

**Fishery Management Report No. 13-42**

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**Recreational Fisheries in the Lower Cook Inlet  
Management Area, 2011–2013, with updates for 2010**

by

**Carol M. Kerkvliet,**

**Michael D. Booz,**

and

**Barbi J. Failor**

November 2013

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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

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Carol M. Kerkvliet,  
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Barbi J. Failor

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

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*Carol M. Kerkvliet,  
Alaska Department of Fish and Game, Division of Sport Fish,  
3298 Douglas Place, Homer, Alaska, USA*

*Michael D. Booz,  
Alaska Department of Fish and Game, Division of Sport Fish,  
3298 Douglas Place, Homer, Alaska, USA*

*and*

*Barbi J. Failor  
Alaska Department of Fish and Game, Division of Sport Fish,  
3298 Douglas Place, Homer, Alaska, USA*

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ADF&G Division of Sport Fish, Research and Technical Services, 333 Raspberry Road, Anchorage AK 99518 (907) 267-2375

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## ABSTRACT

This report is a detailed summary of the recreational fisheries in the Lower Cook Inlet Management area for the years 2011 to 2013 with estimated angler effort, catch, and harvest updated for 2010. Included are a description and historical overview of each fishery, how the fishery is managed, and sport fishery performance and escapement for 2011 to 2013.

Key words: Lower Cook Inlet Management Area, sport fisheries, recreational fisheries, Board of Fisheries

## INTRODUCTION

The Lower Cook Inlet Management Area (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 marine waters and beaches of Cook Inlet bounded by these landmarks (Figure 1).

For sport fishery management purposes, the LCIMA is often divided into four areas: Central Cook Inlet (CCI) is north of Bluff Point; Lower Cook Inlet (LCI) is south of Bluff Point and west of Kachemak Bay; Kachemak Bay is east of a line from Bluff Point to Seldovia; and West Cook Inlet (WCI) consists of the freshwaters along western Cook Inlet.

Easy access to salt water and popular salmon streams combined with proximity to major population centers attracts large numbers of anglers to the diverse sport and personal use fishing opportunities of the LCIMA. Anglers can target five species of North Pacific salmon: pink salmon (*Oncorhynchus gorbuscha*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), chum salmon (*O. keta*), and Chinook salmon (*O. tshawytscha*). Fisheries for these species occur in fresh and salt water. The major salmon fisheries harvest Chinook and coho salmon near shore in CCI and the adjacent freshwater tributaries, in Kachemak Bay, and in the salt waters extending to the west. In Kachemak Bay, the Nick Dudiak Fishing Lagoon (NDFL) is stocked with salmon by the Alaska Department of Fish and Game (ADF&G), Division of Sport Fish (SF) and is a focal point for anglers fishing from shore. A popular fishery occurs on LCIMA's anadromous and resident stocks of Dolly Varden (*Salvelinus malma*) and steelhead or rainbow trout (*O. mykiss*) support popular catch-and-release sport fisheries in the roadside streams on the Kenai Peninsula. In salt waters, the LCIMA accounts for the largest annual landings of sport-caught Pacific halibut (*Hippoglossus stenolepis*) in Alaska; rockfish species (*Sebastes* spp.) and lingcod (*Ophiodon elongates*) are also harvested.

The state's largest recreational Pacific razor clam (*Siliqua patula*) fishery occurs along a 50-mile area of beach between the Kasilof and Anchor rivers on the east side of Cook Inlet. The largest hardshell clam (Pacific littleneck [*Protothaca staminea*] and butter clam [*Saxidomus giganteus*]) fishery in Southcentral Alaska occurs in Kachemak Bay. A fishery for Tanner crab (*Chionoecetes bairdi*) 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.

Coho salmon occur in the tributaries of WCI. These stocks support sport fisheries, though the effort is low. WCI also hosts small fisheries for chum salmon, Pacific halibut, razor clams, and several other species of clams.

Most fishing in the management area occurs from April to September, but a small number of anglers pursue Chinook salmon in marine waters during October through March.

Fisheries of the LCIMA provide recreation for local residents, Alaska residents, and nonresidents. Fishing-directed tourism is a major segment of the economic base of the LCIMA. Sport angler effort and harvest in the LCIMA have been estimated using the Statewide Harvest Survey (SWHS) since 1977 (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b). The SWHS is a mail survey that estimates sport fishing effort and harvest annually. 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 include estimates of catch (release plus harvest) by location. Although harvest and catch are estimated for individual species, the SWHS is not designed to estimate effort directed towards individual species. The precision of the SWHS estimates is related to the number of respondents who reported participating in those fisheries. For any fishery, SWHS estimates based on fewer than 12 respondents are not used. Estimates based on 12 or more, but less than 30 respondents can be useful for detecting relative trends. Estimates based on 30 or more respondents are generally useable (Mills and Howe 1992). Creel surveys have been selectively used for fisheries that require more detailed information for inseason management and to validate the SWHS for fisheries of interest. The following summaries of sport angler effort and harvest in the LCIMA are based on estimates from the SWHS, as are all effort and harvest estimates in subsequent sections, unless noted otherwise. There are slight changes to some annual historical estimates as the data summaries are updated and corrected.

## **SPORT FISHING EFFORT**

The LCIMA supports the second highest sport fishing effort in Alaska after the Upper Kenai Peninsula Management Area. From 1977 through 2009 (historic average), the LCIMA accounted for an average of 13% of the total statewide sport fishing effort. Since 2010, average annual participation in LCIMA sport fisheries has been 11% of statewide (Table 1) and average effort (215,331 angler-days) has dropped about 21% below the historic average for the LCIMA.

In terms of participation, the dominant sport fisheries in Central Cook Inlet are the saltwater fisheries for Pacific halibut and salmon, the freshwater fisheries in the Anchor River, Deep Creek, and the Niniilchik River, and the razor clam fishery. Most fishing in Lower Cook Inlet occurs in salt water for Pacific halibut and salmon. A small amount of effort for clams occurs on the southern shore of Kachemak Bay. Sport fishing effort is comparatively low in freshwater streams in Kachemak Bay and Lower Cook Inlet.

## **SPORT HARVEST**

The LCIMA boasts the largest Pacific halibut fishery in Alaska. More Pacific halibut are harvested in the LCIMA than any other fish species. Pacific halibut harvests for the area have increased since 1977 (Table 2). The 2010–2012 average Pacific halibut harvest (195,406 fish) was approximately 44% higher than the 1977–2009 historic average (135,839 fish).

The Chinook salmon sport fishery is an important LCIMA fishery. The 2010–2012 average harvest of Chinook salmon from the saltwater fishery accounts for about 11% of the 2010–2012 average statewide saltwater Chinook salmon harvest (calculated from Table 3; Jennings et al. *In prep a-b*). Of the combined (fresh and salt waters) Chinook salmon harvests from all areas of the LCIMA, the saltwater fisheries account for 80% of the 1977–2009 historic average harvest and 92% of the average total harvest from 2010 to 2013 (Table 3). The increased proportion of

saltwater fisheries is attributable to a combination of low freshwater run sizes of local stocks, fishery closures in local freshwater streams, and the saltwater harvest of non-local stocks.

Beginning in 1995, ADF&G required sport fishing guide businesses and guides to register before fishing in Alaska. Guides operating in salt water were required to record their clients' effort, harvest, and catches in logbooks beginning in 1998 (Szarzi and Begich 2004a). Chinook salmon harvests from saltwater fisheries reported by guides are similar in magnitude to estimates of harvest from the Statewide Harvest Survey (SWHS; Table 4; Howe et al. 2001c-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010 a-b, 2011a-b, *In prep a-b*).

In terms of numbers of fish, coho salmon are the predominant salmon species harvested in the LCIMA. Coho salmon harvested in the LCIMA only contribute a small percentage of the statewide harvest. Harvests of coho salmon were stable from 1977 through 1988 and increased sharply in 1989 as stocked coho salmon from a new stocking program began returning to the Nick Dudiak Fishing Lagoon (NDFL) on Homer Spit (Table 5). Harvests rose sharply again in 1993 and continued to increase through 2004, when a record of nearly 54,000 coho salmon were harvested. Relatively large harvests during the years 2001–2005 are the result of good survival from 2001 through 2004 of Cook Inlet coho salmon stocks and additional stocked fish returning to the NDFL. The decline in coho salmon harvests since 2006 is partly the result of poor returns of stocked coho salmon to the NDFL (see Stocked Coho Salmon Fisheries section).

Dolly Varden are a commonly harvested fish from the LCIMA. Of the combined (fresh and salt waters) Dolly Varden harvest, the 2010–2012 average decreased by about 75% from the historic average (Table 6; see Dolly Varden Fisheries with an Emphasis on Roadside Fisheries section).

The steelhead trout fishery occurs primarily along roadside streams. The fishery has been catch-and-release only since 1989. More steelhead trout are caught in the Anchor River than in other LCIMA streams. Catches can be quite variable from year to year and from stream to stream and can be influenced by differences in abundance, river conditions, and changes in effort.

Diverse shellfish fisheries occur in LCIMA. The LCIMA has the largest sport fishery for razor clams in Alaska (Table 7) and also supports the largest hardshell clam fisheries north of Southeast Alaska. The tanner crab fishery was reopened in 2008, but then was closed in 2011 (Table 8).

## **CHINOOK SALMON FISHERIES**

### **AREAWIDE OVERVIEW**

#### **Areawide Historical Harvest and Escapement**

Saltwater Chinook salmon fishing occurs throughout the LCIMA, mostly from boats trolling within 3 miles of shore. Three groups of fish are harvested in the saltwater fishery. The first group is composed of maturing Chinook salmon that originate from streams within Cook Inlet and are harvested as they migrate back to their natal stream in the spring and summer. The second group is composed of mature enhanced Chinook salmon from the SF stocking program (see Stocked Chinook Salmon Fisheries section) for terminal enhanced fisheries in Kachemak Bay. The third group is composed of immature (feeder) Chinook salmon that originate from stocks in Southeast Alaska, British Columbia, Washington, and Oregon (McKinley 1999; Begich 2007b; R. Begich, Fisheries Biologist, ADF&G Division of Sport Fish, Soldotna, personal communication).

Cook Inlet stocks with early run timing (April through early July) include the lower Kenai Peninsula drainages (Anchor River, Deep Creek, Ninilchik River, and Stariski Creek) and upper Kenai Peninsula drainages (Kenai and Kasilof rivers) and northern Cook Inlet (Susitna River). Cook Inlet stocks with late run timing (late June through early August) include the Kenai River and to a lesser extent the Kasilof River.

In Central Cook Inlet (CCI), Cook Inlet stocks are generally more prevalent in the saltwater sport fisheries harvest from April through August as they migrate along a corridor within one mile of shore north of Bluff Point. Immature “feeder” Chinook salmon are scattered further offshore (McKinley 1999; Begich 2007b). Poor fishing near shore motivates anglers to fish offshore, changing the composition of the harvest in some years from more spawning Chinook salmon to more feeders. In Lower Cook Inlet (LCI), the saltwater harvest is dominated by feeder Chinook salmon (McKinley 1999; Begich 2007b; R. Begich, Fisheries Biologist, ADF&G Division of Sport Fish, Soldotna, personal communication).

Within Kachemak Bay, in the LCI saltwater area, Chinook salmon have been stocked since the mid-1980s at the Nick Dudiak Fishing Lagoon (NDFL), Seldovia, and Halibut Cove Lagoon. Harvests have been assessed by the SWHS continuously since the inception of the stocking program at the NDFL and these harvests averaged 20% of the areawide saltwater harvest through 2003. Since 2004, the contribution of stocked Chinook salmon to the areawide harvest has declined (Table 3). The decline is attributed to poor marine survival of stocked smolt which may be partly due to low fitness caused by loss of a heat source in the SF hatcheries in 2003 and 2004.

LCIMA freshwater Chinook salmon fisheries occur in Anchor River, Deep Creek, and Ninilchik River, all accessible 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 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 stray stocked fish from outside Kachemak Bay. Few Chinook salmon are harvested in WCI streams.

In the 1960s through the 1980s, Chinook salmon escapement in the Lower Kenai Peninsula streams was indexed with a one-day aerial survey. Starting in late 1980s, a broodstock weir was also used to index Ninilchik River Chinook salmon escapement. In the 2000s DIDSON sonar and a floating weir has been used to estimate Anchor River Chinook salmon escapement. An attempt to assess Chinook salmon escapement using a weir on Deep Creek from 1997 through 2000 was unsuccessful. Chinook salmon escapement in Deep Creek is still indexed with a one-day aerial survey.

The 2010–2012 average Chinook salmon harvest from the CCI saltwater fishery (2,301) dropped about 59% and the freshwater harvest (713) dropped about 81% from their respective historic averages (1977–2009; Table 3). The lower harvests are attributed to low run sizes, which resulted in sport fishing restrictions to the saltwater and inriver fisheries. In contrast, the 2010–2012 average Chinook salmon harvest from the LCI and Kachemak Bay non-stocked saltwater fisheries (6,030) increased nearly 50% compared to the 1977–2009 historic average (3,322). This

is attributed to the continued availability of feeder Chinook salmon and the popularity of the feeder troll fishery.

### **Areawide Fishery Management and Objectives**

The Chinook salmon saltwater sport fisheries are regulated under the general Cook Inlet–Resurrection Bay saltwater regulations (Alaska Administrative Code 5 AAC 58.001) and under three management plans: the Upper Cook Inlet Salt Water Early-Run King Salmon Management Plan (Early-Run Plan; 5 AAC 58.055), the Kenai River Late-Run King Salmon Management Plan (Kenai Late-Run Plan; 5 AAC 21.359), and the Lower Cook Inlet Winter Salt Water King Salmon Sport Fishery Management Plan (Winter King Plan; 5 AAC 58.060). The Chinook salmon inriver sport fisheries are regulated under general Kenai Peninsula Area regulations (5 AAC 56.001). Since 2009, these regulations have been adjusted inseason in response to low runs (see Freshwater Chinook Salmon Fisheries section).

In 1996, the Alaska Board of Fisheries (BOF) adopted the 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). Stipulations of the plan remained unchanged until 2007, when the BOF reduced the closed area north and south of the Anchor River mouth from two miles to one mile in response to large run sizes of Anchor River Chinook salmon (Szarzi et al. 2010b). In 2010, BOF modified the plan in response to smaller run sizes of Anchor River Chinook salmon, reinstating the closed area two miles north and south of the Anchor River mouth. Since 2009, the management plan has been modified inseason in response to low run sizes in the LCIMA and generally paired with restrictions to the inriver fisheries (Appendix A1).

In 1999, 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, 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, BOF changed the plan for the projected late-run Chinook salmon escapement to less than 15,000.

In 2002, BOF established the Winter King Plan. In 2010, BOF moved the northern boundary from Bluff Point approximately 9.25 statute miles north along the shore and 6.8 statute miles from latitude 59°40' N to latitude 59°46.142' N at the Anchor Point Light (see Lower Cook Inlet and Kachemak Bay Saltwater Chinook Salmon Fisheries section).

## **CENTRAL COOK INLET SALTWATER CHINOOK SALMON FISHERY**

### **Fishery Description**

Most of the Chinook salmon harvest in CCI is taken along the beach area (approximately 30 miles) between Bluff Point and Deep Creek (Figure 1) during April through early August. This sport fishery is essentially the first harvest of Chinook salmon returning to Cook Inlet tributaries. Access to this fishery occurs primarily near the mouths of the Anchor River and Deep Creek. Commercial operators provide beach launching and take-out service at Deep Creek and Anchor Point, making it possible to use larger boats and launch all boats at most tide stages. Private boats are also launched at the mouth of the Anchor River and at Deep Creek beach. The unstable beach at Deep Creek precludes most private launching or loading of boats except at high tide. Boats also launch in the Homer Boat Harbor to access the Anchor Point area.

Anglers generally troll near shore within a few hours of high tide. Historically, angler effort has been dependent on local weather conditions. Limited boat launching facilities have restricted, and for the most part continue to restrict, the size of vessels that are used. As a result, adverse weather has, on occasion, limited fishing to as little as 30% of the available fishing days in which Chinook salmon are present. Many anglers fish for halibut as well as Chinook salmon. In the Upper Cook Inlet commercial salmon fishery, only drift gillnet fishing is allowed south of Ninilchik. The commercial drift gillnet fishery does not occur until late June when interception of early-run Chinook salmon is minimal.

The sport fishery targets a mixture of Chinook salmon stocks found in Cook Inlet marine waters. Coded wire tag recovery and maturity data indicate that the high interception of Cook Inlet stocks is not focused on a few selected stocks (McKinley 1999; Begich 2007a; R. Begich, fishery biologist, ADF&G Sport Fish, Soldotna, personal communication). Rather, tag recovery data indicate the origin of harvested mature fish are of broader Cook Inlet distribution composed of numerous individual stocks, none of which make up a large component. By far the most abundant stocks in Cook Inlet are those returning to the Susitna River drainage; therefore, it is reasonable to assume that their contribution to the CCI fishery is proportionate to their abundance in Cook Inlet. A majority of mature spawning fish sampled during the 1996–2002 study were harvested within three-quarter miles of shore. The majority of fish taken more than three-quarter miles from shore were immature fish (nonspawners or feeder Chinook salmon). It is probable that the proportion of immature Chinook salmon in the harvest continues to vary annually as anglers change fishing locations between nearshore and offshore areas to maximize fishing success.

The contribution of Deep Creek and Ninilchik River hatchery-reared Chinook salmon to the CCI salt water harvest was estimated for years when all returning age classes were tagged. Results of these coded-wire-tagging studies estimated an annual harvest of fewer than 300 Deep Creek stock and fewer than 200 hatchery-reared Ninilchik River stock (Deep Creek 1998–2000, Ninilchik River 1996–2002; McKinley 1999; Begich 2007a; R. Begich, fishery biologist, ADF&G Sport Fish, Soldotna, personal communication). Deep Creek Chinook salmon comprised 3.2% (1999) and 1.6% (2000) of the CCI saltwater harvest. Hatchery-reared fish of Ninilchik River origin were between 0.3% and 3.9% of the saltwater harvest from 1996 to 2000 and averaged 1.7% (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 three other wild LCIMA stocks (Anchor River, Stariski Creek, and Ninilchik River wild Chinook salmon) is unknown but was likely low due to similar run sizes and fishing regulations.

## **Historical Harvest**

Sport anglers began trolling for Chinook salmon in CCI marine waters in the early 1970s. Fishery participation and harvest remained fairly stable through the late 1980s (Nelson 1995). The fishery then expanded in the early to mid-1990s (Table 9). The greatest expansion was in guided angler effort (Table 10) and occurred in waters adjacent to Deep Creek. The increase in the 1990s is attributed to more marketing by the sport fish guiding and tourism industries, availability of commercial boat launching services that accommodate larger vessels, development of sport fishing lodges along Cook Inlet beaches, displacement of anglers from the restricted Kenai River fishery to salt water, and increased use of the fishery by Kenai River guides on days when the Kenai River is closed to fishing from boats. High angler success rates reported by the news media also attracted additional participants.



Information about harvest and fishing effort is available from ADF&G creel surveys conducted at the Deep Creek access from 1972 through 1986 and at the Anchor River and Whiskey Gulch access locations in 1986 (Hammarstrom 1974-1981; Hammarstrom and Larson 1982-1984, 1986; Hammarstrom et al. 1985). Harvest after 1986 was determined by the SWHS.

Participation in the Cook Inlet marine Chinook salmon fishery could not be ascertained from SWHS estimates after the creel survey ended in 1986 because SWHS estimates participation by location, not by species, and a major sport halibut fishery occurs in the same area as the Chinook salmon fishery. In 1994 and 1995, because of the rapid expansion of the fishery and a public perception that harvest in this fishery was negatively impacting other Cook Inlet drainage fisheries, creel surveys were conducted at Deep Creek, Whiskey Gulch, and Anchor River (McKinley 1995, 1996) to estimate early- and late-run harvest, to estimate total participation in the combined Chinook salmon and halibut fishery, and to verify the SWHS data. Estimates from SWHS were thought to be more accurate and complete than the creel survey estimates because of temporal, area, and seasonal limitations to the creel survey. Since 1996, the SWHS has requested information from surveyed Central Cook Inlet marine anglers by two time periods: prior to and including 24 June (early run) and after 24 June (late run). This allows the SWHS to generate separate estimates for the early and late runs.

The salt water harvest remained relatively stable from 1996 through 2007 (Table 9). In 2008 and 2009, the salt water harvest dropped because of lower run sizes and restrictions to the salt water fisheries (Szarzi et al. 2010b; Appendix A1).

### **Fishery Management and Objectives**

The CCI salt water Chinook salmon fishery has been regulated by the Early-Run Plan since it was adopted in 1996. The Early-Run Plan applies from 1 April through 30 June and designates marine waters from Bluff Point north to the mouth of the Ninilchik River and within one statute mile of shore as the Early Run King Salmon Special Harvest Area (SHA; Figure 3). In the SHA, guides may not fish while accompanying paid clients (except to provide assistance to a disabled client), and anglers may not continue to fish for any species on the same day after taking a Chinook salmon 20 inches or more in length. The plan also creates three closed areas (Conservation Zones) within the SHA where no sport fishing is allowed: 1) two statute miles north and south of the Anchor River, 2) one statute mile north and south from Stariski Creek, and 3) one statute mile north of the Ninilchik River to two statute miles south of Deep Creek. A harvest guideline of 8,000 Chinook salmon governs the fishery from 1 April to 30 June. If this guideline is exceeded, the plan does not specify how the fishery will be restricted to ensure compliance with the guideline harvest level. The harvest reported in the SWHS is the fishery performance measure.

These Conservation Zones remained unchanged until 2007 when the BOF changed the Anchor River Conservation Zone to one statute mile north and south of the mouth. In fall 2010, BOF extended the Anchor River Conservation Zone back to two statute miles north and south of the mouth. Also, BOF allowed fishing in the Ninilchik River–Deep Creek Conservation Zone during the three regulatory inriver weekend openings beginning Memorial Day weekend.

The contribution of local stocks to the early-run marine harvest before the current saltwater regulations were implemented in 1996 is unknown. The impact of the regulations on escapements to the Ninilchik River, Deep Creek, and the Anchor River is not apparent from fishery data (see sections under Freshwater Chinook Salmon Fisheries). Some users are

concerned that the saltwater early-run Chinook salmon fishery may impact the early-run Kenai River fishery, but data do not support the belief that Kenai River stocks dominate the harvest; rather, they indicate that the harvest consists of many stocks from both within and outside Cook Inlet (Begich 2007a).

During the 2013 Lower Cook Inlet finfish meeting, BOF will address the following proposals: 1) relocate the Anchor River south marker (latitude 59°45.92') to the Anchor Point Light (latitude 59°46.14' N), 2) relocate the Bluff Point Marker (latitude 59°40' N) to the south Anchor River Marker (latitude 59°45.92') for the management of the Cook Inlet Chinook salmon sport fishery, 3) modify the end of the Upper Cook Inlet salt water early-run Chinook salmon season from 30 June to 24 June in the Anchor River and Deep Creek Conservation Zones, and 4) modify the date from 1 April to 1 May that Chinook salmon are applied to the annual limit in the winter Chinook salmon fishery.

### **Fishery Performance in 2010–2013**

In the years 2010–2013, the CCI salt water fisheries were restricted in response to low run sizes (Appendix A1). As a result, early-run harvests during those years easily fell within the harvest guideline of 8,000 Chinook salmon (Table 9). The 2010–2012 average early-run harvest (1,636) was about 55% below the 1972–2009 historic average (3,649) and the 2010–2012 average late-run harvest (621) was about 53% below the historic average (1,322; Table 9). The 2010–2012 average effort in the CCI saltwater finfish fishery (58,806 angler-days) was about 16% below the historic average (69,798 angler-days; Table 1).

The 2010 early- and late-run harvests were larger than 2009 even though the fishery was more restrictive in 2010. In 2010, the Conservation Zone surrounding the mouth of the Anchor River was expanded by emergency order (EO) to two miles north and south from 5 June to 13 July; in 2009, the Conservation Zone was only expanded in June (6–30).

The 2011 early- and late-run harvests were the largest since 2007. In 2011, the Conservation Zone was set at two miles north and south of the Anchor River mouth with no additional restrictions in June despite restrictions to the nearby inriver fisheries. However from 1 to 31 July, an EO maintained the Anchor River Conservation Zone because of the low run size of the Anchor River stock.

The 2012 early- and late-run harvests were the lowest since 1980. The fishery was progressively restricted inseason. From 15 to 30 June, sport fishing was prohibited in the three SHAs. From 1 to 18 July, retention of Chinook salmon was prohibited, but catch-and-release was allowed from Bluff Point to the mouth of the Ninilchik River within one mile of shore. Stipulations of the Kenai Late-Run Plan were enacted from 19 to 31 July, closing the Chinook salmon sport fishery in all marine waters north of the latitude of Bluff Point. As a result, effort dropped sharply in CCI and some of the fishing effort on Chinook salmon transferred to LCI and Kachemak Bay. Based on angler reports to ADF&G staff, Chinook salmon fishing began slowly but was reported “good” for feeder Chinook salmon in June.

In 2013, preseason restrictions set a combined annual limit from 1 May to 30 June of two Chinook salmon from the following areas: the salt waters between the latitude of Bluff Point and the latitude of the mouth of the Ninilchik River, and the Anchor River, Deep Creek, and the Ninilchik River. Fishing for Chinook salmon was prohibited by EO from 15 June to 15 July within one statute mile of shore from Bluff Point to the mouth of the Ninilchik River. Angler

reports to ADF&G staff suggested that fishing was “good” from May until the fishery was closed in mid-June. Some anglers reported catching mainly feeder Chinook salmon. The 2013 SWHS harvest estimates will be available in 2014.

## **LOWER COOK INLET AND KACHEMAK BAY SALTWATER CHINOOK SALMON FISHERIES**

### **Fishery Description**

Since the 1960s or earlier, anglers have trolled for feeder Chinook salmon in LCI and Kachemak Bay throughout the year. During the summer, anglers have also fished for hatchery-reared Chinook salmon returning to the Kachemak Bay enhanced terminal fisheries on the Homer Spit at the Nick Dudiak Fishing Lagoon (NDFL) since 1984, Halibut Cove Lagoon (HCL) since 1979, and Seldovia since 1987. These enhanced fisheries were created to provide additional fishing opportunity for shore and boat anglers (Figure 4).

The feeder Chinook salmon fishery that occurs from 1 October to 31 March is referred to as the “winter king salmon” sport fishery. The stock composition of this fishery is largely unknown, but is likely comprised of nonlocal Chinook salmon from both wild and hatchery stocks. Participation in the winter king salmon fishery is dependent on weather conditions and the size of boat that anglers use to access the fishery. Most of the effort occurs near Bluff Point and the south side of Kachemak Bay, from Point Pogibshi east to Chugachik Island.

Information about the origin, age, length, sex, and sexual maturity of the LCI and Kachemak Bay Chinook salmon harvest has been collected during formal ADF&G sampling programs that collect and analyze the heads of harvested fish missing their adipose fins (fleshy fins on the back immediately preceding the tail; a missing fin indicates the fish might be tagged with a coded wire tag). Chinook salmon are sampled from salmon derbies and from sport anglers voluntarily returning the heads of fish missing their adipose fins. Sport harvested Chinook salmon caught by boat anglers were sampled by ADF&G personnel during the off-season (prior to May and after July) from 1994 through 1996, and during both early-run (May through 24 June) and late-run (25 June through mid-July) summer harvests in 1997 and 1998, and only during early-run harvests from 1999 through 2002 (R. Begich, Fishery Biologist, ADF&G Sport Fish, Soldotna, personal communication). Formal sampling of the summer Chinook salmon fishery in LCI has ended, but ADF&G staff continues to encourage anglers to voluntarily turn in heads of Chinook salmon missing their adipose fins. Staff also sample Chinook salmon during the Winter King Salmon Fishing Derby sponsored by the Homer Chamber of Commerce and held at the end of March, when harvested salmon are weighed in.

Winter stocks are thought to be largely nonlocal because only one coded-wire-tagged Cook Inlet fish has been recovered from the fishery from any source during August through March (R. Begich, Fishery Biologist, ADF&G Sport Fish, Soldotna, personal communication). However, relatively few Chinook salmon stocks of Cook Inlet origin have been tagged and relatively few individual Cook Inlet fish have received tags compared to the diversity of stocks outside of Cook Inlet that are the focus of extensive tagging programs.

Coded wire tags recovered from sport harvest during the summer indicate a mixture of stocks are harvested, including hatchery-reared stocks returning to local stocking projects, wild and hatchery stocks returning to Cook Inlet tributaries further north, and a number of stocks of non-Cook Inlet origin. Tagged fish of non-Cook Inlet origin recovered in LCI and Kachemak Bay

have been mainly from hatcheries in British Columbia, Washington, and Oregon, with some from Southeast Alaska. Feeder Chinook salmon are more predominant in the summer harvest in LCI and Kachemak Bay than in CCI.

### **Historical Harvest**

The LCI and Kachemak Bay Chinook salmon fishery is difficult to characterize because anglers reporting their harvest in the SWHS often generalize their fishing location and because the SWHS does not estimate effort by species. Participation and harvests in the LCI and Kachemak Bay saltwater fisheries generally increased until 2007 (Table 1 and Table 3). The smaller harvests in 2007 through 2009 are attributed partly to poor survival of stocked fish from loss of heated water at SF hatcheries in 2008 and 2009 and to ocean conditions that resulted in poor runs to many Cook Inlet tributaries.

The SWHS questionnaire was modified to provide estimates of winter fishery harvest beginning in 2002. Estimates of winter harvest have been below the harvest guideline of 3,000 Chinook salmon, although the 2005 estimate of 2,958 was close (Table 11). Most of the off-season harvest is from unguided anglers and most of the off-season harvest is taken near or south of Bluff Point.

### **Fishery Management and Objectives**

In 1988, BOF revised the annual limit of five 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 two Chinook salmon of any size.

In 1990, BOF reduced the bag and possession limits north of Bluff Point to one Chinook salmon of any size year round, but maintained the two Chinook salmon limit south of Bluff Point. The bag limit reduction north of Bluff Point was intended to reduce the impact of the sport fishery in those waters where early- and late-run Kenai River Chinook salmon stocks are harvested (Nelson 1990).

In November 2001, BOF set an annual limit of five Chinook salmon for all Cook Inlet waters. The regulation became effective on 18 March 2002. BOF cited increasing fishing effort and harvest and the unknown stock of origin 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, 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 changed to two 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 salt water 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.

The current regulations (5 AAC 58.022(a)(1)) apply to salt waters south of Bluff Point from 1 April through 30 September. These regulations stipulate that the harvest of Chinook salmon 20 inches in length or longer must be recorded and do apply to the annual limit of five Chinook salmon for all Cook Inlet waters. However, additional opportunity is afforded to fisheries south of Bluff Point by maintaining the daily limit of two Chinook salmon; this is more liberal than the 1990 limit of one Chinook salmon north of Bluff Point. Waters in LCI and Kachemak Bay are also open by regulation to snagging on 24 June, except in the vicinity of NDFL on the Homer Spit (see Stocked Chinook Salmon Fisheries section).

During the 2013 BOF meeting, BOF will address the following proposals: 1) decrease the bag and possession limits to one Chinook salmon and establish a two-fish annual limit, and 2) extend the recording dates from 1 April to 1 May. In addition, BOF will address a proposal to allow use of bow and arrow to take salmon where snagging is open by regulation, excluding NDFL.

### **Fishery Performance 2010–2013**

The 2010–2012 average total harvest of LCI and Kachemak Bay (LCI/Kbay) salt water fisheries (6,469 Chinook salmon) has increased by about 13% over the 1977–2009 historic average (5,721 Chinook salmon) despite the record low harvest in the Kachemak Bay stocked fisheries (Table 3). The increased harvest is attributed to the continued availability of feeder Chinook salmon and may reflect increased abundance. The 2010–2012 average effort (109,195 angler-days) increased slightly from the 1977–2009 historic average effort by about 2% and may indicate shifts in effort to the LCI/Kbay fisheries during fishery restrictions in CCI (Table 1).

The 2010–2013 annual harvests from 1 October to 31 March fell within the harvest guideline of 3,000 Chinook salmon (Table 11). Most of the harvest was taken by unguided anglers.

### **STOCKED CHINOOK SALMON FISHERIES**

Early-run Chinook salmon are stocked in the Nick Dudiak Fishing Lagoon (NDFL) on the Homer Spit, in Halibut Cove Lagoon, and in Seldovia to create “terminal” fisheries, which are fisheries of returning salmon that will not naturally reproduce because there is no spawning area available where they were released as smolt (Figure 4). These stocked fisheries are managed so that all returning fish are harvested. The ADF&G objective for these fisheries is to provide for 35,000 angler-days of annual sport fishing opportunity directed at early-run Chinook salmon and coho salmon on the Homer Spit and early-run Chinook salmon in Seldovia Bay and Halibut Cove Lagoon, combined. Harvest and effort is assessed using the SWHS only at NDFL.

The run timing of Chinook salmon for the stocked fisheries is from approximately early May through mid-July, with a peak in mid-June. The average weight of returning adults is 15 to 17 pounds. From 2000 to 2010, the primary broodstock for all three locations has been Ninilchik River, where adults are artificially spawned and taken to SF hatcheries in Anchorage for rearing.

Due to shortages from the Ninilchik River weir broodstock collection, Crooked Creek or Ship Creek broodstocks have been used in 2010 through 2013. From 2004 through 2011, broods were reared for two winters in the hatchery before their release as smolt at the saltwater stocking locations. Starting in 2012, smolt were reared in the new William Jack Hernandez Sport Fish Hatchery (WJHSFH) in Anchorage and stocked as age zero smolt. All salmon produced by ADF&G hatcheries are thermal marked, which produces banding patterns on the 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 particular release locations. Release methods vary by location but when possible, smolt are held in net pens for up to five days after they are stocked to improve imprinting and fed twice each day to ensure growth. The benefits of this practice have not been tested.

From 2009 through 2013, the holding of salmon smolt at Halibut Cove Lagoon (HCL) and NDFL has been complicated by harmful algal blooms, specifically the diatoms *Chaetoceros* spp. These diatoms are found as either individual cells or long chains of individuals linked together. Each individual 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 they cannot avoid 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.<sup>1</sup> *Chaetoceros* spp. concentrations can increase quickly to levels unsafe to hold fish (>10,000 cells/L) and then to bloom-like levels ( $\geq 1,000,000$  cells/L).

Due to the presence of *Chaetoceros* spp., greater than average mortalities have occurred with some stockings at NDFL and HCL since 2009. Each year since 2009, nontraditional stocking methods (i.e., not holding smolt for five days prior to release) have been used and have necessitated an assessment of *Chaetoceros* spp. at NDFL. From 2009 through 2011, qualitative sampling was done to assess *Chaetoceros* spp. concentrations, but due to the limitations of the data, a more rigid and quantitative approach was needed.

In 2012 at NDFL, the *Chaetoceros* spp. concentration was assessed daily throughout the stocking season with a quantitative approach. *Chaetoceros* spp. concentrations remained higher than 10,000 cells/L throughout the monitoring period and stayed high into early August, when sampling was terminated, although there was a five day period from 13 through 17 July when concentrations were below the 10,000 cells/L threshold. The daily *Chaetoceros* spp. concentrations observed throughout the season were also compared to samples collected by Kachemak Bay Research Reserve and the NOAA field station in Kasitsna Bay. Results were generally similar, suggesting that *Chaetoceros* spp. were the predominant plankton throughout Kachemak Bay, and when blooms occurred within NDFL, they also occurred at other locations in the bay.

Periodic assessments of *Chaetoceros* spp. concentrations were also made in 2012 at HCL and the estimates for all samples were well above 10,000 cells/L. The Chinook salmon smolt were released early on the second day after stocking due mortality associated with *Chaetoceros* spp.

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<sup>1</sup> 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](http://www.nwfsc.noaa.gov/hab/habs_toxins/phytoplankton/algal_dynamics.html) (Accessed November 2013).

Starting in 2013 at NDFL and HCL, when *Chaetoceros* spp. concentrations were at harmful levels, stocking methods were changed from holding smolt for five days to only temporarily holding smolt for several hours in the net pens and then releasing them in the dark. Temporary holding helped acclimate smolt to the site and releasing in the dark helped reduce bird predation. Smolt were fed twice per day around the floats without nets. This appears to have helped increase the amount of time that released smolt spent within the stocking location in order to improve imprinting to the release site.

During the 2013 BOF meeting, BOF will address the following proposals: 1) a proposal by SF to eliminate the third annual youth-only fishery area because stocking of late-run coho salmon has been discontinued, and 2) a public proposal to allow use of “archery tackle” at locations open to snagging that could impact the stocked fisheries at Halibut Cove Lagoon and Seldovia.

### **Nick Dudiak Fishing Lagoon**

Early-run Chinook salmon smolt and early- and late-run coho salmon smolt (see Coho Salmon Fisheries section) are stocked in NDFL on the Homer Spit, located in Kachemak Bay. The NDFL was named in 2005 in honor of Nick Dudiak, the ADF&G biologist who initiated the stocking programs for sport anglers in Kachemak Bay. It is commonly known as the “Fishing Hole.” Most sport fishing effort on stocked salmon in Kachemak Bay and LCI is directed at the NDFL. The major goal of the program is to meet the summer demand for more sport fishing opportunities along the Kenai Peninsula road system without compromising wild runs. The majority of the return is harvested by sport anglers.

Early-run Chinook salmon have been stocked by ADF&G in the NDFL since 1984 (Table 12). From 1984 until 1993, the brood stock for the early run came from Crooked Creek, a tributary to the Kasilof River. Between 1993 and 1999, adults were collected from NDFL and spawned in a hatchery to produce the smolt that were then stocked back into 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 salmon smolt and produce 6,500 returning adults, all of which are available for harvest in the recreational fishery. The stocking goal has been met annually despite the difficulty with brood stock collection due to low run sizes.

Late-run Chinook salmon smolt were stocked by SF from 1992 through 1999. The original brood stock 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 13). Annual early-run Chinook salmon harvests from shore during 1988 through 2009 have ranged from 710 to 4,068 fish.

Since 1989, regulations have prohibited snagging while salmon can be caught using conventional angling methods, but have allowed a snag fishery by EO when salmon become sexually mature and can no longer be caught using nonsnagging methods. Snagging dates are determined by staff observation that surplus fish are available and that these fish are no longer “on the bite,” usually in late June or early July. Snagging ends a few days after it opens, when most surplus early-run Chinook salmon have been harvested. This management scheme has been applied to the other salmon species stocked in the lagoon, except for the early-run coho salmon stock, which overlaps

with the onset of the late coho salmon run. Through 1994, snagging was permitted at the NDFL beginning on 24 June. Snag opening dates in the NDFL area have been more variable since 1994 (Appendix A2). There were no snag openings in the years 2010–2013 due to poor runs and a lack of Chinook salmon buildup in NDFL.

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. Youth fishing days have become more popular as public awareness of their existence has grown (Szarzi et al. 2007) but in 2013, the effort seemed to be the lowest since inception.

At its November 2007 meeting, 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.

### ***Fishery Performance 2010–2013***

Below average harvests in the years 2010–2012 are attributed to poor runs for several reasons:

- 1) First, Chinook salmon runs for the years 2010–2012 were comprised of fish from the 2006–2011 stockings which were below average size and required longer rearing at the SF hatcheries due to the loss of heated water. Chinook salmon production at the WJHSFH has rectified this short-coming and the 2012–2013 stockings were at target size and of good quality.
- 2) Second, stocking Chinook salmon smolt during harmful levels of *Chaetoceros* spp. leads to mortality and may have affected surviving smolt from the 2009–2011 stockings. Adaptive stocking methods may have helped reduce this source of decreased production.
- 3) Third, the rearing habitat within NDFL had degraded over time because the depth and flow of water into the lagoon was not maintained. About 60% of the lagoon was four feet or less in depth during residual tide, when water was flowing neither in nor out of the lagoon. In the fall of 2012, the City of Homer dredged 32,500 cubic yards of gravel, sand, and organic material from the NDFL to create its original depth profile. This improved flushing and the rearing area within the lagoon.

Ultimately, stocked Chinook salmon experienced the same poor ocean conditions that may have resulted in below average runs to many Cook Inlet tributaries. In addition to below-average harvest in the years 2010–2012, the SWHS estimate of effort (days fished) for NDFL has been well below average. This is likely attributed to the poor runs. The NDFL salmon sport fishery is not specifically addressed in a regulatory management plan.

### **Halibut Cove Lagoon**

Early-run Chinook salmon are stocked in Halibut Cove Lagoon, located approximately 10 miles across Kachemak Bay from the Homer Spit (Figure 4). This is formerly the site of the Halibut Cove Lagoon Saltwater Rearing Facility, established in 1973 by the former Fisheries Rehabilitation, Enhancement, and Development Division of ADF&G, where all 5 species of Pacific salmon were reared experimentally for varying periods of time. Since 1979, the lagoon has served only as a Chinook salmon imprinting, rearing, and release site. Access to the fishery



is via boat. It provides fishing opportunity in a beautiful and remote setting. Anglers fish from the Alaska State Park 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.

The annual stocking goal through 2006 was 105,000 early-run Chinook salmon smolt in order to produce a run of approximately 3,000 adult fish. From 2001 through 2006, the average number of stocked fish was about 109,000 (Table 12). The stocking goal was reduced to 50,000 smolt in 2007. The reduction was the result of reallocation of Chinook salmon rearing space in SF Anchorage hatcheries to rainbow trout after loss of the heat source resulted in longer use of hatchery space for trout rearing. In 2009, approximately 35,000 smolt were stocked and the stocking goal was not met.

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

This stocked return is subject to a commercial set gillnet fishery adjacent to the lagoon from the first Monday in June until 30 September. The commercial set gillnet fishery harvest of Chinook salmon in the Halibut Cove Subdistrict ranged from 19 in 2008 to 1,400 in 1989, averaging 587 fish annually from 1984 through 2009 (Schroeder and Morrison 1989-1990; Bucher and Morrison 1991; Bucher and Hammarstrom 1993a-b, 1994-1999; Hammarstrom 2000; Hammarstrom and Dickson 2002-2007; Hammarstrom and Ford 2008; L. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer, personal communication). The number of Chinook salmon harvested in the commercial fishery is estimated from fish tickets.

Snagging is prohibited in Halibut Cove Lagoon until 24 June, when Kachemak Bay and LCI are open to snagging by regulation. After this date, the fish are maturing and angler efficiency using nonsnagging techniques dwindles. It has become popular for anglers to target Chinook salmon in Halibut Cove Lagoon during this time. A proposal before the BOF at its 2013 LCI meeting to allow the use of archery in Kachemak Bay locations open to snagging would impact the Halibut Cove Lagoon fishery.

### ***Fishery Performance 2010–2013***

Based on angler reports, harvest and effort were low from 2010 through 2013. In 2010, the stocking goal returned to 105,000 smolt as the stocking program transitioned to the new WJHSFH. In 2013, the stocking goal was not met when approximately 60,000 smolt were stocked. The shortfall was a result of low run sizes and resulted from insufficient broodstock from the Ninilchik River to meet egg take goals.

### **Seldovia**

Seldovia is located approximately 15 miles southwest of Homer Spit across Kachemak Bay (Figure 4). Chinook salmon smolt were first released in the Seldovia Harbor in 1987 to create a new sport fishery. In 2000, the release site was moved to upstream of a dam in Fish Creek, a small tributary to Seldovia Slough, to increase fidelity to the release location in stocked smolt (Szarzi and Begich 2004a).

SWHS estimates of sport angler participation, harvest, and catch in Seldovia was discontinued in 2001. Prior to 2001, the largest reported harvest was 600 in 2000. In most years, fewer than 30 respondents to the survey reported fishing in Seldovia. Estimates based on less than 30 respondents can indicate that sport fishing occurred, but because they are imprecise, they are not used (Mills and Howe 1992).

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 was 20 Chinook salmon per household. The fishery was opened for two 48-hour periods per week from 1 April to 30 May and one 36-hour period each of the first two weekends in August. BOF adopted a proposal extending the April–May period by 10 days to 30 May at its February 1998 meeting. The highest reported subsistence harvest was 189 Chinook salmon in 2000 and the lowest was two in 2008 (Hollowell et al. 2012)

A commercial set gillnet fishery harvests Chinook salmon in Seldovia Bay. Much of this harvest is likely composed of enhanced Chinook salmon returning to Seldovia. Commercial harvests averaged 40 fish from 1984 through 1988, prior to stocking (Hammarstrom and Ford 2010). Since 1991, when the run has consisted of all age classes of stocked fish, the average annual commercial harvest has been 256 and ranged from 22 in 2009 to 770 in 1991 (Schroeder and Morrison 1989-1990; Bucher and Morrison 1991; Bucher and Hammarstrom 1993a-b, 1994-1999; Hammarstrom 2000; Hammarstrom and Dickson 2002-2007; Hammarstrom and Ford 2008; L. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer, personal communication).

In November 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 1991; Bucher and Hammarstrom 1993a-b, 1994-1999; Hammarstrom 2000; Hammarstrom and Dickson 2002-2007; Hammarstrom and Ford 2008; L. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer, personal communication).

To produce a run of approximately 3,000 adult fish, the annual stocking goal through 2006 was 105,000 early-run Chinook salmon smolt. Number of stocked smolt averaged about 102,000 from 2001 to 2006 (Table 12). For the same reason that stocking was reduced at Halibut Cove Lagoon, the stocking goal for Seldovia was reduced to 50,000 smolts in 2007 in order to reallocate hatchery space to rainbow trout rearing. In 2009, about 45,000 smolt were stocked and the stocking goal was not met.

### ***Fishery Performance 2010–2013***

Like other locations around Kachemak Bay and Cook Inlet, poor runs have been reported for Seldovia from 2010 through 2013. In 2010, the stocking goal was returned to 105,000 as ADF&G transitioned to the new hatchery (WJHSFH). In 2011, SF attempted to hold Chinook salmon smolt in net pens at a release site in the harbor, but conditions were deemed too difficult to continue. In 2012 and 2013, the Chinook salmon smolt were released directly near the end of

Fish Slough near some freshwater inputs and stocking was successful. The stocking goal was not met in 2013 when about 63,000 smolt were stocked. The shortfall was a result of lower stocking because there was insufficient broodstock from the Ninilchik River to meet egg take goals.

## **FRESHWATER CHINOOK SALMON FISHERIES**

### **Fishery Descriptions**

Three streams in the LCIMA, within CCI, are open to sport fishing for Chinook salmon: Anchor River, Deep Creek, and Ninilchik River (Figure 2). Chinook salmon return to these streams from approximately early May through late July with a peak in early June. Anchor River has the largest wild Chinook salmon run, followed by Deep Creek, and finally, the Ninilchik River. The Ninilchik River is also stocked with hatchery-reared Chinook salmon. The Sterling Highway crosses the lower reaches of the streams and developed access and camping facilities are located on or near each river. Anglers can access the entire two-mile area open to fishing.

Historically, the streams have been opened to harvest of wild Chinook salmon on weekends and the Mondays following those weekends in late May to mid-June, although fishing time on the Ninilchik River has been liberalized to increase the harvest of hatchery-reared Chinook salmon. The Anchor River and Deep Creek fisheries have been liberalized and restricted to adjust the harvest on wild fish. Chinook salmon spawning occurs above the fishery from mid-July through August in these streams.

The Anchor River watershed is approximately 225 square miles and has about 114 river miles of anadromous fish habitat. Deep Creek watershed is approximately 211 square miles in size with 106 river miles containing anadromous fish habitat. During Chinook salmon sport fishing season, both streams have variable water levels and clarity due to the amount of snow melt runoff and their drainage morphology, which includes 1,000-foot cutbanks of loose substrate. Harvest success is related to these water conditions during fishery openings. Typical spring conditions find both Deep Creek and Anchor River high and muddy for the first and second Chinook salmon fishery openings, respectively, and generally flow subsides and clarity improves during the second opening in Deep Creek and the third Chinook salmon fishery opening in the Anchor River.

The Ninilchik River drainage covers 135 square miles and drains low altitude wetland habitat. Anadromous fish species have been found in 52 miles of the river. Water conditions on the Ninilchik River are generally less turbid than on the Anchor River and Deep Creek, and fishing conditions are good throughout the Chinook salmon fishery in May and early June.

### **Historical Harvest**

Since 1977, Chinook salmon harvest from the Anchor River, Deep Creek, and Ninilchik River has been monitored with the SWHS. The average and range of the historical (1977–2009) Chinook salmon harvest has varied within and between streams (average historical harvest of 1,315 for Anchor River [range 578–2,787], 877 for Deep Creek [range 124–2,503], and 1,615 for Ninilchik River [range 203–5,316]; Tables 14–17). Harvest variations between streams are attributed to differences in abundance; the Anchor River supports the largest wild stock fishery, and supplementation of the Ninilchik River with hatchery-produced fish boosts harvest there. Harvest variation within a given stream is primarily attributed to changes in fishing regulations, angler effort, and river conditions during fishery openings. Harvest success is related to water depth, flow rate, and clarity during fishery openings.

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 marine waters adjacent to Deep Creek. In the late 1970s and early 1980s, other Chinook salmon fisheries developed in the Kenai and Kasilof rivers, and in the Susitna River drainages, and effort in LCIMA freshwaters declined (Figure 5).

From 1992 to 1994, the combined Chinook salmon inriver harvest peaked (Table 3). 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.

In CCI, the increased Chinook salmon harvest in both the freshwater and the nearby saltwater sport fisheries in the early 1990s (Tables 3 and 14) 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, BOF adopted freshwater restrictions in the Anchor River and Deep Creek that included a reduction of the combined annual limit from five to two fish from the two 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 were fairly stable from 1998 through 2008. In 2009, harvest dropped substantially to a record low and was attributed to low runs.

