Fishery Management Report No. 19-20

Sport Fisheries in the Lower Cook Inlet Management Area, 2017–2018, with Updates for 2016

by

Michael D. Booz

Martin Schuster

Holly I. Dickson

and

Carol M. Kerkvliet

November 2019

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

Symbols and Abbreviations

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

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

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

FISHERY MANAGEMENT REPORT NO. 19-20

SPORT FISHERIES IN THE LOWER COOK INLET MANAGEMENT AREA, 2017–2018, WITH UPDATES FOR 2016

by
Michael D. Booz
Alaska Department of Fish and Game, Division of Sport Fish, Homer
Martin Schuster
Alaska Department of Fish and Game, Division of Sport Fish, Homer
Holly I. Dickson
Alaska Department of Fish and Game, Division of Sport Fish, Homer
and
Carol M. Kerkvliet
Alaska Department of Fish and Game, Division of Sport Fish, Homer

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

November 2019

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.

Michael D. Booz,
Alaska Department of Fish and Game, Division of Sport Fish,
3298 Douglas Place, Homer, Alaska, 99603-8027, USA
Martin Schuster
Alaska Department of Fish and Game, Division of Sport Fish,
3298 Douglas Place, Homer, Alaska, 99603-8027, USA
Holly I. Dickson
Alaska Department of Fish and Game, Division of Sport Fish,
3298 Douglas Place, Homer, Alaska, 99603-8027, USA
and
Carol M. Kerkvliet,
Alaska Department of Fish and Game, Division of Sport Fish,
3298 Douglas Place, Homer, Alaska, 99603-8027, USA

This document should be cited as follows:
Booz, M. D., M. Schuster, H. I. Dickson, and C. M. Kerkvliet. 2019. Sport fisheries in the Lower Cook Inlet Management Area, 2017–2018, with updates for 2016. Alaska Department of Fish and Game, Fishery Management Report No. 19-20, Anchorage.

TABLE OF CONTENTS

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS(Continued)

Page

LIST OF TABLES

LIST OF TABLES(Continued)

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

This report provides a detailed summary of the sport fisheries in the Lower Cook Inlet Management Area (LCIMA) for the years 2017 and 2018, with estimates of angler effort, catch, and harvest updated for 2016. Included for each sport fishery are a description and historical overview, current management strategies, and performance for 2017 and 2018. The LCIMA fisheries comprise saltwater salmon fisheries, including sport, terminal and personal use fisheries; freshwater fisheries; groundfish fisheries; shellfish fisheries; and educational fisheries. Updates on access projects are discussed as well.

Key words: Lower Cook Inlet Management Area, sport fisheries, Alaska Board of Fisheries, Chinook salmon, coho salmon, steelhead, Dolly Varden, Pacific halibut, rockfish, lingcod, razor clam, hardshell clam, Tanner crab, Dungeness crab, terminal fisheries, personal use, educational fisheries

INTRODUCTION

This fisheries management report provides information regarding the Lower Cook Inlet Management Area (LCIMA). The LCIMA report series is updated every 3 years and is provided for the Alaska Board of Fisheries (BOF), Fish and Game Advisory Committees (ACs), the general public, and other interested parties. It presents fisheries assessment information and management strategies that are developed from that information. In addition, this report includes a description of the fisheries' regulatory processes, the geographic and regulatory boundaries, funding sources, and other information concerning the Alaska Department of Fish and Game (ADF&G) Division of Sport Fish (SF) management of programs within the area.

The goals of SF are to protect and improve the state's sport fisheries 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. In order to implement these goals, ADF&G has a fisheries management process in place. A regional review is conducted annually, during which the status of important area fisheries is considered, and research needs are identified. Fisheries stock assessment projects are developed, scheduled, and implemented to meet information needs identified by fisheries managers. Projects are planned within a formal operational planning process. Biological information gathered from these research projects is combined with fishing effort information and input from user groups to assess the need for and development of fisheries management plans and to propose regulatory strategies. 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 fishing licenses. Federal aid funds are derived from federal taxes on fishing tackle and equipment, and this was 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 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 and was established by the Wallop–Breaux (W–B) Act. Other peripheral funding sources for research needs of LCIMA fisheries may include contracts with various government agencies and the private sector.

This area management report provides information regarding the LCIMA and its fisheries from 2017 and 2018 with updates on angler effort, catch, and harvest for 2016. This information is meant to inform the BOF, ACs, and the public about the current status of the fisheries and to facilitate discussions of the fisheries for subsequent BOF meetings.

ALASKA BOARD OF FISHERIES

The Alaska Board of Fisheries (BOF) is a 7-member board that sets fishery regulations and harvest levels, allocates fishery resources, and approves or mandates fishery conservation plans for the State of Alaska. BOF members are appointed by the governor for 3-year terms and must be confirmed by the legislature. Under the current operating schedule, the BOF considers fishery issues for regulatory areas or groups of regulatory areas on a 3-year cycle. Proposals to create new or modify existing regulations and management plans are submitted by ADF&G and the public (any individual can submit a proposal to the BOF) for evaluation by the BOF. During its deliberations, the BOF receives input and testimony through oral and written reports from ADF&G staff, members of the general public, representatives of local ACs, and special interest groups such as fishing associations and clubs. Members of the public provide their input concerning regulation changes and allocation by submitting written proposals and testifying directly to the BOF, by participating in local AC meetings, or by becoming members of local ACs.

ADVISORY COMMITTEES

Local ACs have been established throughout the State of Alaska to assist BOF and Alaska Board of Game members in assessing fisheries and wildlife issues and proposed regulation changes. AC meetings allow opportunity for direct public interaction with ADF&G staff attending the meetings to answer questions and provide clarification of proposed regulatory changes regarding resource issues of local and statewide concern. Within the LCIMA, there are 3 ACs: Homer AC, Seldovia AC, and Central Peninsula AC. ACs outside the LCIMA occasionally comment on proposals concerning LCIMA fisheries.

RECENT BOARD OF FISHERIES ACTIONS

The BOF meets annually but deliberates on each individual regulatory area on a 3-year cycle. The most recent BOF meetings for the LCIMA occurred for Lower Cook Inlet Finfish in December 2016, Statewide King and Tanner Crab and Supplemental Issues in March 2017, and Miscellaneous Shellfish in March 2018. The following are lists of regulatory changes from those meetings.

Lower Cook Inlet Finfish Board of Fisheries Meeting December 2016

Saltwater Fisheries

The BOF adopted several changes associated with the Upper Cook Inlet Chinook salmon (*Oncorhynchus tshawytscha*) summer sport fisheries.

The *Upper Cook Inlet Salt Water Early-run King Salmon Management Plan* (Alaska Administrative Code 5 AAC 58.055) was renamed as the *Upper Cook Inlet Summer Salt Water King Salmon Management Plan* because the plan was expanded to incorporate the entire area and season in which mature Cook Inlet Chinook salmon are present in Cook Inlet salt waters. This was accomplished by changing the end date of the plan from 30 June to 31 August; changing the location of the plan from all waters north of the latitude of Bluff Point (lat 59°40.00′N) to all waters north of lat 60°03.99′N, located approximately 1 mile north of the Ninilchik River; removing reference to Special Harvest Areas; and extending the duration for the closed areas surrounding

the Lower Kenai Peninsula roadside stream mouths. Regulations in the plan were updated to the following[1]:

1) After harvesting a king salmon ≥20 inches in length, anglers must stop fishing for king salmon for the remainder of the day but may fish for other species.
2) Guides and their crew may not fish for any species while clients are on board.
3) The conservation zones (the closed area surrounding the mouth of the Anchor River, Stariski Creek, Deep Creek, and the Ninilchik River) were expanded from ending 30 June to ending 15 July, and the closed area boundary north of the Ninilchik River was modified.

The BOF also adopted changes to the *Lower Cook Inlet Winter Salt Water King Salmon Sport Fishery Management Plan* (5 AAC 58.060), including removal of the northern boundary at the Anchor Point Light and expanding the area to include all Cook Inlet salt waters. In addition, the winter fishery season was extended by 1 month. Regulations for all Cook Inlet salt waters from 1 September to 31 March were updated to the following:

1) King salmon bag and possession is 2 of any size.
2) There is no annual limit or recording requirement.
3) The guideline harvest level was increased to 4,500 Chinook salmon.

Freshwater Fisheries

The BOF adopted changes to the Ninilchik River Chinook salmon sport fishery.

1) A youth-only fishery was created for king salmon between 6:00 AM and 9:59 PM on the second Wednesday after Memorial Day from the Sterling Highway bridge down to the mouth of the Ninilchik River (5 AAC 56.122[a][6][G]).
2) The hatchery-only king salmon fishery was expanded by 2 weeks by changing the start date from 1 July to 16 June (5 AAC 56.122[a][6][D][ii]).

Statewide King and Tanner Crab Board of Fisheries Meeting March 2017

The BOF adopted several changes to the Cook Inlet Tanner crab fisheries (5 AAC 58.022[a][11][A], 5 AAC 58.022[a][11][B], 5 AAC 02.325[b]).

1) The personal use fishery was repealed to reduce redundancy and complexity. As a result, the noncommercial Tanner crab fishery was defined as sport or subsistence fisheries.
2) The legal size of male Tanner crab was reduced from 5.5 inches to 4.5 inches based on new analyses of male size-at-maturity.
3) A limited noncommercial fishery was established from 1 October through the end of February. During this fishery, gear was limited to 1 pot per person with a maximum of 1 pot per vessel, bag and possession was limited to 3 legal-sized male Tanner crab, and a permit was required for each person who participates in the fishery.

[1] Note that Chinook salmon (*Oncorhynchus tshawytscha*) are called "king salmon" in the regulatory language.

Statewide Miscellaneous Shellfish Board of Fisheries Meeting March 2018

The BOF adopted a small change to the definition taking clams by requiring diggers to keep all clams dug and expanded this regulation throughout Cook Inlet (5 AAC 58.022[a][14][A] and 5 AAC 58.022[a][14][B]).

ADF&G Emergency Order Authority

ADF&G has emergency order (EO) authority (5 AAC 75.003) to modify time, area, and bag and possession limit regulations. EOs are implemented to address conservation issues for resident species. EOs are also implemented as a tool for inseason management of fisheries. Inseason management is usually in accordance with a fisheries management plan approved by the BOF. EOs issued under this authority for the LCIMA are summarized in Appendix A1.

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)[2]. The SWHS is a mail survey that is used to estimate annual sport fishing effort and harvest. Final estimates are available during the summer of the following year. The survey is designed to estimate effort in angler-days and the number of fish caught and harvested by location. Beginning in 1990, the survey was modified to also estimate catch (number of fish released plus number of fish 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 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 less 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.

Sport Fish Guide Licensing and 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 guided 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* spp.), and lingcod (*Ophiodon elongates*), and 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

[2] Information on the SWHS can be found at http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

(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).

The freshwater sport fishing guide logbook program ended following the 2018 fishing season. This action was a result of ADF&G's budget reduction process. The saltwater logbook program was continued because ADF&G has agreed to provide that data for Southeast Alaska Chinook salmon treaty obligations and federal halibut management actions.

LCIMA Fishery Management Report Structure

This report provides a description, management objectives, and recent performance of the sport fisheries in the LCIMA for 2017–2018 with updates for 2016. Historical monitoring is presented in both the fisheries descriptions and management objectives. Management objective sections include regulations and management plans, emergency order actions, historical regulation changes, and historical monitoring and data associated with each fishery. The focus of the recent performance sections for each fishery is a general overview of the fishery in the last 2 years, including the fishing conditions encountered by anglers when participating in the fishery and any management actions that occurred. Monitoring data for the last 2 years are also presented in the recent fisheries performance sections and are considered preliminary.

Most of the sport fishery catch, harvest and effort data used in this report are from the Statewide Harvest Survey and Charter Logbook (ADF&G Division of Sport Fish Freshwater Logbook Database and Saltwater Logbook Database. 2006 to present [URL not publicly available as some information is confidential. Contact Research and Technical Services for data requests]), and in annual or periodic Fishery Data Series reports focusing on Anchor River Chinook salmon escapement, Ninilchik River stock assessment and supplementation, Deep Creek Chinook salmon stock assessment, Eastside Cook Inlet razor clam assessment, characteristics of the sport rockfish *Sebastes* spp. harvest in Southcentral Alaska, composition of the lingcod sport harvest in Southcentral Alaska, genetic mixed stock assessment of Chinook salmon harvested in the Cook Inlet marine sport fishery, Chinook salmon sport harvest assessment in Cook Inlet salt waters, and bottom trawl surveys for Tanner crab in Kachemak Bay. All historical data used in this report are published in their respective reports.

LOWER COOK INLET MANAGEMENT AREA OVERVIEW

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 salt waters and 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).

LCIMA is divided into 3 subareas for the purpose of managing sport fisheries: upper LCIMA, which is north of Bluff Point but south of the Kasilof River drainage and contains the Kenai Peninsula roadside streams; lower LCIMA, which is south of Bluff Point including Kachemak Bay; and west LCIMA, which consists of the freshwaters and shellfish beaches along western

Cook Inlet within the LCIMA boundary. These area descriptions differ for groundfish fisheries (see Groundfish Fisheries section). The LCIMA supports saltwater sport fisheries for groundfish, salmon, and shellfish, freshwater sport fisheries for salmon and trout, and several personal use and educational fisheries. In the LCIMA, SF is responsible for managing the freshwater sport fisheries and a single freshwater personal use (PU) 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), and 1 PU salmon fishery is managed by the Division of Commercial Fisheries (CF), and except for residency requirements, most shellfish PU fisheries are indistinguishable from sport fisheries and essentially fall within SF jurisdiction.

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 (Figure 1). The 3 subareas of LCIMA comprise upper LCIMA, which includes sport fishing on the Lower Kenai Peninsula roadside streams (Figure 2); lower LCIMA, which historically supported a diversity of shellfish sport fisheries (Figure 3); and west LCIMA, which supports sport fishing opportunities including shellfish and freshwater streams that are remotely accessed by small aircraft or large boats (Figure 4).

The LCIMA sport fisheries result in robust annual harvests of salmon and groundfish. A diversity of groundfish sport fishing opportunities are available in the LCIMA salt waters. Pacific halibut is the primary sport fish harvested in lower LCIMA. 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. Sockeye and coho salmon also support personal use fisheries.

A variety of shellfish stocks have supported sport and personal use fisheries in LCIMA. The state's largest sport and personal use Pacific razor clam (*Siliqua patula*) fishery historically occurred along a 50-mile area of beach between the Kasilof and Anchor rivers on the east side of Cook Inlet, but has been closed since 2015 because of low abundance of adult clams (Figure 3). The razor clam sport and personal use fishery along the west side of Cook Inlet has remained unaffected. The largest hardshell clam (Pacific littleneck [*Protothaca staminea*] and butter clam [*Saxidomus gigantea*]) fishery in Southcentral Alaska occurs in Kachemak Bay. A Tanner crab (*Chionoecetes bairdi*) fishery periodically opens in Kachemak and Kamishak bays. Red king crab (*Paralithodes camtschaticus*), Dungeness crab (*Cancer magister*), and shrimp (*Pandalus* spp.) are all indigenous to the area, but fisheries for these species are all closed because of low stock abundance. Shrimp and Dungeness crab sport fisheries have been closed since the late 1990s.

This report discusses the major sport and personal use fisheries in the LCIMA. It provides sport angler effort, harvest, and catch trends in the LCIMA based on SWHS and Charter Logbook data. There may be some small differences in reported estimates when compared to previous reports as the data summaries are updated and corrected.

MANAGEMENT PLANS

The regulations governing the sport fisheries of the LCIMA are found in Alaska statute and administrative codes. 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 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), *Sport Shark Fishery Management Plan* (5 AAC 75.012), *Southern District Hardshell Clam Fishery Management Plan* (5 AAC 38.318), and *Registration Area H Tanner crab harvest strategy* (5 AAC 35.408).

AREA EFFORT AND HARVEST OVERVIEW

The LCIMA supports the second highest sport fishing effort in Alaska after the Upper Kenai Peninsula Management Area. From 2000 through 2015, LCIMA accounted for an average of 11.4% of the total statewide sport fishing effort (Table 1). In most years, roughly half of the number of anglers that sport fish in LCIMA are chartered; but on average from 2000 to 2015, 30.4% of the angler-days were fished by chartered anglers (calculated from Table 2). On average (2000–2015), resident anglers represent approximately 48% of the number of anglers and 57% of the days fished in LCIMA (Table 2).

Although most of the sport fishing effort occurs in salt waters, for most years, both freshwater finfish and shellfish fisheries have contributed roughly equal portions to the total LCIMA effort (Table 1). Freshwater sport fishing primarily occurs in the roadside streams on the lower Kenai Peninsula (Table 3). The lower Kenai Peninsula roadside 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.

Historically on average (1977–2015), upper LCIMA effort (141,892 angler-days) accounted for 55% of the total LCIMA effort, and lower LCIMA (including Kachemak Bay) effort (118,748 angler-days) accounted for about 45% of the area effort (Kerkvliet et al. 2016). In the upper LCIMA, average effort from 2013 to 2015 (95,314 angler-days) was below the historical average (calculated from Table 1). The reduced effort was primarily in response to closure of the razor clam fishery and restrictions to roadside streams. In lower LCIMA, effort increased from the historical average during 2013–2015 (130,291; calculated from Table 1). The increased effort, primarily in the saltwater finfish fishery, was assumed to be primarily due to the year-round Chinook salmon fishery. Overall, only a small portion of the LCIMA sport fishing effort occurs in west LCIMA. Historically, that effort was equally split between saltwater, shellfish, and freshwater fisheries. Beginning in 2012, SWHS estimates of harvest from west LCIMA saltwater fisheries were incorporated into upper LCIMA and lower LCIMA fisheries to better align with Charter Logbook data.

In the LCIMA, most of the sport fishing effort occurs in salt water, and Pacific halibut is primarily harvested (Table 4). More Pacific halibut are harvested in the LCIMA than any other area in Alaska including all of Southeast Alaska combined. Pacific halibut harvest peaked in 2007 (Table 4). In LCIMA salt waters, Chinook salmon are the primary salmon species targeted, though coho salmon harvest may be higher in some years (Table 4). Cook Inlet is consistently one of the highest

saltwater Chinook salmon harvest locations in Alaska, behind Sitka and similar to Prince of Wales. The harvest of other groundfish contributes to the sport fishing diversity in LCIMA.

Recent Fisheries Performance

In the LCIMA sport fisheries in the recent years (2016–2018), the average number of sport anglers (116,183) and angler-days of effort (203,950) both declined from the last recent fishery performance period (2013–2015 averages: 126,525 anglers and 226,835 angler-days; Table 2). These changes in sport effort are a continued decline observed from all historical averages with the largest declines in nonguided Alaska resident angler effort. Both the number of anglers and days fished by charter nonresidents have remained stable from historical years (1993–1999) to the recent years. Approximately 50% (174,459/348,548) of the number of anglers in recent years were charter anglers. Alaska residents composed roughly 43% of the number of anglers annually and 53–58% of the number of days fished annually in recent years.

The declines in sport fishing effort in the LCIMA also appear in most types of fisheries in the 3 subareas (Table 1). Substantial declines occurred in upper LCIMA shellfish fisheries due to the emergency orders closing the clam fishery (see razor clam section below). The exception is an 3.6% increase in average angler-days in lower LCIMA saltwater fish (2016–2018: 130,592) over the last fisheries performance period (2013–2015: 126,004).

SALTWATER SALMON FISHERIES

AREAWIDE FISHERY DESCRIPTION

Cook Inlet salt waters support a diversity of year-round salmon sport fishing opportunities (Table 4). 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 from late June into September. 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, 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 2). Small boats may also be self-launched from any beach from Homer Spit north through Ninilchik. Residents from the south side of Kachemak Bay (Bear Cove to Port Graham) 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 guided saltwater effort towards salmon has been less than effort towards groundfish (Table 5). Charter Logbook data also 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 5).

CHINOOK SALMON

Fishery Description

Management Area

The LCIMA is composed of 3 boat-based Chinook salmon sport fisheries: the Upper Cook Inlet summer fishery, the Lower Cook Inlet summer fishery, and the winter fishery (all described in more detail below). Chinook salmon are also harvested in the Kachemak Bay terminal fisheries in lower LCIMA (see the Terminal Fisheries section). The Upper Cook Inlet summer fishery was historically divided into early-run (1 April–30 June) and late-run fisheries (after June 30) but these were combined starting in 2017. In lower LCIMA, Chinook salmon have been stocked in Kachemak Bay since the mid-1980s at the Nick Dudiak Fishing Lagoon (NDFL), Seldovia, and Halibut Cove Lagoon to create additional sport fisheries. Almost all effort is boat-based except for stocked terminal fishing opportunities. 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 assumed to be composed of only feeder Chinook salmon. Spawner Chinook salmon are primarily harvested in the Upper Cook Inlet early-run and late-run fisheries and a smaller portion is harvested in the Lower Cook Inlet summer fishery. Stocked Chinook salmon are harvested in all fisheries. Overall in LCIMA salt waters, charter anglers harvest a greater percentage of the total Chinook salmon harvest (Table 6). Based on SWHS estimates, over half of the Chinook salmon that are caught in the LCIMA saltwater sport fisheries are harvested (Figure 6).

In Cook Inlet salt waters, the harvest of both feeder and mature Chinook salmon are composed of a mixture of wild and hatchery stocks. The use of adipose fin clips (AFC) and coded wire tags (CWT) to mark Chinook salmon has not been consistent over time or by release location throughout the Pacific Northwest, which limits the assessment of these marks in the Cook Inlet sport fisheries. In the LCIMA, anglers have voluntarily provided heads from AFC fish to detect CWTs, and ADF&G has also collected heads during derbies or during creel monitoring. These samples were not necessarily collected proportionally to the harvest and may not represent the overall harvest. With these limitations, the results suggest that Chinook salmon from most of the geographic regions in the Pacific Northwest have been harvested in Cook Inlet salt waters (Table 7).

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 Upper Cook Inlet summer sport fishery to assess biological compositions including age, sex, length, and maturity, and the stock contribution through CWT recoveries (McKinley 1999; Begich 2007a). CWT recovery and maturity data from this project indicate that Cook Inlet harvests are composed of a diversity of stocks (Table 7). During these years, most of the harvest was mature fish (Table 8). 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 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 variation in the contribution of Ninilchik River hatchery-reared Chinook salmon is partly due to the reduction in stocking levels in 1995. The contribution of the 3 roadside

stocks (Anchor River, Stariski Creek, and wild Ninilchik River) was unknown but was assumed to be similar to these results.

From 2014 to 2016, composition of the harvest including length, maturity, and presence of CWTs was assessed, and genetic mixed-stock analysis (MSA) was conducted for the boat-based fisheries. Average length of harvested Chinook salmon was consistently larger in the Upper Cook Inlet summer fishery than the Lower Cook Inlet summer and all-area winter fisheries (Table 9). During 2014–2016, the percentage of the Upper Cook Inlet early-run fishery harvest that was mature fish was well below the historical (1996–2002) rates (Table 8). CWT recoveries were assessed with each fishery in these years, but most of the heads from adipose-finclipped fish did not contain a CWT (Table 10). In these years and fisheries, the decoded CWTs comprised a mixture of fish from all geographic regions of the Pacific Northwest. Over these years, the MSA results showed that harvest in all the boat-based fisheries were primarily composed of the *Outside Cook Inlet* reporting group (Barclay et al. 2019; Figure 7).

The SWHS provides estimates of Chinook salmon catch and harvest by location (upper or lower LCIMA), fishery, guided and unguided, and by residency. The SWHS has apportioned LCIMA Chinook salmon harvest by guided and unguided anglers since 1986. Historically, the majority of the saltwater Chinook salmon harvest in LCIMA is by guided anglers (Table 6). The Chinook salmon harvest in the winter fishery is primarily by unguided anglers. Approximately half of the Lower Cook Inlet summer fishery harvest is from guided anglers.

Charter Logbook data provide guided Chinook salmon catch and harvest by statistical area and date for each trip. Since 1998, SWHS estimates of saltwater guided angler Chinook salmon harvest reported in the LCIMA can be compared to the reported Chinook salmon harvest in charter logbooks (Table 11). It is assumed that the Charter Logbook harvest is more precise and accurate because it is required by regulation for guides to complete a log for each trip. Overall, there is fair agreement when comparing the charter logbook and SWHS Chinook salmon harvests for each year. Within the fisheries, the Upper Cook Inlet summer fishery has had the best agreement between the 2 datasets.

Upper Cook Inlet Summer Fishery

The Upper Cook Inlet summer fishery is accessed by the tractor launch facilities in Deep Creek and Anchor Point and the Homer harbor. The area is defined as all salt waters north of the latitude of Bluff Point (lat 59°40.00′N) to the latitude 1 mile north of the mouth of the Ninilchik River (lat 60°03.99′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. *In prep*). Anglers may shift their effort from nearshore waters to offshore waters (or to the Lower Cook Inlet 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 others 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 (Appendix A1). From 1987 to 2008, roughly 45% of the total LCIMA saltwater Chinook salmon harvest occurred in the Upper Cook Inlet summer fishery on average (calculated from Kerkvliet et al. 2016; Table 2), but during the recent low production years (2009–2015) for Cook Inlet stocks, it only composed 24% of the total on average (calculated from Table 6).

Lower Cook Inlet Summer Fishery

The Lower Cook Inlet 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) in the LCIMA. The season is currently aligned with the Upper Cook Inlet summer fishery from 1 April to 31 August. During the summer fishery, Chinook salmon are harvested throughout lower LCIMA 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 2).

Although anglers have been harvesting Chinook salmon in lower LCIMA for some time, the Lower Cook Inlet summer fishery was first defined in 2002 after the establishment of the winter fishery. The 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 GHL 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 Upper Cook Inlet summer fishery because the harvest has been primarily composed of nonlocal feeder Chinook salmon (based on maturity composition and genetic MSA results).

SWHS catch and harvest estimates for the Lower Cook Inlet summer fishery include the boat-based effort for the Kachemak Bay terminal fisheries, but the shore-based effort on Homer Spit is estimated separately. The contribution of these stocked fisheries to the Lower Cook Inlet 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 2002 to 2015, on average, the Lower Cook Inlet summer fishery contributed 41% of the total Cook Inlet saltwater Chinook salmon harvest (Table 6).

Winter Fishery

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 Lower Cook Inlet 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 in 2011. 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 border 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.

In the winter fishery, Chinook salmon are primarily harvested throughout nearshore waters in lower LCIMA, but some harvest does occur in upper LCIMA north of Bluff Point to roughly the Anchor Point Light. It is assumed that the winter fishery harvests only feeder Chinook salmon. Chinook salmon are harvested throughout the season, but September through October are probably when most of the effort and harvest occur. This fishery is managed with a management plan and a GHL of 4,500 fish (see management and regulations below). Since 2002, the winter fishery has not been restricted by EO.

Management and Regulations

Management Area

Since the closure of Chinook salmon sport fishing in all Cook Inlet waters from 1964 to 1966, sport fishing regulations for Chinook salmon have evolved through the Alaska Board of Fisheries (BOF) process to protect Cook Inlet stocks. Sport fishing for Chinook salmon has been opened year-round, but bag, possession, and annual limits; area closures; and special harvest areas have been used to restrict the harvest. Management plans have directed some, but not all, of the Cook Inlet saltwater fisheries. Regulation changes over the years have been incremental to each fishery or area but the regulations 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. These changes were informed by recent genetic MSA results for each fishery (see Chinook salmon management area fishery description section).

Both bag and annual limits for Chinook salmon have been changed over the years. Initially, from 1967 to 1978, there was a recording requirement for Chinook salmon in salt water in combination with the lower Kenai Peninsula roadside streams. The current 5-Chinook salmon annual limit for Cook Inlet waters was implemented in 1979. In 1988, the BOF revised the Chinook salmon annual limit and applied it only to Cook Inlet waters north of the line from Cape Douglas to Point Adam (Figure 1) from 1 April through 30 September. In 1990, the BOF reduced the bag and possession limits to 1 Chinook salmon of any size in Upper Cook Inlet (north of Bluff Point; Figure 1) but maintained the limit of 2 Chinook salmon of any size south of Bluff Point from 1 January to 31 December. In November 2001, the BOF adopted a regulation that created an annual limit of 5 Chinook salmon 20 inches or longer for all Cook Inlet waters from 1 January to 31 December. In 2002, the BOF exempted Chinook salmon from the annual limit in the winter fishery. In 2010, the BOF moved the northern boundary of the winter Chinook salmon fishery from Bluff Point to the Anchor Point Light (Figure 1).

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* (Kenai Late-Run Plan; 5 AAC 21.359), and the *Cook Inlet Winter Salt Water Chinook Salmon Sport Fishery Management Plan* (Winter King Plan; 5 AAC 58.060). The Lower Cook Inlet summer fishery is only regulated under the general Cook Inlet–Resurrection Bay saltwater regulations and does not have a management plan or a GHL.

Upper Cook Inlet Summer Fishery

The Upper Cook Inlet summer fishery management objectives have historically focused on restricting the harvest of Cook Inlet stocks as they migrate through the nearshore waters. Chinook

salmon annual limits and recording requirements have been used to limit harvest in Cook Inlet salt waters.

In 1996, the BOF first adopted the *Upper Cook Inlet Salt Water Early-Run Chinook Salmon Management Plan* (5 AAC 58.055; Early-Run Plan) in response to the expansion of the saltwater fishery in the early 1990s and concerns about the impact on Cook Inlet Chinook salmon stocks, particularly those originating from the Anchor River, Deep Creek, Ninilchik River, and Stariski Creek (roadside streams), and the Kenai River (Szarzi and Begich 2004a).

The Early-Run Plan applied from 1 April through 30 June and designated salt waters from Bluff Point north to the mouth of the Ninilchik River and within 1 statute mile of shore as the early-run Chinook salmon Special Harvest Area or SHA (Figure 2). In the SHA, guides were not allowed to fish while accompanying paid clients (except to provide assistance to a disabled client), and anglers could not continue to fish for any species on the same day after taking a Chinook salmon 20 inches or longer. The plan also created 3 conservation zones within the SHA: 1) south of the latitude of the Ninilchik River to 2 statute miles south of Deep Creek, 2) 1 statute mile north and south from Stariski Creek, and 3) 1 statute mile north and three-quarters statue mile south of the Anchor River. The conservation zones were closed to sport fishing from 1 April to 30 June except that sport fishing was allowed from shore south of the latitude of the Ninilchik River to Deep Creek on Memorial Day weekend and the following 2 weekends including the Monday following each of those weekends.

Stipulations of the Early-Run Plan remained unchanged until 2007, when the BOF reduced the closed area north and south of the Anchor River mouth from 2 miles to 1 mile in response to large run sizes of Anchor River Chinook salmon (Szarzi et al. 2010). In 2010, BOF modified the plan in response to smaller run sizes of Anchor River Chinook salmon, reinstating the closed area 2 miles north and south of the Anchor River mouth. Because the harvest in the Upper Cook Inlet Chinook salmon summer fishery comprises a mixture of local spawners and nonlocal feeders, preseason and inseason restrictions have also been applied to salt waters in combination with restrictions to the roadside streams (Appendix A1). This is consistent with the *Policy for the Management of Mixed Stock Salmon Fisheries* (5 AAC 39.220).

In 2013, the BOF simplified regulations by moving the southern boundary at the Anchor River to the easily identifiable navigational marker at the Anchor Point Light. This change reduced the closed area surrounding the Anchor River mouth by one-quarter statute mile. Due to progressively later Chinook salmon run timing to the lower Kenai Peninsula roadside streams, the end date of the conservation zones was also extended from 30 June to 15 July by the BOF in 2016.

In 1999, the BOF adopted the Kenai Late-Run Plan, stipulating that if the projected inriver run of Kenai River late-run Chinook salmon is less than 17,800 fish, ADF&G shall prohibit sport fishing for Chinook salmon in the salt waters of Cook Inlet north of the latitude of Bluff Point. In fall 2012, the BOF changed the plan for the projected late-run Chinook salmon escapement to less than 15,000 fish.

In 2016, the early-run and late-run fisheries in upper LCIMA were combined into the Upper Cook Inlet 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 SHAs 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 the client with a disability as defined in the Americans with Disabilities Act.

Winter Fishery

The winter fishery has fewer restrictions than the Upper Cook Inlet summer fishery and there have been changes over time to provide sport fishing opportunities for nonlocal feeder Chinook salmon. In 1988, the BOF revised the annual limit of 5 Chinook salmon for the salt waters of Cook Inlet–Resurrection Bay and the freshwaters of Cook Inlet to only the Cook Inlet waters north of the line from Cape Douglas to Point Adam from 1 April through 30 September with no annual limit from 1 October to 31 March. During this period, the Cook Inlet bag and possession limits remained at 2 Chinook salmon of any size.

In November 2001, the BOF set an annual limit of 5 Chinook salmon for all Cook Inlet waters. The regulation became effective on 18 March 2002. The BOF cited increasing fishing effort and harvest and the unknown origin of stocks as reasons for the regulatory change. Public opposition to the regulation prompted the BOF to form a Local Area Management Plan committee charged with developing a regulatory alternative to slowing the growth of the winter Chinook salmon harvest during the spring of 2002. In 2002, the BOF established the Winter King Plan based upon a proposed plan submitted by the Local Area Management Plan committee.

Stipulations of the Winter King Plan applied to the fishery 1 October through 31 March and encompassed salt waters south of the latitude of Bluff Point, including all of Kachemak Bay, to the latitude of Cape Douglas and east to the longitude of Gore Point. During this period, the bag and possession limits were 2 Chinook salmon of any size per day. There was no recording requirement during this period and harvested Chinook salmon did not count against the Cook Inlet annual limit. The management plan included a sport guideline harvest level of 3,000 Chinook salmon for the saltwater area south of Bluff Point.

At the 2010 BOF meeting, the Winter King Plan was modified by moving the Bluff Point boundary north to the Anchor Point Light. Reasons cited for moving the boundary included harvests that were below the guideline harvest limit (GHL), the expectation that increasing the area would not result in harvest exceeding the GHL, and that the Bluff Point land marker was difficult to distinguish. Also, because access is limited north of the Anchor Point Light during the fall and winter months, most effort would occur south of the Anchor Point Light. The SWHS questionnaire was not adjusted to estimate the Chinook salmon harvest from Bluff Point to the Anchor Point Light because anglers typically trolling the Bluff Point area (including north of Bluff Point) were likely to report their harvest as Bluff Point rather than north or south of Bluff Point.

In 2016, the winter fishery was extended by 1 month, starting on 1 September instead of 1 October. This aligned the Lower Cook Inlet summer fishery with the same season as the Upper Cook Inlet summer fishery (1 April through 31 August). The northern boundary of the winter fishery was also eliminated to include all Cook Inlet salt waters. To incorporate the month of September into the fishery, the GHL was increased from 3,000 to 4,500 fish.

Recent Fisheries Performance

Areawide

In 2016–2018, the annual Chinook salmon harvests were all well above the historical averages (1986–2001 and 2002–2015) for the entire LCIMA, but trends were not consistent between fisheries (Table 6). The 2016–2018 average Chinook salmon harvest over all LCIMA (18,533 fish) was over a 30% increase above the average for the last recent performance period (2013–2015; 14,175 fish). The 2016 total harvest (20,005) was the highest annual harvest since 1995. The 2017 total harvest (17,438) was still above the last recent performance average but was below 2016 with declines in all fisheries. The 2018 total harvest (18,157) was above the harvest in 2017 but below the harvest in 2016. In 2016 and 2017, most of the Chinook salmon were harvested in the LCI summer fishery, but in 2018 more were harvested in the winter fishery (Table 6). In 2018, only 34% of the total Chinook salmon harvest in LCIMA was by charter anglers which was smallest annual contribution ever estimated. Chinook salmon were the primary salmon species harvested in 2016, but there were more coho salmon harvested in 2017 and 2018 (Table 4).

Based on Charter Logbook data, the 2016–2018 average number of trips and angler-days for all salmon increased from the 2006–2015 averages (Table 5). The 2016 Chinook salmon harvest (9,458 fish) was the highest since the inception of the logbook program. The 2017 and 2018 harvests (6,395 and 4,396) were still above the 2006–2015 average (3,697) but below the 2016 harvest. There was fair agreement between Charter Logbook and SWHS estimates of guided Chinook salmon LCIMA harvest in 2016 through 2018 with higher estimates from SWHS in 2017 and 2018 (Table 11).

Estimates of maturity (Table 8), average length (Table 9), CWT stock composition (Table 10), and MSA stock composition (Figure 7) of Chinook salmon sampled from the marine harvests in 2017 and 2018 were similar to the 2014–2016 estimates. The 2018 average length of the overall harvest (620 mm) was the lowest for all the years of the study (2014–2018) but this may be because it is the only year the winter fishery was not sampled. CWTs were recovered from similar geographic regions in all years; however, unlike previous years when none were recovered, 1 CWT originating from Cook Inlet was recovered in the 2017 Lower Cook Inlet summer fishery and 1 was recovered in the 2018 Upper Cook Inlet summer fishery. It should be noted that from 2011 to 2014, Cook Inlet hatchery fish were adipose-finclipped and thermally marked, but not coded-wire-tagged, so recovery and analysis of heads from these fish would not provide specific release location. Coded-wire-tagging for some of the Cook Inlet hatchery releases resumed in 2015 and resulted in the 2 recoveries. Cook Inlet hatchery fish probably also make up some proportion of the "no tag" heads. The areawide MSA results for 2017 and 2018 were similar to the 2014–2016 results (Figure 7).

Upper Cook Inlet Summer Fishery

The 2016–2018 average Chinook salmon harvest (3,299 fish) for the Upper Cook Inlet summer fishery was well below the respective historical (1986–2001) average (7,076) but similar to harvest in other recent years (2013–2015; Table 6). In 2016, when the fishery was still split into the 2 fisheries, the early-run fishery composed 65% (2,430/3,763) of the total Upper Cook Inlet summer fishery harvest. The 2016 harvests in both the early- and late-run fisheries were just below the 2015 harvests but still above most recent years since 2007. The 2016 combined harvest may have increased due to increases in Cook Inlet stock abundance and the large presence of feeder Chinook salmon. The 2017 harvest in the summer fishery was less than summer harvests in 2015

and 2016, reflecting the same trend in the Lower Cook Inlet summer fishery and the winter fishery for 2017. In July 2017, the Chinook salmon harvest assessment project observed an increase in effort from Anchor Point to Deep Creek, which probably reflects targeting of mature late-run stocks. In 2018, this fishery was restricted in season by 2 emergency orders due to below-average runs to the Lower Kenai Peninsula roadside streams. The first closed Chinook salmon sport fishing within 1 mile of shore from 2 June through 15 July, and the second maintained the conservation zones through 31 July (Appendix A1). These restrictions had reduced effort to offshore waters south of the Anchor Point Light in June but in mid to late July there was some effort for late-run stocks from Whiskey Gulch to Deep Creek (outside of the Stariski Creek conservation zone). Based on the 2018 run timing in the Anchor River and Deep Creek (see freshwater Chinook salmon section), most of the Chinook salmon spent a large amount of time staging in the nearshore waters during these closures, which highlights the benefit of the conservation zones.

Based on Charter Logbook data, salmon harvest during the Upper Cook Inlet summer fishery has varied in recent years (Table 11). The average harvest (1,886 fish) for the recent fishery performance period (2016–2018) was more than double the average for the last recent fishery performance period (2013–2015; 926). The 2016 harvest (2,158) was the highest Charter Logbook harvest since 2005. The annual harvests in 2017 (2,071) and 2018 (1,428) were both above the 2013–2015 average harvest.

In 2017 and 2018, the percentage of mature Chinook salmon for the entire Upper Cook Inlet summer fishery harvest was within the range of annual estimates from 2014 to 2016 (Table 8). The average percentage of mature Chinook salmon in the harvest during the 2014–2018 period was well below the that of the 1996–2002 period. The percentage of the combined harvest that was mature in the early-run period in 2017 and 2018 was greater than for 2016 but still below the percentage in 2014. The percentage of the harvest that was mature in the Special Harvest Areas was consistently higher than the percentage for the outside area. The 2017 average lengths of the harvest in both early- and late-run periods and for the entire Upper Cook Inlet summer fishery were generally similar to the average for the duration (2014–2018) of the Cook Inlet Marine Harvest Assessment project (Table 9). In 2017 and 2018, CWT tags were recovered from a similar variety of geographic regions as those in 2014–2016, but unlike earlier years when no Cook Inlet CWTs were detected, 1 Cook Inlet CWT was also detected in the Upper Cook Inlet summer fishery in 2018 (Table 10).

Based on the genetic MSA from the Cook Inlet marine Chinook salmon harvest assessment project, the harvest in both the early- and late-run periods were mostly composed of non-Cook Inlet stocks in 2016 through 2018 (Schuster et al. *In prep*; Figure 7). Maturity assessment from this project found that the harvest in the Upper Cook Inlet summer fishery was composed mostly of immature fish in all recent years (Table 8).

Lower Cook Inlet Summer Fishery

The 2016–2018 average annual harvest (8,458 fish) from the Lower Cook Inlet summer fishery was roughly double its historical (2002–2015) average (4,971; Table 6). These above-average harvests are attributed to the presence of nonlocal feeder Chinook salmon. The 2016 harvest (9,868) was the highest SWHS estimate for this fishery (Table 6). The 2017 harvest (8,687) was similar in magnitude to the 2015 and 2016 harvests. The 2018 harvest (6,818) was below the 2016 and 2017 harvests and more similar to the average for the last recent fishery performance period (2013–2015; 6,312). The reduced harvest in 2017 compared to 2016 may be because the

September harvest was included in the 2016 estimate, but not in the 2017 estimate (see fishery description section above). Based on angler reports, the Halibut Cove Lagoon and Seldovia terminal fisheries comprised a small portion of the total Lower Cook Inlet summer fishery harvest in all recent years.

Based on Charter Logbook data, the 2016–2018 average annual Chinook salmon harvest (4,245) during the Lower Cook Inlet summer fishery was well above the historical (1998–2015) harvest of 2,699 (Table 11). The 2016 harvest was similar to the 2015 harvest and the highest Charter Logbook harvest for this fishery since the inception of the program. The 2017 (3,910) and 2018 (2,490) harvests were below the average harvest (4,617) for the last recent fishery performance period (2013–2015).

In 2017 and 2018, there were low percentages of mature Chinook salmon sampled in the Lower Cook Inlet summer harvest, which were similar to the 2014 harvest (Table 8). The average length of Chinook salmon sampled in 2017 (635 mm) was similar to the prior years, but average length in 2018 (584 mm) was smaller than all other years (Table 9). In 2017 and 2018, CWT tags were recovered from a similar variety of geographic regions as those in 2014–2016, but unlike earlier years when no Cook Inlet CWTs were detected, 1 Cook Inlet CWT was also detected in the Lower Cook Inlet summer fishery in 2017 (Table 10).

Based on the genetic MSA for the Cook Inlet marine Chinook salmon harvest assessment project, the harvest was mostly composed of non-Cook Inlet stocks in 2016 through 2018 (Figure 7).

Winter Fishery

In recent years, the average Chinook salmon harvest (5,823 fish) during the winter fishery has been well above its historical (2002–2015) average (2,336; Table 6). The 2016–2018 average annual harvest in the winter fishery was also a 62% increase from the average for the last recent fishery performance period (2013–2015; 3,588). The 2016 harvest during the winter fishery (5,106) was similar to the peak winter fishery harvest in 2015 (5,179). The 2017 harvest was a similar magnitude (about 500 fish less) to the 2015 and 2016 harvests but also included the September harvest due to changes in the management plan (see fishery description section above). The 2018 harvest (7,844) was the largest annual harvest in the winter fishery for all years.

In addition to a high prevalence of nonlocal feeder Chinook salmon, the marine weather was favorable most of the season in recent years. The best weather occurred in both the January through March and October through December periods in 2016. There was only 1 period that stretched over several weeks in February and March of 2017, when the Homer harbor was frozen over and provided limited access.

Based on Charter Logbook data for the winter fishery, the average harvest (609) in recent years was similar to the average harvest (521) in the last recent fishery performance period (Table 11). The 2016 harvest (963) was similar to the 2015 harvest and both are the highest harvests for this fishery since the inception of the program. The 2017 (398) and 2018 (466) annual harvests were below the harvest in 2016 but still above most historical annual harvests.

In 2017, the average length of the winter fishery harvest (613 mm) was lower than the average lengths during 2014 and 2015 but not for 2016 (Table 9). In 2017, CWT tags were recovered from a similar variety of geographic regions as those in 2014–2016 (Table 10).

Based on the genetic MSA from the Cook Inlet marine Chinook salmon harvest assessment project, the harvest was comprised of only non-Cook Inlet stocks in 2016 and 2017 (Figure 7). This fishery was not assessed in 2018.

COHO SALMON

Areawide Fisheries Description

The saltwater fishery for coho salmon occurs throughout the LCIMA, but most effort and harvest occur in a troll fishery along the southern shore of Kachemak Bay from Seldovia west to the Chugach Islands and in offshore waters near the mouth of Kachemak Bay (Figure 2). Based on Charter Logbook data, most of the guided harvest occurs in lower LCIMA from Point Pogibshi to Gore Point (Figure 1) and in offshore waters commonly referred to as "Silver Ridge." In lower LCIMA, coho salmon harvest tends to be moderate and stable with larger harvests during years with above-average runs to Cook Inlet (Table 12). Anglers commonly catch other salmon species including feeder Chinook salmon while targeting coho salmon in LCIMA salt waters. There is also some effort in the salt waters along the eastern Cook Inlet shoreline near stream mouths because of easy access from the road system to harvestable numbers of fish. There are also shore- and boat-based efforts for coho salmon along Homer Spit. These fish are probably composed of both wild stocks returning to the Fox River system at the head of Kachemak Bay and stocked terminal coho salmon from the NDFL (see Terminal Fisheries section).

Coho salmon headed for Cook Inlet tributaries are first encountered by anglers fishing the salt waters off the southern tip of the Kenai Peninsula in early July. These early arrivals are thought destined for tributaries in Northern Cook Inlet Management Area. Local stocks arrive near the mouths of roadside streams and begin their spawning migrations in late July. The migration generally peaks from mid-August to early September and is mostly over by mid-September. Coho salmon spawning migrations into Kachemak Bay tributaries are thought to be a little later than the run timing of the roadside stream stocks. Coho salmon tend to hold in the salt water near natal stream mouths or in the lower reaches of streams until rain raises the stream water level, then they tend to immigrate *en masse*. Peak daily fish counts at the Anchor River weir have exceeded 4,000 during high water (Kerkvliet and Burwen 2010).

Areawide Fisheries Management Objectives

The coho salmon sport fishery in Cook Inlet salt waters is managed through sport fishery regulations (5 AAC Chapter 58) for salmon other than Chinook salmon; these regulations specify seasons, gear, open areas, and bag and possession limits and are the same for all 3 subareas with the exception of the NDFL waters where there are increased bag and possession limits and gear and snagging restrictions (see Terminal Fishery section below). There are no biological or sustainable escapement goals (BEG or SEG) for any coho salmon stocks in the LCIMA. In 1999, to protect coho salmon stocks after low runs throughout Cook Inlet, the BOF reduced the bag and possession limits for coho salmon for all Cook Inlet fresh waters from 3 to 2 fish and for all Cook Inlet salt waters from 6 to 3 fish. The coho salmon bag and possession limits are within the "other than Chinook salmon" limits that allow anglers to harvest 6 salmon of which no more than 3 may be coho salmon.

Areawide Recent Fisheries Performance

There were no regulatory changes or inseason management actions for this fishery in 2017 and 2018. In upper LCIMA salt waters, the 2016–2018 average coho salmon harvest (2,956 fish) was greater than the 1977–1999 historical average of 1,427, but less than the more recent 2000–2015 average (3,454) and 2013–2015 average (4,188; Table 12). In lower LCIMA salt waters, the 2016–2018 average coho salmon harvest (10,706) was above the historical 1977–1999 average (3,009), and very similar to more recent period averages (2000–2015: 10,304; and 2013–2015: 10,224; Table 12). The recent LCIMA saltwater coho salmon harvests ranged from 8,520 in 2016 to 20,932 in 2017.

OTHER SALMON

Areawide Fisheries Description

The saltwater fisheries for other salmon (sockeye, pink, and chum salmon) occur throughout the LCIMA. Sockeye salmon are primarily harvested near terminal stocking locations in China Poot Bay and Tutka Bay lagoon by unguided anglers (Figure 8; see Terminal Fisheries section below). Pink salmon are also harvested in terminal stocking locations. Anglers catch pink, and to a lesser degree, sockeye and chum salmon species while targeting coho salmon and feeder Chinook salmon in LCIMA salt waters. Most of this bycatch occurs in the outer coast waters of the lower LCIMA subarea but can also occur along the southern shore of Kachemak Bay from Eldred Passage to the mouth of Humpy Creek and in upper LCIMA from Bluff Point to Deep Creek.

Besides the terminal stocking locations, sockeye, pink, and chum salmon are also harvested as they migrate through LCIMA to spawn in streams in LCIMA as well as in Northern Cook Inlet, Upper Kenai Peninsula, and Anchorage management areas. Sockeye salmon have limited spawning distribution in LCIMA. In the lower LCIMA subarea, in addition to the terminal stocking locations, sockeye salmon stocks are limited to only a few locations including the English Bay Lakes system. There are small numbers of sockeye salmon that are counted in the escapements of the roadside streams, but it is not known if these fish are strays from other stocks or represent small sustaining populations. In the west LCIMA subarea, Chenik and Mikfik systems support robust sockeye salmon stocks. Pink salmon are found in virtually all LCIMA streams. The lower Kenai Peninsula roadside streams all support small runs (from several hundred to over 10,000) of pink salmon. In the lower LCIMA subarea, robust pink salmon stocks are found from Humpy Creek in Kachemak Bay to streams in Port Dick on the North Gulf Coast. In west LCIMA, the Bruin River produces a large pink salmon run with over 1 million documented via aerial survey. In LCIMA, chum salmon are not stocked and are primarily found in West Cook Inlet drainages such as McNeil and Kamishak rivers. Very few chum salmon are counted in the escapement in the roadside streams. In the lower LCIMA subarea, chum salmon are more present in Seldovia River and outer coast drainages such as the Port Graham River, Port Dick, Island Creek and streams in Dogfish Bay.

Sockeye salmon run timing through LCIMA salt waters to the Upper Kenai Peninsula drainages such as the Kenai and Kasilof rivers is from early June through early August but fish are most prevalent in mid-July. Pink salmon arrive in early July and are prevalent through August. Chum salmon are sporadic but are mostly caught in July, though some have been caught in the winter months. In LCIMA, the 1977–1999 average harvest was higher for pink salmon than sockeye salmon, and lowest for chum salmon (Table 4). The average saltwater harvest for 2016–2018 was 52% higher for pink salmon, almost 4 times greater for sockeye salmon, and double for chum

salmon (Table 4). Based on the 1977–2015 average harvest and the 2016–2018 average harvest, lower LCIMA has supported most of the area harvest of sockeye, pink, and chum salmon (Tables 13, 14, and 15).

Areawide Fisheries Management Objectives

The other-salmon sport fishery in Cook Inlet salt waters is managed through sport fishery regulations (5AAC Chapter 58) that specify seasons, gear, open areas, and bag and possession limits. These regulations are the same for all 3 subareas of LCIMA. There are a series of sustainable escapement goals (SEG) for other salmon stocks that are monitored by the Division of Commercial Fisheries in the LCIMA (Hollowell et al. 2017). The other-salmon bag and possession limits are in combination with coho salmon and anglers can harvest 6 salmon of which no more than 3 may be coho salmon. Sport fishing regulations prohibit snagging year-round north of Anchor Point and allow snagging south of Anchor Point from 24 June through 31 December. In 2013, the BOF adopted a proposal to allow the use of sport-caught pink salmon as bait.

Areawide Recent Fisheries Performance

In recent years (2016–2018), the average annual saltwater harvests of sockeye (8,517 fish) and pink salmon (7,370 fish) were well above their respective historical (1977–1999) average harvests (2,228 and 4,816, respectively; Table 4). The recent years chum salmon average harvest (479) was also above its historical harvest (223) but still low compared to the other species. The average sockeye salmon harvest for the recent fishery performance period was similar to the average for the last recent fishery performance period (2013–2015; 8,052), but the pink salmon harvest in the recent years was a 38% increase over the average for the 2013-2015 period (5,357).

In both upper and lower LCIMA subareas, the recent years' sockeye salmon annual saltwater harvests were above their respective historical (1977–1999) averages (589 and 1,582, respectively) but similar to annual harvests since 2006 (Table 13). The 2017 lower LCIMA sockeye salmon harvest (7,364) was the second highest annual harvest on record (Table 13). The annual saltwater harvests of pink salmon in both upper and lower LCIMA subareas in recent years were also above their historical (1977–1999) averages (221 and 4,564, respectively; Table 14). The 2017 lower LCIMA pink salmon harvest (7,385) was the highest since 1989. Although chum salmon harvest was above average in recent years it has remained low in comparison to sockeye and pink salmon (Table 15).

TERMINAL FISHERIES

Areawide Fisheries Description

In the lower LCIMA, Chinook, coho, sockeye, and pink salmon are stocked at terminal fishery locations (Figure 8). Chinook and coho salmon are stocked by the ADF&G Division of Sport Fish 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 are fisheries of returning salmon that will not naturally reproduce because there is no spawning area in the saltwater location where the released smolt imprint. As such, these stocked sport fisheries are managed so that all returning fish are harvested. ADF&G has strategically

selected saltwater locations where returning adult salmon can be vulnerable to anglers fishing from shore or a small boat.

Stocked Chinook and Coho Salmon Fisheries Description

Hatchery-reared early-run Chinook salmon have been stocked in Halibut Cove Lagoon (HCL) since 1974, the Nick Dudiak Fishing Lagoon (NDFL) on Homer Spit since 1984, and Seldovia Bay since 1987 (Table 16). At NDFL, late-run Chinook salmon were stocked to produce significant harvests from 1996 to 2001 (Table 17). Early-run and late-run coho salmon have also been stocked in NFDL. Late-run coho salmon stocking was discontinued after 2012 (Kerkvliet et al. 2013).

All early-run Chinook and coho salmon smolt were produced by the ADF&G hatchery program (Tables 18–21). As such, the smolt were thermally marked to produce banding patterns on their otoliths. Salmon smolt stocked in Kachemak Bay have a particular banding pattern that indicates they were stocked in Cook Inlet, but the banding is not specific to any particular release location.

The size of Chinook salmon smolt at stocking was reduced in 2001 to decrease the number of ocean-age-1 "jacks" in the runs to these stocked locations (Tables 18, 19, and 20). Anecdotal reports of fewer returning jacks were not confirmed by ADF&G in the years after smolt size was reduced. The run timing of early-run Chinook salmon for the stocked fisheries is from about early May through mid-July, with a peak in mid-June. Chinook salmon have been sighted in Bradley River, Humpy Creek, and Seldovia River, streams not known to have had wild Chinook salmon stocks prior to the stocking program. Otoliths extracted from 3 Chinook salmon caught by ADF&G staff in the Seldovia River in 2006 were banded with the pattern of Cook Inlet hatchery-reared Chinook salmon, indicating they had strayed in 2004 from a Cook Inlet stocking program.

Chinook and coho salmon are harvested in sport fisheries at these terminal locations and additionally in commercial and personal use set gillnet fisheries, and a sport troll fishery that occurs in Kachemak Bay. In HCL, returning salmon are 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 vary by location but historically, Chinook 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. NDFL has no freshwater inputs, HCL has a small second-order stream approximately 0.2 km west of the stocking location and the slough feeding into the Seldovia Harbor has several freshwater streams. Smolt were also fed twice each day while being held in the net pens. The benefits of holding and feeding have not been tested.

Since 2009, the holding of salmon smolt at NDFL and HCL has been complicated by harmful algal blooms, specifically the diatom *Chaetoceros* spp. These diatoms are found as either individual cells or long chains of individuals linked together. Each individual cell has long spines that can lacerate the gill filaments of fish. Chinook salmon smolt held in pens are more susceptible to the harmful effects of *Chaetoceros* spp. because fish are prevented from avoiding the blooms. *Chaetoceros* spp. concentrations as low as 5,000 cells/L can be lethal to salmon held in net pens (Yang and Albright 1994). Plankton blooms are hard to predict but generally blooms are influenced by amount of sunlight and inputs of inorganic nutrients such as nitrate and phosphate. *Chaetoceros* spp. concentrations can increase quickly to levels unsafe to hold fish (>10,000 cells/L) and then to

bloom-like levels (≥1,000,000 cells/L)[3]. Data collected in 2012–2013 indicate that the concentration of *Chaetoceros* spp. is consistently above 10,000 cells/L at the saltwater stocking locations in Kachemak Bay from April through June (stocking season).

To compensate for *Chaetoceros* spp. but still provide adequate rearing time for imprinting, adaptive stocking methods were developed at NDFL and used at HCL. In 2011 and 2012, for most of the stockings, smolt were directly released at NDFL. There were problems with this because of bird predation and lack of a calm location for smolt to recover and acclimate after being transferred from the hatchery. In 2013 through 2016, smolt were temporarily stocked into net pens and then released during the dark hours after birds had left to roost (midnight to 0500). This short holding period gave the smolt the opportunity to adjust to salt water prior to release, protected them from bird predation, and minimized the risk of impacts of *Chaetoceros* spp. The daily number of mortalities was enumerated for each net pen prior to the morning feeding or during the release at NDFL and HCL. Each net pen was pulled up to the surface to count the dead smolt that sink to the bottom. Feed was thrown for the Chinook salmon smolt immediately after stocking them, when releasing them from the net pens, and daily during the weeks after release. At NDFL, the net pen floats and covers were left in place at least until feeding commenced. This adaptive method was highly successful; smolt were observed rearing in the lagoon for several weeks after stocking and were allowed to emigrate freely.

Stocking at HCL has also been problematic in recent years due to the unavailability of barge operators willing to transport the stocking truck to the stocking location. In 2015, smolt were transported in a fish hold of a tender instead of a landing craft. The stocking was successful, but the morning after directly releasing the smolt, they were not observed in the lagoon again. In 2016, the smolt were transported with a landing craft and again they were not observed following release. It should be noted that surveillance of smolt in HCL is minimal and is primarily restricted to the release site. From 2013 to 2016, smolt were directly released at the head of Seldovia Lagoon. Each stocking has been coordinated with Seldovia residents, who play an active role in the stocking, and the Seldovia Village Tribe, who collects water quality data. In 2015, the stocking occurred on 25 June during a period of warm sunny weather, low tidal exchanges, and lack of freshwater input from dried-up streams. An estimated 30% (30,000/102,233) of the smolt died (Table 20), probably due to poor water quality conditions within the slough. In 2016, the Seldovia stocking was scheduled earlier in the season for better conditions and tidal exchanges. In the days leading up to the Seldovia stocking, Seldovia residents provided water quality information. No mortality was observed in 2016.

Nick Dudiak Fishing Lagoon

Early-run Chinook salmon have been stocked by ADF&G in the NDFL since 1984 (Kerkvliet et al. 2016; Table 16). From 1984 until 1993, the broodstock for the early run came from Crooked Creek, a tributary to the Kasilof River. Between 1993 and 1999, adults were collected from the NDFL and spawned in the Anchorage hatchery to produce the smolt stocked back into the NDFL. Since 2000, Chinook salmon from the Ninilchik River have been used as broodstock to produce the early run to the NDFL. The goal is to stock 210,000 early-run Chinook

[3] NOAA (National Oceanic and Atmospheric Administration). 2010. Harmful algal blooms and biotoxins: phytoplankton- algal bloom dynamics. http://www.nwfsc.noaa.gov/hab/habs_toxins/phytoplankton/algal_dynamics.html (Accessed November 2013).

salmon smolt to produce 6,500 returning adults, all of which would be available for harvest in the sport fishery.

Late-run Chinook salmon smolt were stocked from 1992 through 1999 by ADF&G. The original broodstock for the late run was Kasilof River Chinook salmon, but the program was discontinued in 1999 when insufficient numbers of sexually mature adults were available for egg takes (Szarzi and Begich 2004a).

The first significant harvest of stocked early-run Chinook salmon occurred in 1987 (Table 17). Annual early-run Chinook salmon harvests from shore during 1996 through 2009 have ranged from 710 to 4,068. Below-average harvests in 2008 and 2009 are attributed to poor runs partly because of low survival of stocked fish caused by a loss of heated water at Division of Sport Fish (SF) hatcheries, and additionally, to ocean conditions that resulted in below-average runs to many Cook Inlet tributaries. More fish returned in 2010 than in 2008 or 2009, but the run size was lower than expected, suggesting that the SF hatchery and ocean-rearing conditions continued to impact these Chinook salmon runs. The contribution to the harvest of anglers fishing from boats near Homer Spit shoreline is difficult to assess because the reporting of harvest location is imprecise.

From 1988 through 2002, Bear Lake coho salmon were stocked in the NDFL. This late-run stock first arrived at the NDFL near the first of August and the run continued into October. In 2001, ADF&G began stocking early-run coho salmon to provide fishing opportunity during the peak tourist season. Early-run coho salmon begin arriving to the NDFL in late July. In 2003, because of the limited rearing capacity of the ADF&G hatcheries, ADF&G stopped producing late-run coho salmon smolt for stocking at the NDFL. However, from 2003 through 2009, stocking of late-run coho salmon at the NDFL continued by means of private funds to purchase late-run coho salmon from CIAA. CIAA could not supply late-run coho salmon smolt for the 2010 stocking. With the advent of the new William Jack Hernandez Sport Fish Hatchery (WJHSFH), rearing capacity increased, and ADF&G began producing late-run Bear Lake coho salmon smolt to stock the NDFL in 2011 and 2012. In 2013, use of late-run Bear Lake coho salmon ceased per a change in ADF&G stocking policies.

