Fishery Data Series No. 22-15

Chinook Salmon Creel Survey and Inriver Gillnetting Study, Lower Kenai River, Alaska, 2016

by

Jeff Perschbacher

September 2022

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

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

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

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CHINOOK SALMON CREEL SURVEY AND INRIVER GILLNETTING STUDY, LOWER KENAI RIVER, ALASKA, 2016

by
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ABSTRACT

Sport-angler effort, catch, and harvest of late-run Chinook salmon (*Oncorhynchus tshawytscha*) were estimated from a creel survey conducted on the lower Kenai River in 2016. The Chinook salmon sport fishery was closed to fishing 1 May–3 June, and harvest 4–17 June. During the early run, anglers caught 384 (SE = 106) and harvested 112 (SE = 43) Chinook salmon with 8,599 (SE = 917) angler-hours of effort. Approximately 88% of early-run Chinook salmon were harvested upstream of the river mile (RM) 13.7 sonar site. Only 5 early-run Chinook salmon were sampled by the creel survey, and the sample size goal (49) was not met for estimating the age composition of the early-run sport harvest. During the late run, anglers caught 7,813 (SE = 720) and harvested 6,181 (SE = 650) Chinook salmon with 113,981 (SE = 3,916) angler-hours of effort. Approximately 60% of the late-run harvest occurred downstream of the RM 13.7 sonar. The age composition of harvested late-run Chinook salmon was 0.5% age-0.2, 1.6% age-1.1, 19.0% age-1.2, 50.8% age-1.3, 25.9% age-1.4, and 2.1% age-1.5 fish. A standardized gillnetting program at RM 8.6 was conducted 16 May–20 August. During the early run, 177 Chinook salmon, 805 sockeye salmon, and 2 Dolly Varden were captured in gillnets (midriver and nearshore combined). The estimated age composition of early-run Chinook salmon captured in gillnets was 4.9% age-1.1, 26.6% age-1.2, 48.3% age-1.3, 19.6% age-1.4, and 0.7% age-1.5 fish. During the late run, 304 Chinook salmon, 2,761 sockeye salmon, 208 coho salmon, and 930 pink salmon, 7 Dolly Varden, and 2 rainbow trout were captured in gillnets. The estimated age composition of late-run Chinook salmon captured in gillnets was 0.4% age-1.1, 16.3% age-1.2, 42.6% age-1.3, 36.8% age-1.4, and 3.9% age-1.5 fish. During both runs, midriver Chinook salmon captures were on average larger and older than nearshore captures.

Keywords: Kenai River, *Oncorhynchus tshawytscha*, Chinook salmon, creel survey, effort, harvest, gillnet, CPUE, age composition, length distribution, radio tag

INTRODUCTION

The Kenai River (Figure 1) supports the largest freshwater sport fishery in Alaska (Jennings et al. 2015). Anglers fish for Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), pink salmon (*O. gorbuscha*), Dolly Varden (*Salvelinus malma*), and steelhead or rainbow trout (*O. mykiss*). The Kenai River will receive substantial angler effort into the foreseeable future due to its proximity to major population centers, relative ease of access, and large-sized Chinook salmon. The Chinook salmon fishery, one of the most intensively managed sport fisheries in Alaska, relies on inseason data to assess run strength, timing, and harvest rates; and postseason assessment of data to develop escapement goals, annual preseason forecasts, and management plans for Kenai River Chinook salmon. Two Division of Sport Fish projects necessary for providing data are the subjects of this report: the Kenai River Chinook salmon creel survey operated between the Warren Ames Bridge (river mile [RM] 5.2) and the Soldotna Bridge (RM 21.1), and a standardized inriver gillnetting study conducted at RM 8.6 (Figure 2).

Chinook salmon returning to the Kenai River exhibit 2 distinct run-timing patterns: an early run and a late run. Telemetry and genetic studies have shown Chinook salmon that spawn in tributaries primarily enter the river during the early run, whereas Chinook salmon that spawn in the Kenai River mainstem primarily enter the river during the late run (Burger et al. 1985; Bendock and Alexandersdottir 1992; McKinley et al. 2013; Reimer 2013; Reimer and Fleischman 2016; Eskelin and Reimer 2017). For management purposes, the early run is composed of 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 relative to other Chinook salmon stocks (Roni and Quinn 1995). The world record sport-caught Chinook salmon (44.1 kg; 97 lb 4 oz) was harvested from the Kenai River in May 1985.[1]

[1] The current International Game Fish Association (IGFA) world records database for Chinook salmon can be viewed at the following website: http://wrec.igfa.org/WRecordsList.aspx?lc=AllTackle&cn=Salmon,%20Chinook.

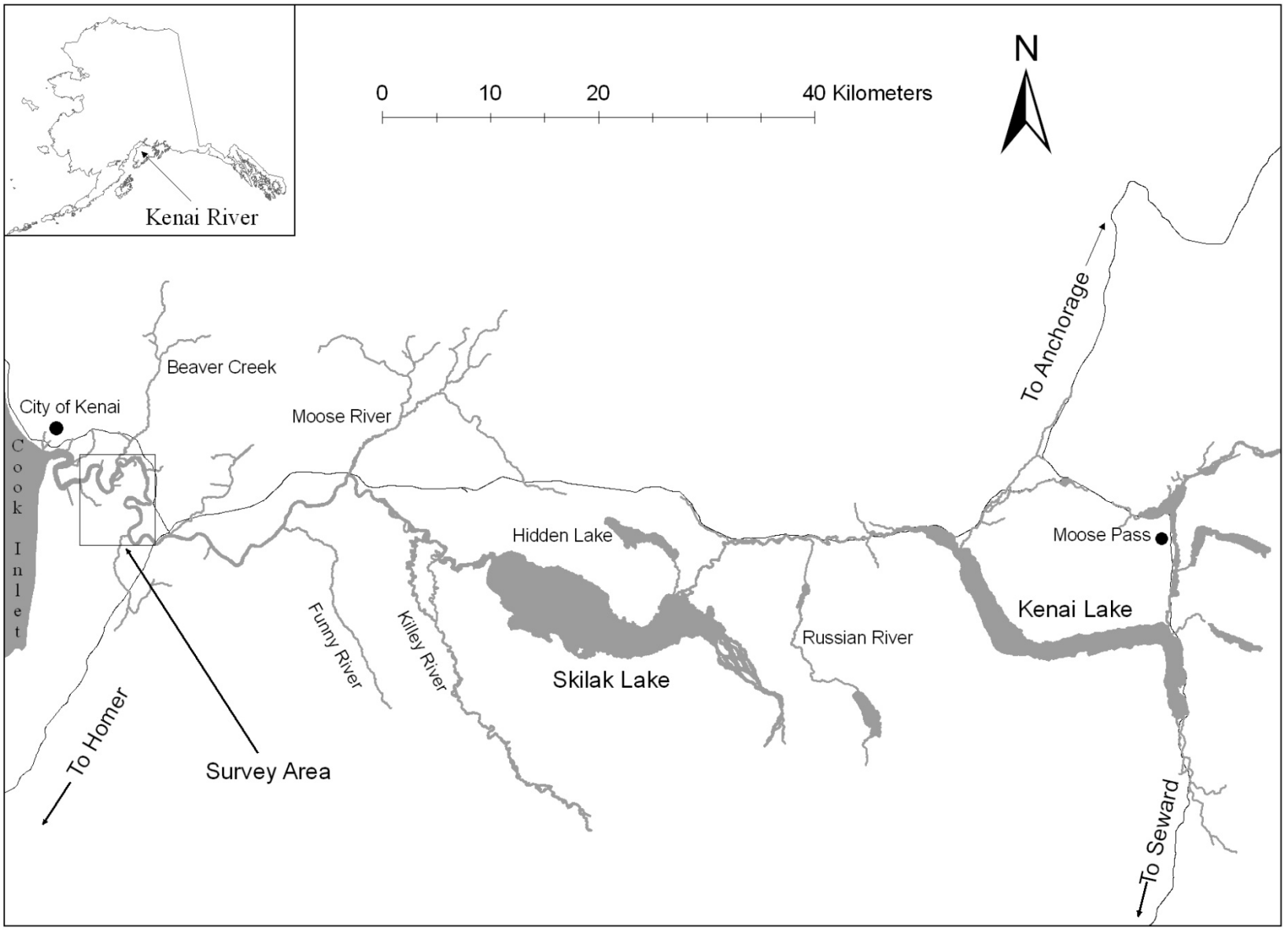

Figure 1.–Kenai River drainage on the Kenai Peninsula in Southcentral Alaska.

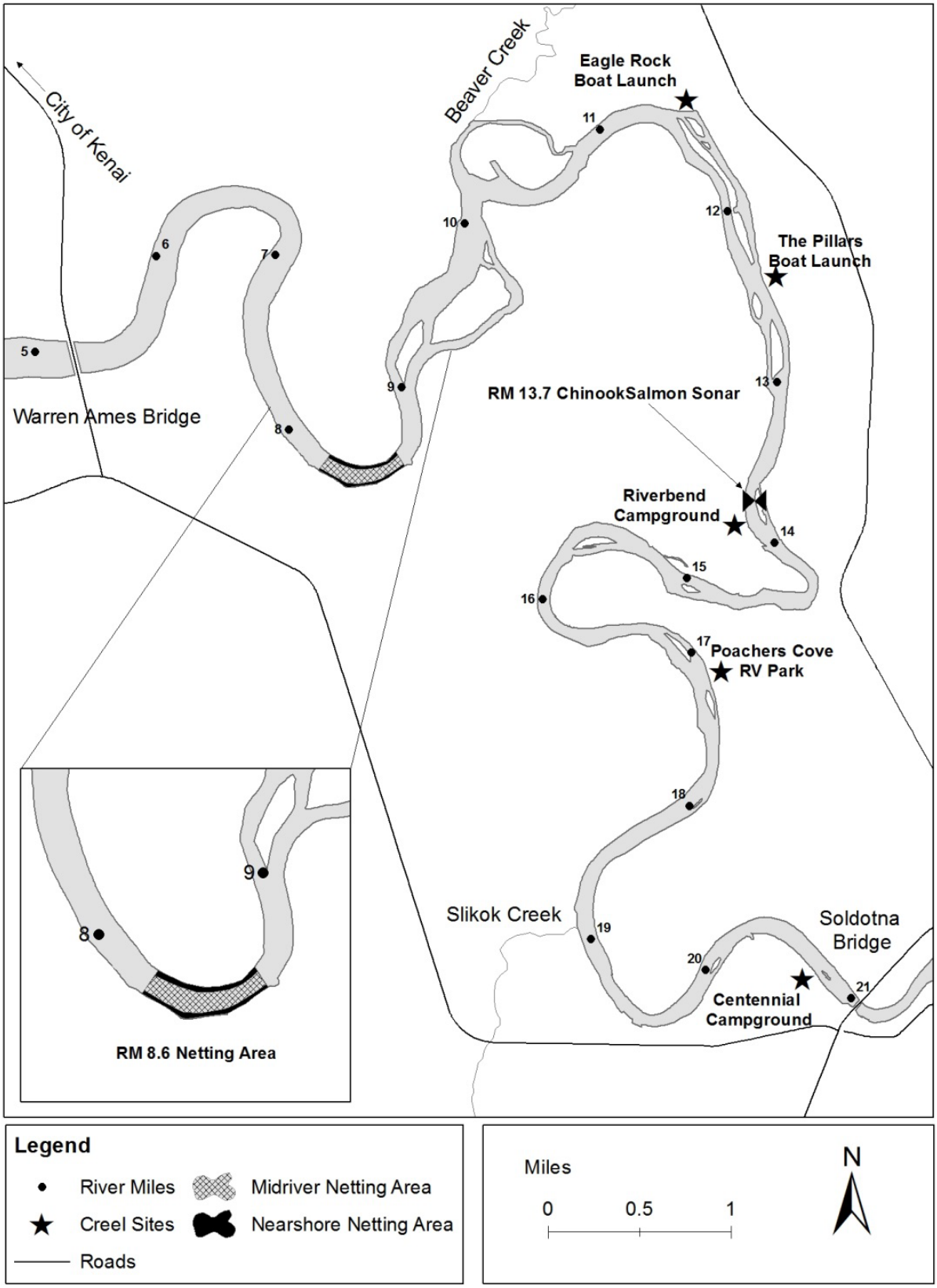

Figure 2.–Lower Kenai River from Warren Ames Bridge (river mile [RM] 5.2) to Soldotna Bridge (RM 21.1).

The management plans for early-run and late-run Kenai River Chinook salmon, adopted by the Alaska Board of Fisheries (BOF), require timely predictions of escapement for inseason management. The primary goal of the creel survey is to estimate sport angler effort, catch, and harvest of Kenai River Chinook salmon.[2] Sport harvest and catch-and-release mortality estimates are deducted from the RM 13.7 Chinook salmon sonar passage estimates to monitor inseason escapement. Alaska Department of Fish and Game (ADF&G) managers use these data to determine if restrictions or liberalizations to regulations are warranted to achieve escapement goals. The primary goals of the inriver netting project are to collect Chinook salmon age, sex, and length (ASL) data and to index inseason abundance of Kenai River Chinook salmon. Escapement estimates provided by the creel survey and RM 13.7 sonar, and ASL data collected by both the creel survey and inriver netting study, are critical to management for maintaining sustained yield and fishing opportunities for Kenai River Chinook salmon.

CREEL SURVEY

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. The Division of Sport Fish (SF) began using sonar at RM 8.6 in 1987 to estimate the inriver run of Chinook salmon, and the creel survey provided the harvest estimates for managing the sport fishery to meet escapement goals. Prior to 1991, anglers were surveyed in the entire area open to Chinook salmon fishing (downstream of Skilak Lake). Since 1991, the creel survey has been used to estimate sport angler effort, catch, and harvest of Chinook salmon between the Warren Ames Bridge and the Soldotna Bridge (Figure 2), where the majority of sport fishing effort has been shown to occur (Jennings et al. 2015).

In 2015, the Chinook salmon sonar site was relocated from RM 8.6 to a location upstream at RM 13.7 to avoid major tidal influence. Key et al. (2016) and Miller et al. (2016) provide comprehensive histories of sonar research and development at Kenai RM 8.6 and RM 13.7, respectively. The new RM 13.7 site is centered in the lower Kenai River Chinook salmon sport fishery, and the creel survey remains essential for monitoring the Chinook salmon sport harvest occurring both upstream and downstream of the RM 13.7 sonar for inseason management decisions that may affect sport, commercial, subsistence, and personal use fisheries.

INRIVER GILLNETTING

The primary goal of the inriver gillnetting study is to estimate the ASL composition of returning Kenai River Chinook salmon. In the mid-1980s prior to using sonar technology, mark–recapture studies used gillnets for the marking phase to estimate the inriver run of Chinook salmon (Hammarstrom and Larson 1984). In 1987, SF began using sonar to estimate the inriver run of Chinook salmon, and the inriver gillnetting study began to provide standardized methods to sample for ASL compositions of the inriver runs (Marsh 2000). Various adult Chinook salmon capture techniques have been evaluated including, but not limited to, fish wheels, seines, and fyke-type traps (Hammarstrom and Larson 1984); smaller mesh-sized nets to reduce bias in species selectivity (Reimer 2004b); and the use of multi-sized mesh nets fished shoreline-to-shoreline

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

during different tidal stages to reduce the bias of size-selective sampling (Perschbacher and Eskelin 2016).

A pilot netting study was developed in 2014 to investigate nearshore sets to reduce size-selective sampling of Chinook salmon. Weir composition data provided by the United States Fish and Wildlife Service (USFWS) for the Killey River weir (Gates and Boersma 2016) and Funny River weir (Boersma and Gates 2016) at that time offered a unique opportunity to assess length composition of early-run Chinook salmon captured in the inriver gillnetting study. The length composition data from these tributary weirs showed a larger proportion of smaller-sized Chinook salmon than the netting program could account for. Although incorporation of nearshore sets into the netting protocol reduced size-selective sampling by showing that smaller Chinook salmon migrate closer to shoreline (Perschbacher and Eskelin 2016), it was unknown whether the mesh sizes used (5.0-inch and 7.5-inch mesh panel nets) also contributed to size-selective sampling.

A pilot netting study conducted for this project during the 2016 early run incorporated a 6.0-inch mesh net and a 4.0-inch mesh net to examine possible size-selective sampling by net size. The 4.0-inch mesh net was essentially a "tangle net." Tangle nets are designed to catch all sizes of fish by the teeth or fins, whereas traditional gillnets capture fish around the head or body. Research conducted by Vander Haegen et al. (2004) and Ashbrook et al. (2004) have also shown that mortality can be reduced with smaller-sized mesh tangle nets. Consequently, Columbia River fishery managers instituted "selective" tangle net fisheries for hatchery Chinook salmon where wild salmon need to be released.

The 2016 early-run netting pilot study was conducted during a different time of day than the traditional netting study to avoid interferance, and other than the change in net sizes, the pilot study followed the same sampling protocol as the traditional netting study. In addition to collecting ASL data, the method of capture (i.e., captured in the mesh by the teeth, fins, body, heady, or gills) was recorded for every Chinook salmon and a subsample of other salmon species captured in both the traditional and pilot netting studies.

MANAGEMENT PLANS

The Alaska Board of Fisheries (BOF) adopted separate management plans for the early and late Kenai River Chinook salmon runs. Management within these plans utilizes inseason estimates of inriver run and harvest. Estimates of inriver run are obtained with sonar (Key et al. 2016), whereas estimates of harvest are obtained from creel surveys (Perschbacher and Eskelin 2016).

The 2016 early-run Chinook salmon sport fishery was managed under the *Kenai River and Kasilof River Early-Run King Salmon Conservation Management Plan* (Alaska Administrative Code 5 AAC 56.070), which mandates the early run be managed to achieve an optimal escapement goal (OEG)[3] of 5,300–9,000 Chinook salmon of any size. If the spawning escapement was projected to exceed 9,000 fish, the fishery could be liberalized to allow bait. If the spawning escapement was projected to be less than 5,300 fish, ADF&G could close the fishery or implement more conservative regulations (adopted by BOF) that restricted harvest of Chinook salmon less than 55 inches total length (TL). In March 2003, BOF introduced a slot limit (harvest restricted between minimum and maximum sizes) to protect early-run Chinook salmon that spend 5 winters in saltwater. During 2016, anglers were required to release Chinook salmon measuring 42–55 inches

[3] Optimal escapement goals are those set by the Alaska Board of Fisheries (5 ACC 39.223).

TL until 1 July from the Kenai River mouth upstream to 300 yards below Slikok Creek (approximately RM 18.7), and until 15 July from RM 18.7 to Skilak Lake (RM 50).

Management of the late-run Chinook salmon sport fishery was more complex because multiple fisheries harvest Chinook salmon prior to the inriver sport fishery. The 2016 late-run Chinook salmon sport fishery was managed under the *Kenai River Late-Run King Salmon Management Plan* (5 AAC 21.360), which mandated the late run be managed to achieve a sustainable escapement goal (SEG)[4] of 15,000–30,000 Chinook salmon of any size. This management plan adopted by the BOF allowed the use of bait during the late run beginning 1 July from the Kenai River mouth upstream to the outlet of Skilak Lake. If the spawning escapement was projected to exceed 30,000 fish, the fishery could be liberalized to allow harvest of Chinook salmon through the first week of August. If the spawning escapement was projected to be less than 15,000 fish, ADF&G could close the inriver fishery or implement more conservative regulations (adopted by BOF) which restricted the use of bait, allowed catch-and-release fishing only, or reduced the area open to Chinook salmon fishing. If the inriver fishery was restricted, other Cook Inlet sport fisheries, personal use fisheries, subsistence fisheries, and Cook Inlet commercial fisheries could also be restricted.

OBJECTIVES

PRIMARY OBJECTIVES

1) Estimate catch and harvest of Chinook salmon by the sport fishery in the Kenai River between the Warren Ames Bridge (RM 5.2) and the RM 13.7 Chinook salmon sonar, and between the RM 13.7 sonar and the Soldotna Bridge (RM 21) from 16 May through 30 June (early run), and from 1 July through 31 July (late run) such that the estimates for each run and geographic stratum are within 25%, or 1,000 fish of the true values 90% of the time.[5]

2) Provide age compositions required in part to estimate total return for the early and late runs by brood year. Subordinate objectives[6] of this report that are associated with total run estimation are as follows:

    a) Estimate the proportion by age of Chinook salmon captured in inriver gillnets from May 16 through 20 August such that all age-proportion estimates for each run are within 10 percentage points of the true values 95% of the time.[7]

    b) Estimate the proportion by age of Chinook salmon harvested by the sport fishery in the Kenai River between the Warren Ames Bridge and the RM 13.7 Chinook salmon sonar and the RM 13.7 sonar and 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.

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[4] Sustainable escapement goals are used in situations where a biological escapement goal cannot be set due to lack of stock-specific catch information (5 ACC 39.223).

[5] High precision is neither possible nor necessary when the harvest is small; meeting the absolute precision goal is sufficient in this case.

[6] Sample sizes required to meet these subordinate objective criteria are sufficient to meet the primary objective of total return estimation (McKinley and Fleischman 2013; Fleischman and McKinley 2013).

[7] Within d of the true value A% of the time' implies: $P(p_i - d \le \hat{p}_i \le p_i + d) = A/100$ for all i, where p_i denotes population age proportion for age class i.

SECONDARY OBJECTIVES

Secondary objectives can be accomplished without altering the current study design or sample sizes.

1) Estimate sport angler effort in angler-hours, by run, upstream and downstream of the RM 13.7 Chinook sonar site. Precision of the effort estimates is driven by that of the catch and harvest estimates (Objective 1).
2) Estimate daily catch per unit effort (CPUE where effort is measured in drift-minutes) of Chinook salmon and other salmon species captured in inriver gillnets at RM 8.6 to index run strength and timing.
3) Collect mid eye to tail fork (METF) data of the sport harvest and provide METF data of all salmon species captured in inriver gillnets for inseason ARIS[8] sonar mixture model species composition evaluation.
4) Insert esophageal radio transmitters into Chinook salmon captured in inriver gillnets between May 16 and 30 June in conjunction with the *Operational Plan: Kenai River Chinook Salmon Radio Telemetry* study (Eskelin 2016).
5) Collect tissue samples for genetic analysis from Kenai River Chinook salmon sampled from inriver gillnets and the sport fish harvest.
6) Collect Secchi disk and water temperature readings midchannel at RM 15.3 during creel survey sampling days, and collect daily Secchi disk readings and tidal conditions at the RM 8.6 netting site.
7) Examine Chinook salmon sampled from the sport harvest and inriver gillnets for the absence of an adipose fin and the presence of a radio tag.
8) Estimate CPUE of Chinook salmon captured in inriver gillnets in relation to tide stage at RM 8.6.
9) During the early run, compare length distributions between Chinook salmon captured in 4.0-inch mesh and 6.0-inch mesh nets (pilot study)[9] to those captured in 5.0-inch and 7.5-inch mesh nets (existing study).
10) During the early run, compare length distributions between Chinook salmon captured in inriver gillnets at RM 8.6 and those sampled at the Killey River and Funny River weirs.

[8] Adaptive resolution imaging sonar (ARIS) is the next generation of multi-beam sonar technology producing images comparable to dual frequency identification sonar (DIDSON) or better.

[9] A 6.25-inch stretched mesh net was referred to in the 2016 Operational Plan but not enough nets were procured preseason, and results were assumed to be not significantly different than that of the 6.0-inch mesh.

METHODS

CREEL SURVEY

A stratified, 2-stage roving-access creel survey (Bernard et al. 1998) was conducted to estimate sport fishing effort, catch, and harvest of Chinook salmon. Although the 2016 creel survey was scheduled for 16 May–31 July, the early-run sport fishery was closed to Chinook salmon fishing 1 May–3 June. First-stage sampling units were days (weekdays or weekends and holidays). The unguided angler-day was assumed to be 20 h long (4:00 AM–12:00 AM), whereas the guided angler-day was 12 h long (6:00 AM–6:00 PM) by regulation. Second-stage units for estimating angler effort, catch, and harvest were periodic angler counts and angler trips. Angler trips were sampled by interviewing anglers at the end of their fishing trips. Daily catch and harvest were estimated as the product of effort (angler counts) and CPUE or HPUE (angler interviews).

Stratification was used to account for the geographical, temporal, and regulatory factors affecting the fishery (Table 1). Because unknown harvest occurring downstream or upstream of the sonar site would affect inriver run or escapement estimation, angler effort (from boat angler counts) and CPUE and HPUE (from angler interviews) were geographically stratified into the following areas: (1) between the Warren Ames Bridge (RM 5.2) and the RM 13.7 Chinook salmon sonar site, and (2) between the RM 13.7 sonar site and the Soldotna Bridge (RM 21.1; Figure 2). A sufficient number of interviews was available for stratified CPUE, HPUE, and angler effort estimates. These methods are different than the methods used in reports from this data series prior to 2015 (Perschbacher and Eskelin 2016), when only angler effort was geographically stratified with regard to sonar location (RM 8.6 Chinook sonar), whereas CPUE and HPUE rates were not. Prior to 2015, attempts to estimate catch and harvest downstream of the RM 8.6 sonar using geographically stratified CPUE and HPUE estimates from angler interviews were ineffective due to small sample size (Marsh 2000). Lastly, because harvest and catch rates can differ by time and angler type, the creel survey was stratified temporally by week and day type (weekdays or weekends and holidays) and by angler type (guided or unguided).

Table 1.–Sampling strata used for conducting Kenai River Chinook salmon angler counts and estimating creel statistics, 2016.

Type	Number of strata	Description
Geographic[a]	2	Warren Ames Bridge (RM 5.2) to Chinook salmon sonar site (RM 13.7) Chinook salmon sonar site (RM 13.7) to Soldotna Bridge (RM 21.1)
Temporal[b]	10	Early run: 4–5 June, 7–12 June, 14–19 June, 21–26 June, 28-30 June Late run: 1–5 July, 7–12 July, 14–19 July, 21–26 July, 28-31 July
Day type[c]	3	Weekdays Weekends or holidays Late-run Mondays
Angler type	2	Guided Unguided

[a] Used for angler counts only.

[b] The early-run sport fishery was closed to all Chinook salmon fishing 1 May to 3 June, and was closed to harvest of Chinook salmon 4–17 June. The late-run sport fishery prohibited the use of bait from 1 to 8 July.

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

Two of 4 available weekdays and both weekend days were sampled each week the fishery was open to Chinook salmon fishing. Due to budgetary constraints, nonholiday Mondays ("late-run Mondays"), when only unguided fishing from a drift-boat is allowed, were assessed with an "index" angler count and an ad hoc procedure to generate effort, catch, and harvest estimates for those days.[10]

Angler Counts

Four angler counts were conducted during each sampled day. The first count began at the start of a randomly chosen hour between 4:00 AM and 8:00 AM with the remaining counts occurring every 5 hours thereafter. This schedule ensured that at least 2 angler counts were conducted while guided anglers were fishing (between 6:00 AM and 6:00 PM) each day.

Counts were conducted from a survey boat between the Soldotna Bridge and the Warren Ames Bridge, a distance of 15.9 RM. To maximize interview time, the direction (upstream or downstream) for conducting angler counts was preselected to minimize total distance traveled and time spent conducting the count. Anglers fishing from boats were counted while driving the survey boat through the survey area, and counts were typically completed in approximately 1 hour. Boat angler counts were treated as instantaneous counts; they reflect fishing effort at the time the count began. Anglers were counted if they were fishing or rigging their lines when observed during an angler count. Hand-held 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 (no active anglers but the boat was in operation)
10) non-active boats (no active anglers and boat was not under operation)

Only categories 5–8 were required for this project; categories 1–4 and 9–10 were supplementary information for management purposes. A single boat count was completed between 10:00 AM and 2:00 PM for each unguided drift-boat Monday during the late-run.

Angler Interviews

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

1) Eagle Rock Campground
2) Pillars Boat Launch

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

3) Riverbend Campground
4) Poacher's Cove
5) Centennial Campground

For each day sampled, the first randomly scheduled boat count of the day was completed prior to conducting interviews such that interviews began between 5:00 AM and 9:00 AM. There were 4 intervals per day during which interviews could be conducted: 3 intervals between consecutive angler counts and 1 interval after the last angler count. There was a smaller probability of anglers being interviewed during the first 1–4 hours of the angler day than other times of day; however, the chance of introducing length-of-stay bias (Bernard et al. 1998) was small based on similar CPUE and HPUE rates observed among the 4 interview time intervals (Reimer 2003). Interview location was chosen with replacement from the locations available. Time and boat launch were paired randomly.

The following information was recorded for each interviewed angler:

1) time of interview
2) boat type (power or drift)
3) angler type (guided or unguided angler)
4) total hours actively fished[11] downstream of the RM 13.7 sonar, rounded to the nearest 15 min
5) total hours actively fished upstream of the RM 13.7 sonar, rounded to the nearest 15 min
6) the number of Chinook salmon harvested within each area (downstream or upstream of the RM 13.7 sonar)
7) the number of Chinook salmon released within each area (downstream or upstream of the RM 13.7 sonar)
8) the size of Chinook salmon released by category: below the lower slot limit (less than 42 inches TL), within the slot limit (42–54.99 inches TL), or above the slot limit (55 inches TL or greater)

Sport Harvest Sampling

Age, Sex, and Length Sampling

Harvested Chinook salmon were sampled for ASL during angler interviews. Chinook salmon samples were stratified into 2 approximately 3-week strata during each run with a sample-size goal of 24 Chinook salmon for each run. The early-run strata were 16 May–9 June and 10–30 June; the late-run strata were 1–19 July and 20–31 July. Sex was identified from external morphological characteristics (i.e., protruding ovipositor on females or a developing kype on males). METF lengths were measured to the nearest half centimeter. Three scales were removed from the right side of the fish approximately 3 rows above the lateral line along the posterior insertion of the

[11] The total time actively fished included when an anglers' line was in the water or being rigged but did not include travel time or time after an angler had harvested a fish.

dorsal fin to the anterior insertion of the anal fin and placed on an adhesive coated card. Acetate impressions of the scales were aged using a microfiche reader by the project leader.

Genetics Sampling

Genetic tissue samples from tips of the axillary process were taken from harvested Chinook salmon for genetic analysis. For detailed genetics sampling instructions, shipping, and archiving information refer to the Perschbacher (2016) operational plan.

Coded Wire Tags and Radio Transmitters

All sampled harvested Chinook salmon were inspected for an adipose fin. A missing adipose fin indicated the fish was either missing the fin naturally or received a coded wire tag (CWT). Presence of a coded wire tag may identify a hatchery-produced Chinook salmon stray or a wild Chinook salmon tagged in another river system that strayed to the Kenai River. If a fish without an adipose fin was found, and permission was granted from the angler, the fish's head was removed and examined postseason for a CWT.

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

INRIVER GILLNETTING

Gillnet Specifications

Each panel net used in the netting project was 60 ft long and constructed of a 30 ft long 5.0-inch mesh panel seamed to a 30 ft long 7.5-inch mesh panel (the Pilot Study netting methods are discussed separately). To ensure each net maintained contact with the bottom of the river, panel nets fished midriver in deeper water were approximately 30 ft deep whereas nearshore panel nets fished in shallow water were approximately 15 ft deep. Depths of nets were determined based on river bottom profiles of the RM 8.6 sonar area conducted by ADF&G during 2013 (Jim Miller, Fishery Biologist, ADF&G, Anchorage, personal communication).

