	32,354	2,671	1,250	160	103	52

Note: "N/A" = no data available.

[a] Emergency order prohibited the use of bait 1 July. Sport fishery closed to harvest of Chinook salmon 20–55 inches TL on 10 July, and closed to all Chinook salmon fishing 19–31 July.

[b] "Catch" = fish harvested plus fish released; catch estimates may not sum to total due to rounding.

[c] "Harvest" = fish kept; harvest estimates may not sum to total due to rounding.

[d] Mondays were days when only unguided drift boat fishing was allowed. Estimates of effort, catch, and harvest were based on an index described in detail in the methods section "Angler Effort, Catch, and Harvest on Mondays."

[e] Unguided angler totals do not include Monday index estimates.

The estimated harvest of Chinook salmon during the early run was 316 (SE 93) fish (Table 2). Early-run harvest was approximately 61% below the recent (2007–2011) 5-year average and 77% below the historical (1977–2011) early run average (Figure 3). Guided anglers accounted for 73% of the harvest compared to 27% for unguided anglers. The estimated catch of early-run Chinook salmon was 471 (SE 109) fish, meaning approximately 33% of the catch was released. There were 636 interviews conducted during the early run; anglers reported releasing 21 Chinook salmon, of which 62% were reported to be below the slot limit of 46 inches TL and 38% were reported to be within the slot limit (46–55 inches TL) (Table 4). The absolute precision (±182 fish) for total early-run harvest and catch (±214 fish) satisfied the project objectives.

Table 4.–Kenai River Chinook salmon reported to be released during the slot-limit sport fishery between Warren Ames Bridge and Soldotna Bridge, 2003–2012.

	Chinook salmon		
	Below slot limit[a]	Within slot limit[a]	Total number released[c]
Year	% Released[b]	% Released[b]	
2003	52%	48%	64
2004	67%	33%	73
2005	65%	35%	109
2006	65%	35%	100
2007	70%	30%	67
2008	78%	22%	89
2009	85%	15%	20
2010	80%	20%	35
2011	83%	17%	23
2012	62%	38%	21
Min	52%	15%	20
Mean	71%	29%	60
Max	85%	48%	109

Source: Eskelin (2007, 2009, 2010); Perschbacher (2012 a-d); Reimer (2004b).

[a] During 2003–2007, the 44–55 inch slot limit was in effect and during 2008–2012, the 46–55 inch slot limit was in effect.

[b] The number of fish released below or within the slot limit was given by anglers during creel survey interviews.

[c] There were no fish reported to be released above the slot limit.

The estimated late-run harvest of Chinook salmon (103 fish, SE 52) was the lowest on record dating back to 1977 (Table 3, Figure 4). Guided anglers accounted for 57% of this harvest. The proportion of guided harvest was similar to the 30-year average of 55%, but the proportion of guided effort (64% versus the 30-year average of 38%) was the highest on record (Figure 4). The estimated catch of late-run Chinook salmon was 1,250 (SE 160) so, given the harvest estimate, 92% of the catch was released. The absolute precision for total late-run harvest (±102) and catch (±314) satisfied the project objectives.

Approximately 0.4% of the early-run effort and 2.5% of the late-run effort occurred downstream of the Chinook salmon sonar site (Appendices C1–C2). The estimate of late-run harvest below the sonar site was 2 (SE 1) (1.9%), whereas 101 (SE 51) (98.1%) Chinook salmon were harvested from the Chinook salmon sonar site to the Soldotna Bridge (Appendix C2).

The daily angler count for each late-run Monday (Appendix A2) and interpolated values of HPUE and CPUE (Appendix B3) were used to index effort, harvest, and catch estimates (Table 3). It was estimated that unguided drift boat anglers caught 49 and harvested 2 Chinook salmon with 832 angler-hours of effort during late-run Mondays (Table 3 and Figure 5). This represented approximately 2.5% of total effort, 3.8% of total catch, and 1.7% of total harvest in the late run.

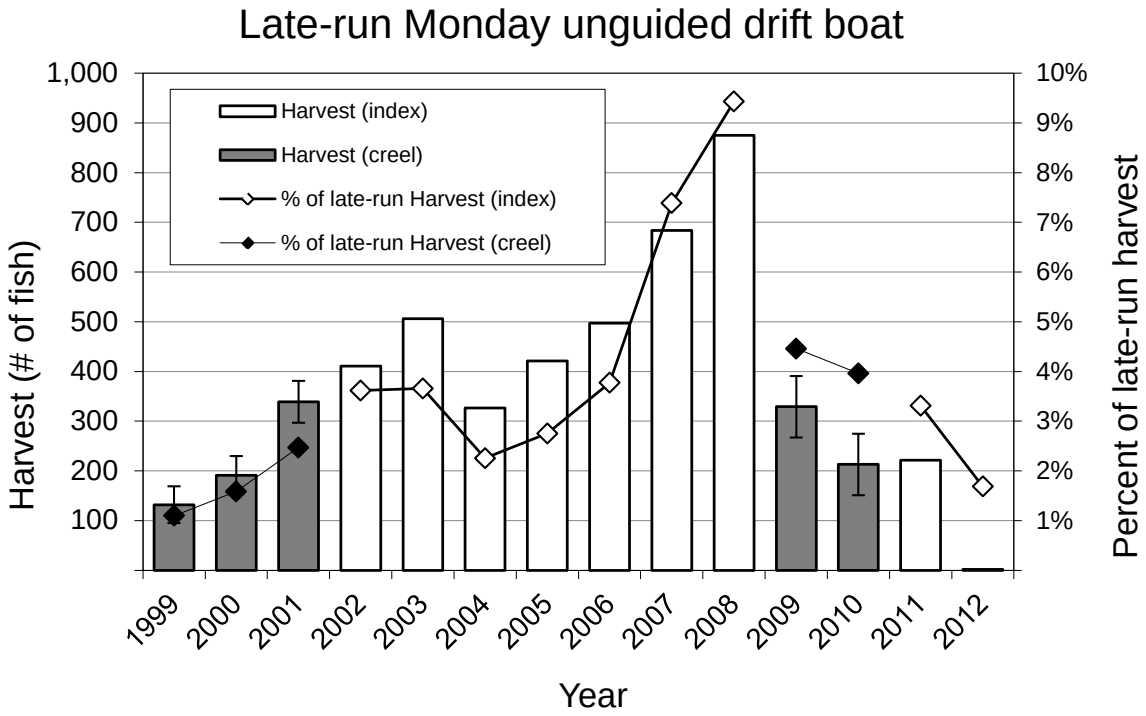

Figure 5.–Late-run Monday unguided drift boat sport harvest and percent of total late-run harvest of Kenai River Chinook salmon estimated by index and creel surveys between Soldotna Bridge and Warren Ames Bridge, 1999–2012.

Source: Eskelin (2007, 2009-2010); Perschbacher (2012 a-d); Reimer (2003, 2004 a-b, 2007); and Reimer et al. (2002).

Note: Error bars show ±1 standard error during 1999–2001 and 2009–2010 when Mondays were included in the creel survey. Precision estimates are unavailable for 2002–2008 and 2011–2012 when angler effort, catch, and harvest were estimated using an index.

SPECIES COMPOSITION FROM INRIVER GILLNETTING

During the early run, 105 Chinook salmon and 953 sockeye salmon greater than 400 mm METF length were captured with gillnets (Appendix D1). A total of 70 other fish (31 starry flounder [*Platichthys stellatus*], 38 eulachon [*Thaleichthys pacificus*], and 1 rainbow trout) were also captured. Only salmonids greater than 400 mm METF were used to calculate both daily CPUE by species and daily Chinook salmon ratios. Daily Chinook salmon CPUE for both mesh sizes ranged from 0 to 0.053, and averaged 0.016 (Appendix D2). The daily ratio of Chinook salmon to total number of fish captured ranged from 0 to 0.64 and averaged 0.15 (Appendix D2).

During the late run, 347 Chinook salmon, 3,710 sockeye salmon, 59 coho salmon, and 1,510 pink salmon greater than 400 mm METF length were captured with gillnets (Appendix D3). A total of 6 other fish (5 Dolly Varden and 1 rainbow trout) were also captured. Daily Chinook salmon CPUE for both mesh sizes combined ranged from 0 to 0.216 and averaged 0.071 (Appendix D4). The daily ratio of Chinook salmon to total number of fish captured ranged from 0 to 0.45 and averaged 0.098 (Appendix D4).

The inriver gillnetting study was extended 5 days through 15 August because of later than usual Chinook salmon run timing. Approximately 8% (28 Chinook salmon) of the late-run Chinook salmon sampled in the inriver gillnets were captured from 11 through 15 August (Appendix D3). In addition, 20 sockeye, 34 coho, and 1,163 pink salmon were captured 11 through 15 August.

Sockeye salmon cumulative CPUE was below the 10-year (2002–2011) early-run average and above the 10-year late-run average (Figure 6). During both the early and late runs, Chinook salmon cumulative CPUE was significantly below the 10-year average.

AGE, SEX, AND LENGTH

Creel Survey

The age composition of the early-run harvest was comprised of approximately 2.6% (SE 2.6%) age-1.2 fish, 23.7% (SE 7.0%) age-1.3 fish, and 73.7% (SE 7.2%) age-1.4 fish (Table 5 and Figure 7). Age-1.4 females (57.9%, SE 8.1%) were harvested in higher proportions than males (15.8%, SE 6.0%), while age-1.3 males (18.4%, SE 6.4%) were harvested in higher proportions than females (5.3%, SE 3.7%), and all harvested age-1.2 Chinook salmon were males. Overall, 63.2% (SE 7.9%) of all early-run Chinook salmon harvested were females; the remaining 36.8% (SE 7.9%) were males.

During the late run, the age composition sample size goal was not met (Table 6). Due to low run strength and fishery closures, only 4 Chinook salmon (1 age-1.1 fish and 3 age-1.4 fish) were sampled for ASL.

The raising of the lower end of the slot limit in 2008 from 44 inches TL to 46 inches TL resulted in an additional 21% of Chinook salmon in the early-run creel survey sample that measured between 44 and 46 inches TL during 2012 (Figure 8). Approximately 2% of early-run Chinook salmon sampled in the 2012 creel survey were below 28 inches TL compared to the 5-year average (2003–2007) of 6%, when Chinook salmon between 20 and 28 inches TL were counted toward the annual limit prior to 1 July.

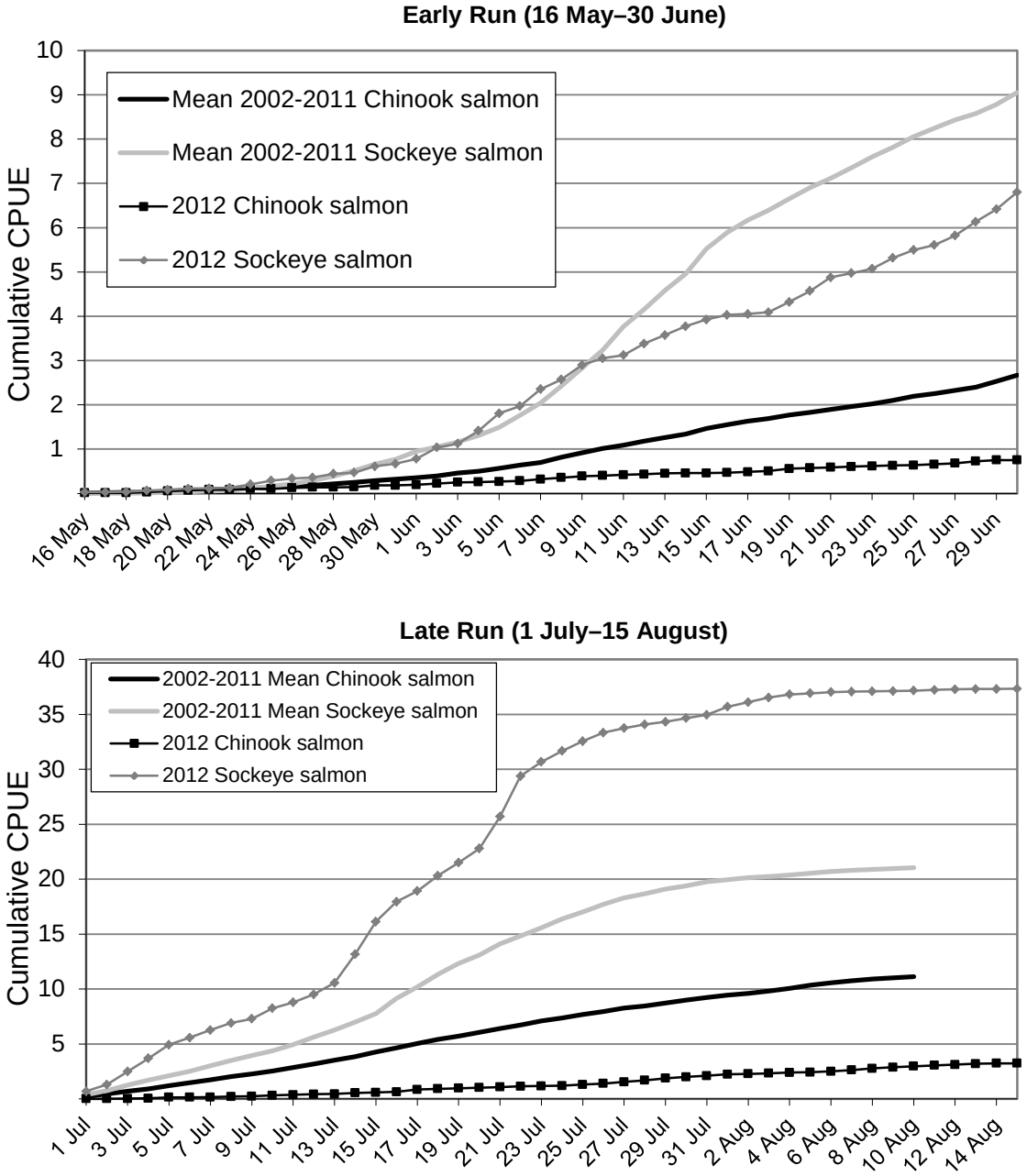

Figure 6.–Cumulative CPUE for early-run (top) and late-run (bottom) Kenai River Chinook and sockeye salmon inriver gillnet catches, 2002–2012.

