Fishery Management Report No. 10-38

Recreational Fisheries in the Lower Cook Inlet Management Area, 2008-2010, with updates for 2007

by

Nicole J. Szarzi,

Carol M. Kerkvliet,

Barbi J. Failor,

and

Michael D. Booz

October 2010

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

Symbols and Abbreviations

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

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

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

FISHERY MANAGEMENT REPORT NO. 10-38

RECREATIONAL FISHERIES IN THE LOWER COOK INLET MANAGEMENT AREA 2008-2010, WITH UPDATES FOR 2007

by

Nicole J. Szarzi,
Carol M. Kerkvliet,
Barbi J. Failor,
and
Michael D. Booz
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

October 2010

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

Nicole J. Szarzi, Carol M. Kerkvliet, Barbi J. Failor and Michael D. Booz
Alaska Department of Fish and Game, Division of Sport Fish,
3298 Douglas Place, Homer, Alaska USA

This document should be cited as:
Szarzi, N. J., C. M. Kerkvliet, B. J. Failor and M. D. Booz. 2010. Recreational fisheries in the Lower Cook Inlet Management Area, 2008-2010, with updates for 2007. Alaska Department of Fish and Game, Fishery Management Report No. 10-38 Anchorage.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

This report is a detailed summary of the recreational fisheries in the Lower Cook Inlet Management Area from 2008 to 2010 with estimated angler effort, catch and harvest updated for 2007. Included are a description and historical overview of each fishery, how each fishery is managed, and sport fishery performance and escapement for 2007 to 2010.

Key words: Lower Cook Inlet Management Area, 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 being close 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 *Oncorhynchus gorbuscha*, coho *O. kisutch*, sockeye *O. nerka*, chum *O. keta* and Chinook *O. tshawytscha*). Fisheries for these species occur in fresh and salt water. The major salmon fisheries harvest Chinook and coho 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 (Fishing Lagoon) is stocked with salmon by the Alaska Department of Fish and Game, Division of Sport Fish (ADF&G, SF) and is a focal point of anglers fishing from shore. A popular fishery occurs on the area's anadromous and resident stocks of Dolly Varden *Salvelinus malma*. Steelhead/rainbow trout *O. mykiss* support popular catch-and-release sport fisheries. The LCIMA accounts for the largest annual landings of sport-caught halibut *Hippoglossus stenolepis* in Alaska. Rockfish species *Sebastes spp*. and lingcod *Ophiodon elongatus* are also harvested.

The state's largest recreational 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 (littleneck *Protothaca staminea* and butter clam *Saxidomus giganteus*) fishery in Southcentral Alaska occurs in Kachemak Bay. A fishery for Tanner crab *Chionoecetes bairdi*, reopened in 2008 after a 5-year closure due to low abundance of legal-sized crabs. 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.

A small fishery for coho salmon occurs on the west side of Cook Inlet. Western Cook Inlet also hosts small fisheries for chum salmon, 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 to 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.

Recreational angler effort and harvest in the LCIMA have been estimated using the Statewide Harvest Survey (SWHS) since 1977 (Mills 1979-1980, 1981a-b, 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.). 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. Creel surveys have been selectively used for fisheries that require more detailed information or inseason management and to validate the SWHS for fisheries of interest. The following summaries of recreational 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. Estimates for 2009 are preliminary and subject to revision.

Sport Fishing Effort

The LCIMA supports the second highest sport fishing effort in Alaska after the Upper Kenai Peninsula Management Area. From 1977 through 2006, the LCIMA accounted for an average of 13.0% of the total statewide recreational effort. Since 2007, average annual participation was 11% (Table 1).

The dominant sport fisheries in Central Cook Inlet, in terms of participation, are the marine fishery for halibut and salmon, the freshwater fisheries in the Anchor River, Deep Creek and the Ninilchik River, and the razor clam fishery. Most fishing in Lower Cook Inlet occurs in the marine waters for halibut and salmon. A small amount of effort for clams occurs across Kachemak Bay from Homer and for Tanner crab in Kachemak Bay. Very little freshwater sport fishing occurs in Lower Cook Inlet.

Sport Harvest

The LCIMA boasts the largest halibut fishery in Alaska. More halibut are harvested in the LCIMA than any other fish species. Halibut harvests for the area have increased since 1977 (Table 2). An average of approximately 130,530 halibut was harvested in the LCIMA from 2007 to 2009, almost twice the historical average and nearly 10% above the previous 5-year (117,915) average.

Chinook salmon in salt water are an important component of the sport harvest from LCIMA waters and have accounted for an average of approximately 10% of the annual statewide harvest and nearly 25% of the annual Cook Inlet harvest since 1999. LCIMA Chinook salmon harvests peaked at nearly 33,000 in 1993. Estimated harvests in 2008 and 2009 are the lowest since the 1980s (Table 3) because of poor wild and hatchery runs in both LCIMA and the remainder of Cook Inlet (Perschbacher *In prep* a-b; Cope *In prep*; Ivey et al. *In prep*).

Coho salmon are the predominant salmon species harvested in the LCIMA in numbers of fish. They have comprised an average of 4% of the total annual statewide harvest since 1999 and 16% of the annual Cook Inlet harvest since 1999. Harvests of coho salmon were stable from 1977-1988 and increased sharply in 1989 as stocked coho salmon from a new stocking program began returning to Homer Spit (Table 4). 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 2001-2005 are the result of good survival of Cook Inlet coho salmon stocks and additional stocked fish to the Homer Spit from 2001-2004 that had good survival. The decline in coho salmon harvests since 2006 is partly the result of poor returns of stocked coho salmon to the Nick Dudiak Fishing Lagoon (see Coho Salmon Stocked Fisheries section).

Dolly Varden rank fourth amongst the most commonly harvested fish from the LCIMA, averaged a fifth of the annual statewide harvest in 1999 through 2009 and 19% of the total Cook Inlet harvest during that period. LCIMA Dolly Varden harvests in 2007 through 2009 were within the range of historical harvests since a 2 fish bag limit was implemented in 1991 (Table 5) (see Dolly Varden section).

The LCIMA has the largest sport fishery for razor clams in Alaska. The razor clam harvest in 2007 was the lowest since 1971 (Table 6). This is likely because diggers avoided young small clams from recent spawning events and because a die-off occurred in 2004. Razor clam harvest increased in 2008 and 2009 as small clams grew to a more desirable size for harvest.

The LCIMA also supports the largest hardshell clam fisheries north of Southeast Alaska (Table 7). In 2007-2009, LCI hardshell clam harvests continued to decline because littleneck clam populations are low on many Kachemak Bay beaches (Table 7).

The Tanner crab fishery in the LCIMA reopened in 2008 with a bag limit of 5 crabs. Participation and harvest had been considerably higher than in 2001 when the bag limit was also 5 for most of the fishery (Table 7).

CHINOOK SALMON FISHERIES

AREAWIDE OVERVIEW

Areawide Historical Harvest and Escapement

Saltwater Chinook salmon fishing occurs throughout the LCIMA, mostly from boats fishing within 3 miles of shore. The harvested fish originate in streams from within the LCIMA, other Cook Inlet tributaries and Southeast (SE) Alaska, British Columbia, Washington and Oregon streams (McKinley 1999, Begich 2007a, R. Begich, ADF&G Sport Fish, Soldotna, personal communication). Chinook salmon from streams outside Cook Inlet that are feeding in area salt waters are caught throughout the year. Cook Inlet Chinook stocks are caught during their spawning migration from April to August.

During April to August in Lower Cook Inlet (LCI), the saltwater harvest is dominated by stocks of non-Cook Inlet origin (McKinley 1999; Begich 2007a, R. Begich, ADF&G Sport Fish, Soldotna, personal communication). During April to August in Central Cook Inlet (CCI), fish from Cook Inlet tributaries are generally more prevalent in the harvest (McKinley 1999; Begich 2007a).

Most saltwater Chinook salmon fishing during September through March occurs south and east of a line from Bluff Point to Point Pogibshi.

Cook Inlet stocks migrate along a corridor within one mile of shore, while non-Cook Inlet stocks are scattered further offshore (McKinley 1999; Begich 2007a). Poor fishing near shore motivates anglers to fish offshore, changing the composition of the harvest in some years from more Cook Inlet fish to more non-Cook Inlet stocks.

Prior to 2002, the average saltwater Chinook salmon harvest from CCI was higher than from LCI and Kachemak Bay. Since 2002, more Chinook salmon were taken from LCI and Kachemak Bay (Table 3). This can be partially attributed to growing popularity of the saltwater troll fishery for nonlocal "feeder" Chinook salmon and stocked fisheries.

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 marine waters of the LCIMA reported by guides are similar in magnitude to estimates of harvest from the Statewide Harvest Survey (SWHS) (Table 8) (Howe et al. 2001c, 2001d; Walker et al. 2003; Jennings et al. 2004, 2006a-b; Jennings et al. 2004, 2006a-b, 2007, In prep.).

Chinook salmon have been stocked since the mid 1980s at the Nick Dudiak Fishing Lagoon (Fishing Lagoon), Seldovia and Halibut Cove Lagoon. Harvests have been assessed by the SWHS continuously since the inception of the stocking program at the Fishing Lagoon and averaged 20% of the areawide marine harvest through 2003. Since 2004, the contribution of stocked Chinook salmon has declined to an annual average of 12% of the areawide harvest (Table 3). The decline is a result of poor marine survival of stocked smolts partly due to low fitness from loss of the heat source in the Sport Fish Division hatcheries in 2003 and 2004. Unknown factors in the marine environment that resulted in poor wild returns to Cook Inlet in 2008 and 2009 are likely to have contributed to poor survival of hatchery runs as well.

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 is closed to 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 in Kachemak Bay or to have originated from stray stocked fish. Few Chinook salmon are harvested in LCIMA streams in WCI.

Freshwater harvests have remained fairly stable except during 1991 through 1997 when Ninilchik River had returns from years with high stocking rates and in 2008 when Chinook salmon returns were poor. The proportion of the total LCIMA Chinook harvest that is taken from Anchor River, Deep Creek and Ninilchik River combined declined from nearly 40% in 1978 to a low of 13% in 2005 as saltwater fishing expanded. The proportion of the area harvest taken in Anchor River, Deep Creek, and Ninilchik River increased to 25% in 2007 and 2008 with the decline in hatchery returns to stocked locations. The overall stability of freshwater harvests is attributed to restrictive sport fishing regulations in place since the inception of the fisheries to protect these relatively small-sized streams from overharvest in light of their popularity. More Chinook salmon have been harvested from Ninilchik River than Anchor River on average, despite Anchor River being larger, because Ninilchik River is stocked. This will probably change because Anchor River regulations were liberalized before the 2008 fishing season. The effects of the regulation changes are unknown because poor fishing conditions in 2008 limited fishing opportunity and low returns in 2009 and 2010 resulted in a fishery closure and fishery restrictions, respectively.

Chinook salmon escapements were counted in the Ninilchik River during 1999-2005 and the Anchor River since 2003. Deep Creek Chinook salmon escapement enumeration was attempted in 1997-2000, but was unsuccessful. The Anchor River has by far the largest run of Chinook salmon among the three streams.

Areawide Fishery Management and Objectives

Chinook salmon sport fishing regulations typically have not been changed inseason in the LCIMA because escapements have been indexed and harvests estimated postseason. Harvest guidelines contained in 5 AAC 58.055 Upper Cook Inlet Salt Water Early-run King Salmon Management Plan and 5 AAC 58.060 Lower Cook Inlet Winter Salt Water King Salmon Sport Fishery Management Plan have not been exceeded. The Kenai River Late-Run King Salmon Management Plan (5 AAC 21.359) requirement that the marine Chinook salmon sport fishery in CCI close if the projected Chinook salmon escapement to the Kenai River is less than 17,800 fish has not been invoked (Szarzi and Begich 2004a-b).

Limited inseason regulation changes have been made by emergency order (EO) (Appendix A1). The Nick Dudiak Fishing Lagoon (Fishing Lagoon) has been opened to snagging for Chinook salmon almost annually when stocked fish returning to the Fishing Lagoon mature sexually to the point that they quit biting and cannot be harvested using conventional sport fishing methods by provision 5 AAC 58.030 (d). Fishing seasons for hatchery-produced Chinook salmon in Ninilchik River have been liberalized to increase the harvest. In Deep Creek, Chinook salmon seasons have increased because fish surplus to sustainable escapements have occurred.

The ability to estimate the entire Anchor River Chinook salmon escapement has resulted in more inseason adjustments both to liberalize the fishery in 2004, and to restrict the fishery in 2009 and 2010.

CENTRAL COOK INLET SALTWATER CHINOOK SALMON FISHERY

Fishery Description

Most 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. Access to this fishery occurs primarily near the mouths of 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 Deep Creek beach. The unstable beach at Deep Creek precludes most private launching or loading of boats except at high tide. Private boats launch from the Anchor River beach at tide levels that expose the sandy beach surface and from a primitive boat launch in the Anchor River estuary 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.

This recreational fishery is essentially the first harvest of Chinook salmon returning to Cook Inlet tributaries. In the commercial 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 fishery targets a mixture of Chinook salmon stocks found in Cook Inlet marine waters. Cook Inlet stocks with early run timing (late April through late June) include the small central Kenai Peninsula drainages (Stariski Creek, Deep Creek, Anchor River and Ninilchik River), and larger drainages in upper and northern Cook Inlet (Kasilof, Kenai, and Susitna rivers) (McKinley 1999, Begich 2007a, R. Begich, ADF&G Sport Fish, Soldotna, personal communication). Cook Inlet stocks with late run timing (late June through early August) include Kenai River and, to a lesser extent, Kasilof River. Immature fish (nonspawning fish commonly referred to as "feeders") are harvested throughout the summer and are of non-Cook Inlet origin, including Southeast Alaska, British Columbia, and to a lesser extent Washington and Oregon (McKinley 1999, Begich 2007a, R. Begich, ADF&G Sport Fish, Soldotna, personal communication).

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, 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.

The largest annual marine harvest of the two stocks closest to the fishery that were coded-wire-tagged, Deep Creek and Ninilchik River hatchery fish, were estimated to be fewer than 300 and fewer than 200, respectively, during the years that all the returning age classes were tagged (Deep Creek 1998-2000; Ninilchik 1996-2002) (McKinley 1999, Begich 2007a, R. Begich, ADF&G Sport Fish, Soldotna, personal communication). Deep Creek Chinook salmon comprised 3.2% (1999) and 1.6% (2000) of the harvest. Ninilchik hatchery-reared fish were between 0.3% and 3.9% of the marine harvest from 1996-2000 and averaged 1.7% (Szarzi and Begich 2004a, Begich 2007a). The variation in the contribution of Ninilchik 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) was likely low due to similar run sizes and fishing regulations. Marine harvest has remained relatively stable since 1996 and fishery regulations mostly static; therefore, the contribution of nearby LCIMA Chinook salmon stocks is likely similar to the levels found in the 1996-2002 study. The 2-mile increase in the area open to fishing at the mouth of the Anchor River in 2008 has not coincided with an increase in the estimated marine harvest; therefore, the contribution of the Anchor River may not have increased.

Maturity sampling of coded wire tagged fish collected during 1996 through 2002 indicated that mature (spawning) fish taken in the fishery were mainly of Cook Inlet origin and that immature (nonspawning) fish were mainly non-Cook Inlet origin (McKinley 1999, Begich 2007a, R. Begich, ADF&G Sport Fish, Soldotna, personal communication). An estimated average of about 2,600 mature early-run Chinook salmon whose origin could not be determined from coded wire tags, but that were presumed to be from Cook Inlet systems, were harvested each year of the study. This indicates that other non-LCIMA Cook Inlet stocks account for most of the early-run marine harvest of mature fish.

The proportion of immature (non-Cook Inlet) fish in samples taken during the 1996-2002 study, ranged between 20% to slightly over 50% of the harvest annually (McKinley 1999, Begich 2007a, R. Begich, ADF&G Sport Fish, Soldotna, personal communication). A majority of mature spawning fish sampled during the 1996-2002 study were harvested within ¾ mile of shore. The majority of fish taken more than ¾ miles from shore were immature fish (nonspawners). 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 to maximize fishing success.

Historical Harvest

Sport anglers began fishing 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 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.

Expansion of the marine fishery in the early 1990s raised concerns about the impact on Cook Inlet Chinook salmon stocks, particularly those originating from small local streams and the Kenai River. A suite of restrictions were implemented during the early-run fishery with passage of 5 AAC 58.055 Upper Cook Inlet Salt Water Early-run King Salmon Management Plan in 1996 by the Alaska Board of Fisheries (BOF; see Fishery Management and Objectives section; Szarzi and Begich 2004a). After 1995, participation and harvest stabilized below their 1995 peak, presumably as a result of the fishery restrictions.

Information about harvest and fishing effort is available from department creel surveys conducted at the Deep Creek access from 1972-1986 and at the Anchor River/Whiskey Gulch access 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 after the creel survey ended because the SWHS determines 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, a creel survey was conducted at Deep Creek, Whiskey Gulch, and Anchor River (McKinley 1995, 1996) to estimate early- and late-run harvest, total participation in the combined Chinook salmon and halibut fishery, and to verify the SWHS data. Estimates from the SWHS were thought to be more accurate and complete than the creel 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 June 24 (early run) and after June 24 (late run). This allows the SWHS to generate separate estimates for the early and late runs.

Fishery Management and Objectives

The CCI marine Chinook salmon fishery has been regulated by the Upper Cook Inlet Salt Water Early-run King Salmon Management Plan since its adoption in 1996 (Szarzi and Begich 2004a). The plan creates a special harvest area from Bluff Point north to Ninilchik (Figure 3). This area extends 1 mile seaward from the beach. From April 1 through June 30, within this special harvest area, guides cannot fish while guiding clients and an angler cannot fish for any species of fish for the remainder of the day after harvesting a Chinook salmon, but may fish outside the special harvest area.

Three conservation zone areas, which are closed to fishing for all species from April 1 through June 30, are located within this special harvest area. These zones extend 1 mile seaward and encompass the area from the mouth of the Ninilchik River to 2 miles south of Deep Creek, 1 mile on either side of Stariski Creek and 1 mile on either side of the mouth of the Anchor River.

A harvest guideline of 8,000 Chinook salmon governs the fishery from April 1 to June 30. 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.

Management of the Cook Inlet marine late-run Chinook salmon recreational fishery north of Bluff Point is addressed in the BOF-adopted Kenai River Late-Run King Salmon Management Plan (5 AAC 21.359) because it is assumed that a portion of the harvest is late-run Chinook salmon of Kenai River origin. The plan states that if the spawning escapement in the Kenai River is projected to be less than 17,800 late-run Chinook salmon, the department shall close the recreational fisheries in the Kenai River and in the salt waters of Cook Inlet north of the latitude of Bluff Point to the taking of Chinook salmon.

The projected escapement to the Kenai River has not been less than 17,800 and restrictions to the marine fishery have not been required since adoption of the threshold in 1999.

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 escapement to the Ninilchik River, Deep Creek and the Anchor River is not apparent from fishery data (see Central Kenai Peninsula freshwater Chinook sections). Some users are concerned that the marine early-run Chinook salmon fishery may impact the early-run Kenai River fishery, but the data do not support the belief that Kenai River stocks dominate the harvest, but rather, that the harvest consists of many stocks both from within and outside Cook Inlet.

At its meeting in November 2007, the BOF liberalized the marine and freshwater fisheries targeting Anchor River Chinook salmon because the sonar/weir project implemented in 2003 to count the entire run found harvest rates were below sustainable levels and the stock could sustain more harvest. The BOF increased the open saltwater area an additional mile on either side of the Anchor River mouth. Proposals to increase the closed saltwater area around the mouths of Deep Creek and the Ninilchik River were not passed because the Chinook salmon escapement index counts in both streams were regularly within the respective escapement goal ranges.

During its meeting in 2010, the BOF will address proposals to: (1) open saltwater fishing from shore at the mouths of Deep Creek and the Ninilchik River during freshwater king salmon openings; (2) increase the saltwater closed area at the Anchor River mouth from 1 to 2 miles north and south of the mouth; (3) to close all marine waters in the special harvest area from the

southern boundary at Bluff Point, north to the latitude of the Ninilchik River whenever Anchor River or Deep Creek Chinook salmon fisheries are closed; and (4) eliminate the 5 Chinook salmon annual limit and recording requirement north of Bluff Point during October 1-March 31.

Fishery Performance in 2007-2010

Despite the reports of slow fishing both nearshore and offshore, the 2007 estimated harvest in the SWHS of 4,015 (Table 9) was within the range of recent harvests since 1996.

Poor weather during much of 2008 frequently kept anglers on shore. Fishing success was generally reported as low when anglers were able to fish. Poor returns to many Cook Inlet tributaries may have contributed to low harvests, particularly during the early run. The estimated harvest from the SWHS in 2008 of 2,137 was the lowest recorded since 1983.

Marine Chinook salmon fishing success in 2009 was characterized as fair to good, but anglers may have confused good weather with good success; long unbroken stretches of sunny weather encouraged the public to get out and participate, but estimated harvests in the SWHS were the lowest since the mid 1980s (Table 9). Chinook salmon escapements to many Cook Inlet tributaries were below average for the second year in a row and may have been the cause of the low harvest.

Fishing for Chinook salmon was more productive in 2010 than the previous 2 years, based upon angler reports. Fishing success in the salt water around the Anchor River mouth was reported as good during June, and angler success was fair to good for Chinook salmon in July from near shore in the Anchor River area north to the Ninilchik River. Fishing offshore where feeder Chinook salmon are more commonly encountered was also reported as good.

LOWER COOK INLET AND KACHEMAK BAY SALTWATER CHINOOK SALMON FISHERIES

Fishery Description

Anglers have fished for Chinook salmon for many years in the waters of LCI and Kachemak Bay. Effort is concentrated during the summer months, but boat anglers are known to have harvested immature "feeder" Chinook salmon in the off-season during the 1960s or earlier. ADF&G SF began ongoing Chinook salmon stocking programs for sport anglers in Halibut Cove Lagoon in 1979, the Fishing Lagoon on the Homer Spit in 1984, and in Seldovia starting in 1987 that created additional fishing opportunity for shore and boat anglers (Figure 4). Anglers generally troll within a mile of shore for Chinook salmon, except near stocked locations where they more frequently fish from anchored boats or from shore. Most Chinook salmon fishing in LCI and Kachemak Bay takes place from boats.

Information about the origin, age, length, sex and sexual maturity of the Chinook salmon harvest has been collected during formal department sampling programs, from salmon derbies and from heads of fish missing their adipose fins (fleshy fins on the back immediately preceding the tail) (indicating that the fish might be tagged with a coded wire tag) voluntarily turned in by sport anglers. Sport harvested Chinook salmon caught by boat anglers were sampled by department personnel during the off-season (prior to May and after July) from 1994 through 1996, both early-run (May through June 24) and late-run (June 25 through mid July) summer harvests in 1997 and 1998, and early-run harvests only after 1998 through 2002 (R. Begich, ADF&G Sport Fish, Soldotna, personal communication). Formal sampling of the summer Chinook fishery in

LCI has ended, but staff continues to encourage anglers to turn in heads of Chinook salmon missing their adipose fins. Staff also sample winter fishing derby harvests for biological information and recover coded wire tags from fish to determine their origin as time permits.

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, 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 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 stocks returning to the local stocking projects, as well as 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. Sexually immature fish are more predominant in the summer harvest in LCI and Kachemak Bay than in CCI.

Historical Harvest

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

The SWHS questionnaire was modified to provide estimates of winter 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 takes place near or south of Bluff Point.

Nonlocal feeding Chinook salmon from many stocks dominate both the summer and winter harvests south of Bluff Point; therefore, the fishery does not pose a threat to conservation of Cook Inlet stocks or visiting nonlocal stocks. The potential harvest of stocks that fall under the strictures of the Endangered Species Act is possible, but the likelihood of impacting those stocks is remote.

Fishery Management and Objectives

Boat anglers fishing marine waters of LCI catch primarily immature Chinook salmon throughout the year. Immature fish offer opportunity as a primary target and as an alternative when other fisheries are poor. Although regulated by a limit of 5 during April through September, no annual bag limit is in place during the rest of the year. Additional opportunity is afforded throughout the year by the daily bag and possession limits in LCI and Kachemak Bay marine waters, which are 2 Chinook salmon compared to 1 in the remainder of Cook Inlet salt waters. Waters in LCI and Kachemak Bay open by regulation to snagging on June 24, except in the vicinity of the Fishing Lagoon on the Homer Spit (see Stocked Chinook Salmon Fisheries section).

Historically, no inseason management of this fishery occurred. The harvest of Chinook salmon has not had an annual limit or harvest recording requirement during October 1 to March 31 since 1988, except during 2001, when the BOF required harvests during the winter fishery be included in the 5 Cook Inlet Chinook salmon annual limit, based upon indications that the fishery was growing (Szarzi and Begich 2004b). The regulation was rescinded by the BOF in 2002, but it established the Lower Cook Inlet Winter Salt Water King Salmon Sport Fishery Management Plan (5 AAC 58.060) which was implemented early in the winter of 2002. The plan contains a sport harvest guideline of 3,000 Chinook salmon for the waters of the LCIMA south of Bluff Point from October 1 through March 31 and stipulates the harvest will be estimated annually with the SWHS. Any restriction of this fishery necessitated by exceeding the harvest guideline would likely be based on data from previous seasons, as no inseason information is available.

During 2010, the BOF will consider a proposal to allow use of bow and arrow to take salmon in Kachemak Bay where snagging is open by regulation, excluding the Fishing Lagoon. The BOF will also consider a proposal to eliminate the Chinook salmon annual limit and recording requirement north of Bluff Point during October 1-March 31.

Fishery Performance 2007-2010

The SWHS estimates harvest, catch and effort for the calendar year; therefore, estimate trends often do not match reported angler success when comparing between winter seasons; and summer trends can be obscured by the variability in winter harvests and vice versa. Trends in SWHS estimates for 2007-2009 (Tables 3 and 11) did not match fishing success reported by anglers.

Cold weather restricted access to Kachemak Bay and LCI during much of the winter of 2006-2007. Fishing for feeders was reported to be poor during the summer of 2007 until late August when fishing improved markedly.

Winter Chinook salmon fishing was reported as fair to good for most of the 2007-2008 winter, and then slowed during the spring of 2008. Trolling success on the south side of Kachemak Bay and Bluff Point was sporadic in May because strong winds and large seas kept boats from fishing many days. In June, fishing improved along Bluff Point, Glacier Spit, and at Point Pogibshi. Trolling success for Chinook salmon off the south side of Kachemak Bay and at Bluff Point was poor in July. In late July, trolling for Chinook salmon was reported as fair for Cook Inlet and Kachemak Bay, then slow through most of August.

Saltwater Chinook salmon fishing was reported as slow during the 2008-2009 winter fishery and continued to be slow in the spring of 2009. Most anglers fished the north side of Kachemak Bay. From mid to late-May, trolling for Chinook salmon was fair in LCI and Kachemak Bay, and fair to good off Bluff Point. Trolling success was sporadic off the south side of Kachemak Bay and Bluff Point throughout most of the summer months. Chinook salmon fishing in the fall 2009 and winter of 2009-2010 was reported as fair to good, with the best success reported off Glacier Spit and Bluff Point.

Slow to fair Chinook salmon fishing was reported in Kachemak Bay during summer 2010. Fishing success was generally fair to good during most of the fall of 2010. Anglers fishing for coho salmon in saltwater areas approximately 20 miles offshore reported good catches of Chinook salmon.

STOCKED CHINOOK SALMON FISHERIES

Early-run Chinook salmon are stocked in the Fishing Lagoon on the Homer Spit, in Halibut Cove Lagoon, and in Seldovia to create "terminal" fisheries, salmon returning will not naturally reproduce because there is no spawning area available. These stocked fisheries are managed so all returning fish are harvested. The department 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 the Fishing Lagoon.

Run-timing is from approximately May 9 through mid-July, with a peak in mid-June. The average weight of returning adults is 15 to 17 pounds. The broodstock is from the Ninilchik River where adults are artificially spawned and eggs fertilized before the eggs are transported to the Ft. Richardson Hatchery in Anchorage to be reared. The fish are currently reared for 2 years in the hatchery before their release as smolt at the saltwater stocking locations until the program is moved to the next hatchery in Anchorage, where heated water will accelerate their growth and they can be raised to stocking size in 1 year.

Smolt are held for up to 5 days after they are stocked and fed by volunteers twice each day. They are held at the saltwater stocking locations to increase fidelity to the stocking locations: Fishing Lagoon and Halibut Cove Lagoon. The benefits of this practice have not been tested.

Smolt size at stocking was reduced in 2001 to reduce the number of 1-ocean "jacks" in the return to these stocked locations. Anecdotal reports of fewer jacks in the return were not confirmed by the department in the years after smolt size was reduced.

All salmon produced by department hatcheries are marked by banding patterns on the otoliths. The banding pattern on the otoliths of salmon stocked in Cook Inlet are different from the pattern on fish stocked in other waters.

Chinook salmon have been sighted in Bradley River, Humpy Creek and Seldovia River, streams not known to have wild Chinook stocks prior to the stocking program. Otoliths extracted from three Chinook salmon caught by department staff in the Seldovia River in 2005 were banded with the pattern of Cook Inlet hatchery-produced Chinook salmon, indicating they had strayed in 2005 from a Cook Inlet stocking program.

Commercial, subsistence or personal use fisheries operate in proximity to stocking sites and conflicts over interception of fish stocked for sport use in other fisheries have been addressed by the BOF at almost every LCI meeting. There are no proposals for the 2010 BOF meeting specifically targeted at the stocked fisheries in Kachemak Bay and Lower Cook Inlet, but a proposal to allow use of "archery tackle" at locations open to snagging in Kachemak Bay could impact the stocked fisheries at Halibut Cove Lagoon and Seldovia.

Nick Dudiak Fishing Lagoon

Early-run Chinook and early- and late-run coho salmon smolts (see the Coho Salmon Fisheries section) are stocked in the Fishing Lagoon on the Homer Spit, located in Kachemak Bay (Figure 4). The Fishing Lagoon 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 Fishing Lagoon. 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 recreational anglers.

Early-run Chinook salmon have been stocked by the department in the Fishing Lagoon since 1984 (Table 12). From 1984 until 1993, the broodstock for the early-run came from Crooked Creek, a tributary to the Kasilof River. Between 1993 and 1999, adults were collected from the Fishing Lagoon and spawned in the hatchery to produce the smolt stocked there. Since 2000, Chinook salmon from the Ninilchik River have been used as broodstock to produce the early run to the Fishing Lagoon. The goal is to stock 210,000 early-run Chinook salmon smolts and produce 6,500 returning adults, all of which are available for harvest in the recreational fishery. The average size of the returning adult is 15 to 17 pounds.

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

The first significant harvest of stocked early-run Chinook salmon occurred in 1987 (Table 13). Annual early-run Chinook salmon harvests from shore during 1988 through 2009 have ranged from 716 to 4,068. Below average harvests in 2008-2009 are attributed to poor returns partly because of low survival of stocked fish from loss of heated water at SFD hatcheries and additionally to ocean conditions that resulted in below average runs to many Cook Inlet tributaries. More fish returned in 2010 than in 2008 or 2009, but the run was lower than expected suggesting that the SF hatchery and ocean rearing conditions continue to impact Chinook salmon returns. The contribution to the harvest of anglers fishing from boats near the Homer Spit shoreline is difficult to assess because reporting harvest location is imprecise, but it may approach 1,000 fish in some years.

The Homer Spit stocked salmon sport fishery is not specifically addressed in a regulatory management plan. 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 by 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 that overlaps with the onset of the late coho salmon run. Through 1994, snagging was permitted at the Fishing Lagoon and the nearby area beginning on June 24. Snag opening dates in the Fishing Lagoon area have been more variable since 1994 (Appendix A2).

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

In 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 the department in the Homer Spit Enhancement Lagoon 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. 2007b).

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 (FRED) of ADF&G, where all five 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 (ASP) dock or from anchored vessels near the dock. A limited amount of trolling occurs in greater Halibut Cove at the mouth of the lagoon channel.

The annual stocking goal through 2006 was 105,000 early-run Chinook salmon smolts, to produce a run of approximately 3,000 adult fish. From 2001-2006, the number of fish stocked averaged about 109,000 (Table 12). The stocking goal was reduced to 50,000 smolts in 2007. The reduction was the result of reallocation of Chinook 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. The stocking goal returned to 105,000 in 2010 as transition to the new William Jack Hernandez Sport Fish Hatchery began.

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 their fishing location as the lagoon when they 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 most years. Chinook salmon returns in 2008 and 2009 were lower than expected and few fish were reported being seen at Halibut Cove Lagoon in 2010. Stocking rates that are half the historical amount and the low survival of stocked fish from loss of heated water at SF hatcheries and ocean conditions that resulted in below average runs to many Cook Inlet tributaries are the likely causes of the poor returns in 2008-2010.

Snagging is prohibited in Halibut Cove Lagoon until June 24 when Kachemak Bay and LCI open to snagging by regulation. On this date, the fish are maturing and angler efficiency using nonsnagging techniques is dwindling. A proposal before the BOF at its 2010 LCI meeting to allow the use of archery in Kachemak Bay locations open to snagging would impact the Halibut Cove Lagoon fishery.

This stocked return is subject to a commercial set gillnet fishery adjacent to the lagoon from the first Monday in June until September 30. 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, Bucher and Hammarstrom 1994-1999; Hammarstom and Dickson 2000; 2001; 2002; 2006, 2007; Hammarstrom and Ford 2009; 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.

Seldovia

Seldovia is located approximately 15 miles southwest of the 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. The release site was moved to upstream of a dam in Fish Creek, a small tributary to Seldovia Slough, in 2000 to increase the fidelity of fish to the release location (Szarzi and Begich 2004a). This is a terminal harvest fishery where all fish are intended for harvest and none spawn at the stocking location.

The annual stocking goal through 2006 was 105,000 early-run Chinook salmon smolts, to produce a run of approximately 3,000 adult fish. Number of smolts stocked averaged about 102,000 from 2001-2006 (Table 12). For the same reason that stocking was reduced at Halibut Cove Lagoon, a reallocation of hatchery space to rainbow trout rearing, the stocking goal for Seldovia was reduced to 50,000 smolts in 2007. Like Halibut Cove Lagoon, this reduction was temporary and the stocking goal returned to 105,000 in 2010 as the transition to the new SF hatchery got underway.

Estimation of sport angler participation, harvest and catch in Seldovia with the SWHS was discontinued in 2001. Prior to 2001, the largest reported harvest was 600 in 2000. Estimates were thought to be conservative because fewer than 30 respondents to the survey reported fishing in Seldovia some years, rendering the estimates inaccurate.

Like other locations around Kachemak Bay and Cook Inlet, runs to Seldovia have been reported to be poor since 2008. Some Seldovia community members blame the slow fishing on the change in stocking location from the harbor to Fish Creek, but the cause of reportedly below average runs is probably similar to Halibut Cove Lagoon: stocking rates half the historical amount, low survival of stocked fish from loss of heated water at SF hatcheries and ocean conditions.

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 fishery in Seldovia Bay. The annual possession limit is 20 Chinook per household. The fishery is opened for two 48-hour periods per week from April 1 to May 30 and one 36-hour period each of the first 2 weekends in August. The BOF adopted a proposal extending the April/May period by 10 days to May 30 at its February 1998 meeting. The highest reported subsistence harvest was 189 Chinook salmon in 2000 and the lowest was 3 reported in 2008 (Hammarstrom and Ford 2010).