The panel nets were hung at a 2:1 hang ratio (length of stretched mesh to length of cork line). Inriver nets were multi-fiber mesh in colors that closely match Kenai River water. Specifications of each mesh type are shown below:

1) 5.0-inch (stretched mesh) multifilament (80-meshes deep for midriver net, 40-meshes deep for nearshore net), R44 color, MS73 (14 strand) twine
2) 7.5-inch (stretched mesh) multifilament (52-meshes deep for midriver net, 26-meshes deep for nearshore net), R44 color, MS93 (18 strand) twine

Gillnetting Schedule and Area

Inriver gillnetting was conducted every day from 16 May through 20 August, concurrent with the sonar study (Key et al. 2019). A single netting crew followed a fixed schedule, netting 6 hours per day (7:00 AM–1:00 PM), nearshore and midriver with equal frequency. The inriver netting area was approximately 0.5 RM in length located at RM 8.6 (Figure 2).

The mesh size deployed nearest to shoreline was alternated to sample representatively based on mesh size and location. One sampling "replicate" consisted of 8 drifts; the first drift for each day

was alternated by location (nearshore or midriver), mesh size deployed towards shoreline (5.0 inch or 7.5 inch), and orientation (towards the left bank or right bank), such that all 8 possibilities were completed before repeating the pattern again. For each set, the netting area, the deployed mesh size, the riverbank, the direction of tidal flow (upstream, downstream, or slack), the start time of the set, and the stop time of the set were recorded on a handheld computer.

The location of the drifts within the study area was critical to ensure data collected during this project was comparable to data collected during 2002–2015 (Reimer 2004a, 2004b, 2007; Eskelin 2007, 2009, 2010; Perschbacher 2012a, 2012b, 2012c, 2012d, 2014, 2015, 2018; Perschbacher and Eskelin 2016). Midriver sets were designed to capture fish that pass through the area of the river channel previously insonified when the sonar was operated at RM 8.6, whereas nearshore sets were designed to capture fish that pass outside of the previously insonified area. The midriver area was approximately 70 m wide with buoys used to mark the outside edges. The right buoy (when facing downstream) was approximately 50 m from the right bank's highest tide line, and the left buoy was approximately 120 m from the right bank's highest tide line. The nearshore areas were the width of the stream between the buoys and each shoreline.

Tide stage affects the direction and speed of the current (including whether there was a current) and therefore a maximum time per drift was set at 10 minutes to prevent overfishing any one tide stage. Drifts were also terminated if any of the following occurred:

1) a Chinook salmon was captured
2) the net was fishing outside the designated area (midriver or nearshore)
3) the downstream end of the study area was reached
4) the net was determined to have captured 5 or more fish
5) the net became snagged on the bottom or was not fishing properly

Inriver Netting Sampling

As the net was retrieved after each set, fish were untangled and the primary "manner of capture" (e.g., tangled by teeth or mouth, gilled [net past the gill plate], mouth clamped [net clamping the mouth closed], or wedged [web around body or past pectoral fins]) was recorded for all salmon sampled for length.

Each captured Chinook salmon was removed from the net and a cotton "tail tie" was secured around the caudal peduncle with the other end affixed to the boat gunwale so the tethered fish remained in the water while other fish were released from the net. To keep track of the capture of Chinook salmon by mesh size, the tail ties were color-coded (red for fish captured in the 5.0-inch mesh and blue for fish in the 7.5-inch mesh). Tethered Chinook salmon were placed in a padded restraint cradle (Larson 1995) affixed to the side of the boat with the fish partially submerged in the river. To prevent resampling, a ¼-inch hole was punched in the dorsal lobe of the caudal fin on every Chinook salmon sampled. Injuries sustained by Chinook salmon during the capture and handling process were also recorded. Chinook salmon missing an adipose fin were sacrificed and the head was removed and examined postseason for a CWT.

All other captured species were counted and recorded before being released. Few rainbow trout (or steelhead) and Dolly Varden were typically captured so every fish was sampled for METF length (nearest 5 mm). Sockeye, pink, and coho salmon are typically captured in large numbers, so they were sampled for METF length (nearest 5 mm) during the first 8 sets of each day.

Chinook salmon Age, Sex, and Length Sampling

Chinook salmon samples were stratified into 2 approximately 3-week strata during each run with a sample-size goal of 149 fish for each stratum. Assuming 15% of the scales were unreadable, this would result in 127 valid scale ages. The early-run strata were 16 May–9 June and 10–30 June; the late-run strata were 1–26 July and 27 July–20 August. The methods used to collect ASL data were like those described for sport harvested Chinook salmon.

Genetics Sampling

In the inriver gillnetting study, tissue samples from dorsal finclips were collected because the axillary process, on the ventral side of the fish, is difficult to remove from Chinook salmon held in the sampling cradle suspended in the water. For detailed genetics sampling instructions, shipping, and archiving information refer to the Perschbacher (2016) operational plan.

Radio Transmitter Deployment

The inriver gillnetting study (and Pilot Study) served as the marking event for a separate Kenai River adult Chinook salmon radiotelemetry study. Eskelin (2016) provides details regarding the deployment of radio transmitters in 2016.

Pilot Study: Alternative Mesh-Size Investigations

In 2016, a separate crew netted 5 days per week from 16 May to 30 June and approximately 2 days per week from 1 July to 20 August for 6 hours per day (1:00 AM–6:00 PM). The pilot study did not interfere with the primary netting study because netting was conducted after the primary netting crew was done for the day.

Three different single-mesh sized nets were used during the pilot study. The stretched mesh sizes of these nets were a 4.0-inch "tangle net," a 6.0-inch mesh, and a 6.25-inch mesh. The 4.0-inch mesh was chosen for its salmon entanglement properties while also allowing small fish such as eulachon (*Thaleichthys pacificus*) or emigrating smolt to pass through the mesh. There were not enough 6.0-inch mesh nets available for the season, so a 6.25-inch mesh net was used to supplement the 6.0-inch mesh net. Data were collected for each of the larger mesh sizes, but results were combined and reported as a single 6.0-inch mesh net category. The 6.0-inch mesh nets were chosen because they were considered a mid-size mesh compared to smaller mesh nets (5.0- to 5.38-inch range) and larger mesh nets (7.0- to 8.0-inch) used in past studies.

The pilot study single-mesh nets were hung in the same configuration as those used in the primary netting study: a 2:1 ratio, a net length of 60 ft, and net depths of 15 ft nearshore and 30 ft midriver. The 4.0-inch tangle nets had 3 additional breast lines tied from the corkline to the leadline at 15 ft increments along the length of the net. These intermediary lines were used to create pockets and prevent the net mesh from stretching as the leadline was dragged along the bottom of the river. The 4.0-inch mesh tangle net was used every other sampling day. The 6.0-inch net was alternated by day with the 4.0-inch mesh net for 1 week, followed by the 6.25-inch and 4.0-inch nets alternated by day for the following week. This sampling protocol was continued throughout the early run 5 days per week and throughout the late run 2 days per week. For each set, the deployed mesh size (4.0-inch, 6.0-inch, or 6.25-inch), netting location (nearshore or midriver), river bank (left or right), start and stop times, number of fish captured by species, and "manner of capture" were recorded on a handheld computer. Fish handling, ASL, genetic sampling, and radiotagging were done in the same way as in the primary netting study, but Chinook salmon were given a

¼-inch hole punched in the ventral lobe of the caudal fin to prevent resampling. The manner of capture was recorded for all other salmon during the early run and a subsample of fish (first 8 sets of the day) during the late run.

ENVIRONMENTAL VARIABLES

Several environmental variables were measured to monitor river conditions that may affect catch rates. At RM 8.6, the netting crews recorded drift direction for the deployed net (upstream, downstream, or slack) to monitor tidal influence for each set. In addition, water clarity was measured midchannel with a Secchi disk (nearest 0.05 m) twice daily (at the beginning and end of each shift). During creel survey sampling days, water temperature (nearest 0.1°F) and water clarity were measured at RM 15.3 twice daily (during the 1st and 3rd angler counts). Daily discharge estimates for the 2016 field season (16 May through 20 August) were recorded by the United States Geological Survey (USGS) at RM 20 and were downloaded postseason from the USGS website.

DATA ANALYSIS

Creel Survey

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:

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

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:

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

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} is the length of the sample day (20 hours for unguided anglers, 12 hours for guided anglers).

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

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

The mean effort for stratum h was estimated by

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

where d_h is the number of days sampled in stratum h.

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

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

Total effort for stratum h was estimated by

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

where D_h is the total number of days the fishery was open in stratum h.

The variance of total effort for each stratum in a 2-stage design, omitting the finite population correction factor for the second stage, was estimated as follows (Bernard et al. 1998):

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

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

Catch and Harvest

Catch and harvest per unit (hour) of effort for day i were 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 interviewed on day i in stratum h was as follows:

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

where

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

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

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

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

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

and the bias corrected mean was

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

where

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

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

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

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

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

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

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

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

When no interviews from a particular angler type (guided or unguided) were obtained during a particular day, there were no CPUE and HPUE estimates to pair with angler counts of that type. 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.

Angler Effort, Catch, and Harvest on Mondays

Regulations allow only unguided fishing from drift boats or from shore on Mondays. Due to budgetary constraints, the creel survey was not conducted on Mondays for the years 2001–2008 and 2011–2016; rather, "index" angler counts were conducted each late-run Monday between 9:00 AM and 1:00 PM. The index count was used in the following ad hoc procedure to estimate effort, catch, and harvest on drift-boat Mondays:

1) Angler counts in 2009 and 2010 were used to estimate the relationship between the number of anglers counted during the 9:00 AM–1:00 PM index period versus the mean number of anglers from the "creel survey" angler counts, which is the average of the 4 counts across the 4 sampling periods. In 2009 and 2010, the mean number of anglers count on Mondays was approximately 54% of the index count during the index period.[12] Therefore, to estimate the mean angler count for Mondays in 2015, the 9:00 AM–1:00 PM index count was multiplied by 54%.
2) To estimate angler-hours of effort E, the estimated mean count (from Equation 1) 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 upstream and downstream of RM 13.7 were estimated as the product of the imputed values of CPUE, HPUE, and the estimate of E derived from the index count.

Inriver Gillnetting

CPUE of Inriver Gillnetting

A midriver drift and a nearshore drift, originating from each side (k) of the river, were conducted with the 5.0-inch mesh size deployed towards the shoreline; the sequence was then repeated with the 7.5-inch mesh size deployed towards the shoreline. A repetition j consisted of a complete set of 8 drifts (4 midriver and 4 nearshore). Daily CPUE r of species s in mesh size m for day i was estimated as follows:

[12] The Monday index conversion factor was reanalyzed and changed from 52% (Perschbacher 2012c) to 54% in 2015. Monday estimates of effort catch and harvest in 2011–2014 used the 52% conversion factor.

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

with variance

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

where c_{smijk} is the catch of species s in mesh m on day i during repetition j of a drift originating from bank k, e_{mijk} is the effort (soak time in minutes) for that drift, J_i is the number of repetitions completed on day i, c_{smij} is the catch of species i in mesh m summed across drifts on both banks conducted during repetition j of day i, $e_{mij.}$ is the effort for mesh m summed across drifts on both banks conducted during repetition j of day i, and $\bar{e}_{mi}$ is the mean of e_{mij} across all repetitions j for mesh m on day i. The variance follows Cochran (1977: 66).

Age and Sex Composition of Sport Harvest and Inriver Netting

Age and sex compositions of the Chinook salmon sport harvest, and age and sex compositions of Chinook salmon captured in the RM 8.6 midriver and nearshore nets were estimated for each run by time stratum t. The proportion of Chinook salmon in age or sex group b in time stratum t was estimated as follows:

$$\hat{p}_{bt} = \frac{n_{bt}}{n_t} \tag{18}$$

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[13] as follows (Cochran 1977):

$$V(\hat{p}_{bt}) = \frac{\hat{p}_{bt}(1 - \hat{p}_{bt})}{(n_t - 1)} \tag{19}$$

Contingency tables and chi-square tests were used to determine if age or sex composition differed significantly ($P < 0.05$) among strata (for sport harvest and inriver netting). If not, the proportion

[13] Variance estimates for species proportions assume that each sampled fish is an independent observation (i.e., that simple random sampling, SRS, was employed). In reality, the sport harvest is sampled with a multistage design (creel survey) and the inriver run with a cluster design (netting), and technically, the age proportion variances should be estimated in the context of those designs. However, age composition changes very slowly over time, and in the past, we have assumed that variability between sampling stages and among clusters is negligible. To verify this, we reanalyzed the 2006 netting data, calculated the age proportions using modified versions of Equations 7 and 8 (for proportions), and compared them to the SRS estimates in Equations 18 and 19. The point estimates and their standard errors were essentially equivalent. Based on this evidence, we continue to use the SRS equations for convenience.

of Chinook salmon in age or sex group *b* during an entire run, and its variance, were estimated by pooling data across strata (Equations 18–19 without stratum subscripts *t*).

The harvest of each age or sex group by time stratum *t* and geographic stratum *g* (upstream and downstream of the RM 13.7 sonar) was estimated by

$$\hat{H}_{gbt} = \hat{H}_{gt}\hat{p}_{bt}, \tag{20}$$

with variance (Goodman 1960)

$$V\left(\hat{H}_{gbt}\right) = \hat{H}_{gt}^2\hat{V}\left(\hat{p}_{bt}\right) + \hat{p}_{bt}^2\hat{V}\left(\hat{H}_{gt}\right) - \hat{V}\left(\hat{p}_{bt}\right)\hat{V}\left(\hat{H}_{gt}\right) \tag{21}$$

where

$\hat{H}_{gt}$ = estimated harvest in geographic stratum *g* during temporal stratum *t* and

$\hat{V}\left(\hat{H}_{gt}\right)$ = variance of estimated harvest 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:

$$\hat{p}_{gb} = \frac{\sum_t \hat{H}_{gt}\hat{p}_{bt}}{\sum_t \hat{H}_{gt}} \tag{22}$$

and

$$\hat{V}(\hat{p}_{gb}) = \frac{1}{\hat{H}_g^2}\left[\frac{\hat{v}(\hat{H}_{g1})\left[\hat{p}_{b1}\hat{H}_{g2} - \hat{H}_{gb2}\right]^2}{\hat{H}_g^2} + \frac{v(\hat{H}_{g2})\left[\hat{p}_{b2}\hat{H}_{g1} - \hat{H}_{gb1}\right]^2}{\hat{H}_g^2} + \hat{v}(\hat{p}_{b1})\hat{H}_{g1}^2 + \hat{v}(\hat{p}_{b2})\hat{H}_{g2}^2\right] \tag{23}$$

The number of Chinook salmon passing RM 13.7 was apportioned by age and sex similarly using Equations 18–23, ignoring geographic stratum subscript *g*, substituting *N* for *H*, and using the net-captured Chinook salmon to estimate *p*. The inriver run *R* of age or sex group *b* was estimated as the sum of the age- or sex-specific sonar passage N_b and harvest below the sonar H_{2b} as follows:

$$\hat{R}_b = \hat{N}_b + \hat{H}_{2b} \tag{24}$$

Comparisons of Midriver, Nearshore, and Tributary Weir Passage Length Compositions

Nonparametric Kolmogorov-Smirnov (K-S) tests were used to test for differences between locations (nearshore vs. midriver) of the length distributions of all Chinook salmon sampled for length in inriver gillnets (broken out by early run and late run), and between early-run fish sampled for length in the RM 8.6 inriver gillnets and those sampled at the Kenai River tributary weirs. Lengths of Chinook salmon sampled at the tributary weirs on the Killey River and Funny River were provided by the USFWS and used in the K-S tests. The D statistics and the associated *P*-value were reported for the following K-S test comparisons:

1) The cumulative length distribution of Chinook salmon captured in nearshore gillnets vs. midriver gillnets at RM 8.6 for the early run and the late run.

2) The cumulative length distribution of all early-run Chinook salmon sampled in gillnets at RM 8.6 vs. the cumulative length distribution of Chinook salmon sampled from the Killey River weir and Funny River weir combined.

A 2-sample K-S test was used to compare cumulative length distributions of 2 samples (Test 1), whereas the 1-sample K-S test (Test 2) was used to compare the cumulative length distribution of a sample with a reference distribution (the Killey River weir and Funny River weir combined length distribution). The sample in Test 2 was the length distribution of all early-run Chinook salmon sampled at RM 8.6.

RESULTS

CREEL SURVEY

Inseason Management Actions

Inseason management actions restricted the Kenai River Chinook salmon early- and late-run sport fisheries to achieve escapement goals. The early-run sport fishery was initially closed drainagewide to all Chinook salmon fishing 1 May through 30 June by emergency order (EO 2-KS-1-03-16). Catch-and-release fishing for Chinook salmon was allowed 4–17 June (EO 2-KS-1-15-16), and harvest was allowed downstream of Slikok Creek (RM 18.7) during 18–30 June (EO 2-KS-1-19-16). During the late-run sport fishery, the use of bait was prohibited 1–8 July (EO 2-KS-1-28-16) upstream of the Kenai River mouth to the Slikok Creek closed area (approximately RM 18.7). The bait restriction was rescinded 9 July (EO 2-KS-1-33-16) and the use of bait was allowed downstream of the Slikok Creek closed area.

Effort, Catch, and Harvest

During the early run, anglers between the Warren Ames Bridge and the Soldotna Bridge harvested 112 (SE = 43) and caught 384 (SE = 106) Chinook salmon with approximately 8,599 (SE = 917) angler-hours of effort (Table 2 and Figure 3). Approximately 88% of harvest (99, SE = 42), 91% of catch (351, SE = 105), and 63% of effort (5,378, SE = 823) occurred upstream of RM 13.7 (Table 2). The remaining 12% of harvest (13, SE = 11), 9% of catch (33, SE = 16), and 37% of effort (3,221, SE = 404) occurred downstream of RM 13.7. Precision estimates for harvest by geographic strata (±69 upstream and ±18 downstream RM 13.7) and catch (±173 upstream and ±26 downstream RM 13.7) were within 25% or 1,000 fish of the true values 90% of the time, satisfying Objective 1.

The early-run creel survey conducted a total of 187 angler interviews and sampled 58% (11/19) of the days the fishery was open to guided anglers and 65% (15/23) of the days the fishery was open to unguided anglers during the early run (Appendix A1). Guided anglers accounted for 92% (103, SE = 42) of the total harvest, 64% (247, SE = 97) of the total catch, and 53% (4,564, SE = 738) of the total angler effort; the remainder was unguided (Table 2 and Figure 3). Approximately 71% (272/384) of the total early-run catch was released. Guided anglers reported releasing 59% (145/247) of their total catch and unguided anglers reported releasing 93% (127/137) of their catch (Table 2).

Table 2.–Estimated early-run Kenai River Chinook salmon sport fishery effort, catch, and harvest by angler type and geographic location between the Soldotna Bridge and the Warren Ames Bridge, 4–30 June 2016.

	Angler effort			Chinook salmon					
				Catch[b]			Harvest[c]		
Parameter[a]	Hours fished	SE	Percent of parameter total	Number	SE	Percent of parameter total	Number	SE	Percent of parameter total
Unguided anglers									
Downstream	1,835	326	45%	26	15	19%	9	10	100%
Upstream	2,200	437	55%	111	42	81%	0	0	0%
Guided anglers									
Downstream	1,386	239	30%	8	6	3%	4	4	4%
Upstream	3,178	698	70%	240	97	97%	99	42	96%
Angler type subtotals									
Unguided	4,035	545	47%	137	44	36%	9	10	8%
Guided	4,564	738	53%	247	97	64%	103	42	92%
Geographic subtotals									
Downstream total	3,221	404	37%	33	16	9%	13	11	12%
Upstream total	5,378	823	63%	351	105	91%	99	42	88%
Early-run total	8,599	917		384	106		112	43	

[a] "Downstream" is the Kenai River reach between Warren Ames Bridge and the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach between the RM 13.7 Chinook salmon sonar site and Soldotna Bridge.

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

[c] "Harvest" is the number of fish kept; harvest estimates may not sum to total due to rounding.

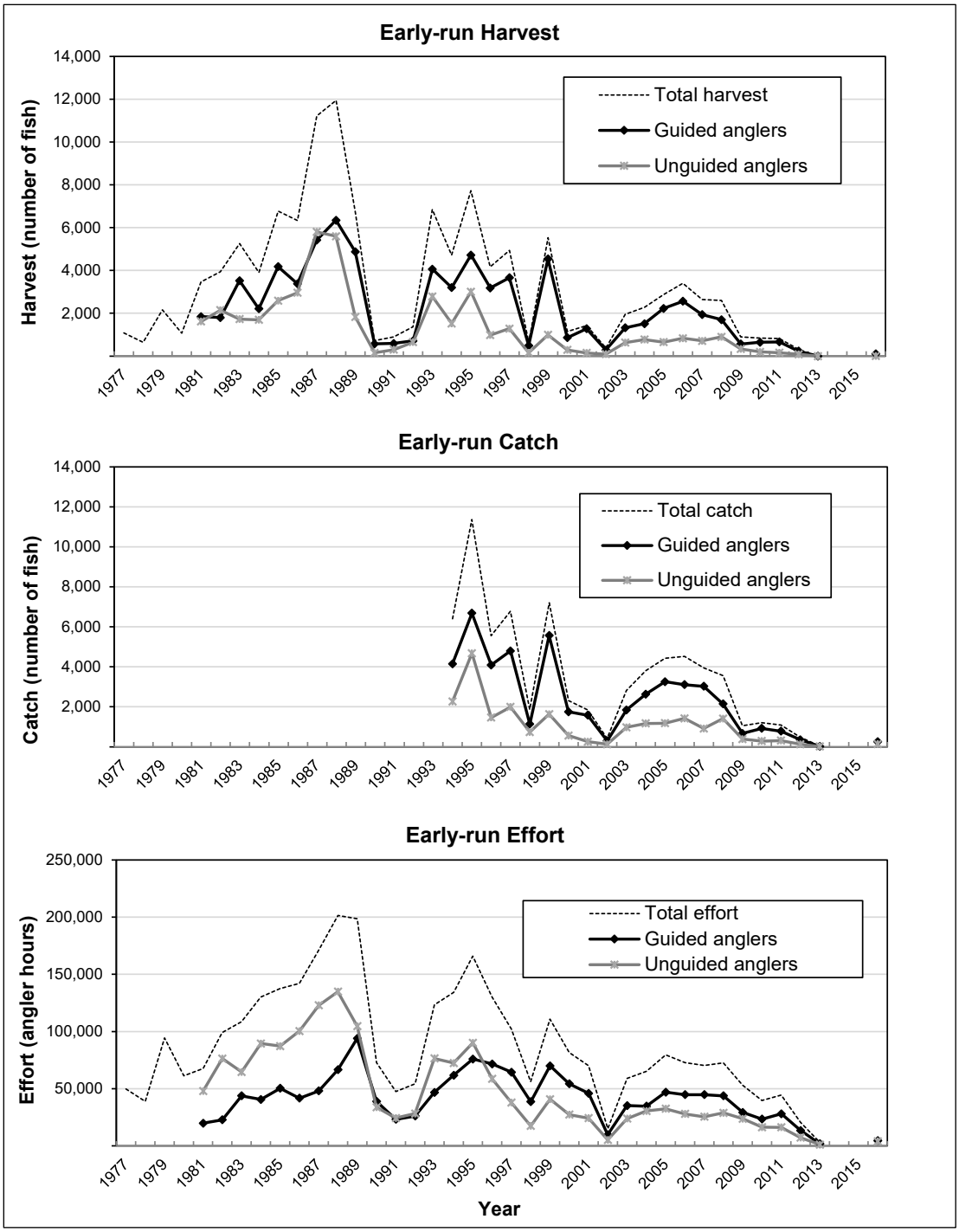

Figure 3.–Guided and unguided sport harvest (top), catch (middle), and angler effort (bottom) from ADF&G creel surveys for the early-run Kenai River Chinook salmon fishery between Soldotna Bridge and Warren Ames Bridge, 1981–2016.

Source: Hammarstrom and Larson (1982–1984, 1986); Hammarstrom et al. (1985); Conrad and Hammarstrom (1987); Hammarstrom (1977–1981, 1988–1994); Schwager-King (1995); King (1996–1997); Marsh (1999, 2000); Reimer et al. (2002); Reimer (2003, 2004a, 2004b, 2007); Eskelin (2007, 2009–2010); Perschbacher (2012a, 2012b, 2012c, 2012d, 2014, 2015) and Perschbacher and Eskelin (2016).

Note: Harvest and error estimates were not stratified by angler type prior to 1981. Catch was not estimated prior to 1994.

Early-run daily effort for both unguided and guided boat anglers combined was greatest on June 18 (1,642 angler hours summed from Appendices B1 and B3). For unguided anglers, the highest daily harvest (9 Chinook salmon) and catch (57 Chinook salmon) during the early run occurred on the 18th and 12th of June, respectively (Appendix B1), and the highest HPUE (0.011 fish per hour) and CPUE (0.381 fish per hour) occurred on the 18th and 11th of June, respectively (Appendix B2). Overall, early-run unguided HPUE and CPUE averaged <0.001 and 0.042 fish per hour, respectively (Appendix B2). For guided anglers, the highest daily harvest and catch (32 Chinook salmon) during the early run occurred on 30 June (Appendix B3), and the highest HPUE (0.072 fish per hour) and CPUE (0.231 fish per hour) occurred on the 30th and 7th of June, respectively (Appendix B4). Overall, guided HPUE and CPUE averaged 0.012 and 0.069 fish per hour, respectively (Appendix B4).

The maximum daily boat angler count during the early run of 81 unguided anglers (47 upstream and 34 downstream of RM 13.7) and 135 guided anglers (116 upstream and 19 downstream of RM 13.7) occurred on 18 June (Appendices C1–C3). These daily maximum counts occurred during the 4:00 AM to 8:59 AM time stratum.

During the late run, sport-fish anglers on the lower Kenai River harvested 6,181 (SE = 650) and caught 7,813 (SE = 720) Chinook salmon with approximately 113,981 (SE = 3,916) angler-hours of effort (Table 3). Late-run harvest ranked 25th highest out of 40 years (1977–2016), catch ranked 17 out of 23 years (1994–2016), and effort ranked 33 out of 40 years (1977–2016; Figure 4). Although harvest and catch ranked in the lower half of the historical estimates, late-run CPUE and HPUE ranked in the top 10 of the historical estimates (Figure 5).

The late-run Chinook salmon harvest was 2,469 (SE = 420) upstream of the RM 13.7 and 3,712 (SE = 497) downstream of RM 13.7, the late-run Chinook salmon catch was 3,130 (SE = 502) upstream of the RM 13.7 and 4,683 (SE = 516) downstream of RM 13.7, and the late-run sport-angler effort was 43,961 (SE = 2,418) upstream of the RM 13.7 and 70,020 (SE = 3,081) downstream of RM 13.7 (Table 3). Precision estimates for harvest by geographic strata (±691 upstream and ±818 downstream RM 13.7) and catch (±826 upstream RM 13.7 and ±849 downstream) were within 25% or 1,000 fish of the true values 90% of the time and satisfied Objective 1. Downstream precision estimates of catch (±22% and 1,011 fish) were not within 25% or 1,000 fish.

A majority of the late-run effort, harvest, and catch (approximately 60%, respectively) occurred downstream of RM 13.7 (Table 3). A larger proportion of late-run harvest occurred downstream of RM 13.7 in 2016 compared to 2015 (Figure 6).

The late-run creel survey conducted a total of 1,255 angler interviews and sampled 64% (14/22) of the days the fishery was open to guided anglers and 70% (19/27) of the days the fishery was open to unguided anglers (Appendix A2). Guided anglers accounted for 51% (3,153, SE = 487) of the total harvest, 48% (3,738, SE = 557) of the total catch, and 33% (37,986, SE = 2,140) of the total angler effort; the remainder was unguided (Table 3). Approximately 21% of the total catch was released. Guided anglers reported releasing 16% of their catch and unguided anglers reported releasing 26% of their catch (calculated from Table 3).

Table 3.–Estimated late-run Kenai River Chinook salmon sport fishery effort, catch, and harvest by angler type and geographic location between the Soldotna Bridge and the Warren Ames Bridge, 1–30 July 2016.

	Effort			Chinook salmon					
				Catch[b]			Harvest[c]		
Parameter[a]	Hours fished	SE	Percent of parameter total	Number	SE	Percent of parameter total	Number	SE	Percent of parameter total
Unguided anglers									
Downstream	47,610	2,648	63%	2,725	398	67%	2,034	393	67%
Upstream	28,385	1,936	37%	1,350	224	33%	994	176	33%
Guided anglers									
Downstream	22,410	1,575	59%	1,957	329	52%	1,677	303	53%
Upstream	15,576	1,448	41%	1,780	449	48%	1,475	381	47%
Angler type subtotals									
Unguided	75,995	3,280	67%	4,075	457	52%	3,028	431	49%
Guided	37,986	2,140	33%	3,738	557	48%	3,153	487	51%
Geographic subtotals									
Downstream total	70,020	3,081	61%	4,683	516	60%	3,712	497	60%
Upstream total	43,961	2,418	39%	3,130	502	40%	2,469	420	40%
Late-run total[d]	113,981	3,916		7,813	720		6,181	650	

[a] "Downstream" is the Kenai River reach between Warren Ames Bridge and the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach between the RM 13.7 Chinook salmon sonar site and Soldotna Bridge.

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

[c] "Harvest" is the number of fish kept; harvest estimates may not sum to total due to rounding.

[d] Unguided angler totals do not include Monday's index estimates of effort (3,042 angler-hours) and Chinook salmon catch (181) and harvest (133) in Appendix A2.

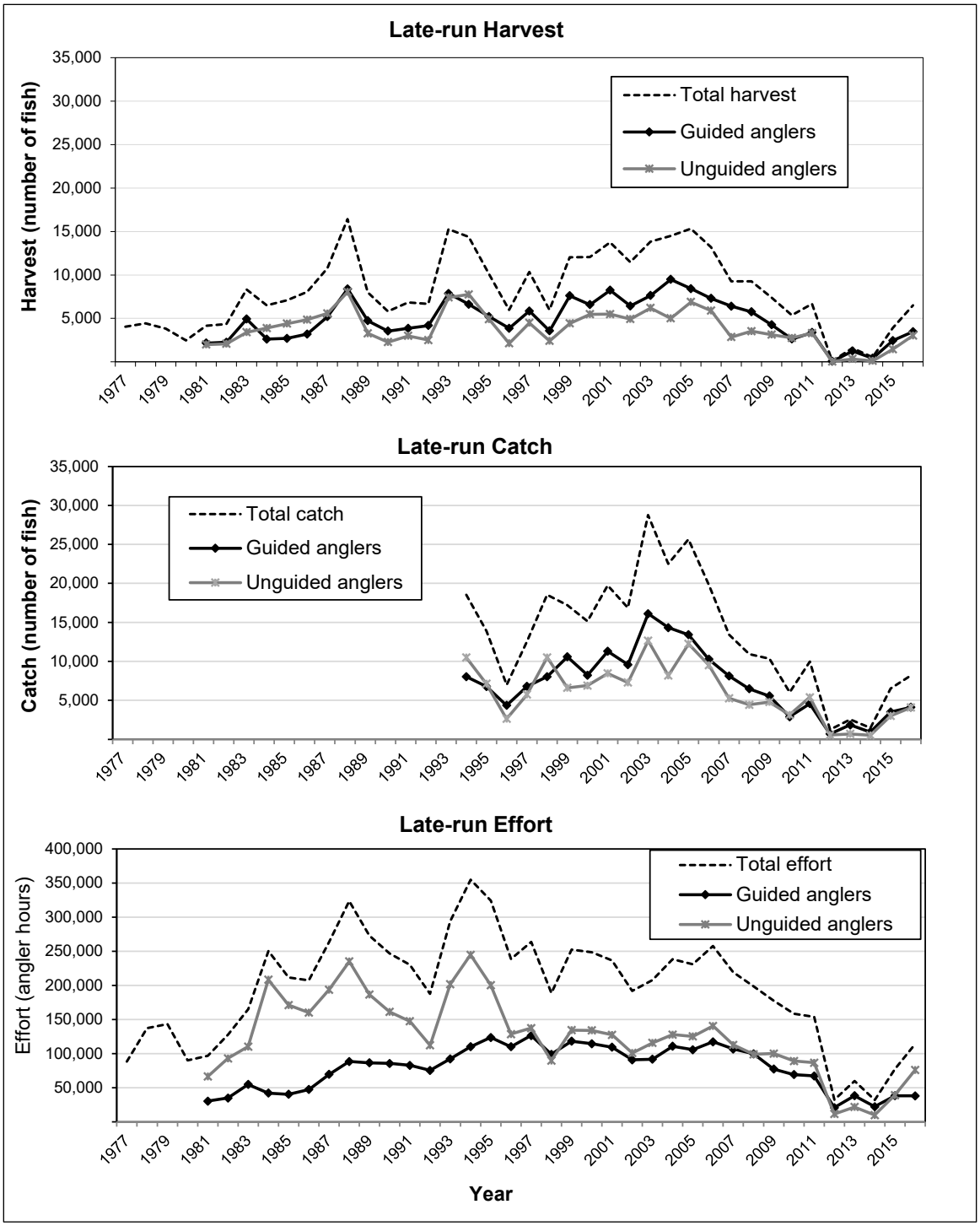

Figure 4.–Guided and unguided sport harvest (top), catch (middle), and angler effort (bottom) from ADF&G creel surveys for the late-run Kenai River Chinook salmon fishery between Soldotna Bridge and Warren Ames Bridge, 1981–2016.

