

**Fishery Management Report No. 23-11**

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**Sport Fisheries in the Lower Cook Inlet Management  
Area, 2022**

by

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and

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October 2023

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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<b>Weights and measures (metric)</b>		<b>General</b>		<b>Mathematics, statistics</b>	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	$H_A$
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	$e$
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, $\chi^2$ , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient (simple)	r
		corporate suffixes:		covariance	cov
<b>Weights and measures (English)</b>		Company	Co.	degree (angular)	$^\circ$
cubic feet per second	ft <sup>3</sup> /s	Corporation	Corp.	degrees of freedom	df
foot	ft	Incorporated	Inc.	expected value	$E$
gallon	gal	Limited	Ltd.	greater than	>
inch	in	District of Columbia	D.C.	greater than or equal to	$\geq$
mile	mi	et alii (and others)	et al.	harvest per unit effort	HPUE
nautical mile	nmi	et cetera (and so forth)	etc.	less than	<
ounce	oz	exempli gratia	e.g.	less than or equal to	$\leq$
pound	lb	(for example)		logarithm (natural)	ln
quart	qt	Federal Information Code	FIC	logarithm (base 10)	log
yard	yd	id est (that is)	i.e.	logarithm (specify base)	log <sub>2</sub> , etc.
		latitude or longitude	lat or long	minute (angular)	'
<b>Time and temperature</b>		monetary symbols (U.S.)	\$, ¢	not significant	NS
day	d	months (tables and figures): first three letters	Jan, ..., Dec	null hypothesis	$H_0$
degrees Celsius	°C	registered trademark	®	percent	%
degrees Fahrenheit	°F	trademark	™	probability	P
degrees kelvin	K	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	$\alpha$
hour	h	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	$\beta$
minute	min	U.S.C.	United States Code	second (angular)	"
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
<b>Physics and chemistry</b>				standard error	SE
all atomic symbols				variance	
alternating current	AC			population sample	Var
ampere	A			sample	var
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				

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The Fishery Management Reports series was established in 1989 by the Division of Sport Fish for the publication of an overview of management activities and goals in a specific geographic area, and became a joint divisional series in 2004 with the Division of Commercial Fisheries. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Fishery Management Reports are available through the Alaska State Library and on the Internet: <http://www.adfg.alaska.gov/sf/publications/>. This publication has undergone regional peer review.

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## **ABSTRACT**

This report provides a detailed summary of the sport fisheries in the Lower Cook Inlet Management Area (LCIMA) through 2022 that will be discussed at the 2023 Lower Cook Inlet Finfish Alaska Board of Fisheries (BOF) meeting. These include the saltwater Chinook salmon fisheries, enhanced terminal salmon fisheries and associated personal use fisheries, freshwater Chinook salmon and steelhead fisheries, and groundfish fisheries. Included for each sport fishery are a description and historical overview, current management strategies, and recent fishery performance of effort, catch, and harvest through 2022. Included for each fishery is information specific to the proposals that the BOF will address. An appendix guiding the reader to specific information relevant to each proposal is also included. Overall, sport fishing effort in LCIMA has continued to decline in saltwater and freshwater fisheries. Recent fishery harvest trends in saltwater fisheries show declines for Pacific halibut and increasing or stable trends of Chinook, coho, and sockeye salmon; lingcod; and rockfish. Recent catch and harvest trends in LCIMA freshwater fisheries showed general declines for most species.

**Keywords:** Lower Cook Inlet Management Area, Alaska Board of Fisheries, Chinook salmon, coho salmon, steelhead, Pacific halibut, rockfish, lingcod, fisheries management, sport fisheries, terminal fisheries, personal use

## **INTRODUCTION**

This fisheries management report provides information regarding sport and personal use fisheries in the Lower Cook Inlet Management Area (LCIMA) that will be discussed at the 2023 Lower Cook Inlet Finfish Alaska Board of Fisheries (BOF) meeting. These fisheries are managed by the Alaska Department of Fish and Game, Division of Sport Fish (SF) based out of the Homer office. This report covers the background and recent fishery performance of the saltwater Chinook salmon fisheries, enhanced terminal salmon fisheries including personal use, freshwater Chinook salmon and steelhead fisheries, and groundfish fisheries. Background information includes a fishery description, history, management and regulatory structure, and any additional fishery and stock monitoring that has occurred. Recent fisheries performance information includes effort, catch, and harvest in 2022 compared to historical periods (1977–1999 and 2000–2018) and the last reporting period (2019–2021). The recent performance also includes any management actions that occurred in 2022 and pertinent current fishery or stock monitoring information. Appendix B1 contains a table guiding the reader to specific information relevant to each proposal.

The mission of SF is to protect and improve the state’s fishery resources by managing for sustainable yield of wild stocks of sport fish, providing diverse sport fishing opportunities, and providing information to assist the BOF in optimizing social and economic benefits from sport fisheries. To implement these goals, SF has in place a fisheries management process that includes an annual regional review of fisheries status and research needs, development of fisheries stock assessments, a formal operational planning process, use of biological and fishing effort data, and input from user groups to assess the need for and to develop management plans and regulatory proposals.

SF management and research activities are funded by ADF&G and Federal Aid in Fisheries Restoration funds. ADF&G funds are derived from the sale of state sport fishing licenses. Federal Aid funds are derived from federal taxes on fishing tackle and equipment established by the Federal Aid in Sport Fish Restoration Act (also referred to as the Dingell–Johnson Act or D–J Act). D–J funds are provided to the states at a match of up to 3-to-1 with state funds. Additional funding specified for providing, protecting, and managing access to fish and game is provided through a tax on boat gas and equipment established by the Wallop–Breaux (W–B) Act. Other

peripheral funding sources may include contracts with various government agencies and the private sector or, in a few cases, State of Alaska general funds (GF).

This area management report provides information for the LCIMA and its fisheries for 2022. This report is organized into primary sections including a management area overview and major fisheries sections for fisheries addressed by the 2023 Lower Cook Inlet Finfish Alaska Board of Fisheries (BOF) meeting. The overview contains a description of the management area, a list of management plans relevant to the BOF meeting, and a summary of effort, harvest, and catch. Each major fishery section includes a description, management objectives, and fisheries performance and management actions taken during the 2022 report period.

## **MANAGEMENT AREA OVERVIEW**

### **MANAGEMENT AREA DESCRIPTION**

The LCIMA includes the freshwater drainages on the west side of the Kenai Peninsula south of the Kasilof River drainage to Gore Point, the freshwater drainages on the west side of Cook Inlet from the south end of Chisik Island to Cape Douglas, and the beaches of Cook Inlet bounded by these landmarks but with the inclusion of beaches north of Tuxedni Bay to Point Harriet in West Cook Inlet (Figure 1). Because very little sport fishing effort occurs in Cook Inlet salt waters north of the Kasilof River, the LCIMA includes all the Cook Inlet and North Gulf Coast salt waters north of the latitude of Cape Douglas and west of Gore Point. These salt waters are designated upper Cook Inlet (UCI) north of Bluff Point and lower Cook Inlet (LCI) south of Bluff Point (Figure 1).

The LCIMA supports saltwater sport fisheries for salmon, groundfish, and shellfish; freshwater sport fisheries for salmon, steelhead, Dolly Varden, and rainbow trout; and several personal use and educational fisheries. SF management staff in Homer are responsible for managing the freshwater sport fisheries in west Cook Inlet south of Chisik Island (Figure 1) and on the Kenai Peninsula south of the Kasilof River (Figure 2) and a single freshwater personal use (PU) sockeye salmon dipnet fishery. Management of the LCIMA saltwater sport fisheries falls primarily under the jurisdiction of SF; however, Pacific halibut fisheries are managed by the National Oceanic and Atmospheric Administration (NOAA) Fisheries, and an additional PU set gillnet fishery for coho salmon in Kachemak Bay is managed by the Division of Commercial Fisheries (CF). Except for residency requirements, most shellfish PU fisheries are indistinguishable from sport fisheries and essentially fall within SF jurisdiction as well.

Easy access to saltwater and popular roadside streams combined with proximity to major population centers attracts large numbers of both Alaska resident and nonresident anglers to the diverse charter and nonguided sport fishing opportunities of the LCIMA (Figures 1 and 2). The LCIMA sport fisheries result in robust annual harvests of salmon and groundfish. A diversity of groundfish sport fishing opportunities is available in LCIMA salt waters, although Pacific halibut (*Hippoglossus stenolepus*) is the primary sport fish harvested. The 5 species of North Pacific salmon—Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), pink salmon (*O. gorbuscha*), and chum salmon (*O. keta*)—support a diversity of freshwater and saltwater sport fishing opportunities throughout LCIMA. Steelhead (sea run *O. mykiss*) and Dolly Varden (*Salvelinus malma*) also support freshwater sport fishing opportunities, and sockeye and coho salmon support personal use fisheries.

## **ESTABLISHED MANAGEMENT PLANS AND POLICIES RELEVANT TO THE 2023 LCI FINFISH BOF MEETING**

The regulations governing the sport fisheries of the LCIMA are found in Alaska statute and administrative codes (AAC). Kenai Peninsula freshwater sport regulations are found in 5 AAC 56.000; Cook Inlet saltwater sport regulations are found in 5 AAC 58.000; Western Cook Inlet freshwater sport regulations are found in 5 AAC 62.000; Statewide sport provisions and definitions are found in 5 AAC 75.000; Personal use fishery regulations are found in 5 AAC 77.000; and Educational Fisheries are found in 5 AAC 93.000.

Management plans that specifically affect LCIMA sport fisheries under consideration by the BOF for the 2023 Lower Cook Inlet finfish meeting are as follows: *Upper Cook Inlet Summer Salt Water Chinook Salmon Management Plan* (5 AAC 58.055), *Kenai River Late-Run Chinook Salmon Management Plan* (Kenai Late-Run Plan; 5 AAC 21.359), *Cook Inlet Winter Salt Water Chinook Salmon Sport Fishery Management Plan* (Winter King Plan; 5 AAC 58.060), *Criteria for Establishing Special Management Areas for Trout* (5 AAC 75.013), and the *Sport Shark Fishery Management Plan* (5 AAC 75.012).

### **SPORT FISHING EFFORT, HARVEST, AND CATCH**

#### **Statewide Harvest Survey**

Since 1977, sport angler effort and harvest in the LCIMA have been estimated using the ADF&G Alaska Sport Fishing Survey (commonly known as the Statewide Harvest Survey, or SWHS; Mills 1979-1980, 1981a, 1981b, 1982-1991, 1992a, 1992b, 1993, 1994; Howe et al. 1995, 1996)<sup>1</sup>. The SWHS is a mail survey that is used to estimate annual sport fishing effort and harvest. Final estimates are available during the early fall of the following year. The survey is designed to estimate effort in angler-days and the number of fish caught and harvested by location. Although harvest and catch are estimated for individual species, the SWHS is not designed to estimate directed effort towards individual species.

The SWHS has been modified over time to add additional stratifications to the estimates and to incorporate changes to the regulatory structure. The effort and harvest of shellfish was not estimated by the SWHS until 1981. Starting in 1986, the survey was modified to produce estimates by nonguided and charter anglers. Beginning in 1990, the survey was modified to also estimate catch (number of fish released plus number of fish harvested) by location. Since 1993, angler residency data have been available. The SWHS has also been modified several times to facilitate producing Chinook salmon catch and harvest estimates for saltwater fisheries.

The precision of the SWHS estimates is related to the number of household respondents who reported participating in those fisheries. For any given fishery, SWHS estimates based on fewer than 12 household respondents are not used. Estimates based on 12 or more but fewer than 30 household respondents can be useful for detecting relative trends. Estimates based on 30 or more respondents generally represent fishing effort, catch, and harvest levels (Mills and Howe 1992). Creel surveys have been used periodically for specific fisheries when more detailed information is needed for inseason management and to validate the SWHS for a given fishery.

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<sup>1</sup> Hereafter, "SWHS" will refer to these references for 1977–1995 data and to the Alaska Sport Fishing Survey database [Internet] Anchorage, AK for data 1996–present: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

In this report, data from the SWHS are generally divided into 3 periods: (1) a historical period with just the averages for 1977–1999 (annual data from these years are published in Kerkvliet et al. 2016 or Booz and Dickson 2023), (2) a second historical period from 2000 through 2018 with annual data and averages, and (3) the previous reporting period 2019–2021 (published in Booz and Dickson 2023). These historical and previous reporting period averages provide context for the effort, catch, and harvest estimates and trends in this reporting period. For some fisheries and estimates, the historical period average prior to 2000 may not include annual data back through 1977 due to limitations from SWHS or fishery regulatory structure.

### **Sport Fish Guide Licensing and Charter Logbook Program**

Beginning in 1995, ADF&G required sport fishing guide businesses and guides to register before fishing in Alaska. Since 1998, SF has operated a program to register and license both sport fishing guides and sport fishing guide businesses and to collect information on sport fishing participation, effort, and harvest by saltwater and freshwater charter clients (Sigurdsson and Powers 2009). In 1998, the BOF adopted statewide sport fishing guide regulations (5 AAC 75.075) that required all sport fishing guides and businesses to register annually with ADF&G. At this time, the BOF also adopted statewide regulations that required logbooks for saltwater charter vessels. The logbooks collected information on charter activity (location, effort, and harvest) necessary to the BOF for allocation and management decisions specific to Chinook salmon (*Oncorhynchus tshawytscha*), rockfish (*Sebastes*), and lingcod (*Ophiodon elongates*); and necessary for the North Pacific Fishery Management Council (NPFMC) for allocation of Pacific halibut (*Hippoglossus stenolepis*).

In 2004, the Alaska Legislature adopted House Bill 452, which established licensing requirements for sport fishing guide business owners and sport fishing guides on a statewide basis (effective 2005). This legislation also required logbook reporting for all freshwater guiding businesses in addition to the existing saltwater reporting requirements. The logbook data provide location of fishing effort, level of participation, and number of species kept and released by clients. This information is used for the regulation, development, and management of fisheries and has been published annually since 2009 (data since 2006; see Sigurdsson and Powers 2009–2014). From 2002 through 2005, for both technical and policy-based reasons, the Charter Logbook program did not require reporting of Pacific halibut catch and harvest (Sigurdsson and Powers 2009). Since 2006, the Charter Logbook data have been consistently reported and these data are used in this report.

The freshwater sport fishing Charter Logbook program ended following the 2018 fishing season. This action was a result of ADF&G’s budget reduction process; no estimates from this program are presented here but see Booz et al. (2019). The saltwater Charter Logbook program was continued because ADF&G agreed to provide these data for Southeast Alaska Chinook salmon treaty obligations and federal (North Pacific Fishery Management Council) halibut management actions. Saltwater Charter Logbook data for 2022 are presented in this report, and prior data are divided into 3 periods: (1) historical 2006–2013, prior to the implementation of the Halibut Catch Sharing Plan (see groundfish section), (2) a transitional period 2014–2018, and (3) previous reporting period 2019–2021.

### **Area Effort and Harvest Overview**

Of all the ADF&G SF management areas, the LCIMA supports the second-highest sport fishing effort after the Northern Kenai Peninsula Management Area. During the historical period 2000–2018, the LCIMA accounted for an average of 11% of the total statewide sport fishing effort

(Table 1). During this period, almost half of the LCIMA anglers were chartered (average 46%), but charter anglers made up just less than a third of total effort on average (31%; calculated from Booz and Dickson 2023: Table 2). On average (2000–2018), resident anglers represented approximately 57% of the days fished in LCIMA (calculated from Booz and Dickson 2023: Table 2), although effort for both residents and nonresidents has steadily declined over those years (Figure 3).

Although most of the sport fishing effort occurs in salt waters, for most years prior to 2015, both freshwater finfish and shellfish fisheries contributed roughly equal portions to the total LCIMA effort (Table 1). Freshwater sport fishing in the LCIMA provides a diversity of catch and harvest opportunities (Figure 2, Table 2) and primarily occurs in the roadside streams on the lower Kenai Peninsula. These streams provide some of the earliest freshwater Chinook salmon sport fishing and the most accessible steelhead (sea run *O. mykiss*) sport fishing in the state. The steelhead fishery has been a catch-and-release fishery since 1989 and the Anchor River has the second-highest catch in Alaska behind the Situk River in Yakutat. Since 2011, effort in these freshwater sport fisheries has declined (Table 2).

In the LCIMA, most of the sport fishing effort occurs in salt water (Table 1) and Pacific halibut is the primary target (Table 3). More Pacific halibut are harvested in the LCIMA than any other area in Alaska, including all of Southeast Alaska combined; peak harvest occurred in 2007 at 253,265 fish (Table 3). Chinook salmon are the primary targeted salmon species in LCIMA salt waters, although coho salmon harvest may be higher in some years (Table 3). Cook Inlet consistently has one of the highest annual saltwater Chinook salmon harvests in Alaska, behind Sitka, and similar to Prince of Wales. The harvest of groundfish other than halibut contributes to the diversity of sport fishing opportunities in the LCIMA.

### **Area Fisheries 2022 Performance**

In the 2022 LCIMA sport fisheries, the effort (angler-days) was 171,144, which was similar to the previous fishery performance period (2019–2021) average of 171,629 angler-days (Table 1). It was also the second-lowest annual effort estimated for LCIMA. Saltwater finfish fisheries effort (155,405 angler-days) was less than other recent years excluding 2020 (Table 1). In 2022, nonguided resident anglers continued to have the highest effort but also continued a declining trend with only 80,965 angler-days (Figure 3). Charter nonresident angler-days was 45,939 in 2022, which was 20% below the number of angler-days in 2021 (Figure 3). The effort in LCIMA sport fisheries remained at 9% of the total sport fishing effort in Alaska (Table 1). Based on Charter Logbook reports, the 2022 charter effort (trips, anglers, and boat hours) towards salmon was similar to the previous reporting period average (Table 4). The 2022 charter effort towards groundfish from Charter Logbook reports was greater than the previous reporting period average, which includes the anomalously low 2020 effort. The 2022 charter effort towards groundfish was most similar to 2021, which was the highest since the implementation of the Halibut Catch Share Program.

LCIMA freshwater sport fisheries catch and harvest for most species in 2022 were below their respective historical (2000–2018) and previous reporting period averages (Table 2). The 2022 catch and harvest of sockeye salmon was the one exception and was similar to the previous reporting period. In the 2022 LCIMA saltwater sport fisheries, the harvest of Pacific halibut (132,448) was below both historical and previous reporting period averages whereas the harvest of Chinook and sockeye salmon were similar to both of these averages (Table 3). Both lingcod and

rockfish harvests in 2022 were above these averages. Based on Charter Logbook reports, the 2022 charter harvest for Chinook salmon (11,224) was the highest reported harvest (Table 4). The 2022 pelagic (41,228) and nonpelagic (2,650) rockfish harvests were also above their respective historical and previous reporting period averages (Table 4).

## **SALTWATER SALMON FISHERIES**

Cook Inlet salt waters support a diversity of year-round salmon sport fishing opportunities (Table 3). Although Chinook and coho salmon are primarily targeted, all salmon species are intercepted by sport anglers as they migrate through Cook Inlet to their spawning locations. Chinook salmon support year-round fisheries, whereas coho, pink, sockeye, and chum salmon are caught during their spawning migration through Cook Inlet salt waters. Mature (spawning) Chinook salmon are caught April through August and “feeder” (immature) Chinook salmon are caught year-round. Chinook, coho, pink, and sockeye salmon are stocked into terminal fisheries within the LCIMA. In some years, these stockings have contributed significantly to the harvest of that species in LCIMA salt waters.

In the LCIMA, except for stocked terminal fisheries (Figure 4), saltwater salmon sport fisheries are primarily boat-based troll fisheries. Primary access to these waters occurs at tractor launch facilities on the Deep Creek and Anchor Point beaches (May through August) and year-round from the Homer harbor (Figure 1). Small boats may also be self-launched from any beach from Homer Spit north through Ninilchik, with Whiskey Gulch north of the Anchor River being a popular location. Residents from the south side of Kachemak Bay (Bear Cove to Port Graham area) also participate in these fisheries.

In the LCIMA, saltwater fisheries are primarily monitored with SWHS data and Charter Logbook data. Chinook salmon sport fisheries have been assessed through periodic dock sampling. Angler effort towards saltwater Chinook and coho salmon has not been quantified due to limitations with SWHS data and because anglers routinely fish for multiple species on a given trip in LCIMA salt waters. Based on Charter Logbook data, annual charter saltwater effort towards salmon has been less than effort towards groundfish (Table 4). Charter Logbook data also provide both spatial and temporal distribution of the charter sport fishing effort because guides are required to record a daily trip log including a statistical area code for the primary area fished (Figure 5).

## **SALTWATER CHINOOK SALMON FISHERIES**

### **Saltwater Chinook Salmon Fisheries Description**

The LCIMA is composed of 3 boat-based Chinook salmon sport fisheries: the Upper Cook Inlet (UCI) Summer Fishery, the Lower Cook Inlet (LCI) Summer Fishery, and the Winter Fishery (all described in more detail below). Chinook salmon are also harvested in the Kachemak Bay terminal fisheries (see the Terminal Fisheries section) and to a lesser extent may be caught from shore along the Kenai Peninsula. Chinook salmon have been stocked in Kachemak Bay since the mid-1970s at the Nick Dudiak Fishing Lagoon (NDFL), Seldovia, and Halibut Cove Lagoon (discontinued after 2017) to create additional sport fisheries.

These fisheries target both local (mature) and nonlocal (immature feeder) stocks and have been refined over time to restrict the harvest of mature Cook Inlet stocks while maximizing fishing opportunities for nonlocal stocks. Feeder Chinook salmon are harvested year-round, whereas stocked and spawner Chinook salmon are harvested April through August. The Winter Fishery

harvest is composed of almost entirely feeder Chinook salmon made up of a high mixture of stocks throughout the Pacific Northwest (Booz et al. 2019; Schuster et al. 2021). Spawner Chinook salmon are primarily harvested in the UCI Summer Fishery and a smaller portion is harvested in the LCI Summer Fishery. Hatchery-produced Chinook salmon are harvested in all fisheries. Historically, in LCIMA salt waters, charter anglers have harvested a smaller percentage of the total saltwater Chinook salmon harvest, although that portion has been increasing (Table 5).

There have been 2 large-scale monitoring projects focused on saltwater Chinook salmon sport fisheries in the LCIMA. From 1996 to 2002, a creel program was conducted in the UCI Summer Fishery to assess age, sex, and length composition; maturity; and stock contribution through CWT recoveries (McKinley 1999; Begich 2007a). CWT recovery and maturity data from this project indicated that UCI harvests were composed of a diversity of stocks, and that most of the harvest was mature fish. It was assumed that the greatest stock contribution to the harvest of mature fish was from the Susitna River because these stocks were most abundant. The lower Kenai Peninsula roadside stream stocks were assessed through coded-wire-tagging of wild Deep Creek and hatchery-reared Ninilchik River stocks. Their annual contribution averaged 1.7% and ranged from 0.3% to 3.9% (Szarzi and Begich 2004a; Begich 2007a). The second large-scale monitoring project was conducted from 2014 to 2018 to determine the composition of boat-based sport harvest including length, maturity, presence of CWTs, and genetic mixed-stock analysis (MSA; Schuster et al. 2021). During 2014–2018, the percentage of the UCI early-run fishery harvest that was mature fish was well below the historical (1996–2002) percentages. Over these years, the MSA results showed that harvest in all boat-based fisheries were primarily composed of the *Outside Cook Inlet* reporting group.

### ***Upper Cook Inlet Summer Fishery for Chinook Salmon***

The UCI Summer Fishery is accessed by the tractor launch facilities in Deep Creek and Anchor Point and by the Homer harbor. The area is defined as all Cook Inlet salt waters north of the latitude of Bluff Point (lat 59°40.00'N). The season for this fishery is from 1 April through 31 August, which is the period when mature Cook Inlet stocks are present in these waters. Most of the effort towards mature Chinook salmon occurs in nearshore waters from the Anchor Point Light to Deep Creek in May and early June for early-run stocks and then in July for late-run stocks. Early-run Cook Inlet stocks include all Susitna River and Kenai Peninsula stocks, and late-run stocks are limited to the Kenai River and, to a lesser extent, the Kasilof River. Feeder Chinook salmon are caught throughout this fishery, but primarily from the Bluff Point to Whiskey Gulch area and more commonly at a greater distance from shore (Schuster et al. 2021). Anglers may shift their effort from nearshore waters to offshore waters (or to the LCI Summer Fishery as well) with changes in abundances of mature and feeder Chinook salmon.

Due to the interception of Cook Inlet stocks, this sport fishery has more regulatory complexity than most of the other sport fisheries in LCIMA and is managed with a management plan and a guideline harvest level (GHL) of 7,500 fish (see management and regulations section below). Since 2009, this fishery has also been restricted by preseason and inseason EOs in years with below-average production of Cook Inlet stocks (Booz et al. 2019). From 1987 to 2008, roughly 45% of the total LCIMA saltwater Chinook salmon harvest occurred in the UCI Summer Fishery on average (calculated from Kerkvliet et al. 2016: Table 9; Table 5) but averaged 20% during 2009–2021 Summer Fisheries (calculated from Table 5).

### ***Lower Cook Inlet Summer Fishery for Chinook Salmon***

The LCI Summer Fishery is primarily accessed from the Homer harbor, but some effort comes from the Anchor Point tractor launch and small communities on the south side of Kachemak Bay. The area is defined as all salt waters south of the latitude of Bluff Point (lat 59°40.00'N). The season is currently aligned with the UCI Summer Fishery from 1 April to 31 August. During the LCI Summer Fishery, Chinook salmon are harvested throughout, but primarily along the shoreline from Homer Spit north to Bluff Point and along the south side of Kachemak Bay from Bear Cove to the Chugach Islands in the North Gulf Coast (Figure 1).

Although anglers have been harvesting Chinook salmon south of Bluff Point since statehood, the LCI Summer Fishery was first defined in 2002 after the establishment of the Winter Fishery. The LCI Summer Fishery primarily harvests feeder Chinook salmon, but mature Cook Inlet stocks and stocked terminal fish are also harvested. Chinook salmon are harvested throughout the season, but harvest tends to peak in May and then again in late August. There is no management plan or GHF for this fishery, and it is only structured by Cook Inlet–Resurrection Bay area regulations (Alaska Administrative Code [AAC] 5 Chapter 58; see management section below). This fishery has not been restricted by EO in unison with the UCI Summer Fishery because the harvest has been primarily composed of nonlocal feeder Chinook salmon (Schuster et al. 2021).

