Special Publication No. 24-10

Monitoring the Chinook Salmon Sport Fishery on the Nushagak River Drainage, 2023

by

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and

Lee K. Borden

REVISION

This report was revised in November 2024 to correct significant errors in Table 4 and associated text on pages 11–12 and in Figure 4.

April 2024

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

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figures or figure captions.

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

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

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ABSTRACT

The Chinook salmon (*Oncorhynchus tshawytscha*) sport fishery on the Nushagak River was examined from 17 June to 14 July 2023 by creel survey and angler interviews. Index counts of anglers fishing the survey area ranged from 48 on 17 June to 204 on 29 June, with an average for the study period of 97 per day. Information was collected on angler-days of effort by type of angler (guided vs. unguided), gear (bait or no bait), and catch and harvest rates of Chinook salmon. Samples of harvested fish were used to determine age, sex, length, and weight characteristics of Chinook salmon in the sport harvest. These data provided information about sport fishing success as well as the composition of the harvest concurrent with the sport fishery during the months of June and July. Data collected from this onsite survey will also provide documented use patterns that will enable regulations to be designed that accommodate the sport fishery and maintain angling opportunity. Results will also guide review of current regulations and will be used to assess the effectiveness of current regulations.

Keywords: Chinook salmon, *Oncorhynchus tshawytscha*, creel survey, Nushagak River, Bristol Bay Management Area, angler effort, harvest, age, sex, length, sport fishery, Southwest Alaska

INTRODUCTION

This project was initiated to provide managers with data contemporaneous with the sport fishery on sport effort and catch/harvest rates, as well as to provide biological data from sport-harvested Chinook salmon (*Oncorhynchus tshawytscha*) that returned to the Nushagak River in 2023.

The Nushagak River is located in Southwestern Alaska and flows approximately 390 km from its headwaters into Bristol Bay (Figure 1). The Nushagak River drainage supports the largest sport fisheries for Chinook salmon in the Bristol Bay Management Area (BBMA). Under the *Nushagak and Mulchatna King Salmon Management Plan* (5 AAC 06.361, adopted January 1992 and amended 6 times), Chinook salmon are managed to attain an inriver run of 95,000 fish, which is expected to provide 55,000 to 120,000 spawning fish per year, a reasonable opportunity to harvest Chinook salmon in the inriver subsistence fishery, and a guideline harvest level in the sport fishery of 5,000 fish. However, since 2019, runs have failed to meet this 95,000-fish goal (Table 1; Borden and Adickes 2022) and as a result, the *Nushagak King Salmon Stock of Concern Action Plan* was created in the spring of 2023 to manage Chinook salmon harvest to achieve the established escapement goal.

Historically (2000 to 2016), the total harvest by commercial, subsistence, and sport fisheries averaged 54,791 Chinook salmon annually (Table 1). Based on this average, the majority (66%) of the harvest was taken by the commercial fishery, 22% was taken by the subsistence fishery, and 12% was taken by sport anglers (calculated from Table 1). Sport harvest of Chinook salmon averaged 6,500 fish from 2000 through 2016 (calculated from Table 1).

In recent years (2017–2021), the total harvest by commercial, subsistence, and sport fisheries averaged 35,533 Chinook salmon (Table 1). The majority (59%) of the total harvest was taken by the commercial fishery, 25% by the subsistence fishery, and 15% by sport anglers. Sport harvest of Chinook salmon averaged 5,298 fish from 2017 through 2021 (Table 1). Numbers of Chinook salmon in the Nushagak–Mulchatna Rivers drainage have also declined in recent years. Historically, total runs of Nushagak and Mulchatna Rivers Chinook salmon averaged 179,624 fish from 2000 through 2016, ranging from 94,245 to 356,240 fish, but from 2017 to 2021, the average annual run totaled 90,716 Chinook salmon, ranging from 147,742 fish in 2018 to 57,968 in 2020 (Table 1).

As a result of the newly created *Nushagak King Salmon Stock of Concern Action Plan*, entering into the 2023 Chinook season, sport fishery regulations stipulated in part an annual bag limit of 4

Chinook salmon 20 inches or longer, only 1 of which may be over 28 inches, and a daily bag limit of 2 Chinook salmon 20 inches or longer, only 1 of which may be longer than 28 inches total length in the Nushagak River drainage. Due to concerns over catch-and-release mortality, the Alaska Board of Fisheries (BOF) adopted regulations in 2012 requiring anglers to use single hooks and, after harvesting a bag limit, to use only unbaited, single-hook, artificial lures for the remainder of that day[1].