Source: Hammarstrom and Larson (1982–1984, 1986); Hammarstrom et al. (1985); Conrad and Hammarstrom (1987); Hammarstrom (1977–1981, 1988–1994); Schwager-King (1995); King (1996–1997); Marsh (1999, 2000); Reimer et al. (2002); Reimer (2003, 2004a, 2004b, 2007); Eskelin (2007, 2009–2010); Perschbacher (2012a, 2012b, 2012c, 2012d, 2014, 2015) and Perschbacher and Eskelin (2016).

Note: Harvest and error estimates were not stratified by angler type prior to 1981. Catch was not estimated prior to 1994.

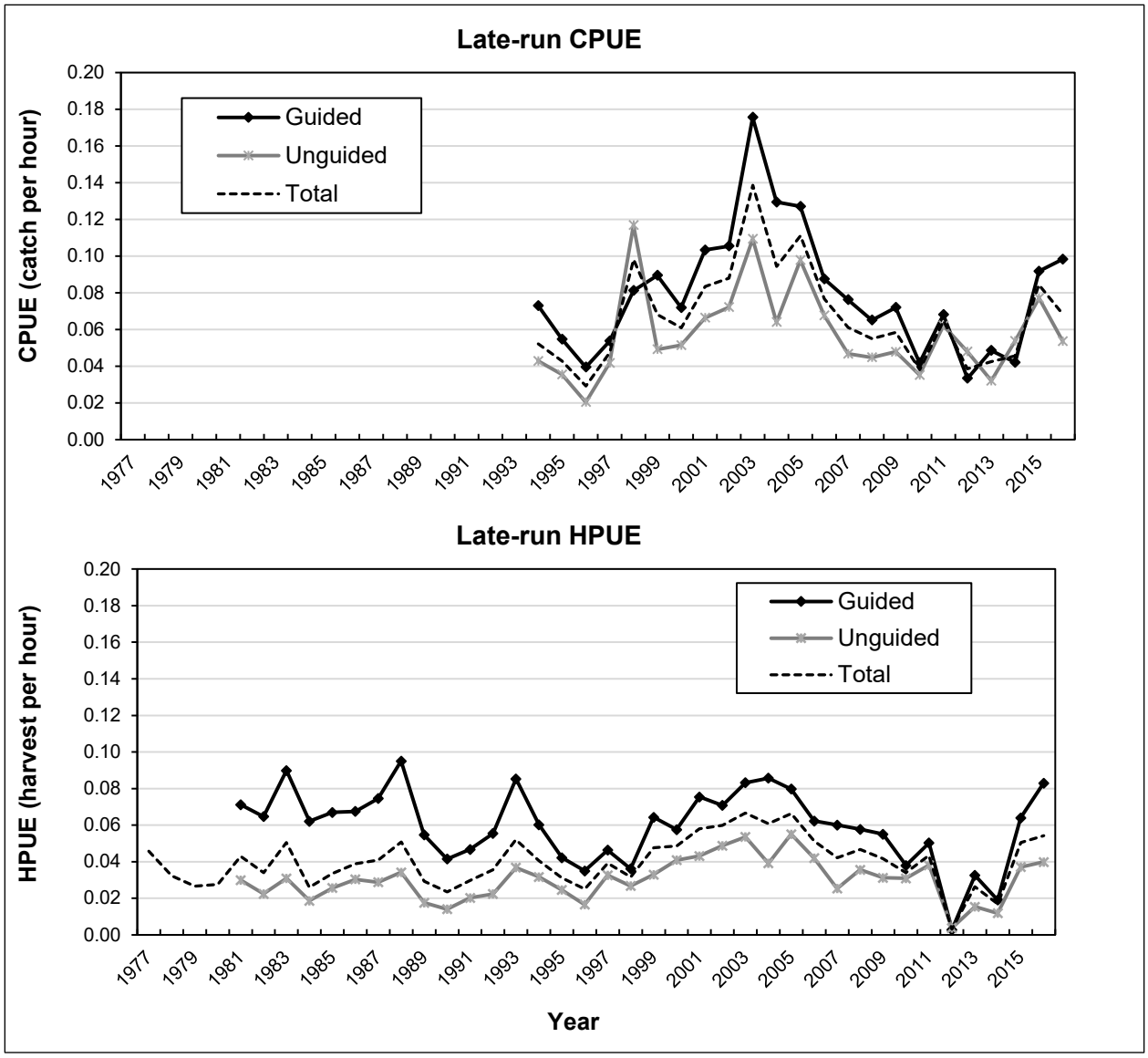

Figure 5.–Guided and unguided CPUE (top) and HPUE (bottom) from ADF&G creel surveys for the late-run Kenai River Chinook salmon fishery between Soldotna Bridge and Warren Ames Bridge, 1981–2016.

Note: Catch was not estimated prior to 1994.

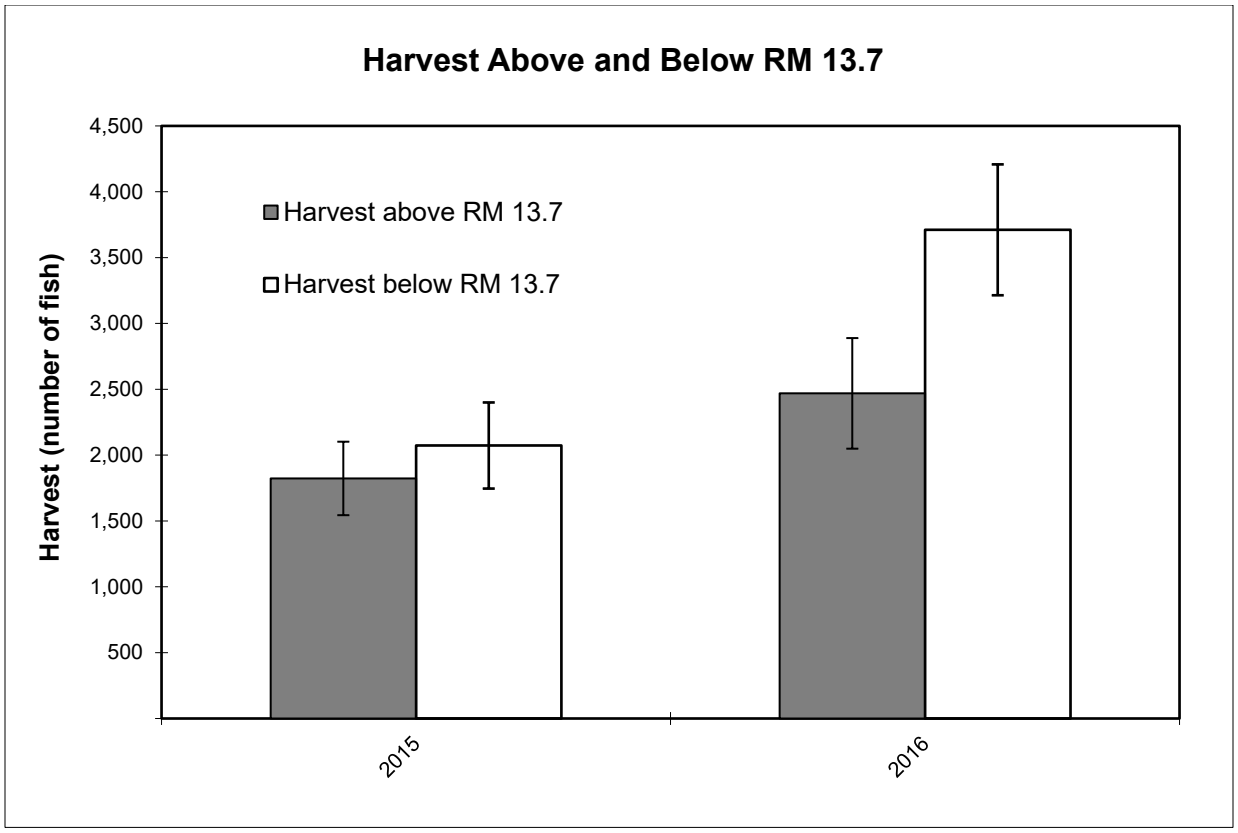

Figure 6.–Estimated sport harvest of late-run Kenai River Chinook salmon between the Warren Ames Bridge and the Chinook salmon sonar site (below RM 13.7) and between the sonar site and the Soldotna Bridge (above RM 13.7), 2015 and 2016.

Note: Error bars show ±1 standard error.

For late-run unguided anglers, the highest daily effort (5,520 angler hours), catch (336 Chinook salmon), and harvest (300 Chinook salmon) occurred on 19 July (Appendix B5), and the highest HPUE (0.108 fish per hour) and CPUE (0.162 fish per hour) occurred on 13 July (Appendix B6). Overall, unguided HPUE and CPUE averaged 0.038 and 0.052 fish per hour, respectively (Appendix B6). For late-run guided anglers, the highest daily effort (2,512 angler hours) occurred on 21 July, whereas the highest catch (367 Chinook salmon) and harvest (319 Chinook salmon) occurred on 13 July (Appendix B7), and the highest HPUE (0.186 fish per hour) and CPUE (0.284 fish per hour) occurred on 13 July and 9 July, respectively (Appendix B8). Overall, guided HPUE and CPUE averaged 0.087 and 0.105 fish per hour, respectively (Appendix B8).

The maximum daily boat angler count of 456 unguided anglers (173 upstream and 283 downstream of RM 13.7) occurred on 19 July, and the maximum daily count of 326 guided anglers (141 upstream and 185 downstream of RM 13.7) occurred on 21 July (Appendices C4–C6). These daily maximum counts both occurred during the 4:00 AM to 8:59 AM time stratum.

Late-Run Drift-Boat Monday Index

Between the Soldotna Bridge and the Warren Ames Bridge, an estimated 3,042 angler-hours were expended by unguided drift boat anglers to catch 181 and harvest 133 Chinook salmon during drift-boat Mondays during the late run (calculated from Appendix A2). Estimated harvest of

Chinook salmon on drift-boat Mondays was 2.2% of the total late-run harvest (excluding Mondays) in 2016. Harvest on drift-boat Mondays has been less than 5% of the total late-run harvest since 2009 (Figure 7).

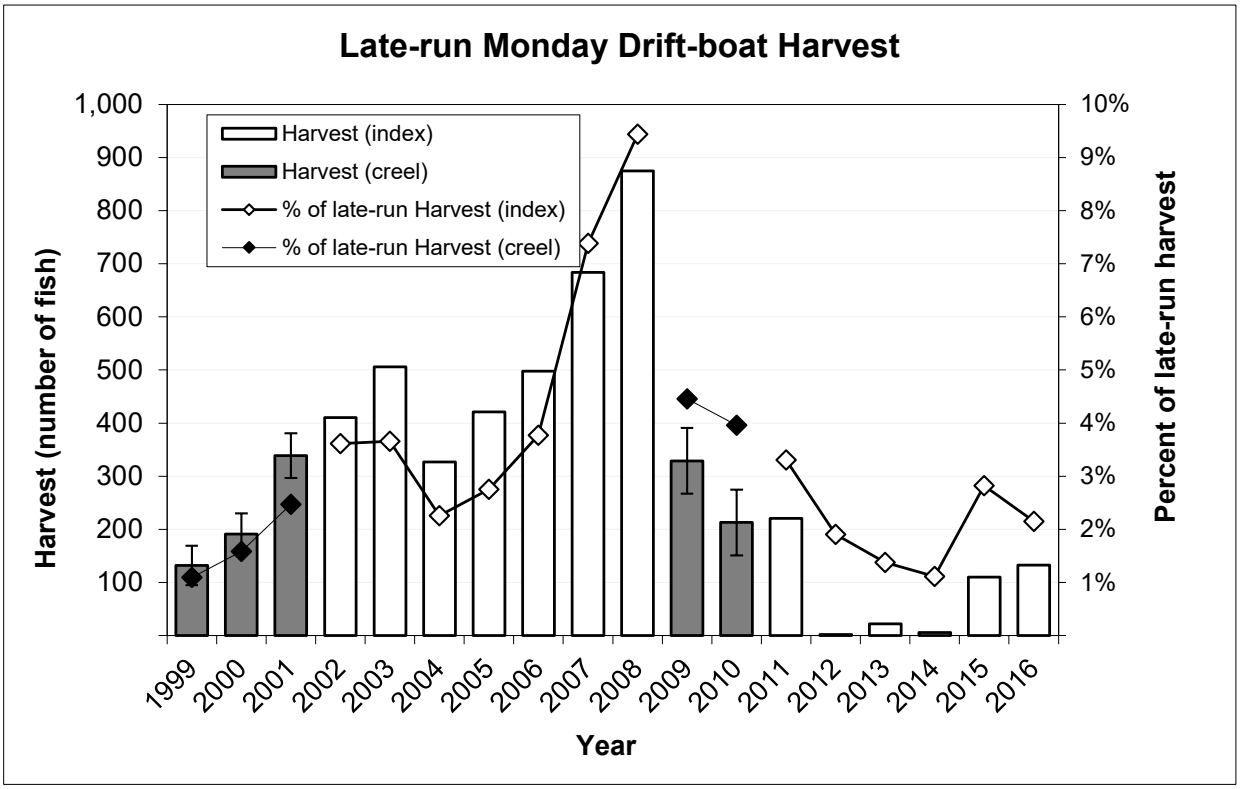

Figure 7.–Late-run Monday unguided drift-boat sport harvest and percent of total late-run harvest of Kenai River Chinook salmon estimated by index and creel surveys between Soldotna Bridge and Warren Ames Bridge, 1999–2016.

Sport Harvest Age, Sex, and Length Compositions

Only 5 valid age samples were collected in the early-run sport fishery; therefore, the sample size goal of 19 valid scale ages was not met and ASL compositions were not generated.

There were 189 valid age samples collected in the late-run sport fishery. These samples were composed of 0.5% age-0.2 fish, 1.6% age-1.1 fish, 19.0% age-1.2 fish, 50.8% age-1.3 fish, 25.9% age-1.4 fish, and 2.1% age-1.5 fish (Table 4).

Approximately 60.3% of the harvested late-run Chinook salmon were males; the remaining 39.7% were females (Table 4). The 1.3-age class accounted for the greatest age proportions of the sport harvest for both male and female Chinook salmon.

The average length of sampled age-1.3 females (890 mm) was slightly larger than the average length of age-1.3 males (843 mm), otherwise males averaged larger in all other age classes (Table 5). The average length of sport-harvested Chinook salmon sampled for age was 846 mm, with a range of 275 mm to 1,115 mm.

Table 4.–Age composition and estimated sport harvest by age class and geographic stratum for late-run Kenai River Chinook salmon harvested between Soldotna Bridge and Warren Ames Bridge, 1–31 July 2016.

		Age						
Sex	Parameter[a]	0.2	1.1	1.2	1.3	1.4	1.5	Total
Female								
	Sample size	0	0	0	46	27	2	75
	% Sample	–	–	–	24.3%	14.3%	1.1%	39.7%
	SE % sample	–	–	–	3.1%	2.6%	0.7%	3.6%
	Downstream harvest	–	–	–	903	530	39	1,473
	SE downstream harvest	–	–	–	167	118	28	237
	Upstream harvest	–	–	–	601	353	26	980
	SE upstream harvest	–	–	–	127	86	19	188
	Total harvest	–	–	–	1,504	883	65	2,453
	SE total harvest	–	–	–	249	182	46	339
Male								
	Sample size	1	3	36	50	22	2	114
	% Sample	0.5%	1.6%	19.0%	26.5%	11.6%	1.1%	60.3%
	SE % sample	0.5%	0.9%	2.9%	3.2%	2.3%	0.7%	3.6%
	Downstream harvest	20	59	707	982	432	39	2,239
	SE downstream harvest	20	34	142	177	104	28	327
	Upstream harvest	13	39	470	653	287	26	1,489
	SE upstream harvest	13	23	106	136	75	19	268
	Total harvest	33	98	1,177	1,635	719	65	3,728
	SE total harvest	33	57	215	262	162	46	449
Both								
	Sample size	1	3	36	96	49	4	189
	% Sample	0.5%	1.6%	19.0%	50.8%	25.9%	2.1%	100.0%
	SE % sample	0.5%	0.9%	2.9%	3.6%	3.2%	1.0%	0.0%
	Downstream harvest	20	59	707	1,885	962	79	3,712
	SE downstream harvest	20	34	142	243	157	40	497
	% Downstream harvest	0.3%	1.0%	11.4%	30.5%	15.6%	1.3%	60.1%
	Upstream harvest	13	39	470	1,254	640	52	2,469
	SE upstream harvest	13	23	106	186	114	26	420
	% Upstream harvest	0.2%	0.6%	7.6%	20.3%	10.4%	0.8%	39.9%
	Total harvest	33	98	1,177	3,140	1,602	131	6,181
	SE total harvest	33	57	215	362	244	66	650

Note: Values given by age and sex may not sum to totals due to rounding. An en dash means not applicable.

[a] "Downstream" is the Kenai River reach between Warren Ames Bridge and the RM 13.7 sonar site. "Upstream" is the Kenai River reach between the RM 13.7 sonar site and Soldotna Bridge.

Table 5.–Late-run sport harvested Kenai River Chinook salmon lengths by sex and age, 1–30 July 2016.

		Age						
Sex	Parameter	0.2	1.1	1.2	1.3	1.4	1.5	Combined
Female								
	Sample size	0	0	0	46	27	2	75
	Mean length (SE)	–	–	–	890 (5)	940 (5)	1,033 (3)	911 (5)
	Min–max lengths	–	–	–	810–950	895–995	1,030–1,035	810–1,035
Male								
	Sample size	1	3	36	50	22	2	114
	Mean length (SE)	635	385 (57)	648 (8)	843 (9)	989 (11)	1,113 (3)	802 (15)
	Min–max lengths	635	275–465	510–715	715–955	900–1,090	1,110–1,115	275–1,115
Both								
	Sample size	1	3	36	96	49	4	189
	Mean length (SE)	635	385 (57)	648 (8)	865 (6)	962 (7)	1,073 (23)	846 (10)
	Min–max lengths	635	275–465	510–715	715–955	895–1,090	1,030–1,115	275–1,115

Note: All lengths were measured in millimeters from mid eye to tail fork. An en dash means not applicable.

INRIVER GILLNETTING

During the early run, approximately 56% of drifts (474/847 drifts) and 65% of drift minutes (4,898/7,528 minutes) occurred within the midriver area; the remainder were within the nearshore area. Overall, inriver nets captured a total of 177 Chinook salmon (114 midriver and 63 nearshore), 805 sockeye salmon (461 midriver and 344 nearshore), and 2 Dolly Varden (Appendix D1). The majority of Chinook salmon (64%) and sockeye salmon (57%) were captured midriver.

Early-run CPUE (measured as catch per minute) for Chinook salmon averaged 0.025 (0.026 midriver and 0.024 nearshore) and was the highest nearshore (0.130) on 7 June. Early-run CPUE for sockeye salmon averaged 0.115 (0.105 midriver and 0.130 nearshore) and was the highest midriver (0.576) on 4 June (Appendix D2).

During the late run, approximately 50% of drifts (409/813 drifts) and 59% of drift minutes (4,307/7,342 minutes) occurred midriver (Appendix D3). Overall, late-run inriver nets captured a total of 304 Chinook salmon (219 midriver and 85 nearshore), 2,761 sockeye salmon (1,230 midriver and 1,531 nearshore), 208 coho salmon (95 midriver and 113 nearshore), 930 pink salmon (478 midriver and 452 nearshore), 7 Dolly Varden, and 2 rainbow trout (Appendix D4). The majority of Chinook salmon (72%) and pink salmon (51%) were caught midriver, whereas the majority of sockeye salmon (55%) and coho salmon (54%) were caught nearshore (Appendix D4).

Late-run CPUE for Chinook salmon averaged 0.050 (0.056 midriver and 0.031 nearshore) and was the highest (0.165) midriver on 16 July, whereas CPUE for all sockeye salmon averaged 0.438 (0.310 midriver and 0.536 nearshore) and was the highest (1.513) nearshore on 16 July (Appendix D5). CPUEs for other salmon species were not required to meet objectives (Appendix D6).

During the 2016 early run, the shoreline-to-shoreline Chinook salmon cumulative CPUE was higher than 2014 and similar to 2015 (Figure 8). The late-run Chinook salmon cumulative CPUE was higher than 2014 and less than 2015 (Figure 9). The 2016 early- and late-run shoreline-to-shoreline sockeye salmon cumulative CPUEs were below both 2014 and 2015 (Figures 10 and 11).

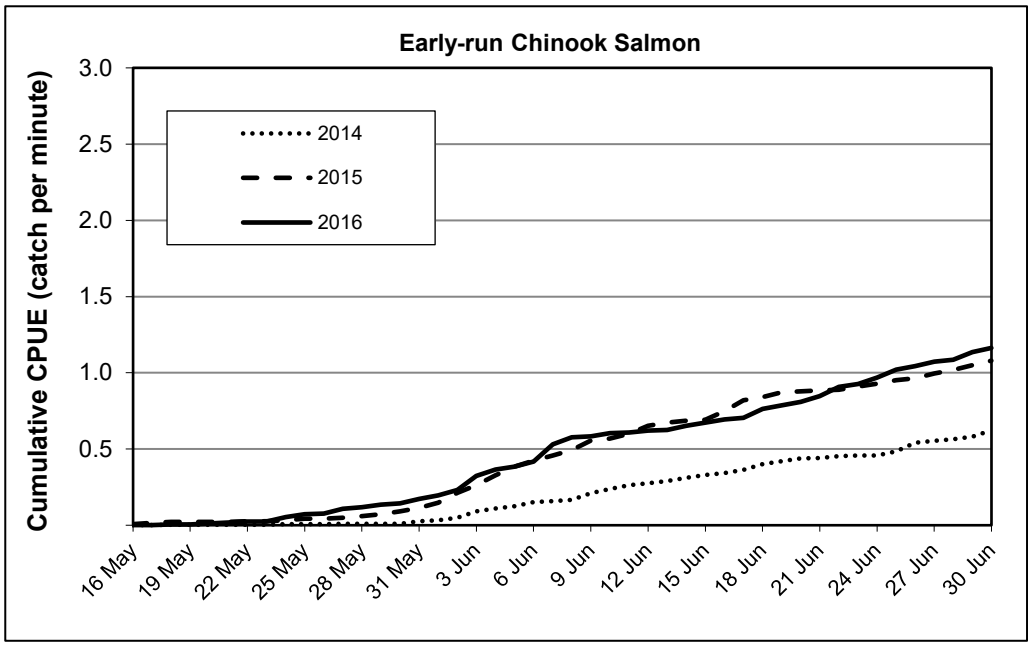

Figure 8.–Cumulative CPUEs (catch per minute) of early-run Kenai River Chinook salmon captured shoreline-to-shoreline in inriver gillnets, 16 May–30 June 2014–2016.

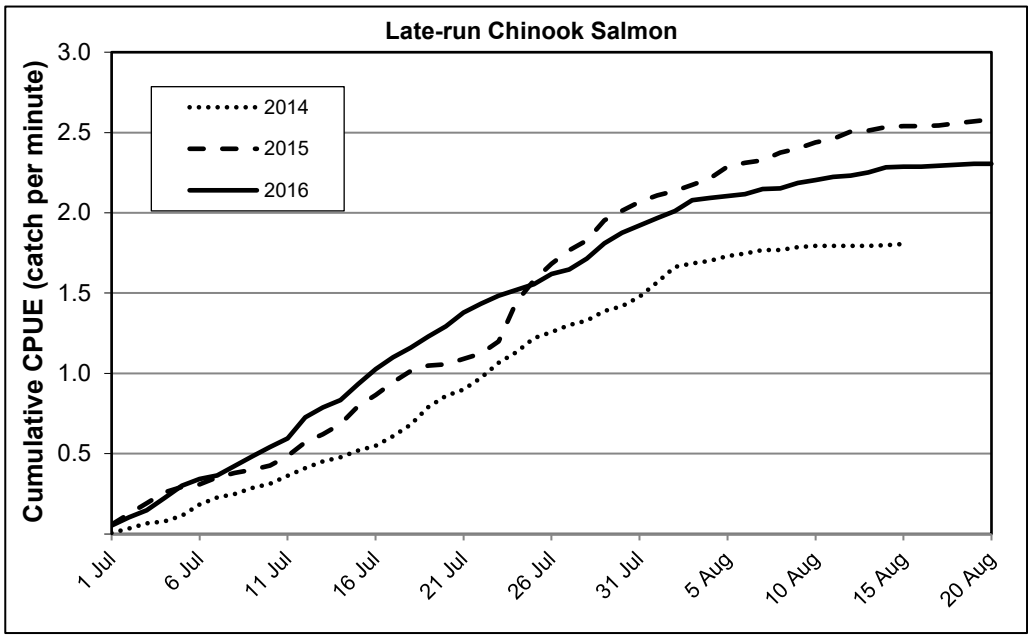

Figure 9.–Cumulative CPUEs (catch per minute) of late-run Kenai River Chinook salmon captured shoreline-to-shoreline in inriver gillnets, July 1–15 August 2014, July 1–20 August 2015 and 2016.

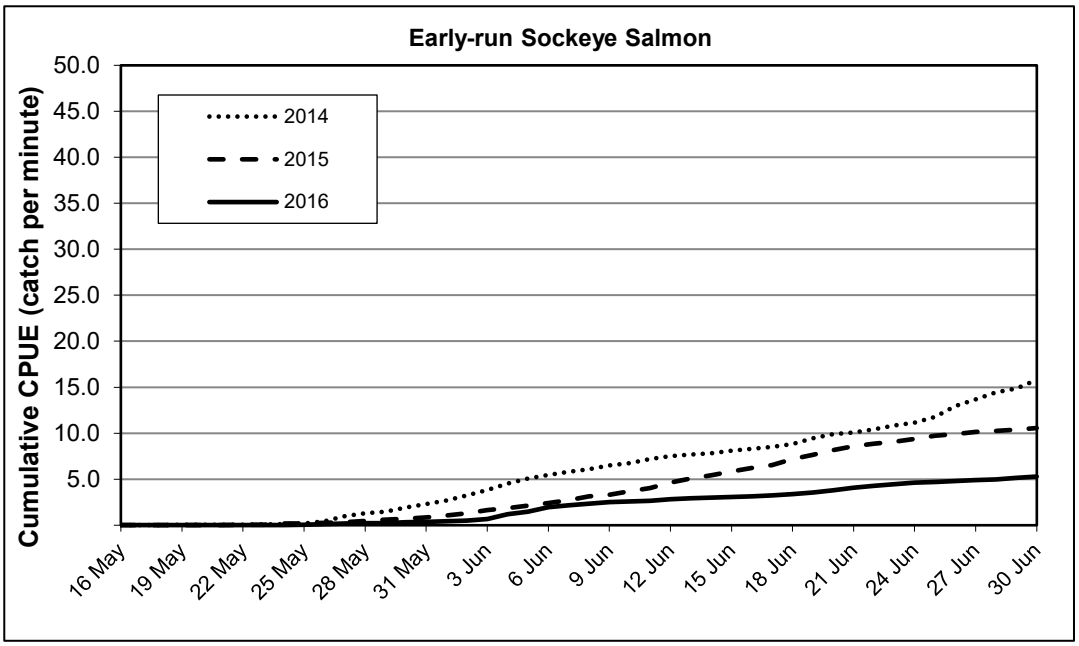

Figure 10.–Cumulative CPUEs (catch per minute) of early-run sockeye salmon captured shoreline-to-shoreline in inriver gillnets, 16 May–30 June 2014–2016.

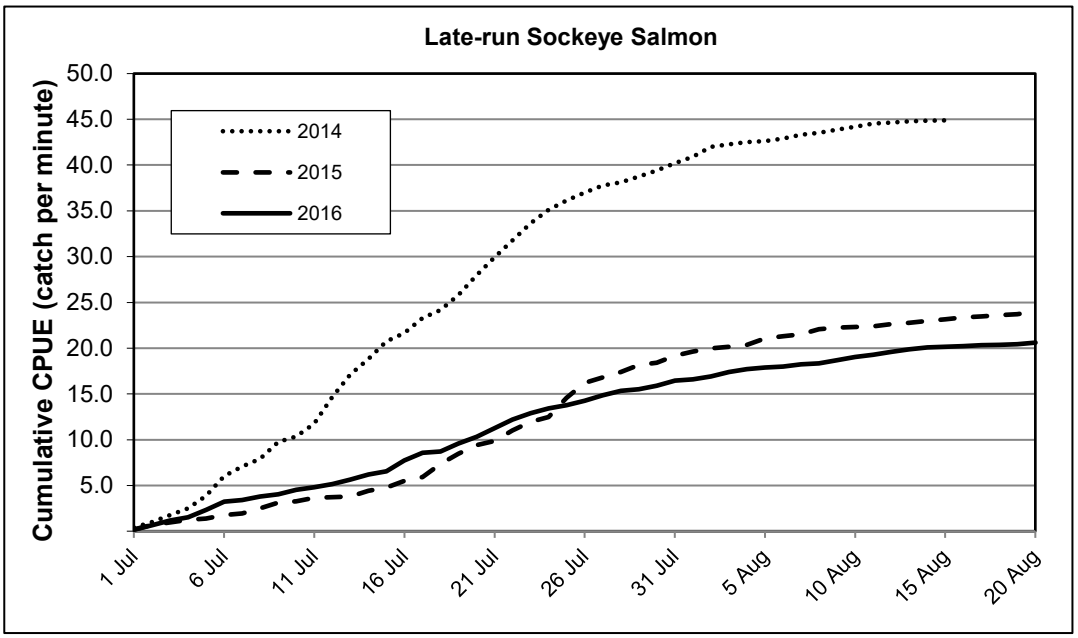

Figure 11.–Cumulative CPUEs (catch per minute) of late-run sockeye salmon captured shoreline-to-shoreline in inriver gillnets, July 1–15 August 2014, July 1–20 August 2015 and 2016.

Chinook Salmon Catch by Tide Stage

Chinook salmon catch was estimated for each netting area (nearshore and midriver) and tidal stage (low, rising, high, and falling tidal stages) for the early and late runs (Figures 12 and 13). A complete tide cycle of approximately 12.5 hours consisted of 2.0 hours of low tide, 4.25 hours of rising tide, 2.0 hours of high tide, and 4.25 hours of falling tide. To compare catch rates by each tidal stage, the number of Chinook salmon captured during low tide and during high tide were estimated as if there 4.25 hours of netting time.

