Fishery Data Series No. 12-75

Chinook Salmon Creel Survey and Inriver Gillnetting Study, Lower Kenai River, Alaska, 2010

by

Jeff Perschbacher

December 2012

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. 12-75

CHINOOK SALMON CREEL SURVEY AND INRIVER GILLNETTING STUDY, LOWER KENAI RIVER, ALASKA, 2010

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December 2012

This investigation was partially financed by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777K) under project F-10-19, Job No. S-2-5a.

ADF&G Fishery Data Series was established in 1987 for the publication of Division of Sport Fish technically oriented results for a single project or group of closely related projects, and in 2004 became a joint divisional series with the Division of Commercial Fisheries. Fishery Data Series reports are intended for fishery and other technical professionals and are available through the Alaska State Library and on the Internet: http://www.adfg.alaska.gov/sf/publications/. This publication has undergone editorial and peer review.

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This document should be cited as:
Perschbacher, J. 2012. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2010. Alaska Department of Fish and Game, Fishery Data Series No. 12-75, Anchorage.

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ABSTRACT

A creel survey to estimate angler effort, catch, and harvest of early- and late-run Chinook salmon (*Oncorhynchus tshawytscha*) was conducted on the Kenai River between the Soldotna Bridge and the Warren Ames Bridge from 16 May through 31 July, 2010. A standardized inriver gillnetting program was conducted to estimate catch rates and species composition near the Chinook salmon sonar site from 16 May through 10 August 2010. Estimates obtained from the creel survey and inriver gillnetting program were used for inseason management of the Kenai River Chinook salmon early and late runs. The early-run sport fishery was closed between the Soldotna Bridge and Warren Ames Bridge from 5 to 11 June, reopened to harvest of Chinook salmon either less than 20 inches or 55 inches or greater in length from 12 to 14 June, and reopened to harvest of Chinook salmon either less than 46 inches or 55 inches or greater in length from 15 to 30 June, by emergency order(s). During the early run (16 May–4 June; 12–30 June) anglers harvested 837 (SE 94) Chinook salmon with 39,739 (SE 2,995) angler-hours of effort. Unguided anglers accounted for 41% of effort and 23% of harvest; the remaining effort and harvest were guided. During the early run, 164 Chinook salmon and 1,125 sockeye salmon were captured in the inriver gillnetting program near the Chinook salmon sonar site; the ratio of Chinook salmon CPUE to all species CPUE averaged 0.20. The age composition of the early-run Chinook salmon passage at the sonar site of 7.0% (SE 2.4%) age-1.1 fish, 25.1% (SE 3.9%) age-1.2 fish, 47.5% (SE 4.4%) age-1.3 fish, 20.0% (SE 3.4%) age-1.4 fish, and 0.5% (SE 0.5%) age-1.5 fish, was similar to the age composition of the early-run harvest although a smaller proportion of age-1.1 fish (2.2%, SE 2.2%), and zero age-1.5 fish were harvested. During the late run (1–31 July), anglers harvested 5,375 (SE 441) Chinook salmon with 158,189 (SE 6,099) angler-hours of effort. Unguided anglers accounted for 56% of effort and 51% of harvest; the remaining effort and harvest were guided. During the late run, 311 Chinook salmon, 3,454 sockeye salmon, 90 coho salmon, and 446 pink salmon were captured in the inriver gillnetting program; the ratio of Chinook salmon CPUE to all species CPUE averaged 0.08. The age composition of late-run (1 July–10 August) Chinook salmon passage at the sonar site of 4.0% (SE 1.2%) age-1.1 fish, 20.1% (SE 2.6%) age-1.2 fish, 34.0% (SE 3.3%) age-1.3 fish, 35.7% (SE 3.3%) age-1.4 fish, and 6.2% (SE 1.8%) age-1.5 fish, was similar to the age composition of the late-run harvest although smaller proportions of age-1.2 fish (13.9%, SE 2.7%), and age-1.5 fish (4.1%, SE 1.4%) were harvested.

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 two distinct run timing patterns: “early” (late April–late June), and “late” (late June–early August). 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 those entering on or after 1 July. Sport 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.

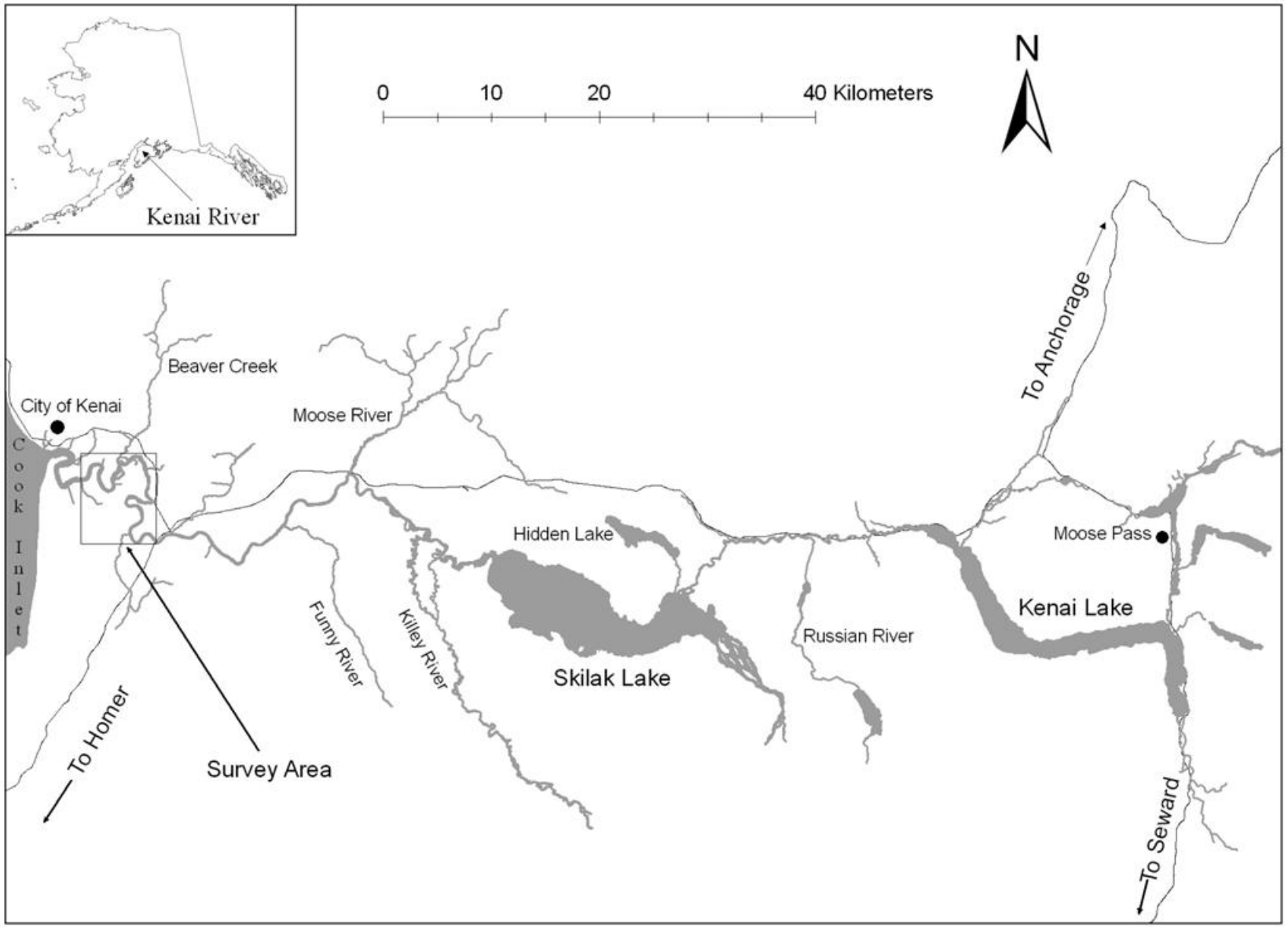

Figure 1.–Kenai River drainage on the Kenai Peninsula in Southcentral Alaska.

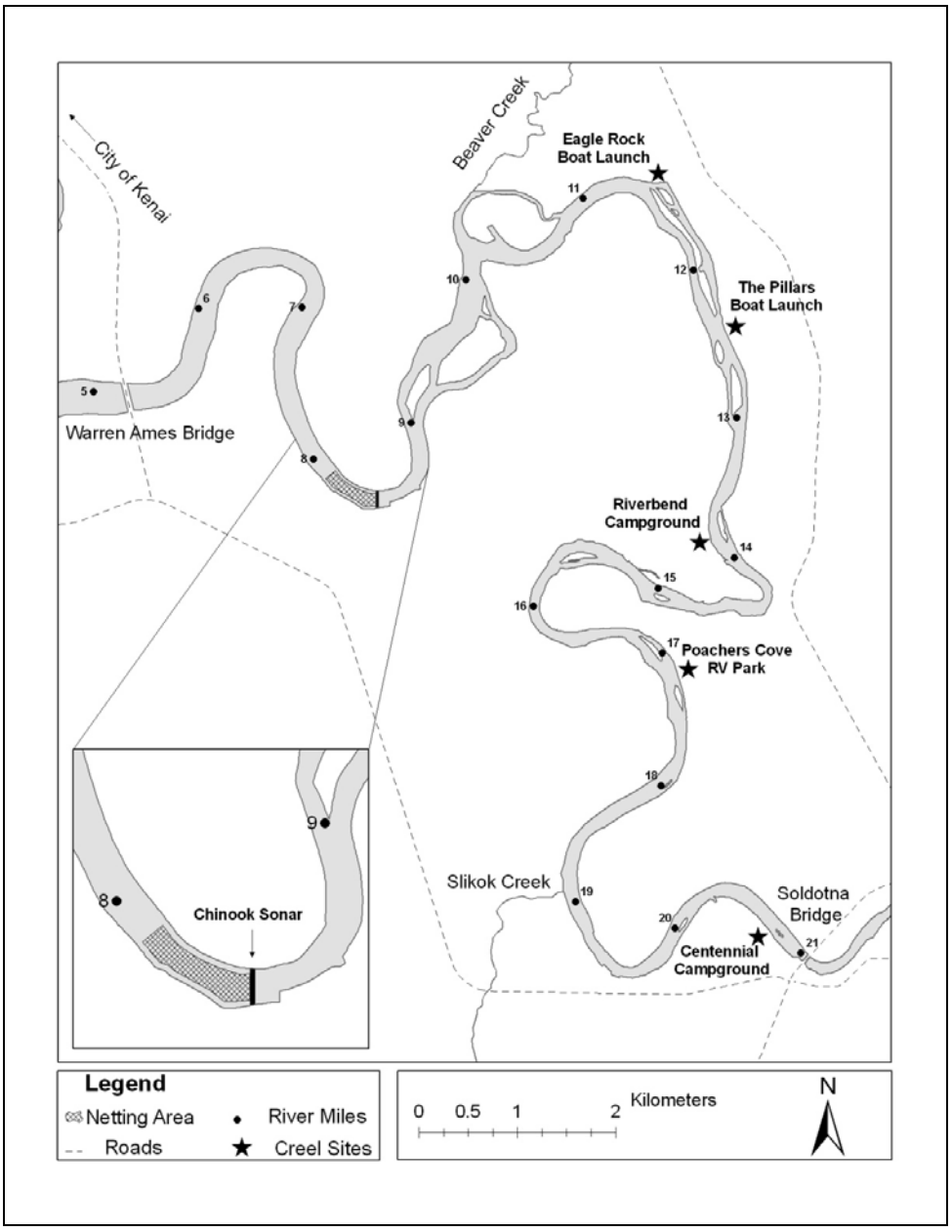

Figure 2.–Lower Kenai River from Warren Ames Bridge (RM 5.2) to Soldotna Bridge (RM 21.1).

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 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).

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 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 early and late Kenai River Chinook salmon runs have separate management plans adopted by the Alaska Board of Fisheries (BOF). 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 (1975-1981, 1988-1994); Hammarstrom et al. 1985; Hammarstrom and Larson (1982-1984, 1986); King (1995-1997); Marsh (1999, 2000); Perschbacher (2012a, 2012b); Reimer (2003, 2004a, 2004b); and Reimer et al. (2002).

The early run is managed to attain an optimal escapement goal 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 implements more conservative regulations adopted by the BOF which restricts the harvest of Chinook salmon less than 55 inches total length (TL) or closes the fishery. 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 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 (Figure 5). This change was implemented to protect early-run Chinook salmon that spend five 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 five 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* (5 AAC 21.359 updated through register 174; Figure 5), which mandates that the late run be managed to achieve a spawning escapement of 17,800 to 35,700 late-run Chinook salmon.

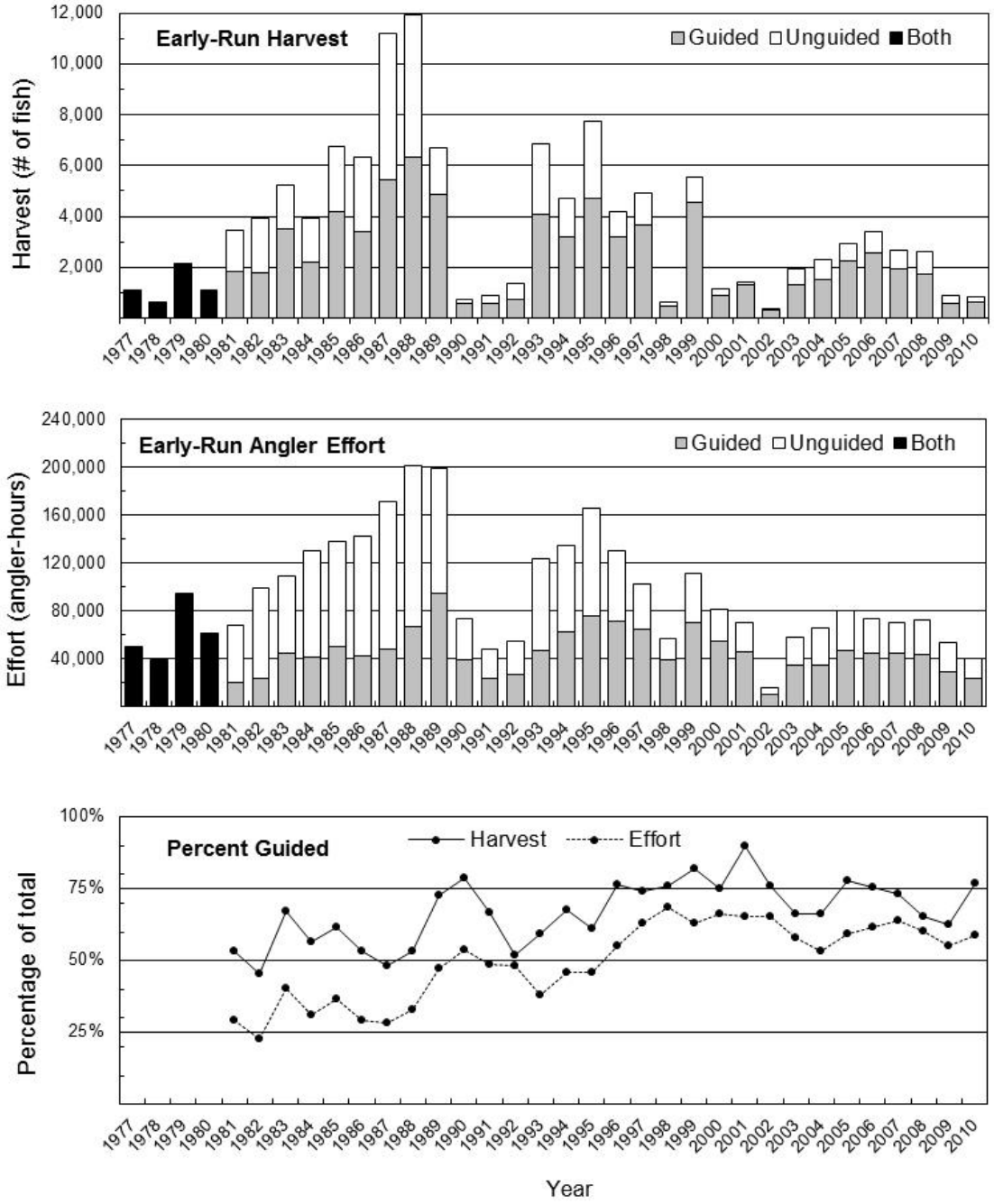

Figure 3.–Guided and unguided sport harvest (top), angler effort (middle), and percent of guided anglers (bottom) from ADF&G creel surveys for the early-run Kenai River Chinook salmon fishery between Soldotna Bridge and Warren Ames Bridge, 1977–2010.

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

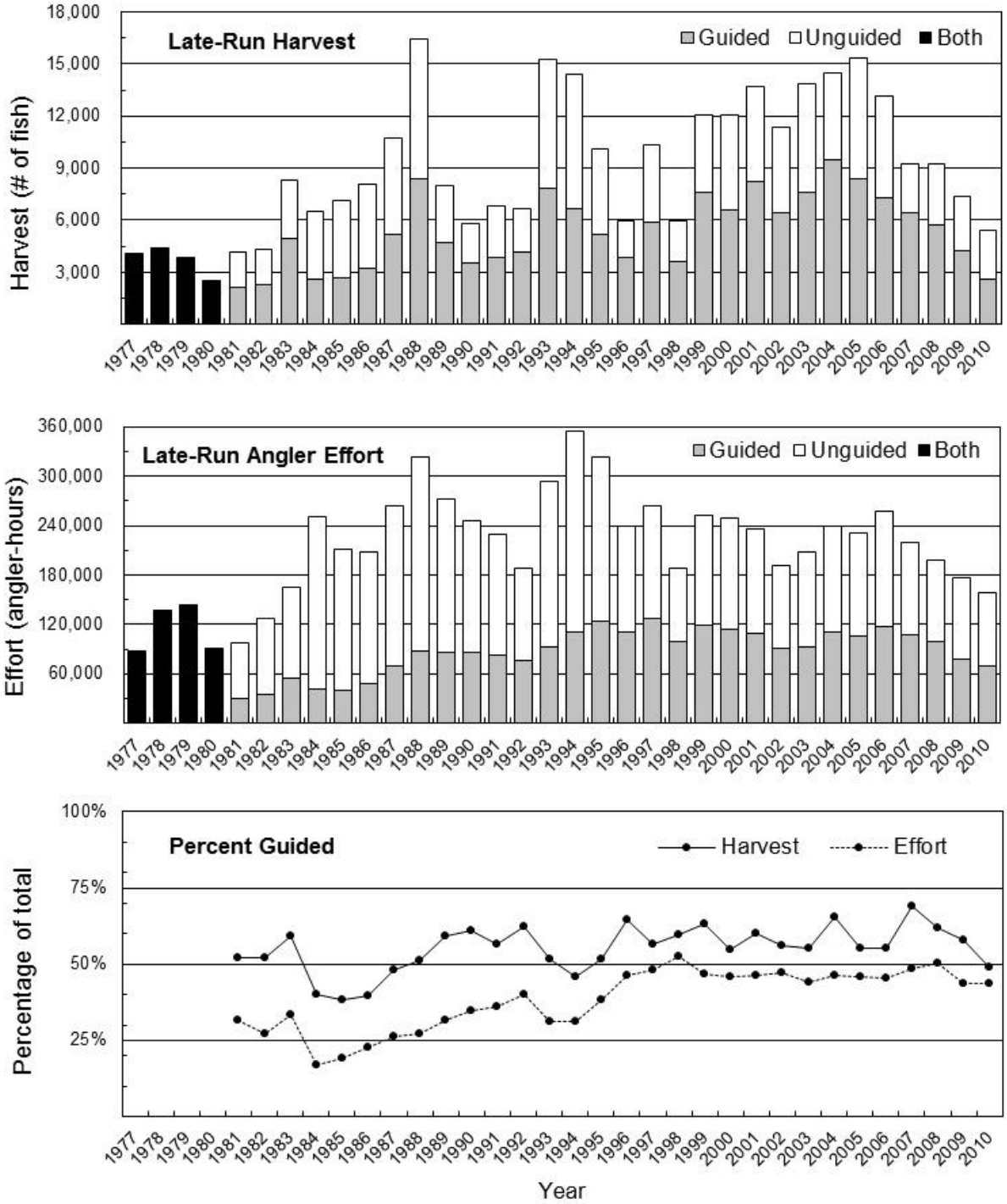

Figure 4.–Guided and unguided sport harvest (top), angler effort (middle), and percent of guided anglers (bottom) from ADF&G creel surveys for the late-run Kenai River Chinook salmon fishery between Soldotna Bridge and Warren Ames Bridge, 1977–2010.