From 1988 to 1994, the Ninilchik River was stocked by SF with an average of 182,000 Chinook salmon smolt to provide additional recreational fishing opportunity. To prevent unsustainable wild Chinook salmon harvests, negative hatchery-wild smolt interactions, straying of hatchery fish, and “recycling” of hatchery-produced fish during Chinook salmon egg takes, stocking levels were reduced to 50,000 smolt in 1995. The inriver run timing of hatchery fish estimated from harvest sampling is variable. The peak escapement to the eggtake weir, located approximately five miles upstream from the river mouth, is approximately seven days later for hatchery fish than wild fish.

### ***Anchor River***

From 1977 to 2009, the Chinook salmon harvest ranged from 578 to 2,787; the lowest harvest was in 1989 and the highest was in 1993 (Table 15). Annual harvest was influenced by the number of days that the sport fishery was open. From 1978 to 1987, when the inriver fishery was open four 3-day weekends with an annual limit of five Chinook salmon, the average harvest was 1,121. From 1988 to 1995 and 2004, when there were five 3-day weekend fishery openings and the seasonal limit was two 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 two 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. From 2005 to 2007, average harvest was 1,636 Chinook salmon, which is slightly lower than the 1989–1995 and 2004 average harvest.

The most liberal Anchor River sport fishery since 1977 took place in 2008 when the fishery was allowed 20 opening days, Wednesdays were added, and the seasonal limit was five Chinook salmon. Despite these liberalizations, the 2008 Chinook salmon harvest (1,486) was only slightly higher than the 1977–2009 historic average (1,240). In 2009, the fishery was closed by EO after allowing 14 opening days and a seasonal limit of five Chinook salmon. The harvest (737 Chinook salmon) was the fifth lowest since 1977.

### ***Deep Creek***

From 1977 to 2009, the Chinook salmon harvest ranged from 124 to 2,503, with the lowest harvest occurring in 2009 and the highest in 1993 (Table 16). 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. From 1988 to 1995 and 2004, when the number of fishery openings increased to five 3-day weekends and the seasonal limit was reduced two 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 two in combination with the Anchor River, the average harvest dropped to 743 Chinook salmon. In 2008 and 2009, when the Deep Creek seasonal limit was no longer tied to the Anchor River seasonal limit, the average harvest dropped to 363 Chinook salmon.

### ***Ninilchik River***

Prior to stocking (1978–1990), the average harvest from the Ninilchik River was 990 Chinook salmon (Table 17). During this period, the inriver fishery was open three 3-day weekends, the daily bag and possession limits were one Chinook salmon, and the seasonal limit was five. From 1991 to 1997, three- to 14-day fishery extensions were issued to target the returns 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. Stocking was reduced to 50,000 smolt in 1995 was accompanied by a subsequent reduction in the average harvest during the years 1999–2009 to 1,279 Chinook salmon.

The SWHS does not differentiate between wild and stocked Chinook salmon. Estimates of hatchery contribution to the Ninilchik River harvest from 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 2006b, 2007b). In 2006, sampling from the three regulatory weekend openings, but not the EO fishery, which lasted 31 days, indicated that hatchery-reared Chinook salmon comprised a minimum of 39% of the harvest (Booz and Kerkvliet 2011a).

### **Historical Escapement**

Chinook salmon escapements to the Anchor River, Deep Creek, and the Ninilchik River have been assessed since 1962 (escapement assessments shown for 1976 and later in Tables 14 and 18–21). Techniques used to assess spawning escapement in each river were similar at first, but diverged as more knowledge was gained about the river systems and counting technology advanced. Prior to 1974, fixed-wing aircraft were used in tandem with foot surveys. Surveys were conducted in each stream where the majority of 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.

A shift towards monitoring escapement with weirs instead of aerial surveys occurred in the 1990s. The first of the LCIMA streams to have a weir was the Ninilchik River in the late 1980s. The purpose of this weir was to collect broodstock for the stocking program and not necessarily to monitor escapement. The weir was only operated for a few weeks in July (during peak spawning) and its location provided road access to mature Chinook salmon. A significant

number of Chinook salmon migrated past this weir location prior to and after operation and based on aerial survey data, roughly 35% spawned downstream. Of the three streams, the Ninilchik River was 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. Starting in 2003, Chinook salmon escapement in the Anchor River was monitored with a combination of sonar and weirs (Kerkvliet et al. 2008; Kerkvliet and Burwen 2010; Kerkvliet and Booz 2012; Kerkvliet et al. 2012). Aerial surveys were continued through 2008 to compare trends between the two escapement monitoring methods. No relationship was found and the Anchor River aerial survey was discontinued in 2009. In 1999 and 2000, an attempt was made to install a weir on Deep Creek but high water during spring runoff prevented weir installation until after a significant number of Chinook salmon had escaped past the weir site. Of the three streams, Deep Creek is the most suitable stream for using aerial surveys to index Chinook salmon escapement and for this river, it is the current monitoring method.

### ***Anchor River***

In 2003, an escapement monitoring location was selected upstream of the fishery and just downstream of the confluence of the North and South forks. At first, 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, field operations were extended to monitor Chinook salmon over the entire run using DIDSON during high spring flows in May and June. Once stream flows were lower, a floating weir was installed and escapement was censused. In 2009, the DIDSON was not required because low water levels allowed for the installation of the floating weir prior to the run, which provided the first complete census of Anchor River Chinook salmon escapement. During the periods when the escapement was monitored using DIDSON, escapement was estimated from the net upstream fish passage (upstream count minus downstream count). The estimate was considered conservative because all fish passing upstream or downstream of the sonar beam were counted as Chinook salmon even though a small but unknown percentage of the downstream moving fish were post-spawning steelhead trout emigrating to saltwater (Kerkvliet et al. 2008).

Estimated Chinook salmon escapements for the Anchor River from 2003 to 2007 were near the estimated carrying capacity of 10,000 Chinook salmon. The 2008 and 2009 escapements were the lowest on record and fell below the sustainable escapement goal (SEG) lower bound of 5,000 Chinook salmon (Table 19). From 2003 to 2009, the inriver exploitation of the Anchor River stock ranged from 9.9% to 21.7%.

### ***Deep Creek***

The aerial index average from 1976 to 2009 was 600 Chinook salmon (Table 14). The 2008–2009 average was about 22% lower than the 2003–2007 average, which reflects a decrease observed for the same years for the Anchor River Chinook salmon escapement. The 2008 index count was the lowest since 1997.

### *Ninilchik River*

From 1999 to 2005, the Ninilchik River eggtake weir operation was extended to enumerate the entire escapement. On average, 65% of the total wild Chinook salmon weir escapement was counted during the current index monitoring period from 3 to 31 July. Since 2006, the weir has been operated from at least 3–31 July but with additional operation in many years as well. Wild Ninilchik River Chinook salmon escapements have been near the lower bound of the SEG goal of 550 Chinook salmon since 2007. The collection of broodstock during years of low runs increases the probability of not achieving the escapement goal because variability in run timing makes it difficult to predict if the goal will be met until late in weir operation after some eggtakes have already been conducted (Kerkvliet 2008; Kerkvliet and Booz 2010; Booz and Kerkvliet 2011a-c, 2012).

The average escapement of Ninilchik River Chinook salmon during the SEG period (3–31 July) from 1999 to 2009 was 861 wild fish. Over this period, the SEG was reached 8 of the 11 years. The escapement fell short of the SEG range (550–1,300 fish) in 2003 by 33 fish, in 2007 by 7 fish, and by 22 fish in 2009. No broodstock was collected in 2010 because production was being shifted to the new William Jack Hernandez Sport Fish Hatchery in Anchorage, and the wild Chinook salmon run met the SEG by 55 fish.

### **Fishery Management and Objectives**

Regulation changes have been modified as more information has prompted modification of escapement goals. Chinook salmon biological escapement goals (BEGs) were first adopted in 1993 for Anchor River (1,790), Deep Creek (950), and Ninilchik River (830), and were defined as the average of the expanded aerial index surveys (1962–1993). 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. 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 40<sup>th</sup> and 80<sup>th</sup> percentiles of aerial helicopter counts conducted from 1976 to 1997 (Szarzi and Begich 2004a).

Escapement goals for salmon stocks in Cook Inlet were reevaluated in 2001<sup>2</sup> 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 was developed to set escapement goals for stocks where total returns cannot be enumerated, based on the performance of salmon stock dynamics where total returns are known. The 25<sup>th</sup> to 75<sup>th</sup> 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 base management decisions on because of limited stream visibility. The Ninilchik River Chinook salmon SEG range (400–850) was changed to the 1994–2000 15<sup>th</sup> percentile and the maximum observed wild Chinook salmon escapement to the eggtake weir during July 8–24.

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<sup>2</sup> 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.

The overall objective of the LCIMA freshwater Chinook salmon fisheries is to provide sustainable and predictable fisheries via management by regulation of the wild Chinook salmon stocks of the Anchor River, Deep Creek, and the Ninilchik River. Specific objectives have been established for these stocks.

The objective for the Anchor River is as follows:

- 1) Determine the SEG that is predicted to maintain the population to ensure sustained yield.

The objective for Deep Creek is as follows:

- 1) Ensure through appropriate management and research programs that the spawning escapement index does not decline below levels predicted to ensure sustained yield. This number is the SEG, which is 350–800 Chinook salmon for Deep Creek

Objectives for the Ninilchik River are as follows:

- 1) Ensure that annual wild Chinook salmon escapement upstream of the eggtake weir falls within SEG range, which was established in 2007 as 550–1,300 Chinook salmon during 3–31 July
- 2) Stock 50,000 Chinook salmon smolt originating from Ninilchik River stock back into the Ninilchik River

The management approaches for wild Chinook salmon sport fisheries in the Anchor River, Deep Creek, and Ninilchik River have consistently been heavily restricted throughout most of their history. 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. Results 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, 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.

Since 1971, until the Anchor River sonar-weir project began estimating Chinook salmon escapement in 2003, most changes to Chinook salmon regulations were made postseason through the BOF because timely inseason escapement data were not available. However, changes were made inseason in 1988, when a fifth 3-day opening weekend was added by EO to the Anchor River and Deep Creek fishery because of lost fishing opportunity earlier in the season due to high water conditions, and inseason changes were made in the years 1991–1996 when the Ninilchik River Chinook salmon fishery was extended by EO based on inseason foot survey counts upstream of the fishery when large numbers of stocked fish returned. Deep Creek was liberalized by EO in 2001 by adding a 3-day weekend after high water had discouraged anglers from fishing during all three open weekends.

In 1996, the inriver Chinook salmon fisheries were restricted in concert with adoption of the Early-Run Plan in response to concerns over the high 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 permanently closed to salmon fishing. The restrictions also reduced the Deep Creek fishery to three 3-day weekend openings, and 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 five to two Chinook salmon over 16 inches in length.

During the 2013 BOF meeting, BOF will address the following proposals: 1) a public proposal to close the Anchor River Wednesday fishery, 2) an ADF&G proposal to delay reopening the Anchor River, Deep Creek, and Stariski Creek to sport fishing the first two weeks in July, 3) allow sport fishing on the roadside streams in November and December, and 4) reduce the bag and possession limit to one Chinook salmon on the Ninilchik River.

### ***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 four of six escapement index counts from 1996 to 2001 below the SEG (Szarzi and Begich 2004a-b; Table 14). This triggered a series of regulatory changes. At the fall 2001 BOF meeting, the fifth 3-day weekend was closed resulting in four 3-day weekends. In 2003, once escapement reflected large run sizes, the fishery was progressively liberalized through 2009 (Table 15). 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 SEG for Anchor River Chinook salmon has been refined as 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 the 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. 2010b).

In 2007, in response to a series of years with high annual escapement and low exploitation, BOF adopted a suite of regulations that further liberalized the Anchor River sport fishery: adding Wednesdays following each of the five 3-day weekend openings for a total of 20 opening days and increasing the annual limit from two to five Chinook salmon 20 inches or longer. Wednesday openings proved to be popular fishing days.

Beginning in 2009 and annually thereafter, in response to low Anchor River Chinook salmon escapements, ADF&G has issued EOs restricting the inriver and nearby marine fisheries (Appendix A1). The 2009 fishery was closed by EO and the opening was reduced from 20 to 14 days. In addition, the conservation zone surrounding the Anchor River mouth was increase (see Central Cook Inlet Saltwater Chinook Salmon Fishery section).

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. Without data on low escapement years as well, the accuracy of the SEG is highly uncertain. The completion of the

return from the 2009 brood will be available in 2015 and will provide recruitment data from a low escapement year.

### ***Deep Creek***

The Deep Creek SEG has remained unchanged since 2001. In 2013, the SEG was reanalyzed with the aerial survey data from 1976 through 2013 and results suggested no change in the SEG range. Since 2001, aerial index counts have fallen within the SEG range except for the 2008 count (Table 14). Index counts since 2006 reflect lower run sizes compared to the 2003–2005 counts.

Deep Creek Chinook salmon regulations have received little modification since the restrictions of 1996, aside from the addition of a 3-day weekend opening by EO in 2001 in response to poor fishing conditions throughout the regulatory openings. At the 2007 BOF meeting, the combined annual limit with the Anchor River was separated, which left Deep Creek with an annual limit of two 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 two Chinook salmon was recombined with the Anchor River.

### ***Ninilchik River***

From 1978 to 2004, the Chinook salmon fishery was open on the Ninilchik River for three 3-day weekends beginning on the Memorial Day weekend, with bag and possession limits of one Chinook salmon 20 inches or larger and an annual limit of five. Emergency orders increased the number of open fishing days for all Chinook salmon during the years 1991–1996 and in 2001 (Appendix A1), to maximize the harvest of hatchery-reared Chinook salmon.

Comparison of escapement counts for the entire run (May–August) to index counts during weir operation for eggtakes (July) led to revision of the SEG range in 2007 to 550–1,300 Chinook salmon. The 2007 SEG was the 15<sup>th</sup> percentile and the maximum wild Chinook salmon escapement upstream of the eggtake weir during 3–31 July each year from 1999 to 2007 (Table 21). 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 no change to the Ninilchik River wild Chinook salmon SEG.

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 have been near the lower bound of the SEG goal since 2007. 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 eggtakes 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 in the future.

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 one to two, of which no more than one fish could be a wild Chinook salmon.

During the years 2006–2007, EOs again increased the number of days when hatchery fish could be targeted. 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.

In 2010, the use of bait was prohibited by EO for the third regulatory weekend opening of the Chinook salmon sport fishery. This restriction was meant to reduce transferred effort resulting from restrictions on the Kenai and Kasilof rivers and the low Anchor River escapement.

### **Fishery Performance and Escapement 2010–2013**

In 2011 through 2013, the Anchor River, Deep Creek, and Ninilchik River experienced below-average Chinook salmon runs with record low harvests in 2012 (Tables 15–17 and 19–21). In 2011, water conditions for fishing were better earlier than usual for the Anchor River and Deep Creek and provided more opportunity for harvesting Chinook salmon. In 2012 and 2013, water conditions for fishing on the Anchor River and Deep Creek were more typical and better conditions occurred somewhat later than an average year. In the Ninilchik River, the water conditions for fishing were fairly normal and were good for fishing for all regulatory weekends in 2011 through 2013; although, on the first regulatory weekend in 2013, the water level was higher than average.

#### ***Anchor River***

The average harvest from 2010 to 2012 was 74% below the 1977–2009 historic harvest (Table 15). The 2012 harvest (38) was the lowest on record. The average catch from 2010 to 2012 (768) was 83% below the historic average (4,402; Table 15). The average exploitation rate of 7.4% from 2010 to 2012 was about half of the 2003–2009 average (15.6%; from Table 19). Exploitation in 2012 (0.8%) was the lowest on record. The SEG (3,800–10,000 Chinook salmon) was reached in 2012 and 2013, but not in 2011 (Table 19). Because the SEG range of 3,800–10,000 Chinook salmon was adopted after the 2010 season, the 2010 escapement (4,449 fish) was well below the lower bound SEG of 5,000 Chinook salmon that existed at the time. However, the 2010 escapement exceeded the lower bound of the new SEG.

The 2010–2011 fisheries were managed using inseason restrictions to provide for escapement goals. Beginning in 2012, strategies shifted to using a combination of pre-season and inseason restrictions to provide for escapement goals.

In 2010, the Anchor River was high and turbid through most of the Memorial Day weekend and fishing success was low. Toward the end of the weekend, the water began to drop but remained turbid. Saltwater fishing success was reportedly excellent over the Memorial Day weekend. After a bait closure went into effect, fishing pressure was relatively high on Saturday (5 June) with fair success on Sunday and Monday; when success waned, effort dropped. When the lower Anchor River reopened to fishing on 1 July (except fishing for Chinook salmon), Chinook salmon were observed holding in a popular fishing hole located downstream of the weir closure area. ADF&G received complaints of anglers illegally targeting Chinook salmon in the open area downstream of the weir. In response to illegal snagging, ADF&G extended the area closed to sport fishing downstream of the weir on 2 July to increase escapement to meet the escapement goal (Szarzi et al. 2010b). The 2010 estimated escapement was 4,449 (SE 103) Chinook salmon (Table 19), which met the lower bound of the SEG (see above).

In 2011, fishing conditions were good to excellent early in the season. The Wednesday openings proved especially popular days to fish. During the second and third Wednesday opening, escapement counts were noticeably lower than the Tuesday before and the Thursday after the Wednesday openings. As escapement counts fell further behind and were projected to fall below the SEG, the fishery was progressively restricted. Bait was prohibited starting on the fourth weekend opening but the fishing was described as good; the fishery was closed on the fifth Wednesday opening. In late June, large numbers of Chinook salmon were observed holding in the lower reaches and it was unlikely the escapement goal would be reached. To reduce the catch rates of Chinook salmon holding in the lower sections of the Anchor River, gear was restricted to one unbaited single hook when the sport fishery for species other than Chinook salmon was opened on 1 July. In 2011, 22% of the escapement was counted from 1 July to 31 July. The 2011 estimated escapement was 3,545 (SE 0) Chinook salmon (Table 19), which did not meet the lower bound of the SEG.

In 2012, a preseason EO restricted the fishery by closing the five Wednesday openings and by extending the closed area downstream of the Anchor River sonar-weir site by 1,000 feet to protect holding Chinook salmon. Because escapement was projected to fall below the SEG, an inseason EO was issued restricting gear to one unbaited single-hook artificial lure on the third weekend and then the fishery was closed on the fourth weekend (9 June) through 15 July. Fishing was generally poor prior to the closure, most likely due to the poor water conditions. The July fishery was closed to protect holding Chinook salmon from hooking mortality for the reasons stated above. Of the total 2012 escapement, 30% was counted from 1 July to 30 July, of which 11% was counted from 1 July to 15 July. The 2012 estimated escapement was 4,509 (SE 100) Chinook salmon (Table 19), which met the lower bound of the SEG.

In 2013, the preseason EOs were designed to provide more days of fishing opportunity and reduce inseason disruptions to the fishery. Preseason EOs closed the five Wednesday openings; extended the closed area downstream of the Anchor River sonar-weir site 1,000 feet; set a combined annual limit at two Chinook salmon for the Anchor River, Deep Creek, and Ninilchik River, and the saltwater areas between the latitude of Bluff Point and the mouth of the Ninilchik River; restricted gear to one unbaited single-hook artificial lure; and required anglers to stop fishing after harvesting a Chinook salmon on the Anchor River, Deep Creek, or Ninilchik River. An inseason EO closed the fifth opening weekend through 15 July. Based on angler reports, fishing success was poor prior to the closure and was likely impacted by poor water conditions going into the fourth weekend. Some anglers reported better catches on Sunday and Monday of the fourth weekend. Of the total 2013 escapement, 31% was counted from 1 July to 30 July, of which 23% was counted from 1 July to 15 July. The 2013 preliminary estimated escapement was 4,393 Chinook salmon (Table 19), which met the lower bound of the SEG.

### ***Deep Creek***

From 2010 to 2013, aerial index counts fell within the SEG range of 350–800 Chinook salmon (Table 14). The 2010–2012 average harvest (178 Chinook salmon) was 79% below the 1977–2009 historic harvest (827 Chinook salmon; Table 16). The 2012 harvest was the lowest on record (33 Chinook salmon). The 2010–2012 average catch (619 Chinook salmon) was 76% below the 1977–2009 historic average (2,590 Chinook salmon).

The Deep Creek Chinook salmon fishery was restricted by EO from 2010 to 2013 even though aerial index counts typically have fallen within the SEG range. Restrictions were justified by the

need to minimize transferring angler effort to Deep Creek from the conservation actions restricting primarily the Anchor River fishery as well as the restrictive actions on the Ninilchik River. In 2010 and 2011, bait was prohibited on the third opening weekend. In 2012, gear was restricted to one unbaited, single-hook artificial lure on the second and third weekend. In 2013, Deep Creek was included in the preseason EO that set an annual limit of two Chinook salmon in combination with the Anchor River, Deep Creek, and the salt water fishery, and gear was restricted to one unbaited, single-hook artificial lure for all three weekend openings. In July, fishing was closed through 15 July to reduce the associated hooking mortality on migrating Chinook salmon.

The 2010 aerial index of 387 Chinook salmon was below the 1976–2009 historical average (600 Chinook salmon), but within the SEG by 37 fish. Fishing conditions were poor and effort low over the first opening weekend and into the middle of the second weekend opening. Use of bait was prohibited during the last weekend opening. During this last weekend, fishing conditions were good, but success was fair and the fishery was crowded.

In 2011, fishing conditions were good during the last two opening weekends and similar to 2010. In both years, bait was prohibited on the last weekend opening. Harvest was similar in 2010 and 2011.

In 2012, fishing conditions were poor (high turbid water) over the first two weekends then improved slightly on the last weekend opening. The fishing conditions in combination with the EO fishing restriction (one single hook artificial lure) resulted in record low harvest and catch.

In 2013, fishing conditions were poor over the first two weekends and into the third and then improved slightly on the last two opening days.

### ***Ninilchik River***

In 2010 through 2013, the wild Ninilchik River Chinook salmon escapement counts (761, 561, and 591, respectively; Table 21) met the SEG (550–1,300 Chinook salmon). Below average weir counts of both wild and hatchery-reared Chinook salmon were observed during the SEG period for 2010 through 2013 (Table 21). In 2010, no eggs were needed for stocking because fish production at the new WJHSFH was sufficient (Szarzi et al. 2010b). There were sufficient numbers of wild Chinook salmon to meet the egg take goal in 2011, but not 2012 nor 2013. For both 2012 and 2013, the SEG was not met until the last day of the SEG period and the holding of wild fish for egg takes was delayed until then. Weir operations were extended in the years 2011–2013 to meet the eggtake goal. A high prevalence of jack (ocean-age-1 Chinook salmon) were observed in the 2012 wild and the 2012–2013 hatchery-reared runs.

In the years 2010–2013, the Ninilchik River Chinook salmon sport harvest was well below average. The decline in harvest was attributed to below average run sizes, annual inseason (preseason in 2013) restrictions and a decline in effort.

In 2010, the Chinook salmon sport harvest and catch was 358 and 1,371 Chinook salmon, respectively (Table 17). Based on angler reports, harvest and effort were likely highest during the first of the regulatory weekend openings. The inseason restriction that prohibited bait on the third regulatory opening, likely reduced effort during that opening. The 2010 SWHS estimate of effort was 5,296 angler-days, which was well below the 1978–1990 average estimated effort (12,336 angler-days) during the time period prior to runs that were comprised of stocked fish from the major age classes. The 2010 effort estimate was also below the average for the reduced stocking

years (1999–2009: 10,270 angler-days). These effort estimates are for the entire year, not just for effort on Chinook salmon; therefore, changes in effort may not reflect changes toward Chinook salmon.

The sport fishery in 2011 was similar to 2012 but with noticeably decreased effort. The 2011 SWHS estimate of effort (2,292 angler-days) was roughly half of the 2010 estimate. This reduction could have been influenced by the shift of some effort towards Anchor River and Deep Creek due to earlier than normal improved fishing conditions and due to the EO that restricted the use of bait on the third regulatory weekend. In 2011, the hatchery-reared only Chinook salmon sport fishery that began on 1 July was popular with anglers through 4 July, but then declined. Anglers reported that catch was primarily of wild Chinook salmon.

In 2012, anglers found poor success for the first and second regulatory weekend openings with somewhat improved fishing on the last weekend. Angler reports suggested that effort was low and similar to 2011. The 2012 SWHS Chinook salmon harvest estimate (16) was the lowest estimate recorded for the Ninilchik River. There were two EOs that affected the Chinook salmon sport fishery in 2012: the first restricted bait and limited gear to single hook for the second and third regulatory weekend openings and the second closed the hatchery-reared Chinook salmon fishery that started in July.

In 2013, 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 five Chinook salmon was reduced to two 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 one Chinook salmon regardless wild or hatchery-produced. The hatchery-produced Chinook salmon fishery was closed from 1 July through 31 October. The first regulatory weekend opening had higher than normal water levels but was still fishable. Water conditions were normal for the second and third regulatory weekend openings. Based on angler reports, effort was low and similar to 2011 and 2012.

## **COHO SALMON FISHERIES**

### **AREAWIDE OVERVIEW**

#### **Areawide Historical Harvest and Escapement**

Coho salmon are harvested throughout LCIMA in all salt waters and from freshwater tributaries on the east and west sides of Cook Inlet. The salt water fishery for coho salmon occurs throughout LCIMA but most effort that occurs is a troll fishery along the southern shore of Kachemak Bay from Seldovia west to the Flat Island area of LCI. There is also some effort in saltwater along the eastern Cook Inlet shoreline near the stream mouths because of easy access from the road system to harvestable numbers of fish. There is also shore and boat based effort on enhanced coho salmon from the NDFL stocking program in Kachemak Bay (see Stocked Coho Salmon 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 to be destined for tributaries in Northern Cook Inlet (NCI). Local stocks arrive at CCI stream mouths and begin their 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 Kachemak Bay tributaries are thought to be a little later than the run timing of CCI 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.

Freshwater harvests mostly come from the eastern CCI tributaries: Anchor and Ninilchik rivers and Deep and Stariski creeks. Historically, the streams in CCI have supported over 50% of the area's coho salmon harvest most years until 1990, when the coho salmon from the first full stocking of NDFL returned as adults (Table 5). These streams contributed only 18%, on average, to the area harvest when stocked returns were peaking from 2001 through 2005. Since 2006, they have contributed an average of 30% to the area-wide harvest. Stocked fish returning to the NDFL contributed an average of 22% from 1986 to 2009. From 2010 to 2012, NDFL contributed an average of 3% to the area coho salmon harvest.

The 2010–2012 average CCI saltwater coho salmon harvest (2,612) increased about 27% and the freshwater harvest (3,891) dropped about 29% from their respective historic averages (1977–2009; Table 5). The low freshwater harvest is attributed to the lower runs sizes of CCI streams. In contrast, the 2010–2012 average LCI and Kachemak Bay saltwater coho salmon harvest (5,946) was similar to the historic average (5,623) despite the record low harvest in the Kachemak Bay stocked fisheries (419). This is attributed to the fishing effort on coho salmon runs returning to the Fox River and streams within Kachemak Bay. Most of the harvest in WCI occurs in freshwater streams. On average (2010–2012), the WCI harvest (823) has dropped about 35% from the historic average (1,267) and is attributed to the combination of lower run sizes. Also, due to its remoteness, in recent years decreased effort may account for the lower harvest due to the associated increase in travel costs.

Coho salmon escapements were enumerated in the Anchor River from 1987 to 1989 and in 1992 through a weir operated to count Dolly Varden and steelhead (Table 18; Larson et al. 1988; Larson and Balland 1989; Larson 1990, 1993), and from 2004 through 2011 (Table 22; Kerkvliet et al. 2008; Kerkvliet and Burwen 2010; Kerkvliet et al. 2012; Kerkvliet and Booz 2012). Anchor River coho salmon runs are extremely variable; the lowest escapement of 1,866 was counted in 2011 and the highest in 1989 was 20,187. In 2004, a weir was operated in the North Fork of the Anchor River as well (see Freshwater Chinook Salmon Fisheries section). Based on the mainstem and North Fork weir counts, 88% of the coho salmon counted at the mainstem weir use the South Fork to spawn.

A floating weir was operated in Deep Creek from 1996 through 2001 (Table 23; Begich 2002, 2006a; Begich and Evans 2005; King and Breakfield 1999, 2002)<sup>3</sup> Deep Creek coho salmon escapement ranged from 1,537 in 1997 to 6,164 in 2001 and averaged 3,193 fish annually over the 6 years the weir was operational (Table 23). Coho salmon escapement in the Fox River is indexed by periodic aerial flights over Clearwater Slough, one of its few small clearwater tributaries. Coho salmon escapements in some small streams in WCI near Chinitna Bay including Clearwater Creek, Fitz Creek, Shelter Creek, and Silver Salmon Creek, have been estimated with periodic aerial and foot surveys.

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<sup>3</sup> C. M. Kerkvliet, Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Biologist, Unpublished data for Deep Creek coho salmon smolt studies, 1994-2004.

## **Areawide Fishery Management and Objectives**

There are no biological or sustainable escapement goals (BEG and SEG) for any coho salmon stock in the LCIMA. Weirs have periodically been used to monitor the Anchor River and Deep Creek coho salmon stocks. The sport fisheries are managed through sport fishery regulations that specify seasons, gear, open areas, and bag and possession limits. 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 three to two fish and for all Cook Inlet salt waters from six to two fish. The exceptions were fresh waters south of the West Forelands, including the west side of the LCIMA, where the bag and possession limits remained at three coho salmon, and the NDFL where the limits remained at six.

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 Central and NCI from three to one fish per day. Late-season coho salmon numbers increased in CCI streams and the EO was rescinded (Appendix A1). The coho salmon fishery in the NDFL is opened to snagging by EO when there is a buildup of fish that are becoming mature and are no longer striking at lures (Appendices A1 and A2). Otherwise, the NDFL is closed to snagging for coho salmon.

## **CENTRAL COOK INLET FRESHWATER COHO SALMON FISHERIES**

### **Fishery Description**

The Anchor and Ninilchik rivers, and Deep and Stariski creeks all support popular coho salmon fisheries. Run timing is approximately mid-July through September with a peak in late August or early September. These stocks are all early-run fish (compared to the Kenai River, which supports a late run that returns in September). Spawning can occur two miles upstream of their mouths and can occur upstream throughout most of the remainder of these drainages. Coho salmon spawn in a variety of habitat types, including narrow shallow areas with a gravel bottom, and they seem to favor areas with groundwater upwelling. The majority of juvenile fish rear in fresh water for two years before leaving as smolt. Most mature adults return to local streams after spending only one year feeding in salt water. Returning coho salmon generally mill in the salt water near river mouths and in lower freshwater reaches when river levels are low and then migrate upstream after rains cause river levels to rise.

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 four watersheds, Stariski Creek is the smallest (draining approximately 52 square miles with about 30 river miles as habitat for anadromous fish). 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 forms long meanders again 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 Chinook Salmon Fisheries section.

The following sections detail historical coho salmon harvests and escapements through 2007, and fishery management and objectives and fishery performance from 2008 through 2010.



## Historical Harvest

The Anchor River and Deep Creek support the largest freshwater coho salmon fisheries in the LCIMA. The Ninilchik River and Stariski Creek support smaller harvests than some streams in WCI (Tables 15–17, 24 and 25). Fewer than 30 respondents to the SWHS have reported fishing in Stariski Creek each year since the inception of the survey; therefore, the harvest estimates can only be used to indicate trends in harvests, and the large spike in estimated harvest in 1998 is likely due to sampling variation resulting from the annually low number of respondents to the SWHS that report fishing in Stariski Creek.

Since 1977, coho salmon harvests from the Anchor River, Deep Creek, and the Ninilchik River have been monitored with the SWHS. The average and range of the 1977–2009 historical coho salmon harvest has varied between streams (average historical harvest is 2,830 [range 1,021–5,314] for Anchor River, 1,414 [range 306–2,651] for Deep Creek, 970 [range 88–3,425] for Ninilchik River, and 27 [25–1,168] for Stariski Creek). Harvest variations between streams are attributed to differences in abundance, with the Anchor River supporting the largest fishery. Annual differences in harvest from a given stream are primarily attributed to changes in water depth, flow rate, and clarity conditions, rather than variations in run strength between years because generally when large schools are migrating through the fishery, river levels can be high, causing poor fishing conditions. The salt water fishery at the mouths of these streams harvests an unknown number of these stocks.

The inriver exploitation of Anchor River coho salmon tends to be lower during large runs and higher during smaller runs (Table 22). The range of exploitation for Deep Creek coho salmon from 1996 through 2001 (23–57%) fell within the range observed for Anchor River coho salmon.

## Historical Escapement

### *Anchor River*

Anchor River coho salmon escapement was opportunistically monitored from 1987 through 1995 at a weir operated for the purpose of counting Dolly Varden and immigrating steelhead trout (Table 18; Larson 1990–1995, 1997). The weir was located approximately 1.6 river kilometers (RKM) from the river mouth, within the river section open to sport fishing. For the four years the weir was operated throughout the coho salmon run (1987–1989, 1992), weir counts of coho salmon ranged from 2,409 to 20,187 fish (Table 18). These counts are considered maxima because there was an unknown level of harvest that occurred upstream of the weir. The relationship between the counts and the actual escapement of coho salmon for the remaining years (1990–1991 and 1993–1995) is unknown because the weir operation dates did not span the run and therefore the counts are underestimates by an unknown amount.

In 2004 through 2001, the Anchor River sonar–weir site escapement project was expanded to include coho salmon. No harvest occurs above this weir site. Monitoring with a video-equipped weir in 2010 and 2011 was under a cooperative agreement between SF and the United States Fish and Wildlife Service (USFWS). Between 2004 and 2011, the weir washed out twice (2005 and 2006). The 2005 estimated escapement (18,977 coho salmon, Table 22) was considered a reasonable approximation of actual escapement because the weir washed out late in the run (Kerkvliet and Burwen 2010). However, the same was not true in 2006 because the weir washed out in mid-August, near the peak of the coho salmon run, which was projected to be exceptionally large. For years when the weir operation was maintained throughout the entire run

(2004, 2007–2011), coho salmon escapement ranged from 1,866 fish (2011) to 8,226 fish (2007). Run timing comparisons from 2004 through 2008 at the sonar–weir site have been highly correlated with river stage, with the highest passage occurring during peak flows (Kerkvliet et al. 2008; Kerkvliet and Burwen 2010).

### *Deep Creek*

Assessment of Deep Creek coho salmon escapement occurred during a smolt abundance and marine survival study that was initiated in 1995. In the first phase of the study, smolt were captured, coded-wire-tagged, adipose fin-clipped and then released. Smolt were tagged from 1995 through 1997, and again in 2000 through 2003 (Table 23; Begich 2002, 2006a; Begich and Evans 2005). In the second phase of the study, the proportion of coded-wire-tagged fish was estimated from returning adults. Returning adults were initially captured in nets in 1996. From 1997 to 2001, coho salmon were counted throughout their migration at a floating weir installed approximately 2.5 miles upstream from the mouth of Deep Creek. In 2003 and 2004, nets were again used to sample the adult returns to estimate smolt abundance and marine survival.

Weir counts of coho salmon escapement for Deep Creek ranged from 1,537 in 1998 to 6,164 in 2001 (Table 23). The peak of the Deep Creek coho salmon run ranged from 17 August in 1998 to 26 August in 1997 (King and Breakfield 1998, 1999, 2002; Begich 2002, 2006a; Begich and Evans 2005).

Deep Creek coho salmon smolt abundance estimates ranged from about 20,000 to 57,700 (King and Breakfield 1998-1999, 2002; Eskelin 2004). The estimated marine survival rates for coho salmon smolt in 1996, 1997, and 2001 were 8.1%, 17.8% and 19.3% respectively.<sup>4</sup>

### **Fishery Management and Objectives**

The overall objective is to manage the coho salmon stocks of the Anchor River, Deep Creek, Ninilchik River, and Stariski Creek by regulation to provide sustainable and predictable fisheries.

These streams have pass-through fisheries for salmon, including coho salmon, in which fishing is open only in the waters from their mouths upstream approximately two miles on the Anchor River, Deep Creek, or Ninilchik River, or approximately one mile upstream on Stariski Creek; spawning areas upstream are permanently closed. These streams are open to salmon fishing (other than Chinook salmon) from 1 July for the rest of the year. Beginning 1 September, only unbaited single hooks are allowed. The daily bag and possession limits are two coho salmon.

Historical regulations governing the coho salmon fisheries were consistently applied to all four streams. Bait was allowed throughout the fisheries from 1977 through 1983. From 1984 through 1988, bait use was prohibited from 16 September through 31 December. In 1989 and 1990, bait use was prohibited earlier in the season, beginning 16 August. Since 1991, bait has been prohibited from 1 September through 31 December.

The bag and possession limits for coho salmon 16 inches or greater were three from 1977 through 1999. During the winter of 1999, the BOF held a special meeting to address persistently low coho salmon returns to some Cook Inlet tributaries, including the Kenai River and northern NCI tributaries. The freshwater bag and possession limits for coho salmon on the east side of Cook Inlet were reduced from three to two.

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<sup>4</sup> C. M. Kerkvliet, Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Biologist, Unpublished data for Deep Creek coho salmon smolt studies, 1994-2004.

Throughout their history, there have been few inseason management actions taken in these coho salmon fisheries. Prior to 1989, there were none. In 1989, an exceptionally large return to Anchor River resulted in an EO opening to coho salmon fishing of an additional five miles upstream in the South Fork. This additional area was open from 2 to 10 September. Opening this additional area did not significantly increase harvest and this management tactic has not been used since.

Regulation changes during the coho migration have had no detectable impact on coho salmon harvests. In 1989, because of an exceptionally large coho salmon run in the Anchor River, an EO increased the open area upstream of the traditional fishery by five miles on the South Fork for nine days. The large run and resulting EO did not coincide with a significant increase in harvest in 1989. In 1997, the coho salmon sport fish bag and possession limits were reduced to two and tackle was restricted inlet-wide by EO because runs were poor. A subsequent regulation reducing the bag and possession limits was implemented beginning in the 2000 season through the present. Since the bag and possession limit restrictions, coho salmon harvests have increased in the Anchor River, Deep Creek, and Ninilchik River and Stariski Creek.

Changes in bait regulations did not coincide with any detectable change in the coho salmon harvest from the roadside streams during the years 1977–1999, when the bag and possession limits for coho salmon were three. Before any bait restrictions (1977–1983), the average harvest from the Anchor and Ninilchik rivers and Deep Creek combined was 3,113 fish. The average harvest increased to 3,701 fish when bait was prohibited from 16 September through 31 December during the years 1984–1988. When bait was prohibited earlier in the season on 15 August (1989 and 1990), the average harvest increased to 4,765 fish, and when the bait restriction was shifted back to 1 September in 1991 (1991–1999), the average harvest increased to 5,292. The cause or causes for the increase in coho salmon harvests despite bait restrictions are unknown. Some factors may include increases in angler-effort targeting coho salmon, increased angler efficiency at harvesting coho salmon without bait or stream conditions that promoted harvest of coho salmon.

In fall 2010, BOF adopted a regulation that a person could not remove coho salmon 16 inches or longer from fresh water before releasing the fish. If the fish were removed from fresh water, it must be kept and become part of the bag limit of the person who originally hooked the fish.

During the 2013 BOF meeting, BOF will address the following proposals: 1) an ADF&G proposal to delay reopening the Anchor River, Deep Creek, and Stariski Creek to sport fishing the first two weeks in July, and 2) allow sport fishing on the roadside streams in November and December.

### **Fishery Performance 2010–2013**

Based on angler reports to SF and periodic observations made by SF staff, the overall fishing success in the Anchor River, Deep Creek, Ninilchik River, and Stariski Creek was poor. Anglers were more successful at catching coho salmon under the following conditions: when the streams had begun to rise from recent rains, during the early morning hours, and near the river mouths on incoming tides. Based on angler reports for the 2012 fishing season, anglers appeared to have somewhat better fishing success than 2011. In 2013, anglers reported fair to good fishing during periods of changing water levels in mid-August.

Coho salmon fishing in Deep and Stariski creeks and Ninilchik River were more similar to other years and at times, anglers had better fishing success in those places than in the Anchor River.

### ***Anchor River***

The Anchor River harvest from 2010 to 2012 (1,597 coho salmon) was 40% below the 1977–2009 historic harvest (2,669 coho salmon; Table 15). The 2011 harvest was the lowest on record (808 coho salmon) and the 2012 ranked third lowest (1,121 coho salmon). The average catch from 2010 to 2012 was 59% below the historic average.

The coho salmon escapement monitoring through late September in 2010 and 2011, verified that escapement counts through 11 September had monitored about 92–97% of the escapement in prior years. The 2010 escapement estimate was the fifth highest on record (6,014 coho salmon) and the 2011 estimate was the lowest (1,866; Table 22). The exploitation rates in 2010 (32.3%) and 2011 (30.2%) fell within the historic range (1987–1989, 1992, 2004–2009) and was similar to the historic average for those same years.

Based on angler reports, fishing success was better in 2010 than during the years 2011–2013. Anglers reported being more successful at catching coho salmon under the following conditions: when the river had begun to rise from recent rains, during the early morning hours, and near the mouth of the river on the incoming tide. Based on reported catch, the 2012 coho salmon fishing season appeared similar or somewhat better than 2011 and anglers reported fair to good fishing during periods of changing water levels in mid-August in 2013.

### ***Deep Creek, Ninilchik River, and Stariski Creek***

The 2010–2012 average harvests from Deep Creek and the Ninilchik River were about 2% and 23% below the average 1977–2009 historic harvests, respectively, and the 2010–2012 average catches were about 29% and 62% below the average historic catches, respectively (Tables 16 and 17). In Stariski Creek, the 2010–2012 average harvest was similar to the historic average (272 vs. 271, respectively) while the catch was 38% below the historic average (Table 24).

Deep Creek annual coho salmon harvest estimates from 2010 through 2012 were fairly similar to the 1977–2009 historic average (1,351; Table 16); the 2012 harvest estimate (1,122) was the lowest of the three recent years. Deep Creek coho salmon catch was fair in 2011 and 2012 (1,507 and 1,536, respectively; Table 16) but better than catch in the Anchor River (808 and 1,121, respectively; Table 15). Based on angler reports to SF, fishing at the mouth of the stream on an incoming tide was productive for catching coho salmon in both years. Coho salmon fishing was reported to be fair to good in 2013.

The Ninilchik River annual coho salmon harvest estimates from 2010 through 2012 were more variable than Deep Creek but, except for 2011, similar to the 1977–2009 historic average (915; Table 17). Fishing success for catching coho salmon on the Ninilchik River was poor and similar to the Anchor River in 2011. The SWHS 2011 estimate of Ninilchik River coho salmon harvest (356) was well below the 1977–2009 historic average (915). Angler reports suggested improved fishing in 2012 particularly in mid-August in the area around the Sterling highway bridge. In 2013, angler success with catching coho salmon in the Ninilchik River was similar to 2012.

The Stariski Creek annual coho salmon harvest estimates from 2010 through 2012 were variable, but the average (272) was similar to the 1977–2009 historic average (271; Table 24). The 2011 harvest estimate (538) was the higher than average while the 2012 harvest estimate (78) was well

below average. Most anglers target coho salmon at the mouth of Stariski Creek on the incoming tide and success was reported to be similar to Deep Creek for the years 2011–2013.

## **LOWER COOK INLET AND KACHEMAK BAY COHO SALMON FISHERIES**

### **Fishery Description**

Most sport fishing for coho salmon in LCI and Kachemak Bay occurs in salt water. Anglers target a mixture of Cook Inlet stocks from boats in LCI. Kachemak Bay stocks predominate in the harvest near and east of Homer Spit, and most anglers fish from shore in Kachemak Bay for coho salmon stocked in the NDFL. Boat anglers troll or mooch herring, flies, or lures (jig) for coho salmon. Shore anglers cast flies or lures, or drift eggs, or herring.

The Fox River, at the head of Kachemak Bay, is thought to be the major producer of wild coho salmon in Kachemak Bay and LCI. Sport anglers fishing from shore and boat have historically targeted these fish as they migrate close to shore past the tip and along the eastern side of Homer Spit.

Only a small amount of fishing occurs in the fresh waters of LCI and Kachemak Bay. The Fox River is remote and access is difficult. Other 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 several other small tributaries that enter the south side of Kachemak Bay, also support small coho salmon harvests.

A personal use set gillnet fishery (managed by CF) targets mixed coho salmon stocks of Kachemak Bay from near Bluff Point to near the Fox River on the north side of Kachemak Bay, and on the south side of Kachemak Bay from Fox River to Jakolof Bay (Hollowell et al. 2012). Coho salmon are intercepted in a set gillnet subsistence fishery in the Port Graham–Nanwalek area. A limited commercial fishery harvests coho salmon, primarily in eastern LCI and in Kachemak Bay.

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 to be destined for tributaries in Northern Cook Inlet (NCI). Local stocks arrive at CCI stream mouths and begin their 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 Kachemak Bay tributaries are thought to be a little later than the run timing of CCI stocks. Coho salmon tend to hold in salt water near natal stream mouths or in the lower reaches of streams until rain raises the stream water level, then to immigrate en masse. Peak daily fish counts at the Anchor River weir have exceeded 4,000 during high water.

### **Historical Harvest**

The average annual sport harvest of coho salmon in LCI and Kachemak Bay from 1978 to 1988 was stable at about 1,500–2500 fish (Table 5). The first return of stocked coho salmon to the NDFL in 1989 doubled the harvest. Annual coho salmon sport harvests generally increased to approximately 30,000 in 2005 and then decreased dramatically as returns to the NDFL declined. Interannual harvest trends have generally been similar between the NDFL and the remainder of Kachemak Bay and LCI.

## **Historical Escapement**

Wild coho salmon escapement in the LCI and Kachemak Bay has been regularly monitored only in Clearwater Slough, a Fox River tributary. Aerial counts were first made in 1969. Peak counts have ranged between 125 in 1997 and 3,023 in 2001 and averaged 1,200 (1997–2006; Bucher and Hammarstrom 1998-1999; Hammarstrom 2000; Hammarstrom and Dickson 2002, 2004; Hammarstrom and Ford 2010; L. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer, personal communication). Significant numbers of coho salmon are only visible at the slough's confluence with Fox River so the usefulness of the survey is limited. The Fox River may have experienced the low runs observed in other Cook Inlet tributaries in 1997 (L. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer, personal communication).

## **Fishery Management and Objectives**

The overall objective for the coho salmon fisheries in LCI and Kachemak Bay is to provide sustainable and predictable fisheries. There are no escapement goals or specific objectives established for these stocks. There is relatively little effort focused on coho salmon stocks returning to tributaries in LCI and Kachemak Bay by either sport or commercial fisheries; therefore, active research and management of the stocks is minimal. The freshwater fisheries are currently so small that few respondents to the SWHS report fishing there. Saltwater coho salmon harvests are significant and are likely made up of many Cook Inlet stocks because the fisheries occur away from tributary mouths and primarily in the waters outside of Homer Spit.

The personal use coho salmon set gillnet fishery in Kachemak Bay targets a mixture of wild stocks primarily bound for the Fox River drainage at the head of Kachemak Bay and stocked fish bound for the NDFL. The fishery extends along the shoreline from near Homer to Jakolof Bay, with some closed areas at stream mouths and in sensitive wildlife habitat. The guideline harvest range is 1,000–2,000 coho salmon and is based on the average harvest prior to stocking. The BOF had lowered the guideline harvest range from 2,500–3,500 coho salmon beginning in 1999 because discontinuation of coho salmon stocking projects at Caribou Lake and Fritz Creek, on the north Kachemak Bay shoreline near the head of the bay, was threatening to focus the gillnet fishery too much on wild stocks.

## **Fishery Performance and Escapement 2010–2013**

In 2013, fishing at the head of Homer Spit in Mud Bay was reportedly excellent for coho salmon and likely a result of a large run returning to the Fox River drainage. Coho salmon harvests from elsewhere in Kachemak Bay and LCI during the years 2010–2012 were similar to the 1977–2009 historic average (5,623; Table 5), but lower than the peak harvests in the years 2001–2005 (10,300–18,264 coho salmon).

With the decline in stocked salmon returns to the NDFL, the proportion of personal use permits fished in the vicinity of the lagoon has declined and was 20% in 2010. In the years 2011–2013, personal use effort on the Homer Spit was similar to 2010 and the vast majority of the coho salmon harvest occurred in other reporting areas.

Aerial index counts of coho salmon in Clearwater Slough, the only tributary monitored for escapement in Kachemak Bay and LCI, were below the 1977–2009 historic average of 1,000 in 2011 (170) and 2012 (30) and above average in 2013 (1,350; E. G. Ford, Commercial Fisheries Biologist, ADF&G, Homer, personal communication). Index counts for this system are comprised of the peak number observed among one to four surveys conducted annually.

## Stocked Coho Salmon Fisheries

ADF&G SF has stocked coho salmon in the NDFL since 1988 (Table 12). The objectives of that the stocking program are as follows:

- 1) Annually stock 120,000–210,000 coho smolt in the NDFL, which will return approximately 6,000 adult fish, all of which will be available for harvest in the recreational fishery.
- 2) Generate 10,000 angler-days of sport fishing opportunity directed at stocked coho salmon in Kachemak Bay.

Two runs of coho salmon, one with earlier run timing than the other, are stocked in the NDFL. The early run fish are from Ship Creek stock, in Anchorage. The late-run fish are from Bear Lake in the Salmon Creek drainage about 10 miles north of Seward. The early-run coho salmon return closer to the peak tourist season: the fish arrive on approximately 15 July; the run peaks in early August, and is over by mid-August. The late-run begins to arrive around the first of August; the run peaks during the third or fourth week in August and continues until mid-October. The early-run was first stocked in 2001.

SF discontinued stocking late-run coho salmon after 2001. Funding from the City of Homer, the Kenai Peninsula Borough, Port Graham Native Association, businesses, and fundraising events by a citizen group, Friends of the Fishing Hole, covered expenses for Cook Inlet Aquaculture Association (CIAA) to rear and stock late-run coho salmon from Bear Lake each year from 2001 to 2009. CIAA ceased taking coho salmon eggs to stock the NDFL in 2008 and the last return of CIAA-stocked coho salmon was in 2010.