During the 2016 early run, most Chinook salmon were captured during the falling tide (90), followed by the low tide (30), the rising tide (26), and high tide (21; calculated from Figure 12). During the 2016 late run, most Chinook salmon were captured during the falling tide (148), followed by the rising tide (94), low tide (44), and high tide (23; calculated from Figure 13).

Overall, the majority of Chinook salmon were captured during the falling tide and more Chinook salmon were captured midriver than nearshore during all tidal stages for both runs.

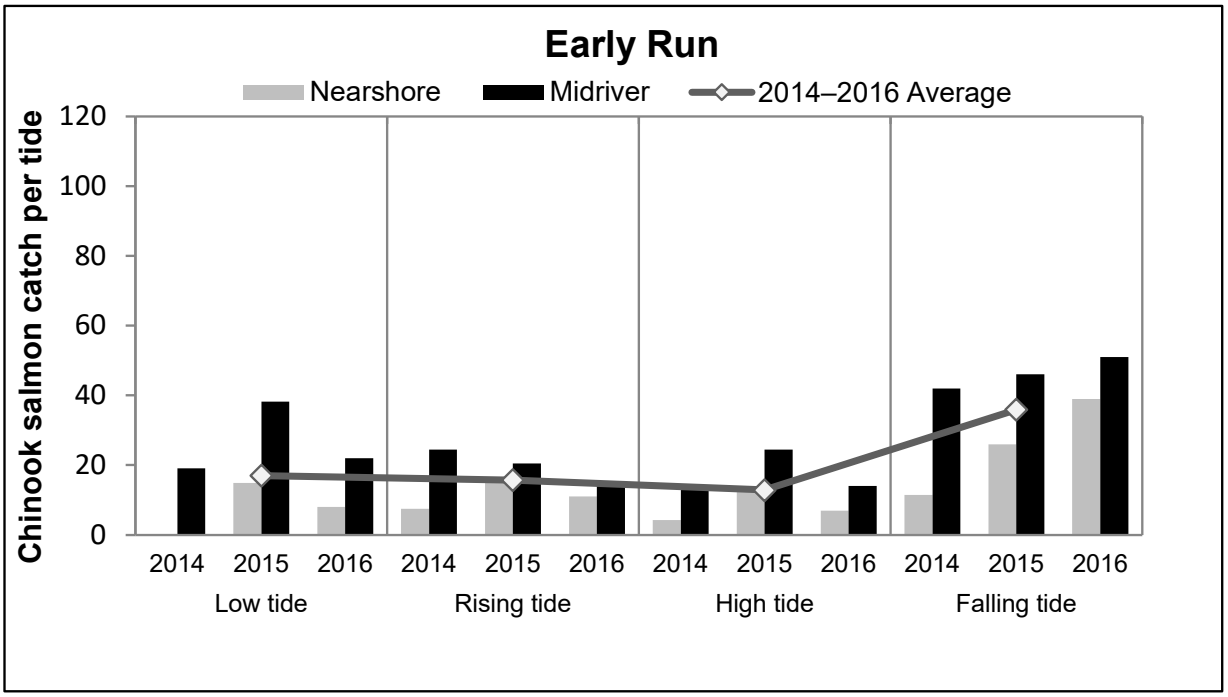

Figure 12.–Early-run Chinook salmon catch by tide stage and year in nearshore and midriver nets, and the 2014–2016 mean catch for all netting during each tide stage.

Note: Time of catch by the netting crew was related to stage of tide from the 2015 Kenai City Pier Tide Table.

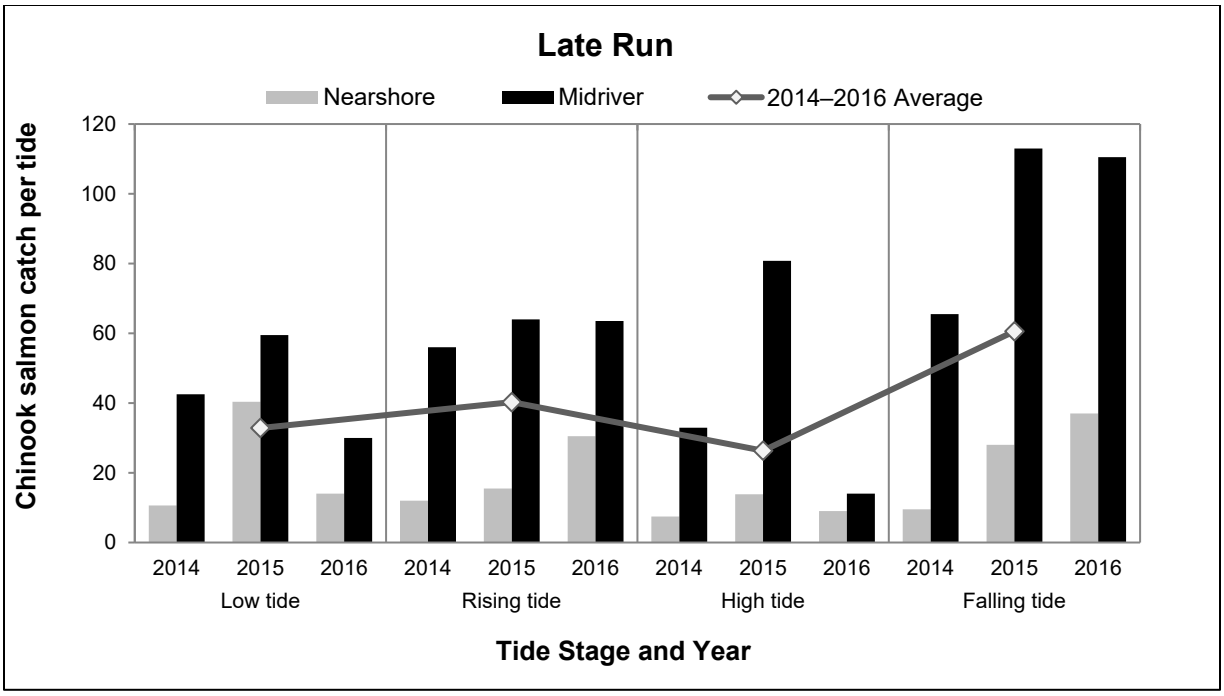

Figure 13.–Late-run Chinook salmon catch by tide stage and year in nearshore and midriver nets, and the 2014–2016 mean catch for all netting during each tide stage.

Note: Time of catch by the netting crew was related to stage of tide from the 2015 Kenai City Pier Tide Table.

Age, Sex, and Length Compositions

Unless stated otherwise, the following results from inriver gillnetting are given as combined results of both nearshore and midriver netting. During the early run, 143 valid age samples were collected in the gillnetting study (Table 6). The estimated age composition of early-run Chinook salmon was 4.9% age-1.1 fish, 26.6% age-1.2 fish, 48.3% age-1.3 fish, 19.6% age 1.4-fish, and 0.7% age-1.5 fish (Table 6). The percentages of age-1.4 early-run Chinook salmon have been among the lowest on record for the last 3 years, regardless of mesh size or area netted (Figure 14). The proportion of early-run age-1.5 Chinook salmon captured with the 7.5-inch mesh (2.6%) has been less than 4% since 2006 (Figure 14).

Of the total valid-age samples, the age composition of the (96) midriver gillnetting samples was 4.2% age-1.1 fish, 16.8% age-1.2 fish, 30.8% age 1.3-fish, 14.7% age-1.4 fish, and 0.7% age-1.5 fish, and the age composition of the (47) nearshore gillnetting samples was 0.7% age-1.1 fish, 9.8% age-1.2 fish, 17.5% age-1.3 fish, and 4.9% age-1.4 fish (Table 6). Age-1.3 Chinook salmon made up the highest percentages of both midriver and nearshore fish for either sex. The only age-1.5 Chinook salmon was captured midriver. A larger percentage of males were captured midriver (47.6%) than nearshore (23.1%; Table 6). Overall, 70.6% of early-run Chinook salmon captured in inriver gillnets were males; the remaining 29.4% were females.

Table 6.–Age composition for early-run Kenai River Chinook salmon captured in nearshore and midriver nets, 16 May–30 June 2016.

			Age					
Source	Sex	Parameter	1.1	1.2	1.3	1.4	1.5	Total
Midriver								
	Female							
		Sample size	0	1	13	13	1	28
		Percent	–	0.7%	9.1%	9.1%	0.7%	19.6%
		SE percent	–	0.7%	2.4%	2.4%	0.7%	3.3%
	Male							
		Sample size	6	23	31	8	0	68
		Percent	4.2%	16.1%	21.7%	5.6%	–	47.6%
		SE percent	1.7%	3.1%	3.5%	1.9%	–	4.2%
	Both							
		Sample size	6	24	44	21	1	96
		Percent	4.2%	16.8%	30.8%	14.7%	0.7%	67.1%
		SE percent	1.7%	3.1%	3.9%	3.0%	0.7%	3.9%
Nearshore								
	Female							
		Sample size	0	0	10	4	0	14
		Percent	–	–	7.0%	2.8%	–	9.8%
		SE percent	–	–	2.1%	1.4%	–	2.5%
	Male							
		Sample size	1	14	15	3	0	33
		Percent	0.7%	9.8%	10.5%	2.1%	–	23.1%
		SE percent	0.7%	2.5%	2.6%	1.2%	–	3.5%
	Both							
		Sample size	1	14	25	7	0	47
		Percent	0.7%	9.8%	17.5%	4.9%	–	32.9%
		SE percent	0.7%	2.5%	3.2%	1.8%	–	3.9%
Combined								
	Females							
		Sample size	0	1	23	17	1	42
		Percent	–	0.7%	16.1%	11.9%	0.7%	29.4%
		SE percent	–	0.7%	3.1%	2.7%	0.7%	3.8%
	Male							
		Sample size	7	37	46	11	0	101
		Percent	4.9%	25.9%	32.2%	7.7%	–	70.6%
		SE percent	1.8%	3.7%	3.9%	2.2%	–	3.8%
	Both							
		Sample size	7	38	69	28	1	143
		Percent	4.9%	26.6%	48.3%	19.6%	0.7%	100.0%
		SE percent	1.8%	3.7%	4.2%	3.3%	0.7%	0.0%

Note: An en dash means not applicable.

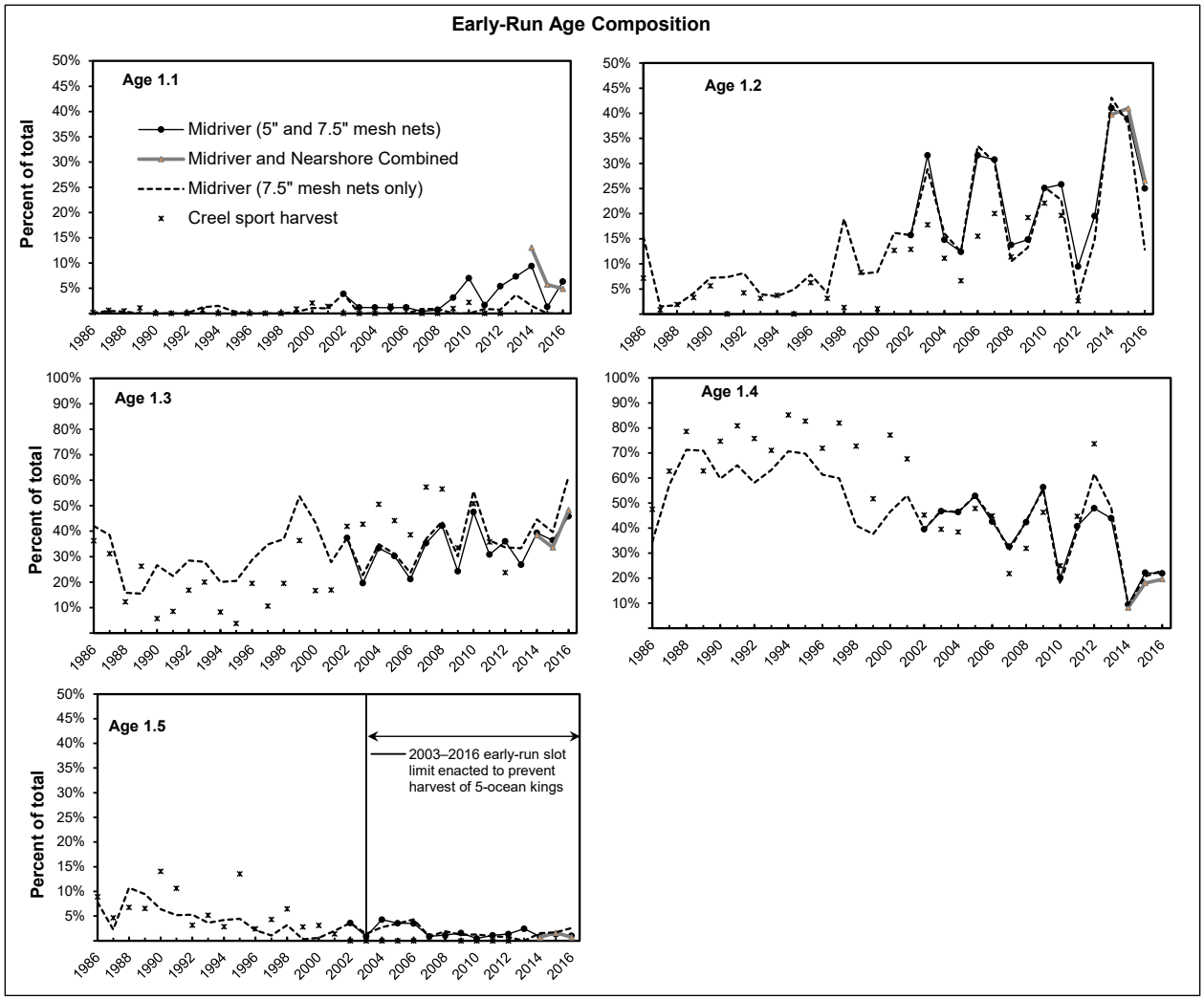

Figure 14.–Age composition of early-run harvest versus inriver netting for age-1.1 (top left), age-1.2 (top right), age-1.3 (middle left), age-1.4 (middle right), and age-1.5 (bottom left) Kenai River Chinook salmon 1986–2016.

Source: Hammarstrom and Larson (1982–1984, 1986); Hammarstrom et al. (1985); Conrad and Hammarstrom (1987); Hammarstrom (1977–1981, 1988–1994); Schwager-King (1995); King (1996–1997); Marsh (1999, 2000); Reimer et al. (2002); Reimer (2003, 2004a, 2004b, 2007); Eskelin (2007, 2009–2010); Perschbacher (2012a, 2012b, 2012c, 2012d, 2014, 2015) and Perschbacher and Eskelin (2016).

Note: "Percent of total" axes differ between ages. The 2014 and 2015 early-run sport fishery was closed to all Chinook salmon fishing. The sample size goal of 19 readable scales was not met in 2016. Inriver run age compositions derived from midriver netting samples 2002–2015 using 5.0-inch and 7.5-inch mesh nets (only 7.5-inch mesh nets were used 1986–2001). The Chinook salmon sport fishery slot limit was 44–55 inches total length during 2003–2007, 46–55 inches during 2008–2013, and 42–55 inches during 2014–2015.

During the 2016 late run, 258 valid-age samples were collected from the inriver gillnetting study (Table 7). The estimated age composition of late-run Chinook salmon was 0.4% age-1.1 fish, 16.3% age-1.2 fish, 42.6% age-1.3 fish, 36.8% age 1.4-fish, and 3.9% age-1.5 fish (Table 7). Age-1.1 fish were not captured in significant numbers regardless of mesh size or area netted (Figure 15), whereas the highest proportion of age-1.4 fish (55%) captured was in the 7.5-inch mesh.

Table 7.–Age composition for late-run Kenai River Chinook salmon captured in nearshore and midriver nets, 1 July–20 August 2016.

			Age					
Source	Sex	Parameter	1.1	1.2	1.3	1.4	1.5	Total
Midriver								
	Female							
		Sample size	0	0	37	44	5	86
		Percent	–	–	14.3%	17.1%	1.9%	33.3%
		SE percent	–	–	2.2%	2.3%	0.9%	2.9%
	Male							
		Sample size	0	27	41	33	4	105
		Percent	–	10.5%	15.9%	12.8%	1.6%	40.7%
		SE percent	–	1.9%	2.3%	2.1%	0.8%	3.1%
	Both							
		Sample size	0	27	78	77	9	191
		Percent	–	10.5%	30.2%	29.8%	3.5%	74.0%
		SE percent	–	1.9%	2.9%	2.9%	1.1%	2.7%
Nearshore								
	Female							
		Sample size	0	0	14	13	0	27
		Percent	–	–	5.4%	5.0%	–	10.5%
		SE percent	–	–	1.4%	1.4%	–	1.9%
	Male							
		Sample size	1	15	18	5	1	40
		Percent	0.4%	5.8%	7.0%	1.9%	0.4%	15.5%
		SE percent	0.4%	1.5%	1.6%	0.9%	0.4%	2.3%
	Both							
		Sample size	1	15	32	18	1	67
		Percent	0.4%	5.8%	12.4%	7.0%	0.4%	26.0%
		SE percent	0.4%	1.5%	2.1%	1.6%	0.4%	2.7%
Combined								
	Females							
		Sample size	0	0	51	57	5	113
		Percent	–	–	19.8%	22.1%	1.9%	43.8%
		SE percent	–	–	2.5%	2.6%	0.9%	3.1%
	Male							
		Sample size	1	42	59	38	5	145
		Percent	0.4%	16.3%	22.9%	14.7%	1.9%	56.2%
		SE percent	0.4%	2.3%	2.6%	2.2%	0.9%	3.1%
	Both							
		Sample size	1	42	110	95	10	258
		Percent	0.4%	16.3%	42.6%	36.8%	3.9%	100.0%
		SE percent	0.4%	2.3%	3.1%	3.0%	1.2%	0.0%

Note: An en dash means not applicable.

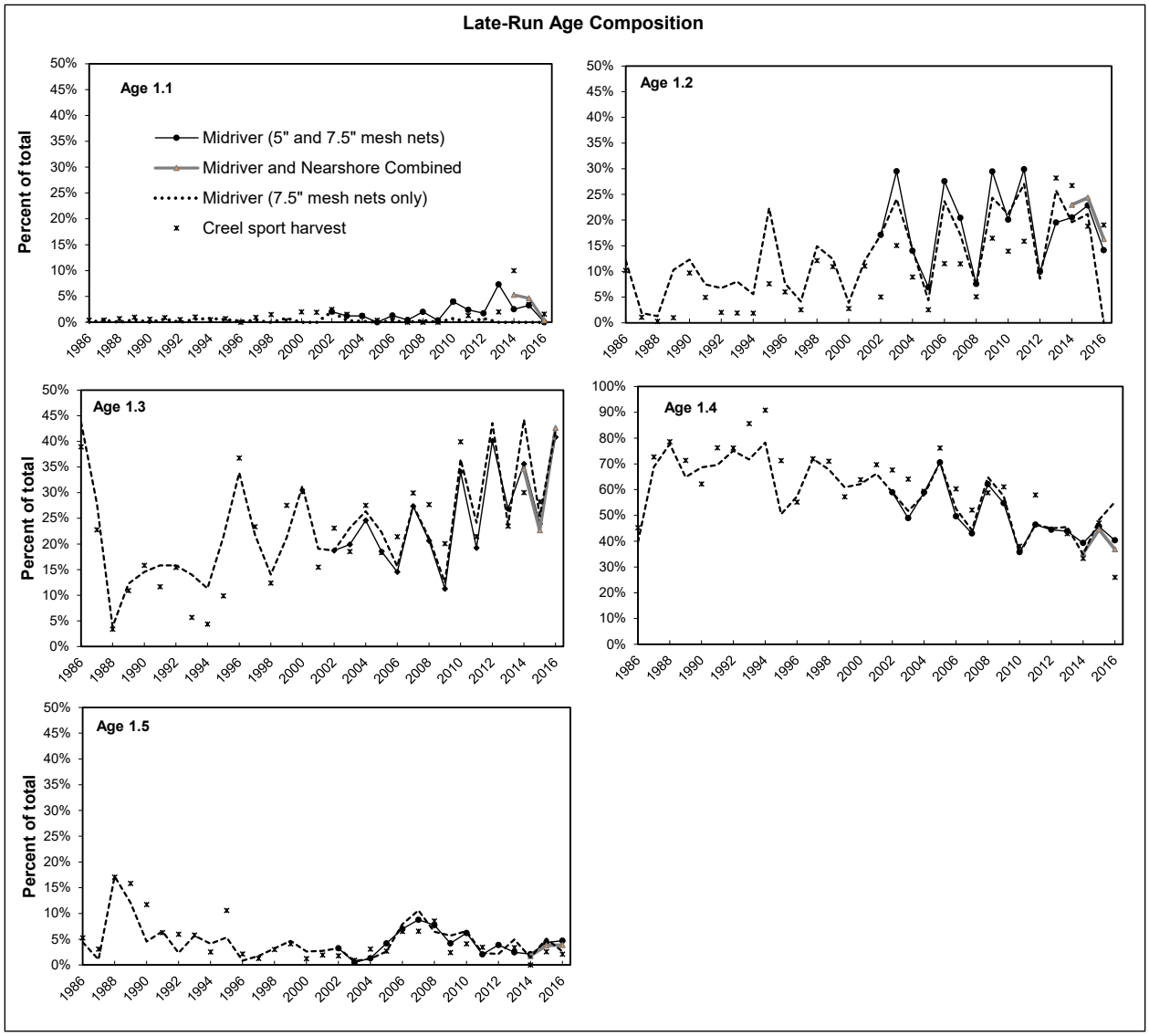

Figure 15.–Age composition of late-run harvest versus inriver netting for age-1.1 (top left), age-1.2 (top right), age-1.3 (middle left), age-1.4 (middle right), and age-1.5 (bottom left) Kenai River Chinook salmon 1986–2016.

Source: Hammarstrom and Larson (1982–1984, 1986); Hammarstrom et al. (1985); Conrad and Hammarstrom (1987); Hammarstrom (1977–1981, 1988–1994); Schwager-King (1995); King (1996–1997); Marsh (1999, 2000); Reimer et al. (2002); Reimer (2003, 2004a, 2004b, 2007); Eskelin (2007, 2009–2010); Perschbacher (2012a, 2012b, 2012c, 2012d, 2014, 2015) and Perschbacher and Eskelin (2016).

Note: "Percent of total" axes differ between ages. Inriver run age compositions were derived for midriver netting samples 2002–2016 using 5.0-inch and 7.5-inch mesh nets (only 7.5-inch mesh nets were used 1986–2001), and midriver and nearshore samples 2014–2016. Age compositions of the 2012 sport fishery were unreported because the sample size goal (19 readable scales) was not met. There was no reported harvest of age-1.5 Chinook salmon during 2014.

Of the total valid-age samples, the age composition of the (191) late-run midriver gillnetting samples was 10.5% age-1.2 fish, 30.2% age-1.3 fish, 29.8% age-1.4 fish, and 3.5% age-1.5 fish; and the age composition of the (67) late-run nearshore gillnetting samples was 0.4% age-1.1 fish, 5.8% age-1.2 fish, 12.4% age-1.3 fish, 7.0% age-1.4 fish, and 0.4% age-1.5 fish (Table 7). Chinook salmon captured midriver composed 74.0% of the inriver captures; the remaining 26.0% were

captured nearshore (Table 7). Age-1.3 Chinook salmon made up the highest percentages of both midriver and nearshore fish. The majority of age-1.5 Chinook salmon (9 out of 10) were captured midriver, and the only age-1.1 Chinook salmon was captured nearshore. Overall, 56.2% of late-run Chinook salmon captured in inriver gillnets were males; the remaining 43.8% were females. A larger percentage of males was captured midriver (40.7%) than nearshore (15.5%; Table 7).

During both runs, Chinook salmon sampled for age that were captured in nearshore gillnets were smaller on average than those captured midriver (Tables 8 and 9). Chinook salmon captured during the early run were smaller on average (776 mm) than those captured during the late run (861 mm).

Table 8.–Early-run Kenai River Chinook salmon lengths by age and sex from midriver, nearshore, and combined gillnet samples at RM 8.6, 16 May–30 June 2016.

			Age					
Source	Sex	Parameter	1.1	1.2	1.3	1.4	1.5	Combined
Midriver								
	Female							
		Sample size	0	1	13	13	1	28
		Mean length (SE)	–	645	837 (14)	947 (9)	1,020	888 (16)
		Min–max lengths	–	645	740–920	880–1,000	1,020	645–1,020
	Male							
		Sample size	6	23	31	8	0	68
		Mean length (SE)	442 (20)	643 (7)	807 (12)	978 (21)	–	739 (18)
		Min–max lengths	350–480	565–695	370–930	870–1,060	–	350–1,060
	Both							
		Sample size	6	24	44	21	1	96
		Mean length (SE)	442 (20)	643 (7)	815 (9)	959 (10)	1,020	782 (15)
		Min–max lengths	350–480	565–695	670–930	870–1,060	1,020	350–1,060
Nearshore								
	Female							
		Sample size	0	0	10	4	0	14
		Mean length (SE)	–	–	782 (22)	939 (15)	–	826 (25)
		Min–max lengths	–	–	700–900	915–980	–	700–980
	Male							
		Sample size	1	14	15	3	0	33
		Mean length (SE)	435	642 (12)	791 (20	1,031 (13	–	737 (24)
		Min–max lengths	435	570–720	660–930	1,000–1,040	–	435–1,040
	Both							
		Sample size	1	14	25	7	0	47
		Mean length (SE)	435	642 (12)	787 (15)	971 (18)	–	764 (19)
		Min–max lengths	435	570–720	660–930	915–1,040	–	435–1,040
Combined								
	Female							
		Sample size	0	1	23	17	1	42
		Mean length (SE)	–	645	813 (13)	945 (8)	1,020	867 (14)
		Min–max lengths	–	645	700–920	880–1,000	1,020	645–1,020
	Male							
		Sample size	7	37	46	11	0	101
		Mean length (SE)	441 (17)	643 (6)	801 (10)	987 (16)	–	738 (15)
		Min–max lengths	350–480	565–720	660–930	870–1,060	–	350–1,060
	Both							
		Sample size	7	38	69	28	1	143
		Mean length (SE)	441 (17)	643 (6)	805 (8)	962 (9)	1,020	776 (12)
		Min–max lengths	350–480	565–720	660–930	870–1,060	1,020	350–1,060

Note: All lengths were measured in millimeters from mid eye to tail fork. An en dash means not applicable.

Table 9.–Late-run Kenai River Chinook salmon lengths by age and sex from midriver, nearshore, and combined gillnet samples at RM 8.6, 1 July–20 August 2016.

			Age					
Source	Sex	Parameter	1.1	1.2	1.3	1.4	1.5	Combined
Midriver								
	Female							
		Sample size	0	0	37	44	5	86
		Mean length (SE)	–	–	875 (6)	944 (5)	1,056 (20)	921 (6)
		Min–max lengths	–	–	805–955	890–1,035	1,015–1,125	805–1,125
	Male							
		Sample size	0	27	41	33	4	105
		Mean length (SE)	–	642 (10)	802 (12)	1,001 (12)	1,171 (17)	837 (16)
		Min–max lengths	–	520–730	640–945	900–1,200	1,130–1,205	520–1,205
	Both							
		Sample size	0	27	78	77	9	191
		Mean length (SE)	–	642 (10)	837 (8)	968 (7)	1,107 (24)	875 (10)
		Min–max lengths	–	520–730	640–955	890–1,200	1,015–1,205	520–1,205
Nearshore								
	Female							
		Sample size	0	0	14	13	0	27
		Mean length (SE)	–	–	893 (9)	933 (9)	–	913 (7)
		Min–max lengths	–	–	815–950	890–990	–	815–990
	Male							
		Sample size	1	15	18	5	1	40
		Mean length (SE)	420	640 (12)	801 (15)	961 (19)	1,170	760 (23)
		Min–max lengths	420	545–695	705–920	900–1,000	1,170	420–1,170
	Both							
		Sample size	1	15	32	18	1	67
		Mean length (SE)	420	640 (12)	841 (13)	941 (8)	1,170	822 (17)
		Min–max lengths	420	545–695	705–950	890–1,000	1,170	420–1,170
Combined								
	Female							
		Sample size	0	0	51	57	5	113
		Mean length (SE)	–	–	880 (5)	941 (4)	1,056 (20)	919 (5)
		Min–max lengths	–	–	805–955	890–1,035	1,015–1,125	805–1,125
	Male							
		Sample size	1	42	59	38	5	145
		Mean length (SE)	420	641 (8)	802 (10)	996 (11)	1,171 (14)	816 (14)
		Min–max lengths	420	520–730	640–945	900–1,200	1,130–1,205	420–1,205
	Both							
		Sample size	1	42	110	95	10	258
		Mean length (SE)	420	642 (8)	838 (7)	963 (6)	1,114 (22)	861 (9)
		Min–max lengths	420	520–730	640–955	890–1,200	1,015–1,205	420–1,205

Note: All lengths were measured in millimeters from mid eye to tail fork. An en dash means not applicable.

CHINOOK SALMON AGE COMPOSITION COMPARISONS FOR INRIVER NETTING AND SPORT FISHERY HARVEST

The age composition of Chinook salmon captured in midriver gillnets did not differ significantly from the age composition of those captured nearshore during the early run ($\chi^2 = 1.29$, df = 2, $P = 0.52$) nor during the late run ($\chi^2 = 5.01$, df = 2, $P = 0.08$; Tables 6 and 7). Age-1.3 Chinook salmon were captured in the highest proportions during both the early run (Table 6) and late run (Table 7).

The age compositions of Chinook salmon captured in gillnets during the early and late runs was significantly different ($\chi^2 = 14.50$, df = 2, $P < 0.01$; Tables 6 and 7). The 1.1-, 1.2-, and 1.3-age classes composed the highest proportions of early-run Chinook salmon (4.9%, 26.6%, and 48.3%, respectively), whereas the 1.3, 1.4, and 1.5 age classes composed the highest proportions of late-run Chinook salmon (42.6%, 36.8%, and 3.9%, respectively).

The age compositions of the late-run Chinook salmon sport harvest upstream and downstream of the RM 13.7 sonar were not significantly different ($\chi^2 = 0.008$, df = 5, $P = 0.99$; Table 4). The overall age composition of the late-run sport harvest was significantly different than the RM 8.6 late-run gillnetting ($\chi^2 = 6.07$, df = 2, $P = 0.47$; Tables 4 and 7).

CHINOOK SALMON LENGTH COMPOSITION COMPARISONS AMONG MIDRIVER NETTING, NEARSHORE NETTING, AND TRIBUTARY WEIRS

During the early run, the length distribution of all Chinook salmon sampled for length in nearshore nets (60) was compared to the 109 Chinook salmon sampled for length in midriver nets (Figure 16). There was no significant difference between the 2 length distributions ($D = 0.15$, $P = 0.35$; Figure 17).

During the late run, the length distribution of all Chinook salmon sampled for length in nearshore nets (81) was compared to the 215 Chinook salmon sampled for length in midriver nets (Figure 18). A significant difference ($D = 0.19$, $P = 0.03$) between the 2 length distributions was observed (Figure 19).

The length distribution of all early-run Chinook salmon sampled for length in nearshore and midriver nets at RM 8.6 ($n = 169$) was compared to the length distribution of 847 Chinook salmon sampled for length by the USFWS at the Killey River and Funny River weirs (Figure 20); there was a significant difference ($D = 0.27$, $P < 0.001$) between these 2 length distributions.