Note: Cumulative CPUE is catch per minute. Late-run inriver netting was conducted through 10 August during 2002–2011, and through 15 August during 2012.

Table 5.–Age composition and estimated sport harvest by age class for early-run Kenai River Chinook salmon between Soldotna Bridge and Warren Ames Bridge, 16 May–21 June 2012.

	Age			
Parameter	1.2	1.3	1.4	Total
Female				
Sample size		2	22	24
Harvest		17	183	200
SE harvest		12	59	64
% Harvest		5.3%	57.9%	63.2%
SE % harvest		3.7%	8.1%	7.9%
Male				
Sample size	1	7	6	14
Harvest	8	58	50	117
SE harvest	8	26	23	42
% Harvest	2.6%	18.4%	15.8%	36.8%
SE % harvest	2.6%	6.4%	6.0%	7.9%
Both sexes combined				
Sample size	1	9	28	38
Harvest	8	75	233	316
SE harvest	8	31	72	93
% Harvest	2.6%	23.7%	73.7%	100.0%
SE % harvest	2.6%	7.0%	7.2%	0.0%

Note: Values given by age and sex may not sum to totals due to rounding.

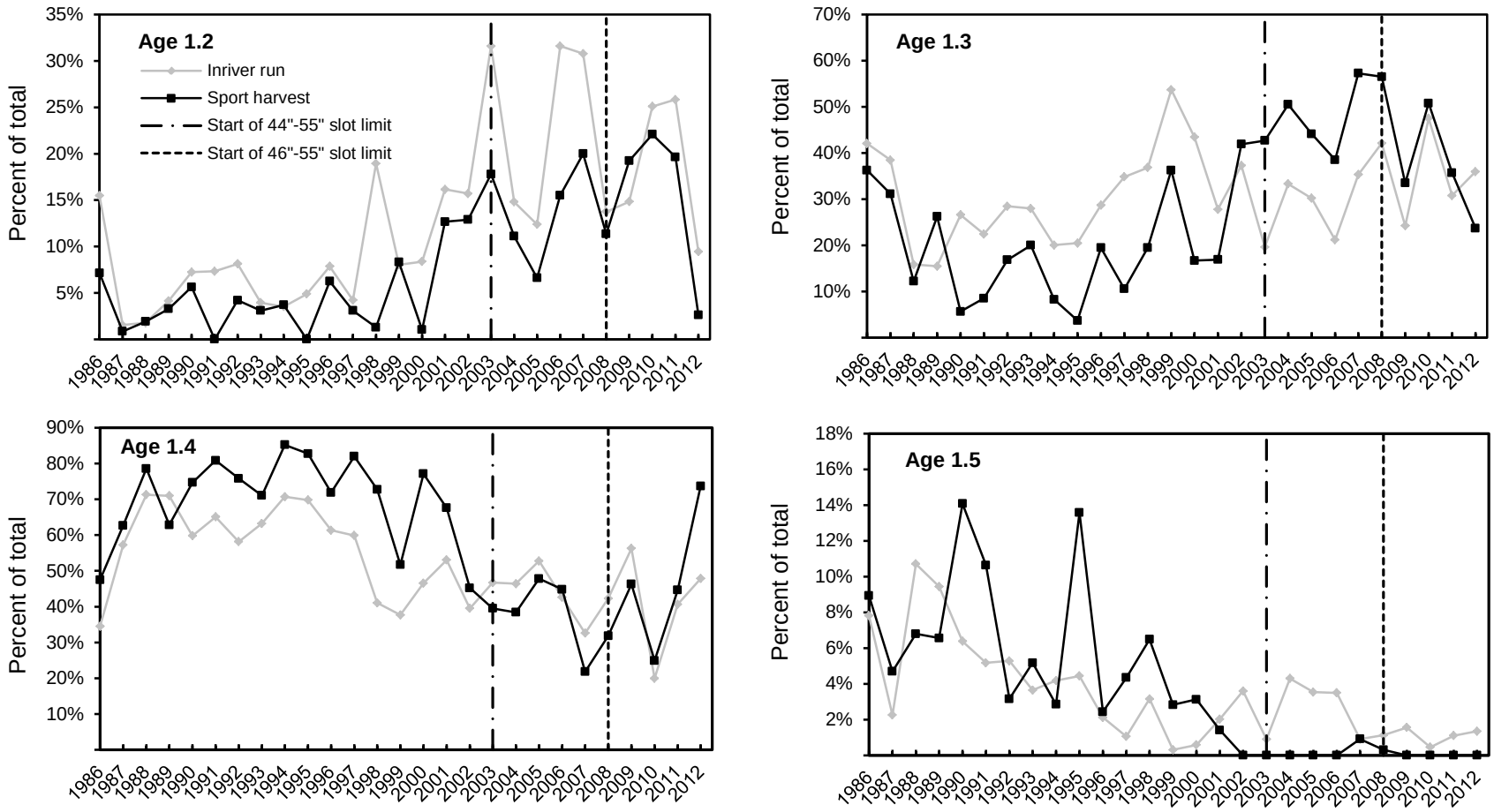

Figure 7.–Age composition of early-run harvest versus inriver early run between Soldotna Bridge and Warren Ames Bridge for age-1.2 (top left), age-1.3 (top right), age-1.4 (bottom left), and age-1.5 (bottom right) Chinook salmon, Kenai River, 1986–2012.

Sources: Conrad and Hammarstrom (1987); Eskelin (2007, 2009-2010); Hammarstrom (1977-1981, 1988-1994); Hammarstrom et al. (1985); Hammarstrom and Larson (1982-1984, 1986); King (1996-1997); Marsh (1999, 2000); Perschbacher (2012a-d); Reimer (2003, 2004a-b, 2007); Reimer et al. (2002); and Schwager-King (1995).

Table 6.–Age composition and estimated sport harvest by age class and geographic strata for late-run Kenai River Chinook salmon between Soldotna Bridge and Warren Ames Bridge, 1–18 July 2012.

	Age		
Parameter[a]	1.1	1.4	Total
Female			
Sample size[b]		1	1
% Sample		25.0%	25.0%
SE % sample		25.0%	25.0%
Downstream harvest		0	0
SE downstream harvest		0	0
Upstream harvest		25	25
SE upstream harvest		25	25
Total harvest		26	26
SE total harvest		26	26
Male			
Sample size[b]	1	2	3
% Sample	25.0%	50.0%	75.0%
SE % sample	25.0%	28.9%	25.0%
Downstream harvest	0	1	1
SE downstream harvest	0	1	1
Upstream harvest	25	50	76
SE upstream harvest	25	36	44
Total harvest	26	51	77
SE total harvest	26	36	45
Both sexes combined			
Sample size[b]	1	3	4
% Sample	25.0%	75.0%	100.0%
SE % sample	25.0%	25.0%	0.0%
Downstream harvest	0	1	2
SE downstream harvest	0	1	1
Upstream harvest	25	76	101
SE upstream harvest	25	44	51
Total harvest	26	77	103
SE total harvest	26	45	52

Note: Values given by age and sex may not sum to totals due to rounding.

[a] "Downstream" = Kenai River reach between Warren Ames Bridge and the Chinook salmon sonar site; "Upstream" = Kenai River reach between the Chinook salmon sonar site and Soldotna Bridge; "Total harvest" = the downstream and upstream reach harvests combined.

[b] Sample size goal of 19 valid scale ages was not met.

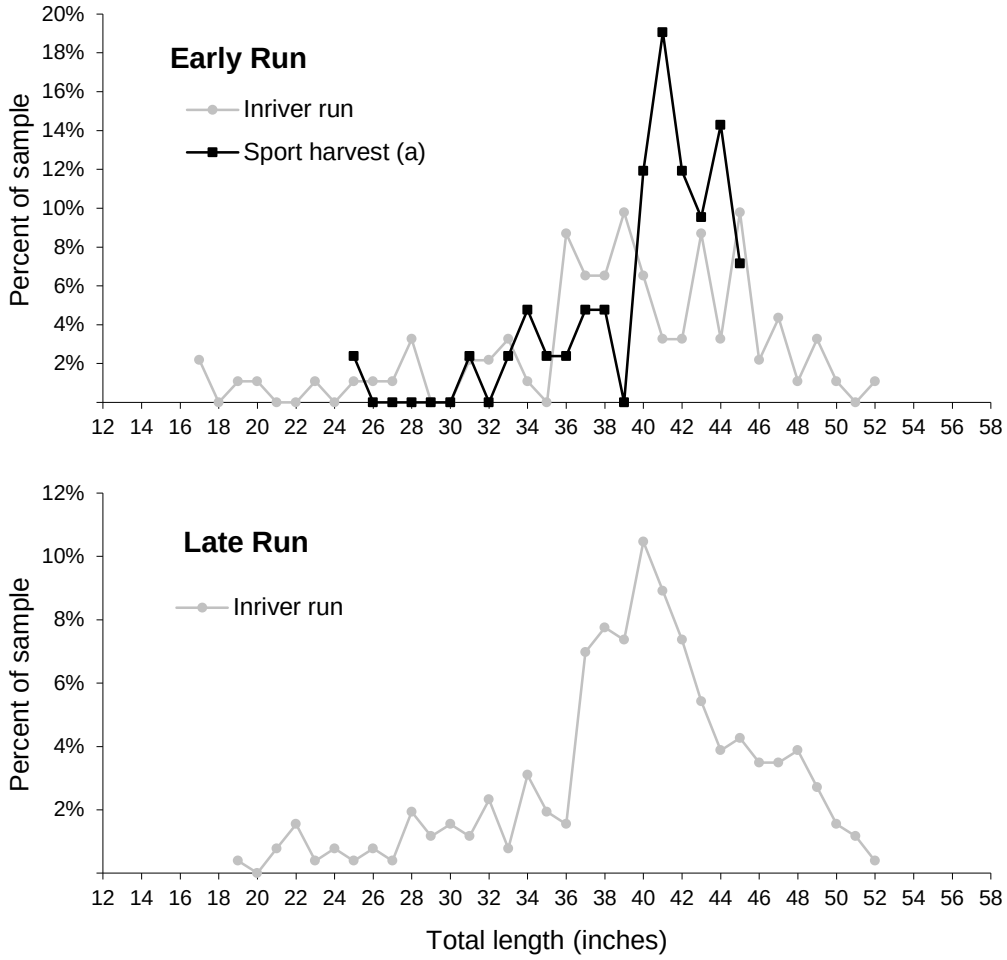

Figure 8.–Length distribution of early-run (top) and late-run (bottom) Kenai River Chinook salmon creel survey and inriver gillnetting samples, 2012.

Note: Due to low run strength and fishery restrictions, only 4 Chinook salmon were sampled by the creel survey during the late-run Kenai River sport fishery.

[a] Early-run Chinook salmon sport harvest truncated by 46–55 inch slot limit.

Inriver Gillnetting

The age composition sample size goal of 127 valid scale ages from the Chinook salmon inriver early run was not met (Table 7). The age composition of 82 Chinook salmon sampled during the inriver early run was estimated to be 4.9% (SE 2.4%) age-1.1 fish, 8.5% (SE 3.1%) age-1.2 fish, 35.4% (SE 5.3%) age-1.3 fish, 50% (SE 5.6%) age-1.4 fish, and 1.2% (SE 1.2%) age-1.5 fish (Table 7 and Figure 7). The proportion of captured age-1.4 males and females was similar (25.6% and 24.4%, respectively), whereas a majority of younger Chinook salmon (age-1.1 and -1.2) and all of the oldest 1.5 age class were males. During the late run, the age composition of the inriver run was estimated to be 1.7% (SE 0.9%) age-1.1 fish, 9.9% (SE 2.0%) age-1.2 fish, 40.1% (SE 3.2%) age-1.3 fish, 44.4% (SE 3.3%) age-1.4 fish, and 3.9% (SE 1.3%) age-1.5 fish (Table 8). Overall, males (50.9%, SE 3.3%) were captured in relatively equal proportions to females (49.1%, SE 3.3%). Captured males made up a larger proportion of the younger age classes (age-1.1 and -1.2) and the 1.5 age class (3.0%, SE 1.1% males; 0.9%, SE 0.6% females), although age-1.4 females (25.9%, SE 2.9%) were captured in higher proportions than males (18.5%, SE 2.6%).