In both 2005 and 2006, the late-run Bear Lake coho salmon smolt contracted, and were treated for, bacterial kidney disease. High mortality occurred in smolt stocked in 2005 and virtually none of them returned as adults to the NDFL in 2006. In 2006, nearly 325,000 treated smolt were released in the NDFL in good condition. The run in 2007 was smaller than expected and effort was similar to runs from average stocking levels. The 2008 run of late-run coho salmon was also smaller than expected. In 2009, early and late coho salmon runs were very poor. The reason for this is unknown, but is likely due to a combination of factors including poor marine survival of wild Cook Inlet stocks as well as the factors affecting stocked Chinook salmon at NDFL (see Stocked Chinook Salmon Fisheries section). The SWHS annual estimates of coho salmon harvest at NDFL have been well below average since 2009.

The proportion of total permits fished in the personal use fishery on the Homer Spit adjacent to the NDFL peaked in 1999 at 60% and the proportion of personal use coho salmon harvest in the same area peaked in 1998 at 70% (L. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer, personal communication). A study was conducted in 1999 and 2000 to estimate the contribution of hatchery-reared coho salmon to the personal use set gillnet fishery on the east side of the Homer Spit (Szarzi and Begich 2004a). The average proportion of hatchery-reared coho salmon examined in 1999 (499 coho salmon) and 2000 (685) during the personal use fisheries was approximately 81% in 1999 and 90% in 2000. The number of hatchery fish in the harvest was higher during the latter part of the fishery in both years. It was previously thought that the wild coho salmon run to the Fox River occurs later than the enhanced run.

Beginning in 2001 and continuing through 2010, angler counts were conducted at regular intervals in the vicinity of the NDFL from 15 August through 15 September to monitor the

response of the sport fishery to the different stocks released in the NDFL (ADF&G unpublished data). The counts take place during daylight hours during an incoming tide when fishing effort peaks as the water is first pouring over the sill into the lagoon. The early-run coho salmon stock proved to be very popular; much more angler effort occurred during this run than was attracted by the late-run Chinook salmon, last stocked in 1999. Starting in 2009, effort declined and the survey was discontinued in 2011 due to an even further decline in effort and shifting work towards other priorities.

During the 2013 meeting, the BOF will address a proposal submitted by ADF&G to eliminate the third youth-only fishery at NDFL. ADF&G submitted this proposal because this fishery was established to target late-run coho salmon, which will no longer be stocked starting in 2013.

### **Fishery Performance and Escapement 2010–2013**

Stocked coho salmon runs to the NDFL in the years 2010–2013 were well below the historic average. Estimated harvests in the SWHS for 2010–2012 were correspondingly low and the 2012 harvest estimate (58) was the lowest since the inception of the stocking program (Table 13) The 2010–2012 average harvest (419) was 94% below the historic average (7,164 coho salmon).

The 2010–2012 average annual SWHS estimate of effort for all species at NDFL (7,028 days fished) was a third of the 1988–2009 historic average (21,471 days fished; Table 13). The 2012 estimate of 4,086 angler-days fished was the lowest annual estimate for the NDFL and well below the target objective of 10,000 angler-days.

In 2010, only early-run coho salmon were stocked at NDFL. SF resumed stocking late-run coho salmon in 2011 and 2012, once rearing capacity increased with the construction of the new WJHSFH but was discontinued again starting in 2013 because ADF&G's genetic guidelines no longer approved stocking of fish originating from outside Cook Inlet. The 2011 and 2012 stockings of early- and late-run coho salmon were reduced to about 60,000 smolt each from 120,000 smolt each. Stocking goals for coho salmon have been met every year for NDFL.

## **WEST COOK INLET FRESHWATER COHO SALMON FISHERIES**

### **Fishery Description**

Coho salmon are widely distributed in WCI fresh waters where they spawn in a variety of freshwater habitats. Coho salmon begin to enter streams in this area to spawn in late July and continue their immigration through mid-September. The exact location and duration of spawning for each stock is unknown. There is little research on coho salmon in this area because there is relatively low sport and commercial fishing effort. The small fisheries that do occur are remote and have low yield, and it is expensive to participate in them. Access is by plane, helicopter, or boat, and anglers are typically guided. There are few facilities to house anglers overnight. In the fisheries south of Chinitna Bay, participants are mostly guided anglers flown in and out on a daily basis from the Lake Iliamna area.

The largest coho salmon sport fisheries occur in Silver Salmon Creek and the Kamishak River. Silver Salmon Creek is located midway between Tuxedni and Chinitna bays (Figure 1). 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 one of two sport fishing lodges that are located in the vicinity of the mouth of Silver Salmon Creek. Additional day-use access to the fishery occurs via regular commercial air service from the



communities of Soldotna and Homer, which lands on the beach adjacent to the creek, and from private planes.

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 on a daily basis. Guides transport clients by jet boat 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 here 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 four have been active over the years, but none have been in place since 2005.

Commercial fishing parties harvest coho salmon in WCI setnet and drift gillnet fisheries. In spring 2005, the BOF repealed a 1996 regulatory closure of the commercial fishery after 9 August for the marine waters outside Chinitna Bay and including the waters adjacent to Silver Salmon Creek (Shields 2006). Commercial fishing in WCI now closes by EO. The harvests have been well below the historic average due to low prices. Relatively good prices for coho salmon in 2010 resulted in more fishing effort on the west side of Cook Inlet, including the waters near Silver Salmon Creek and in Chinitna Bay.

## **Harvest and Escapement**

Information concerning WCI coho salmon sport fisheries comes from the SWHS, which provides estimates of sport fishing effort (days fished), and catch and harvest of coho salmon in many WCI tributaries. However, because of the relatively small number of anglers who fish these tributaries and corresponding low number of anglers participating in the survey, many coho salmon fisheries only appear sporadically in the survey. Additional information regarding these fisheries is pieced together from freshwater guide logbooks, anecdotal reports by anglers, inseason observation of selected fisheries by ADF&G staff and National Park Service staff on site, harvest reports required of guides fishing in the McNeil Game Sanctuary, and periodic stream surveys of selected tributaries to index coho salmon spawning escapement.

The number of anglers that fish Silver Salmon Creek is generally large enough that the SWHS provides useful estimates of fishing effort, and coho salmon harvest and catch most years. Harvest and catch in Silver Salmon Creek are variable, with no increasing trend (Table 25). Catches peaked between 2003 and 2006 (5,234–10,902 coho salmon; Table 25) and were comparable to catches in the Anchor River, the largest coho salmon fishery in the LCIMA (Table 15).

Sport fishery estimates from the SWHS for the Kamishak River are not reliable because the number of respondents to the survey that report fishing in the river each year is generally fewer than 12. Most fishing in the Kamishak River is guided. Estimates of guided fishing effort and coho salmon harvest and catch have been available from freshwater guide logbooks since 2005, and are thought represent a majority of the fishing activity (Table 26).

Clearwater and Shelter creeks are small tributaries to Chinitna Bay, and fishing effort and harvest are reported sporadically in the SWHS. The SWHS estimates are not reliable due to the small number of survey respondents that report fishing there, but the low number of respondents indicates a minimal level of angler effort at both locations and therefore, negligible sport harvests from either creek. Estimated harvests for Shelter Creek are typically fewer than 100 coho salmon, while harvests reported intermittently from Clearwater Creek since 1989 averaged 87 coho salmon. There is no detectable increase in harvest at these locations. Lake Clark National Park Service employees stationed in Chinitna Bay have observed little sport fishing activity in bay tributaries since the closure of two fishing guide businesses that operated through 2005; most visitors in recent years are bear viewers. Guided logbook data shows some effort in both Shelter and Clearwater creeks for most years. From 2006 to 2012, there was an average of six guided trips per year for Shelter Creek. Clearwater Creek had an average of 11 guided trips per year but there was no effort reported in 2012.

Coho salmon escapement data are limited for WCI streams. No foot surveys have been conducted to estimate coho salmon escapements since 2002 when Clearwater Slough was last surveyed (Szarzi et al. 2007). CF counts coho salmon incidentally during August and early September aerial chum salmon escapement surveys. Surveys attempt to coincide with peak instream abundance of chum salmon but not coho salmon, which return later than chum salmon. Peak aerial coho salmon counts represent the minimum escapement because they are flown prior to the peak of the coho salmon immigration. It is difficult to differentiate between chum and coho salmon during aerial surveys when both species are present, so counts may be inaccurate, particularly in Clearwater Creek, which has a large chum salmon run.

CF has flown aerial surveys of Clearwater Creek since 2000. Fish thought to be coho salmon have been spotted from the air in 1999–2001 and 2008. Aerial coho salmon counts have ranged from 500 in 2001 to 2,720 in 2008.

From 2000 to 2005 and in 2010, CF conducted aerial surveys of Silver Salmon and Shelter creeks as time allowed, in addition to its Chinitna Bay chum salmon surveys (L. F. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer, personal communication). Peak annual aerial counts of coho salmon in Silver Salmon Creek have ranged from 630 in 2003 to 6,900 in 2000, and averaged 3,475 for the years 2000–2005. Shelter Creek peak coho salmon counts have ranged from 420 in 2003 to 4,500 in 2000 and averaged 1,800 for the years 2000–2005. Three surveys were flown in 2010 over Silver Salmon and Shelter creeks, and the highest coho salmon count occurred on 17 August in both creeks (350 and 1,860 respectively).

### **Fishery Management and Objectives**

WCI fisheries are managed by regulation but no regulatory management plan specifically addresses the coho salmon fisheries of WCI. The daily limits for salmon, except Chinook salmon, 16 inches or more in length, are three per day and six in possession. The bag and possession limits for Chinook salmon less than 20 inches and other salmon less than 16 inches in length are 10 per day and 10 in possession. Only unbaited artificial lures may be used from 15 August through 15 May. The McNeil River is closed to fishing.

Prior the 1980s, all flowing waters (except portions of McNeil River) from the southern tip of Chisik Island to Cape Douglas were open to fishing the entire year. Bait was prohibited from 1 September through 31 December. The bag and possession limits were three coho salmon.

Many of the regulatory restrictions in place for WCI coho salmon sport fisheries are the result of public proposals during the 1990s to reduce hooking mortality of coho salmon and other species. The bait prohibition was extended to 1 September through 15 May by the BOF in 1994. At the 1999 BOF meeting, a 1 January through 30 September season was established for coho salmon and bait restrictions were increased to 15 July through 15 May to encompass the July arrival of coho salmon to west side tributaries. Area restrictions included limiting the fisheries at Clearwater and Shelter creeks within Chinitna Bay to the lower 1-mile section of each creek (5 AAC 61.022(a)(3)A).

In 2000, a flood changed the stream by creating a new northern Clearwater Creek channel that flowed into Chinitna River. At the 2001 BOF meeting, ADF&G recommended redefining the closed area to address the change in stream morphology. BOF adopted the proposed change and closed the northern Clearwater Creek channel to sport fishing upstream from an ADF&G marker located approximately one-half mile upstream of the confluence with the Chinitna River. The original southern Clearwater Creek channel was redefined as Roscoe Creek and the closed area was reduced from one mile to one-half mile upstream of its confluence with the Chinitna River. As a consequence, the regulation stated Roscoe Creek as closed to sport fishing upstream from an ADF&G regulatory marker located approximately one-half mile upstream of its confluence with the Chinitna River.

Public proposals to lower the daily bag limit and restrict tackle to artificial single hook lures south of the North Forelands and to restrict a portion of Silver Salmon Creek to fly-fishing only were not passed by the BOF in January 2005.

During the BOF meeting in 2013, BOF will address a proposal submitted by ADF&G to clarify the upstream sport fishing boundary closure of the Chinitna River drainage. ADF&G submitted the proposal because the current closed waters description is confusing. Roscoe Creek does not flow directly into the Chinitna River; it flows into Clearwater Creek. The two Clearwater Creek channels flow into the Chinitna River.

### **Fishery Performance and Escapement 2010–2013**

The Silver Salmon Creek coho salmon harvests from the SWHS in 2010 through 2012 were below the 1983–2009 historic average harvest (994 coho salmon; Table 25). Catches during the years 2010–2012 were also below the historic average (3,001; Table 25). There were also fewer respondents that fished Silver Salmon Creek in 2011 and 2012, which decreases the reliability of the estimates. Guide logbooks report very little fishing effort or harvest on Silver Salmon Creek, indicating that most of the fishing activity there is unguided. National Park Service also operated a weir on Silver Salmon Creek near the outlet of the lake in 2011 through 2013.

Based on logbook data, the Kamishak River receives the most guided effort of West Cook Inlet streams in LCIMA (Table 26). Average guided effort, catch, and harvest from the Kamishak River for 2010 through 2012 (303 angler-days, and 1,043 and 440 coho salmon, respectively) were similar to the 2005–2009 historic averages (399 angler-days, and 2,021 and 607 coho salmon, respectively) with the exception of the coho salmon catch, which was roughly half. The reason for this decrease is unknown but might be due in part to smaller coho salmon run sizes, also observed in other Cook Inlet streams. The proportion of the Kamishak River catch that is released is generally higher than that in Silver Salmon Creek.

Amakdedori Creek has appeared occasionally in the SWHS since 1983 (there are no estimates from 2010 to 2012); fishing in Amakdedori Creek was reported in freshwater guide logbooks in 2007 through 2011 but not 2012, with an average of three guided trips per year. The Douglas River rarely shows up in the SWHS (there are no estimates from 2010 to 2012), but fishing trips at the Douglas River were reported in freshwater guide logbooks in 2006 through 2011, with an average of six trips per year. The annual participation, catch, and harvest on these small stocks of coho salmon have remained low with no increasing trend. Similar to the Kamishak River, the majority of coho salmon caught are released.

Most sport fishing effort on Clearwater Creek is thought to be from guided anglers. Based on logbook data, guiding effort was very low from 2010 to 2012. Respondents to the SWHS for the years 2010–2012 were too few to estimate harvest. CF had conducted aerial surveys of the Chinitna River and Clearwater Creek drainages as time allowed. These surveys are primarily conducted to index chum salmon escapement, but coho salmon are counted too. In 2011, 1,921 coho salmon were counted in a survey flown on 28 August. In 2012 and 2013, no coho salmon were counted during the 25 August or 15 August aerial surveys, respectively (Glen Hollowell, Fisheries Biologist, ADF&G Department of Commercial Fisheries, Homer, personal communication).

## **DOLLY VARDEN FISHERIES WITH AN EMPHASIS ON ROADSIDE FISHERIES**

### **AREAWIDE OVERVIEW**

#### **Areawide Historical Harvest and Abundance**

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 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.

Peak harvest 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 pink and chum salmon. Dolly Varden run timing occurs between returns of Chinook salmon and coho salmon, and provides opportunity in roadside streams with small pink and chum salmon returns. Incidental harvest of Dolly Varden occurs in the Cook Inlet marine recreational Chinook salmon fishery during June through early July, and in nearly all freshwater salmon sport fisheries of the LCIMA. Hence, 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 available.

## **Areawide Fishery Management and Objectives**

Dolly Varden fisheries in the LCIMA are not specifically addressed in a regulatory management plan, but rather, by regulations governing methods, means, time, and area. Criteria for establishing special management areas for Dolly Varden on the Kenai Peninsula (5 AAC 56.014) were adopted in 1999. Special Dolly Varden fisheries have not been created in the LCIMA to date. In the LCI/Kbay fisheries, most of the Dolly Varden harvest occurs in saltwater while in the CCI fisheries, most of the harvest occurs inriver (Table 6). In most years, over 50% of the Dolly Varden harvest in the LCIMA is taken from the inriver sport fisheries. The daily bag and possession limits were 20 fish from 1960 to 1968, 10 fish from 1969 to 1983, and 5 fish from 1984 to 1990.

## **ROADSIDE DOLLY VARDEN FISHERIES**

### **Fishery Description**

Dolly Varden provide harvest opportunity in roadside streams during July to mid-August. They are in nearly every stream along the road system, but many streams have barriers to salt water and resident fish do not attain sizes attractive to anglers. The road system streams include Anchor and Ninilchik rivers, and Deep and Stariski creeks, and these offer the greatest opportunity to catch Dolly Varden.

### **Harvest and Abundance**

Historically, the Anchor River has supported the largest Dolly Varden fishery in the LCIMA, with other roadside systems, including Deep Creek, Ninilchik River, and Stariski Creek also supporting large fisheries. Declines in harvest at Anchor River from 21,364 fish in 1979 to just 2,735 in 1987 were mirrored by declines in harvest at the other streams (Table 27). Declines in harvest were assumed to reflect stock abundance declines. From 1978 through 1981, a creel census was conducted from June through September to assess Dolly Varden harvest. The results reported little fishing effort until mid-July; most effort directed toward Dolly Varden occurred from mid-July to mid-August. In 1987, a study was initiated in the Anchor River to 1) assess abundance by counting fish at a weir, 2) identify overwintering areas through tagging and recapture, and 3) determine the age structure of the population. The weir was operated approximately one 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 (Table 18). 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 behavior of the species, it was thought that low inriver abundance could result from numerous out-of-system factors. Management goals, therefore, focused on stopping and reversing the decline of the numbers 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 five to two 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; Table 27). A comparison between the catch and harvest information from 2007 to 2009 indicates that LCIMA roadside Dolly Varden

fisheries had become a popular catch-and-release fishery (Table 27). Catch-and-release mortality of Dolly Varden in LCIMA tributaries is not known. Production of roadside stocks is probably commensurate with the existing habitat. Overexploitation of these stocks is not likely under the current regulations. Dolly Varden in Southeast Alaska and Kodiak Island show an affinity to overwinter in freshwater systems containing lakes (Armstrong 1965, 1984; Sonnichsen 1990). Tributaries of the LCIMA with headwater lakes that are in relatively close proximity to roadside Dolly Varden populations are few, and include Packers Lake, English Bay lakes, and Tustumena Lake. It is not known to what extent local roadside stocks use these systems for spawning and overwintering. The extent of the coastal distribution of Dolly Varden originating in local roadside tributaries remains unknown.

### **Fishery Management and Objectives**

The Anchor River, Deep Creek, and Ninilchik River fisheries are open in May and June during the Chinook salmon weekend openings from the river mouths to approximately two miles upstream where regulatory markers are posted (see Freshwater Chinook Salmon Fisheries section). On 1 July, the fishery opens again in the lower two miles of the Anchor River, Ninilchik River, and Deep Creek, and on Stariski Creek upstream to the Sterling Highway Bridge (approximately one mile). On 1 August, the upstream areas of the rivers open for the rest of the season. The daily bag and possession limits are two Dolly Varden. Beginning 1 September, only unbaited, single hook, artificial lures are allowed.

A proposal by the public to open the Anchor River upstream of the forks to fishing with barbless hooks on 15 July was not passed by the BOF at its meeting in November 2004 to protect spawning Chinook salmon.

In fall 2010, 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.

During the 2013 BOF meeting, BOF will consider the following proposals: 1) a proposal to allow sport fishing on the roadside streams in November and December and 2) a proposal to delay opening the Anchor River, Deep Creek, and Stariski Creek to sport fishing by two weeks, opening on 15 July instead of 1 July.

### **Fishery Performance 2010–2013**

From 2011 through 2013, the July fishery was restricted by EO in response to low runs of Chinook salmon. In 2011, bait was prohibited on the Anchor River and Ninilchik River from 1 through 31 July. In 2012, the Anchor River and Ninilchik River were restricted to one unbaited, single-hook artificial lure; also the Anchor River was also closed to sport fishing from 1 to 15 July. In 2013, the Anchor River, Deep Creek, Ninilchik River, and Stariski Creek were closed from 1 to 15 July and restricted to an unbaited, single-hook artificial lure through July 31.

The 2010–2012 total average harvest and catch for the roadside streams (642 and 10,074 Dolly Varden, respectively) decreased about 64% and 51% respectively from the 1991–2009 historic average (1,796 and 20,620, respectively; Table 27). The total harvest was within the historic range (898–3,463) in 2010 but below the range in 2011 and 2012 (1,047, 551, and 327, respectively). The total catch was within the historic range (9,091–31,872) in 2010 and 2012 but below the range in 2011 (11,885, 7,872, and 10,464, respectively). The Ninilchik River saw the

greatest decrease in average harvest and catch (about 86% and 66%, respectively) followed by Deep Creek (about 73% and 54%, respectively).

In 2010, Dolly Varden fishing began to improve in early August and catches of large-sized Dolly Varden were reported in the upstream areas of the Anchor River. Anglers who had fished the Anchor River regularly over the years reported excellent Dolly Varden fishing in August. Fishing success slowed in early September but improved later in the month (Szarzi et al. 2010b). The 2011 Dolly Varden fishery was reported by anglers as fair to good throughout the season. The fall fishing was good in the Anchor River upstream of the forks. In 2012, when the river opened to sport fishing on 15 July, fishing was reported excellent for Dolly Varden and remained good into throughout the fall. In 2013, Dolly Varden fishing started off slow in mid-July then gradually improved in late July as more fish entered the river. In 2012 and 2013, significant fall rains negatively influenced the number of days that these streams were fishable for Dolly Varden.

## **STEELHEAD TROUT WITH AN EMPHASIS ON ROADSIDE FISHERIES**

### **AREAWIDE OVERVIEW**

#### **Areawide Historical Harvest and Abundance**

Steelhead and rainbow trout are the same species of fish but with different life histories. Steelhead trout are anadromous and rainbow trout are freshwater residents. Steelhead and rainbow trout are not physically different, but look subtly different at various times during their life cycles. Juvenile steelhead trout 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, but generally are more fusiform in shape. In LCIMA, adult steelhead trout overwinter in freshwater streams and spawn in April and May. Unlike salmon, steelhead trout can spawn more than once. Steelhead and rainbow trout presence in LCIMA fresh waters has been confirmed only in Anchor and Ninilchik rivers, and Deep and Stariski creeks.

The LCIMA steelhead and rainbow trout fisheries have been catch-and-release only since 1989. Most of the steelhead trout fishery occurs in the fall when fish return to the rivers to overwinter and continues until the rivers freeze up in late October through November. Some anglers fish for emigrating steelhead trout in the spring, but most are incidentally hooked by anglers fishing for Chinook salmon.

The historic harvest from 1977 through 1988 ranged from 18 (1988 in Stariski Creek) to 2,305 (1978 in the Anchor River; Table 28). The Anchor River average annual harvest was approximately 1,100 steelhead trout during these years (Table 28). Ninilchik River and Deep Creek average annual harvests were approximately 300 steelhead trout each during these years and for Stariski Creek, the average annual harvest was approximately 100 steelhead trout.

Little information is known about the abundance of steelhead trout in LCIMA streams. Although steelhead trout 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 of steelhead trout entering these streams. However, the 1989 weir operation on the Anchor River at river

mile 1, counted 769 steelhead trout through November 11. Overall, run sizes to these streams are likely to be between hundreds to up to several thousand fish.

### **Areawide Fishery Management and Objectives**

Steelhead trout 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 boards, fisheries managers, and the sport fishing public with the following: 1) management policies and implementation directives for area rainbow and steelhead 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.

No inseason management of steelhead and rainbow trout has occurred in the LCIMA. Steelhead and rainbow trout populations are managed by regulation. In all fresh waters of the LCIMA north of the latitude of Point Adam (Figure 1) the annual limit for steelhead and rainbow trout is two fish. The freshwater daily bag and possession limits for steelhead and rainbow trout are two in flowing waters or five in ponds and lakes; only one fish may be longer than 20 inches. The Anchor and Ninilchik rivers, and Deep and Stariski creeks drainages are exceptions to these regulations where steelhead and rainbow trout may not be retained.

In the salt waters north of a line from Point Adam to Cape Douglas, steelhead and rainbow trout may not be retained. South of that line, the saltwater daily bag and possession limits are one steelhead or rainbow trout 20 inches or greater, and there are no limits for steelhead and rainbow trout under 20 inches.

## **ROADSIDE STEELHEAD TROUT FISHERIES**

### **Fishery Description**

Anchor River, Ninilchik River, Deep Creek, and Stariski Creek support popular steelhead and rainbow trout fisheries. Steelhead trout studies in LCIMA occurred on the Anchor and Ninilchik rivers, but life history data are currently available only for Anchor River stock. Thus, information on life history characteristics of Anchor River steelhead trout serve as an example of life history behavior typical of all LCIMA stocks. The steelhead trout stocks are exclusively defined as fall-run fish that enter fresh water as adults as early as July and into November, spawn from April to May, and emigrate after spawning during May and June (Larson and Balland 1989; VanHulle 1985; ADF&G 1990). Anchor River studies in 1989 and 1990 found about 19% of the spawning steelhead population are repeat spawners (Larson and Balland 1989; ADF&G 1990; Larson 1993). Most of the repeat spawners are thought to be predominately female because there is higher post-spawning mortality among males; in the Kasilof River, radiotelemetric studies from 2008 to 2009 (Gates and Boersma 2010) found that more females survived spawning (average 87%) than males (average 52%). Larson and Balland (1989) found a majority of sampled steelhead trout had spent three years in freshwater as juveniles before emigrating. Fish that reared for two and four years were also sampled.



## Harvest, Catch, and Stock Assessment

According to catch data, implementation of the catch-and-release regulation has served to maintain and possibly increase steelhead trout stock levels in LCIMA roadside tributaries (Table 28). The annual estimated steelhead trout catch in the Anchor River has exceeded the estimated stock size, thought to approximate 1,500 fish in some years based on weir counts (Larson 1993), since catch was first estimated in 1989 (Table 28). The estimated annual catch of steelhead trout from the Anchor River has been more than twice the estimated stock size of 1,500 fish since 1996, with catches in 1996, 2000, 2007 and 2008 approaching nearly 6 times the approximate stock size. Assuming that trout catchability and angler effort had not changed over the years, these estimates may indicate that the number of steelhead trout in the run had likely increased, and that anglers handled a large portion of the run. Furthermore, estimates also indicate that a large fraction of the population was exposed to multiple hooking. Catches in the other systems have also increased. At Deep Creek and Ninilchik River, where stock size is believed to be smaller than the Anchor River, the estimated catch also indicates that large portion of the runs is being caught and released by anglers.

In general, hooking induced mortality can occur directly from a hook wound or indirectly through a hook injury, stress, and hook-induced diseases. Delayed hooking mortality estimates for steelhead trout were estimated in the range of 0 to 10% (Reingold 1975; Caverhill 1977; Pettit 1977; Hooten 1988; Taylor and Barnhart 1999). However, these studies were not based on multiple hooking. Taking into account the current regulations that complement mandatory catch-and-release, particularly the unbaited single hook requirement and the prohibition of removal from the water, there is little reason to suspect that mortality is considerably higher for LCIMA steelhead trout.

Creel surveys were conducted from 1978 to 1985 on the Anchor River (Wallis and Hammarstrom 1979-1980, 1982-1983; Balland 1985-1986). Most of the fall fishing effort from August through mid-September is assumed to be directed primarily towards coho salmon, Dolly Varden, and steelhead trout because of their run timing. In 1981, the highest fall fishing effort occurred in October, and in 1982 and 1983, effort was highest in September. Most of the effort from mid-September is assumed to be Dolly Varden and steelhead trout. Effort dropped by mid-October and the lowest effort was in November.

Starting in 1989, the SWHS estimated the catch of steelhead trout in these streams. From 1989 through 2009, the steelhead catch in the Anchor River and Deep Creek was variable, but generally stable (Table 28). The annual variation in catch estimates was thought to be influenced by run size, amount of days the stream conditions are conducive to fishing, shifts in effort between streams, and potentially increased angler effort. From 2006 to 2009, catch estimates for the Anchor River reached record high levels twice and have averaged 6,433, almost double the 1989–2005 historical average of 3,699 (from Table 28). The 2006–2009 Deep Creek average catch of 2,259 fish was more than double the 1989–2005 average of 1,238 fish. The Ninilchik River average catch from 2006 to 2009 was 984 fish and nearly twice the 1989–2005 historic average of 564.

Anchor River steelhead trout immigration was enumerated during the three years that a weir was operated at approximately one mile upstream of the mouth (1988, 1989, and 1992) and 878, 769, and 1,261 fish were counted, respectively (Table 18; Larson and Balland 1989; Larson 1990; Larson 1993). The midpoint of immigration occurred between 13 and 25 September and 90% of

the immigration was complete by 2 October. Cumulative counts of immigrating steelhead trout at the Anchor River weir through at least 31 August in the years 1987–1989 and 1992 averaged 96 and ranged from 21 to 251.

The steelhead trout entering the Anchor River were counted annually from 2004 to 2009 when a weir was operated to monitor coho salmon escapement at approximately two miles upstream of the mouth (Kerkvliet et al. 2008, 2012; Kerkvliet and Burwen 2010; Kerkvliet and Booz 2012). The 2004–2009 counts were not interpreted as an index of abundance because the weir was typically removed in mid-September before all fish had immigrated into the river, and it is likely that a portion of the run overwinters below the weir site. In 2009, the first count of the entire emigration of steelhead trout was collected for the Anchor River. The midpoint of the emigration was 7 June. Catches of steelhead trout from beach seine sampling upstream of the Anchor River sonar site from 2004 to 2009 indicated the emigration of steelhead trout extends through mid-June.

Beginning in 2002, the Ninilchik River weir was used to capture and enumerate postspawning steelhead trout (kelts) as they emigrated from the river. The steelhead trout assessment was a cooperative effort between the U.S. Geological Survey of Alaska (USGS) and SF. In 2002, 449 steelhead trout were counted at the weir; 82 were surgically implanted with either an acoustic or archival tag. In 2003, a total of 416 steelhead trout were captured, of which a total of 80 were implanted with either an acoustic or archival tag (C. Zimmerman, Fisheries Biologist, USGS, Anchorage, personal communication). During emigration, an array of acoustic receivers detected tagged fish at the river mouth. Mean rate of travel between the weir and the receiver array was 3.2 miles per day and 5.3 miles per day in 2002 and 2003, respectively. These data suggest that most steelhead trout kelts spend less than 24 hours in the area open to sport fishing. The emigrating steelhead trout counts for 1999–2000, and 2001–2005 were 335, 278, 293, 449, 416, 418, and 681 respectively, and averaged 410 fish (C. Zimmerman, Fisheries Biologist, USGS, Anchorage, personal communication). The peak emigration of steelhead trout through the Ninilchik River weir in the years 1999–2005 occurred from the last week in May through the first week in June.

What little that is known about adult steelhead trout movements during their freshwater residence comes from steelhead trout implanted with radio tags in the Anchor River in 1981 and 1982 that survived a significant period of time with their tags operational (Wallis et al. 1982–1984). Of the 16 steelhead trout that were radiotagged in fall 1981, eight transmitted signals into December. All eight remained in the road-accessible portion of the lower Anchor River near or downstream of the North and South forks. In fall 1982, nine radiotagged steelhead trout were tracked through February 1983 and six of those through June. The steelhead trout overwintered near the North and South forks confluence in deeper areas of the river. The six fish that transmitted until spring 1983 moved to spawning areas in April and May. Spawning areas were located on the South Fork near the Blackwater Bend area, Chakok River, and the confluence of the North Fork and Chakok River. After spawning, the surviving fish emigrated downstream and arrived at the North and South forks confluence during the first two weeks in June. There is evidence that other steelhead trout populations from small streams overwinter where pools and channels are deeper (Wallis et al. 1984; Gates and Boersma 2010). Radiotagging data suggest that the fish remained in the road-accessible portion of the lower Anchor River throughout their freshwater residency (Wallis et al. 1982–1984).

Studies indicate that a significant proportion of the population may not be exposed to the Chinook salmon fishery. During late May, most of the steelhead trout are thought to be in upstream spawning areas based on the following Anchor River studies: tracking of radiotagged fish in 1982, beach seine catches from 2004 to 2008, and emigration timing in 2009 (Wallis et al. 1982-1984; Kerkvliet et al. 2008, 2012; Kerkvliet and Burwen 2010; Kerkvliet and Booz 2012). In 1982, fish emigrated from May through early June. Steelhead trout were captured in beach seines during the years 2004–2008 in May through June upstream of the fishery, indicating that not all of the steelhead trout population was exposed to all fishery openings. In 2009, of the total number of emigrating steelhead trout counted, 44% passed downstream on the days when the fishery was open. Radiotagging data from the Ninilchik River (see above) suggests that most steelhead trout kelts spend less than 24 hours in the area open to sport fishing (C. Zimmerman, Fisheries Biologist, USGS, Anchorage, personal communication). Upon emigrating from spawning areas, Crooked Creek steelhead trout take approximately 7 to 7.6 days, on average, to travel approximately two miles before they enter brackish water (Gates and Boersma 2010).

### **Fishery Management and Objectives**

LCIMA roadside streams are currently catch-and-release only fisheries for steelhead and rainbow trout and retention is prohibited. Only unbaited, single-hook, artificial lures are allowed 1 September through 31 December. Other restrictions control allowable fishing time and area open to fishing. During the Chinook salmon season, Deep Creek and Anchor and Ninilchik rivers are open to fishing from salt water to approximately two miles upstream on 3-day weekends (weekends include Monday). The Anchor River is open five consecutive weekends beginning Saturday of the weekend before Memorial Day, while Deep Creek and Ninilchik River are open for three consecutive weekends beginning Saturday of the Memorial Day weekend. The Anchor River is also open on the Wednesday following each 3-day weekend. The streams are then closed to all fishing and reopen on 1 July. The lower section of Stariski Creek does not open to fishing until 1 July. The entire drainage of each stream opens to fishing beginning 1 August and continues through 31 December.

The conservative regulatory framework for LCIMA steelhead trout fisheries has evolved over a period of nearly two decades, during which angler participation and harvest in the steelhead trout fishery were generally increasing and numbers of returning steelhead trout enumerated each fall at a weir in place at the Anchor River were declining. Specifically, in 1977, the bag and possession limits were two steelhead trout daily with no seasonal limit. The season was closed from 1 May to 30 June. By 1984, the bag and possession limits had been reduced to one fish daily; a seasonal limit of two fish was imposed and a harvest record was required. Beginning in 1984, fishing was permitted only from 1 July through 31 December. From 1984 through 1988, bait was prohibited after 15 September. In 1989 and 1990, bait was prohibited beginning 16 August. Since 1991, bait has been prohibited beginning 1 September. On 7 October 1988, the Anchor River steelhead trout fishery was closed by EO for resource conservation when the number of steelhead trout counted through the weir was judged insufficient to support an inriver fishery. Since 1989, the steelhead and rainbow trout fishery has been catch-and-release only.

At the 2010 fall meeting, 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 to reduce catch-and-release mortality on steelhead trout.

In 2013, BOF will consider a proposal to overturn the 2010 regulation that closed the roadside streams from 1 November to 31 December. BOF will also consider a proposal to delay opening the Anchor River, Deep Creek, and Stariski Creek to sport fishing by two weeks, opening on 15 July instead of 1 July and a proposal to close the Anchor River Wednesday fishery in May and June.

### **Fishery Performance 2010–2013**

From 2010 to 2013, the fishery restrictions for July, issued in response to low runs of Chinook salmon (see Dolly Varden Fisheries with an Emphasis on Roadside Fisheries section), likely did not impact the steelhead trout fisheries because of the later immigration timing of steelhead trout. The 1 November–31 December closure also likely did not have much impact on the fishery because effort is traditionally low during this period; however it did reduce opportunity.

The 2010–2012 total average catch of steelhead trout for the roadside streams (2,251) decreased about 65% from the 1989–2009 historic average (6,385; Table 28). The catch in 2010 (3,442) fell within the historic range (2,930–14,065) and catches for 2011 (595) and 2012 (2,717) fell below the range with 2011 the lowest catch on record. Between recent (2010–2013) and historic (1989–2009) average catches, Stariski Creek saw the greatest decrease (about 75%) followed by the Ninilchik River (about 70%), the Anchor River (about 66%), and Deep Creek (about 57%; Table 28).

From 2010 through 2013, steelhead trout were captured during beach seine sampling upstream of the Anchor River sonar site from May into June. In 2013, one postspawning steelhead trout was captured in July.

In 2010, a weir on the Anchor River was operated through 30 September and 586 steelhead trout were counted. In 1989, when the weir was operated through 11 November, approximately 14% of the immigration continued after 30 September; therefore, the 2010 count likely reflected run strength for that year. In 2011, the Anchor River weir was operated through 21 September and 132 steelhead trout were counted. This count likely reflected run strength for 2011. Based on the enumeration of steelhead trout in 1988, 1989, and 1992 at another weir operated about one mile upstream of the mouth, 46% to 73% of the immigration was counted by 21 September (Larson and Balland 1989; Larson 1990, 1993).

In 2010, the water level on the Anchor River remained low through September and anglers reported low catches of steelhead trout. Some anglers reported that some of their favorite steelhead trout fishing holes had disappeared with the low river level. At the end of September, heavy rains caused the river to rise rapidly. In early October, effort increased on the Anchor River (Szarzi et al. 2010b). In 2011, fishing was reported as slow even though fishing conditions were good through most of the season and the catch reached a record low on all four roadside streams. In 2012, river conditions were high over long durations in September and October, resulting in poor fishing conditions. Catches in 2012 improved over those in 2011 and fell within 1989–2009 historic ranges for Deep Creek (681) and Stariski Creek (34), but catches for the Anchor (1,833) and Ninilchik (169) rivers fell below their respective ranges (Table 28).

The 2013, fishing conditions were similar to 2010 and 2011 and fishing was reported as good to excellent.

## OTHER SALMON FISHERIES

### OVERVIEW

#### Fishery Description, Harvest and Escapement

Pink, chum, and sockeye salmon are harvested in LCIMA sport fisheries. Pink salmon are present in virtually every freshwater drainage in the LCIMA and are a popular target of sport anglers. Pink salmon runs generally peak during odd-numbered years in Cook Inlet from late June through mid-September. In LCIMA, sport fishing for sockeye salmon is more limited than for pink salmon, but in terms of harvest, sockeye salmon are a more sought-after species, particularly in Kachemak Bay salt waters. Of the three other salmon species, chum salmon are the least harvested and provide limited opportunities in LCIMA (Hollowell et al. 2012).

Within the LCIMA, the largest pink salmon runs are produced in Western Cook Inlet and in Port Dick on the outer Kenai Peninsula coast, but Humpy Creek, located in Kachemak Bay also supports a large run of pink salmon. Commercial fisheries target pink salmon, and escapement of numerous area pink salmon stocks is monitored with aerial surveys by CF (Hollowell et al. 2012). The average annual SWHS estimate for pink salmon sport harvest for the entire LCIMA between 1977 and 2009 was about 4,900 fish. From 1990 to 2009, the average catch was about 13,000 fish annually, and ranged from 7,200 to 23,000. An average of 70% of the harvest and 90% of the catch comes from salt water, mostly within Kachemak Bay. The freshwater streams in CCI also support pink salmon fisheries. The highest reported catch from CCI streams combined was 5,462 pink salmon in 2009. Based on SWHS estimates, most of the catch that occurs in CCI streams is released. In the years 2006–2009, the Kachemak Bay pink salmon sport harvest dropped more than 50% following suspension of pink salmon enhancement at Tutka Bay Fish Hatchery.

Chum salmon return to freshwater drainages from early June through August and from late June through mid-September, and play a minor role in the fisheries because of their low run sizes in the more accessible streams. Most of the larger chum salmon runs are concentrated in WCI, with McNeil River supporting the largest run. Small runs occur within Kachemak Bay (e.g., Humpy Creek and the Seldovia River), along the outer North Gulf Coast, and in the CCI roadside streams. CF indexes escapement of 13 chum salmon stocks in LCIMA (Hollowell et al. 2012).

In LCIMA, sport fishing for sockeye salmon is limited to several small fisheries. The English Bay drainage in LCI has the only significant wild sockeye salmon run in the eastern portion of the area, with escapements of 8,200 to 22,500 reported at the English Bay River weir, which has been in operation since 1994 (Hammarstrom and Ford 2009). Mikfik and Chenik lakes drainages have the only significantly-sized wild runs in WCI; aerial survey counts of the Mikfik drainage range from 5,400 to 17,700 sockeye salmon, while Chenik Lake aerial, weir, and video counts range between 300 and 18,200 sockeye salmon (Hammarstrom and Ford 2010). Most sockeye salmon harvested in LCIMA sport fisheries are taken in the stocked terminal saltwater fisheries in China Poot Bay and Tutka Bay Lagoon. A few are hooked incidentally when anglers fish for Chinook and coho salmon in salt water and some are taken from the fresh waters in CCI (Tables 15–17 and 24). The average annual sockeye salmon sport saltwater harvest in the LCIMA increased from 3,083 for the years 1988–2006 to an average annual harvest of 7,540 for the years 2007–2009 (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b; *In prep a-b*). The harvest

increase in the years 2007–2009 is primarily from Kachemak Bay and may be partly comprised of fish that began returning in 2007 from the new sockeye commercial fishery enhancement program by the Cook Inlet Aquaculture Association (CIAA) in Tutka Bay Lagoon.

## **Fishery Management**

Fisheries for pink, chum, and sockeye salmon are managed by regulation. Inseason regulation changes of sport fisheries on these stocks are rare, and have occurred in association with stocking projects to achieve brood stock goals for pink salmon at Tutka Bay Lagoon Hatchery or to harvest surplus enhanced pink salmon. The personal use dip net fishery in China Poot Bay has been extended in the past to harvest surplus sockeye salmon before the season was lengthened by regulation by the BOF in 1995.

In 2007, BOF prohibited sport fishing for salmon within 100 yards of the net pens anchored in Tutka Bay Lagoon to prevent anglers from interfering with CIAA daily operations, collecting broodstock, and rearing salmon.

In 2013, the BOF will consider the following proposals: 1) to allow archery gear in salt water where snagging is allowed, 2) to require salmon caught by personal use in the China Poot dipnet fishery to be marked, 3) to allow sport-caught pink salmon from salt water to be used for bait, and 4) to allow sport caught pink and chum salmon from salt water to be used for bait.

## **Stocked Fisheries**

### ***China Poot Bay Sockeye Salmon***

Leisure Lake, also known as China Poot Lake, is located across Kachemak Bay in a southeasterly direction from the Homer Spit (Figure 4). The lake was first stocked in 1980 (Kyle 1994) and was stocked annually with an average of 1.7 million juvenile sockeye salmon fry from 1984 to 2009 to supplement commercial catches in Kachemak Bay (Lee Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer, personal communication). 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] describes 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 six sockeye salmon. A person may harvest a bag limit of sockeye salmon in the China Poot personal use dipnet fishery in addition to harvesting a bag limit of sport-caught sockeye salmon. Runs have been weak by historical standards since 2004 and have been the lowest since the 1980s, shortly after the project began (Hammarstrom and Ford 2010). The personal use harvest reported in the SWHS peaked at 8,605 in 1995, the last year that information is available. Annual sport harvests from China Poot Bay reported in the SWHS are fewer than 1,200 and average 250 (Szarzi and Begich 2004a).

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.

Conflicts occasionally occur in China Poot Bay between commercial seiners harvesting sockeye 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 in China Poot Bay.

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

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

Commercial sockeye salmon enhancement projects in Leisure, Hazel, and Kirschner lakes are in jeopardy as CIAA searches for a brood source. Prohibition on the use of Tustemena Lake, in the Kasilof River drainage, as a brood source due to its protected status within the Kenai National Wildlife Refuge, affected these projects in 2004. Hidden Lake, located in the Kenai River drainage upstream of Skilak Lake, was chosen as an alternative brood source for the years 2004–

2010. CIAA first stocked Tutka Bay Lagoon with sockeye salmon smolt from Hidden Lake in 2005, with the intention of developing an alternate brood source to Hidden Lake. The first return from this stocking was in 2007. Hidden Lake stock may have been a poor choice because the run timing of the fish returning to Tutka Bay Lagoon in 2008 and 2009 was 2–4 weeks later than desired, and the fish were smaller than expected. CIAA continues to seek an alternative broodstock in the Kenai Lake drainage to use for developing a run to Tutka Bay Lagoon. If successful, the run will provide broodstock for ongoing LCI enhancement projects at Leisure, Hazel, and Kirschner lakes that support commercial fisheries and, incidentally, benefit sport fisheries and a personal use sockeye salmon fishery in China Poot Bay.

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. 2010b).

### **Fishery Performance 2010–2013**

The 2010–2012 average pink salmon sport harvest in the LCIMA (2,414) was about 45% below average this 1977–2009 historic average (4,373). Most notable was a 53% decline in average annual harvest within LCI and Kachemak Bay salt waters from 2010 to 2012. The 2010–2012 average pink salmon sport harvest (496) in the CCI salt water increased about 35% from the 1977–2009 historic average (301). The 2010 and 2011 pink salmon catches in LCI and Kachemak Bay salt waters (5,115 and 4,727, for 2010 and 2011 respectively) were within the 1990–2009 historic range (4,344–15,515; unpublished SWHS data). In 2012, the catch of pink salmon was 10,048 fish in LCI and Kachemak Bay salt waters which is within the historic range. Data are unavailable for 2013, but anglers reported that pink salmon were plentiful in the catches while trolling for Chinook and coho salmon along the southern shore of Kachemak Bay from mid-July through August. In Tutka Bay Lagoon, pink salmon dominated the catch over sockeye salmon in 2013.

The 2010–2012 sockeye salmon harvests in the LCI and CCI salt water sport fisheries were well above the 1977–2009 historic average (3,270) for all three years (harvest was 9,560 in 2010; 6,972 in 2011; and 7,245 in 2012). Within Kachemak Bay, the 2010–2012 average annual harvest was similar to the 2006–2009 average annual harvest; thus the increase over the historic average might be in part due to the continued sockeye salmon production at TBLH. Estimated sockeye salmon runs to Tutka Bay Lagoon were 43,981 in 2010; 15,559 in 2011 and 15,757 in 2012, and 39,335 in 2013 (Caroline Cherry, CIAA Hatchery Operations Coordinator, personal communication). The increase in CCI salt water harvest was likely due to the strong runs of sockeye salmon in Upper Cook Inlet systems.



# SHELLFISH FISHERIES

## AREAWIDE OVERVIEW

The lower Cook Inlet Management Area (LCIMA) has a diversity of sport and personal use shellfish fisheries. The beaches on the east side of CCI support the largest sport fishery for Pacific razor clams (*Siliqua patula*) in Alaska. Southcentral Alaska's largest hardshell clam fishery occurs in Kachemak Bay for littleneck clams (*Protothaca staminea*) and butter clams (*Saxidomus giganteus*). A noncommercial Tanner crab fishery (*Chionoecetes bairdi*) periodically occurs in Kachemak and Kamishak bays and the North Gulf Coast. Once thriving fisheries for king crabs (*Lithodes* spp), Dungeness crabs (*Cancer magister*), and shrimp (*Pandalus* spp.) in Kachemak Bay are now closed because of low abundance. The noncommercial king crab fishery has been closed since 1985. Other mollusks such as foolish (blue) mussels (*Mytilus trossulus*), cockles (*Clinocardium* spp. and *Serripes* spp.), softshell clams (Family Myidae), tritons (*Fusitriton oregonensis*), sea urchins (Class Echinoidea), and sea cucumbers (*Parastichopus californicus*) are harvested in small amounts.

### Areawide Historical Harvest and Abundance

King crab have been incidentally caught during Tanner crab trawl surveys since 1991. In most years the king crab catch is in the single digits for most years since 1994, except 1997 (ADF&G unpublished data). The trawl survey does not target king crab habitat specifically, but it is likely the survey catches reflect gross population trends of king crab.

The noncommercial shrimp fishery closed in 1997. An ADF&G small mesh trawl survey, conducted periodically from 1975 to 2006, found that shrimp stocks have remained at extremely low levels since 1993 (Gustafson 1994; Gustafson and Bechtol 2001, 2005; Trowbridge and Goldman 2006).

Both king crab and shrimp fisheries are anticipated to remain closed for an indeterminate time because there is little evidence of a recovery in their population sizes.

The fisheries and population trends for Tanner and Dungeness crabs and razor and hardshell clams are detailed in the sections that follow.

### Areawide Fishery Management and Objectives

There are currently no management plans for Dungeness crabs, king crabs, or shrimp, and no criteria for opening the noncommercial fisheries on these species. When stocks show signs of recovery, triggers for opening noncommercial fisheries will need to be developed while sustaining stocks and providing harvest opportunity. The management objectives and tools for Tanner and Dungeness crabs and razor and hardshell clams are detailed in the sections that follow.

## RAZOR CLAMS

### Fishery Description

The Kenai Peninsula Pacific razor clam sport fishery occurs primarily on sandy beaches along a 50-mile area on the east side of Cook Inlet between Kasilof River and Anchor River (Figure 6). Most diggers concentrate in two areas of high clam density: Clam Gulch Beach and Ninilchik Beach. Both areas have developed accesses and nearby camping facilities. Clam Gulch Beach and the beaches within 5–10 miles are relatively shallow in slope and are composed of

homogeneous sand. Beaches south from the Ninilchik Beach area become more steep, and sandy areas are interspersed with coal seams and mud. Razor clams become more patchily distributed south from the Ninilchik Beach area.

Razor clams may be dug on any minus tide; however, tides lower than  $-2.0$  feet on the northern beaches and  $-3.0$  on the southern beaches are preferred. On the northern beaches, these tides occur about 65 days annually, while on the more southern beaches, the average number of days this species is available to the sport digger declines to about 35.

Clams grow faster from north to south along the eastside beaches and as a result, the average length of razor clams increases from north to south (Szarzi and Hansen 2009). Razor clams live to a maximum age of approximately 13 years. The average age at mortality is approximately 8.

Every 4 to 7 years, a new year class of clams is particularly abundant either because of favorable environmental conditions or because they came from a large parent year class (Szarzi and Hansen 2009). As these strong year classes grow into the size when they are regularly encountered by diggers, they swamp the beach, giving the impression to diggers that no large clams are left and that harm has come to the population, when actually, the presence of small clams is a sign that the population is successfully replenishing itself. This type of recruitment recently occurred on Ninilchik area beaches starting in 2009.