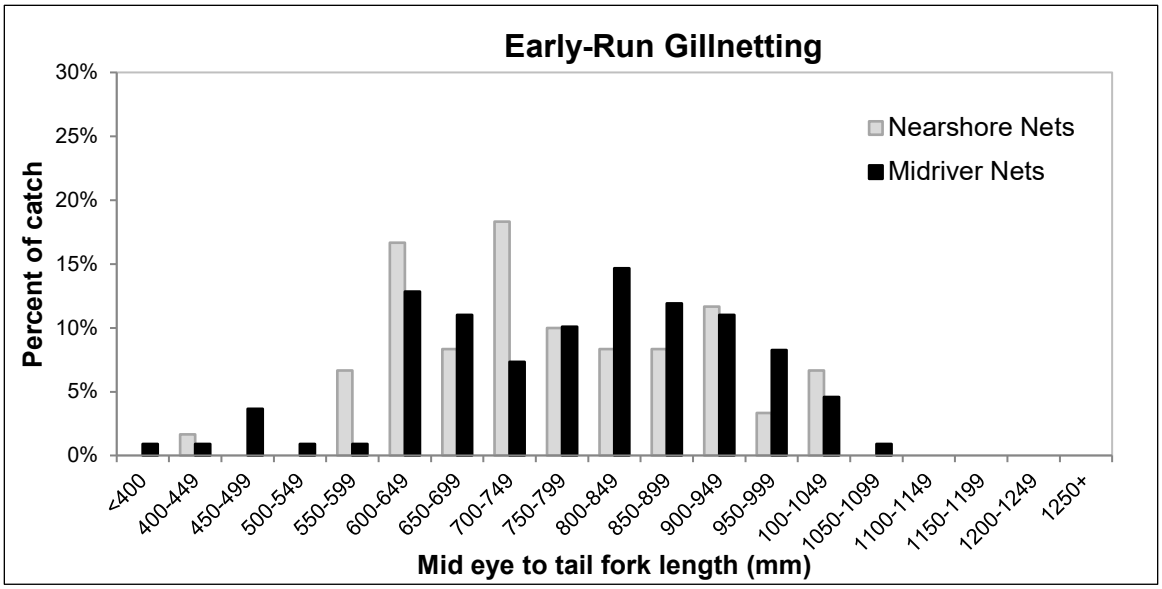

Figure 16.–Length compositions of early-run Chinook salmon caught in midriver and nearshore nets at RM 8.6 in 2016.

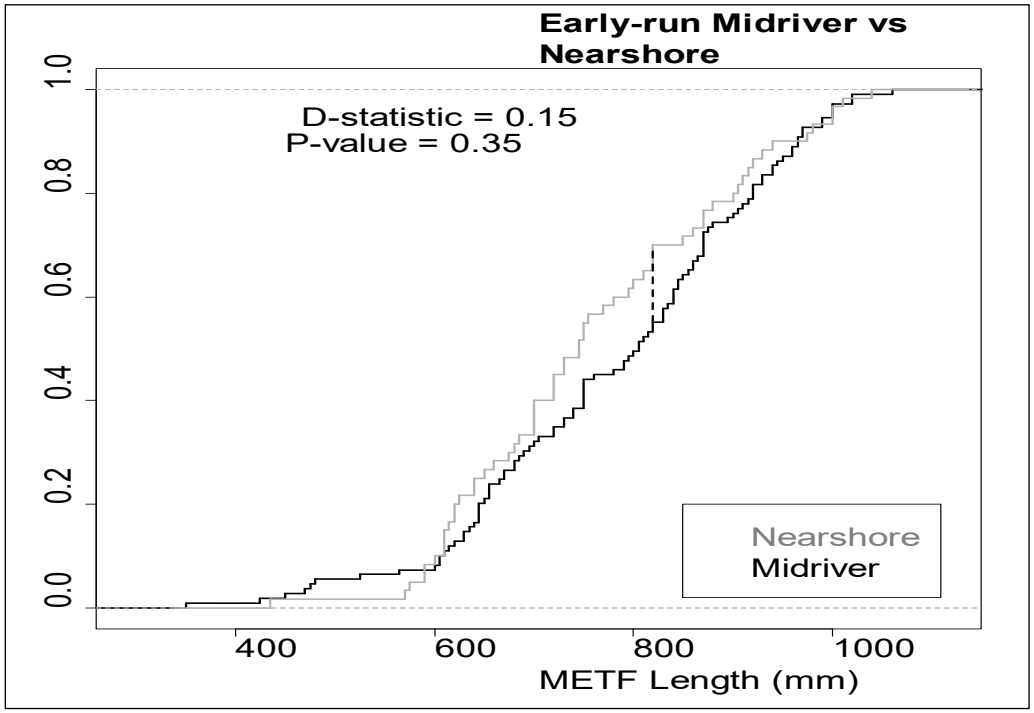

Figure 17.–Kolmogorov-Smirnov test between early-run Chinook salmon captured midriver and nearshore at RM 8.6, 2016.

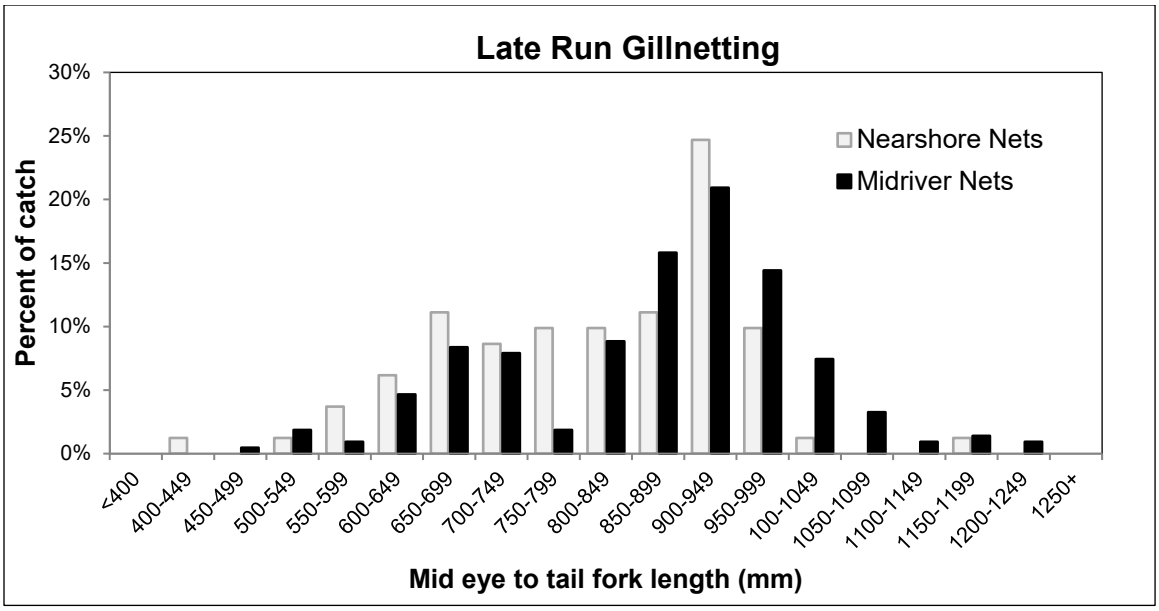

Figure 18.–Length compositions of late-run Chinook salmon caught in midriver and nearshore nets at RM 8.6, 2016.

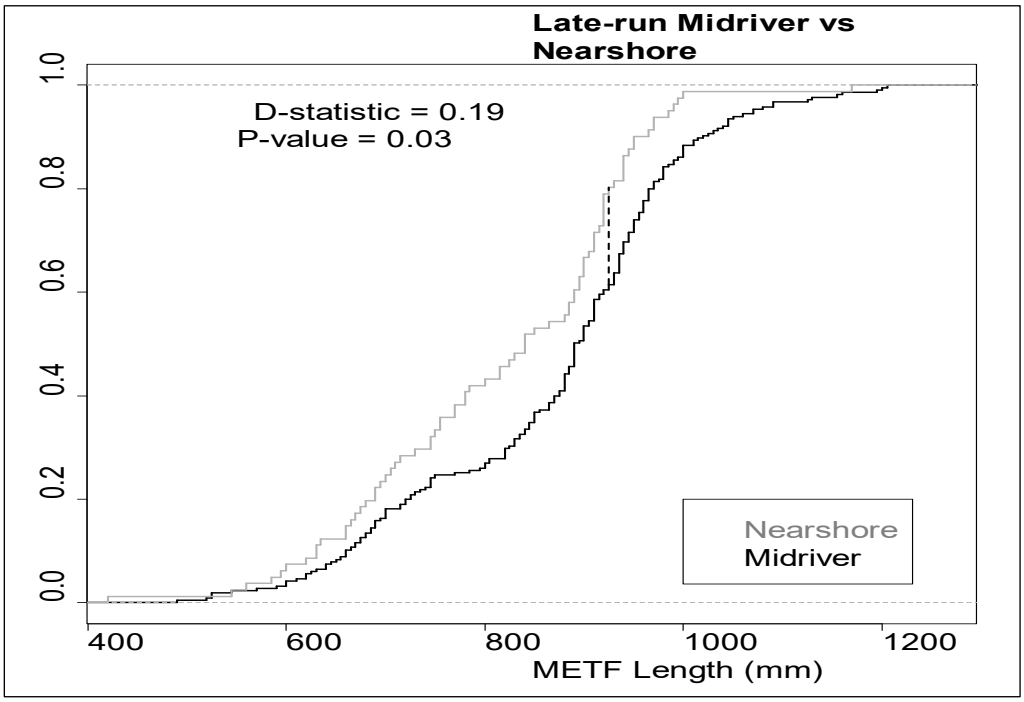

Figure 19.–Kolmogorov-Smirnov test between late-run Chinook salmon captured midriver and nearshore at RM 8.6, 2016.

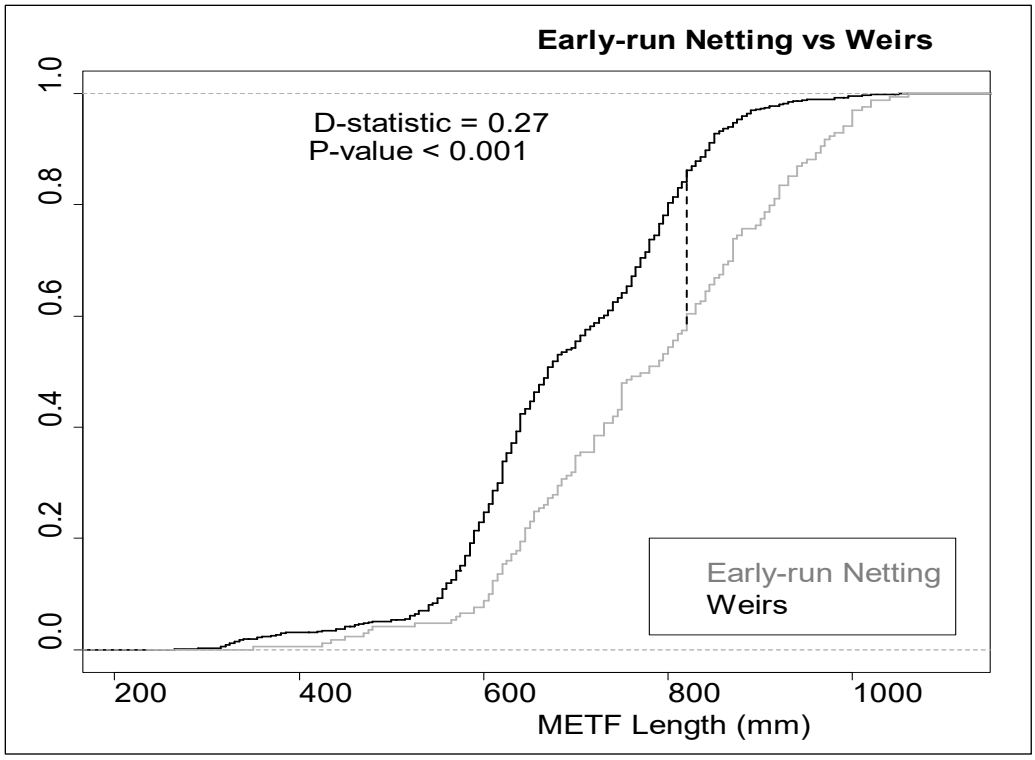

Figure 20.–Kolmogorov-Smirnov test between early-run Chinook salmon captured midriver and nearshore at RM 8.6 versus Chinook salmon sampled at tributary weirs, 2016.

PILOT STUDY MESH-SIZE COMPARISONS

Note that in the results given below, because effort was split between 6.0-inch and 6.25-inch mesh due to a limited amount of 6.0-inch web, the results for the 6.0-inch and 6.25-inch mesh nets were combined and are reported as 6-inch mesh hereafter.

Chinook Salmon

During the early run, the length compositions were compared between Chinook salmon captured in the traditional inriver-netting study using the 5.0-inch and 7.5-inch mesh nets (Figure 21, right 2 figures), and those captured in the pilot study using 4.0-inch and 6-inch mesh nets (Figure 21, left 2 figures).

The largest range of size distributions of Chinook salmon were captured with the smaller 4.0-inch (300–999 mm METF) and 5.0-inch (350–1,100 mm METF) mesh nets (Figure 21). The 4.0-inch mesh net theoretically captured the least biased length composition of Chinook salmon because it effectually serves as a tangle net for all sizes of Chinook salmon, whereas the 5.0-inch mesh net captured relatively few smaller Chinook salmon (<600 mm METF) despite being fished twice as much as the 4.0-inch tangle net (Table 10). Chinook salmon captured in the 7.5-inch mesh net ranged from 550 to 1,050 mm METF, with a majority of Chinook salmon >800 mm METF and only 1 Chinook salmon <600 mm METF (Figure 21).

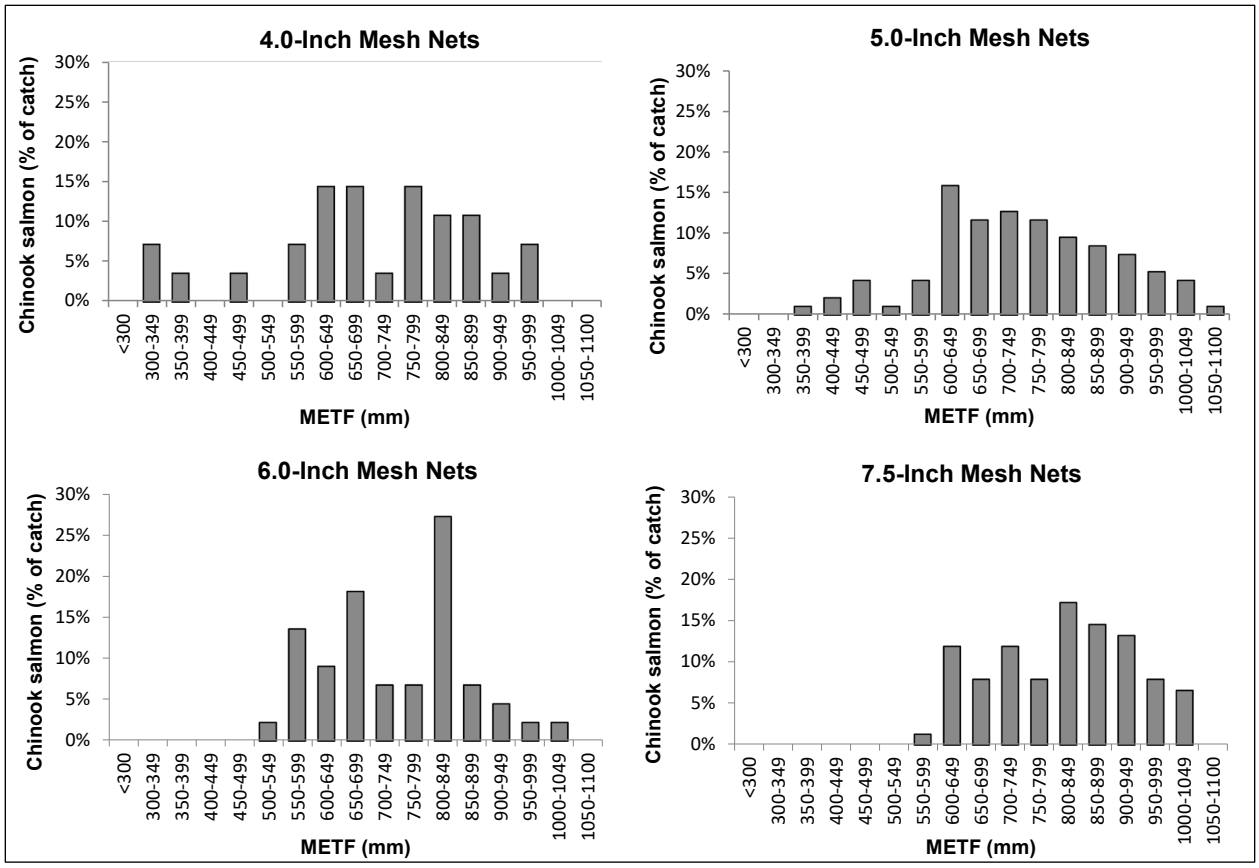

Figure 21.–Length distributions of early-run Chinook salmon caught in 4.0-inch (top left), 5.0-inch (top right), 6-inch (bottom left), and 7.5-inch (bottom right) mesh nets during the inriver netting and pilot study, 2016.

Table 10.–Chinook and sockeye salmon catch and CPUE (catch per drift minutes) by mesh size during the early run, 2016.

Mesh size	Drift minutes	Number of Chinook captured	Chinook CPUE	Number of sockeye captured	Sockeye CPUE
4.0-inch	1605	28	0.017	257	0.160
5.0-inch	3764	95	0.025	306	0.081
6-inch	2157	44	0.020	170	0.079
7.5-inch	3764	76	0.020	170	0.045

For each mesh size, condition of capture was rated from most harmful (i.e., gilling or mouthclamp, which can damage the gills or deprive the fish of oxygen) to least harmful (i.e., net wrapped around the body (or fins) or by the teeth (Figure 22). The percentage of Chinook salmon captured by gilling was the lowest in the 4.0-inch mesh tangle net and 5.0-inch mesh net (4.0% and 18.0%, respectively), followed by the 6-inch (25%) and 7.5-inch (27%) mesh nets. The percentage of Chinook salmon captured by the teeth (least harmful) was the highest using the 4.0-inch tangle net (43%) followed by the 5.0-inch (27%), 6-inch (20%), and 7.5-inch (19%) mesh nets. Across all mesh sizes, more Chinook salmon were captured by the body (44%) and the teeth (25%) than by gilling (21%) and mouthclamps (10%).

Catch rates for Chinook salmon were the highest with the 5.0-inch mesh nets (approximately 0.025 fish per minute), followed by the 6-inch and 7.5-inch (both 0.020) mesh nets; the 4.0-inch tangle net had the lowest CPUE (0.017; Table 10).

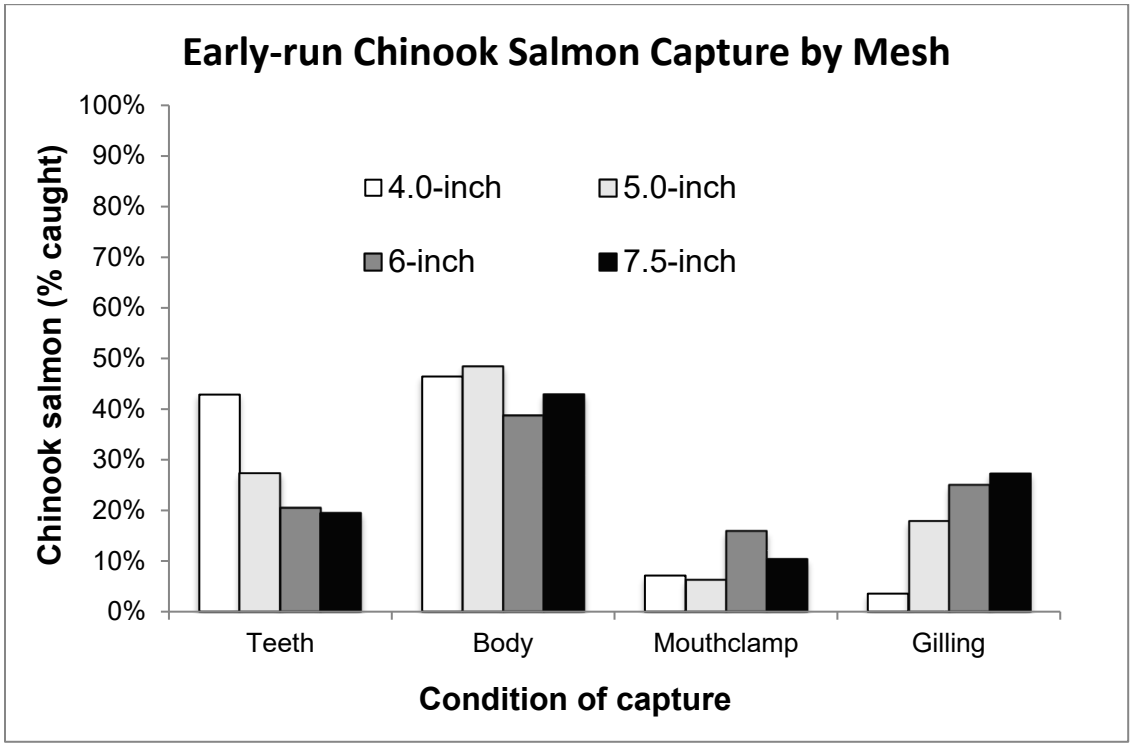

Figure 22.–Comparisons of condition of capture for early-run Chinook salmon in gillnets by mesh size, 2016.

Sockeye Salmon

As with early-run Chinook salmon, the condition of capture rated from most harmful (gilled, mouthclamp) to least harmful (body, teeth) was compared (for both runs) between sockeye salmon captured in the inriver netting study with the 5.0-inch and 7.5-inch mesh nets versus those captured in the pilot study with the 4.0-inch and 6-inch mesh nets (Figure 23).

During the early run, all mesh sizes captured their highest percentage of sockeye salmon by the body (Figure 23). The mesh size with the highest percentage of catch by the body (69%) was the 6-inch mesh, followed by 66% in the 7.5-inch mesh, 47% in the 5.0-inch, and 39% in the 4.0-inch tangle net. The 4.0-inch mesh size had the highest percentage of fish captured by the teeth (23%), whereas the 5.0-inch mesh net had the highest percentage of sockeye salmon captured by the gills (35%). The 4.0-inch net also had the highest proportion of sockeye salmon captured by mouthclamp (25%) followed by 14% in the 7.5-inch net, 10% in the 5.0-inch net, and 7% in the 6-inch mesh nets.

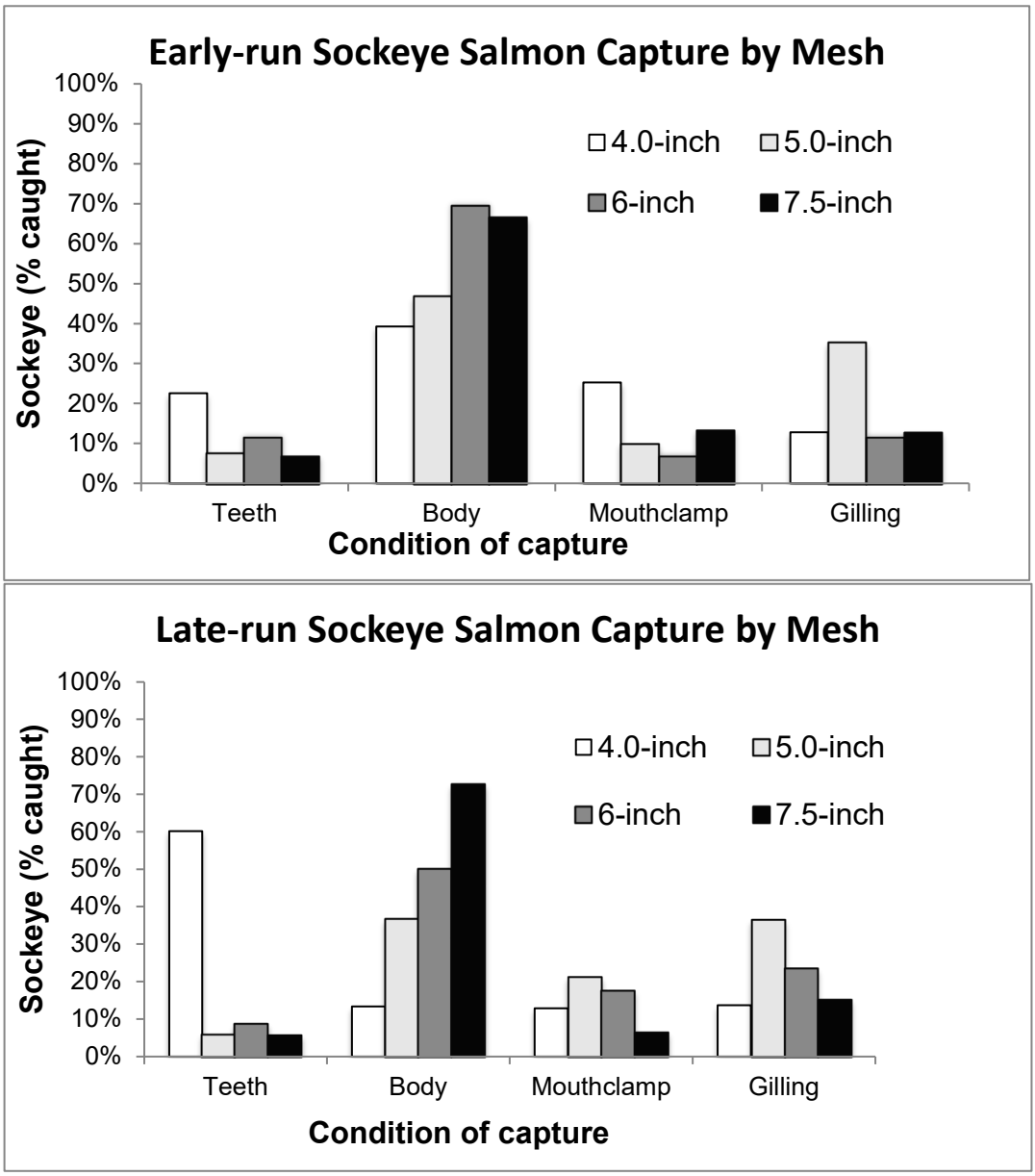

Figure 23.–Comparisons of capture condition for early- and late-run sockeye salmon in gillnets by mesh size, 2016.

During the late run, the mesh size with the highest percentage of sockeye salmon captured by the teeth (60%) was the 4.0-inch tangle net, followed by approximately equal proportions 6–9% in the 5.0-, 6-, and 7.5-inch mesh nets (Figure 23). The mesh size with the highest percentage of sockeye salmon captured by the gills (36%) was the 5.0-inch net, followed by approximately 15% in the 4.0-, 6-, and 7.5-inch mesh nets. The highest percentage of sockeye salmon captured by mouthclamp (21%) was with the 5.0-inch net, followed by 13% in the 4.0-, and 6-inch nets, and 7% in the 7.5-inch mesh nets. The mesh size with the highest percentage of sockeye salmon captured by the body (72%) was the 7.5-inch mesh, followed by the 64% in the 6-inch, 37% in the 5.0-inch, and 13% in the 4.0-inch mesh tangle net.

ENVIRONMENTAL VARIABLES

Average daily Kenai River discharge during 2016, measured by USGS at the Soldotna Bridge, was above the historical average (1965–2015) during both the early and late runs. During the early run, discharge measurements averaged 11,478 ft^3/s vs. the historical average of 7,227 ft^3/s, and the late run averaged 17,233 ft^3/s compared to the historical average of 14,029 ft^3/s (Figure 24).

Average daily Secchi disk measurements at the RM 8.6 netting site during 2016 were equal to the historical (1998–2015) average during both the early run (0.6 m compared to 0.6 m, respectively), and the late run (0.7 m compared to 0.7 m, respectively; Figure 24). The average Secchi disk measurements collected at RM 15.3 during the creel survey of the sport fishery during the early and late runs were similar to the historical (1987–2015) averages collected at RM 15.3 during the early run (0.7 m compared to 0.8 m, respectively), and the late run (1.0 m compared to 0.9 m, respectively).

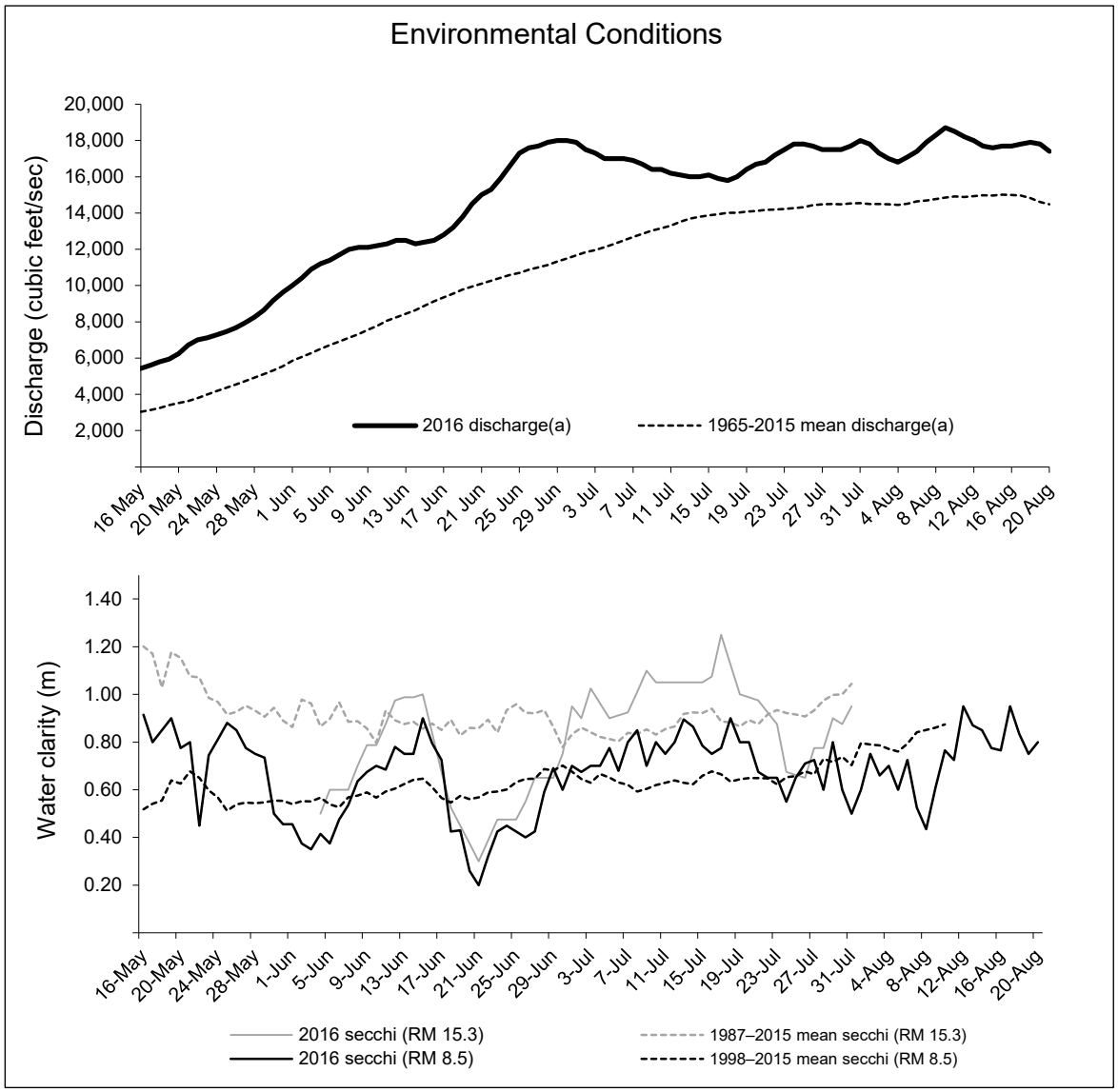

Figure 24.–Kenai River discharge (top) and water clarity (bottom), 16 May–20 August 2016.