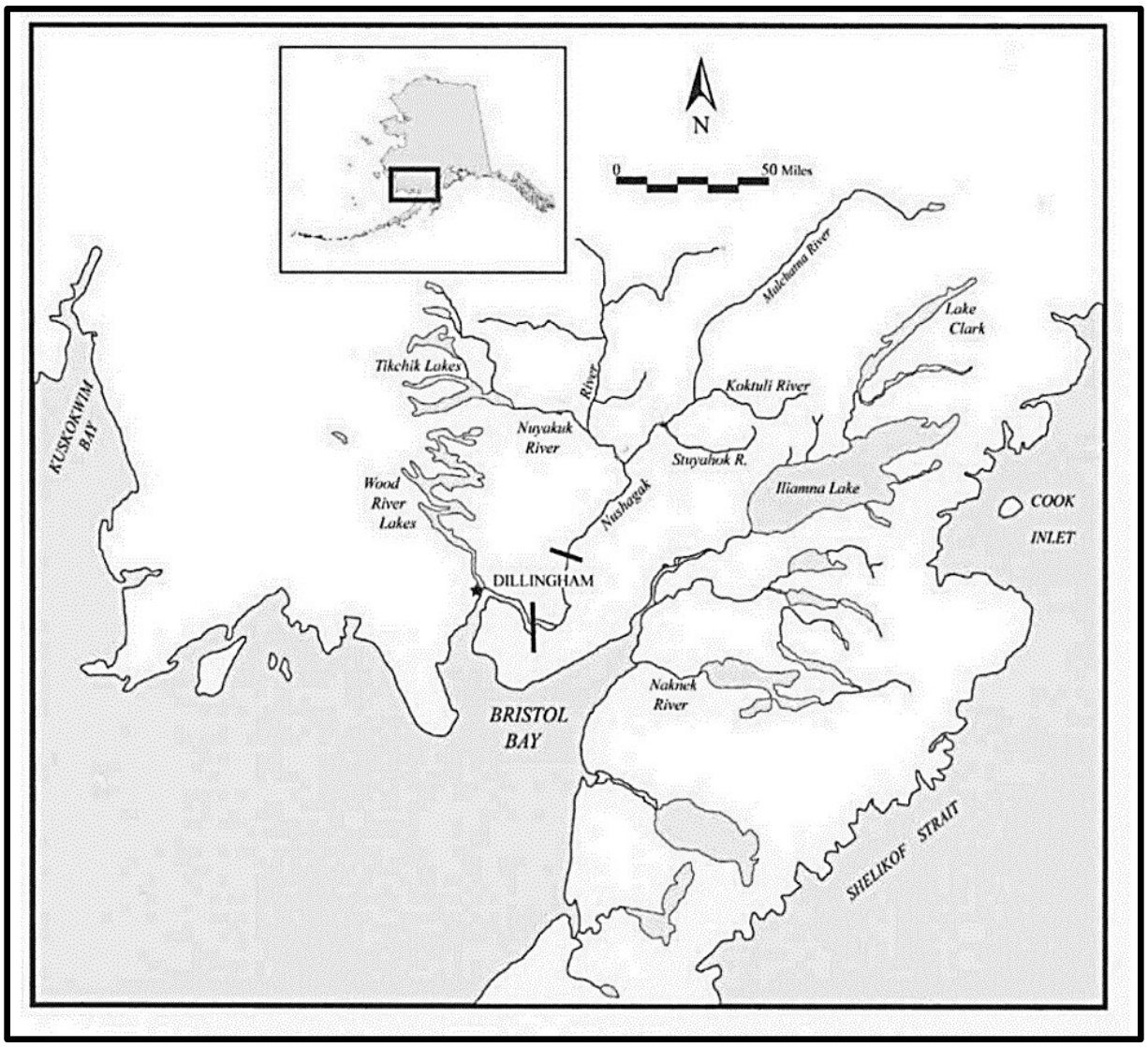

Figure 1.–Nushagak River Chinook salmon study site.

[1] Southwest Alaska sport fishing regulations summary, 2023 (effective until the 2024 summary is issued), Alaska Department of Fish and Game, Division of Sport Fish, Anchorage

Table 1.–Chinook salmon commercial, subsistence, and sport harvests, and escapement for the Nushagak River drainage, 2000–2022.

		Harvests below sonar			Inriver sonar	Harvests above sonar		Spawning	Total
Year	Total run[a]	Commercial[b]	Subsistence[c]	Sport[d]	estimate	Subsistence[e]	Sport[f]	escapement[g]	harvest
2000	138,044	12,120	7,247	1,389	117,288	1,979	4,628	110,682	27,362
2001	213,306	11,746	7,972	1,600	191,988	3,372	4,299	184,317	28,989
2002	229,485	40,039	6,946	1,193	181,307	4,103	2,500	174,704	54,781
2003	225,594	43,485	13,399	2,203	166,507	4,448	3,752	158,307	67,287
2004	356,240	100,846	10,644	2,567	242,183	4,422	4,339	233,422	122,818
2005	307,701	62,764	7,951	2,863	234,123	4,471	5,702	223,950	83,751
2006	218,861	84,881	6,131	3,166	124,683	3,012	4,307	117,364	101,497
2007	125,435	51,831	9,564	3,581	60,459	3,411	6,088	50,960	74,475
2008	128,752	18,968	9,149	3,305	97,330	2,571	3,395	91,364	37,388
2009	117,936	24,693	9,312	2,451	81,480	2,796	3,903	74,781	43,155
2010	94,245	26,056	6,345	1,659	60,185	1,845	2,248	56,092	38,153
2011	145,232	26,927	8,485	1,542	108,278	2,981	3,302	101,995	43,237
2012	195,106	11,952	7,236	1,833	174,085	2,398	4,098	167,589	27,517
2013	132,782	10,213	6,889	1,971	113,709	4,201	4,714	104,794	27,988
2014	96,639	11,868	11,942	2,369	70,460	3,890	3,891	62,679	33,960
2015	160,713	50,675	9,505	2,514	98,019	2,209	4,720	91,090	69,623
2016	167,540	24,937	14,182	3,053	125,368	1,933	5,358	118,077	49,463
2017	102,083	33,376	8,912	2,834	56,961	1,827	3,161	51,973	50,110
2018	147,742	36,626	10,427	3,450	97,239	1,408	4,742	91,089	56,653
2019	80,250	22,725	7,162	3,600	46,763	2,967	2,706	41,090	39,160
2020	57,968	7,452	5,988	1,496	43,032	2,265	454	40,313	17,655
2021	65,539	4,820	3,922	1,575	55,222	1,297	2,472	51,453	14,086
2022	62,086	5,431	NA	NA	44,434	NA	NA	NA	NA
Average [% Total harvest]									
2000–2016	179,624	36,118 [66%]	8,994 [16%]	2,309 [4%]	132,203	3,179 [6%]	4,191 [8%]	124,833	54,791
2017–2021	90,716	21,000 [59%]	7,282 [20%]	2,591 [7%]	59,843	1,953 [5%]	2,707 [8%]	55,184	35,533