SWHS catch and harvest estimates for the LCI Summer Fishery include the boat-based effort for the Kachemak Bay terminal fisheries, but the shore-based effort on the Homer Spit is estimated separately. The contribution of these stocked fisheries to the LCI Summer Fishery harvest has changed with shifts in productivity. Historically (1977–mid-2000s), more of the Chinook salmon harvest came from Halibut Cove Lagoon than in recent years (Dudiak et al. 1987). From 2009 to 2021, on average, the LCI Summer Fishery contributed 45% of the total Cook Inlet saltwater Chinook salmon harvest (calculated from Table 5).

### ***Winter Fishery for Chinook Salmon***

Although anglers have been harvesting Chinook salmon during the winter months in Cook Inlet salt waters for many years, the Winter Fishery was first established in regulation starting in 2002. Like the LCI Summer Fishery, this fishery is primarily accessed from the Homer harbor, but this location is prone to freezing during cold winters, which limits access. Winter storms also limit angler participation. When the fishery was first defined, the area was limited to Kachemak Bay (Bluff Point to Point Pogibshi), but the northern border was expanded to the Anchor Point Light at the 2010 BOF meeting. The fishery area was expanded by the BOF to all of Cook Inlet starting in 2017. The historical Chinook salmon sport fishing effort north of the Anchor Point Light during the Winter Fishery is unknown but assumed to be low. The boundary was changed more for simplifying the regulations than to change the fishery. From 2002 through 2016, the season for this fishery was 1 October through 31 March. The season was expanded by the BOF to include September starting in 2017.

In the Winter Fishery, Chinook salmon are primarily harvested throughout nearshore waters in the lower part of the LCIMA, but some harvest does occur north of Bluff Point, to roughly the Anchor Point Light. Chinook salmon are harvested throughout the season, but September through October are probably when most of the effort and harvest occur because of greater daylight and typically fairer marine weather at this time (based on ADF&G staff observations). This fishery is managed with a management plan and a GHF of 4,500 fish (see management and regulations below). Since establishment in 2002, the Winter Fishery has not been restricted by EO. From 2009 to 2021, on



average, the Winter Fishery has composed 29% of the total Cook Inlet saltwater Chinook salmon harvest (calculated from Table 5).

### **Saltwater Chinook Salmon Fisheries Management Objectives**

Regulation changes to the Chinook salmon sport fisheries in Cook Inlet salt waters have changed incrementally through the BOF process but were overhauled for the entire LCIMA at the 2016 BOF meeting to simplify and better align regulations for when mature Cook Inlet stocks are present in Cook Inlet salt waters. The Chinook salmon saltwater sport fisheries are currently regulated under the general Cook Inlet–Resurrection Bay saltwater regulations (5 AAC Chapter 58) and under 3 management plans: the *Upper Cook Inlet Salt Water Summer King Salmon Management Plan* (5 AAC 58.055), the *Kenai River Late-Run Chinook Salmon Management Plan* (referred to here as the Kenai Late-Run Plan; 5 AAC 21.359), and the *Cook Inlet Winter Salt Water Chinook Salmon Sport Fishery Management Plan* (referred to here as the Winter King Plan; 5 AAC 58.060). The LCI Summer Fishery is only regulated under the general Cook Inlet–Resurrection Bay saltwater regulations and does not have a management plan or a GHL. This fishery has bag and possession limits of 2 of any size, and fish 20 inches or greater in length count towards the Cook Inlet annual limit of 5. The management of these fisheries is consistent with the *Policy for the Management of Mixed Stock Salmon Fisheries* (5 AAC 39.220).

#### ***Upper Cook Inlet Summer Fishery Management and Regulations***

Chinook salmon sport fishing regulations in UCI salt waters have been restrictive and modified over time through the BOF process to reduce the harvest of Cook Inlet stocks (Szarzi and Begich 2004a; Booz et al. 2019). In 1996, the BOF first adopted the *Upper Cook Inlet Salt Water Early-Run Chinook Salmon Management Plan* (5 AAC 58.055). The initial plan included a suite of regulations that included conservation zone closures around the mouths of the lower Kenai Peninsula roadside streams (Booz et al. 2019). In 1989, the BOF adopted the Kenai Late-Run Plan that included a stipulation that would close Chinook salmon sport fishing north of Bluff Point if the Kenai River Chinook salmon run was projected to not achieve the lower end of the optimum escapement goal. The bag and possession limits are 1 fish of any size, and fish 20 inches or greater in length count towards the Cook Inlet annual limit of 5.

In 2016, the early-run and late-run fisheries were combined into the UCI Summer Fishery and the plan was renamed the *Upper Cook Inlet Salt Water Summer King Salmon Management Plan*. Although the fishery season was extended to end 31 August, the GHL remained unchanged. These changes were made to provide the same restrictions throughout both runs. The special harvest areas within a mile of shore were changed to include all waters north of Bluff Point to 1 mile north of Ninilchik. This area was referred to as the *Special King Salmon Management Area*. In this area, anglers were required to stop fishing for Chinook salmon after harvesting a Chinook salmon 20 inches or greater, and guides were not allowed to sport fish while a client was present or within the guide’s control, unless the guide was providing assistance to a client with a disability as defined in the Americans with Disabilities Act.

#### ***Winter Fishery Management and Regulations***

The Winter Fishery has had fewer restrictions than the UCI Summer Fishery and the regulations have been changed over time to provide sport fishing opportunities for nonlocal feeder Chinook salmon (Booz et al. 2019). In 2002, the BOF adopted the Winter King Plan, which first established the fishery in regulation. The fishery regulations were last changed by the BOF in 2016 (Booz et

al. 2019). Currently, the fishery includes all Cook Inlet salt waters, the season is September through March, bag and possession limits are 2 fish of any size with no annual limit, and the GHL is 4,500 fish. Annual SWHS harvest estimates are used to assess the fishery harvest towards the GHL, which means that the annual harvest estimates are from January through March and September through December in any given year.

## **Saltwater Chinook Salmon Fisheries 2022 Performance**

### ***Areawide Saltwater Chinook Salmon 2022 Fishery Performance***

In 2022, the annual Chinook salmon harvest (16,768) for the entire LCIMA salt waters remained approximately 3,000 fish above the historical averages (1986–2001 and 2002–2018) and similar to the average harvest in the previous reporting period (2019–2021; Table 5). Both the charter and nonguided SWHS-estimated 2022 harvests in all fisheries were similar to their respective averages from the previous reporting period. The 2022 SWHS-estimated charter harvest (7,544) composed 45% of the total harvest, which was 5 percentage points lower than the average charter portion for the previous reporting period (2019–2021). However, like the previous reporting period, the LCI Summer Fishery made up the largest contribution to the total Chinook salmon harvest in all recent years.

Based on the 2022 Charter Logbook reports, the number of trips (3,138) and anglers (17,545) for all salmon were similar to both the post-Halibut CSP period (2014–2018) and the previous (2019–2021) reporting period averages (Table 4). The 2022 Chinook salmon harvest (11,224 fish) was the highest since the inception of the logbook program.

### ***Upper Cook Inlet Summer Fishery 2022 Performance***

In 2022, the annual Chinook salmon harvest (2,387) for the UCI Summer Fishery was a 14% increase from the previous reporting period average harvest but was below the 8,000 fish guideline harvest level outlined in the management plan for this fishery (Table 5). This increase in harvest was not anticipated, especially considering the preseason and inseason EO restrictions (Appendix A1). These EO restrictions resulted in the UCI Summer Fishery being closed for most of June and July. The SWHS-estimated 2022 charter harvest (1,490) composed 62% of the total UCI Summer Fishery harvest, which was 3 percentage points above the average percentage for the previous reporting period (2019–2021; Table 5).

### ***Lower Cook Inlet Summer Fishery 2022 Performance***

In 2022, the annual Chinook salmon harvest (8,387) for the LCI Summer Fishery was well above the average harvest in the historical period (2002–2018) and similar to the average harvest from the previous (2019–2021) reporting period (Table 5). No preseason or inseason management actions were issued for this fishery in 2022. The 2022 harvest in this fishery composed half (50%) of the total Chinook salmon harvest in LCIMA salt waters (calculated from Table 5). The charter harvest (4,534) composed 54% of the total harvest for this fishery, which was 12 percentage points smaller than the average proportion for the previous reporting period but 11 percentage points larger than the average proportion during the historical period (calculated from Table 5).

### ***Winter Fishery Performance***

In 2022, the annual Chinook salmon harvest (4,942) during the Winter Fishery was well above its historical (2002–2018) average (2,943) but was similar to the previous reporting period average of 5,080 (Table 5). It is likely that the prevalence of feeder Chinook salmon, favorable winter marine

weather, and increased effort all contributed to this harvest. The fishery started off the year with good success in the Seldovia area then tapered off through March. Fishing success was high in September, particularly in the Silver Ridge area, and stayed high through the remainder of the year in Kachemak Bay. The 2022 harvest exceeded the guideline harvest level of 4,500 by 492 fish (Figure 6). The 2022 annual SWHS-estimated charter harvest (1,520) in the Winter Fishery continued to be higher than the historical average (510) and composed 30% of the total fishery harvest.

## **ENHANCED TERMINAL FISHERIES**

In the lower LCIMA, Chinook, coho, sockeye, and pink salmon are stocked at terminal fishery locations (Figure 4). Chinook and coho salmon are stocked by the ADF&G SF via the William J. Hernandez Sport Fish Hatchery (WJHSFH) to provide an alternative to heavily fished local stocks and to provide additional fishing opportunities. Cook Inlet Aquaculture Association (CIAA) stocks sockeye and pink salmon in several terminal fishery locations in the LCIMA for the purpose of commercial fishing, but these stockings also support sport and personal use fisheries in their terminal locations. These “terminal” fisheries consist of returning salmon that will not naturally reproduce because there is no spawning area in the saltwater location where released smolt imprint. As such, these terminal sport fisheries are managed so that all returning fish are harvested. ADF&G SF has strategically selected saltwater locations where returning adult salmon are accessible to anglers fishing from shore or a small boat.

### **CHINOOK AND COHO SALMON TERMINAL FISHERIES**

#### **Chinook and Coho Salmon Terminal Fisheries Description**

Hatchery-reared early-run Chinook salmon have been stocked in the Nick Dudiak Fishing Lagoon (NDFL) on Homer Spit since 1984 and Seldovia Bay since 1987 (Table 6; Kerkvliet et al. 2016:Table 17). Halibut Cove Lagoon (HCL) was stocked with early-run Chinook salmon from 1974 through 2017 (Kerkvliet et al. 2016: Table 17; Booz and Dickson 2023: Table 9). At NDFL, late-run Chinook salmon stocking produced significant harvests (Tables 6 and 7). The HCL stocking program was discontinued to better support harvest opportunities at NDFL (Booz et. al 2019). Early-run and late-run coho salmon have also been stocked in NDFL, but late-run coho salmon stocking was discontinued after 2013 (Kerkvliet et al. 2013). All Chinook salmon smolt and most coho salmon smolt released in the LCIMA have been produced by the ADF&G hatchery program. Late-run coho salmon smolt were also produced by CIAA (Trail Lakes hatchery) from 2003 through 2011 for NDFL. A variety of marks have been used with stocked smolt, but thermal marks have been the primary method since 2002. Salmon smolt stocked in Kachemak Bay have a particular banding pattern that indicates they were stocked in Cook Inlet in a particular year, but the banding is not specific to any release location.

The run timing of early-run Chinook salmon in stocked fisheries is approximately mid-May through early July, with a peak in mid-June. Early-run coho salmon begin arriving in early July and the run is typically complete by mid-August. Chinook and coho salmon are harvested in sport fisheries at these terminal locations and additionally in commercial, personal use set gillnet, and sport troll fisheries that occur in Kachemak Bay. In HCL, returning salmon were primarily harvested from boats whereas at the NDFL and Seldovia, salmon are primarily harvested from shore, but some harvest also occurs from boats.

Stocking release methods have changed since the inception of the program and vary by location (Booz et al. 2019). Historically, Chinook and coho salmon smolt were held in net pens for 5 days prior to release at the terminal fisheries locations. It was assumed that a 5-day holding period improved imprinting to the stocking location. Currently at the NDFL, smolt are stocked into net pens and released the following morning, but feeding continues for up to a month (Dickson and Booz 2019). At Seldovia, smolt are directly released at the head of the Seldovia Slough lagoon. Currently, the Chinook salmon smolt target size is 13–14 g in both locations and the coho salmon smolt target size is 20–21 g.

### ***Nick Dudiak Fishing Lagoon Chinook and Coho Salmon***

Since 2000, Chinook salmon from the Ninilchik River have been considered the primary broodstock for NDFL, but both Ship Creek and Crooked Creek broodstocks have been used when there are shortages in the Ninilchik River. The stocking goal increased from 210,000 to 315,000 early-run Chinook salmon smolt in 2018 when the smolt previously designated for HCL were re-allocated to NDFL. Annual early-run Chinook salmon harvests at NDFL have fluctuated from a high of 4,068 in 2004 to a low of 14 in 2012 (Table 7). Changes in ocean productivity, changes to the production of smolt at the sport fish hatcheries, and challenges with mortality during stocking have all contributed to the fluctuation (Booz et al. 2019).

Significant changes in coho salmon stocking at NDFL have occurred over time (Booz et al. 2019). Both early-run and late-run stocks have been used to provide a long season of harvest opportunities. In 2013, use of late-run Bear Lake coho salmon ceased due to a change in ADF&G stocking policies. Currently, the coho salmon smolt stocking goal is 120,000, which has been met in most years (Booz and Dickson 2023: Table 13). Like Chinook salmon, coho salmon harvests have fluctuated greatly over the years. Additionally, in some years, the harvest of Kachemak Bay wild coho salmon stocks has contributed to the estimated SWHS harvest from the Homer Spit shore reporting location, which is used for assessing the harvest in NDFL. Annual coho salmon harvests have ranged from a high of 21,009 in 2004 to a low of 58 in 2012 (Table 7).

The NDFL is the property of the City of Homer, which is responsible for the maintenance of the facilities. Several large-scale projects have occurred over time to improve and maintain the facilities (Booz et al. 2019). Homer ADF&G SF staff have periodically assessed the residual depth of NDFL to better understand the rate of filling that is occurring within the lagoon (Booz et al 2019).

### ***Seldovia Chinook Salmon***

Chinook salmon smolt were first released in the Seldovia Harbor area in 1987 (Figure 4). Stocking methods have changed substantially over the years, but smolt are currently released at the head of the lagoon (Dickson and Booz 2019). The stocking goal for this location has been 105,000 smolt, but was reduced for a period of years, when smolt production was transitioning to the WJHSFH (Booz et. Al 2019). Anglers target Chinook salmon along the shore, from the bridge over the slough, and from boats in the lagoon. The SWHS discontinued estimation of sport angler participation, harvest, and catch in Seldovia in 2001. Prior to 2001, the largest reported harvest was 600 in 2000. Estimates were thought to be conservative because fewer than 30 respondents to the survey reported fishing in Seldovia in some years, rendering the estimates imprecise (Mills and Howe 1992). Annual harvests in Seldovia are likely half or a third of NDFL harvest estimates due to the number of smolt stocked, but fluctuations in returns are likely due to the same factors affecting the NDFL Chinook salmon returns.

In addition to the directed sport fishery in Seldovia Slough, the Chinook salmon returning to this location are also harvested in subsistence and commercial set gillnet fisheries along the west shore of Seldovia Bay (Booz et. al 2019). The BOF has made changes to these fisheries to reduce their impact on the run of stocked fish returning to Seldovia Slough (Booz et al. 2019). At the 2019 BOF meeting, the subsistence fishery season and area were expanded, but effort and Chinook salmon harvest at this fishery have not increased much with these changes (G. Hollowell, Fisheries Biologist, ADF&G, Division of Commercial Fisheries, Homer, pers. comm.).

### **Chinook Salmon Terminal Fisheries Management Objectives**

ADF&G outlines 5-year stocking objectives for Kachemak Bay annually in the “Statewide Stocking Plan for Sport Fisheries” (Stocking Plan)<sup>2</sup>. Before the Stocking Plan is finalized, it is open to public comment. Only fish stocking activities specifically initiated for improving sport fisheries are included in the plan. Stockings initiated by CIAA to benefit common property fisheries that may also benefit sport anglers or personal use fisheries are not included in the plan<sup>3</sup>.

Sport fishing regulations that apply to the terminal Chinook salmon fisheries have evolved over time, and there are no management plans for these fisheries. However, terminal fishery regulations for Chinook salmon are consistent with the saltwater limits south of Bluff Point, which state that between 1 April and 31 August there is a daily bag limit of 2 Chinook salmon of any size (5AAC Chapter 58). Chinook salmon 20 inches or longer must be recorded and counted as part of the Cook Inlet annual limit of 5 Chinook salmon. For NDFL, coho salmon bag and possession limits are 6 per day, which is greater than the coho salmon limits (3 per day) in LCIMA salt waters.

There are no special regulations for the Seldovia Slough fishery, but there are several for NDFL. NDFL waters are defined in regulation under 5 AAC 58.030, which also prohibits snagging in these waters year-round (see below); the use of weights, bobbers, or any floatation device below the hook has been prohibited (since 2008) when closed to snagging. However, the NDFL is opened to snagging by emergency order to harvest any remaining Chinook and coho salmon near the end of the runs (Appendix A2). This allows salmon to be harvested prior to maturation and, because this is a terminal fishery, prevents them from being wasted. Generally, emergency orders regulating the Chinook salmon fishery are effective only long enough to maximize harvest without affecting the start of the coho salmon run. The duration of emergency orders regulating coho salmon varies based on annual conditions.

The SWHS is used to measure the effectiveness of the Kachemak Bay stocking program; however, because the number of household respondents in the SWHS for Seldovia is too low to produce precise harvest estimates, only harvest estimates from the NDFL are used.

### **Chinook and Coho Salmon Terminal Fisheries 2022 Performance**

#### ***Nick Dudiak Fishing Lagoon Chinook and Coho Salmon Fishery 2022 Performance***

Both Chinook and coho salmon smolt were stocked in the NDFL in 2022 (Table 6). Chinook salmon stocking used Ninilchik River broodstock, and coho salmon stocking used Ship Creek broodstock. A total of 347,872 Chinook salmon smolt were released (10.4% above the goal of 315,000). Average weight of Chinook salmon smolt met the target size at 13.8 g, and the overall mortality rate during the stocking was 0.16%. The coho salmon stocking at NDFL resulted in

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<sup>2</sup> <http://www.adfg.alaska.gov/index.cfm?adfg=fishingsportstockinghatcheries.stockingplan> accessed October 2022.

<sup>3</sup> Details of CIAA stockings however can be found at <http://www.ciaa.net.org/hatcheries.html> (accessed October 2018).

116,145 smolt released, 3.2% below the goal of 120,000 smolt. The coho salmon smolt met the target size with an average weight of 20.7 g, and this stocking had a mortality rate of 1%.

In 2022, fishing effort at the NDFL increased approximately 16% to 20% (angler-days and anglers, respectively) from the previous reporting period (2019–2021) average but remained below the historical averages (Table 7). The 2022 harvest of Chinook salmon was similar to the 2020 and 2021 harvests. The 2022 coho salmon harvest greatly increased from the previous reporting period, but also remained below the historical average (Table 7). Based on the number of fish released and age composition of the annual runs of hatchery fish returning to Crooked Creek and the Ninilchik River, the marine survival of stocked Chinook salmon was less than 0.5% in 2022 (calculated from Tables 6 and 7). Using the same approach for coho salmon and the assumption that all coho salmon return 1 year after being stocked, the marine survival was 2.6% in 2022. As in the previous reporting period, NDFL was opened to snagging by EO at the end of the Chinook salmon run (Appendix A2). No EO was issued to allow snagging at the end of the coho salmon run because there were not enough fish at the end of the season to justify the change. It is likely the remainder of the stocked fish have been harvested in the Kachemak Bay coho salmon personal use fishery, which occurs along the Homer Spit. The sport fishing closure by the BOF in the Barge Basin waters (Figure 7) probably reduced the shore-based harvest on Homer Spit. Sport anglers wanting to snag coho salmon targeted them nearer to the northern boundary of the NDFL waters and along the shore and sloughs on the east side of Homer Spit at high tide.

### ***Seldovia Chinook Salmon Fisheries 2022 Performance***

In 2022, 75,611 early-run Chinook salmon smolt were released into Seldovia Slough (Figure 4, Table 6). A break in the hose used for transporting fish from the stocking truck to the water resulted in an estimated mortality of 8,000 smolt, with many failing to reach the slough. The Chinook salmon stocking goal of 105,000 smolt was not met. The average weight of stocked smolt (13.9 g) was within the target size range.

No direct monitoring occurred to assess this fishery in 2022 and SWHS estimates are not available for this location. Based on angler reports, the harvest trends in Seldovia have been similar to the NDFL. No management actions were taken in 2022 for the terminal Chinook salmon fishery in Seldovia Slough. Homer ADF&G SF staff and the City of Seldovia have been making efforts to better promote the fishery to increase use by a broader range of anglers.

## **SOCKEYE AND PINK SALMON TERMINAL FISHERIES**

### **China Poot Sockeye Salmon Description**

Leisure Lake, also known as China Poot Lake, is located across Kachemak Bay in a southeasterly direction from Homer Spit (Figure 4) and is stocked with sockeye salmon by CIAA. The lake was first stocked in 1976 (Kyle 1994) and with the exception of 1979, 1994, and 2016, has been stocked annually with an average of 1.6 million juvenile sockeye salmon fry to supplement commercial catch in Kachemak Bay (Hollowell et al. 2019). The project was initiated by ADF&G but was transferred to CIAA in 1996 (Bucher and Hammarstrom 1997). Due to the presence of barrier falls upstream from the intertidal area of China Poot Creek, adult sockeye salmon returning to Leisure Lake are harvested in a terminal fishery. The terminal harvest area has provided excellent opportunities for anglers and personal use dipnetters. A personal use fishery occurs along 200 yards of state land in China Poot Creek between the intertidal area and the barrier falls. Szarzi et al. (2007) described the history of land ownership changes near the fishery. The sport fishery

occurs along an expanse of intertidal mud flats in China Poot Bay. The sport and personal use fisheries each have a bag limit of 6 sockeye salmon. A person may harvest a bag limit of sockeye salmon in the China Poot personal use dip net fishery in addition to harvesting a bag limit of sport-caught sockeye salmon. The personal use harvest reported in the SWHS peaked at 8,605 in 1995, which is the last year that information was collected (Szarzi and Begich 2004a). Annual sport harvests from China Poot Bay reported in the SWHS are fewer than 1,200 and average 250 (Szarzi and Begich 2004a). Currently, there are no SWHS effort and harvest estimates for the sport or personal use fisheries, but the overall Cook Inlet saltwater harvest can be used as an index for these sockeye salmon fisheries because most of the harvest in the management area is thought to occur there. The utility of that index for stocked pink salmon at Tutka Lagoon (see below) is poor because large numbers of pink salmon are also caught while trolling for Chinook salmon.

### **Tutka Bay Pink and Sockeye Salmon Description**

Tutka Bay Lagoon, located across Kachemak Bay approximately 9 miles south of Homer Spit (Figure 4), is the site of Tutka Bay Lagoon Hatchery (TBLH). The stocking of pink salmon to enhance commercial fisheries began in 1976 with the development of the state-owned TBLH. Chum salmon stocking projects occurred from 1979 to 1990. Operation of the TBLH was transferred to Cook Inlet Aquaculture Association (CIAA) in 1996. Pink salmon stocking was suspended at the TBLH from 2005 to 2010. In 1996, CIAA began releasing sockeye salmon in Tutka Bay Lagoon. In 2011, CIAA resumed pink salmon stocking, which resulted in both pink and sockeye salmon returning to Tutka Bay Lagoon (Hollowell et al. 2012).

A small sport fishery evolved in Tutka Bay near the mouth of the lagoon and in Tutka Bay Lagoon itself around the hatchery-reared pink salmon that returned there until 2006. The small, 35-acre lake-like lagoon is only accessible to incoming salmon through a narrow intertidal channel during high tide. Pink salmon entered Tutka Lagoon and staged for several weeks prior to moving into Tutka Bay Lagoon Creek to spawn. This staging period offered an excellent opportunity to sport fish for pink salmon. As many as 40 boats and 150 anglers could be observed fishing in the lagoon during a single high tide period at the peak of the migration. All intercepting fisheries were closed during years of low returns to ensure sufficient numbers of fish were available to provide broodstock for the hatchery. In 1987, due to low stocking levels, both the commercial and sport fisheries were closed by EO (Nelson 1995). The sport fishery was liberalized inseason to take advantage of a surplus of stocked pink salmon in 1997 (Szarzi and Begich 2004a).

CIAA has also used TBLH for production of sockeye salmon, and the lagoon to collect broodstock for stocking locations in Kachemak Bay. Sockeye salmon fry are reared at Trail Lakes Hatchery instead of TBLH. Estimated sockeye salmon runs to Tutka Bay Lagoon were 8,200 in 2007, 20,104 in 2008, and 15,559 in 2009 (Gary Fandei, CIAA Executive Director for 2007 and Caroline Cherry, CIAA Hatchery Operations Coordinator for 2008 and 2009, personal communication). A few anglers took advantage of the first small run of stocked sockeye salmon to Tutka Bay Lagoon in 2007. At a meeting in 2007, the BOF passed a proposal closing 100 yards around the Tutka Bay Lagoon net pens to sport fishing to protect the held broodstock from disturbance. Since 2007, anglers have utilized the sockeye salmon run to Tutka Bay Lagoon each year, contributing to an increase in the estimated average annual sockeye salmon harvest from Kachemak Bay (Szarzi et al. 2010).

## **Pink and Sockeye Salmon Terminal Fisheries Management Objectives**

Sport fisheries for pink and sockeye salmon are managed by regulation (5 AAC Chapter 58). Inseason regulation changes to sport fisheries for these stocks are rare and have occurred in association with stocking projects to achieve broodstock goals for pink salmon at Tutka Bay Lagoon Hatchery or to harvest surplus stocked pink salmon. The regulations for the personal use dip net fishery in China Poot Creek are listed in the *Kachemak Bay Personal Use Dip Net Fishery Plan* (5 AAC 77.545). Unlike other personal use salmon fisheries in Cook Inlet, this fishery does not require a permit, has an individual bag and possession limit of 6 sockeye salmon, and has no annual limit.