OTHER RESULTS

Genetic tissue samples were collected from 553 Chinook salmon sampled from inriver gillnets at RM 8.6 (237 early run and 316 late run), and 223 samples were collected from the creel survey sport harvest (5 early run, 218 late run).

Esophageal implant radio transmitters were inserted into 133 Chinook salmon captured in inriver gillnets at RM 8.6 during the early run. Inferences between radiotagged Chinook salmon fates (migrants, censored, drop-outs, and regurgitation) and the mesh size they were captured in were inconclusive due to low sample sizes.

There was no reported harvest of Chinook salmon 55 inches TL or greater. The heads of 3 Chinook salmon missing the adipose fin were sent to the Mark, Tag and Age Lab in Juneau, but the heads did not have any CWTs.

DISCUSSION AND RECOMMENDATIONS

CREEL SURVEY

To achieve early- and late-run escapement goals during 2016, inseason management actions were imposed to restrict harvest of Kenai River Chinook salmon monitored by the creel survey. The early run has been closed or restricted to catch-and-release fishing since 2013. The use of bait was temporarily restricted for the 2016 late run, otherwise the entire late run remained open for harvest. Prior to this (2011–2015), the late run was restricted to catch-and-release fishing or closed for at least a portion of the fishery.

During times of low abundance and fishery restrictions, guided anglers made up a greater proportion of the effort and harvest than unguided anglers. During1981–2011, guided angler effort and harvest averaged 38% and 55%, respectively (calculated from Figure 4). During 2012–2015, when late-run harvest was restricted, guided anglers averaged 62% of the angler effort and 69% of the harvest (calculated from Figure 4). In 2016, the first year since 2011 that the late-run sport fishery remained open to Chinook salmon harvest, guided angler effort and harvest returned to 33% and 51%, respectively (Table 3). In addition to angler effort, inriver abundance and fishing restrictions also affected fishing locations. Sport anglers expended more effort upstream of the RM 8.6 sonar site during years of low abundance and fishery restrictions compared to years of high abundance because fishing without bait was more effective upstream in clearer water (Perschbacher and Eskelin 2016). During 2014 and 2015, when the use of bait was restricted, sport anglers expended between 48–50% of total angler effort downstream of RM 13.7, whereas in 2016 when bait was allowed, approximately 61% of angler effort occurred downstream of RM 13.7 (Table 3).

During 2016, CPUE and HPUE (from angler interviews) could be geographically stratified (upstream and downstream of the new RM 13.7 sonar site) for the second season. This is because the RM 13.7 sonar site is located in the center of the lower Kenai River Chinook salmon fishery, and a majority of anglers interviewed spent a portion of their time fishing both upstream and downstream of the sonar site. Anglers were asked for the total hours they fished, the number of Chinook salmon released, and the number of Chinook salmon harvested with respect to their position above or below the RM 13.7 Chinook salmon sonar.

Recommendations for Creel Survey

Late-run drift-boat Mondays continue to be monitored using an index rather than being included into the regular creel survey sampling schedule due to low fishery effort and budgetary restrictions. This unique portion of the fishery should continue to be monitored annually, with periodic calibration of the index estimation method to ensure accuracy.

Continued analysis of sufficient interviews to estimate angler effort, catch, harvest, CPUE, HPUE, and age compositions relative to the RM 13.7 sonar will be required for inseason management and postseason stock assessment. Currently, sport angler-effort and Chinook salmon harvest and catch can be monitored using the existing creel survey study design, but as Chinook salmon management evolves, the creel survey should be amended to meet objectives required for effective fisheries management. With the probable introduction of a new large Chinook salmon (≥750 mm METF) escapement goal, the creel survey will need to modify angler interview questions in ensure accurate catch and harvest estimates related to a large-fish escapement goal.

INRIVER GILLNETTING

The inriver gillnetting study has gone through several modifications during its tenure to capture a representative sample of Kenai River Chinook salmon (see *Introduction*). Most notably, the addition of the 5.0-inch mesh nets to the inriver gillnetting study in 2002, netting nearshore in 2014, and the use of a 4.0-inch tangle net in 2016, which has resulted in sampling higher proportions of smaller, younger Chinook salmon that would have been unaccounted for.

Nearshore netting continued to be more complicated for the netting crew than netting midriver because it is more hazardous and therefore shorter drifts were required to avoid submerged trees from eroded banks, especially along the left bank. Chinook salmon catch rates with respect to tidal stage during the early and late run were similar during 2014–2016, with higher catches occurring during rising and falling tides compared to other tide stages. Although catch rates varied, length and age compositions of Chinook salmon were similar regardless of the tide stage they were captured.

Results for KS tests between midriver and nearshore length compositions have varied during 2013–2016, but overall, the average lengths of Chinook salmon captured nearshore have been smaller than those captured midriver for both runs in all 4 years. KS tests between length distributions of early-run Chinook salmon captured in netting vs. those sampled at the USFWS tributary weirs found that larger fish were captured in the netting program, suggesting mesh sizes could be a contributing factor.

In 2016, condition of capture by mesh size was recorded for Chinook and sockeye salmon for the first time. The 4.0-inch mesh tangle net was the most effective at safely capturing early-run Chinook salmon by the teeth and body, and least effective at harmful capture by gilling or mouthclamp. With respect to sockeye salmon, the 4.0-inch mesh captured a higher percentage of smaller early-run fish by mouthclamp, and was most effective at capturing the more abundant, larger late-run sockeye salmon by the teeth. The pilot study and inriver netting study show that the widest range of Chinook salmon lengths was captured by the smaller meshed nets (4.0-inch tangle net and 5.0-inch mesh net). The 4.0-inch mesh net captured Chinook salmon 400 mm and greater, although the netting crew observed that the largest Chinook salmon had more of a tendency to escape the 4.0-inch tangle net. The largest 7.5-inch mesh captured the fewest small Chinook

salmon and appeared to capture some of the largest Chinook salmon, which tend to roll out of the 4.0-inch mesh.

The primary goal of the inriver netting program is to capture a representative ASL sample of returning Chinook salmon. Previous efforts to relate proportions of Chinook salmon to other species of salmon for sonar-related inriver abundance estimation is no longer a secondary objective as it was prior to 2015. Incidentally, the addition of the 5.0-inch mesh in 2002 improved the estimation of ASL composition of Chinook salmon but was an ideal mesh size for capturing the more abundant sockeye salmon by the gills, which was not desired. Most of the effort at the 5.0-inch mesh nets by the netting crew was spent untangling sockeye salmon, especially during the more abundant late run. The pilot-study identified that no single mesh size is perfect for catching all sizes of Chinook salmon while reducing incidental mortality by gilling, but replacing the 5.0-inch mesh with the 4.0-inch mesh might improve capturing a representative sample of Chinook salmon while spending less effort untangling gilled sockeye salmon. CPUE rates increased for sockeye salmon with the 4.0-inch mesh, but because the majority were captured by the teeth, less crew effort was spent releasing fish from the nets, which reduced incidental harm.

Recommendations for Inriver Gillnetting

Continued analysis of length and age compositions of Chinook salmon captured midriver and nearshore are required because RM 8.6 midriver catch information has been used to establish current escapement goals, and both nearshore and midriver catch data will be used to establish future (shoreline to shoreline) escapement goals concurrent with the RM 13.7 Chinook salmon sonar passage estimates. Although midriver and nearshore fish appear size-specific, length compositions of Chinook salmon may be biased because previous years' results were built on the framework of maintaining historical continuity during the sonar's transition from RM 8.6 to RM 13.7. Paired netting abundance and sonar abundance estimates are less relevant with advancements in size detection by the RM 13.7 ARIS sonar, and length composition estimates from inriver netting may improve without size-specific mesh sizes.

Incorporating nearshore sets into the netting study is warranted because collection of a representative ASL sample of returning Chinook salmon captured from shoreline to shoreline will align with the new RM 13.7 sonar, which insonifies the entire water column from shoreline to shoreline.

Incorporating the 4.0-inch mesh tangle net into the primary 2017 netting study would help to reduce size-selective sampling of Chinook salmon. The 4.0-inch tangle net has demonstrated that it captures a less biased length composition of early-run Chinook salmon (except possibly the largest Chinook salmon) while reducing the number of Chinook and sockeye salmon captured by gilling or mouthclamp. In 2016, insufficient information was collected during the pilot study to evaluate the length composition of late-run Chinook salmon. Incorporating the 4.0-inch mesh into the inriver netting program during a portion of the late-run is recommended to compare length compositions of late-run Chinook salmon captured in 4.0-, 5.0- and 7.5- inch mesh sizes. The method of capture and length measurements should continue to be collected for all sampled Chinook salmon and a subsample of sockeye salmon captured in all 3 mesh sizes. In addition, when possible, the length of Chinook salmon that escape or fall out of the nets should also be estimated.

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APPENDIX A: EFFORT, CATCH, AND HARVEST ESTIMATES BY GEOGRAPHIC STRATA DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2016

Appendix A1.–Estimated early-run Kenai River sport fishery effort, catch, and harvest estimates by geographic strata, between the Soldotna Bridge and Warren Ames Bridge, 4–30 June 2016.

				Downstream[b] creel estimates						Upstream[b] creel estimates					
						Chinook salmon						Chinook salmon			
				Effort		Catch		Harvest		Effort		Catch		Harvest	
Fishing periods[a]	Days open to fishing from powerboats	Sampling days	Number of interviews	Angler-hours	SE	No.	SE	No.	SE	Angler-hours	SE	No.	SE	No.	SE
4–5 June															
Guided weekend	1	1	6	54	30	4	4	–	–	36	36	4	4	–	–
Unguided weekend	2	2	7	60	13	0	0	–	–	95	40	13	9	–	–
7–12 June															
Guided weekday	4	2	10	0	0	0	0	–	–	356	123	50	20	–	–
Guided weekend	1	1	4	72	72	0	0	–	–	126	42	29	27	–	–
Unguided weekday	4	2	4	110	41	0	0	–	–	50	38	4	4	–	–
Unguided weekend	2	2	8	105	80	7	9	–	–	220	82	94	40	–	–
14–19 June															
Guided weekday	4	2	17	256	133	0	0	–	–	760	222	52	27	–	–
Guided weekend	1	1	40	172	70	4	4	4	4	640	291	4	4	4	4
Unguided weekday	4	2	2	200	75	0	0	–	–	360	83	0	0	–	–
Unguided weekend	2	2	23	570	93	9	10	9	10	545	136	0	0	9	10
21–26 June															
Guided weekday	4	2	10	208	61	0	0	0	0	312	130	4	4	0	0
Guided weekend	1	1	8	174	66	0	0	0	0	66	30	2	2	0	0
Unguided weekday	4	2	9	320	124	0	0	0	0	510	169	0	0	0	0
Unguided weekend	2	2	19	200	68	3	3	0	0	165	51	0	0	0	0
28–30 June															
Guided weekday	3	1	4	450	10	0	0	0	0	882	156	95	42	95	42
Unguided weekday	3	1	16	270	53	7	4	0	0	255	112	0	0	0	0
Day type subtotals															
Guided weekday	15	7	41	914	204	0	0	0	0	2,310	631	201	93	95	42
Guided weekend	4	4	58	472	124	8	6	4	4	868	298	38	27	4	4
Unguided weekday	15	7	31	900	294	7	4	0	0	1,175	402	4	4	0	0
Unguided weekend	8	8	57	935	141	19	14	9	10	1,025	171	107	42	0	0

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Fishing periods[a]	Days open to fishing from powerboats	Sampling days	Number of interviews	Downstream[b] creek estimates						Upstream[b] creek estimates					
						Chinook salmon						Chinook salmon			
				Effort		Catch		Harvest		Effort		Catch		Harvest	
				Angler-hours	SE	No.	SE	No.	SE	Angler-hours	SE	No.	SE	No.	SE
Angler type subtotals															
Guided	19	11	99	1,386	239	8	6	4	4	3,178	698	240	97	99	42
% Guided	45%	42%	53%	43%	–	23%	–	29%	–	59%	–	68%	–	100%	–
Unguided	23	15	88	1,835	326	26	15	9	10	2,200	437	111	42	0	0
% Unguided	55%	58%	47%	57%	–	77%	–	71%	–	41%	–	32%	–	0%	–
Early-run total	42	26	187	3,221	404	33	16	13	11	5,378	823	351	105	99	42

Note: An en dash means not applicable.

[a] Emergency order prohibited all Chinook salmon fishing 1 May to 3 June and was closed to harvest of Chinook salmon 4 to 17 June.

[b] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar site to Soldotna Bridge.

Appendix A2.–Estimated late-run Kenai River sport fishery effort, catch, and harvest estimates by geographic strata, between the Soldotna Bridge and Warren Ames Bridge, 1–31 July 2016.

Fishing periods[a]	Days open to fishing from power-boats	Sampling days	No. of inter-views	Downstream[b] creel estimates						Upstream[b] creel estimates					
						Chinook salmon						Chinook salmon			
				Effort		Catch		Harvest		Effort		Catch		Harvest	
				Angler-hours	SE	No.	SE	No.	SE	Angler-hours	SE	No.	SE	No.	SE
1–3 July															
Guided weekday	1	1	8	272	70	0	0	0	0	644	181	65	75	65	75
Guided weekend	1	1	11	516	132	22	18	22	18	450	30	17	18	17	18
Unguided weekday	1	1	8	165	78	12	13	12	13	255	100	0	0	0	0
Unguided weekend	2	2	24	1,025	300	0	0	0	0	915	83	27	22	27	22
4–10 July															
Monday[c]	0	0	0	302	–	0	–	0	–	244	–	3	–	3	–
Guided weekday	4	2	52	1,540	292	160	73	160	73	2,620	448	354	208	198	116
Guided weekend	1	1	8	588	207	205	113	79	53	584	189	127	215	127	215
Unguided weekday	4	2	21	1,490	254	60	71	60	71	1,140	241	21	19	9	11
Unguided weekend	2	2	89	3,215	305	298	72	268	69	2,305	302	204	64	135	52
11–17 July															
Monday[c]	0	0	0	416	–	46	–	42	–	354	–	40	–	21	–
Guided weekday	4	2	89	3,848	1,018	566	153	487	131	2,852	863	628	267	548	229
Guided weekend	1	1	7	1,410	78	86	127	86	127	768	228	52	51	52	51
Unguided weekday	4	2	89	5,890	1,090	716	180	426	186	3,990	962	196	103	115	57
Unguided weekend	2	2	99	4,840	627	325	80	196	62	2,375	411	79	56	37	29
18–24 July															
Monday[c]	0	0	0	530	–	34	–	26	–	468	–	27	–	16	–
Guided weekday	4	2	59	5,996	537	332	73	282	74	3,768	957	324	165	279	138
Guided weekend	1	1	79	1,356	277	78	24	53	19	820	267	54	25	48	23
Unguided weekday	4	2	127	11,400	1,833	556	298	477	298	6,830	1,362	275	113	240	92
Unguided weekend	2	2	137	5,295	644	205	65	145	50	2,770	418	117	55	95	48

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Fishing periods[a]	Days open to fishing from power-boats	Sampling days	No. of inter-views	Downstream[b] creek estimates						Upstream[b] creek estimates					
						Chinook salmon						Chinook salmon			
				Effort		Catch		Harvest		Effort		Catch		Harvest	
				Angler-hours	SE	No.	SE	No.	SE	Angler-hours	SE	No.	SE	No.	SE
25–31 July															
Monday[c]	0	0	0	406	–	10	–	7	–	322	–	21	–	18	–
Guided weekday	4	2	37	5,108	933	367	205	367	205	2,380	183	110	63	110	63
Guided weekend	1	1	34	1,776	228	140	48	140	48	690	102	49	26	31	27
Unguided weekday	4	2	135	8,510	957	297	110	259	109	4,960	615	334	113	258	100
Unguided weekend	2	2	142	5,780	696	257	64	192	53	2,845	280	97	56	78	54
Day type subtotals															
Mondays[c]	0	0	0	1,654	–	90	–	75	–	1,388	–	91	–	58	–
Guided weekday	17	9	245	16,764	1,512	1,425	276	1,296	265	12,264	1,388	1,481	389	1,200	308
Guided weekend	5	5	139	5,646	442	532	179	381	148	3,312	413	299	225	275	225
Unguided weekday	17	9	380	27,455	2,352	1,641	372	1,233	375	17,175	1,796	826	191	622	148
Unguided weekend	10	10	491	20,155	1,215	1,085	141	801	118	11,210	722	524	118	372	96
Angler type subtotals															
Guided	22	14	384	22,410	1,575	1,957	329	1,677	303	15,576	1,448	1,780	449	1,475	381
% Guided	45%	42%	31%	32%	–	42%	–	45%	–	35%	–	57%	–	60%	–
Unguided[d]	27	19	871	47,610	2,648	2,725	398	2,034	393	28,385	1,936	1,350	224	994	176
% Unguided	55%	58%	69%	68%	–	58%	–	55%	–	65%	–	43%	–	40%	–
Late-run total[d]	49	33	1,255	70,020	3,081	4,683	516	3,712	497	43,961	2,418	3,130	502	2,469	420

Note: An en dash means not applicable.

[a] Emergency order prohibited the use of bait 1–24 July.

[b] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar site to Soldotna Bridge.

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

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

APPENDIX B: DAILY EFFORT, CATCH, HARVEST, CPUE, AND HPUE ESTIMATES BY GEOGRAPHIC STRATA AND ANGLER TYPE DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2016

Appendix B1.–Daily estimates of unguided boat angler effort, catch, and harvest, by geographic stratum, during the early-run Kenai River Chinook salmon sport fishery, 4 May–30 June 2016.

		Downstream[b] creel estimates						Upstream[b] creel estimates						Combined totals					
		Effort		Catch		Harvest		Effort		Catch		Harvest		Effort		Catch		Harvest	
Date	Day type[a]	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
4 Jun	WE	15	12	0	0	0	0	50	37	7	8	0	0	65	39	7	8	0	0
5 Jun	WE	45	4	0	0	0	0	45	15	6	6	0	0	90	15	6	6	0	0
7 Jun	WD	40	9	0	0	0	0	25	9	2	2	0	0	65	13	2	2	0	0
8 Jun	WD	15	12	0	0	0	0	0	0	0	0	0	0	15	12	0	0	0	0
9 Jun	WD[c]	28	–	0	–	0	–	13	–	1	–	0	–	40	–	1	–	0	–
10 Jun	WD[c]	28	–	0	–	0	–	13	–	1	–	0	–	40	–	1	–	0	–
11 Jun	WE	15	17	1	2	0	0	100	41	43	22	0	0	115	45	44	22	0	0
12 Jun	WE	90	78	6	9	0	0	120	71	51	34	0	0	210	106	57	35	0	0
14 Jun	WD[c]	50	–	0	–	0	–	90	–	0	–	0	–	140	–	0	–	0	–
15 Jun	WD	30	8	0	0	0	0	90	31	0	0	0	0	120	32	0	0	0	0
16 Jun	WD[c]	50	–	0	–	0	–	90	–	0	–	0	–	140	–	0	–	0	–
17 Jun	WD	70	33	0	0	0	0	90	50	0	0	0	0	160	60	0	0	0	0
18 Jun	WE	400	84	9	10	9	10	430	119	0	0	0	0	830	146	9	10	9	10
19 Jun	WE	170	41	0	0	0	0	115	64	0	0	0	0	285	76	0	0	0	0
21 Jun	WD	50	22	0	0	0	0	165	90	0	0	0	0	215	93	0	0	0	0
22 Jun	WD[c]	80	–	0	–	0	–	128	–	0	–	0	–	208	–	0	–	0	–
23 Jun	WD	110	60	0	0	0	0	90	23	0	0	0	0	200	64	0	0	0	0
24 Jun	WD[c]	80	–	0	–	0	–	128	–	0	–	0	–	208	–	0	–	0	–
25 Jun	WE	95	64	0	0	0	0	130	50	0	0	0	0	225	82	0	0	0	0
26 Jun	WE	105	22	3	3	0	0	35	10	0	0	0	0	140	24	3	3	0	0
28 Jun	WD[c]	90	–	2	–	0	–	85	–	0	–	0	–	175	–	2	–	0	–
29 Jun	WD[c]	90	–	2	–	0	–	85	–	0	–	0	–	175	–	2	–	0	–
30 Jun	WD	90	31	2	2	0	0	85	65	0	0	0	0	175	72	2	2	0	0
Minimum		15	–	0	–	0	–	0	–	0	–	0	–	15	–	0	–	0	–
Average		80	–	1	–	0	–	96	–	5	–	0	–	175	–	6	–	0	–
Maximum		400	–	9	–	9	–	430	–	51	–	0	–	830	–	57	–	9	–

Note: "Effort" is angler hours; "Catch" is fish harvested plus fish released; "Harvest" is fish kept; an en dash means not applicable.

[a] WD is weekday, and WE is weekend.

[b] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar site to Soldotna Bridge.

[c] Harvest, catch, and effort estimates for unsampled weekdays were the average harvest, catch, and effort estimates, respectively, of sampled weekdays within the same stratum.

Appendix B2.–Daily estimates of unguided boat angler CPUE and HPUE, by geographic stratum, during the early-run Kenai River Chinook salmon sport fishery, 4 May–30 June 2016.

			Downstream[c] creel estimates				Upstream[c] creel estimates				Combined totals			
			CPUE		HPUE		CPUE		HPUE		CPUE		HPUE	
Date	Day type[a]	Interviews[b]	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
4 Jun	WE	4	0.000	0.000	0.000	0.000	0.133	0.113	0.000	0.000	0.103	0.113	0.000	0.000
5 Jun	WE	3	0.000	0.000	0.000	0.000	0.133	0.113	0.000	0.000	0.067	0.113	0.000	0.000
7 Jun	WD	3	0.000	0.000	0.000	0.000	0.082	0.064	0.000	0.000	0.031	0.064	0.000	0.000
8 Jun	WD	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9 Jun	WD[d]	–	0.000	–	0.000	–	0.082	–	0.000	–	0.026	0.000	0.000	0.000
10 Jun	WD[d]	–	0.000	–	0.000	–	0.082	–	0.000	–	0.026	0.000	0.000	0.000
11 Jun	WE	4	0.067	0.081	0.000	0.000	0.429	0.128	0.000	0.000	0.381	0.152	0.000	0.000
12 Jun	WE	4	0.067	0.081	0.000	0.000	0.429	0.128	0.000	0.000	0.273	0.152	0.000	0.000
14 Jun	WD[d]	–	0.000	–	0.000	–	0.000	–	0.000	–	0.000	0.000	0.000	0.000
15 Jun	WD	2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16 Jun	WD[d]	–	0.000	–	0.000	–	0.000	–	0.000	–	0.000	0.000	0.000	0.000
17 Jun	WD	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18 Jun	WE	13	0.023	0.026	0.023	0.026	0.000	0.000	0.000	0.000	0.011	0.026	0.011	0.026
19 Jun	WE	10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21 Jun	WD	2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22 Jun	WD[d]	–	0.000	–	0.000	–	0.000	–	0.000	–	0.000	0.000	0.000	0.000
23 Jun	WD	7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24 Jun	WD[d]	–	0.000	–	0.000	–	0.000	–	0.000	–	0.000	0.000	0.000	0.000
25 Jun	WE	5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26 Jun	WE	14	0.026	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.019	0.026	0.000	0.000
28 Jun	WD[d]	–	0.024	–	0.000	–	0.000	–	0.000	–	0.012	0.000	0.000	0.000
29 Jun	WD[d]	–	0.024	–	0.000	–	0.000	–	0.000	–	0.012	0.000	0.000	0.000
30 Jun	WD	16	0.024	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.012	0.024	0.000	0.000
Minimum		0	0.000	–	0.000	–	0.000	–	0.000	–	0.000	–	0.000	–
Average		6	0.011	–	0.001	–	0.060	–	0.000	–	0.042	–	<0.001	–
Maximum		16	0.067	–	0.023	–	0.429	–	0.000	–	0.381	–	0.011	–

Note: "CPUE" is catch per unit effort (hours); "HPUE" is harvest per unit effort (hours); an en dash means not applicable.

[a] WD is weekday, and WE is weekend.

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

[c] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar site to Soldotna Bridge.

[d] Harvest, catch, and effort estimates for unsampled weekdays were the average harvest, catch, and effort estimates, respectively, of sampled weekdays within the same.

Appendix B3.–Daily estimates of guided boat angler effort, catch, and harvest, by geographic stratum, during the early-run Kenai River Chinook salmon sport fishery, 4 May–30 June 2016.

		Downstream[b] creel estimates						Upstream[b] creel estimates						Combined totals					
		Effort		Catch		Harvest		Effort		Catch		Harvest		Effort		Catch		Harvest	
Date	Day type[a]	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
4 Jun	WE	54	30	4	4	0	0	36	36	4	4	0	0	90	47	8	6	0	0
7 Jun	WD	0	0	0	0	0	0	52	34	12	13	0	0	52	34	12	13	0	0
8 Jun	WD	0	0	0	0	0	0	126	30	13	5	0	0	126	30	13	5	0	0
9 Jun	WD[c]	0	–	0	–	0	–	89	–	13	–	0	–	89	–	13	–	0	–
10 Jun	WD[c]	0	–	0	–	0	–	89	–	13	–	0	–	89	–	13	–	0	–
11 Jun	WE	72	72	0	0	0	0	126	42	29	27	0	0	198	83	29	27	0	0
14 Jun	WD[c]	64	–	0	–	0	–	190	–	13	–	0	–	254	–	13	–	0	–
15 Jun	WD	28	34	0	0	0	0	252	81	8	6	0	0	280	88	8	6	0	0
16 Jun	WD[c]	64	–	0	–	0	–	190	–	13	–	0	–	254	–	13	–	0	–
17 Jun	WD	100	50	0	0	0	0	128	52	18	15	0	0	228	72	18	15	0	0
18 Jun	WE	172	70	4	4	4	4	640	291	4	4	4	4	812	300	7	6	7	6
21 Jun	WD	40	17	0	0	0	0	52	26	0	0	0	0	92	32	0	0	0	0
22 Jun	WD[c]	52	–	0	–	0	–	78	–	1	–	0	–	130	–	1	–	0	–
23 Jun	WD	64	31	0	0	0	0	104	71	2	2	0	0	168	78	2	2	0	0
24 Jun	WD[c]	52	–	0	–	0	–	78	–	1	–	0	–	130	–	1	–	0	–
25 Jun	WE	174	66	0	0	0	0	66	30	2	2	0	0	240	72	2	2	0	0
28 Jun	WD[c]	150	–	0	–	0	–	294	–	32	–	32	–	444	–	32	–	32	–
29 Jun	WD[c]	150	–	0	–	0	–	294	–	32	–	32	–	444	–	32	–	32	–
30 Jun	WD	150	6	0	0	0	0	294	90	32	24	32	24	444	90	32	24	32	24
Minimum		0	–	0	–	0	–	36	–	0	–	0	–	52	–	0	–	0	–
Average		73	–	0	–	0	–	167	–	13	–	5	–	240	–	13	–	5	–
Maximum		174	–	4	–	4	–	640	–	32	–	32	–	812	–	32	–	32	–

Note: "Effort" is angler hours; "Catch" is fish harvested plus fish released; "Harvest" is fish kept; an en dash means not applicable.

[a] WD is weekday, and WE is weekend.

[b] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar site to Soldotna Bridge.

[c] Harvest, catch, and effort estimates for unsampled weekdays were the average harvest, catch, and effort estimates, respectively, of sampled weekdays within the same stratum.

Appendix B4.–Daily estimates of guided boat angler CPUE and HPUE, by geographic stratum, during the early-run Kenai River Chinook salmon sport fishery, 4 May–30 June 2016.

			Downstream[c] creel estimates				Upstream[c] creel estimates				Combined totals			
			CPUE		HPUE		CPUE		HPUE		CPUE		HPUE	
Date	Day type[a]	Inter-views[b]	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
4 Jun	WE	6	0.072	0.071	0.000	0.000	0.104	0.061	0.000	0.000	0.085	0.094	0.000	0.000
7 Jun	WD	2	0.000	0.000	0.000	0.000	0.231	0.198	0.000	0.000	0.231	0.198	0.000	0.000
8 Jun	WD	8	0.000	0.000	0.000	0.000	0.105	0.035	0.000	0.000	0.105	0.035	0.000	0.000
9 Jun	WD[d]	–	0.000	–	0.000	–	0.142	–	0.000	–	0.142	0.000	0.000	–
10 Jun	WD[d]	–	0.000	–	0.000	–	0.142	–	0.000	–	0.142	0.000	0.000	–
11 Jun	WE	4	0.000	0.000	0.000	0.000	0.231	0.198	0.000	0.000	0.147	0.198	0.000	0.000
14 Jun	WD[d]	–	0.000	–	0.000	–	0.068	–	0.000	–	0.051	0.000	0.000	–
15 Jun	WD	12	0.000	0.000	0.000	0.000	0.032	0.022	0.000	0.000	0.028	0.022	0.000	0.000
16 Jun	WD[d]	–	0.000	–	0.000	–	0.068	–	0.000	–	0.051	0.000	0.000	–
17 Jun	WD	5	0.000	0.000	0.000	0.000	0.141	0.100	0.000	0.000	0.079	0.100	0.000	0.000
18 Jun	WE	40	0.021	0.023	0.021	0.023	0.006	0.006	0.006	0.006	0.009	0.023	0.009	0.023
21 Jun	WD	6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22 Jun	WD[d]	–	0.000	–	0.000	–	0.012	–	0.000	–	0.007	0.000	0.000	–
23 Jun	WD	4	0.000	0.000	0.000	0.000	0.018	0.018	0.000	0.000	0.011	0.018	0.000	0.000
24 Jun	WD[d]	–	0.000	–	0.000	–	0.012	–	0.000	–	0.007	0.000	0.000	–
25 Jun	WE	8	0.000	0.000	0.000	0.000	0.026	0.026	0.000	0.000	0.007	0.026	0.000	0.000
28 Jun	WD[d]	–	0.000	–	0.000	–	0.108	–	0.108	–	0.072	0.000	0.072	–
29 Jun	WD[d]	–	0.000	–	0.000	–	0.108	–	0.108	–	0.072	0.000	0.072	–
30 Jun	WD	4	0.000	0.000	0.000	0.000	0.108	0.076	0.108	0.076	0.072	0.076	0.072	0.076
Minimum		2	0.000	–	0.000	–	0.000	–	0.000	–	0.000	–	0.000	–
Average		9	0.005	–	0.001	–	0.087	–	0.017	–	0.069	–	0.012	–
Maximum		40	0.072	–	0.021	–	0.231	–	0.108	–	0.231	–	0.072	–

Note: "CPUE" is catch per unit effort (hours); "HPUE" is harvest per unit effort (hours); an en dash means not applicable.

[a] WD is weekday, and WE is weekend.

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

[c] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar site to Soldotna Bridge.

[d] Harvest, catch, and effort estimates for unsampled weekdays were the average harvest, catch, and effort estimates, respectively, of sampled weekdays within the same.

Appendix B5.–Daily estimates of unguided boat angler effort, catch, and harvest, by geographic stratum, during the late-run Kenai River Chinook salmon sport fishery, 1–31 July 2016.