Diggers shift to areas where clams are larger and more abundant and away from areas where clams are fewer or smaller or both. The first recorded shift was during the years 1986–1995 when a significant number of diggers first discovered that the clams were larger at Ninilchik Beach and moved there from Clam Gulch Beach (Table 29). Diggers shifted back to Clam Gulch Beach during the years 1996–2004 when a large cohort of young clams first appeared at Ninilchik Beach (Athons 1992; Athons and Hasbrouck 1994; Szarzi and Hansen 2009). In the years 2004–2009, the trend reversed again as more diggers moved away from Clam Gulch Beach and back to Ninilchik Beach and, for the first time, moved south of Ninilchik Beach to Whiskey Gulch and Happy Valley beaches because of the die-off and slow growth of Clam Gulch Beach clams. As clam growth improved at Clam Gulch Beach in 2008 and a new very large year class appeared at Ninilchik Beach in the years 2009–2010, more diggers were seen at Clam Gulch in 2010.

## **Harvest and Abundance**

Information about the razor clam fishery is available from the SWHS, and research and management programs conducted annually since the mid-1960s (D. Nelson, Alaska Department of Fish and Game, Homer, unpublished data; Szarzi 1991; Athons 1992; Athons and Hasbrouck 1994; Szarzi and Hansen 2009; Szarzi et al. 2010a). Currently, aerial surveys are used to apportion the annual effort and harvest to each beach section. In 2009 and 2013, a one-day digger success survey was conducted to improve the harvest apportionment by beach. Periodic abundance surveys have been conducted at Ninilchik and Clam Gulch beaches since the late 1980s. Approximately 150 razor clams are dug by hand from up to 10 different beach sections annually to assess the size and age structure.

Average annual participation was approximately 32,000 digger days and annual harvest averaged roughly 0.8 million razor clams from 1977 to 2009 (Table 7). Participation and harvest peaked in 1994 when about 48,500 digger days were spent digging about 1.2 million razor clams.

## **Fishery Management and Objectives**

The razor clam fishery is regulated by bag, possession, and gear limitations. 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 clam daily bag limit and increase the possession limit to 2 daily bag limits (120 clams).

Currently, there is no closed season, but winter weather conditions and night-time low tides preclude most digging during October through February.

Exploitation rates at Ninilchik Beach are periodically greater than 25%, the sustainable rate estimated for fisheries in Washington State, and are cause for alertness.

## **Fishery Performance 2010–2013**

The annual SWHS estimate of participation and harvest were below the 1977–2009 historic averages in 2010 through 2012 (Table 7). The 2012 harvest (260,857) was lowest estimate since 1971. The 2010–2012 average annual harvest was 61% below the historic average and participation had a 32% reduction.

The reasons for this decline in harvest are unknown but are in part due to the decline in effort and may be due to shifts in effort between beaches and perceived declines in abundances on some beaches (Table 29). Based on aerial survey data, 60–75% of the total annual effort from CCI beaches occurred on Ninilchik area beaches in the years 2010–2012. During this time, the abundance of Ninilchik area razor clams was above average from the recruitment that occurred in 2009 (see below). Abundances on other beaches were not assessed during the 2010–2012 period. In November 2010, a large die-off of razor clams occurred on the beaches in the Ninilchik area. The source of the die-off was unknown but was likely due to a large storm that displaced the clams from the substrate whereupon they failed to rebury themselves. The die-off was thought to include thousands of clams but the exact number was never estimated due to the lack of information. To investigate the effects of the die-off, SF in collaboration with Alaska Pacific University (APU) initiated an abundance survey on the Ninilchik beaches in spring 2011. The Ninilchik beaches were divided into Ninilchik South Beach (approximately 1 mile long, between Deep Creek and Ninilchik River) and Ninilchik North Beach (approximately 3.2 miles long, between Ninilchik River and Leaman Point). The Ninilchik South Beach estimate was 1.2 million clams greater than 80 mm and that was about twice as many clams than were estimated for the same area in 2005 (Table 30). The North Beach estimate was 1.2 million clams and well within the historical range of abundance estimates.

The abundance survey was conducted again by SF and APU in 2012 and 2013 at Ninilchik South Beach. The abundance declined by roughly 50% from the 2011 to the 2012 survey and declined 95% from the 2011 to 2013 survey. The 2013 preliminary estimate of 79,000 razor clams was the lowest abundance observed since periodic surveys were started in 1990. Most of the razor clams

observed in each survey were from the 2009 recruitment and this suggested that there has been a lack of recruitment since.

ADF&G issued an EO that reduced the bag and possession limit of razor clams from 60 to 25 south of the Kenai River to the end of the Homer Spit. This EO was issued to all beaches to minimize shifting effort from Ninilchik beaches to other beaches where abundances were unknown. Preliminary estimates of effort from the aerial survey data suggest that less than half of the effort occurred on the Ninilchik beaches in 2013. Clam diggers moved to more northerly beaches such as Clam Gulch Beach, Cohoe Beach, and to the WCI beaches where clams were generally bigger and in higher densities. Digging success was good at the WCI beaches as well as Clam Gulch and Cohoe beaches; there were many small clams harvested at Clam Gulch Beach and medium-sized clams harvested at Cohoe Beach. Digger success on the Ninilchik beaches was fair despite the decline, and smaller clams started showing and being harvested in late July. The smaller clams at Clam Gulch and Ninilchik beaches suggest that there was some recruitment to those beaches and this was likely more significant at Clam Gulch Beach. SF in collaboration with APU will continue razor clam abundance surveys in the coming years. Significant annual recruitment needs to occur for several years for the abundance to rebound at Ninilchik area beaches.

## **HARDSHELL CLAM**

### **Fishery Description**

The beaches of lower Cook Inlet (primarily within Kachemak Bay from Chugachik Island to Seldovia Bay) support commercial and noncommercial (sport, personal use, and subsistence) hardshell clam fisheries. In regulation, “hardshell” clam, refers to Pacific littleneck clams (*Protothaca staminea*) and butter clams (*Saxidomus giganteus*). The commercial fishery targets primarily Pacific littleneck clams. Noncommercial diggers also target butter clams. The commercial fishery occurs on beaches certified for commercial digging by the Alaska Department of Environmental Conservation on the south side of Kachemak Bay (Figure 7) between Bradley River and Barabara Point. The subsistence fishery effort and harvest primarily occurs in Kasitsna and Jakolof bays. All beaches in LCI are open to the taking of clams for sport and personal use. However, the harvest is almost entirely from the Kachemak Bay area, and has historically been focused on China Poot, Jakolof, and Kasitsna bays; Sadie Cove; and the east side of the Homer Spit (Figure 7).

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, while butter clams are encountered to depths of 1 ft.

### **Harvest and Abundance**

Since 1981, the Statewide Harvest Survey (SWHS) has estimated the annual sport and personal use harvest of hardshell clams in gallons but the survey does not provide species composition or estimate harvest by specific beaches.

From 1997 to 2002, a shellfish permit was required to harvest clams and provided additional data on the noncommercial harvest, effort, harvest composition, and harvest location, but was discontinued because of bias caused by noncompliance of the permit requirement by nonlocal

diggers. The permit was required in 2003, but entry and analysis of the 2003 permit data did not occur. BOF rescinded the permit in 2006.

A dramatic decline in shellfish effort and hardshell clam harvest occurred in 1998 (Table 8), probably as a result of the closure of the Dungeness crab recreational fishery; diggers often supplemented a trip to fish Dungeness crabs with a visit to the clam beaches. Estimates of shellfish effort remained variable from 1996 to 2002, when both the Tanner crab and hardshell clam fisheries were open, but were not as high as effort prior to the Dungeness crab closure. Effort was fairly stable during the years 2003–2007, when the hardshell clam fishery was the only major fishery in terms of participation. Shellfish effort in 2008 and 2009 returned to 2003–2006 levels, when the Tanner crab fishery reopened in 2008.

From 1994 through 2008, the distribution of hardshell clam diggers was assessed by aerial flights that apportioned digger counts by beach area where they were seen digging. The aerial survey data were not used to apportion the harvest by sub-bays in a similar fashion to the approach used with razor clams due to the changes in abundances, differences in the relative success of the diggers, and differences in the composition of the harvest between the areas.

The historic (1981–2009) SWHS hardshell clam harvest estimates in Kachemak Bay and LCI average roughly 12,000 gallons annually and ranged from the 2009 harvest of 3,202 gallons to 29,163 gallons in 1996 (Table 8). Since 2010, shellfish effort in LCI has declined (2010–2012 average: 3,600 angler-days) and was well below the historic average (1981–2009 average: 12,232 angler-days). The 2012 estimated effort (2,194 angler-days) is the lowest for Kachemak Bay and LCI. The 2010 harvest estimate (2,805 gallons) was about 12% below the 2009 estimate (3,202 gallons).

The commercial harvest is comprised of Pacific littleneck clams. From 1997 to 2010, the total annual commercial harvest has averaged 15,502 pounds and ranged from 1,222 in 2006 to 31,549 in 1997. Since 2006, interest in the commercial fishery has diminished and harvest occurred only in 2008 when four permits were issued (ADF&G unpublished data).

In 2003, the most recent year a comprehensive subsistence survey was completed in Lower Cook Inlet, 450 gallons (1,350 pounds) of hardshell clams were harvested by residents of Nanwalek and Port Graham. Between 2008 and 2011, a total of 39 permits were issued. Among those, 10 harvest reports were returned; seven reported no harvest effort, and three reported a total harvest of 26 gallons of butter clams from Jakolof and Kasitsna bays. In 2010, ADF&G staff received reports from Nanwalek residents that hardshell clams were difficult to find locally such as at Jakolof Bay, and that residents had to travel outside the area to look for clams.

ADF&G has assessed the abundance of legal-sized hardshell clams in several locations that are important to the fisheries since 1990.<sup>5</sup> From 1990 to 1997, surveys were typically conducted on commercial beaches or locations with suitable clam habitat. Since then, the primary beach sections surveyed were Chugachik Island, China Poot Bay, and Jakolof Bay. These beach sections were selected for longer-term monitoring based on where commercial digger effort, non-commercial digger effort, or both had been traditionally high. At each location, abundance was assessed through an estimate of clam density (the number of clams per square meter). The density of legal-size clams was estimated from the samples, and the number of sub-legal clams

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<sup>5</sup> N. J. Szarzi, Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Biologist, Unpublished data for Harvest, Abundance, Age and Length Characteristics of Razor Clams from Eastern Cook Inlet Beaches, 1993-2003.

was also evaluated. In 2008 and 2010, a new assessment approach was used in Jakolof Bay that focused on several beach sections that were known to support Pacific littleneck clams and that represented the available habitats and levels of effort (based on aerial survey data). This replaced randomly selected sites that were used to estimate the overall abundance of clams within a sub-bay. This new approach was also implemented in China Poot Bay in 2009. The new approach produces much more precise abundance estimates that allows changes in abundance to be tracked over time. Statically significant decline was observed from 2008 to 2010 in Jakolof Bay. Although the methods were different between the historic survey and the new survey, many similarities were maintained between the two which allowed for estimates of densities to be compared (instead of abundances) between years.

A major decline was observed in all three locations. In Jakolof Bay from 2001 to 2010, legal-size Pacific littleneck clam densities fell from 21 to 3 and butter clams from 3 to 1 clams per square meter, which reflects 83% and 64% decreases, respectively. In China Poot Bay from 1999 to 2009, legal-size Pacific littleneck clam densities fell from 42 to 3 and butter clams from 41 to 20 clams per square meter, which reflect 93% and 51% decreases, respectively. And in Chugachik Island from 1999 to 2008, the legal-size Pacific littleneck clam densities fell from 47 to 14 and butter clams from 6 to 3 clams per square meter, which reflect 71% and 50% decreases, respectively (ADF&G unpublished data). Although complete enumeration of sub-legal hardshell clams has not been assessed at any beach section, the number of sub-legal hardshell clams found in the abundance surveys suggests poor Pacific littleneck clam recruitment, but recruitment has remained fairly stable or increased for butter clams. The cause (or causes) of the declines in abundance and poor recruitment of Pacific littleneck clams is (are) unknown.

### **Fishery Management and Objectives**

Since 1997, sport, personal use, and commercial hardshell clam fisheries have been managed by the *Southern District Hardshell Clam Fishery Management Plan* (5 AAC 38.318). The plan limits the annual non-commercial (sport, personal use, and subsistence) and commercial harvests to 160,000 pounds and 40,000 pounds, respectively. The harvest level for the noncommercial fishery was established based on the average harvest in the fishery from 1981 to 1995. In 2007, the Alaska Board of Fisheries made a positive customary and traditional use finding for hardshell clams in LCI, established an amount reasonably necessary for subsistence use of 6,800–10,200 pounds of hardshell clams within the subsistence area, and required a harvest permit for participation in the subsistence fishery. In all fisheries, harvest may only occur by hand, or with a rake or shovel. In the commercial and noncommercial fisheries, Pacific littleneck clams must be a minimum length of 1.5 inches and 2.5 inches for butter clams. The size limits allow clams to reach reproductive maturity before harvest. Nonresidents can participate under sport fishing regulations, while residents can participate under sport, personal use, or subsistence regulations. Bag and possession limits under any type of fishery regulation cannot be added to the bag and possession limits of another type.

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.

## **Fishery Performance 2011-2013**

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, 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 a limit to 80 in combination. Because the SWHS estimate of harvest is currently unavailable, there is not enough information to assess if this restriction has reduced the harvest.

The SWHS harvest estimates for 2011 and 2012 were reported in numbers instead of gallons but both years were similar (Table 8). Using the average number of clams for each species of hardshell clam and assuming 100% of the harvest was of either species, the harvest estimate in numbers can be converted to a range of gallons. For example, in 2012, 23,406 hardshell clams were harvested. By assuming 100% of the harvest was butter clams and using a 20 clam per gallon conversion, the harvest was 1,170 gallons. Assuming 100% of the harvest was Pacific littleneck clams and using a 90 clam per gallon conversion, the harvest was 260 gallons. The converted 2012 harvest estimate would range from 260 to 1,170 gallons, which is less than half of the 2010 harvest estimate. It is likely that the actual harvest in gallons is within this range. The record low hardshell clam harvests since 2006 reflect either a decline in Pacific littleneck clam abundance, or that fewer diggers may be digging, or both. Sustainable harvest rates of Pacific littleneck clams are not known for Alaska. Beaches in British Columbia sustain harvest rates from 10% to 53% (Gillespie et al. 2005).

## **TANNER CRAB**

### **Fishery Description**

Tanner crab occur throughout LCIMA but are primarily found in Kachemak and Kamishak bays. The noncommercial Tanner crab fishery occurs mainly in the deep waters of Kachemak Bay. 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. Tanner crab may live to an estimated maximum age of 14 years. Legal-sized male Tanner crab vary from 2 to 4 pounds and have a carapace size 5½ inches or greater.

### **Historical Harvest and Abundance**

Historically, Tanner crab in LCIMA supported both commercial and noncommercial fisheries. Due to low abundances, the commercial fisheries have been closed since 1995. The noncommercial fisheries have had periodic closures since 1989. Noncommercial harvest data are available from the Statewide Harvest Survey (SWHS) beginning in 1981 (Table 8), and from shellfish permits starting from 1996 to 2002 and from 2008 to the present (Table 31). 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 from permits from 1996 to 2000 was approximately 15,400 crab under a bag and possession limit of 20 Tanner crab (Tables 8 and 31). A bag limit reduction to five Tanner crab resulted in an estimated harvest in 2001 of 6,499 crab. 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.

The permit estimate of Tanner crab harvest for the 2008–2009, and 2009–2010 seasons averaged about 18,000 crab (Table 31). Over 90% of the harvest was taken from Kachemak Bay, most of the remainder coming from the rest of Cook Inlet (mainly Kamishak Bay area). The guideline harvest level (GHL) of 13,373 crab for the 2008–2009 season and of 14,860 for the 2009–2010 season for Kachemak Bay was exceeded during the 2008–2009 and 2009–2010 seasons.

From the 1970s to 1990, pot surveys were used to index crab abundance in Kachemak Bay and Lower Cook Inlet (LCI). Trawl surveys in Kachemak and Kamishak bays have been used annually since 1990 to estimate abundance of Tanner crab (Table 32). The 2008 Kachemak Bay survey was deemed unusable due to poor trawl performance and no survey was conducted in 2010. Tanner crab abundance in all surveyed districts has been low since the early 1990s. Estimates of legal male Tanner crab abundance in the Kachemak Bay declined sharply in 1994. The Kamishak Bay trawl survey went to a biennial schedule after 2007.

### **Fishery Management and 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 waters within the Southern, Kamishak and Barren Island districts (Figure 8). The strategy established abundance thresholds for the commercial and noncommercial Tanner crab fisheries by district. For the commercial fishery in each district, the strategy includes thresholds of estimated abundance of legal male Tanner crab that would be to open to harvest, 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 GHL may not exceed 10 percent of the recent five-year average of legal male Tanner crab harvest. Also within the harvest strategy, there are provisions that close the noncommercial fishery based on the estimated abundance of legal male Tanner crab from the trawl surveys conducted in Kachemak and Kamishak bays. The noncommercial fisheries are designated by areas A–E (Figure 8). 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 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. In 1993, 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 could 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 (Figure 8). Harvest was restricted to males and the minimum size was 5½ inches across the widest part of the shell including spines. The daily noncommercial bag and possession limits were 5 crab (5½ inches or greater carapace width). No more than two pots could be fished per vessel. Gear restrictions were similar to those of commercial gear and were required to have escape mechanisms and must 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 8) to a maximum of six 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-Matsu-Kenai nonsubsistence area (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.

During the March 2014 meeting, BOF will consider an ADF&G proposal to change the 5-year average abundance in the harvest strategy to a 3-year average abundance of legal size male Tanner crab estimated from both the Kachemak and Kamishak trawl surveys and a proposal submitted by the Homer Advisory Committee to change the opening season date of the noncommercial fisheries from 15 July to 1 October. BOF will also address a public proposal to modify the noncommercial Tanner crab fisheries in Cook Inlet by reducing the open season to November and February and impose pot size limit and reduce the limit to two crab.

### **Fishery Performance 2010–2013**

Current legal male Tanner crab abundance levels are well below those that would allow for a commercial fishery in all districts. The noncommercial fisheries were open in all areas in 2010 (Figure 8). Since the Kachemak Bay GHL was exceeded during the 2008–2009 and 2009–2010 seasons, ADF&G conducted a bag limit analysis prior to the 2010–2011 season. The results suggested reducing the bag limit from five to four Tanner crab and an EO was issued prior to the start of the season for all Cook Inlet areas and from Cook Inlet to Gore Point (Areas A, B, D, and E; Figure 8). No Kachemak Bay trawl survey was conducted in 2010 and the Kachemak Bay GHL was set at 18,284 crab based on the most recent five-year average. The 2010–2011 season harvest in Areas D and E (Kachemak Bay east and west of Homer Spit; harvest of 12,676 crab; Table 31) was about 30% below the GHL and therefore no EO was issued to reduce the bag limit for the 2011–2012 season.

However, when the results of the Kachemak Bay trawl survey were available, the 2011 legal male Tanner crab abundance estimate (41,595; Table 32) fell below the 50,000-crab threshold to open the fishery. The noncommercial Tanner crab fishery in Kachemak Bay (Areas D and E) was closed inseason on 6 September by EO as directed by the harvest strategy. The 2012 and 2013 abundance estimates of legal male Tanner crab from the Kachemak Bay trawl survey (20,501 and 38,053, respectively; Table 32) were the lowest estimates of abundance in the history of the trawl survey and the fishery remained closed through the 2012–2013 and 2013–2014 seasons.

In 2011, the fisheries managed under the Kamishak provisions in the harvest strategy remained opened (Areas A, B, and C). In 2012, the Kamishak Bay trawl survey estimate of legal male Tanner crab abundance fell below the 40,000 crab threshold and therefore the noncommercial Tanner crab fisheries outside of Kachemak Bay were closed by EO. The Kamishak Bay survey occurs biennially and the fishery remained closed for the 2013–2014 season.

In the 2011 and 2012 Kachemak Bay trawl surveys, a larger number than most years of less than 70-mm crabs (also known as pre-4 recruits that require 4 more years or molts to reach legal size) was estimated (Table 32; ADF&G unpublished data); Hopefully, these crabs will continue to grow and eventually recruit into the fishery. Current abundances will likely keep the fishery closed for at least two more years.

## **DUNGENESS CRAB**

### **Fishery Description**

When the fishery was open, Dungeness crab were taken in pots, primarily in Kachemak Bay east of the 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.

### **Historical Harvest**

Sport and personal use shellfish harvest and effort estimates are available from the SWHS since 1981 (Table 8). Estimates of Dungeness crab harvest and effort for Kachemak Bay and Cook Inlet are also available from shellfish permits beginning in 1996 (Table 31). 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 harvests obtained by the SWHS (Tables 8 and 31) and are therefore, assumed to be unbiased.

The sport and personal use harvest averaged nearly 21,000 crabs (44,100 pounds) 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 (Table 8). Most of the Dungeness crab harvest reported on permits occurred in Kachemak Bay east of the Homer Spit, fewer were caught west of Homer Spit (Table 31), and the remainder was taken in Cook Inlet and from outer Gulf Coast waters.

Effort for all shellfish species combined in Kachemak Bay and LCI from 1981 through 1997 averaged 15,995 days of fishing (Table 8). Effort was reported on permits as trips in 1996, rather than in numbers of people who fished. A total of 2,896 trips were made for crab in 1996 (Table 31). Analysis of individual permits reveals that only Dungeness crabs were caught on 55% of those trips. Both trips and days fished were recorded on permits in 1997. Approximately 4,250 days of effort reported on permits were spent crabbing in 1997. People who caught only Dungeness crab accounted for approximately 20% of the effort for crab, whether effort was measured in days fished 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 crabs 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 crabs are available since 1961 (Trowbridge and Goldman 2006). The commercial fishery was the primary harvester of Dungeness crabs, with a historical average harvest in the Southern District of about 612,000 pounds (Trowbridge and Goldman 2006), equating to about 290,000 crabs annually (the average weight of one 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 (Table 33). 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. Fewer than 100 male crab of any size have been caught in any August Dungeness crab pot survey east of the 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 crabs were caught (R. Gustafson, Commercial Fisheries Biologist, ADF&G, Homer, personal communication). ADF&G trawl surveys have typically caught more sublegal than legal Dungeness crabs. The large catches of juvenile crabs in 2001 and 2006 did not persist in the surveys that followed in 2002–2003 or 2007–2008, therefore confirming that populations are at low levels over a broader range (R. Gustafson, Commercial Fisheries Biologist, ADF&G, Homer, personal communication).

A pot survey was conducted from 10 to 13 August 2009 to estimate catch per unit effort of Dungeness crabs 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 sub-legal 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 one 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 LCI, and all commercial and noncommercial fisheries are closed. The sport and personal use fisheries for Dungeness crab in LCI were closed by EO in 1991, but reopened from 1992 to 1998. During these years, there were no regulations authorizing subsistence fishing for Dungeness crabs 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 crabs 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 fishery in Kachemak Bay and eastern LCI 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 fishing was closed in all Cook Inlet areas by BOF action in 1997.

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

noncommercial Dungeness crab fishery. There is currently no management plan for Dungeness crab and no criteria for opening the noncommercial fishery.

## **COOK INLET RECREATIONAL PACIFIC HALIBUT FISHERIES**

### **FISHERY DESCRIPTION**

In the LCIMA, there are two relatively distinct sport fisheries for Pacific halibut: Central Cook Inlet (CCI) and Lower Cook Inlet (LCI). The main access points in CCI include boat ramps and beach launch sites at Deep Creek, Ninilchik, and Anchor Point. The CCI fleet fishes primarily the east side and central portion of Cook Inlet about as far south as the latitude of the Homer Spit. Harvest of Pacific halibut has also been reported as far north as Bishop Creek and the mouth of the Kenai River, but the harvest is negligible north of Ninilchik. There is also a small harvest on the west side of Cook Inlet, mostly from charter boats originating on the east side or from lodges on the west side. The Homer harbor is the major access point for the LCI fishery, with a smaller numbers of boats originating from Seldovia and numerous private docks and clusters of vacation and permanent homes on the south side of Kachemak Bay. Boats based in Homer fish primarily in outer Kachemak Bay, in the central waters of Cook Inlet Inlet, sometimes overlapping with the CCI fleet, south to the Barren Islands and Shuyak Island, and east to Port Dick. Vessels making overnight trips may venture farther to the east or south. Most of the Cook Inlet harvest occurs from May to September, with the CCI fishery waning by late August.

The Pacific halibut sport fishery is vital to the economy in the Cook Inlet area. Pacific halibut fishing draws vast numbers of tourists, and local derbies raise money for community projects and organizations (Denny 1990). In 1986, guided 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 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 (ADF&G 2009).

### **HISTORICAL HARVEST AND ABUNDANCE**

The Statewide Harvest Survey (SWHS) is used as the basis of all charter and private sport harvest estimates presented in this report for Pacific halibut. 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 charter harvest on the order of 12–42% each year (harvest reported in the logbook was greater). As a result of these discrepancies, ADF&G discontinued collection of Pacific halibut data in charter logbooks beginning in 2002. Beginning in 2006, recording of the number of halibut kept and released was once again a requirement of the saltwater logbook program. Harvest by charter and non-charter anglers has been estimated by the SWHS since 1986 for all Kenai Peninsula fisheries, but not for

the west side of Cook Inlet. Since 1995, harvest in the WCI reporting area has been estimated by user group, and merged with the CCI and LCI estimates.

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 (Table 2). 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 1990–2012. In 2012, the estimated Cook Inlet sport harvest was 189,986 fish (Table 2).

Growth in the CCI Pacific halibut fishery during the late 1980s and early 1990s was due largely to an increase in the guided component. In the late 1980s, the CCI fishery was dominated by noncharter anglers (Table 34). The charter harvest component increased from 9% to 50% during the period 1989–1994 as many Kenai River guides moved to the Deep Creek–Ninilchik area when restrictions were placed on the early-run Kenai River Chinook salmon fishery. In addition, the CCI saltwater fishery offered opportunities to harvest halibut, as well as Chinook salmon, and catch rates were reportedly high (Nelson 1995). From Anchorage, Ninilchik is about an hour less driving time than Homer, and the boat ride to the fishing grounds is often shorter or smoother. Development of beach access during the early 1990s and use of tractors to launch boats at any tide stage also facilitated development of the guided fishery during that period.

Harvest in the LCI fishery has consistently exceeded that of the CCI fishery. Harvest has been quite variable, but has averaged about 95,000 fish per year from 1990 until 2003 when it began to gradually climb to a record harvest in 2007 (156,085 fish; Table 2). The charter portion of the harvest has remained relatively stable at about 60–65% most years.

Halibut management agencies typically describe halibut fishery removals using net weight (headed and gutted) in pounds as the standard unit (net weight = 0.75 round weight). Harvest in pounds, or harvest biomass, is estimated by multiplying numbers of fish by estimates of average weight for each user group obtained through sampling of the recreational harvest. Average weight is estimated from length measurements using a length-weight relationship (Clark 1992). These estimates ranged from 1.07–1.47 million lb for CCI and 1.51–2.38 million lb for LCI during the recent five-year period 2007–2011.

Harvest estimates do not include catch-and-release mortality. Sport anglers in Cook Inlet have released 41–51% of the Pacific halibut they caught during the last 10 years (2003–2012). The International Pacific Halibut Commission (IPHC) assumes a mortality rate of 3.5% for Pacific halibut caught on longline gear using circle hooks and released in excellent condition (Kaimmer and Trumble 1998). Circle hooks are the predominant terminal gear in the Cook Inlet sport fishery. Not all sport-caught halibut are released in excellent condition, but unlike commercial gear, there is no soak time (time in which halibut are hooked, but not brought to the surface) associated with sport gear. Meyer (2007) estimated that discard mortality represented an additional removal of about 2–3% on top of the reported harvest in IPHC Regulatory Area 3A (Kodiak to Cape Spencer).

Since 1982, the IPHC has been estimating stock size using an age-structured model. Each year the IPHC updates the time series of commercial catch, survey catch, age composition, and other data to reassess the stock. There have been numerous changes to the model since the mid-1990s, mostly dealing with specification of survey selectivity (based on length or age). The changes were made in response to a long term decline in growth rate that reduced vulnerability to harvest

and caused underestimation of recruitment. With each succeeding year, changes in the assessment model resulted in increased estimates of historical biomass. An entirely new model was developed for the 2003 assessment that modeled abundance by sex, parameterized selectivity differently, and accounted for changes in the ageing method (Clark and Hare 2006).

In December 2006, the IPHC announced that recent information from tagging programs indicated that the halibut stock was more migratory than previously assumed. As a result, they assessed the stock using a coastwide model, and apportioned the overall biomass among regulatory areas based on relative catch rates in the longline survey weighted by bottom habitat area (Clark and Hare 2007). The coastwide assessment and apportionment was not used to set catch limits for 2007, largely because of objections to assumptions of the apportionment method. The IPHC began apportioning the overall biomass using relative catch rates when setting catch limits for the 2008 season. The coastwide assessment indicated an exploitable biomass in IPHC Regulatory Area 3A at the beginning of 2012 of about 91.997 million lb. The biomass has been on a downward trajectory since the late 1990s, the result of relatively weak recruitments and lower growth rates in recent years. Biomass is projected to level out in coming seasons due to recruitment of the 1999 and 2000 year classes.

## **FISHERY MANAGEMENT AND OBJECTIVES**

Pacific halibut are managed in state and federal waters primarily by federal agencies, the IPHC and the North Pacific Fishery Management Council (NPFMC). The IPHC was established in 1923 by a convention between Canada and the United States. The IPHC conducts research on halibut biology and population dynamics throughout the range of the stock, determines the harvest strategy, and sets allowable levels of harvest annually in each of ten regulatory areas. The 1953 Halibut Convention, as amended by the 1979 Protocol, mandates that the IPHC manage the stock on the basis of optimum yield (McCaughran and Hoag 1992). The term “optimum yield” is not explicitly defined in the Halibut Convention, but is commonly interpreted to imply consideration of food production, recreational opportunity, protection of the ecosystem, and other social and economic benefits. In addition to the management goal of optimum yield, the IPHC strives to maintain high, stable yields with a low risk of stock collapse (IPHC 1987: page 40).

The NPFMC is one of eight regional fishery councils created under the Magnuson Fisheries Conservation and Management Act of 1976. The NPFMC is responsible for allocation of the halibut resource in state and federal waters among competing user groups. Although the State of Alaska does not have direct management authority for halibut, the state has an active role in the Council process. The Magnuson-Stevens Fisheries Conservation and Management Act, as amended in 1996, provides that the Commissioner of ADF&G (or designee) is a voting member of the NPFMC.

Other agencies are involved in halibut management. The National Marine Fisheries Service (NMFS) writes regulations to convert council motions to law, and is responsible for implementation and enforcement of federal regulations. The BOF can adopt federal halibut regulations, and can also adopt state regulations that may impact halibut fisheries as long as those regulations are not specifically for halibut and do not conflict with federal regulations.

ADF&G SF collects information on the recreational harvest and provides it to federal management agencies. This is done through the region-wide halibut and groundfish harvest monitoring (port sampling) program, which was begun in 1991 (e.g., Meyer et al. 2008).

Sampling of the sport harvest and interviews with anglers and charter captains in the LCIMA are conducted in the Homer harbor and at Anchor Point and at Deep Creek beaches from mid-May through the end of August or early September.

The ADF&G objective with respect to Pacific halibut management is to provide the agencies (IPHC, NPFMC, and BOF) with the best possible information regarding the recreational Pacific halibut fishery so that management and allocation decisions can be made that optimize the social and economic benefits of the fishery to the State of Alaska. The sport fishery is regulated throughout Alaska using daily bag and possession limits and a closed season.

The IPHC first adopted regulations for the sport fishery in 1973, at the request of the State of Alaska and NMFS. The BOF adopted the IPHC regulations for the sport fishery in 1975. Between 1975 and 1988, there were a number of changes to the regulations, including changes to the open season and bag and possession limits. In 1988, the BOF adopted an IPHC regulation that prohibits cleaning or disfiguring Pacific halibut in a manner that prevents determination of the number of fish caught or possessed. In 2008, the IPHC further restricted the cleaning or disfiguring of Pacific halibut at sea by requiring that halibut cleaned at sea may not be cut into more than four fillets (two ventral and two dorsal) and two cheeks with skin on.

As of 2013, the sport regulations for Pacific halibut in Cook Inlet provide for an open season of 1 February–31 December, a daily bag limit of two halibut and possession limit of four halibut, and there is no size limit. Fish cleaned at sea must comply with the regulation described above. A statewide regulation prohibits taking of halibut in any manner contrary to federal regulations (5 AAC 75.067). State statutes regarding licensing for sport fishing (AS 16.05.340-430) also apply to the sport halibut fishery. Rules governing charter registration, logbooks, and vessel registration are found in statewide sport fishing regulations, 5 AAC 75.075-.077.

Over the years, the Pacific halibut sport harvest has grown unconstrained by catch quotas such as those placed on the commercial longline fishery. Individual fishing quotas (IFQs) were implemented for the commercial longline fishery in 1995, providing longliners a percentage share of the longline quota. Sport harvest is currently taken off the top of the total allowable harvest before the commercial quota is set. As a result, long-term increases in the sport harvest have caused allocation conflicts between commercial and sport user groups, conflicts that date back to the early 1990s.

Many years of deliberations among stakeholders eventually led the NPFMC to pursue the adoption of policies designed to resolve these halibut allocation conflicts on a permanent basis. Chief among these was adoption of a guideline harvest level (GHL) that went into effect in September 2003, and approval of a motion to incorporate the charter fleets in Southcentral and Southeast Alaska into the existing IFQ program. The IFQ plan, if implemented, would have replaced the GHL. The NPFMC rescinded the IFQ motion in December 2005, largely because of concerns over recency of the data that would be used to award quota shares. The NPFMC then passed a motion that replaced the IFQ program with a suite of alternatives for management of the charter fleet, including a moratorium, limited entry, direct allocation, and another IFQ program that incorporated recent fishery entrants. In March 2007, the NPFMC passed a motion to implement a moratorium on halibut charter boats. The proposed moratorium final rule was signed in January 2010 and the program was implemented for the 2011 charter halibut season.

The Area 3A sport charter boat fishery is currently managed under a GHL. If the GHL is exceeded, the NPFMC can initiate a process to identify and implement control measures. The

GHL was exceeded in 2004 by 0.5%, in 2005 by 1.1%, in 2006 by 0.4%, and in 2007 by 9.6%. Although the council approved an analysis of measures designed to bring the Area 3A charter fleet under the GHL in 2007, no management measures were implemented for 2008 through 2012 because the harvest was projected to be close to or under the GHL. ADF&G issued EOs to prohibit captain and crew retention of all fish (including halibut) for portions of the 2007–2009 seasons to help keep the charter harvest within the GHL.

In October 2008, the council approved a Catch Sharing Plan that would allocate Pacific halibut among the commercial and sport charter fleets, and specify bag and size limits pre-season to keep the charter fishery within its allocation range. The plan would also allow charter operators to lease commercial IFQs within a season to provide additional fishing opportunity for clients, and these fish would count toward the commercial catch limit. This Catch Sharing Plan is intended to replace the GHL and will be implemented in 2014 at the earliest.

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

## **FISHERY PERFORMANCE 2010–2012**

As of January 2010, the exploitable biomass of Pacific halibut in Area 3A was believed by the IPHC to be at an intermediate level of about 131 million pounds and on a downward trajectory, which was attributed to relatively weak recruitments through most of the 1990s (Hare 2010). By January 2012, the 3A exploitable biomass was estimated at just under 92 million pounds. Growth rates are also much lower than they were 20 years ago, so fish are smaller at age and therefore less vulnerable to the fishery (Clark and Hare 2004).

Sport harvest of Pacific halibut in the LCIMA climbed in stepwise fashion throughout the 1990s and 2000s. The record harvest of 2007 (253,265 fish) surpassed the previous record in 2005 by about 35,000 fish (Table 2). Harvest dropped in 2008 and 2009, presumably in response to the nationwide economic downturn. From 2003 through 2011, the Southcentral Alaska charter fishery operated under a GHL of 3.65 million pounds. The declining trend in exploitable biomass in 3A impacted the GHL in 2012, dropping the GHL by regulation to the next lower level of 3.103 million pounds. Estimated charter harvest in 3A has been less than three million pounds since 2009 and no bag limit restrictions have been implemented. Charter anglers in Cook Inlet harvested approximately 61% of the Pacific halibut harvested by all charter anglers in Southcentral Alaska in 2010; they harvested 65% in 2011, and 66% in 2012.

Harvest of Pacific halibut from the unguided sector of the sport fishery has remained relatively stable in the CCI fishery, averaging approximately 32,000 fish from 2010 to 2012 (from Table 34). The LCI unguided fishery harvest peaked at just over 62,000 fish in 2007, declining to 46,525 fish in 2012. However, as the NPFMC regulatory package regulating the charter fishery for halibut becomes fully implemented in the coming years, it is possible there will be an upward trend in the level of participation in the unguided sector.



# COOK INLET SPORT ROCKFISH FISHERY

## FISHERY DESCRIPTION

Over 30 species of rockfish (genus *Sebastes*) inhabit the Gulf of Alaska. Sixteen species have been identified in the recreational harvest from the LCIMA since 1991, but four species—black, dark, dusky, and yelloweye rockfish—typically make up the vast majority of the harvest.

Rockfishes are categorized into three assemblages based on habitat preferences (Table 35). For purposes of managing the recreational fishery, however, only two assemblages are defined in sport regulations (5 AAC 75.995): pelagic and nonpelagic. The pelagic assemblage includes black, dusky, dark, widow, yellowtail, and blue rockfish, and the nonpelagic assemblage includes all other species.

The State of Alaska has management authority for all recreational rockfish fisheries in state waters, as well as federal waters of the Exclusive Economic Zone (EEZ). State regulations apply in the EEZ because the NPFMC's Gulf of Alaska Fishery Management Plan does not address any recreational groundfish fisheries. 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 plan for the sport fishery.

Most rockfish are caught in state waters (within 3 nautical miles of shore) on the east side of Cook Inlet and around the Barren Islands. The directed fishery for rockfish is relatively small; most rockfish are taken incidentally to fishing for other species or while targeting rockfish only after fishing for other species. Interview data gathered in CCI and LCI during the three-year period 2010–2012 show that nearly all pelagic and nonpelagic rockfish were harvested by anglers that reported targeting halibut, bottomfish, or bottomfish and salmon (Table 36).

The economic value of the rockfish sport fishery in Cook Inlet is unknown. Furthermore, both the economic value and fishing effort for rockfish are not entirely separable from Pacific halibut because most of the rockfish harvest is incidental to halibut fishing.

## HISTORICAL HARVEST AND ABUNDANCE

Estimates of annual harvest in Cook Inlet have risen from about 2,000–4,000 rockfish (all species) in the late 1970s to well over 10,000 fish in recent years (Table 37). Average harvest during the 5-year period 2007–2011 was about 15,000 fish. The Cook Inlet harvest has made up 7–16% of the Southcentral Region recreational rockfish harvest since 1990. In numbers of fish, the charter component has accounted for 0–96% of the CCI harvest and 26–68% of the LCI harvest since 1986 (Table 38). Black, dusky, and dark rockfish are regularly caught in outer Kachemak Bay, either as a target species or incidental to halibut or salmon fishing. All species regularly occurring in the LCIMA are taken along the outer Kenai Peninsula coast and around the Chugach Islands.

There is uncertainty regarding the accuracy of rockfish harvest estimates from the SWHS. The biggest concern is with the magnitude of estimated harvest in the CCI fishery (Anchor Point and northward). SWHS estimated annual harvest in this fishery has ranged from about 200 to 1,900 fish since 1986 (Table 38). From 1995 to 2001, however, only one rockfish was reported harvested in over 4,500 vessel-trip interviews. It is unknown whether this estimated rockfish harvest was made up of other species such as sculpins or greenlings that were misidentified as rockfish, or whether rockfish that were actually taken in LCI were reported in CCI by SWHS

respondents. Only since 2002 has interview data from Anchor Point indicated that some of those anglers are harvesting rockfish from LCI waters (Meyer and Failor *In prep*).

Harvest biomass (pounds round weight) has been estimated for the pelagic and nonpelagic management groups since 1991 by integrating SWHS and port sampling data from Homer (Table 39). 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 in Homer. Total harvest has ranged from about 19,000 lb in 1991 to nearly 89,000 lb in 2011 (Table 39). Pelagic species accounted for most of the increase in harvest; harvest of nonpelagic species was relatively stable.

Because rockfish are caught incidentally to other fisheries, most of them are released. The numbers of rockfish released each year in Cook Inlet generally exceeded the number retained through 2008 (Figure 9). The magnitude of the release component is important because of the potential for high immediate or delayed mortality. 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 and are more often caught in salmon troll fisheries. Port sampling interview data collected in Homer since 1995 show that pelagic species made up 29–100% of the rockfish released each year (Meyer and Failor *In prep*). 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 mortality rates approaching 100% if released at the surface as is the general practice of most anglers. However, recent research by Hochhalter and Reed (2011) suggests that release at depth of capture (recompression) can substantially improve survival rates of yelloweye rockfish.

## **FISHERY MANAGEMENT AND OBJECTIVES**

ADF&G manages the sport rockfish fishery in state and federal waters on the constitutionally mandated sustained yield principle. Within this principle, SF seeks to optimize social and economic benefits, and where possible, to provide expanded opportunity to participate in diverse fisheries. ADF&G and the BOF have attempted to take a conservative approach to management of rockfish fisheries in Cook Inlet and the rest of Alaska. Sport bag limits have been reduced during the last decade 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 that avoid incidental catch and waste in the sport fishery.

The sport rockfish fishery in Cook Inlet 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 five rockfish per day, 10 in possession. In 1995, the BOF approved an ADF&G proposal to limit harvest of nonpelagic (demersal and slope) species, recognizing the relative difference in productivity between these groups. Even though increasingly conservative steps have been taken to curtail

harvest and manage incidental catch and waste, it is unknown whether these efforts are providing optimum yield or adequately protecting rockfish populations.

The current regulations, effective since 1996, include a year-round season, a daily bag limit of five rockfish per day, and a possession limit of 10 rockfish, of which no more than one daily and two in possession may be nonpelagic species. Bag and possession limits, special restrictions, and state authority in the 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. Charter operators are required to report the numbers of pelagic, yelloweye, and other rockfish kept and released daily by each angler in logbooks. Logbook requirements are outlined in AS 16.40.280 and 5 AAC 75.076.

The status of rockfish stocks in Cook Inlet is for the most part unknown. Because this is mostly an incidental fishery, little has been invested by SF in rockfish research in LCI. Virtually nothing is known of fish movement or stock structure, no analytical stock assessment has yet been done, there is substantial uncertainty in the harvest estimates, and catch-and-release mortality is unknown. An index of relative abundance, such as catch per unit effort (CPUE), has not yet been developed using fishery data. This is partly because fishery CPUE for rockfish tends to be hyperstable, or remain high as the stock declines, and partly because most rockfish are taken incidentally, so there is no measurement of effective effort. No surveys have been conducted in Cook Inlet in order to obtain a fishery-independent estimate of relative abundance. Information on locations and quantity of rockfish habitat, and spatial or depth distribution by species are also lacking.

There are, however, rudimentary indicators of the condition of the rockfish stock(s). Despite a steady growth in recreational harvest, there is no obvious trend in the average length or average weight of black, dusky, or yelloweye rockfish harvested in the sport fishery (Figure 10). 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 (Figure 11). Therefore, if past levels of harvest have exceeded surplus production, they have not done so by a large amount.

Age composition data do show, however, 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. Recruitment variability is common in rockfish and reinforces the principle that allowable levels of harvest have to 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.

Overfishing is by far the primary management concern for rockfish. These concerns are largely based on rockfish life history characteristics such as extreme longevity, relatively late age at maturity, high recruitment variability, and susceptibility to mortality from decompression trauma (Leaman and Beamish 1984; Munk 2001a; 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.

Cost effective, fishery independent surveys for rockfish in the LCIMA and the Gulf of Alaska are not presently available. Instead, the fishery-dependent SWHS has been used since 1977 to estimate the recreational harvest, catch, and effort for the primary species of interest, including

rockfish. Recreational harvest biomass (pounds round weight) has also been estimated since 1991 by integrating SWHS estimates of the number of fish taken and estimates of species composition and average weight by species assemblage from port sampling (Table 39).

## **FISHERY PERFORMANCE 2010–2012**

Rockfish harvest in 2010 from LCI was estimated at 17,170 fish, about 1,500 fish more than the previous year, and the highest harvest on record for this fishery up to that date. As participation in the Pacific halibut fishery increased, harvest for all groundfish species went up, including rockfish. Recreational anglers targeting Pacific halibut or any combination of bottomfish frequently will retain the rockfish they catch. Also, once those aboard a vessel targeting Pacific halibut have achieved their bag limit, they will often specifically target rockfish for a portion of their trip.

The sport harvest of rockfish in the CCI fishery in 2010 was 1,274 fish (Table 37). This level of harvest was within the observed range for that fishery. Anglers departing from the beaches of Anchor Point and Deep Creek primarily fish in waters with few rockfish present and are nearly exclusively targeting Pacific halibut and salmon. The few rockfish that are incidentally caught, mostly black or dusky rockfish, are not retained.

The estimated rockfish harvest in LCI in 2011 was 15,471 fish (Table 37), the fourth highest harvest on record for the area, but a decrease from the previous season. While halibut was the primary target for the vast majority of those anglers, the harvest of rockfish, both targeted and incidental, can be attributed to more angler days of effort.

A slight increase in harvest in 2011 was observed in the CCI fishery, although total harvest was still only a modest 1,376 fish (Table 37).

There was an increase in the total rockfish harvest in both the Central and LCI fisheries in 2012. The 2012 LCI rockfish harvest exceeded the previous season slightly with the second highest harvest on record of 16,283 fish (Table 37). The high incidence of mushy halibut syndrome may have led some anglers to seek other species during trips in which high numbers of Pacific halibut with mushy halibut syndrome were encountered. The 2012 CCI recreational harvest of rockfish was estimated to be 1,803 fish, the second highest on record for CCI, nearly 42% of which was harvested by unguided anglers (from Table 38). The 2012 CCI harvest was over two times the average number of rockfish harvested in this area during the preceding 10 years.

## **COOK INLET RECREATIONAL LINGCOD FISHERY**

### **FISHERY DESCRIPTION**

Lingcod are distributed from the Alaska Peninsula south to Baja California (Cass et al. 1990). In Cook Inlet, they are common along the outer Kenai Peninsula from Gore Point to the Chugach Islands and around the Barren Islands, and occasionally juveniles are found in Kachemak Bay and as far north as Anchor Point. While adult lingcod can be found to depths of 1,200 ft, they more typically inhabit nearshore rocky reefs from 30–300 ft in depth (Cass et al. 1990).

The sport fishery is the primary source of removals in the LCIMA. Most lingcod are caught in state waters, around the Barren Islands and along the Kenai Peninsula coast south of Point Pogibshi. Sublegal-sized fish are also reportedly caught occasionally by salmon trollers in portions of Kachemak Bay and in Cook Inlet near 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. Lingcod was the target species for three of the 1,386 vessel-trip interviews from Homer during the period 2010–2012. Ninety percent of the lingcod harvest landed in Homer was by anglers targeting Pacific halibut or bottomfish, and 96% of the harvest was taken by charter anglers.

The economic value of the lingcod sport fishery in Cook Inlet is unknown. As with rockfish, the economic value of lingcod is not separable from Pacific halibut because most of the harvest is incidental to Pacific halibut fishing.

## **HISTORICAL HARVEST AND ABUNDANCE**

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 the sport harvest estimates. Some basic fishery information may provide clues to stock status, however. The estimated average weight increased from about 23 lb in 1993, the first year with a minimum size limit, to over 30 lb in the early 2000s (Table 40). Average weight has declined slightly, to about 27 lb in recent years, due to recruitment of a strong 1997 year class (Figure 12). The strong 1989 year class continued to contribute to the harvest even as 23-year-olds in 2012. It appears there has been a broad range of age classes represented in the harvest and periodic recruitment.

As with rockfish, there is uncertainty with certain 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, CCI has accounted for up to 40% of the total Cook Inlet harvest (Table 41), but very few lingcod have been documented by ADF&G port samplers or creel survey crews stationed at Deep Creek and Anchor Point during May–August every year since 1994. The SWHS is believed to overestimate the percentage of lingcod harvest taken by noncharter anglers in LCI. For the period 1995–2012, SWHS estimates show that noncharter anglers accounted for an annual average of 29% of the LCI harvest (from Table 42). On the other hand, the estimate from port sampling interview data from the same time period is only 12% (B. Failor, Sport Fish Biologist, ADF&G, Homer, unpublished data). Part of the problem 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. It is unknown to what extent the problems are caused by misidentification or misreporting of the area fished.

## **FISHERY MANAGEMENT AND OBJECTIVES**

ADF&G manages the lingcod sport fishery in state and federal waters on the constitutionally-mandated sustained yield principle. Within this principle, SF seeks to optimize social and economic benefits, and where possible, expand opportunities to participate in diverse fisheries. Lacking a comprehensive stock assessment, ADF&G and the BOF have adopted a precautionary approach for management of the sport lingcod 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 two 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 LCIMA, the open season is 1 July–31 December, the daily bag and possession limits are two 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.

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.

The current harvest assessment program at Southcentral Alaskan ports is effective at characterizing the lingcod harvest in the recreational fishery and provides a basis for evaluating the effects of regulatory proposals (e.g., Stock and Meyer 2005). Primary objectives for this program include: estimation of age, length, and sex composition, as well as spatial distribution of effort and harvest.

Abundance data are needed. Data sources are being gathered and summarized to begin the process of developing a standardized index of abundance. Several potential data sources for this index should be evaluated, including interview data, charter logbook data, IPHC longline survey data, and NMFS trawl survey data. The assessment should include summaries of sport and commercial removals, spatial distribution of harvest, and age, length, and sex composition of the harvest. Existing information can be analyzed to estimate growth, natural mortality, and other assessment inputs.