Until 1995, the personal use season was 1 July through 31 July. In some years, sockeye salmon continued to enter China Poot Creek after the close of the season. Harvest of these fish was accomplished by extending the fishery by EO through early August. The decision to extend the season was determined by index counts of sockeye salmon present in the stream in late July. Openings for personal use dipnetting were extended by EO from ADF&G in August during the years 1983–1985, 1989, and 1994 to completely harvest fish that had entered China Poot Creek. The BOF extended the season through 7 August in 1995 to maximize the opportunity to harvest stocked sockeye salmon while minimally impacting wild pink salmon that spawn in China Poot Creek. The fishery was liberalized to extend the season and increase the bag limit by EO in 2017 due to a large buildup of sockeye salmon remaining in the creek at the end of the regulatory season.

When changes were made to the Cook Inlet personal use regulations in 1995, the prohibition on the harvest of other salmon species in the China Poot personal use dip net fishery was erroneously deleted (Szarzi and Begich 2004a). At its November 2001 meeting, the BOF reinstated the regulation that only sockeye salmon may be possessed or retained.

Conflicts occasionally occur in both China Poot Bay and Tutka Bay Lagoon between commercial seiners harvesting sockeye and pink salmon for cost recovery, and sport anglers. SF regulation summary publications and weekly fishing reports contain advisories to anglers to yield to commercial cost-recovery operations.

## **Pink and Sockeye Salmon Terminal Fisheries 2022 Performance**

Although there was no direct assessment of the terminal pink and sockeye salmon sport fisheries and sockeye salmon personal use fisheries in 2022, angler reports and observations made by ADF&G SF staff suggest that these stockings continue to provide robust harvest of sockeye salmon. Pink salmon harvest was likely minimal and incidental to anglers attempting to snag sockeye salmon in Tutka Bay Lagoon. Observed effort in the China Poot personal use fishery was consistently high through most of the season in 2022, with a decline in effort at the end of the season.

Based on SWHS estimates of sockeye salmon harvest in Cook Inlet salt waters, harvest has continued to increase (Table 3). The harvest in 2022 (10,281 fish) was nearly identical to the previous reporting period and higher than the historical harvest. It is likely that most, but not all, of the recent increase is associated with the Tutka and China Poot terminal fisheries. The SWHS also resumed producing estimates of effort and harvest for the China Poot Personal Use Dip Net



Fishery in 2022. Effort was 5,704 angler-days and the sockeye salmon harvest was 25,900 fish or an estimated of 4.5 sockeye salmon per day fished<sup>4</sup>.

Homer ADF&G SF staff conducted a foot survey in late June 2022 to assess the number of sockeye salmon in the creek prior to the opening of the personal use fishery and observed a large buildup of approximately 1,000 fish. Additional efforts have been made in concert with the ADF&G CF staff to ensure that a foot survey at China Poot Creek occurs close to the end of the personal use fishery season. The 2022 survey found few sockeye salmon remaining in China Poot Creek at the end of the season.

## **FRESHWATER FISHERIES**

### **FRESHWATER FISHERIES DESCRIPTION**

The LCIMA has a diversity of freshwater sport fishing opportunities, although effort in the freshwater finfish sport fisheries is lower than effort in the saltwater finfish sport fisheries (Table 1). The lower Kenai Peninsula roadside streams (Figure 2) support most freshwater effort in the LCIMA (Booz et al. 2019). Chinook salmon, coho salmon, steelhead, and Dolly Varden are the primary targets in these streams. West Cook Inlet has several robust coho salmon stocks, but freshwater effort is substantially less than in the roadside streams due to limited access (Booz et al. 2019). Freshwater effort in Kachemak Bay and lower Cook Inlet is nearly always low (Booz et al. 2019), although sport anglers can target pink, chum, and some small coho salmon stocks and even steelhead (English Bay Lakes drainage) on the south side of Kachemak Bay.

Although some creel sampling has occurred historically in the LCIMA, the freshwater fisheries are primarily monitored through the SWHS and, to a lesser extent, by Charter Logbook data. Guided catch and harvest by species and effort data in LCIMA fresh waters were available from the Charter Logbook database from 2006 to 2018, but the freshwater logbook program was discontinued starting in 2019 (Booz et al. 2019). Based on SWHS estimates, guided catch, harvest, and effort are only a small portion of the overall catch, harvest, and effort in the Kenai Peninsula roadside streams (Booz and Dickson 2023: Tables 14 and 15).

Based on the SWHS, LCIMA freshwater sport fisheries historically supported robust effort with an average of approximately 60,000 annual angler-days from 1977 through 1999. After 2000, there has been a nearly continuous decline culminating in 75% lower effort during the previous reporting period (2019–2021; Table 2). During years without restrictions to Chinook salmon fisheries, most of the freshwater angler effort targets Chinook salmon in the Anchor and Ninilchik Rivers and Deep Creek. In years with Chinook salmon restrictions to the lower Kenai Peninsula roadside streams, steelhead has become the primary species targeted in LCIMA. The Anchor River supports the largest road-accessible steelhead stock in the state.

### **FRESHWATER CHINOOK SALMON FISHERIES**

#### **Freshwater Chinook Salmon Fisheries Description**

The LCIMA freshwater Chinook salmon fisheries primarily occur in the Anchor River, Deep Creek, and Ninilchik River (“the roadside streams”) excluding Stariski Creek, which has been closed in regulation. West Cook Inlet fresh waters are open to Chinook salmon fishing, but effort

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<sup>4</sup> Alaska Sport Fishing Survey database [Internet]. 2002–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

has historically been low, and runs are assumed to be small (Kerkvliet et al. 2016). The remaining fresh waters in the LCIMA, mainly the south side of Kachemak Bay, are closed to Chinook salmon fishing. Chinook salmon have been observed entering the Bradley River, Humpy Creek, and Seldovia River. Chinook salmon in streams on the south side of Kachemak Bay are thought to be strays, likely from the terminal stocking programs within Kachemak Bay (Booz memorandum<sup>5</sup>).

The roadside streams are generally small, shallow streams with good angler access through Alaska State Parks facilities and ADF&G–owned property. The Anchor River has the largest wild Chinook salmon run, followed by Deep Creek, and lastly, the Ninilchik River. Stariski Creek is assumed to have a small run size. Based on escapement and harvest estimates for the Anchor River, Deep Creek, and Ninilchik River annual run sizes to the roadside streams combined during the previous reporting period have been around 8,500 fish (Booz and Dickson 2023: Table 23) and have likely fluctuated widely.

The Ninilchik River Chinook salmon run has been supplemented with hatchery-reared Chinook salmon since 1987 (Booz and Kerkvliet 2019; Booz and Dickson 2023: Table 16). Chinook salmon return to the roadside streams from early May through early August, with a peak in mid- to late June. Chinook salmon spawning occurs from late July through mid-August (Booz and Dickson 2023).

The Anchor River, Deep Creek, and Ninilchik River Chinook salmon fisheries are conservatively managed through stream-specific restrictions in regulation (5 AAC 56.122) that limit season, area, gear, bag and possession limits, and annual limits. There are no management plans for these fisheries (see management objectives section below). A sustainable escapement goal (SEG) for each stream is reviewed every 3 years. The fisheries are managed to meet their SEG, and the annual performance toward each goal has been used to make regulatory changes through the BOF process and management actions by ADF&G via EO. Since 2003, weir-based escapement data have been collected on Anchor River Chinook salmon. This has provided a preseason forecast and inseason projection, both of which are used to make pre- and inseason management decisions for all 3 streams (e.g., Appendix A1). The Anchor River, Deep Creek, and Ninilchik River wild Chinook salmon fisheries have been managed together to prevent shifting effort between the streams, but the Ninilchik River hatchery-only fishery has been managed more independently through EO and the BOF process to encourage the harvest of hatchery-reared fish.

Historically, the Anchor River, Deep Creek, and Ninilchik River have been open to harvest of wild Chinook salmon for 3-day weekends (Saturday through Monday) in late May to mid-June, although the number of weekends for each stream has varied over time. The Anchor River has a larger run size than Deep Creek and Ninilchik River, allowing for 2 additional 3-day weekend openers, and since 2008, five additional Wednesday openers. Additionally, the return of hatchery fish in the Ninilchik River has provided additional sport fishing opportunity after the weekend openers with a continuous hatchery-only fishery. In addition to a limited season, the regulatory structure for these streams only allows salmon sport fishing in the lower 2-mile sections.

The average and range of the historical Chinook salmon harvests have varied within and between the roadside streams (Table 8). Harvest variation between streams is primarily attributed to differences in abundance and stream conditions. Harvest variation within a given stream is primarily attributed to changes in run size, angler effort, river conditions, and fishing regulations.

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<sup>5</sup> M.D. Booz, 2009 memorandum to N. Szarzi, ADF&G, on assessment Chinook salmon strays from stocked terminal fisheries in Kachemak Bay.

Harvest success is related to run timing, stream conditions, and whether the use of bait is allowed or not (Booz et al. 2019). Between 2000 and 2018, on average 44% of the annual Chinook salmon harvest in these streams occurs in the Anchor River (calculated from Table 8) but most Chinook salmon caught in the roadside streams sport fisheries (nearly 70% on average) are released (calculated from Table 8). Overall, harvest and effort in the roadside streams has declined since the 1970s as other major Chinook salmon fisheries in the Kasilof, Kenai, and Susitna Rivers developed through the 1980s, and more recently, low harvest and effort can be attributed to declines in the productivity of these Chinook salmon stocks.

### ***Anchor River Chinook Salmon***

The number of days open to fishing for Chinook salmon on the Anchor River has remained the same since 2008, with five 3-day weekends and 5 Wednesdays open in late May and June, along with an annual limit of 2 Chinook salmon in conjunction with Deep Creek (Kerkvliet et al. 2013). Water conditions typically don't clear until Memorial Day weekend or the first weekend of June. Run timing has been progressing later, with the midpoint of the run occurring in late June or early July since 2018, which has resulted in fewer fish available for harvest during the inriver sport fishery (Booz and Dickson 2023). Historical harvest rates are unknown but since 2003, inriver exploitation of Anchor River Chinook salmon has been less than 20% annually (Booz et al. 2023: Table 20).

Periods of poor productivity (2009–2014 and since 2018) have resulted in both preseason and inseason management by EO (Kerkvliet et al. 2016: Appendix A1). As a result of poor productivity and restrictions to the fishery, harvest has decreased in recent years from an average of 1,306 in the 1977–1999 historical period to 172 in the previous reporting period (Table 8). Since the 20-day fishery began in 2008, the Anchor River has been open to fishing for the full 20 days only 5 of 15 years (Booz et al. 2019: Appendix A1; Booz et al. 2023: Appendices A1–A3).

### ***Deep Creek Chinook Salmon***

The number of days the Deep Creek Chinook salmon fishery is open has changed over time, but since 1996, there have been three 3-day weekend openers (9 days) beginning on Memorial Day weekend. Of the 3 roadside streams open to Chinook salmon fishing, Deep Creek has been the most conservatively managed due to more limited stock assessment. For most of its history (except 2008–2010), the Deep Creek seasonal limit of 2 Chinook salmon was in conjunction with the Anchor River. Water conditions are typically poor for good fishing success on Deep Creek through Memorial Day weekend, often poorer than the Anchor River. The third of the three 3-day weekends is typically the most successful. Historical harvest rates are unknown, but during 2018–2020, exploitation ranged from 1% to 16% (Booz and Dickson 2023: Table 20).

The annual Chinook salmon harvests from Deep Creek have varied across years due to water conditions, productivity, and fishery restrictions (Table 8; Kerkvliet et al. 2016: Table 21). During the 2000–2018 historical period, 20% of the Chinook salmon harvest in the roadside streams occurred in Deep Creek (calculated from Table 8). From 1977 to 1999, an average of 994 Chinook salmon were harvested annually from Deep Creek (Table 8). Productivity shifted in 2009 (Booz et al. 2023: Table 20), and harvest has remained below average since then. The lowest harvests of Chinook salmon since recording began in 1977 occurred in 2012, 2018, and 2021. Productivity briefly recovered in 2015–2017 (Booz et al. 2023: Table 20) and SWHS harvest estimates increased slightly. Productivity returned to low levels in 2018, and harvest has averaged 163 Chinook salmon in the previous reporting period (Table 8).

### *Ninilchik River Chinook Salmon*

The annual Ninilchik River Chinook salmon sport fishery has primarily occurred on 3 consecutive weekends and Mondays beginning on Memorial Day weekend but additional opportunity has been provided to harvest surplus hatchery-reared Chinook salmon (Kerkvliet and Booz 2010). Beginning in the 2008 season, a hatchery-only fishery that started 1 July was added by regulation. That fishery was extended to begin on 16 June beginning in the 2017 season. A youth-only fishery was also added into regulation beginning in the 2017 season for the second Wednesday following Memorial Day weekend. The sport fishery has also been liberalized by EO to harvest surplus hatchery-reared fish (Kerkvliet et al. 2016: Appendix A1). In years of small wild Chinook salmon run size, the sport fishery has been restricted or closed for both wild and hatchery-reared fish. In some years, the sport fishery has been simultaneously restricted to protect returning wild Chinook salmon and liberalized to encourage the harvest of hatchery-reared Chinook salmon. The annual limit has remained at 5 since the Cook Inlet combined annual limit of 5 was implemented in 1979.

The Ninilchik River was annually stocked by SF with an average 182,000 smolt from 1988 to 1994 in order to provide additional sport fishing opportunities (Booz and Kerkvliet 2019: Table 3). The stocking level was reduced to about 50,000 smolt from 1995 through 2014 and then was increased to a level of 150,000 annually beginning in 2015 (Booz and Dickson 2023: Table 16).

The annual average harvest of Chinook salmon has varied widely over time with the introduction and varying success of the stocking program, as well as with changes in wild Chinook salmon productivity and with regulation structure (Dickson and Booz 2022). Prior to the return of stocked fish, the annual average harvest from 1977 to 1990 was 990 Chinook salmon (Kerkvliet et al. 2016: Table 24). Harvest (Table 8) and recent weir data (Booz and Dickson 2023: Table 23) suggest the Ninilchik River has had the highest exploitation (harvest rate) of all 3 roadside streams. During years when large stockings returned (1991–1997), an average of 3,414 Chinook salmon were harvested annually, which resulted in the Ninilchik River providing the most annual Chinook salmon harvest of the roadside streams (Kerkvliet et al. 2016: Table 24). From 2000 through 2008, productivity and harvests remained high, with 1,325 Chinook salmon harvested annually (calculated from Table 8). From 2009 to 2018, annual harvests dropped, averaging 215 Chinook salmon (calculated from Table 8), although 673 fish were harvested in 2016. During the previous reporting period (2019–2021) the average harvest increased to 599 fish, which included an exceptional harvest of 1,283 fish in 2020 (Table 8).

The SWHS does not differentiate between wild and hatchery-reared Chinook salmon. Estimates of hatchery-reared contribution to the Ninilchik River harvest from sport fishery sampling were 77% in 1991, 57% in 1992, and approximately 50% in other years of sampling from the mid-1990s and early 2000s (Boyle et al. 1993; Balland et al. 1994; Balland and Begich 2007; Marsh 1995; Begich 2006, 2007b). In 2006, sampling from the 3 regulatory weekend openings, but not the EO fishery lasting 31 days, indicated that hatchery-reared Chinook salmon composed a minimum of 39% of the harvest (Booz and Kerkvliet 2011). During the previous reporting period, the retention of wild Chinook salmon has been prohibited for the entirety of the season, so the SWHS harvest estimate can be assumed hatchery-reared only. The hatchery-reared exploitation estimates in these years were 2%, 5%, and 37%, respectively (H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data).

## **Historical Chinook Salmon Escapement**

In the 1960s through the 1980s, the annual Chinook salmon escapement in the Lower Kenai Peninsula roadside streams was indexed with a 1-day aerial survey (Kerkvliet et al. 2016). Prior to 1974, fixed-wing aircraft were used in tandem with foot surveys. After 1973, helicopters replaced fixed-wing aircraft. Foot surveys were discontinued after 1995 because trends in foot survey counts mirrored trends in aerial counts and because foot survey counts added an additional source of variability in estimating the true escapement.

Chinook salmon escapement monitoring has progressed from aerial survey indexes toward full enumeration through sonar and weirs. The aerial surveys were first discontinued on the Ninilchik River in the 1990s in favor of using the broodstock collection weir to monitor escapement. Aerial surveys on the Anchor River continued through the mid-2000s before transitioning escapement monitoring using a combination of sonar and weir. Despite attempts to operate weirs, the aerial survey has still been used on Deep Creek to monitor escapement.

### ***Anchor River Chinook Salmon Escapement***

The average annual aerial survey escapement index count from 1977 to 2003 was approximately 1,150 Chinook salmon (Kerkvliet et al. 2016: Table 24). Anchor River Chinook salmon escapements have been fully enumerated with a combination of sonar, livebox weirs, and instream floating video weirs since 2004 (Booz and Dickson 2023: Table 20). Aerial surveys continued through 2008 to compare survey results to weir counts (Kerkvliet et al. 2016), but no relationship was found, and the Anchor River aerial survey was discontinued in 2009. Escapement was monitored with sonar and livebox weir on the mainstem just upstream of the fishery and just downstream of the confluence of the north and south forks from 2003 through 2012. Instream video technology replaced the livebox in 2011. Beginning in 2013, separate monitoring sites on the north and south forks have been used after the mainstem weir site washed out in spring floods.

When weir monitoring began in 2003, Chinook salmon annual escapements were near or above the estimated carrying capacity of 10,000 Chinook salmon based on spawner-recruit analysis (Otis et al. 2016). This high productivity lasted through 2008 with an average escapement of 9,464 Chinook salmon (Figure 8; Booz and Dickson 2023: Table 20). Productivity was poor for runs from 2009 to 2014, with escapements averaging 3,808 but run size recovered from 2015 to 2017, with an average escapement of 7,663 (Figure 8; Booz and Dickson 2023: Table 20). Except for a moderate run of 5,603 in 2019, most escapements have been low (Figure 8).

### ***Deep Creek Chinook Salmon Escapement***

From 1976 through 2020, the Deep Creek annual aerial index Chinook salmon counts have ranged from 63 in 1992 to as high as 1,190 in 1999 (Figure 9). During the previous reporting period, no aerial survey was conducted in 2021 but there were 751 counted in 2019 and 301 counted in 2020.

From 1997 through 2000, attempts to fully enumerate the Deep Creek Chinook salmon escapement using a weir were unsuccessful due to high flows that prevented installing the weir before most of the run had passed the weir site (Begich and Evans 2005). Based on aerial index counts and drainage size, it was assumed that the annual Chinook salmon run in Deep Creek is larger than the wild Ninilchik River run and smaller than the Anchor River run. This assumption proved correct in 2018 through 2020 with the first full enumeration of the Deep Creek Chinook salmon run via an ARIS (Adaptive Resolution Imaging Sonar) and floating video weir at 4.2 river kilometers (RKM) from the mouth. The escapement count was 2,550 in 2018, 3,480 in 2019, and 1,951

Chinook salmon in 2020 (H. I. Dickson, Fishery Biologist, ADF&G SF Homer, unpublished data). The estimated total run of wild Chinook salmon in the Ninilchik River was 46% to 49% of the Deep Creek Chinook salmon run size in all 3 years (calculated from Booz and Dickson 2023: Table 23).

### ***Ninilchik River Chinook Salmon Escapement***

Starting in the late 1980s, a weir was operated to collect broodstock during July from the Ninilchik River, 7.7 RKM upstream of the mouth. In the mid-1990s, the weir began to be used to monitor escapement in lieu of the aerial survey, but the transition is not well-documented. Based on historical aerial survey data, it was assumed that roughly 35% of the total Chinook salmon escapement spawns downstream (Marsh unpublished<sup>6</sup>). The aerial survey was continued through 2001 but no relationship was found between the weir and aerial survey counts.

From 1999 to 2005, the Ninilchik River broodstock weir operation dates were extended to enumerate the entire run to the weir (Kerkvliet and Booz 2010). During this period, total wild and hatchery-reared escapements ranged from approximately 1,500 to 2,500 fish (Figure 10) From 2006 through 2015, escapement was only monitored in the month of July. Based on monitoring during 1999–2005, approximately 65% of the total wild run to the broodstock weir was counted in July. From 2006 through 2015, wild and hatchery-reared escapements ranged from approximately 800 to 2,500 (Figure 10). Beginning in 2016, instream video was used to enumerate the entire run to the broodstock weir, and total escapement ranged from approximately 1,100 to 2,200 from 2016 to 2021. The broodstock weir escapement counts are still considered an index of escapement, given that Chinook salmon spawned downstream of the weir.

### **Freshwater Chinook Salmon Fisheries Management Objectives**

The Chinook salmon fisheries on the Lower Kenai Peninsula roadside streams are managed to achieve separate SEGs established for the wild Chinook salmon stocks of the Anchor River, Deep Creek, and the Ninilchik River. Chinook salmon escapement goals were first adopted for Anchor River, Deep Creek, and Ninilchik River in 1993 and have been refined over time as improved monitoring and analysis methods have become available (Booz et al. 2019). SEGs established for each stream align with the *Policy for the Management of Sustainable Salmon Fisheries* (5 AAC 39.222) and the *Policy for Statewide Salmon Escapement Goals* (5 AAC 39.223). There is not a management plan specific to the Chinook salmon fisheries on the lower Kenai Peninsula roadside streams.

These Chinook salmon sport fisheries are primarily managed through special provisions to the Kenai Peninsula sport fishery regulations (5 AAC 56.122) that specify seasons, gear, open areas, and bag and possession limits. Bag and possession limits for Chinook salmon less than 20 inches in total length are the exception and are stipulated in statewide provisions in 5 AAC 75.018. Preseason and inseason management actions for the roadside streams are currently made based on Anchor River preseason forecasts and inseason projections (e.g., Appendix A1). To the greatest extent possible, restrictions are standardized for all 3 streams to prevent shifting effort from one drainage to the other. All 3 drainages fall within the Southern Kenai Peninsula genetic reporting group and are genetically indistinguishable from one another (Schuster et al. 2021). Prioritizing harvest of the Ninilchik River hatchery-reared Chinook salmon run is an exception to standardizing restrictions between all 3 streams, however. Because the harvest in the saltwater UCI Summer

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<sup>6</sup> L. E. Marsh, 1997 memorandum to B. Clark, ADF&G, on preliminary evaluation of the stocking program at the Ninilchik River.

Fishery is composed of a mixture of local spawners and nonlocal “feeder” (immature) Chinook salmon, preseason and inseason restrictions have also been employed in this fishery in combination with restrictions to the roadside streams. This is consistent with the *Policy for the Management of Mixed Stock Salmon Fisheries* (5 AAC 39.220).

The management approaches for wild Chinook salmon sport fisheries in the Anchor River, Deep Creek, and Ninilchik River have been heavily restrictive throughout most of their history due to a lack of high-resolution escapement data. Saltwater regulations in the UCI Summer Fishery (see *Saltwater Chinook Salmon Fisheries* section) have also been structured historically to restrict the harvest of lower Kenai Peninsula roadside stream stocks. The evolution of the current regulations, which restrict time and area surrounding the stream mouths in salt water, date back to the 1960s (Booz et al. 2019). In 1996, the inriver Chinook salmon fisheries were restricted with adoption of the *Early-run Chinook Salmon Management Plan* (5 AAC 58.055) in response to concerns over the large harvest of LCIMA Chinook salmon stocks.

Due to later Chinook salmon run timing, nearby salt water and inriver sport fishery restrictions have been extended into July through the BOF process and by EO, which has changed or limited Dolly Varden fishing opportunities in the lower river (e.g., Appendix A1; Booz et al. 2019).

### ***Anchor River Chinook Salmon Management***

In 2001, the Anchor River stock was classified as a “stock of management concern” in response to the guidelines established in the *Policy for Management of Sustainable Salmon Fisheries* (5 AAC 39.222 [f] [21]) with 4 of 6 escapement aerial index counts from 1996 to 2001 below the SEG (Szarzi and Begich 2004a,b). This triggered a series of regulatory changes. At the fall 2001 BOF meeting, the fifth 3-day weekend was removed. More intensive escapement monitoring began in 2003, but once weir escapement counts reflected large run sizes, the fishery was restructured to add the fifth 3-day weekend back in as well as 5 Wednesdays (Kerkvliet et al. 2016).

The SEG has been modified over time as more refined escapement data has become available. The Anchor River was managed without an SEG from 2003 to 2007. A lower-bound SEG of 5,000 was added in 2008, and beginning in the 2011 season, the SEG was set with a lower bound of 3,800 and an upper bound of 10,000. Beginning in the 2017 season, the upper bound of the SEG was lowered to 7,600 Chinook salmon (Otis et al. 2016). Since the lower-bound SEG was adopted in 2008, the Anchor River Chinook salmon stock has met the SEG in 7 years (2012, 2013, 2016, 2017, 2019, and 2021), failed to meet the lower end in 6 years (2009–2011, 2014, 2018, 2020), and exceeded the upper end in 1 year (2015; (Figure 8).

### ***Deep Creek Chinook Salmon Management***

Deep Creek Chinook salmon sport fishery regulations have received little modification since 1996 (Booz et al. 2019). This fishery has been primarily managed in unison with the Anchor River sport fishery and has been restricted or closed by EO whenever the Anchor River sport fishery has been restricted (e.g., Kerkvliet et al. 2016: Appendix A1). Aerial survey index counts have not provided sufficient data to assess the Deep Creek Chinook salmon run size or to determine if this stock could support more sport fishing opportunity.

The Deep Creek aerial survey SEG was first established in 1998 with bounds of 450 to 950 Chinook salmon. The lower end of the Deep Creek aerial escapement SEG was lowered to 350 in 2001 and has remained there since. The upper end of the SEG was lowered to 850 in 2001 and remained there until it was removed in 2016 (Otis et al. 2016). Since 2001, aerial index counts

have fallen within the SEG range except during 2003–2005, when they were higher, and in 2008, 2018, and 2020, when they were lower (Figure 9). The survey was not flown in 2016 due to poor water conditions and in 2021 due to budget reductions. A weir-based goal is not used because managing Deep Creek with the Anchor River fishery appears effective when comparing similar fishery trends for the Anchor River and Ninilchik River Chinook salmon stocks during 2018–2020 (Booz and Dickson 2023).

