Fishery Data Series No. 18-26

Chinook Salmon Creel Survey and Inriver Gillnetting Study, Lower Kenai River, Alaska, 2015

by

Jeff Perschbacher

December 2018

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

Symbols and Abbreviations

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

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

FISHERY DATA SERIES NO. 18-26

CHINOOK SALMON CREEL SURVEY AND INRIVER GILLNETTING STUDY, LOWER KENAI RIVER, ALASKA, 2015

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 1–31 July on the lower Kenai River in 2015. The Chinook salmon sport fishery was closed to fishing during the entire early run (1 May–30 June). During the late run, anglers caught 6,522 (SE 549) and harvested 3,896 (SE 430) Chinook salmon with 77,276 (SE 2,869) angler-hours of effort. Approximately 53% of late-run Chinook salmon were harvested downstream of the river mile (RM) 13.7 Chinook sonar site, the remaining 47% were harvested upstream of RM 13.7. The age composition of harvested late-run Chinook salmon was 2.6% age-1.1, 18.8% age-1.2, 47.0% age-1.3, 29.9% age-1.4, 0.9% age-1.5, and 0.9% age-2.3 fish. A standardized gillnetting program at RM 8.6 estimated the Chinook salmon age composition, catch rates, and species composition within midriver and nearshore areas 16 May–20 August 2015. During the early run, 150 Chinook salmon and 1,443 sockeye salmon were captured in gillnets (midriver and nearshore combined). The estimated age composition of 114 early-run Chinook salmon captured in gillnets was 4.4% age-1.1, 41.2% age-1.2, 36.8% age-1.3, 16.7% age-1.4, and 0.9% age-1.5 fish. During the late run, 311 Chinook salmon, 2,864 sockeye salmon, 113 coho salmon, and 5 pink salmon were captured in gillnets. The estimated age composition of 238 late-run Chinook salmon captured in gillnets was 5.0% age-1.1, 29.4% age-1.2, 36.1% age-1.3, 27.7% age-1.4, and 1.7% age-1.5 fish. During both runs, Chinook salmon captured nearshore were smaller and younger than those captured midriver.

Key words: 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 (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), sockeye (*O. nerka*), and 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 these data are the subjects of this report: the Kenai River Chinook salmon creel survey 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

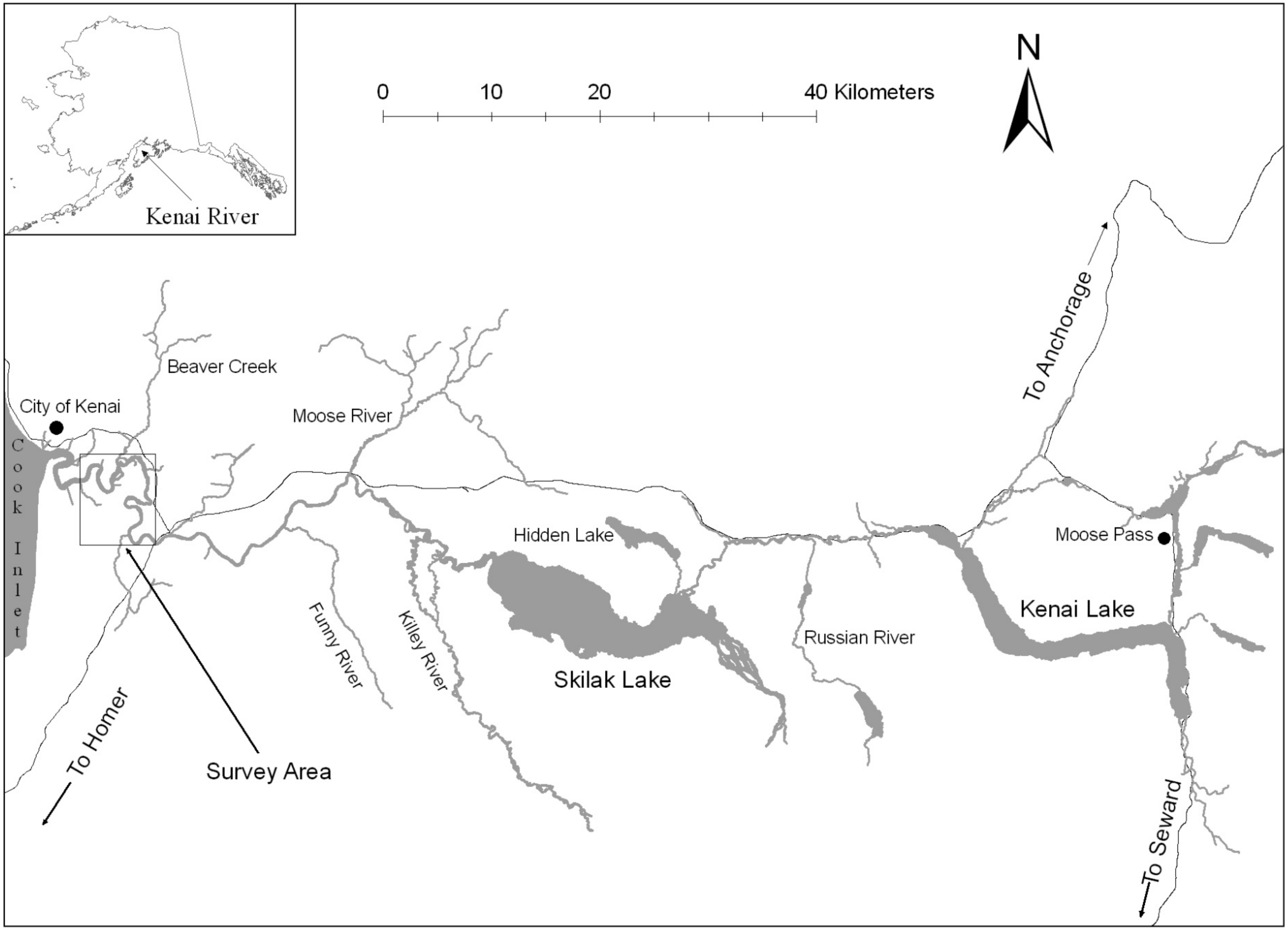

Figure 1.–Kenai River drainage on the Kenai Peninsula in Southcentral Alaska.

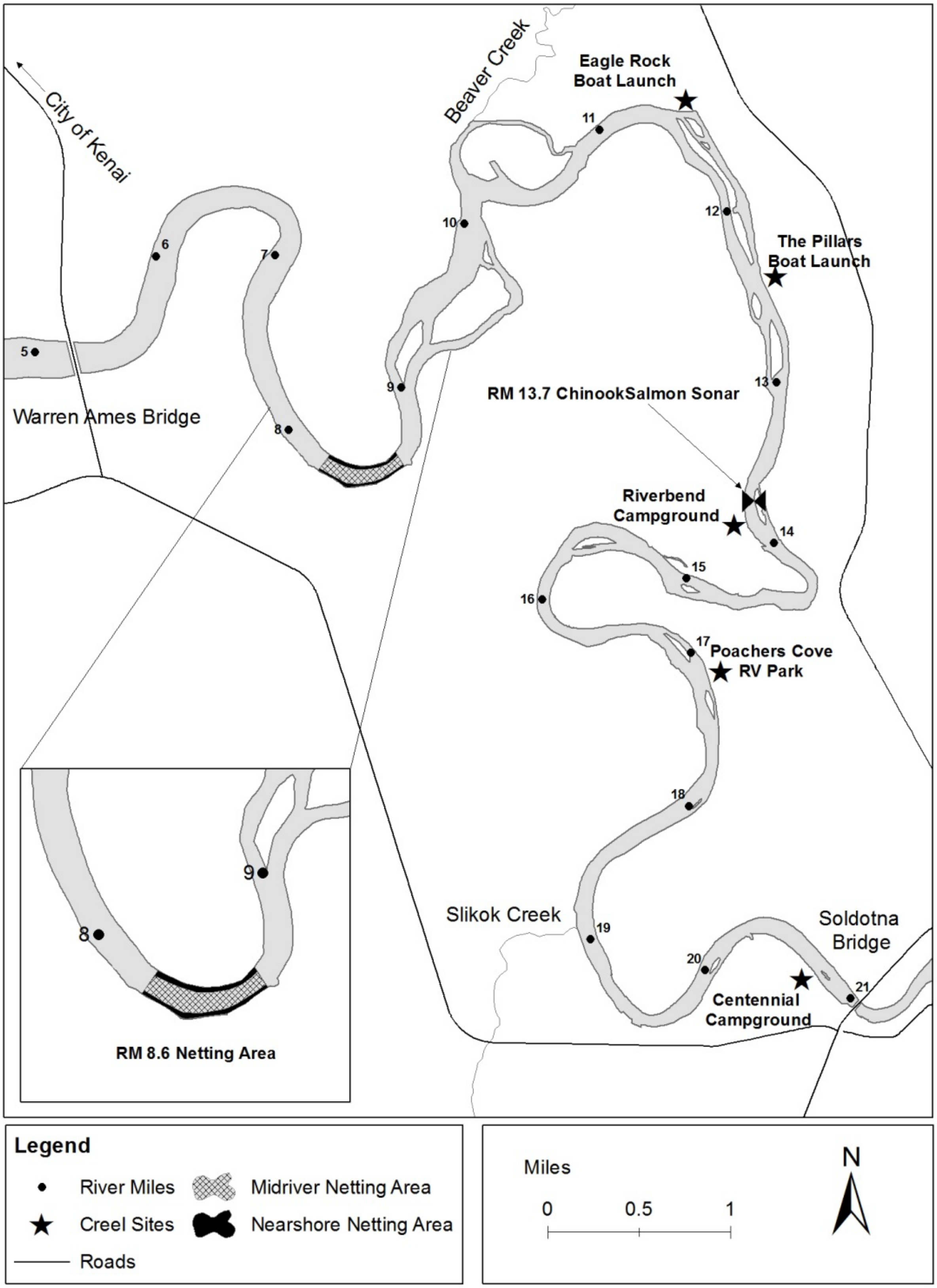

Figure 2.–Lower Kenai River from Warren Ames Bridge (RM 5.2) to Soldotna Bridge (RM 21.1).

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, and the 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 goal of the inriver netting project is 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 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. 2017)[3]. This new site is centered in the lower Kenai River Chinook salmon sport fishery. The creel survey remained 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

Beginning in the mid-1980s, mark–recapture studies used gillnets for the marking phase to estimate the inriver run of Chinook salmon (Hammarstrom and Larson 1984). Various adult Chinook salmon capture techniques had been evaluated including, but not limited to, fish wheels, seines, and fyke-type traps, and the use of drift gillnets were found to be the most effective. SF began using sonar in 1987 to estimate the inriver runs of Chinook salmon and the inriver gillnetting study provided ASL compositions of the inriver runs (Marsh 2000). The gillnetting program was standardized and modified in 1998 to include catch rates, and modified further in 2002 to include species composition of fish passing through the insonified (midriver) area of the RM 8.6 Chinook salmon sonar site (Reimer 2004b). Also in 2002, a smaller 5.0-inch stretched

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

3 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.

mesh net was added to the netting program and fished in conjunction with a 7.5-inch stretched mesh net.

During 2002–2012, the inriver gillnetting program remained relatively unchanged and was conducted exclusively within the midriver area insonified by the RM 8.6 sonar. Although the netting program provided an estimate of the ASL composition of fish passing through the midriver insonified area, other Kenai River studies found that the ASL composition may not always be representative of the Chinook salmon runs. During 2012, weirs operated by the United States Fish and Wildlife Service (USFWS) on the Killey River (Gates and Boersma 2013) and the Funny River (Boersma and Gates 2013), both Kenai River tributaries, sampled relatively larger numbers of small Chinook salmon than the sonar and gillnetting program could account for. In addition, data collected by Miller et al. (2014) found that significant numbers of Chinook salmon migrated shoreward of the transducers (noninsonified nearshore area) during high tide, and Chinook salmon captured in a pilot study netting the noninsonified nearshore area were found to be shorter in length than those captured midriver (Perschbacher 2015).

In 2014, several modifications were made to the RM 8.6 inriver gillnetting study in order to capture a more representative sample of returning Chinook salmon (Perschbacher and Eskelin 2016). Netting effort was doubled, the river was fished rigorously from shoreline to shoreline for the first time, panel nets consisting of 2 mesh sizes were instituted, the netting schedule was based on a set time of day rather than tidal stage, and a second upriver netting site was investigated. These changes were incorporated for the following reasons: 1) to compare sizes of Chinook salmon captured midriver and nearshore to those sampled at tributary weirs, 2) to examine the feasibility of netting shoreline to shoreline during all tide stages, 3) to determine if there are any tidal effects on catch rate and size of Chinook salmon captured in inriver gillnets, and 4) to investigate the feasibility of netting an upstream site closer to the RM 13.7 Chinook salmon sonar. A summary of results from the 2014 inriver gillnetting study showed that catch rates were highest during the morning hours, fish captured nearshore were on average smaller than those captured midriver, and ASL compositions of Chinook salmon were similar among all tidal stages (Perschbacher and Eskelin 2016). In addition, length compositions of Chinook salmon captured at RM 8.6 in both nearshore and midriver nets did not differ significantly from those sampled at the USFWS tributary weirs. Ideally, the netting program would operate just downstream of the RM 13.7 sonar, but the 2014 pilot study concluded the upstream netting area closer to RM 13.7 would not be conducive for an intensive inriver gillnetting study because of social issues, heavy boat traffic, and possible net avoidance by fish due to the clearer water (Perschbacher and Eskelin 2016).

Given what was learned from the 2014 gillnetting study, the 2015 inriver gillnetting study was conducted at RM 8.6 during the morning hours (7:00 AM–1:00 PM) regardless of tidal stage, with netting divided equally between nearshore and midriver areas. When sonar operations were moved to the RM 13.7 site in 2015, the nearly shoreline-to-shoreline insonification at RM 13.7 corresponded to the shoreline-to-shoreline netting at RM 8.6.

MANAGEMENT PLANS

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

The 2015 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[4] (OEG) of 5,300–9,000 Chinook salmon of any size. If the spawning escapement is projected to exceed 9,000 fish, the fishery may be liberalized to allow bait. If the spawning escapement is projected to be less than 5,300 fish, ADF&G may close the fishery or implement more conservative regulations (adopted by BOF) that restrict 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 salt water. During 2015, anglers were required to release Chinook salmon measuring 42–55 inches 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 is more complex because multiple fisheries harvest Chinook salmon prior to the inriver sport fishery. The 2015 late-run Chinook salmon sport fishery was managed under the *Kenai River Late-Run King Salmon Management Plan* (5 AAC 21.360), which mandates the late run be managed to achieve a sustainable escapement goal[5] (SEG) of 15,000–30,000 Chinook salmon of any size. This management plan adopted by the BOF allows 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 is projected to exceed 30,000 fish, the fishery may be liberalized to allow harvest of Chinook salmon through the first week of August. If the spawning escapement is projected to be less than 15,000 fish, ADF&G may close the inriver fishery or implement more conservative regulations (adopted by BOF) such as restricting the use of bait, allowing catch-and-release fishing only, or reducing the area open to Chinook salmon fishing. If the inriver fishery is restricted, other Cook Inlet sport fisheries, personal use fisheries, subsistence fisheries, and Cook Inlet commercial fisheries may also be restricted.

OBJECTIVES

PRIMARY OBJECTIVES

1) Estimate catch and harvest of Chinook salmon by the sport fishery in the Kenai River between Warren Ames Bridge (RM 5.2) and the RM 13.7 Chinook salmon sonar, and between the RM 13.7 sonar and 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[6].
2) Provide age compositions required in part to estimate total return for the early and late runs by brood years. Subordinate objectives[7] of this report that are associated with total run estimation are as follows:

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

5 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).

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

7 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).

a) Estimate the proportion by age of Chinook salmon captured in inriver gillnets from 16 May through 20 August such that all age-proportion estimates for each run are within 0.1 of the true values 95% of the time[8].

b) Estimate the proportion by age of Chinook salmon harvested by the sport fishery in the mainstem Kenai River between the Warren Ames Bridge and the RM 13.7 Chinook salmon sonar, and between the RM 13.7 sonar and the Soldotna Bridge such that all age-proportion estimates for each run are within 0.20 of the true values 80% of the time.

SECONDARY OBJECTIVES

Secondary objectives can be accomplished without altering the current study design or sample sizes and include the following:

1) Estimate sport angler effort in angler-hours, by run, upstream and downstream of the RM 13.7 Chinook salmon sonar site. Precision of the effort estimates is driven by that of the catch and harvest estimates (Primary Objective 1).
2) Estimate daily catch per unit effort (CPUE), where effort is measured in drift-minutes, for Chinook salmon and for other salmon species captured in inriver gillnets at RM 8.6 to index run strength and run timing for fisheries managers.
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 adaptive resolution imaging sonar (ARIS)[9] sonar mixture model species composition evaluation.
4) Insert esophageal radio transmitters into Chinook salmon captured in inriver gillnets between 16 May and 30 June, in conjunction with the *Kenai River Adult Chinook Salmon Monitoring and Reporting* study (Eskelin 2015).
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 the 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, examine length distributions of Chinook salmon captured in inriver gillnets at RM 8.6 and those sampled at the Killey River and Funny River weirs.

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8 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.

9 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.

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 2015 creel survey was scheduled for 16 May–31 July, fishery closures restricted the creel survey to 1–31 July. First-stage sampling units were days. 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. Daily catch and harvest were estimated as the product of effort (angler-hours) and CPUE or HPUE. 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.

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 affects inriver run or escapement estimation, angler effort (from boat angler counts), and CPUE and HPUE (from angler interviews) were geographically stratified into the following 2 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 were available for stratum-specific 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, 2015.

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]	5	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 and angler interviews.

[b] The early-run sport fishery was closed to all Chinook salmon fishing 1 May to 30 June. The late-run sport fishery prohibited the use of bait from 1 to 24 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 travel 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 less than 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 conducted between 9:00 AM and 1:00 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
3) Riverbend Campground
4) Poacher's Cove
5) Centennial Campground

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

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 time 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, Perschbacher 2014b). 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) location and number of Chinook salmon harvested within each area (downstream or upstream of the RM 13.7 sonar)
7) number and location 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

Chinook Salmon Age, Sex, and Length

Harvested Chinook salmon were sampled for ASL during angler interviews. Sex was identified from external morphological characteristics (i.e., protruding ovipositor on females or a developing kype on males). 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 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

Tissue samples from tips of the axillary process were taken from harvested Chinook salmon for genetic analysis. Each sample was a half-inch piece of tissue placed in a 2 mL plastic vial that was completely covered with a buffered 95% alcohol solution such that the liquid to tissue ratio was approximately 3:1. Plastic vials were sequentially numbered and sent to the ADF&G Gene Conservation Laboratory in Anchorage for future genetic analysis.

[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.

Coded Wire Tags and Radio Transmitters

All harvested fish 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 CWT 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 this 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. 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. 2017). A single inriver gillnetting 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 2002–2014 (Reimer 2004a, 2004b, 2007; Eskelin 2007, 2009, 2010; Perschbacher 2012a, 2012b, 2012c, 2012d, 2014a, 2015;

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 or not there is 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 Gillnet Sampling

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. In order to track 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 quarter-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. Few rainbow trout (or steelhead) and Dolly Varden are typically captured so every fish was sampled for METF length (nearest 5 mm). Sockeye salmon, pink salmon, and coho salmon are typically captured in large numbers, so they were sampled every third day for METF length (nearest 5 mm).

Chinook Salmon Age, Sex, and Length

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 similar to those described for sport harvested Chinook salmon.

Genetics Sampling

In the inriver gillnetting study, tissue samples from dorsal fin clips 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. The dorsal fin clip consisted of a half-inch piece of tissue that was placed in a 2 mL plastic vial and completely covered with a buffered 95% alcohol solution such that the liquid to tissue ratio was approximately 3:1. Plastic vials were sequentially numbered and sent to the ADF&G Gene Conservation Laboratory in Anchorage for future genetic analysis.

Radio Transmitter Deployment

The inriver gillnetting study served as the marking event for a separate Kenai River adult Chinook Salmon radiotelemetry study (Eskelin and Reimer 2017). Eskelin and Reimer (2017) provide details regarding the deployment of radio transmitters in 2015.

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 count). Daily discharge estimates for the 2015 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:

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

where

x_{hig} = the number of anglers observed in the gth 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:

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

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

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

where

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

The within-day variance (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

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

where

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

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

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

Total effort for stratum *h* was estimated by

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

where

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

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

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

where

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

Catch and Harvest

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

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

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* was estimated using Equations 5–8, substituting estimated catch ($\hat{C}_{hi}$) and harvest ($\hat{H}_{hi}$) during sample day *i* for the estimated effort ($\hat{E}_{hi}$) during day *i*.

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

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 2011–2015; rather, an "index" angler count was 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 2009–2010 were used to estimate the relationship between the number of anglers counted during the 9:00 AM–1:00 PM "index" time 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 time periods. In 2009–2010, the mean number of anglers count on Mondays was approximately 54% of the "index" count during the "index" time 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 and HPUE and the estimate of *E* derived from the index count.

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[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.