-continued-

Source:

Commercial (total Nushagak District): 2000: Jones et al. (2014: Appendix A19); 2001–2021 Elison et al. (2022: Appendix A17); 2022: data provided by Jordan Head, Division of Commercial Fisheries, Region II, Anchorage.

Subsistence (above and below sonar. Data for 2000–2021 provided by Jordan Head, Division of Commercial Fisheries, Region II, Anchorage.

Sport harvests (above and below sonar): Alaska Sport Fishing Survey database [Intranet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 16, 2022) http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Sonar estimates: 2000 Morstad et al. (2012: Table 10); 2001–2021 Elison et al. (2022: Appendix A17); 2022: Bristol Bay Salmon Season Summary https://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1438246231.

[a] Run refers to an aggregation of salmon of all ages returning from ocean feeding grounds to spawn in any given year.

[b] Total Nushagak District commercial harvest 2001 to present includes personal use reported from commercial harvest.

[c] Includes Nushagak River bound Chinook salmon harvests from below the sonar site.

[d] Sport harvest total for 2000–2021 is Nushagak River sport harvest from Black Point to sonar.

[e] Includes Ekwok area, Iowithla River, Klutuk River, Koliganek area, New Stuyahok area, Portage Creek area, Kokwok area, Mulchatna River, and an unknown Nushagak River watershed site.

[f] Sport harvest total for 2000 to 2001 is 50% of the Nushagak River harvest plus the Black Point to Iowithla River, Nushagak River upstream of Iowithla River, Mulchatna River system, Tikchik–Nuyakuk Rivers, and the Koktuli River harvests. Sport harvest total for 2002–2021 is Nushagak River drainage excluding Black Point to sonar.

[g] Spawning escapement for 2000–2021 are sonar estimates minus subsistence and sport harvest above sonar.

OBJECTIVES

The objectives for the 2023 survey of the Chinook salmon sport fishery on the Nushagak River near Portage Creek are as follows:

1) Index angler-days of guided, unguided, and total angler effort in the lower Nushagak River from June 15 to July 31.
2) Index catch and harvest rates of Chinook salmon and composition of angler-days by gear (bait vs. no bait) and angler type (guided vs. unguided and Alaska resident vs. nonresident) in the lower Nushagak River from June 15 to July 31.
3) Estimate the age, sex, length, and weight compositions of Chinook salmon in the sport harvest, separately and in total, for both guided and unguided anglers in the lower Nushagak River from June 15 to July 31 such that the estimates are within 10 percentage points of the true values 90% of the time.

METHODS

STUDY SITE

The survey focused on Black Point to the lower Ekwok land boundary (LELB) at latitude 59°10′25″N, longitude 157°42′35″W and was broken into 3 sublocations: (1) Black Point to the sonar site near Portage Creek, (2) the sonar site to LELB in the west channel, and (3) in the east channel, the Keefer cutoff just downstream of Portage Creek upstream to the channel convergence (Figure 2).

ANGLER EFFORT

One angler count was conducted during each sample day (Objective 1), resulting in 6 sample days per week. Sample days were randomly generated before beginning the project (Appendix A1). All counts were conducted at 10:00 AM, representing what is thought to be the peak time of angling activity, and took 1.5–2.5 hours to complete. Two boats were used to conduct counts, with 1 boat stationed at the start of Sublocation 1 and the other stationed at the start of Sublocation 2 (Figure 2). These counts were run simultaneously. Once the Sublocation 2 count was completed, the Sublocation 3 count was begun. The boats maintained a safe constant cruising speed while maneuvering the river and counting active anglers; no stops were made until the count was completed. These counts provided an instantaneous representation of active angler effort, broken into guided and unguided anglers. Guided and unguided anglers were identified by the presence or absence of the green guide vessel decals with current-year registration stickers as required for any vessel that provides commercial guiding services.