		Downstream[b] creel estimates						Upstream[b] creel estimates						Combined totals					
	Day	Effort		Catch		Harvest		Effort		Catch		Harvest		Effort		Catch		Harvest	
Date	type[a]	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
1 Jul	WD	165	78	12	13	12	13	255	100	0	0	0	0	420	127	12	13	12	13
2 Jul	WE	340	155	0	0	0	0	225	72	10	12	10	12	565	171	10	12	10	12
3 Jul	WE	685	257	0	0	0	0	690	40	17	19	17	19	1,375	260	17	19	17	19
4 Jul	M	302	–	0	–	0	–	244	–	3	–	3	–	546	–	3	–	3	–
5 Jul	WD	375	68	0	0	0	0	275	153	0	0	0	0	650	167	0	0	0	0
6 Jul	WD[c]	373	–	15	–	15	–	285	–	5	–	2	–	658	–	20	–	17	–
7 Jul	WD	370	167	30	40	30	40	295	72	11	9	5	6	665	182	40	41	34	41
8 Jul	WD[c]	373	–	15	–	15	–	285	–	5	–	2	–	658	–	20	–	17	–
9 Jul	WE	1,320	124	118	42	88	38	875	234	77	38	63	35	2,195	265	195	57	152	52
10 Jul	WE	1,895	278	180	58	180	58	1,430	192	127	51	72	39	3,325	338	306	77	252	70
11 Jul	M	416	–	46	–	42	–	354	–	40	–	21	–	770	–	86	–	63	–
12 Jul	WD[c]	1,473	–	179	–	107	–	998	–	49	–	29	–	2,470	–	228	–	135	–
13 Jul	WD	1,160	132	227	62	166	49	720	236	77	40	37	30	1,880	271	305	74	203	58
14 Jul	WD[c]	1,473	–	179	–	107	–	998	–	49	–	29	–	2,470	–	228	–	135	–
15 Jul	WD	1,785	432	131	56	47	26	1,275	314	21	21	21	21	3,060	534	151	60	68	33
16 Jul	WE	1,690	268	92	39	36	26	1,195	255	16	17	16	17	2,885	370	108	42	53	32
17 Jul	WE	3,150	567	233	70	160	56	1,180	322	63	53	21	23	4,330	652	296	88	181	61
18 Jul	M	530	–	34	–	26	–	468	–	27	–	16	–	998	–	61	–	42	–
19 Jul	WD	3,405	515	236	74	218	72	2,115	469	100	43	83	40	5,520	697	336	86	300	83
20 Jul	WD[c]	2,850	–	139	–	119	–	1,708	–	69	–	60	–	4,558	–	208	–	179	–
21 Jul	WD	2,295	426	42	31	21	22	1,300	208	37	24	37	24	3,595	474	79	39	58	32
22 Jul	WD[c]	2,850	–	139	–	119	–	1,708	–	69	–	60	–	4,558	–	208	–	179	–
23 Jul	WE	2,515	264	91	44	73	39	1,295	323	43	37	21	25	3,810	417	135	58	95	46
24 Jul	WE	2,780	588	113	48	72	31	1,475	265	74	41	74	41	4,255	645	187	63	146	51
25 Jul	M	406	–	10	–	7	–	322	–	21	–	18	–	728	–	31	–	25	–
26 Jul	WD	1,840	338	40	22	30	18	1,040	164	57	25	41	21	2,880	376	98	33	71	28
27 Jul	WD[c]	2,128	–	74	–	65	–	1,240	–	84	–	64	–	3,368	–	158	–	129	–
28 Jul	WD[c]	2,128	–	74	–	65	–	1,240	–	84	–	64	–	3,368	–	158	–	129	–
29 Jul	WD	2,415	113	108	32	99	31	1,440	46	110	55	88	48	3,855	122	218	63	187	57
30 Jul	WE	2,130	385	98	40	74	34	1,065	258	30	18	10	10	3,195	464	128	44	84	35
31 Jul	WE	3,650	580	159	50	119	41	1,780	109	68	53	68	53	5,430	590	226	73	186	67

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	Downstream[b] creel estimates						Upstream[b] creel estimates						Combined totals					
	Effort		Catch		Harvest		Effort		Catch		Harvest		Effort		Catch		Harvest	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Minimum	165	–	0	–	0	–	225	–	0	–	0	–	420	–	0	–	0	–
Average	1,589	–	91	–	68	–	960	–	46	–	34	–	2,550	–	137	–	102	–
Maximum	3,650	–	236	–	218	–	2,115	–	127	–	88	–	5,520	–	336	–	300	–

Note: "Effort" is angler hours; "Catch" is fish harvested plus fish released; "Harvest" is fish kept; an en dash means not applicable.

[a] WD is weekday, WE is weekend, M is drift-boat Mondays.

[b] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar site to Soldotna Bridge.

[c] Harvest, catch, and effort estimates for unsampled weekdays were the average harvest, catch, and effort estimates, respectively, of sampled weekdays within the same stratum.

Appendix B6.–Daily estimates of unguided boat angler CPUE and HPUE, by geographic stratum, during the late-run Kenai River Chinook salmon sport fishery, 1–31 July 2016.

			Downstream[c] creel estimates				Upstream[c] creel estimates				Combined totals			
			CPUE		HPUE		CPUE		HPUE		CPUE		HPUE	
Date	Day type[a]	Inter-views[b]	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
1 Jul	WD	8	0.072	0.069	0.072	0.069	0.000	0.000	0.000	0.000	0.028	0.069	0.028	0.069
2 Jul	WE	10	0.000	0.000	0.000	0.000	0.043	0.050	0.043	0.050	0.017	0.050	0.017	0.050
3 Jul	WE	14	0.000	0.000	0.000	0.000	0.025	0.028	0.025	0.028	0.012	0.028	0.012	0.028
4 Jul	M	–	0.000	–	0.000	–	0.012	–	0.012	–	0.005	–	0.005	–
5 Jul	WD	11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6 Jul	WD[d]	–	0.040	–	0.040	–	0.019	–	0.008	–	0.031	–	0.026	–
7 Jul	WD	10	0.081	0.103	0.081	0.103	0.036	0.028	0.015	0.021	0.061	0.106	0.052	0.105
8 Jul	WD[d]	–	0.040	–	0.040	–	0.019	–	0.008	–	0.031	–	0.026	–
9 Jul	WE	36	0.089	0.031	0.067	0.028	0.088	0.036	0.073	0.035	0.089	0.048	0.069	0.045
10 Jul	WE	53	0.095	0.027	0.095	0.027	0.089	0.034	0.050	0.026	0.092	0.043	0.076	0.038
11 Jul	M	–	0.111	–	0.101	–	0.113	–	0.059	–	0.112	–	0.082	–
12 Jul	WD[d]	–	0.122	–	0.072	–	0.049	–	0.029	–	0.092	–	0.055	–
13 Jul	WD	42	0.196	0.048	0.143	0.039	0.108	0.043	0.051	0.039	0.162	0.065	0.108	0.055
14 Jul	WD[d]	–	0.122	–	0.072	–	0.049	–	0.029	–	0.092	–	0.055	–
15 Jul	WD	47	0.073	0.026	0.026	0.013	0.016	0.016	0.016	0.016	0.049	0.030	0.022	0.021
16 Jul	WE	36	0.054	0.021	0.022	0.015	0.013	0.014	0.013	0.014	0.037	0.025	0.018	0.021
17 Jul	WE	63	0.074	0.018	0.051	0.015	0.053	0.043	0.018	0.019	0.068	0.046	0.042	0.024
18 Jul	M	–	0.064	–	0.049	–	0.058	–	0.034	–	0.061	–	0.042	–
19 Jul	WD	80	0.069	0.019	0.064	0.019	0.047	0.018	0.039	0.017	0.061	0.026	0.054	0.025
20 Jul	WD[d]	–	0.049	–	0.042	–	0.040	–	0.035	–	0.046	–	0.039	–
21 Jul	WD	47	0.018	0.013	0.009	0.009	0.029	0.018	0.029	0.018	0.022	0.022	0.016	0.020
22 Jul	WD[d]	–	0.049	–	0.042	–	0.040	–	0.035	–	0.046	–	0.039	–
23 Jul	WE	57	0.036	0.017	0.029	0.015	0.034	0.027	0.016	0.019	0.035	0.032	0.025	0.024
24 Jul	WE	80	0.041	0.015	0.026	0.010	0.050	0.026	0.050	0.026	0.044	0.030	0.034	0.028
25 Jul	M	–	0.025	–	0.017	–	0.065	–	0.056	–	0.043	–	0.034	–
26 Jul	WD	70	0.022	0.011	0.017	0.010	0.055	0.022	0.039	0.019	0.034	0.025	0.025	0.021
27 Jul	WD[d]	–	0.035	–	0.030	–	0.067	–	0.052	–	0.047	–	0.038	–
28 Jul	WD[d]	–	0.035	–	0.030	–	0.067	–	0.052	–	0.047	–	0.038	–
29 Jul	WD	65	0.045	0.013	0.041	0.013	0.076	0.038	0.061	0.033	0.057	0.040	0.049	0.036
30 Jul	WE	61	0.046	0.017	0.035	0.015	0.028	0.016	0.009	0.009	0.040	0.023	0.026	0.017
31 Jul	WE	81	0.043	0.012	0.032	0.010	0.038	0.030	0.038	0.030	0.042	0.032	0.034	0.031

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	Inter-views[b]	Downstream[c] creel estimates				Upstream[c] creel estimates				Combined totals			
		CPUE		HPUE		CPUE		HPUE		CPUE		HPUE	
		Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Minimum	8	0.000	–	0.000	–	0.000	–	0.000	–	0.000	–	0.000	–
Average	46	0.056	–	0.043	–	0.046	–	0.032	–	0.052	–	0.038	–
Maximum	81	0.196	–	0.143	–	0.113	–	0.073	–	0.162	–	0.108	–

Note: "CPUE" is catch per unit effort (hours); "HPUE" is harvest per unit effort (hours); an en dash means not applicable.

[a] WD is weekday, WE is weekend, and M is drift boat Monday.

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

[c] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar site to Soldotna Bridge.

[d] Harvest, catch, and effort estimates for unsampled weekdays were the average harvest, catch, and effort estimates, respectively, of sampled weekdays within the same.

Appendix B7.–Daily estimates of guided boat angler effort, catch, and harvest, by geographic stratum, during the late-run Kenai River Chinook salmon sport fishery, 1–30 July 2016.

		Downstream[b] creel estimates						Upstream[b] creel estimates						Combined totals					
		Effort		Catch		Harvest		Effort		Catch		Harvest		Effort		Catch		Harvest	
Date	Day type[a]	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
1 Jul	WD	272	70	0	0	0	0	644	181	65	75	65	75	916	194	65	75	65	75
2 Jul	WE	516	132	22	18	22	18	450	30	17	18	17	18	966	135	39	25	39	25
5 Jul	WD	428	187	48	48	48	48	668	182	155	59	84	41	1,096	262	204	76	133	63
6 Jul	WD[c]	385	–	40	–	40	–	655	–	88	–	49	–	1,040	–	129	–	90	–
7 Jul	WD	342	6	32	10	32	10	642	258	22	15	15	12	984	258	53	18	46	15
8 Jul	WD[c]	385	–	40	–	40	–	655	–	88	–	49	–	1,040	–	129	–	90	–
9 Jul	WE	588	207	205	113	79	53	584	189	127	215	127	215	1,172	280	333	243	207	222
12 Jul	WD[c]	962	–	142	–	122	–	713	–	157	–	137	–	1,675	–	299	–	259	–
13 Jul	WD	820	303	135	57	119	51	892	344	231	102	200	88	1,712	458	367	117	319	102
14 Jul	WD[c]	962	–	142	–	122	–	713	–	157	–	137	–	1,675	–	299	–	259	–
15 Jul	WD	1,104	588	148	91	125	78	534	354	83	58	74	53	1,638	686	231	108	199	94
16 Jul	WE	1,410	78	86	127	86	127	768	228	52	51	52	51	2,178	241	138	136	138	136
19 Jul	WD	1,458	198	85	35	60	30	912	612	35	32	35	32	2,370	643	120	48	95	44
20 Jul	WD[c]	1,499	–	83	–	71	–	942	–	81	–	70	–	2,441	–	164	–	140	–
21 Jul	WD	1,540	314	81	38	81	38	972	283	126	66	104	61	2,512	422	207	76	185	72
22 Jul	WD[c]	1,499	–	83	–	71	–	942	–	81	–	70	–	2,441	–	164	–	140	–
23 Jul	WE	1,356	277	78	24	53	19	820	267	54	25	48	23	2,176	385	132	34	102	30
26 Jul	WD	1,002	150	36	23	36	23	546	18	39	35	39	35	1,548	151	75	42	75	42
27 Jul	WD[c]	1,277	–	92	–	92	–	595	–	27	–	27	–	1,872	–	119	–	119	–
28 Jul	WD[c]	1,277	–	92	–	92	–	595	–	27	–	27	–	1,872	–	119	–	119	–
29 Jul	WD	1,552	332	147	90	147	90	644	83	16	17	16	17	2,196	342	163	92	163	92
30 Jul	WE	1,776	228	140	48	140	48	690	102	49	26	31	27	2,466	250	190	55	171	55
Minimum		272	–	0	–	0	–	450	–	16	–	15	–	916	–	39	–	39	–
Average		1,019	–	89	–	76	–	708	–	81	–	67	–	1,727	–	170	–	143	–
Maximum		1,776	–	205	–	147	–	972	–	231	–	200	–	2,512	–	367	–	319	–

Note: "Effort" is angler hours; "Catch" is fish harvested plus fish released; "Harvest" is fish kept; an en dash means not applicable.

[a] WD is weekday, and WE is weekend.

[b] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar site to Soldotna Bridge.

[c] Harvest, catch, and effort estimates for unsampled weekdays were the average harvest, catch, and effort estimates, respectively, of sampled weekdays within the same stratum.

Appendix B8.–Daily estimates of guided boat angler CPUE and HPUE, by geographic stratum, during the late-run Kenai River Chinook salmon sport fishery, 1–30 July 2016.

			Downstream[c] creel estimates				Upstream[c] creel estimates				Combined totals			
			CPUE		HPUE		CPUE		HPUE		CPUE		HPUE	
Date	Day type[a]	Inter-views[b]	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
1 Jul	WD	8	0.000	0.000	0.000	0.000	0.101	0.113	0.101	0.113	0.071	0.113	0.071	0.113
2 Jul	WE	11	0.043	0.033	0.043	0.033	0.038	0.039	0.038	0.039	0.041	0.051	0.041	0.051
5 Jul	WD	13	0.113	0.100	0.113	0.100	0.233	0.062	0.126	0.051	0.186	0.117	0.121	0.112
6 Jul	WD[d]	–	0.104	–	0.104	–	0.135	–	0.076	–	0.124	–	0.086	–
7 Jul	WD	39	0.093	0.028	0.093	0.028	0.034	0.020	0.023	0.016	0.054	0.034	0.047	0.033
8 Jul	WD[d]	–	0.104	–	0.104	–	0.135	–	0.076	–	0.124	–	0.086	–
9 Jul	WE	8	0.349	0.148	0.135	0.077	0.218	0.362	0.218	0.362	0.284	0.391	0.176	0.370
12 Jul	WD[d]	–	0.147	–	0.127	–	0.220	–	0.192	–	0.178	–	0.155	–
13 Jul	WD	61	0.165	0.034	0.145	0.031	0.259	0.055	0.224	0.049	0.214	0.064	0.186	0.058
14 Jul	WD[d]	–	0.147	–	0.127	–	0.220	–	0.192	–	0.178	–	0.155	–
15 Jul	WD	28	0.134	0.041	0.113	0.036	0.155	0.035	0.139	0.037	0.141	0.054	0.121	0.052
16 Jul	WE	7	0.061	0.090	0.061	0.090	0.068	0.063	0.068	0.063	0.063	0.110	0.063	0.110
19 Jul	WD	32	0.058	0.023	0.041	0.020	0.039	0.024	0.039	0.024	0.051	0.033	0.040	0.031
20 Jul	WD[d]	–	0.055	–	0.047	–	0.086	–	0.074	–	0.067	–	0.057	–
21 Jul	WD	27	0.053	0.022	0.053	0.022	0.130	0.056	0.107	0.055	0.083	0.061	0.074	0.059
22 Jul	WD[d]	–	0.055	–	0.047	–	0.086	–	0.074	–	0.067	–	0.057	–
23 Jul	WE	79	0.058	0.013	0.039	0.011	0.065	0.022	0.059	0.021	0.061	0.025	0.047	0.024
26 Jul	WD	20	0.036	0.023	0.036	0.023	0.071	0.063	0.071	0.063	0.048	0.067	0.048	0.067
27 Jul	WD[d]	–	0.072	–	0.072	–	0.046	–	0.046	–	0.064	–	0.064	–
28 Jul	WD[d]	–	0.072	–	0.072	–	0.046	–	0.046	–	0.064	–	0.064	–
29 Jul	WD	17	0.095	0.055	0.095	0.055	0.025	0.026	0.025	0.026	0.074	0.061	0.074	0.061
30 Jul	WE	34	0.079	0.025	0.079	0.025	0.071	0.037	0.044	0.038	0.077	0.045	0.069	0.046
Minimum		7	0.000	–	0.000	–	0.025	–	0.023	–	0.041	–	0.040	–
Average		27	0.095	–	0.079	–	0.113	–	0.094	–	0.105	–	0.087	–
Maximum		79	0.349	–	0.145	–	0.259	–	0.224	–	0.284	–	0.186	–

Note: "CPUE" is catch per unit effort (hours); "HPUE" is harvest per unit effort (hours); an en dash means not applicable.

[a] WD is weekday, and WE is weekend.

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

[c] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar site; "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar site to Soldotna Bridge.

[d] Harvest, catch, and effort estimates for unsampled weekdays were the average harvest, catch, and effort estimates, respectively, of sampled weekdays within the same.

APPENDIX C: BOAT ANGLER COUNTS DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2016

Appendix C1.–Guided and unguided boat angler counts below RM 13.7 during the early-run Kenai River Chinook salmon fishery, 4 May–30 June 2016.

		Downstream[b] angler counts									
		Unguided anglers[c]					Guided anglers[c]				
Date	Day type[a]	$\bar{X}$	A	B	C	D	$\bar{X}$	A	B	C	D
4 Jun	WE	0.8	3	0	0	0	4.5	2	7	–	–
5 Jun	WE	2.3	3	2	2	2	–	–	–	–	–
7 Jun	WD	2.0	0	2	3	3	0.0	0	0	0	–
8 Jun	WD	0.8	0	0	0	3	0.0	0	0		–
11 Jun	WE	0.8	0	0	3	0	6.0	–	12	0	–
12 Jun	WE	4.5	3	15	0	0	–	–	–	–	–
15 Jun	WD	1.5	2	2	2	0	2.3	0	7	0	–
17 Jun	WD	3.5	3	0	7	4	8.3	7	15	3	–
18 Jun	WE	20.0	34	23	20	3	14.3	19	22	2	–
19 Jun	WE	8.5	14	14	6	0	–	–	–	–	–
21 Jun	WD	2.5	3	2	0	5	3.3	7	3	0	–
23 Jun	WD	5.5	4	14	4	0	5.3	12	4	0	–
25 Jun	WE	4.8	0	8	0	11	14.5	–	20	9	–
26 Jun	WE	5.3	3	6	8	4	–	–	–	–	–
30 Jun	WD	4.5	0	4	9	5	12.5	–	12	13	–
Min (All A–D)		0					0				
Average (All A–D)		4					6				
Max (All A–D)		34					22				

Note: An en dash indicates that fishing was closed for guided anglers during the time of this count and therefore there are no data to present.

[a] WD is weekday, and WE is weekend.

[b] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar site.

[c] Angler count times: A = 0400–0859 hours; B = 0900–1359 hours; C = 1400–1959 hours; D = 2000–2359; $\bar{X}$ is the average count of the 4 count times.

Appendix C2.–Guided and unguided boat angler counts above RM 13.7 during the early-run Kenai River Chinook salmon fishery, 4 May–30 June 2016.

		Upstream[b] angler counts									
		Unguided anglers[c]					Guided anglers[c]				
Date	Day type[a]	$\bar{X}$	A	B	C	D	$\bar{X}$	A	B	C	D
4 Jun	WE	2.5	9	0	0	1	3.0	6	0	–	–
5 Jun	WE	2.3	5	2	2	0	–	–	–	–	–
7 Jun	WD	1.3	3	2	0	0	4.3	9	0	4	–
8 Jun	WD	0.0	0	0	0	0	10.5	13	8	–	–
11 Jun	WE	5.0	3	9	2	6	10.5	–	14	7	–
12 Jun	WE	6.0	17	0	2	5	–	–	–	–	–
15 Jun	WD	4.5	7	1	3	7	21.0	37	22	4	–
17 Jun	WD	4.5	4	11	1	2	10.7	17	15	0	–
18 Jun	WE	21.5	47	21	15	3	53.3	116	40	4	–
19 Jun	WE	5.8	10	0	10	3	–	–	–	–	–
21 Jun	WD	8.3	24	2	4	3	4.3	10	3	0	–
23 Jun	WD	4.5	9	7	2	0	8.7	8	18	0	–
25 Jun	WE	6.5	0	4	14	8	5.5	–	8	3	–
26 Jun	WE	1.8	0	2	3	2	–	–	–	–	–
30 Jun	WD	4.3	0	0	13	4	24.5	–	32	17	–
Min (All A–D)		0					0				
Average (All A–D)		5					15				
Max (All A–D)		47					116				

Note: An en dash indicates that fishing was closed for guided anglers during the time of this count and therefore there are no data to present.

[a] WD is weekday, and WE is weekend.

[b] "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar site to the Soldotna Bridge.

[c] Angler count times: A = 0400–0859 hours; B = 0900–1359 hours; C = 1400–1959 hours; D = 2000–2359; $\bar{X}$ is the average count of the 4 count times.

Appendix C3.–Guided and unguided combined boat angler counts above and below the RM 13.7 sonar during the early-run Kenai River Chinook salmon fishery, 4 May–30 June 2016.

		Combined strata[b]									
		Unguided anglers[c]					Guided anglers[c]				
Date	Day type[a]	$\bar{X}$	A	B	C	D	$\bar{X}$	A	B	C	D
4 Jun	WE	3.3	12	0	0	1	7.5	8	7	–	–
5 Jun	WE	4.5	8	4	4	2	–	–	–	–	–
7 Jun	WD	3.3	3	4	3	3	4.3	9	0	4	–
8 Jun	WD	0.8	0	0	0	3	10.5	13	8	–	–
11 Jun	WE	5.8	3	9	5	6	16.5	–	26	7	–
12 Jun	WE	10.5	20	15	2	5	–	–	–	–	–
15 Jun	WD	6.0	9	3	5	7	23.3	37	29	4	–
17 Jun	WD	8.0	7	11	8	6	19.0	24	30	3	–
18 Jun	WE	41.5	81	44	35	6	67.7	135	62	6	–
19 Jun	WE	14.3	24	14	16	3	–	–	–	–	–
21 Jun	WD	10.8	27	4	4	8	7.7	17	6	0	–
23 Jun	WD	10.0	13	21	6	0	14.0	20	22	0	–
25 Jun	WE	11.3	0	12	14	19	20.0	–	28	12	–
26 Jun	WE	7.0	3	8	11	6	–	–	–	–	–
30 Jun	WD	8.8	0	4	22	9	37.0	–	44	30	–
Min (All A–D)		0					0				
Average (All A–D)		10					21				
Max (All A–D)		81					135				

Note: An en dash indicates that fishing was closed for guided anglers during the time of this count and therefore there are no data to present.

[a] WD is weekday, and WE is weekend.

[b] Includes the Kenai River reach from Warren Ames Bridge to the Soldotna Bridge.

[c] Angler count times: A = 0400–0859 hours; B = 0900–1359 hours; C = 1400–1959 hours; D = 2000–2359; $\bar{X}$ is the average count of the 4 count times.

Appendix C4.–Guided and unguided boat angler counts below RM 13.7 during the late-run Kenai River Chinook salmon fishery, 1–31 July 2016.

		Downstream[b] angler counts									
		Unguided anglers[c]					Guided anglers[c]				
Date	Day type[a]	$\bar{X}$	A	B	C	D	$\bar{X}$	A	B	C	D
1 Jul	WD	8.3	6	4	18	5	22.7	28	30	10	–
2 Jul	WE	17.0	7	18	37	6	43.0	–	54	32	–
3 Jul	WE	34.3	30	27	65	15	–	–	–	–	–
5 Jul	WD	18.8	26z	17	10	22	35.7	43	58	6	–
7 Jul	WD	18.5	17	13	38	6	28.5	28	29	–	–
9 Jul	WE	66.0	89	70	64	41	49.0	93	44	10	–
10 Jul	WE	94.8	144	77	84	74	–	–	–	–	–
13 Jul	WD	58.0	83	53	44	52	68.3	126	75	4	–
15 Jul	WD	89.3	93	83	136	45	92.0	–	141	43	–
16 Jul	WE	84.5	132	115	54	37	117.5	124	111	–	–
17 Jul	WE	157.5	54	192	199	185	–	–	–	–	–
19 Jul	WD	170.3	283	165	131	102	121.5	–	138	105	–
21 Jul	WD	114.8	178	82	113	86	128.3	185	139	61	–
23 Jul	WE	125.8	175	116	119	93	113.0	172	96	71	–
24 Jul	WE	139.0	253	125	122	56	–	–	–	–	–
26 Jul	WD	92.0	40	118	119	91	83.5	–	96	71	–
29 Jul	WD	120.8	123	129	129	102	129.3	145	168	75	–
30 Jul	WE	106.5	146	142	114	24	148.0	167	129	–	–
31 Jul	WE	182.5	218	185	229	98	–	–	–	–	–
Min (All A–D)		4					4				
Average (All A–D)		89					83				
Max (All A–D)		283					185				

Note: An en dash indicates that fishing was closed for guided anglers during the time of this count and therefore there are no data to present.

[a] WD is weekday, and WE is weekend.

[b] "Downstream" is the Kenai River reach from Warren Ames Bridge to the RM 13.7 Chinook salmon sonar.

[c] Angler count times: A = 0400–0859 hours; B = 0900–1359 hours; C = 1400–1959 hours; D = 2000–2359; $\bar{X}$ is the average count of the 4 count times.

Appendix C5.–Guided and unguided boat angler counts above RM 13.7 during the late-run Kenai River Chinook salmon fishery, 1–31 July 2016.

		Upstream[b] angler counts									
		Unguided anglers [c]					Guided anglers[c]				
Date	Day type[a]	$\bar{X}$	A	B	C	D	$\bar{X}$	A	B	C	D
1 Jul	WD	12.8	31	7	9	4	53.7	78	67	16	–
2 Jul	WE	11.3	1	18	15	11	37.5	–	40	35	–
3 Jul	WE	34.5	38	32	37	31	–	–	–	–	–
5 Jul	WD	13.8	39	2	8	6	55.7	94	53	20	–
7 Jul	WD	14.8	22	13	19	5	53.5	75	32	–	–
9 Jul	WE	43.8	89	33	23	30	48.7	88	47	11	–
10 Jul	WE	71.5	93	72	81	40	–	–	–	–	–
13 Jul	WD	36.0	83	26	22	13	74.3	148	55	20	–
15 Jul	WD	63.8	53	38	102	62	44.5	–	74	15	–
16 Jul	WE	59.8	74	65	80	20	64.0	83	45	–	–
17 Jul	WE	59.0	20	93	63	60	–	–	–	–	–
19 Jul	WD	105.8	173	99	42	109	76.0	–	127	25	–
21 Jul	WD	65.0	105	62	39	54	81.0	141	75	27	–
23 Jul	WE	64.8	105	34	43	77	68.3	119	42	44	–
24 Jul	WE	73.8	121	79	72	23	–	–	–	–	–
26 Jul	WD	52.0	55	34	43	76	45.5		47	44	–
29 Jul	WD	72.0	79	78	68	63	53.7	69	56	36	–
30 Jul	WE	53.3	102	48	48	15	57.5	66	49	–	–
31 Jul	WE	89.0	111	92	74	79	–	–	–	–	–
Min (All A–D)		1					11				
Average (All A–D)		52					59				
Max (All A–D)		173					148				

Note: An en dash indicates that fishing was closed for guided anglers during the time of this count and therefore there are no data to present.

[a] WD is weekday, and WE is weekend.

[b] "Upstream" is the Kenai River reach from the RM 13.7 Chinook salmon sonar to Soldotna Bridge.

[c] Angler count times: A = 0400–0859 hours; B = 0900–1359 hours; C = 1400–1959 hours; D = 2000–2359; $\bar{X}$ is the average count of the 4 count times.

Appendix C6.–Guided and unguided boat angler counts above and below the RM 13.7 sonar during the late-run Kenai River Chinook salmon fishery, 1–31 July 2016.

		Combined strata									
		Unguided anglers[c]					Guided anglers[c]				
Date	Day type[a]	$\bar{X}$	A	B	C	D	$\bar{X}$	A	B	C	D
1 Jul	WD	21.0	37	11	27	9	76.3	106	97	26	–
2 Jul	WE	28.3	8	36	52	17	80.5	–	94	67	–
3 Jul	WE	68.8	68	59	102	46	–	–	–	–	–
5 Jul	WD	32.5	65	19	18	28	91.3	137	111	26	–
7 Jul	WD	33.3	39	26	57	11	82.0	103	61	–	–
9 Jul	WE	109.8	178	103	87	71	97.7	181	91	21	–
10 Jul	WE	166.3	237	149	165	114	–	–	–	–	–
13 Jul	WD	94.0	166	79	66	65	142.7	274	130	24	–
15 Jul	WD	153.0	146	121	238	107	136.5	–	215	58	–
16 Jul	WE	144.3	206	180	134	57	181.5	207	156	–	–
17 Jul	WE	216.5	74	285	262	245	–	–	–	–	–
19 Jul	WD	276.0	456	264	173	211	197.5	–	265	130	–
21 Jul	WD	179.8	283	144	152	140	209.3	326	214	88	–
23 Jul	WE	190.5	280	150	162	170	181.3	291	138	115	–
24 Jul	WE	212.8	374	204	194	79	–	–	–	–	–
26 Jul	WD	144.0	95	152	162	167	129.0	–	143	115	–
29 Jul	WD	192.8	202	207	197	165	183.0	214	224	111	–
30 Jul	WE	159.8	248	190	162	39	205.5	233	178	–	–
31 Jul	WE	271.5	329	277	303	177	–	–	–	–	–
Min (All A–D)		8					21				
Average (All A–D)		142					142				
Max (All A–D)		456					326				

Note: An en dash indicates that fishing was closed for guided anglers during the time of this count and therefore there are no data to present.

[a] WD is weekday, and WE is weekend.

[b] Includes the Kenai River reach from Warren Ames Bridge to the Soldotna Bridge.

[c] Angler count times: A = 0400–0859 hours; B = 0900–1359 hours; C = 1400–1959 hours; D = 2000–2359; $\bar{X}$ is the average count of the 4 count times.

APPENDIX D: INRIVER GILLNETTING DAILY CATCH AND EFFORT AND CPUE DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2016

Appendix D1.–Daily number of drifts, drift minutes, and early-run Chinook salmon, sockeye salmon, and Dolly Varden caught in midriver and nearshore 5.0- and 7.5-inch mesh gillnets at RM 8.6, 16 May–30 June 2016.