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:

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

with variance

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

where c_{smijk} is the catch of species s in mesh m during a drift originating from bank k during repetition j on day i, e_{mijk} is the effort (soak time in minutes) for that drift, J_i is the number of repetitions completed on day i, c_{smij} is the catch of species i in mesh m summed across drifts on both banks conducted during repetition j of day i, $e_{mij.}$ is the effort for mesh m summed across drifts on both banks conducted during repetition j of day i, and $\bar{e}_{mi}$ is the mean of e_{mij} across all repetitions j for mesh m on day i. The variance follows Cochran (1977: page 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 the Chinook salmon captured in RM 8.6 midriver and nearshore gillnets, 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):

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

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 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* (above and below the sonar at RM 13.7), was estimated by

$$\hat{H}_{gbt} = \hat{H}_{gt}\hat{p}_{bt}, \qquad (20)$$

with variance (Goodman 1960)

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

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:

$$\hat{p}_{gb} = \frac{\sum_t \hat{H}_{gt}\hat{p}_{bt}}{\sum_t \hat{H}_{gt}}, \text{ and} \qquad (22)$$

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

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:

$$\hat{R}_b = \hat{N}_b + \hat{H}_{2b}. \qquad (24)$$

[13] Variance estimates for species proportions assume that each fish sampled is an independent observation (i.e., that simple random sampling, SRS, was employed). In reality, the sport harvest is sampled with a multistage design (creel survey) and the inriver run with a cluster design (netting), and technically, the age proportion variances should be estimated in the context of those designs. However, age composition changes very slowly over time, and in the past, we have assumed that variability between sampling stages and among clusters is negligible. To verify this, we reanalyzed the 2006 netting data, calculated the age proportions using a modified version of Equations 7 and 8, 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.

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

Nonparametric Kolmogorov-Smirnov (K-S) tests were used to test for differences between length distributions of all Chinook salmon sampled for length in inriver gillnets by location (nearshore vs. midriver), and between early-run fish sampled for length in RM 8.6 inriver gillnets and those sampled at Kenai River tributary weirs. Tributary weirs were operated by the USFWS on the Killey River (Gates and Boersma 2016) and Funny River (Boersma and Gates 2016) in 2015. Lengths of Chinook salmon sampled at the tributary weirs 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 versus 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 versus the cumulative length distribution of Chinook salmon sampled from the Killey River weir and Funny River weir combined (Funny River and Killey River weir length distributions were weighted by relative abundance).

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 weighted by abundance). The sample in Test 2 was the length distribution of all 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 in order to achieve escapement goals. The early-run sport fishery was closed drainagewide to all Chinook salmon fishing 1 May through 30 June by emergency order (EO 2-KS-1-05-15) because the preseason forecast for early-run Chinook salmon was less than the lower end of the OEG. During the late-run sport fishery, the use of bait was prohibited drainagewide during 1–24 July. Inseason projections indicated the lower end of the SEG would be met and the bait restriction was rescinded downstream of the Slikok Creek closed area (RM 18.6) during 25–31 July (EO 2-KS-1-46-15).

Effort, Catch, and Harvest

Anglers between the Warren Ames Bridge and the Soldotna Bridge harvested 3,896 (SE 430) and caught 6,522 (SE 549) late-run Chinook salmon with approximately 77,276 (SE 2,869) angler-hours of effort (Table 2 and Figure 3). The Chinook salmon harvest was 1,823 (SE 279) upstream of RM 13.7 and 2,073 (SE 327) downstream of RM 13.7. The Chinook salmon catch was 3,495 (SE 401) fish upstream of RM 13.7 and 3,027 (SE 375) fish downstream of RM 13.7, and the sport-angler effort was 38,709 hours (SE 2,089) upstream of RM 13.7 and 38,567 hours (SE 1,966) downstream of RM 13.7 (Table 2). Precision estimates for late-run harvest by geographic strata (±548 upstream and ±641 downstream of RM 13.7) and late-run catch (±22%

upstream and ±24% downstream of RM 13.7) were within 25%, or 1,000 fish, of the true values 90% of the time and satisfied Objective 1.

Overall angler effort was approximately equal upstream and downstream of RM 13.7 (Table 2). Chinook salmon harvest was slightly higher downstream of RM 13.7 (53% of total harvest), whereas catch was slightly higher upstream of RM 13.7 (54% of total catch). Approximately 40% of the total catch was released; however, anglers released a higher percentage of their catch upstream of RM 13.7 (48%) than downstream of RM 13.7 (31%; calculated from Table 2).

Table 2.–Estimated late-run Kenai River Chinook salmon sport fishery effort, catch, and harvest by angler type, and geographic location between Soldotna Bridge and Warren Ames Bridge, 1–31 July 2015.

	Angler effort			Chinook salmon: Catch			Chinook salmon: Harvest		
Parameter [a]	Hours fished	SE	Percent of total	Number	SE	Percent of total	Number	SE	Percent of total
Unguided anglers									
Downstream	21,094	1,319	54%	1,325	208	44%	788	160	54%
Upstream	17,963	1,329	46%	1,687	257	56%	661	155	46%
Guided anglers									
Downstream	17,473	1,458	46%	1,701	312	48%	1,285	285	53%
Upstream	20,746	1,612	54%	1,808	307	52%	1,162	232	47%
Angler type subtotals									
Unguided total	39,057	1,873	51%	3,012	331	46%	1,449	223	37%
Guided total	38,219	2,173	49%	3,509	438	54%	2,447	368	63%
Geographic subtotals									
Downstream total	38,567	1,966	50%	3,027	375	46%	2,073	327	53%
Upstream total	38,709	2,089	50%	3,495	401	54%	1,823	279	47%
Late-run total	77,276	2,869		6,522	549		3,896	430	

Note: Unguided angler totals do not include Monday's index estimates of effort (2,312 angler hours), Chinook salmon catch (208), and harvest (114).

[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 the Soldotna Bridge.

The 2015 late-run harvest was 43% of the recent 10-year average, catch was 36% of the recent 10-year average, and effort was 49% of the recent 10-year average (calculated from Figure 3). The 2015 late-run CPUE was 42% higher, and HPUE was 36% higher than recent 10-year averages (calculated from Figure 4).

The creel survey conducted a total of 769 angler interviews and sampled 61% (14/23) of the days the fishery was open to guided anglers and 67% (18/27) of the days the fishery was open to unguided anglers (Appendix A1). Guided anglers accounted for 63% (2,447, SE 368) of the harvest, 54% (3,509, SE 401) of the catch, and 49% (38,219, SE 2,173) of angler effort; the remainder was unguided (Table 2 and Figure 3). Guided anglers reported releasing approximately 30% of their total catch and unguided anglers reported releasing 52% of their catch (calculated from Table 2).

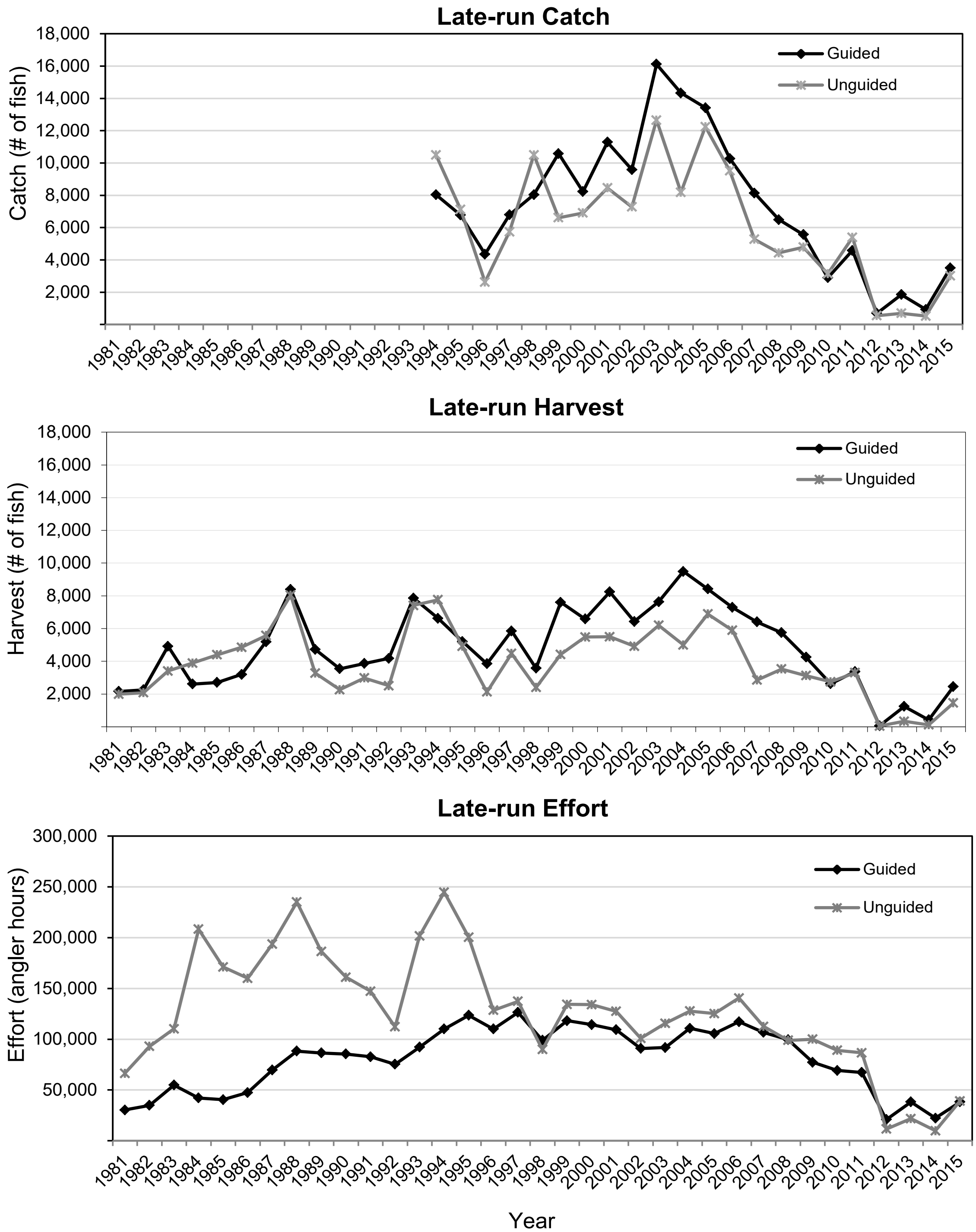

Figure 3.–Guided and unguided sport catch (top), harvest (middle), and angler effort (bottom), from ADF&G creel surveys for the late-run Kenai River Chinook salmon fishery between the Soldotna Bridge and the Warren Ames Bridge, 1981–2015.

Source: Hammarstrom and Larson (1982–1984, 1986); Hammarstrom et al. (1985); Conrad and Hammarstrom (1987); Hammarstrom (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).

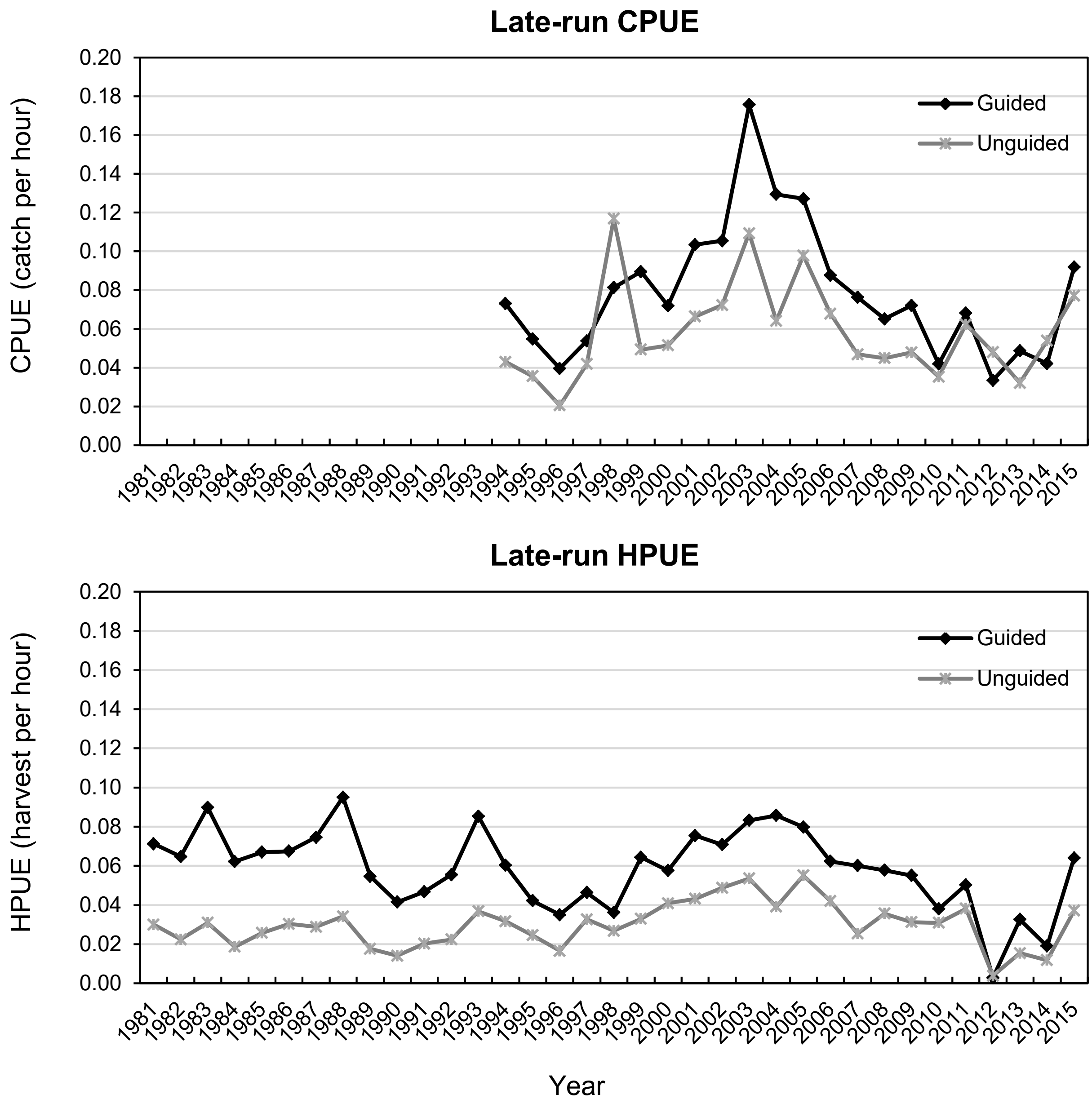

Figure 4.–Guided and unguided CPUE (top), and HPUE (bottom) from ADF&G creel surveys for the late-run Kenai River Chinook salmon fishery between the Soldotna Bridge and the Warren Ames Bridge, 1981–2015.

Source: Hammarstrom and Larson (1982–1984, 1986); Hammarstrom et al. (1985); Conrad and Hammarstrom (1987); Hammarstrom (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).

Late-run daily effort for both unguided and guided boat anglers combined was greatest (4,104 angler-hours) on 30 July, whereas the largest harvest (274 Chinook salmon) and catch (495 Chinook salmon) occurred on 29 July (summed from Appendices B1 and B2). Late-run daily effort for unguided boat anglers was greatest (3,665 angler-hours) on 25 July, whereas the largest harvest (391 Chinook salmon) and catch (559 Chinook salmon) occurred on 26 July (Appendix B1). Unguided anglers also had the highest daily HPUE (0.114 fish per hour) and CPUE (0.163 fish per hour) on 26 July (Appendix B3). Overall, unguided HPUE and CPUE averaged 0.025 and 0.056 fish per hour, respectively. Guided anglers' greatest daily effort (2,328 angler-hours) and harvest (246 Chinook salmon) occurred on 21 July, whereas the greatest daily catch (377 Chinook salmon) occurred on 28 July (Appendix B2). Guided anglers' highest daily HPUE (0.151 fish per hour) and CPUE (0.275 fish per hour) occurred on 25 July (Appendix B4). Overall, guided HPUE and CPUE averaged 0.059 and 0.086 fish per hour, respectively.

The maximum boat angler count of 281 unguided anglers (147 upstream and 134 downstream of RM 13.7) occurred on 25 July, and the maximum count of 316 guided anglers (207 upstream and 109 downstream of RM 13.7) occurred on 28 July (Appendices C1–C3). The unguided and guided maximum counts occurred during the 4:00 AM–8:59 AM time stratum.

Late-Run Monday Index

It was estimated that between the Soldotna Bridge and the Warren Ames Bridge, unguided drift-boat anglers caught 208 and harvested 114 Chinook salmon with 2,312 angler-hours of effort during late-run Mondays (calculated from Appendix A1). Estimated harvest of Chinook salmon on drift-boat Mondays was 2.9% of the total estimated late-run harvest (excluding Mondays) in 2015.

Sport Harvest Age, Sex, and Length Compositions

There were 117 valid age samples collected in the late-run sport fishery which was composed of 2.6% age-1.1 fish, 18.8% age-1.2 fish, 47.0% age-1.3 fish, 29.9% age-1.4 fish, 0.9% age-1.5 fish, and 0.9% age-2.3 fish (Table 3)[14].

The harvests of females and males were approximately equal (52.1% males, 47.9% females; Table 3). 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 female Chinook salmon (916 mm) was larger than male Chinook salmon (814 mm; Table 4). The average length of sport-harvested Chinook salmon sampled for age was 862 mm, with a range of 410 mm to 1,190 mm.

[14] See associated tables for SEs of age, sex, and length compositions of sport harvested early- and late-run Chinook salmon.

Table 3.–Age composition and estimated sport harvest by age class and geographic stratum for late-run Kenai River Chinook salmon between Soldotna Bridge and Warren Ames Bridge, 1–31 July 2015.

		Age						
Sex	Parameter [a]	1.1	1.2	1.3	1.4	1.5	2.3	Total
Female								
	Summed sample size		2	31	22	1		56
	% Sample		1.7%	26.5%	18.8%	0.9%		47.9%
	SE % sample		1.2%	4.1%	3.6%	0.9%		4.6%
	Downstream harvest		39	585	408	20		1,052
	SE downstream harvest		28	129	101	20		195
	Upstream harvest		32	489	346	16		882
	SE upstream harvest		23	111	87	16		170
	Total harvest		71	1,074	754	36		1,934
	SE total harvest		50	205	168	36		287
Male								
	Summed sample size	3	20	24	13		1	61
	% Sample	2.6%	17.1%	20.5%	11.1%		0.9%	52.1%
	SE % sample	1.5%	3.5%	3.7%	2.9%		0.9%	4.6%
	Downstream harvest	43	296	448	215		20	1,021
	SE downstream harvest	26	86	108	67		20	192
	Upstream harvest	45	302	377	200		16	941
	SE upstream harvest	26	72	92	59		16	156
	Total harvest	88	598	825	415		36	1,962
	SE total harvest	51	140	177	118		36	277
Both								
	Summed sample size	3	22	55	35	1	1	117
	% Sample	2.6%	18.8%	47.0%	29.9%	0.9%	0.9%	100.0%
	SE % sample	1.5%	3.6%	4.6%	4.3%	0.9%	0.9%	0.0%
	Downstream harvest	43	335	1,033	623	20	20	2,073
	SE downstream harvest	26	92	192	132	20	20	327
	Upstream harvest	45	334	866	546	16	16	1,823
	SE upstream harvest	26	77	168	114	16	16	279
	Total harvest	88	669	1,899	1,169	36	36	3,896
	SE total harvest	51	150	284	210	36	36	430

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

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

Table 4.–Late-run Kenai River Chinook salmon lengths by sex and age from creel survey samples, 1–31 July 2015.

		Age						
Sex	Parameter	1.1	1.2	1.3	1.4	1.5	2.3	Combined
Female								
	Sample size		2	31	22	1		56
	Mean length (SE)		663 (28)	904 (7)	948 (10)	1,070		916 (9)
	Min–max lengths		635–690	835–970	855–1,045	1,071		635–1,070
Male								
	Sample size	3	20	24	13		1	61
	Mean length (SE)	433 (12)	643 (16)	895 (22)	1,003 (22)		940	814 (24)
	Min–max lengths	410–445	415–730	650–995	875–1,190		940	410–1,190
Both								
	Sample size	3	22	55	35	1	1	117
	Mean length (SE)	433 (12)	645 (14)	900 (10)	968 (11)	1,070	940	862 (14)
	Min–max lengths	410–445	415–730	650–995	855–1,190	1,070	940	410–1,190

Note: All lengths were measured (mm) from mid eye to tail fork.

INRIVER GILLNETTING

During the early run, approximately 60% of drifts (490/820 drifts) and 69% of drift minutes (4,888/7,109 minutes) occurred within the midriver area because the midriver area is larger than the nearshore area (Appendices D1 and D2). Overall, inriver nets captured 150 Chinook salmon (96 midriver and 54 nearshore), 1,443 sockeye salmon (786 midriver and 657 nearshore), 2 Dolly Varden nearshore, and 1 rainbow trout midriver. The majority of both Chinook salmon (64%) and sockeye salmon (54%) were captured midriver.