The NDFL has been maintained and modified since the establishment of the terminal fishery. An expansion of the NDFL, from 2.3 to 3.8 acres, occurred in 1994 to sculpt the basin into its current hourglass configuration. Two years later, the toll of tidal forces and seasonal storm surges on the inlet berms of the fishing lagoon had become readily apparent. Mitigation was necessary and a local company was contracted for repair work in 1996. This proved to be a temporary fix and further investment became necessary to strengthen the fishing hole a few years later. In January 1998, bidding went out to excavate the silted material inside the fishing hole and place stockpiled gravel into the containment berms. The project was completed in April 1998 and was funded for under $16,000 in conjunction with another excavation project on Homer Spit. In 1999, a project to construct 3 groins, reinforced by riprap and cobble, on the east side, and to construct access ramps, paved parking, and walkways on the west side was funded by a cooperative venture between the City of Homer, Alaska Department of Transportation, and ADF&G for $400,000. The final ramp was poured in August 1999. In 2006, 350 cubic yards of a silt bar were removed because it had materialized on the inside of the NDFL. In November of 2012, the City of Homer funded $467,000 to dredge the entire lagoon and removed 32,000 cubic yards of gravel, sand, and organic material.

In 2016, the residual depth of the NDFL was assessed to quantify how much the lagoon has filled with sediment since the last dredging in 2012. At low tide, data were collected by boat using a standard surveyor pole and a Trimble Ag132[4] GPS unit to acquire submeter georeferenced depths at various locations throughout the lagoon. As depths and locations were measured, they were entered into an Allegro Cx portable field computer. The perimeter of the lagoon was delineated in a similar manner with a reference depth of 0 feet. Data were imported into ArcGIS and projected into the NAD 1983 State Plane Alaska 4 FIPS 5004 Feet coordinate system. An inverse distance weighted (IDW) interpolation was used to infer the remaining unmeasured depths within the lagoon. The interpolated depths were classified by 2-foot depth increments and rendered accordingly. Total surface area of each depth class was determined by enumerating the rasterized cells by depth class and multiplying by the raster cell size. Raster cell volume was estimated by using the interpolated depths of each cell multiplied by cell area. Total lagoon volume was estimated as a summation of all raster cell volumes.

It is estimated that when the bathymetry study was performed in 2011, NDFL held 420,000 ft^3 at residual tide. After the 2012 dredging operation, residual volume was estimated to be 1,030,000 ft^3. With the most recent measurements, residual volume was estimated to be 800,000 ft^3 in 2016. If the dredged volume is taken to be ideal, the lagoon was functioning at 41% and 78% of its intended capacity in 2011 and 2016, respectively. Depths greater than 8 feet were estimated at 6.8% of the lagoon surface area in 2011, 59.7% in 2012, and 33.4% in 2016.

Halibut Cove Lagoon

Halibut Cove Lagoon (HCL) is formerly the site of the Halibut Cove Lagoon Saltwater Rearing Facility, established in 1973 by the former Fisheries Rehabilitation, Enhancement, and Development Division (FRED) of ADF&G, where all 5 species of Pacific salmon were reared experimentally for varying periods of time. Since 1979, the lagoon has served as a Chinook salmon imprinting, rearing, and release site. From 1986 to 1992, 3–6 million pink salmon fry that had been incubated at the Tutka Lagoon Hatchery were imprinted and released annually into Halibut Cove Lagoon. Access to fisheries in the lagoon is via boat. It provides fishing opportunities in a beautiful and remote setting. Anglers fish from the Alaska State Park (ASP) dock or from anchored vessels near the dock. A limited amount of trolling occurs in greater Halibut Cove at the mouth of the lagoon channel.

To produce a run of approximately 3,000 adult fish, the annual stocking goal through 2006 was 105,000 early-run Chinook salmon smolt. From 1975 to 2006, the annual number of stocked fish averaged about 107,260 (Table 19). The stocking goal was reduced to 50,000 smolt in 2007. The reduction was the result of reallocation of SF Anchorage hatchery rearing space from Chinook salmon to rainbow trout (freshwater *O. mykiss*) after loss of the heat source resulted in longer use of hatchery space for trout rearing. The stocking goal returned to 105,000 in 2010 when transition to the new William Jack Hernandez Sport Fish Hatchery began.

Sport effort, harvest, and catch in HCL have not been estimated with the SWHS since 2000 because of the uncertainty caused by anglers who were misreporting their fishing location as the lagoon when they fished elsewhere (halibut were reported to be harvested in the lagoon, which is unlikely because of the shallow entrance and limited presence of prey species). The Chinook salmon terminal fishery is relatively small, with harvests probably fewer than 1,000 fish in most years.

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

Chinook salmon runs in 2008 and 2009 were lower than expected and few fish were reported seen at HCL in 2010. Stocking rates that are half the historical amount, the low survival of stocked fish from the loss of heated water at SF hatcheries, and ocean conditions that resulted in below-average runs to many Cook Inlet tributaries are the likely causes of the poor runs (based on angler reports) to HCL in 2008–2016.

The stocked run to HCL is subject to a commercial set gillnet fishery adjacent to the lagoon from the first Monday in June until 30 September. Since 1969, the commercial set gillnet fishery harvest of Chinook salmon in the Halibut Cove Subdistrict ranged from zero in 1970 to 962 in 1988, averaging 327 fish annually since 1969 (Fish Ticket Database, Alaska Department of Fish and Game, Division of Commercial Fisheries. Accessed October 2016. [URL not publicly available as some information is confidential. Contact Research and Technical Services for data requests]. This database is referred to as the ADF&G Fish Ticket Database throughout this report.).

Seldovia

Seldovia is located approximately 15 miles southwest of Homer Spit across Kachemak Bay (Figure 8). Chinook salmon smolt were first released in the Seldovia Harbor in 1987 to create a new sport fishery. The release site was moved in 2000 to a site upstream of a reservoir in Fish Creek, a small tributary to Seldovia Slough, to increase the fidelity of fish to the release location (Szarzi and Begich 2004a). This is a terminal harvest fishery where all fish are intended for harvest and none spawn at the stocking location. In 2012, the stocking location was changed to the head of Seldovia Lagoon Slough and smolt were released directly. The slough has several small freshwater inputs and has enough water that allows smolt to emigrate to the harbor even at low tide.

To produce a run of approximately 3,000 adult fish, the annual stocking goal through 2006 was 105,000 early-run Chinook salmon smolt. The number of stocked smolt averaged about 98,095 from 1987 to 2005 (Table 20). For the same reason that stocking was reduced at Halibut Cove Lagoon (a reallocation of hatchery space to rainbow trout rearing) the stocking goal for Seldovia was reduced to 50,000 smolt in 2007. Like Halibut Cove Lagoon, this reduction was temporary, and the stocking goal returned to 105,000 in 2010 as the transition to the new WJHSF hatchery got underway.

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.

Like other locations around Kachemak Bay and Cook Inlet, runs to Seldovia have been reported to be poor since 2008. The reasons for reportedly poor runs were probably similar to that of the Halibut Cove Lagoon runs: stocking rates were half the historical amount, low survival of stocked fish from loss of heated water at SF hatcheries, and poor ocean conditions. In addition, the low survival was also attributed to high mortality and bird predation when smolt were stocked in the Fish Creek reservoir.

A subsistence set gillnet fishery for salmon was created in Seldovia Bay by the BOF during its 1995 meeting. The harvest of Chinook salmon was limited to 200 fish to avoid impacting the stocked Chinook salmon fishery in Seldovia Bay. The annual possession limit is 20 Chinook salmon per household. The fishery is opened for two 48-hour periods per week from 1 April to

30 May and one 36-hour period each of the first 2 weekends in August. At its February 1998 meeting, the BOF adopted a proposal extending the April–May period by 10 days to 30 May. The highest reported subsistence harvest was 189 Chinook salmon in 2000 and the lowest was 3 reported in 2011 (ADF&G Fish Ticket Database).

A commercial set gillnet fishery also harvests Chinook salmon in Seldovia Bay. Much of this harvest is probably composed of stocked Chinook salmon returning to Seldovia. Commercial harvests averaged 31 fish prior to stocking from 1969 through 1988 (ADF&G Fish Ticket Database). Since 1991, when the run consisted of all age classes of stocked fish, the average annual commercial harvest has been 203 and ranged from 5 in 2012 to 770 in 1991 (ADF&G Fish Ticket Database).

In November of 2004, the BOF changed the start of the commercial set gillnet fishery season in the Southern District from the first Monday in June to a start date no earlier than 1 June, to be opened by EO. The BOF directed ADF&G to establish the start of the season so that no change in allocation between the commercial and sport fisheries would occur compared to preceding years. Since the 2005 fishing season, commercial harvests of Chinook salmon in Seldovia Bay have been below the 1991–2004 average of 330 and commercial fishery regulations have not been adjusted (Schroeder and Morrison 1989, 1990; Bucher and Morrison 1990; Bucher and Hammarstrom 1993a, 1993b, 1994-1999; Hammarstrom 2000; Hammarstrom and Dickson 2001–2007; Hammarstrom and Ford 2008–2011; L. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer, personal communication).

Stocked Chinook and Coho Salmon Fisheries Management Objectives

ADF&G outlines future 5-year stocking objectives for Kachemak Bay annually in the "Statewide Stocking Plan for Sport Fisheries" (Stocking Plan)[5]. 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. Fish 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[6].

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 Halibut Cove Lagoon and Seldovia is too low to produce precise harvest estimates, only harvest estimates from the NDFL are used.

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 are consistent with lower LCIMA saltwater regulations 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 lower LCIMA salt waters. Because NDFL waters are defined in regulation under 5 AAC 58.030, which also prohibits snagging in these waters year-round (see below) and since 2008, has prohibited the use of weights, bobbers, or any floatation device below the hook when closed to snagging, the Division of Sport Fish has opened NDFL to snagging by emergency order to harvest any remaining Chinook and coho salmon near the end of the runs (Appendix A2). This allows the salmon to be harvested prior

[5] http://www.adfg.alaska.gov/index.cfm?adfg=fishingsportstockinghatcheries.stockingplan accessed October 2018.

[6] Details of CIAA stockings however can be found at http://www.ciaanet.org/hatcheries.html (accessed October 2018).

to them maturing and being wasted. Most of the Chinook salmon emergency orders are for a small time period so the start of the coho salmon run is not affected. The duration of the coho salmon emergency orders varies based on annual conditions.

Regulations that prohibit snagging east of the Anchor Point to Point Pogibshi line from 1 January to 16 June began in 1983. Although snagging techniques were found to be very effective in allowing for a complete harvest of the stocked early-run Chinook salmon, based on hatchery fish run timing in the Ninilchik River, approximately half of the Chinook salmon returned to Homer Spit after this date. As a result, conflicts arose between anglers who wished to continue harvesting Chinook salmon by nonsnagging methods and those who wished to snag. Concerns also included the safety and aesthetics of the fishery. In 1988, the BOF removed the NDFL waters from the waters open to snagging, including the waters from the Homer City Dock near the entrance to the Homer Boat Harbor northwest along the east side of Homer Spit to the ADF&G marker placed approximately 200 yards northwest of the entrance to the Fishing Lagoon, to a distance of 300 feet from the shore. However, the BOF did provide that ADF&G could open the NDFL waters to snagging by EO when staff observed that surplus fish were available and that these fish could no longer be harvested by nonsnagging methods (Appendix A2).

Snagging concerns in the NDFL were brought up by the public to the BOF at the November 2007 meeting. Anglers had developed a technique using a weight or bobbers following a single hook, referred to as "tight lining," that was technically legal, but resulted in fish being snagged in the mouth, as well as in other body parts. The technique increased the incidence of snagging-related complaints by the public and snagging citations by enforcement personnel. The BOF passed a public proposal intended to eliminate the practice of snagging fish by tight lining and bobber snagging by prohibiting the use of any gear following the hook in NDFL waters.

In April 2004, the Alaska Legislature passed HB 98, giving the BOF authority to establish restricted seasons and areas necessary for persons less than 16 years of age to participate in sport fishing. At its November 2004 meeting, the BOF passed a public proposal to allow only youths under 16 years of age to fish along an area designated by ADF&G in the NDFL on the third Saturday in June and the first and third Saturdays in August (Szarzi et al. 2007). After late-run coho salmon were no longer stocked in the NDFL, the BOF omitted the third Saturday in the August youth fishery.

Recent Stocking and Fisheries Performance of Chinook and Coho Salmon

Nick Dudiak Fishing Lagoon

At NDFL in 2017 and 2018, all Chinook and coho salmon stockings were largely successful with the adaptive stocking methods (described above). Stocking and overnight mortality was less than 1% for all stockings. In 2017, the Chinook salmon stocking goal of 210,000 was nearly met with a combination of Ship Creek and Ninilchik River broodstock (Table 18). In 2018, the Chinook salmon stocking goal was increased to 315,000 following cessation of Halibut Cove Lagoon stocking. The goal was met with a combination of Crooked Creek and Ninilchik River broodstock. The Chinook salmon smolt size was larger than the target size of 13.0 g in all stockings except for 29 May in 2018. The coho salmon stocking goals (105,000 smolt annually) were met in both recent years (Table 21). In 2018, an additional 110,000 coho salmon smolt were stocked due to a change in production at WJHSFH. In 2016, there were insufficient broodstock available for producing Bear Lake coho salmon, which allowed the hatchery to increase production of Ship Creek coho salmon.

In the fall of 2017 and 2018, the bathymetry of NDFL was assessed to estimate the volume of rearing habitat available. From 2016 to 2017, there was roughly a 5% loss of volume but the volume remained unchanged from 2017 to 2018. Overall, the current conditions at NDFL are 23% below the designed volume of the lagoon.

In recent years (2016–2018), the average annual Chinook (828) and coho salmon harvests (2,398) at NDFL were well below their respective historical (1987–2015) averages (2,150 and 6,085, respectively; Table 17). The declining Chinook salmon annual harvest in recent years was similar to observations of other Cook Inlet Chinook salmon stocks over these years (See roadside stream section below). The annual coho salmon harvests in 2016–2018 ranged from 2,246 in 2017 to 4,995 in 2018. In 2017, an EO was issued to allow snagging from 14 July through 16 July at the end of the Chinook salmon run (Appendix A2). Based on angler observations, there were several hundred Chinook salmon harvested during the snagging period. In 2018, an EO was issued to allow snagging from 11 August through the remainder of the year to harvest the remaining coho salmon. Anglers were successful at harvesting coho salmon in the first couple of days of this opener.

In addition to coho salmon harvest within NDFL waters, there was also consistent shore-based and some directed boat-based sport fishing effort along the east side of Homer Spit in 2017 and 2018. Most anglers used snagging gear to harvest coho salmon in the waters outside of NDFL.

Halibut Cove Lagoon

At HCL in 2017, Chinook salmon stocking occurred on 30 May after a few days of delay due to marine weather (Table 19). The marine weather also prohibited construction of the floating net pens, but a modified structure was used to temporarily hold the smolt. The stocking was largely successful with the adaptive stocking methods (described above). Stocking mortality and overnight mortality were less than 1% for this stocking. The number of stocked smolt was roughly 10% below the stocking goal of 105,000. In 2018, no Chinook salmon smolt were stocked at HCL due to declining effort in this fishery over the last decade and in order to reallocate the smolt to NDFL.

In HCL, based on personal observation and angler reports, sport fishing effort and Chinook salmon harvest were both low in 2017 and 2018. Most of the harvest occurred after the area opened to snagging on June 24 by regulation. In 2017, a volunteer with the Alaska State Parks stationed at facilities near the lagoon counted anglers daily at high tide from 8 June through 8 July. Participation in this fishery was low and only 56 anglers were counted (Table 22). Otherwise, no direct monitoring has occurred to assess this fishery in during 2017 and 2018.

Seldovia

In 2017, Chinook salmon smolt were stocked at 3:00 AM on 20 May after being rescheduled due to delays because the Alaska Marine Highway ferry was out of service (Table 20). Local residents assisted with the stocking by setting up the stocking hose prior to the arrival of the stocking truck. The smolt were observed still rearing in the lagoon several days later. In 2018, the stocking truck was delivered to Seldovia on a private landing craft on 29 May. The use of the landing craft was dictated by the time of high tide and occurred at 2:00 PM. Both stockings were directly released into the Seldovia Harbor slough from the stocking truck at the northern end of the lagoon. Both the 2017 and 2018 stockings were at the 105,000 smolt stocking goal.

In both 2017 and 2018, small schools of ocean-age-1 and ocean-age-2 Chinook salmon were reported returning to the lagoon. Local anglers also reported improved fishing in the Seldovia Harbor slough. Even so, the Chinook salmon harvest in the Seldovia Harbor slough was reported

low based on angler reports. No direct monitoring occurred to assess this fishery during 2017 and 2018.

Stocked Sockeye and Pink Salmon Fisheries Description

China Poot Sockeye Salmon

Leisure Lake, also known as China Poot Lake, is located across Kachemak Bay in a southeasterly direction from Homer Spit (Figure 8) 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 catches 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 along China Poot Creek between the intertidal area and the barrier falls. Szarzi et al. (2007) describe the history of the 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, the last year that information is available (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).

Tutka Bay Pink and Sockeye Salmon

Tutka Bay Lagoon, located across Kachemak Bay approximately 9 miles south of Homer Spit (Figure 8), 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 hatchery 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).

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 enhanced sockeye salmon to Tutka Bay Lagoon in 2007. At a meeting in 2007, BOF passed a proposal closing 100 yards around the Tutka Bay Lagoon net pens to sport fishing to protect holding broodstock from disturbance. Since 2007, more 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 from 1,796 during the years 1988–2006 to 4,946 during the years 2007–2009 (Szarzi et al. 2010).

Stocked Pink and Sockeye Salmon Fisheries Management Objectives

Sport fisheries for pink and sockeye salmon are managed by regulation (5 AAC Chapter 58). Inseason regulation changes to sport fisheries on 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 enhanced pink salmon. The regulations for the personal use dip net fishery in China Poot Creek are under 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 no annual limit. This fishery has been extended in the past to harvest surplus sockeye salmon before the season was lengthened by regulation by the BOF in 1995.

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; no inseason extensions have been required since.

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. In 2009, the public reported that numerous salmon were holding in China Poot Creek after the 7 August regulatory closure and asked for a fishery extension. ADF&G foot surveys found low numbers of fish in the creek, and the fishery was not extended.

At a meeting in 2007, BOF passed a proposal closing 100 yards around the Tutka Bay Lagoon net pens to sport fishing to protect holding broodstock from disturbance. Since 2007, more 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 from 1,796 during the years 1988–2006 to 4,946 during the years 2007–2009 (Szarzi et al. 2010).

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.

Stocked Pink and Sockeye Salmon Fisheries Recent Performance

In 2017 and 2018, the sockeye salmon runs to China Poot Creek were improved over other recent years (2013–2015) but still limited in commercial harvest opportunity (Hollowell et al. 2016). This combination provided more sockeye salmon for the sport and personal use fisheries. In 2017, an emergency order was issued to extend the season through 14 August and increase the bag and possession limit to 25 sockeye salmon. This was due to roughly 700 sockeye salmon still remaining in the creek on 1 August. In 2018, effort in both sport and personal use fisheries increased due to the improved return and in part due to the poor personal use salmon fishery in the Kenai River.

In 2017 and 2018, Tutka Bay pink and sockeye salmon runs were robust and supported sport fishing opportunities. Because of increased pink salmon production in Tutka Bay Lagoon, anglers' ability to specifically target sockeye salmon was limited due to the large number of pink salmon present.

In lower LCIMA, the 2016–2018 average sockeye and pink salmon harvests were well above their historical (1977–2015) averages (Tables 13 and 14). During these recent years, the contribution of hatchery pink salmon to the harvest in lower LCIMA was unknown. The 2017 pink salmon harvest in lower LCIMA was the highest harvest ever estimated by the SWHS, which coincided with a well above-average harvest of coho salmon. It is likely that many of the pink salmon were harvested by anglers targeting coho salmon and not by anglers in the enhanced fishery locations. The 2017 sockeye salmon harvest in lower LCIMA was also the highest harvest ever estimated by the SWHS. Like pink salmon, it is unknown how much of the sockeye salmon harvest in lower LCIMA was in enhanced fishery locations during these recent years, but there was considerable effort observed by ADF&G in China Poot Bay that year.

FRESHWATER FISHERIES

FISHERIES DESCRIPTION

The LCIMA has a diversity of freshwater sport fishing opportunities, although effort in freshwater fisheries is lower than effort in saltwater finfish sport fisheries (calculated from Table 1). The lower Kenai Peninsula roadside streams (in upper LCIMA) support the majority of freshwater effort in the LCIMA (Table 1). West LCIMA has several robust coho salmon stocks, but freshwater effort in west LCIMA is substantially less than upper LCIMA due to limited access (Table 1). Freshwater effort in lower LCIMA is nearly always lowest (Table 1), though sport anglers can target pink, chum, and some small coho salmon stocks.

Freshwater fisheries in the LCIMA are primarily monitored through the SWHS and charter logbook data. Guided catch and harvest by species and effort data in LCIMA fresh waters has been available from the Charter Logbooks since 2006 (Tables 23 and 24). 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 in upper LCIMA (Tables 25 and 26). Beginning in 2011, comparisons were made between SWHS effort, catch, and harvest estimates and the Charter Logbook data to assess guided contributions in these streams. Due to low number of responses with the SWHS, estimates of effort didn't consistently follow the same trends as the logbook data and in general, the SWHS estimates of guided angler-days and trips were higher (compare Tables 24 and 25). In contrast, the 2014 Charter Logbook Chinook and coho salmon harvests (123 and 126, respectively) and Chinook salmon catch (416) were much higher than the estimated SWHS harvests and catch (zero, 20, and zero, respectively; Tables 24 and 26).

Since 2011, private anglers on the roadside streams have accounted for most of the annual effort, harvest and catch of Chinook, coho, other salmon, Dolly Varden (*Salvelinus malma*), and steelhead (Tables 25 and 26). Based on the SWHS, the upper LCIMA roadside streams supported an average of approximately 66,000 angler-days annually from 1977 through 1999 and about 33,000 from 2000 through 2015 (Table 3). Most of the freshwater angler effort targets Chinook salmon in the Anchor and Ninilchik rivers and Deep Creek in upper LCIMA. On average (2011–2015), 37% of the Chinook salmon caught by guided anglers and 28% of the Chinook salmon caught by private anglers are harvested in these streams (calculated from Table 26) and in most years, the vast majority (72% on average) of the Chinook salmon caught by guided anglers in these streams are in the Ninilchik River (unpublished SWHS data, ADF&G Homer). These streams continue to support coho salmon, steelhead, and Dolly Varden fisheries throughout the remainder of the season. On average, approximately 56% of coho salmon caught by guided anglers and 66% caught by private anglers are harvested in these streams (calculated from Table 26), with most of the catch in the Anchor River (unpublished SWHS data, ADF&G Homer). The Anchor River supports the largest road accessible steelhead stock in the state. Guided steelhead catch in the roadside streams occurs mostly in the Anchor River and Deep Creek, whereas only 15% of the steelhead catch occurs in the Ninilchik River (unpublished SWHS data, ADF&G Homer). Dolly Varden are found in fresh waters throughout the LCIMA, but they are primarily targeted in the Anchor River; few of the Dolly Varden caught by guided anglers are harvested (Table 26).

CHINOOK SALMON FISHERIES

Fisheries Description

LCIMA freshwater Chinook salmon fisheries occur in Anchor River, Deep Creek, and Ninilchik River (roadside streams in upper LCIMA); all are accessible along the lower Kenai Peninsula from the Sterling Highway (Figure 2). The Ninilchik River wild Chinook salmon run has been supplemented with stocked fish since 1987. Stariski Creek, also accessible from the Sterling Highway, has Chinook salmon, but has been closed to Chinook salmon sport fishing due to the small run size. Chinook salmon enter Bradley River, Humpy Creek, and Seldovia River on the south side of Kachemak Bay, but successful spawning has only been documented in Bradley River. Chinook salmon in streams on the south side of Kachemak Bay are thought to be strays from marine stocking programs within Kachemak Bay or to have originated from strayed stocked fish from outside Kachemak Bay (Hauser et al. 2017). Few Chinook salmon are harvested in western LCIMA streams (Kerkvliet et al. 2016).

Chinook salmon return to the roadside streams from approximately early May through late-July, with a peak in early June. These fish are classified as early-run Chinook salmon. The Anchor River has the largest wild Chinook salmon run, followed by Deep Creek, and lastly, the Ninilchik River. The Ninilchik River is also stocked with hatchery-reared Chinook salmon (Table 27). The Sterling Highway crosses the lower reaches of the streams; developed access and camping facilities are located on or near each river. Anglers can access the entire 2-mile area open to salmon fishing. Chinook salmon spawning occurs above the fishery boundary from mid-July through August in these streams. Based on the SWHS, Chinook salmon caught in the roadside streams sport fisheries are primarily released (Figure 9).

The Anchor River, Deep Creek, and Ninilchik River Chinook salmon fisheries are conservatively managed through limited time, area, bag and possession limits, and annual limits. A sustainable escapement goal (SEG) for each stream is reviewed every 3 years and the fisheries are managed

to their SEG. Historically, more robust data have been collected on Anchor River Chinook salmon escapements, which allowed for a preseason forecast and inseason projection, both of which were used to make pre- and inseason management decisions for all 3 streams. ADF&G has used its EO authority to restrict these sport fisheries both preseason and inseason to achieve the SEGs in years of low productivity.

In the early 1970s, the Anchor River, Deep Creek, and Ninilchik River were the major Chinook salmon fisheries in Southcentral Alaska. The only other Southcentral Chinook salmon fishery of consequence occurred in the salt waters adjacent to Deep Creek. In the late 1970s and early 1980s, other Chinook salmon fisheries developed in Northern Cook Inlet in the Kenai and Kasilof rivers, and in the Susitna River drainages (Figure 1), and effort in LCIMA fresh waters declined. Historically, the Anchor River, Deep Creek, and Ninilchik River have been opened to harvest of wild Chinook salmon for 3-day weekends (Saturday through Monday) in late May to mid-June. The Anchor River is also open to sport fishing for 5 Wednesdays during that time. Additional fishing opportunity has occurred on the Ninilchik River through EO and the BOF process to increase the harvest of hatchery-reared Chinook salmon.

During the Chinook salmon sport fishing season, the roadside streams have variable water levels and clarity due to the amount of snowmelt runoff and drainage morphology that includes cut banks of loose substrate. Harvest success is related to these water conditions during fishery openings. Generally, the Ninilchik River is the first stream to have improved conditions during the season. Typical spring weather and runoff create high and muddy water conditions for both Deep Creek and Anchor River at the beginning of the season. Generally, flows subside and clarity improves throughout the remainder of the season.

Since 1977, Chinook salmon harvests from the Anchor River, Deep Creek, and Ninilchik River have been monitored with the SWHS. The average and range of the historical Chinook salmon harvests have varied within and between streams (Tables 28–30). Harvest variation between streams is attributed to differences in abundance and stream conditions. Harvest variation within a given stream is primarily attributed to changes in productivity, angler effort, river conditions, and fishing regulations. Harvest success is related to run timing and stream conditions.

From 1992 to 1994, the combined Chinook salmon inriver harvest for the roadside streams peaked near 9,600 fish (Kerkvliet et al. 2016). The peak harvest was the result of efforts to increase fishing opportunity in Anchor River and Deep Creek; in 1989, a fifth 3-day Chinook salmon opening was added, and in 1991, the first major year class of stocked fish to Ninilchik River bolstered harvest and effort there. The increased Chinook salmon harvest in both the freshwater and the nearby saltwater sport fisheries in the early 1990s (Kerkvliet et al. 2016) coincided with a decrease in escapements to Deep Creek and the Anchor River, which caused concerns that Anchor River and Deep Creek Chinook salmon were being overharvested. In 1996, the BOF adopted freshwater restrictions in the Anchor River and Deep Creek that included a reduction of the combined annual limit from 5 to 2 fish from the 2 streams and a reduction of Deep Creek openings to three 3-day weekends. These restrictions reduced and stabilized the Chinook salmon harvest. The combined inriver harvests did not vary much (between 2,384 and 4,284 fish) from 2000 through 2008 (Table 3). In 2009, harvest dropped substantially to a record-low of 1,064 and continued to remain quite low through 2015. In 2012, only 87 Chinook salmon were harvested. Low productivity continued through 2014. In 2015–2016, robust runs to the roadside streams allowed harvest and catch to begin increasing to an average of 1,594 and 4,412, respectively. These averages were

much lower than the recent (2000–2008) average during years of high productivity (2,203 fish harvested and 6,864 caught; calculated from Table 3).

Anchor River

The number of days the annual Anchor River inriver Chinook salmon sport fishery has been open has varied since 1977, and this has influenced annual harvest numbers (Table 28). From 1978 to 1987, when the inriver fishery was open four 3-day weekends with an annual limit of 5 Chinook salmon, the average harvest was 1,121 (Kerkvliet et al. 2016). From 1988 to 1995 and 2004, when there were five 3-day weekend fishery openings and the seasonal limit was 2 in combination with Deep Creek, the average harvest of Chinook salmon increased to 1,563. In 2002 and 2003, when there were four 3-day weekends and the seasonal limit was 2 in combination with Deep Creek, the average harvest dropped to 1,029 Chinook salmon. Beginning in 2005, a fifth 3-day weekend opening was added before the traditional Memorial Day weekend opening. Harvest averaged 1,636 from 2005 to 2007.

The most liberal Anchor River sport fishery since 1977 took place in 2008 when the fishery was open to fishing for 20 days, Wednesdays were added, and the seasonal limit was 5 Chinook salmon. Despite these liberalizations, the 2008 Chinook salmon harvest (1,486) was only slightly higher than the historical 1977–1999 average of 1,306 (Table 28). From 2009 to 2014, EO restrictions due to low productivity contributed to the historically lowest Chinook salmon harvests since 1977. In 2015, preseason EO restrictions were issued in the same fashion as 2014, but some were rescinded after the run exceeded the lower end of the sustainable escapement goal (SEG). The 2015 harvest increased only slightly from the 2009–2014 average. For the first time since 2008, no EO restrictions or liberalizations were issued in 2016. The fishery remained structured with 5 weekends and 5 Wednesdays open in late-May and June, along with an annual limit of 2 Chinook salmon in combination with Deep Creek.

Since 2003, the inriver exploitation of the Anchor River stock has been less than 22% annually (Table 31). In general, years with the higher exploitation rates were years of moderate to low escapements following years with large escapements. The exception is 2015, when the third-largest escapement occurred following the 2009–2014 period of poor production and restrictions to the sport fishery that remained in place throughout most of the season. Years with low exploitation rates occurred during years of moderate to small escapements coupled with restrictions to the sport fishery, with 2015 being the exception. The exploitation rate of 16% in 2016 was similar to the historical (2003–2008) average exploitation rate of 15%.

Deep Creek

The Deep Creek Chinook salmon fishery has changed over time. This fishery has occurred on weekends and Mondays beginning Memorial Day weekend. From 1978 to 1987, the Deep Creek inriver fishery was opened for four 3-day weekends with an annual limit of 5 Chinook salmon. In the late 1980s, angler effort appeared to be declining and the Alaska Board of Fisheries (BOF) extended the fishery by adding a fifth consecutive 3-day weekend from 1989 through 1995, but also reduced the seasonal limit to 2 in combination with the Anchor River. From 1996 through 2016, the regulatory fishery established by the BOF was three 3-day weekends.

In 2001, the fishery was liberalized by EO to provide an additional 3-day weekend at the end of the regulatory season. In 2008 and 2009, the Deep Creek seasonal limit was not tied to the Anchor River seasonal limit. From 2010 through 2015, the LCIMA streams were managed in combination

(including nearby salt waters) by EO to prevent shifting effort from one stock to another (Kerkvliet et al. 2016).

The annual Chinook salmon harvests from Deep Creek have varied across years as the regulations structuring the sport fishery have varied. From 1978 to 1987, when the inriver fishery was open four 3-day weekends with an annual limit of 5 Chinook salmon, the harvest averaged 680 (Kerkvliet et al. 2016). From 1988 to 1995 and 2004, when the number of fishery openings increased to five 3-day weekends and the seasonal limit was reduced to 2 in combination with the Anchor River, the average Chinook salmon harvest increased to 1,450. From 1996 to 2000 and from 2002 to 2007, when fishery was open for three 3-day weekends and the seasonal limit was 2 in combination with the Anchor River, the average harvest dropped to 743 Chinook salmon. In 2008, the Deep Creek seasonal limit was not tied to the Anchor River. From 2009 to 2015, the lowest harvests of Chinook salmon occurred since recording began in 1977. On average, 169 Chinook salmon were harvested annually. EO restrictions due to low runs contributed to these small harvests (Table 29). In 2016, there were no EO restrictions to the three 3-day weekends and harvest and catch increased slightly over the 2009–2015 average.

Ninilchik River

The annual Ninilchik River Chinook salmon sport fishery has changed over time but has primarily occurred on 3 weekends and Mondays beginning on Memorial Day. From 1988 to 1994, to provide additional sport fishing opportunity, the Ninilchik River was stocked by SF with an average of 163,922 Chinook salmon smolt annually (Table 27). To prevent unsustainable wild Chinook salmon harvests, negative hatchery versus wild smolt interactions, straying of hatchery fish, and "recycling" of hatchery-reared fish during Chinook salmon egg takes, stocking levels were reduced to 50,000 smolt in 1995. The sport fishery has been liberalized by EO and expanded by BOF to harvest surplus hatchery fish. Unlike the Anchor River and Deep Creek, the Chinook salmon annual limit has remained at 5 over the years.

Prior to stocking (1977–1990), the average harvest from the Ninilchik River was 976 Chinook salmon (Kerkvliet et al. 2016). During this period, the inriver fishery was open three 3-day weekends, the daily bag and possession limit was 1 Chinook salmon, and the seasonal limit was 5. From 1991 to 1997, 3- to 14-day fishery extensions were issued to target the runs of hatchery-reared Chinook salmon from high stocking years. These extensions increased the average annual Chinook salmon harvest to 3,414 fish, which was a threefold increase. Harvest averaged 1,614 Chinook salmon from 1996 to 2008 (Kerkvliet et al. 2016). At the 2007 BOF meeting, a hatchery-only fishery beginning on July 1 was added in regulation. From 2009 to 2015, EO restrictions due to low productivity contributed to the historically lowest Chinook salmon harvests since recording began in 1977. An average of 170 Chinook salmon were harvested annually during those years (Table 30). The stocking level was increased to 150,000 smolt beginning in 2014 (Table 27). In 2016, the Ninilchik sport fishery was liberalized by inseason EO to allow fishing and harvest of hatchery-reared Chinook salmon beginning June 16, which partially contributed to the increased 2016 harvest of 673 Chinook salmon.

The SWHS does not differentiate between wild and hatchery-reared Chinook salmon. Estimates of hatchery 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 1993 to 1996 and 2001 to 2002 (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, which lasted 31 days, indicated that hatchery-reared Chinook salmon composed a minimum of 39% of the harvest (Booz and Kerkvliet 2011a).

Historical 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. Surveys were conducted in each stream where most spawning was thought to occur. A standard section of each river was flown and a subsection of the flight path was counted by foot. If foot survey counts were higher than aerial counts in the subsection, the aerial count for the entire stream was expanded by the difference in the subsection count; otherwise, the aerial count for the entire stream section was used. 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. The aerial surveys were discontinued on the Anchor and Ninilchik rivers in the 2000s in favor of using weirs to monitor escapement. Escapement data from the Anchor River sonar and floating weirs are used to make preseason forecasts and inseason projections, both of which are used to inform management decisions for all the lower Kenai Peninsula roadside streams.

Anchor River

Chinook salmon escapement on the Anchor River has been monitored with a combination of sonar, weirs, and instream video systems since 2003 (Table 31). Aerial surveys were continued through 2008 to compare trends between the 2 escapement monitoring methods (Kerkvliet et al. 2016). No relationship was found, and the Anchor River aerial survey was discontinued in 2009. The escapement monitoring location on the mainstem was selected upstream of the fishery and just downstream of the confluence of the north and south forks of the Anchor River. In 2003, dual-frequency identification sonar (DIDSON) was used to monitor Chinook salmon escapement over most of the run to test its utility for estimating escapement. The 2003 Anchor River Chinook salmon DIDSON escapement estimate was higher than previously suggested from aerial index counts. Beginning in 2004, the entire Chinook salmon run was monitored with DIDSON during high flows in May and June and a floating weir after water levels became manageable. Escapement is estimated during DIDSON operation from the net upstream fish passage (upstream count minus downstream count). The estimate is considered conservative because all fish passing upstream or downstream of the sonar beam are counted as Chinook salmon even though a small but unknown percentage of the downstream moving fish are postspawning steelhead emigrating to saltwater (Kerkvliet et al. 2008). Since 2004, the method used to monitor escapement has been initially determined by stream flows. When stream flows are too high for the installation of a floating weir, escapement is monitored using DIDSON. Once flows allow the installation of a floating weir, the DIDSON is removed, a floating weir is installed, and escapement is censused. In 2009, 2014, and 2015, the DIDSON was not required because low water levels allowed for the installation of the floating weir prior to the run, which provided censuses of the escapement in those years. The DIDSON has operated for a range of 9–34 days during years that required its use.

A motion-sensing instream video system has been used during the floating weir operation since 2011 (Table 31). In 2013, after a series of floods rendered the mainstem monitoring site unusable, the DIDSON was relocated approximately 300 m downstream and used to monitor escapement on the mainstem throughout the high flow. After flows lessened, weirs were installed on each fork to

continue escapement monitoring. Since 2014, Anchor River Chinook salmon escapement has been monitored on the north fork with instream video and the south fork with DIDSON and instream video. The smaller size of the north fork allows for floating weir installation in early May, which has provided a census of the north fork escapement since 2014. The north fork weir was a traditional fixed-picket weir in 2014 but was transitioned to a floating weir starting in 2015.

Estimated Chinook salmon annual escapements for the Anchor River from 2003 to 2007 were near or above the estimated carrying capacity of 10,000 Chinook salmon based on spawner-recruit analysis. During the low production years from 2009 through 2014, the average Chinook salmon escapement (3,808) was well-below the 2003–2008 average (9,464) (Table 31). The Chinook salmon runs in 2015 and 2016 were improved over the 2009–2014 average.

Deep Creek

The historical (1976–2015) Deep Creek annual aerial index has averaged roughly 590 Chinook salmon (Kerkvliet et al. 2016). 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. Based on aerial index counts and drainage size, it is 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.

Ninilchik River

Starting in the late 1980s, a weir was also operated to collect broodstock from the Ninilchik River during July. Initially, the weir was only operated for a few weeks in July (during peak spawning) and its location 7.7 river kilometers (RKM) upstream provided road access to mature Chinook salmon. A significant number of Chinook salmon migrate past this weir location prior to and after operation, and based on aerial survey data, roughly 35% spawn downstream (Marsh unpublished[7]). In the mid-1990s there was a shift from monitoring escapement using aerial surveys to using counts from the broodstock weir; however, the transition is not well documented. Of the 3 streams, the Ninilchik River is the most difficult to survey from air due to lack of water clarity and the nature of the stream topography. In 2001, the Ninilchik River aerial survey was discontinued and Chinook salmon escapement was indexed using weir counts. No relationship was found between the weir and aerial survey index counts.

From 1999 to 2005, the Ninilchik River broodstock weir operation was extended to enumerate the entire escapement (Kerkvliet and Booz 2010). On average during these years, 65% of the total wild Chinook salmon weir escapement was counted between 3 and 31 July. From 2006 through 2015, the weir was operated at least for the index monitoring period from 3 to 31 July, often with additional operation in August to continue broodstock collection. An index monitoring period SEG of 550–1,300 wild Chinook salmon was used to evaluate escapement from 2005 through 2016 (Kerkvliet 2008; Kerkvliet and Booz 2010; Booz and Kerkvliet 2011a, 2011b, 2011c, 2012). Beginning in 2016, instream video was used to enumerate the entire run to the broodstock weir.

From 1999 to 2005, the average escapement of wild Ninilchik River Chinook salmon during the SEG period (3–31 July) was 971 wild fish. From 2006 to 2015 the wild Chinook salmon escapement during the index monitoring period averaged 685 (Figure 10). More robust runs in 2014 through 2016 allowed the wild Chinook salmon escapement to achieve the SEG.

[7] L. E. Marsh, 1997 memorandum to B. Clark, ADF&G, on preliminary evaluation of the stocking program at the Ninilchik River.

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. 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. To the greatest extent possible, restrictions are standardized for all 3 streams to prevent shifting effort from one drainage to the other. Since the harvest in the Upper Cook Inlet Chinook salmon Summer Fishery comprises a mixture of local spawners and nonlocal feeders, preseason and inseason restrictions have also been employed in salt water 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 consistently throughout most of their history due to a lack of high-resolution escapement data. The dates for the open season in May and June for Chinook salmon fisheries in roadside streams were based on creel survey results from the early 1960s which reported that catch rates increased on the Memorial Day weekend and that the run was virtually over by the first of July. In 1962, the sport fisheries were open from 7 May to 8 July and then were closed in 1964 and 1965. In 1966, the BOF left Stariski Creek fishery closed but opened the Anchor River, Deep Creek, and Ninilchik River to sport fishing for Chinook salmon. The fisheries were limited to May and June beginning Memorial Day.

Historically, most regulation changes have been made postseason through the BOF because timely inseason escapement data were not available until the Anchor River sonar-weir project began estimating Chinook salmon escapement in 2003. However, there were a few exceptions. A fifth 3-day opening weekend was added by EO to the Anchor River and Deep Creek fishery inseason in 1988 because of lost fishing opportunity earlier in the season due to high water conditions. The Ninilchik River Chinook salmon fishery was also extended by EO from 1991 to 1996 when the foot survey counts upstream of the fishery detected large numbers of hatchery fish. Deep Creek was liberalized by EO in 2001 by adding a 3-day weekend after high water had discouraged anglers from fishing during all 3 open weekends.

Saltwater regulations in the UCI summer fishery (see saltwater Chinook salmon section) have also been structured historically to restrict the harvest of lower Kenai Peninsula roadside stream stocks. The evolution of current regulations, which restrict time and area surrounding the stream mouths in salt water, date back to the 1960s when the freshwater Chinook salmon bag limits and seasons applied to within a one-half mile radius of the Ninilchik River, Deep Creek, Stariski Creek and the Anchor River. Seasonal area closures around the mouths (now referred to as conservation zones) of the roadside streams have been in place since 1978. Once the Cook Inlet–Resurrection Bay Saltwater Area was defined in 1981, special provisions closed the salt waters within 1 mile of

lower Kenai Peninsula roadside streams to the taking of Chinook salmon from 1 January through 30 June.

In 1996, the inriver Chinook salmon fisheries were restricted in concert 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. The areas upstream of the 2-mile markers on the Anchor River, Deep Creek, Ninilchik River, and Stariski Creek were restructured to open on 1 August instead of 1 July to close these stream sections to sport fishing during peak Chinook salmon spawning. The restrictions also reduced the Deep Creek fishery to three 3-day weekend openings. In the Anchor River and Deep Creek combined fishery, an angler could no longer fish for the remainder of the day after harvesting a Chinook salmon 20 inches in length or longer. The annual limit in the Anchor River and Deep Creek combined was reduced from 5 to 2 Chinook salmon over 16 inches in length. The Early-Run Plan also closed the 1-mile radius in front the roadside streams to all fishing from 1 April to 30 June.

The later Chinook salmon run timing in recent years has required changes to both freshwater and saltwater sport fishery regulations. During years of low Chinook salmon productivity, EOs were issued restricting use of bait in July when the roadside stream fisheries opened for fishing other than Chinook salmon. The BOF adopted an ADF&G proposal to restrict gear to 1 unbaited, single-hook, artificial lure for 1–15 July in the Anchor River, Stariski Creek, and Deep Creek. The Ninilchik River was not included due to the hatchery-only fishery that remains open in July. In 2016, to realign salt- and freshwater regulations, the BOF adopted an ADF&G proposal to maintain the conservation zone closures around the mouths of the roadside streams for an additional 2 weeks through 15 July.

In 1993, Chinook salmon biological escapement goals (BEGs) were first adopted for Anchor River (1,790), Deep Creek (950), and Ninilchik River (830), and were defined as the average of the expanded (by foot surveys; see escapement section above) aerial index surveys from 1962 to 1993. In 1998, the BEGs were rescaled based on historical aerial survey counts alone and the relationship of the aerial survey counts to sport fishing harvests. The BEG ranges for the Anchor River (1,050–2,200), Deep Creek (400–950), and the Ninilchik River (500–900) were the 40th and 80th percentiles of aerial rotary-wing counts conducted from 1976 to 1997 (Szarzi and Begich 2004a).

Escapement goals for salmon stocks in Cook Inlet were reevaluated in 2001[8] after the *Policy for Management of Sustainable Salmon Fisheries* (5 AAC 39.222) and the *Policy for Statewide Salmon Escapement Goals* (5 AAC 39.223) were adopted into regulation by the BOF in 2000. A set of standard criteria were developed to set escapement goals for stocks where total runs cannot be enumerated, based on the performance of salmon stock dynamics where total runs are known. The 25th to 75th percentiles of annual 1976–2000 helicopter aerial escapement counts for Anchor River (750–1,500) and Deep Creek (350–800) were established as the new SEG ranges for those streams. Ninilchik River aerial counts were too poor in quality to use for management decisions. The Ninilchik River Chinook salmon SEG range (400–850) was changed to the 1994–2000 15th percentile and the maximum observed wild Chinook salmon escapement to the egg-take weir during 8–24 July.

[8] Bue, B. G., and J. J. Hasbrouck. *Unpublished.* Escapement goal review of salmon stocks of Upper Cook Inlet. Alaska Department of Fish and Game, Report to the Alaska Board of Fisheries, November 2001 (and February 2002), Anchorage.

Anchor River

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 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. In 2003, once escapement reflected large run sizes, the fishery was progressively liberalized through 2008 (Kerkvliet et al. 2016). Since 2003, when full enumeration of the Chinook salmon escapement began, the Anchor River Chinook salmon sport fishery has been more actively managed.

The SEG for Anchor River Chinook salmon has been refined as more annual escapement data have become available. In 2004, an SEG based on aerial index counts was discontinued. From 2005 to 2007, Anchor River Chinook salmon were managed without an escapement goal. In fall 2007, ADF&G conducted a spawner-recruit analysis using all available data and established a lower bound SEG of 5,000 for Anchor River Chinook salmon (Szarzi and Begich 2004b). A lower bound, rather than a range, was selected because the small amount of total escapement data resulted in uncertainty about what the SEG range should be. In 2010, ADF&G updated the spawner-recruit model with escapement and harvest data and modified the goal to an SEG of 3,800–10,000 Chinook salmon. The lower end of this SEG is the point estimate for maximum sustained yield and the upper bound is the estimated carrying capacity. The range minimizes the risk of overfishing and allows for liberalization of the harvest when escapements are large (Szarzi et al. 2010). In 2013, the Anchor River SEG was not evaluated using the 2011–2013 spawner-recruit data because the data only contained returns from high escapement years. In 2016, the SEG was updated to a range of 3,800–7,600 based on the same spawner-recruit model using aerial survey data from 1997 through 2008 and escapement, age, and harvest data through 2015, and assumed marine harvest rates (Otis et al. 2016).

The Anchor River stock has experienced a series of regulation changes through the BOF and by EO in response to high productivity from 2003 through 2008 and low productivity from 2009 through 2014. In 2004, the fifth 3-day weekend opening was reinstated by EO and the SEG based on aerial index counts was discontinued. At the 2004 fall BOF meeting, the management concern listing was rescinded and a public proposal was adopted to add a fifth 3-day weekend opening before the Memorial Day weekend (Appendix A1). The BOF adopted a suite of regulations in 2007 that further liberalized the Anchor River sport fishery. Wednesdays were added following each of the five 3-day weekend openings for a total of 20 open days and the annual limit was increased from 2 to 5 Chinook salmon 20 inches or longer. From 2009 through 2015, in response to low escapements, EOs were used to restrict the inriver and nearby marine fisheries (Appendix A1). After EO restrictions were issued in 2009 through 2014, except for 2010, the Anchor River fishery was closed by the fifth weekend opening. The July "other species" fishery was closed or restricted in many of those years to 1 unbaited, single-hook, artificial lure due to later run-timing of Chinook salmon. From 2009 to 2014, a range of 22–31% of the escapement was counted during July. Anchor River Chinook salmon failed to achieve the SEG in 2009–2011 and 2014, despite EO restrictions. The SEG (3,800 fish lower bound) was achieved in 2012 and 2013 with preseason and inseason EO restrictions. The escapement counts surpassed the upper bounds of the SEG in 2015. In 2016, there were no preseason or inseason restrictions to the Anchor River and the SEG was met.

Deep Creek

Deep Creek Chinook salmon sport fishery regulations have received little modification since the restrictions of 1996. This fishery has been primarily managed in unison with the Anchor River sport fishery. Aerial survey index counts have not provided sufficient data to assess the Deep Creek Chinook salmon run size or if this stock could support more sport fishing opportunity.

At the 2007 BOF meeting, the combined Deep Creek–Anchor River annual limit of Chinook salmon was separated, which left Deep Creek with an annual limit of 2 Chinook salmon. In 2010, the use of bait was prohibited by EO for the third regulatory weekend opening of the Chinook salmon sport fishery. This restriction reduced the transferred effort resulting from restrictions on the Kenai and Kasilof rivers and the low Anchor River escapement. At the 2010 fall BOF meeting, the Deep Creek annual limit of 2 Chinook salmon was recombined with the Anchor River. In 2012, Deep Creek was restricted by EO to restrict the use of bait and limit gear to single hook. In 2013 through 2015, a series of preseason and inseason restrictions were placed on the Deep Creek Chinook salmon sport fishery. Gear was restricted to 1 unbaited, single-hook, artificial lure for all weekends. The Chinook salmon annual limit was combined with the Anchor and Ninilchik rivers and the UCI saltwater fisheries. There were no EOs issued for the Deep Creek Chinook salmon fishery in 2016.

The lower end of the Deep Creek aerial escapement SEG (350) has remained unchanged since 2001 but the upper end was removed after 2016 (Otis et al. 2016). Since 2001, aerial index counts have fallen within the SEG range except in 2008 (Kerkvliet et al. 2016). There was no survey in 2016 due to water conditions. The number of Chinook salmon observed during a beach seine survey in Deep Creek in June 2016 suggested the SEG would have been easily achieved had the survey flight occurred.

Ninilchik River

The management of Ninilchik River Chinook salmon sport fishery has been complicated with supplementation of hatchery fish. The sport fishery has been liberalized to maximize the harvest of hatchery 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. This complexity distinguishes the management of the Ninilchik River sport fishery from the other roadside streams.

Since 2007, smaller run sizes have compromised our ability to simultaneously meet the SEG and spawn enough fish for stocking the Ninilchik River and Kachemak Bay saltwater terminal fisheries. Wild Ninilchik River Chinook salmon escapements were near the lower bound of the SEG goal from 2007 through 2013. The collection of broodstock during years of low runs increases the probability of not achieving the escapement goal (as occurred in 2007) because variability in run timing makes it difficult to predict if the goal will be met until late in weir operation after some egg takes have already been conducted. The competing requirements of fish needed for escapement versus stocking during poor runs has highlighted the need to evaluate the role of stocking and taking eggs from the Ninilchik River Chinook salmon stock in the future.

Emergency orders increased the number of open fishing days for all Chinook salmon on the Ninilchik River during the years 1991–1996 and in 2001 (Appendix A1) to maximize the harvest of hatchery-reared Chinook salmon. During the years 2002–2004 and 2006–2007, EOs increased the number of days when hatchery fish could be targeted. In fall 2004, the BOF adopted a regulation to maximize the hatchery-reared harvest while protecting wild fish, which increased the

daily bag limit of Chinook salmon from 1 to 2, of which no more than 1 fish could be a wild Chinook salmon. In fall 2007, the BOF allowed anglers to harvest hatchery-reared fish after 1 July through 31 December to further increase the harvest of hatchery-reared fish.

From 2010 to 2015, EOs were used on the Ninilchik River to restrict the fishery during years of poor runs. In 2010, the use of bait was prohibited by EO for the third regulatory weekend opening of the Chinook salmon sport fishery. In 2012, the second and third weekend openings were limited to single-hook no bait and the July hatchery-only fishery was closed. In 2013 through 2015, a series of preseason and inseason restrictions were placed on the Ninilchik River Chinook salmon sport fishery. Gear was restricted to single hook, and bait was prohibited for all weekends. The annual limit of 5 Chinook salmon was reduced to 2 and combined with Chinook salmon harvest in Deep Creek, Anchor River, and the marine waters north of Bluff Point. The daily bag limit was reduced to 1 Chinook salmon regardless of whether wild or hatchery-reared. The hatchery-reared Chinook salmon fishery was closed from 1 July through 31 October in 2013, but remained open in 2014 and 2015. There were no preseason restrictions in 2016, but an EO issued in June liberalized the hatchery-only fishery to open 2 weeks early on 16 June. In fall 2016, the BOF adopted this change into regulation. The BOF also created a 1-day youth-only fishery in early June. There were no preseason or inseason EOs in 2017. In 2018, the Ninilchik River fishery was closed by EO after the first open weekend. It reopened to hatchery-only harvest on 16 July.

Comparison of escapement counts for the entire run (May–August) to index counts during July led to revision of the SEG range in 2007 to 550–1,300 Chinook salmon. The 2007 SEG was determined by the 15th percentile and the maximum wild Chinook salmon escapement upstream of the egg-take weir during 3–31 July each year from 1999 to 2007. The change was meant to represent a greater proportion of the wild escapement, encompass more of the variability in run timing, and reduce the likelihood of mistaking low escapements for late run timing. In 2013, the assessment of the SEG with the inclusion of the 2008–2013 escapement counts suggested there should be no change to the Ninilchik River wild Chinook salmon SEG. In 2016, the SEG was updated to 750–1,300 using the percentile approach to reflect monitoring the full run to the weir site (Otis et al. 2016). In years, when the run was not fully enumerated, the escapement counts were expanded based on the average percent of the run that passed the weir during the annual operation dates.

Recent Fisheries Performance

In 2017, the lower Kenai Peninsula roadside streams Chinook salmon fishery experienced the last year of a 3-year period with strong runs. In 2018, one of the weakest Anchor River runs (3,162 fish) was observed since fully enumerating the escapement in 2003 (Table 31). All 3 roadside streams were closed to fishing after Memorial Day weekend (Appendix A1). Additional EO restrictions were issued for the saltwater Upper Cook Inlet Summer Fishery due to the weak roadside stream runs in 2018. From 16 to 31 July, gear for other species was restricted by EO in all roadside streams due to the continued weak Chinook salmon run.

In 2016–2018, average catch and harvest of Chinook salmon for the Lower Kenai Peninsula roadside streams (3,933 and 1,338, respectively), was above the 2000–2015 averages (6,864 catch and 2,203 harvest) but above the recent 2013–2015 averages (2,104 catch and 508 harvest) (Table 3). On average (2016–2018) for the roadside streams, approximately 32% of the Chinook salmon caught were harvested, which was exactly the same as the 2000–2015 historical average (Figure 9; calculated from Table 3). Due to the fishery closures after Memorial Day weekend, both

catch and harvest declined in 2018 to 413 and 114, respectively. The strong runs in 2015 and 2016 prompted no preseason restrictions for 2017 and 2018. Water conditions were better earlier than normal on the lower Kenai Peninsula roadside streams during 2016–2018, as observed by ADF&G staff. The combination of good water conditions and later run-timing provided better fishing opportunity as the season progressed in 2017. In 2018, the combination of late run timing and small run size meant there were very few fish in the streams during the first open weekend on the Anchor River and during Memorial Day weekend on all 3 streams.

In general, the total angler-days for the roadside streams is high when there are no restrictions to the Chinook salmon fishery in the spring and remains average or below-average when pre- or inseason restrictions are issued to that fishery. The average angler-days for the roadside streams in 2016–2018 (16,680 angler days) decreased from the recent 2013–2015 average (18,748 angler days). The angler-days in 2016 and 2017 increased from recent averages, but effort decreased in 2018 to 10,281 angler-days following closures of the Chinook salmon fisheries.

Anchor River

In 2016 and 2017, Anchor River Chinook salmon catch and harvest increased to levels greater than the 2009–2015 averages (1,016 and 337, respectively) and closer to the 2000–2008 averages (4,921 and 1,403, respectively). Despite this, estimates of days of effort during those years, which are estimates of effort directed at all species throughout the year, remained at about half the 2000–2008 historical average of 21,900 (Table 28). In 2018, catch and harvest (305 and 40 Chinook salmon, respectively) were well-below the historical average. The exploitation rates during 2016–2018 ranged from 1.2% to 16% and averaged 10.1%, which was greater than the 2009–2015 average exploitation rate (7.6%) and less than the 2003–2008 average (15.2%) (Table 31). The SEG was met in 2017 with an escapement of 5,796 Chinook salmon. An escapement of 3,162 Chinook salmon in 2018 did not achieve the SEG (3,800–7,600 Chinook salmon; Table 31).

In 2016, fishing conditions were good throughout the season with low flows that were conducive to harvesting Chinook salmon. Effort increased over recent years and was more similar to the historical average effort based on observations by ADF&G staff. The 2016 Chinook salmon catch of 4,232 was the highest since 2007 and the harvest of 1,384 was the highest since 2008 (Table 28). In 2017, fishing conditions were reported to be marginal during the opening weekend but improved and were good for the remainder of the season. The 2017 Chinook salmon catch of 2,888 and harvest of 845 was less than 2016 but greater than the 2009–2015 averages of 1,016 and 337, respectively (Table 28). In 2018, water levels were relatively low and favorable to harvesting Chinook salmon, but very few fish were inriver during the first 2 weekend and Wednesday openings. Prior to the EO fishery closure after Memorial Day weekend, there was moderate effort following 3 years of strong runs.

Deep Creek

Deep Creek Chinook salmon catch and harvest in 2016 (850 and 424, respectively) and 2017 (849 and 322, respectively) increased slightly in comparison to the recent years (2009–2015) averages (616 and 169, respectively) but remained well-below the 2000–2008 averages (Table 29). Estimates of angler-days of effort in 2016 and 2017 (4,730 and 3,978, respectively) were similar to the 2009–2015 average (5,014) but had decreased 68–71% from the 1977–1999 average (13,705). In 2018, 37 Chinook salmon were caught and harvested. Only 1 year, 2012, estimated a smaller harvest than 2018. The 2016 Chinook salmon catch of 850 was slightly larger than the

2009–2015 average, but still 62% less than the 2000–2008 average of 2,266. In 2017, fishing conditions were good for all 3 weekends. Effort observed by ADF&G staff remained low and similar to 2016. The Chinook salmon catch of 849 was very similar to 2016 and the harvest of 322 was slightly less. In 2018, water conditions were good for the only open weekend, but there were few fish inriver and effort was low.

In 2018, the Deep Creek Chinook salmon escapement was fully enumerated for the first time using a combination of sonar and instream video system, similar to the escapement monitoring approach on the Anchor River. The run was monitored at 4.2 RKM (just above the fishery and same location as historical weir operation) with adaptive resolution imaging sonar (ARIS) from 14 May through 7 June and an instream video system attached to a resistance board weir from 7 June through 9 August. The total escapement was 2,598 with approximately 12% of the weir count being hatchery fish. The estimated exploitation rate was 1.4%.

Although a weir was operated in 2018, Chinook salmon escapement was still assessed with a single aerial survey index count for these recent years. In 2016, no survey was conducted due to poor water conditions throughout late July and early August. The SEG was met in 2017 but not met in 2018 (Figure 11).

Ninilchik River

Ninilchik River Chinook salmon average catch and harvest for 2016–2018 were well below the 2000–2008 averages and similar to the recent 2009–2015 averages (Table 30). The average Chinook salmon harvest from 2016 to 2018 was 307, which was 77% below the 2000–2008 average. In 2016, the Chinook salmon catch (1,578) and harvest (630) was the highest observed since 2008. This may in part be due to the EO that opened the river on 16 June to the harvest of only hatchery-reared Chinook salmon. The 2017 catch (988) was roughly 37% less than the 2016 catch (Table 30). During 2016–2018, angler effort was more focused on the Anchor River and Deep Creek than the Ninilchik River. Anglers tend to prefer the Anchor River, and to a lesser extent, Deep Creek because the run sizes are larger. The number of angler-days fished on the Ninilchik River from 2016 to 2018 (2,353) was less than the 2009–2015 average (3,710).

In 2017, the first 1-day youth-only fishery occurred on 7 June. Participation was low based on ADF&G staff observations. Effort was also low during the hatchery-only fishery that opened 16 June. In 2018, water conditions were ideal for Memorial Day weekend but there were very few fish in the river based on ADF&G beach seining in the sport fishery area. The youth-only fishery did not occur in 2018 and there was little effort in mid-July when the river opened to the harvest of hatchery Chinook salmon.

In 2017 and 2018, the Ninilchik River Chinook salmon wild and hatchery escapements were monitored in late May through June using an instream video system, the live box in the broodstock weir in July and early-August, and video at the end of the run in mid-August. The wild Chinook salmon escapement was within the SEG range in both years (Figure 10). The hatchery-reared run was also fairly robust in both years, and the hatchery-reared contribution to the escapement was 23% (252/1,107) in 2017 and 18% (220/1,199) in 2018. The proportion of the total escapement that occurs below the weir location as well as the wild to hatchery proportion of the sport harvest is unknown, so no estimates of exploitation are available.