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 prior to stocking from 1984 through 1988 (Hammarstrom and Ford 2010). Since 1991, when the run consists 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, Bucher and Hammarstrom 1994-1999; Hammarstom and Dickson 2000; 2001; 2002; 2006, 2007; Hammarstrom and Ford 2009; L. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer; personal communication).

In November of 2004, the BOF changed the start of the commercial set gillnet fishery season in the Southern District from the first Monday in June to a start date no earlier than June 1, to be opened by EO. The BOF directed the department 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, Bucher and Hammarstrom 1994-1999; Hammarstom and Dickson 2000; 2001; 2002; 2006, 2007; Hammarstrom and Ford 2009; 2010; L. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer; personal communication).

FRESHWATER CHINOOK SALMON FISHERIES

Fishery Descriptions

Three streams in the LCIMA 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. Only the waters from the mouth upstream approximately 2 miles are open for fishing and the spawning areas located upstream of 2 miles are permanently closed to salmon fishing. Anglers can easily access the entire 2-mile open fishing area. The streams have historically been open to the harvest of wild Chinook salmon on weekends and the Mondays following those weekends in late May and early 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 each stream.

Anchor River and Deep Creek

The Anchor River watershed is approximately 225 square miles in size and about 114 miles of the river have been identified as habitat for anadromous fish. The Deep Creek watershed is approximately 211 square miles in size; 106 miles of the river contain anadromous fish species. Water levels and water clarity in the Anchor River and Deep Creek are variable due to their length, relatively steep gradient, and drainage morphology that includes 1,000-foot cutbanks of loose substrate. Harvest success is related to water depth, flow rate and clarity during fishery openings. Typical spring conditions find both Deep Creek and Anchor River high and muddy for the first and second Chinook fishery openings, respectively, and generally flow subsides and clarity improves during the second opening in Deep Creek and third Chinook fishery opening in the Anchor River.

From 1978 to 1988, the Deep Creek and Anchor River Chinook salmon fishery opened for four 3-day weekends beginning on the Memorial Day weekend, and anglers were allowed to harvest 5 Chinook salmon larger than 16 inches from either drainage. In 1989, a fifth 3-day weekend was added to both fisheries. In 1996, a suite of fishery restrictions was adopted by the BOF for the Deep Creek and Anchor River fisheries and nearby marine fishery from Bluff Point north to

Ninilchik. The restrictions reduced the Deep Creek fishery to three 3-day weekend openings, and in both the Anchor River and Deep Creek, an angler could no longer fish for the remainder of the day after harvesting a Chinook salmon. The annual limit in the Anchor River and Deep Creek combined was reduced from 5 to 2 Chinook salmon over 16 inches.

Ninilchik 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. The Ninilchik River was stocked by SF with an average of 182,000 Chinook salmon smolts from 1988-1994 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 smolts in 1995. Hatchery-produced Chinook salmon can be recognized by the missing adipose fin. The timing of hatchery fish in the fishery estimated from harvest sampling is variable. The peak escapement to the egg-take weir, located approximately 4 miles upstream, is approximately 7 days later for hatchery fish than wild fish.

Historical Harvest

The Chinook salmon harvest from the Anchor River, Deep Creek and Ninilchik has been monitored since 1977 with the SWHS. The historical (1977-2006) Chinook salmon harvest average and harvest range has varied between streams (Anchor River=1,303, Deep Creek=920, and the Ninilchik River=1,684; Tables 14-16) and within a given stream: Anchor River range=578-2,787, Deep Creek=182-2,503, and Ninilchik River=420-5,316. Harvest variations between streams are attributed to differences in abundance, with the Anchor River supporting the largest wild stock fishery, and supplementation of the Ninilchik River with hatchery-produced fish boosting the 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 the 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, at the Homer Spit and in the Susitna River drainages, and effort in LCIMA freshwaters declined (Figure 5). In the early 1990s, participation stabilized in Anchor River and Deep Creek, while harvest increased. At the same time, both participation and harvest increased in Ninilchik River. The increases in harvests in the 1990s were the result of efforts to increase fishing opportunity in Anchor River and Deep Creek, with the 1989 addition of a fifth 3-day Chinook salmon opening. The return of the first major year class of stocked fish to Ninilchik River in 1991 bolstered harvest and effort there.

The marine fishery near the Anchor River and Deep Creek grew in the late-1980s and early 1990s. The increase in both the freshwater and marine fisheries and the coincidental decrease in escapements to Deep Creek and the Anchor River caused concerns that Anchor River and Deep Creek Chinook salmon were being overharvested. In 1996, marine restrictions (see CCI Saltwater Chinook Salmon Fishery section) and freshwater restrictions in the Anchor River and

Deep Creek, including reduction of the combined annual limit from the two streams to 2 and reduction of Deep Creek openings to three 3-day weekends, reduced and stabilized harvests in both the fresh and salt waters.

Anchor River

The annual Anchor River Chinook salmon harvest from 1977-1988 averaged 1,105, when the inriver fishery was open four 3-day weekends and had an annual limit of 5 kings. After the inriver fishery was liberalized to five 3-day weekends (1989-1995), the harvest average increased (average=1,647). Once the Upper Cook Inlet Salt Water Early-run King Salmon Management Plan was adopted and the annual limit combined with Deep Creek was reduced to 2 and anglers had to stop fishing after harvesting a Chinook salmon, the harvest average (1996-2001) dropped to 1,310.

In 2001, the Anchor River stock was classified as a stock of "management concern" because 4 of 6 recent escapement index counts from 1996-2001 were below the SEG range (Szarzi and Begich 2004a). The classification was accompanied by a reduction in fishery openings from 5 to 4. The harvest average (2002 and 2003) dropped to 1,029, similar to the average harvest when the fishery was previously open for four 3-day weekends in 1977-1988. A sonar and weir project, begun in 2003, found that many more Chinook salmon returned to the river than was evident from aerial surveys and fishery openings were again increased to five 3-day weekends in 2004. The harvest average (2004-2007) increased to 1,617, which was similar to the 1989-1995 average when there were 5 fishery openings, but when the annual limit was 5.

From 2003-2007, the inriver exploitation of the Anchor River stock averaged 12.8% and ranged from approximately 10% in 2003 to 18% in 2007.

Deep Creek

The Deep Creek Chinook salmon harvest averaged 667 during 1977-1988 when the inriver fishery was open four 3-day weekends with an annual limit of 5 Chinook salmon. After the inriver fishery was opened to five 3-day weekends (1989-1995), the harvest average increased (average=1,636). Once the Chinook salmon fishery was restricted to three 3-day openings in 1996, the harvest average (1996-2006) dropped to 740. During the years of Deep Creek weir operation to enumerate Chinook salmon (1997-2000), weir integrity was compromised or high water prevented installation at the start of the migration, so Chinook salmon escapements were undercounted. Resulting inriver harvest rates are maximum estimates and averaged 41% (1997-2000) and ranged from 27% in 1999 to 60% in 1998 (Begich and Evans 2005).

Ninilchik River

Prior to stocking, the average harvest from the Ninilchik River (1977-1990) was 990 Chinook salmon. During this period, the inriver fishery was open three 3-day weekends, the daily bag and possession limit was 1 king salmon, and the season limit was 5. Returns from stocking >85,000 Chinook salmon (1991-1997) resulted in fishery extensions of 3 to 14 days, in addition to the regulatory weekend openings, and an increase in the average harvest to 3,414 fish. The stocking reduction to 50,000 smolts in 1995 was accompanied by a reduction in the average harvest during 1998-2006 to 1,419.

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 1993-1996 and 2001-2002

(Boyle et al. 1993; Balland et al. 1994; Balland and Begich 2007; Marsh 1995 and Begich 2006b, 2007b). In 2006, hatchery-reared Chinook salmon comprised a minimum of 39% of the harvest from sampling the 3 regulatory weekend openings, but not the EO fishery, which lasted 31 days (Booz and Kerkvliet *In prep*). The inriver exploitation rates of wild Ninilchik River Chinook salmon, estimated from fishery surveys and weir counts of the entire Chinook salmon escapement, were 35% in 2000 and 33% in 2001 (Begich 2006b, Balland and Begich 2007).

Historical Escapement

Chinook salmon escapements to the Anchor River, Deep Creek, and the Ninilchik River have been assessed since 1962 (Tables 17-21). Techniques used to assess spawning escapement 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 (Table 17). 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.

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 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 Ninilchik River (500-900) were the 40th and 80th 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 (Bue and Hasbrouck *Unpublished*[1]) 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 25th to 75th percentiles of annual 1976-2000 helicopter aerial escapement counts for Anchor River (750-1,500) and Deep Creek (350-800) were established as the new sustainable escapement goal (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 15th percentile and the maximum observed wild Chinook salmon escapement to the egg-take weir during July 8-24, from 1994-2000.

Anchor River

The Anchor River goal was rescinded in 2004 because a sonar and weir project, begun in 2003, found that many more Chinook salmon returned to the river than indicated from aerial surveys.

[1] 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.

Dual-frequency Identification Sonar (DIDSON) was used during high spring flow in May and June (Table 18; Szarzi et al. 2007a). Beginning in 2004, a weir was installed as stream flow allowed and the escapement was censused. The site was located upstream of the fishery and just downstream of the confluence of the North and South forks. During the period when the escapement was monitored using DIDSON, the estimation of escapement was calculated from the net upstream fish passage. The estimate was considered conservative because all the fish that passed 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 postspawning steelhead trout emigrating to saltwater.

A new Anchor River lower bound SEG of 5,000 Chinook salmon was established in 2007. This goal was the posterior median of S_{MSY} (S_{MSY}=the number of spawners needed to produce the maximum sustained yield) that had been determined from a full probability spawner-recruit model that used 31 years (1977–2007) of aerial survey escapement indices, inriver recreational harvest estimates (1977-2007), plus 5 years (2003–2007) of weir/sonar estimates of escapement and age composition data (Szarzi et al. 2007a). Marine harvests were estimated from harvest rates of nearby stocks. The average Chinook salmon escapement estimate for the Anchor River from 2003-2007 was 10,195, near the estimated carrying capacity, and ranged from 8,945 to 12,016. In 2003, the sonar wasn't installed at the onset of the run; even so the count was 9,238 (Table 18).

Deep Creek

The Deep Creek SEG has remained unchanged since 2001. The average aerial Chinook salmon index for Deep Creek from 1976-2006 was 619, about midway in the SEG range (350-800), and ranged from 63 in 1992 to 1,190 in 1999 (Table 17). After the adjacent marine and inriver sport fisheries were restricted in 1996 (see Freshwater Chinook Salmon Fisheries - Fishery Management and Objectives section), Deep Creek escapement counts increased and were within or above the goal through 2007. A weir in operation from 1997-2002 to enumerate Chinook salmon escapements in Deep Creek was unsuccessful because of poor weir integrity in 1997 and because high water prevented installation at the beginning of the runs in 1998-2001.

Ninilchik River

From 1999-2005, the Ninilchik egg-take weir operation was extended to enumerate the entire escapement. Comparison of escapement counts for the entire run (May-August) to index counts during weir operation for egg takes (July) led to revision of the SEG range in 2007 to 550-1,300 (Table 18). The new SEG was the 15th percentile and the maximum wild escapement upstream of the egg-take weir during July 3-31 each year from 1999-2007 (Table 21). The change was 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.

The average escapement of Ninilchik River Chinook salmon during the SEG period (July 3-31) from 1999-2007 was 928 wild fish. Over this period, the SEG was reached 7 of the 9 years. The escapement fell short of the SEG range (550-1,300) in 2003 by 7 fish and in 2007 by 33 fish. The escapement approached upper end of the range in 1999, 2000, 2005 and 2006 (Table 21).

Fishery Management and Objectives

The overall objective of the LCIMA freshwater Chinook salmon fisheries is to manage the wild Chinook salmon stocks of the Anchor River and Deep Creek and the Ninilchik River wild fish,

by regulation, to provide sustainable and predictable fisheries. Specific objectives have been established for these stocks.

The objective for the Anchor River is to:

1. Determine a BEG that maintains the population at a level to ensure sustained yield.

The objective for Deep Creek is to:

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

Objectives for the Ninilchik River are to:

1. Ensure that annual wild Chinook salmon escapement upstream of the egg-take weir in the Ninilchik River falls within SEG range, established in 2007, of 550-1,300 during July 3-31.
2. Ensure that the historical age and sex composition are not significantly altered by supplemental production.
3. Stock 50,000 Chinook salmon smolt into the Ninilchik River to yield a 3% survival or 1,500 returning adults.
4. Provide approximately 2,500 additional angler-days of participation for Chinook salmon at the Ninilchik River during June with the stocking program.

The sport fisheries for wild Chinook salmon in the Anchor River, Deep Creek and Ninilchik River have been consistently and heavily restricted by regulation throughout most of their history. 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. Exceptions were Ninilchik River Chinook salmon fishery EO extensions during 1991-1996 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 during all three weekends discouraged anglers from fishing.

Since 1960, the open area for salmon fishing has been limited to the lower portions of all three drainages from the mouth, upstream approximately 2 miles. In 1996, the upstream spawning areas were closed to all fishing until August 1 to protect spawning Chinook salmon.

Anchor River

In 2001, the Anchor River stock was classified as a stock of "management concern" in response to the guidelines established in the Policy for Management of Sustainable Salmon Fisheries (5 AAC 39.222 (f) (21)) with 4 of 6 escapement index counts from 1996-2001 below the SEG (Szarzi and Begich 2004 a-b) (Table 18). Effective for the 2002 season, the BOF eliminated the last 3-day weekend, reducing the Anchor River Chinook salmon fishery openings to four 3-day weekends. In 2004, the fifth 3-day weekend opening was reinstated by EO after new information revealed that the Anchor River could support more harvest because many more Chinook salmon returned to the river than was indicated from aerial surveys. In 2005, the BOF passed a public proposal asking to reinstate the fifth 3-day weekend opening before the Memorial Day weekend.

Spawner-recruit analysis of the existing data through 2007 resulted in a new lower bound Chinook salmon SEG of 5,000. In 2007, the BOF cautiously liberalized the Anchor River fishery. The BOF had a host of proposed regulation changes to decide from, including proposals to: (1) extend the Anchor River weekly Chinook salmon openings from 3 to 5 or 6 days; (2) remove the regulatory 3-day weekend before Memorial Day weekend and add a 3-day weekend at the end of the current openings; (3) increase the annual limit from 2 to 5 Chinook salmon 20 inches or greater; (4) allow anglers to continue fishing in the Anchor River after harvesting a Chinook salmon; (5) change the ending date in the UCI Salt Water Early-Run King Salmon Management Plan from June 30 to June 24; and (6) reduce the closed area in the salt waters adjacent to the Anchor River mouth during April 1 to June 30 from 2 miles north and south from the mouth to 1 mile north and south of the mouth. With public input, 5 Wednesday openings were added after each of the five 3-day weekend openings, the annual limit for the Anchor River Chinook salmon was increased to 5 in combination with most other streams in Cook Inlet and the marine closed area north and south of the mouth was decreased from 2 miles to 1 mile.

A full probability spawner-recruit analysis was updated with escapement, age composition and harvest data collected through 2009. In 2010, department staff is recommending a change from a lower-bound SEG of 5,000 to an SEG range of 3,800 to 10,000 to the directors of CF and SF. The recommended lower end of the SEG of 3,800 is the point estimate (posterior median) of S_{MSY} from the model. The upper end of the range is the point estimate of carrying capacity: 10,000 from the updated model. The change is the result of the availability of more actual return data (2003-2009), but is conservative because production data are still unavailable for escapements near the lower bound of the SEG. The SEG range of 3,800 to 10,000 minimizes the risk of overfishing by establishing the lower bound at the point that maximizes the likelihood of achieving maximum sustained yield and yet allows liberalization of the harvest when escapements are large.

During the 2010 meeting, the BOF will consider 13 public proposals to restrict instream Anchor River Chinook salmon fishing regulations. The proposals are likely a response to escapements near or below the current SEG of 5,000 in 2008-2010. Three proposals that seek to roll back liberalizations implemented in 2007 would return the annual limit of Chinook salmon over 20 inches in length to 2, in combination with Deep Creek. Two proposals would rescind the Wednesday openings and reduce the number of regulatory 3-day weekend openings from 5 to 4 unless achievement of the escapement goal can be projected. Five proposals would restrict bait use by either: (1) eliminating the use of bait; (2) allowing bait use only after the escapement goal is projected to be met; or (3) allow use of only single hook, artificial lures or flies. Another proposal would require the use of circle hooks only. Lastly, a proposal would require the department to change the goal from a lower bound SEG to a range.

Deep Creek

Deep Creek Chinook salmon regulations have remained unchanged 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, and an EO in 2010 to eliminate bait use to mitigate the effects of increased fishing pressure from emergency closures and restrictions on the Kenai, Kasilof and Anchor rivers. Anglers continue to have three 3-day weekend openings and an annual limit of 2 Chinook salmon over 20 inches and anglers may not fish in Deep Creek on the same day after harvesting a Chinook salmon from Deep Creek or the Anchor River.

Escapements since the 1996 restrictions were mostly within the SEG range, with a few escapements above the range, indicating the current regulations are producing sustainable harvests.

At its 2010 meeting, the BOF will address proposals to manage Deep Creek fish stocks, including Chinook salmon in tandem with the Anchor River, based on Anchor River data. In conjunction with managing the 2 streams together, 2 proposals would make the regulations identical for the 2 rivers by adding a fourth 3-day weekend opening for Chinook salmon in Deep Creek before Memorial Day. Proposals to restrict bait use in the Anchor River include Deep Creek.

Ninilchik River

From 1978-2004, the Chinook salmon fishery was open on the Ninilchik River for three 3-day weekends beginning on the Memorial Day weekend, with a bag and possession limit of 1 king salmon 20 inches or larger and an annual limit of 5. Emergency orders increased the number of open fishing days for all Chinook salmon during 1991-1996 and in 2001 (Appendix A1), to maximize the harvest of hatchery-reared Chinook salmon. During 2002-2004 and 2006-2007, EOs increased the number of days when hatchery fish could be targeted. The BOF adopted a regulation in 2004 that increased the daily bag limit of Chinook salmon from 1 to 2, of which no more than 1 fish could be a wild Chinook salmon, to maximize the hatchery-reared harvest while protecting wild fish. In 2007, the BOF allowed anglers to harvest hatchery-reared fish after July 1 through December 31 to further increase the harvest of hatchery-reared fish.

There are no proposals before the BOF in 2010 addressing the Ninilchik River Chinook salmon freshwater fishery.

Fishery Performance and Escapement 2007-2010

In some years from 2007-2010 the Anchor River, Deep Creek and Ninilchik River experienced below average Chinook salmon runs (Tables 17-21). Harvests dropped from above average or average amounts in 2007, to record lows in 2009 for all three streams. Water conditions in the Anchor River and Deep Creek were unusually high and turbid throughout the fisheries in 2008 and unusually low and clear throughout the 2009 fisheries; otherwise, they were typical, with high muddy water early in the season, dropping and clearing by sometime during the second fishery opening in Deep Creek and during the third Anchor River opening. Water conditions during 2007-2010 were good for fishing in the Ninilchik River, as is typical.

Anchor River

Chinook salmon escapements to the Anchor River were considerably lower in 2008-2010 than the preceding 5 years (2003-2007) and below the SEG (5,000) in 2009 and 2010. The 2008-2010 average was approximately 4,557 fish compared to the 2003-2007 average of 10,195 fish. Low river conditions in May 2009 permitted the immediate installation of the floating weir, allowing the entire escapement to be censused for the first time since initiation of the project in 2003. In 2009 and 2010, aerial surveys were discontinued because trends in index counts did not match trends in actual total escapements at the sonar/weir.

The 2007 inriver harvest of Anchor River Chinook salmon was the highest since 1994, yet the exploitation rate was still low at approximately 18%. The 2007 escapement exceeded SEG by 4,622. Szarzi et al. 2007b contains a detailed overview of the 2007 fishery.

Liberalizations adopted by the BOF in 2007 that went into effect for the 2008 season did not result in an increase in harvest in 2008; the estimated 2008 harvest of 1,486 was less than the 2007 harvest of 2,081 and similar to the average harvest of 1,433 during prior years without Wednesday openings, but with five 3-day weekend openings (1996-2001, 2004-2007). The low harvest was attributed to the poor fishing conditions, in combination with the lower run size and later run timing (Kerkvliet et al. *In prep* a). The 2008 escapement exceeded the SEG by 806 fish. Despite the low escapement, the harvest rate was low (20%).

In 2008, high water resulted in poor fishing during the first 2 Anchor River openings. Fishing improved as the river level began to subside on the third Wednesday opening and as more Chinook salmon entered the river. The Wednesday openings were popular with almost as many anglers as the Saturday mornings, when the highest number of anglers is seen.

In 2009, Anchor River Chinook salmon fishery closed on June 6 by EO because the escapement was projected to fall below the SEG. The closure eliminated the fourth and remaining openings. As a result, the inriver harvest was well below average (730). The 2009 escapement fell below the SEG by 1,545 fish. The exploitation rate was approximately 17%. The midpoint of the Anchor River Chinook salmon run has typically been around the second week in June, but occurred on June 22, about 10-15 days later in 2009.

Despite good water conditions during the first 2 weekends of the 2009 Chinook salmon fishery, fishing success was poor. Fishing improved on the third weekend, but was still considered poor. Fishing was fair on the last Wednesday opening before the EO closed the river to fishing June 6. Throughout the last opening day, staff observed the fishery to determine if more Chinook salmon were entering the river and the emergency closure could be avoided or postponed.

In 2010, a series of EOs progressively restricted the Anchor River Chinook salmon fishery as the run developed and escapement projections remained below the SEG. After the second Wednesday opening, when typically 25% to 40% of the Anchor River Chinook salmon escapement is upstream of the weir/sonar site, the escapement was behind the cumulative count for the same day in 2009, a year when the goal was never achieved. It was plausible that the daily counts would increase as the run developed, so the use of bait was prohibited and the closed area at the mouth of the Anchor River was extended an additional 1 mile north and south to slow the harvest. Bait use was also prohibited in Deep Creek and the Ninilchik River at the same time, to prevent overharvest by an influx of anglers displaced from the restricted fisheries elsewhere on the Peninsula, including the Anchor, Kenai and Kasilof rivers. Effective June 12, retention of Chinook salmon from the Anchor River was prohibited because the cumulative escapement was slightly behind the cumulative count for 2008, a year when the SEG was barely achieved, and interannual variability in past run timing prevented projecting with certainty that the Anchor River Chinook salmon SEG would be attained. The saltwater closure adjacent to the river mouth remained in effect. Significant numbers of Chinook salmon were still migrating through the weir as July 1 approached, the date when the marine waters at the mouth open, so the marine closure was extended from July 1-13, until it appeared the run was concluding and there weren't significant numbers of Chinook salmon available to be intercepted in the marine fishery. An additional 548 fish passed the sonar after July 13, suggesting that rescinding the marine closure on July 13 may have been premature.

The Anchor River was high and turbid through most of the Memorial Day weekend in 2010 and fishing success was low. Towards 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 the bait closure went into effect, fishing pressure was relatively high on Saturday (June 5) with fair success on Sunday. On Monday success waned, and effort dropped.

When the lower Anchor River reopened on July 1 to fishing (except for Chinook salmon), Chinook salmon were observed holding in a popular fishing hole located downstream of the closed area around the weir. The department received complaints of anglers illegally targeting Chinook salmon in the open area downstream of the weir. On July 2, the department extended the area closed to sport fishing downstream of the weir due to illegal snagging and because more fish were needed to reach the escapement goal. Staff surveyed the channel and regularly found 30 to 60 fish holding until August 1 when the number of holding fish dwindled. From July 2-31, 831 Chinook salmon were counted through the weir. Similar magnitudes of holding fish were observed at this location in July 2007 (Szarzi et al. 2007a), but the area was not closed because the achievement of the SEG was not in jeopardy.

Deep Creek

The 2007 inriver harvest of 628 was similar to recent harvests since the fishery was restricted to in 1996. The aerial index count (553) fell within the SEG range. Fishing conditions were excellent after the first weekend fishery. Further details of fishing performance are in Szarzi et al. 2007a.

In 2008, fishing conditions were poor during all 3 weekends because of high turbid flows. The aerial survey index of 205 fish was below the SEG of 350-800 fish and was the lowest since 1997. The 2008 harvest (602) was only slightly lower than in 2007 when fishing conditions were better and the escapement index was much higher.

The 2009 harvest (124) was the lowest ever recorded for Deep Creek. The aerial index (483) fell within the SEG range. The low water was conducive to fishing for all 3 weekend openings. Fishing success was reported poor for the first 2 weekends and fair on the third weekend. After the Anchor River closed to fishing on June 6, 2009, angler effort increased dramatically on Deep Creek on the third weekend opening causing parking areas to overflow.

The 2010 aerial index of 387 Chinook salmon was below the historical average, but within the SEG by 37 fish. Fishing conditions were poor and effort low over the first opening weekend and through the middle of the second weekend opening. Bait use was prohibited during the last weekend opening. During this last weekend, fishing conditions were good, success was fair and the fishery was crowded.

Ninilchik River

Since 2006, later onset and shorter duration of fish migration to the weir and 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 in 2007 because variability in run timing makes it difficult to predict if the goal will be met until late in weir operation after some egg takes have already been conducted.

In 2007, the escapement of wild Chinook salmon was 7 fish below the SEG (550-1,300). The egg-take goal was met. The inriver harvest was 1,575 Chinook salmon. The escapement of

hatchery-reared fish was 63, the lowest since 1999. Refer to Szarzi et al. 2007a for further details of fishery performance.

In 2008, a regulation liberalizing the fishery for hatchery-reared fish beginning July 1 went into effect. The escapement of 586 wild Chinook salmon was within the SEG by 36 fish. The low harvest (976) was likely influenced by the combination of poor runs of both wild and hatchery fish. The weir was operated into August so more fish could be held for egg takes, yet broodstock goals were not reached, so additional fish were spawned at Crooked Creek for stocking the Kachemak Bay terminal fisheries.

Fishing was slow over the first 2 weekend openings of the 2008 fishery, but improved on the third weekend. Fishing effort was low during the July hatchery-only fishery, but fishing success was good. Fresh fish were still entering the Ninilchik River through the second week of July, but effort remained low as anglers focused on digging razor clams on nearby beaches during the low tide series.

A poor run in 2009 resulted in a record low harvest (203 fish), failure to reach the SEG by 22 fish, and failure to reach the broodstock goal despite a goal reduction of wild adult females from 60 to 15. Similar to 2008, additional fish from Crooked Creek were spawned to fill the shortfall for stocking in Kachemak Bay. Fishing was reported as slow over the first 2 weekend openings then improved on the third. During the July 1 hatchery-only fishery, fishing effort was low although, the river attracted some anglers in July who were still seeking to catch a Chinook salmon after the Anchor River closure reduced their opportunity.

The 2010 escapement was within the SEG by approximately 62 wild fish. The weir count of hatchery fish (n=34) for the SEG period (July 3-31) was the lowest recorded since 1999. No eggs were necessary for stocking because fish production was in the process of being shifted to the new SF William Jack Hernandez Fish Hatchery in Anchorage. Fishing success was fair during the first 2 weekends. After the bait closure, fishing pressure dropped.

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. Starting in 2011, the department will conduct additional research to evaluate if the Ninilchik River wild stock can sustain the traditional 3 weekend openings without stocked hatchery fish, and whether the terminal stocked fisheries can be supplied from the Ninilchik or must come from some other source.

COHO SALMON FISHERIES

AREAWIDE OVERVIEW

Areawide Historical Harvest and Escapement

Coho salmon are harvested from freshwater tributaries on the east and west sides of Cook Inlet. Freshwater harvests mostly come from the eastern CCI tributaries, Anchor and Ninilchik rivers and Deep and Stariski creeks. Saltwater coho salmon fishing occurs primarily along the eastern Cook Inlet shoreline because of easy access from the road system to harvestable numbers of fish.

Coho salmon harvest in the LCIMA increased eight-fold from approximately 7,000 when it was first estimated in 1977, to a peak of nearly 54,000 in 2004, at the height of stocked returns to the

Fishing Lagoon on the Homer Spit (Table 4). Since 2004, runs of stocked coho salmon have fallen and the harvest of 516 in 2009 is the lowest since stocking began in 1989.

Historically, the streams in Central Cook CCI supported over 50% of the area's coho salmon harvest most years until 1990, when the first coho returned as a result of fully stocking the Fishing Lagoon (Table 4). These streams contributed only 20%, on average, to the area harvest when stocked returns were peaking from 2001 through 2005. Since 2006, they have contributed an average of 33% of the areawide harvest. Stocked fish returning to the Fishing Lagoon contributed an average of 25% throughout the stocking period. The Fishing Lagoon contributed an average of 35% of the area coho salmon harvest during the large runs from 2001-2005. Since 2006, the contribution of stocked coho salmon has averaged 14% of the areawide harvest. Coho salmon harvests from other locations in LCI, besides the Fishing Lagoon, have increased from an average of 28% of the area total during 1977-2005 to 43% of the area total during 2006-2009.

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 immigrate en masse. Peak daily fish counts at the Anchor River weir have exceeded 4,000 during high water.

Coho salmon escapement monitoring in the LCIMA has occurred periodically using weirs and foot or aerial surveys. Coho salmon escapement was enumerated in the Anchor River from 1987-1989 and 1992 through a weir operated to count Dolly Varden and steelhead (Table 18; Larson 1990; Larson 1993; Larson and Balland 1989; Larson et al. 1988), and since 2004 (Table 19; Kerkvliet et al. 2008; Kerkvliet and Burwen 2010; Kerkvliet et al. *In prep*-a). Anchor River coho salmon runs are extremely variable; the lowest escapement of 2,409 was counted in 1987 and the highest in 1989 was 20,187 (Table 18). Counts since 2004 averaged 8,244 and ranged from 5,728 in 2004 to 18,977 in 2005 (Table 19). The count in 2005 is incomplete because the weir washed out in high water before the end of the migration.

A floating weir was operated in Deep Creek from 1996 through 2001 (Table 22; Begich 2002, 2006a; Begich and Evans 2005; King and Breakfield 1999, 2002, Kerkvliet et al. *In prep*-b). 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 22). Coho salmon escapement to the Fox River is indexed by periodic aerial flights in one of its few small clearwater tributaries, Clearwater Slough. Coho salmon escapement to some small streams in WCI near Chinitna Bay including Clearwater Creek, Fitz Creek, Shelter Creek and Silver Salmon Creek, has been estimated with periodic aerial and foot surveys.

Areawide Fishery Management and Objectives

There are no sport fishery management plans for LCIMA coho salmon stocks. Area coho salmon sport fishery regulations 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 coho salmon bag and possession limits for all Cook Inlet fresh waters from 3 to 2 fish and for all Cook Inlet salt waters from 6 to 2 fish. The exceptions were fresh waters south of the West

Forelands, including the west side of the LCIMA, where the limits remained 3, and the Fishing Lagoon where the limits remained 6.

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 3 to 1 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 Fishing Lagoon is opened to snagging almost annually by EO after the immigrating fish have matured sexually to the point they are no longer striking at lures (Appendices A1 and A2). Otherwise, the Fishing Lagoon 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 occurs 2 miles upstream of their mouths and 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 seem to favor areas with groundwater upwelling. The majority of the juvenile fish rear in fresh water for 2 years before leaving as smolt. Most mature adults return to local streams after spending only 1 year feeding in salt water. Returning coho salmon generally mill in the salt water near the mouth and the 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 period immediately after sunrise and just before darkness. During peak flows, angler success is 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 again forms long meanders 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, fishery management and objectives and fishery performance from 2008 through 2010.

Historical Harvest and Escapement

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. A marine fishery at the mouths of these streams harvests an unknown number of these stocks. The average annual coho salmon in freshwater harvest (1977-2006) has varied between streams (Anchor River (2,692), Deep Creek (1,414), Ninilchik River (961), and Stariski Creek

(271) (Tables 14-16, Table 23) and within a given stream (Anchor River (1,021-5,314), Deep Creek (306-3,425), Ninilchik River (88-2,980), and Stariski Creek (25-1,168). Harvest variations between streams are attributed to differences in stock size, with the Anchor River return generally being the largest (eclipsed by Deep Creek in 1985, 1996 and 1999). 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.

Harvests from all four streams have generally increased from 1977 through 2006 (Tables 14-16, 23). 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 inaccurate because of the low number of respondents to the SWHS that reported fishing in Stariski Creek.

Regulations 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 5 miles on the South Fork for 9 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 limit was reduced to 2 and tackle was restricted inlet-wide by EO because runs were poor. A subsequent regulation reducing the bag and possession limit was implemented beginning in the 2000 season through the present. Since the bag/possession limit restrictions, coho salmon harvests have increased in the Anchor River, Deep Creek, and Ninilchik River and Stariski Creek.

Changes in bait regulations have not coincided with any detectable change in the coho salmon harvest from the roadside streams during 1977-1999 when the bag and possession limit for coho salmon was 3. Before any bait restrictions, (1977-1983) the average harvest from the Anchor and Ninilchik rivers and Deep Creek combined was 3,113 fish. When bait was prohibited from September 16 through December 31, (1984-1988) the harvest average increased to 3,701 fish. When bait was prohibited earlier in the season on August 15 (1989 and 1990) the harvest average increased to 4,765 fish, and when the bait restriction was shifted back to September 1 in 1991, the harvest average (1991-1999) increased to 5,292. The cause or causes for the increase in coho salmon harvest 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.

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 Anchor River coho salmon escapement was enumerated throughout most of the migration in 1987-1989, 1992 and 2004-2010. (Larson and Balland 1989; Larson et al. 1988; Larson 1990-1995, 1997, Kerkvliet et al. 2008; Kerkvliet and Burwen 2010; Kerkvliet et al. *In prep-a*; Kerkvliet and Booz *In prep*). Anchor River escapements varied widely from 2,409 in 1987 to 20,187 in 1989 (Tables 18 and 19). Large escapements were not the norm and the median escapement (5,840) better represents the magnitude of typical runs. Counts in 1987-1989 and 1992 were conducted when the weir was in the middle of the fishery and are considered maximums. Counts in 2005 and 2006 are incomplete due to high water.

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.

Run timing of Anchor River coho salmon through the weirs was approximately mid July through mid-September. Passage rates were linked to water level. When water levels were low, passage rates tended to drop, whereas during high water periods, passage rates tended to increase dramatically. From 2004 to 2006, most of the coho salmon counted (78%, 72%, and 81%, respectively) were counted during high river conditions. In 2004, 78% of the escapement was counted in only 2 days (September 2 and 3).

The inriver exploitation of Anchor River coho salmon in 1989 (12%) was much lower than the other years when exploitation ranged from approximately 22% to 57%. For years with runs smaller than the median run size (1987, 1988, 1992, 2004, and 2009), average exploitation rates were slightly higher in 2004 and 2009 (50%) compared to the earlier years (41%).

Escapement counts of Deep Creek coho salmon arose from a smolt abundance study that was initiated in 1995 (Bendock 1995, 1996). In the first phase of the study, smolt were captured, coded-wire-tagged, adipose finclipped and then released. Smolt were tagged from 1995-1997, and again in 2000-2003 (Table 22; King and Breakfield 1998, 1999, 2002; 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 1997-2001, coho salmon were counted throughout their migration at a floating weir installed approximately 2.5 miles upstream from the mouth. In 2003 and 2004, nets were again used to sample the adult returns to estimate smolt abundance and marine survival.

Weir counts of coho escapement in Deep Creek ranged from 1,537 in 1998 to 6,164 in 2002 (Table 22). The peak of the Deep Creek coho salmon run ranged from August 17 in 1998 to August 26 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 (Kerkvliet et al. *In prep-b*).