The age composition of the inriver early and late runs did not differ significantly ($\chi^2 = 0.88$, df = 2, $P = 0.64$) with age-1.2, -1.3, and -1.4 fish considered (Tables 7–8). Age-1.4 Chinook salmon made up the highest proportions of the early and late runs, followed by age-1.3 fish, age-1.2 fish, age-1.1 fish, and age-1.5 fish.

The age composition of the early-run harvest and the inriver early run did not differ significantly ($\chi^2 = 4.8$, df = 2, $P = 0.09$) with age-1.2, -1.3, and -1.4 fish considered (Tables 5 and 7). Sample sizes were insufficient in the late-run harvest to test whether the age composition differed from the inriver late-run age composition.

LENGTH-AT-AGE COMPARISONS

METF lengths were compiled by age and sex for the early run (Table 9) and the late run (Table 10). A graphical depiction of length-at-age is shown in Figure 9. On average, age-1.3 female Chinook salmon were slightly larger than age-1.3 males, whereas age-1.4 and age-1.5 male Chinook salmon were larger on average than females of these ages.

Table 7.–Age composition and estimated inriver run by age class for early-run Kenai River Chinook salmon, 16 May–30 June 2012.

	Age					
Parameter	1.1	1.2	1.3	1.4	1.5	Total
Female						
Sample size[a]		1	17	20		38
% Inriver run		1.2%	20.7%	24.4%		46.3%
SE % inriver run		1.2%	4.5%	4.8%		5.5%
Male						
Sample size[a]	4	6	12	21	1	44
% Inriver run	4.9%	7.3%	14.6%	25.6%	1.2%	53.7%
SE % inriver run	2.4%	2.9%	3.9%	4.8%	1.2%	5.5%
Both sexes combined						
Sample size[a]	4	7	29	41	1	82
% Inriver run	4.9%	8.5%	35.4%	50.0%	1.2%	100.0%
SE % inriver run	2.4%	3.1%	5.3%	5.6%	1.2%	0.0%

Note: Values given by age and sex may not sum to totals due to rounding.

[a] Sample size goal of 127 valid scale ages was not met.

Table 8.–Age composition and estimated inriver run by age class for late-run Kenai River Chinook salmon, 1 July–15 August 2012.

	Age					
Parameter	1.1	1.2	1.3	1.4	1.5	Total
Female						
Sample size		4	48	60	2	114
% Inriver run		1.7%	20.7%	25.9%	0.9%	49.1%
SE % inriver run		0.9%	2.7%	2.9%	0.6%	3.3%
Male						
Sample size	4	19	45	43	7	118
% Inriver run	1.7%	8.2%	19.4%	18.5%	3.0%	50.9%
SE % inriver run	0.9%	1.8%	2.6%	2.6%	1.1%	3.3%
Both sexes combined						
Sample size	4	23	93	103	9	232
% Inriver run	1.7%	9.9%	40.1%	44.4%	3.9%	100.0%
SE % inriver run	0.9%	2.0%	3.2%	3.3%	1.3%	0.0%

Note: Values given by age and sex may not sum to totals due to rounding.

Table 9.–Early-run Kenai River Chinook salmon lengths by sex and age from creel survey during 16 May–21 June and inriver gillnet samples during 16 May–30 June 2012.

		Age					
Source	Parameter	1.1	1.2	1.3	1.4	1.5	Combined
Creel Survey							
	Females						
	Sample size			2	22		24
	Mean length (mm)			838	956		946
	SE length (mm)			28	9		11
	Min length (mm)			810	890		810
	Max length (mm)			865	1,065		1,065
	Males						
	Sample size		1	7	6		14
	Mean length (mm)		590	804	1,003		874
	SE length (mm)			21	15		36
	Min length (mm)		590	755	945		590
	Max length (mm)		590	910	1,045		1,045
	Both sexes combined						
	Sample size		1	9	28		38
	Mean length (mm)		590	811	966		919
	SE length (mm)			17	8		16
	Min length (mm)		590	755	890		590
	Max length (mm)		590	910	1,065		1,065
Inriver Gillnet Samples							
	Females						
	Sample size		1	17	20		38
	Mean length (mm)		640	839	977		906
	SE length (mm)			16	12		16
	Min length (mm)		640	710	880		640
	Max length (mm)		640	920	1,050		1,050
	Males						
	Sample size	4	6	12	21	1	44
	Mean length (mm)	426	603	859	1,030	1,170	874
	SE length (mm)	16	16	9	14		32
	Min length (mm)	400	540	820	880	1,170	400
	Max length (mm)	470	640	940	1,135	1,170	1,170
	Both sexes combined						
	Sample size	4	7	29	41	1	82
	Mean length (mm)	426	609	848	1,004	1,170	889
	SE length (mm)	16	15	10	10		19
	Min length (mm)	400	540	710	880	1,170	400
	Max length (mm)	470	640	940	1,135	1,170	1,170

Note: All lengths measured from mid eye to tail fork.

Table 10.–Late-run Kenai River Chinook salmon lengths by sex and age from creel survey during 1 18 July, and inriver gillnet samples during 1 July–15 August 2012.

		Age					
Source	Parameter	1.1	1.2	1.3	1.4	1.5	Combined
Creel Survey							
	Females						
	Sample size				1		1
	Mean length (mm)				995		995
	SE length (mm)						
	Min length (mm)				995		995
	Max length (mm)				995		995
	Males						
	Sample size	1			2		3
	Mean length (mm)	315			1,055		808
	SE length (mm)				15		247
	Min length (mm)	315			1,040		315
	Max length (mm)	315			1,070		1,070
	Both sexes combined						
	Sample size	1			3		4
	Mean length (mm)	315			1,035		855
	SE length (mm)				22		181
	Min length (mm)	315			995		315
	Max length (mm)	315			1,070		1,070
Inriver Gillnet Samples							
	Females						
	Sample size		4	48	60	2	114
	Mean length (mm)		701	880	980	1,088	930
	SE length (mm)		11	6	7	53	8
	Min length (mm)		680	780	855	1,035	680
	Max length (mm)		730	960	1,110	1,140	1,140
	Males						
	Sample size	4	19	45	43	7	118
	Mean length (mm)	481	614	848	1,027	1,119	879
	SE length (mm)	18	14	11	10	16	17
	Min length (mm)	430	495	700	890	1,035	430
	Max length (mm)	510	705	960	1,170	1,150	1,170
	Both sexes combined						
	Sample size	4	23	93	103	9	232
	Mean length (mm)	481	629	865	999	1,112	904
	SE length (mm)	18	14	6	6	15	9
	Min length (mm)	430	495	700	855	1,035	430
	Max length (mm)	510	730	960	1,170	1,150	1,170

Note: All lengths measured from mid eye to tail fork.

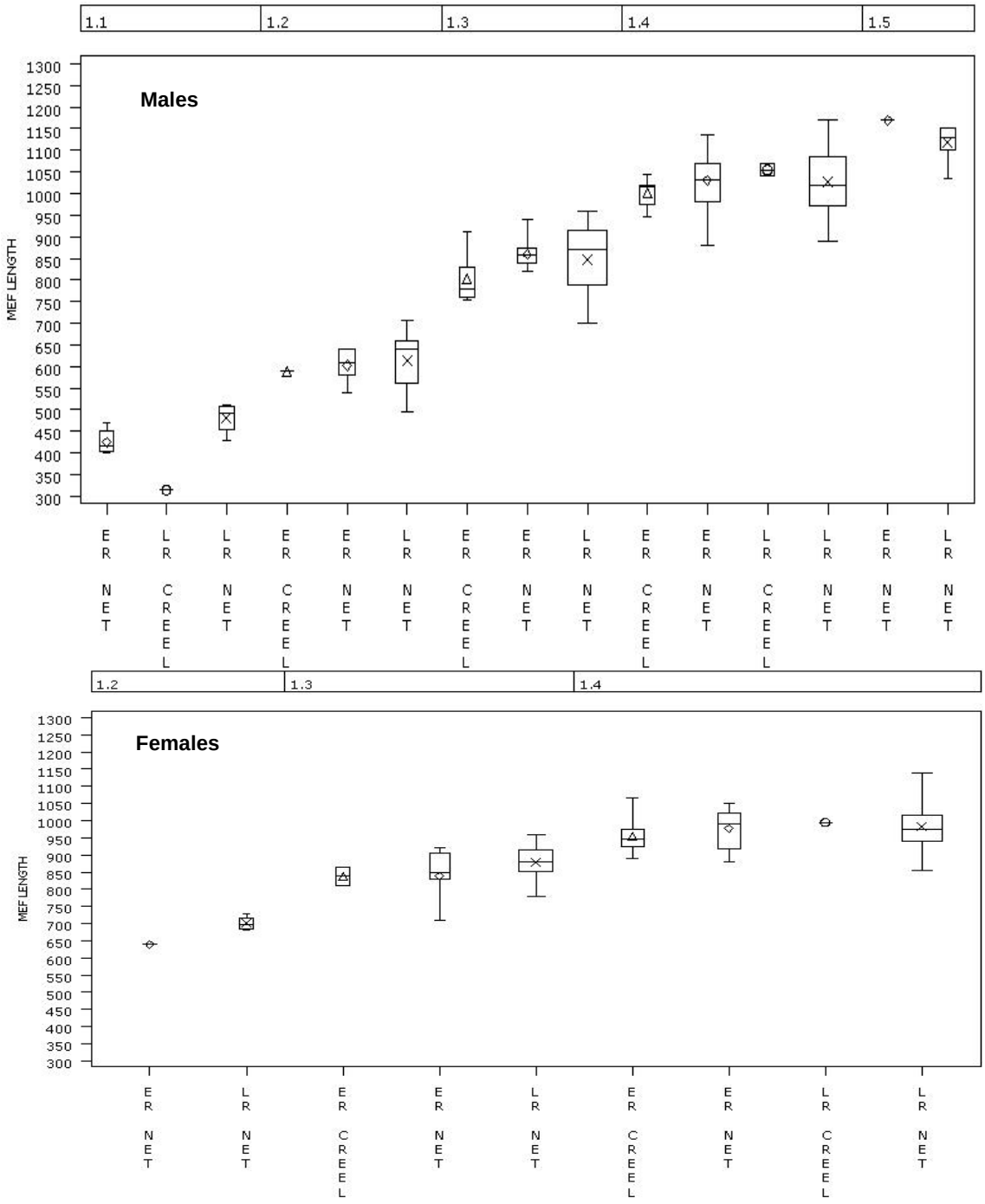

Figure 9.–Box plots of length distribution by sex and age of early- and late-run Kenai River Chinook salmon males (top) and females (bottom) from creel survey and inriver gillnetting samples, 2012.

Note: "ER" = early run; "LR" = late run. The single character within each box identifies the source of the data (e.g., Δ = early-run creel; ◊ = early-run net; O = late-run creel; and X = late-run net).

OTHER RESULTS

During 2012, river conditions during both the early and late runs were above average in water clarity, with average river discharge measurements (Figure 10). Kenai River Secchi disk measurements of water clarity in the sport fishery (taken in the sport fishery at RM 15.3) ranged between 0.5 m and 2.0 m, with the average (1.2 m) slightly above the historical (1998–2011) average of 0.9 m. Secchi disk measurements at the Chinook salmon sonar site (RM 8.5) ranged between 0.2 m and 1.4 m with an average (0.8 m) slightly above the historical average of 0.6 m. The 2012 average discharge (10,283 ft^3/s) was about equal to the historical (1965–2011) average of 10,210 ft^3/s.