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

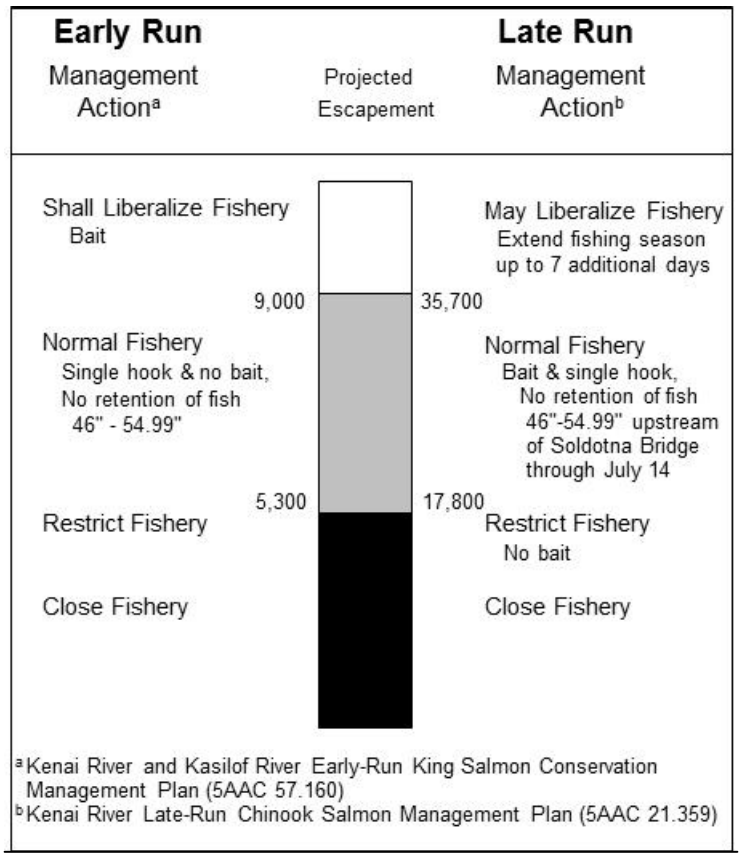

Figure 5.–Escapement levels and sport fish management actions for the Kenai River Chinook salmon fisheries.

FISHING REGULATIONS

Regulations for the Chinook salmon sport fishery in the Kenai River are among the most restrictive of any waters open to Chinook salmon fishing in Alaska. Although fish do not enter the river in appreciable numbers until mid-May, the Chinook salmon season is open from 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 and 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 from 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 are restricted for 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 limit for Kenai River Chinook salmon is one Chinook salmon per day 20 inches TL or longer, or 10 Chinook salmon less than 20 inches TL per day. The annual

limit is two 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 between 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 non-motorized vessels (those that do not have a motor on board) downstream of the outlet of Skilak Lake.

Kenai River Chinook salmon 55 inches TL or greater must be "sealed" within three 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 of 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.

During 2010, the early-run sport fishery was closed between the Soldotna Bridge and Warren Ames Bridge from 5 to 11 June, reopened to harvest of Chinook salmon less than 20 inches TL or 55 inches TL or greater from 12 to 14 June, and reopened to harvest of Chinook salmon less than 46 inches TL or 55 inches TL or greater from 15 to 30 June, by emergency order(s). The early-run sport fishery was further liberalized to allow the use of bait from 19 June through 30 June. No inseason management actions were taken during the late run in 2010.

OBJECTIVES

Objectives for the 2010 study were as follows:

1) Estimate catch and harvest of Chinook salmon[1] 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 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 10 August such that all age-proportion estimates for each run are within 10 percentage points of the true values 95% of the time.
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.

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

In addition to the objectives outlined above, the project was responsible for completing the following tasks[2]:

1) Estimate total sport angler effort, by run, in angler-hours. Precision of the effort estimates is driven by that of the catch and harvest estimates (Objective 1).
2) Estimate daily 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 in Chinook salmon captured in inriver gillnets between 16 May and 5 July, in conjunction with the *Kenai River Chinook salmon Abundance and Migratory Timing Study*.[3]
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.

METHODS

CREEL SURVEY

A stratified, two-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). The creel survey was conducted from 16 May through 4 June, and 15 June through 31 July 2010. First-stage sampling units were days. The unguided angler day was assumed to be 20 h long (0400 to 2400 hours) while 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 two 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-

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

[3] Reimer FY10/FY11 Operational Plan, *Kenai River Chinook Salmon Abundance and Migratory Timing Study*.

stratified angler interviews were ineffective (Marsh 2000). Thus, catch and harvest downstream of the sonar site are based on estimated effort downstream of the sonar site while assuming CPUE and HPUE are constant throughout the study area.

The creel survey was temporally stratified by week and day type (weekday, weekends/holidays) because harvest and catch rates can differ by time (King 1995-1997), and by angler type (guided vs. unguided) because catch rates between guided and unguided anglers can differ (Reimer 2004b). Mondays during the late run were included in the creel survey in order to recalibrate the index method. The sampling strata used for conducting Kenai River Chinook salmon angler counts and estimating creel statistics are presented in Table 1.

Table 1.–Sampling strata used for conducting Kenai River Chinook salmon angler counts and estimating creel statistics, 2010.

Type	Number	Description
Geographic[a]	2	Warren Ames Bridge (RM 5.2) to Chinook salmon sonar site (RM 8.5)
		Chinook salmon sonar site (RM 8.5) to Soldotna Bridge (RM 21.1)
Temporal	8	Early run: 16 May, 18–23 May, 25–31 May, 1–4 June, 15–20 June, 22–27 June, and 29–30 June
	5	Late run: 1–4 July, 5–11 July, 12–18 July, 19–25 July, 26–31 July
Day type	3	Weekdays
		Weekends/holidays
		Late-run Mondays
Angler type	2	Guided
		Unguided

[a] Used for angler counts only.

Two of the four available weekdays and both weekend days were sampled each week the fishery was open. An exception was the week of 25–31 May, when two days were selected randomly from the three weekend or holiday days available. The early run was composed of 25 strata. The late run was composed of 20 strata.

For Mondays, an "index" angler count and ad hoc procedure were conducted from 2002 to 2008 to generate effort, catch, and harvest estimates.[4] A trend of increasing popularity and the rise of harvest estimates on late-run Mondays from less than 3% of the total late-run harvest below Soldotna Bridge in 2001, to over 9% in 2008 (Perschbacher 2012a), justified including late-run Mondays into the 2009 and 2010 creel sampling schedule. Late-run Monday creel survey estimates of effort, catch, and harvest from 2009 and 2010 were compared to the index estimates to recalibrate the index estimation method.

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.

[4] See page 11 for an explanation of Monday angler counts.

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 five hours. The schedule ensured that at least two 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 pre-selected 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 one 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 line when observed during an angler count. Boats were counted as fishing if the boat contained at least one 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 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 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) Pillars Boat Launch
5) 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. Centennial Campground was added to the sampling schedule on 29 May, Riverbend Campground was added on 5 June, Poacher's Cove was added on 13 June, and Eagle Rock Campground was added on 1 July. For each day sampled, the first randomly scheduled boat count of the day was completed (between 0500 and 0900 hours) prior to conducting interviews; therefore, the entire angler day was not sampled. 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.

[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.

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

There were four time intervals per day during which interviews could be conducted: three intervals between consecutive angler counts and one 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 any launch was repeated in the daily schedule. During the late run, when there were more accessible boat launches than interview periods, access location was chosen without 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, 46–55 inches TL, or 55 inches TL or greater.

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). Mid eye to tail fork (METF) length was 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, 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.

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, as well as gillnetting time and area considerations, the gillnetting program was standardized to estimate ASL of inriver runs, CPUE, and species composition (Reimer 2004b). Inriver gillnetting was conducted six hours each day from 16 May through 10 August in an area approximately 0.3 mi in length located immediately downstream of the Chinook salmon sonar site at RM 8.5 (Figure 2). Nets of two mesh sizes were fished with equal frequency. Specifications of the nets used during 2002–2010 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.

[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 not travel time or time after an angler had harvested a fish.

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 six hours per day from three hours before to three 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 2007–2009, sampling was scheduled for six consecutive hours beginning five hours before low tide. One tide was sampled each day, excluding hours of darkness (2300–0400 hours). For most years, this sampling schedule change resulted in a higher percentage of fish passing the Chinook salmon sonar site during the time when inriver gillnetting was conducted (Figure 6). As a result, the 2007–2009 schedule continued to be used for sampling in 2010; one tide per day beginning five hours before low tide, for six consecutive hours, excluding hours of darkness.

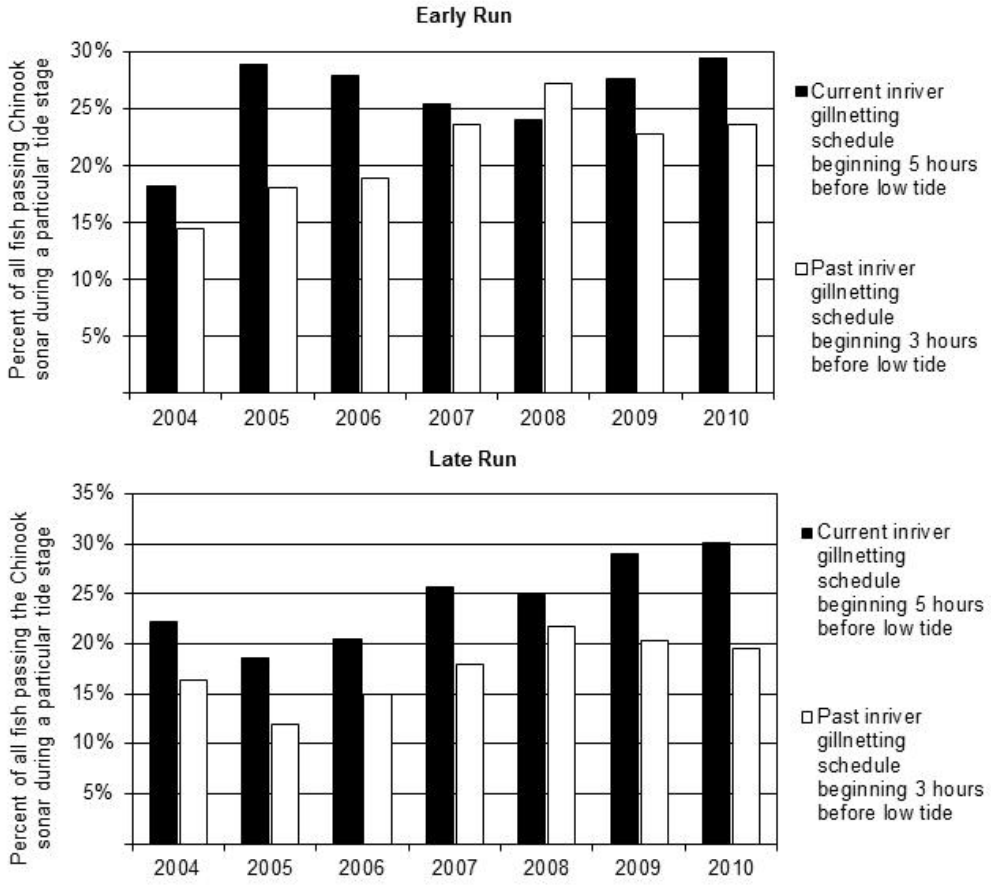

Figure 6.–Percentage of all fish passing the Kenai River Chinook salmon sonar site during two tide stages in six hour periods for early- (top) and late-run (bottom) Kenai River Chinook salmon, 2004–2010.

Note: two tide stages were compared: three hours before low tide to three hours after low tide (2002–2006 gillnet sampling schedule) vs. five hours before low tide to one hour after low tide (2007–2010 gillnet sampling schedule).

Each drift was positioned to sample fish that would 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 five fish in the net, or 2) the net was drifting within approximately 30 m of either bank, or 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 (one starting on each bank) were completed with one 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 three times daily (beginning, middle, and end of scheduled shift) in midchannel, near the sonar site at RM 8.5.

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 two approximately three-week strata during each run with a sample-size goal of 149 fish for each stratum. Strata for the early run were 16 May through 9 June, and 10 through 30 June; strata for the late run were 1 through 20 July, and 21 July through 10 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 sockeye 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 Chinook salmon captured and sampled for ASL. 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 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.

Radio Transmitter Deployment

The inriver gillnetting study served as the marking event for a separate Kenai River King salmon Abundance and Migratory Timing Study (Reimer *In prep*). During 16 May through 5 July, all Chinook salmon sampled for ASL received an Advanced Telemetry Systems (ATS, Isanti, MN) model F1845B radio transmitter. Fish with profusely bleeding gills, or observed to be injured

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

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

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

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 of 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 of each stratum in a two-stage design, omitting the finite population correction factor for the second stage, was estimated as follows (Bernard et al. 1998):

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

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 calculated 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

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

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

$$\hat{V}\left(\overline{CPUE}_{hi}^{**}\right) = \frac{m_{hi}-1}{m_{hi}} \sum_{j=1}^{m_{hi}} \left(CPUE_{hij}^{*} - \overline{CPUE}_{hi}^{*}\right)^2. \tag{12}$$

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

$$\hat{C}_{hi} = \hat{E}_{hi}\,\overline{CPUE}_{hi}^{**}, \tag{13}$$

and the variance by (Goodman 1960)

$$\hat{V}\left(\hat{C}_{hi}\right) = \hat{V}\left(\hat{E}_{hi}\right)\left(\overline{CPUE}_{hi}^{**}\right)^2 + \hat{V}\left(\overline{CPUE}_{hi}^{**}\right)\hat{E}_{hi}^2 - \hat{V}\left(\hat{E}_{hi}\right)\hat{V}\left(\overline{CPUE}_{hi}^{**}\right) \tag{14}$$

HPUE was estimated by substituting angler harvest for angler catch in equations (9) through (12). Harvest during sample day *i* was estimated by substituting the appropriate $HPUE_{hi}$ statistics into equations (13) and (14). 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

During 2010, results of effort, catch, and harvest from the creel survey conducted on Mondays during the late run (restricted to unguided drift boats) were compared to estimates derived from the single index angler count conducted every late-run Monday between 0800 and 1400 hours.

For 2010, 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 2001 angler count data was used to estimate the relationship between index counts and mean angler counts on Mondays for 2002–2010. For 2001, the mean number of anglers was approximately 78% 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 were conducted with one mesh size, originating from each side (*k*) of the river; the sequence was then repeated with the other mesh size. A repetition *j* consisted of a complete set of four such drifts. Daily CPUE *r* of species *s* in mesh *m* for day *i* was estimated as follows:

$$\hat{r}_{smi} = \frac{\sum_{j=1}^{J_i}\sum_{k=1}^{2} c_{smijk}}{\sum_{j=1}^{J_i}\sum_{k=1}^{2} e_{mijk}} \tag{15}$$

with variance

$$\hat{V}(\hat{r}_{smi}) = \frac{\sum_{j=1}^{J_i}\left(c_{smij\cdot} - \hat{r}_{smi} e_{mij\cdot}\right)^2}{\bar{e}_{mi}^{\,2} J_i (J_i - 1)} \tag{16}$$

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*, $e_{mij\cdot}$ 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).

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:

$$\hat{p}_{si} = \frac{\sum_{j}^{J_i} \hat{r}_{sij}}{\sum_{s}\sum_{j}^{J_i} \hat{r}_{sij}}, \text{with} \tag{17}$$

$$\hat{V}(\hat{p}_{si}) = \frac{\sum_{j=1}^{J_i} \left(\hat{r}_{sij} - \hat{p}_{si}\hat{r}_{\cdot ij}\right)^2}{\bar{r}_i^2 J_i (J_i - 1)} \tag{18}$$

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:

$$\hat{r}_{sij} = \frac{1}{2}\sum_{m=1}^{2} \frac{\sum_{k=1}^{2} c_{smijk}}{\sum_{k=1}^{2} e_{mijk}}, \tag{19}$$

where

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

$\bar{r}_i$ = the mean CPUE of salmon (all species) caught across all drifts k during day i.

Only data from repetitions with at least 1 drift with each mesh were used for estimation of species proportions.

Age and Sex Composition

Age and sex composition 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

$$\hat{p}_{bt} = \frac{n_{bt}}{n_t}, \tag{20}$$

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):

$$\hat{V}(\hat{p}_{bt}) = \frac{\hat{p}_{bt}(1-\hat{p}_{bt})}{(n_t - 1)}. \tag{21}$$

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 20–21 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

$$\hat{H}_{gbt} = \hat{H}_{gt}\hat{p}_{bt} \tag{22}$$

with variance (Goodman 1960)

$$\hat{V}\left(\hat{H}_{gbt}\right) = \hat{H}_{gt}^2\hat{V}(\hat{p}_{bt}) + \hat{p}_{bt}^2\hat{V}\left(\hat{H}_{gt}\right) - \hat{V}(\hat{p}_{bt})\hat{V}\left(\hat{H}_{gt}\right) \tag{23}$$

where

$\hat{H}_{gt}$ and $\hat{V}\left(\hat{H}_{gt}\right)$ = 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:

$$\hat{p}_{gb} = \frac{\sum_t \hat{H}_{gt}\hat{p}_{bt}}{\sum_t \hat{H}_{gt}}, \text{and} \tag{24}$$

$$\hat{V}(\hat{p}_{gb}) = \frac{1}{\hat{H}_g^2}\left[\frac{\hat{v}(\hat{H}_{g1})\left[\hat{p}_{b1}\hat{H}_{g2} - \hat{H}_{gb2}\right]^2}{\hat{H}_g^2} + \frac{v(\hat{H}_{g2})\left[\hat{p}_{b2}\hat{H}_{g1} - \hat{H}_{gb1}\right]^2}{\hat{H}_g^2} + \hat{v}(\hat{p}_{b1})\hat{H}_{g1}^2 + \hat{v}(\hat{p}_{b2})\hat{H}_{g2}^2\right]. \tag{25}$$

The number of Chinook salmon passing the sonar *N* was apportioned by age and sex similarly, using equations 20–24, 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},

$$\hat{R}_b = \hat{N}_b + \hat{H}_{2b}. \tag{26}$$

[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 return is sampled 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 following equation 8 and compared them to the SRS estimator in equation 20. The point estimates and their standard errors were essentially equivalent. Based on this evidence, we continue to use the SRS equations for convenience.

RESULTS

CREEL SURVEY

Effort, Catch, and Harvest

The creel survey was conducted from 16 May through 4 June, and 15 June through 31 July. The Chinook salmon fishery was not sampled when it was open to harvest of Chinook salmon either less than 20 inches TL or 55 inches TL or greater, below Soldotna Bridge (12–14 June). During the early run, the creel survey sampled 59% (16/27) of the days the fishery was open to guided anglers and 63% (20/32) of the days open to unguided anglers (Table 2). During the late run, the creel survey sampled 61% (14/23) of the days the fishery was open to guided anglers and 71% (22/31) of the days the fishery was open to unguided anglers, including four Mondays, when only unguided fishing from non-motorized boats was allowed (Table 3). The creel survey estimates of catch, harvest, and effort on late-run Mondays are included in the seasonal totals presented herein. A total of 2,683 angler interviews were conducted: 863 during the early run and 1,820 during the late run (Tables 2–3).

During the early run, angler counts ranged from 0 to 160 for unguided anglers and from 0 to 267 for guided anglers (Appendix A1). The largest count occurred on 27 June for unguided anglers and on 22 June for guided anglers. The largest count in the early run for guided and unguided anglers combined was 352 anglers on 19 June. During the late run, angler counts ranged from 14 to 477 for unguided anglers and from 46 to 489 for guided anglers (Appendix A2). The largest count occurred on 27 July for unguided anglers and on 30 July for guided anglers. The largest count in the late run for guided and unguided anglers combined was 806 anglers on 20 July.

Estimated effort was 39,739 (SE 2,995) angler hours during the early run (Table 2), and 158,189 (SE 6,099) angler hours during the late run (Table 3). Angler effort was below average for both runs; early-run effort was approximately 43% below the recent five-year average and 58% below the historic (1977–2009) early run average, while late-run effort was 27% below the recent five-year average and was the lowest on record since 1982 (Figures 3–4). Guided anglers accounted for 59% of the early-run effort and 44% of the late-run effort.