Like the Anchor River, exploitation rates of coho salmon in Deep Creek have been high some years. The inriver exploitation of coho salmon in Deep Creek averaged 40% from 1997 to 2002 and ranged from 27% in 1999, to 60% in 1998 (Begich and Evans 2005) (Table 22). The 1999 regulation that lowered the coho salmon bag and possession limits from 3 to 2 coincided with a lower average inriver exploitation from 2000-2002 of 31%, compared to the average annual exploitation rate from 1997 to 1999 of 49%. Average harvests from 2003-2006 were comparable in magnitude to the 2000-2002 average; if escapements were comparable, exploitation rates during 2003-2006 may have been similar to 2000-2002.

Annual variability in run size may be less in Deep Creek than the Anchor River based on weir data (Tables 18, 19, 22). The Anchor River weir daily coho salmon count fluctuations were much more linked to river levels than the Deep Creek counts were (King and Breakfield 1998, 1999, 2002; Begich 2002, 2006a; Begich and Evans 2005, Kerkvliet et al. *In prep*).

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 only the waters from their mouths upstream approximately 2 miles on the Anchor River, Deep Creek and Ninilchik River, or approximately 1 mile on Stariski Creek are open and the upstream spawning areas are permanently closed. These streams are open from July 1 for the rest of the year to fishing for salmon, other than Chinook salmon. Beginning September 1, only unbaited single hooks are allowed. The daily bag and possession limit is 2 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 September 16 through December 31. In 1989 and 1990, bait use was prohibited earlier in the season, beginning August 16. Since 1991, bait has been prohibited from September 1 through December 31.

The bag and possession limit for coho salmon 16 inches or greater was 3 from 1977 through 1999. During the winter of 1999, the BOF held a special meeting to address persistent low coho salmon returns to some Cook Inlet tributaries, including the Kenai River and northern NCI tributaries. The freshwater bag and possession limit for coho salmon on the east side of Cook Inlet was reduced from 3 to 2.

There have been few inseason management actions taken in these coho salmon fisheries throughout their history. Prior to 1989, there were none. In 1989, an exceptionally large return to Anchor River resulted in an EO opening of an additional 5 miles upstream in the south fork to coho salmon fishing. This additional area was open from September 2-10. Opening this additional area did not significantly increase harvest and has not been used since.

During the 2010 meeting, the BOF will consider proposals to increase the bag and possession limit to 3 coho salmon for Cook Inlet tributaries in the LCIMA. Abundance has remained stable, based on escapement counts and coho salmon exploitation on the Anchor River. Recent variations in Anchor River coho salmon abundances from 2004 through 2010 are similar to historical variations in 1987-1989 and 1992. Exploitation rates are similar between the two periods (33% 1987-1989 and 1992; 38% 2004-2009). However, the average harvest has almost doubled since the bag limit reduction from 3 to 2 was implemented in 2000 (Tables 20 and 21). The reasons for this are unknown but may be a the result of more angling effort for coho salmon, increased angler efficiency harvesting fish without bait or stream conditions and run timing that promoted coho salmon harvest without bait.

The range of exploitation for Deep Creek coho salmon (23% to 57%) from 1996 through 2001 falls within the range observed for Anchor River coho salmon (Tables 18, 19 and 22). The decrease in average exploitation to 35% during 2000-2003, after the bag limit change from 49% in 1997-1999, probably did not persist because of the increase in harvests since 2000.

Five proposals that seek to reduce mortality on steelhead, stabilize salmon stocks, and reduce snagging would restrict bait on the Anchor River and Deep Creek during the coho salmon fishery by prohibiting bait after August 20 or prohibiting bait use year round. Historical restrictions of bait have not resulted in decreasing the harvest or catch of steelhead trout even when bait restrictions were in place as late as August 15 through December 31 (see Steelhead Trout

section). Increased bait restrictions on Anchor River and Deep Creek coho salmon stocks could draw more effort to the smaller stocks returning to Stariski Creek and the Ninilchik River and result in unsustainable harvests. Changes in bait closures may not have impacted the fisheries, in general, because the average combined harvest of all the streams increased following the bait closure periods: no restriction (1977-1983), September 16-December 31 (1984-1988), August 16-December 31 (1989 and 1990), and September–December 31 (1991-present).

Fishery Performance 2007-2010

Run timing of Anchor River coho salmon from 2007 through 2010 was similar to historical timing with the highest passage through the Anchor River weir occurring during high water. Furthermore, from 2007 through 2009 most of the escapement (89%, 66% and 61%, respectively) was counted in less than 5 days when river levels were high. SF monitored the escapement of Anchor River coho salmon from 2004 through 2009. The 2010 escapement was monitored under a cooperative agreement between SFD and the U.S. Fish and Wildlife Service (USFWS) with a video-equipped weir. Infrequent rains caused low river conditions in 2007 and 2009 and created favorable fishing conditions throughout most of August and September. River levels were higher throughout most of August and early September in 2008 and 2010.

Coho salmon escapements and exploitation were within historical ranges during 2007-2009. The average annual coho salmon harvest (2007-2009) increased over historical averages from 1977-2006, except for Stariski Creek. The average harvest (2007-2009) varied between the Anchor River (4,211), Deep Creek (1,629), Ninilchik River (1,059), and Stariski Creek (268) (Tables 14-16, Table 23).

The 2007 coho salmon escapement in the Anchor River was 8,226 and exploitation was 33%. The midpoint of the 2007 coho salmon run at the weir site was September 8. Run timing was much later than in 2004 through 2006 and in 2008 through 2010. The later run timing was attributed to fish holding below the weir site when the river level was low. The 2007 fisheries performance is detailed in Szarzi et al. 2007a.

The Anchor River coho salmon escapement in 2008 was 5,951 and exploitation was 45%. In 2004, the escapement size (5,728) and exploitation (43%) was similar to 2008. The midpoint of the run was August 22. River conditions were relatively high throughout most of August and early September; daily passage rates were more consistent than in years when river height fluctuated more. The best coho salmon fishing occurred from mid to late August on the Anchor River. Coho salmon fishing on Deep Creek was also good in mid August, especially at high tide near the mouth.

The 2009 escapement is considered a minimum count of coho salmon; because on the last day the weir was operated (September 11), a relatively high number of coho salmon (353 fish) were counted through the weir. Even so, the 2009 escapement of 2,629 was probably similar to escapements in 1987 and 1988 based on reports of poor fishing in mid September after the weir was removed. The 2009 Anchor River coho salmon escapement was the second lowest run during the years the escapement has been monitored (1987-1989, 1992, and 2004-2010) and the lowest since 2004. The midpoint of the run was August 29, but may have been later because the weir operating period ended as a significant number of fish were immigrating. Although fishing conditions were good in mid August and a high number of coho salmon were observed by anglers in offshore areas, fishing success was poor. Coho salmon were not reported jumping near the mouth of the Anchor River while the river levels were low as they had been in the past,

so fish may not have held offshore in 2009. Anglers did report fair to good fishing at the mouth and inriver during the early morning tides. By mid September 2009, fishing pressure waned in all the streams as success declined.

During the first week of August in 2009, anglers reported some success trolling off the mouth of Deep Creek. Fishing for coho salmon near the mouth of Deep Creek was reported as good at high tide in mid-August. By mid August, fishing for coho salmon in the Ninilchik River slowed.

On August 2, 2010, USFWS incorporated a video camera in the weir to monitor escapement. The midpoint of the run was August 22. The river was relatively high throughout most of August and early September, which was similar to 2008. Daily passage rates were more consistent than in years when river height fluctuated more. Fishing conditions were generally fair through August and success ranged from fair to good. In mid-August, anglers trolled near the mouth and reported good catches of coho salmon, but did not observe many coho salmon jumping.

In 2010, fishing for coho salmon in Deep Creek was reported as good at the beginning of the season. In mid August, anglers reported fair to good catches during the early morning hours.

Fishing was spotty in the Ninilchik River at the beginning of the 2010 season. On August 23, coho salmon were reported jumping near the mouth of the river, and anglers were catching coho salmon in the Ninilchik River.

In 2010, anglers regularly fished for coho salmon in Stariski Creek near the mouth. Holding salmon were observed in Stariski Creek near the mouth from mid to late August. Charter operators reported limiting on coho salmon in the salt waters adjacent to the mouth of Stariski Creek during the third week of August.

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 the Homer Spit, and most anglers fish from shore in Kachemak Bay for coho salmon stocked in the Fishing Lagoon. 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 the Kachemak Bay and LCI. Recreational shore and boat anglers 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 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. 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. Commercial fishing also occurs on coho salmon stocks in WCI, primarily in Kamishak Bay.

Historical Harvest and Escapement

The annual average sport harvest of coho salmon in LCI and Kachemak Bay combined, from 1978-1988, was stable at about 1,500-2,500 fish (Table 4). The first return of stocked coho salmon to the Fishing Lagoon 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 Fishing Lagoon declined. Interannual harvest trends have occurred and have generally been similar between the Fishing Lagoon and the remainder of Kachemak Bay and LCI.

Wild coho salmon escapement in the LCI and Kachemak Bay has been regularly monitored only in the Fox River tributary, Clearwater Slough. 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 and Dickson 2000-2002; 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 stock 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 the 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 Fishing Lagoon. 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 fish and is based on the average harvest prior to stocking. The BOF lowered the guideline harvest range from 2,500-3,500 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.

Effort and coho salmon harvest in the personal use fishery on the Homer Spit has declined steadily since 1998-1999 and now focuses on the open fishing areas adjacent to the Fox River mouth towards the head of Kachemak Bay.

Fishery Performance and Escapement 2007-2010

Stocked coho salmon returns to the Fishing Lagoon in 2007-2010 were well below average. Estimated harvests in the SWHS for 2007-2009 were correspondingly low (Table 4). Coho salmon harvests from elsewhere in Kachemak Bay and LCI during 2007-2009 were above the 1977-2006 average, but lower than the peak harvests in 2001-2005.

Aerial index counts of coho salmon in Clearwater Slough, the lone tributary in Kachemak Bay and LCI where escapement is monitored, were above the 1997-2006 average of 1,200 in 2009 (1,400) and below average in 2008 (810) and 2010 (900) (L. F. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer; personal communication). The aerial count was 2,900 fish in 2007, near the record of 3,023 in 2001.

Stocked Coho Salmon Fisheries

ADF&G SF has stocked coho salmon in the Fishing Lagoon since 1988 (Table 12). The objectives of that program are to:

1. Annually stock 120,000 coho smolt in the Homer Spit Enhancement Lagoon, 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 an earlier run timing than the other are stocked in the Fishing Lagoon. 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 July 15; 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.

The department 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, also from Bear Lake, each year from 2001-2009. CIAA ceased taking coho salmon eggs to stock the Fishing Lagoon in 2008 and the last return of coho salmon they stocked was in 2010.

In addition to stocking early-run coho salmon, SF will resume stocking late-run coho salmon of Bear Lake origin in 2011. The same total number of coho salmon smolt as SF has stocked in the past (120,000) will be stocked, but half, or 60,000, will be early-run fish and half late-run fish. The expected return of each stock will be 3,000-4,000. The expanded hatchery rearing capacity of the new SF hatchery will allow the goal of stocking 120,000 early- and 120,000 late-run coho salmon in the Fishing Lagoon to be achieved by 2013.

The proportion of the total permits fished in the personal use fishery on the Homer Spit adjacent to the Fishing Lagoon peaked in 1999 at 60% and the proportion of personal use coho salmon harvest in 1998 at 70% (L. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer; personal communication). A study was conducted to estimate the contribution of hatchery-produced coho salmon to the personal use set gillnet fishery on the east side of the Homer Spit

was conducted in 1999 and 2000 (Szarzi and Begich 2004a). The average proportion of hatchery-produced coho salmon was approximately 81% in 1999 and 90% overall in 2000. The number of hatchery fish in the harvest was higher during the later part of the fishery in both years. It was previously thought that the wild return to the Fox River occurs later than the enhanced return. With the decline in stocked salmon returns to the Fishing Lagoon, the proportion of personal use permits fished in the vicinity of the lagoon has declined and was 20% in 2010.

Beginning in 2001 and continuing to the present, angler counts were conducted at regular intervals in the vicinity of the Fishing Lagoon from August 15 through September 15 to monitor the response of the sport fishery to the different stocks planted in the Fishing Lagoon. The counts take place during the daylight hours 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 Chinook salmon run that was last stocked in 1999.

In both 2005 and 2006, the late-run Bear Lake coho salmon smolt contracted, and were treated for, bacterial kidney disease (BKD). High mortality occurred in smolt stocked in 2005 and virtually none of them returned as adults to the Fishing Lagoon in 2006. In 2006, nearly 325,000 treated smolt were released in the Fishing Lagoon in good condition. The return 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 lower than expected. In 2009 and 2010, early- and late- coho runs were very poor. The reason for this is unknown, but may be related to issues with cold water temperatures in the SF hatchery in Anchorage and small smolt size of CIAA releases.

All salmon produced by department hatcheries are now marked by altering hatchery water temperatures to produce banding patterns on the salmon otoliths. The banding pattern on the otoliths of salmon stocked in Cook Inlet is different from the pattern on fish stocked in other waters. Limited sampling in LCIMA wild salmon streams has occurred to ascertain whether straying is occurring from department stocking programs. Otolith bands matching Bear Lake and Cook Inlet hatchery patterns were found on 2 of 3 coho salmon smolt captured from Beluga Slough in 2008. In 2009, no otolith banding patterns were observed from 3 coho salmon smolt captured from Beluga Slough.

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 low yield, and it is expensive to participate in them. Access is by plane, helicopter or boat, and anglers are typically guided. Facilities to house anglers overnight are few. 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 that 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 Strike Creek nearby 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 fishers harvest coho salmon in WCI set net and drift gillnet fisheries. In spring 2005, the BOF repealed a 1996 regulatory closure of the commercial fishery after August 9 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 Through 2010

Information concerning WCI coho salmon sport fisheries comes from the SWHS, which provides estimates of sport fishing effort, 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. Information regarding the fisheries is pieced together from freshwater guide logbooks, anecdotal reports by anglers, inseason observation of selected fisheries by the department staff and National Park Service (NPS) 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 generally provides reliable estimates of fishing effort, and coho salmon harvest and catch most years. Harvest and catch are variable, but stable, in Silver Salmon Creek with no increasing trend (Table 24). Catches peaked between 2003 and 2006 and were comparable to catches in the largest coho salmon fishery in the LCIMA, the Anchor River (Table 14). The Silver Salmon Creek coho salmon harvests from the SWHS in 2007 and 2009 were above the average for 1983-2006, but lower than the peak harvests that occurred from 2003-2005. Catches during 2007-2009 were below the 1983-2006 average. High water and poor fishing conditions from frequent rain events may have caused the low harvest and catch in 2008. Guide logbooks report very little

fishing effort or harvest on Silver Salmon Creek, indicating that most of the fishing activity there is unguided.

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 to represent a majority of the fishing activity (Table 25). Guided effort, catch and harvest from the Kamishak River generally trended downward from 2004-2009. The reason for this decrease is unknown. The proportion of the Kamishak River catch that is released is higher than that in Silver Salmon Creek.

Amakdedori Creek has appeared occasionally in the SWHS since 1983 and was reported being fished in freshwater guide logbooks only in 2009. The Douglas River rarely shows up in the SWHS, but fishing trips there were reported in freshwater guide logbooks in 2005-2006 and 2008-2009. The annual participation, catch and harvest on these small stocks has remained low with no increasing trend. Similar to the Kamishak River, the majority of coho salmon caught are released.

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 inaccurate 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 40 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 NPS employees stationed in Chinitna Bay have observed little sport fishing activity in bay tributaries since closure of two fishing guide businesses that operated through 2005; most visitors in recent years are bear viewers. Reported coho salmon harvests in freshwater guide logbooks for 2005-2009 are comparable in magnitude to the SWHS estimates, and average 31 for Shelter Creek and 60 for Clearwater Creek.

Coho salmon escapement data are scarce and sketchy 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. 2007b). Commercial Fisheries Division (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 and 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 height of 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.

CF conducted aerial surveys of Silver Salmon and Shelter creeks as time allowed, in addition to its Chinitna Bay chum salmon surveys from 2000-2005 and in 2010 (L. F. Hammarstrom, Commercial Fisheries Biologist, ADF&G, Homer; personal communication). Peak annual aerial

counts of coho salmon in Silver Salmon Creek ranged from 630 in 2003 to 6,900 in 2000, and averaged 3,475 for 2000-2005. Shelter Creek peak coho salmon counts ranged from 420 in 2003 to 4,500 in 2000 and averaged 1,800 for 2000-2005. Three surveys were flown in 2010 over Silver Salmon and Shelter creeks, and the highest coho salmon count occurred on August 17 in both creeks (350 and 1,860, respectively).

Fishery Management and Objectives

No regulatory management plan specifically addresses the coho salmon fisheries of WCI; they are managed by regulation. The daily limits for salmon, except Chinook salmon, 16 inches or more in length, are 3 per day and 6 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 August 15 through May 15. The McNeil River is closed to fishing.

Prior to 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 September 1 through December 31. The bag limit for coho salmon was 3 daily and in possession.

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 September 1 through May 15 by the BOF in 1994. At the 1999 BOF meeting, a January 1 through September 30 season was established for coho salmon and bait restrictions were increased to July 15 through May 15 to encompass the July arrival of coho salmon to westside tributaries. Area restrictions included limiting the fisheries at Clearwater and Shelter creeks within Chinitna Bay to the lower 1-mile section of each creek.

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.

Public proposals for the BOF meeting in 2010 would lower the coho salmon bag limit in Silver Salmon and Shelter creeks to 2 per day and designate a portion of Silver Salmon Creek for fly fishing.

Lack of escapement data and uncertainty about the extent of coho salmon mortality from the sport fisheries in the tributaries of WCI make it unclear if hooking mortality is a problem, or is likely to be, as effort on these streams continues to increase. Information about harvest and participation is only adequate to gauge trends and relative magnitude on a broad scale, and not actual amounts, but harvests are relatively small and appear to be stable. As these fisheries grow, we may not be able to detect when harvests are no longer sustainable.

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 before returning to fresh water during mid-summer. 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 the salmon to feed on eggs, and overlaps 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 to fisheries for other species, and provide directed sport fishing opportunity when little opportunity is available.

Historically, Dolly Varden contributed the most fish to LCIMA freshwater sport fish harvests (Table 5). Daily bag limits were 20 fish from 1960-1968, 10 fish from 1969–1983 and 5 fish between 1984 and 1990.

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.

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, Anchor and Ninilchik rivers, and Deep and Stariski creeks, offer the greatest opportunity to catch Dolly Varden.

Harvest and Abundance

Historically, the Anchor River supported the largest Dolly Varden fishery, with other roadside systems, including Deep Creek, Ninilchik River, and Stariski Creek also supporting 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 26). Declines in harvest were assumed to reflect stock abundance declines. 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. Weir counts of Dolly Varden at the Anchor River declined from 19,062 in 1987 to 10,427 by 1990 (Table 21). 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, the BOF adopted a department proposal during its 1990 BOF cycle reducing the Dolly Varden bag and possession limit from 5 to 2 fish.

Dolly Varden harvest has stabilized since 1991 compared to harvest prior to 1990 when the bag and possession limit was higher. For instance, harvest at Anchor River has averaged 1,303 fish and ranged from 662 to 2,532 fish, while harvests from 1977 through 1990 averaged 9,202 and ranged from 1,476 to 21,364 fish. Prior to 1991, Anchor River accounted for 80% of the harvest followed by Deep Creek (10%), Ninilchik River (6%) and Stariski Creek (4%). Since 1991, the proportion of the total taken from the Anchor River is lower (73%) and more of the total harvest now comes from Deep Creek (19%). The proportion from Stariski Creek has declined to 1%.

Recent catch and harvest information indicates the LCIMA roadside Dolly Varden fishery has become primarily a catch-and-release fishery. Catch may be an indicator of run strength, and if so, indicates fluctuations in annual run size with no decreasing trend (Table 26). The portion of the run handled by anglers at the Anchor River is likely high, as the 2000 catch estimate of over 20,000 fish approximates the highest weir count at Anchor River for this species (Table 18). 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 and Kodiak, Alaska show an affinity to overwinter in freshwater systems containing lakes. 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.

The Anchor River salmon weir, operated since 2004, was designed with larger gaps between the pickets and small Dolly Varden can pass through the weir uncounted. Although Dolly Varden are counted when they are passed upstream through the live box, these counts are only considered an index. From 2004 through 2010, the peak Dolly Varden count occurred in 2004 (7,846) and the highest count occurred on average in the third week of July (Table 19).

Fishery Management and Objectives

The fisheries are open from their mouths to approximately 2 miles upstream where regulatory markers are posted on the Anchor River, Deep Creek, and the Ninilchik River in May and June during the Chinook salmon weekend openings (see Chinook Salmon Fisheries section). On July 1, the fishery opens again in the lower 2 miles of the Anchor River, Ninilchik River, and Deep Creek and on Stariski Creek upstream to the Sterling Highway Bridge (approximately 1 mile). On August 1, the upstream areas of the rivers open for the rest of the season. The daily bag and possession limit is 2. Beginning September 1, only unbaited, single hook, artificial lures are allowed.

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

In 2010, 5 BOF proposals would restrict bait on the Anchor River and Deep Creek when Dolly Varden are present in the fishery either by: (1) prohibiting bait from August 20 through December 31; (2) prohibiting bait until the Chinook salmon escapement goal is projected to be met in the spring and early summer; and (3) prohibiting bait all year. The proposals do not specifically address the Dolly Varden fisheries; however, bait restrictions will likely reduce the Dolly Varden catch and harvest in Anchor River and Deep Creek, and increase harvest on smaller streams such as the Ninilchik River and Stariski Creek.

Three additional proposals would close fishing on November 1 to protect steelhead (see Steelhead Trout section).

Fishery Performance 2007-2010

Stream conditions during the Dolly Varden fisheries from 2007 through 2010 are detailed in the Freshwater Chinook Salmon section of this report.

From 2007 through 2009, the average combined harvest (1,363) from the roadside streams dropped slightly from the 1991 through 2006 average harvest (1,877). The catch average (2007-2009) increased substantially (29,578) over the 1991 through 2006 average (18,940). Most of the increase catch was driven by catches from the Anchor River. From 2007 through 2009, Anchor River catches (26,842, 23,757, and 20,117, respectively) were the highest or near the highest on record for all the roadside streams.

Anglers fishing for Dolly Varden in the Anchor River reported catching them earlier than usual in 2007. In 2008, fishing was reported to be slow until mid July. In 2009, Anchor River fishing was reported as slow in mid July but improved by the end of July. Angler effort was high throughout September and October in 2009 because of low clear water.

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.

STEELHEAD TROUT WITH AN EMPHASIS ON ROADSIDE FISHERIES

AREAWIDE OVERVIEW

Areawide Historical Harvest and Abundance

The steelhead trout is a seagoing rainbow trout. 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 when they 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 rainbows, but quickly lose their sheen and are indistinguishable from rainbow trout in color, but generally are more fusiform in shape. Juvenile steelhead trout generally rear 2 to 3 years in freshwater, but may stay only 1 year, or as long as 4 years, in fresh water before migrating to salt water.

Adult steelhead overwinter in freshwater streams, and spawn in April and May. Unlike salmon, steelhead can spawn more than once. After spawning, some fish die while others emigrate to the ocean in the spring and early summer. Emigrating steelhead are also referred to as kelts. Steelhead trout often spawn more than once, and fish over 28 inches are usually repeat spawners. Rarely, steelhead will return to a freshwater stream within a few months of having spawned, but most repeat spawners spend at least 1 winter in the sea between spawning migrations.

Summer run steelhead trout are rare in Alaska and are found only in a few streams in Southeast. Rainbow/steelhead trout presence in LCIMA fresh waters has been confirmed only in Anchor and Ninilchik rivers, and Deep and Stariski creeks.

Areawide Fishery Management and Objectives

Trout management is guided by the Criteria for Establishing Special Management Areas for Trout (5 AAC 75.013). The criteria were adopted by the department in 1986 to provide future boards, fisheries managers and the sport fishing public with: (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 the spring of 1999. There are no special management areas or management plans for rainbow/steelhead trout in the LCIMA.

No inseason management of trout has occurred in the LCIMA. 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 rainbow/steelhead trout is 2 fish. The freshwater daily bag and possession limits for rainbow/steelhead trout are 2 in flowing waters or 5 in ponds and lakes; only 1 fish may be longer than 20 inches. The Anchor and Ninilchik rivers, and Deep and Stariski creek drainages are exceptions to these regulations where rainbow/steelhead trout may not be retained.

In the salt waters north of a line from Point Adam to Cape Douglas, rainbow/steelhead may not be retained. South of that line, the saltwater daily bag and possession limits are 1 rainbow/steelhead 20 inches or greater, and there are no limits for rainbow/steelhead trout under 20 inches.

ROADSIDE STEELHEAD FISHERIES

Fishery Description

Anchor River, Ninilchik River, Deep Creek and Stariski Creek support popular rainbow/steelhead trout fisheries. Steelhead 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 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 due to higher post-spawning mortality among males; in Kasilof River, radiotelemetry studies from 2008-2009, 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 spent 3 years in freshwater as juveniles before emigrating. Fish that reared for 2 and 4 years were also sampled.

These rainbow/steelhead trout fisheries have been catch and release only since 1989. Most of the steelhead 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.

Harvest, Catch and Stock Assessment

According to catch data, implementation of the catch-and-release regulation has served to maintain and possibly increase steelhead stock levels in LCIMA roadside tributaries (Table 26). The annual estimated steelhead catch in the Anchor River has exceeded the stock size, thought to approximate 1,500 fish, since catch was first estimated in 1989 (Table 14). The estimated annual catch of steelhead 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. These estimates may indicate that the number of steelhead in the run had likely increased and that anglers handle 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 a 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 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 prohibition of removal from the water, there is little reason to suspect that mortality is considerably higher for LCIMA steelhead.

From 1989 through 2009, the steelhead catch in the Anchor River and Deep Creek was variable, but generally stable. The annual variation in catch estimates is influenced by run size, amount of days the stream conditions are conducive to fishing, shifts in effort between streams and potentially increased angler effort. In recent years (2006-2009), the annual steelhead catch estimates for the Anchor River have reached record high levels twice and have averaged 6,500, almost double the historical average of 3,700. The average annual steelhead catch from Deep Creek since 2003 has more than doubled to 2,500 from the 1989-2002 average of 1,000. Annual catches have also increased in the Ninilchik River since 2003 and catches from Stariski Creek have been higher on average since 2000.

Creel surveys were conducted on the Anchor River through November 1 in 1980, through October 31 in 1981 and through October 30 in 1982 (Wallis and Hammarstrom 1980, 1982, 1983). Researchers selected these ending dates because they coincided with the end of the fishery. In 1981, the highest effort occurred in October, and in 1982 and 1983, effort was highest in September. Based upon more recent observations of the fishery by staff, fishing pressure continues to be minimal in November and December.

Anchor River steelhead immigration was enumerated during 3 years of the weir operation (1988, 1989 and 1992) and 878, 769, and 1,261 fish were counted, respectively (Larson and Balland 1989; Larson et al. 1988; Larson 1990-1995, 1997). The midpoint of immigration occurred between September 13-25 and 90% of the immigration was complete by October 2. Cumulative counts of immigrating steelhead at a weir operated in the Anchor River through at least August 31 in 1987-1989 and 1992 averaged 96 and ranged from 21 and 251. Cumulative steelhead weir counts through August 31 during 2004-2010 averaged 38 and ranged from 4 to 81.

In 2009, the first count of the entire emigration of steelhead trout was collected for the Anchor River. The midpoint of the emigration was June 7. Catches of steelhead from beach seine sampling upstream of the Anchor River sonar site from 2004 to 2010 indicate the emigration of steelhead extends through mid-June.

Beginning in 2002, the Ninilchik River weir was used to capture and enumerate postspawn steelhead as they emigrated. The steelhead assessment was a cooperative effort between the U.S. Geological Survey of Alaska (USGS) and the SF. In 2002, 449 steelhead were counted at the weir; 82 were surgically implanted with either an acoustic or archival tag. In 2003, a total of 416 steelhead 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, 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 kelts spend less than 24 hours in the area open to sport fishing. The emigrating steelhead counts for 1999, 2000, 2001 2002, 2003, 2004 and 2005 were 335, 278, 293, 449, 416, 418, and 681, respectively, and averaged 410 fish from 1999 through 2005. The peak emigration of steelhead trout through the Ninilchik River weir in 1999-2005 occurred from the last week in May through the first week in June.

What little that is known about adult steelhead 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 radiotagged in fall of 1981, 8 transmitted signals into December. All 8 remained in the road accessible portion of the lower Anchor River near or downstream of the North and South forks. In the fall of 1982, 9 radiotagged steelhead were tracked through February of 1983 and six of those through June. The steelhead overwintered near the North and South fork confluence in deeper areas of the river. The 6 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 confluence of the North Fork and Chakok. After spawning, the surviving fish emigrated downstream and arrived at the North and South fork confluence during the first 2 weeks in June. There is evidence that other steelhead populations from small streams overwinter where pools and channels are deeper (Wallis et al. 1984; Gates and Boersma 2010). Radiotagging data suggests that the fish remained in the road-accessible portion of the lower Anchor River throughout their freshwater residency (Wallis et al. 1982, 1983, 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 2004-2008 and 2010, and emigration timing in 2009. In 1982, fish emigrated from May through early June. Steelhead were captured in beach seines

2004-2008 and 2010 in May through June upstream of the fishery, indicating that not all of the steelhead population was exposed to all fishery openings. In 2009, of the total number of emigrating steelhead counted, 44% passed downstream on the days the fishery was open. Radiotagging data from the Ninilchik River (see above) suggests that most steelhead 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 take approximately 7 to 7.6 days, on average, to travel approximately 2 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 rainbow/steelhead trout and retention is prohibited. Only unbaited, single-hook, artificial lures are allowed September 1 through December 31. 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 2 miles upstream on 3-day weekends (weekends include Monday). The Anchor River is open 5 consecutive weekends beginning Saturday of the weekend before Memorial Day, while Deep Creek and Ninilchik River are open for 3 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 July 1. The lower section of Stariski Creek does not open to fishing until July 1. The entire drainage of each stream opens to fishing beginning August 1 and continues through December 31.

The conservative regulatory framework for LCIMA steelhead fisheries evolved over a period of nearly 2 decades, during which angler participation and harvest in the steelhead fishery were generally increasing and numbers of returning steelhead enumerated each fall at a weir in place at the Anchor River were declining. Specifically, in 1977, the bag and possession limit was 2 steelhead trout daily with no seasonal limit. The season was closed from May 1 to June 30. By 1984, the bag and possession limit had been reduced to 1 fish daily; a seasonal limit of 2 fish was imposed and a harvest record required. Beginning in 1984, fishing was permitted only from July 1 through December 31. From 1984 through 1988, bait was prohibited after September 15. In 1989 and 1990, bait was prohibited beginning August 16. Since 1991, bait has been prohibited beginning September 1. On October 7, 1988, the Anchor River steelhead trout fishery was closed by EO for resource conservation when the number of steelhead counted through the weir was judged insufficient to support an inriver fishery. Since 1989, the rainbow/steelhead fishery has been catch-and-release only.

In 2010, there are three BOF proposals that seek to close fishing on November 1 to protect steelhead. One proposes to close steelhead fishing on all 4 roadside streams from November 1 through the opening day of the Chinook salmon fisheries. Two other proposals seek to close just the Anchor River and Deep Creek to all fishing from November 1 through the opening day of the Chinook salmon season.

Five BOF proposals would restrict bait on the Anchor River and Deep Creek when steelhead are present in the fishery either by: (1) prohibiting bait from August 20 through December 31; (2) prohibiting bait until the Chinook salmon escapement goal is projected to be met in the spring and early summer; and (3) prohibiting bait all year.

Three BOF proposals would restrict gear to: (1) single hooks with a gap ¾ inches or less; and (2) circle hooks fished singly or in tandem. There is an unknown level of hooking mortality of steelhead trout associated with all catch and release fishing regardless of gear type. Hooking mortality is often higher for fish that have been hooked in vital areas such the esophagus and gills. The use of bait increases the likelihood of a fish being hooked in vital areas therefore, causing a higher mortality rate. Other factors such as fish size, gear type, bleeding and elapsed time to unhooking the fish can influence survival, but to a lesser degree than hook location (Lindsay et. al 2004).

Fishery Performance 2007-2010

Stream conditions when steelhead trout were outmigrating during 2004-2007 are detailed in the Freshwater Chinook Salmon section of this report. Stream conditions during their immigration are detailed in the Freshwater Coho Salmon section.

The Anchor River, Deep Creek, and Ninilchik River average (2007-2009) steelhead catches (7,072, 2,601, and 1,124, respectively) increased substantially over the historical average, while average catch from Stariski Creek (111) was slightly higher than average. The Anchor River catch reached a record high in 2008 (8,733) and near record high in 2007 (8,365). In 2007 and 2008, Deep Creek catches were near record levels (2,668 and 3,672, respectively). Ninilchik River catches were at record highs in 2008 and 2009 (1,465 and 1,181).

The steelhead trout entering the Anchor River to overwinter were opportunistically counted from 2007 through 2010 at the Anchor River weir site. The counts are not interpreted as an index of abundance because the weir is typically removed before all fish immigrate into the river; it is likely that a portion of the run overwinters below the weir site. However, counts have been used to estimate the beginning of the immigration. Steelhead began immigrating upstream through the weir as early as mid July, but most were counted in late August and early September.

Report of anglers removing steelhead trout from the river for photos, and of steelhead being misidentified and harvested have increased since 2007. The department responded to these reports by posting additional regulatory signs and designing signs to help anglers distinguish steelhead from Chinook and coho salmon. In 2008, the department designed fish identification cards for steelhead, Chinook and coho salmon, and secured a grant from USFWS for printing. Cards were distributed to local fishing license vendors.

In 2007, anglers reported good steelhead fishing on the Anchor River from late August to early September. In 2008, some anglers reported that fishing on the Anchor River was not as good as previous years. In 2007 and 2008, the department received reports from long-term residents and department staff that regularly travel between Homer and Anchor Point of the numerous parked vehicles at access points along the Anchor River. In 2009, low river levels and mild temperatures attracted large numbers of anglers to fish the local streams from September through October. On some days, angler effort on steelhead appeared to exceed the effort expended on coho salmon earlier in the season. In 2010, the river level remained low through September and anglers reported low catches of steelhead trout. Some anglers reported that some of their favorite steelhead fishing holes had disappeared with the low river level. At the end of September, heavy rains cause the river to rise rapidly. In early October, effort increased on the Anchor River.

In 2009, from May 14 through June 23, 605 emigrating steelhead were counted at the Anchor River weir site. The midpoint of the emigration was June 7. Most of the steelhead (95%)

emigrated between midnight and 4:00 a.m. (Kerkvliet and Booz *In prep-a*). An estimate of the number of steelhead that immigrated in 2008 was calculated by using mortality rate averages estimated from Kasilof River radiotelemetry studies conducted from 2007 through 2009 (Gates and Boersma 2010).

In 2008, genetic samples were collected from immigrating steelhead trout. The samples were analyzed by USFWS and compared to steelhead from the Kasilof River watershed (Crooked Creek and Nikolai Creek) (Gates et al. 2010). Results revealed that steelhead from Crooked Creek and the Anchor River are more closely related than steelhead from Crooked Creek and another Kasilof drainage, Nikolai Creek. The relationship between the Anchor River and Crooked Creek steelhead populations may stem from use of Anchor River broodstock in the early 1980s as a source of fertilized eggs to begin the Crooked Creek enhancement program (Gates et al. 2010).