Broodstock collection goals were not achieved in 2017 but were surpassed in 2018 to support shortages for the region. In both years, broodstock collection was aided using inriver raceways and

a releasing hormone called Ovaplant (Smith and Booz 2018). Survival to the eyed-egg stage was greatly improved over other recent years. The hatchery contribution to broodstock collection was also increased in 2017 and 2018 compared to other recent years. In both 2017 and 2018, approximately 150,000 smolt were stocked with an average size of just under 14 g (Table 27). The 2017 stocking occurred on 2 May at the Brody Road bridge, which was not planned. These fish needed to be removed from the hatchery earlier than expected due to testing positive to bacterial kidney disease. The upper stocking location at RKM 25.8 was not an option due to the road conditions. It is unknown if this stocking was successful, but the cohort will be monitored closely as it returns. The 2018 stocking was delayed roughly 1 week due to road conditions at the upper release site but still occurred by late May after repairs to the road.

COHO SALMON FISHERIES

Fisheries Description

Coho salmon are harvested throughout the LCIMA in fresh waters, including Kenai Peninsula roadside streams (upper LCIMA), West Cook Inlet (west LCIMA) streams, and Kachemak Bay and Lower Cook Inlet (lower LCIMA) streams (Table 12). LCIMA stocks begin their freshwater spawning migrations in mid to late July. The migration peaks in mid to late August and the migration is mostly over by mid-September. Coho salmon spawning migrations into lower LCIMA tributaries are thought to be a little later than the run timing of roadside stream stocks. Coho salmon tend to hold in the salt water near their natal stream mouths or in the lower reaches of streams until rain raises the stream water level, then they tend to immigrate *en masse*. Peak daily fish counts at the Anchor River weir have exceeded 4,000 during high water (Kerkvliet et al. 2008).

The Kenai Peninsula roadside streams, comprising the Anchor and Ninilchik rivers, and Deep and Stariski creeks, all support popular coho salmon fisheries (Table 3). The Sterling Highway crosses the lower reaches of the Anchor River, Ninilchik River, Deep Creek, and Stariski Creek, and developed access and camping facilities are located on or near each river. Anglers can easily access the entire 2-mile open fishing area. Fishing success varies by time of day and river levels. In general, successful anglers fish the relatively brief periods immediately after sunrise and just before darkness. During peak flows, angler success in the Anchor River and Deep Creek is generally low because the rivers are muddy. Of the 4 watersheds, Stariski Creek is the smallest (draining approximately 52 square miles with about 30 river miles as habitat for anadromous fish) and most of the sport fishing effort (Kerkvliet et al. 2016) occurs at the mouth. The upper Stariski Creek drainage forms long meanders as it flows through low lying wetlands, straightens as it gets closer to the intertidal area, then enters a wetland complex as it runs parallel to the shore before flowing into Cook Inlet. The Anchor River, Deep Creek, and the Ninilchik River watersheds are described in the Freshwater Fisheries–Chinook Salmon Fisheries section. Historically, the roadside streams supported approximately 50% of the LCIMA's coho salmon harvest most years until 1990 (Kerkvliet et al. 2016), when the coho salmon from the first full stocking of NDFL returned as adults. These streams contributed only 18%, on average, to the area harvest when stocked returns were peaking from 2001 through 2005 (calculated from Table 12). Since 2006, they have contributed an average of 23% to the area-wide total harvest.

Coho salmon are widely distributed in west LCIMA fresh waters. The small fisheries that do occur are remote and it is expensive to participate in them. Access is by plane, helicopter, or boat. In the fisheries south of Chinitna Bay, participants are mostly guided anglers flown in and out daily from the Lake Iliamna area. The largest coho salmon sport fisheries occur in Silver Salmon Creek and

the Kamishak River (Table 32). Silver Salmon Creek is located midway between Tuxedni and Chinitna bays (Figure 4). The drainage is contained within the borders of Lake Clark National Park except where it abuts private lodge-owner properties. Access is by airplane or boat. Most anglers are housed in 1 of 2 sport fishing lodges that are located near the mouth of Silver Salmon Creek. Additional day-use access to the fishery occurs via private planes and a regular commercial air service from the communities of Soldotna and Homer that lands on the beach adjacent to the creek. The Kamishak River flows into the southern end of Kamishak Bay. Several sport fishing operations from the Lake Iliamna area moor boats in the Kamishak River and fly clients in and out of the Kamishak drainage daily. Guides transport clients by jetboat up the Kamishak River or to the Little Kamishak River and nearby Strike Creek to fish. Other fisheries in tributaries to Kamishak Bay, Amakdedori Creek, and the Douglas River are accessed most commonly by plane or helicopter. Anglers have been observed fishing in these remote rivers but runs in these locations are thought to be relatively minor in size compared to the run to Kamishak River. Clearwater and Shelter creeks are small tributaries to Chinitna Bay where sport fishing for coho salmon occurs regularly. The number of encampments that house anglers fluctuates; up to 4 have been active over the years, but none have been in place since 2005. Based on freshwater charter logbooks, the number of guides and angler-days have historically been higher for West Cook Inlet streams than the upper LCIMA roadside streams (Table 23).

Coho salmon harvest in lower LCIMA fresh waters is relatively small in comparison to the Kenai Peninsula roadside streams (upper LCIMA). The Fox River, at the head of Kachemak Bay, is thought to be the major producer of wild coho salmon in lower LCIMA. The Fox River is remote, and access is difficult. Other lower LCIMA coho salmon runs are small. Sport fishing has historically occurred on Clearwater Slough, a small tributary to the Fox River, Silver Creek, a tributary to China Poot Bay, the Seldovia River, and Port Graham River, along with North Gulf coast drainages such as the Rocky River.

Fisheries Management Objectives

There are no biological or sustainable escapement goals (BEG and SEG) or management plans for any coho salmon stocks in the LCIMA. Coho salmon escapement has been monitored in the Kenai Peninsula roadside streams to assess exploitation. A weir was operated on the Anchor River for 12 years (Kerkvliet et al. 2016). Escapements were highly variable and generally with modest annual exploitation rates. A weir was operated on Deep Creek for 6 years (Kerkvliet et al. 2016). Over monitored years, there was less range in coho salmon escapement counts on Deep Creek compared to the Anchor River. Exploitation rates were higher than the Anchor River but still at a moderate rate. On both streams, the exploitation rate was higher in years with smaller run sizes.

The Kenai Peninsula roadside streams sport fisheries are managed through Kenai Peninsula Area general provisions (5 AAC 56.120) that specify seasons, bag and possession limits, and special provisions (5 AAC 56.120) that describe gear and area. Coho salmon are within regulations for salmon other than Chinook salmon. Any coho salmon removed from freshwater may not be released and becomes a part of the angler's limits. Gear is restricted to 1 unbaited, single-hook artificial lure from 1 to 15 July and 1 September to 31 October on the roadside streams (5 AAC 56.122). The remaining lower LCIMA freshwater fisheries are managed through the Kenai Peninsula Area sport fishery regulations.

The west LCIMA freshwater fisheries are managed through West Cook Inlet general provisions (5 AAC 62.120) that specify season, bag and possession limits, and special provisions

(5 AAC 62.122) that describe gear and area. Coho salmon are within regulations for salmon other than Chinook salmon. Any coho salmon removed from fresh water may not be released and becomes a part of the angler's limits. Gear is restricted to unbaited, artificial lures from 15 July through 15 May for drainages south of Chisik Island. Area closures are described for Clearwater Creek including Roscoe Creek in Chinitna Bay, McNeil River, Shelter Creek, and Silver Salmon Creek.

Postseason and inseason management have been limited for freshwater coho salmon fisheries in LCIMA. In 1999, to protect coho salmon stocks after low runs throughout Cook Inlet, the BOF reduced the bag and possession limits for coho salmon for all Cook Inlet fresh waters from 3 to 2 fish. The exceptions were fresh waters south of the West Foreland, including the west side of the LCIMA, where the bag and possession limits remained at 3 coho salmon. The only inseason management action for wild coho salmon occurred in 1997 and restricted the daily bag and possession limits temporarily in the freshwaters of UCI from 3 to 1 fish per day. Late-season coho salmon numbers increased in roadside streams and the EO was rescinded (Appendix A1).

Recent Fisheries Performance

During 2016–2018, the average annual freshwater coho salmon harvest of 2,479 in the LCIMA was below the 2000–2015 average of 7,534 (Table 12). For 2016–2018, below-average harvests occurred in the Kenai Peninsula roadside streams (Tables 28–30) and west LCIMA (Table 32). The freshwater coho salmon harvest in lower LCIMA remained a small component of the overall freshwater harvest (Table 12). The overall LCIMA freshwater coho salmon harvest in 2016 was the lowest since the inception of the SWHS in 1977 (Table 12). This was due to the lowest observed harvests in both western and upper LCIMA streams. The 2018 SWHS coho salmon harvest estimate for fresh waters of LCIMA was smaller than the historical averages (Table 12). Based on the SWHS, the percent of the average coho salmon harvest from roadside streams by guided anglers increased from 4% (121/3,191) for 2011–2015 to 7% (150/2,137) for 2016–2018 (calculated from Table 26).

The 2016–2018 coho salmon average harvest of 2,137 in the roadside streams was below the historical (1977–1999) average of 4,487, and the more recent (2000–2015) average of 6,230 (Table 3). The 2016–2018 coho salmon catch and harvest trends among the roadside streams remained much like the historical proportions, with the highest catch and harvest occurring within the Anchor River and the lowest in Stariski Creek (Tables 28–30; Kerkvliet et al. 2016). The coho salmon catch and harvest were well below the 2009–2015 average in all of the roadside streams in all 3 recent years (2016–2018). In west LCIMA, most of the coho salmon catch and harvest continued to occur in Silver Salmon Creek (Table 32). In 2016, the sport fishing effort in Silver Salmon Creek (1,014 angler-days) was similar to the historical (1983–2015) average (944 angler-days) but both coho salmon catch (1,267) and harvest (701) were below the historical averages (Table 32). The 2017 and 2018 Silver Salmon Creek estimates were some of the lowest observed with the SWHS.

No inseason management actions were taken with LCIMA freshwater coho salmon fisheries in 2017–2018. Generally, anglers experienced good water conditions in both years. In 2018, the coho salmon runs in the roadside streams seemed to be earlier than usual based on coho salmon counted at the Chinook salmon monitoring weirs and from other ADF&G staff observations. Coho salmon were observed in decent numbers at escapement monitoring in the Anchor River, Deep Creek, and the Ninilchik River in late July through mid-August.

STEELHEAD AND RAINBOW TROUT FISHERIES

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 and rainbow trout, though the same species, can look subtly different at various times during their life cycles. Juvenile steelhead change appearance from rainbow trout just prior to becoming smolt and just prior to migrating from freshwater, when they lose their parr marks and become silvery. Adults returning to freshwater are initially more silver than resident rainbow trout, but quickly lose their sheen and are indistinguishable from rainbow trout in color, although they are generally more fusiform in shape. In the LCIMA, adult steelhead overwinter in freshwater streams and spawn in April and May. Unlike salmon, steelhead can spawn more than once. The presence of steelhead and rainbow trout in LCIMA fresh waters has been confirmed only in the Anchor and Ninilchik rivers, and Deep and Stariski creeks, although there are reports of them in the English Bay Lakes system in the lower LCIMA subarea.

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

The upper LCIMA steelhead and rainbow trout fisheries in the Lower Kenai Peninsula roadside streams have been catch-and-release only since 1989. 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. Some anglers fish for emigrating steelhead in the spring, but most are incidentally hooked by anglers fishing for Chinook salmon. In most years, the steelhead catch in the Anchor River composes the largest portion of the total roadside stream catch.

Little is known about the abundance of steelhead in LCIMA streams. Although steelhead have been counted at weir projects on the Anchor and Ninilchik rivers and Deep Creek, no complete assessment has been made because of the late fall run timing. However, the 1989 weir operation on the Anchor River at RM 1 counted 769 steelhead through 11 November (Kerkvliet et al. 2016). Overall run sizes to these streams are likely to be between hundreds to up to several thousand fish. Emigrating steelhead (kelt) counts have been periodically completely enumerated in the Anchor River (2009 and 2011; Kerkvliet and Booz 2012 and Kerkvliet and Booz 2018) and the Ninilchik River (1999–2005; unpublished data, ADF&G, Homer) and have all been less than 1,000 fish.

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 and became effective in spring 1999. There are

no special management areas or management plans for steelhead and rainbow trout in the LCIMA. The regulatory framework for the roadside stream steelhead fishery evolved over a period of nearly 2 decades. Since 1989, retention has been prohibited and fish may not be removed from the water prior to release. Since 1991, only 1 unbaited, single-hook, artificial lure has been allowed beginning 1 September. From 1996 to 2010, each stream was opened to fishing through 31 December. In 2010, the BOF closed the roadside streams to fishing after 31 October to reduce potential release mortality of steelhead. In 2013 and 2016, the public submitted proposals to the BOF to change the end date for increased sport fishing opportunity, but the proposals failed unanimously.

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.

Recent Fisheries Performance

Annual average rainbow trout and steelhead catch in the roadside streams from 2016 to 2018 (3,792 fish) was below the historical (1989–2015) average (5,652 fish), but very similar to the recent 2013–2015 average (Table 33). Since 2011, the roadside streams have been closed to sport fishing on October 31, but prior to that they closed December 31. The Anchor River continued to compose most of the catch for all 4 roadside streams. The Stariski Creek 2016–2018 average catch increased to 220 from the 1989–2015 average of 80. The Ninilchik River 2018 catch was 1,089, which was a 67% increase over the 2009–2015 average (Table 33). Based on charter logbooks, the guided steelhead catch composed a small portion of the total catch in the roadside streams (Table 24). Based on the SWHS, the percent of the roadside stream catch that was guided increased from the 2011–2015 average of 6% (166/3,014) to the 2016–2018 average of 10% (366/3,792) of the total catch (Table 26).

No inseason management actions were taken for LCIMA freshwater steelhead fisheries in 2017 and 2018. Generally, anglers experienced good water conditions in both years, but there were some rain events that made the roadside streams unproductive for fishing. In 2018, September was unseasonably mild on the lower Kenai Peninsula. The streams remained ice free through the close of the season on 31 October.

DOLLY VARDEN FISHERIES

Fisheries Description

Dolly Varden are the most common, widely distributed, and complex sport fish in the LCIMA. They spawn during autumn and overwinter in numerous drainages. Adults that survive spawning return to Cook Inlet during spring and forage in salt water before returning to fresh water during midsummer. Adults exhibit intertributary spawning as well as overwintering behavior (i.e., a fish may spawn and overwinter in the Anchor River one year and spawn and overwinter in another freshwater system the next year). Juveniles become smolt and migrate to Cook Inlet to forage and often return to a different drainage during midsummer, where they remain to overwinter. Their prolonged freshwater residence makes them available to sport anglers throughout much of the year.

Dolly Varden are important to the LCIMA because they add diversity to the fishing experience by being available concurrent with fisheries for other species and because they provide directed sport fishing opportunity when little opportunity is otherwise available. Peak catch in Dolly Varden

sport fisheries typically occurs during July to mid-August. This period coincides with the return of Dolly Varden to fresh water as they follow salmon upstream to feed on eggs and overlaps with the migration period of abundant spawning salmon. Dolly Varden run timing occurs between the run timing of Chinook salmon and coho salmon and provides extra sport fishing opportunity in Lower Kenai Peninsula roadside streams. Incidental harvest of Dolly Varden occurs in the Cook Inlet marine sport Chinook salmon fishery during the summer months and in nearly all freshwater salmon sport fisheries of the LCIMA.

Historically, the Anchor River has supported the largest Dolly Varden fishery in the LCIMA, with other roadside systems also supporting large fisheries (Table 34). Declines in harvest at the Anchor River from 21,364 fish in 1979 to just 2,735 in 1987 were mirrored by declines in harvest at the other streams (Kerkvliet et al. 2016). Declines in harvest were assumed to reflect stock abundance declines. From 1978 through 1981, a creel census was conducted by ADF&G from June through September to assess Dolly Varden harvest. The results reported little fishing effort until mid-July; most effort that is directed toward Dolly Varden occurred from mid-July to mid-August (Larson et al. 1988). In 1987, ADF&G initiated a study to assess Dolly Varden abundance by counting fish at a weir on the Anchor River, identify overwintering areas through tagging and recapture, and determine the age structure of the population (Larson et al. 1988). The weir was operated approximately 1 mile upstream of the mouth from 1987 to 1995 beginning the first week of July. Weir counts of Dolly Varden at the Anchor River declined from 19,062 in 1987 to 10,427 by 1990 (Larson 1991). Other major findings of the study indicated that immediate stock concerns were best served by controlling harvests targeting individual spawning stocks and by protecting overwintering populations. Furthermore, due to the multifaceted life history of the species, it was thought that low inriver abundance could result from numerous out-of-system factors. Management goals, therefore, focused on mitigating the decline in the number of returning Dolly Varden to the Anchor River, maintaining fishing opportunities for Dolly Varden, and meshing regulations for Dolly Varden with concurrent fisheries of other species. Consequently in 1990, BOF adopted a proposal by ADF&G to reduce the Dolly Varden daily bag and possession limits from 5 to 2 fish.

Since 1991, Dolly Varden harvest has stabilized under the lower bag limit. From 1991 to 2009, Anchor River harvest averaged 1,300 fish (range 662 to 2,532 fish), and from 1977 to 1990, harvest averaged 9,202 fish (range 1,476 to 21,364 fish; Kerkvliet et al. 2016). A comparison between the catch and harvest information indicates that angler behavior changed and Dolly Varden fisheries on the roadside streams became primarily catch-and-release fisheries by 1990 (Kerkvliet et al. 2016). Catch-and-release mortality of Dolly Varden in LCIMA tributaries is not known. Production of roadside streams stocks is probably commensurate with the existing habitat. Overexploitation of these stocks is not likely under the current regulations and angler behavior. Dolly Varden in Southeast Alaska and Kodiak Island show an affinity to overwinter in freshwater systems containing lakes (Armstrong 1965a, 1965b, 1984; Sonnichsen 1990). Tributaries of the LCIMA with headwater lakes that are relatively close to roadside Dolly Varden populations are few and include Packers Lake, English Bay lakes, and Tustumena Lake. It is not known to what extent stocks from the roadside streams use these systems for spawning and overwintering. The extent of the coastal distribution of Dolly Varden originating in local roadside tributaries remains unknown.

Fisheries Management Objectives

Dolly Varden sport fisheries in LCIMA are managed through general provisions for western LCIMA in 5 AAC 62.120 and on the Kenai Peninsula (upper and lower LCIMA) in 5 AAC 56.120.

There are some special provisions that affect Dolly Varden sport fisheries in west LCIMA (5 AAC 62.122) and the Kenai Peninsula (5 AAC 56.122) as well, but generally these provisions are focused on other species. Additionally, there are regulations for identifying the criteria for establishing special management areas in west LCIMA (5 AAC 62.195) and on the Kenai Peninsula (5 AAC 56.195). There has been no inseason management of Dolly Varden in the LCIMA.

Although the Anchor River, Deep Creek, and Ninilchik River fisheries are open to fishing for Dolly Varden in May and June during the Chinook salmon weekend openings from the river mouths to approximately 2 miles upstream (see Freshwater Chinook Salmon Fisheries section), there are very few Dolly Varden inriver during that time. On 1 July, the fishery opens again in the lower 2 miles for all the roadside streams, and this is when anglers primarily target Dolly Varden. On 1 August, the upstream areas of these streams are open to sport fishing for the rest of the season.

There have been some proposals to change the regulations for the roadside streams at the BOF meetings over the years. To protect spawning Chinook salmon, the BOF at its meeting in November 2004 did not pass a proposal by the public to open the Anchor River upstream of the forks to fishing with barbless hooks on 15 July. In fall 2010, the BOF adopted a public proposal to close sport fishing on the Anchor River, Deep Creek, Ninilchik River, and Stariski Creek on 1 November to 31 December. The proposal was adopted to reduce catch-and-release mortality on steelhead during cold temperatures.

The later Chinook salmon run timing in recent years has required sport fishery regulation changes in fresh water. During years of low Chinook salmon productivity, EOs were issued to restrict the use of bait in the "other species" fisheries in the roadside streams. The BOF modified an ADF&G proposal to restrict gear to unbaited, single-hook, artificial lure for 1–15 July in the Anchor River, Stariski Creek, and Deep Creek. The Ninilchik River was not included due to the hatchery-only fishery that remains open through July. These changes have primarily impacted Dolly Varden fisheries but have been well received by the public and have helped limit the incidental catch of Chinook salmon in early July.

Recent Fisheries Performance

In each of the Kenai Peninsula roadside streams (upper LCIMA), the 2016–2018 average catch (15,051) and harvest (673) of Dolly Varden was below the 1977–1999 and 2000–2015 averages (Table 34). The overall catch of Dolly Varden in the roadside streams was 42% less than the 2013–2015 average of 26,050. The below-average catch could be due in part to the overall decline in sport fishing effort in the roadside streams in recent years (Table 3). Based on charter logbooks, the guided Dolly Varden catch and harvest composed a small portion of the total catch in the roadside streams (Table 24). Based on the SWHS, the percent of the roadside stream catch that was guided decreased from 6% for 2011–2015 to 1% for 2016–2018 (calculated from Table 26).

No inseason management actions were taken for LCIMA freshwater Dolly Varden fisheries in 2017–2018. Generally, anglers reported experiencing good water conditions in both years. In 2017, the immigration of Dolly Varden into the roadside streams was noticeably larger than in other recent years. Escapement monitoring in the Anchor River corroborated this. The streams remained ice free through the close of the season on 31 October.

GROUNDFISH FISHERIES

FISHERY DESCRIPTION

The Lower Cook Inlet Management Area (LCIMA) supports a diversity of sport groundfish fisheries, focused primarily on Pacific halibut (*Hippoglossus stenolepis*). Pelagic and nonpelagic rockfish species (*Sebastes* spp.) and lingcod (*Ophiodon elongatus*) are also targeted. Halibut is federally managed (see halibut management section), but rockfish and lingcod are state-managed sport fish stocks. 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 35). Charter logbook data also provide comparisons of harvest and effort estimates for guided anglers (Table 5). 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.

Pacific halibut harvest data were also required to be reported in charter logbooks from 1998 through 2001, but there were discrepancies between logbook harvest data and SWHS estimates of guided harvest on the order of 12–42% each year (harvests reported in the logbooks were greater). As a result of these discrepancies, ADF&G discontinued collection of Pacific halibut data in charter logbooks beginning in 2002. The saltwater logbook requirement was reinstated in 2006 to record the number of Pacific halibut harvested and released. Charter logbook data also includes the harvest and release of rockfishes by (biologically characterized) assemblage as well as lingcod. Harvest by charter and unguided anglers has been estimated by the SWHS since 1986 for all LCIMA fisheries, but not for west LCIMA. Since 1995, harvest in the west LCIMA reporting area has been estimated within the upper LCIMA and lower LCIMA estimates.

For groundfish fisheries monitoring purposes, the LCIMA is divided into 2 subareas: Lower Cook Inlet (Groundfish–LCI) and Central Cook Inlet (Groundfish–CCI), which differ from the areas described for the rest of the LCIMA (Figure 13). Groundfish–LCI sampling effort focuses on fish landed south of Anchor Point, primarily at the Homer Harbor. Groundfish–CCI sampling effort focuses on fish landed north of Anchor Point at the Anchor Point and Deep Creek tractor launches. Vessels launched from Groundfish–CCI are more likely to target Pacific halibut and (or) salmon whereas vessels launched from Groundfish–LCI may target Pacific halibut, rockfish, lingcod, salmon, or any combination thereof. Multiday trips originating from the Homer Harbor may land fish from other management areas such as North Gulf Coast (NGC) or Kodiak.

PACIFIC HALIBUT FISHERY

Fishery Description

The Pacific halibut sport fishery is a federally managed sport fishery that is vital to the economy in LCIMA. In 1986, charter and unguided anglers spent an estimated $18.5 million in Southcentral Alaska (excluding Kodiak area waters) in pursuit of Pacific halibut and indicated a willingness to pay an additional $25 million to ensure the continued availability of Pacific halibut fishing opportunity (Jones & Stokes 1987). In a separate study, the Homer Pacific halibut charter fishery

generated an estimated $9.1 million in gross income and the equivalent of 64 year-round jobs in the Homer economy in 1986 (Coughenower 1986). The most recent estimates specific to Pacific halibut indicate that about $19.3 million was spent in Alaska by Cook Inlet Pacific halibut charter boat clients in 1998, with $15 million of that spent in the Cook Inlet area (NPFMC 2001: page 71). An economic study of sport fishing in Alaska in 2007 estimated that nearly $733 million was spent by anglers in the Cook Inlet region during that year, but contained no further breakdown as to target species or waters (Southwick Associates Inc. et al. 2008).

Historical Harvest and Abundance

Collectively, the Cook Inlet fisheries constitute 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). Harvest stabilized in 2014 and has averaged approximately 175,000 fish annually from 2014 to the present (calculated from Table 36). Cook Inlet fisheries have accounted for 61–82% of the total Southcentral Alaska Pacific halibut sport harvest since 1990 and 40–60% of the statewide sport harvest (in number of fish) during the period 1990–2015 (Kerkvliet et al. 2016).

Growth in the LCIMA Pacific halibut fishery during the mid-1980s and early 1990s was due largely to an increase in charter fishing. In the mid-1980s, the Pacific halibut fishery was dominated by unguided anglers (Kerkvliet et al. 2016). The charter harvest increased from 28% to 55% during the period 1986–1994 as many Kenai River freshwater guides changed their focus to marine fisheries in the Deep Creek–Ninilchik area. Development of beach access in Groundfish–CCI during the early 1990s and use of tractors to launch boats at any tide stage also facilitated development of the charter fishery during that period.

Fishery Management and Regulations

Pacific halibut are managed in state and federal waters primarily by the International Pacific Halibut Commission (IPHC; international agency) and the North Pacific Fishery Management Council (NPFMC; federal agency). Other involved agencies are the National Marine Fisheries Service (NMFS; federal agency) and the Alaska Department of Fish and Game (ADF&G) through the Alaska Board of Fisheries (BOF) process. The BOF can adopt federal Pacific halibut regulations and can also adopt state regulations that may impact Pacific halibut fisheries as long as those regulations are not specifically for Pacific halibut and do not conflict with federal regulations.

ADF&G Division of Sportfish collects information on the sport Pacific halibut harvest and provides it to federal management agencies. This is accomplished through a region-wide Pacific halibut and groundfish harvest monitoring (port sampling) program that was established in 1991 (e.g., Meyer et al. 2008). Sampling of the sport harvest and interviews with anglers and guides in the LCIMA are conducted in Groundfish–LCI and Groundfish–CCI from mid-May through early September.

Sport regulations for Pacific halibut in Cook Inlet provide for an open season of 1 February–31 December. Unguided anglers have a daily bag limit of 2 fish and possession limit of 4 fish, and there is no size limit. Regulations for charter anglers change annually. State statutes for licensed sport fishing (AS 16.05.340-430) also apply to the Pacific halibut sport fishery. Rules governing guide registration, logbooks, and vessel registration are found in the statewide sport fishing regulations (5 AAC 75.075–.077).

In 2014, the NPFMC implemented a Catch Sharing Plan (CSP) that allocates Pacific halibut among the commercial and sport-guided fleets and includes annual management measures implemented preseason to keep the charter fishery within its allocation. The plan also allows guides to lease a commercial individual fishing quota (IFQ) within a season to provide additional fishing opportunity for clients, and those fish count towards the commercial catch limit. The CSP allocates Pacific halibut between the commercial and charter sectors, establishes bag and size limits annually, and provides for additional harvest opportunity for the sport charter fleet through use of commercial IFQ.

Changes in Pacific halibut growth rates and exploitable biomass, changes in stock assessment procedures, and allocation conflicts all underscore the need for continued sport Pacific halibut harvest monitoring by ADF&G.

Recent Fishery Performance

From 2016 to 2018, Pacific halibut sport harvest averaged about 163,000 fish annually (Table 36). Charter anglers continued to contribute approximately 50% of the total Pacific halibut harvest. Within these recent years, neither Charter Logbook nor SWHS-estimated charter Pacific halibut harvest fluctuated much (Tables 5 and 36). The 2016–2018 average Pacific halibut harvest for nonguided anglers was similar to the historical average (1995–2015) of 77,695 fish, although the 2017 and 2018 harvests of 73,809 and 71,138 fish respectively, were the lowest since 2002 (Table 36).

Charter halibut regulations for 2016–2018 included the following: a daily bag limit of 2 fish of which 1 may be any size and the second must be less than or equal to 28 inches, an annual limit of 4 fish caught on charter vessels with a recording requirement, a charter vessel limit of 1 trip daily during which Pacific halibut are retained, and no retention of Pacific halibut allowed on Wednesdays. Additionally, in 2017, 3 Tuesdays were closed to charter halibut fishing, and in 2018, 6 Tuesdays were closed to charter halibut fishing. Halibut cleaned at sea must comply with the regulations described above.

ROCKFISH FISHERY

Fishery Description

Over 30 species of rockfish (genus *Sebastes*) inhabit the Gulf of Alaska. Since 1991, 16 species have been identified in the sport harvest from the LCIMA, but black (*S. melanops*), dark (*S. ciliatus*), 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 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 70% of the harvest occurring south of Point Pogibshi (Figure 1). Most rockfish are taken incidentally to fishing for other species or while targeting rockfish only after fishing for other species (Kerkvliet et al. 2016).

Historical Harvest and Abundance

Estimates of annual rockfish harvest in Cook Inlet have risen from about 2,000–4,000 fish in the late 1970s to over 30,000 fish in 2016 (Kerkvliet et al. 2016; Table 37). The LCIMA harvest has made up 7–15% of the Southcentral Region sport rockfish harvest since 1990[9]. From the 1980s to mid-1990s, unguided anglers harvested more rockfish than charter anglers in the LCIMA. Since 2003, charter harvest of rockfish has been greater than unguided harvest (Table 35). Beginning in 2014, charter rockfish harvest has increased substantially, a trend that may be attributed to more stringent Pacific halibut regulations and a subsequent redistribution of fishing effort to other species.

There is uncertainty about the accuracy of historical rockfish harvest estimates from the SWHS. The biggest concern is with the magnitude of estimated harvest north of Anchor Point in Groundfish–CCI. SWHS estimates of annual harvest in this fishery have ranged from about 200 to 3,000 fish since 1985. From 1995 to 2001, however, only 1 rockfish was ever reported harvested in over 4,500 vessel-trip interviews (ADF&G unpublished data). It is unknown whether the 1985–1995 estimated rockfish harvests were made up of other species such as sculpins or greenlings that were misidentified as rockfish, or whether rockfish that were actually taken in Groundfish–LCI were reported in Groundfish–UCI by SWHS respondents. Interview data from Anchor Point have indicated that it is only since 2002 that some UCI anglers have harvested rockfish from LCI waters (St. Saviour et al. *In prep*).

Rockfish harvest biomass (pounds round weight) has been estimated for pelagic, yelloweye, and nonpelagic rockfishes since 1991 by integrating SWHS and port sampling data from Homer. Estimates are computed as the product of SWHS estimates of the number of fish harvested, the proportion of harvest, and average weight by species. Species composition and average weight are obtained from port sampling at the Homer harbor. Total harvest has ranged from about 19,000 lb in 1991 to roughly 136,000 lb in 2017 (Table 37). Pelagic species accounted for most of the increase in harvest; the harvests of yelloweye and other nonpelagic species did not vary much.

Because rockfish are caught incidentally in other sport fisheries, many of them are released. The number of rockfish released in Cook Inlet each year generally exceeded the number retained through 2008 (Figure 13). From 2009 to present, anglers generally retained more fish than they released. The magnitude of the release component is important because of the potential for high immediate or delayed mortality. Release mortality is a concern because rockfish have a specialized gas-filled swim bladder that makes them susceptible to barotrauma[10]. Release mortality has not been estimated in Cook Inlet 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.

The status of rockfish stocks in Cook Inlet is mostly unknown. Because this is mostly an incidental fishery, little has been invested in rockfish research in the LCIMA. Little is known about stock structure, and an index of relative abundance has not been established. There are, however, rudimentary indicators that can be used to judge the condition of the rockfish stock(s). Despite a steady growth in sport harvest, there are no obvious shifts to older (larger) fish indicated by the average length or average weight of black or yelloweye rockfish harvested in the sport fishery that

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

[10] http://www.adfg.alaska.gov/index.cfm%3Fadfg%3DfishingSportFishingInfo.rockfishconservation

might indicate a lack of recruitment (Figure 14). In addition, there is broad representation of ages in the black and yelloweye rockfish harvest, and no obvious truncation of these distributions due to excessive harvest over time (Figures 15 and 16). Therefore, if past levels of harvest have exceeded surplus production, they have not done so by a large amount.

If harvest is representative, the age composition data show that relatively large year classes are the exception. The 1991 year class of black rockfish was relatively large, but the preceding recruitment of another large year class occurred at least 10 years earlier (unpublished data, ADF&G, Homer). Recruitment variability is common in rockfish (Haggarty et al. 2017) and reinforces the principle that allowable levels of harvest must take natural variability into account and that fisheries should be managed to maintain a diversity of age groups in the population in order to buffer the natural variability in production.

Fishery Management and Regulations

The sport rockfish fishery in the LCIMA was unregulated until 1973 when the BOF adopted limits of 10 fish daily and 10 in possession 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.

ADF&G and the BOF have attempted to take a conservative approach to management of rockfish fisheries in the LCIMA and the rest of Alaska. Sport bag limits have been reduced regionwide in recognition of the failure of other Pacific rockfish fisheries (see below) and the life history variables 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 fishing practices such as the use of deepwater release mechanisms (DRM) to promote the survival of released rockfish.

Due to the unvented nature of their swim bladders, rockfish brought to the surface from depths in excess of 20 meters often suffer from decompression trauma (Parker et al. 2006; Hannah and Matteson 2007; Jarvis and Lowe 2008; Pribyl et al. 2009; Wilde 2009). Most species are believed to suffer high mortality rates if released at the surface, which is the general practice of most anglers. However, ADF&G research by Hochhalter and Reed (2011) suggests that release at the depth of capture (recompression) can substantially improve survival rates of yelloweye rockfish.

Recently, an outreach program has been launched by the ADF&G Division of Sport Fish to educate recreational anglers and guides on the proper use of DRM. Deep water release mechanisms allow the release of rockfishes at the depth of capture instead of at the surface, which can increase survival by up to 99% (Blain and Sutton 2016).

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, further inhibiting population recovery.

Recent Fishery Performance

In 2016, rockfish harvest in the LCIMA was 32,905 fish, which was nearly a 7,000 fish increase over the previous year (Table 37, Figure 13). This level of harvest remained steady in 2017 and increased further to 40,149 in 2018. These recent years were the 3 highest years of harvest observed in the SWHS. Charter logbook harvests during the same time period were also at an all-time high (Table 5).

The proportion of charter to unguided rockfish harvests remained similar from 2016 through 2018, with charter anglers accounting for about 75% of the average rockfish harvest in the LCIMA during those years (Table 35). Although overall rockfish harvests remained similar, pelagic rockfish harvests decreased between 2016 and 2017 by 11% (3,486/31,132) whereas yelloweye and nonpelagic rockfish harvest more than doubled (Table 37).

Mean total length and mean age remained similar from 2016 to 2017, though a 7 cm decrease in length and a 4-year decrease in age were observed in 2018 (Figure 14). Young black rockfish fish continued to recruit into the fishery from 2016 to 2018, specifically a new cohort of 4-year old black rockfish were seen in 2017 (Figure 15).

Interview data gathered in the LCIMA during the 3-year period 2016–2018 show that nearly all pelagic and nonpelagic rockfish were harvested by anglers that reported targeting Pacific halibut, groundfish, or groundfish and salmon (St. Saviour et al. *In prep*). The incidental nature of rockfish harvest in the LCIMA suggests that any changes in Pacific halibut or salmon regulations can be expected to be reflected in the rockfish effort and harvest. Recently, the IPHC has suggested that Pacific halibut stocks are in a period of low recruitment, which could result in higher rockfish harvests as guides attempt to provide opportunity to clients in times of low Pacific halibut abundance.

Beginning in 2018, port samplers and ADF&G area offices throughout Southcentral Alaska provided deepwater release mechanisms (DRM) and best practices information to anglers and charter operators free of charge. At the end of the 2018 field season, a survey was sent by ADF&G to over 1,100 participants in the DRM program in order to determine effective methods for increasing DRM use by the general public.

LINGCOD FISHERY

Fishery Description

The lingcod sport fishery is the primary source of lingcod harvest in the LCIMA. Most lingcod are harvested in state waters around the Barren and Chugach Islands and along the Kenai Peninsula coast from Point Pogibshi 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, unpublished data). As with rockfish, the economic value of lingcod is not easily separable from that of Pacific halibut because most of the harvest is incidental to Pacific halibut fishing.

Historical Harvest and Abundance

Harvest estimates from the SWHS are available since 1990. Annual lingcod sport harvest in Cook Inlet ranged from a low of about 1,100 fish in 1995 to a high of about 7,500 fish in 2011 (Kerkvliet et al. 2016; Table 35). From 1993 until 2003, the harvest was variable, averaging around 1,700 fish per year (Kerkvliet et al. 2016). Although variable, total lingcod sport harvest substantially increased from 2004 through 2015 (Table 35). For the period from 2004 through 2006, the average harvest was around 3,200 fish, nearly double the previous 10-year average. Then from 2007 to 2009, the average harvest again nearly doubled to approximately 6,300 fish but then declined to an average of roughly 5,100 from 2010 to 2015.

As with rockfish, there is uncertainty about some aspects of the lingcod sport harvest estimates from the SWHS. Concerns center on potential misreporting of other species as lingcod and misreporting the area of harvest. According to the SWHS, Groundfish–CCI has accounted for up to 40% of the total Cook Inlet harvest, but very few lingcod have been documented by ADF&G port samplers stationed at Deep Creek and Anchor Point. The SWHS is also believed to overestimate the percentage of lingcod harvest taken by unguided anglers in Groundfish–LCI. For the period 1996–2015, SWHS estimates show that unguided anglers accounted for an average of 28% of the LCIMA lingcod harvest. However, port sampling interview data from the same time period shows only 5% of the lingcod harvest from unguided anglers (M. Schuster, Sport Fish Biologist, ADF&G, Homer, unpublished data). Part of the difference may be that anglers are reporting charter harvest in the unguided section of the SWHS questionnaire. Anglers may also be confusing Pacific cod (*Gadus macrocephalus*) with 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. ADF&G hopes to incorporate the available time series of harvest information from sport and commercial fisheries, including age and size data, in working toward a comprehensive stock assessment for lingcod that will provide estimates and strategies for optimizing harvest.

The Cook Inlet 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 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 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. In 2003, the restriction on the use of gaffs for lingcod was lifted with passage of a statewide gaffing regulation.

The current regulations for lingcod were put into place during the early 1990s as a precautionary approach. In the LCIMA, the open season is 1 July–31 December, the daily bag and possession limits are 2 lingcod, and there is a minimum size limit of 35 inches (28 inches with the head removed). Only marine fishes not regulated by bag or size limits may be used for live bait. Anglers may gaff only legal-sized lingcod that they intend to harvest during the open season. Charter operators are required to report the number of lingcod kept and released daily in logbooks. Bag and possession limits, special restrictions, and state authority in the EEZ are found in area regulations in 5 AAC 58. Regulations outlining ADF&G EO authority, gaffing and waste, and the charter logbook program are outlined in 5 AAC 75.

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. Some basic fishery information may provide clues to stock status, however. The estimated average weight per fish increased from about 23 lb in 1993, the first year with a minimum size limit, to over 30 lb in the early 2000s (Kerkvliet et al. 2016). Average weight has declined to about 23 lb in recent years following the declining contribution of a strong 1997 year class as it aged (Figure 17). Age composition data show that the lingcod harvest is composed of a broad range of age classes represented with periodic recruitment (1997, 2005, 2013) (Figure 17).

A fishery-independent index of abundance, such as that from a remotely operated vehicle (ROV) survey, is highly desirable. A reliable index could be used for management in the absence of a stock assessment or could be used to build an age- or size-structured assessment model. Because lingcod do not move much and are generally found in easily identified rocky habitat, the fishery can maintain stable catch rates even as abundance declines. 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 survey would provide data on the sublegal portion of the population which may give insight into future recruitment.

The effectiveness of the current 35-inch minimum size limit should also be evaluated. The size limit concentrates harvest on the largest, and thus most fecund, females and was implemented without a thorough analysis of the long-term effects on population dynamics. This may require a field project to estimate maturity as a function of age and size.

As with rockfish, estimates of lingcod habitat are needed to evaluate spatial harvest data and may be helpful for interpreting stock assessment results, modeling alternative harvest strategies, and

designing future research. Given the lack of stock status information, management concerns center around 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 harvest.

Recent Fishery Performance

Lingcod harvest from 2016 to 2018 remained steady in the LCIMA but was down approximately 1,200 fish from the previous reporting period average (2013–2015; Table 35). The 2017 harvest of 2,899 fish is the lowest lingcod harvest estimated since 2003. As with rockfish, interview data gathered in the LCIMA during the 3-year period 2016–2018 show that nearly all lingcod were harvested by anglers that reported targeting Pacific halibut, groundfish, or groundfish and salmon (ADF&G, unpublished data). The 2016–2018 average weight was well below the historical (1981–2015) average (Table 37).

Charter anglers accounted for an estimated 74% of the lingcod harvest during the 2016–2018 reporting period (Table 35). Interestingly, charter logbook data show that lingcod harvest was 63% less in 2016 (821 fish) than the average from the previous reporting period (2013–2015; 2,206 fish; Table 5). Most of the lingcod caught in Cook Inlet are released, either because they are not a species of interest, they are sublegal-sized fish, or the season is closed (Figure 18). The total catch of lingcod in the LCIMA in 2018 (20,309), was the largest ever and approximately 4,600 fish greater than the second-largest total catch estimated in 2011 (Figure 18). The number of lingcod released annually from 2016 to 2018 in Cook Inlet ranged from 3,797 in 2016 to 17,048 in 2018, representing 55–84% of the catch (Figure 18).

EDUCATIONAL FISHERIES

FISHERY DESCRIPTION

The objectives for educational fisheries are specified in 5 AAC 93.235 as "educating persons concerning historic, contemporary, or experimental methods for locating, harvesting, handling, or processing fishery resources." Standards, general conditions, and requirements of the educational fishery program are outlined in 5 AAC 93.200-235. A federal court initially ordered the establishment of educational fisheries while litigation was underway regarding issues surrounding rural preference for subsistence uses in Alaska and in Cook Inlet. Nelson et al. (1999) outline the legal and political events surrounding conflicts over subsistence rights in Alaska that pertain to the creation of educational fisheries on the Kenai Peninsula.

The submission deadline for an educational fishery permit application is 120 days before the date of the proposed fishery. The application is first reviewed by the local area manager then forwarded to the regional office where the permit is reviewed. If further revisions are necessary, they are revised with the area manager and regional office. Once the final draft is approved, it goes to the ADF&G Commissioner's Office for signature. Finalized permits are then mailed to the permitee as well as to the Division of Commercial Fisheries, the Division of Subsistence, and the Alaska Department of Public Safety.

The terms of each permit require that an agent or employee of the permitted organization be present at the educational fishery site at all times while the fishery is being conducted. Gear is specified for each educational fishery and a harvest quota, season, and reporting requirement is specified for

each permit. Weekly reporting requirements are used by the area manager to track the harvest quota.

Beginning in 2012, the educational fishery reporting section was updated, and a fishing schedule notification requirement was added to the permit. This change was made to help ADF&G and Alaska Wildlife Troopers better monitor fishing activity and to ensure the terms of the permit are followed. In addition, a logging requirement was added requiring that fish be recorded immediately upon harvest and marked before concealing the salmon from plain view.

MANAGEMENT AND OBJECTIVES

Ninilchik Permits

The first educational fishery permit granted in the LCIMA was issued to the Ninilchik Traditional Council (NTC) in 1993 (Nelson et al. 1999). The goal of the NTC educational fishery was to teach and preserve the cultural and traditional subsistence way of life as well as provide food for the Elders and others in need. They were the lone permit applicant from 1993 through 1996. Stipulations contained within the permit established harvest quotas, fishing area, season and gear, and reporting requirements. The 1993 permit stipulations allowed a saltwater harvest quota of 2,000 salmon, of which no more than 100 could be Chinook salmon and 250 coho salmon (Table 38). In addition, only 50 Chinook salmon could be taken prior to 21 July; 50 more Chinook salmon could be taken beginning 21 July if the Chinook salmon spawning escapement to the Kenai River was projected to be above 22,300 fish. The fishing area extended north 1 mile from near the Ninilchik River and one-quarter mile from shore. Gear was limited to a single 10-fathom gillnet. Harvest reporting was required along with a season summary 10 days after the completion of the season. Virtually the same permit requirements were in place in 1994 through 1997 with a few alterations. Beginning in 1996, 100 Chinook salmon could be taken prior to 21 July and 50 thereafter if the Kenai River escapement goal was met. In 1995, a limited freshwater fishery using traditional methods was also permitted on the Ninilchik River downstream of the Sterling Highway Bridge. The freshwater harvest quota was limited to no more than 20 Chinook salmon and 30 coho salmon.

In 1998, a group of NTC members formed a new organization called the Ninilchik Native Descendants (NND) and requested a separate permit with similar goals of passing on traditional knowledge and providing food for needy tribal members. Initially, 1 permit was granted to both organizations jointly with the same stipulations as in the past. This was not acceptable to the NTC. The NND fished upon receiving the joint permit whereas the NTC members did not fish until they were granted a separate permit. Because the 2 groups represented the same constituents served in the past by 1 permit, 2 permits were issued and the allocation normally granted to NTC was divided in half between them. Each permit was allowed a harvest quota of 1,000 salmon of which no more than 50 could be Chinook salmon and no more than 125 coho salmon. In addition, only 25 Chinook salmon could be harvested before 21 July. Each permit allowed a freshwater harvest quota of 15 Chinook salmon and 10 coho salmon. The remaining terms of the permits were the same as in the past. Each permitee was allowed its own net.

After the 1998 permits had been issued, NTC members requested an additional 20 Chinook salmon, which was the number caught by NND before separate permits were issued. This increased the NTC quota to 70 Chinook salmon prior to 21 July. The NTC permit was then amended to allow the taking of 18 additional Chinook salmon because the NTC had taken 52, which was 2 more than the amount allotted to them at the time of their request for additional fish. Members of the NTC

also requested an additional 25 coho salmon but were refused. Their coho salmon allocation was thought to achieve the educational purposes stipulated in the permit; coho salmon harvests in previous years had not exceeded 119 in total. The educational fishery was closed 28 July through 2 August because sockeye salmon runs to the Kenai River were projected to be under the escapement goal.

In 1999, NTC and NND both received permits, and the stipulations were the same as in 1998. After NTC reached their 50 Chinook salmon harvest quota 25 May, they made an inseason request for 50 more Chinook salmon. Their request was approved to allow NTC to meet their educational goals and because the increased harvest was not thought to negatively impact the Chinook salmon resource or other fisheries. By early July, NTC and NND had exceeded their Chinook salmon quotas and were instructed to cease their harvest of Chinook salmon until after 20 July. No further Chinook salmon were reported harvested.

In 2000, the NTC and NND permits contained the same stipulations and quotas as initially granted in 1998, and the fishery proceeded without inseason changes. In 2001, NTC requested they be allowed to use 2 gillnets instead of 1 to increase their harvest of sockeye salmon and to better achieve their educational goals. Use of a second gillnet was then permitted after 10 June. In anticipation of increased participation in the NND educational fishery, NND requested that their harvest quota be increased to 75 Chinook salmon prior to 21 July. As a result, the quota was increased to 75 Chinook salmon prior to 21 July for both the NND and NTC educational fisheries.

In 2002, despite requests from NTC and NND to increase harvest quotas, the quotas remained at 75 Chinook salmon prior to 21 July and 25 thereafter if the Kenai River spawning escapement goal was projected to be met; the coho salmon quota remained at 125, and the total salmon quota remained at 1,000 for each group. The freshwater quota from the Ninilchik River also remained at zero Chinook salmon and 15 coho salmon taken over four 3-day periods. Salmon harvests were below harvest quotas.

In 2003, a third educational fishery was established for the Ninilchik saltwater area after Ninilchik Emergency Services (NES) requested they conduct classes from 1 July through 15 August. The NES quota was set at 250 salmon, of which no more than 25 could be Chinook salmon and no more than 50 could be coho salmon. Also, Chinook salmon could only be taken after 20 July if the Kenai River Chinook salmon escapement projection was above the spawning escapement goal. As a result of the third educational fishery, the salmon quotas for the NTC and NND were decreased to 850 for each group to accommodate the NES quota. In addition, of the 850 salmon in the quotas for NTC and NND, no more than 100 could be Chinook salmon and no more than 100 could be coho salmon. Harvest stipulations for Chinook salmon after 20 July and freshwater stipulations and quotas were not changed.

In 2003, NND's educational fishery permit was modified to permit an educational fishery in April to use a 20-foot long gillnet with a mesh size not to exceed 2 inches to catch no more than 1,000 herring (*Clupea pallasi*) or eulachon (*Thaleichthys pacificus*).

The educational fisheries permits issued to NTC, NND, and NES from 2004 through 2006 were very similar to the 2003 permits issued for each group (Table 38). In 2006, the NND eulachon quota was removed and herring were no longer permitted because opportunity to harvest herring was provided in Cook Inlet personal use regulations. NES did not fish in 2006 or 2007.

In 2007, NTC and NND received increased Chinook and coho salmon saltwater quotas (Table 38). NTC also received an educational fishing permit for the Kasilof River saltwater area. NTC received a harvest quota of 50 Chinook salmon and 200 coho salmon for the Kasilof River but did not fish the area for the first year. Through their misinterpretation of the individual quotas and stipulations for the Kasilof River and the Ninilchik River and their late reporting, their harvest quota for coho salmon was exceeded for the Ninilchik area fishery (Table 39).

In 2008, the NTC and NND Chinook salmon harvest quotas were reduced for the Ninilchik area because the added harvest could negatively impact the Ninilchik River Chinook salmon escapement and sport fishery (Table 38). To mitigate the reduced Ninilchik area quota, NTC received an increased quota for the Kasilof River area fishery that maintained the overall 300 Chinook salmon and 500 coho salmon harvest quotas (Table 39). In 2009, the NTC and NND Chinook salmon quotas were reduced again because of continued low Chinook salmon escapement to the Ninilchik River and have remained the same since then. Also, their coho salmon quotas were reduced because of continued above-average harvest by all user groups. NES did not request a permit from 2008 to 2011.

From 2010 through 2016, the Chinook salmon quotas for the Ninilchik area permits were reduced annually due to low productivity of Cook Inlet Chinook salmon stocks (Table 38). Additional restrictions were also used for conservation measures for Chinook salmon and to avoid allocation issues. The 2012 open area was reduced by 100 yards at the north end to help reduce potential conflict with commercial setnets fishing at the marker while still maintaining adequate educational opportunity. Permits were modified twice following sport fishing restrictions on the Ninilchik River to conserve Chinook salmon. The harvest of Chinook salmon was prohibited in the saltwater fishery beginning 1 July unless the fish was too significantly injured to allow a reasonable chance of survival. Modifications also closed the 2 inriver educational fisheries. Even before these modifications, NND and NES voluntarily began releasing wild Chinook salmon. In total, they released 14 wild Chinook salmon. All 3 educational fisheries fell within their respective harvest quotas for the total number of salmon allowed. NTC exceeded their harvest quota for coho salmon by 15 fish (Table 39).

In 2013, NTC was permitted to fish the beach section on the south side of the Ninilchik River from 15 June to 15 September (Table 38). In May, a mudslide blocked access to the beach section north of the Ninilchik River where the educational fisheries were traditionally allowed. In response, NTC and NND requested and their permits were modified to allow fishing on the south side of the Ninilchik River through 20 May. In response to sport fishing restrictions, all 3 permits were modified to prohibit harvest of Chinook salmon from 15 June to 15 July in saltwater. All 3 educational fisheries fell within their respective harvest quotas for the total number of salmon allowed. NTC exceeded their harvest quota for coho salmon by 10 fish (Table 39).

Seldovia Village Tribe Permit

In 2004, a permit was issued to the Seldovia Village Tribe (SVT) for a fishery in Seldovia during a youth camp from 15 through 21 July. Standard gillnet gear was permitted and the harvest limit was 70 salmon of which no more than 50 pink salmon, 20 chum salmon, and 20 sockeye salmon could be harvested. The harvest of 15 Dolly Varden was permitted. The permit required that all released Chinook salmon be reported. Permits were granted in 2005 and 2006 with the same stipulations except for date changes (see Table 40 for fishing periods).

A permit was issued to the SVT in 2008 for 18–22 August with the same quotas as 2007. A fishery was not authorized during the requested period of 27–31 May because a subsistence fishery was already opened on the dates requested and was expected to serve the needs. Members of SVT later relayed that they lacked funding for their cultural camp and could not participate in the educational fishery. A permit was granted in 2009 and 2010 with the same 2007 harvest quotas but no educational fisheries were conducted. Starting in 2011, SVT stopped requesting a permit.

Anchor Point Veterans of Foreign Wars Post 10221 Permit

The Anchor Point Veterans of Foreign Wars Men's Auxiliary Post 10221 (APVFW) received educational fisheries permits from 2007 to 2010 to conduct an educational fishery approximately 1.5 miles north of the Anchor River (Table 41). The gear specifications were the same as for the Ninilchik-area permittees. The APVFW permit included a fishing season from 15 July through 31 August and a quota of 160 salmon, no more than 80 of which could be coho salmon and no more than 80 could be sockeye salmon. The APVFW harvest quota was increased to 240 salmon in 2008, of which no more than 120 could be sockeye salmon and no more than 80 could be coho salmon. Quotas remained unchanged in 2009. The 2009 permit added explicit words prohibiting retention of Chinook salmon and added a recording requirement for released Chinook salmon. In 2010, the quota was reduced to 200 salmon, of which no more than 100 could be sockeye salmon and no more than 50 could be coho salmon. The reported harvests from 2008 to 2013 fell within the permitted quotas.

Southcentral Foundation Permit

The Southcentral Foundation (SCF) was granted its first permit in 2010 to conduct an educational fishery in salt waters approximately 2 miles south of Silver Salmon Creek on the west side of Cook Inlet. The permit allowed salmon to be harvested using a set gillnet not exceeding 10 fathoms in length, 45 meshes deep, and minimum 4.5-inch to a maximum 6-inch mesh size. The permitted SCF fishing season was 1 July to 15 September on Tuesdays, Wednesdays, and Fridays–Sundays, to avoid regularly scheduled commercial fishing periods (Table 42). The 2013 permit application requested a later start date of 15 July and this was granted. The fishery was permitted to operate only during daylight hours to ensure that the net was attended to deter bears from obtaining fish from the net. The SCF permit allowed an authorized SCF representative and their students to harvest a quota of no more than 300 salmon, of which only 50 could be coho salmon. Only sockeye, chum, pink, and coho salmon harvest was allowed. No retention of Chinook salmon or steelhead was permitted and catches of these species had to be recorded. Stipulations for fish handling practices to reduce attraction and habituation of bears to the fishery were included in the permit. The coho salmon harvest fell within the harvest quota.

Sons of the American Legion Post 16

The Sons of the American Legion Post 16, applied for their first permit in 2011. They were granted a permit at a site approximately 1.6 miles south of the Whiskey Gulch Spur Road. The gear specifications and general stipulations for the permit were the same as the other educational fishery permits. Their fishing season was permitted 15 July–31 August with a quota of 200 salmon; no more than 50 could be coho salmon (Table 43). Their harvests fell within their quota from 2011 to 2013.

RECENT FISHERIES PERFORMANCE

Ninilchik Permits

In the Ninilchik educational fisheries, the 2017 and 2018 Chinook, coho and total salmon harvests were all within their quotas (Table 38 and Table 39). In 2018, because indicators suggested that Chinook salmon runs to the roadside streams were weak, the Ninilchik permits were modified to extend the closed period from 21 May–15 June to 21 May–15 July.

Ninilchik Traditional Council-Kasilof River

In 2017 and 2018, educational fishery permits were issued to NTC for the Kasilof River area (Table 38). Harvest quotas were the same as other years. All Chinook, coho, and total salmon harvests were within their quotas for both years (Table 39).

In 2018, an NTC request for an increased coho salmon quota for the Ninilchik area was accommodated by shifting up to 50 coho salmon from the Kasilof River quota to the Ninilchik quota. The total coho salmon quota remained at 500 (Table 38).

Seldovia Village Tribe Permit

Seldovia Village Tribe did not apply for an educational permit for 2017 or 2018 (Table 40).

Anchor Point Veterans of Foreign Wars Post 10221 Permit

Educational fishery permits were issued to the Anchor Point Veterans of Foreign Wars Post 10221 in 2017 and 2018 (Table 41). Harvest quotas have remained at 2007 levels. All Chinook, coho, and total salmon harvests fell within their annual quotas.

Southcentral Foundation Permit

Educational fishery permits were issued to the Southcentral Foundation in 2017 and 2018 (Table 42). Harvest quotas remained at the 2010 levels. All Chinook, coho, and total salmon harvests fell within their annual quotas.

Sons of the American Legion Post 16 Permit

Educational fishery permits were issued to the Sons of the American Legion Post 16 in 2017 and 2018 (Table 43). Harvest quotas remained at the 2011 levels. All Chinook, coho and total salmon harvests fell within their annual quotas.

SHELLFISH FISHERIES

The LCIMA supports a diversity of sport and personal use fishing opportunities for shellfish. In upper LCIMA, the intertidal beaches are mostly composed of sandy substrate that historically supported a robust razor clam sport fishery (Table 44). In upper LCIMA, there are some locations with blue mussels and some crab stocks, but their presence is relatively low in comparison to razor clams. Although lower LCIMA has historically supported robust stocks of king crab, Tanner crab, Dungeness crab, shrimp, and hardshell clams, currently most of these stocks have declined to low levels. This has led to reduced or closed sport and personal use fisheries for these stocks (Table 45). A variety of other shellfish including octopus and blue mussels are still available in this subarea. West LCIMA has both sandy and rocky intertidal beaches that support both razor clams and hardshell clams. Other shellfish stocks in west LCIMA include Tanner crab and weathervane

scallops. Most of the sport and personal use effort for shellfish in west LCIMA targets razor clams in the Polly Creek and Crescent River area (Table 46).

RAZOR CLAM FISHERIES

Eastside Cook Inlet Fisheries Description

The Eastside Cook Inlet Pacific razor clam sport and personal use fisheries occur almost exclusively on sandy intertidal beaches stretching approximately 76 km along the Kenai Peninsula between the Kasilof and Anchor rivers (Figure 3). Historically, the sport fishery constituted the largest shellfish sport fishery in Alaska, due largely to accessibility. Historically, effort has concentrated in areas with public access from the Sterling Highway and in areas of greatest clam density at Clam Gulch and Ninilchik. Both Clam Gulch and Ninilchik have a developed access road and nearby camping facilities. Razor clams may be dug on any minus tide. Most of the effort occurs within a 5-month period from April through August when minus tides occur during daylight hours and warmer temperatures prevail. During the darker winter months from October through February, most clam digging is precluded when the low tides occur at night, temperature are cold, and ice builds up on beaches. There are about 60 minus tides annually from April through August. Diggers locate razor clams by the presence of a "show" or dimple in the sand, which allows them to effectively dig clams.

Razor clam life history influences the productivity and ultimately the stock's ability to support harvest. Razor clam growth rate varies inversely with latitude along the eastern beaches and as a result, the average length-at-age increases as one moves south (Szarzi and Hansen 2009). Clams of the same age class at Ninlchik reach harvestable size 1 year prior to those from Clam Gulch, despite being separated by only 10 miles of beach. Razor clams live to a maximum age of approximately 19 years in Alaska (Weymouth and McMillan 1931). Along eastern beaches, the oldest razor clam found in hand-dug surveys by ADF&G was 15 years old at Ninilchik in 2004 (Kerkvliet et al. *In prep*). By contrast, razor clam lifespan at the southern end of its range in California is generally 5 years (Weymouth and McMillan 1931). Relying on broadcast spawning, recruitment success is highly dependent on environmental conditions. Razor clam recruitment is highly variable between beach and year. More consistent annual recruitment occurs on the Clam Gulch beaches and less frequent, larger recruitments occur on Ninilchik beaches.

Based on creel monitoring and SWHS, the 1969–1999 average annual effort was approximately 30,000 digger-days and annual harvest averaged roughly 0.8 million razor clams in the Eastside Cook Inlet razor clam fishery (Table 44). Participation and harvest peaked in 1994 when about 48,500 digger-days were spent digging about 1.27 million razor clams. From 2009 to 2012, average harvest had declined to about 0.37 million razor clams and 22,800 digger-days. From 2001 through 2014, resident harvest and effort composed the majority of the total harvest and effort (Table 44). These fisheries have been restricted or closed since 2013 due to low abundances of adult-sized clams; allowing any harvest would probably delay the recovery of clam abundances (Tables 47 and 48).

Fisheries Management Objectives

The razor clam sport (5 AAC 58.022 [a][14][A]) and personal use (5 AAC 77.518) fisheries are only regulated by bag, possession, and statewide "method and means" clam gear restrictions (5 AAC 75.035[6] for the sport fishery and 5 AAC 77.010 [3] for the personal use fishery). Clam

diggers are also required to harvest all razor clams taken. Gear is limited to the use of a shovel or clam gun, which must be manipulated by hand.

There are no management plans for the Eastside Cook Inlet sport and personal use fisheries and for the most part, both fisheries are concurrent and identical except that only Alaska residents can participate in the personal use fishery whereas the sport fishery is open to all with a sport fishing license. Bag and possession limits under either fishery cannot be added to the bag and possession limits of the other. Following the closure to commercial digging on the Eastside beaches in 1959, the sport and personal use razor clam fishery has been managed exclusively by the Division of Sport Fish even though regulations governing the fishery shifted from sport to personal use regulations from 1982 to 1990. Since 1960, regardless how the fishery was defined (sport or personal use), a valid Alaska sport fishing license was required for participation. Shifts between regulating the fishery as sport versus personal use originated in 1981 when personal use regulations were adopted and combined with sport fishing regulations (5 AAC 77.010). Complications arose, however, once the State Legislature adopted a statute that defined personal use fishing as "the taking, fishing for or possession of finfish, shellfish or other fishery resources, by Alaska residents," effectively disqualifying nonresidents. This statute did not align with the intent of the Alaska Board of Fisheries (BOF) for the Cook Inlet fisheries for shellfish when personal use regulations were initially adopted. In the fall of 1989, the BOF adopted sport fishing regulations for Cook Inlet shellfish that were identical to personal use regulations.