The effectiveness of the current 35-inch minimum size limit should be evaluated. The size limit concentrates harvest on the largest, and thus most fecund females, and was implemented without a thorough analysis of 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, there is considerable uncertainty regarding the sport harvest estimates. The SWHS estimates should be evaluated using all available data to either justify them or make recommendations for improvement.

A fishery-independent index of abundance, such as that from a survey, is highly desirable. A reliable index could be used for management in the absence of a stock assessment, or could be used to tune 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 for 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 catch data on the sublegal portion of the population, data that may give insight on future recruitment.

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.

BOF will also consider the following proposals: 1) to decrease the lingcod bag and possession limits in Cook Inlet from two to one, 2) to change the lingcod sport fishing season to begin on 1 June instead of 1 July. In addition, BOF will consider a public proposal to use spiny dogfish shark (*Squalus acanthias*) for bait in the saltwaters of Cook Inlet.

## **RECENT FISHERY PERFORMANCE**

Harvest estimates from the SWHS are available since 1990. Annual sport lingcod 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 (Table 41). From 1993 until 2003, the harvest was variable but there was no trend, averaging around 1,700 fish per year. Since 2003 however, total lingcod sport harvest has substantially increased. For the period from 2004 through 2006, the average harvest was around 3200 fish, nearly double the previous 10-year average (from Table 41). Then from 2007 to 2009, the average harvest again nearly doubled to approximately 6,300 fish. The average harvest over the most recent three year period (2010–2012) has declined slightly to about 6,100 fish. Harvest of lingcod in Cook Inlet in 2010 was below the previous three year average at approximately 5,200 fish, then peaked in 2011 at nearly 7,500 fish, decreasing to 5,500 fish in 2012. Cook Inlet has accounted for 15–32% of the total Southcentral Region lingcod harvest since 1991 (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*). Guided anglers accounted for an estimated 6–100% (1990–2012 average 61%) of the CCI harvest (in numbers of fish) and 36–82% (1990–2012 average 67%) of the LCI harvest each year (Table 42).

Harvest biomass (pounds round weight) has been estimated for the sport fishery since 1992 by multiplying average weight estimates from harvest samples at Homer by the SWHS estimates for all of Cook Inlet. Harvest biomass ranged from about 29,000 to 209,000 pounds during the period 1992-2012 (Table 40).

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. The number of lingcod released annually from 1990 to 2012 in Cook Inlet ranged from 3,500 to 11,700 fish, representing 52%–83% of the catch (Figure 13). Lingcod do not have a swim bladder and are not subject to

barotrauma when caught in deep water. Release mortality has not been estimated in Alaska sport fisheries, but is believed to be low because many lingcod are caught on circle hooks in the halibut fishery and because released lingcod are quite hardy (Davis and Olla 2002; Parker et al. 2003). Albin and Karpov (1998) estimated the mortality rate for lingcod caught on rod and reel with single J-hooks and treble hooks, and held in aquaria, at about 4%.

## **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 fisheries by boating and non-boating 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 “Dingell-Johnson”) and the Wallop-Breaux amendment was made to the act in 1984.

The primary beneficiaries of each access project that involves Federal Aid funding must be the recreational boater or sport fishing public. A minimum of 15% of the Federal Aid funds allocated to the state is mandated to be used for recreational boating access projects. Federal Aid funds cannot be used for projects that support subsistence and 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 two 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 two 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.



Construction of three new accessible plumbed restrooms located at the top of the load and launch ramps (2-toilet unit) and at the top of the Ramp 4 (7-toilet unit) and Ramp 6 (7-toilet unit) transient mooring floats in the Homer Boat Harbor started in late summer of 2004 and has been completed. 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 by about \$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 and a roof with Lexan panels for natural illumination, plumbing, and painting. 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.

In summer 2006, a custom fish cleaning table was constructed (about \$950) in the ADF&G maintenance shop in Palmer for Halibut Cove Lagoon. Transportation and installation was coordinated with DPOR. Annual maintenance contracts for dumpster and portable toilets include about \$2,720 per year for Whiskey Gulch, about \$4,310 per year for Ninilchik for portable-latrines rental and pumping services, and about \$10,000 for the Ninilchik Scenic Overlook Site for a cooperative project with DPOR for operations and maintenance of the site.

ADF&G 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.

Maintenance projects paid for by ADF&G 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. Vehicles and camper trailers were found abandoned at Whiskey Gulch in 2007. While researching ADF&G's authority to penalize the owners, it was discovered that DNR is presently the official property owner. DNR is drafting a transfer document for ADF&G to become the property manager owner. During 2012, 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 an ADF&G FY08 Capital Improvement Project request in fall 2006. 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 recreational boaters and anglers to park and walk. In addition, an orientation and fee kiosk and a launch concessioner area provides a better-designed and more easily maintained facility. The sum of these

improvements have 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.

## **CURRENT PROJECTS SPORT FISHING ACCESS PROJECTS**

Annual installation and pumping of portable toilets and refuse service at Whiskey Gulch and Ninilchik River is paid by access funds. DPOR is given \$10,000 annually for operation and maintenance of the Ninilchik Wayside.

Bank improvement and stabilization needs for the Ninilchik River are being investigated and prioritized. Funding sources are also being investigated.

## **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 land owners are becoming less tolerant of trespass, particularly as subdivision of large tracts of private property occurs and access for fishing is decreasing. 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 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 (from previous landowner Elliot), a 60-acre parcel just upstream (from Thorne and Crowser), and 3 additional acquisitions: from Knol (37 acres), Thompson (61 acres), and Nakata (5 acres). All of these parcels are 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 trout, 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.

## **EDUCATIONAL FISHERIES**

### **BACKGROUND**

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 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.

## **HISTORY OF LCIMA EDUCATIONAL FISHERIES**

### **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 applicant for a permit from 1993 through 1996. Permit stipulations in 1993 allowed a saltwater harvest of 2,000 salmon; not more than 100 could be Chinook salmon and 250 coho salmon (Table 43). Only 50 Chinook salmon could be taken prior to 21 July. An additional 50 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 one mile from near the Ninilchik River and one-quarter mile from shore. Gear was limited to a single 10-fathom gillnet. Regular 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. The duration of the permit expanded each year until 1996; since then fishing has been allowed from 1 May until 31 October. A very limited freshwater fishery using traditional methods was permitted on the Ninilchik River downstream of the Sterling Highway Bridge beginning in 1995. After 1995, the freshwater harvest was limited to no more than 30 Chinook salmon and 20 coho salmon. The annual harvest in the educational fishery is reported in Table 43.

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, one 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 while the NTC members did not fish until they were granted a separate permit. Because the two groups represented the same constituents that had been served in the past by one permit, two permits were issued and the allocation normally granted to the NTC was divided in half between them. Each permit allowed the taking of 1,000 salmon. No more than 50 Chinook salmon could be harvested in total, with 25 taken before 21 July, and no more than 125 coho salmon in total. No more than 15 Chinook salmon and 10 coho salmon could be taken during the limited freshwater fishery. The remaining terms of the permits were the same as in the past. Each permittee was allowed its own net.

After the permits had been issued in 1998, the members of NTC asked that they be allowed an additional 20 Chinook salmon, which was the number caught by NND before separate permits were granted, for a total of 70 prior to 21 July. The NTC permit was amended to allow the taking of 18 additional Chinook salmon because NTC had taken 52, which was two more than the amount allotted 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 returns to the Kenai River were projected to be under the escapement goal.

Both NTC and NND applied for and received permits in 1999. The stipulations of the two permits were the same as in 1998. The NTC requested an additional 50 Chinook salmon on 25 May, after members harvested their initial quota of 50. The additional harvest was approved to allow NTC to meet its educational goals and because the additional allocation was not thought to negatively impact the Chinook salmon resource or other fisheries. Both organizations exceeded their allocations of Chinook salmon in early July and were requested to cease their harvest of Chinook salmon until after 20 July. No further Chinook salmon were reported harvested.

The educational fishery permits issued in 2000 contained the same stipulations and quotas as initially granted in 1998. The fishery proceeded without inseason changes.

In 2001, the members of NTC were allowed the use of an additional net, at their request, to better attain their quota of sockeye salmon. The NND requested an additional 25 Chinook salmon prior to 21 July, for a total of 75 during that period, to provide educational opportunities for an anticipated increase in participants to the program. The Chinook salmon quota of both groups was increased to 75 prior to 21 July; the increase for the members of NTC was approved to allow them to achieve their quota of sockeye salmon and to better achieve their educational goals.

Since 2001, NTC's educational fishery permit has allowed the use of a second net after 10 June. Despite requests from both the NTC and NND for more fish, the harvest quotas in 2002 for each group were 75 Chinook salmon prior to 21 July and 25 thereafter if the Kenai River spawning escapement goal was projected to be met. No more than 125 coho salmon could be taken by either group. Each group's freshwater quota from the Ninilchik River was no more than 10 Chinook salmon or 15 coho salmon taken over four 3-day periods. Salmon harvests were below harvest quotas.

A new organization in Ninilchik requested an education permit in 2003: Ninilchik Emergency Services (NES). NES wished to conduct classes in July and requested a permit for 1 July through 15 August. The group was allocated 250 salmon, including no more than 50 coho salmon and 25 Chinook salmon. Chinook salmon could be taken after 20 July only if the Kenai River Chinook salmon escapement projection was above the spawning escapement goal. Due to poor weather on scheduled class days, only one student participated in the NES program during one day. Salmon quotas for the NTC and NND, adjusted to accommodate the requested harvest by the NES, were 850 for each group. No more than 100 of each group's 850 salmon could be Chinook salmon and no more than 100 could be coho salmon. The restriction on harvest of Chinook salmon after 20 July was the same as in previous years and the same freshwater restrictions applied as in previous years. For April, NND was granted use of a 20-foot long gillnet with a mesh size not to exceed two inches to catch no more than 1,000 herring (*Clupea pallasii*) or eulachon (*Thaleichthys pacificus*). Salmon harvests were well below harvest quotas. No fishing occurred for herring or eulachon. In 2007, members of NES did not fish their permit.

Permits with similar stipulations as in 2003 were granted from 2004 through 2006 to the NND, NTC, and NES. The NND eulachon limit was removed in 2006 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 (Table 43).

In 2007, Chinook and coho salmon saltwater limits were increased for the NTC and NND. Educational fishing opportunity was provided to the NTC in the Kasilof River for the first time. Members of the NTC met their Chinook salmon quota of 300. Late reporting and misinterpretation of permit stipulations by NTC resulted in a harvest 428 coho salmon, exceeding their quota of 300 coho salmon.

In 2008, the NTC and NND Chinook salmon harvest quotas were reduced for the Ninilchik River area because the added harvest could negatively impact the Ninilchik River Chinook salmon escapement and sport fishery. To mitigate the NTC reduction, the Kasilof River area quotas were increased to maintain the 300 Chinook and 500 coho salmon harvest allocation. Total harvest fell within their allocations.

In 2009, Chinook salmon quotas were reduced again because of continued low Chinook salmon escapement to the Ninilchik River. Also, the NTC and NND coho salmon quotas were reduced because of continued above average harvest by all user groups. In 2010, harvest quotas have remained at the 2009 reduced levels. In 2010, only NTC applied for a permit.

### **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 could be 50 pink salmon, 20 chum salmon, and 20 sockeye salmon. 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 44 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.

### **Anchor Point Veterans of Foreign Wars Post 10221 Permit**

The Anchor Point Veterans of Foreign Wars Men’s Auxiliary Post 10221 (APVFW) received an educational permit from 2007 to 2010 to conduct an educational fishery approximately 1.5 miles north of the Anchor River (Table 45). The gear specifications were the same as for Ninilchik-area permittees. The APVFW permit included a fishing season from 15 July 15 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 verbiage 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 2010 fell within the quotas.

## **Southcentral Foundation Permit**

The Southcentral Foundation (SCF) was granted its first permit in 2010 to conduct an educational fishery in marine 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 46). 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 combined, 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 trout 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.

## **EDUCATIONAL FISHERIES IN THE LCIMA 2011–2013**

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

### **Ninilchik River Area Permits**

In 2011, NTC and NND received educational fishery permits and harvest quotas remained the same as 2010 quotas and harvest fell within their quotas (Table 43).

In 2012, NTC, NND, and NES were issued permits. This was the first year that NES had applied since 2007. 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. The initial harvest quotas for 2012 were unchanged for NTC and NND and unchanged from the 2007 quota for NES. However, as a result of sport fishing restrictions on the Ninilchik River to conserve Chinook salmon, the permits were modified twice. The harvest of Chinook salmon was prohibited in the salt water fishery beginning 1 July unless the fish was too significantly injured to allow a reasonable chance of survival. Modifications also closed the two inriver educational fisheries. Even before the modifications, NND and NES voluntarily began releasing wild Chinook salmon. In total, they released 14 wild Chinook salmon. All three education 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.

In 2013, the NTC permit allowed an educational fishery on the beach section requested on the south side of the Ninilchik River from 15 June to 15 September. The preseason quotas were unchanged. NND and NES also were permitted educational fisheries that remained the same as stipulated in their 2012 permits. In the days leading into the opening of the educational fisheries, a mud slide blocked access to the beach section north of the Ninilchik River where the educational fisheries were traditionally allowed. In response, NTC and NND requested to fish south of the Ninilchik River instead. They were permitted to fish the south beach site

(approximately 500 ft) through 20 May with a harvest quota of 40 Chinook salmon. NTC's request of two additional fishing days on the south beach section was also granted. NND did not fish the south beach area. All three permits were modified in response to a sport fishing restriction to the Ninilchik River. From 15 June to 15 July, the harvest of Chinook salmon was prohibited in the marine educational fishery unless it was significantly injured and did not have a reasonable chance of survival, and the last two inriver educational fisheries were closed. Following the modification, NTC harvested 52 and released 65 Chinook salmon, NND harvested 11 and released 21 Chinook salmon and NES harvested 13 and released 8 Chinook salmon. All three 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.

### **Seldovia Village Tribe Permit**

The Seldovia Village Tribe only fished two days in 2011 and no fish were harvested (Table 44). No educational fisheries were conducted by SVT in 2012 or 2013.

### **Anchor Point Veterans of Foreign Wars Post 10221 Permit**

The APVWF was granted permits from 2011-2013. Their harvest fell within their quota all three years (Table 45).

### **Southcentral Foundation Permit**

The SCF was granted an educational fishery permit from 2011 to 2013 and harvest quotas remained unchanged (Table 46). The 2013 dates were changed as requested to 15 July–20 September. The opening days were also adjusted from the Tuesdays, Wednesdays, and Fridays–Sundays to Tuesday, Wednesday, Friday, and Sunday. The educational fishing schedule change was made to avoid fishing during commercial openings. The harvest fell within the quota for all three years.

### **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 47). They also received permits in 2012 and 2013. Their harvest fell within their quotas all three years.

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## **TABLES**

Table 1.– Angler-days of effort expended by recreational anglers fishing Lower Cook Inlet Management Area waters, 1977–2012.

Year	West Cook Inlet		Central Cook Inlet			Lower Cook Inlet and Kachemak Bay			LCIMA total	LCMI % of state	Alaska total
	Salt water <sup>a</sup>	Fresh water	Saltwater finfish	Saltwater shellfish	Freshwater finfish	Saltwater finfish	Saltwater shellfish	Freshwater finfish			
1977			57,611b		55,706	46,827 <sup>b</sup>			160,144	13.4	1,198,486
1978			64,429b		74,378	59,128 <sup>b</sup>			197,935	15.4	1,286,063
1979	880		65,677b		77,027	64,656 <sup>b</sup>			208,240	15.3	1,364,739
1980	928		63,481b		63,273	57,078 <sup>b</sup>			184,760	12.4	1,488,962
1981	972		25,538	31,298	59,648	67,894	25,391		210,741	14.8	1,420,772
1982	1,501		29,718	31,954	49,687	61,315	15,712		189,887	11.7	1,623,090
1983	707	1,739	45,337	31,470	52,721	91,229	20,334	3,844	247,381	14.3	1,732,528
1984	1,673	652	53,955	30,013	53,320	72,441	25,162	2,243	239,459	12.8	1,866,837
1985	1,942	970	55,435	32,652	63,464	63,272	16,732	1,024	235,491	12.1	1,943,069
1986	2,562	399	66,377	33,486	63,132	74,781	21,755	2,231	264,723	12.8	2,071,412
1987	810	903	80,565	25,427	71,191	104,602	20,710	2,569	306,777	14.2	2,152,886
1988	3,989	782	54,799	30,998	50,260	127,784	13,306	2,339	284,257	12.3	2,311,291
1989	2,136	1,474	62,503	22,693	44,583	98,922	9,594	2,180	244,085	10.8	2,264,079
1990	2,406	1,140	82,881	29,427	61,718	133,938	10,342	4,068	325,920	13.3	2,453,284
1991	2,287	1,187	83,988	32,012	60,052	118,015	6,690	1,613	305,844	12.5	2,456,328
1992	2,526	989	93,175	44,537	67,710	127,971	15,727	2,575	355,210	14.0	2,540,374
1993	3,064	2,534	85,363	40,376	70,330	140,399	13,741	2,155	357,962	14.0	2,559,408
1994	4,151	900	111,560	48,546	70,085	143,033	18,187	3,071	399,533	14.7	2,719,911
1995	4,254	2,239	121,936	42,220	55,785	156,222	17,682	3,717	404,055	14.5	2,787,670
1996	2,753	1,865	73,229	29,943	37,797	116,089	11,584	802	274,062	13.7	2,006,528
1997	2,819	1,551	81,602	28,343	38,435	114,998	9,263	1,003	278,014	13.4	2,079,514
1998	2,403	937	68,967	26,636	35,766	99,481	3,926	752	238,868	12.9	1,856,976
1999	2,336	1,887	75,790	36,278	48,263	107,623	9,149	695	282,021	11.3	2,499,152
2000	3,344	1,414	84,615	37,755	48,895	122,600	11,445	1,097	311,165	11.8	2,627,805
2001	2,275	744	73,577	32,642	38,252	108,426	8,090	1,900	265,906	11.8	2,261,906
2002	2,120	1,638	65,204	34,406	38,468	120,892	7,439	644	270,811	12.0	2,259,091
2003	1,220	2,487	56,969	25,361	37,118	132,586	5,836	708	262,285	11.8	2,219,398
2004	2,304	1,619	65,968	30,211	42,392	137,910	6,641	931	287,976	11.6	2,473,961
2005	1,984	2,255	68,393	32,835	40,396	154,229	6,415	803	307,310	12.5	2,463,929

-continued-

Table 1.–Part 2 of 2.

Year	West Cook Inlet		Central Cook Inlet			Lower Cook Inlet and Kachemak Bay			LCIMA total	LCMI % of state	Alaska total
	Salt water <sup>a</sup>	Fresh water	Saltwater finfish	Saltwater shellfish	Freshwater finfish	Saltwater finfish	Saltwater shellfish	Freshwater finfish			
2006	170	2,260	65,745	25,482	34,351	134,827	6,704	854	270,393	11.8	2,297,961
2007	74	2,121	69,304	25,170	54,678	142,883	4,476	845	299,551	11.8	2,543,674
2008	83	1,226	59,799	28,806	45,082	115,164	6,240	780	257,180	11.1	2,315,601
2009	198	1,077	61,853	26,982	38,509	104,422	6,463	716	240,220	10.9	2,216,445
2010	282	1,039	56,143	19,412	29,689	111,654	4,886	674	223,799	11.2	2,000,167
2011	142	870	61,137	23,021	15,628	107,077	3,720	922	212,517	11.1	1,919,313
2012			59,139	21,872	15,622	108,853	2,194	1,997	209,677	11.1	1,885,768
Averages											
1977–2009	1,964	1,444	69,798	31,999	52,802	106,716	12,232	1,710	271,763	13	2,132,216
2010–2012	212	955	58,806	21,435	20,313	109,195	3,600	1,198	215,331	11	1,935,083

Source: Mills (1979-1980, 1981a-c, 1982-1994), Howe et al. (1995-1996, 2001a-d), Walker et al. (2003), Jennings et al. (2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

<sup>a</sup> West Cook Inlet saltwater harvest, except for shellfish, was included in Central and Lower Cook Inlet harvest starting in 2006.

<sup>b</sup> Includes shellfish.

Table 2.—Historical recreational harvest of Pacific halibut in Cook Inlet waters, 1977–2012.

Year	Lower Cook Inlet <sup>a</sup>	Central Cook Inlet <sup>b</sup>	West Cook Inlet <sup>c</sup>	Cook Inlet total	Statewide total
1977	9,416	4,050	<sup>d</sup>	13,466	23,244
1978	20,756	4,821	<sup>d</sup>	25,577	37,085
1979	20,479	6,518	<sup>d</sup>	26,997	47,705
1980	21,808	8,177	<sup>d</sup>	29,985	64,658
1981	29,294	9,427	<sup>d</sup>	38,721	74,212
1982	28,851	10,681	<sup>d</sup>	39,532	92,358
1983	36,623	23,503	<sup>d</sup>	60,126	117,042
1984	37,747	23,455	<sup>d</sup>	61,202	124,950
1985	41,450	21,198	510	63,158	127,634
1986	41,943	42,072	1,072	85,087	160,885
1987	44,380	33,039	869	78,288	145,829
1988	91,688	44,321	1,192	137,201	225,106
1989	73,892	51,739	1,224	126,855	229,016
1990	90,380	56,397	1,685	148,462	247,202
1991	86,405	60,423	1,576	148,404	266,523
1992	81,430	60,670	984	143,084	264,943
1993	92,057	67,826	2,507	162,390	313,147
1994	88,260	79,775	2,725	170,760	329,046
1995	86,832	81,322	<sup>e</sup>	168,154	325,188
1996	105,968	81,807	<sup>e</sup>	187,775	350,220
1997	105,646	88,270	<sup>e</sup>	193,916	380,256
1998	94,209	85,153	<sup>e</sup>	179,362	350,464
1999	86,239	69,264	<sup>e</sup>	155,503	332,657
2000	107,736	93,991	<sup>e</sup>	201,727	403,280
2001	94,864	87,618	<sup>e</sup>	182,482	365,539
2002	93,625	73,398	<sup>e</sup>	167,023	350,809
2003	112,386	77,708	<sup>e</sup>	190,094	402,862
2004	125,595	86,107	<sup>e</sup>	211,702	482,550
2005	133,147	85,548	<sup>e</sup>	218,585	500,048
2006	124,823	84,619	<sup>e</sup>	209,442	462,855
2007	156,085	97,180	<sup>e</sup>	253,265	584,764
2008	124,492	84,590	<sup>e</sup>	209,082	516,480
2009	110,092	85,202	<sup>e</sup>	195,294	440,255
2010	117,900	74,803	<sup>e</sup>	192,703	397,998
2011	122,032	81,496	<sup>e</sup>	203,528	393,571
2012	116,259	73,727	<sup>e</sup>	189,986	387,713
<b>Averages</b>					
1977–2009	78,745	56,663	1,434	135,839	276,934
2010–2012	118,730	76,675		195,406	393,094

Source: Mills (1979–1980, 1981a–c, 1982–1994), Howe et al. (1995–1996, 2001a–d), Walker et al. (2003), Jennings et al. (2004, 2006a–b, 2007, 2009a–b, 2010a–b, 2011a–b, *In prep a–b*).

<sup>a</sup> Cook Inlet salt waters east of the center of Cook Inlet, south of Anchor Point including Kachemak Bay and Gulf Coast waters west of Gore Point.

<sup>b</sup> Cook Inlet salt waters east of the center of Cook Inlet and north of Anchor Point.

<sup>c</sup> Cook Inlet salt waters west of the center of Cook Inlet and from the Susitna River south to Cape Douglas.

<sup>d</sup> Pacific halibut information was not requested in the SWHS West Cook Inlet questionnaire before 1985.

<sup>e</sup> After 1994, the West Cook Inlet estimates were apportioned and included in the Central and Lower Cook Inlet subareas.



Table 3.–Chinook salmon harvest in Lower Cook Inlet Management Area waters, 1977–2012.

Year	West Cook Inlet			Lower Cook Inlet and Kachemak Bay				Central Cook Inlet			All areas
	Salt water	Fresh water	Total	Salt water stocked locations	Salt water other locations	Fresh water	Total	Salt water	Fresh water	Total	
1977					970		970	4,470	2,670	7,140	8,110
1978					816		816	4,800	4,358	9,158	9,974
1979	10		10		1,034		1,034	4,070	4,109	8,179	9,223
1980					431		431	1,636	1,510	3,146	3,577
1981	95		95		1,145		1,145	2,711	3,196	5,907	7,147
1982	189		189		1,963		1,963	3,836	2,749	6,585	8,737
1983	41		41		2,664	189	2,853	2,832	3,294	6,126	9,020
1984	75		75	537	1,559	12	2,108	4,613	2,407	7,020	9,203
1985	50		50		883		883	6,256	1,904	8,160	9,093
1986	112		112	665	439		1,104	4,174	2,462	6,636	7,852
1987	29		29	1,738	452		2,190	5,125	2,489	7,614	9,833
1988	171		171	8,222	1,472		9,694	6,018	2,548	8,566	18,431
1989	183	58	241	3,486	899		4,385	5,487	2,182	7,669	12,295
1990	23		23	3,513	1,123	12	4,648	6,719	3,583	10,302	14,973
1991	149		149	2,786	775		3,561	6,883	5,997	12,880	16,590
1992	166	9	175	2,602	2,978	18	5,598	8,609	8,389	16,998	22,771
1993	141		141	7,007	4,400		11,407	11,725	9,543	21,268	32,816
1994	328	19	347	3,985	6,154	29	10,168	9,272	8,064	17,336	27,851
1995	164	76	240	5,508	3,642	28	9,178	11,283	5,087	16,370	25,788
1996	181		181	3,592	3,509		7,101	7,092	4,770	11,862	19,144
1997	371	133	504	4,000	3,591		7,591	8,926	6,075	15,001	23,096
1998	117		117	2,584	3,417		6,001	7,682	2,775	10,457	16,575
1999				3,638	3,605		7,243	6,386	4,095	10,481	17,724
2000	93	207	300	3,028	3,628		6,656	6,074	4,449	10,523	17,479
2001	55	21	76	2,835	3,715	116	6,666	4,948	2,881	7,829	14,571
2002	28		28	2,621 <sup>a</sup>	5,300	26	7,947	3,889	2,384	6,273	14,248
2003	72	37	109	4,059 <sup>a</sup>	6,394	24	10,477	4,303	3,238	7,541	18,127
2004	13		13	4,068 <sup>a</sup>	8,103		12,171	5,553	3,624	9,177	21,361
2005	46	92	138	2,810 <sup>a</sup>	11,128	27	13,965	4,866	3,416	8,282	22,385

-continued-

Table 3.–Part 2 of 2.

Year	West Cook Inlet			Lower Cook Inlet and Kachemak Bay				Central Cook Inlet			All areas
	Salt water	Fresh water	Total	Salt water stocked locations	Salt water other locations	Fresh water	Total	Salt water	Fresh water	Total	
2006	b			2,092 <sup>a</sup>	8,287		10,379	5,989	3,174	9,163	19,542
2007	b			1,757 <sup>a</sup>	5,970		7,727	4,829	4,284	9,113	16,840
2008	b	90	90	833 <sup>a</sup>	5,049		5,882	2,680	3,064	5,744	11,716
2009	b	264	264	710 <sup>a</sup>	4,140		4,850	1,696	1,064	2,760	7,874
2010	b			883 <sup>a</sup>	6,928		7,811	2,323	971	3,294	11,105
2011	b	22	22	418 <sup>a</sup>	5,711		6,129	3,155	1,082	4,237	10,388
2012	b			14 <sup>a</sup>	5,452		5,466	1,424	87	1,511	6,977
Averages											
1977–2009	116	91	145	3,147	3,322	48	5,721	5,619	3,813	9,432	15,272
2010–2012		22	22	438	6,030		6,469	2,301	713	3,014	9,490

Source: Mills (1979-1980, 1981a-c, 1982-1994), Howe et al. (1995-1996, 2001a-d), Walker et al. (2003), Jennings et al. (2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

<sup>a</sup> Halibut Cove Lagoon and Seldovia harvests no longer assessed individually; includes only Homer Spit shore angler harvest estimates.

<sup>b</sup> West Cook Inlet saltwater harvest included in Central and Lower Cook Inlet harvest.

Table 4.—Comparison of LCIMA saltwater guided angler Chinook salmon harvest reported in charter logbooks and estimated with the Statewide Harvest Survey, 1998–2012.

Year	Charter logbook (reported harvest)	Statewide Harvest Survey (estimated harvest)
1998	4,245	5,478
1999	4,180	4,688
2000	4,304	4,422
2001	3,560	4,410
2002	3,954	3,694
2003	4,710	4,347
2004	5,867	6,958
2005	6,813 <sup>a</sup>	6,644
2006	4,708 <sup>a</sup>	6,547
2007	2,907 <sup>a</sup>	4,926
2008	1,732 <sup>a</sup>	3,363
2009	1,184 <sup>a</sup>	1,763
2010	2,873 <sup>a</sup>	2,253
2011	3,096 <sup>a</sup>	3,467
2012	2,279 <sup>a</sup>	2,728

*Sources:* Dora Sigurdsson, ADF&G, Division of Sport Fish, Research and Technical Services, Anchorage; *Source:* Mills (1979-1980, 1981a-c, 1982-1994), Howe et al. (1995-1996, 2001a-d), Walker et al. (2003), Jennings et al. (2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*); Sigurdsson and Powers (2009–2013).

<sup>a</sup> Includes charter crew harvest.

Table 5.-Coho salmon harvest in Lower Cook Inlet Management Area waters, 1977–2012.

Year	West Cook Inlet			Lower Cook Inlet and Kachemak Bay				Central Cook Inlet			LCIMA total
	Salt water	Fresh water	Total	Nick Dudiak Lagoon	Saltwater other locations	Fresh water	Total	Salt water	Fresh water	Total	
1977					4,749		4,749	557	1,900	2,457	7,206
1978					2,137		2,137	503	3,231	3,734	5,871
1979	50		50		2,633		2,633	387	3,707	4,094	6,777
1980	69		69		1,748		1,748	405	3,603	4,008	5,825
1981	48		48		2,149		2,149	918	4,255	5,173	7,370
1982	755		755		2,148		2,148	639	3,105	3,744	6,647
1983	62	1,872	1,934		2,408		2,408	860	2,401	3,261	7,603
1984	125	773	898		1,397		1,397	972	2,881	3,853	6,148
1985	124	747	871		1,232		1,232	734	5,262	5,996	8,099
1986	78	302	380	245	1,193		1,438	1,467	2,132	3,599	5,417
1987	127	706	833	459	994		1,453	1,986	4,111	6,097	8,383
1988	18	764	782	200	1,328		1,528	1,109	4,602	5,711	8,021
1989	251	875	1,126	1,439	1,766		3,205	888	5,682	6,570	10,901
1990	110	375	485	1,272	2,540		3,812	1,274	4,430	5,704	10,001
1991	63	1,144	1,207	3,822	3,604		7,426	1,365	5,528	6,893	15,526
1992	283	567	850	1,109	2,540		3,649	1,270	3,886	5,156	9,655
1993	177	1,579	1,756	5,823	4,186		10,009	2,190	6,962	9,152	20,917
1994	65	443	508	5,355	3,866		9,221	3,478	6,971	10,449	20,178
1995	1,018	1,979	2,997	5,367	3,418		8,785	2,020	4,786	6,806	18,588
1996	702	3,502	4,204	9,060	6,233		15,293	2,788	5,572	8,360	27,857
1997	32	722	754	6,091	4,905		10,996	2,793	3,264	6,057	17,807
1998	158	697	855	6,672	6,402		13,074	1,795	6,425	8,220	22,149
1999	235	885	1,120	3,890	5,629		9,519	2,425	7,564	9,989	20,628
2000	440	1,264	1,704	7,067	5,903		12,970	3,136	6,765	9,901	24,575
2001	483	2,232	2,715	11,015	11,273		22,288	5,301	5,766	11,067	36,070
2002	665	1,289	1,954	14,508	18,264		32,772	5,807	7,684	13,491	48,217
2003	173	2,511	2,684	18,531	10,300		28,831	2,865	8,585	11,450	42,965
2004	410	2,225	2,635	21,009	15,457		36,466	4,237	10,656	14,893	53,994
2005	182	1,845	2,027	15,075	16,187		31,262	3,541	9,234	12,775	46,064

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Year	West Cook Inlet			Lower Cook Inlet and Kachemak Bay				Central Cook Inlet			LCIMA total
	Salt water	Fresh water	Total	Nick Dudiak Lagoon	Saltwater other locations	Fresh water	Total	Salt water	Fresh water	Total	
2006	<sup>a</sup>	1,667		4,450	9,975		14,425	3,418	8,278	11,696	27,788
2007	<sup>a</sup>	1,384		4,617	11,522		16,139	2,456	7,870	10,326	27,849
2008	<sup>a</sup>	573		3,767	7,859		11,626	1,902	7,396	9,298	21,497
2009	<sup>a</sup>	1,289		509	9,616		10,125	2,202	6,237	8,439	19,853
2010	<sup>a</sup>	858		1,007	6,724	51	7,731	2,375	5,257	7,632	16,221
2011	<sup>a</sup>	713		192	7,530	18	7,740	2,384	3,060	5,444	13,897
2012	<sup>a</sup>	898		58	3,584	234	3,876	3,078	3,356	6,434	11,208
Averages											
1977–2009	256	1,267	1,341	6,306	5,623		10,209	2,051	5,477	7,528	18,983
2010–2012		823		419	5,946	101	6,449	2,612	3,891	6,503	13,775

Source: Mills (1979-1980, 1981a-c, 1982-1994), Howe et al. (1995-1996, 2001a-d), Walker et al. (2003), Jennings et al. (2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

<sup>a</sup> West Cook Inlet saltwater harvest included in Central and Lower Cook Inlet harvest.

Table 6.–Dolly Varden harvest in Lower Cook Inlet Management Area waters, 1977–2012.

Year	Lower Cook Inlet and Kachemak Bay			Central Cook Inlet			LCIMA total
	Salt water	Fresh water	Total	Salt water	Fresh water	Total	
1977	4,137		4,137	603	11,437	12,040	16,177
1978	2,866		2,866	325	22,418	22,743	25,609
1979	3,218		3,218	382	27,808	28,190	31,408
1980	3,917		3,917	164	13,156	13,320	17,237
1981	4,212		4,212	313	18,403	18,716	22,928
1982	3,606		3,606	526	12,484	13,010	16,616
1983	3,997	1,678	5,675	493	18,871	19,364	25,039
1984	1,659	312	1,971	237	7,595	7,832	9,803
1985	2,324		2,324	243	8,826	9,069	11,393
1986	2,172	306	2,478	15	5,367	5,382	7,860
1987	1,358	380	1,738	379	3,911	4,290	6,028
1988	2,819	218	3,037	200	3,802	4,002	7,039
1989	2,083	343	2,426	382	1,848	2,230	4,656
1990	1,522	176	1,698	61	3,811	3,872	5,570
1991	1,393	275	1,668	246	1,983	2,229	3,897
1992	1,804	378	2,182	205	3,097	3,302	5,484
1993	1,720	172	1,892	150	1,506	1,656	3,548
1994	1,516	216	1,732	311	2,034	2,345	4,077
1995	737	154	891	285	2,102	2,387	3,278
1996	1,765	586	2,351	171	2,162	2,333	4,684
1997	1,541	706	2,247	378	2,178	2,556	4,803
1998	1,790	115	1,905	297	3,854	4,151	6,056
1999	774	209	983	288	1,671	1,959	2,942
2000	1,045	695	1,740	491	2,605	3,096	4,836
2001	1,019	195	1,214	422	2,131	2,553	3,767
2002	580	114	694	196	1,158	1,354	2,048
2003	1,265	289	1,554	117	1,539	1,656	3,210
2004	1,089	230	1,319	166	1,193	1,359	2,678
2005	524	158	682	440	945	1,385	2,067
2006	775	194	969	282	1,217	1,499	2,468
2007	661	179	840	256	1,668	1,924	2,764
2008	1,105	151	1,256	280	1,437	1,717	2,973
2009	1,685	207	1,892	156	1,407	1,563	3,455
2010	466	29	495	295	1,192	1,487	1,982
2011	277	30	307	143	583	726	1,033
2012	1,173	1,609	2,782	164	375	539	3,321
Averages							
1977–2009	1,899	332	2,161	287	5,928	6,215	8,376
2010–2012	639	556	1,195	201	717	917	2,112

Source: Mills (1979-1980, 1981a-c, 1982-1994), Howe et al. (1995-1996, 2001a-d), Walker et al. (2003), Jennings et al. (2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

Table 7.—Razor clam harvest, participation, and success rates on east side Kenai Peninsula beaches north of Anchor Point, 1969–2012.

Year	Participation (digger-days)	Harvest	Clams per digger day
1969	12,200	375,800	31
1970	11,370	314,650	28
1971	6,800	187,760	28
1972	15,400	437,530	28
1973	23,770	682,600	29
1974	27,410	872,450	32
1975	24,260	896,080	37
1976	29,320	939,000	32
1977	25,393	871,247	34
1978	29,750	896,667	30
1979	30,323	966,677	32
1980	31,494	771,603	25
1981	31,298	829,436	27
1982	31,954	963,994	30
1983	31,470	978,720	31
1984	30,013	1,044,307	35
1985	32,652	1,070,265	33
1986	33,486	1,124,728	34
1987	25,427	979,020	39
1988	30,998	1,171,308	38
1989	22,693	832,155	37
1990	29,427	950,974	32
1991	32,012	1,166,787	36
1992	44,537	1,156,034	26
1993	40,376	947,437	23
1994	48,546	1,271,174	26
1995	42,220	1,158,107	27
1996	29,943	814,360	27
1997	28,343	829,841	29
1998	26,636	643,612	24
1999	36,278	750,447	21
2000	37,755	842,270	22
2001	32,642	640,633	20
2002	34,406	767,780	22
2003	25,361	568,662	22
2004	30,211	519,217	17
2005	32,835	427,016	13
2006	25,482	447,963	18
2007	25,170	350,224	14
2008	28,806	536,537	19
2009	26,982	501,500	19
2010	19,412	327,150	17
2011	23,021	406,430	18
2012	21,872	260,857	12
Averages			
1977–2009	31,664	842,142	27
2010–2012	21,435	331,479	15

Source: Harvest and participation were determined by creel survey through 1976, and since that time by the Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

Table 8.—Lower Cook Inlet and Kachemak Bay shellfish sport and personal use fishery harvest and participation, 1981–2012.

Year	Participation all species (angler-days)	King crab (number)	Dungeness crab (number)	Tanner crab (number) <sup>a</sup>	Shrimp (gallons)	Hardshell clams (gallons)	Hardshell clams (number)	Razor clams (number)	Other shellfish (number)
1981	25,391	6,178	22,928	4,320	7,117	8,132			38,560
1982	15,712	1,981	9,956	4,234	5,009	5,135			1,782
1983	20,334	409	15,083	3,084	3,577	16,110			2,633
1984	25,162	62	15,113	2,332	2,419	8,891		37,476	349
1985	16,732	closed	29,530	3,502	3,260	10,334		16,205	2,982
1986	21,755	closed	34,217	7,926	4,771	20,212		40,937	128
1987	20,710	closed	51,279	8,988	7,788	23,577		25,855	9,080
1988	13,306	closed	32,053	4,669	2,090	26,597		18,374	3,474
1989	9,594	closed	10,075	closed	1,199	18,195		15,954	13,015
1990	10,342	closed	7,034	closed	2,038	11,821		21,701	11,707
1991	6,690	closed	closed	1,142	613	10,476		7,963	1,513
1992	15,727	closed	10,050	4,165	1,547	9,993		11,358	13,327
1993	13,741	closed	15,198	9,206	656	8,350		10,692	7,995
1994	18,187	closed	19,155	9,648	2,087	13,279		13,974	2,384
1995	17,682	closed	8,957	10,936	1,654	20,311		14,669	7,708
1996	11,584	closed	6,428	12,053	301	29,163		6,089	1,327
1997	9,263	closed	5,905	11,357	closed	9,426		1,997	882
1998	3,926	closed	closed	16,763	closed	12,431		4,030	
1999	9,149	closed	closed	17,045	closed	7,971		4,524	216
2000	11,445	closed	closed	19,672	closed	14,697		7,275	992
2001	8,090	closed	closed	6,499 <sup>b</sup>	closed	13,141		3,838	1,620
2002	7,439	closed	closed	3,574 <sup>c</sup>	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

-continued-



Table 8.–Part 2 of 2.

Year	Participation all species (angler-days)	King crab (number)	Dungeness crab (number)	Tanner crab (number) <sup>a</sup>	Shrimp (gallons)	Hardshell clams (gallons)	Hardshell clams (number)	Razor clams (number)	Other shellfish (number)
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 <sup>d</sup>	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 <sup>e</sup>	closed	2,805		6,537	1,304
2011	3,720	closed	closed	14,803 <sup>e</sup>	closed		22,360	1,219	1,859
2012	2,194	closed	closed	closed	closed		23,406	2,797	2,451
Averages									
1981–2009	12,232	2,158	18,310	8,960	2,883	12,259		12,022	4,897
2010–2012	3,600			14,274		2,805	22,883	3,518	1,871

*Source:* Harvests were estimated from the Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prepa-b*) except Tanner crab harvests 1996–2002 and 2008–2010, which are reported on returned shellfish permits.

<sup>a</sup> Calendar year Tanner crab harvest from 1 January to 15 March and from 15 July to 31 December until 2008, then season harvest was from July to March.

<sup>b</sup> Bag limit reduced from 20 to 5 on 12 July.

<sup>c</sup> Fishery closed 3 August.

<sup>d</sup> Fishery opened 15 July.

<sup>e</sup> Estimate based on 29 June 2011, E. Russ, Division of Commercial Fisheries Biologist, ADF&G Homer, AK, personal communication.

Table 9.—Marine early- and late-run Central Cook Inlet Chinook salmon sport fishery harvest, 1972–2012.

Year	Chinook salmon harvest		Total
	Early run	Late run	
1972	1,000	1,250	2,250
1973	519	491	1,010
1974	500	100	600
1975	540	345	885
1976	5,495	1,382	6,877
1977	4,617	366	4,983
1978	2,669	2,693	5,362
1979	3,088	1,164	4,252
1980	521	747	1,268
1981	2,363	170	2,533
1982	2,497	1,173	3,670
1983	1,000	1,707	2,707
1984	2,386	835	3,221
1985	5,087	1,731	6,818
1986	2,888	1,208	4,096
1987	3,613	1,512	5,125
1988	4,243	1,775	6,018
1989	3,863	1,616	5,479
1990	4,694	1,964	6,658
1991	4,824	2,019	6,843
1992	5,996	2,509	8,505
1993	8,136	3,404	11,540
1994	6,850	2,296	9,146
1995	8,230	2,673	10,903
1996	4,702	2,006	6,708
1997	5,646	2,850	8,496
1998	5,783	1,680	7,463
1999	4,907	997	5,904
2000	4,773	1,026	5,799
2001	3,671	860	4,531
2002	3,368	427	3,795
2003	4,042	200	4,242
2004	3,880	1,539	5,419
2005	3,746	1,040	4,786
2006	5,035	898	5,933
2007	4,015	797	4,829
2008	2,137	517	2,654
2009	1,415	256	1,671
2010	1,753	558	2,311
2011	2,201	853	3,054
2012	955	453	1,408
<hr/>			
Averages			
1972–2009	3,649	1,322	5,078
2010–2012	1,636	621	2,258

Source: 1972–1986 from creel surveys (Hammarstrom 1974-1981; Hammarstrom and Larson 1982-1984; Hammarstrom et al. 1985; Hammarstrom and Larson 1986). 1987–2003 from SWHS (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*). Harvest was apportioned 70.5% early run and 29.5% late run for 1987–1993 based on estimates from onsite creel surveys 1972–1986. Early-run percentages of total harvest for 1994 and 1995 were 74.9% and 75.48% respectively, based on creel surveys (McKinley 1995, 1996). Beginning in 1996, SWHS has generated separate estimates for the early (prior to and including June 24) and late (after June 24) runs. Table numbers may not necessarily match those of the SWHS summaries because different site groupings were used for this report; all boat sites north of Bluff Point to Ninilchik were used.

Table 10.—Early- and late-run guided and unguided angler Chinook salmon harvests from boats fishing north of Bluff Point, 1986–2012.

Year	Early run			Late run			Unguided total	Guided total	Overall total
	Unguided	Guided	Total	Unguided	Guided	Total			
1986	2,719	168	2,888	1,138	71	1,208	3,857	239	4,096
1987	3,268	345	3,613	1,368	144	1,512	4,636	489	5,125
1988	4,026	217	4,243	1,684	91	1,775	5,710	308	6,018
1989	3,611	252	3,863	1,511	105	1,616	5,122	357	5,479
1990	4,186	508	4,694	1,752	212	1,964	5,938	720	6,658
1991	3,031	1,794	4,824	1,268	750	2,019	4,299	2,544	6,843
1992	3,624	2,372	5,996	1,516	993	2,509	5,140	3,365	8,505
1993	4,548	3,588	8,136	1,903	1,501	3,404	6,451	5,089	11,540
1994	3,809	3,042	6,850	1,276	1,019	2,296	5,085	4,061	9,146
1995	4,225	4,004	8,230	1,373	1,301	2,673	5,598	5,305	10,903
1996	2,464	2,238	4,702	1,099	907	2,006	3,563	3,145	6,708
1997	2,989	2,657	5,646	1,656	1,194	2,850	4,645	3,851	8,496
1998	2,600	3,183	5,783	1,164	516	1,680	3,764	3,699	7,463
1999	2,598	2,309	4,907	624	373	997	3,222	2,682	5,904
2000	2,613	2,160	4,773	457	569	1,026	3,070	2,729	5,799
2001	1,457	2,214	3,671	559	301	860	2,016	2,515	4,531
2002	1,621	1,747	3,368	204	223	427	1,825	1,970	3,795
2003	1,827	2,215	4,042	89	111	200	1,916	2,326	4,242
2004	1,631	2,249	3,880	764	775	1,539	2,395	3,024	5,419
2005	1,746	2,000	3,746	669	371	1,040	2,415	2,371	4,786
2006	2,212	2,823	5,035	398	500	898	2,610	3,323	5,933
2007	1,681	2,334	4,015	345	452	797	2,026	2,786	4,812
2008	680	1,457	2,137	232	285	517	912	1,742	2,654
2009	847	568	1,415	179	77	256	1,026	645	1,671
2010	1,261	492	1,753	319	239	558	1,580	731	2,311
2011	1,212	989	2,201	534	319	853	1,746	1,308	3,054
2012	484	471	955	343	110	453	827	581	1,408
Averages									
1986–2009	2,667	1,935	4,602	968	535	1,503	3,635	2,470	6,105
2010–2012	986	651	1,636	399	223	621	1,384	873	2,258

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*). Harvest was apportioned 70.5% early run and 29.5% late run for the years 1987–1995 based on estimates from onsite creel surveys 1972–1986 (Hammarstrom 1974-1981; Hammarstrom and Larson 1982-1984; Hammarstrom et al. 1985; Hammarstrom and Larson 1986). Beginning in 1996, the Statewide Harvest Survey has generated separate estimates for the early (prior to and including June 24) and late (after June 24) runs.

Table 11.—Chinook salmon harvested in Lower Cook Inlet and Kachemak Bay during October through March, 2002–2012.

Year	Harvest <sup>a</sup>		Harvest total
	Guided	Unguided	
2002 <sup>b</sup>	204	1,219	1,423
2003 <sup>b</sup>	289	1,515	1,804
2004 <sup>b</sup>	419	1,650	2,069
2005 <sup>b</sup>	412	2,546	2,958
2006 <sup>b</sup>	169	1,346	1,515
2007 <sup>b</sup>	404	1,607	2,011
2008 <sup>b</sup>	336	1,356	1,692
2009 <sup>b</sup>	310	1,386	1,696
2010 <sup>b</sup>	789	1,770	2,559
2011 <sup>c</sup>	441	1,559	2,000
2012 <sup>c</sup>	330	1,749	2,079
Average	373	1,609	1,982

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

<sup>a</sup> Excludes shoreline harvest.

<sup>b</sup> Fishery extending west of Gore Point to Cape Douglas and north to the latitude of Bluff Point (lat 59°40'N).

<sup>c</sup> Fishery extending west of Gore Point to Cape Douglas and north to the latitude of Anchor Point Light (lat 59°46.142'N).

Table 12.—Salmon smolt releases to terminal fisheries in Kachemak Bay, 1974–2013.

Release year	Nick Dudiak Fishing Lagoon				Halibut Cove Lagoon	Seldovia	
	Early-run Chinook	Late-run Chinook	Early-run coho	Late-run coho	Early-run Chinook	Early-run Chinook	Late-run coho
1974							
1975					3,463		
1976					16,183		
1977					48,907		
1978					126,306		
1979					305,145		
1980					260,295		
1981					76,472		
1982							
1983					200,900		
1984	88,753				84,000		
1985	152,226				98,000		
1986	103,946				101,331		
1987	103,860				94,100	80,420	
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 <sup>a</sup>	105,000 <sup>b</sup>	106,844	107,521	
2004	168,743		130,243	110,000 <sup>b</sup>	103,771	88,682	
2005	220,822		125,707	91,485 <sup>b,c</sup>	112,521	114,984	
2006	224,053		125,216	324,200 <sup>b,c</sup>	117,549	113,974	113,800 <sup>b,c</sup>
2007	226,972		127,244	100,600 <sup>b</sup>	54,560	54,276	
2008	212,141		125,108	95,000 <sup>b</sup>	59,784	54,464	
2009	164,234		113,696	44,695 <sup>d</sup>	35,065	44,487 <sup>e</sup>	
2010	213,503 <sup>d</sup>		130,206		111,134	114,421	
2011	224,028 <sup>d</sup>		64,595	64,595	107,338	104,095	
2012	221,547		53,625	53,625	110,253	95,800	
2013	216,963		66,014	66,014	60,666	63,311	

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

<sup>b</sup> Purchased from Cook Inlet Aquaculture Association (CIAA) with non-ADF&G funding.