### ***Ninilchik River Chinook Salmon Management***

The management of the Ninilchik River Chinook salmon sport fishery has been complicated with supplementation of hatchery-reared fish. The sport fishery has been liberalized through the BOF process and by EO to maximize the harvest of hatchery-reared fish, and it has been restricted in years of weak runs to ensure there were enough fish to achieve annual broodstock and future stocking goals (e.g., Kerkvliet et al. 2016: Appendix A1). In some years, the regulations on hatchery-reared fish are liberalized while regulations on wild Chinook salmon are simultaneously restricted. This complexity distinguishes the management of the Ninilchik River sport fishery from the other roadside streams.

The collection of wild broodstock during years of low runs increases the probability of not achieving the escapement goal because variability in run timing makes it difficult to predict if the goal will be met until late in weir operation after some wild broodstock have already been collected (Dickson and Booz 2022). The wild Chinook salmon were managed to an index monitoring period SEG from 1999 through 2016. The goal was 400–850 from 1999 through 2007 and 550–1,300 from 2008 through 2016 (Figure 10). Beginning in 2017, the goal was updated to 750–1,300 to reflect the entire wild run to the broodstock collection weir. The SEG was met in all years from 1999 to 2021, except for 2009.

In years of low wild escapement and increased hatchery-reared returns, the possibility of using some hatchery-reared Chinook salmon to stock the Ninilchik River has been considered. Years of increased hatchery-reared returns has also brought up the issue of wild and hatchery-reared composition of the escapement. ADF&G’s genetic policy states that no more than 10% of the escapement may be hatchery-reared (Davis et al. 1985). ADF&G genetics staff also recommend following guidelines by the Hatchery Scientific Review Group (HSRG), which outlines how to maintain the genetic fitness of an integrated population of wild and hatchery-reared salmon by minimizing the influence of domestication selection from hatchery-reared fish (Pearsons et al. 2020). The guideline suggested by the HSRG is to calculate the proportionate natural influence (PNI) on the wild stock using 2 metrics: (1) the proportion of wild fish used in the broodstock (proportion natural origin broodstock or pNOB) and (2) the proportion of hatchery-reared spawners in the spawning escapement (proportion hatchery origin spawners or pHOS) where

$$\text{PNI} = \text{pNOB}/(\text{pNOB} + \text{pHOS})$$

The recommended pNOB value is 0.90 or greater, meaning at least 90% of fish used for broodstock should be of wild origin. The recommended pHOS value, which aligns with ADF&G’s genetic policy, is 0.10, meaning no more than 10% of the spawning escapement should be hatchery-reared. The PNI value should remain at 0.67 or greater according to the HSRG, meaning the genetics of an integrated wild and hatchery-reared stock, such as Ninilchik River Chinook salmon, would be mostly (two-thirds or more) influenced by wild genetics. Increasing the proportion of hatchery-reared fish used in the broodstock (pNOB) significantly influences the PNI value more than increasing the percentage of hatchery-reared fish in the spawning escapement.



Since 1999, the pNOB value has been 1.0 annually, meaning 100% of fish used for Ninilchik River broodstock have been wild (Table 9). The pHOS value has varied with differing hatchery-reared run sizes and with different run timing, with a general increase over time. The annual pHOS value was calculated from the escapement upstream of the broodstock weir throughout the run (Figure 10). Prior to 2013, the only hatchery-reared fish that were removed from the escapement were those spawned for broodstock. Beginning in 2013, some additional hatchery-reared fish were removed as they arrived to the broodstock weir so as to minimize the hatchery-reared proportion in the spawning escapement. From 2013 through 2021, hatchery-reared fish were only removed from the escapement during broodstock collection in July and August. Any hatchery-reared fish that arrived to the weir in May or June were able to pass into the escapement. The pHOS value remained well under 0.5 through 2019 but surpassed that value in both 2020 and 2021 at 0.57 and 0.61, respectively (Table 9). The competing requirements of wild fish needed for escapement towards the SEG, stocking during poor runs, and mitigating the impacts of hatchery-reared fish on the stock's genetics has highlighted the need to continue evaluating the role of supplementation and collection of broodstock from the Ninilchik River Chinook salmon stock in the future.

### **Freshwater Chinook Salmon Fisheries 2022 Performance**

In 2022, the roadside stream Chinook salmon sport fisheries all began with preseason restrictions, given the Anchor River forecast was below the SEG and the recent poor escapements. Both Anchor River and Deep Creek were restricted to fishing with a single hook without bait, and retention of Chinook salmon was not allowed (Appendix A1). Retention of wild Chinook salmon was also not allowed for the Ninilchik River, but bait was allowed on a single hook and the bag limit was increased to 2 hatchery-reared Chinook salmon. Both the Anchor River and Deep Creek were closed by EO before the third 3-day weekend, and the Ninilchik River was closed by EO after the third 3-day weekend but before the hatchery-only fishery on 16 June. All 3 streams remained closed to sport fishing through July 15. These pre- and inseason management actions contributed to one of the lowest combined harvest estimates of 206 Chinook salmon (Table 8). Catch was also very low at 909 (Table 8). All of the Chinook salmon harvest occurred in the Ninilchik River due to preseason restrictions that closed harvest in the Anchor River and Deep Creek. Overall effort on the streams, which includes all species all season, was the lowest annual effort ever estimated by the SWHS (Table 8).

#### ***Anchor River Chinook Salmon 2022 Performance***

The Anchor River was open for 12 days of fishing in 2022, during which it was restricted to no retention of Chinook salmon and gear was limited to single hook, no bait. There were no Chinook salmon harvested in the Anchor River in 2022 due to the EO retention restriction (Table 8). The catch of 47 Chinook salmon was below the averages from the historical (2000–2018) and previous reporting periods (Table 8). Water conditions improved after Memorial Day weekend, but effort was light, and success was limited with the gear restrictions. The fishery closed after Wednesday, June 8, just after 10% of the escapement had been counted (approximately 320 Chinook salmon; H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data).

In 2022, the SEG was not achieved with a count of 3,123 Chinook salmon (Figure 8). Despite the preseason harvest restrictions and inseason fishery closure, the SEG was not achieved in 2022. The quarter point of the 2022 run was 22 June, which would have been the last day of the fishery had it remained open (H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data).

### ***Deep Creek Chinook Salmon 2022 Performance***

Deep Creek was open for 6 days of fishing in 2022, during which it was restricted to no retention of Chinook salmon, and gear was limited to a single hook with no bait. There were no Chinook salmon harvested in Deep Creek in 2022 due to the EO retention restriction (Table 8). The catch of 19 Chinook salmon was below the historical (2000–2018) and previous reporting periods averages (Table 8). Water conditions improved after Memorial Day weekend, but effort was light and success was limited with the gear restrictions. The fishery closed after Monday, June 6 (Appendix A1).

No escapement estimate is available for Deep Creek in 2022 because the aerial survey was not flown and a weir was not operated. If the Deep Creek Chinook salmon escapement followed the 2018–2020 trend, when weirs fully enumerated the wild Chinook salmon escapements on all 3 roadside streams, then the Deep Creek Chinook salmon run was probably about twice as large as the Ninilchik River wild Chinook salmon run (Booz and Dickson 2023) or approximately 2,000 Chinook salmon (see below).

### ***Ninilchik River Chinook Salmon 2022 Performance***

In contrast to the other roadside streams, the Ninilchik River experienced moderate effort during the 9 days it was open to fishing for Chinook salmon in 2022. The harvest of 206 hatchery-reared Chinook salmon was below the previous reporting period average harvest (599 Chinook salmon), but well below the averages for other periods (Table 8). The 2022 catch of 843 Chinook salmon was 25% below the average catch for the previous reporting period. The 2022 effort (3,319 angler-days) was well below both the 1977–1999 average (14,237) and the 2000–2018 historical period average (6,472) but a small increase from the average catch in the previous reporting period of 2,605 (Table 8).

Water conditions were fair to good for fishing success on the Ninilchik River throughout the open weekends. Fishing success varied, with most anglers finding success when the fishery opened at midnight on Friday night or early on Saturday morning. The use of bait was restricted for the last weekend it was open (11–13 June); the fishery was closed after Monday 13 June and remained closed until 16 July. There was very light effort for the remaining hatchery-reared fish in the lower river when the fishery reopened in mid-July. Because harvest was restricted to only hatchery-reared fish for the duration of the season, an exploitation estimate was possible. The estimate of 7% was well below the estimate of 37% in 2021 and more similar to the 2019 and 2020 estimates of 2% and 5%, respectively (Booz and Dickson 2023).

The competing goals of meeting the wild SEG, collecting broodstock, and minimizing the number of hatchery-reared Chinook salmon in the escapement continued to complicate management of the Ninilchik River Chinook salmon fishery in 2022. The SEG was not achieved at the broodstock weir in 2022 for the first time since 2009, despite restricting the harvest to only hatchery-reared fish and fully closing the sport fishery after 13 June. The total wild escapement count at the broodstock collection weir was 687 Chinook salmon, which accounted for broodstock removals. The lower end of the SEG (750) would not have been made even if broodstock had not been collected. At the lower weir, 1,011 wild Chinook salmon were counted, but only 73% of them reached the broodstock weir, which is lower than the average percentage of 86% from 2019 through 2021 (H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data). The number of hatchery-reared Chinook salmon enumerated above the fishery was much larger than the wild component, with 2,963 counted at the lower weir and 2,347 counted at the broodstock

weir (H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data). To reduce the hatchery-reared contribution to the escapement, 1,867 hatchery-reared Chinook salmon were culled at the broodstock collection weir. Most of these fish were small ocean-age-1 and age-2 males. The restricted number of hatchery-reared Chinook salmon spawning above the broodstock collection weir helped keep the PNI value above the desired 0.67 level in 2022 (Table 9).

In 2022, the broodstock collection goal of 45 wild Chinook salmon pairs (required to stock the Ninilchik River at the 150,000 smolt level) was reduced in season to 30 pairs to minimize the number of wild Chinook salmon removed from the escapement. Other options were discussed with genetics staff, including use of hatchery-reared Chinook salmon to meet the goal, but ultimately it was decided to use all wild broodstock to meet a reduced goal and avoid the use of hatchery-reared broodstock. This allowed the guidelines for the proportion of hatchery-reared fish in broodstock (0.10 or less) to be met and helped keep the PNI level above 0.67 (see discussion on PNI in the *Freshwater Chinook Salmon Fisheries Management Objectives* section above). The hatchery-reared broodstock goal for stocking terminal saltwater fisheries in Kachemak Bay was met.

Approximately 143,000 smolt were stocked into the Ninilchik River at the upper stocking location (RKM 25.8) in 2022 (H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data). The smolt were stocked at an average weight of 13.2 g (H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data). The stockings were split into 2 events occurring on 6 June and 14 June to explore increasing freshwater residency time with approximately 70,000 smolt stocked at each event. No attempts were made to hold the smolt for improved imprinting in 2022. Stocked hatchery-reared smolt are typically observed traveling through the video chute at the broodstock collection weir for 1 to 3 days after the stocking, indicating the total freshwater residence time of the stocked smolt is probably less than a week.

## **FRESHWATER STEELHEAD AND RAINBOW TROUT FISHERIES**

### **Freshwater Steelhead and Rainbow Trout Fisheries Description**

Steelhead and rainbow trout are the same species of fish (*O. mykiss*) but with different life histories. Steelhead are anadromous and rainbow trout only reside in freshwater. Steelhead in the LCIMA are fall-run iteroparous (spawning more than once in a lifetime) anadromous fish that spend 2 to 3 years rearing in fresh water as juveniles, emigrating as smolt in the spring to saltwater where they spend 1 to 3 years, returning to fresh water as adults from late July through November, spawning from April to May, and then emigrating back to salt water after spawning during May and June (Larson 1993). Anchor River studies in 1989 and 1990 found about 19% of the spawning steelhead population were spawning for at least the second time (Larson and Balland 1989; Larson 1993).

The presence of steelhead and rainbow trout in LCIMA fresh waters has been confirmed only in the roadside streams and the English Bay Lakes system, although they have been reported in several drainages in Kamishak Bay. Most of the steelhead fishery occurs in the fall when fish return to the streams to overwinter and continues until the rivers freeze up in late October or until the fishery is closed by regulation on 31 October. Emigrating steelhead are also caught in the spring, but most are incidentally hooked by anglers targeting Chinook salmon. Rainbow trout, which employ a freshwater resident life history strategy, are present in the all the roadside streams but are much less common than the anadromous steelhead.

The historical harvests in each of the various roadside streams from 1977 through 1988 ranged from 18 (1988 in Stariski Creek) to 2,305 (1978 in the Anchor River; Kerkvliet et al. 2016:

Table 31). The average annual estimated harvest for the Anchor River was 1,119 steelhead during these years (Kerkvliet et al. 2016). During 1977 to 1988, the average annual estimated harvests for Ninilchik River and Deep Creek were about 300 steelhead each, and the average annual estimated harvest for Stariski Creek was about 100 steelhead (Kerkvliet et al. 2016). Anglers began to voluntarily release a larger proportion of the catch through the 1980s as angler concern for overexploitation of the steelhead fishery grew (Wallis et al. 1984). Through the BOF process with public-submitted proposals, regulations became more restrictive through the 1980s as well (Wallis et al. 1984). The steelhead and rainbow trout fisheries in the Lower Kenai Peninsula roadside streams have been catch-and-release only since 1989.

From 1989 to 1999, the average annual catch for all roadside streams combined was 4,911 steelhead (Table 10). During those years, the catch ranged from a low of 2,930 in 1995 to a high of 9,218 in 1996 (Kerkvliet et al. 2016: Table 31). From 2000 through 2018, the average annual total catch was 5,787 with a range of 595 (2011) to 14,065 (2008; Table 10). In every year but 2004, the Anchor River steelhead catch has composed the largest portion of the total roadside stream catch (Table 10).

Steelhead have been counted historically at weir projects on the Anchor and Ninilchik Rivers and Deep Creek. The 1988, 1989, and 1992 weir operation on the Anchor River at RKM 2.5 counted 878, 769, and 1,261 steelhead respectively, but all years were considered incomplete due to weir failures and weir removal prior to the end of the run (Dickson et al. 2020). A 1983 and 1984 Floy tagging study in the Anchor River estimated the run size to be 1,682 and 1,361, respectively (Wallis et al. 1983, 1984). Emigrating steelhead (kelt) have been periodically completely enumerated in the Anchor River (2009 and 2011; Dickson et al. 2020) and the Ninilchik River (1999–2005; unpublished data, ADF&G, Homer) and have all been less than 1,000 fish. Incomplete assessments of kelts in some years (2017 Ninilchik kelt count: 704, and 2017 Anchor River kelt count: 662; Dickson and Booz 2022; H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data) indicates run size may have been upwards of 3,000 in some recent years for the roadside streams combined. In 2020, 552 steelhead were counted through 26 October on the Anchor River at the north and south fork weirs (H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data). Although this count was an underestimate, confirmed by the presence of dozens of steelhead detected in a beach seine survey downstream of the weirs at the time of removal, it was also considered one of the most complete counts to date (H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data).

### **Freshwater Steelhead and Rainbow Trout Fisheries Management Objectives**

Steelhead management is guided by the *Criteria for Establishing Special Management Areas for Trout* (5 AAC 75.013). The criteria were adopted by ADF&G in 1986 to provide future BOF, fisheries managers, and the sport fishing public with the following: (1) management policies and implementation directives for area steelhead and rainbow trout fisheries, (2) a systematic approach to developing sport fishing regulations that includes a process for rational selection of waters for special management codified in 5 AAC 75.013, and (3) recommended research objectives. These criteria were adopted by the BOF in October 1998. There are no special management areas or management plans for steelhead and rainbow trout in the LCIMA.

The current regulatory framework for the roadside stream steelhead fishery evolved over a period of nearly 2 decades and has resulted in one of the most conservative sport fisheries in Alaska (Booz et al. 2019). No inseason management of steelhead and rainbow trout has occurred in the LCIMA.

Steelhead and rainbow trout populations are managed by special provision regulations (5 AAC 56.122). Although general provisions for the Kenai Peninsula allow the harvest of steelhead and rainbow trout, they may not be removed from water or retained in the roadside streams.

### **Freshwater Steelhead and Rainbow Trout Fisheries 2022 Performance**

In 2022, the total roadside stream steelhead catch of 1,139 fish was 36% below the previous reporting period (2019–2021) average of 1,991 (Table 10). Of the 4 streams, the Anchor River composed the largest percentage of the total catch at 75% or 857 steelhead. This Anchor River catch estimate was also 28% below the previous reporting period average (1,190) and well below both historical averages (Table 10). There were no responses to the SWHS for Stariski Creek in 2022. Both the Deep Creek and Ninilchik River catch estimates for 2022 (196 and 86, respectively) were well below the previous reporting period average catch estimates (553 and 218, respectively; Table 10).

No inseason management actions were taken for LCIMA freshwater steelhead fisheries in 2022. The roadside streams experienced typical fall weather with periodic rains that raised river levels beyond what is conducive to successful fishing, followed by periods of falling water levels that provided good fishing conditions. The Ninilchik River stayed at low river levels more often than the Anchor River or Deep Creek did. The fall weather remained warm until the last few days of October when the rivers began icing up. All roadside streams were still fishable on the last day of the season on 31 October.

In 2022, steelhead were enumerated on the Anchor River at the north and south fork floating video weirs. The north fork weir was operated through 29 September and the south fork weir was operated through 14 October resulting in a total count of 1,210 steelhead (H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data). With the 2022 catch estimate of 857, this results in a catch rate estimate of 70%, which is biased high due to the incomplete escapement count (H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data). Only 20 kelts were counted at the Ninilchik River broodstock collection weir in 2022, which was much less than the 2019–2021 average of 338 (H. I. Dickson, Fisheries Biologist, ADF&G SF Homer, unpublished data).

## **GROUND FISH FISHERIES**

### **GROUND FISH FISHERY DESCRIPTION**

The Lower Cook Inlet Management Area (LCIMA) supports a diversity of sport groundfish fisheries but effort is focused primarily on Pacific halibut (*Hippoglossus stenolepis*). The Pacific halibut sport fishery is a federally managed sport fishery, and changes to its regulations influence effort and harvest trends for all other groundfish sport fisheries in LCIMA (Booz et al. 2023). The LCIMA sport fishery constitutes the largest discrete Pacific halibut sport fishery in the world. Estimated harvest increased in stair-step fashion from 13,466 fish in 1977 to 253,265 fish in 2007, the highest harvest on record for Pacific halibut in the LCIMA (Kerkvliet et al. 2016). With North Pacific Fisheries Management Council (NPFMC) adopting the Pacific halibut catch share plan in 2014, annual harvests have generally declined since 2013 (Table 3). Cook Inlet fisheries have accounted for 61–82% of the total Southcentral Alaska Pacific halibut sport harvest and 40–60% of the statewide sport harvest (in number of fish) since 1990.

Pelagic and nonpelagic rockfish species (*Sebastes*) and lingcod (*Ophiodon elongatus*) are also harvested in LCIMA, but most anglers do not target them exclusively (Booz et al. 2019). Rockfish and lingcod are state-managed stocks for sport and commercial fisheries. Fishing effort is highest during the months of May–September when large charter (guided) and nonguided (private) fleets target Pacific halibut throughout the management area. Most anglers access these boat-based fisheries through the Homer harbor or the tractor launch facilities in Anchor Point or Deep Creek. Some effort also occurs from the smaller communities on the south side of Kachemak Bay such as Seldovia and Halibut Cove.

The data from the statewide harvest survey (SWHS) are primarily used to assess all charter and unguided sport groundfish harvest in LCIMA (Table 3). Charter Logbook data also provide comparisons of harvest and effort estimates for guided anglers (Table 4). These data provide both spatial and temporal distribution of the guided sport fishing effort because guides are required to record a daily trip log, including a statistical area code for the primary area fished (Figure 11).

## ROCKFISH FISHERY

### Rockfish Fishery Description

Over 30 species of rockfish (genus *Sebastes*) inhabit the Gulf of Alaska. In LCIMA, rockfish are harvested in directed sport and commercial jig fisheries, and as bycatch in state and federally managed sport and commercial groundfish fisheries. Since 1991, 16 species have been identified in the sport harvest from the LCIMA, but black (*S. melanops*), dark (*S. ciliates*), dusky (*S. variabilis*), and yelloweye (*S. ruberrimus*) rockfish typically make up the majority of the harvest. The sport fishery is managed using 2 species assemblages based on habitat preference, and these are defined in statewide sport regulations (5 AAC 75.995) as pelagic and nonpelagic. The pelagic assemblage includes black, dusky, dark, widow (*S. entomelas*), yellowtail (*S. flavidus*), and blue (*S. mystinus*) rockfish, and the nonpelagic assemblage includes all other species. The State of Alaska has management authority for all sport rockfish fisheries in state waters (within 3 nautical miles of shore), as well as federal waters of the Exclusive Economic Zone (EEZ). Most rockfish are caught in the state waters of the LCIMA from the Bluff Point area, along the southern shore of Kachemak Bay from Eldred Passage west to the outer coast around the Chugach Islands, and around the Barren Islands, with most of the harvest occurring south of Point Pogibshi (Figure 1). Historically, most rockfish are taken incidentally while fishing for other species or while targeting rockfish only after fishing for other species (Kerkvliet et al. 2016).

### Historical Rockfish Harvest and Abundance

SWHS estimates of annual rockfish harvest in Cook Inlet have risen from about 2,000–4,000 fish in the late 1970s to nearly 50,000 fish in 2021 (Table 3; Booz and Dickson 2023). The LCIMA harvest made up less than 20% of the Southcentral Region sport rockfish harvest through 2016 but increased to 27–29% in the previous reporting period<sup>7</sup>. From the 1980s to mid-1990s, unguided anglers harvested more rockfish than charter anglers in the LCIMA. Since 2006, charter harvest of rockfish has been greater than unguided harvest (Table 11). Beginning in 2014, with the implementation of the halibut Catch Sharing Plan (CSP), charter rockfish harvest has increased substantially (Booz et al. 2019).

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<sup>7</sup> (ADF&G) Alaska Department of Fish and Game. 2018. Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish <http://www.adfg.alaska.gov/sf/sportfishingsurvey/> [cited September 22, 2018]

In addition to SWHS estimates and Charter Logbook reports, biological data from the sport rockfish harvest has been collected annually from port sampling in the Homer harbor. These data have been used in combination to conduct harvest reconstruction to species and assemblage Howard et al. (2020). Although there was general agreement of guided rockfish harvest with SWHS estimates and Charter Logbook reports for LCIMA, the SWHS estimates consistently underestimated the rockfish harvest, resulting in harvest estimates that were 11% to 19% below the Charter Logbook reports (Booz and Dickson 2023). Harvest reconstruction estimates derived from expanding Charter Logbook rockfish harvest by the SWHS proportions of charter and unguided harvest and apportioned to species or assemblage with port sampling data were assumed to provide much more accurate and precise harvest estimates. For LCIMA, these estimates for rockfish were first developed in the previous reporting period (2019–2021; Booz and Dickson 2023). These reconstructed harvests produced an average black rockfish harvest of approximately 35,000 fish and an average total rockfish harvest of approximately 50,000 fish in the previous reporting period (Table 11).

The biological data from port sampling includes rockfish species composition, which is used for the harvest reconstruction estimates. From 2006 through 2013, black rockfish composed 48% of the rockfish harvest on average in LCIMA (Table 11). Additionally, age, sex, and length data are collected for both black and yelloweye rockfish and have provided useful indices for fishery assessment. Yearly mean age and length of black rockfish remained close to the long-term (1996–2013) average through 2017, but both mean age and length fell below average during 2018 through 2021 (Figure 12; Booz et al. 2023). For yelloweye rockfish, both mean length and age have been below the historical averages since 2012 (Figure 13). From the historical period to the transitional period average annual yelloweye rockfish harvest increased approximately 10% but increased by 39% during the previous reporting period (Table 11).

Because rockfish were caught incidentally in other sport fisheries, more rockfish were released than harvested through the mid-2000s; that trend reversed starting in 2009 when a larger proportion of the catch was harvested than released (Booz and Dickson 2023). During the previous reporting period (2019–2021), 25% of the total rockfish catch was released on average.

Charter Logbook reports also provide data on the release of pelagic, nonpelagic, and yelloweye rockfish by guided anglers. From 2006 through 2018, on average, 91% of the pelagic rockfish charter catch was harvested, 95% of the yelloweye rockfish charter catch was harvested, and 87% of the other nonpelagic rockfish charter catch was harvested (ADF&G SF, Homer, unpublished data). The magnitude of the released component is important because of the potential for high rates of immediate or delayed mortality. Release mortality is a concern because rockfish have a specialized gas-filled swim bladder that makes them susceptible to barotrauma<sup>8</sup>. Release mortality has not been estimated in LCIMA fisheries but is believed to be higher for nonpelagic species than for pelagic species, primarily because pelagic species generally inhabit shallower waters, making them less susceptible to decompression trauma.

## **Rockfish Fishery Management and Regulations**

Although there is no management plan for the LCIMA sport rockfish fishery, ADF&G and the BOF have attempted to take a conservative approach to management of rockfish fisheries in the

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<sup>8</sup> ADF&G (Alaska Department of Fish and Game). 2023. Rockfish Conservation, Statewide Rockfish Initiative. <http://www.adfg.alaska.gov/index.cfm%3Fadfg%3DfishingSportFishingInfo.rockfishconservation> [cited March 10, 2023]

LCIMA and the rest of Alaska. Sport bag limits have been reduced regionwide in recognition of the failure of other Pacific rockfish fisheries and the life history characteristics that make rockfish susceptible to overharvest. More restrictive bag limits have been set for the longer-lived and less productive nonpelagic species to discourage targeted harvest while still allowing for retention of incidental catch. Seasons or size limits for rockfish have not been implemented because of concerns regarding mortality from decompression trauma. Along with regulation changes, efforts have been made to educate anglers regarding the risks and consequences of rockfish overharvest and to foster best fishing practices, such as the use of deepwater release mechanisms (DRM), to increase the survival of released rockfish.