In the early run, daily CPUE varied from 0 to 0.052 and averaged 0.015 fish per hour for unguided anglers, while daily CPUE for guided anglers ranged from 0 to 0.121 and averaged 0.029 fish per hour (Appendices B1–B2). Daily CPUE in the early run was greatest on 25 May for unguided anglers and on 19 June (bait opener), for guided anglers. In the late run, daily CPUE varied from 0 to 0.068 and averaged 0.032 fish per hour for unguided anglers, while daily CPUE for guided anglers ranged from 0.005 to 0.101 and averaged 0.040 fish per hour (Appendices B3–B4). Daily CPUE was greatest in the late run on 19 July for unguided anglers (a drift boat Monday), and 17 July for guided anglers.

Table 2.–Estimated early-run Kenai River Chinook salmon sport fishery effort, catch, and harvest between Soldotna Bridge and Warren Ames Bridge, 16 May–30 June 2010.

						Chinook salmon			
				Effort		Catch[b]		Harvest[c]	
Fishing periods[a]	Days open to fishing from powerboats	Sampling days	Number of interviews	Hours fished	SE	No. fish	SE	No. fish	SE
16 May									
Unguided weekends	1	1	16	100	90	0	0	0	0
18–23 May									
Guided weekdays	4	2	20	448	173	6	6	6	6
Guided weekends	1	1	19	432	84	18	8	11	7
Unguided weekdays	4	2	30	380	108	7	8	7	8
Unguided weekends	2	2	61	500	139	9	5	9	5
25–31 May									
Guided weekdays	4	2	25	1,496	350	29	23	17	14
Guided weekends/holiday	2	2	13	918	145	0	0	0	0
Unguided weekdays	4	2	56	780	187	39	15	25	10
Unguided weekends/holiday	3	2	53	1,005	287	5	5	5	5
1–4 June									
Guided weekdays	4	2	12	556	190	0	0	0	0
Unguided weekdays	4	2	29	320	109	0	0	0	0
15–20 June									
Guided weekdays	4	2	55	4,932	1,132	221	53	190	49
Guided weekends	1	1	43	1,572	442	190	68	119	47
Unguided weekdays	4	2	31	1,660	335	16	16	0	0
Unguided weekends	2	2	95	3,560	568	128	42	75	29
22–27 June									
Guided weekdays	4	2	86	9,648	2,353	370	104	234	42
Guided weekends	1	1	27	1,076	411	40	23	22	14
Unguided weekdays	4	2	55	2,770	586	31	12	21	9
Unguided weekends	2	2	84	3,260	548	33	18	33	18
29–30 June									
Guided weekday	2	1	22	2,316	548	44	21	44	21
Unguided weekday	2	1	31	2,010	162	17	12	17	12
Day type subtotals									
Guided weekdays	22	11	220	19,396	2,703	670	121	492	69
Guided weekends/holiday	5	5	102	3,998	626	248	72	152	49
Unguided weekdays	22	11	232	7,920	735	111	29	71	19
Unguided weekends/holiday	10	9	309	8,425	856	175	46	122	35
Angler type subtotals									
Guided	27	16	322	23,394	2,775	918	141	645	85
% Guided			37%	59%		76%		77%	
Unguided[d]	32	20	541	16,345	1,128	286	55	193	40
% Unguided			63%	41%		24%		23%	
Early-run total [d]			863	39,739	2,995	1,203	151	837	94

[a] Chinook salmon fishery was closed 5 June, reopened to harvest of Chinook salmon less than 20 inches or 55 inches or greater 12–14 June, reopened to harvest of all non-slot limit Chinook salmon 15 June, and liberalized to use of bait 19–30 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, 1–31 July 2010.

Fishing periods	Days open to fishing from powerboats	Sampling days	Number of interviews	Effort		Chinook salmon Catch[a]		Chinook salmon Harvest[b]	
				Hours fished	SE	No. fish	SE	No. fish	SE
1–4 July									
Guided weekdays	2	1	22	3,704	725	211	69	211	69
Guided weekends	1	1	6	1,404	804	30	38	30	38
Unguided weekdays	2	1	30	1,900	248	79	25	26	14
Unguided weekends	2	2	105	4,365	501	34	16	26	14
5–11 July									
Monday	1	1	105	1,045	471	64	31	48	23
Guided weekdays	4	2	64	9,832	1,839	174	93	174	93
Guided weekends	1	1	53	2,178	1,268	29	21	23	18
Unguided weekdays	4	2	51	5,350	524	73	60	73	60
Unguided weekends	2	2	78	4,210	752	44	24	44	24
12–18 July									
Monday	1	1	82	1,075	330	25	11	15	8
Guided weekdays	4	2	50	9,556	1,790	225	88	225	88
Guided weekends	1	1	24	3,546	630	358	125	358	125
Unguided weekdays	4	2	45	7,560	971	242	142	242	142
Unguided weekends	2	2	130	7,020	725	279	64	266	63
19–25 July									
Monday	1	1	82	2,315	1,132	157	82	94	51
Guided weekdays	4	2	145	15,972	1,801	1,152	138	978	120
Guided weekends	1	1	41	4,074	649	166	55	166	55
Unguided weekdays	4	2	116	14,190	1,437	463	222	436	204
Unguided weekends	2	2	164	9,930	1,746	551	132	472	116
26–31 July									
Monday	1	1	104	2,105	772	67	29	56	25
Guided weekdays	4	2	131	15,980	2,250	459	97	382	72
Guided weekends	1	1	36	2,948	721	95	40	81	37
Unguided weekdays	4	2	84	22,630	2,856	965	187	853	207
Unguided weekends	1	1	72	5,300	303	98	38	98	38
Day type subtotals									
Mondays	4	4	373	6,540	1,486	312	93	213	62
Guided weekdays	18	9	412	55,044	3,926	2,221	223	1,969	202
Guided weekends	5	5	160	14,150	1,896	677	149	657	148
Unguided weekdays	18	9	326	51,630	3,391	1,823	330	1,630	329
Unguided weekends	9	9	549	30,825	2,117	1,006	154	905	141
Angler type subtotals									
Guided	23	14	572	69,194	4,360	2,898	268	2,627	250
% Guided			31%	44%		48%		49%	
Unguided[c]	31	22	1,248	88,995	4,265	3,141	376	2,748	363
% Unguided			69%	56%		52%		51%	
Late-run total[c]			1,820	158,189	6,099	6,039	462	5,375	441

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

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

[c] Unguided angler estimates include Mondays sampled.

The estimated harvest of Chinook salmon during the early run was 837 (SE 94) fish (Table 2). Early-run harvest was approximately 66% below the recent five-year average, and 77% below the historic (1977–2009) early run average (Figure 3). Guided anglers accounted for 77% of the harvest compared to 23% for unguided anglers. The estimated catch of early-run Chinook salmon was 1,203 (SE 151) fish, meaning approximately 30% of the catch was released (Table 2). There were 863 interviews conducted during the early run; anglers reported releasing 35 Chinook salmon, of which 80% were reported below the slot limit (less than 46 inches TL) and 20% were reported within the slot limit (46–55 inches TL) (Table 4). The absolute precision (±184 fish) for total early-run harvest and catch (±296 fish) satisfied the project objectives.

Table 4.–Kenai River Chinook salmon reported to be released during the early-run slot-limit sport fishery between Warren Ames Bridge and Soldotna Bridge, 2003–2010.

	Chinook salmon		
	Below slot limit[a]	Within slot limit[a]	Total number
Year	% released [b]	% released [b]	released[c]
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
Min	52%	15%	20
Mean	70%	30%	70
Max	85%	48%	109

[a] During 2003–2007 the 44–55 inch slot limit was in effect and during 2008–2010 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 harvest of Chinook salmon during the late run was 5,375 (SE 441) fish (Table 3). Late-run harvest was approximately 51% below the recent five-year average, and 40% below the historic (1977–2009) late-run average harvest (Figure 4). Guided anglers accounted for 49% of the harvest compared to 51% for unguided anglers. The estimated catch of late-run Chinook salmon was 6,039 (SE 462), meaning 11% of the catch was released (Table 3). The relative precision for total late-run harvest (±16.1%) and catch (±15.0%) satisfied the project objectives.

Approximately 1.4% of the early-run effort and 8.3% of the late-run effort occurred downstream of the Chinook salmon sonar site (Appendices C1–C2). The estimate of late-run harvest below the Chinook salmon sonar site was 445 (SE 65) (8.3%), whereas 4,930 (SE 437) (91.7%) Chinook salmon were harvested from the Chinook salmon sonar site to the Soldotna Bridge (Appendix C2).

Late-run Mondays

Two separate methods (index and creel survey) were used to estimate angler effort, catch, and harvest of Chinook salmon on Mondays during the late run. The index method indicated an effort of 10,234 angler-hours, a catch of 430, and harvest of 389 Chinook salmon (Figure 7). The late-run Monday index estimates of HPUE and CPUE were 0.038 and 0.042, respectively.

The creel survey method estimated an effort of 6,540 (SE 1,486) angler-hours, a catch of 312 (SE 93), and harvest of 213 (SE 62) Chinook salmon (Table 3, Figure 7). Estimates of HPUE and CPUE were 0.033 and 0.048, respectively.

The index method overestimated angler effort compared to the creel survey by 29% during 2009 (Perschbacher 2012b), and 36% during 2010. Creel survey angler counts were used to estimate that the percent of effort occurring during the hours of 0900–1359 was 55% of the daily mean angler effort in 2009, and 49% of the daily mean angler effort in 2010, compared to 78% of the daily mean angler effort estimated in 2001(Figure 8). The 2009 index CPUE was slightly greater than the creel CPUE, while the index HPUE was slightly less than the creel survey HPUE; in contrast, the 2010 index CPUE was slightly less than the creel CPUE, while the index HPUE was slightly greater than the creel survey HPUE.

The index estimates of harvest for late-run Mondays were approximately 6.5% of the total late-run harvests in both 2009 and 2010. The creel estimates of harvest for late-run Mondays were approximately 4.2% of the total late-run harvests in both 2009 and 2010, compared to 2.5% of the total in 2001 (Figure 9).

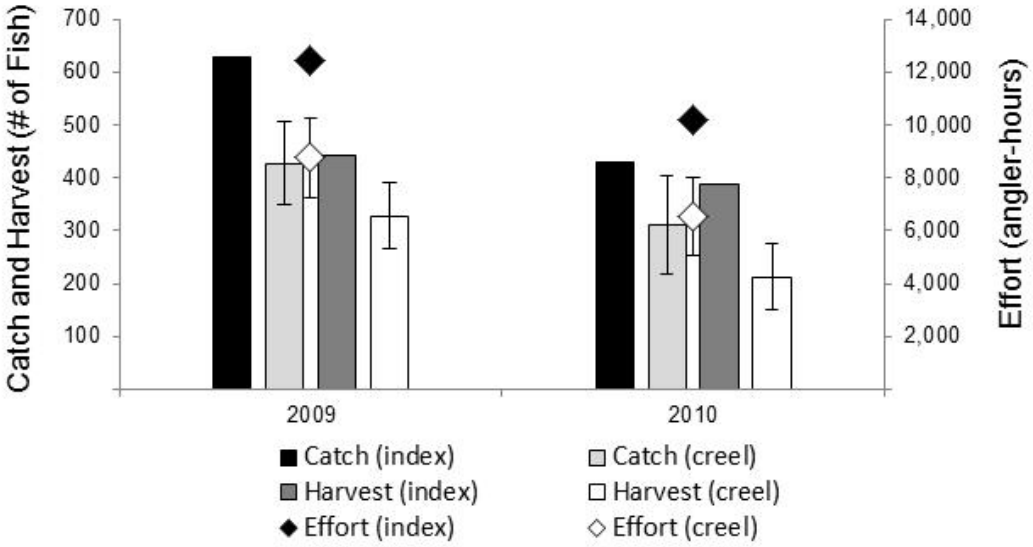

Figure 7.–Index count and creel survey estimates of unguided angler effort, sport harvest, and catch of Chinook salmon, occurring on Mondays during the late run, between Soldotna Bridge and Warren Ames Bridge, Kenai River, 2009–2010.

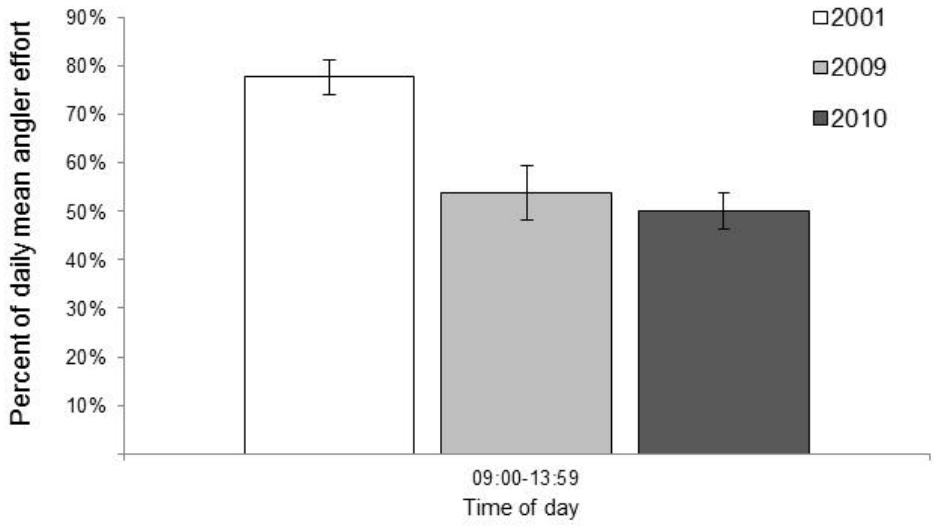

Figure 8.–Percent of daily mean unguided effort occurring during 0900–1359 hours for late-run Mondays, between Soldotna Bridge and Warren Ames Bridge, Kenai River, 2001 and 2009–2010.

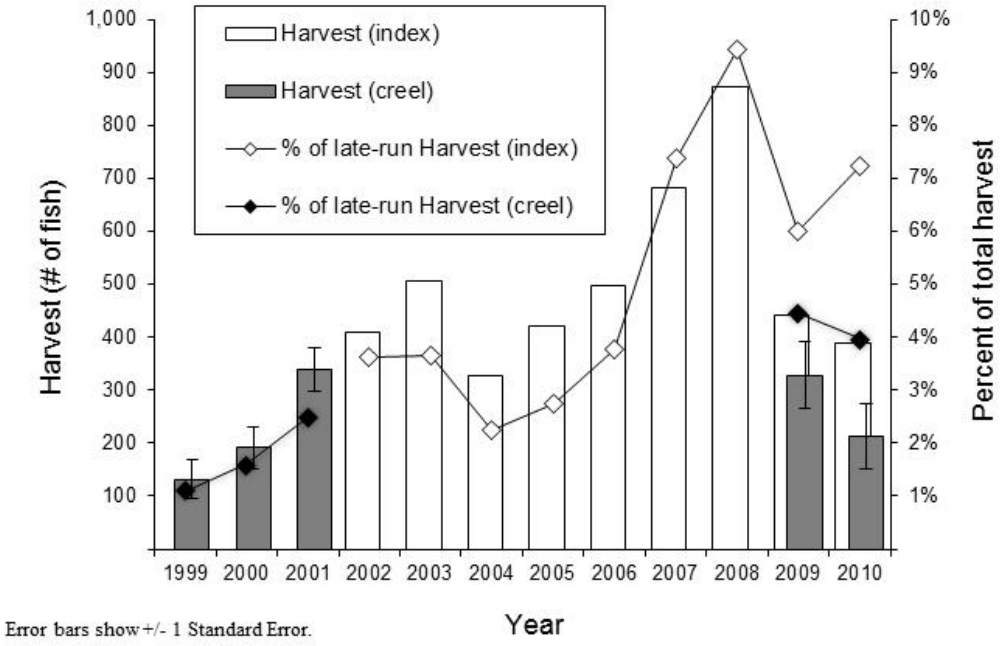

Figure 9.–Late-run Monday unguided drift-boat sport harvest, and percent of total late-run harvest of Kenai River Chinook salmon estimated by index and creel surveys between Soldotna Bridge and Warren Ames Bridge, 1999–2010.

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

SPECIES COMPOSITION FROM INRIVER GILLNETTING

During the early run, 166 Chinook salmon and 1,141 sockeye salmon greater than 400 mm METF length were captured with gillnets (Appendix D1). A total of 150 other fish (one rainbow trout, two Dolly Varden, 36 starry flounder [*Platichthys stellatus*], and 111 eulachon [*Thaleichthys pacificus*]) were also captured. Only salmonids greater than 400 mm METF (the lower length limit that is detectable by the split-beam sonar; Debby Burwen, ADF&G, Sport Fish Division, Anchorage, personal communication) were used to calculate daily CPUE by species and daily Chinook salmon ratios. Daily Chinook salmon CPUE for both mesh sizes combined ranged from 0 to 0.112 and averaged 0.029 (Appendix D2). The daily ratio of Chinook salmon to total number of fish captured ranged from 0 to 1.00 and averaged 0.20 (Appendix D2).

During the late run, 321 Chinook salmon, 3,549 sockeye salmon, 92 coho salmon, and 464 pink salmon greater than 400 mm METF length were captured with gillnets (Appendix D3). One Dolly Varden was also captured. Daily Chinook salmon CPUE ranged from 0.016 to 0.171 and average 0.074 (Appendix D4). The daily ratio of Chinook salmon to total number of fish captured ranged from 0.02 to 0.23 and averaged 0.08 (Appendix D4).

Sockeye salmon cumulative CPUE was similar to the 2002–2009 average during the early run and substantially above average during the late run (Figure 10). Chinook salmon cumulative CPUE was substantially below average in both the early and late runs.

AGE, SEX, AND LENGTH

Creel Survey

The age composition of the early-run harvest differed significantly (χ^2 = 30.94, df = 2, P < 0.0001) between temporal strata (16 May–4 June, 15–30 June). Therefore, early-run age composition estimates were weighted by the harvest in each temporal stratum (Table 5 and Appendix E1). The age composition for the first time stratum, prior to the Chinook salmon fishery closure, consisted of 100% (SE 0%) age-1.4 fish, of which 67% (SE 13%) were females, and 33% (SE 13%) were males (Appendix E1). The age composition for the second early-run temporal stratum, when the fishery was reopened to allow harvest, was mainly composed of 24% (SE 7%) age-1.2 fish, 56% (SE 8%) age-1.3 fish, and 17% (SE 6%) age-1.4 fish (Appendix E1). The slot limit truncated the early-run harvest length composition at 46 inches TL (Figure 11).

During the late run, the age composition of the harvest differed significantly (χ^2 = 24.94, df = 3, P < 0.0001) between temporal strata (1–18 July, 19–31 July). Therefore, late-run age composition estimates were weighted by the harvest in each temporal stratum (Table 6 and Appendix E2). Younger fish were more prevalent in the first time stratum than the second time stratum (Appendix E2). Overall the late-run harvest was composed of 4% (SE 2%) age-1.1 fish, 14% (SE 3%) age-1.2 fish, 40% (SE 4%) age-1.3 fish, 38% (SE 4%) age-1.4 fish, and 4% (SE 1%) age-1.5 fish (Table 6). Males were harvested in larger proportions than females for their respective age classes except for age-1.4 females (21%, SE 3%) (Table 6).

The 2008 slot limit change resulted in an additional 9% of Chinook salmon sampled in the creel survey measuring between 44 inches TL and 46 inches TL during 2010 (Figure 11). Approximately 9% of early-run Chinook salmon sampled in the creel survey were below 28 inches TL compared to the five-year average (2003–2007) of 6% when Chinook salmon

measuring between 20 inches TL and 28 inches TL counted toward the annual limit prior to 1 July.

Sample size goals and relative precision goals for estimates of age proportions of the harvest were met for each sampling stratum in both the early run and late run.