Early-run CPUE (measured as catch per drift minute) for Chinook salmon averaged 0.023 (0.023 midriver and 0.025 nearshore) and was the highest (0.070) on 17 June, whereas CPUE for sockeye salmon averaged 0.229 (0.183 midriver and 0.287 nearshore) and was the highest (0.644) on 18 June (Appendix D3).

During the late run, approximately 51% of drifts (451/891 drifts) and 61% of drift minutes (4,300/7,003 minutes) occurred midriver (Appendix D4). Overall, inriver nets captured a total of 311 Chinook salmon (243 midriver and 68 nearshore), 2,864 sockeye salmon (1,120 midriver and 1,744 nearshore), 113 coho salmon (51 midriver and 62 nearshore), 5 pink salmon (2 midriver and 3 nearshore), 3 Dolly Varden nearshore, and 1 rainbow trout midriver (Appendices D4 and D5). The majority of Chinook salmon (78%) were caught midriver, and the majority of the sockeye salmon (61%), coho salmon (55%), and pink salmon (60%) were caught nearshore (Appendix D4).

Late-run CPUE for Chinook salmon averaged 0.055 (0.065 midriver and 0.026 nearshore) and was the highest (0.244) on 24 July, whereas CPUE for sockeye salmon averaged 0.504 (0.293 midriver and 0.837 nearshore) and was the highest (2.097) on 25 July (Appendix D6).

The 2015 early- and late-run Chinook salmon cumulative CPUEs for nearshore and midriver combined were slightly higher than the respective runs of 2014 (Figures 5 and 6). The 2015 early-run sockeye salmon cumulative CPUE (nearshore and midriver combined) was slightly lower than 2014 early run, whereas the 2015 late-run sockeye salmon CPUE was substantially below the 2014 late run (Figures 7 and 8).

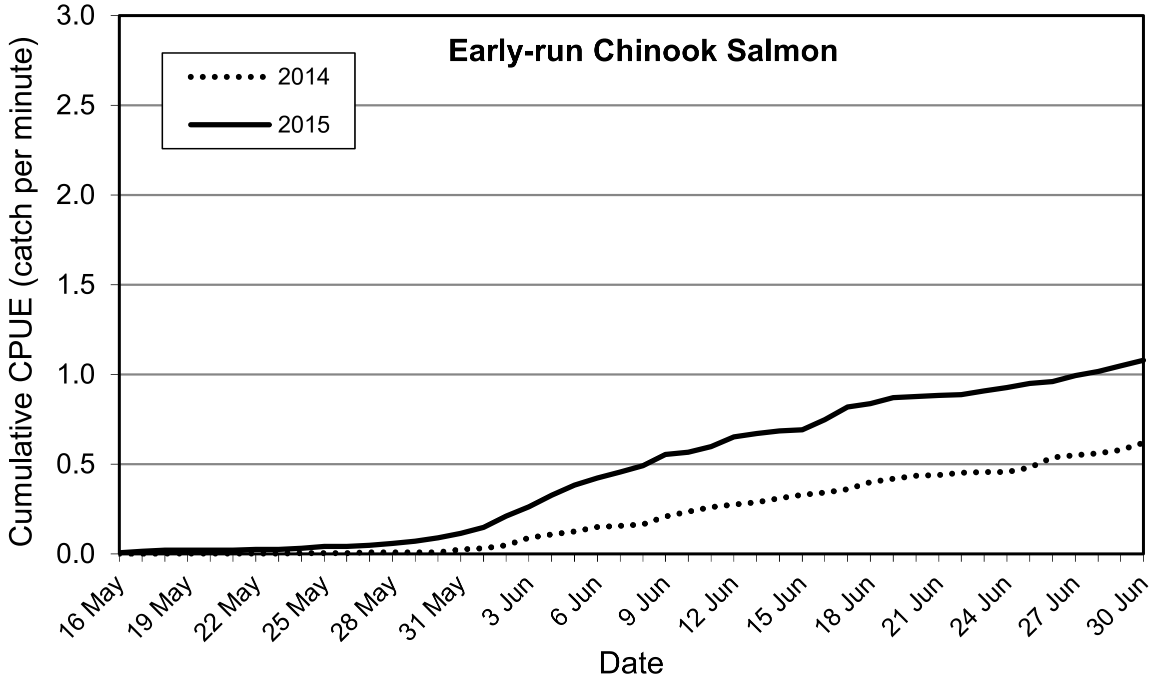

Figure 5.–Cumulative CPUE of Kenai River Chinook salmon captured shoreline-to-shoreline in inriver gillnets during the early run during 2014 and 2015.

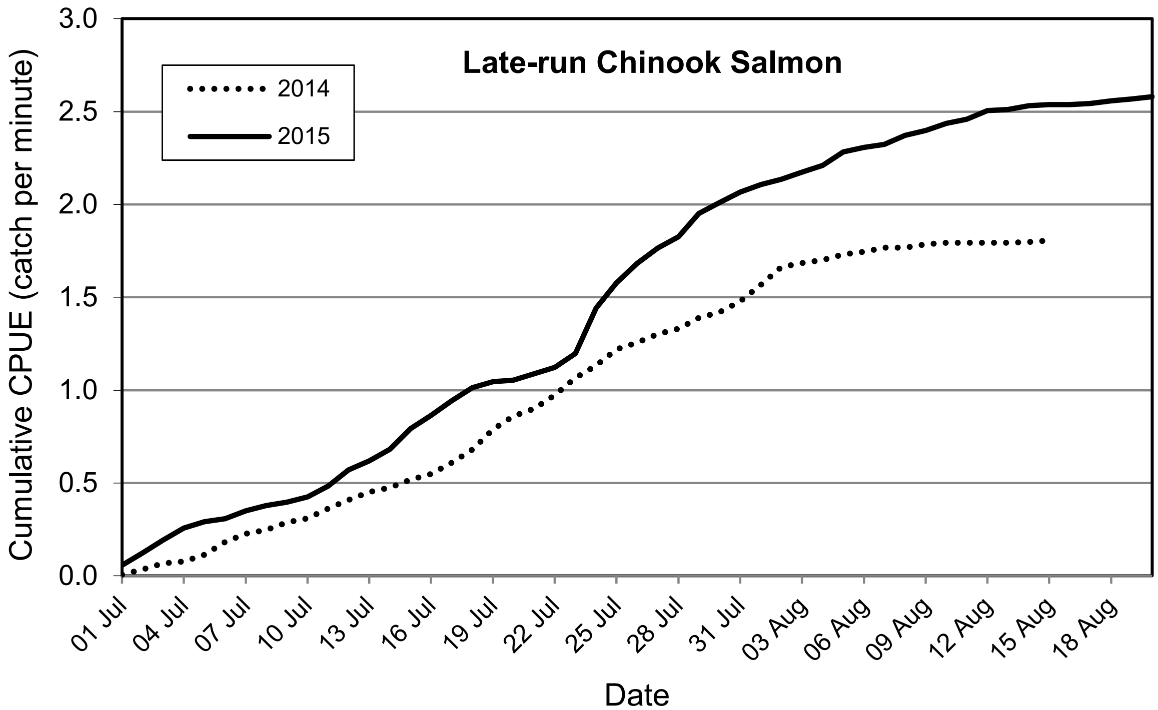

Figure 6.–Cumulative CPUE of Kenai River Chinook salmon captured shoreline-to-shoreline in inriver gillnets during the late run during 2014 and 2015.

Note: Late-run inriver netting was conducted through 15 August in 2014 and 20 August in 2015.

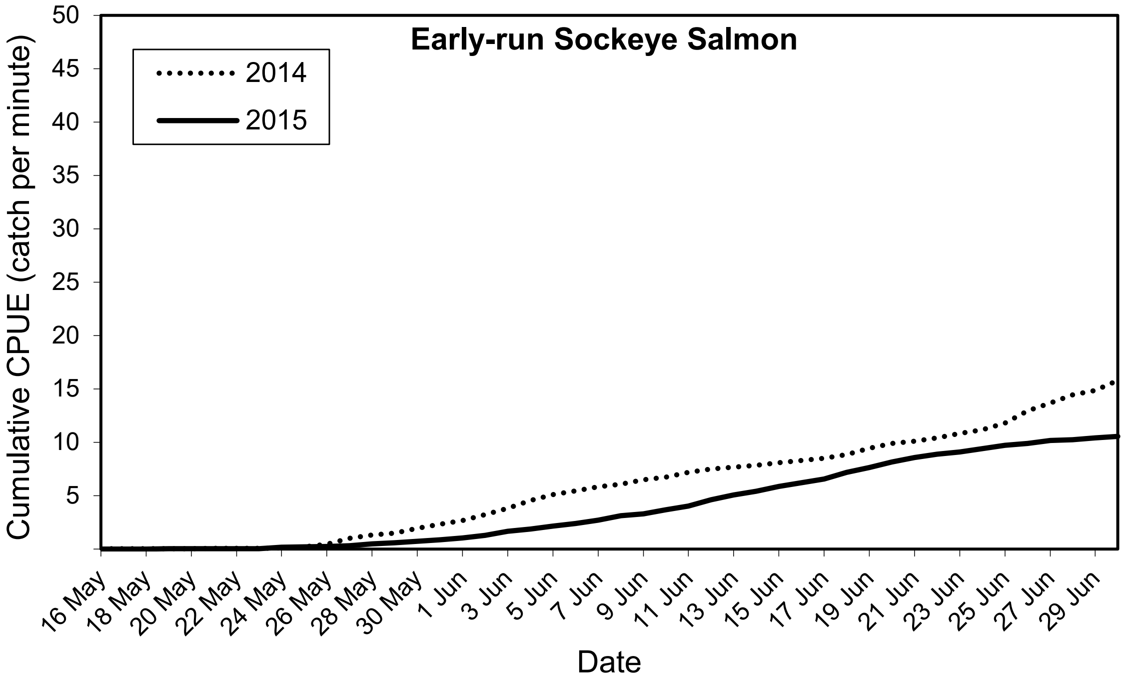

Figure 7.–Cumulative CPUE of Kenai River sockeye salmon captured shoreline-to-shoreline in inriver gillnets during the early run during 2014 and 2015.

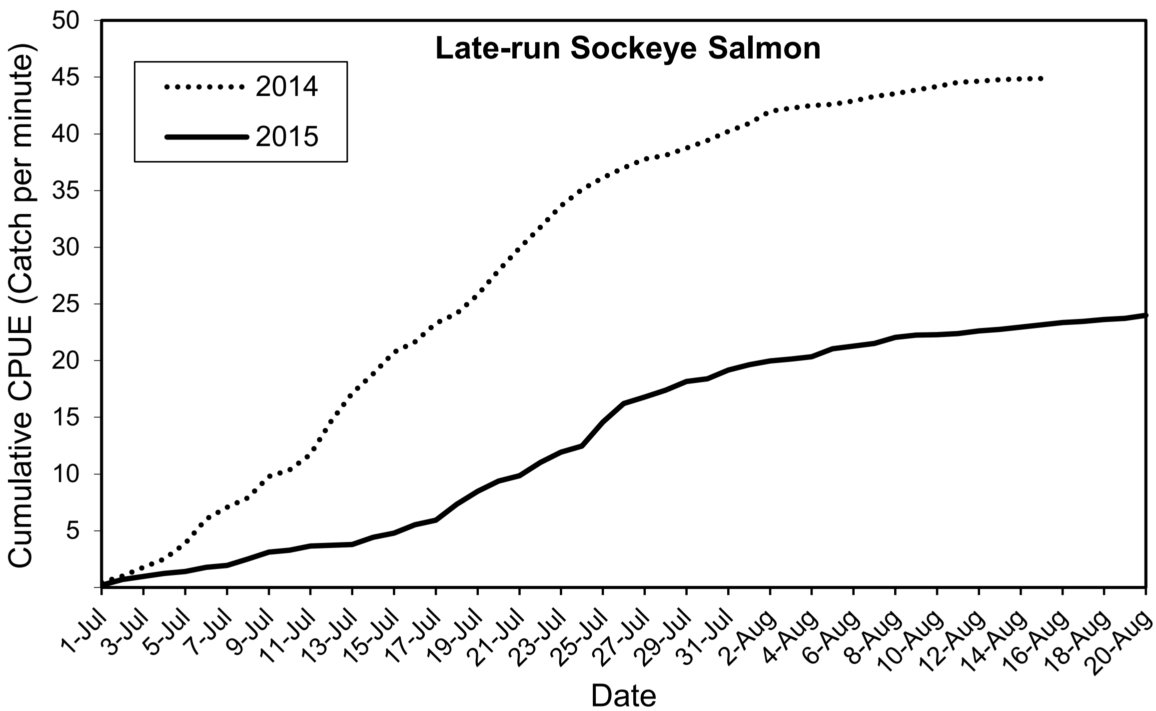

Figure 8.–Cumulative CPUE of Kenai River sockeye salmon captured shoreline-to-shoreline in inriver gillnets during the late run during 2014 and 2015.

Note: Late-run inriver netting was conducted through 15 August in 2014 and 20 August in 2015.

Chinook Salmon Catch by Tide Stage

Chinook salmon catch was estimated for each area and tidal stage (low, rising, high, and falling tidal stages), for the early and late runs (Figure 9). 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. In order 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.

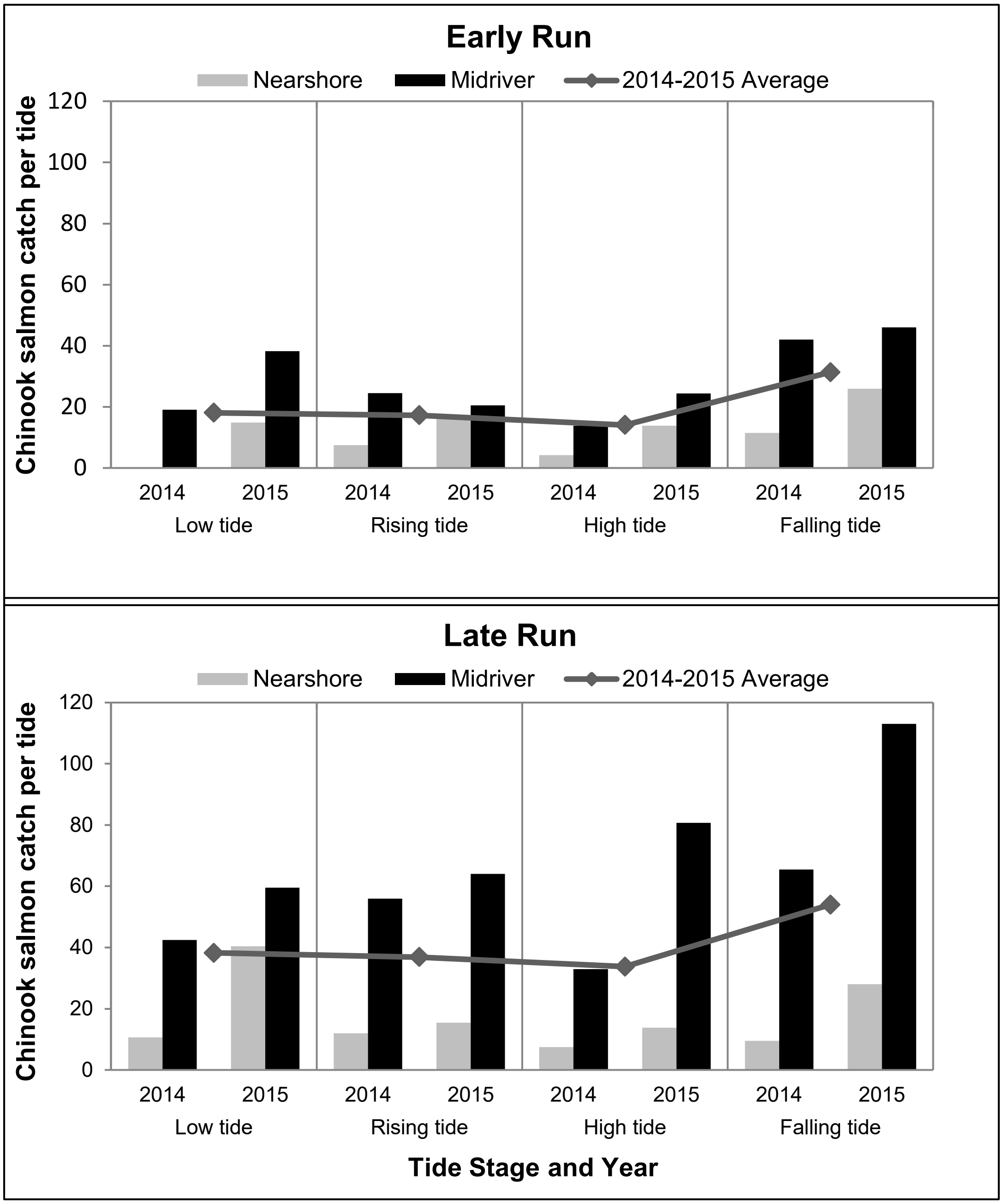

Figure 9.–Early- and late-run Chinook salmon catch by tide stage and year in nearshore and midriver nets, and the 2014–2015 mean catch for all netting during each tide stage.

Note: Numbers of Chinook salmon were estimated as if there were 4.25 hours of netting time in each tide stage.

During the 2015 early run, most Chinook salmon were captured during the falling tide (72), followed by the low tide (53), high tide (38), and rising tide (37) (calculated from Figure 9). Similar results were observed when data were restricted to either nearshore netting catches or midriver netting catches.

During the 2015 late run, most Chinook salmon were captured during the falling tide (141), followed by the low tide (100), high tide (95), and rising tide (80) (calculated from Figure 9). The majority of fish captured in midriver nets were captured during the falling tide, whereas the majority of fish captured in nearshore nets were captured during the low tide stage.

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.

Age, Sex, and Length Composition

Unless stated otherwise, the following results from inriver gillnetting are given as combined results of both nearshore and midriver netting. During the early run, 114 age samples were collected in the gillnetting study; this did not meet the sample size goal of 127 valid scale ages (Table 5)[15]. Although the sample size goal was not met, Objective 2b (age proportion estimates within 0.20 of the true values 80% of the time) was achieved. The estimated age composition of early-run Chinook salmon was 4.4% age-1.1 fish, 41.2% age-1.2 fish, 36.8% age-1.3 fish, 16.7% age 1.4-fish, and 0.9% age-1.5 fish (Table 5). Over the last 2 years, the percentages of age-1.2 fish captured have been the highest on record and the percentages of age-1.4 have been among the lowest on record, regardless of mesh size or area netted (Figure 10).

The early-run midriver gillnetting age composition of 71 sampled Chinook salmon was 38.0% age-1.2 fish, 43.7% age-1.3 fish, 16.9% age 1.4-fish, and 1.4% age-1.5 fish (Table 5). In early-run nearshore gillnetting, the age composition of 43 sampled Chinook salmon was 11.6% age-1.1 fish, 46.5% age-1.2 fish, 25.6% age-1.3 fish, and 16.3% age-1.4 fish. All jack (age-1.1 fish) Chinook salmon were captured in nearshore nets. A larger proportion of males were captured nearshore (69.8%) than midriver (53.5%; Table 5). Overall, 59.6% of early-run Chinook salmon captured in inriver gillnets were males; the remaining 40.4% were females.

During the late run, 238 valid age samples of Chinook salmon were collected from inriver gillnetting (Table 6). The estimated age composition of the late-run was 5.0% age-1.1 fish, 29.4% age-1.2 fish, 36.1% age-1.3 fish, 27.7% age 1.4-fish, and 1.7% age-1.5 fish (Table 6). During 2015, the percentage of age-1.4 Chinook salmon was the lowest on record, regardless of mesh size or area netted (Figure 11).

The late-run midriver gillnetting age composition of 181 sampled Chinook salmon was 3.3% age-1.1 fish, 28.2% age-1.2 fish, 38.1% age-1.3 fish, 28.7% age 1.4-fish, and 1.7% age-1.5 fish (Table 6). The late-run nearshore gillnetting age composition of 57 sampled Chinook salmon was 10.5% age-1.1 fish, 33.3% age-1.2 fish, 29.8% age-1.3 fish, 24.6% age-1.4 fish, and 1.8% age-1.5 fish. Similar to the early-run, larger percentages of smaller and younger fish (age-1.1 and age-1.2) were captured nearshore than midriver. Overall, 52.5% of late-run Chinook salmon

[15] Standard errors of age, sex, and length compositions of early- and late-run Chinook salmon captured in inriver gillnets are reported in the associated tables.

captured in inriver gillnets were males; the remaining 47.5% were females. Males were captured in slightly larger percentages midriver (53.6%) than nearshore (49.1%; Table 6).

During both runs, Chinook salmon captured in nearshore gillnets were smaller on average than those captured midriver (Tables 7 and 8). Chinook salmon captured during the early run were smaller on average (754 mm) than those captured during the late run (845 mm).

Table 5.–Early-run Kenai River Chinook salmon age compositions from midriver, nearshore, and combined gillnet samples, 16 May–30 June 2015.