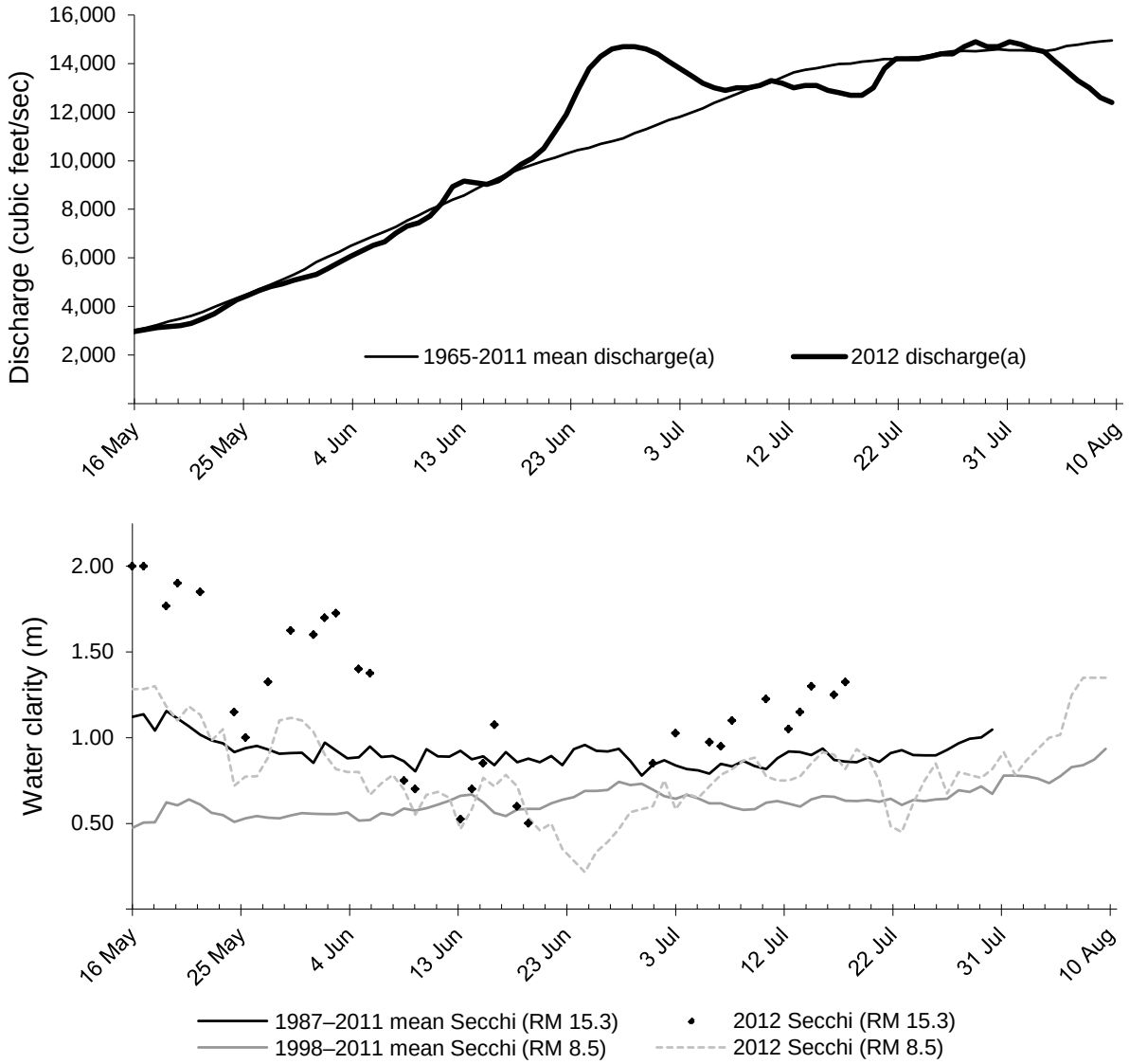

Figure 10.–Kenai River discharge (top) and water clarity (bottom), 16 May–10 August 2012.

[a] Discharge data downloaded from USGS 15266300 Kenai River at Soldotna, AK, 2012-12-06 12:50 EST http://waterdata.usgs.gov/ak/nwis/dv.

Harvest of late-run Chinook salmon downstream of the Chinook salmon sonar site (a tidally influenced section of river) had increased from 5% to 25% of the total late-run harvest for the years 1996–2006, but then decreased from 19% to 2% of the harvest from 2007 to 2012 (Figure 11).

Two Chinook salmon with adipose finclips were sent to the ADF&G Mark, Age, and Tag Laboratory to be inspected for the presence of a coded wire tag (CWT). One of the adipose finclipped Chinook salmon did not have a CWT, while the other had a CWT implanted from the Crooked Creek, Alaska, 2008 brood year.

There was no reported harvest of Chinook salmon 55 inches TL or greater in either run.

Genetic tissue samples were taken from 399 Chinook salmon sampled from inriver gillnets (91 early run, 308 late run), and 87 tissue samples were taken from Chinook salmon sampled from the creel survey (43 early run, 44 late run).

A total of 225 Chinook salmon received an esophageal radio transmitter during the inriver gillnetting study from 16 May through 15 August at RM 8.5 (84 early run, 141 late run). No radio transmitters were recovered from harvested Chinook salmon during creel survey sampling.

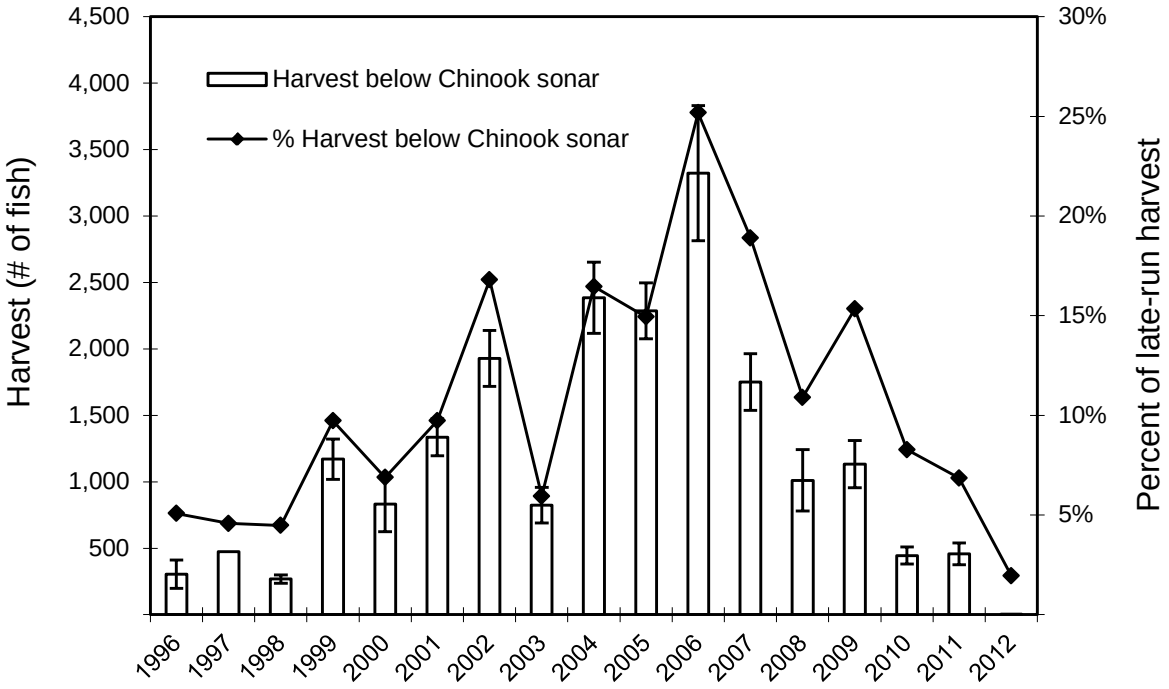

Figure 11.–Estimated number of fish and percent of late-run Kenai River Chinook salmon sport harvest between the Chinook salmon sonar site (RM 8.5) and Warren Ames Bridge (RM 5.2) 1996–2012.

Sources: Eskelin (2007, 2009-2010); King (1997); Marsh (1999-2000); Perschbacher (2012 a-d); Reimer (2003, 2004 a-b, 2007); and Reimer et al. (2002).

Note: Error bars show ±1 standard error. Precision estimates are unavailable for 1997.

DISCUSSION AND RECOMMENDATIONS

CREEL SURVEY

The early-run slot limit regulations (44–55 inches TL from 2003 to 2007, 46–55 inches TL from 2008 to 2012) have been implemented to protect ocean-age-5 Chinook salmon in the early run. Since the inception of the slot limit in 2003, only 2 early-run ocean-age-5 Chinook salmon have been sampled in the creel survey (1 each in 2007 and 2008). Among early-run ocean-age-4 fish, females have been harvested at a higher rate than males (Table 5), most likely because ocean-age-4 males are longer on average than ocean-age-4 females (Table 9) and more likely to be protected under the slot limit than females. As a result of the change to the lower bound of the early-run slot limit (from 44 inches to 46 inches TL in 2008), an additional 8% to 21% of the annually harvested Chinook salmon sampled were between 44 and 46 inches TL (Figure 8, Perschbacher 2012a-d, for years 2008–2012); none of these were age-1.5 fish.

Inseason management actions taken during both the early and late runs limited effort and harvest during 2012. Early-run effort and harvest were among the lowest observed, and late-run effort and harvest were the lowest on record (Figures 3–4). Prior to the setting of harvest restrictions on Chinook salmon less than 20 inches TL or 55 inches TL or greater (15 June during the early run and 10 July during the late run), approximately 20% of early-run (Appendices B1–B2) and 37% (Appendices B2–B3) of late-run Chinook salmon were released in the sport fishery. After the early- and late-run restrictions were implemented, 100% of Chinook salmon caught were released until the sport fisheries were closed to all Chinook salmon fishing. The estimated harvest of early-run and late-run Chinook salmon downstream of the sonar was only 2 fish and no fish, respectively.

During 2012, late-run Monday estimates of unguided angler effort, catch, and harvest were generated using a recalibrated index and were the lowest on record (Figure 5). The Monday fishery has grown in popularity, although unguided harvest was estimated to be only 2% of the total late-run harvest in 2012. Index estimates should continue to be included in season totals to monitor this portion of the fishery. To ensure the accuracy of the estimates of angler effort based on a single index count, and because imputed HPUE and CPUE rates are used, Mondays should be included in the creel sampling schedule on a 5-year cycle (beginning 2015).

Currently, the Kenai River Chinook salmon creel survey CPUE rates are used with 3 other indices by fisheries managers to gauge run strength and run timing of Kenai River Chinook salmon. The creel survey, coupled with management tools used for inseason estimates of run strength, timing, and abundance (such as the inriver gillnetting project, ESSN fishery, and the dual frequency identification sonar [DIDSON] project) are critical for inseason and postseason assessment of Kenai River Chinook salmon.

INRIVER GILLNETTING

Since 2007, the inriver gillnetting schedule has been changed to sample as close to the high tide as possible without interfering with the gillnetting crew's ability to drift the net effectively. Greater sonar fish passage than before has been observed in 6 of the last 8 early runs and 8 of the last 8 late runs during the current netting schedule (Perschbacher 2012d). Fish passage results for 2012 are preliminary as the Chinook salmon sonar transitions from the split-beam sonar to the DIDSON sonar. It is recommended that the change to the inriver gillnetting sampling schedule be retained.

Since 2011, managers have relied more heavily on inseason inriver gillnetting CPUE as ADF&G transitions from the split-beam sonar to DIDSON sonar to estimate Kenai River Chinook salmon abundance. The inriver gillnetting program continues to be an integral part of Kenai River Chinook salmon stock assessment and is critical to both inseason and postseason management of Kenai River Chinook salmon.

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APPENDIX A: BOAT ANGLER COUNTS DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2012

Appendix A1.–Guided and unguided boat angler counts by geographic strata during the early-run Kenai River Chinook salmon fishery, 16 May–21 June 2012.

		Downstream[b]								Upstream[b]								Combined strata							
	Day	Unguided anglers[c]				Guided anglers[c]				Unguided anglers[c]				Guided anglers[c]				Unguided anglers[c]				Guided anglers[c]			
Date	type[a]	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
16 May	wd	0	0	0	0	0	0	0		0	1	4	0	4	6	0		0	1	4	0	4	6	0	
17 May	wd		0	0	0		0	0			3	7	2		4	0			3	7	2		4	0	
19 May	we/hol	0	2	0	0	0	0	0		3	7	4	0	4	9	20		3	9	4	0	4	9	20	
20 May	we/hol	0	0	0	0					4	8	8	0					4	8	8	0				
22 May	wd	0	0	0	0	0	0			6	7	14	0	25	5			6	7	14	0	25	5		
25 May	wd	0	0	0	0	0	0	0		4	4	6	5	38	27	5		4	4	6	5	38	27	5	
26 May	we/hol	0	0	0	0		0	0		0	22	10	5		47	35		0	22	10	5		47	35	
28 May	we/hol	0	0	0	0	0	0	0		0	23	10	6	20	50	8		0	23	10	6	20	50	8	
30 May	wd	0	0	0	0	0	0	0		6	13	11	4	33	59	3		6	13	11	4	33	59	3	
1 Jun	wd	0	0	0	0	0	0	0		12	9	9	20	56	53	23		12	9	9	20	56	53	23	
2 Jun	we/hol	0	0	0	0	0	0	0		8	19	20	19	60	64	41		8	19	20	19	60	64	41	
3 Jun	we/hol	0	4	0	0					31	24	36	11					31	28	36	11				
5 Jun	wd	0	0	0	0		4	0		16	12	28	14		101	30		16	12	28	14		105	30	
6 Jun	wd	0	0	0	0		0	0		2	15	12	8		102	37		2	15	12	8		102	37	
9 Jun	we/hol	0	0	0	0	0	0			54	34	31	2	130	94			54	34	31	2	130	94		
10 Jun	we/hol	0	0	0	0					40	77	34	13					40	77	34	13				
14 Jun	wd	0	0	0	0	0	0	0		9	32	17	4	137	70	28		9	32	17	4	137	70	28	
15 Jun	wd	0	0	0	0	0	0			3	5	11	0	41	29			3	5	11	0	41	29		
16 Jun	we/hol	0	0	0	0	0	0	0		5	13	23	0	50	51	17		5	13	23	0	50	51	17	
17 Jun	we/hol	0	0	0	0					15	34	16	8					15	34	16	8				
19 Jun	wd	0	0	0	0	0	0	0		6	8	0	3	77	36	18		6	8	0	3	77	36	18	
20 Jun	wd	0	0	0	0	0	0	0		3	6	7	2	47	21	5		3	6	7	2	47	21	5	
Min (All A–D)			0				0				0				0				0				0		
Mean (All A–D)			0				0				12				39				12				39		
Max (All A–D)			4				4				77				137				77				137		

Note: Blank space in data fields indicates that fishing was closed for guided anglers during the time of this count and there are no data to present.