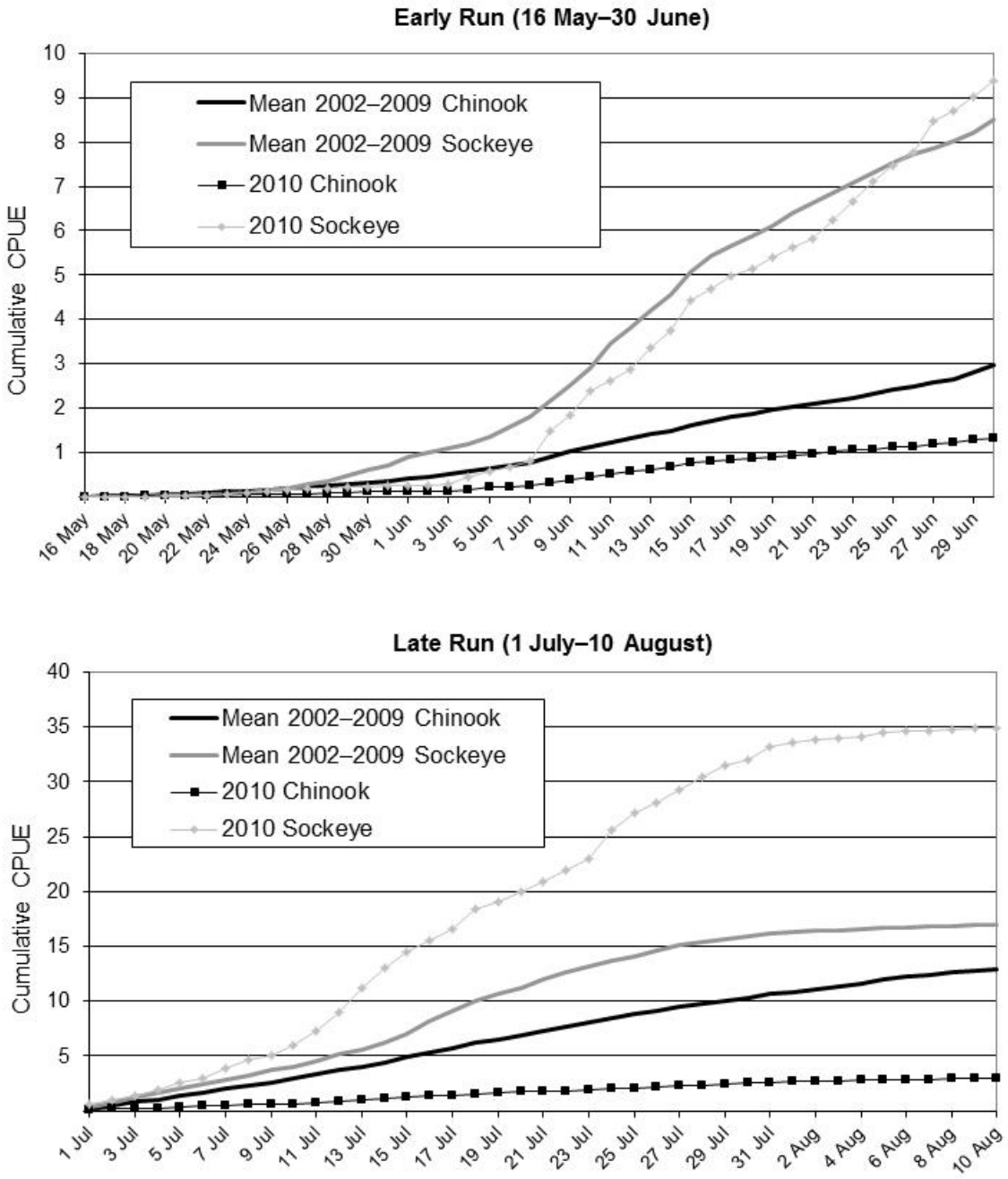

Figure 10.–Cumulative CPUE for early-run (top) and late-run (bottom) Kenai River Chinook and sockeye salmon inriver gillnet catches, 2002–2010.

Table 5.–Estimated sport harvest by age class and sex for early-run Kenai River Chinook salmon between Soldotna Bridge and Warren Ames Bridge, 16 May–30 June 2010.

	Age				
Parameter	1.1	1.2	1.3	1.4	Total
Female					
Summed sample size			14	12	26
% Sample			25.0%	21.4%	46.4%
SE % sample			5.8%	5.5%	6.7%
Harvest			259	90	349
SE harvest			54	50	70
% Harvest			30.9%	10.7%	41.6%
SE % harvest			6.8%	3.5%	7.1%
Male					
Summed sample size	1	10	9	10	30
% Sample	1.8%	17.9%	16.1%	17.9%	53.6%
SE % sample	1.8%	5.2%	5.0%	5.2%	6.7%
Harvest	18	185	166	119	489
SE harvest	15	46	44	46	81
% Harvest	2.2%	22.1%	19.9%	14.2%	58.4%
SE % harvest	2.2%	6.2%	5.9%	4.8%	7.1%
Both sexes combined					
Summed sample size	1	10	23	22	56
% Sample	1.8%	17.9%	41.1%	39.3%	100.0%
SE % sample	1.8%	5.2%	6.6%	6.6%	0.0%
Harvest	18	185	425	209	837
SE harvest	15	46	67	66	94
% Harvest	2.2%	22.1%	50.8%	24.9%	100.0%
SE % harvest	2.2%	6.2%	7.2%	5.6%	0.0%

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

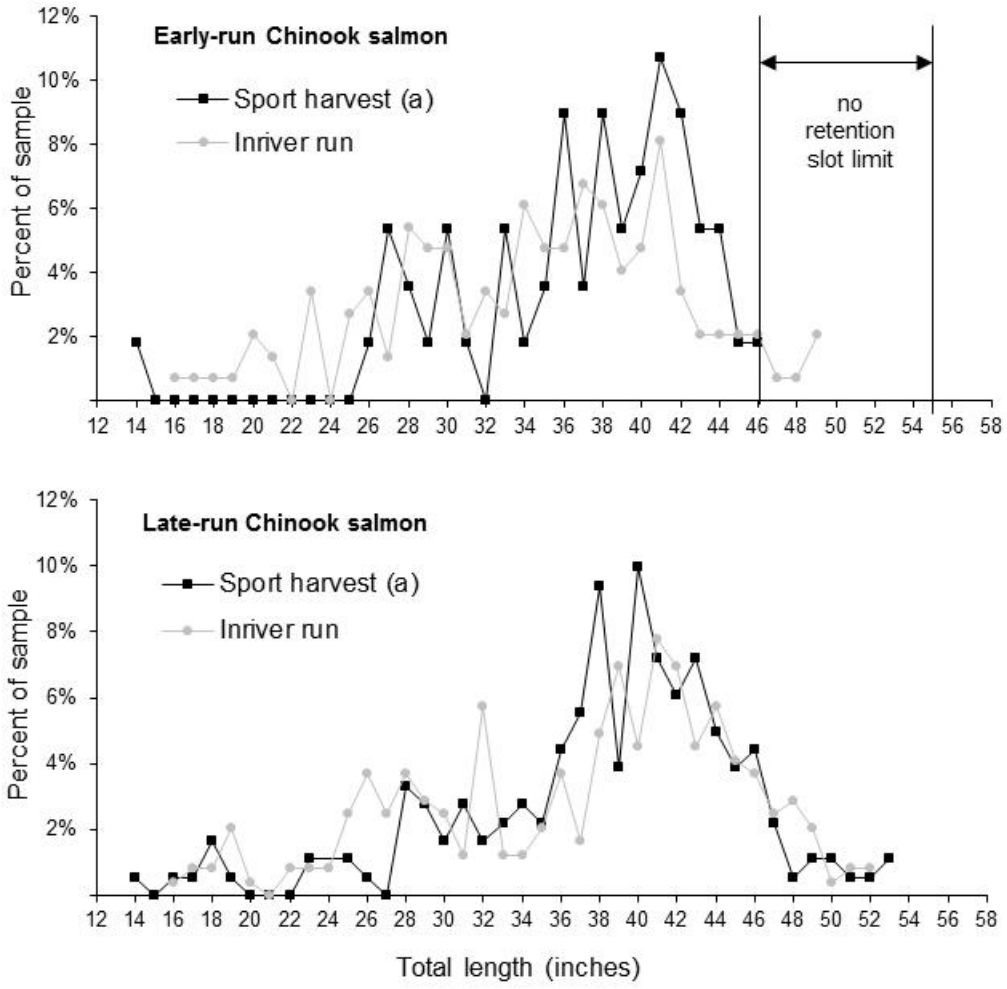

Figure 11.–Length distribution of early-run (top) and late-run (bottom) Kenai River Chinook salmon creel survey and inriver gillnetting samples, 2010.

[a] Length distribution of the early-run harvest is truncated at 46 inches due to the 46–55 inch slot limit.

Table 6.–Estimated sport harvest by age class, sex, and geographic strata for late-run Kenai River Chinook salmon between Soldotna Bridge and Warren Ames Bridge, 1–31 July 2010.

	Age					
Parameter[a]	1.1	1.2	1.3	1.4	1.5	Total
Female						
Summed sample size		2	35	40		77
% Sample		1.1%	19.3%	22.1%		42.5%
SE % sample		0.8%	2.9%	3.1%		3.7%
Downstream harvest		3	91	104		199
SE downstream harvest		3	20	22		35
Upstream harvest		67	913	1,037		2,017
SE upstream harvest		47	162	174		254
Total harvest		70	1,004	1,142		2,216
SE total harvest		50	175	187		267
% Harvest		1.3%	18.7%	21.2%		41.2%
SE % harvest		0.9%	2.9%	3.0%		3.6%
Male						
Summed sample size	7	21	37	31	8	104
% Sample	3.9%	11.6%	20.4%	17.1%	4.4%	57.5%
SE % sample	1.4%	2.4%	3.0%	2.8%	1.5%	3.7%
Downstream harvest	16	44	85	79	22	246
SE downstream harvest	6	11	18	17	8	39
Upstream harvest	200	634	1,058	822	199	2,912
SE upstream harvest	77	143	182	154	71	317
Total harvest	216	679	1,143	901	221	3,159
SE total harvest	82	151	193	166	79	328
% Harvest	4.0%	12.6%	21.3%	16.8%	4.1%	58.8%
SE % harvest	1.5%	2.6%	3.1%	2.8%	1.4%	3.7%
Both sexes combined						
Summed sample size	7	23	72	71	8	181
% Sample	3.9%	12.7%	39.8%	39.2%	4.4%	100.0%
SE % sample	1.4%	2.5%	3.6%	3.6%	1.5%	0.0%
Downstream harvest	16	48	176	183	22	445
SE downstream harvest	6	12	30	33	8	65
Upstream harvest	200	701	1,971	1,859	199	4,930
SE upstream harvest	77	151	252	242	71	437
Total harvest	216	749	2,146	2,043	221	5,375
SE total harvest	82	159	264	255	79	441
% Harvest	4.0%	13.9%	39.9%	38.0%	4.1%	100.0%
SE % harvest	1.5%	2.7%	3.7%	3.6%	1.4%	0.0%

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.

Inriver Gillnetting

The inriver early-run age composition differed significantly ($\chi^2 = 11.01$, df = 3, $P = 0.01$) among temporal strata (16 May–9 June, 10–30 June), and age composition estimates for Chinook salmon passing by the sonar site were weighted by the sonar passage estimates in each temporal stratum (Table 7 and Appendix E3). Older fish were more prevalent in the first time stratum than in the second stratum (Appendix E3). Overall, the inriver run was estimated to be composed of 48% (SE 4%) age-1.3 fish, followed by 25% (SE 4%) age-1.2 fish, 20% (SE 3%) age-1.4 fish, 7% (SE 2%) age-1.1 fish, and 1% (SE 1%) age-1.5 fish (Table 7). The proportion of age-1.4 fish in the early-run (20%, SE 3%) was the lowest on record dating back to 1986 (Figure 12).

Table 7.–Estimated sonar passage by age class and sex for early-run Kenai River Chinook salmon, 16 May–30 June 2010.

	Age					
Parameter	1.1	1.2	1.3	1.4	1.5	Total
Female						
Summed sample size		3	34	17	1	55
Sonar passage estimate		292	3,601	1,359	60	5,311
SE sonar passage estimate		167	509	345	77	565
% Sonar passage		2.2%	27.2%	10.3%	0.5%	40.1%
SE % sonar passage		1.3%	3.8%	2.6%	0.6%	4.2%
Male						
Summed sample size	8	31	29	14		82
Sonar passage estimate	925	3,033	2,691	1,288		7,937
SE sonar passage estimate	290	480	459	337		574
% Sonar passage	7.0%	22.9%	20.3%	9.7%		59.9%
SE % sonar passage	2.2%	3.6%	3.4%	2.5%		4.2%
Both sexes combined						
Summed sample size	8	34	63	31	1	137
Sonar passage estimate	925	3,325	6,292	2,646	60	13,248
SE sonar passage estimate	314	516	599	450	60	235
% Sonar passage	7.0%	25.1%	47.5%	20.0%	0.5%	100.0%
SE % sonar passage	2.4%	3.9%	4.4%	3.4%	0.5%	0.0%

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

The inriver late-run age composition differed significantly ($\chi^2 = 18.55$, df = 2, $P < 0.0001$) among temporal strata (1–20 July, 21 July–10 August) and age composition estimates for Chinook salmon passing by the sonar site were weighted by the sonar passage estimates in each temporal stratum (Table 8 and Appendix E4). Older fish were more prevalent in the second time stratum (Appendix E4). Age-1.4 fish and age-1.3 fish were the most abundant, comprising 36% (SE 3%), and 34% (SE 3%) of the total run respectively, followed by 20% (SE 3%) age-1.2 fish, 6% (SE 2%) age-1.5 fish, and 4% (SE 1%) age-1.1 fish (Table 8). As in the early run, the proportion of age-1.4 fish (36%, SE 3%) in the late-run was the lowest on record dating back to 1986.

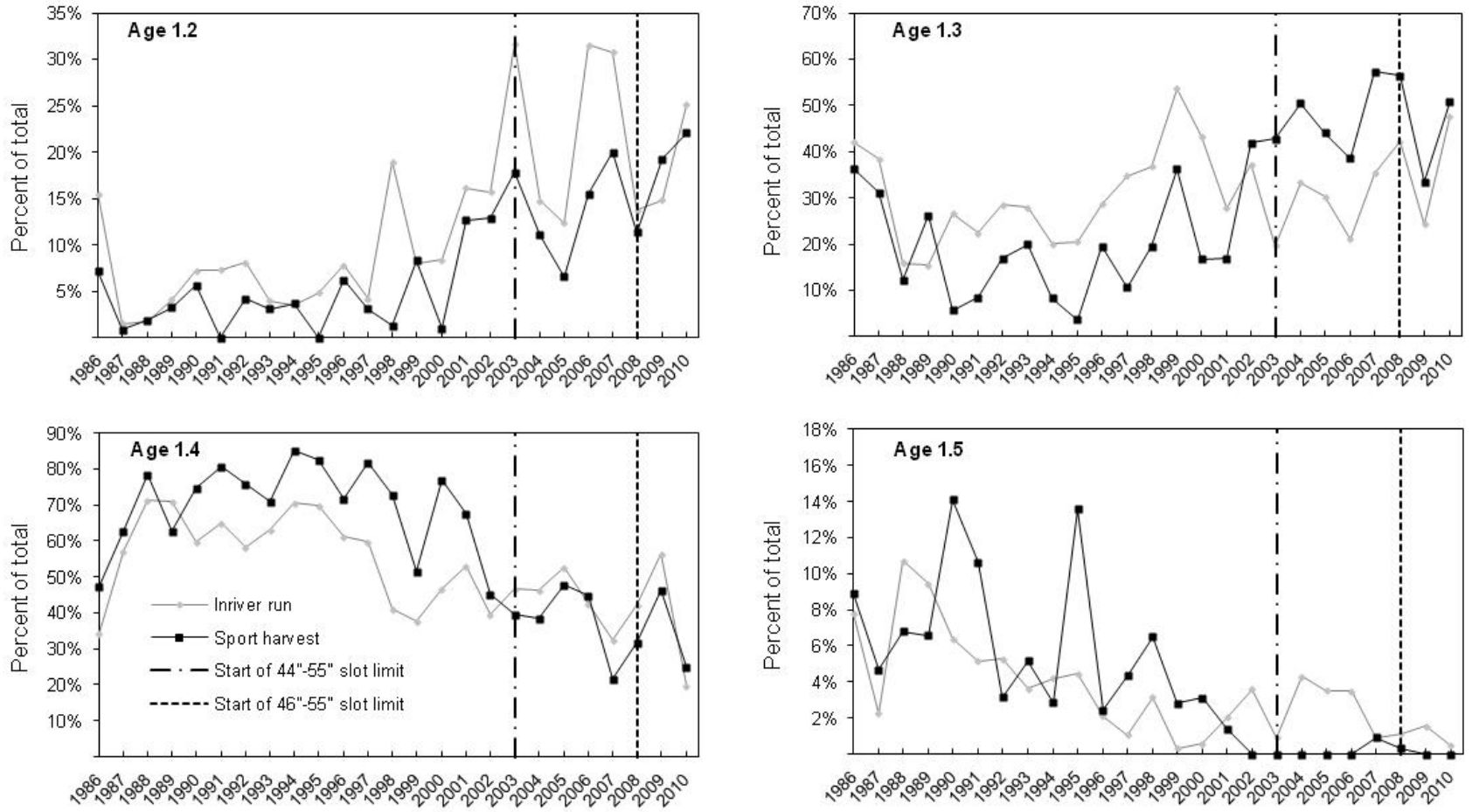

Figure 12.–Age composition of early-run Kenai River Chinook salmon sport harvest versus inriver early run between Soldotna Bridge and Warren Ames Bridge for age-1.2 (top left), age-1.3 (top right), age-1.4 (bottom left), and age-1.5 (bottom right) Chinook salmon, 1986–2010.

Table 8.–Estimated sonar passage by age class and sex for late-run Kenai River Chinook salmon, 1 July–10 August 2010.

	Age					
Parameter	1.1	1.2	1.3	1.4	1.5	Total
Female						
Summed sample size		4	37	34	6	81
Sonar passage estimate		761	9,698	8,906	1,585	20,950
SE sonar passage estimate		546	1,683	1,622	712	2,250
% Sonar passage		1.4%	18.3%	16.8%	3.0%	39.6%
SE % sonar passage		0.8%	2.8%	2.7%	1.3%	3.4%
Male						
Summed sample size	11	46	35	41	6	139
Sonar passage estimate	2,093	9,859	8,321	10,016	1,696	31,984
SE sonar passage estimate	605	1,342	1,368	1,505	692	2,069
% Sonar passage	4.0%	18.6%	15.7%	18.9%	3.2%	60.4%
SE % sonar passage	1.2%	2.5%	2.5%	2.7%	1.3%	3.4%
Both sexes combined						
Summed sample size	11	50	72	75	12	220
Sonar passage estimate	2,093	10,620	18,019	18,922	3,280	52,934
SE sonar passage estimate	605	1,363	1,922	1,962	942	2,100
% Sonar passage	4.0%	20.1%	34.0%	35.7%	6.2%	100.0%
SE % sonar passage	1.2%	2.6%	3.3%	3.3%	1.8%	0.0%

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

The age composition of the inriver early and late runs differed significantly ($\chi^2 = 7.61$, df = 2, $P = 0.02$) (Tables 7–8). Age-1.2 (25%, SE 4%) fish and age-1.3 (48%, SE 4%) fish in the early run were the most abundant, while age-1.4 (36%, SE 3%) fish and age-1.3 (34%, SE 3%) fish were the most abundant in the late run.

The age composition of the early-run harvest and the early-run inriver run did not differ significantly ($\chi^2 = 4.8$, df = 2, $P = 0.09$), with ages 1.2, 1.3, and 1.4 considered. The age composition of the late-run harvest and the late-run inriver run also did not differ significantly ($\chi^2 = 8.07$, df = 4 $P = 0.09$), with ages 1.1, 1.2, 1.3, 1.4, and 1.5 considered.

LENGTH-AT-AGE COMPARISONS

METF lengths are 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 13. On average, age-1.2 and age-1.3 female Chinook salmon were slightly larger than males of these ages, while age-1.4 and age-1.5 male Chinook salmon were larger on average than females of these ages.

Table 9.–Early-run Kenai River Chinook salmon lengths by sex and age from creel survey and inriver gillnet samples, 16 May–30 June 2010.