There have been several changes to the razor clam bag and possession limits in the Eastside Cook Inlet fishery. The razor clam bag limit was 30 from 1959 until 1962, when it was increased to 60. In 1960, a sport fishing license was required and a seasonal closure from 10 July through 31 August was implemented. The seasonal closure was repealed in 1968. Also in 1968, the bag limit was amended to the "first 60 clams dug" (D. Nelson, ADF&G, Homer, unpublished data). A possession limit was adopted in 1994, the first significant regulatory change in more than 20 years (Szarzi and Begich 2004a). In 1994, the bag limit was 60 and possession limit was 3 daily limits (180 clams). In 2000, the bag limit was lowered to 45 clams and the possession limit to 2 daily limits (90 clams) based on public reports of wastage related to the bag limit of 60. In 2003, the BOF passed a public proposal to reinstate the 60 clams daily bag limit and increase the possession limit to 2 daily bag limits (120 clams).

The Eastside Cook Inlet razor clam stock and the sport and personal use fisheries have been monitored primarily with 3 datasets: 1) estimates of razor clam harvest and effort, 2) estimates of the age and length compositions of the razor clam harvest, and 3) estimates of razor clam density and abundance. Prior to 1977, creel surveys conducted by ADF&G were used to estimate razor clam harvest and assess CPUE (number clams per digger per day). Since 1977, the ADF&G Statewide Harvest Survey (SWHS) has produced annual estimates of razor clam harvest and effort for all the Eastside Cook Inlet razor clam beaches as a whole. Aerial surveys were flown annually during minus tides to count the number of diggers between different sections of the Eastside beaches to determine their distribution. As a result, the beach section boundaries[11] were split into management areas (MAs) and subareas to better define digger distribution. The aerial survey data were then used to apportion the SWHS harvest and effort estimates to management area and this allowed clams per unit effort (CPUE) to be calculated for each management area. Razor clam age and length composition data, collected by ADF&G from hand dug samples since 1966, have been

[11] In this report and future reports, subarea is used to explicitly reference a beach within a management area.

assessed by management area or subarea. Razor clam density and abundance have also been periodically assessed on subareas at Clam Gulch and Oil Pad Access MAs beginning in 1988 and at Ninilchik MA since 1990. The sport fishery harvest rate (exploitation) of both adult (≥80 mm) and total razor clams at Ninilchik and Clam Gulch MAs have periodically been assessed for years when both abundances estimates were generated and aerial surveys were used to apportion total Eastside razor clam harvest to MAs using aerial survey.

Based on these monitoring efforts, ADF&G has documented that the Eastside Cook Inlet razor clam stock has gone through significant declines since the late 2000s. From 2009 to 2012, the overall Eastside sport fishery average harvest (371,903) was 54% below the historical (1977–2008) average (799,956), and effort declined 22% with the same comparison (from 29,215 to 22,822; Table 44). Both harvest and effort were greatest in subareas within the Ninilchik Management Area. For the Eastside beaches as a whole, annual age and length compositions of the harvest since 2009 were truncated and were significantly different ($P < 0.01$) compared to the historical averages (1966–2008) (Table 49). From 2013 through 2016, juvenile, adult, and total clam abundances were well below their respective historical average abundances at all subareas where abundance was assessed (Tables 47 and 48).

Due to these declines, the Eastside Cook Inlet razor clam fisheries have been restricted or closed by emergency order annually since 2013 (Appendix A1). The bag and possession limits were first reduced in 2013 from 60 to 25 razor clams by emergency order due to low abundance of adult clams at Ninilchik South subarea. In 2014, the beaches in the Ninilchik Management Area were closed to the taking of clams and all other beaches were restricted to a reduced bag and possession limit of 25 razor clams. In 2015 and 2016, the Eastside beaches as a whole were closed to the harvest of all clams. The decline in razor clam abundance was directly related to the high rate of natural mortality and the lack of recruitment of juvenile clams to the beaches. The causes for these changes remain unknown but may include a combination of heavy surf, habitat changes, environmental stressors and predation.

Recent Fisheries Performance

The Eastside Cook Inlet razor clam sport and personal use fisheries were closed by emergency order in 2017 and 2018 (Appendix A1). Both abundance surveys and hand-dug harvest monitoring continued in these years. Since 2016, above-average recruitment of juvenile razor clams on Ninilchik and Clam Gulch beaches indicated good success in spawning and settling and improved productivity based on preliminary results (Tables 47 and 48). However, based on preliminary data, the shell growth of these clams in 2017 was 13% below the historical average (1966–2008) at Ninilchik and 18% below average at Clam Gulch (ADF&G unpublished data). This resulted in fewer than expected juvenile-sized (<80 mm) razor clams recruiting to adults (≥80 mm) in 2018. From 2017 to 2018, natural mortality of adult razor clams decreased from approximately 40% to 10% at Ninilchik and at Clam Gulch. As a result of the low natural mortality, abundance of adult razor clams at Ninilchik was approximately 3 times higher in 2018 than the 2013–2017 average whereas at Clam Gulch, abundance remained at a historical low. The 2016–2018 age and length compositions for the Eastside beaches as a whole showed a continued decline compared to their historical averages (Table 49).

These improvements in recruitment and increased survival suggest that the Eastside razor clam populations are beginning to rebuild, but uncertainties remain if this will continue. Razor clam abundance surveys are scheduled to continue annually on Ninilchik and Clam Gulch beaches to

assess abundance of juvenile and adult razor clams, recruitment to the beach and to adult size, annual shell growth, natural mortality, and potential harvest opportunity.

At the 2018 Miscellaneous Shellfish meeting, the BOF adopted an ADF&G proposal to change the language associated with the bag limit. Historically, the bag limit was defined as the first 60 clams harvested, which was intended to require all clams be kept to prevent wastage of broken or unwanted clams. The language was changed to the first 60 dug, which is more explicit and enforceable. The BOF failed to adopt a 2018 ADF&G proposal that sought to eliminate the personal use fishery because it was deemed redundant for residents. The BOF cited a desire to maintain the personal use fishery to possibly give priority to residents in the future when the fisheries reopen. Based on SWHS (2001–2014), 69% of the razor clam harvest and 71% of the effort was by residents (calculated from Table 44).

Westside Cook Inlet Fisheries Description

Razor clams are found in sandy intertidal beaches interspersed throughout west LCIMA. Unlike the Eastside Cook Inlet beaches, the sandy intertidal areas are not continuous and razor clam distribution throughout the west LCIMA is not well documented. The more well-known locations are from Polly Creek to the Crescent River bar, Chinitna Bay, Silver Salmon Creek, and Oil Bay. Both commercial and sport–personal use razor clam fisheries occur in west LCIMA. The commercial fishery only occurs in a 19-mile section from Harriet Point to Crescent River Bar. The sport and personal use fisheries are open throughout west LCIMA but the most popular area overlaps with the commercial fishery at Polly Creek and Crescent River bar. West LCIMA razor clam fisheries are accessed from the tractor launch facilities in Anchor Point and Deep Creek, the City of Kenai boat launch on the Kenai River, and by small fixed-wing aircraft from Cook Inlet communities. Boating to these fisheries requires crossing Cook Inlet for at least 30 miles in open seas, which usually requires a sufficiently large vessel. Access by fixed-wing aircraft requires landing on the intertidal beach in locations of higher elevation with stable substrate. It is assumed most of the effort in the sport and personal use fisheries occurs from May through August and on days with larger minus tides. Some charter operators that operate out of the Deep Creek tractor launch offer boat transport to the fishery. Because clam diggers harvest clams unassisted, all harvest is considered unguided and the charter operators are not required to complete a logbook for the trip.

The SWHS has produced shellfish effort and razor clam harvest estimates in numbers of clams in west LCIMA since 1986; commercial effort and harvest in pounds is available from Division of Commercial Fisheries fish ticket data (Table 46). The west LCIMA sport and personal use harvest has been estimated for several locations with the harvest primarily occurring in the Polly Creek to Crescent River area. On average, west LCIMA has historically (1986–2012), accounted for about 5% of the total LCIMA sport and personal use razor clam harvest but this proportion increased in 2013 when the Eastside razor clam fishery was restricted by EO (calculated from Tables 44 and 46). To facilitate comparisons between the sport and commercial harvest in the Polly Creek and Crescent River area, conversions from numbers to pounds were generated by razor clam length-weight relationship data collected by a graduate student in the late 2000s (McKellar 2014). On average from 1986 through 2015, the sport and personal use fisheries in west LCIMA harvested over 38,000 clams and the commercial fishery harvested about 900,000 clams in this area. Roughly 98% of the 1986–2015 average total harvest was in the commercial fishery (Table 46).

Fisheries Management Objectives

The west LCIMA razor clam sport (5 AAC 58.022 [a][14][B]) and personal use (5 AAC 77.518) fisheries are under the areawide regulations for the Cook Inlet–Resurrection Bay Saltwater area. There are no bag and possession limits for razor clams in these fisheries. Statewide "method and means" regulations restrict clam gear in the sport fishery (5 AAC 75.035[6]) and in the personal use fishery (5 AAC 77.010 [3]). Gear is limited to the use of a shovel or clam gun, which must be manipulated by hand. Clam diggers are also required to harvest all razor clams that they take. There are no management plans for the west LCIMA sport and personal use razor clam fisheries. The west LCIMA commercial razor clam fishery is open from Redoubt Creek south to Crescent River with an annual harvest limit of 400,000 lb of whole weight razor clams. The commercial fishery is prosecuted under the guidelines of a commissioner's permit where annual limit and individual size limits (clams must be 4.5 inches or larger) are established.

The west LCIMA razor clam stocks and fisheries are not as closely monitored as the Eastside beaches in upper LCIMA. Sport and personal use fisheries assessment has primarily been through SWHS effort and harvest estimates (see above). Starting in 2013, age and length compositions of west LCIMA clam stocks have been assessed through hand-dug samples collected by SF staff; sampling methods are similar to those used on the Eastside beaches (Tables 50 and 51). Division of Commercial Fisheries fish ticket data have provided some stock assessment information through annual and monthly CPUE (Figure 19). From 2002 through 2016, the annual CPUE was above the 1984–2018 average.

Recent Fisheries Performance

The total west LCIMA 2016–2018 average sport and personal use razor clam harvest (37,177) and days fished (1,320) declined from their historical (1986–2015) harvest (38,324) and days fished (1,397) averages (Table 46). Although the west LCIMA annual razor clam harvest estimates have fluctuated 10-fold in recent years, it is assumed that this is more of a reflection of the number of responses to the SWHS then actual changes in harvest. The recent averages in the subareas remained generally similar to their historical averages although south of Chinitna subarea has had very low reported harvest. The commercial fishery at Polly Creek failed to achieve the annual harvest limit (400,000 lb whole weight) in 2017 and 2018. This is noteworthy but may not necessarily be a reflection of stock decline. Based on SF staff personal observations at Polly Creek and Crescent River bar in 2017, razor clam density was high. The 2016–2018 age and length compositions at Polly Creek and Crescent River were similar to other recent years (Tables 50 and 51). In 2018, fewer larger and older clams were dug at Polly Creek and no samples were collected at Crescent River due to weather delays prohibiting sampling.

HARDSHELL CLAM FISHERIES

Fisheries Description

Kachemak Bay (part of lower LCIMA) supports hardshell clam sport, personal use, and subsistence fisheries, and has historically supported commercial fisheries (Table 45). Some hardshell clams are also found in west LCIMA but their distribution is not well known and there is little to no sport harvest. The generic term, hardshell clam, refers to the Pacific littleneck (*Leukoma staminea*) and butter clam (*Saxidomus gigantea*). Pacific littleneck and butter clams are found in the intertidal areas (from +5 ft to −5 ft) of bays, estuaries, and open coastlines in the LCIMA. They are encountered in a variety of beach habitats and gravel sizes with Pacific littleneck

clams preferring gravel beaches with more mud content. Pacific littleneck clams typically inhabit the upper 4–6 inches of the substrate and occasionally to depths of 8 inches, whereas butter clams are encountered to depths of 1 ft. Historically, Jakolof Bay, China Poot Bay, and Bear Cove were the primary areas for harvesting littleneck clams. Butter clams have been primarily harvested on the islands in China Poot Bay. Like razor clams, most of the sport–personal use effort occurs within a 5-month period from April through August when minus tides occur during daylight hours and warmer temperatures prevail. During the darker winter months from October through February, most clam digging is precluded when the low tides occur at night, temperature are cold, and ice builds up on beaches. There are about 60 minus tides annually from April through August.

Harvest in the sport fishery has been assessed by the SWHS and reported in gallons through 2010 and in numbers since then (Table 45). The SWHS estimates are for a combination of littleneck and butter clams and are not apportioned by species. Conversion between gallons and numbers is difficult without species apportionment and considering the large size difference between littleneck and butter clams. Average annual harvest of hardshell clams from 1981 to 2010 was approximately 12,000 gallons and from 2011 through 2015 averaged about 26,000 clams.

Fisheries Management Objectives

Since 1997, hardshell clam fisheries have been managed by the *Southern District Hardshell Clam Fishery Management Plan* (5 AAC 38.318). The plan limits the annual noncommercial (sport and personal use) and commercial harvests to 160,000 pounds and 40,000 pounds, respectively. The harvest level for the noncommercial fishery was based on the average harvest in the fishery from 1981 to 1995. In 2007, the Alaska Board of Fisheries (BOF) made a positive "customary and traditional use" finding for shellfish in the portion of Cook Inlet outside the Anchorage, Matanuska–Susitna and Kenai Peninsula nonsubsistence area. The amount "necessary for subsistence uses" of hardshell clams was 6,800–10,200 pounds (round weight).

Additional sport fishery regulations in 5 AAC 58.022(a)(12) and additional personal use regulations in 5 AAC 77.518 define season, bag and possession limits, and size restrictions. Sport fishery gear is defined in statewide method and means 5 AAC 75.035(6) and personal use gear is defined in 5 AAC 77.010 (3). There are also 2 small areas in China Poot and Peterson bays closed to the taking of shellfish listed in 5 AAC 58.022(b)(4)(A)(B). In all fisheries, harvest may only occur by hand or with a rake or shovel. In the sport and personal use fisheries, Pacific littleneck clams must be a minimum length of 1.5 inches and butter clams must be at least 2.5 inches. The size limits allow clams to reach reproductive maturity before harvest. Bag and possession limits under any type of fishery regulation cannot be added to the bag and possession limits of another type.

Bag and possession limits in the sport and personal use fisheries have changed over time. In 1994, bag and possession limits of Pacific littleneck and butter clams were established at 1,000 and 700 clams, respectively. The bag limits were established to facilitate enforcement of commercial closures by removing the incentive for commercial harvesters to dig during commercial closures and were not established to maintain an annual harvest below the harvest level established in the management plan. In 2011, due to declining abundances observed in Jakolof Bay from 2001 to 2010, in China Poot Bay from 1999 to 2009, and at Chugachik Island from 1999 to 2008 (Szarzi et al. *In prep*), ADF&G issued an EO to reduce the bag and possession limits of hardshell clams to 80 clams in combination between Pacific littleneck and butter clams for all

noncommercial fisheries. In 2012, the BOF adopted the ADF&G proposal to reduce the bag limit to 80 in combination.

The ADF&G Division of Commercial Fisheries (CF) and Division of Sport Fish (SF) conducted annual hardshell clam abundance surveys throughout Kachemak Bay from the mid-1990s through 2010 (Szarzi et al. *In prep*). Sampling occurred on small beach sections from Jakolof Bay to Chugachik Island (Figures 2 and 3). The surveyed beach sections included Jakolof Bay, China Poot Bay, and Chugachik Island. These beach sections were selected for long-term monitoring based on the locations where noncommercial and commercial digger effort had been consistently higher. At each location, abundance was estimated from the density of clams (clams/m^2) in hand-dug quadrats. Although the primary focus of these surveys was to estimate the abundance of legal-sized Pacific littleneck (38.1 mm) and butter clam (63.5 mm), captured sublegal hardshell clams were also used to assess recruitment. The density of sublegal hardshell clams was probably underestimated in these surveys due to an inability to detect clams below a certain size.

Recent Fisheries Performance

From 2016 through 2018, the harvest of hardshell clams in Kachemak Bay declined substantially from historical harvest (Table 45). The recent 3-year average was 3,056 clams which was an 88% decline from the 2011–2015 average of (26,136 clams). Additionally, harvest declined annually from 2016 (5,318) through 2018 (1,343). Although most of the historical annual harvests were estimated in pounds, the years 2016–2018 are probably the lowest 3 annual harvests estimated by the SWHS (note: different harvest units were used prior to 2011). In these recent years, effort towards all shellfish in Kachemak Bay has also continued to decline from the 2011–2015 period.

In 2018, a multi-year hardshell clam abundance study was launched to estimate the density of sublegal and legal Pacific littleneck and butter clams on the beaches with the longest time series of data (Booz and St. Saviour 2019). Beaches to be surveyed include Chugachik Island, the islands in China Poot Bay and sites within Jakolof Bay. The data will be compiled and available for the 2021 miscellaneous shellfish BOF meeting.

TANNER CRAB FISHERIES

Fisheries Description

Tanner crab occur throughout LCIMA but are primarily found in Kachemak Bay in lower LCIMA, where they are primarily harvested in deep waters (>100 m), and Kamishak Bay in west LCIMA. Due to the depth where they are found (up to 1,200 feet) and size of these crabs, large heavy pots are required to harvest them, along with mechanical pullers or boats with sufficient horsepower to raise the pots.

Historically, Tanner crab in LCIMA supported both commercial and noncommercial (sport, personal use, and subsistence) fisheries. Tanner crab abundance has been assessed with a bottom trawl survey since 1990 (Table 52). Due to low stock abundance, the commercial fisheries have been closed since 1995. The noncommercial fisheries have had periodic closures since 1989 (Table 45; Kerkvliet et al. 2016). Noncommercial harvest data are available from the Statewide Harvest Survey (SWHS) from 1981 through 1995 and from shellfish permits starting in 1996 (Kerkvliet et al. 2016). SWHS estimates of noncommercial Tanner crab harvest in most years are much lower and more variable than estimates obtained from shellfish permits. This may be the result of imprecision in harvest estimates because of the small number of respondents to the SWHS that fished for Tanner crab. Noncommercial Tanner crab harvests reported on permits are

considered to be more accurate than SWHS estimates because permit compliance is high. The average annual noncommercial harvest estimated for all areas from permits from 1996 to 2000 was approximately 15,400 crab under a bag and possession limit of 20 Tanner crab (Kerkvliet et al. 2016). A bag limit reduction to 5 Tanner crab resulted in an estimated harvest in 2001 of 6,499 crab (Table 45). The fishery closed early inseason in 2002 to protect Tanner crab in Kachemak Bay from overharvest; the harvest reported on permits was 3,574 crab (Table 45). From 2008 to 2011, the total Tanner crab harvest for all areas averaged roughly 16,000 crab (Table 45).

Fisheries Management Objectives

In March 2002, the Alaska Board of Fisheries (BOF) adopted the *Registration Area H Tanner Crab Harvest Strategy* (5 AAC 35.408), which includes Cook Inlet Area waters within the Southern, Kamishak, and Barren Island districts (Figure 20). The strategy established abundance thresholds for the commercial and noncommercial Tanner crab fisheries by district. For the commercial fishery in each district, the management strategy includes thresholds of estimated abundance of legal male Tanner crab required to open the fishery and the maximum harvest rates for a given abundance level. Additional provisions were established in the harvest strategy to close the commercial fisheries. When the estimated abundance of legal male Tanner crab is below the minimum threshold for a commercial fishery, the harvest strategy specifies that the noncommercial Tanner crab fisheries guideline harvest level (GHL) may not exceed 10 percent of the recent 5-year average of legal male Tanner crab harvest (changed to a 3-year average in 2014). Furthermore, within the harvest strategy, there are provisions that close the noncommercial fishery based on the estimated abundance of legal male Tanner crab from ADF&G trawl surveys conducted in Kachemak and Kamishak bays. The noncommercial fisheries are designated by areas A–E (Figure 20). In areas A, B, and C, the Tanner crab noncommercial fisheries are managed from the Kamishak Bay trawl survey. In areas D and E, the noncommercial fisheries are managed from the Kachemak Bay trawl survey. Regulation 5 AAC 35.410 ties the areas outside of Kachemak Bay (A, B, and C) together for management of the noncommercial fishery.

Other regulations for the noncommercial fisheries restricted season, established a minimum size limit and bag and possession limits, and specified legal gear and permit requirements. Sport regulations are generally listed in Chapter 58, but the statewide permit regulations in 5 AAC 75.016 apply to this Tanner crab fishery. Season and limits are listed for the entire Cook Inlet–Resurrection Bay area in 5 AAC 58.022 (a)(11), for upper LCIMA in 5 AAC 58.022(b)(1)(B), and for Kachemak Bay in 5 AAC 58.022(b)(2)(D). Sport fish Cook Inlet area permit regulations are in 5 AAC 58.026 and Cook Inlet area methods and means are listed in 5 AAC 58.035. Personal Use regulations are listed in 5 AAC 77.507, 77.509, and 77.509. Subsistence regulations are listed in Chapter 2 and the Cook Inlet Tanner Crab regulations are in 5 AAC 02.325.

In 1993, the BOF adopted a regulation that protected Tanner crab during the molting season by only allowing harvest from 15 July through 15 March, except that in Kachemak Bay east of a line from Anchor Point to Point Pogibshi, male Tanner crab may be taken from 15 July through 31 December and again from 15 January or the beginning of the commercial Tanner crab season (whichever is later) through 15 March. Harvest was restricted to males and the minimum size was 5.5 inches across the widest part of the shell including spines. The daily noncommercial bag and possession limits were set at 5 crab (5.5 inches or greater carapace width). No more than 2 pots could be fished per vessel. Gear restrictions were similar to those of commercial gear and were required to have escape mechanisms and be properly identified. A household permit was also required to

participate in the Tanner crab noncommercial fishery. In March 2011, BOF increased the shellfish vessel pot limit in the North Gulf Coast waters east of Gore Point (Area C; Figure 20) to a maximum of 6 pots per vessel. This mainly affected participants out of Seward that have more limited opportunities due to weather and longer travel distances to fishing grounds.

In November 2007, the BOF made a positive customary and traditional use finding for all shellfish in Cook Inlet outside the Anchorage, Matanuska–Susitna, and Kenai nonsubsistence areas (5 AAC 02.311). Therefore, if ADF&G determined that there was a harvestable surplus of Tanner crab within areas subject to the customary and traditional use finding (outside the nonsubsistence area), subsistence regulations would be needed for those areas. Although all Alaskans are eligible to participate in subsistence fisheries, the Tanner crab population could not support more liberal subsistence limits. Therefore, BOF adopted regulations governing subsistence Tanner crab fishing in the areas outside the nonsubsistence area that are identical to the personal use and sport fishing regulations, except a sport fishing license is not required.

Additional regulation changes have been made to the noncommercial fishery at the last 2 statewide king and Tanner crabs BOF meetings. At the March 2014 meeting, the BOF adopted regulations that changed the harvest strategy to manage the noncommercial fisheries based on a 3-year average instead of a 5-year average of legal male Tanner crab abundance from both the Kachemak and Kamishak trawl surveys. Additionally, a season date change was adopted for Kachemak Bay of 1 September through 31 March for the noncommercial fishery (changed from 15 July through 15 March) while maintaining the closed period of 1 January to 14 January. At the March 2017 meeting, the BOF adopted several substantial regulations to the noncommercial fishery. First, the personal use fishery was repealed because it was viewed as redundant with the sport fishery. Second, the legal size of males was reduced from 5.5 inches (carapace width) to 4.5 inches (114 mm). Finally, sport and subsistence regulations allowed a small harvest opportunity in the absence of trawl survey abundance estimates or when the estimates were below the noncommercial threshold. This smaller noncommercial fishery was given a season 1 October through the end of February, bag and possession limit of 3 legal males, and gear was restricted to 1 pot per person and per vessel.

Recent Fisheries Performance

The noncommercial fishery reopened for the 2017–2018 season for the newly established smaller noncommercial fishery. The smaller fishery provided an opportunity for ADF&G to implement a mandatory online reporting requirement that was tied to the availability of permits only through the ADF&G online store[12]. This requirement allowed ADF&G to enforce the authority under 5 AAC 58.026(a) and 5 AAC 01.015(c) to deny a permit to those who failed to return a harvest report for the previous year. Following the first season of this change, during the reporting period, inconsistencies were introduced by ADF&G staff accepting paper permits. By doing so, the integrity of the chain of custody was compromised. As a result, permit holders who failed to report their harvest for the 2017–2018 season were not penalized and were able to receive a sport and (or) subsistence permit for the 2018–2019 season. During the 2018–2019 season, reporting guidelines were distributed to ADF&G staff. These guidelines made clear that only through online reporting can a chain of custody be established that can be used to deny permits to individuals who failed to report their harvest.

[12] ADF&G online store available at https://www.adfg.alaska.gov/Store/.

For the 2017–2018 season, a total of 1,782 sport and 148 subsistence individual permits were issued online. The failure to report (FTR) list was 3.3% for sport permits and 3.4% for subsistence permits. Approximately 53% of the sport permit holders and 32% of the subsistence permit holders participated in the fishery. The total effort and Tanner crab harvest for all areas was expanded to account for the nonreporting. This resulted in a total effort of 3,304 crabber-days and 8,545 Tanner crab harvested in the noncommercial fishery (Table 53). Most of the effort (92%) and harvest (94%) occurred in Kachemak Bay, which was similar to the location of historical effort and harvest in the noncommercial fishery (Table 53). The number of crabs harvested per crabber-day was roughly 2.6 in the Kachemak Bay area, which suggests most crabbers were successful. Based on permit records, only 8% of crabber-days had no associated harvest of crabs, and 81% of crabber-days were associated with a bag limit harvest. Permit records show the Tanner crab harvest and effort were fairly evenly distributed over the months of fishery season (1 October–28 February). In Kachemak Bay, the lowest monthly harvest (15% of the total) occurred in January and highest monthly harvest occurred in December (23%). Effort was highest in October (25%) and lowest in January (15%). Success (crab harvest/effort) ranged from 2.3 in October to 2.8 in February (ADF&G, unpublished data).

For the 2018–2019 season, a total of 1,611 sport and 193 subsistence individual permits were issued online. The failure to report (FTR) list was 17.6% for sport permits and 21.2% for subsistence permits. Approximately 59% of the sport permit holders and 48% of the subsistence permit holders participated in the fishery. The total effort and Tanner crab harvest for all areas was expanded to account for the nonreporting. This resulted in a total effort of 3,288 days fished and 8,769 Tanner crab harvested in the noncommercial fishery (Table 53). Most of the effort (95%) and harvest (96%) occurred in Kachemak Bay, which was similar to the location of historical effort and harvest in the noncommercial fishery (Table 53). The number of crabs harvested per crabber-day was roughly 2.7 in the Kachemak Bay area, which suggests most crabbers were successful. Based on permit records, only 1% of the crabber-days had no associated harvest and 81% of the crabber-days were associated with harvesting the bag limit. Permit records show the Tanner crab harvest and effort were fairly evenly distributed over the months of fishery season. In Kachemak Bay, the lowest monthly harvest (9% of the total) occurred in December and highest monthly harvest occurred in February (28%). Effort was highest in February (27%) and lowest in December (9%). Success (crab harvest/effort) ranged from 2.5 in October to 2.8 in February.

The Kachemak Bay trawl survey also resumed in 2017 with funding from the Division of Sport Fish and abundance estimates for all size classes were restructured using the new legal size of ≥114 mm (Table 52). The survey was conducted from 29 August through 6 September. The 2017 legal male abundance was the second lowest estimate since the inception of the trawl survey. In 2018, the legal male abundance increased roughly 78% from the 2017 trawl survey and after the 2017–2018 noncommercial fishery harvest. The 2018 Pre-3 through Pre-1 size classes substantially increased from 2017 and resulted in the highest total male abundance from the trawl survey since 1990.

DUNGENESS CRAB FISHERIES

Fisheries Description

When the fishery was open (prior to 1999), Dungeness crab were taken in pots, primarily in Kachemak Bay east of Homer Spit. Dungeness crab are found primarily on sandy or muddy substrates in salt or brackish water at depths usually shallower than 45 feet. Pots used to capture

Dungeness crab were lightweight and could be deployed and retrieved by hand. The fishery is currently closed because low stock abundance cannot sustain harvest.

Sport and personal use shellfish harvest and effort estimates are available from the SWHS since 1981 (Table 45; Kerkvliet et al. 2016). Estimates of Dungeness crab harvest and effort for Kachemak Bay and Cook Inlet are also available from shellfish permits beginning in 1996 (Kerkvliet et al. 2016). Although hardshell clam fishery statistics from permits are biased toward clams (see Razor Clams and Hardshell Clams sections), Dungeness crab harvests reported on permits were fairly close to harvest estimates obtained by the SWHS and are therefore assumed to be unbiased (Kerkvliet et al. 2016).

The sport and personal use harvest of Dungeness crabs averaged nearly 21,000 crabs (44,100 pounds) from 1981 through 1994 and then dropped by more than half to nearly 9,000 crabs (18,900 pounds) from 1995 until the fishery was closed in 1998 (Kerkvliet et al. 2016). Most of the Dungeness crab harvest reported on permits occurred in Kachemak Bay east of Homer Spit; fewer were caught west of Homer Spit, and the remainder were taken in Cook Inlet and from outer Gulf Coast waters (Kerkvliet et al. 2016).

Combined effort for all shellfish species in lower LCIMA from 1981 through 1999 averaged 14,999 angler-days (Table 45). In 1996, when ADF&G first issued sport and personal use crab permits, effort was reported as trips rather than in numbers of people who fished. A total of 2,896 trips were made for crab in 1996 (Kerkvliet et al. 2016). Analysis of individual permits revealed that only Dungeness crab were caught on 55% of those trips. Both trips and crabber-days were recorded on permits in 1997 and approximately 4,250 crabber-days were reported on permits in 1997. People who caught only Dungeness crab accounted for approximately 20% of the effort for crab, whether effort was measured in crabber-days or trips. Approximately 15% of the effort was attributed to persons who harvested both Dungeness and Tanner crabs. The remainder (65%) was people who harvested only Tanner crab or harvested nothing. Effort directed at Dungeness crab in areas that remained open to fishing was insignificant after Kachemak Bay was closed to Dungeness crab fishing in May 1998.

Commercial harvest data for Dungeness crab are available since 1961 (Trowbridge and Goldman 2006). The commercial fishery was the primary harvester of Dungeness crab, with a historical average harvest in the Southern District of about 612,000 pounds (Trowbridge and Goldman 2006), equaling about 290,000 crab annually (the average weight of 1 crab is estimated to be 2.1 pounds).

ADF&G conducts periodic Dungeness crab pot surveys in the shallows (4 to 60 feet in depth) on the north side of Kachemak Bay to monitor changes in stock status (Kerkvliet et al. 2016). The pot survey indexes abundance but does not provide a means to estimate total abundance. In 1993, a dramatic decline in the ADF&G pot survey catch occurred and since then, fewer than 100 male crab of any size have been caught in any August Dungeness crab pot survey east of Homer Spit since 1995. Estimates of Dungeness crab abundance from incidental catches in the ADF&G Tanner crab trawl survey have also been low, except in 2001 and 2006, when over 500 juvenile Dungeness crab were caught (Szarzi et al. 2007). ADF&G trawl surveys have typically caught more sublegal than legal-sized Dungeness crab. The large catches of juvenile crab in 2001 and 2006 did not persist in the surveys that followed in 2002–2003 or 2007–2008, confirming that populations were at low levels over a broad range (R. Gustafson, Commercial Fisheries Biologist, ADF&G, Homer, personal communication).

A pot survey was conducted by ADF&G from 10 to 12 August 2009 to estimate catch per unit effort of Dungeness crab in historical survey areas east of Homer Spit. Pots were also fished in waters adjacent to the historical index area in Mud Bay at the mouth of the Homer Boat Harbor and in the deep trench located south and southwest of Homer Spit. Ninety pots were set in the historical survey area, and the catch was composed of 32 sublegal males (ADF&G, unpublished data). Fifteen pots were fished in Mud Bay near the harbor mouth and the catch was composed of 10 legal and 23 sublegal males, and 1 female. The 15 pots fished in the deep trench caught 7 females and 1 sublegal male. The pot survey indicated that the Kachemak Bay Dungeness crab population had not rebounded sufficiently to support a harvest, but the catch of sublegal males in 2009 was higher than the 1998 and 2000 catches.

Fishery Management and Objectives

Dungeness crab populations are presently at low levels of abundance in lower LCIMA, and all commercial and noncommercial fisheries are closed. There is currently no management plan for Dungeness crab and no criteria for opening the noncommercial fishery. The sport and personal use fisheries for Dungeness crab in lower LCIMA were closed by EO in 1991 but reopened from 1992 to 1998. During these years, there were no regulations authorizing subsistence fishing for Dungeness crab in the LCIMA. In May 1998, Kachemak Bay was closed to sport and personal use fisheries by EO because the continued poor catches of Dungeness crab in ADF&G pot surveys indicated that sport and personal use harvests could be affecting the maintenance and recovery of the stock. The fishery remained closed by EO until the BOF closed it by regulation in 2000. Prior to the closure, Dungeness crab seasons in Kachemak Bay were from 15 July through 31 December and from 15 January or the beginning of the commercial Tanner crab season, whichever was later, through 15 March. The bag and possession limits were 5 male crab with a minimum carapace width of 6.5 inches. Pots, ring nets, diving gear, hooked or hookless hand lines, or hands were legal harvest methods in the noncommercial fishery. The commercial Dungeness crab fishery in Kachemak Bay and eastern lower LCIMA was closed by EO beginning in 1991 (C. E. Trowbridge, ADF&G, Homer, personal communication), although the remainder of Cook Inlet and the outer coast remained open. Commercial Dungeness crab fishing was closed in all Cook Inlet areas by BOF action in 1997.

In 1982, the BOF closed all subsistence shellfish fisheries in LCIMA, except for clams, because there was not a customary and traditional use finding. In November 2007, the BOF made a positive customary and traditional use determination finding for all shellfish outside the Anchorage, Matanuska–Susitna, and Kenai nonsubsistence areas (5 AAC 02.311). If the Dungeness crab stocks recover such that there is a harvestable surplus, the BOF will need to adopt subsistence fishing regulations for the noncommercial Dungeness crab fishery.

Recent Fisheries Performance

The Dungeness crab sport fishery was closed in all subareas of LCIMA in 2017 and 2018 (Table 45). There were no pot surveys in 2017 and 2018. The Kachemak Bay trawl survey detected improved densities of Dungeness crab in 2017 and 2018 (Table 54). The 2018 legal male density was similar to the density the during the 1990–1997 period when the fishery was last opened. The 2018 female density was the highest ever observed in the trawl survey. These results suggest that Dungeness crab population numbers may be improving in Kachemak Bay.

ACCESS PROJECTS

BACKGROUND OF THE SPORT FISHING ACCESS PROGRAM

The Division of Sport Fish sport fishing access program coordinates and implements projects to improve access to sport fisheries by boating and nonboating anglers. Funding is derived from a combination of state and federal sources, including sport fishing license sales and a federal excise tax on sport fishing equipment and motorboat fuel. The federal funding source is the result of the Federal Aid in Sport Fish Restoration Act (also known as the Dingell–Johnson Act) and the Wallop–Breaux amendment made to the act in 1984.

The primary beneficiaries of each access project that involves Federal Aid funding must be the sport fish boater or sport fishing public. A minimum of 15% of the Federal Aid funds allocated to the state is mandated to be used for sport fish boating access projects. Federal Aid funds cannot be used for projects that support subsistence or personal use fisheries because of Alaska resident status restrictions placed on these fisheries and the type of fishing gear used (subsistence and personal use gear do not fit under the federal definition of sport fishing gear). Federal Aid funds cannot be used to support commercial user groups because commercial fishermen are exempt from the federal taxes that support the program. Federal Aid funds pay for approximately 75% of eligible access projects. The remaining 25%, called the state match, must be made up of nonfederal funds or assets.

In 1996, ADF&G cooperated with the Department of Natural Resources (DNR), Division of Parks and Outdoor Recreation (DPOR) to fund the fabrication and installation of 2 public mooring buoys in Halibut Cove Lagoon. The buoys became the property of DNR in 1999. In 1997, additional funds were added to the original agreement for construction and installation of 2 additional mooring buoys in Tutka Bay. ADF&G is no longer funding mooring-buoy projects due to liability and maintenance concerns.

Handicapped accessible ramps and landings were installed at the Nick Dudiak Fishing Lagoon (NDFL) in 1999 to allow full accessibility to the sport fishery. The parking area adjacent to the ramps and a trail to an accessible toilet facility near the lagoon were paved. DNR and Alaska Department of Transportation and Public Facilities (ADOTPF) were cooperators through grants. Also in 1999, the seaward banks of the NDFL were hardened to reduce maintenance costs and to provide winter storm protection for the upgrades inside the lagoon. Hardening of the outer banks of the NDFL and protection of the channel leading into the lagoon were accomplished with funds from the Federal Aid in Sport Fish Restoration Program and ADOTPF.

ADF&G cooperated with the City of Homer to construct an additional fish cleaning table, carcass trailer, an industrial fish waste grinder, and a building to house the grinder in the vicinity of the Homer Boat Harbor during 2000 and 2001 because the amount of fish waste being dumped by the city was exceeding United States Environmental Protection Agency (EPA) limits. The fish cleaning facility was operational beginning in June 2001 and the city is now in compliance with EPA regulations.

During 2004, 3 handicapped accessible plumbed restrooms were built for the Homer Boat Harbor at the top of the load and launch ramp (2-toilet unit) and at the tops of Ramp 4 (7-toilet unit) and Ramp 6 (7-toilet unit) transient mooring floats. In December of 2005, the grant agreement period for the renovation of the Ramp 4 fish cleaning tables was extended to 2007, and the funding amount was increased to $60,000. The project was completed late in the summer of 2007 and features a

roof and asphalt apron, photocell-operated lights, paint, landscaping, and plumbing. Ramp 6 was completed in the summer of 2007 with the addition of a carcass trailer with plumbing, paint, and a roof composed of Lexan panels for natural illumination. The City of Homer contributed additional funds (about $20,000) to complete Ramp 6 renovations and supplied city crews as a labor force for both projects. Transportation and installation were coordinated with DPOR. During 2006, a custom fish cleaning table (about $950) was also constructed by the ADF&G maintenance shop in Palmer for Halibut Cove Lagoon.

Maintenance projects paid for by ADF&G access fund that relate to sport fishing access include annual upkeep of the road to the beach and the camping areas at Whiskey Gulch. During summer 1999, the road was graded and brushed along the edges near the entrance, widened at the top of the bluff, and drainage culverts were installed on both sides. The existing roadbed materials were replaced with more stable roadbed materials and a drainage culvert was installed in the streambed at the base of the bluff road. During 2007, while researching ADF&G's authority to penalize owners who abandoned vehicles and camper trailers at Whiskey Gulch, it was discovered that DNR was the official property owner. DNR subsequently transferred land ownership to ADF&G. During 2012, roadwork maintenance continued, and a drainage culvert was reinstalled in the streambed at the base of the bluff road by ADOTPF and ADF&G.

A request from the Kenai Peninsula Superintendent of State Parks for help with vehicle and boat trailer traffic and parking problems at the boat tractor launch at the Anchor River State Recreation Site was addressed with a request by ADF&G in fall 2006 for a 2008 funding year (FY08) Capital Improvement Project. The request included funds for improvements to the Anchor River Tractor Launch of about $250,000. The request was approved by the Statewide Access Program Coordinator and submitted to and approved by the Alaska State Legislature. This was a cooperative project between DPOR and ADF&G using access program funds for the parking lot and turn-around design and construction. This project was completed in 2012 within the proposed timeframe and budget. Relocating and improving the existing beach access ramp provides a safer and easier access to the beach and decreases the potential for damage to boat trailers and vehicles. Providing an improved road, accessible parking area, staging lane, and turnaround area helped to decrease traffic congestion and provide a safer and more convenient area for sport fish boaters and anglers to park and walk. In addition, an orientation and fee kiosk and a launch concessioner area provide a better-designed and more easily maintained facility. The sum of these improvements has increased the quality of the access site by providing a safer, more accessible and efficient facility.

Removal of the broken wire gabion "mattresses" that were originally installed for slope stabilization adjacent to the Deep Creek boat ramp, and their replacement with articulated concrete matting, was completed during spring 2002. Interpretive display signboards were also constructed and installed at the boat launch as part of this project. The ramp was completely removed by floodwaters in fall 2002 but was replaced in 2008.

In 2016, the new Homer Boat Harbor launch ramp was completed with 5 concrete plank launch ramps and 2 boarding floats in the northeast end of the harbor addressing the sport boating needs of the communities of the Kenai Peninsula, Anchorage and the Matanuska–Susitna Valley. New updated concrete launch planks and boarding floats provide better traction, and new rub rails provide boat (and float) protection and slip-resistant surfacing. Improvements meet current ADA guidelines and provide improved accessibility for all users. This improved facility will be managed and maintained by the City of Homer per a cooperative agreement with ADF&G, Division of Sport Fish. The total cost of this project (Phase I and II) was approximately $4,000,000.

ADF&G has sought additional public easements to eastside Cook Inlet beaches for public access to clam digging and angling north of the Ninilchik River through development of existing public easements, or lease or purchase and improvement of easements currently in private ownership. Funding is inadequate to cover the estimated costs of these alternatives.

CURRENT SPORT FISHING ACCESS PROJECTS

In 2017 and 2018, the annual installation and pumping of a portable toilet at Whiskey Gulch ($2,200 per year) was paid for by access funds, and the DPOR was given $10,000 per year for the operation and maintenance of the Ninilchik Scenic Overlook Wayside.

In 2017, renovations were completed for the Nick Dudiak Fishing Lagoon Cleaning Table Project. This included installing an additional fish cleaning table, constructing a roof for overhead protection, installing surrounding curtains to reduce attracting birds to the area, and redirecting the drainage of fish effluent from the lagoon to the east side of Homer Spit.

LAND PURCHASES

Large sections of the watersheds of the road-accessible streams and many remote streams on the Central and Lower Kenai Peninsula are privately owned. Private landowners are becoming less tolerant of trespass, particularly as subdivision of large tracts of private property occurs and access for fishing decreases. ADF&G has limited options for protecting public access through land purchase or easement dedication. Several private nonprofit organizations based on the Lower Peninsula can purchase land or protect it from development through easements. Public access for sport fishing can be an outcome of agreements between private landowners and these nonprofit agencies, but habitat protection is the priority. Access for sport fishing in the Central and Lower Kenai Peninsula will be sharply reduced in the future without further public land acquisition or easements.

ADF&G has been actively involved in land protection efforts on the Anchor River. Through the Exxon Valdez Trustee Council, the state successfully acquired a 20-acre parcel just downstream of the Sterling Highway, a 60-acre parcel just upstream, and 3 additional acquisitions totaling 103 acres. All of these parcels are now managed by ADF&G. In cooperation with The Nature Conservancy, ADF&G also obtained and is administering a National Coastal Wetland Conservation Grant to purchase approximately 57 acres of estuarine wetlands and barrier beach near the mouth of the Anchor River. This purchase is expected to provide lasting benefits for Pacific salmon, steelhead, and Dolly Varden that migrate, spawn, and rear throughout the river. These efforts are also intended to ensure that angler access is maintained on the Anchor River, which is one of the most popular sport fishing streams in Southcentral Alaska. The purchase was completed in 2010.

REFERENCES CITED

Armstrong, R. H. 1965a. Some feeding habits of the anadromous Dolly Varden *Salvelinus malma* (Walbaum) in Southeastern Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, Informational Leaflet 51, Juneau., Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/afrbil.051.pdf

Armstrong, R. H. 1965b. Some migratory habits of the anadromous Dolly Varden *Salvelinus malma* (Walbaum) in southeast Alaska. Alaska Department of Fish and Game Research Report 3:1-36, Juneau.

Armstrong, R. H. 1984. Migration of anadromous Dolly Varden charr in southeastern Alaska - A manager's nightmare. Pages 559–570 [*In*] Johnson, L., and B. L. Burns, editors. Biology of the Arctic charr, Proceedings of the International Symposium on Arctic Charr. University of Manitoba Press, Winnipeg, Manitoba.

Balland, D. T., and R. N. Begich. 2007. Ninilchik River Chinook salmon assessment, 2001. Alaska Department of Fish and Game, Fishery Data Series No. 07-60, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/fds07-60.pdf

Balland, D. T., S. Sonnichsen, and S. L. Timmons. 1994. Contribution of stocked Chinook salmon to the Ninilchik River sport fishery, 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-25, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds94-25.pdf

Barclay, A. W., M. Schuster, C. M. Kerkvliet, M. D. Booz, B. J. Failor, and C. Habicht. 2019. Genetic and coded wire tag augmented mixed stock analysis of Chinook salmon harvested in Cook Inlet marine sport fishery, 2014-2017. Alaska Department of Fish and Game, Fishery Manuscript No. 19-04, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMS19-04.pdf

Begich, R. N. 2006. Ninilchik River Chinook salmon assessment, 1999 and 2000. Alaska Department of Fish and Game, Fishery Data Series No. 06-27, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds06-27.pdf

Begich, R. N. 2007a. Contributions of coded wire tagged Chinook salmon stocks to the early-run marine sport fishery in Cook Inlet, 1999 through 2001. Alaska Department of Fish and Game, Fishery Data Series No. 07-54, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds07-54.pdf

Begich, R. N. 2007b. Ninilchik River Chinook salmon assessment, 2002 and 2003. Alaska Department of Fish and Game, Fishery Data Series No. 07-41, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds07-41.pdf

Blain, B. J., and T. M. Sutton. 2016. Reproductive status and blood plasma indicators of sex and gonad maturation status for yelloweye rockfish following barotrauma and recompression events. Transactions of the American Fisheries Society 145(6):1234-1240. https://doi.org/10.1080/00028487.2016.1225598

Booz, M. D., and C. M. Kerkvliet. 2011a. Ninilchik River Chinook salmon stock assessment and supplementation, 2006. Alaska Department of Fish and Game, Fishery Data Series No. 11-05, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS11-05.pdf

Booz, M. D., and C. M. Kerkvliet. 2011b. Ninilchik River Chinook salmon stock assessment and supplementation, 2007. Alaska Department of Fish and Game, Fisheries Data Series No. 11-51, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS11-51.pdf

Booz, M. D., and C. M. Kerkvliet. 2011c. Ninilchik River Chinook salmon stock assessment and supplementation, 2008. Alaska Department of Fish and Game, Fishery Data Series No. 11-54, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS11-54

Booz, M. D., and C. M. Kerkvliet. 2012. Ninilchik River Chinook salmon stock status assessment, 2009. Alaska Department of Fish and Game, Fishery Data Series No. 12-16., Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS12-16.pdf

Booz, M. D., and C. M. Kerkvliet. 2016. Ninilchik River Chinook salmon stock assessment and supplementation 2010. Alaska Department of Fish and Game, Fishery Data Series No. 16-50, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FDS16-50.pdf

Booz, M. D., and A. St. Saviour. 2019. Operational Plan: Kachemak Bay hardshell clam stock assessment, 2018–2020. Alaska Department of Fish and Game, Regional Operational Plan ROP.SF.2A.2019.02, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/ROP.SF.2A.2019.02.pdf

REFERENCES CITED (Continued)

Boyle, L., S. Sonnichsen, and T. D. Balland. 1993. Contribution of stocked Chinook salmon to the Ninilchik River sport fishery, 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-21, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds93-21.pdf

Bucher, W. A., and L. Hammarstrom. 1993a. 1991 Lower Cook Inlet area annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A93-10, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/RIR.2A.1993.10.pdf

Bucher, W. A., and L. Hammarstrom. 1993b. 1992 Lower Cook Inlet area annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A93-11, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/RIR.2A.1993.11.pdf

Bucher, W. A., and L. Hammarstrom. 1994. 1993 Lower Cook Inlet area annual finfish management report. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 2A94-11, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/RIR.2A.1994.11.pdf

Bucher, W. A., and L. Hammarstrom. 1995. 1994 Lower Cook Inlet area annual finfish management report. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 2A95-06, Anchorage http://www.adfg.alaska.gov/FedAidPDFs/RIR.2A.1995.06.pdf

Bucher, W. A., and L. F. Hammarstrom. 1996. 1995 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A96-14, Anchorage. www.cf.adfg.state.ak.us/FedAidpdfs/RIR.2A.1996.14.pdf

Bucher, W. A., and L. F. Hammarstrom. 1997. 1996 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A97-07, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/RIR.2A.1997.07.pdf

Bucher, W. A., and L. F. Hammarstrom. 1998. 1997 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A98-25, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/RIR.2A.1998.25.pdf

Bucher, W. A., and L. F. Hammarstrom. 1999. 1998 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A99-25, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/RIR.2A.1999.25.pdf

Bucher, W. A., and R. Morrison. 1990. Review of the 1990 Lower Cook Inlet salmon fishery, report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2H90-10, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/RIR.2H.1990.10.pdf

Coughenower, D. D. 1986. Homer, Alaska, charter fishing industry study. Alaska Sea Grant College Program, Marine Advisory Bulletin No. 22. University of Alaska, Fairbanks.

Dudiak, N., M. Dickson, and W. J. Hauser. 1987. Halibut Cove Lagoon Chinook salmon, *Oncorhynchus tshawytscha*, enhancement project, 1973–1984. Alaska Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement and Development, Report No. 78, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/fred.078.pdf

Goldman, K. J., M. Byerly, J. Mumm, J. Rumble, and J. Zheng. 2018. Bottom trawl surveys for Tanner crab in Lower Cook Inlet and Prince William Sound 1990–2015, with harvest strategy recommendations for Prince William Sound. Alaska Department of Fish and Game, Fishery Manuscript 18-02, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMS18-02.pdf

Haggarty, D. R., K. E. Lotterhos, J. B. Shurin. 2017. Young-of-the-year recruitment does not predict the abundance of older age classes in black rockfish in Barkley Sound, British Columbia, Canada. Marine Ecology Progress Series 574:113-126. https://doi.org/10.3354/meps12202

Hammarstrom, L. F. 2000. 1999 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A00-17, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/RIR.2A.2000.17.pdf

REFERENCES CITED (Continued)

Hammarstrom, L. F., and M. S. Dickson. 2001. 2000 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A01-01, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/RIR.2A.2001.01.pdf

Hammarstrom, L. F., and M. S. Dickson. 2002. 2001 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A02-16, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/RIR.2A.2002.16.pdf

Hammarstrom, L. F., and M. S. Dickson. 2003. 2002 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A03-04, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/RIR.2A.2003.04.pdf

Hammarstrom, L. F., and M. S. Dickson. 2004. 2003 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A04-01, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/RIR.2A.2004.01.pdf

Hammarstrom, L. F., and M. S. Dickson. 2005. 2004 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 05-29, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fmr05-29.pdf

Hammarstrom, L. F., and M. S. Dickson. 2006. 2005 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 06-35, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fmr06-35.pdf

Hammarstrom, L. F., and M. S. Dickson. 2007. 2006 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 07-42, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/fmr07-42.pdf

Hammarstrom, L. F., and E. G. Ford. 2008. 2007 Lower Cook Inlet Annual Finfish Management Report. Alaska Department of Fish and Game, Fishery Management Report No. 08-12, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/fmr08-12.pdf

Hammarstrom, L. F., and E. G. Ford. 2009. Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 9-28, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/fmr09-28.pdf

Hammarstrom, L. F., and E. G. Ford. 2010. 2009 Lower Cook Inlet Annual Finfish Management Report. Alaska Department of Fish and Game, Fishery Management Report No. 10-17, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FMR10-17.pdf

Hammarstrom, L. F., and E. G. Ford. 2011. 2010 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 11-26, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FMR11-26.pdf

Hannah, R. W., and K. M. Matteson. 2007. Behavior of nine species of Pacific rockfish after hook-and-line capture, recompression and release. Transactions of the American Fisheries Society. 136:24–33. https://doi.org/10.1577/T06-022.1

Hauser, W. J., P. A. H. Westley, C. Kerkvliet, and N. Dudiak. 2017. Homing of Pacific salmon to a marine release site: a case study of the Homer Spit fishing hole, Alaska. Northwest Science 91(3):314-323. https://doi.org/10.3955/046.091.0310

Hochhalter, S. J., and D. J. Reed. 2011. The Effectiveness of Deepwater Release at Improving the Survival of Discarded Yelloweye Rockfish. North American Journal of Fisheries Management 31(5):852-860. https://doi.org/10.1080/02755947.2011.629718

Hollowell, G., E. O. Otis, and E. Ford. 2016. 2015 Lower Cook Inlet area finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 16-19, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR16-19.pdf

REFERENCES CITED (Continued)

Hollowell, G., E. O. Otis, and E. Ford. 2017. 2016 Lower Cook Inlet area finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 17-26, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR17-26.pdf

Hollowell, G., E. O. Otis, and E. Ford. 2019. 2017 Lower Cook Inlet area finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 19-08, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR19-08.pdf

Hollowell, G., T. Otis, and E. Ford. 2012. 2011 Lower Cook Inlet area finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 12-30, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FMR12-30

Howe, A. L., G. Fidler, A. E. Bingham, and M. J. Mills. 1996. Harvest, catch, and participation in Alaska sport fisheries during 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-32, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds96-32.pdf

Howe, A. L., G. Fidler, and M. J. Mills. 1995. Harvest, catch, and participation in Alaska sport fisheries during 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-24, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds95-24.pdf

Jarvis, E. T., and C. G. Lowe. 2008. The effects of barotrauma on the catch-and-release survival of southern California nearshore and shelf rockfishes (Scorpaenidae, Sebastes spp.). Canadian Journal of Fish. and Aquatic Science 65:1286-1296. https://doi.org/10.1139/F08-071

Jones & Stokes. 1987. Southcentral Alaska sport fishing economic study. Prepared for Alaska Department of Fish and Game, Division of Sport Fish. Report No. JSA86-0413, Sacramento, CA. https://econweb.ucsd.edu/~rcarson/papers/Jones&Stokes87.pdf

Kerkvliet, C. M. 2008. Ninilchik River Chinook salmon assessment, 2004. Alaska Department of Fish and Game, Fishery Data Series No. 08-07, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds08-07.pdf

Kerkvliet, C. M., and M. D. Booz. 2010. Ninilchik River Chinook salmon stock assessment and supplementation, 2005. Alaska Department of Fish and Game, Fishery Data Series No. 10-35, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/Fds10-35.pdf

Kerkvliet, C. M., and M. D. Booz. 2012. Anchor River Chinook and coho salmon escapement, 2009. Alaska Department of Fish and Game, Fishery Data Series No. 12-07, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS12-07

Kerkvliet, C. M., and M. D. Booz. 2018. Anchor River Chinook salmon escapement, 2011. Alaska Department of Fish and Game, Fishery Data Series No. 18-05, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FDS18-05.pdf

Kerkvliet, C. M., M. D. Booz, and B. J. Failor. 2013. Recreational fisheries in the Lower Cook Inlet Management Area, 2011–2013, with updates for 2010. Alaska Department of Fish and Game, Fishery Management Report No. 13-42, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR13-42.pdf

Kerkvliet, C. M., M. D. Booz, B. J. Failor, and T. Blackmon. 2016. Sport fisheries in the Lower Cook Inlet Management Area, 2014–2016, with updates for 2013. Alaska Department of Fish and Game, Fishery Management Report No. 16-32, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR16-32.pdf

Kerkvliet, C. M., M. D. Booz, T. J. Blackmon, and P. A. Hansen. *In Prep*. Eastside Cook Inlet razor clam assessment, 2009–2013. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Kerkvliet, C. M., and D. L. Burwen. 2010. Anchor River Chinook and coho salmon escapement project, 2005-2006. Alaska Department of Fish and Game, Fishery Data Series No. 10-26, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/Fds10-26.pdf

Kerkvliet, C. M., D. L. Burwen, and R. N. Begich. 2008. Anchor River 2003 and 2004 Chinook salmon and 2004 coho salmon escapement. Alaska Department of Fish and Game, Fishery Data Series 08-06, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds08-06.pdf

REFERENCES CITED (Continued)

Kyle, G. B. 1994. Nutrient treatment of 3 coastal Alaskan lakes: trophic level responses and sockeye production trends. Alaska Fishery Research Bulletin 1(2):153-167. http://www.adfg.alaska.gov/FedAidpdfs/AFRB.01.2.153-167.pdf

Larson, L. L. 1991. Statistics for Dolly Varden on the Anchor River, Alaska, during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-13, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds91-13.pdf

Larson, L. L., D. T. Balland, and S. Sonnichsen. 1988. Statistics for selected sport fisheries on the lower Kenai Peninsula, Alaska, during 1987 with emphasis on Dolly Varden char. Alaska Department of Fish and Game, Fishery Data Series No. 68, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/fds-068.pdf

Leaman, B. M., and R. J. Beamish. 1984. Ecological and management implications of longevity in some Northeast Pacific groundfishes. International North Pacific Fisheries Commission Bulletin 42:85-97.

Marsh, L. E. 1995. Harvest of stocked Chinook salmon in the Ninilchik River sport fishery, 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-33, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds95-33.pdf

McKellar, J. M. , 2014. Growth and maturity of the Pacific razor clam in Eastern Cook Inlet, Alaksa. A Master's of Science Thesis, University of Alaska, Fairbanks. http://hdl.handle.net/11122/4811

McKinley, T. R. 1999. Contributions of coded wire tagged Chinook salmon to the recreational fishery in Central Cook Inlet, Alaska, 1996. Alaska Department of Fish and Game, Fishery Data Series No. 99-2., Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds99-02.pdf

Meyer, S. C. 1992. Biological characteristics of the sport harvest of marine groundfishes in Southcentral Alaska, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-41, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds92-41.pdf

Meyer, S. C., and B. J. Failor. *In prep.* Characteristics of the recreational rockfish Sebastes harvest in Southcentral Alaska, 1996–2012. Alaska Department of Fish and Game, Fishery Management Report, Anchorage.

Meyer, S. C., M. J. Jaenicke, and B. Failor. 2008. Final Completion Report: Assessment of recreational halibut harvest in Alaska. Alaska Department of Fish and Game, Division of Sport Fish, NOAA Grant Award NA07NMF7370168, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/NA04NMF4370027_CompletionReport.pdf

Mills, M. J. 1979. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1978-1979, Project F-9-11 (20) SW-I-A, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/FREDf-9-11(20)SW-I-A.pdf

Mills, M. J. 1980. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980, Project F-9-12 (21) SW-I-A, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/FREDf-9-12(21)SW-I-A.pdf

Mills, M. J. 1981a. Alaska statewide sport fish harvest studies–1979 data. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1980-1981, Project F-9-13 (22a) SW-I-A, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/FREDf-9-13(22a)SW-I-A.pdf

Mills, M. J. 1981b. Alaska statewide sport fish harvest studies–1980 data. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1980-1981, Project F-9-13 (22b) SW-I-A, Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDf-9-13(22b)SW-I-A.pdf

Mills, M. J. 1982. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1981–1982, Project F-9-14 (23) SW-I-A, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/FREDf-9-14(23)SW-I-A.pdf

Mills, M. J. 1983. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1982-1983, Project F-9-15 (24) SW-I-A, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/FREDf-9-15(24)SW-I-A.pdf

REFERENCES CITED (Continued)

Mills, M. J. 1984. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1983-1984, Project F-9-16 (25) SW-I-A, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/FREDf-9-16(25)SW-I-A.pdf

Mills, M. J. 1985. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1984-1985, Project F-9-17 (26) SW-I-A, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/FREDf-9-17(26)SW-I-A.pdf

Mills, M. J. 1986. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1985-1986, Project F-10-1 (27) RT-2, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/FREDf-10-1(27)RT-2.pdf

Mills, M. J. 1987. Alaska statewide sport fisheries harvest report, 1986. Alaska Department of Fish and Game, Fishery Data Series No. 2, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/fds-002.pdf

Mills, M. J. 1988. Alaska statewide sport fisheries harvest report, 1987. Alaska Department of Fish and Game, Fishery Data Series No. 52, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/fds-052.pdf

Mills, M. J. 1989. Alaska statewide sport fisheries harvest report, 1988. Alaska Department of Fish and Game, Fishery Data Series No. 122, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/fds-122.pdf

Mills, M. J. 1990. Harvest and participation in Alaska sport fisheries during 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-44, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds90-44.pdf

Mills, M. J. 1991. Harvest, catch, and participation in Alaska sport fisheries during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-58, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds91-58.pdf

Mills, M. J. 1992. Harvest, catch, and participation in Alaska sport fisheries during 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-40, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds92-40.pdf

Mills, M. J. 1993. Harvest, catch, and participation in Alaska sport fisheries during 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-42, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds93-42.pdf

Mills, M. J. 1994. Harvest, catch, and participation in Alaska sport fisheries during 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-28, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds94-28.pdf

Mills, M. J., and A. L. Howe. 1992. An evaluation of estimates of sport fish harvest from the Alaska statewide mail survey. Alaska Department of Fish and Game, Special Publication No. 92-02., Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/sp92-02.pdf

Munk, K. M. 2001. Maximum ages of groundfishes in waters off Alaska and British Columbia and considerations of age determination. Alaska Fishery Research Bulletin 8(1):12-21. http://www.adfg.alaska.gov/FedAidpdfs/AFRB.08.1.012-021.pdf

Nelson, D. C. 1995. Area management report for the recreational fisheries of the Kenai Peninsula, 1994. Alaska Department of Fish and Game, Fishery Management Report No. 95-04, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fmr95-04.pdf

Nelson, D. C., D. Athons, P. Berkhahn, and S. Sonnichsen. 1999. Area management report for the recreational fisheries of the Kenai Peninsula, 1995-1997. Alaska Department of Fish and Game, Fishery Management Report No. 99-3, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fmr99-03.pdf

North Pacific Fishery Management Council (NPFMC). 2001. Environmental assessment/regulatory impact review/initial regulatory flexibility analysis for a regulatory amendment to incorporate the halibut charter sector into the halibut individual fishing quota program or implement a moratorium on entry into the charter fleet for Pacific halibut in Areas 2C and 3A (March 12, 2001 public review draft). North Pacific Fishery Management Council, Anchorage, AK.