[a] "wd" = weekday; "we/hol" = weekend/holiday

[b] "Downstream" = Kenai River reach from Warren Ames Bridge to the Chinook salmon sonar site; "Upstream" = Kenai River reach from the Chinook salmon sonar site to Soldotna Bridge.

[c] Angler count times: A = 0400–0859 hours; B = 0900–1359 hours; C = 1400–1959 hours; and D = 2000–2359 hours.

Appendix A2.–Guided and unguided boat angler counts by geographic strata during the late-run Kenai River Chinook salmon fishery, 1–18 July 2012.

		Downstream[b]								Upstream[b]								Combined strata							
		Unguided anglers[c]				Guided anglers[c]				Unguided anglers[c]				Guided anglers[c]				Unguided anglers[c]				Guided anglers[c]			
Date	Day type[a]	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1 Jul	we/hol	0	6	0	0					218	112	36	19					218	118	36	19				
2 Jul	Mon																		9						
3 Jul	wd	0	0	0	0		6	0		36	60	28	25		256	76		36	60	28	25		262	76	
6 Jul	wd	0	0	2	0		0	2		28	45	33	12		185	45		28	45	35	12		185	47	
7 Jul	we/hol	0	4	4	0	0	2	7		65	47	28	15	214	89	25		65	51	32	15	214	91	32	
8 Jul	we/hol	0	1	7	0					62	50	36	32					62	51	43	32				
9 Jul	Mon																		18						
11 Jul	wd	0	4	0	0		8	0		1	16	10	9		181	80		1	20	10	9		189	80	
13 Jul	wd	0	0	0	0	0	3	0		22	33	18	21	198	123	33		22	33	18	21	198	126	33	
14 Jul	we/hol	0	0	0	0		0	0		6	40	55	13		172	140		6	40	55	13		172	140	
15 Jul	we/hol	0	0	0	0					31	48	66	25					31	48	66	25				
16 Jul	Mon																		15						
17 Jul	wd	1	0	0	4	0	9	0		51	50	62	55	289	207	87		52	50	62	59	289	216	87	
18 Jul	wd	2	7	40	0	4	12			33	39	29	99	216	155			35	46	69	99	220	167		
Min (All A–D)			0				0				1				25				1				32		
Mean (All A–D)			2				3				41				146				41				149		
Max (All A–D)			40				12				218				289				218				289		

Note: Blank space in data fields indicates that fishing was closed for guided anglers during the time of this count and there are no data to present.

[a] "wd" = weekday; "we/hol" = weekend/holiday; "Mon" = Monday index count (0800–1359); Monday angler count was not geographically stratified.

[b] "Downstream" = Kenai River reach from Warren Ames Bridge to the Chinook salmon sonar site; "Upstream" = Kenai River reach from the Chinook salmon sonar site to Soldotna Bridge.

[c] Angler count times: A = 0400–0859 hours; B = 0900–1359 hours; C = 1400–1959 hours; and D = 2000–2359 hours.

APPENDIX B: EFFORT, CATCH, AND HARVEST ESTIMATES BY GEOGRAPHIC STRATA DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2012

Appendix B1.–Daily estimates by geographic strata of unguided boat angler CPUE, HPUE, angler effort, and catch and harvest during the early-run Kenai River Chinook salmon fishery, 16 May–21 June 2012.

		Angler interview data[a]					Downstream[b]								Upstream[b]							
			Catch		Harvest		Counts		Effort		Catch		Harvest		Counts		Effort		Catch		Harvest	
Date	Day type[c]	*n*[d]	CPUE	SE	HPUE	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE
16 May	wd	4	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	1.3	25	21	0	0	0	0
17 May	wd	7	0.000	0.000	0.000	0.000	3	0	0	0	0	0	0	0	3	4.0	80	37	0	0	0	0
19 May	we/hol	13	0.035	0.034	0.000	0.000	4	0.5	10	12	0	1	0	0	4	3.5	70	26	2	3	0	0
20 May	we/hol	9	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	5.0	100	37	0	0	0	0
22 May	wd	11	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	6.8	135	64	0	0	0	0
25 May	wd	8	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	4.8	95	9	0	0	0	0
26 May	we/hol	21	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	9.3	185	104	0	0	0	0
28 May	we/hol	25	0.050	0.026	0.037	0.023	4	0	0	0	0	0	0	0	4	9.8	195	109	10	7	7	6
30 May	wd	13	0.062	0.038	0.062	0.038	4	0	0	0	0	0	0	0	4	8.5	170	41	10	7	10	7
1 Jun	wd	18	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	12.5	250	47	0	0	0	0
2 Jun	we/hol	27	0.012	0.012	0.000	0.000	4	0	0	0	0	0	0	0	4	16.5	330	45	4	4	0	0
3 Jun	we/hol	27	0.020	0.012	0.013	0.010	4	1.0	20	23	0	1	0	0	4	25.5	510	117	10	6	7	5
5 Jun	wd	8	0.059	0.060	0.030	0.030	4	0	0	0	0	0	0	0	4	17.5	350	88	21	22	10	11
6 Jun	wd	16	0.034	0.024	0.034	0.024	4	0	0	0	0	0	0	0	4	9.3	185	57	6	5	6	5
9 Jun	we/hol	44	0.005	0.005	0.000	0.000	4	0	0	0	0	0	0	0	4	30.3	605	144	3	3	0	0
10 Jun	we/hol	42	0.016	0.009	0.016	0.009	4	0	0	0	0	0	0	0	4	41.0	820	247	13	9	13	9
14 Jun	wd	11	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	15.5	310	124	0	0	0	0
15 Jun	wd	5	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	4.8	95	52	0	0	0	0
16 Jun	we/hol	8	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	10.3	205	107	0	0	0	0
17 Jun	we/hol	18	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	18.3	365	112	0	0	0	0
19 Jun	wd	5	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	4.3	85	36	0	0	0	0
20 Jun	wd	11	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	4.5	90	24	0	0	0	0
	Min	4	0.000		0.000		3	0	0		0		0		3	1.3	25		0		0	
	Mean	16	0.013		0.009		4	0	1		0		0		4	11.9	239		4		2	
	Max	44	0.062		0.062		4	1.0	1		0		0		4	41.0	820		21		13	

-continued-

Note: "Catch" = fish harvested plus fish released; "Harvest" = fish kept; "Effort" = angler-hours; "CPUE" = catch per unit effort; "HPUE" = harvest per unit effort.

[a] Angler counts were geographically stratified; angler interviews were not. CPUE and HPUE are catch and harvest per hour.

[b] "Downstream" = Kenai River reach from Warren Ames Bridge to the Chinook salmon sonar site; "Upstream" = Kenai River reach from the Chinook salmon sonar site to Soldotna Bridge.

[c] "wd" = weekday; "we/hol" = weekend/holiday.

[d] On days with fewer than 5 angler interviews, pooled estimates of CPUE and HPUE from other days in the stratum were used.

Appendix B2.–Daily estimates by geographic strata of guided boat angler CPUE, HPUE, angler effort, and catch and harvest during the early-run Kenai River Chinook salmon fishery, 16 May–21 June 2012.

		Angler interview data[a]					Downstream[b]								Upstream[b]							
			Catch		Harvest		Counts		Effort		Catch		Harvest		Counts		Effort		Catch		Harvest	
Date	Day type[c]	*n*[d]	CPUE	SE	HPUE	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE
16 May	wd	2	0.010	0.007	0.010	0.007	3	0	0	0	0	0	0	0	3	3.3	40	22	0	0	0	0
17 May	wd	9	0.000	0.000	0.000	0.000	2	0	0	0	0	0	0	0	2	2.0	24	24	0	0	0	0
19 May	we/hol	10	0.016	0.019	0.016	0.019	3	0	0	0	0	0	0	0	3	11.0	132	42	2	3	2	3
22 May	wd	25	0.030	0.015	0.022	0.013	2	0	0	0	0	0	0	0	2	15.0	180	120	5	5	4	4
25 May	wd	14	0.000	0.000	0.000	0.000	3	0	0	0	0	0	0	0	3	23.3	280	85	0	0	0	0
26 May	we/hol	21	0.016	0.012	0.016	0.012	3	0	0	0	0	0	0	0	3	41.0	492	72	8	6	8	6
28 May	we/hol	12	0.013	0.014	0.013	0.014	3	0	0	0	0	0	0	0	3	26.0	312	179	4	5	4	5
30 May	wd	20	0.050	0.021	0.041	0.020	3	0	0	0	0	0	0	0	3	31.7	380	214	19	13	16	12
1 Jun	wd	10	0.000	0.000	0.000	0.000	3	0	0	0	0	0	0	0	3	44.0	528	104	0	0	0	0
2 Jun	we/hol	18	0.037	0.020	0.037	0.020	3	0	0	0	0	0	0	0	3	55.0	660	81	25	13	25	13
5 Jun	wd	26	0.074	0.024	0.066	0.024	3	2.0	24	24	2	2	2	2	3	65.5	786	426	58	37	52	34
6 Jun	wd	13	0.017	0.012	0.009	0.009	3	0	0	0	0	0	0	0	3	69.5	834	390	14	12	7	8
9 Jun	we/hol	49	0.014	0.007	0.010	0.006	2	0	0	0	0	0	0	0	2	112.0	1,344	216	18	10	14	8
14 Jun	wd	14	0.009	0.010	0.009	0.010	3	0	0	0	0	0	0	0	3	78.3	940	274	9	9	9	9
15 Jun	wd	11	0.000	0.000	0.000	0.000	2	0	0	0	0	0	0	0	2	35.0	420	72	0	0	0	0
16 Jun	we/hol	16	0.073	0.023	0.000	0.000	3	0	0	0	0	0	0	0	3	39.3	472	118	35	14	0	0
19 Jun	wd	8	0.053	0.025	0.000	0.000	3	0	0	0	0	0	0	0	3	43.7	524	155	28	16	0	0
20 Jun	wd	7	0.000	0.000	0.000	0.000	3	0	0	0	0	0	0	0	3	24.3	292	106	0	0	0	0
	Min	2	0.000		0.000		2	0	0		0		0		2	2.0	24		0		0	
	Mean	16	0.023		0.014		3	0	1		0		0		3	40.0	480		12		8	
	Max	49	0.074		0.066		3	2.0	24		2		2		3	112.0	1,344		58		52	

Note: "Catch" = fish harvested plus fish released; "Harvest" = fish kept; "Effort" = angler-hours; "CPUE" = catch per unit effort; "HPUE" = harvest per unit effort.

[a] Angler counts were geographically stratified; angler interviews were not. CPUE and HPUE are catch and harvest per hour.

[b] "Downstream" = Kenai River reach from Warren Ames Bridge to the Chinook salmon sonar site; "Upstream" = Kenai River reach from the Chinook salmon sonar site to Soldotna Bridge.

[c] "wd" = weekday; "we/hol" = weekend/holiday.

[d] On days with fewer than 5 angler interviews, pooled estimates of CPUE and HPUE from other days in the stratum were used.

Appendix B3.–Daily estimates by geographic strata of unguided boat angler CPUE, HPUE, angler effort, and catch and harvest during the late-run Kenai River Chinook salmon fishery, 1–18 July 2012.

		Angler interview data[a]					Downstream[b]								Upstream[b]							
			Catch		Harvest		Counts		Effort		Catch		Harvest		Counts		Effort		Catch		Harvest	
Date	Day type[c]	*n*[d]	CPUE	SE	HPUE	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE
1 Jul	we/hol	40	0.016	0.009	0.010	0.007	4	1.5	30	35	0	1	0	0	4	96.3	1,925	537	30	19	20	15
2 Jul	Mon[e]		0.013		0.010																	
3 Jul	wd	20	0.009	0.010	0.009	0.010	4	0	0	0	0	0	0	0	4	37.3	745	164	7	8	7	8
6 Jul	wd	18	0.000	0.000	0.000	0.000	4	0.5	10	12	0	0	0	0	4	29.5	590	121	0	0	0	0
7 Jul	we/hol	21	0.012	0.012	0.012	0.012	4	2.0	40	23	0	1	0	1	4	38.8	775	119	9	10	9	10
8 Jul	we/hol	9	0.033	0.032	0.000	0.000	4	2.0	40	38	1	2	0	0	4	45	900	77	30	29	0	0
9 Jul	Mon[e]		0.022		0.000																	
11 Jul	wd	2	0.053	0.031	0.000	0.000	4	1.0	20	23	1	1	0	0	4	9.0	180	66	10	8	0	0
13 Jul	wd	19	0.056	0.024	0.000	0.000	4	0	0	0	0	0	0	0	4	23.5	470	77	26	12	0	0
14 Jul	we/hol	3	0.226	0.112	0.000	0.000	4	0	0	0	0	0	0	0	4	28.5	570	229	129	67	0	0
15 Jul	we/hol	19	0.225	0.052	0.000	0.000	4	0	0	0	0	0	0	0	4	42.5	850	196	191	62	0	0
16 Jul	Mon[e]		0.135		0.000																	
17 Jul	wd	19	0.030	0.022	0.000	0.000	4	1.3	25	17	1	1	0	0	4	54.5	1,090	57	33	25	0	0
18 Jul	wd	10	0.032	0.033	0.000	0.000	4	12.3	245	213	8	11	0	0	4	50.0	1,000	290	32	34	0	0
	Min	2	0.000		0.000		4	0	0		0		0		4	9.0	180		0		0	
	Mean	16	0.062		0.003		4	1.9	37		1		0		4	41.3	827		45		3	
	Max	40	0.226		0.012		4	12.3	245		8		0		4	96.3	1,925		191		20	

Note: "Catch" = fish harvested plus fish released; "Harvest" = fish kept; "Effort" = angler-hours; "CPUE" = catch per unit effort; "HPUE" = harvest per unit effort.