The sport rockfish fishery in the LCIMA was unregulated until 1973 when the BOF adopted bag and possession limits of 10 for the Cook Inlet–Resurrection Bay Saltwater Area. In 1989, the BOF revised the Cook Inlet–Resurrection Bay Area bag limit to 5 rockfish per day and 10 in possession. In 1995, the BOF approved an ADF&G proposal to limit harvest of nonpelagic species, recognizing the relative difference in productivity between these groups. Even though increasingly conservative steps have been taken to restrict harvest, it is unknown whether these efforts are providing optimal yield or adequately protecting rockfish populations.

The current regulations in the LCIMA, effective since 1996, include a year-round season, a daily bag limit of 5 rockfish per day, and a possession limit of 10 rockfish, of which no more than 1 daily and 2 in possession may be nonpelagic species. Bag and possession limits, special restrictions, and state authority in the exclusive economic zone (EEZ) are found in area regulations in 5 AAC 58. The terms “rockfish,” “nonpelagic rockfish,” and “pelagic rockfish” are defined in statewide regulations, 5 AAC 75.995. Guides are required to report the numbers of pelagic, yelloweye, and other rockfish kept and released daily by each angler in Charter Logbooks. Logbook requirements are outlined in AS 16.40.280 and 5 AAC 75.076.

Overfishing is by far the primary management concern for rockfish. This concern is largely based on rockfish life history characteristics such as extreme longevity, high site fidelity, relatively late age at maturity, high recruitment variability, and susceptibility to mortality from decompression trauma (Leaman and Beamish 1984; Munk 2001; Parker et al. 2000). Many species recruit to the fishery before reaching sexual maturity, and fisheries develop on the standing stock rather than on the surplus production. Removal of the older spawning stock reduces spawning biomass, potentially further inhibiting population recovery.

### **Rockfish Fishery 2022 Performance**

Estimated rockfish harvest from the LCIMA harvest reconstruction of 63,039 is a continued increase from the previous and historical reporting periods (Table 11). In 2022, based on SWHS rockfish harvest proportions by users, 74% of the total rockfish harvest was charter anglers, which was similar to the average percentage in the previous reporting period (calculated from Table 11). Using the 2022 Charter Logbook reports, 89% of the rockfish harvest was pelagic rockfish (calculated from Table 11). With species apportionment from port sampling data, black rockfish composed 36% of the nonguided harvest, which was well below the average percentage (69%) in the previous reporting period (calculated from Table 11). The 2022 black rockfish harvest (40,798) was a 13% increase from the previous reporting period. The 2022 yelloweye rockfish harvest (3,200) was 3% decrease from the previous reporting period. Both the other pelagic harvest (15,536) and other nonpelagic harvest (3,504) in 2022 was the highest annual estimate with this assessment.



The age and length compositions of LCIMA harvests of black rockfish in 2022 continue to show significant changes from historical harvests. Both mean length and age remained below their respective 1996–2013 historical averages (Figure 12). The 2022 mean length was 45 cm, which was an increase over the past 4 years but still below the historical average mean length (51.5 cm). Mean age was 10.3 years in 2022, which was greater than the previous reporting period average mean age but still below the historical average of 16.1 years. Separating the harvest composition into 3 age bins (less than 9 years old to represent juveniles, 9–15 years old to represent maturing fish, and greater than 15 years old to represent fully mature fish), suggests that most (68%) of the black rockfish harvest in 2022 was juvenile rockfish (Figure 14).

These trends suggest that the increased rockfish harvest in recent years is primarily supported by a young, strong cohort of black rockfish that was first harvested in 2017. Harvest of a singular, strong, and young cohort may represent a substantial increase in recruitment from this cohort and (or) that fewer black rockfish from older cohorts still exist in LCIMA. Given that harvest has increased, and anglers are still catching good numbers of pelagic rockfish without any additional increase in the number of trips or more time spent fishing per trip, it is likely that this cohort's recruitment is larger than most others historically. Determining if older individuals are still surviving will probably require fishery-independent assessment.

Although the sample size was small, the 2022 yelloweye rockfish age and length compositions also showed changes in the LCIMA harvest (Figure 13). In 2022, the mean length of the yelloweye rockfish harvest was 53.9 cm, which was the lowest mean length observed in port sampling monitoring. In 2022, mean age was 25.8 years, which was similar to 2020 and 2021.

Although effort towards rockfish by charter and nonguided anglers cannot be directly estimated by SWHS or Charter Logbook harvest reports, it is likely that the effort shift observed in the previous reporting period continued in 2022. For charter anglers, the halibut CSP provisions included additional closure days for the 2022 season (Appendix A3). With progressively more restrictive charter halibut regulations, it is likely this trend will continue in future years.

## **LINGCOD FISHERY**

### **Lingcod Fishery Description**

In LCIMA, lingcod are primarily harvested in the sport fishery but are also harvested in a directed commercial jig fishery and as bycatch in other commercial groundfish fisheries. Most lingcod are harvested in state waters around the Barren and Chugach Islands and along the Kenai Peninsula coast from Point Adam to Gore Point (Figure 1). Juveniles can be found and caught incidentally in nearshore waters throughout Kachemak Bay and as far north as Anchor Point. Very few anglers target lingcod exclusively, and as with rockfish, most lingcod are taken by anglers targeting other species or targeting lingcod in conjunction with other species (ADF&G SF, Homer, unpublished data).

### **Historical Lingcod Harvest and Abundance**

Lingcod catch and harvest estimates from the SWHS are available since 1991 and from Charter Logbook records consistently since 2006. From 2006 through 2013, on average about 25% of the Southcentral sport fish region lingcod harvest occurred in LCIMA<sup>9</sup>. Although there is generally a

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<sup>9</sup> (ADF&G) Alaska Department of Fish and Game. 2018. Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish <http://www.adfg.alaska.gov/sf/sportfishingsurvey/> [cited September 22, 2018]

good agreement between Charter logbook reports and SWHS estimates of lingcod harvests, the SWHS estimates tend to overestimate the charter harvest (Booz and Dickson 2023). Harvest reconstruction estimates derived from expanding Charter Logbook lingcod harvest by the SWHS proportions of charter and unguided harvest, as was done for rockfish harvest reconstruction, probably provide much more accurate and precise harvest estimates (Howard et al. 2020). Based on SWHS data, approximately 75% of the total lingcod harvest was obtained by charter anglers (Table 12).

Based on Charter Logbook reports, charter lingcod harvest in the 2006–2013 historical period averaged 3,557 fish (Table 12). Using harvest reconstruction, the nonguided lingcod harvest averaged 1,205 fish over the same period. Lingcod harvest declined precipitously after this period, and annual total lingcod harvests fell to under 1,000 fish in 2016 and 2018. In the previous reporting period, lingcod harvests were starting to increase by 300–400 fish annually in 2020 and 2021 (Booz and Dickson 2023).

In addition to SWHS estimates and Charter Logbook reports, biological data from the sport lingcod harvest is collected annually from port sampling in the Homer harbor. The biological data include age, sex, and length data that have provided useful indices of changes to the stock. Annual mean length and age have changed little with respect to the historical (1996–2013) averages, although there appears to be some decline in both mean length and age since 2018 (Figure 15).

### **Lingcod Fishery Management and Regulations**

Lacking a comprehensive stock assessment, ADF&G and the BOF have adopted a precautionary approach for management of the lingcod sport fishery. In Cook Inlet, the approach includes a conservative bag limit, a minimum size limit designed to allow fish to spawn prior to harvest, and closed seasons to protect spawners and nest-guarding males. The status of the lingcod population in Cook Inlet is unknown. There is no stock assessment, no proven index of abundance, and considerable uncertainty regarding sport harvest estimates. Work is needed to develop survey methods that provide an unbiased index of abundance. The minimum size limit of 35 inches also precludes the use of fishery data as an index of recruitment and no data are available on the sizes of released fish. A fishery independent survey would provide data on the sublegal portion of the population, which may give insight into future fishery recruitment. Given the lack of stock status information, management concerns center on whether current levels of harvest are sustainable, whether the current regulations represent an optimal harvesting policy, and the potential effects of other fishery changes on future lingcod harvests.

The lingcod sport fishery was unregulated before 1987. In that year, the BOF established a daily bag and possession limit of 2 lingcod for the Cook Inlet–Resurrection Bay Saltwater Regulatory Area in response to concerns over increased harvest, mainly in the Seward area. In 1995, the State of Alaska extended its regulatory authority for sport fisheries into federal waters of the EEZ off Alaska through an emergency regulation. Section 306 of the Magnuson–Stevens Fisheries Conservation and Management Act, amended in 1996, allows the state to regulate sport vessels in federal waters in the absence of a federal plan for the sport fishery.

The current regulations for the LCIMA lingcod sport fishery were put into place during the early 1990s. In 1992, the BOF adopted a suite of regulatory measures for the entire Cook Inlet–Resurrection Bay Regulatory Area, again largely in response to declining recruitment of lingcod in the North Gulf fishery (Meyer 1992; Vincent-Lang and Bechtol 1992). Changes that applied to the Cook Inlet portion (waters west of Gore Point) included the following: (1) establishing a closed

season of 1 January–30 June to protect spawning and nest-guarding lingcod, (2) establishing a minimum size limit of 35 inches total length, and (3) specifying that lingcod may only be landed by hand or with a landing net. In 2003, the restriction on the use of gaffs for lingcod was lifted with passage of a statewide gaffing regulation.

### **Lingcod Fishery 2022 Performance**

In 2022, the lingcod harvest reconstruction estimate was 2,137, which suggests that there is a continued increase of lingcod harvest in LCIMA (Table 12). The percentage of harvest taken by charter anglers was 69% in 2022. The 2022 Charter Logbook lingcod harvest (1,470) was a 42% increase from the previous reporting period. The 2022 harvest reconstruction estimate for nonguided anglers (667) was a 77% increase from the previous reporting period.

Mean age and length of the LCIMA lingcod harvest showed improvement in 2022 (Figure 15). Mean age in 2022 was 11.3 years, which is still below the historical average mean age of 12.8 years. In 2022, mean length improved for the second year in a row to 102.6 cm but was still below historical average mean length of 107.3 cm. The 2022 age composition showed that the harvest was composed of a diversity of age classes and that there may be a strong cohort recruiting to the fishery in recent years (M. Booz, Fisheries Biologist, ADF&G SF Homer, unpublished data). The current harvest and trends in biological compositions suggest that there may be some improvement with this stock and that effort may shift from other groundfish towards lingcod.

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## **TABLES**

Table 1.–SWHS estimates of angler-days of effort by fishery type in Lower Cook Inlet Management Area (LCIMA) waters, 2000–2022.

Year	Lower Cook Inlet Management Area angler-days				LCIMA % of state	Alaska total
	Saltwater finfish	Saltwater shellfish	Freshwater finfish	Total		
2000	210,559	50,187	51,406	312,152	11.9	2,627,805
2001	184,278	41,341	40,896	266,515	11.8	2,261,906
2002	188,216	42,366	40,750	271,332	12.0	2,259,091
2003	190,775	31,583	40,313	262,671	11.8	2,219,398
2004	206,182	37,460	44,942	288,584	11.7	2,473,961
2005	224,606	41,250	43,454	309,310	12.6	2,463,929
2006	200,572	34,149	37,465	272,186	11.8	2,297,961
2007	212,187	30,781	57,625	300,593	11.8	2,543,648
2008	174,963	36,663	47,088	258,714	11.2	2,315,592
2009	166,275	35,148	40,302	241,725	10.9	2,216,436
2010	167,797	25,786	31,402	224,985	11.2	2,000,152
2011	168,214	29,836	17,307	215,357	11.2	1,919,312
2012	168,040	25,344	19,040	212,424	11.3	1,885,692
2013	192,745	30,155	17,535	240,435	10.9	2,202,957
2014	196,037	12,813	22,497	231,347	10.0	2,309,851
2015	185,388	5,280	22,311	212,979	9.6	2,212,331
2016	181,843	2,789	22,131	206,763	10.4	1,982,300
2017	185,501	2,721	20,404	208,626	10.4	2,006,244
2018	180,905	3,037	12,209	196,151	10.4	1,878,009
2019	166,664	4,903	15,072	186,639	9.0	2,075,431
2020	126,887	2,942	17,353	147,182	9.4	1,566,516
2021	165,847	3,554	11,666	181,067	9.2	1,978,655
2022	155,405	3,442	12,297	171,144	9.4	1,827,809
Averages						
1977–1999	211,709	46,309	56,037	314,056	13.1	2,383,929
2000–2018	189,802	31,884	35,896	257,582	11.4	2,263,126
2019–2021	153,133	3,800	14,697	171,629	9.2	1,873,534

Source: Mills (1979-1980. 1981a, 1981b, 1982-1994); Howe et al. (1995, 1996); Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Data for 1977–1999 published in Kerkvliet et al. (2016: Table 1).

Note: Inception date for database is 1977.

Table 2.—SWHS estimates of sport angler effort, harvest, and catch of salmon and trout in fresh waters of the Lower Cook Inlet Management Area, 2000–2022.

Lower Cook Inlet Management Area fresh waters																
Year	Effort		Chinook salmon		Coho salmon		Pink salmon		Sockeye salmon		Chum salmon		Steelhead and rainbow trout		Dolly Varden	
	Anglers	Angler-days	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
2000	22,222	51,406	4,656	13,167	8,448	17,090	687	6,159	1,307	1,644	86	2,139	12	11,609	3,324	28,325
2001	17,562	40,896	3,018	7,168	8,129	14,988	547	2,229	1,514	1,920	60	1,055	226	4,647	2,369	16,216
2002	17,898	40,750	2,410	8,918	9,091	20,159	647	5,547	161	649	17	512	81	5,102	1,272	16,649
2003	17,517	40,313	3,299	11,036	11,211	31,767	311	1,796	1,101	1,886	50	1,708	55	6,972	1,915	33,399
2004	18,840	44,942	3,624	11,273	12,881	34,665	240	6,777	787	1,262	49	699	140	9,519	1,468	27,356
2005	18,198	43,454	3,535	9,403	11,326	28,159	169	3,530	1,626	2,311	ND	1,100	221	5,279	1,170	12,412
2006	17,465	37,465	3,174	9,532	10,205	26,040	213	4,315	731	3,913	ND	1,850	47	6,635	1,411	18,740
2007	20,425	57,625	4,284	17,059	9,255	19,730	467	7,501	878	2,171	45	1,397	ND	12,199	2,030	35,246
2008	18,777	47,088	3,154	8,366	8,084	15,255	612	6,761	1,199	2,011	122	2,251	ND	14,065	1,638	34,420
2009	13,809	40,302	1,328	4,217	7,526	14,298	592	5,695	1,039	1,916	135	1,483	48	7,427	1,614	28,272
2010	13,213	31,402	971	3,068	6,166	12,137	311	6,241	173	515	237	1,064	101	3,713	1,426	13,476
2011	7,093	17,307	1,104	2,912	3,791	5,302	143	1,724	30	434	ND	2,006	146	1,822	623	9,606
2012	7,006	19,040	87	420	4,619	7,416	336	2,713	180	434	30	1,355	ND	2,968	2,175	15,382
2013	5,729	17,535	330	984	2,177	4,085	193	1,507	43	209	ND	1,701	160	3,713	2,725	18,437
2014	7,463	22,497	486	3,165	5,182	8,287	43	1,161	27	395	49	698	80	6,259	1,259	30,131
2015	7,542	22,311	707	2,196	4,462	11,810	401	2,546	404	753	20	874	133	4,122	3,096	37,480
2016	8,561	22,131	2,481	6,678	2,213	4,093	256	1,665	69	262	52	86	86	3,629	1,368	19,582
2017	8,112	20,404	1,420	4,725	2,972	5,119	597	6,489	508	749	36	99	137	4,488	477	13,314
2018	5,036	12,209	114	432	2,964	5,712	285	1,648	497	816	ND	65	143	4,106	244	13,853
2019	6,327	15,072	372	1,568	3,423	5,271	180	1,952	155	321	60	854	ND	1,979	191	14,547
2020	5,262	17,353	2,031	3,403	2,993	4,571	383	5,889	168	237	21	497	144	3,235	1,855	12,223
2021	6,535	11,666	409	894	2,118	3,877	584	1,774	633	989	ND	469	69	1,380	44	6,662
2022	5,038	12,297	206	843	2,340	3,104	70	1,888	446	495	ND	809	50	1,257	795	6,636
Averages																
1977–1999	30,914	60,146	4,111	13,200	5,424	13,478	513	3,785	4,014	5,038	88	861	1,225	6,009	8,179	21,320
2000–2018	13,288	33,109	2,115	6,564	6,879	15,059	371	4,000	646	1,276	71	1,165	114	6,225	1,663	22,226
2019–2021	6,041	14,697	937	1,955	2,845	4,573	382	3,205	319	516	41	607	107	2,198	697	11,144

Source: Mills (1979-1980, 1981a, 1981b, 1982-1994); Howe et al. (1995, 1996); Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Data for 1977–1999 presented in Booz and Dickson (2023: Appendix B).

Note: Inception date for database is 1977. Catch was first reported in the SWHS during 1990 and number of anglers in 1984. ND means no estimates from the SWHS due to a lack of responses for the fishery.

Table 3.—SWHS estimates of effort towards finfish and groundfish sport harvest in Lower Cook Inlet Management Area salt waters, 2000–2022.

Year	Lower Cook Inlet Management Area salt waters											
	Effort		Salmon					Groundfish				
	Anglers	Angler-days	Chinook salmon	Coho salmon	Sockeye salmon	Pink salmon	Chum salmon	Pacific halibut	Lingcod	Rockfish	Sablefish	Pacific cod
2000	112,732	210,559	12,730	16,546	4,312	3,212	337	201,727	1,814	6,124	ND	
2001	105,723	184,278	11,499	28,072	6,458	2,862	557	182,482	1,987	4,611	ND	3,642
2002	107,229	188,216	11,810	39,244	5,570	3,893	352	167,023	1,600	5,903	ND	2,588
2003	116,499	190,775	14,756	31,869	6,107	4,604	489	190,094	2,119	7,515	ND	3,909
2004	119,173	206,182	17,724	41,113	3,532	3,701	169	211,702	3,311	9,756	ND	3,588
2005	123,863	224,606	18,804	34,985	5,164	6,508	355	218,695	3,036	11,607	ND	4,485
2006	118,590	200,572	16,368	17,843	4,921	2,491	398	209,442	3,307	9,431	ND	2,198
2007	119,859	212,187	12,556	18,595	7,277	1,600	105	253,265	7,012	12,789	ND	2,789
2008	106,767	174,963	8,562	13,528	7,381	2,526	216	209,082	6,133	11,258	ND	3,780
2009	94,580	166,275	6,546	12,327	7,963	2,159	262	195,294	5,866	16,488	ND	8,344
2010	99,794	167,797	10,134	10,106	9,560	2,810	169	192,703	5,225	18,444	ND	8,499
2011	113,583	168,214	9,284	10,106	6,972	2,257	508	203,528	7,477	16,847	ND	12,203
2012	105,599	168,040	6,890	6,720	7,245	2,176	176	189,986	5,543	18,086	ND	10,060
2013	116,555	192,745	11,022	11,319	10,430	4,967	475	207,482	5,630	18,093	ND	9,508
2014	107,969	196,037	11,989	21,038	7,471	3,115	1,060	177,305	4,320	22,622	810	10,238
2015	107,244	185,388	19,515	23,459	6,254	7,989	538	179,766	2,908	26,218	ND	ND
2016	111,640	181,843	20,005	8,520	6,646	7,858	458	177,832	3,112	32,905	1,539	9,594
2017	105,880	185,501	17,438	20,932	10,151	8,565	539	160,462	2,899	32,254	1,605	4,217
2018	102,491	180,905	18,157	18,730	8,753	5,687	445	151,917	3,261	40,149	1,621	1,759
2019	94,875	166,664	15,650	17,009	12,409	13,310	285	142,018	2,088	47,793	1,756	2,961
2020	70,525	126,887	15,145	6,952	6,929	4,291	251	110,973	3,469	32,201	ND	628
2021	105,415	169,401	18,341	13,819	11,531	8,149	102	151,217	4,648	48,434	1,141	9,597
2022	87,525	155,405	16,768	16,173	10,281	3,065	208	132,448	4,085	48,285	2,372	10,717
Averages												
1977–1999	114,076	169,508	10,707	6,843	2,228	4,816	223	106,260	1,903	4,266	ND	3,842
2000–2018	110,304	188,689	13,463	20,266	6,956	4,157	400	193,673	4,029	16,900	ND	5,965
2019–2021	90,272	154,317	16,379	12,593	10,290	8,583	213	134,736	3,402	42,809	1,449	4,395

Source: Mills (1979-1980: 1981a, 1981b, 1982-1994); Howe et al. (1995, 1996); Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Data for 1977–1999 presented in Booz and Dickson (2023: Appendix B).

Note: Inception date for database is 1977. NA means no estimates from the SWHS due to a lack of responses for the fishery.

Table 4.—Charter Logbook finfish and groundfish charter sport harvest and effort estimates in Lower Cook Inlet Management Area salt waters, 2006–2022.

Lower Cook Inlet Management Area saltwater Charter Logbook														
Year	Salmon						Groundfish							
	Effort			Harvest			Effort			Harvest				
	Trips	Anglers	Boat-hours	Chinook	Coho	Other	Trips	Anglers	Boat-hours	Pacific halibut	Lingcod	Rockfish		
											Pelagic	Nonpelagic	Yelloweye	
2006	4,272	23,709	13,984	4,708	7,202	2,535	14,129	98,440	62,550	179,144	2,239	4,236	318	838
2007	3,876	18,417	12,359	2,907	8,490	1,354	14,526	88,993	64,015	166,956	4,166	6,388	314	970
2008	2,887	13,566	9,250	1,732	4,682	1,105	12,960	79,388	59,811	146,517	4,589	5,921	249	1,040
2009	2,466	11,969	6,824	1,184	7,597	1,303	10,728	64,349	48,472	121,929	3,758	8,125	258	1,088
2010	2,504	13,055	7,752	2,873	3,024	1,781	11,033	73,166	50,606	137,067	3,387	9,774	1,862	1,245
2011	2,574	14,163	7,830	3,096	4,765	2,460	10,645	74,939	47,441	140,723	4,695	10,826	1,008	1,575
2012	1,749	9,262	5,898	2,279	538	1,906	10,028	72,878	45,800	136,831	2,661	10,883	660	1,244
2013	2,150	11,913	7,096	4,087	2,298	1,773	10,109	75,477	45,313	138,509	2,963	12,140	638	1,343
2014	2,514	14,008	7,741	5,339	4,620	2,176	8,505	57,684	37,679	105,337	1,631	14,405	734	1,166
2015	3,456	19,964	11,330	8,770	9,518	7,443	8,304	54,127	35,945	94,382	874	17,387	899	1,266
2016	3,364	17,363	11,552	9,458	745	2,957	8,528	55,304	38,552	92,499	656	22,395	1,187	1,460
2017	3,919	21,388	12,671	6,395	11,638	7,973	8,482	54,582	37,962	89,164	861	21,592	1,226	2,010
2018	2,914	15,469	9,640	4,396	6,571	2,320	8,389	52,683	38,441	83,636	638	25,587	1,476	1,827
2019	3,414	18,612	10,682	6,267	6,065	12,585	8,114	50,643	35,821	79,646	827	35,477	1,550	2,691
2020	2,161	11,601	6,037	8,268	2,548	4,948	5,798	34,451	25,077	59,563	882	22,774	1,336	1,790
2021	4,059	22,976	12,245	10,578	6,385	10,161	9,975	65,063	41,820	111,466	1,389	42,268	2,269	3,123
2022	3,138	17,545	9,064	11,224	5,309	4,035	9,215	59,730	38,632	101,290	1,470	41,228	2,650	2,579
Averages														
2006–2013	2,810	14,507	8,874	2,858	4,825	1,777	11,770	78,454	53,001	145,960	3,557	8,537	663	1,168
2014–2018	3,233	17,638	10,587	6,872	6,618	4,574	8,442	54,876	37,716	93,004	932	20,273	1,104	1,546
2019–2021	3,211	17,730	9,655	8,371	4,999	9,231	7,962	50,052	34,239	83,558	1,033	33,506	1,718	2,535

Source: Charter Logbook database [Internet]. 2006–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). URL not publicly available as some information is confidential. Contact Research and Technical Services for data requests.

Note: Inception date for database is 2006. Averages cover the historical period 2006–2013 prior to the implementation of Halibut Catch Sharing Plan, a transitional reporting period 2014–2018, and this reporting period 2019–2021.

Table 5.—SWHS estimates of Chinook salmon sport harvest by fishery and user in Lower Cook Inlet Management Area salt waters, 2002–2022.

Year	Lower Cook Inlet Management Area											
	UCI Summer			LCI Summer			Winter			Total MA <sup>a</sup>		Overall total
	Charter	Non-guided	Total	Charter	Non-guided	Total	Charter	Non-guided	Total	Charter	Non-guided	
2002	1,970	1,825	3,795	1,520	1,990	3,510	204	1,219	1,423	3,694	8,116	11,810
2003	2,326	1,916	4,242	1,732	2,498	4,230	289	1,515	1,804	4,347	10,409	14,756
2004	3,024	2,395	5,419	3,515	2,420	5,935	419	1,650	2,069	6,958	10,766	17,724
2005	2,371	2,415	4,786	3,861	3,331	7,192	412	2,546	2,958	6,644	12,160	18,804
2006	3,323	2,610	5,933	3,055	2,943	5,998	169	1,346	1,515	6,547	9,821	16,368
2007	2,786	2,026	4,812	1,736	1,923	3,659	404	1,607	2,011	4,926	7,630	12,556
2008	1,742	912	2,654	1,285	1,749	3,034	336	1,356	1,692	3,363	5,199	8,562
2009	645	1,026	1,671	808	1,481	2,289	310	1,386	1,696	1,763	4,783	6,546
2010	731	1,580	2,311	2,580	1,673	4,253	789	1,770	2,559	4,100	6,034	10,134
2011	1,308	1,746	3,054	1,718	1,806	3,524	441	1,559	2,000	3,467	5,817	9,284
2012	581	827	1,408	1,817	1,514	3,331	330	1,749	2,079	2,728	4,162	6,890
2013	1,438	1,099	2,537	3,180	2,630	5,810	638	1,773	2,411	5,256	5,766	11,022
2014	1,160	1,379	2,539	2,964	2,095	5,059	438	2,735	3,173	4,562	7,427	11,989
2015	2,282	1,904	4,186	3,594	4,472	8,066	902	4,277	5,179	6,778	12,737	19,515
2016	1,962	1,801	3,763	5,335	4,533	9,868	344	4,762	5,106	7,641	12,364	20,005
2017	1,862	1,294	3,156	5,059	3,628	8,687	903	3,615	4,518	7,824	9,614	17,438
2018	1,436	1,541	2,977	3,318	3,500	6,818	1,341	6,503	7,844	6,095	12,062	18,157
2019	1,586	645	2,231	4,246	2,589	6,835	1,667	3,656	5,323	7,499	8,151	15,650
2020	592	1,188	1,780	4,756	2,319	7,075	1,795	3,540	5,335	7,143	8,002	15,145
2021	1,315	464	1,779	7,471	3,544	11,015	1,455	3,128	4,583	10,241	8,100	18,341
2022	1,490	897	2,387	4,534	3,853	8,387	1,520	3,422	4,942	7,544	9,224	16,768
Averages												
1986–2001 <sup>b</sup>	4,507	2,569	7,076	–	–	–	–	–	–	4,222	9,581	13,804
2002–2018	1,820	1,664	3,485	2,769	2,599	5,368	510	2,433	2,943	5,100	8,522	13,621
2019–2021	1,164	766	1,930	5,491	2,817	8,308	1,639	3,441	5,080	8,294	8,084	16,379

Source: Mills (1987–1994); Howe et al. (1995, 1996); Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: ADF&G, Division of Sport Fish (cited September 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Data for 1986–2001 published in Kerkvliet et al. (2016: Table 9).