Otis, E. O., J. W. Erickson, C. Kerkvliet, and T. McKinley. 2016. A review of escapement goals for salmon stocks in Lower Cook Inlet, Alaska, 2016. Alaska Department of Fish and Game, Fishery Manuscript Series No. 16-08, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMS16-08.pdf

REFERENCES CITED (Continued)

Parker, S. J., S. A. Berkeley, J. T. Golden, D. R. Gunderson, J. Heifetz, M. A. Hixon, R. Larson, B. M. Leaman, M. S. Love, J. A. Musick, V. M. O'Connell, S. Ralston, H. J. Weeks, and M. M. Yoklavich. 2000. Management of Pacific rockfish. AFS Policy Statement. Fisheries 25(3):22-30. https://doi.org/10.1577/1548-8446(2000)025%3C0022:MOPR%3E2.0.CO;2

Parker, S. J., H. I. McElderry, P. S. Rankin, and R. W. Hannah. 2006. Buoyancy regulation and barotrauma in two species of nearshore rockfish. Transactions of the American Fisheries Society 135:1213-1223. https://doi.org/10.1577/T06-014.1

Pribyl, A. L., C. B. Schreck, M. L. Kent, and S. J. Parker. 2009. The differential response to decompression in three species of nearshore Pacific rockfish. North American Journal of Fisheries Management 29:1479-1486. https://doi.org/10.1577/M08-234.1

Schroeder, T. R., and R. Morrison. 1989. Lower Cook Inlet area annual finfish management report, 1988. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2H89-02, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/RIR.2H.1989.01.pdf

Schroeder, T. R., and R. Morrison. 1990. 1989 Lower Cook Inlet Area annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2H90-03, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/RIR.2H.1990.03.pdf

Schuster, M. D., M. D. Booz, A. W. Barclay, and C. Habitcht. *In prep*. Chinook salmon sport harvest assessment in Cook Inlet salt waters, 2014-2018. Alaska Department of Fish and Game.

Sigurdsson, D., and B. Powers. 2009. Participation, effort, and harvest in the sport fish business/guide licensing and logbook reporting programs, 2006-2008. Alaska Department of Fish and Game, Special Publication No. 09-11, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/SP09-11.pdf

Sigurdsson, D., and B. Powers. 2010. Participation, effort, and harvest in the sport fish business/guide licensing and logbook programs, 2009. Alaska Department of Fish and Game, Fishery Data Series No. 10-65, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/Fds10-65.pdf

Sigurdsson, D., and B. Powers. 2011. Participation, effort, and harvest in the sport fish business/guide licensing and logbook programs, 2010. Alaska Department of Fish and Game, Fishery Data Series No. 11-31, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS11-31.pdf

Sigurdsson, D., and B. Powers. 2012. Participation, effort, and harvest in the sport fish business/guide licensing and logbook programs, 2011. Alaska Department of Fish and Game, Fishery Data Series No. 12-27, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS12-27

Sigurdsson, D., and B. Powers. 2013. Participation, effort, and harvest in the sport fish business/guide licensing and logbook programs, 2012. Alaska Department of Fish and Game, Fishery Data Series No. 13-37, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FDS13-37.pdf

Sigurdsson, D., and B. Powers. 2014. Participation, effort, and harvest in the sport fish business/guide licensing and logbook programs, 2013. Alaska Department of Fish and Game, Fishery Data Series No. 14-23, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS14-23

Smith, H. I., and M. D. Booz. 2018. Operational Plan: Ninilchik River Chinook salmon stock assessment and supplementation, 2018. Alaska Department of Fish and Game, Regional Operational Plan ROP.SF.2A.2018.21, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/ROP.SF.2A.2018.21.pdf

Sonnichsen, S. 1990. Stock assessment of Dolly Varden in the Buskin River, Kodiak, Alaska 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-41, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds90-41.pdf

Southwick Associates Inc., W. J. Romberg, A. E. Bingham, G. B. Jennings, and R. A. Clark. 2008. Economic impacts and contributions of sportfishing in Alaska, 2007. Alaska Department of Fish and Game, Professional Paper No. 08-01, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/pp08-01.pdf

REFERENCES CITED (Continued)

St. Saviour, A., M. D. Schuster, and B. J. Failor. *In prep*. Characteristics of the sport harvest of rockfishes Sebastes in Southcentral Alaska, 1996-2016. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Szarzi, N. J., and R. N. Begich. 2004a. Recreational fisheries in the Lower Cook Inlet Management Area, 1995-2000. Alaska Department of Fish and Game, Fishery Management Report No. 04-06, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fmr04-06.pdf

Szarzi, N. J., and R. N. Begich. 2004b. Recreational fisheries in the Lower Cook Inlet Management Area, 2001-2004: Fisheries under consideration by the Alaska Board of Fisheries 2004. Alaska Department of Fish and Game, Fishery Management Report No. 04-08, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fmr04-08.pdf

Szarzi N. J., R. L. Gustafson, P. A. Hansen. *In prep*. Hardshell clam population characteristics at selected locations in Kachemak Bay 1999-2006. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Szarzi, N. J., and P. A. Hansen. 2009. Harvest, abundance, age and length characteristics of razor clams from eastern Cook Inlet beaches 2004-2008. Alaska Department of Fish and Game, Fishery Data Series No. 09-03, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/fds09-03.pdf

Szarzi, N. J., C. M. Kerkvliet, B. J. Failor, and M. D. Booz. 2010. Recreational fisheries in the Lower Cook Inlet Management Area, 2008-2010, with updates for 2007. Alaska Department of Fish and Game, Fishery Management Report No. 10-38, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/Fmr10-38.pdf

Szarzi, N. J., C. M. Kerkvliet, C. E. Stock, and M. D. Booz. 2007. Recreational fisheries in the Lower Cook Inlet Management Area, 2005-2007, with updates for 2004. Alaska Department of Fish and Game, Fishery Management Report No. 07-55, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/fmr07-55.pdf

Trowbridge, C. E., and K. J. Goldman. 2006. 2006 review of Cook Inlet Area commercial fisheries for Dungeness crab, shrimp, and miscellaneous shellfish fisheries: A report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Special Publication No. 06-09, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/sp06-09.pdf

Vincent-Lang, D., and W. Bechtol. 1992. Current status and recommendations for the future management of the lingcod stocks of the central Gulf of Alaska. A report to the Alaska Board of Fisheries, October 1992. Alaska Department of Fish and Game, Anchorage.

Weymouth, F. W., and H. C. McMillan. 1931. Relative growth and mortality of the Pacific razor clam, (*Siliqua patula*, Dixon), and their bearing on the commercial fishery. U. S. Government Printing Office. Bureau of Fisheries 1099:543-567. https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/fish-bull/fb46.10.pdf

Wilde, G. R. 2009. Does venting promote survival of released fish? Fisheries 34(1):20-28. https://doi.org/10.1577/1548-8446-34.1.20

Yang, C. Z., and L. J. Albright. 1994. The harmful phytoplankter *Chaetoceros concavicornis* causes high mortalities and leucopenia in Chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon (*Oncorhynchus kisutch*). Canadian Journal of Fisheries and Aquatic Sciences. 51:2493-2500. https://doi.org/10.1139/f94-248

TABLES

Table 1.–SWHS estimates of angler-days of effort expanded by sport anglers fishing Lower Cook Inlet Management Area waters, 1977–2018.

	Lower Cook Inlet Management Area											
	West LCIMA [a]			Upper LCIMA			Lower LCIMA					
Year	Saltwater fish	Saltwater shellfish	Freshwater fish	Saltwater fish	Saltwater shellfish	Freshwater fish	Saltwater fish	Saltwater shellfish	Freshwater fish	Total	Percent of state	Alaska total
2000	3,344	987	1,414	84,615	37,755	48,895	122,600	11,445	1,097	311,165	11.8	2,627,805
2001	2,275	398	744	73,577	32,642	38,252	108,426	8,090	1,900	265,906	11.8	2,261,906
2002	2,120	499	1,638	65,204	34,406	38,468	120,892	7,439	644	270,811	12.0	2,259,091
2003	1,220	386	2,487	56,969	25,361	37,118	132,586	5,836	708	262,285	11.8	2,219,398
2004	2,304	608	1,619	65,968	30,211	42,392	137,910	6,641	931	287,976	11.6	2,473,961
2005	1,984	2,000	2,255	68,393	32,835	40,396	154,229	6,415	803	307,310	12.5	2,463,929
2006		1,963	2,260	65,745	25,482	34,351	134,827	6,704	854	272,186	12	2,297,961
2007		1,135	2,102	69,304	25,170	54,678	142,883	4,476	845	300,593	12	2,543,648
2008		1,617	1,226	59,799	28,806	45,082	115,164	6,240	780	258,714	11	2,315,592
2009		1,703	1,077	61,853	26,982	38,509	104,422	6,463	716	241,725	11	2,216,436
2010		1,488	1,039	56,143	19,412	29,689	111,654	4,886	674	224,985	11	2,000,152
2011		3,095	776	61,137	23,021	15,609	107,077	3,720	922	215,357	11	1,919,312
2012		1,278	1,421	59,139	21,872	15,417	108,901	2,194	1,997	212,219	11	1,885,692
2013		3,523	1,575	69,714	23,875	14,970	123,031	2,757	990	240,435	11	2,202,957
2014		4,084	1,118	63,202	7,871	20,597	132,835	2,815	779	233,301	10	2,309,851
2015		1,423	995	63,241	1,796	20,677	122,147	2,061	639	212,979	10	2,212,331
2016		1,480	1,058	53,573	181	20,782	128,270	1,128	235	206,707	10	1,982,300
2017		1,142	582	55,136	223	18,978	130,365	1,356	844	208,626	10	2,006,244
2018		1,338	845	47,763	82	10,281	133,142	1,617	789	195,857	10	1,878,009
Averages												
1990–1999 [b]	2,234	1,403	1,391	67,895	29,326	47,678	108,392	10,662	931	264,089	12.4	2,125,471
2000–2015	2,208	1,637	1,484	65,250	24,858	33,444	123,724	5,511	955	257,691	11.4	2,263,126
2013–2015		3,010	1,229	65,386	11,181	18,748	126,004	2,544	803	228,905	10.2	2,241,713
2016–2018		1,320	828	52,157	162	16,680	130,592	1,367	623	203,730	10.4	1,955,518

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

[a] West LCIMA saltwater harvest except for shellfish is included in the upper and lower LCIMA harvest starting in 2006.

[b] 1990–1999 data published in Kerkvliet et al. (2016).

Table 2.–SWHS estimates of sport anglers and effort (angler-days) by user group in the Lower Cook Inlet Management Area, 2000–2018.

	Charter				Private				Combined					
	Alaska resident		Nonresident		Alaska resident		Nonresident		Alaska resident		Nonresident		Combined	
Year	Anglers	Angler-days	Anglers	Angler-days	Anglers	Angler-days	Anglers	Angler-days	Anglers	Angler-days	Anglers	Angler-days	Anglers	Angler-days
2000	17,899	23,741	44,292	57,926	65,128	154,850	39,356	74,662	83,027	178,591	83,648	132,588	166,675	311,179
2001	20,306	22,585	47,257	62,311	53,472	123,553	29,489	57,457	73,778	146,138	76,746	119,768	150,524	265,906
2002	17,864	22,745	45,009	53,537	58,695	142,246	30,512	52,283	76,559	164,991	75,521	105,820	152,080	270,811
2003	21,814	24,522	43,841	49,366	59,769	128,431	33,759	59,966	81,583	152,953	77,600	109,332	159,183	262,285
2004	20,136	24,224	48,691	57,167	57,396	136,649	38,065	69,936	77,532	160,873	86,756	127,103	164,288	287,976
2005	21,624	27,827	54,031	65,997	55,236	144,994	36,277	68,492	76,860	172,821	90,308	134,489	167,168	307,310
2006	19,488	23,225	55,377	67,259	49,083	120,569	31,207	59,340	68,571	143,794	86,584	126,599	155,155	270,393
2007	18,433	24,465	53,631	67,556	54,480	148,517	32,161	58,994	72,913	172,982	85,792	126,550	158,705	299,532
2008	17,514	21,762	47,203	54,136	48,372	124,172	31,542	57,110	65,886	145,934	78,745	111,246	144,631	257,180
2009	17,757	21,446	36,987	41,925	48,365	126,806	24,522	50,043	66,122	148,252	61,509	91,968	127,631	240,220
2010	18,190	20,292	41,878	47,656	46,333	103,825	23,440	52,006	64,523	124,117	65,318	99,662	129,841	223,779
2011	19,637	19,870	47,256	55,603	49,166	94,913	23,015	42,018	68,803	114,783	70,271	97,621	139,074	212,404
2012	15,063	17,872	48,230	56,855	38,465	95,551	28,809	40,732	53,528	113,423	77,039	97,587	130,567	211,010
2013	18,900	22,147	50,752	58,316	45,812	110,273	22,677	46,391	64,712	132,420	73,429	104,707	138,141	237,127
2014	15,796	18,620	40,299	48,707	46,240	119,292	21,489	43,779	62,036	137,912	61,788	92,486	123,824	230,398
2015	15,493	16,214	39,360	46,188	42,407	108,678	20,351	41,899	57,900	124,892	59,711	88,087	117,611	212,979
2016	14,956	15,937	46,920	49,850	38,839	100,484	21,697	40,436	53,795	116,421	68,617	90,286	122,412	206,707
2017	12,260	12,938	46,031	56,892	37,659	96,900	20,573	41,896	49,919	110,058	66,604	99,227	116,523	208,626
2018	12,550	13,950	41,742	45,604	34,649	100,243	20,672	36,060	47,199	114,193	62,414	81,664	109,613	195,857
Averages														
1993–1999 [a]	22,229	29,254	43,312	52,346	76,205	154,928	43,644	81,770	98,434	184,182	86,956	134,116	185,391	318,298
2000–2015	18,495	21,972	46,506	55,657	51,151	123,957	29,167	54,694	69,646	145,930	75,673	110,351	145,319	256,281
2013–2015	16,730	18,994	43,470	51,070	44,820	112,748	21,506	44,023	61,549	131,741	64,976	95,093	126,525	226,835
2016–2018	13,255	14,275	44,898	50,782	37,049	99,209	20,981	39,464	50,304	113,557	65,878	90,392	116,183	203,730

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: Effort estimates include shellfish

[a] 1993–1999 data published in Kerkvliet et al. (2016).

Table 3.–SWHS estimates of sport angler effort (angler-days), harvest, and catch of salmon and trout in the Lower Kenai Peninsula roadside streams in the Lower Cook Inlet Management Area, 2000–2018.

	Effort		Chinook salmon		Coho salmon		Steelhead and rainbow trout	Dolly Varden	
Year	Number of Anglers	Angler-days	Harvest	Catch	Harvest	Catch	Catch	Harvest	Catch
2000	20,703	48,895	4,449	12,751	6,765	12,355	11,585	2,510	24,354
2001	16,547	38,092	2,881	6,809	5,766	10,380	3,963	2,131	14,624
2002	16,641	38,382	2,384	8,834	7,684	14,795	4,937	1,158	15,380
2003	16,226	37,118	3,238	10,637	8,585	20,378	6,895	1,458	29,228
2004	17,421	42,337	3,624	11,249	10,656	20,173	8,514	1,140	24,898
2005	16,347	40,256	3,416	8,861	9,234	19,408	4,919	898	9,091
2006	15,985	34,351	3,174	9,471	8,278	14,412	6,304	1,013	15,800
2007	19,144	54,678	4,284	17,059	7,870	15,766	11,792	1,668	31,872
2008	17,628	45,082	3,064	7,935	7,396	13,204	14,065	1,015	31,611
2009	12,734	38,446	1,064	3,623	6,237	10,787	6,876	1,407	25,252
2010	12,233	29,581	971	3,068	5,257	8,996	3,442	1,047	11,885
2011	6,103	15,553	1,082	2,799	3,060	3,700	595	551	7,872
2012	11,379	15,622	87	420	3,356	4,275	2,717	327	10,464
2013	4,601	14,970	330	984	1,605	2,163	2,899	2,372	15,750
2014	6,385	20,597	486	3,165	4,412	6,253	4,871	1,064	26,555
2015	6,819	20,677	707	2,163	3,524	8,059	3,989	2,971	35,561
2016	7,811	20,782	2,481	6,660	1,501	2,815	3,267	1,352	18,918
2017	7,253	18,978	1,420	4,725	2,581	4,277	4,145	423	12,748
2018	4,174	10,281	114	413	2,328	3,590	3,963	244	13,567
Averages									
1977–1999 [a]	31,336	66,290	4,089	13,856	4,487	9,171	4,911	7,758	18,696
2000–2015	13,556	33,415	2,203	6,864	6,230	11,569	6,148	1,421	20,637
2013–2015	5,935	18,748	508	2,104	3,180	5,492	3,920	2,136	25,955
2016–2018	6,413	16,680	1,338	3,933	2,137	3,561	3,792	673	15,078

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

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

[a] 1977–1999 data published in Kerkvliet et al. (2016).

Table 4.–SWHS estimates of finfish and groundfish sport harvest and effort (angler-days) in Lower Cook Inlet Management Area salt waters, 2000–2018.

	Lower Cook Inlet Management Area									
	Salmon					Groundfish			Effort	
Year	Chinook salmon	Coho salmon	Sockeye salmon	Pink salmon	Chum salmon	Pacific halibut	Lingcod	Rockfish	Anglers	Angler-days
2000	12,823	9,479	4,312	3,212	337	201,411	1,814	6,124	112,732	210,559
2001	11,553	17,057	6,458	2,862	557	182,240	1,987	4,626	105,723	184,278
2002	11,838	24,736	5,570	3,893	352	167,023	1,600	5,835	107,229	188,216
2003	14,828	13,338	6,107	4,604	489	190,094	2,119	7,515	116,499	190,775
2004	17,737	20,104	3,532	3,701	169	211,702	3,311	9,756	119,173	206,182
2005	18,850	19,910	5,164	6,508	355	218,585	3,036	11,607	123,863	224,606
2006	16,368	17,843	4,921	2,491	398	209,442	3,307	9,431	118,590	200,572
2007	12,556	18,595	7,277	1,600	105	253,265	7,012	12,789	119,859	212,187
2008	8,562	13,528	7,381	2,526	216	209,082	6,133	11,258	106,767	174,963
2009	6,546	12,327	7,963	2,159	262	195,294	5,866	16,296	94,580	166,275
2010	10,134	10,106	9,560	2,810	169	192,703	5,225	18,444	99,791	167,797
2011	9,284	10,106	6,972	2,257	508	203,528	7,477	16,847	113,584	168,214
2012	6,890	6,720	7,245	2,176	176	189,986	5,543	18,086	95,638	168,040
2013	11,022	11,319	10,430	4,967	475	207,482	5,630	18,093	116,560	192,745
2014	11,989	21,038	7,471	3,115	1,060	177,305	4,320	22,622	107,969	196,037
2015	19,515	23,459	6,254	7,989	538	179,766	2,908	26,218	107,246	185,388
2016	20,005	8,520	6,646	7,858	458	177,832	3,112	32,905	109,638	181,843
2017	17,438	19,619	10,151	8,565	539	160,448	2,899	32,254	94,713	185,501
2018	18,157	18,730	8,753	5,687	441	151,917	3,260	40,149	89,264	180,841
Averages										
1977–1999 [a]	10,736	4,634	2,228	4,816	223	106,040	1,903	4,121	114,076	169,508
2000–2015	12,531	15,604	6,664	3,554	385	199,307	4,206	13,472	110,363	189,802
2013–2015	14,175	18,605	8,052	5,357	691	188,184	4,286	22,311	110,592	191,390
2016–2018	18,533	15,623	8,517	7,370	479	163,399	3,090	35,103	97,872	182,728

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

[a] 1977–1999 data published in Kerkvliet et al. (2016).

Table 5.–Charter Logbook estimates of finfish and groundfish guided sport harvest and effort in Lower Cook Inlet Management Area salt waters, 2006–2018.

	Lower Cook Inlet Management Area													
	Salmon						Groundfish							
	Harvest			Effort			Harvest					Effort		
									Rockfish					
Year	Chinook salmon	Coho salmon	Other salmon	Trips	Guides	Angler-days	Pacific halibut	Lingcod	Pelagic	Non-Pelagic	Yelloweye	Trips	Guides	Angler-days
2006	4,708	7,202	154	4,272	885	23,709	181,662	2,239	4,236	318	838	14,844	511	102,791
2007	2,905	8,490	187	3,876	734	18,417	168,410	4,166	6,388	314	970	15,036	503	91,503
2008	1,732	4,682	102	2,887	586	13,566	148,091	4,589	5,921	249	1,040	13,332	464	81,320
2009	1,184	7,597	269	2,466	579	11,969	122,795	3,758	8,125	258	1,088	10,951	409	65,507
2010	2,873	3,024	315	2,504	546	13,055	137,867	3,387	9,774	1,862	1,245	11,261	401	74,446
2011	3,096	4,765	461	2,574	561	14,163	141,340	4,695	10,826	1,008	1,575	10,845	348	76,061
2012	2,279	538	250	1,749	389	9,262	137,354	2,661	10,883	660	1,244	10,242	320	74,070
2013	4,087	2,298	124	2,150	459	11,913	138,994	2,963	12,140	638	1,343	10,326	324	76,768
2014	5,339	4,620	146	2,514	544	14,008	106,049	1,631	14,405	734	1,166	8,739	311	59,032
2015	8,770	9,518	326	3,456	696	19,964	94,870	874	17,387	899	1,266	8,766	324	56,472
2016	9,458	745	208	3,364	654	17,363	93,065	656	22,395	1,187	1,460	9,026	322	57,643
2017	6,395	11,638	317	3,919	ND	21,388	89,683	861	21,592	1,226	2,010	8,482	ND	54,582
2018	4,396	6,571	126	2,914	ND	15,469	84,445	638	25,587	1,476	1,827	8,389	ND	52,683
Averages														
2006–2015	3,697	5,273	233	2,845	598	15,003	137,743	3,096	10,009	694	1,178	11,434	392	75,797
2013–2015	6,065	5,479	199	2,707	566	15,295	113,304	1,823	14,644	757	1,258	9,277	320	64,091
2016–2018	6,750	6,318	217	3,399	654	18,073	89,064	718	23,191	1,296	1,766	8,632	322	54,969

Source: http://docushare.sf.adfg.state.ak.us/dsweb/View/Collection-38

Table 6.–SWHS estimates of Chinook salmon sport harvest by fishery and user in Lower Cook Inlet Management Area salt waters, 2002–2018.

	Lower Cook Inlet Management Area											
	UCI Summer			LCI Summer			Winter			Total MA[a]		
Year	Charter	Non-guided	Total	Charter	Non-guided	Total	Charter	Non-guided	Total	Charter	Non-guided	Overall total
2002	1,825	1,970	3,795	2,357	1,520	3,877	204	1,219	1,423	8,144	3,694	11,838
2003	1,916	2,326	4,242	2,858	1,732	4,590	289	1,515	1,804	10,481	4,347	14,828
2004	2,395	3,024	5,419	2,519	3,515	6,034	419	1,650	2,069	10,779	6,958	17,737
2005	2,415	2,371	4,786	4,309	3,861	8,170	412	2,546	2,958	12,206	6,644	18,850
2006	2,610	3,323	5,933	3,717	3,055	6,772	169	1,346	1,515	9,821	6,547	16,368
2007	2,026	2,786	4,812	2,223	1,736	3,959	404	1,607	2,011	7,630	4,926	12,556
2008	912	1,742	2,654	2,072	1,285	3,357	336	1,356	1,692	5,199	3,363	8,562
2009	1,026	645	1,671	1,636	808	2,444	310	1,386	1,696	4,783	1,763	6,546
2010	1,580	731	2,311	1,789	2,580	4,369	789	1,770	2,559	6,034	4,100	10,134
2011	1,746	1,308	3,054	1,993	1,718	3,711	441	1,559	2,000	5,817	3,467	9,284
2012	827	581	1,408	1,556	1,817	3,373	330	1,749	2,079	4,162	2,728	6,890
2013	1,099	1,438	2,537	2,630	3,180	5,810	638	1,773	2,411	5,766	5,256	11,022
2014	1,379	1,160	2,539	2,095	2,964	5,059	438	2,735	3,173	7,427	4,562	11,989
2015	1,904	2,282	4,186	4,472	3,594	8,066	902	4,277	5,179	12,737	6,778	19,515
2016	1,801	1,962	3,763	4,533	5,335	9,868	344	4,762	5,106	12,364	7,641	20,005
2017	1,294	1,862	3,156	3,628	5,059	8,687	903	3,615	4,518	9,614	7,824	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
Averages												
1986–2001 [b]	4,507	2,569	7,076	–	–	–	–	–	–	9,632	4,222	13,855
2002–2015	1,690	1,835	3,525	2,588	2,383	4,971	434	1,892	2,326	7,928	4,652	12,580
2013–2015	1,461	1,627	3,087	3,066	3,246	6,312	659	2,928	3,588	8,643	5,532	14,175
2016–2018	1,510	1,788	3,299	3,826	4,631	8,458	863	4,960	5,823	9,358	9,176	18,533

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

[a] The total management area (MA) harvest contains harvest from other locations including the Nick Dudiak Fishing Lagoon and shoreline fishing in upper LCIMA and is not just the sum of the summer and winter fisheries.

[b] 1986–2001 data published in Kerkvliet et al. (2016).

Table 7.–The number of Chinook salmon release sites detected from Cook Inlet saltwater sport fisheries through CWT origin by geographic area, 1978–2018.

	Geographic area of decoded coded wire tags									
Year	Cook Inlet Alaska	SE Alaska	British Columbia	Washington	Oregon	Idaho	Total heads collected	Heads without tags	Total CWT decoded	Total number of release sites
1978	0	0	2	1	2	0	5	0	5	5
1979	0	1	0	0	3	0	4	0	4	2
1980	0	0	1	1	0	0	2	0	2	2
1981	0	1	4	0	0	0	5	0	5	4
1982	0	2	0	0	2	0	4	0	4	2
1983	1	0	0	0	6	0	7	0	7	3
1984	0	0	1	0	0	0	1	0	1	1
1985	0	0	2	1	1	0	4	0	4	4
1986	0	0	2	0	0	0	3	1	2	1
1987	0	0	1	0	0	0	1	0	1	1
1988	0	0	5	1	0	0	6	0	6	5
1990	0	0	3	0	0	0	4	1	3	2
1991	2	0	4	0	0	0	6	0	6	4
1992	3	1	18	0	0	0	25	3	22	7
1993	1	0	7	0	0	0	9	1	8	7
1994	0	1	19	0	1	0	21	0	21	13
1995	4	4	32	0	1	0	44	3	41	19
1996	16	1	16	1	2	0	43	7	36	16
1997	71	3	13	0	0	0	102	15	87	21
1998	56	1	39	2	0	0	122	24	98	28
1999	61	3	10	3	0	0	87	10	77	22
2000	59	5	12	2	6	0	98	14	84	25
2001	53	16	26	6	8	0	134	25	109	42
2002	18	6	27	4	10	0	120	55	65	34
2003	1	1	18	3	2	0	41	16	25	16
2004	0	2	8	1	0	0	15	4	11	9
2005	0	4	8	2	0	0	20	6	14	12
2006	0	1	10	1	0	0	21	9	12	9
2007	0	1	0	0	0	0	2	1	1	1
2008	0	1	2	0	0	0	7	4	3	3
2009	0	0	3	0	3	0	13	7	6	4
2010	0	3	5	3	5	0	33	17	16	13
2011	2	2	8	3	0	0	38	23	15	11
2012	0	3	8	1	3	0	29	14	15	13
2013	0	5	6	3	2	0	33	17	16	12
2014	0	22	64	53	41	1	421	240	181	52
2015	0	26	110	147	58	4	927	582	345	77
2016	0	24	82	66	27	0	533	334	199	57
2017	1	24	42	54	27	0	384	236	148	59
2018	1	10	27	15	10	0	164	101	63	34

Source: ADF&G Tag Laboratory report generated March 2019.

Table 8.–The percentage of the Cook Inlet summer Chinook salmon saltwater fisheries sport harvest that was mature by location and fishery, 1996–2018.

	Percent mature					
	Upper Cook Inlet summer					
	Early run					
Year	SHA [a]	Outside [b]	Combined	Late run	Entire summer [c]	LCI summer
1996	–	–	81.5	–	–	–
1997	80.0	33.3	77.8	89.1	–	–
1998	65.7	16.7	60.3	71.6	–	–
1999	82.6	35.6	71.7	–	–	–
2000	76.4	29.0	60.0	–	–	–
2001	70.1	37.1	58.2	–	–	–
2002	52.3	25.7	49.0	–	–	–
2014 [d]	38.0	19.1	34.3	41.7	35.0	8.9
2015 [d]	24.7	20.4	21.5	42.7	22.4	11.1
2016 [d]	15.4	10.4	11.7	11.4	11.3	10.6
2017 [d]	23.9	10.1	13.6	15.3	14.3	4.2
2018 [d]	34.4	12.1	23.4	10.2	18.5	7.2
Averages						
1996–2002	71.2	29.6	65.5	80.4	–	–
2014–2018	27.3	14.4	20.9	24.3	20.3	8.4

Source: Schuster et al. (*In prep*).

[a] "SHA" is special harvest areas, which are within 1 mile from shore bordering the conservation zones around the mouths of the roadside streams. Starting in 2017, SHAs were no longer defined in regulation.

[b] All remaining waters in Upper Cook Inlet summer early-run fishery greater than 1 mile from shore.

[c] Starting in 2017, the Upper Cook Inlet early-run and late-run fisheries were combined into 1 fishery for the Upper Cook Inlet summer Fishery from 1 April through 30 August.

[d] Preliminary.

Table 9.–Average mid eye to tail fork (METF) length of Chinook salmon sport harvest by area and fishery in LCIMA, 2014–2018.

	Average length (mm) of Chinook salmon harvest					
	Upper Cook Inlet					All fisheries
Year	Early run	Late run	Entire summer	LCI Summer	Winter	
2014	705	725	707	653	670	663
2015	717	754	719	638	676	653
2016	662	636	654	625	623	631
2017	706	663	689	635	613	650
2018	684	634	666	584	ND	620
Average	695	653	683	632	645	645

Source: Schuster et al. (*In prep*)

Table 10.–Number of Chinook salmon by origin containing a CWT in LCIMA saltwater sport fisheries, 2014–2018.

		Geographic area of decoded coded wire tags							
Year	Fishery	Cook Inlet Alaska	SE Alaska	British Columbia	Washington	Oregon	Idaho	Total heads collected	Total CWT decoded
2014	UCI Summer	0	1	9	2	2	0	33	14
	LCI Summer	0	18	35	38	28	1	282	120
	Winter	0	0	8	3	7	0	42	18
	Combined	0	19	52	43	37	1	357	152
2015	UCI Summer	0	1	10	7	4	0	53	22
	LCI Summer	0	24	57	98	32	4	591	215
	Winter	0	2	26	24	14	0	190	66
	Combined	0	27	93	129	50	4	834	303
2016	UCI Summer	0	2	15	9	4	0	96	30
	LCI Summer	0	12	23	39	14	0	253	88
	Winter	0	2	7	3	2	0	39	14
	Combined	0	16	45	51	20	0	388	132
2017	UCI Summer	0	7	10	10	4	0	93	31
	LCI Summer	1	10	16	25	14	0	171	66
	Winter	0	6	12	12	6	0	79	36
	Combined	1	23	38	47	24	0	343	133
2018	UCI Summer	1	0	5	2	2	0	44	10
	LCI Summer	0	8	20	7	6	0	96	41
	Winter	No data collected							
	Combined	1	8	25	9	8	0	140	51
All years combined	UCI Summer	1	11	49	30	16	0	319	107
	LCI Summer	1	72	151	207	94	5	1393	530
	Winter	0	10	53	42	29	0	350	134
	Combined	2	93	253	279	139	5	2062	771

Source: Schuster et al. (*In prep*).

Table 11.–Comparison of Charter Logbook and SWHS estimates of guided Chinook salmon sport harvest by fishery in Lower Cook Inlet Management Area salt waters, 1998–2018.

	Lower Cook Inlet Management Area								
	UCI summer		LCI summer		Winter		Total MA [a]		SWHS
Year	Logbook	SWHS	Logbook	SWHS	Logbook	SWHS	Logbook	SWHS	overall total
1998	3,283	3,699	949	–	4	–	4,245	5,478	13,800
1999	2,689	2,682	1,404	–	24	–	4,180	4,688	13,629
2000	2,473	2,729	1,769	–	69	–	4,304	4,422	12,823
2001	1,716	2,515	1,712	–	114	–	3,560	4,780	11,553
2002	1,713	1,970	1,985	1,520	154	204	3,954	3,694	11,838
2003	1,789	2,326	2,501	1,732	251	289	4,710	4,347	14,828
2004	2,109	3,024	3,350	3,515	222	419	5,867	6,958	17,737
2005	2,371	2,371	4,110	3,861	334	412	6,813	6,644	18,850
2006	–	5,933	–	3,055	–	169	4,711	6,547	16,368
2007	–	4,829	–	1,736	–	404	2,908	4,926	12,556
2008	–	2,654	–	1,285	–	336	1,744	3,363	8,562
2009	–	1,671	–	808	–	310	1,184	1,763	6,546
2010	519	731	2,106	2,580	246	789	2,873	4,100	10,134
2011	985	1,308	1,937	1,718	174	441	3,096	3,467	9,284
2012	459	581	1,689	1,817	140	330	2,288	2,728	6,890
2013	713	1,438	3,018	3,180	357	638	4,088	5,256	11,022
2014	653	1,160	4,514	2,964	172	438	5,340	4,562	11,989
2015	1,412	2,282	6,320	3,594	1,035	902	8,771	6,778	19,515
2016	2,158	1,962	6,336	5,335	963	344	9,457	7,641	20,005
2017	2,071	1,862	3,910	5,059	398	903	6,379	7,824	17,438
2018	1,428	1,436	2,490	3,318	466	1,341	4,384	6,095	18,157
Average									
1998–2015	1,635	2,439	2,669	2,383	235	434	4,146	4,998	12,662
2013–2015	926	1,627	4,617	3,246	521	659	6,066	5,532	14,175
2016–2018	1,886	1,753	4,245	4,571	609	863	6,740	7,187	18,533

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/. Saltwater Logbook Database (Alaska Department of Fish and Game, Division of Sport Fish. 2006–present. Accessed September 2019. URL not publicly available as some information is confidential. Contact Research and Technical Services for data requests).

[a] The SWHS total management area (MA) harvest contains harvest from other locations including the NDFL and shoreline fishing in the Upper Cook Inlet fisheries and is not just the sum of the summer and winter fisheries.

Table 12.–SWHS estimates of coho salmon sport harvest in Lower Cook Inlet Management Area, 2000–2018.

	Lower Cook Inlet Management Area												
	West LCIMA [a]			Upper LCIMA			Lower LCIMA				Total		
Year	Salt water	Fresh water	Total	Salt water	Fresh water	Total	Nick Dudiak Lagoon	Saltwater other locations	Fresh water	Total	Salt waters	Fresh waters	Total
2000	440	1,264	1,704	3,136	6,765	9,901	7,067	5,903		12,970	16,546	8,029	24,575
2001	483	2,232	2,715	5,301	5,766	11,067	11,015	11,273		22,288	28,072	7,998	36,070
2002	665	1,289	1,954	5,807	7,684	13,491	14,508	18,264		32,772	39,244	8,973	48,217
2003	173	2,511	2,684	2,865	8,585	11,450	18,531	10,300		28,831	31,869	11,096	42,965
2004	410	2,225	2,635	4,237	10,656	14,893	21,009	15,457		36,466	41,113	12,881	53,994
2005	182	1,845	2,027	3,541	9,234	12,775	15,075	16,187		31,262	34,985	11,079	46,064
2006		1,667		3,418	8,278	11,696	4,450	9,975		14,425	17,843	9,945	27,788
2007		1,324		2,456	7,870	10,326	4,617	11,522		16,139	18,595	9,254	27,849
2008		573		1,902	7,396	9,298	3,767	7,859		11,626	13,528	7,969	21,497
2009		1,289		2,202	6,237	8,439	509	9,616		10,125	12,327	7,526	19,853
2010		858		2,375	5,257	7,632	1,007	6,724	51	7,731	10,106	6,166	16,221
2011		713		2,384	3,060	5,444	192	7,530	18	7,740	10,106	3,791	13,897
2012		966		3,078	3,356	6,434	58	3,584	234	3,876	6,720	4,488	11,208
2013		504		4,371	1,605	5,976	233	6,715	68	7,016	11,319	2,177	13,496
2014		770		2,582	4,412	6,994	9,418	9,038		18,456	21,038	4,712	25,750
2015		938		5,610	3,524	9,134	2,930	14,919		17,849	23,459	4,462	27,921
2016		712		2,316	1,501	3,817	1,404	4,800		6,204	8,520	1,501	10,021
2017		309		3,572	2,581	6,153	1,313	16,047	82	17,442	20,932	2,972	23,904
2018		636		2,981	2,328	5,309	4,477	11,272		15,749	18,730	2,964	21,694
Averages													
1977–1999 [b]	217	1,055	1,071	1,427	4,446	5,873	3,629	3,009		5,218	6,843	5,322	12,068
2000–2015	392	1,311	2,287	3,454	6,230	9,684	7,149	10,304	93	17,473	21,054	7,534	28,585
2013–2015		737		4,188	3,180	7,368	4,194	10,224	68	14,440	18,605	3,784	22,389
2016–2018		552		2,956	2,137	5,093	2,398	10,706	82	13,132	16,061	2,479	18,540

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

[a] West Cook Inlet saltwater harvest included in Central and Lower Cook Inlet harvest.

[b] 1977–1999 data published in Kerkvliet et al. (2016).

Table 13.–SWHS estimates of sockeye salmon sport harvest in Lower Cook Inlet Management Area, 1977–2018.

	Lower Cook Inlet Management Area									
	West LCIMA			Upper LCIMA			Lower LCIMA			
Year	Salt water	Fresh water	Total	Salt water	Fresh water	Total	Salt water	Fresh water	Total	LCIMA total
2000	197	153	350	1,275	452	1,727	2,840	702	3,542	5,619
2001	96	85	181	1,565	1,371	2,936	4,797	58	4,855	7,972
2002	291		291	1,374	161	1,535	3,905		3,905	5,731
2003	72		72	1,573	1,101	2,674	4,462		4,462	7,208
2004				903	526	1,429	2,629	261	2,890	4,319
2005	24	144	168	1,404	1,002	2,406	3,736	480	4,216	6,790
2006		12	12	2,176	696	2,872	2,745	23	2,768	5,652
2007		101	101	2,191	567	2,758	5,086	210	5,296	8,155
2008		224	224	2,734	975	3,709	4,647		4,647	8,580
2009				1,572	607	2,179	6,391	432	6,823	9,002
2010		30	30	1,834	143	1,977	7,726		7,726	9,733
2011				2,476	17	2,493	4,496	13	4,509	7,002
2012		19	19	1,847	30	1,877	5,398	131	5,529	7,425
2013				3,798	43	3,841	6,632		6,632	10,473
2014				2,595	27	2,622	4,876		4,876	7,498
2015				2,086	404	2,490	4,168		4,168	6,658
2016				2,150	69	2,219	4,496		4,496	6,715
2017		26	26	2,787	13	2,800	7,364	469	7,833	10,659
2018				1,933	199	2,132	6,820	298	7,118	10,660
Averages										
1977–1999 [a]	89	50	102	589	1,122	1,369	1,582	120	1,670	3,115
2000–2015	136	96	145	1,963	508	2,470	4,658	257	4,803	7,364
2013–2015				2,826	158	2,984	5,225		5,225	8,210
2016–2018		26	26	2,290	94	2,384	6,227	384	6,482	9,345

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

[a] 1977–1999 data published in Kerkvliet et al. (2016).

Table 14.–SWHS estimates of pink salmon sport harvest in Lower Cook Inlet Management Area, 1977–2018.

	Lower Cook Inlet Management Area									
	West LCIMA			Upper LCIMA			Lower LCIMA			
Year	Salt water	Fresh water	Total	Salt water	Fresh water	Total	Salt water	Fresh water	Total	LCIMA total
2000	10		10	410	205	615	2,792	482	3,274	3,899
2001				250	11	261	2,612	536	3,148	3,409
2002		15	15	634	432	1,066	3,259	200	3,459	4,540
2003				323	68	391	4,281	243	4,524	4,915
2004				577	195	772	3,124	45	3,169	3,941
2005		15	15	1,267	123	1,390	5,241	31	5,272	6,677
2006		9	9	596	121	717	1,895	83	1,978	2,704
2007		44	44	152	343	495	1,448	80	1,528	2,067
2008		0		394	465	859	2,132	147	2,279	3,138
2009		0		241	581	822	1,918	11	1,929	2,751
2010		0		658	73	731	2,152	238	2,390	3,121
2011		0		312	143	455	1,945		1,945	2,400
2012		11	11	518	115	633	1,658	210	1,868	2,512
2013				967	96	1,063	4,000	97	4,097	5,160
2014				388	43	431	2,727		2,727	3,158
2015				1,308	225	1,533	6,681	176	6,857	8,390
2016				1,953	143	2,096	5,905	113	6,018	8,114
2017				1,180	438	1,618	7,385	159	7,544	9,162
2018				1,005	114	1,119	4,682	171	4,853	5,972
Averages										
1977–1999 [a]	65	39	69	221	272	493	4,564	220	4,726	5,267
2000–2015	10	10	17	562	202	765	2,992	184	3,153	3,924
2013–2015				888	121	1,009	4,469	137	4,560	5,569
2016–2018				1,379	232	1,611	5,991	148	6,138	7,749

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

[a] 1977–1999 data published in Kerkvliet et al. (2016).

Table 15.–SWHS estimates of chum salmon sport harvest in Lower Cook Inlet Management Area, 1977–2018.

	Lower Cook Inlet Management Area									
	West LCIMA			Upper LCIMA			Lower LCIMA			
Year	Salt water	Fresh water	Total	Salt water	Fresh water	Total	Salt water	Fresh water	Total	LCIMA total
2000				120		120	217	86	303	423
2001				73		73	484	60	544	617
2002	11	17	28	18		18	323		323	369
2003		12	12	28	38	66	461		461	539
2004				33	33	66	136	16	152	218
2005				18		18	337		337	355
2006							398		398	398
2007		45	45				105		105	150
2008		122	122	26		26	190		190	338
2009		101	101		34	34	262		262	397
2010		237	237	141		141	28		28	406
2011				84		84	424		424	508
2012				120	21	141	56	9	65	206
2013				206		206	269		269	475
2014		36	36	758		758	302	13	315	1,109
2015				32	20	52	506		506	558
2016				281	52	333	177		177	510
2017				58		58	481	36	517	575
2018				240		240	201		201	441
Averages										
1977–1999 [a]	32	59	56	45	25	57	188	59	193	264
2000–2015	11	81	83	127	29	129	281	37	293	442
2013–2015		36	36	332	20	339	359	13	363	714
2016–2018				193	52	210	286	36	298	509

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

Note: Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

[a] 1977–1999 data published in Kerkvliet et al. (2016).

Table 16.–Salmon smolt releases to terminal fisheries in Kachemak Bay, 1988–2018.

	Nick Dudiak Fishing Lagoon on Homer Spit				Halibut Cove Lagoon	Seldovia	
Release year	Early-run Chinook	Late-run Chinook	Early-run coho	Late-run coho	Early-run Chinook	Early-run Chinook	Late-run coho
1988	219,572			62,550	93,874	111,435	
1989	212,737			153,844	115,682	108,300	
1990	210,087			122,945	112,458	98,525	
1991	190,915			100,029	92,363	91,592	
1992	227,125	126,130		100,570	117,850	112,935	
1993	212,292	100,000		116,129	100,228	106,497	
1994	163,963	156,873		156,213	98,872	107,246	
1995	216,026	123,048		110,701	37,577	116,165	
1996	204,085	108,204		149,685	97,729	118,274	
1997	217,733	100,933		232,146	78,133	103,757	
1998	177,730	112,100		130,219	65,893	69,461	
1999	163,170	59,611		129,602	79,221	74,057	
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[a]	105,000[b]	106,844	107,521	
2004	168,743		130,243	110,000[b]	103,771	88,682	
2005	220,822		125,707	91,485[b,c]	112,521	114,984	
2006	224,053		125,216	324,200[b,c]	117,549	113,974	113,800[b,c]
2007	226,972		127,244	100,600[b]	54,560	54,276	
2008	212,141		125,108	95,000[b]	59,784	54,464	
2009	164,234		113,696	44,695[d]	35,065	44,487[e]	
2010	213,503[d]		130,206		111,134	114,421	
2011	224,028[d]		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	

Note: 1974–1987 data available in Kerkvliet et al. 2016.

[a] Includes 100,000 coho diverted from Bird Creek because of highway construction.

[b] Purchased from Cook Inlet Aquaculture (CIAA) with non-ADF&G funding source.

[c] Treated for bacterial kidney disease (BKD).

[d] An additional 67,305 were stocked but died from *Chaetoceros* sp. (diatom) infestation.

[e] One net pen with rearing salmon was sucked down the culvert resulting in unknown but significant mortality.

Table 17.–Shore-based sport harvest and days fished directed toward hatchery Chinook and coho salmon on Homer Spit, 1987–2018.

Year	Chinook salmon harvest [a]			Pink salmon harvest [b]	Coho salmon harvest	Total		
	Early-run	Late-run [c]	Total			Harvest	Catch	Days fished
1987	833		833			833		
1988	5,275		5,275	1,819		7,094		20,282
1989	1,956		1,956	3,856	1,439	7,251		15,753
1990	2,027		2,027	697	1,272	3,996	5,001	22,751
1991	1,634		1,634	647	3,822	6,103	6,150	11,495
1992	1,406		1,406	485	1,109	3,000	3,442	8,440
1993	4,997		4,997	1,836	5,823	12,656	14,821	28,290
1994	2,607		2,607		5,355	7,962	10,495	30,221
1995	4,266		4,266		5,367	9,633	12,344	36,451
1996	933	1,423	2,356		9,060	11,416	19,094	24,315
1997	1,512	1,450	2,962		6,091	9,053	14,257	23,197
1998	1,051	805	1,856		6,672	8,528	11,929	15,093
1999	1,753	688	2,441		3,890	6,331	8,730	19,448
2000	1,223	789	2,012		7,067	9,079	14,021	23,075
2001	1,371	1,164	2,535		11,015	13,550	15,698	18,516
2002	2,621		2,621		14,508	17,129	23,460	24,981
2003	4,059		4,059		18,531	22,590	33,087	28,380
2004	4,068		4,068		21,009	25,077	33,101	32,185
2005	2,810		2,810		15,075	17,885	22,237	28,097
2006	2,092		2,092		4,450	6,542	9,368	20,898
2007	1,757		1,757		4,617	6,374	8,092	18,861
2008	833		833		3,767	4,600	6,070	12,649
2009	710		710		509	1,219	1,730	8,988
2010	883		883		1,007	1,890	2,853	10,551
2011	418		418		192	610	916	6,446
2012	14		14		58	72	88	4,086
2013	95		95		233	328	646	8,397
2014	1,060		1,060		9,418	10,478	12,515	20,566
2015	1,766		1,766		2,930	4,696	5,636	16,998
2016	1,033		1,033		1,404	2,437	3,169	13,356
2017	933		933		1,313	2,246	2,901	12,861
2018	518		518		4,477	4,995	6,184	14,183
Averages								
1987–2015	1,932	1,053	2,150	1,557	6,085	8,137	11,376	19,265
2013–2015	974		974		4,194	5,167	6,266	15,320
2016–2018	828		828		2,398	3,226	4,085	13,467

Source: Mills (1988-1994); 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 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

[a] Early-run fish only prior to 1993 when ocean-age-1 late-run fish were first available.

[b] Stocking program discontinued; last return was in 1993.

[c] Stocking program discontinued in 2000; last return occurred in 2004. Beginning in 2002, the SWHS no longer assessed the late run.

Table 18.–Chinook salmon smolt released at Nick Dudiak Fishing Lagoon (NDFL) terminal saltwater fishery on the Homer Spit, 2006–2018.

Release year [a]	Stocking date	Brood year	Broodstock [b]	Hatchery [c]	Mark type [d]	Avg. length (mm)	Avg. weight (g)	Number of smolt [e]		
								Stocked	Mortality	Released
2006	19 June	2004	NR	FR	TM	107	13.1	113,479	2,390	111,089
2006	22 June	2004	NR	FR	TM	107	13.2	115,084	2,120	112,964
2007	11 June	2005	NR	FR	TM	102	11.3	113,736	400	113,336
2007	14 June	2005	NR	FR	TM	102	11.2	114,206	570	113,636
2008	13 June	2006	NR	FR	TM	104	12.4	113,570	2,768	110,802
2008	17 June	2006	NR	FR	TM	99	10.7	113,020	11,681	101,339
2009	17 June	2007	NR	FR	TM	ND	9.4	109,021	1,105	107,916
2009	24 June	2007	NR	FR	TM	ND	10.3	57,087	769	56,318
2010	7 June	2008	CC	FR	TM	ND	10.9	119,664	13,867	105,797
2010	21 June	2008	NR	FR	TM	ND	10.4	112,121	4,415	107,706
2011	13 June	2009	CC	FR	TM	ND	12.3	112,244	4,241	108,003
2011	6 July	2009	CC, NR	FR	TM	ND	12.5	ND	ND	111,784
2012	27 April	2011	NR	WJHSFH	TM	ND	10.9	18,238	2,310	15,928
2012	12 July	2011	NR	WJHSFH	TM	ND	16.2	123,807	200	123,607
2012	13 July	2011	NR	WJHSFH	TM	ND	16.2	ND	ND	82,012
2013	29 May	2012	CC, NR, SC	WJHSFH	TM	ND	12.2	110,820	671	110,149
2013	25 June	2012	CC, NR, SC	WJHSFH	TM	ND	13.8	110,819	4,676	106,143
2014	28 May	2013	CC, NR	WJHSFH	TM	ND	13.8	ND	ND	104,565
2014	16 June	2013	CC, NR	WJHSFH	TM	ND	13.5	ND	ND	101,689
2015	26 May	2014	CC, SC	WJHSFH	TM	ND	13.7	107,074	77	106,997
2015	17 June	2014	CC, SC	WJHSFH	TM	ND	13.6	103,681	135	103,546
2016	23 May	2015	CC, NR	WJHSFH	TM	ND	14.0	111,461	480	110,981
2016	13 June	2015	CC, NR	WJHSFH	TM	ND	14.2	103,038	240	102,798
2017	7 June	2016	SC, NR	WJHSFH	TM	ND	15.2	102,259	100	102,159
2017	15 June	2016	SC, NR	WJHSFH	TM	ND	13.8	100,249	50	100,199
2018	29 May	2017	CC, NR	WJHSFH	TM	ND	13.0	177,291	600	176,691
2018	5 June	2017	CC, NR	WJHSFH	TM	ND	14.8	151,873	650	151,223

-continued-

Table 18.–Page 2 of 2.

Release year [a]	Stocking date	Brood year	Broodstock [b]	Hatchery [c]	Mark type [d]	Avg. length (mm)	Avg. weight (g)	Number of smolt [e]		
								Stocked	Mortality	Released
Averages										
1992–2005 [f]							16.4	ND	ND	205,752
2006–2015							12.3	216,197	4,763	195,839
2013–2015							13.4	216,197	2,780	211,030
2016–2018							14.2	248,724	707	248,017

Note: "ND" means no data. These data were not included in the averages.

[a] Smolt were released as freshwater-age-0 fish from 1975 through 2003 and 2012 through 2015. From 2004 through 2011, smolt were released as freshwater-age-1 fish.

[b] "CC" is Crooked Creek; "NR" is Ninilchik River; "SC" is Ship Creek. Since 1995, the primary broodstock used for stocking NDFL has been the Ninilchik River. Due to shortages during Ninilchik River egg takes, both Crooked Creek and Ship Creek broodstocks have been used.

[c] "FR" is Fort Richardson hatchery; "WJHSFH" is the William Jack Hernandez Sport Fish Hatchery.

[d] "TM" is thermal mark (on otolith).

[e] Number released includes smolt that had shed their coded wire tags.

[f] 1992–2005 data from Booz and Kerkvliet (2016).

Table 19.–Chinook salmon smolt released at Halibut Cove Lagoon terminal saltwater fishery, 2006–2018.

Release year [a]	Stocking date	Brood year	Broodstock [b]	Hatchery [c]	Mark type [d]	Average length (mm)	Average weight (g)	Number of smolt [e]		
								Stocked	Mortality	Released
2006	14 June	2004	NR	FR	TM	ND	11.7	119,739	2,190	117,549
2007	13 June	2005	NR	FR	TM	ND	9.8	54,636	76	54,560
2008	19 June	2006	NR	FR	TM	ND	11.6	59,784	1,110	58,674
2009	18 June	2007	NR	FR	TM	ND	9.6	35,875	810	35,065
2010	11 June	2008	NR	FR	TM	ND	9.6	116,719	5,585	111,134
2011	1 July	2009	CC/NR	FR	TM	ND	12.8	109,978	2,640	107,338
2012	3 June	2011	NR	WJHSFH	TM	ND	11.9	112,303	2,050	110,253
2013	10 June	2012	CC	WJHSFH	TM	ND	14.4	ND	ND	60,666
2014	11 June	2013	CC/NR/SC	WJHSFH	TM	ND	13.6	ND	ND	85,856
2015	9 June	2014	CC/NR	WJHSFH	TM	ND	13.0	103,019	301	102,718
2016	7 June	2015	SC/NR	WJHSFH	TM	ND	13.6	110,596	50	110,546
2017	30 May	2016	SC/NR	WJHSFH	TM	ND	13.3	94,196	40	94,236
2018 [e]	Did not stock									
Averages										
1975–2005 [f]							17.3	107,260	ND	84,630
2006–2015							11.8	89,007	1,845	84,381
2013–2015							13.7	103,019	301	83,080
2016–2018							13.5	102,396	45	102,391

Note: "ND" means no data. These data were not included in the averages.

[a] Smolt were released as freshwater-age-0 fish from 1975 through 2003 and 2012 through 2015. From 2004 through 2011, smolt were released as freshwater-age-1 fish.

[b] "CC" is Crooked Creek; "NR" is Ninilchik River; "SC" is Ship Creek. Since 1995, the primary broodstock used for stocking NDFL has been the Ninilchik River. Due to shortages during Ninilchik River egg takes, both Crooked Creek and Ship Creek broodstocks have been used.

[c] "FR" is Fort Richardson hatchery; "WJHSFH" is the William Jack Hernandez Sport Fish Hatchery.

[d] "TM" is thermal mark (on otolith).

[e] Number released includes smolt that had shed their coded wire tags.

[f] 1975–2005 data from Booz and Kerkvliet (2016).

Table 20.–Chinook salmon smolt released at Seldovia Bay terminal saltwater fishery, 2006–2018.

Release year [a]	Stocking date	Brood year	Broodstock [b]	Release location	Hatchery [c]	Mark type [d]	Average length (mm)	Average weight (g)	Number of smolt [e]		
									Stocked	Mortality	Released
2006	30 May	2004	NR	Fish Creek	FR	TM	102	11.4	ND	ND	113,974
2007	5 June	2005	NR	Fish Creek	FR	TM	99	10.5	ND	ND	54,276
2008	3 June	2006	NR	Fish Creek	FR	TM	104	12.0	ND	ND	54,464
2009	2 June	2007	NR	Fish Creek	FR	TM	94	9.6	44,979	492	44,487
2010	17 June	2008	NR	Fish Creek	FR	TM	97	10.1	114,921	500	114,421
2011	16 June	2009	CC	SH	FR	TM	102	11.4	ND	ND	103,382
2012	12 June	2011	NR	SH slough	WJHSFH	TM	ND	13.0	ND	ND	95,800
2013	15 June	2012	CC	SH slough	WJHSFH	TM	ND	15.4	ND	ND	63,311
2014	14 June	2013	CC/NR/SC	SH slough	WJHSFH	TM	ND	13.9	ND	ND	74,259
2015	25 June	2014	CC/NR	SH slough	WJHSFH	TM	ND	12.3	102,233	30,000	72,233
2016	9 June	2015	CC/NR/SC	SH slough	WJHSFH	TM	ND	13.6	ND	ND	102,552
2017	20 May	2016	SC/NR	SH slough	WJHSFH	TM	ND	13.5	ND	ND	104,806
2018	29 May	2017	NR	SH slough	WJHSFH	TM	ND	14.6	ND	ND	104,890
Averages											
1987–2005 [f]								16.0	ND	ND	98,095
2006–2015								12.0	87,378	10,331	79,061
2013–2015								13.9	102,233	30,000	69,934
2016–2018								13.9	ND	ND	104,083

Note: "ND" means no data. These data were not included in the averages. "SH" is Seldovia Harbor.

[a] Smolt were released as freshwater-age-0 fish from 1975 through 2003 and 2012 through 2015. From 2004 through 2011, smolt were released as freshwater-age-1 fish.

[b] "CC" is Crooked Creek; "NR" is Ninilchik River; "SC" is Ship Creek. Since 1995, the primary broodstock used for stocking NDFL has been the Ninilchik River. Due to shortages during Ninilchik River egg takes, both Crooked Creek and Ship Creek broodstocks have been used.

[c] "FR" is Fort Richardson hatchery; "WJHSFH" is the William Jack Hernandez Sport Fish Hatchery.

[d] "TM" is thermal mark (on otolith).

[e] Number released includes smolt that had shed their coded wire tags.

[f] 1987–2005 data from Booz and Kerkvliet (2016).

Table 21.–Coho salmon smolt released at Nick Dudiak Fishing Lagoon (NDFL) terminal saltwater fishery on Homer Spit, 2006–2018.

Release year	Stocking date	Brood year	Broodstock [a]	Hatchery [b]	Mark type [c]	Average weight (g)	Number of smolt [d]		
							Stocked	Mortality	Released
2006	7 June	2004	BL	TL	TM	10.9	160,680	1,420	159,260
2006	14 June	2004	BL	TL	TM	10.9	161,015	1,085	159,930
2006	29 June	2004	SC	FR	TM	19.4	125,216	670	124,546
2007	6 June	2005	BL	TL	TM	9.7	100,787	213	100,574
2007	20 June	2005	SC	FR	TM	14.6	127,244	467	126,777
2008	9 June	2006	BL	TL	TM	11.7	94,931	69	94,862
2008	25 June	2006	SC	FR	TM	17.2	122,843	2,265	120,578
2009	3 June	2007	BL	TL	TM	12.2	89,000	67,000	22,000
2009	24 June	2007	BL	TL	TM	12.2	21,948	52	21,896
2009	30 June	2007	SC	FR	TM	12.5	113,696	211	113,485
2010	12 July	2008	SC	FR	TM	19.1	130,206	585	129,621
2011	11 July	2009	SC, BL	FR	TM	16.7	129,080	110	128,970
2011	11 July	2009	SC, BL	TL	TM	ND	64,595	ND	64,595
2012	18 July	2011	SC, BL	WJHSFH	TM	17.5	107,250	ND	107,250
2013	20 May	2011	SC, BL	WJHSFH	TM	21.0	132,027	ND	132,027
2014	20 May	2012	SC	WJHSFH	TM	21.3	76,535	ND	76,535
2015	14 May	2013	SC	WJHSFH	TM	20.5	122,963	551	122,412
2016	19 May	2014	SC	WJHSFH	TM	22.6	122,528	74	122,454
2017	18 May	2015	SC	WJHSFH	TM	21.8	135,713	1000	134,713
2018	15 May	2017	SC	WJHSFH	TM	20.6	106,184	520	105,664
2018	22 May	2017	SC	WJHSFH	TM	22.2	130,420	120	130,300
Averages									
1988–2005 [e]						22.4	76,813	ND	76,499
2006–2015						16.9	109,024	3,747	106,406
2013–2015						20.9	110,508	551	110,325
2016–2018						21.9	125,514	465	125,050

Note: "ND" means no data. These data were not included in the averages.

[a] "BL" is Bear Lake; "SC" is Ship Creek.

[b] "TL" is Trail Lakes hatchery; "FR" is Fort Richardson hatchery; "WJHSFH" is the William Jack Hernandez Sport Fish Hatchery.

[c] "TM" is thermal mark (on otolith).

[d] Number released includes smolt that had shed their coded wire tags.

[e] 1988–2005 data from Booz and Kerkvliet (2016).

Table 22.–Daily number of sport anglers for Halibut Cove Lagoon, 2017.