OTHER SALMON FISHERIES

OVERVIEW

Fishery Description, Harvest and Escapement

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. Commercial fisheries target pink salmon, and escapement of numerous area pink salmon stocks is monitored with aerial surveys (Hammarstrom and Ford 2009). The largest runs are produced in WCI and Port Dick on the outer Kenai Peninsula coast, but significant runs to Humpy Creek attract the most anglers.

The average annual pink salmon sport harvest for the entire LCIMA between 1977 and 2009 was only 4,825; the average catch was 13,351 annually, during 1990-2009, when catch data are available, and ranged from 7,200 to 23,000 (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009 a-b, 2010a-b, *In prep*.). An average of 70% of the harvest and 90% of the catch comes from salt water, most from Kachemak Bay. The freshwater streams in CCI also support pink salmon fisheries. The highest reported catch from CCI streams, combined, was approximately 5,462 pink salmon in 2009 (Tables 14-16, Table 23).

Sockeye salmon play a minor role in LCIMA sport 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 weir which has been in operation since 1994 (Hammarstrom and Ford 2009). Mikfik and Chenik drainages have the only significantly-sized wild runs in WCI; aerial survey counts of Mikfik range from 5,400-17,700, while Chenik Lake aerial/weir/video counts range between 300 and 18,200 (Hammarstrom and Ford 2010). Most sockeye salmon harvested in LCIMA sport fisheries are taken in the stocked terminal saltwater fishery in China Poot Bay. 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 14-16, Table 23). The average annual sockeye salmon sport harvest increased recently from 4,184 during 1988-2006, with a range of 1,206 in 1990 to 7,972 in 2001, to an annual average of 8,613 during 2007-2009 (Mills 1979-1980, 1981a-b, 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*.). The harvest increase in 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 CIAA in Tutka Bay Lagoon.

Fishery Management

Fisheries for pink 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 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 in regulation by the BOF in 1995.

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 with an average of 1.7 million juvenile sockeye salmon fry from 1984-2009 to supplement commercial catches in Kachemak Bay (L. 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. 2007b 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 6 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.

Until 1995, the personal use season was July 1 through July 31. 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 department EO in August of 1983-1985, 1989 and 1994 to completely harvest fish that had entered China Poot Creek. The BOF extended the season through August 7 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 the creek after the August 7 regulatory closure and asked for a fishery extension. Department 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 9 miles south of Homer Spit (Figure 4), is the site of Tutka Bay Lagoon Hatchery, which operated from 1975-2006 to enhance commercial pink and sockeye salmon fisheries. Pink salmon broodstock from Tutka Bay Lagoon Creek were spawned and their offspring reared in the hatchery from 1975-2003, and sockeye salmon broodstock from Tustumena and Packers lakes were remotely spawned and the progeny experimentally reared at the hatchery in 1991 and 1994-1997.

A small salmon 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 until 2006. The small, 35 acre lake-like lagoon is only accessible 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 successfully sport fish. 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 return 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 Tustumena 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 2004-2010. CIAA first stocked Tutka Bay Lagoon with sockeye 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, 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; 22,000 in 2008; 16,000 in 2009; and 43,200 in 2010 (Gary Fandrei, personal communication). A few anglers took advantage of the first small run of enhanced sockeye salmon to Tutka Lagoon in 2007. At a BOF meeting in 2007, the board passed a proposal closing 100 yards around the Tutka Lagoon

netpens 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 1,935 during 1988-2006 to 5,148 in 2007-2009.

SHELLFISH FISHERIES

AREAWIDE OVERVIEW

The beaches on the east side of CCI support the largest fishery for razor clams in Alaska. Southcentral Alaska's largest hardshell clam fishery occurs in Kachemak Bay for littleneck clams *Protothaca staminea* and butter clams *Saxidomus giganteus*. A fishery for Tanner crabs C*hionoecetes bairdi* reopened in Cook Inlet in 2008 after a 6 year closure. Once thriving fisheries for king crabs *Lithodes* spp, Dungeness crabs, and shrimp in Kachemak Bay are now closed because of low abundance. Other mollusks such as cockles *Clinocardium* spp, *Serripes* spp, softshell clams Family Myidae, tritons *Fusitriton oregonensis*, sea urchins Class Echinoidea, and sea cucumbers *Parasthichopus californicus* are harvested in small amounts.

Areawide Historical Harvest and Abundance

The noncommercial king crab fishery has been closed since 1985. Incidental catches of king crabs in department Tanner crab trawl surveys conducted since 1991 number in the single digits for most years since 1994, except 1997. 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. A department small mesh trawl survey that has been conducted periodically since 1975 has found shrimp stocks remain mostly at extremely low levels since 1993 (Goldman et al. *In prep*; Gustafson 1994-1996; Gustafson and Bechtol 1998; 2000; 2001; 2005)

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 razor clam *Siliqua patula* 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 and Ninilchik. Both areas have developed accesses and nearby camping facilities. Clam Gulch and the beaches within 5-10 miles are relatively shallow in slope and are composed of homogeneous

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

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 et al. 2010). 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 et al. 2010). As these strong year classes grow into the size when they are regularly encountered by diggers, they swamp the beach giving the impression no large clams are left and harm has come to the population, when actually, the presence of small clams is a sign of the population successfully replenishing itself.

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 et al. 2010).

Average annual participation was approximately 32,000 digger days and annual harvest averaged nearly 0.9 million razor clams from 1977-2006 (Table 6). Participation and harvest peaked in 1994 when 48,500 digger days were spent digging 1.2 million razor clams. Since 1994, participation has returned to near the historical average, but harvests for 2005-2007 are near historical lows. The low harvests of 2005-2007 followed a die-off at Clam Gulch of the older, larger clams between 2004 and 2005, and a period of unusually slow clam growth between 2005 and 2007 that resulted in few and small clams for an extended period (2004-2007). Harvests are rebounding as a new year class grows into size and growth rates return to normal at Clam Gulch.

Diggers shift to areas where clams are larger and more abundant and away from areas where clams are fewer and/or smaller. The first recorded shift was from 1986-1995 when a significant number of diggers first discovered that the clams were larger at Ninilchik and moved there from Clam Gulch (Table 28). Diggers shifted back to Clam Gulch from 1996-2004 when a large cohort of young clams first appeared at Ninilchik Beach (Athons 1992; Athons and Hasbrouck 1994, Szarzi et al. 2010). In 2004-2009, the trend reversed again as more diggers moved away from Clam Gulch and back to Ninilchik and, for the first time, moved south of Ninilchik to Whiskey Gulch and Happy Valley because of the die-off and slow growth of Clam Gulch clams. As clam growth improved at Clam Gulch in 2008 and a new very large year class appeared at Ninilchik in 2009-2010, more diggers were seen at Clam Gulch in 2010.

The razor clam fishery along eastern Cook Inlet is sustainable. The razor clam harvest rates for the most heavily harvested beaches, Ninilchik and Clam Gulch, are sustainable and harvest rates of the remaining beaches are even lower (Table 29). The time series of abundance estimates from Ninilchik and Clam Gulch is limited, but there is no overall trend to indicate that harvest is

negatively affecting recruitment or exploitable abundance in the immediate vicinity. Other indications of sustainable harvest are age compositions on five sampled beaches from Cohoe Beach to Deep Creek, generally having a broad range of ages present. Also, new year classes recruit regularly onto all eastside Cook Inlet beaches, replenishing them for the future.

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 July 10 through August 31 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 are periodically greater than 25%, which is the sustainable rate estimated for fisheries in Washington State, and is cause for alertness. Better methods for determining razor clams ages are needed so managers can predict population trends better and anticipate needed changes in advance.

HARDSHELL CLAM

Fishery Description

The beaches of lower Cook Inlet support commercial and noncommercial (sport and personal use) 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.

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 Sadie Cove, China Poot, Jakolof, and Kasitsna bays and the east side of the Homer Spit (Figure 7).

Littleneck and butter clams are found in bays, estuaries and open coastlines in the LCIMA from +5 to -5 ft around mean lower low tide (0 ft). They are encountered in a variety of beach gravel sizes with littlenecks preferring gravel beaches with more mud content. Littleneck clams typically inhabit the upper 6-8 inches of the substrate and occasionally to depths of 8 inches while butter clams are encountered to depths of 1 ft.

Littleneck clams up to 16 years of age have been found in Southcentral Alaska. A Southcentral Alaska littleneck clam around 1.5 inches length may be 8 to 10 years old.

Harvest and Abundance

Estimates of noncommercial effort and harvest have been available from the SWHS for Kachemak Bay since 1981 (Table 7). Effort is for all shellfish species harvested at a particular location, rather than for effort directed at individual species. Littleneck and butter clam harvests are reported together as “hardshell” clams in "gallons of clams," the proportion of littleneck and butter clams is unknown. Approximately 100-120 Pacific littleneck clams comprise a gallon and approximately 20 butter clams equal 1 gallon. One gallon of hardshell clams, including their shells, is equal to approximately 8.5 pounds.

A shellfish permit, required of diggers from 1997 through 2002, provided a second source of statistics concerning 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.) Digger distribution is currently determined by aerial flights that apportion digger counts by beach area where they were seen digging.

The estimated hardshell clam harvest in Kachemak Bay and LCI ranged from the preliminary 2009 harvest of 3,202 gallons to 29,163 gallons in 1996 and averaged 12,235 gallons from 1981-2009 (Table 7). A dramatic decline in shellfish effort and hardshell clam harvest occurred in 1998 (Table 7), 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. Shellfish effort estimates remained variable from 1996-2002 when both the Tanner crab and hardshell clam fisheries were open, but did not reach as high as prior to the Dungeness crab closure. Effort was fairly stable during 2003-2007, when the hardshell clam fishery was the only major fishery in terms of participation. The decline in effort in 2007 may be a reflection of a decline in abundance of littleneck clams at several popular beach locations. Shellfish effort in 2008 and 2009 returned to 2003-2006 levels, possibly because the Tanner crab fishery reopened in 2008. The record low hardshell clam harvests since 2006 may reflect the decline in littleneck clam concentrations at some beaches, or that fewer diggers may be digging, or both.

The department clam assessment tool is surveys to estimate legal-sized clam abundance in locations important to the fisheries (Szarzi et al. 2010). Survey effort has been focused on littleneck clams. Butter clams have also been collected, but are likely underrepresented in samples because their habitat extends deeper into the substrate than littleneck clams. From 1990-1997, surveys were typically conducted on commercial beaches or locations with suitable clam habitat. The survey was modified in 1999 to estimate long-term trends in clam abundance and sustainable yield, mean annual biomass, size-at-age and substrate composition for entire bays or large portions of bays. New areas were incorporated, including locations where noncommercial diggers concentrated.

Abundance estimates were imprecise, but conservative littleneck clam harvest rates were estimated for 2001 and 2002 from the lower confidence bound of estimated abundance, the total harvest from the SWHS, and the harvest proportion for a bay from permits. The harvest of littleneck clams from the south side of Kachemak Bay in all fisheries was likely less than 20% of the biomass of legal-sized clams in 2000 and 2001. It was less than 10% in all locations where department abundance sampling occurred, except China Poot Bay (28%) and Jakolof Bay (13%) (Szarzi et al. 2010).

Legal-sized littleneck clam abundance at a popular recreational beach in China Poot Bay averaged 337,000 during 1999-2002 and ranged from 209,000 to 437,600. Between 2002 and 2003, estimated legal-sized littleneck clam abundance at the China Poot Bay beach (Figure 7) declined from 286,063 to 51,836 (Szarzi et al. 2010). The decline was a much larger magnitude than could be accounted for by harvest. A large decline occurred between surveys conducted in 2002 and in 2004 on the lightly-harvested beach in the vicinity of China Poot Bay between Grewingk River and Mallard Bay, further indicating the decrease had an environmental rather than human source. Butter clam abundance at the China Poot Bay beach remained stable and averaged 424,680 each year during 1999-2003 and 2005 (Szarzi et al. 2010). Butter clam populations between Grewingk River and Mallard Bay also remained stable, while the abundance of littleneck clams plummeted between 2002 and 2004. Butter clams are found deeper than littleneck clams, indicating the environmental agent to the decline could have been temperature related.

Estimates of legal-sized littleneck clam abundance in Jakolof Bay declined between 2003 and 2005, but less dramatically than in China Poot Bay and the beach between Grewingk River and Mallard Bay.

A new assessment program was implemented in 2008 to try and help manage hardshell clam populations sustainably because the tools to monitor harvest rates apparently were not working; estimates of clam abundance were too imprecise, and harvest by location and species was unavailable after failure of the permit program in 2002. Starting in 2008, littleneck clam abundance was estimated precisely for index areas in similar habitats with historically low, medium and high digger numbers within several popular bays. The pattern of abundance trends will be used to determine if harvests were impacting abundance. Preliminary 2008 estimates from index areas sampled in Jakolof Bay that overlap areas sampled previously indicate that abundance of littleneck clams may have declined further since 2005. Results from a survey of Jakolof Bay index areas in 2010 are pending.

Sustainable harvest rates of littleneck clams are not known for Alaska. Beaches in British Columbia sustain harvest rates from 10-53% (Gillespie et al. 2005), but it is unknown if those rates are applicable to Alaska. While harvests from Kachemak Bay, in general, have declined since 2005, relative digger effort focused on Jakolof Bay increased until 2007, meaning that harvests may have remained relatively high there until 2007. The most recent estimate in 2009 indicates that the number of diggers in Jakolof Bay has declined relative to other locations in Kachemak Bay. While the relative effort in Jakolof Bay has declined, it is unknown if current harvest rates are sustainable given the decline in abundance.

Analysis of 2009 survey data from index areas in China Poot Bay is not complete, but recovery of the littleneck clam population there was not evident from preliminary data. China Poot Bay continues to be the primary focus of diggers in Kachemak Bay; butter clams now dominate the harvest.

It is difficult to know whether measured declines in littleneck clam abundance in survey locations reflect a widespread decrease in abundance throughout Kachemak Bay. Declines in the relative number of diggers on the Homer Spit and Halibut Cove Lagoon between 2006 and 2007 may be evidence of declines in clam abundance at those locations. Given the low harvest rate throughout much of the bay in 2000 and 2001, and the subsequent decrease in harvest through 2009, it is unlikely that the decline is harvest-related.

Fishery Management and Objectives

This fishery is addressed in the Southern District Hardshell Clam and Mussel Fishery Management Plan (5 AAC 38.315). The management plan mandates the annual noncommercial harvest not exceed 160,000 hardshell clams in Kachemak Bay.

Harvest may only occur by hand, or with a rake or shovel. The commercial and noncommercial minimum lengths of 1.5 inches for littleneck clams and 2.5 inches for butter clams and bag and possession limits of 1,000 littleneck clams and 700 butter clams, were adopted in 1994. The size limits allow clams to reach reproductive maturity before harvest. The bag limits facilitate enforcement of commercial closures by removing the incentive for commercial harvesters to dig during commercial closures.

Nonresidents can participate under sport fishing regulations, while residents can participate under either sport or personal use regulations. Bag/possession limits under sport regulations cannot be added to the bag/possession limits allowed by personal use regulations and vice versa.

The sport regulations are liberal enough that they have had little or no effect on the daily harvest by noncommercial users. A guideline harvest level of 160,000 lb was established for the noncommercial fishery in 1997 based on the average harvest in the fishery from 1981–1995. The permit requirement instituted in 1997 was suspended in 2004 and was rescinded by the BOF in 2006. Compliance with permit acquisition and recording by diggers was poor due to lack of enforcement. Local diggers were more likely to obtain permits than nonlocal diggers and had different harvest patterns than nonlocals; therefore, statistics from permits were not accurate.

In 2007, the BOF made a positive customary and traditional use finding for miscellaneous shellfish, including hardshell clams, and established an amount reasonably necessary for subsistence use outside the nonsubsistence area (Figure 8). A permit is required for the subsistence harvest of hardshell clams.

To date, no EO has been issued to manage the lower Cook Inlet noncommercial hardshell clam fishery inseason.

TANNER CRAB

Fishery Description

The Tanner crab fishery occurs primarily in the deep waters west of the Homer Spit. Tanner crab may live to an estimated maximum age of 15 years. Legal-sized male crabs vary from 2 to 4 pounds and have a carapace size 5 ½ in or greater. 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.

Historical Harvest and Abundance

Noncommercial harvest data are available from the SWHS beginning in 1981 (Table 7), and from shellfish permits starting from 1996 to 2002 and from 2008-present (Table 7, Table 30). SWHS estimates of noncommercial Tanner crab harvest in most years are significantly 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. An additional source of error may have been uncertainty about reporting personal use, as well as sport crab harvests. Noncommercial Tanner crab harvests reported on

permits are probably more accurate than SWHS estimates because permit compliance is thought to be high. The average annual noncommercial harvest estimated from permits from 1996 to 2000 was about 15,400 crab (Table 7, Table 30) under a bag and possession limit of 20. A bag limit restriction to 5 resulted in an estimated harvest in 2001 of 6,499. The fishery closed early in the season in 2002 to protect Tanner crab stocks from overharvest. The harvest reported on permits was 3,574.

A commercial Tanner crab fishery began in the mid 1960s in the Southern District as incidental harvest to red king crabs *Paralithodes camtschaticus* harvests (Davis 1982). Fishing effort directed at Tanner crabs increased during the 1970s when price and demand increased, and fishing effort quickly expanded to other Cook Inlet districts. The commercial fishery was the primary harvester of Tanner crabs during that time. The commercial Tanner crab fishery on the outer Kenai Peninsula coast closed in 1990. A commercial fishery was prosecuted in Kachemak Bay and eastern LCI until it was closed in 1995 after department trawl surveys estimated that insufficient numbers of crabs were available to support a commercial fishery (Trowbridge and Goldman 2006). The commercial fishery remains closed.

Tanner crab commercial harvest data are available since 1968 (Trowbridge and Goldman 2006). Average annual harvest in the Southern District (Kachemak Bay area) approximated 1.2 million pounds or about 480,000 crabs.

From the 1970s to 1990, pot surveys were used to index crab abundance in Kachemak Bay and LCI. Trawl surveys have been used annually since 1990 to estimate absolute abundance of Tanner crabs (Table 31). Tanner crab stocks in all surveyed districts have been at low abundance levels since the early 1990s. Estimates of Tanner crab abundance in the Southern District declined sharply in 1994. Large numbers of juvenile crab were captured in 1999, 2001-2003 and 2009 surveys. Surveys in years that follow large juvenile catches have not captured a significant number of recruits in older size classes for unknown reasons.

The 2006 trawl survey in Kamishak Bay indicated a substantial increase in Tanner crab abundance, which in turn indicated recruitment to the harvestable population (K. Goldman, Commercial Fisheries Biologist, ADF&G, Homer). This prompted the department to propose harvest guidelines in the Tanner Crab Harvest Strategy that would open the noncommercial fishery in waters west of Kachemak Bay, including the outer coast of the Kenai Peninsula.

Fishery Management and Objectives

In March of 2002, the BOF passed the Tanner Crab Management Plan for Area H (5 AAC 35.408) (Cook Inlet and North Gulf Coast waters). The plan covers sport fisheries in salt waters west of the longitude of Cape Puget, and commercial and personal use fisheries in salt waters west of the longitude of Cape Fairfield. The plan includes harvest rates that vary in relation to stock abundance estimates, stock abundance thresholds below which fisheries would remain closed, and gear restrictions. The plan stipulated if the estimate of legal males from the department trawl survey in Kachemak Bay were equal to or exceeded the maximum sustainable yield (MSY) stock size of 1.0 million crabs, the stock could be harvested, in aggregate, among commercial and noncommercial users at an annual exploitation rate of 25% of estimated legal male abundance. If the legal male population were equal to or exceeded the minimum stock threshold of 500,000 crabs for a commercial fishery, but is less than MSY stock size, the stock could be harvested, in aggregate, among commercial and noncommercial users at an annual exploitation rate of 15% of estimated legal male abundance.

A commercial fishery will not occur if commercial harvests would drive the population below the minimum stock threshold. It is assumed that as the allowable aggregate harvest rate increases, the commercial proportion of the harvest would increase because of relatively low efficiency of noncommercial users.

When estimated legal male Tanner crab abundance, including fishery removals, is lower than 500,000 crab, no commercial harvest will occur. The noncommercial exploitation rate will be 10% when the 5-year average stock size is lower than 500,000 legal male crab. When the 5-year mean of estimated legal male Tanner crab population abundance is lower than 100,000 crabs, the most recent three estimates are lower than 100,000 crabs, or the most recent abundance estimate is less than 50,000 crab, the noncommercial fisheries will be closed. The 5-year average is used to provide fishery stability amid high annual crab abundance variability.

When the 2002 management plan was adopted, the noncommercial fishery was still open. Regulations adopted by the BOF at its January 1993 meeting protecting this species during the molting season were in place, and included the provisions that only male Tanner crabs could be taken from July 15 through March 15, except that in Kachemak Bay east of a line from Anchor Point to Point Pogibshi, male Tanner crabs could be taken from July 15 through December 31 and again from January 15 or the beginning of the commercial Tanner crab season (whichever was later) through March 15. The daily noncommercial bag and possession limits were 5 legal sized male crabs (legal sized crabs have a 5 1/2 inches or greater carapace). No more than 2 pots could be fished per vessel. After the trawl survey the summer of 2002, the stipulations in the management plan were invoked and the noncommercial fishery closed because the Tanner crab abundance in Kachemak Bay fell below the amount necessary to open the fishery.

The 2006 Kamishak Bay trawl survey indicated increased Tanner crab recruitment to the population. This led the department to propose a harvest threshold for sport and personal use fisheries in the Southern District west of a line from Point Pogibshi to Anchor Point based on Kamishak Bay trawl surveys because openings and closures of the areas outside Kachemak Bay were still based on Tanner crab abundance in Kachemak Bay; when Kachemak Bay was closed, the remainder of Cook Inlet was closed and if Kachemak Bay opened, all Cook Inlet opened.

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). Because of this finding, if the department determined that there was a harvestable surplus of Tanner crab in the area subject to the customary and traditional use finding, subsistence regulations would be needed for the area.

In March 2008, the BOF added the following regulations for noncommercial Tanner crab fisheries: (1) for the Southern District west of the line from Point Pogibshi to Anchor Point, including the Kamishak and Barren Island districts, stock abundance will be based on Kamishak Bay trawl surveys; if the 5-year mean of the estimated abundance of legal size males is lower than 50,000 crab or the most recent abundance estimate is lower than 40,000 crab, then the fishery will close; (2) for the Southern District east of the line from Point Pogibshi to Anchor Point, stock abundance will be based on Kachemak Bay trawl surveys. The regulation governing the fishery in Kachemak Bay was left as stated in the original plan (the Tanner crab fishery would close east of the line from Point Pogibshi to Anchor Point when the 5-year mean of estimated legal male Tanner crab population abundance is lower than 100,000 crabs, the most recent three estimates are lower than 100,000 crab, or the most recent abundance estimate is lower than 50,000 crab).

Because all Alaskans are eligible to participate in subsistence fisheries the stock could not support more liberal subsistence limits so regulations governing subsistence Tanner crab fishing in the areas outside the nonsubsistence area are identical to the personal use and sport fishing regulations, except a sport fishing license was not required.

During its March 2011 meeting, the BOF will consider a proposal to change the opening date of the personal use Tanner crab fishery from July 15 to October 1. Another proposal would increase the maximum personal use vessel gear limit from 2 pots to 6 pots.

Fishery Performance 2008-2010

In 2008 and 2009, the Tanner crab fisheries opened by regulation on July 15 because estimated abundance of legal size male Tanner crab in the Kachemak (Table 31) and Kamishak trawl surveys met the minimum criteria for opening the fisheries. Over 90% of the harvests from the 2008-2009 and 2009-2010 seasons were taken from Kachemak Bay (Table 30).

The noncommercial Tanner crab fisheries opened in 2010, but the daily bag limit was reduced by EO from 5 to 4 legal sized males in Cook Inlet. The harvest guideline for the Kachemak Bay 2010-2011 fishery from July 15, 2010 through March 15, 2011, was 18,284 legal male Tanner crab. The estimated harvest of legal male Tanner crabs in Kachemak Bay for the previous season (2009-2010) expanded for nonresponse bias was 20,645. A reduction in the bag limit from 5 to 4 was projected to reduce harvest in Kachemak Bay to approximately 17,800 Tanner crab, keeping the harvest below the required guideline harvest level. Due to lack of trawl surveys in 2008 and 2010, and resulting uncertainty in the harvest guideline estimate, the Tanner crab bag limit was reduced from 5 to 4 in the remainder of Cook Inlet to increase enforceability of the regulation. The bag limit along the north Gulf of Alaska to Cape Fairfield including Resurrection Bay remained 5 male Tanner crabs.

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 crabs are found primarily on sandy or muddy substrates in salt or brackish water at depths usually shallower than 45 feet. The Dungeness pots that were used 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 7). Estimates of crab harvest and effort for Kachemak Bay and Cook Inlet are also available from shellfish permits beginning in 1996 (Table 30). Although hardshell clam fishery statistics from permits were biased for clams (see Razor Clams and Hardshell Clams sections), Dungeness harvests reported on permits were fairly close to harvests obtained by the SWHS (Table 7, Table 30) and are therefore, assumed to be unbiased.

The sport and personal use harvest averaged nearly 21,000 crabs (44,100 pounds) through 1994 (Table 7) and then dropped by more than half to nearly 9,000 crabs (18,900 pounds) from 1995 until the fishery was closed in 1998. 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 30), 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 approximately 14,800 days of fishing (Table 7). 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 30). Analysis of individual permits reveals that only Dungeness crab 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 (Table 30). 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 fishing in May of 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).

The department 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 32). The pot survey indexes abundance, but does not provide a means to estimate total abundance. In 1993, a dramatic decline in the department pot survey catch occurred. Fewer than 100 male crabs of any size have been caught in the August Dungeness pot survey east of the Homer Spit since 1995 (Table 32). Estimates of Dungeness crab abundance from incidental catches in the department 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). Department 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).

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 crabs 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 department 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 July 15 through December 31, and from January 15 or the beginning of the commercial Tanner crab season, whichever was later, through March 15. The bag and possession limit was 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, the 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 stocks recover to the point that there is a harvestable surplus, the BOF will need to adopt subsistence fishing regulations. There is currently no management plan for Dungeness crab and no criteria for opening the noncommercial fishery.

Fishery Performance 2007-2010

A pot survey was conducted from August 10-13, 2009 to estimate catch per unit effort of Dungeness crabs in historical survey areas east of the 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 the Homer Spit. Ninety pots were set in the historical survey area, and the catch was composed of 32 sub-legal males (Table 32). 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.

COOK INLET RECREATIONAL HALIBUT FISHERIES

FISHERY DESCRIPTION

In the LCIMA, there are two relatively distinct sport fisheries for halibut: CCI and 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 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, 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 recreational halibut fishery is vital to the economy in the Cook Inlet area. 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 halibut, and indicated a willingness to pay an additional $25 million to ensure the continued availability of halibut fishing opportunity (Jones & Stokes 1987). In a separate study, the Homer 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 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 is used as the basis of all charter and private sport harvest estimates presented in this report for halibut. Halibut harvest data was also required to be reported in charter logbooks from 1998 through 2001, but there were discrepancies between logbook harvest 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 halibut data in the logbook 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 noncharter 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 recreational halibut 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 halibut in the LCIMA (Table 2). Cook Inlet fisheries have accounted for 61-82% of the total Southcentral Alaska sport halibut harvest since 1990, and 40%-60% of the statewide sport harvest (in number of fish) during the period 1990-2009. In 2009, the estimated Cook Inlet sport harvest was 195,294 fish.

Growth in the CCI halibut fishery during the late 1980s and early 1990s was due largely to an increase in the guided component. As of the late 1980s, the CCI fishery was dominated by noncharter anglers (Table 33). 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). Ninilchik was about an hour less driving time than Homer from Anchorage, and the boat ride to the fishing grounds was 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 (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 1.20-1.47 million lb for CCI and 1.80-2.38 million lb for LCI during the recent 5-year period 2004-2008 (Meyer 2003, 2006).

Harvest estimates do not include catch-and-release mortality. Recreational anglers in Cook Inlet have released 45-50% of the halibut they caught during the last 10 years (1999-2008). The International Pacific Halibut Commission (IPHC) assumes a mortality rate of 3.5% for 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, on the other hand, there is no soak time associated with sport gear like there is with commercial 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 and reassesses 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 have 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 a biomass in IPHC Regulatory Area 3A at the end of 2009 of about 131 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 expected to increase, however, due to strong recruitments during the years 1998-2000.

FISHERY MANAGEMENT AND OBJECTIVES

Halibut are managed in state and federal waters primarily by federal agencies, the IPHC and the North Pacific Fishery Management Council (NPFMC, or council). 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 10 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 regionwide 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 halibut management is to provide the agencies (IPHC, NPFMC, and BOF) with the best possible information regarding the recreational 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 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 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 the skin on.

As of 2010, the sport regulations for halibut in Cook Inlet provide for an open season of February 1–December 31, a daily bag limit of 2 halibut and possession limit of 4 halibut, and there is no minimum 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, 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 rule was published in April 2009 and the final rule signed in January of 2010. The application period for moratorium permits closed April 5, 2010 with implementation expected to occur in 2011.

The Area 3A sport charter boat fishery is currently managed under a GHL of 3.65 million lb. 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 or 2009 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 (CSP) that would allocate halibut among the commercial and sport charter fleets, and specify bag and size limits preseason 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 CSP is intended to replace the GHL and will be implemented in 2011 at the earliest.

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

FISHERY PERFORMANCE 2007-2009

As of January 2010, the exploitable biomass of 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. 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 halibut in the LCIMA climbed in stepwise fashion throughout the 1990s and 2000s. The record harvest of 2007 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. Since 2003, the Southcentral Alaska charter fishery has been operating under a GHL of 3.65 million pounds. This GHL was exceeded in 2007 by 9.6%, but in 2008 and 2009 the charter sector was estimated to have been under the GHL by 7.5% and 25%, respectively. Charter anglers in Cook Inlet harvested approximately 65% of the charter halibut harvested in Southcentral Alaska in 2007, 63% of the charter halibut harvested in 2008 and 61% of the halibut harvested by charter anglers in 2009.

Halibut harvest from the unguided sector of the sport fishery has remained relatively stable in the CCI fishery averaging approximately 37,000 fish from 2007-2009. The LCI unguided fishery harvest peaked at just over 62,000 fish in 2007, but declined steadily during the next 2 years to 51,549 in 2009. 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. Fifteen species have been identified in the recreational harvest from the LCIMA since 1991, but three species—black, dusky, and yelloweye rockfish—typically make up the vast majority of the harvest.

Rockfishes are categorized into three assemblages based on habitat preferences (Table 34). For purposes of managing the recreational fishery, however, only two assemblages are defined in sport regulations (5 AAC 75.995): pelagic and non-pelagic. The pelagic assemblage includes black, dusky, dark, widow, yellowtail, and blue rockfish, and the non-pelagic 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 Central and LCI during the 3-year period 2007-2009 show that nearly all pelagic and non-pelagic rockfish were harvested by anglers that reported targeting halibut, bottomfish or bottomfish and salmon (Table 35).

The economic value of the recreational rockfish fishery in Cook Inlet is unknown. As is the case with effort, the economic value of rockfish fishing is not entirely separable from halibut because most of the 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 36). Average harvest during the 5-year period 2004-2008 was about 11,000 fish. The Cook Inlet harvest has made up

7-14% 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 26-64% of the LCI harvest since 1986 (Table 37). 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). Harvest in this fishery has been estimated at 200 to 1,900 fish per year since 1986 (Table 37). 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 rockfish that were actually taken in LCI and 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.

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 38). 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 79,000 lb in 2007. Pelagic species accounted for most of the increase in harvest; harvest of nonpelagics was relatively stable.

Because rockfish are caught incidental to other fisheries, most of them are released. The numbers of rockfish released each year in Cook Inlet generally exceed the number retained (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. Rockfish caught in fewer than 45 ft of water generally have a high probability of survival when released. Port sampling interview data collected in Homer since 1995 show that pelagic species made up 95-100% of the rockfish released each year.

FISHERY MANAGEMENT AND OBJECTIVES

The department 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. The department 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 bycatch and waste in the sport fishery. Halibut stocks are projected to increase in the near term, which may take some pressure off state-managed groundfish species such as rockfish.

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 5 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 bycatch 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, daily bag limit of 5 rockfish per day and possession limit of 10 rockfish, of which no more than 1 daily and 2 in possession may be nonpelagic species. Bag and possession limits, special restrictions and state authority in the 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 previous large year class to recruit was 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 2001; Parker et al. 2000). Many species recruit to the fishery before reaching sexual maturity, and fisheries develop on the standing stock rather than on the surplus production. Removal of the older spawning stock reduces spawning biomass, further inhibiting population recovery.

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 38).

FISHERY PERFORMANCE 2007-2009

Rockfish harvest in 2007 from LCI was estimated at 12,399 fish, about 3,000 fish more than the previous year, and the highest harvest on record for this fishery up to that date. As participation in the halibut fishery increased, harvest for all groundfish species went up, including rockfish. Recreational anglers targeting halibut or any combination of bottomfish frequently will retain the rockfish they catch. Also, once those aboard a vessel targeting halibut have achieved their bag limit, they will often specifically target rockfish for a portion of their trip.

The recreational harvest of rockfish in the CCI fishery in 2007 was 390 fish. 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 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 2008 was 10,692 fish, the third highest harvest on record, but a decrease from the previous season. Marginal weather and record high fuel prices kept many vessels closer to port during the season and likely contributed to the decrease in harvest from the previous season.

A slight increase in harvest in 2008 was observed in the CCI fishery, although total harvest was still only a modest 566 fish.

There was an increase in the total rockfish harvest in both the Central and LCI fisheries in 2009. The 2009 LCI rockfish harvest exceeded the previous season by nearly 46% with a record harvest of 15,619 fish. Favorable weather and calm seas during the months of June through August allowed greater access for both guided and unguided vessels to a large portion of the LCI fishing area. 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. The 2009 CCI recreational harvest of rockfish was estimated to be 677 fish, nearly 61% of which was harvested by unguided anglers. The 2009 CCI harvest was slightly above the average number of rockfish harvested in this area over the past 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 not the target species for any of the 1,733 vessel-trip interviews from Homer during the period 2007-2009. Ninety-six percent of the lingcod harvest was by anglers targeting halibut or bottomfish, and 93% of the harvest was taken by charter anglers.

The economic value of the recreational lingcod fishery in Cook Inlet is unknown. As with rockfish, the economic value of lingcod is not separable from halibut because most of the harvest is incidental to 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 39). Average weight has declined slightly, to about 28 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 20-year-olds in 2009. 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 recreational lingcod 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 40), 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 1995-2002, SWHS estimates show that noncharter anglers accounted for an annual average of 34% of the LCI harvest. On the other hand, the estimate from port sampling interview data from the same time period is only 12%. 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

The department manages the sport lingcod 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. The department 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 recreational lingcod fishery was unregulated before 1987. In that year the BOF established a daily bag and possession limit of 2 lingcod for the Cook Inlet-Resurrection Bay Saltwater Regulatory Area in response to concerns over increased harvest, mainly in the Seward area. In 1992 the BOF adopted a suite of regulatory measures for the entire Cook Inlet-Resurrection Bay Regulatory Area, again largely in response to declining recruitment of lingcod in the North Gulf fishery (Meyer 1992; Vincent-Lang and Bechtol 1992). Changes that applied to the Cook Inlet portion (waters west of Gore Point) included: (1) establishing a closed season of January 1-June 30 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 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 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 July 1-December 31, bag and possession limit of 2 lingcod, and 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 effect 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.