[a] Angler counts were geographically stratified; angler interviews were not. CPUE and HPUE are catch and harvest per hour.

[b] "Downstream" = Kenai River reach from Warren Ames Bridge to the Chinook salmon sonar site; "Upstream" = Kenai River reach from the Chinook salmon sonar site to Soldotna Bridge.

[c] "wd" = weekday; "we/hol" = weekend/holiday; "Mon" = Monday index estimates, not geographically stratified.

[d] On days with fewer than 5 angler interviews, pooled estimates of CPUE and HPUE from other days in the stratum were used.

[e] Monday CPUE and HPUE estimates were selected based on CPUE and HPUE estimates that occurred on adjacent power-boat days before and after each Monday.

Appendix B4.–Daily estimates by geographic strata of guided boat angler CPUE, HPUE, angler effort, and catch and harvest during the late-run Kenai River Chinook salmon fishery, 1–18 July 2012.

		Angler interview data[a]					Downstream[b]							Upstream[b]							
			Catch		Harvest		Counts		Effort		Catch		Harvest		Counts		Effort		Catch		Harvest	
Date	Day type[c]	*n*[d]	CPUE	SE	HPUE	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE
3 Jul	wd	41	0.013	0.007	0.013	0.007	3	3.0	36	36	0	1	0	1	3	166.0	1,992	1,080	25	20	25	20
6 Jul	wd	14	0.000	0.000	0.000	0.000	3	1.0	12	12	0	0	0	0	3	115.0	1,380	840	0	0	0	0
7 Jul	we/hol	24	0.006	0.006	0.006	0.006	3	3.0	36	19	0	0	0	0	3	109.3	1,312	486	8	8	8	8
11 Jul	wd	57	0.047	0.012	0.000	0.000	3	4.0	48	48	2	2	0	0	3	130.5	1,566	606	73	34	0	0
13 Jul	wd	43	0.031	0.013	0.000	0.000	3	1.0	12	15	0	0	0	0	3	118.0	1,416	406	43	22	0	0
14 Jul	we/hol	49	0.069	0.012	0.000	0.000	3	0	0	0	0	0	0	0	3	156.0	1,872	192	129	27	0	0
17 Jul	wd	37	0.059	0.013	0.000	0.000	3	3.0	36	44	2	3	0	0	3	194.3	2,332	503	137	42	0	0
18 Jul	wd	67	0.057	0.010	0.000	0.000	2	8.0	96	48	5	3	0	0	2	185.5	2,226	366	127	31	0	0
	Min	14	0.000		0.000		2	0	0		0		0		2	109.3	1,312		0		0	
	Mean	42	0.035		0.002		3	2.9	35		1		0		3	146.8	1,762		68		4	
	Max	67	0.069		0.013		3	8.0	96		5		0		3	194.3	2,332		137		25	

Note: "Catch" = fish harvested plus fish released; "Harvest" = fish kept; "Effort" = angler-hours; "CPUE" = catch per unit effort; "HPUE" = harvest per unit effort.

[a] Angler counts were geographically stratified; angler interviews were not. CPUE and HPUE are catch and harvest per hour.

[b] "Downstream" = Kenai River reach from Warren Ames Bridge to the Chinook salmon sonar site; "Upstream" = Kenai River reach from the Chinook salmon sonar site to Soldotna Bridge.

[c] "wd" = weekday; "we/hol" = weekend/holiday.

APPENDIX C: EFFORT, CATCH, AND HARVEST ESTIMATES BY TEMPORAL AND GEOGRAPHIC STRATA DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2012

Appendix C1.–Estimated effort, catch, and harvest, by geographic strata, during the early-run Kenai River Chinook salmon fishery, 16 May–21 June 2012.

	Downstream[a] creek estimates						Upstream[a] creek estimates								
	Effort		Catch		Harvest		Effort		Catch		Harvest				
Fishing periods	Hours fished	SE	No. fish	SE	No. fish	SE	Hours fished	SE	No. fish	SE	No. fish	SE	Downstream % Effort	Catch	Harvest
16–20 May															
Guided weekdays	0	0	0	0	0	0	96	42	1	1	1	1	0.0%	0.0%	0.0%
Guided weekends	0	0	0	0	0	0	132	42	2	3	2	3	0.0%	0.0%	0.0%
Unguided weekdays	0	0	0	0	0	0	158	70	0	0	0	0	0.0%	N/A	N/A
Unguided weekends	10	12	0	1	0	0	170	45	2	3	0	0	5.6%	12.5%	N/A
22–28 May															
Guided weekdays	0	0	0	0	0	0	920	252	11	10	8	8	0.0%	0.0%	0.0%
Guided weekends	0	0	0	0	0	0	804	193	12	8	12	8	0.0%	0.0%	0.0%
Unguided weekdays	0	0	0	0	0	0	460	108	0	0	0	0	0.0%	N/A	N/A
Unguided weekends	0	0	0	0	0	0	570	185	15	12	11	10	0.0%	0.0%	0.0%
29 May–3 June															
Guided weekdays	0	0	0	0	0	0	1,816	396	38	33	31	28	0.0%	0.0%	0.0%
Guided weekends	0	0	0	0	0	0	660	81	25	13	25	13	0.0%	0.0%	0.0%
Unguided weekdays	0	0	0	0	0	0	840	143	21	18	21	18	0.0%	0.0%	0.0%
Unguided weekends	20	23	0	1	0	0	840	125	14	7	7	5	2.3%	2.8%	3.8%
5–10 June															
Guided weekdays	48	48	4	4	3	3	3,240	820	145	82	118	80	1.5%	2.4%	2.6%
Guided weekends	0	0	0	0	0	0	1,344	216	18	10	14	8	0.0%	0.0%	0.0%
Unguided weekdays	0	0	0	0	0	0	1,070	277	54	38	33	18	0.0%	0.0%	0.0%
Unguided weekends	0	0	0	0	0	0	1,425	286	17	9	13	9	0.0%	0.0%	0.0%
12-17 June															
Guided weekdays	0	0	0	0	0	0	2,720	837	17	18	17	18	0.0%	0.0%	0.0%
Guided weekends	0	0	0	0	0	0	472	118	35	14	0	0	0.0%	0.0%	N/A
Unguided weekdays	0	0	0	0	0	0	810	359	0	0	0	0	0.0%	N/A	N/A
Unguided weekends	0	0	0	0	0	0	570	155	0	0	0	0	0.0%	N/A	N/A
19–21 June															
Guided weekdays	0	0	0	0	0	0	1,224	305	42	31	0	0	0.0%	0.0%	N/A
Unguided weekdays	0	0	0	0	0	0	263	53	0	0	0	0	0.0%	N/A	N/A

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	Downstream[a] creel estimates						Upstream[a] creel estimates								
			Chinook salmon						Chinook salmon						
	Effort		Catch		Harvest		Effort		Catch		Harvest				
Fishing periods	Hours fished	SE	No. fish	SE	No. fish	SE	Hours fished	SE	No. fish	SE	No. fish	SE	Downstream % Effort	Catch	Harvest
Day type subtotals															
Guided weekdays	48	48	4	4	3	3	10,016	1,299	253	96	175	87	0.5%	1.4%	1.8%
Guided weekends/holiday	0	0	0	0	0	0	3,412	326	91	23	52	18	0.0%	0.0%	0.0%
Unguided weekdays	0	0	0	0	0	0	3,600	495	75	42	54	25	0.0%	0.0%	0.0%
Unguided weekends/holiday	30	26	1	1	0	0	3,575	397	48	17	31	14	0.8%	1.6%	0.8%
Angler type subtotals															
Guided	48	48	4	4	3	3	13,428	1,340	344	99	228	89	0.4%	1.0%	1.4%
% Guided	61.5%		82.5%		92.4%		65.2%		73.7%		72.8%				
Unguided	30	26	1	1	0	0	7,175	635	123	45	85	29	0.4%	0.6%	0.3%
% Unguided	38.5%		17.5%		7.6%		34.8%		26.3%		27.2%				
Early-run total	78	55	4	4	3	3	20,603	1,482	467	109	313	93	0.4%	0.9%	1.1%

Note: "N/A" = not applicable.

[a] "Downstream" = Kenai River reach from Warren Ames Bridge to the Chinook salmon sonar site; "Upstream" = Kenai River reach from the Chinook salmon sonar site to Soldotna Bridge.

Appendix C2.–Estimated effort, catch, and harvest, by geographic strata, during the late-run Kenai River Chinook salmon fishery, 1–18 July 2012.

	Downstream[a] creek estimates						Upstream[a] creek estimates								
	Effort		Catch		Harvest		Effort		Catch		Harvest				
Fishing periods	Hours fished	SE	No. fish	SE	No. fish	SE	Hours fished	SE	No. fish	SE	No. fish	SE	Downstream % Effort	Catch	Harvest
1 July															
Unguided weekends	30	35	0	1	0	0	1,925	537	30	19	20	15	1.5%	1.5%	1.5%
3-8 July															
Guided weekdays	96	63	1	1	1	1	6,744	2,120	50	45	50	45	1.4%	1.8%	1.8%
Guided weekends	36	19	0	0	0	0	1,312	486	8	8	8	8	2.7%	2.7%	2.7%
Unguided weekdays	20	22	0	0	0	0	2,670	362	14	15	14	15	0.7%	0.0%	0.0%
Unguided weekends	80	44	2	2	0	1	1,675	142	39	30	9	10	4.6%	4.4%	4.9%
10-15 July															
Guided weekdays	120	87	5	4	0	0	5,964	1,053	232	71	0	0	2.0%	2.2%	N/A
Guided weekends	0	0	0	0	0	0	1,872	192	129	27	0	0	0.0%	0.0%	N/A
Unguided weekdays	40	43	2	2	0	0	1,300	434	72	31	0	0	3.0%	2.9%	N/A
Unguided weekends	0	0	0	0	0	0	1,420	301	320	103	0	0	0.0%	0.0%	N/A
17-18 July															
Guided weekdays	132	65	8	4	0	0	4,558	622	264	52	0	0	2.8%	2.8%	N/A
Unguided weekdays	270	213	9	11	0	0	2,090	295	65	42	0	0	11.4%	11.6%	N/A
Day type subtotals															
Guided weekdays	348	126	14	6	1	1	17,266	2,447	546	99	50	45	2.0%	2.4%	1.8%
Guided weekends	36	19	0	0	0	0	3,184	523	137	28	8	8	1.1%	0.2%	2.7%
Unguided weekdays	330	219	11	11	0	0	6,060	638	151	54	14	15	5.2%	6.6%	0.0%
Unguided weekdays	110	56	2	2	1	1	5,020	632	389	109	29	18	2.1%	0.6%	2.6%
Angler type subtotals															
Guided	384	128	14	6	1	1	20,450	2,503	683	103	58	46	1.8%	2.0%	1.9%
% Guided	46.6%		51.7%		58.6%		64.9%		55.8%		57.2%				
Unguided	440	226	13	11	1	1	11,080	898	540	122	43	23	3.8%	2.3%	1.8%
% Unguided	53.4%		48.3%		41.4%		35.1%		44.2%		42.8%				
Late-run total[a]	824	259	27	13	2	1	31,530	2,659	1,223	160	101	51	2.5%	2.1%	1.9%

Note: "N/A" = not applicable.

[a] "Downstream" = Kenai River reach from Warren Ames Bridge to the Chinook salmon sonar site; "Upstream" = Kenai River reach from the Chinook salmon sonar site to Soldotna Bridge.

APPENDIX D: INRIVER GILLNETTING DAILY CATCH, CPUE, AND SPECIES PROPORTION DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2012

Appendix D1.–Number of Chinook salmon, sockeye salmon, and rainbow trout caught inriver in 5.0-inch and 7.5-inch mesh gillnets during the early-run Kenai River Chinook salmon sport fishery, 16 May–30 June 2012.