			Age					
Source	Sex	Parameter	1.1	1.2	1.3	1.4	1.5	Total
Midriver								
	Female							
		Sample size		8	16	9		33
		Percent		11.3%	22.5%	12.7%		46.5%
		SE percent		3.8%	5.0%	4.0%		6.0%
	Male							
		Sample size		19	15	3	1	38
		Percent		26.8%	21.1%	4.2%	1.4%	53.5%
		SE percent		5.3%	4.9%	2.4%	1.4%	6.0%
	Both							
		Sample size		27	31	12	1	71
		Percent		38.0%	43.7%	16.9%	1.4%	100.0%
		SE percent		5.8%	5.9%	4.5%	1.4%	0.0%
Nearshore								
	Female							
		Sample size		1	9	3		13
		Percent		2.3%	20.9%	7.0%		30.2%
		SE percent		2.3%	6.3%	3.9%		7.1%
	Male							
		Sample size	5	19	2	4		30
		Percent	11.6%	44.2%	4.7%	9.3%		69.8%
		SE percent	4.9%	7.7%	3.2%	4.5%		7.1%
	Both							
		Sample size	5	20	11	7		43
		Percent	11.6%	46.5%	25.6%	16.3%		100.0%
		SE percent	4.9%	7.7%	6.7%	5.7%		0.0%
Combined								
	Female							
		Sample size		9	25	12		46
		Percent		7.9%	21.9%	10.5%		40.4%
		SE percent		2.5%	3.9%	2.9%		4.6%
	Male							
		Sample size	5	38	17	7	1	68
		Percent	4.4%	33.3%	14.9%	6.1%	0.9%	59.6%
		SE percent	1.9%	4.4%	3.4%	2.3%	0.9%	4.6%
	Both							
		Sample size	5	47	42	19	1	114
		Percent	4.4%	41.2%	36.8%	16.7%	0.9%	100.0%
		SE percent	1.9%	4.6%	4.5%	3.5%	0.9%	0.0%

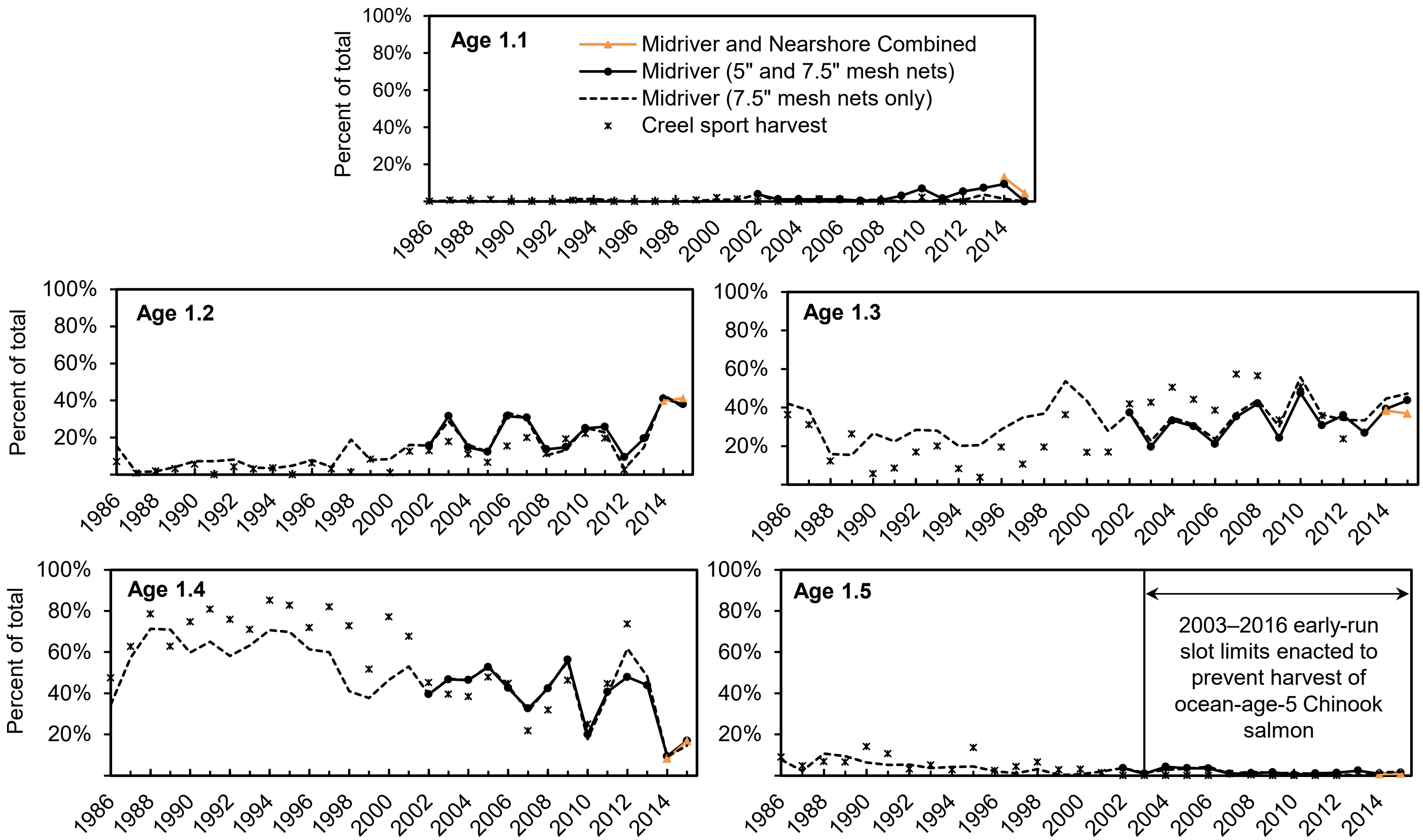

Figure 10.–Age composition of early-run harvest versus early-run netting for age-1.1 (top), age-1.2 (middle left), age-1.3 (middle right), age-1.4 (bottom left), and age-1.5 (bottom right) Kenai River Chinook salmon, 1986–2015.

Source: Hammarstrom and Larson (1982–1984, 1986); Hammarstrom et al. (1985); Conrad and Hammarstrom (1987); Hammarstrom (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: Early-run age compositions were derived for midriver netting samples using 7.5-in mesh nets during 1986–2001 and 5.0- and 7.5-in mesh nets during 2002–2015. Midriver and nearshore samples were used for age compositions during 2014 and 2015. The 2014 and 2015 early-run sport fisheries were closed to all Chinook salmon fishing 1 May–30 June. The Chinook salmon slot limit was 44–55 inches total length (TL) during 2003–2007, 46–55 inches TL during 2008–2013, and 42–55 inches TL during 2014–2015.

Table 6.–Late-run Kenai River Chinook salmon age compositions from midriver, nearshore, and combined gillnet samples, 1 July–20 August 2015.

			Age					
Source	Sex	Parameter	1.1	1.2	1.3	1.4	1.5	Total
Midriver								
	Female							
		Sample size		9	38	37		84
		Percent		5.0%	21.0%	20.4%		46.4%
		SE percent		1.6%	3.0%	3.0%		3.7%
	Male							
		Sample size	6	42	31	15	3	97
		Percent	3.3%	23.2%	17.1%	8.3%	1.7%	53.6%
		SE percent	1.3%	3.1%	2.8%	2.1%	1.0%	3.7%
	Both							
		Sample size	6	51	69	52	3	181
		Percent	3.3%	28.2%	38.1%	28.7%	1.7%	100.0%
		SE percent	1.3%	3.4%	3.6%	3.4%	1.0%	0.0%
Nearshore								
	Female							
		Sample size		6	11	11	1	29
		Percent		10.5%	19.3%	19.3%	1.8%	50.9%
		SE percent		4.1%	5.3%	5.3%	1.8%	6.7%
	Male							
		Sample size	6	13	6	3		28
		Percent	10.5%	22.8%	10.5%	5.3%		49.1%
		SE percent	4.1%	5.6%	4.1%	3.0%		6.7%
	Both							
		Sample size	6	19	17	14	1	57
		Percent	10.5%	33.3%	29.8%	24.6%	1.8%	100.0%
		SE percent	4.1%	6.3%	6.1%	5.8%	1.8%	0.0%
Combined								
	Female							
		Sample size		15	49	48	1	113
		Percent		6.3%	20.6%	20.2%	0.4%	47.5%
		SE percent		1.6%	2.6%	2.6%	0.4%	3.2%
	Male							
		Sample size	12	55	37	18	3	125
		Percent	5.0%	23.1%	15.5%	7.6%	1.3%	52.5%
		SE percent	1.4%	2.7%	2.4%	1.7%	0.7%	3.2%
	Both							
		Sample size	12	70	86	66	4	238
		Percent	5.0%	29.4%	36.1%	27.7%	1.7%	100.0%
		SE percent	1.4%	3.0%	3.1%	2.9%	0.8%	0.0%

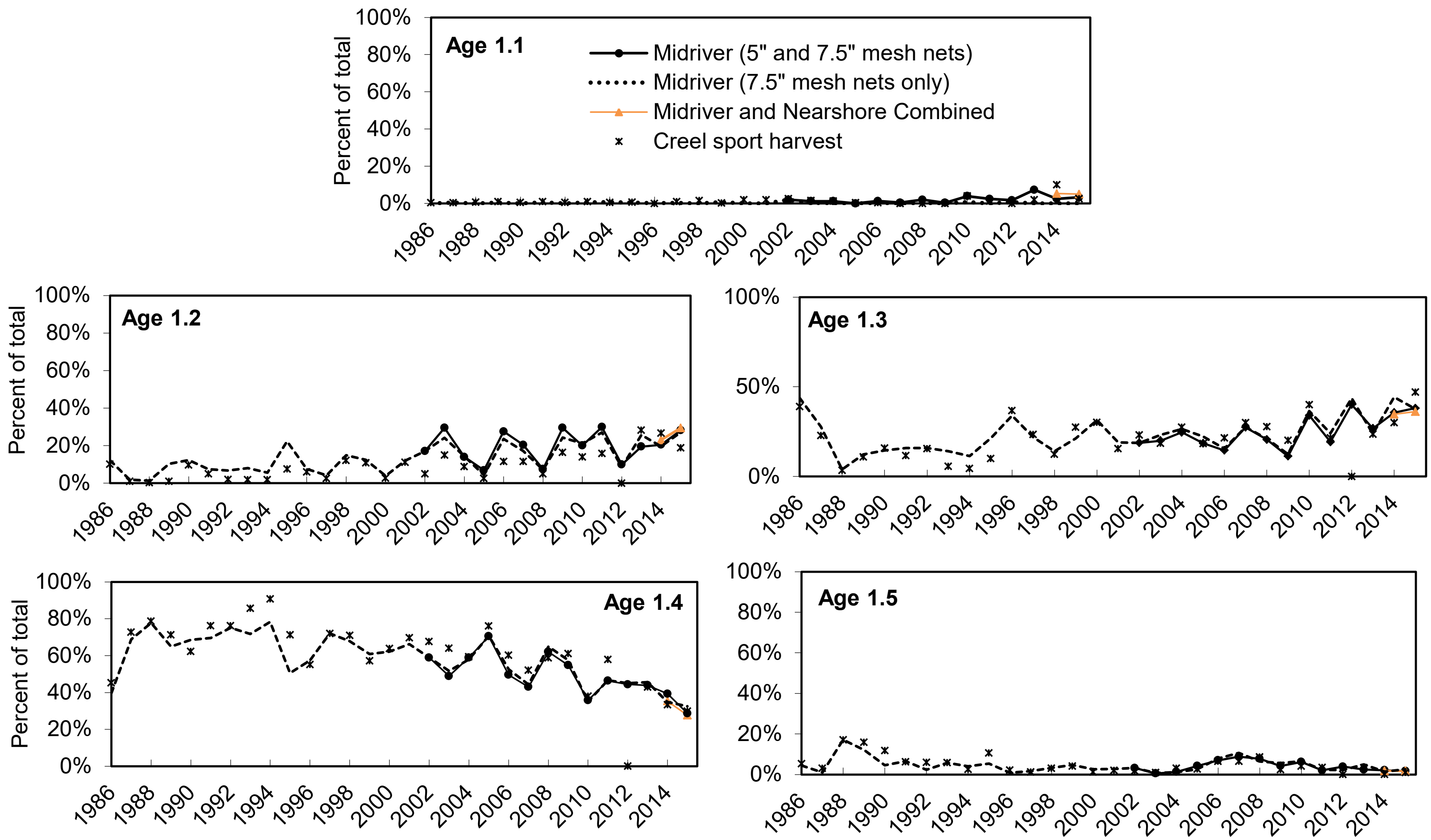

Figure 11.–Age composition of late-run harvest versus inriver netting for age-1.1 (top), age-1.2 (middle left), age-1.3 (middle right), age-1.4 (bottom left), and age-1.5 (bottom right) Kenai River Chinook salmon, 1986–2015.

Source: Hammarstrom and Larson (1982–1984, 1986); Hammarstrom et al. (1985); Conrad and Hammarstrom (1987); Hammarstrom (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: Late-run age compositions were derived for midriver netting samples using the 7.5-in mesh nets during 1986–2001, and 5.0- and 7.5-in mesh nets during 2002–2015. Midriver and nearshore samples were used for age compositions during 2014 and 2015. Age compositions of the 2012 sport harvest 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.

Table 7.–Early-run Kenai River Chinook salmon lengths by sex and age from midriver, nearshore, and combined gillnet samples, 16 May–30 June 2015.

			Age					
Source	Sex	Parameter	1.1	1.2	1.3	1.4	1.5	Combined
Midriver								
	Female							
		Sample size		8	16	9		33
		Mean length (SE)		644 (12)	845 (13)	937 (16)		822 (21)
		Min–max lengths		605–700	750–940	865–1,020		605–1,020
	Male							
		Sample size		19	15	3	1	38
		Mean length (SE)		626 (7)	846 (24)	993 (30)	1,040	752 (24)
		Min–max lengths		575–680	715–970	935–1,035	1,040	575–1,040
	Both							
		Sample size		27	31	12	1	71
		Mean length (SE)		631 (6)	846 (13)	951 (16)	1,040	785 (17)
		Min–max lengths		575–700	715–970	865–1,035	1,040	575–1,040
Nearshore								
	Female							
		Sample size		1	9	3		13
		Mean length (SE)		595	817 (15)	945 (44)		829 (28)
		Min–max lengths		595	750–885	860–1,005		595–1,005
	Male							
		Sample size	5	19	2	4		30
		Mean length (SE)	411 (18)	622 (16)	898 (27)	956 (37)		649 (32)
		Min–max lengths	380–480	460–700	870–925	865–1,030		380–1,030
	Both							
		Sample size	5	20	11	7		43
		Mean length (SE)	411 (18)	621 (15)	831 (16)	951 (26)		703 (27)
		Min–max lengths	380–480	460–700	750–925	860–1,030		380–1,030
Combined								
	Female							
		Sample size		9	25	12		46
		Mean length (SE)		639 (12)	835 (10)	939 (15)		824 (16)
		Min–max lengths		595–700	750–940	860–1,020		595–1,020
	Male							
		Sample size	5	38	17	7	1	68
		Mean length (SE)	411 (18)	623 (8)	852 (21)	972 (24)	1,040	707 (20)
		Min–max lengths	380–480	460–700	715–970	865–1,035	1,040	380–1,040
	Both							
		Sample size	5	47	42	19	1	114
		Mean length (SE)	411 (18)	627 (7)	842 (10)	951 (13)	1,040	754 (15)
		Min–max lengths	380–480	460–700	715–970	860–1,035	1,040	380–1,040

Note: All lengths were measured (mm) from mid eye to tail fork.

Table 8.–Late-run Kenai River Chinook salmon lengths by sex and age for midriver, nearshore, and combined gillnet samples, 1 July–20 August 2015.

			Age					
Source	Sex	Parameter	1.1	1.2	1.3	1.4	1.5	Combined
Midriver								
	Female							
		Sample size		9	38	37		84
		Mean length (SE)		679 (11)	892 (11)	994 (8)		915 (12)
		Min–max lengths		630–720	675–1,020	905–1,080		630–1,080
	Male							
		Sample size	6	42	31	15	3	97
		Mean length (SE)	432 (13)	680 (8)	917 (15)	1,063 (10)	1,145 (25)	815 (20)
		Min–max lengths	400–475	460–760	700–1,050	980–1,115	1,105–1,190	400–1,190
	Both							
		Sample size	6	51	69	52	3	181
		Mean length (SE)	432 (13)	680 (7)	903 (9)	1,014 (8)	1,145 (25)	861 (12)
		Min–max lengths	400–475	460–760	675–1,050	905–1,115	1,105–1,190	400–1,190
Nearshore								
	Female							
		Sample size		6	11	11	1	29
		Mean length (SE)		673 (13)	897 (25)	998 (14)	1,070	895 (26)
		Min–max lengths		635–710	730–960	910–1,070	1,070	635–1,070
	Male							
		Sample size	6	13	6	3		28
		Mean length (SE)	422 (14)	671 (12)	852 (46)	1,008 (50)		693 (36)
		Min–max lengths	380–475	600–740	710–960	910–1,075		380–1,075
	Both							
		Sample size	6	19	17	14	1	57
		Mean length (SE)	422 (14)	671 (9)	881 (23)	1,000 (14)	1,070	796 (26)
		Min–max lengths	380–475	600–740	710–960	910–1,075	1,070	380–1,075
Combined								
	Females							
		Sample size		15	49	48	1	113
		Mean length (SE)		676 (8)	893 (10)	995 (7)	1,070	909 (11)
		Min–max lengths		630–720	670–1,020	905–1,080	1,070	630–1,080
	Males							
		Sample size	12	55	37	18	3	125
		Mean length (SE)	427 (9)	679 (6)	906 (15)	1,054 (12)	1,145 (25)	787 (18)
		Min–max lengths	380–475	460–760	700–1,050	910–1,115	1,105–1,190	380–1,190
	Both							
		Sample size	12	70	86	66	4	238
		Mean length (SE)	427 (9)	678 (5)	899 (9)	1,011 (7)	1,126 (26)	845 (11)
		Min–max lengths	380–475	460–760	670–1,050	900–1,115	1,070–1,190	380–1,190

Note: All lengths were measured (mm) from mid eye to tail fork.

CHINOOK SALMON AGE COMPOSITION COMPARISONS BETWEEN 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 (χ^2 = 2.63, df = 2, *P* = 0.26), nor during the late run (χ^2 = 5.96, df = 3, *P* = 0.11; Table 6). Age-1.2 Chinook salmon were captured in the highest proportions during the early run (Table 5) and age-1.3 Chinook salmon were captured in the highest proportions during the late run (Table 6).

The age compositions of Chinook salmon captured in gillnets during the early and late runs were not significantly different (χ^2 = 7.20, df = 3, *P* = 0.06; Tables 5 and 6). The 1.2 and 1.3 age classes composed the highest proportions of both early-run Chinook salmon (41.2% and 36.1%, respectively) and late-run Chinook salmon (29.4% and 36.1%, 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 (χ^2 = 4.47, df = 4, *P* = 0.35; Table 3). The overall age composition of the late-run sport harvest was not significantly different than the RM 8.6 late-run gillnetting (χ^2 = 5.57, df = 2, *P* = 0.56; Tables 3 and 6).

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

During the early run, the length distribution of 51 Chinook salmon captured in nearshore nets was compared to the length distribution of 88 Chinook salmon captured midriver (Figure 12). Although the average length of all early-run Chinook salmon captured nearshore (720 mm) was slightly smaller than those captured midriver (781 mm), there was no significant difference between the 2 length distributions (D = 0.17, *P* = 0.28; Figure 13).

During the late run, the length distribution of 64 Chinook salmon captured in nearshore nets was compared to the length distribution of 224 Chinook salmon captured midriver (Figure 14). The average length of all late-run Chinook salmon captured nearshore (793 mm) was smaller than those captured midriver (864 mm), and a significant difference (D = 0.23, *P* = 0.01) between the 2 length distributions was observed (Figure 15).

The length distribution of all early-run Chinook salmon sampled in nearshore and midriver nets at RM 8.6 (*n* = 139) was compared to the length distribution (weighted by abundance) of 1,197 Chinook salmon sampled at the Killey River and Funny River weirs (Figure 16). There was a significant difference (D = 0.22, *P* < 0.001) between these two length distributions.

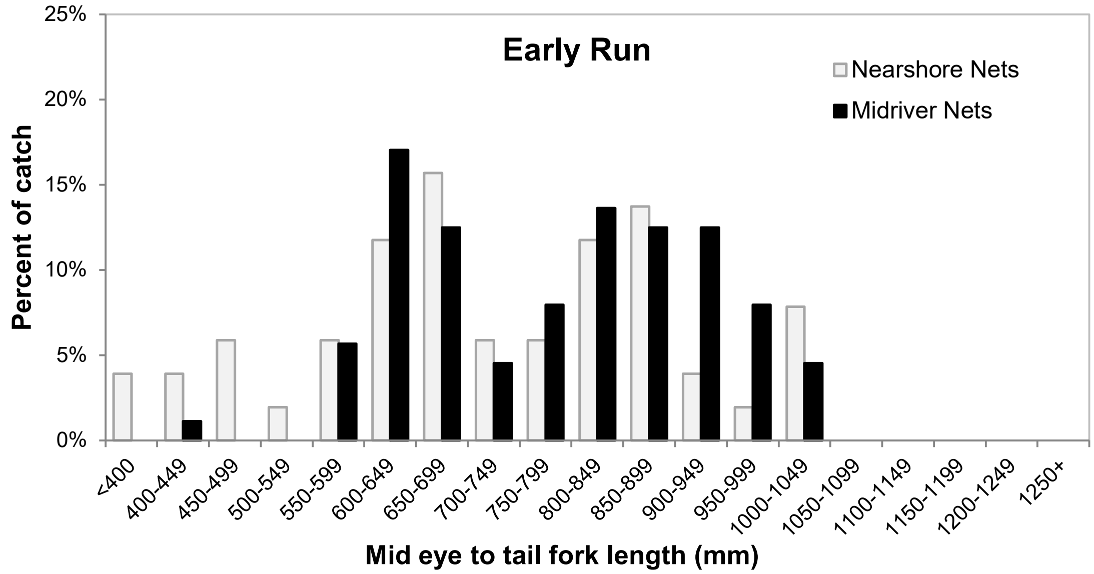

Figure 12.–Length compositions of all early-run Chinook salmon caught in midriver (n = 88) and nearshore (n = 51) nets at RM 8.6 that were measured for length, 2015.