		Age					
Source	Parameter	1.1	1.2	1.3	1.4	1.5	Combined
Creel Survey							
	Females						
	Sample size[a]			14	12		26
	Mean length (mm)			832	956		889
	SE length (mm)			14	10		15
	Min length (mm)			730	890		730
	Max length (mm)			935	1,010		1,010
	Males						
	Sample size[a]	1	10	9	10		30
	Mean length (mm)	330	650	838	974		804
	SE length (mm)		9	22	16		31
	Min length (mm)	330	610	710	900		330
	Max length (mm)	330	695	920	1,040		1,040
	Both sexes combined						
	Sample size[a]	1	10	23	22		56
	Mean length (mm)	330	650	834	964		843
	SE length (mm)		9	12	9		19
	Min length (mm)	330	610	710	890		330
	Max length (mm)	330	695	935	1,040		1,040
Inriver Gillnet Samples							
	Females						
	Sample size[a]		3	34	17	1	55
	Mean length (mm)		635	833	984	1,140	874
	SE length (mm)		33	9	12		15
	Min length (mm)		570	720	920	1,140	570
	Max length (mm)		675	950	1,060	1,140	1,140
	Males						
	Sample size[a]	8	31	29	14		82
	Mean length (mm)	436	620	821	993		737
	SE length (mm)	12	10	14	20		20
	Min length (mm)	380	520	675	900		380
	Max length (mm)	475	695	945	1,100		1,100
	Both sexes combined						
	Sample size[a]	8	34	63	31	1	137
	Mean length (mm)	436	621	827	988	1,140	792
	SE length (mm)	12	9	8	11		14
	Min length (mm)	380	520	675	900	1,140	380
	Max length (mm)	475	695	950	1,100	1,140	1,140

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

[a] Age and sex values may not sum to totals due to rounding.

Table 10.–Late-run Kenai River Chinook salmon lengths by sex and age from creel survey and inriver gillnet samples, 1–31 July 2010.

Source	Parameter	Age 1.1	1.2	1.3	1.4	1.5	Combined
Creel Survey							
	Females						
	Sample size[a]		2	35	40		77
	Mean length (mm)		658	887	978		928
	SE length (mm)		8	7	6		8
	Min length (mm)		650	735	900		650
	Max length (mm)		665	960	1,080		1,080
	Males						
	Sample size[a]	7	21	37	31	8	104
	Mean length (mm)	391	644	820	1,007	1,138	836
	SE length (mm)	18	12	11	10	24	20
	Min length (mm)	300	530	690	855	1,010	300
	Max length (mm)	435	720	945	1,120	1,235	1,235
	Both sexes combined						
	Sample size[a]	7	23	72	71	8	181
	Mean length (mm)	391	645	853	991	1,138	875
	SE length (mm)	18	11	8	6	24	12
	Min length (mm)	300	530	690	855	1,010	300
	Max length (mm)	435	720	960	1,120	1,235	1,235
Inriver Gillnet Samples							
	Females						
	Sample size[a]		4	37	34	6	81
	Mean length (mm)		676	897	989	1,070	938
	SE length (mm)		24	6	6	17	10
	Min length (mm)		610	780	920	1,000	610
	Max length (mm)		725	980	1,070	1,110	1,110
	Males						
	Sample size[a]	11	46	35	41	6	139
	Mean length (mm)	425	635	822	1,021	1,123	801
	SE length (mm)	7	8	12	9	18	18
	Min length (mm)	380	510	710	910	1,075	380
	Max length (mm)	460	740	985	1,150	1,175	1,175
	Both sexes combined						
	Sample size[a]	11	50	72	75	12	220
	Mean length (mm)	425	639	861	1,007	1,096	851
	SE length (mm)	7	8	8	6	14	13
	Min length (mm)	380	510	710	910	1,000	380
	Max length (mm)	460	740	985	1,150	1,175	1,175

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

[a] Age and sex values may not sum to totals due to rounding.

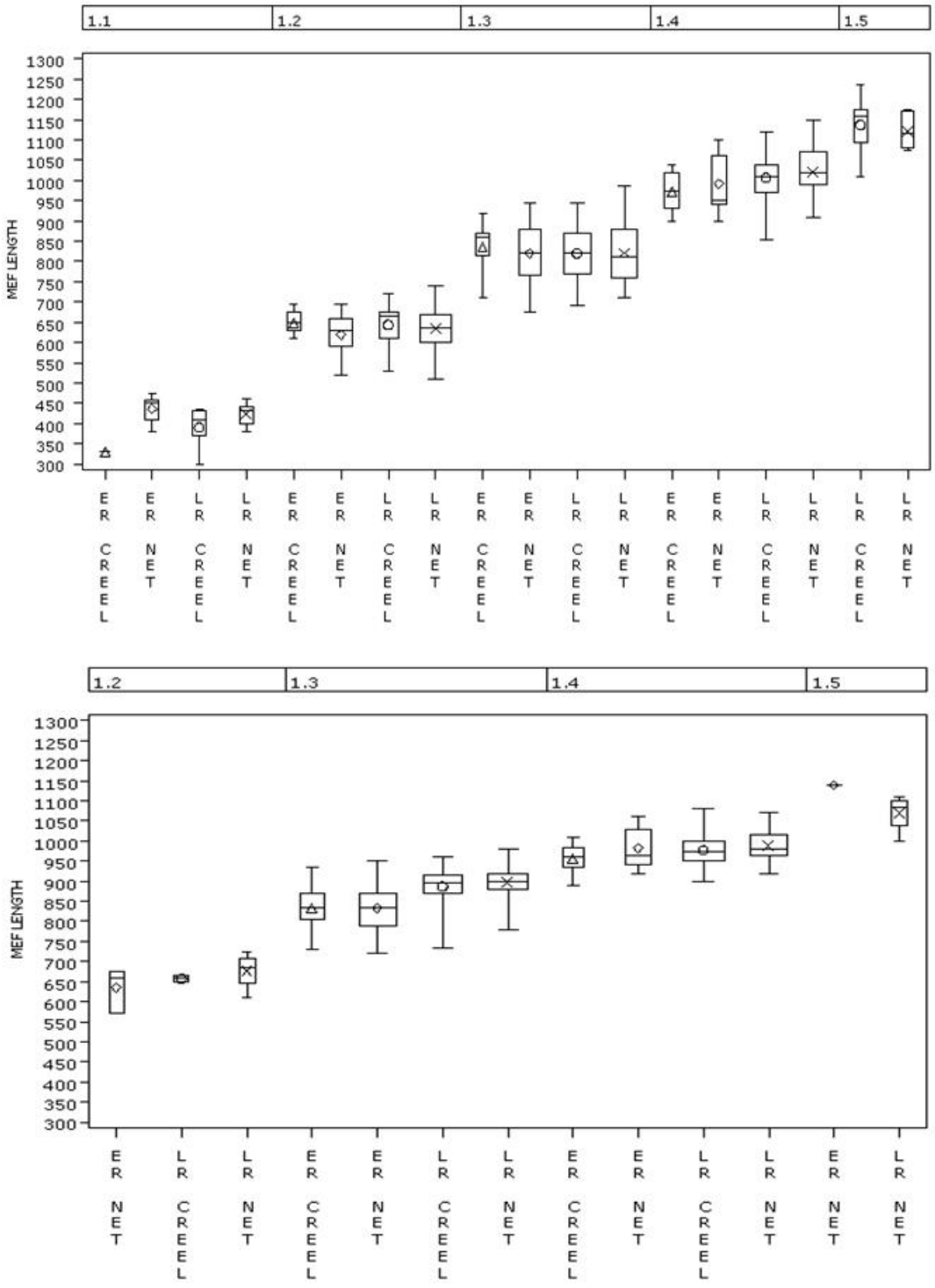

Figure 13.–Box plots of length distribution by sex and age of early- and late-run Kenai River Chinook salmon males (top) and females (bottom) from creel survey and inriver gillnetting samples, 2010.

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 2010, there were two high water events that occurred during the midpoints of the early run (2–11 June), and the late run (13–22 July) (Figure 14). These were reflected in decreased secchi disk measurements of water clarity, and increased measurements of discharge. Secchi disk measurements at RM 15.3 ranged between 0.3 m and 1.6 m during the early run, and 0.4 m and 1.2 m during the late run (Figure 14). The early-run average discharge (8,160 ft^3/s) and late-run average discharge (14,444 ft^3/s) were both above historic early- and late-run averages of 7,081 ft^3/s, and 13,841 ft^3/s, respectively.

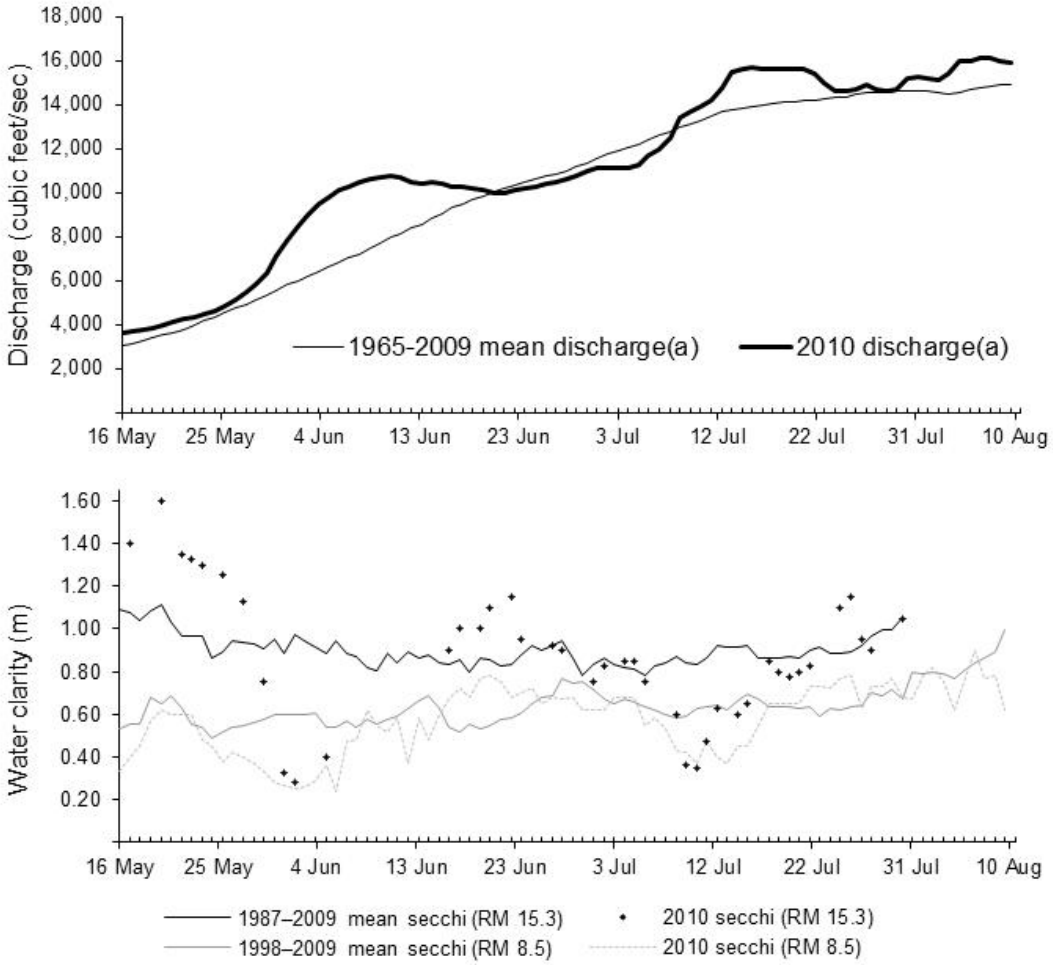

Figure 14.–Kenai River discharge (top) and water clarity (bottom), 16 May–10 August 2010.

[a] Discharge data downloaded from USGS 15266300 KENAI RIVER AT SOLDOTNA AK, 2010-10-20 13:10:11 EST http://waterdata.usgs.gov/ak/nwis/discharge.

All Chinook salmon in the creel survey and inriver gillnetting study were examined for the presence of an adipose finclip. The one Chinook salmon observed missing an adipose fin in the inriver gillnetting study had a coded wire tag implanted from the Crooked Creek, Alaska, 2005 brood year.

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

Harvest of late-run Chinook salmon downstream of the Chinook salmon sonar site (a tidally-influenced section of river) increased from 5% to 25% of total late-run harvests (1996–2006), but has decreased from 19% to 8% of total late-run harvests from 2007 to 2010 (Figure 15).

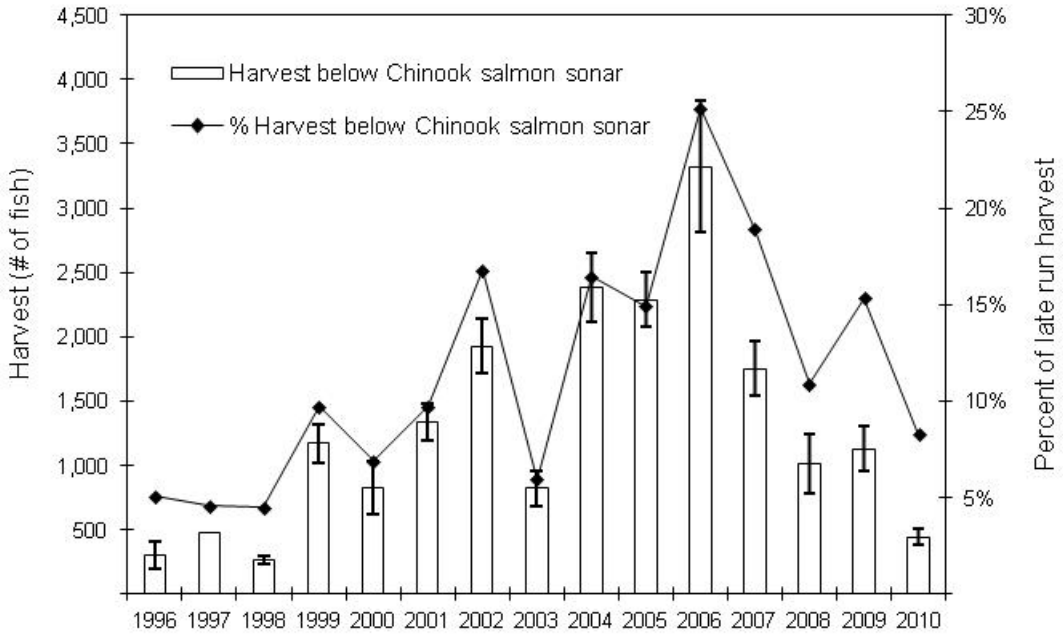

Figure 15.–Estimated number of fish and percent of late-run Kenai River Chinook salmon sport harvest between the Chinook salmon sonar site (RM 8.5) and Warren Ames Bridge (RM 5.2), 1996–2010.

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

Genetic tissue samples were taken from 512 Chinook salmon captured in inriver gillnets (217 early run, 295 late run), and 288 tissue samples were taken from Chinook salmon sampled during the creel survey (69 early run, 219 late run).

A total of 249 Chinook salmon received an esophageal radio transmitter during the inriver gillnetting study at RM 8.5. During 16 May–5 July, 180 Chinook salmon received a radio transmitter with an additional 69 radio transmitters deployed at approximately RM 8.8 by a second crew from 6 through 15 June. The second crew consisted of creel survey technicians that were displaced from normal duties due to the early-run sport fishery restrictions.

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 2010) have been effective at protecting ocean-age-5 Chinook salmon in the early run. Since the slot-limit inception in 2003, only two early-run ocean-age-five Chinook salmon have been sampled in the creel survey. Among ocean-age-four fish in the early run, females have been

harvested at a higher rate than males because ocean-age-four males are longer on average than ocean-age-four females 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 9% of the harvested Chinook salmon sampled were between 44 inches and 46 inches TL during the 2010 creel survey; none of these were age-1.5 fish.

During the early run in 2010, harvest, catch and angler effort were affected by full and partial fishery closures from 5 to 14 June. There were no inseason management actions in the late-run Chinook salmon fishery.

The two high-water events occurring during the midpoints of both the early and late runs coincide typically to peak run-timing of early- and late-run Chinook salmon. As a result, harvest success may have been reduced and a larger proportion of Chinook salmon may have eluded harvest in the lower Kenai River.

Late-Run Mondays

This is the second consecutive year that a standard creel survey estimate was produced for late-run Mondays for comparison with results from the index/impute method used since 2002. The index method resulted in effort estimates that were 29.5% and 36.1% higher for 2009 and 2010, respectively, than the more rigorous creel survey estimates. The discrepancies are the result of an increase of angler effort during the hours of the day (0800–1400) when index counts are conducted. Based on angler counts during 2001, the index method assumes that the daily mean angler effort is, on average, 78% of the effort that occurs randomly during 0800–1400 hours. In 2009 and 2010, effort reached a relatively higher peak (during 0800–1400 hours) than it did in 2001, when the index effort methodology was devised. As a result, the mean effort is lower relative to a random estimation of effort during those hours: 54% in 2009 and 50% in 2010.

During 2009 and 2010, the HPUE and CPUE values for index estimation were similar to the creel survey estimates. The HPUE and CPUE, either imputed with the index method or estimated with the creel survey, did not substantially influence the calculations of catch and harvest during 2009 or 2010.

Late-Run Monday Recommendation

The late-run Monday fishery continues to grow in popularity with unguided anglers and should be included into the regular creel sampling schedule. If late-run Mondays are not included into the creel sampling schedule, the index should be recalibrated from the 2001 conversion factor of 78% to 52%. The new conversion factor is based on the average (2009–2010) efforts estimated during the index period, in relation to daily mean angler efforts.

Unguided angler success has exhibited an autocorrelated time trend for Mondays. Selection of CPUE and HPUE from plotted creel survey estimates versus days (with angler interviews), is a reliable substitution if angler interviews are unavailable.

INRIVER GILLNETTING

In 2010, approximately 29% of all fish passed the Chinook salmon sonar during the time when inriver gillnetting was conducted in the early run, and approximately 30% of all fish passed the Chinook salmon sonar during the time inriver gillnetting was conducted in the late run (Figure 6). During the 2010 early run, a 6% increase in fish passage was observed. In six out of the past

seven years, a higher percentage of fish passage was observed than if the schedule had remained unchanged. During the 2010 late run, an 11% increase in fish passage was observed. In seven out of the past seven years, a higher percentage of fish passage was observed with the new inriver gillnetting schedule. It is recommended that the change to the inriver gillnetting sampling schedule be retained in future years.

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.

ACKNOWLEDGEMENTS

Thanks are due to those individuals involved with the continued success of this project. Area research supervisor Tim McKinley oversaw the project and assisted when needed in all aspects of this project. Tony Eskelin provided knowledge of this project's technical, management, and biological issues. Steve Fleischman provided valuable biometric assistance. The field crews did an excellent job in collecting most of the data used in this report. Returning creel survey crew field technicians Ivan Karic and Stacie Mallette adapted successfully to reassignment of duties and schedules due to the early-run fishery closure. The netting crew consisted of returning technicians Bob Zeyer, Sherra Pritchard, and Tim Lybrand who successfully integrated their daily duties with tagging Chinook salmon for the Kenai River Chinook Salmon Abundance and Migratory Timing Study.

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APPENDIX A: BOAT AND ANGLER COUNTS DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2010

Appendix A1.–Guided and unguided boat angler counts, by geographic strata, during the early-run Kenai River Chinook salmon fishery, 16 May–30 June 2010.

		Downstream[c]								Upstream[c]								Combined strata							
		Unguided anglers[d]				Guided anglers[d]				Unguided anglers[d]				Guided anglers[d]				Unguided anglers[d]				Guided anglers[d]			
Date[a]	Day type[b]	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	we/hol	0	0	0	0					0	2	17	1					0	2	17	1				
19 May	wd	0	0	0	0	0	0	0		5	5	6	10	4	12	0		5	5	6	10	4	12	0	
21 May	wd	0	0	0	0	0	0	0		6	2	4	0	16	20	4		6	2	4	0	16	20	4	
22 May	we/hol	0	0	0	0	0	0			8	19	4	0	29	43			8	19	4	0	29	43		
23 May	we/hol	0	0	0	0					16	34	14	5					16	34	14	5				
25 May	wd	0	0	0	0	0	0	0		2	17	11	19	49	40	34		2	17	11	19	49	40	34	
27 May	wd	0	0	0	0	0	0	0		5	3	13	8	30	26	8		5	3	13	8	30	26	8	
29 May	we/hol	0	0	0	0	0	4			26	31	33	4	48	57			26	31	33	4	48	61		
31 May	we/hol	0	0	0	0	0	0			23	15	2	0	33	11			23	15	2	0	33	11		
1 Jun	wd	0	0	0	0	0	0	0		8	0	3	0	14	6	0		8	0	3	0	14	6	0	
4 Jun	wd	0	0	0	0	0	0			10	0	4	7	21	12			10	0	4	7	21	12		
16 Jun	wd	0	3	0	0	0	0			22	12	34	2	170	81			22	15	34	2	170	81		
17 Jun	wd	0	3	0	0		0	0		4	26	18	42		100	60		4	29	18	42		100	60	
19 Jun	we/hol	6	0	0	0	3	2	0		131	95	39	44	212	141	35		137	95	39	44	215	143	35	
20 Jun	we/hol	0	6	0	3					39	148	125	76					39	154	125	79				
22 Jun	wd	0		0	0	0		0		78		25	20	267		17		78		25	20	267		17	
23 Jun	wd	0	0	0	0	0	0			30	37	36	10	165	105			30	37	36	10	165	105		
26 Jun	we/hol	3	6	0	0	0	9	0		101	71	111	43	172	57	31		104	77	111	43	172	66	31	
27 Jun	we/hol	4	3	0	0					156	74	72	8					160	77	72	8				
30 Jun	wd	0	0	9	0		0	14		29	38	54	71		121	58		29	38	63	71		121	72	
Min (All A–D)				0				0				0				0				0				0	
Mean (All A–D)				1				1				29				59				30				60	
Max (All A–D)				9				14				156				267				160				267	

Note: blank space in data fields = fishing was closed for guided anglers during the time of this count, therefore no data to present.