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 7,000 fish in 2007 (Table 40). From 1993 until 2003, the harvest was variable but stable around an average of 1,700 fish per year. Since 2003 however, total recreational lingcod harvest has significantly increased. For the period from 2004 through 2006 the average harvest was around 3200 fish, nearly double the previous 10-year average. During the most recent period from 2007-2009, the average harvest again nearly doubled to approximately 6,300 fish. Harvest of lingcod in Cook Inlet peaked in 2007 at just over 7,000 fish, decreasing to 6,100 fish in 2008 and further falling to nearly 5,800 fish in 2009. Cook Inlet has accounted for 15-28% of the total Southcentral Region lingcod harvest since 1991. Guided anglers accounted for an estimated 6-100% (average 62%) of the CCI harvest (in numbers of fish) and 36-82% (average 66%) of the LCI harvest each year (Table 41).

Harvest biomass (lb 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 201,000 pounds during the period 1992-2009 (Table 39).

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 2009 in Cook Inlet ranged from 3,500 to 11,700 fish, representing 55%-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 nonboating anglers. Funding is derived from a combination of state and federal sources, including sport fishing license sales and a federal excise tax on sport fishing equipment and motorboat fuel. The federal funding source is the result of the Federal Aid in Sport Fish Restoration Act (also known as "Dingell-Johnson") and the Wallop-Breaux amendment made to the act in 1984.

The primary beneficiary 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 due to 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, the department 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 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. The department is no longer funding mooring buoy related projects due to liability and maintenance concerns.

Handicapped accessible ramps and landings were installed at the Fishing Lagoon 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 lagoon 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 fishing lagoon and protection of the channel leading into the lagoon were accomplished with funds from the Federal Aid in Sport Fish Restoration Program and ADOTPF.

The department 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 3 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 ~ $60K. 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 (~$20K) to complete Ramp 6 renovations and supplied city crews as a labor force for both projects.

In the summer of 2006, a custom fish cleaning table was constructed (~$950) in the ADF&G maintenance shop in Palmer for Halibut Cove Lagoon. Transportation and installation was coordinated with DPOR. Annual maintenance contracts for amenities presently are: Whiskey Gulch ~$2.72K per year, Ninilchik ~$4.31 per year for portable-latrine rental and pumping services, and Ninilchik Scenic Overlook Site ~$10K for a cooperative project with DPOR for operations and maintenance of the site.

The department 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 the department that relate to sport fishing access include annual upkeep of the road to the beach at Whiskey Gulch. During the summer of 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.

A request from the Kenai Peninsula Superintendent of state parks for help with vehicle and boat trailer traffic and parking problems at the boat tractor launch at the Anchor River State Recreation Site was addressed with a department FY08 Capital Improvement Project (CIP) request in the fall of 2006. The request included funds for the Anchor River Tractor Launch Improvements of ~$220K. The request was approved by the Statewide Access Program Coordinator and submitted to and approved by the Legislature. This was a cooperative project with DPOR with ADF&G using access program funds for the parking lot and turn-around design and construction.

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 the spring of 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 the fall of 2002. The ramp was replaced in 2008.

CURRENT PROJECTS SPORT FISHING ACCESS PROJECTS

Funding is being sought to construct stairways to access the Seldovia Slough at the ends of the Seldovia Slough Bridge for sport anglers to descend to the water more easily and to eliminate trespassing on property adjacent to the fishery.

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.

The department 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 (previous landowner Elliot), a 60-acre parcel just upstream (Thorne/Crowser), and 3 additional acquisitions: 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 is expected to be 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 outlines 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

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 and 250 coho salmon (Table 42). Only 50 Chinook salmon could be taken prior to July 21. An additional 50 could be taken beginning July 21 if the Chinook salmon spawning escapement to the Kenai River was projected above 22,300. The fishing area extended north 1 mile from near the Ninilchik River and ¼ 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 July 21 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 May 1 until October 31. A very limited freshwater fishery was permitted on the Ninilchik River downstream of the Sterling Highway Bridge beginning in 1995 using traditional methods. After 1995, the freshwater harvest was limited to no more than 30 Chinook 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, the Ninilchik Native Descendents (NND), and requested a separate permit with similar goals of passing on traditional knowledge and providing food for needy tribal members. Initially, 1 permit was granted to both organizations jointly with the same stipulations as in the past. This was not acceptable to the NTC. The NND fished upon receiving the joint permit while the NTC members did not fish until they were granted a separate permit. Since the 2 groups represented the same constituents that had been served in the past by 1 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 July 21, and no more than 125 coho salmon in total. No more than 15 Chinook 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, the NTC asked that they be allowed an additional 20 Chinook salmon, the number caught by the NND before separate permits were granted, for a total of 70 prior to July 21. The NTC permit was amended to allow the taking of 18 additional Chinook salmon because they had taken 52, 2 more than the amount allotted them at the time of their request for additional fish. 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 July 28 through August 2 because sockeye returns to the Kenai River were projected to be under the goal.

Both the NTC and NND applied for and received permits in 1999. The stipulations of the 2 permits were the same as in 1998. The NTC requested an additional 50 Chinook salmon on May 25 after they harvested their initial quota of 50. The additional harvest was approved because they would not meet their educational goals otherwise and the additional allocation was not thought to negatively impact the Chinook salmon resource or other fisheries. Both organizations exceeded its allocation of Chinook salmon in early July and were requested to cease their harvest of Chinook until after July 20. 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 NTC was 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 July 21, 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 prior to July 21 to 75; the increase to the NTC was to allow them to achieve their quota of sockeye salmon and better achieve their educational goals.

Since 2001, the educational fishery permit of the NTC was allowed the use of a second net after June 10. 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 July 21 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 king 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). They wished to conduct classes in July and requested a permit for July 1 through August 15. The group was allocated 250 salmon, including no more than 50 coho salmon and 25 Chinook salmon. Chinook salmon could be taken after July 20 only if the Kenai River run projection was above the spawning escapement goal. Due to poor weather on scheduled class days only 1 student participated in the NES program during 1 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 the group's 850 salmon could be Chinook salmon or 100, coho salmon. The restriction on harvest of Chinook salmon after July 20 was the same as in previous years and the same freshwater restrictions applied as in previous years. For April, NND were granted use of a 20 foot long gillnet with a mesh size not to exceed 2 inches to catch no more than 1,000 herring *Clupea pallasi* or hooligan *Thaleichthys pacificus*. Salmon harvests were well below harvest quotas. No fishing occurred for herring or hooligan. In 2007, NES did not fish their permit.

The permits from 2004 through 2006 with similar stipulations as in 2003 were granted to the NND, NTC, and NES. The NND hooligan 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.

In 2007, Chinook, coho and 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. The NTC met its Chinook salmon quota of 300. Late reporting and misinterpretation of permit

stipulations by NTC resulted in a harvest 428 coho salmon, an exceedence of their coho salmon quota of 300.

The Anchor Point Veterans of Foreign Wars (APVFW) applied for an educational fishery permit in 2007 and was permitted to conduct an educational fishery approximately 1.5 miles north of the Anchor River. The gear and gear specifications were the same as for the Ninilchik area permittees. Their fishing season was July 15-August 31. Their quota was 160 salmon, no more than 80 of which could be coho salmon and 80 sockeye salmon (Table 44).

In 2004, a permit was issued to the Seldovia Village Tribe (SVT) for a fishery in Seldovia, from July 15 through July 21, during a youth camp. The standard gillnet gear was permitted and the harvest amount was 70 salmon of which no more could be 50 pink salmon, 20 chum salmon, and 20 sockeye salmon (Table 45). 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.

EDUCATIONAL FISHERIES IN THE LCIMA 2008-2010

Ninilchik River Area Permits

The NTC and NND Chinook salmon harvest quotas were reduced in 2008 for the Ninilchik River area because the added harvest could negatively impact the Ninilchik River escapement and sport fishery. In 2007, the Ninilchik River Chinook salmon escapement goal was not achieved and the 2008 egg-take goal increased (see Freshwater Chinook Salmon Fisheries section). The coho salmon harvest quotas were also reduced for the Ninilchik River area because of concerns of above average coho salmon sport harvests (Table 16).

In 2008, to mitigate the reduced NTC quota for the Ninilchik River area, the Kasilof River area quotas were increased to maintain the 300 Chinook and 500 coho salmon harvest allocation. The NND quota was reduced to a 100 Chinook and 150 coho salmon harvest cap; otherwise, the NND permit stipulations were the same as in recent years. The reported total harvests from the NTC and NND educational fisheries fell well within their harvest quotas (Tables 42 and 43). The Chinook salmon educational fishery harvest quotas in the Ninilchik River area were reduced again in 2009 because of continued low Chinook salmon escapement to the Ninilchik River. Also, the NTC coho salmon quota for the Ninilchik River area was reduced because of continued above average sport harvest. The NTC total salmon quota was left at recent levels, but the quota for the Ninilchik River area was reduced to 100 Chinook and 200 coho salmon; their Kasilof River area quotas remained unchanged from 2008. The NND Chinook salmon quota was reduced to 50 fish and the coho salmon quota was left at 150 fish. To reduce the interception of Ninilchik River Chinook salmon in the educational fisheries, the saltwater areas near the Ninilchik River were closed from May 21 through June 14. NTC and NND educational fisheries harvests fell well within their permitted quotas (Table 42 and 43).

Only NTC applied for an educational fishery permit in 2010. The 2010 harvest quotas were unchanged from 2010 for Chinook salmon because the Ninilchik River escapement goal was not achieved in 2007 and 2009, and escapement was low in 2008. The NTC coho salmon harvest quota was also left unchanged from 2009. The 2010 Chinook and coho salmon harvests fell within the permitted quotas for NTC.

Anchor Point Veterans of Foreign Wars Permit

The APVWF was granted permits from 2008 through 2010. Their harvest quota was increased from 160 in 2007 to 240 salmon in 2008, of which no more than 120 could be sockeye salmon and no more than 80 could be coho salmon. The permit also stipulated that the number of released coho salmon must be included in their weekly reports. 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. Reported releases in 2009 were 2 Chinook salmon. In 2010 there were no reported releases. In 2010, 1 Dolly Varden was kept.

Seldovia Village Tribe Permit

A permit was issued to the Seldovia Village Tribe (SVT) in 2008 for August 18-22 with the same quotas as 2007. A fishery was not authorized during the requested period of May 27-31 because a subsistence fishery was already open on the dates requested and was expected to serve the need of the permittee. The permittee later relayed 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. The 2009 permit added a recording requirement for released Chinook salmon. No educational fisheries were conducted by SVT in 2009 or 2010.

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. Their fishing season was July 1 to September 15 on Tuesdays, Wednesdays, and Fridays-Sundays, to avoid regularly scheduled commercial fishing periods. 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. Their permit allowed an authorized SCF representative and their students a harvest quota of no more than 300 salmon combined, of which only 50 could be coho salmon (Table 46). 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.

REFERENCES CITED

ADF&G (Alaska Department of Fish and Game). 1990. A review of steelhead in Alaska, an interagency report. International symposium on steelhead management pages 1-25 [*in*] International Symposium on Steelhead Trout Management, Pacific State Marine Fisheries Commission and Association of Northwest Steelheaders, Portland.

Albin, D. P., and K. A. Karpov. 1998. Mortality of lingcod, *Ophiodon elongates*, related to capture by hook and line. Marine Fisheries Review 60(3):29-34.

Athons, D. E. 1992. Harvest distribution, age composition, density and abundance of razor clams along the eastern beaches of Cook Inlet, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-50, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds92-50.pdf

Athons, D. E., and J. J. Hasbrouck. 1994. Harvest distribution, age composition, and abundance of razor clams along the eastern beaches of Cook Inlet, 1992. Alaska Department of Fish and Game, Fishery Data Series No. 94-3, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds94-03.pdf

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

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

Begich, R. N. 2002. Deep Creek Chinook and coho salmon escapement studies, 1999. Alaska Department of Fish and Game, Fishery Data Series No. 02-13, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds02-13.pdf

Begich, R. N. 2006a. Deep Creek coho salmon escapement studies, 2001 and 2002. Alaska Department of Fish and Game, Fishery Data Series No. 06-15, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds06-15.pdf

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

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

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

Begich, R. N., and D. G. Evans. 2005. Deep Creek Chinook and coho salmon escapement studies, 2000. Alaska Department of Fish and Game, Fishery Data Series No. 05-34, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/Fds05-34.pdf

Bendock, T. N. 1995. Marking juvenile Chinook salmon in the Kenai River and Deep Creek, Alaska, 1993-1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-17, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds95-17.pdf

Bendock, T. N. 1996. Marking juvenile Chinook salmon in the Kenai River and Deep Creek, Alaska, 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-33, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds96-33.pdf

Booz, M., and C. M. Kerkvliet. *In prep*. Ninilchik River Chinook salmon stock status assessment, 2006. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage.

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

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

REFERENCES CITED (Continued)

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

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

Bucher, W. A., and L. F. Hammarstrom. 1995. Review of the 1995 Lower Cook Inlet area commercial herring fisher, report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Regional Information Report 2A95-40, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/RIR.2A.1995.40.pdf

Bucher, W. A., and L. F. Hammarstrom. 1996. 1995 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A96-14, Anchorage.

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

Bucher, W. A., and L. F. Hammarstrom. 1998. 1997 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A98-25, Anchorage.

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

Bucher, W. A., and R. Morrison. 1991. 1990 Lower Cook Inlet Area annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2H91-01, Anchorage.

Cass, A. J., R. J. Beamish, and G. A. McFarlane. 1990. Lingcod (*Ophiodon elongatus*). Canadian Special Publication of Fisheries and Aquatic Sciences 109, Ottawa.

Caverhill, P. A. 1977. The B.C. experience in catch and release fishing. Pages 151 - 160 [*in*] R. A. Barnhart and T. D. Roelofs editors. Catch and release fishing, Sponsored by California Trout Inc., California Cooperative Fisheries Research Unit, Humboldt State University, Arcata.

Clark, W. G. 1992. Validation of the IPHC length-weight relationship for halibut. Pages 113-116 [*In*] Report of Assessment and Research Activities 1991. International Pacific Halibut Commission, Seattle.

Clark, W. G., and S. R. Hare. 2004. Assessment of the Pacific halibut stock at the end of 2003. International Pacific Halibut Commission Report of Assessment and Research Activities. 2003:171-200.

Clark, W. G. and S. R. Hare. 2006. Assessment of the Pacific halibut stock at the end of 2005. International Pacific Halibut Commission Report of Assessment and Research Activities 2005:105-122. IPHC, Seattle.

Clark, W. G. and S. R. Hare. 2007. Assessment of the Pacific halibut stock at the end of 2006. International Pacific Halibut Commission Report of Assessment and Research Activities 2006:97-128. IPHC, Seattle.

Cope, J. *In prep*. Early-run Chinook salmon creel survey, Kasilof River, Alaska, 2002-2008. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Coughenower, D. 1986. Homer, Alaska charter fishing industry study. Marine Advisory Program Bulletin No. 22, University of Alaska, Anchorage.

Davis, A. S. 1982. The commercial otter trawl shrimp fishery of Cook Inlet. Alaska Department of Fish and Game, Division of Commercial Fisheries, Informational Leaflet No. 205, Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/afrbil.205.pdf

REFERENCES CITED (Continued)

Davis, M. W., and B. L. Olla. 2002. Mortality of lingcod towed in a net as related to fish length, seawater temperature, and air exposure: a laboratory bycatch study. North American Journal of Fisheries Management 22:1095-1104.

Denny, C. 1990. Derby days. Alaska Business Monthly 6: 47-53.

Eskelin, A. 2004. An assessment of trap efficiency to estimate coho salmon smolt abundance in a small Alaskan stream. Master's Thesis, University of Alaska, Fairbanks.

Gates, K. S. and J. K. Boersma. 2010. Spawning and seasonal distribution of adult steelhead in southcentral Alaska's Kasilof River watershed from 2007 to 2009. Fishery Data Series Report Number 2010-06. (pdf)

Gates, K. S., J. K Boersma, and J. B. Olsen. 2010. Characteristics of spawning adult steelhead in Crooked and Nikolai Creeks, Kenai Peninsula, Alaska, 2004-2009, Fishery Data Series Report Number 2010-9 (pdf)

Gillespie. G. E., W. C. Hajas, and J. S. Dunham. 2005. Evaluation of assessment and management frameworks in the British Columbia depuration fishery for intertidal clams. Science Branch, Pacific Region Marine Ecosystems and Aquaculture, Shellfish Section, Fisheries and Oceans, Canada Research Document 2005/052

Goldman, K. J., R. L. Gustafson, and M. Byerly. *In prep*. Monitoring ecosystem parameters in the Northern Gulf of Alaska, Exxon Valdez Oil Spill Restoration Project final report (GEM Project G-040639). Alaska Department of Fish and Game, Division of Commercial Fisheries, Homer, Alaska.

Gustafson, R. 1995. Kachemak Bay littleneck clam assessments, 1990-1994. Alaska Department of Fish and Game, Commercial Fisheries Management and Development, Regional Information Report 2A95-19, Anchorage.

Gustafson, R. 1996. Kachemak Bay littleneck clam assessments, 1995. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A96-12, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/RIR.2A.1996.12.pdf

Gustafson, R., and W. Bechtol. 1998. Abundance, recruitment, and mortality of Pacific littleneck clams *Protothaca staminea* at Chugachik Island, Alaska. Journal of Shellfish Research, 17:4.

Gustafson, R. L. 1994. Trawl shrimp index fishing in the Southern District of the Cook Inlet Management Area, spring 1992 and 1993. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A94-23, Anchorage.

Gustafson, R. L., and W. R. Bechtol. 2000. Kachemak Bay littleneck clam assessments, 1996-1997. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A00-25, Anchorage.

Gustafson, R. L., and W. R. Bechtol. 2001. Trawl shrimp index surveys in the southern district of the Cook Inlet management area, spring 1995 and 1997. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A01-09, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/RIR.2A.2001.09.pdf

Gustafson, R. L., and W. R. Bechtol. 2005. Kachemak Bay small-mesh trawl survey, 2000. Alaska Department of Fish and Game, Fishery Data Series No. 05-54, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds05-54.pdf

Hammarstom, L. F., and M. Dickson. 2000. 1999 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A00-17, Anchorage.

Hammarstrom, L. F., and M. Dickson. 2001. 2000 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A01-01, Anchorage.

REFERENCES CITED (Continued)

Hammarstrom, L. F., and M. Dickson. 2002. 2001 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A02-16, Anchorage.

Hammarstrom, L. F., and M. Dickson. 2003. 2002 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A03-04, Anchorage.

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

Hammarstrom, L. F., and M. S. Dickson. 2006. 2005 Lower Cook Inlet annual finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 06-35, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds06-35.pdf

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

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

Hammarstrom, S. L. 1974. Inventory and cataloging of Kenai Peninsula, Cook Inlet, and fish stocks. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1973-1974, Project F-9-6, 15 (G-I-C), Juneau.

Hammarstrom, S. L. 1975. Inventory and cataloging of Kenai Peninsula, Cook Inlet, Prince William Sound, and fish stocks. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1974-1975, Project F-9-7, 16 (G-I-C), Juneau http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDF-9-7(16)G-I-C.pdf

Hammarstrom, S. L. 1976. Inventory and cataloging of Kenai Peninsula, and Cook Inlet drainages and fish stocks. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1975-1976, Project F-9-8(17)G-I-C, Juneau. http://www.sf.adfg.state.ak.us/FedAidpdfs/FREDF-9-8(17)G-I-C.pdf

Hammarstrom, S. L. 1977. Evaluation of Chinook salmon fisheries of the Kenai Peninsula. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1976-1977, Project F-9-9, 18 (G-II-L), Juneau.

Hammarstrom, S. L. 1978. Evaluation of Chinook salmon fisheries of the Kenai Peninsula. Federal Aid in Fish Restoration, Annual Report of Performance, 1977-1978, Project F-9-10, Volume 19 (G-II-L), Juneau, Alaska, USA, Juneau.

Hammarstrom, S. L. 1979. Evaluation of Chinook salmon fisheries of the Kenai Peninsula. Federal Aid in Fish Restoration, Annual Report of Performance, 1978-1979, Project F-9-11, Volume 20 (G-II-L), Juneau, Alaska, USA, Juneau. http://www.sf.adfg.state.ak.us/fedaidpdfs/FREDf-9-11(20)g-ii-l.pdf

Hammarstrom, S. L. 1980. Evaluation of Chinook salmon fisheries of the Kenai Peninsula. Alaska Department of Fish and Game, Sport Fish Division. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-12(21)G-II-L, Juneau. http://www.sf.adfg.state.ak.us/FedAidpdfs/FREDf-9-12(21)G-II-L.pdf

Hammarstrom, S. L. 1981. Evaluation of Chinook salmon fisheries of the Kenai Peninsula. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (G-II-L), Juneau.

Hammarstrom, S. L., L. Larson, M. Wenger, and J. Carlon. 1985. Kenai Peninsula Chinook and coho salmon studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration. Annual Performance Report,

REFERENCES CITED (Continued)

1984-1985, Project F-9-17, 26 (G-II-L), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDf-9-17(26)G-II-L.pdf

Hammarstrom, S. L., and L. L. Larson. 1982. Evaluation of Chinook salmon fisheries of the Kenai Peninsula. Federal Aid in Fish Restoration, Annual Report of Performance, 1981-1982, Project F-9-14, Volume 23 (G-II-L), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDf-9-14(23)G-II-L.pdf

Hammarstrom, S. L., and L. L. Larson. 1983. Evaluation of Chinook salmon fisheries of the Kenai Peninsula. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24 (G-II-L), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDf-9-15(24)G-II-L.pdf

Hammarstrom, S. L., and L. L. Larson. 1984. Evaluation of Chinook salmon fisheries of the Kenai Peninsula. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1983-1984, Project F-9-16, 25 (G-II-L), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDf-9-16(25)G-II-L.pdf

Hammarstrom, S. L., and L. L. Larson. 1986. Kenai River salmon escapement. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1985-1986, Project F-10-1, 27 (S-32-2), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDf-10-1(27)S-32-1,2,4,5.pdf

Hooten, R. S. 1988. Catch and release as a management strategy for steelhead in British Columbia. Pages 143 - 156 [*in*] R. A. Barnhart and T. D. Roelofs editors. Catch and release fishing, a decade of experience. California Cooperative Fisheries Research Unit, Humboldt State University,, Arcata.

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

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

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001a. Revised Edition. Harvest, catch, and participation in Alaska sport fisheries during 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-29 (revised), Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds97-29(revised).pdf

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001b. Revised Edition. Harvest, catch, and participation in Alaska sport fisheries during 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-25 (revised), Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds98-25(revised).pdf

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001c. Revised Edition. Participation, catch, and harvest in Alaska sport fisheries during 1998. Alaska Department of Fish and Game, Fishery Data Series No. 99-41 (revised), Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds99-41(revised).pdf

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001d. Participation, catch, and harvest in Alaska sport fisheries during 1999. Alaska Department of Fish and Game, Fishery Data Series No. 01-08, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds01-08.pdf

IPHC (International Pacific Halibut Commission). 1987. The Pacific halibut: biology, fishery, and management. International Pacific Halibut Commission, Technical Report No. 22, Seattle.

Ivey, S., C. Brockman and D. Rutz. *In prep*. Overview of Northern Cook Inlet Area sport fisheries with proposal under consideration by the Alaska Board of Fisheries, February 2012. Alaska Department of Fish and Game, Fishery Management Report, Anchorage.

Jennings, G. B., K. Sundet, and A. E. Bingham. 2007. Participation, catch, and harvest in Alaska sport fisheries during 2004. Alaska Department of Fish and Game, Fishery Data Series No. 07-40, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds07-40.pdf

REFERENCES CITED (Continued)

Jennings, G. B., K. Sundet, and A. E. Bingham. 2009a. Estimates of participation, catch, and harvest in Alaska sport fisheries during 2005. Alaska Department of Fish and Game, Fishery Data Series No. 09-47, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/FDS09-47.pdf

Jennings, G. B., K. Sundet, and A. E. Bingham. 2009b. Estimates of participation, catch, and harvest in Alaska sport fisheries during 2006. Alaska Department of Fish and Game, Fishery Data Series No. 09-54, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/FDS09-54.pdf

Jennings, G. B., K. Sundet, and A. E. Bingham. 2010a. Estimates of participation, catch, and harvest in Alaska sport fisheries during 2007. Alaska Department of Fish and Game, Fishery Data Series No. 10-02, Anchorage. http://www.sf.adfg.state.ak.us/FedAidpdfs/Fds10-02.pdf

Jennings, G. B., K. Sundet, and A. E. Bingham. 2010b. Estimates of participation, catch, and harvest in Alaska sport fisheries during 2008. Alaska Department of Fish and Game, Fishery Data Series No. 10-22, Anchorage. http://www.sf.adfg.state.ak.us/FedAidpdfs/FDS10-22.pdf

Jennings, G. B., K. Sundet, and A. E. Bingham. *In prep*. Estimates of participation, catch, and harvest in Alaska sport fisheries during 2009. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Jennings, G. B., K. Sundet, and A. E. Bingham. In prep. Participation, catch, and harvest in Alaska sport fisheries during 2005. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Jennings, G. B., K. Sundet, A. E. Bingham, and D. Sigurdsson. 2004. Participation, catch, and harvest in Alaska sport fisheries during 2001. Alaska Department of Fish and Game, Fishery Data Series No. 04-11, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds04-11.pdf

Jennings, G. B., K. Sundet, A. E. Bingham, and D. Sigurdsson. 2006a. Participation, catch, and harvest in Alaska sport fisheries during 2002. Alaska Department of Fish and Game, Fishery Data Series No. 06-34, Anchorage. http://www.sf.adfg.state.ak.us/FedAidpdfs/fds06-34.pdf

Jennings, G. B., K. Sundet, A. E. Bingham, and D. Sigurdsson. 2006b. Participation, catch, and harvest in Alaska sport fisheries during 2003. Alaska Department of Fish and Game, Fishery Data Series No. 06-44, Anchorage. http://www.sf.adfg.state.ak.us/FedAidpdfs/fds06-44.pdf

Jones & Stokes. 1987. Southcentral Alaska sport fishing economic study. Final research report, November 1987. (JSA86-0413), Sacramento, CA. Prepared for ADF&G, Research and Technical Services, Anchorage.

Kaimmer, S. M., and R. J. Trumble. 1998. Injury, condition, and mortality of Pacific halibut bycatch following careful release by Pacific cod and sablefish longline fisheries. Fisheries Research 38: 131-144.

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

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

Kerkvliet, C. M., and M. D. Booz. *In prep*. Anchor River 2009 Chinook and coho salmon escapement project. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Kerkvliet, C. M, M. D. Booz, and R. N. Begich. *In prep* b. Deep Creek coho salmon smolt studies, 1994-2004. Alaska Department of Fish and Game, Fishery Data Series report, Anchorage

Kerkvliet, C. M., M. Booz, and D. Burwen. *In prep* a. Anchor River 2007 and 2008 Chinook and coho salmon escapement. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

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

REFERENCES CITED (Continued)

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

King, B. E., and J. A. Breakfield. 1998. Coded wire tagging of coho and Chinook salmon in the Kenai River and Deep Creek, Alaska, 1996. Alaska Department of Fish and Game, Fishery Data Series No. 98-9, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds98-09.pdf

King, B. E., and J. A. Breakfield. 1999. Chinook and coho salmon coded wire tagging studies in the Kenai River and Deep Creek, Alaska, 1997. Alaska Department of Fish and Game, Fishery Data Series No. 99-11, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds99-11.pdf

King, B. E., and J. A. Breakfield. 2002. Coded wire tagging studies in the Kenai River and Deep Creek, Alaska, 1998. Alaska Department of Fish and Game, Fishery Data Series No. 02-03, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds02-03.pdf

Larson, L. L. 1990. Statistics for selected sport fisheries on the Anchor River, Alaska, during 1989 with emphasis on Dolly Varden char. Alaska Department of Fish and Game, Fishery Data Series No. 90-57, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds90-57.pdf

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

Larson, L. L. 1992. Stock assessment of Dolly Varden on the Anchor River, Alaska during 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-14, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds92-14.pdf

Larson, L. L. 1993. Lower Kenai Peninsula Dolly Varden and steelhead trout studies during 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-54, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds93-54.pdf

Larson, L. L. 1994. Lower Kenai Peninsula Dolly Varden studies during 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-51, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds94-51.pdf

Larson, L. L. 1995. Lower Kenai Peninsula Dolly Varden studies during 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-44, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds95-44.pdf

Larson, L. L. 1997. Lower Kenai Peninsula Dolly Varden studies during 1995. Alaska Department of Fish and Game. Fishery Data Series No. 97-2, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds97-02.pdf

Larson, L. L., and D. T. Balland. 1989. Statistics for selected sport fisheries on the lower Kenai Peninsula, Alaska, during 1988 with emphasis on Dolly Varden char. Alaska Department of Fish and Game, Fishery Data Series No. 101, Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds-101.pdf

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

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

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

McCaughran, D. A., and S. H. Hoag. 1992. The 1979 Protocol to the convention and related legislation. International Pacific Halibut Commission, Technical Report No. 26, Seattle.

REFERENCES CITED (Continued)

McKinley, T. R. 1995. Angler effort and harvest of Chinook salmon and Pacific halibut in the marine recreational fishery of Central Cook Inlet, 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-34, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds95-34.pdf

McKinley, T. R. 1996. Angler effort and harvest of Chinook salmon and Pacific halibut in the marine recreational fishery of Central Cook Inlet, 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-46, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds96-46.pdf

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

Meyer, S. 2007. Halibut discard mortality in recreational fisheries in IPHC areas 2C and 3A. Discussion paper for North Pacific Fishery Management Council, October 2007 meeting.

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

Meyer, S. C. 2000. Composition and biomass of the recreational rockfish Sebastes harvest in Southcentral Alaska, 1992-1995. Alaska Department of Fish and Game, Fishery Data Series No. 00-6, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds00-06.pdf

Meyer, S. C. 2003. Recreational halibut fishery statistics for Southcentral Alaska (Regulatory Area 3A), 1995-1999. A report to the International Pacific Halibut Commission. Alaska Department of Fish and Game, Special Publication No. 03-06, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/sp03-06.pdf

Meyer, S. C. 2006. Recreational halibut fishery statistics for Southcentral Alaska (Area 3A), 2000-2002. A report to the International Pacific Halibut Commission. Alaska Department of Fish and Game, Special Publication No. 06-22, Anchorage. http://www.sf.adfg.state.ak.us/FedAidpdfs/sp06-22.pdf

Meyer, S. C., M. J. Jaenicke, B. Failor. 2008. Final completion report: assessment of recreational halibut harvest in Alaska. NOAA Grant Award NA07NMF4370168. Alaska Department of Fish and Game, Juneau. http://www.fakr.noaa.gov/alaskagrants/reports/NA07NMF4370168_FINALRpt.pdf

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

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

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

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

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

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

REFERENCES CITED (Continued)

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

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

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

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

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

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

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

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

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

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

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

Munk, K. M. 2001. Maximum ages of groundfishes in waters off Alaska and British Columbia and considerations of age determination. Alaska Fishery Research Bulletin 8(1):12-21.

Nelson, D. C. 1995. Area management report for the recreational fisheries of the Kenai Peninsula, 1994. Alaska Department of Fish and Game, Fishery Management Report No. 95-4, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fmr95-04.pdf

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

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

Parker, S. J., S. A. Berkeley, J. T. Golden, D. R. Gunderson, J. Heifetz, M. A. Hixon, R. Larson, B. M. Leaman, M. S. Love, J. A. Musick, V. M. O'Connell, S. Ralston, H. J. Weeks, and M. M. Yoklavich. 2000. Management of Pacific rockfish. AFS Policy Statement. Fisheries 25(3): 22-30.

REFERENCES CITED (Continued)

Parker, S. J., P. S. Rankin, R. W. Hannah, and C. B. Schreck. 2003. Discard mortality of trawl-caught lingcod in relation to tow duration and time on deck. North American Journal of Fisheries Management 23:530-542.

Pettit, S. W. 1977. Comparative reproductive success of caught-and-released and unplayed hatchery female steelhead trout (*Salmo gairdneri*) from the Clearwater River, Idaho. Transactions of the American Fisheries Society 106:431–435.

Reingold, M. 1975. Effects of displacing, hooking and releasing migrating adult steelhead trout. Transactions of the American Fisheries Society 104:458-460.

Schroeder, T. R., and R. Morrison. 1989. 1988 Lower Cook Inlet area annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2H89-02, Anchorage.

Schroeder, T. R., and R. Morrison. 1990. 1989 Lower Cook Inlet Area annual finfish management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2H90-03, Anchorage.

Shields, P. 2006. Upper Cook Inlet commercial fisheries annual management report, 2005. Alaska Department of Fish and Game, Fishery Management Report No. 06-42, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fmr06-42.pdf

Stock, C. E., and S. C. Meyer. 2005. Composition of the recreational lingcod harvest in Southcentral Alaska, 1993-2002. Alaska Department of Fish and Game, Fishery Data Series No. 05-35, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/Fds05-35.pdf

Szarzi, N. J. 1991. Distribution and abundance of the Pacific razor clam, *Siliqua patula* (Dixon), on the east side Cook Inlet beaches. University of Alaska, Fairbanks, M.Sc. thesis, Juneau, Alaska.

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

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

Szarzi, N. J., S. J. Fleischman, R. A. Clark, and C. M. Kerkvliet. 2007a. Stock status and recommended escapement goal for Anchor River Chinook salmon. Alaska Department of Fish and Game, Fishery Manuscript No. 07-05, Anchorage. http://www.sf.adfg.state.ak.us/FedAidpdfs/fms07-05

Szarzi, N. J., P. A. Hansen, and J. J. Hasbrouck. 2010. Harvest, abundance, age and length characteristics of razor clams from eastern Cook Inlet beaches, 1993-2003. Alaska Department of Fish and Game, Fishery Data Series No. 10-49, Anchorage. http://www.sf.adfg.state.ak.us/FedAidpdfs/FDS10-49.pdf

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

Taylor, G. and R. A. Barnhart. 1999. Mortality of angler caught and released summer steelhead. California Cooperative Fishery Research Unit and Humboldt State University Foundation, Contract Number FG 5018 IF, California Department of Fish and Game, Steelhead Trout Catch Report-Restoration Card.

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

REFERENCES CITED (Continued)

VanHulle, F. D. 1985. Alaska steelhead workshop. Alaska Department of Fish and Game, Division of Sport Fish, Juneau.