CATCH AND HARVEST RATES AND ANGLER-DAY COMPOSITIONS

Individual angler interviews were conducted every sample day. Roving surveys were utilized to located completed day anglers, along with a randomized selection of the guided lodges present in the fishery. Each interviewed angler was asked a series of questions to collect the following data: length of time fished, duration of trip, number and species of fish caught and harvested, bait usage, and whether the services of a guide were utilized, along with demographic data. Field technicians also collected biological data (outlined below) from all sport-harvested fish that were encountered during the interviews. This provided data on catch and harvest rates and composition (proportion) of angler-days by gear (bait usage) and angler type (guided vs. unguided; Objective 2).

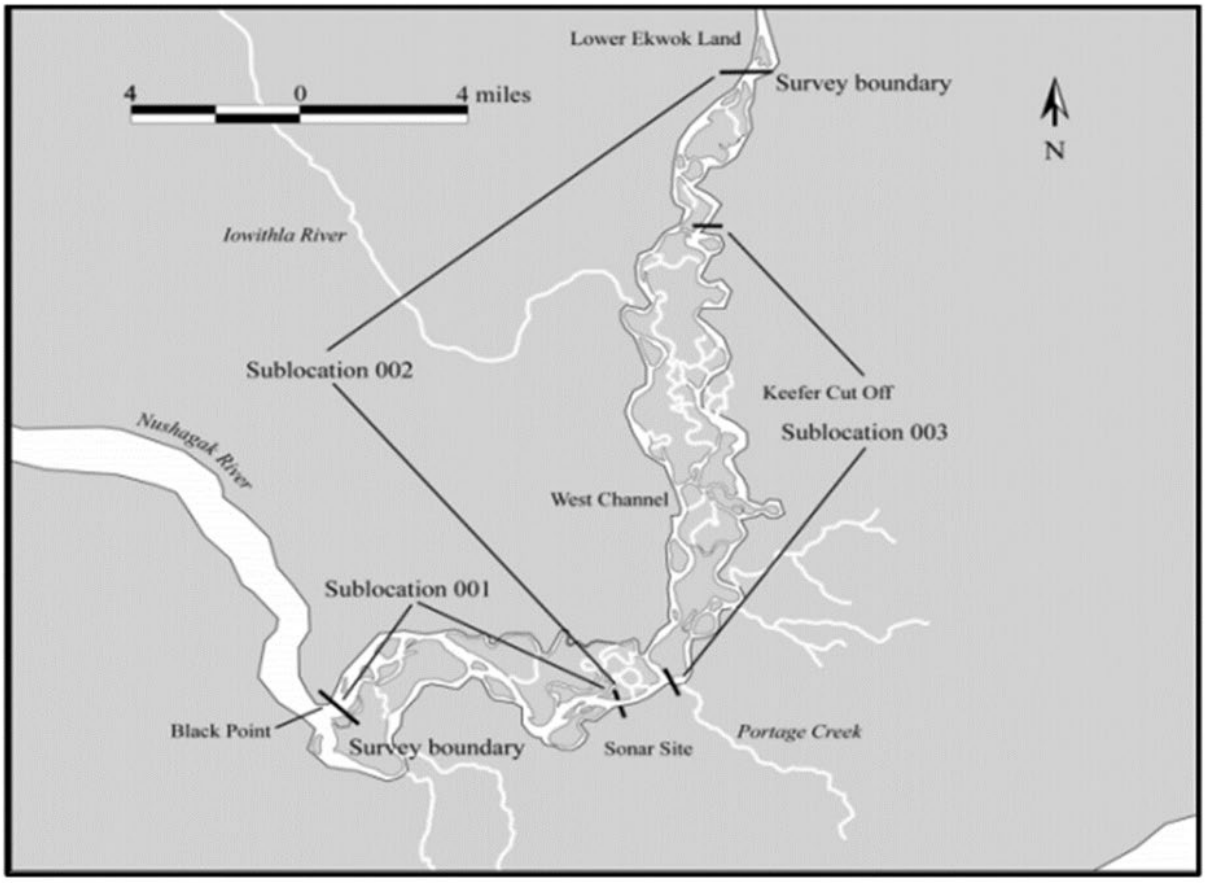

Figure 2.–Nushagak River Chinook salmon study area and sublocations.

BIOLOGICAL COMPOSITION OF HARVESTED FISH

The following data were obtained from samples of harvested Chinook salmon: length (mid eye to tail fork [METF]), weight (nearest 0.1 kilograms), age (from scales), and sex determined from external characteristics (developing kype on males, ovipositor on females). Ages were obtained by removing 3 scales from the preferred area[2] and mounting them on an adhesive-coated card. Standard age determination procedures were used (see Jearld [1983] for a general description of the principles used). The European system of age designation was used, where the number of freshwater winter annuli precedes the decimal and the number of marine winter annuli follows. Total age from the brood year is the sum of the 2 numerals plus 1.

DATA ANALYSIS

Angler Effort

The single angler count conducted each day represents an index of angler effort. Only a summary of the daily counts by study area, sublocation, and angler type (guided vs. unguided) was performed.