[a] Chinook salmon fishery closed 5 June, reopened to harvest of Chinook salmon less than 20 inches or 55 inches or greater 12–14 June, reopened to harvest of all non-slot limit Chinook salmon 15 June, and liberalized to use of bait 19–30 June.

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

[c] "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.

[d] 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, 1–31 July 2010.

		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
1 Jul	wd	1	5	0	0	0	6	10		49	60	26	49	213	190	44		50	65	26	49	213	196	54	
3 Jul	w/h	0	6	3	0		3	3		32	103	71	138		181	47		32	109	74	138		184	50	
4 Jul	w/h	16	18	12	0					144	157	106	67					160	175	118	67				
5 Jul	Mon	0	0	10	3					29	113	38	16					29	113	48	19				
8 Jul	wd	2	17	0	3	8	57	0		106	44	53	33	289	156	55		108	61	53	36	297	213	55	
9 Jul	wd	11	21	4	0	0	29	0		89	60	67	25	422	167	46		100	81	71	25	422	196	46	
10 Jul	w/h	0	7	0	0		12	0		61	103	100	52		281	70		61	110	100	52		293	70	
11 Jul	w/h	0	6	14	7					25	158	204	105					25	164	218	112				
12 Jul	Mon	0	0	11	0					14	86	65	39					14	86	76	39				
14 Jul	wd	0	14	0	0	0	14	4		122	70	104	48	386	201	84		122	84	104	48	386	215	88	
15 Jul	wd	0	0	12	0		4	13		29	139	83	135		215	105		29	139	95	135		219	118	
17 Jul	w/h	0	3	15	3	17	13			250	147	78	63	333	228			250	150	93	66	350	241		
18 Jul	w/h	12	5	9	3					256	230	130	200					268	235	139	203				
19 Jul	Mon	0	0	20	0					59	264	88	32					59	264	108	32				
20 Jul	wd	28	27	0	4	23	38	0		336	211	39	79	419	265	104		364	238	39	83	442	303	104	
21 Jul	wd	18	33	5	6	25	57			209	220	136	68	332	351			227	253	141	74	357	408		
24 Jul	w/h	0	43	24	2		71	45		196	194	152	195		334	229		196	237	176	197		405	274	
25 Jul	w/h	17	64	0	4					376	235	414	70					393	299	414	74				
26 Jul	Mon	0	4	3	4					40	199	113	58					40	203	116	62				
27 Jul	wd	0	36	43	3		101	104		477	248	241	249		330	178		477	284	284	252		431	282	
30 Jul	wd	3	52	32	2	4	57	47		263	198	162	254	485	240	95		266	250	194	256	489	297	142	
31 Jul	w/h	5	35	25	0	21	35	15		297	268	213	217	376	195	95		302	303	238	217	397	230	110	
Min (All A–D)			0				0				14				44				14				46		
Mean (All A–D)			9				24				135				221				144				245		
Max (All A–D)			64				104				477				485				477				489		

Note: blank space in data fields = fishing was closed for guided anglers during the time of this count, therefore no data to present.

[a] "wd" = weekday; "w/h" = weekend/holiday; "Mon" = Monday, unguided drift boat fishing only.

[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, 2010.

Appendix B1.–Daily estimates of unguided boat angler CPUE, HPUE, angler effort, catch and harvest, by geographic strata, during the early-run Kenai River Chinook salmon fishery, 16 May–30 June 2010.

		Angler interview data[c]					Downstream[e]								Upstream[e]							
			Catch		Harvest		Counts		Effort		Catch		Harvest		Counts		Effort		Catch		Harvest	
Date[a]	Day type[b]	*n*[d]	CPUE	SE	HPUE	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE
16 May	we/hol	16	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	5	100	90	0	0	0	0
19May	wd	14	0.029	0.031	0.029	0.031	4	0	0	0	0	0	0	0	4	7	130	17	4	4	4	4
21 May	wd	16	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	3	60	24	0	0	0	0
22 May	we/hol	33	0.016	0.012	0.016	0.012	4	0	0	0	0	0	0	0	4	8	155	78	3	2	3	2
23 May	we/hol	28	0.018	0.012	0.018	0.012	4	0	0	0	0	0	0	0	4	17	345	116	6	5	6	5
25 May	wd	26	0.052	0.028	0.031	0.019	4	0	0	0	0	0	0	0	4	12	245	74	13	8	8	5
27 May	wd	30	0.045	0.023	0.033	0.020	4	0	0	0	0	0	0	0	4	7	145	46	6	4	5	3
29 May	we/hol	38	0.007	0.007	0.007	0.007	4	0	0	0	0	0	0	0	4	24	470	120	3	3	3	3
31 May	we/hol	15	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	10	200	63	0	0	0	0
1 Jun	wd	14	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	3	55	37	0	0	0	0
4 Jun	wd	15	0.000	0.000	0.000	0.000	4	0	0	0	0	0	0	0	4	5	105	46	0	0	0	0
16 Jun	wd	16	0.000	0.000	0.000	0.000	4	1	15	17	0	0	0	0	4	18	350	164	0	0	0	0
17 Jun	wd	15	0.018	0.018	0.000	0.000	4	1	15	17	0	0	0	0	4	23	450	137	8	8	0	0
19 Jun	we/hol	40	0.029	0.016	0.011	0.008	4	2	30	24	1	1	0	0	4	77	1,545	273	44	26	18	13
20 Jun	we/hol	55	0.042	0.014	0.029	0.011	4	2	45	37	2	2	1	1	4	97	1,940	497	81	33	56	26
22 Jun	wd	53	0.011	0.006	0.008	0.005	3	0	0	0	0	0	0	0	3	41	820	307	9	6	6	5
23 Jun	wd	2	0.011	0.007	0.007	0.005	4	0	0	0	0	0	0	0	4	28	565	110	6	4	4	3
26 Jun	we/hol	27	0.008	0.008	0.008	0.008	4	2	45	27	0	0	0	0	4	82	1,630	345	14	14	14	14
27 Jun	we/hol	57	0.012	0.007	0.012	0.007	4	2	35	13	0	0	0	0	4	78	1,550	425	19	12	19	12
30 Jun	wd	31	0.009	0.009	0.009	0.009	4	2	45	52	0	1	0	1	4	48	960	102	8	9	8	9
	Min	2	0.000		0.000		3	0	0		0		0		3	3	55		0		0	
	Mean	27	0.015		0.011		4	1	12		0		0		4	30	591		11		8	
	Max	57	0.052		0.033		4	2	12		2		1		4	97	1,940		81		56	

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

[a] Chinook salmon fishery closed 5 June, reopened to harvest of Chinook salmon less than 20 inches or 55 inches or greater 12–14 June, reopened to harvest of all non-slot limit Chinook salmon 15 June, and liberalized to use of bait 19–30 June.

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

[c] Angler counts are geographically stratified, angler interviews are not.

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

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

Appendix B2.–Daily estimates of guided boat angler CPUE, HPUE, angler effort, catch and harvest, by geographic strata, during the early-run Kenai River Chinook salmon fishery, 16 May–30 June 2010.

		Angler interview data[c]					Downstream[e]								Upstream[e]							
			Catch		Harvest		Counts		Effort		Catch		Harvest		Counts		Effort		Catch		Harvest	
Date[a]	Day type[b]	*n*[d]	CPUE	SE	HPUE	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE
19 May	wd	9	0.000	0.000	0.000	0.000	3	0	0	0	0	0	0	0	3	5	64	50	0	0	0	0
21 May	wd	11	0.019	0.019	0.019	0.019	3	0	0	0	0	0	0	0	3	13	160	57	3	3	3	3
22 May	we/hol	19	0.041	0.017	0.024	0.014	2	0	0	0	0	0	0	0	2	36	432	84	18	8	11	7
25 May	wd	10	0.000	0.000	0.000	0.000	3	0	0	0	0	0	0	0	3	41	492	37	0	0	0	0
27 May	wd	15	0.056	0.030	0.033	0.020	3	0	0	0	0	0	0	0	3	21	256	64	14	8	9	5
29 May	we/hol	7	0.000	0.000	0.000	0.000	2	2	24	24	0	0	0	0	2	53	630	54	0	0	0	0
31 May	we/hol	6	0.000	0.000	0.000	0.000	2	0	0	0	0	0	0	0	2	22	264	132	0	0	0	0
1 Jun	wd	2	0.000	0.000	0.000	0.000	3	0	0	0	0	0	0	0	3	7	80	35	0	0	0	0
4 Jun	wd	10	0.000	0.000	0.000	0.000	2	0	0	0	0	0	0	0	2	17	198	54	0	0	0	0
16 Jun	wd	37	0.037	0.013	0.033	0.012	2	0	0	0	0	0	0	0	2	126	1,506	534	56	28	50	25
17 Jun	wd	18	0.057	0.022	0.047	0.021	3	0	0	0	0	0	0	0	3	80	960	240	54	25	45	23
19 Jun	we/hol	43	0.121	0.027	0.076	0.021	3	2	20	8	2	1	2	1	3	129	1,552	442	188	68	118	46
22 Jun	wd[f]	35	0.039	0.014	0.020	0.010	2	0	0	0	0	0	0	0	1	267	3,204		126		63	
23 Jun	wd	51	0.037	0.010	0.034	0.010	2	0	0	0	0	0	0	0	2	135	1,620	360	59	21	55	20
26 Jun	we/hol	27	0.037	0.017	0.021	0.011	3	3	36	44	1	2	1	1	3	87	1,040	408	38	23	22	14
30 Jun	wd	22	0.019	0.012	0.019	0.012	3	7	84	84	2	2	2	2	3	90	1,074	378	21	15	21	15
	Min	2	0.000		0.000		2	0	0		0		0		1	5	64		0		0	
	Mean	20	0.029		0.020		3	1	10		0		0		3	70	846		36		25	
	Max	51	0.121		0.076		3	7	84		2		2		3	267	3,204		188		118	

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

[a] Chinook salmon fishery closed 5 June, reopened to harvest of Chinook salmon less than 20 inches or 55 inches or greater 12–14 June, reopened to harvest of all non-slot limit Chinook salmon 15 June, and liberalized to use of bait 19–30 June.

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

[c] Angler counts are geographically stratified, angler interviews are not.

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

[e] "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.

[f] No SE estimates for upstream effort, catch, or harvest due to a single boat conducted during guided fishing hours (0600–1800).

Appendix B3.–Daily estimates of unguided boat angler CPUE, HPUE, angler effort, catch and harvest, by geographic strata, during the late-run Kenai River Chinook salmon fishery, 1–31 July 2010.

		Angler interview data[b]					Downstream[c]								Upstream[c]							
			Catch		Harvest		Counts		Effort		Catch		Harvest		Counts		Effort		Catch		Harvest	
Date	Day type[a]	*n*	CPUE	SE	HPUE	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE
1 Jul	wd	30	0.042	0.017	0.014	0.010	4	1.5	30	26	1	1	0	0	4	46.0	920	173	38	18	13	10
3 Jul	w/h	40	0.006	0.006	0.006	0.006	4	2.3	45	30	0	0	0	0	4	86.0	1,720	419	10	10	10	10
4 Jul	w/h	65	0.009	0.005	0.006	0.004	4	11.5	230	55	2	1	1	1	4	118.5	2,370	267	22	13	15	10
5 Jul	Mon	105	0.061	0.011	0.046	0.009	4	3.3	65	50	4	3	3	2	4	49.0	980	468	60	31	45	23
8 Jul	wd	23	0.028	0.021	0.028	0.021	4	5.5	110	93	3	4	3	4	4	59	1,180	268	34	26	34	26
9 Jul	wd	28	0.000	0.000	0.000	0.000	4	9.0	180	82	0	0	0	0	4	60.3	1,205	210	0	0	0	0
10 Jul	w/h	30	0.000	0.000	0.000	0.000	4	1.8	35	40	0	0	0	0	4	79.0	1,580	261	0	0	0	0
11 Jul	w/h	48	0.017	0.008	0.017	0.008	4	6.8	135	50	2	1	2	1	4	123.0	2,460	702	42	24	42	24
12 Jul	Mon	82	0.023	0.008	0.014	0.006	4	2.8	55	64	1	2	1	1	4	51.0	1,020	324	23	11	15	8
14 Jul	wd	19	0.058	0.028	0.058	0.028	4	3.5	70	81	4	5	4	5	4	86.0	1,720	341	100	53	100	53
15 Jul	wd	26	0.009	0.009	0.009	0.009	4	3.0	60	69	1	1	1	1	4	96.5	1,930	547	16	18	16	18
17 Jul	w/h	47	0.018	0.009	0.018	0.009	4	5.3	105	70	2	2	2	2	4	134.5	2,690	510	47	26	47	26
18 Jul	w/h	83	0.054	0.013	0.051	0.012	4	7.3	145	41	8	3	7	3	4	204.0	4,080	510	222	59	209	57
19 Jul	Mon	82	0.068	0.013	0.040	0.010	4	5.0	100	115	7	8	4	5	4	110.8	2,215	1,126	150	82	90	51
20 Jul	wd	75	0.053	0.015	0.049	0.014	4	14.8	295	112	16	7	14	7	4	166.3	3,325	883	176	67	163	64
21 Jul	wd	41	0.012	0.008	0.012	0.008	4	15.5	310	130	4	3	4	3	4	158.3	3,165	443	37	27	37	27
24 Jul	w/h	65	0.056	0.017	0.048	0.015	4	17.3	345	212	19	13	16	11	4	184.3	3,685	246	207	65	175	56
25 Jul	w/h	99	0.055	0.012	0.047	0.011	4	21.3	425	325	23	19	20	16	4	273.8	5,475	1,685	301	112	260	100
26 Jul	Mon	104	0.032	0.007	0.027	0.007	4	2.8	55	17	2	1	1	1	4	102.5	2,050	771	65	29	54	25
27 Jul	wd	55	0.034	0.012	0.026	0.011	4	20.5	410	222	14	9	11	7	4	303.8	6,075	936	209	82	156	71
30 Jul	wd	29	0.054	0.022	0.054	0.022	4	22.3	445	248	24	16	24	16	4	219.3	4,385	483	236	98	236	98
31 Jul	w/h	72	0.018	0.008	0.018	0.008	4	16.3	325	165	6	4	6	4	4	248.8	4,975	254	92	38	92	38
	Min	19	0.000		0.000		4	1.5	30		0		0		4	46.0	920		0		0	
	Mean	57	0.032		0.027		4	9.0	181		7		6		4	134.6	2,691		95		82	
	Max	105	0.068		0.058		4	22.3	445		24		24		4	303.8	6,075		301		260	

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

[a] "wd" = weekday; "w/h" = weekend/holiday; "Mon" = Monday, unguided drift boat fishing only.

[b] Angler counts are geographically stratified, angler interviews are not.

[c] "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 B4.–Daily estimates of guided boat angler CPUE, HPUE, angler effort, catch and harvest, by geographic strata, during the late-run Kenai River Chinook salmon fishery, 1–31 July 2010.

		Angler interview data[b]					Downstream[c]								Upstream[c]							
			Catch		Harvest		Counts		Effort		Catch		Harvest		Counts		Effort		Catch		Harvest	
Date	Day type[a]	*n*	CPUE	SE	HPUE	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE	*n*	Mean	Est.	SE	Est.	SE	Est.	SE
1 Jul	Wd	22	0.057	0.022	0.057	0.022	3	5.3	64	25	4	2	4	2	3	149.0	1,788	512	102	49	102	49
3 Jul	w/h	6	0.021	0.025	0.021	0.025	3	3.0	36	0	1	1	1	1	3	114.0	1,368	804	29	38	29	38
8 Jul	Wd	33	0.033	0.014	0.033	0.014	3	21.7	260	260	9	9	9	9	3	166.7	2,000	579	66	34	66	34
9 Jul	Wd	31	0.005	0.005	0.005	0.005	3	9.7	116	142	1	1	1	1	3	211.7	2,540	978	12	13	12	13
10 Jul	w/h	53	0.013	0.006	0.011	0.005	3	6.0	72	72	1	1	1	1	3	175.5	2,106	1,266	28	21	22	18
14 Jul	Wd	43	0.022	0.010	0.022	0.010	3	6.0	72	60	2	1	2	1	3	223.7	2,684	758	58	30	58	30
15 Jul	Wd	7	0.026	0.026	0.026	0.026	3	8.5	102	54	3	3	3	3	3	160.0	1,920	660	50	53	50	53
17 Jul	w/h	24	0.101	0.032	0.101	0.032	2	15.0	180	24	18	6	18	6	2	280.5	3,366	630	340	125	340	125
20 Jul	Wd	63	0.085	0.017	0.071	0.015	3	20.3	244	142	21	13	17	11	3	262.7	3,152	772	269	84	225	72
21 Jul	Wd	82	0.062	0.011	0.054	0.010	2	41.0	492	192	31	13	26	11	2	341.5	4,098	114	256	44	220	41
24 Jul	w/h	41	0.041	0.014	0.041	0.014	3	58.0	696	156	28	12	28	12	3	281.5	3,378	630	137	54	137	54
27 Jul	Wd	71	0.034	0.008	0.025	0.007	3	102.5	1,230	18	42	10	31	9	3	254.0	3,048	912	104	39	77	31
30 Jul	Wd	60	0.022	0.007	0.022	0.007	3	36.0	432	187	10	5	10	5	3	273.3	3,280	986	74	33	74	33
31 Jul	w/h	36	0.032	0.012	0.027	0.012	3	23.7	284	85	9	4	8	4	3	222.0	2,664	716	86	40	73	37
	Min	6	0.005		0.005		2	3.0	36		1		1		2	114.0	1,368		12		12	
	Mean	41	0.040		0.037		3	25.5	306		13		11		3	222.6	2,671		115		106	
	Max	82	0.101		0.101		3	102.5	1,230		42		31		3	341.5	4,098		340		340	

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

[a] "wd" = weekday; "w/h" = weekend/holiday.

[b] Angler counts are geographically stratified, angler interviews are not.

[c] "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 C: EFFORT, CATCH, AND HARVEST ESTIMATES BY TEMPORAL AND GEOGRAPHIC STRATA DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2010.

Appendix C1.–Estimated effort, catch, and harvest, by geographic strata, during the early-run Kenai River Chinook salmon sport fishery, 16 May–30 June 2010.