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

<sup>d</sup> An additional 67,305 smolt were stocked but died from *Chaetoceros* spp. infestation.

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

Table 13.—Shorebased harvest and angler participation directed toward enhanced Chinook and coho salmon stocks in the Nick Dudiak Fishing Lagoon fishery, 1987–2012.

Year	Chinook Salmon Harvest <sup>a</sup>			Pink salmon harvest <sup>c</sup>	Coho salmon harvest	Total		
	Early run	Late run <sup>b</sup>	Total			Harvest	Catch	Days fished
1987			833			833		
1988			5,275	1,819		7,094		20,282
1989			1,956	3,856	1,439	7,251		15,753
1990			2,027	697	1,272	3,996	5,001	22,751
1991			1,634	647	3,822	6,103	6,150	11,495
1992			1,406	485	1,109	3,000	3,442	8,440
1993			4,997	1,836	5,823	12,656	14,821	28,290
1994			2,607		5,355	7,962	10,495	30,221
1995			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
Averages								
1987–2009	1,914	1,053	2,527	1,557	7,164	9,474	13,656	21,471
2010–2012	438		438		419	857	1,286	7,028

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

<sup>a</sup> Only early-run fish were stocked prior to 1993 when ocean age 1 late-run fish were first available. Early and late run harvests were estimated separately beginning in 1996.

<sup>b</sup> Stocking program discontinued in 2000; last return occurred in 2004. Beginning in 2002, the SWHS no longer assessed the late run.

<sup>c</sup> Stocking program discontinued; last return was in 1993.

Table 14.—Sport harvest (1976–2012) and unexpanded escapement index counts (1976–2013) of Chinook salmon in Anchor River, Deep Creek, and Ninilchik River.

Year	Anchor River		Deep Creek		Ninilchik River	
	Harvest	Aerial escapement	Harvest	Aerial escapement	Harvest	Aerial escapement
1976	830	2,125	220	1,075	630	956
1977	1,077	3,585	425	848	1,168	1,169
1978	2,109	2,209	804	582	1,445	724
1979	1,913	1,335	703	726	1,493	854
1980 <sup>a</sup>	605		182		723	
1981 <sup>a</sup>	1,069	1,066	604	427	1,523	552
1982	718	1,493	791	977	1,240	947
1983	1,269	1,033	1,154	550	871	445
1984	998	1,087	761	380	648	346
1985	672	1,328	249	644	983	582
1986	1,098	2,287	944	976	420	307
1987	761	2,524	604	968	1,112	523
1988	976	1,458	777	409	795	569
1989	578	940	843	561	744	280
1990	1,479	967	1,411	347	693	288
1991	1,047	589	1,776	294	3,123 <sup>c</sup>	594
1992	1,685	99	1,379	63	5,316 <sup>c</sup>	
1993	2,787	1,110	2,503	486	4,235 <sup>c</sup>	688
1994	2,478	837	2,379	364	3,108 <sup>c</sup>	252
1995	1,475	<sup>b</sup>	1,161	229	2,451 <sup>c</sup>	
1996	1,483	277	886	193	2,401 <sup>c</sup>	158
1997	1,563	477	1,249	136	3,263 <sup>c</sup>	393
1998	783	789	539	676	1,453 <sup>c</sup>	316
1999	1,409	685	741	1,190	1,945 <sup>c</sup>	357
2000	1,730	752	937	556	1,782 <sup>c</sup>	578
2001	889	414	593	551	1,399 <sup>c</sup>	268
2002	1,047	748	507	696	830 <sup>c</sup>	<sup>d</sup>
2003	1,011	680	775	1,008	1,452 <sup>c</sup>	<sup>d</sup>
2004	1,561	834	823	1,075	1,240 <sup>c</sup>	<sup>d</sup>
2005	1,432	651	642	1,076	1,342 <sup>c</sup>	<sup>d</sup>
2006	1,394	899	451	507	1,329 <sup>c</sup>	<sup>d</sup>
2007	2,081	678	628	553	1,575 <sup>c</sup>	<sup>d</sup>
2008	1,486	528	602	205	976 <sup>c</sup>	<sup>d</sup>
2009	737	<sup>e</sup>	124	483	203 <sup>c</sup>	<sup>d</sup>
2010	364	<sup>e</sup>	249	387	358 <sup>c</sup>	<sup>d</sup>
2011	573	<sup>e</sup>	251	696	258 <sup>c</sup>	<sup>d</sup>
2012	38	<sup>e</sup>	33	447	16 <sup>c</sup>	<sup>d</sup>
2013				475		<sup>d</sup>
Average						
1976–2009	1,301	1,112	858	600	1,586	528
2010–2013	325		178	501	211	

-continued-

Table 14.–Part 2 of 2.

*Source:* Harvest estimates for all three streams in 1976 are from punch card returns (Hammarstrom 1977); all other harvest estimates are from Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

*Note:* escapement estimates are aerial counts. There is a sustainable escapement goal (SEG) of 350–800 fish for Deep Creek.

- <sup>a</sup> Escapement counts not conducted or considered minimal due to high turbid water during aerial surveys.
- <sup>b</sup> Aerial escapement counts not obtained due to high water.
- <sup>c</sup> Enhanced run.
- <sup>d</sup> Aerial count discontinued. Escapement indexed by weir count during index monitoring period.
- <sup>e</sup> Aerial count discontinued. Escapement estimated by sonar and weir.



Table 15.—Angler participation, harvest, and catch of Chinook, coho, pink, and sockeye salmon; Dolly Varden; and steelhead and rainbow trout, Anchor River, 1977–2012.

Year	Chinook salmon		Coho salmon		Dolly Varden		Steelhead and rainbow trout		Pink salmon	Sockeye salmon	Days fished
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch <sup>b</sup>	Harvest	Harvest	
1977	1,077		1,339		9,222		2,099		27		31,515
1978	2,109		1,559		17,357		2,305		139		42,671
1979	1,913		4,006		21,364		1,782		18		44,220
1980	605		2,649		10,948		1,186		339		33,272
1981	1,069		2,949		15,271		928		11		34,257
1982	718		2,379		10,375		698		161		24,709
1983	1,269		1,395		17,277		1,605		252		28,881
1984	998		1,135		5,599		985		249	167	26,919
1985	672		2,239		7,716		475		124	224	31,715
1986	1,098		1,021		3,914		520		136	39	34,938
1987	761		2,010		2,735		643		54	1,263	39,045
1988	976		2,219		2,746		200		109	109	24,356
1989	578		2,635		1,476			2,066	115	136	19,145
1990	1,479	4,119	2,782	4,666	2,821	11,441	1,978		163	136	28,829
1991	1,047	2,540	3,169	3,980	1,409	14,433	2,349		125	152	22,187
1992	1,685	4,506	2,267	4,850	2,532	18,303	2,720		92	66	24,028
1993	2,787	6,022	4,003	6,657	1,031	9,719	4,156		98	45	29,338
1994	2,478	3,890	3,360	5,136	1,574	13,305	4,035		79	82	27,856
1995	1,475	3,545	3,080	5,141	1,537	10,957	2,232		47	94	25,888
1996	1,483	6,594	1,762	4,025	963	17,189	7,570		78	218	16,016
1997	1,563	5,289	1,636	4,017	1,575	17,467	3,103		321	165	17,020
1998	783	2,443	2,386	3,949	2,105	16,195	3,878		7	174	14,310
1999	1,409	6,903	1,780	3,807	1,061	17,076	3,920		54	174	21,184
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

-continued-

Table 15.–Part 2 of 2.

Year	Chinook salmon		Coho salmon		Dolly Varden		Steelhead and rainbow trout		Pink salmon	Sockeye salmon	Days fished
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch <sup>b</sup>	Harvest	Harvest	
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
Averages											
1977–2009	1,240	4,402	2,669	6,207	4,387	14,946	959	4,028	120	182	25,337
2010–2012	325	768	1,597	2,541	530	8,089		1,417	52	19	11,368

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

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

<sup>a</sup> Steelhead and rainbow trout are caught and released. Retention of this species is prohibited. 1989 catch estimates are from unpublished SWHS data.

Table 16.—Angler participation and harvest of Chinook, coho, pink, and sockeye salmon; Dolly Varden; and steelhead and rainbow trout, Deep Creek, 1977–2012.

Year	Chinook salmon		Coho salmon		Dolly Varden		Steelhead and rainbow trout		Pink salmon	Sockeye salmon	Days fished
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch <sup>a</sup>	Harvest	Harvest	
1977	425		306		1,330		569		109		11,399
1978	804		1,383		3,046		498		294		13,872
1979	703		362		2,027		263		9		12,560
1980	182		478		1,028		236		321		8,796
1981	604		464		1,382		248		11		10,127
1982	791		366		1,247		239		293		12,149
1983	1,154		545		1,112		315		42		13,505
1984	761		1,197		973		311		112	318	15,760
1985	249		2,301		850		179		37	187	19,802
1986	944		588		306		688		52	52	17,354
1987	604		1,050		72		85		18	191	16,734
1988	777		1,528		219		291		72	182	12,115
1989	843		2,254		333			409	28	117	13,414
1990	1,411	3,625	1,111	2,039	708	3,862	1,291		35	165	23,567
1991	1,776	3,947	1,290	1,710	287	2,480	425		50	876	17,048
1992	1,379	3,045	737	1,239	401	2,941	740		46	378	15,226
1993	2,503	7,058	1,722	2,790	145	1,423	1,448		81	145	19,535
1994	2,379	4,174	1,895	2,970	377	3,437	1,156		25	141	18,357
1995	1,161	2,470	1,014	1,636	301	1,325	520		180	87	12,727
1996	886	2,426	2,313	3,818	615	4,346	1,079		21	55	9,629
1997	1,249	2,574	1,115	1,943	276	2,409	384		106	252	9,712
1998	539	1,456	2,035	3,635	1,061	4,477	1,350		47	185	9,206
1999	741	2,453	2,651	3,991	496	2,458	689		165	214	11,367
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		0	129	7,834
2002	507	2,551	1,832	3,663	452	2,765	954		223	0	8,925
2003	775	2,121	1,751	3,179	314	9,703	2,456		0	406	8,959
2004	823	2,727	2,474	4,624	268	8,673	4,365		0	45	10,575
2005	642	1,791	2,202	4,631	149	1,800	1,355		54	447	10,182

-continued-

Table 16.–Part 2 of 2.

Year	Chinook salmon		Coho salmon		Dolly Varden		Steelhead and rainbow trout		Pink salmon	Sockeye salmon	Days fished
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch <sup>a</sup>	Harvest	Harvest	
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	0	3,537
2012	33	156	1,122	1,536	49	1,041		681	36	0	4,037
Averages											
1977–2009	827	2,590	1,351	2,859	603	3,398	280	1,367	83	187	12,259
2010–2012	178	619	1,321	2,024	93	1,651		615	33	17	4,911

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

<sup>a</sup> Steelhead and rainbow trout are caught and released. Retention of this species is prohibited. 1989 catch estimates are from unpublished SWHS data.

Table 17.—Angler participation and harvest of Chinook, coho, sockeye, and pink salmon; Dolly Varden; and steelhead and rainbow trout, Ninilchik River, 1978–2012.

Year	Chinook salmon <sup>a</sup>		Coho salmon		Dolly Varden		Steelhead and rainbow trout		Pink salmon	Sockeye salmon	Days fished
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch <sup>b</sup>	Harvest	Harvest	
1977	1,168		122		424		230		0		11,350
1978	1,445		88		1,003		307		46		14,173
1979	1,493		200		2,390		509		0		18,282
1980	723		321		853		381		260		19,706
1981	1,523		432		875		464		0		14,184
1982	1,240		241		514		179		10		11,806
1983	871		210		199		157		42		9,458
1984	648		549		524		137		150	1,405	10,122
1985	983		697		87		501		0	373	10,213
1986	420		336		505		275		13	465	9,250
1987	1,112		924		507		291		108	2,488	13,329
1988	795		709		655		272		36	1,073	12,533
1989	744		379		39			505	216	526	9,977
1990	693	1,598	368	633	115	1,614		177	12	58	8,323
1991	3,123	5,260	789	899	222	887		512	116	203	19,640
1992	5,316	11,425	785	1,433	131	1,573		1,008	37	1,101	27,816
1993	4,235	9,491	845	1,636	29	410		442	0	406	20,466
1994	3,108	5,482	1,089	1,486	65	167		804	17	943	21,827
1995	2,451	4,313	620	971	133	332		178	38	161	16,160
1996	2,401	7,481	1,071	1,332	560	2,297		522	0	284	11,445
1997	3,263	6,879	402	948	141	1,024		380	32	236	11,064
1998	1,453	3,395	836	963	272	1,016		576	13	101	10,994
1999	1,945	4,153	2,980	5,127	114	818		694	107	964	15,344
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	0	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	0	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	0	399	9,003

-continued-

Table 17.–Part 2 of 2.

Year	Chinook salmon <sup>a</sup>		Coho salmon		Dolly Varden		Steelhead and rainbow trout		Pink salmon	Sockeye salmon	Days fished
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch <sup>b</sup>	Harvest	Harvest	
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	0	2,292
2012	16	75	1,035	1,113	0	13		169	13	0	2,995
Averages											
1977–2009	1,522	4,236	915	2,050	323	939	265	616	47	525	12,503
2010–2012	211	708	701	782	19	326		194	25	27	3,528

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

<sup>a</sup> Enhanced return beginning in 1991.

<sup>b</sup> Steelhead and rainbow trout are caught and released. Retention of this species is prohibited. 1989 catch estimates are from unpublished SWHS data.

Table 18.—Counts of all species passed upstream through the Anchor River Dolly Varden weir, 1987–1995.

Year	Dates of operation	Dolly Varden	Coho salmon	Pink salmon	Chinook salmon	Sockeye salmon	Chum salmon	Steelhead and rainbow trout
1987	4 July–10 Sep	19,062	2,409	2,084	204	33	19	136
1988	3 Jul–5 Oct	14,935	2,805	777	245	30	24	878
1989	6 Jul–5 Nov	11,384	20,187	4,729	95	212	165	769 <sup>a</sup>
1990	4 Jul–15 Aug	10,427	190	355	144	39	17	3
1991	4 Jul–15 Aug	18,002	13	1,757	39	46	9	5
1992	4 Jul–1 Oct	10,051	4,596	992	129	174	39	1,261
1993	3 Jul–16 Aug	8,262	299	1,019	90	71	12	1
1994	3 Jul–16 Aug	17,259	420	723	111	61	2	1
1995	4 Jul–12 Aug	10,994	725	1,094	112	73	4	10

Source: Larson et al 1988–1989; Larson 1990–1995, 1997.

<sup>a</sup> Weir overtopped 18 September –7 November.

Table 19.—Estimates of Anchor River Chinook salmon escapement, freshwater harvest, total run, and exploitation, 2003–2013.

Year	Project dates	Escapement		Inriver harvest		Total inriver run <sup>a</sup>	
		Estimate <sup>b</sup>	SE	Estimate	SE	Estimate	Exploitation rate (%)
2003	30 May–9 Jul	9,238	0	1,011	157	10,249	9.9 <sup>c</sup>
2004	15 May–15 Sep	12,016	283	1,561	198	13,577	11.5
2005	13 May–9 Sep	11,156	229	1,432	233	12,588	11.4
2006	15 May–24 Aug	8,945	289	1,394	197	10,339	13.5
2007	14 May–12 Sep	9,622	238	2,081	326	11,703	17.8
2008	13 May–12 Sep	5,806	169	1,612	241	7,418	21.7
2009	12 May–11 Sep	3,455	0	737	212	4,192	17.6
2010	13 May–29 Sep	4,449	103	364	118	4,813	7.6
2011	13 May–21 Sep	3,545	0	573	163	4,118	13.9
2012	14 May–3 Aug	4,509	100	38	23	4,547	0.8
2013 <sup>d</sup>	15 May–3 Aug	4,393				Not available	
Averages							
2003–2008		9,464		1,515		10,979	15.2
2009–2012		3,990		428		4,418	10.0
2010–2013		4,224					

Source: Harvest estimates from Statewide Harvest Survey (Jennings et al. 2006b, 2007, 2009a–b, 2010a–b, 2011a–b, *In prep a–b*).

<sup>b</sup> In 2003, escapement was not fully assessed due to operational dates. The 2003 estimate was based on a census of all dual-frequency identification sonar (DIDSON) files. From 2004 to 2008, 2010, and 2012, escapement was based on estimated escapement using DIDSON counts plus a census of escapement through a weir. In 2009, escapement was based on a census through a weir. In 2011, escapement was based on a census of all DIDSON files plus a census of escapement through a weir.

<sup>c</sup> Exploitation is biased and high compared to other years because escapement was not fully enumerated.

<sup>d</sup> Preliminary.

Table 20.—Chinook salmon run and escapement counts for Ninilchik River weir, 1999–2005.

Year	Stock	Weir count	Proportion	Inriver harvest	Total run	Inriver exploitation	CWT recovery	Egg take kill	Spawning escapement
1999	Wild	1,644	0.72	973 <sup>a</sup>	2,617 <sup>b</sup>	0.37		68	1,576
	Hatchery	641	0.28	972 <sup>a</sup>	1,613 <sup>b</sup>	0.60	42	26	573
	Total	2,285	1.00	1,945	4,230	0.46	42	94	2,149
2000	Wild	1,634	0.66	869	2,503	0.35		81	1,553
	Hatchery	853	0.34	869	1,722	0.5	108	60	685
	Total	2,487	1.00	1,738	4,225	0.41	108	141	2,238
2001	Wild	1,414	0.68	699	2,113	0.33		175	1,239
	Hatchery	673	0.32	699	1,372	0.51	130		543
	Total	2,087	1.00	1,398	3,485	0.40	130	175	1,782
2002	Wild	1,516	0.73			0.78 <sup>c</sup>		176	1,340
	Hatchery	559	0.27			0.22 <sup>c</sup>	109	55	395
	Total	2,075	1.00	830	2,905	0.29	109	231	1,735
2003	Wild	1,258	0.75			0.69 <sup>c</sup>		131	1,127
	Hatchery	425	0.25			0.31 <sup>c</sup>	69	52	336
	Total	1,683	1.00	1,452	3,135	0.46	69	183	1,463
2004	Wild	1,525	0.74					132	1,393
	Hatchery	536	0.26				67	0	469
	Total	2,061	1.00	1,240	3,301	0.38	67	132	1,862
2005	Wild	2,241	0.83					165	2,076
	Hatchery	462	0.17				53	0	409
	Total	2,703	1.00	1,342	4,045	0.33	53	165	2,485
Averages	Wild	1,605	0.73	847	2,411	0.35 <sup>d</sup>		133	1,472
	Hatchery	593	0.27	847	1,569	0.54 <sup>d</sup>		28	487
	Total	2,197		1,421	3,618	0.39	83	160	1,959

Source: Begich 2006b, 2007b; Balland and Begich 2007; Kerkvliet 2008; Kerkvliet and Booz 2010. Harvest estimates are from the Statewide Harvest Survey (Howe et al. 2001a; Walker et al 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a).

<sup>a</sup> Assumed 50% of the sport harvest was hatchery fish based on harvest sampling in 2001 and 2001.

<sup>b</sup> Weir count includes 31 wild and 38 hatchery Chinook salmon netted downstream of the weir.

<sup>c</sup> Exploitation rate during third regulatory weekend only.

<sup>d</sup> Average for 1999–2001.



Table 21.—Number and escapement of wild and hatchery-reared Chinook salmon counted at the Ninilchik River weir during the sustainable escapement goal (SEG) periods from 1999–2013.

Year	Wild Chinook salmon					Hatchery Chinook salmon				
	Total run		SEG period		SEG period % of total escapement	Total Run		SEG Period		SEG period % of total escapement
	Weir counts	Escapement counts	Weir counts	Escapement counts		Weir counts	Escapement counts	Weir counts	Escapement counts	
1999	1,644	1,576	1,351	1,283	81.4	641	573	515	453	79.1
2000	1,634	1,553	1,346	1,265	81.5	853	685	786	626	91.4
2001	1,414	1,239	1,072	897	72.4	673	543	601	483	89.0
2002	1,516	1,340	1,073	897	66.9	559	395	403	266	67.3
2003	1,258	1,127	648	517	45.9	425	336	293	217	64.6
2004	1,525	1,393	811	679	48.7	536	469	409	373	79.5
2005	2,241	2,076	1,424	1,259	60.6	462	409	339	295	72.1
2006	ND	ND	1,114	1,013	-	ND	ND	260	192	-
2007	ND	ND	672	543	-	ND	ND	83	63	-
2008	ND	ND	721	586	-	ND	ND	83	63	-
2009	ND	ND	551	528	-	ND	ND	97	65	-
2010	ND	ND	605	605	-	ND	ND	34	34	-
2011	ND	ND	761	668	-	ND	ND	52	25	-
2012	ND	ND	561	555	-	ND	ND	65	52	-
2013 <sup>a</sup>	ND	ND	591	571	-	ND	ND	210	9	-
Averages										
1999–2005	1,605	1,472	1,104	971	65	593	487	478	388	78
2011–2013			638	598				109	29	

Note: SEG range = 550 to 1,300 wild Chinook salmon from 3–31 July.

<sup>a</sup> Preliminary.

Table 22.—Anchor River coho salmon escapement, freshwater harvest, total run, and exploitation estimates, 1987–1989, 1992, 2004–2011.

Year	Project dates	Escapement estimate <sup>b</sup>	Freshwater harvest		Total run <sup>a</sup>	
			Estimate	SE	Estimate	Exploitation rate (%) <sup>c</sup>
1987	05 Jul–11 Sep	2,409	2,010	ND	4,419 <sup>d</sup>	45.5
1988	03 Jul–06 Oct	2,805	2,219	ND	5,024 <sup>d</sup>	44.2
1989	06 Jul–07 Nov	20,187	2,635	ND	22,822 <sup>d</sup>	11.5
1992	04 Jul–02 Oct	4,596	2,267	ND	6,863 <sup>d</sup>	33.0
2004	15 May–15 Sep	5,728	4,383	722	10,111	43.3
2005	13 May–09 Sep	18,977 <sup>e</sup>	5,314	949	24,291	21.9
2006	15 May–24 Aug	10,181 <sup>e</sup>	3,920	975	14,101	27.8
2007	14 May–12 Sep	8,226	3,962	679	12,188	32.5
2008	13 May–12 Sep	5,951	4,790	821	10,741	44.6
2009	12 May–11 Sep	2,692 <sup>e</sup>	3,882	737	6,574	59.1
2010	12 May–29 Sep	6,014	2,863	580	8,877	32.3
2011	13 May–21 Sep	1,866	808	259	2,674	30.2
Averages						
1987–2009		7,129	3,538	814	13,001	36
2010–2011		3,940	1,836	420	5,776	31

Source: Harvest estimates from Statewide Harvest Survey (Jennings et al. 2006b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

<sup>a</sup> Total run = escapement + freshwater harvest; this total does not account for the marine harvest.

<sup>b</sup> From 1987 to 1989 and in 1992, the escapement weir was located about 1.6 river kilometers (RKM) from the Anchor River mouth and from 2004 to 2011 it was about 2.8 RKM upstream of the mouth.

<sup>c</sup> Percent harvest per total run.

<sup>d</sup> Estimates are biased and may be high because an unknown number of fish in the escapement estimate were harvested after they were counted passing through the weir.

<sup>e</sup> The escapement estimates for 2005 and 2006 are minimums because the weir washed out; The 2009 estimate is minimum because counts were high when weir was removed.

Table 23.—Parameter estimates for coho salmon in Deep Creek from coded wire tag and weir projects, 1996–2004.

Tagging year	Number smolt tagged	Recovery year	Gear type	Weir count	Number examined for CWT	Tagged proportion	Estimated Smolt Abundance	Inriver harvest	Inriver run	Exploited proportion	Marine survival fraction
1995	9,671	1996	Gillnet		205	0.278	34,351	2,313			
1996	4,868	1997	Weir	2,017	2,017	0.125	38,683	1,115	3,132	0.36	0.081 <sup>a</sup>
1997	6,948	1998	Weir	1,537	1,537	0.345	20,097	2,035	3,572	0.57	0.178 <sup>a</sup>
1998		1999	Weir	2,267				2,651	4,918	0.54	
1999		2000	Weir	3,425				2,018	5,443	0.37	
2000		2001	Weir	3,747				1,828	5,575	0.33	
2001	2,538	2002	Weir	6,164		0.061	38,473	1,832	7,996	0.23	0.208
2002	7,412	2003	Seine		1,485	0.128	57,672	1,751			
2003	2,667	2004	Seine		1,027	0.059 <sup>b</sup>	44,480 <sup>b</sup>				

Source: Bendock (1996), King and Breakfield (1998-1999, 2002), Begich (2002, 2006a); Begich and Evans (2005); C. M. Kerkvliet, Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Biologist, *Unpublished data* for Deep Creek coho salmon smolt studies, 1994-2004.

Harvest estimates were obtained from Howe et al. (2001a-d); Walker et al. (2003); Jennings et al. (2004, 2006a-b).

<sup>a</sup> Revised harvest and resulting marine survival estimates differ from unrevised harvest and marine survival estimates published in King and Breakfield (1999, 2002).

<sup>b</sup> Preliminary.

Table 24.—Angler participation and harvest of Chinook, coho, sockeye, and pink salmon; Dolly Varden; and steelhead and rainbow trout, 1977–2012.

Year	Pink salmon	Sockeye salmon	Coho salmon		Dolly Varden		Steelhead and rainbow trout		Days fished
	Harvest	Harvest	Harvest	Catch	Harvest	Catch	Harvest	Catch	
1977	26		133		461		294		1,442
1978	15		201		1,012		352		3,662
1979			275		2,027		236		1,965
1980			155		327		105		1,499
1981			410		875		118		1,080
1982			119		348		59		1,023
1983			251		283		42		877
1984			0		499		137		519
1985			25				50		1,422
1986			187		183		31		1,162
1987		153	127		199		62		1,612
1988		36	146		182		18		819
1989			396					10 <sup>a</sup>	1,533
1990		29	169	287	167	375		104 <sup>a</sup>	935
1991		13	280	339	65	91		12 <sup>a</sup>	1,143
1992		33	97	138	8	8		70 <sup>a</sup>	523
1993			392	602	67	184		31 <sup>a</sup>	813
1994			446	464	9	36		75 <sup>a</sup>	1,160
1995		105	72	72	55	119		<sup>a</sup>	896
1996			426	482	24	269		47 <sup>a</sup>	694
1997			111	178	64	213		<sup>a</sup>	489
1998			1,168	1,289	25	261		71 <sup>a</sup>	922
1999			153	436		22		305 <sup>a</sup>	327
2000			419	534	24	232		327 <sup>a</sup>	1,217
2001			270	328	11	43		8 <sup>a</sup>	461
2002			367	384		203		14 <sup>a</sup>	640
2003			309	470		161		46 <sup>a</sup>	646
2004			374	915		266		39 <sup>a</sup>	782
2005			379	475		71		106 <sup>a</sup>	875
2006			280	407		39		13 <sup>a</sup>	382
2007			385	502				34	695
2008			283	1,386		1,482		195	1,174
2009			137	261		45		113	335
2010			199	315		0		21	307
2011			538	538		21		19	543
2012			78	78				34	151
Averages									
1977–2009	21	62	271	497	314	217	125	85	1,022
2010–2012			272	310		11		25	334

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

Note: There are no records of Chinook salmon harvest because Stariski Creek is closed to fishing for Chinook salmon.

<sup>a</sup> Steelhead and rainbow trout caught and released. Retention of this species is prohibited. Catch estimates for 1989 from unpublished Statewide Harvest Survey data.

Table 25.—Coho salmon harvest, catch, and angler participation (days fished) estimates for Silver Salmon Creek, 1983–2012.

Year	Harvest	Catch	Days fished	Responses
1983	1,872		1,585	23
1984	661		552	12
1985	647		555	8
1986	302		292	6
1987	706		831	19
1988	709		673	11
1989	735		1,285	16
1990	320	1,212	915	12
1991	1,120	1,207	1,112	22
1992	494	842	597	17
1993	1,080	1,280	853	40
1994	329	689	270	18
1995	1,715	2,831	1,851	34
1996	1,979	3,440	1,373	34
1997	408	1,036	932	26
1998	422	1,104	440	18
1999	590	2,157	1,408	22
2000	1,013	2,293	904	28
2001	2,054	3,178	517	15
2002	942	2,598	612	22
2003	2,269	7,377	1,522	25
2004	1,389	10,902	1,203	27
2005	1,568	7,053	1,653	24
2006	997	5,234	1,680	27
2007	1,041	1,998	1,424	24
2008	356	776	687	17
2009	1,133	2,812	873	28
2010	714	2,201	886	20
2011	640	1,238	601	14
2012	419	1,012	737	15
<b>Averages</b>				
1983–2009	994	3,001	985	21
2010–2012	591	1,484	741	16

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

Table 26.—Kamishak River coho salmon harvest, catch, and participation (angler-days) reported in guide logbooks, 2005–2012.

Year	Coho salmon			
	Harvest	Released	Catch	Angler-days
2005	923	2672	3,595	656
2006	906	2377	3,283	411
2007	536	724	1,260	346
2008	352	477	829	249
2009	316	820	1,136	332
2010	333	473	806	223
2011	469	743	1,212	357
2012	517	593	1,110	330
Average				
2005–2009	607	1,414	2,021	399
2010–2012	440	603	1,043	303

Table 27.—Harvest and catch of Dolly Varden from Lower Kenai Peninsula roadside streams, 1977–2012.

Year	Anchor River		Stariski Creek		Deep Creek		Ninilchik River		All streams	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
1977	9,222		461		1,330		424		11,437	
1978	17,357		1,012		3,046		1,003		22,418	
1979	21,364		2,027		2,027		2,390		27,808	
1980	10,948		327		1,028		853		13,156	
1981	15,271		875		1,382		875		18,403	
1982	10,375		348		1,247		514		12,484	
1983	17,277		283		1,112		199		18,871	
1984	5,599		499		973		524		7,595	
1985	7,716				850		87		8,653	
1986	3,914		183		306		505		4,908	
1987	2,735		199		72		507		3,513	
1988	2,746		182		219		655		3,802	
1989	1,476				333		39		1,848	
1990	2,821	11,441	167	375	708	3,862	115	1,614	3,811	17,292
1991	1,409	14,433	65	91	287	2,480	222	887	1,983	17,891
1992	2,532	18,303	8	8	401	2,941	131	1,573	3,072	22,825
1993	1,031	9,719	67	184	145	1,423	29	410	1,272	11,736
1994	1,574	13,305	9	36	377	3,437	65	167	2,025	16,945
1995	1,537	10,957	55	119	301	1,325	133	332	2,026	12,733
1996	963	17,189	24	269	615	4,346	560	2,297	2,162	24,101
1997	1,575	17,467	64	213	276	2,409	141	1,024	2,056	21,113
1998	2,105	16,195	25	261	1,061	4,477	272	1,016	3,463	21,949
1999	1,061	17,076		22	496	2,458	114	818	1,671	20,374
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

-continued-

Table 27.–Part 2 of 2.

Year	Anchor River		Stariski Creek		Deep Creek		Ninilchik River		All streams	
	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch
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	0	13	327	10,464
Averages										
1977–1990	9,202		547		1,045		621		11,336	
1991–2009	1,300	15,917	35	208	340	3,552	137	953	1,796	20,620
2010–2012	530	8,089		21	93	1,651	19	326	642	10,074

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

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



Table 28.—Harvest and catch of steelhead and rainbow trout in Lower Kenai Peninsula roadside streams, 1977–2012.

Year	Anchor River		Stariski Creek		Deep Creek		Ninilchik River		All streams	
	Harvest	Catch <sup>a</sup>	Harvest	Catch <sup>a</sup>	Harvest	Catch <sup>a</sup>	Harvest	Catch <sup>a</sup>	Harvest	Catch
1977	2,099		294		569		230		3,192	
1978	2,305		352		498		307		3,462	
1979	1,782		236		263		509		2,790	
1980	1,186		105		236		381		1,908	
1981	928		118		248		464		1,758	
1982	698		59		239		179		1,175	
1983	1,605		42		315		157		2,119	
1984	985		137		311		137		1,570	
1985	475		50		179		501		1,205	
1986	520		31		688		275		1,514	
1987	643		62		85		291		1,081	
1988	200		18		291		272		781	
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

-continued-

Table 28.–Part 2 of 2.

Year	Anchor River		Stariski Creek		Deep Creek		Ninilchik River		All streams	
	Harvest	Catch <sup>a</sup>	Harvest	Catch <sup>a</sup>	Harvest	Catch <sup>a</sup>	Harvest	Catch <sup>a</sup>	Harvest	Catch
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
Average										
1989–2009		4,220		97		1,433		644		6,385
2010–2012		1,417		25		615		194		2,251

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

<sup>a</sup> Catch first estimated by SWHS during 1989. Catch estimates for 1989 are from unpublished SWHS data.

Table 29.—Percentage of harvest by beach area in the Cook Inlet eastside beach razor clam fishery adjusted for relative success rate, 1977–2012.

Year	No. of surveys	Percentage of harvest per beach					
		Cohoe	Clam Gulch	Oil Pad	Ninilchik	Happy Valley	Whiskey Gulch
1977	3	2.2	70.6	11.2	11.4	3.1	1.5
1978	9	1.8	74.7	10.4	6.9	4.3	1.9
1979	8	2.5	77.1	7.3	7.5	4.8	0.8
1980	8	2.0	67.5	8.2	11.7	8.3	2.3
1981	9	1.7	60.9	12.8	11.1	10.2	3.4
1982	6	1.2	49.6	10.9	13.7	18.4	6.2
1983	6	1.7	48.5	12.8	15.7	15.0	6.3
1984	6	0.9	45.7	19.5	20.2	10.0	3.7
1985	5	0.9	35.1	17.5	31.1	12.7	2.7
1986	4	1.0	25.3	21.4	35.5	13.3	3.5
1987	3	0.2	21.6	13.1	51.9	9.5	3.7
1988	3	0.8	26.1	4.9	53.3	11.2	3.7
1989	11	0.2	28.8	12.1	50.4	5.7	2.8
1990 <sup>a</sup>	12	0.3	30.5	14.8	46.4	6.0	2.0
1991 <sup>a</sup>	10	0.6	28.0	13.6	50.2	6.2	1.5
1992 <sup>a</sup>	13	0.3	21.6	10.4	61.9	5.0	0.8
1993 <sup>a</sup>	13	0.3	21.0	11.8	61.9	4.3	0.7
1994 <sup>a</sup>	13	0.3	19.8	10.0	65.0	4.0	1.0
1995 <sup>a</sup>	13	0.1	19.9	10.5	65.5	3.2	0.7
1996 <sup>a</sup>	13	0.6	23.3	13.6	57.5	3.9	1.1
1997 <sup>a</sup>	12	0.6	26.5	13.6	56.1	2.2	1.1
1998 <sup>a</sup>	12	1.0	28.3	16.6	50.6	2.4	1.1
1999 <sup>a</sup>	14	1.2	27.1	13.4	53.5	4.0	0.9
2000 <sup>a</sup>	13	2.2	31.1	12.8	47.8	4.9	1.2
2001 <sup>a</sup>	13	1.8	37.1	16.8	39.4	3.6	1.3
2002 <sup>a</sup>	14	2.0	28.0	17.5	47.3	3.4	2.0
2003 <sup>a</sup>	13	1.3	34.2	18.8	40.0	4.4	1.7
2004 <sup>a</sup>	12	1.2	30.5	16.2	44.8	5.1	2.3
2005 <sup>a</sup>	13	0.9	26.4	10.0	53.2	6.3	3.3
2006 <sup>a</sup>	14	0.3	18.1	7.4	62.9	6.7	4.6
2007 <sup>a</sup>	14	0.5	12.2	3.5	68.1	9.8	6.0
2008 <sup>a</sup>	15	0.3	12.7	4.2	68.0	10.6	4.2
2009 <sup>a</sup>	12	0.7	5.9	4.3	74.5	11.1	3.4
2010 <sup>a</sup>	12	1.1	10.6	7.5	60.0	12.5	8.2
2011 <sup>a</sup>	13	1.1	8.4	4.1	75.0	9.4	2.0
2012 <sup>a</sup>	13	1.8	9.4	4.8	73.5	8.8	1.8
Average	10	1.0	31.7	11.6	45.7	7.3	2.6

Source: Athons (1992); Athons and Hasbrouck (1994); Szarzi and Hansen (2009); Szarzi et al. (2010a).

<sup>a</sup> Harvest percentage weighted by tidal height beginning in 1990.

Table 30.—Estimates of harvest (H), abundance of exploitable individuals (>80 mm; N), and exploitation rate (Exp) with associated standard errors, of razor clams from Tower to A-frame at Clam Gulch, and from Deep Creek to Lehman's Point, 1988–2011.

Beach	Year	Harvest	SE(H)	N <sub>e</sub>	SE(N <sub>e</sub> )	Exp	SE(Exp)
Clam Gulch	1988 <sup>a</sup>	286,375	14,646	2,463,695	607,132	0.116	0.029
	1989 <sup>a</sup>	224,173	11,465	4,773,362	371,752	0.047	0.004
	1999	185,144	10,286	4,052,949	217,262	0.046	0.004
	2008	28,373	2,186	1,391,378	192,506	0.020	0.003
Ninilchik	1989 <sup>a</sup>	334,889	18,139	559,252	113,278	0.598	0.125
	1990	321,354	26,342	741,462	202,179	0.433	0.123
	1991	354,583	20,952	2,128,979	355,182	0.167	0.029
	1992	563,709	24,690	3,645,057	1,002,100	0.155	0.043
	1998	287,423	15,845	964,109	170,445	0.298	0.055
	2001	219,972	12,371	832,451	116,180	0.264	0.040
	2003	210,385	14,293	1,532,484	335,507	0.137	0.031
	2005	220,171	15,042	1,376,166	347,580	0.160	0.042
	2011			2,769,269	409,737		

Source: Athons (1992); Athons and Hasbrouck (1994), Szarzi et al. (2010a).

<sup>a</sup> Harvest estimated as the product of the proportion of total beach harvest that occurred in smaller beach area and the harvest of the entire beach as reported in Table 3 of Athons and Hasbrouck (1994). Variance estimated as the product of the square of the harvest estimate and the average squared coefficient of variation.

Table 31.—Sport and personal use crab harvests in Cook Inlet reported on permits for 1996–2002 and during the 2008–2009, 2009–2010, 2010–2011, and 2011–2012 seasons (estimates of harvest not expanded for non-reporting).

Year	Location	Effort		Harvest (numbers)	
		Trips	Crabber-days	Dungeness crab	Tanner crab
1996	Cook Inlet north of Anchor Point	33		12	300
	Cook Inlet remainder	6		0	0
	North Gulf Coast	19		15	6
	Kachemak Bay east of Homer Spit	2,132		7,337	2,495
	Kachemak Bay west of Homer Spit	651		341	9,112
	Unknown	55		167	146
	Total	2,896		7,872	12,059
1997	Cook Inlet north of Anchor Point	29	58	146	5
	Cook Inlet remainder	30	65	42	791
	North Gulf Coast	21	46	6	19
	Kachemak Bay east of Homer Spit	1,674	3,057	6,977	2,856
	Kachemak Bay west of Homer Spit	560	956	475	7,559
	Unknown	34	68	128	146
	Total	2,348	4,250	7,774	11,376
1998	Cook Inlet north of Anchor Point	13	17	40	0
	Cook Inlet remainder	10	15	1	46
	North Gulf Coast	3	4	0	0
	Kachemak Bay east of Homer Spit	232	420	17	2,285
	Kachemak Bay west of Homer Spit	850	1,144	58	13,386
	Unknown	75	162	0	1,046
	Total	1,183	1,762	116	16,763

-continued-

Table 31.—Part 2 of 3.

Year	Location	Effort		Dungeness crab number released	Tanner crab number harvested
		Trips	Crabber-days		
1999	Cook Inlet north of Anchor Point	5	5	0	0
	Cook Inlet remainder	39	64	77	792
	North Gulf Coast	10	10	0	0
	Kachemak Bay east of Homer Spit	315	575	303	2,562
	Kachemak Bay west of Homer Spit	783	1,066	1,176	13,102
	Unknown	50	62	33	589
	Total	1,202	1,782	1,589	17,045
2000	Cook Inlet north of Anchor Point	2	3	0	0
	Cook Inlet remainder	12	23	50	204
	North Gulf Coast	9	27	0	0
	Kachemak Bay east of Homer Spit	258	419	453	2,216
	Kachemak Bay west of Homer Spit	1,161	1,603	2,150	16,341
	Unknown	76	107	149	911
	Total	1,518	2,182	2,802	19,672
2001	Cook Inlet north of Anchor Point	2	2	0	0
	Cook Inlet remainder	6	8	1	76
	North Gulf Coast	2	4	0	0
	Kachemak Bay east of Homer Spit	205	359	265	932
	Kachemak Bay west of Homer Spit	719	1,114	1,180	5,374
	Unknown	46	38	3	117
	Total	980	1,525	1,449	6,499
2002	Cook Inlet north of Anchor Point	0	0	0	0
	Cook Inlet remainder	2	2	10	10
	North Gulf Coast	0	0	0	0
	Kachemak Bay east of Homer Spit	94	179	214	530
	Kachemak Bay west of Homer Spit	430	756	924	2,929
	Unknown	15	10	0	105
	Total	541	947	1,148	3,574

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Table 31.–Part 3 of 3.

Year	Location	Effort		Tanner crab	
		Trips	Crabber-days	Harvest numbers	Catch numbers
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 <sup>a</sup>	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 <sup>a</sup>	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 <sup>a, b</sup>	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

Note: Column headers change on each page of this table.

<sup>a</sup> Harvest numbers for 2009–2010, 2010–2011, and 2011–2012 fishery seasons were expanded for non-respondents.

<sup>b</sup> Closed by EO 6 September 2011.

Table 32.—Abundance of male Tanner crab in Kachemak Bay estimated from trawl surveys, 1990–2013.

Year	No. tows	Pre-4 (<70 mm)	Pre-3 (70–91 mm)	Pre-2 (92–114 mm)		Pre-1 (115–139 mm)		Recruit (140–165 mm)		Postrecruit (>165 mm)		Males		Total
				New	Old	New	Old	New	Old	New	Old	Legal	Mature	
1990	19	500,377	726,045	608,033	10,503	453,381	41,040	145,890	173,780	12,268	58,162	390,100	884,520	2,729,478
(SE)		(162,723)	(231,659)	(169,309)	(4,040)	(136,379)	(12,346)	(44,864)	(128,938)	(5,485)	(49,220)	(201,278)	(331,569)	(575,486)
1991	20	294,871	281,582	779,874	33,018	743,583	110,120	262,865	172,972	43,218	22,159	501,214	1,354,916	2,744,262
(SE)		(150,200)	(100,930)	(168,661)	(12,869)	(142,441)	(40,407)	(81,820)	(73,395)	(12,081)	(10,843)	(111,542)	(218,674)	(439,151)
1992	18	211,948	123,479	418,542	35,503	696,802	222,848	829,341	148,111	54,037	27,431	1,058,920	1,978,570	2,768,042
(SE)		(81,188)	(33,205)	(117,210)	(16,194)	(191,260)	(131,226)	(320,606)	(98,181)	(18,771)	(20,195)	(376,958)	(553,697)	(576,964)
1993	20	614,626	101,806	125,215	14,441	246,694	126,147	345,927	191,983	52,474	18,689	609,073	981,914	1,838,002
(SE)		(174,022)	(28,822)	(31,651)	(5,346)	(54,851)	(53,917)	(126,149)	(97,666)	(20,592)	(9,503)	(185,361)	(271,528)	(339,498)
1994	20	307,358	207,891	122,248	9,808	94,447	65,642	67,109	102,556	6,641	23,090	199,397	359,485	1,006,790
(SE)		(119,335)	(58,505)	(26,925)	(4,407)	(23,689)	(23,624)	(21,137)	(45,864)	(4,143)	(10,860)	(57,451)	(84,930)	(227,218)
1995	20	356,705	390,375	547,530	18,071	465,902	39,911	187,967	68,885	7,645	10,952	275,449	781,263	2,093,943
(SE)		(125,729)	(135,621)	(249,655)	(7,149)	(250,522)	(16,361)	(114,088)	(41,996)	(5,297)	(8,500)	(150,081)	(394,798)	(655,520)
1996	19	187,040	44,714	370,451	151,826	416,787	180,553	51,355	47,571		98,926	696,266	1,450,297	
(SE)		(73,505)	(20,698)	(253,509)	(68,948)	(227,832)	(65,852)	(17,842)	(19,319)		(33,414)	(277,803)	(591,041)	
1997	23	163,873	118,850	270,676	7,182	276,004	38,227	128,040	10,812	695		139,547	453,778	1,014,358
(SE)		(44,892)	(27,044)	(54,977)	(3,492)	(67,837)	(11,112)	(38,731)	(3,887)	(735)		(39,828)	(100,562)	(151,543)
1998	23	344,212	19,461	12,974	11,120	127,268	68,654	129,198	71,048	6,178		206,424	402,345	790,113
(SE)		(127,621)	(7,436)	(5,442)	(4,056)	(58,558)	(42,369)	(52,550)	(59,810)	(4,067)		(94,644)	(172,953)	(186,469)
1999	20	927,252	1,162,413	611,856	86,657	121,786	81,087	60,159	42,011	849	1,545	104,563	307,436	3,095,614
(SE)		(540,683)	(657,248)	(242,830)	(23,784)	(54,126)	(53,019)	(30,832)	(31,990)	(907)	(1,649)	(46,153)	(120,994)	(1,389,427)
2000	23	525,829	459,415	385,124	17,221	372,427	12,897	72,592	8,572		1,545	82,709	468,032	1,855,622
(SE)		(244,492)	(192,561)	(127,598)	(4,685)	(97,272)	(5,382)	(31,089)	(4,144)		(1,634)	(36,416)	(128,896)	(387,537)
2001	22	1,628,434	658,453	296,160	23,785	291,990	101,629	71,125	24,481		1,545	97,150	490,769	3,097,601
(SE)		(717,398)	(326,465)	(116,429)	(9,883)	(122,454)	(60,782)	(29,265)	(14,744)		(1,639)	(30,555)	(153,492)	(1,002,304)
2002	21	2,036,757	1,277,179	472,621	28,949	194,256	17,299	86,404	1,765			88,170	299,724	4,115,229
(SE)		(758,742)	(448,071)	(159,453)	(13,042)	(82,488)	(7,275)	(34,562)	(1,276)			(34,536)	(115,010)	(1,039,513)
2003	23	1,233,647	1,191,205	674,070	38,922	271,570	19,384	37,532	11,429			48,961	339,915	3,477,758
(SE)		(393,002)	(381,061)	(173,422)	(12,347)	(73,228)	(6,250)	(19,018)	(7,859)			(26,451)	(95,665)	(862,680)

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Table 32.–Part 2 of 2.

Year	No. tows	Pre-4 (<70 mm)	Pre-3 (70–91 mm)	Pre-2 (92–114 mm)		Pre-1 (115–139 mm)		Recruit (140–165 mm)		Postrecruit (>165 mm)		Males		Total
				New	Old	New	Old	New	Old	New	Old	Legal	Mature	
2004	23	636,770	865,236	763,375	68,544	473,161	96,808	62,784	22,009			84,794	654,763	2,988,688
(SE)		(193,785)	(310,455)	(204,634)	(32,846)	(142,022)	(56,856)	(22,111)	(18,344)			(25,200)	(166,152)	(704,379)
2005	22	1,046,973	186,659	97,778	90,117	174,221	175,127	27,678	18,205			45,882	395,230	1,816,758
(SE)		(438,977)	(92,290)	(36,201)	(49,985)	(65,947)	(144,149)	(6,799)	(16,715)			(20,801)	(220,020)	(538,287)
2006	23	1,094,364	164,259	198,161	46,181	195,535	45,177	212,988	25,871			238,859	479,571	1,982,536
(SE)		(735,560)	(120,572)	(125,658)	(18,312)	(144,750)	(32,951)	(138,963)	(18,722)			(151,714)	(308,974)	(962,011)
2007	23	338,506	94,200	150,827	28,618	283,780	96,252	46,781	117,822	785		165,387	545,419	1,157,570
(SE)		(113,422)	(59,825)	(136,585)	(23,560)	(243,739)	(77,085)	(35,491)	(96,799)	(830)		(120,957)	(437,825)	(635,933)
2008														
(SE)														
2009	16	1,002,804	645,080	800,662	60,982	423,611	132,463	107,217	37,065			144,282	700,356	3,209,885
(SE)		(390,536)	(328,174)	(342,154)	(22,478)	(192,603)	(76,832)	(72,244)	(25,389)			(72,309)	(257,415)	(1,190,113)
2010	0													
(SE)														
2011	38	4,726,502	158,495	15,748	23,457	10,115	83,555	12,235	29,360	–	–	41,595	135,265	5,059,467
(SE)		(1,104,941)	(48,959)	(8,137)	(7,566)	(6,190)	(40,534)	(10,757)	(17,790)	–	–	(20,322)	(60,116)	(1,123,156)
2012	37	2,036,538	2,545,879	171,843	18,287	4,583	52,504	–	20,501	–	–	20,501	77,588	4,850,135
(SE)		(379,127)	(637,406)	(38,744)	(7,352)	(2,571)	(18,339)	–	(10,254)	–	–	(10,254)	(26,316)	(920,820)
2013	37	983,075	680,417	1,304,422	90,194	74,774	67,160	1,885	33,549	–	2,619	38,053	179,987	3,238,095
(SE)		(230,855)	(132,780)	(272,259)	(34,912)	(19,497)	(32,112)	(1,363)	(16,118)	–	(2,123)	(17,354)	(53,237)	(503,935)

Source: Richard Gustafson, Fisheries Biologist, ADF&G Division of Commercial Fisheries, Homer, unpublished data.