	Boat based		Shore based	
Date	Boats	Anglers	Anglers	Total anglers
8 Jun	0	0	0	0
9 Jun	0	0	0	0
10 Jun	0	0	0	0
11 Jun	0	0	0	0
12 Jun	0	0	0	0
13 Jun	0	0	0	0
14 Jun	0	0	0	0
15 Jun	1	2	0	2
16 Jun	0	0	0	0
17 Jun	0	0	0	0
18 Jun	1	2	0	2
21 Jun	0	0	0	0
22 Jun	1	2	0	2
23 Jun	2	4	1	5
24 Jun	7	16	2	18
25 Jun	0	0	0	0
26 Jun	5	11	0	11
27 Jun	2	4	2	6
28 Jun	1	2	0	2
29 Jun	0	0	0	0
30 Jun	0	0	0	0
1 Jul	0	0	0	0
2 Jul	0	0	0	0
3 Jul	0	0	0	0
4 Jul	0	0	0	0
5 Jul	0	0	0	0
6 Jul	1	2	0	2
7 Jul	2	4	0	4
8 Jul	1	2	0	2
Totals	24	51	5	56

Source: Observations made by ADF&G and Alaska State Parks staff.

Table 23.–Charter Logbook estimates of number of trips, guides, and angler-days of guided sport effort by subarea in Lower Cook Inlet Management Area fresh waters, 2006–2016.

	LCIMA											
	West LCIMA			Upper LCIMA			Lower LCIMA			Total		
Year	Trips	Guides	Days fished	Trips	Guides	Days fished	Trips	Guides	Days fished	Trips	Guides	Days fished
2006	276	48	893	148	21	580	25	3	104	449	72	1,577
2007	208	43	524	184	24	760	101	10	358	493	77	1,642
2008	157	39	542	149	23	610	66	8	280	372	70	1,432
2009	189	34	593	116	21	424	36	6	154	341	61	1,171
2010	142	36	475	139	21	440	37	5	185	318	62	1,100
2011	145	40	455	142	17	470	29	3	165	316	60	1,090
2012	184	38	460	93	15	280	49	6	215	326	59	955
2013	170	48	457	113	17	342	5	1	28	288	66	827
2014	180	40	464	136	19	379	19	2	110	335	61	953
2015	254	47	670	173	19	490	3	1	16	430	67	1,176
2016	148	33	392	227	26	617	12	1	55	387	60	1,064
Averages												
2006–2013	184	41	550	136	20	488	44	5	186	363	66	1,224
2014–2016	194	40	509	179	21	495	11	1	60	384	63	1,064

Source: Freshwater Logbook Database (Alaska Department of Fish and Game, Division of Sport Fish. 2006–present. Accessed September 2019. URL not publicly available as some information is confidential. Contact Research and Technical Services for data requests.

Table 24.–Charter Logbook estimates of guided sport effort, harvest, and catch by species in the Lower Kenai Peninsula roadside streams (upper LCIMA), 2006–2016.

	Roadside streams									
	Effort			Chinook salmon		Coho salmon		Steelhead	Dolly Varden	
Year	Trips	Guides	Angler-days	Harvest	Catch	Harvest	Catch	Catch	Harvest	Catch
2006	148	21	580	117	432	177	286	20	66	303
2007	184	24	760	95	800	172	279	117	51	666
2008	149	23	610	94	386	160	214	88	107	967
2009	116	21	424	67	392	143	175	35	23	284
2010	139	21	440	21	197	118	141	60	63	592
2011	142	17	470	19	139	73	89	13	52	677
2012	93	15	280	17	41	101	119	14	24	837
2013	113	17	342	11	31	120	162	39	37	246
2014	136	19	379	123	416	126	193	52	30	629
2015	173	19	490	59	199	227	361	25	40	613
2016	227	26	617	104	219	88	128	106	37	391
Averages										
2006–2013	136	20	488	55	302	133	183	48	53	572
2014–2016	179	21	495	95	278	147	227	61	36	544

Source: Freshwater Logbook Database (Alaska Department of Fish and Game, Division of Sport Fish. 2006–present. Accessed September 2019). URL not publicly available as some information is confidential. Contact Research and Technical Services for data requests.

Table 25.–SWHS estimates of guided and private sport effort, in the Lower Kenai Peninsula roadside streams (upper LCIMA), 2011–2018.

	Effort					
	Anglers		Trips		Angler-days	
Year	Guided	Nonguided	Guided	Nonguided	Guided	Nonguided
2011	677	5,375	714	10,969	917	14,586
2012	464	5,050	351	10,928	540	14,860
2013	382	4,218	398	11,010	537	14,433
2014	271	6,087	212	16,379	418	20,152
2015	627	6,192	1,002	13,910	1,134	19,543
2016	414	7,341	327	13,981	472	20,254
2017	1,092	6,374	678	15,658	1,323	17,655
2018	197	4,000	219	6,518	288	9,993
Averages						
2011–2015	484	5,384	535	12,639	709	16,715
2016–2018	568	5,905	408	12,052	694	15,967

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Table 26.–SWHS estimates of guided and private sport harvest and catch of Chinook and coho salmon, steelhead, and Dolly Varden in the Lower Kenai Peninsula roadside streams (upper LCIMA), 2011–2018.

	Chinook salmon				Coho salmon				Steelhead		Dolly Varden			
	Guided		Nonguided		Guided		Nonguided		Guided	Nonguided	Guided		Nonguided	
Year	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Catch	Catch	Harvest	Catch	Harvest	Catch
2011	68	152	1,014	2,681	73	182	2,987	3,518	21	574		278	551	7,594
2012		65	87	355	120	163	3,236	4,112	526	2,191	11	170	316	10,294
2013	56	75	274	909	100	164	1,505	1,999	187	2,712	18	246	2,354	15,504
2014			486	3,165	20	40	4,392	6,213	53	4,818		1,730	1,064	24,825
2015	18	88	689	2,075	290	534	3,234	7,525	42	3,947	78	3,452	2,893	31,839
2016	87	212	2,394	6,448	115	149	1,386	2,666	206	3,061		104	1,352	18,814
2017	76	207	1,344	4,518	266	324	2,315	3,953	852	3,293	71	289	352	12,459
2018			114	337	70	70	2,258	3,520	40	3,923		242	244	13,325
Averages														
2011–2015	47	95	510	1,837	121	217	3,071	4,673	166	2,848	36	1,175	1,436	18,011
2016–2018	82	210	1,284	3,768	150	181	1,986	3,380	366	3,426	71	212	649	14,866

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

Table 27.–Chinook salmon smolt released at Ninilchik River, 2006–2018.

Release year	Stocking date	Brood year	Release location [a]	Hatchery [b]	Mark type [c]	Percent adipose finclip [d]	Percent CWT	CWT tag code	Average length (mm)	Average weight (g)	Number of smolt [e]
2006	17 May	2004	Brody	FR	Ad, CWT, TM	99.2	99.4	310341	ND	9.6	57,537
2007	17 May	2005	Brody	FR	Ad, CWT, TM	99.5	99.7	310366	92	8.7	56,325
2008	15 May	2006	Brody	FR	Ad, CWT, TM	99.9	99.5	310372	96	10.3	56,943
2009	14 May	2007	Brody	FR	Ad, CWT, TM	100.0	99.1	310376	87.6	8.2	54,797
2010	13 May	2008	Brody	FR	Ad, CWT, TM	ND	98.2	310379	92.7	9.4	58,297
2011	17 May	2009	Brody	FR	Ad, TM	100.0	0.0	NA	98.2	11.2	59,462
2012	17 May	2011	Brody	WJHSFH	Ad, TM	ND	0.0	NA	ND	14.6	54,780
2013	3 June	2012	Brody	WJHSFH	Ad, TM	100.0	0.0	NA	112.3	18.4	50,315
2014	23 June	2013	RKM 25.8	WJHSFH	Ad, TM	100.0	0.0	NA	114.3	18.6	49,858
2015	20 May	2014	RKM 25.8	WJHSFH	Ad, CWT, TM	98.8	98.7	multiple [f]	99.3	12.8	151,155
2016	26 May	2015	RKM 25.8	WJHSFH	Ad, CWT, TM	99.7	97.8	44371	98.9	12.3	147,510
2017 [g]	2 May	2016	Brody	WJHSFH	Ad, TM	ND	0.0	NA	ND	13.6	147,953
2018	24 May	2018	RKM 25.8	WJHSFH	Ad, TM	96.6	0.0	NA	ND	13.9	150,053
Averages											
1988–1994 [h]							20.2		104.7	12.6	163,922
1995–2003 [h]							97.9		102.0	12.7	46,463
2004–2011 [h]							86.0		95.6	10.2	56,237
2012–2015							24.7		108.6	16.1	76,527
2016–2018							32.6		98.9	13.3	148,505

Note: ND means no data; NA means not applicable.

[a] "Brody" is the Brody Road bridge; RKM 25.8 is the release location on Cook Inlet Region, Inc. land at lat 60°03′33″N, long 151°26′36″ W.

[b] "FR" is Fort Richardson; "WJHSFH" is William Jack Hernandez Sport Fish Hatchery.

[c] "Ad" is adipose finclip; "CWT" is coded wire tag; "TM" is thermal mark (on otolith).

[d] Smolt were checked prior to release for finclip quality starting in 2006.

[e] Number released includes smolt that shed coded wire tags.

[f] In 2015, 4 different CWT codes were used: 102,577 smolt were tagged with 043883; 15,635 smolt were tagged with 310383; 22,557 smolt were tagged with 310382; 10,506 smolt were tagged with 310312.

[g] In 2017, smolt were released early at the Brody Road location due to a detection of bacterial kidney disease while they were still held in the WJHSFH. No assessment of percent adipose finclipped was made prior to release, but as in all years, there was an attempt to clip all smolt.

[h] 1988–2005 data from Booz and Kerkvliet (2016).

Table 28.–SWHS estimates of sport harvest and catch of Chinook, coho, pink, and sockeye salmon; Dolly Varden; rainbow trout and steelhead; and angler-days of effort in the Anchor River, 2000–2018.

	Chinook salmon		Coho salmon		Dolly Varden		Steelhead and rainbow trout	Pink salmon	Sockeye salmon	Angler-
Year	Harvest	Catch	Harvest	Catch	Harvest	Catch	Catch [a]	Harvest	Harvest	days
2000	1,730	5,200	2,604	4,807	1,903	20,469	8,693	123	127	22,971
2001	889	2,415	2,960	6,327	1,652	11,980	3,045	11	61	19,195
2002	1,047	4,103	3,830	7,510	662	11,419	3,501	124	52	19,245
2003	1,011	4,311	3,999	12,133	1,124	18,412	3,409	68	504	17,520
2004	1,561	5,561	4,383	10,194	736	15,052	3,710	146	11	20,452
2005	1,432	5,028	5,314	11,639	675	6,820	2,524	69	156	20,079
2006	1,394	4,638	3,920	7,634	897	12,920	4,513	112	54	17,065
2007	2,081	9,792	3,962	9,881	1,327	26,842	8,365	298	53	34,390
2008	1,486	3,245	4,790	7,658	822	23,757	8,733	179	652	26,182
2009	737	2,296	3,882	6,332	1,123	20,117	4,119	267	169	22,057
2010	364	889	2,863	4,799	790	8,321	2,018	48	10	16,740
2011	573	1,227	808	1,275	521	6,536	401	43	17	9,131
2012	38	189	1,121	1,548	278	9,410	1,833	66	30	8,234
2013	97	423	912	1,360	2,175	15,086	2,246	96		11,173
2014	203	926	1,528	2,638	894	24,122	3,621	43	13	10,481
2015	344	1,159	2,072	5,070	2,920	26,169	2,892	84		13,850
2016	1,384	4,232	651	1,638	1,352	17,229	2,516	76	52	12,755
2017	845	2,888	934	1,912	354	10,804	3,010	289		11,685
2018	40	305	1,071	1,353	170	9,463	2,052	114		6,540
Averages										
1977–1999 [b]	1,306	4,585	2,337	4,623	6,200	14,609	3,455	122	203	27,926
2000–2008	1,403	4,921	3,974	8,643	1,089	16,408	5,166	126	186	21,900
2009–2015	337	1,016	1,884	3,289	1,243	15,680	2,447	92	48	13,095
2016–2018	756	2,475	885	1,634	625	12,499	2,526	160	52	10,327

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: Catch first reported in SWHS during 1990. Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

[a] Rainbow trout and steelhead caught and released. Retention of this species is prohibited.

[b] 1977–1999 data published in Kerkvliet et al. (2016).

Table 29.–SWHS estimates of sport harvest and catch of Chinook, coho, pink, and sockeye salmon; Dolly Varden; rainbow trout and steelhead; and angler-days of effort in Deep Creek, 2000–2018.

	Chinook salmon		Coho salmon		Dolly Varden		Steelhead and rainbow trout	Pink salmon	Sockeye salmon	Angler-
Year	Harvest	Catch	Harvest	Catch	Harvest	Catch	Catch [a]	Harvest	Harvest	days
2000	937	2,903	2,018	3,660	355	2,209	1,805	62	72	12,174
2001	593	1,380	1,828	2,529	240	1,271	627		129	7,834
2002	507	2,551	1,832	3,663	452	2,765	954	223		8,925
2003	775	2,121	1,751	3,179	314	9,703	2,456		406	8,959
2004	823	2,727	2,474	4,624	268	8,673	4,365		45	10,575
2005	642	1,791	2,202	4,631	149	1,800	1,355	54	447	10,182
2006	451	1,829	1,606	3,302	61	2,108	1,219	0	86	7,128
2007	628	2,493	1,932	3,158	277	3,679	2,668	15	289	9,382
2008	602	2,600	1,631	3,174	164	5,636	3,672	135	144	9,332
2009	124	767	1,323	2,341	230	4,356	1,463	263	85	8,367
2010	249	808	1,484	3,028	209	2,743	1,043	12	52	7,160
2011	251	894	1,358	1,507	21	1,170	122	50		3,537
2012	33	156	1,122	1,536	49	1,041	681	36		4,037
2013	130	439	359	457		421	515			2,003
2014	101	807	1,889	2,385	136	2,167	932		14	5,494
2015	294	441	1,085	2,069	51	8,529	728	141	364	4,498
2016	424	850	530	743		1,358	386	67	17	4,730
2017	322	849	728	1,272	56	1,844	952	114	13	3,978
2018	37	37	740	1,269	34	3,395	822			2,741
Averages										
1977–1999 [b]	1,024	3,013	1,461	2,772	544	3,222	1,022	81	219	13,705
2000–2008	662	2,266	1,919	3,547	253	4,205	2,125	82	202	9,388
2009–2015	169	616	1,231	1,903	116	2,918	783	100	129	5,014
2016–2018	261	579	666	1,095	45	2,199	720	91	15	3,816

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: Catch first reported in SWHS during 1990. Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

[a] Rainbow trout and steelhead caught and released. Retention of this species is prohibited.

[b] 1977–1999 data published in Kerkvliet et al. (2016).

Table 30.–SWHS estimates of sport harvest and catch of Chinook, coho, pink, and sockeye salmon; Dolly Varden; rainbow trout and steelhead; and angler-days of effort in the Ninilchik River, 2000–2018.

	Chinook salmon [a]		Coho salmon		Dolly Varden		Steelhead and rainbow trout	Pink salmon	Sockeye salmon	Angler-
Year	Harvest	Catch	Harvest	Catch	Harvest	Catch	Catch [b]	Harvest	Harvest	days
2000	1,782	4,648	1,724	3,354	228	1,444	760	20	255	12,432
2001	1,399	3,014	708	1,196	228	1,330	283		1,181	10,602
2002	830	2,180	1,655	3,238	44	993	468	85	109	9,572
2003	1,452	4,205	2,526	4,596	20	952	984		191	9,843
2004	1,240	2,961	3,425	4,440	136	907	400	49	470	10,500
2005	1,342	2,042	1,339	2,663	74	400	934		399	9,003
2006	1,329	3,004	2,472	3,069	55	733	559	9	556	9,620
2007	1,575	4,774	1,591	2,225	64	1,351	725	30	225	10,211
2008	976	2,090	692	986	29	736	1,465	151	179	8,158
2009	203	560	895	1,853	54	734	1,181	51	353	7,687
2010	358	1,371	711	854	48	821	360	13	81	5,296
2011	258	678	356	380	9	145	53	50		2,292
2012	16	75	1,035	1,113		13	169	13		2,995
2013	103	122	220	232	104	122	100		43	1,232
2014	182	1,432	820	997	34	187	309			4,306
2015	69	563	300	833		849	336		40	2,162
2016	630	1,578	320	434		251	145			3,166
2017	253	988	782	956	13	100	183	35		3,081
2018	37	71	269	720	20	668	1,089		199	812
Averages										
1977–1999 [c]	1,912	5,948	751	1,543	299	1,014	527	50	674	13,892
2000–2008	1,325	3,213	1,792	2,863	98	983	731	57	396	9,993
2009–2015	170	686	620	895	50	410	358	32	129	3,710
2016–2018	307	879	457	703	17	340	472	35		2,353

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: Catch first reported in SWHS during 1990. Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

[a] Enhanced return from stocked fish beginning in 1991.

[b] Rainbow trout and steelhead caught and released. Retention of this species is prohibited.

[c] 1977–1999 data published in Kerkvliet et al. (2016).

Table 31.–Anchor River Chinook salmon escapement, freshwater harvest, total run, and exploitation, 2003–2018.

Year	Project dates	Location	Method	Escapement		Inriver harvest		Total inriver run [a]	
				Estimate	SE	Estimate	SE	Estimate	Exploitation rate (%)
2003[b]	30 May–9 Jul	South and north forks confluence	DIDSON	9,238	0	1,011	157	10,249	9.9 [c]
2004	15 May–15 Sep	South and north forks confluence	DIDSON–Resistance board weir	12,016	283	1,561	198	13,577	11.5
2005	13 May–9 Sep	South and north forks confluence	DIDSON–Resistance board weir	11,156	229	1,432	233	12,588	11.4
2006	15 May–24 Aug	South and north forks confluence	DIDSON–Resistance board weir	8,945	289	1,394	197	10,339	13.5
2007	14 May–12 Sep	South and north forks confluence	DIDSON–Resistance board weir	9,622	238	2,081	326	11,703	17.8
2008	13 May–12 Sep	South and north forks confluence	DIDSON–Resistance board weir	5,806	169	1,612	241	7,418	21.7
2009	12 May–11 Sep	South and north forks confluence	Resistance board weir	3,455	0	737	212	4,192	17.6
2010	13 May–29 Sep	South and north forks confluence	DIDSON–Resistance board weir	4,449	103	364	118	4,813	7.6
2011	13 May–21 Sep	South and north forks confluence	DIDSON–video weir	3,545	0	573	163	4,118	13.9
2012	14 May–3 Aug	South and north forks confluence	DIDSON–video weir	4,509	100	38	23	4,547	0.8
2013	15 May–3 Aug	Mainstem, south and north Forks	DIDSON–video weir	4,393	117	97	55	4,490	2.2
2014	14 May–3 Aug	South and north forks	video weirs	2,497	0	203	74	2,700	7.5
2015	10 May–3 Aug	South and north forks	video weirs	10,048	0	344	103	10,392	3.3
2016	3 May–3 Aug	South and north forks	DIDSON–video weir	7,146	68	1,384	252	8,530	16.2
2017	4 May–4 Aug	South and north forks	DIDSON–video weir	5,796		845	189	6,641	12.7
2018	3 May–8 Aug	South and north forks	DIDSON–video weir	3,162		40	40	3,202	1.2
Averages									
2003–2008				9,464		1,515		10,979	15.2
2009–2015				4,699	46	337	108	5,036	7.6
2016–2018				5,368	68	756	252	6,124	10.1

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: DIDSON means dual-frequency identification sonar.

[a] Total inriver run is the escapement plus inriver harvest; total does not account for marine harvest.

[b] In 2003, escapement was not fully assessed due to operational dates. The 2003 estimate was based on a census of all DIDSON files.

[c] Exploitation is biased high compared to other years because escapement was not fully enumerated.

Table 32.–SWHS estimates of coho salmon sport harvest, catch, and effort (angler-days) for west LCIMA freshwater streams, 1983–2018.

	Silver Salmon Creek			Kamishak River			Other Streams			Total		
Year	Harvest	Catch	Angler-days	Harvest	Catch	Angler-days	Harvest	Catch	Angler-days	Harvest	Catch	Angler-days
1983	1,872		1,585						154	1,872		1,739
1984	661		552	112		100				773		652
1985	647		555	100		381			34	747		970
1986	302		292						107	302		399
1987	706		831						72	706		903
1988	709		673				55		109	764		782
1989	735		1,285				140		189	875		1,474
1990	320	1,212	915		220	44	55	55	181	375	1,487	1,140
1991	1,120	1,207	1,112				24	24	75	1,144	1,231	1,187
1992	494	842	597	57	202	117	16	49	275	567	1,093	989
1993	1,080	1,280	853	76	535	704	423	844	977	1,579	2,659	2,534
1994	329	689	270	54	134	272	60	130	358	443	953	900
1995	1,715	2,831	1,851	216	1,040	204	48	274	184	1,979	4,145	2,239
1996	1,979	3,440	1,373	109	317	83		5,364	409	3,502	9,121	1,865
1997	408	1,036	932	177	975	171	137	653	448	722	2,664	1,551
1998	422	1,104	440	201	413	305	74	458	192	697	1,975	937
1999	590	2,082	1,408	288	575	177		368	302	885	3,025	1,887
2000	1,013	2,293	904	220	1,323	220	31	115	290	1,264	3,731	1,414
2001	2,054	3,178	517	183	721	185			42	2,237	3,899	744
2002	942	2,598	612	277	2,258	956	70	349	70	1,289	5,205	1,638
2003	2,269	7,377	1,522	127	1,488	427	115	1,165	538	2,511	10,030	2,487
2004	1,389	10,902	1,203	836	3,564	416				2,225	14,466	1,619
2005	1,568	7,053	1,653	132	570	357	145	809	245	1,845	8,432	2,255
2006	997	5,234	1,680	612	2,681	473	58	1,099	107	1,667	9,014	2,260
2007	1,041	1,998	1,424	135	1,234	472	148	331	206	1,324	3,563	2,102
2008	356	776	687	58	394	123	159	335	416	573	1,505	1,226
2009	1,133	2,812	873	156	699	190				1,289	3,511	1,077
2010	714	2,201	886	119	534	106	25	25	47	858	2,760	1,039
2011	640	1,238	601	73	291	175				713	1,529	776

-continued-

Table 32.–Page 2 of 2.

Year	Silver Salmon Creek			Kamishak River			Other Streams			Total		
	Harvest	Catch	Angler-days	Harvest	Catch	Angler-days	Harvest	Catch	Angler-days	Harvest	Catch	Angler-days
2012	419	1,012	737	230	1,059	276	317	635	408	966	2,706	1,421
2013	224	311	956	195	824	329	85	719	290	504	1,854	1,575
2014	409	950	629	239	432	249	122	652	240	770	2,034	1,118
2015	864	2,081	751	74	960	173			71	938	3,041	995
2016	701	1,267	1,014	11	11	44				712	1,278	1,058
2017	286	714	518	23	23	64				309	737	582
2018	249	821	578	268	884	221	119	352	80	636	2,057	879
Averages												
1983–2015	913	2,605	944	194	938	285	110	688	243	1,179	4,063	1,391
2016–2018	412	934	703	101	306	110	119	352	80	552	1,357	840

Source: Mills (1984–1994); 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 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

Table 33.–SWHS estimates of sport catch of steelhead and rainbow trout in Lower Kenai Peninsula roadside streams, 1989–2018.

Year	Anchor River	Stariski Creek	Deep Creek	Ninilchik River	All streams
1989	2,066	10	409	505	2,990
1990	1,978	104	1,291	177	3,550
1991	2,349	12	425	512	3,298
1992	2,720	70	740	1,008	4,538
1993	4,156	31	1,448	442	6,077
1994	4,035	75	1,156	804	6,070
1995	2,232		520	178	2,930
1996	7,570	47	1,079	522	9,218
1997	3,103		384	380	3,867
1998	3,878	71	1,350	576	5,875
1999	3,920	305	689	694	5,608
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		952	183	4,145
2018	2,052		822	1,089	3,963
Average					
1989–2015	3,764	80	1,263	550	5,652
2013–2015	2,920	27	725	248	3,920
2016–2018	2,526	220	720	472	3,792

Source: Mills (1990-1994); 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 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/. Catch was first estimated by the SWHS during 1989. The 1989 catch estimates from unpublished SWHS data.

Note: Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

Table 34.–SWHS estimates of sport harvest and catch of Dolly Varden from Lower Kenai Peninsula roadside streams, 2000–2018.

	Anchor River		Stariski Creek		Deep Creek		Ninilchik River		All streams	
Year	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
2000	1,903	20,469	24	232	355	2,209	228	1,444	2,510	24,354
2001	1,652	11,980	11	43	240	1,271	228	1,330	2,131	14,624
2002	662	11,419		203	452	2,765	44	993	1,158	15,380
2003	1,124	18,412		161	314	9,703	20	952	1,458	29,228
2004	736	15,052		266	268	8,673	136	907	1,140	24,898
2005	675	6,820		71	149	1,800	74	400	898	9,091
2006	897	12,920		39	61	2,108	55	733	1,013	15,800
2007	1,327	26,842			277	3,679	64	1,351	1,668	31,872
2008	822	23,757		1,482	164	5,636	29	736	1,015	31,611
2009	1,123	20,117		45	230	4,356	54	734	1,407	25,252
2010	790	8,321			209	2,743	48	821	1,047	11,885
2011	521	6,536		21	21	1,170	9	145	551	7,872
2012	278	9,410			49	1,041		13	327	10,464
2013	2,175	15,086		161		421	104	122	2,279	15,790
2014	894	24,122		266	136	2,167	34	187	1,064	26,742
2015	2,920	26,169		71	51	8,529		849	2,971	35,618
2016	1,352	17,229				1,358		251	1,352	18,838
2017	354	10,804			56	1,844	13	100	423	12,748
2018	170	9,463	20	41	34	3,395	20	668	244	13,567
Averages										
1977–1999 [a]	6,200	14,609	344	158	808	2,916	450	1,014	7,758	18,696
2000–2015	1,156	16,090	18	235	198	3,642	81	732	1,415	20,655
2013–2015	1,996	21,792		166	94	3,706	69	386	2,105	26,050
2016–2018	625	12,499			45	2,199	17	340	673	15,051

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

[a] 1977–1999 data published in Kerkvliet et al. (2016).

Note: Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

Table 35.–SWHS estimates of sport groundfish harvest by users in LCIMA, 1996–2018.

	Lingcod			Rockfish			Pacific cod			Shark spp.		
Year	Charter	Nonguided	Total	Charter	Nonguided	Total	Charter	Nonguided	Total	Charter	Nonguided	Total
1996	1,237	854	2,091	2,491	2,704	5,195	490	1,012	1,502	10	89	99
1997	1,363	872	2,235	1,910	2,581	4,491	3,608	3,495	7,103	482	610	1,092
1998	888	568	1,456	1,763	2,243	4,006	1,947	1,907	3,854	101	134	235
1999	714	557	1,271	2,380	3,778	6,158	885	1,784	2,669	66	118	184
2000	1,260	554	1,814	3,291	2,833	6,124	905	2,145	3,050	34	94	128
2001	1,389	598	1,987	2,357	2,254	4,611	1,683	1,706	3,389	152	133	285
2002	1,116	484	1,600	2,724	3,111	5,835	971	1,591	2,562	91	67	158
2003	1,628	491	2,119	3,945	3,570	7,515	1,269	2,552	3,821	217	218	435
2004	2,124	1,187	3,311	5,135	4,621	9,756	979	2,556	3,535	102	104	206
2005	2,168	868	3,036	5,381	6,226	11,607	1,272	3,033	4,305	266	210	476
2006	2,700	607	3,307	5,300	4,131	9,431	1,141	1,057	2,198	186	139	325
2007	5,357	1,655	7,012	6,823	5,966	12,789	633	2,156	2,789	147	255	402
2008	5,003	1,130	6,133	7,195	4,063	11,258	1,385	2,395	3,780	108	163	271
2009	4,073	1,793	5,866	8,931	7,557	16,488	2,388	5,956	8,344	58	101	159
2010	4,043	1,182	5,225	11,401	7,043	18,444	2,425	6,074	8,499	121	8	129
2011	5,297	2,180	7,477	11,332	5,515	16,847	4,865	7,338	12,203	293	12	305
2012	3,850	1,693	5,543	11,747	6,339	18,086	4,096	5,964	10,060	85	35	120
2013	4,144	1,486	5,630	12,757	5,336	18,093	2,485	7,023	9,508	105	231	336
2014	3,335	985	4,320	15,881	6,741	22,622	3,825	6,413	10,238	272	853	1,125
2015	2,022	886	2,908	18,020	8,198	26,218	2,532	6,257	8,789	443	63	506
2016	2,228	884	3,112	24,081	8,824	32,905	3,470	6,124	9,594	41	117	158
2017	2,371	528	2,899	25,341	6,913	32,254	929	3,288	4,217	50	26	76
2018	2,290	971	3,261	26,789	13,360	40,149	786	973	1,759	52	125	177
Averages												
1981–1995 [a]	929	1,086	2,016	1,785	3,053	3,225						
1996–2015	2,686	1,032	3,717	7,038	4,741	11,779	1,989	3,621	5,610	167	182	349
2013–2015	3,167	1,119	4,286	15,553	6,758	22,311	2,947	6,564	9,512	273	382	656
2016–2018	2,296	794	3,091	25,404	9,699	35,103	1,728	3,462	5,190	48	89	137

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

[a] 1981–1995 data published in Kerkvliet et al. (2016).

Table 36.–SWHS estimates of sport Pacific halibut harvest (number of fish) by users in LCIMA, 1995–2018.

	LCIMA harvest				Statewide harvest		
Year	Charter	Nonguided	Total	Percent charter	Charter	Nonguided	Total
1995	100,698	67,456	168,154	59.9	193,139	134,913	328,052
1996	109,570	78,205	187,775	58.4	209,212	145,113	354,325
1997	111,365	82,551	193,916	57.4	215,089	169,117	384,206
1998	104,603	74,759	179,362	58.3	200,631	150,364	350,995
1999	91,975	63,532	155,507	59.1	185,845	148,733	334,578
2000	113,758	87,969	201,727	56.4	223,194	182,527	405,721
2001	119,120	63,362	182,482	65.3	233,207	136,792	369,999
2002	105,601	61,422	167,023	63.2	221,437	134,065	355,502
2003	109,440	80,654	190,094	57.6	244,396	165,837	410,233
2004	127,079	84,623	211,702	60.0	289,920	196,522	486,442
2005	135,061	83,634	218,695	61.8	316,070	191,685	507,755
2006	135,475	73,967	209,442	64.7	302,166	165,407	467,573
2007	152,866	100,399	253,265	60.4	353,392	234,836	588,228
2008	123,867	85,215	209,082	59.2	309,832	211,582	521,414
2009	102,247	93,047	195,294	52.4	227,094	215,754	442,848
2010	109,410	83,293	192,703	56.8	222,015	176,984	398,999
2011	120,020	83,508	203,528	59.0	220,838	170,666	391,504
2012	113,905	76,081	189,986	60.0	216,018	168,055	384,073
2013	124,392	82,790	207,182	60.0	251,923	199,646	451,569
2014	94,297	83,008	177,305	53.2	210,694	196,185	406,879
2015	87,464	92,302	179,766	48.7	209,633	210,041	419,674
2016	92,007	85,825	177,832	51.7	202,661	195,296	397,957
2017	86,653	73,809	160,462	54.0	182,464	169,789	352,253
2018	80,779	71,138	151,917	53.2	187,226	164,616	351,842
Averages							
1995–2015	97,661	77,695	175,356	55.7	240,750	176,420	364,742
2013–2015	102,051	86,033	188,084	54.3	224,083	201,957	426,041
2016–2018	86,480	76,924	163,404	52.9	190,784	176,567	367,351

Source: Howe et al. (1996); Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Table 37.–SWHS estimates of sport lingcod and rockfish harvest in numbers of fish and pounds round weight in LCIMA, 1991–2018.

	Lingcod		Pelagic rockfish		Yelloweye rockfish		Other nonpelagic rockfish		Rockfish totals [a]	
Year	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
1991	2,820	ND	1,106	4,611	1,588	14,420	60	165	2,754	19,196
1992	3,190	49,400	2,954	9,116	1,366	11,316	216	255	4,537	20,687
1993	1,681	38,500	2,670	10,819	2,177	21,708	121	170	4,968	32,697
1994	1,240	33,900	3,087	11,789	1,994	16,599	103	118	5,184	28,506
1995	1,147	28,600	2,756	11,642	1,531	15,948	111	151	4,399	27,741
1996	1,317	35,964	3,325	11,999	1,732	23,100	139	257	5,195	35,356
1997	1,765	47,775	1,818	6,987	2,476	26,972	197	246	4,491	34,205
1998	995	29,773	2,883	13,136	910	9,844	212	292	4,006	23,272
1999	1,045	30,531	4,751	17,637	1,372	14,416	106	218	6,229	32,271
2000	1,588	47,626	2,952	10,477	2,830	33,055	342	595	6,124	44,127
2001	1,514	49,794	2,861	10,307	1,598	20,248	167	250	4,626	30,805
2002	1,364	46,134	4,390	18,574	1,285	15,004	161	289	5,835	33,867
2003	1,754	55,295	5,418	25,838	1,898	23,734	199	320	7,515	49,892
2004	2,863	85,337	6,963	31,788	2,410	29,667	383	607	9,756	62,062
2005	2,754	86,681	8,269	37,931	2,889	33,463	448	897	11,607	72,291
2006	2,997	94,882	6,471	26,192	2,683	31,869	276	478	9,431	58,539
2007	6,826	199,384	10,869	57,034	1,651	20,087	269	659	12,789	77,780
2008	5,937	171,672	8,924	42,571	1922	24,914	412	786	11,258	68,271
2009	5,449	155,465	13,957	54,025	2,043	22,834	292	434	16,296	77,293
2010	4,819	128,326	16,763	66,103	1,218	15,290	463	742	18,444	82,135
2011	6,785	193,058	13,986	61,558	2,225	26,938	636	911	16,847	89,407
2012	5,073	138,336	15,733	68,594	1,780	19,464	572	1,057	18,086	89,115
2013	5,376	139,711	15,147	68,505	2,180	22,284	765	1,205	18,093	91,994
2014	4,158	105,793	20,001	77,805	1,456	15,029	1,165	1,747	22,622	94,581
2015	2,760	63,597	23,212	90,902	1,879	20,867	1,127	1,490	26,218	113,259
2016	2,991	77,064	31,132	109,584	780	6,381	993	1,556	32,905	117,521
2017	2,873	84,893	27,646	109,808	2,463	23,209	2,145	3,084	32,254	136,101
2018	3,261	81,952	35,777	102,119	2,454	20,981	1,918	5,441	40,149	128,541

-continued-

Table 37.–Page 2 of 2.

Year	Lingcod		Pelagic rockfish		Yelloweye rockfish		Other nonpelagic rockfish		Rockfish totals [a]	
	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Averages										
1991–2015	3,089	85,647	8,051	33,838	1,884	21,163	358	574	10,292	55,574
2013–2015	4,098	103,033	19,453	79,071	1,838	19,393	1,019	1,481	22,311	99,945
2016–2018	3,042	81,303	31,518	107,170	1,899	16,857	1,685	3,360	35,103	127,388

Source: Mills (1992-1994); 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 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

[a] Sum of ADF&G assemblage harvest may not equal total harvest due to rounding.

Table 38.–Harvest quotas in the Ninilchik and Kasilof area educational fisheries, 1993–2018.

			Chinook salmon quotas				Coho salmon quotas					
			Ninilchik				Ninilchik					
Year	Saltwater fishing period	Participant	Salt water	Ninilchik River	Kasilof River	Total	Salt water	Ninilchik River	Kasilof River	Total	Total salmon quota	Eulachon and herring quota
1993	15 May–31 Oct	NTC [a]	100	20		100	250	30		250	2000	
1994	15 May–31 Oct	NTC	100	20		100	250	30		250	2000	
1995	15 May–31 Oct	NTC	100	20		100	250	30		250	2000	
1996	15 May–31 Oct	NTC	150	20		150	250	30		250	2000	
1997	15 May–31 Oct	NTC	150	20		150	250	30		250	2000	
1998	15 May–31 Oct	NTC	75	10		75	125	15		125	1,000	
	15 May–31 Oct	NND [b]	75	10		75	125	15		125	1,000	
		Total	150	20		150	250	30		250	2,000	
1999	15 May–31 Oct	NTC	75	10		75	125	15		125	1,000	
	15 May–31 Oct	NND	75	10		75	125	15		125	1,000	
		Total	150	20		150	250	30		250	2,000	
2000	15 May–31 Oct	NTC	75	10		75	125	15		125	1,000	
	15 May–31 Oct	NND	75	10		75	125	15		125	1,000	
		Total	150	20		150	250	30		250	2,000	
2001	15 May–31 Oct	NND	100	10		100	125	15		125	1,000	
	15 May–31 Oct	NTC	100	10		100	125	15		125	1,000	
		Total	200	20		200	250	30		250	2,000	
2002	15 May–31 Oct	NTC	100	10		100	125	15		125	1,000	
	15 May–31 Oct	NND	100	10		100	125	15		125	1,000	
		Total	200	20		200	250	30		250	2,000	
2003	15 May–31 Oct	NTC	100	10		100	100	15		100	850	
	15 May–31 Oct	NND	100	10		100	100	15		100	850	1,000
	01 Jul–15 Aug	NES [c]	25			25	50			50	250	
		Total	225	20		225	250	30		250	1950	1,000
2004	1 May–31 Oct	NTC	100	10		100	100	15		100	850	
	1 Apr–31 Oct	NND	100	10		100	100	15		100	850	1,000
	1 Jul–15 Aug	NES	25			25	50			50	250	
		Total	225	20		225	250	30		250	1950	1,000

-continued-

Table 38.–Page 2 of 3.

Year	Saltwater fishing period	Participant	Chinook salmon quotas				Coho salmon quotas				Total salmon quota	Eulachon and herring quota
			Ninilchik				Ninilchik					
			Salt water	Ninilchik River	Kasilof River	Total	Salt water	Ninilchik River	Kasilof River	Total		
2005	1 May–31 Oct	NTC	100	10		100	100	15		100	850	
	1 Apr–31 Oct	NND	100	10		100	100	15		100	850	1,000
	1 Jul–15 Aug	NES	25			25	50			50	250	
		Total	225	20		225	250	30		250	1950	1,000
2006	1 May–31 Oct	NTC	100	10		100	100	15		100	850	
	1 Apr–31 Oct	NND	100	10		100	100	15		100	850	no limit [d]
	1 Jul–15 Aug	NES	25			25	50			50	250	
		Total	225	20		225	250	30		250	1950	1,000
2007	1 May–31 Oct	NTC	300	10	50	300	300	15	200	500	2,800	
	1 Apr–31 Oct	NND	200	10		200	200	15		200	2,800	no limit [d]
	1 Jul–15 Aug	NES	25			25	50			50	250	
		Total	525	20	50	525	550	30	200	750	5850	1,000
2008	1 May–15 Sep	NTC	200	10	100	300	300	15	200	500	2,800	
	1 Apr–15 Sep	NND	100	10		100	150	15		150	2,800	no limit [d]
		Total	300	20	100	400	450	30	200	650	5,600	1,000
2009	1–20 May; 15 Jun–15 Sep	NTC	100	10	100	200	200	15	300	500	2,800	
	1 Apr–20 May; 15 Jun–15 Sep	NND	50	10		50	150	15		150	2,800	no limit [d]
		Total	150	20	100	250	350	30	300	650	5,600	
2010	1–20 May; 15 Jun–15 Sep	NTC	100	10	100	200	200	15	300	500	2,800	
2011	1 Apr–20 May; 15 Jun–15 Sep	NND	50	10		50	150	15		150	2,800	no limit [d]
	1–20 May; 15 Jun–15 Sep	NTC	100	10	100	200	200	15	300	500	2,800	
		Total	150	20	100	250	350	30	300	650	5,600	
2012[e]	1–20 May; 15 Jun–15 Sep	NTC	100	10	100	200	200	15	300	500	2,800	
	1 Apr–20 May; 15 Jun–15 Sep	NND	50	10		50	150	15		150	2,800	no limit [d]
	1–20 May; 15 Jun–15 Sep	NES	25			25	50			50	250	
		Total	175	20	100	275	400	30	300	700	5,850	

-continued-

Table 38.–Page 3 of 3.

Year	Saltwater fishing period	Participant	Chinook salmon quotas				Coho salmon quotas				Total salmon quota	Eulachon and herring quota
			Ninilchik				Ninilchik					
			Salt water	Ninilchik River	Kasilof River	Total	Salt water	Ninilchik River	Kasilof River	Total		
2013 [e]	1–20 May; 15 Jun–15 Sep	NTC	100	10	100	200	200	15	300	500	2,800	
	1 Apr–20 May; 15 Jun–15 Sep	NND	50	10		50	150	15		150	2,800	no limit [d]
	1–20 May; 15 Jun–15 Sep	NES	25			25	50			50	250	
		Total	175	20	100	275	400	30	300	700	5,850	
2014	1–20 May; 15 Jun–15 Sep	NTC	100	10	100	200	200	15	300	500	2,800	
	1 Apr–20 May; 15 Jun–15 Sep	NND	50	10		50	150	15		150	2,800	no limit [d]
	1–20 May; 15 Jun–15 Sep	NES	25			25	50			50	250	
		Total	175	20	100	275	400	30	300	700	5,850	
2015	1–20 May; 13 Jun–15 Sep	NTC	100	10	100	200	200	15	300	500	2,800	
	1 Apr–20 May; 13 Jun–15 Sep	NND	50	10		50	150	15		150	2,800	no limit [d]
	1–20 May; 13 Jun–15 Sep	NES	25			25	50			50	250	
		Total	175	20	100	275	400	30	300	700	5,850	
2016	1–20 May; 15 Jun–15 Sep	NTC	100	10	100	200	200	15	300	500	2,800	
	1 Apr–20 May; 15 Jun–15 Sep	NND	50	10		50	150	15		150	2,800	no limit [d]
	1–20 May; 15 Jun–15 Sep	NES	25			25	50			50	250	
		Total	175	20	100	275	400	30	300	700	5,850	
2017	1–20 May; 15 Jun–15 Sep	NTC	100	10	100	200	200	15	300	500	2,800	
	1 Apr–20 May; 15 Jun–15 Sep	NND	50	10		50	150	15		150	2,800	no limit [d]
	1–20 May; 15 Jun–15 Sep	NES	25			25	50			50	250	
		Total	175	20	100	275	400	30	300	700	5,850	
2018	1–20 May; 16 July–15 Sep	NTC	100	10	100	200	235	15	250	500	2,800	
	1 Apr–20 May; 16 July–15 Sep	NND	50	10		50	150	15		150	2,800	no limit [d]
	1–20 May; 16 July–15 Sep	NES	25			25	50			50	250	
		Total	175	20	100	275	435	30		700	5,850	

[a] Ninilchik Traditional Council.

[b] Ninilchik Native Descendants.

[c] Ninilchik Emergency Services.

[d] Unlimited eulachon harvest permitted. Herring harvest not permitted because opportunity was available via personal use regulations (April 1 for herring); salmon permit began May 1.

[e] Educational fishery modifications for the Ninilchik area include harvest quotas (effective July 1; no retention of Chinook salmon) and the closing of the last two freshwater educational fisheries.

Table 39.–Harvest in the Ninilchik and Kasilof area educational fisheries, 1993–2018.

		Ninilchik area							Kasilof area						
			Harvest							Harvest					
Year	Participant	Saltwater fishing period	Chinook	Sockeye	Coho	Pink	Chum	Total	Fishing period	Chinook	Sockeye	Coho	Pink	Chum	Total
1993	NTC [a]	15 May–31 Oct						215							
1994	NTC	15 May–31 Oct	7	162	119	16		304							
1995	NTC	15 May–31 Oct	77	229	85	23		414							
1996	NTC	15 May–31 Oct	101	910	56	8		1,075							
1997	NTC	15 May–31 Oct	94	474	99	55		722							
1998	NTC	15 May–31 Oct	67	506	95	57		725							
	NND [b]	15 May–31 Oct	52	139	110	20		321							
	Total		119	645	205	77		1,046							
1999	NTC	15 May–31 Oct	117	434	84	5		640							
	NND	15 May–31 Oct	56	302	76	18		452							
	Total		173	736	160	23		1,092							
2000	NTC	15 May–31 Oct	50	439	59	57		605							
	NND	15 May–31 Oct	51	199	96	15		361							
	Total		101	638	155	72		966							
2001	NND	15 May–31 Oct	73	310	123	0		506							
	NTC	15 May–31 Oct	75	760	125	42		1002							
	Total		148	1,070	248	42		1,508							
2002	NTC	15 May–31 Oct	44	138	95	31		308							
	NND	15 May–31 Oct	65	339	106	52		562							
	Total		109	477	201	83		870							
2003	NTC	15 May–31 Oct	86	426	100	15		627							
	NND	15 May–31 Oct	65	98	80	12		255							
	NES [c]	01 Jul–15 Aug	0	4	0	0		4							
	Total		151	528	180	27		886							
2004	NTC	1 May–31 Oct	73	395	83	0		551							
	NND	1 Apr–31 Oct	78	199	79	14		370							
	NES	1 Jul–15 Aug	1	77	0	9		87							
	Total		152	671	162	23		1008							

-continued-

Table 39.–Page 2 of 4.

		Ninilchik area							Kasilof area						
			Harvest							Harvest					
Year	Participant	Saltwater fishing period	Chinook	Sockeye	Coho	Pink	Chum	Total	Fishing period	Chinook	Sockeye	Coho	Pink	Chum	Total
2005	NTC	1 May–31 Oct	70	264	83	0		417							
	NND	1 Apr–31 Oct	88	84	78	15		265							
	NES	1 Jul–15 Aug	0	5	0	0		5							
	Total		158	353	161	15		687							
2006	NTC	1 May–31 Oct	75	550	100	0		725							
	NND	1 Apr–31 Oct	64	55	99	10		228							
	NES	1 Jul–15 Aug			Did not fish										
	Total		139	605	199	10		953							
2007	NTC	1 May–31 Oct	300	1,363	483	2		2,148				Did not fish			
	NND	1 Apr–31 Oct	65	227	102	14		408							
	NES	1 Jul–15 Aug			Did not fish										
	Total		365	1590	585	16		2556							
2008	NTC	1 May–15 Sep	199	857	200	248		1,504	8 Aug–15 Sep	0	0	3	0	0	3
	NND	1 Apr–15 Sep	69	192	150	69		480	8 Aug–15 Sep						
	Total		268	1,049	350	317		1,984		0	0	3	0	0	3
2009	NTC	1–20 May; 15 Jun–15 Sep	32	788	200	123		1,143	8 Aug–15 Sep	0	56	254	0	0	310
	NND	1 Apr–20 May; 15 Jun–15 Sep	20	276	56	34		386							
	Total		52	1,064	256	157		1,529		0	56	254	0	0	310
2010	NTC	1–20 May; 15 Jun–15 Sep	78	605	200	108		991	8 Aug–15 Sep	5	38	300	155	0	498
2011	NND	1 Apr–20 May; 15 Jun–15 Sep	29	185	84	37		335							
	NTC	1–20 May; 15 Jun–15 Sep	64	500	181	131		876	8 Aug–15 Sep	0	94	166	0	0	260
	Total		93	685	265	168		1,211		0	94	166	0	0	260

-continued-

Table 39.–Page 3 of 4.

		Ninilchik area							Kasilof area						
			Harvest							Harvest					
Year	Participant	Saltwater fishing period	Chinook	Sockeye	Coho	Pink	Chum	Total	Fishing period	Chinook	Sockeye	Coho	Pink	Chum	Total
2012[e]	NTC	1–20 May; 15 Jun–15 Sep	67	240	215	54		576	8 Aug–15 Sep	1	7	191	199	0	398
	NND	1 Apr–20 May; 15 Jun–15 Sep	17	65	145	25		252							
	NES	1–20 May; 15 Jun–15 Sep	1	37	0	2		40							
	Total		85	342	360	81		868		1	7	191	199	0	398
2013[e]	NTC	1–20 May; 15 Jun–15 Sep	60	594	210	52		916	8 Aug–15 Sep	2	29	224	4	0	259
	NND	1 Apr–20 May; 15 Jun–15 Sep	16	195	128	26		365							
	NES	1–20 May; 15 Jun–15 Sep	13	141	50	23		227							
	Total		89	930	388	101		1,508		2	29	224	4	0	259
2014	NTC	1–20 May; 15 Jun–15 Sep	62	744	37	166	2	1,011	8 Aug–15 Sep	0	56	118	55	0	229
	NND	1 Apr–20 May; 15 Jun–15 Sep	21	108	79	10	0	218							
	NES	1–20 May; 15 Jun–15 Sep	22	163	50	6	9	250							
	Total		105	1,015	166	182	11	1,479		0	56	118	55	0	229
2015	NTC	1–20 May; 13 Jun–15 Sep	104	294	153	41	0	592	8 Aug–15 Sep	3	75	159	10	0	247
	NND	1 Apr–20 May; 13 Jun–15 Sep	36	37	45	0	0	118							
	NES	1–20 May; 13 Jun–15 Sep	34	58	46	8	1	147							
	Total		174	389	244	49	1	857		3	75	159	10	0	247

-continued-

Table 39.–Page 4 of 4.

		Ninilchik area							Kasilof area						
			Harvest							Harvest					
Year	Participant	Saltwater fishing period	Chinook	Sockeye	Coho	Pink	Chum	Total	Fishing period	Chinook	Sockeye	Coho	Pink	Chum	Total
2016	NTC	1–20 May; 15 Jun–15 Sep	93	250	182	136	1	662	8 Aug–15 Sep	2	69	212	97	0	380
	NND	1 Apr–20 May; 15 Jun–15 Sep	50	57	34	11	1	153							
	NES	1–20 May; 15 Jun–15 Sep	18	41	38	7	0	104							
	Total		161	348	254	154	2	919		2	69	212	97	0	380
2017	NTC	1–20 May; 15 Jun–15 Sep	48	649	200	193	0	1,090	8 Aug–15 Sep	2	224	282	31	0	539
	NND	1 Apr–20 May; 15 Jun–15 Sep	31	220	55	39	0	345							
	NES	1–20 May; 15 Jun–15 Sep	16	110	34	20	0	180							
	Total		95	979	289	252	0	1,615		2	224	282	31	0	539
2018	NTC	1–20 May; 16 July–15 Sep	5	169	219	110	0	503	8 Aug–15 Sep	0	87	281	72	0	440
	NND	1 Apr–20 May; 16 July–15 Sep	6	23	85	15	0	129							
	NES	1–20 May; 16 July–15 Sep	0	6	0	0	0	6							
	Total		11	198	304	125	0	638		0	87	281	72	0	440

[a] Ninilchik Traditional Council.

[b] Ninilchik Native Descendants.

[c] Ninilchik Emergency Services.

[d] Unlimited eulachon harvest permitted. Herring harvest not permitted because opportunity was available via personal use regulations (April 1 for herring); salmon permit began May 1.

[e] Educational fishery modifications for the Ninilchik area include harvest quotas (effective July 1; no retention of Chinook salmon) and the closing of the last two freshwater educational fisheries.

Table 40.–Harvest and harvest quotas in the Seldovia area to the Seldovia Village Tribe (SVT) educational fisheries, 2004–2018.

Year	Educational fishery participant	Seldovia saltwater fishing period	Seldovia Village Tribe area harvest							Fish quotas						
			Chinook	Sockeye	Coho	Chum	Pink	Dolly Varden	Total	Chinook	Sockeye	Coho	Chum	Pink a	Dolly Varden	Total
2004	SVT	15–21 Jul	0	0	0	9	1	0	10	0	20	0	20	50	15	70
2005	SVT	10–15 Jul	0	0	0	0	0	0	0	0	20	0	20	50	15	70
2006	SVT	10–15 Jul			DID NOT FISH					0	20	0	20	50	15	70
2007	SVT	30 Jun; 6–15 Jul	0	2	0	0	0	0	2	0	20	0	20	50	15	70
2008	SVT	18–22 Aug			DID NOT FISH					0	20	0	20	50	15	70
2009	SVT	13–20 Jul			DID NOT FISH					0	20	0	20	50	15	70
2010	SVT	15–17 Jul			DID NOT FISH					0	20	0	20	50	15	70
2011	SVT	21–22 Jul	0	0	0	0	0	0	0	0	20	0	20	50	15	70
2012	SVT	no permit								0	20	0	20	50	15	70
2013	SVT	no permit								0	20	0	20	50	15	70
2014	SVT	21–22 Jul			DID NOT FISH					0	20	0	20	50	15	70
2015	SVT	no permit								0	20	0	20	50	15	70
2016	SVT	no permit								0	20	0	20	50	15	70
2017	SVT	no permit								0	20	0	20	50	15	70
2018	SVT	no permit								0	20	0	20	50	15	70

Table 41.–Harvest and harvest quotas between the Anchor River and Whiskey Gulch to the Veterans of Foreign Wars Men's Auxiliary Post 10221 (APVFW) education fishery, 2011–2018.

Year	Educational fishery participant	Anchor Point saltwater fishing period	Anchor Point area harvest						Salmon quotas		
			Chinook salmon	Sockeye salmon	Coho salmon	Pink salmon	Chum salmon	Total harvest	Chinook salmon	Coho salmon	Total
2007	APVFW	15 Jul–31 Aug	0	77	76	0	0	153	0	80	160
2008	APVFW	15 Jul–31 Aug	1	89	38	11	0	139	0	80	240
2009	APVFW	15 Jul–31 Aug	0	103	75	6	0	184	0	80	240
2010	APVFW	15 Jul–31 Aug	0	37	47	21	1	106	0	50	200
2011	APVFW	15 Jul–31 Aug	0	47	41	21	0	109	0	50	200
2012	APVFW	15 Jul–31 Aug	0	66	25	15	0	106	0	50	200
2013	APVFW	15 Jul–31 Aug	0	50	21	40	1	112	0	50	200
2014	APVFW	15 Jul–31 Aug	0	44	48	40	0	132	0	50	200
2015	APVFW	15 Jul–31 Aug	0	50	32	26	9	117	0	50	200
2016	APVFW	15 Jul–31 Aug	0	30	39	34	0	103	0	50	200
2017	APVFW	15 Jul–31 Aug	0	4	9	7	0	20	0	50	200
2018	APVFW	15 Jul–31 Aug	0	28	21	20	0	69	0	50	200

Table 42.–Harvest and harvest quotas in the Silver Salmon Creek area to the Southcentral Foundation (SCF) educational fisheries, 2010–2018.

Year	Educational fishery participant	Silver Salmon Creek saltwater fishing period	Silver Salmon Creek area harvest					Salmon quotas		
			Sockeye salmon	Coho salmon	Chum salmon	Pink salmon	Total harvest	Chinook salmon	Coho salmon	Total
2010	SCF	1 Jul–15 Sep[a]	0	27	0	0	27	0	50	300
2011	SCF	1 Jul–15 Sep[a]	34	5	0	0	39	0	50	300
2012	SCF	1 Jul–15 Sep[a]	76	36	0	0	112	0	50	300
2013	SCF	15 Jul–15 Sep[b]	0	30	0	0	30	0	50	300
2014	SCF	1 Jul–20 Sep[b]	44	35	3	2	84	0	50	300
2015	SCF	6 Jul–20 Sep[b]	13	16	21	0	50	0	50	300
2016	SCF	1 Jul–20 Sep[b]	53	14	0	0	67	0	50	300
2017	SCF	6 Jul–20 Sep[b]	54	15	12	0	81	0	50	300
2018	SCF	1 Jul–20 Sep[b]	14	17	2	0	33	0	50	300

[a] Opening days on Tuesdays, Wednesdays and Friday through Sunday only.

[b] Opening days on Tuesdays, Wednesdays, and Fridays only.

Table 43.–Harvest and harvest quotas between the Anchor River and Whiskey Gulch to the Sons of the American Legion Post 16 (Post 16) educational fishery, 2011–2018.

Year	Educational fishery participant	Anchor Point saltwater fishing period	Anchor Point area harvest						Salmon quotas		
			Chinook salmon	Sockeye salmon	Coho salmon	Pink salmon	Chum salmon	Total harvest	Chinook salmon	Coho salmon	Total
2011	Post 16	1–31 Aug	0	39	35	0	0	74	0	50	200
2012	Post 16	15 Jul–31 Aug	0	65	39	0	0	104	0	50	200
2013	Post 16	15 Jul–31 Aug	0	67	24	0	0	91	0	50	200
2014	Post 16	15 Jul–31 Aug	0	45	31	0	0	76	0	50	200
2015	Post 16	15 Jul–31 Aug	0	45	3	2	0	50	0	50	200
2016	Post 16	15 Jul–31 Aug	0	11	23	0	0	34	0	50	200
2017	Post 16	15 Jul–31 Aug	0	7	58	10	0	75	0	50	200
2018	Post 16	15 Jul–31 Aug	0	35	27	0	0	62	0	50	200

Table 44.–Harvest and effort in the sport–personal use razor clam fisheries from the entire (Kasilof River to Anchor River) eastside beach based on SWHS data, 2001–2018.

	Residents		Nonresidents				
Year	Razor clam harvest	Digger-days	Razor clam harvest	Digger-days	Total razor clam harvest	Total digger-days	Total clams per digger-day
2001	379,166	21,066	264,645	11,723	643,811	32,789	20
2002	602,435	24,634	165,345	9,772	767,780	34,406	22
2003	405,253	19,008	163,409	6,353	568,662	25,361	22
2004	354,952	22,250	164,265	7,961	519,217	30,211	17
2005	292,361	22,255	134,655	10,580	427,016	32,835	13
2006	301,273	18,712	146,690	6,770	447,963	25,482	18
2007	223,695	17,685	126,529	7,485	350,224	25,170	14
2008	389,667	20,250	146,870	8,556	536,537	28,806	19
2009	386,638	20,591	106,538	6,391	493,176	26,982	18
2010	212,620	11,803	114,530	7,609	327,150	19,412	17
2011	225,220	16,640	181,210	6,381	406,430	23,021	18
2012	169,662	15,658	91,195	6,214	260,857	21,872	12
2013 [a]	126,125	18,457	48,180	5,418	174,305	23,875	7
2014 [b]	22,580	6,263	9,616	1,581	32,196	7,844	4
2015 [c]	0	0	0	0	0	0	NA
2016 [c]	0	0	0	0	0	0	NA
2017 [c]	0	0	0	0	0	0	NA
2018 [c]	0	0	0	0	0	0	NA
Averages							
1969–2000	ND	ND	ND	ND	866,783	29,174	30
2001–2014	292,261	18,234	133,120	7,342	425,380	25,576	16
2013–2014	74,353	12,360	28,898	3,500	103,251	15,860	6
2015–2018	0	0	0	0	0	0	NA

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 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: "ND" means no data; "NA" means cannot be calculated.

[a] Bag and possession limit reduced to 25 by emergency order.

[b] Ninilchik south and north management subareas closed and bag and possession limits reduced by emergency order to 25 razor clams for the remaining subareas.

[c] Entire beach closed by emergency order.

[d] 1969–2000 data published in Kerkvliet et al. (2016).

Table 45.–Shellfish sport and personal use fishery harvest and effort in Lower Cook Inlet and Kachemak Bay, 2000–2018.

Year	Participation (angler-days)	King crab (number)	Dungeness crab (number)	Tanner crab (number) [a]	Shrimp (gallons)	Hardshell clams (gallons)	Hardshell clams (number)	Razor clams (number)	Other shellfish (number)
2000	11,445	closed	closed	19,672	closed	14,697		7,275	992
2001	8,090	closed	closed	6,499 [b]	closed	13,141		3,838	1,620
2002	7,439	closed	closed	3,574 [c]	closed	12,047		7,887	2,163
2003	5,836	closed	closed	closed	closed	10,074		7,241	1,925
2004	6,641	closed	closed	closed	closed	8,399		6,412	1,372
2005	6,415	closed	closed	closed	closed	11,625		3,677	1,874
2006	6,704	closed	closed	closed	closed	4,210		6,529	1,108
2007	4,476	closed	closed	closed	closed	4,144		3,133	1,423
2008	6,240	closed	closed	17,173 [d]	closed	3,562		2,307	3,874
2009	6,463	closed	closed	18,827	closed	3,202		12,475	1,702
2010	4,886	closed	closed	13,745 [e]	closed	2,805		6,537	1,304
2011	3,720	closed	closed	14,803 [e]	closed		22,360	1,219	1,859
2012	2,194	closed	closed	closed	closed		23,406	2,797	2,451
2013	2,757	closed	closed	closed	closed		34,926	7,700	
2014	2,815	closed	closed	closed	closed		19,612	931	3,237
2015	2,061	closed	closed	closed	closed		30,376		1,093
2016	1,128	closed	closed	closed	closed		5,318		4,342
2017	1,356	closed	closed	8,645	closed		2,508		1,001
2018	3,037	closed	closed	8,319	closed		1,343		455
Averages									
1981–1999 [f]	14,999	2,158	18,310	7,728	2,883	14,232		15,737	6,615
2000–2015	5,511	closed	closed	13,470	closed	7,991	26,136	5,331	1,866
2013–2015	2,544	closed	closed	closed	closed		28,305	4,316	2,165
2016–2018	1,840	closed	closed		closed		3,056		1,933

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

[a] Tanner crab permit data.

[b] July 12 reduced bag limit from 20 to 5.

[c] August 3 closed fishery.

[d] Fishery opened July 15.

[e] Estimate based on 29 June 2011 (E. Russ, ADF&G Fishery Biologist, Homer, personal communication).

[f] 1981–1999 data published in Kerkvliet et al. (2016).

Table 46.–Razor clam sport–personal use and commercial fisheries harvest and effort in west LCIMA, 1986–2018.