	Downstream[b] creel estimates						Upstream[b] creel estimates								
			Chinook salmon						Chinook salmon						
	Effort		Catch		Harvest		Effort		Catch		Harvest				
Fishing periods[a]	Hours fished	SE	No. fish	SE	No. fish	SE	Hours fished	SE	No. fish	SE	No. fish	SE	Downstream % Effort	Catch	Harvest
16 May															
Unguided weekends	0	0	0	0	0	0	100	90	0	0	0	0	0.0%	N/A	N/A
18–23 May															
Guided weekdays	0	0	0	0	0	0	448	173	6	6	6	6	0.0%	0.0%	0.0%
Guided weekends	0	0	0	0	0	0	432	84	18	8	11	7	0.0%	0.0%	0.0%
Unguided weekdays	0	0	0	0	0	0	380	108	7	8	7	8	0.0%	0.0%	0.0%
Unguided weekends	0	0	0	0	0	0	500	139	9	5	9	5	0.0%	0.0%	0.0%
25–31 May															
Guided weekdays	0	0	0	0	0	0	1,496	350	29	23	17	14	0.0%	0.0%	0.0%
Guided weekends/holiday	24	24	0	0	0	0	894	143	0	0	0	0	2.6%	N/A	N/A
Unguided weekdays	0	0	0	0	0	0	780	187	39	15	25	10	0.0%	0.0%	0.0%
Unguided weekends/holiday	0	0	0	0	0	0	1,005	287	5	5	5	5	0.0%	0.0%	0.0%
1–4 June															
Guided weekdays	0	0	0	0	0	0	556	190	0	0	0	0	0.0%	N/A	N/A
Unguided weekdays	0	0	0	0	0	0	320	109	0	0	0	0	0.0%	N/A	N/A
15–20 June															
Guided weekdays	0	0	0	0	0	0	4,932	1,132	221	53	190	49	0.0%	0.0%	0.0%
Guided weekends	20	8	2	1	2	1	1,552	442	188	68	118	46	1.3%	1.3%	1.3%
Unguided weekdays	60	35	1	1	0	0	1,600	333	16	16	0	0	3.6%	3.2%	N/A
Unguided weekends	75	44	3	2	2	1	3,485	567	125	42	74	29	2.1%	2.1%	2.2%
22–27 June															
Guided weekdays	0	0	0	0	0	0	9,648	2,353	370	104	234	42	0.0%	0.0%	0.0%
Guided weekends	36	44	1	2	1	1	1,040	408	38	23	22	14	3.3%	3.3%	3.3%
Unguided weekdays	0	0	0	0	0	0	2,770	586	31	12	21	9	0.0%	0.0%	0.0%
Unguided weekends	80	30	1	1	1	1	3,180	547	33	18	33	18	2.5%	2.4%	2.4%
29–30 June															
Guided weekday	168	119	3	3	3	3	2,148	535	41	21	41	21	7.3%	7.3%	7.3%
Unguided weekday	90	73	1	1	1	1	1,920	144	17	12	17	12	4.5%	4.5%	4.5%

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Appendix C1.–Part 2 of 2.

	Downstream[b] creel estimates						Upstream[b] creel estimates								
			Chinook salmon						Chinook salmon						
	Effort		Catch		Harvest		Effort		Catch		Harvest				
Fishing periods[a]	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	168	119	3	3	3	3	19,228	2,700	667	121	489	69	0.9%	0.5%	0.7%
Guided weekends/holiday	80	51	4	2	2	1	3,918	624	244	72	150	49	2.0%	1.5%	1.5%
Unguided weekdays	150	81	1	1	1	1	7,770	731	110	29	70	19	1.9%	1.2%	1.1%
Unguided weekends/holiday	155	54	4	2	2	1	8,270	854	171	46	120	35	1.8%	2.0%	2.0%
Angler type subtotals															
Guided	248	129	7	3	5	3	23,146	2,772	911	141	639	85	1.1%	0.8%	0.9%
% Guided	44.8%		59.0%		63.0%		59.1%		76.4%		77.1%				
Unguided	305	97	5	2	3	2	16,040	1,124	281	55	189	40	1.9%	1.7%	1.7%
% Unguided	55.2%		41.0%		37.0%		40.9%		23.6%		22.9%				
Early-run total	553	162	12	4	9	3	39,186	2,991	1,192	151	829	94	1.4%	1.0%	1.0%

[a] Chinook salmon fishery closed 5 June, reopened to harvest of Chinook salmon less than 20 inches or 55 inches or greater 12–14 June, reopened to harvest of all non-slot limit Chinook salmon 15 June, and liberalized to use of bait 19–30 June.

[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.

Appendix C2.–Estimated effort, catch, and harvest, by geographic strata, during the late-run Kenai River Chinook salmon sport fishery, 1–31 July 2010.

	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
1–4 July															
Guided weekdays	128	35	7	3	7	3	3,576	724	203	69	203	69	3.5%	3.5%	3.5%
Guided weekends	36	0	1	1	1	1	1,368	804	29	38	29	38	2.6%	2.6%	2.6%
Unguided weekdays	60	37	3	2	1	1	1,840	245	77	25	25	14	3.2%	3.2%	3.2%
Unguided weekends	275	63	2	1	2	1	4,090	497	32	16	24	14	6.3%	7.0%	6.5%
5–11 July															
Monday	65	50	4	3	3	2	980	468	60	31	45	23	6.2%	6.2%	6.2%
Guided weekdays	752	466	18	17	18	17	9,080	1,779	156	92	156	92	7.6%	10.5%	10.5%
Guided weekends	72	72	1	1	1	1	2,106	1,266	28	21	22	18	3.3%	3.3%	3.3%
Unguided weekdays	580	202	6	7	6	7	4,770	484	67	60	67	60	10.8%	8.5%	8.5%
Unguided weekends	170	64	2	1	2	1	4,040	749	42	24	42	24	4.0%	5.2%	5.2%
12–18 July															
Monday	55	64	1	2	1	1	1,020	324	23	11	15	8	5.1%	5.1%	5.1%
Guided weekdays	348	121	8	5	8	5	9,208	1,786	217	88	217	88	3.6%	3.7%	3.7%
Guided weekends	180	24	18	6	18	6	3,366	630	340	125	340	125	5.1%	5.1%	5.1%
Unguided weekdays	260	151	9	9	9	9	7,300	959	233	142	233	142	3.4%	3.8%	3.8%
Unguided weekends	250	81	10	3	9	3	6,770	721	269	64	257	63	3.6%	3.5%	3.5%
19–25 July															
Monday	100	115	7	8	4	5	2,215	1,126	150	82	90	51	4.3%	4.3%	4.3%
Guided weekdays	1,472	487	103	29	88	26	14,500	1,734	1,049	135	890	118	9.2%	8.9%	9.0%
Guided weekends	696	156	28	12	28	12	3,378	630	137	54	137	54	17.1%	17.1%	17.1%
Unguided weekdays	1,210	243	38	20	36	19	12,980	1,416	425	221	399	204	8.5%	8.3%	8.3%
Unguided weekends	770	388	43	23	37	20	9,160	1,702	509	130	435	115	7.8%	7.8%	7.8%
26–31 July															
Monday	55	17	2	1	1	1	2,050	771	65	29	54	25	2.6%	2.6%	2.6%
Guided weekdays	3,324	1,159	103	48	81	33	12,656	1,928	356	84	301	64	20.8%	22.5%	21.3%
Guided weekends	284	85	9	4	8	4	2,664	716	86	40	73	37	9.6%	9.6%	9.6%
Unguided weekdays	1,710	473	76	30	69	32	20,920	2,816	889	185	784	204	7.6%	7.9%	8.1%
Unguided weekends	325	165	6	4	6	4	4,975	254	92	38	92	38	6.1%	6.1%	6.1%

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Appendix C2.–Part 2 of 2.

	Downstream[a] creek estimates						Upstream[a] creek 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															
Monday	275	142	14	9	9	5	6,265	1,479	299	92	204	62	4.2%	4.4%	4.4%
Guided weekdays	6,024	1,347	240	59	203	46	49,020	3,688	1,980	215	1,766	197	10.9%	10.8%	10.3%
Guided weekends	1,268	193	57	14	56	14	12,882	1,886	620	148	602	147	9.0%	8.5%	8.5%
Unguided weekdays	3,820	590	132	38	121	38	47,810	3,339	1,691	328	1,508	327	7.4%	7.3%	7.4%
Unguided weekends	1,790	438	63	23	56	20	29,035	2,071	943	152	850	139	5.8%	6.3%	6.2%
Angler type subtotals															
Guided	7,292	1,361	298	61	259	48	61,902	4,142	2,600	261	2,368	246	10.5%	10.3%	9.8%
% Guided	55.3%		58.7%		58.1%		42.7%		47.0%		48.0%				
Unguided	5,885	748	209	45	186	44	83,110	4,199	2,932	373	2,562	361	6.6%	6.7%	6.8%
% Unguided	44.7%		41.3%		41.9%		57.3%		53.0%		52.0%				
Late-run total	13,177	1,553	507	76	445	65	145,012	5,898	5,532	456	4,930	437	8.3%	8.4%	8.3%

[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, 2010.

Appendix D1.–Number of Chinook and sockeye salmon 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 2010.

	Inriver drift gillnetting catch										
	5.0-inch mesh					7.5-inch mesh					
Date	No. drifts	Time fished (min)	No. Chinook salmon	No. sockeye salmon	Total fish	No. drifts	Time fished (min)	No. Chinook salmon	No. sockeye salmon	Total fish	Combined total[a]
16 May	10	97	0	1	1	9	86	1	0	1	2
17 May	9	90	0	0	0	10	104	0	0	0	0
18 May	10	116	0	0	0	8	93	0	0	0	0
19 May	7	81	2	0	2	8	93	1	0	1	3
20 May	9	106	0	1	1	8	91	2	0	2	3
21 May	8	93	0	0	0	8	93	0	0	0	0
22 May	10	108	1	3	4	8	86	0	0	0	4
23 May	8	93	1	4	5	9	99	0	0	0	5
24 May	9	88	0	7	7	8	86	0	3	3	10
25 May	8	85	0	3	3	8	87	1	2	3	6
26 May	9	91	1	3	4	8	90	1	1	2	6
27 May	10	95	0	2	2	10	98	1	1	2	4
28 May	10	96	0	5	5	9	89	3	1	4	9
29 May	8	76	1	1	2	10	89	2	0	2	4
30 May	9	83	0	3	3	8	71	1	0	1	4
31 May	10	94	1	3	4	10	86	0	1	1	5
1 Jun	10	89	0	1	1	9	71	0	0	0	1
2 Jun	10	86	0	1	1	10	90	0	0	0	1
3 Jun	11	89	2	2	4	10	71	0	2	2	6
4 Jun	9	67	0	19	19	10	77	3	1	4	23
5 Jun	10	81	3	10	13	8	66	6	4	10	23
6 Jun	8	63	1	8	9	8	68	2	3	5	14
7 Jun	10	85	1	18	19	9	75	2	5	7	26
8 Jun	6	47	3	46	49	7	61	3	22	25	74
9 Jun	8	70	5	38	43	7	49	4	9	13	56
10 Jun	6	49	3	37	40	7	71	4	21	25	65
11 Jun	8	58	3	18	21	7	53	4	9	13	34
12 Jun	7	49	3	21	24	8	54	4	8	12	36
13 Jun	11	76	0	43	43	10	72	4	24	28	71
14 Jun	7	54	3	29	32	8	63	5	18	23	55
15 Jun	7	55	2	50	52	6	49	9	22	31	83
16 Jun	8	64	0	24	24	9	68	3	10	13	37
17 Jun	8	59	2	25	27	7	54	2	8	10	37
18 Jun	8	68	2	14	16	9	73	2	9	11	27
19 Jun	8	69	3	22	25	8	65	3	12	15	40
20 Jun	8	61	1	16	17	8	66	3	12	15	32

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Appendix D1.–Part 2 of 2.

	Inriver drift gillnetting catch										
	5.0-inch mesh					7.5-inch mesh					
Date	No. drifts	Time fished (min)	No. Chinook salmon	No. sockeye salmon	Total fish	No. drifts	Time fished (min)	No. Chinook salmon	No. sockeye salmon	Total fish	Comb. total[a]
21 Jun	10	80	1	28	29	8	61	2	5	7	36
22 Jun	6	54	3	34	37	8	68	4	12	16	53
23 Jun	8	69	2	51	53	8	63	0	8	8	61
24 Jun	8	59	1	37	38	8	60	1	16	17	55
25 Jun	8	61	5	34	39	7	58	2	13	15	54
26 Jun	8	63	1	28	29	8	61	2	7	9	38
27 Jun	7	54	2	54	56	6	50	2	14	16	72
28 Jun	8	65	3	23	26	8	63	1	4	5	31
29 Jun	8	63	8	32	40	7	56	1	8	9	49
30 Jun	7	54	1	29	30	8	60	4	18	22	52
Total	390	3,453	71	828	899	380	3,362	95	313	408	1,307
Min	6	47	0	0	0	6	49	0	0	0	0
Mean	8	75	2	18	20	8	73	2	7	9	28
Max	11	116	8	54	56	10	104	9	24	31	83

[a] Combined total number of fish is all 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- 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 2010.

				Inriver drift gillnetting catch									
				Chinook salmon			Sockeye salmon			Total			
Date	Reps[a]	No. drifts	Time fished (min)	No. fish	CPUE	SE	No. fish	CPUE	SE	No. fish	CPUE	Chinook salmon Prop.[b]	Chinook salmon SE
16 May	5	19	183	1	0.006	0.006	1	0.004	0.004	2	0.011	0.57	0.39
17 May	5	19	194	0	0.000	0.000	0	0.000	0.000	0	0.000		
18 May	4	16	184	0	0.000	0.000	0	0.000	0.000	0	0.000		
19 May	4	15	174	3	0.016	0.011	0	0.000	0.000	3	0.017	1.00	0.00
20 May	4	16	186	2	0.012	0.007	1	0.005	0.005	3	0.016	0.70	0.17
21 May	4	16	186	0	0.000	0.000	0	0.000	0.000	0	0.000		
22 May	4	16	172	1	0.006	0.006	3	0.018	0.006	4	0.023	0.23	0.18
23 May	4	16	184	1	0.006	0.006	4	0.022	0.013	5	0.027	0.21	0.13
24 May	4	16	168	0	0.000	0.000	9	0.054	0.011	9	0.054	0.00	0.00
25 May	4	16	173	1	0.006	0.006	5	0.029	0.018	7	0.040	0.14	0.17
26 May	4	16	170	2	0.013	0.008	4	0.025	0.010	6	0.035	0.34	0.19
27 May	5	20	194	1	0.005	0.005	3	0.014	0.006	4	0.021	0.25	0.17
28 May	5	19	185	3	0.020	0.010	6	0.029	0.018	9	0.049	0.41	0.10
29 May	4	16	148	2	0.013	0.007	1	0.007	0.007	3	0.020	0.66	0.32
30 May	4	16	145	1	0.006	0.006	3	0.020	0.007	4	0.028	0.24	0.18
31 May	5	20	180	1	0.005	0.005	4	0.021	0.013	5	0.028	0.19	0.13
1 Jun	5	19	161	0	0.000	0.000	1	0.006	0.006	1	0.006	0.00	0.00
2 Jun	5	20	176	0	0.000	0.000	1	0.006	0.006	1	0.006	0.00	0.00
3 Jun	5	20	152	2	0.013	0.008	4	0.027	0.012	6	0.039	0.33	0.14
4 Jun	5	19	145	3	0.020	0.013	20	0.172	0.058	23	0.159	0.10	0.05
5 Jun	4	16	133	8	0.059	0.031	14	0.110	0.036	22	0.165	0.35	0.11
6 Jun	4	16	131	3	0.023	0.008	11	0.094	0.044	14	0.107	0.19	0.12
7 Jun	5	19	160	3	0.018	0.007	23	0.140	0.025	26	0.163	0.11	0.05
8 Jun	3	12	100	6	0.065	0.038	68	0.693	0.091	74	0.739	0.09	0.05
9 Jun	4	15	119	9	0.069	0.024	47	0.356	0.072	56	0.470	0.16	0.04
10 Jun	3	12	113	7	0.067	0.034	56	0.530	0.135	63	0.559	0.11	0.05
11 Jun	4	15	111	7	0.057	0.037	27	0.224	0.103	35	0.314	0.20	0.04
12 Jun	4	15	104	7	0.065	0.017	29	0.262	0.094	36	0.347	0.20	0.09
13 Jun	5	20	140	4	0.029	0.014	67	0.501	0.216	71	0.506	0.06	0.02
14 Jun	4	15	117	8	0.064	0.045	47	0.374	0.238	55	0.472	0.15	0.01
15 Jun	3	12	101	11	0.112	0.034	70	0.687	0.122	81	0.805	0.14	0.02
16 Jun	4	16	126	3	0.023	0.014	34	0.266	0.024	37	0.294	0.08	0.04
17 Jun	4	15	113	4	0.033	0.019	33	0.279	0.076	37	0.327	0.10	0.03
18 Jun	4	16	134	4	0.031	0.001	23	0.172	0.047	27	0.201	0.15	0.03
19 Jun	4	16	134	6	0.047	0.016	34	0.263	0.053	40	0.298	0.15	0.06
20 Jun	4	16	127	4	0.030	0.021	28	0.216	0.098	32	0.252	0.12	0.11

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Appendix D2.–Part 2 of 2.

				Inriver drift gillnetting catch								
				Chinook salmon			Sockeye salmon			Total		
Date	Reps[a]	No. drifts	Time fished (min)	No. fish	CPUE	SE	No. fish	CPUE	SE	No. fish	CPUE	Chinook salmon Prop.[b]	Chinook salmon SE
21 Jun	4	16	127	3	0.024	0.016	26	0.199	0.024	29	0.228	0.11	0.06
22 Jun	3	12	104	7	0.069	0.013	43	0.410	0.082	50	0.482	0.14	0.00
23 Jun	4	16	132	2	0.013	0.013	59	0.427	0.034	61	0.462	0.03	0.03
24 Jun	4	16	119	2	0.017	0.010	53	0.443	0.037	55	0.463	0.04	0.02
25 Jun	4	15	118	7	0.055	0.015	47	0.371	0.121	54	0.456	0.13	0.05
26 Jun	4	16	124	3	0.024	0.016	35	0.281	0.058	39	0.316	0.08	0.05
27 Jun	3	12	95	4	0.039	0.020	67	0.729	0.243	71	0.746	0.05	0.01
28 Jun	4	16	128	4	0.029	0.017	27	0.215	0.104	31	0.243	0.12	0.10
29 Jun	4	15	120	9	0.071	0.023	40	0.315	0.063	49	0.409	0.18	0.07
30 Jun	4	15	114	5	0.042	0.032	47	0.379	0.188	52	0.454	0.10	0.03
Total	190	745	6,602	164	1.322		1,125	9.394		1,292	0.196	NA	NA
Min	3	12	95	0	0.000		0	0.000		0	0.000	0.00	
Mean	4	16	144	4	0.029		24	0.204		28	0.196	0.20	
Max	5	20	194	11	0.112		70	0.729		81	0.418	1.00	

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

Appendix D3.–Number of Chinook, sockeye, coho, and pink salmon caught inriver in 5.0- and 7.5-inch mesh gillnets during the late-run Kenai River Chinook salmon sport fishery, 1 July–10 August 2010.

	Inriver drift gillnetting catch														
	5.0-inch mesh							7.5-inch mesh							
Date	No. drifts	Time fished (min)	No. Chinook salmon	No. sockeye salmon	No. coho salmon	No. pink salmon	Total fish	No. drifts	Time fished (min)	No. Chinook salmon	No. sockeye salmon	No. coho salmon	No. pink salmon	Total fish	Combined total[a]
1 Jul	7	54	7	48	0	0	55	6	49	3	19	0	0	22	77
2 Jul	7	51	4	18	0	0	22	8	61	7	19	0	0	26	48
3 Jul	9	78	1	42	0	0	43	8	61	1	15	0	0	16	59
4 Jul	7	53	2	45	0	0	47	8	67	4	24	0	0	28	75
5 Jul	8	58	5	55	0	0	60	7	50	4	24	0	0	28	88
6 Jul	6	48	5	34	0	0	39	8	69	5	17	0	0	22	61
7 Jul	8	63	6	67	0	0	73	6	48	3	31	0	0	34	107
8 Jul	7	49	2	52	0	0	54	8	64	4	35	0	0	39	93
9 Jul	10	82	0	29	0	0	29	8	66	4	12	0	0	16	45
10 Jul	8	52	1	69	0	0	70	8	55	3	30	0	0	33	103
11 Jul	8	51	3	95	0	0	98	8	49	6	40	0	0	46	144
12 Jul	6	35	5	83	0	0	88	6	37	7	34	0	0	41	129
13 Jul	12	53	5	163	0	0	168	10	43	2	36	0	0	38	206
14 Jul	7	44	5	117	0	0	122	8	50	5	50	0	0	55	177
15 Jul	8	55	7	105	0	1	113	7	42	3	40	0	0	43	156
16 Jul	7	42	2	69	0	0	71	8	53	16	42	0	0	58	129
17 Jul	8	50	2	82	0	1	85	7	46	5	27	0	0	32	117
18 Jul	6	36	4	98	0	0	102	6	38	5	39	0	0	44	146
19 Jul	10	67	6	77	0	0	83	9	61	2	13	0	0	15	98
20 Jul	7	47	5	63	0	0	68	8	58	9	31	0	1	41	109
21 Jul	8	65	5	76	0	0	81	6	48	3	25	0	0	28	109
22 Jul	8	52	1	79	0	2	82	9	61	2	24	0	0	26	108
23 Jul	9	64	5	90	0	5	100	8	50	6	29	0	0	35	135
24 Jul	5	35	2	110	0	0	112	6	38	5	91	0	0	96	208

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Appendix D3.–Part 2 of 2.