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

Walker, R. J., C. Olnes, K. Sundet, A. L. Howe, and A. E. Bingham. 2003. Participation, catch, and harvest in Alaska sport fisheries during 2000. Alaska Department of Fish and Game, Fishery Data Series No. 03-05, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds03-05.pdf

Wallis, J., D. T. Balland, and D. Thomas. 1982. Anchor River steelhead study. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982, Project AFS-48, 23 (AFS-48-2), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDf-9-14(23)AFS48-2.pdf

Wallis, J., D. T. Balland, and D. Thomas. 1983. Anchor River steelhead study. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24 (AFS-48-3), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDf-9-15(24)AFS-48-3.pdf

Wallis, J., D. T. Balland, and D. Thomas. 1984. Anchor River steelhead study. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1983-1984, F-9-16 (25) AFS-48, Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDf-9-16(25)AFS-48.pdf

Wallis, J., and S. Hammarstrom. 1980. Inventory and cataloging of Kenai Peninsula, and Cook Inlet drainages and fish stocks. Alaska Department of Fish and Game, Sport Fish Division. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-12(21)G-I-C, Juneau. http://www.sf.adfg.state.ak.us/FedAidpdfs/FREDf-9-12(21)G-I-C.pdf

Wallis, J., and S. Hammarstrom. 1982. Inventory and cataloging of Kenai Peninsula, and Cook Inlet drainages and fish stocks. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982, Project F-9-14, 23 (G-I-C), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDf-9-14(23)G-I-C.pdf

Wallis, J., and S. Hammarstrom. 1983. Inventory and cataloging of Kenai Peninsula, and Cook Inlet drainages and fish stocks. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24 (G-I-C), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/FREDf-9-15(24)G-I-C.pdf

TABLES AND FIGURES

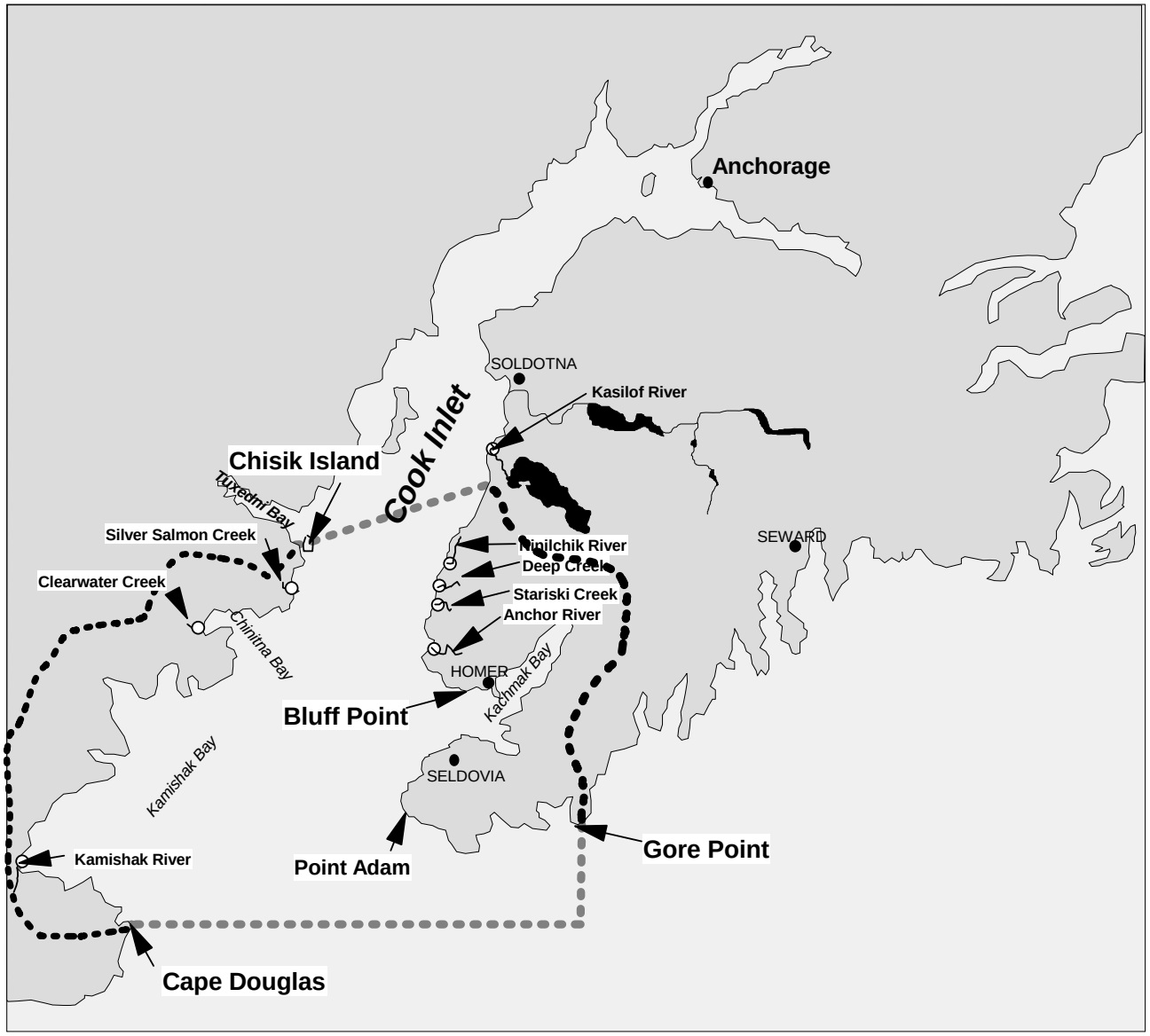


Figure 1.-Lower Cook Inlet Management Area.

Table 1.-Angler days of effort expended by recreational anglers fishing Lower Cook Inlet Management Area waters, 1977-2009.

	West Cook Inlet		Central Cook Inlet			Lower Cook Inlet and Kachemak Bay				Percent	
Year	Salt Water [a]	Fresh Water	Saltwater Finfish	Saltwater Shellfish	Freshwater Finfish	Saltwater Finfish	Saltwater Shellfish	Freshwater Finfish	Total	of State	Alaska Total
1977			57,611 [b]		55,706	46,827 [b]			160,144	13.4	1,198,486
1978			64,429 [b]		74,378	59,128 [b]			197,935	15.4	1,286,063
1979	880		65,677 [b]		77,027	64,656 [b]			208,240	15.3	1,364,739
1980	928		63,481 [b]		63,273	57,078 [b]			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	45337	31,470	52,721	91,229	20,334	3,844	247,381	14.3	1,732,528
1984	1,673	652	53955	30,013	53,320	72,441	25,162	2,243	239,459	12.8	1,866,837
1985	1,942	970	55435	32,652	63,464	63,272	16,732	1,024	235,491	12.1	1,943,069
1986	2,562	399	66377	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
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	142883	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
1977-2006 Mean	2,161	1,440	69,480	32,577	53,473	105,306	12,983	1,826	272,374	13	2,109,580
2007-2009 Mean	118	1,475	63,652	26,986	46,090	120,823	5,726	780	265,650	11	2,358,573

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

[a] West Cook Inlet saltwater harvest except for shellfish included in Central and Lower Cook Inlet harvest starting in 2006.

[b] Includes shellfish

Table 2.-Historical recreational harvest of Pacific halibut in Cook Inlet waters, 1977-2009.

Year	Lower Cook Inlet [a]	Central Cook Inlet [b]	West Cook Inlet [c]	Total Cook Inlet	Statewide Total
1977	9,416	4,050	[d]	13,466	23,244
1978	20,756	4,821	[d]	25,577	37,085
1979	20,479	6,518	[d]	26,997	47,705
1980	21,808	8,177	[d]	29,985	64,658
1981	29,294	9,427	[d]	38,721	74,212
1982	28,851	10,681	[d]	39,532	92,358
1983	36,623	23,503	[d]	60,126	117,042
1984	37,747	23,455	[d]	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	[e]	168,154	325,188
1996	105,968	81,807	[e]	187,775	350,220
1997	105,646	88,270	[e]	193,916	380,256
1998	94,209	85,153	[e]	179,362	350,464
1999	86,239	69,264	[e]	155,503	332,657
2000	107,736	93,991	[e]	201,727	403,280
2001	94,864	87,618	[e]	182,482	365,539
2002	93,625	73,398	[e]	167,023	350,809
2003	112,386	77,708	[e]	190,094	402,862
2004	125,595	86,107	[e]	211,702	482,550
2005	133,147	85,548	[e]	218,585	500,048
2006	124,823	84,619	[e]	209,442	462,855
2007	156,085	97,180	[e]	253,265	584,764
2008	124,492	84,590	[e]	209,082	516,480
2009	111,012	84,282	[e]	195,294	440,255
Averages					
1977-2006	73,598	53,430		127,502	253,244
2007-2009	130,530	88,684		219,214	513,833

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

[a] 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.

[b] Cook Inlet salt waters east of the center of Cook Inlet and north of Anchor Point.

[c] Cook Inlet salt waters west of the center of Cook Inlet and from the Susitna River south to Cape Douglas .

[d] Halibut information was not requested in the SWHS West Cook Inlet questionnaire before 1985.

[e] 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, 1977-2009.

	West Cook Inlet			Lower Cook Inlet and Kachemak Bay			Central Cook Inlet			
Year	Salt Water	Fresh Water	Total	Salt Water Stocked Locations	Salt Water Other Locations	Total	Salt Water	Fresh Water	Total	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	2,664	2,832	3,294	6,126	8,831
1984	75		75	537	1,559	2,096	4,613	2,407	7,020	9,191
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	4,636	6,719	3,583	10,302	14,961
1991	149		149	2,786	775	3,561	6,883	5,997	12,880	16,590
1992	166	9	175	2,602	2,978	5,580	8,609	8,389	16,998	22,753
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	10,139	9,272	8,064	17,336	27,822
1995	164	76	240	5,508	3,642	9,150	11,283	5,087	16,370	25,760
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 [a]	3,715	6,550	4,948	2,881	7,829	14,455
2002	28		28	2,621 [a]	5,300	7,921	3,889	2,384	6,273	14,222
2003	72	37	109	4,059 [a]	6,394	10,453	4,303	3,238	7,541	18,103
2004	13		13	4,068 [a]	8,103	12,171	5,553	3,624	9,177	21,361
2005	46	92	138	2,810 [a]	11,128	13,938	4,866	3,416	8,282	22,358
2006	[b]			2,092 [a]	8,287	10,379	5,989	3,174	9,163	19,542
2007	[b]			1,757 [a]	5,970	7,727	4,829	4,284	9,113	16,840
2008	[b]	90	90	833 [a]	5,049	5,882	2,680	3,064	5,744	11,716
2009	[b]	264	264	710 [a]	4,140	4,850	1,696	1,064	2,760	7,874
1977-2006 Mean	116	72	142	3,426	3,149	5,662	5,874	3,914	9,788	15,569
2007-2009 Mean		177	177	1,100	5,053	6,153	3,068	2,804	5,872	12,143

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

[a] Halibut Cove Lagoon and Seldovia harvests no longer assessed individually; includes only Homer Spit shore angler harvest estimates.

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

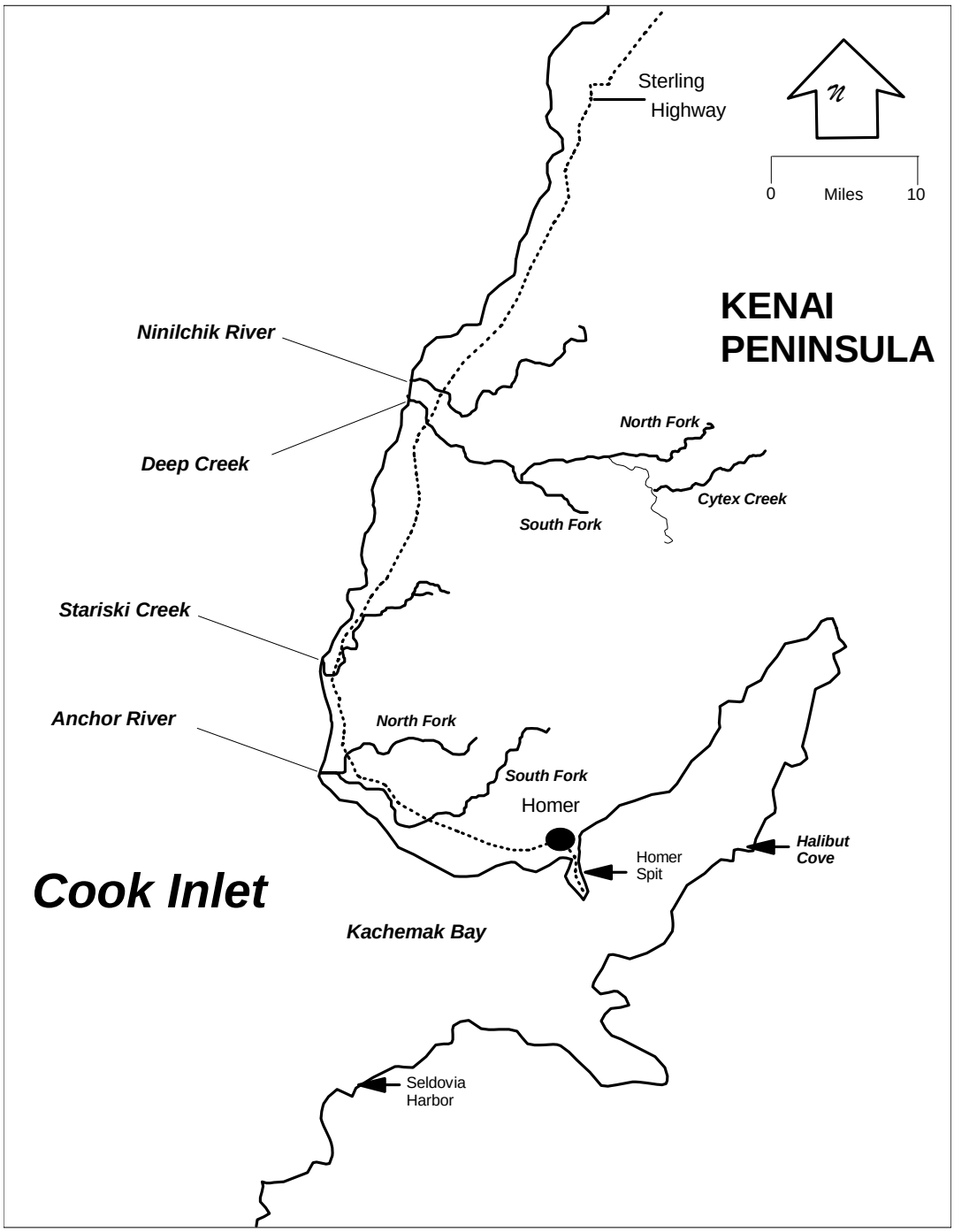


Figure 2.-Lower Kenai Peninsula road system streams.

Table 4.-Coho salmon harvest in Lower Cook Inlet Management Area waters, 1977-2009.

	West Cook Inlet			Lower Cook Inlet and Kachemak Bay			Central Cook Inlet			Total
Year	Salt Water	Fresh Water	Total	Nick Dudiak Lagoon	Saltwater Other Locations	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
2006	[a]	1,667		4,450	9,975	14,425	3,418	8,278	11,696	26,121
2007	[a]	1,384		4,617	11,522	16,139	2,456	7,870	10,326	26,465
2008	[a]	573		3,767	7,859	11,626	1,902	7,396	9,298	20,924
2009	[a]	1,289		509	9,616	10,125	2,202	6,237	8,439	38,417
1977-2006 Mean	256	1,290	1,341	6,784	5,219	9,967	2,038	5,308	7,345	18,519
2007-2009 Mean		1,082		2,964	9,666	12,630	2,187	7,168	9,354	28,602

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

[a] West Cook Inlet saltwater harvest included in Central and Lower Cook Inlet harvest beginning in 2006.

Table 5.-Dolly Varden harvest in Lower Cook Inlet Management Area waters, 1977-2009.

	Lower Cook Inlet and Kachemak Bay			Central Cook Inlet			
Year	Salt Water	Fresh Water	Total	Salt Water	Fresh Water	Total	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
1977-2006 Mean	1,974	352	2,244	292	6,370	6,663	8,907
2007-2009 Mean	1,150	179	1,329	231	1,504	1,735	3,064

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

[a] Preliminary.

Table 6.-Razor clam harvest, participation and success rates on eastside Kenai Peninsula beaches north of Anchor Point, 1969-2009.

Year	Participation (Digger-days)	Harvest	Clams/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
1977-2006 Mean	32,132	880,081	28
2007-2009 Mean	26,986	462,754	17

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

Table 7.-Shellfish harvest in Lower Cook Inlet Management Area waters, 1981-2009.

Year	Participation All Species (angler-days)	King Crab (numbers)	Dungeness Crab (numbers)	Tanner Crab [a] (numbers)	Shrimp (gallons)	Hardshell Clams (gallons)	Razor Clams (numbers)	Other Shellfish (numbers)
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 [b]	closed	13,141	3,838	1,620
2002	7,439	closed	closed	3,574 [c]	closed	12,047	7,887	2,163
2003	5,836	closed	closed	closed	closed	10,074	7,241	1,925
2004	6,641	closed	closed	closed	closed	8,399	6,412	1,372
2005	6,415	closed	closed	closed	closed	11,625	3,677	1,874
2006	6,704	closed	closed	closed	closed	4,210	6,529	1,108
2007	4,476	closed	closed	closed	closed	4,144	3,133	1,423
2008	6,240	closed	closed	17,164 [d, e]	closed	3,562	2,307	3,874
2009	6,463	closed	closed	17,852 [e]	closed	3,202	12,475	1,702
1981-2006 Mean	12,983		18,310	8,056	2,883	13,254	12,811	5,205
2007-2009 Mean	5,726					3,636	5,972	2,333

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

[c] Calendar year Tanner crab harvest from January 1-March 15 and July 15-December 31until 2008, then season harvest from July-March.

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

[c] August 3 closed fishery

[d] Fishery opened July 15

[e] Estimate based on 10/14/2010 database query.

Table 8.-Comparison of charter logbook data and Statewide Harvest Survey marine Chinook salmon guided angler harvest in the LCIMA, 1998-2009.

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 [a]	6,644
2006	4,708 [a]	6,547
2007	2,907 [a]	4,926
2008	1,732 [a]	3,363
2009	1,184 [a]	1,763

[a] Includes charter crew harvest.

Table 9.-Central Cook Inlet marine early- and late-run Chinook salmon sport fishery harvest and effort, 1972-2009.

	Harvest		
Year	Early-run	Late-run	Total
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
Mean	3,756	1,322	5,078

Source: 1972-1986 from creel survey (Hammarstrom 1974-1981; Hammarstrom and Larson 1982-1984, Hammarstrom and Larson 1986; Hammarstrom et al. 1985). 1987-2003 data from Statewide Harvest Survey (Mills 1979-1980, 1981a-b, 1982-1994, Howe et al. 1995, 1996, 2001 a-d, Walker et al. 2003, Jennings et al. 2004, 2006a-b, 2007, 2009 a-b, 2010 a-b and *In prep*). Harvest was apportioned 70.5% to the early run and 29.5% to the late run for 1987-1993, based on estimates from onsite creel surveys from 1972-1986. Early-run percentages of total harvest for 1994 and 1995 were 74.9% and 75.48%, respectively, based on creel survey (McKinley 1995, 1996). 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 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 Chinook harvests of guided and unguided anglers, Central Cook Inlet, 1986-2009.

	Early run		Early run	Late run		Late run	Total	Total	Total
Year	Unguided	Guided	Total	Unguided	Guided	Total	Unguided	Guided	Overall
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**

Source: Statewide Harvest Survey (Mills 1987-1994, Howe et al. 1995, 1996, 2001 a-d, Walker et al. 2003, Jennings et al. 2004, 2006a-b, 2007, 2009 a-b, 2010 a-b and *In prep*). Harvest was apportioned 70.5% to the early run and 29.5% to the late run for 1987-1995, based on estimates from onsite creel surveys from 1972-1986. 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.

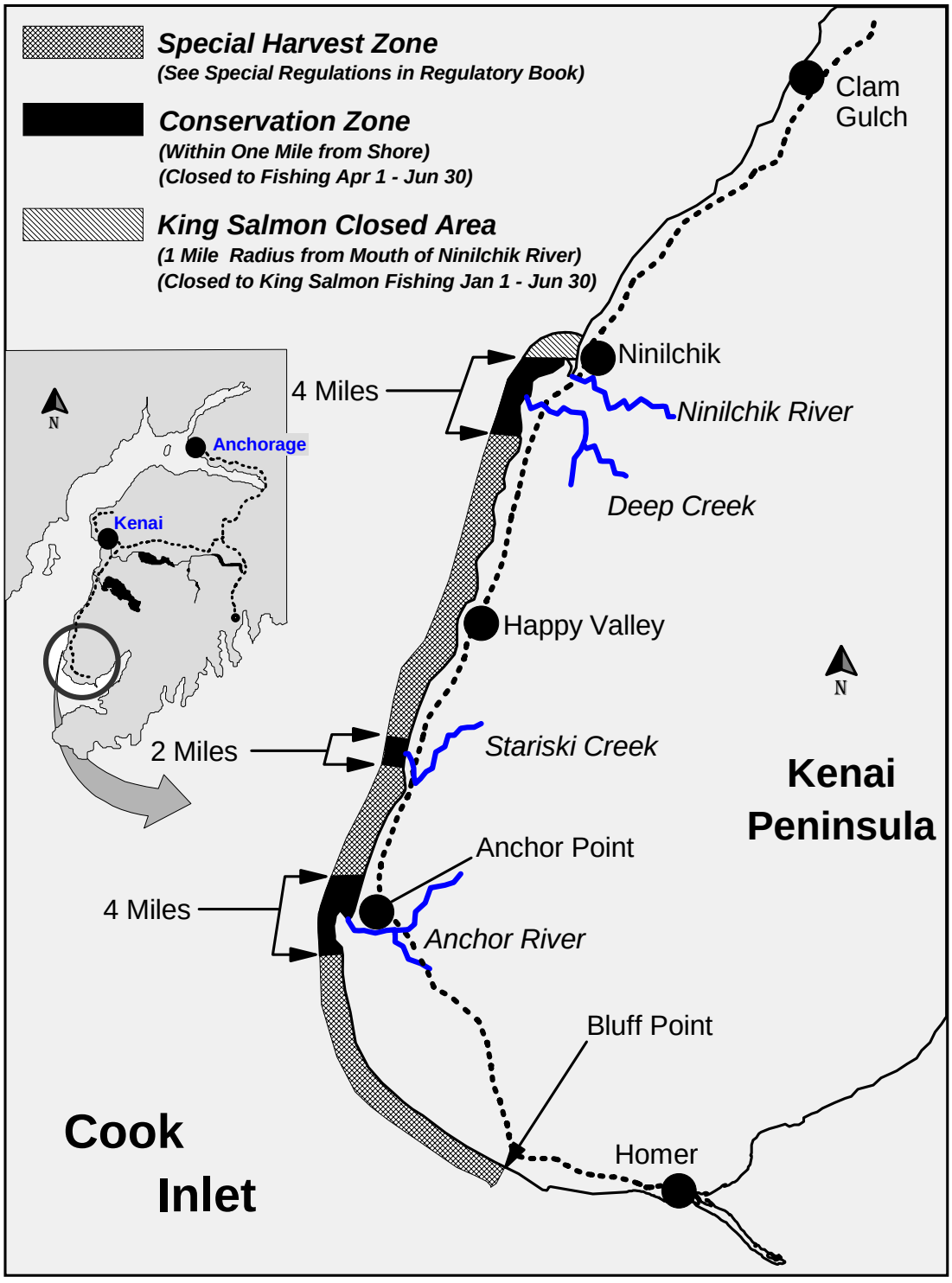


Figure 3.–Central Cook Inlet regulatory zones.

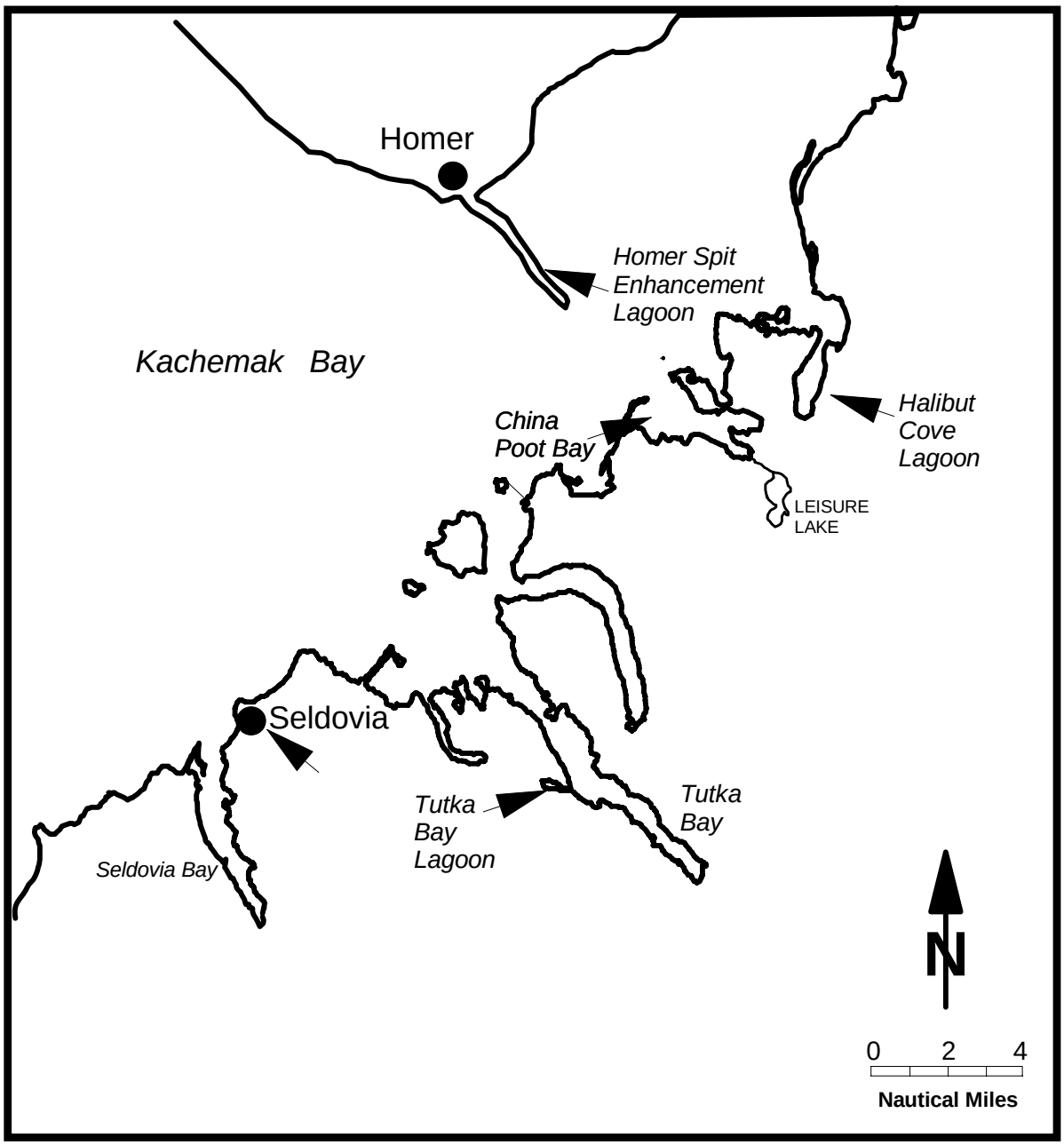


Figure 4.–Saltwater stocking locations in Kachemak Bay and Lower Cook Inlet.

Table 11.-Chinook salmon harvested in Lower Cook Inlet and Kachemak Bay during October-March, 2002-2009.

	Harvest		Total
YEAR	Guided	Unguided	Harvest
2002	204	1,219	1,423
2003	289	1,515	1,804
2004	419	1,650	2,069
2005	412	2,546	2,958
2006	169	1,346	1,515
2007	404	1,607	2,011
2008	336	1,356	1,692
2009	310	1,386	1,696
Mean	318	1,578	1,896

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

Table 12.-Salmon smolt releases to terminal fisheries in Kachemak Bay, 1974-2010.

	Homer Spit				Halibut Cove Lagoon	Seldovia	
Release Year	Early-run Chinook	Late-run Chinook	Early-run Coho	Late-run Coho	Early-run Chinook	Early-run Chinook	Late-run Coho
1974					3,872		
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 [a]	105,000 [b]	106,844	107,521	
2004	168,743		130,243	110,000 [b]	103,771	88,682	
2005	220,822		125,707	91,485 [b,c]	112,521	114,984	
2006	224,053		125,216	324,200 [b,c]	117,549	113,974	113,800 [b,c]
2007	226,972		127,244	100,600 [b]	54,560	54,276	
2008	212,141		125,108	95,000 [b]	59,784	54,464	
2009	164,234		113,696	44,695 [d]	35,065	44,487 [e]	
2010	213,503		130,206		111,134	114,421	

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

[b] Purchased from CIAA with non-Fish and Game funding source.

[c] Treated for BKD

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

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

Table 13.-Shorebased harvest and angler participation for enhanced Chinook pink and coho salmon stocks at the Homer Spit fishery, 1987-2009.

	Chinook Salmon Harvest[a]			Pink Salmon	Coho Salmon	Total		
Year	Early run	Late run[b]	Total	Harvest[c]	Harvest	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		15753
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
Mean	1,914	1,053	2,527	1,557	7,164	9,474	13,656	21,471

Source: Statewide Harvest Survey (Mills 1988-1994, Howe et al. 1995, 1996, 2001 a-d, Walker et al. 2003, Jennings et al. 2004, 2006a-b, 2007, 2009 a-b, 2010 a-b and *In prep*).

[a] Early-run fish only prior to 1993 when 1-ocean late-run fish were first available. Early- and late-run harvests estimated separately beginning in 1996.

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

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

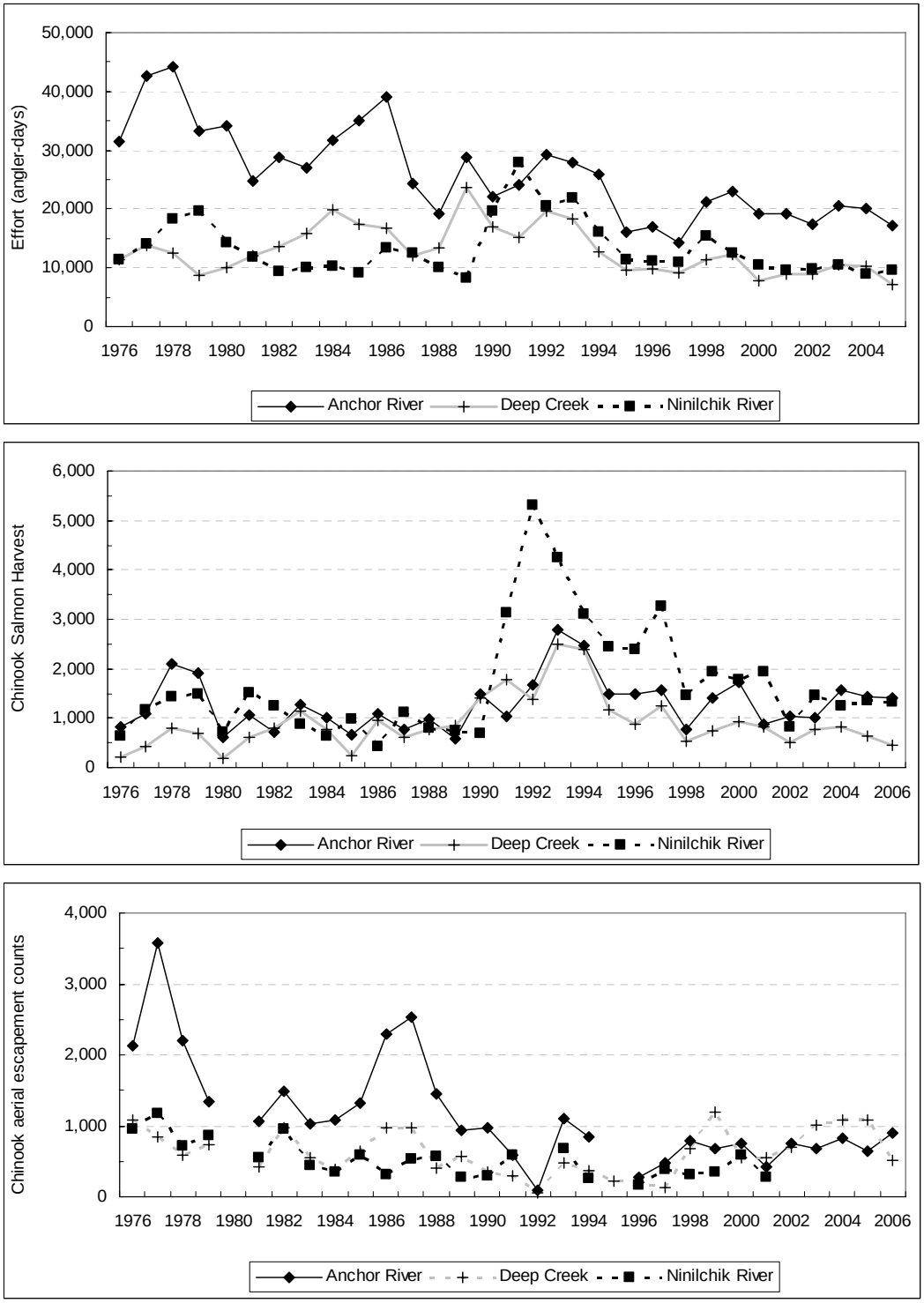


Figure 5.–Sport effort and Chinook salmon harvest (1976-2006) and unexpanded escapement index counts (1976-2007) of Chinook salmon in Anchor River, Deep Creek, and Ninilchik River.

Table 14.-Angler participation and harvest and catch of Chinook, coho, pink and sockeye salmon; Dolly Varden; rainbow trout and steelhead trout, Anchor River, 1977-2009.

	Chinook Salmon		Coho Salmon		Dolly Varden		Rainbow/Steelhead		Harvest		
									Pink	Sockeye	Days
Year	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch [b]	Salmon	Salmon	Fished
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
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
1977-2006 Mean	1,303	4,536 [a]	2,692	6,263	5,009	14,303	1,119	3,745	115	183	25,961
2007-2009 Mean	1,435	5,111	4,211	7,957	1,091	23,572		7,072	248	291	27,543

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

[a] Catch first reported in SWHS during 1990.

[b] Rainbow/steelhead trout caught and released. Retention of this species is prohibited. 1989 catch estimates from unpublished Statewide Harvest Survey data.

Table 15.-Angler participation and harvest and catch of Chinook, coho, pink and sockeye salmon; Dolly Varden; rainbow trout and steelhead trout, Deep Creek, 1977-2009.

	Chinook Salmon		Coho Salmon		Dolly Varden		Rainbow/ Steelhead		Harvest		
									Pink	Sockeye	Days
Year	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch [a]	Salmon	Salmon	Fished
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
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
1977-2006 Mean	920	2,855	1,414	3,021	681	3,393	327	1,237	83	206	12,991
2007-2009 Mean	451	1,953	1,629	2,891	224	4,557		2,601	138	173	9,027

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

[a] Rainbow/steelhead trout caught and released. Retention of this species is prohibited. 1989 catch estimates from unpublished Statewide Harvest Survey data.

Table 16.-Angler participation and harvest and catch of Chinook, coho, pink and sockeye salmon; Dolly Varden; rainbow trout and steelhead trout, Ninilchik River, 1977-2009.

	Chinook Salmon[a]		Coho Salmon		Dolly Varden		Rainbow/ Steelhead		Harvest		
									Pink	Sockeye	Days
Year	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch[b]	Salmon	Salmon	Fished
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
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
1977-2006 Mean	1,684	4,796	961	2,234	371	994	309	566	47	606	13,301
2007-2009 Mean	918	2,475	1,059	1,688	49	940		1,124	77	252	8,685

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

[a] Enhanced return beginning in 1991.

[b] Rainbow/steelhead trout caught and released. Retention of this species is prohibited. 1989 catch estimates from unpublished Statewide Harvest Survey data.

Table 17.-Sport harvest (1976-2009) and unexpanded escapement index counts (1976-2010) of Chinook salmon in Anchor River, Deep Creek, and Ninilchik River.