Note: Charter and nonguided designations were first reported in the SWHS in 1986.

<sup>a</sup> The total Management Area (MA) harvest contains harvest from other locations including the NDFL and shoreline fishing in Upper Cook Inlet and is not just the sum of the summer and winter fisheries.

<sup>b</sup> The LCI Summer and Winter Fisheries were not separated in regulation prior to 2002 and thus cannot be averaged over that time.

Table 6.—Annual salmon smolt releases to terminal fisheries in Kachemak Bay, 2000–2022.

Release year	Nick Dudiak Fishing Lagoon on the Homer Spit			Halibut Cove Lagoon	Seldovia	
	Early-run Chinook	Early-run coho	Late-run coho	Early-run Chinook	Early-run Chinook	Late-run coho
2000	219,984	–	122,338	83,277	68,114	–
2001	208,062	100,280	124,762	106,719	102,793	–
2002	190,026	95,648	120,707	106,279	83,045	–
2003	206,292	222,735 <sup>a</sup>	105,000 <sup>b</sup>	106,844	107,521	–
2004	168,743	130,243	110,000 <sup>b</sup>	103,771	88,682	–
2005	220,822	125,707	91,485 <sup>b,c</sup>	112,521	114,984	–
2006	224,053	125,216	324,200 <sup>b,c</sup>	117,549	113,974	113,800 <sup>b,c</sup>
2007	226,972	127,244	100,600 <sup>b</sup>	54,560	54,276	–
2008	212,141	125,108	95,000 <sup>b</sup>	59,784	54,464	–
2009	164,234	113,696	44,695 <sup>d</sup>	35,065	44,487 <sup>e</sup>	–
2010	213,503 <sup>d</sup>	130,206	–	111,134	114,421	–
2011	224,028 <sup>d</sup>	64,595	64,595	107,338	104,095	–
2012	221,547	53,625	53,625	110,253	95,800	–
2013	216,963	66,014	66,014	60,666	63,311	–
2014	178,224	76,535	–	85,856	74,259	–
2015	210,543	122,963	–	102,718	72,233	–
2016	213,779	131,491	–	110,546	102,552	–
2017	202,358	135,713	–	94,236	104,806	–
2018	329,164	236,604	–	–	104,890	–
2019	313,734	121,514	–	–	108,779	–
2020	315,322	122,171	–	–	102,467	–
2021	328,484	123,277	–	–	103,679	–
2022	347,872	116,145	–	–	75,611	–

Source: Wilson 2021, 2022 and ADF&G hatchery program.

Note: Booz et al. (2019) reports these data from 1988 to 2019. An en dash indicates no stocking of this type at the location occurred.

<sup>a</sup> Includes 100,000 coho salmon diverted from Bird Creek because of highway construction.

<sup>b</sup> Purchased from Cook Inlet Aquaculture (CIAA) with a non-Fish and Game funding source.

<sup>c</sup> Treated for bacterial kidney disease (BKD).

<sup>d</sup> An additional 67,305 were stocked but died from a *Chaetoceros* sp. (diatom) bloom.

<sup>e</sup> One net pen with rearing salmon was sucked down the culvert resulting in unknown but significant mortality.

Table 7.—SWHS estimates of shore-based sport harvest and angler-days fished directed toward Chinook and coho salmon enhanced terminal fisheries on the Homer Spit, 2000–2022.

Year	Effort		Chinook salmon		Coho salmon	
	Number of Anglers	Angler-days	Harvest	Catch	Harvest	Catch
2000	9,663	23,236	2,012	2,471	7,067	9,120
2001	8,989	18,552	2,535	2,180	11,015	13,800
2002	12,611	25,083	2,621	3,925	14,508	19,535
2003	14,437	28,380	4,059	7,188	18,531	25,899
2004	12,945	32,185	4,068	5,886	21,009	27,215
2005	11,106	28,097	2,810	4,293	15,075	17,944
2006	8,764	20,898	2,092	3,133	4,450	6,235
2007	8,397	18,861	1,757	2,729	4,617	5,363
2008	5,903	12,649	833	1,237	3,767	4,833
2009	4,146	8,988	710	1,137	509	593
2010	4,332	10,551	883	1,382	1,007	1,471
2011	3,637	6,446	418	441	192	475
2012	2,666	4,086	14	30	58	58
2013	5,209	8,397	95	405	233	241
2014	8,544	20,566	1,060	1,200	9,418	11,315
2015	7,877	17,026	1,766	2,234	2,930	3,402
2016	6,737	13,384	1,033	1,268	1,404	1,901
2017	5,655	12,861	933	1,371	1,313	1,530
2018	7,975	14,183	518	1,186	4,477	4,998
2019	4,680	11,618	1,226	1,830	2,097	2,512
2020	4,238	8,368	906	1,192	1,215	1,585
2021	5,531	10,753	907	1,241	1,381	1,475
2022	5,756	11,899	948	1,064	3,201	4,529
Averages						
1986–1999	10,166	19,705	2,494	3,921	4,536 <sup>a</sup>	6,247
2000–2018	7,873	17,075	1,590	2,300	6,399	8,207
2019–2021	4,816	10,246	1,013	1,421	1,564	1,857

Source: Mills (1987–1994); Howe et al. (1995, 1996); Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited January 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Charter Logbook database [Internet]. 2006–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). URL not publicly available as some information is confidential. Contact Research and Technical Services for data requests. Data for 1986–1999 presented in Booz and Dickson (2023: Appendix B5).

Note: Catch was first reported in the SWHS during 1990.

<sup>a</sup> Coho salmon were first stocked in NDFL in 1989; average harvest is for 1989–1999.



Table 8.—SWHS estimates of Chinook salmon effort, harvest, and catch compared to days open for fishing for Kenai Peninsula roadside streams, 2000–2022.

Year	Anchor River				Deep Creek				Ninilchik River				All streams			
	Angler-days	Days open	Chinook salmon		Angler-days	Days open	Chinook salmon		Angler-days	Days open	Chinook salmon		Angler-days	Days open	Chinook salmon	
			Harvest	Catch			Harvest	Catch			Harvest	Catch			Harvest	Catch
2000	22,971	15	1,730	5,200	12,174	9	937	2,903	12,432	9	1,782	4,648	47,577	33	4,449	12,751
2001	19,195	15	889	2,415	7,834	12	593	1,380	10,602	12	1,399	3,014	37,631	39	2,881	6,809
2002	19,245	12	1,047	4,103	8,925	9	507	2,551	9,572	12	830	2,180	37,742	33	2,384	8,834
2003	17,520	12	1,011	4,311	8,959	9	775	2,121	9,843	26	1,452	4,205	36,322	47	3,238	10,637
2004	20,452	15	1,561	5,561	10,575	9	823	2,727	10,500	55	1,240	2,961	41,527	79	3,624	11,249
2005	20,079	15	1,432	5,028	10,182	9	642	1,791	9,003	9	1,342	2,042	39,264	33	3,416	8,861
2006	17,065	15	1,394	4,638	7,128	9	451	1,829	9,620	40	1,329	3,004	33,813	64	3,174	9,471
2007	34,390	15	2,081	9,792	9,382	9	628	2,493	10,211	58	1,575	4,774	53,983	82	4,284	17,059
2008	26,182	20	1,486	3,245	9,332	9	602	2,600	8,158	23	976	2,090	43,672	52	3,064	7,935
2009	22,057	8	737	2,296	8,367	9	124	767	7,687	23	203	560	38,111	40	1,064	3,623
2010	16,740	20	364	889	7,160	9	249	808	5,296	23	358	1,371	29,196	52	971	3,068
2011	9,131	15	573	1,227	3,537	9	251	894	2,292	23	258	678	14,960	47	1,082	2,799
2012	8,234	9	38	189	4,037	9	33	156	2,995	9	16	75	15,266	27	87	420
2013	11,173	12	97	423	2,003	9	130	439	1,232	9	103	122	14,408	30	330	984
2014	10,481	12	203	926	5,494	9	101	807	4,306	23	182	1,432	20,281	44	486	3,165
2015	13,850	13	344	1,159	4,498	9	294	441	2,162	23	69	563	20,510	45	707	2,163
2016	12,699	20	1,384	4,232	4,730	9	424	850	3,166	39	673	1,578	20,595	68	2,481	6,660
2017	11,685	20	845	2,888	3,978	9	322	849	3,081	39	253	988	18,744	68	1,420	4,725
2018	6,540	8	40	304	2,741	3	37	37	812	39	37	71	10,093	50	114	412
2019	7,722	9	151	575	2,796	9	105	528	1,950	39	116	465	12,468	57	372	1,568
2020	8,640	7	364	570	4,217	6	373	567	2,565	39	1,283	2,149	15,422	52	2,020	3,286
2021	4,803	8	0	104	2,284	3	10	10	3,301	39	399	780	10,388	50	409	894
2022	4,698	12	0	47	1,995	6	0	19	3,319	9	206	843	10,012	27	206	909
Averages																
1977–1999	27,926	14	1,306	4,585	14,085	13	994	3,323	14,237	12	1,789	5,948	56,249	38	4,089	13,856
2000–2018	16,826	14	908	3,096	6,897	9	417	1,392	6,472	26	741	1,913	30,194	49	2,066	6,401
2019–2021	7,055	8	172	416	3,099	6	163	368	2,605	39	599	1,131	12,759	53	934	1,916

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Data for 1977–1999 published in Kerkvliet et al. (2016).

Table 9.–Ninilchik River Chinook salmon proportionate natural influence (PNI) metrics as calculated by proportion wild broodstock (pNOB) and proportion hatchery spawners (pHOS), 2011–2022.

Year	Chinook salmon		
	pNOB	pHOS	PNI
1999	1.0	0.27	0.79
2000	1.0	0.31	0.77
2001	1.0	0.30	0.77
2002	1.0	0.23	0.81
2003	1.0	0.23	0.81
2004	1.0	0.25	0.80
2005	1.0	0.16	0.86
2006	1.0	0.16	0.86
2007	1.0	0.09	0.92
2008	1.0	0.06	0.94
2009	1.0	0.08	0.92
2010	1.0	0.05	0.96
2011	1.0	0.03	0.97
2012	1.0	0.06	0.94
2013	1.0	0.09	0.92
2014	1.0	0.22	0.82
2015	1.0	0.13	0.88
2016	1.0	0.32	0.76
2017	1.0	0.23	0.81
2018	1.0	0.18	0.84
2019	1.0	0.26	0.79
2020	1.0	0.61	0.62
2021	1.0	0.61	0.62
2022	1.0	0.41	0.71
Averages			
1999–2018	1.0	0.17	0.86
2019–2021	1.0	0.49	0.68

Source: Dickson and Booz 2022; unpublished data ADF&G SF Homer.

Note: PNI = pNOB/(pNOB + pHOS)

Table 10.—SWHS estimates of sport catch of steelhead and rainbow trout in Lower Kenai Peninsula roadside streams, 2000–2022.

Year	Anchor River	Stariski Creek	Deep Creek	Ninilchik River	All streams
2000	8,693	329	1,805	760	11,587
2001	3,045	51	627	283	4,006
2002	3,501	203	954	468	5,126
2003	3,409	46	2,456	952	6,863
2004	3,710	39	4,365	400	8,514
2005	2,524	106	1,355	934	4,919
2006	4,513	13	1,234	563	6,323
2007	8,365	23	2,668	725	11,781
2008	8,733	195	3,672	1,465	14,065
2009	4,119	113	1,463	1,181	6,876
2010	2,018	21	1,043	360	3,442
2011	401	19	122	53	595
2012	1,833	34	681	169	2,717
2013	2,246	38	515	100	2,899
2014	3,621	9	932	309	4,871
2015	2,892	33	728	336	3,989
2016	2,516	220	386	145	3,267
2017	3,010	ND	952	183	4,145
2018	2,052	ND	822	1,089	3,963
2019	1,368	ND	334	235	1,937
2020	1,943	88	1,125	201	3,357
2021	260	ND	201	219	680
2022	857	ND	196	86	1,139
Average					
1989–1999	3,455	81	863	527	4,911
2000–2018	3,747	88	1,409	551	5,787
2019–2021	1,190	88	553	218	1,991

Source: Mills (1991–1994); Howe et al. (1995, 1996); Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. 1989 catch estimates from unpublished Statewide Harvest Survey data. Data for 1989–2015 catch and harvest presented in Kerkvliet et al. (2016: Table 31).

Note: ND means no data, indicating no estimates from the SWHS due to a lack of responses for the fishery. Catch first estimated by SWHS during 1989.

Table 11.—Harvest reconstruction for rockfish from Charter Logbook data expanded to include nonguided harvest proportions from SWHS data and species proportions from the port sampling data for lower Cook Inlet Management Area salt waters, 2006–2022.

Year	Black rockfish			Other pelagic rockfish			Yelloweye rockfish			Other nonpelagic rockfish			Total rockfish		
	Non-guided	Charter	Total	Non-guided	Charter	Total	Non-guided	Charter	Total	Non-guided	Charter	Total	Non-guided	Charter	Total
2006	1,051	2,955	4,006	2,101	1,281	3,382	750	838	1,588	300	318	618	4,203	5,392	9,595
2007	3,884	5,355	9,239	1,648	1,033	2,681	1,177	970	2,147	0	314	314	6,708	7,672	14,380
2008	1,733	5,721	7,454	2,339	200	2,539	0	1,040	1,040	0	249	249	4,071	7,210	11,281
2009	1,715	6,605	8,320	5,230	1,520	6,750	787	1,088	1,875	281	258	539	8,014	9,471	17,485
2010	3,111	5,231	8,342	4,715	4,543	9,258	0	1,245	1,245	131	1,862	1,993	7,957	12,881	20,838
2011	2,175	7,755	9,931	3,723	3,071	6,794	376	1,575	1,951	251	1,008	1,259	6,526	13,409	19,935
2012	3,179	6,520	9,698	2,326	4,363	6,689	1,396	1,244	2,640	0	660	660	6,900	12,787	19,687
2013	3,699	8,187	11,886	1,376	3,953	5,329	659	1,343	2,002	172	638	810	5,907	14,121	20,028
2014	2,372	9,059	11,430	4,065	5,346	9,412	339	1,166	1,505	145	734	879	6,921	16,305	23,226
2015	2,689	12,996	15,686	5,585	4,391	9,976	414	1,266	1,680	207	899	1,106	8,895	19,552	28,447
2016	3,266	15,204	18,470	5,443	7,191	12,635	233	1,460	1,693	233	1,187	1,420	9,176	25,042	34,218
2017	3,951	14,773	18,724	2,084	6,819	8,903	521	2,010	2,531	217	1,226	1,443	6,773	24,828	31,601
2018	8,326	15,622	23,947	4,724	9,965	14,689	827	1,827	2,654	531	1,476	2,007	14,408	28,890	43,298
2019	11,227	25,561	36,788	3,742	9,916	13,658	798	2,691	3,489	245	1,550	1,795	16,013	39,718	55,731
2020	7,947	18,596	26,543	1,214	4,178	5,392	993	1,790	2,783	0	1,336	1,336	10,154	25,900	36,054
2021	6,938	36,510	43,448	3,869	5,758	9,627	534	3,123	3,657	667	2,269	2,936	12,008	47,660	59,668
2022	6,042	34,755	40,798	621	2,579	3,200	9,064	6,473	15,536	854	2,650	3,504	16,582	46,457	63,039
Averages															
Pre CSP															
2006–2013	2,568	6,041	8,609	2,932	2,495	5,428	643	1,168	1,811	142	663	805	6,286	10,368	16,654
Post CSP															
2014–2018	4,121	13,531	17,652	4,380	6,742	11,123	467	1,546	2,012	267	1,104	1,371	9,235	22,923	32,158
2019–2021	8,704	26,889	35,593	2,942	6,617	9,559	775	2,535	3,310	304	1,718	2,022	12,725	37,759	50,484

Source: Charter Logbook database [Internet]. 2006–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited January 2023). URL not publicly available as some information is confidential. Contact Research and Technical Services for data requests. Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Schuster, M., S. C. Meyer, and A. B. St. Saviour, ADF&G SF, unpublished data but see Booz and Dickson (2023).

Note: CSP means catch sharing plan for halibut management.

Table 12.—Harvest reconstruction of lingcod from Charter Logbook data expanded to include nonguided harvest proportions from SWHS data for lower Cook Inlet Management Area salt waters, 2006–2022.

Year	Charter Logbook harvest	SWHS harvest charter proportion	Expanded nonguided harvest	Total harvest
2006	2,239	0.816	503	2,742
2007	4,166	0.764	1,287	5,453
2008	4,589	0.816	1,036	5,625
2009	3,758	0.694	1,654	5,412
2010	3,387	0.774	990	4,377
2011	4,695	0.708	1,932	6,627
2012	2,661	0.695	1,170	3,831
2013	2,963	0.736	1,063	4,026
2014	1,631	0.772	482	2,113
2015	874	0.695	383	1,257
2016	656	0.716	260	916
2017	861	0.818	192	1,053
2018	638	0.702	271	909
2019	827	0.793	216	1,043
2020	882	0.614	554	1,436
2021	1,389	0.796	356	1,745
2022	1,470	0.688	667	2,137
<b>Averages</b>				
Pre CSP 2006–2013	3,557	0.75	1,205	4,762
Post CSP 2014–2018	932	0.74	317	1,249
2019–2021	1,033	0.73	376	1,408

Source: Charter Logbook database [Internet]. 2006–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited January 2023). URL not publicly available as some information is confidential. Contact Research and Technical Services for data requests. Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Schuster, M., S. C. Meyer, and A. B. St. Saviour, ADF&G SF, unpublished data but see Booz and Dickson (2023).

Note: CSP means catch sharing plan for halibut management.



## **FIGURES**

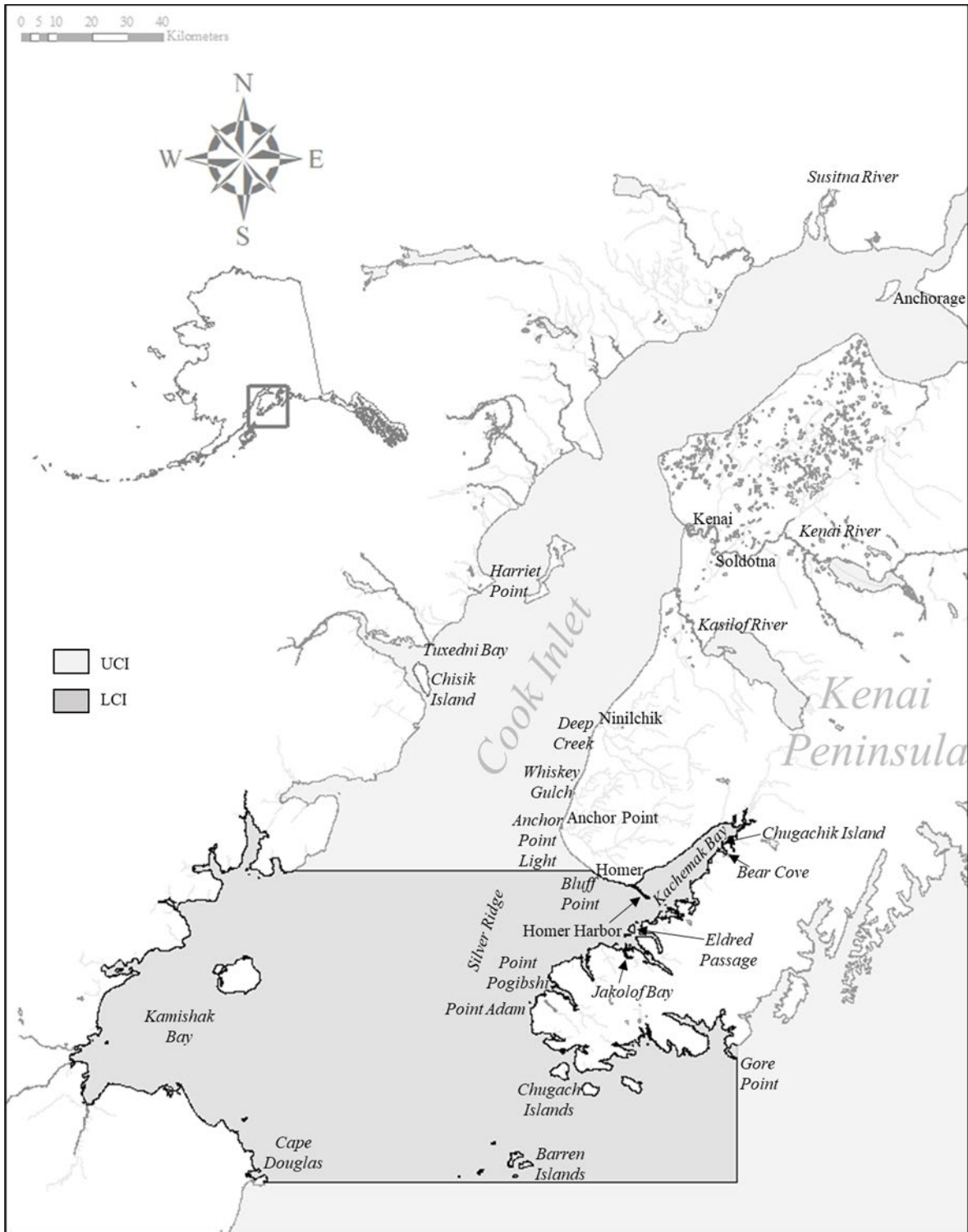


Figure 1.—Alaska Department of Fish and Game, Division of Sport Fish, Lower Cook Inlet Management Area (LCIMA).

*Note:* “LCI” is lower Cook Inlet; all LCI salt and fresh waters are included in LCIMA. “UCI” is upper Cook Inlet; all UCI salt waters are included in the LCIMA. Only the fresh waters south of the Kasilof River (Figure 2) and south of Chisik Island are included in the LCIMA; other fresh waters are located in different ADF&G management areas.





Figure 2.—Kenai Peninsula freshwater sport fishery locations (*italics*) in the Lower Cook Inlet Management Area.

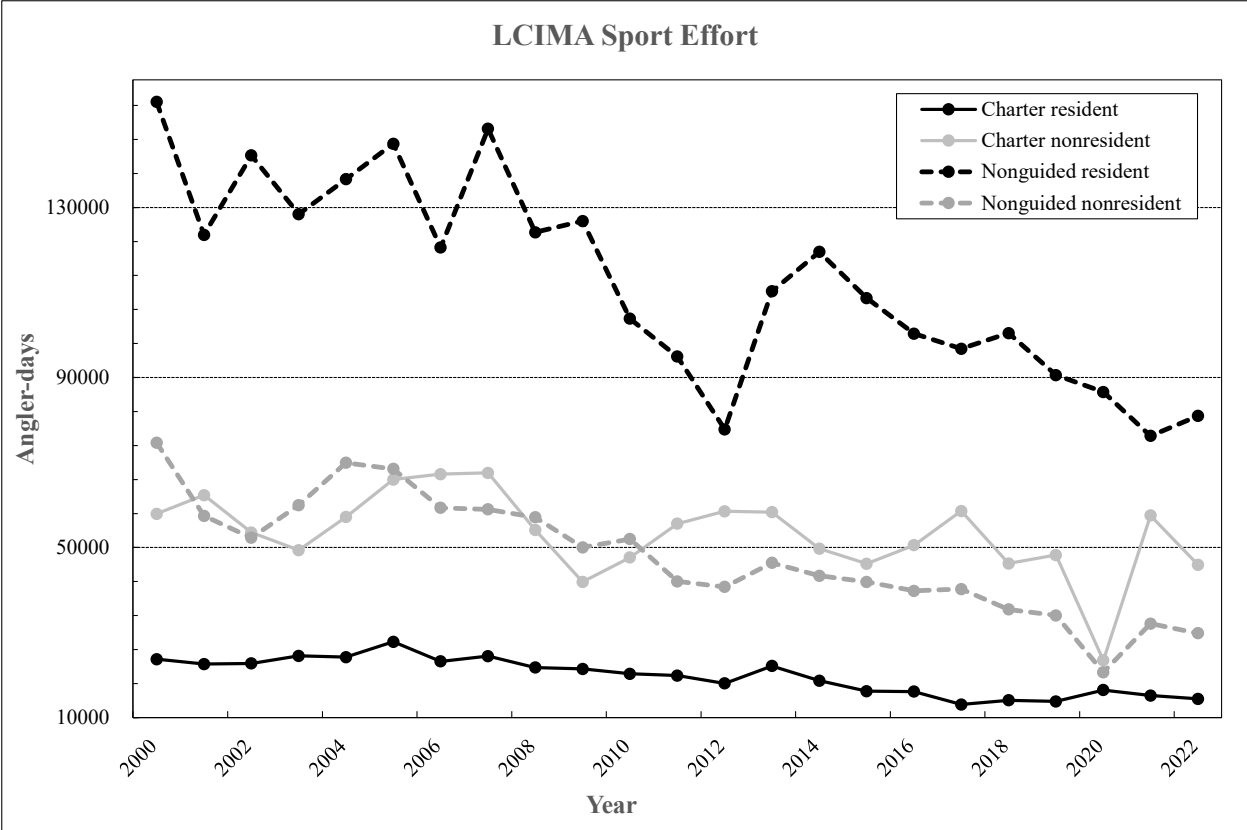


Figure 3.—SWHS estimates of sport anglers and effort (angler-days) by user group in the Lower Cook Inlet Management Area, 1993–2022.