	West Cook Inlet										
	SWHS razor clam sport–personal use harvest							Commercial harvest (Polly Cr., Crescent R.)			Commercial percentage of total Polly Cr., Crescent R. harvest
					Totals						
Year	Polly Cr., Crescent R.	North of Chinitna	South of Chinitna	Other	Digger-days	Pounds [a]	Number	Digger-days	Pounds	Number [b]	
1986	103,748	5,256	6,132		2,880	28,682	115,136	1,776	275,750	782,097	ND
1987	103,328				2,031	25,741	103,328	2,909	353,303	1,002,057	ND
1988	50,046	8,413	8,684		1,907	16,727	67,143	2,838	399,376	1,132,732	ND
1989	44,415	4,710	8,321		1,010	14,311	57,446	1,700	222,747	631,767	ND
1990	47,826		421		1,314	12,019	48,247	2,009	323,533	917,622	ND
1991	27,658		1,070		871	7,157	28,728	1,069	201,320	570,995	ND
1992	26,739	2,055	4,327		768	8,251	33,121	1,550	296,727	841,593	99.5
1993	25,850	5,799	6,313		1,280	9,457	37,962	1,930	310,481	880,603	99.3
1994	14,428	3,763	5,232		758	5,835	23,423	2,074	355,165	1,007,338	99.5
1995	11,559	1,900	3,319		791	4,180	16,778	1,320	248,358	704,406	99.5
1996	13,815		4,052		541	4,451	17,867	1,991	355,448	1,008,141	98.3
1997	13,490		1,903		572	3,835	15,393	1,677	366,532	1,039,578	98.5
1998	5,951		2,611		329	2,133	8,562	1,848	371,877	1,054,738	99.2
1999	13,814		2,179		677	3,984	15,993	1,655	352,910	1,000,942	98.4
2000	21,000		7,276		987	7,044	28,276	1,761	369,397	1,047,704	97.4
2001	7,621	2,411	4,868		398	3,712	14,900	1,575	348,917	989,617	98.5
2002	6,228		2,900		499	2,274	9,128	1,460	338,938	961,314	99.1
2003	10,326		2,887		386	3,292	13,213	1,483	411,403	1,166,843	98.9
2004	17,639		2,544	4,093	608	6,048	24,276	1,308	419,697	1,190,367	98.0
2005	17,471		2,280		2,000	4,920	19,751	1,290	371,395	1,053,371	98.2
2006	15,696	8,098	229		1,963	5,985	24,023	1,244	368,953	1,046,444	97.8
2007	26,617	6,114	548		1,135	8,290	33,279	915	283,085	908,667	96.5
2008	25,948	14,755	444	906	1,617	10,476	42,053	1,277	390,999	1,243,075	96.7
2009	19,541	20,632	4,113	3,749	1,703	11,966	48,035	1,054	361,388	976,774	95.3
2010	9,390	6,838	4,944	455	1,488	5,388	21,627	1,299	379,547	989,819	97.9
2011	18,390	7,680	864	620	3,095	6,864	27,554	635	189,172	471,918	94.5
2012	42,559	9,816			1,278	18,838	52,375	1,188	307,409	789,494	93.8

-continued-

Table 46.–Page 2 of 2.

	West Cook Inlet										
	SWHS razor clam sport–personal use harvest							Commercial harvest (Polly Cr., Crescent R.)			Commercial percentage of total Polly Cr., Crescent R. harvest
					Totals						
Year	Polly Cr., Crescent R.	North of Chinitna	South of Chinitna	Other	Digger-days	Pounds[a]	Number	Digger-days	Pounds	Number[b]	
2013	87,910	17,189	156	3,210	3,523	41,491	108,465	1,173	380,912	981,714	90.1
2014	52,894	2,437			4,084	21,425	55,331	1,146	348,294	931,094	94.4
2015	34,863	2,274	1,170		1,423	8,284	38,307	1,240	318,538	873,698	95.8
2016	61,936	13,123			1,480	17,189	75,059	1,089	284,600	874,465	92.1
2017	6,132	8,428	168	135	1,142	2,944	14,863	813	177,147	588,984	97.5
2018	19,289	590		1,729	1,338	4,280	21,608	1,001	199,162	676,229	96.9
Average											
1986–2015	30,559	7,230	3,325	2,172	1,397	10,435	38,324	1,546	334,052	939,884	97.3
2016–2018	29,119	7,380	168	932	1,320	8,138	37,177	968	220,303	713,226	95.5

Source: ADF&G Division of Commercial Fisheries fish ticket database. 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 September 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: Blank values represent no estimates from the SWHS due to a lack of responses for the fishery.

Table 47.–Juvenile sized (<80 mm), adult sized (≥80 mm), and total razor clam abundances for the subareas in Ninilchik and Oil Pad Access Management Area, 1988–2018.

	Ninilchik Management Area						Oil Pad Access MA		
	South subarea			North subarea			North subarea		
Year	Juvenile	Adults	Total	Juvenile	Adults	Total	Juvenile	Adults	Total
1988	ND	ND	ND	ND	ND	ND	307,323	1,844,530	2,151,853
1989	ND	ND	ND	1,499,166	421,675	1,920,841	679,117	1,171,220	1,850,338
1990	475,649	125,937	601,586	1,084,464	573,810	1,658,274	ND	ND	ND
1991	44,174	251,601	295,775	102,676	1,821,120	1,923,796	ND	ND	ND
1992	57,234	237,755	294,989	41,608	3,336,073	3,377,681	ND	ND	ND
1998	114,628	308,129	422,757	390,003	597,993	987,996	ND	ND	ND
1999	ND	ND	ND	ND	ND	ND	1,054,746	6,578,773	7,633,518
2001	359,037	275,475	634,512	220,256	540,652	760,908	ND	ND	ND
2003	402,163	241,475	643,638	2,303,824	1,249,055	3,552,879	ND	ND	ND
2005	517,109	440,851	957,960	506,444	857,322	1,363,766	ND	ND	ND
2008	ND	ND	ND	ND	ND	ND	515,758	864,413	1,380,170
2011	156,410	1,621,765	1,778,175	60,887	1,212,311	1,273,198	ND	ND	ND
2012	40,776	624,992	665,768	ND	ND	ND	ND	ND	ND
2013	108,540	65,688	174,228	ND	ND	ND	ND	ND	ND
2014	135,650	90,344	225,994	ND	ND	ND	ND	ND	ND
2015	33,208	69,934	103,142	43,161	33,535	76,696	1,058,755	107,474	1,166,229
2016 [a]	840,245	45,674	885,919	ND	ND	ND	1,784,504	73,047	1,857,551
2017 [a]	815,527	93,653	909,180	ND	ND	ND	ND	ND	ND
2018 [a]	2,360,897	251,122	2,612,019	ND	ND	ND	ND	ND	ND
Averages									
1988–2008	281,428	268,746	550,174	768,555	1,174,713	1,943,268	639,236	2,614,734	3,253,970
2011–2015	94,917	494,545	589,461	52,024	622,923	674,947	1,058,755	107,474	1,166,229
2016–2018	1,338,890	130,150	1,469,039				1,784,504	73,047	

Note: "MA" means management area; "ND" means no data.

[a] Preliminary data.

Table 48.–Juvenile sized (<80 mm), adult sized (≥80 mm), and total razor clam abundances for the subareas in Clam Gulch Management Area, 1988–2018.

	Clam Gulch Management Area					
	South subarea			North subarea		
Year	Juvenile	Adults	Total	Juvenile	Adults	Total
1988	1,511,345	1,339,042	2,850,387	ND	ND	ND
1989	1,513,810	2,616,217	4,130,027	1,474,779	1,645,048	3,119,827
1990	3,416,956	1,074,908	4,491,864	2,272,240	1,798,280	4,070,520
1991	ND	ND	ND	ND	ND	ND
1992	ND	ND	ND	ND	ND	ND
1998	ND	ND	ND	ND	ND	ND
1999	1,215,406	6,139,901	7,355,307	852,083	4,036,610	4,888,693
2001	ND	ND	ND	ND	ND	ND
2003	ND	ND	ND	ND	ND	ND
2005	ND	ND	ND	ND	ND	ND
2008	765,571	600,037	1,365,608	1,170,770	651,872	1,822,642
2011	ND	ND	ND	ND	ND	ND
2012	ND	ND	ND	ND	ND	ND
2013	ND	ND	ND	ND	ND	ND
2014	115,250	174,188	289,438	332,407	327,815	660,222
2015	321,564	106,005	427,569	332,750	164,851	497,601
2016 [a]	ND	ND	ND	4,430,032	240,951	4,670,983
2017 [a]	ND	ND	ND	5,216,900	183,078	5,399,978
2018 [a]	ND	ND	ND	8,394,054	161,054	8,555,108
Averages						
1988–2008	1,684,618	2,354,021	4,038,639	1,442,468	2,032,952	3,475,421
2011–2015	218,407	140,097	358,504	332,579	246,333	578,912
2016–2018				6,013,662	195,028	

Note: "MA" means management area and "ND" means "No Data."

[a] Preliminary data.

Table 49.–Razor clam harvest age and length compositions and number of samples for the Eastside beaches as a whole, 2009–2018.

	Age (years)						Length (mm)						
										Percentage by size class			
Year	Min	Max	Mean	Mode	Number of broods	Percent ≥5 yr	Min	Max	Mean	<80 mm	≥80 mm to <129 mm	≥130 mm	Number of samples
2009	1	10	4.3	4	10	37.7	21	152	107	4.6	87.9	7.5	1,361
2010	2	11	3.6	2	9	28.5	38	143	91	35.0	62.3	2.7	1,350
2011	2	10	3.9	3	11	23.6	54	159	99	4.1	94.4	1.5	1,489
2012	1	11	4.4	4	15	27.9	9	166	107	3.5	93.1	3.5	1,506
2013 [a]	1	9	4.8	5	13	57.4	39	140	101	19.5	77.3	3.2	1,386
2014 [b]	1	11	4.2	2	13	31.2	11	158	97	19.5	75.6	4.9	1,392
2015 [c]	1	9	3.9	3	14	33.1	37	145	96	18.6	77.6	3.8	1,540
2016	1	11	3.4	2	11	18.9	23	153	84	41.4	56.1	2.4	1,320
2017	1	10	2.8	3	10	10.9	19	157	72	73.7	24.9	1.4	1,311
2018	1	8	3.0	3	8	3.6	6	131	69	75.6	24.3	0.1	1,339
	Min	Max	Mean	Mode	Mean	Mean	Min	Max	Mean	Mean	Mean	Mean	Total
1966–2008 [d]	1	15	5.5	5	13	62.9	18	184	111	7.9	72.0	20.1	35,672
2009–2012	1	11	4.0	4	11	29.3	9	166	102	11.4	84.8	3.8	5,706
2013–2015	1	11	4.0	3	11	40.2	11	158	98	19.2	76.8	4.0	4,318
2016–2018	1	11	3.1	3	11	11.3	6	157	75	63.6	35.1	1.3	3,970

Note: "ND" means no data.

[a] In 2013, bag and possession limits were reduced by emergency order from 60 to 25 razor clams from the mouth of the Kenai River to the tip of the Homer Spit including the Eastside beaches as a whole.

[b] In 2014, Ninilchik Bar, Ninilchik South, and Ninilchik North subareas were closed to the taking of clams by emergency order and bag and possession limits were reduced to 25 razor clams for other subareas and beaches from the Kenai River to the tip of Homer Spit. Although the 3 Ninilchik subareas were closed to harvesting of razor clams, the age and length samples were still obtained from these subareas and incorporated into the composition estimates to maintain standardization of the data through the years.

[c] In 2015, all beaches and management areas from the Kenai River to the tip of the Homer Spit were closed to the taking of clams by emergency order. Although the Eastside beaches as a whole were closed to harvesting of razor clams, the age and length samples were still obtained from the subareas and incorporated into the composition estimates to maintain standardization of the data through the years.

[d] 1966–2008 data published in Kerkvliet et al. (2016).

Table 50.–Razor clam age and length compositions for Polly Creek, 2013–2018.

	Polly Creek												
	Age (years)						Length (mm)						
										Percentage by size class			
Year	Min	Max	Mean	Mode	Number of broods	Percent ≥5 yr	Min	Max	Mean	<80 mm	≥80 mm to <129 mm	≥130 mm	Number of samples [a]
2013	4	11	6.7	7	8	91.0	105	162	135	0.0	33.0	67.0	100
2014	3	13	7.6	7	11	98.1	112	163	139	0.0	20.0	80.0	160
2015	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
2016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
2017	1	13	6.3	4	12	73.3	66	120	120	2.0	67.3	30.7	150
2018	3	10	5.4	5	8	78.7	13	145	109	2.0	87.3	10.7	150
Cumulative													
2013–2015	3.5	12.0	7.2	7.0	9.5	94.6	108.2	162.4	136.7	0.0	26.5	73.5	260
2016–2018	2.0	11.5	5.9	4.5	10.0	76.0	39.5	132.6	114.5	2.0	77.3	20.7	300

[a] The number of razor clams sampled for age and length is the total number of clams with ages and includes some samples without total length.

Table 51.–Razor clam age and length compositions for Crescent River, 2013–2018.

	Crescent River												
	Age (years)						Length (mm)						
										Percentage by size class			
Year	Min	Max	Mean	Mode	Number of broods	Percent ≥5 yr	Min	Max	Mean	<80 mm	≥80 mm to <129 mm	≥130 mm	Number of samples [a]
2013	5	17	10.3	7	13	100.0	101	174	142	0.0	19.5	80.4	133
2014	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
2015	2	16	7.3	8	15	79.7	39	165	117	6.5	63.0	30.4	138
2016	1	18	6.8	5	17	80.0	41	172	119	8.0	54.7	37.3	150
2017	2	12	5.4	5	11	71.3	61	159	109	3.3	90.0	6.7	150
2018	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
Cumulative													
2013–2015	3.5	16.5	8.8	7.5	14.0	89.9	70.1	169.7	129.3	3.3	41.3	55.4	271
2016–2018	1.5	15.0	6.1	5.0	14.0	75.7	50.9	165.4	114.0	5.7	72.4	22.0	300

[a] The number of razor clams sampled for age and length is the total number of clams with ages and includes some samples without total length.

Table 52.–Kachemak Bay male Tanner crab abundance estimates from trawl surveys, 1990–2018.

		Pre-recruits					
Year	Tows [a]	Pre-4 (<66 mm)	Pre-3 (66-79 mm)	Pre-2 (80-95 mm)	Pre-1 (96-113 mm)	Legal males (≥114 mm)	Total males [b]
1990	14	434,468	336,711	556,501	493,498	893,456	2,714,634
1991	15	252,510	131,374	273,576	685,422	1,379,426	2,722,308
1992	15	209,831	71,948	134,688	381,086	1,978,011	2,775,565
1993	16	558,464	59,025	73,378	107,855	848,811	1,647,532
1994	16	260,137	127,473	161,944	101,303	356,245	1,007,104
1995	16	300,509	198,207	301,598	484,296	811,735	2,096,344
1996	16	176,841	32,054	49,592	454,902	742,973	1,456,364
1997	16	134,484	87,749	107,042	244,548	478,055	1,051,879
1998	16	320,868	16,134	9,216	20,131	403,196	771,087
1999	16	713,951	699,162	830,294	518,904	312,049	3,074,360
2000	16	446,734	231,376	345,433	316,831	480,494	1,820,868
2001	16	1,508,596	470,833	344,754	255,343	504,698	3,084,224
2002	14	1,673,386	908,731	838,260	369,526	311,822	4,101,726
2003	16	884,933	861,700	806,086	553,965	358,230	3,464,914
2004	16	635,416	355,266	1,041,375	723,209	868,019	3,623,284
2005	15	986,832	174,394	87,049	155,515	405,890	1,809,679
2006	17	970,276	133,238	113,845	191,802	456,127	1,865,289
2007	16	326,276	38,953	100,798	116,841	561,046	1,143,914
2008	16	528,442	87,852	187,970	125,792	351,461	1,281,516
2009	15	818,177	439,944	547,114	636,899	752,945	3,195,079
2010				no survey			
2011	37	4,005,798	190,619	78,819	32,032	139,263	4,447,159
2012	37	1,527,582	2,375,372	721,862	123,414	80,921	4,829,149
2013	37	778,423	390,244	716,835	1,098,146	192,637	3,179,046
2014				no survey			
2015				no survey			
2016				no survey			
2017	38	180,159	369,070	274,479	187,270	124,965	1,135,943
2018	39	410,009	1,597,348	2,153,925	3,608,940	222,852	7,993,072
Averages							
1990–2013		802,301	366,016	366,436	356,142	594,240	2,485,349
2017–2018		295,084	983,209	1,214,202	1,898,105	173,909	4,564,508

[a] From 1990 to 2009, tow lengths were approximately 1 nmi; since 2011, tow lengths have been approximately 0.5 nmi (Goldman et al. 2018).

[b] In 1998, 2011, and 2013, summations of size classes total does not equal estimated total males and differing by 0.2%, 0.2%, and 0.9% due to either minor imperfections in the input data or truncated values which propagated through the computations before expansion.

Table 53.–Sport, personal use, and subsistence crab harvests in Cook Inlet reported on ADF&G permits 2008–2012 and 2017–2019.

		Effort		Tanner crab	
Year	Location	Trips	Crabber-days	Harvest	Catch
2008–2009	Cook Inlet north of Anchor Point	2	3	0	0
	Cook Inlet remainder	148	249	823	3,861
	North Gulf Coast	12	19	9	48
	Kachemak Bay east of Homer Spit	699	1,203	3,443	13,995
	Kachemak Bay west of Homer Spit	2,079	3,580	12,742	58,157
	Unknown	38	54	156	452
	Total	2,978	5,108	17,173	76,513
2009–2010 [a]	Cook Inlet north of Anchor Point	5	5	20	131
	Cook Inlet remainder	138	357	1,320	4,123
	North Gulf Coast	70	128	241	1,901
	Kachemak Bay east of Homer Spit	581	1,149	3,358	13,093
	Kachemak Bay west of Homer Spit	2,203	3,625	13,783	61,058
	Unknown	21	23	105	302
	Total	3,018	5,287	18,827	80,608
2010–2011 [a]	Cook Inlet north of Anchor Point	8	14	34	114
	Cook Inlet remainder	92	197	610	1,543
	North Gulf Coast	24	31	41	179
	Kachemak Bay east of Homer Spit	437	759	1,708	4,871
	Kachemak Bay west of Homer Spit	2,251	3,537	10,968	38,360
	Unknown	67	185	384	1,335
	Total	2,879	4,723	13,745	46,402
2011–2012 [a, b]	Cook Inlet north of Anchor Point	6	9	21	48
	Cook Inlet remainder	57	104	372	1,002
	North Gulf Coast	15	19	48	170
	Kachemak Bay east of Homer Spit	312	518	1,509	3,266
	Kachemak Bay west of Homer Spit	1,167	2,145	6,762	23,324
	Unknown	37	68	267	628
	Total	1,594	2,863	8,979	28,438
2017–2018 [a]	Cook Inlet north of Anchor Point	ND	3	7	ND
	Cook Inlet remainder	ND	7	15	ND
	North Gulf Coast	ND	49	63	ND
	Kachemak Bay east of Homer Spit	ND	161	335	ND
	Kachemak Bay west of Homer Spit	ND	3,030	8,010	ND
	Unknown	ND	54	115	ND
	Total	ND	3,304	8,545	ND
2018–2019 [a]	Cook Inlet north of Anchor Point	ND	15	29	ND
	Cook Inlet remainder	ND	26	46	ND
	North Gulf Coast	ND	124	313	ND
	Kachemak Bay east of Homer Spit	ND	137	242	ND
	Kachemak Bay west of Homer Spit	ND	2,986	8,139	ND
	Unknown	ND	0	0	ND
	Total	ND	3,288	8,769	ND

Note: "ND" means no data available.

[a] Harvest numbers were expanded for nonrespondents.

[b] Closed by EO 6 September 2011.

Table 54.–Dungeness crab density (number of crabs/nautical mile towed) in the Kachemak Bay trawl survey, 1990–2018.

		Males			
		Small	Legal		
Year	Tows [a]	<165.1 mm	≥165.1 mm	Total	Total females
1990	14	21.93	0.35	22.28	40.25
1991	15	12.00	2.83	14.83	23.63
1992	15	9.62	4.35	13.97	35.13
1993	16	4.21	4.85	9.06	26.69
1994	16	0.73	1.51	2.24	6.05
1995	16	9.06	0.54	9.60	6.05
1996	16	7.51	3.48	10.99	22.88
1997	16	1.54	0.55	2.10	5.30
1998	16	0.32	0.19	0.51	0.76
1999	16	0.38	0.62	1.00	1.48
2000	16	0.31	0.35	0.44	1.12
2001	16	33.17	2.83	33.48	41.34
2002	14	5.43	4.35	6.34	24.70
2003	16	11.54	4.85	12.10	17.28
2004	16	3.45	1.51	4.32	5.38
2005	15	2.45	0.54	3.31	2.69
2006	17	53.05	3.48	56.12	25.93
2007	16	7.97	0.55	9.04	27.22
2008	16	8.19	0.19	9.08	15.53
2009	15	0.73	0.00	0.73	0.20
2010			no survey		
2011	37	0.05	0.05	0.10	0.10
2012	37	0.25	0.00	0.25	0.06
2013	37	0.33	0.00	0.33	0.17
2014			no survey		
2015			no survey		
2016			no survey		
2017	38	10.58	0.21	10.79	18.64
2018	39	23.98	2.45	26.44	78.55
Averages					
1990–1997		8.33	2.31	10.63	20.75
1998–2013		8.51	1.30	9.15	10.93
2017–2018		17.28	1.33	18.61	48.60

[a] From 1990 to 2009, tow lengths were approximately 1 nmi; since 2011, tow lengths have been approximately 0.5 nmi (Goldman et al. 2018).

FIGURES

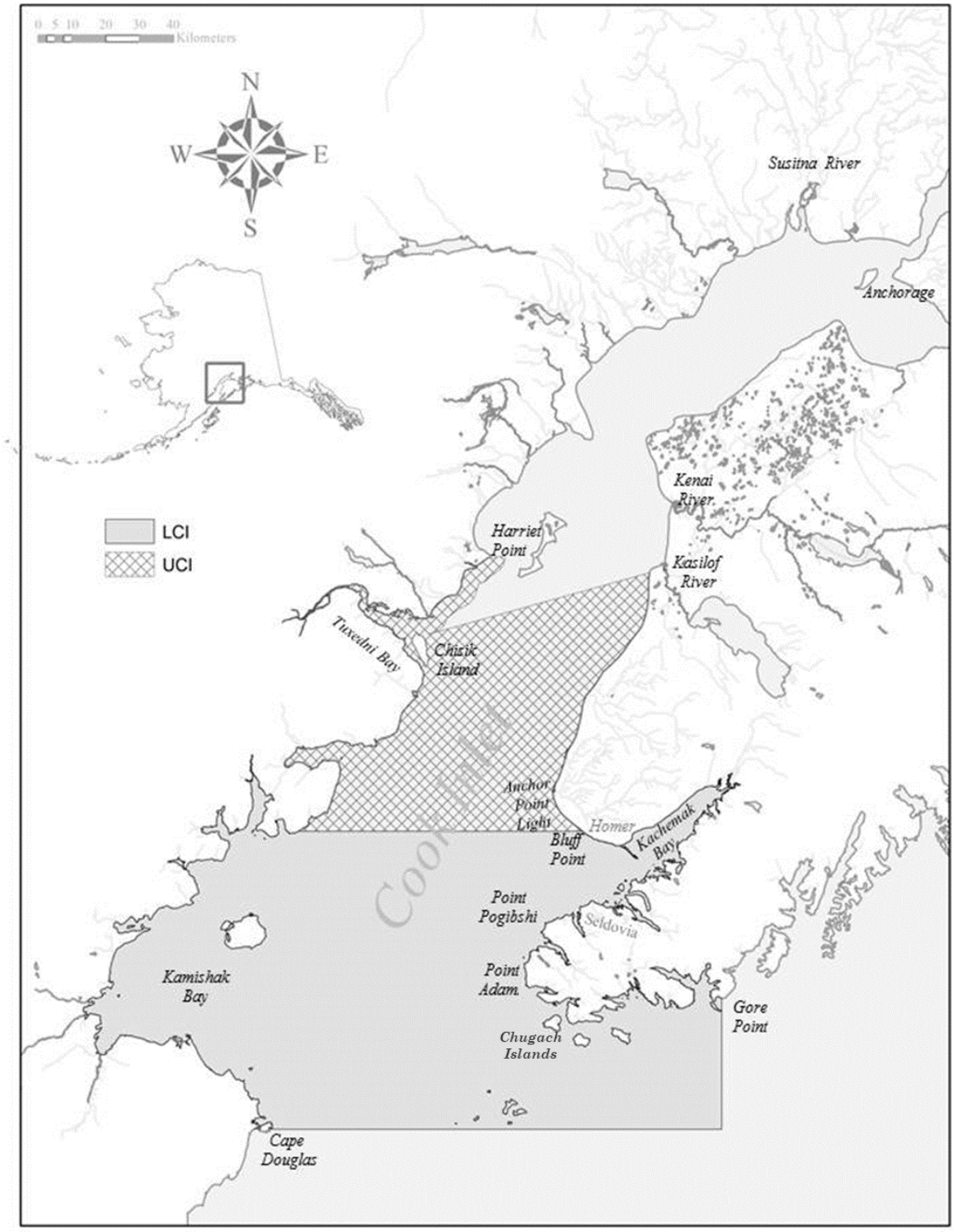

Figure 1.–Alaska Department of Fish and Game, Division of Sport Fish, Lower Cook Inlet Management Area (LCIMA).

Note: "LCI" is lower LCIMA and "UCI" is upper LCIMA.

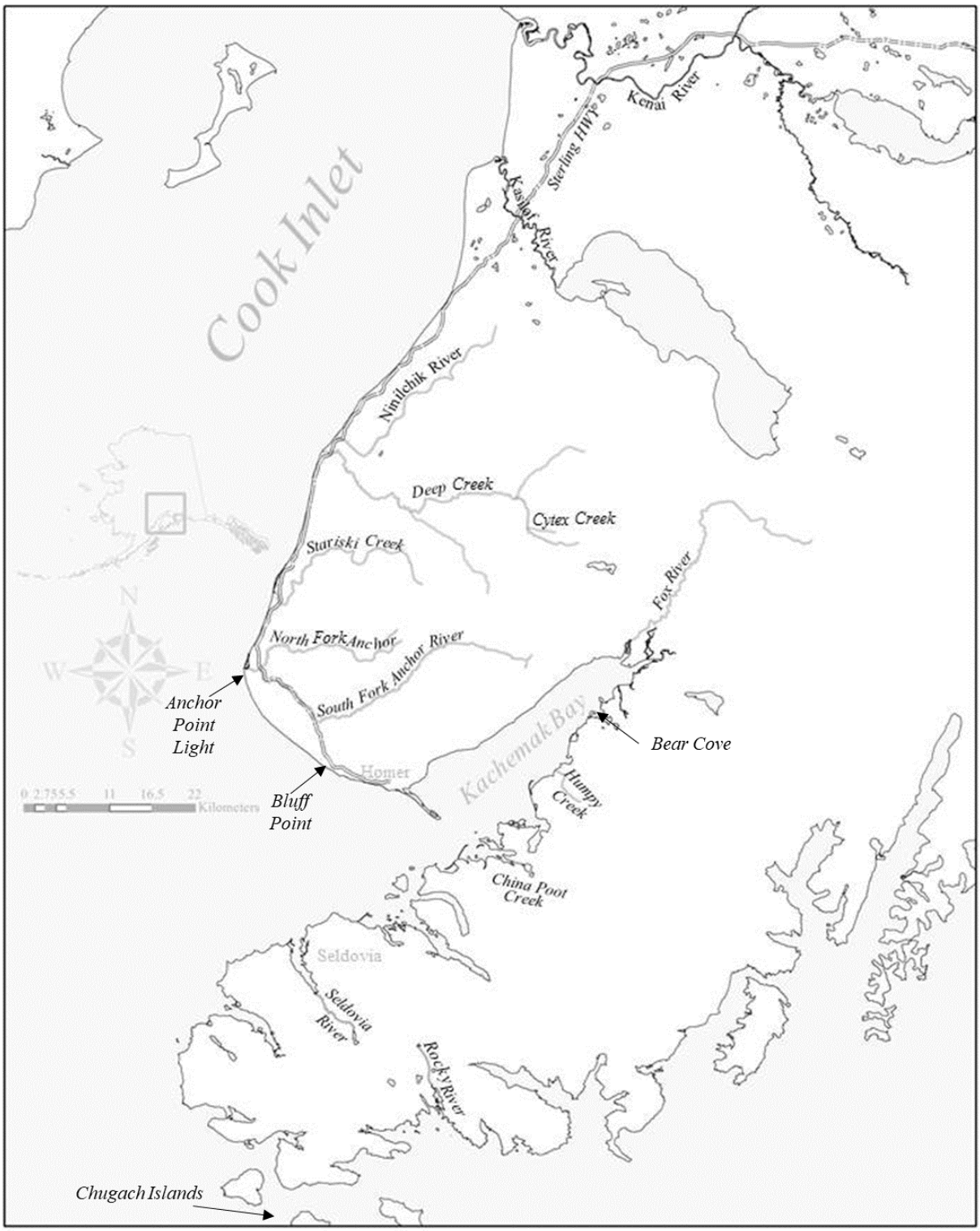

Figure 2.–Kenai Peninsula freshwater sport fishery locations in LCIMA.

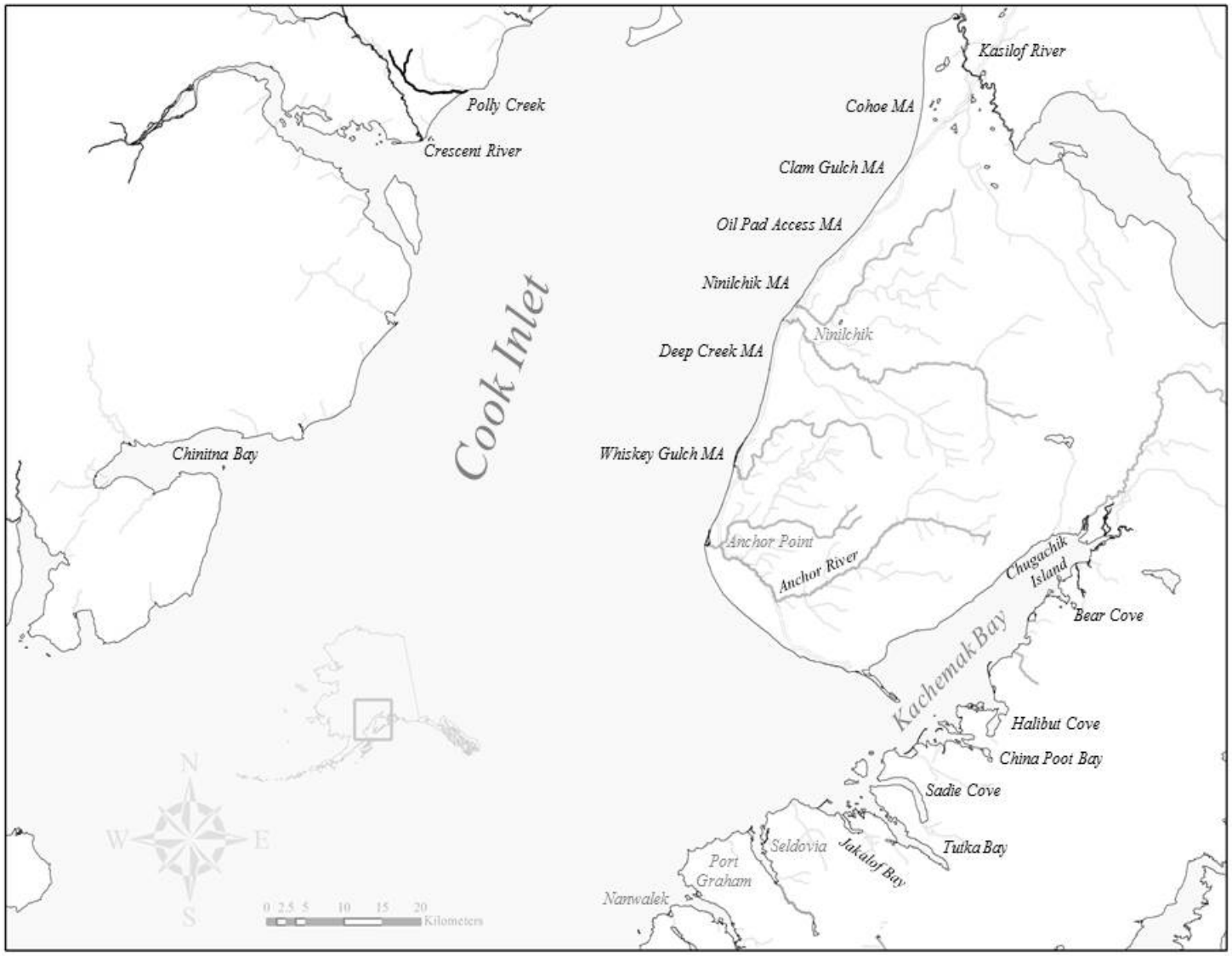

Figure 3.–Shellfish sport–personal use fishery locations in LCIMA.

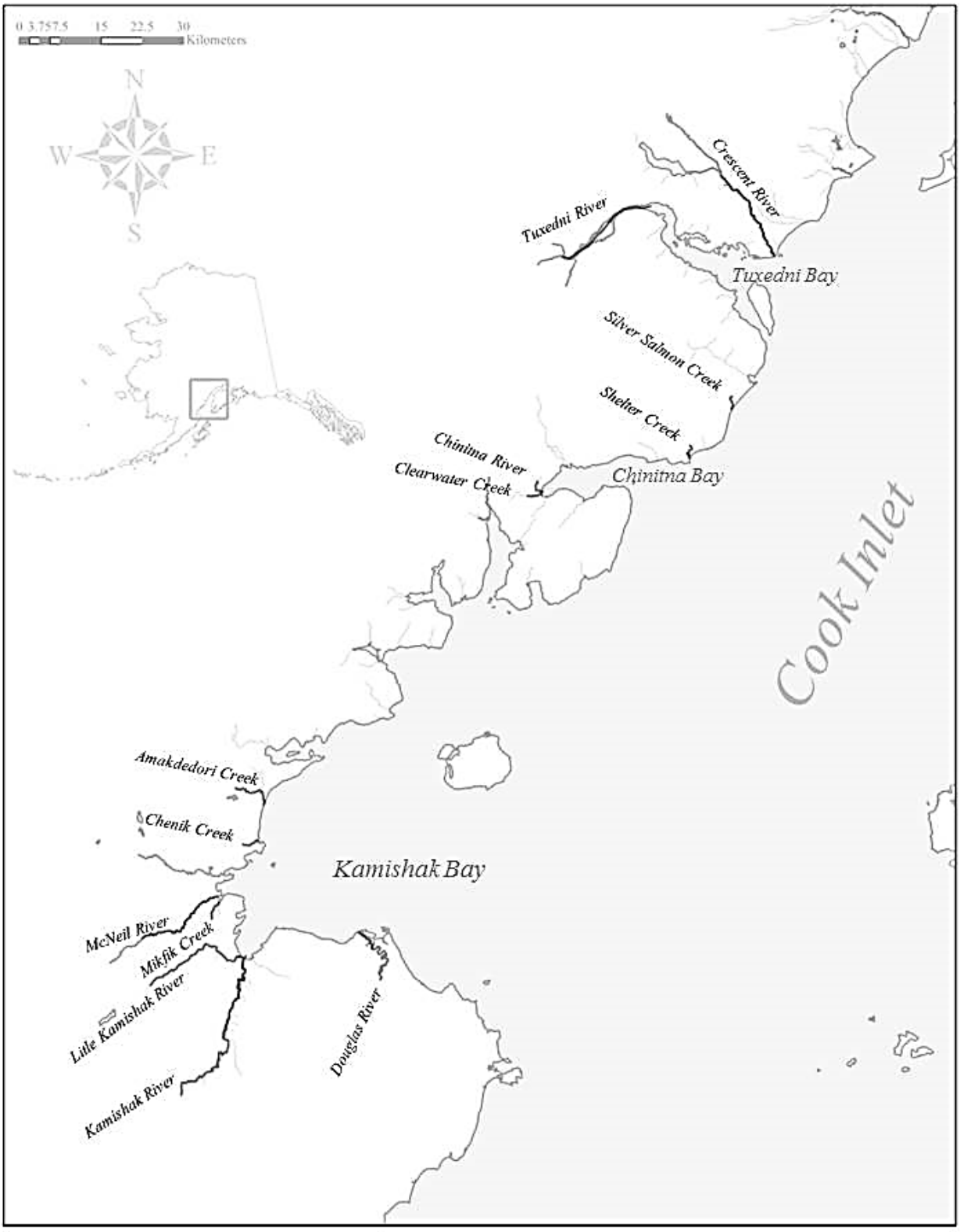

Figure 4.–West LCIMA freshwater sport fishery locations.

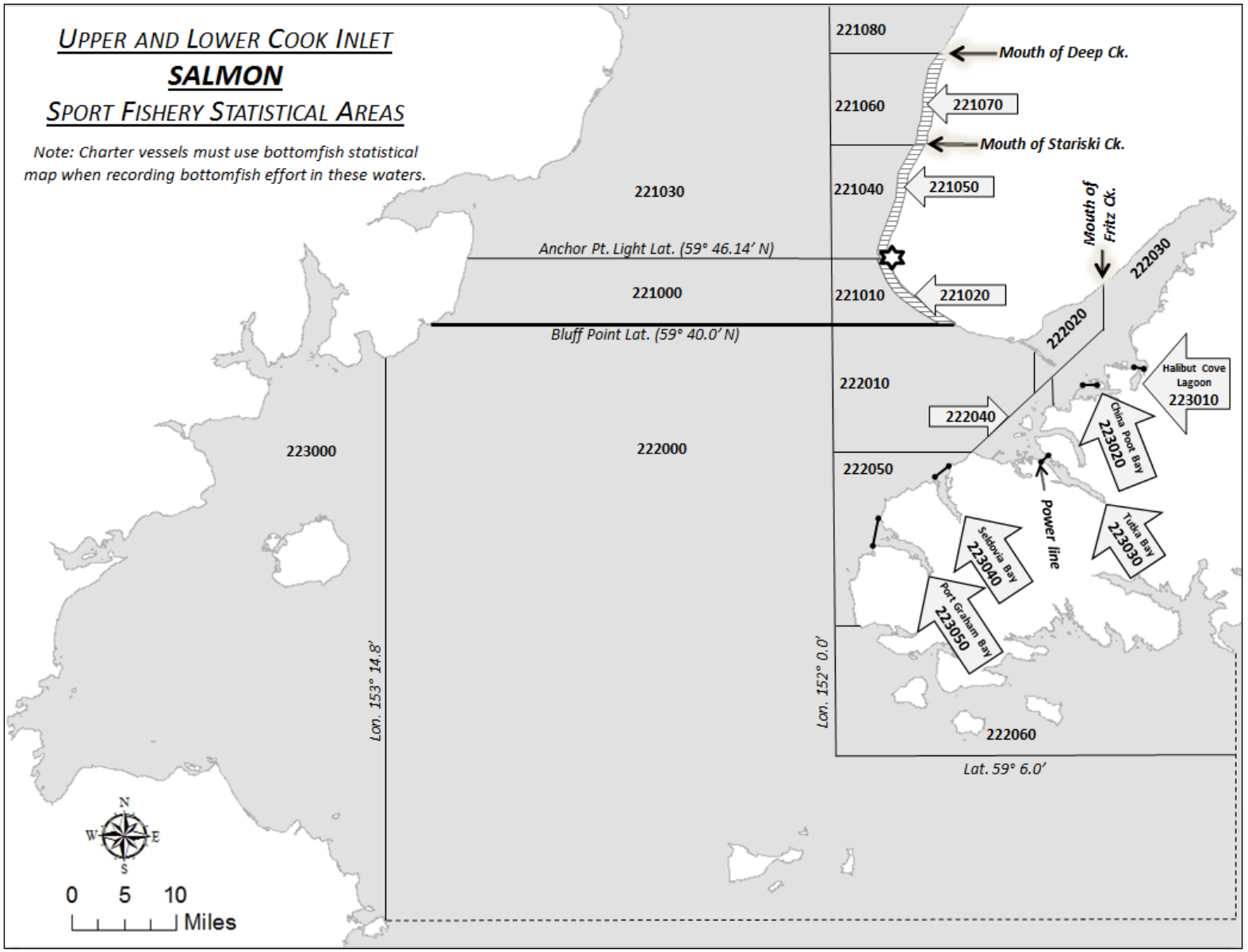

Figure 5.–Upper and lower LCIMA salmon statistical areas for Charter Logbook reporting.

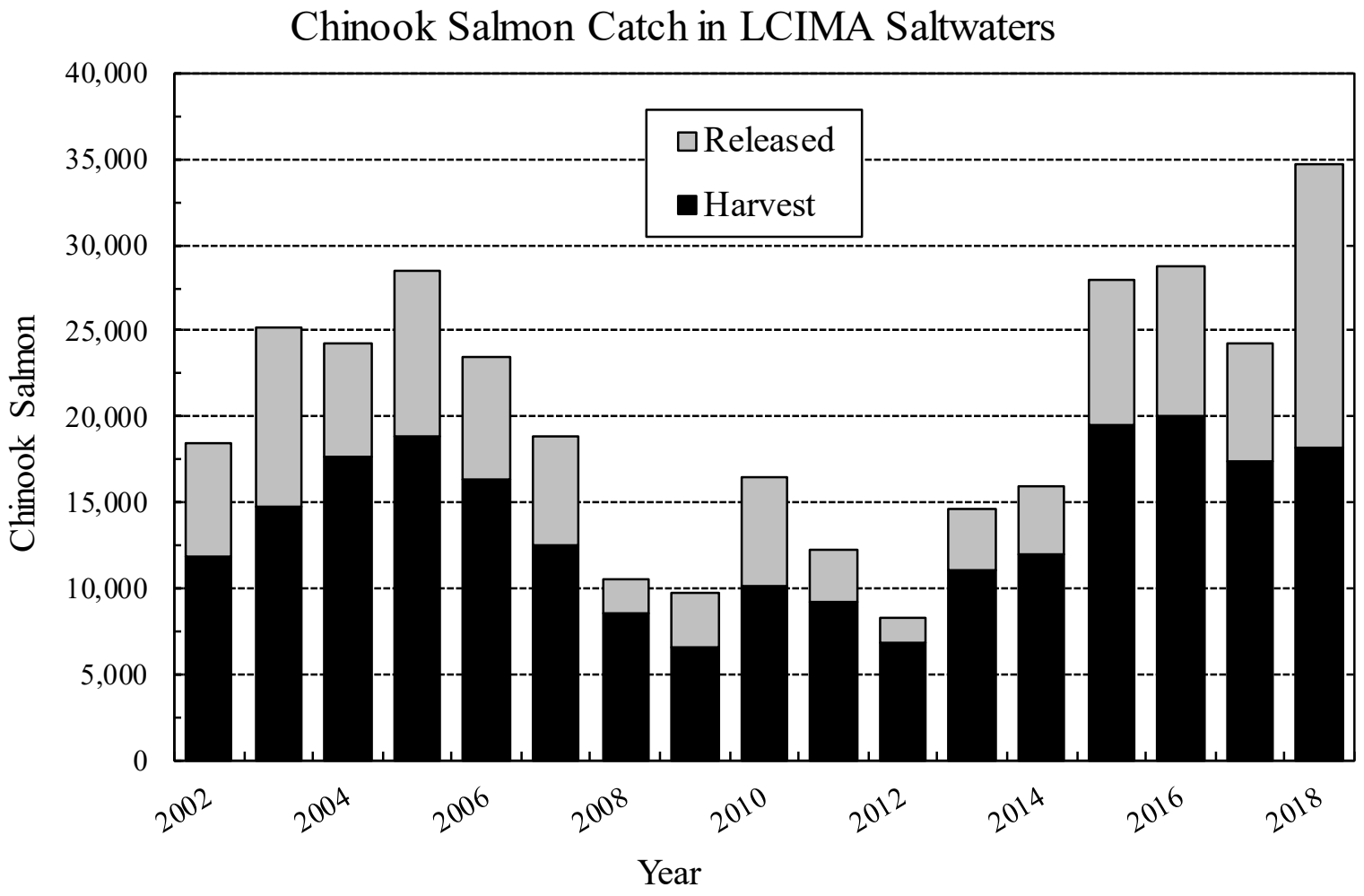

Figure 6.–SWHS estimates of Chinook salmon sport catch by numbers harvested and released in LCIMA salt waters, 1990–2018.

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 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

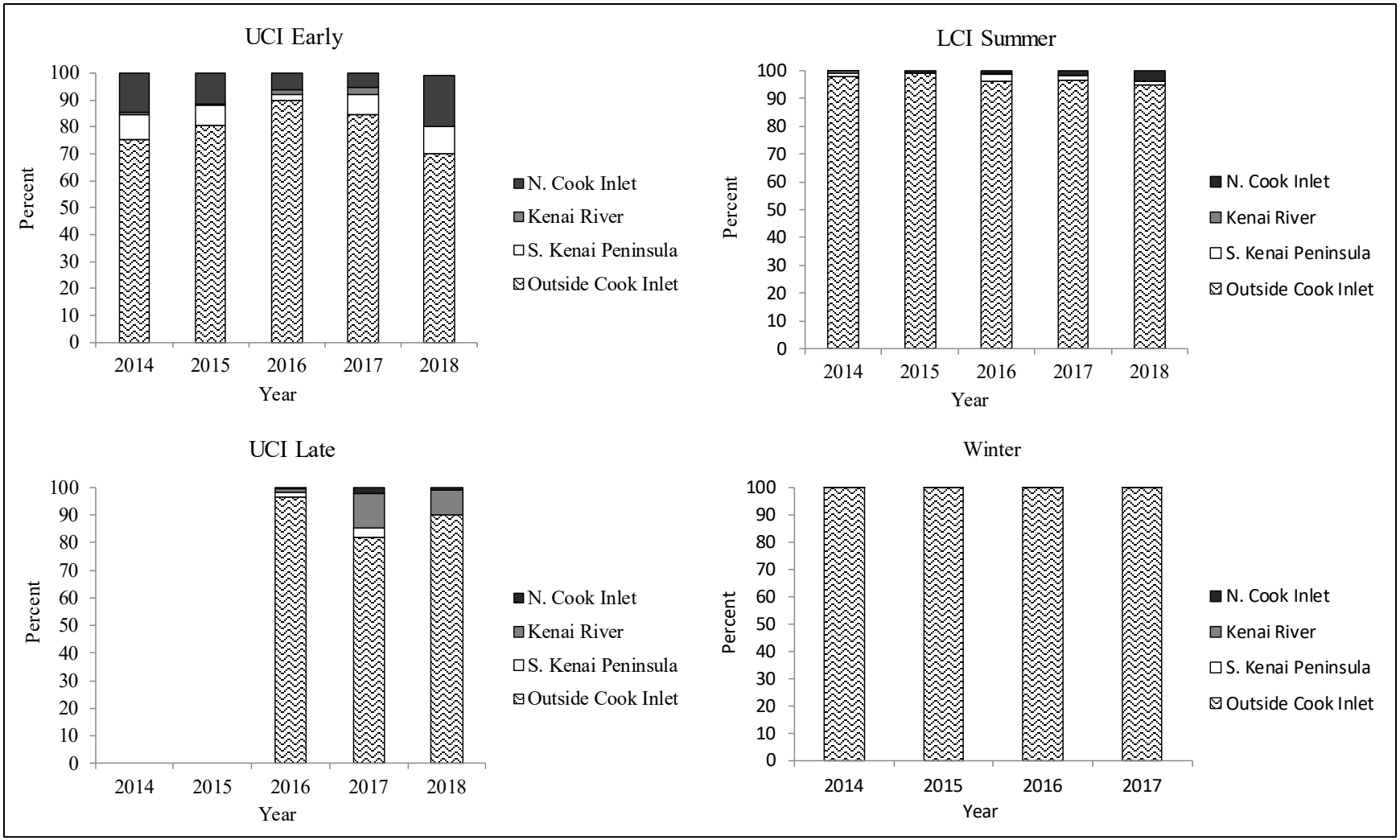

Figure 7.–Genetic mixed stock analysis (MSA) by reporting group for the Upper Cook Inlet early run (top left), Upper Cook Inlet late run (bottom left), Lower Cook Inlet summer (top right), and Winter (bottom right) Chinook salmon sport fisheries, 2014–2018.

Source: Barclay et al. (2019).

Figure 8.–Lower Cook Inlet terminal salmon fishery locations in LCIMA.

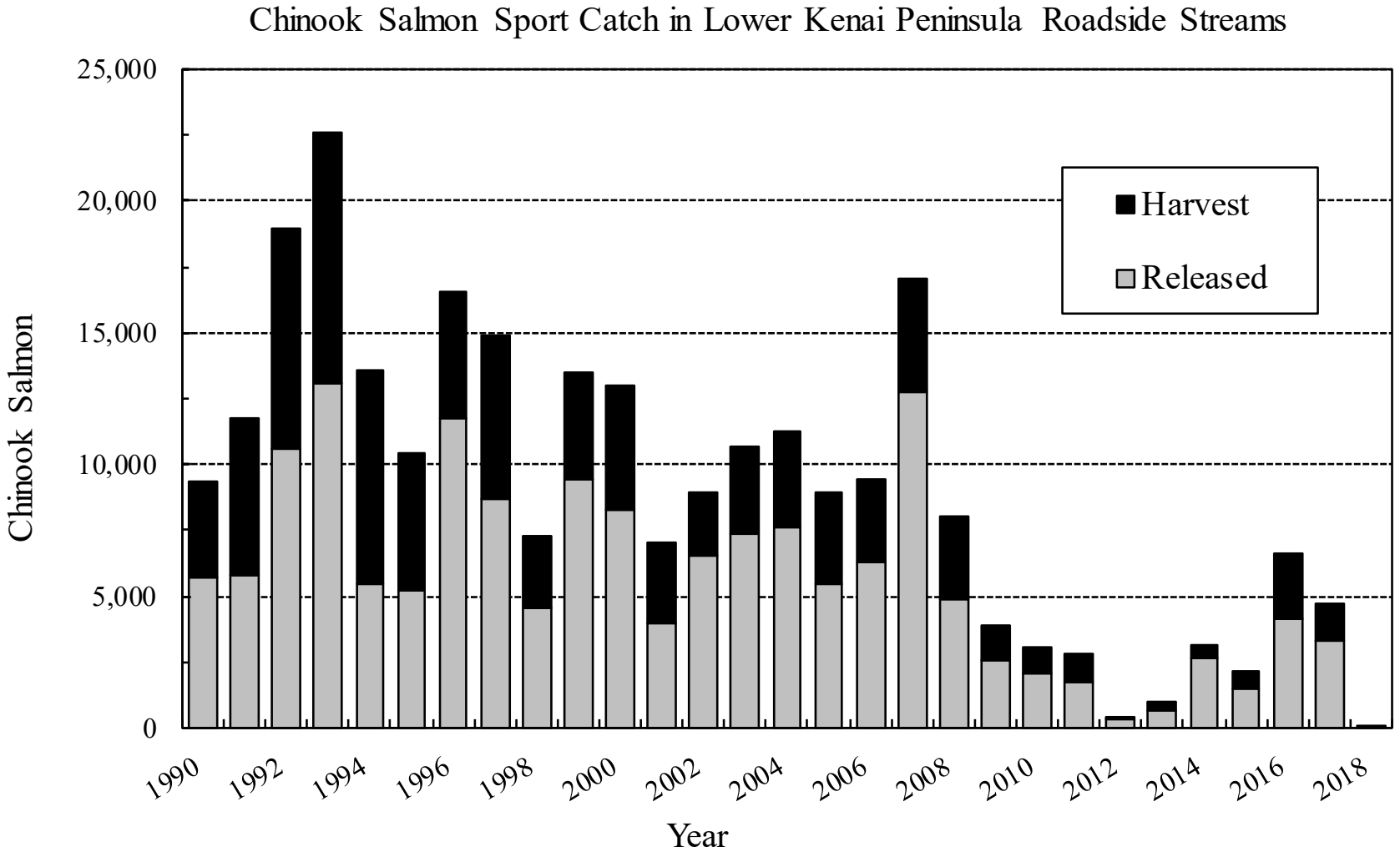

Figure 9.–SWHS estimates of Chinook salmon sport catch by harvest and number released in the lower Kenai Peninsula roadside streams, 1990–2018.

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 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

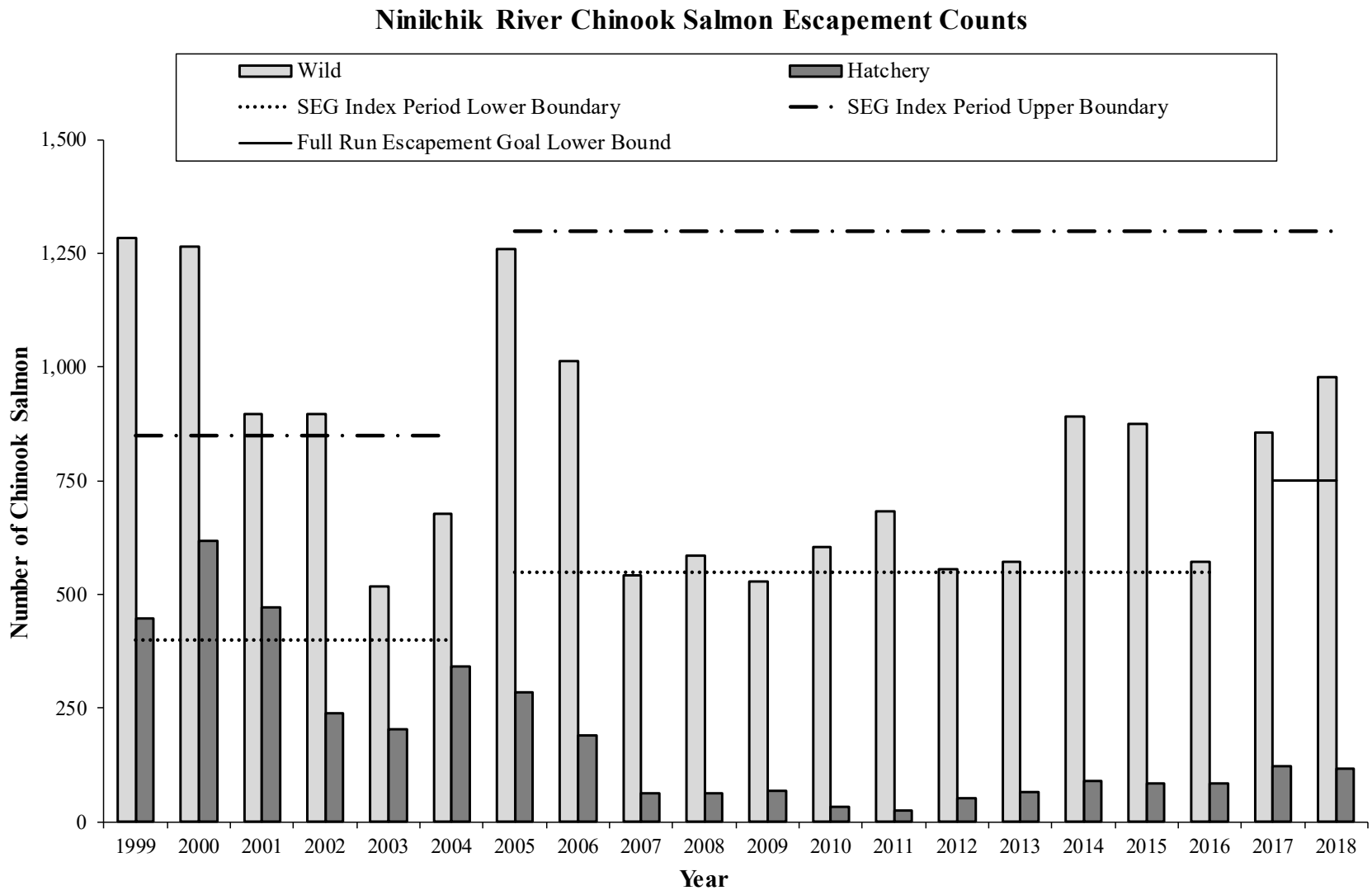

Figure 10.–Ninilchik River Chinook salmon annual escapement counts during the periods monitored for the escapement goal, 1999–2018.

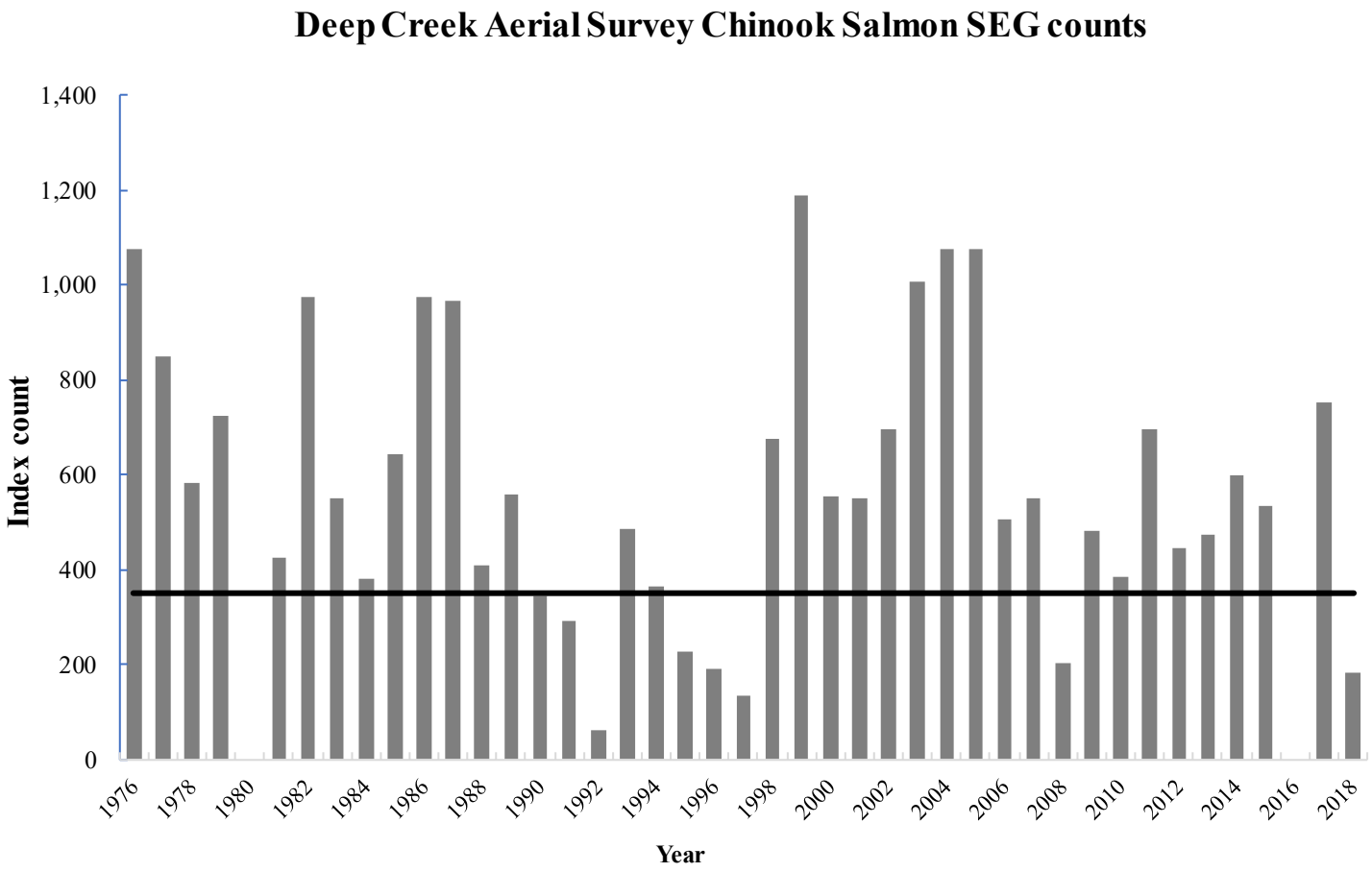

Figure 11.–Aerial Survey counts of Chinook salmon for Deep Creek, 1976–2018.