Table 33.—Dungeness crab catch, in numbers, from Southern District Dungeness crab pot surveys, 1990–2000, 2009.

Year	Dates	Location <sup>a</sup>	Pots pulled	Females	Sublegal males	Legal males	Total males	Soft-shell males (%)
1990	15–17 May	East of Spit	90	53	47	17	64	8 (13)
	19–21 Jun		90	54	65	23	88	9 (10)
1991	04–06 Jun	East of Spit	89	6	116	110	226	21 (9)
	09–11 Jul		90	21	388	263	651	36 (6)
	06–08 Aug		90	85	625	475	1,100	47 (4)
	12–14 Sep		90	30	615	492	1,107	5 (<1)
	02–06 Jul	West of Spit	82	9	6	5	11	2 (18)
	14–16 Aug		95	9	7	11	18	0 (0)
1992 <sup>b</sup>	31 May–04 Jun	East of Spit	89	27	276	180	456	2 (1)
	30 Jun–02 Jul		89	76	583	578	1,161	31 (3)
	27–29 Jul		90	65	621	531	1,152	50 (4)
	11–13 Aug		90	47	849	792	1,641	14 (1)
	25–27 Aug		88	47	853	737	1,590	24 (2)
	10–12 Sep		89	47	621	749	1,370	4 (<1)
	07–09 Oct		90	19	516	349	865	2 (<1)
	05–07 Jul	West of Spit	96	30	7	14	21	1 (5)
	05–07 Aug		78	59	49	59	108	0
	1993 <sup>b</sup>	17–19 May	East of Spit	90	18	105	120	225
15–17 Jun		90		60	226	203	429	5 (1)
20–22 Jul		90		95	297	448	745	25 (3)
16–23 Aug		90		84	352	555	907	35 (4)
22–24 Sep		86		78	148	280	428	5 (1)
13–15 Jul		West of Spit		70	11	6	3	9
09–11 Aug			80	25	9	34	43	0
1994 <sup>b</sup>		23–25 May	East of Spit	90	18	9	7	16
	21–23 Jun	90		119	28	48	76	0
	19–21 Jul	90		113	39	93	132	0
	22–24 Aug	88		37	58	119	177	3 (2)
	12–14 Jul	West of Spit	70	17	0	3	3	0
	16–18 Aug		77	13	3	8	11	0

-continued-

Table 33.—Part 2 of 2.

Year	Dates	Location <sup>a</sup>	Pots pulled	Females	Sublegal males	Legal males	Total males	Soft-shell males (%)
1995 <sup>b</sup>	23–25 May	East of Spit	90	0	5	3	8	0
	27–29 Jun		90	14	22	8	30	0
	25–27 Jul		90	88	20	9	29	0
	29–31 Aug		90	49	18	13	31	2
	18–20 Jul	West of Spit	77	31	3	10	13	0
	16–18 Aug		74	41	8	51	59	0
1996 <sup>b</sup>	12–14 Jun	East of Spit	89	5	16	6	22	3
	13–15 Jul		90	20	39	20	59	4
	11–13 Aug		90	64	55	19	74	0
1997 <sup>b</sup>	21–23 Jun	East of Spit	90	2	15	8	23	1 (4)
	21–23 Jul		89	11	19	8	27	1(<1)
	20–22 Aug		90	21	58	5	63	0
1998 <sup>b</sup>	16–18 Aug	East of Spit	90	0	11	3	14	0
2000 <sup>b</sup>	14–16 Aug	East of Spit	87	1	8	1	9	1(11)
2009 <sup>b</sup>	10–12 Aug	East of Spit	90	3	32	0	32	0

Source: Richard Gustafson, Fisheries Biologist, ADF&G Division of Commercial Fisheries, Homer, unpublished data.

<sup>a</sup> Location relative to Homer Spit.

<sup>b</sup> 33% of escape rings closed 1992–2009.

Table 34.—Estimated recreational Pacific halibut harvest (number of fish) by charter and non-charter users in the Central (CCI) and Lower Cook Inlet (LCI) fisheries, 1986–2012.

Year	CCI				LCI			
	Charter	Non-charter	Total	% Charter	Charter	Non-charter	Total	% Charter
1986	1,615	40,457	42,072	4%	21,698	20,245	41,943	52%
1987	2,019	31,020	33,039	6%	22,009	22,371	44,380	50%
1988	3,956	40,365	44,321	9%	47,147	44,541	91,688	51%
1989	4,722	47,017	51,739	9%	44,199	29,693	73,892	60%
1990	7,866	48,531	56,397	14%	58,030	32,350	90,380	64%
1991	12,457	47,966	60,423	21%	58,413	27,992	86,405	68%
1992	24,613	36,057	60,670	41%	49,000	32,430	81,430	60%
1993	30,040	37,786	67,826	44%	57,429	34,628	92,057	62%
1994	40,122	39,653	79,775	50%	52,284	35,976	88,260	59%
1995	44,585	36,737	81,322	55%	56,113	30,719	86,832	65%
1996	41,573	40,234	81,807	51%	67,997	37,971	105,968	64%
1997	43,442	44,828	88,270	49%	67,923	37,723	105,646	64%
1998	43,777	41,376	85,153	51%	60,826	33,383	94,209	65%
1999	38,663	30,601	69,264	56%	53,308	32,931	86,239	62%
2000	48,569	45,422	93,991	52%	65,189	42,547	107,736	61%
2001	53,990	33,628	87,618	62%	65,130	29,734	94,864	69%
2002	44,718	28,680	73,398	61%	60,883	32,742	93,625	65%
2003	45,559	32,149	77,708	59%	63,881	48,505	112,386	57%
2004	50,915	35,192	86,107	59%	76,164	49,431	125,595	61%
2005	54,057	31,491	85,548	63%	81,004	52,143	133,147	61%
2006	55,915	28,704	84,619	66%	79,560	45,263	124,823	64%
2007	58,933	38,247	97,180	61%	93,933	62,152	156,085	60%
2008	53,197	31,393	84,590	63%	70,670	53,822	124,492	57%
2009	43,704	41,498	85,202	51%	58,543	51,549	110,092	53%
2010	45,781	29,022	74,803	61%	63,629	54,271	117,900	54%
2011	45,535	35,961	81,496	56%	74,485	47,547	122,032	61%
2012	44,171	29,556	73,727	60%	69,734	46,525	116,259	60%

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

Note: Estimates before 1995 do not include the relatively minor West Cook Inlet component.

Table 35.—Management assemblage classification and maximum ages and lengths of rockfishes *Sebastes* sampled from the Cook Inlet recreational fishery, 1991–2012.

Assemblage	Common name	Scientific name	Maximum published age <sup>a</sup>	Cook Inlet sport harvest data <sup>b</sup>			
				Max. age	Number aged	Max. length (cm)	Number measured
Pelagic							
	Black	<i>S. melanops</i>	50	54	3,608	65	3,658
	Dark	<i>S. ciliatus</i>	ND	54	961	54	959
	Dusky	<i>S. variabilis</i>	ND	62	1,070	57	1,221
	Dusky/Dark <sup>c</sup>		67	58	149	57	149
	Yellowtail	<i>S. flavidus</i>	64	24	3	52	3
	Widow	<i>S. entomelas</i>	60	13	2	51	2
Nonpelagic							
	Bocaccio	<i>S. paucispinis</i>	46	15	1	41	1
	Canary	<i>S. pinniger</i>	84	23	28	49	28
	China	<i>S. nebulosus</i>	78	70	41	40	40
	Copper	<i>S. caurinus</i>	50	42	48	56	48
	Quillback	<i>S. maliger</i>	90	71	87	53	87
	Rougheye	<i>S. aleutianus</i>	205	30	7	58	7
	Shortraker	<i>S. borealis</i>	157	33	9	73	8
	Silvergray	<i>S. brevispinis</i>	81	42	4	67	4
	Tiger	<i>S. nigrocinctus</i>	116	68	33	52	33
	Yelloweye	<i>S. ruberrimus</i>	118	100	1,910	87	2,063

<sup>a</sup> Munk 2001b.

<sup>b</sup> Meyer 1992, 2000, and ADF&G unpublished data for 1996–2009 available in Homer.

<sup>c</sup> Dusky and dark rockfish were considered alternate morphs of a single species (dusky rockfish) before 2004.

Table 36.—Central and Lower Cook Inlet rockfish harvest reported in angler interviews, by target species category, 2010–2012.

Fishery	Target category	Number of interviews <sup>a</sup>	Pelagic rockfish		Nonpelagic rockfish	
			Number	Percent	Number	Percent
Central Cook Inlet	Bottomfish	9	159	70%	2	100%
	Bottomfish + salmon	290	1	0%	0	0%
	Halibut	1,744	0	0%	0	0%
	Rockfish	3	66	29%	0	0%
	Salmon	1	0	0%	0	0%
	Total	2,047	226	100%	2	100%
Lower Cook Inlet	Bottomfish	33	324	34%	13	23%
	Bottomfish + salmon	172	175	19%	5	9%
	Halibut	1,133	335	35%	33	59%
	Lingcod	3	59	6%	3	5%
	Rockfish	3	45	5%	2	4%
	Salmon	42	6	1%	0	0%
Total	1,386	944	100%	56	100%	

Source: ADF&G unpublished data available in Homer.

<sup>a</sup> Number of interviews represent vessel-trips.

Table 37.—Estimated recreational rockfish harvest (number of fish) in Cook Inlet, 1977–2012.

Year	Central Cook Inlet	Lower Cook Inlet	Total
1977	206	1,654	1,860
1978	561	3,770	4,332
1979	458	2,531	2,989
1980	16	1,979	1,995
1981	9	3,566	3,575
1982	133	2,339	2,473
1983	301	4,060	4,361
1984	736	2,462	3,198
1985	248	2,475	2,723
1986	949	4,976	5,925
1987	906	2,368	3,274
1988	1,933	7,626	9,559
1989	479	3,592	4,071
1990	361	2,333	2,694
1991	291	2,463	2,754
1992	474	4,063	4,537
1993	799	4,169	4,968
1994	961	4,223	5,184
1995	850	3,549	4,399
1996	1,072	4,157	5,229
1997	561	3,930	4,491
1998	225	3,781	4,006
1999	353	5,764	6,117
2000	291	5,833	6,124
2001	1,224	3,402	4,626
2002	502	5,401	5,903
2003	1,025	6,490	7,515
2004	577	9,179	9,756
2005	840	10,767	11,607
2006	275	9,156	9,431
2007	390	12,399	12,789
2008	566	10,692	11,258
2009	677	15,619	16,296
2010	1,274	17,170	18,444
2011	1,376	15,471	16,847
2012	1,803	16,283	18,086

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

Table 38.—Estimated recreational rockfish harvest (number of fish) by charter and non-charter users in the Central (CCI) and Lower Cook Inlet (LCI) fisheries, 1986–2012.

Year	CCI				LCI			
	Charter	Noncharter	Total	% Charter	Charter	Noncharter	Total	% Charter
1986	0	949	949	0%	1,489	3,487	4,976	30%
1987	55	851	906	6%	829	1,539	2,368	35%
1988	509	1,424	1,933	26%	2,000	5,626	7,626	26%
1989	30	449	479	6%	1,330	2,262	3,592	37%
1990	72	289	361	20%	966	1,367	2,333	41%
1991	0	291	291	0%	892	1,571	2,463	36%
1992	285	189	474	60%	1,156	2,907	4,063	28%
1993	304	495	799	38%	2,096	2,073	4,169	50%
1994	648	313	961	67%	2,117	2,106	4,223	50%
1995	430	420	850	51%	1,865	1,684	3,549	53%
1996	577	495	1,072	54%	1,948	2,209	4,157	47%
1997	378	183	561	67%	1,532	2,398	3,930	39%
1998	160	65	225	71%	1,603	2,178	3,781	42%
1999	70	283	353	20%	2,265	3,499	5,764	39%
2000	280	11	291	96%	3,011	2,822	5,833	52%
2001	621	603	1,224	51%	1,721	1,681	3,402	51%
2002	338	164	502	67%	2,454	2,947	5,401	45%
2003	314	711	1,025	31%	3,631	2,859	6,490	56%
2004	268	309	577	46%	4,867	4,312	9,179	53%
2005	540	300	840	64%	4,840	5,927	10,767	45%
2006	175	100	275	64%	5,125	4,031	9,156	56%
2007	161	229	390	41%	6,662	5,737	12,399	54%
2008	310	256	566	55%	6,885	3,807	10,692	64%
2009	265	412	677	39%	8,554	7,065	15,619	55%
2010	669	605	1,274	53%	10,732	6,438	17,170	63%
2011	857	519	1,376	62%	10,475	4,996	15,471	68%
2012	1,052	751	1,803	58%	10,695	5,588	16,283	66%

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).



Table 39.—Estimated Cook Inlet recreational rockfish harvest in numbers of fish and pounds round weight by management group, 1991–2012.

Year	Pelagic rockfish		Nonpelagic rockfish		Harvest (no. fish)	Harvest biomass (lb)
	Number	Pounds	Number	Pounds		
1991	1,106	4,533	1,648	14,213	2,754	18,746
1992	2,954	8,996	1,583	11,596	4,537	20,592
1993	2,670	10,641	2,298	21,456	4,968	32,097
1994	3,087	11,646	2,097	16,450	5,184	28,096
1995	2,756	11,480	1,643	15,895	4,399	27,375
1996	3,347	12,310	1,882	23,100	5,229	35,410
1997	2,045	8,259	2,446	24,453	4,491	32,712
1998	2,883	12,912	1,123	10,098	4,006	23,010
1999	4,666	17,048	1,451	14,223	6,117	31,271
2000	2,952	10,341	3,172	33,396	6,124	43,737
2001	2,861	10,141	1,765	20,427	4,626	30,568
2002	4,441	18,439	1,462	15,353	5,903	33,792
2003	5,410	25,455	2,105	23,838	7,515	49,293
2004	6,963	31,440	2,793	30,015	9,756	61,455
2005	8,269	37,455	3,338	34,403	11,607	71,858
2006	6,459	25,774	2,972	32,055	9,431	57,829
2007	10,869	56,309	1,920	20,877	12,789	77,186
2008	8,924	41,905	2,334	25,645	11,258	67,550
2009	13,824	52,862	2,472	24,792	16,296	77,654
2010	16,849	65,623	1,595	14,895	18,444	80,518
2011	14,015	61,170	2,832	27,781	16,847	88,951
2012	15,647	65,816	2,439	21,598	18,086	87,414

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

Note: Preliminary estimates of pounds round weight are based on assemblage composition of harvest samples from Homer applied to the total Cook Inlet harvest.

Table 40.—Estimated average weight and harvest in pounds round weight in the Cook Inlet recreational lingcod fishery, 1992–2012.

Year	Average weight (lb) <sup>a</sup>	Harvest biomass (lb) <sup>b</sup>
1992	15.6	49,400
1993	22.9	38,500
1994	27.3	33,900
1995	24.9	28,600
1996	26.9	59,300
1997	26.7	59,600
1998	29.5	43,000
1999	28.7	37,200
2000	29.5	53,600
2001	32.4	64,400
2002	33.3	53,300
2003	31.1	65,900
2004	29.3	97,100
2005	30.9	93,700
2006	31.6	102,800
2007	28.7	201,000
2008	28.4	174,400
2009	28.0	162,200
2010	26.2	136,900
2011	28.0	209,400
2012	26.9	149,100

Source: B. Failor, Sport Fish Biologist, ADF&G Homer, unpublished data.

<sup>a</sup> Based on harvest samples from Homer applied to the total Cook Inlet harvest.

<sup>b</sup> Preliminary estimate to nearest 100 lb.

Table 41.—Statewide Harvest Survey estimates of recreational lingcod harvest (number of fish) in Cook Inlet 1990–2012.

Year	West Cook Inlet	Central Cook Inlet		Lower Cook Inlet		Total
		Number	% of total	Number	% of total	
1990	<sup>a</sup>	839	32%	1,805	68%	2,644
1991	35	989	36%	1,751	63%	2,775
1992	0	942	29%	2,257	71%	3,199
1993	45	0	0%	1,636	97%	1,681
1994	56	0	0%	1,184	95%	1,240
1995	28	149	13%	970	85%	1,147
1996	<sup>b</sup>	888	40%	1,317	60%	2,205
1997	<sup>b</sup>	473	21%	1,762	79%	2,235
1998	<sup>b</sup>	461	32%	995	68%	1,456
1999	<sup>b</sup>	219	17%	1,079	83%	1,298
2000	<sup>b</sup>	214	12%	1,600	88%	1,814
2001	<sup>b</sup>	473	24%	1,514	76%	1,987
2002	<sup>b</sup>	236	15%	1,364	85%	1,600
2003	<sup>b</sup>	364	17%	1,755	83%	2,119
2004	<sup>b</sup>	459	14%	2,852	86%	3,311
2005	<sup>b</sup>	283	9%	2,753	91%	3,036
2006	<sup>b</sup>	310	9%	2,997	91%	3,307
2007	<sup>b</sup>	186	3%	6,826	97%	7,012
2008	<sup>b</sup>	196	3%	5,937	97%	6,133
2009	<sup>b</sup>	345	6%	5,449	94%	5,794
2010	<sup>b</sup>	406	8%	4,819	92%	5,225
2011	<sup>b</sup>	692	9%	6,785	91%	7,477
2012	<sup>b</sup>	470	8%	5,073	92%	5,543

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

<sup>a</sup> Lingcod information was not requested in the Statewide Harvest Survey questionnaire before 1991.

<sup>b</sup> After 1995, the West Cook Inlet estimates were apportioned and merged with the Central and Lower Cook Inlet estimates.

Table 42.—Statewide Harvest Survey estimated recreational lingcod harvest (number of fish) by charter and non-charter users in the Central (CCI) and Lower Cook Inlet (LCI) fisheries, 1990–2012.

Year	CCI				LCI			
	Charter	Noncharter	Total	% Charter	Charter	Noncharter	Total	% Charter
1990	71	768	839	8%	1,046	759	1,805	58%
1991	63	926	989	6%	806	945	1,751	46%
1992	327	615	942	35%	802	1,455	2,257	36%
1993	0	0	0	–	993	643	1,636	61%
1994	0	0	0	–	766	418	1,184	65%
1995	140	9	149	94%	703	267	970	72%
1996	392	496	888	44%	855	462	1,317	65%
1997	190	283	473	40%	1,225	537	1,762	70%
1998	336	125	461	73%	617	378	995	62%
1999	112	107	219	51%	616	463	1,079	57%
2000	190	24	214	89%	1,110	490	1,600	69%
2001	345	128	473	73%	1,054	460	1,514	70%
2002	206	30	236	87%	910	454	1,364	67%
2003	242	122	364	66%	1,411	344	1,755	80%
2004	139	320	459	30%	2,027	825	2,852	71%
2005	283	0	283	100%	1,896	857	2,753	69%
2006	301	9	310	97%	2,399	598	2,997	80%
2007	139	47	186	75%	5,218	1,608	6,826	76%
2008	164	32	196	84%	4,839	1,098	5,937	82%
2009	233	112	345	68%	3,789	1,660	5,449	70%
2010	351	55	406	86%	3,692	1,127	4,819	77%
2011	346	346	692	50%	4,951	1,834	6,785	73%
2012	107	363	470	23%	3,743	1,330	5,073	74%

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

<sup>a</sup> Estimates after 1995 include the West Cook Inlet portion, apportioned between Central and Lower Cook Inlet.

Table 43.—Harvest quotas in the Ninilchik-area educational fisheries, 1993–2013.

Year	Participant	Ninilchik salt water fishing period (day/month)	Ninilchik area harvest				Chinook salmon quotas				Coho salmon quotas				Total salmon quota	Eulachon and herring quota	
			Chinook salmon	Sockeye salmon	Coho salmon	Pink salmon	Total	Salt water	Nin. River	Kas. River	Total	Salt water	Nin. River	Kas. River			Total
1993	NTC <sup>a</sup>	5/1–10/31					215	100	20		100	250	30		250	2000	
1994	NTC	5/1–10/31	7	162	119	16	304	100	20		100	250	30		250	2000	
1995	NTC	5/1–10/31	77	229	85	23	414	100	20		100	250	30		250	2000	
1996	NTC	5/1–10/31	101	910	56	8	1,075	150	20		150	250	30		250	2000	
1997	NTC	5/1–10/31	94	474	99	55	722	150	20		150	250	30		250	2000	
1998	NND <sup>b</sup>	5/1–10/31	52	139	110	20	317	75	10		75	125	15		125	1,000	
	NTC	5/1–10/31	67	506	95	57	721	75	10		75	125	15		125	1,000	
	Total	5/1–10/31	119	645	205	77	1,038	150	20		150	250	30		250	2,000	
1999	NND		56	302	76	18	452	75	10		75	125	15		125	1,000	
	NTC	5/1–10/31	117	434	84	5	640	75	10		75	125	15		125	1,000	
	Total	5/1–10/31	173	736	160	23	1,092	150	20		150	250	30		250	2,000	
2000	NND		51	199	96	15	361	75	10		75	125	15		125	1,000	
	NTC	5/1–10/31	50	439	59	57	605	75	10		75	125	15		125	1,000	
	Total	5/1–10/31	101	638	155	72	966	150	20		150	250	30		250	2,000	
2001	NND		73	310	123	0	506	100	10		100	125	15		125	1,000	
	NTC	5/1–10/31	75	760	125	42	1002	100	10		100	125	15		125	1,000	
	Total	5/1–10/31	148	1070	248	42	1508	200	20		200	250	30		250	2,000	
2002	NND		65	339	106	52	562	100	10		100	125	15		125	1,000	
	NTC	5/1–10/31	44	138	95	31	308	100	10		100	125	15		125	1,000	
	Total	5/1–10/31	109	477	201	83	870	200	20		200	250	30		250	2,000	
2003	NND		65	98	80	12	255	100	10		100	100	15		100	850	1,000
	NTC	5/1–10/31	86	426	100	15	627	100	10		100	100	15		100	850	
	NES <sup>c</sup>	5/1–10/31	0	4	0	0	4	25			25	50			50	250	
	Total	7/1–8/15	151	528	180	27	886	225	20		225	250	30		250	1,950	1,000

-continued-

Table 43.–Part 2 of 3.

Year	Participant	Ninilchik salt water fishing period (day/month)	Ninilchik area harvest				Chinook salmon quotas				Coho salmon quotas				Total salmon quota	Eulachon and herring quota	
			Chinook salmon	Sockeye salmon	Coho salmon	Pink salmon	Total	Salt water	Nin. River	Kas. River	Total	Salt water	Nin. River	Kas. River			Total
2004	NND	4/1–10/31	78	199	79	14	370	100	10		100	100	15		100	850	1,000
	NTC	5/1–10/31	73	395	83	0	551	100	10		100	100	15		100	850	
	NES	7/1–8/15	1	77	0	9	87	25			25	50			50	250	
	Total		152	671	162	23	1,008	225	20		225	250	30		250	1,950	1,000
2005	NND	4/1–10/31	88	84	78	15	265	100	10		100	100	15		100	850	1,000
	NTC	5/1–10/31	70	264	83	0	417	100	10		100	100	15		100	850	
	NES	7/1–8/15	0	5	0	0	5	25			25	50			50	250	
	Total		158	353	161	15	687	225	20		225	250	30		250	1,950	1,000
2006	NND	4/1–10/31	64	55	99	10	171	100	10		100	100	15		100	850	no limit <sup>d</sup>
	NTC	5/1–10/31	75	550	100	0	671	100	10		100	100	15		100	850	
	NES	7/1–8/15		Did not fish				25			25	50			50	250	
	Total		139	605	199	10	842	225	20		125	250	30		150	1,950	
2007 <sup>ef</sup>	NND	4/1–10/31	65	227	102	14	408	200	10		200	200	15		200	2,800	no limit <sup>d</sup>
	NTC	5/1–10/31	300	1,363	483	2	2,148	300	10	50	300	300	15	200	500	2,800	
	NES	7/1–8/15		Did not fish				25			25	50			50	250	
	Total		365	1,590	585	16	2,556	525	20	50	525	550	30	200	750	5,850	
2008 <sup>f</sup>	NND	4/1–9/15	69	192	150	69	480	100	10		100	150	15		150	2,800	no limit <sup>d</sup>
	NTC	5/1–9/15	199	857	200	248	1,504	200	10	100	300	300	15	200	500	2,800	
	Total	–	268	1,049	350	317	1,984	300	20	100	400	450	30	200	650	5,600	
2009 <sup>f</sup>	NND	4/1–5/20; 6/15–9/15	20	276	56	34	386	50	10		50	150	15		150	2,800	no limit <sup>d</sup>
	NTC	5/1–5/20; 6/15–9/15	32	788	200	123	1,143	100	10	100	200	200	15	300	500	2,800	
	Total	–	52	1,064	256	157	1,529	150	20	100	250	350	30	300	650	5,600	

-continued-

Table 43.–Part 3 of 3.

Year	Participant	Ninilchik salt water fishing period (day/month)	Ninilchik area harvest					Chinook salmon quotas				Coho salmon quotas				Total salmon quota	Eulachon and herring quota
			Chinook salmon	Sockeye salmon	Coho salmon	Pink salmon	Total	Salt water	Nin. River	Kas. River	Total	Salt water	Nin. River	Kas. River	Total		
2010 <sup>f</sup>	NTC	5/1–5/20; 6/15–9/15	78	605	200	108	991	100	10	100	200	200	15	300	500	2,800	
2011	NND	4/1–5/20; 6/15–9/15	29	185	84	37	335	50	10		50	150	15		150	2,800	no limit <sup>d</sup>
	NTC	5/1–5/20; 6/15–9/15	64	500	181	131	876	100	10	100	200	200	15	300	500	2,800	
	Total	–	93	685	265	168	1,211	150	20	100	250	350	30	300	650	5,600	
2012 <sup>g</sup>	NND	4/1–5/20; 6/15–9/15	17	65	145	25	252	50	10		50	150	15		150	2,800	no limit <sup>d</sup>
	NTC	5/1–5/20; 6/15–9/15	67	240	215	54	576	100	10	100	200	200	15	300	500	2,800	
	NES	5/1–5/20; 6/15–9/15	1	37	0	2	40	25			25	50			50	250	
	Total	–	85	342	360	81	868	175	20	100	275	400	30	300	700	5,850	
2013 <sup>g</sup>	NND	4/1–5/20; 6/15–9/15	16	195	128	26	365	50	10		50	150	15		150	2,800	no limit <sup>d</sup>
	NTC	5/1–5/20; 6/15–9/15	60	594	210	52	916	100	10	100	200	200	15	300	500	2,800	
	NES	5/1–5/20; 6/15–9/15	13	141	50	23	227	25			25	50			50	250	
	Total	–	89	930	388	101	1,508	175	20	100	275	400	30	300	700	5,850	

Note: Nin. River = Ninilchik River; Kas. River = Kasilof River.

<sup>a</sup> Ninilchik Traditional Council.

<sup>b</sup> Ninilchik Native Descendants.

<sup>c</sup> Ninilchik Emergency Services.

<sup>d</sup> Unlimited eulachon (*Thaleichthys pacificus*) harvest permitted. Herring (*Clupea pallasii*) harvest not permitted because opportunity is available via personal use regulations (1 April for herring); salmon permit begins 1 May.

<sup>e</sup> Educational fishery participants didn't fish in the Kasilof River area during 2007.

<sup>f</sup> In addition, three coho salmon were harvested from the Kasilof River saltwater area in 2008, 254 more in 2009, and 225 more in 2010.

<sup>g</sup> Educational fishery modifications: harvest quotas (effective 1 July, no retention of Chinook salmon); the last two freshwater educational fisheries were closed.

Table 44.—Harvest in the Seldovia area to the Seldovia Village Tribe (SVT) educational fisheries, 2004–2013.

Year	Educational fishery participant	Seldovia salt water fishing period	Seldovia Village Tribe area harvest						Total harvest
			Chinook salmon	Sockeye salmon	Coho salmon	Chum salmon	Pink salmon	Dolly Varden	
2004	SVT	15–21 Jul				9	1		10
2005	SVT	10–15 Jul							0
2006	SVT	10–15 Jul				DID NOT FISH			
2007	SVT	30 Jun, 6–15 Jul		2					2
2008	SVT	18–22 Aug				DID NOT FISH			
2009	SVT	13–20 Jul				DID NOT FISH			
2010	SVT	15–17 Jul				DID NOT FISH			
2011	SVT	21–22 Jul	0	0	0	0	0	0	0
2012	SVT	no permit	0	0	0	0	0	0	0
2013	SVT	no permit	0	0	0	0	0	0	0



Table 45.—Harvest and harvest quotas between the Anchor River and Whiskey Gulch to the Veterans of Foreign Wars Men’s Auxilliary Post 10221 (APVFW) educational fisheries, 2011–2013.

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	Sockeye salmon	Coho salmon	Total
2007	APVFW	15 Jul–31 Aug	0	77	76	0	0	153		80	80	160
2008	APVFW	15 Jul–31 Aug	1	89	38	11	0	139		120	80	240
2009	APVFW	15 Jul–31 Aug	0	103	75	6	0	184	0	120	80	240
2010	APVFW	15 Jul–31 Aug	0	37	47	21	1	106	0	100	50	200
2011	APVFW	15 Jul–31 Aug	0	47	41	21	0	109	0	100	50	200
2012	APVFW	15 Jul–31 Aug	0	66	25	15	0	106	0	100	50	200
2013	APVFW	15 Jul–31 Aug	0	50	21	40	1	112	0	100	50	200

Table 46.—Harvest and harvest quotas in the Silver Salmon Creek area to the Southcentral Foundation (SCF) educational fisheries, 2010–2013.

Year	Educational fishery participant	Silver Salmon Creek salt water fishing period	Sockeye salmon harvest	Coho salmon harvest	Chum salmon harvest	Pink salmon harvest	Total harvest	Fish Quotas				Total
								Sockeye salmon	Coho salmon	Chum salmon	Pink salmon	
2010	SCF	1 Jul–15 Sep <sup>a</sup>		27			27		50			300
2011	SCF	1 Jul–15 Sep <sup>a</sup>	34	5			39		50			300
2012	SCF	1 Jul–15 Sep <sup>a</sup>	76	36	0	0	112		50			300
2013	SCF	1 Jul–15 Sep <sup>b</sup>	0	30	0	0	30		50			300

<sup>a</sup> Opening days on Tuesdays, Wednesdays, and Friday through Sunday only.

<sup>b</sup> Opening days on Tuesday, Wednesday, Friday, and Sunday only.

Table 47.—Harvest and harvest quotas between the Anchor River and Whiskey Gulch to Sons of the American Legion Post 16 (Post 16) educational fisheries, 2011–2013.

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	Sockeye salmon	Coho salmon	Pink salmon	Chum 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	0	50			200
2013	Post 16	15 Jul–31 Aug	0	67	24	20	0	111	0	0	50			200

## **FIGURES**

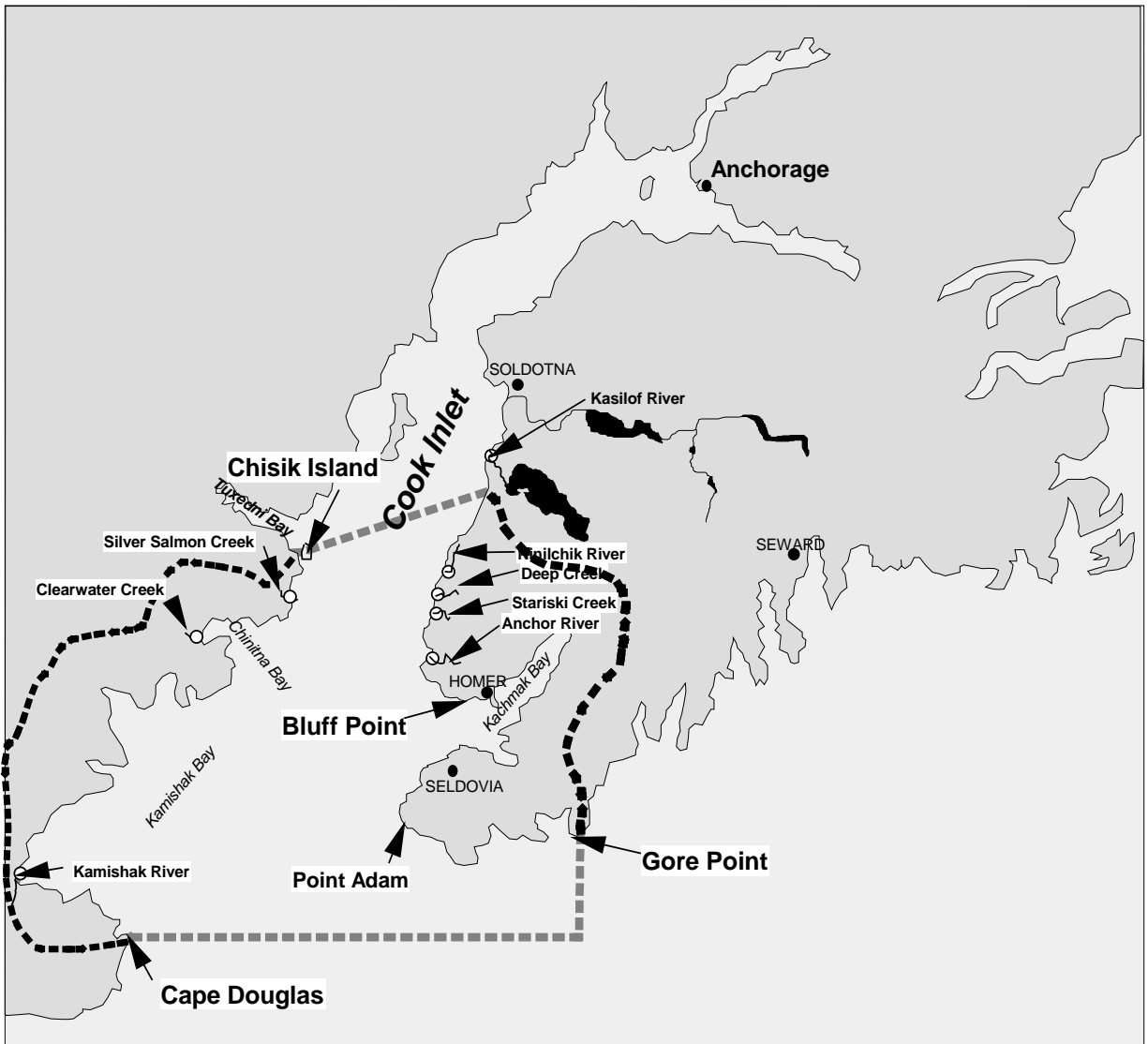


Figure 1.—Lower Cook Inlet Management Area.

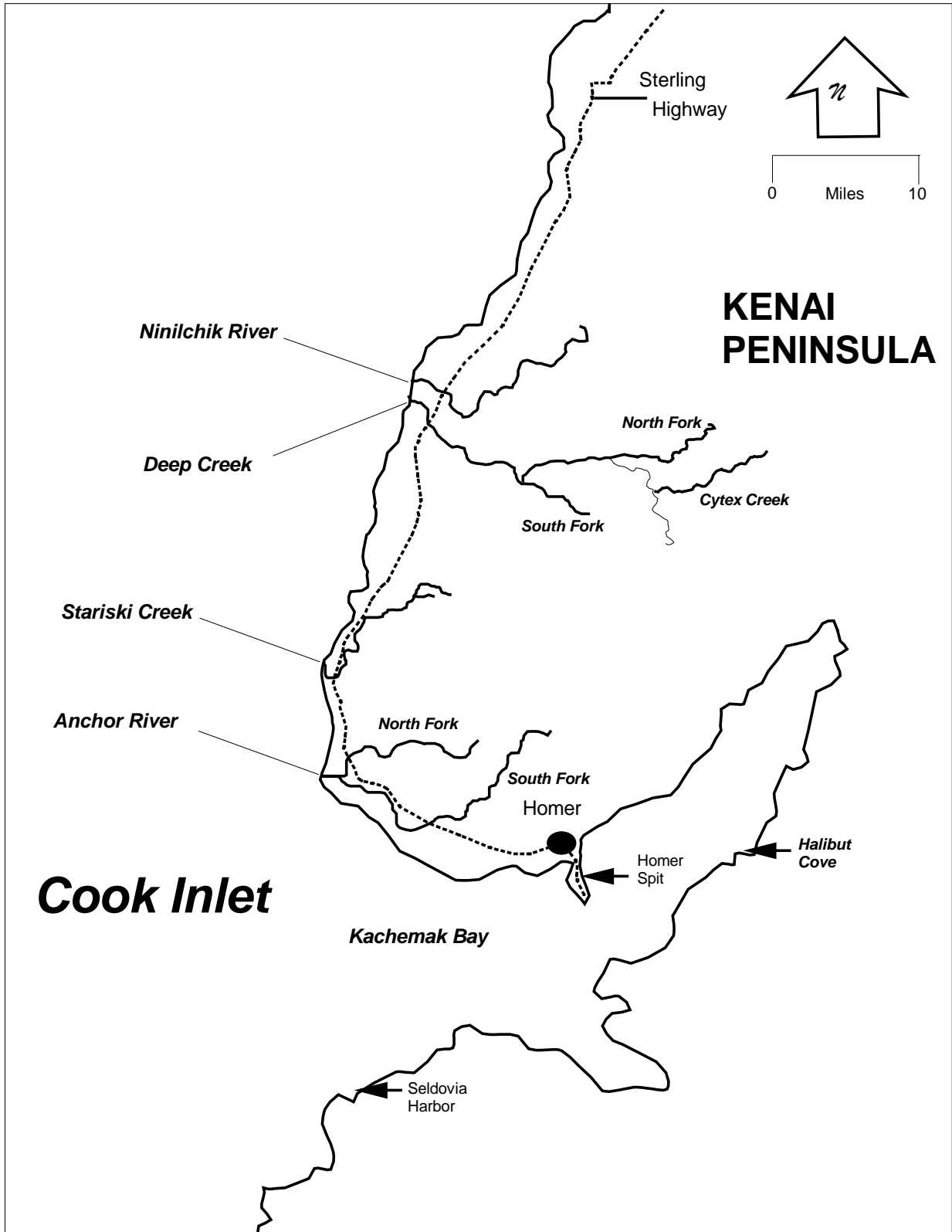


Figure 2.—Lower Kenai Peninsula road system streams.

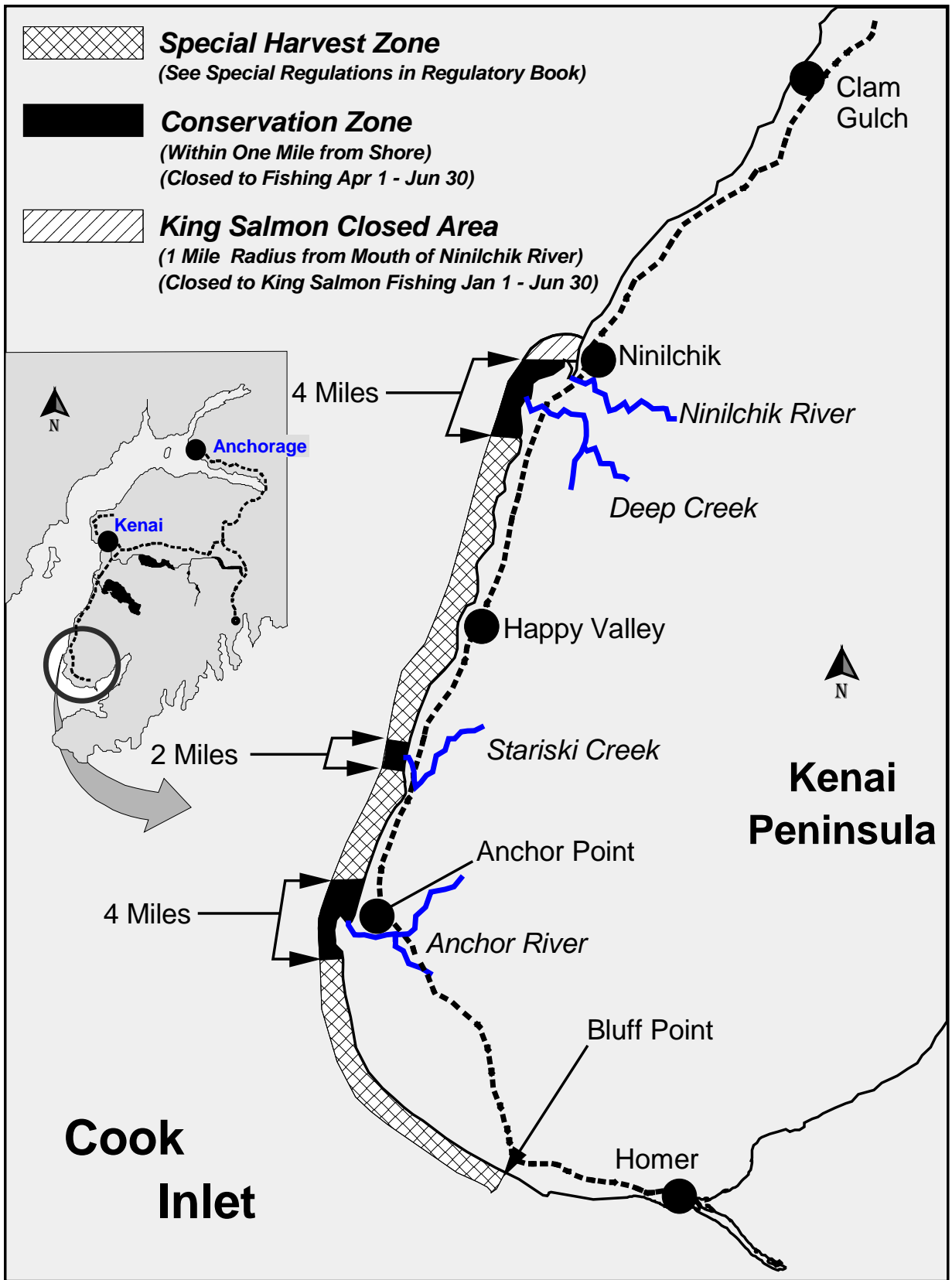


Figure 3.—Central Cook Inlet regulatory zones.

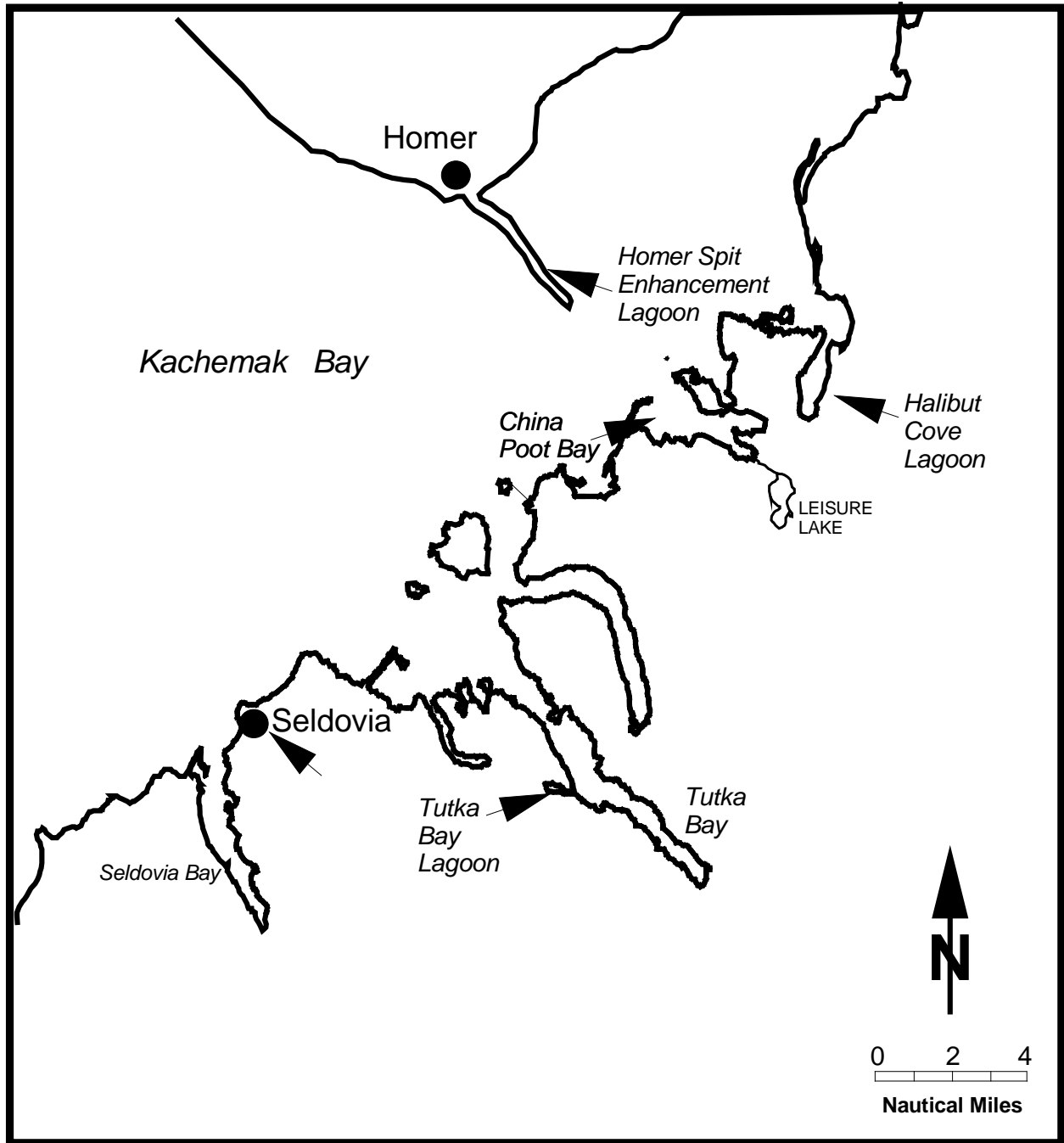


Figure 4.—Saltwater stocking locations in Kachemak Bay and Lower Cook Inlet.

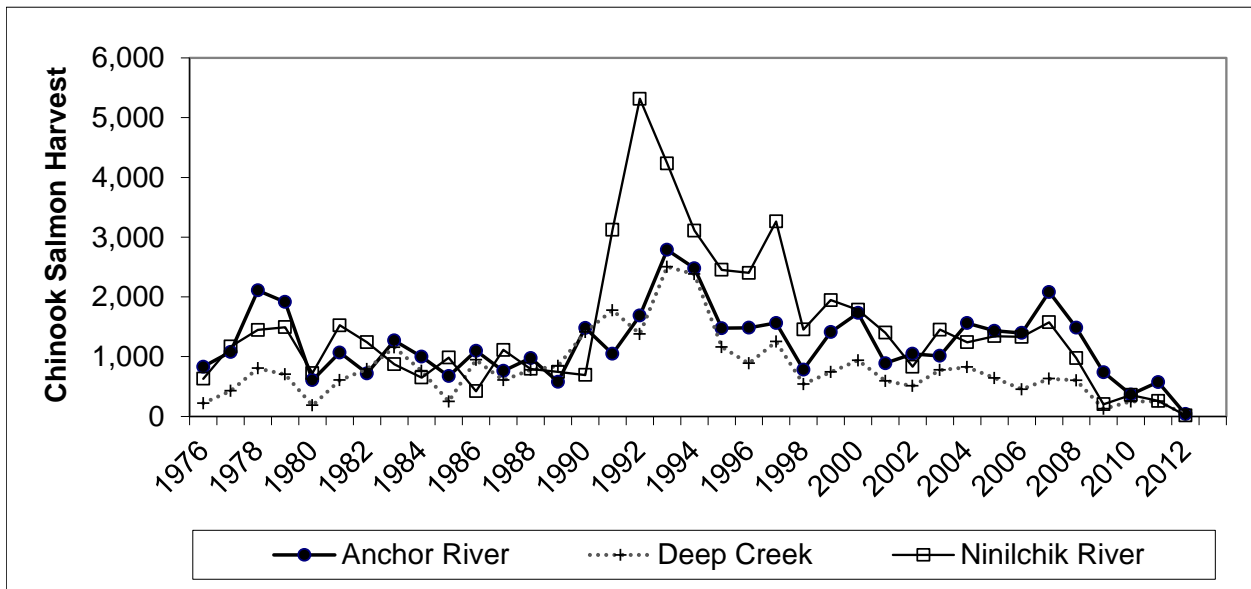
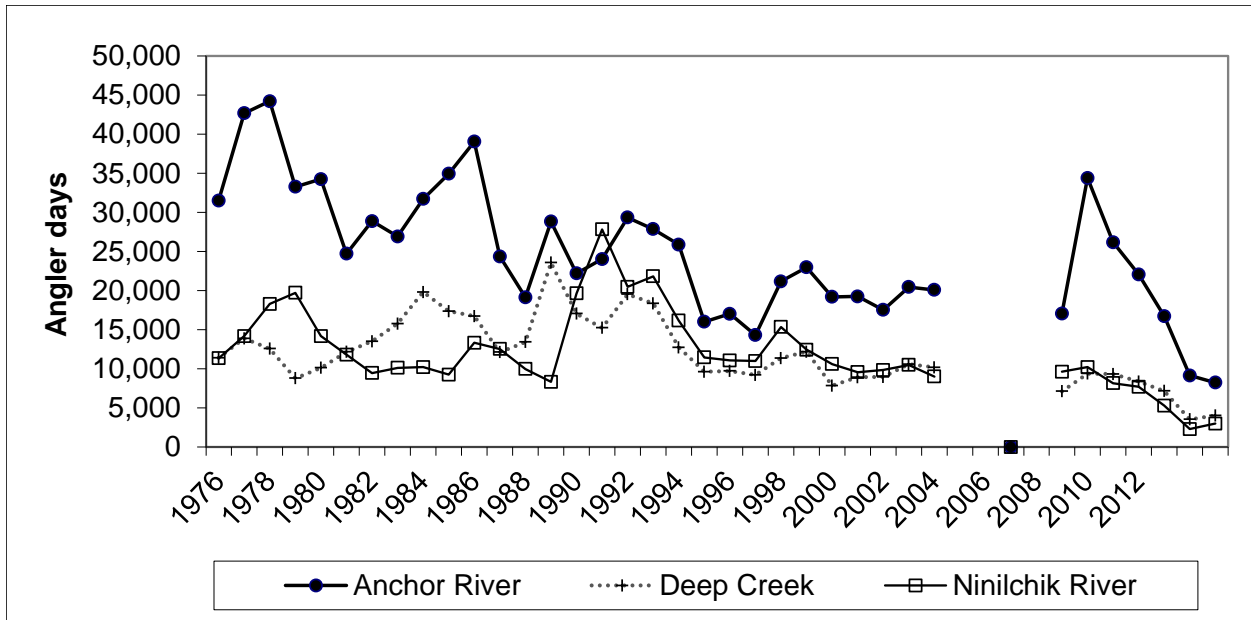


Figure 5.—Sport fishing effort (top) and Chinook salmon harvest (bottom) for the years 1976–2012 in Anchor River, Deep Creek, and Ninilchik River.