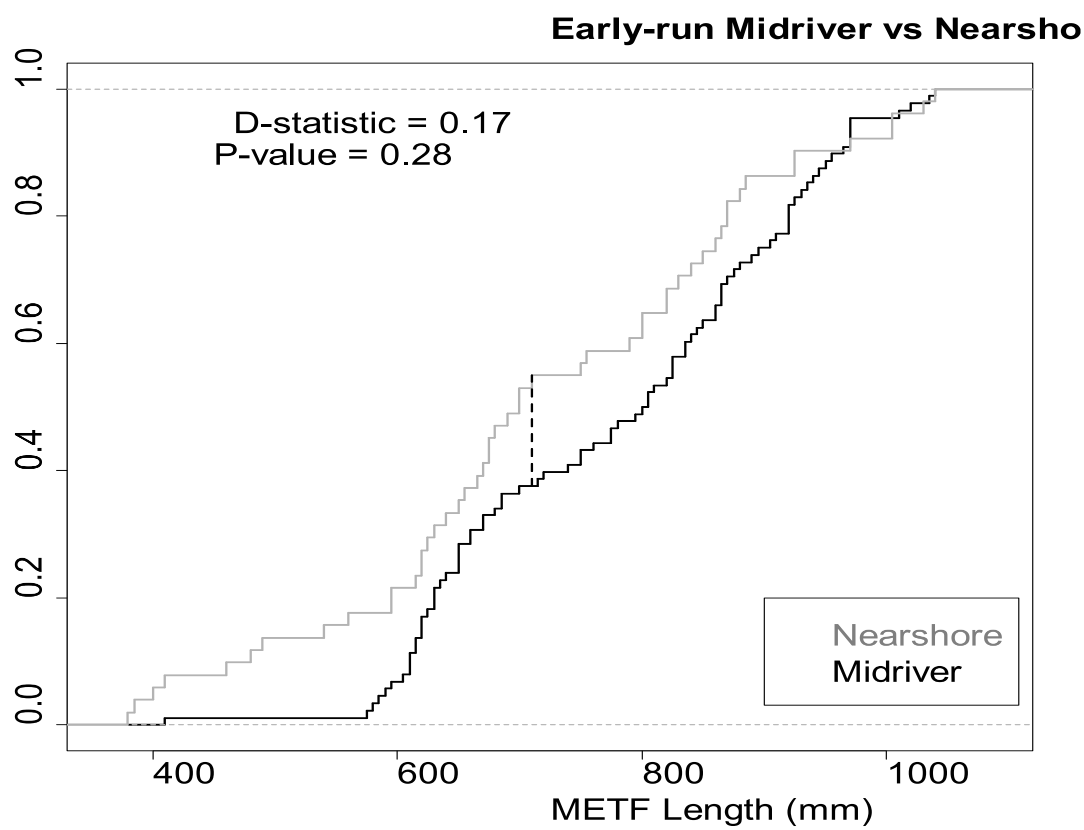

Figure 13.–Cumulative distributions and K-S test results for METF lengths of Chinook salmon sampled in early-run midriver (n = 88) versus nearshore (n = 51) netting, 2015.

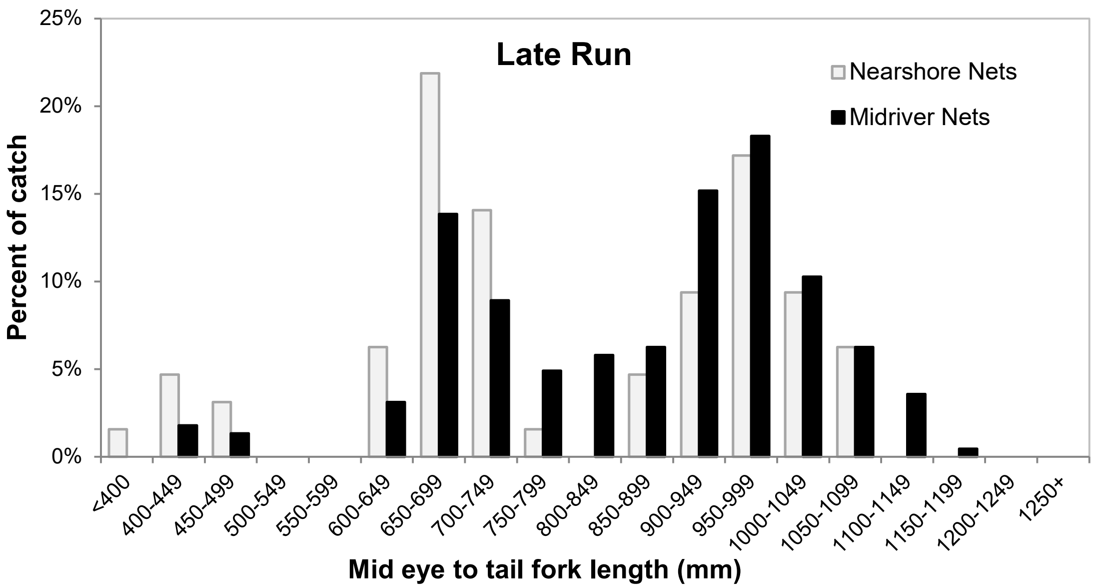

Figure 14.–Length compositions of late-run Chinook salmon caught in midriver (n = 224) and nearshore (n = 64) nets at RM 8.6 that were measured for length, 2015.

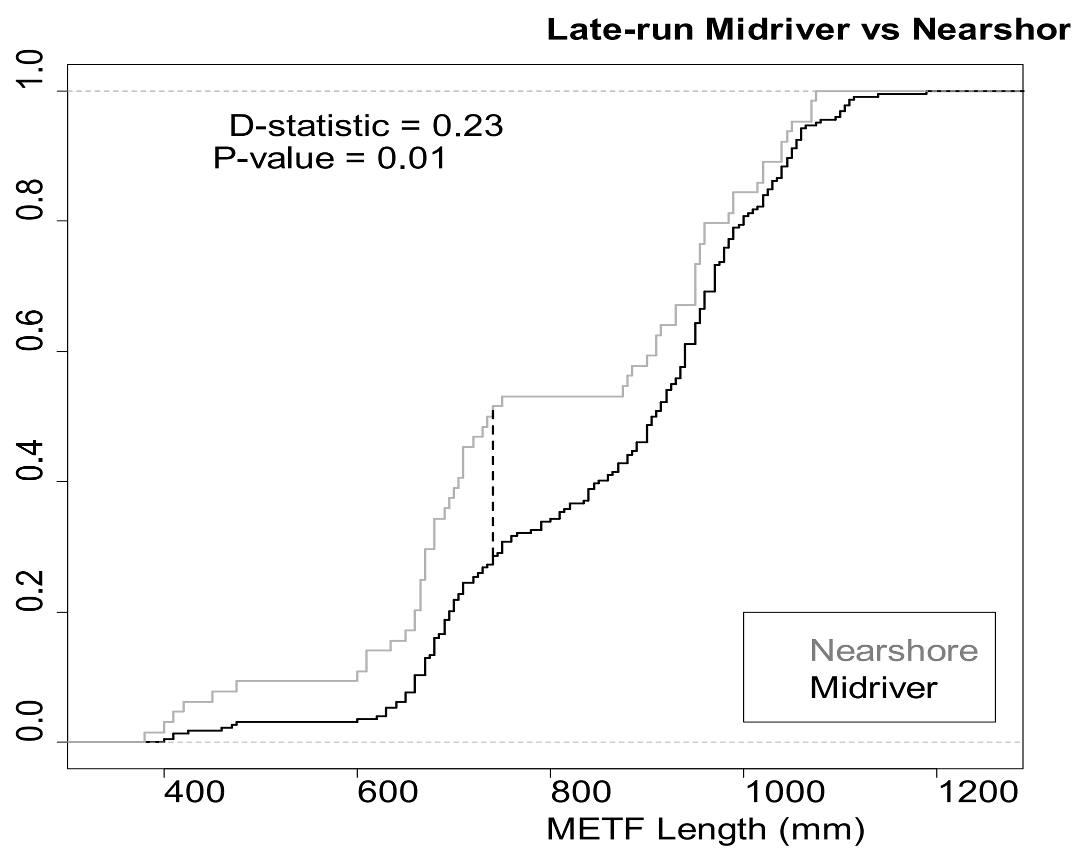

Figure 15.–Cumulative distributions and K-S test results for METF lengths of Chinook salmon sampled in late-run midriver (n = 224) versus nearshore (n = 64) netting, 2015.

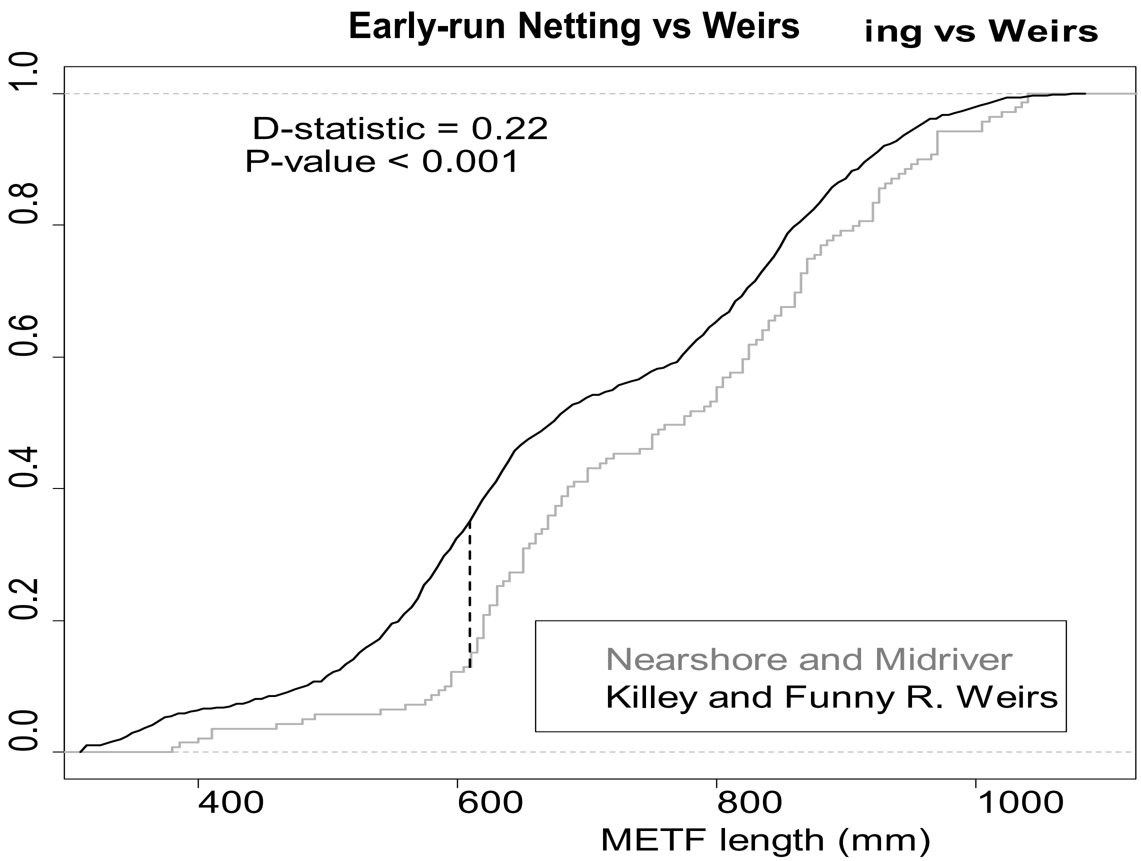

Figure 16.–Cumulative distributions and K-S test results for METF lengths of Chinook salmon sampled in the early-run netting (n = 139) versus Funny River and Killey River weirs (n = 1,197), 2015.

ENVIRONMENTAL VARIABLES

Kenai River discharge measurements during the early run (measured by USGS at the Soldotna Bridge), averaged 8,468 ft^3/s, which was above the historical (1965–2014) average (7,202 ft^3/s), whereas average discharge during the late run (13,451 ft^3/s), was below the historical average (14,040 ft^3/s; Figure 17).

Early-run Secchi disk measurements at RM 8.6 ranged between 0.3 m and 0.6 m with an average (0.4 m) that was below the historical (1998–2014) average (0.6 m; Figure 17). Late-run Secchi disk measurements at RM 8.6 ranged between 0.5 m and 1.2 m with an average (0.7 m) that was the same as the historical average (0.7 m). Late-run Secchi disc measurements in the sport fishery at RM 15.3 ranged between 0.6 m and 1.2 m with an average (0.9 m) that was the same as the historical (1987–2014) average (0.9 m).

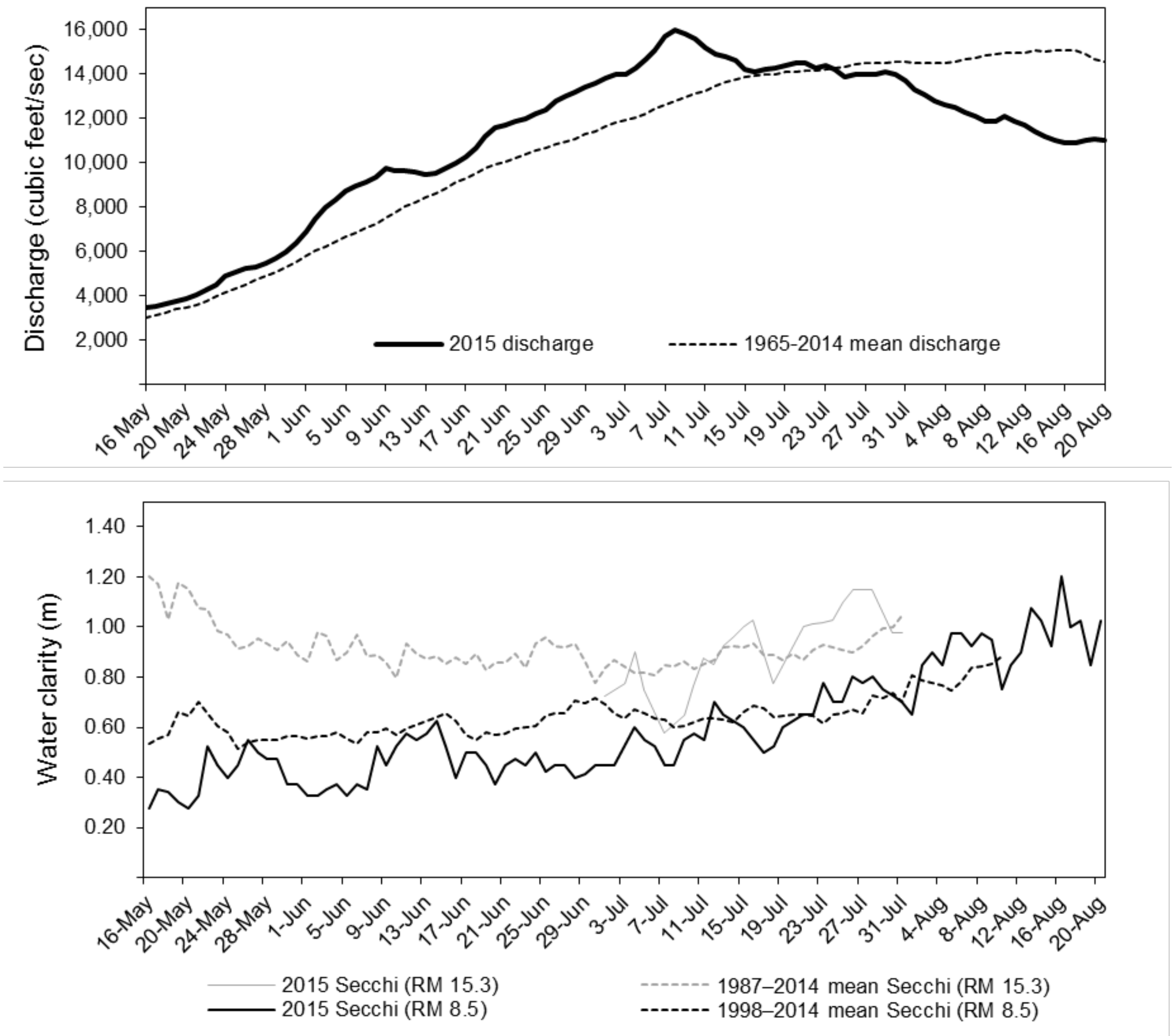

Figure 17.–Kenai River discharge (top) and water clarity (bottom), 16 May–20 August 2015, with means from historical data collected by ADF&G.

Note: Discharge data downloaded from USGS 15266300 KENAI RIVER AT SOLDOTNA AK. 2015-09-11 10:10 EST http:waterdata.usgs.gov/ak/nwis/dv.

OTHER RESULTS

Genetic tissue samples were collected from 426 Chinook salmon sampled from inriver gillnets at RM 8.6 (139 early run, 287 late run), and 135 samples were collected from the creel survey sport harvest (late run only).

Esophageal implant radio transmitters were inserted into 77 Chinook salmon captured in inriver gillnets at RM 8.6 during the early run. No radio transmitters were recovered from harvested Chinook salmon during creel survey sampling.

There was no reported harvest of Chinook salmon 55 inches TL or greater, and no Chinook salmon were observed by the inriver gillnetting crew or the creel survey crew that had a missing adipose fin.

DISCUSSION AND RECOMMENDATIONS

CREEL SURVEY

To achieve early- and late-run escapement goals during 2015, inseason management actions were imposed to restrict harvest of Kenai River Chinook salmon. The early run has been closed since 2013 and the late run has been restricted or closed for at least a portion of the fishery since 2011.

Recent fishery restrictions have had an influence on sport-angler effort (guided and unguided) as well as locations where angling occurs. Historically (1981–2011), unguided anglers have accounted for a majority (62%) of late-run angler effort, but during recent years of low Chinook salmon abundance and fishing restrictions (2012–2014) guided anglers have accounted for a majority (65%) of angler effort (Figure 3). In 2015, late-run Chinook salmon returned in sufficient numbers to allow harvest for the entire run and unguided anglers accounted for a slightly higher proportion of effort (51%) than guided anglers (Table 2). Fishery restrictions have also had an influence on where anglers direct their effort. During 2011–2014, management regulations restricted the use of bait, and sport anglers expended more effort upstream of the RM 8.6 sonar site where fishing without bait is more effective in clearer water. Although the Chinook salmon sonar site was located further upstream at RM 13.7 in 2015, a majority of angler effort (53%) still occurred upstream of the sonar site when bait was restricted during 1–24 July, whereas a majority of angler effort (54% of total effort) occurred downstream of the sonar site when the use of bait was allowed during 25–31 July (calculated from Appendices B1 and B2).

During 2015, CPUE and HPUE (from angler interviews) were geographically stratified upstream and downstream of the new RM 13.7 sonar site for the first time. Anglers were asked for the total hours they fished, the number of Chinook salmon released, and the number of Chinook salmon harvested related to their location upstream or downstream of the RM 13.7 Chinook salmon sonar. A sufficient number of interviews were collected from anglers that fished in each area, and catch and harvest estimates for both above and below the RM 13.7 sonar site satisfied Objective 1 precision goals.

Recommendations for Creel Survey

Due to low angler effort compared to other days, late-run unguided drift-boat Mondays should continue to be monitored using an index rather than being part of the regular creel survey sampling schedule. This unique portion of the fishery should continue to be monitored annually with the index estimation method, but periodic calibration will be required to determine if angling patterns or success change over time.

Continued analysis of effort, catch, harvest, CPUE, HPUE, and age compositions in relation 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 updated to meet objectives required for effective fisheries management.

INRIVER GILLNETTING

During the tenure of the inriver gillnetting study (1998 to present), there have been several modifications to the design in order to capture a representative sample of returning Kenai River Chinook salmon. Most notably were the addition of the 5.0-inch mesh nets in 2002 and the addition of nearshore netting in 2014. These modifications have improved the assessment of Chinook salmon sex, age, and length compositions of both the early and late runs. The addition of a smaller mesh size and nearshore netting has resulted in capturing larger proportions of smaller age-1.1 Chinook salmon that probably would not have been captured in representative numbers otherwise (Figure 10).