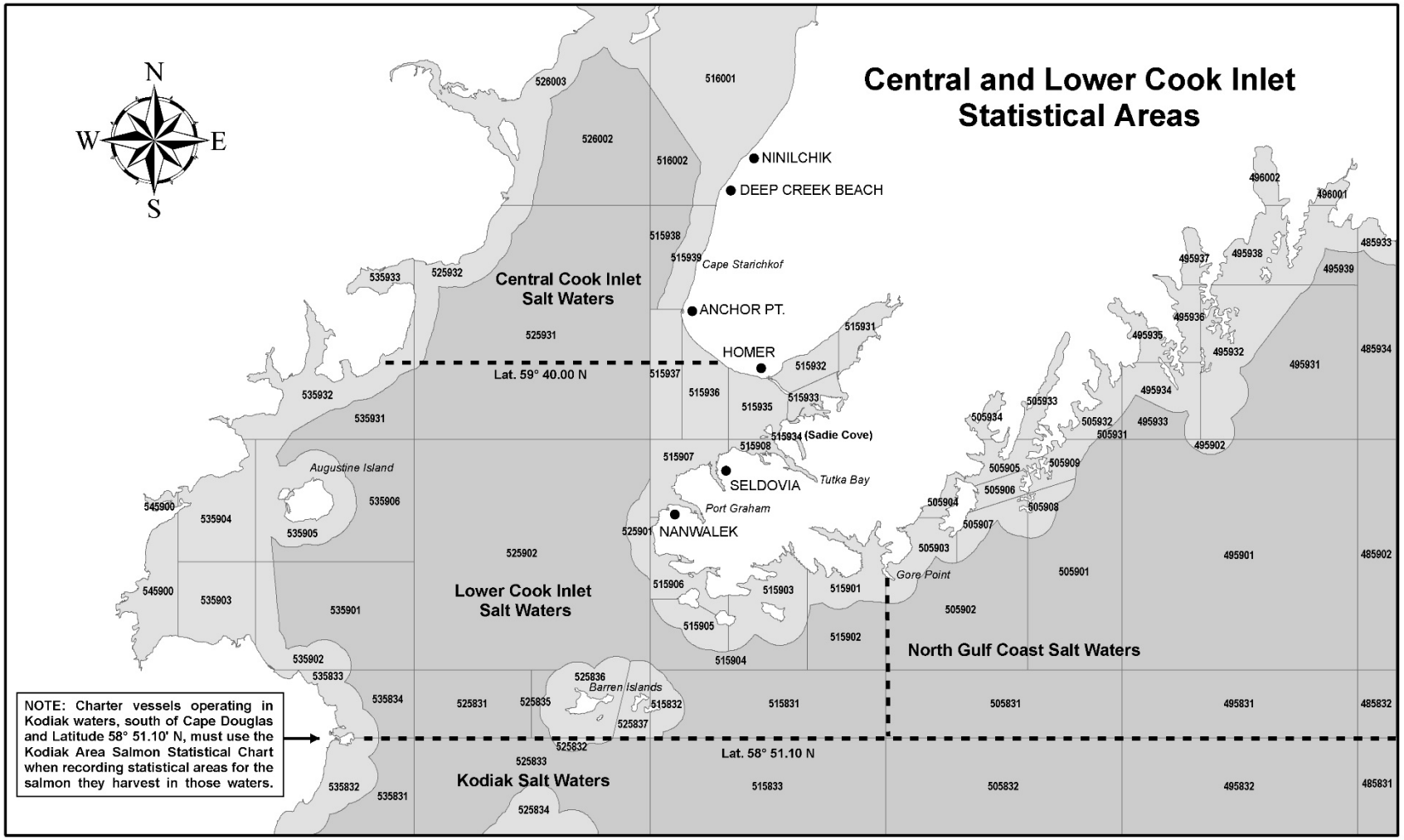

Figure 12.–Groundfish statistical areas for Charter Logbook reporting in LCIMA.

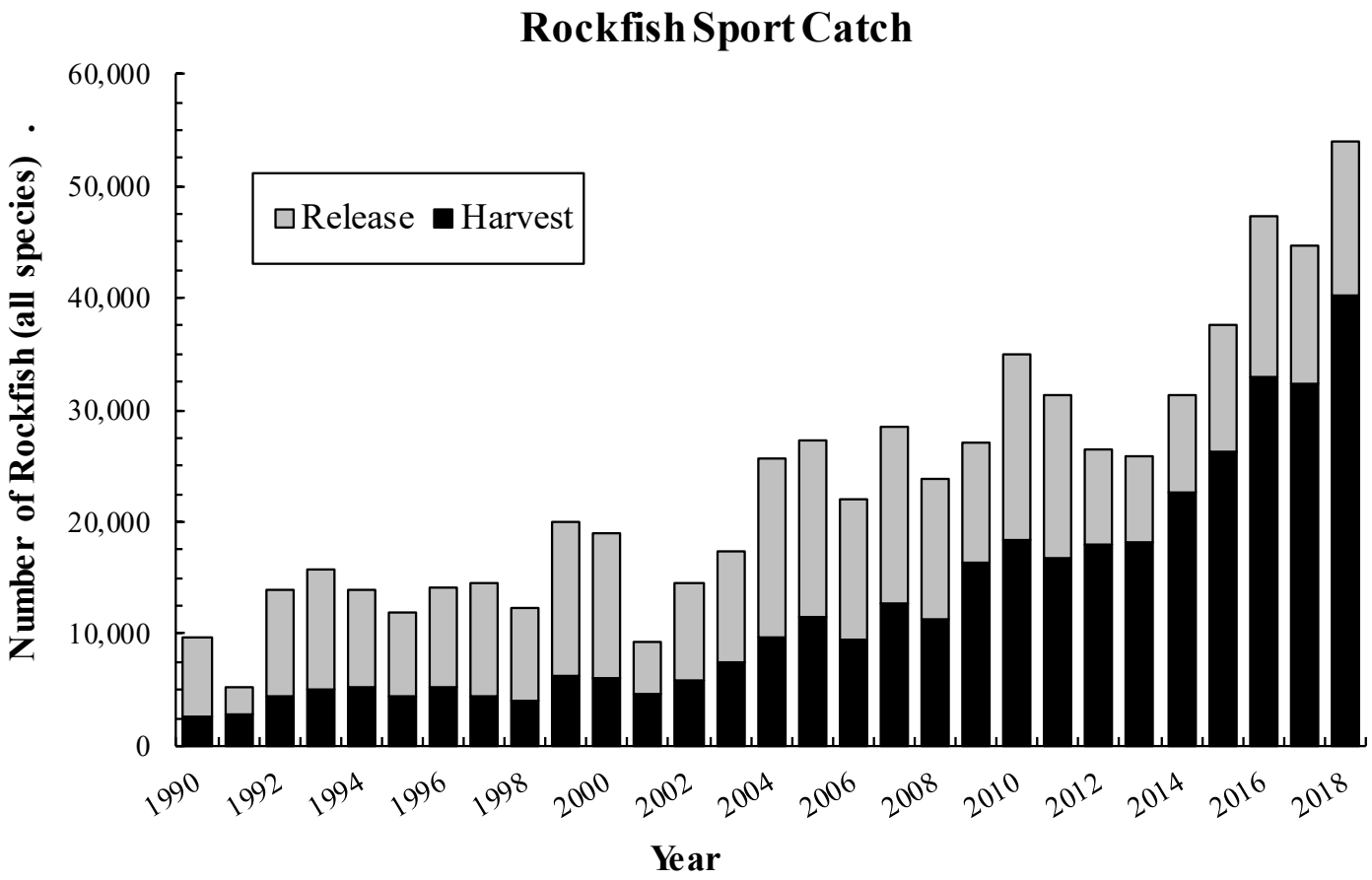

Figure 13.–SWHS estimates of rockfish sport catch by numbers harvested and released in LCIMA, 1990–2018.

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 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

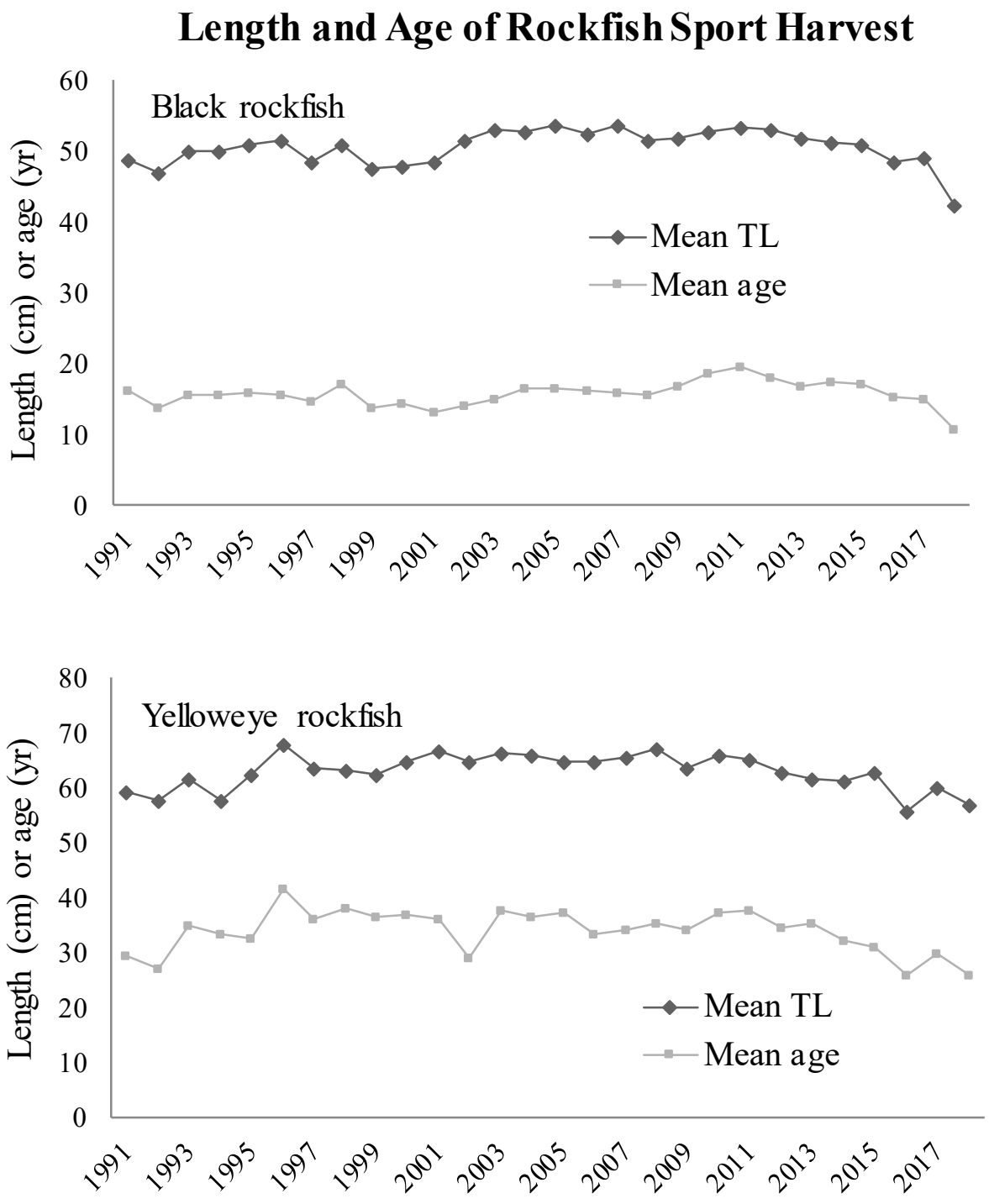

Figure 14.–Mean total length (TL) and age of black (top) and yelloweye (bottom) rockfish sport harvest in LCIMA, 1991–2018.

Source: Unpublished data, M. Schuster, Fishery Biologist, ADF&G, Homer.

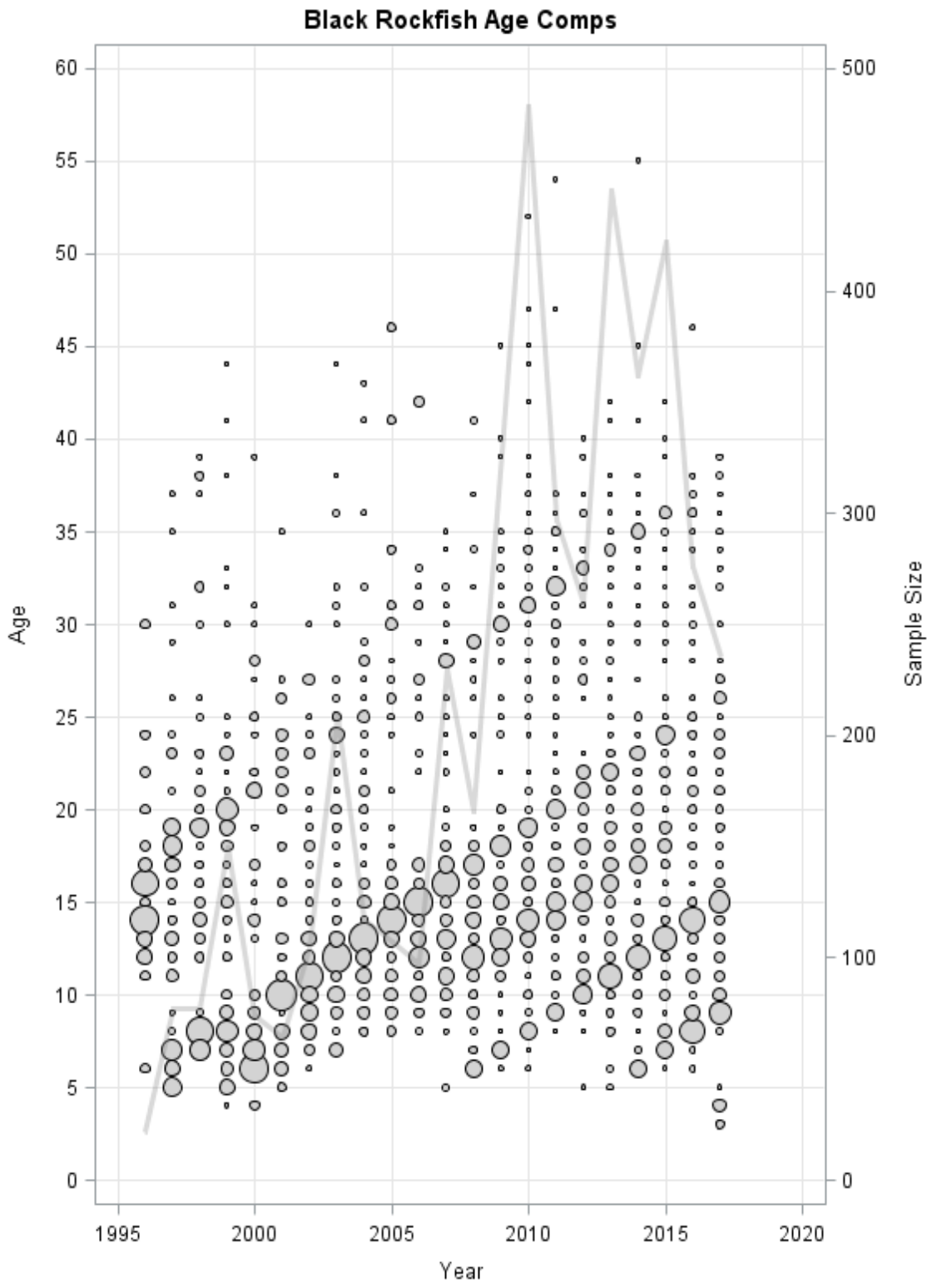

Figure 15.–Age composition of black rockfish sport harvest in the LCIMA, 1991–2018.

Source: Meyer and Failor (*In prep*).

Note: Sample size given in light grey line.

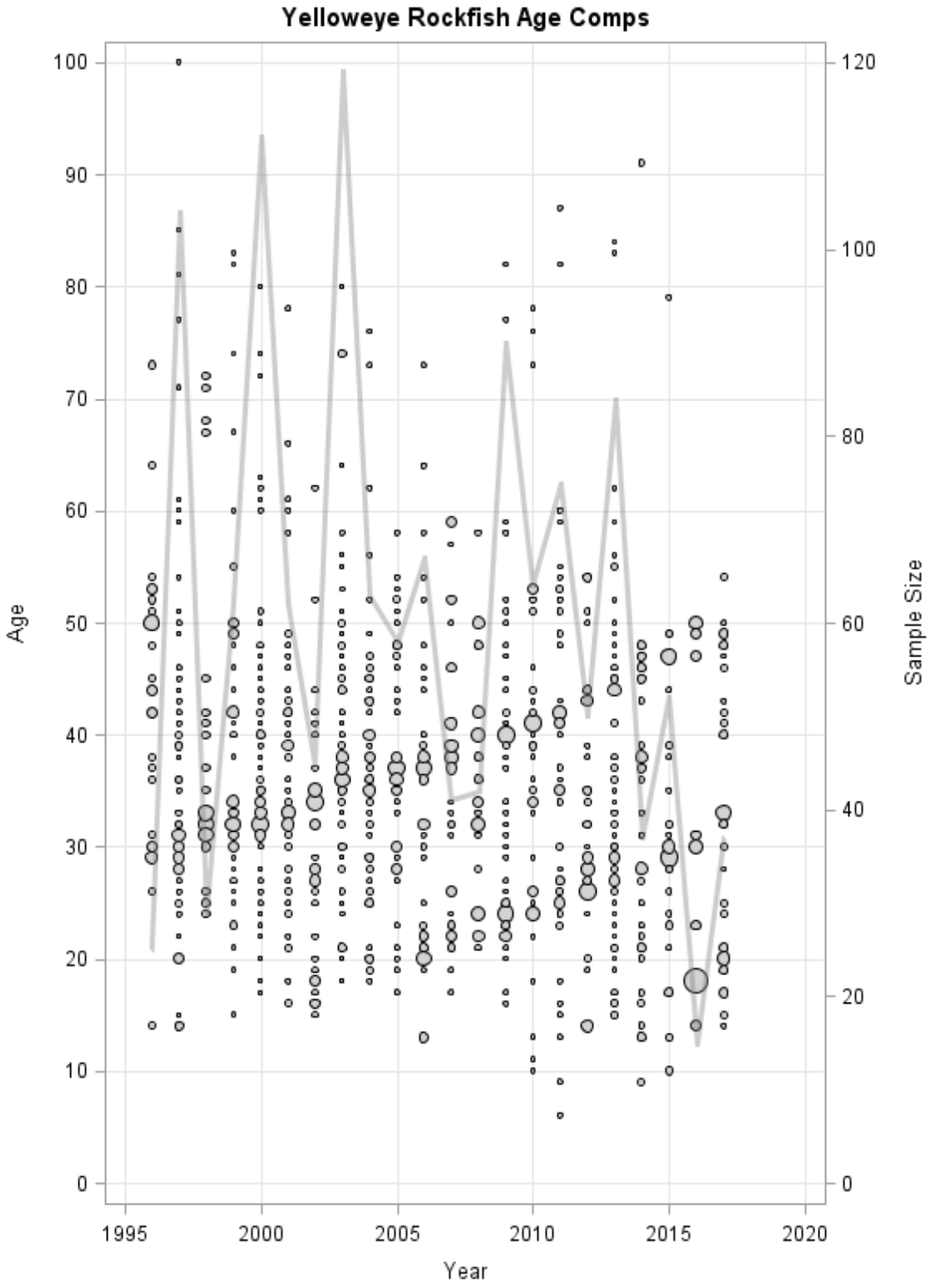

Figure 16.–Age composition of black rockfish sport harvest in the LCIMA, 1991–2018.

Source: Meyer and Failor (*In prep*).

Note: Sample size given in light grey line.

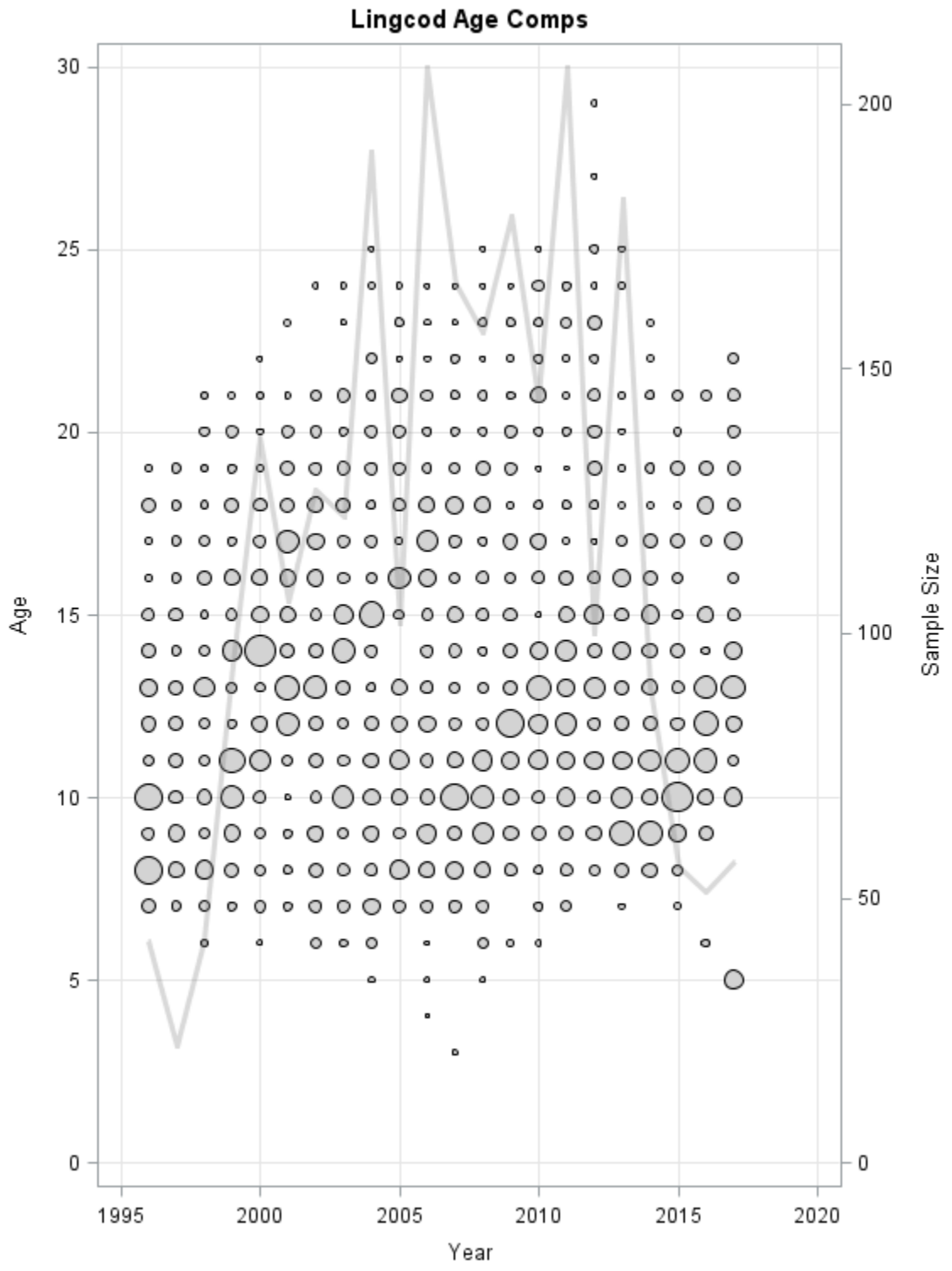

Figure 17.–Age composition of lingcod sport harvest in the LCIMA, 1991–2018.

Source: Meyer and Failor (*In prep*).
Note: Sample size given in light grey line.

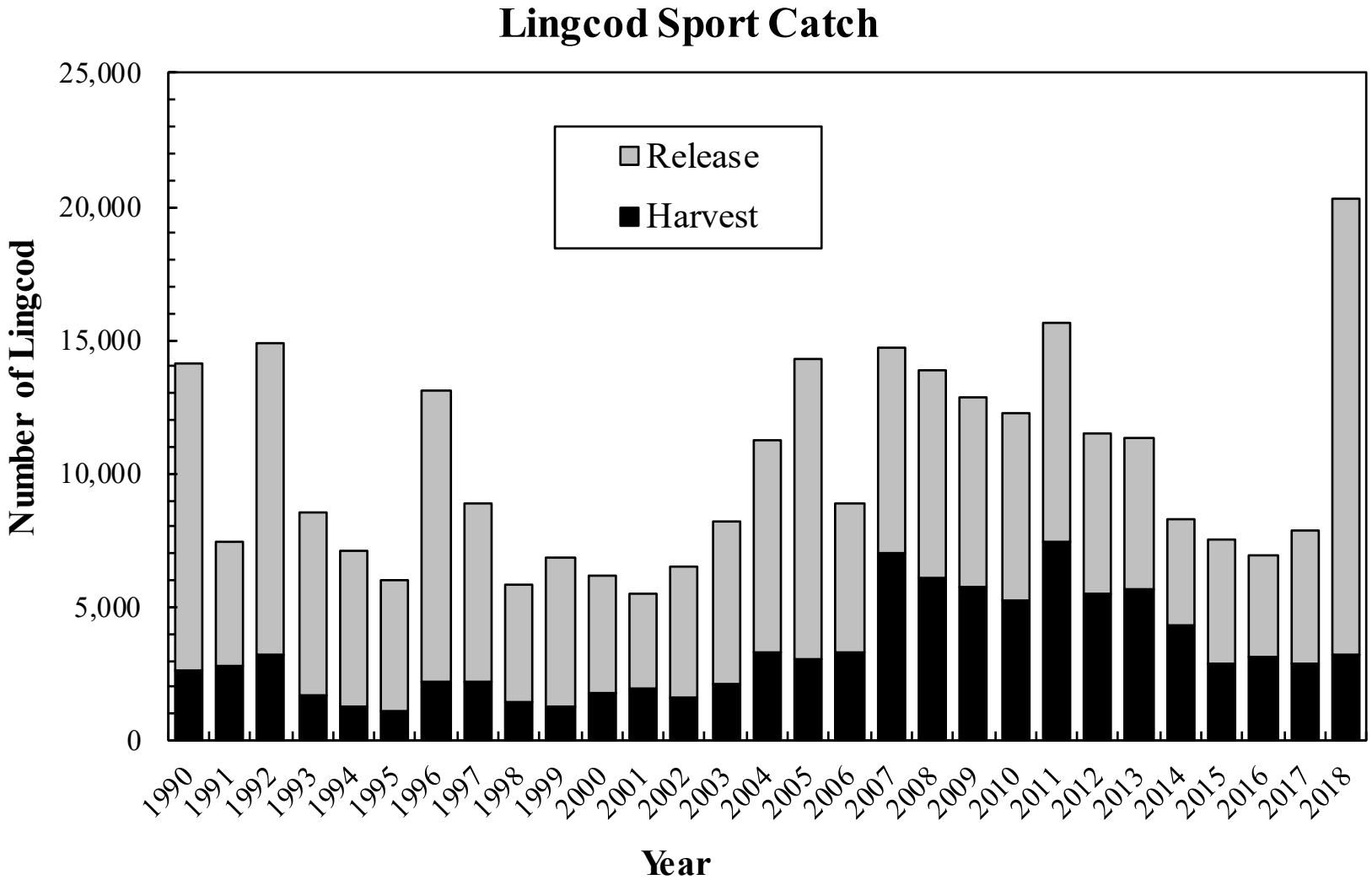

Figure 18.–SWHS estimates of lingcod sport catch by numbers harvested and released in LCIMA, 1990–2018.

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 2019). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

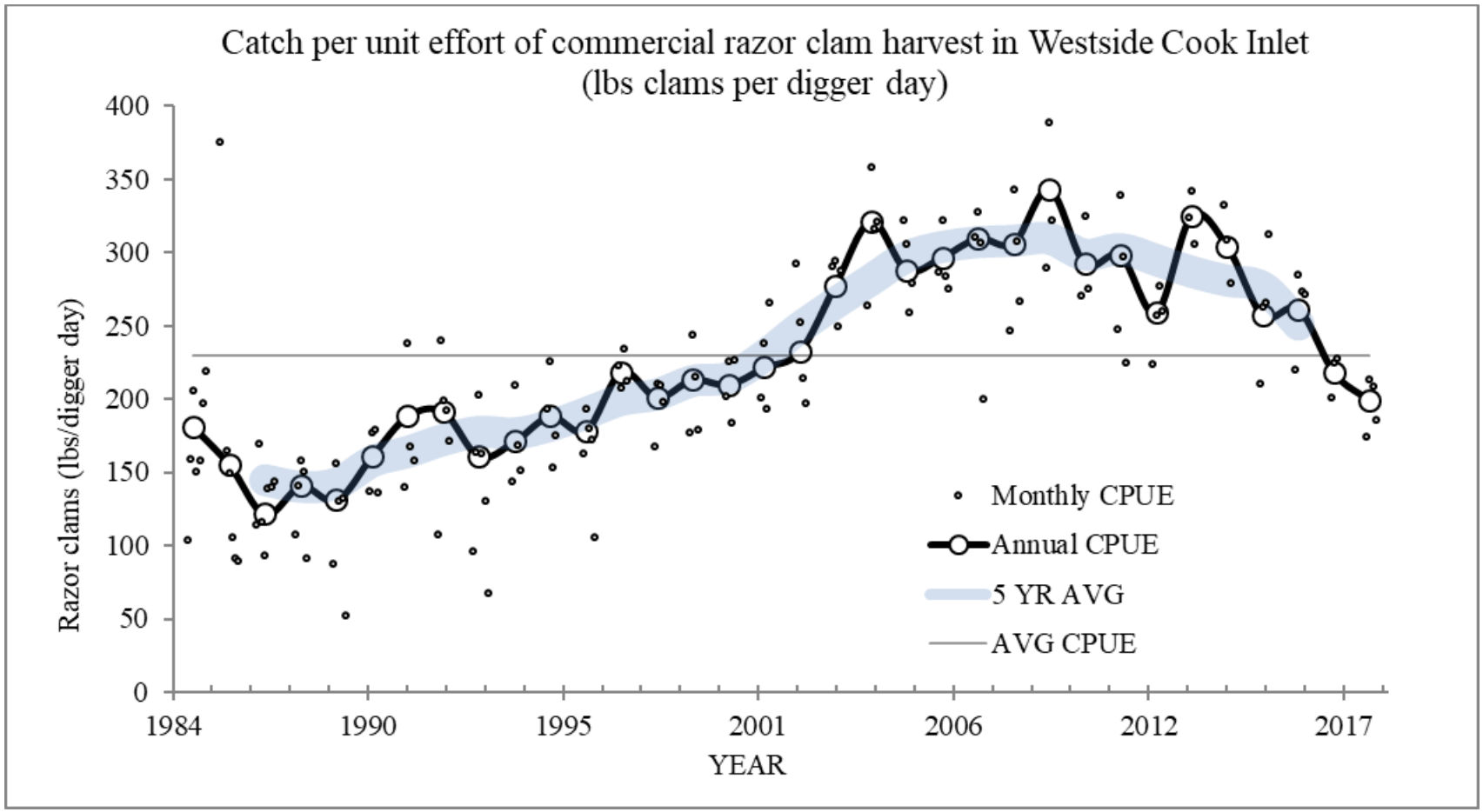

Figure 19.–Catch per unit effort of the commercial razor clam fishery in west LCIMA, 1984–2018.

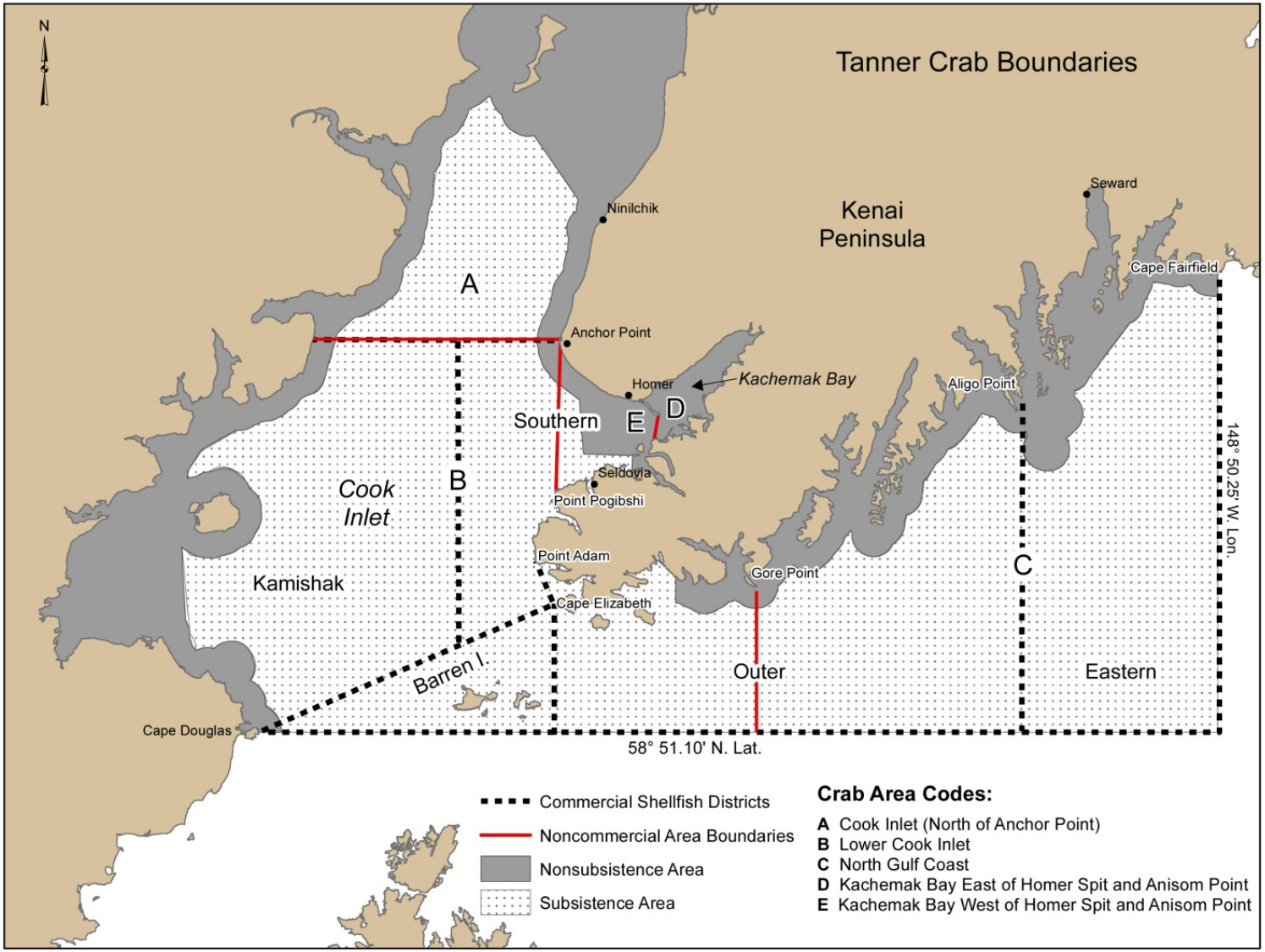

Figure 20.–Tanner crab harvest area codes and subsistence and nonsubsistence areas.

APPENDIX A: EMERGENCY ORDERS

Appendix A1.–Emergency orders (EOs) issued for LCIMA waters during 2008–2018[13].

Emergency Orders issued in 2008:

1) EO 2-RS-7-06-08 closed the waters of the English Bay drainage and Port Graham Subdistrict to sport fishing for sockeye salmon from 11:59 PM, Saturday, 31 May 2008 through 11:59 PM, Thursday, 31 July 2008.
2) EO 2-RS-7-15-08 rescinded the English Bay and Port Graham closure effective 6:00 AM, Tuesday, 1 July 2008.
3) EO 2-SS-7-27-08 opened NDFL to snagging from 12:00 noon, Friday, 12 September 2008 through 11:59 PM, Wednesday, 31 December 2008.

Emergency Orders issued in 2009:

1) EO 2-KS-7-08-09 closed waters of the Anchor River drainage from its mouth upstream to the junction of the north and south forks to fishing and increased the closed area in the salt waters of Cook Inlet at the mouth of the Anchor River from 2 miles to 4 miles beginning 12:01 AM, Saturday, 6 June 2009 through 11:59 PM, Tuesday, 30 June 2009.

Emergency Orders issued in 2010:

1) EO 2-KS-7-10-10 prohibited the use of bait in the Anchor River, Deep Creek, and Ninilchik River drainages, and increased the closed area in the salt waters of Cook Inlet at the mouth of the Anchor River from 1 to 2 miles north and south of the Anchor River mouth and 1 mile off shore beginning 12:01 AM, Saturday, 5 June 2010 through 11:59 PM, Wednesday, 30 June 2010.
2) EO 2-KS-7-15-10 prohibited the retention of Chinook salmon in the Anchor River drainage from its mouth upstream to the junction of the north and south forks beginning 12:01 AM, Saturday, 12 June 2010 through 11:59 PM, Wednesday, 30 June 2010. Chinook salmon could not be possessed or retained; Chinook salmon caught could not be removed from the water and had to be released immediately. EO 2-KS-7-10-10, which prohibited the use of bait in the Anchor River, Deep Creek, and Ninilchik River drainages, remained in effect.
3) EO 2-KS-7-28-10 closed the salt waters of Cook Inlet at the mouth of the Anchor River to all sport fishing from 2 miles north and south of the Anchor River mouth and 1 mile offshore beginning 12:01 AM, Thursday, 1 July 2010 through 11:59 PM, Saturday, 31 July 2010.
4) EO 2-TC-7-27-10 reduced the daily bag and possession limits for male Tanner crab in Cook Inlet from 5 per person to 4 per person beginning 12:01 AM, Thursday, 15 July 2010 through 11:59 PM, Tuesday, 15 March 2011 during open fishing periods.
5) EO 2-KS-7-36-10 rescinded EO 2-KS-7-28-10 issued 29 June 2010. Effective 12:01 AM, Tuesday, 13 July 2010, the salt waters of Cook Inlet at the mouth of the Anchor River from 2 miles north and south of the Anchor River mouth and 1 mile offshore were open to all sport fishing.

-continued-

[13] See Kerkvliet et al. (2016) for emergency orders from 1996 through 2007.

Emergency Orders issued in 2011:

1) EO 2-HC-7-04-11 reduced the combined sport fishery bag and possession limits of littleneck and butter clams in the Cook Inlet–Resurrection Bay Saltwater Area, including Kachemak Bay, to 80 clams per person beginning 12:01 AM, Saturday, 14 May 2011 through 11:59 PM, Saturday, 31 December 2011.
2) EO 2-HC-7-05-11 reduced the combined personal use bag and possession limits of littleneck and butter clams in the Cook Inlet–Resurrection Bay Saltwater Area, including Kachemak Bay, to 80 clams per person beginning 12:01 AM, Saturday, 14 May 2011 through 11:59 PM, Saturday, 31 December 2011.
3) EO 2-KS-7-06-11 prohibited the use of bait in the Anchor River, Deep Creek, and Ninilchik River drainages beginning 11 June 2011 through 11:50 PM, Wednesday, 22 June 2011.
4) EO 2-KS-7-07-11 closed the waters of the Anchor River drainage from its mouth upstream to the junction of the north and south forks to sport fishing beginning 12:01 AM, Wednesday, 15 June 2011 through 11:59 PM, Thursday, 30 June 2011.
5) EO 2-KS-7-16-11 required the use of only 1 unbaited, single-hook, artificial lure in the flowing waters of the Anchor River drainage, and closed the salt waters of Cook Inlet at the mouth of the Anchor River to all sport fishing from 2 miles north and south of the Anchor River mouth and 1 mile offshore beginning 12:01 AM, Friday, 1 July 2011 through 11:59 PM, Sunday, 31 July 2011.
6) EO 2-TC-7-28-11 closed the Tanner crab fishery in waters of Kachemak Bay located east of a line from Anchor Point to Point Pogibshi beginning 12:01 AM, Tuesday, 6 September 2011 through 11:59 PM, Thursday, 15 March 2012.

Emergency Orders issued in 2012:

1) EO 2-HC-7-04-12 reduced the combined sport fishery bag and possession limits of littleneck and butter clams in the Cook Inlet–Resurrection Bay Saltwater Area, including Kachemak Bay, to 80 clams per person beginning 12:01 AM, Wednesday, 4 April 2012 through 11:59 PM, Monday, 31 December 2012.
2) EO 2-HC-7-05-12 reduced the combined personal use fishery bag and possession limits of littleneck and butter clams in the Cook Inlet–Resurrection Bay Saltwater Area, including Kachemak Bay, to 80 clams per person beginning 12:01 AM, Wednesday, 4 April 2012 through 11:59 PM, Monday, 31 December 2012.
3) EO 2-KS-7-08-12 closed waters of the Anchor River drainage from its mouth upstream to the junction of the north and south forks to sport fishing each Wednesday during the Chinook salmon season beginning 12:01 AM, Saturday, 19 May 2012. In addition, this EO also decreases the waters of the Anchor River drainage open to sport fishing by relocating the ADF&G regulatory marker downstream approximately 1,000 feet below the junction of the north and south forks beginning 12:01 AM, Saturday, 19 May 2012 through 11:59 PM, Tuesday, 31 July 2012.
4) EO 2-KS-7-09-12 limited sport fishing gear to only 1 unbaited, single-hook, artificial lure when fishing in the Anchor River, Deep Creek, and Ninilchik River drainages beginning 12:01 AM, Saturday, 2 June 2012 through 11:59 PM, Wednesday, 20 June 2012.

-continued-

Emergency Orders issued in 2012 (continued):

5) EO 2-KS-7-10-12 closed waters of the Anchor River drainage from its mouth upstream to the junction of the north and south forks to sport fishing beginning 12:01 AM, Saturday, 9 June 2012 through 11:59 PM, Saturday, 30 June 2012.
6) EO 2-KS-7-13-12 prohibited sport fishing within 1 mile of shore in the salt waters of Cook Inlet south of the latitude of the mouth of the Ninilchik River to the latitude of Bluff Point beginning 12:01 AM, Friday, 15 June 2012 through 11:59 PM, Saturday, 30 June 2012.
7) EO 2-KS-7-21-12 closed waters of the Anchor River and Ninilchik River from the mouth upstream approximately 2 miles to the ADF&G markers to sport fishing for any species of fish, beginning 12:01 AM, Sunday, 1 July 2012 through 11:59 PM, Sunday, 15 July 2012.
8) EO 2-KS-7-22-12 limited sport fishing gear to only 1 unbaited, single-hook, artificial lure when fishing in the Ninilchik River, Deep Creek, Stariski Creek, and Anchor River drainages beginning 12:01 AM, Sunday, 1 July 2012 through 11:59 PM, Tuesday, 31 July 2012.
9) EO 2-KS-7-23-12 prohibited the retention of Chinook salmon while sport fishing within 1 mile of shore in the salt waters of Cook Inlet south of the latitude of the mouth of the Ninilchik River to the latitude of Bluff Point beginning 12:01 AM, Sunday, 1 July 2012, through 11:59 PM, Sunday, 15 July 2012. Catch-and-release fishing for Chinook salmon was allowed, but Chinook salmon could not be retained or possessed. Chinook salmon that were caught could not be removed from the water and had to be released immediately.
10) EO 2-TC-7-27-12 closed the Tanner crab season in Cook Inlet and North Gulf Coast waters effective 12:01 AM, Sunday, 15 July 2012 through 11:59 PM, Saturday, 15 March 2013.
11) EO 2-RS-7-32-12 closed all waters of the English Bay River drainage and Port Graham Subdistrict to sport fishing for sockeye salmon from 12:01 AM, Wednesday, 4 July 2012 through 11:59 PM, Tuesday, 31 July 2012.
12) EO 2-KS-7-39-12 prohibited sport fishing for Chinook salmon in the Ninilchik River beginning 12:01 AM, Monday, 16 July 2012 through 11:59 PM, Wednesday, 31 October 2012. This closure prohibited all sport fishing for Chinook salmon, including catch-and-release fishing. Chinook salmon could not be retained or possessed; Chinook salmon caught while fishing for other species could not be removed from the water and had to be released immediately.
13) EO 2-KS-7-41-12 prohibited the retention of Chinook salmon while sport fishing within 1 mile of shore in the salt waters of Cook Inlet south of the latitude of the mouth of the Ninilchik River to the latitude of Bluff Point beginning 12:01 AM, Monday, 16 July 2012 through 11:59 PM, Tuesday, 31 July 2012. Catch-and-release fishing for Chinook salmon is allowed, but Chinook salmon could not be retained or possessed. Chinook salmon that are caught could not be removed from the water and had to be released immediately.
14) EO 2-KS-7-44-12 superseded EO 2-KS-7-41-12, issued Friday, 13 July 2012. This EO prohibits sport fishing for Chinook salmon in the salt waters of Cook Inlet north of the latitude of Bluff Point beginning 12:01 AM, Thursday, 19 July 2012, through 11:59 PM, Tuesday, 31 July 2012. Chinook salmon could not be retained or possessed. Chinook salmon caught while fishing for other species could not be removed from the water and had to be released immediately.

-continued-

Emergency Orders issued in 2013:

1) EO 2-KS-7-03-13 closed waters of the Anchor River drainage from its mouth upstream to the junction of the north and south forks to sport fishing each Wednesday during the Chinook salmon season and decreased the waters of the Anchor River drainage open to sport fishing by relocating the ADF&G regulatory marker downstream approximately 1,000 feet below the junction of the north and south forks. This EO was effective from 12:01 AM, Wednesday, 1 May 2013 through 11:59 PM, Sunday, 30 June 2013.
2) EO 2-KS-7-04-13 established a combined annual limit of 2 Chinook salmon 20 inches or greater in length for fish harvested in the Anchor River, Deep Creek, Ninilchik River, and all marine waters south of the latitude of the mouth of the Ninilchik River (lat 60°03.99′N) to the latitude of Bluff Point (lat 59°40.00′N). In addition, a person who took and retained a Chinook salmon 20 inches or greater in length from either Deep Creek, Anchor River, or Ninilchik River could not sport fish in any of those drainages for the rest of that day. This EO was effective from 12:01 AM, Wednesday, 1 May 2013 through 11:59 PM, Sunday, 30 June 2013. Any Chinook salmon caught in these waters and recorded before Wednesday, 1 May 2013 on the harvest portion of an Alaska sport fishing license or harvest record card did not count against the annual limit of 2 Chinook salmon after 12:01 AM, Wednesday, 1 May 2013, but did count against the Cook Inlet annual limit of 5 Chinook salmon.
3) EO 2-KS-7-05-13 limited sport fishing gear to only 1 unbaited, single hook, artificial lure when fishing in the Anchor River, Deep Creek, or Ninilchik River drainages beginning 12:01 AM, Wednesday, 1 May 2013 through 11:59 PM, Sunday, 30 June 2013.
4) EO 2-KS-7-06-13 reduced the bag and possession limit for Chinook salmon in the Ninilchik River drainage to 1 Chinook salmon 20 inches or greater in length. During the 3-day weekend fishing periods that begin on Memorial Day weekend, anglers could retain either a hatchery Chinook salmon or a naturally-produced (wild) Chinook salmon. Beginning in July, anglers could only retain hatchery Chinook salmon. This EO was effective beginning 12:01 AM, Wednesday, 1 May 2013 through 11:59 PM, Thursday, 31 October 2013
5) EO 2-RC-7-12-13 reduced the sport bag and possession limit for razor clams to the first 25 razor clams harvested from the eastside Cook Inlet beaches extending from the mouth of the Kenai River to the southernmost tip of Homer Spit. This EO was effective beginning 12:01 AM, Thursday, 23 May 2013 through 11:59 PM, Tuesday, 31 December 2013.
6) EO 2-RC-7-13-13 reduced the personal use bag and possession limit for razor clams to the first 25 razor clams harvested from the eastside Cook Inlet beaches extending from the mouth of the Kenai River to the southernmost tip of Homer Spit. This EO was effective beginning 12:01 AM, Thursday, 23 May 2013 through 11:59 PM, Tuesday, 31 December 2013.
7) EO 2-KS-7-17-13 superseded EOs 2-KS-7-03-13 and 2-KS-7-06-13 issued 18 April 2013. This EO closed waters of the Anchor River, Deep Creek, Ninilchik River, and Stariski Creek from the mouth upstream approximately 2 miles to ADF&G markers or to clearly recognizable physical features to sport fishing for any species of fish, beginning 12:01 AM, Saturday, 15 June 2013 through 11:59 PM, Monday, 15 July 2013.

-continued-

Emergency Orders issued in 2013 (continued):

8) EO 2-KS-7-18-13 superseded EO 2-KS-7-04-13, issued 18 April 2013. This emergency order prohibited Chinook salmon fishing (including catch-and-release) while sport fishing within 1 mile of shore in the salt waters of Cook Inlet south of the latitude of the mouth of the Ninilchik River (lat 60°03.99′N) to the latitude of Bluff Point (lat 59°40.00′N). Chinook salmon incidentally caught while fishing for other fish could not be removed from the water and had to be released immediately. This emergency order was effective from 12:01 AM, Saturday, 15 June 2013 through 11:59 PM, Monday, 15 July 2013.
9) EO 2-TC-7-32-13 closed the Tanner crab season in Cook Inlet and North Gulf Coast waters effective 12:01 AM, Monday, 15 July 2013 through 11:59 PM, Saturday, 15 March 2014.
10) EO 2-KS-7-35-13 prohibited sport fishing for Chinook salmon in the Ninilchik River drainage effective beginning 12:01 AM, Tuesday, 16 July 2013 through 11:59 PM, Thursday, 31 October 2013.

Emergency Orders issued in 2014:

1) EO 2-KS-7-01-14 closed the Anchor River drainage to sport fishing each Wednesday during the Chinook salmon season and reduced the waters of the Anchor River open to sport fishing during the Chinook salmon season. Under this EO, waters open to sport fishing extended from the mouth to the downstream side of the Old Sterling Highway Bridge approximately 550 feet below the junction of the north and south forks. This EO was effective from 12:01 AM, Thursday, 1 May 2014, through 11:59 PM, Monday, 30 June 2014.
2) EO 2-KS-7-02-14 established a combined annual limit of 2 Chinook salmon 20 inches or greater in length in the Anchor River, Deep Creek, Ninilchik River, and all marine waters south of the latitude of the mouth of the Ninilchik River (lat 60°03.99′N) to the latitude of Bluff Point (lat 59°40.00′N). This emergency order was effective from12:01 AM, Thursday, 1 May 2014, through 11:59 PM, Monday, 30 June 2014. Chinook salmon harvested in these waters and recorded before Thursday, 1 May and after Monday, 30 June 2014 do not count against the 2–Chinook salmon annual limit after 12:01 AM, Thursday, 1 May 2014, but do count against the Cook Inlet annual limit of 5 Chinook salmon.
3) EO 2-KS-7-03-14 restricted sport fishing gear in the Anchor River, Deep Creek, and Ninilchik river drainages to only 1 unbaited, single-hook, artificial lure beginning 12:01 AM, Thursday, 1 May 2014, through 11:59 PM, Monday, 30 June 2014.
4) EO 2-RCL-7-09-14 closed Ninilchik Beach areas to the taking of clams from the north bank of Deep Creek north to a marker located approximately 3.2 miles north of the Ninilchik River at lat 60°05.66′N, and it reduces the bag and possession limit for razor clams to the first 25 razor clams harvested for the remaining eastside Cook Inlet beaches extending from the mouth of the Kenai River to the southernmost tip of Homer Spit. This EO was effective beginning 12:01 AM, Wednesday, 12 March 2014, through 11:59 PM, Wednesday, 31 December 2014.

-continued-

Emergency Orders issued in 2014 (continued):

5) EO 2-RCL-7-10-14 closed Ninilchik Beach areas to the taking of clams from the north bank of Deep Creek north to a marker located approximately 3.2 miles north of the Ninilchik River at lat 60°05.66′N, and it reduced the bag and possession limit for razor clams to the first 25 razor clams harvested for the remaining eastside Cook Inlet beaches extending from the mouth of the Kenai River to the southernmost tip of Homer Spit. This emergency order was effective beginning 12:01 AM, Wednesday, 12 March 2014, through 11:59 PM, Wednesday, 31 December 2014.
6) EO 2-KS-7-16-14 superseded EO 1-KS-7-01-14 issued 27 February 2014. This EO closed waters of the Anchor River drainage from its mouth upstream to the junction of the north and south forks to sport fishing; and prohibited Chinook salmon fishing (including catch-and-release) while sport fishing within 1 mile of shore in the salt waters of Cook Inlet south of the latitude of the mouth of the Ninilchik River (lat 60°03.99′N) to the latitude of Bluff Point (lat 59°40.00′N). Chinook salmon incidentally caught while fishing for other fish may not be removed from the water and must be released immediately. This EO was effective from 12:01 AM, Friday, 13 June 2014, through 11:59 PM, Monday, 30 June 2014.
7) EO 2-TC-7-37-14 closed the Tanner crab season in Cook Inlet and North Gulf Coast waters effective 12:01 AM, Tuesday, 15 July 2014, through 11:59 PM, Sunday, 15 March 2015.
8) EO 2-KS-7-43-14 prohibited sport fishing for Chinook salmon in the salt waters of Cook Inlet north of the latitude of Bluff Point beginning 12:02 AM, Saturday, 26 July 2014, through 11:59 PM, Thursday, 31 July 2014. Chinook salmon could not be retained or possessed. Chinook salmon caught while fishing for other species could not be removed from the water and had to be released immediately.
9) EO 2-SS-7-49-14 allowed snagging in the waters of the Nick Dudiak Fishing Lagoon and adjacent waters along Homer Spit. The waters opened to snagging extend from the Homer City Dock near the entrance of the Homer Boat Harbor, northwest along the east side of Homer Spit to the ADF&G marker placed approximately 200 yards northwest of the entrance to the Nick Dudiak Fishing Lagoon, to a distance of 300 feet from shore. Snagging will be permitted from 12:01 AM, Friday, 15 August 2014 through 11:59 PM Wednesday, 31 December 2014.

Emergency Orders issued in 2015:

1) EO 2-KS-7-01-15 closed the first and fifth opening weekend and the 5 Wednesday openings in May and June for the Anchor River drainage and decreased the waters of the Anchor River drainage open to sport fishing to the downstream side of the Old Sterling Highway Bridge approximately 550 feet below the junction of the north and south forks. This EO was effective from 12:01 AM, Wednesday, 1 April 2015 through 11:59 PM, Tuesday, 30 June 2015.
2) EO 2-KS-7-02-15 limited sport fishing gear to only 1 unbaited, single-hook, artificial lure when fishing in the Anchor River, Deep Creek, or Ninilchik River drainages. This EO was effective from 12:01 AM, Wednesday, 1 April 2015 through 11:59 PM, Tuesday, 30 June 2015.

-continued-

Emergency Orders issued in 2015 (continued):

3) EO 2-KS-7-03-15 established a combined annual limit of 2 Chinook salmon 20 inches or greater in length for fish harvested in Anchor River, Deep Creek, Ninilchik River, and all marine water south of the latitude of the mouth of the Ninilchik River (lat 59°40.00′N) to the latitude of Bluff Point (lat 59°40.00′N). This EO was effective from 12:01 AM, Wednesday, 1 April 2015 through 11:59 PM, Tuesday, 30 June 2015.
4) EO 2-KS-7-04-15 extended the date by 2 weeks of the closed saltwater area surrounding the Anchor River mouth and the special harvest areas north to lat 59°92.98′N, located approximately 1 mile south of Stariski Creek and south to Bluff Point (lat 59°40.00′N). This EO was effective from 12:01 AM, Wednesday, 1 July 2015 through 11:59 PM, Wednesday, 15 July 2015.
5) EO 2-RCL-7-11-15 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. This EO was effective from 12:01 AM, Sunday, 1 March through 11:59 PM, Thursday, 31 December 2015.
6) EO 2-RCL-7-12-15 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 in the sport fishery. This EO was effective from 12:01 AM, Sunday, 1 March through 11:59 PM, Thursday, 31 December 2015.
7) EO 2-KS-7-20-15 superseded EO 2-KS-7-01-15 and allowed sport fishing during the first opening weekend from 13 to 15 June, and the fifth Wednesday, 17 June for the Anchor River drainage. The preseason actions that restricted gear and established a combined annual limit of 2 Chinook salmon 20 inches or greater in length for fish harvested in the Anchor River, Deep Creek, and Ninilchik River and all marine waters south of the latitude of the mouth of the Ninilchik River to the latitude of Bluff Point remained in effect. This EO was effective from 12:01 AM, Saturday, 13 June through 11:59 PM, Tuesday, 30 June 2015.
8) EO 2-KS-7-21-15 rescinded EO 2-KS-7-04-15, which extended the closed saltwater area surrounding the Anchor River mouth and the special harvest areas through 15 July. The affected waters surround the Anchor River mouth and the special harvest areas north to lat 59°52.98′N located approximately 1 mile south of Stariski Creek and south to Bluff Point (lat 59°40.00′N). The preseason actions that restricted gear and established a combined annual limit of 2 Chinook salmon 20 inches or greater in length for fish harvested in the Anchor River, Deep Creek, and Ninilchik River and all marine waters south of the latitude of the mouth of the Ninilchik River to the latitude of Bluff Point still remained in effect. This EO was effective from 12:01 AM, Wednesday 1 July 2015 through 11:59 PM, Wednesday, 15 July 2015.
9) EO 2-KS-7-27-15 rescinded EO 2-KS-7-03-15 and restored the Cook Inlet annual limit of 5 Chinook salmon 20 inches or greater in length for fish harvested in the Ninilchik River and all marine waters south of the latitude of the mouth of the Ninilchik River (lat 60°03.99′N) to the latitude of Bluff Point (lat 59°40.00′N). This EO was effective from 12:01 AM, Saturday, 20 June 2015. Any Chinook salmon recorded before Saturday, 20 June of the harvest portion of an Alaska sport fishing license or harvest record card counted toward the Cook Inlet annual limit.

-continued-

Emergency Orders issued in 2015 (continued):

10) EO 2-KS-7-32-15 allowed snagging along the east side of Homer Spit, from the Homer City Dock (excluding the Homer Boat Harbor) to the ADF&G markers about 200 yards northwest of the entrance to the Nick Dudiak Fishing Lagoon (including the Nick Dudiak Fishing Lagoon) to a distance of 300 feet from shore. This EO was effective from 12:00 noon, Friday, 26 June through 11:59 PM, Sunday, 28 June 2015.
11) EO 2-TC-7-43-15 closed the Tanner crab season in Cook Inlet and North Gulf Coast waters effective 12:01 AM, Wednesday, 15 July 2015 through 11:59 PM, Tuesday, 15 March 2016.
12) EO 2-SS-7-56-15 allowed snagging along the east side of Homer Spit, from the Homer City Dock (excluding the Homer Boat Harbor) to the ADF&G markers about 200 yards northwest of the entrance to the Ninilchik Dudiak Fishing Lagoon (including the Nick Dudiak Fishing Lagoon) to a distance of 300 feet from shore. This EO was effective from 12:00 noon, Friday, 28 August through 11:59 PM, Thursday, 31 December 2015.

Emergency Orders issued in 2016:

1) EO 2-RCL-7-01-16 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. This EO was effective from 12:01 AM, Friday, 1 January through 11:59 PM, Saturday, 31 December 2016.
2) EO 2-RCL-7-02-16 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. This EO was effective from 12:01 AM, Friday, 1 January through 11:59 PM, Saturday, 31 December 2016.
3) EO 2-KS-7-21-16 opened the Ninilchik River to fishing for hatchery Chinook salmon from its mouth to an ADF&G regulatory marker located approximately 2 miles upstream. In addition, only 1 unbaited single-hook, artificial lure was allowed while sport fining in the Ninilchik River. This EO was effective from 12:01 AM, Saturday, 16 June 2016 through 11:59 PM, Friday, 15 July 2016.
4) EO 2-KS-7-25-16 allowed snagging along the east side of Homer Spit, from the Homer City Dock (excluding the Homer Boat Harbor) to the ADF&G markers about 200 yards northwest of the entrance to the Nick Dudiak Fishing Lagoon (including the Nick Dudiak Fishing Lagoon) to a distance of 300 feet from shore. This EO was effective from 12:00 noon, Friday, 1 July 2016 through 11:59 PM, Monday, 4 July 2016.
5) EO 2-TC-7-26-16 closed the Tanner crab season in Cook Inlet and North Gulf Coast waters effective 12:01 AM, Friday, 15 July 2016 through 11:59 PM, Monday, 15 March 2017.

Emergency Orders issued in 2017:

1) EO 2-RCL-7-04-17 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. This EO was effective from 12:01 AM, Friday, 1 January through 11:59 PM, Saturday, 31 December 2016.

-continued-

Emergency Orders issued in 2017 (continued):

2) EO 2-RCL-7-03-17 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. This EO was effective from 12:01 AM, Friday, 1 January through 11:59 PM, Saturday, 31 December 2016.
3) EO 2-KS-7-30-17 allowed snagging along the east side of Homer Spit, from the Homer City Dock (excluding the Homer Boat Harbor) to the ADF&G markers about 200 yards northwest of the entrance to the Nick Dudiak Fishing Lagoon (including the Nick Dudiak Fishing Lagoon) to a distance of 300 feet from shore. This EO was effective from 12:00 noon, Friday, 14 July 2017 through 11:59 PM, Sunday, 16 July 2017.
4) EO 2-RS-7-34-17 increased the personal use bag and possession limits for sockeye salmon in China Poot Creek from 6 to 25 fish and extended the season through 14 August. This EO was effective from 12:01 AM, Friday 4 August through 11:59 PM Monday, 14 August 2017.

Emergency Orders issued in 2018:

1) EO 2-RCL-7-02-18 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. This EO was effective from 12:01 AM, Friday, 1 January through 11:59 PM, Saturday, 31 December 2016.
2) EO 2-RCL-7-01-18 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. This EO was effective from 12:01 AM, Friday, 1 January through 11:59 PM, Saturday, 31 December 2016.
3) EO 2-KS-7-11-18 closed the waters of the Anchor River, Deep Creek, and Ninilchik River drainages to sport fishing. This EO was effective from 12:01 AM, Saturday, 2 June 2018 through 11:59 PM, Sunday, 15 July 2018.
4) EO 2-KS-7-12-18 prohibited Chinook salmon sport fishing within 1 mile of shore in Cook Inlet salt waters north of Bluff Point (lat 59°40.00′N). This EO was effective from 12:01 AM, Saturday, 2 June 2018 through 11:59 PM, Sunday, 15 July 2018.
5) EO 2-KS-7-36-18 maintained the conservation zones for Chinook salmon surrounding the Anchor River, Stariski Creek, Deep Creek, and the Ninilchik River through 31 July 2018. This EO was effective from 12:01 AM, Monday, 16 July through 11:59 PM, Tuesday, 31 July 2018.
6) EO 2-KS-7-37-18 restricted sport fishing gear to only 1 unbaited, single hook, artificial lure in the Anchor River, Stariski Creek, Deep Creek, and the Ninilchik River. This EO was effective from 12:01 AM, Monday, 16 July through 11:59 PM, Tuesday, 31 July 2018.
7) EO 2-SS-7-53-18 allowed snagging along the east side of Homer Spit, from the Homer City Dock (excluding the Homer Boat Harbor) to the ADF&G markers about 200 yards northwest of the entrance to the Nick Dudiak Fishing Lagoon (including the Nick Dudiak Fishing Lagoon) to a distance of 300 feet from shore. This EO was effective from 12:00 PM, Saturday, 11 August through 11:59 PM, Monday, 31 December 2018.

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

	Broodstock		
Year	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	