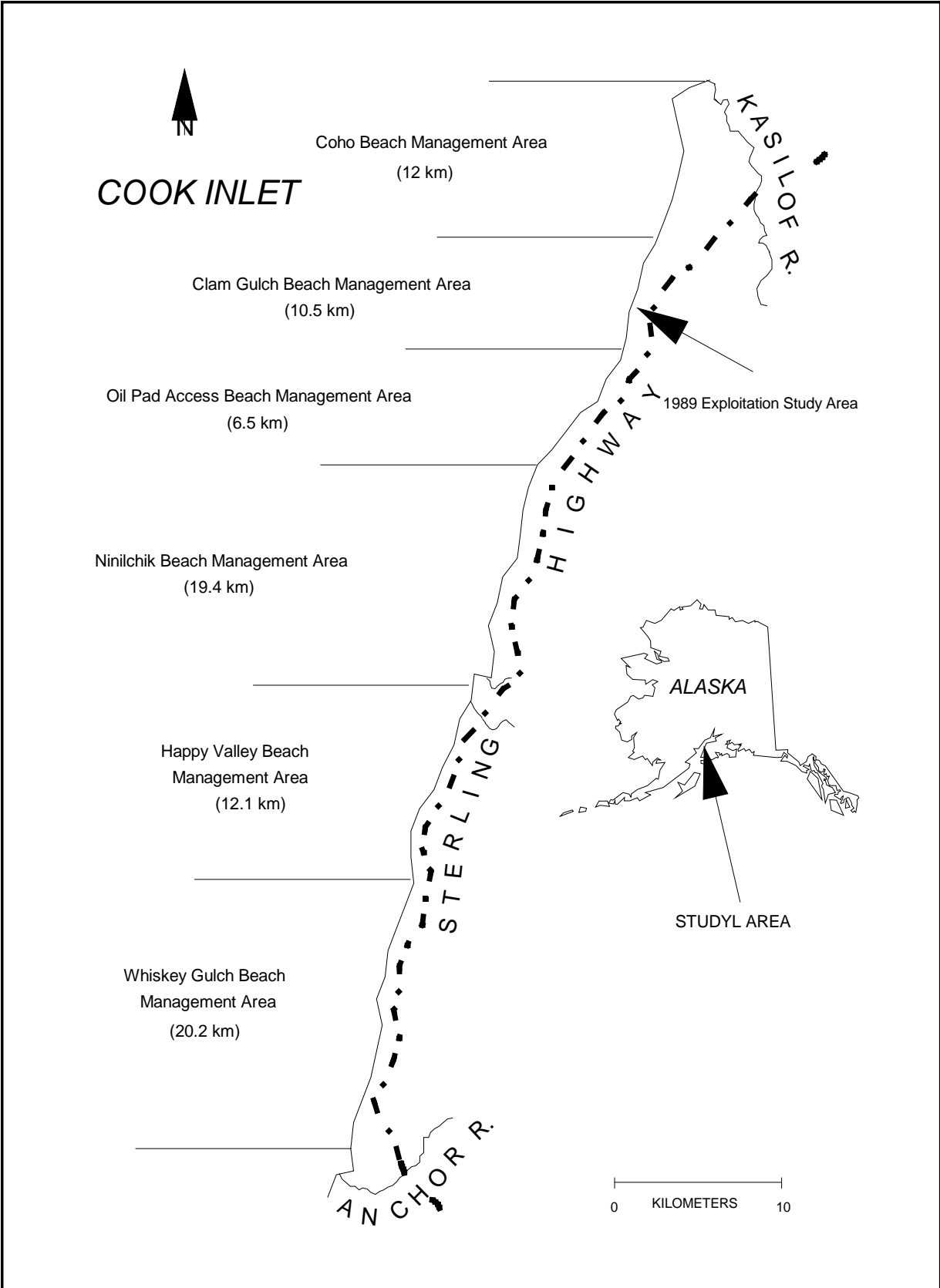


Figure 6.—Eastside Cook Inlet razor clam beaches.

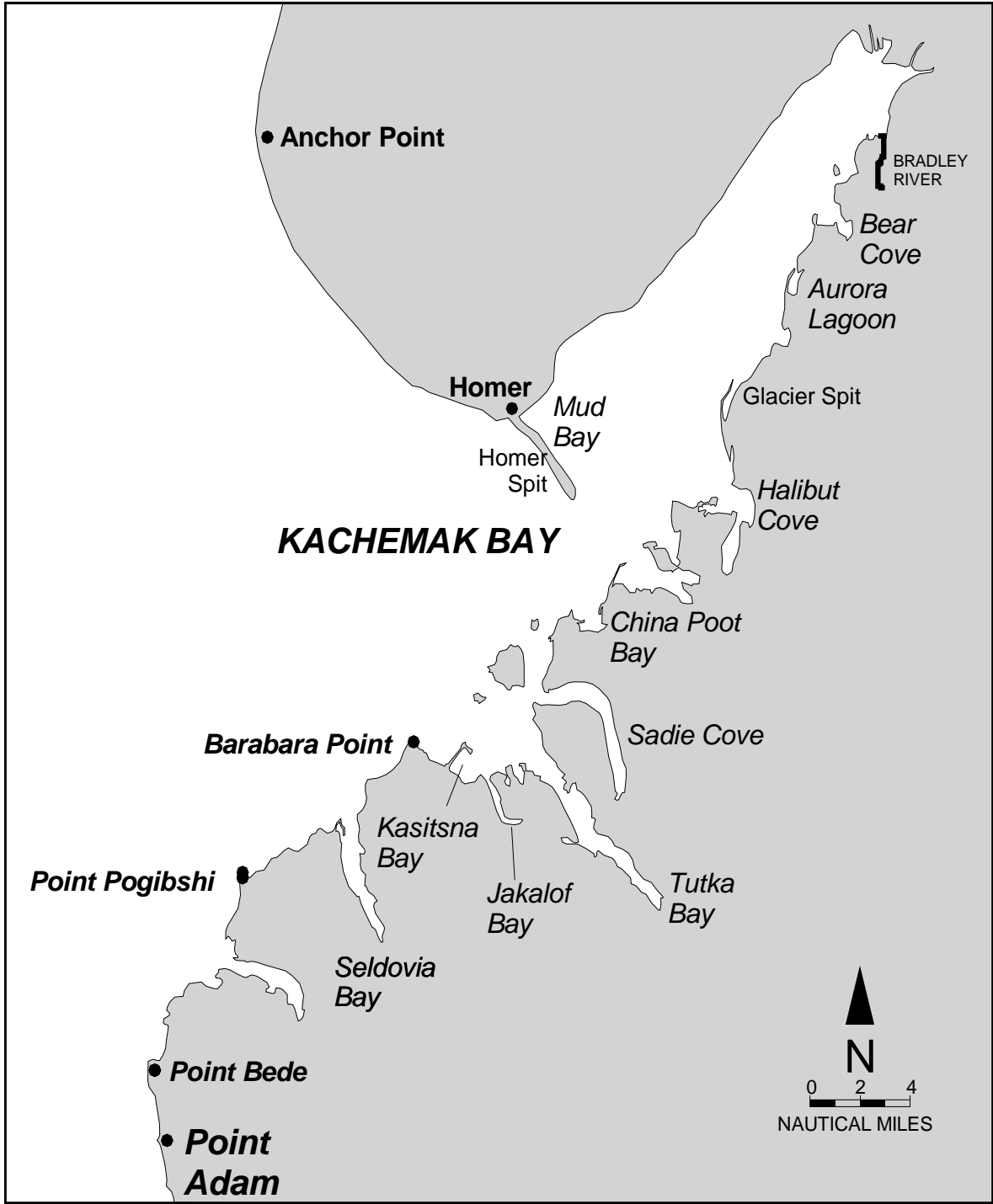


Figure 7.—Kachemak Bay.

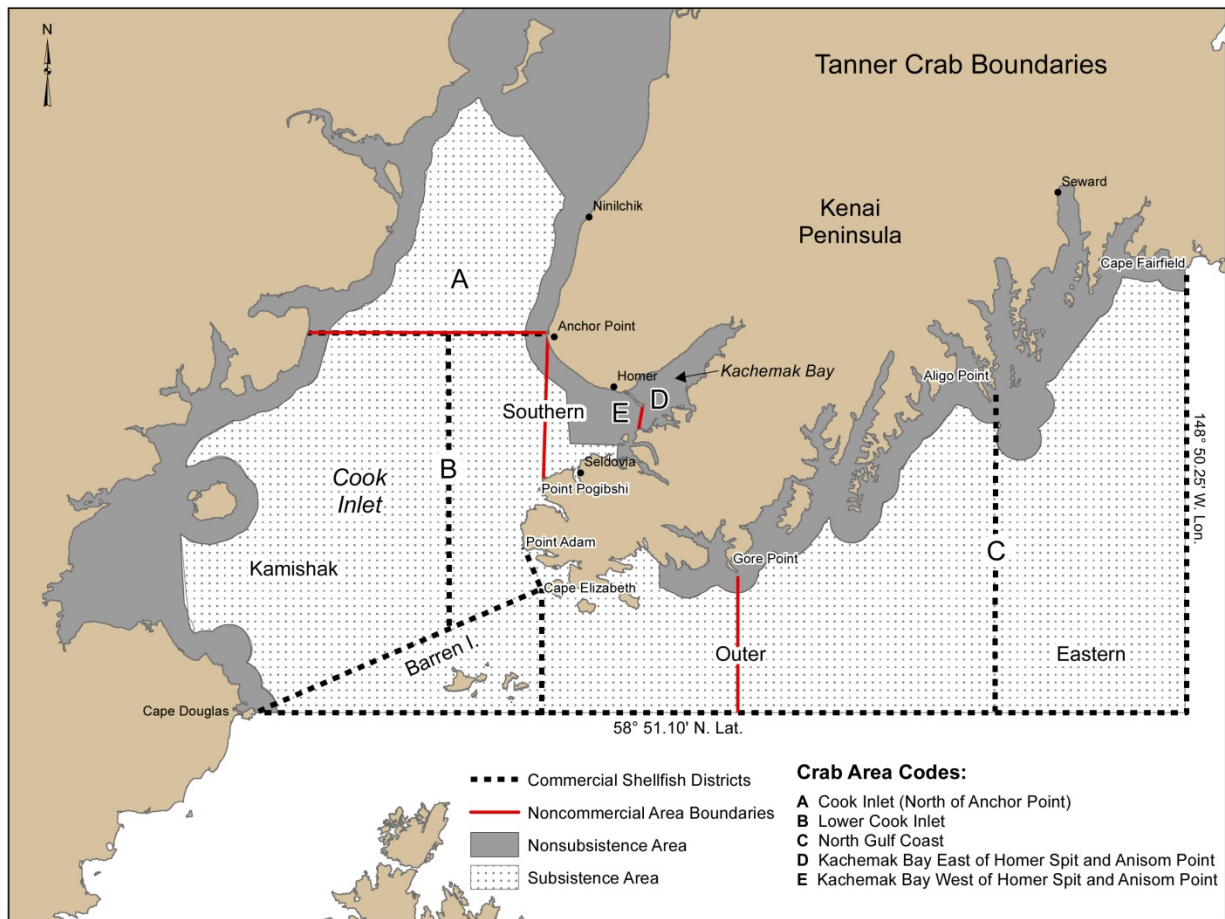


Figure 8.—Shellfish subsistence and nonsubsistence areas.

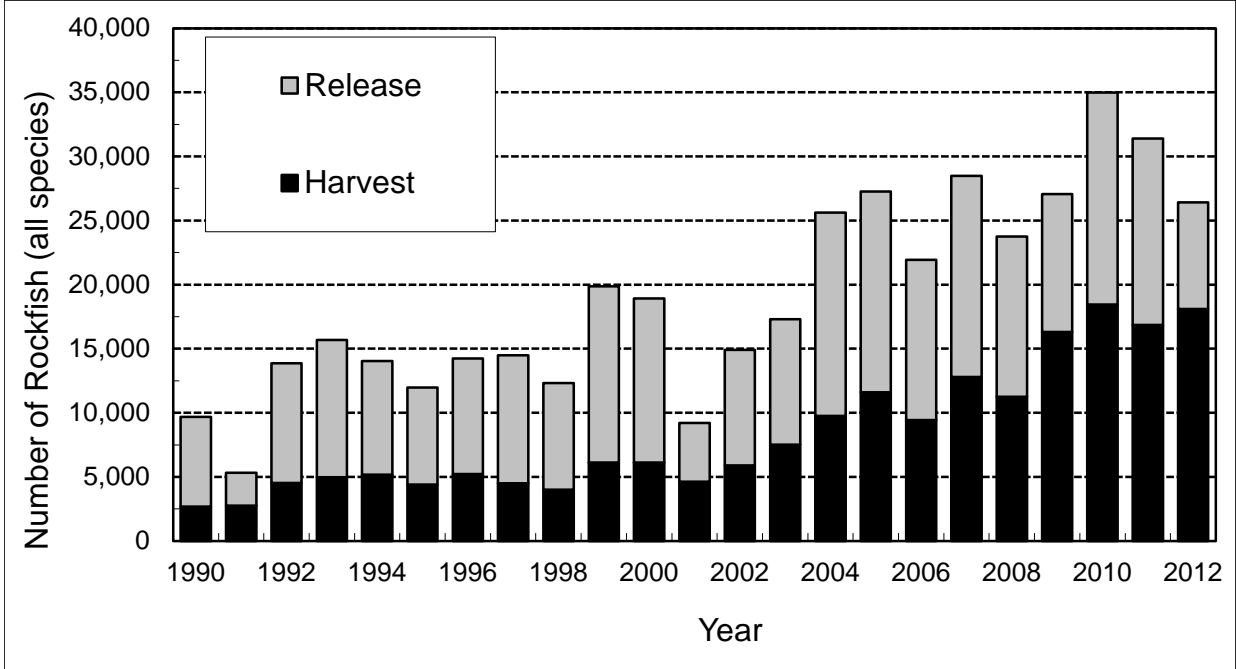


Figure 9.—Estimated numbers of rockfish harvested and released in Cook Inlet, 1990–2012.

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).

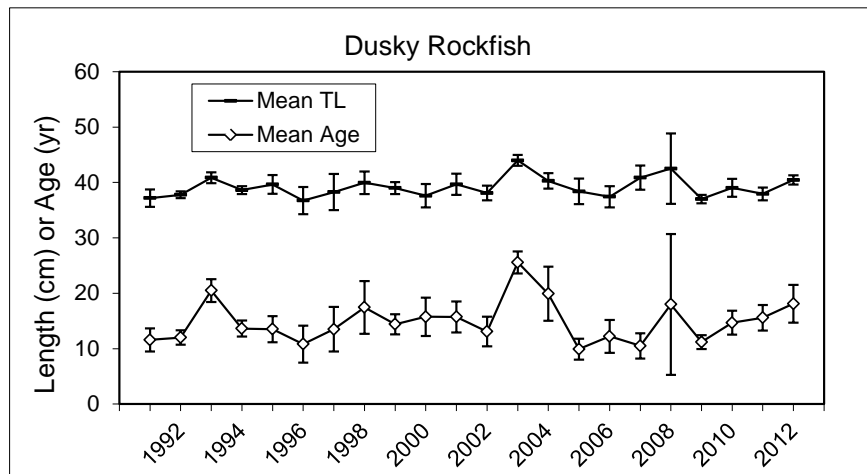
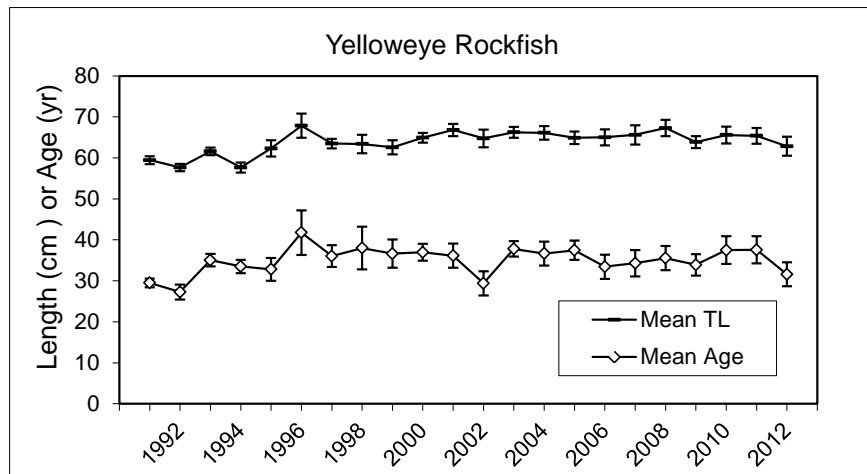
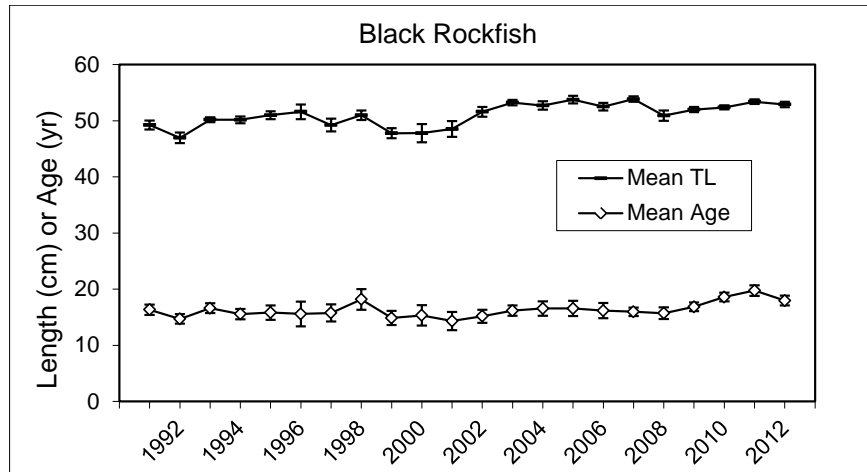


Figure 10.—Trends in mean total length (TL) and age of black (top), yelloweye (middle), and dusky (bottom) rockfish in the Lower Cook Inlet sport harvest, 1991–2012.

Source: Meyer and Failor *In prep.*

Note: Error bars show 95% confidence intervals.

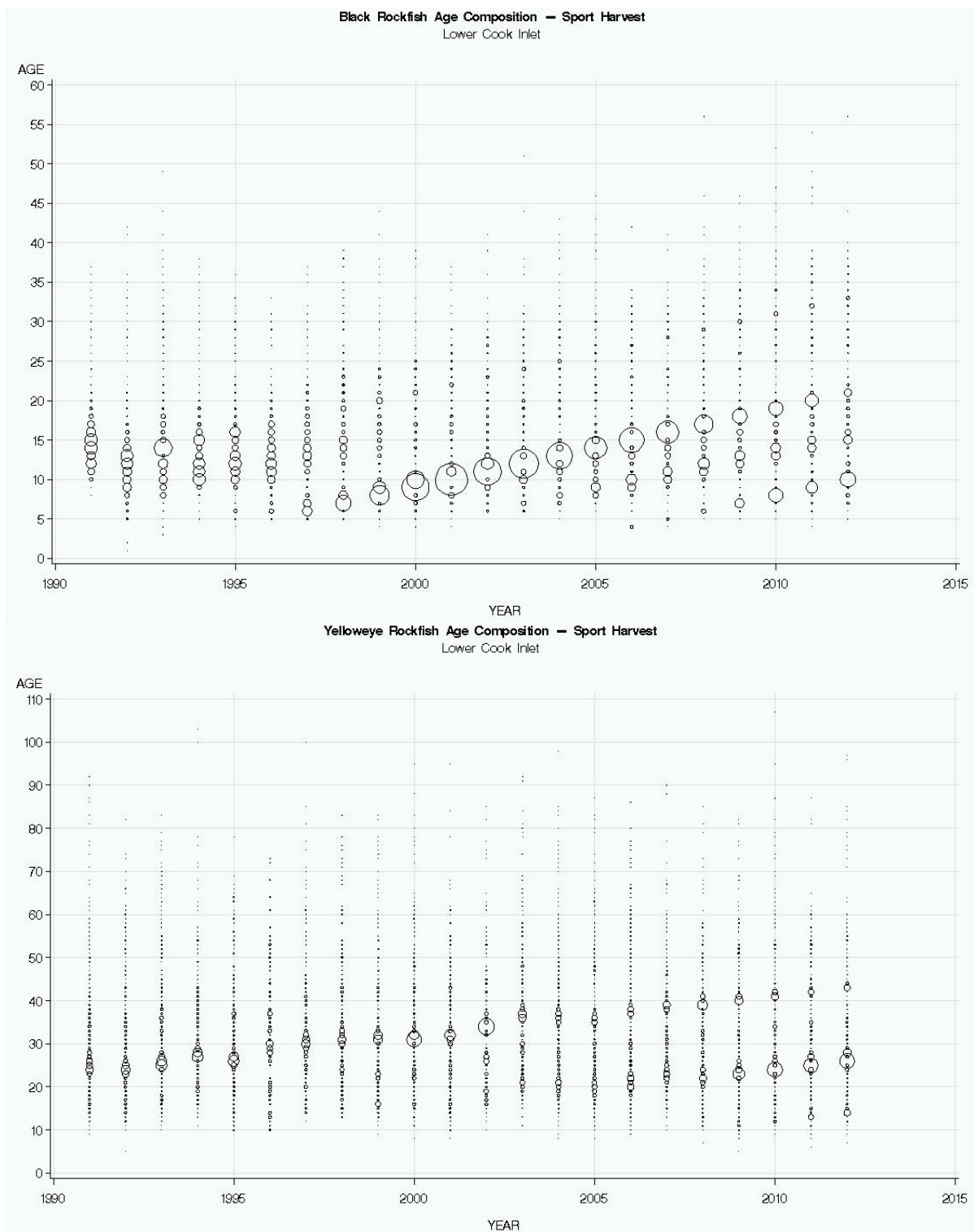


Figure 11.—Age composition of the recreational black (top) and yelloweye (bottom) rockfish harvest landed at Homer, 1991–2012.

Source: Meyer and Failor *In prep.*

Note: Bubble diameter is proportional to the percentage of harvest in each age group.

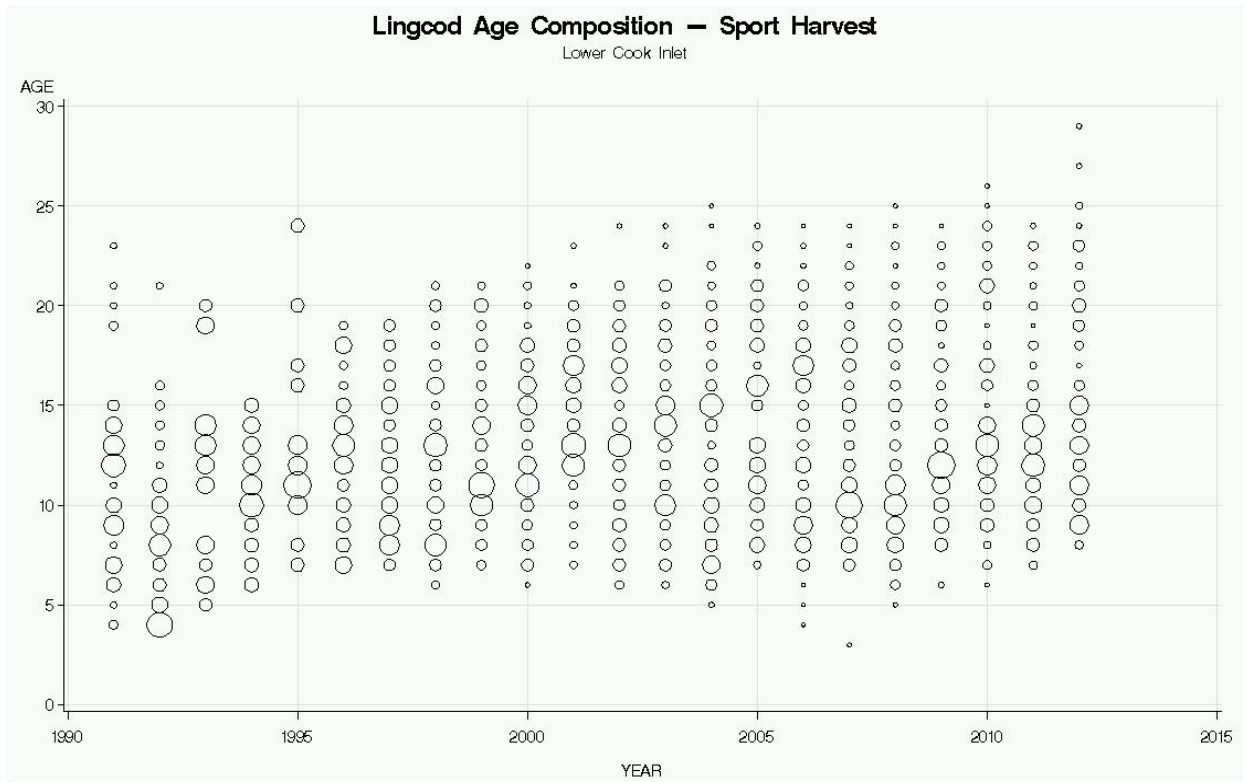


Figure 12.—Age composition of the recreational lingcod harvest landed at Homer, 1991–2012.

Source: Meyer and Failor *In prep.*

Note: Bubble diameter is proportional to the percentage of harvest in each age group.

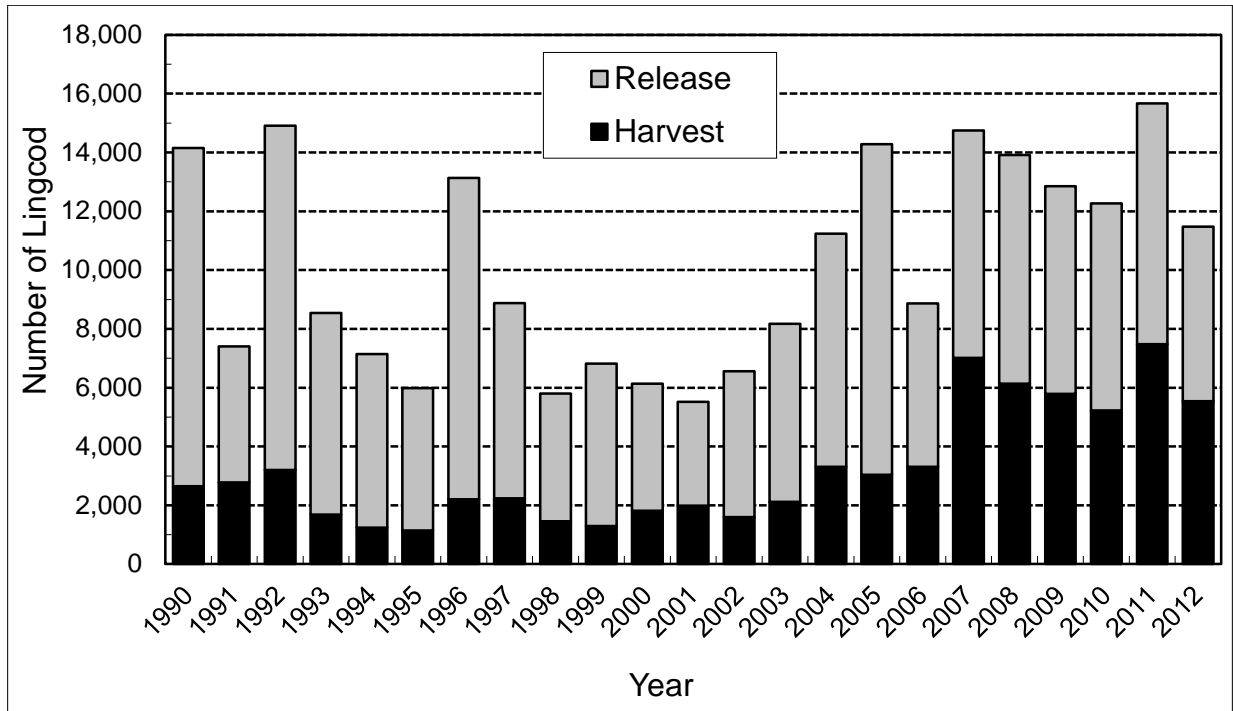


Figure 13.—Estimated numbers of lingcod harvested and released in Cook Inlet, 1990–2012.

Source: Statewide Harvest Survey (Mills 1979-1980, 1981a-c, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep a-b*).



## **APPENDIX A: EMERGENCY ORDERS**

**Emergency Orders issued in 1996:**

- 1) E.O. No. 2-SHR-1-08-96 closed the recreational shrimp fishery in Kachemak Bay east of a line from Anchor Point to Point Pogibshi. Effective 15 April through 31 December 1996.
- 2) E.O. No. 2-KS-1-20-96 extended the Chinook (king) salmon fishery on the Ninilchik River on a continual basis between Saturday, 15 June through Monday, 24 June. Effective 15 June, 12:01 AM through Monday 24 June 1996.
- 3) E.O. No. 2-SS-1-41-96 opened the NDFL to snagging for Chinook salmon and coho salmon. Effective 8 September through 31 December 1996.

**Emergency Orders issued in 1997:**

- 1) E.O. No. 2-SHR-7-01-97 closed sport fishing for shrimp in all of Kachemak Bay east of a line from Anchor Point to Point Pogibshi. Effective 1 January through 31 December 1997.
- 2) E.O. No. 2-PU-H-02-96 closed the personal use fishery for shrimp in waters of Kachemak Bay east of a line from Anchor Point to Point Pogibshi. Effective 1 January through 31 December 1997.
- 3) E.O. No. 2-KS-7-21-97 opened snagging at the Homer Lagoon. Effective 12:00 PM, 2 July through 7 July 1997.
- 4) E.O. No. 2-PS-7-32-97 increased the bag limit for pink salmon to 12 per day in the marine waters of Tutka Bay. Effective 9 August through 21 September 1997.
- 5) E.O. No. 2-SS-7-35-97 closed the Fox Creek Personal Use dip net fishery.
- 6) E.O. No. 2-SS-7-36-97 increased the daily bag and possession limit for salmon other than Chinook salmon, including coho (silver) salmon 16 inches or more in length from one to three in Ninilchik River, Deep Creek, Stariski Creek, and the Anchor River. Effective 29 August through 15 October 1997.
- 7) E.O. No. 2-SS-7-41-97 opened the Homer Lagoon to snagging. Effective 7 August through 31 December 1997.

**Emergency Orders issued in 1998:**

- 1) E.O. No. 2-DC-7-05-98 closed the Dungeness crab sport fishery in Lower Cook Inlet east of a line extending from Anchor Point to Point Bede. Effective 29 May until further notice.
  - 2) E.O. No. 2-DC-7-06-98 closed the personal use fishery for Dungeness crab in Lower Cook Inlet east from a line extending from Anchor Point to Point Bede. Effective 29 May until further notice.
  - 3) E.O. No. 2-KS-7-13-98 opened the Homer Spit and enhancement lagoon to snagging. Effective 1 July through 7 July 1998.
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- 4) E.O. No. 2-RS-7-24-98 closed the Ninilchik Traditional Council Educational Fishery. Effective 28 July through 10 August 1998.
- 5) E.O. No. 2-RS-1-27-98 rescinded E.O. No. 2-RS-7-24-98 and restored the Ninilchik Traditional Council Educational fishery to the regular fishing times. Effective 3 August through 1 October 1998.
- 6) E.O. No. 2-PU-7-29-98 closed the personal use dip net fishery in Fox Creek. Effective 22 August through 31 December 1998.
- 7) E.O. No. 2-SS-7-32-98 opened snagging on the Homer Spit. Effective 12:00 PM 18 September through 31 December 1998.

**Emergency Orders issued in 1999:**

- 1) E.O. No. 2-KS-7-08-99 opened the Homer Spit NDFL to snagging. Effective 12:00 PM, 30 June through 4 July 1999.
- 2) E.O. No. 2-RS-7-19-99 opened China Poot Creek to sockeye salmon dipnetting. Effective 12:00 PM, 11 August through 12:00 PM, 20 August 1999.
- 3) E.O. No. 2-SS-7-24-99 opened Homer Spit and enhancement lagoon to snagging. Effective 12:00 PM, 24 September through 31 December 1999.

**Emergency Orders issued in 2000:**

- 1) E.O. No. 2-KS-7-08-00 opened snagging on the Homer Spit and enhancement lagoon. Effective 24 June through 2 July 2000.
- 2) E.O. No. 2-SS-7-22-00 opened the Homer Spit and lagoon to snagging. Effective 12:00 PM, 22 September through 31 December 2000.

**Emergency Orders issued in 2001:**

- 1) E.O. No. 2-RS-7-02-01 closed all waters of the English Bay River drainage and Port Graham Subdistrict to sockeye salmon sport fishing from 12:01 AM, 1 June 2001 until 31 August.
- 2) E.O. No. 2-KS-7-05-01 opened Deep Creek downstream of the regulatory marker for an additional 3-day weekend, 12:01 AM, 16 June 2001 to 11:59 PM, 18 June 2001.
- 3) E.O. No. 2-KS-7-05-02 opened the Ninilchik River downstream of the regulatory marker for an additional 3-day weekend, 12:01 AM, 16 June 2001 to 11:59 PM, 18 June 2001.
- 4) E.O. No. 2-KS-7-10-01 opened the Homer Spit Enhancement Lagoon area to snagging from noon, Friday, 29 June 2001 until 11:59 PM, Sunday, 8 July 2001.
- 5) E.O. No. 2-KS-7-11-01 prohibited the use of weighted hooks or weights following hooks in the Homer Spit Enhancement Lagoon area from Monday, 9 July 2001 until superseded by E.O.

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- 6) E.O. No. 2-TC-7-19-01 reduced the personal use daily bag and possession limit from 20 male crab to five and the pot limit from five to one per person and two per boat.
- 7) E.O. No. 2-TC-7-18-01 reduced the sport fishery daily bag and possession limit from 20 male crab to five and the pot limit from five to one per person and two per boat.
- 8) E.O. No. 2-SS-7-22-01 opened the Homer Spit Enhancement Lagoon area to snagging from noon, Sunday, 16 September 2001 through 11:59 PM, Monday, 31 December 2001.

**Emergency Orders issued in 2002:**

- 1) E.O. No. 2-KS-7-08-02 opened the Ninilchik River from its mouth to the downstream edge of the Sterling Highway Bridge, from 12:01 AM, Saturday, 15 June to 11:59 PM, Monday, 17 June 2002, to sport fishing for hatchery king salmon only. The daily bag and possession limit was one fish 20 inches or greater in length or 10 fish under 20 inches. Only unbaited artificial lures were permitted.
- 2) E.O. No. 2-KS-7-16-02 opened the Homer Spit Enhancement Lagoon area to snagging for king salmon from noon, Friday, 28 June 2002 until 11:59 PM, Sunday, 7 July 2002.
- 3) E.O. No. 2-TC-7-19-02 reduced sport Tanner crab bag and possession limits from 20 per person to 5 per person, effective 19 July 2002. The number of pots used to harvest Tanner crab was reduced to two per person and a maximum of two per vessel.
- 4) E.O. No. 2-TC-7-20-02 reduced personal Tanner crab bag and possession limits from 20 per person to 5 per person effective 19 July 2002. The number of pots used to harvest Tanner crab was reduced to two per person and a maximum of two per vessel.
- 5) E.O. No. 2-SS-7-16-02 opened the Homer Spit Enhancement Lagoon area to snagging for silver salmon from noon, Friday, 13 September 2002 through 11:59 PM, Tuesday, 31 December 2002.

**Emergency Orders issued in 2003:**

- 1) E.O. No. 2-KS-7-03-03 opened the Ninilchik River from its mouth to the downstream edge of the Sterling Highway Bridge from 12:01 AM, Saturday, 14 June 2003 to 11:59 PM, Monday, 31 June 2003 to sport fishing for hatchery king salmon only. The daily bag and possession limit was one fish 20 inches or greater in length and 10 fish under 20 inches. Use of only one single hook was allowed.
- 2) E.O. 2-KS-7-09-03 opened the Homer Spit Enhancement Lagoon area to snagging from noon, Wednesday, 25 June 2003 until 11:59 PM, Sunday, 6 July 2003.
- 3) E.O. No. 2-SS-7-24-03 opened the Homer Spit Enhancement Lagoon area to noon, Wednesday, 17 September 2003 until 11:59 PM, Wednesday, 31 December 2003.

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**Emergency Orders issued in 2004:**

- 1) E.O. No. 2-KS-7-03-04 opened the Ninilchik River from its mouth upstream to the regulatory marker located approximately two miles upstream, to fishing for hatchery king salmon 7 days per week. Bait was allowed. Only one, single hook could be used. A person could not possess a king salmon that had been filleted, headed, mutilated, or otherwise disfigured in a manner that prevented identification of hatchery or wild origin until permanently transported away from the fishing site if the fish was taken from the riverbank. "Fishing site" meant the riverbank where the fish was hooked and removed from the water. The emergency order was effective 12:01 AM, Saturday, 29 May 2004 until 11:59 PM 31 December 2004.
- 2) E.O. No. 2-KS-7-07-04 opened the Anchor River to fishing on 12:00 AM, Saturday, 26 June 2004 through 11:59 PM 28 June 2004 from its mouth upstream approximately two miles to the ADF&G marker located approximately 600 feet downstream of the confluence of the North and South forks of the Anchor River.
- 3) E.O. No. 2-KS-7-12-04 opened the Homer Spit to snagging king salmon, 12:01 PM, Thursday, 1 July 2004 through 11:59 PM, Monday, 5 July 2004.
- 4) E.O. No. 2-KS-7-15-04 rescinded Emergency Order 2-KS-7-03-04, which opened the Ninilchik River to fishing for hatchery king salmon 7 days per week.
- 5) E.O. No. 2-SS-7-24-04 opened the Homer Spit to snagging silver salmon noon, Friday, 10 September through 11:59 PM, Friday, 31 December 2004

**Emergency Orders issued in 2005:**

- 1) E.O. No. 2-RS-7-4-05 closed the waters of the English Bay drainage and Pt. Graham Subdistrict to sport fishing for sockeye salmon from 11:59 PM, Wednesday, 1 June until further notice.
- 2) E.O. No. 2-KS-7-11-05 opened the Homer Spit to snagging king salmon, noon, Wednesday, 29 June through 11:59 PM, Monday, 4 July 2005.
- 3) E.O. No. 2-RS-7-19-05 rescinds E.O. No. 2-RS-7-4-05, effective 12:01 AM, Saturday, 2 July 2005.
- 4) E.O. No. 2-SS-7-29-05 opened the Homer Spit to snagging silver salmon noon, Wednesday, 14 September through 11:59 PM, Saturday, 31 December 2005.

**Emergency Orders issued in 2006:**

- 1) E.O. No. 2-KS-7-12-06 opened the Ninilchik River from the mouth to the regulatory markers approximately 2 miles upstream to harvest of hatchery king salmon 12:01 AM, Wednesday, 4 June until 11:59 PM, Friday, 14 July 2006. Bait was allowed but only one single hook could be used.
- 2) E.O. No. 2-RS-7-9-06 closed the waters of the English Bay drainage and Pt. Graham Subdistrict to sport fishing for sockeye salmon from 11:59 PM, Wednesday, 31 May through 11:59 PM, Monday, 31 July 2006.

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- 3) E.O. No. 2-KS-7-22-06 opened the Homer Spit to snagging king salmon 12:01 PM, Thursday, 6 July through 11:59 PM, Sunday, 9 July 2006.
- 4) E.O. No. 2-RS-7-23-06 rescinded E.O. No. 2-RS-7-9-06, effective 12:01 AM, Thursday, 6 July 6 2006.

**Emergency Orders issued in 2007:**

- 1) E.O. No. 2-KS-7-06-07 opened the Ninilchik River from the mouth to the regulatory markers approximately 2 miles upstream to harvest of hatchery king salmon. Effective 12:01 AM, Saturday, 26 May through 12:59 PM, Sunday, 15 July 2007. Bait was allowed but only one single hook could be used.
- 2) E.O. No. 2-RS-7-11-07 closed the waters of the English Bay drainage and Pt. Graham Subdistrict to sport fishing for sockeye salmon from 12:01 AM, Thursday, 31 May 2007 through 11:59 PM, Tuesday, 31 July 2007.
- 3) E.O. No. 2-KS-7-23-07 opened NDFL to snagging from 12:00 noon, Thursday, 5 July 2007 through 11:59 PM, Sunday, 8 July 2007.
- 4) E.O. No. 2-RS-7-18-07 rescinded the English Bay and Pt. Graham closure effective 6:00 AM, Tuesday, 26 June 2007.

**Emergency Orders issued in 2008:**

- 1) E.O. No. 2-RS-7-06-08 closed the waters of the English Bay drainage and Pt. 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) E.O. No. 2-RS-7-15-08 rescinded the English Bay and Pt. Graham closure effective 6:00 AM, Tuesday, 1 July 2008.
- 3) E.O. No. 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) E.O. No. 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) E.O. No. 2-KS-7-10-10 prohibited the use of bait in the Anchor River, Deep Creek, and Ninilchik River drainages, and increased the closed are in the salt waters of Cook Inlet at the mouth of the Anchor River from one to two miles north and south of the Anchor River mouth and one mile offshore beginning 12:01 a.m., Saturday, June 5, 2010 through 11:59 p.m., Wednesday, June 30, 2010.

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- 2) E.O. No. 2-KS-7-15-10 prohibited the retention of king 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. King salmon could not be possessed or retained; king salmon caught could not be removed from the water and had to be released immediately. Emergency Order No. 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) E.O. No. 2-KS-7-28-10 closed the salt waters of Cook Inlet at the mouth of the Anchor River to all sport fishing from two miles north and south of the Anchor River mouth and one mile offshore beginning 12:01 AM, Thursday, 1 July 2010 through 11:59 PM, Saturday, 31 July 2010.
- 4) E.O. No. 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) E.O. No. 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 two miles north and south of the Anchor River mouth and one mile offshore were open to all sport fishing.

**Emergency Orders issued in 2011:**

- 1) E.O. No. 2-HC-7-04-11 reduced the combined sport fishery bag and possession limits of littleneck and butter clams in 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) E.O. No. 2-HC-7-05-11 reduced the combined personal use bag and possession limits of littleneck and butter clams in 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) E.O. No. 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) E.O. No. 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) E.O. No. 2-KS-7-16-11 required the use of only one 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 two miles north and south of the Anchor River mouth and one mile offshore beginning 12:01 AM, Friday, 1 July 2011 through 11:59 PM, Sunday, 31 July 2011.
- 6) E.O. 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.

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**Emergency Orders issued in 2012:**

- 1) E.O. No. 2-HC-7-04-12 reduced the combined sport fishery bag and possession limits of littleneck and butter clams in 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) E.O. No. 2-HC-7-05-12 reduced the combined personal use fishery bag and possession limits of littleneck and butter clams in 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) E.O. No. 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 king salmon season beginning 12:01 AM, Saturday, 19 May 2012. In addition, this emergency order 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) E.O. No. 2-KS-7-09-12 limited sport fishing gear to only one 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.
- 5) E.O. No. 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) E.O. No. 2-KS-7-13-12 prohibited sport fishing within one 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) E.O. No. 2-KS-7-21-12 closed waters of the Anchor River and Ninilchik River from the mouth upstream approximately two miles to 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) E.O. No. 2-KS-7-22-12 limited sport fishing gear to only one 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) E.O. No. 2-KS-7-23-12 prohibited the retention of king salmon while sport fishing within one 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 king salmon was allowed, but king salmon could not be retained or possessed. King salmon that were caught could not be removed from the water and had to be released immediately.

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- 10) E.O. No. 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) E.O. No. 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, July 31 2012.
- 12) E.O. No. 2-KS-7-39-12 prohibited sport fishing for king salmon in the Ninilchik River beginning, 12:01 AM, Monday, 16 July 2012 through 11:59 PM, Wednesday, 31 October 2012. This closure prohibits all sport fishing for king salmon, including catch-and-release fishing. King salmon could not be retained or possessed; king salmon caught while fishing for other species could not be removed from the water and had to be released immediately.
- 13) E.O. No. 2-KS-7-41-12 prohibited the retention of king salmon while sport fishing within one 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 a.m., Monday, July 16, 2012, through 11:59 p.m., Tuesday, July 31, 2012. Catch-and-release fishing for king salmon is allowed, but king salmon could not be retained or possessed. King salmon that are caught could not be removed from the water and had to be released immediately.
- 14) E.O. No. 2-KS-7-44-12 superseded Emergency Order No. 2-KS-7-41-12, issued Friday, July 13, 2012. This emergency order prohibits sport fishing for king salmon in the salt waters of Cook Inlet north of the latitude of Bluff Point beginning 12:01 a.m., Thursday, July 19, 2012, through 11:59 p.m., Tuesday, July 31, 2012. King salmon could not be retained or possessed. King salmon caught while fishing for other species could not be removed from the water and had to be released immediately.

**Emergency Orders issued in 2012:**

- 1) E.O. No. 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 king 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 emergency order was effective from 12:01 AM, Wednesday, 1 May 2013 through 11:59 PM, Sunday, 30 June 2013.
  - 2) E.O. No. 2-KS-7-04-13 established a combined annual limit of two king 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 king 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 emergency order was effective from 12:01AM, Wednesday, 1 May 2013 through 11:59 PM, Sunday, 30 June 2013. Any king 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 two king salmon annual limit after 12:01 AM, Wednesday, 1 May 2013, but did count against the Cook Inlet annual limit of five king salmon.
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- 3) E.O. No. 2-KS-7-05-13 limited sport fishing gear to only one 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) E.O. No. 2-KS-7-06-13 reduced the bag and possession limit for king salmon in the Ninilchik River drainage to one king 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 king salmon or a naturally-produced (wild) king salmon. Beginning in July, anglers could only retain hatchery king salmon. This emergency order was effective beginning 12:01 AM, Wednesday, 1 May 2013 through 11:59 PM, Thursday, 31 October 2013
  - 5) E.O. No. 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 the Homer Spit. This emergency order was effective beginning 12:01 AM, Thursday, 23 May 2013 through 11:59 PM, Tuesday, 31 December 2013.
  - 6) E.O. No. 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 the Homer Spit. This emergency order was effective beginning 12:01 AM, Thursday, 23 May 2013 through 11:59 PM, Tuesday, 31 December 2013.
  - 7) E.O. No. 2-KS-7-17-13 superseded Emergency Orders No. 2-KS-7-03-13 and No. 2-KS-7-06-13 issued 18 April 2013. This emergency order closed waters of the Anchor River, Deep Creek, Ninilchik River, and Stariski Creek from the mouth upstream approximately two 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.
  - 8) E.O. No. 2-KS-7-18-13 superseded Emergency Order No. 2-KS-7-04-13, issued 18 April 2013. This emergency order prohibited king salmon fishing (including catch-and-release) while sport fishing within one 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). King 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) E.O. No. 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) E.O. No. 2-KS-7-35-13 prohibited sport fishing for king salmon in the Ninilchik River drainage effective beginning 12:01 AM, Tuesday, 16 July 2013 through 11:59 PM, Thursday, 31 October 2013.
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Appendix A2.–Dates when snagging was opened by EO at the Homer Spit NDFL.

Year	Broodstock		
	Early-run Chinook salmon	Coho salmon	Pink salmon
1989	Sat, 24 Jun	Sat, 02 Sep	Sat, 01 Jul
1990	Sun, 24 Jun	Mon, 17 Sep	
1991	Mon, 24 Jun	Wed, 18 Sep	
1992	Wed, 24 Jun	Fri, 18 Sep	Tue, 28 Jul
1993	Thu, 24 Jun	Wed, 22 Sep	Wed, 04 Aug
1994	Fri, 24 Jun	Wed, 14 Sep	
1995	Wed, 28 Jun	Thu, 14 Sep	
1996		Sun, 08 Sep	
1997	Wed, 02 Jul–Mon, 07 Jul	Sat, 20 Sep	
1998	Wed, 01 Jul–Sun, 05 Jul	Fri, 18 Sep	
1999	Wed, 30 Jun–Sun, 04 Jul	Fri, 24 Sep	
2000	Sat, 24 Jun–Sun, 02 Jul	Fri, 22 Sep	
2001	Fri, 29 Jun–Sun, 08 Jul	Sun, 16 Sep	
2002	Fri, 28 Jun–Sun, 07 Jul	Fri, 13 Sep	
2003	Wed, 25 Jun–Sun, 06 Jul	Wed, 17 Sep	
2004	Thu, 01 Jul–Mon, 05 Jul	Fri, 10 Sep	
2005	Wed, 29 Jun–Fri, 01 Jul	Wed, 14 Sep	
2006	Thu, 06 Jul–Sun, 09 Jul		
2007	Thu, 05 Jul–Mon, 09 Jul		
2008		Fri, 12 Sep	
2009			
2010			