[2] The left side of the fish approximately 2 rows above the lateral line and on the diagonal row downward from the posterior insertion of the dorsal fin as used on sockeye salmon by Clutter and Whitesel (1956).

Angler Interviews

Catch and Harvest Rate

Daily and weekly estimates of catch per unit of effort (CPUE) were calculated as described below. A unit of effort was defined as an individual angler-day. Daily CPUE on the *i*th day during the *h*th week was calculated as follows:

$$cpue_{hi} = \frac{c_{hi}}{n_{hi}} \tag{1}$$

where c_{hi} equals the number of fish caught (both kept and released) on the *i*th day during the *h*th week of the survey, and n_{hi} is the number of completed-day anglers interviewed on the *i*th day.

Variance of daily CPUE was estimated as follows:

$$\text{var}(cpue_{hi}) = \frac{\sum_{a=1}^{n_{hi}} (c_{hia} - cpue_{hi})^2}{n_{hi}(n_{hi} - 1)} \tag{2}$$

where c_{hia} is catch of angler *a* interviewed on day *i* of week *h*.

Then the weekly estimate of CPUE was calculated as follows using pooled weekly catch data:

$$cpue_h = \frac{\sum_{i=1}^{m_h} c_{hi}}{\sum_{i=1}^{m_h} n_{hi}} \tag{3}$$

where m_h equals the number of days sampled in the lower study area during week *h* of the survey.

Variance of weekly CPUE was estimated by

$$\text{var}(cpue_h) = \frac{\sum_{i=1}^{m_h} \sum_{a=1}^{n_{hi}} (c_{hia} - cpue_h)^2}{(\sum_{i=1}^{m_h} n_{hi})(\sum_{i=1}^{m_h} n_{hi} - 1)} \tag{4}$$

The standard error (SE) was estimated as the square root of the variance estimate. Harvest per unit of effort (HPUE) was estimated similarly, replacing harvest (only fish kept) for catch.

Angler Compositions

The proportion of anglers by type (guided vs. unguided), terminal gear type (bait use), or angler demographic (Alaska resident vs. nonresident) *z* was estimated as follows:

$$\hat{p}_z = \frac{m_z}{m} \tag{5}$$

where m_z equals the number of the interviewed anglers whose trips were categorized as *z*, and *m* equals the total number of classifiable anglers interviewed.

No estimates of the sampling variance were calculated because these proportions were merely descriptive in nature and cannot be used to make inferences about the fishery.

Biological Composition of Harvested Fish

The proportion of harvested Chinook salmon of category (age, sex, length, or weight class) u was estimated as follows:

$$\hat{p}_u = \frac{n_u}{n} \tag{6}$$

where n_u equals the number of sampled Chinook salmon in category u, and n equals the total number of Chinook salmon sampled.

Variance of each proportion was estimated without the finite population correction factor because we do not have harvest estimates:

$$\text{var}(\hat{p}_u) = \frac{\hat{p}_u(1-\hat{p}_u)}{n-1} \tag{7}$$

Mean length- and weight-at-age of harvested Chinook salmon were estimated following standard procedures (Sokal and Rohlf 1981: boxes 4.2 and 7.1, pages 56 and 139). The standard error was estimated as the square root of the variance estimate.

RESULTS

ANGLER EFFORT

During the 2023 sampling period (June 17–July 14), creel technicians performed 22 angler counts, completed 239 angler interviews, and observed 1,607.5 rod-hours of effort (Table 2). Index counts of anglers fishing in the survey area reached a peak of 204 on 29 June (Figure 3), with an average for the study period of 97 anglers per sample day. Demographic composition of interviewed anglers was 7.5% Alaska resident anglers and 92.5% nonresident anglers; 94.1% utilized a guided service and 5.9% were unguided (Table 3). Two counts were missed, July 5 and 6, due to unsafe boat operating weather. The field crew were extracted July 14 because effort dropped below 1% of the maximum observed effort in conjunction with an emergency order effective July 13 that moved Chinook salmon sport fishing on the Nushagak River to catch-and-release only.

Table 2.–Summary of weekly angler data obtained on the Nushagak River for Chinook salmon anglers during the sampling period of June 17 to July 13, 2023.

Week date range	Angler counts	Interviewed anglers	Resident anglers	Catch		Angler-hours (rod-hours)	CPUE[a]	CPUE SE	HPUE[b]	HPUE SE
				Released	Harvest					
6/17–6/20	270	11	6	9	12	85	1.9	0.3	1.1	0.2
6/21–6/25	786	33	2	15	34	212	1.5	0.1	1	0.1
6/26–7/2	881	128	8	236	98	875	2.6	0.3	0.8	0.1
7/3–7/9	136	34	2	61	27	185	2.6	0.5	0.8	0.1
7/10–7/13	55	33	0	62	21	251	2.5	0.6	0.6	0.1
Weekly average	–	–	–	–	–	–	2.2	–	0.9	–
Grand total	2,128	239	18	383	192	1,608	–	–	–	–

[a] Catch per unit effort (CPUE) is the number of fish caught per angler-day.

[b] Harvest per unit effort (HPUE) is number of fish harvested per angler-day.