	Inriver drift gillnetting catch													
	5.0-inch mesh						7.5-inch mesh					Combined total[a]		
Date	No. drifts	Time fished (min)	Chinook salmon	Sockeye salmon	Rainbow trout	Total	No. drifts	Time fished (min)	Chinook salmon	Sockeye salmon	Total	Chinook salmon	Sockeye salmon	Total
16 May	8	102	1	6	0	7	8	83	1	0	1	2	6	8
17 May	7	91	0	0	0	0	8	100	0	0	0	0	0	0
18 May	8	98	0	1	0	1	7	95	0	0	0	0	1	1
19 May	8	85	1	4	0	5	9	99	2	1	3	3	5	8
20 May	9	105	2	4	0	6	8	87	2	0	2	4	4	8
21 May	8	86	1	3	0	4	8	94	2	1	3	3	4	7
22 May	7	74	1	1	0	2	6	68	1	0	1	2	1	3
23 May	7	61	0	1	0	1	8	87	0	1	1	0	2	2
24 May	8	76	1	11	0	12	8	69	2	1	3	3	12	15
25 May	6	56	0	7	0	7	6	56	0	3	3	0	10	10
26 May	7	65	0	4	0	4	6	56	2	1	3	2	5	7
27 May	7	49	0	1	0	1	9	75	2	2	4	2	3	5
28 May	10	87	0	9	0	9	8	63	0	3	3	0	12	12
29 May	8	68	0	1	0	1	9	79	1	3	4	1	4	5
30 May	8	65	2	12	0	14	7	57	3	3	6	5	15	20
31 May	5	35	0	4	0	4	6	48	0	2	2	0	6	6
1 Jun	8	72	2	10	0	12	8	71	0	6	6	2	16	18
2 Jun	8	72	1	30	0	31	8	76	3	7	10	4	37	41
3 Jun	10	73	1	9	0	10	8	62	2	1	3	3	10	13
4 Jun	8	64	1	23	0	24	8	58	0	13	13	1	36	37
5 Jun	10	70	2	52	0	54	8	64	0	11	11	2	63	65
6 Jun	9	67	1	15	0	16	10	81	2	6	8	3	21	24
7 Jun	8	59	1	32	0	33	7	49	2	11	13	3	43	46
8 Jun	9	60	2	22	0	24	10	76	3	10	13	5	32	37
9 Jun	9	68	0	32	0	32	8	57	4	10	14	4	42	46

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	Inriver drift gillnetting catch													
	5.0-inch mesh						7.5-inch mesh					Combined total[a]		
Date	No. drifts	Time fished (min)	Chinook salmon	Sockeye salmon	Rainbow trout	Total	No. drifts	Time fished (min)	Chinook salmon	Sockeye salmon	Total	Chinook salmon	Sockeye salmon	Total
10 Jun	9	59	0	15	0	15	10	78	2	8	10	2	23	25
11 Jun	12	90	1	10	0	11	11	74	2	3	5	3	13	16
12 Jun	9	75	0	29	0	29	10	74	2	7	9	2	36	38
13 Jun	10	77	0	20	0	20	9	63	2	7	9	2	27	29
14 Jun	9	56	0	21	0	21	10	75	1	5	6	1	26	27
15 Jun	12	84	0	18	0	18	12	83	0	9	9	0	27	27
16 Jun	10	70	0	15	0	15	10	78	2	2	4	2	17	19
17 Jun	10	67	0	3	0	3	10	60	2	0	2	2	3	5
18 Jun	12	76	1	6	0	7	12	72	2	0	2	3	6	9
19 Jun	12	69	1	21	0	22	12	67	6	10	16	7	31	38
20 Jun	12	69	2	29	0	31	12	69	0	6	6	2	35	37
21 Jun	14	79	1	40	1	42	13	76	1	8	9	2	48	51
22 Jun	15	78	1	9	0	10	16	88	2	2	4	3	11	14
23 Jun	16	92	1	15	0	16	15	85	1	4	5	2	19	21
24 Jun	13	66	1	21	0	22	14	72	1	11	12	2	32	34
25 Jun	14	70	1	15	0	16	14	67	0	11	11	1	26	27
26 Jun	16	79	1	8	0	9	16	77	2	9	11	3	17	20
27 Jun	14	64	0	9	0	9	13	63	3	17	20	3	26	29
28 Jun	12	61	5	27	0	32	12	61	1	11	12	6	38	44
29 Jun	16	87	1	21	0	22	15	76	2	24	26	3	45	48
30 Jun	12	75	0	28	0	28	12	73	0	29	29	0	57	57
Total	459	3,352	37	674	1	712	454	3,339	68	279	347	105	953	1,059
Min	5	35	0	0	0	0	6	48	0	0	0	0	0	0
Mean	10	73	1	15	0	15	10	73	1	6	8	2	21	23
Max	16	105	5	52	1	54	16	100	6	29	29	7	63	65

[a] Combined totals are sum for each salmon species or total number of fish caught in 5.0-inch and 7.5-inch mesh gillnets.

Appendix D2.–Catch and CPUE of Chinook and sockeye salmon, and proportion of Chinook salmon caught inriver in 5.0-inch and 7.5-inch mesh gillnets, for replicates with at least 1 drift from each mesh size, during the early-run Kenai River Chinook salmon sport fishery, 16 May–30 June 2012.

	Inriver drift gillnetting catch												
				Chinook salmon			Sockeye salmon			Total		Chinook salmon	
Date	Reps[a]	No. drifts	Time fished (min)	No. fish	CPUE[b]	SE	No. fish	CPUE[b]	SE	No. fish	CPUE[b]	Prop.[c]	SE
16 May	4	16	185	2	0.012	0.012	6	0.030	0.006	8	0.043	0.29	0.23
17 May	4	15	192	0	0.000	0.000	0	0.000	0.000	0	0.000		
18 May	4	15	193	0	0.000	0.000	1	0.005	0.005	1	0.005	0.00	0.00
19 May	4	16	175	3	0.016	0.011	5	0.030	0.012	8	0.046	0.35	0.22
20 May	4	16	182	4	0.023	0.009	3	0.016	0.006	7	0.039	0.58	0.17
21 May	4	16	180	3	0.018	0.012	4	0.027	0.027	7	0.039	0.40	0.11
22 May	3	12	129	2	0.016	0.008	1	0.009	0.009	3	0.023	0.64	0.17
23 May	4	15	147	0	0.000	0.000	2	0.013	0.013	2	0.014	0.00	0.00
24 May	4	16	145	3	0.021	0.007	12	0.076	0.014	15	0.103	0.22	0.06
25 May	3	12	112	0	0.000	0.000	10	0.087	0.061	10	0.089	0.00	0.00
26 May	3	12	110	2	0.019	0.009	5	0.046	0.032	7	0.064	0.29	0.25
27 May	4	16	125	2	0.012	0.007	3	0.024	0.009	5	0.040	0.34	0.15
28 May	4	16	132	0	0.000	0.000	11	0.081	0.028	11	0.084	0.00	0.00
29 May	4	16	138	1	0.007	0.007	4	0.027	0.019	5	0.036	0.21	0.24
30 May	4	15	122	5	0.036	0.018	15	0.141	0.064	20	0.164	0.20	0.14
31 May	3	11	83	0	0.000	0.000	6	0.061	0.033	6	0.073	0.00	0.00
1 Jun	4	16	143	2	0.015	0.008	16	0.110	0.075	18	0.126	0.12	0.07
2 Jun	4	16	148	4	0.028	0.013	37	0.257	0.047	41	0.277	0.10	0.04
3 Jun	4	16	119	3	0.026	0.009	10	0.084	0.018	13	0.109	0.24	0.09
4 Jun	4	16	122	1	0.008	0.008	36	0.291	0.041	37	0.304	0.03	0.03
5 Jun	4	16	125	1	0.008	0.008	49	0.395	0.135	50	0.401	0.02	0.01
6 Jun	5	19	149	3	0.017	0.007	21	0.163	0.036	24	0.162	0.10	0.05
7 Jun	4	15	108	3	0.037	0.016	43	0.383	0.121	46	0.427	0.09	0.05
8 Jun	5	19	136	5	0.034	0.016	32	0.218	0.066	37	0.273	0.14	0.04
9 Jun	4	16	118	4	0.034	0.012	39	0.326	0.069	43	0.364	0.09	0.02

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	Inriver drift gillnetting catch											
				Chinook salmon			Sockeye salmon			Total		
Date	Reps[a]	No. drifts	Time fished (min)	No. fish	CPUE[b]	SE	No. fish	CPUE[b]	SE	No. fish	CPUE[b]	Chinook salmon Prop.[c]	Chinook salmon SE
10 Jun	5	19	137	2	0.012	0.008	23	0.154	0.040	25	0.183	0.07	0.03
11 Jun	6	23	163	3	0.017	0.011	13	0.069	0.016	16	0.098	0.19	0.12
12 Jun	5	19	149	2	0.013	0.013	36	0.259	0.035	38	0.254	0.05	0.05
13 Jun	5	19	140	2	0.021	0.014	27	0.195	0.078	29	0.208	0.10	0.03
14 Jun	5	19	130	1	0.007	0.007	26	0.197	0.053	27	0.207	0.03	0.03
15 Jun	6	24	168	0	0.000	0.000	27	0.153	0.050	27	0.161	0.00	0.00
16 Jun	5	20	148	2	0.011	0.007	17	0.106	0.046	19	0.128	0.09	0.03
17 Jun	5	20	128	2	0.015	0.010	3	0.019	0.012	5	0.039	0.45	0.04
18 Jun	6	24	148	3	0.022	0.010	6	0.039	0.020	9	0.061	0.36	0.20
19 Jun	6	24	136	7	0.053	0.018	31	0.231	0.061	38	0.279	0.19	0.05
20 Jun	6	24	138	2	0.015	0.010	35	0.248	0.039	37	0.269	0.06	0.04
21 Jun	7	27	155	2	0.013	0.008	48	0.309	0.070	50	0.323	0.04	0.03
22 Jun	8	31	166	3	0.019	0.009	11	0.097	0.036	14	0.084	0.16	0.05
23 Jun	8	31	177	2	0.011	0.007	19	0.099	0.033	21	0.119	0.10	0.04
24 Jun	7	27	139	2	0.014	0.009	32	0.244	0.045	34	0.245	0.05	0.03
25 Jun	7	28	137	1	0.008	0.008	26	0.180	0.061	27	0.197	0.04	0.05
26 Jun	8	32	156	3	0.018	0.009	17	0.110	0.023	20	0.129	0.14	0.07
27 Jun	7	27	126	3	0.022	0.011	26	0.214	0.034	29	0.229	0.09	0.04
28 Jun	6	24	122	6	0.046	0.023	38	0.314	0.074	44	0.360	0.13	0.06
29 Jun	8	31	162	3	0.028	0.018	45	0.280	0.044	48	0.296	0.09	0.06
30 Jun	6	24	148	0	0.000	0.000	57	0.386	0.097	57	0.386	0.00	0.00
Total	230	901	6,587	104	0.753		934	6.802		1,038	0.1576	NA	
Min	3	11	83	0	0.000		0	0.000		0	0.000	0.00	
Mean	5	20	143	2	0.016		20	0.148		23	0.1576	0.15	
Max	8	32	193	7	0.053		57	0.395		57	0.2951	0.64	

Note: NA = not applicable.

[a] A complete replicate (rep) consists of 4 drifts (2 mesh sizes, 2 banks). Only reps that had at least 1 drift from each mesh size were used in this table.

[b] CPUE is catch per minute.

[c] Proportion of combined total catch = Chinook salmon CPUE / combined total all species CPUE.

Appendix D3.–Number of Chinook, sockeye, coho, and pink salmon, Dolly Varden, and rainbow trout caught inriver in 5.0-inch and 7.5-inch mesh gillnets during the late-run Kenai River Chinook salmon sport fishery, 1 July–15 August 2012.