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.



Figure 4.–Lower Cook Inlet enhanced terminal salmon fishery locations (italics) in the Lower Cook Inlet Management Area.

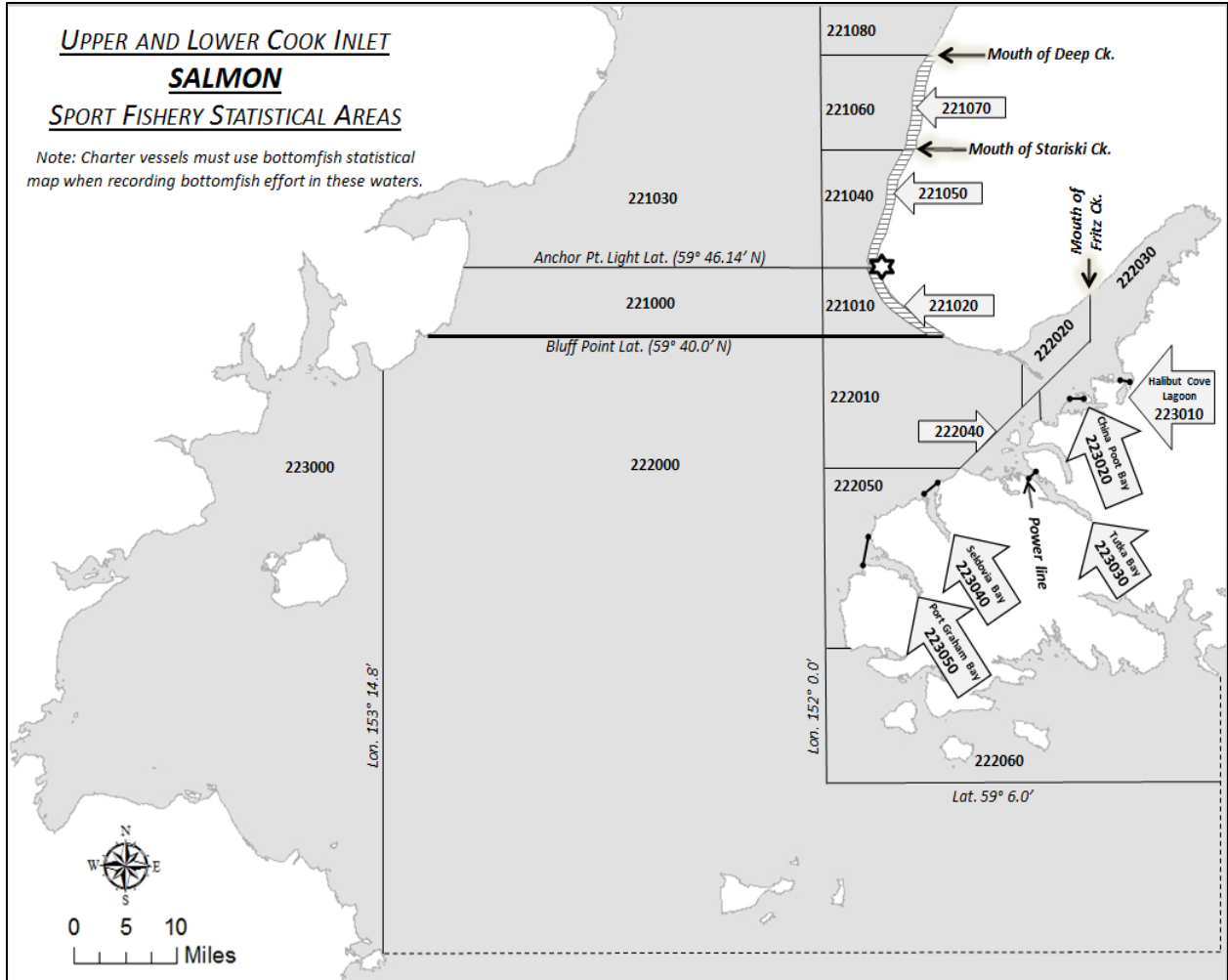


Figure 5.—Upper and Lower Cook Inlet salmon statistical areas for Charter Logbook reporting in the Lower Cook Inlet Management Area.

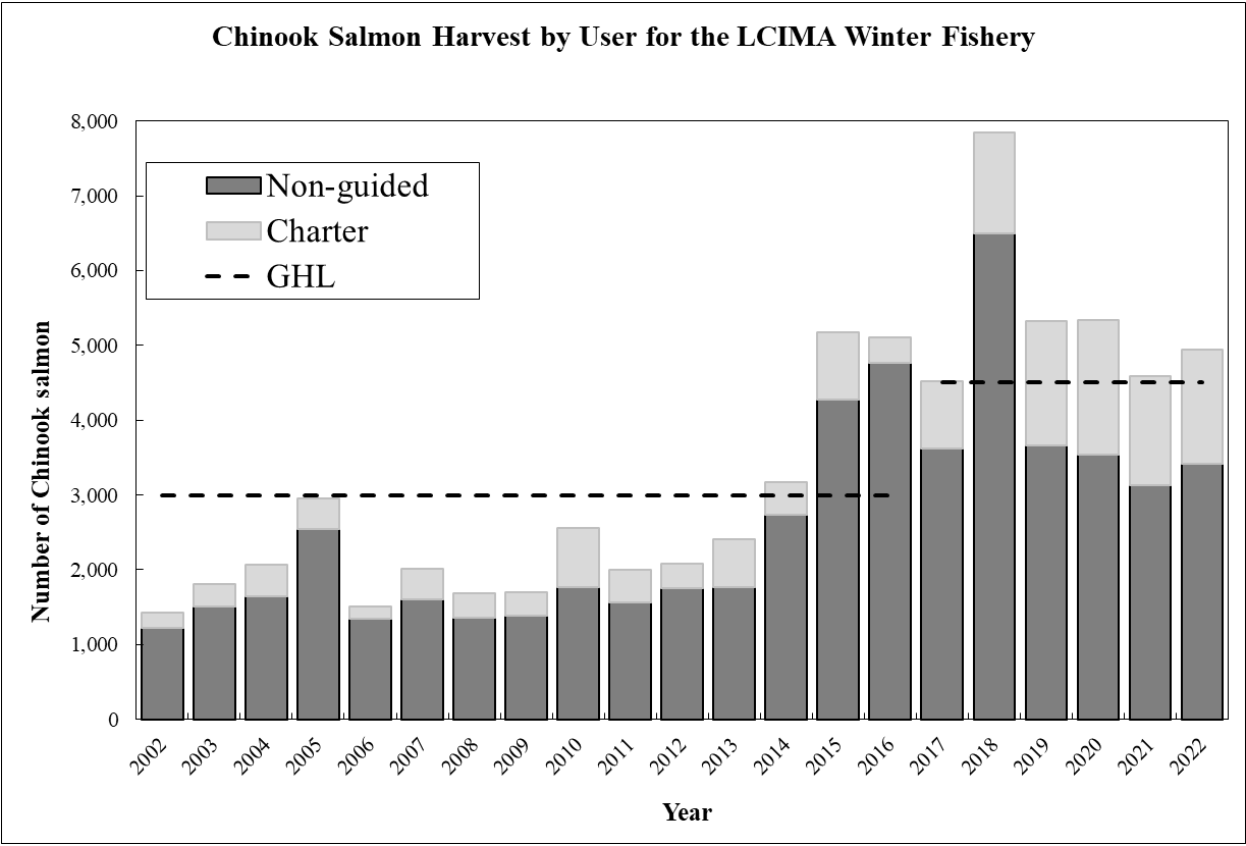


Figure 6.—SWHS estimates of Chinook salmon sport harvest by user group during the Winter Fishery in Lower Cook Inlet Management Area salt waters, 2002–2021.

Source: Alaska Sport Fishing Survey database [Internet]. 2002–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2023). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

Note: Dotted line indicates guideline harvest level (GHL) in place at the time.

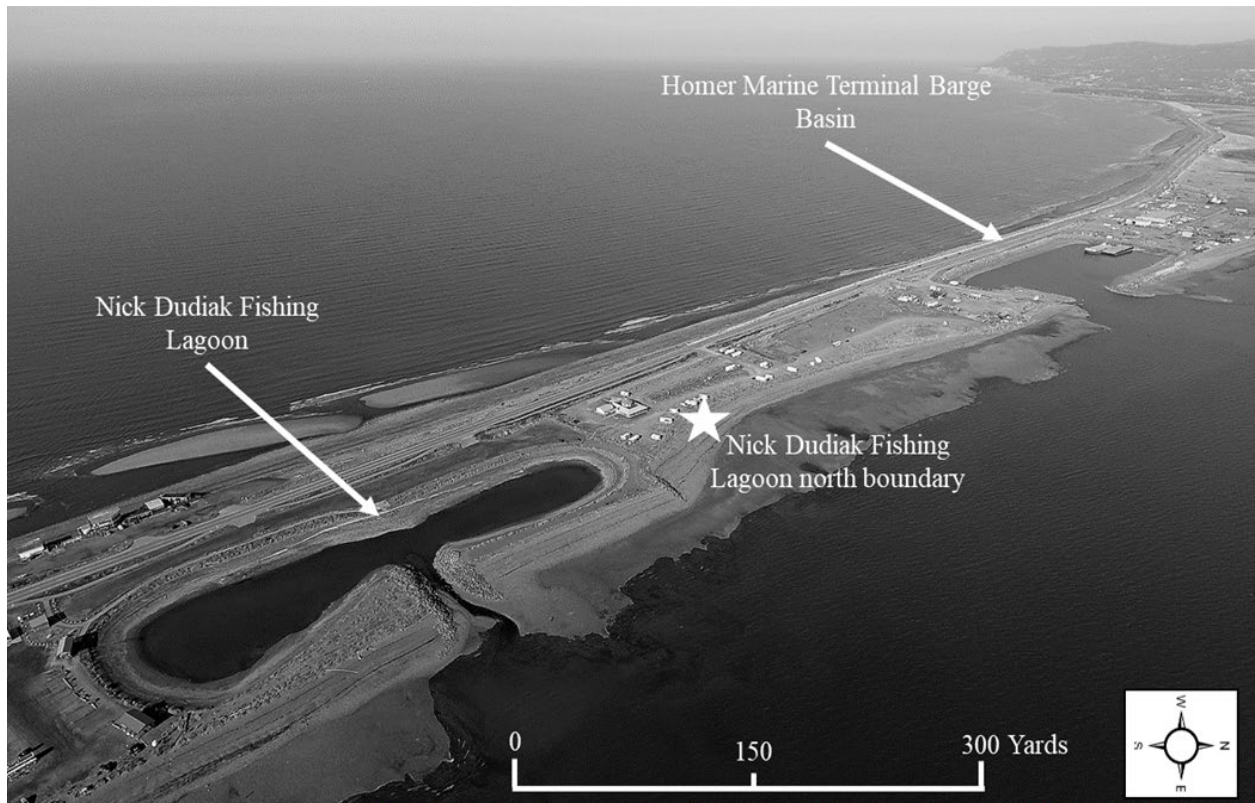


Figure 7.—Location of Nick Dudiak Fishing Lagoon, its northern land boundary, and Barge Basin on the Homer Spit.

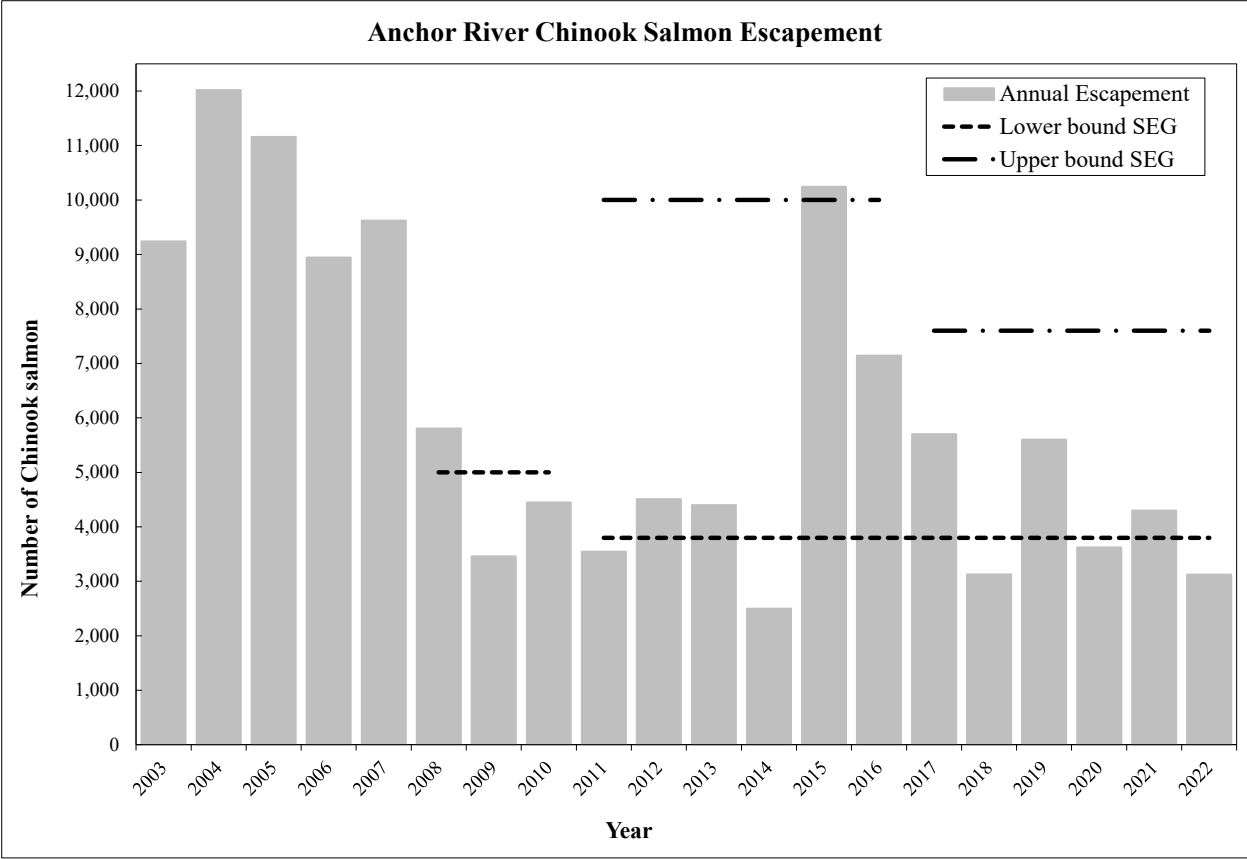


Figure 8.—Anchor River Chinook salmon escapement counts from fully enumerated runs relative to escapement goals, 2003–2022.

Source: Kerkvliet and Booz 2020; unpublished data ADF&G SF Homer.

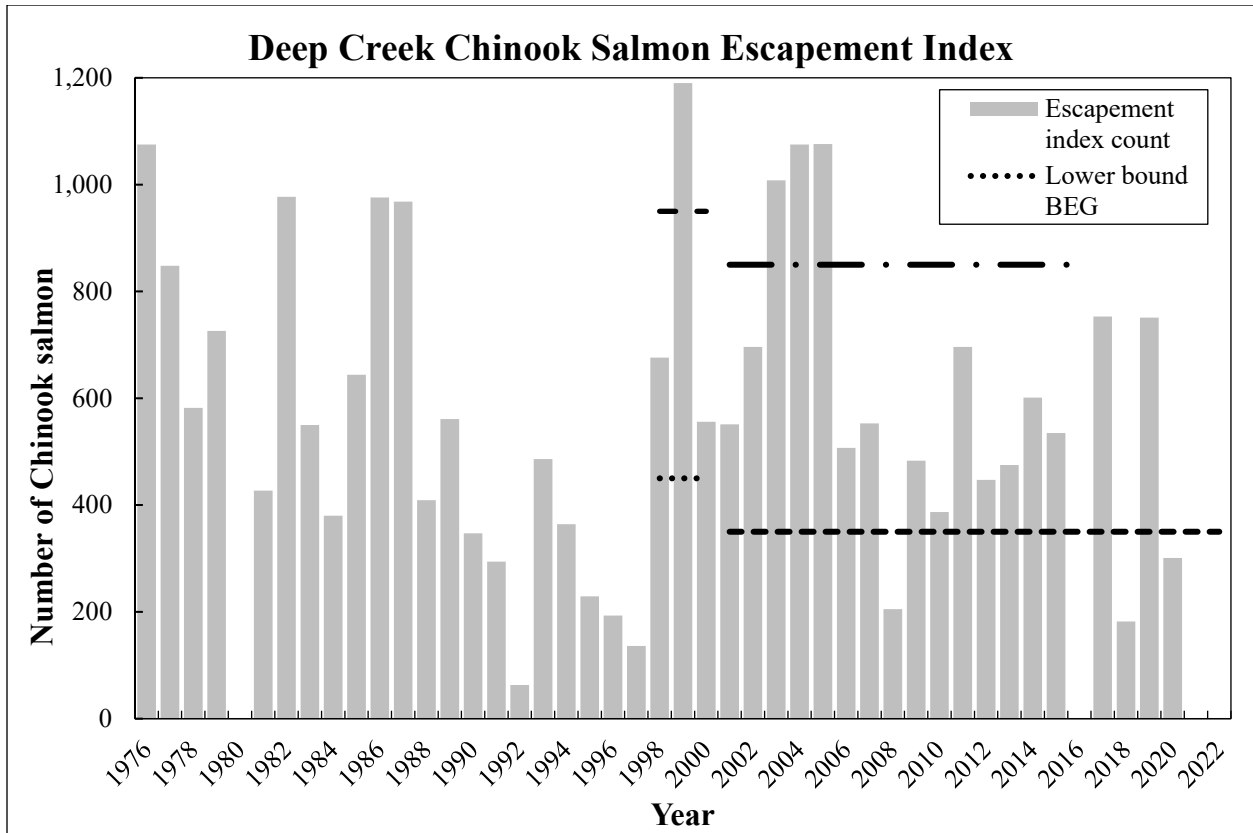


Figure 9.—Deep Creek Chinook salmon escapement counts from aerial surveys relative to escapement goals, 1976–2022.

Source: Begich and Evans 2005; unpublished data ADF&G SF Homer.



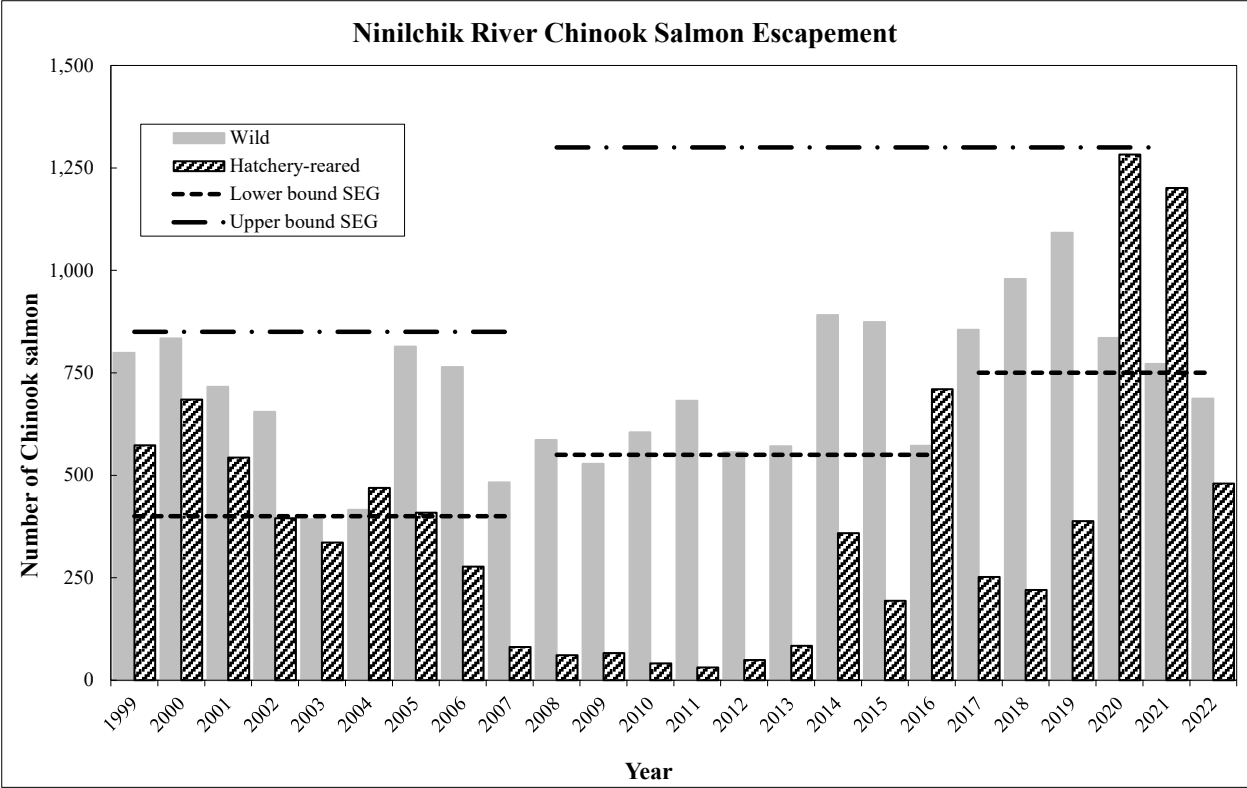


Figure 10.—Ninilchik River wild and hatchery-reared Chinook salmon escapement counts relative to escapement goals at the broodstock collection weir, 1999–2022.

Source: Dickson and Booz 2022; unpublished data ADF&G SF Homer.

Note: The SEG index monitoring period of July 8–24 was used to evaluate the escapement goal from 1999 to 2007. The period of July 3–31 was used from 2008–2016. Starting in 2017, the full run was used to monitor escapement.

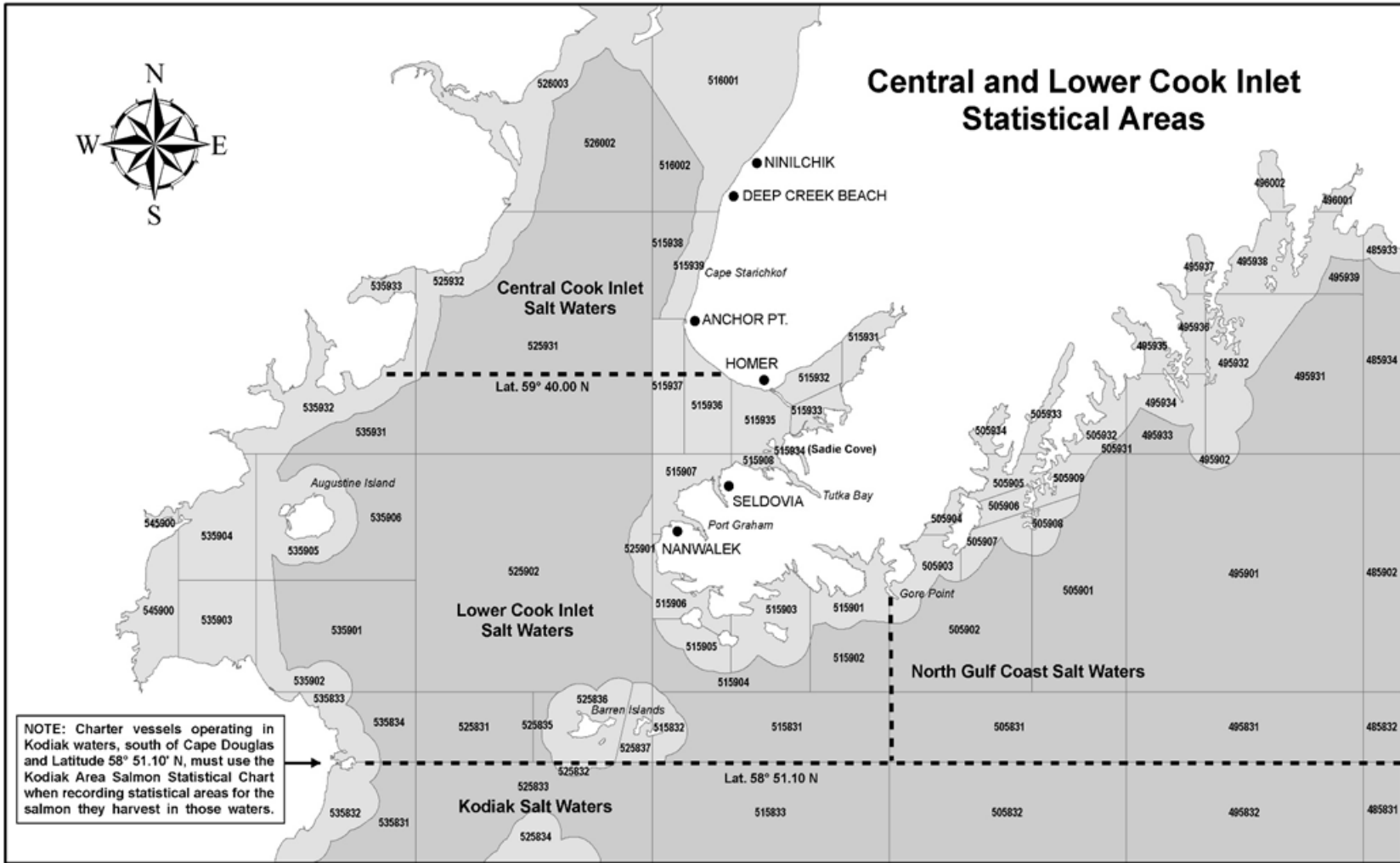


Figure 11.—Groundfish statistical areas for port sampling and Charter Logbook reporting in the Lower Cook Inlet Management Area.