Since including nearshore sets in 2014, the average length of Chinook salmon captured nearshore has been smaller than the average length of Chinook salmon captured midriver for each run (Tables 7 and 8; Perschbacher and Eskelin 2016). In addition, K-S test results indicate the size difference between Chinook salmon captured midriver and nearshore was larger during the late run than the early run (Figures 13 and 15; Perschbacher and Eskelin 2016).

This was the second year that the length composition of early-run Chinook salmon captured nearshore and midriver at RM 8.6 was compared to the length composition of fish sampled at the Funny River and Killey River weirs. During 2014, the two length compositions were similar (Perschbacher and Eskelin 2016), whereas in 2015, the length composition of early-run Chinook salmon captured in inriver nets was different (larger in size) than those sampled at the Killey River and Funny River weirs (Figure 16). These differing results may be due to the year-to-year variation in the size and age of returning Chinook salmon (i.e., in 2014, the early-run proportions of the smaller-sized age-1.1 and -1.2 Chinook salmon were the highest on record [Figure 10]), or the effectiveness of the existing mesh sizes used in the netting study to capture a representative sample. However, there may not necessarily be agreement between the two size compositions (those sampled in the netting program and tributary weirs) because telemetry studies indicate that early-run Chinook salmon captured in the netting program also spawn below these tributary weirs, in other tributaries, and in the mainstem Kenai River (Reimer 2013, Eskelin and Reimer 2017) and may therefore not reflect the Killey River and Funny River populations.

Overall, nearshore netting was more complicated and hazardous than netting midriver because of submerged trees along the shoreline (mostly the left bank) from eroding banks. The time spent within these more hazardous areas was reduced by making shorter sets and modifications to the nets from a 4-panel net to a 2-panel net, which reduced the time spent handling fish while drifting downstream. Although netting nearshore can be problematic, field crews identified submerged hazards early in the season during low water and were able to avoid these areas for safety and the prevention of snagging and tearing panel nets.

The 2015 netting schedule, based on a fixed time of day (7:00 AM–1:00 PM) rather than a fixed tide stage, worked well aside from early-season netting during large spring tides. During both 2014 and 2015, the greatest Chinook salmon catches and the 2014–2015 average catch were highest during the falling tide for both runs. The 2014–2015 average catch was similar during the low and rising tides, and slightly lower during the high tide for both runs.

Recommendations for Inriver Gillnetting

The time-based netting schedule was initiated in 2014 to eliminate bias from capturing different sized Chinook salmon during different tidal stages. Although no bias was detected during 2014 or 2015, these years were among the lowest Chinook salmon runs on record. The time-based schedule should continue to be evaluated as Chinook salmon return in higher numbers.

Introducing different mesh-size nets or a tangle net should be incorporated to continue to investigate possible bias in length and age compositions of the inriver netting study.

Theoretically, a smaller mesh net will entangle all sizes of Chinook salmon and other salmon species but prevent fish from entering the net too far, reducing external and internal injuries. Tangle nets with hang ratios specifically designed to entangle Chinook salmon have been used with success in other systems, specifically the Columbia River commercial fishery where released tagged Chinook salmon suffered less mortality than those captured with gillnets (Vander Haegen et al. 2004). Consequently, in a continued effort to capture a more representative sample of returning Chinook salmon and reduce incidental harm to fish, it is recommended that in 2016 we conduct a pilot study using either a smaller mesh size (e.g., 4.0-inch mesh tangle net), or a mesh size between 5.0 inch and 7.5 inch (e.g., 6.0-inch mesh), or both.

Continuing to net both nearshore and midriver areas is warranted for accurate Chinook salmon ASL data and because the new RM 13.7 sonar insonifies the entire water column from shoreline to shoreline. Sonar mixture model estimates of abundance rely on length composition of salmon captured in inriver nets, so the netting program needs to account for fish from shoreline to shoreline for years to come. Continued analysis of length and age compositions of Chinook salmon captured both midriver and nearshore will also be required because RM 8.6 midriver catch data were 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 RM 13.7 Chinook salmon sonar passage estimates.

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APPENDIX A: EFFORT, CATCH, HARVEST ESTIMATES BY GEOGRAPHIC STRATUM DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2015

Appendix A1.–Estimated late-run Kenai River sport fishery effort, catch, and harvest estimates by geographic stratum between the Soldotna Bridge and Warren Ames Bridge, 1–30 July 2015.

				Downstream [b] creel estimates						Upstream [b] creel estimates					
						Chinook salmon						Chinook salmon			
	Days open to			Effort		Catch		Harvest		Effort		Catch		Harvest	
Fishing periods [a]	fishing from powerboats	Sampling days	Interviews	Angler-hours	SE	No.	SE	No.	SE	Angler-hours	SE	No.	SE	No.	SE
1–5 July															
Guided WD	3	2	35	1,185	328	38	28	38	28	2,646	797	142	52	101	40
Guided WE	1	1	8	276	108	0	0	0	0	246	102	13	12	13	12
Unguided WD	3	2	43	1,148	235	37	28	18	16	1,050	306	31	25	10	11
Unguided WE	2	2	25	825	168	0	0	0	0	520	53	6	6	6	6
6–12 July															
Monday [c]	0	1	0	76	NA	0	NA	0	NA	65	NA	0	N/A	0	NA
Guided WD	4	2	44	1,456	319	0	0	0	0	2,544	395	101	50	29	25
Guided WE	1	1	15	624	72	47	80	47	80	810	126	51	28	41	24
Unguided WD	4	2	16	650	114	0	0	0	0	870	158	38	29	6	6
Unguided WE	2	2	48	917	345	32	34	23	33	1,043	75	91	18	17	10
13–19 July															
Monday [c]	0	1	0	119	NA	7	NA	1	NA	216	NA	13	NA	2	NA
Guided WD	4	2	76	3,864	739	182	93	182	93	4,908	837	220	83	186	63
Guided WE	1	1	25	1,308	444	156	186	156	186	846	66	69	25	61	24
Unguided WD	4	2	21	1,790	392	96	54	15	16	1,600	355	0	0	0	0
Unguided WE	2	2	25	1,580	274	108	63	63	45	1,715	255	0	0	0	0
20–26 July															
Monday [c]	0	1	0	227	NA	18	NA	10	NA	410	NA	33	NA	18	NA
Guided WD	4	2	42	3,648	809	529	146	338	125	3,888	678	485	132	378	162
Guided WE	1	1	40	924	216	268	85	151	56	426	138	104	42	52	23
Unguided WD	4	2	60	3,840	567	283	108	119	59	3,480	452	486	85	178	92
Unguided WE	2	2	109	3,585	519	361	108	282	92	3,505	549	747	190	303	90

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				Downstream [b] creel estimates						Upstream [b] creel estimates					
						Chinook salmon						Chinook salmon			
	Days open to fishing from powerboats	Sampling days	Interviews	Effort		Catch		Harvest		Effort		Catch		Harvest	
Fishing periods [a]				Angler-hours	SE	No.	SE	No.	SE	Angler-hours	SE	No.	SE	No.	SE
27–31 July															
Monday [c]	0	1	0	378	NA	43	NA	26	NA	821	NA	94	NA	57	NA
Guided WD	4	2	78	4,188	675	482	136	373	110	4,432	771	622	248	302	140
Unguided WD	4	2	59	6,760	840	407	105	269	100	4,180	971	287	146	141	85
Day type subtotals															
Monday [c]	0	4	0	800	NA	68	NA	37	NA	1,512	NA	140	NA	77	NA
Guided WD	19	10	275	14,341	1,366	1,231	222	931	193	18,418	1,596	1,570	302	996	228
Guided WE	4	4	88	3,132	511	471	220	354	210	2,328	223	238	58	166	43
Unguided WD	19	10	199	14,188	1,117	823	162	421	118	11,180	1,180	842	173	335	126
Unguided WE	8	8	207	6,907	701	502	130	367	108	6,783	612	845	190	326	91
Angler type subtotals															
Guided	23	14	363	17,473	1,458	1,701	312	1,285	285	20,746	1,612	1,808	307	1,162	232
% Guided	46%	44%	47%	45%		56%		62%		54%		52%		64%	
Unguided [d]	27	18	406	21,094	1,319	1,325	208	788	160	17,963	1,329	1,687	257	661	155
% Unguided	54%	56%	53%	55%		44%		38%		46%		48%		36%	
Late-run total [d]	50	32	769	38,567	1,966	3,027	375	2,073	327	38,709	2,089	3,495	401	1,823	279

Note: "Catch" is fish harvested plus fish released, "Harvest" is fish kept, "CPUE" is catch per unit effort (hours), "HPUE" is harvest per unit effort (hours), "WD" is weekday, "WE" is weekend, and "NA" means no data are available.

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

[b] "Downstream" is the Kenai River reach from the 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 the Soldotna Bridge.

[c] Mondays were days when only unguided drift boat fishing was allowed. Estimates of effort, catch, and harvest were based on an index (see Methods).

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

APPENDIX B: DAILY EFFORT, CATCH, HARVEST, CPUE, AND HPUE ESTIMATES BY GEOGRAPHIC STRATUM AND ANGLER TYPE DURING THE KENAI RIVER CHINOOK SALMON SPORT FISHERY, 2015

Appendix B1.–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 2015.

		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	465	110	25	14	12	10	380	197	21	14	7	8	845	226	46	20	19	13
2 Jul	WD [c]	383		12		6		350		10		3		733	0	23	0	9	0
3 Jul	WD	300	106	0	0	0	0	320	147	0	0	0	0	620	181	0	0	0	0
4 Jul	WE-H	275	62	0	0	0	0	205	38	6	6	6	6	480	73	6	6	6	6
5 Jul	WE-H	550	156	0	0	0	0	315	37	0	0	0	0	865	161	0	0	0	0
6 Jul	M	76		0		0		65		0		0		141		0		0	
7 Jul	WD	140	50	0	0	0	0	235	90	0	0	0	0	375	103	0	0	0	0
8 Jul	WD [c]	163		0		0		218		10		1		380	0	10	0	1	0
9 Jul	WD	185	44	0	0	0	0	200	57	19	7	3	3	385	72	19	7	3	3
10 Jul	WD [c]	163		0		0		218		10		1		380	0	10	0	1	0
11 Jul	WE-H	407	327	23	33	23	33	493	65	20	11	6	7	900	333	42	35	29	34
12 Jul	WE-H	510	112	9	10	0	0	550	37	72	14	11	7	1,060	118	81	17	11	7
13 Jul	M	119		7		1		216		13		2		335		20		3	
14 Jul	WD [c]	448		24		4		400		0		0		848	0	24	0	4	0
15 Jul	WD	555	146	24	35	0	0	290	92	0	0	0	0	845	173	24	35	0	0
16 Jul	WD	340	95	24	16	8	9	510	79	0	0	0	0	850	123	24	16	8	9
17 Jul	WD [c]	448		24		4		400		0		0		848	0	24	0	4	0
18 Jul	WE-H	685	256	54	47	26	31	675	155	0	0	0	0	1,360	299	54	47	26	31
19 Jul	WE-H	895	99	55	42	37	33	1,040	203	0	0	0	0	1,935	226	55	42	37	33
20 Jul	M	227		18		10		410		33		18		637		51		28	
21 Jul	WD	1,140	132	95	46	37	30	770	180	124	47	68	42	1,910	223	219	66	105	51
22 Jul	WD [c]	960		71		30		870		122		44		1,830	0	192	0	74	0
23 Jul	WD [c]	960		71		30		870		122		44		1,830	0	192	0	74	0
24 Jul	WD	780	116	47	38	23	26	970	173	119	37	21	16	1,750	208	165	53	44	31
25 Jul	WE-H	1,735	215	92	60	92	60	1,930	304	458	152	101	44	3,665	372	550	164	194	74
26 Jul	WE-H	1,850	472	269	90	189	70	1,575	457	290	113	201	78	3,425	657	559	144	391	105

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		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
27 Jul	M	378		43		26		821		94		57		1,199		137		83	
28 Jul	WD	1,795	409	115	48	46	26	1,350	263	108	57	35	38	3,145	487	223	74	81	46
29 Jul	WD [c]	1,690		102		67		1,045		72		35		2,735	0	173	0	102	0
30 Jul	WD	1,585	375	88	50	88	50	740	174	36	47	36	47	2,325	414	124	68	124	68
31 Jul	WD [c]	1,690		102		67		1,045		72		35		2,735	0	173	0	102	0
	Min	76		0		0		62		0		0		141		0		0	
	Average	706		45		27		628		59		24		1,332		104		50	
	Max	1,850		269		189		1,930		458		201		3,665		559		391	

Notes: "Catch" is fish harvested plus fish released, "Harvest" is fish kept, and "Effort" is angler hours.

[a] "M" is Monday index estimate (9:00 AM–1:00 PM), "WD" is weekday, and "WE-H" is weekend and holiday.

[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 the Soldotna Bridge.

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

Appendix B2.–Daily estimates of guided boat angler effort, catch, and harvest by geographic stratum during the late-run Kenai River Chinook salmon sport fishery, 1–31 July 2015.

		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	508	204	9	9	9	9	1,224	407	55	34	28	22	1,732	455	64	35	36	24
2 Jul	WD [c]	395		13		13		882		47		34		1,277	0	60	0	46	0
3 Jul	WD	282	66	17	20	17	20	540	156	39	22	39	22	822	169	56	30	56	30
4 Jul	WE-H	276	108	0	0	0	0	246	102	13	12	13	12	522	149	13	12	13	12
7 Jul	WD	404	203	0	0	0	0	612	170	11	12	0	0	1,016	265	11	12	0	0
8 Jul	WD [c]	364		0		0		636		25		7		1,000	0	25	0	7	0
9 Jul	WD	324	60	0	0	0	0	660	216	39	19	14	10	984	224	39	19	14	10
10 Jul	WD [c]	364		0		0		636		25		7		1,000	0	25	0	7	0
11 Jul	WE-H	624	72	47	80	47	80	810	126	51	28	41	24	1,434	145	98	85	88	83
14 Jul	WD [c]	966		45		45		1,227		55		46		2,193	0	100	0	92	0
15 Jul	WD	708	36	73	34	73	34	1,446	342	77	30	59	26	2,154	344	149	46	132	43
16 Jul	WD	1,224	72	18	13	18	13	1,008	204	33	25	33	25	2,232	216	52	29	52	29
17 Jul	WD [c]	966		45		45		1,227		55		46		2,193	0	100	0	92	0
18 Jul	WE-H	1,308	444	156	186	156	186	846	66	69	25	61	24	2,154	449	225	188	216	188
21 Jul	WD	1,140	312	159	83	110	69	1,188	24	137	66	137	66	2,328	313	296	106	246	96
22 Jul	WD [c]	912		132		84		972		121		95		1,884	0	254	0	179	0
23 Jul	WD [c]	912		132		84		972		121		95		1,884	0	254	0	179	0
24 Jul	WD	684	149	105	28	59	21	756	207	106	59	52	41	1,440	255	211	65	112	46
25 Jul	WE-H	924	216	268	85	151	56	426	138	104	42	52	23	1,350	256	372	95	203	61
28 Jul	WD	840	228	154	62	108	66	1,196	499	223	110	107	74	2,036	549	377	126	216	99
29 Jul	WD [c]	1,047		120		93		1,108		155		76		2,155	0	276	0	169	0
30 Jul	WD	1,254	66	87	29	78	28	1,020	132	88	23	44	16	2,274	148	175	38	122	32
31 Jul	WD [c]	1,047		120		93		1,108		155		76		2,155	0	276	0	169	0
	Min	276		0		0		246		11		0		522		11		0	
	Average	760		74		56		902		79		51		1,662		153		106	
	Max	1,308		268		156		1,446		223		137		2,328		377		246	

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Notes: "Catch" is fish harvested plus fish released, "Harvest" is fish kept, and "Effort" is angler hours.

[a] "WD" is weekday, and "WE-H" is weekend and holiday.

[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 the Soldotna Bridge.

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

Appendix B3.–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 2015.

			Downstream[b] creel estimates				Upstream[b] creel estimates				Combined totals			
			CPUE		HPUE		CPUE		HPUE		CPUE		HPUE	
Date	Day type[a]	Interviews	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
1 Jul	WD	31	0.054	0.027	0.026	0.020	0.055	0.025	0.018	0.018	0.054	0.037	0.022	0.027
2 Jul	WD[c]		0.033	0.014	0.016	0.010	0.030		0.010		0.031	0.014	0.013	0.010
3 Jul	WD	12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4 Jul	WE-H	19	0.000	0.000	0.000	0.000	0.029	0.030	0.029	0.030	0.013	0.030	0.013	0.030
5 Jul	WE-H	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
6 Jul	M		0.000		0.000		0.000		0.000		0.000		0.000	
7 Jul	WD	8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8 Jul	WD[c]		0.000		0.000		0.044		0.006		0.025	0.000	0.004	0.000
9 Jul	WD	8	0.000	0.000	0.000	0.000	0.095	0.019	0.014	0.016	0.049	0.019	0.007	0.016
10 Jul	WD[c]		0.000		0.000		0.044		0.006		0.025	0.000	0.004	0.000
11 Jul	WE-H	15	0.056	0.068	0.056	0.068	0.040	0.021	0.012	0.014	0.047	0.071	0.032	0.069
12 Jul	WE-H	33	0.018	0.018	0.000	0.000	0.130	0.024	0.021	0.013	0.076	0.031	0.011	0.013
13 Jul	M		0.059		0.008		0.060		0.009		0.060		0.009	
14 Jul	WD[c]		0.054		0.008		0.000		0.000		0.028	0.000	0.004	0.000
15 Jul	WD	8	0.044	0.061	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.061	0.000	0.000
16 Jul	WD	13	0.069	0.043	0.022	0.025	0.000	0.000	0.000	0.000	0.028	0.043	0.009	0.025
17 Jul	WD[c]		0.054		0.008		0.000		0.000		0.028	0.000	0.004	0.000
18 Jul	WE-H	14	0.078	0.062	0.038	0.043	0.000	0.000	0.000	0.000	0.039	0.062	0.019	0.043
19 Jul	WE-H	11	0.061	0.047	0.041	0.036	0.000	0.000	0.000	0.000	0.028	0.047	0.019	0.036
20 Jul	M		0.079		0.044		0.080		0.044		0.080		0.044	
21 Jul	WD	27	0.083	0.039	0.032	0.026	0.162	0.048	0.088	0.050	0.115	0.062	0.055	0.056
22 Jul	WD[c]		0.074		0.031		0.140		0.051		0.105	0.000	0.041	0.000
23 Jul	WD[c]		0.074		0.031		0.140		0.051		0.105	0.000	0.041	0.000
24 Jul	WD	33	0.060	0.048	0.029	0.033	0.122	0.031	0.022	0.016	0.094	0.057	0.025	0.037
25 Jul	WE-H	44	0.053	0.034	0.053	0.034	0.237	0.070	0.052	0.021	0.150	0.077	0.053	0.040
26 Jul	WE-H	65	0.145	0.031	0.102	0.027	0.184	0.048	0.128	0.033	0.163	0.057	0.114	0.043

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Date	Day type [a]	Interviews	Downstream [b] creel estimates				Upstream [b] creel estimates				Combined totals			
			CPUE		HPUE		CPUE		HPUE		CPUE		HPUE	
			Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
27 Jul	M		0.114		0.069		0.114		0.069		0.114		0.069	
28 Jul	WD	40	0.064	0.022	0.026	0.013	0.080	0.039	0.026	0.028	0.071	0.045	0.026	0.031
29 Jul	WD [c]		0.060		0.040		0.069		0.034		0.063	0.000	0.037	0.000
30 Jul	WD	19	0.056	0.029	0.056	0.029	0.048	0.062	0.048	0.062	0.053	0.069	0.053	0.069
31 Jul	WD [c]		0.060		0.040		0.069		0.034		0.063	0.000	0.037	0.000
	Min	6	0.000		0.000		0.000		0.000		0.000		0.000	
	Average	23	0.048		0.025		0.064		0.025		0.056		0.025	
	Max	65	0.145		0.102		0.237		0.128		0.163		0.114	

Notes: "CPUE" is catch per unit effort (hours) and "HPUE" is harvest per unit effort (hours).

[a] "M" is Monday index estimate (9:00 AM–1:00 PM), "WD" is weekday, and "WE-H" is weekend and holiday.

[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 the Soldotna Bridge.

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

Appendix B4.–Daily estimates of guided CPUE and HPUE by geographic stratum during the late-run Kenai River Chinook salmon sport fishery, 1–31 July 2015.