	Anchor River		Deep Creek		Ninilchik River	
Year	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 [a]	605		182		723	
1981 [a]	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 [c]	594
1992	1,685	99	1,379	63	5,316 [c]	[b]
1993	2,787	1,110	2,503	486	4,235 [c]	688
1994	2,478	837	2,379	364	3,108 [c]	252
1995	1,475	[b]	1,161	229	2,451 [c]	[b]
1996	1,483	277	886	193	2,401 [c]	158
1997	1,563	477	1,249	136	3,263 [c]	393
1998	783	789	539	676	1,453 [c]	316
1999	1,409	685	741	1,190	1,945 [c]	357
2000	1,730	752	937	556	1,782 [c]	578
2001	889	414	593	551	1,399 [c]	268
2002	1,047	748	507	696	830 [c]	[d]
2003	1,011	680	775	1,008	1,452 [c]	[d]
2004	1,561	834	823	1,075	1,240 [c]	[d]
2005	1,432	651	642	1,076	1,342 [c]	[d]
2006	1,394	899	451	507	1,329 [c]	[d]
2007	2,081	678	628	553	1,575 [c]	[d]
2008	1,486		602	205	976 [c]	[d]
2009	737		124	483	203 [c]	[d]
2010				387		
Mean	1,284	1,132	912	594	1,661	528
SEG				350-800		

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-b, 1982-1994, Howe et al. 1995, 1996, 2001 a-d, Walker et al. 2003, Jennings et al. 2004, 2006a-b, 2007, 2009 a-b, 2010 and *In prep*). Escapement estimates are aerial counts.

[a] Escapement counts not conducted or considered minimal due to high turbid water during aerial escapement surveys.

[b] Aerial escapement counts not obtained due to high water.

[c] Enhanced run.

[d] Discontinued. Run strength now indexed by weir count between July 8 and July 24.

Table 18.-Counts of all species passed upstream at the Anchor River Dolly Varden weir, 1987-1995.

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

Source: Larson et al. 1988, Larson and Balland 1989, Larson 1990-1995, 1997.

[a] Weir overtopped September 18-November 7

Table 19.-Estimates of fish passage in the mainstem Anchor River using a combination of DIDSON and floating weir, 2003-2010.

Year	Dates of operation		King Salmon	Silver Salmon	Pink Salmon	Red Salmon	Chum Salmon	Dolly Varden[a]	Steelhead/ rainbow
	Sonar	Weir							
2003	5/30-7/9		9,238						
2004	5/15-6/9	6/10-9/13	12,016 (SE 283)	5,728	1,079	45	79	7,846	20
2005	5/13-6/3	6/4-9/9	11,156 (SE 229)	18,977[b]	4,916	319	146	5,719	107
2006	5/15-6/13,8/22-24	6/13-8/18	8,945 (SE 289)	10,181[c]	954	38	45	234	4
2007	5/14-6/7	6/7-9/11	9,622 (SE 238)	8,226	3,916	200	156	1,309	344
2008	5/13-6/16	6/16-9/11	5,806 (SE 169)	5,951	2,017	52	66	1,344	262
2009		5/12-9/11	3,455	2,629	4,975	62	68	1,404	107
2010[d]	5/12-6/7	6/7-9/29	4,419	6,014	972	212	67	1,352	593
2004-2010 Average			7,917	8,244	2,690	133	90	2,744	205

[a] Not completely enumerated because weir picket spacing allows Dolly Varden passage.

[b] Weir washed out 9/9.

[c] Weir washed out 8/19. DIDSON operated 8/22-8/24, then removed due to high water.

[c] Weir washed out 8/19. DIDSON operated 8/22-8/24, then removed due to high water.

Table 20.-Chinook salmon harvest, mortality and escapement counts Ninilchik River weir, 1999-2005.

Year	Component	Weir Count	Weir Proportion	Inriver Harvest	Total Return	Inriver Exploitation	CWT Recovery	Egg Take	Spawning Escapement
1999	Wild	1,644	0.72	973 [a]	2,617	0.37		68	1,576
	Hatchery	641	0.28	972 [a]	1,613	0.60	42	26	573
	Total	2,285 [b]	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 [c]		176	1,340
	Hatchery	559	0.27			0.22 [c]	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 [c]		131	1,127
	Hatchery	425	0.25			0.31 [c]	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 [d]	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 [e]		133	1,472
	Hatchery	593	0.27	847	1,569	0.54 [e]		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 Statewide Harvest Survey: Howe et al. 2001d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a.

[a] Hatchery harvest estimate average of 50% is based on harvest sampling in 2000 and 2001.

[b] Weir count includes 31 wild Chinook and 38 hatchery Chinook netted downstream of the weir.

[c] Exploitation rate during third regulatory weekend only.

[d] Includes 1 Chinook salmon that died in the live box.

[e] 1999 through 2001 average.

Table 21.-Number of wild and hatchery-reared Chinook salmon counted at the Ninilchik River weir during SEG periods from 1999-2010.

Year	Wild Chinook Salmon				Hatchery Chinook Salmon				
		SEG Period [a]		Escapement		SEG Period [a]		Escapement	
	Total Run [b]	Weir Counts [c]	Escapement Counts [c]	Percentage of Run	Total Run	Weir Counts [a]	Escapement Counts [c]	Percentage of Run	
1999	1,576	1,351	1,283	81.4	573	515	447	78.0	
2000	1,553	1,346	1,265	81.5	685	786	618	90.2	
2001	1,239	1,072	897	72.4	543	601	471	86.7	EO Ju
2002	1,340	1,073	897	66.9	395	403	238	60.3	EO dc
2003	1,127	648	517	45.9	336	293	204	60.7	EO op
2004	1,393	811	679	48.7	469	409	342	72.9	EO op
2005	2,076	1,424	1,259	60.6	409	339	286	69.9	Regul
2006	ND	1,114	1,013	-	ND	260	191	-	EO O
2007	ND	672	543	-	ND	83	63	-	2007
2008	ND	721	586	-	ND	83	62	-	Open
2009	ND	551	528	-	ND	97	69	-	No ba
2010 [d]	ND	606	606	-	ND	34	34	-	
1999 - 2005 Average	1,472	1,104	971	65	487	478	372	74	
2006-2010 Average		733	655			111	84		

a SEG=Sustainable Escapement Goal established in 2007 based on weir counts July 3-July 31, 1999-2007.

b Total count of fish through the weir.

c Number of fish counted through the weir from July 3-July 31.

c Number of live fish released upstream of the weir after egg takes and other mortality

d Preliminary.

Table 22.-Parameter estimates for coho salmon in Deep Creek from coded wire tag and weir projects, 1995-2003.

Tagging Year	Number Smolt Tagged	Recovery Year	Gear Type	Weir Count	Number Examined for CWT	Tagged Proportion	Estimated Smolt Abundance	Inriver harvest	Inriver Return	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 [a]
1997	6,948	1998	Weir	1,537	1,537	0.345	20,097	2,035	3,572	0.57	0.178 [a]
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 [b]	44,480 [b]				

Source: Bendock 1996, King and Breakfield 1998, 1999, 2002, Begich 2002, Begich 2006a, Begich and Evans 2005, Kerkvliet et al. *In prep*-b, Sport Fish Division, Homer, personal communication. Harvest estimates from Howe et al. 2001a-d; Walker et al. 2003; Jennings et al. 2004, Jennings et al. *In prep* a-b

[a] Revised harvest and resulting marine survival estimates differ from unrevised harvest and marine survival estimates published in Breakfield 1999 and 2002.

[b] Preliminary.

Table 23.-Angler participation and harvest of Chinook, coho, and pink salmon; Dolly Varden, rainbow trout and steelhead trout, Stariski Creek, 1977-2009.

Year	Harvest			Coho Salmon		Dolly Varden		Rainbow/ Steelhead		Days
	Chinook Salmon [a]	Pink Salmon	Sockeye Salmon	Harvest	Catch	Harvest	Catch	Harvest	Catch	Fished
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 [b]	1,533
1990			29	169	287	167	375		104 [b]	935
1991			13	280	339	65	91		12 [b]	1,143
1992			33	97	138	8	8		70 [b]	523
1993				392	602	67	184		31 [b]	813
1994				446	464	9	36		75 [b]	1,160
1995			105	72	72	55	119		[b]	896
1996				426	482	24	269		47 [b]	694
1997				111	178	64	213		[b]	489
1998				1,168	1,289	25	261		71 [b]	922
1999				153	436		22		305 [b]	327
2000				419	534	24	232		327 [b]	1,217
2001				270	328	11	43		8 [b]	461
2002				367	384		203		14 [b]	640
2003				309	470		161		46 [b]	646
2004				374	915		266		39 [b]	782
2005				379	475		71		106 [b]	875
2006				280	407		39		13 [b]	382
2007				385	502	0	0		34	695
2008				283	1,386		1,482		195	1,174
2009				137	261		45		113	335
1977-2006 Mean		21	62	271	459	314	153	125	80	1,051
2007-2009 Mean				268	716		509		114	735

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

[a] Stariski Creek closed to fishing for Chinook salmon.

[b] Rainbow/steelhead trout caught and released. Retention of this species is prohibited. 1989 catch estimates from unpublished Statewide Harvest Survey data.

Table 24.-Coho salmon harvest, catch and angler effort (angler days) estimates for Silver Salmon Creek and Kamishak River, 1983-2009.

	Silver Salmon Creek			
Year	Harvest	Catch	Effort	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
Mean 1983-2006	1,013	3,202	984	21
Mean 2007-2009	843	1,862	995	23

Source: Statewide Harvest Survey (Mills 1984-1994, Howe et al. 1995, 1996, 2001 a-d, Walker et al. 2003, Jennings et al. 2004, 2006a-b, 2007, 2009 a-b, 2010 a-b and *In prep*).

[a] Effort (angler-days fished) for all species.

Table 25.-Kamishak River coho salmon harvest, catch and angler participation (angler days) reported in guide logbooks, 2005-2009.

	Kamishak River			
Year	Harvest	Released	Catch	Effort
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
Mean	607	1,414	2,021	399

Table 26.-Harvest and catch of Dolly Varden in Lower Kenai Peninsula roadside streams, 1977 through 2009.

	Anchor River		Stariski Creek		Deep Creek		Ninilchik River		All	
Year	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
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
Avg. 1977-1990	9,202		547		1,045		621		11,336	
Avg. 1991-2009	1,300	15,917	35	208	340	3,552	137	953	1,796	20,620

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

Note: Catch first reported in SWHS during 1990.

Table 27.-Harvest and catch of steelhead trout in Lower Kenai Peninsula roadside streams, 1977 through 2009.

	Anchor River		Stariski Creek		Deep Creek		Ninilchik River		All	
Year	Harvest	Catch[a]	Harvest	Catch[a]	Harvest	Catch[a]	Harvest	Catch[a]	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
2006		4,525		13		1,234		563		6,335
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
Average	1,119	3,699	125	95	327	1,238	309	564	1,880	5,590

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

[a] Catch first estimated by SHS during 1989. 1989 catch estimates from unpublished Statewide Harvest Survey data.

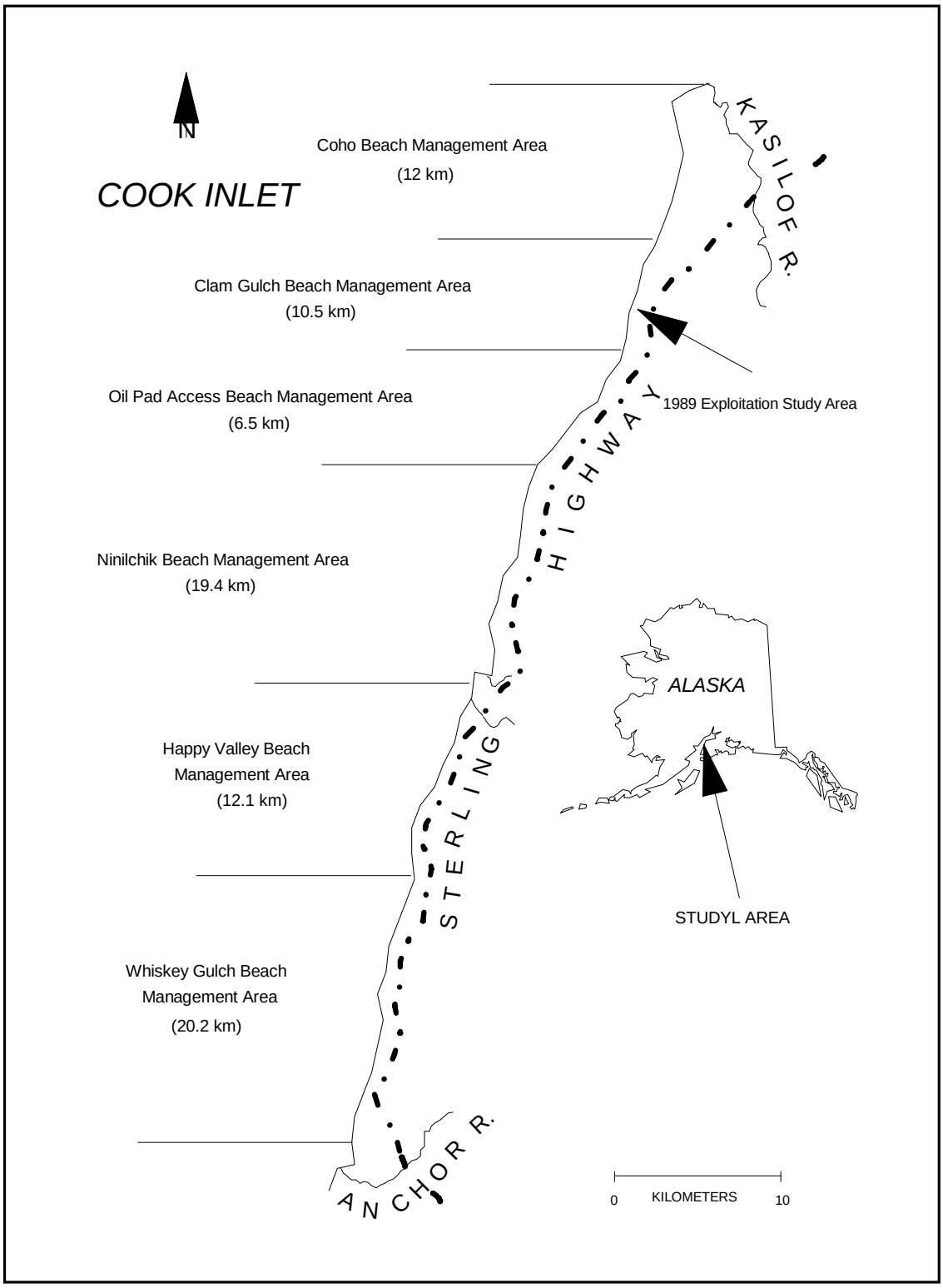


Figure 6.–Eastside Cook Inlet razor clam beaches.

Table 28.-Percentage of harvest by beach area in the Cook Inlet eastside beach razor clam fishery adjusted for relative success rate, 1977-2009.

		Percentage of Harvest					
Year	No. of Surveys	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 [a]	12	0.3	30.5	14.8	46.4	6.0	2.0
1991 [a]	10	0.6	28.0	13.6	50.2	6.2	1.5
1992 [a]	13	0.3	21.6	10.4	61.9	5.0	0.8
1993 [a]	13	0.3	21.0	11.8	61.9	4.3	0.7
1994 [a]	13	0.3	19.8	10.0	65.0	4.0	1.0
1995 [a]	13	0.1	19.9	10.5	65.5	3.2	0.7
1996 [a]	13	0.6	23.3	13.6	57.5	3.9	1.1
1997 [a]	12	0.6	26.5	13.6	56.1	2.2	1.1
1998 [a]	12	1.0	28.3	16.6	50.6	2.4	1.1
1999 [a]	14	1.2	27.1	13.4	53.5	4.0	0.9
2000 [a]	13	2.2	31.1	12.8	47.8	4.9	1.2
2001 [a]	13	1.8	37.1	16.8	39.4	3.6	1.3
2002 [a]	14	2.0	28.0	17.5	47.3	3.4	2.0
2003 [a]	13	1.3	34.2	18.8	40.0	4.4	1.7
2004 [a]	12	1.2	30.5	16.2	44.8	5.1	2.3
2005 [a]	13	0.9	26.4	10.0	53.2	6.3	3.3
2006 [a]	14	0.3	18.1	7.4	62.9	6.7	4.6
2007 [a]	14	0.5	12.2	3.5	68.1	9.8	6.0
2008 [a]	15	0.3	12.7	4.2	68.0	10.6	4.2
2009 [a]	12	0.7	5.9	4.3	74.5	11.1	3.4
Average	10.3	1.0	33.7	12.2	43.5	7.1	2.5

Source: Athons 1992, Athons and Hasbrouck 1994, Szarzi et al. *In prep*

[a] Harvest percentage weighted by tidal height beginning in 1990.

Table 29.-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.

Beach	Year	Harvest	SE(H)	N_e	SE(N_e)	Exp	SE(Exp)
Clam Gulch	1988 [a]	286,375	14,646	2,463,695	607,132	0.116	0.029
	1989 [a]	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 [a]	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

Source: Athons 1992, Athons and Hasbrouck 1994, Szarzi et al. *In prep*-a

[a] 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.

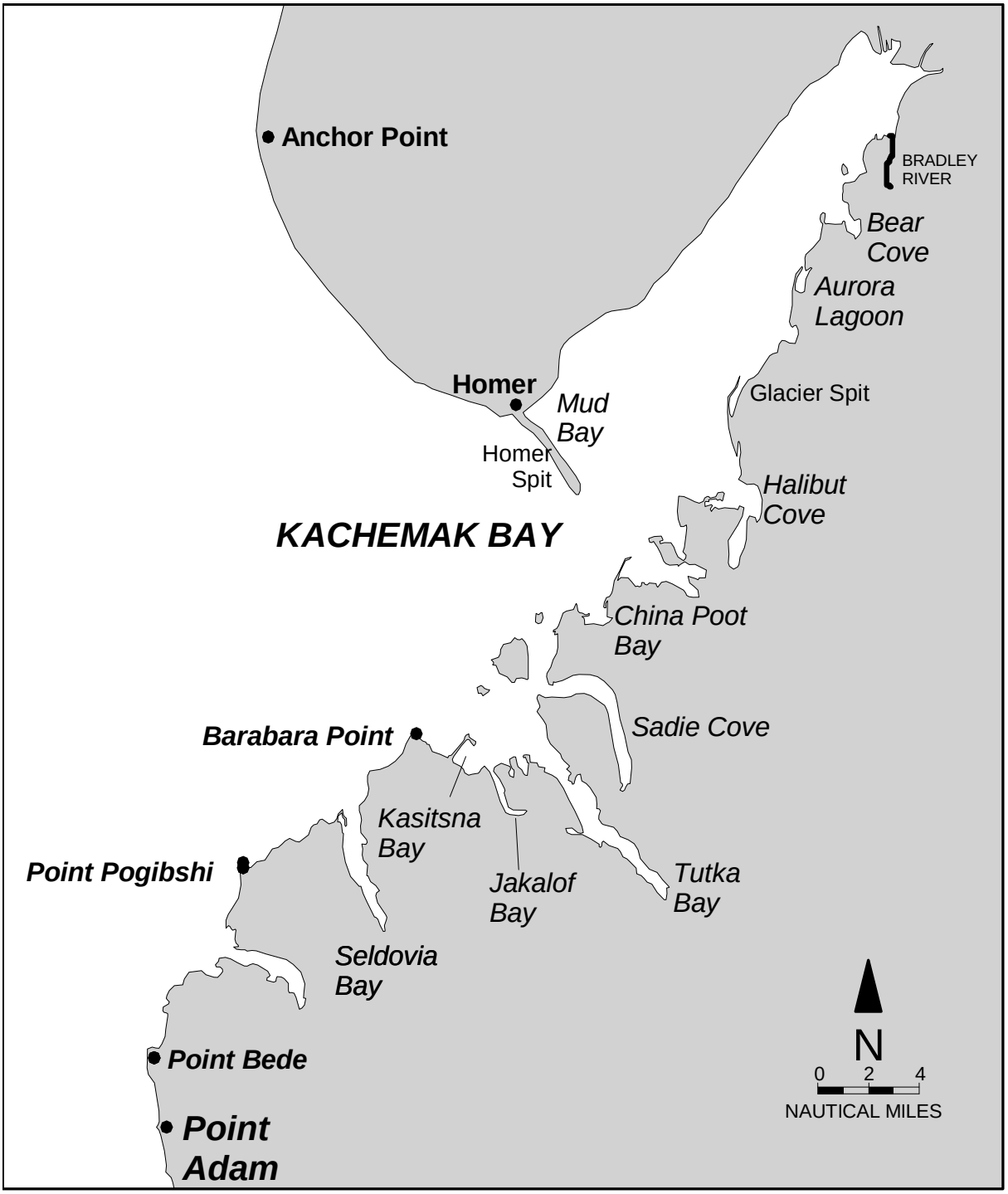


Figure 7.–Kachemak Bay.

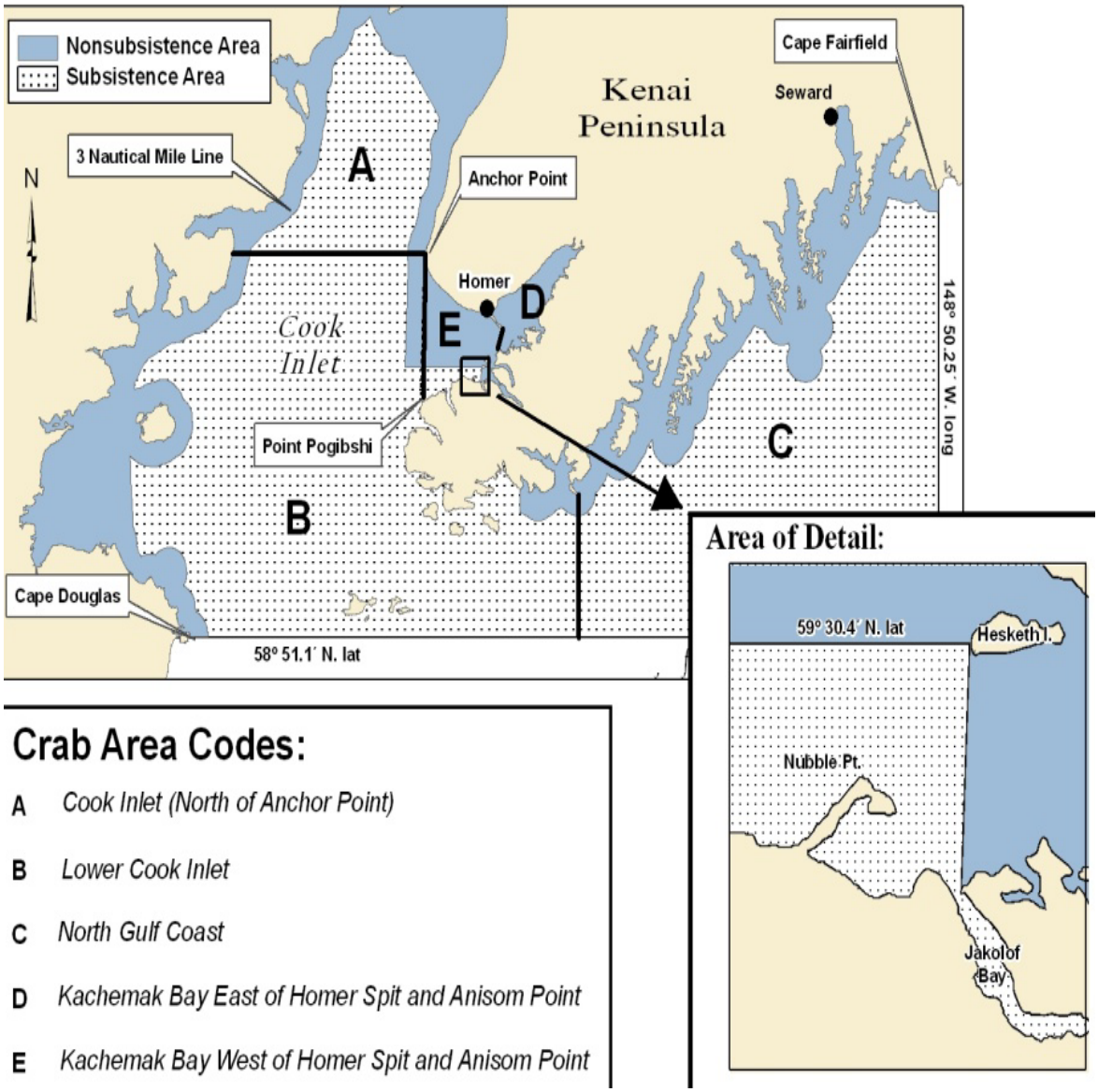


Figure 8.–Shellfish nonsubsistence and subsistence areas.

Table 30.-Sport and personal use effort directed at crab and sport and personal use harvests of crab in Cook Inlet reported on permits 1996 through 2002 and 2009/2010 seasons (estimates of harvest not expanded for non-reporting).

	Effort		Harvest	
			Dungeness	Tanner
Location	Trips	Crabber-Days	Numbers	Numbers
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 30-Page 2 of 3.

Location	Effort		Dungeness Number Released	Tanner 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

-continued-

Table 30.-Page 3 of 3.

Location	Effort		Tanner	
	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 [a]				
Cook Inlet north of Anchor Point	5	5	20	131
Cook Inlet remainder	138	357	1,267	4,070
North Gulf Coast	70	128	231	1,891
Kachemak Bay east of Homer Spit	581	1,149	3,224	12,959
Kachemak Bay west of Homer Spit	2,202	3,625	13,240	60,515
Unknown	21	23	101	298
Total	3,017	5,287	18,083	79,864

[a] Preliminary

Table 31.-Abundance of male Tanner crab in Kachemak Bay estimated from trawl surveys, 1990-2009.

		Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Post-recruit		Males		Total
	No. of	<70 mm	70-91 mm	92-114 mm		115-139 mm		140-165		>165				
Year	Tows			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
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

Table 32.-Dungeness crab catch, in numbers in the Southern District Dungeness pot surveys, 1990-2000, 2009.

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

-continued-

Table 32.-Page 2 of 2.

Year	Dates	Location	Pots Pulled	Females	Sublegal Males	Legal Males	Total Males	Soft-Shell Males (%)
1995 [a]	5/23-25	East of Spit	90	0	5	3	8	0
	6/27-29		90	14	22	8	30	0
	7/25-27		90	88	20	9	29	0
	8/29-31		90	49	18	13	31	2
	7/18-20	West of Spit	77	31	3	10	13	0
	8/16-18		74	41	8	51	59	0
1996 [a]	6/12-14	East of Spit	89	5	16	6	22	3
	7/13-15		90	20	39	20	59	4
	8/11-13		90	64	55	19	74	0
1997 [a]	6/21-23	East of Spit	90	2	15	8	23	1 (4)
	7/21-23		89	11	19	8	27	1(<1)
	8/20-22		90	21	58	5	63	0
1998 [a]	8/16-18	East of Spit	90	0	11	3	14	0
2000 [a]	8/14-8/16	East of Spit	87	1	8	1	9	1(11)
2009 [a]	8/10-8/12	East of Spit	90	3	32	0	32	0

[a] 33% of escape rings closed 1992-2009.

Table 33.-Estimated recreational halibut harvest (number of fish) by charter and non-charter users in the Central (CCI) and Lower Cook Inlet (LCI) fisheries, 1986-2009.

	CCI				LCI			
Year	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%

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

Table 34.-Management assemblage classification and maximum ages and lengths of rockfishes *Sebastes* sampled from the Cook Inlet recreational fishery, 1991-2009.

Assemblage and Common Name	Scientific Name	Maximum Published Age[a]	Cook Inlet Sport Harvest Data[b]			
			Max. Age	Number Aged	Max. Length (cm)	Number Measured
Pelagic						
Black	*S. melanops*	50	46	2,576	65	2,620
Dark	*S. ciliatus*	n.d.	48	290	54	290
Dusky	*S. variabilis*	n.d.	50	204	50	206
Dusky/Dark[c]		67	58	821	57	971
Yellowtail	*S. flavidus*	64	24	2	52	2
Widow	*S. entomelas*	60	13	2	51	2
Non-Pelagic						
Bocaccio	*S. paucispinis*	46	15	1	41	1
Canary	*S. pinniger*	84	23	28	49	28
China	*S. nebulosus*	78	56	31	40	30
Copper	*S. caurinus*	50	35	19	53	19
Quillback	*S. maliger*	90	71	64	53	64
Rougheye	*S. aleutianus*	205	30	6	58	6
Shortraker	*S. borealis*	157	33	9	73	8
Silvergray	*S. brevispinis*	81	42	2	67	2
Tiger	*S. nigrocinctus*	116	68	31	52	31
Yelloweye	*S. ruberrimus*	118	100	1,721	87	1,868

[a] Munk 2001

[b] Meyer 1992, Meyer 2000, and ADF&G unpublished data for 1996-2009 available in Homer.

[c] Dusky and dark rockfish were considered morphs of a single species (dusky rockfish) before 2004.

Table 35.-Central and Lower Cook Inlet rockfish harvest reported in angler interviews, by target species category, 2004-2009.

Fishery	Target Category	Number of Interviews[a]	Pelagic	Percent	Non-pelagic	Percent
Central Cook Inlet	Bottomfish	925	128	96%	15	--
	Bottomfish + salmon	384	6	4%	0	--
	Halibut	702	0	0%	0	--
	Salmon	4	0	0%	0	--
		2,015	134		15	
Lower Cook Inlet	Bottomfish	76	550	50%	60	50%
	Bottomfish + salmon	215	153	14%	19	16%
	Halibut	1,411	391	35%	41	34%
	Rockfish	1	2	0%	0	0%
	Salmon	30	14	1%	0	0%
		1,733	1,110		120	

[a] Number of interviews represent vessel-trips.

Table 36.-Estimated recreational rockfish harvest (number of fish) in Cook Inlet, 1977-2009.

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

Table 37.-Estimated recreational rockfish harvest (number of fish) by charter and non-charter users in the Central (CCI) and Lower Cook Inlet (LCI) fisheries, 1986-2009.

	CCI				LCI			
Year	Charter	Non-charter	Total	%charter	Charter	Non-charter	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%

Table 38.-Estimated Cook Inlet recreational rockfish harvest in numbers of fish and pounds round weight by assemblage, 1991-2009.

	Pelagic		Non-Pelagic		Harvest	Harvest
Year	No. Fish	Pounds	No. Fish	Pounds	(no. fish)	Biomass (lb)
1991	1,106	4,611	1,648	14,585	2,754	19,195
1992	2,954	9,116	1,583	11,877	4,537	20,993
1993	2,670	10,819	2,298	22,272	4,968	33,092
1994	3,087	11,789	2,097	16,858	5,184	28,648
1995	2,756	11,642	1,643	16,280	4,399	27,922
1996	3,347	12,078	1,882	23,822	5,229	35,900
1997	2,045	8,419	2,446	25,181	4,491	33,600
1998	2,883	13,136	1,123	10,487	4,006	23,623
1999	4,666	17,320	1,451	14,630	6,117	31,949
2000	2,952	10,477	3,172	34,365	6,124	44,843
2001	2,861	10,307	1,765	20,799	4,626	31,106
2002	4,441	18,790	1,462	15,823	5,903	34,613
2003	5,410	25,907	2,105	24,539	7,515	50,446
2004	6,963	31,788	2,793	31,006	9,756	62,794
2005	8,269	37,943	3,338	35,441	11,607	73,384
2006	6,471	26,254	2,960	32,922	9,431	59,176
2007	10,869	57,034	1,920	21,539	12,789	78,573
2008	8,924	42,573	2,334	26,648	11,258	69,221
2009	13,824	53,690	2,472	25,338	16,296	79,027