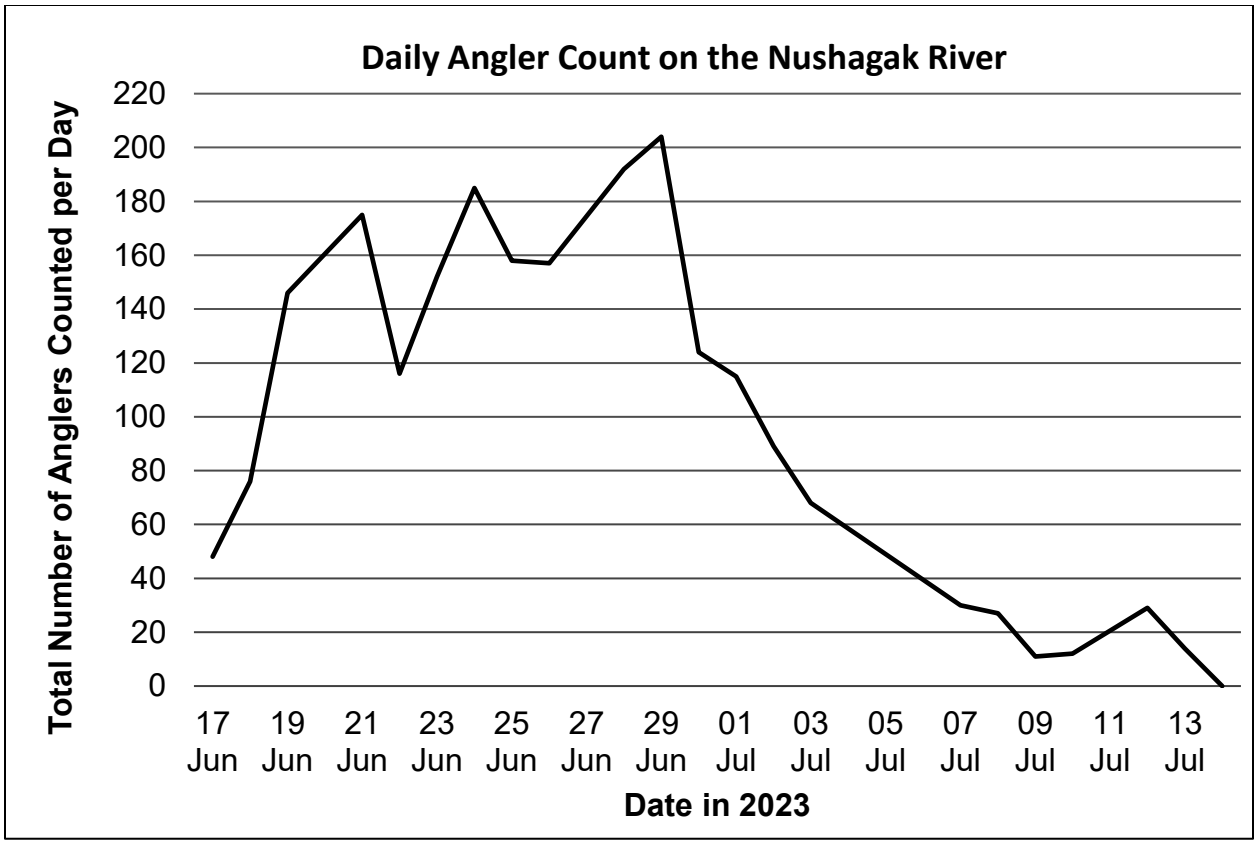

Figure 3.–Total number of anglers counted per day over all sublocations throughout the duration of the project.

Table 3.–Summary of angler composition on the Nushagak River during the sampling period of June 17 to July 13, 2023.

Category	Angler type	Counts	Proportion
Residency			
	Nonresident	221	92.5%
	Alaska resident	13	5.4%
	Local resident	5	2.1%
Usage of guide services			
	Guided	225	94.1%
	Unguided	14	5.9%
Gear utilized			
	Baited	217	90.8%
	Unbaited	20	8.4%
	Baited and unbaited	2	0.8%

HARVEST

A total of 239 individual interviews were conducted throughout all sublocations, with biological data collected from 179 sport-harvested Chinook salmon. The average weekly catch per unit effort

(CPUE) during the study, where effort was defined as an individual angler-day, was 2.2, and the average weekly harvest per unit effort (HPUE) was 0.9 (Table 2).

BIOLOGICAL COMPOSITION OF HARVESTED FISH

Age was determined from scales collected from all sampled Chinook salmon. Nineteen fish samples were removed from age analysis due to the inability to age the scales. The average length of returning Chinook salmon from mid eye to tail fork (METF) was 597 mm with an average weight of 3.4 kg (Table 4). The largest of 179 sampled Chinook salmon was 945 mm METF and weighed 14.25 kg. METF length is measured from the mid eye whereas the regulatory size (28 inches) applies to total length, meaning a METF length equivalent to 28 inches (711 mm) would automatically be greater than 28 inches TL. There were 49 fish whose METF length was greater than 711 mm, placing these fish in the regulatory size of "greater than 28 inches." Four fish that were less than 711 mm nevertheless may have reached or exceeded 28 inches if total length had been measured. Of the total fish measured, 33 were female (0.18 of total). Sampled age categories include 1.1, 1.2, 1.3, and 1.4. The age category with the most samples was 1.2 with 61 fish, followed by 1.3 with 58 fish.