			Downstream [b] creel estimates				Upstream [b] creel estimates				Combined totals			
			CPUE		HPUE		CPUE		HPUE		CPUE		HPUE	
Date	Day type [a]	Interviews	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
1 Jul	WD	25	0.017	0.017	0.017	0.017	0.045	0.023	0.023	0.016	0.037	0.029	0.021	0.024
2 Jul	WD [c]		0.032		0.032		0.054		0.038		0.047	0.000	0.036	0.000
3 Jul	WD	10	0.061	0.070	0.061	0.070	0.073	0.036	0.073	0.036	0.069	0.079	0.069	0.079
4 Jul	WE-H	8	0.000	0.000	0.000	0.000	0.053	0.044	0.053	0.044	0.025	0.044	0.025	0.044
7 Jul	WD	15	0.000	0.000	0.000	0.000	0.019	0.019	0.000	0.000	0.011	0.019	0.000	0.000
8 Jul	WD [c]		0.000		0.000		0.040		0.011		0.025	0.000	0.007	0.000
9 Jul	WD	29	0.000	0.000	0.000	0.000	0.059	0.021	0.022	0.014	0.040	0.021	0.015	0.014
10 Jul	WD [c]		0.000		0.000		0.040		0.011		0.025	0.000	0.007	0.000
11 Jul	WE-H	15	0.076	0.128	0.076	0.128	0.063	0.033	0.051	0.029	0.068	0.132	0.061	0.131
14 Jul	WD [c]		0.047		0.047		0.045		0.038		0.046	0.000	0.042	0.000
15 Jul	WD	46	0.103	0.048	0.103	0.048	0.053	0.017	0.041	0.015	0.069	0.051	0.061	0.051
16 Jul	WD	30	0.015	0.011	0.015	0.011	0.033	0.024	0.033	0.024	0.023	0.027	0.023	0.027
17 Jul	WD [c]		0.047		0.047		0.045		0.038		0.046	0.000	0.042	0.000
18 Jul	WE-H	25	0.119	0.137	0.119	0.137	0.082	0.029	0.072	0.028	0.104	0.140	0.100	0.139
21 Jul	WD	8	0.140	0.062	0.096	0.055	0.115	0.055	0.115	0.055	0.127	0.083	0.106	0.078
22 Jul	WD [c]		0.145		0.093		0.125		0.097		0.135	0.000	0.095	0.000
23 Jul	WD [c]		0.145		0.093		0.125		0.097		0.135	0.000	0.095	0.000
24 Jul	WD	34	0.154	0.024	0.087	0.024	0.140	0.068	0.069	0.050	0.147	0.072	0.078	0.056
25 Jul	WE-H	40	0.290	0.062	0.164	0.047	0.244	0.059	0.122	0.036	0.275	0.086	0.151	0.059
28 Jul	WD	19	0.184	0.054	0.129	0.071	0.186	0.048	0.090	0.049	0.185	0.072	0.106	0.086
29 Jul	WD [c]		0.115		0.089		0.140		0.068		0.128	0.000	0.078	0.000
30 Jul	WD	59	0.069	0.023	0.062	0.022	0.086	0.020	0.043	0.015	0.077	0.031	0.054	0.026
31 Jul	WD [c]		0.115		0.089		0.140		0.068		0.128	0.000	0.078	0.000
	Min	8	0.000		0.000		0.019		0.000		0.011		0.000	
	Average	26	0.081		0.062		0.087		0.055		0.086		0.059	
	Max	59	0.290		0.164		0.244		0.122		0.275		0.151	

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Notes: "CPUE" is catch per unit effort (hours) and "HPUE" is harvest per unit effort (hours).

[a] "WD" is weekday, and "WE-H" is weekend and holiday.

[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 the Soldotna Bridge.

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

APPENDIX C: BOAT ANGLER COUNTS DURING THE KENAI RIVER CHINOOK SALMON SPORT FISHERY, 2015

Appendix C1.–Guided and unguided boat angler counts, downstream of the RM 13.7 sonar site, during the late-run Kenai River Chinook salmon sport fishery, 1–31 July 2015.

		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	23	45	20	19	9	42	33	70	24	
3 Jul	WD	15	19	14	25	2	24	29	18		
4 Jul	WE-H	14	4	15	22	14	23		32	14	
5 Jul	WE-H	28	16	41	41	12					
7 Jul	WD	7	12	14	2	0	34	44	57	0	
9 Jul	WD	9	10	11	4	12	27		32	22	
11 Jul	WE-H	20	6	47	8		52	46	58		
12 Jul	WE-H	26	12	35	35	20					
15 Jul	WD	28	37	30	39	5	59	56	62		
16 Jul	WD	17	33	14	17	4	102	108	96		
18 Jul	WE-H	34	6	62	34	35	109		146	72	
19 Jul	WE-H	45	42	47	56	34					
21 Jul	WD	57	84	61	52	31	95	121	69		
24 Jul	WD	39	33	54	35	34	57	81	65	25	
25 Jul	WE-H	87	134	85	67	61	77		95	59	
26 Jul	WE-H	93	22	133	123	92					
28 Jul	WD	90	139	53	97	70	70	109	80	21	
30 Jul	WD	79	99	95	107	16	105	110	99		
	Min (All A–D)			0					0		
	Average (All A–D)			40					61		
	Max (All A–D)			139					146		

Note: Blank spaces in data fields indicate that fishing was closed for guided anglers during the time of the count so therefore there are no data to present.

[a] "WD" is weekday and "WE-H" is weekend and holiday.

[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 is 4:00 AM–8:59 AM, B is 9:00 AM–1:59 PM, C is 2:00 PM–6:59 PM, D is 7:00 PM–11:59 PM, and $\bar{x}$ is the average of the 4 count times.

Appendix C2.–Guided and unguided boat angler counts, upstream of the RM 13.7 sonar site, during the late-run Kenai River Chinook salmon sport fishery, 1–31 July 2015.

		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	19	54	6	10	6	102	184	104	18	
3 Jul	WD	16	33	5	21	5	45	58	32		
4 Jul	WE-H	10	15	14	5	7	21		29	12	
5 Jul	WE-H	16	20	13	17	13					
7 Jul	WD	12	27	6	4	10	51	87	48	18	
9 Jul	WD	10	12	10	3	15	55		73	37	
11 Jul	WE-H	25	33	23	18		68	78	57		
12 Jul	WE-H	28	32	30	22	26					
15 Jul	WD	15	25	12	19	2	121	149	92		
16 Jul	WD	26	43	28	20	11	84	101	67		
18 Jul	WE-H	34	5	43	43	44	71		76	65	
19 Jul	WE-H	52	92	47	45	24					
21 Jul	WD	39	78	37	25	14	99	101	97		
24 Jul	WD	49	85	52	26	31	63	107	50	32	
25 Jul	WE-H	97	147	94	55	90	36		47	24	
26 Jul	WE-H	79	9	111	120	75					
28 Jul	WD	68	104	50	41	75	100	207	76	16	
30 Jul	WD	37	55	27	46	20	85	96	74		
	Min (All A–D)			2					12		
	Average (All A–D)			35					72		
	Max (All A–D)			147					207		

Note: Blank spaces in data fields indicate that fishing was closed for guided anglers during the time of the count so therefore there are no data to present.

[a] "WD" is weekday and "WE-H" is weekend and holiday.

[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 is 4:00 AM–8:59 AM, B is 9:00 AM–1:59 PM, C is 2:00 PM–6:59 PM, D is 7:00 PM–11:59 PM, and $\bar{x}$ is the average of the 4 count times.

Appendix C3.–Guided and unguided boat angler counts from Warren Ames Bridge to Soldotna Bridge during the late-run Kenai River Chinook salmon sport fishery, 1–31 July 2015.

		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
1 Jul	WD	42	99	26	29	15	144	217	174	42	
3 Jul	WD	31	52	19	46	7	69	87	50		
4 Jul	WE-H	24	19	29	27	21	44		61	26	
5 Jul	WE-H	43	36	54	58	25					
7 Jul	WD	19	39	20	6	10	85	131	105	18	
9 Jul	WD	19	22	21	7	27	82		105	59	
11 Jul	WE-H	45	39	70	26		120	124	115		
12 Jul	WE-H	53	44	65	57	46					
15 Jul	WD	42	62	42	58	7	180	205	154		
16 Jul	WD	43	76	42	37	15	186	209	163		
18 Jul	WE-H	68	11	105	77	79	180		222	137	
19 Jul	WE-H	97	134	94	101	58					
21 Jul	WD	96	162	98	77	45	194	222	166		
24 Jul	WD	88	118	106	61	65	120	188	115	57	
25 Jul	WE-H	183	281	179	122	151	113		142	83	
26 Jul	WE-H	171	31	244	243	167					
28 Jul	WD	157	243	103	138	145	170	316	156	37	
30 Jul	WD	116	154	122	153	36	190	206	173		
	Min (All A–D)			6					18		
	Average (All A–D)			75					133		
	Max (All A–D)			281					316		

Note: Blank spaces in data fields indicate that fishing was closed for guided anglers during the time of the count so therefore there are no data to present.

[a] "WD" is weekday and "WE-H" is weekend and holiday.

[b] "Combined strata" is the Kenai River reach from Warren Ames Bridge to the Soldotna Bridge.

[c] Angler count times: A is 4:00 AM–8:59 AM, B is 9:00 AM–1:59 PM, C is 2:00 PM–6:59 PM, D is 7:00 PM–11:59 PM, and $\bar{x}$ is the average of the 4 count times.

APPENDIX D: KENAI RIVER INRIVER GILLNETTING DAILY CATCH AND CPUE DURING THE KENAI RIVER CHINOOK SALMON FISHERY, 2015

Appendix D1.–Number of Chinook, sockeye, coho, and pink salmon caught during the early run in midriver and nearshore 5.0- and 7.5-inch mesh gillnets, 16 May–30 June 2015.

	No. of drifts			Drift minutes			Inriver drift gillnetting catch								
							Chinook salmon			Sockeye salmon			All salmon 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
16 May	15		15	137		137	1		1	0		0	1	0	1
17 May	14		14	127		127	1		1	0		0	1	0	1
18 May	16	2	18	153	9	162	1	0	1	0	0	0	1	0	1
19 May	10	6	16	110	35	144	0	0	0	0	3	3	0	3	3
20 May	15	6	21	124	27	151	0	0	0	1	0	1	1	0	1
21 May	11	8	19	150	36	185	0	0	0	0	0	0	0	0	0
22 May	10	8	18	132	63	195	1	0	1	0	1	1	1	1	2
23 May	8	8	16	110	70	180	0	0	0	1	0	1	1	0	1
24 May	10	8	18	124	50	173	1	0	1	15	4	19	16	4	20
25 May	11	12	23	105	78	182	2	0	2	2	0	2	4	0	4
26 May	9	4	13	110	40	150	0	0	0	6	0	6	6	0	6
27 May	9	4	13	118	46	164	1	0	1	4	6	10	5	6	11
28 May	16	2	18	166	21	186	2	0	2	20	2	22	22	2	24
29 May	17		17	172		172	2		2	17		17	19	0	19
30 May	16		16	160		160	3		3	16		16	19	0	19
31 May	14	4	18	147	22	169	4	0	4	17	2	19	21	2	23
1 Jun	17	2	19	163	14	176	6	0	6	25	1	26	31	1	32
2 Jun	8	8	16	59	35	95	4	2	6	13	20	33	17	22	39
3 Jun	11	4	15	92	25	117	5	1	6	38	12	50	43	13	56
4 Jun	8	8	16	63	46	109	5	2	7	15	13	28	20	15	35
5 Jun	11	6	17	89	32	121	5	2	7	34	4	38	39	6	45
6 Jun	7	8	15	66	62	128	4	1	5	20	16	36	24	17	41
7 Jun	9	8	17	92	61	152	3	2	5	18	26	44	21	28	49
8 Jun	9	10	19	90	74	164	5	1	6	20	36	56	25	37	62
9 Jun	7	6	13	64	49	113	2	5	7	21	2	23	23	7	30
10 Jun	10	11	21	79	78	156	1	1	2	22	30	52	23	31	54
11 Jun	10	9	19	96	63	159	3	2	5	43	5	48	46	7	53
12 Jun	9	10	19	65	49	114	3	3	6	31	49	80	34	52	86

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	No. of drifts			Drift minutes			Inriver drift gillnetting catch								
							Chinook salmon			Sockeye salmon			All salmon 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
13 Jun	11	9	20	96	53	149	1	2	3	39	23	62	40	25	65
14 Jun	10	10	20	94	52	146	2	0	2	19	29	48	21	29	50
15 Jun	10	8	18	112	52	163	0	1	1	34	25	59	34	26	60
16 Jun	8	9	17	81	60	141	4	4	8	17	33	50	21	37	58
17 Jun	8	6	14	67	33	99	3	4	7	19	26	45	22	30	52
18 Jun	9	10	19	94	55	149	0	3	3	35	53	88	35	56	91
19 Jun	9	8	17	103	53	155	3	2	5	21	41	62	24	43	67
20 Jun	9	10	19	90	64	154	1	0	1	31	39	70	32	39	71
21 Jun	11	10	21	111	81	193	0	1	1	28	30	58	28	31	59
22 Jun	10	10	20	115	76	191	1	0	1	20	20	40	21	20	41
23 Jun	12	11	23	114	75	188	4	0	4	21	8	29	25	8	33
24 Jun	8	10	18	95	71	165	1	2	3	17	26	43	18	28	46
25 Jun	10	8	18	108	56	164	1	3	4	29	15	44	30	18	48
26 Jun	11	12	23	105	84	188	1	1	2	10	14	24	11	15	26
27 Jun	10	10	20	89	69	158	1	4	5	18	18	36	19	22	41
28 Jun	9	10	19	90	77	167	1	3	4	3	10	13	4	13	17
29 Jun	10	8	18	101	59	160	5	0	5	10	10	20	15	10	25
30 Jun	8	9	17	66	69	135	2	2	4	16	5	21	18	7	25
Total	490	330	820	4,888	2,221	7,109	96	54	150	786	657	1,443	882	711	1,593
Min	7	2	13	59	9	95	0	0	0	0	0	0	0	0	0
Average	11	8	18	106	53	155	2	1	3	17	16	31	19	15	35
Max	17	12	23	172	84	195	6	5	8	43	53	88	46	56	91

Note: Blank space in data fields indicate no nearshore netting occurred because nearshore netting area was not available during negative tidal stage.

Appendix D2.–Number of Dolly Varden and rainbow trout caught during the early run in midriver and nearshore 5.0- and 7.5-inch mesh gillnets, 16 May–30 June 2015.

	Inriver drift gillnetting catch								
	Dolly Varden			Rainbow trout			All nonsalmon species		
Date	Midriver	Nearshore	All	Midriver	Nearshore	All	Midriver	Nearshore	All
16 May	0		0	0		0	0	0	0
17 May	0		0	0		0	0	0	0
18 May	0	0	0	0	0	0	0	0	0
19 May	0	0	0	0	0	0	0	0	0
20 May	0	0	0	0	0	0	0	0	0
21 May	0	0	0	0	0	0	0	0	0
22 May	0	0	0	0	0	0	0	0	0
23 May	0	0	0	0	0	0	0	0	0
24 May	0	0	0	0	0	0	0	0	0
25 May	0	0	0	0	0	0	0	0	0
26 May	0	0	0	1	0	1	1	0	1
27 May	0	0	0	0	0	0	0	0	0
28 May	0	0	0	0	0	0	0	0	0
29 May	0		0	0		0	0	0	0
30 May	0		0	0		0	0	0	0
31 May	0	0	0	0	0	0	0	0	0
1 Jun	0	0	0	0	0	0	0	0	0
2 Jun	0	1	1	0	0	0	0	1	1
3 Jun	0	0	0	0	0	0	0	0	0
4 Jun	0	0	0	0	0	0	0	0	0
5 Jun	0	0	0	0	0	0	0	0	0
6 Jun	0	0	0	0	0	0	0	0	0
7 Jun	0	0	0	0	0	0	0	0	0
8 Jun	0	0	0	0	0	0	0	0	0
9 Jun	0	0	0	0	0	0	0	0	0
10 Jun	0	0	0	0	0	0	0	0	0
11 Jun	0	0	0	0	0	0	0	0	0
12 Jun	0	0	0	0	0	0	0	0	0

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	Inriver drift gillnetting catch								
	Dolly Varden			Rainbow trout			All non-salmon species		
Date	Midriver	Nearshore	All	Midriver	Nearshore	All	Midriver	Nearshore	All
13 Jun	0	0	0	0	0	0	0	0	0
14 Jun	0	0	0	0	0	0	0	0	0
15 Jun	0	1	1	0	0	0	0	1	1
16 Jun	0	0	0	0	0	0	0	0	0
17 Jun	0	0	0	0	0	0	0	0	0
18 Jun	0	0	0	0	0	0	0	0	0
19 Jun	0	0	0	0	0	0	0	0	0
20 Jun	0	0	0	0	0	0	0	0	0
21 Jun	0	0	0	0	0	0	0	0	0
22 Jun	0	0	0	0	0	0	0	0	0
23 Jun	0	0	0	0	0	0	0	0	0
24 Jun	0	0	0	0	0	0	0	0	0
25 Jun	0	0	0	0	0	0	0	0	0
26 Jun	0	0	0	0	0	0	0	0	0
27 Jun	0	0	0	0	0	0	0	0	0
28 Jun	0	0	0	0	0	0	0	0	0
29 Jun	0	0	0	0	0	0	0	0	0
30 Jun	0	0	0	0	0	0	0	0	0
Total	0	2	2	1	0	1	1	2	3
Min	0	0	0	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0	0
Max	0	1	1	1	0	1	1	1	1

Note: Blank space in data fields indicate no nearshore netting occurred because nearshore netting area was not available during negative tidal stage.

Appendix D3.–CPUE of Chinook and sockeye salmon captured during the early run in midriver and nearshore 5.0- and 7.5-inch mesh gillnets, 16 May–30 June 2015.

	CPUE [a]									
	Chinook salmon					Sockeye salmon				
Date	Midriver	SE	Nearshore	SE	All	Midriver	SE	Nearshore	SE	All
16 May	0.007	0.007			0.007	0.000	0.000			0.000
17 May	0.008	0.008			0.008	0.000	0.000			0.000
18 May	0.007	0.007	0.000	0.000	0.006	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	0.087	0.036	0.022
20 May	0.000	0.000	0.000	0.000	0.000	0.008	0.008	0.000	0.000	0.007
21 May	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22 May	0.008	0.008	0.000	0.000	0.005	0.000	0.000	0.016	0.016	0.007
23 May	0.000	0.000	0.000	0.000	0.000	0.009	0.009	0.000	0.000	0.007
24 May	0.008	0.008	0.000	0.000	0.006	0.121	0.027	0.080	0.042	0.139
25 May	0.019	0.014	0.000	0.000	0.011	0.019	0.013	0.000	0.000	0.015
26 May	0.000	0.000	0.000	0.000	0.000	0.055	0.018	0.000	0.000	0.044
27 May	0.008	0.009	0.000	0.000	0.006	0.034	0.013	0.130	0.063	0.073
28 May	0.012	0.008	0.000	0.000	0.011	0.121	0.031	0.097	0.003	0.161
29 May	0.012	0.008			0.012	0.099	0.035			0.124
30 May	0.019	0.010			0.019	0.100	0.024			0.117
31 May	0.027	0.013	0.000	0.000	0.024	0.116	0.026	0.093	0.056	0.139
1 Jun	0.037	0.019	0.000	0.000	0.034	0.154	0.029	0.073	0.101	0.190
2 Jun	0.067	0.032	0.057	0.038	0.063	0.219	0.066	0.567	0.172	0.241
3 Jun	0.055	0.035	0.039	0.045	0.051	0.415	0.083	0.473	0.453	0.366
4 Jun	0.079	0.045	0.044	0.029	0.064	0.238	0.094	0.283	0.073	0.205
5 Jun	0.056	0.025	0.062	0.039	0.058	0.381	0.094	0.125	0.077	0.278
6 Jun	0.061	0.033	0.016	0.017	0.039	0.305	0.175	0.257	0.098	0.263
7 Jun	0.033	0.023	0.033	0.023	0.033	0.196	0.077	0.429	0.223	0.322
8 Jun	0.055	0.025	0.013	0.014	0.036	0.221	0.114	0.486	0.171	0.410
9 Jun	0.031	0.019	0.102	0.074	0.062	0.326	0.085	0.041	0.026	0.168
10 Jun	0.013	0.013	0.013	0.013	0.013	0.280	0.067	0.386	0.132	0.380
11 Jun	0.031	0.016	0.032	0.020	0.031	0.446	0.112	0.080	0.034	0.351
12 Jun	0.046	0.035	0.062	0.033	0.053	0.478	0.134	1.005	0.383	0.585
13 Jun	0.010	0.010	0.038	0.024	0.020	0.404	0.092	0.438	0.142	0.453
14 Jun	0.021	0.014	0.000	0.000	0.014	0.201	0.054	0.561	0.111	0.351
15 Jun	0.000	0.000	0.019	0.021	0.006	0.305	0.079	0.484	0.167	0.432
16 Jun	0.050	0.026	0.066	0.038	0.057	0.211	0.082	0.548	0.163	0.366
17 Jun	0.045	0.022	0.122	0.094	0.070	0.285	0.100	0.794	0.219	0.329
18 Jun	0.000	0.000	0.055	0.029	0.020	0.373	0.041	0.966	0.098	0.644
19 Jun	0.029	0.015	0.038	0.039	0.032	0.205	0.059	0.777	0.182	0.453
20 Jun	0.011	0.012	0.000	0.000	0.007	0.346	0.163	0.611	0.249	0.512
21 Jun	0.000	0.000	0.012	0.013	0.005	0.251	0.065	0.369	0.135	0.424
22 Jun	0.009	0.009	0.000	0.000	0.005	0.174	0.054	0.263	0.080	0.293
23 Jun	0.035	0.015	0.000	0.000	0.021	0.185	0.067	0.107	0.036	0.212

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	CPUE [a]									
	Chinook salmon					Sockeye salmon				
Date	Midriver	SE	Nearshore	SE	All	Midriver	SE	Nearshore	SE	All
24 Jun	0.011	0.010	0.028	0.029	0.018	0.180	0.062	0.368	0.083	0.315
25 Jun	0.009	0.009	0.053	0.026	0.024	0.269	0.096	0.267	0.041	0.322
26 Jun	0.010	0.010	0.012	0.012	0.011	0.096	0.030	0.168	0.064	0.176
27 Jun	0.011	0.011	0.058	0.033	0.032	0.203	0.051	0.260	0.078	0.263
28 Jun	0.011	0.011	0.039	0.027	0.024	0.033	0.024	0.129	0.073	0.095
29 Jun	0.050	0.031	0.000	0.000	0.031	0.099	0.036	0.169	0.041	0.146
30 Jun	0.030	0.031	0.029	0.020	0.030	0.243	0.091	0.072	0.040	0.154
Min	0.000		0.000		0.000	0.000		0.000		0.000
Average	0.023		0.025		0.023	0.183		0.287		0.229
Max	0.079		0.122		0.070	0.478		1.005		0.644

Note: Blank space in data fields indicate no nearshore netting occurred because nearshore netting area was not available during negative tidal stage.