							Inriver drift gillnetting catch											
	No. of drifts			Drift minutes			Chinook salmon			Sockeye salmon			Dolly Varden			All species		
Date	Mid-river	Near shore	All	Mid-river	Near shore	All	Mid-river	Near shore	All	Mid-river	Near shore	All	Mid-river	Near shore	All	Mid-river	Near shore	All
16 May	12	6	18	126	51	177	0	0	0	0	0	0	0	0	0	0	0	0
17 May	13	2	15	143	9	152	0	0	0	0	0	0	0	0	0	0	0	0
18 May	17	4	21	158	26	184	1	0	1	0	0	0	0	0	0	1	0	1
19 May	15	4	19	144	35	179	0	0	0	0	0	0	0	0	0	0	0	0
20 May	14	5	19	128	37	165	1	0	1	0	1	1	0	0	0	1	1	2
21 May	10	6	16	102	46	148	1	0	1	0	0	0	0	0	0	1	0	1
22 May	16	4	20	160	26	186	1	0	1	1	0	1	0	0	0	2	0	2
23 May	13	10	23	132	63	194	0	0	0	1	0	1	0	0	0	1	0	1
24 May	13	8	21	112	50	162	3	2	5	0	0	0	0	0	0	3	2	5
25 May	12	10	22	105	59	164	2	1	3	4	3	7	0	0	0	6	4	10
26 May	13	8	21	125	59	184	0	1	1	6	4	10	0	0	0	6	5	11
27 May	8	8	16	74	61	135	1	3	4	4	4	8	0	0	0	5	7	12
28 May	8	8	16	103	63	166	1	1	2	5	2	7	0	0	0	6	3	9
29 May	11	10	21	120	78	198	1	2	3	2	3	5	0	0	0	3	5	8
30 May	11	10	21	117	83	200	2	0	2	11	5	16	0	0	0	13	5	18
31 May	10	10	20	102	76	178	4	1	5	4	5	9	0	0	0	8	6	14
1 Jun	12	5	17	122	46	169	3	1	4	6	2	8	0	0	0	9	3	12
2 Jun	8	9	17	90	47	137	3	2	5	3	9	12	0	0	0	6	11	17
3 Jun	10	4	14	100	31	131	10	2	12	15	7	22	0	0	0	25	9	34
4 Jun	12	6	18	94	22	116	3	2	5	54	7	61	0	0	0	57	9	66
5 Jun	12	10	22	104	60	164	3	0	3	20	27	47	0	0	0	23	27	50
6 Jun	10	10	20	87	59	146	1	4	5	35	33	68	0	0	0	36	37	73
7 Jun	8	7	15	77	48	125	10	4	14	17	11	28	0	0	0	27	15	42
8 Jun	7	8	15	84	66	150	5	2	7	18	8	26	0	0	0	23	10	33
9 Jun	10	10	20	102	62	164	1	0	1	16	8	24	0	0	0	17	8	25
10 Jun	8	9	17	112	84	196	1	3	4	9	9	18	0	0	0	10	12	22
11 Jun	11	10	21	118	69	186	0	1	1	9	5	14	0	0	0	9	6	15

-continued-

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							Inriver drift gillnetting catch											
	No. of drifts			Drift minutes			Chinook salmon			Sockeye salmon			Dolly Varden			All species		
Date	Mid-river	Near shore	All	Mid-river	Near shore	All	Mid-river	Near shore	All	Mid-river	Near shore	All	Mid-river	Near shore	All	Mid-river	Near shore	All
12 Jun	10	10	20	109	62	172	2	0	2	12	16	28	0	0	0	14	16	30
13 Jun	10	10	20	114	71	185	1	0	1	6	11	17	0	0	0	7	11	18
14 Jun	8	9	17	112	78	190	3	2	5	9	9	18	0	0	0	12	11	23
15 Jun	10	8	18	114	56	170	1	3	4	5	5	10	0	0	0	6	8	14
16 Jun	8	10	18	79	82	161	1	2	3	2	11	13	0	0	0	3	13	16
17 Jun	10	10	20	100	62	162	1	1	2	4	10	14	0	0	0	5	11	16
18 Jun	8	10	18	79	79	158	5	4	9	13	11	24	0	0	0	18	15	33
19 Jun	10	9	19	115	55	170	3	1	4	21	9	30	0	0	0	24	10	34
20 Jun	10	11	21	102	65	167	3	1	4	24	13	37	1	0	1	28	14	42
21 Jun	9	8	17	92	45	137	3	2	5	22	18	40	0	0	0	25	20	45
22 Jun	8	8	16	71	59	130	3	5	8	11	17	28	0	0	0	14	22	36
23 Jun	8	8	16	98	62	160	1	2	3	15	8	23	0	1	1	16	11	27
24 Jun	7	8	15	77	62	139	5	1	6	14	11	25	0	0	0	19	12	31
25 Jun	8	6	14	98	58	156	6	2	8	8	2	10	0	0	0	14	4	18
26 Jun	9	10	19	114	59	173	4	0	4	7	12	19	0	0	0	11	12	23
27 Jun	11	10	21	103	65	168	4	1	5	13	8	21	0	0	0	17	9	26
28 Jun	9	10	19	94	78	171	2	0	2	8	2	10	0	0	0	10	2	12
29 Jun	9	8	17	99	62	161	4	4	8	14	13	27	0	0	0	18	17	35
30 Jun	8	9	17	88	55	143	4	0	4	13	5	18	0	0	0	17	5	22
Total	474	373	847	4,898	2,630	7,528	114	63	177	461	344	805	1	1	2	576	408	984
Minimum	7	2	14	71	9	116	0	0	0	0	0	0	0	0	0	0	0	0
Average	10	8	18	106	57	164	2	1	4	10	7	18	0	0	0	13	9	21
Maximum	17	11	23	160	84	200	10	5	14	54	33	68	1	1	1	57	37	73

Appendix D2.–CPUE of early-run Chinook salmon and sockeye salmon caught in midriver and nearshore 5.0- and 7.5-inch mesh gillnets at RM 8.6, 16 May–30 June 2016.

	CPUE[a]									
	Chinook salmon					Sockeye salmon				
Date	Midriver	SE	Nearshore	SE	All	Midriver	SE	Nearshore	SE	All
16 May	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17 May	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18 May	0.006	0.006	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000
19 May	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20 May	0.008	0.008	0.000	0.000	0.006	0.000	0.000	0.027	0.026	0.006
21 May	0.010	0.010	0.000	0.000	0.007	0.000	0.000	0.000	0.000	0.000
22 May	0.006	0.006	0.000	0.000	0.005	0.006	0.006	0.000	0.000	0.005
23 May	0.000	0.000	0.000	0.000	0.000	0.008	0.008	0.000	0.000	0.005
24 May	0.027	0.014	0.040	0.025	0.031	0.000	0.000	0.000	0.000	0.000
25 May	0.019	0.013	0.017	0.017	0.018	0.038	0.021	0.051	0.038	0.043
26 May	0.000	0.000	0.017	0.018	0.005	0.048	0.019	0.068	0.039	0.054
27 May	0.014	0.014	0.049	0.028	0.030	0.054	0.029	0.066	0.058	0.059
28 May	0.010	0.010	0.016	0.016	0.012	0.049	0.023	0.032	0.033	0.042
29 May	0.008	0.008	0.025	0.017	0.015	0.017	0.011	0.038	0.019	0.025
30 May	0.017	0.017	0.000	0.000	0.010	0.094	0.030	0.060	0.029	0.080
31 May	0.039	0.015	0.013	0.014	0.028	0.039	0.022	0.066	0.027	0.051
1 Jun	0.025	0.013	0.022	0.019	0.024	0.049	0.023	0.043	0.045	0.047
2 Jun	0.033	0.016	0.043	0.044	0.036	0.033	0.016	0.192	0.080	0.088
3 Jun	0.100	0.052	0.064	0.044	0.091	0.150	0.081	0.225	0.105	0.168
4 Jun	0.032	0.017	0.092	0.102	0.043	0.576	0.087	0.321	0.163	0.528
5 Jun	0.029	0.016	0.000	0.000	0.018	0.192	0.067	0.452	0.121	0.287
6 Jun	0.011	0.012	0.068	0.035	0.034	0.400	0.138	0.559	0.158	0.464
7 Jun	0.130	0.046	0.083	0.037	0.112	0.221	0.125	0.229	0.087	0.225
8 Jun	0.060	0.038	0.030	0.021	0.047	0.214	0.052	0.122	0.043	0.174
9 Jun	0.010	0.011	0.000	0.000	0.006	0.156	0.056	0.130	0.048	0.146
10 Jun	0.009	0.009	0.036	0.025	0.020	0.080	0.034	0.108	0.043	0.092
11 Jun	0.000	0.000	0.015	0.014	0.005	0.077	0.039	0.073	0.044	0.075
12 Jun	0.018	0.018	0.000	0.000	0.012	0.110	0.041	0.256	0.098	0.163
13 Jun	0.009	0.008	0.000	0.000	0.005	0.053	0.018	0.155	0.062	0.092
14 Jun	0.027	0.021	0.026	0.017	0.026	0.080	0.034	0.116	0.043	0.095
15 Jun	0.009	0.009	0.054	0.039	0.023	0.044	0.016	0.089	0.053	0.059
16 Jun	0.013	0.012	0.024	0.017	0.019	0.025	0.019	0.134	0.077	0.081
17 Jun	0.010	0.010	0.016	0.017	0.012	0.040	0.023	0.161	0.079	0.087
18 Jun	0.063	0.029	0.051	0.036	0.057	0.164	0.048	0.140	0.047	0.152
19 Jun	0.026	0.019	0.018	0.018	0.023	0.182	0.043	0.163	0.061	0.176
20 Jun	0.029	0.015	0.015	0.015	0.024	0.235	0.040	0.201	0.080	0.222
21 Jun	0.033	0.016	0.045	0.047	0.037	0.239	0.075	0.401	0.073	0.292
22 Jun	0.042	0.033	0.084	0.039	0.061	0.155	0.044	0.286	0.099	0.215
23 Jun	0.010	0.010	0.032	0.022	0.019	0.154	0.061	0.128	0.039	0.144
24 Jun	0.065	0.027	0.016	0.017	0.043	0.182	0.092	0.177	0.082	0.179
25 Jun	0.061	0.029	0.034	0.025	0.051	0.082	0.039	0.034	0.036	0.064
26 Jun	0.035	0.014	0.000	0.000	0.023	0.061	0.029	0.203	0.060	0.110

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	CPUE[a]									
	Chinook salmon					Sockeye salmon				
Date	Midriver	SE	Nearshore	SE	All	Midriver	SE	Nearshore	SE	All
27 Jun	0.039	0.022	0.016	0.016	0.030	0.126	0.043	0.124	0.050	0.125
28 Jun	0.021	0.015	0.000	0.000	0.012	0.085	0.035	0.026	0.025	0.058
29 Jun	0.040	0.022	0.065	0.024	0.050	0.142	0.052	0.210	0.150	0.168
30 Jun	0.046	0.024	0.000	0.000	0.028	0.148	0.060	0.091	0.041	0.126
Minimum	0.000		0.000		0.000	0.000		0.000		0.000
Average	0.026		0.024		0.025	0.105		0.130		0.115
Maximum	0.130		0.092		0.112	0.576		0.559		0.528

[a] CPUE is catch per minute.

Appendix D3.–Daily number of drifts and drift minutes for late-run midriver and nearshore 5.0- and 7.5-inch mesh gillnets at RM 8.6, 1 July–20 August 2016.

	No. of drifts			Drift minutes		
Date	Midriver	Near shore	All	Midriver	Near shore	All
1 Jul	8	8	16	87	64	152
2 Jul	6	8	14	60	57	118
3 Jul	9	8	17	87	50	137
4 Jul	8	9	17	78	55	132
5 Jul	8	7	15	79	53	132
6 Jul	7	8	15	68	71	139
7 Jul	10	8	18	118	67	186
8 Jul	6	8	14	58	77	135
9 Jul	6	6	12	92	57	149
10 Jul	7	8	15	70	68	138
11 Jul	8	7	15	93	56	149
12 Jul	5	6	11	71	44	115
13 Jul	6	6	12	75	54	129
14 Jul	6	7	13	84	73	156
15 Jul	7	6	13	75	44	119
16 Jul	6	7	13	61	48	108
17 Jul	7	6	13	70	37	107
18 Jul	8	8	16	82	56	138
19 Jul	6	6	12	67	62	129
20 Jul	6	7	13	76	64	140
21 Jul	8	6	14	79	40	118
22 Jul	6	7	13	66	56	122
23 Jul	7	6	13	83	43	125
24 Jul	8	8	16	84	56	140
25 Jul	8	6	14	93	47	140
26 Jul	6	7	13	67	58	125
27 Jul	8	8	16	81	66	148
28 Jul	8	10	18	87	45	132
29 Jul	8	6	14	71	53	123
30 Jul	6	8	14	56	54	110
31 Jul	8	8	16	79	48	127
1 Aug	8	8	16	79	52	130
2 Aug	8	8	16	82	58	140
3 Aug	7	8	15	72	60	132
4 Aug	8	8	16	87	61	148
5 Aug	8	8	16	84	66	150
6 Aug	10	10	20	116	72	187
7 Aug	8	8	16	80	74	154
8 Aug	10	10	20	102	88	190
9 Aug	8	8	16	87	63	150
10 Aug	12	6	18	121	54	175
11 Aug	7	8	15	81	59	140
12 Aug	10	5	15	102	42	144

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	No. of drifts			Drift minutes		
Date	Midriver	Near shore	All	Midriver	Near shore	All
13 Aug	9	10	19	88	60	148
14 Aug	8	8	16	71	56	127
15 Aug	12	10	22	118	65	184
16 Aug	11	12	23	108	80	188
17 Aug	10	8	18	92	62	154
18 Aug	12	13	25	118	93	212
19 Aug	10	10	20	110	70	181
20 Aug	12	14	26	115	77	191
Total	409	404	813	4,307	3,035	7,342
Minimum	5	5	11	56	37	107
Average	8	8	16	84	60	144
Maximum	12	14	26	121	93	212

Appendix D4.–Number of late-run Chinook salmon, sockeye salmon, coho salmon, pink salmon, and Dolly Varden, and rainbow trout caught in midriver and nearshore 5.0- and 7.5-inch mesh gillnets at RM 8.6, 1 July–20 August 2016.

	Chinook salmon			Sockeye salmon			Coho salmon			Pink salmon			Dolly Varden			Rainbow trout			All species		
Date	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All
1 Jul	6	2	8	9	17	26	0	0	0	0	0	0	0	0	0	0	0	0	15	19	34
2 Jul	2	4	6	34	22	56	0	0	0	0	0	0	0	0	0	0	0	0	36	26	62
3 Jul	5	1	6	40	33	73	0	0	0	0	0	0	0	1	1	0	0	0	45	35	80
4 Jul	9	1	10	23	25	48	0	0	0	0	0	0	0	0	0	0	0	0	32	26	58
5 Jul	4	6	10	61	44	105	0	0	0	0	0	0	0	0	0	0	0	0	65	50	115
6 Jul	1	5	6	58	69	127	0	0	0	1	0	1	0	0	0	0	0	0	60	74	134
7 Jul	4	0	4	28	1	29	0	0	0	0	0	0	0	0	0	0	0	0	32	1	33
8 Jul	4	4	8	13	38	51	0	0	0	0	0	0	0	0	0	0	0	0	17	42	59
9 Jul	6	3	9	15	24	39	0	0	0	0	0	0	0	0	0	0	0	0	21	27	48
10 Jul	4	4	8	24	45	69	0	0	0	0	0	0	0	0	0	0	0	0	28	49	77
11 Jul	5	3	8	25	16	41	0	0	0	0	0	0	0	0	0	0	0	0	30	19	49
12 Jul	11	4	15	13	24	37	0	0	0	0	0	0	0	0	0	0	1	1	24	29	53
13 Jul	6	2	8	12	55	67	0	0	0	1	0	1	0	1	1	0	0	0	19	58	77
14 Jul	7	0	7	18	68	86	0	0	0	0	0	0	0	0	0	0	0	0	25	68	93
15 Jul	11	1	12	23	19	42	0	0	0	0	1	1	0	0	0	0	0	0	34	21	55
16 Jul	10	0	10	56	72	128	0	0	0	1	2	3	0	0	0	0	0	0	67	74	141
17 Jul	5	3	8	49	39	88	0	0	0	6	0	6	0	0	0	0	0	0	60	42	102
18 Jul	4	4	8	7	14	21	0	0	0	2	1	3	0	1	1	0	0	0	13	20	33
19 Jul	7	2	9	38	73	111	0	0	0	4	2	6	0	0	0	0	0	0	49	77	126
20 Jul	9	0	9	51	50	101	0	0	0	4	0	4	0	0	0	0	0	0	64	50	114
21 Jul	4	6	10	64	50	114	0	0	0	5	5	10	0	0	0	0	0	0	73	61	134
22 Jul	6	1	7	57	57	114	0	0	0	10	3	13	0	0	0	0	0	0	73	61	134
23 Jul	5	1	6	64	25	89	0	0	0	12	5	17	0	0	0	0	0	0	81	31	112
24 Jul	3	2	5	43	30	73	0	0	0	15	9	24	0	0	0	0	0	0	61	41	102
25 Jul	5	0	5	20	28	48	0	0	0	18	5	23	0	0	0	0	0	0	43	33	76
26 Jul	5	3	8	32	26	58	0	0	0	7	4	11	0	0	0	0	0	0	44	33	77
27 Jul	2	2	4	30	60	90	0	0	0	10	14	24	0	0	0	0	0	0	42	76	118
28 Jul	7	2	9	36	27	63	0	0	0	14	10	24	0	0	0	0	0	0	57	39	96
29 Jul	8	4	12	8	14	22	0	0	0	22	13	35	0	0	0	0	0	0	38	31	69

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	Chinook salmon			Sockeye salmon			Coho salmon			Pink salmon			Dolly Varden			Rainbow trout			All species		
Date	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All
30 Jul	5	2	7	9	33	42	3	3	6	11	32	43	0	0	0	0	0	0	28	70	98
31 Jul	5	1	6	35	37	72	2	1	3	34	17	51	0	0	0	0	0	0	76	56	132
1 Aug	5	1	6	9	10	19	0	0	0	7	0	7	0	0	0	0	0	0	21	11	32
2 Aug	4	2	6	14	29	43	0	1	1	17	27	44	0	0	0	0	0	0	35	59	94
3 Aug	7	2	9	26	36	62	2	1	3	18	30	48	0	0	0	0	0	0	53	69	122
4 Aug	1	1	2	19	28	47	1	0	1	25	45	70	0	0	0	0	0	0	46	74	120
5 Aug	2	0	2	8	20	28	1	0	1	4	10	14	0	0	0	0	0	0	15	30	45
6 Aug	1	1	2	10	7	17	0	0	0	21	13	34	0	0	0	0	0	0	32	21	53
7 Aug	5	0	5	13	28	41	0	3	3	30	42	72	0	0	0	0	0	0	48	73	121
8 Aug	0	1	1	9	7	16	1	1	2	36	8	44	1	0	1	0	0	0	47	17	64
9 Aug	5	0	5	15	41	56	9	11	20	27	25	52	0	0	0	0	0	0	56	77	133
10 Aug	3	0	3	29	28	57	3	3	6	36	32	68	0	1	1	0	0	0	71	64	135
11 Aug	2	1	3	14	23	37	6	11	17	8	33	41	0	0	0	0	0	0	30	68	98
12 Aug	0	1	1	14	32	46	4	8	12	15	11	26	1	1	2	0	0	0	34	53	87
13 Aug	2	1	3	6	33	39	8	12	20	18	18	36	0	0	0	0	0	0	34	64	98
14 Aug	3	1	4	7	21	28	14	10	24	5	5	10	0	0	0	0	1	1	29	38	67
15 Aug	1	0	1	4	7	11	4	8	12	6	4	10	0	0	0	0	0	0	15	19	34
16 Aug	0	0	0	3	11	14	14	16	30	11	12	23	0	0	0	0	0	0	28	39	67
17 Aug	1	0	1	6	7	13	3	7	10	5	5	10	0	0	0	0	0	0	15	19	34
18 Aug	1	0	1	4	5	9	4	3	7	3	2	5	0	0	0	0	0	0	12	10	22
19 Aug	1	0	1	7	7	14	11	9	20	6	4	10	0	0	0	0	0	0	25	20	45
20 Aug	0	0	0	18	16	34	5	5	10	3	3	6	0	0	0	0	0	0	26	24	50
Total	219	85	304	1,230	1,531	2,761	95	113	208	478	452	930	2	5	7	0	2	2	2,024	2,188	4,212
Min.	0	0	0	3	1	9	0	0	0	0	0	0	0	0	0	0	0	0	12	1	22
Avg.	4	2	6	24	30	54	2	2	4	9	9	18	0	0	0	0	0	0	40	43	83
Max.	11	6	15	64	73	128	14	16	30	36	45	72	1	1	2	0	1	1	81	77	141

Note: Mid = midriver gillnets; Near = nearshore gillnets.

Appendix D5.–CPUE of late-run Chinook salmon and sockeye salmon caught in midriver and nearshore 5.0- and 7.5-inch mesh gillnets at RM 8.6, 1 July–20 August 2016.

	CPUE[a]									
	Chinook salmon					Sockeye salmon				
Date	Mid-river	SE	Near shore	SE	All	Mid-river	SE	Near shore	SE	All
1 Jul	0.069	0.039	0.031	0.021	0.053	0.103	0.048	0.264	0.059	0.171
2 Jul	0.033	0.021	0.070	0.047	0.051	0.563	0.193	0.384	0.156	0.476
3 Jul	0.058	0.026	0.020	0.020	0.044	0.460	0.123	0.659	0.191	0.533
4 Jul	0.116	0.037	0.018	0.019	0.076	0.297	0.116	0.458	0.042	0.363
5 Jul	0.051	0.029	0.113	0.064	0.076	0.776	0.250	0.826	0.346	0.796
6 Jul	0.015	0.015	0.070	0.029	0.043	0.857	0.349	0.969	0.316	0.914
7 Jul	0.034	0.019	0.000	0.000	0.022	0.237	0.069	0.015	0.015	0.156
8 Jul	0.069	0.034	0.052	0.026	0.059	0.225	0.101	0.492	0.148	0.378
9 Jul	0.065	0.014	0.052	0.034	0.060	0.164	0.040	0.419	0.197	0.262
10 Jul	0.057	0.031	0.059	0.037	0.058	0.341	0.100	0.662	0.230	0.499
11 Jul	0.054	0.027	0.053	0.055	0.054	0.268	0.073	0.285	0.114	0.274
12 Jul	0.156	0.038	0.090	0.055	0.130	0.184	0.064	0.540	0.211	0.322
13 Jul	0.080	0.024	0.037	0.026	0.062	0.160	0.021	1.020	0.438	0.520
14 Jul	0.084	0.042	0.000	0.000	0.045	0.215	0.033	0.938	0.274	0.551
15 Jul	0.147	0.027	0.023	0.023	0.101	0.306	0.173	0.434	0.150	0.353
16 Jul	0.165	0.056	0.000	0.000	0.092	0.921	0.216	1.513	0.494	1.181
17 Jul	0.072	0.029	0.081	0.031	0.075	0.703	0.170	1.050	0.275	0.824
18 Jul	0.049	0.032	0.072	0.047	0.058	0.085	0.050	0.251	0.057	0.152
19 Jul	0.104	0.027	0.032	0.021	0.070	0.563	0.139	1.181	0.360	0.858
20 Jul	0.118	0.044	0.000	0.000	0.064	0.671	0.150	0.785	0.132	0.723
21 Jul	0.051	0.027	0.151	0.096	0.085	0.815	0.224	1.260	0.429	0.964
22 Jul	0.091	0.042	0.018	0.013	0.057	0.866	0.260	1.018	0.296	0.936
23 Jul	0.061	0.029	0.023	0.024	0.048	0.776	0.303	0.585	0.300	0.711
24 Jul	0.036	0.035	0.036	0.035	0.036	0.513	0.126	0.538	0.193	0.523
25 Jul	0.054	0.014	0.000	0.000	0.036	0.215	0.089	0.597	0.139	0.343
26 Jul	0.074	0.038	0.052	0.040	0.064	0.474	0.093	0.449	0.218	0.463
27 Jul	0.025	0.016	0.030	0.019	0.027	0.370	0.060	0.904	0.279	0.610
28 Jul	0.080	0.037	0.045	0.046	0.068	0.413	0.136	0.604	0.180	0.478
29 Jul	0.113	0.050	0.076	0.038	0.097	0.113	0.050	0.266	0.177	0.178
30 Jul	0.089	0.029	0.037	0.028	0.064	0.161	0.045	0.614	0.140	0.383
31 Jul	0.063	0.018	0.021	0.021	0.047	0.442	0.124	0.773	0.180	0.567
1 Aug	0.064	0.026	0.019	0.019	0.046	0.115	0.043	0.193	0.119	0.146
2 Aug	0.049	0.026	0.034	0.021	0.043	0.170	0.082	0.500	0.154	0.307
3 Aug	0.098	0.036	0.033	0.021	0.068	0.362	0.127	0.600	0.289	0.470
4 Aug	0.012	0.012	0.016	0.017	0.013	0.219	0.061	0.456	0.142	0.317
5 Aug	0.024	0.015	0.000	0.000	0.013	0.095	0.042	0.305	0.242	0.187
6 Aug	0.009	0.009	0.014	0.014	0.011	0.086	0.053	0.098	0.048	0.091
7 Aug	0.063	0.038	0.000	0.000	0.032	0.163	0.058	0.376	0.147	0.266
8 Aug	0.000	0.000	0.011	0.011	0.005	0.088	0.031	0.079	0.025	0.084
9 Aug	0.058	0.024	0.000	0.000	0.033	0.173	0.067	0.647	0.205	0.373
10 Aug	0.025	0.013	0.000	0.000	0.017	0.240	0.063	0.515	0.160	0.325

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	CPUE[a]									
	Chinook salmon					Sockeye salmon				
Date	Mid-river	SE	Near shore	SE	All	Mid-river	SE	Near shore	SE	All
11 Aug	0.025	0.016	0.017	0.018	0.021	0.173	0.069	0.389	0.064	0.265
12 Aug	0.000	0.000	0.024	0.023	0.007	0.137	0.050	0.764	0.076	0.320
13 Aug	0.023	0.015	0.017	0.018	0.020	0.068	0.034	0.547	0.152	0.263
14 Aug	0.042	0.032	0.018	0.017	0.032	0.099	0.042	0.375	0.064	0.221
15 Aug	0.008	0.008	0.000	0.000	0.005	0.034	0.018	0.107	0.032	0.060
16 Aug	0.000	0.000	0.000	0.000	0.000	0.028	0.020	0.138	0.027	0.075
17 Aug	0.011	0.011	0.000	0.000	0.006	0.065	0.036	0.113	0.037	0.084
18 Aug	0.008	0.008	0.000	0.000	0.005	0.034	0.026	0.054	0.023	0.043
19 Aug	0.009	0.009	0.000	0.000	0.006	0.063	0.031	0.100	0.062	0.078
20 Aug	0.000	0.000	0.000	0.000	0.000	0.157	0.080	0.209	0.123	0.178
Minimum	0.000		0.000		0.005	0.028		0.015		0.060
Average	0.056		0.031		0.050	0.310		0.536		0.438
Maximum	0.165		0.151		0.130	0.921		1.513		1.181

[a] CPUE is catch per minute.

Appendix D6.–CPUE of late-run coho salmon and pink salmon caught in midriver and nearshore 5.0- and 7.5-inch mesh gillnets at RM 8.6, 1 July–20 August 2016.

	CPUE[a]									
	Coho salmon					Pink salmon				
Date	Mid-river	SE	Near shore	SE	All	Mid-river	SE	Near shore	SE	All
1 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6 Jul	0.000	0.000	0.000	0.000	0.000	0.015	0.020	0.000	0.000	0.007
7 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13 Jul	0.000	0.000	0.000	0.000	0.000	0.013	0.018	0.000	0.000	0.008
14 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.031	0.008
16 Jul	0.000	0.000	0.000	0.000	0.000	0.016	0.021	0.042	0.054	0.028
17 Jul	0.000	0.000	0.000	0.000	0.000	0.086	0.089	0.000	0.000	0.056
18 Jul	0.000	0.000	0.000	0.000	0.000	0.024	0.029	0.018	0.024	0.022
19 Jul	0.000	0.000	0.000	0.000	0.000	0.059	0.058	0.032	0.037	0.046
20 Jul	0.000	0.000	0.000	0.000	0.000	0.053	0.061	0.000	0.000	0.029
21 Jul	0.000	0.000	0.000	0.000	0.000	0.064	0.072	0.126	0.140	0.085
22 Jul	0.000	0.000	0.000	0.000	0.000	0.152	0.143	0.054	0.062	0.107
23 Jul	0.000	0.000	0.000	0.000	0.000	0.145	0.133	0.117	0.127	0.136
24 Jul	0.000	0.000	0.000	0.000	0.000	0.179	0.180	0.161	0.162	0.172
25 Jul	0.000	0.000	0.000	0.000	0.000	0.194	0.183	0.107	0.109	0.165
26 Jul	0.000	0.000	0.000	0.000	0.000	0.104	0.100	0.069	0.084	0.088
27 Jul	0.000	0.000	0.000	0.000	0.000	0.123	0.121	0.211	0.216	0.163
28 Jul	0.000	0.000	0.000	0.000	0.000	0.161	0.163	0.224	0.245	0.182
29 Jul	0.000	0.000	0.000	0.000	0.000	0.311	0.313	0.247	0.255	0.284
30 Jul	0.054	0.061	0.056	0.067	0.055	0.197	0.202	0.595	0.561	0.392
31 Jul	0.025	0.028	0.021	0.029	0.024	0.429	0.407	0.355	0.345	0.401
1 Aug	0.000	0.000	0.000	0.000	0.000	0.089	0.095	0.000	0.000	0.054
2 Aug	0.000	0.000	0.017	0.024	0.007	0.207	0.206	0.466	0.480	0.314
3 Aug	0.028	0.032	0.017	0.023	0.023	0.251	0.252	0.500	0.491	0.364
4 Aug	0.012	0.016	0.000	0.000	0.007	0.288	0.273	0.732	0.743	0.472
5 Aug	0.012	0.012	0.000	0.000	0.007	0.047	0.051	0.152	0.172	0.093
6 Aug	0.000	0.000	0.000	0.000	0.000	0.181	0.183	0.182	0.178	0.181
7 Aug	0.000	0.000	0.040	0.041	0.019	0.375	0.354	0.565	0.533	0.466
8 Aug	0.010	0.013	0.011	0.011	0.011	0.353	0.349	0.091	0.087	0.231
9 Aug	0.104	0.103	0.174	0.170	0.133	0.311	0.307	0.394	0.372	0.346
10 Aug	0.025	0.027	0.055	0.061	0.034	0.298	0.290	0.589	0.541	0.388

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	CPUE[a]									
	Coho salmon					Pink salmon				
Date	Mid-river	SE	Near shore	SE	All	Mid-river	SE	Near shore	SE	All
11 Aug	0.074	0.074	0.186	0.180	0.122	0.099	0.102	0.559	0.550	0.293
12 Aug	0.039	0.041	0.191	0.191	0.083	0.147	0.158	0.263	0.245	0.181
13 Aug	0.091	0.093	0.199	0.208	0.135	0.205	0.197	0.299	0.304	0.243
14 Aug	0.198	0.195	0.179	0.182	0.190	0.071	0.071	0.089	0.084	0.079
15 Aug	0.034	0.036	0.122	0.134	0.065	0.051	0.050	0.061	0.067	0.054
16 Aug	0.130	0.133	0.201	0.204	0.160	0.102	0.107	0.151	0.166	0.123
17 Aug	0.033	0.035	0.113	0.125	0.065	0.054	0.062	0.080	0.095	0.065
18 Aug	0.034	0.037	0.032	0.039	0.033	0.025	0.028	0.021	0.030	0.024
19 Aug	0.100	0.098	0.128	0.133	0.111	0.054	0.056	0.057	0.068	0.055
20 Aug	0.044	0.046	0.065	0.077	0.052	0.026	0.031	0.039	0.048	0.031
Minimum	0.000		0.000		0.000	0.000		0.000		0.000
Average	0.020		0.035		0.020	0.109		0.150		0.133
Maximum	0.198		0.201		0.190	0.429		0.732		0.472

[a] CPUE is catch per minute.