Table 4.–Composition of sport-harvested Chinook salmon sampled on the Nushagak River during the sampling period of June 17 to July 13, 2023.

		Length (mm)		Weight (kg)				
Parameter	Age	Average	SE	Average	SE	Count	Proportion	SE
Male								
	1.1	387.0	–	0.3	–	28	–	–
	1.2	542.1	–	2.0	–	59	–	–
	1.3	664.1	–	4.3	–	34	–	–
	1.4	759.7	–	6.6	–	3	–	–
	All male	–	–	–	–	140	78.2%	3.1%
Female								
	1.1	–	–	–	–	0	–	–
	1.2	609.5	–	2.2	–	2	–	–
	1.3	763.0	–	6.8	–	24	–	–
	1.4	839.9	–	9.3	–	10	–	–
	All female	–	–	–	–	39	21.8%	3.1%
All								
	1.1	387.0	–	0.3	–	28	17.5%	3.0%
	1.2	541.6	–	2.0	–	61	38.1%	3.9%
	1.3	705.0	–	5.3	–	58	36.3%	3.8%
	1.4	821.4	–	8.8	–	13	8.1%	2.2%
	Overall	597.0	11.8	3.4	0.2	160	–	–

Note: Counts may not sum because not all fish have an assigned age. An en dash indicates the statistic was not calculated.

DISCUSSION

Understanding angler effort and Chinook salmon sport harvest on the Nushagak River is crucial for management and conservation of the stock. In November of 2022, the Alaska Board of Fisheries listed the Nushagak River Chinook salmon as a stock of concern. In May of 2023, the *Nushagak King Salmon Stock of Concern Action Plan* was created and implemented several regulation changes so as to conserve the stock. These included reducing the number of harvested

Chinook salmon over 28 inches from 4 to 1 to increase the number of large females (with a higher fecundity) in the river (Malick et al. 2023). In the sport harvest samples for 2023, 49 out of 179 (0.27) sampled fish were over 28 inches in total length and 33 of those fish were female (0.18 of total). A similar creel survey on the Nushagak River in 2007 (Dye 2012)—at a time when the annual bag limit was 4 over 20 inches and the daily limit was 2 over 20 inches, with only 1 over 28 inches—recorded the female portion of the sampled harvest as nearly double (0.39) the portion found in this study, although it is possible this is due to differences in run composition rather than harvest regulations.

This project, initiated in June 2023, focused on providing an inseason in-depth representation of the sport fishery and harvest of Chinook salmon on the Nushagak River, with a glimpse into the size and age composition of the run. This project provides reference data on inriver Chinook salmon numbers that can be used alongside the Portage Creek sonar data (Elison et al. 2022) to help area managers track Chinook salmon abundance and composition. An internal review of telemetry data collected from 2011 to 2014 by the ADF&G Division of Commercial Fisheries found that an annual average of 57% of the Chinook salmon run migrated outside the sonar beam at Portage Creek, with an annual range of 47–65% uncounted (Maxwell et al. 2020). Inseason monitoring allows the Chinook stock to be assessed in real time and allows for necessary adjustments in management to be made to best preserve this stock of concern. This can be seen through the emergency order management actions such as lowering the bag limit and moving to a catch and release fishery for Chinook salmon. These decisions were supported by the data reported both by the sonar and creel survey.

Based on the composition of the sampled fish, the majority of the Chinook salmon harvested in the Nushagak River sport fishery in 2023 were 4 years old, with 61 age-1.2 fish making up a total of 34.3% of the sampled Chinook salmon (Figure 4, Table 4). The overall average length was 597 mm, which is less than what was found in Dye (2012) when the overall average length of the Chinook salmon sport harvest sampled in the lower Nushagak River was 776 mm. The decrease could be due to a number of reasons from a general change in the composition of the run to the new regulations placed on the Nushagak River Chinook salmon anglers allowing only 1 fish over 28 inches to be harvested.

Total effort hit a peak midseason on June 29, which is reflected in the daily and weekly CPUE of 11.5 and 2.6 fish per angler-day respectively, which were maximums during the project (Appendix B1). It was noted by project staff that the overall effort on the river appeared less than in previous years. This study had a maximum count of 204 anglers on June 29 (Figure 3), with an average of 96.7 anglers per day and a total angler count for the sampling period of 2,128 (Table 2).

The project concluded July 14 after the angler counts had decreased below 1% of the maximum observed effort. Sampling could no longer be conducted because an emergency order was issued effective July 13 restricting the Chinook salmon fishery to catch-and-release only. This was preceded by an emergency order effective July 7 that called for the reduction of bag and possession limits for Chinook salmon, 20 inches or greater in length, to 1 fish with an annual limit of 2, only 1 of which may be 28 inches or greater in length in the Nushagak–Mulchatna River drainage.