[a] CPUE is catch per minute.

Appendix D4.–Number of Chinook, sockeye, coho, and pink salmon captured during the late run in midriver and nearshore 5.0- and 7.5-inch mesh gillnets, 1 July–20 August 2015.

	No. of drifts			Drift minutes			Inriver drift gillnetting catch															
							Chinook salmon			Sockeye salmon			Coho salmon			Pink salmon			All salmon 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	10	8	18	85	52	137	6	2	8	18	9	27	0	0	0	0	0	0	24	11	35
2 Jul	8	9	17	77	56	134	6	3	9	32	36	68	0	0	0	0	0	0	38	39	77
3 Jul	10	9	19	88	62	150	6	4	10	32	10	42	0	0	0	0	0	0	38	14	52
4 Jul	9	10	19	75	62	136	7	2	9	10	26	36	0	0	0	0	0	0	17	28	45
5 Jul	10	9	19	104	70	174	4	2	6	8	19	27	0	0	0	0	0	0	12	21	33
6 Jul	10	10	20	100	82	181	3	0	3	38	27	65	0	0	0	0	0	0	41	27	68
7 Jul	8	7	15	100	65	165	3	4	7	17	14	31	0	0	0	0	0	0	20	18	38
8 Jul	8	8	16	94	47	140	4	0	4	34	43	77	0	0	0	0	0	0	38	43	81
9 Jul	10	10	20	91	65	156	2	1	3	42	56	98	0	0	0	0	0	0	44	57	101
10 Jul	10	10	20	103	83	186	1	4	5	15	13	28	0	0	0	0	0	0	16	17	33
11 Jul	9	8	17	77	57	134	4	4	8	20	29	49	0	0	0	1	1	2	25	34	59
12 Jul	10	10	20	64	54	117	9	1	10	2	7	9	0	0	0	0	0	0	11	8	19
13 Jul	10	8	18	101	58	159	6	2	8	4	8	12	0	0	0	0	0	0	10	10	20
14 Jul	8	8	16	71	55	126	4	4	8	20	58	78	0	0	0	0	1	1	24	63	87
15 Jul	8	8	16	60	49	108	7	5	12	16	24	40	0	0	0	0	0	0	23	29	52
16 Jul	7	8	15	62	52	114	5	3	8	37	48	85	0	0	0	0	0	0	42	51	93
17 Jul	10	9	19	83	57	140	10	1	11	35	22	57	0	0	0	0	0	0	45	23	68
18 Jul	6	7	13	46	39	85	6	0	6	59	62	121	0	0	0	0	0	0	65	62	127
19 Jul	10	9	19	80	41	120	3	1	4	68	69	137	0	0	0	0	0	0	71	70	141
20 Jul	8	8	16	72	54	126	1	0	1	50	65	115	0	0	0	0	0	0	51	65	116
21 Jul	8	8	16	87	57	144	3	2	5	33	32	65	0	0	0	0	0	0	36	34	70
22 Jul	6	8	14	57	60	117	4	0	4	48	90	138	0	0	0	0	0	0	52	90	142
23 Jul	8	6	14	79	41	120	7	2	9	48	62	110	0	0	0	0	0	0	55	64	119
24 Jul	5	6	11	51	31	82	16	4	20	6	37	43	0	0	0	0	0	0	22	41	63
25 Jul	10	9	19	52	14	66	9	0	9	28	111	139	0	0	0	0	0	0	37	111	148
26 Jul	8	8	16	60	26	87	9	0	9	61	83	144	0	0	0	0	0	0	70	83	153
27 Jul	9	8	17	87	32	119	8	2	10	16	52	68	0	0	0	0	0	0	24	54	78
28 Jul	6	6	12	51	31	82	4	1	5	25	25	50	0	0	0	0	0	0	29	26	55

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							Inriver drift gillnetting catch												
	No. of drifts			Drift minutes			Chinook salmon			Sockeye salmon			Coho salmon			Pink salmon			All salmon species		
Date	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All	Mid	Near	All
29 Jul	8	8	16	63	41	104	10	3	13	13	67	80	0	0	0	0	0	0	23	70	93
30 Jul	8	9	17	71	48	118	7	0	7	10	18	28	0	0	0	0	0	0	17	18	35
31 Jul	10	9	19	72	35	107	5	1	6	38	43	81	0	1	1	0	0	0	43	45	88
1 Aug	8	8	16	78	46	124	5	0	5	17	40	57	0	0	0	0	0	0	22	40	62
2 Aug	8	8	16	87	55	142	4	0	4	17	33	50	0	0	0	0	0	0	21	33	54
3 Aug	8	8	16	88	67	156	6	0	6	12	13	25	0	0	0	0	0	0	18	13	31
4 Aug	8	8	16	97	59	156	2	4	6	8	25	33	0	0	0	0	0	0	10	29	39
5 Aug	9	10	19	65	58	123	7	2	9	12	74	86	0	1	1	0	1	1	19	78	97
6 Aug	10	8	18	114	53	167	3	1	4	15	26	41	0	0	0	0	0	0	18	27	45
7 Aug	12	12	24	127	59	186	3	0	3	10	33	43	0	1	1	0	0	0	13	34	47
8 Aug	10	8	18	104	43	146	5	2	7	42	36	78	2	0	2	0	0	0	49	38	87
9 Aug	8	10	18	95	62	157	4	0	4	14	18	32	0	0	0	0	0	0	18	18	36
10 Aug	10	10	20	98	57	155	5	1	6	4	2	6	0	0	0	0	0	0	9	3	12
11 Aug	8	10	18	90	47	137	3	0	3	3	7	10	1	1	2	0	0	0	7	8	15
12 Aug	8	8	16	70	40	110	5	0	5	5	24	29	4	1	5	0	0	0	14	25	39
13 Aug	9	10	19	95	53	148	1	0	1	5	12	17	2	2	4	0	0	0	8	14	22
14 Aug	11	10	21	94	55	148	3	0	3	6	25	31	5	6	11	0	0	0	14	31	45
15 Aug	10	10	20	104	71	176	1	0	1	14	21	35	0	7	7	0	0	0	15	28	43
16 Aug	10	8	18	113	53	167	0	0	0	15	17	32	15	9	24	1	0	1	31	26	57
17 Aug	10	9	19	107	65	172	1	0	1	12	8	20	8	10	18	0	0	0	21	18	39
18 Aug	10	9	19	105	49	154	2	0	2	9	14	23	5	11	16	0	0	0	16	25	41
19 Aug	10	10	20	90	74	164	2	0	2	6	10	16	6	4	10	0	0	0	14	14	28
20 Aug	9	8	17	115	63	178	2	0	2	11	41	52	3	8	11	0	0	0	16	49	65
Total	451	440	891	4,300	2,703	7,003	243	68	311	1,120	1,744	2,864	51	62	113	2	3	5	1,416	1,877	3,293
Min	5	6	11	46	14	66	0	0	0	2	2	6	0	0	0	0	0	0	7	3	12
Average	9	9	17	84	53	137	5	1	6	22	34	56	1	1	2	0	0	0	28	37	65
Max	12	12	24	127	83	186	16	5	20	68	111	144	15	11	24	1	1	2	71	111	153

Note: “Mid” is midriver and “Near” is nearshore.

Appendix D5.–Number of Dolly Varden and rainbow trout captured during the late run in midriver and nearshore 5.0- and 7.5-inch mesh gillnets, 1 July–20 August 2015.

	Inriver drift gillnetting catch								
	Dolly Varden			Rainbow trout			All nonsalmon species		
Date	Midriver	Nearshore	All	Midriver	Nearshore	All	Midriver	Nearshore	All
1 Jul	0	0	0	0	0	0	0	0	0
2 Jul	0	0	0	0	0	0	0	0	0
3 Jul	0	0	0	0	0	0	0	0	0
4 Jul	0	0	0	0	0	0	0	0	0
5 Jul	0	0	0	0	0	0	0	0	0
6 Jul	0	0	0	0	0	0	0	0	0
7 Jul	0	0	0	0	0	0	0	0	0
8 Jul	0	0	0	0	0	0	0	0	0
9 Jul	0	0	0	0	0	0	0	0	0
10 Jul	0	0	0	0	0	0	0	0	0
11 Jul	0	0	0	1	0	1	1	0	1
12 Jul	0	1	1	0	0	0	0	1	1
13 Jul	0	0	0	0	0	0	0	0	0
14 Jul	0	0	0	0	0	0	0	0	0
15 Jul	0	0	0	0	0	0	0	0	0
16 Jul	0	1	1	0	0	0	0	1	1
17 Jul	0	0	0	0	0	0	0	0	0
18 Jul	0	0	0	0	0	0	0	0	0
19 Jul	0	0	0	0	0	0	0	0	0
20 Jul	0	0	0	0	0	0	0	0	0
21 Jul	0	0	0	0	0	0	0	0	0
22 Jul	0	0	0	0	0	0	0	0	0
23 Jul	0	0	0	0	0	0	0	0	0
24 Jul	0	0	0	0	0	0	0	0	0
25 Jul	0	0	0	0	0	0	0	0	0
26 Jul	0	0	0	0	0	0	0	0	0
27 Jul	0	0	0	0	0	0	0	0	0
28 Jul	0	0	0	0	0	0	0	0	0
29 Jul	0	0	0	0	0	0	0	0	0
30 Jul	0	0	0	0	0	0	0	0	0
31 Jul	0	0	0	0	0	0	0	0	0
1 Aug	0	0	0	0	0	0	0	0	0
2 Aug	0	0	0	0	0	0	0	0	0
3 Aug	0	0	0	0	0	0	0	0	0
4 Aug	0	0	0	0	0	0	0	0	0
5 Aug	0	0	0	0	0	0	0	0	0
6 Aug	0	0	0	0	0	0	0	0	0
7 Aug	0	1	1	0	0	0	0	1	1
8 Aug	0	0	0	0	0	0	0	0	0
9 Aug	0	0	0	0	0	0	0	0	0
10 Aug	0	0	0	0	0	0	0	0	0

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	Inriver drift gillnetting catch								
	Dolly Varden			Rainbow trout			All nonsalmon species		
Date	Midriver	Nearshore	All	Midriver	Nearshore	All	Midriver	Nearshore	All
11 Aug	0	0	0	0	0	0	0	0	0
12 Aug	0	0	0	0	0	0	0	0	0
13 Aug	0	0	0	0	0	0	0	0	0
14 Aug	0	0	0	0	0	0	0	0	0
15 Aug	0	0	0	0	0	0	0	0	0
16 Aug	0	0	0	0	0	0	0	0	0
17 Aug	0	0	0	0	0	0	0	0	0
18 Aug	0	0	0	0	0	0	0	0	0
19 Aug	0	0	0	0	0	0	0	0	0
20 Aug	0	0	0	0	0	0	0	0	0
Total	0	3	3	1	0	1	1	3	4
Min	0	0	0	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0	0
Max	0	1	1	1	0	1	1	1	1

Appendix D6.–CPUE of Chinook and sockeye salmon captured during the late run in midriver and nearshore 5.0- and 7.5-inch mesh gillnets, 1 July–20 August 2015.

	CPUE [a]									
	Chinook salmon					Sockeye salmon				
Date	Midriver	SE	Nearshore	SE	All	Midriver	SE	Nearshore	SE	All
1 Jul	0.071	0.031	0.038	0.037	0.058	0.212	0.064	0.171	0.081	0.197
2 Jul	0.077	0.026	0.053	0.026	0.067	0.413	0.103	0.639	0.147	0.508
3 Jul	0.068	0.032	0.064	0.025	0.067	0.364	0.119	0.161	0.074	0.280
4 Jul	0.094	0.027	0.032	0.022	0.066	0.134	0.064	0.422	0.149	0.264
5 Jul	0.038	0.022	0.028	0.019	0.034	0.077	0.042	0.271	0.124	0.155
6 Jul	0.030	0.022	0.000	0.000	0.017	0.381	0.105	0.331	0.124	0.359
7 Jul	0.030	0.017	0.061	0.037	0.042	0.171	0.077	0.215	0.109	0.188
8 Jul	0.043	0.034	0.000	0.000	0.028	0.362	0.102	0.922	0.344	0.548
9 Jul	0.022	0.014	0.015	0.015	0.019	0.460	0.095	0.859	0.153	0.626
10 Jul	0.010	0.010	0.048	0.020	0.027	0.146	0.047	0.158	0.053	0.151
11 Jul	0.052	0.022	0.070	0.039	0.060	0.260	0.081	0.507	0.246	0.365
12 Jul	0.141	0.035	0.019	0.018	0.085	0.031	0.032	0.130	0.052	0.077
13 Jul	0.059	0.043	0.035	0.034	0.050	0.040	0.022	0.139	0.054	0.076
14 Jul	0.056	0.042	0.072	0.029	0.063	0.282	0.147	1.046	0.227	0.617
15 Jul	0.117	0.067	0.102	0.055	0.111	0.268	0.058	0.492	0.187	0.369
16 Jul	0.081	0.052	0.057	0.041	0.070	0.596	0.111	0.920	0.326	0.744
17 Jul	0.121	0.025	0.018	0.018	0.079	0.424	0.101	0.387	0.135	0.409
18 Jul	0.130	0.066	0.000	0.000	0.070	1.279	0.454	1.578	0.717	1.416
19 Jul	0.038	0.021	0.025	0.027	0.033	0.854	0.166	1.700	0.609	1.139
20 Jul	0.014	0.014	0.000	0.000	0.008	0.690	0.114	1.212	0.339	0.912
21 Jul	0.035	0.024	0.035	0.023	0.035	0.380	0.068	0.557	0.150	0.450
22 Jul	0.070	0.025	0.000	0.000	0.034	0.839	0.144	1.511	0.239	1.182
23 Jul	0.088	0.050	0.049	0.052	0.075	0.604	0.117	1.525	0.269	0.916
24 Jul	0.313	0.057	0.131	0.045	0.244	0.117	0.121	1.207	0.416	0.526
25 Jul	0.172	0.066	0.000	0.000	0.136	0.534	0.226	7.995	3.965	2.097
26 Jul	0.149	0.082	0.000	0.000	0.104	1.009	0.295	3.148	1.470	1.659
27 Jul	0.092	0.035	0.062	0.063	0.084	0.183	0.056	1.617	0.573	0.569
28 Jul	0.078	0.029	0.032	0.029	0.061	0.487	0.106	0.803	0.157	0.606
29 Jul	0.159	0.052	0.073	0.041	0.125	0.206	0.050	1.632	0.704	0.769
30 Jul	0.099	0.036	0.000	0.000	0.059	0.141	0.077	0.377	0.102	0.236
31 Jul	0.069	0.025	0.029	0.027	0.056	0.527	0.121	1.226	0.273	0.756
1 Aug	0.064	0.028	0.000	0.000	0.040	0.218	0.080	0.871	0.319	0.460
2 Aug	0.046	0.037	0.000	0.000	0.028	0.196	0.069	0.598	0.184	0.352
3 Aug	0.068	0.035	0.000	0.000	0.038	0.136	0.049	0.193	0.066	0.160
4 Aug	0.021	0.020	0.068	0.038	0.038	0.082	0.042	0.423	0.142	0.211
5 Aug	0.108	0.039	0.034	0.024	0.073	0.185	0.077	1.274	0.359	0.700
6 Aug	0.026	0.019	0.019	0.020	0.024	0.132	0.029	0.492	0.152	0.246
7 Aug	0.024	0.014	0.000	0.000	0.016	0.079	0.054	0.558	0.208	0.231
8 Aug	0.048	0.021	0.047	0.032	0.048	0.406	0.087	0.840	0.290	0.533
9 Aug	0.042	0.023	0.000	0.000	0.026	0.147	0.056	0.291	0.093	0.204
10 Aug	0.051	0.022	0.018	0.018	0.039	0.041	0.031	0.035	0.024	0.039

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	CPUE [a]									
	Chinook salmon					Sockeye salmon				
Date	Midriver	SE	Nearshore	SE	All	Midriver	SE	Nearshore	SE	All
11 Aug	0.033	0.018	0.000	0.000	0.022	0.033	0.024	0.150	0.060	0.073
12 Aug	0.071	0.021	0.000	0.000	0.046	0.071	0.042	0.602	0.179	0.264
13 Aug	0.011	0.011	0.000	0.000	0.007	0.053	0.023	0.226	0.067	0.115
14 Aug	0.032	0.018	0.000	0.000	0.020	0.064	0.039	0.458	0.178	0.209
15 Aug	0.010	0.010	0.000	0.000	0.006	0.134	0.036	0.294	0.076	0.199
16 Aug	0.000	0.000	0.000	0.000	0.000	0.132	0.040	0.319	0.086	0.192
17 Aug	0.009	0.009	0.000	0.000	0.006	0.112	0.027	0.123	0.049	0.116
18 Aug	0.019	0.013	0.000	0.000	0.013	0.085	0.027	0.288	0.062	0.149
19 Aug	0.022	0.016	0.000	0.000	0.012	0.066	0.043	0.136	0.046	0.098
20 Aug	0.017	0.012	0.000	0.000	0.011	0.095	0.036	0.653	0.210	0.292
Min	0.000		0.000		0.006	0.031		0.035		0.039
Average	0.065		0.026		0.055	0.293		0.837		0.504
Max	0.313		0.131		0.244	1.279		7.995		2.097

[a] CPUE is catch per minute.

Appendix D7.–CPUE of coho and pink salmon captured during the late run in midriver and nearshore 5.0- and 7.5-inch mesh gillnets, 1 July–20 August 2015.

	CPUE [a]									
	Coho salmon					Pink salmon				
Date	Midriver	SE	Nearshore	SE	All	Midriver	SE	Nearshore	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	0.000	0.000	0.000	0.000	0.000
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	0.013	0.018	0.017	0.024	0.015
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	0.000	0.000	0.000	0.000	0.000
14 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.025	0.008
15 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
27 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
28 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
29 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30 Jul	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
31 Jul	0.000	0.000	0.029	0.039	0.009	0.000	0.000	0.000	0.000	0.000
1 Aug	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2 Aug	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3 Aug	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4 Aug	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5 Aug	0.000	0.000	0.017	0.024	0.008	0.000	0.000	0.017	0.017	0.008
6 Aug	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7 Aug	0.000	0.000	0.017	0.024	0.005	0.000	0.000	0.000	0.000	0.000
8 Aug	0.019	0.022	0.000	0.000	0.014	0.000	0.000	0.000	0.000	0.000
9 Aug	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10 Aug	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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	CPUE [a]									
	Coho salmon					Pink salmon				
Date	Midriver	SE	Nearshore	SE	All	Midriver	SE	Nearshore	SE	All
11 Aug	0.011	0.015	0.021	0.029	0.015	0.000	0.000	0.000	0.000	0.000
12 Aug	0.057	0.061	0.025	0.036	0.046	0.000	0.000	0.000	0.000	0.000
13 Aug	0.021	0.029	0.038	0.044	0.027	0.000	0.000	0.000	0.000	0.000
14 Aug	0.053	0.058	0.110	0.122	0.074	0.000	0.000	0.000	0.000	0.000
15 Aug	0.000	0.000	0.098	0.097	0.040	0.000	0.000	0.000	0.000	0.000
16 Aug	0.132	0.135	0.169	0.162	0.144	0.009	0.012	0.000	0.000	0.006
17 Aug	0.075	0.075	0.154	0.147	0.105	0.000	0.000	0.000	0.000	0.000
18 Aug	0.047	0.047	0.226	0.221	0.104	0.000	0.000	0.000	0.000	0.000
19 Aug	0.066	0.073	0.054	0.056	0.061	0.000	0.000	0.000	0.000	0.000
20 Aug	0.026	0.026	0.127	0.133	0.062	0.000	0.000	0.000	0.000	0.000
Min	0.000		0.000		0.000	0.000		0.000		0.000
Average	0.010		0.021		0.005	0.000		0.001		0.001
Max	0.132		0.226		0.074	0.013		0.018		0.015

[a] CPUE is catch per minute.