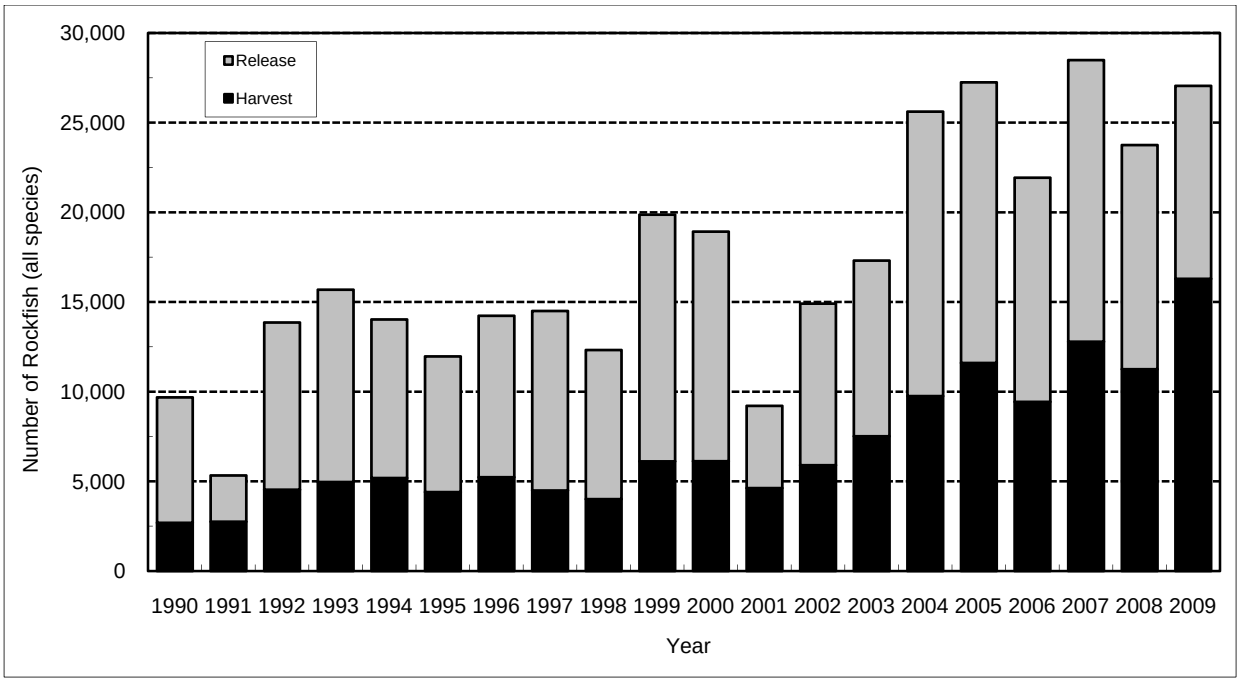
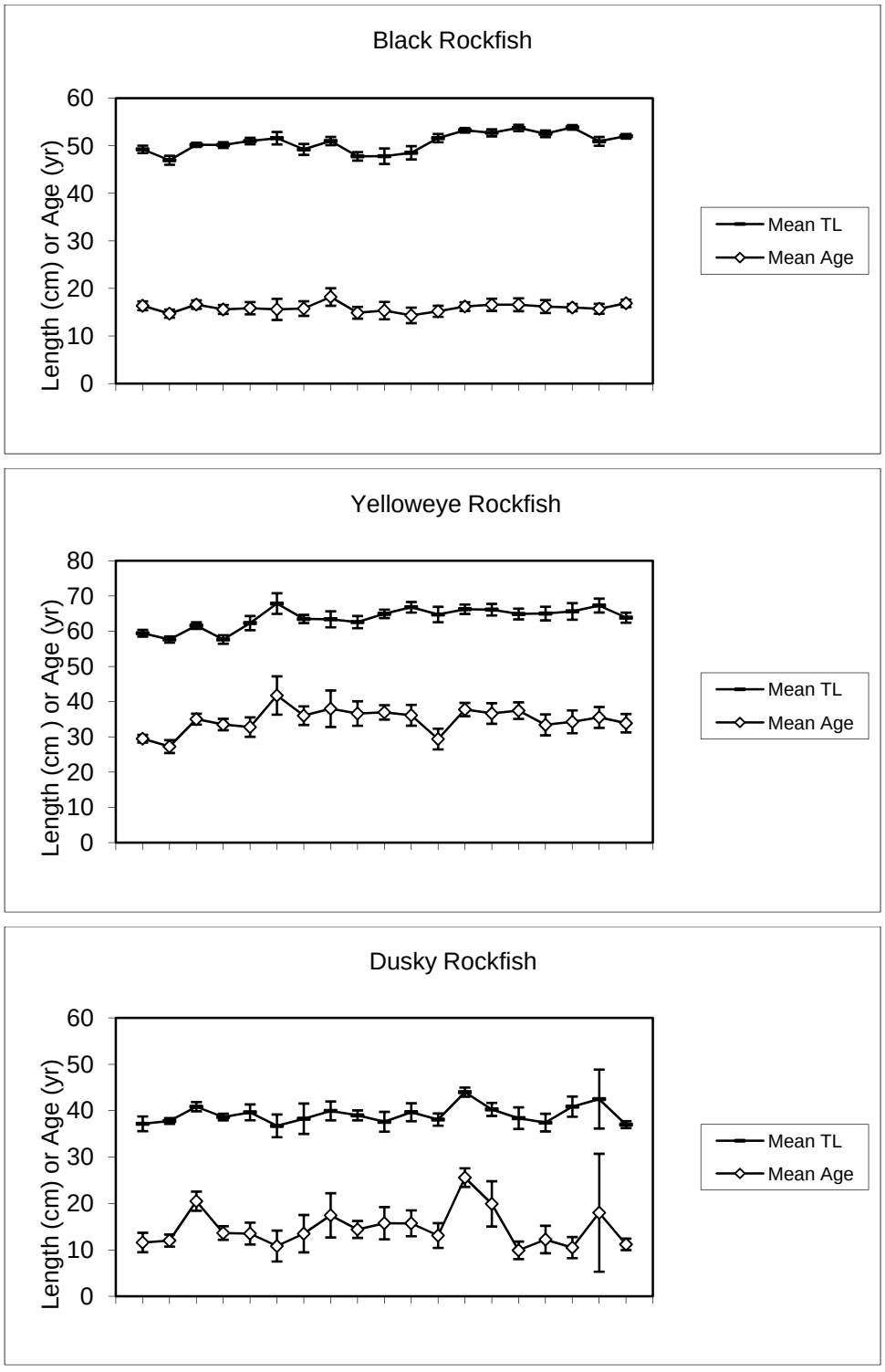
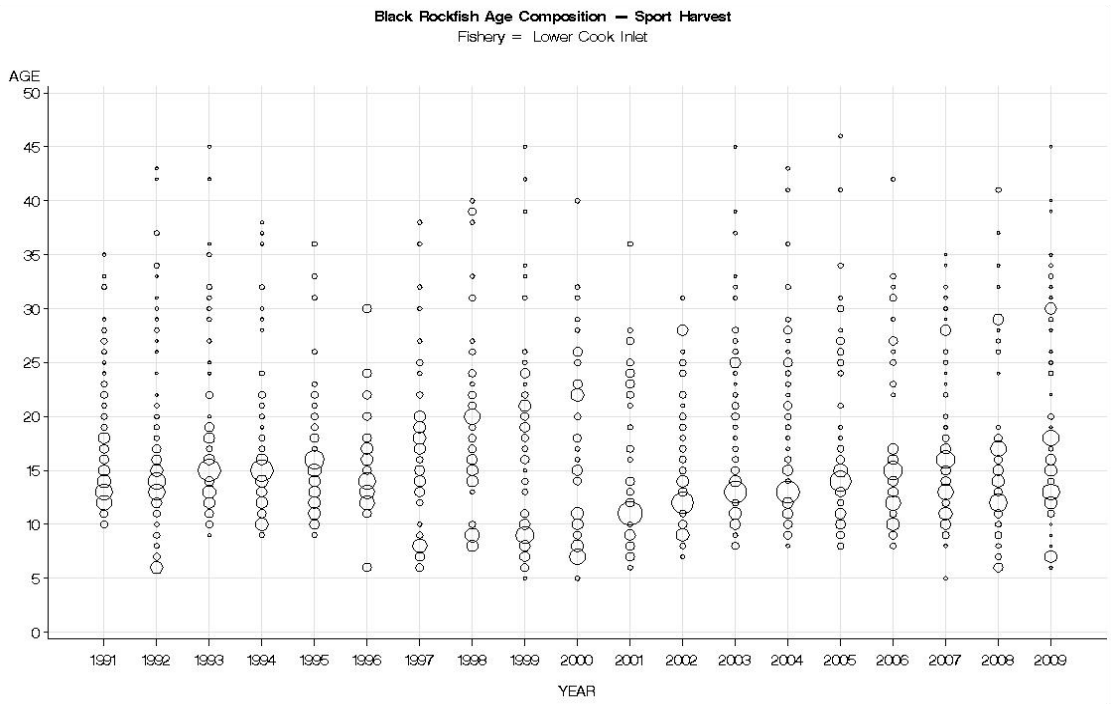


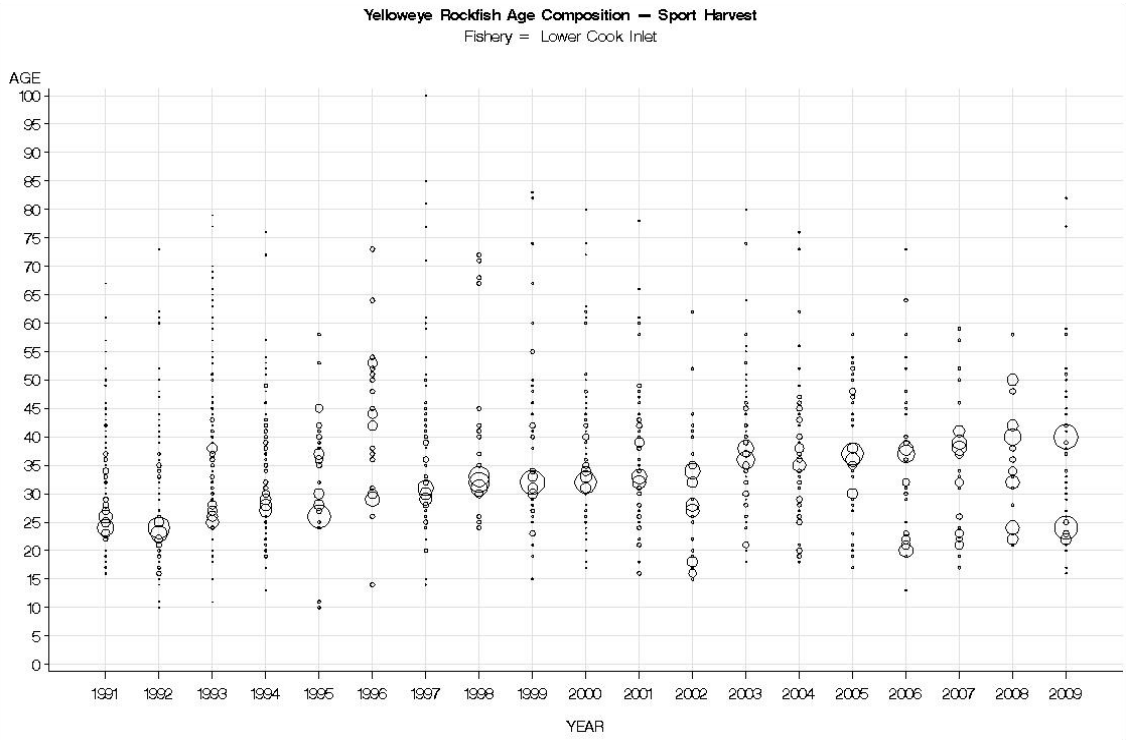
Figure 9.–Estimated numbers of rockfish harvested and released in Cook Inlet, 1990-2009.



Note: Error bars show 95% confidence intervals.

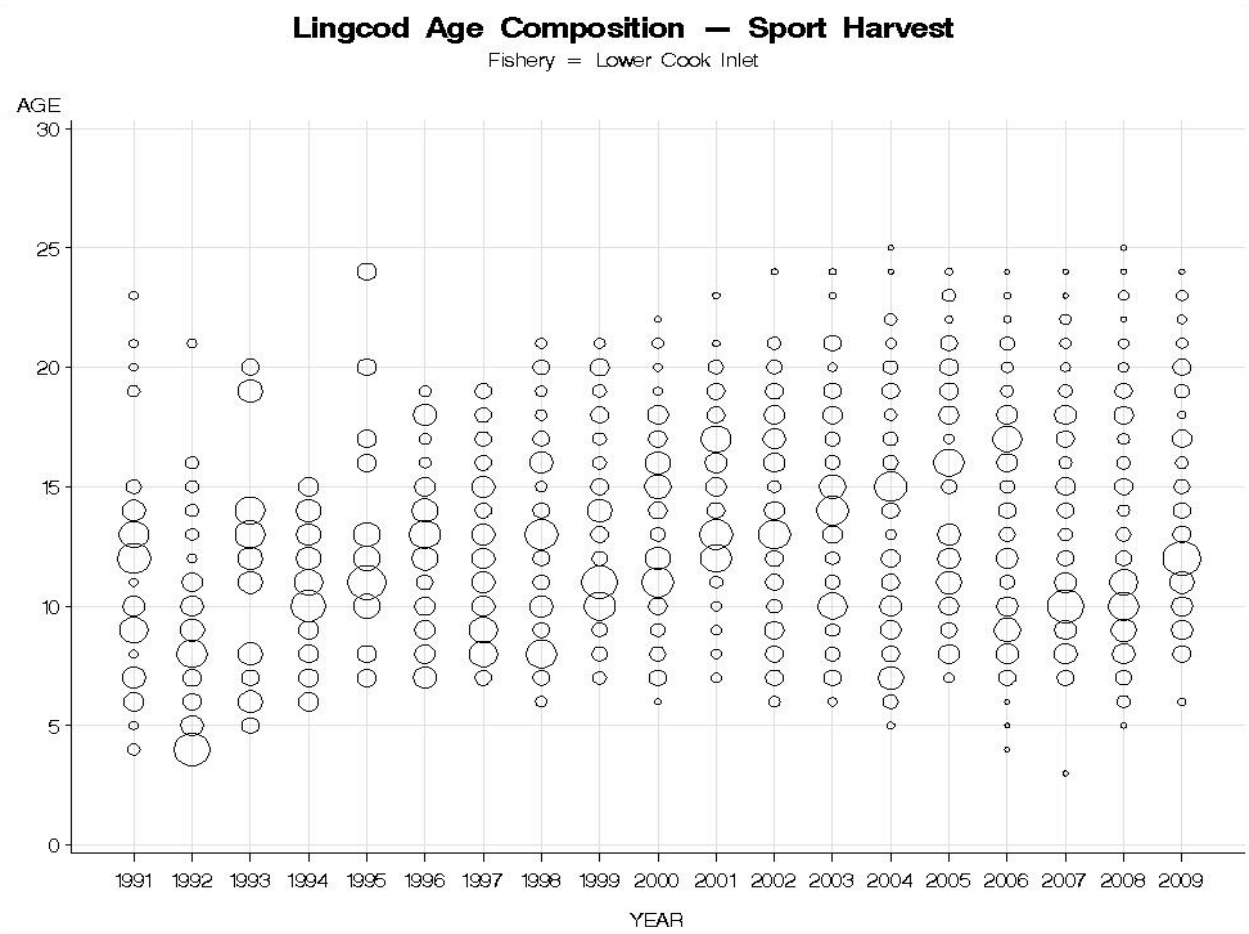
Figure 10.–Trends in mean total length (TL) and age of selected rockfish species in the Lower Cook Inlet sport harvest, 1991-2004.





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

Figure 11.–Age composition of the recreational black and yelloweye rockfish harvest landed at Homer, 1991-2009.



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, 1991-2009.

Table 39.-Estimated average weight and harvest in pounds round weight in the Cook Inlet recreational lingcod fishery, 1992-2009.

Year	Average Weight (lb)[a]	Harvest Biomass (lb)[b]
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

[a] Based on harvest samples from Homer applied to the total Cook Inlet harvest.

[a] Preliminary estimate to nearest 100 lb.

Table 40.-SWHS estimates of recreational lingcod harvest (number of fish) in Cook Inlet, 1990-2009.

Year	West Cook Inlet	Central Cook Inlet	Lower Cook Inlet	Total
1990	[a]	839	1,805	2,644
1991	35	989	1,751	2,775
1992	0	942	2,257	3,199
1993	45	0	1,636	1,681
1994	56	0	1,184	1,240
1995	28	149	970	1,147
1996	[b]	888	1,317	2,205
1997	[b]	473	1,762	2,235
1998	[b]	461	995	1,456
1999	[b]	219	1,079	1,298
2000	[b]	214	1,600	1,814
2001	[b]	473	1,514	1,987
2002	[b]	236	1,364	1,600
2003	[b]	364	1,755	2,119
2004	[b]	459	2,852	3,311
2005	[b]	283	2,753	3,036
2006	[b]	310	2,997	3,307
2007	[b]	186	6,826	7,012
2008	[b]	196	5,937	6,133
2009	[b]	345	5,449	5,794

[a] Lingcod information was not requested in the SWHS questionnaire before 1991.

[b] After 1995 the West Cook Inlet estimates were apportioned and merged with the Central and Lower Cook Inlet estimates.

Table 41.-Estimated recreational lingcod harvest (number of fish) by charter and non-charter users in the Central (CCI) and Lower Cook Inlet (LCI) fisheries, 1990-2009.

	CCI				LCI			
Year	Charter	Non-charter	Total	%charter	Charter	Non-charter	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%

Note: Estimates after 1995 include the West Cook Inlet portion, apportioned between Central and Lower Cook Inlet.

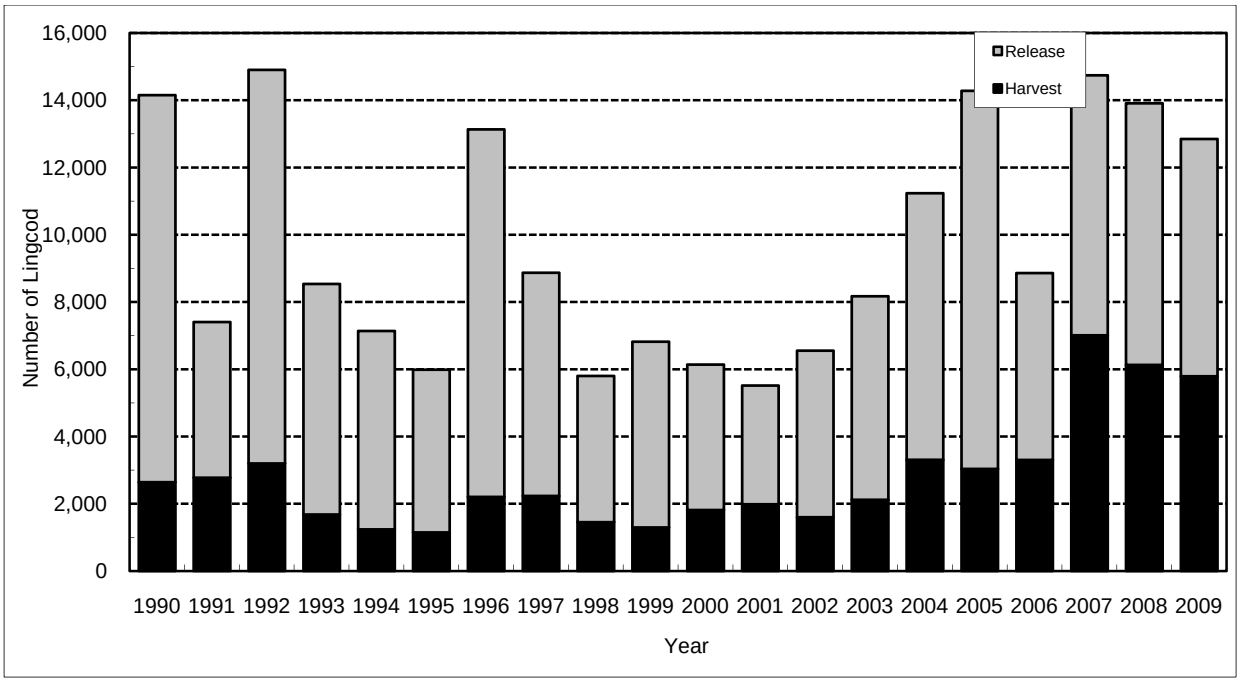


Figure 13.–Estimated numbers of lingcod harvested and released in Cook Inlet, 1990-2009

Table 42.-Harvest quotas in the Ninilchik-area educational fisheries, 1993-2010.

			QUOTAS									
			Chinook Salmon Quotas				Coho Salmon Quotas					
Year	Educational fishery participant	Ninilchik Saltwater Fishing Period	Saltwater	Ninilchik River	Kasilof River	Total	Saltwater	Ninilchik River	Kasilof River	Total	Total Salmon Quota	Hooligan/ Herring Quota
1993	NTC[a]	May 1- Oct. 31	100	20		100	250	30		250	2000	
1994	NTC	May 1- Oct. 31	100	20		100	250	30		250	2000	
1995	NTC	May 1- Oct. 31	100	20		100	250	30		250	2000	
1996	NTC	May 1- Oct. 31	150	20		150	250	30		250	2000	
1997	NTC	May 1- Oct. 31	150	20		150	250	30		250	2000	
1998	NND[b]	May 1- Oct. 31	75	10		75	125	15		125	1,000	
	NTC	May 1- Oct. 31	75	10		75	125	15		125	1,000	
	Total		150	20		150	250	30		250	2,000	
1999	NND	May 1- Oct. 31	75	10		75	125	15		125	1,000	
	NTC	May 1- Oct. 31	75	10		75	125	15		125	1,000	
	Total		150	20		150	250	30		250	2,000	
2000	NND	May 1- Oct. 31	75	10		75	125	15		125	1,000	
	NTC	May 1- Oct. 31	75	10		75	125	15		125	1,000	
	Total		150	20		150	250	30		250	2,000	
2001	NND	May 1- Oct. 31	100	10		100	125	15		125	1,000	
	NTC	May 1- Oct. 31	100	10		100	125	15		125	1,000	
	Total		200	20		200	250	30		250	2,000	
2002	NND	May 1- Oct. 31	100	10		100	125	15		125	1,000	
	NTC	May 1- Oct. 31	100	10		100	125	15		125	1,000	
	Total		200	20		200	250	30		250	2,000	
2003	NND	May 1- Oct. 31	100	10		100	100	15		100	850	1,000
	NTC	May 1- Oct. 31	100	10		100	100	15		100	850	
	NES[c]	July 1 - Aug. 15	25			25	50			50	250	
	Total		225	20		225	250	30		250	1,950	1,000
2004	NND	April 1 - Oct. 31	100	10		100	100	15		100	850	1,000
	NTC	May 1- Oct. 31	100	10		100	100	15		100	850	
	NES	July 1 - Aug. 15	25			25	50			50	250	
	Total		225	20		225	250	30		250	1,950	1,000
2005	NND	April 1 - Oct. 31	100	10		100	100	15		100	850	1,000
	NTC	May 1- Oct. 31	100	10		100	100	15		100	850	
	NES	July 1 - Aug. 15	25			25	50			50	250	
	Total		225	20		225	250	30		250	1,950	1,000
2006	NND	April 1 - Oct. 31	100	10		100	100	15		100	850	NO LIMIT[d]
	NTC	May 1- Oct. 31	100	10		100	100	15		100	850	
	NES	July 1 - Aug. 15	25			25	50			50	250	
	Total		225	20		125	250	30		150	1,950	
2007[e,f]	NND	April 1 - Oct. 31	200	10		200	200	15		200	2,800	NO LIMIT[d]
	NTC	May 1- Sept. 15	300	10	50	300	300	15	200	500	2,800	
	NES	July 1 - Aug. 15	25			25	50			50	250	
	Total		525	20	50	525	550	30	200	750	5,850	
2008[f]	NND	April 1 - Sept. 15	100	10		100	150	15		150	2,800	NO LIMIT[d]
	NTC	May 1- Sept. 15	200	10	100	300	300	15	200	500	2,800	
	Total		300	20	100	400	450	30	200	650	5,600	
2009[f]	NND	4/1- 5/20; 6/15-9/15	50	10		50	150	15		150	2,800	NO LIMIT[d]
	NTC	5/1- 5/20; 6/15-9/15	100	10	100	200	200	15	300	500	2,800	
	Total		150	20	100	250	350	30	300	650	5,600	
2010[f]	NTC	5/1- 5/20; 6/15-9/15	100	10	100	200	200	15	300	500	2,800	

[a] Ninilchik Traditional Council

[b] Ninilchik Native Descendents

[c] Ninilchik Emergency Services

[d] Unlimited hooligan harvest permitted. Herring harvest not permitted because opportunity is available via personal use regulations.

[e] Educational fishery participants didn't fish in the Kasilof River area during 2007.

[f] In addition 3 coho salmon were harvested from the Kasilof River saltwater area in 2008, 254 more in 2009, and 225 more in 2010.

Table 43.-Harvest in the Ninilchik-area educational fisheries, 1993-2010.

			NINILCHIK AREA HARVEST				
Year	Educational fishery participant	Ninilchik Saltwater Fishing Period	Chinook Salmon Harvest	Sockeye Salmon Harvest	Coho Salmon Harvest	Pink Salmon Harvest	Total Harvest
1993	NTC[a]	May 1- Oct. 31					215
1994	NTC	May 1- Oct. 31	7	162	119	16	304
1995	NTC	May 1- Oct. 31	77	229	85	23	414
1996	NTC	May 1- Oct. 31	101	910	56	8	1,075
1997	NTC	May 1- Oct. 31	94	474	99	55	722
1998	NND[b]	May 1- Oct. 31	52	139	110	20	317
	NTC	May 1- Oct. 31	67	506	95	57	721
	Total		119	645	205	77	1,038
1999	NND	May 1- Oct. 31	56	302	76	18	452
	NTC	May 1- Oct. 31	117	434	84	5	640
	Total		173	736	160	23	1,092
2000	NND	May 1- Oct. 31	51	199	96	15	361
	NTC	May 1- Oct. 31	50	439	59	57	605
	Total		101	638	155	72	966
2001	NND	May 1- Oct. 31	73	310	123	0	506
	NTC	May 1- Oct. 31	75	760	125	42	1002
	Total		148	1070	248	42	1508
2002	NND	May 1- Oct. 31	65	339	106	52	562
	NTC	May 1- Oct. 31	44	138	95	31	308
	Total		109	477	201	83	870
2003	NND	May 1- Oct. 31	65	98	80	12	255
	NTC	May 1- Oct. 31	86	426	100	15	627
	NES[c]	July 1 - Aug. 15	0	4	0	0	4
	Total		151	528	180	27	886
2004	NND	April 1 - Oct. 31	78	199	79	14	370
	NTC	May 1- Oct. 31	73	395	83	0	551
	NES	July 1 - Aug. 15	1	77	0	9	87
	Total		152	671	162	23	1,008
2005	NND	April 1 - Oct. 31	88	84	78	15	265
	NTC	May 1- Oct. 31	70	264	83	0	417
	NES	July 1 - Aug. 15	0	5	0	0	5
	Total		158	353	161	15	687
2006	NND	April 1 - Oct. 31	64	55	99	10	171
	NTC	May 1- Oct. 31	75	550	100	0	671
	NES	July 1 - Aug. 15			Did not fish		
	Total		139	605	199	10	842
2007[d e]	NND	April 1 - Oct. 31	65	227	102	14	408
	NTC	May 1- Sept. 15	300	1,363	483	2	2,148
	NES	July 1 - Aug. 15			Did not fish		
	Total		365	1,590	585	16	2,556
2008[e]	NND	April 1 - Sept. 15	69	192	150	69	480
	NTC	May 1- Sept. 15	199	857	200	248	1,504
	Total		268	1,049	350	317	1,984
2009[e]	NND	4/1- 5/20; 6/15-9/15	20	276	56	34	386
	NTC	5/1- 5/20; 6/15-9/15	32	788	200	123	1,143
	Total		52	1,064	256	157	1,529
2010[e]	NTC	5/1- 5/20; 6/15-9/15	78	605	200	108	991

b Ninilchik Traditional Council

b Ninilchik Native Descendents

c Ninilchik Emergency Services

d Educational fishery participants didn't fish in the Kasilof River area during 2007.

e In addition 3 coho salmon were harvested from the Kasilof River saltwater area in 2008, 254 more in 2009, and 300 more in 2010.

Table 44.-Harvest and harvest quotas in the Anchor Point-area educational fisheries, 2007-2010.

		ANCHOR POINT AREA HARVEST							Salmon Quotas				Fish Releases					
Year	Educational fishery participant [a]	Anchor Point Saltwater Fishing Period	Chinook Salmon Harvest	Sockeye Salmon Harvest	Coho Salmon Harvest	Pink Salmon Harvest	Chum Salmon Harvest	Total Harvest	Chinook	Sockeye	Coho	Total	Chinook	Sockeye	Coho	Pink	Chum	Steelhead
2007	AP VFW	July 15- August 31	0	77	76	0	0	153		60	60	240						
2008	AP VFW	July 15- August 31	1	89	38	11	0	139		120	80	240						
2009	AP VFW	July 15- August 31	0	103	75	6	0	184	0	120	80	240	2	0	0	43	1	8
2010	AP VFW	July 15- August 31	0	37	47	21	1	106	0	100	50	200	0	0	0	0	0	0

Table 45.-Harvest and harvest quotas in the Seldovia-area educational fisheries, 2004-2010.

			ANCHOR POINT AREA HARVEST							Fish Quotas						
Year	Educational fishery participant [a]	Seldovia Saltwater Fishing Period	Chinook Salmon Harvest	Sockeye Salmon Harvest	Coho Salmon Harvest	Chum Salmon Harvest	Pink Salmon Harvest	Dolly Varden Harvest	Total Harvest	Chinook Salmon	Sockeye Salmon	Coho Salmon	Chum Salmon	Pink Salmon	Dolly Varden	Total
2004	SVT	July 15-21				9	1		10	0	20	0	20	50	15	70
2005	SVT	July 10-15							0	0	20	0	20	50	15	70
2006	SVT	July 10-15		DID NOT FISH						0	20	0	20	50	15	70
2007	SVT	June 30, July 6-15		2					2	0	20	0	20	50	15	70
2008	SVT	August 18-22		DID NOT FISH						0	20	0	20	50	15	70
2009	SVT	July 13-20		DID NOT FISH						0	20	0	20	50	15	70
2010	SVT	July 15-17		DID NOT FISH						0	20	0	20	50	15	70

[a] Seldovia Village Tribe

Table 46.-Harvest and harvest quotas in the Silver Salmon Creek educational fisheries, 2010.

Year	Educational fishery participant [a]	Silver Salmon Creek Saltwater Fishing Period [b]	Sockeye Salmon Harvest	Coho Salmon Harvest	Chum Salmon Harvest	Pink Salmon Harvest	Total Harvest	Fish Quotas				
								Sockeye Salmon	Coho Salmon	Chum Salmon	Pink Salmon	Total
2010	SCF	July 1- Sept. 15			27		27		50			300

[a] Southcentral Foundation

[b] Opening days on Tuesdays, Wednesday, and Friday-Saturday only

APPENDIX A. EMERGENCY ORDERS

Appendix A1.-Emergency orders issued for LCIMA waters during 1996-2010.

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 April 15 through December 31, 1996.
2. E.O. No. 2-KS-1-20-96 extended the Chinook salmon fishery on the Ninilchik River on a continual basis between Saturday, June 15 through Monday, June 24. Effective June 15, 12:01 a.m. through Monday June 24, 1996.
3. E.O. No. 2-SS-1-41-96 opened the Homer spit lagoon to snagging for Chinook salmon and coho salmon. Effective September 8 through December 31, 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 January 1 through December 31, 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 January 1 through December 31, 1997.
3. E.O. No. 2-KS-7-21-97 opened snagging at the Homer Lagoon. Effective 12:00 p.m. July 2 through July 7, 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 August 9 through September 21, 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 silver salmon 16 inches or more in length from one to three in Ninilchik River, Deep Creek, Stariski Creek and the Anchor River. Effective August 29 through October 15, 1997.
7. E.O. No. 2-SS-7-41-97 opened the Homer Lagoon to snagging. Effective August 7 through December 31, 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 May 29 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 May 29 until further notice.

3. E.O. No. 2-KS-7-13-98 opened the Homer Spit and enhancement lagoon to snagging. Effective July 1 through July 7, 1998.
4. E.O. No. 2-RS-7-24-98 closed the Ninilchik Traditional Council Educational Fishery. Effective July 28 through August 10, 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 August 3 through October 1, 1998.
6. E.O. No. 2-PU-7-29-98 closed the personal use dip net fishery in Fox Creek. Effective August 22 through December 31, 1998.
7. E.O. No. 2-SS-7-32-98 opened snagging on the Homer Spit. Effective 12:00 p.m. September 18 through December 31, 1998.

Emergency Orders issued in 1999:

1. E.O. No. 2-KS-7-08-99 opened the Homer Spit fishing lagoon to snagging. Effective 12:00 p.m. June 30 through July 4, 1999.
2. E.O. No. 2-RS-7-19-99 opened China Poot Creek to sockeye dipnetting. Effective 12:00 p.m. August 11 through 12:00 p.m. August 20, 1999.
3. E.O. No. 2-SS-7-24-99 opened Homer Spit and enhancement lagoon to snagging. Effective 12:00 p.m. September 24 through December 31, 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 June 24 through July 2, 2000.
2. E.O. No. 2-SS-7-22-00 opened the Homer Spit and lagoon to snagging. Effective 12:00 p.m. September 22 through December 31, 2000.
1.

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 June 1, 2001 12:01 a.m. until August 31.
2. E.O. No. 2-KS-7-05-01 opened Deep Creek downstream of the regulatory marker for an additional 3-day weekend, June 16, 2001, 12:01 a.m. to June 18, 2001, 11:59 p.m.
3. E.O. No. 2-KS-7-05-02 opened the Ninilchik River downstream of the regulatory marker for an additional 3-day weekend, June 16, 2001, 12:01 a.m. to June 18, 2001, 11:59 p.m.
4. E.O. No. 2-KS-7-10-01 opened the Homer Spit Enhancement Lagoon area to snagging from noon, Friday, June 29, 2001, until 11:59 p.m., Sunday, July 8, 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, July 9, 2001 until superceded by E.O.
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 September 16, 2001 through 11:59 p.m., Monday, December 31, 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 Saturday, June 15, 12:01 a.m. to Monday, June 17, 11:59 p.m., 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, June 28, 2002 until 11:59 p.m., Sunday, July 7, 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 July 19, 2002. The number of pots used to harvest Tanner crab were reduced to are 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 July 19, 2002. The number of pots used to harvest Tanner crab were reduced to are 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, September 13, 2002 through 11:59 p.m. Tuesday, December 31, 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 Saturday, June 14, 12:01 a.m., 2003 to Monday, June 30, 11:59 p.m., 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, June 25, 2003 until 11:59 p.m., Sunday, July 6, 2003.
3. E.O. No. 2-SS-7-24-03 opened the Homer Spit Enhancement Lagoon area to noon, Wednesday, September 17, 2003 until 11:59 p.m., Wednesday, December 31, 2003.

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 may 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 a.m., Saturday, May 29, 2004 until 11:59 p.m. December 31, 2004.
2. E.O. No. 2-KS-7-07-04 opened the Anchor River to fishing on 12:00 a.m., Saturday, June 26, 2004, through 11:59 p.m. June 28, 2004 from its mouth upstream approximately two miles to the Department 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 p.m., Thursday, July 1, 2004 through 11:59 p.m., Monday July 5, 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, September 10 through 11:59 p.m., Friday, December 31, 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 p.m., Wednesday, June 1 until further notice.
2. E.O. No. 2-KS-7-11-05 opened the Homer Spit to snagging king salmon, noon, Wednesday, June 29 through 11:59 p.m., Monday, July 4.
3. E.O. No. 2-RS-7-19-05 rescinds E.O. No. 2-RS-7-4-05, effective Saturday, July 2 at 12:01 a.m.
4. E.O. No. 2-SS-7-29-05 opened the Homer Spit to snagging silver salmon noon, Wednesday, September 14 through 11:59 p.m., Saturday, December 31, 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 Wednesday, June 4 12:01 a.m. until Friday, July 14, 11:59 p.m.. Bait is allowed but only one single hook may 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 p.m., Wednesday, May 31 through Monday, July 31, 11:59 p.m..
3. E.O. No. 2-KS-7-22-06 opened the Homer Spit to snagging king salmon, 12:01 p.m., Thursday, July 6 through 11:59 p.m., Sunday July 9.

4. E.O. No. 2-RS-7-23-06 rescinds E.O. No. 2-RS-7-9-06, effective Thursday, July 6 at 12:01 a.m.

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 a.m., Saturday, May 26 through Sunday, July 15, 12:59 p.m.. Bait is allowed but only one single hook may 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 a.m., Thursday, May 31, 2007 through 11:59 p.m., Tuesday, July 31, 2007.
3. E.O. No. 2-KS-7-23-07 opened the Nick Dudiak Fishing Lagoon to snagging from 12:00 noon, Thursday, July 5, 2007, through 11:59 p.m. Sunday, July 8.
4. E.O No. 2-RS-7-18-07 rescinds English Bay/Pt. Graham closure effective 6:00 a.m., Tuesday June 26, 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 p.m., Saturday, May 31 2008, through 11:59 p.m., Thursday, July 31, 2008.
2. E.O. No. 2-RS-7-15-08 rescinds English Bay/Pt. Graham closure effective 6:00 a.m., Tuesday, July 1, 2008.
3. E.O. No. 2-SS-7-27-08 opened the Nick Dudiak Fishing Lagoon to snagging from 12:00 noon, Friday, September 12, 2008, through 11:59 p.m. Wednesday, December 31, 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 a.m., Saturday, June 6, 2009, through 11:59 p.m., Tuesday, June 30, 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.
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 a.m., Saturday, June 12, 2010, through 11:59 p.m., Wednesday, June 30, 2010. King salmon could not be possessed or retained; king salmon caught may not be removed from the water and must 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 remains 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 a.m., Thursday, July 1, 2010, through 11:59 p.m., Saturday, July 31, 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 a.m., Thursday, July 15, 2010, through 11:59 p.m., Tuesday, March 15, 2011 during open fishing periods.
5. E.O. No. 2-KS-7-36-10 rescinded EO 2-KS-7-28-10 issued June 29, 2010. Effective 12:01a.m., Tuesday, July 13, 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 are open to all sportfishing.

Appendix A2.-Snag opening dates at the Homer Spit Fishing Lagoon.

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Early Chinook	6/24	6/24	6/24	6/24	6/24	6/24	6/28		Wed 7/02-7/07	Wed 7/01-7/05	Fri 6/30-7/4
Coho	Sat 9/02	Mon 9/17	Wed 9/18	Fri 9/18	Wed 9/22	Wed 9/14	Thu 9/14	Sun 9/08	Sat 9/20	Fri 9/18	Fri 9/24
Pink	7/01			7/28	8/04						

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Early Chinook	Sat 6/24-7/2	Fri 6/29-7/8	Fri 6/28-7/7	Wed 6/25-7/6	Thu 7/1-7/5	Wed 6/29-7/1	Thu. 7/6-7/9	Thu.7/5-7/9			
Coho	Fr9/22 i	Sun 9/16	Fri 9/13	Wed 9/17	Fri 9/10	Wed 9/14			Fri 9/12		