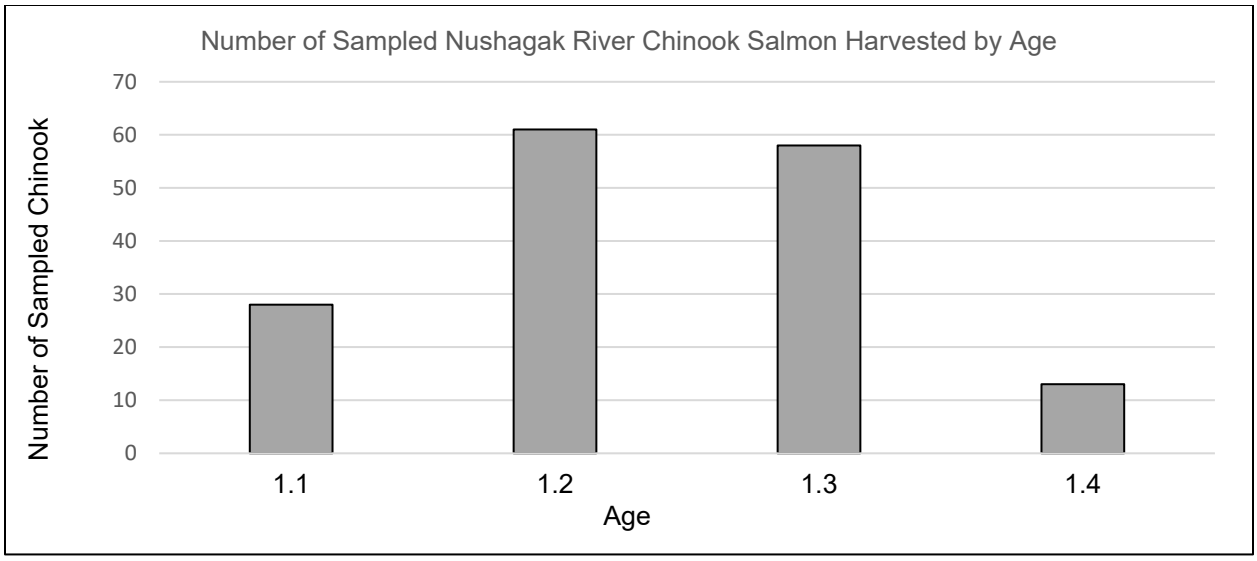

Figure 4.–Number of sampled sport-harvested Chinook salmon by age.

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APPENDIX A: SAMPLING SCHEDULE

Appendix A1.–Angler count schedule.

Date	Scheduled sample days	Actual sample days
15 Jun	X	
16 Jun	X	
17 Jun	X	X
18 Jun	X	X
19 Jun	X	X
20 Jun		
21 Jun	X	X
22 Jun	X	X
23 Jun	X	X
24 Jun	X	X
25 Jun	X	X
26 Jun	X	X
27 Jun		
28 Jun	X	X
29 Jun	X	X
30 Jun	X	X
1 Jul	X	X
2 Jul	X	X
3 Jul	X	X
4 Jul		
5 Jul	X	
6 Jul	X	
7 Jul	X	X
8 Jul	X	X
9 Jul	X	X
10 Jul	X	X
11 Jul		
12 Jul	X	X
13 Jul	X	X
14 Jul	X	X
15 Jul	X	
16 Jul	X	
17 Jul	X	
18 Jul		
19 Jul	X	
20 Jul	X	
21 Jul	X	
22 Jul	X	
23 Jul	X	
24 Jul	X	
25 Jul		
26 Jul	X	
27 Jul	X	
28 Jul	X	
29 Jul	X	
30 Jul	X	

Note: An "X" indicates survey days.

APPENDIX B: DAILY EFFORT DATA OF SAMPLED SPORT-HARVESTED CHINOOK SALMON

Appendix B1.–Daily effort data of sampled sport-harvested Chinook salmon.

		Daily				
Date	Week	Interviews conducted	CPUE	CPUE SE	HPUE	HPUE SE
17 Jun	1	2	1.5	0.5	1.5	0.5
18 Jun	1	9	2.0	0.3	1.0	0.2
21 Jun	2	7	1.0	0.0	1.0	0.0
22 Jun	2	4	1.3	0.3	0.5	0.3
23 Jun	2	9	1.6	0.2	1.1	0.1
24 Jun	2	7	1.9	0.4	1.0	0.0
25 Jun	2	6	1.7	0.3	1.3	0.2
26 Jun	3	5	1.2	0.2	1.0	0.3
28 Jun	3	34	1.9	0.4	0.5	0.2
29 Jun	3	11	11.5	2.0	2.1	0.5
30 Jun	3	26	2.4	0.3	0.8	0.2
1 Jul	3	31	1.2	0.2	0.6	0.1
2 Jul	3	21	1.9	0.5	0.5	0.1
3 Jul	4	14	1.2	0.5	0.6	0.2
7 Jul	4	10	3.9	1.2	0.8	0.1
8 Jul	4	5	4.6	1.1	1.2	0.2
9 Jul	4	5	1.8	0.4	1.0	0.0
10 Jul	5	7	7.7	1.7	1.1	0.1
12 Jul	5	20	1.3	0.3	0.7	0.2
13 Jul	5	6	0.7	0.2	0.0	0.0