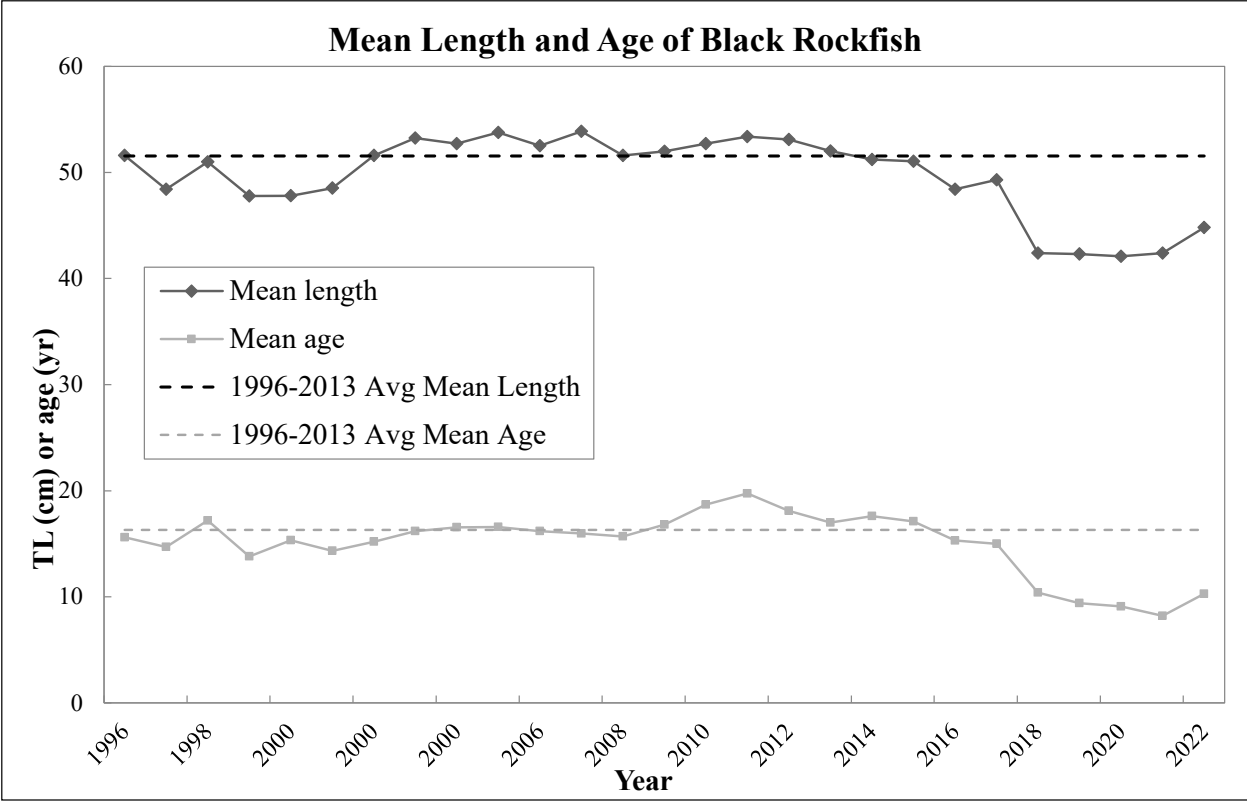


Figure 12.—Estimates of average total length (TL) and average age compared to historical averages of sport harvested black rockfish in the Lower Cook Inlet Management Area, 1996–2022.

Source: Schuster, M., ADF&G SF, unpublished data.

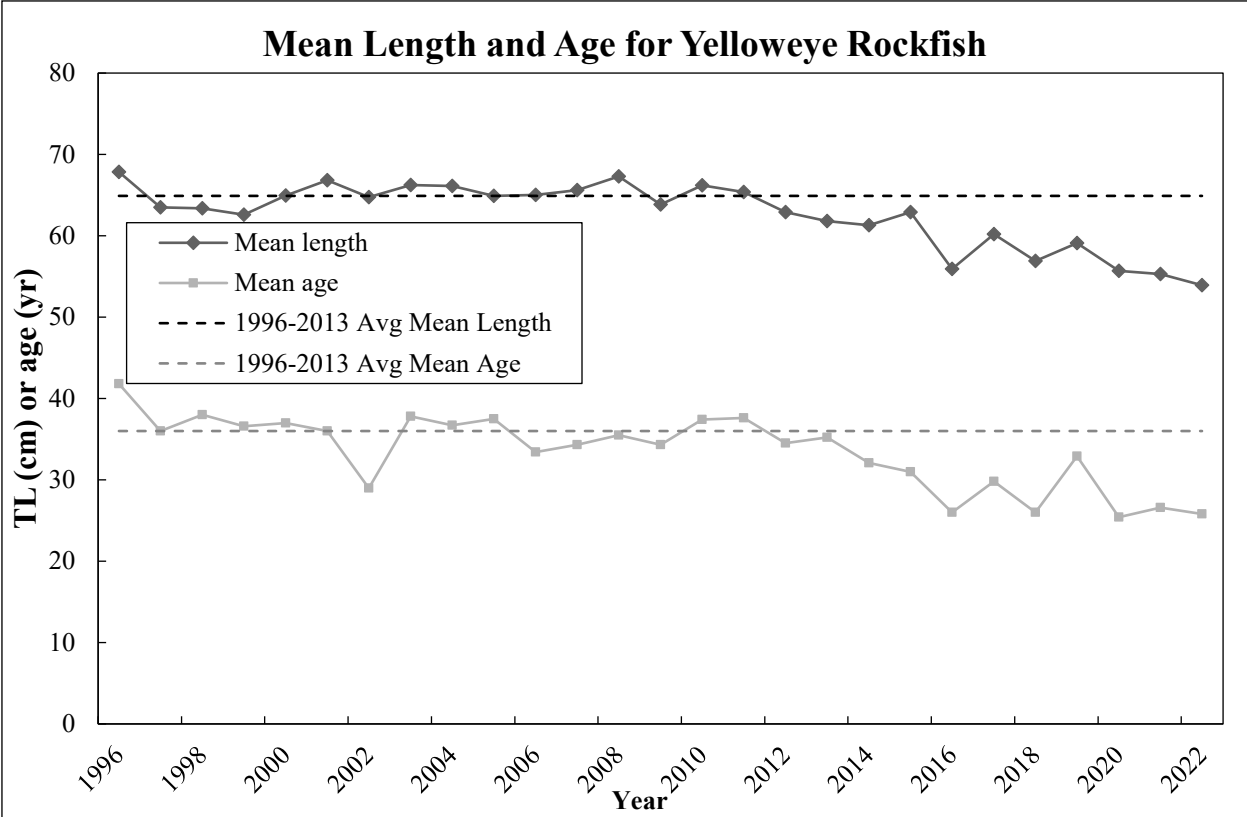


Figure 13.—Estimates of average total length (TL) and average age compared to historical average of sport harvested yelloweye rockfish in the Lower Cook Inlet Management Area, 1996–2022.

Source: Schuster, M., ADF&G SF, unpublished data.

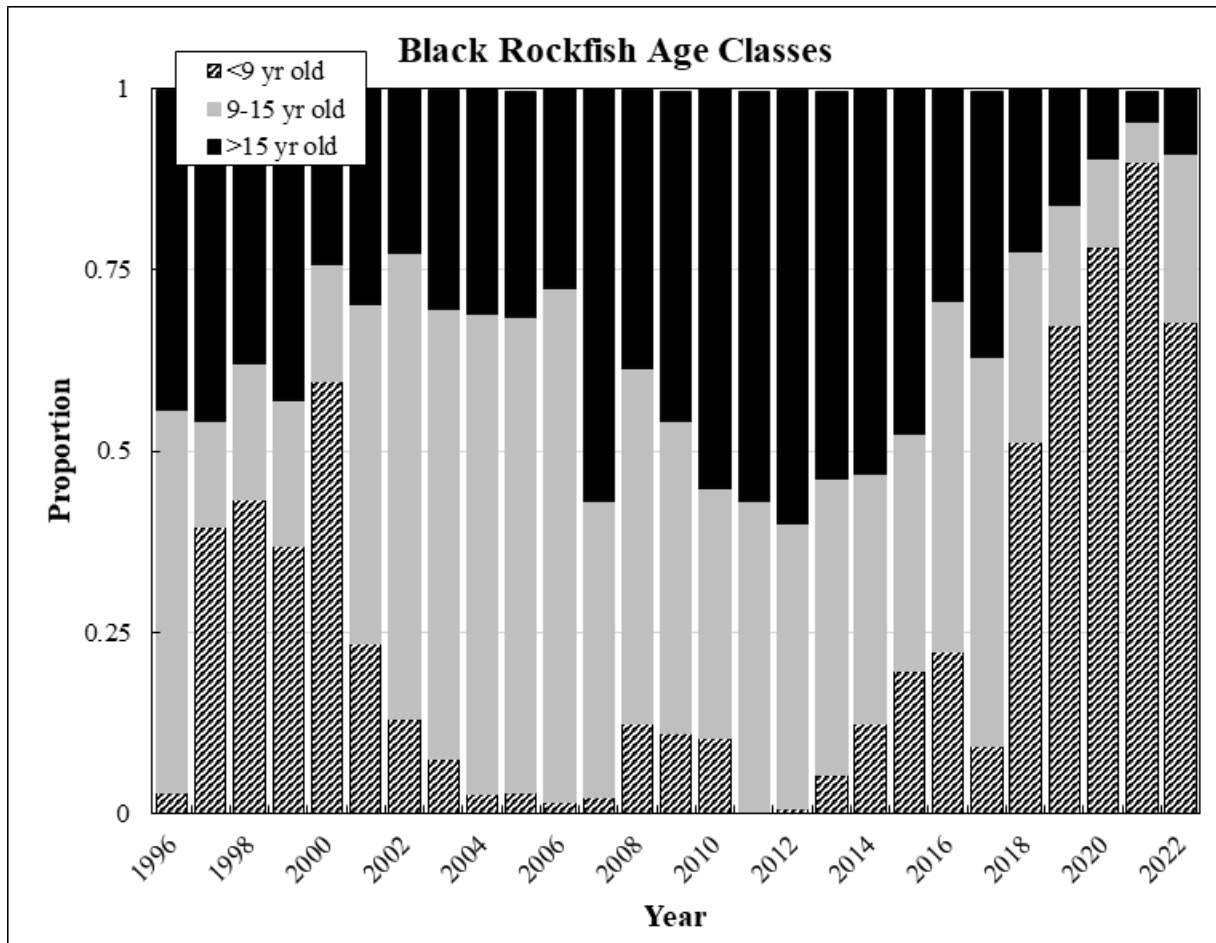


Figure 14.—Proportion of sport harvested black rockfish by age class in the Lower Cook Inlet Management Area, 1996–2022.

Source: Schuster, M., ADF&G SF, unpublished data.

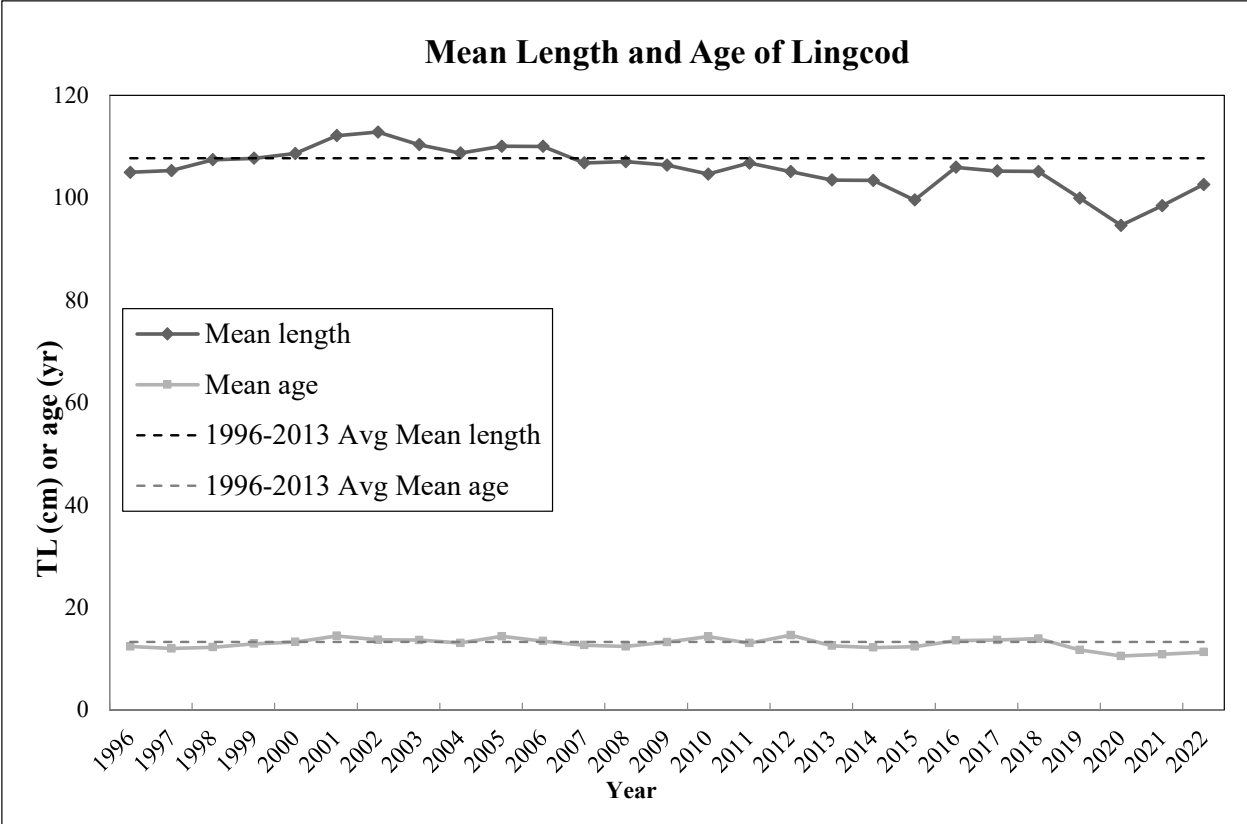


Figure 15.—Annual estimates of mean total length (TL) and mean age compared to historical averages of sport harvested lingcod in the Lower Cook Inlet Management Area, 1996–2022.

Source: Schuster, M., ADF&G SF, unpublished data.

## **APPENDIX A: EMERGENCY ORDERS**

**Emergency Orders issued in 2022:**

- 1) EO 2-RCL-7-01-22 closed east Cook Inlet beach areas from the mouth of the Kenai River to the southernmost tip of Homer Spit to sport fishing of all clam species, effective 12:01 AM, Saturday, 1 January through 11:59 PM, Saturday, 31 December 2022.
- 2) EO 2-RCL-7-02-22 closed east Cook Inlet beach areas from the mouth of the Kenai River to the southernmost tip of Homer Spit to the taking of all clam species for personal use, effective 12:01 AM, Saturday, 1 January through 11:59 PM, Saturday, 31 December 2022.
- 3) EO 2-KS-7-10-22 reduced the annual limit of Chinook salmon 20 inches or greater in length harvested in Cook Inlet salt waters north of the latitude of Bluff Point from 5 to 2 fish and prohibited Chinook salmon fishing within 1 mile of shore in the salt waters of Cook Inlet north of the latitude of Bluff Point, effective 12:01 AM Sunday, May 1 through 11:59 PM Sunday, July 31, 2022.
- 4) EO 2-KS-7-11-22 prohibited retention of Chinook salmon and restricted gear to only 1 unbaited, single-hook, artificial lure in the Anchor River effective 12:01 AM Saturday, May 21 through 11:59 PM Wednesday, June 22, 2022.
- 5) EO 2-KS-7-12-22 changed the Chinook salmon bag and possession limits in the Ninilchik River to hatchery Chinook salmon only. During the Memorial Day weekend (May 28–30, 2022), and the following 2 weekends and the Monday following each weekend (June 4–6 and June 11–13), and from June 16 to October 31, the bag and possession limits were 2 hatchery Chinook salmon 20 inches or greater in length and 10 hatchery Chinook salmon under 20 inches. During the Youth-Only Fishery on Wednesday, June 8, the bag and possession limits were 2 hatchery Chinook salmon of any size. From May 28 to June 13, after harvesting 2 Chinook salmon 20 inches or greater in length, anglers must stop fishing in the Ninilchik River, Deep Creek, and the Anchor River for the rest of that day. From June 16 to October 31, after harvesting 2 Chinook salmon 20 inches or greater in length, anglers must stop fishing in the Ninilchik River for the rest of that day. This emergency order also restricted gear to single-hook but allowed the use of bait from May 28 to July 15. This EO was effective from 12:01 AM Saturday, May 28 through 11:59 PM Monday, October 31, 2022.
- 6) EO 2-KS-7-24-22 superseded EO 2-KS-7-11-22 and closed the waters of the Anchor River and Deep Creek to sport fishing, effective 12:01 AM Saturday, June 11 through 11:59 PM, Friday, July 15, 2022.
- 7) EO 2-KS-7-25-22 superseded EO 2-KS-7-12-22 and restricted gear for the Ninilchik River to only 1 unbaited, single-hook, artificial lure and maintained the Chinook salmon bag and possession limits of 2 hatchery Chinook salmon 20 inches or greater and 10 hatchery Chinook salmon under 20 inches, effective 12:01 AM Saturday, June 11 through 11:59 PM, Friday, July 15, 2022.
- 8) EO 2-KS-7-28-22 superseded EO 2-KS-7-10-22 and prohibited sport fishing for Chinook salmon in the salt waters of Cook Inlet north of the latitude of Bluff Point, effective 12:01 AM Wednesday, June 15 through 11:59 PM, Friday, July 15, 2022.
- 9) EO 2-KS-7-29-22 superseded EO 2-KS-7-25-22 and closed the Ninilchik River to all sport fishing, effective 12:01 AM Thursday, June 16 through 11:59 PM, Friday, July 15, 2022.
- 10) EO 2-KS-7-38-22 allowed snagging in Nick Dudiak Fishing Lagoon waters beginning 12:00 PM, Wednesday, 29 June through 11:59 PM, Friday, 1 July 2022.
- 11) EO 2-KS-7-55-22 prohibited Chinook salmon fishing in the salt waters of Cook Inlet north of the latitude of Bluff Point effective 12:01 AM Sunday, July 17 through 11:59 PM Sunday, July 31, 2022.



Appendix A2.—Dates when snagging was opened by emergency order (EO) at Homer Spit’s Nick Dudiak Fishing Lagoon (NDFL).

Year	Broodstock		
	Early-run Chinook salmon	Coho salmon	Pink salmon
1989	Sat, 24 Jun	Sat, 02 Sep	Sat, 01 Jul
1990	Sun, 24 Jun	Mon, 17 Sep	—
1991	Mon, 24 Jun	Wed, 18 Sep	—
1992	Wed, 24 Jun	Fri, 18 Sep	Tue, 28 Jul
1993	Thu, 24 Jun	Wed, 22 Sep	Wed, 04 Aug
1994	Fri, 24 Jun	Wed, 14 Sep	—
1995	Wed, 28 Jun	Thu, 14 Sep	—
1996	—	Sun, 08 Sep	—
1997	Wed, 02 Jul to Mon, 07 Jul	Sat, 20 Sep	—
1998	Wed, 01 Jul to Sun, 05 Jul	Fri, 18 Sep	—
1999	Wed, 30 Jun to Sun, 04 Jul	Fri, 24 Sep	—
2000	Sat, 24 Jun to Sun, 02 Jul	Fri, 22 Sep	—
2001	Fri, 29 Jun to Sun, 08 Jul	Sun, 16 Sep	—
2002	Fri, 28 Jun to Sun, 07 Jul	Fri, 13 Sep	—
2003	Wed, 25 Jun to Sun, 06 Jul	Wed, 17 Sep	—
2004	Thu, 01 Jul to Mon, 05 Jul	Fri, 10 Sep	—
2005	Wed, 29 Jun to Fri, 01 Jul	Wed, 14 Sep	—
2006	Thu, 06 Jul to Sun, 09 Jul	—	—
2007	Thu, 05 Jul to Mon, 09 Jul	—	—
2008	—	Fri, 12 Sep	—
2009–2013	—	—	—
2014	—	Fri, 14 Aug	—
2015	Fri, 26 Jun to Sun, 28 Jun	Fri, 28 Aug	—
2016	Fri, 01 Jul to Mon, 04 Jul	—	—
2017	Fri, 14 Jul to Sun, 16 Jul	—	—
2018	—	Sat, 11 Aug	—
2019	Thu, 4 Jul to Sun, 7 Jul	—	—
2020	Tue, 30 Jun to Thu, 2 Jul	—	—
2021	Fri, June 25-27	—	—
2022	Wed, 29 Jun to Fri, 1 Jul	—	—

Appendix A3.– Halibut regulations including the implementation of halibut catch share plan (CSP) for Area 3A, 1995–2022.

Year	Halibut charter regulations					
	Bag Limit	Annual limit	Trip limits	Crew harvest	Closures	Other
1995–2006	2-fish bag limit (no size limit)	None	None	Crew harvest allowed	None	None
2007	2-fish bag limit (no size limit)	None	None	State EO prohibiting crew harvest May 1–Dec 31	None	None
2008	2-fish bag limit (no size limit)	None	None	State EO prohibiting crew harvest May 24–Sep 1	None	None
2009	2-fish bag limit (no size limit)	None	None	State EO prohibiting crew harvest May 23–Sep 1	None	None
2010–2013	2-fish bag limit (no size limit)	None	None	Crew harvest allowed	None	None
2014	2 fish bag limit, 1 ≤29 in	None	1 trip/vessel/day	Prohibited by CSP	None	Halibut CSP provisions
2015	2 fish bag limit, 1 ≤29 in	5	1 trip/vessel/day	Prohibited by CSP	Thursdays closed from Jun 15–Aug 31	Halibut CSP provisions
2016	2 fish bag limit, 1 ≤28 in	4	1 trip/vessel/day	Prohibited by CSP	Wednesdays closed all season	Halibut CSP provisions
2017	2 fish bag limit, 1 ≤28 in	4	1 trip/vessel/day	Prohibited by CSP	Wednesdays closed all season and 6 Tuesday closures	Halibut CSP provisions
2018	2 fish bag limit, 1 ≤28 in	4	1 trip/vessel/day	Prohibited by CSP	Wednesdays closed all season and 6 Tuesday closures	Halibut CSP provisions
2019	2 fish bag limit, 1 ≤28 in	4	1 trip/vessel/day	Prohibited by CSP	Wednesdays closed all season and 5 Tuesday closures	Halibut CSP provisions
2020	2 fish (1 ≤26 in Feb 1-Jun 14, ≤32 in after Jun 14)	4 through Jun 14	1 trip/vessel and per charter halibut permit per day	Prohibited by CSP	Tuesday and Wednesday closed Feb 1–Jun 14; none after Jun 14	Halibut CSP provisions
2021	2 fish (1 ≤32 in)	None	1 trip/vessel/day	Prohibited by CSP	Wednesdays closed all season	Halibut CSP provisions
2022	2 fish (1 ≤28 in)	None	1 trip/vessel/day	Prohibited by CSP	Wednesdays closed all season and 2 Tuesdays closed	Halibut CSP provisions

**APPENDIX B: CROSS-REFERENCED BOARD OF  
FISHERIES INFORMATION**

Appendix B1.—Cross reference of tables and figures specific to the 2023 Lower Cook Inlet Finfish Alaska Board of Fisheries meeting proposals.

Proposal number	Stock or species	Fishery	Background and recent performance pages	Tables	Figures
1	Chinook salmon	UCI Summer Fishery	Pages 6–11	4, 5	1
2	Chinook salmon	UCI Summer Fishery	Pages 6–11	4, 5	1
3	Chinook salmon	UCI Summer Fishery	Pages 6–11	4, 5	1
4	Chinook salmon	UCI Summer Fishery	Pages 6–11	4, 5	1
5	Chinook salmon	UCI Summer Fishery	Pages 6–11	4, 5	1
6	Chinook salmon	LCI Summer fishery	Pages 6–11	4, 5	1
7	Chinook salmon	Seldovia Enhanced Terminal Fishery	Pages 11–14	6	4
8	Chinook salmon	Seldovia Enhanced Terminal Fishery	Pages 11–14	6	4
9	Chinook salmon	Winter Fishery	Pages 6–11	4, 5	1, 6
10	Chinook salmon	Winter Fishery	Pages 6–11	4, 5	1, 6
11	Chinook salmon	Winter Fishery	Pages 6–11	4, 5	1, 6
13	Chinook salmon	Lower Kenai Peninsula Roadside Streams	Pages 18–27	8	2, 8, 9, 10
14	Chinook salmon	Ninilchik River	Pages 18–27	8, 9	2, 8, 9, 10
15	Chinook salmon	Ninilchik River	Pages 18–27	8, 9	2, 8, 9, 10
16	Chinook salmon	Ninilchik River	Pages 18–27	8, 9	2, 8, 9, 10
17	Chinook salmon	Ninilchik River	Pages 18–27	8, 9	2, 8, 9, 10
18	Rockfish	Cook Inlet-Resurrection Bay saltwater area	Pages 30–33	11	1, 12, 13, 14
19	Rockfish	Cook Inlet-Resurrection Bay saltwater area	Pages 30–33	11	1, 12, 13, 14
20	Rockfish	Cook Inlet salt waters	Pages 30–33	11	1, 12, 13, 14
21	Rockfish	Cook Inlet salt waters	Pages 30–33	11	1, 12, 13, 14
22	Rockfish	Cook Inlet salt waters	Pages 30–33	11	1, 12, 13, 14
23	Lingcod	Cook Inlet salt waters	Pages 34–35	12	1, 15
24	Spiny dogfish	Cook Inlet salt waters	None	None	None
25	Rockfish	Cook Inlet-Resurrection Bay saltwater area	Pages 30–33	11	1, 12, 13, 14
26	Lingcod	Cook Inlet-Resurrection Bay saltwater area	Pages 34–35	12	1, 15
29	Steelhead	Lower Kenai Peninsula Roadside Streams	Pages 27–29	10	None
31	Sockeye salmon	China Poot Personal Use Dip Net Fishery	Pages 15–17	None	4
32	Sockeye salmon	China Poot Personal Use Dip Net Fishery	Pages 15–17	None	4
33	Sockeye salmon	China Poot Personal Use Dip Net Fishery	Pages 15–17	None	4