	Inriver drift gillnetting catch																	
	5.0-inch mesh									7.5-inch mesh								Comb. total[a]	
Date	No. drifts	Time fished (min)	Chinook salmon	Sockeye salmon	Coho salmon	Pink salmon	Rainbow trout	Dolly Varden	Total	No. drifts	Time fished (min)	Chinook salmon	Sockeye salmon	Coho salmon	Pink salmon	Dolly Varden	Total	Chinook salmon	Total
1 Jul	12	72	1	44	0	0	0	0	45	11	60	1	47	0	0	0	48	2	93
2 Jul	12	73	0	51	0	0	0	0	51	12	72	1	33	0	0	0	34	1	85
3 Jul	12	62	1	82	0	0	0	0	83	11	52	1	53	0	0	0	54	2	137
4 Jul	10	54	2	70	0	0	0	0	72	10	52	1	59	0	0	0	60	3	132
5 Jul	9	46	1	47	0	0	0	0	48	8	39	6	51	0	0	0	57	7	105
6 Jul	11	60	0	46	0	0	0	0	46	12	67	1	29	0	0	0	30	1	76
7 Jul	12	71	2	56	0	0	1	0	59	12	70	0	41	0	0	0	41	2	100
8 Jul	11	65	2	51	0	0	0	0	53	11	68	4	35	0	0	0	39	6	92
9 Jul	11	68	1	36	0	0	0	0	37	10	58	3	15	0	0	0	18	4	55
10 Jul	10	60	4	68	0	0	0	0	72	10	64	5	47	0	0	0	52	9	124
11 Jul	10	63	3	45	0	0	0	0	48	10	55	3	17	0	0	0	20	6	68
12 Jul	10	64	4	60	0	0	0	0	64	10	66	3	30	0	0	0	33	7	97
13 Jul	10	62	3	65	0	0	0	0	68	10	52	0	51	0	0	0	51	3	119
14 Jul	10	41	3	108	0	0	0	0	111	10	44	4	88	0	0	0	92	7	203
15 Jul	9	37	0	125	0	0	0	0	125	8	29	2	63	0	0	0	65	2	190
16 Jul	9	40	1	90	0	0	0	0	91	10	49	1	83	0	0	0	84	2	175
17 Jul	8	41	7	48	0	0	0	0	55	8	41	10	32	0	0	0	42	17	97
18 Jul	10	51	3	82	0	0	0	0	85	11	56	4	62	0	0	0	66	7	151
19 Jul	12	59	3	88	0	0	0	0	91	11	58	4	55	0	0	1	60	7	151
20 Jul	10	52	0	70	0	0	0	0	70	11	58	7	71	0	0	0	78	7	148
21 Jul	8	41	0	137	0	0	0	0	137	8	39	4	85	0	0	0	89	4	226
22 Jul	9	32	1	163	0	0	0	0	164	10	40	4	108	0	0	0	112	5	276
23 Jul	11	52	2	87	0	0	0	0	89	10	48	1	44	0	0	0	45	3	134
24 Jul	13	64	1	80	0	0	0	0	81	14	67	2	59	0	0	0	61	3	142
25 Jul	12	61	6	80	0	0	0	0	86	11	56	7	30	0	0	1	38	13	124

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	Inriver drift gillnetting catch																		
	5.0-inch mesh									7.5-inch mesh								Comb. total[a]	
Date	No. drifts	Time fished (min)	Chinook salmon	Sockeye salmon	Coho salmon	Pink salmon	Rainbow trout	Dolly Varden	Total	No. drifts	Time fished (min)	Chinook salmon	Sockeye salmon	Coho salmon	Pink salmon	Dolly Varden	Total	Chinook salmon	Total
26 Jul	10	50	4	49	0	0	0	1	54	11	55	6	31	0	0	0	37	10	91
27 Jul	8	49	7	29	0	0	0	0	36	8	44	7	11	0	0	0	18	14	54
28 Jul	11	57	9	32	0	0	0	0	41	12	63	10	11	0	2	0	23	19	64
29 Jul	10	51	9	18	0	0	0	0	27	9	45	9	7	0	0	0	16	18	43
30 Jul	12	58	2	31	0	4	0	0	37	12	62	12	8	0	6	0	26	14	63
31 Jul	12	59	6	30	0	5	0	0	41	11	51	6	7	0	0	0	13	12	54
1 Aug	10	47	4	57	0	9	0	0	70	10	45	8	10	0	3	0	21	12	91
2 Aug	14	66	2	45	0	7	0	0	54	14	66	4	10	0	1	0	15	6	69
3 Aug	12	58	3	44	0	36	0	1	84	13	65	4	8	0	7	0	19	7	103
4 Aug	13	64	4	34	0	7	0	0	45	12	63	4	3	0	1	0	8	8	53
5 Aug	15	71	2	12	0	21	0	0	35	16	71	3	4	0	9	0	16	5	51
6 Aug	15	75	1	14	1	16	0	0	32	14	67	9	1	2	0	1	13	10	45
7 Aug	12	59	5	5	0	15	0	0	25	13	66	10	0	0	3	0	13	15	38
8 Aug	10	52	7	3	3	45	0	0	58	10	54	8	0	0	17	0	25	15	83
9 Aug	10	68	4	4	9	26	0	0	43	10	66	9	0	2	9	0	20	13	63
10 Aug	10	64	4	4	8	68	0	0	84	10	58	7	1	0	30	0	38	11	122
11 Aug	9	55	1	7	10	114	0	0	132	10	57	8	1	2	57	0	68	9	200
12 Aug	10	61	6	5	6	151	0	0	168	9	54	1	0	2	85	0	88	7	256
13 Aug	11	64	5	2	3	91	0	0	101	12	80	4	3	2	77	0	86	9	187
14 Aug	10	68	1	0	5	143	0	0	149	9	57	2	0	3	127	0	132	3	281
15 Aug	8	54	0	2	1	163	0	0	166	10	64	0	0	0	155	0	155	0	321
Total	493	2,642	137	2,306	46	921	1	2	3,413	494	2,612	210	1,404	13	589	3	2,219	347	5,632
Min	8	32	0	0	0	0	0	0	25	8	29	0	0	0	0	0	8	0	38
Mean	11	57	3	50	1	20	0	0	74	11	57	5	31	0	13	0	48	8	122
Max	15	75	9	163	10	163	1	1	168	16	80	12	108	3	155	1	155	19	321

[a] Combined totals are sum of the number of Chinook salmon or total number of fish caught in 5.0- and 7.5-inch mesh gillnets.

Appendix D4.–Catch and CPUE of Chinook, sockeye, coho, and pink salmon, and proportion of Chinook salmon caught inriver in 5.0-inch and 7.5-inch mesh gillnets, for replicates with at least 1 drift from each mesh size, during the late-run Kenai River Chinook salmon sport fishery, 1 July–15 August 2012.

				Inriver drift gillnetting catch												
				Chinook salmon			Sockeye salmon			Coho salmon			Pink salmon			Chinook salmon
Date	R[a]	No. drifts	Time fished (min)	No.	CPUE[b]	SE	No.	CPUE[b]	SE	No.	CPUE[b]	SE	No.	CPUE[b]	SE	Prop.[c]	SE
1 Jul	6	23	132	2	0.013	0.008	91	0.693	0.100	0	0.000	0.000	0	0.000	0.000	0.02	0.01
2 Jul	6	24	145	1	0.008	0.008	84	0.616	0.140	0	0.000	0.000	0	0.000	0.000	0.01	0.01
3 Jul	6	23	113	2	0.016	0.010	135	1.182	0.178	0	0.000	0.000	0	0.000	0.000	0.01	0.01
4 Jul	5	20	106	3	0.027	0.011	129	1.208	0.160	0	0.000	0.000	0	0.000	0.000	0.02	0.01
5 Jul	4	16	80	7	0.085	0.030	96	1.240	0.317	0	0.000	0.000	0	0.000	0.000	0.06	0.03
6 Jul	6	23	127	1	0.007	0.007	75	0.635	0.097	0	0.000	0.000	0	0.000	0.000	0.01	0.01
7 Jul	6	24	141	2	0.013	0.008	97	0.689	0.034	0	0.000	0.000	0	0.000	0.000	0.02	0.01
8 Jul	6	22	132	6	0.048	0.020	86	0.644	0.068	0	0.000	0.000	0	0.000	0.000	0.07	0.03
9 Jul	5	20	121	4	0.033	0.008	50	0.393	0.104	0	0.000	0.000	0	0.000	0.000	0.08	0.02
10 Jul	5	20	124	9	0.074	0.034	115	0.959	0.159	0	0.000	0.000	0	0.000	0.000	0.07	0.03
11 Jul	5	20	118	6	0.054	0.017	62	0.536	0.159	0	0.000	0.000	0	0.000	0.000	0.09	0.01
12 Jul	5	20	131	7	0.054	0.016	90	0.726	0.192	0	0.000	0.000	0	0.000	0.000	0.07	0.02
13 Jul	5	20	114	3	0.024	0.015	116	1.040	0.263	0	0.000	0.000	0	0.000	0.000	0.02	0.02
14 Jul	5	20	84	7	0.098	0.044	196	2.604	0.486	0	0.000	0.000	0	0.000	0.000	0.04	0.01
15 Jul	4	16	62	2	0.034	0.020	181	2.966	0.806	0	0.000	0.000	0	0.000	0.000	0.01	0.01
16 Jul	5	19	89	2	0.053	0.053	173	1.818	0.325	0	0.000	0.000	0	0.000	0.000	0.03	0.03
17 Jul	4	16	82	17	0.216	0.075	80	0.976	0.051	0	0.000	0.000	0	0.000	0.000	0.18	0.05
18 Jul	5	20	100	7	0.070	0.020	142	1.399	0.229	0	0.000	0.000	0	0.000	0.000	0.05	0.02
19 Jul	6	23	117	7	0.055	0.019	143	1.187	0.169	0	0.000	0.000	0	0.000	0.000	0.04	0.01
20 Jul	5	20	105	6	0.053	0.026	138	1.271	0.339	0	0.000	0.000	0	0.000	0.000	0.04	0.01
21 Jul	4	16	79	4	0.048	0.034	222	2.908	0.937	0	0.000	0.000	0	0.000	0.000	0.02	0.01
22 Jul	5	19	72	5	0.065	0.023	271	3.701	0.983	0	0.000	0.000	0	0.000	0.000	0.02	0.00
23 Jul	5	20	96	3	0.031	0.013	125	1.282	0.283	0	0.000	0.000	0	0.000	0.000	0.02	0.01
24 Jul	7	27	131	3	0.024	0.011	139	0.998	0.334	0	0.000	0.000	0	0.000	0.000	0.02	0.01
25 Jul	6	23	117	13	0.108	0.031	110	0.889	0.192	0	0.000	0.000	0	0.000	0.000	0.11	0.03

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	Inriver drift gillnetting catch																
				Chinook salmon			Sockeye salmon			Coho salmon			Pink salmon			Chinook salmon	
Date	R[a]	No. drifts	Time fished (min)	No.	CPUE[b]	SE	No.	CPUE[b]	SE	No.	CPUE[b]	SE	No.	CPUE[b]	SE	Prop.[c]	SE
26 Jul	5	20	100	10	0.096	0.029	80	0.772	0.178	0	0.000	0.000	0	0.000	0.000	0.11	0.01
27 Jul	4	16	93	14	0.144	0.056	40	0.419	0.126	0	0.000	0.000	0	0.000	0.000	0.26	0.09
28 Jul	6	23	120	19	0.145	0.041	43	0.329	0.098	0	0.000	0.000	2	0.019	0.019	0.29	0.06
29 Jul	5	19	96	18	0.191	0.021	25	0.234	0.066	0	0.000	0.000	0	0.000	0.000	0.45	0.08
30 Jul	6	24	121	14	0.114	0.019	39	0.332	0.057	0	0.000	0.000	10	0.082	0.038	0.22	0.04
31 Jul	6	23	110	12	0.105	0.030	37	0.313	0.069	0	0.000	0.000	5	0.042	0.020	0.23	0.07
1 Aug	5	20	91	12	0.132	0.028	67	0.728	0.075	0	0.000	0.000	12	0.129	0.025	0.13	0.02
2 Aug	7	28	132	6	0.046	0.014	55	0.413	0.063	0	0.000	0.000	8	0.060	0.029	0.09	0.03
3 Aug	6	24	119	6	0.051	0.026	51	0.434	0.078	0	0.000	0.000	43	0.367	0.088	0.06	0.03
4 Aug	6	24	123	8	0.067	0.029	34	0.280	0.050	0	0.000	0.000	8	0.067	0.024	0.16	0.07
5 Aug	8	31	142	5	0.033	0.013	16	0.107	0.042	0	0.000	0.000	30	0.198	0.056	0.10	0.05
6 Aug	7	28	138	10	0.075	0.028	15	0.105	0.029	3	0.022	0.016	16	0.111	0.037	0.23	0.08
7 Aug	6	24	120	15	0.120	0.035	5	0.038	0.024	0	0.000	0.000	18	0.150	0.059	0.39	0.04
8 Aug	5	20	105	15	0.152	0.049	3	0.024	0.016	3	0.028	0.028	62	0.663	0.298	0.18	0.02
9 Aug	5	20	134	13	0.102	0.035	4	0.028	0.013	11	0.084	0.032	35	0.262	0.051	0.21	0.04
10 Aug	5	20	123	11	0.097	0.019	5	0.040	0.012	8	0.065	0.040	98	0.850	0.210	0.09	0.01
11 Aug	5	19	112	9	0.078	0.026	8	0.067	0.022	12	0.124	0.044	171	1.518	0.175	0.04	0.01
12 Aug	5	19	115	7	0.065	0.013	5	0.052	0.028	8	0.061	0.017	236	2.265	0.350	0.03	0.01
13 Aug	6	23	143	9	0.085	0.052	5	0.032	0.012	5	0.034	0.022	168	1.148	0.282	0.07	0.05
14 Aug	5	19	126	3	0.035	0.026	0	0.000	0.000	8	0.061	0.024	270	2.402	0.555	0.01	0.01
15 Aug	4	16	112	0	0.000	0.000	2	0.023	0.023	1	0.008	0.008	282	2.703	0.763	0.00	0.00
Total	248	974	5,194	345	3.244		3,685	37.333		59	0.486		1,474	13.036		NA	
Min	4	16	62	0	0.000		0	0.000		0	0.000		0	0.000		0.000	
Mean	5	21	113	8	0.071		80	0.812		1	0.011		32	0.283		0.098	
Max	8	31	145	19	0.216		271	3.701		12	0.124		282	2.703		0.450	

Note: NA = not applicable.

[a] A complete replicate (R) consists of 4 drifts (2 mesh sizes, 2 banks). Only replicates that had at least 1 drift from each mesh size were used in this table.

[b] CPUE is catch per minute.

[c] Proportion of combined total catch = Chinook salmon CPUE / combined total of all species CPUE.