	Inriver drift gillnetting catch														
	5.0-inch mesh							7.5-inch mesh							
Date	No. drifts	Time fished (min)	No. Chinook salmon	No. sockeye salmon	No. coho salmon	No. pink salmon	Total fish	No. drifts	Time fished (min)	No. Chinook salmon	No. sockeye salmon	No. coho salmon	No. pink salmon	Total fish	Combined total[a]
25 Jul	10	62	0	147	0	1	148	8	50	4	28	0	0	32	180
26 Jul	7	47	2	68	0	0	70	8	56	9	27	0	3	39	109
27 Jul	8	57	1	101	1	2	105	8	57	9	29	0	3	41	146
28 Jul	7	46	1	86	1	0	88	8	55	6	40	0	4	50	138
29 Jul	8	60	3	100	3	7	113	8	57	5	24	0	4	33	146
30 Jul	8	53	4	36	3	3	46	9	58	8	17	0	3	28	74
31 Jul	8	51	0	89	1	11	101	8	43	4	29	1	13	47	148
1 Aug	9	60	3	27	6	11	47	10	67	8	11	2	8	29	76
2 Aug	9	59	2	33	3	15	53	8	51	4	5	1	9	19	72
3 Aug	8	60	0	10	1	9	20	10	73	7	4	2	11	24	44
4 Aug	8	69	4	13	1	19	37	8	64	3	7	1	23	34	71
5 Aug	8	55	2	25	1	40	68	10	73	3	17	5	33	58	126
6 Aug	9	74	2	13	7	32	54	8	60	4	2	4	10	20	74
7 Aug	8	63	1	6	7	29	43	8	61	2	1	6	24	33	76
8 Aug	10	64	3	13	21	32	69	9	59	2	6	8	10	26	95
9 Aug	9	58	0	9	3	28	40	10	62	4	2	0	10	16	56
10 Aug	9	59	3	10	2	34	49	8	52	4	1	1	13	19	68
Total	329	2,286	121	2,552	61	282	3,016	327	2,262	200	997	31	182	1,410	4,426
Min	5	35	0	6	0	0	20	6	37	1	1	0	0	15	44
Mean	8	56	3	62	1	7	74	8	55	5	24	1	4	34	108
Max	12	82	7	163	21	40	168	10	73	16	91	8	33	96	208

[a] Combined total number of fish is all fish caught in 5.0-inch 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- 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–10 August 2010.

	Inriver drift gillnetting catch																		
				Chinook salmon			Sockeye salmon			Coho salmon			Pink salmon			Total			
Date	Reps[a]	No. drifts	Time fished (min)	No. fish	CPUE	SE	No. fish	CPUE	SE	No. fish	CPUE	SE	No. fish	CPUE	SE	No. fish	CPUE	Chinook salmon Prop.[b]	Chinook salmon SE
1 Jul	3	12	97	9	0.100	0.068	65	0.672	0.101	0	0.000	0.000	0	0.000	0.000	74	0.7638	0.13	0.06
2 Jul	4	15	112	11	0.092	0.017	37	0.304	0.111	0	0.000	0.000	0	0.000	0.000	48	0.4302	0.23	0.09
3 Jul	4	16	130	2	0.016	0.009	53	0.403	0.057	0	0.000	0.000	0	0.000	0.000	55	0.4241	0.04	0.02
4 Jul	4	15	121	6	0.046	0.013	69	0.537	0.141	0	0.000	0.000	0	0.000	0.000	75	0.6221	0.08	0.03
5 Jul	4	15	108	9	0.108	0.034	79	0.670	0.180	0	0.000	0.000	0	0.000	0.000	88	0.8152	0.14	0.07
6 Jul	3	12	100	10	0.102	0.022	43	0.445	0.097	0	0.000	0.000	0	0.000	0.000	53	0.5277	0.19	0.01
7 Jul	3	12	97	7	0.068	0.039	85	0.887	0.097	0	0.000	0.000	0	0.000	0.000	92	0.9489	0.07	0.05
8 Jul	4	15	113	6	0.050	0.008	87	0.774	0.120	0	0.000	0.000	0	0.000	0.000	94	0.8292	0.06	0.01
9 Jul	4	16	132	4	0.030	0.012	40	0.307	0.125	0	0.000	0.000	0	0.000	0.000	44	0.3321	0.09	0.02
10 Jul	4	16	107	4	0.040	0.017	99	0.991	0.309	0	0.000	0.000	0	0.000	0.000	103	0.961	0.04	0.02
11 Jul	4	16	100	9	0.090	0.038	135	1.348	0.297	0	0.000	0.000	0	0.000	0.000	144	1.4431	0.06	0.02
12 Jul	3	12	72	12	0.160	0.038	117	1.707	0.640	0	0.000	0.000	0	0.000	0.000	129	1.7867	0.09	0.05
13 Jul	5	20	86	7	0.083	0.024	179	2.223	0.639	0	0.000	0.000	0	0.000	0.000	186	2.159	0.04	0.02
14 Jul	4	15	94	10	0.132	0.067	167	1.781	0.485	0	0.000	0.000	0	0.000	0.000	177	1.883	0.07	0.05
15 Jul	4	15	98	10	0.092	0.031	145	1.382	0.322	0	0.000	0.000	1	0.009	0.009	156	1.5975	0.06	0.03
16 Jul	4	15	96	18	0.171	0.037	111	1.085	0.437	0	0.000	0.000	0	0.000	0.000	129	1.347	0.14	0.03
17 Jul	4	15	96	7	0.064	0.028	109	1.051	0.351	0	0.000	0.000	1	0.009	0.009	117	1.2171	0.06	0.01
18 Jul	3	12	74	9	0.123	0.028	137	1.817	0.945	0	0.000	0.000	0	0.000	0.000	146	1.9602	0.06	0.04
19 Jul	5	19	129	8	0.061	0.036	90	0.688	0.210	0	0.000	0.000	0	0.000	0.000	98	0.7603	0.08	0.04
20 Jul	4	15	106	14	0.135	0.013	94	0.893	0.187	0	0.000	0.000	1	0.009	0.009	109	1.032	0.13	0.02
21 Jul	3	12	100	7	0.064	0.040	88	0.879	0.050	0	0.000	0.000	0	0.000	0.000	95	0.9541	0.07	0.04
22 Jul	4	16	108	3	0.028	0.010	102	1.059	0.397	0	0.000	0.000	2	0.018	0.018	107	0.9927	0.03	0.01
23 Jul	4	16	106	10	0.096	0.033	111	1.015	0.132	0	0.000	0.000	5	0.045	0.007	126	1.1911	0.08	0.03
24 Jul	3	11	74	7	0.089	0.014	201	2.664	0.360	0	0.000	0.000	0	0.000	0.000	208	2.8235	0.03	0.01
25 Jul	4	16	100	4	0.036	0.025	160	1.595	0.264	0	0.000	0.000	1	0.010	0.010	165	1.6558	0.02	0.02

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Appendix D4.–Part 2 of 2.

	Inriver drift gillnetting catch																		
				Chinook salmon			Sockeye salmon			Coho salmon			Pink salmon			Total		Chinook salmon	
Date	Reps[a]	No. drifts	Time fished (min)	No. fish	CPUE	SE	No. fish	CPUE	SE	No. fish	CPUE	SE	No. fish	CPUE	SE	No. fish	CPUE	Prop.[b]	SE
26 Jul	4	15	103	11	0.099	0.028	95	0.911	0.249	0	0.000	0.000	3	0.028	0.028	109	1.0586	0.10	0.02
27 Jul	4	16	114	10	0.088	0.021	130	1.150	0.182	1	0.009	0.009	5	0.044	0.021	146	1.2854	0.07	0.01
28 Jul	4	15	102	7	0.065	0.019	126	1.215	0.271	1	0.009	0.009	4	0.036	0.001	138	1.3583	0.05	0.01
29 Jul	4	16	117	8	0.071	0.030	124	1.057	0.249	3	0.025	0.016	11	0.095	0.019	146	1.2464	0.06	0.02
30 Jul	4	16	104	12	0.114	0.041	53	0.507	0.141	3	0.028	0.018	6	0.060	0.038	74	0.7099	0.16	0.04
31 Jul	4	16	94	4	0.043	0.017	118	1.201	0.378	2	0.022	0.013	24	0.248	0.020	148	1.5731	0.03	0.01
1 Aug	5	19	127	11	0.087	0.061	38	0.306	0.029	8	0.069	0.022	19	0.149	0.046	76	0.5991	0.14	0.08
2 Aug	4	16	104	5	0.049	0.019	31	0.302	0.098	3	0.030	0.019	20	0.201	0.095	59	0.5677	0.08	0.05
3 Aug	4	16	121	6	0.048	0.014	13	0.114	0.032	3	0.025	0.009	19	0.164	0.034	41	0.3377	0.14	0.05
4 Aug	4	16	132	7	0.058	0.031	20	0.160	0.094	2	0.017	0.010	42	0.374	0.196	71	0.536	0.09	0.02
5 Aug	4	16	116	3	0.026	0.009	41	0.356	0.029	5	0.042	0.027	68	0.590	0.084	117	1.0075	0.03	0.01
6 Aug	4	16	126	6	0.050	0.018	15	0.120	0.037	11	0.083	0.022	40	0.324	0.093	72	0.5723	0.09	0.02
7 Aug	4	16	124	3	0.024	0.017	7	0.045	0.029	13	0.105	0.042	53	0.429	0.125	76	0.6136	0.04	0.02
8 Aug	5	19	123	5	0.040	0.018	19	0.140	0.040	29	0.274	0.074	42	0.319	0.051	95	0.7741	0.05	0.02
9 Aug	5	19	119	4	0.033	0.008	11	0.088	0.060	3	0.029	0.018	38	0.310	0.073	56	0.4691	0.07	0.02
10 Aug	4	16	104	6	0.055	0.009	10	0.095	0.035	3	0.027	0.009	41	0.394	0.062	60	0.5782	0.10	0.03
Total	162	632	4,384	311	3.025		3,454	34.943		90	0.795		446	3.866		4,302	0.981	NA	NA
Min	3	11	72	2	0.016		7	0.045		0	0.000		0	0.000		41	0.568	0.02	
Mean	4	15	107	8	0.074		84	0.852		2	0.019		11	0.094		105	0.981	0.08	
Max	5	20	132	18	0.171		201	2.664		29	0.274		68	0.590		208	1.570	0.23	

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

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

APPENDIX E: TEMPORALLY STRATIFIED AGE COMPOSITION ESTIMATES FOR THE KENAI RIVER CHINOOK SALMON FISHERY, 2010

Appendix E1.–Temporally stratified sport harvest estimates by age class and sex for early-run Kenai River Chinook salmon between Soldotna Bridge and Warren Ames Bridge, 16 May–30 June 2010.

		Age				
Dates[a]	Parameter	1.1	1.2	1.3	1.4	Total
16 May–4 June						
	Female					
	Sample size				10	10
	% Sample				66.7%	66.7%
	SE % sample				12.6%	12.6%
	Harvest				53	53
	SE harvest				18	18
	Male					
	Sample size				5	5
	% Sample				33.3%	33.3%
	SE % sample				12.6%	12.6%
	Harvest				26	26
	SE harvest				12	12
	Both sexes combined					
	Sample size				15	15
	% Sample				100.0%	100.0%
	SE % sample				0.0%	0.0%
	Harvest				79	79
	SE harvest				22	22
15–30 June						
	Female					
	Sample size			14	2	16
	% Sample			34.1%	4.9%	39.0%
	SE % sample			7.5%	3.4%	7.7%
	Harvest			259	37	296
	SE harvest			64	26	68
	Male					
	Sample size	1	10	9	5	25
	% Sample	2.4%	24.4%	22.0%	12.2%	61.0%
	SE % sample	2.4%	6.8%	6.5%	5.2%	7.7%
	Harvest	18	185	166	92	462
	SE harvest	18	56	53	40	80
	Both sexes combined					
	Sample size	1	10	23	7	41
	% Sample	2.4%	24.4%	56.1%	17.1%	100.0%
	SE % sample	2.4%	6.8%	7.8%	5.9%	0.0%
	Harvest	18	185	425	129	758
	SE harvest	18	56	78	47	91

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

[a] No creel-sampled Chinook salmon 5–12 June, due to sport fishery closure(s).

Appendix E2.–Temporally stratified sport harvest estimates by age class, sex, and geographic strata, for late-run Kenai River Chinook salmon between Soldotna Bridge and Warren Ames Bridge, 1–31 July 2010.

		Age					
Dates	Parameter	1.1	1.2	1.3	1.4	1.5	Total
1–18 July							
	Female						
	Sample size		2	5	5		12
	% Sample		4.0%	10.0%	10.0%		24.0%
	SE % sample		2.8%	4.3%	4.3%		6.1%
	Downstream harvest		3	9	9		21
	SE downstream harvest		3	4	4		7
	Upstream harvest		67	167	167		402
	SE upstream harvest		47	75	75		119
	Total harvest		70	176	176		423
	SE total harvest		50	79	79		123
	Male						
	Sample size	3	13	16	6		38
	% Sample	6.0%	26.0%	32.0%	12.0%		76.0%
	SE % sample	3.4%	6.3%	6.7%	4.6%		6.1%
	Downstream harvest	5	23	28	10		66
	SE downstream harvest	3	8	9	5		18
	Upstream harvest	100	435	536	201		1,272
	SE upstream harvest	58	124	138	83		222
	Total harvest	106	458	564	211		1,338
	SE total harvest	61	128	143	87		225
	Both sexes combined						
	Sample size	3	15	21	11		50
	% Sample	6.0%	30.0%	42.0%	22.0%		100.0%
	SE % sample	3.4%	6.5%	7.1%	5.9%		0.0%
	Downstream harvest	5	26	36	19		87
	SE downstream harvest	3	9	11	7		23
	Upstream harvest	100	502	703	368		1,674
	SE upstream harvest	58	133	160	113		260
	Total harvest	106	528	740	387		1,761
	SE total harvest	61	138	164	118		261

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Appendix E2.–Part 2 of 2.

Dates	Parameter	Age 1.1	1.2	1.3	1.4	1.5	Total
19–31 July							
	Female						
	Sample size			30	35		65
	% sample			22.9%	26.7%		49.6%
	SE % sample			3.7%	3.9%		4.4%
	Downstream harvest			82	96		178
	SE downstream harvest			19	21		34
	Upstream harvest			746	870		1,615
	SE upstream harvest			144	157		225
	Total harvest			828	965		1,793
	SE total harvest			156	169		237
	Male						
	Sample size	4	8	21	25	8	66
	% sample	3.1%	6.1%	16.0%	19.1%	6.1%	50.4%
	SE % sample	1.5%	2.1%	3.2%	3.4%	2.1%	4.4%
	Downstream harvest	11	22	57	68	22	180
	SE downstream harvest	6	8	15	17	8	34
	Upstream harvest	99	199	522	621	199	1,640
	SE upstream harvest	50	71	118	130	71	227
	Total harvest	110	221	579	690	221	1,821
	SE total harvest	55	79	129	141	79	239
	Both sexes combined						
	Sample size	4	8	51	60	8	131
	% sample	3.1%	6.1%	38.9%	45.8%	6.1%	100.0%
	SE % sample	1.5%	2.1%	4.3%	4.4%	2.1%	0.0%
	Downstream harvest	11	22	139	164	22	358
	SE downstream harvest	6	8	28	32	8	61
	Upstream harvest	99	199	1,267	1,491	199	3,256
	SE upstream harvest	50	71	195	214	71	351
	Total harvest	110	221	1,407	1,655	221	3,614
	SE total harvest	55	79	207	227	79	356

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

[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 E3.–Temporally stratified sonar passage estimates by age class and sex for early-run Kenai River Chinook salmon, 16 May–30 June 2010.

		Age					
Dates	Parameter	1.1	1.2	1.3	1.4	1.5	Total
16 May–9 June							
	Female						
	Sample size		1	6	11	1	19
	% Sample		2.1%	12.8%	23.4%	2.1%	40.4%
	SE % sample		1.5%	3.5%	4.5%	1.5%	7.2%
	Sonar passage estimate		60	363	665	60	1,148
	SE sonar passage estimate		159	369	470	159	758
	Male						
	Sample size		10	12	6		28
	% Sample		21.3%	25.5%	12.8%		59.6%
	SE % sample		6.0%	6.4%	4.9%		7.2%
	Sonar passage estimate		604	725	363		1,692
	SE sonar passage estimate		173	184	140		213
	Both sexes combined						
	Sample size		11	18	17	1	47
	% Sample		23.4%	38.3%	36.2%	2.1%	100.0%
	SE % sample		6.2%	7.2%	7.1%	2.1%	0.0%
	Sonar passage estimate		665	1,088	1,027	60	2,840
	SE sonar passage estimate		179	207	204	60	97
10–30 June							
	Female						
	Sample size		2	28	6		36
	% Sample		2.2%	31.1%	6.7%		40.0%
	SE % sample		1.6%	4.9%	2.6%		5.2%
	Sonar passage estimate		231	3,238	694		4,163
	SE sonar passage estimate		163	515	276		547
	Male						
	Sample size	8	21	17	8		54
	% Sample	8.9%	23.3%	18.9%	8.9%		60.0%
	SE % sample	3.0%	4.5%	4.1%	3.0%		5.2%
	Sonar passage estimate	925	2,429	1,966	925		6,245
	SE sonar passage estimate	314	469	434	314		555
	Both sexes combined						
	Sample size	8	23	45	14		90
	% Sample	8.9%	25.6%	50.0%	15.6%		100.0%
	SE % sample	3.0%	4.6%	5.3%	3.8%		0.0%
	Sonar passage estimate	925	2,660	5,204	1,619		10,408
	SE sonar passage estimate	314	484	562	401		214

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

Appendix E4.–Temporally stratified sonar passage estimates by age class and sex for late-run Kenai River Chinook salmon, 1 July–10 August 2010.

		Age					
Dates	Parameter	1.1	1.2	1.3	1.4	1.5	Total
1–20 July							
	Female						
	Sample size		4	13	12	2	31
	% Sample		3.3%	10.8%	10.0%	1.7%	25.8%
	SE % sample		1.8%	3.1%	3.0%	1.3%	4.0%
	Sonar passage estimate		761	2,473	2,283	380	5,897
	SE sonar passage estimate		546	964	929	388	1,316
	Male						
	Sample size	11	36	20	21	1	89
	% Sample	9.2%	30.0%	16.7%	17.5%	0.8%	74.2%
	SE % sample	2.6%	4.2%	3.4%	3.5%	0.8%	4.0%
	Sonar passage estimate	2,093	6,848	3,805	3,995	190	16,931
	SE sonar passage estimate	605	968	783	799	190	976
	Both sexes combined						
	Sample size	11	40	33	33	3	120
	% Sample	9.2%	33.3%	27.5%	27.5%	2.5%	100.0%
	SE % sample	2.6%	4.3%	4.1%	4.1%	1.4%	0.0%
	Sonar passage estimate	2,093	7,609	6,278	6,278	571	22,828
	SE sonar passage estimate	605	998	943	943	327	456
21 July–10 August							
	Female						
	Sample size			24	22	4	50
	% Sample			24.0%	22.0%	4.0%	50.0%
	SE % sample			4.3%	4.2%	2.0%	5.0%
	Sonar passage estimate			7,225	6,623	1,204	15,053
	SE sonar passage estimate			1,380	1,329	597	1,825
	Male						
	Sample size		10	15	20	5	50
	% Sample		10.0%	15.0%	20.0%	5.0%	50.0%
	SE % sample		3.0%	3.6%	4.0%	2.2%	5.0%
	Sonar passage estimate		3,011	4,516	6,021	1,505	15,053
	SE sonar passage estimate		929	1,121	1,275	666	1,825
	Both sexes combined						
	Sample size		10	39	42	9	100
	% Sample		10.0%	39.0%	42.0%	9.0%	100.0%
	SE % sample		3.0%	4.9%	5.0%	2.9%	0.0%
	Sonar passage estimate		3,011	11,741	12,645	2,710	30,106
	SE sonar passage estimate		929	1,675	1,721	883	2,050

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